April 2014

# VOLUME 7.0 FRESHWATER ENVIRONMENT

## Final Environmental Impact Statement (FEIS) – Meliadine Gold Project

REPORT

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# 7-ᑎᓴᖅᓯᒃ ᑕᓯᖅᓭᒃ ᐃᒪᖅᓭᐅᑕᓂᒃ
# ᐅᓂᐸᑲᓴᒋᒧᒍ ᓇᐃᐧᓴᖅᓯᒪᔪᖅ

## ᐱᔪᓀᑎᕆᐅᔪᖅ

7-ᑎᓴᖅᓯᒃ ᑭᖓᓪᓕᖅᐸᓪᓕᐹᒥᒃ ᓄᓇᒥᒃ ᐊᒪᓗ ᐊᐅᑐᖅᓯᓂᖅᓚᒍ ᐅᖅᑲᐅᓯᐅᔪᖅ (FEIS) ᑕᓯᔪᐊᖅ ᔫᑐᒍᒃ ᐅᓴᖅᑕᕆᓇᒪᒍᒃ ᐱᓕᕆᓇᒪᒍᒃ (ᐱᓕᕆᓇᖅ) ᐃᓯᒪᒃᖅᓯᐅᑕᑎᖅᑲᐅᑐᖅ ᑕᓯᖅᓭᒃ ᐃᒪᖅᓭᐅᑕᓂᒃ. ᐱᔪᓀᑎᓴᐅᔪᖅ 7-ᑎᓴᖅᓯᒃ ᐱᓕᕆᓇᕆᔨᑦᑐᑎᒃ ᒪᓕᒃᑕᐅᔪᒃᐱᐃᑦ ᓴᖅᑭᑎᑕᐅᔪᒃ ᓄᓇᕗᒻᒥᒃ ᐊᐅᓚᑦᑎᓇᓕᒃᑯᓂᒃ ᑲᑎᕋᕐᓂᖅᓴᒃᑯᑦ (NIRB) ᐱᔪᓀᑎᖅᑐᐊᖅᓱᓐᓂᒃ ᐊᐅᑐᖅᓯᓯᐅᑎᐅᔪᓂᒃ ᐱᓕᕆᓇᒥᒃ ᐃᒪᓂᒃ ᓄᓇᐅᔪᓂ ᐊᑦᑕᓐᑐᓂᒃ ᖃᐅᔨᓴᓐᑐᓂᒃᑐᓐᓂᒃ ᐊᐅᑐᖅᓯᓯᐅᑎᐅᔪᓂ ᐃᒪᓗ ᓄᓇᒥᒃ ᐃᒪᓂᒃ, ᐃᒪᓂᒃ ᐃᓕᓴᐃᓕᓴᐅᔪᓂ ᐃᓕᐅᔨᓐᑎᒃ ᐃᒪᐅᔨ ᐊᖏᕐᓂᑕᓴᖅᓯᒪ, ᖃᐅᖅᓯᒪ ᐊᒪᓗ ᑕᓯᔪᐊᒃ ᐊᓐᓇᓄᐊᖅᓯᒪᔪᓂ ᖃᐅᓄᐃᑐᓂᖅᓴᒃᑯᒥᒃ, ᐊᒪᓗ ᐃᖅᑲᐃᑦ ᐃᓕᓴᐅᔪᓂ ᐃᓕᐅᔨᓐᑎᒃ ᐃᒪᐅᔨ ᐊᖏᕐᓂᑕᓴᖅᓯᒪᔪᓂ ᐃᓕᐅᔨᓐᑎᒃ ᐊᐅᑐᖅᓯᓯᐅᑎᐅ

ᐊᓯᖏᑦᓗ ᐱᓕᕆᓕᐊᓂᐅᔪᓄᑦ, ᖃᓄᐃᓕᐅᕈᓐᓃᖅ, ᐊᒻᒪᓗ ᐱᑎᕋᑎᓴᒃᑯᑦ ᐃᒪᖓᓂ ᐃᓕᖅᑯᓯᓚᖅᑐᔪᓄᑦ ᐃᓕᐅᕐᓗᑎᒃ ᐃᒪᐅᕐ ᖃᓄᖅᑕ ᐊᑐᓕᖅᑎᑦ, ᐃᖃᓗᐃᖅᓯᖅᑎᑦ, ᑕᓯᖏᐊᖅᑎᑦ ᑯᓘᓂᑦᓗ, ᑲᖏᖅᓯᓂᖅ, ᐊᒻᒪᓗ ᐃᓗᓕᓴᖏᐊᖅᑎᓗ ᑯᓴᖅ ᐊᖓᑎᖅᓚᖅ.

ᐅᑯᐊ ᐊᖏᕐᓂᓚᖏᓪᓕ ᑭᓪᓕᕆᕐᐅᓄᑦ ᐊᑐᖅᑕᐅᓕᐅᖅᑐᑦ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᑦ ᐃᒪᐅᕐ ᖃᓄᖅᑭᓂ ᐊᒻᒪᓗ ᐃᒪᖅᑎᑦ ᑕᓯᑯᓂ ᐊᓗᐊᓄᐊᖅᓱᓪᓚᕆᐊᖅᑎᑦ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᑦ, ᐃᖃᓗᐃᑦ ᐊᒻᒪᓗ ᐃᖃᓗᐃᑦ ᐃᓂᕕᑐᓂᖅᓯᒪᑦ.

- ᖃᐅᓪᓗᑎᑦ ᓄᓇᐅᔨᒃ ᖃᐅᔨᓴᐃᓂᖅ (LSA) ᓇᓗᓇᐃᖅᑕᐅᓕᐅᖅᑐᑦ ᐃᓕᐅᑎᕐᓗᑎᑦ ᐃᒪᐃᑦ ᐊᒻᒪᓗ ᑯᓘᓪᓕ ᐊᐅᖅᑕᐅᓯᒪᔪᓇᖅᑐᑦ ᐱᓕᕆᓗᒻᒥ ᐃᓕᐅᕐᓂᖅᑕᐅᔨᒪᔨᓄᑦ ᐃᓕᐅᕐᓂᐊᓕᖅᑐᒃ ᓄᓇᕐᓂᐊᓯᖅ, ᓯᖃᐅᑎᑕᖅᓴᔨᑦ, ᐊᔪᖁᑎᑦ, ᐅᑯᐊᐃᖅᓯᒪᔨᑦ ᒪᓂᖅᐹᒥᑦ, ᐊᑐᕐᑎᑕᓄᑦ ᐅᔾᔨᖏᓄᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᑦ ᑯᓘᓂᐊᐅᓚᐅᖏᓐᓄᑦ ᐊᔪᖁᑎᑦ. ᐊᖏᕐᓂᓚᖏᓪᓕ ᖃᐅᓪᓗᑎᑦ ᓄᓇᐅᔨᒃ ᖃᐅᔨᓴᐃᓂᖅ (LSA) ᐊᑲᐅᕈᖏᑦᑑᓂ ᐅᔾᔭᖃᐅᓚᐅᒪᔪᑦ, ᐊᖏᖅᓱᒪᓕᐅᑎᒃ ᐊᑐᖅᑕᐅᔨᒪᔨᖅ ᐊᑐᖅᑯᒥᒃ (AWAR)ᒪᑦ, ᐊᒻᒪᓗ ᑲᖏᖅᓯᒪᓂᖅᑎᑦ ᐱᓕᕆᐊᖓᔨᓄᑦ ᐃᓂᖏᑎᐅᔨᓄᑦ. ᐅᔾᔭᖃᐅᓚᐊᑦ, ᖃᓄᖅᑭᓂ ᓄᓇᐅᔨᒃ ᖃᐅᔨᓴᐃᓂᖅ (LSA)ᑦ ᐃᓕᐅᕐᑎᑦ ᐃᒪᐃᑦ ᐊᒻᒪᓗ ᑯᓘᓪᓕ ᐃᒪᖅᑕᖅᓴᓂᐊᖅᑐᑦ ᐃᒪᐃᖅᑕᐅᔨᓂᖅ ᐊᒻᒪᓗ ᐊᓐᖁᖏᓐᓄᑦ ᐃᓂᖏᑎᐅᔨᓄᑦ. ᐅᔾᔭᖃᐅᓚᐊᑦ, ᖃᓄᖅᑭᓂ ᓄᓇᐅᔨᒃ ᖃᐅᔨᓴᐃᓂᖅ (LSA)ᑦ ᐃᓕᐅᕐᓂᐊᓕᖅᑐᒃ ᐊᒻᒪᓗ ᑯᓘᓪᓕ ᐃᒪᖅᑕᖅᓴᓂᐊᖅᑐᑦ ᐃᒪᐃᖅᑕᐅᔨᓂᖅ ᐊᒻᒪᓗ ᐊᓐᖁᖏᓐᓄᑦ ᐃᓂᖏᑎᐅᔨᓄᑦ.

- ᖃᐅᓪᓗᑎᑦ ᓄᓇᐅᔨᒃ ᖃᐅᔨᓴᐃᓂᖅ (LSA) ᐊᖏᕐᓂᓚᖏᓪᓕ ᐊᑐᖅᑕᐅᔨᒪᔨᖅ ᐊᐅᖅᑯᑎᒃ (AWAR)ᒪᑦ ᐃᓕᐅᕐᑎᑦ ᐃᒪᖅᑎᑦ ᐊᒻᒪᓗ ᑯᓘᓪᓕ ᐊᐅᖅᑯᑎᒃ ᐊᑐᖅᑕᐅᔨᑦ, ᐊᒻᒪᓗ ᓄᓇ 100ᒥᑕᓂᒃ ᐅᖃᓗᐊᖅᑎᓕᒪᑦ ᑭᓪᓕᖅᑲᓐᓂᑦ ᓇᓕᑐᐃᓐᓇᖅᓯᓂᑦ ᐊᐅᖅᑯᑎᒃ ᖃᐅᔨᓴᐃᓂᖅ (LSA) ᑲᑎᒪᔨᖅᑕᐅᓯᒪᓂᖅ ᐱᖓᓱᖏᑦ ᐃᓂᖏᑎᐅᔨᓄᑦ ᐃᓕᐅᕐᓂᐊᓕᖅᑐᒃ ᐊᒻᒪᓗ ᐊᓐᖁᖏᓐᓄᑦ ᐃᓂᖏᑎᐅᔨᓄᑦ.

- ᐊᖏᕐᓂᖅᓯᒪᒃ ᓄᓇᒃ ᖃᐅᔨᓴᐃᓂᖅ (RSA)ᑦ ᐃᓕᐅᑦ ᖃᓄᖅᑭᓂ ᐊᒻᒪᓗ ᑕᓯᐅᑦ ᐊᓗᐊᓄᐊᖅᑎᑦ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᑦ, ᐃᖃᓗᐃᑦ ᐃᒪᐅᕐᓂᐊᓕᖅᑐᑦ ᐃᓕᐅᕐᓂᖅᑕᐅᓕᐅᖅᑐᑦ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᑦ.

## ᐊᓯᖏᓐᓄᓕᒫᓂ ᖃᐅᔨᓴᐃᓂᖅ

ᐊᓯᖏᓐᓄᓕᒫᓂ ᖃᐅᔨᓴᐃᓂᖅᐅᔪᓂ ᖃᐅᔨᓴᐃᓂᖅᑕᕆᖃᖅᑎᑎᔪᓂ ᐊᓯᖏᓐᓄᑦᑎᐅᔨᒪᔨᓂᖅᐹᖅᑐᒃ ᐱᓕᕆᐊᒻᒪᓕᒫᓂᖅᑐᒃ ᐊᒻᒪᓗ ᑲᑎᒪᔨᖅᑕᐅᓕᐅᖅᑐᖅᑐᒃ (ᐊᑐᓚᐊᖃᖅᐸᑦ) ᐊᓯᖏᓐᓄᑦᑎᐅᔨᓴᐃᓂᖅ ᑕᓯᖏᓂ ᐃᓕᐅᔨᓂᖅ. ᐊᓯᖏᓐᓄᓕᒫᓂ ᖃᐅᔨᓴᐃᓂᖅ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᓂᖅ ᐃᓕᓴᕐᓂ, ᐃᓕᐃᑦ ᐃᓕᐅᕐᓂᐊᓕᖅᑐᒃ ᐊᑐᖅᑕᐅᔨᒪᔨᖅ ᐊᒻᒪᓗ ᐊᓯᖏᓐᓄᑦᑎᐅᔨᓴᐃᓂᖅᓯᒪᑦ ᐃᓕᐅᕐᓂᐊᓕᖅᑐᒃ ᐃᓕᐅᕐᓂᖅᑕᐅᓕᐅᖅᑐᖅᑐᒃ ᐊᓯᖏᓐᓄᑦᑎᐅᔨᒪᔨᓂᖅᐹᖅᑐᒃ ᐊᒻᒪᓗ ᐊᓯᖏᓐᓄᑦᑎᐅᔨᒪᔨᓂᖅᐹᖅᑐᒃ ᐃᓕᐅᕐᓂᖅᑕᐅᓕᐅᖅᑐᖅᑐᒃ ᐃᓕᐅᕐᓂᖅᑕᐅᓕᐅᖅᑐᖅᑐᒃ ᐊᓯᖏᓐᓄᑦᑎᐅᔨᒪᔨᓂᖅᐹ

ᑕᒪᐃᓂᒃ, ᐱᓕᕆᐊᖅ ᓂᕆᐅᕐᓴᐅᔪᖅ ᖃᐅᔨᒪᓐᓇᖅᑑᑎᓪᓗ ᒥᑭᔨᐅᒍ ᐊᔪᖕᒪᑦ ᐊᓯᐊᖓᔪᖅᑎᑎᓇᓴᖅᑐᖅ ᐃᒪᖏᑦ ᐊᒪᓗ ᓄᓇᒋᑐᒥᑦ ᐃᒪᐃᑦ ᖃᓄᐃᖓᓂᕆᔨᖓᓂᒃ ᐊᒪᓗ/ᐅᖓᔨᓂᒃ ᖃᓄᐃᑎᐅᓂᕆᔨᖓᓂᒃ.

## ᐃᒪᓄᑦ ᐃᓕᖅᑯᓯᕆᔨᐅᔪᑦ, ᐃᓕᐅᑦᔪᓂ ᐃᒪᐅᑦ ᐊᖏᕐᓂᕆᔨᖓ

ᐊᑦᔪᑯᑎᑎᔨᓗᓂᐊᖅᑐᑦ ᐃᒪᖏᓄᑦ ᐃᓕᖅᑯᓯᕆᔨᐅᓄᑦ ᐃᓕᐅᑦᔪᓂ ᐃᒪᐅᑦ ᐊᖏᕐᓂᕆᔨᖓ ᑕᐃᒪᓐᓇᐃᑐᖅ ᐃᒪᐃᔨᐃᓂᖏᓪᓗᑦ, ᐅᔨᖅᑕᕆᓇᒥᒃ ᐱᓪᓚᕐᓇᓂᖏᓪᓗᓐᓂ, ᐊᒪᓗ ᐊᓯᐊᖓᐃᓂᖏᓄᑦ ᖃᓄᐃᓇᑕᐅᔨᓂᑦ ᐱᓕᕆᓇᑕᒥᑦ. ᐃᓗᓐᓂᔨᐊᓂᒃ ᐱᓪᓚᕐᓇᓂᖏᓄᑦ ᓂᕆᐅᕐᓴᐅᔪᖅ ᐋᖅᑭᒃᓯᐊᓪᓚᕐᓇᓂᖏᓄᑦᑎᒃ ᐊᖏᕐᓂᕆᔨᖓᓄᓗᓐᓂ ᑕᓯᓂᑦ-ᓄᓇᒪᑦ ᓂᕈᐊᖅᑕᐅᔨᓂᒃ ᑯᓗᒃᑑᑦ ᐊᔪᖕᒪᖏᓪᓗᒃ, ᐃᒪᐃᔨᐃᓂᖏᓄᑦ ᓴᐲᑎᑎᓕᓚᓂᖅᓄᓪᓗᓐᓂ ᖃᓄᐃᓇᑕᐅᓂᖏᓄᑦ ᐃᓐᓇᕐᓂᖏᓪᓗᒃ ᐃᒪᐃᓗ ᐊᒃᑎᒥᓂᕆᔨᖓᓂᖏᓪᓗᒃ ᐱᔨᐅᑎᓪᓗᑎᒃ ᐃᓐᓇᕐᓂᖏᓪᓗᒃ ᐃᒪᐃᓗ ᐊᒃᑎᒥᓂᕆᔨᖓᓂᖏᓪᓗᒃ ᐊᒃᑐᖅᑕᐅᖏᓂᑐᓂᒃ ᐃᒪᓐᓇᑦ. ᒡᒃᑯᐊ ᐊᒃᑐᖅᓯᓂᒃ ᐊᔨᔪᕐᖓᓂᖏᓪᓗᓂᖅᓇᓂᖅᑐᓂᒃᑐᖅᓯᓂᒃ ᐅᓂᒃᑐᓄᑦ ᐃᓐᓇᕐᓂᖏᓪᓗᒃ ᐃᒪᐃᓗ ᑕᓯᓂᒃ ᐊᒃᑐᖅᑕᐅᖏᓂᑐᓂᒃ ᐃᒪᐃᓗ ᐱᓕᕆᓇᒥᒃ ᐱᓕᕆᓇᒥᒃ (AWAR)ᑎᑦ ᐊᒪᓗ ᑲᖏᖅᑯᓂᖅᑎᑦ ᐊᑦᔪᓯᓯᖅᑕᐅᔨᖅ ᐊᖏᕐᓗᐊᖅᓱᖏᓪᓕᓯᔨᖓᓄᑦᑎᒃ ᖃᓄᐃᑕᐅᔨᖅᓴᖅ ᐊᑦᔪᓯᑎᑎᒃ ᐊᑦᔪᓯᑎᑎᓇᓴᖅᑐᖅ ᐊᖏᕐᓗᐊᖅᓱᖏᓪᓕᓯᔨᖓᓄᑦᑎᒃ ᐊᒃᑐᖅᑕᐅᖏᓂᑐᓂᒃ ᐃᓐᓇᕐᓂᖏᓪᓗᒃ ᐃᓕᖅᑯᓯᕆᔨᐅᔪᑦ ᐃᒪᐃᓗ ᐊᖏᕐᓂᕆᔨᖓᓄᑦ ᑕᓯᔨᖅᑕᐅᔨᓂᖏᓪᓗᒃ ᐃᓕᖅᑯᓯᕆᔨᐅᔪᑦ ᐃᒪᐃᓗ ᐊᖏᕐᓂᕆᔨᖓᓄᑦ ᐊᖏᕐᓂᕆᔨᖓᓄᑦ ᐃᒪᐃᓗ

ᐊᓯᐊᖓᔪᓂᒃ ᑕᓯᐅᑦ ᐊᓗᐊᓄᐊᖅᓯᒪᔪᑦ ᖃᓄᐃᑐᒋᓕᒃ ᐱᔪᑎᑎᑦᓗᒍ (TSS) ᐅᕙᓗᑐᒋᓕᒃ ᐱᖁᐅᔪᓂᒃ ᖃᑎᖅᑎᓇᖃᑎᒌᒋᔪᓕᒃ ᐊᑐᖅᓯᓂᖃᕐᓂᐊᓯᓯᕐᓂᑦᑐᑦ ᐊᓯᐊᖓᔪᓂᒃ (TSS)ᓗᑦ ᐃᒪᔪᑦ ᓂᓚᐅᑎᐅᖅᓯᒪᒪᒃ. ᓴᐃᑦ ᑲᑎᖅᓯᖅᓯᒪᔪᑦ ᓂᓚᐅᑎᐅᖅᔪᑦ ᐊᔪᐃᖅᑐᓂᖃᓕᒫᓂᖅᑐᓂᖃᕐᓂᐅᑐᓂᒃ ᐃᒪᓂᑦ, ᐃᓕᖅᑎᑦ ᐃᒪᐃᑦ ᐊᖏᕐᓄᑦᓂᖃᑦᓂᖃᕐᓂᐅᑐᓂᒃ ᐃᓕᖅᑐᓂᒃ ᓴᐃᔅᓂᐊᕐᓂᐅᑐᓂᒃ ᐃᓕᖅᑐᓂᒃ ᐊᖏᕐᓄᑦᓂᖃᑦᓂᖃᕐᓂᐅᑐᓂᒃ ᐃᓕᖅᑐᓂᒃ ᐅᕙᓗᑐᒋᓕᒃ ᐃᓕᖅᑐᓂᒃ ᓴᐃᔅᓂᐊᕐᓂᐅᑐᓂ

ᐊᑐᖅᓂᓕᖏᓐᓄᑦᓂᒃ ᐃᖅᑲᓐᓂᒃ ᑕᒫᓂ ᖃᐅᔨᓴᐃᓂᖅᑭᒃ ᐊᒪᓗ ᑕᒫᓂ ᓄᓇᐅᑦ ᐊᓯᐊᓂᑦ. ᓇᓗᓇᖅᑐᑦ ᓇᓕᐅᑦᓯᓐᓂᑦ ᐅᖃᐅᓯᐅᓕᐅᖅᑐᑦ ᐅᖏᓪᓕᐅᑎᓗᐊᖅᑐᓂᒃ ᐊᐅᑐᖅᓯᐅᐊᓂᖓᓇᖅᑐᓂᒃ ᐊᒪᓗ ᐃᓕᖅᑯᓯᑎᒍᑦ ᐃᓕᐅᑎᕆᑎᑦᓯᓂᖅ ᐃᓂᖅᖃᕕᐅᔪᓂᒃ ᐱᖓᓱᓕᕐᓂᖅ ᐱᐊᓂᕈᐅᓂᖅᓂᒃ ᐃᓕᓕᐅᑎᓗᒍ ᐊᓯᔨᓴᕐᑎᓂᖅᓯᒪᓂ ᐊᕐᕌᖅᑐᑦᓯᒪᓂ ᐱᖓᓱᓕᕐᓂᖅ.

## ᖃᐅᔨᓴᖃᕐᓂᖅᓂᖅ ᐊᒪᓗ ᖃᐅᔨᓴᕆᐊᖃᓂᖃᕐᓂᖅᓂᖅ

ᖃᐅᔨᓴᖃᕐᓂᖅᓂᖅ ᐱᓕᕌᐊᓂᒃ ᐊᑐᓕᖅᑎᑕᐅᔪᓂ ᐱᓕᕌᐊᖅᑲ ᐊᐅᓕᓂᖅᓴᓂᓂ ᐅᑯᐊ ᑲᑎᖅᓯᒪᓗᑎᐅᔪᖓᓇᖅᑐᓂᒃ ᓄᓇᕐᑐᒃ ᖃᐅᔨᓴᐃᖃᕐᓂᖅᓂᖅ ᖃᓄᐃᔅᑐᐅᔪᖓᓂᒃ ᖃᐅᔨᓴᐃᓂᖅᓯᒪᓂ ᐊᒪᓗ ᐊᑐᓕᖅᑎᑕᐅᓂᖅᓯᒪᓂ ᒥᓂᕆᐊᖅᑎᑕᐅᓂᖅᓯᖅᑐᒃ ᐱᓴᕌᐊᓕᒃ ᐊᑐᓪᓗᒍ ᐊᒪᓗ ᖃᐅᔨᓴᕆᐊᖃᓂᖃᕐᓂᖅᓂᒃᑐᓗᒍ ᓇᓗᓇᐃᕈᓪᓚᓪᓗᒍ ᓄᓚᒪᐅᑎᓪᓚᓂᑦ ᐊᐅᓚᑦᑎᓂᒃ ᐊᒪᓗ ᐊᑐᓕᖅᑎᑕᐅᓂᖅᓯᒪᓂ ᒥᓂᕆᐊᖅᑎᑕᐅᓂᖅᓯᖅᑐᒃ ᐱᓴᕌᐊᓕᒃ ᓚᓪᓕᓪᓗᒍ.

ᖃᐅᔨᓴᖃᕐᓂᖅᓂᖅ ᐱᓕᕌᐊᓂᒃ ᐃᓚᖓᓂ ᓄᓇᐅᑦ ᐊᑕᓄᑐᓂᒃ ᖁᓪᓚᓄᑐᓂᓪᓕᓄᑦᓂ ᐊᒪᓗ ᓄᓇᒥᑦ ᐃᓚᖓᓄᑦ, ᐊᒪᓗ ᐃᓚᖓᓄᑦ ᐃᓕᓴᕐᓂᖅᓴᐅᔪᓂᒃ ᐃᓕᐅᓂᐊᖅᑐᓂᒃ ᖃᐅᔨᓴᐃᓂᖅᓂᒃ ᐃᓚᐅᑦ ᖁᓪᓚᓄᑐᓂᒃ ᐃᓚᖓᓄᑦ ᐃᖏᕐᕋᓂᖅᓯᒪᓂᒃ ᐊᒪᓗ ᓄᓇᒥᑦ ᐃᓚᖓᓄᑦ ᐃᓕᓴᕐᓂᖅᓯᒪᓂᒃ ᐊᒪᓗ ᓄᓇᒥᑦᑎᓪᓗᒍ ᒥᓂᕆᐊᖅᑎᑕᐅᓂᖅᓯᖅᑐᒃ ᐱᓴᕌᐊᓕᒃ (LSA)ᒥᑦ ᐊᒪᓗ ᐱᓕᕌᐊᑦ ᐃᓗᓪᓕᕆᐊᖃᕐᓂᑦ ᐊᐅᓪᓚᕐᓂᖅᓴᖅᓯᒪᓕᒃ ᓇᓂᕐᕕᓂᐊᓂᖅᓴᖅᓯᒪᓕᒃ ᐱᓕᕌᐊᑦ. ᖃᑎᖅᑭᐅᓂᒃᑯᑦ ᖃᐅᔨᓴᐃᖃᕐᓂᖅᓂᖅᑕᖃᖃᕐᓂᖅᓂᐊᖅᑎᒋᔪᖅ ᖃᐅᔨᓴᐃᓂᖅᓂᐊᖅᑐᓂ ᐃᓗᐃᑐᐃᓐᓇᕆᐊᖃᓕᒫᓂᖅᓯᒪᓕᒃ ᐱᓕᕌᐊᑦ ᐃᓗᐃᑐᐃᓐᓇᕆᐊᖃᓕᒫᓂᖅᓯᒪᓕᒃᓯᒪᓂᒃ ᐱᓕᕌᐊᑦ. ᖃᑎᖅᑭᐅᓂᒃᑯᑦ ᖃᐅᔨᓴᐃᖃᕐᓂᖅᓂᖅᑕᖃᖃᕐᓂᖅᓂᐊᖅᑎᒋᔪᖅ ᖃᐅᔨᓴᐃᓂᖅᓂᐊᖅᑐᓂ ᐃᓗᐃᑐᐃᓐᓇᕆᐊᖃᓕᒫᓂᖅᓯᒪᓕᒃ ᐱᓕᕌᐊᑦ ᐃᓗᐃᑐᐃᓐᓇᕆᐊᖃᓕᒫᓂᖅᓯᒪᓕᒃᓯᒪᓂᒃ ᐱᓕᕌᐊᑦ. ᖃᑎᖅᑭᐅᓂᒃᑯᑦ ᖃᐅᔨᓴᐃᖃᕐᓂᖅᓂᖅᑕᖃᖃᕐᓂᖅᓂᐊᖅᑎᒋᔪᖅ ᖃᐅᔨᓴᐃᓂᖅᓂᐊᖅᑐᓂ ᐃᓗᐃᑐᐃᓐᓇᕆᐊᖃᓕᒫᓂᖅᓯᒪᓕ

# VOLUME 7 FRESHWATER ENVIRONMENT
# EXECUTIVE SUMMARY

## *Purpose*

Volume 7 of the Final Environmental Impact Statement (FEIS) for the Meliadine Gold Project (Project) considers the freshwater environment. The purpose of Volume 7 is to address the Guidelines issued by the Nunavut Impact Review Board for the Project, specifically relating to the impact of the Project on hydrogeology and groundwater, hydrology including water quantity, surface water and sediment quality, and fish and fish habitat.

The assessment includes potential direct and indirect changes resulting from Project-related components and associated activities, and evaluates all Project phases, including construction, operation, maintenance, and temporary, final, and post-closure activities. Cumulative effects for existing and reasonably foreseeable projects in the Project area have been incorporated, where applicable.

## *Study Areas*

To facilitate the assessment and interpretation of potential effects associated with the Project, it is necessary to define appropriate spatial boundaries. The freshwater spatial boundaries were delineated based on the concepts of watershed boundaries, the predicted spatial extent of the Project-related effects and the life history attributes of valued ecosystem components (VECs) potentially influenced by the Project.

The following spatial boundaries were used for purposes of the hydrogeological and groundwater assessment:

- the local study area (LSA) was defined to consist of the Project facilities, open pits and underground mine, buildings and infrastructure, and the nearest lakes with open taliks (unfrozen ground surrounded by permafrost extending to the deep groundwater regime); and
- the regional study area (RSA) was defined to include regional lakes with open taliks sufficient to define the regional groundwater flow directions.

For purposes of the hydrology assessment, the following spatial boundaries were used.

- The LSA was defined to include watersheds that contain a proposed component of mine infrastructure, including camp, mill, roads, open pits, and waste rock and tailings storage facilities, as well as sections of watercourses at road crossings. The extent of the LSA for hydrology varies between the main Project areas (i.e., mine site, All-weather access road [AWAR], and Rankin Inlet).

  For the mine Project location, the LSA includes watersheds under the direct mine footprint and the Meliadine Lake watershed. The LSA for the AWAR and Rankin Inlet bypass road includes sections of watercourses crossed by the road corridor at the watercourse crossing locations.
- The RSA was defined to consider the effects of the mine, the AWAR, and development at Rankin Inlet, along with other developments, activities, and natural factors that influence hydrology including surface water quantity within the Atulik, Char River, Dry Cove, Meliadine Lake, Meliadine River, Rankin Inlet, and Thompson watersheds.

The following spatial boundaries were used for the surface water and sediment quality, fish and fish habitat assessments:

- The LSA was defined to include waterbodies and watercourses potentially affected by a proposed component of Project infrastructure including camp, mill, roads, open pits, waste rock and tailings storage

facilities, and effluent discharge point. The extent of the LSA varies for the mine site, AWAR, and Rankin Inlet project areas. For the mine site, the LSA includes waterbodies and watercourses that are both under the direct mine footprint or downstream of the footprint within a contributing sub-basin. The LSA also includes those waterbodies and watercourses that will receive water from dewatered ponds and treated effluent discharge.

- The LSA for the AWAR includes watercourses crossed by the road corridor, and the area 100-m to either side of the centre line of the corridor at all watercourse crossings. The LSA for Rankin Inlet includes watercourses crossed by the Rankin Inlet bypass road, and other Project infrastructure with the potential for direct impact to surface water.
- The RSA for surface water and sediment quality, as well as fish and fish habitat, is the same as that used for the hydrology assessment.

### *Effects Analysis*

An effects analysis provides the general approach to analyzing potential Project-specific and cumulative (where applicable) effects on the freshwater environment. The effects analysis for hydrogeology and groundwater, hydrology including water quantity, surface water and sediment quality, and fish and fish habitat VECs followed the assessment methodology described in Volume 4 of the FEIS.

### *Effects from the Project on the Freshwater Environment*

**Hydrogeology and Groundwater**

While groundwater within the LSA is a VEC it does not have assessment endpoints. Groundwater is not used as a resource by local populations and is not anticipated to become a resource in the future. This examination included an assessment of both changes to groundwater and hydrogeology that are specific to that system, and changes to groundwater and hydrogeology that may present potential effect pathways to other VECs. Changes in hydrogeology and groundwater by itself can only be evaluated in context to how it changes the other components such as fish habitat. As a result, potential effects to groundwater were examined, but residual impacts were not classified The Project is expected to result in no detectable to negligible environmental change in groundwater and hydrogeology quality and/or quantity.

**Hydrology, including Water Quantity**

Primary pathways for hydrology including water quantity are the result of dewatering, mine infrastructure development, and diversion activities for the Project. Infrastructure development is anticipated to modify the size and lake-to-land ratio of select watersheds, while dewatering and diversion activities will augment flows and water levels in receiving waterbodies, and/or reduce flows and water levels in bypassed waterbodies. These effects will vary over time and between the various Project phases.

Overall, the potential residual effects on flows, water levels, and channel/bank stability from dewatering, infrastructure development, and diversions are expected to be negligible. Potential residual effects from the AWAR and Rankin Inlet bypass road are also expected to be negligible compared to baseline conditions. Classification of the significance of the residual effects on hydrology including water quantity is provided in the fish and fish habitat section.

Cumulative effects to hydrology including water quantity from existing and reasonably foreseeable projects in the RSA are also expected to be negligible and are anticipated to be confined to the Atulik, Char River, Diana River, Dry Cove, Meliadine Lake, Meliadine River, and Thompson watersheds.

**Surface Water and Sediment Quality**

Water and sediment quality has a linkage to both ecological and human health VECs. Assessment of water and sediment quality provides a basis for evaluating aquatic ecosystems to determine whether water quality during each phase of the Project meets acceptable levels for the protection of aquatic life, source drinking water, and water for wildlife consumption.

Primary pathways to water and sediment quality include potential Project effects from the release of mine wastewater, and from alteration of watersheds and deposition of dust and metals from air emissions. Based on the results of the effects analysis, only minor changes in Meliadine Lake water and sediment quality are expected, with no water quality parameters predicted to exceed Canadian Council of Ministers of the Environment guidelines for the protection of aquatic life.

Changes to water and sediment quality in the small waterbodies surrounding the Project site could result from diversion of water, changes in watershed size and contributing areas, natural hydrological processes, evaporation, and aerial deposition of particulate matter (modelled as total suspended solids [TSS]), nutrients from blasting activities (modelled as nitrate), and metals. Aerial deposition from mine activities are expected to increase from baseline levels during preproduction, peak during pit development, and decrease to baseline levels by closure. TSS and nitrate concentrations are not predicted to increase to levels that would affect aquatic life, and changes to sediment quality as a result of TSS or nutrient input from blasting activities are not expected since changes to TSS and nitrate in water are not expected. Metal concentrations are predicted to vary between waterbodies, with some waterbodies experiencing increases for select metals above guidelines and/or greater than 10% from baseline conditions.

Effects to water and sediment quality are anticipated to be confined to the Meliadine Lake watersheds and are expected to vary over time and between the various Project phases. Classification of the significance of the residual effects on water and sediment quality is provided in the fish and fish habitat section. Cumulative effects to water and sediment quality from existing and reasonably foreseeable projects in the Project area are expected to be negligible.

**Fish and Fish Habitat**

The effects assessment for fish and fish habitat includes potential changes resulting from Project-related components and associated activities, including air quality, water quality, and water quantity.

Project primary pathways influencing the abundance and distribution of fish were determined to be negligible to moderate in magnitude, local to regional in geographic extent, and medium-term to permanent in duration. The range in scales in the residual impact classification reflects the number of pathways and related mechanisms that were predicted to affect aquatic habitat and fish, specifically Arctic char, lake trout, and Arctic grayling. Pathways included direct impacts related to habitat quantity and fragmentation, indirect impacts from the Project on the quality of habitat (i.e., water quality), and direct impacts from increased harvest on survival. The probability of impacts occurring is predicted to be likely to highly likely for the primary pathways, which does not change the expected magnitude and duration (or environmental significance). Similarly, the frequency of most impacts is anticipated to occur continuously throughout construction and operation, except for impacts associated with fish harvests.

The incremental and cumulative impacts from the Project are predicted to not significantly influence the long-term maintenance of self-sustaining populations of Arctic char, lake trout, and Arctic grayling in the region. The scale of impacts from the Project pathways, independently or combined, should not be large enough to cause irreversible changes at the population level and decrease the resilience of the VECs. The largest impact from the

Project could be for Arctic grayling that move through and use aquatic habitats within a subset of the LSA waterbodies. However, the impacted area is considered to be a small proportion of the region based on the typical spatial extent of Arctic grayling populations. Although there could be a local change in the distribution of fish species, people that fish in the region should not observe a major change in the availability of fish due to impacts from the Project, relative to current natural changes in population sizes and distributions.

The incremental changes to the quantity, quality, and spatial distribution of habitats should not have a significant impact on the structure and function of fish populations in the ecosystem. Also, the risk to fish health (survival, reproduction) as a result of the Project will be low. Therefore, the Project should not have a significant adverse impact on the continued opportunity for traditional and non-traditional use of fish in the local study area and beyond. Uncertainty in predictions was addressed by overestimating impacts and conservatively omitting habitat gains that will be achieved as part of the Offsetting Plan for the Project.

### *Monitoring and Follow-up*

Monitoring programs implemented during the life of the Project may be a combination of environmental monitoring to track conditions and implement further mitigation as required and follow-up monitoring to verify the accuracy of effect predictions and adaptively manage and implement further mitigation as required.

Monitoring programs for hydrogeology and groundwater, and hydrology will include monitoring of surface and groundwater flows, water quality and levels at key locations in the LSA and Project infrastructure during all phases of the Project. Visual inspections will also be undertaken to assess the integrity of shorelines, outlets and stream crossings to monitor for the development of channel or bank erosion.

In addition, an Aquatic Effects Monitoring Plan (AEMP) will be implemented, which takes into account the range of Project activities and potential Project-environment interactions identified as being of concern for the aquatic ecosystem. The purpose of the AEMP is to provide information on the health of the aquatic receiving environment, and will include routine monitoring of water quality in lakes and streams, and the health of fish and other aquatic life and their habitat in the freshwater environment.

The AEMP will function as an integrated monitoring program, which considers a variety of pathways identified as pertinent to potential effects of the Project on the aquatic environment. The AEMP will be designed to address predicted impacts to the aquatic environment related to changes in surface water quantity and quality, sediment quality, aquatic life, fish habitat and fish health due to physical alterations of the watersheds, and water and air emissions during construction, operations and closure.

The AEMP will be developed in consultation with Inuit communities, stakeholders, and regulatory authorities. Incorporation of Traditional Knowledge (TK) into the AEMP design will be actively pursued during the consultation period.

# Abbreviation and Acronym List

| | |
|---|---|
| AEM | Agnico Eagle Mines Limited |
| AEMP | Aquatic Effects Monitoring Plan |
| AFDM | Ash-free Dry Mass |
| ARD | Acid Rock Drainage |
| AWAR | All-weather Access Road |
| CCME | Canadian Council of Ministers of the Environment |
| COPC | Chemicals of Potential Concern |
| CWQG | Canadian Water Quality Guidelines |
| DFO | Department of Fisheries and Oceans |
| EEM | Environmental Effects Monitoring |
| FEIS | Final Environmental Impact Statement |
| GIS | Geographical Information System |
| Golder | Golder Associates Ltd. |
| GPS | Global Positioning System |
| HQ | Hazard quotient |
| HU | Habitat Unit |
| IQ | Inuit Qaujimajatuqangit (see note [1]) |
| ISQG | Interim Sediment Quality Guidelines |
| LSA | Local Study Area |
| NAG | Non-acid Generating |
| NIRB | Nunavut Impact Review Board |
| NNL | No Net Loss |
| NTS | National Topographic System |
| PAG | Potentially Acid Generating |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PEL | Probable Effect Level |
| PPV | Peak Particle Velocities |
| Project | Meliadine Gold Project |
| RSA | Regional Study Area |
| TDS | Total Dissolved Solids |
| TSF | tailings storage facility |
| TSS | Total Suspended Solids |
| VEC | Valued Ecosystem Component |
| VSEC | Valued Socio-Economic Component |

*Note: [1] IQ symbol appearing in right hand margin denotes where IQ is referenced in the assessment.

# Index of Freshwater Fish Species Found in the Local Study Area

| Common Name | Scientific Name | Inuktitut Name | Image |
|---|---|---|---|
| Arctic char | *Salvelinus alpinus* (Linnaeus) | ᐃᖃᓗᓕᕆᔨ / ᑕᓪᓕᐅᑎᐅᑕᖅ |  |
| lake trout | *Salvelinus namaycush* (Walbaum) | ᐃᓱᒋᖅ |  |
| Arctic grayling | *Thymallus arcticus* (Pallas) | ᐊᒥᒋᓪᓗᐊᖅ |  |
| round whitefish | *Prosopium cylindraceum* (Pennant) | ᓱᓗᐊᐸᐅᒐᓕᒃ |  |
| cisco | *Coregonus artedi* Lesueur | ᐊᒥᒋᓪᓗᐊᖅ |  |
| burbot | *Lota lota* (Linnaeus) | ᑎᑭᒃᑕᒃ |  |
| slimy sculpin | *Cottus cognatus* Richardson | ᑲᓇᕐᖅ |  |
| ninespine stickleback | *Pungitius pungitius* (Linnaeus) | ᑲᑭᓪᓚᒃ |  |
| threespine stickleback | *Gasterosteus aculeatus* Linnaeus | ᑲᑭᓪᓚᒃ |  |

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# 7.0 FRESHWATER ENVIRONMENT

## 7.1 Spatial and Temporal Boundaries

To assess potential effects of the Meliadine Gold Project (Project) on the Freshwater Environment (hydrogeology and groundwater; hydrology including water quantity; surface water quality; and fish and fish habitat) appropriate spatial boundaries need to be defined. The Local Study Area (LSA) is the area where there exists the potential for measurable impacts due to Project activities. The Regional Study Area (RSA) is the area within which there exists the potential for residual effects, including direct and indirect effects, as well as incremental effects from the Project and cumulative effects from historical, existing, and reasonably foreseeable developments, including the Project.

The LSAs and RSAs for the Freshwater Environment were defined for baseline studies, which were initiated before the Guidelines for the Project were issued. The boundaries for these areas were developed based on 2 concepts:

- Watershed (both surface water and groundwater) boundaries; and
- Predicted extent of residual effects from the Project.

The spatial boundaries were set so that all the potential residual effects (direct and indirect) of the Project would fall within the study area boundaries.

The approach used to determine the temporal boundaries of effects from natural and human-related disturbances on Valued Ecosystem Components (VECs) and Valued Socio-Economic Components (VSECs) is similar to the approach used to define spatial boundaries. In this assessment, temporal boundaries are linked to 2 concepts:

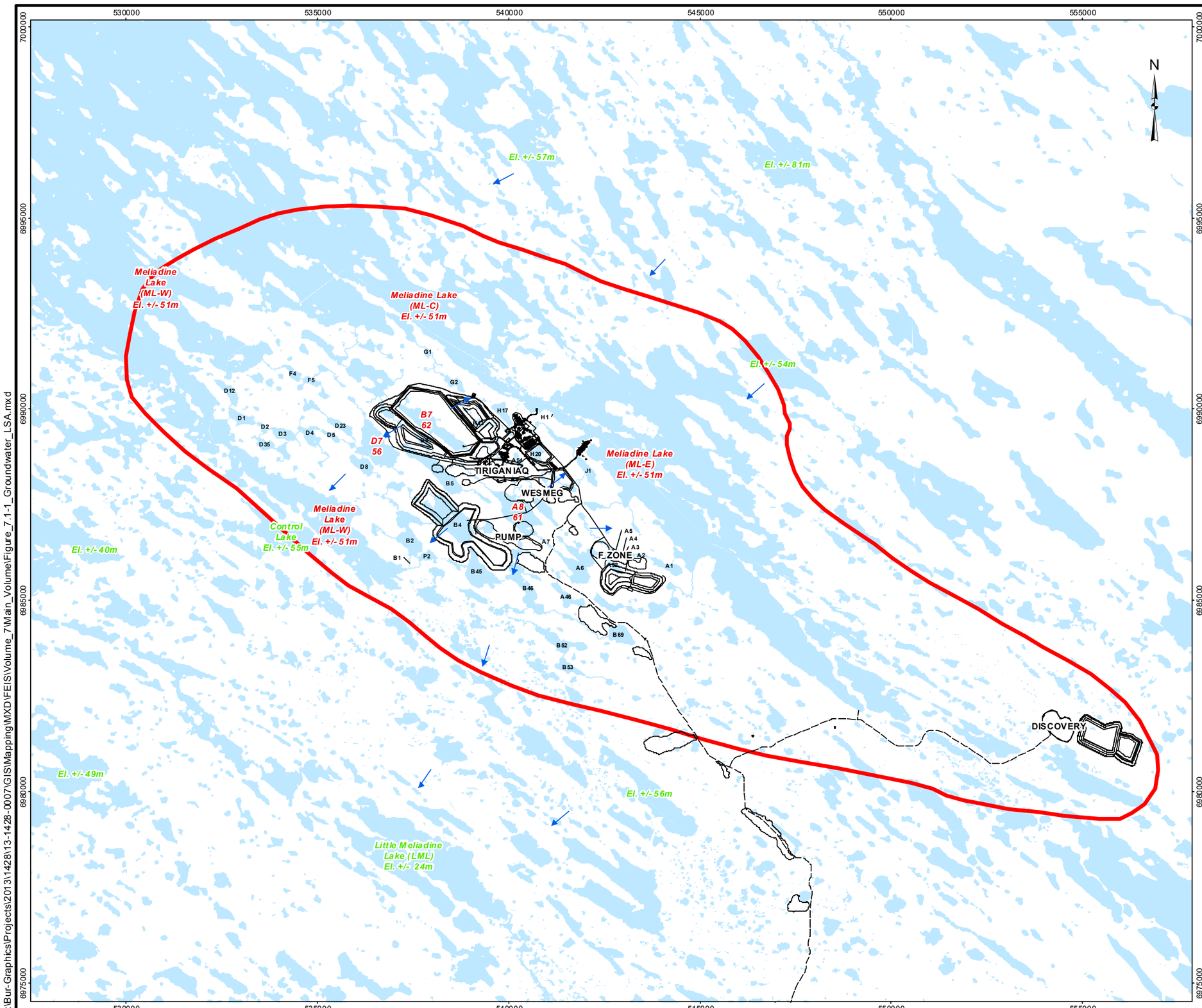
- the development phases of the Project (i.e., construction, operation, maintenance, temporary closure [care and maintenance], final closure [decommissioning and reclamation]); and
- the predicted duration of effects from the Project on a VEC or VSEC, which may extend beyond final closure (i.e., post-closure).

Thus, the temporal boundary for a VEC or VSEC is defined as the amount of time between the start and end of a relevant Project activity or stressors (which are related to development phases), plus the duration required for the effect to be reversed (NIRB 2012a).

### 7.1.1 Hydrogeology and Groundwater

#### *7.1.1.1 Local Study Area*

The LSA for hydrogeology and groundwater includes all the Project facilities, open pits and underground mine, buildings and infrastructure and the nearest lakes with open taliks, as presented on Figure 7.1-1.




**LEGEND**

- Groundwater Local Study Area (LSA)
- Inferred Ground Water Flow Direction
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

*Red Lake Label* — Surface Area and Depth Large Enough to Support an Open Talik

*Green Lake Label* — Surface Area Large Enough to Support an Open Talik (Bathymetry Unavailable)

**REFERENCE**

Lake elevations obtained from the Schlenker Survey where available. Otherwise, lake elevations obtained from the 1:50,000 National Topographic Data Base.
Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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MELIADINE GOLD PROJECT
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TITLE
**HYDROGEOLOGY AND GROUNDWATER LSA**

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|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
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| GIS | CDB | 02 Mar. 2012 | | |
| CHECK | SM | 18 Jun. 2012 | | |
| REVIEW | DC | 18 Jun. 2012 | | |

**FIGURE 7.1-1**

Golder Associates

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#### 7.1.1.2 Regional Study Area

The extent of the RSA for hydrogeology and groundwater includes regional lakes with open taliks sufficient to define the regional groundwater flow directions, as presented on Figure 7.1-2.

#### 7.1.1.3 Temporal Boundaries

Groundwater flow velocities are much slower than surface water flow velocities; therefore, temporal boundaries for groundwater may extend over longer periods of time than surface water boundaries. The duration of the development phase includes pre-production that is expected to occur over three years, mine operations over 13 years, and initial long-term closure over 10 years. The predicted duration of effects from the Project on groundwater quality and quantity after the development phase may extend 100's of years beyond closure.

### 7.1.2 Hydrology including Water Quantity

#### 7.1.2.1 Local Study Area

The LSA for hydrology includes watersheds that contain a proposed component of mine infrastructure, including camps, mills, roads, open pits, and tailings and waste rock storage facilities. It also includes watercourses with watercourse crossings. The extent of the LSA for hydrology varies between the main Project locations (i.e., mine site, All-weather Access Road [AWAR], and Rankin Inlet).

For the mine project location, the LSA includes watersheds under the direct mine footprint, including watersheds A, B, C, D, E, G, H, I, J, P, X, CH, and the Meliadine Lake watershed, as presented on Figure 7.1-3. The LSA for the AWAR and Rankin Inlet Road includes sections of watercourses crossed by the road corridor at the watercourse crossing locations, as presented on Figure 7.1-4.

#### 7.1.2.2 Regional Study Area

The mine site, AWAR, and Rankin Inlet bypass road are located within the Atulik, Char River, Dry Cove, Meliadine Lake, Meliadine River, Rankin Inlet, and Thompson watersheds. Therefore, the RSA for hydrology including water quantity was defined to consider the effects of the mine, the AWAR, and development at Rankin Inlet along with other developments, activities, and natural factors that influence hydrology including surface water quantity within these watersheds (Figure 7.1-5). The proposed RSA was the same spatial extent considered for water and sediment quality, and fish and fish habitat.

#### 7.1.2.3 Temporal Boundaries

The Project will result in effects to hydrology including water quantity which will vary over time. The effects are projected to occur during all phases of the Project, with certain effects that will continue after Closure for the long-term.

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525000 530000 535000 540000 545000 550000 555000 560000

7000000 6995000 6990000 6985000 6980000 6975000

N

El. +/- 57m

El. +/- 81m

El. +/- 54m

El. +/- 40m

El. +/- 49m

El. +/- 56m

Meliadine Lake (ML-W) El. +/- 51m

Meliadine Lake (ML-C) El. +/- 51m

Meliadine Lake (ML-E) El. +/- 51m

Meliadine Lake (ML-W) El. +/- 51m

Control Lake El. +/- 55m

Little Meliadine Lake (LML) El. +/- 24m

TIRIGANIAQ

WESMEG

PUMP

F ZONE

DISCOVERY

B7 62

D7 56

A8 61

G1 G2 F4 F5 D12 D1 D2 D3 D4 D5 D23 D35 D8 B5 B4 B2 B1 P2 B45 B46 A46 H17 H11 H20 A44 J1 A7 A6 A5 A4 A3 A2 A1 B52 B53 B69

## LEGEND

- Groundwater Regional Study Area (RSA)
- Inferred Ground Water Flow Direction
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

*Red Lake Label* — Surface Area and Depth Large Enough to Support an Open Talik

*Green Lake Label* — Surface Area Large Enough to Support an Open Talik (Bathymetry Unavailable)

## REFERENCE

Lake elevations obtained from the Schlenker Survey where available. Otherwise, lake elevations obtained from the 1:50,000 National Topographic Data Base.
Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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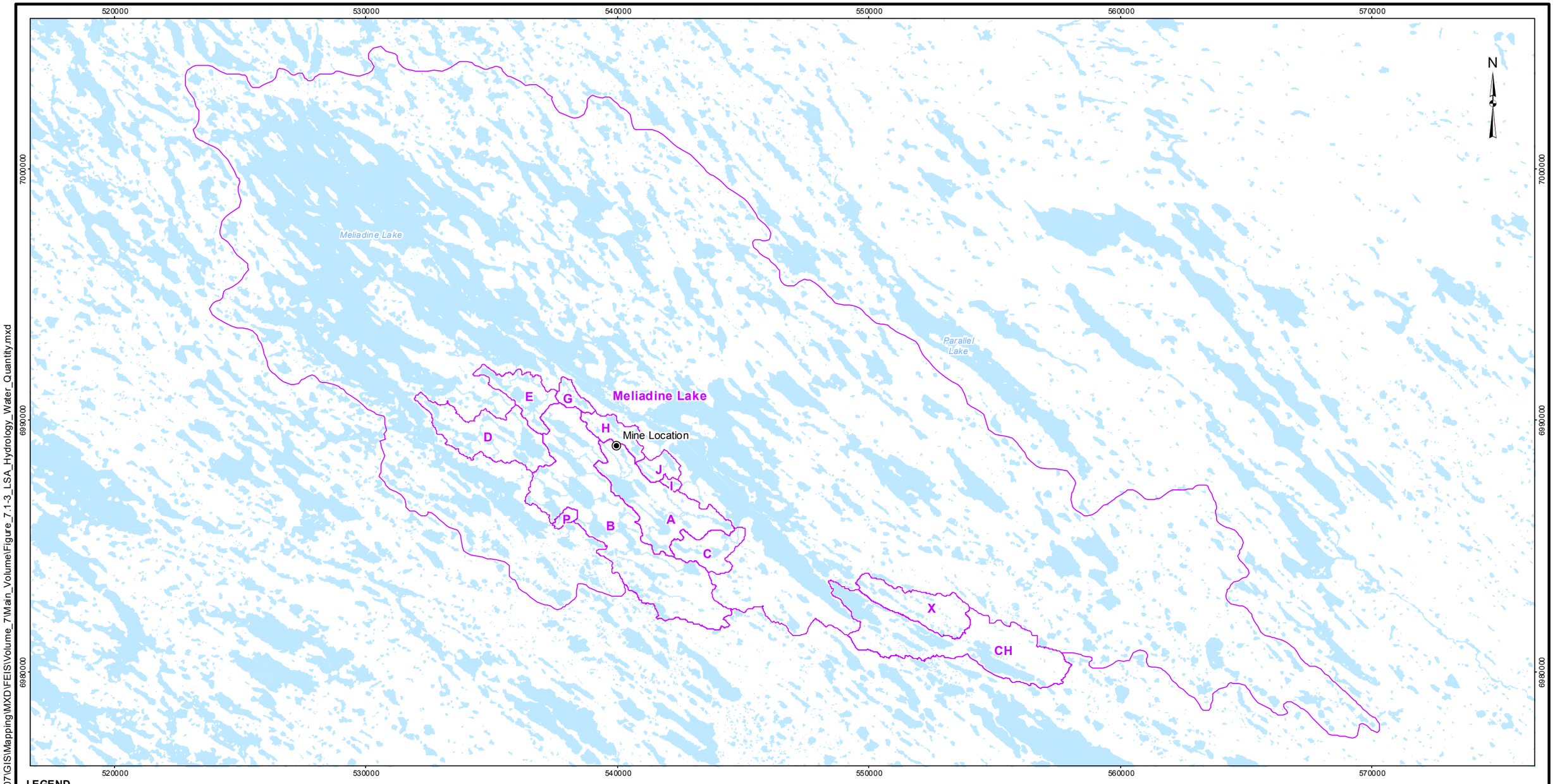
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TITLE
# HYDROGEOLOGY AND GROUNDWATER RSA

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| GIS | DSC | 25 Oct. 2012 | | |
| CHECK | SM | 07 Jan. 2013 | | |
| REVIEW | DW | 18 Jan. 2013 | | |

**FIGURE 7.1-2**




**LEGEND**

- Watercourse
- Sub-Watershed Boundary
- Waterbody

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KILOMETRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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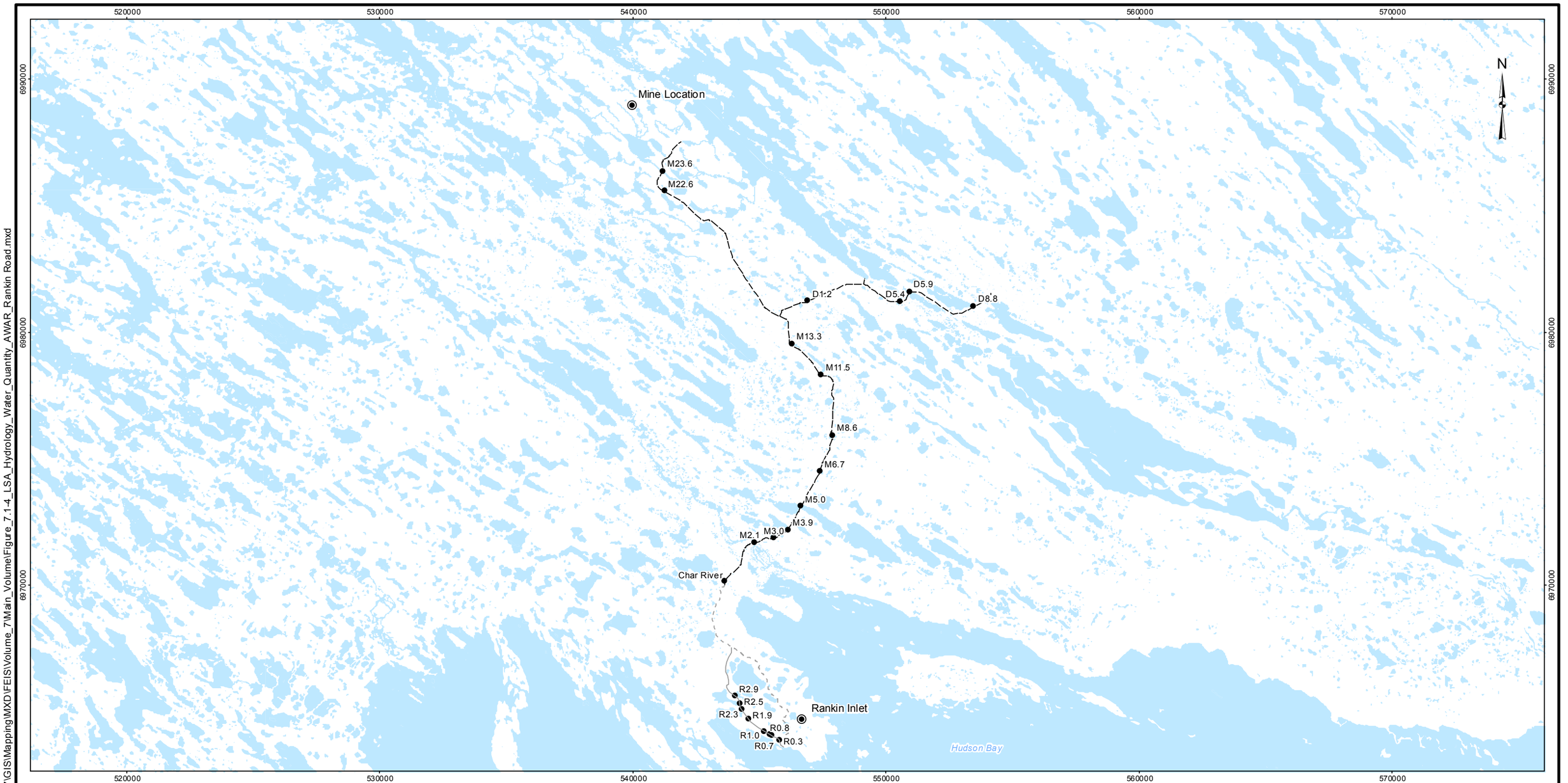
TITLE
**LOCAL STUDY AREA FOR HYDROLOGY INCLUDING WATER QUANTITY - MINE SITE**

Golder Associates

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| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 23 Aug. 2012 | | |
| CHECK | JL | 07 Jan. 2013 | | |
| REVIEW | DW | 07 Jan. 2013 | | |

**FIGURE 7.1-3**

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**LEGEND**

- Watercourse Crossing
- All-weather Access Road (AWAR)
- Rankin Inlet Bypass Road
- Existing Road
- Watercourse
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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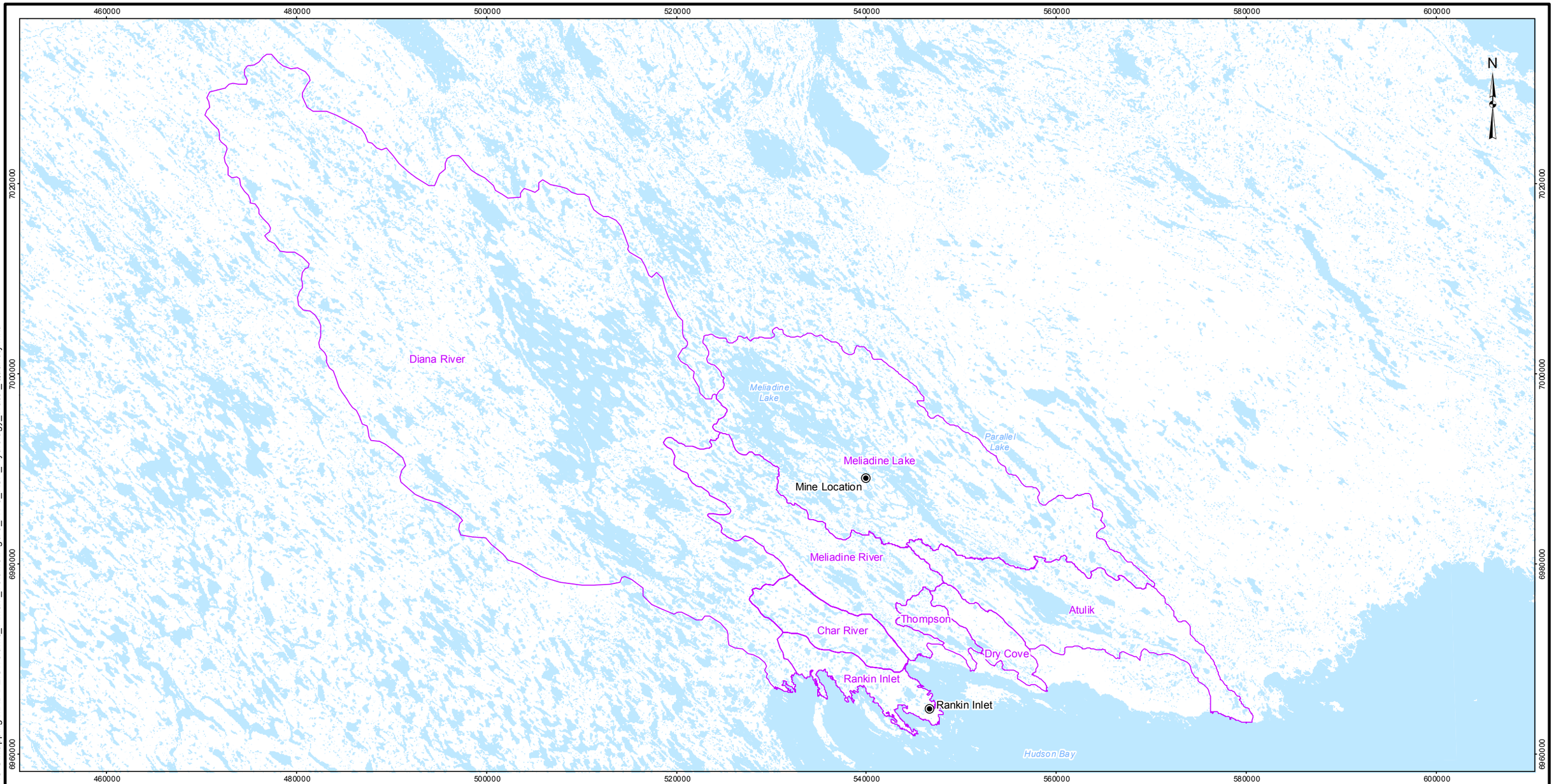
TITLE
**LOCAL STUDY AREA FOR HYDROLOGY AND WATER QUANTITY, WATER QUALITY, SEDIMENT QUALITY, FISH, AND FISH HABITAT - AWAR AND RANKIN INLET BYPASS ROAD**

Golder Associates

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| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 23 Aug. 2012 | | |
| CHECK | JL | 07 Jan. 2013 | | |
| REVIEW | DW | 07 Jan. 2013 | | |

**FIGURE 7.1-4**

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**LEGEND**

- Watercourse
- Watershed Boundary
- Waterbody

10 0 10
KILOMETRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

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TITLE

**REGIONAL STUDY AREA FOR HYDROLOGY AND WATER QUANTITY, WATER QUALITY, SEDIMENT QUALITY, FISH, AND FISH HABITAT**

Golder Associates

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| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 23 Aug. 2012 | | |
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| REVIEW | DW | 07 Jan. 2013 | | |

**FIGURE 7.1-5**

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## 7.1.3 Water and Sediment Quality, and Fish and Fish Habitat

### *7.1.3.1 Local Study Area*

The LSA for water and sediment quality, and fish and fish habitat includes waterbodies and watercourses to be affected by a proposed component of mine infrastructure including camps, mills, roads, open pits, tailings and waste rock storage facilities, and effluent discharge point (Figure 7.1-6).

The extent of the LSA varies for the mine site, AWAR and Rankin Inlet Project locations. For the mine site, the LSA includes waterbodies and watercourses that are both under the direct mine footprint or downstream of the footprint within contributing sub-basins. The LSA also includes those waterbodies and watercourses that will receive water from dewatered ponds and treated effluent discharge. As such, the LSA includes waterbodies and watercourses within watersheds on the Peninsula of Meliadine Lake (including Basins A, B, C, D, E, F, G, H, I, J, and P), the Chickenhead watershed, as well as Meliadine Lake itself (Table 7.1-1).

The LSA for the AWAR is the same as that defined for hydrology including water quantity, and includes watercourses crossed by the Meliadine and Discovery road corridors and the area 100 metres (m) to either side of the centre line of the corridor at all watercourse crossings (Figure 7.1-4).

The LSA for Rankin Inlet includes watercourses crossed by the Rankin Inlet bypass road, and other Project infrastructure (e.g., fuel storage area, laydown area) with the potential for direct impact to surface water. No waterbodies are located within the AWAR or Rankin Inlet LSAs.

**Table 7.1-1: Abbreviations for Watercourses and Waterbodies Surveyed for the Project, 1997 to 2012**

| Location | Naming Code | Description |
|---|---|---|
| LSA | A, B, C, D, E, F, G, H, I, J, P | Watersheds within Peninsula on Meliadine Lake |
| | CH | Chickenhead Lake watershed (part of Meliadine Lake drainage) |
| | ML | Meliadine Lake |
| | ML-C | Meliadine Lake (Central Basin) |
| | ML-E | Meliadine Lake (East Basin) |
| | ML-S | Meliadine Lake (South Basin) |
| | ML-SE | Meliadine Lake (Southeast portion of South Basin) |
| | ML-W | Meliadine Lake (West Basin) |
| RSA | K, L, M, N, O | Watersheds within Peninsula on Meliadine Lake |
| | DR | Diana River |
| | CON | Control Lake |
| | HSL | Horseshoe Lake (part of LML drainage) |
| | LML | Little Meliadine Lake |
| | ML-MR | Meliadine Lake outlet to Meliadine River |
| | ML-PL | Meliadine Lake outlet to Peter Lake |
| | MR | Meliadine River |
| | MR-L | Lower Meliadine River (downstream of LML) |
| | MR-U | Upper Meliadine River (between LML and ML) |
| | PL | Peter Lake |
| Other | HB | Hudson Bay |
| | PAR | Parallel Lake |
| | PB | Prairie Bay (part of Hudson Bay) |

520000 530000 540000 550000 560000 570000

7000000

6990000

6980000

Meliadine Lake

Parallel Lake

N

520000 530000 540000 550000 560000 570000

**LEGEND**

- Local Study Area (LSA)
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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TITLE

# LOCAL STUDY AREA FOR WATER QUALITY, SEDIMENT QUALITY, FISH, AND FISH HABITAT - MINE SITE

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| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | CP | 27 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | CDB | 27 Dec. 2012 | | |
| CHECK | CP | 07 Jan. 2013 | | |
| REVIEW | DW | 07 Jan. 2013 | | |

**FIGURE 7.1-6**

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#### 7.1.3.2 Regional Study Area

The spatial extent of the RSA for water and sediment quality, and fish and fish habitat is the same as that defined for hydrology including water quantity (Figure 7.1-5). The RSA considered the potential range relevant for the dynamics of populations of Arctic char, lake trout, Arctic grayling, and their movements. In addition to the mine, AWAR, and Rankin Inlet portions of the LSA, the RSA includes watersheds within the Peninsula (Basins K, L, M, N, and O), the Meliadine River (including Little Meliadine Lake), the Atulik River watershed, the Diana River watershed (including Peter and Diana lakes), the Char River watershed, the Rankin Inlet watershed, as well as the Hudson watershed defined by the combined watershed of Thompson River, Dry Cove, and smaller sub-basins along the Hudson Bay coast between the Atulik and Meliadine River watersheds.

#### 7.1.3.3 Temporal Boundaries

The temporal boundaries for water and sediment quality, and fish and fish habitat vary depending on the VEC. The duration of some changes to habitat induced by Project activities, such as potential changes to water quality from dust deposition, are expected to end by post-closure. In contrast, effects to fish will continue throughout the closure phase while the open pits are being flooded. The duration of effects will continue until populations re-establish and stabilize in reclaimed areas and downstream locations of the LSA. However, it is expected that a functional aquatic ecosystem, including fish populations, will re-establish in affected waterbodies of the LSA after refilling and reconnection.

## 7.2 Hydrogeology and Groundwater Quantity and Quality

### 7.2.1 Introduction

#### 7.2.1.1 Purpose and Scope

The purpose of this section is to describe the baseline conditions for hydrogeology and groundwater and assess the effects of the Project on hydrogeology and groundwater quantity and quality. This assessment includes potential changes resulting from Project-related components and associated activities. The effects assessment will evaluate all Project phases, including construction, operation, maintenance, closure (decommissioning and reclamation), and post-closure. Indirect and cumulative effects have been incorporated throughout this section, where applicable.

While hydrogeology and groundwater quantity and quality is a VEC (Volume 4, Table 4.2-1), changes in hydrogeology and groundwater quantity and quality can only be evaluated in the context of how these changes in turn may result in changes to other valued components such as fish habitat. No impact predictions are made for hydrogeology and groundwater quantity and quality by themselvesas impacts to these components directly influence, and therefore are captured in, the assessment of impacts for other VECs including hydrology, surface water quality and fish and fish habitat.

Baseline conditions and effects assessment for hydrology and surface water quality are presented in Sections 7.3 and 7.4, respectively.

#### 7.2.1.2 Concordance with Terms of Reference

The purpose of this section is to address Guidelines issued by the Nunavut Impact Review Board (NIRB) for the Project (NIRB 2012a), specifically relating to the impact of the Project on hydrogeology and groundwater quality. The complete Guidelines for the Project, including FEIS section and page number referencing, are summarized in the main FEIS concordance table (Volume 1, Appendix 1-A).

Specific requirements set out in the guidelines relating to the baseline and the impact assessment for hydrogeology and groundwater are presented in Volume 1, Appendix 1.0-A.

### 7.2.2 Hydrogeology Baseline Environment

The following sections establish the geologic and hydrogeologic setting within the LSA for the Project (Figure 7.1-1). The baseline setting is defined from published work and field investigations.

#### 7.2.2.1 Geology

##### 7.2.2.1.1 Overburden Geology

In general, the local overburden stratigraphy consists of a thin layer of topsoil overlying a layer of silty gravelly sand. Cobbles and boulders are observed throughout the entire site and at various depths in the boreholes. The grain angularity is found mainly to be sub-angular to angular and few are identified as sub-rounded. The bedrock surface at site is encountered between about 2 to 18 m below ground surface (bgs).

##### 7.2.2.1.2 Bedrock Geology

The following descriptions are based on information contained in Snowden (2008) and Fingler (2001). For a more detailed description of the geology of the Project area, the reader is referred to these reports.

The Project is located within the Archaean Rankin Inlet Greenstone Belt, within the Churchill Structural Province of the Canadian Shield (Figure 7.2-1). The rocks of the Rankin Inlet Greenstone Belt have been subjected to polyphase deformational events and metamorphism. The rocks consist of a sequence of mafic volcanic rocks, felsic pyroclastic rocks, sedimentary rocks, and gabbro sills.

Archaean and Proterozoic deformational events have resulted in an alignment of stratigraphy trending in a northwest to southeast direction which defines the Meliadine trend. To the south of the deposits is the Pyke Fault, a major regional fault zone, which extends over several kilometres and is characterized by multiple foliations and regional shear zones.

The geology of the Tiriganiaq Deposit consists of greywacke and argillite sediments (Sam Formation), iron formation, and mixed iron formation, greywacke, and siltstone (Upper Oxide Formation) in fault contact with underlying mafic volcanic rocks (Wesmeg Formation). The sequence trends in an east/west direction, and dips northward at inclinations greater than about 60 degrees. The stratigraphy is aligned for over 3 kilometres (km) along the mineralized shear direction. The fault contact between the Tiriganiaq and the Wesmeg Formation is referred to as the Lower Fault Zone. A zone of graphitic, mineralized fault gouge (0.5 to 3 m in thickness) commonly occurs over this zone.

The stratigraphy of the F Zone area is dominated by mafic volcanic rocks and the east southeast striking Lower Lean Iron Formation. The deposit area is located north of the Pyke Fault which runs sub-parallel to the Lower Iron Formation. Mineralization of the F Zone is hosted by the Lower Lean Iron Formation and is associated with quartz veins and east striking shear zones.

The stratigraphy of the Discovery area is dominated by a thick package of inter-bedded clastic sedimentary units, chemical sediments (oxide facies iron formations) and minor gabbroic dikes. In the deposit area, the hanging wall to the main gold-bearing iron formation horizon is dominated by a greywacke unit which contains minor interbedded argillaceous units, chemical sediments and gabbroic dikes. Gold mineralization is generally restricted to a folded and variably sheared oxide facies iron formation package, which generally consists of banded chert and magnetite horizons (banding on the millimetres [mm] to centimetres [cm] scale), with lesser interbedded chlorite-rich beds and chert and minor local interbedded greywacke units. The footwall to the main mineralized iron formation horizon consists of a similar succession of clastic sedimentary units as found in the hanging wall. The footwall stratigraphy is dominated by greywacke, with a more argillaceous interval, approximately 20 to 40 m below the mineralized iron formation.

There appears to be 2 parts to the Wesmeg gold deposit: a northern and southern part. In the northern part, the stratigraphy strikes east-west and dips 65 degrees to the north. The stratigraphy in the southern part strikes northwest-southeast and dips 50 degrees to the north. The host Wesmeg Formation is massive to pillowed basalts and interlayered mafic volcaniclastics, with rare gabbro dikes and some interflow sediments consisting of siltstone, mudstone, and minor iron formations.

The stratigraphy in the Pump deposit area strikes northwest-southeast and dips 50 degrees to the north. Similar to the F Zone and Wesmeg deposits, the host rocks at the Pump area are massive to pillowed basalts of the Wesmeg Formation, which are cut by rare gabbro dikes and interflow sediments.

530000
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TIRIGANIAQ
WESMEG
PUMP
F ZONE
DISCOVERY

N

**LEGEND**

- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

Regional Geology

- Quartzite
- Quartzite-Siltstone
- Pillowed Mafic Volcanic Rock
- Quartzite-Felsic Volcanic Rock
- Ultramafic Volcanic Rock
- Greywacke-Iron Formation
- Volcanic Rock
- Mafic Volcanic Rock
- Graywacke
- Gabbro
- Granitoid
- Iron Formation
- Andesitic Volcanic Rock
- Carbonated Schist
- Argillite
- Conglomerate
- Dolomite
- Intermediate Volcanic Rock
- Biotite Schist

Major Fault

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

2500 0 2500
METRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# REGIONAL GEOLOGY

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | DC | 01 Mar. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | CDB | 01 Mar. 2012 | | |
| CHECK | SM | 18 Jun. 2012 | | |
| REVIEW | DC | 18 Jun. 2012 | | |

**FIGURE 7.2-1**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.2-1_Regional_Geology.mxd

### 7.2.2.2 Groundwater Flow Regimes

The Project lies within the Canadian Shield in an area of continuous permafrost. In areas of continuous permafrost, there are generally 2 groundwater flow regimes: a shallow groundwater flow regime located in the active (seasonally thawed) layer near the ground surface, and a deep groundwater flow regime beneath permafrost. There is generally little to no hydraulic connection between the 2 flow systems because of the thick, low permeability permafrost. These 2 groundwater regimes are illustrated in the schematic cross section on Figure 7.2-2.

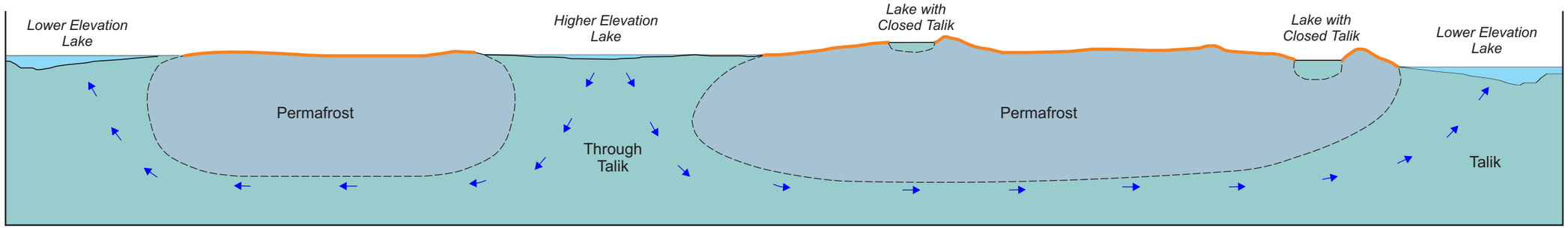
#### 7.2.2.2.1 Shallow Groundwater Flow Regime

From the late spring to early autumn, when temperatures are above 0 degrees Celsius (˚C), the active layer becomes thawed. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface (Figure 7.2-2). Groundwater gradients would, therefore, be similar to topographic gradients. Groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

Permafrost reduces the hydraulic conductivity of the rock by several orders of magnitude (McCauley et al. 2002; Burt and Williams 1976). Consequently, the permafrost in the rock at the Project would be virtually impermeable to groundwater flow. The shallow groundwater flow regime, therefore, has little to no hydraulic connection with the groundwater regime located below the permafrost.

#### 7.2.2.2.2 Deep Groundwater Flow Regime

Taliks (unfrozen ground surrounded by permafrost) exist beneath lakes which have sufficient depth such that they do not freeze to the bottom over the winter. Taliks beneath larger lakes can extend down to the deep groundwater regime. The elevations of these lakes provide the driving force for deep groundwater flow. The presence of thick permafrost beneath land masses results in negligible recharge to the deep groundwater flow regime from these areas. Consequently, recharge to the deep groundwater flow regime is predominantly limited to areas of taliks beneath large, surface water bodies. Generally, deep groundwater will flow from higher-elevation lakes to lower-elevation lakes (Figure 7.2-2). To a lesser degree, groundwater beneath the permafrost is influenced by density differences due to the upward diffusion of deep seated brines (density-driven flow).




# CROSS SECTION

Schematic Only
Not to Scale

## LEGEND

- Conceptual Groundwater Flow Direction
- Active Layer

PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE: CONCEPTUAL PERMAFROST AND GROUNDWATER FLOW MODEL BASELINE CONDITIONS

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 10-1373-0076 | | | PHASE No. 3000 | |
| DESIGN | DC | 02MAR12 | SCALE NTS | REV. |
| CADD | GG | 02MAR12 | FIGURE 7.2-2 | |
| CHECK | DW | 14JAN13 | | |
| REVIEW | DW | 14JAN13 | | |

DRAWING DATE: 01-Mar-12 COREL FILE: N:\Bur-Graphics\Projects\2010\1373\10-1373-0076\Drafting\3000\10137330076-3000-04.cdr

#### 7.2.2.3 Groundwater Usage

Groundwater sources from both the active layer and from the deep groundwater below the permafrost are generally not used for drinking water in continuous permafrost regions. Due to the presence of deep permafrost, the highly saline groundwater below the permafrost, the seasonal nature of the active layer, and the availability of good quality drinking water from surface water sources, it is unlikely that groundwater near the Project site will be used as a drinking water source in the future.

#### 7.2.2.4 Data Review

##### 7.2.2.4.1 Lake Elevations and Bathymetry Data

Approximate elevations of lakes near the project site were obtained from the local topographic survey data. Where local survey data were not available, approximate lake elevations were obtained from the National Topographic System (NTS) map sheets published by the Government of Canada.

Lake bathymetry (measured as lake bottom depth below water surface) data were obtained from data collected during field programs in 1997 and 1998 (RL&L 1999) and in 2011 (SD 7-1 2009 Aquatic Synthesis Report and SD 7-2 2011 Aquatics Baseline).

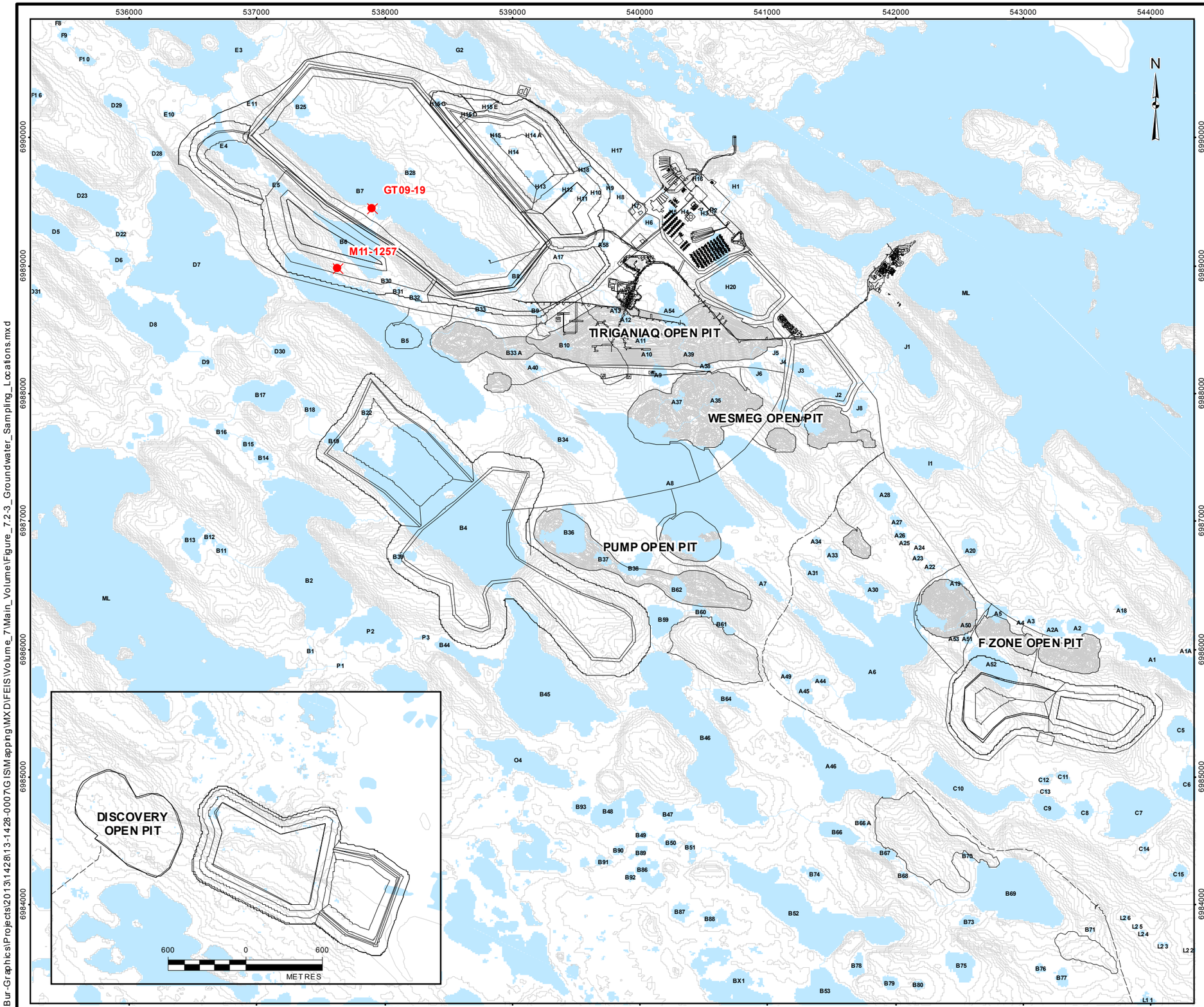
##### 7.2.2.4.2 Hydrogeologic Testing and Groundwater Sampling

In 2009, three-single well response tests were conducted in 2 boreholes (Golder 2009). Two of these tests were conducted in borehole GT09-19, within the talik of Lake B7 (Figure 7.2-3) at vertical depths of about 40 and 100 m bgs. The other test was conducted in borehole M09-860 from about 420 m bgs (the predicted base of the permafrost) to about 560 m bgs. After single-well response testing of borehole GT09-19 was complete, a groundwater sample was collected from a depth interval of about 50 to 150 m bgs. The methodology for collecting the sample was described by Golder (2009) and is presented in Appendix 7.2-C.

In 2011, three additional single-well response tests were conducted at borehole M11-1257, located in the area of the proposed Tiriganiaq underground mine and below the base of the permafrost (Figure 7.2-3). The first 2 tests were conducted using a packer at depths of 459 to 601 m bgs, and 596 to 632 m bgs. Tests 3 through 7 at this location were conducted subsequent to the installation of a Westbay system in the borehole, and were conducted in intervals 2 (602 to 613 m bgs), 2A (615 to 623 m bgs), 3 (574 to 585 m bgs), 4 (519 to 530 m bgs), and 5 (449 to 461 m bgs), respectively. The transmissivity and bulk hydraulic conductivity in these intervals were estimated from the pressure responses collected with the sampling cylinders of the Westbay system. The testing methods and sampling procedures are presented in Appendix 7.2-C and 7.2- A, respectively.

The results of single well response testing are summarized in Table 7.2-1. These tests indicate that the rock at the Project site below the base of the permafrost or in taliks is generally of low hydraulic conductivity, on the order of 3 x $10^{-9}$ metres per second (m/s).

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**LEGEND**

- Borehole
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

600 0 600
METRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# GROUNDWATER SAMPLING LOCATIONS

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | DC | 02 Mar. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | CDB | 02 Mar. 2012 | | |
| CHECK | SM | 18 Jun. 2012 | | |
| REVIEW | DC | 18 Jun. 2012 | | |

**FIGURE 7.2-3**

**Table 7.2-1: Single-Well Response Testing Results**

| Borehole | Test No. | Transmissivity ($m^2/s$) | Hydraulic Conductivity (m/s) | Interval Top (m bgs vertical) | Interval Bottom (m bgs vertical) | Interval Midpoint (m bgs vertical) | WestBay Interval | Geology |
|---|---|---|---|---|---|---|---|---|
| M09-860 | 1 | $5 \times 10^{-7}$ | $3 \times 10^{-9}$ | 424 | 563 | 494 | | Sam Formation, Upper Oxide, Wesmeg, Lower Fault |
| GT09-19 | 1 | $1 \times 10^{-7}$ | $3 \times 10^{-9}$ | 27 | 56 | 42 | | Sam Formation |
| GT09-19 | 2 | $2 \times 10^{-7}$ | $2 \times 10^{-9}$ | 54 | 153 | 104 | | Sam Formation |
| M11-1257 | 1 | $7 \times 10^{-8}$ | $5 \times 10^{-10}$ | 459 | 601 | 530 | | Sam Formation and Upper Oxide |
| M11-1257 | 2 | $1 \times 10^{-7}$ | $3 \times 10^{-9}$ | 596 | 632 | 614 | | Upper Oxide, Tiriganiaq, Wesmeg |
| M11-1257 | 3 | $2 \times 10^{-8}$ | $2 \times 10^{-9}$ | 602 | 613 | 608 | Interval 2 | Tiriganiaq |
| M11-1257 | 4 | $1 \times 10^{-8}$ | $1 \times 10^{-9}$ | 615 | 623 | 619 | Interval 2A | Wesmeg |
| M11-1257 | 5 | $8 \times 10^{-8}$ | $7 \times 10^{-9}$ | 574 | 585 | 580 | Interval 3 | Upper Oxide |
| M11-1257 | 6 | $6 \times 10^{-8}$ | $5 \times 10^{-9}$ | 519 | 530 | 525 | Interval 4 | Sam Formation |
| M11-1257 | 7 | $3 \times 10^{-8}$ | $2 \times 10^{-9}$ | 449 | 461 | 455 | Interval 5 | Sam Formation |

In each of boreholes M09-860 and M11-1257, a single-well response test was conducted over an interval in deep bedrock that included the Lower Fault Zone. Analysis of these tests indicated that the hydraulic conductivity over these test intervals were similar to those calculated for intervals that did not include the Lower Fault Zone; therefore, it appears that the Lower Fault Zone does not represent an enhanced permeability zone.

### *7.2.2.5 Groundwater Quality*

In the Canadian Shield, concentrations of Total Dissolved Solids (TDS) in groundwater increase with depth, primarily in response to upward diffusion of deep-seated brines. The chemicals that contribute to TDS in shield brines are typically chloride and calcium, with sodium to a lesser degree. By comparison, sea water is mostly composed of chloride and sodium. At the Project, three groundwater samples were collected in 2011 as follows (Appendix 7.2-A):

- Groundwater sample from about 100 m bgs with a TDS of about 4700 milligrams per litre (mg/L);
- Groundwater sample from about 450 m bgs with a TDS of about 60 900 mg/L; and
- Groundwater sample from about 600 m bgs with a TDS of about 61 000 mg/L.

These values are greater than has been observed at other sites in the Canadian Shield at corresponding depths (Frape and Fritz 1987; Blowes and Logsdon 1997). This difference, together with the relatively high proportion of sodium relative to calcium in groundwater samples (SD 2-6 Surface Water Management Plan, Appendix C;

Appendix 7.2-A) likely indicates the presence of relic sea water in bedrock. It is known that this area was largely overlain by seawater during the last period of glaciation (Dyke et al. 2003). Such occurrences have been observed at other areas where land was submerged by oceans in the past (Séguin 1995).

Figure 7.2-4 presents the TDS profile with depth from sites in the Canadian Shield and that of the Project groundwater samples. The Frape and Fritz profile (1987) was developed based on chemical analyses of deep saline water collected by various investigators from several sites in the Canadian Shield. The Diavik Profile is based on site-specific data from Diavik, supplemented by information from the Lupin Mine site located about 200 km north of Diavik (Blowes and Logsdon 1997). The Meadowbank profile (Golder 2004) was developed based on site specific data from the Meadowbank Mine site supplemented by the data sources discussed above (Frape and Fritz 1987; Blowes and Logsdon 1997). The Meadowbank profile is based on the highest TDS value observed in three field seasons at the site, and parallels the Diavik profile.

Figure 7.2-4 presents a “Meliadine profile” based on the three samples identified above. It is assumed that the TDS attributed to the sodium chloride of the recent incursion of seawater will decrease with depth down to the calcium chloride profile established for Meadowbank.

In the summer of 2013, an additional groundwater sampling round was undertaken in the Westbay well. The development and sampling methods and the results of this sampling round are presented in Appendix 7.2-D and on Figure 7.2-4. The TDS of the three groundwater samples collected in 2013 are as follows:

- Groundwater sample from about 455 m bgs with a TDS of about 54,290 mg/L;
- Groundwater sample from about 510 m bgs with a TDS of about 57,700 mg/L; and
- Groundwater sample from about 580 m bgs with a TDS of about 58,420 mg/L.

It is expected that the following key salinity parameters will vary with depth at the Project site: chloride, sulphate calcium, magnesium, potassium, sodium and strontium. The concentration of dissolved trace metals in the groundwater is low in all water samples, including arsenic which has a concentration that is below the analytical method detection limit in all samples (SD 2-6 Surface Water Management Plan Appendix C; Appendix 7.2-A). All parameters not associated with salinity are expected to be constant with depth.

### *7.2.2.6 Permafrost*

Permafrost is defined as soil or rock where temperatures remain at or below 0$^{o}$C for at least 2 consecutive years. The field work and data collected on site permafrost conditions is presented in SD 6-1 Permafrost Baseline Report. Based on thermistor data collected at the Site, the depth of permafrost is estimated to be on the order of 360 to 495 m.

Data from site thermistors indicate that away from the influence of taliks, the base of the permafrost is between about 430 and 470 m bgs at the Tiriganiaq deposit.

The freezing point of water decreases when pressure and salinity increase; as a consequence, unfrozen groundwater could be encountered at temperatures less than 0˚C, and in isolated pockets within the permafrost. Groundwater inflows to the mine are expected to be negligible until mining of the Tiriganiaq deposit extends below the portion of the permafrost that may contain unfrozen groundwater. At that time groundwater flows are

expected to increase. The base of permafrost is interpreted as an undulating surface; therefore, this base may vary spatially within the overall mine workings. Shallower permafrost would result in groundwater inflows to the mine occurring at shallower depths and earlier times in the mine life.

At the Project, the portion of the permafrost where groundwater may be partially or wholly unfrozen due to the freezing point depression has been estimated to be at a depth of 350 to 375 m (SD-6-1 Permafrost Baseline Report).

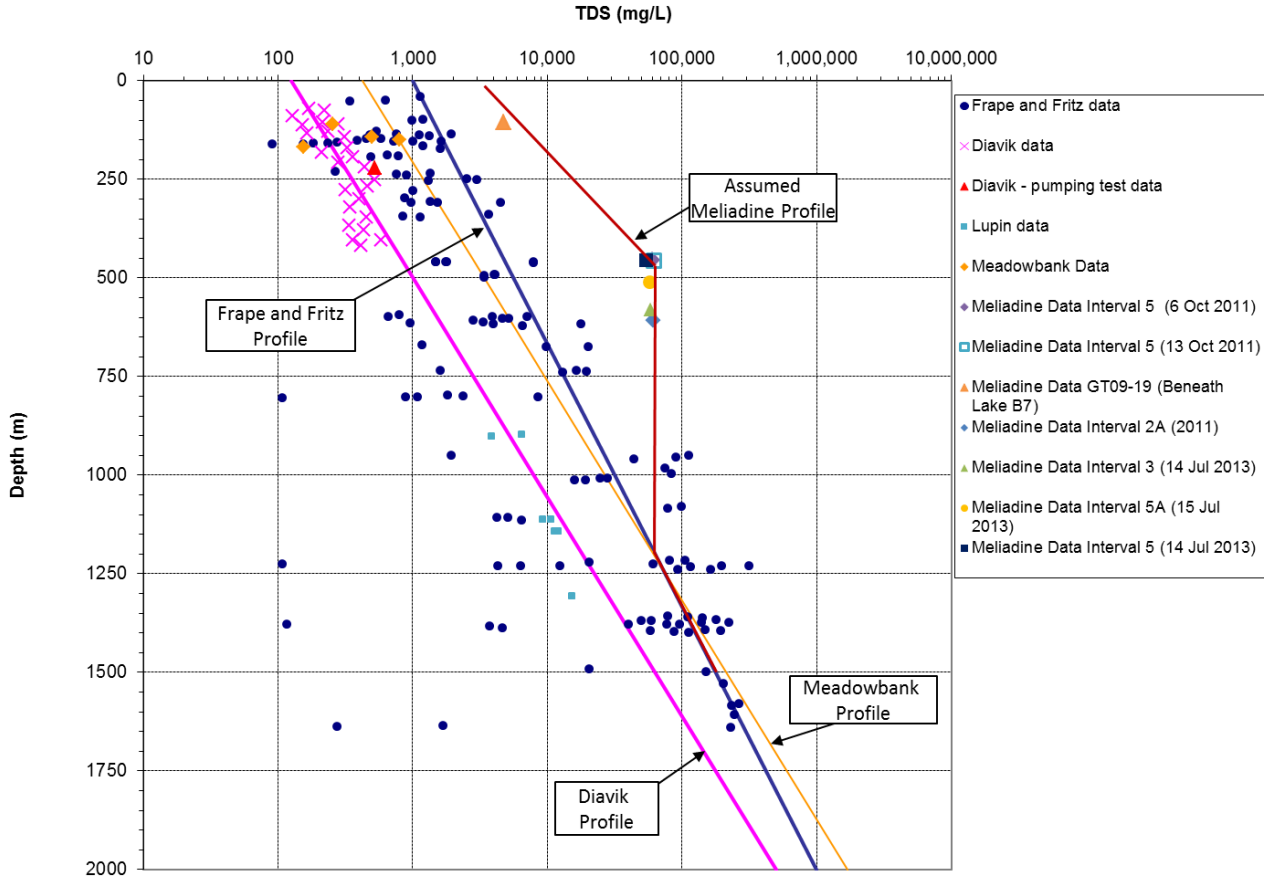



*Figure 7.2-4: Baseline TDS vs. Depth*

### 7.2.2.7 Groundwater Flow

#### 7.2.2.7.1 Shallow Groundwater Flow

The active layer becomes thawed in the late spring to early autumn, when ambient air temperatures are above 0°C. The water table in this layer is generally a subdued replica of topography, with groundwater gradients in the layer similar to topographic gradients. Topographic gradients generally vary from 0.006 to 0.05 m/m throughout the Project site. Groundwater in the active layer flows to local depressions and ponds that drain to larger lakes. The active layer is generally about 1.7 m thick. The overburden material within the active layer generally consists

of silty gravelly sand with a hydraulic conductivity on the order of 1 x $10^{-6}$ m/s. Groundwater velocities in the active layer are estimated to range from about 0.0025 to 0.02 m/day.

#### 7.2.2.7.2 Deep Groundwater

The elevations of the larger lakes with taliks extending down to the deep groundwater regime (referred to as open taliks) provide the principal driving force for deep groundwater flow. Essentially, lakes with open taliks are equivalent to a large diameter monitoring well with the permafrost surrounding the talik equivalent to the pipe in a monitoring well. In Sykes et al (2009), it was concluded that, on a regional scale, in deep sparely fracture rock, large surface water features provide a better estimate of groundwater flow directions than widely spaced small diameter wells. Generally, groundwater will flow from higher elevation lakes to lower elevation lakes.

Talik development beneath a lake is dependent on the size and depth of the lake. To support a talik, a lake must be deep enough to maintain an unfrozen bottom throughout the winter. Ice thicknesses in the Project area were measured prior to spring melt in 1998, 1999, 2000 (AEE 1998a, b, 1999; AMEC 2000; RL&L 1999) and 2009 (SD-7-1 2009 Aquatics Synthesis Baseline*)*, and generally range between 1.5 and 2 m.

As presented in the SD 6-1 Permafrost Baseline Report, when the size of a lake is above a critical value, the talik beneath the lake will be an open talik, which connects to the deep groundwater flow regime beneath the permafrost. Beneath smaller lakes, which do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow system will form (Figure 7.2-3).

Results of thermal modeling (SD 6-1 Permafrost Baseline Report) indicate that elongate lakes with terraces (where lake depth is within the range of winter ice thickness), and central pool(s) (where lake depth is greater than the range of winter ice thickness) having a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Project site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that near the Tiriganiaq deposit, only Meliadine Lake, Lake B7 and Lake D7 will have open taliks connected to the deep groundwater flow regime.

Figure 7.2-5 presents the inferred directions of groundwater flow in the deep groundwater below the permafrost.

The Westbay multi-level monitoring system that was installed in borehole M11-1257 (Figure 7.2-3) is situated between two lakes predicted to be connected to the deep groundwater flow regime through open taliks (Lake B7 and Lake D7). The multi-level sampling intervals in the Westbay system were installed beneath permafrost at vertical depths ranging from approximately 440 to 640 m below ground surface.

Reliable groundwater pressures were recorded in four of the six multi-level sampling ports installed in M11-1257 in October 2011. The pressures measured in Ports 2, 3, 4, and 5 are presented as freshwater equivalent hydraulic head in Table 7.2-2.

The approximate direction of vertical groundwater flow can be estimated using the freshwater heads with a correction for the buoyancy effects, as outlined by Post et al. (2007). Table 7.2-2, shows that the calculated directions of groundwater flow are highly dependent on the assumed TDS vs. depth profile. If the base case TDS profile indicated in Figure 7.2-4 is assumed, the overall groundwater flow direction between the lake and the deep bedrock appears to be downward. The same is the case for the upper bound TDS profile. For the low bound TDS profile, a weakly upward average gradient was calculated. There is no chemical or physical evidence of groundwater discharge, such as seeps, from the deep groundwater up into the surface water bodies.

However, it is inferred from the elevation of water levels in lakes with open taliks that groundwater flow from Lake B7, a higher elevation lake (62 m), is towards Meliadine Lake (west), which is a lower elevation lake (51 m). Therefore, a general downward groundwater flow direction from high elevation lakes to low elevation lakes (with B7 being a high elevation lake), is supported by the measurements presented in Table 7.2-2.

**Table 7.2-2: Estimated Freshwater Heads, Flow Directions and Gradients**

| | | | | Low Bound | | Upper Bound | | Base Case | |
|---|---|---|---|---|---|---|---|---|---|
| **Port** | **Vertical Depth (m)[a]** | **Freshwater Head at Port (masl)[b]** | **Freshwater Head at Lake B7 (masl)[c]** | **Average Density (kg/m$^3$)** | **Gradient** | **Average Density (kg/m$^3$)** | **Gradient** | **Average Density (kg/m$^3$)** | **Gradient** |
| 2 | 602.2 | 65.6 | 62 | 1010 | 0.0044 | 1031 | 0.0247 | 1023 | 0.0174 |
| 3 | 573.7 | 72.0 | 62 | 1009 | -0.0080 | 1027 | 0.0092 | 1022 | 0.0047 |
| 4 | 518.7 | 64.3 | 62 | 1008 | 0.0036 | 1021 | 0.0166 | 1020 | 0.0152 |
| 5 | 448.6 | 71.5 | 62 | 1006 | -0.0146 | 1015 | -0.0058 | 1015 | -0.0058 |
| **Average Gradient** | | | | | **-0.0036** | | **0.0112** | | **0.0079** |

Notes: Gradients calculated between each multi-level port and Lake B7.

A positive value indicates a downward gradient.

[a] Due to borehole deviation the actual depth could be +/- 1 m from the tabulated value

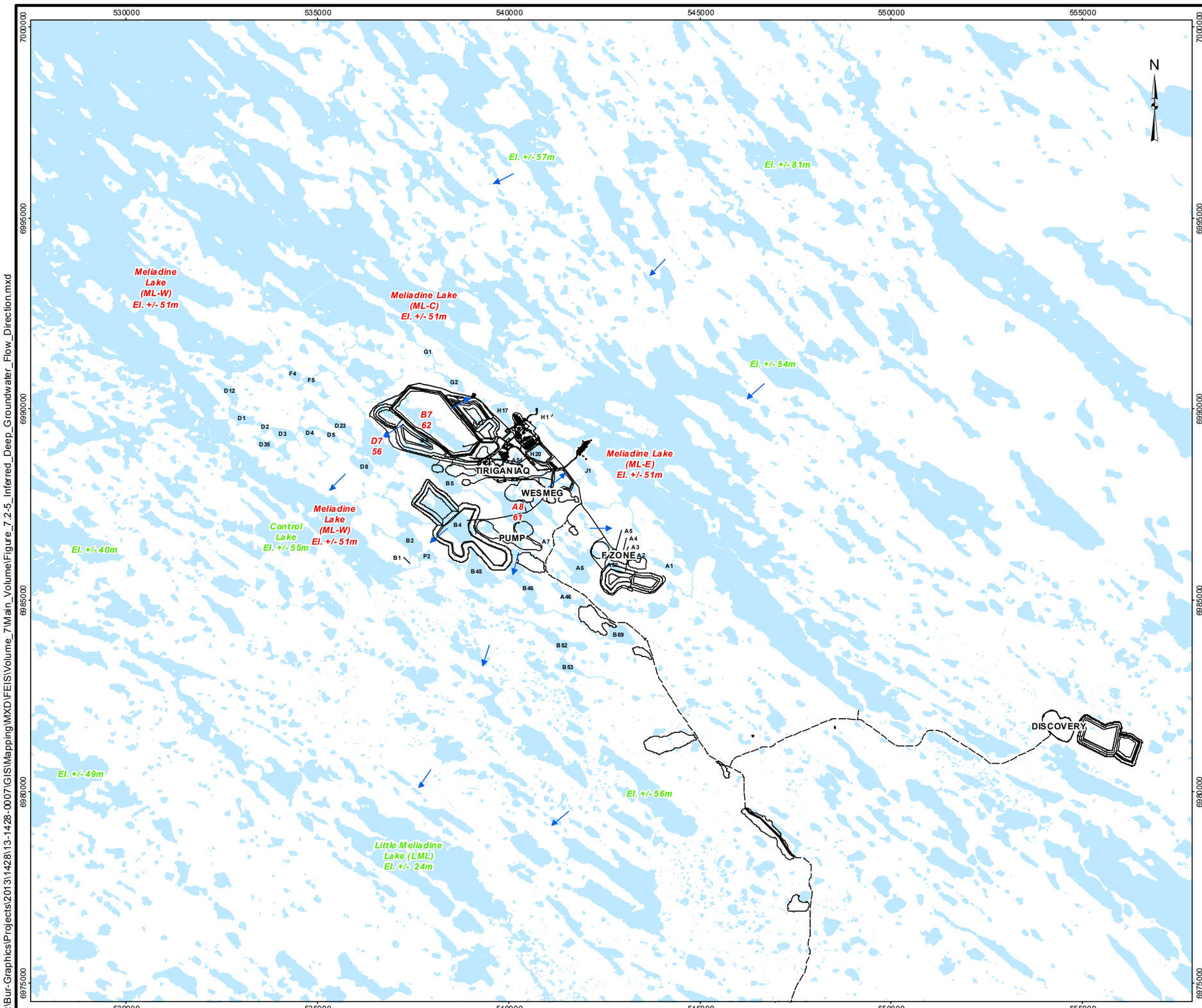
[b] The accuracy of the freshwater head is not known due to potential incomplete equilibration of each port with the surrounding formation after drilling and installation.

[c] Seasonal variation in lake level of Lake B7 has been measured to be up to 0.6 m.

masl = metres above mean sea level.

Given the hydraulic conductivity of the bedrock below the permafrost and the small hydraulic gradients between the lakes with open taliks, groundwater velocities are expected to be very low. Groundwater velocities in the deep groundwater flow system were predicted using the numerical hydrogeological model that was developed for the site. This model and estimates of the flow velocities are presented in the following Section.

Permafrost is assumed to be virtually impermeable; therefore, the permafrost present beneath the ground surface between lakes with open taliks was assigned hydraulic conductivity and storage values 3 to 4 orders of magnitude lower, respectively, than the surrounding unfrozen rock.




**LEGEND**

- Inferred Ground Water Flow Direction
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

*Red Lake Label* — Surface Area and Depth Large Enough to Support an Open Talik

*Green Lake Label* — Surface Area Large Enough to Support an Open Talik (Bathymetry Unavailable)

**REFERENCE**

Lake elevations obtained from the Schlenker Survey where available. Otherwise, lake elevations obtained from the 1:50,000 National Topographic Data Base.
Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

2000 0 2000
METRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
**INFERRED DEEP GROUNDWATER FLOW DIRECTION**

Golder Associates

| PROJECT NO. 10-1373-0076 | | | FILE No. | |
|---|---|---|---|---|
| DESIGN | DC | 02 Mar. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | CDB | 02 Mar. 2012 | | |
| CHECK | SM | 21 Jun. 2012 | | |
| REVIEW | DC | 21 Jun. 2012 | | |

**FIGURE 7.2-5**

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### 7.2.2.8 Numerical Hydrogeological Model

A numerical hydrogeologic model was constructed evaluate the baseline hydrogeology conditions prior to mining. This model was also used to estimate the quantity and quality of potential inflows to the proposed Tiriganiaq underground mine for the impact assessment. The numerical hydrogeological model is described in detail in Appendix 7.2-B.

All of the open pits will be excavated entirely within permafrost or in closed taliks (not connected to the deep groundwater regime); therefore, groundwater seepage to the open pits is expected to be relatively small, seasonal (in the summer months only) and with relatively low Total Dissolved Solids (TDS).

#### 7.2.2.8.1 Hydrostratigraphy

The Project is located within the Archaean Rankin Inlet Greenstone Belt, within the Churchill Structural Province of the Canadian Shield. The Rankin Inlet Greenstone Belt consists of mafic volcanic rocks, felsic pyroclastic rocks, sedimentary rocks, and gabbro sills. The geology of the Tiriganiaq deposit of the Project consists of greywacke and argillite sediments (Sam Formation), Iron Formation and mixed iron formation, greywacke and siltstone (Upper Oxide Formation) in fault contact with underlying volcanic rocks (Wesmeg Formation). The stratigraphy of the F Zone area is dominated by mafic volcanic rocks and the east southeast striking Lower Lean Iron Formation. The stratigraphy of the Discovery area is dominated by a thick package of inter-bedded clastic sedimentary units, chemical sediments (oxide facies iron formations), and minor gabbroic dikes.

In general, hydraulic conductivity in bedrock can range in value over about 12 orders of magnitude with higher hydraulic conductivity related to sedimentary deposits derived from materials of larger grain size or from sedimentary or crystalline rocks with greater levels of fracturing due to weathering, cooling, isostatic stress relief, or tectonic forces (Domenico and Schwartz, 1998). The greywacke (sandstone) of the Sam and Upper Oxide formations could be expected to have higher hydraulic conductivity ($10^{-10}$ to $10^{-6}$ m/s, Domenico and Schwartz, 1998, Page 39) than the argillite (mudstone) of the Sam Formation or the siltstone of the Upper Oxide Formation ($10^{-13}$ to $10^{-8}$ m/s, Domenico and Schwartz, 1998, Page 39). However, these values will be highly site specific as sedimentary rocks may be fractured due to differences in stress conditions, geological structure, and weathering (Schwartz and Zhang, 2003). For mafic volcanic rocks, hydraulic conductivity is expected to be anisotropic, and heterogeneous with estimates of hydraulic conductivity generally varying from $10^{-11}$ to $10^{-7}$ m/s (Domenico and Schwartz, 1998, Page 39). For pyroclastic rocks, hydraulic conductivity is related to the degree of welding, and the development of cooling fractures with estimates of hydraulic conductivity between $10^{-11}$ and $10^{-7}$ m/s (Maidment, 1992).

The majority of hydraulic testing data collected to date has characterized the Sam Formation (6 tests in GT09-19, and M11-1257), with fewer tests intersecting the Upper Oxide (4 tests), Tiriganiaq (2 tests), and Wesmeg Formations (3 tests). The results of all hydraulic testing to date have yielded consistently low hydraulic conductivity values ranging from $5 \times 10^{-10}$ m/s to $7 \times 10^{-9}$ m/s (Table 7.2-1). These values are at the low end of the ranges described above.

At the Meadowbank Mine site, the results of hydraulic testing indicated that there was not a discernible difference in the hydraulic conductivity of the various rock types at the site with ultramafic volcanics at a given depth having similar hydraulic conductivity to intermediate volcanics at the same depth (Cumberland Ltd. (now AEM) 2005). This has also been the case at numerous other sites (Stober and Bucher 2007, Kuchling et al.

2000, DeBeers, 2010), where hydraulic conductivity has been found to be correlated to depth (decreasing with increasing depth) or related to the locations of high permeability fractured zones (Stober and Bucher, 2007). However, fractured granite has been shown to have generally greater hydraulic conductivity than gneiss in the crystalline basement (Stober and Bucher, 2007).

In the Canadian Shield, the uppermost zone of bedrock typically has higher hydraulic conductivity (on the order of $10^{-7}$ m/s [Kuchling et al., 2000, DeBeers 2010, Cumberland Resources Ltd. (now AEM), 2005]) as a result of the formation of stress relief joints due to isostatic rebound following glacial retreat. Consequently, the hydraulic conductivity of bedrock to 120 m depth at the Project site has been assumed to be one to two orders of magnitude greater than the values obtained from hydraulic testing. Further reduction in hydraulic conductivity with depth is expected below the planned Tiriganiaq underground mine (Stober and Bucher, 2007); however, the hydraulic conductivity of competent bedrock has been assumed to remain constant with depth below 120 m depth to provide conservatively high estimates of groundwater inflow for this assessment.

In crystalline rocks, fault zones may act as groundwater flow conduits, barriers, or a combination of the two in different regions of the fault depending of the direction of groundwater flow and the fault zone architecture (Gleeson and Novakowski, 2009). As described previously, all fault zones in the vicinity of the proposed mine were conservatively assumed, for this assessment, to have enhanced hydraulic conductivity approximately 1.5 to 2.5 orders of magnitude greater than the surrounding rock. In addition, sensitivity analysis was performed in which the hydraulic conductivity of the Lower Fault Zone (for the most hydraulically significant fault zone) was increased by an additional factor of 10 to be approximately 3.5 orders of magnitude greater than the surrounding rock.

The conceptual model for the site consists of two hydrostratigraphic units consisting of competent rock and fractured rock zones associated with sub-vertical faults. Relatively competent bedrock is assumed to comprise the majority of the rock domain, and the hydraulic conductivity of competent rock is assumed to decrease with depth. Areas of greater fracturing associated with fault zones are assumed to have greater hydraulic conductivity than the surrounding less disturbed rock mass.

Results of on-site hydraulic testing indicate that the competent rock, at all depths, is generally of low hydraulic conductivity on the order of $3 \times 10^{-9}$ m/s. Based on these test results, combined with experience at the Meadowbank Mine north of Baker Lake, Nunavut (Golder 2004), and reductions in hydraulic conductivity with depth observed at other sites in the Canadian Shield and presented in Figure 7.2-7 (Stevenson et al. 1996 a & b; Ophori et al. 1996; Ophori and Chan 1994; Bieber et al. 2006; Stober and Bucher 2007), the hydraulic conductivity profile presented in Table 7.2-1 for depths below the base of the permafrost or within taliks was assumed for the competent rock.

The locations of regional faults near the Project area are presented in Figure 7.2-6. Based on their locations, three faults were considered to be of possible hydrogeologic significance for the Tiriganiaq underground mine and were included in the conceptual model for the Project site. They are the Lower Fault Zone, the Pyke Fault Zone, and a fault trending east-west (the North Fault), which is roughly parallel to the Lower Fault Zone in the Project area and passes through the north end of Lake B7 to the north of the Tiriganiaq deposit. Major faulting in the area tends to be inclined at relatively steep angles, on the order of 60 to 70 degrees, and dipping to the north or slightly northeast. Faulting is typically parallel to sub-parallel to the trend of the mineralized deposits.

The Lower Fault Zone that forms the fault contact between the Tiriganiaq and the Wesmeg formations consists of a zone of graphitic, mineralized fault gouge (0.5 to 3 m in thickness) in the area of the planned Tiriganiaq

underground mine. This zone intersects the underground mine (Appendix 7.2-B, Figure 7.2-B6) and has been assumed to be associated with a fractured rock zone with a hydraulic conductivity of 1 x $10^{-7}$ m/s, and width of 5 m. The fault passing through the north end of Lake B7, referred to as the North Fault, has also been assumed to have a hydraulic conductivity of 1 x $10^{-7}$ m/s, and width of 5 m. The Pyke Fault, which is considered to be a larger regional feature, has been assumed to have a hydraulic conductivity of 5 x $10^{-7}$ m/s and width of 10 m.

Tests conducted over intervals that included the Lower Fault Zone found that the permeability was the same as that of the relatively massive rock; therefore, the hydraulic conductivity of the fault zone is assumed to be the same as the competent rock. No hydraulic testing data are available for the Pyke Fault Zone or the fault north of the Lower Fault zone that passes through the north end of Lake B7. For the fault passing through the north end of Lake B7 (hereafter referred to as the North Fault), a hydraulic conductivity of 1 x $10^{-7}$ m/s and a width of 5 m were assumed. Based on structural geology information, the Pyke Fault is considered to be a large feature of regional significance with a higher hydraulic conductivity and width than the other 2 faults: therefore, a hydraulic conductivity of 5 x $10^{-7}$ m/s (5 times greater than assumed for the North Fault Zone), and a width of 10 m were assumed for this feature.

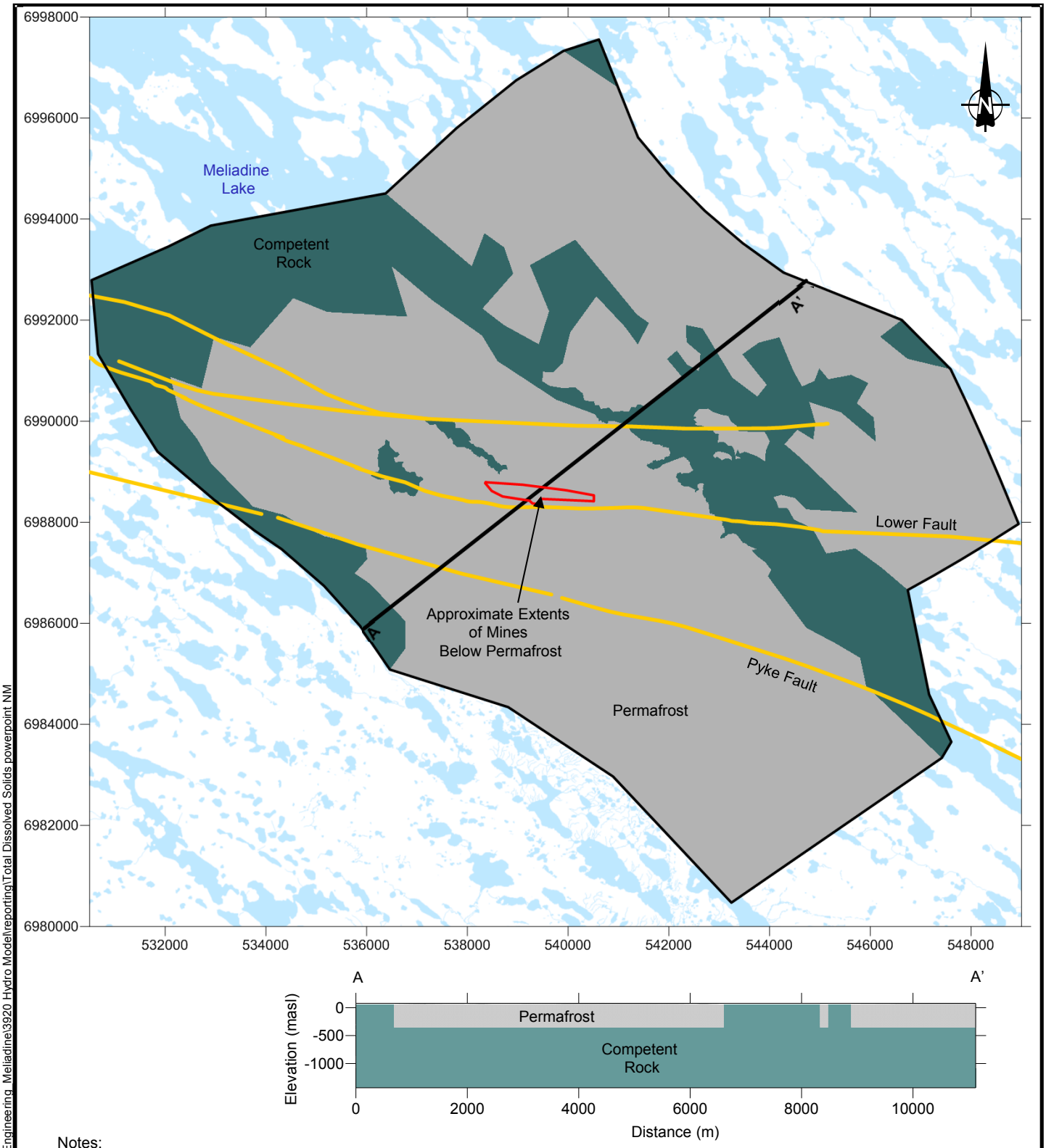
The hydraulic conductivities of all of the above fault zones have been assumed to be enhanced over the entire model domain. This assumption is conservative as in reality these zones are unlikely to be associated with enhanced hydraulic conductivity on the scale of several kilometres. The permeability and width of a fault zone can be heterogeneous along strike (Gleeson and Novakowski, 2009) potentially resulting in zones of greater hydraulic conductivity along strike over short distances; however, the presence of zones of fractures infilled with fault gouge will act to decrease hydraulic connectivity along strike over larger distances.

Data collected from the Giant Mine Site, Con Mine, and Meadowbank Mine, which are all gold projects in the Canadian Shield, are described below for reference in the assessment of the hydraulic conductifvities of faults at the Project site. At the Giant Mine Site, the available hydraulic testing data suggests that the conductivities of the West Bay and Townsite faults are of the same magnitude or lower than the surrounding bedrock, which has been assumed to be on the order of 1 x $10^{-9}$ m/s below 100 depth (Steffan Robertson, and Kirsten (Canada) Inc, 2002, SRK Consulting, 2005).

At the Con Mine Site, four fault systems, the Angel, Negus, Pud, and West Bay are present. These faults have been found to act as conduits for groundwater flow. However, they are extremely heterogeneous and hydraulic testing results in the fault zones exhibit a wide range of hydraulic conductivities; therefore, the large scale hydraulic influence of these faults will be governed by an average of the high and low zones of hydraulic conductivity. Assuming a width of 1 m for each fault, the geometric means of hydraulic testing in each of these faults range from 1 x $10^{-8}$ m/s to 1 x $10^{-7}$ m/s (INTERA Consultants Ltd., 1997).

Two main faults, the Bay Zone Fault and Second Portage Fault are present at the Meadowbank Mine Site (Cumberland Ltd. (now AEM), 2005). Hydraulic testing in these faults suggests that the Bay Zone Fault has hydraulic conductivity similar to the surrounding rock while the Second Portage Fault is approximately 5 m wide and has enhanced hydraulic conductivity of 5 x $10^{-6}$ m/s (approximately 2.5 orders of magnitude greater than the surrounding rock).

Based on these reference data, the assumed hydraulic conductivities of the fault zones at the Project are expected to result in conservatively high predictions of groundwater inflow and conservatively short predicted groundwater travel times from deep groundwater to surface water bodies.




Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Fractured rock zones (FRZs) assumed to be associated with faults were represented with two-dimensional discrete elements.
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

PROJECT

AGNICO EAGLE

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**MELIADINE GOLD PROJECT**
**NUNAVUT**

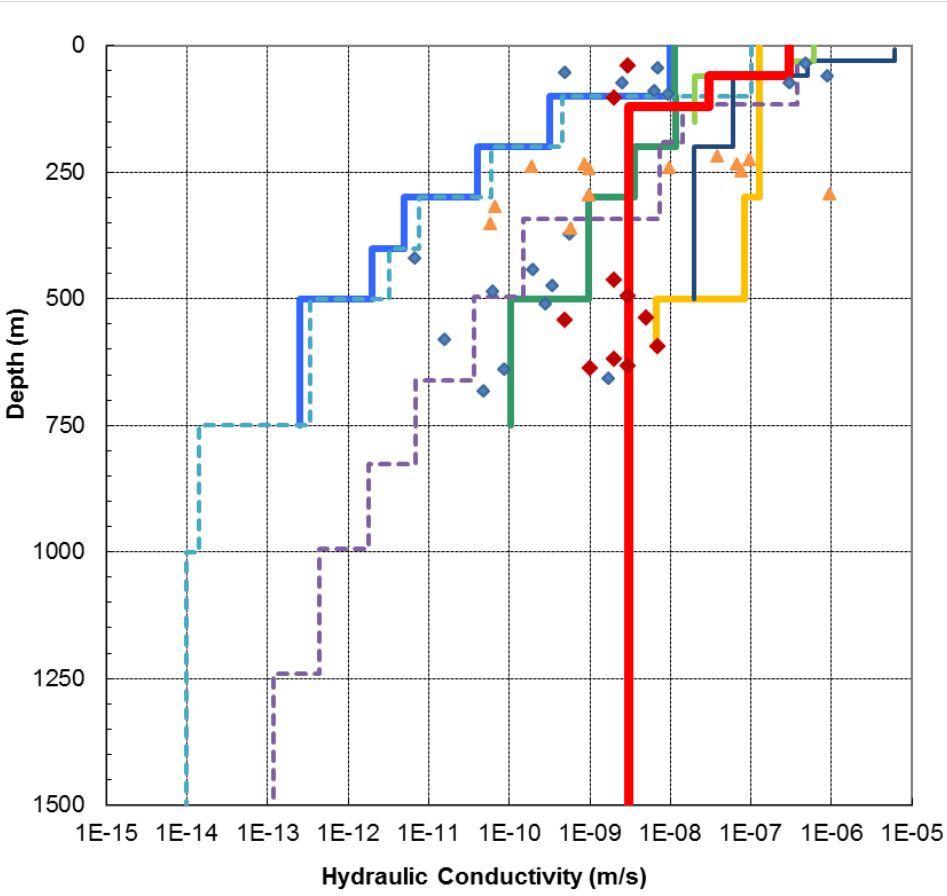
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# LOCATION AND EXTENT OF HYDROSTRATIGRAPHIC UNITS

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-6** | |
| REVIEW | DC | 2DEC12 | | |

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PROJECT

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# HYDRAULIC CONDUCTIVITY WITH DEPTH – CANADIAN SHIELD

Golder Associates

| | | | | |
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| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | CB | 8MAR10 | | |
| CHECK | DC | 11MAR14 | | |
| REVIEW | DC | 11MAR14 | | |

**FIGURE 7.2-7**

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Figure 7.2-6 illustrates the hydrostratigraphy in the Project area, and Table 7.2-3 presents values of hydrogeologic parameters. The hydraulic conductivity versus depth profile presented in Table 7.2-3 is expected to result in conservative groundwater flow estimates, as a greater reduction in hydraulic conductivity with depth has been observed at other sites (Stober and Bucher 2007). Values of hydrogeologic parameters were obtained from in-situ testing where available. Where in-situ values were not available, typical values published in the literature were used.

**Table 7.2-3: Model Parameters**

| Unit | Depth Interval (m) | Hydraulic Conductivity (m/s)[a] | Specific Storage (1/m)[b] | Effective Porosity (-)[c] |
|---|---|---|---|---|
| Competent Rock | 0 to 60 | $3 \times 10^{-7}$ | $1 \times 10^{-5}$ | 0.001 |
| Competent Rock | 60 to 120 | $3 \times 10^{-8}$ | $1 \times 10^{-5}$ | 0.001 |
| Competent Rock | 120 to 1500 | $3 \times 10^{-9}$ | $1 \times 10^{-5}$ | 0.001 |
| FRZ Associated with the Lower Fault | 0 to 1500 | $3 \times 10^{-9}$ | $1 \times 10^{-5}$ | 0.001 |
| FRZ Associated with the North Fault | 0 to 1500 | $1 \times 10^{-7}$ | $1 \times 10^{-5}$ | 0.001 |
| FRZ Associated with Pyke Fault | 0 to 1500 | $5 \times 10^{-7}$ | $1 \times 10^{-5}$ | 0.001 |

[a] Estimated from in-situ testing and experience from other similar sites.
[b] Maidment (1992)
[c] Stober and Bucher (2007)
FRZ = fractured rock zones

Permafrost is assumed to be virtually impermeable; therefore, the permafrost present beneath the ground surface between lakes with open taliks was assigned hydraulic conductivity and storage values approximately four and three orders of magnitude lower, respectively, than the surrounding unfrozen rock. The portion of the permafrost that may contain unfrozen groundwater, due to the freezing point depression, is assumed to be entirely unfrozen and have a hydraulic conductivity equivalent to the unfrozen rock at that depth. In reality isolated pockets of groundwater within this zone may be frozen resulting in a decrease in the hydraulic conductivity of the rock compared to that of the entirely unfrozen rock. The degree of this reduction, however, is difficult to quantify; therefore, it is conservatively assumed that there is no reduction in hydraulic conductivity over this portion of the permafrost.

Table 7.2–4 presents a summary of the conservative assumptions that have been incorporated into the numerical hydrogeological model.

**Table 7.2-4: Conservative Hydrogeological Assumptions in Numerical Hydrogeological Model**

| Parameter | Lower Bound | Upper Bound | Value Assumed in FEIS (Volume 7, Appendix 7.2-B) | Comment |
|---|---|---|---|---|
| Porosity[1] | 0.001 | 0.023 | 0.001 | Conservative (shorter travel times and greater saline upwelling) |
| Specific storage[2] | $1 \times 10^{-7}$ 1/m | $1 \times 10^{-5}$ 1/m | $1 \times 10^{-5}$ 1/m | Conservative (greater release of water from storage in bedrock and greater calculated groundwater inflow quantity). |
| Hydraulic conductivity of shallow bedrock | $3 \times 10^{-9}$ m/s | $3 \times 10^{-7}$ m/s | $3 \times 10^{-7}$ m/s (0 to 60 m depth); and $3 \times 10^{-8}$ m/s (60 to 120 m depth) | Conservative: Two measurements of hydraulic conductivity were taken at shallow depth at Meliadine: $3 \times 10^{-9}$ m/s and $2 \times 10^{-9}$ m/s at depths of 41 m below ground surface and 104 m below ground surface, respectively. Higher hydraulic conductivities used in model results in greater underground mine inflow quantity and shorter travel times. |
| Hydraulic conductivity between the basal cryopeg and base of permafrost | $1 \times 10^{-12}$ m/s | $3 \times 10^{-9}$ m/s | $3 \times 10^{-9}$ m/s | Conservative (permafrost between basal cryopeg and the zero degree isotherm, between 350 m and 450 m depth, is assumed to have a hydraulic conductivity equivalent to unfrozen rock results in higher predicted inflow quantity). |
| Hydraulic conductivity beneath underground mine | $1 \times 10^{-13}$ m/s | $3 \times 10^{-9}$ m/s | $3 \times 10^{-9}$ m/s | Conservative: Hydraulic conductivity beneath the underground mine is assumed to remain constant to bottom of model domain (i.e., there is no reduction in hydraulic conductivity with depth). This will result in the promotion of higher saline water up into the underground mine. |
| Density effects | | | Freshwater (1000 kg/m$^3$) | Conservative (shorter travel times and more upwelling than if density effects were considered). |

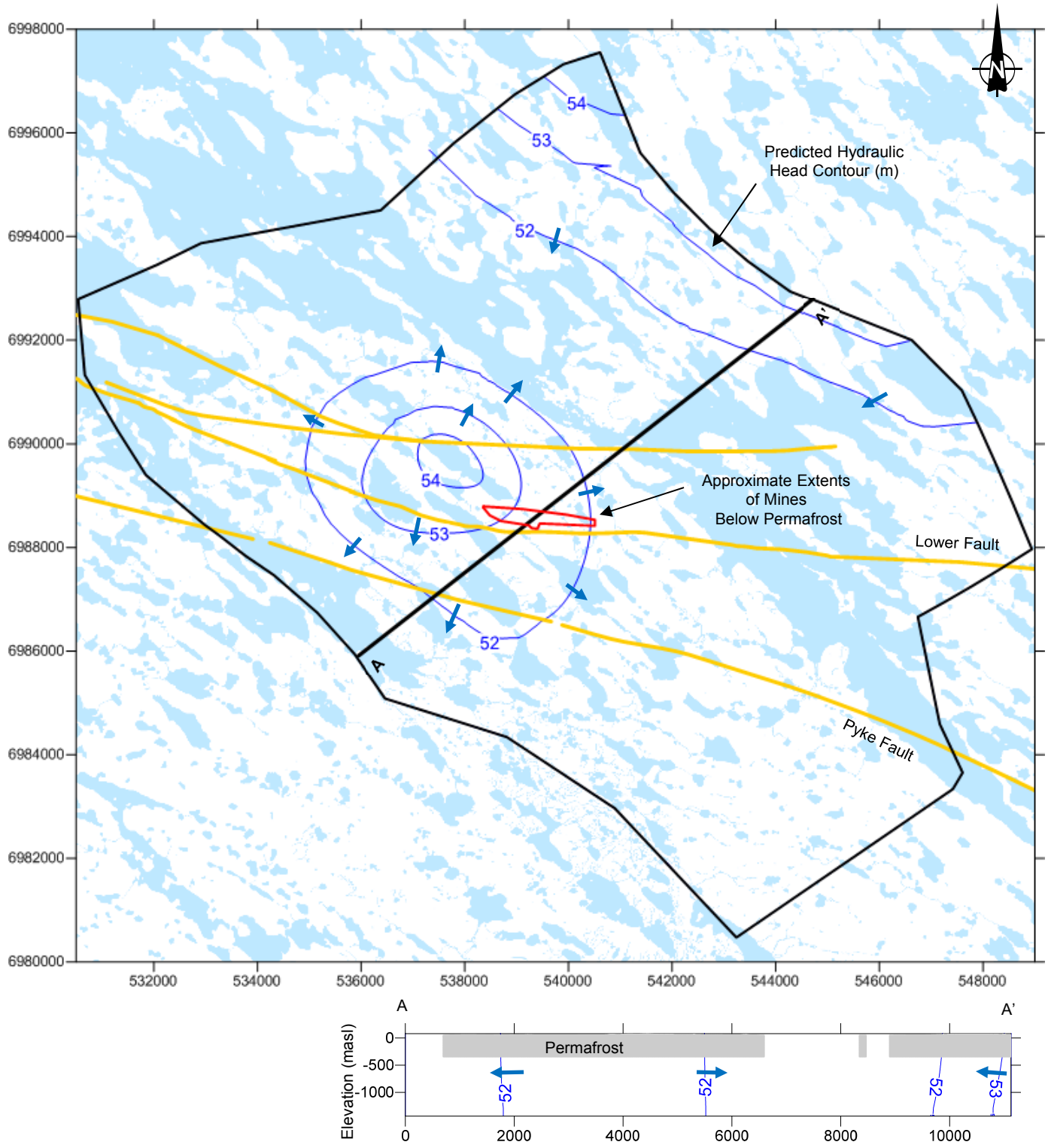
Notes:

1. Maidment, David R. 1992. Handbook of Hydrology. McGraw-Hill, New York.
2. Stober, I and Bucher, K. 2007. Hydraulic Properties of the Crystalline Basement. Hydrogeology Journal. 15:213-224.

### 7.2.2.9 Groundwater Flow – Taliks and Deep Groundwater

Predicted hydrogeologic conditions for the baseline in the open taliks and in the deep groundwater below the permafrost are presented in Figure 7.2-8. The Tiriganiaq underground mine is located in the area of a groundwater flow divide, with groundwater in the area of the planned mine flowing predominantly to Meliadine Lake East, and to a lesser extent to Meliadine Lake West.

Groundwater velocities in the deep groundwater regime are very low and on the order of 0.2 to 0.3 m per year. For example, groundwater from Lake B7 would take over 5000 years to travel in a northeast direction to Meliadine Lake (ML-E).




Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Hydraulic heads plotted at -714 m above sea level near the bottom of the proposed underground mine
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

→ Predicted Groundwater Flow Direction

PROJECT

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TITLE

# PREDICTED HYDRAULIC HEADS PRE-MINING CONDITIONS

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| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-8** | |
| REVIEW | DC | 2DEC12 | | |

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## 7.2.3 Pathway Analysis

### *7.2.3.1 Methods*

Pathway analysis for groundwater and hydrogeology identifies and assesses the linkages between Project components or activities. However, changes in hydrogeology and groundwater quantity and quality can only be evaluated in the context of how these changes in turn may result in changes to other valued components. Therefore, no impact predictions are made for hydrogeology and groundwater quantity and quality as impacts to these components directly influence, and therefore are captured in, the assessment of impacts on other VECs including hydrology, surface water quality and fish and fish habitat.

The first part of the pathway analysis is to produce a list of all potential effects pathways for the Project (FEIS Volume 4, Section 4.3). Each pathway is initially considered to have a linkage to potential effects on hydrogeology and groundwater quantity and quality. This step is followed by the development of environmental design features and mitigation that can be incorporated into the development description to remove a pathway or limit (mitigate) the effects to hydrogeology and groundwater. Environmental design features include Project design elements, environmental best practices, management policies and procedures, and social programs. Environmental design features are developed through an iterative process between the Project's engineering and environmental teams to avoid or mitigate effects.

Pathway analysis is a screening step that is used to determine the existence and magnitude of linkages from the initial list of potential effects pathways for the Project. This screening step is intended to focus the effects analysis on pathways that require a more comprehensive assessment of effects on assessment endpoints for other VECs resulting from changes to hydrogeology and groundwater. Pathways are determined to be primary, minor, or as having no linkage using scientific and traditional knowledge, logic, and experience with similar developments and environmental design features. Each potential pathway is assessed and described as follows:

- no linkage – pathway is removed by environmental design features and mitigation so that the Project results in no detectable environmental change and residual effects to hydrogeology and groundwater relative to baseline or guideline values;
- minor – pathway could result in a minor environmental change, but would have a negligible residual effect on hydrogeology and groundwater relative to baseline or guideline values; or
- primary – pathway is likely to result in a measurable environmental change that could contribute to residual effects on hydrogeology and groundwater relative to baseline or guideline values.

Primary pathways require further effects analysis to determine the environmental significance from the Project on hydrogeology and groundwater. Pathways determined to have no linkage to hydrogeology and groundwater or those that are considered minor are not predicted to result in environmentally significant effects on hydrogeology and groundwater. No linkage and minor pathways are summarized, but not carried through the effects assessment. While groundwater is considered a VEC, it. is not used as a resource by local populations and is not anticipated to become as resource in the future. As a result, potential effects to groundwater were examined, but residual impacts were not classified. This examination included an assessment of both changes to groundwater and hydrogeology that are specific to that system (e.g., the dewatering of lakes may affect groundwater quantity in the Meliadine Lake area, or spills can cause changes to groundwater quality) and changes to groundwater and hydrogeology that may present potential effect pathways to valued components,

such as surface water quality (e.g., inflow of saline groundwater to the mined out pits may lead to potential effects to the water quality of the pit lakes after flooding).

Project activities will result in changes to the shallow and deep groundwater regimes. These changes will occur as a result of the dewatering of B7 Lake, the development of the underground mine at Tiriganiaq, and construction of the mine rock and tailings storage facilities. As the underground mine is developed, groundwater will be induced to flow into the mine. As described above, groundwater quality is expected to change with depth. The higher TDS content water found at depth will influence underground water quality during the life of the mine and during closure activities.

Table 7.2-5 provides a description of all pathways that are relevant to groundwater and hydrogeology, both from the perspective of direct effects focused on these systems, and effects that create potential pathways for other components. Environmental design features and mitigation incorporated into the design of the Project to remove a pathway or limit the effects to groundwater and hydrogeology are listed, and pathways are determined to be primary, minor, or as having no linkage. The following section discusses the potential pathways relevant to groundwater and hydrogeology.

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Groundwater**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| Lake Dewatering | Groundwater quantity | Groundwater flow from un-dewatered lakes may be increased because of higher gradients towards dewatered lakes. May lower water levels in un-dewatered lakes | With the exception of Lake B7, all lakes that will be dewatered do not have open taliks connected to the deep groundwater regime. Furthermore B7 is a headwater lake. Therefore, groundwater flow from lakes that will not be dewatered to those that will does not currently occur and will not occur once the lakes are dewatered. At closure the water levels in the dewatered lakes will be restored to near pre-mining levels.<br><br>Lake B7, which is headwater lake and is predicted to have an open talik, will be converted into the tailings storage facility (TSF). Lake B7 water levels will be temporarily lowered by approximately 1 m to facilitate TSF dike construction. Once operational, the water level in the reclaim pond will be near to or above pre-mining levels. | No Linkage Section 7.2.3.2 |
| | | Groundwater flow from dewatered lakes may be reduced thereby reducing the flow to nearby un-dewatered lakes, thereby lowering water levels in those nearby lakes | With the exception of Lake B7, all lakes that will be dewatered do not have open taliks connected to the deep groundwater regime. Therefore, groundwater flow from these lakes to other nearby lakes does not currently occur<br><br>Lake B7, which is a headwater lake and is predicted to have an open talik, will be converted into the tailings storage facility (TSF). Lake B7 water levels will be temporarily lowered by approximately 1 m to facilitate TSF dike construction, which may reduce groundwater flow to Lake D7 and Meliadine Lake, thereby lowering water levels in these lakes. Once operational, the water level in the reclaim pond will be near to or above pre-mining levels. | Minor Section 7.2.3.3 |
| | | Lowering of Lake B7 for construction of the TSF may result in artesian conditions that will need to be controlled | Lake B7 currently has a water level that is the highest of lakes with open taliks in the LSA.<br><br>Lake B7 will be dewatered by 1 m during the development of the TSF; however, it will still have the highest water level of lakes with open taliks in the LSA. Once operational, the water level in the reclaim pond will be near to or above pre-mining levels. Therefore no artesian pressures will be created. | No Linkage Section 7.2.3.2 |

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Grounwater (continued)**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| Open Pits | Groundwater quantity | The development of the open pits may result in higher hydraulic gradients and groundwater flows away neighbouring lakes; thereby lowering their lake levels. | All of the open pits are developed in permafrost; therefore, deep groundwater is unaffected by open pit excavation. | No Linkage Section 7.2.3.2 |
| | | Large open pits will alter thermal regime and may produce open taliks were none existed before that may alter the regional groundwater flow directions. | Flooded open pits that have produced open taliks where none existed before will develop static water levels that will reproduce the current regional groundwater flow conditions. | Minor Section 7.2.3.3 |
| Underground | Groundwater quality and quantity | High TDS mine inflow will be induced to flow up into underground mine and may alter groundwater quality and quantity | During mining, groundwater flowing into the underground mine will be collected and treated, if necessary.<br><br>At closure the underground mine will be flooded with fresh water to keep high TDS in the lower portions of the mine | Minor Section 7.2.3.3 |
| | | Removal of bedrock and ore material may change or alter existing faults and change contaminant transport processes in subsurface and surface water quality | Groundwater investigations found that faults intersecting the underground mine have hydraulic conductivities similar to the adjacent un-faulted rock. | No Linkage Section 7.2.3.2 |
| | Groundwater quantity | When mining the underground below the permafrost, deep groundwater will be induced to flow to the underground mine. This groundwater flow may originate from nearby lakes that have an open talik and may result in a lowering of water levels in the lake. | Only lakes B7 and D7 and Meliadine Lake have open taliks connected to the deep groundwater regime.<br><br>At closure, the groundwater flow directions and quantities will be restored. | Minor Section 7.2.3.3 |
| | | When mining the | Only lakes B7 and D7 and Meliadine Lake have open taliks | Minor |

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Grounwater (continued)**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| | | underground below the permafrost, deep groundwater will be induced to flow to the underground mine. This groundwater inflow may reduce the inflow to a nearby lake that has an open talik and this may result in a lowering of water levels in the lake. | connected to the deep groundwater regime.<br><br>Lake B7 is a headwater lake and deep groundwater does not currently report to this lake.<br><br>At closure the groundwater flow directions and quantities will be restored. | Section 7.2.3.3 |
| | Groundwater quality | When mining the underground below the permafrost, progressive backfilling of mine stopes with cemented tailings and/or cemented crushed rock will occur and groundwater quality may be affected. | During operations when mining is occurring in the underground below the permafrost, groundwater flowing through the backfill and into the mine will be collected, monitored and treated, if required.<br><br>Once the cemented backfill is cured, metals will no longer leach from the backfill. | No Linkage<br>Section 7.2.3.2 |
| | | High TDS water will flow into underground mine at closure which may result in a flooded volume with high salinity | Freshwater will be pumped into underground mine at closure so that flooding of the mine will occur more rapidly and high TDS groundwater will remain at the bottom of the mine at near existing concentrations. | No Linkage<br>Section 7.2.3.2 |
| Tailings storage facility | Groundwater quantity and quality | Tailings storage facility (TSF) is located in a dewatered headwater lake that has an open talik; therefore, groundwater flow and quality may be affected | Only lakes B7 and D7 and Meliadine Lake have open taliks connected to the deep groundwater regime.<br><br>Currently, groundwater outflow from Lake B7 to Lake D7 and Meliadine Lake is small<br><br>Lake B7 water levels will be temporarily lowered by approximately 1 m to facilitate TSF dike construction, which may reduce groundwater flow to Lake D7 and Meliadine Lake, thereby lowering water levels in these lakes. Once operational, the water level in the reclaim pond will be near to or above pre-mining levels. | Minor<br>Section 7.2.3.3 |

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Grounwater (continued)**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| | | | During operations, the groundwater reporting from the TSF will flow into the Underground mine and will be collected and treated.<br><br>Geochemical testing indicates that the tailings are non-potentially acid generating. Kinetic tests completed on all waste rock types and at various scales show that drainage water quality is expected to meet Canadian Council of Ministers of the Environment (CCME) limits, except for results for arsenic and cyanide.<br><br>At closure, the reclaim pond will be drained and the tailings will be shaped and completed with a layer of non-acid generating mine rock to prevent erosion and water ponding on the surface of the tailings<br><br>Permafrost conditions are anticipated to establish in the tailings. Over time, the open talik beneath the TSF will become closed. | |
| Waste rock storage facility | Groundwater quality | Seepage from waste rock storage facilities could result in changes to groundwater quality. | Waste rock storage facilities are located above permafrost or lakes with closed taliks (unfrozen ground does not extend to groundwater regime beneath permafrost). During operations seepage will be collected and treated.<br><br>Geochemical testing indicates that waste rock and overburden is non-potentially acid generating and non-metal leaching. Kinetic tests completed on all waste rock types and at various scales show that drainage water quality is expected to meet Metal Mining Effluent Regulations (MMER) monthly mean effluent limits. | No Linkage Section 7.2.3.2 |

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Grounwater (continued)**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| Underground water storage and Waste rock storage facilty in Lake B4 | Groundwater quality | Underground water from the Tiriganiaq mine is stored in the dewatered Lake B4 in Years 1 and 2 may effect the talik or permafrost beneath the basin either during its use for storage of underground water or subsequently when it is drained to develop the waste rock storage facility at B4 | Saline water will be pumped from the underground and temporariliy stored in the dewatered Lake B4 basin in Year 1 and 2. After Year 2, the basin is drained again and used as a waste rock storage facility (WRSF).<br>Lake B4 is underlain by a closed talik. The temporary storage of saline water will not likely result in the development of an open talik beneath the basin. After year 2, the WRSF and the foundation beneath it, are anticipated to freeze thereby restricting the further infiltration of water. | Minor<br>Section 7.2.3.3 |
| Mine infrastructure (e.g., open pits, dikes, waste rock storage facilities, mine plant, site roads).<br>Project All-weather Access Road (AWAR) and haul roads.<br>Rankin Inlet Infrastructure | Groundwater quality | Sediment releases from infrastructure and road construction, including watercourse crossings, may affect quality of groundwater. | Best management practices will be used to control sediment releases during construction.<br><br>Where possible, in-stream works will be constructed in winter when watercourses are frozen; no in-stream works will be conducted between 1 May to 15 July to avoid critical periods for fish<br><br>Construction runoff will be captured and discharged into an attenuation pond to settle out suspended sediments.<br><br>Roads will be designed as narrow as possible, while maintaining safe construction and operation practices, and meeting legislated requirements. For example, minimum haul road widths are defined under the *Mine Health and Safety Act*.<br><br>Roads constructed on permafrost, which provides a barrier to downward flow of poor quality water to the deep groundwater regime. | No Linkage<br>Section 7.2.3.2 |
| General construction of mine and supporting infrastructure | Groundwater Quality | Potential impacts on groundwater quality in relation to site waste management activities other than waste rock and tailings, | A Landfill and Waste Management Plan (SD 2-11) will be implemented.<br><br>The rotary biological contactor sewage treatment plant for the camp facilities will be designed to meet the Nunavut effluent | No Linkage<br>Section 7.2.3.2 |

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Grounwater (continued)**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| | | including: handling and landfilling of waste; handling of contaminated ice, snow and/or soil; the management of historical contaminated material (e.g., previous spills, mishaps, releases, etc.), and sewage effluent discharges. | guidelines for wastewater discharge.<br><br>Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers (i.e., SD 2-13 Hazardous Materials Management Plan).<br><br>As necessary, individuals working on-site and handling hazardous materials will be trained, notably in the Transportation of Dangerous Goods and Hazmat.<br><br>Biopiles will be constructed to treat soils and rock contaminated by light hydrocarbons.<br><br>Soils contaminated with heavy hydrocarbon oil spills will be excavated, placed into appropriate containers and transported for remediation at a certified hazardous materials treatment site and disposed of appropriately.<br><br>Infrastructure will be constructed on permafrost, which provides a barrier to downward flow of poor quality water to the deep groundwater regime. | |
| | Groundwater quality | Spills and leaks during equipment operation may affect groundwater quality | Equipment will be re-fueled, serviced, and washed away from stream crossings and on impermeable pads wherever possible. There will be a wash bay in the maintenance shop.<br><br>Emergency response (SD 2-15) and spill contingency plans (SD 2-16) will be developed and implemented.<br><br>Ready access to an emergency spill clean-up kit for cleaning-up any spills.<br><br>Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers (i.e., SD 2-13 Hazardous Materials Management Plan). | No Linkage Section 7.2.3.2 |

**Table 7.2-5: Potential Pathways for Effects to Hydrogeology and Grounwater (continued)**

| Project Component/ Activity | Component | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/ Section for Further Discussion |
|---|---|---|---|---|
| | | | As necessary, individuals working on-site and handling hazardous materials will be trained, notably in the Transportation of Dangerous Goods and Hazmat.<br><br>Biopiles will be constructed to treat soils and rock contaminated by light hydrocarbons.<br><br>Soils contaminated with heavy hydrocarbon oil spills will be excavated, placed into appropriate containers and transported for remediation at a certified hazardous materials treatment site and disposed of appropriately.<br><br>Fuel storage tanks will be situated in a secondary containment area capable of containing 110% of the contents of the largest tank. The storage tanks and fuel-dispensing systems will be constructed in accordance with current regulatory requirements and National Fire Code. Fuel reconciliation will be conducted and structural integrity will be routinely inspected.<br><br>Construction and mining equipment, machinery, and vehicles will be regularly maintained.<br><br>Permafrost will provide a barrier for downward flow of poor quality water to the deep groundwater regime. | |

### 7.2.3.2 Pathways with No Linkage

A pathway may have no linkage if the activity does not occur (e.g., effluent is not released), or if the pathway is removed by environmental design features so that the Project results in no detectable (measurable) environmental change and no residual effects to groundwater and hydrogeology. The following pathways are anticipated to have no linkage to groundwater and hydrogeology, and therefore will not be carried through the effects assessment.

- **Groundwater flow from un-dewatered lakes to dewatered lakes may be increased thereby lowering water levels in un-dewatered lakes**

Upon dewatering a lake, the hydraulic gradients and groundwater discharge may be increased from nearby un-dewatered lakes which may lower the water levels in the un-dewatered lakes.

At the Project site, all of the lakes that will be dewatered, except for Lake B7, have closed taliks beneath them. Furthermore, Lake B7 is a headwater lake. Therefore, groundwater flow from lakes that will not be dewatered to those that will does not currently occur and will not exist at any time during the mine life. Dewatered lakes will have no effect on water levels in nearby lakes.

Lake B7 is underlain by an open talik with connection to the deep groundwater regime beneath the permafrost. This lake will be converted into a tailings storage facility (TSF). Lake B7 water levels will be temporarily lowered by approximately 1 m to facilitate TSF dike construction; however, water levels will remain the highest of lakes with open taliks in the LSA. During operations, the TSF will include a Reclaim Pond that will have a water level near to or above to pre-mining levels. Therefore, the hydraulic gradient and the groundwater flow from nearby un-dewatered lakes with open taliks will not be increased due to higher flows being directed to the Lake B7 basin. Consequently, the water levels in nearby un-dewatered lakes are not expected the change as a result of this pathway.

Based on the above, this pathway is considered to have no linkage to groundwater and hydrogeology.

- **Lowering of Lake B7 for construction of the TSF may result in artesian conditions that will need to be controlled**

Lake B7 currently has a water level elevation that is the highest of lakes with open taliks within the LSA. Lake B7 will be dewatered by 1 m during the construction of the TSF, but the lake will still have the highest water level of lakes with open taliks in the LSA. During operations, the TSF will include a Reclaim Pond that will have a water level near to or above pre-mining levels. Current and future conditions will not result in artesian pressures in the TSF; therefore this pathway is considered to have no linkage to hydrogeology and groundwater.

- **Development of the open pits may result in higher groundwater flow from nearby un-dewatered lakes, thereby lowering their lake levels**

All of the open pits will be developed in permafrost; therefore, they are not connected to the deep groundwater regime. This pathway is considered to have no linkage.

- **Removal of ore and bedrock in underground may change or alter existing faults thereby changing contaminant transport process and surface water quality**

The Underground mine at Tiriganiaq is the only mine workings that penetrate through the permafrost. None of the open pits penetrate through the permafrost; therefore, any faults that cut through the open pits would be frozen and would not provide a preferential pathway for groundwater flow.

Faults running through or near the underground mine have been found to have a similar hydraulic conductivity to that of the surrounding un-faulted bedrock. The faults have no effect on groundwater flow process. At closure the underground mine will be flooded. The numerical hydrogeological model predicts that the travel time from the Underground mine to Meliadine Lake will be between 500 to 1 000 years and the discharge rate would be about 3 cubic metres ($m^3$)/day (Appendix 7.2-B). This groundwater discharge rate represents less than 0.002 percent of the average daily discharge from Meliadine Lake.

This pathway is considered to have no linkage.

- **Backfilling of the underground mine may affect groundwater quality**

During mining below the permafrost, progressive backfilling of underground openings with cemented crushed rock and/or tailings will occur. Prior to curing of the cement, groundwater that is flowing into the Underground mine will flow along or through the backfill from which metals may be leached. During this period of cement curing, the groundwater flowing into the Underground mine will be collected and treated; therefore, during mine development this pathway is considered to have no linkage.

At closure and post-closure, the backfill cement will be fully cured and the backfill will no longer have the potential to affect groundwater quality. Therefore, this pathway is considered to have no linkage during closure and post-closure.

- **High TDS water will flow into the underground mine at closure which may result in a flooded volume with high salinity**

At closure, brine from the treatment process will be pumped back into into the planned underground mine. In addition, saline water will continue to flow into the underground mine through the bedrock located both below the unfrozen portions of the permafrost (the cryopeg) and the permafrost zone itself. Both of these sources of water will flow (density driven) down to the deep part of the mine and flood voids in backfilled and open development areas and stopes. The brine is estimated to fill approximately one-sixth of the mine below the top of the cryopeg. The water level in the underground will continue to gradually rise due to natural saline groundwater inflow. The rate of natural saline groundwater inflow will become less as the water level in the former mine openings rises. It is estimated that if the flooding of the underground mine by natural groundwater was to occur with no freshwater inputs, it would take about 3 years to flood the underground workings to the top of the cryopeg and over 4 years to flood from the top of the cryopeg to the final pit lake level (i.e., a total of approximately 7 years in the absence of additional freshwater inputs).

Freshwater from Meliadine Lake will also be pumped into the underground mine at closure so that flooding of the mine will occur more rapidly and to provide a freshwater cap to the saline water. In the initial stages of flooding with freshwater, natural saline groundwater will continue to flow into the underground mine. However, as the water level in the mine rises, the pumped freshwater volumes will be much greater than the natural inflow. A lower density freshwater layer will form on top of the high TDS water. Hydro-dynamic modelling has predicted that a 150 m cap of freshwater would be sufficient to keep concentrations in the Tiriganiaq Pit Lake below 300 mg/L (Appendix B of 7.4-B). It is expected that the freshwater cap would be thicker than 150 m; therefore, this pathway is considered to have no linkage.

- **Seepage from waste rock storage facilities may result in changes to groundwater quality**

The mine rock storage facilities are all installed over continuous permafrost and/or lakes with no open taliks to the deep groundwater regime beneath the permafrost. Therefore no hydraulic connection exists between the waste rock storage facilities and the groundwater. Furthermore, geochemical testing indicates that waste rock is non-potentially acid generating and non-metal leaching.

This pathway is considered to have no linkage.

- **Sediment releases from infrastructure and road construction, including watercourse crossings, may affect quality of groundwater**

Best management practices will be used to control sediment releases during construction. In-stream construction work will be avoided, or limited to the minimum extent possible. Where possible, in-stream works will be constructed in winter when watercourses are frozen in-stream work will follow regulatory guidance (i.e. where it applies, Department of Fisheries and Oceans (DFO) *operational statements* will be followed to ensure the protection of streams during critical periods). Construction runoff will be managed and may require runoff to be captured and discharged into an attenuation pond to settle out suspended sediments. Roads will be designed as narrow as possible, while maintaining safe construction and operation practices, and meeting legislated requirements.

Roads and most of the infrastructure will be constructed on top of permafrost that will act as a barrier to downward migration of water to the deep groundwater regime.

This pathway is considered to have no linkage.

- **Waste Management activities other than waste rock and tailings storage, such as handling and landfilling of waste; handling of contaminated ice, snow and/or soil; the management of historical contaminated material (e.g., previous spills, mishaps, releases, etc.), and sewage effluent discharges may effect groundwater quality**

A Landfill and Waste Management Plan (SD 2-11) will be developed and implemented to handle and contain site wastes. The rotary biological contactor sewage treatment plant for the camp facilities will be designed to meet the Nunavut effluent guidelines for wastewater discharge. Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers, and hazardous materials will be stored at the mine site in a dedicated waste management building and handled according to the Hazardous Materials Management Plan (SD 2-13). As necessary, individuals working on the Project and handling hazardous materials will be trained, notably in the Transportation of Dangerous Goods. Emergency spill kits will be readily available. Biopiles will be constructed to treat soils contaminated by light hydrocarbons, and soils contaminated with heavy hydrocarbon oil spills will be excavated, placed into appropriate containers, undergo remediation at a certified hazardous material treatment site and disposed of appropriately.

Most of the site is underlain by permafrost, which will prevent the downward movement of contaminants to the deep regional groundwater regime. Any contaminant releases will be contained within the active layer.

This pathway is considered to have no linkage.

- **Spills and leaks during equipment operation may affect groundwater quality**

A Risk Management and Emergency Response Plan (SD 2-15), Spill Contingency Plan (SD 2-16), and Fuel Management Plan (part of SD 2-13) will be developed and implemented to minimize the likelihood of accidental spills, or if they do occur, to quickly respond and clean up any spills. Agnico Eagles Mine Limited (AEM) will not permit the deposit of chemicals, sediment, wastes, or fuels into any waterbody. During construction, equipment will be re-fueled, serviced, and washed away from stream crossings and on impermeable pads wherever possible. There will be a wash bay in the maintenance shop where water will be managed appropriately. Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers, and hazardous materials will be stored at the mine site in a dedicated waste management building and handled according to the Hazardous Materials Management Plan (SD 2-13). As necessary, individuals working on the Project and handling hazardous materials will be trained, notably in the Transportation of Dangerous Goods. Emergency spill kits will be readily available. Biopiles will be constructed to treat soils contaminated by light hydrocarbons, and soils contaminated with heavy hydrocarbon oil spills will be excavated, placed into appropriate containers, undergo remediation at a certified hazardous material treatment site and disposed of appropriately. Construction and mining equipment, machinery, and vehicles will be regularly maintained.

The implementation of the Risk Management and Emergency Response Plan (SD 2-15), and environmental design features, including proper equipment maintenance and driver training, are expected to reduce the frequency and severity of spills. However, in the event of a spill, contaminated materials will either be collected and treated on-site, or shipped off-site for treatment and disposal.

In addition, most of the equipment will be operated on top of continuous permafrost that will inhibit the downward movement of spills and leaks. Spills will be isolated to the active layer and direct spills to open taliks are not expected to occur.

Based on the above, this pathway is considered to have no linkage groundwater and hydrogeology.

#### *7.2.3.3 Minor Pathways*

In some cases, both a source and a pathway exist, but the change caused by the Project is anticipated to result in a minor environmental change, and would have a negligible residual effect. The following pathways are anticipated to be minor with respect to groundwater and hydrogeology, and were not carried through the effects assessment.

- **Groundwater flow from dewatered lakes to un-dewatered lakes may be reduced thereby lowering the water levels in un-dewatered lakes**

By dewatering a lake, groundwater flow from that lake to a nearby un-dewatered lake will be reduced thereby potentially lowering the water level in the nearby un-dewatered lake.

With the exception of Lake B7, all of the Project lakes that will be dewatered have closed taliks beneath them. Therefore, groundwater flow from these lakes to other nearby lakes does not currently occur.

Lakes B7 and Lake D7 and Meliadine Lake have open taliks that connect to the deep groundwater regime. Lake B7, which is a headwater lake and is predicted to have an open talik, will be converted into the TSF. Lake B7 water levels will be temporarily lowered by approximately 1 m to facilitate TSF dike construction, which may reduce groundwater flow to Lake D7 and Meliadine Lake, thereby lowering water levels in these lakes. Once operational, the water level in the reclaim pond will be near to or above pre-mining levels.

Presently the groundwater outflow from B7 to D7 is estimated from the numerical hydrogeological model to be zero and the groundwater flow from B7 to Meliadine Lake is estimated to be about 3 $m^3$/day. This represents less than 0.002 percent of the average daily outflow from Meliadine Lake (172 200 $m^3$/day)

Based on the above, the changes to the water levels in Lake D7 and Meliadine Lake due to the temporary lowering of Lake B7 during TSF dike construction are expected to be negligible and this pathway is determined to be minor and no further analysis is required.

- **Large open pits will alter thermal regime and may produce open taliks where none existed before thereby altering the regional groundwater flow directions**

Flooded open pits may produce open taliks were none existed before. However, the open pits will develop static water levels that will reproduce the current regional groundwater flow conditions. Therefore, any changes to the regional groundwater flow directions are expected to be negligible and this pathway is determined to be minor and no further analysis is required.

- **High TDS groundwater induced to flow into underground mine may alter groundwater quality and quantity**

During mining, the Underground mine at Tiriganiaq will act as a sink for groundwater flow. Groundwater seeping into the Underground mine will originate from surface waters and from deep bedrock. Groundwater flow originating from deep bedrock will draw high TDS content groundwater to the mine. The TDS content of groundwater flowing into the mine will increase as the mine workings become deeper because the TDS in the deep bedrock increases with depth, and because of upwelling of saline water from beneath the mine due to the vertical hydraulic gradient that is created as a result of Project activities.

The creation of the Underground mine will induce groundwater to flow toward the mine from all directions. Although temporary changes to groundwater flow directions will occur, no measureable effects are anticipated in the receiving environment (such as reduced water levels in the surrounding lakes; see below). Furthermore, the water level in the dewatered lakes will be restored during closure, which will in turn restore the groundwater flow directions. Therefore, this pathway was determined to have negligible residual effect on groundwater flow directions and was classified as a minor pathway that required no further analysis.

However, a quantitative analysis of groundwater inflow rates and associated TDS mass loading rates to the Underground mine was completed because this pathway may still be valid to groundwater quality and to surface water quality in nearby lakes.

The results of the quantitative analysis, which is described in more detail in Appendix 7.2-B, indicate that groundwater inflow to the underground is predicted to be fairly constant, ranging from 420 $m^3$/day (Years -2 to 1) to 640 $m^3$/day (Years 5 to 12), with average predicted TDS concentration of the inflow ranging from 56 000 mg/L (Years -2 to 1) to 59 000 mg/L (Years 5 to 12). These TDS concentrations are similar to those found during water sampling beneath the permafrost in the area of the Underground mine (Appendix 7.2-A). The reason for this is the very low hydraulic conductivity of the deep bedrock ($3 \times 10^{-9}$ m/s) which limits the upward flow of more saline water.

During mining, the groundwater collected in the underground will be treated prior to discharge; therefore, during mining this pathway was determined to have negligible residual effect and was classified as a minor pathway that required no further analysis. The quantitative analysis presented above and in Appendix 7.2-B, indicates

that the TDS of the groundwater will not be altered due to the development of the mine; therefore, at closure the changes to the chemistry of the groundwater is expected to be negligible and this pathway is determined to minor and no further analysis is required.

- **Groundwater flow to the underground mine may increase groundwater outflow from a nearby lake thereby lowering water levels in the lake**

As previously outlined, the reduced groundwater pressures in the deep groundwater flow system may cause a small volume of water to flow from neighbouring lakes (with open taliks) toward the underground mine at Tiriganiaq. Lakes B7 and D7 and Meliadine Lake are the only lakes in the LSA with open taliks to the deep groundwater regime. The results of a quantitative analysis, described in detail in Appendix 7.2-B, indicate that prior to mining, groundwater outflow from D7 is about 1 $m^3$/day, and from B7 it is 3 $m^3$/day. There is no outflow from Meliadine Lake to the immediate area of the Project. At the maximum extent of underground mining, the groundwater outflow from these lakes is estimated to be 11 $m^3$/day for Lake D7, 35 $m^3$/day for Lake B7, and 37 $m^3$/day for Meliadine Lake with most of it coming from Meliadine Lake east of the mine. These estimated changes in outflows represent about 1% of the annual mean daily surface water outflow from D7 (886 $m^3$/day), about 3% of the mean of the annual daily surface water outflow from B7 (1132 $m^3$/day), and less than about 0.02% of the mean annual daily outflow from Meliadine Lake (172 200 $m^3$/day). As such, climatic inputs to the area vastly overwhelm the magnitude of the change potential induced by mine pit development and this pathway is considered minor and no further analysis is required.

- **Groundwater flow to the underground mine may reduce the groundwater inflow to a nearby lake thereby lowering water levels in the lake**

The reduced groundwater pressures in the deep groundwater flow system resulting from the underground mine, may also result in a reduction in groundwater discharge to nearby lakes with open taliks, which in turn may lower the water levels in these lakes. Lakes B7 and D7 and Meliadine Lake are the only lakes in the LSA with open taliks to the deep groundwater regime. The quantitative analysis outlined above predicted that the groundwater inflow to D7 and to B7 prior to mining is 0 $m^3$/day, and the groundwater inflow to Meliadine Lake is 7 $m^3$/day, with most of this discharge to Meliadine Lake east of the mine. At the full extent of the underground mine, the estimated inflow to lakes B7 and D7 remains 0 $m^3$/day, whereas the inflow to Meliadine Lake is reduced to 3 $m^3$/day (Appendix 7.2-B). The change in inflow to Meliadine Lake represents less than 0.003% of the mean annual discharge from Meliadine Lake. As such, climatic inputs to the area vastly overwhelm the magnitude of the change potential induced by mine pit development and this pathway is considered minor and no other analysis is required.

- **Underground water from the Tiriganiaq mine stored in Lake B4 in Years 1 and 2 may affect the talik or permafrost beneath Lake B4 either during its use for storage of underground water or subsequently when it is drained to develop the waste rock storage facility (WRSF) at B4**

The saline groundwater that infiltrates the Tiriganiaq underground mine will be pumped to surface and stored in the Lake B4 basin during Years 1 and 2 of the mining operations. Prior to storing the saline groundwater in the B4 basin, the lake and upstream lakes will be dewatered. In addition to the saline water in the first two years of operation, run-off and net direct precipitation will feed the B4 basin. Mixing of the saline groundwater with run-off and direct precipitation will act to dilute the saline groundwater stored in the B4 basin. After Year 2, the basin will be drained and used as a waste rock storage facility (WRSF).

Concentrations of TDS in B4 derived from groundwater reporting to the Tiriganiaq underground mine are predicted to be diluted by up to 3 times in the warm season from June to September. However, in the cold season when runoff and precipitation are negligible and surface temperatures are lower, TDS concentrations within the basin will be essentially equal to those reporting to the underground mine, which are predicted to range in concentration from 56,000 mg/L to 58,000 mg/L in Years 1 and 2. The freezing point depression estimated for a sample of groundwater obtained from 450 m depth with TDS of approximately 61,000 mg/l is -3.2°C, which provides a conservative estimate of the freezing point of the saline waters stored in the B4 basin during the winter months. During the warm season when shallow ground temperatures peak, the actual freezing point of the water stored in the basin will be less than -3.2°C due to dilution by surface water inputs. In the winter, when the freezing point of the saline water is -3.2°C (no dilution by surface water), the shallow ground temperature is lower than -3.2°C.

Lake B4 has a size of approximately 500 m wide by 1000 m long. Considering these dimensions, this lake could potentially present an open talik. However, the mean depth of water in Lake B4 is 0.9 m which is less than the average mean ice thickness at the Project (i.e., approximately 1.7 m); therefore, the majority of the lake surface area will consist of shallow lake terraces that will freeze to the bottom during winter. Considering the water depth of Lake B4 and the reported ice thickness, an open talik connected to the deep groundwater flow regime under Lake B4 is considered unlikely.

Although an open talik is not expected, the temperature of the permafrost beneath Lake B4 that results in the closed talik may not be colder than -3.2°C. In the winter season, if the 'worst case' saline groundwater (not diluted by freshwater runoff and precipitation) was stored in the B4 basin, and this water was not impeded by the colder near surface ground temperatures; it would infiltrate the ground surface and migrate downwards. As it migrates downwards it may become diluted by freshwater previously occupying the pore spaces within the ground and by melted permafrost water. This will slow down its migration and raise its freezing point depression. If the freezing point of the mixture is a higher temperature than the permafrost, it will generally freeze on contact; if it is lower than the permafrost, then melting of the permafrost could occur. The degree of this melting will depend on a number of factors including the temperature of the permafrost, the thermal energy of the saline water and the velocity of the saline front. In the worst case scenario, the infitration would result in the temporary development of an open talik beneath the B4 basin.

After Year 2, the lake is drained and used as a WRSF. Based on the thermal profile of a thermistor installed in borehole GT11-14 and located about 80 m north of Lake B4, the Depth of Zero Annual Amplitude is estimated at about 15 m below ground surface, with a corresponding temperature of about -6°C. While the data at this location are limited, the estimated depth and temperature are consistent with other thermistors installed in the Project area. In addition, the average annual air temperature is about -10°C at the site. These low ground and annual air temperatures will result in the freezing of the WRSF and any saline water remaining as pore water within the basin and the underlying talik after Year 2 resulting in the formation of a closed talik if one was not present prior to the construction of the WRSF.

Based on the above discussion, the potential effects to the subsurface conditions beneath the Lake B4 basin as a result of saline groundwater storage during Years 1 and 2 are expected to be negligible by virtue of the low hydraulic conductivity of the bedrock, the brief period of time the saline groundwater will remain in the B4 basin, and the absence of an open talik. In the unlikely event that the existing talik is open or it becomes open due to melting of the permafrost by the saline water, the saline groundwater will flow at a very low rate through the B4 talik down to the deep groundwater regime and then up to the Tiriganiaq underground during mining and to

Meliadine Lake West after closure. The saline water reporting to the deep groundwater regime will have a similar TDS concentration to that of the baseline groundwater at that depth. Although calculations of the travel time of this saline water have not been made for the flow of solutes from B4, a calculation of travel time for water in the underground mine when flooded to flow to Meliadine Lake was predicted to be between 500 to 1000 years with a flow rate to Meliadine Lake of 3 $m^3$/day. This volume of groundwater flow represents less than 0.003% of the average daily discharge from Meliadine Lake. Travel times and flow rates of a similar order of magnitude would be expected for the flow from the B4 basin to Meliadine Lake during closure if there was an open talik beneath B4.

Considering the above, this pathway is considered minor and no other analysis is required.

- **Tailings storage facility located in a dewatered lake that has an open talik may affect groundwater quantity and quality**

As presented previously, the creation of the underground mine will induce groundwater to flow from nearby lakes with open taliks. Lake B7 has an open talik. This lake will be converted into the TSF. The pore water chemistry of the TSF is expected to meet Canadian Council of Ministers of the Environment (CCME) limits except for arsenic and cyanide.

During operations, any groundwater reporting from the TSF will flow into the Underground mine in the quantitative analysis presented in Appendix 7.2-B the travel time for a particle of groundwater to reach the underground mine was estimated. This analysis predicts that it will take approximately 8 years for groundwater originating from the TSF to reach the underground mine. During mine development groundwater flowing into the underground will be collected and treated; therefore, this pathway, during development, is considered to have no linkage.

At closure, the reclaim pond will be drained, and the open pits and underground mine at Tiriganiaq will be flooded and groundwater flow directions restored. With time, permafrost conditions are anticipated to establish in the tailings and open talik beneath the TSF (SD 6-1 Permafrost Baseline Report), and groundwater flows will become zero.

Any groundwater originating from the TSF over the period from closure to freezing of the talik beneath the TSF will flow down to the deep groundwater flow regime and then towards the eastern portion of Meliadine Lake. The qualitative analysis (Appendix 7.2-B) has estimated a travel time of 500 to 1000 years for a particle of groundwater to reach Meliadine Lake. As noted above, the talik is expected to close with time. In the event that groundwater originating from the TSF were to pass through the talik prior to freezing, the rate of discharge to Meliadine Lake would be about 3 $m^3$/day. This volume of groundwater flow represents less than 0.002% of the average daily discharge from Meliadine Lake.

The above analysis considered only solute transport due to differences in freshwater hydraulic heads (Appendix 7.2-B). It does not consider density-driven flow. The high hydraulic gradients produced during development of the Underground mine overwhelm the density-driven flow; therefore, during the development phase of mining, density-driven flow is negligible. However, at post closure the hydraulic gradients are very small and density-driven transport of solutes will dominate. Density-driven solute transport would tend to increase the travel times and reduce the discharge rate of solutes (in this case cyanide and arsenic) originating from the TSF to Meliadine Lake. The values presented above for travel times are, therefore, considered to be conservatively

low and the estimated discharge rate conservatively high. As such, any changes to Meliadine Lake water quality are expected to be negligible and this pathway is considered minor and no other analysis is required.

As noted above, the talik beneath Lake B7 is expected to close with time due to the presence of the TSF. This may reduce groundwater flow to Lake D7 and Meliadine Lake, thereby lowering water levels in these lakes. The quantitative analysis outlined above predicted that the total groundwater inflow to D7 and to Meliadine Lake prior to mining is 0 $m^3$/day and 7 $m^3$/day, respectively. At the full extent of the underground mine, the estimated inflow to Lake D7 remains 0 $m^3$/day, whereas the inflow to Meliadine Lake is reduced to 3 $m^3$/day (Appendix 7.2-B). Assuming that the Underground mine is effective at capturing all groundwater flows from the Lake B7 basin during operations, similar groundwater flow rates to Lake D7 and Meliadine Lake would be expected to occur following freezing of the Lake B7 talik. As noted above, this change in groundwater inflow to Meliadine Lake represents less than 0.003 percent of the mean annual discharge from Meliadine Lake. As such, climatic inputs to the area vastly overwhelm the magnitude of the change potential induced by mine pit development and any changes to lake levels are expected to be negligible. Therefore, this pathway is considered minor and no other analysis is required.

#### 7.2.3.4 Primary Pathways

There are no primary pathways for groundwater and hydrogeology, or to other VECs as a result of change to hydrogeology and groundwater quantity and quality. Therefore, effects analysis and subsequent residual impact classification were not undertaken.

#### 7.2.3.5 Future Developments

The Meliadine Project has been designed with some growth in mind (FEIS, Section 2.3). This growth will be limited to the known ore bodies and does not extend to ore bodies not yet discovered. Any further ore bodies would have to be addressed through future phases of development, which would have to undergo future environmental assessment.

The Wolf deposit, located north-west of the Tiriganiaq deposit, is currently known, but still requires some exploration work to be better defined and included in the mine plan. Currently, the Wolf deposit does not have sufficient proven reserves to be economically mined; however, there are strong possibilities that this deposit could be economically developed in the future should exploration results and the associated economic analyses be successful.

The open pit for the Wolf deposit would be located entirely with permafrost; therefore, incorporation of the Wolf Pit as a potential future project results in no measurable environmental change and no residual effects to hydrogeology and groundwater.

#### 7.2.3.6 Effects of Long-Term Warming Trends

Thermal analyses have determined that under the temperature changes predicted by available long-term climate change models (FEIS, Section 5.4), minimum effects to permafrost depth and the thickness of the active layer will occur during the Project life and into closure. Furthermore, thermal modelling, (FEIS, Appendix 6.3-E) has

found that freezing of the talik below the Tailing Storage Facility (TSF) will still occur under the temperature changes predicted by climate change models.

Based on the predicted minimum effects to permafrost and to the development of permafrost beneath the TSF, long-term warming trends are expected to result in no measurable environmental change and no residual effects to hydrogeology and groundwater.

### 7.2.4 Monitoring and Follow-Up

This section describes, in broad terms, the type of groundwater monitoring that will be implemented for the Project. Monitoring will occur at the onset of development to determine the response of the environment to the disturbance by mining. All of the open pits will be excavated entirely within permafrost or in closed taliks (not connected to the deep groundwater regime); therefore, groundwater seepage to the open pits is expected to be relatively small, seasonal (in the summer months only) and with relatively low Total Dissolved Solids (TDS). Consequently much of the groundwater monitoring will be focused on the underground development at Tiriganiaq, which extends below the permafrost to the deep groundwater regime.

The hydrogeological conditions will be monitored for changes throughout each phase of the Project. During each phase of the Project, groundwater monitoring will include the following on a daily to annual basis:

- implementation of established quality assurance/quality control measures for data acquisition, groundwater sampling, and analysis;
- measurement of groundwater inflow to the open pits and underground mine;
- seepage mapping in the open pits and underground mine;
- collection of groundwater samples in sumps in the open pits and the underground mine;
- pressure measurements from ports at designated depths and respective water levels in the Westbay well;
- collection of groundwater samples from ports in the Westbay well;
- water sample analysis for main ions and other parameters of interest;
- review and compilation of relevant permafrost, soils quality, surface water quality and hydrology reports and information; and
- data and information assessment and completion of a groundwater monitoring report including recommendations for mine management team.

Groundwater monitoring during the first 2 years of the development of the underground mine at Tiriganiaq will be conducted using the existing Westbay monitoring well which was completed within the deep groundwater regime. The underground mine at Tiriganiaq is the only mine that extends below the permafrost into the deep groundwater regime. As the open pits will be completed either within closed taliks or permafrost, the Westbay system would not respond to the development of these mines. Groundwater quality monitoring will occur annually during the first 2 years of the development of the underground mine. Groundwater level monitoring will mostly occur on a daily and evaluated on a weekly basis (transducers and dataloggers will be installed for this purpose) during the internal development of the Underground mine, and it is expected that the frequency of these measurements will be scaled down over the last few years of the Underground mine development.

Groundwater inflow quantity will be measured on a weekly basis in the sumps in the Underground mine and the open pits. Water quality samples from the sumps will be collected monthly. For the underground mine, separate flow meters would be installed on several levels of the mine to assess inflow variability. In the open pits, monthly sump pump rates will be monitored and additional sumps or weirs may be installed to monitor individual seepages. If the observed inflow or quality values or changes are within 25% less than predicted, then the hydrogeological model would not need to be re-calibrated and future inflows predicted. If, however, the observed values are greater (poorer quality or higher quantity) than predicted, then model re-calibration will be required so that future inflows can be predicted and managed. Seepage mapping of the groundwater inflows in the Underground Mine and open pits will be undertaken on an annual basis. Any high inflow zones, if present will be mapped and sampled.

The need for additional Westbays would be evaluated as the Project proceeds. The monitoring program will focus on providing data required to update groundwater modelling results, specifically:

- to assess ongoing effects of underground mine development on groundwater movement and water quality;
- to assess preferential pathways for groundwater flow;
- to predict long-term groundwater movement and water quality; and
- to provide details to the design team for adaptive management of groundwater flows and pit water quality.

Modifications to the monitoring program will be based on a comparison of the monitored information to the predicted values. The intervals between monitoring events would likely be increased (i.e., less frequently sampled) if the observed values or changes are less than predicted. If the observed values or changes are greater than predicted, the monitoring will continue as deemed necessary.

Potential for effects on groundwater quality from the tailings and waste rock storage facilities will be evaluated using water quality monitoring results for perimeter collection systems and the analyses of water samples collected from the Westbays and Underground Mine. For the TSF an indicator parameter would be the presence of cyanide, which does not occur in baseline geochemistry and is used in the extraction of metals. If unexpected results are observed, revisions to the groundwater monitoring program will be made.

The groundwater monitoring program described above is summarized in Table 7.2-4.

**Table 7.2-4: Proposed Groundwater Monitoring Program**

| Monitored Feature | Type of Monitoring Program | Timing of Monitoring | Monitoring Results |
|---|---|---|---|
| Groundwater quality and level | monitoring Westbay well | weekly | Hydraulic head profiles with depth in the underground mine |
| Groundwater inflow quantity | flow meters for total inflow and inflow at separate levels in underground mine<br>monitoring of sump pumping rates in the open pits | weekly | water inflow quantity to the underground mine and open pits |
| Groundwater inflow quality | water sampling of underground and open pit sumps | monthly | water inflow quality to the underground mine and open pits |
| Groundwater inflow quality and quantity | Seepage mapping of underground and open pits (quality and quantity) | Annually, as deemed necessary | Assess water quantity and quality of preferential pathways, if any, for groundwater flow |
| Groundwater quality | monitoring Westbay well | Annually for first 2 years | seasonal variations in groundwater quality in well |

## 7.3 Hydrology including Water Quantity

The purpose of this section is to address the Guidelines issued by the NIRB for the Project (NIRB 2012a), specifically relating to the impact of the Project on hydrology including water quantity. The complete Guidelines for the Project, including FEIS section and page number referencing, are summarized in the main FEIS concordance table (Volume 1, Appendix 1.0-A).

### 7.3.1 Baseline Environment

The following section provides a brief description of the existing environment in the Meliadine Lake watershed that is directly relevant to hydrology including water quantity. The focus of the descriptions is on baseline results. For additional details on methods or results, supplementary information regarding the existing environment of the Meliadine Lake watershed is provided in SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline. Some of the results presented, including drainage patterns of previously non-investigated watersheds, updated watershed lake and land areas, updated lake names, and stream geomorphology, are based on preliminary results of ongoing field studies conducted in 2012, which will be reported on in late 2012 or early 2013.

#### *7.3.1.1 Methods*

The description of hydrology focuses on characterizing the streamflow and water level regimes at lake outlets in the LSA. Hydrometric data, stream geomorphology data, and ice conditions and winter flow information were collected for baseline reporting. The baseline report examined local and regional data to develop the following estimates:

- long-term mean values of discharge and corresponding stages, and annual water yield;
- ranges of natural variability including dry and wet year values;
- peak discharges; and
- low flows.

A water balance model was developed to derive long-term mean characteristics and variability for key waterbodies within the LSA since the long-term regional hydrometric station network is sparse, regional data are not applicable to small, local watersheds with variable storage and lake outlet geometry, and there are only short periods of record for hydrometric stations at the Project.

The flow regime for the Diana River, located in the RSA, was also characterized based on available hydrometric data (Environment Canada 2009).

#### *7.3.1.2 Results*

The mine site of the Project is located within the Meliadine Lake watershed. Meliadine Lake has a water surface area of approximately 107 square kilometres ($km^2$), a maximum length of 31 km, features a highly convoluted shoreline of 465 km in length, and has over 200 islands. Unlike most lakes, it has 2 outflows that drain into

Hudson Bay through 2 separate river systems. It has a drainage area of 560 km$^2$ upstream of its 2 outflows. Most drainage occurs via the Meliadine River, which originates at the south west end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km) (visible on Figure 7.1-5 in Section 7.1). At its mouth, the Diana River has a drainage area of 1460 km$^2$.

Watersheds within the LSA comprise an extensive network of waterbodies, and interconnecting streams. These watersheds have lake surface fractions (i.e., the ratio of lake area to land area) of up to 51%, and the hydrology of these watersheds is dominated by lake storage and evaporation. The general characteristics of component watersheds are summarized in Table 7.3-1. The local drainage network of the LSA is presented in Figure 7.3-1.

**Table 7.3-1: Local Study Area Watershed Area Summary**

| Watershed | Land Surface Area (km$^2$) | Lake Surface Area (km$^2$) | Total Area (km$^2$) | Lake Surface Fraction |
|---|---|---|---|---|
| A | 7.15 | 2.32 | 9.47 | 0.325 |
| B | 16.83 | 5.94 | 22.77 | 0.353 |
| C | 2.78 | 0.50 | 3.28 | 0.181 |
| D | 5.45 | 2.26 | 7.71 | 0.415 |
| E | 2.38 | 1.20 | 3.58 | 0.505 |
| G | 0.88 | 0.18 | 1.05 | 0.201 |
| H | 1.79 | 0.40 | 2.20 | 0.226 |
| I | 0.23 | 0.08 | 0.31 | 0.332 |
| J | 1.11 | 0.28 | 1.39 | 0.248 |
| P | 0.35 | 0.11 | 0.46 | 0.301 |
| CH | 10.39 | 4.79 | 15.18 | 0.461 |
| X | 4.66 | 0.62 | 5.28 | 0.117 |
| Meliadine Lake[a] | 361 | 199 | 560 | 0.355 |

[a] Including all sub-watersheds upstream of its 2 outflows

#### 7.3.1.2.1 Drainage Patterns

The drainage networks of sub-watersheds examined in the LSA are presented in Figure 7.3-2 to Figure 7.3-5. In general, sub-watersheds were numbered relative to their position in each drainage basin, with numbers increasing in the upstream direction (e.g., Lake D2 drains to Lake D1).

520000 530000 540000 550000 560000 570000

7000000

6990000

6980000

N

Meliadine Lake

Parallel Lake

Meliadine Lake

E G H D Mine Location J I P B A C X CH

**LEGEND**

- Direction of Flow at Watershed Outlet
- Watercourse
- Watershed Boundary
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

3 0 3
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

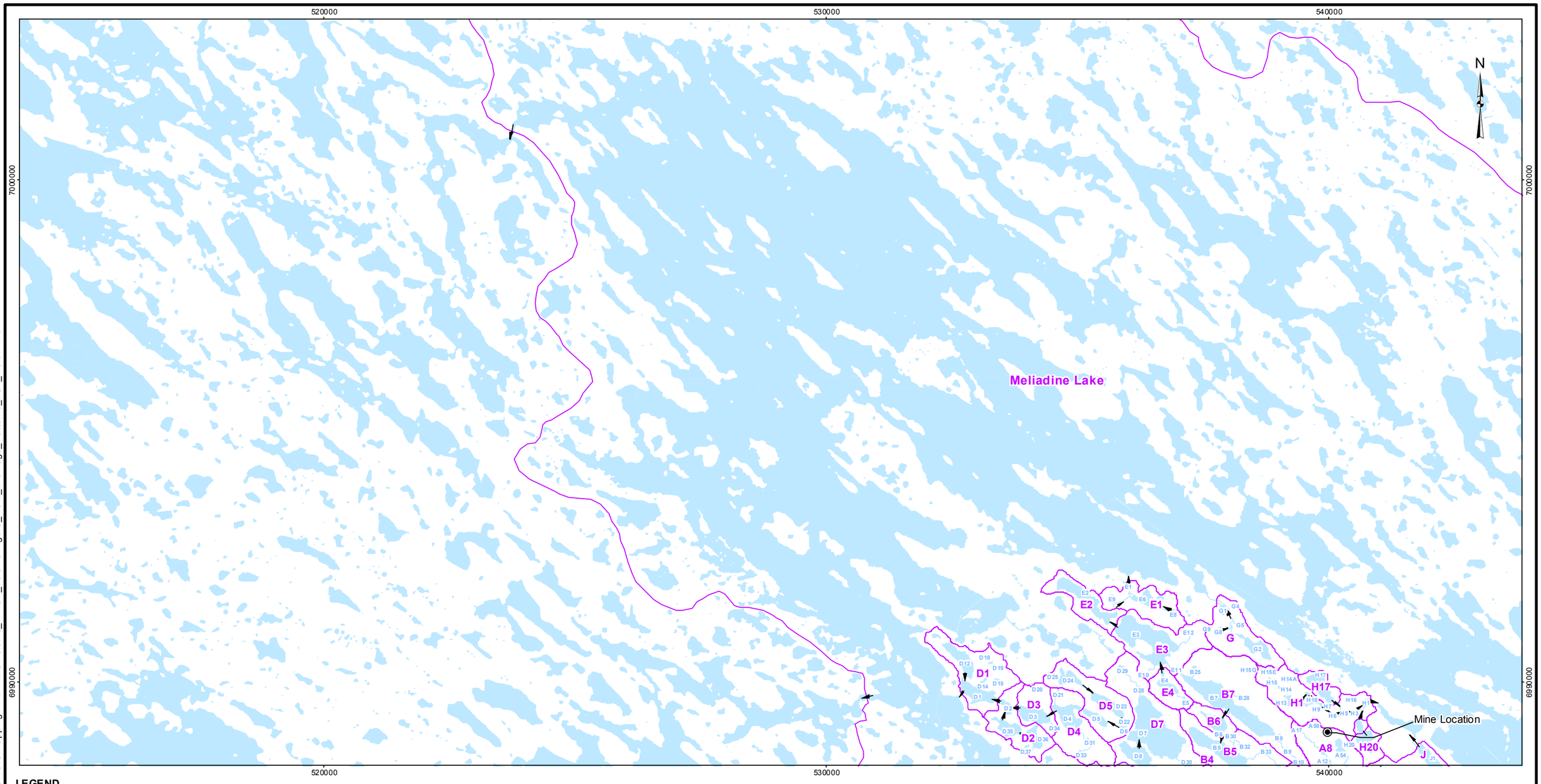
TITLE
**LSA WATERSHEDS**

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 21 Aug. 2012 | | |
| CHECK | DW | 20 Jan. 2013 | | |
| REVIEW | DW | 20 Jan. 2013 | | |

**FIGURE 7.3-1**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.3-1_LSA_Watersheds.mxd




**LEGEND**

- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

2 0 2
KILOMETRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

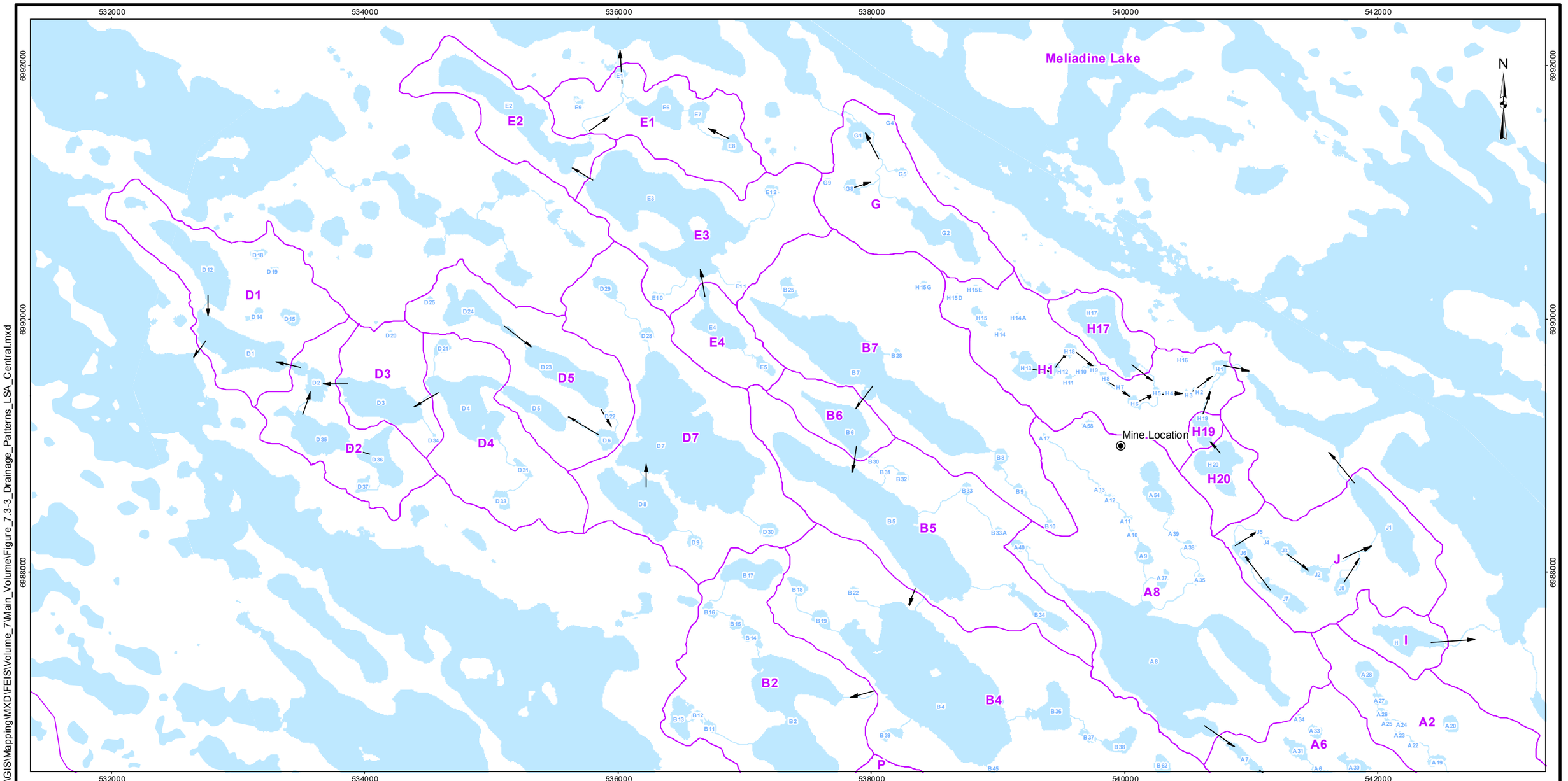
# DRAINAGE PATTERNS OF LSA WATERSHEDS (NORTH)

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 22 Aug. 2012 | | |
| CHECK | DW | 20 Jan. 2013 | | |
| REVIEW | DW | 20 Jan. 2013 | | |

**FIGURE 7.3-2**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7Main_Volume\Figure_7.3-2_Drainage_Patterns_LSA_North.mxd




**LEGEND**

- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

750 0 750
METRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

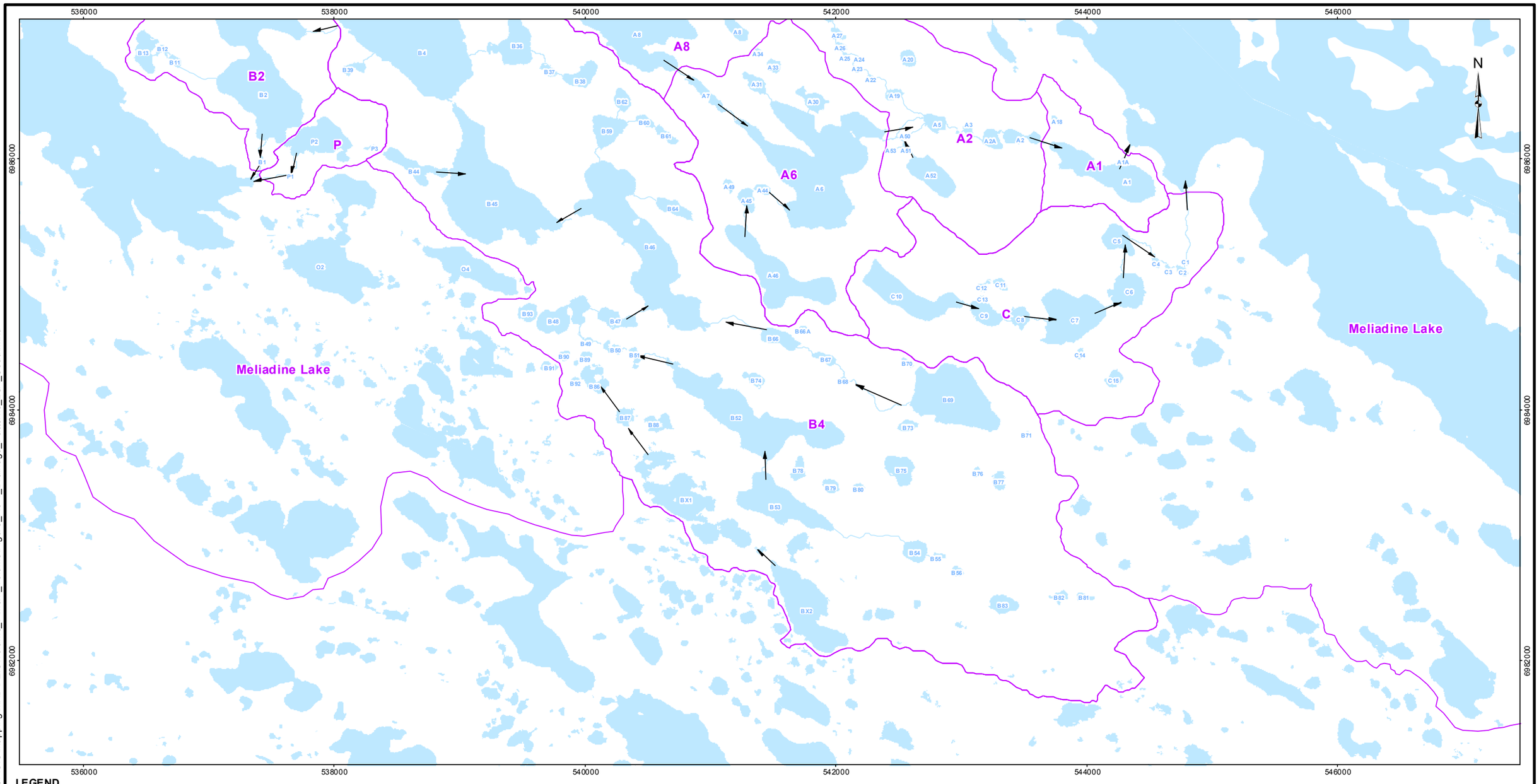
# DRAINAGE PATTERNS OF LSA WATERSHEDS (CENTRAL)

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 22 Aug. 2012 | | |
| CHECK | DW | 20 Jan. 2013 | | |
| REVIEW | DW | 20 Jan. 2013 | | |

**FIGURE 7.3-3**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.3-3_Drainage_Patterns_LSA_Central.mxd




**LEGEND**

- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

750 0 750
METRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# DRAINAGE PATTERNS OF LSA WATERSHEDS (SOUTH)

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 21 Aug. 2012 | | |
| CHECK | DW | 20 Jan. 2013 | | |
| REVIEW | DW | 20 Jan. 2013 | | |

**FIGURE 7.3-4**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\EIS\Volume_7\Main_Volume\Figure_7.3-4_Drainage_Patterns_LSA_South.mxd

548000 550000 552000 554000 556000 558000

6984000 6982000 6980000

Meliadine Lake

X

CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8 CH9 CH10 CH11 CH12 CH13 CH14 CH15 CH16 CH17 CH18 CH19 CH20 CH21 CH24 CH25 CH26 CH27 CH28 CH29 CH32 CH33 CH34 CH35 CH36 CH37 CH38 CH39 CH40 CH41 CH42

N

**LEGEND**

- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

750 0 750

METRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# DRAINAGE PATTERNS OF LSA WATERSHEDS (EAST)

Golder Associates

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. | 0 |
| GIS | DSC | 21 Aug. 2012 | | | |
| CHECK | DW | 20 Jan. 2013 | | | |
| REVIEW | DW | 20 Jan. 2013 | | | |

**FIGURE 7.3-5**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.3-5_Drainage_Patterns_LSA_East.mxd

#### 7.3.1.2.2 Stream Geomorphology

Waterbodies comprise greater than 30% of the landscape within the LSA and are typically connected by short outlet channels, which have low slopes at the headwaters, but are steep relative to land slopes at the lower end of the watershed. Channels are typically only slightly entrenched, have high bankfull width-to-depth ratios (greater than 12) and moderate sinuosity (S) (greater than 1.2). Most lake outlet channels in the LSA could be described predominantly as C2 channels by the Rosgen Level II classification system (Rosgen 1994).

The beds of larger channels are typically armoured with inerodible boulder and cobble layers. Channels may include flat and steep reaches as governed by the local topography. Channel banks typically consist of vegetated mats of organic material, below which are found organics and fine soils within a matrix of cobble and boulders similar to the bed materials. Mid-channel islands were observed to also consist of a veneer of vegetated organic material resting on a bouldery substrate. Erosion resistance of channel banks is also likely enhanced by frozen conditions during spring snowmelt peak discharges, as has been observed in other northern areas (Scott 1978). However, during unfrozen conditions after spring runoff, these banks may be sensitive to changes in flow regime.

In 2012 field data were collected at site to characterize the baseline conditions for lake shorelines and stream geomorphology. Appendix 7.3-D presents the analysis and results of the field program. The main conclusions of the analysis are summarized below:

- Large waterbodies with permanent flows (Lake A1, A2, A3, A4, A5, A6, A7, A8, A31, B2, B6, B45, B46, D4, D5, D6, D7, and J1):
  - The majority of the lake shorelines consist of soils and organics underlying cobble and gravel and sometimes boulders. Limited sections of shoreline with exposed cobble and boulders are present as well but are not typical for the area.
  - Streambeds of the lake outlet channels consist mostly of gravel and cobble, with boulders at times. Organics can be found in limited sections, mixed with gravel and cobble. The channel banks have soil and organics overlaying the gravel and cobble. Isolated boulders can be found at times.
- Small waterbodies with temporary flows during freshet or rain events (Lake A9, A10, A11, A12, A13, A17, A35, A38, A39, A54, B34, B44, H1, H2, I1, J2, J3, J4, J5, J6, J7, J8, P2 and P3):
  - Lake shorelines consist mainly of soils and organics underlying gravel and cobble. Vegetation is found in shallow waters of some of the lakes.
  - Outlet channels are relatively shallow and with soil and organics as the typical material. Vegetation is also present in many of the outlet channels, with flows through low areas covered with grass and no apparent channel.

#### 7.3.1.2.3 Ice and Winter Flows

##### Winter Conditions

Data and observations of ice conditions and winter flows in the LSA are summarized in Table 7.3-2. Only limited field data were collected, because all lake outlets that were examined, with the exception of the outlet of Meliadine Lake, were consistently observed to be completely frozen, with no measurable flow during the winter. This appears to be typical winter condition for all lake outlets in the LSA. However, IQ indicates that in general IQ

ice on freshwater lakes in Nunavut is forming later in the year than in the past, ice does not get as thick as it did in the past, and there are areas that ice stays thin all winter (Government of Nunavut 2005).

**Table 7.3-2: Ice Thicknesses in the Meliadine River Watershed**

| Waterbody | Date Sampled | Ice Thickness (m) | Lake Depth including Ice at Sampling Location (m) |
|---|---|---|---|
| Lake A1 | May 1998 | 1.82 | - |
| | May 2000 | 1.75 | - |
| Lake A6 | April 1998 | 1.70 | 3.80 |
| | May 1998 | 1.60 | - |
| | April 2009 | 1.66 | 4.16 |
| Lake A8 | April 1998 | 1.80 | 3.00 |
| | April 2009 | 1.63 | 2.73 |
| Lake B2 | April 1998 | 1.80 | 2.50 |
| | May 1998 | 1.90 | - |
| | May 1999 | 1.30 | - |
| | May 2000 | 1.42 | - |
| Lake B4 | May 1998 | 1.00 | - |
| | May 1999 | 1.30 | - |
| Lake B5 | April 1998 | 1.80 | 2.20 |
| | May 1998 | 2.09 | - |
| | May 1999 | 1.30 | - |
| | April 2009 | 1.63 | 2.63 |
| Lake B6 | April 2009 | 1.74 | 3.48 |
| Lake B7 | April 1998 | 1.80 | 3.20 |
| | May 1998 | 1.99 | - |
| | May 1999 | 1.20 | - |
| | Apr 2009 | 1.79 | 3.82 |
| | May 2000 | 2.00 | - |
| Lake D1 | April 1998 | 1.50 | 2.20 |
| Lake D5 | May 1998 | 1.30 | - |
| Lake D5 | May 1999 | 1.30 | - |
| Lake D7 | April 1998 | 1.80 | 2.30 |
| Lake CH6 | April 2009 | 1.73 | 8.98 |
| Meliadine Lake | April 1998 | 1.80 | 11.50 |
| | April 2009 | 1.67 | 5.36 |
| | April 2009 | 1.78 | 5.14 |
| | April 2009 | 1.93 | 10.12 |
| | April 1998 | 2.30 | 4.20 |
| | April 1998 | 1.80 | 5.00 |
| | May 1998 | 1.97 | - |
| | May 2000 | 1.98 | - |
| | April 1998 | 1.80 | 3.00 |
| | April 2009 | 1.72 | 3.14 |

Note: -= no available data

## Spring Melt Conditions

IQ

IQ has indicated that ice melt in Nunavut has started earlier in the last few years, and that the duration of melt has been shorter (i.e., melt has been quicker) (Government of Nunavut, 2005). During the first week or two of the runoff period, regular observations of water levels and discharge measurements were made at intervals of 1 to 2 days at selected lake outlet monitoring stations. Notable data relating to the start of runoff for the monitoring stations from 1997 to 2011 are presented in Table 7.3-3.

**Table 7.3-3: Runoff Start-up Dates in the Local Study Area, 1997 to 2011**

| Location | Year | Start of Runoff | First Discharge Measurement | Spring Runoff Peak |
|---|---|---|---|---|
| Lake A1 | 1999 | 2 June | 2 June | 4 June |
| | 2000 | 13 June | 13 June | 17 June |
| Lake B2 | 1999 | 2 June | 5 June | 5 June |
| | 2000 | 14 June | 15 June | 17 June |
| | 2009 | - | 11 June | 15 June |
| Lake B7 | 1999 | 2 June | 5 June | 6 June |
| | 2000 | 14 June | 14 June | 17 June |
| Lake D1 | 2009 | - | 11 June | 14 June |
| | 2011 | - | 14 June | 16 June |
| Lake E1 | 2011 | - | 14 June | 17 June |
| Lake H1 | 2011 | - | 16 June | 16 June |
| Meliadine Lake Main Outlet | 1997 | continuous | 19 May | 23 May |
| | 1998 | continuous | 7 May | 16 June |
| | 1999 | 31 May | 31 May | 25 June |
| | 2000 | 10 June | continuous | 27 June |
| Meliadine Lake West Outlet | 1997 | - | 12 June | 23 June |
| | 1998 | - | 6 June | 16 June |
| | 1999 | 31 May | 31 May | 25 June |
| | 2000 | 16 June | continuous | 27 June |
| Meliadine River near the Mouth | 1998 | - | 4 June | 5 June |
| | 1999 | 31 May | 31 May | 5 June |
| | 2000 | 11 June | 12 June | 14 June |

Note: -= no available data

## Freeze-up Conditions

On the basis of the observed winter conditions; observed start and end of season lake levels; and the likely influence of watershed area, upstream waterbodies, and typical regional temperatures, the following estimates were made for freeze-up of the outlets:

- LSA waterbodies typically discharge to the end of October; and
- Meliadine River sometimes discharges through the winter.

#### 7.3.1.2.4 Mean Water Balance

A mean annual water balance for a typical watershed in the LSA (Lake B7) was developed based on a hydrological year basis to provide a basic characterization for mean conditions (Table 7.3-4). The total evaporative loss from lake and land surface (lake evaporation and land evapotranspiration) equals 106.4 mm, or 34%, of the net precipitation input. When combined with sublimation (61.1 mm), the total loss equals 167.5 mm or 41% of the total precipitation. The surface runoff amount represents 51% of the total precipitation, or 66% of the net precipitation, which is the precipitation remaining after snow sublimation loss.

**Table 7.3-4: Representative Watershed (Lake B7) Mean Annual Water Balance for Natural Conditions**

| Component | Magnitude (mm) | Comment |
|---|---|---|
| Total Precipitation | 411.7 | Mean annual value, adjusted for undercatch |
| Rainfall | 207.1 | Mean annual value, adjusted for undercatch |
| Snowfall as SWE | 204.6 | Mean annual value |
| Spring SWE | 107.4 | Mean annual value, accounting for 47.5% loss due to sublimation (97.2 mm) |
| Net Precipitation Input | 314.5 | Rainfall + spring SWE |
| Surface Runoff (at Lake B7) | 208.1 | Mean annual value |
| Lake Evaporation at 323 mm | 78.8 | 24.4% of Watershed B7 is lake surface |
| Evapotranspiration at 36.5 mm | 27.6 | 75.6 % of Watershed B7 is land surface |
| Net Watershed Output | 314.5 | Surface runoff + lake evaporation + evapotranspiration |

Note: SWE = snow water equivalent.

#### 7.3.1.2.5 Lake Outlet Flow Regimes

Frequency analyses of the hydrology model results (floods and droughts) for lake outflows of interest at waterbodies downstream of the Project site were carried out for use in fisheries and water quality assessments and to provide a basis for environmental impact assessment and engineering design. The following parameters were examined:

- Maximum and mean daily outflow volumes for each calendar month, and corresponding stages;
- Annual 7-day and 14-day flood discharges, and corresponding stages; and
- Annual 30-day, 60-day, and 90-day low flow discharges for the period of July, August, and September, and corresponding stages.

Results are presented for selected lake outflows in each modeled watershed, and for a watercourse in the RSA (i.e., A1, B2, C6, D1, E1, G1, H1, I1, J1, CH6, and the Diana River). Results for additional lake outflows and watercourses are presented in Appendix 7.3-A, SD 7-1 2009 Aquatics Synthesis Baseline, and SD 7-2 2011 Aquatics Baseline. Annual water yields are also presented for all modeled waterbodies in Appendix 7.3-A. Lake areas corresponding to stages (e.g., flood zones) can be derived from these results and were not tabulated. Baseline parameters are not presented beyond drainage patterns for the X watershed because the area of the Project footprint overlapping the X watershed is negligible (Section 7.3.3.7).

## Lake A1

Results for Lake A1 are presented in Table 7.3-5 (mean daily outflow volumes) and Table 7.3-6 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-5: Monthly Mean Discharges at the Lake A1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | 50 | 28 700 | 83 300 | 15 700 | 8 290 | 6 590 | 4 200 |
| | 20 | 21 200 | 71 600 | 12 100 | 6 080 | 5 340 | 3 060 |
| | 10 | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | 5 | 10 300 | 52 700 | 7 270 | 3 280 | 3 440 | 1 600 |
| Median | 2 | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| Dry | 5 | 0 | 26 000 | 2 630 | 851 | 1 070 | 355 |
| | 10 | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | 20 | 0 | 17 500 | 1 690 | 413 | 415 | 173 |
| | 50 | 0 | 14 000 | 1 370 | 273 | 159 | 126 |
| | 100 | 0 | 11 900 | 1 200 | 201 | 12 | 105 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-6: Derived Representative Discharges at the Lake A1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | 50 | 4.07 | 179 000 | 129 000 | 3 940 | 5 840 | 7 350 |
| | 20 | 3.34 | 159 000 | 117 000 | 3 160 | 4 680 | 6 120 |
| | 10 | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | 5 | 2.35 | 127 000 | 94 300 | 2 010 | 2 980 | 4 220 |
| Median | 2 | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| Dry | 5 | 1.23 | 77 900 | 57 400 | 636 | 974 | 1 730 |
| | 10 | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | 20 | 1.03 | 61 500 | 43 500 | 279 | 459 | 1 010 |
| | 50 | 0.99 | 54 500 | 37 200 | 144 | 265 | 721 |
| | 100 | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |

Note: Q= discharge; m3/s= cubic metres per second; m3/d= cubic metres per day.

## Lake B2

Results for Lake B2 are presented in Table 7.3-7 (mean daily outflow volumes) and Table 7.3-8 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-7: Monthly Mean Discharges at the Lake B2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | 50 | 61 200 | 193 000 | 48 400 | 20 300 | 20 200 | 13 000 |
| | 20 | 45 200 | 167 000 | 35 900 | 13 600 | 14 300 | 9 210 |
| | 10 | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | 5 | 21 700 | 124 000 | 20 100 | 6 160 | 7 110 | 4 280 |
| Median | 2 | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| Dry | 5 | 0 | 64 700 | 6 380 | 1 220 | 1 340 | 564 |
| | 10 | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | 20 | 0 | 46 300 | 3 910 | 587 | 403 | 191 |
| | 50 | 0 | 38 700 | 3 120 | 414 | 117 | 116 |
| | 100 | 0 | 34 200 | 2 710 | 332 | 0 | 87 |

Note: m3/d= cubic metres per day.

**Table 7.3-8: Derived Representative Discharges at the Lake B2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | 50 | 9.56 | 376 000 | 290 000 | 10 200 | 15 800 | 20 800 |
| | 20 | 7.89 | 342 000 | 266 000 | 7 410 | 11 400 | 16 400 |
| | 10 | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | 5 | 5.56 | 283 000 | 221 000 | 3 910 | 5 950 | 10 200 |
| Median | 2 | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| Dry | 5 | 3.08 | 189 000 | 140 000 | 864 | 1 360 | 3 330 |
| | 10 | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | 20 | 2.51 | 155 000 | 107 000 | 315 | 576 | 1 710 |
| | 50 | 2.31 | 140 000 | 91 700 | 140 | 329 | 1 120 |
| | 100 | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |

Note: Q= discharge; m3/s= cubic metres per second; m3/d= cubic metres per day.

## Lake C6

Results for Lake C6 are presented in Table 7.3-9 (mean daily outflow volumes) and Table 7.3-10 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-9: Monthly Mean Discharges at the Lake C6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 12 500 | 25 200 | 4 350 | 2 990 | 2 850 | 1 720 |
| | 50 | 10 600 | 23 600 | 3 570 | 2 550 | 2 540 | 1 510 |
| | 20 | 8 020 | 21 200 | 2 620 | 1 980 | 2 110 | 1 190 |
| | 10 | 6 110 | 19 100 | 1 960 | 1 550 | 1 770 | 918 |
| | 5 | 4 150 | 16 700 | 1 340 | 1 100 | 1 380 | 628 |
| Median | 2 | 1 280 | 12 200 | 545 | 449 | 746 | 243 |
| Dry | 5 | 0 | 7 880 | 74 | 0 | 221 | 69 |
| | 10 | 0 | 5 700 | 0 | 0 | 0 | 32 |
| | 20 | 0 | 3 940 | 0 | 0 | 0 | 17 |
| | 50 | 0 | 1 990 | 0 | 0 | 0 | 8 |
| | 100 | 0 | 719 | 0 | 0 | 0 | 5 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-10: Derived Representative Discharges at the Lake C6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.21 | 54 500 | 41 700 | 1 040 | 1 810 | 2 450 |
| | 50 | 1.11 | 51 400 | 39 300 | 807 | 1 550 | 2 120 |
| | 20 | 0.97 | 47 000 | 36 000 | 538 | 1 220 | 1 690 |
| | 10 | 0.86 | 43 500 | 33 200 | 364 | 968 | 1 370 |
| | 5 | 0.75 | 39 700 | 30 000 | 210 | 702 | 1 050 |
| Median | 2 | 0.59 | 33 300 | 24 700 | 32 | 301 | 583 |
| Dry | 5 | 0.47 | 28 100 | 20 200 | 0 | 9 | 265 |
| | 10 | 0.42 | 25 800 | 18 100 | 0 | 0 | 141 |
| | 20 | 0.39 | 24 000 | 16 500 | 0 | 0 | 56 |
| | 50 | 0.35 | 22 200 | 14 900 | 0 | 0 | 0 |
| | 100 | 0.34 | 21 100 | 13 800 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake D1

Results for Lake D1 are presented in Table 7.3-11 (mean daily outflow volumes) and Table 7.3-12 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-11: Monthly Mean Discharges at the Lake D1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 27 000 | 73 800 | 19 000 | 7 030 | 6 500 | 15 300 |
| | 50 | 22 300 | 67 400 | 14 900 | 5 860 | 5 630 | 9 840 |
| | 20 | 16 400 | 58 700 | 10 400 | 4 390 | 4 470 | 5 080 |
| | 10 | 12 100 | 51 700 | 7 490 | 3 330 | 3 590 | 2 820 |
| | 5 | 7 780 | 44 200 | 5 030 | 2 270 | 2 660 | 1 380 |
| Median | 2 | 1 830 | 32 100 | 2 280 | 824 | 1 280 | 347 |
| Dry | 5 | 0 | 22 500 | 955 | 0 | 273 | 82 |
| | 10 | 0 | 18 400 | 565 | 0 | 0 | 35 |
| | 20 | 0 | 15 300 | 339 | 0 | 0 | 15 |
| | 50 | 0 | 12 200 | 156 | 0 | 0 | 3 |
| | 100 | 0 | 10 300 | 66 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-12: Derived Representative Discharges at the Lake D1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.92 | 152 000 | 111 000 | 2 860 | 4 680 | 7 160 |
| | 50 | 3.45 | 143 000 | 105 000 | 2 230 | 3 970 | 6 060 |
| | 20 | 2.87 | 129 000 | 95 800 | 1 510 | 3 050 | 4 700 |
| | 10 | 2.45 | 118 000 | 88 300 | 1 030 | 2 370 | 3 720 |
| | 5 | 2.05 | 106 000 | 79 800 | 619 | 1 690 | 2 770 |
| Median | 2 | 1.51 | 87 400 | 65 000 | 137 | 718 | 1 470 |
| Dry | 5 | 1.18 | 72 200 | 51 900 | 0 | 66 | 656 |
| | 10 | 1.06 | 65 400 | 45 600 | 0 | 0 | 358 |
| | 20 | 0.98 | 60 500 | 40 800 | 0 | 0 | 160 |
| | 50 | 0.91 | 55 400 | 35 600 | 0 | 0 | 0 |
| | 100 | 0.87 | 52 300 | 32 300 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake E1

Results for Lake E1 are presented in Table 7.3-13 (mean daily outflow volumes) and Table 7.3-14 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-13: Monthly Mean Discharges at the Lake E1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 12 900 | 38 700 | 18 300 | 3 570 | 3 530 | 2 110 |
| | 50 | 10 800 | 34 700 | 13 700 | 2 960 | 2 990 | 1 830 |
| | 20 | 8 090 | 29 500 | 8 890 | 2 200 | 2 290 | 1 460 |
| | 10 | 6 080 | 25 600 | 6 050 | 1 650 | 1 770 | 1 170 |
| | 5 | 4 050 | 21 400 | 3 780 | 1 110 | 1 250 | 862 |
| Median | 2 | 1 140 | 15 200 | 1 510 | 369 | 508 | 385 |
| Dry | 5 | 0 | 10 600 | 569 | 0 | 11 | 26 |
| | 10 | 0 | 8 750 | 324 | 0 | 0 | 0 |
| | 20 | 0 | 7 430 | 192 | 0 | 0 | 0 |
| | 50 | 0 | 6 140 | 92 | 0 | 0 | 0 |
| | 100 | 0 | 5 390 | 46 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-14: Derived Representative Discharges at the Lake E1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.18 | 73 700 | 55 700 | 1 400 | 2 420 | 6 640 |
| | 50 | 1.04 | 65 600 | 51 100 | 1 080 | 2 040 | 5 230 |
| | 20 | 0.87 | 55 500 | 45 000 | 724 | 1 560 | 3 650 |
| | 10 | 0.74 | 48 300 | 40 300 | 491 | 1 210 | 2 630 |
| | 5 | 0.63 | 41 400 | 35 200 | 286 | 849 | 1 760 |
| Median | 2 | 0.47 | 32 200 | 27 500 | 49 | 342 | 769 |
| Dry | 5 | 0.38 | 26 600 | 21 700 | 0 | 2 | 284 |
| | 10 | 0.35 | 24 500 | 19 200 | 0 | 0 | 138 |
| | 20 | 0.32 | 23 200 | 17 500 | 0 | 0 | 53 |
| | 50 | 0.30 | 22 000 | 15 800 | 0 | 0 | 0 |
| | 100 | 0.29 | 21 400 | 14 700 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake G1

Results for Lake G1 are presented in Table 7.3-15 (mean daily outflow volumes) and Table 7.3-15 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-15: Monthly Mean Discharges at the Lake G1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 5 200 | 9 980 | 3 900 | 1 520 | 1 250 | 1 260 |
| | 50 | 4 410 | 9 370 | 2 630 | 1 230 | 1 050 | 912 |
| | 20 | 3 370 | 8 450 | 1 460 | 887 | 802 | 558 |
| | 10 | 2 580 | 7 640 | 861 | 659 | 629 | 359 |
| | 5 | 1 770 | 6 660 | 453 | 454 | 463 | 210 |
| Median | 2 | 566 | 4 810 | 129 | 208 | 245 | 72 |
| Dry | 5 | 0 | 2 980 | 32 | 75 | 112 | 22 |
| | 10 | 0 | 2 030 | 13 | 33 | 66 | 10 |
| | 20 | 0 | 1 250 | 4 | 7 | 35 | 4 |
| | 50 | 0 | 376 | 0 | 0 | 8 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-16: Derived Representative Discharges at the Lake G1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.93 | 24 100 | 16 700 | 389 | 854 | 857 |
| | 50 | 0.82 | 22 600 | 15 900 | 306 | 698 | 750 |
| | 20 | 0.69 | 20 500 | 14 600 | 210 | 513 | 611 |
| | 10 | 0.59 | 18 800 | 13 600 | 146 | 388 | 506 |
| | 5 | 0.49 | 16 900 | 12 300 | 90 | 273 | 399 |
| Median | 2 | 0.34 | 13 800 | 10 100 | 22 | 132 | 243 |
| Dry | 5 | 0.24 | 11 300 | 8 040 | 0 | 53 | 133 |
| | 10 | 0.20 | 10 100 | 7 020 | 0 | 28 | 90 |
| | 20 | 0.17 | 9 270 | 6 210 | 0 | 12 | 60 |
| | 50 | 0.15 | 8 390 | 5 340 | 0 | 0 | 31 |
| | 100 | 0.13 | 7 850 | 4 770 | 0 | 0 | 14 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake H1

Results for Lake H1 are presented in Table 7.3-17 (mean daily outflow volumes) and Table 7.3-18 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-17: Monthly Mean Discharges at the Lake H1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 960 | 9 880 | 2 160 | 694 | 878 | 445 |
| | 50 | 3 360 | 8 970 | 1 660 | 588 | 708 | 370 |
| | 20 | 2 580 | 7 740 | 1 120 | 453 | 509 | 273 |
| | 10 | 1 990 | 6 750 | 788 | 353 | 378 | 203 |
| | 5 | 1 390 | 5 690 | 511 | 252 | 261 | 137 |
| Median | 2 | 513 | 3 980 | 215 | 110 | 121 | 58 |
| Dry | 5 | 0 | 2 640 | 82 | 15 | 47 | 22 |
| | 10 | 0 | 2 060 | 45 | 0 | 24 | 13 |
| | 20 | 0 | 1 620 | 23 | 0 | 9 | 8 |
| | 50 | 0 | 1 190 | 7 | 0 | 0 | 5 |
| | 100 | 0 | 927 | 0 | 0 | 0 | 4 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-18: Derived Representative Discharges at the Lake H1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.34 | 18 200 | 14 000 | 302 | 475 | 750 |
| | 50 | 0.30 | 16 800 | 13 100 | 237 | 404 | 636 |
| | 20 | 0.25 | 14 800 | 11 800 | 162 | 313 | 495 |
| | 10 | 0.22 | 13 300 | 10 700 | 113 | 246 | 393 |
| | 5 | 0.18 | 11 700 | 9 550 | 70 | 179 | 294 |
| Median | 2 | 0.14 | 9 280 | 7 560 | 19 | 85 | 160 |
| Dry | 5 | 0.11 | 7 420 | 5 860 | 0 | 22 | 76 |
| | 10 | 0.10 | 6 630 | 5 080 | 0 | 0 | 46 |
| | 20 | 0.09 | 6 070 | 4 490 | 0 | 0 | 25 |
| | 50 | 0.09 | 5 510 | 3 860 | 0 | 0 | 7 |
| | 100 | 0.08 | 5 170 | 3 480 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake I1

Results for Lake I1 are presented in Table 7.3-19 (mean daily outflow volumes) and Table 7.3-20 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-19: Monthly Mean Discharges at the Lake I1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 610 | 3 000 | 409 | 271 | 300 | 198 |
| | 50 | 1 360 | 2 810 | 333 | 219 | 248 | 167 |
| | 20 | 1 040 | 2 530 | 241 | 156 | 184 | 127 |
| | 10 | 797 | 2 290 | 176 | 112 | 137 | 98 |
| | 5 | 545 | 1 990 | 115 | 71 | 92 | 68 |
| Median | 2 | 172 | 1 430 | 35 | 18 | 31 | 25 |
| Dry | 5 | 0 | 872 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 584 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 349 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 85 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-20: Derived Representative Discharges at the Lake I1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.20 | 7 550 | 5 260 | 89 | 156 | 217 |
| | 50 | 0.18 | 7 010 | 4 940 | 66 | 128 | 184 |
| | 20 | 0.15 | 6 280 | 4 490 | 42 | 92 | 142 |
| | 10 | 0.13 | 5 710 | 4 120 | 26 | 67 | 111 |
| | 5 | 0.11 | 5 110 | 3 710 | 13 | 43 | 79 |
| Median | 2 | 0.08 | 4 190 | 3 010 | 0 | 11 | 32 |
| Dry | 5 | 0.07 | 3 490 | 2 430 | 0 | 0 | 0 |
| | 10 | 0.06 | 3 200 | 2 160 | 0 | 0 | 0 |
| | 20 | 0.05 | 2 990 | 1 950 | 0 | 0 | 0 |
| | 50 | 0.05 | 2 790 | 1 740 | 0 | 0 | 0 |
| | 100 | 0.05 | 2 670 | 1 610 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake J1

Results for Lake I1 are presented in Table 7.3-21 (mean daily outflow volumes) and Table 7.3-22 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-21: Monthly Mean Discharges at the Lake J1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 46 300 | 66 700 | 23 300 | 12 100 | 12 100 | 4 240 |
| | 50 | 39 400 | 61 900 | 15 900 | 9 920 | 9 750 | 3 190 |
| | 20 | 30 400 | 55 000 | 9 380 | 7 250 | 6 920 | 2 100 |
| | 10 | 23 400 | 49 200 | 6 040 | 5 340 | 4 990 | 1 470 |
| | 5 | 16 200 | 42 300 | 3 620 | 3 490 | 3 210 | 948 |
| Median | 2 | 5 400 | 30 000 | 1 310 | 987 | 989 | 369 |
| Dry | 5 | 0 | 18 700 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 13 200 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 8 820 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 4 070 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 1 010 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-22: Derived Representative Discharges at the Lake J1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.86 | 30 600 | 22 600 | 230 | 1 200 | 1 180 |
| | 50 | 0.76 | 28 700 | 21 300 | 127 | 829 | 979 |
| | 20 | 0.64 | 26 100 | 19 400 | 57 | 493 | 735 |
| | 10 | 0.56 | 24 000 | 17 700 | 29 | 317 | 568 |
| | 5 | 0.48 | 21 600 | 15 900 | 14 | 187 | 410 |
| Median | 2 | 0.37 | 17 800 | 12 800 | 3 | 60 | 201 |
| Dry | 5 | 0.29 | 14 900 | 10 200 | 0 | 0 | 51 |
| | 10 | 0.27 | 13 600 | 8 980 | 0 | 0 | 0 |
| | 20 | 0.25 | 12 800 | 8 060 | 0 | 0 | 0 |
| | 50 | 0.24 | 12 000 | 7 200 | 0 | 0 | 0 |
| | 100 | 0.24 | 11 600 | 6 730 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Lake CH6

Results for Lake CH6 are presented in Table 7.3-23 (mean daily outflow volumes) and Table 7.3-24 (peak and low flow discharges). Corresponding stages are presented in Appendix 7.3-A.

**Table 7.3-23: Monthly Mean Discharges at the Lake CH6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 28 200 | 71 800 | 16 700 | 7 760 | 7 050 | 9 600 |
| | 50 | 23 400 | 66 300 | 13 400 | 6 530 | 6 280 | 6 960 |
| | 20 | 17 300 | 58 600 | 9 720 | 4 960 | 5 200 | 4 290 |
| | 10 | 12 900 | 52 200 | 7 260 | 3 810 | 4 340 | 2 780 |
| | 5 | 8 420 | 45 100 | 5 060 | 2 660 | 3 390 | 1 640 |
| Median | 2 | 2 180 | 33 100 | 2 450 | 1 040 | 1 840 | 581 |
| Dry | 5 | 0 | 23 000 | 1 080 | 0 | 572 | 188 |
| | 10 | 0 | 18 400 | 651 | 0 | 8 | 94 |
| | 20 | 0 | 14 900 | 388 | 0 | 0 | 45 |
| | 50 | 0 | 11 200 | 168 | 0 | 0 | 11 |
| | 100 | 0 | 8 930 | 55 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-24: Derived Representative Discharges at the Lake CH6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.08 | 158 000 | 109 000 | 3 330 | 5 300 | 6 970 |
| | 50 | 2.78 | 147 000 | 103 000 | 2 670 | 4 560 | 6 090 |
| | 20 | 2.39 | 133 000 | 94 900 | 1 890 | 3 590 | 4 950 |
| | 10 | 2.10 | 121 000 | 87 900 | 1 360 | 2 850 | 4 070 |
| | 5 | 1.79 | 108 000 | 79 800 | 870 | 2 090 | 3 170 |
| Median | 2 | 1.34 | 86 500 | 65 400 | 264 | 958 | 1 830 |
| Dry | 5 | 1.03 | 69 300 | 52 200 | 0 | 147 | 872 |
| | 10 | 0.90 | 61 700 | 45 800 | 0 | 0 | 486 |
| | 20 | 0.81 | 56 000 | 40 700 | 0 | 0 | 214 |
| | 50 | 0.73 | 50 200 | 35 200 | 0 | 0 | 0 |
| | 100 | 0.68 | 46 600 | 31 700 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

## Diana River

The Diana River is located southwest of the Project and flows directly into Hudson Bay from Peter Lake and other nearby minor sub-basins. The river runs parallel to the Meliadine River, which is located approximately 10 km northeast (perpendicular distance). The Diana River near the mouth has a mean bankfull width of approximately 40 m.

The Diana River near Rankin Inlet has a gross drainage area of 1460 $km^2$ and is the largest watercourse in the area. The flow regime for the Diana River is characterized in Table 7.3-25, based on 7 years of data from 1989 to 1995, recorded at Environment Canada Hydrometric Station 06NC001 (Diana River near Rankin Inlet; Environment Canada 2009). Additional manual discharge measurement data also were available for the open water seasons of 1997 to 1999 from previous studies (AEE 1998a, b; AEE 1999), but were not used in the mean daily, maximum daily, and minimum daily flow statistics since these data were not continuous. Mean monthly discharges varied from 0 $m^3/s$ (due to frozen conditions) during January to May, to 37.9 $m^3/s$ in July. The peak daily discharge typically occurs in June, with a maximum value of 102 $m^3/s$ recorded in June 1991. A frequency analysis was not performed due the short period of record.

**Table 7.3-25: Diana River Monthly Discharges ($m^3/s$), 1989 to 1995**

| | Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Mean Discharges | 1989 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 18.5 | 42.1 | 17.0 | 7.66 | 3.35 | 0.688 | 0.008 | 7.51 |
| | 1990 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 39.2 | 27.0 | 21.1 | 9.31 | 2.18 | 0.105 | 9.16 |
| | 1991 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 59.5 | 45.7 | 18.2 | 14.8 | 8.22 | 1.28 | 0.045 | 12.3 |
| | 1992 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.5 | 59.3 | 29.5 | 32.5 | 11.7 | 2.60 | 0.142 | 12.5 |
| | 1993 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 31.6 | 29.6 | 18.4 | 13.7 | 7.25 | 2.21 | 0.186 | 8.61 |
| | 1994 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 27.3 | 25.6 | 9.34 | 7.39 | 4.58 | 1.19 | 0.076 | 6.32 |
| | 1995 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 18.2 | 23.5 | 19.7 | 14.7 | 7.36 | 0.751 | 0.083 | 7.06 |
| | 1997[a] | - | - | - | - | - | 32.2 | 24.3 | 9.24 | 5.16 | - | - | - | - |
| | 1998[a] | - | - | - | - | - | 43.3 | 30.4 | 17.3 | 14.1 | - | - | - | - |
| | 1999[a] | - | - | - | - | - | 59.8 | 47.2 | 25.6 | 25.3 | - | - | - | - |
| **Mean Daily** | | **0.000** | **0.000** | **0.000** | **0.000** | **0.001** | **25.5** | **37.9** | **19.9** | **16.0** | **7.39** | **1.56** | **0.092** | **9.08** |
| **Maximum Daily** | | **0.000** | **0.000** | **0.000** | **0.000** | **0.080** | **102** | **75.8** | **39.8** | **36.4** | **22.2** | **4.80** | **0.860** | **102** |
| **Minimum Daily** | | **0.000** | **0.000** | **0.000** | **0.000** | **0.000** | **0.000** | **15.7** | **6.91** | **5.68** | **1.85** | **0.105** | **0.000** | **0.000** |

[a] Data from previous open water studies (AEE 1998a, b; AEE 1999) not included in mean daily, maximum daily, and minimum daily statistics

Note: $m^3/s$= cubic metres per second; -= no available data

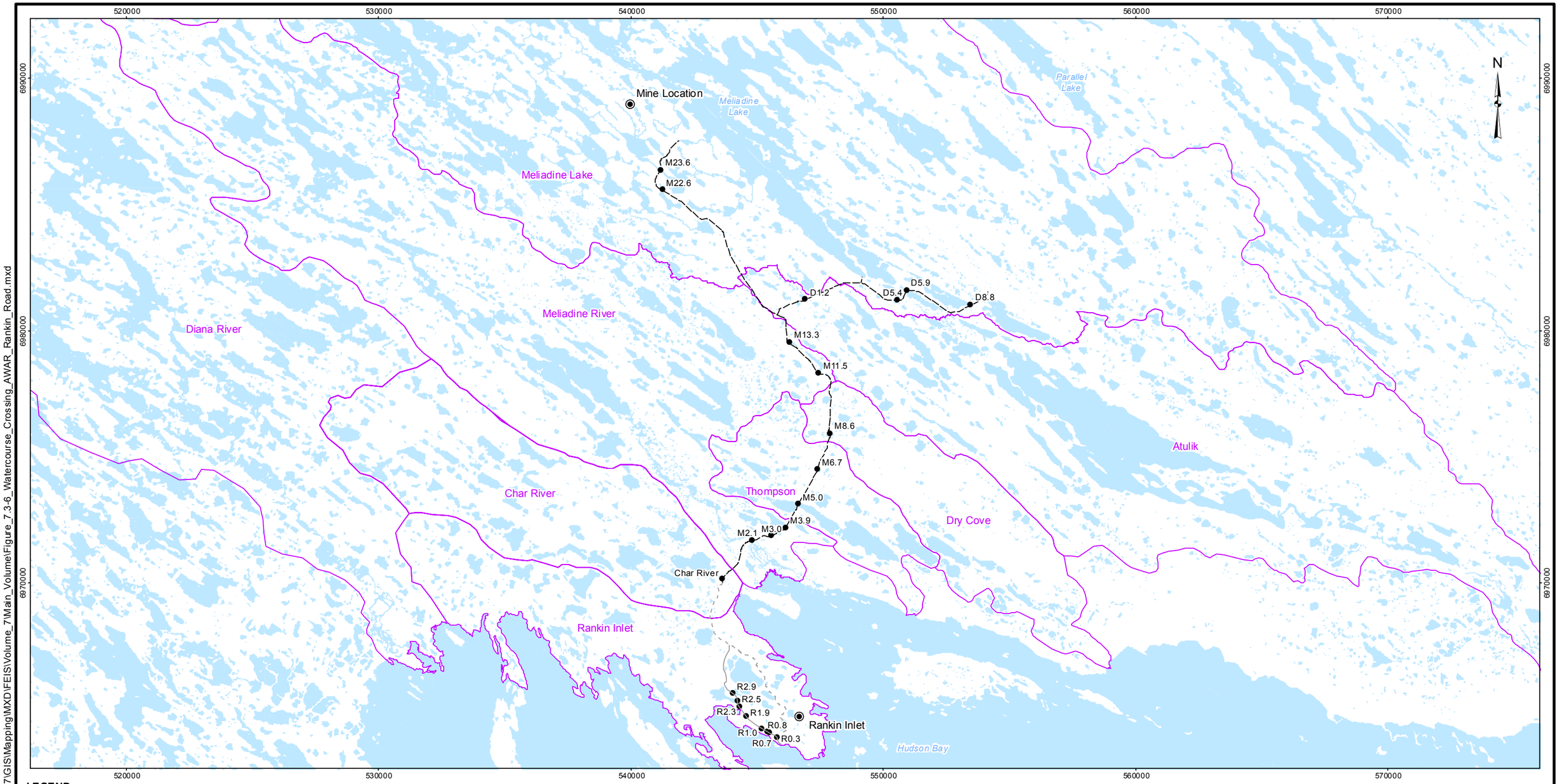
## Road Crossings

The AWAR is comprised of 2 sections described herein as the Main road and the Discovery road. The Main road extends from the Char River bridge turnoff to the Meliadine West exploration site at Meliadine Lake, and crosses 11 watercourses located in the Meliadine Lake, Meliadine River, Dry Cove, Thompson, and Char River watersheds, including the Char River near its mouth, the Meliadine River near its mouth (identified as M2.1), a permanent unnamed watercourse (M5.0) and 8 shallow ephemeral watercourses (M3.0, M3.9, M6.7, M8.6, M11.5, M13.3, M22.6, and M23.7). The Discovery road extends from the Main road approximately 1.3 km north of M13.3 to the Discovery Zone, and crosses 4 ephemeral watercourses located in the Atulik and Meliadine Lake watersheds (D1.2, D5.4, D5.9, and D8.8). The Rankin Inlet bypass Road connects the Tank Farm to the Main road, and crosses 8 ephemeral watercourses (R0.3, R0.7, R0.8, R1.0, R1.9, R2.3, R2.5, and R2.9) located in the Rankin Inlet watershed, defined as the area draining into Hudson Bay between the Char River and Diana River watersheds. Characteristics of these watercourse crossings are presented in Table 7.3-26. The location of watercourse crossings of the AWAR and Rankin Inlet bypass road is shown in Figure 7.3-6. Watercourse geomorphology described in Section 7.3.1.2.2 is applicable to watercourse crossed by the Rankin Inlet bypass road.

**Table 7.3-26: Location and Characteristics of Watercourse Crossings of the All-weather Access Road and Rankin Inlet bypass road**

| Crossing ID | Latitude | Longitude | Watershed | Drainage Area ($km^2$) | Bankfull Width (m) | Bankfull Depth (m) |
|---|---|---|---|---|---|---|
| Char River | 62°51’31.8” | 93°51’27.9” | Char River | 69 | N/A | N/A |
| M2.1 | 62°52'21.8" | 92°07'10.4" | Meliadine River | 796 | 60 | 1.20 |
| M3.0 | 62°52'26.6" | 92°06'16.6" | Meliadine River | 2.77 | 2.5 | 0.12 |
| M3.9 | 62°52'36.2" | 92°05'32.5" | Meliadine River | 1.82 | 2.5 | 0.10 |
| M5.0 | 62°53'06.5" | 92°04'58.5" | Thompson | 11.02 | 10.0 | 0.20 |
| M6.7 | 62°53'50.4" | 92°04'04.3" | Thompson | 0.82 | 1.0 | 0.05 |
| M8.6 | 62°54'36.1" | 92°03'25.3" | Dry Cove | 1.40 | 3.9 | 0.16 |
| M11.5 | 62°55'53.8" | 92°03'55.7" | Meliadine River | 1.38 | 1.5 | 0.26 |
| M13.3 | 62°56'34.0" | 92°05'16.6" | Meliadine River | 0.16 | 3.8 | 0.20 |
| M22.6 | 62°59'51.2" | 92°11'08.8" | Meliadine Lake | 0.97 | 0.9 | 0.13 |
| M23.6 | 63°00'16.6" | 92°11'12.2" | Meliadine Lake | 3.62 | 3.2 | 0.25 |
| D1.2 | 62°57'28.6" | 92°04'30.1" | Atulik | 3.23 | 0.6 | 0.10 |
| D5.4 | 62°57'26.5" | 92°00'12.2" | Meliadine Lake | 0.24 | 0.8 | 0.40 |
| D5.9 | 62°57'38.3" | 91°59'45.2" | Meliadine Lake | 1.31 | 20.0 | 0.10 |
| D8.8 | 62°57'18.3” | 91°56'46.0" | Meliadine Lake | 7.84 | 20.5 | 0.22 |
| R0.3 | 62°48'08.1" | 92°06'07.4" | Rankin Inlet[a] | 0.39 | 0.6 | 0.10 |
| R0.7 | 62°48'14.2" | 92°06'27.4" | Rankin Inlet[a] | 0.01 | 0.2 | 0.10 |
| R0.8 | 62°48'15.5" | 92°06'32.4" | Rankin Inlet[a] | 0.30 | 0.8 | 0.40 |
| R1.0 | 62°48'20.1" | 92°06'49.2" | Rankin Inlet[a] | 1.10 | 20.0 | 0.10 |
| R1.9 | 62°48'36.2" | 92°07'33.0" | Rankin Inlet[a] | 0.21 | 0.4 | 0.20 |
| R2.3 | 62°48'47.6" | 92°07'51.3” | Rankin Inlet[a] | 0.17 | 30.0 | 0.20 |
| R2.5 | 62°48'55.3" | 92°07'56.9" | Rankin Inlet[a] | 6.44 | 0.7 | 0.10 |
| R2.9 | 62°49'05.0" | 92°08'09.7" | Rankin Inlet[a] | 2.92 | 1.0 | 0.15 |

[a] The Rankin Inlet watershed is defined as the area draining into Hudson Bay between the Char River watershed and the Diana River watershed.




**LEGEND**

- Watercourse Crossing
- All-weather Access Road (AWAR)
- Rankin Inlet bypass Road
- Existing Road
- Watercourse
- Watershed Boundary
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
# LOCATIONS OF WATERCOURSE CROSSINGS ALONG AWAR AND RANKIN INLET BYPASS ROAD

| | | | | |
|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | JL | 20 Aug. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 23 Aug. 2012 | | |
| CHECK | DW | 20 Jan. 2013 | | |
| REVIEW | DW | 20 Jan. 2013 | | |

Golder Associates

**FIGURE 7.3-6**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.3-6_Watercourse_Crossing_AWAR_Rankin_Road.mxd

## 7.3.2 Pathway Analysis

### *7.3.2.1 Methods*

Pathway analysis identifies and assesses the linkages between Project components or activities, and the correspondent potential residual effects to hydrology including water quantity. The first part of the analysis is to produce a list of all potential effects pathways for the Project (FEIS Volume 4, Section 4.3). Each pathway is initially considered to have a linkage to potential effects on hydrology including water quantity. This step is followed by the development of environmental design features and mitigation that can be incorporated into the development description to remove a pathway or limit (mitigate) the effects to hydrology including water quantity. Environmental design features include Project design elements, environmental best practices, management policies and procedures, and social programs. Environmental design features are developed through an iterative process between the Project's engineering and environmental teams to avoid or mitigate effects.

Pathway analysis is a screening step that is used to determine the existence and magnitude of linkages from the initial list of potential effects pathways for the Project. This screening step is intended to focus the effects analysis on pathways that require a more comprehensive assessment of effects on hydrology including water quantity. Pathways are determined to be primary, minor, or as having no linkage using scientific and traditional knowledge (IQ), logic, and experience with similar developments and environmental design features. Where available, Inuit concerns were taken into consideration while developing pathways including concerns relating to lower water levels, thin ice conditions, later freeze-up, and earlier and more rapid melt of lakes and rivers (Government of Nunavut 2005). Each potential pathway is assessed and described as follows: IQ

- no linkage – pathway is removed by environmental design features and mitigation so that the Project results in no detectable environmental change and residual effects to hydrology including water quantity relative to baseline or guideline values;
- minor – pathway could result in a minor environmental change, but would have a negligible residual effect on hydrology including water quantity relative to baseline or guideline values; or
- primary – pathway is likely to result in a measurable environmental change that could contribute to residual effects on hydrology including water quantity relative to baseline or guideline values.

Primary pathways require further effects analysis to determine the environmental significance from the Project on hydrology including water quantity. Pathways determined to have no linkage to hydrology including water quantity or those that are considered minor are not predicted to result in environmentally significant effects on hydrology including water quantity. No linkage and minor pathways are summarized, but not carried through the effects assessment.

### *7.3.2.2 Results*

Pathways potentially leading to effects on hydrology, including water quantity downstream of the Project, are presented in Table 7.3-27.

**Table 7.3-27: Potential Pathway for Effects to Hydrology including Water Quantity Downstream of the Project**

| Project Component/Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Assessment |
|---|---|---|---|
| Project Footprint (e.g., dikes, mine pits, waste rock, access roads, mine plant) | Project footprint, which will physically alter watershed areas and drainage patterns, may change downstream flows, water levels, and channel/bank stability in streams, and affect water quality, fish habitat, and fish | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Access roads will be as narrow as possible, while maintaining safe construction and operation practices.<br><br>Best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management), where needed. | Primary |
| General Construction and Operation of Mine and Supporting Infrastructure | Process and potable water use may result in reduced water levels in Meliadine Lake | Water withdrawal rate will be controlled to avoid adverse effects on the water source waterbody.<br><br>Fresh water sourced from Melidiadine Lake for operation purposes will be minimized by optimizing the usage of contact water and the recycling of process water accumulated at the Tailing Storage Facility and Attenuation Pond. | Minor |
| Site Water Management: Dewatering of Project Footprint Waterbodies to Downstream Receiving Waterbodies (e.g., to Lake A7, A1, B6, B34, Meliadine Lake) | Dewatering of waterbodies may change flows, water levels, and channel/bank stability in receiving and downstream waterbodies, and affect water quality, fish habitat, and fish | Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Final discharge locations will be determined during the detailed design stage and may be modified based on monitoring results. | Primary |
| Site Water Management: Dewatering of Project Footprint Waterbodies to Downstream Receiving Waterbodies (e.g., to Lake A7, A1, B6, B34, Meliadine Lake) | Dewatering of waterbodies may result in ice damming and alter flow path | Pumped discharge will cease during the winter | Minor |
| Site Water Management: Watershed Modification by Diversion of Water (e.g., Lake A8 to Lake A31, Upper B to D Watershed, Lower B to P Watershed) | Alteration of watershed flow paths may change flows, water levels, and channel/bank stability in downstream waterbodies, and affect water quality, fish habitat and fish | Shoreline areas susceptible to extensive erosion will be addressed by appropriate erosion protection measures to reduce erosion and associated re-suspension of fine sediment.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms. | Primary |

**Table 7.3-27: Potential Pathway for Effects to Hydrology including Water Quantity Downstream of the Project (continued)**

| Project Component/Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Assessment |
|---|---|---|---|
| Pit development and closure | Removal of bedrock and ore material during the active mining of pits may change shallow groundwater quantity in local watersheds, and the water level in small waterbodies in local watersheds | Mined-out pit flooding will be augmented by active fresh water diversion Active flooding will reduce the period required to flood the pits, and the period of time with increased hydraulic gradients between waterbodies. | Minor |
| Construction and operation of mine site roads, AWAR, and Rankin Inlet bypass Road | Cross-drainage structures for the mine site roads, AWAR, and Rankin Inlet bypass Road may alter stream hydraulics and geomorphology | Cross-drainage structures will be designed and constructed such that structures will convey peak flows corresponding to 1:25 year 24-hour rainfall event. | Minor |
| | Freezing and plugging of culverts in the winter may result in the following:<br>1. over-topping and erosion of road surface releasing silt onto terrain and soils;<br>2. ponding of water adjacent to road flanks;<br>3. potential instability and thaw settlement of road shoulders;<br>4. thaw settlement beneath and adjacent to culverts; and<br>5. ice lens growth. | Use of staggered culvert configuration, and removal of snow at the culvert inlet and outlet prior to the freshet to promote drainage during spring thaw and freshet.<br><br>Regular inspection of the road to identify any areas where ponding of water along the road represents a risk, and installing additional culverts to alleviate the risk. | Minor |
| | Cross-drainage structures for the mine site roads, AWAR, and Rankin Inlet bypass road will prevent navigability | Cross-drainage structures will be designed to allow navigation (i.e., bridge) for crossings with navigable waters.<br>Regular inspections will be completed | No Linkage |
| | Widening of the AWAR may alter stream hydraulics and geomorphology | The full base width of the AWAR road was constructed during Phase 1 of the AWAR. For Phase 2, the running surface of the AWAR will be widened without widening the base width. | Minor |

### 7.3.2.3 Pathways with No Linkage

A pathway may have no linkage if the activity does not occur (e.g., flows not altered), or if the pathway is removed by environmental design features so that the Project results in no detectable (measurable) environmental change and residual effects to hydrology, including water quantity, relative to baseline or guideline values. The following pathways are anticipated to have no linkage, and will not be carried through the effects assessment.

- **Cross-drainage structures for mine site roads, All-Weather Access Road, and Rankin Inlet bypass road may prevent navigability.**

Cross drainage structures for crossings with navigable waters will be single span bridges, designed in accordance to Transport Canada (TC 2009) requirements, with a minimum freeboard of 1.0 m over the peak flow elevation, and will not impede navigability. Following a request of determination (Golder 2010), Transport Canada determined that M2.1 (Meliadine River) was the only crossing with navigable waters amongst the streams crossed by the proposed AWAR. Although M5.0 was determined as a crossing with non-navigable waters, a clear-span bridge will be installed for this crossing location. The proposed activity on the Char River is the installation of a new clear-span bridge, immediately adjacent to the existing bridge, to allow larger and heavier loads to pass, with the new bridge also meeting Navigable Waters Protection Act (NWPA) requirements. Watercourse crossings along the Rankin Inlet bypass Road (i.e., R0.3, R0.7, R0.8, R1.0, R1.9, R2.3, R2.5, and R2.9) and the Discovery road (i.e., D1.2, D5.4, D5.9, and D8.8) are currently under review, but are not expected to be navigable based on their drainage areas.

Amendments to the NWPA are anticipated to come into force in April 2014 as part of the Federal Government's 2012's Bill C-45 (TC 2013). These amendments will:

- Change the name of the NWPA to the Navigation Protection Act;
- Include a schedule which clearly lists the major waterways for which regulatory approval is required prior to the placement or construction of a work;
- Allow proponents of works in non-scheduled waters to opt-in and seek approval of their proposed work to give them additional legal certainty; and
- Expand the list of low risk works (e.g., minor repairs on bridges) that can be pre-approved because they pose very little impact on safe navigation.

Schedules listing major waterways requiring regulatory approval include Schedule 2 Part 1 – Oceans and Lakes and Schedule 2 Part 2 – Rivers and Riverines, and do not include any of the watercourses crossed by the Project. As such, none of the waterbodies crossed by the Project will require regulatory approval under amendments anticipated to come into force in April 2014.

While watercourses crossed by the Project may not be classified as navigable by Transport Canada following amendments to the NWPA, it is recognized that some watercourses may be identified for potential navigational use by the community through consultation. Crossings on such watercourses will be designed and inspected regularly so as to not impede navigability.

### 7.3.2.4 Minor Pathways

In some cases, both a source and a pathway exist, but the change caused by the Project is anticipated to result in a minor environmental change, and would have a negligible residual effect on hydrology including water quantity, relative to baseline or guideline values. The following pathways are anticipated to be minor and will not be carried through the effects assessment.

- **Process and potable water use may result in reduced water levels in Meliadine Lake.**

The source of process and potable water for the camp will be Meliadine Lake. Freshwater requirements for process and potable water are estimated at 1 840 000 cubic metres per year ($m^3$/y), or a constant rate of 5040 cubic metres per day ($m^3$/d) during operations. Supply volumes are small in comparison to median monthly and annual outflow volumes at Meliadine Lake (Table 7.3-28), and residual effects on water levels are expected to be negligible. In comparison, mean monthly water levels are expected to decrease by less than 0.050 m during closure under median conditions (assessed quantitatively in Section 7.3.3.10), during which approximately 17 100 000 $m^3$/y will be pumped out of Meliadine Lake over a compressed schedule of 4 months per year to accelerate pit refilling.

**Table 7.3-28: Median Annual Outflow Volumes at the Outlet of Meliadine Lake during Baseline and Closure**

| Snapshot | Median Mean Monthly and Annual Outflow Volume ($m^3$) | | | | | | |
|---|---|---|---|---|---|---|---|
| | May | Jun | Jul | Aug | Sep | Oct | Annual |
| Baseline | 1 790 000 | 41 800 000 | 20 100 000 | 8 520 000 | 6 580 000 | 2 570 000 | 84 700 000 |
| Closure | 1 400 000 | 34 800 000 | 16 800 000 | 6 190 000 | 4 170 000 | 1 520 000 | 67 600 000 |

Note: $m^3$= cubic metres.

- **Dewatering of waterbodies may result in ice damming.**

Ice damming can result from ice jams on large rivers and accumulation of aufeis deposits which can cause backwatering and upstream diversions during spring runoff. None of these mechanisms have been observed or reported in the RSA. Ice damming can also result from long duration discharges to frozen streams over the winter period. Dewatering of waterbodies will cease prior to freeze-up mitigating the potential for ice damming as the result of waterbodies dewatering.

- **Removal of bedrock and ore material from the active mining of pits may change shallow groundwater quantity in local watersheds, and the water level in small waterbodies in local watersheds.**

None of the planned open pits will intersect the deep groundwater regime below the permafrost or through open taliks below waterbodies. However, portions of pits will intersect dewatered ponds that could present unfrozen groundwater within closed taliks beneath them. This groundwater would then report to the pits. Groundwater flows into the pits from these closed taliks are predicted to be minor, ranging from less than 1 m³/d to about 130 m³/d. No groundwater inflows are expected to be captured by the Discovery Pit. As such, the residual effect to groundwater quantity and related effect on water level in small waterbodies in local watersheds are expected to be negligible.

Additional details and other pathways related to surface water and groundwater interaction are assessed in Section 7.2.

- **Cross-drainage structures for roads may alter stream hydraulics.**

The installation of cross-drainage structures to prevent roads from impeding water flow can result in a constriction of the stream channel, which could impact flow velocities. Potential impacts on velocities can be mitigated through the application of hydraulic design principles. Cross-drainage structures will be implemented in such a way that they will provide sufficiently low flow velocity that the slowest local fish can navigate the structure under a particular design flow condition (i.e., 3-day delay; 1:10 year return flood condition). The structures will also provide a design conveyance for 1:25 year event without overtopping the roadway, which will result in minor changes in stream velocity. The implementation of appropriate cross-drainage structures is expected to result in minor changes to stream flow velocity in the vicinity of the structures relative to baseline conditions and have negligible residual effects on water quantity.

The 1:25 year rainfall event was selected as the design criterion because of the proposed use of the road for 10 to 15 years for the construction and operation of the proposed mine, and because of the general absence of additional public infrastructure in the vicinity of the road. Rainfall events exceeding the 1:25 year rainfall event may result in short-term surcharging of culvert head ponds and are not anticipated to represent a major environmental risk. The road will also be inspected regularly.

- **Cross-drainage structures for roads will alter stream geomorphology.**

As described previously, cross-drainage structures will be implemented in such a way that they will provide a design conveyance for 1:25 year event without overtopping the roadway, which will result in minor changes in stream velocity, and prevent channel aggradation, degradation, erosion, or changes to bankfull width or depth. The implementation of appropriate cross-drainage structures is expected to result in minor changes to stream flow velocity in the vicinity of the structures relative to baseline conditions and have negligible residual effects on geomorphology.

The 1:25 year rainfall event was selected as the design criterion because of the proposed use of the road for 10 to 15 years for the construction and operation of the proposed mine, and because of the general absence of additional public infrastructure in the vicinity of the road. Rainfall events exceeding the 1:25 year rainfall event may result in short-term surcharging of culvert head ponds and are not anticipated to represent a major environmental risk. The road will also be inspected regularly.

- **Freezing and plugging of culverts in the winter.**

The use of a staggered culvert configuration and regular inspection of the road, including potential snow and ice removal prior to freshet, will alleviate the risk of freezing and plugging of culverts.

- **Widening of the AWAR may alter stream hydraulics and geomorphology.**

The running surface of the Phase 1 AWAR is a single lane road (6.5 m width) with passing turnouts (9.5 m total width at passing turnouts). For the Phase 2 AWAR, the running surface will be widened to a double lane road (8.0 m width) (Volume 2, Section 2.6.4.1), with no alteration to the base width.

Locations and hydraulic characteristics of water crossings will remain unchanged with the widening of the Phase 2 AWAR running surface to 8.0 metres. No changes are expected to the configuration of cross-drainage structures installed for the Phase 1 AWAR. The potential environmental impacts of the road widening are expected to be minor because the maximum footprint impact from the road occurred during the Phase 1 AWAR

Project. Thus, residual effects on stream hydraulics and geomorphology from widening are expected to be negligible.

## 7.3.3 Effects Analysis

The pathway analysis presented in Section 7.3.2 considered potential effects to hydrology including water quantity. A summary of the valid pathways by which change to hydrology including water quantity could occur during the Project (i.e., the primary pathways from Table 7.3-27) is presented in Table 7.3-29.

Section 7.3.2.1 provides an overview of the methodology used to develop predictions for effects on waterbodies and streams due to the Project, followed by a discussion of the results of the effects analysis in Section 7.3.2.2.

**Table 7.3-29: Valid Pathways for Effects to Hydrology including Water Quantity**

| Project Activity | Pathway | Effect Statement | Effects Addressed |
|---|---|---|---|
| Project Footprint (e.g., dikes, mine pits, waste rock, access roads, mine plant) | Project footprint, which will physically alter watershed areas and drainage patterns, may change downstream flows, water levels, and channel/bank stability in streams | Effects of Project infrastructure to flows, water levels, and channel/bank stability in downstream waterbodies and streams | Section 7.3.3.3 to Section 7.3.3.11 |
| Site Water Management: Dewatering of Project Footprint Waterbodies to Downstream Receiving Lakes (e.g., to Lake A7, A1, B6, B34, Meliadine Lake) | Dewatering of waterbodies may change flows, water levels, and channel/bank stability in receiving and downstream waterbodies | Effects of dewatering to flows, water levels, and channel/bank stability in downstream waterbodies and streams | Section 7.3.3.3 to Section 7.3.3.11 |
| Site Water Management: Watershed Modification by Diversion of Water (e.g., Lake A8 to Lake A31, Upper B to D Watershed, Lower B to P Watershed) | Alteration of watershed flow paths may change flows, water levels, and channel/bank stability in downstream waterbodies | Effects of watershed diversions on flows, water levels, and channel/bank stability in downstream waterbodies and streams | Section 7.3.3.3 to Section 7.3.3.11 |

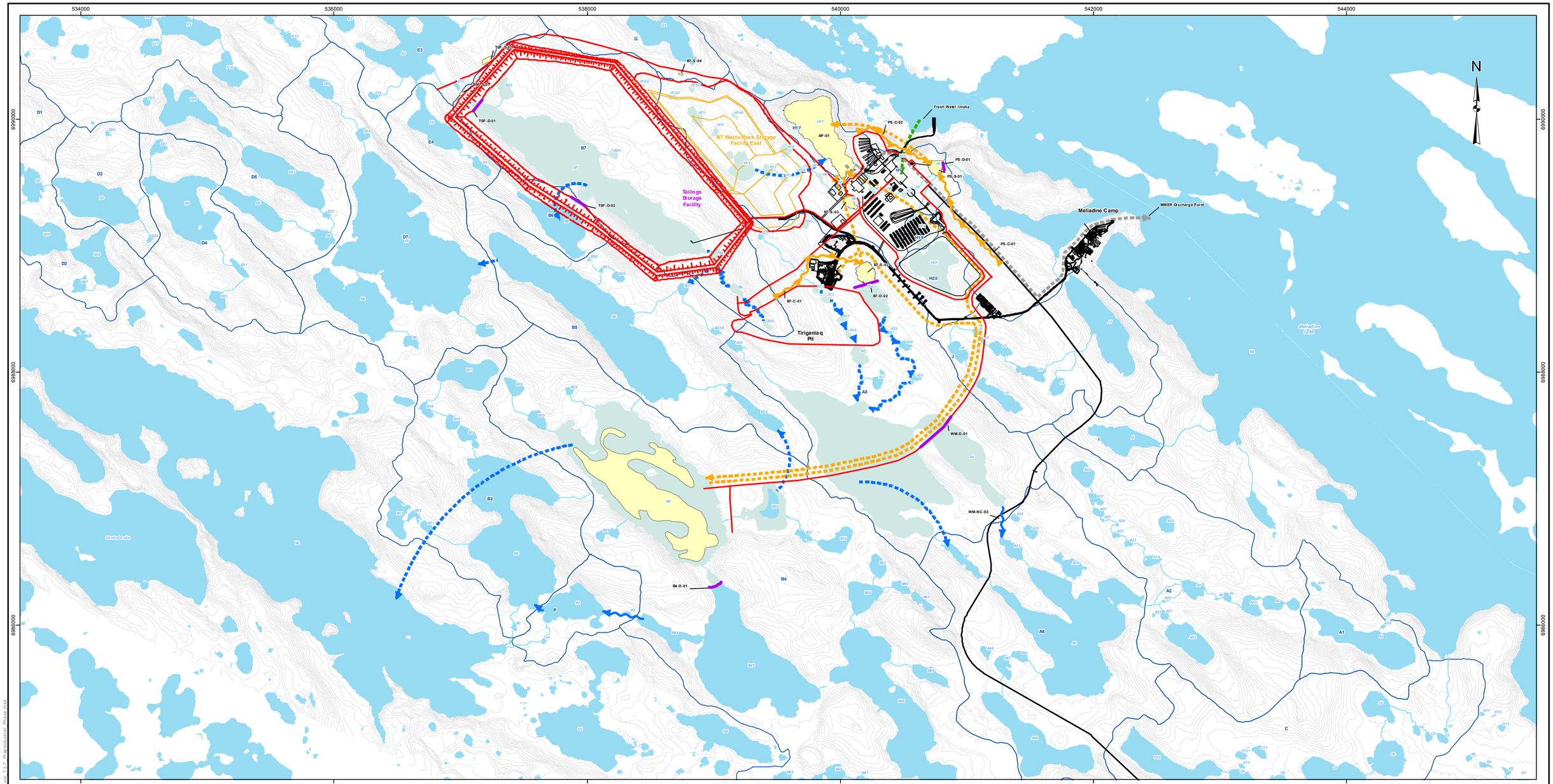
### *7.3.3.1 Effect Analysis Methods*

#### 7.3.3.1.1 Water Balance Model

The baseline water balance model, described in Appendix 7.3-B, was modified to represent changes to LSA watersheds for each phase of the Project. The model was set up using GoldSim™ software on a daily time step for the period of 1982 to 2011. This time period was selected to correspond with the long term climate data derived for the site. Local study area watersheds, including the A, B, C, D, E, G, H, I, J, P, CH, and Meliadine Lake watersheds, were divided into sub-watersheds including lake and land areas. Effects in the X watershed are expected to be negligible (Section 7.3.3.7) and watershed X was not modeled.

The water balance for each sub-watershed considered rainfall and snowmelt runoff, inflow from upstream watersheds, changes in lake storage, lake evaporation and direct precipitation, and discharge to downstream sub-watersheds. The model incorporated runoff coefficients from land surfaces, lake outlet stage-discharge rating curves, and degree-day models for snowmelt and spring ice melt in outlet channels. These parameters were used to calibrate the model using site-specific data collected from 1997 to 2000, and from 2008 to 2011.

The baseline water balance model described in Appendix 7.3-B was modified to model the effects on LSA watersheds during construction, operations, closure, and post-closure. Changes to the water balance model are described below for phases of the water management plan (SD 2-6 Surface Water Management Plan). Project activities relevant to hydrology including water quantity are described for each phase in the Water Management Plan (SD 2-6) and are summarized in the effects analysis sections (Sections 7.3.3.3 to 7.3.3.11). Summary figures of the water management plan are presented below for each phase.




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METRES

## LEGEND

- Contact Flow Path
- Non Contact Flow Path
- Dike
- New Infrastructure
- Watercourse
- Existing Infrastructure
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Tailings Facility
- Pumped Contact Water
- Pumped Dewatering
- Mine Water discharge to Environment
- Fresh Water Intake
- Topographic Contour (1.0 m Interval above sea level)
- Dewatered or Filled in Lake
- Lake
- Contact Water Pond
- Watershed Boundary

## NOTE

Dewatering of lakes may require TSS control.
Pumped water from waste rock storage facilities, pits and the tailing storage facility to sumps not shown for clarity.
Pumped contact water from B4 is assumed to be treated prior to discharge to AP01.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

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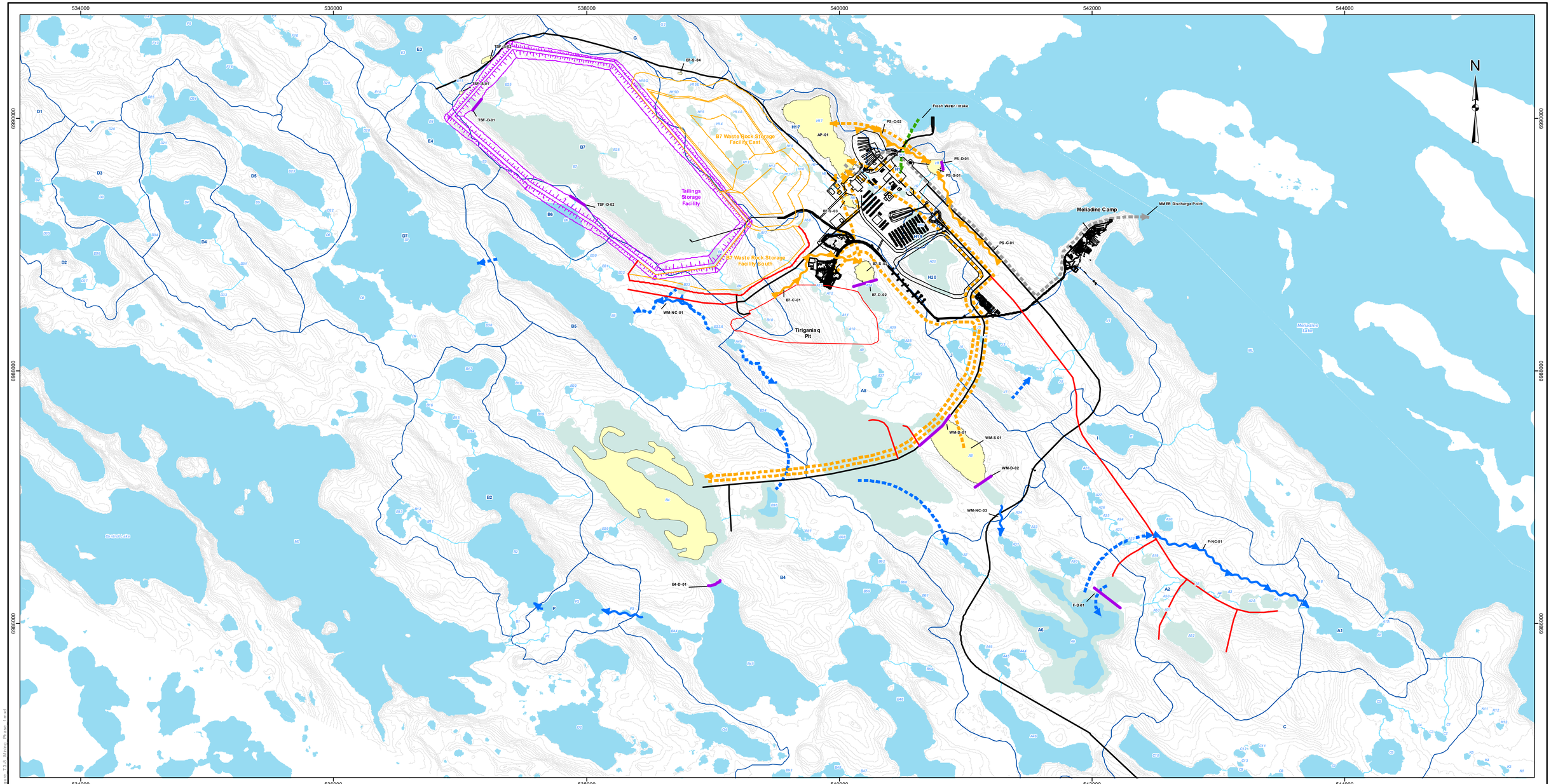
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# PREPRODUCTION PHASE - YEARS -3, -2, -1

Golder Associates

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| PROJECT NO. | | 10-1373-0076 | FILE No. | | |
| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. | 0 |
| GIS | DSC | 09 Nov. 2012 | | | |
| CHECK | DW | 20 Jan. 2013 | FIGURE 7.3-7 | | |
| REVIEW | DW | 20 Jan. 2013 | | | |

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**LEGEND**

- Contact Flow Path
- Non Contact Flow Path
- Dike
- New Infrastructure
- Watercourse
- Existing Infrastructure
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Tailings Facility
- Pumped Contact Water
- Pumped Dewatering
- Mine Water discharge to Environment
- Fresh Water Intake
- Topographic Contour (1.0 m Interval above sea level)
- Dewatered or Filled in Lake
- Lake
- Contact Water Pond
- Watershed Boundary

**NOTE**

Dewatering of lakes may require TSS control.
AP01 attenuation pond may require linear.
Pumped water from waste rock storage facilities, pits and the tailing storage facility to sumps not shown for clarity.
Pumped contact water from B4 is assumed to be treated prior to discharge to AP01.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

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# MINING PHASE 1 - YEARS 1, 2

| | | | | | |
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| PROJECT NO. | | 10-1373-0076 | FILE No. | | |
| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. | 0 |
| GIS | DSC | 09 Nov. 2012 | | | |
| CHECK | DW | 20 Jan. 2013 | FIGURE 7.3-8 | | |
| REVIEW | DW | 20 Jan. 2013 | | | |

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534000 536000 538000 540000 542000 544000

6990000 6988000 6986000

N

B7 Waste Rock Storage Facility North
B7 Waste Rock Storage Facility West
B7 Waste Rock Storage Facility East
B7 Waste Rock Storage Facility South
Tailings Storage Facility
B4 Waste Rock Storage Facility
A45-2 Waste Rock Storage Facility
Tiriganiaq Pit
Wesmeg #2
Wesmeg #3
Ore Stockpile
F Zone Pit #3
F Zone Pit #2
F Zone Pit #1
Meliadine Camp
Fresh Water Intake
WMER Discharge Point
Meliadine Lake
Cornish Lake

TSF-C-01 TSF-D-01 TSF-S-01 TSF-D-02
B7-S-04 B7-D-01 B7-S-01 B7-C-01 B7-S-02 B7-D-02
AP-01 AP-02
PS-C-02 PS-D-01 PS-S-01 PS-C-01
WM-NC-01 B5-C-01
WM-S-02 WM-D-01 WM-S-01 WM-D-02 WM-NC-03
B4-S-01 B4-C-02 B4-D-01 B4-S-02 B4-C-03 B4-C-04
F-NC-01 F-D-01 F-D-02 F-S-03 F-C-05 F-S-02 F-C-01 F-S-01 F-C-04 F-C-03 F-C-02

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METRES

## LEGEND

- Contact Flow Path
- Non Contact Flow Path
- Dike
- New Infrastructure
- Watercourse
- Existing Infrastructure
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Tailings Facility
- Pumped Contact Water
- Pumped Dewatering
- Mine Water discharge to Environment
- Fresh Water Intake
- Topographic Contour (1.0 m Interval above sea level)
- Dewatered or Filled in Lake
- Lake
- Contact Water Pond
- Watershed Boundary

## NOTE

Dewatering of lakes may require TSS control.
Pumped water from waste rock storage facilities, pits and the tailing storage facility to sumps not shown for clarity.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT
AGNICO EAGLE

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TITLE

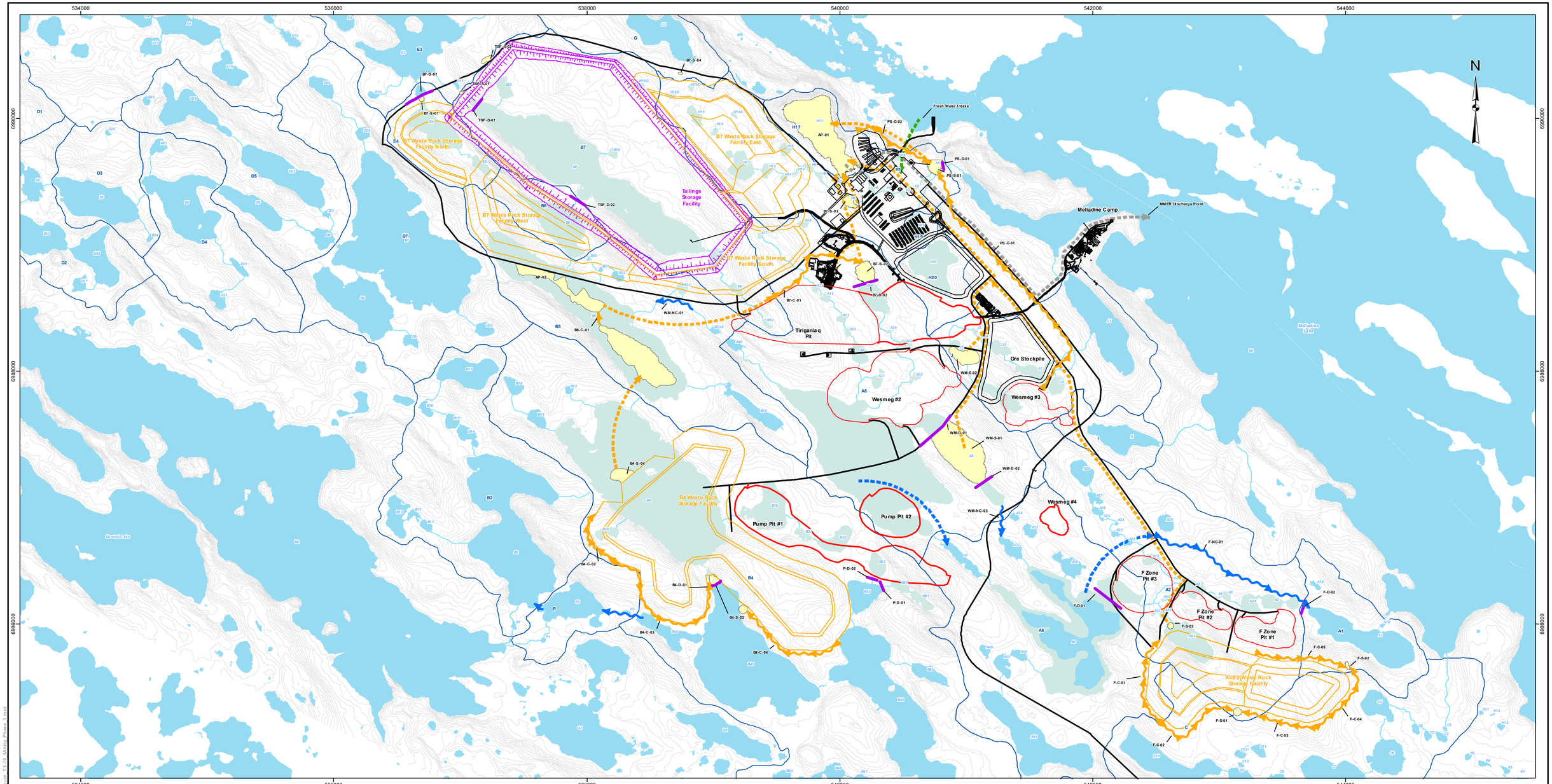
# MINING PHASE 2 - YEARS 3, 4

Golder Associates

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FIGURE 7.3-9

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**LEGEND**

- Contact Flow Path
- Non Contact Flow Path
- Dike
- New Infrastructure
- Watercourse
- Existing Infrastructure
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Tailings Facility
- Pumped Contact Water
- Pumped Dewatering
- Mine Water discharge to Environment
- Fresh Water Intake
- Topographic Contour (1.0 m Interval above sea level)
- Dewatered or Filled in Lake
- Lake
- Contact Water Pond
- Watershed Boundary

**NOTE**

Dewatering of lakes may require TSS control.
Pumped water from waste rock storage facilities, pits and the tailing storage facility to sumps not shown for clarity.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

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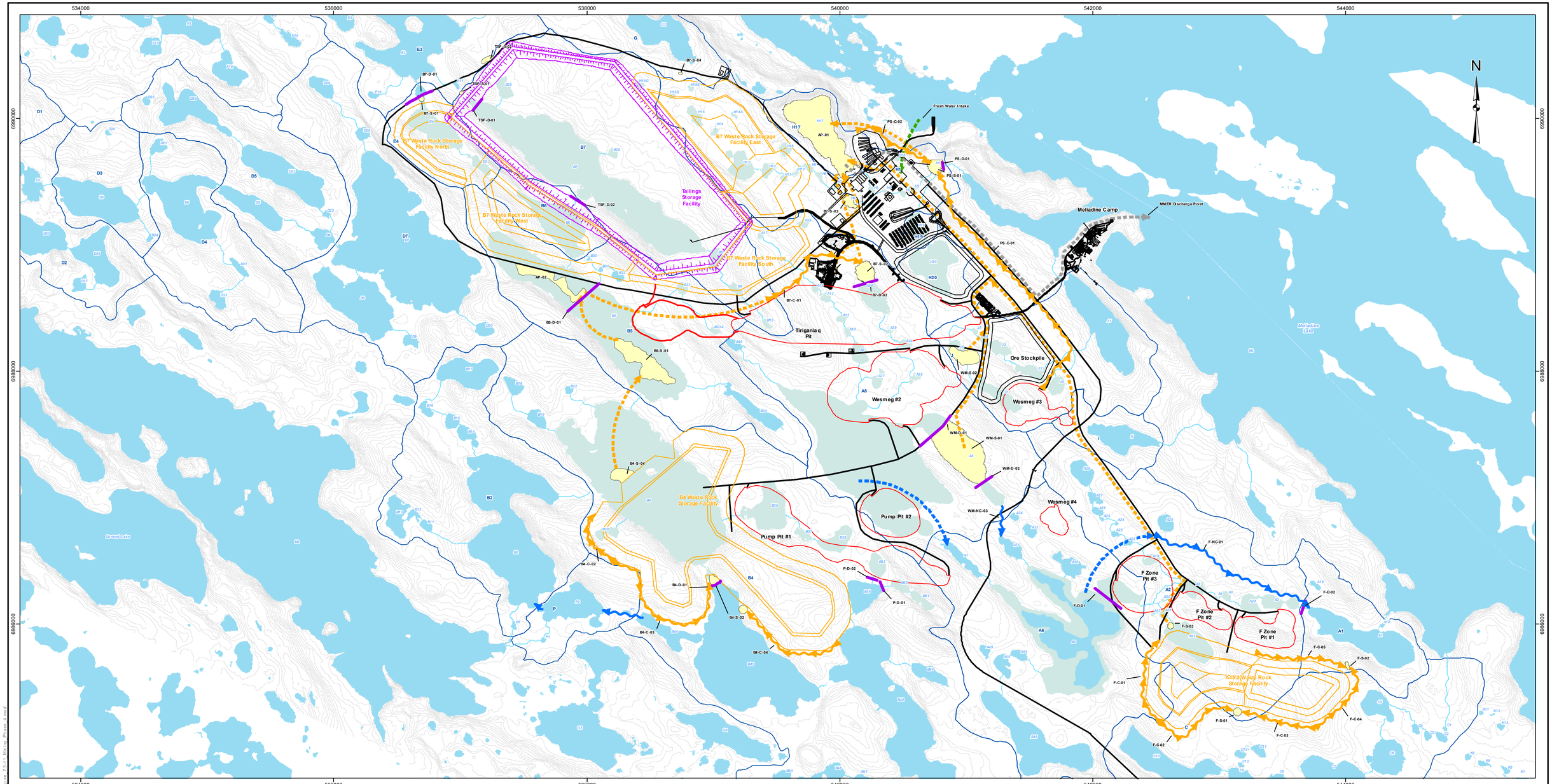
# MINING PHASE 3 - YEARS 5, 6, 7, 8

Golder Associates

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| PROJECT NO. | | 10-1373-0076 | FILE No. | |
| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 09 Nov. 2012 | | |
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**FIGURE 7.3-10**

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## LEGEND

- Contact Flow Path
- Non Contact Flow Path
- Dike
- New Infrastructure
- Watercourse
- Existing Infrastructure
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Tailings Facility
- Pumped Contact Water
- Pumped Dewatering
- Mine Water discharge to Environment
- Fresh Water Intake
- Topographic Contour (1.0 m Interval above sea level)
- Dewatered or Filled in Lake
- Lake
- Contact Water Pond
- Watershed Boundary

## NOTE

Dewatering of lakes may require TSS control.
Pumped water from waste rock storage facilities, pits and the tailing storage facility to sumps not shown for clarity.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

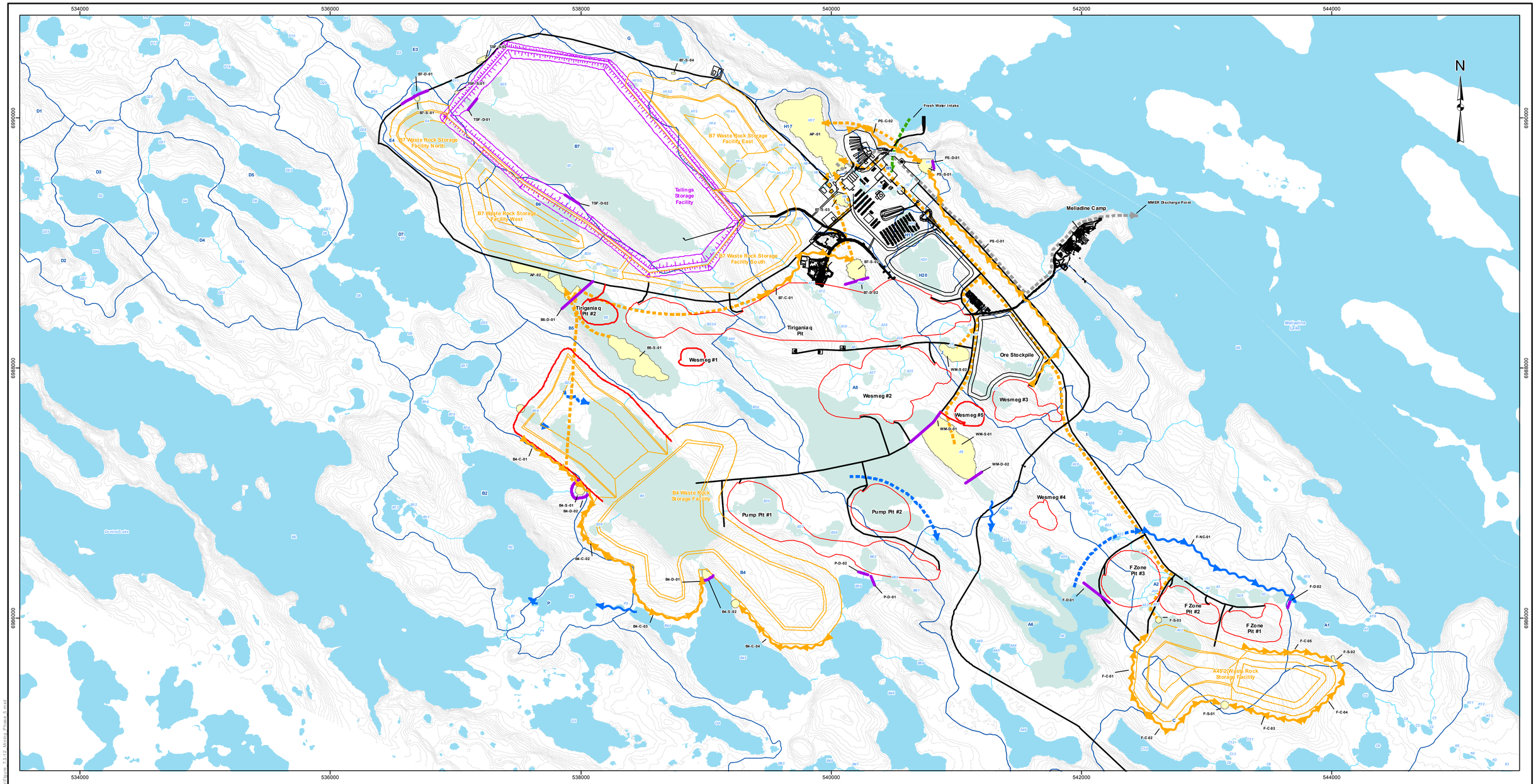
TITLE

# MINING PHASE 4 - YEAR 9

| | | | | | |
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| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. | 0 |
| GIS | DSC | 09 Nov. 2012 | | | |
| CHECK | DW | 20 Jan. 2013 | | | |
| REVIEW | DW | 20 Jan. 2013 | | | |

FIGURE 7.3-11

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## LEGEND

- Contact Flow Path
- Non Contact Flow Path
- Dike
- New Infrastructure
- Watercourse
- Existing Infrastructure
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Tailings Facility
- Pumped Contact Water
- Pumped Dewatering
- Mine Water discharge to Environment
- Fresh Water Intake
- Topographic Contour (1.0 m Interval above sea level)
- Dewatered or Filled in Lake
- Lake
- Contact Water Pond
- Watershed Boundary

## NOTE

Dewatering of lakes may require TSS control.
Pumped water from waste rock storage facilities, pits and the tailing storage facility to sumps not shown for clarity.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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TITLE

# MINING PHASE 5 - YEARS 10, 11, 12

Golder Associates

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| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. | 0 |
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| REVIEW | DW | 20 Jan. 2013 | | | |

**FIGURE 7.3-12**

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548000 550000 552000 554000 556000 558000

6984000 6982000 6980000

N

Meliadine Lake
Chicken Head Lake
Ahuk Lake

CH1 CH2 CH3 CH4 CH5 CH6

Discovery Pit

Discovery Waste Rock Storage Facility

D-C-01 D-C-02 D-S-01

## LEGEND

- Contact Flow Path
- All-weather Access Road (AWAR)
- Open Pit
- Waste Rock Storage Facility
- Watercourse
- Topographic Contour
- Dewatered or Filled in Lake
- Contact Water Pond
- Watershed Boundary
- Lake

## NOTE

Pumped water may require TSS control.
Pumped water from waste rock storage facility and pit to sumps not shown for clarity.
Water from D-S-01 will be used as dust control or trucked to site.
Contour data in certain areas are separated every 1m and 7-8m in others
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
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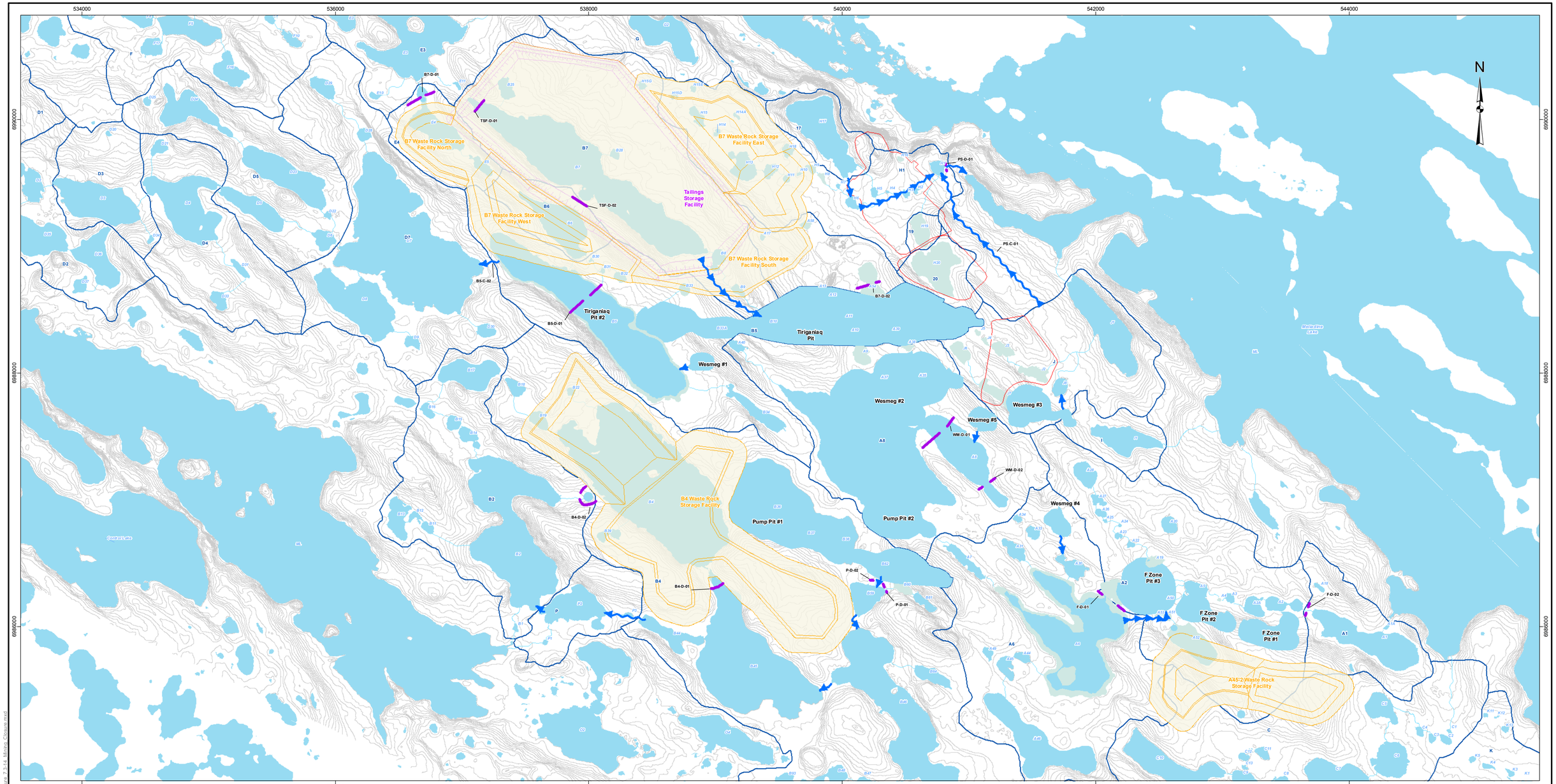
TITLE
# DISCOVERY PIT

Golder Associates

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|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 09 Nov. 2012 | | |
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| REVIEW | DW | 20 Jan. 2013 | | |

FIGURE 7.3-13

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**LEGEND**

- Non Contact Flow Path
- Dike
- Scarified Rock Pad
- Tailings Facility
- Watercourse
- Topographic Contour (1.0 m Interval above sea level)
- Waste Rock Storage Facility
- Watershed Boundary
- Dewatered or Filled in Lake
- Lake

**NOTE**

Dewatering of lakes may require TSS control.
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

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AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
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TITLE

# MINING POST-CLOSURE

Golder Associates

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| PROJECT NO. | | 10-1373-0076 | FILE No. | |
| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. 0 |
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**FIGURE 7.3-14**

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548000 550000 552000 554000 556000 558000

6984000 6982000 6980000

Meliadine Lake

Chicken Head Lake

Ahuk Lake

CH1 CH2 CH3 CH4 CH5 CH6

Discovery Pit

Discovery Waste Rock Storage Facility

N

1000 0 1000

METRES

## LEGEND

- Non Contact Flow Path
- All-weather Access Road (AWAR)
- Watercourse
- Topographic Contour
- Waste Rock Storage Facility
- Dewatered or Filled in Lake
- Watershed Boundary
- Lake

## NOTE

Pumped water may require TSS control.
Pumped water from waste rock storage facility and pit to sumps not shown for clarity.
Water from D-S-01 will be used as dust control or trucked to site.
Contour data in certain areas are separated every 1m and 7-8m in others
Pipe and ditch alignments shown are conceptual for information purposes only.
Final alignments to be confirmed during detailed design and will be subject to change based on local field conditions.

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

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TITLE

# DISCOVERY PIT POST-CLOSURE

Golder Associates

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| DESIGN | MP | 08 Nov. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 09 Nov. 2012 | | |
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| REVIEW | DW | 20 Jan. 2013 | | |

FIGURE 7.3-15

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### Pre-production Phase, Year -3

To model the effects on watersheds located downstream of project activities during the Pre-production Phase (Year -3), the following changes were made to the water balance model:

- Dewatering discharge from Lake A8 and upstream waterbodies was conveyed to the A6 sub-watershed;
- Dewatering discharge from Lake B7 and upstream waterbodies was conveyed to the B6 sub-watershed;
- Runoff from the B5 sub-watershed was diverted to Lake D7;
- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed was diverted to Lake B44, once elevated;
- Runoff from the B4 (i.e., the northern portion of Lake B4/B45) sub-watershed was disconnected from Lake B2 to reflect dewatering to Meliadine Lake;
- Runoff from the B44 sub-watershed was diverted to Lake P2, once elevated; and
- Runoff from the P2 sub-watershed was diverted to Lake B2.

### Pre-production Phase, Years -2 to -1

To model the effects on watersheds located downstream of project activities during the Pre-production Phase (Years -2 to -1), the following changes were made to the water balance model:

- Dewatering discharge from Lake A8 and upstream waterbodies was conveyed to the A6 sub-watershed, but at reduced quantities compared to Year -3;
- The B6 sub-watershed was treated as a headwater sub-watershed, with no further runoff contributions from the B7 sub-watershed;
- Land and lake areas contributing to the B5, B6, and E4 sub-watersheds were updated to reflect the construction of the TSF encroaching on these sub-watersheds;
- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed remained diverted to Lake B44;
- Dewatering discharge from Lake B36 was conveyed to Lake B34; and
- Runoff from the B5 sub-watershed remained diverted to Lake D7 from the previous phase.

### Mining Phase 1, Years 1 to 2

To model the effects on watersheds located downstream of project activities during the Mining Phase 1 (Years 1 to 2), the following changes were made to the water balance model:

- Dewatering discharge from Lake A6 and runoff of upstream waterbodies A22 to A28 were conveyed to the A1 sub-watershed;

- The B6 sub-watershed remained treated as a headwater sub-watershed, with no further runoff contributions from the B7 sub-watershed, as per the Pre-production Phase (Years -2 to -1);
- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed remained diverted to Lake B44;
- Dewatering discharge from Lake B36 remained conveyed to Lake B34; and
- Dewatering discharge from Lake J7 was conveyed to the J1 sub-watershed.

### Mining Phase 2, Years 3 to 4

To model the effects on watersheds located downstream of project activities during the Mining Phase 2 (Years 3 to 4), the following changes were made to the water balance model:

- Dewatering discharge from Lake A6 and runoff of upstream waterbodies A22 to A28 remained conveyed to the A1 sub-watershed;
- Runoff from Lakes A2 to A5, A19, A50 to A53, was diverted out of the Lake A1 sub-watershed due to the presence of Dike F-D-02;
- Catchment of the A45-2 waste rock storage facility was diverted out of the A and C watersheds;
- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed remained diverted to Lake B44;
- Catchment of the B4 waste rock storage facility was diverted out of the B watershed;
- Catchment of the B7 waste rock storage facility North was diverted out of the E watershed;
- Catchment of the Wesmeg #3 Pit was diverted out of the I watershed; and
- Dewatering discharge from upstream waterbodies was directed to the Lake J1 sub-watershed. This phase also included the isolation of Lake J1 from upstream watersheds to reflect the completion of dewatering in Year 4.

### Mining Phase 3, Years 5 to 8

To model the effects on watersheds located downstream of project activities during the Mining Phase 3 (Years 5 to 8), the following changes were made to the water balance model:

- Dewatering discharge from Lake A6 and runoff from upstream waterbodies A22 to A28 remained conveyed to the A1 sub-watershed;
- Runoff from Lakes A2 to A5, A19, A50 to A53 remained diverted out of the Lake A1 sub-watershed due to the presence of Dike F-D-02;
- Catchment of the A45-2 waste rock storage facility remained diverted out of the A and C watersheds;

- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed remained diverted to Lake B44;
- Additional catchment of the B4 waste rock storage facility was diverted out of the B watershed from the previous Mining Phase 2;
- Catchment upstream of Dikes P-D-01 and P-D-01 was diverted out of the B watershed;
- Catchment of the B7 waste rock storage facility North remained diverted out of the E watershed;
- Catchment of the Wesmeg #3 Pit remained diverted out of the I watershed;
- Lake J1 remained isolated from upstream lake runoff; and
- Catchment of the Discovery Pit was diverted out of the CH watershed.

### Mining Phase 4, Year 9

There was no new major activity relevant to hydrology (including water quantity) from the previous phase during Mining Phase 4 (Year 9), and the model of Mining Phase 3 is representative of Mining Phase 4.

### Mining Phase 5, Years 10 to 12

To model the effects on watersheds located downstream of project activities during the Mining Phase 5 (Years 10 to 12), the following changes were made to the water balance model:

- Dewatering discharge from Lake A6 and runoff of upstream waterbodies A22 to A28 remained conveyed to the A1 sub-watershed;
- Runoff from Lakes A2 to A5, A19, A50 to A53 remained diverted out of the Lake A1 sub-watershed due to the presence of Dike F-D-02;
- Catchment of the A45-2 waste rock storage facility remained diverted out of the A and C watersheds;
- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed remained diverted to Lake B44;
- Catchment of the B4 waste rock storage facility remained diverted out of the B watershed from the previous Mining Phase 4, Mining Phase 3;
- Catchment upstream of Dikes P-D-01 and P-D-02 remained diverted out of the B watershed;
- Catchment of the B7 waste rock storage facility North remained diverted out of the E watershed;
- Catchment of the Wesmeg #3 Pit remained diverted out of the I watershed;
- Lake J1 remained isolated from upstream lake runoff;
- Catchment of the Discovery Pit remained diverted out of the CH Lake watershed; and
- Additional catchment of the B4 waste rock storage facility was diverted out of the B watershed from the previous phase.

### Mining Closure

To model the effects on Meliadine Lake during Closure, the following changes were made to the water balance model:

- A constant pumping rate was applied out of Meliadine Lake to assist with pit flooding.

### Mining Post-Closure

To model the effects on watersheds located downstream of project activities during the Mining Post-Closure, the following changes were made to the water balance model:

- Runoff from the B45 (i.e., the southern portion of Lake B4/B45) sub-watershed remained diverted to Lake B44;
- Watershed configurations were modified in the A, B, D, H, I, J, and CH watersheds, due to the presence of the refilled Pits, and runoff reporting from the TSF; and
- Lake to land ratios were modified in the A, B, C, E, H, J, and CH watersheds due to the presence of the refilled Pits, TSF and waste rock covering lake areas, in-filled waterbodies, and new water level regimes (Lake A6 only).

## *7.3.3.2 Effect Analysis Results – Layout*

Effect analysis results are presented by the following primary pathway as identified in Section 7.3.2:

- Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams;
- Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams; and
- Effects of Watershed Diversion on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams.

When several pathways overlapped (e.g., effect of dewatering, and effect of diversion, on Lake D7 and downstream waterbodies), effect analysis results were only presented in the section related to the most dominant pathway (e.g., effect of diversion) for each snapshot.

Results are presented in terms of change in flow and water level regimes, from which additional information can be derived (e.g., flood zones). These results (and derived information from these results) were considered in the project design and mitigation measures.

### 7.3.3.3 Effect Analysis Results – Pre-production Phase (Year -3)

#### 7.3.3.3.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### 7.3.3.3.1.1 Project Activities

During dewatering (direct discharge), untreated water will be pumped from the northern portion of Lake A54 to Lake H17 (i.e., AP-01), Lake A8 to Lake A7, Lake B7 to Lake B6, Lake B4 to Meliadine Lake, and from waterbodies upstream of Lake H1 and Lake H1 to Lake H17 (i.e., AP-01). Dewatering of Lake A8 also includes dewatering of upstream waterbodies A13, A12, A11, A10 and A9, which will be pumped to Lake A8. This will affect downstream waterbodies including Lake A6 and Lake A1. Dewatering of Lake B7 also includes dewatering of upstream waterbodies B28, B25, B10, B9, and B8. Lake B7 will be dewatered through Lake B6, which will affect downstream waterbodies including Lake B5. Other waterbodies affected by the dewatering of Lake B7 will include Lake D7 to Lake D1 from the diversion of Lake B5 through Lake D7, and are assessed as part of the effects of watershed diversion presented in Section 7.3.3.3.3. Therefore, waterbodies D7 to D1 are not discussed further in the dewatering effect analysis for Pre-production Phase (Years -3) below.

Dewatered waterbodies during the Pre-production Phase (Year -3) are summarized in Table 7.3-30. Dewatering will reduce lake areas by 0.976 $km^2$ in the A watershed, 1.480 $km^2$ in the B watershed, and 0.222 $km^2$ in the H watershed during the Pre-production Phase (Year -3).

##### 7.3.3.3.1.2 Environmental Design Feature and Mitigation

Inflows and outflows will be managed at Lake H17 (i.e., AP-01) such that water level fluctuations are minimal, and water levels do not exceed baseline conditions.

Pumped discharges will be conveyed to the lake environment, and not directly to outlets, to attenuate flow changes. Final discharge locations will be determined during the detailed design stage and may be modified based on monitoring results.

##### 7.3.3.3.1.3 Effect Analysis

Potential effects of the dewatering of Lake B4 to Meliadine Lake are expected to be negligible and are not examined further in this section.

Potential effects of the dewatering of the northern portion of Lake A54 and waterbodies upstream of Lake H1 and Lake H1 to AP-01 will be mitigated by site water management to minimize water level fluctuations and water levels exceeding baseline conditions, and are not further examined in this section.

**Table 7.3-30: Dewatered Waterbodies during Pre-production Phase (Year -3)**

| Present/Future Development | Dewatered Waterbody | Lake Area Reduction ($km^2$) |
|---|---|---|
| tailings storage facility | B7 | 0.578 |
| | B8 | 0.014 |
| | B25 | 0.016 |
| | B28 | 0.004 |
| Pits | A8 | 0.905 |
| | A9 | 0.018 |
| | A10 | 0.003 |
| | A11 | 0.004 |
| | A12 | 0.004 |
| | A13 | 0.003 |
| | A54 | 0.039 |
| | B10 | 0.003 |
| B7 waste rock storage facility | B9 | 0.006 |
| | H8 | 0.003 |
| | H9 | 0.004 |
| | H10 | 0.001 |
| | H11 | 0.003 |
| | H12 | 0.010 |
| | H13 | 0.035 |
| | H14 | 0.002 |
| | H14A | 0.002 |
| | H15 | 0.011 |
| | H15D | 0.002 |
| | H15E | 0.002 |
| | H15G | 0.003 |
| | H18 | 0.007 |
| Plant Site | H1 | 0.011 |
| | H2 | 0.002 |
| | H3 | 0.003 |
| | H4 | 0.001 |
| | H5 | 0.004 |
| | H7 | 0.001 |
| | H16 | 0.002 |
| | H19 | 0.029 |
| | H20 | 0.096 |
| B4 waste rock storage facility | B4 | 0.858 |
| **Lake Area Reduction in the A Watershed** | | **0.976** |
| **Lake Area Reduction in the B Watershed** | | **1.480** |
| **Lake Area Reduction in the H Watershed** | | **0.233** |

### *Lake A6 to Lake A1*

The water balance model for the Project was used to examine potential dewatering effects on flows, water levels, and outlet channel/bank stability during Pre-production (Year -3) in all downstream waterbodies between the Lake A6 and the Lake A1 outlet channel. Project effects at the Lake A6 outlet during dewatering are summarized in Figure 7.3-16 to Figure 7.3-17 with additional information in Appendix 7.3-C. Project effects at the Lake A1 outlet during dewatering are summarized in Figure 7.3-18 to Figure 7.3-19 with additional information in Appendix 7.3-C.

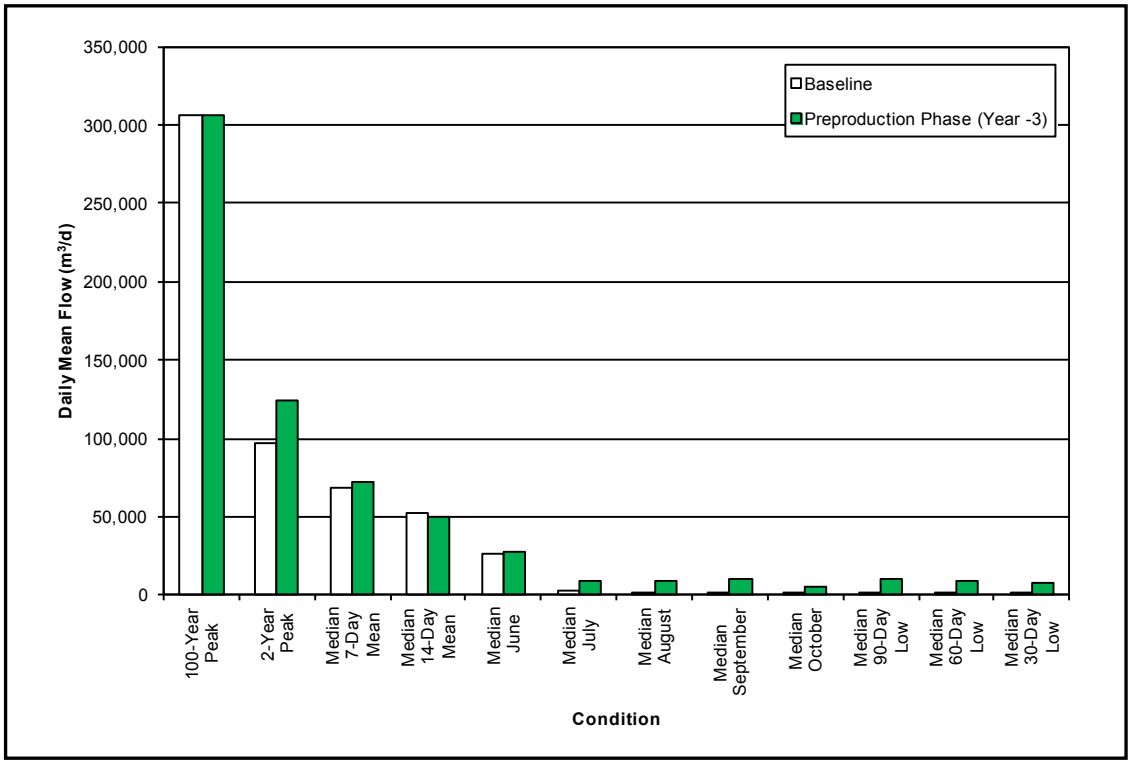



*Figure 7.3-16: Comparison of Effects on Lake A6 Outlet Discharges - Pre-production Phase (Year -3)*

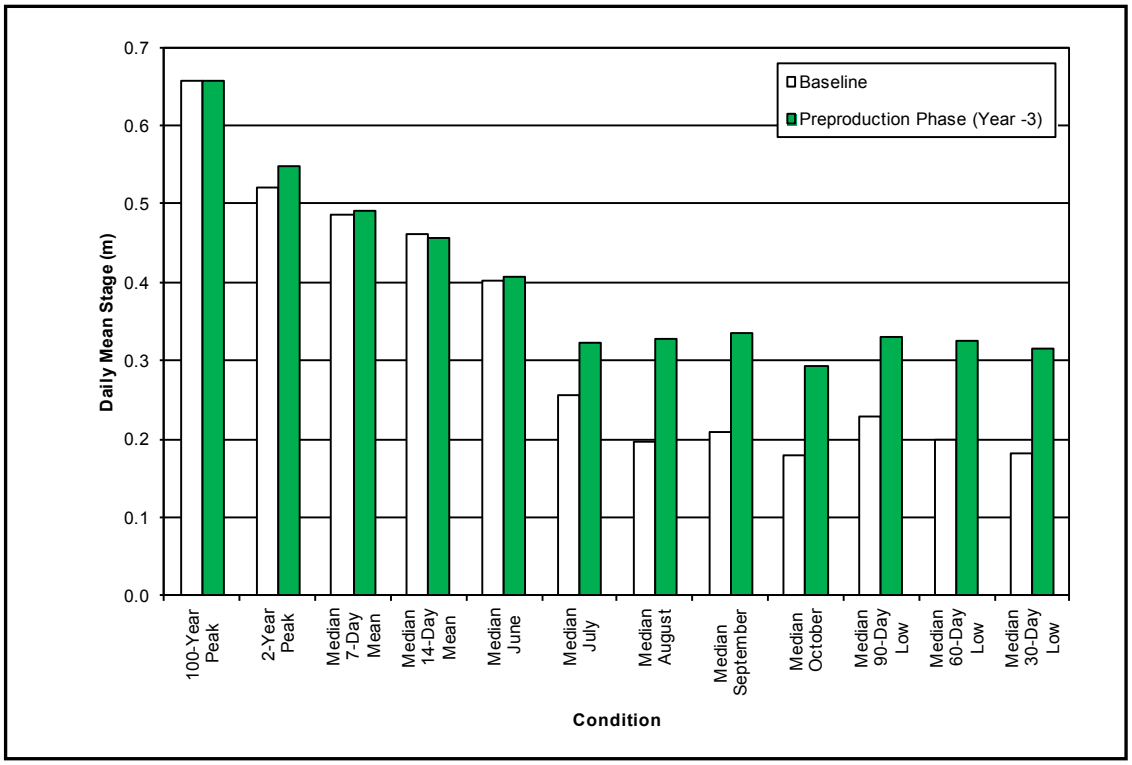



*Figure 7.3-17: Comparison of Effects on Lake A6 Stages - Pre-production Phase (Year -3)*

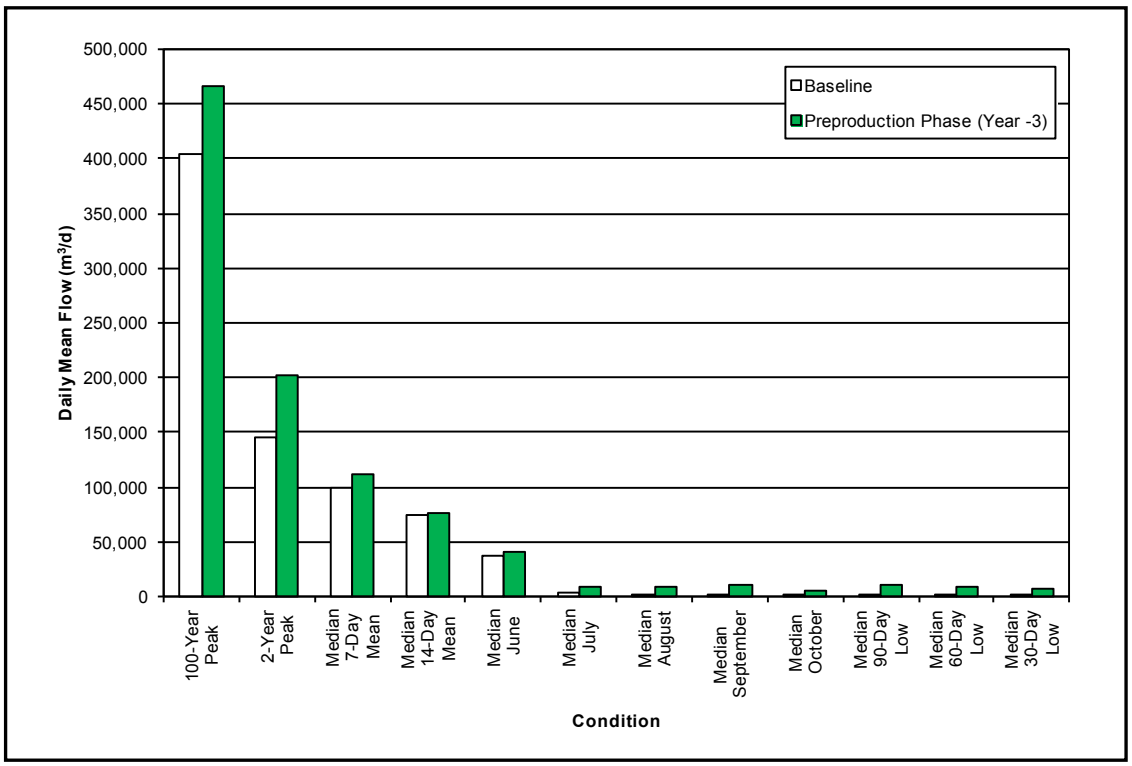



*Figure 7.3-18: Comparison of Effects on Lake A1 Outlet Discharges - Pre-production Phase (Year -3)*

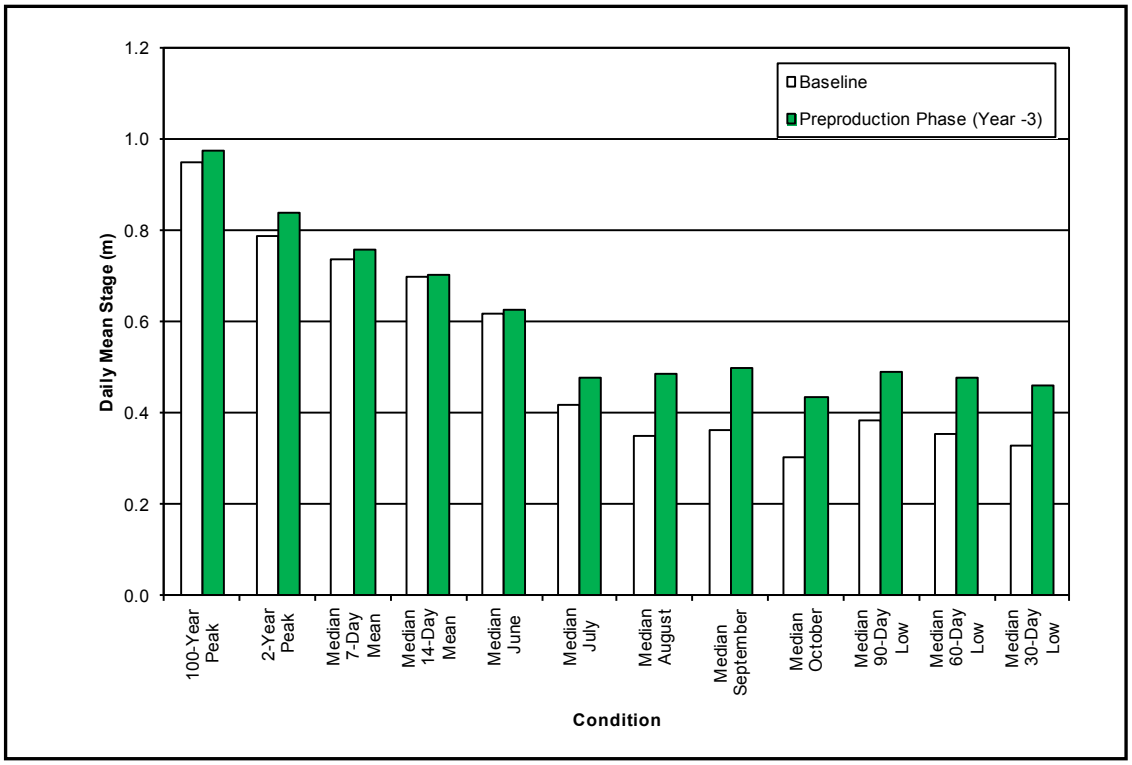



*Figure 7.3-19: Comparison of Effects on Lake A1 Stages - Pre-production Phase (Year -3)*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake A6 Outlet Flows:** the water balance results for Lake A6 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to the dewatering of Lake A8 and upstream waterbodies at a constant rate until the end of the open water season. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 29% above the baseline value, and the 100-year flood discharge will remain unchanged. Dewatering will cause low flows to increase by 534% to 1515% compared to baseline conditions.

**Lake A6 Water Levels:** Lake A6 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.027 m, while monthly mean stages are expected to increase by 0.020 m (May), 0.006 m (June), 0.067 m (July), 0.132 m (August), 0.127 m (September), and 0.112 m (October), under median conditions. The 100-year flood level is expected to remain unchanged

**Lake A6 and Outlet Channel/Bank Stability:** No effects on Lake A6 and Outlet channel or bank stability are expected during Pre-production (Year -3), because flood magnitudes will only exceed baseline values for a small period during the freshet and are not sustained.

**Lake A1 Outlet Flows:** the water balance results for Lake A1 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to dewatering of Lake A8 and upstream waterbodies at a constant rate until the end of the open water season. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 39% above the baseline value, and the 100-year flood discharge by 15%. Dewatering will cause low flows to increase by 275% to 526% compared to baseline conditions.

**Lake A1 Water Levels:** Lake A1 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.049 m, and the 100-year flood level by 0.024 m, while monthly mean stages are expected to increase by 0.024 m (May), 0.010 m (June), 0.059 m (July), 0.134 m (August), 0.134 m (September), and 0.130 m (October), under median conditions.

**Lake A1 and Outlet Channel/Bank Stability:** No effects on Lake A1 and Outlet channel or bank stability are expected during Pre-production (Year -3), because flood magnitudes will only exceed baseline values for a small period during the freshet and are not sustained.

### *Lake B6 to Lake B5*

The water balance model for the Project was used to examine potential dewatering effects on flows, water levels, and outlet channel/bank stability during Pre-production (Year -3) in all downstream waterbodies between Lake B6 and the Lake B5 outlet channel. Project effects at the Lake B6 outlet during dewatering are summarized in Figure 7.3-20 to Figure 7.3-21 with additional information in Appendix 7.3-C. Project effects at the Lake B5 outlet during dewatering are summarized in 7.3-22 to Figure 7.3-23 with additional information in Appendix 7.3-C.

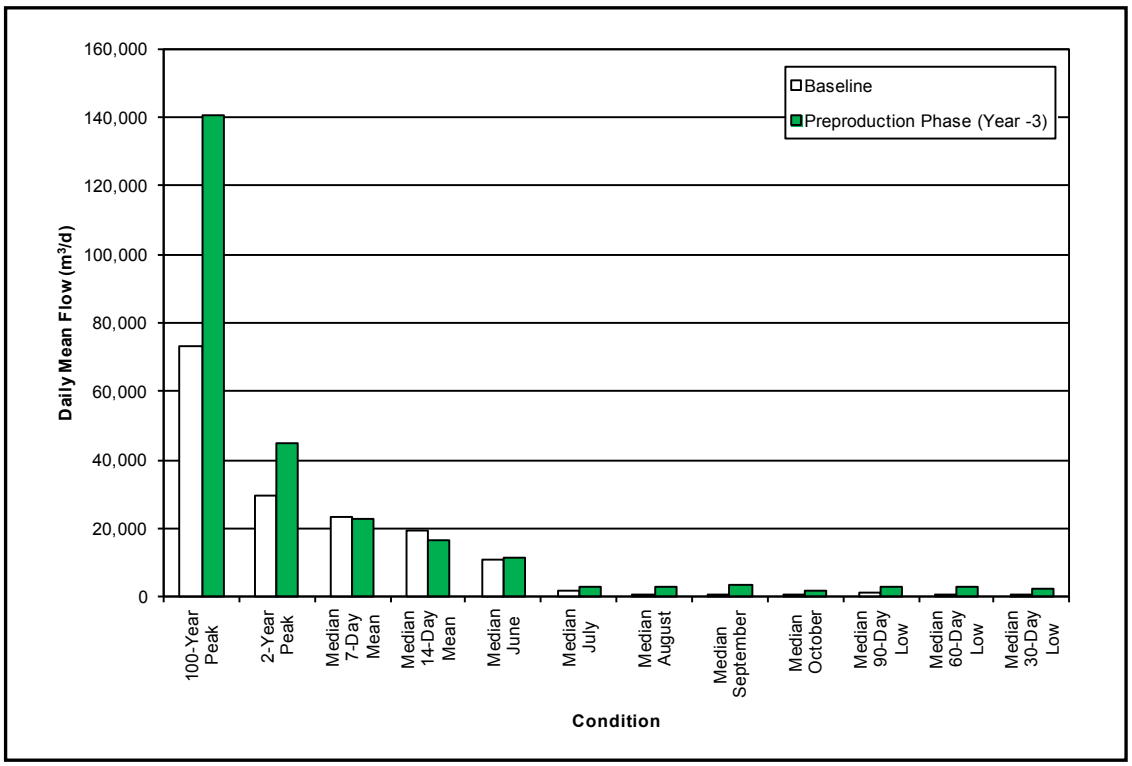



*Figure 7.3-20: Comparison of Effects on Lake B6 Outlet Discharges - Pre-production Phase (Year -3)*

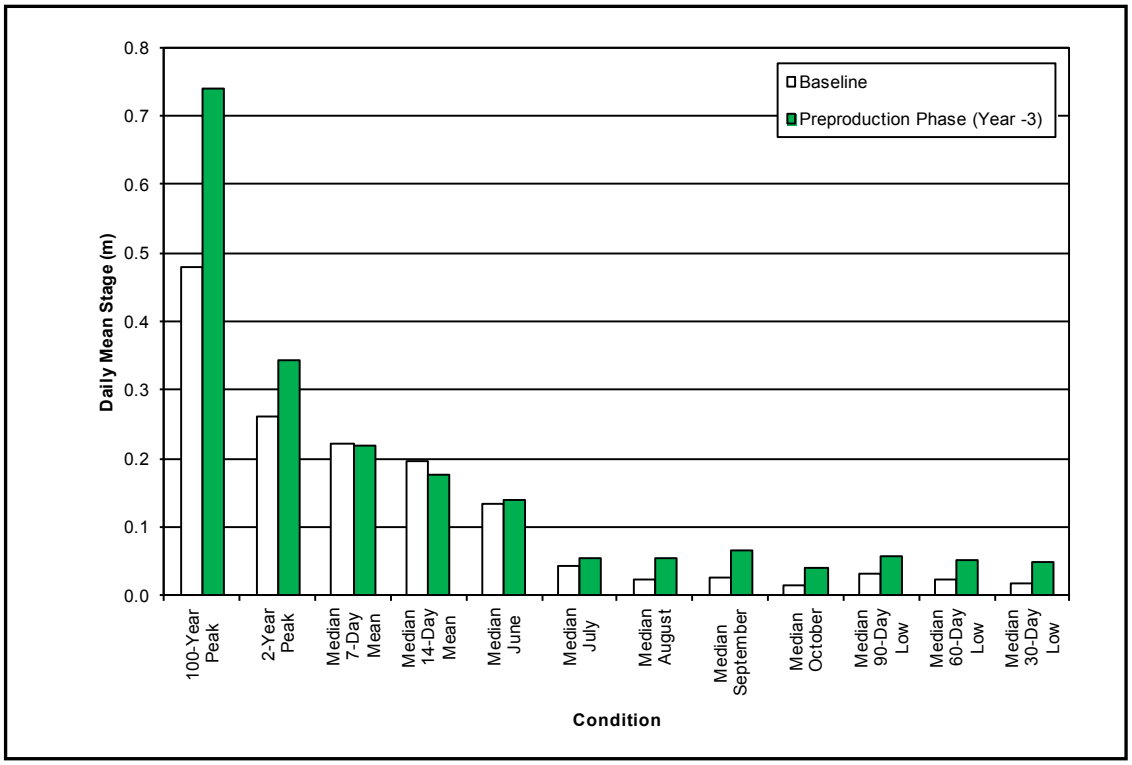



*Figure 7.3-21: Comparison of Effects on Lake B6 Stages - Pre-production Phase (Year -3)*

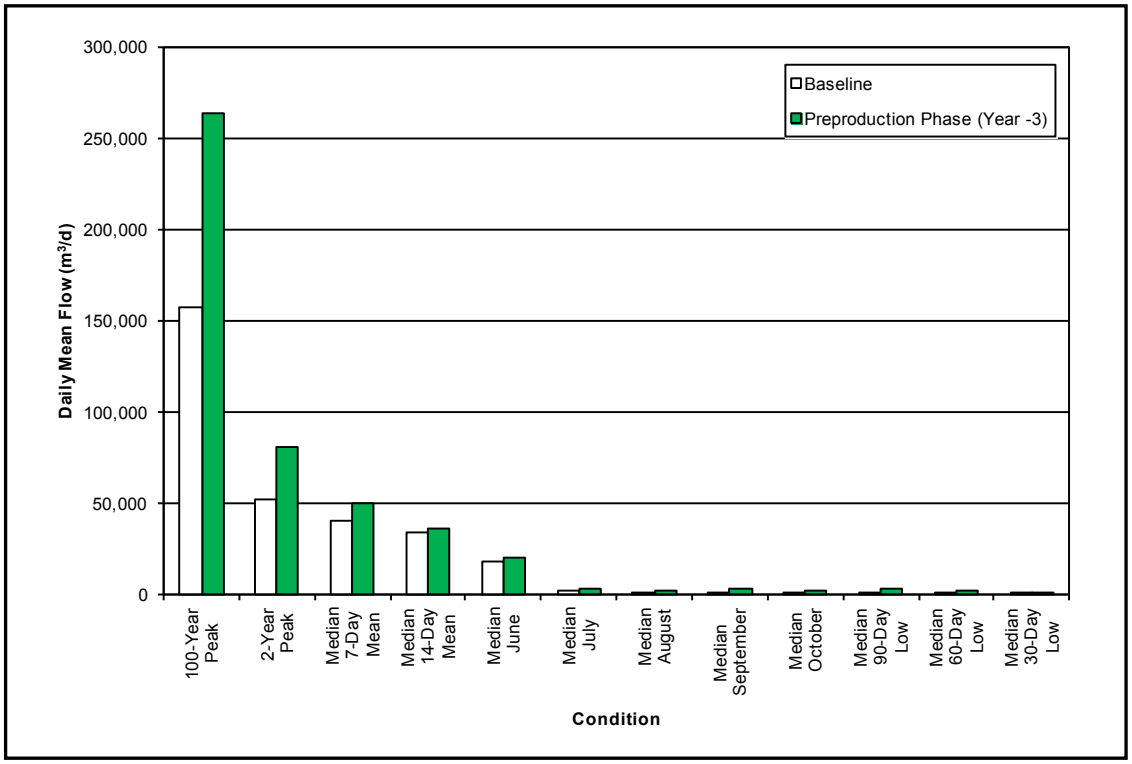



*Figure 7.3-22: Comparison of Effects on Lake B5 Outlet Discharges - Pre-production Phase (Year -3)*

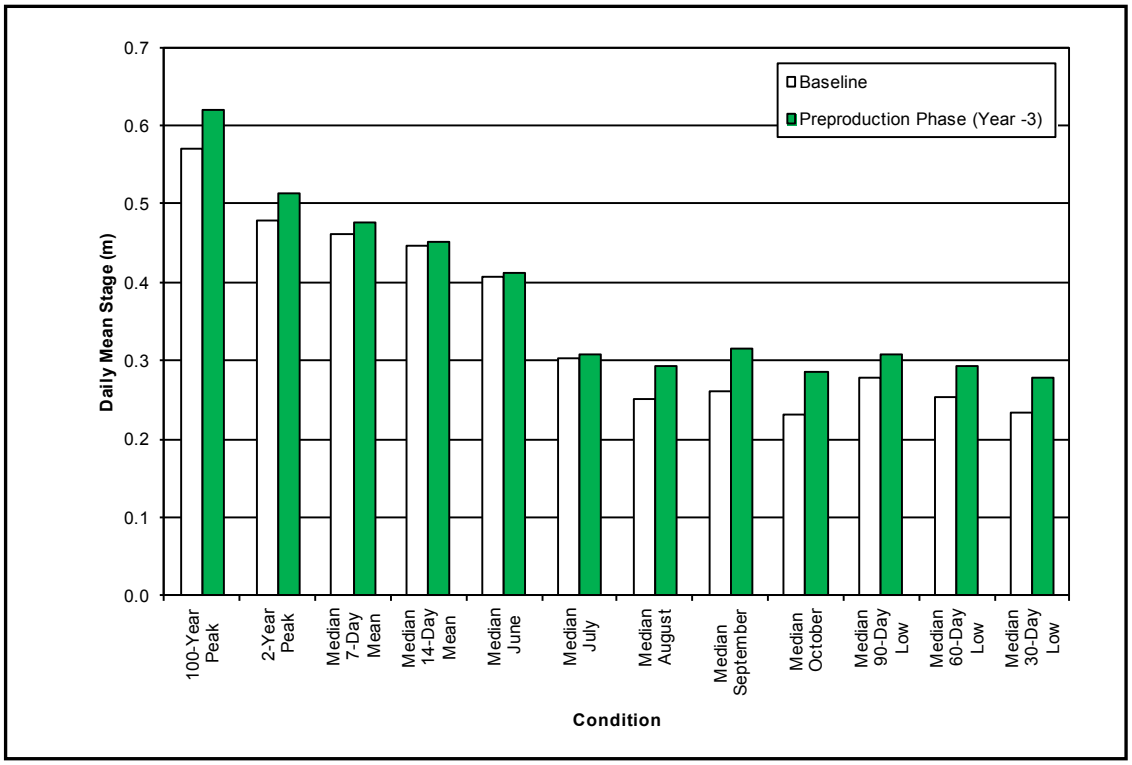



*Figure 7.3-23: Comparison of Effects on Lake B5 Stages - Pre-production Phase (Year -3)*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake B6 Outlet Flows:** the water balance results for Lake B6 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to dewatering of Lake B7 and upstream waterbodies until the end of the open water season. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 53% above the baseline value, and the 100-year flood discharge by 92%. Dewatering will cause low flows to increase by 142% to 408% compared to baseline conditions.

**Lake B6 Water Levels:** Lake B6 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.083 m, and the 100-year flood level by 0.260 m, while monthly mean stages are expected to remain unchanged in May, and increase by 0.005 m in June, 0.010 m in July, 0.032 m in August, 0.040 m in September, and 0.027 m in October, under median conditions.

**Lake B6 and Outlet Channel/Bank Stability:** increased flood regimes from the dewatering of Lake B7 and upstream waterbodies could result in increased erosion potential. To minimize potential stream erosion, dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping to Lake B6 will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at baseline condition thereby minimizing the potential for increased erosion (see Appendix 7.3-D).

**Lake B5 Outlet Flows:** the water balance results for Lake B5 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to dewatering of Lake B7 and upstream waterbodies until the end of the open water season. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 57% above the baseline value, and the 100-year flood discharge by 68%. Dewatering will cause low flows to increase by 84% to 203% compared to baseline conditions.

**Lake B5 Water Levels:** Lake B5 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.036 m, and the 100-year flood level by 0.049 m, while monthly mean stages are expected to increase by 0.012 m (May), 0.007 m (June), 0.007 m (July), 0.043 m (August), 0.055 m (September), and 0.053 m (October), under median conditions.

**Lake B5 and Outlet Channel/Bank Stability:** increased flood regimes from the dewatering of Lake B7 and upstream waterbodies could result in increased erosion potential. As such, dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping to Lake B6 will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at baseline condition thereby minimizing the potential for increased erosion (see Appendix 7.3-D).

#### 7.3.3.3.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.3.2.1 Project Activities*

No analysis of potential project infrastructure effects during Pre-production (Year -3) is required.

#### 7.3.3.3.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.3.3.1 Project Activities*

Construction of the road to the B4 Waste Rock Area during Pre-production (Year -3) will require the portion of Lake A8 located south of Dike WM-D-01 to be diverted to Lake A31. This will affect Lake A31 and other waterbodies downstream including Lake A6 and Lake A1. Effects of this diversion were considered in Section 7.3.3.3.1 (effects of dewatering in the A watershed during Pre-production (Year -3)), and therefore are not discussed further in the watershed diversion effect analysis for Pre-production Phase (Years -3) below.

Dewatering of Lake B4 to Meliadine Lake will require the diversion of Lake B5 to Lake D7, Lake B45 (identified as part of Lake B4 during baseline field programs based on observed water levels) to Lake B44, Lake B44 to Lake P2, and Lake P2 to Lake B2. Lake B5 will be diverted to Lake D7 by pumps. Lakes B45 (portion of Lake B4), and B44 will be permanently diverted following construction of Dike B4-D-01, which will raise the water level of these two waterbodies by approximately 0.9 m and 0.5 m, respectively (Table 7.3-31), resulting in a single combined waterbody. These diversions will affect waterbodies further downstream Lakes D7 to D1 and waterbodies P2 and B2.

**Table 7.3-31: Nominal Elevation and Lake Areas of Raised Waterbodies B44 and B45**

| Waterbody | Baseline | | Diversion | |
|---|---|---|---|---|
| | Nominal Elevation (m) | Lake Area ($km^2$) | Nominal Elevation (m) | Lake Area ($km^2$) |
| B45 | 56.55 | 0.475 | 57.43 | 0.656 |
| B44 | 56.98 | 0.050 | 57.43 | |

##### *7.3.3.3.3.2 Environmental Design Feature and Mitigation*

A channel will be constructed at diversion outlets to convey flows. Diversion outlet channels will be designed to approximate the natural hydrograph to the extent possible, so as to manage the water level regime of the diverted waterbodies. Diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn at al. 2012) and to incorporate lessons learned at other mine sites in the north (Jones et al. 2003).

##### *7.3.3.3.3.3 Effect Analysis*

###### *Lake D7 to Lake D1*

The water balance model for the Project was used to examine potential watershed diversion effects on flows, water levels, and outlet channel/bank stability during Pre-production (Year -3) in all downstream waterbodies between Lake D7 and the Lake D1 outlet channel. Project effects at the Lake D7 outlet during diversion of Lake B5 are summarized in 7.3-24 to Figure 7.3-25, at the Lake D3 outlet in 7.3-26 to Figure 7.3-27, and at the Lake D1 outlet in 7.3-28 to Figure 7.3-29. Additional information for each outlet is also provided in Appendix 7.3-C.

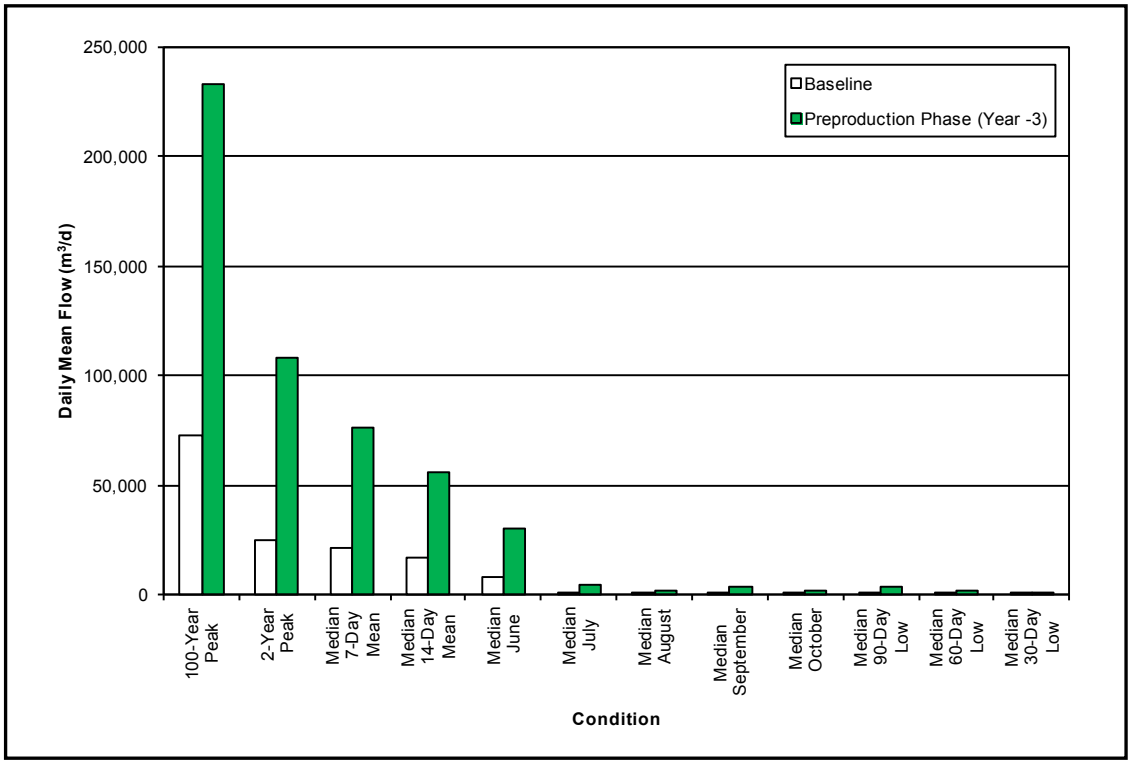



*Figure 7.3-24: Comparison of Effects on Lake D7 Outlet Discharges - Pre-production Phase (Year -3)*

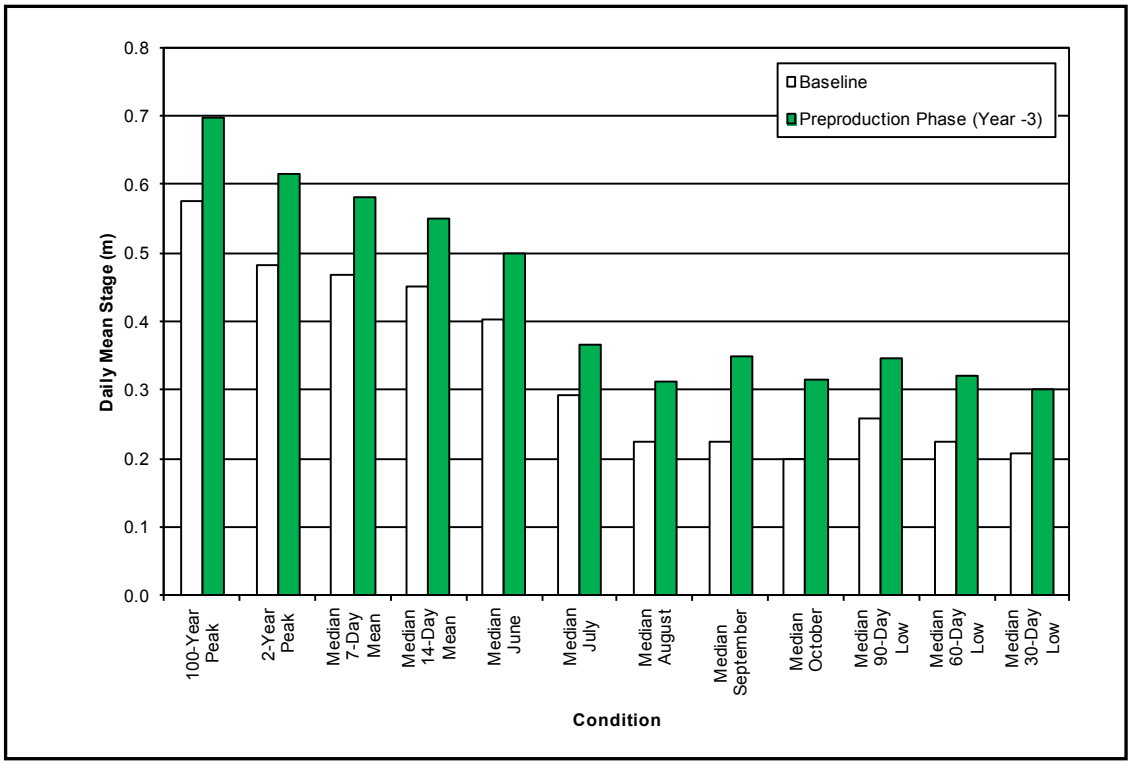



*Figure 7.3-25: Comparison of Effects on Lake D7 Stages - Pre-production Phase (Year -3)*

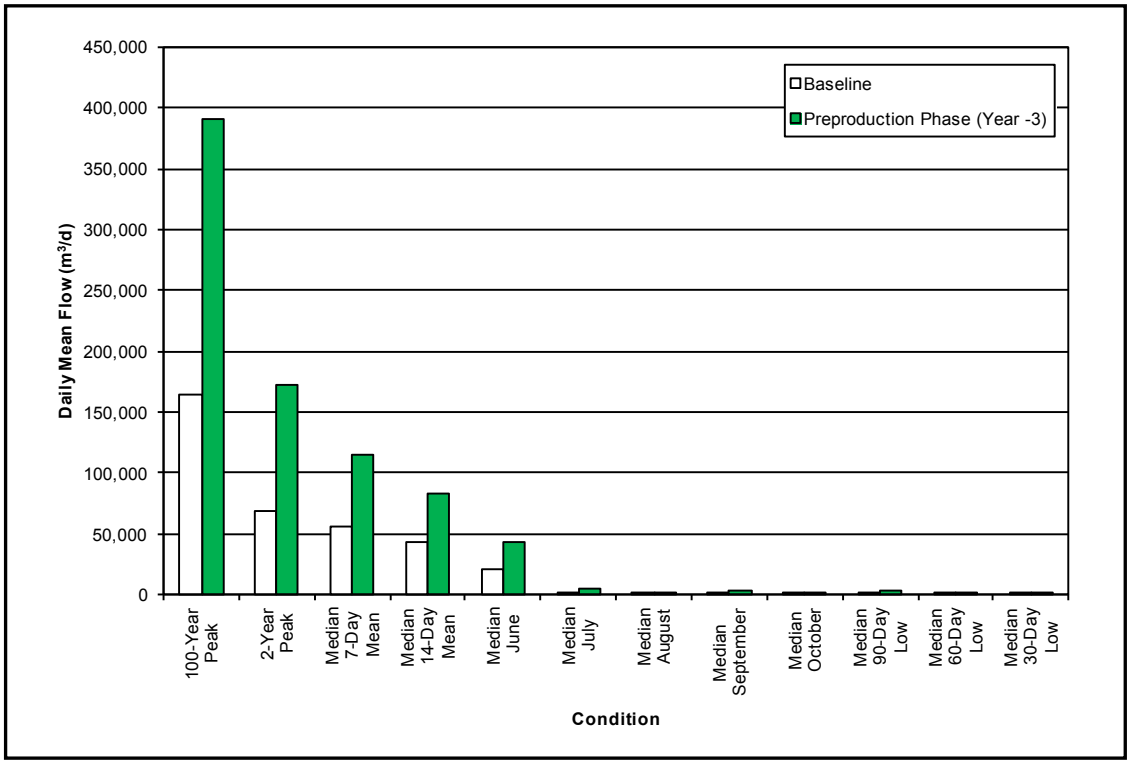



*Figure 7.3-26: Comparison of Effects on Lake D3 Outlet Discharges - Pre-production Phase (Year -3)*

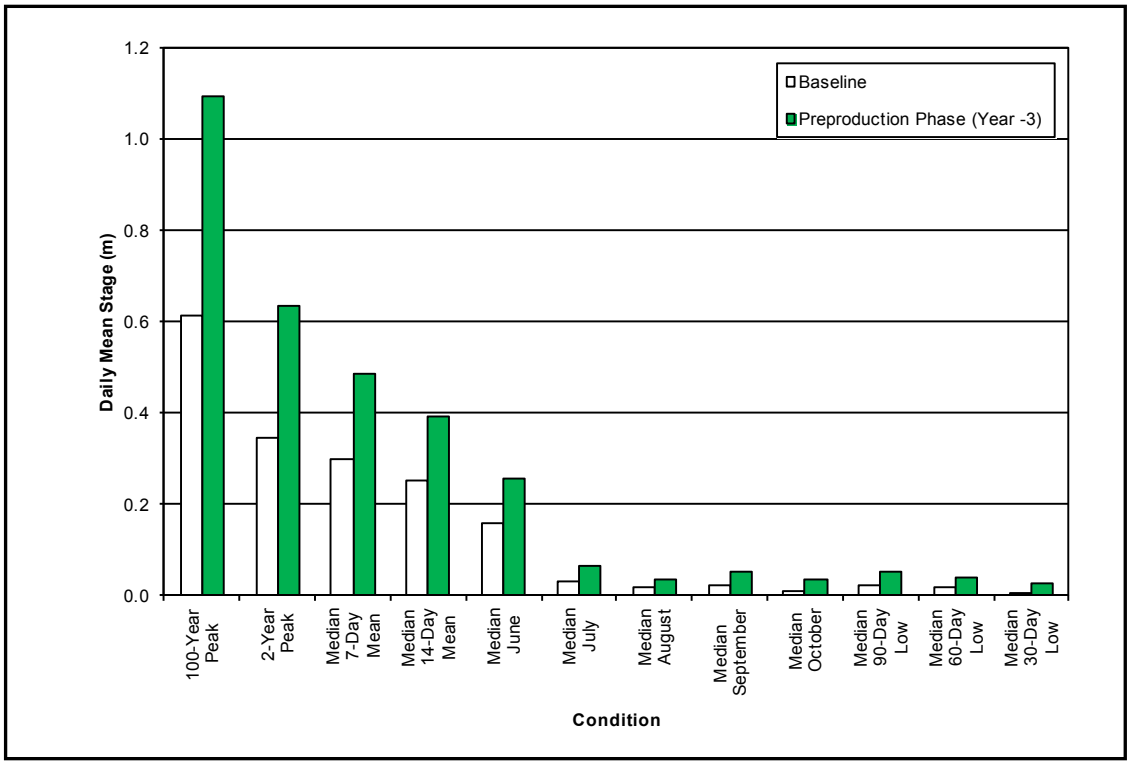



*Figure 7.3-27: Comparison of Effects on Lake D3 Stages - Pre-production Phase (Year -3)*

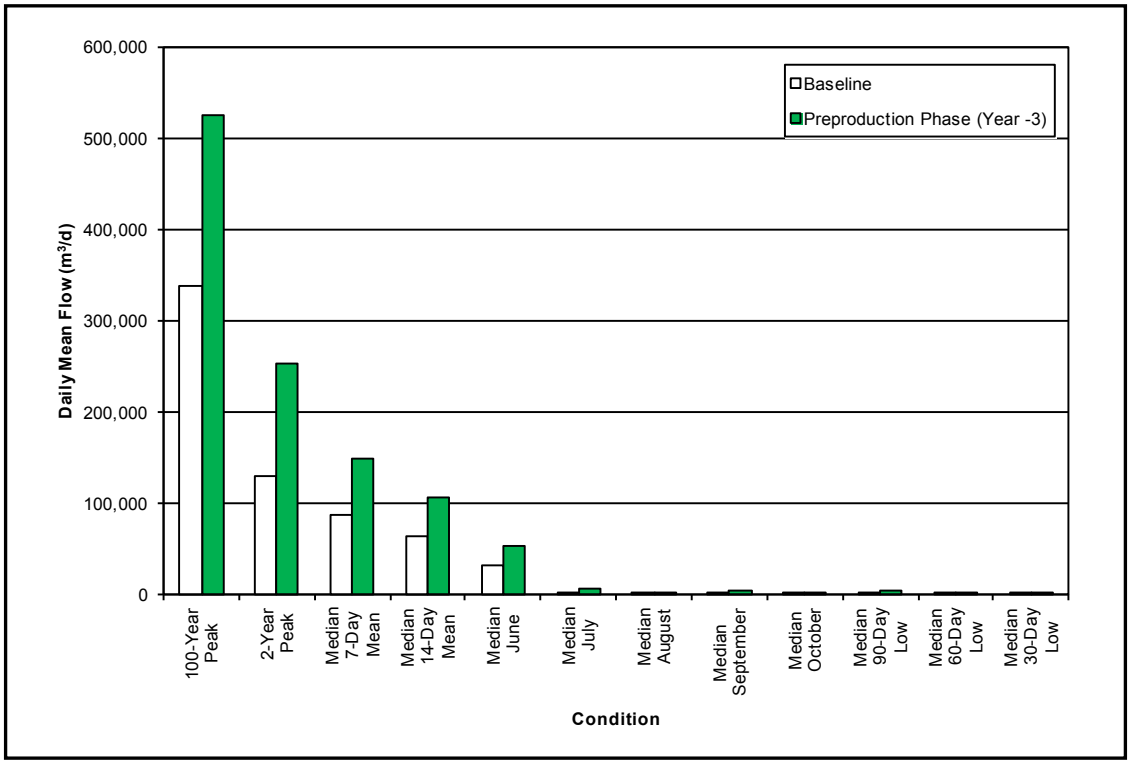



*Figure 7.3-28: Comparison of Effects on Lake D1 Outlet Discharges - Pre-production Phase (Year -3)*

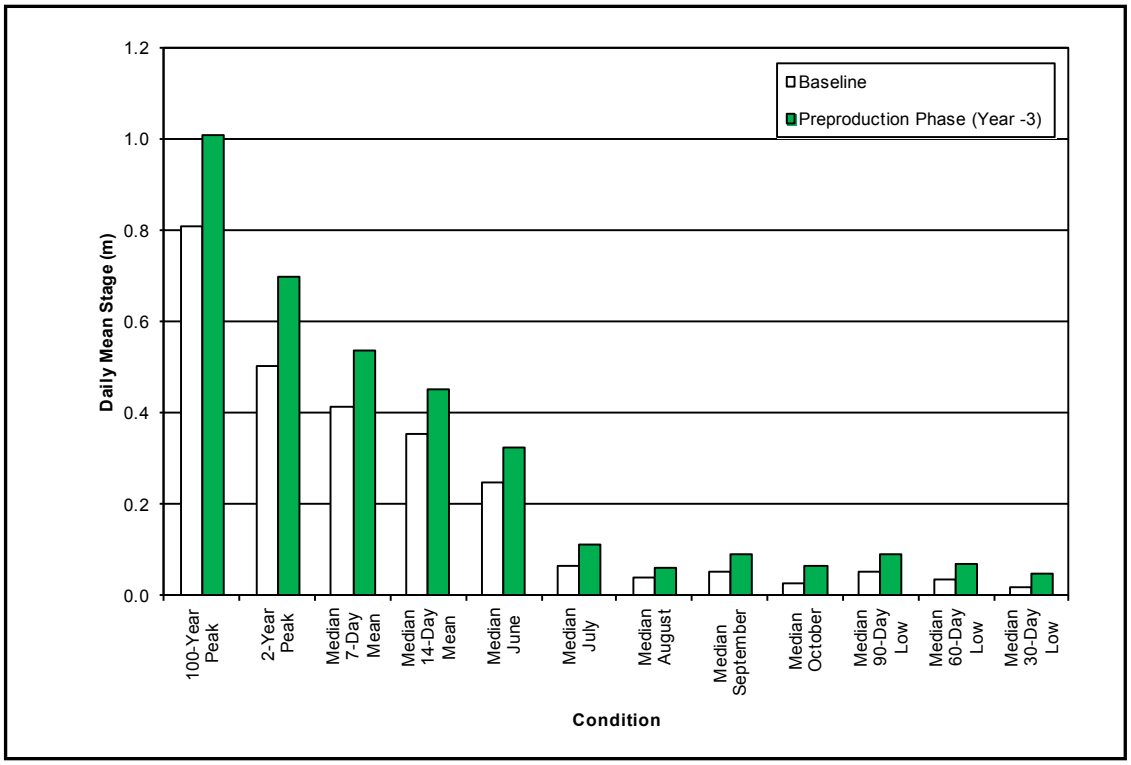



*Figure 7.3-29: Comparison of Effects on Lake D1 Stages - Pre-production Phase (Year -3)*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake D7 Outlet Flows:** the water balance results for Lake D7 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to the diversion of Lake B5 to Lake D7. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 331% above the baseline value, and the 100-year flood discharge by 221%. The diversion will cause low flows to increase by 482% to 842% compared to baseline conditions.

**Lake D7 Water Levels:** Lake D7 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.131 m, and the 100-year flood level by 0.123 m, while monthly mean stages are expected to increase by 0.076 m (May), 0.095 (June), 0.075 m (July), 0.088 m (August), 0.125 m (September), and 0.117 m (October), under median conditions.

**Lake D7 and Outlet Channel/Bank Stability:** increased flood regimes from the dewatering of Lake B7 and upstream waterbodies, and the diversion of Lake B5 to Lake D7 are expected to increase erosion potential. As such, dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping of Lake B7 to Lake B6, and Lake B5 to Lake D7, will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at baseline condition (see Appendix 7.3-D).

**Lake D3 Outlet Flows:** the water balance results for Lake D3 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to the diversion of Lake B5 to Lake D7. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 149% above the baseline value, and the 100-year flood discharge by 138%. The diversion will cause low flows to increase by 231% to 783% compared to baseline conditions.

**Lake D3 Water Levels:** Lake D3 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.288 m, and the 100-year flood level by 0.480 m, while monthly mean stages are expected to increase by 0.014 m (May), 0.095 m (June), 0.034 m (July), 0.017 m (August), 0.031 m (September), and 0.024 m (October), under median conditions.

**Lake D3 and Outlet Channel/Bank Stability:** increased flood regimes from the dewatering of Lake B7 and upstream waterbodies, and the diversion of Lake B5 to Lake D7 are expected to increase erosion potential. As such, dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping of Lake B7 to Lake B6, and Lake B5 to Lake D7, will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at baseline condition.

**Lake D1 Outlet Flows:** the water balance results for Lake D1 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to the diversion of Lake B5 to Lake D7. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 94% above the baseline value, and the 100-year flood discharge by 55%. The diversion will cause low flows to increase by 193% to 776% compared to baseline conditions.

**Lake D1 Water Levels:** Lake D1 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.197 m, and the

100-year flood level by 0.199 m, while monthly mean stages are expected to increase by 0.018 m (May), 0.074 m (June), 0.044 m (July), 0.022 m (August), 0.040 m (September), and 0.039 m (October), under median conditions.

**Lake D1 and Outlet Channel/Bank Stability:** increased flood regimes from the dewatering of Lake B7 and upstream waterbodies, and the diversion of Lake B5 to Lake D7 are expected to increase erosion potential. As such, dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping of Lake B7 to Lake B6, and Lake B5 to Lake D7, will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at baseline condition.

### *Lake B45 to Lake B2*

Dewatering of Lake B4 to Meliadine Lake will require the diversion of B45 to Lake B44, Lake B44 to Lake P2, and Lake P2 to Lake B2 through the construction of Dike B4-D-01. The water balance model for the Project was used to examine potential watershed diversion effects on flows, water levels, and outlet channel/bank stability during Pre-production (Year -3) in all downstream waterbodies between the Lake B45 and the Lake B2 outlet channel. As noted above, Lake B45 was identified as being a portion of Lake B4 during baseline field studies based on observed water levels. Therefore, the flow, water level and channel/bank stability effects to Lake B45 and outlet channel as the result of construction of Dike B4-D-01 were compared to Lake B4 baseline conditions. Once raised, Lake B44 and Lake B45 will form one waterbody, at elevation 57.43 m, and as such, the effect analysis for Lake B44 was combined with Lake B45. This waterbody is referred to as Lake B45/44 below.

Project effects at the Lake B45/44 outlet during diversion are summarized in Figure 7.3-30 to Figure 7.3-31, at the Lake P2 outlet in Figure 7.3-32 to Figure 7.3-33 (based on the existing stage-discharge rating curve), and at the Lake B2 outlet in Figure 7.3-34 to Figure 7.3-35. Additional information for these outlets is also provided in Appendix 7.3-C.

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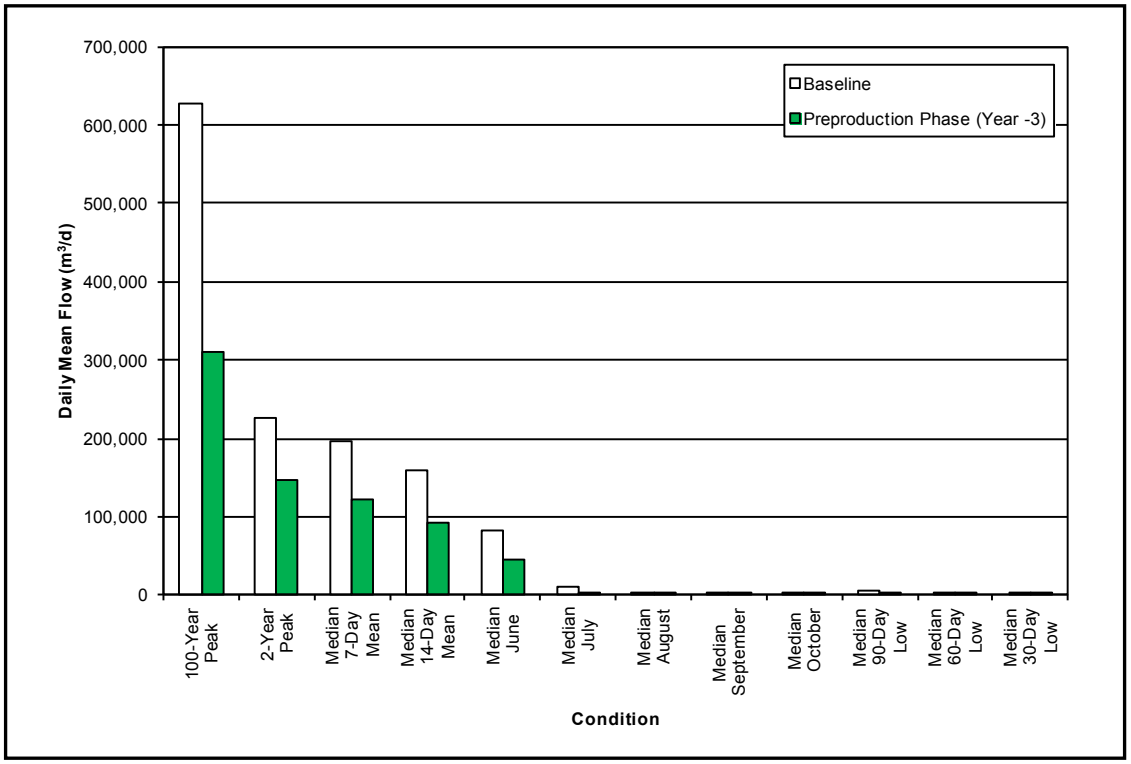



*Figure 7.3-30: Comparison of Effects on Lake B45/44 Outlet Discharges - Pre-production Phase (Year -3, Baseline Conditions based on Lake B4)*

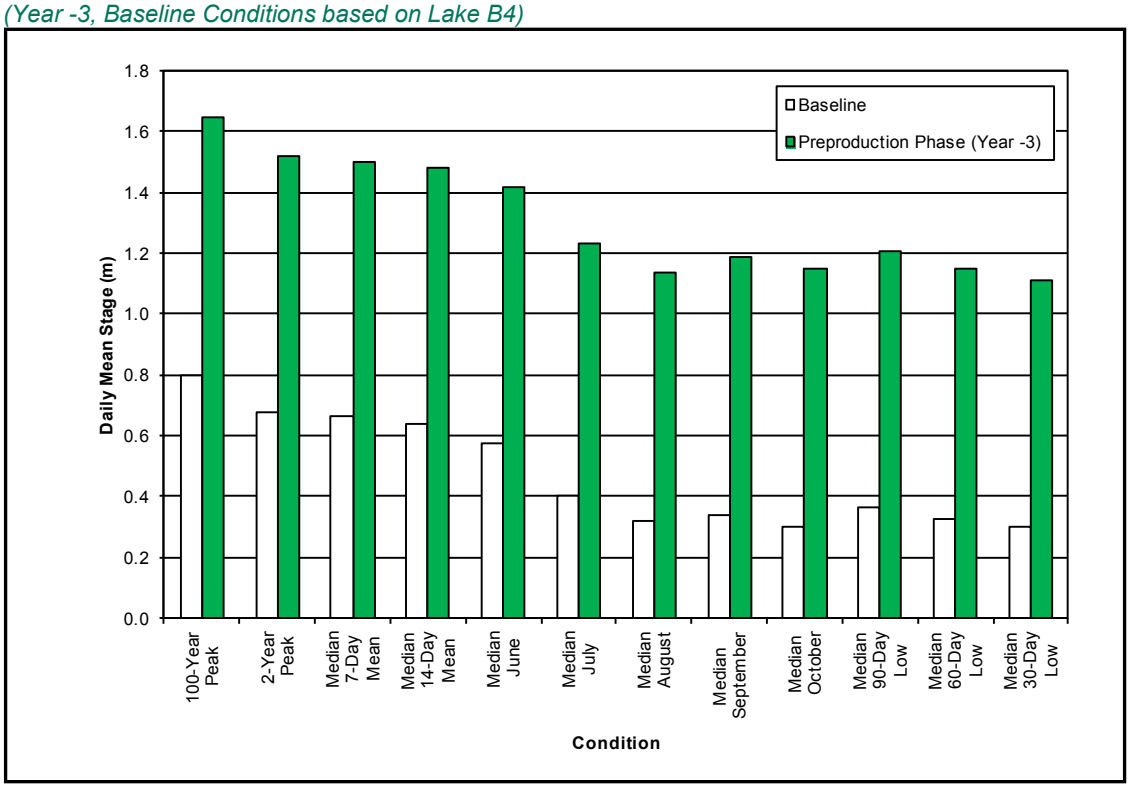



*Figure 7.3-31: Comparison of Effects on Lake B45/44 Stages - Pre-production Phase (Year -3, Baseline Conditions based on Lake B4)*

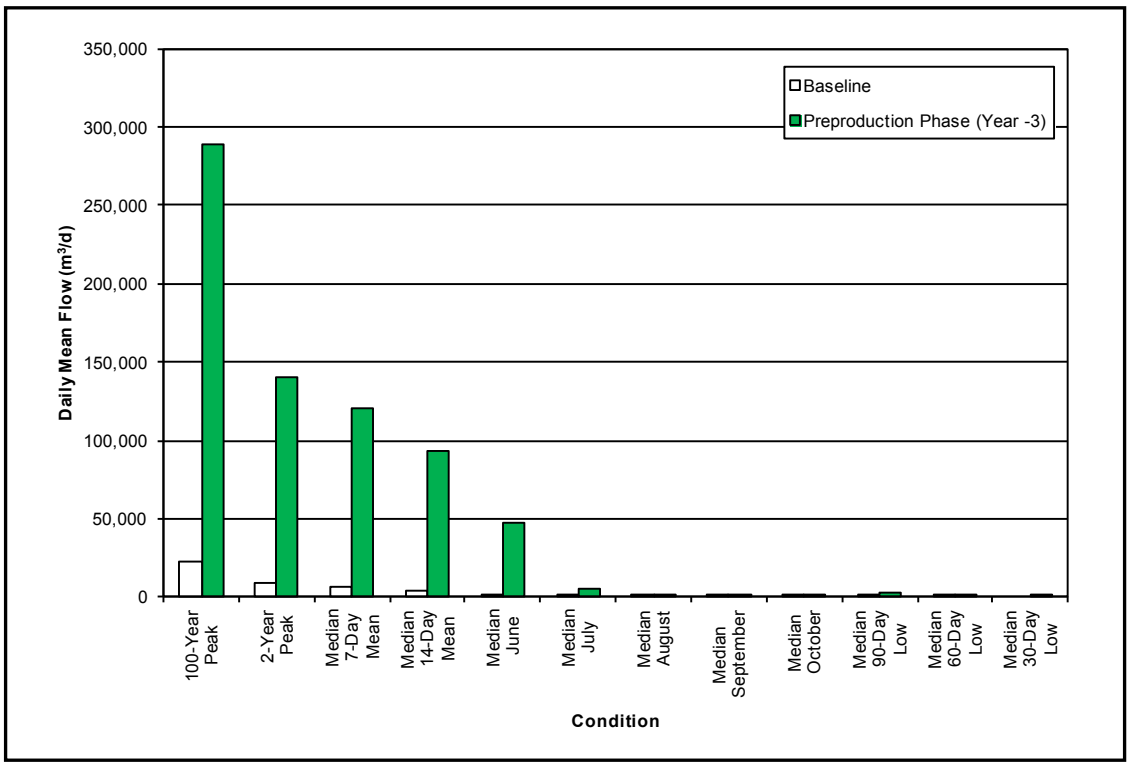



*Figure 7.3-32: Comparison of Effects on Lake P2 Outlet Discharges - Pre-production Phase (Year -3)*

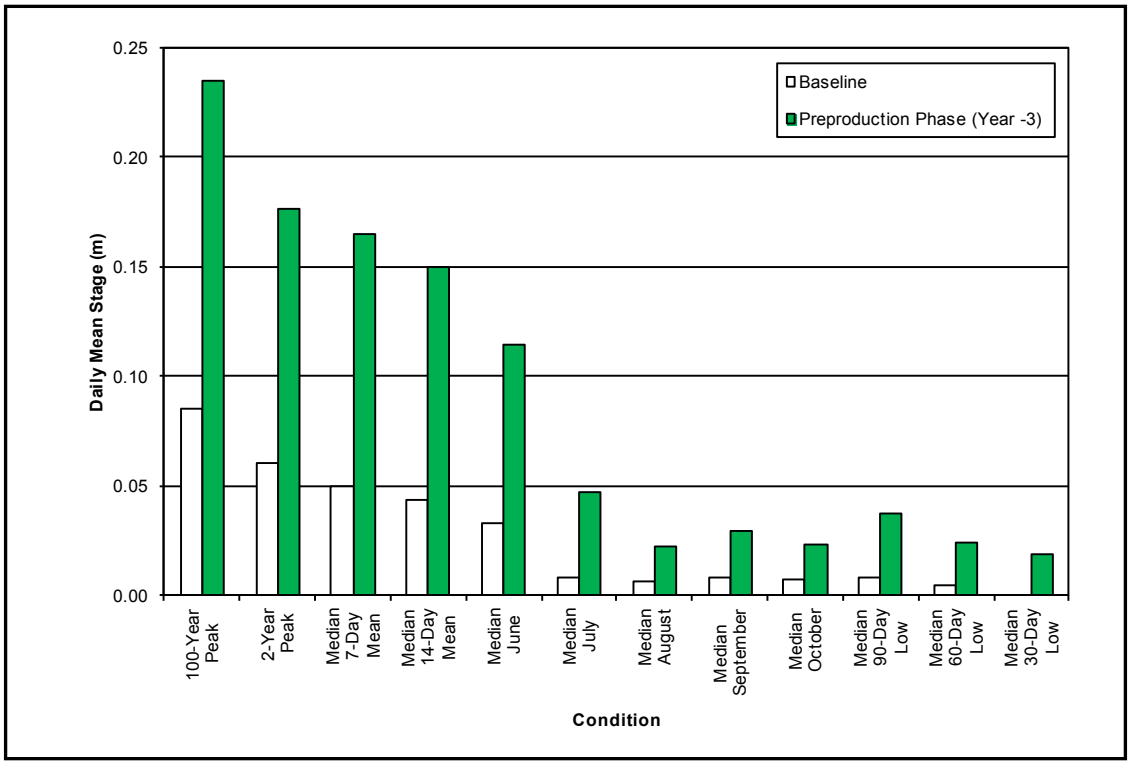



*Figure 7.3-33: Comparison of Effects on Lake P2 Stages - Pre-production Phase (Year -3)*

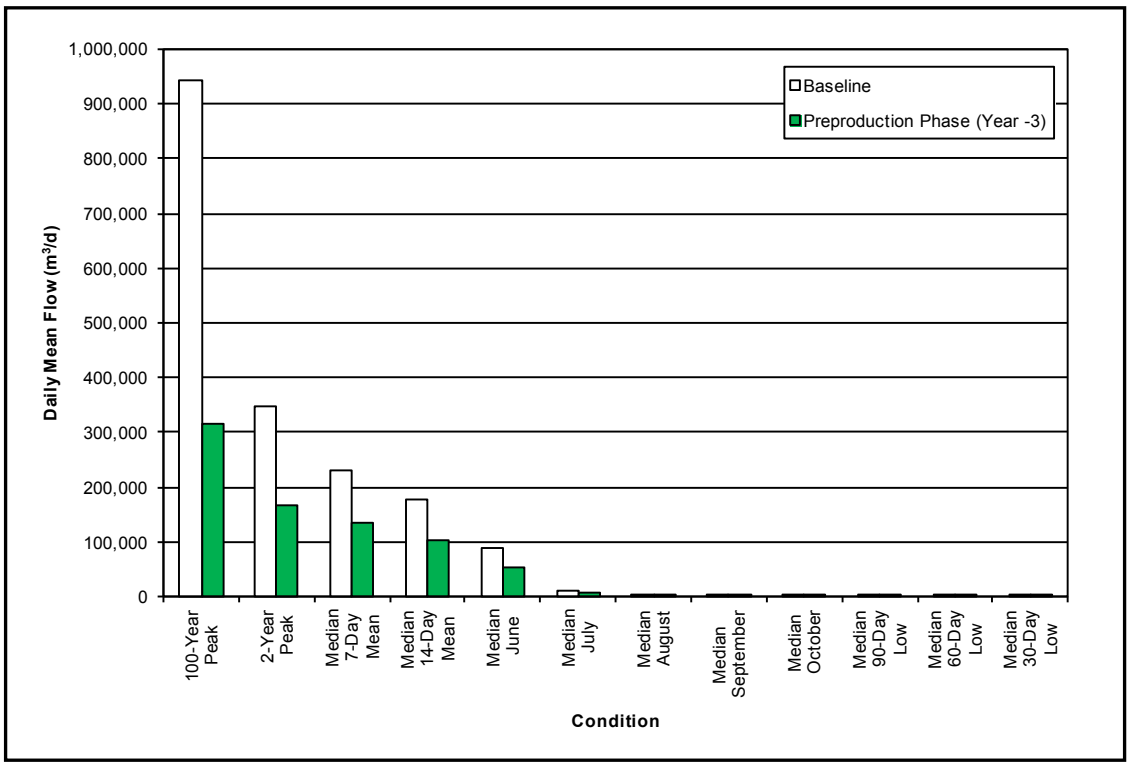



*Figure 7.3-34: Comparison of Effects on Lake B2 Outlet Discharges - Pre-production Phase (Year -3)*

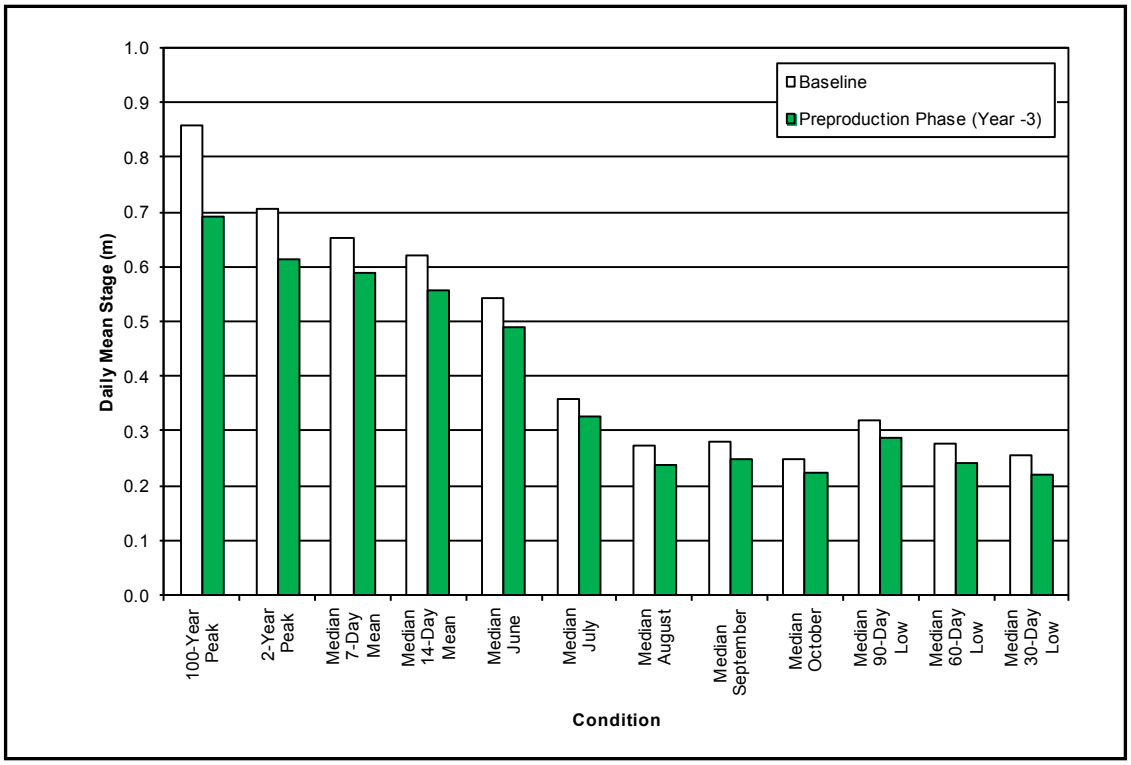



*Figure 7.3-35: Comparison of Effects on Lake B2 Stages - Pre-production Phase (Year -3)*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

Lakes B45/44 and P2 will be permanently diverted following construction of Dike B4-D-01. This diversion will result in reduced flow regimes (from the reduction in drainage area) and increased water level regimes at Lake B45/44 and outlet channel, relative to baseline conditions in Lake B4.

The diversion of Lake P2 to Lake B2 was modeled using the baseline stage-discharge rating curve of Lake P2, due to unknown design hydraulic parameters of the diversion channel at the time of this assessment.

**Lake B45/44 Outlet Flows:** the water balance results for Lake B45/44 show that during Pre-production (Year -3), monthly mean flows will be decreased compared to baseline due to the reduction in drainage area through the construction of Dike B4-D-01. The 2-year flood discharge during Pre-production (Year -3) will decrease by approximately 35% below the baseline value, and the 100-year flood discharge by 50%. The diversion will cause low flows to decrease by 53% to 79% compared to baseline conditions.

**Lake B45/44 Water Levels:** Lake B45/44 water levels will be raised from baseline conditions during Pre-production (Year -3). The 2-year flood level is expected to increase by approximately 0.834 m, and the 100-year flood level by 0.794 m compared to baseline conditions in Lake B45 (Lake B4), while monthly mean stages are expected to increase by 0.830 m (May), 0.826 m (June), 0.828 m (July), 0.819 m (August), 0.849 m (September), and 0.846 m (October), under median conditions.

**Lake B45/44 and Outlet Channel/Bank Stability:** the diversion of Lake B45/44 to the P watershed will create new shorelines at higher elevations than the existing shorelines. This will expose new soils, often on steeper slopes than the existing shorelines, to wave erosion and potential instability due to permafrost disturbance.

It is expected that Lake B45/44 will take less than two weeks to fill to the point of spilling over to the P watershed. Due to the rapid increase in elevation, an increase in total suspended solids (TSS) is likely, and mitigation measures to minimize shoreline erosion are proposed according to the analysis presented in Appendix 7.3-D. These include two possible mitigation options:

- Preventative mitigation – the shoreline is modified by armouring or re-sloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.
- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for at least 10 years following the onset of the increased water level.

**Lake P2 Outlet Flows:** the water balance results for Lake P2 show that during Pre-production (Year -3), monthly mean flows will be increased compared to baseline due to the diversion of Lake B45/44 to the P watershed. The 2-year flood discharge during Pre-production (Year -3) will increase by approximately 1373% above the baseline value, and the 100-year flood discharge by 1185%. The diversion will cause low flows to increase by over 500 times compared to baseline conditions.

**Lake P2 Water Levels:** Lake P2 water levels are also expected to be increased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to increase by approximately 0.116 m, and the 100-year flood level by 0.150 m, while monthly mean stages are expected to increase by 0.019 m (May), 0.081 m (June), 0.039 m (July), 0.016 m (August), 0.021 m (September), and 0.016 m (October), under median conditions. It should be noted that these estimates were based on the existing stage-discharge rating curve of Lake P2, and actual increases in water levels will depend on the detailed design of the diversion channel connecting Lake P2 to Lake B2. The diversion channel will act to mitigate potential impacts related to increases in water level in Lake P2 (and flows in the existing Lake P2 outlet) by providing an additional outlet from Lake P2. The diversion channel will be constructed at the south west end of Lake P2, where Lake P2 and Lake B2 are approximately 20 m apart, with a minimum elevation difference of approximately 0.10 m from Lake P2 to the watershed divide with Lake B2 (approximate water surface elevation difference between waterbodies P2 and B2 is 0.90m). Thus, the maximum increase to water levels that could be accommodated in Lake P2 in the absence of a diversion channel and prior to spilling to Lake B2 is relatively small (i.e., approximately 0.10 m), and less than the estimated 2-year flood level provided above.

**Lake P2 and Outlet Channel/Bank Stability:** No effects on Lake P2 and the existing outlet channel or bank stability are expected during Pre-production (Year -3) because potential effects will be mitigated by the diversion channel, designed and constructed to prevent erosion and sedimentation.

**Lake B2 Outlet Flows:** the water balance results for Lake B2 show that during Pre-production (Year -3), monthly mean flows will be decreased compared to baseline due to the reduction in drainage area from the diversion of Lake B5 to Lake D7, and the isolation of Lake B4 north of Dike B4-D-01. The drainage area of Lake B2 will be lower still during the filling time of Lake B44 and Lake B45, but will increase once the raised waterbodies spill into the P watershed. Nevertheless, the net catchment area to Lake B2 including the P2 watershed will be reduced compared to baseline conditions. The 2-year flood discharge during Pre-production (Year -3) will decrease by approximately 51% below the baseline value, and the 100-year flood discharge by 67%. The diversion of water from Lake P2 will cause low flows to decrease by 39% to 53% compared to baseline conditions.

**Lake B2 Water Levels:** Lake B2 water levels are also expected to be decreased during Pre-production (Year -3) compared to baseline. The 2-year flood level is expected to decrease by approximately 0.094 m, and the 100-year flood level by 0.167 m, while monthly mean stages are expected to decrease by 0.044 m (May), 0.051 m (June), 0.031 m (July), 0.035 m (August), 0.032 m (September), and 0.023 m (October), under median conditions due to the diversion of water from Lake P2.

**Lake B2 and Outlet Channel/Bank Stability:** No effects on Lake B2 and Outlet channel or bank stability are expected during Pre-production (Year -3) because flood magnitudes will be reduced from baseline values.

### *7.3.3.4 Effect Analysis Results – Pre-production Phase (Years -2 to -1)*

#### 7.3.3.4.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.4.1.1 Project Activities*

Following the dewatering of Lake A8 and other upstream wasterbodies during Pre-production Year -3 (Section 7.3.3.3.1, effect of dewatering in the A watershed during Pre-production Year -3), additional pumping

from Lake A8 to Lake A7 (at a reduced rate from Pre-production Year -3) will be required during Pre-production Years -2 to -1 to maintain Lake A8 in a dewatered condition throughout the open water season. Pumping rates will be higher during the month of June, and lower during other open water months. This will affect downstream waterbodies, including Lake A6 and Lake A1.

Lake B36 will be dewatered through Lake B34 during Pre-production Years -2 to -1, which will increase inflows to Lake B5 and Lake B6. Dewatering of Lake B36 will further reduce the lake area in the B watershed by 0.059 $km^2$. The effect analysis for the dewatering of Lake B36 during Pre-production Years -2 to -1 was included with the effect analysis for reduction in drainage area of Lakes B6 and B5 from the isolation of Lake B7 (Section 7.3.3.4.2, effects of project infrastructure in the B watershed), and therefore this activity is not discussed further in the dewatering effect analysis for Pre-production Phase (Years -2 to -1) below.

#### *7.3.3.4.1.2 Environmental Design Feature and Mitigation*

Pumped discharges will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Final discharge locations will be determined during the detailed design stage and may be modified based on monitoring results.

#### *7.3.3.4.1.3 Effect Analysis*

##### *Lake A6 to Lake A1*

The water balance model for the Project was used to examine potential effects of dewatering on flows, water levels, and outlet channel/bank stability during Pre-production Years -2 to -1 in all downstream waterbodies between Lake A6 and the Lake A1 outlet channel. Project effects at the Lake A6 outlet are summarized in Figure 7.3-36 to Figure 7.3-37, and at the Lake A1 outlet in Figure 7.3-38 to Figure 7.3-39. Additional information is provided in Appendix 7.3-C.

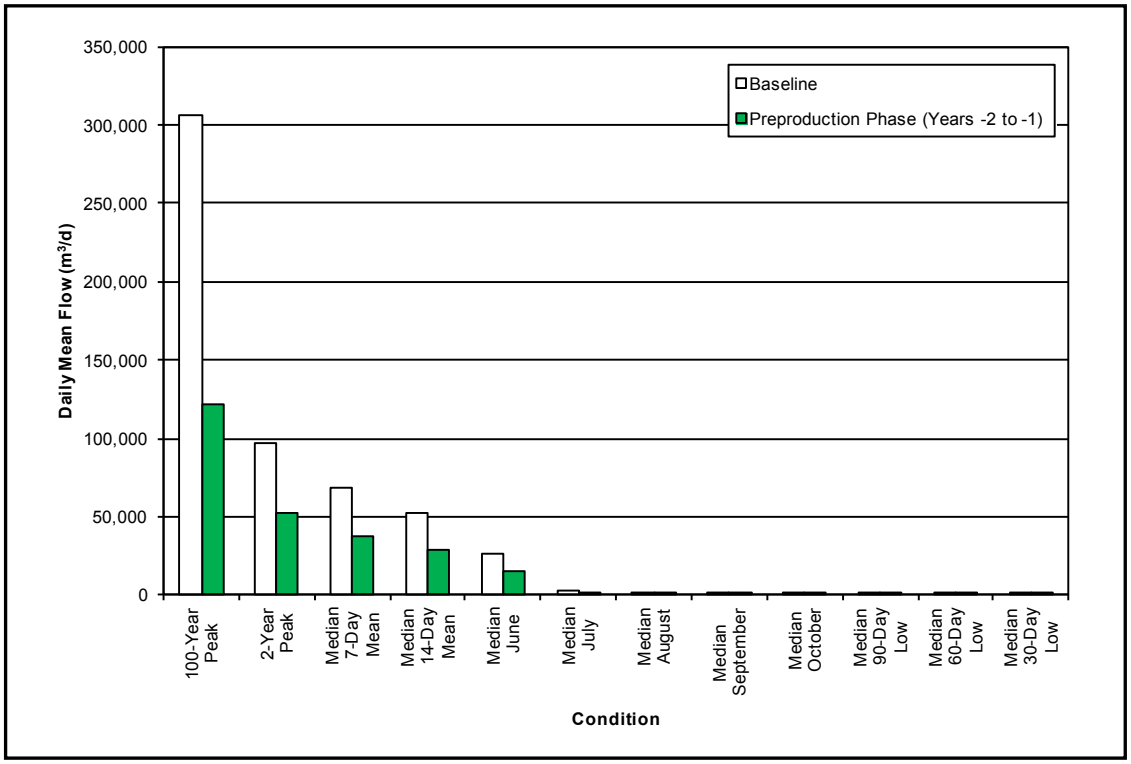



*Figure 7.3-36: Comparison of Effects on Lake A6 Outlet Discharges - Pre-production Phase (Years -2 to -1)*

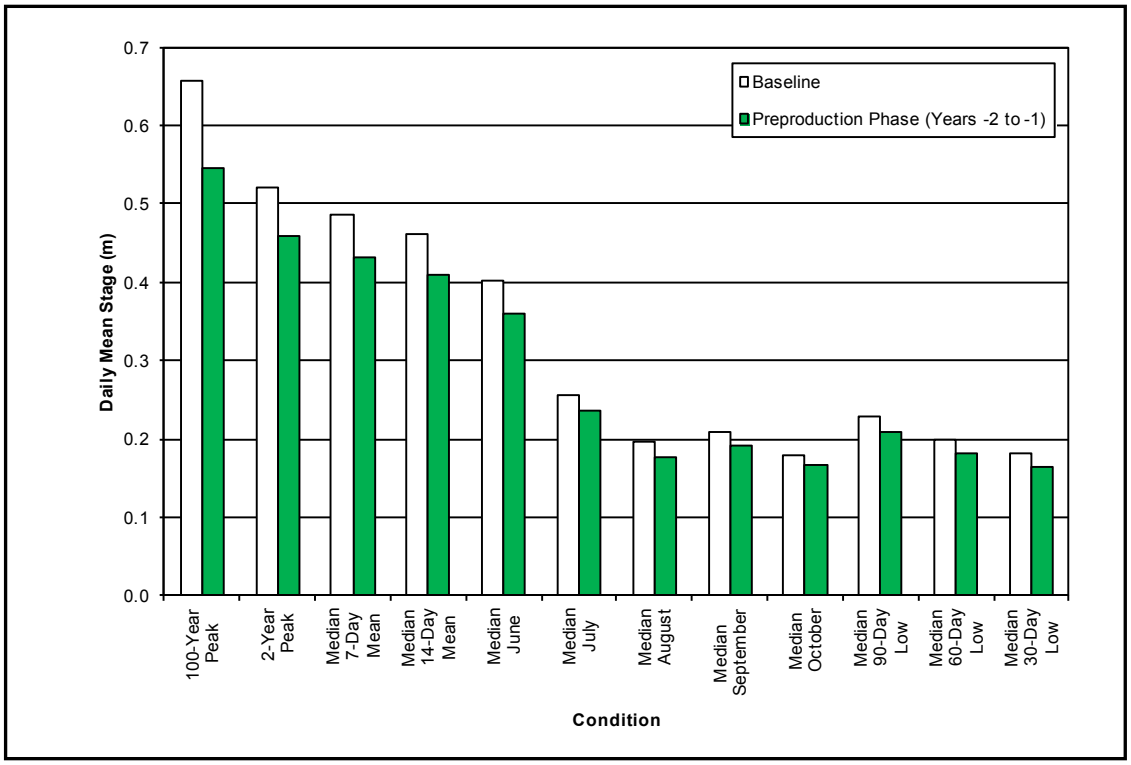



*Figure 7.3-37: Comparison of Effects on Lake A6 Stages - Pre-production Phase (Years -2 to -1)*

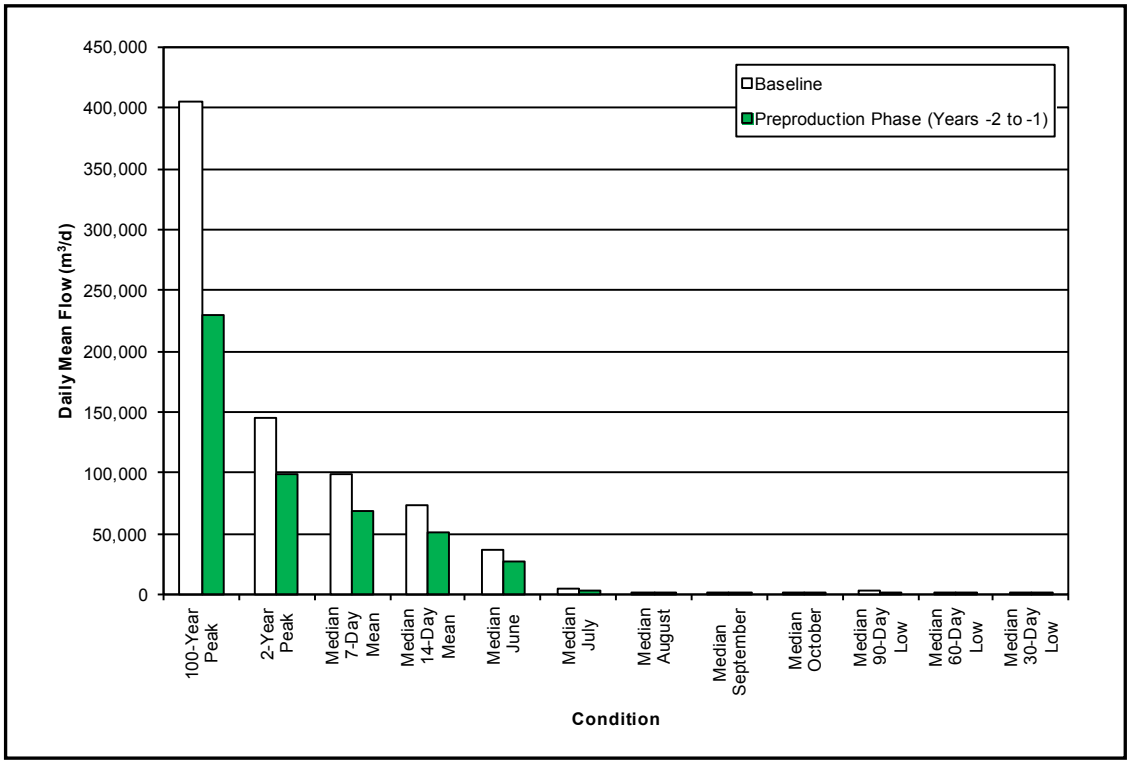



*Figure 7.3-38: Comparison of Effects on Lake A1 Outlet Discharges - Pre-production Phase (Years -2 to -1)*

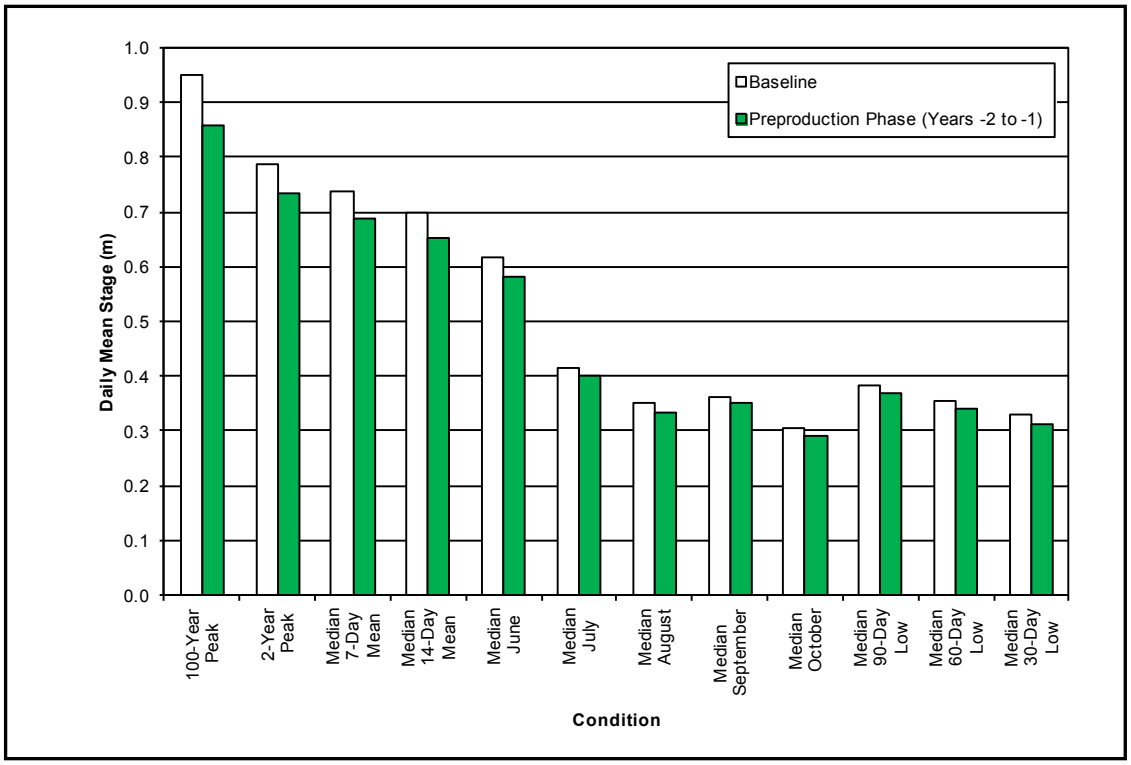



*Figure 7.3-39: Comparison of Effects on Lake A1 Stages - Pre-production Phase (Years -2 to -1)*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake A6 Outlet Flows:** the water balance results for Lake A6 show that during Pre-production (Years -2 to -1), monthly mean flows will be decreased compared to baseline due to a reduction in effective drainage area at Lake A8 (resulting in reduced dewatering rates from Lake A8 from Pre-production Year -3 during the open water season). The 2-year flood discharge during Pre-production (Years -2 to -1) will decrease by approximately 46% below the baseline value, and the 100-year flood discharge by 60%. Flow reduction from dewatering of upstream waterbodies at low rates will cause low flows to decrease by 36% to 39% compared to baseline conditions.

**Lake A6 Water Levels:** Lake A6 water levels are also expected to be decreased during Pre-production (Years -2 to -1) compared to baseline. The 2-year flood level is expected to decrease by approximately 0.030 m, and the 100-year flood level by 0.111 m, while monthly mean stages are expected to decrease by 0.033 m (May), 0.040 m (June), 0.018 m (July), 0.019 m (August), 0.016 m (September), and 0.014 m (October), under median conditions.

**Lake A6 and Outlet Channel/Bank Stability:** No effects on Lake A6 and Outlet channel or bank stability are expected during Pre-production (Years -2 to -1) because flood magnitudes will be reduced from baseline values.

**Lake A1 Outlet Flows:** the water balance results for Lake A1 show that during Pre-production (Years -2 to -1), monthly mean flows will be decreased compared to baseline due to reduced inflows from Lake A8 during the open water season. The 2-year flood discharge during Pre-production (Years -2 to -1) will decrease by approximately 32% below the baseline value, and the 100-year flood discharge by 43%. Flow reduction from dewatering at low rates will cause low flows to decrease by 21% to 23% compared to baseline conditions.

**Lake A1 Water Levels:** Lake A1 water levels are also expected to be decreased during Pre-production (Years -2 to -1) compared to baseline. The 2-year flood level is expected to decrease by approximately 0.053 m, and the 100-year flood level by 0.093 m, while monthly mean stages are expected to decrease by 0.025 m (May), 0.036 m (June), 0.016 m (July), 0.016 m (August), 0.013 m (September), and 0.012 m (October), under median conditions.

**Lake A1 and Outlet Channel/Bank Stability:** No effects on Lake A1 and Outlet channel or bank stability are expected during Pre-production (Years -2 to -1) because flood magnitudes will be reduced from baseline values.

#### 7.3.3.4.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.4.2.1 Project Activities*

The Tailing Storage Facility will encroach on watersheds B5 and B6 during the Pre-production Phase (Years -2 to -1), reducing their drainage areas. This activity will affect Lake B6 and Lake B5. In addition, Lake B7 will be dewatered and isolated from downstream waterbodies during the Pre-production Phase (Years -2 to -1), which will also act to reduce inflows to downstream Lake B6 and Lake B5. Lake B7 will remain isolated from downstream waterbodies until the Post-Closure phase.

##### *7.3.3.4.2.2 Environmental Design Feature and Mitigation*

Environmental design features and mitigations are not required.

#### 7.3.3.4.2.3 Effect Analysis

### Lake B6 to Lake B5

The water balance model for the Project was used to examine the potential project infrastructure effects on flows, water levels, and channel/bank stability during Pre-production Years -2 and -1 on all downstream waterbodies between Lake B6 and the Lake B5 outlet channel. Project effects at the Lake B6 outlet are summarized in Figure 7.3-40 to Figure 7.3-41, and at the Lake B5 outlet in Figure 7.3-42 to Figure 7.3-43. Additional information is provided in Appendix 7.3-C.

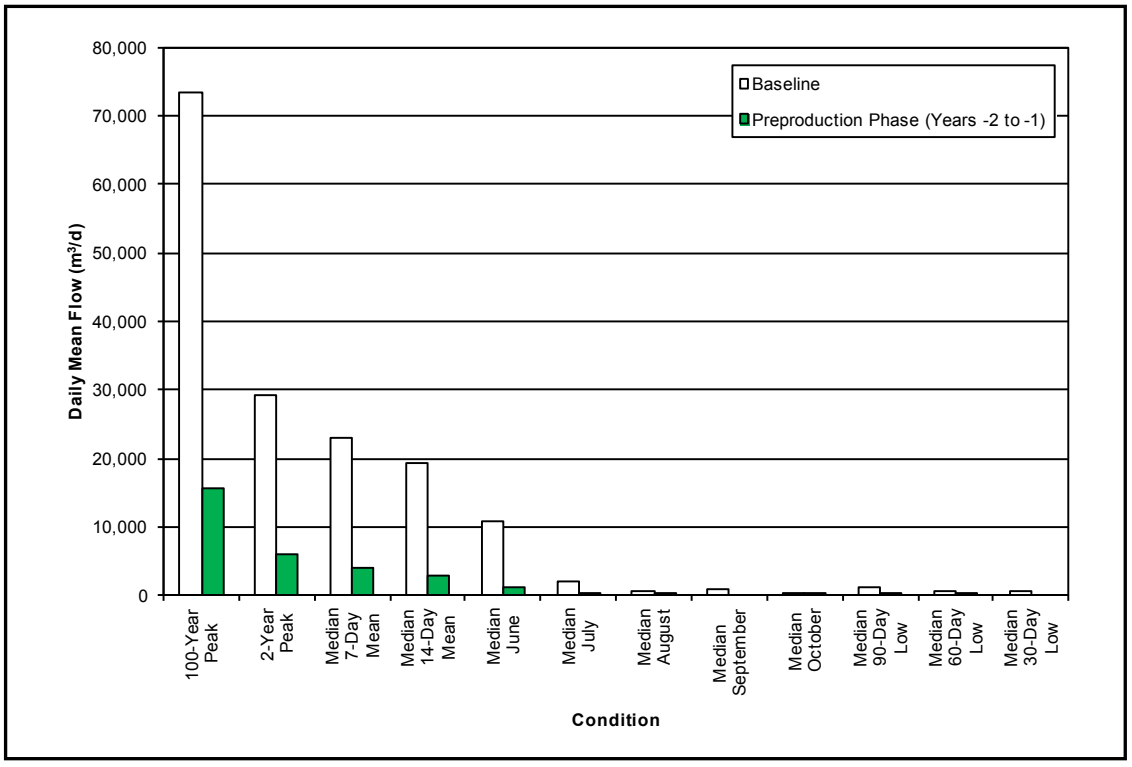



*Figure 7.3-40: Comparison of Effects on Lake B6 Outlet Discharges - Pre-production Phase (Years -2 to -1)*

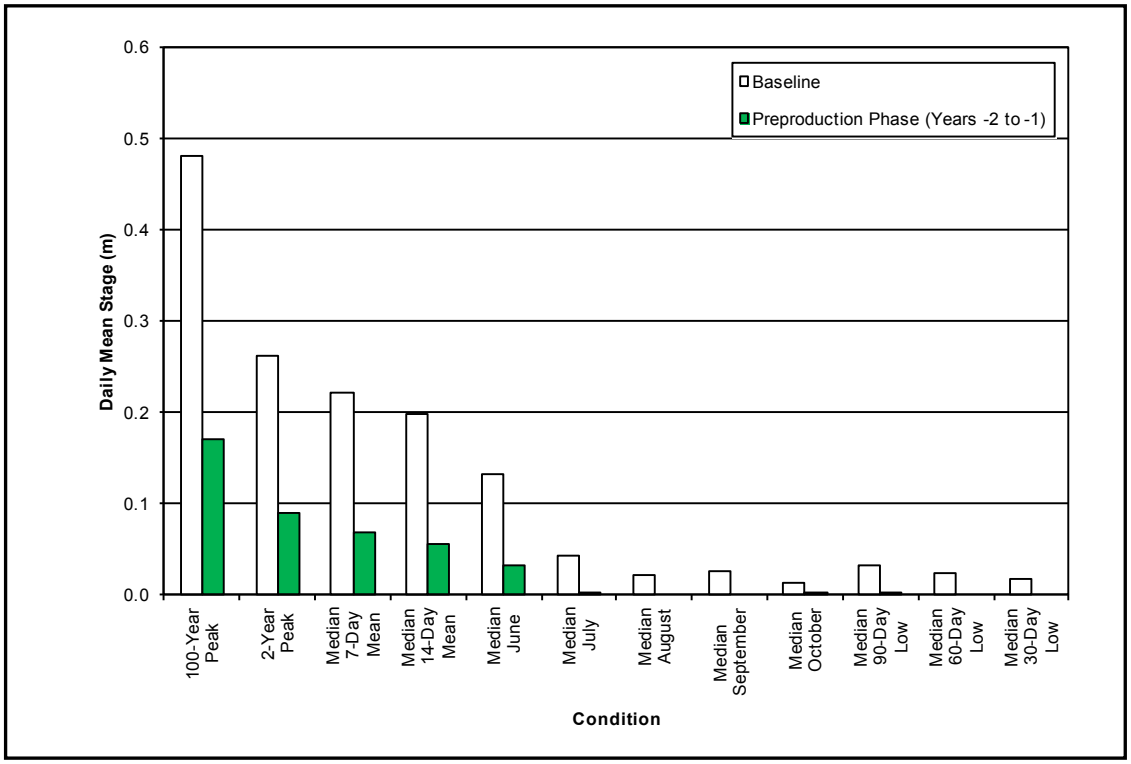



*Figure 7.3-41: Comparison of Effects on Lake B6 Stages - Pre-production Phase (Years -2 to -1)*

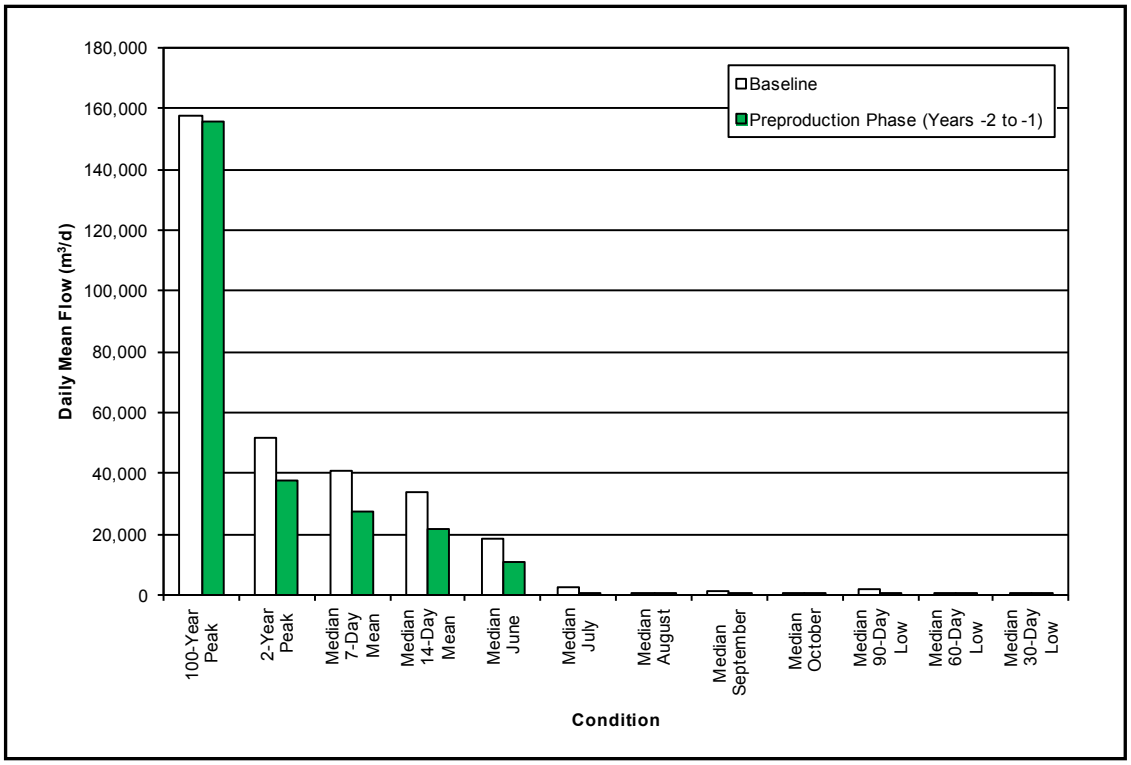



*Figure 7.3-42: Comparison of Effects on Lake B5 Outlet Discharges - Pre-production Phase (Years -2 to -1)*

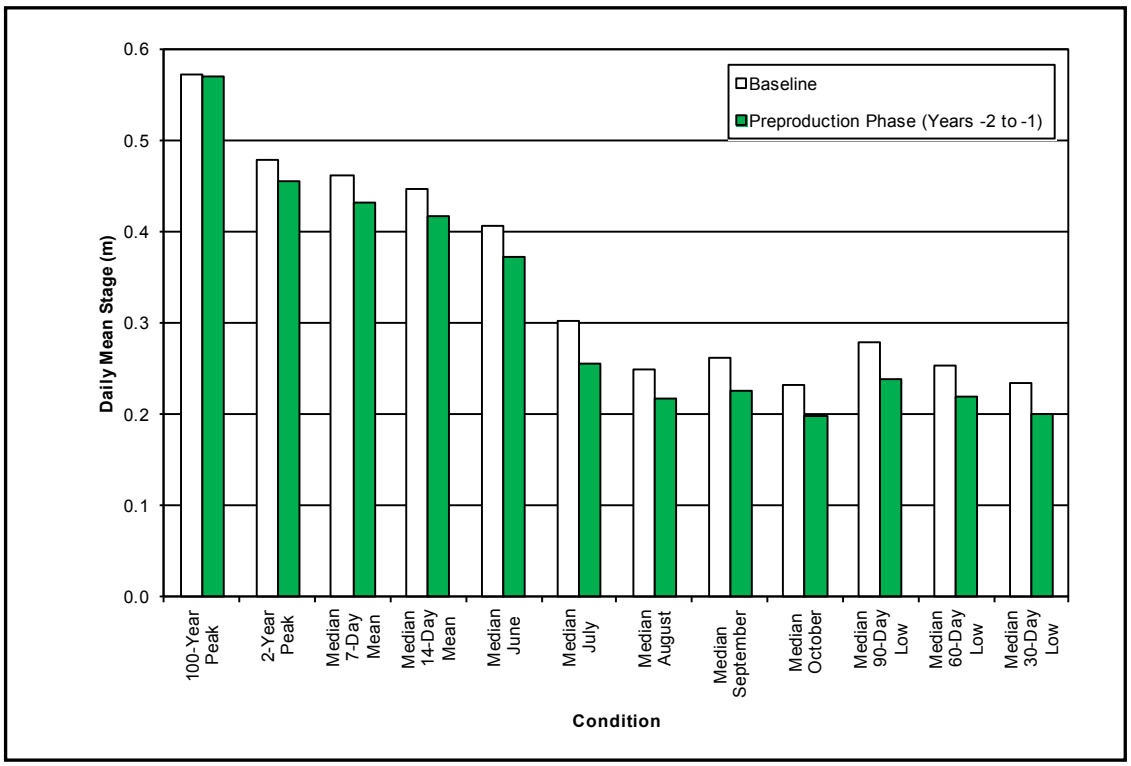



*Figure 7.3-43: Comparison of Effects on Lake B5 Stages - Pre-production Phase (Years -2 to -1)*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake B6 Outlet Flows:** the water balance results for Lake B6 show that during Pre-production (Years -2 to -1), monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the isolation of Lake B7. The 2-year flood discharge during Pre-production (Years -2 to -1) will decrease by approximately 79% below the baseline value, and the 100-year flood discharge by 79%. The reduction in drainage area from the isolation of Lake B7 will cause low flows to decrease by 99% to 100% compared to baseline conditions.

**Lake B6 Water Levels:** Lake B6 water levels are also expected to be decreased during Pre-production (Years -2 to -1) compared to baseline. The 2-year flood level is expected to decrease by approximately 0.172 m, and the 100-year flood level by 0.310 m, while monthly mean stages are expected to decrease by 0.012 m (May), 0.101 m (June), 0.042 m (July), 0.022 m (August), 0.025 m (September), and 0.013 m (October), under median conditions.

**Lake B6 and Outlet Channel/Bank Stability:** No effects on Lake B6 and Outlet channel or bank stability are expected during Pre-production (Years -2 to -1) because flood magnitudes will be reduced from baseline values.

**Lake B5 Outlet Flows:** the water balance results for Lake B5 show that during Pre-production (Years -2 to -1), monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the isolation of Lake B7. The 2-year flood discharge during Pre-production (Years -2 to -1) will decrease by approximately 27% below the baseline value, and the 100-year flood discharge by 1%. The reduction in drainage area from the isolation of Lake B7 will cause low flows to decrease by 60% to 62% compared to baseline conditions.

**Lake B5 Water Levels:** Lake B5 water levels are also expected to be decreased compared to baseline during Pre-production (Years -2 to -1). The 2-year flood level is expected to decrease by approximately 0.022 m, and the 100-year flood level by 0.001 m, while monthly mean stages are expected to decrease by 0.014 m (May), 0.034 m (June), 0.046 m (July), 0.033 m (August), 0.036 m (September), and 0.034 m (October), under median conditions.

**Lake B5 and Outlet Channel/Bank Stability:** No effects on Lake B5 and Outlet channel or bank stability are expected during Pre-production (Years -2 to -1) because flood magnitudes will be reduced from baseline values.

#### 7.3.3.4.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.4.3.1 Project Activities*

Diversion of the portion of Lake A8 located south of Dike WM-D-01 to Lake A31 will continue during Pre-production Phase (Years -2 to -1). This will affect Lake A31 and other downstream waterbodies, including Lake A6 and Lake A1. Effects of this diversion were considered in Section 7.3.3.4.1 (effects of dewatering on the A watershed during the Pre-production Phase (Years -2 to -1)), and therefore are not discussed further in the watershed diversion effect analysis for Pre-production Phase (Years -2 to -1) below.

Diversions of Lake B5 to Lake D7, Lake B45/44 to Lake P2, and Lake P2 to Lake B2 will remain from Pre-production (Year -3). In addition, the construction of the Tailing Storage Facility and Tiriganiaq Pit will require the diversion of a portion of the B7 watershed to the B5 watershed. These diversions will affect downstream waterbodies including Lake B5, Lakes D7 to D1 and Lakes B45/44, P2, and B2. Effects of diversion of a portion of the B7 watershed to the B5 watershed were considered in Section 7.3.3.4.2 (effects of project infrastructure on the B watershed during the Pre-production Phase (Years -2 to -1)) and therefore are not discussed further in the watershed diversion effect analysis for Pre-production Phase (Years -2 to -1) below.

##### *7.3.3.4.3.2 Environmental Design Feature and Mitigation*

At diversion outlets, a channel will be constructed to convey flows. A diversion outlet structure will be designed to approximate the natural hydrograph to the extent possible so as to manage the water level regime of the diverted waterbodies. Diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn et al. 2012) and to incorporate lessons learned at the Ekati Diamond Mine (Jones et al. 2003).

##### *7.3.3.4.3.3 Effect Analysis*

Effects of watershed diversions in the B watershed on flows, water levels, and channel/bank stability in downstream waterbodies and streams have been assessed for the Pre-production Phase (Year -3) in Section 7.3.3.3.2. Effects at Lakes B45/44 to B2 will not change from Pre-production Phase (Year -3). Flows at Lakes D7 to D1 will be slightly reduced from Pre-production Phase (Year -3) with the isolation of Lake B7, and the assessment presented in Section 7.3.3.3.2 is considered a conservative estimation of effects for these waterbodies during the Pre-production Phase (Years -2 to -1).

### *Lake B45/44 to Lake B2*

The water balance model for the Project was used to examine potential watershed diversions effects on flows, water levels, and channel/bank stability during Pre-production (Years -2 to -1) in all downstream waterbodies between the Lake B45/44 outlet channel and the Lake B2 outlet channel (see also Section 7.3.3.3.3). Project effects at the Lake B45/44 outlet are summarized in Figure 7.3-44 to Figure 7.3-45, the Lake P2 outlet in Figure 7.3-46 to Figure 7.3-47, and at the Lake B2 outlet in Figure 7.3-48 to Figure 7.3-49. Additional information is provided in Appendix 7.3-C.

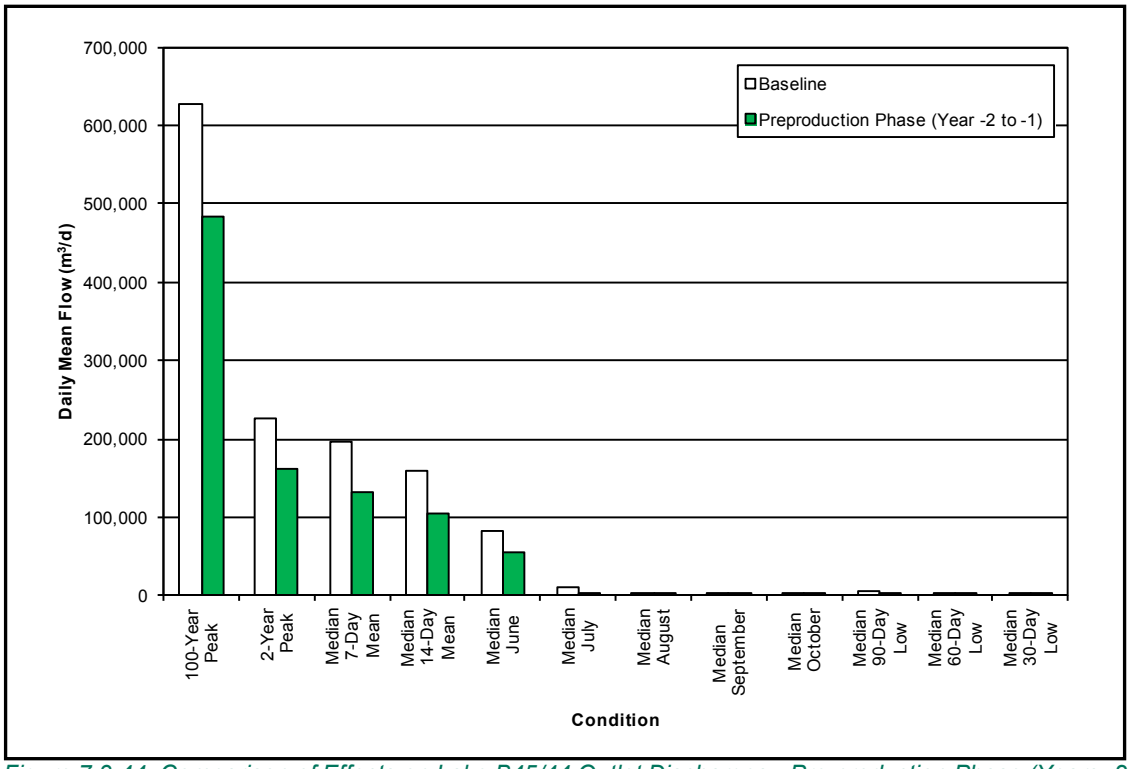



*Figure 7.3-44: Comparison of Effects on Lake B45/44 Outlet Discharges - Pre-production Phase (Years -2 to -1, Baseline Conditions based on Lake B4)*

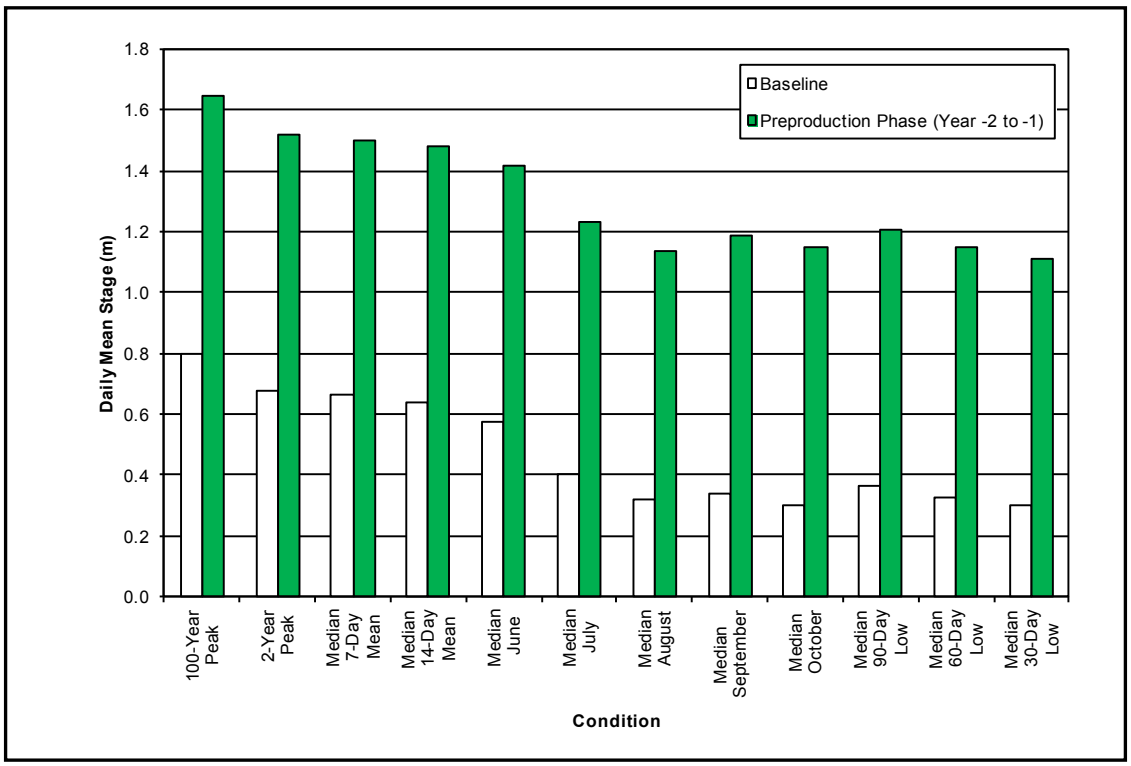



*Figure 7.3-45: Comparison of Effects on Lake B45/44 Stages - Pre-production Phase (Years -2 to -1, Baseline Conditions based on Lake B4)*

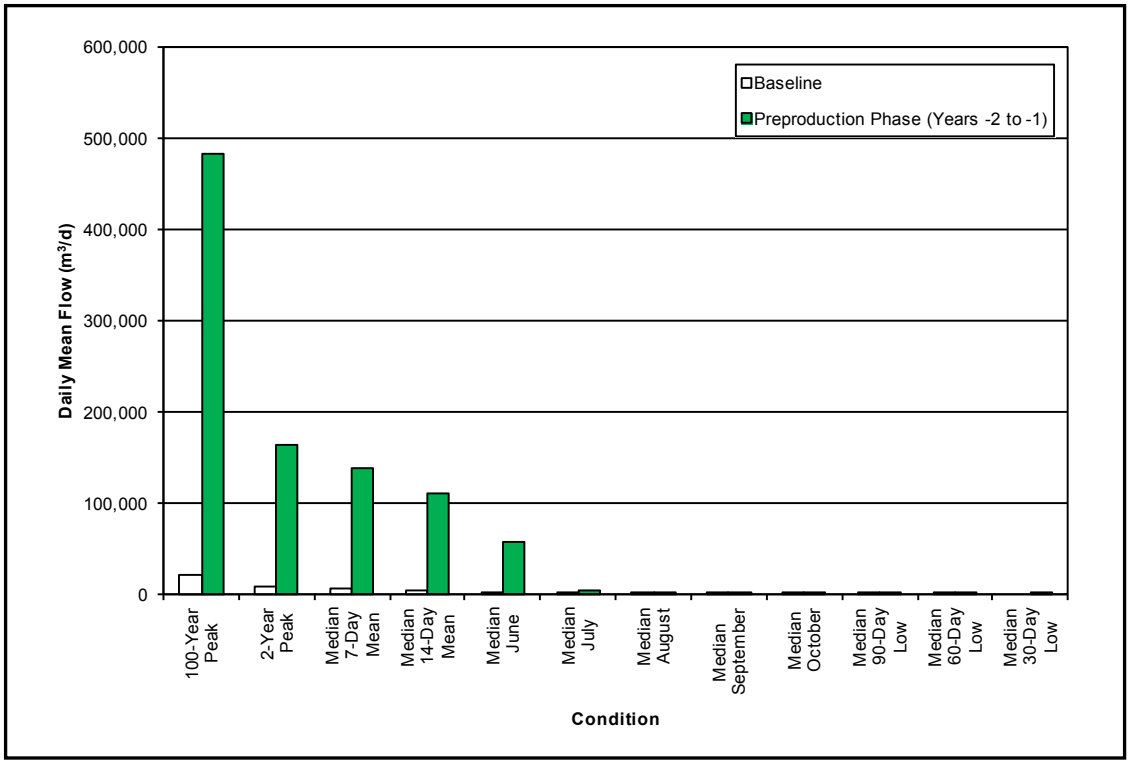



*Figure 7.3-46: Comparison of Effects on Lake P2 Outlet Discharges - Pre-production Phase (Years -2 to -1)*

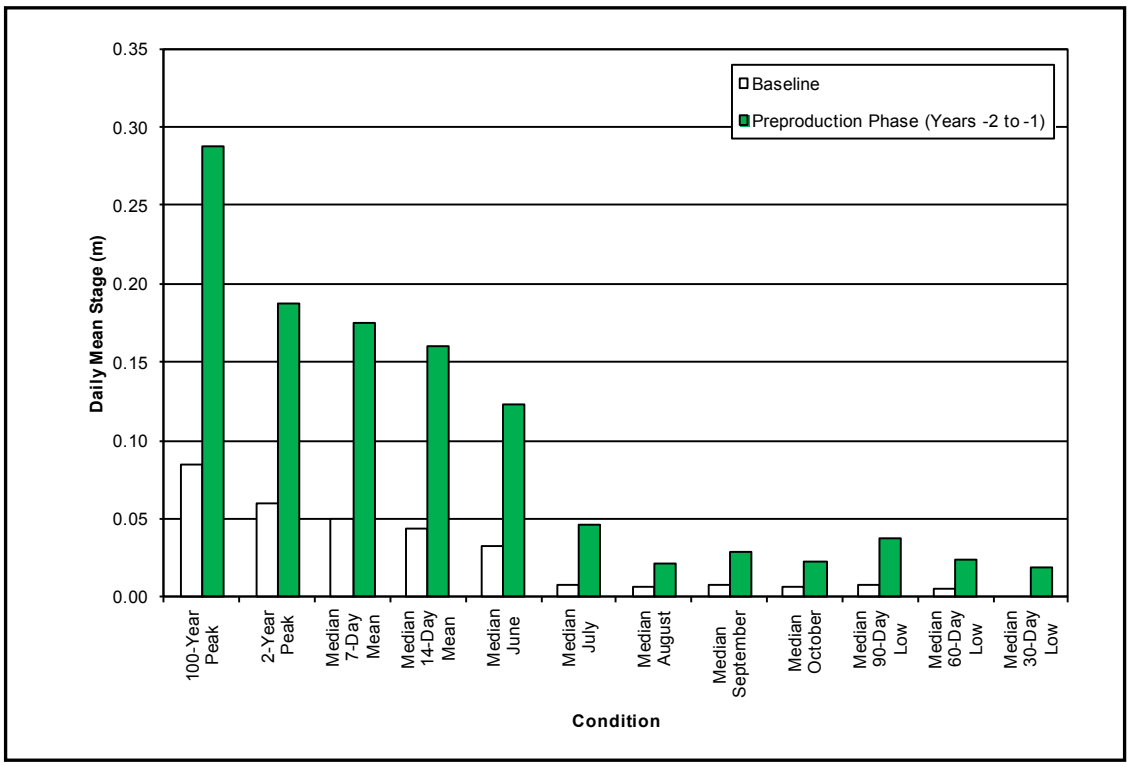



*Figure 7.3-47: Comparison of Effects on Lake P2 Stages - Pre-production Phase (Years -2 to -1)*

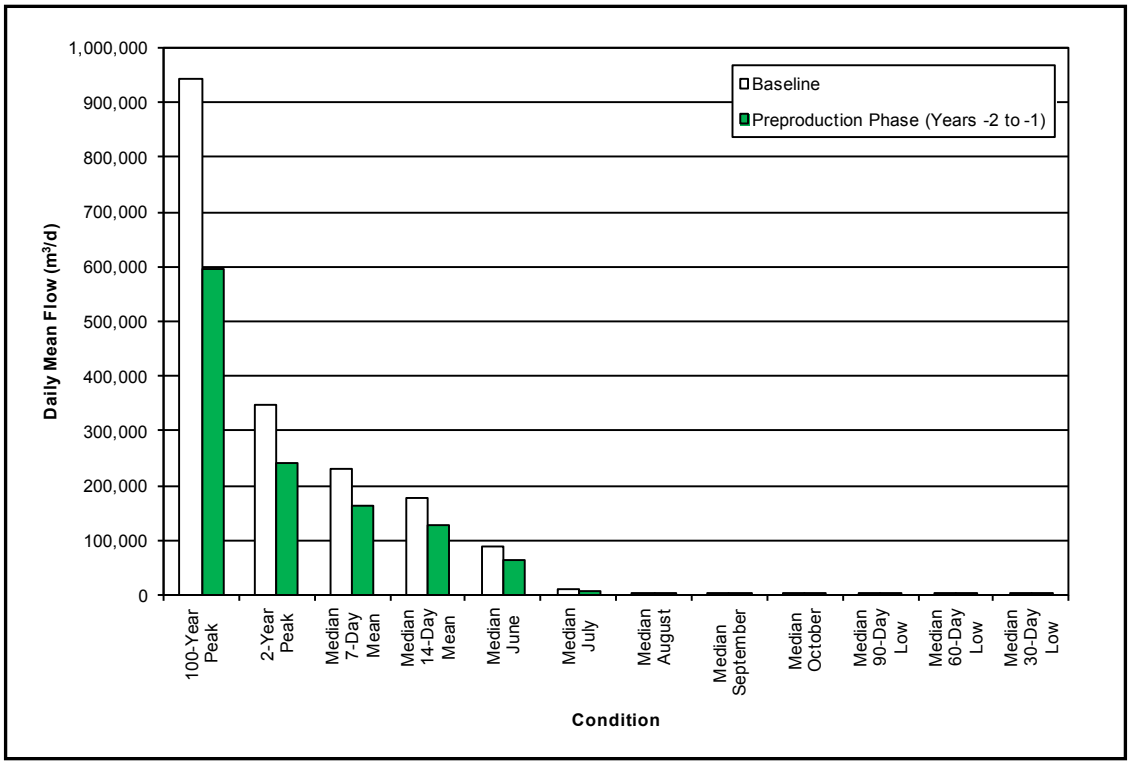



*Figure 7.3-48: Comparison of Effects on Lake B2 Outlet Discharges - Pre-production Phase (Years -2 to -1)*

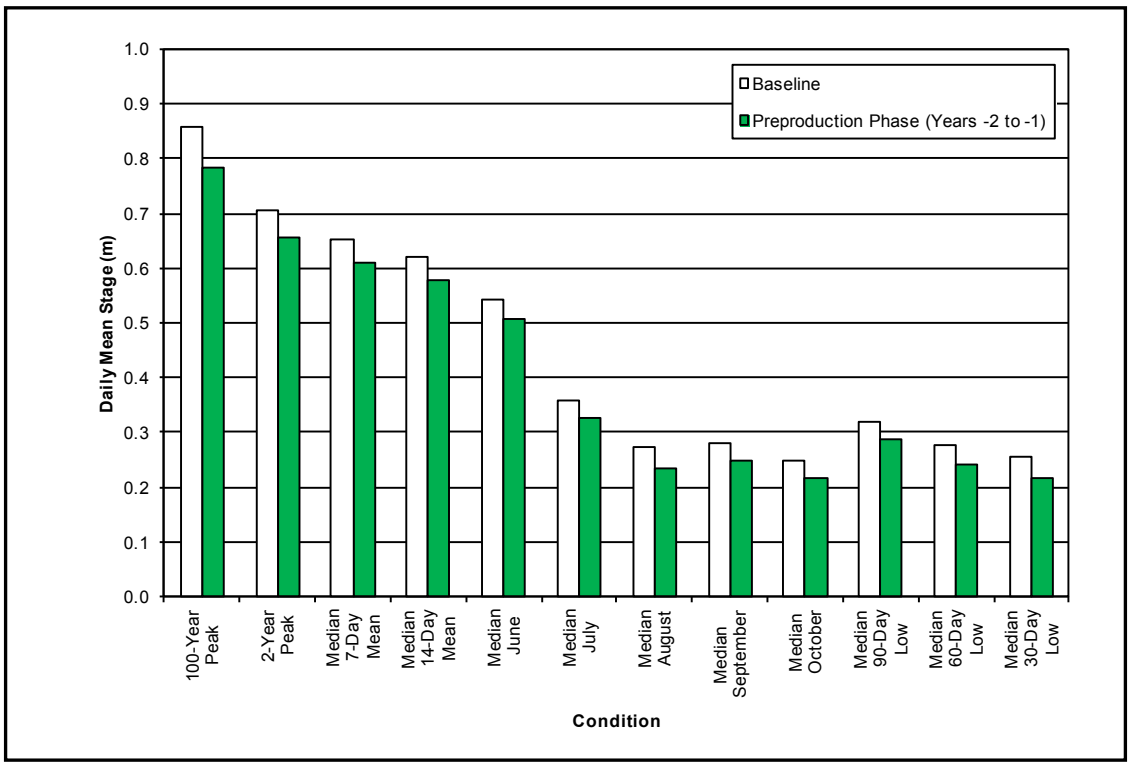



*Figure 7.3-49: Comparison of Effects on Lake B2 Stages - Pre-production Phase (Years -2 to -1)*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

The permanent diversion of Lake B45/44 to Lake P2, and Lake P2 to Lake B2, will result in reduced flow regimes from the reduction in drainage area, and increased water level regimes at Lake B45/44 and Outlet channel, relative to baseline conditions.

The diversion of Lake P2 to Lake B2 was modeled using the baseline stage-discharge rating curve of Lake P2, due to unknown design hydraulic parameters of the diversion channel at the time of this assessment.

**Lake B45/44 Outlet Flows:** the water balance results for Lake B45/44 show that during Pre-production (Years -2 to -1), monthly mean flows will be decreased compared to baseline due to the reduction in drainage area resulting from the construction of Dike B4-D-01 in Pre-production Year -3. The 2-year flood discharge during Pre-production (Years -2 to -1) will decrease by approximately 29% below the baseline value, and the 100-year flood discharge by 23%. The diversion will cause low flows to decrease by 54% to 80% compared to baseline conditions.

**Lake B45/44 Water Levels:** Lake B45/44 will be raised from baseline conditions during Pre-production (Year -2 to -1). The 2-year flood level is expected to increase by approximately 0.844 m, and the 100-year flood level by 0.847 m, while monthly mean stages are expected to increase by 0.861 m (May), 0.842 m (June), 0.826 m (July), 0.817 m (August), 0.847 m (September), and 0.846 m (October), under median conditions.

**Lake B45/44 and Outlet Channel/Bank Stability:** the diversion of Lake B45/44 to the P watershed in Pre-production Year -3 will create new shorelines at higher elevations than the existing shorelines. This will expose new soils, often on steeper slopes than the existing shorelines, to wave erosion and potential instability due to

permafrost disturbance. Mitigation measures to minimize shoreline erosion are proposed according to the analysis presented in Appendix 7.3-D. These include two possible mitigation options:

- Preventative mitigation – the shoreline is modified by armouring or re-sloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.
- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for a period of at least 10 years following the onset of the increased water level.

**Lake P2 Outlet Flows:** the water balance results for Lake P2 show that during Pre-production (Years -2 to -1), monthly mean flows will be increased compared to baseline due to the diversions of Lake B45/44 to Lake P2. The 2-year flood discharge during Pre-production (Year -2 to -1) will increase by approximately 1627% above the baseline value, and the 100-year flood discharge by 2046%. The diversion will cause low flows to increase by approximately 450 times compared to baseline conditions.

**Lake P2 Water Levels:** Lake P2 water levels are also expected to be increased during Pre-production(Years -2 to -1) compared to baseline. The 2-year flood level is expected to increase by approximately 0.127 m, and the 100-year flood level by 0.203 m, while monthly mean stages are expected to increase by 0.026 m (May), 0.090 m (June), 0.038 m (July), 0.015 m (August), 0.021 m (September), and 0.016 m (October), under median conditions. It should be noted that these estimates were based on the existing stage-discharge rating curve of Lake P2, and actual increases in water levels will depend on the detailed design of the diversion channel connecting Lake P2 to Lake B2. The diversion channel will act to mitigate potential impacts related to increases in water level in Lake P2 (and flows in the existing Lake P2 outlet) by providing an additional outlet from Lake P2.

**Lake P2 and Outlet Channel/Bank Stability:** No effects on Lake P2 and the existing outlet channel or bank stability are expected during Pre-production (Years -2 to -1) because potential effects will be mitigated by the diversion channel, designed and constructed to prevent erosion and sedimentation.

**Lake B2 Outlet Flows:** the water balance results for Lake B2 show that during Pre-production (Year -2 to -1), monthly mean flows will be decreased compared to baseline due to the reduction in drainage area from the diversion of Lake B5 to Lake D7, and the isolation of Lake B4 north of Dike B4-D-01. The 2-year flood discharge during Pre-production (Year -2 to -1) will decrease by approximately 31% below the baseline value, and the 100-year flood discharge by 37%. The diversion of water from Lake P2 will cause low flows to decrease by 41% to 56% compared to baseline conditions.

**Lake B2 Water Levels:** Lake B2 water levels are also expected to be decreased during Pre-production (Year -2 to-1) compared to baseline. The 2-year flood level is expected to decrease by approximately 0.050 m, the 100-year flood level by 0.074 m, while monthly mean stages are expected to decrease by 0.024 m (May), 0.035 m (June), 0.033 m (July), 0.037 m (August), 0.034 m (September), and 0.029 m (October), under median conditions.

**Lake B2 and Outlet Channel/Bank Stability:** No effects on Lake B2 and Outlet channel or bank stability are expected during Pre-production (Year -2 to -1) because flood magnitudes will be reduced from baseline values.

### *7.3.3.5 Effect Analysis Results – Mining Phase 1 (Years 1 to 2)*

#### 7.3.3.5.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.5.1.1 Project Activities*

Pumping from Lake A8 to Lake A7 will continue to maintain Lake A8 dry from runoff throughout the open water season during Mining Phase 1. Partial dewatering will also lower water levels in Lake A6 to construct dike F-D-01 and channel F-NC-01 that will convey pumped flows from Lake A6 to Lake A1. Pumping rates will be higher during the month of June, and lower during other open water months. This will affect downstream waterbodies including Lake A1. The partial dewatering of Lake A6 during Mining Phase 1 will further reduce the lake area of the A watershed by 0.190 $km^2$.

Construction of the Low Grade Ore Stockpile and Wesmeg #3 Pit in subsequent mining phases will require dewatering of Lake J7 to Lake J2 during Mining Phase 1. Pumping will be at a constant rate beginning at the start of June and ending at the end of September. This will affect Lake J2 and Lake J1. Dewatering of Lake J7 will reduce the lake area of the J watershed by 0.035 $km^2$.

Accumulated runoff to Lake B36 dewatered during the Pre-production Phase (Years -2 to -1) will be pumped through Lake B34 during Mining Phase 1, which will increase inflows to Lake B5 and Lake B6. Pumping rates during Mining Phase 1 will be lower than during Pre-production (Years -2 to -1). Effect analysis for pumping of accumulated runoff from of Lake B36 was included with the effect analysis of the reduction in drainage area of Lake B6 and Lake B5 from the isolation of Lake B7 during Mining Phase 1 (Section 7.3.3.5.2), and therefore is not discussed further below.

Dewatered waterbodies from the Pre-production Phase (Year -3) to Mining Phase 1 are summarized in Table 7.3-32.

**Table 7.3-32: Dewatered Waterbodies from Pre-production Phase (Year -3) to Mining Phase 1**

| Present/Future Development | Dewatered Waterbodies | Lake Area Reduction ($km^2$) |
|---|---|---|
| Tailing Storage Facility | B7 | 0.578 |
| | B8 | 0.014 |
| | B25 | 0.016 |
| | B28 | 0.004 |
| Pits | A6 | 0.190 |
| | A8 | 0.905 |
| | A9 | 0.018 |
| | A10 | 0.003 |
| | A11 | 0.004 |
| | A12 | 0.004 |
| | A13 | 0.003 |
| | A54 | 0.039 |
| | B10 | 0.003 |
| | B36 | 0.059 |
| | J7 | 0.035 |
| B7 waste rock storage facility | B9 | 0.006 |
| | B33 | 0.007 |
| | H8 | 0.003 |
| | H9 | 0.004 |
| | H10 | 0.001 |
| | H11 | 0.003 |
| | H12 | 0.010 |
| | H13 | 0.035 |
| | H14 | 0.002 |
| | H14A | 0.002 |
| | H15 | 0.011 |
| | H15D | 0.002 |
| | H15E | 0.002 |
| | H15G | 0.003 |
| | H18 | 0.007 |
| Plant Site | H1 | 0.011 |
| | H2 | 0.002 |
| | H3 | 0.003 |
| | H4 | 0.001 |
| | H5 | 0.004 |
| | H7 | 0.001 |
| | H16 | 0.002 |
| | H19 | 0.029 |
| | H20 | 0.096 |
| B4 waste rock storage facility | B4 | 0.858 |
| **Lake Area Reduction in the A Watershed** | | **1.166** |
| **Lake Area Reduction in the B Watershed** | | **1.546** |
| **Lake Area Reduction in the H Watershed** | | **0.233** |
| **Lake Area Reduction in the J Watershed** | | **0.035** |

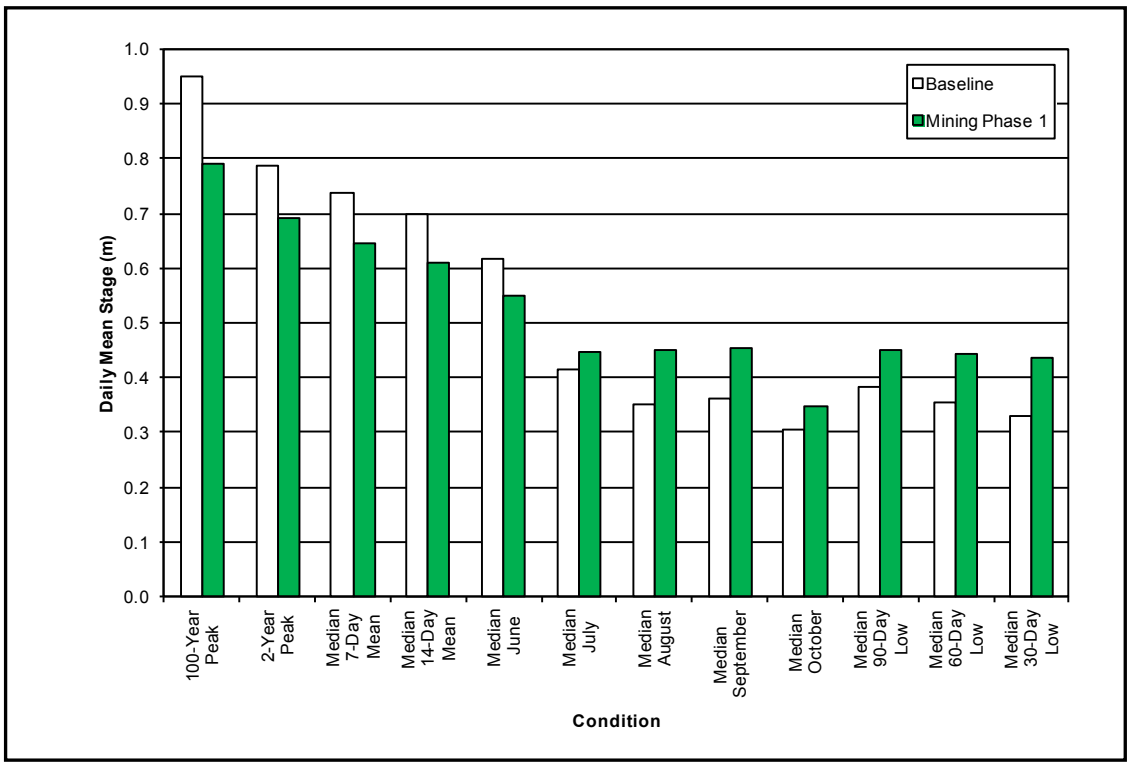



*Figure 7.3-51: Comparison of Effects on Lake A1 Stages - Mining Phase 1*

**Lake A1 Outlet Flows:** the water balance results for Lake A1 show that during Mining Phase 1, monthly mean flows will be decreased compared to baseline in May and June due to inflows from upstream waterbodies being limited by pumping capacities. Conversely, mean monthly flows will be increased compared to baseline from July to October as a result of the sustained pumping from the upstream waterbodies. The 2-year flood discharge during Mining Phase 1 will decrease by approximately 51% below the baseline value, and the 100-year flood discharge by 63%. Dewatering will cause low flows to increase by 145% to 366% compared to baseline conditions.

**Lake A1 Water Levels:** Lake A1 water levels are also expected to be decreased in May and June, and increased from July to October during Mining Phase 1 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.098 m, and the 100-year flood level by 0.159, while monthly mean stages are expected to decrease by 0.048 m and 0.066 m in May and June, respectively, and increase by 0.030 m in July, 0.100 m in August, 0.092 m in September, and 0.042 m in October under median conditions.

**Lake A1 and Outlet Channel/Bank Stability:** No effects on Lake A1 and Outlet channel or bank stability are expected during Pre-production Mining Phase 1 because flood magnitudes will be reduced from baseline values.

### *Lake J2 to Lake J1*

The water balance model for the Project was also used to examine potential dewatering effects of Lake J7 on flows, water levels, and channel/bank stability during Mine Phase 1 in all downstream waterbodies between Lake J2 and the Lake J1 outlet channel. Project effects at the Lake J2 outlet are summarized in Figure 7.3-52 to Figure 7.3-53, and at the Lake J1 outlet in Figure 7.3-54 to Figure 7.3-55. Additional information is provided in Appendix 7.3-C.

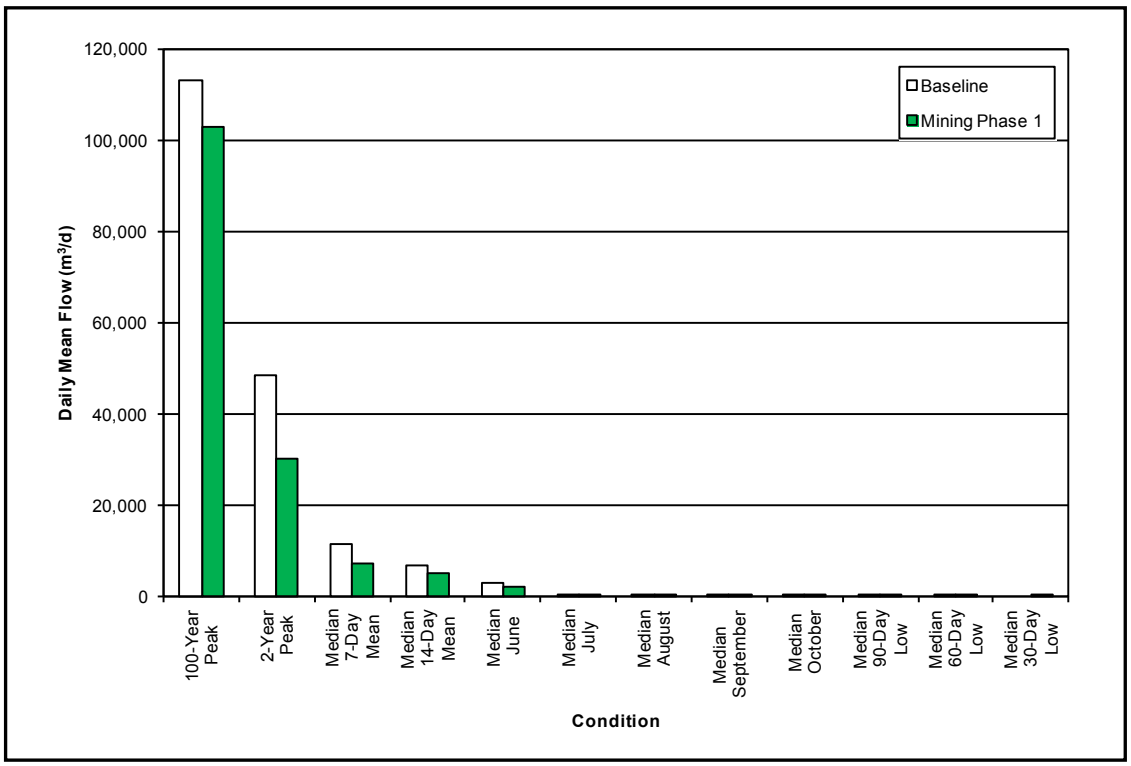



*Figure 7.3-52: Comparison of Effects on Lake J2 Outlet Discharges - Mining Phase 1*

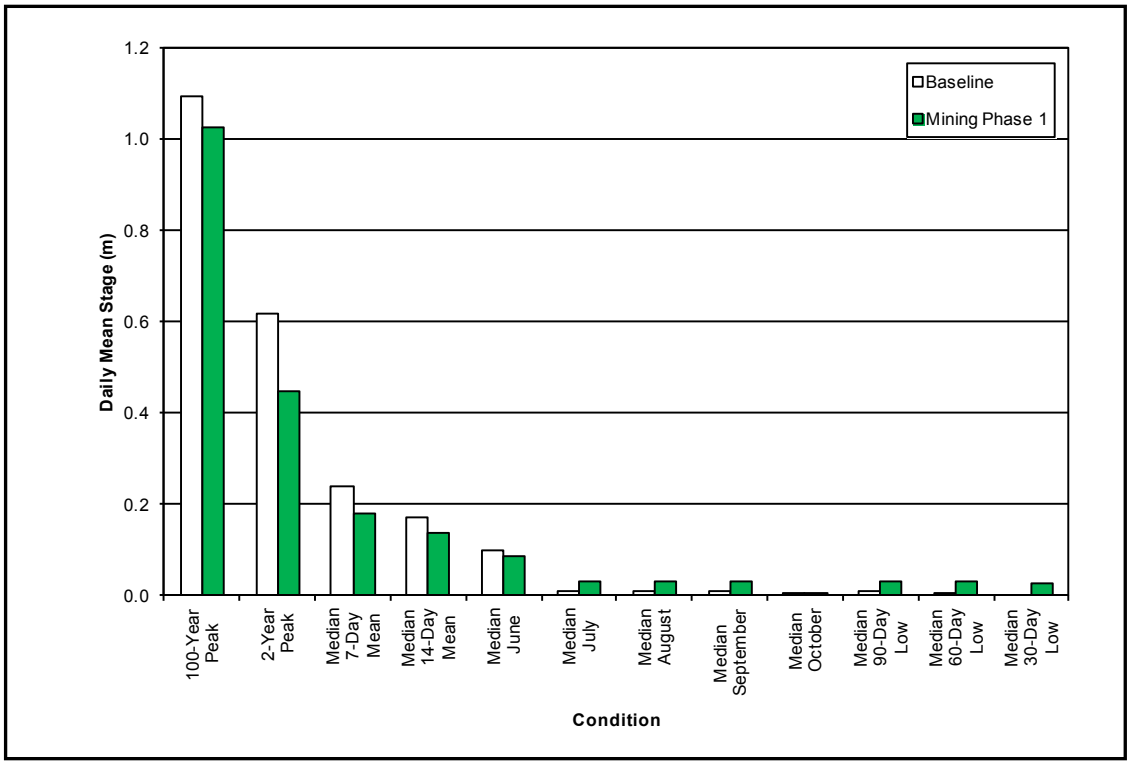



*Figure 7.3-53: Comparison of Effects on Lake J2 Stages - Mining Phase 1*

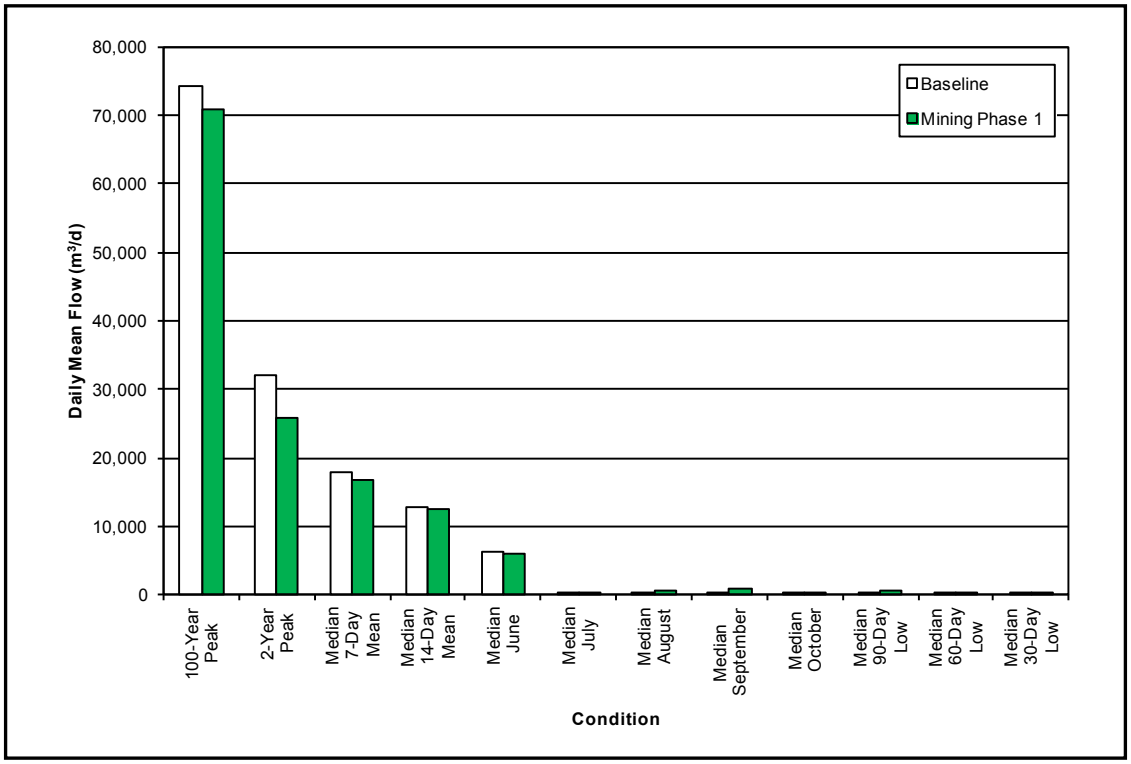



*Figure 7.3-54: Comparison of Effects on Lake J1 Outlet Discharges - Mining Phase 1*

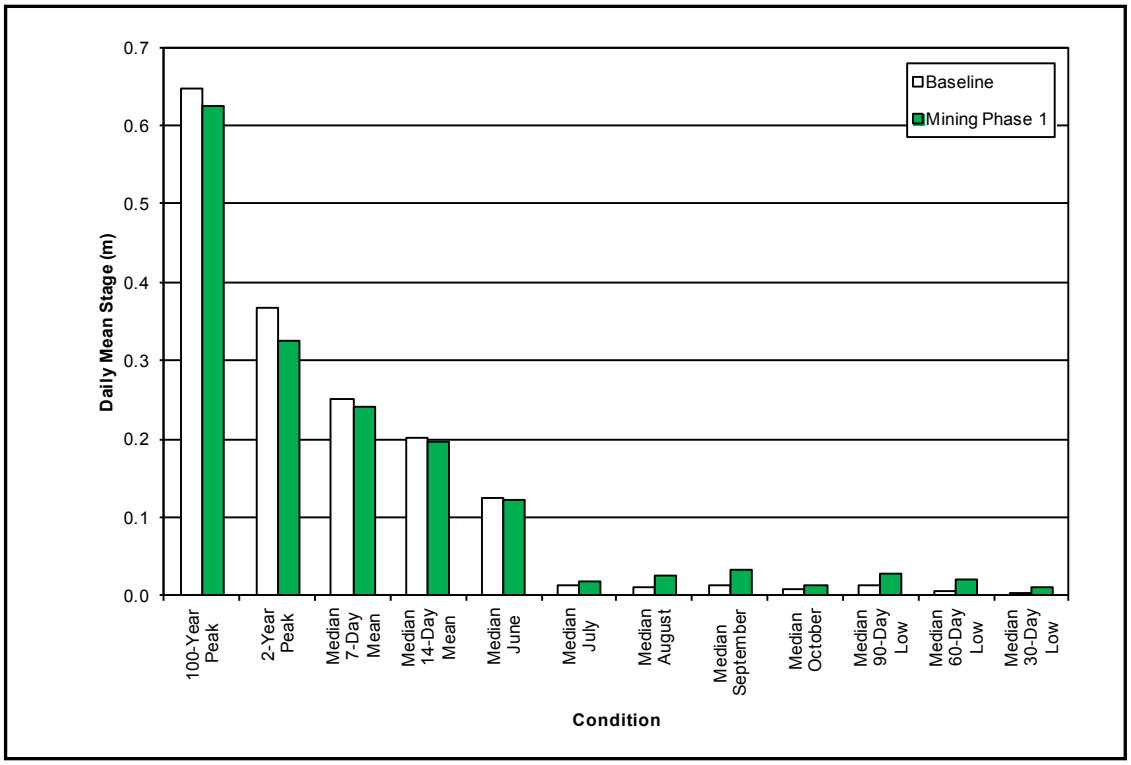



*Figure 7.3-55: Comparison of Effects on Lake J1 Stages - Mining Phase 1*

#### 7.3.3.5.1.2 Environmental Design Feature and Mitigation

Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Final discharge locations will be determined during the detailed design stage and may be modified based on monitoring results.

#### 7.3.3.5.1.3 Effect Analysis

##### Lake A1

The water balance model for the Project was used to examine potential dewatering effects on flows, water levels, and channel/bank stability during Mining Phase 1 in all downstream waterbodies between the Lake A5 outlet channel and the Lake A1 outlet channel. Project effects on the Lake A1 outlet during dewatering of Lake A6 are summarized in Figure 7.3-50 to Figure 7.3-51 with additional information in Appendix 7.3-C.

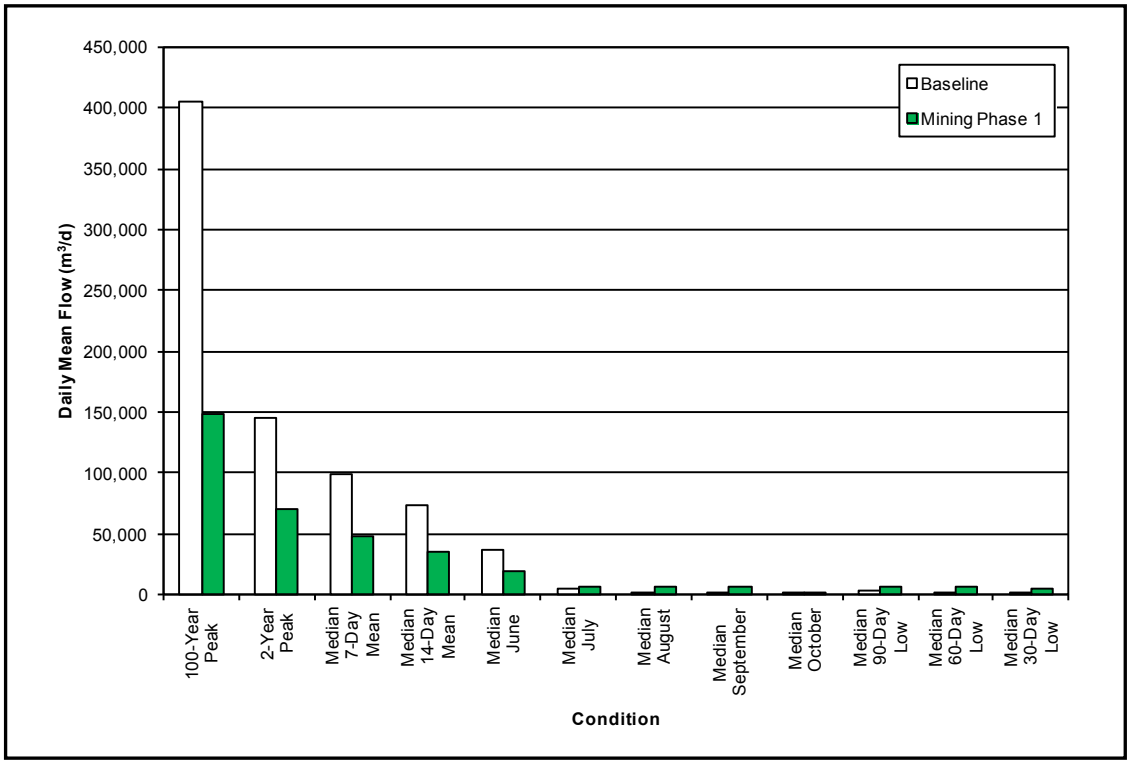



*Figure 7.3-50: Comparison of Effects on Lake A1 Outlet Discharges - Mining Phase 1*

### Summary of Effects on Flows, Water Levels, and Channel/Bank Stability

**Lake J2 Outlet Flows:** the water balance results for Lake J2 show that during Mining Phase 1, monthly mean flows will be decreased compared to baseline in May and June, and increased compared to baseline from July to October due to the pumping schedule of Lake J7 to Lake J2. The 2-year flood discharge during Mining Phase 1 will decrease by approximately 38% below the baseline value, and the 100-year flood discharge by 9%. Dewatering will cause low flows to increase by 220% to 26 times compared to baseline conditions.

**Lake J2 Water Levels:** Lake J2 water levels are also expected to be decreased in May and June, and increased from July to October during Mining Phase 1 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.170 m, and the 100-year flood level by 0.068 m, while monthly mean stages are expected to decrease by 0.011 m and 0.014 m in May and June, respectively, and increase by 0.022 m in July, 0.024 m in August, 0.022 m in September, and 0.001 m in October under median conditions.

**Lake J1 and Outlet Channel/Bank Stability:** No effects on Lake J2 and Outlet channel or bank stability are expected during Pre-production Mining Phase 1 because flood magnitudes will be reduced from baseline values.

**Lake J1 Outlet Flows:** the water balance results for Lake J1 show that during Mining Phase 1, monthly mean flows will be decreased compared to baseline in May and June, and increased compared to baseline from July to October due to the pumping schedule of Lake J7 to Lake J2. The 2-year flood discharge during Mining Phase 1 will decrease by approximately 19% below the baseline value, and the 100-year flood discharge by 5%. Dewatering will cause low flows to increase by up to 56 times compared to baseline conditions.

**Lake J1 Water Levels:** Lake J1 water levels are also expected to be decreased in May and June, and increased from July to October during Mining Phase 1 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.044 m, and the 100-year flood level by 0.023 m, while monthly mean stages are expected to decrease by 0.009 m and 0.001 m in May and June, respectively, and increase by 0.005 m in July, 0.016 m in August, 0.018 m in September, and 0.005 m in October, under median conditions.

**Lake J1 and Outlet Channel/Bank Stability:** No effects on Lake J1 and Outlet channel or bank stability are expected during Pre-production Mining Phase 1 because flood magnitudes will be reduced from baseline values.

#### 7.3.3.5.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.5.2.1 Project Activities*

The Lake B7 catchment area diverted to Lake B5 will be further reduced during Mine Phase 1 through the advancement of the B7 waste rock facility footprint between the Tiriganiaq Pit and the Tailing Storage Facility. This activity will decrease inflows to Lake B5 and downstream waterbodies compared to the Pre-production Phase (Years -2 to -1). Potential project infrastructure effects to Lake B6 will remain the same as described in Section 7.3.3.4.2 of the Pre-production Phase (Years -2 to -1), respectively, and therefore are not discussed further in the project infrastructure effect analysis for Mining Phase 1 below.

##### *7.3.3.5.2.2 Environmental Design Feature and Mitigation*

Environmental design features and mitigations are not required.

##### *7.3.3.5.2.3 Effect Analysis*

The water balance model for the Project was used to examine potential project infrastructure effects on flows, water levels, and channel/bank stability during Mining Phase 1 in all downstream waterbodies between Lake B6 and the Lake B5 outlet channel. Project effects at the Lake B5 outlet during Mining Phase 1 are summarized in Figure 7.3-56 to Figure 7.3-57 with additional information in Appendix 7.3-C.

## Lake B5

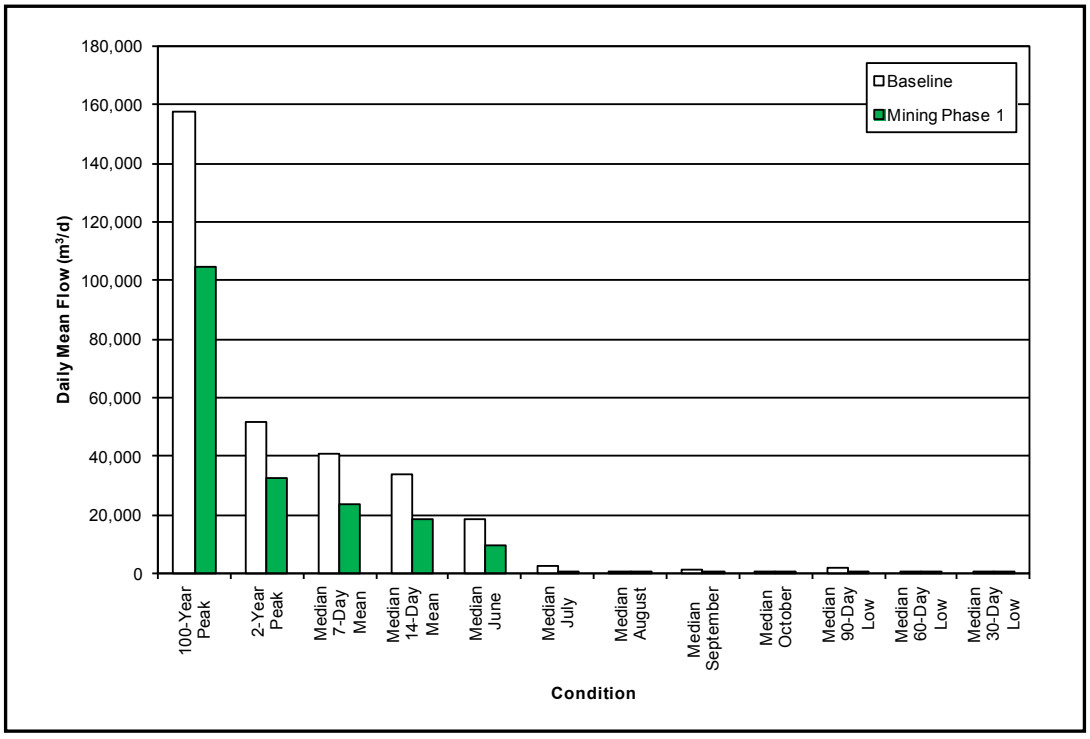



*Figure 7.3-56: Comparison of Effects on Lake B5 Outlet Discharges - Mining Phase 1*

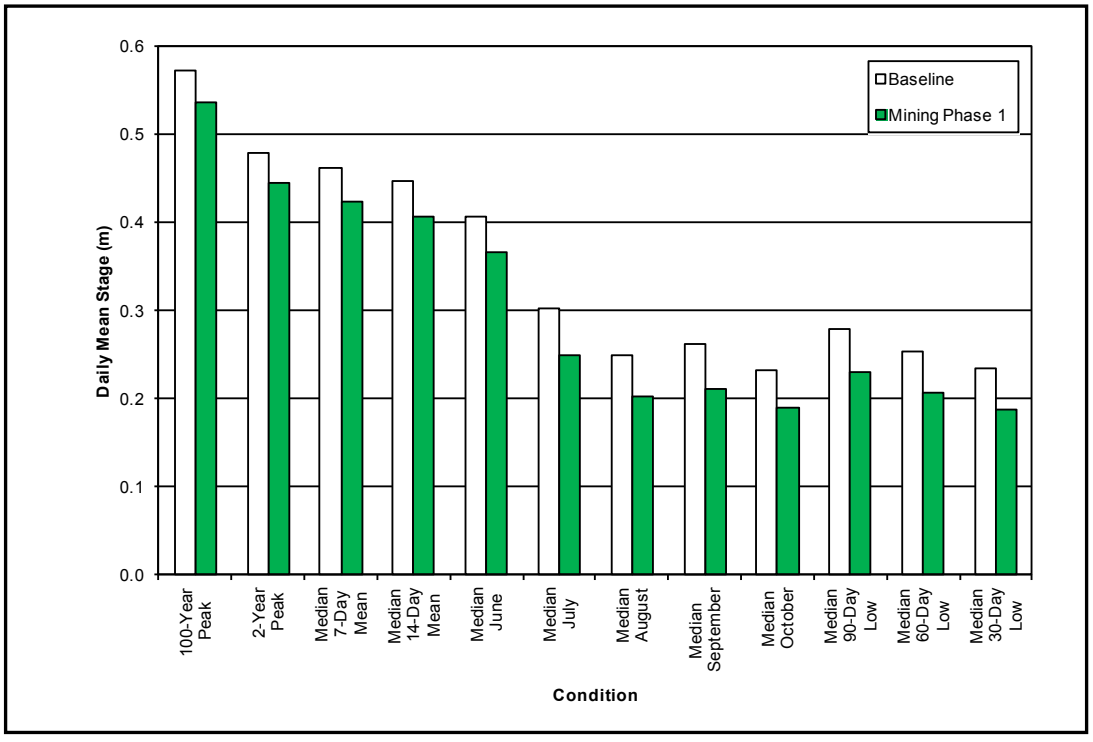



*Figure 7.3-57: Comparison of Effects on Lake B5 Stages - Mining Phase 1*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake B5 Outlet Flows:** the water balance results for Lake B5 show that during Mining Phase 1, monthly mean flows will be decreased compared to baseline due a reduction in Lake B7 drainage area contributing to Lake B5. The 2-year flood discharge during Mining Phase 1 will decrease by approximately 37% below the baseline value, and the 100-year flood discharge by 34%. Dewatering will cause low flows to decrease by 71 to 75% compared to baseline conditions.

**Lake B5 Water Levels:** Lake B5 water levels are also expected to be decreased during Mining Phase 1 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.034 m, and the 100-year flood level by 0.036, while monthly mean stages are expected to decrease by 0.021 m (May), 0.041 m (June), 0.053 m (July), 0.047 m (August), 0.050 m (September), and 0.043 m (October) under median conditions.

**Lake B5 and Outlet Channel/Bank Stability:** No effects on Lake B5 and Outlet channel or bank stability are expected during Mining Phase 1 because flood magnitudes will be reduced from baseline values.

## 7.3.3.5.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### *7.3.3.5.3.1 Project Activities*

Diversion of the portion of Lake A8 located south of Dike WM-D-01 to Lake A31 will continue during Mining Phase 1. This will affect Lake A31 and other waterbodies downstream including Lake A6 and Lake A1. Effects of this diversion were considered in Section 7.3.3.5.1 (effects of dewatering in the A watershed during Mining Phase 1), and therefore are not discussed further in the watershed diversion effect analysis for Mining Phase 1 below.

Similarly, construction of the road to the F Zone Pits will require the diversion of pumped flows from Lake A6, and of runoff of waterbodies located upstream of Lake A19 (including Lake A22, Lake A23, Lake A24, Lake A25, Lake A26, Lake A27 and Lake A28) through constructed channel F-NC-01 to Lake A1. Effects of these diversions were considered in Section 7.3.3.5.1 (effects of dewatering in the A watershed during Mining Phase 1), and therefore are also not discussed further in the watershed diversion effect analysis for Mining Phase 1 below.

Likewise, construction of the B7 waste rock storage facility will require the diversion of Lake B33A to Lake B5 through constructed channel WM-NC-01. Effects of diversion of Lake B33A to the B5 watershed were considered in Section 7.3.3.5.2 (effects of project infrastructure on the B watershed during Mining Phase 1), and therefore are not discussed further in the watershed diversion effect analysis for Mining Phase 1 below.

Diversions of Lake B5 to Lake D7, Lake B45/44 to Lake P2, and Lake P2 to Lake B2 will remain from previous phases. This will affect waterbodies downstream of diversions including Lake B5, Lakes D7 to D1 and waterbodies B45/44, P2, and B2. Effects of diversion of Lake B45/44 to Lake P2, and Lake P2 to Lake B2 will not change from the Pre-production Phase (Years -2 to -1) and are presented in Section 7.3.3.4.3 (effects of dewatering on the B watershed during the Pre-production Phase (Year -2 to -1)); and therefore are not discussed further in the watershed diversion effect analysis for Mining Phase 1 below.

#### 7.3.3.5.3.2 Environmental Design Feature and Mitigation

At diversion outlets, a channel will be constructed to convey flows. The diversion outlet channel will be designed to approximate the natural hydrograph to the extent possible so as to manage the water level regime of the diverted waterbodies. Diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn et al. 2012) and to incorporate lessons learned at other northern sites (Jones et al. 2003).

#### 7.3.3.5.3.3 Effect Analysis

The water balance model for the Project was used to examine potential watershed diversion effects on flows, water levels, and channel/bank stability during Mining Phase 1 in all downstream waterbodies between Lake D7 and the Lake D1 outlet channel. Project effects at the Lake D7 outlet during Mining Phase 1 are summarized in Figure 7.3-58 to Figure 7.3-59, at the Lake D3 outlet in Figure 7.3-60 to Figure 7.3-61, and at the Lake D1 outlet in Figure 7.3-62 to Figure 7.3-63. Additional information is provided in Appendix 7.3-C.

### Lake D7 to Lake D1

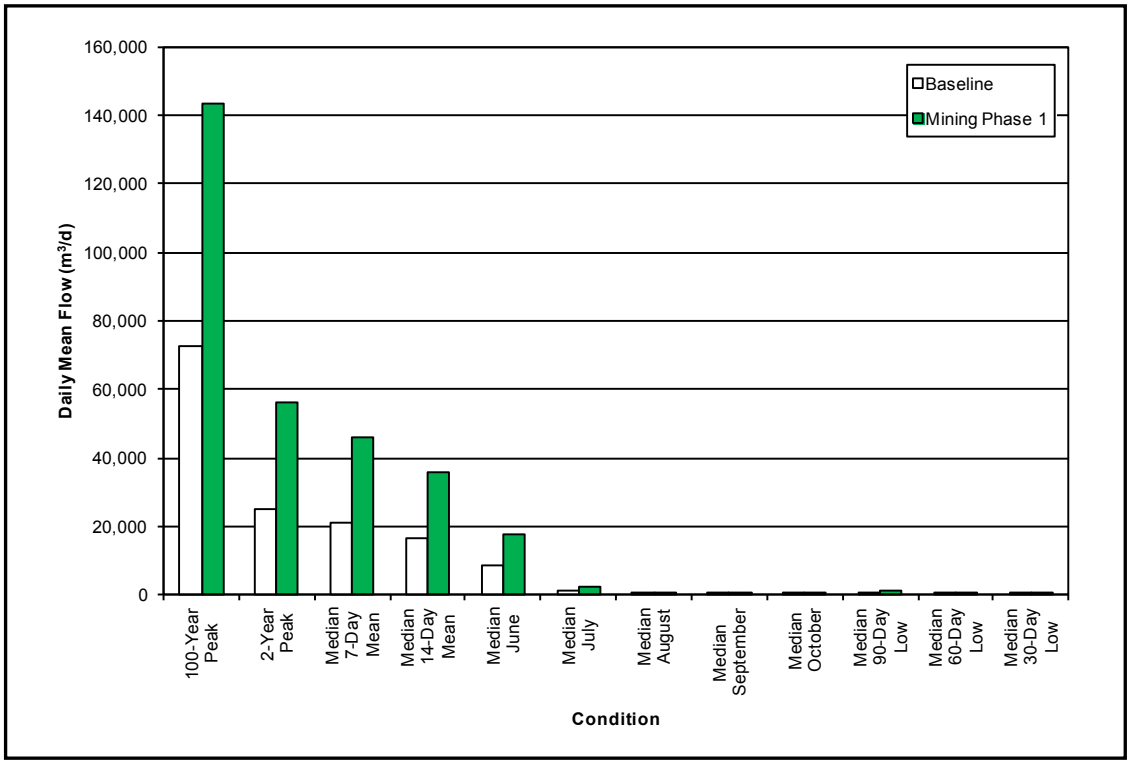



*Figure 7.3-58: Comparison of Effects on Lake D7 Outlet Discharges - Mining Phase 1*

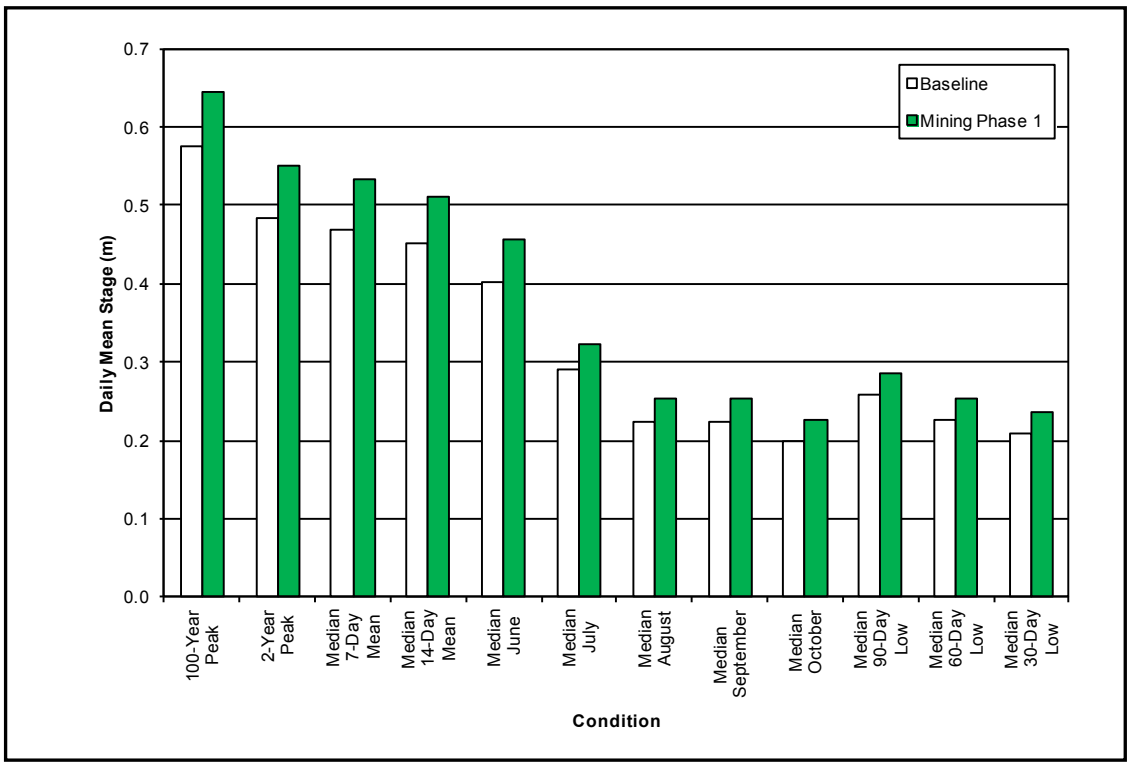



*Figure 7.3-59: Comparison of Effects on Lake D7 Stages - Mining Phase 1*

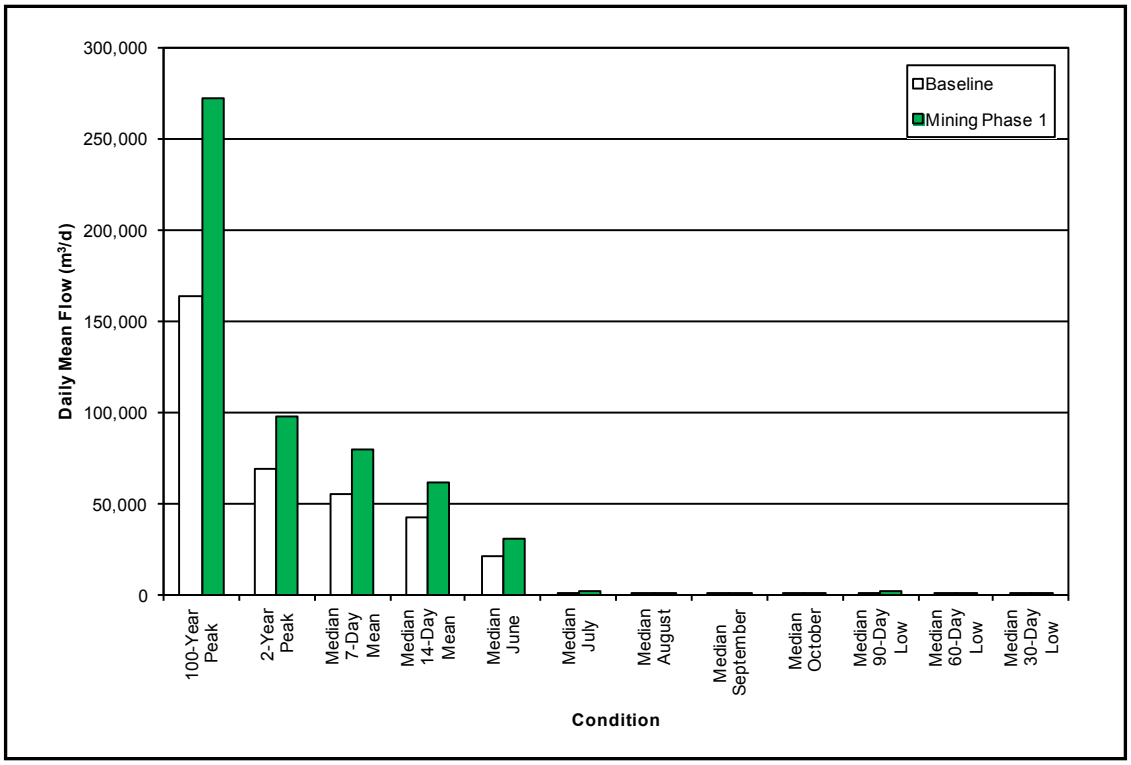



*Figure 7.3-60: Comparison of Effects on Lake D3 Outlet Discharges - Mining Phase 1*

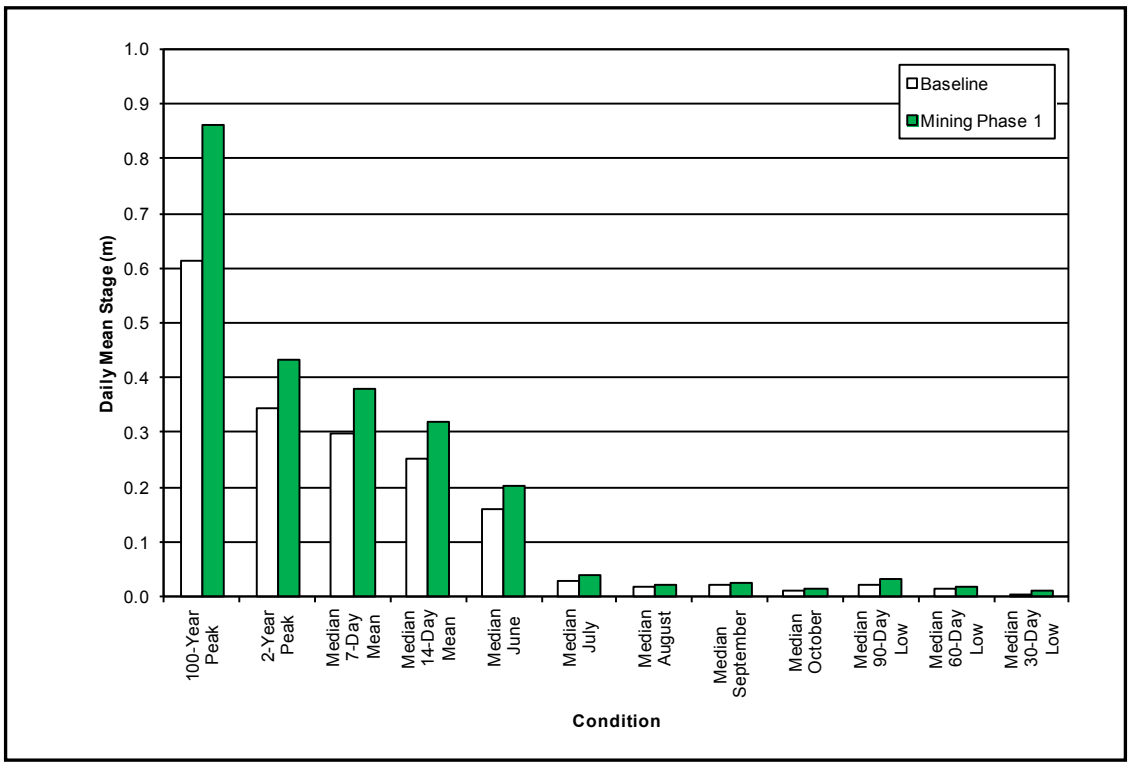



*Figure 7.3-61: Comparison of Effects on Lake D3 Stages - Mining Phase 1*

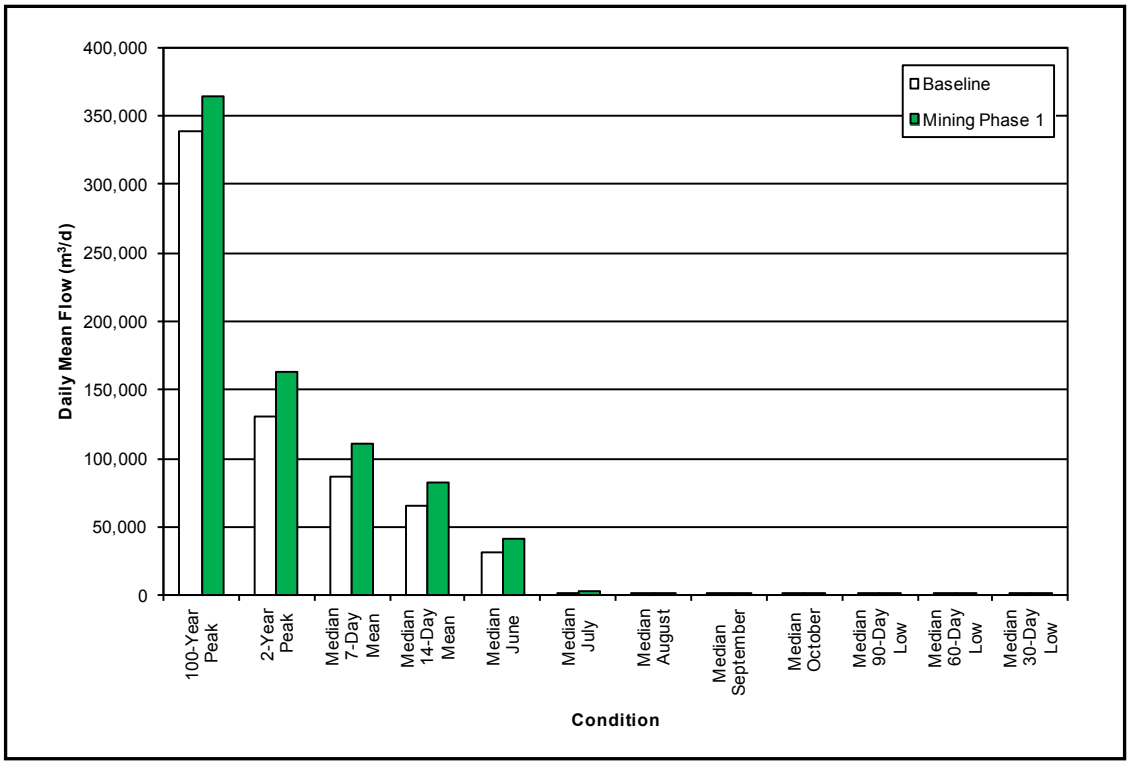



*Figure 7.3-62: Comparison of Effects on Lake D1 Outlet Discharges - Mining Phase 1*

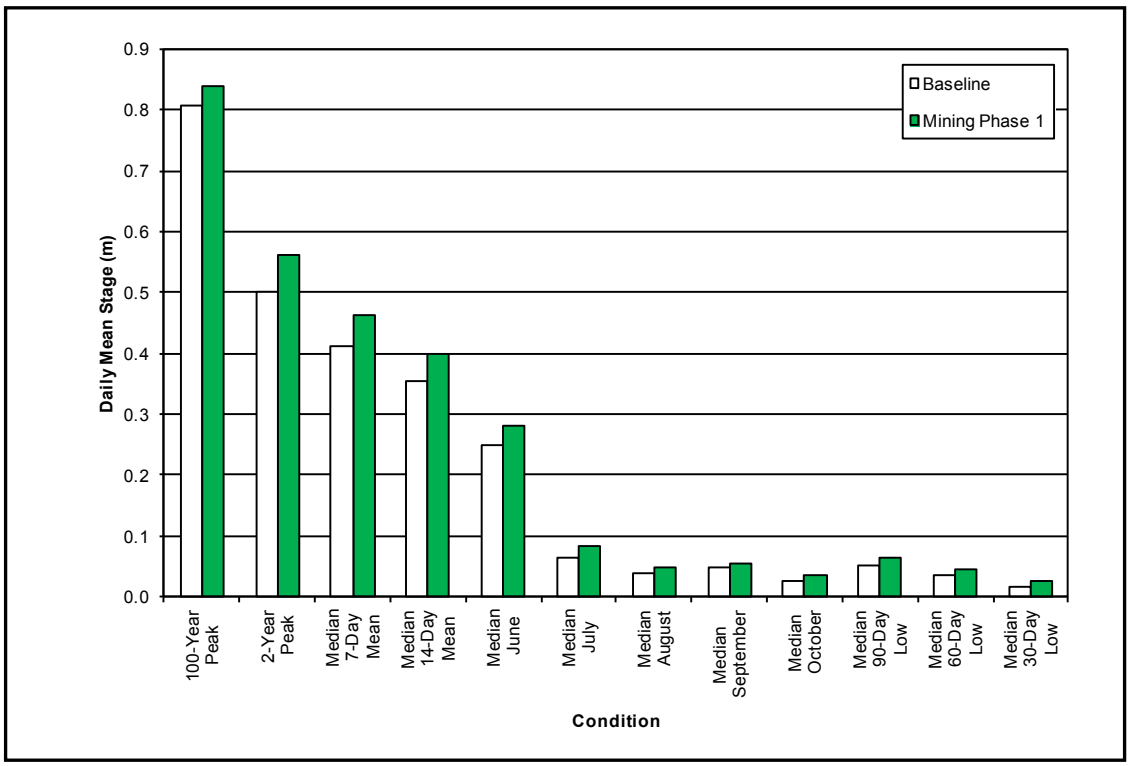



*Figure 7.3-63: Comparison of Effects on Lake D1 Stages - Mining Phase 1*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake D7 Outlet Flows:** the water balance results for Lake D7 show that during Mining Phase 1, monthly mean flows will be increased compared to baseline due to the diversions of Lake B5 to Lake D7 and Lake B36 to Lake B5. The 2-year flood discharge during Mining Phase 1 will increase by approximately 124% above the baseline value, and the 100-year flood discharge by 98%. Diversions will cause low flows to increase by 88% to 117% compared to baseline conditions.

**Lake D7 Water Levels:** Lake D7 water levels are also expected to be increased during Mining Phase 1 compared to baseline. The 2-year flood level is expected to increase by approximately 0.068 m, and the 100-year flood level by 0.069 m, while monthly mean stages are expected to increase by 0.040 m (May), 0.053 m (June), 0.031 m (July), 0.029 m (August), 0.031 m (September), and 0.027 m (October) under median conditions.

**Lake D7 and Outlet Channel/Bank Stability:** increased flood regimes from the diversion of Lake B5 to Lake D7 are expected to increase erosion potential in the Lake D7 outlet. This increase in flood regimes results from the ongoing diversion of Lake B5 to Lake D7. As for the Pre-production phases, pumping of Lake B5 to Lake D7 will be delayed until after the spring freshet, and will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, and keep peak flows at baseline conditions (see Appendix 7.3-D).

**Lake D3 Outlet Flows:** the water balance results for Lake D3 show that during Mining Phase 1, monthly mean flows will be increased compared to baseline due to the diversions of Lake B5 to Lake D7 and Lake B36 to Lake B5. The 2-year flood discharge during Mining Phase 1 will increase by approximately 41% above the baseline

value, and the 100-year flood discharge by 136%. Dewatering will cause low flows to increase by 37% to 136% compared to baseline conditions.

**Lake D3 Water Levels:** Lake D3 water levels are also expected to be increased during Mining Phase 1 compared to baseline. The 2-year flood level is expected to increase by approximately 0.089 m, and the 100-year flood level by 0.249 m, while monthly mean stages are expected to increase by 0.005 m (May), 0.043 m (June), 0.011 m (July), 0.005 m (August), 0.003 m (September), and 0.003 m (October) under median conditions.

**Lake D3 and Outlet Channel/Bank Stability:** increased flood regimes from the diversion of Lake B5 to Lake D7 are expected to increase erosion potential in the Lake D3 outlet. This increase in flood regimes results from the ongoing diversion of Lake B5 to Lake D7. As for the Pre-production phases, pumping of Lake B5 to Lake D7 will be delayed until after the spring freshet, and will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, and keep peak flows at baseline conditions.

**Lake D1 Outlet Flows:** the water balance results for Lake D1 show that during Mining Phase 1, monthly mean flows will be increased compared to baseline due to the diversions of Lake B5 to Lake D7 and Lake B36 to Lake B5. The 2-year flood discharge during Mining Phase 1 will increase by approximately 25% above the baseline value, and the 100-year flood discharge by 7%. The diversion will cause low flows to increase by 50% to 144% compared to baseline conditions.

**Lake D1 Water Levels:** Lake D1 water levels are also expected to be increased during Mining Phase 1 compared to baseline. The 2-year flood level is expected to increase by approximately 0.059 m, and the 100-year flood level by 0.030 m, while monthly mean stages are expected to increase by 0.006 m (May), 0.033 m (June), 0.016 m (July), 0.008 m (August), 0.006 m (September), and 0.009 m (October) under median conditions.

**Lake D1 and Outlet Channel/Bank Stability:** increased flood regimes from the diversion of Lake B5 to Lake D7 are expected to increase erosion potential in the Lake D1 outlet. This increase in flood regimes results from the ongoing diversion of Lake B5 to Lake D7. As for the Pre-production phases, pumping of Lake B5 to Lake D7 will be delayed until after the spring freshet, and will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, and keep peak flows at baseline conditions.

### *7.3.3.6 Effect Analysis Results – Mining Phase 2 (Years 3 to 4)*

#### 7.3.3.6.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.6.1.1 Project Activities*

During Mining Phase 2, pumping from Lake A8 to Lake A7 and Lake A6 to constructed channel F-NC-01 will continue, but at a lower rate than during Mining Phase 1, so as to maintain Lake A8 dry and Lake A6 lowered by 1.5 m.

Pumping from Lake B36 to Lake B34 will be ongoing from the previous Mining Phase 1 to maintain Lake B36 dry, with similar pumping rates than during Mining Phase 1. Since Lake B5 will serve as Contact Water Pond AP-02 starting Mining Phase 2 and will no longer affect receiving waterbodies, the effect analysis was not carried forward.

Construction of the B7 waste rock storage facility will also require the dewatering of Lake E4 to Lake E3 during Mining Phase 2. This will affect Lakes E3 to E1.

Construction of the Low Grade Ore Stockpile and Wesmeg #3 Pit during Mining Phase 2 will require the dewatering of Lake J6, Lake J3, Lake J2, and Lake J8, to Lake J1. Dewatering of Lake J6, Lake J3, Lake J2, and Lake J8 will further reduce the lake area in the J watershed by 0.065 $km^2$.

Dewatered waterbodies from the Pre-production Phase (Year -3) to Mining Phase 2 are summarized in Table 7.3-33.

**Table 7.3-33: Dewatered Lakes from Pre-production Phase (Year -3) to Mining Phase 2**

| Present/Future Development | Dewatered Waterbody | Lake Area Reduction ($km^2$) |
|---|---|---|
| Tailing Storage Facility | B7 | 0.578 |
| | B8 | 0.014 |
| | B25 | 0.016 |
| | B28 | 0.004 |
| Pits | A6 | 0.190 |
| | A8 | 0.905 |
| | A9 | 0.018 |
| | A10 | 0.003 |
| | A11 | 0.004 |
| | A12 | 0.004 |
| | A13 | 0.003 |
| | A54 | 0.039 |
| | B5 | 0.567 |
| | B6 | 0.118 |
| | B10 | 0.003 |
| | B36 | 0.059 |
| | J2 | 0.019 |
| | J3 | 0.015 |
| | J6 | 0.018 |
| | J7 | 0.035 |
| | J8 | 0.014 |
| B7 waste rock storage facility | B9 | 0.006 |
| | B33 | 0.007 |
| | H8 | 0.003 |
| | H9 | 0.004 |
| | H10 | 0.001 |
| | H11 | 0.003 |
| | H12 | 0.010 |
| | H13 | 0.035 |
| | H14 | 0.002 |
| | H14A | 0.002 |
| | H15 | 0.011 |
| | H15D | 0.002 |
| | H15E | 0.002 |
| | H15G | 0.003 |
| | H18 | 0.007 |
| Plant Site | H1 | 0.011 |
| | H2 | 0.002 |
| | H3 | 0.003 |
| | H4 | 0.001 |
| | H5 | 0.004 |

**Table 7.3-33: Dewatered Lakes from Pre-production Phase (Year -3) to Mining Phase 2 (continued)**

| Present/Future Development | Dewatered Waterbody | Lake Area Reduction ($km^2$) |
|---|---|---|
| | H7 | 0.001 |
| | H16 | 0.002 |
| | H19 | 0.029 |
| | H20 | 0.096 |
| B4 waste rock storage facility | B4 | 0.858 |
| **Lake Area Reduction in the A Watershed** | | **1.166** |
| **Lake Area Reduction in the B Watershed** | | **2.231** |
| **Lake Area Reduction in the H Watershed** | | **0.233** |
| **Lake Area Reduction in the J Watershed** | | **0.100** |

#### *7.3.3.6.1.2 Environmental Design Feature and Mitigation*

Pumped discharges will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Final discharge locations will be determined during the detailed design stage and may be modified based on monitoring results.

#### *7.3.3.6.1.3 Effect Analysis*

The water balance model for the Project was used to examine potential dewatering effects on flows, water levels, and channel/bank stability during Mining Phase 2 in the Lake A1 outlet channel, the Lake J1 outlet channel, and all downstream waterbodies between the Lake E3 outlet channel and the Lake E1 outlet channel. Project effects at the Lake A1 outlet during Mining Phase 2 are summarized in Figure 7.3-64 to Figure 7.3-65, the Lake E3 outlet in Figure 7.3-66 to Figure 7.3-67, the Lake E1 outlet in Figure 7.3-68 to Figure 7.3-69, and the Lake J1 outlet in Figure 7.3-70 to Figure 7.3-71. Additional information is provided in Appendix 7.3-C.

## Lake A1

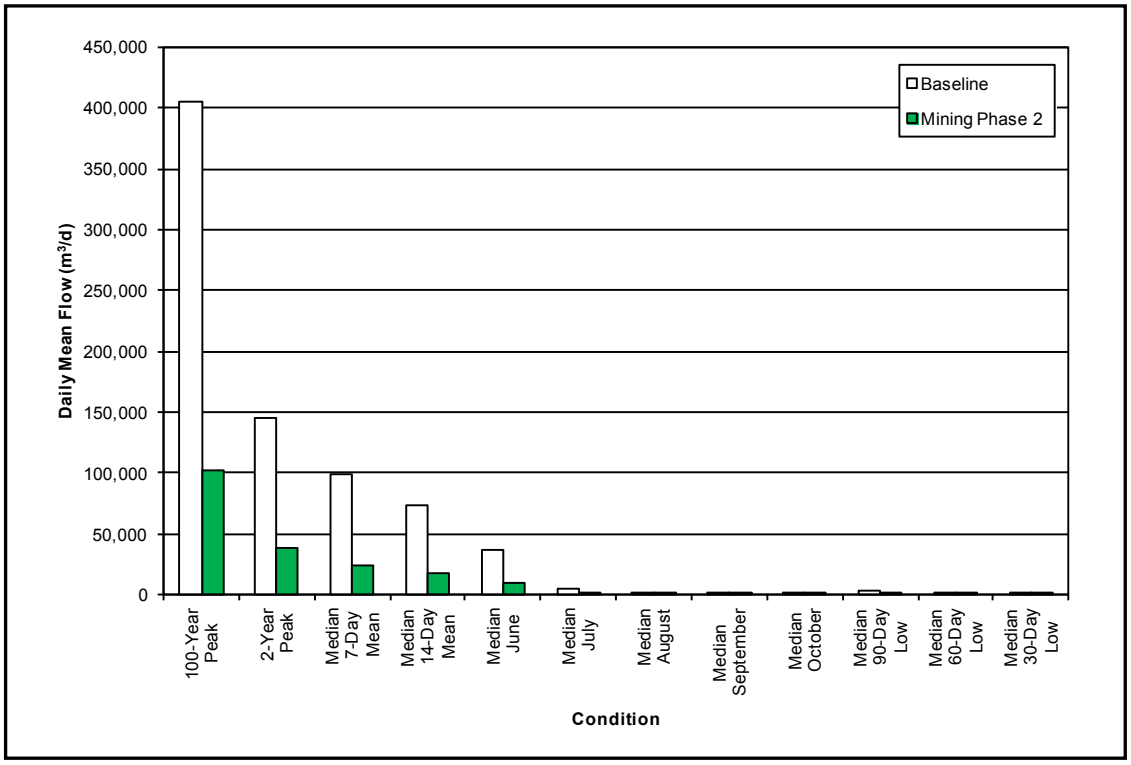



*Figure 7.3-64: Comparison of Effects on LakeA1 Outlet Discharges - Mining Phase 2*

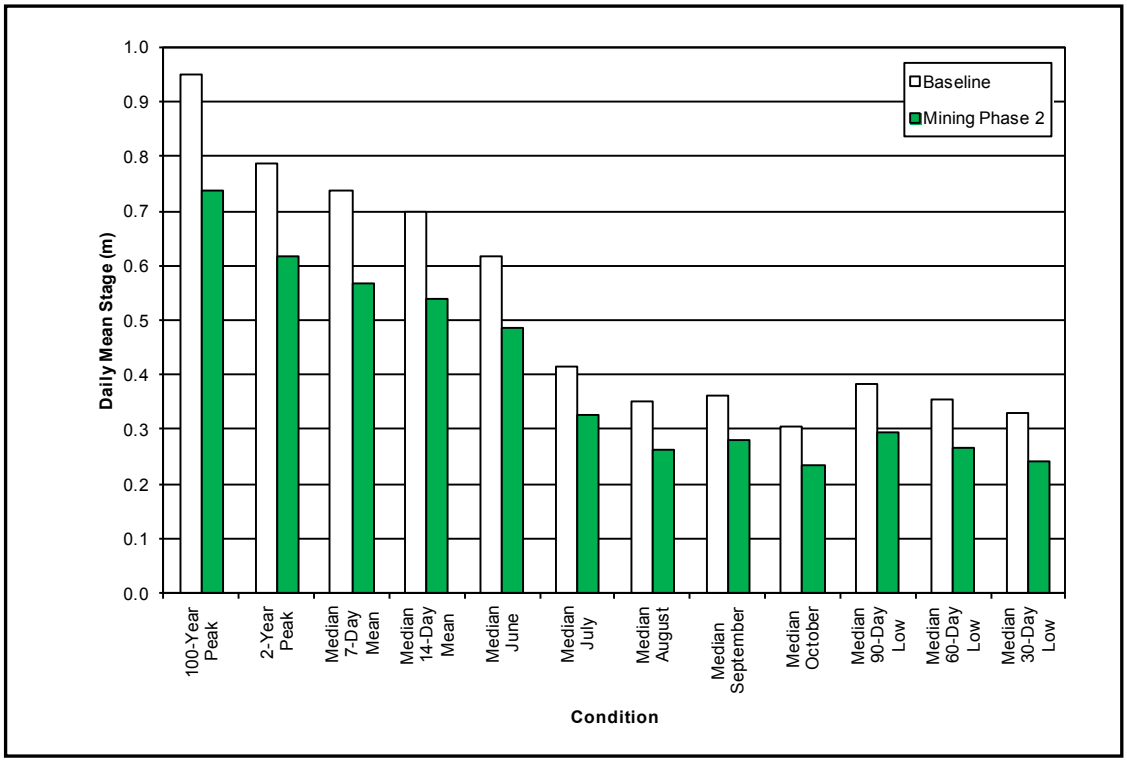



*Figure 7.3-65: Comparison of Effects on LakeA1 Stages - Mining Phase 2*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake A1 Outlet Flows:** the water balance results for Lake A1 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due to inflows from upstream waterbodies including Lake A8 and Lake A6 being limited by pumping capacities. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 74% below the baseline value, and the 100-year flood discharge by 75%. Dewatering will cause low flows to decrease by 77% to 81% compared to baseline conditions.

**Lake A1 Water Levels:** Lake A1 water levels are also expected to be decreased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.170 m, and the 100-year flood level by 0.211, while monthly mean stages are expected to decrease by 0.092 m (May), 0.131 m (June), 0.091 m (July), 0.089 m (August), 0.081 m (September), and 0.071 m (October) under median conditions.

**Lake A1 and Outlet Channel/Bank Stability:** No effects on Lake A1 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

### *Lake E3 to Lake E1*

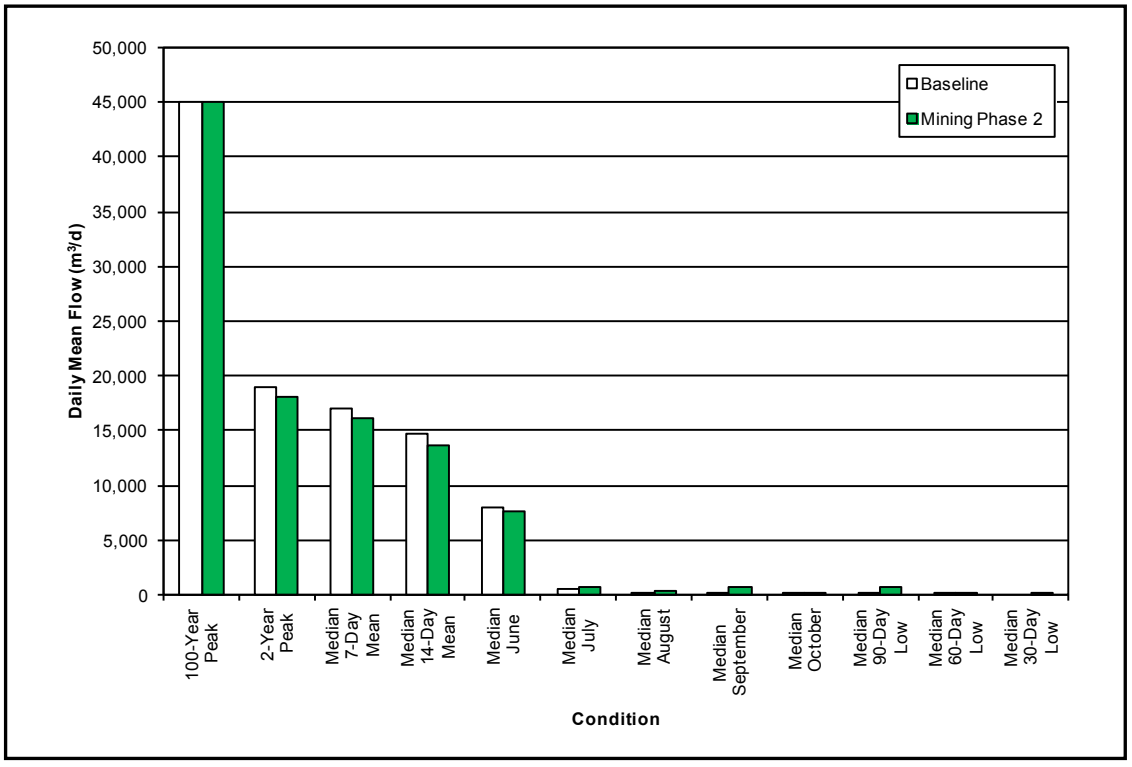



*Figure 7.3-66: Comparison of Effects on Lake E3 Outlet Discharges - Mining Phase 2*

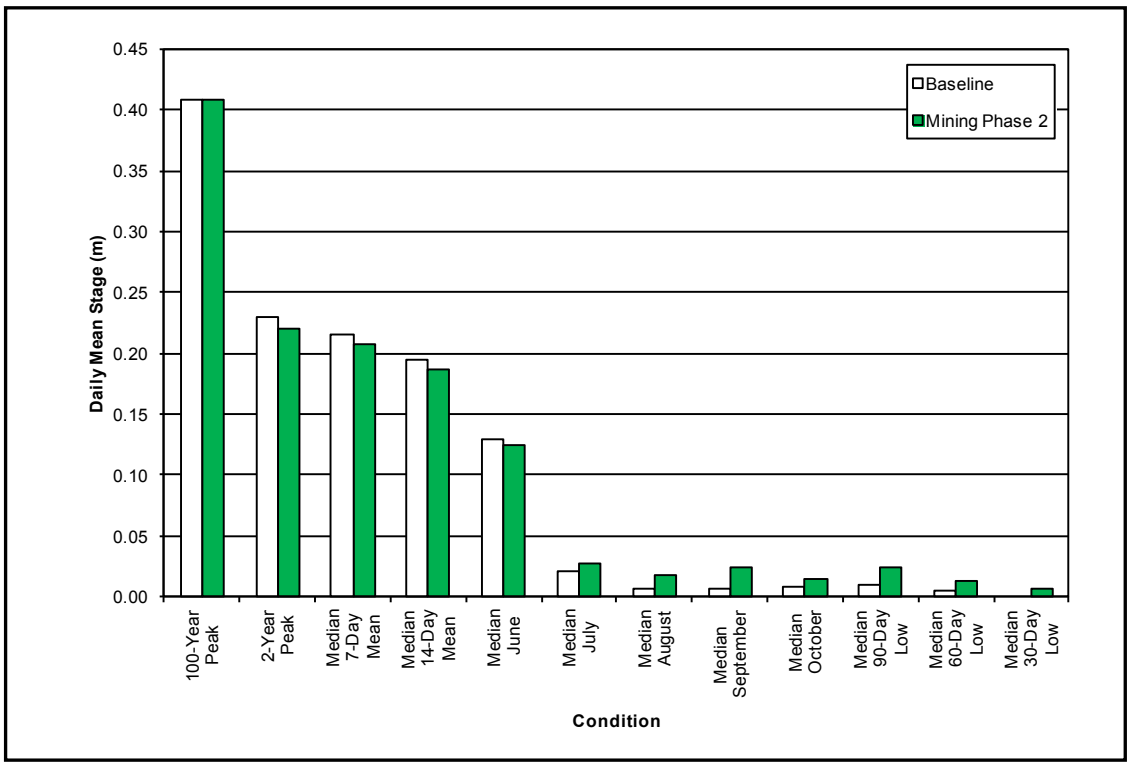



*Figure 7.3-67: Comparison of Effects on Lake E3 Stages - Mining Phase 2*

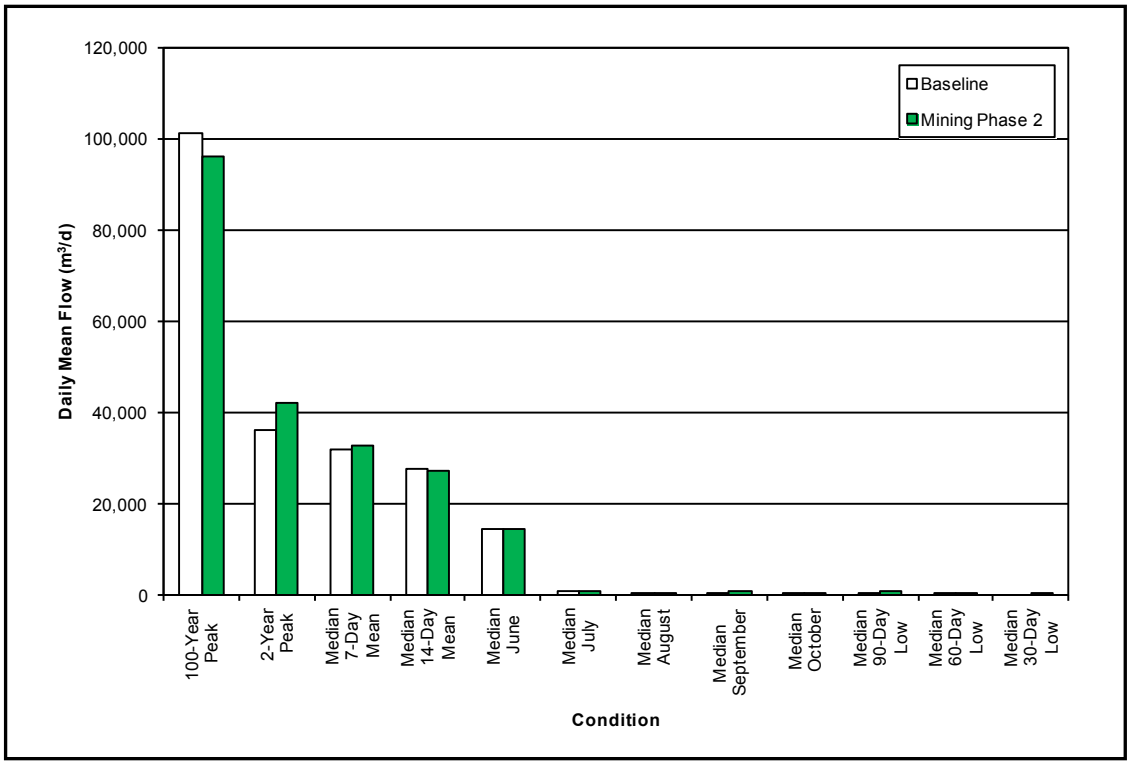



*Figure 7.3-68: Comparison of Effects on Lake E1 Outlet Discharges - Mining Phase 2*

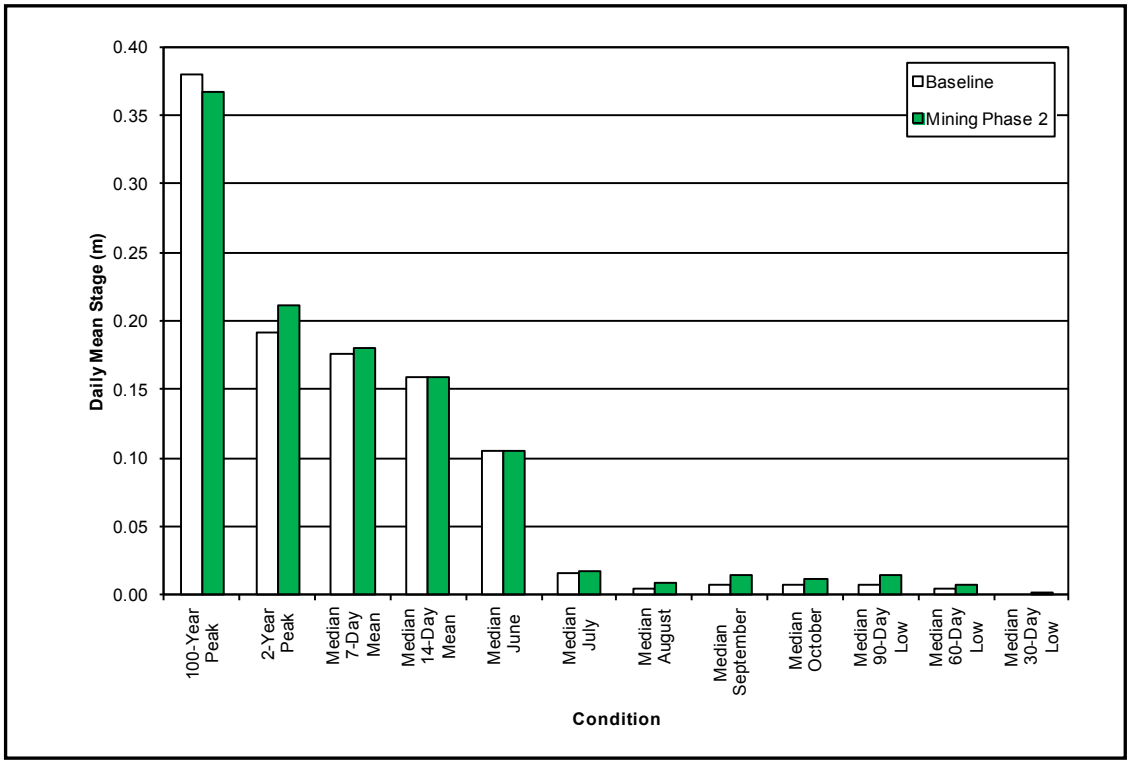



*Figure 7.3-69: Comparison of Effects on Lake E1 Stages - Mining Phase 2*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake E3 Outlet Flows:** the water balance results for Lake E3 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline from May to June, and increased from July to October due to the dewatering schedule of Lake E4. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 5% below the baseline value, and the 100-year flood discharge will remain unchanged. Dewatering of Lake E4 will cause low flows in Lake E3 to increase up to 100 times compared to baseline conditions.

**Lake E3 Water Levels:** Lake E3 flood water levels are also expected to be decreased from May to June, and increased from July to October during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.010 m, and the 100-year flood level will remain unchanged, while monthly mean stages are expected to decrease by 0.001 m and 0.004 m in May and June, respectively, and increase by 0.006 m in July, 0.012 m in August, 0.018 m in September, and 0.006 m in October under median conditions.

**Lake E3 and Outlet Channel/Bank Stability:** No effects on Lake E3 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be similar to baseline values.

**Lake E1 Outlet Flows:** the water balance results for Lake E1 show that during Mining Phase 2, monthly mean flows will be increased compared to baseline due to the dewatering schedule of Lake E4. The 2-year flood discharge during Mining Phase 2 will increase by approximately 17% above the baseline value, and the 100-year flood discharge will decrease by 5%. Dewatering of Lake E4 will cause low flows to increase by up to 25 times compared to baseline conditions.

**Lake E1 Water Levels:** Lake E1 water levels are also generally expected to be increased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to increase by approximately 0.019 m, and the 100-year flood level to decrease by 0.013 m, while monthly mean stages are expected to increase by less than 0.001 m (May), less than 0.001 m (June), 0.001 m (July), 0.004 m (August), 0.008 m (September), and 0.004 m (October) under median conditions.

**Lake E1 and Outlet Channel/Bank Stability:** No effects on Lake E1 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be similar to baseline values.

### *Lake J1*

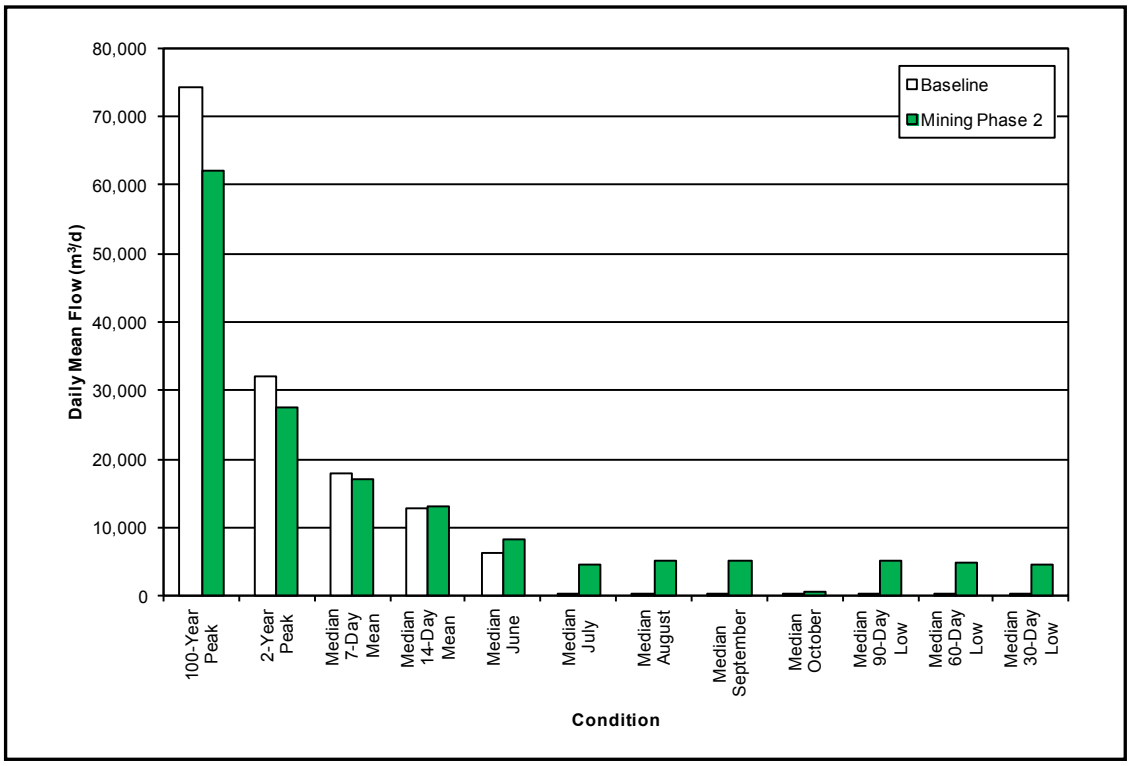



*Figure 7.3-70: Comparison of Effects on Lake J1 Outlet Discharges - Mining Phase 2*

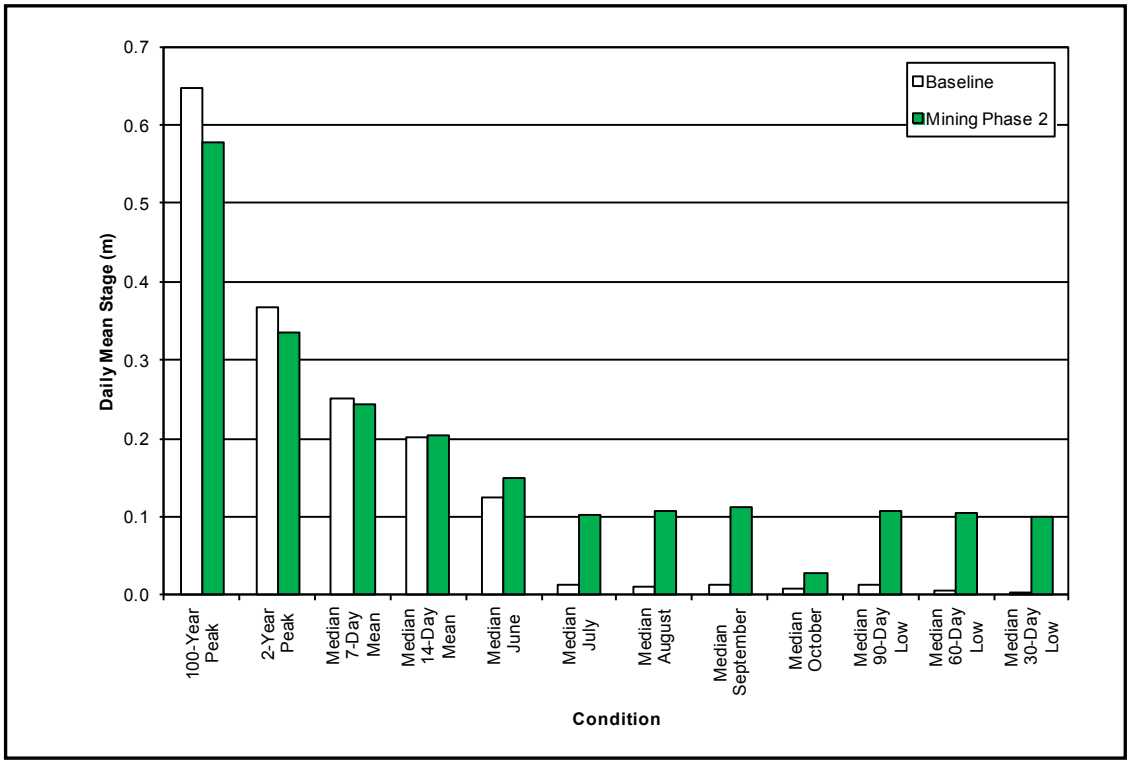



*Figure 7.3-71: Comparison of Effects on Lake J1 Stages - Mining Phase 2*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake J1 Outlet Flows:** the water balance results for Lake J1 show that during Mining Phase 2, monthly mean flows will be decreased in May compared to baseline, and increased from June to October due to the dewatering schedule of upstream waterbodies to Lake J1. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 14% below the baseline value, and the 100-year flood discharge by 16%. Dewatering of upstream waterbodies to Lake J1 will cause low flows to increase by 24 to 1500 times compared to baseline conditions.

**Lake J1 Water Levels:** Lake J1 water levels are also expected to be decreased in May, and increased from June to October during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.033 m, and the 100-year flood level by 0.071 m, while monthly mean stages are expected to decrease by 0.001 m in May, and increase by 0.025 m in June, 0.090 m in July, 0.097 m in August, 0.097 m in September, and 0.018 m in October under median conditions.

**Lake J1 and Outlet Channel/Bank Stability:** No effects on Lake J1 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

#### 7.3.3.6.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.6.2.1 Project Activities*

The construction of F Zone Pits during Mining Phase 2 will intercept runoff south of the constructed channel F-NC-01 and from Lake A5, Lake A4, Lake A3, Lake A2A, and Lake A2, that would have reported to Lake A1 under baseline conditions. This activity was considered in the effect analysis for the dewatering of Lake A6 to Lake A1 during Mining Phase 2 in Section 7.3.3.6.1, and therefore is not discussed further in the project infrastructure effect analysis for Mining Phase 2 below.

Similarly, development of the A45-2 waste rock storage facility during Mining Phase 2 will reduce runoff inflows to watersheds A and C. This activity was also considered in the effect analysis for the dewatering of Lake A6 to Lake A1 during Mining Phase 2 in Section 7.3.3.6.1, and therefore is not discussed further in the project infrastructure effect analysis for Mining Phase 2 below.

The construction of the B7 waste rock storage facility during Mining Phase 2 will require the infill of Lake B6, and Lake B5 will become Contact Water Pond AP-02. As such, Lake B6 and Lake B5 are no longer carried forward for assessment.

New project infrastructure activities for Mining Phase 2 include the construction of the B4 waste rock storage facility which will reduce inflows to downstream waterbodies including Lake B46, Lake B45/44, and Lake P2 from the pumping of contact water to AP-02. Likewise, the construction of the Wesmeg Pit #3 will reduce inflows to Lake I1 through the capture of drainage area runoff within the pit.

Following dewatering of Lake J6, Lake J5, Lake J4, Lake J3, Lake J2, and Lake J8 (Section 7.3.3.6.1, effects of dewatering in the J watershed during Mining Phase 2), the construction of the Wesmeg Pit #3 and of the Low Grade Ore Stockpile during Mining Phase 2 will require the isolation of Lake J1, which will have further effects on this waterbody.

##### *7.3.3.6.2.2 Environmental Design Feature and Mitigation*

Environmental design features and mitigations are not required.

##### *7.3.3.6.2.3 Effect Analysis*

The water balance model for the Project was used to examine potential project infrastructure effects on flows, water levels, and channel/bank stability during Mining Phase 2 on all downstream waterbodies between Lake B46 and the Lake B2 Lake outlet channel, between Lake C10 and the Lake C6 Lake outlet channel, and at the Lake I1 and Lake J1 outlets.

Potential project infrastructure effects during Mining Phase 2 are summarized for the:

- Lake B46 outlet in Figure 7.3-72 to Figure 7.3-73;
- Lake B4 outlet in Figure 7.3-74 to Figure 7.3-75;
- Lake P2 outlet in Figure 7.3-76 to Figure 7.3-77;
- Lake B2 outlet in Figure 7.3-78 to Figure 7.3-79;
- Lake C10 outlet in Figure 7.3-80 to Figure 7.3-81;
- Lake C6 outlet in Figure 7.3-82 to Figure 7.3-83;

- Lake I1 outlet in Figure 7.3-84 to Figure 7.3-85; and
- Lake J1 outlet in Figure 7.3-86 to Figure 7.3-87.

Additional information is provided in Appendix 7.3-C.

### *Lake B46 to Lake B2*

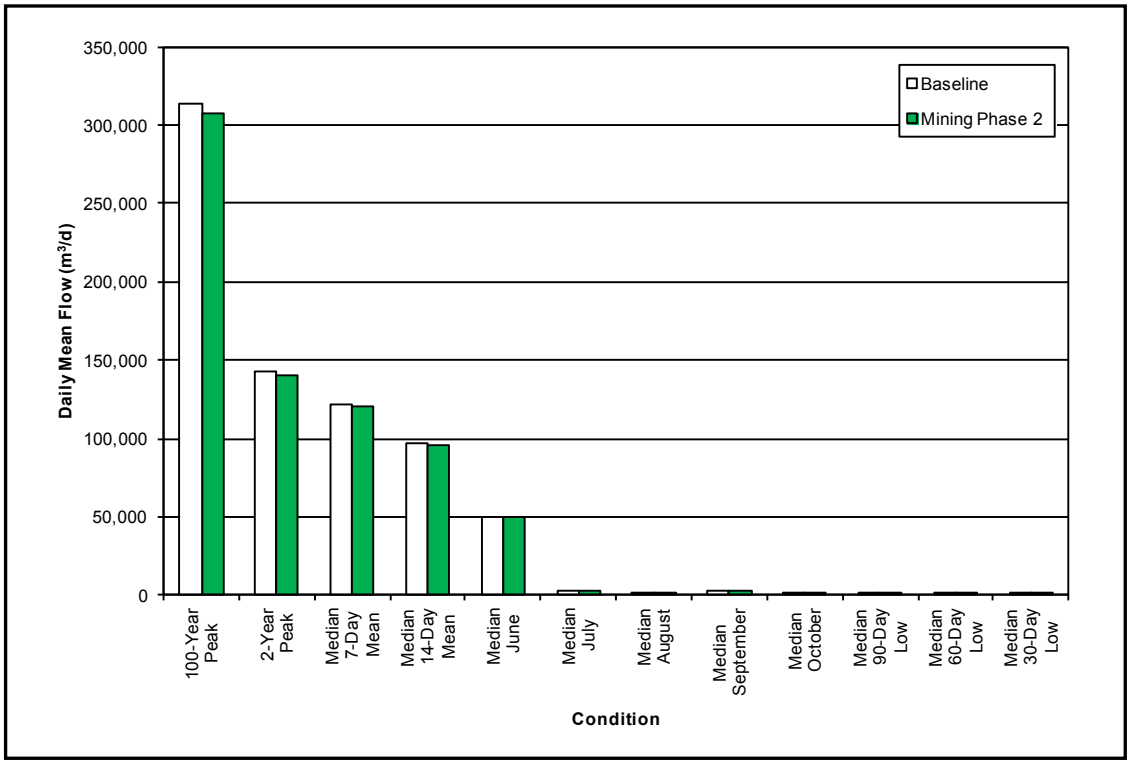



*Figure 7.3-72: Comparison of Effects on Lake B46 Outlet Discharges - Mining Phase 2*

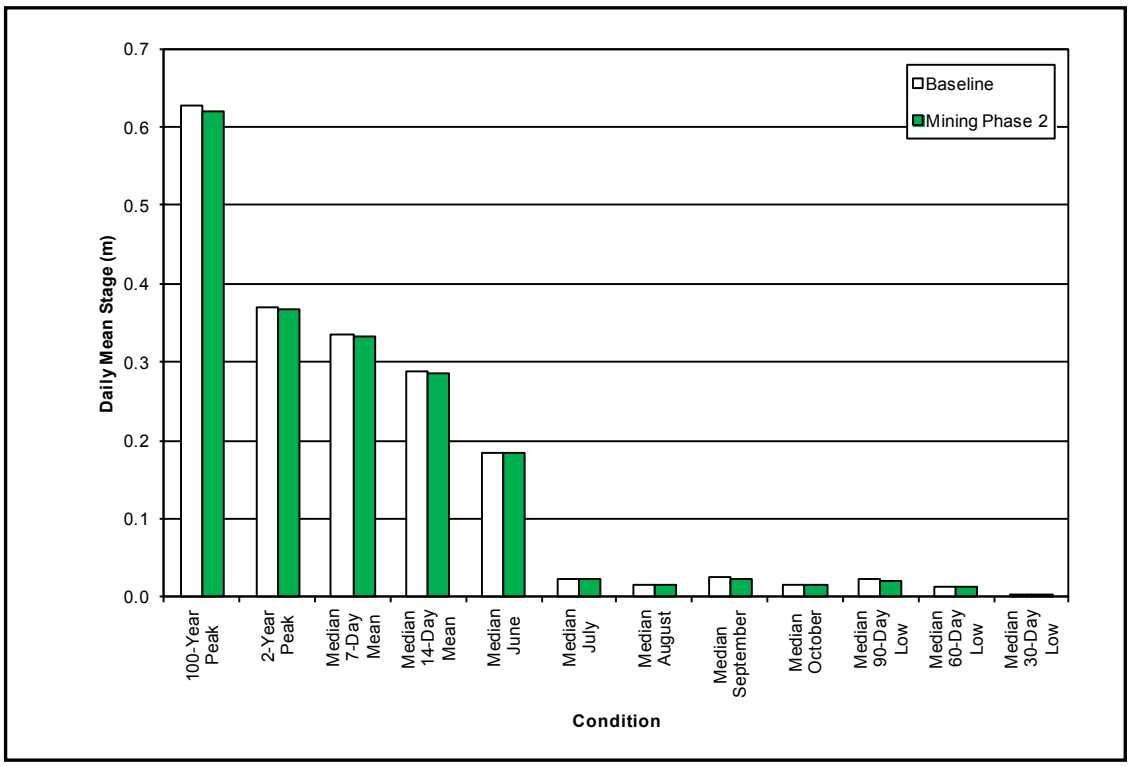



*Figure 7.3-73: Comparison of Effects on Lake B46 Stages - Mining Phase 2*

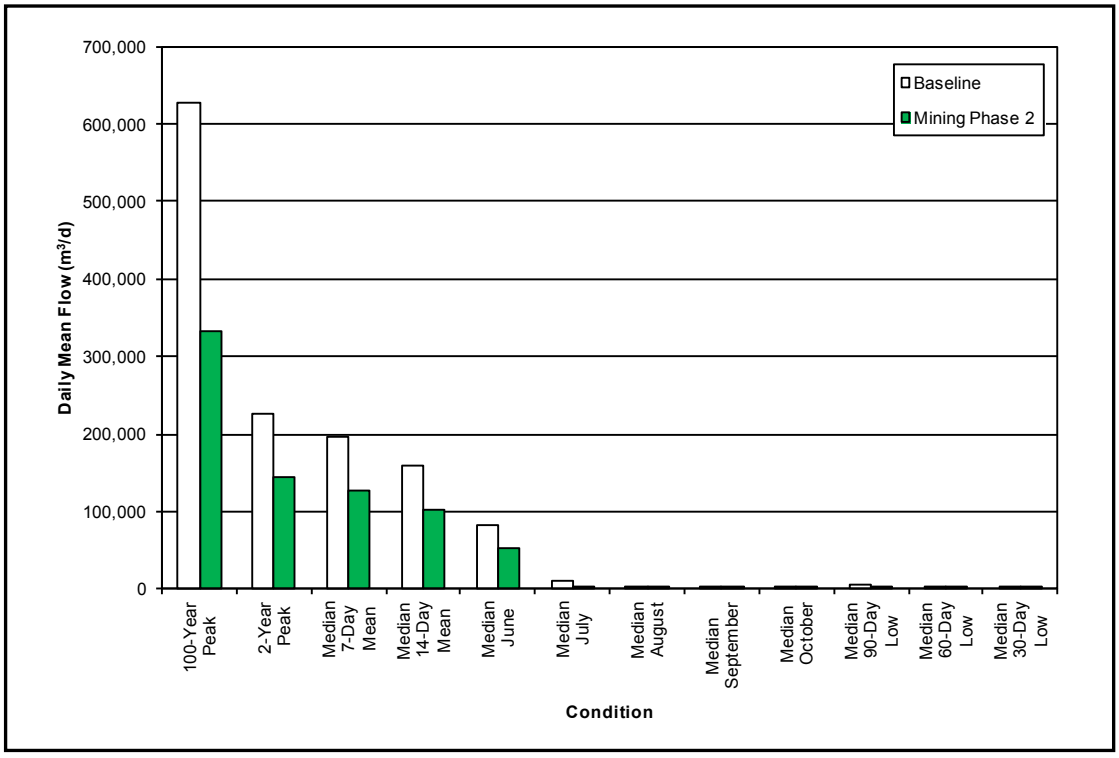



*Figure 7.3-74: Comparison of Effects on Lake B45/44 Outlet Discharges - Mining Phase 2 (Baseline Conditions based on Lake B4)*

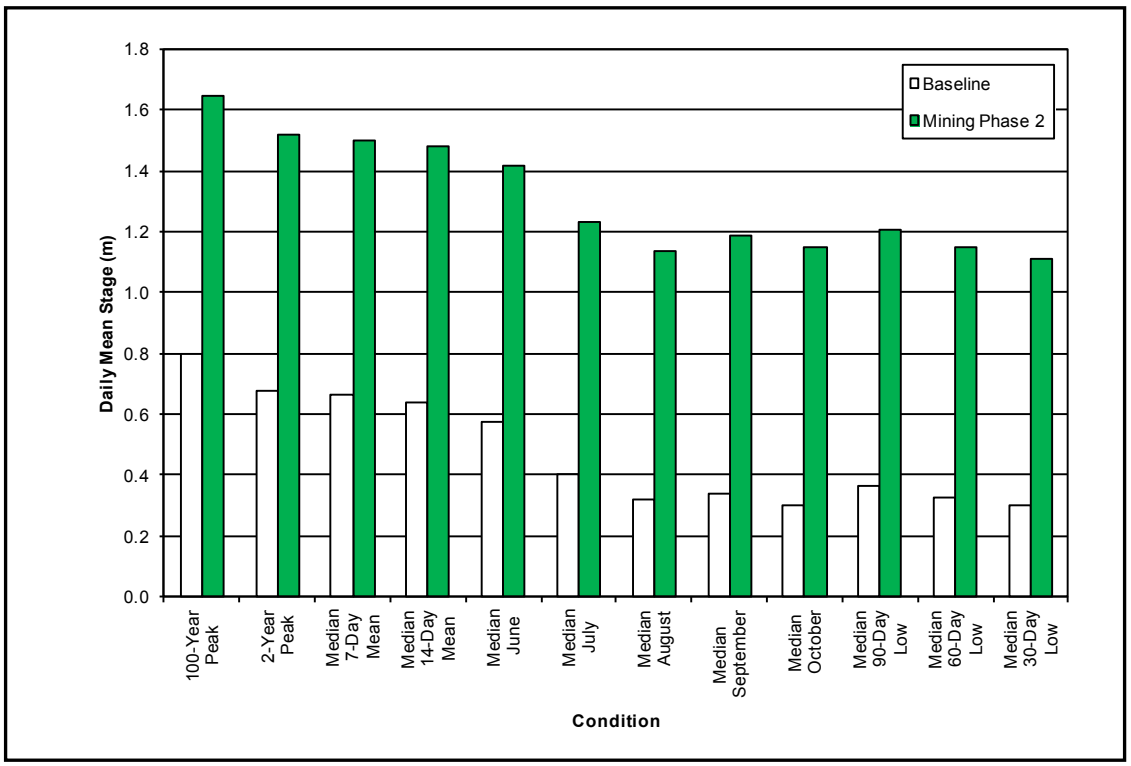



*Figure 7.3-75: Comparison of Effects on Lake B45/44 Stages - Mining Phase 2 (Baseline Conditions based on Lake B4)*

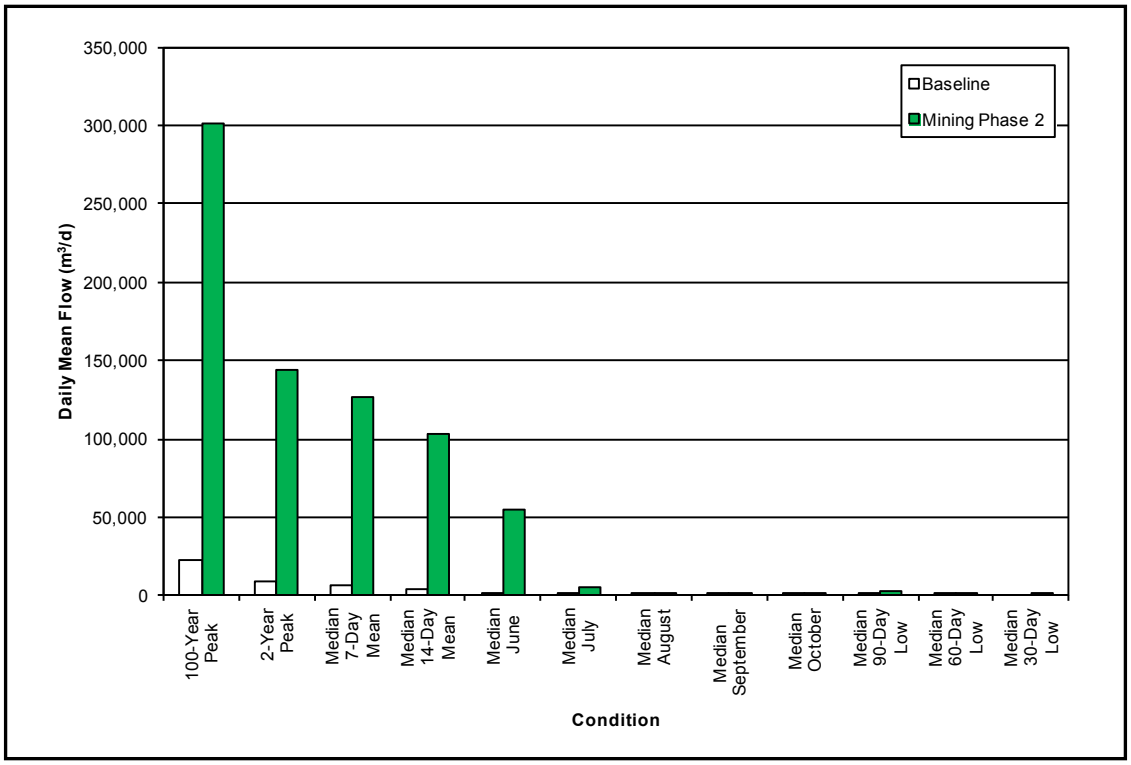



*Figure 7.3-76: Comparison of Effects on Lake P2 Outlet Discharges - Mining Phase 2*

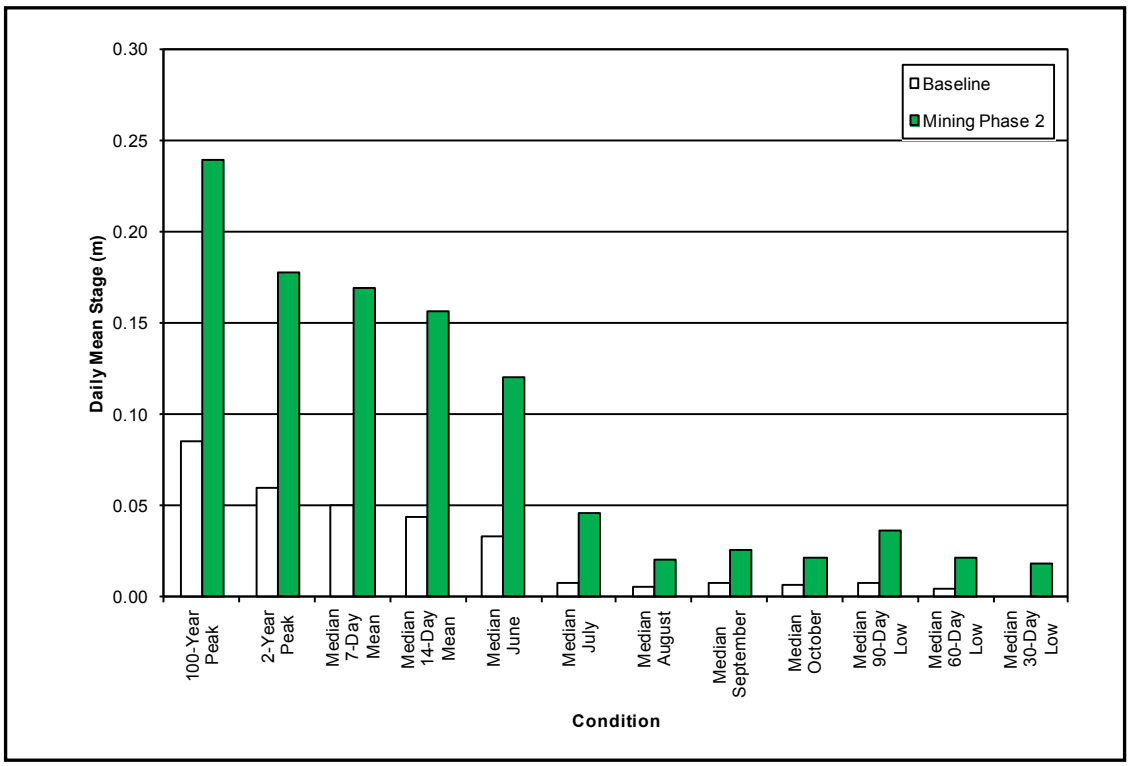



*Figure 7.3-77: Comparison of Effects on Lake P2 Stages - Mining Phase 2*

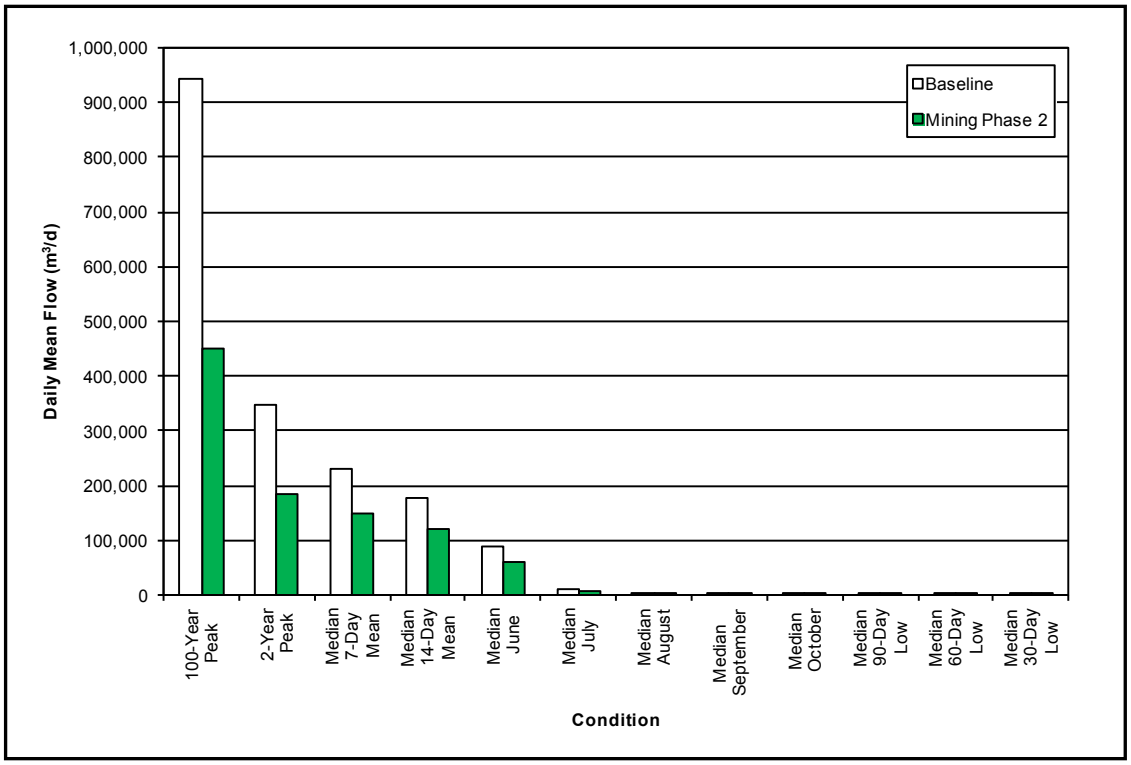



*Figure 7.3-78: Comparison of Effects on Lake B2 Outlet Discharges - Mining Phase 2*

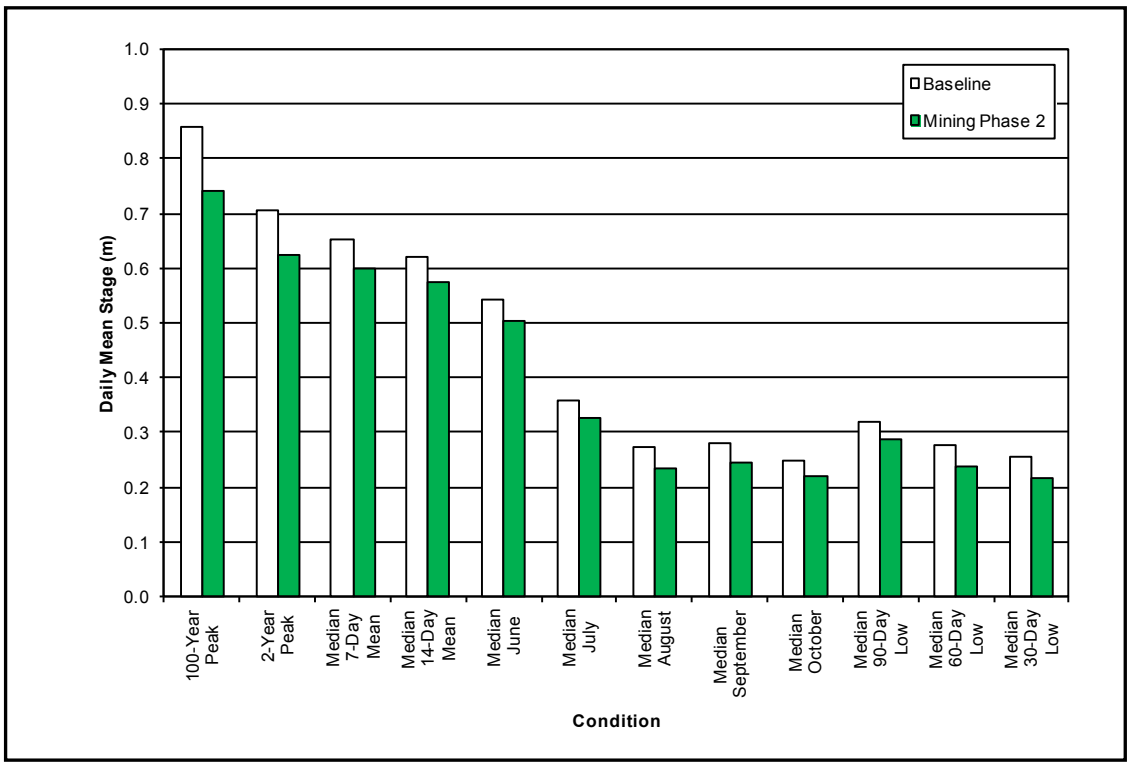



*Figure 7.3-79: Comparison of Effects on Lake B2 Stages - Mining Phase 2*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

The permanent diversion of Lake B45/44 to Lake P2, and Lake P2 to Lake B2, will result in reduced flow regimes (from the reduction in drainage area) and increased water level regimes at the Lake B45/44 and Outlet channel, relative to baseline conditions in Lake B4 (Section 7.3.3.3.3).

The diversion of Lake P2 to Lake B2 was modeled using the baseline stage-discharge rating curve of Lake P2, due to unknown design hydraulic parameters of the diversion channel at the time of this assessment.

**Lake B46 Outlet Flows:** the water balance results for Lake B46 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the B4 waste rock storage facility. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 1% below the baseline value, and the 100-year flood discharge by 2%. The reduction in drainage area will cause low flows to decrease by 5% to 9% compared to baseline conditions.

**Lake B46 Water Levels:** Lake B46 water levels are also expected to be decreased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.003 m, and the 100-year flood level by 0.008 m, while monthly mean stages are expected to decrease by 0.001 m (May), 0.002 m (June), less than 0.001 m (July), less than 0.001 m (August), 0.001 m (September), and less than 0.001 m (October) under median conditions.

**Lake B46 and Outlet Channel/Bank Stability:** No effects on Lake B46 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

**Lake B45/44 Outlet Flows:** the water balance results for Lake B45/44 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the B4 waste rock storage facility. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 36% below the baseline value, and the 100-year flood discharge by 47%. The additional reduction in drainage area will cause low flows to decrease by 55% to 83% compared to baseline conditions.

**Lake B45/44 Water Levels:** Lake B45/44 water levels will be raised compared to baseline conditions during Mining Phase 2. The 2-year flood level is expected to increase by approximately 0.833 m compared to baseline, and the 100-year flood level by 0.802 m, while monthly mean stages are expected to increase by 0.858 m (May), 0.838 m (June), 0.826 m (July), 0.812 m (August), 0.839 m (September), and 0.841 m (October) under median conditions.

**Lake B45/44 and Outlet Channel/Bank Stability:** the diversion of Lake B45/44 to the P watershed in Pre-production Year -3 will create new shorelines at higher elevations than the existing shorelines. The will expose new soils, often on steeper slopes than the existing shorelines, to wave erosion and potential instability due to permafrost disturbance. Mitigation measures to minimize shoreline erosion are proposed according to the analysis presented in Appendix 7.3-D. These include two possible mitigation options:

- Preventative mitigation – the shoreline is modified by armouring or re-sloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.

- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for at least 10 years following the onset of the increased water level.

**Lake P2 Outlet Flows:** the water balance results for Lake P2 show that during Mining Phase 2, monthly mean flows will be increased compared to baseline due to the diversion of the B watershed to the P watershed, despite a reduction in local drainage area from the B4 waste rock storage facility. The 2-year flood discharge during Mining Phase 2 will increase by approximately 14 times over the baseline value, and the 100-year flood discharge by 1242%. Low flows will increase by 36 to approximately 470 times compared to baseline conditions.

**Lake P2 Water Levels:** Lake P2 water levels are also expected to be increased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to increase by approximately 0.118 m, and the 100-year flood level by 0.154 m, while monthly mean stages are expected to increase by 0.026 m (May), 0.087 m (June), 0.038 m (July), 0.014 m (August), 0.018 m (September), and 0.015 m (October) under median conditions. It should be noted that these estimates were based on the existing stage-discharge rating curve of Lake P2 and actual increases in water levels will depend on the detailed design of the diversion channel connecting Lake P2 to Lake B2. The diversion channel will act to mitigate potential impacts related to increases in water level in Lake P2 (and flows in the existing Lake P2 outlet) by providing an additional outlet from the waterbody.

**Lake P2 and Outlet Channel/Bank Stability:** No effects on Lake P2 and existing outlet channel or bank stability are expected during Mining Phase 2 because potential effects will be mitigated by the diversion channel. In addition, the diversion channel will be designed and constructed to prevent erosion and sedimentation.

**Lake B2 Outlet Flows:** the water balance results for Lake B2 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the B4 waste rock storage facility. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 47% below the baseline value, and the 100-year flood discharge by 52%. The reduction in drainage area will cause low flows to decrease by 41% to 56% compared to baseline conditions.

**Lake B2 Water Levels:** Lake B2 water levels are also expected to be decreased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.082 m, and the 100-year flood level by 0.117 m, while monthly mean stages are expected to decrease by 0.025 m (May), 0.039 m (June), 0.032 m (July), 0.038 m (August), 0.038 m (September), and less than 0.027 m (October) under median conditions.

**Lake B2 and Outlet Channel/Bank Stability:** No effects on Lake B2 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

### *Lake C10 to Lake C6*

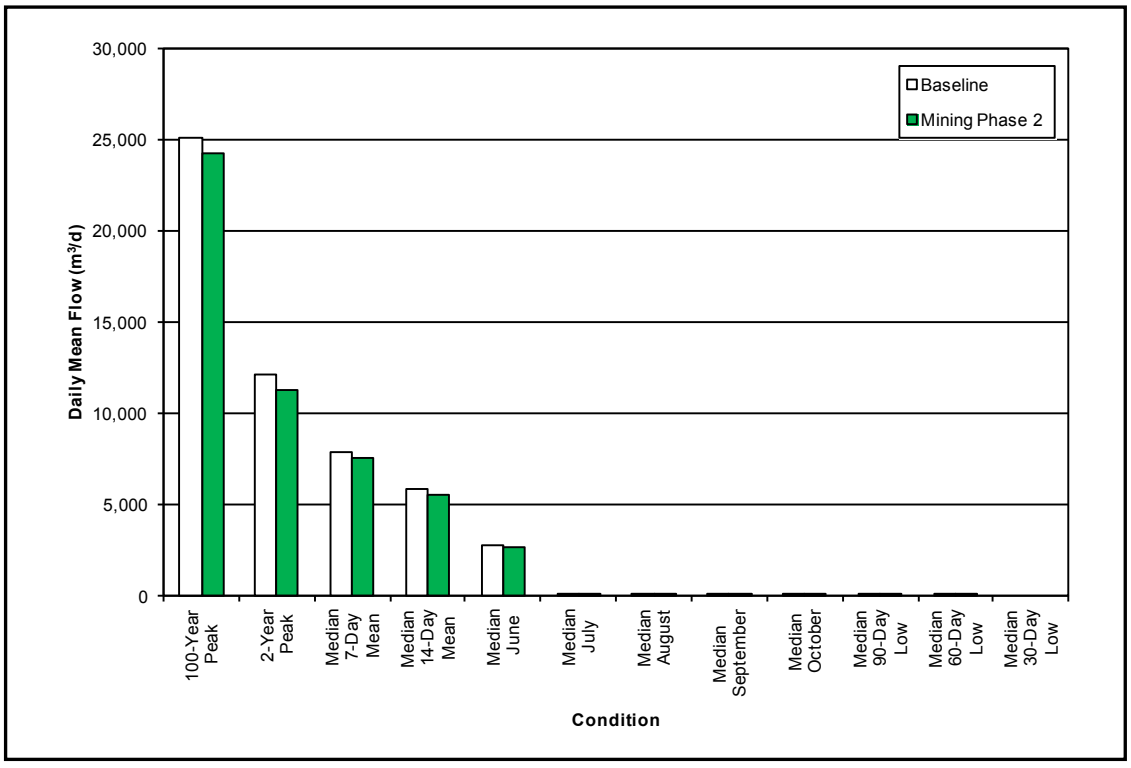



*Figure 7.3-80: Comparison of Effects on Lake C10 Outlet Discharges - Mining Phase 2*

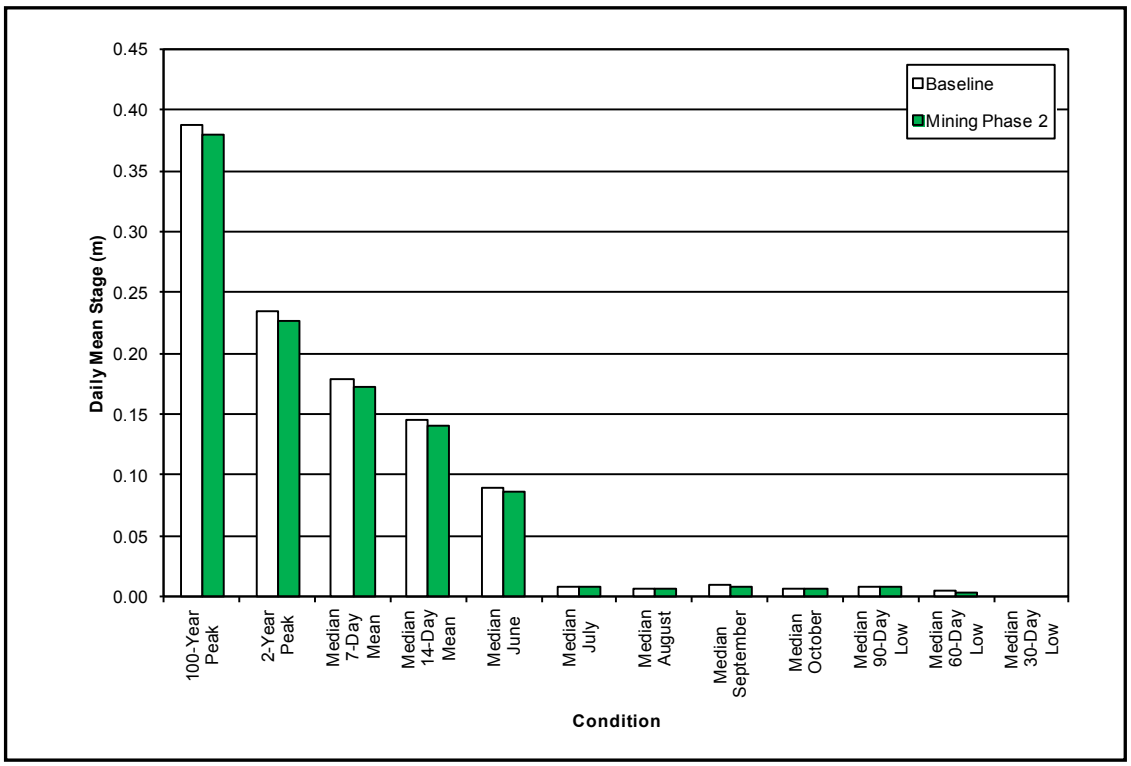



*Figure 7.3-81: Comparison of Effects on Lake C10 Stages - Mining Phase 2*

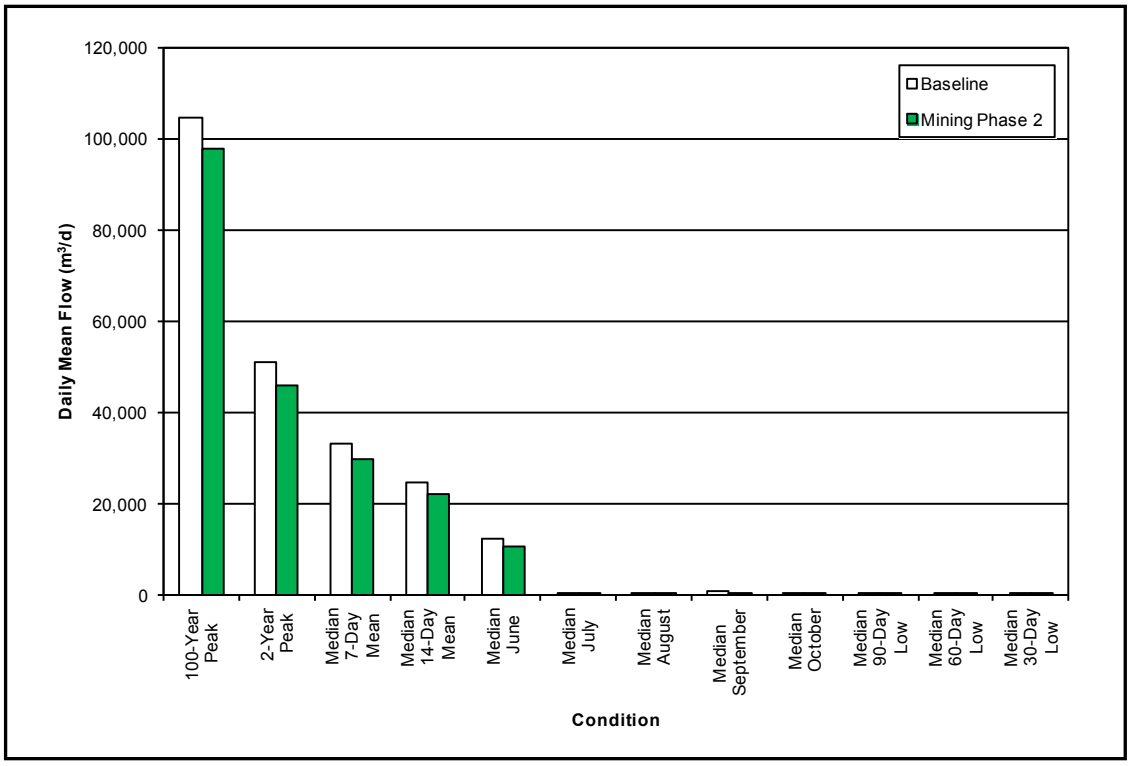



*Figure 7.3-82: Comparison of Effects on Lake C6 Outlet Discharges - Mining Phase 2*

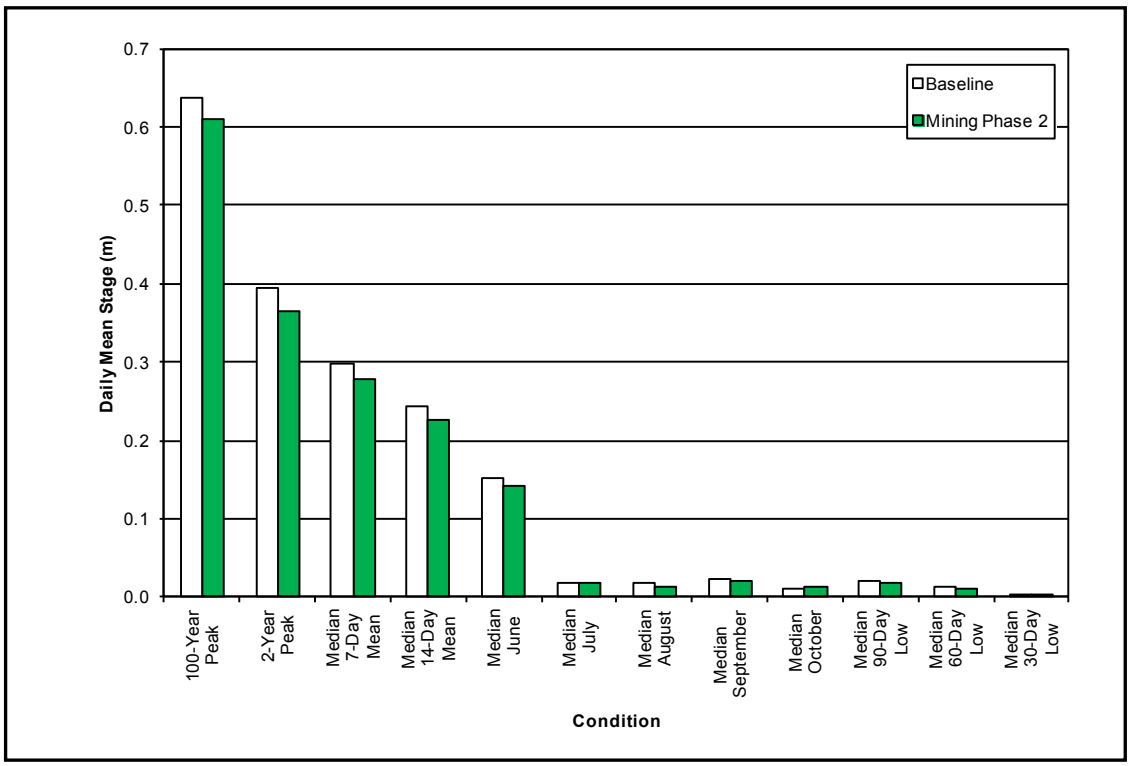



*Figure 7.3-83: Comparison of Effects on Lake C6 Stages - Mining Phase 2*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake C10 Outlet Flows:** the water balance results for Lake C10 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the A45-2 waste rock storage facility. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 7% below the baseline value, and the 100-year flood discharge by 3%. The reduction in drainage area will cause low flows to decrease by 11% to 20% compared to baseline conditions.

**Lake C10 Water Levels:** Lake C10 water levels are also expected to be decreased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.008 m, and the 100-year flood level by 0.009 m, while monthly mean stages are expected to decrease by 0.001 m (May), 0.003 m (June), less than 0.001 m (July), 0.001 m (August), 0.001 m (September), and 0.001 m (October) under median conditions.

**Lake C10 and Outlet Channel/Bank Stability:** No effects on Lake C10 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

**Lake C6 Outlet Flows:** the water balance results for Lake C6 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the A45-2 waste rock storage facility. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 10% below the baseline value, and the 100-year flood discharge by 7%. The reduction in drainage area will cause low flows to decrease by 23% to 50% compared to baseline conditions.

**Lake C6 Water Levels:** Lake C6 water levels are also expected to be decreased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.028 m, and the

100-year flood level by 0.028 m, while monthly mean stages are expected to decrease by 0.003 m (May), 0.011 m (June), 0.002 m (July), 0.003 m (August), 0.004 m (September), and increase by 0.001 m (October), under median conditions.

**Lake C6 and Outlet Channel/Bank Stability:** No effects on Lake C6 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

### *Lake I1*

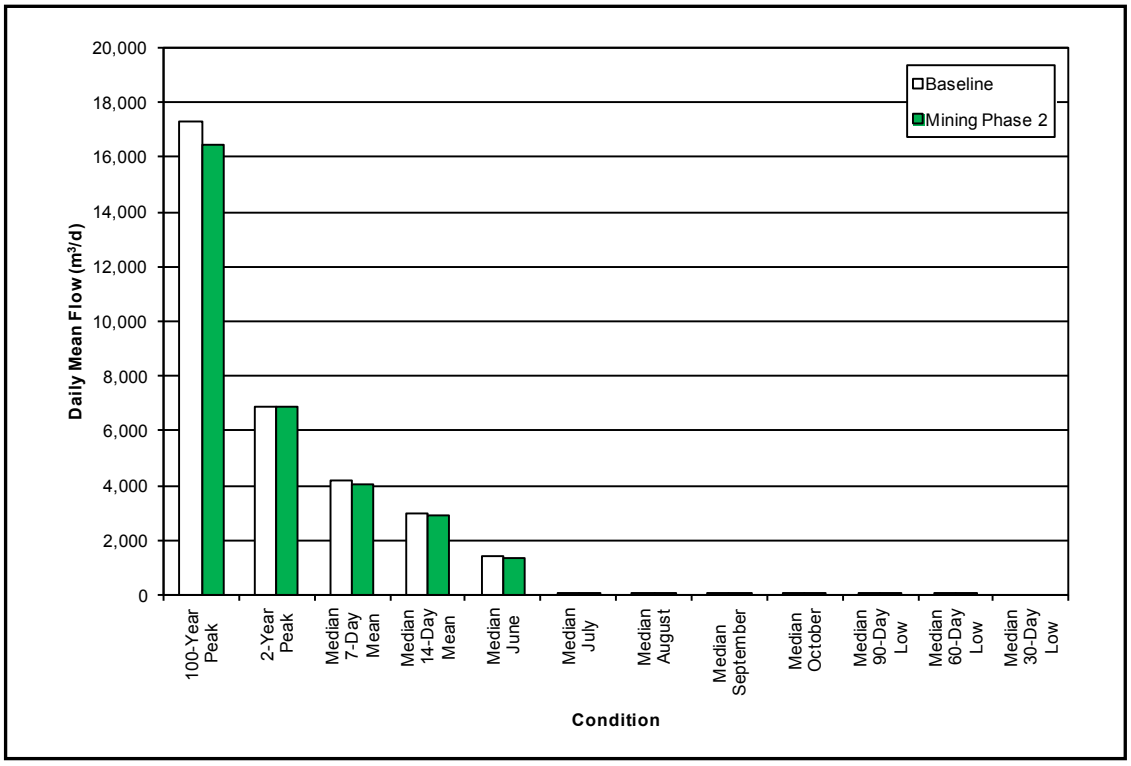



*Figure 7.3-84: Comparison of Effects on Lake I1 Outlet Discharges - Mining Phase 2*

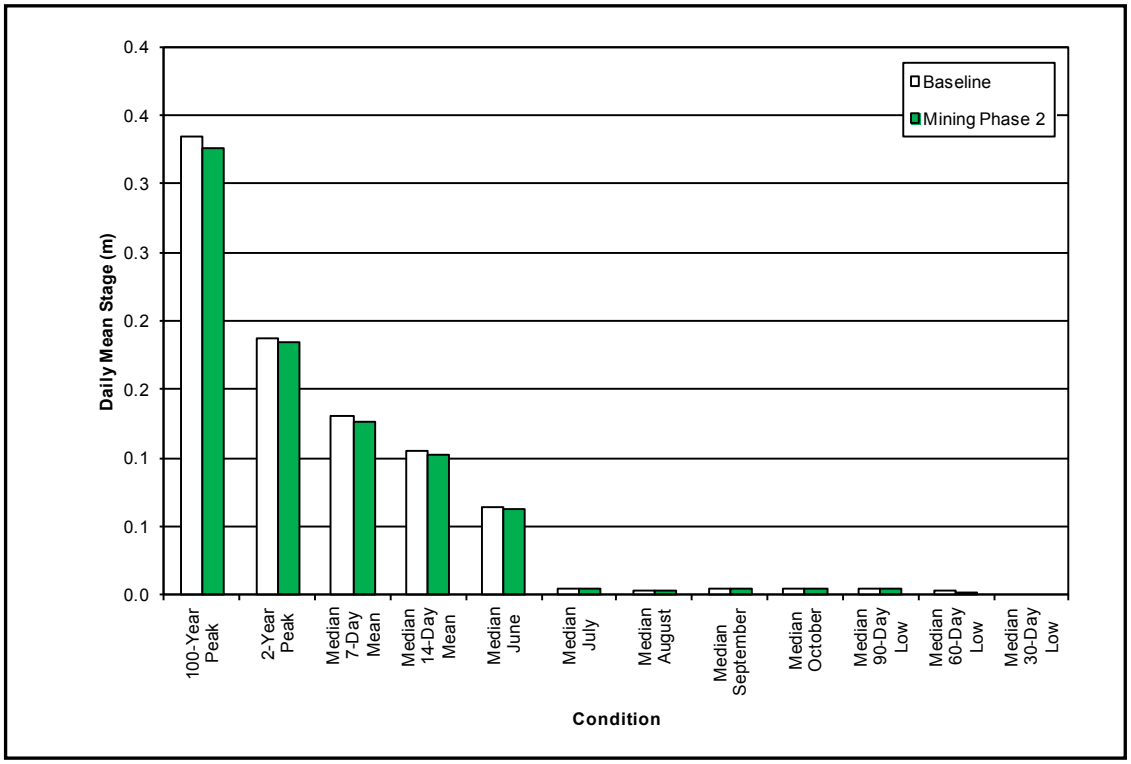



*Figure 7.3-85: Comparison of Effects on Lake I1 Stages - Mining Phase 2*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake I1 Outlet Flows:** the water balance results for Lake I1 show that during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the Wesmeg #3 Pit. The 2-year flood discharge during Mining Phase 2 will decrease by less than 0.01% below the baseline value, and the 100-year flood discharge by 5%. The reduction in drainage area from the Wesmeg #3 Pit will cause low flows to decrease up to 9% compared to baseline conditions.

**Lake I1 Water Levels:** Lake I1 water levels are also expected to be decreased during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.003 m, and the 100-year flood level by 0.008 m, while monthly mean stages are expected to decrease by 0.001 m (May), 0.002 m (June), less than 0.001 m (July), less than 0.001 m (August), less than 0.001 m (September), and less than 0.001 m (October) under median conditions.

**Lake I1 and Outlet Channel/Bank Stability:** No effects on Lake I1 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

## Lake J1

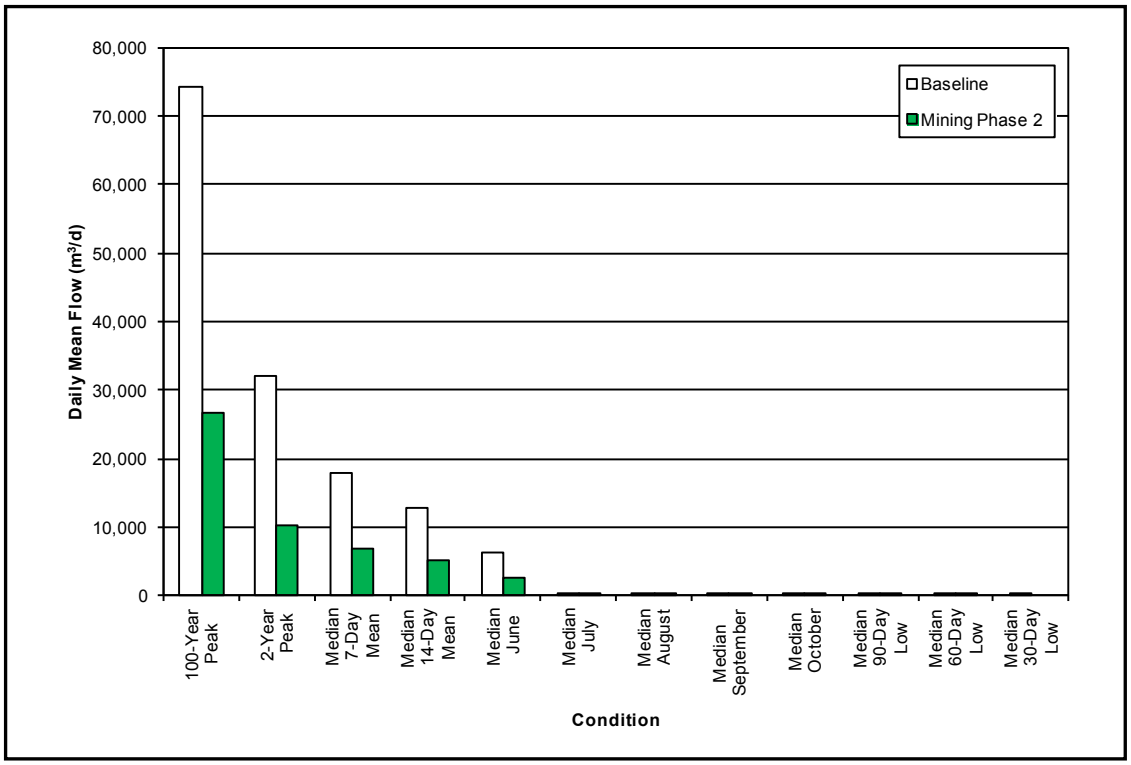



*Figure 7.3-86: Comparison of Effects on Lake J1 Outlet Discharges - Mining Phase 2*

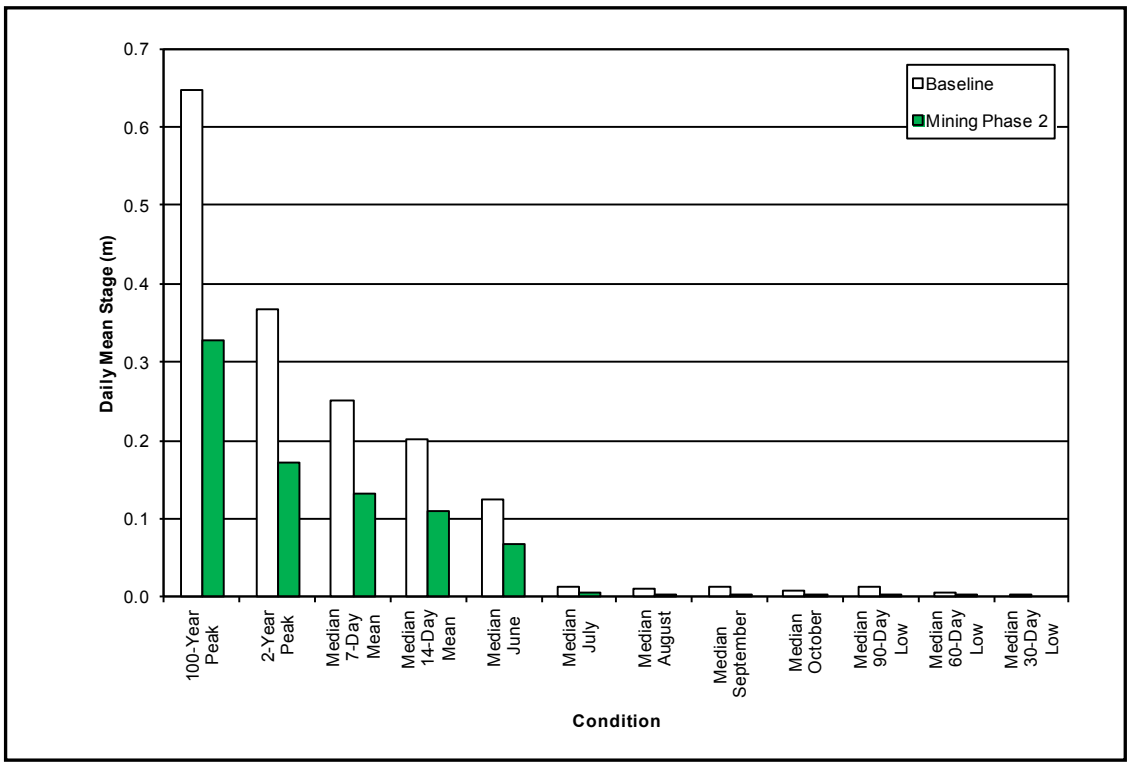



*Figure 7.3-87: Comparison of Effects on Lake J1 Stages - Mining Phase 2*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake J1 Outlet Flows:** the water balance results for Lake J1 show that following development of Wesmeg #3 Pit during Mining Phase 2, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from the isolation of Lake J1 from upstream inflow. The 2-year flood discharge during Mining Phase 2 will decrease by less than approximately 68% below the baseline value, and the 100-year flood discharge by 64%. The reduction in drainage area will cause low flows to decrease from 80% to 100% compared to baseline conditions.

**Lake J1 Water Levels:** Lake J1 water levels are also expected to be decreased following development of Wesmeg #3 Pit during Mining Phase 2 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.197 m, and the 100-year flood level by 0.320 m, while monthly mean stages are expected to decrease by 0.013 m (May), 0.056 m (June), 0.007 m (July), 0.008 m (August), 0.011 m (September), and 0.006 m (October) under median conditions.

**Lake J1 and Outlet Channel/Bank Stability:** No effects on Lake J1 and Outlet channel or bank stability are expected during Mining Phase 2 because flood magnitudes will be reduced from baseline values.

#### 7.3.3.6.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.6.3.1 Project Activities*

The road to the B4 Waste Rock Area will require ongoing diversion of the portion of Lake A8 located south of Dike WM-D-01 to Lake A31 during Mining Phase 2. This will affect Lake A31 and other waterbodies downstream including Lake A6 and Lake A1. Effects of this diversion were considered in Section 7.3.3.6.2 (effects of Project infrastructure in the A watershed during Mining Phase 2), and therefore are not discussed further in the watershed diversion effect analysis for Mining Phase 2 below.

Similarly, mining of the F Zone Pits will require the ongoing diversion of pumped flows from Lake A6, and of runoff of waterbodies located upstream of Lake A19 (including Lake A22, Lake A23, Lake A24, Lake A25, Lake A26, Lake A27 and Lake A28) through constructed channel F-NC-01 to Lake A1 during Mining Phase 2. Effects of these diversions were considered in Section 7.3.3.6.2 (effects of Project infrastructure in the A watershed during Mining Phase 2), and therefore are also not discussed further in the watershed diversion effect analysis for Mining Phase 2 below.

Likewise, diversions of Lake B45/44 to Lake P2, and Lake P2 to Lake B2 will remain from previous phases. Effects of these diversions during Mining Phase 2 were considered in Section 7.3.3.6.2 (effects of Project infrastructure in the B watershed during Mining Phase 2), and therefore are not discussed further in the watershed diversion effect analysis 2 below.

The B7 waste rock storage facility will require ongoing diversion of Lake B33A away from the B7 waste rock storage facility through constructed channel WM-NC-01 to Lake B5 during Mining Phase 2. Since Lake B5 will become Contact Water Pond AP-02 during Mining Phase 2, an effect analysis was not carried forward.

##### *7.3.3.6.3.2 Environmental Design Feature and Mitigation*

At diversion outlets, a channel will be constructed to convey flows. The diversion outlet channel will be designed to approximate the natural hydrograph to the extent possible so as to manage the water level regime of the diverted waterbodies. Diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn et al. 2012) and to incorporate lessons learned at other northern sites (Jones et al. 2003).

### *7.3.3.7 Effect Analysis Results – Mining Phase 3 (Years 5 to 8)*

#### 7.3.3.7.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.7.1.1 Project Activities*

During Mining Phase 3, pumping from Lake A8 to Lake A7 and Lake A6 to constructed channel F-NC-01 will continue, but at a lower rate than during Mining Phase 2, so as to maintain Lake A8 dry and Lake A6 lowered by 1.5 m.

#### 7.3.3.7.1.2 Environmental Design Feature and Mitigation

Pumped discharges will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Final discharge locations will be determined during the detailed design stage and may be modified based on monitoring results.

#### 7.3.3.7.1.3 Effect Analysis

The water balance model for the Project was used to examine potential dewatering effects on flows, water levels, and channel/bank stability during Mining Phase 3 in the Lake A1 outlet channel. Project effects at the Lake A1 outlet during Mining Phase 2 are summarized in Figure 7.3-88 to Figure 7.3-89 with additional information provided in Appendix 7.3-C.

### Lake A1

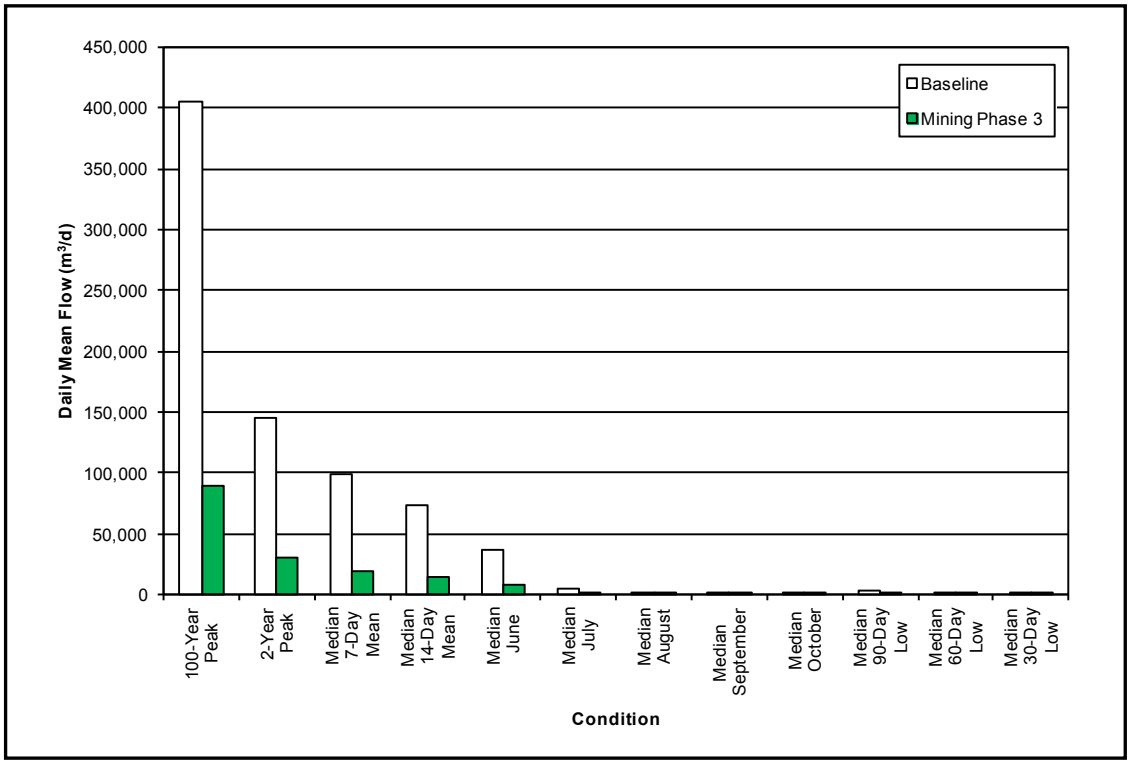



*Figure 7.3-88: Comparison of Effects on Lake A1 Outlet Discharges - Mining Phase 3*

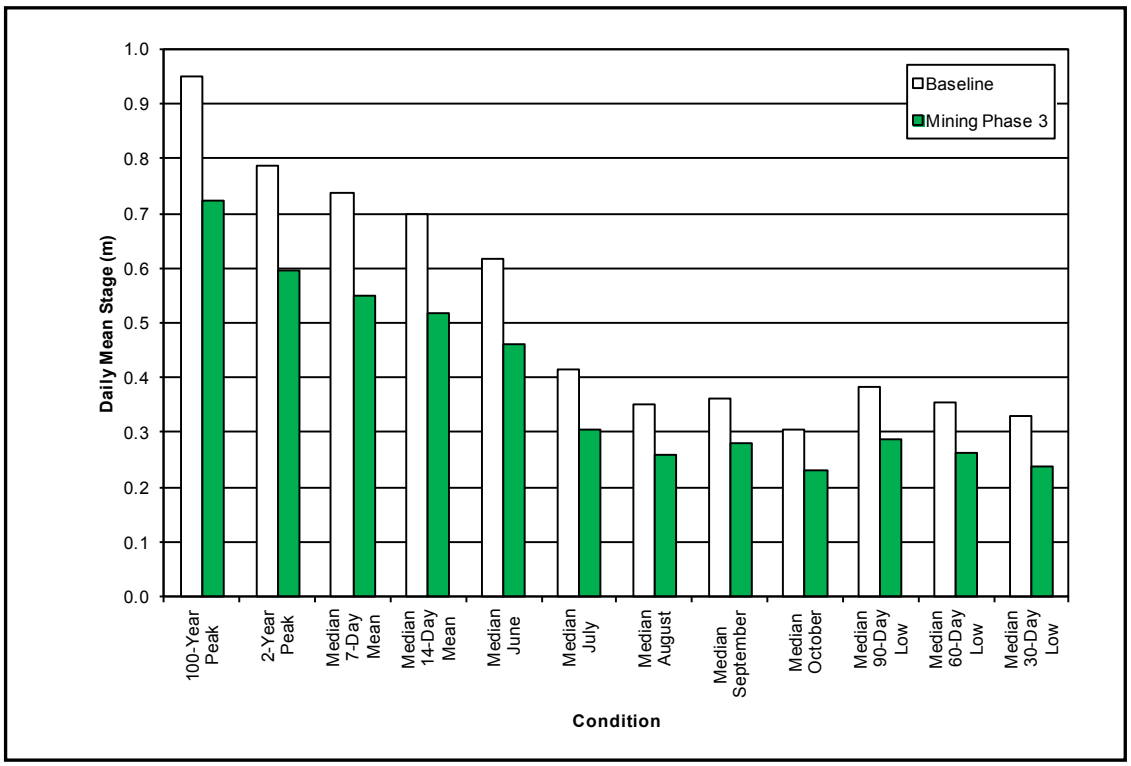



*Figure 7.3-89: Comparison of Effects on Lake A1 Stages - Mining Phase 3*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake A1 Outlet Flows:** the water balance results for Lake A1 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due to reduced inflows from upstream watersheds. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 79% below the baseline value, and the 100-year flood discharge by 78%. Dewatering will cause low flows to decrease by 80% to 83% compared to baseline conditions.

**Lake A1 Water Levels:** Lake A1 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.194 m, and the 100-year flood level by 0.227, while monthly mean stages are expected to decrease by 0.092 m (May), 0.154 m (June), 0.109 m (July), 0.093 m (August), 0.083 m (September), and 0.072 m (October) under median conditions.

**Lake A1 and Outlet Channel/Bank Stability:** No effects on Lake A1 and Outlet channel or bank stability are expected during Pre-production Mining Phase 3 because flood magnitudes will be reduced from baseline values.

#### 7.3.3.7.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.7.2.1 Project Activities*

The F Zone Pits will continue to intercept runoff south of the constructed channel F-NC-01 and from Lake A5, Lake A4, Lake A3, Lake A2A, and Lake A2, that would have reported to Lake A1 under baseline conditions. This activity was considered in the effect analysis for the dewatering of Lake A6 to Lake A1 during Mining Phase 3 in Section 7.3.3.7.1, and therefore is not discussed further in the project infrastructure effect analysis for Mining Phase 3 below.

Runoff from the A45-2 waste rock storage facility will continue to be pumped to AP-01 during Mining Phase 3, thereby reducing inflows to watersheds A and C. This activity was considered in the effect analysis for the dewatering of Lake A6 to Lake A1 during Mining Phase 3 in Section 7.3.3.7.1, and in the effect analysis for infrastructure in the C watershed during Mining Phase 2 in Section 7.3.3.6.2. Therefore, this activity is also not discussed further in the project infrastructure effect analysis for Mining Phase 3 below.

Similarly, Wesmeg Pit #3 will continue capture of drainage area runoff within the pit during Mining Phase 3, and corresponding potential effects to Lake I1 and Lake J1 will remain the same as described in Section 7.3.3.6.2 of Mining Phase 2. Therefore, these lakes are not discussed further in the project infrastructure effect analysis for Mining Phase 3 below.

New activities in Mining Phase 3 include the construction of dikes P-D-01 and P-D-02 to allow for mining of Pump Pit #1. This dike infrastructure will act to further reduce inflows to the B46 sub-watershed (inflows were also reduced in Mining Phase 2 through the development of the B4 waste rock storage facility), which will affect waterbodies downstream including Lake B46, Lake B45/44, Lake P2 and Lake B2.

In addition, the B7 waste rock storage facility will continue to expend to cover most of Lake E4 dewatered during Mining Phase 2, thereby further reducing inflows to Lake E3. This will affect waterbodies downstream of Dike B7-D-01 including Lake E3, Lake E2, and Lake E1.

The construction of the Discovery Pit and of the Discovery Pit Waste Rock Pile in the CH6 sub-watershed during Mining Phase 3 will reduce inflows to Lake CH6. This will affect Lake CH6 and downstream waterbodies including Lake CH5 and Lake CH1. The Discovery Pit also overlaps slightly on the X watershed (approximately 0.020 $km^2$) and effects are expected to be negligible and are not discussed further.

##### *7.3.3.7.2.2 Environmental Design Feature and Mitigation*

Environmental design features and mitigations are not required.

##### *7.3.3.7.2.3 Effect Analysis*

The water balance model for the Project was used to examine potential project infrastructure effects on flows, water levels, and channel/bank stability during Mining Phase 3 on all downstream waterbodies between Lake B46 and the Lake B2 Lake outlet channel, Lake E3 and the Lake E1 Lake outlet channel, and Lake CH6 the Lake CH1 Lake outlet channel.

Potential project infrastructure effects during Mining Phase 3 are summarized for the:

- Lake B46 outlet in Figure 7.3-90 to Figure 7.3-91;
- Lake B45/44 outlet in Figure 7.3-92 to Figure 7.3-93;
- Lake P2 outlet in Figure 7.3-94 to Figure 7.3-95;
- Lake B2 outlet Figure 7.3-96 to Figure 7.3-97;
- Lake E3 outlet in Figure 7.3-98 to Figure 7.3-99;
- Lake E1 outlet in Figure 7.3-100 to Figure 7.3-101;
- Lake CH6 outlet in Figure 7.3-102 to Figure 7.3-103; and
- Lake CH1 outlet in Figure 7.3-104 to Figure 7.3-105.

Additional information is also provided in Appendix 7.3-C.

### *Lake B46 to Lake B2*

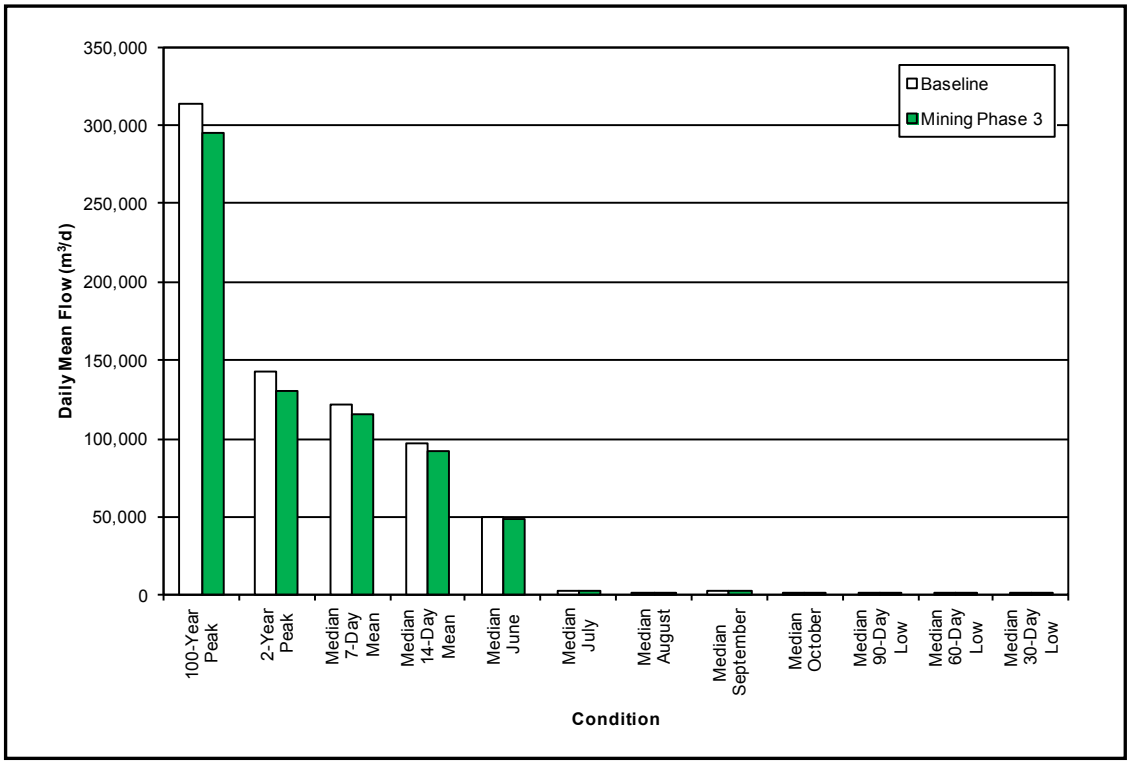



*Figure 7.3-90: Comparison of Effects on Lake B46 Outlet Discharges - Mining Phase 3*

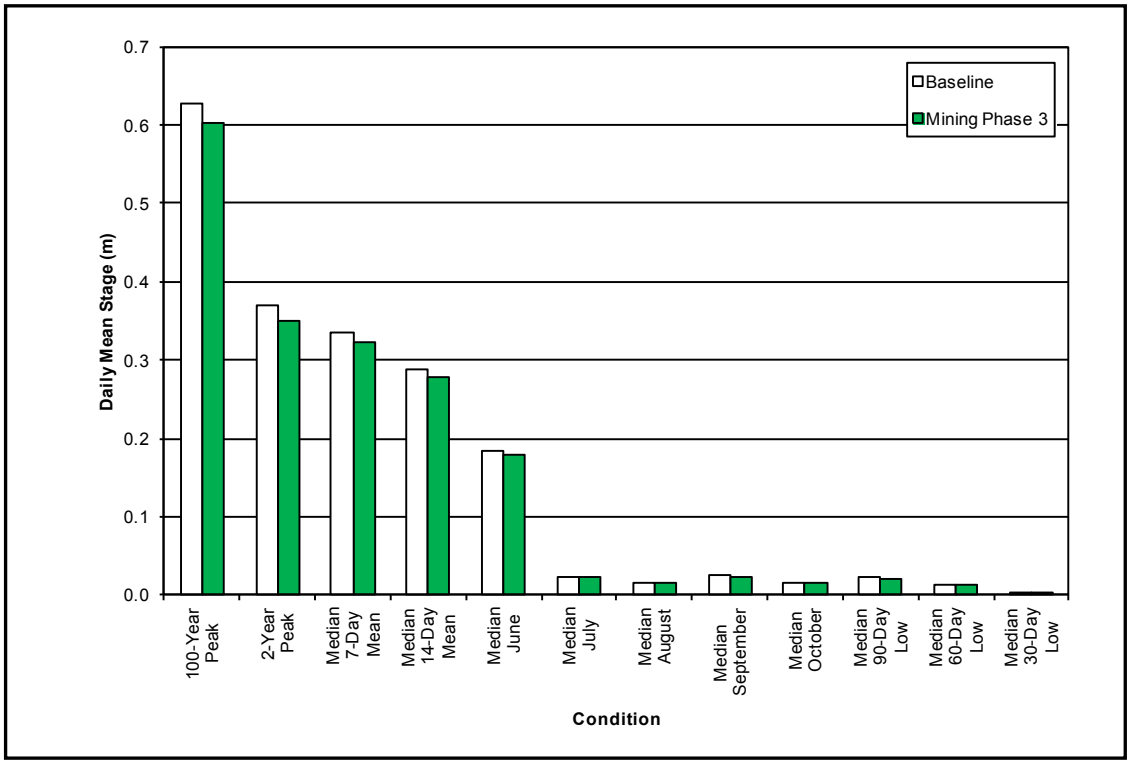



*Figure 7.3-91: Comparison of Effects on Lake B46 Stages - Mining Phase 3*

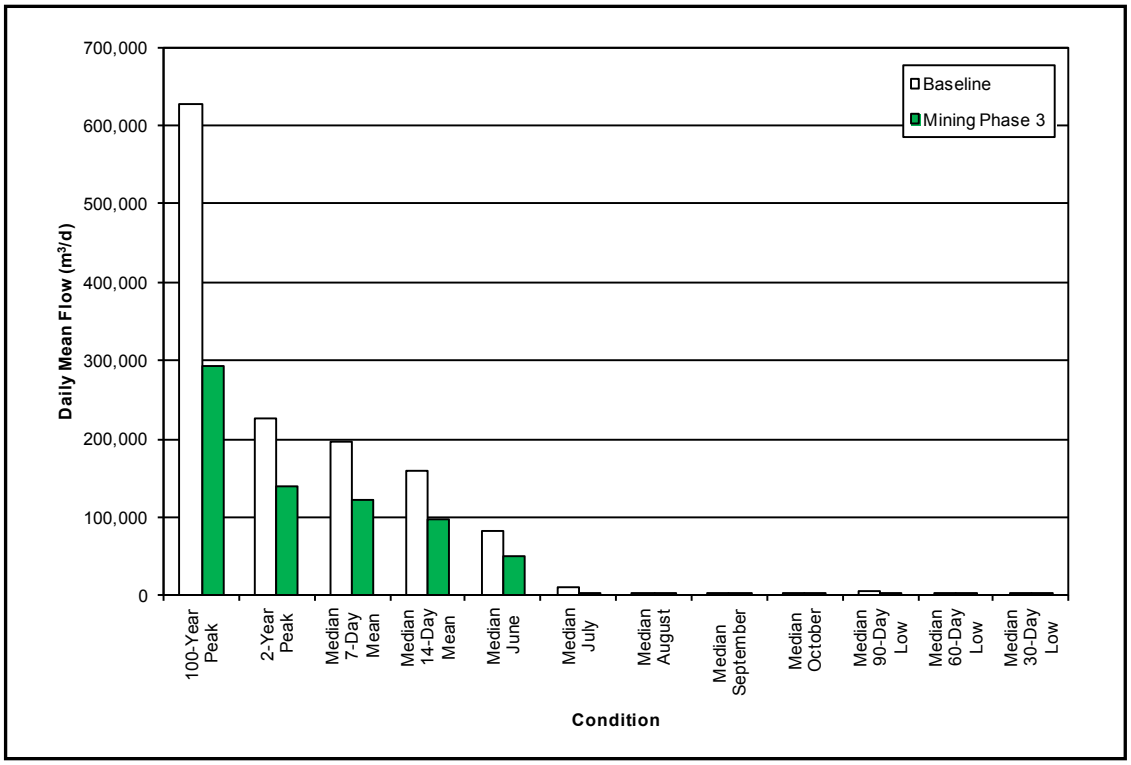



*Figure 7.3-92: Comparison of Effects on Lake B45/44 Outlet Discharges - Mining Phase 3 (Baseline Conditions based on Lake B4)*

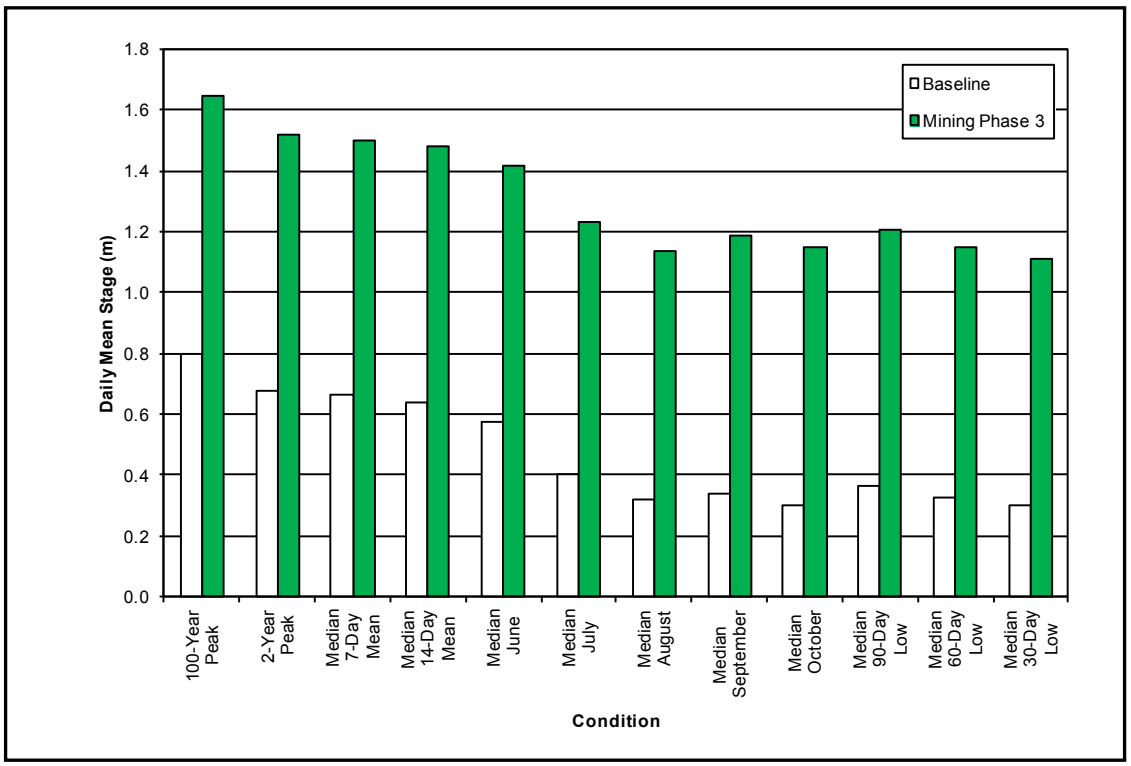



*Figure 7.3-93: Comparison of Effects on Lake B45/44 Stages - Mining Phase 3 (Baseline Conditions based on Lake B4)*

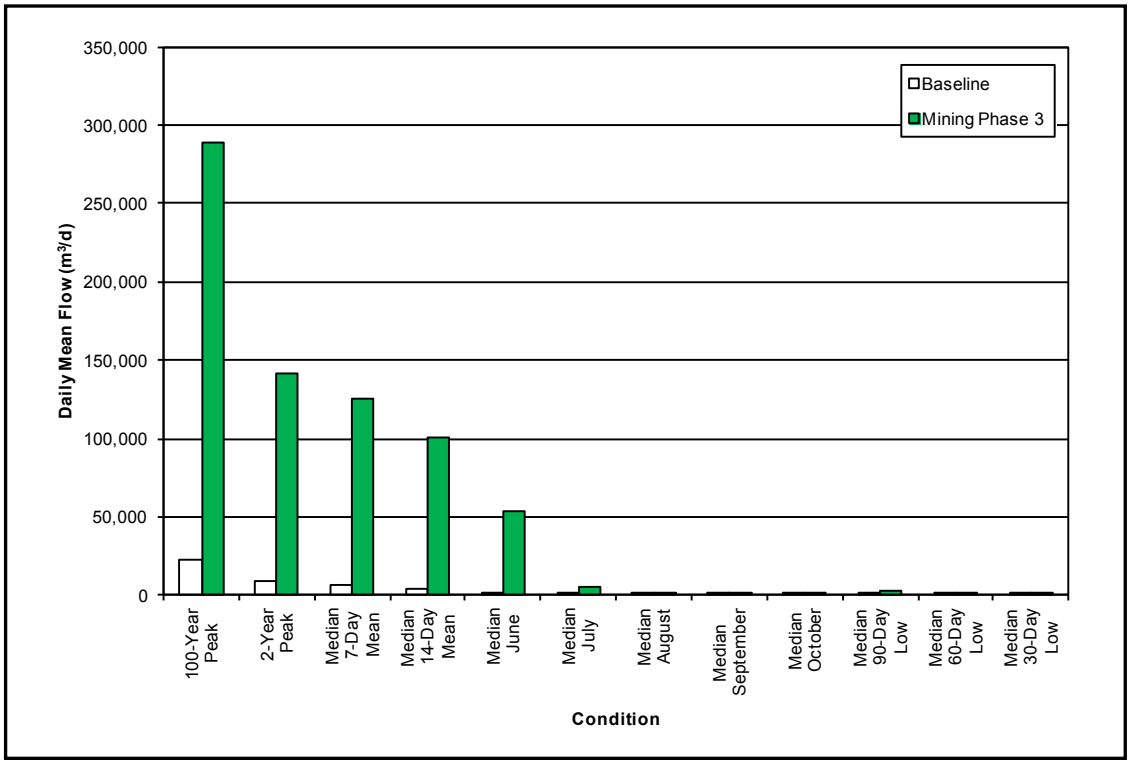



*Figure 7.3-94: Comparison of Effects on Lake P2 Outlet Discharges - Mining Phase 3*

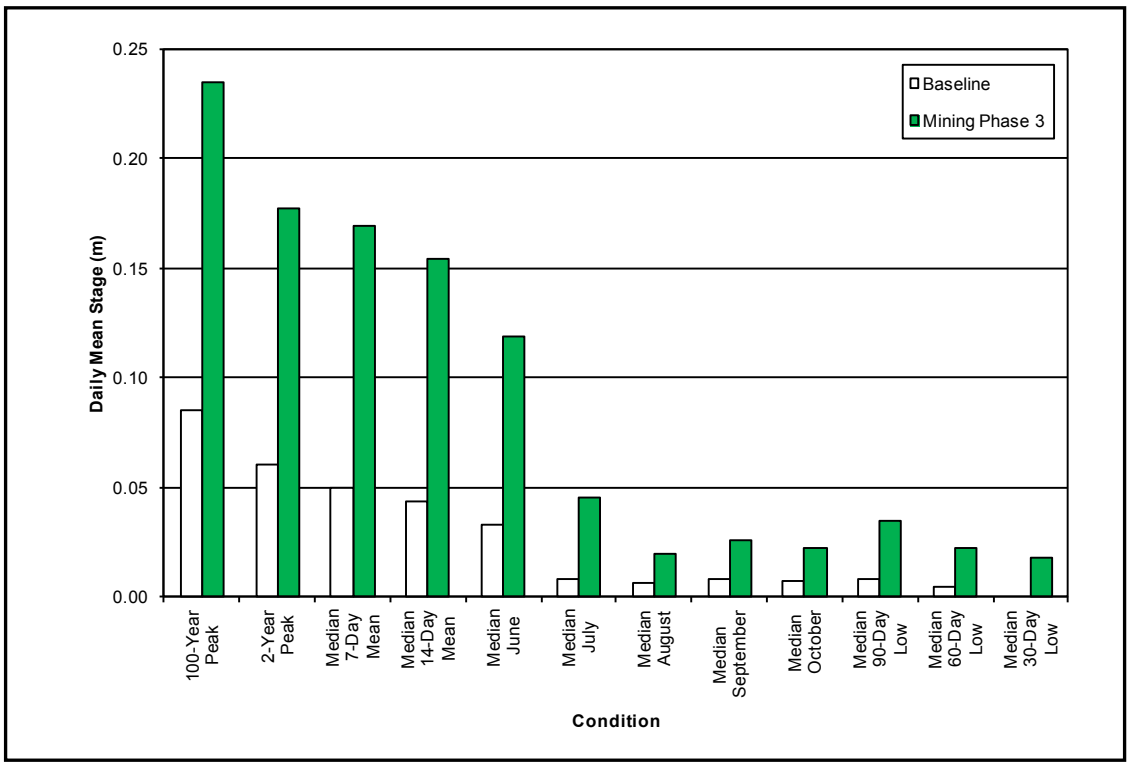



*Figure 7.3-95: Comparison of Effects on Lake P2 Stages - Mining Phase 3*

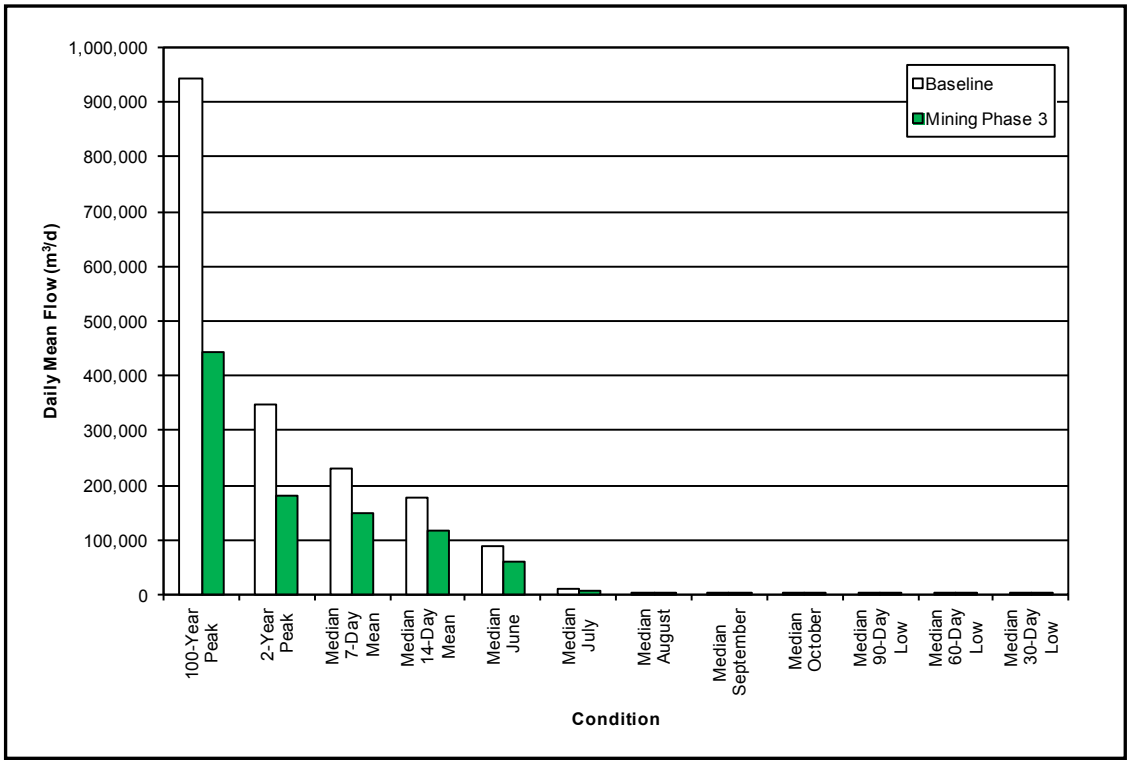



*Figure 7.3-96: Comparison of Effects on Lake B2 Outlet Discharges - Mining Phase 3*

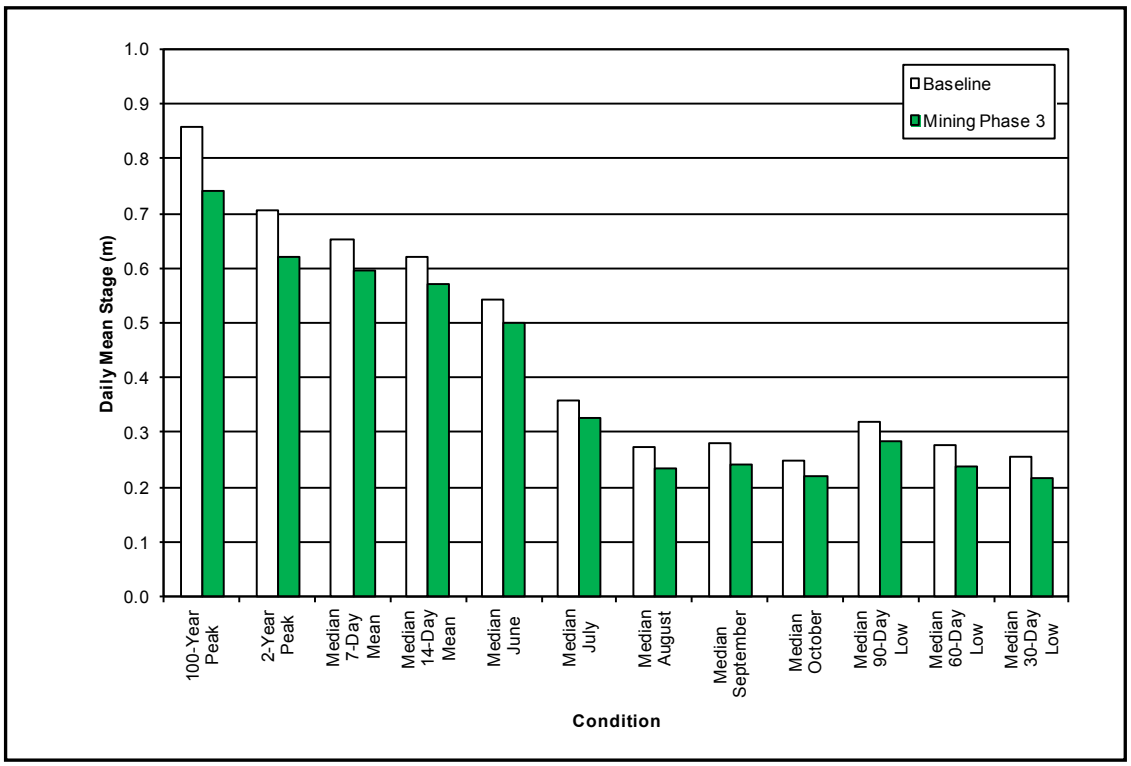



*Figure 7.3-97: Comparison of Effects on Lake B2 Stages - Mining Phase 3*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

The permanent diversion of Lake B45/44 to Lake P2, and Lake P2 to Lake B2, will result in reduced flow regimes (from the reduction in drainage area) and increased water level regimes at Lake B45/44 and Outlet channel, relative to baseline conditions in Lake B4 (Section 7.3.3.3.3).

The diversion of Lake P2 to Lake B2 was modeled using the baseline stage-discharge rating curve of Lake P2, due to unknown design hydraulic parameters of the diversion channel at the time of this assessment.

**Lake B46 Outlet Flows:** the water balance results for Lake B46 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from development of the B4 waste rock storage facility and construction of dikes P-D-01 and P-D-02. The 2-year flood discharge during Mining Phase 2 will decrease by approximately 8% below the baseline value, and the 100-year flood discharge by 6%. The reduction in drainage area will cause low flows to decrease by 6% to 9% compared to baseline conditions.

**Lake B46 Water Levels:** Lake B46 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.021 m, and the 100-year flood level by 0.026 m, while monthly mean stages are expected to decrease by 0.001 m (May), 0.005 m (June), less than 0.001 m (July), less than 0.001 m (August), 0.001 m (September), and less than 0.001 m (October) under median conditions.

**Lake B46 and Outlet Channel/Bank Stability:** No effects on Lake B46 and Outlet channel or bank stability are expected during Mining Phase 3 because flood magnitudes will be reduced from baseline values.

**Lake B45/44 Outlet Flows:** the water balance results for Lake B45/44 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from development of the B4 waste rock storage facility and construction of dikes P-D-01 and P-D-02. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 39% below the baseline value, and the 100-year flood discharge by 53%. The reduction in drainage area will cause low flows to decrease by 58% to 83% compared to baseline conditions.

**Lake B45/44 Water Levels:** Lake B45/44 water levels will be raised compared to baseline conditions during Mining Phase 3. The 2-year flood level is expected to increase by approximately 0.829 m compared to baseline, and the 100-year flood level by 0.788 m, while monthly mean stages are expected to increase by 0.857 m (May), 0.836 m (June), 0.825 m (July), 0.811 m (August), 0.836 m (September), and 0.840 m (October) under median conditions.

**Lake B45/44 and Outlet Channel/Bank Stability:** the diversion of Lake B45/44 to the P watershed in Pre-production Year -3 will create new shorelines at higher elevations than the existing shorelines. This will expose new soils, often on steeper slopes than the existing shorelines, to wave erosion and potential instability due to permafrost disturbance. Mitigation measures to minimize shoreline erosion are proposed according to the analysis presented in Appendix 7.3-D. These include two possible mitigation options:

- Preventative mitigation – the shoreline is modified by armouring or resloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.

- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for at least 10 years following the onset of the increased water level.

**Lake P2 Outlet Flows:** the water balance results for Lake P2 show that during Mining Phase 3, monthly mean flows will be increased compared to baseline due to the diversion of the B watershed to the P watershed, despite a reduction in local drainage area from the B4 waste rock storage facility and construction of dikes P-D-01 and P-D-02. The 2-year flood discharge during Mining Phase 3 will increase by approximately 14 times over the baseline value, and the 100-year flood discharge by approximately 12 times. Low flows will increase by 36 to approximately 470 times compared to baseline conditions.

**Lake P2 Water Levels:** Lake P2 water levels are also expected to be increased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to increase by approximately 0.117 m, and the 100-year flood level by 0.150 m, while monthly mean stages are expected to increase by 0.025 m (May), 0.086 m (June), 0.037 m (July), 0.014 m (August), 0.018 m (September), and 0.015 m (October) under median conditions. It should be noted that these estimates were based on the existing stage-discharge rating curve of Lake P2 and actual increases in water levels will depend on the detailed design of the diversion channel connecting Lake P2 to Lake B2. The diversion channel will act to mitigate potential impacts related to increases in water level in Lake P2 (and flows in the existing Lake P2 outlet) by providing an additional outlet from the waterbody.

**Lake P2 and Outlet Channel/Bank Stability:** No effects on Lake P2 and existing outlet channel or bank stability are expected during Mining Phase 3 because potential effects will be mitigated by the diversion channel. In addition, the diversion channel will be designed and constructed to prevent erosion and sedimentation.

**Lake B2 Outlet Flows:** the water balance results for Lake B2 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in drainage area from development of the B4 waste rock storage facility and construction of dikes P-D-01 and P-D-02. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 48% below the baseline value, and the 100-year flood discharge by 53%. The reduction in drainage area will cause low flows to decrease by 42% to 57% compared to baseline conditions.

**Lake B2 Water Levels:** Lake B2 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.086 m, and the 100-year flood level by 0.118 m, while monthly mean stages are expected to decrease by 0.026 m (May), 0.041 m (June), 0.033 m (July), 0.039 m (August), 0.039 m (September), and less than 0.028 m (October) under median conditions.

**Lake B2 and Outlet Channel/Bank Stability:** No effects on Lake B2 and Outlet channel or bank stability are expected during Mining Phase 3 because flood magnitudes will be reduced from baseline values.

### *Lake E3 to Lake E1*

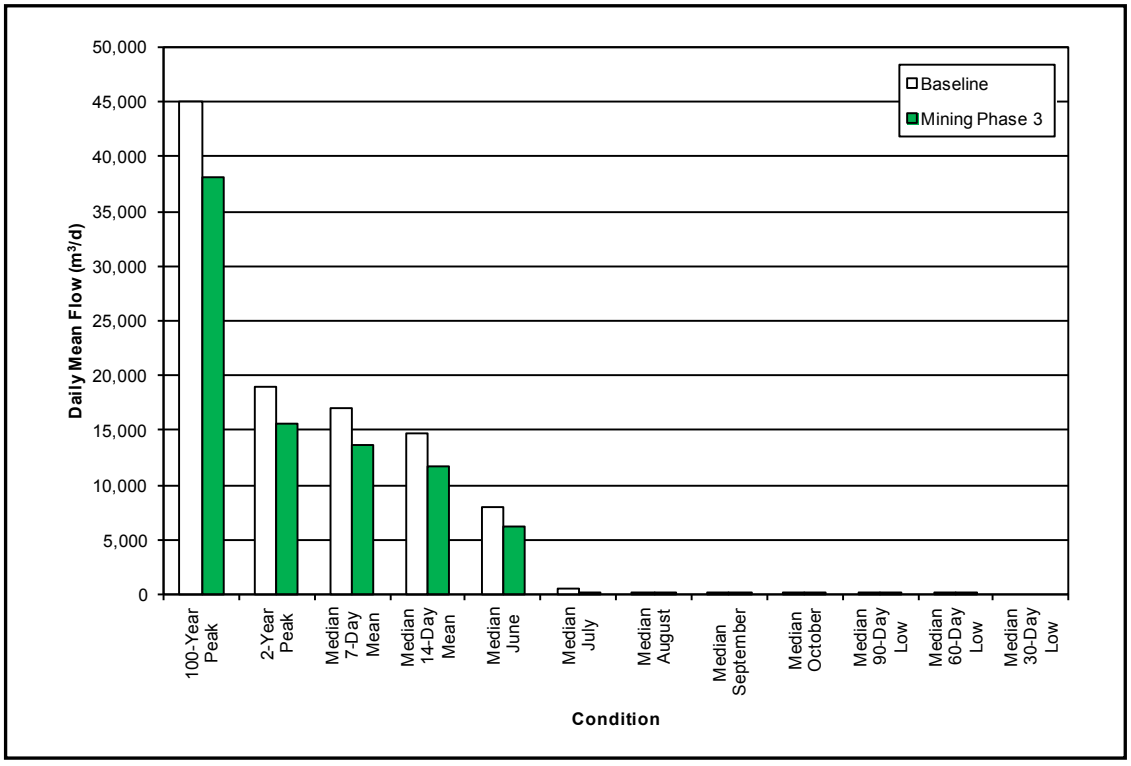



*Figure 7.3-98: Comparison of Effects on Lake E3 Outlet Discharges - Mining Phase 3*

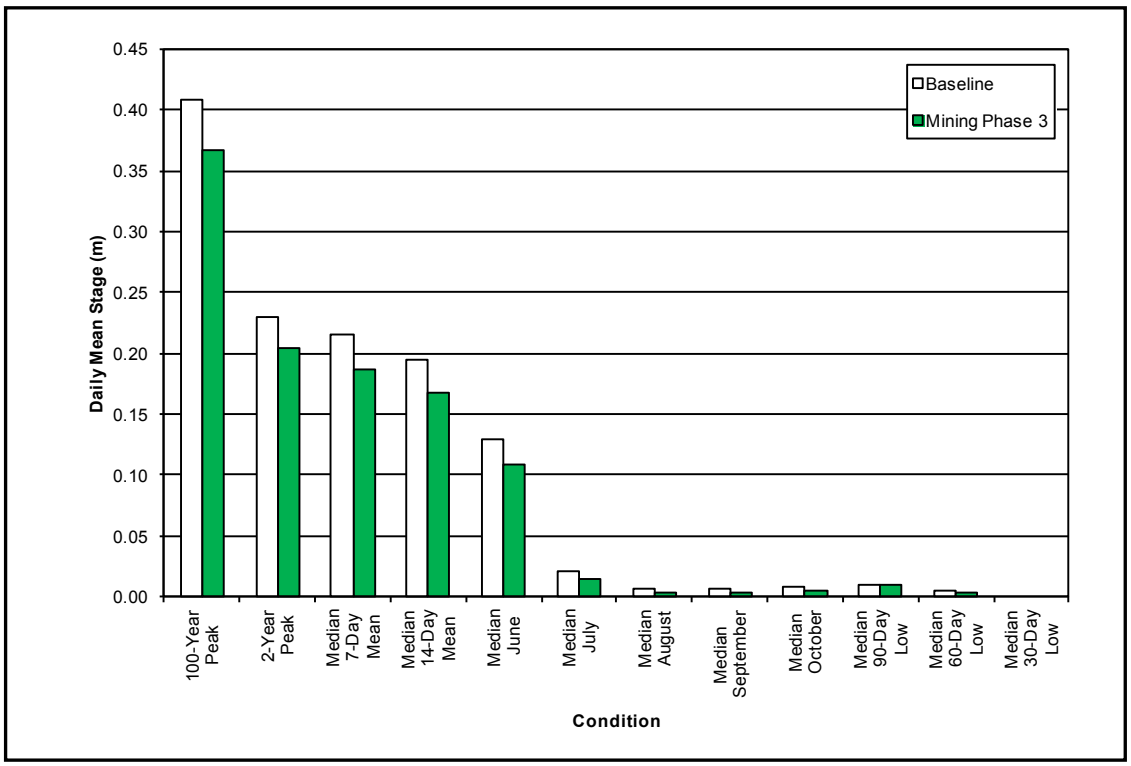



*Figure 7.3-99: Comparison of Effects on Lake E3 Stages - Mining Phase 3*

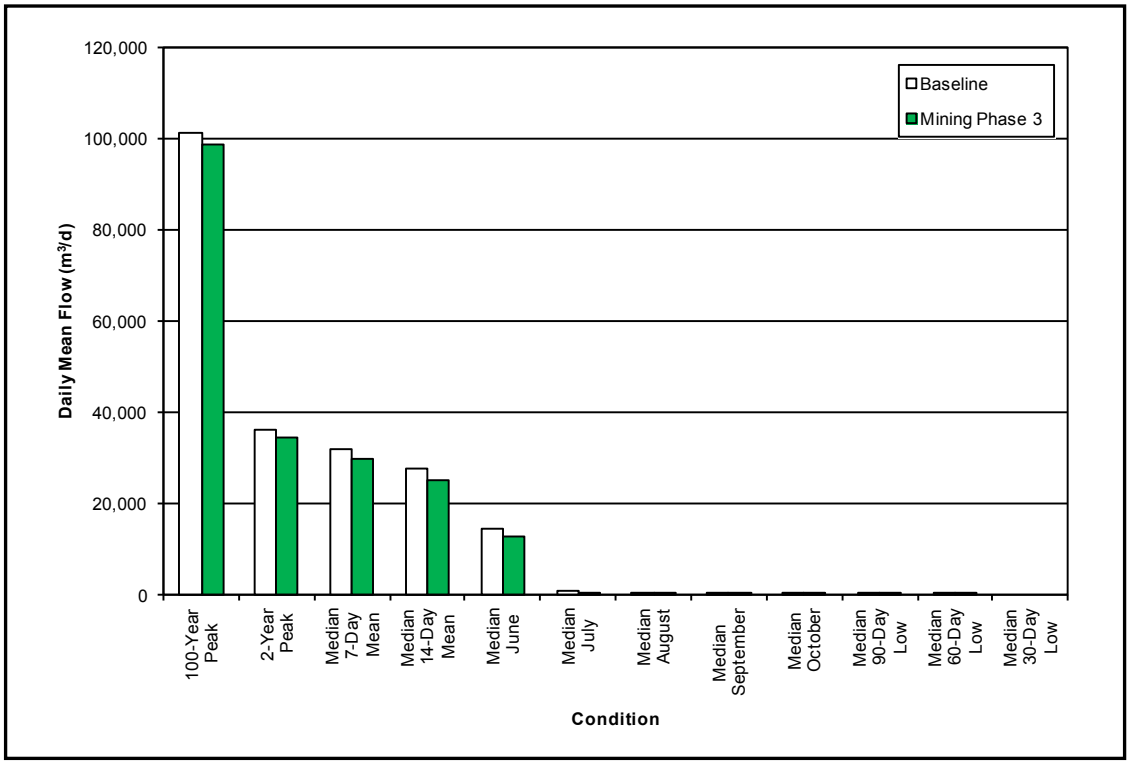



*Figure 7.3-100: Comparison of Effects on Lake E1 Outlet Discharges - Mining Phase 3*

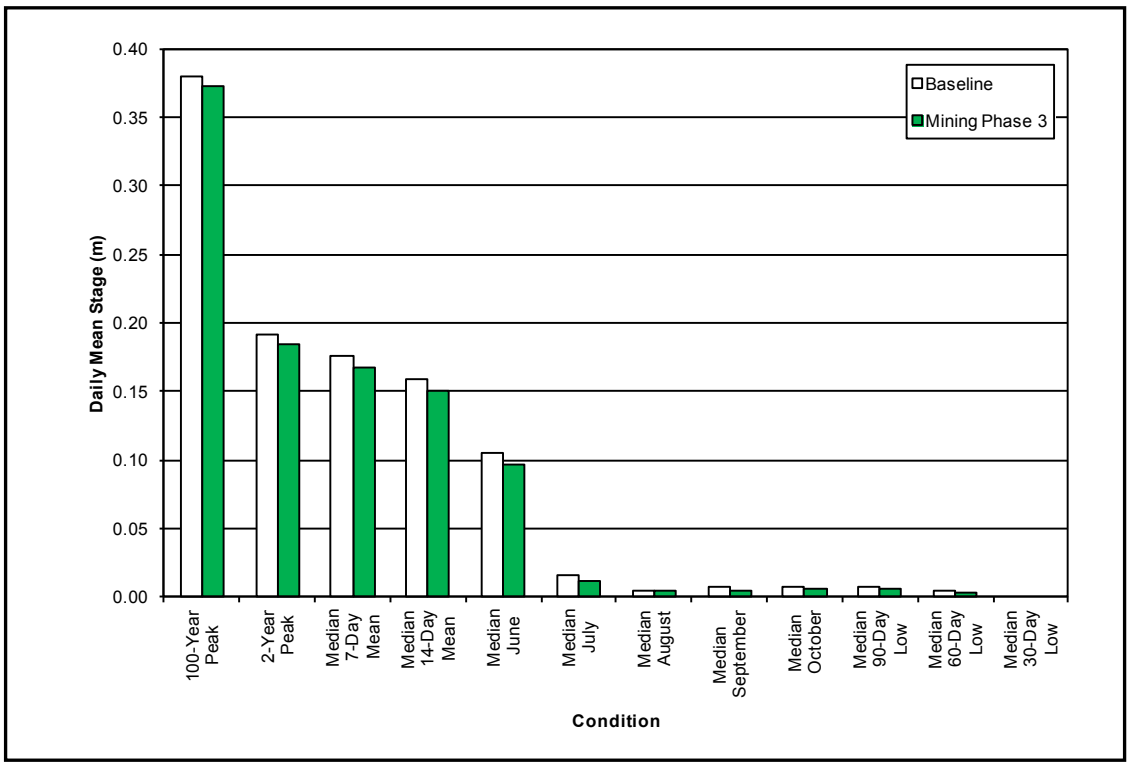



*Figure 7.3-101: Comparison of Effects on Lake E1 Stages - Mining Phase 3*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake E3 Outlet Flows:** the water balance results for Lake E3 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in drainage area upstream of Lake E3. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 18% below the baseline value, and the 100-year flood discharge by 15%. The reduction in drainage area upstream of Lake E3 will cause low flows to decrease by 2% to 63% compared to baseline conditions.

**Lake E3 Water Levels:** Lake E3 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.025 m, and the 100-year flood level by 0.042 m, while monthly mean stages are expected to decrease by 0.003 m (May), 0.020 m (June), 0.007 m (July), 0.003 m (August), 0.003 m (September), and 0.003 m (October) under median conditions.

**Lake E3 and Outlet Channel/Bank Stability:** No effects on Lake E3 and Outlet channel or bank stability are expected during Mining Phase 3 because flood magnitudes will be reduced from baseline values.

**Lake E1 Outlet Flows:** the water balance results for Lake E1 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in drainage area upstream of Lake E3. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 5% below the baseline value, and the 100-year flood discharge will decrease by 3%. The reduction in drainage area upstream of Lake E3 will cause low flows to decrease by 0% to 36% compared to baseline conditions.

**Lake E1 Water Levels:** Lake E1 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.007 m, and the 100-year flood level to decrease by 0.007 m, while monthly mean stages are expected to decrease by less than 0.001 m (May), 0.008 m (June), 0.004 m (July), 0.001 m (August), 0.002 m (September), and 0.001 m (October) under median conditions.

**Lake E1 and Outlet Channel/Bank Stability:** No effects on Lake E1 and Outlet channel or bank stability are expected during Mining Phase 3 because flood magnitudes will be reduced from baseline values.

### *Lake CH6 to Lake CH1*

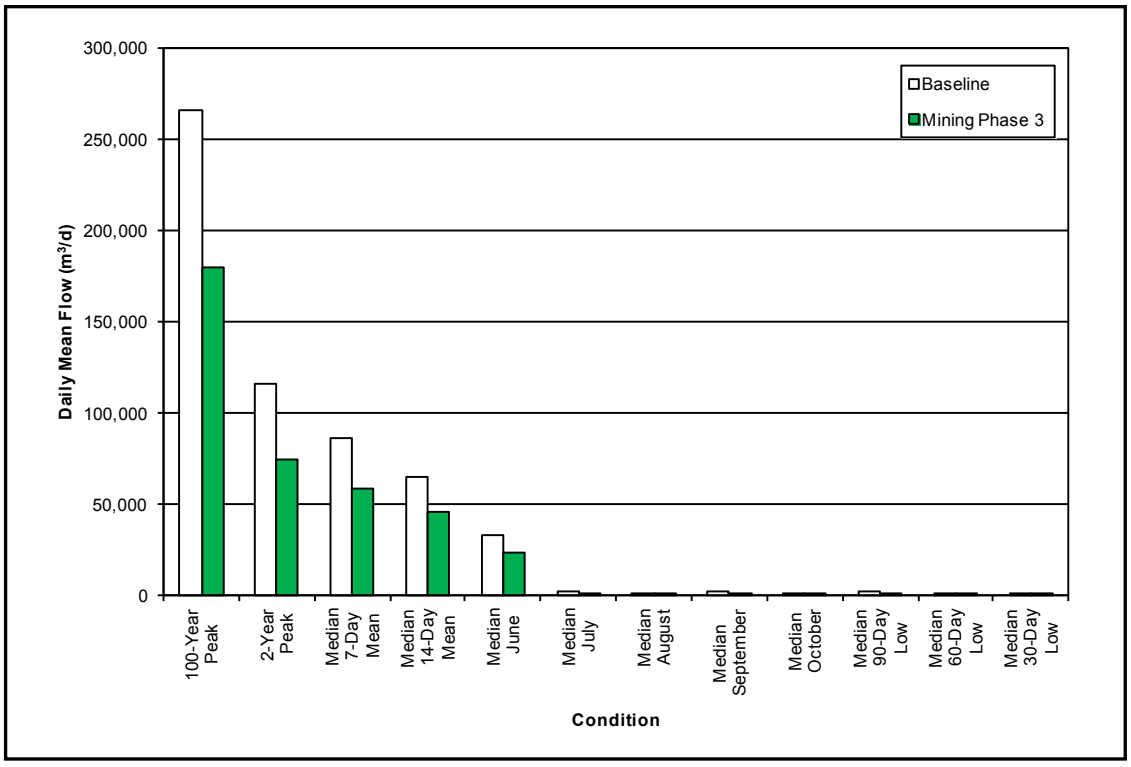



*Figure 7.3-102: Comparison of Effects on Lake CH6 Outlet Discharges - Mining Phase 3*

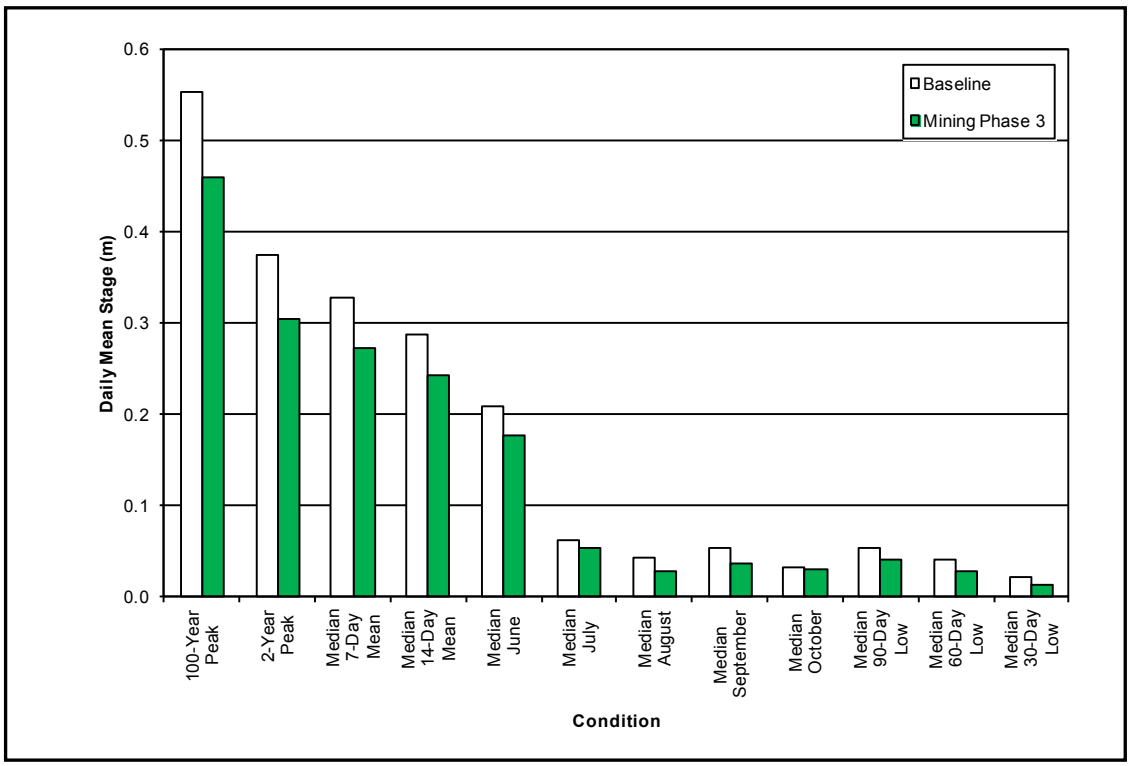



*Figure 7.3-103: Comparison of Effects on Lake CH6 Stages - Mining Phase 3*

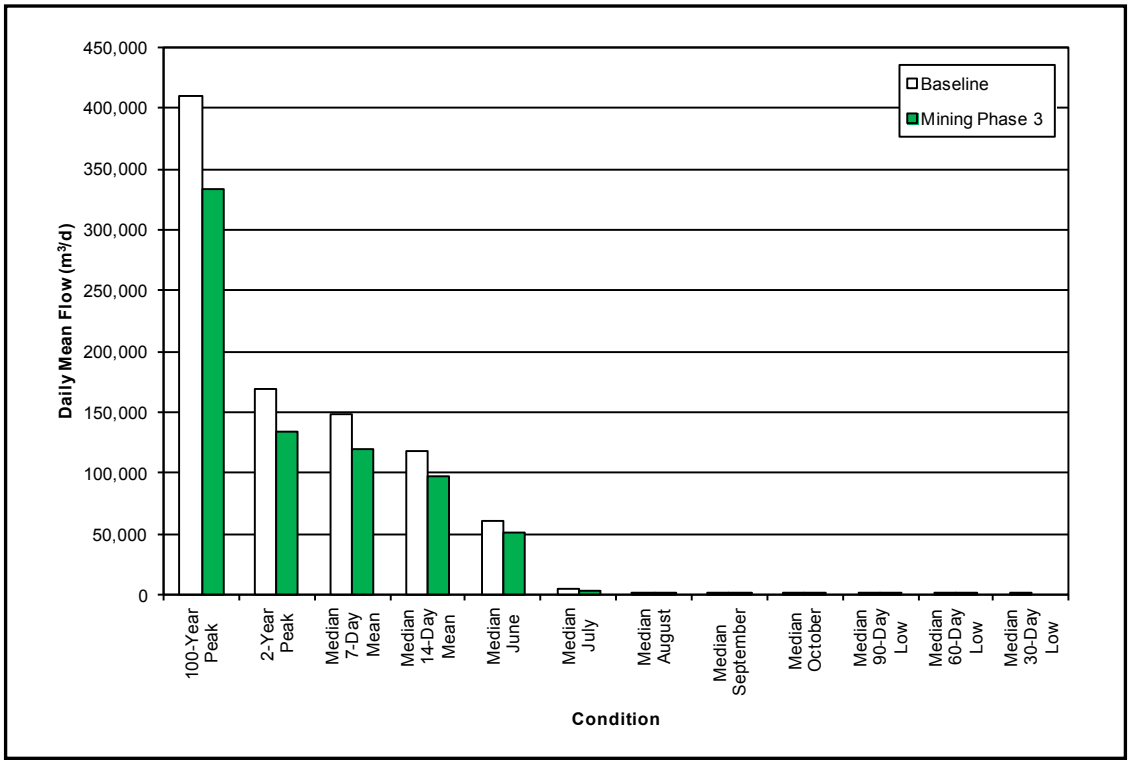



*Figure 7.3-104: Comparison of Effects on Lake CH1 Outlet Discharges - Mining Phase 3*

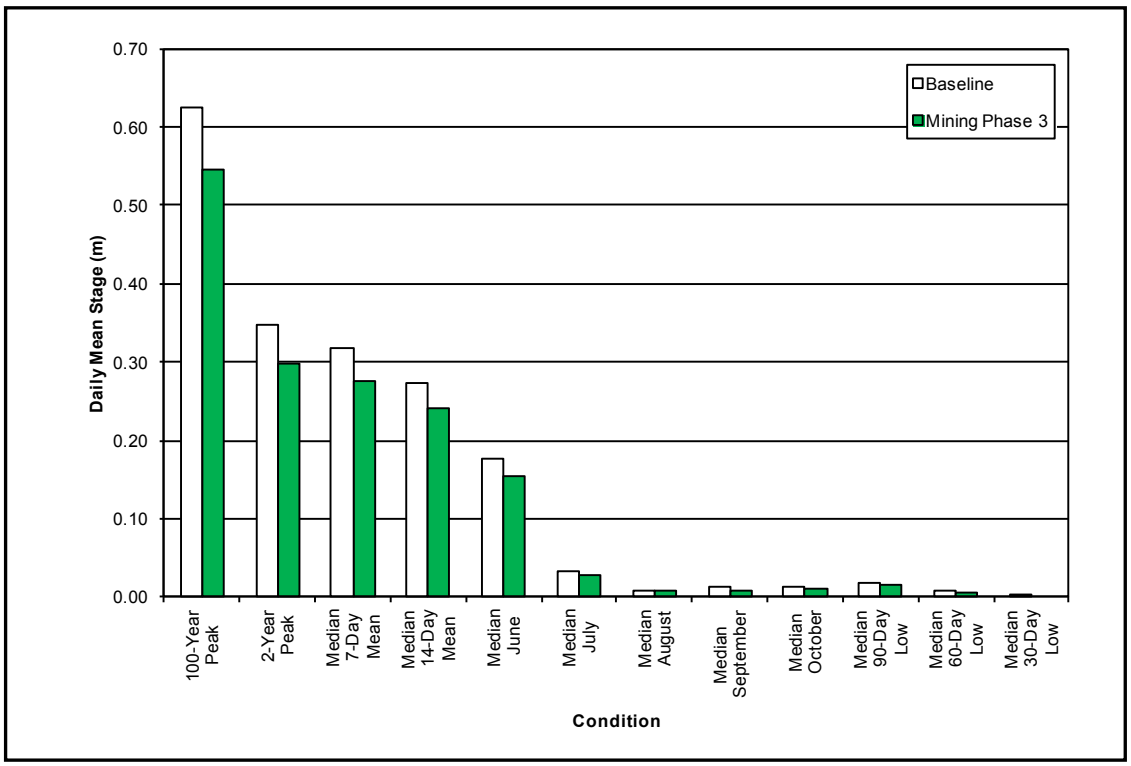



*Figure 7.3-105: Comparison of Effects on Lake CH1 Stages - Mining Phase 3*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake CH6 Outlet Flows:** the water balance results for Lake CH6 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in inflows to Lake CH6 from mining of the Discovery Pit and the construction of the Discovery Pit Waste Rock Pile. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 36% below the baseline value, and the 100-year flood discharge by 32%. The reduction in inflows will cause low flows to decrease by 46% to 56% compared to baseline conditions.

**Lake CH6 Water Levels:** Lake CH6 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.070 m, and the 100-year flood level by 0.092 m, while monthly mean stages are expected to decrease by 0.011 m (May), 0.032 m (June), 0.009 m (July), 0.014 m (August), 0.018 m (September), and 0.002 m (October) under median conditions.

**Lake CH6 and Outlet Channel/Bank Stability:** No effects on Lake CH6 and Outlet channel or bank stability are expected during Mining Phase 3 because flood magnitudes will be reduced from baseline values.

**Lake CH1 Outlet Flows:** the water balance results for Lake CH1 show that during Mining Phase 3, monthly mean flows will be decreased compared to baseline due a reduction in inflows to Lake CH6 from mining of the Discovery Pit and the construction of the Discovery Pit Waste Rock Pile. The 2-year flood discharge during Mining Phase 3 will decrease by approximately 21% below the baseline value, and the 100-year flood discharge by 19%. The reduction in inflows will cause low flows to decrease by 29% to 100% compared to baseline conditions.

**Lake CH1 Water Levels:** Lake CH1 water levels are also expected to be decreased during Mining Phase 3 compared to baseline. The 2-year flood level is expected to decrease by approximately 0.050 m, and the 100-year flood level by 0.081 m, while monthly mean stages are expected to decrease by 0.002 m (May), 0.021 m (June), 0.004 m (July), 0.002 m (August), 0.005 m (September), and 0.004 m (October) under median conditions.

**Lake CH1 and Outlet Channel/Bank Stability:** No effects on Lake CH1 and Outlet channel or bank stability are expected during Mining Phase 3 because flood magnitudes will be reduced from baseline values.

#### 7.3.3.7.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### *7.3.3.7.3.1 Project Activities*

The road to the B4 Waste Rock Area will require ongoing diversion of the portion of Lake A8 located south of Dike WM-D-01 to Lake A31 during Mining Phase 3. This will affect Lake A31 and other waterbodies downstream including Lake A6 and Lake A1. Effects of this diversion were considered in Section 7.3.3.7.1 (effects of dewatering in the A watershed during Mining Phase 3), and therefore are not discussed further in the watershed diversion effect analysis for Mining Phase 3 below.

Similarly, mining of the F Zone Pits will require the ongoing diversion of pumped flows from Lake A6, and of runoff of waterbodies located upstream of Lake A19 (including Lake A22, Lake A23, Lake A24, Lake A25, Lake A26, Lake A27 and Lake A28) through constructed channel F-NC-01 to Lake A1 during Mining Phase 3. Effects of these diversions were considered in Section 7.3.3.7.1 (effects of project infrastructure in the A watershed during Mining Phase 3), and therefore are also not discussed further in the watershed diversion effect analysis for Mining Phase 3 below.

Likewise, diversions of Lake B45/44 to Lake P2, and Lake P2 to Lake B2 will remain from previous phases. Effects of these diversions during Mining Phase 3 were considered in Section 7.3.3.7.2 (effects of project infrastructure in the B watershed during Mining Phase 3), and therefore are not discussed further in the watershed diversion effect analysis below.

The B7 waste rock storage facility will require ongoing diversion of Lake B33A away from the B7 waste rock storage facility through constructed channel WM-NC-01 to Lake B5 during Mining Phase 3. Since Lake B5 will become Contact Water Pond AP-02 during Mining Phase 2, an effect analysis was not carried forward.

##### *7.3.3.7.3.2 Environmental Design Feature and Mitigation*

At diversion outlets, a channel will be constructed to convey flows. The diversion outlet channel will be designed to approximate the natural hydrograph to the extent possible so as to manage the water level regime of the diverted waterbodies. Diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn et al. 2012) and to incorporate lessons learned at other northern sites (Jones et al. 2003).

### *7.3.3.8 Effect Analysis Results – Mining Phase 4 (Year 9)*

Activities relevant to hydrology are identical to the previous Mining Phase 3, and no further analysis is required.

### 7.3.3.9 Effect Analysis Results – Mining Phase 5 (Years 10 to 12)

#### 7.3.3.9.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### 7.3.3.9.1.1 Project Activities

Project activities during Mining Phase 5 will be identical to those from the previous Mining Phase 3 and Mining Phase 4 (Section 7.3.3.7.1). No further analysis of potential dewatering effects during Mining Phase 5 is required.

#### 7.3.3.9.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### 7.3.3.9.2.1 Project Activities

Project activities are mostly identical to those from the previous Mining Phase 3 and Mining Phase 4, and effects of Project infrastructure representative of Mining Phase 5 are presented in Section 7.3.3.7.2 (Project infrastructure in the B, E, P, and CH watersheds).

Additional activity not considered in previous Mining Phase 3 and Mining Phase 4 include the construction of ditch B4-C-01 and Dike B4-D-02 in the B2 watershed to collect contact water from the B4 waste rock storage facility. This infrastructure will reduce the local watershed area of Lake B2 by 0.021 $km^2$, or by approximately 1% of the Lake B2 watershed. This is expected to result in negligible effects on the flow regime of Lake B2, and therefore the Lake B2 flow regime is expected to be similar to that presented in Section 7.3.3.7.2 for Mining Phase 3.

No further analysis of potential project infrastructure effects during Mining Phase 5 is required.

#### 7.3.3.9.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

##### 7.3.3.9.3.1 Project Activities

Project activities during Mining Phase 5 will be identical to those from the previous Mining Phase 3 and Mining Phase 4 (Section 7.3.3.9.3), and therefore no further analysis of potential watershed diversion effects during Mining Phase 5 is required.

### 7.3.3.10 Effect Analysis Results – Closure

#### 7.3.3.10.1 Effects of Dewatering (Refilling) Activities on Flows, Water Levels, and Channel/Bank Stability on Meliadine Lake

##### 7.3.3.10.1.1 Project Activities

Refilling of the Discovery, F Zone, Pump, Tiriganiaq, and Wesmeg Pits will be based on active refilling from Meliadine Lake, in addition to natural runoff, to expedite refilling time. Pumping of water from Meliadine Lake will take place at a constant rate from the start of June to the end of September each year, for a period of approximately 10 years. The volume of each pit is presented in Table 7.3-34.

**Table 7.3-34: Surface Area and Volume of the Pits**

| Pit | Surface Area ($km^2$) | Volume ($m^3$) | Comment |
|---|---|---|---|
| Discovery | 0.441 | 35 700 000 | - |
| F Zone | 0.348 | 13 700 000 | Combined pits |
| Pump | 0.513 | 21 500 000 | Combined pits |
| Tiriganiaq | 0.849 | 68 400 000 | - |
| Wesmeg | 0.623 | 31 300 000 | Combined pits |
| Total | 2.77 | 170 600 000 | - |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

#### *7.3.3.10.1.2 Environmental Design Feature and Mitigation*

Pumping rates will be managed to minimize effects to Meliadine Lake and will ensure that the total annual discharge does not drop below the 10-year dry condition. In years during which Meliadine Lake discharges are forecast to naturally fall below the 10-year dry condition, no pumping will occur.

A 10-year pit refilling schedule conservatively meets this objective.

#### *7.3.3.10.1.3 Effect Analysis*

The water balance model for the Project was used to examine potential dewatering (refilling) effects on flows, water levels, and channel/bank stability during Closure in the Meliadine Lake outlet channels. Project effects at the Meliadine Lake outlets during Closure are summarized in Figure 7.3-106 to Figure 7.3-107 with additional information provided in Appendix 7.3-C.

### 7.3.3.10.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

#### *7.3.3.10.2.1 Project Activities*

Permanent changes to sub-watersheds at Post-Closure from permanent infrastructure are summarized in Table 7.3-35 and will include:

- A net decrease in the Lake A8 sub-watershed area, including a net increase in lake area and a net decrease in land from the Tiriganiaq Pit, Wesmeg #2 Pit, Wesmeg #5 Pit, Pump #2 Pit, and associated pit waterbodies;
- A net decrease in the Lake A6 sub-watershed area, including a net decrease in lake area and a net increase in land area from the Pump Pit #1, Wesmeg #4 Pit, F Zone #3 Pit, and the constructed channel connecting Lake A6 to the filled F Zone #3 Pit, and a Lake A6 water elevation reduced by 1.5 m from baseline conditions;
- A net increase in the Lake A2 sub-watershed area, including a net increase in lake area and a net decrease in land area from the A45-2 waste rock storage facility and F Zone Pits, which will affect Lake A1;

- A net increase in the Lake B5 sub-watershed area, including a net increase in lake and land areas from the Tiriganiaq Pit, Wesmeg #1 Pit, B7 waste rock storage facility, and Tailing Storage Facility. This includes the B7 sub-watershed which will be part of the B5 sub-watershed at Post-Closure;
- A net increase in the Lake B46 sub-watershed area, including a net increase in lake and land areas from the Pump Pits, and B4 waste rock storage facility;
- A net decrease in the Lake B4 sub-watershed area, including a net decrease in lake and land areas from the B4 waste rock storage facility (part of the B46 and B2 sub-watersheds at Post-Closure);
- A net increase in the Lake B2 sub-watershed area, including a net increase in lake and land areas from the B4 waste rock storage facility;
- A net increase in Lake E3 sub-watershed area, including a net increase in lake and land areas from the B7 waste rock storage facility (portion of B7 waste rock storage facility partially covering the Lake E4 sub-watershed will drain to the E watershed through Lake E3);
- A net increase in Lake H1 (reclaimed at Post-Closure) sub-watershed area, including no changes in lake area and a net increase in land area from the Tiriganiaq Pit and infilled Lake H20 and Lake H19;
- A net decrease in the I sub-watershed area, including no change in lake area and a net decrease in land area from the Wesmeg #3 Pit. This effect analysis is available in Section 7.3.3.6.2 (effects of infrastructure on Lake I1 during Mining Phase 2);
- A net increase in the J sub-watershed area, including a net increase in lake and land areas from the Tiriganiaq Pit, Wesmeg #3, and infilled Lake J7 (partial), Lake J6, Lake J5, Lake J4, Lake J3, and Lake J2 draining to Lake J8;
- A net decrease in sub-watershed area, including no changes in lake area and a net decrease in land area, from the new watershed configuration from the infilled upstream lake area draining to Lake J8, and Wesmeg #3 and Tiriganiaq Pit;
- A net increase in the Lake CH6 sub-watershed area, including a net increase in lake area and a decrease in land area from the Discovery Pit and the Discovery Pit Waste Rock Pile; and
- A net decrease in the X watershed, including a net decrease in land area from the Discovery Pit.

**Table 7.3-35: Net Area Gain from Permanent Project Infrastructure at Post-Closure**

| Sub-Watershed | Net Area Gain ($km^2$) | | | Permanent Project Infrastructure |
|---|---|---|---|---|
| | Lake | Land | Total | |
| Lake A8 | 0.301 | -1.501 | -1.200 | Tiriganiaq Pit, Wesmeg #2, Wesmeg #5, Pump #2 |
| Lake A6 | -0.168 | 0.077 | -0.091 | Wesmeg #4, Channel (A6 to F Zone #3) |
| Lake A1 | 0.248 | -0.224 | 0.024 | A45-2 WRF, F Zone Pits in Lake A2 sub-watershed |
| Lake B7 | -1.117 | -1.499 | -2.616 | Covered by Tailing Storage Facility |
| Lake B6 | -0.239 | -0.117 | -0.356 | B7 WRF |
| Lake B5 | 0.800 | 3.230 | 4.030 | Tiriganiaq Pit, Wesmeg #1, B7 WRF, Tailing Storage Facility |
| Lake B46 | 0.592 | 0.397 | 0.989 | Pump Pits, B4 waste rock storage facility |
| Lake B4 | -1.034 | -1.829 | -2.863 | B4 WRF |
| Lake B2 | 0.000 | 1.874 | 1.874 | B4 WRF |
| Lake E4 | -0.183 | 0.183 | 0.000 | B7 WRF |
| Lake H20 | -0.192 | -0.110 | -0.301 | Infilled |
| Lake H19 | -0.029 | -0.037 | -0.066 | Infilled |
| Lake H1 | 0.000 | 0.295 | 0.295 | Tiriganiaq Pit, Infilled Waterbodies H20 and H19 |
| Lake I1 | 0.000 | -0.008 | -0.008 | Wesmeg #3 |
| Lake J8 | 0.111 | 0.389 | 0.500 | Tiriganiaq Pit, Wesmeg #3, Infilled Waterbodies |
| Lake J1 | 0.000 | -0.210 | -0.210 | New watershed configuration |
| Lake CH6 | 0.442 | -0.422 | 0.020 | Discovery Pit, Discovery Waste Rock Pile |
| X Lakes | 0.000 | -0.020 | -0.020 | Discovery Pit |
| **Net** | **-0.468** | **0.468** | **0.000** | - |

Note: $km^2$ = square kilometres; WRF = waste rock storage facility.

#### *7.3.3.10.2.2 Environmental Design Feature and Mitigation*

Environmental design features and mitigations are not required.

#### *7.3.3.10.2.3 Effect Analysis*

The water balance model for the Project was used to examine potential project infrastructure effects on flows, water levels, and channel/bank stability during Post-Closure in:

- all downstream waterbodies between Lake A8 and the Lake A1 Lake outlet channel (Figure 7.3-108 to Figure 7.3-113);
- the Lake B5 outlet channel (Figure 7.3-114 to Figure 7.3-115); and
- all downstream waterbodies between Lake E3 and the Lake E1.

## Meliadine Lake

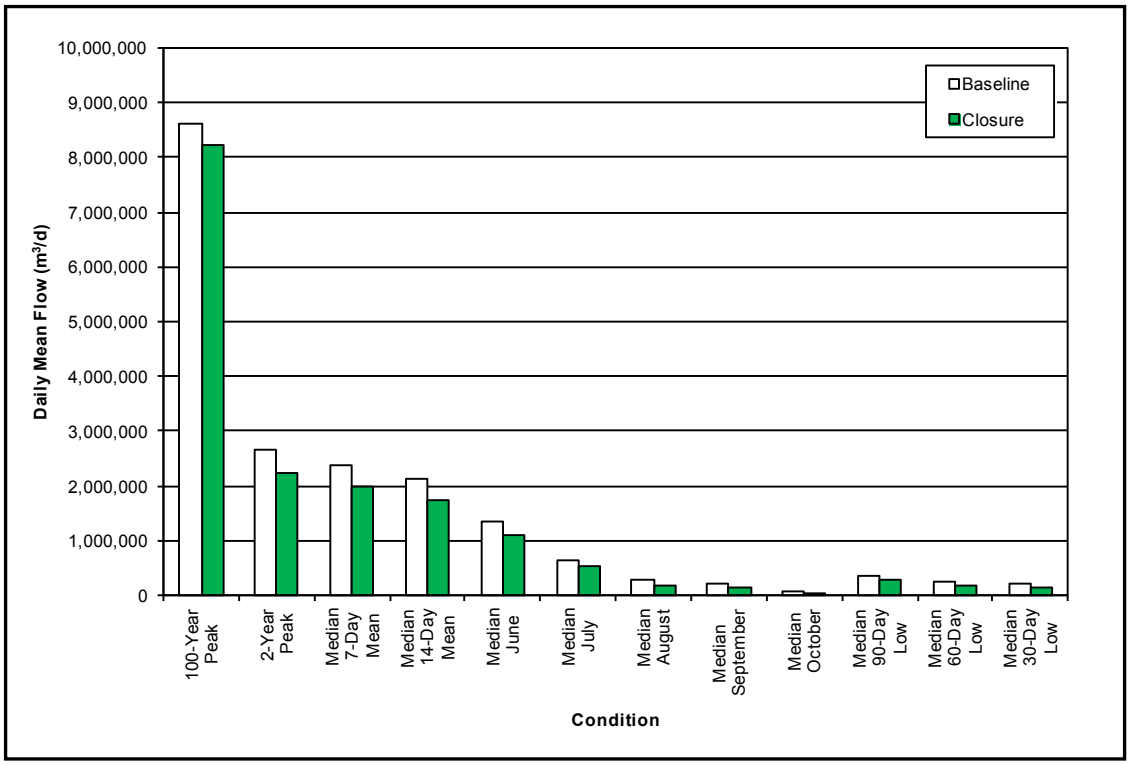



*Figure 7.3-106: Comparison of Effects on Meliadine Lake Outlet Discharges - Closure*

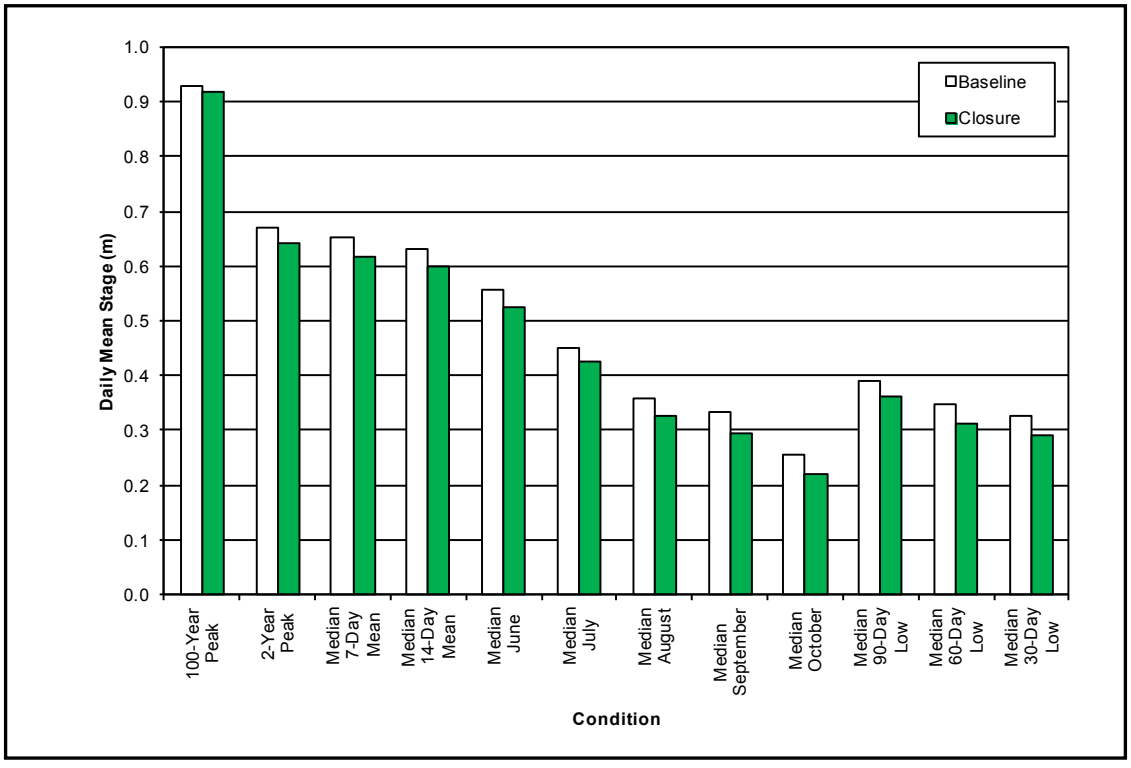



*Figure 7.3-107: Comparison of Effects on Meliadine Lake Stages - Closure*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

Effects on flows and water levels were based on a constant withdrawal rate over the period of 10 years, starting from the start of June to the end of September each year. Results represent both main and west outlets of Meliadine Lake combined, and effects at each individual outlet will thus be smaller than results below.

**Meliadine Lake Outlet Flows:** the water balance results for Meliadine Lake show that during Closure, monthly mean flows will be decreased compared to baseline due to the diversion of water for refilling of the pits. The 2-year flood discharge during Closure will decrease by approximately 15% below the baseline value, and the 100-year flood discharge by 4%. The refilling of the pits will cause low flows to decrease by 24% to 35% compared to baseline conditions.

**Meliadine Lake Water Levels:** Meliadine Lake water levels are also expected to be decreased during Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.030 m, and the 100-year flood level by 0.011 m, while monthly mean stages are expected to decrease by 0.015 m (May), 0.029 m (June), 0.024 m (July), 0.030 m (August), 0.040 m (September), and 0.035 m (October) under median conditions.

**Meliadine Lake and Outlet Channel/Bank Stability:** No effects on Meliadine Lake and Outlet channel or bank stability are expected during Closure because flood magnitudes will be reduced from baseline values.

Median conditions at Closure are expected to be drier than median baseline conditions, and wetter than the 5-year dry baseline condition.

## 7.3.3.10.3 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### *7.3.3.10.3.1 Project Activities*

Project activities during Closure will be identical to those from the previous Mining Phase 3, Mining Phase 4, and Mining Phase 5, and effects of Project infrastructure representative of Closure are presented in Section 7.3.3.7.2 (Project infrastructure in the B, E, P, and CH watersheds).

No further analysis of potential project infrastructure effects during Closure is required.

## 7.3.3.10.4 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### *7.3.3.10.4.1 Project Activities*

Project activities during Closure will be identical to those from the previous Mining Phase 3, Mining Phase 4, and Mining Phase 5, and effects of Project diversions representative of Closure are presented in Section 7.3.3.9.3, and therefore no further analysis of potential watershed diversion effects during Closure is required.

### 7.3.3.11 Effect Analysis Results – Post-Closure

#### 7.3.3.11.1 Effects of Dewatering Activities on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

Dewatering activities will cease at Post-Closure and no further analysis of potential project dewatering effects during Post-Closure is required.

- A net decrease in the Lake A8 sub-watershed area, including a net increase in lake area and a net decrease in land from the Tiriganiaq Pit, Wesmeg #2 Pit, Wesmeg #5 Pit, Pump #2 Pit, and associated pit waterbodies;
- A net decrease in the Lake A6 sub-watershed area, including a net decrease in lake area and a net increase in land area from the Pump Pit #1, Wesmeg #4 Pit, F Zone #3 Pit, and the constructed channel connecting Lake A6 to the filled F Zone #3 Pit, and a Lake A6 water elevation reduced by 1.5 m from baseline conditions;
- A net increase in the Lake A2 sub-watershed area, including a net increase in lake area and a net decrease in land area from the A45-2 waste rock storage facility and F Zone Pits, which will affect Lake A1;
- A net increase in the Lake B5 sub-watershed area, including a net increase in lake and land areas from the Tiriganiaq Pit, Wesmeg #1 Pit, B7 waste rock storage facility, and Tailing Storage Facility. This includes the B7 sub-watershed which will be part of the B5 sub-watershed at Post-Closure;
- A net increase in the Lake B46 sub-watershed area, including a net increase in lake and land areas from the Pump Pits, and B4 waste rock storage facility;
- A net decrease in the Lake B4 sub-watershed area, including a net decrease in lake and land areas from the B4 waste rock storage facility (part of the B46 and B2 sub-watersheds at Post-Closure);
- A net increase in the Lake B2 sub-watershed area, including a net increase in lake and land areas from the B4 waste rock storage facility;
- A net increase in Lake E3 sub-watershed area, including a net increase in lake and land areas from the B7 waste rock storage facility (portion of B7 waste rock storage facility partially covering the Lake E4 sub-watershed will drain to the E watershed through Lake E3);
- A net increase in Lake H1 (reclaimed at Post-Closure) sub-watershed area, including no changes in lake area and a net increase in land area from the Tiriganiaq Pit and infilled Lake H20 and Lake H19;
- A net decrease in the I sub-watershed area, including no change in lake area and a net decrease in land area from the Wesmeg #3 Pit. This effect analysis is available in Section 7.3.3.6.2 (effects of infrastructure on Lake I1 during Mining Phase 2);
- A net increase in the J sub-watershed area, including a net increase in lake and land areas from the Tiriganiaq Pit, Wesmeg #3, and infilled Lake J7 (partial), Lake J6, Lake J5, Lake J4, Lake J3, and Lake J2 draining to Lake J8;

- A net decrease in sub-watershed area, including no changes in lake area and a net decrease in land area, from the new watershed configuration from the infilled upstream lake area draining to Lake J8, and Wesmeg #3 and Tiriganiaq Pit;
- A net increase in the Lake CH6 sub-watershed area, including a net increase in lake area and a decrease in land area from the Discovery Pit and the Discovery Pit Waste Rock Pile; and
- A net decrease in the X watershed, including a net decrease in land area from the Discovery Pit.

**Table 7.3-35: Net Area Gain from Permanent Project Infrastructure at Post-Closure**

| Sub-Watershed | Net Area Gain ($km^2$) | | | Permanent Project Infrastructure |
|---|---|---|---|---|
| | Lake | Land | Total | |
| Lake A8 | 0.301 | -1.501 | -1.200 | Tiriganiaq Pit, Wesmeg #2, Wesmeg #5, Pump #2 |
| Lake A6 | -0.168 | 0.077 | -0.091 | Wesmeg #4, Channel (A6 to F Zone #3) |
| Lake A1 | 0.248 | -0.224 | 0.024 | A45-2 WRF, F Zone Pits in Lake A2 sub-watershed |
| Lake B7 | -1.117 | -1.499 | -2.616 | Covered by Tailing Storage Facility |
| Lake B6 | -0.239 | -0.117 | -0.356 | B7 WRF |
| Lake B5 | 0.800 | 3.230 | 4.030 | Tiriganiaq Pit, Wesmeg #1, B7 WRF, Tailing Storage Facility |
| Lake B46 | 0.592 | 0.397 | 0.989 | Pump Pits, B4 waste rock storage facility |
| Lake B4 | -1.034 | -1.829 | -2.863 | B4 WRF |
| Lake B2 | 0.000 | 1.874 | 1.874 | B4 WRF |
| Lake E4 | -0.183 | 0.183 | 0.000 | B7 WRF |
| Lake H20 | -0.192 | -0.110 | -0.301 | Infilled |
| Lake H19 | -0.029 | -0.037 | -0.066 | Infilled |
| Lake H1 | 0.000 | 0.295 | 0.295 | Tiriganiaq Pit, Infilled Waterbodies H20 and H19 |
| Lake I1 | 0.000 | -0.008 | -0.008 | Wesmeg #3 |
| Lake J8 | 0.111 | 0.389 | 0.500 | Tiriganiaq Pit, Wesmeg #3, Infilled Waterbodies |
| Lake J1 | 0.000 | -0.210 | -0.210 | New watershed configuration |
| Lake CH6 | 0.442 | -0.422 | 0.020 | Discovery Pit, Discovery Waste Rock Pile |
| X Lakes | 0.000 | -0.020 | -0.020 | Discovery Pit |
| **Net** | **-0.468** | **0.468** | **0.000** | - |

Note: $km^2$ = square kilometres; WRF = waste rock storage facility.

#### *7.3.3.11.1.1 Environmental Design Feature and Mitigation*

Environmental design features and mitigations are not required.

#### *7.3.3.11.1.2 Effect Analysis*

The water balance model for the Project was used to examine potential project infrastructure effects on flows, water levels, and channel/bank stability during Post-Closure in:

- all downstream waterbodies between Lake A8 and the Lake A1 Lake outlet channel (Figure 7.3-108 to Figure 7.3-113);

- the Lake B5 outlet channel (Figure 7.3-114 to Figure 7.3-115);
- all downstream waterbodies between Lake E3 and the Lake E1 Lake outlet channel (Figure 7.3-116 to Figure 7.3-119);
- the Lake H1 outlet channel (Figure 7.3-120 to Figure 7.3-121);
- all downstream waterbodies between Lake J8 and the Lake J1 Lake outlet channel (Figure 7.3-122 to Figure 7.3-125); and
- all downstream waterbodies between Lake CH6 and the Lake CH1 Lake outlet channel (Figure 7.3-126 to Figure 7.3-129).

Additional information is provided in Appendix 7.3-C. As presented in Section 7.3.3.7, the area of the Discovery Pit overlapping the X watershed is small and effects are expected to be negligible, and are not further discussed.

### *Lake A8 to Lake A1*

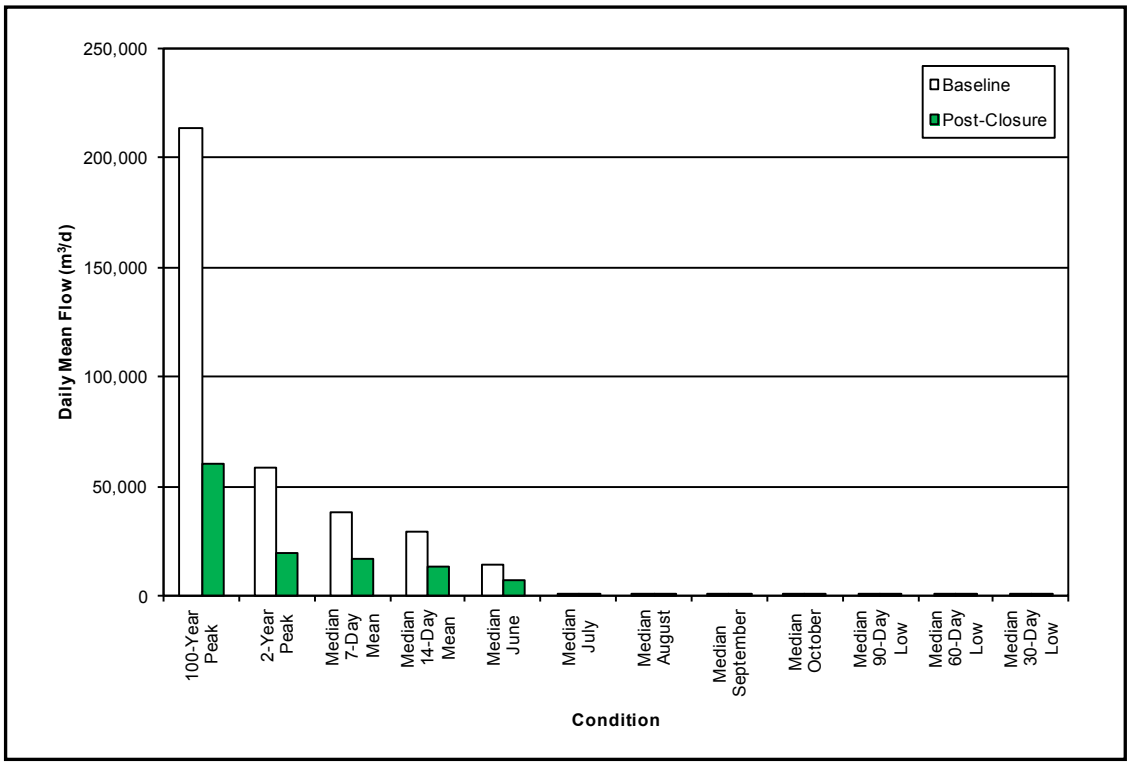



*Figure 7.3-108: Comparison of Effects on Lake A8 Outlet Discharges - Post-Closure*

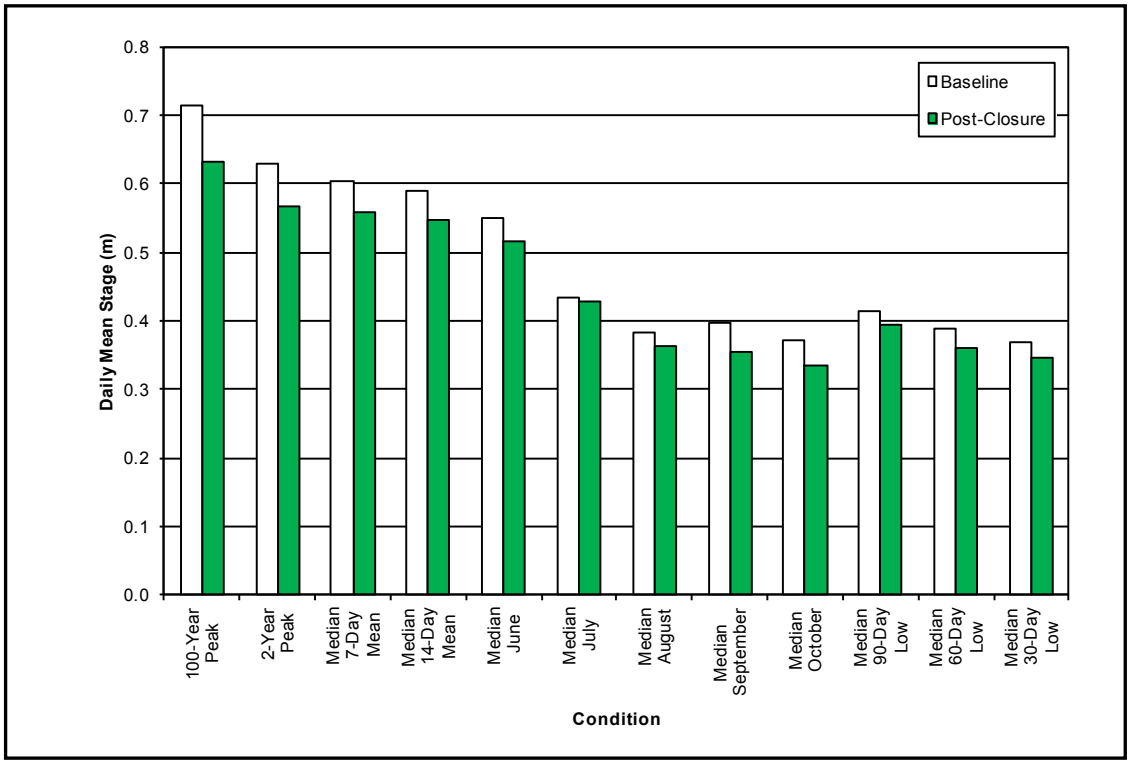



*Figure 7.3-109: Comparison of Effects on Lake A8 Stages - Post-Closure*

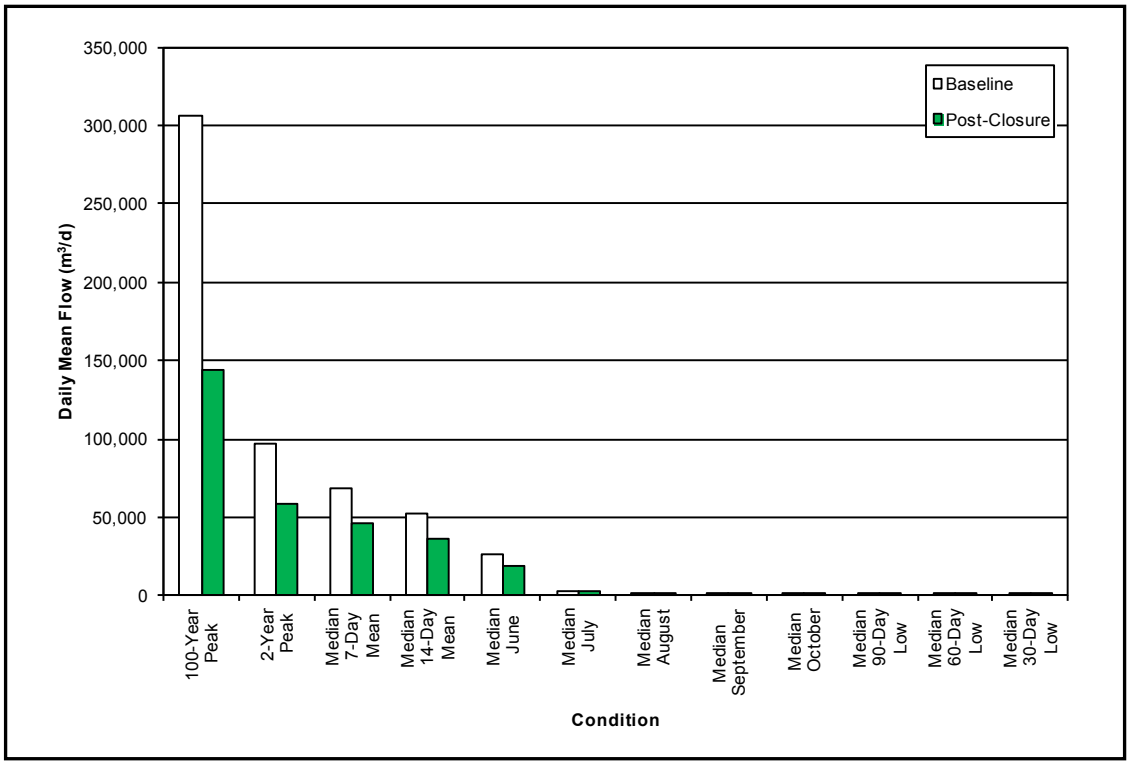



*Figure 7.3-110: Comparison of Effects on Lake A6 Outlet Discharges - Post-Closure*

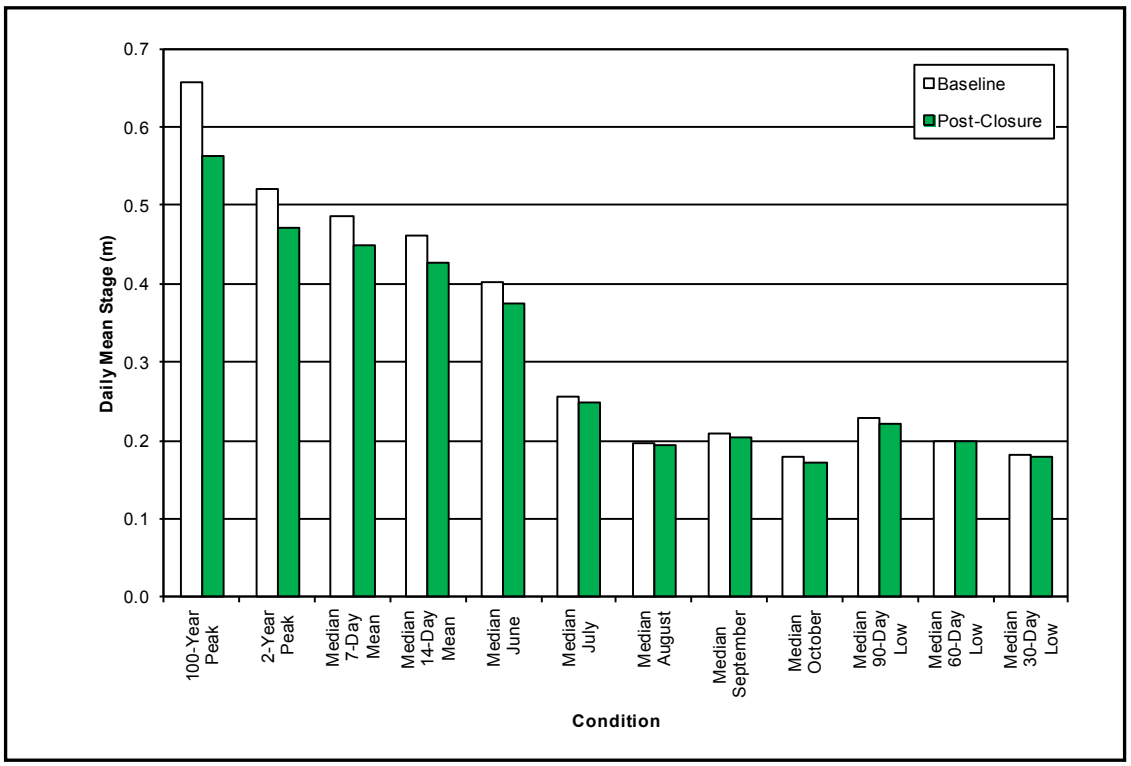



*Figure 7.3-111: Comparison of Effects on Lake A6 Stages - Post-Closure*

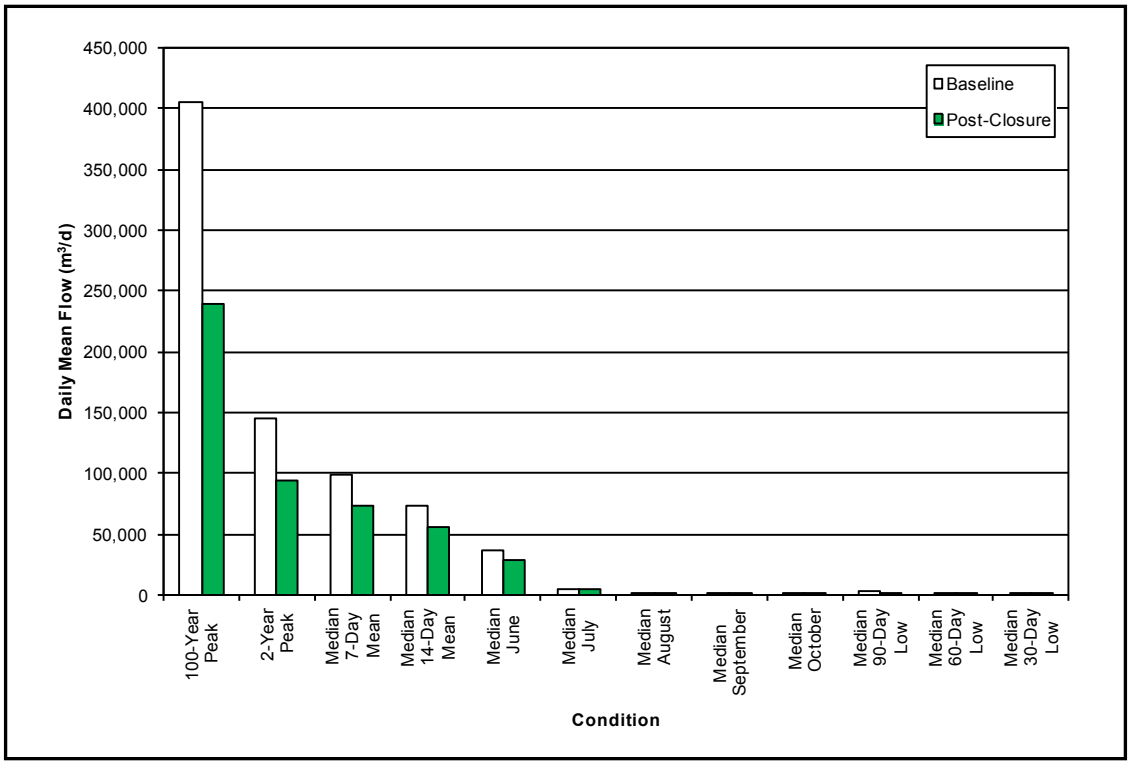



*Figure 7.3-112: Comparison of Effects on Lake A1 Outlet Discharges - Post-Closure*

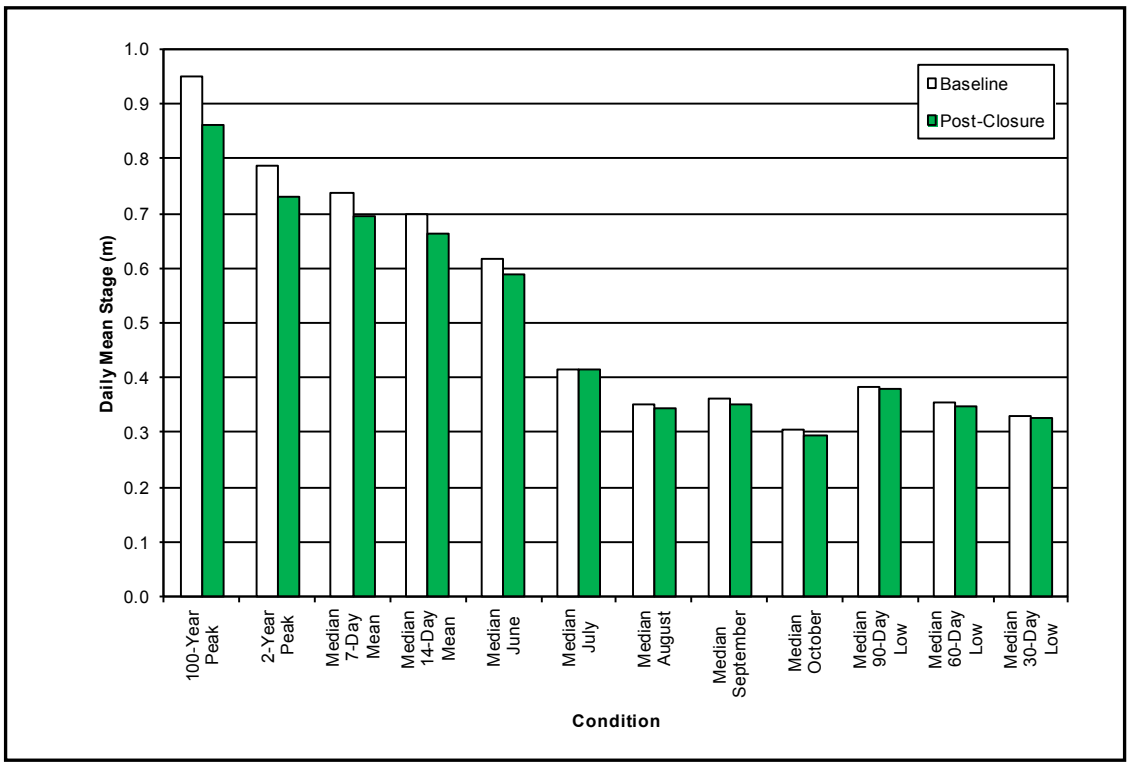



*Figure 7.3-113: Comparison of Effects on Lake A1 Stages - Post-Closure*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake A8 Outlet Flows:** the water balance results for Lake A8 show that during Post-Closure, monthly mean flows will be decreased compared to baseline due to a reduction in drainage area from the Tiriganiaq Pit, and increased lake areas from the Wesmeg #2, Wesmeg #5, and Pump #2 pits. The 2-year flood discharge during Post-Closure will decrease by approximately 66% below the baseline value, and the 100-year flood discharge by 72%. The reduction in inflows to Lake A8 will cause low flows to decrease by 38% to 53% compared to baseline conditions.

**Lake A8 Water Levels:** Lake A8 water levels are also expected to be decreased during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.063 m, and the 100-year flood level by 0.083 m, while monthly mean stages are expected to decrease by 0.051 m (May), 0.035 m (June), 0.008 m (July), 0.021 m (August), 0.042 m (September), and 0.038 m (October) under median conditions.

**Lake A8 and Outlet Channel/Bank Stability:** No effects on Lake A8 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

**Lake A6 Outlet Flows:** the water balance results for Lake A6 show that during Post-Closure, monthly mean flows will be decreased compared to baseline conditions due to a slight reduction in drainage area from the Pump Pit #1, reduction in lake area from the constructed channel allowing Lake A6 to drain to F Zone Pit #3 at a water level lower than baseline by 1.5 m, and an increase in lake area from the Wesmeg Pit #4. The 2-year flood discharge during Post-Closure will decrease by approximately 39% below the baseline value, and the 100-year flood discharge by 39%. Lake A6 outlet low flows will decrease by 5% to 11% compared to baseline conditions.

**Lake A6 Water Levels:** Lake A6 water levels are also expected to be decreased during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.050 m, and the 100-year flood level by 0.093 m, while monthly mean stages are expected to decrease by 0.018 m (May), 0.026 m (June), 0.006 m (July), 0.001 m (August), 0.004 m (September), and 0.009 m (October) under median conditions.

**Lake A6 and Outlet Channel/Bank Stability:** No effects on Lake A6 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

**Lake A1 Outlet Flows:** the water balance results for Lake A1 show that during Post-Closure, monthly mean flows will be decreased compared to baseline due to an increase in lake area from the F Zone Pits, and a decrease in lake area from the infilling of Lake A52 (partially covered by the A45-2 waste rock storage facility) in sub-watershed A2. The 2-year flood discharge during Post-Closure will decrease by approximately 35% below the baseline value, and the 100-year flood discharge by 41%. Lake A1 outlet low flows will decrease by 7% to 11% compared to baseline conditions.

**Lake A1 Water Levels:** Lake A1 water levels are also expected to be decreased during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.059 m, and the 100-year flood level by 0.087 m, while monthly mean stages are expected to decrease by 0.029 m (May), 0.029 m (June), less than 0.001 m (July), 0.008 m (August), 0.011 m (September), and 0.008 m (October) under median conditions.

**Lake A1 and Outlet Channel/Bank Stability:** No effects on Lake A1 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

### *Lake B5*

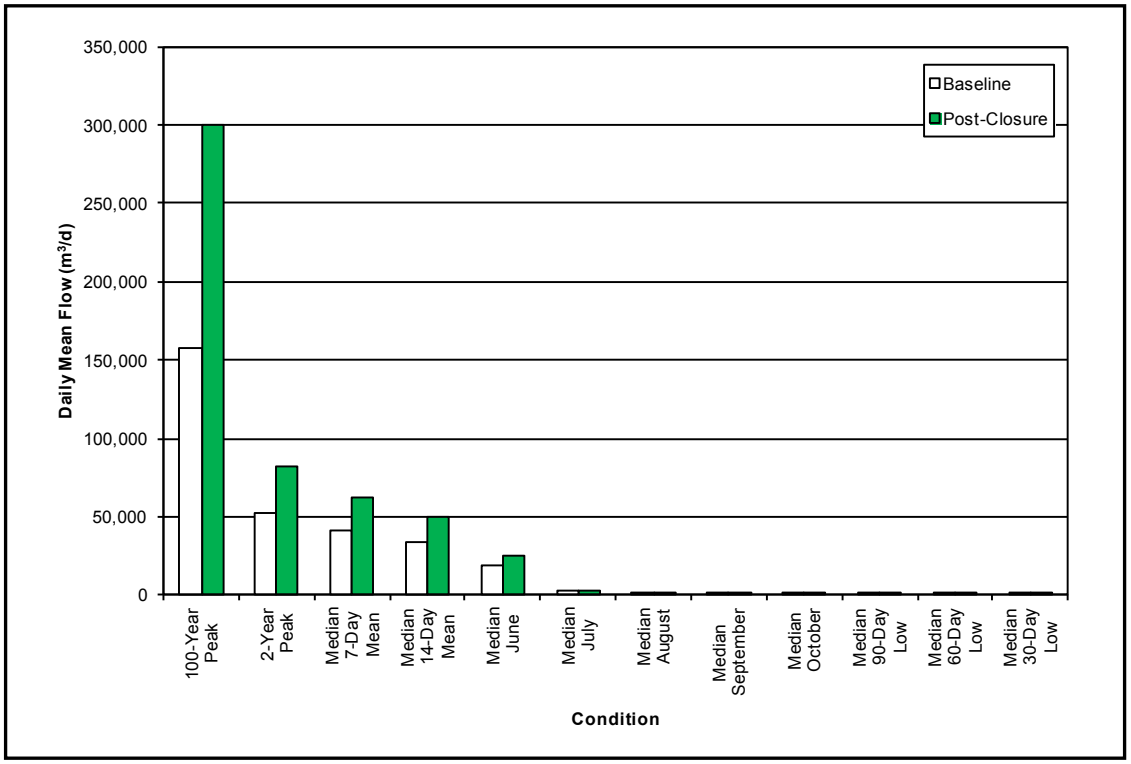



*Figure 7.3-114: Comparison of Effects on Lake B5 Outlet Discharges - Post-Closure*

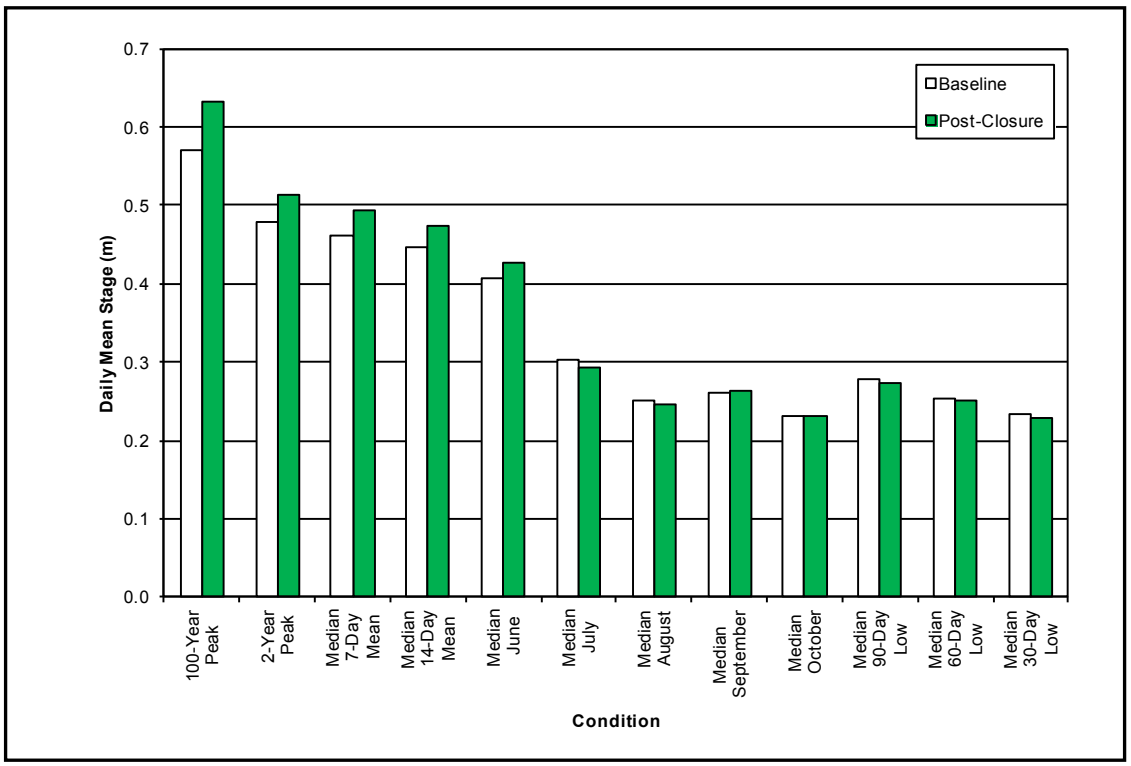



*Figure 7.3-115: Comparison of Effects on Lake B5 Stages - Post-Closure*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake B5 Outlet Flows:** the water balance results for Lake B5 show that during Post-Closure, monthly mean flows will be increased compared to baseline during the months of May, June, and September, and decreased during the months of July, August, and October due to a change in watershed configuration including an increase in drainage area from the Tiriganiaq Pit and the TSF (covering Lake B7), an increase in lake area from the Tiriganiaq Pit, a slight increase in lake area from the Wesmeg #1 Pit, and decrease in lake area from Lake B6, Lake B30, Lake B31, Lake B32, Lake B33, and Lake B9 (infilled, and covered or partially covered by the B7 waste rock storage facility). The 2-year flood discharge during Post-Closure will increase by approximately 58% above the baseline value, and the 100-year flood discharge by 91%. The change in configuration of Lake B5 will cause low flows to decrease by 8% to 12% compared to baseline conditions.

**Lake B5 Water Levels:** Lake B5 water levels are also expected to be increased during the months of May, June, and September, and decreased during the months of July, August, and October during Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.036 m, and the 100-year flood level by 0.062 m, while monthly mean stages are expected to increase by 0.024 m (May), 0.021 m (June), 0.003 m (September), 0.010 m (July), 0.004 m (August), and 0.001 m (October) under median conditions.

**Lake B5 and Outlet Channel/Bank Stability:** increased flood regimes from a change in watershed configuration are expected to increase erosion potential in Lake B5 and its outlet Post-Closure. Potential impacts related to increased discharge and water level regimes will be mitigated by the detailed design of diversion channel B5-C-02 connecting Lake B5 to Lake D7, designed to approximate the natural hydrograph to the extent possible.

## Lake E3 to Lake E1

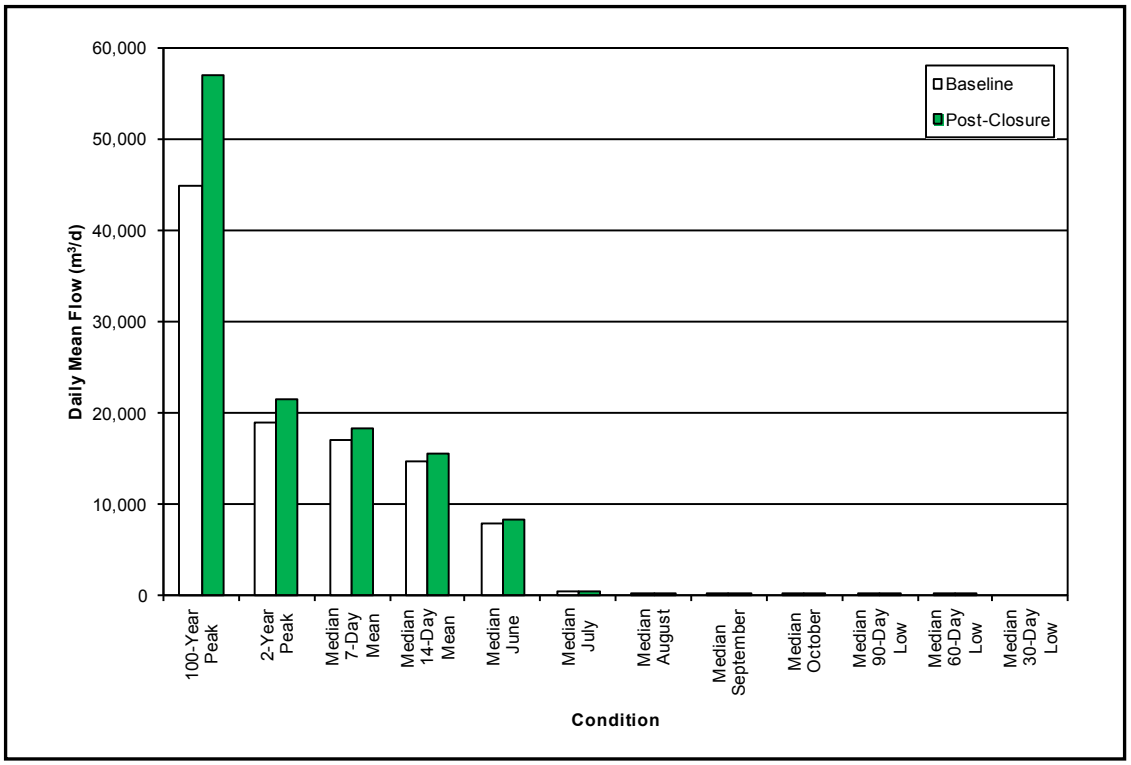



*Figure 7.3-116: Comparison of Effects on Lake E3 Outlet Discharges - Post-Closure*

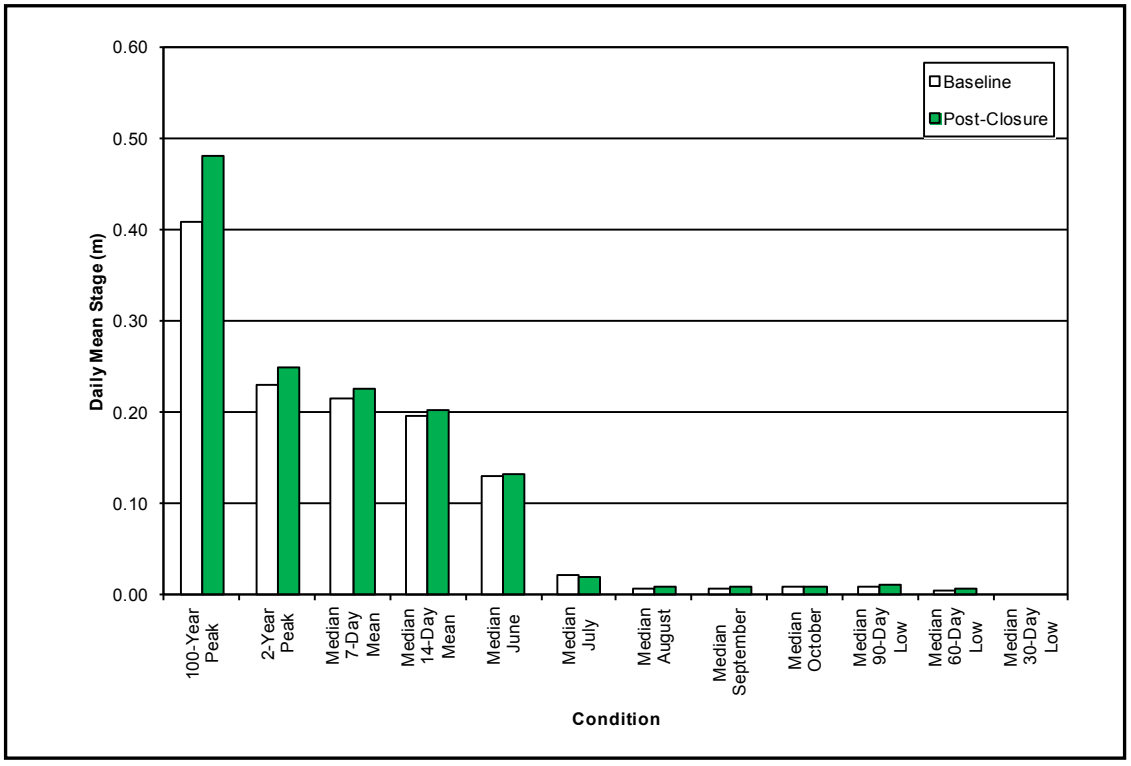



*Figure 7.3-117: Comparison of Effects on Lake E3 Stages - Post-Closure*

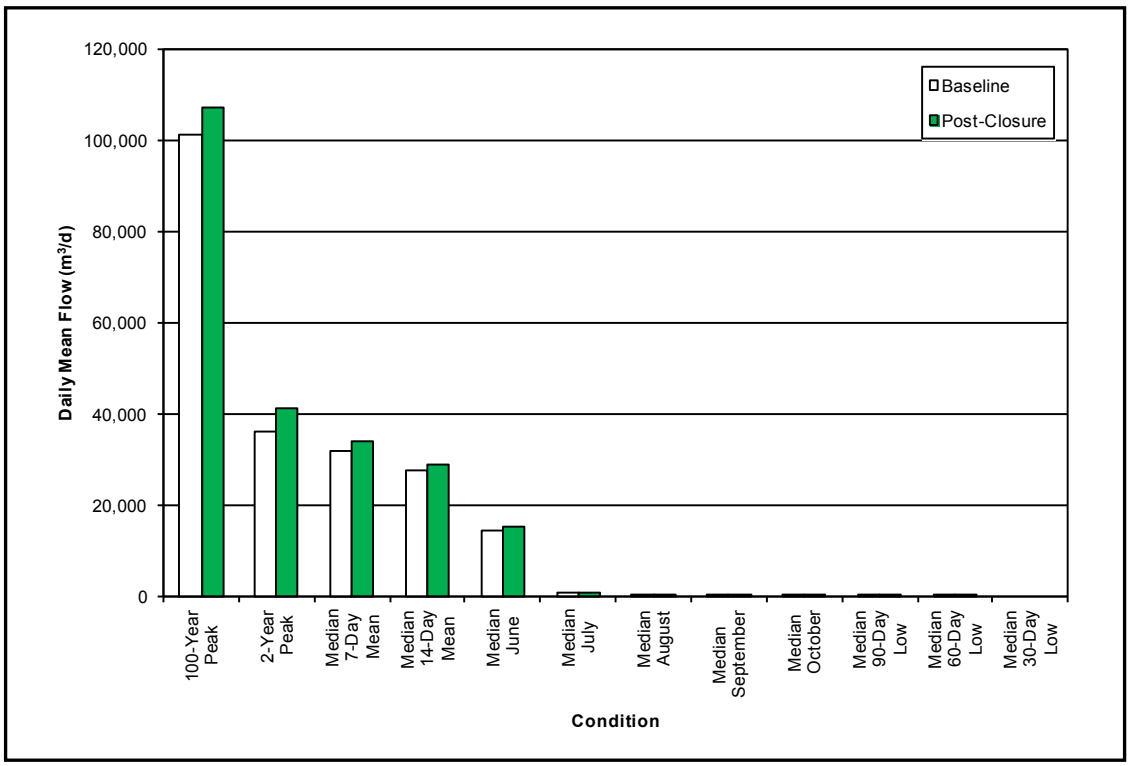



*Figure 7.3-118: Comparison of Effects on Lake E1 Outlet Discharges - Post-Closure*

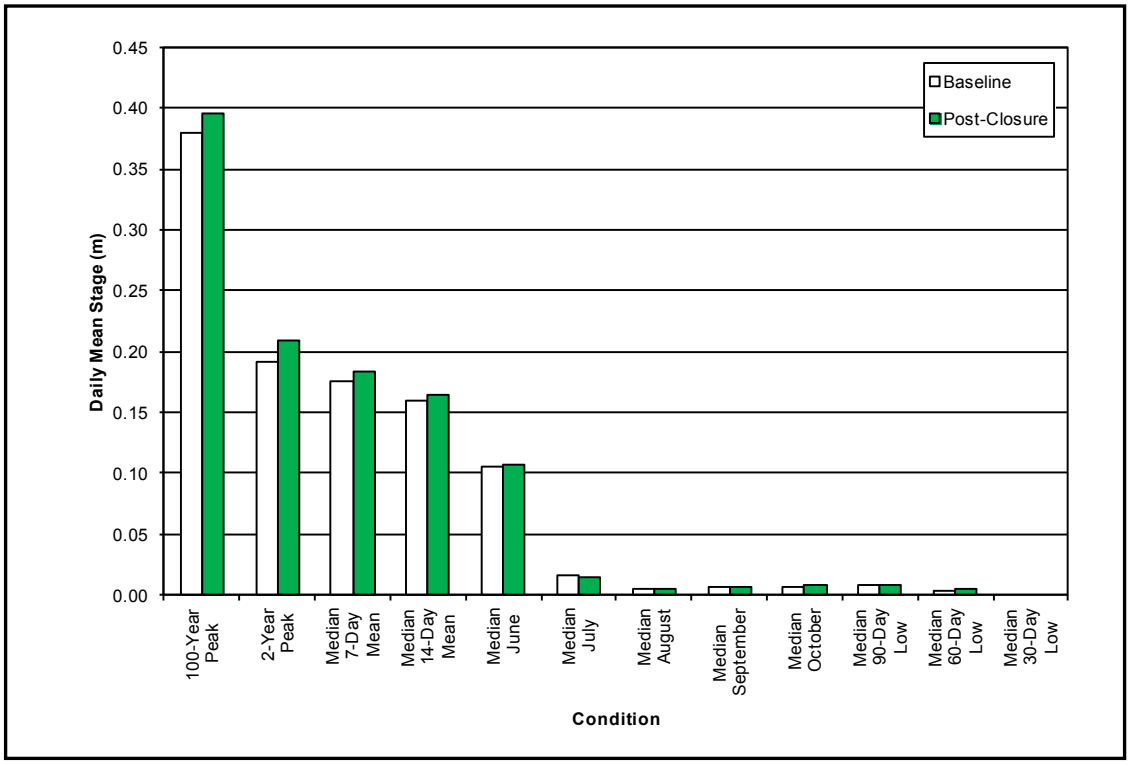



*Figure 7.3-119: Comparison of Effects on Lake E1 Stages - Post-Closure*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake E3 Outlet Flows:** the water balance results for Lake E3 show that during Post-Closure, monthly mean flows will be increased during the months of May, June, August, September, and October, and decreased during the month of July compared to baseline due to a change in watershed configuration including a decrease in lake-to-land area ratio with the B7 waste rock storage facility covering most of the Lake E4 watershed following the breach of Dike B7-D-01. The 2-year flood discharge during Post-Closure will increase by approximately 14% above the baseline value, and the 100-year flood discharge by 27%. The change in watershed configuration of Lake E3 will cause low flows to decrease by 0% to 42% compared to baseline conditions.

**Lake E3 Water Levels:** Lake E3 water levels are also expected to be increased during the months of May, June, August, September, and October, and decreased during the month of July in Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.018 m, and the 100-year flood level by 0.072 m, while monthly mean stages are expected to increase by 0.002 m in May, 0.004 m in June, 0.002 m in August, 0.003 m in September, and 0.002 m in October, and decrease by 0.002 m in July, under median conditions.

**Lake E3 and Outlet Channel/Bank Stability:** permanently increased flood regimes from a change in watershed configuration are expected to increase erosion potential in Lake E3 and its outlet at Post-Closure. Mitigation measures to minimize shoreline erosion include two possible mitigation options:

- Preventative mitigation – the shoreline is modified by armouring or re-sloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.

- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for at least 10 years following the onset of the increased water level.

**Lake E1 Outlet Flows:** the water balance results for Lake E1 show that during Post-Closure, monthly mean flows will be increased during the months of May, June, August, September, and October, and decreased during the month of July compared to baseline due to a change in watershed configuration including a decrease in lake-to-land area ratio with the B7 waste rock storage facility covering most of the Lake E4 watershed following the breach of Dike B7-D-01. The 2-year flood discharge during Post-Closure will increase by approximately 6% above the baseline value, and the 100-year flood discharge by 14%. The change in configuration of Lake E1 will cause low flows to decrease by 5% to 8% compared to baseline conditions.

**Lake E1 Water Levels:** Lake E1 water levels are also expected to be increased during the months of May, June, August, September, and October, and decreased during the month of July in Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.017 m, and the 100-year flood level by 0.015 m, while monthly mean stages are expected to increase by less than 0.001 m in May, 0.002 m in June, less than 0.001 m in August, less than 0.001 m in September, and 0.001 m in October, and decrease by 0.001 m in July, under median conditions.

**Lake E1 and Outlet Channel/Bank Stability:** permanently increased flood regimes from a change in watershed configuration are expected to increase erosion potential in Lake E1 and its outlet at Post-Closure. Mitigation measures to minimize shoreline erosion include two possible mitigation options:

- Preventative mitigation – the shoreline is modified by armouring or resloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.
- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for at least 10 years following the onset of the increased water level.

### *Lake H1*

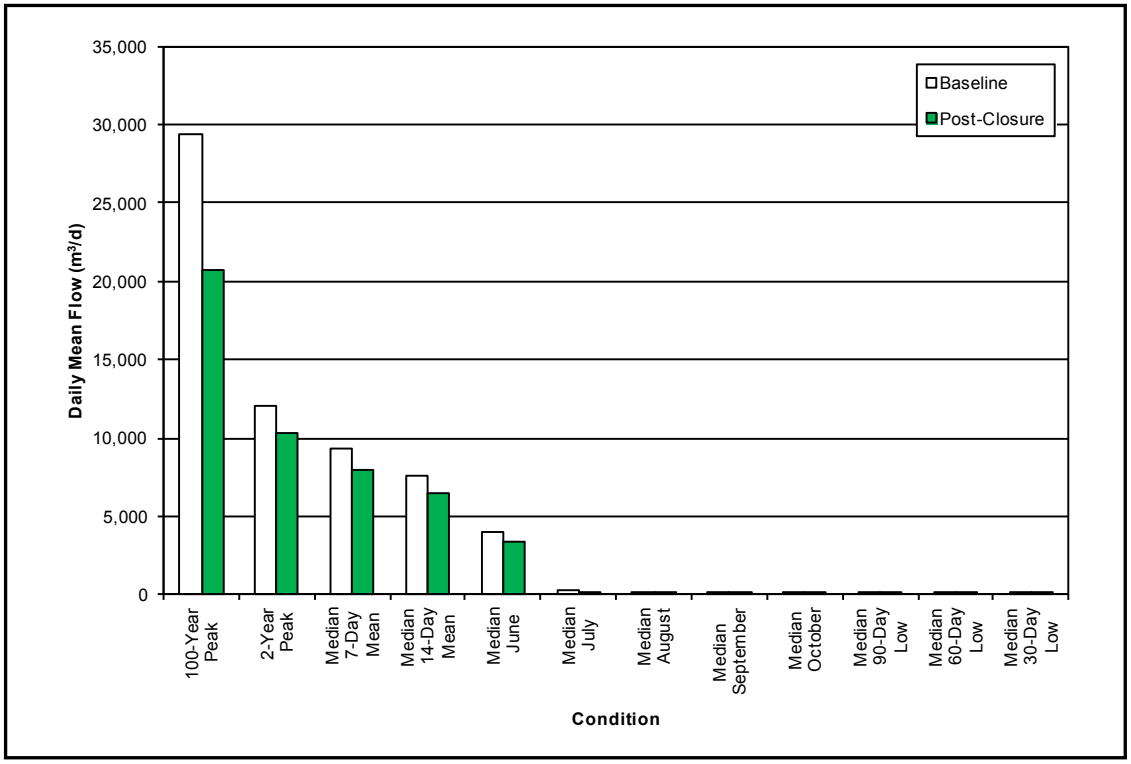



*Figure 7.3-120: Comparison of Effects on Lake H1 Outlet Discharges - Post-Closure*

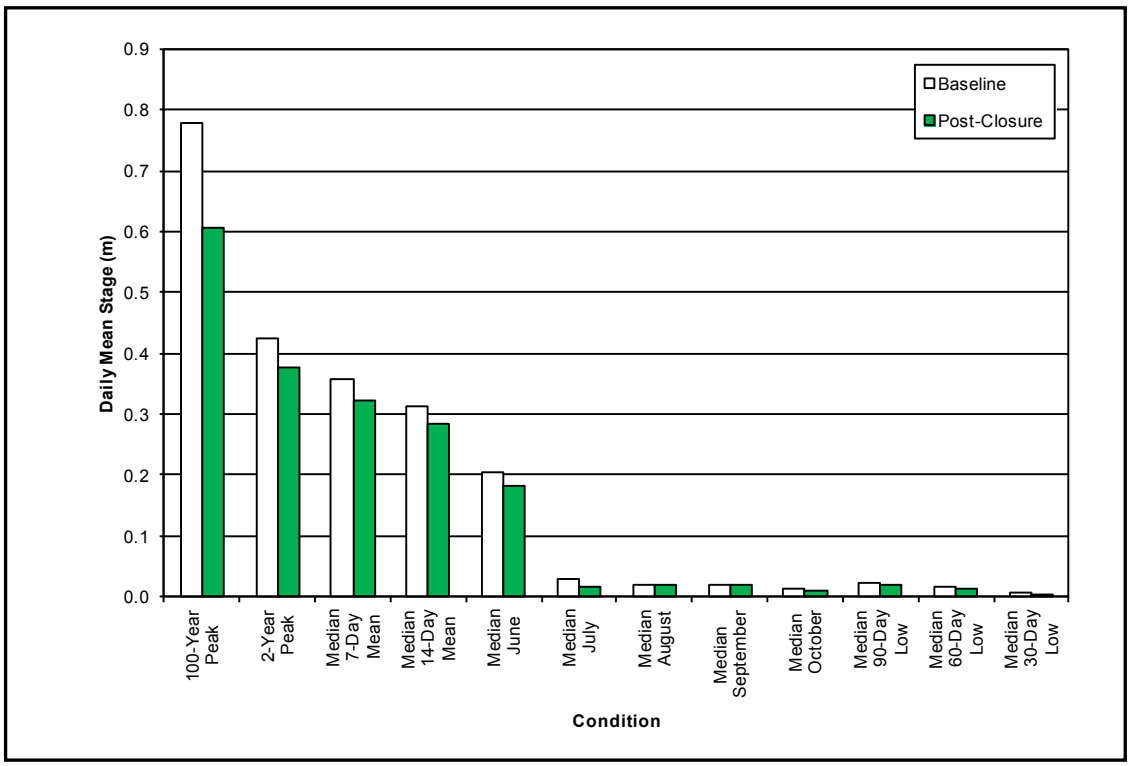



*Figure 7.3-121: Comparison of Effects on Lake H1 Stages - Post-Closure*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake H1 Outlet Flows:** the water balance results for Lake H1 show that during Post-Closure, monthly mean flows will be increased during the month of May compared to baseline, and decreased during the months of June, July, August, September, and October due to the reduction in drainage area from the Tiriganiaq Pit, and the infilling of Lake H20 and Lake H19. The B7 waste rock storage facility covering waterbodies upstream of Lake H7 is anticipated to have little to negligible effects on Lake H1 as these waterbodies have low storage capacity and provide little contribution to Lake H1 under baseline conditions. The 2-year flood discharge during Post-Closure will decrease by approximately 14% below the baseline value, and the 100-year flood discharge by 29%. The decrease in drainage area will cause low flows to decrease by 19% to 32% compared to baseline conditions.

**Lake H1 Water Levels:** Lake H1 water levels are also expected to be increased during the month of May, and decreased during the months of June, July, August, September, and October during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.046 m, and the 100-year flood level by 0.172 m, while monthly mean stages are expected to increase by 0.006 m in May, and decrease by 0.022 m in June, 0.011 m in July, less than 0.001 m in August, 0.001 m in September and 0.003 m in October under median conditions.

**Lake H1 and Outlet Channel/Bank Stability:** No effects on Lake H1 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

## Lake J8, Lake J1

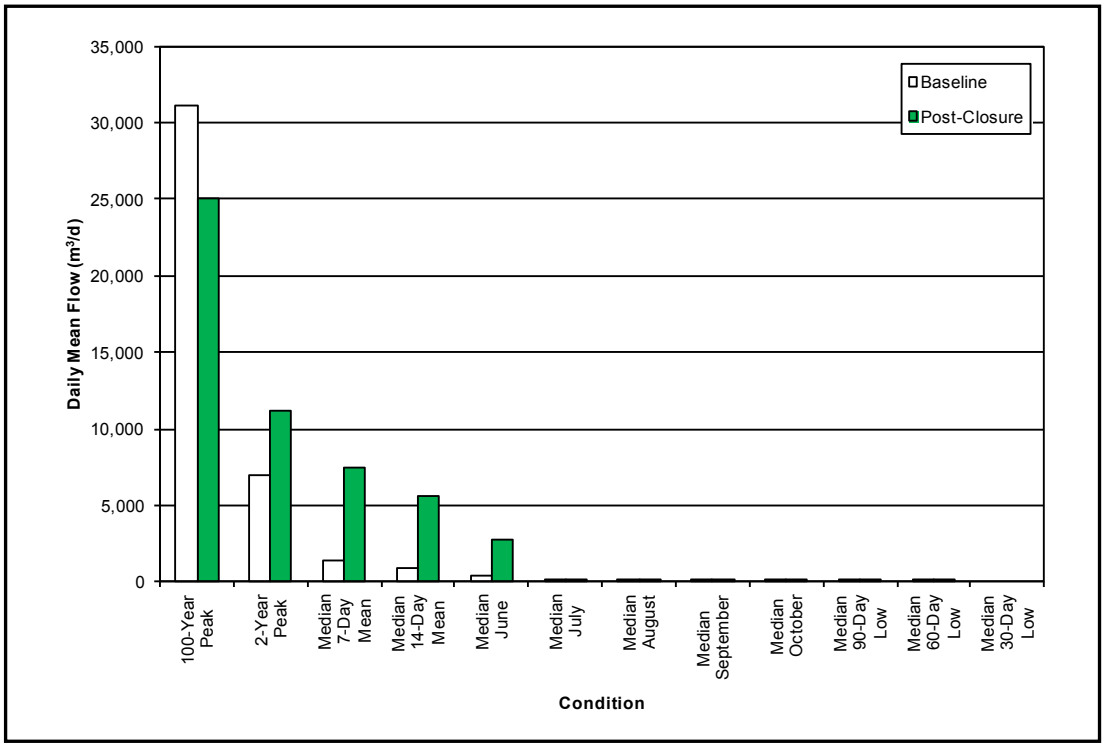



*Figure 7.3-122: Comparison of Effects on Lake J8 Outlet Discharges - Post-Closure*

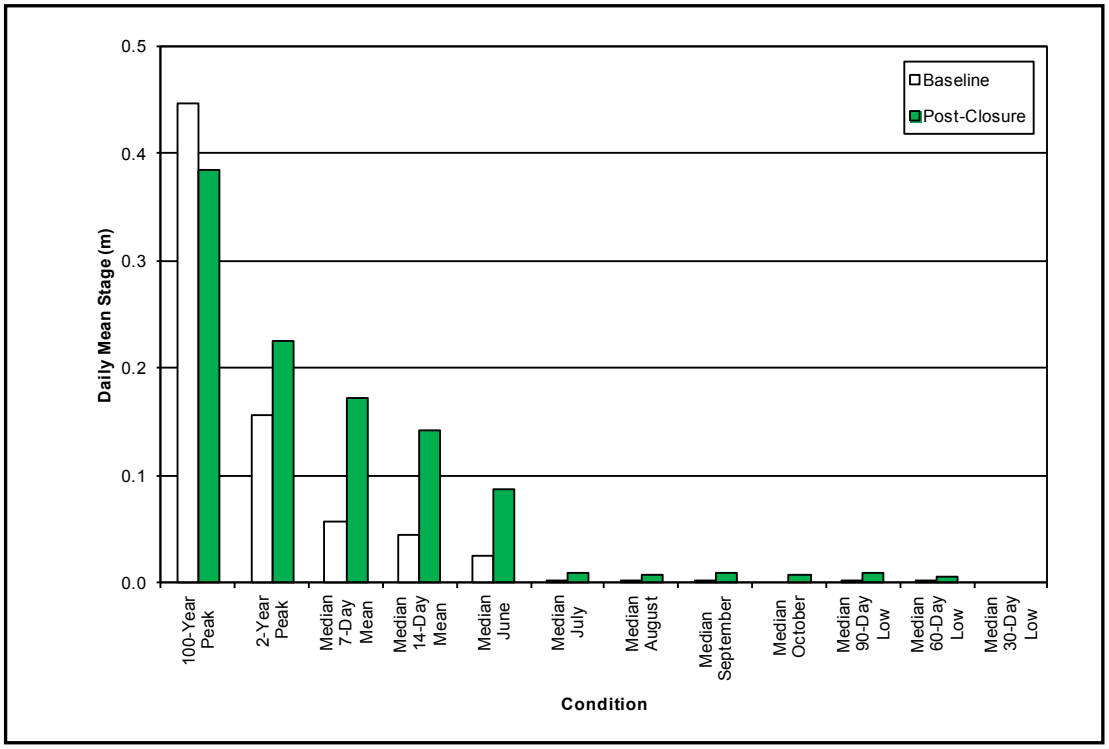



*Figure 7.3-123: Comparison of Effects on Lake J8 Stages - Post-Closure*

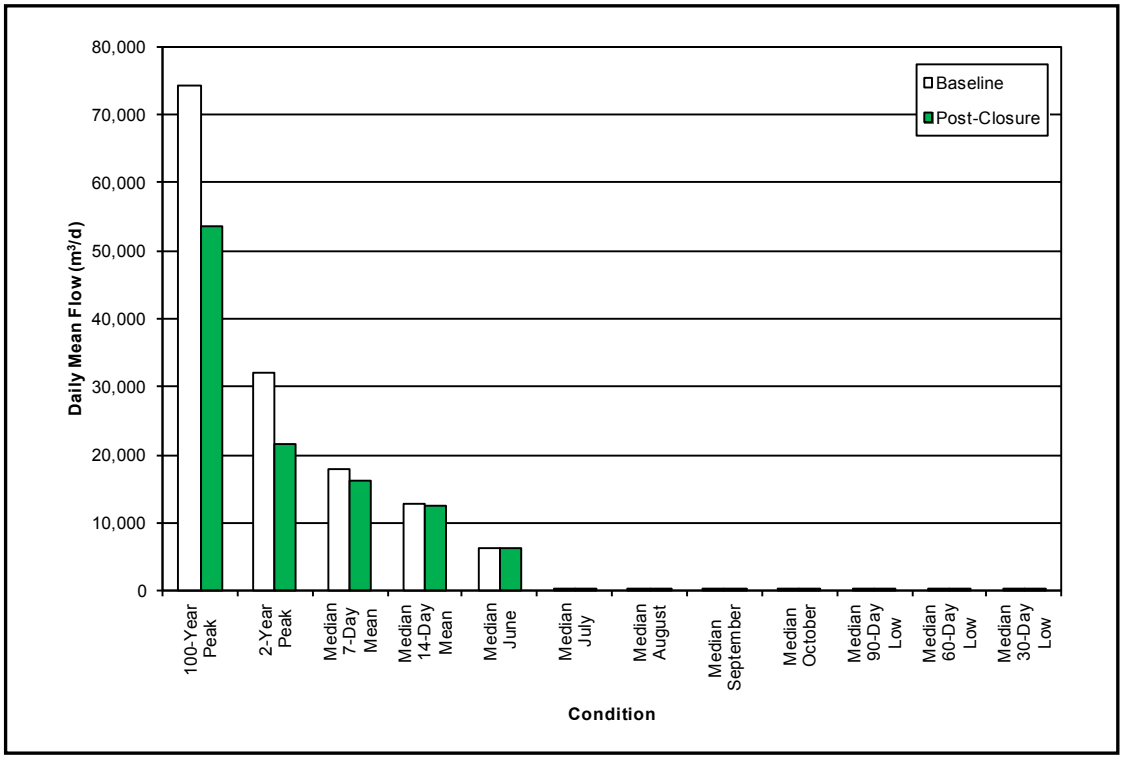



*Figure 7.3-124: Comparison of Effects on Lake J1 Outlet Discharges - Post-Closure*

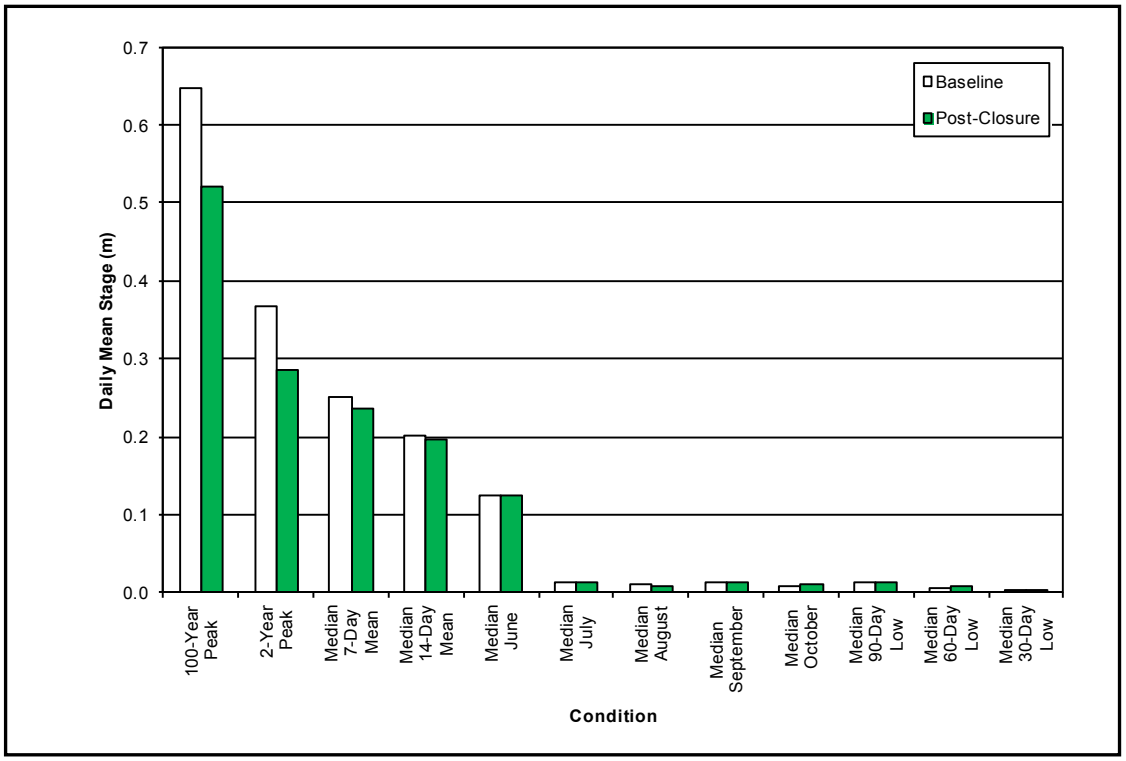



*Figure 7.3-125: Comparison of Effects on Lake J1 Stages - Post-Closure*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake J8 Outlet Flows:** the water balance results for Lake J8 show that during Post-Closure, monthly mean flows will be increased compared to baseline due to the change in watershed configuration, including an increase in drainage area from the Wesmeg #3 Pit and a change in drainage patterns draining former waterbodies (now infilled) J7, J6, J5, J4, J3, and J2 to Lake J8. 2-year flood discharge during Post-Closure will increase by approximately 63% above the baseline value, and the 100-year flood discharge will decrease by 19%. The change in watershed configuration will cause low flows to increase by 0% to 825% compared to baseline conditions.

**Lake J8 Water Levels:** the 2-year and 100-year Lake J8 flood water levels are also expected to be increased and decreased, respectively during Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.069 m, and the 100-year flood level is expected to decrease by 0.062 m, while monthly mean stages are expected to increase by 0.015 m (May), 0.063 m (June), 0.007 m (July), 0.005 m (August), 0.008 m (September), 0.007 m (October) under median conditions.

**Lake J8 and Outlet Channel/Bank Stability:** permanently increased 2-year flood discharges from a change in watershed configuration are expected to result in a minimum increase in erosion potential in Lake J8 and its outlet Post-Closure (Appendix 7.3-D). The Lake J8 outlet channel is short (approximately 15 m long) and connects with the existing Lake J2 outlet channel. During Post-Closure, the existing Lake J2 outlet channel will only be carrying the augmented discharge from Lake J8, but this is expected to be less than the baseline discharge from Lake J2; therefore, no potential erosion is anticipated. Potential effects on the outlet channel from Lake J8 to the confluence with the Lake J2 outlet channel will be mitigated by designing the channel such that it will mimic characteristics similar to the existing Lake J2 outlet channel. The existing channel from Lake J2 may be used as a design guideline because it is expected to have excess capacity. The Lake J8 2-year flood water levels are expected to increase (i.e. the infilled Wesmeg Pit #3 will collect the runoff from Lake J6 and J7 area and will drain into Lake J8). The effects on the shoreline are expected to be minimal to negligible because the water level increase will be small and for a short period of time during the freshet period. Monitoring of the shoreline will occur for at least 10 years following the onset of the increased water level with proactive measures implemented if required to prevent erosion.

**Lake J1 Outlet Flows:** the water balance results for Lake J1 show that during Post-Closure, monthly mean flows will be similar to baseline conditions despite a change in watershed configuration including an increase in drainage area from the Wesmeg #3 Pit and a change in drainage patterns draining former waterbodies (now infilled) J7, J6, J5, J4, J3, and J2 to Lake J8. The 2-year flood discharge during Post-Closure will decrease by approximately 32% below the baseline value, and the 100-year flood discharge by 28%. The change in watershed configuration will cause low flows to decrease by 0% to 47% compared to baseline conditions.

**Lake J1 Water Levels:** Lake J1 water levels are also expected to decrease during Post-Closure. The 2-year flood level is expected to decrease by approximately 0.083 m, and the 100-year flood level is expected to decrease by 0.126 m, while monthly mean stages are expected to decrease by 0.001 m (May), less than 0.001 m (June), 0.001 m (August), less than 0.001 m (September), and increase by 0.001 m (July) and 0.001 m (October) under median conditions.

**Lake J1 and Outlet Channel/Bank Stability:** No effects on Lake J1 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

## Lake CH6 to Lake CH1

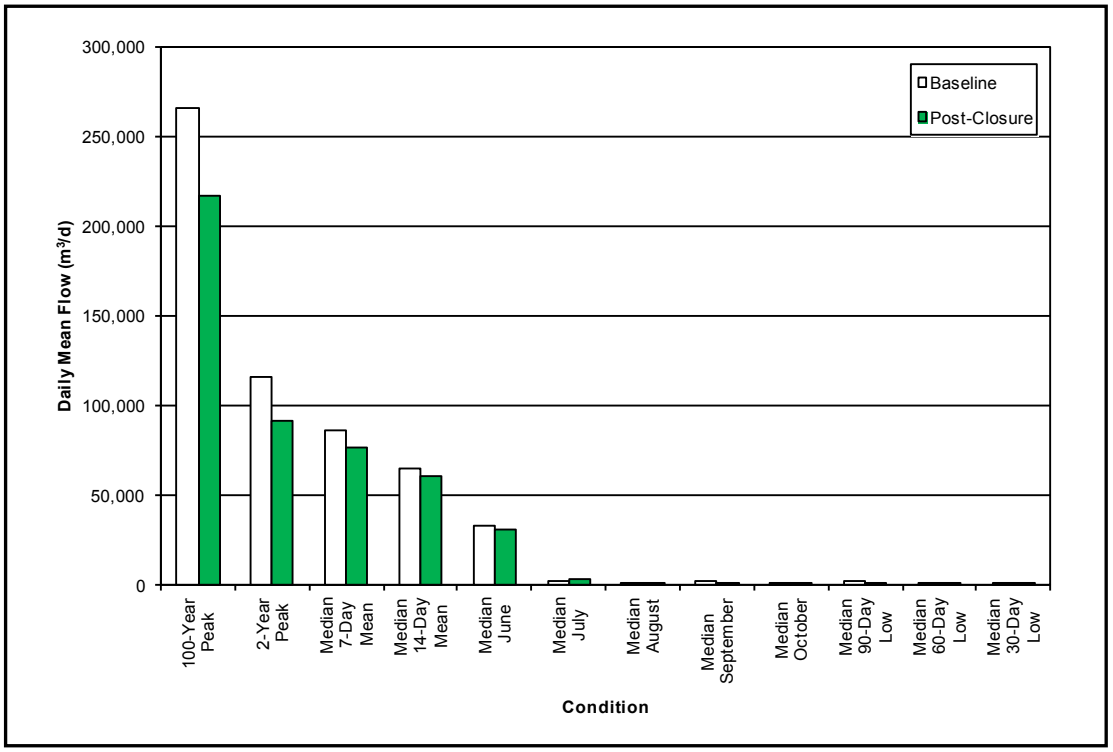



*Figure 7.3-126: Comparison of Effects on Lake CH6 Outlet Discharges - Post-Closure*

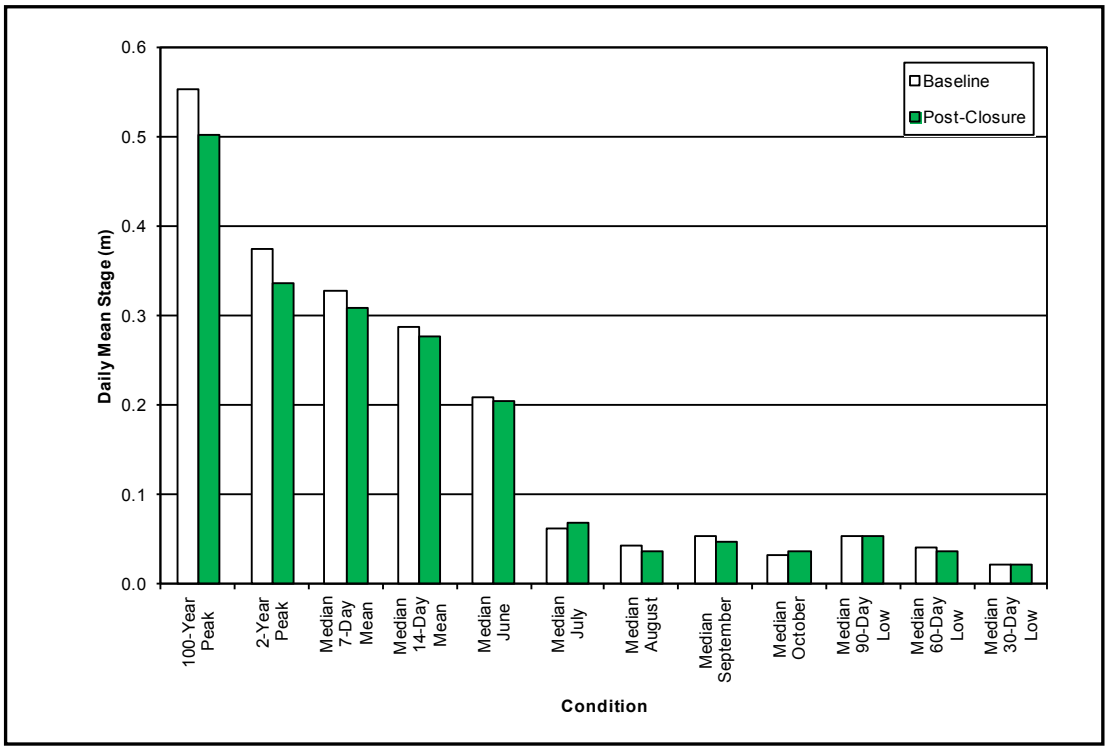



*Figure 7.3-127: Comparison of Effects on Lake CH6 Stages - Post-Closure*

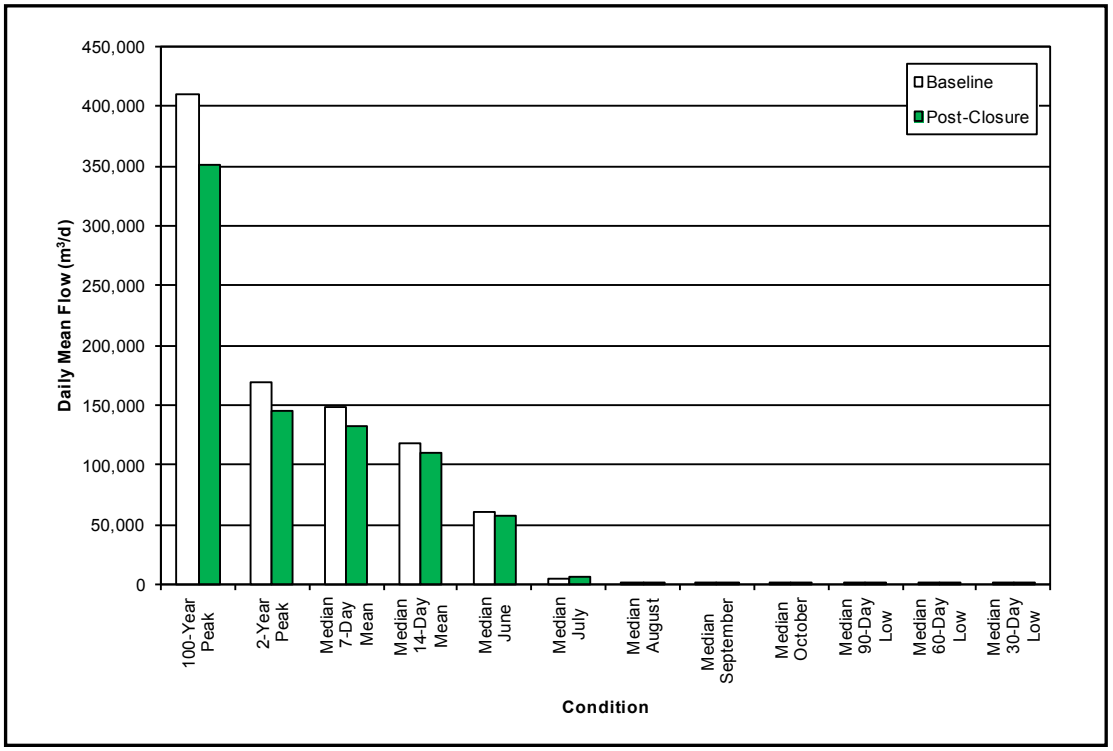



*Figure 7.3-128: Comparison of Effects on Lake CH1 Outlet Discharges - Post-Closure*

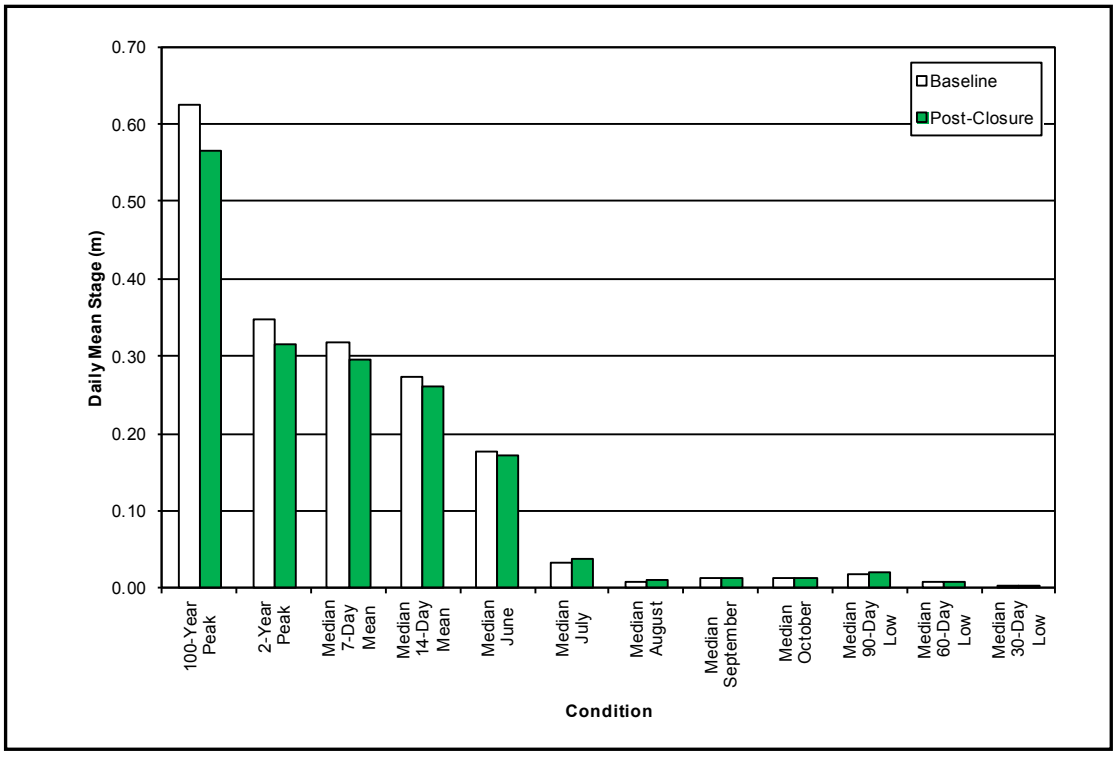



*Figure 7.3-129: Comparison of Effects on Lake CH1 Stages - Post-Closure*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake CH6 Outlet Flows:** the water balance results for Lake CH6 show that during Post-Closure, monthly mean flows will be increased during the months of July and October compared to baseline, and decreased during the months of May, June, August, and September due to a change in watershed configuration, including a slight increase in drainage area from Discovery Pit, and an increase in lake area from the Discovery Pit. The Discovery Waste Rock Pile will not cover any waterbodies contributing to Lake CH6, and will have little to negligible effects on the hydrology of Lake CH6. The 2-year flood discharge during Post-Closure will decrease by approximately 21% below the baseline value, and the 100-year flood discharge by 19%. The change in watershed configuration will cause low flows to increase by 14% to approximately 240 times compared to baseline conditions.

**Lake CH6 Water Levels:** Lake CH6 water levels are also expected to be increased during the months of July and October, and decreased during the months of May, June, August, and September during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.039 m, and the 100-year flood level by 0.050 m, while monthly mean stages are expected to increase by 0.007 m in July and 0.005 m in October, and decrease by 0.005 m in May, 0.005 in June, 0.005 m in August and 0.007 m in September under median conditions.

**Lake CH6 and Outlet Channel/Bank Stability:** No effects on Lake CH6 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

**Lake CH1 Outlet Flows:** the water balance results for Lake CH1 show that during Post-Closure, monthly mean flows will be increased during the months of July and August compared to baseline, and decreased during the months of May, June, September, and October due to a change in watershed configuration, including a slight increase in drainage area from Discovery Pit, and an increase in lake area from the Discovery Pit. The Discovery Waste Rock Pile will not cover any waterbodies contributing to Lake CH1, and will have little to negligible effects on the hydrology of Lake CH1. The 2-year flood discharge during Post-Closure will decrease by approximately 13% below the baseline value, and the 100-year flood discharge by 13%. The change in watershed configuration will cause low flows to increase by 2% to 35% compared to baseline conditions.

**Lake CH1 Water Levels:** Lake CH1 water levels are also expected to be increased during the months of July and August, and decreased during the months of May, June, September, and October during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.032 m, and the 100-year flood level by 0.060 m, while monthly mean stages are expected to increase by 0.004 m in July and 0.001 m in August, and decrease by less than 0.001 m in May, 0.005 in June, 0.001 m in September and 0.001 m in October under median conditions.

**Lake CH1 and Outlet Channel/Bank Stability:** No effects on Lake CH1 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

## 7.3.3.11.2 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### *7.3.3.11.2.1 Project Activities*

At Post-Closure, Lake B5 will be permanently diverted to Lake D7 through constructed channel B5-C-02. This will affect waterbodies downstream of the diversion including Lake D7, Lake D3, and Lake D1.

### 7.3.3.11.2.2 Environmental Design Feature and Mitigation

At diversion outlets, a channel will be constructed to convey flows. The diversion outlet channel will be designed to approximate the natural hydrograph to the extent possible so as to manage the water level regime of the diverted waterbodies. Diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn et al. 2012) and to incorporate lessons learned at other northern sites (Jones et al. 2003).

### 7.3.3.11.2.3 Effect Analysis

The water balance model for the Project was used to examine potential watershed diversion effects on flows, water levels, and channel/bank stability during Post-Closure all downstream waterbodies between Lake B46 and the Lake B2 outlet channel, and Lake D7 and the Lake D1 outlet channel. Project effects at the Lake B46 outlet during Post-Closure are summarized in Figure 7.3-130 to Figure 7.3-131, the Lake B45/44 outlet in 7.3-132 to Figure 7.3-133, the Lake P2 outlet in 7.3-134 to Figure 7.3-135, the Lake B2 outlet in 7.3-136 to Figure 7.3-137, the Lake D7 outlet in 7.3-138 to Figure 7.3-139, the Lake D3 outlet in 7.3-140 to Figure 7.3-141, and the Lake D1 outlet in 7.3-142 to Figure 7.3-143. Additional information is provided in Appendix 7.3-C.

#### Lake B46 to Lake B2

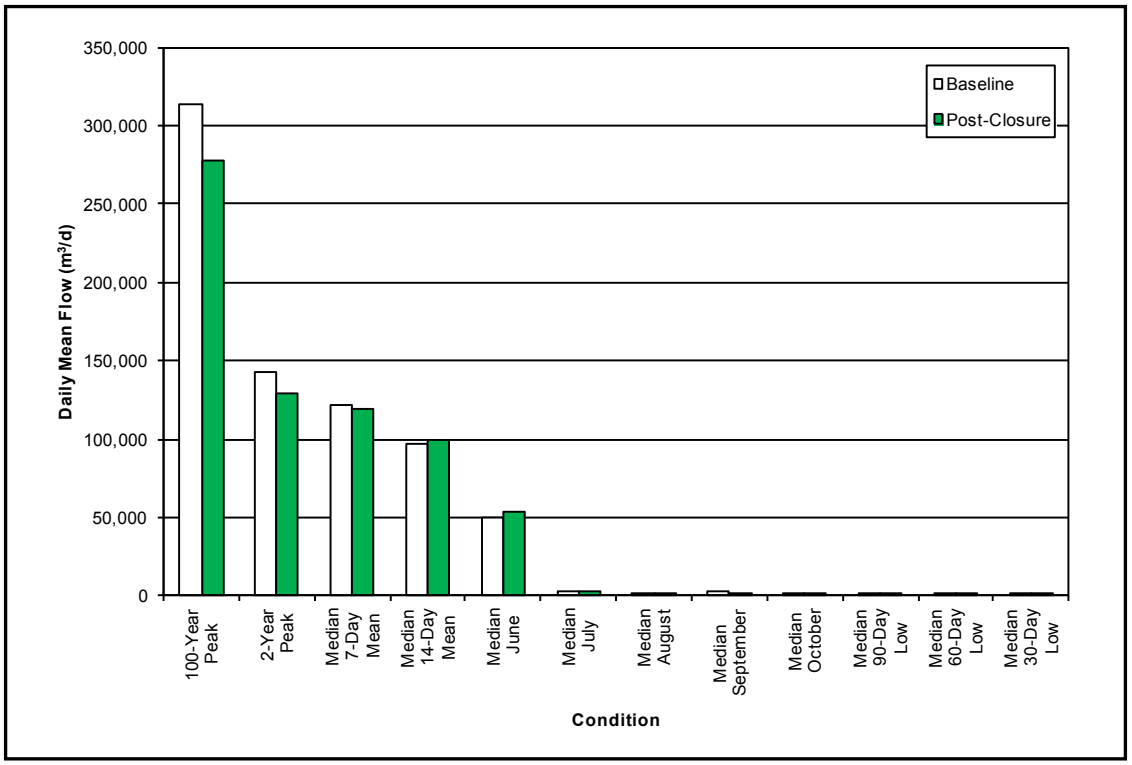



*Figure 7.3-130: Comparison of Effects on Lake B46 Outlet Discharges - Post-Closure*

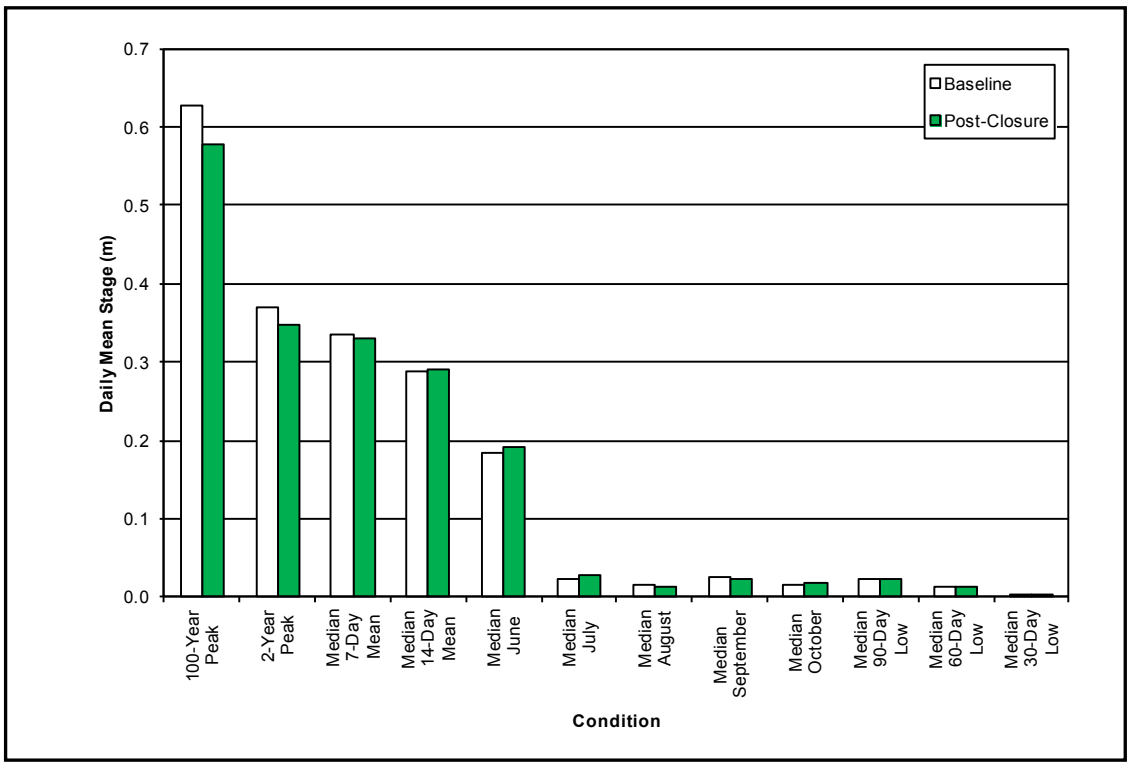



*Figure 7.3-131: Comparison of Effects on Lake B46 Stages - Post-Closure*

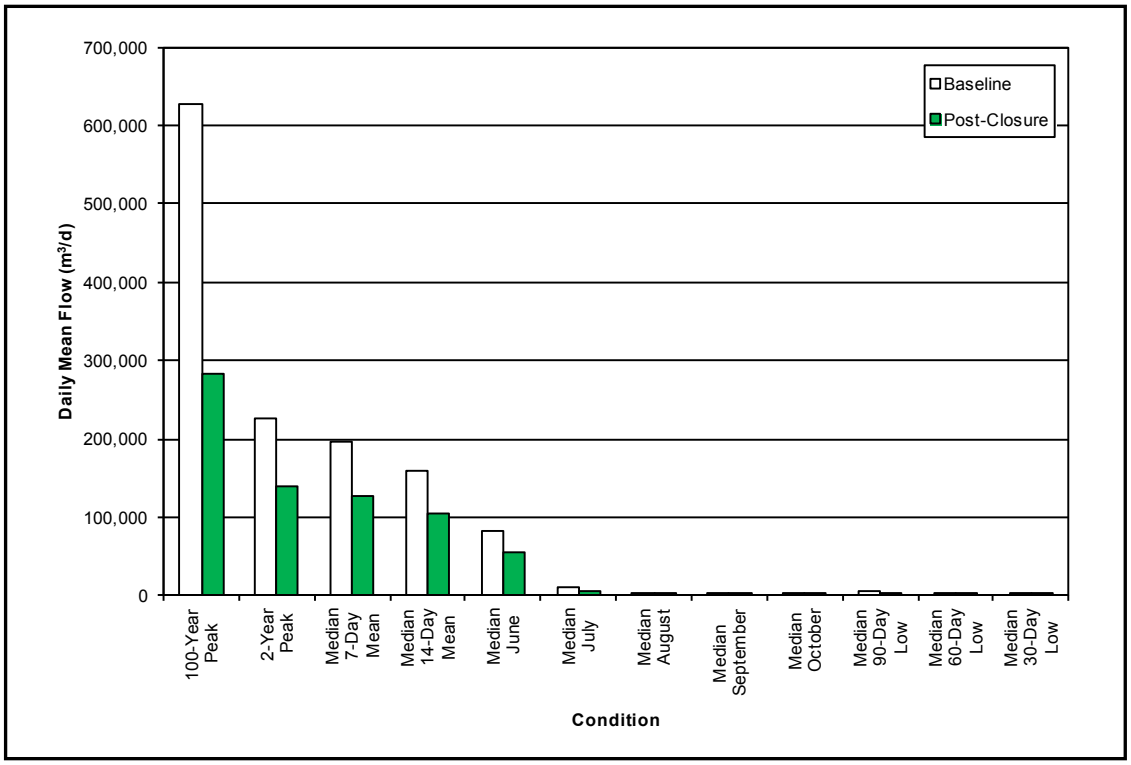



*Figure 7.3-132: Comparison of Effects on Lake B45/44 Outlet Discharges - Post-Closure (Baseline Conditions based on Lake B4)*

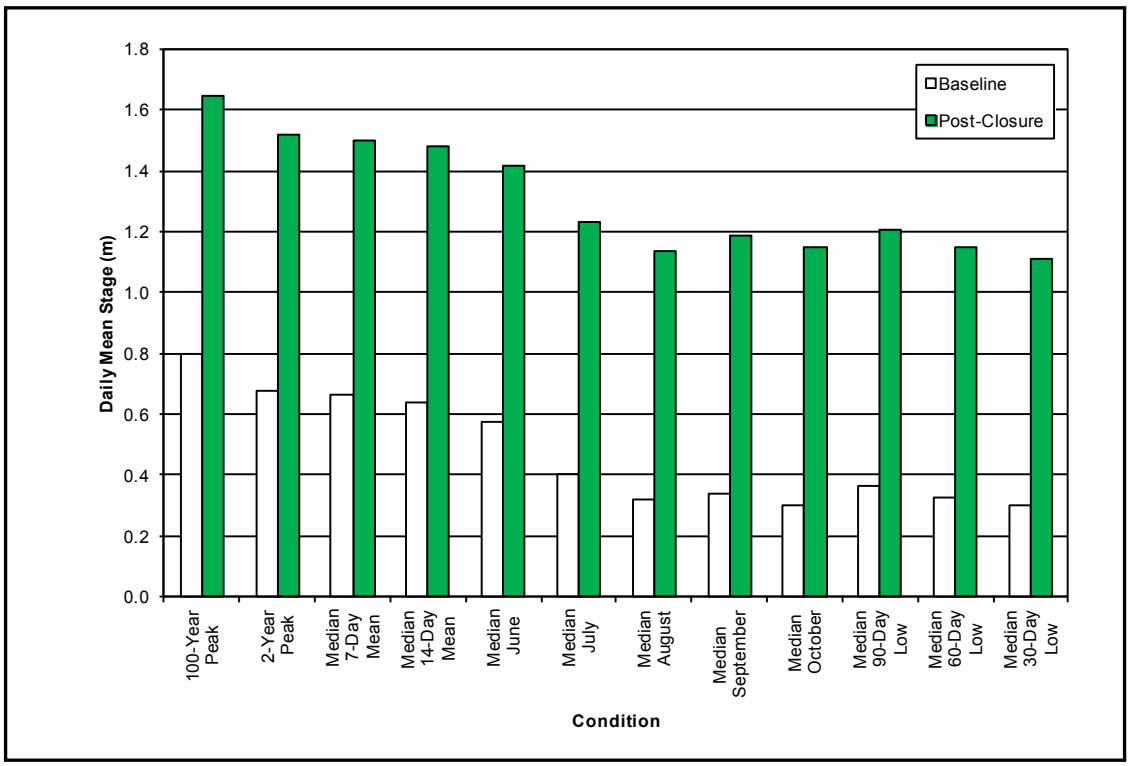



*Figure 7.3-133: Comparison of Effects on Lake B45/44 Stages - Post-Closure (Baseline Conditions based on Lake B4)*

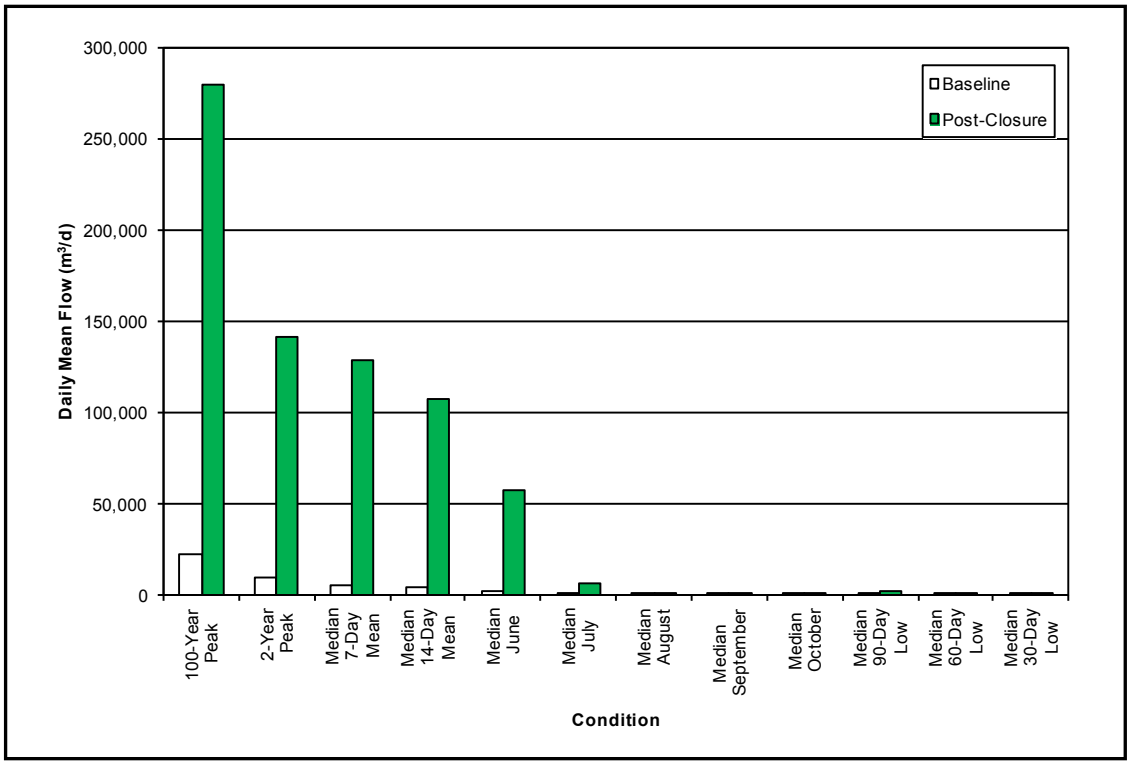



*Figure 7.3-134: Comparison of Effects on Lake P2 Outlet Discharges - Post-Closure*

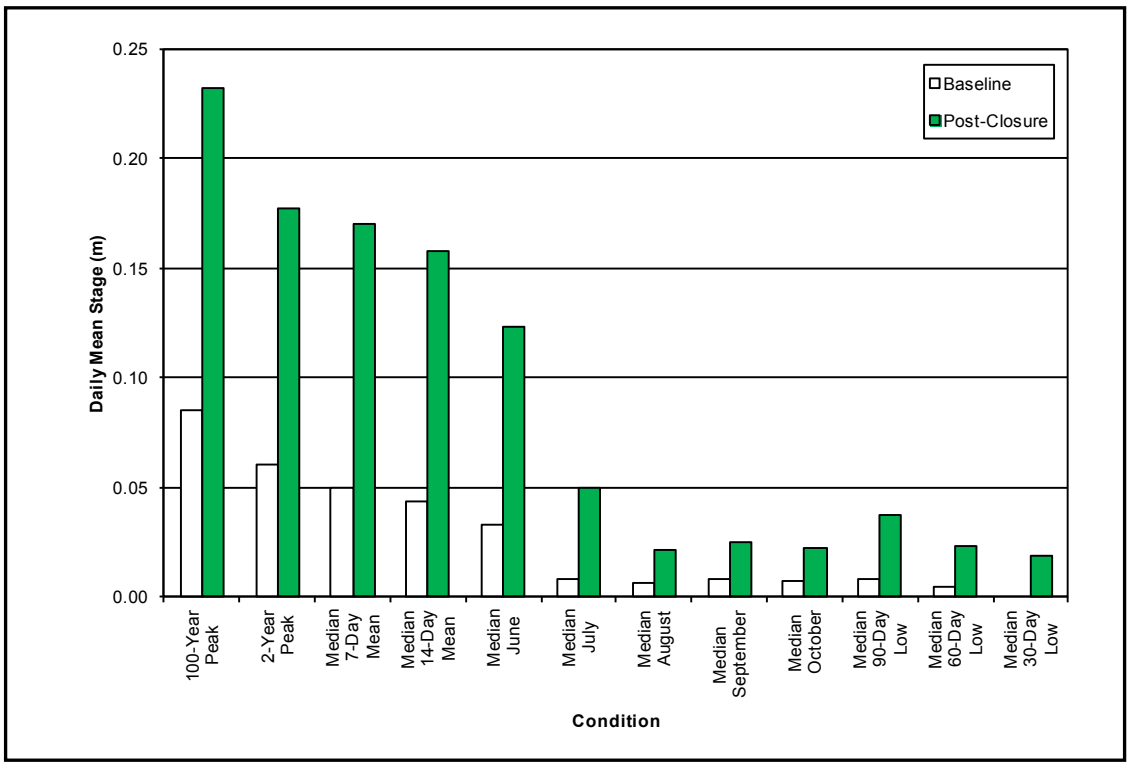



*Figure 7.3-135: Comparison of Effects on Lake P2 Stages - Post-Closure*

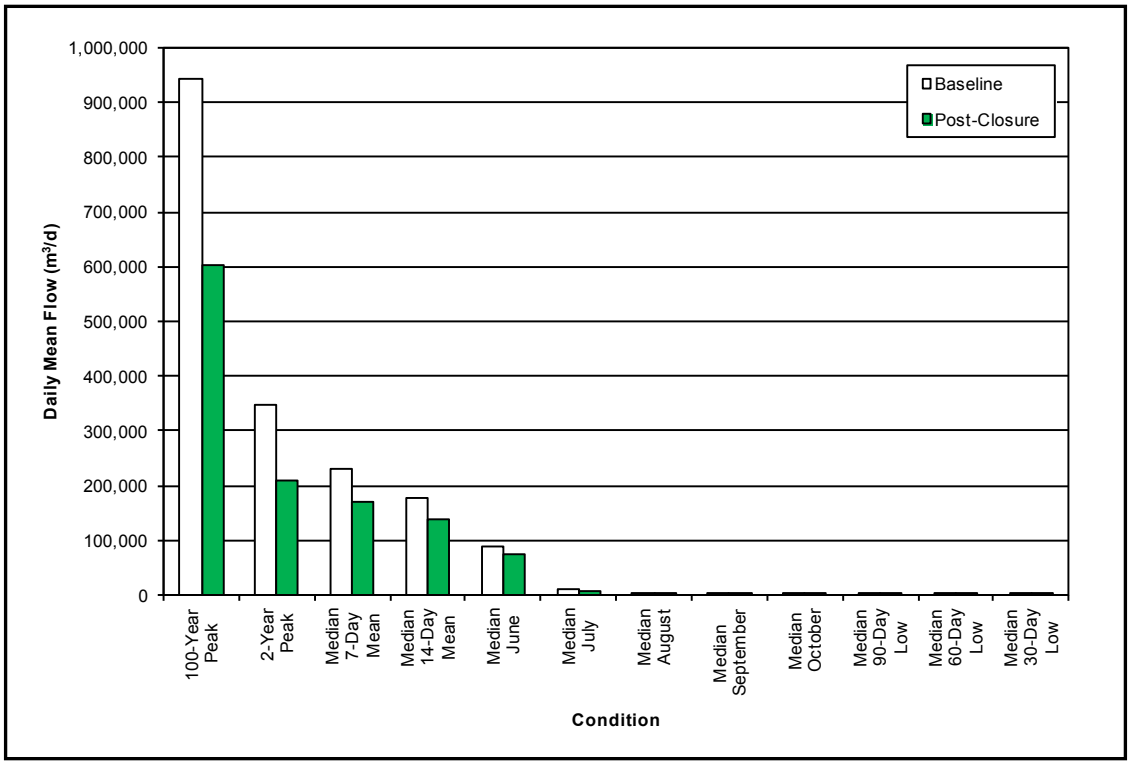



*Figure 7.3-136: Comparison of Effects on Lake B2 Outlet Discharges - Post-Closure*

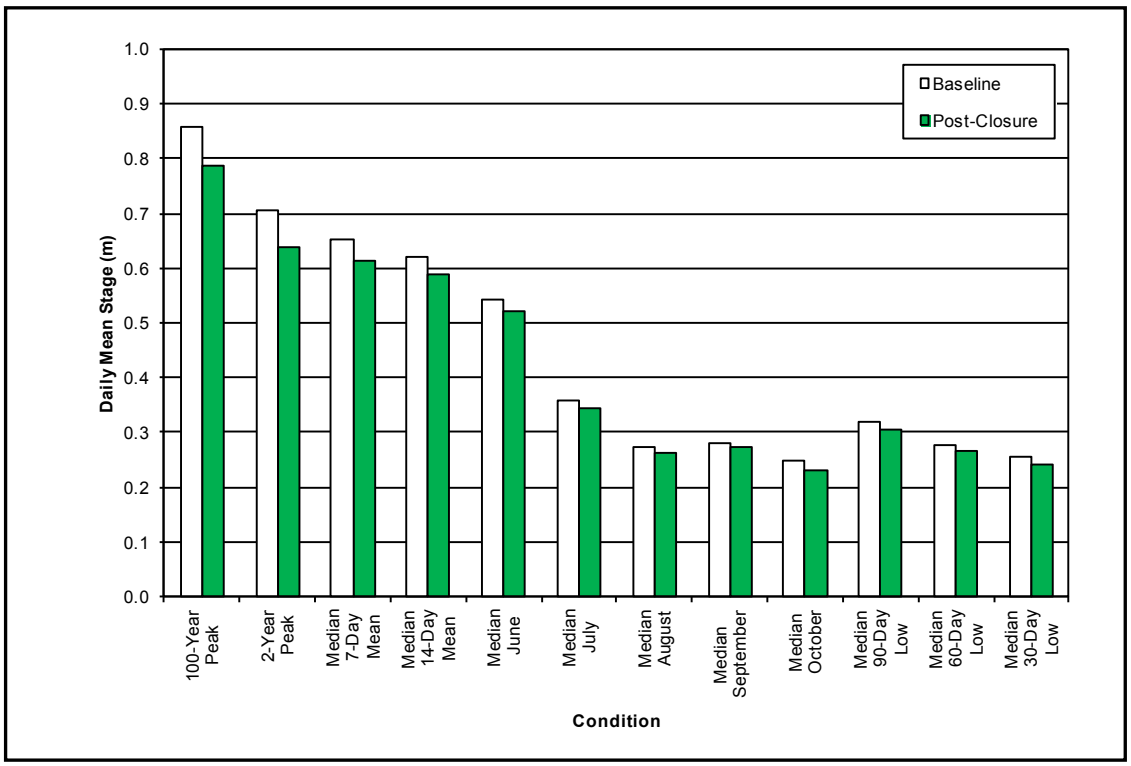



*Figure 7.3-137: Comparison of Effects on Lake B2 Stages - Post-Closure*

### *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

The permanent diversion of Lake B45/44 to Lake P2, and Lake P2 to Lake B2, will result in reduced flow regimes from the reduction in drainage area, and increased water level regimes at Lake B45/44 and Outlet channel, relative to baseline conditions in Lake B4 (Section 7.3.3.3.3).

The diversion of Lake P2 to Lake B2 was modeled using the baseline stage-discharge rating curve of Lake P2, due to unknown design hydraulic parameters of the diversion channel at the time of this assessment.

**Lake B46 Outlet Flows:** the water balance results for Lake B46 show that during Post-Closure, monthly mean flows will be increased during the months of June, July, and October compared to baseline, and decreased during the months of May, August, and September due to a change in watershed configuration, including a slight increase in drainage area from the Pump #1 Pit, and an increase in lake area from the Pump #1 Pit. The B4 waste rock storage facility is located on land in the B46 watershed and will have little to negligible impact on the hydrology of Lake B46. 2-year flood discharge during Post-Closure will decrease by approximately 9% below the baseline value, and the 100-year flood discharge by 12%. The change in watershed configuration will cause low flows to decrease by 3% to 10% compared to baseline conditions.

**Lake B46 Water Levels:** Lake B46 water levels are also expected to be increased during the months of June, July, and October, and decreased during the months of May, August, and September during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.023 m, and the 100-year flood level by 0.050 m, while monthly mean stages are expected to increase by 0.007 m in June, 0.006 m in

July and 0.001 m in October, and decrease by 0.002 m in May, 0.002 in August and 0.003 m in September, under median conditions.

**Lake B46 and Outlet Channel/Bank Stability:** No effects on Lake B46 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

**Lake B45/44 Outlet Flows:** the water balance results for Lake B45/44 show that during Post-Closure, monthly mean flows will be decreased compared to baseline due to a change in watershed configuration, including a slight increase in drainage area from the Pump #1 Pit, and an increase in lake area from the Pump #1 Pit. The B4 waste rock storage facility is located on land in the B45/44 watershed and will have little to negligible impact on the hydrology of Lake B45/44. 2-year flood discharge during Post-Closure will decrease by approximately 39% below the baseline value, and the 100-year flood discharge by 55%. The change in watershed configuration will cause low flows to decrease by 52% to 81% compared to baseline conditions.

**Lake B45/44 Water Levels:** Lake B45/44 water levels will be permanently raised in Post-Closure compared to baseline conditions. The 2-year flood level is expected to increase by approximately 0.829 m, and the 100-year flood level by 0.784 m, while monthly mean stages are expected to increase by 0.855 m (May), 0.844 m (June), 0.840 m (July), 0.816 m (August), 0.829 m (September) and 0.840 m (October) under median conditions.

**Lake B45/44 and Outlet Channel/Bank Stability:** the diversion of Lake B45/44 to the P watershed in Pre-production Year -3 will create new shorelines at higher elevations than the existing shorelines. This will expose new soils, often on steeper slopes than the existing shorelines, to wave erosion and potential instability due to permafrost disturbance. Mitigation measures to minimize shoreline erosion are proposed according to the analysis presented in Appendix 7.3-D. These include two possible mitigation options:

Preventative mitigation – the shoreline is modified by armouring or re-sloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion.

- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, boulder and cobble berms may be used to reinforce the impacted areas of shoreline.

The preferred mitigation option will be decided during the detailed design phase of the Project following a cost-benefit analysis. Monitoring of the shoreline will be ongoing for at least 10 years following the onset of the increased water level.

**Lake P2 Outlet Flows:** the water balance results for Lake P2 show that during Post-Closure, monthly mean flows will increase compared to baseline due to an increase in drainage area from the diversion of Lake B46 to Lake B5/44, and Lake B5/44 to Lake P2. 2-year flood discharge during Post-Closure will increase by approximately 1391% above the baseline value, and the 100-year flood discharge by 1142%. The increase in drainage area will cause low flows to increase by up to 520 times compared to baseline conditions.

**Lake P2 Water Levels:** Lake P2 water levels are also expected to be increased during Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.117 m, and the 100-year flood level by 0.147 m, while monthly mean stages are expected to increase by 0.025 m (May), 0.090 m (June), 0.042 m (July), 0.015 m (August), 0.017 m (September) and 0.015 m (October) under median conditions. It should be noted that these estimates were based on the existing stage-discharge rating curve of Lake P2 and actual increases in water levels will depend on the detailed design of the diversion channel connecting Lake P2 to Lake

B2. The diversion channel will act to mitigate potential impacts related to increases in water level in Lake P2 (and flows in the existing Lake P2 outlet) by providing an additional outlet from the waterbody.

**Lake P2 and Outlet Channel/Bank Stability:** No effects on Lake P2 and existing Outlet channel or bank stability are expected during Post-Closure, because potential effects will be mitigated by the diversion channel. In addition, the diversion channel will be designed and constructed to prevent erosion and sedimentation.

**Lake B2 Outlet Flows:** the water balance results for Lake B2 show that during Post-Closure, monthly mean flows will be decreased compared to baseline due to a reduction in drainage area. The 2-year flood discharge during Post-Closure will decrease by approximately 40% below the baseline value, and the 100-year flood discharge by 36%. The increase in drainage area will cause low flows to decrease by 17% to 21% compared to baseline conditions.

**Lake B2 Water Levels:** Lake B2 water levels are also expected to be decreased during Post-Closure compared to baseline. The 2-year flood level is expected to decrease by approximately 0.068 m, and the 100-year flood level by 0.073 m, while monthly mean stages are expected to decrease by 0.012 m (May), 0.021 m (June), 0.014 m (July), 0.010 m (August), 0.009 m (September) and 0.016 m (October) under median conditions.

**Lake B2 and Outlet Channel/Bank Stability:** No effects on Lake B2 and Outlet channel or bank stability are expected during Post-Closure because flood magnitudes will be reduced from baseline values.

### *Lake D7 to Lake D1*

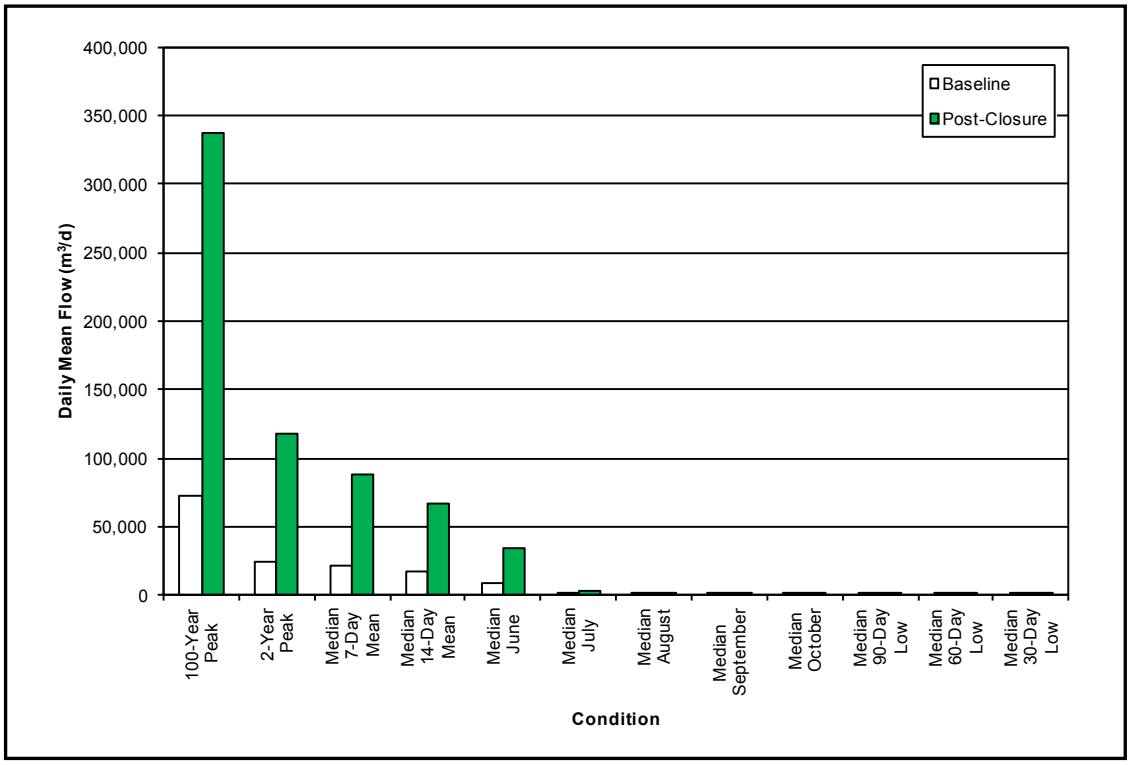



*Figure 7.3-138: Comparison of Effects on Lake D7 Outlet Discharges - Post-Closure*

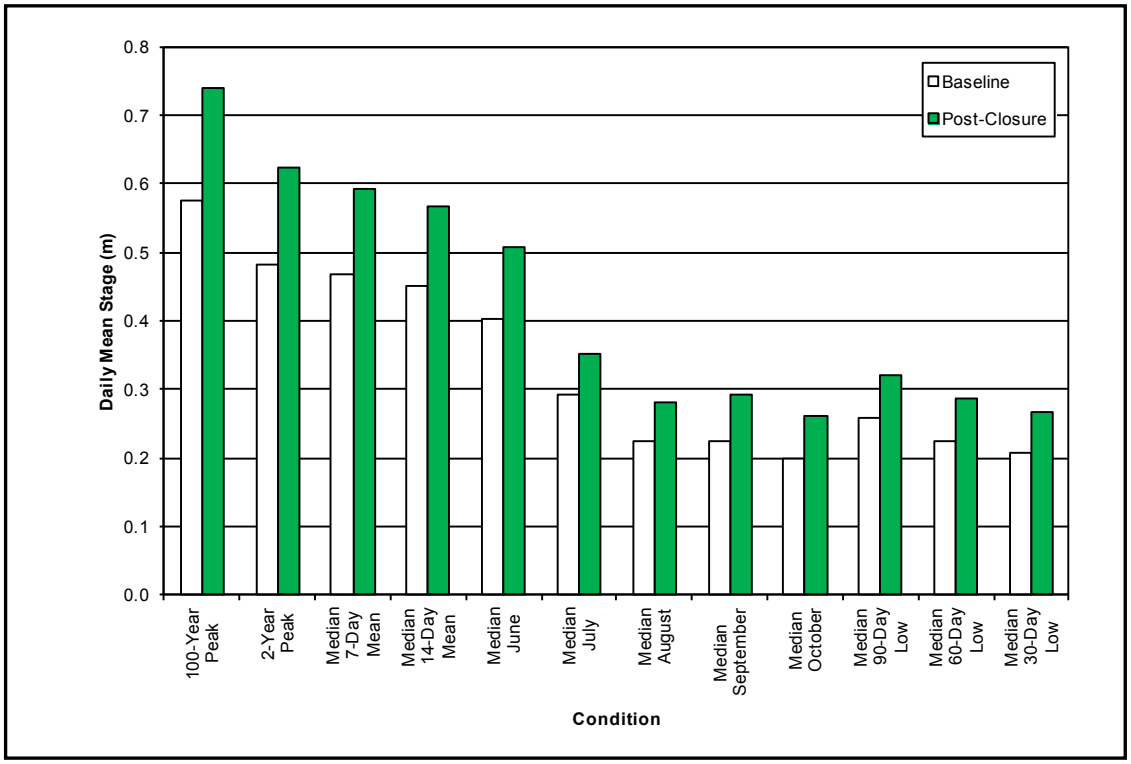



*Figure 7.3-139: Comparison of Effects on Lake D7 Stages - Post-Closure*

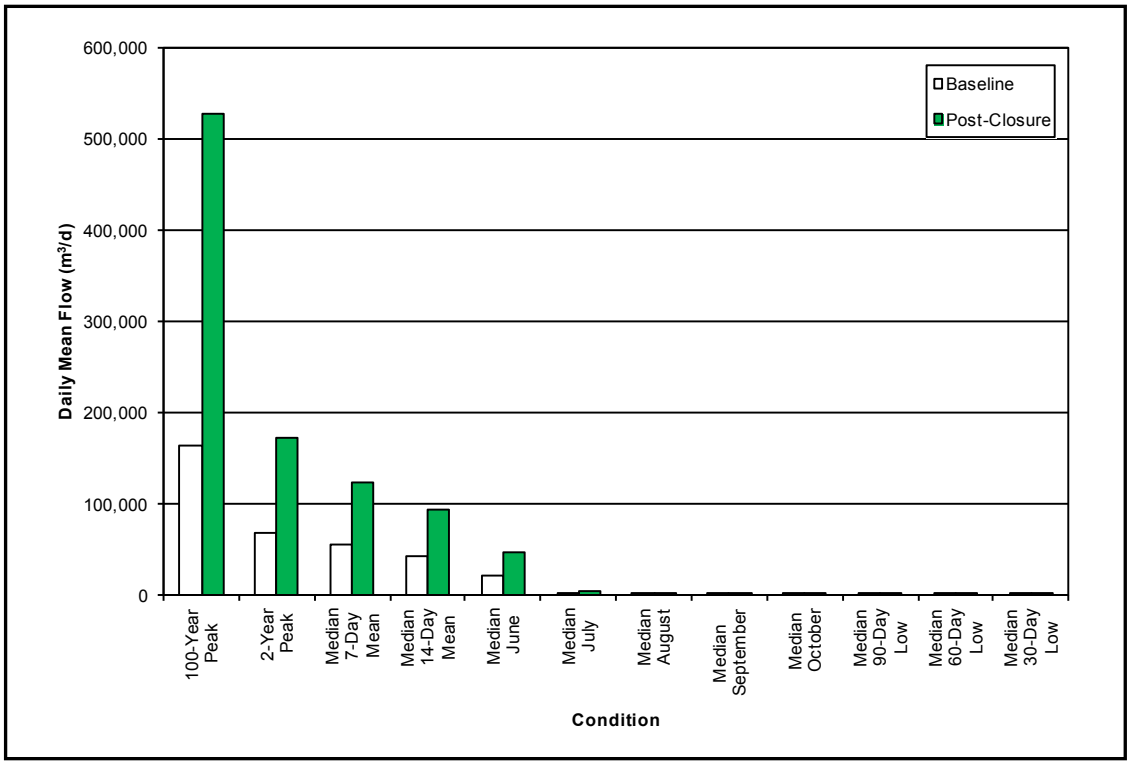



*Figure 7.3-140: Comparison of Effects on Lake D3 Outlet Discharges - Post-Closure*

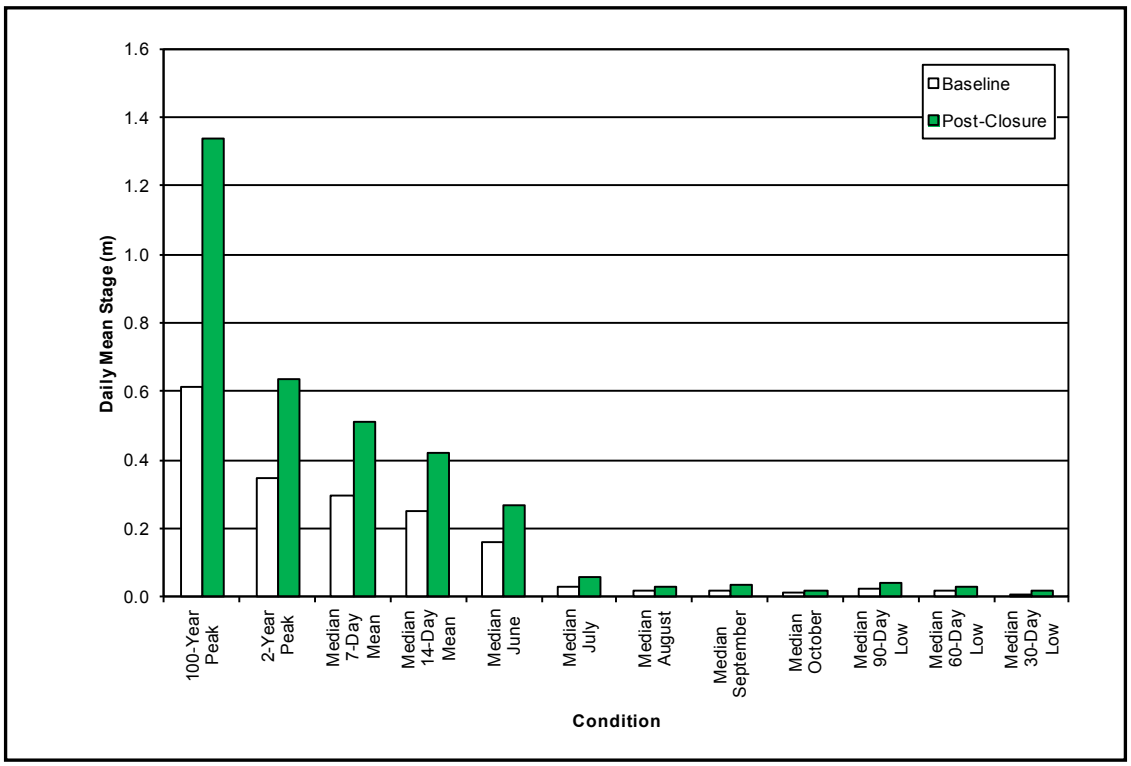



*Figure 7.3-141: Comparison of Effects on Lake D3 Stages - Post-Closure*

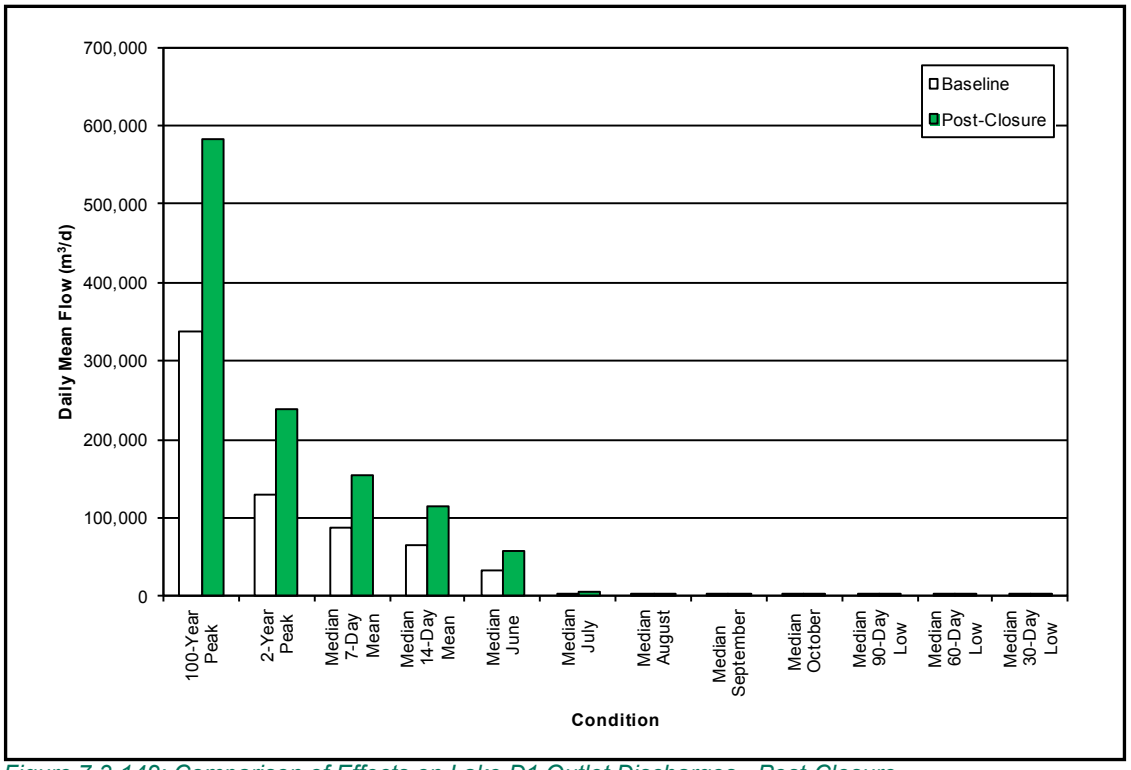



*Figure 7.3-142: Comparison of Effects on Lake D1 Outlet Discharges - Post-Closure*

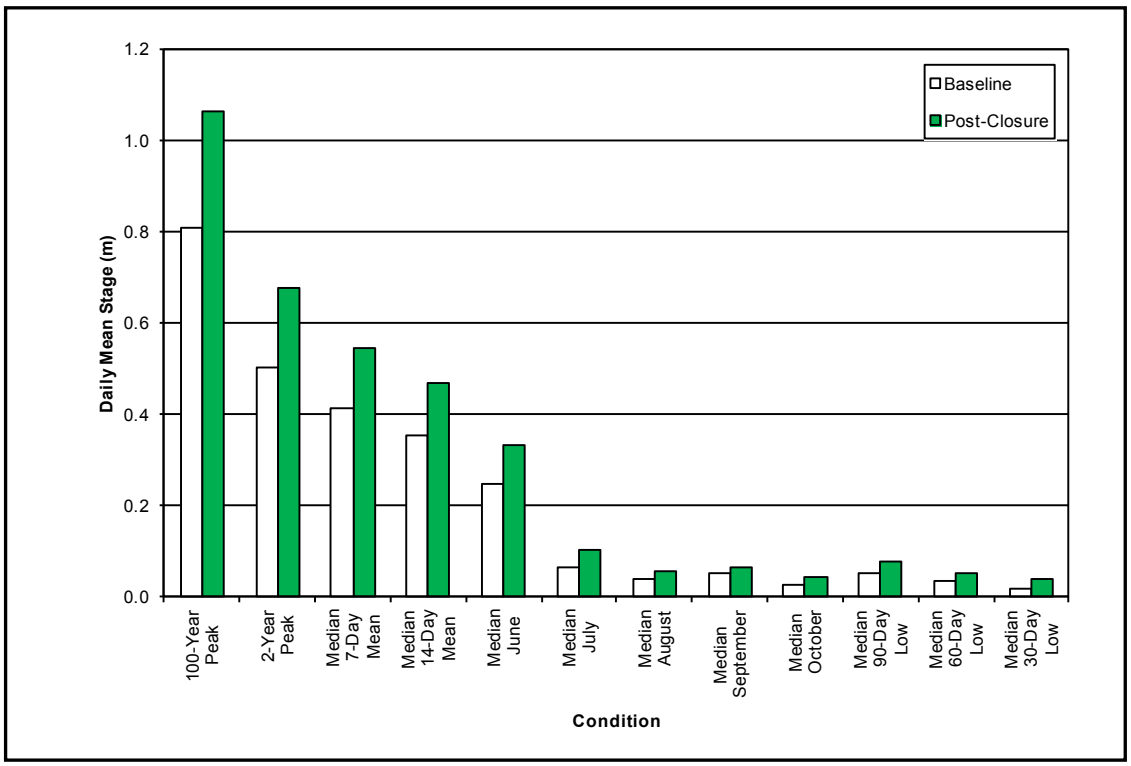



*Figure 7.3-143: Comparison of Effects on Lake D1 Stages - Post-Closure*

## *Summary of Effects on Flows, Water Levels, and Channel/Bank Stability*

**Lake D7 Outlet Flows:** the water balance results for Lake D7 show that during Post-Closure, monthly mean flows will be increased compared to baseline due to the permanent diversion of Lake B5 to Lake D7. The 2-year flood discharge during Post-Closure will increase by approximately 372% above the baseline value, and the 100-year flood discharge by 364%. The permanent diversion of Lake B5 to Lake D7 will cause low flows to increase by 265% to 338% compared to baseline conditions.

**Lake D7 Water Levels:** Lake D7 water levels are also expected to be increased during Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.141 m and the 100-year flood level by 0.166 m, while monthly mean stages are expected to increase by 0.082 m (May), 0.105 m (June), 0.062 m (July), 0.058 m (August), 0.069 m (September) and 0.062 m (October) under median conditions.

**Lake D7 and Outlet Channel/Bank Stability:** the permanent diversion of Lake B5 to Lake D7 watershed will increase flows and water levels at Lake D7, which will be subject to new shoreline formation and potential channel erosion. This will be mitigated by the detailed design of diversion channel B5-C-02, and channel enhancement of lake outlets of Lake D7, Lake D4_D5, Lake D3, Lake D2, and Lake D1. Diversion channel B5-C-02 and enhanced lake outlets will be designed such that water levels remain at baseline condition in the D watershed.

**Lake D3 Outlet Flows:** the water balance results for Lake D3 show that during Post-Closure, monthly mean flows will be increased compared to baseline due to the permanent diversion of Lake B5 to Lake D7. The 2-year flood discharge during Post-Closure will increase by approximately 149% above the baseline value, and the 100-year flood discharge by 222%. The permanent diversion of Lake B5 to Lake D7 will cause low flows to increase by 131% to 423% compared to baseline conditions.

**Lake D3 Water Levels:** Lake D3 water levels are also expected to be increased during Post-Closure compared to baseline conditions. The 2-year flood level is expected to increase by approximately 0.288 m, and the 100-year flood level by 0.724 m, while monthly mean stages are expected to increase by 0.015 m (May), 0.107 m (June), 0.027 m (July), 0.011 m (August), 0.012 m (September) and 0.008 m (October) under median conditions.

**Lake D3 and Outlet Channel/Bank Stability:** the permanent diversion of Lake B5 to Lake D7 watershed will increase flows and water levels at Lake D3, which will be subject to new shoreline formation and potential channel erosion. This will be mitigated by the detailed design of diversion channel B5-C-02, and channel enhancement of lake outlets of Lake D7, Lake D4_D5, Lake D3, Lake D2, and Lake D1. Diversion channel B5-C-02 and enhanced lake outlets will be designed such that water levels remain at baseline condition in the D watershed.

**Lake D1 Outlet Flows:** the water balance results for Lake D1 show that during Post-Closure, monthly mean flows will be increased compared to baseline due to the permanent diversion of Lake B5 to Lake D7. The 2-year flood discharge during Post-Closure will increase by approximately 82% above the baseline value, and the 100-year flood discharge by 72%. The permanent diversion of Lake B5 to Lake D7 will cause low flows to increase by 109% to 449% compared to baseline conditions.

**Lake D1 Water Levels:** Lake D1 water levels are also expected to be increased during Post-Closure compared to baseline. The 2-year flood level is expected to increase by approximately 0.175 m, and the 100-year flood level by 0.253 m, while monthly mean stages are expected to increase by 0.020 m (May), 0.083 m (June), 0.036 m (July), 0.018 m (August), 0.014 m (September) and 0.018 m (October) under median conditions.

**Lake D1 and Outlet Channel/Bank Stability:** the permanent diversion of Lake B5 to Lake D7 watershed will increase flows and water levels at Lake D1, which will be subject to new shoreline formation and potential channel erosion. This will be mitigated by the detailed design of diversion channel B5-C-02, and channel enhancement of lake outlets of Lake D7, Lake D4_D5, Lake D3, Lake D2, and Lake D1. Diversion channel B5-C-02 and enhanced lake outlets will be designed such that water levels remain at baseline condition in the D watershed.

### 7.3.4 Residual Impact Summary

The Project will result in effects to the hydrology of watersheds in the LSA including watersheds A, B, D, E, H, I, J, CH, and Meliadine Lake which will vary over time. The effects are projected to occur during the Pre-production Phase, Mining Phase 1 to Mining Phase 5, Closure, with effects that will continue after Closure for the long-term. Classification of the projected effects on hydrology including quantity is presented in Section 7.5, based on a residual impact classification system.

Potential effects on flows, water levels, and channel/bank stability from the Project Pre-production Phase to Post-Closure presented in Sections 7.3.3.3 to 7.3.3.11 are summarized by mining phase and primary pathway in the following tables:

- Table 7.3-36: Summary of Potential Effects – Pre-Production (Year -3);
- Table 7.3-37: Summary of Potential Effects – Pre-Production (Years -2 to -3);
- Table 7.3-38: Summary of Potential Effects – Mining Phase 1 (Years 1 to 2);
- Table 7.3-39: Summary of Potential Effects – Mining Phase 2 (Years 3 to 4);
- Table 7.3-40: Summary of Potential Effects – Mining Phase 3 (Years 5 to 8);
- Table 7.3-41: Summary of Potential Effects – Mining Phase 4 (Year 9);
- Table 7.3-42: Summary of Potential Effects – Mining Phase 5 (Years 10 to 12);
- Table 7.3-43: Summary of Potential Effects – Closure; and
- Table7.3-44: Summary of Potential Effects – Post-Closure.

**Table 7.3-36: Summary of Potential Effects – Pre-Production (Year -3) (Section 7.3.3.3)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| Dewatering | Lake A6 to Lake A1 | Lake A6 | none | +29% | No effects | +534% | +1515% | +29% | No effects | +0.006 m | June | +0.132 m | August | No effects | Flood magnitudes will only exceed baseline values for a small period during the freshet and are not sustained. |
| | | Lake A1 | none | +39% | +15% | +275% | +526% | +0.049 m | +0.024 m | +0.010 m | June | +0.134 m | August | No effects | Flood magnitudes will only exceed baseline values for a small period during the freshet and are not sustained. |
| | Lake B6 to Lake B5 | Lake B6 | Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | | Lake B5 | Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| Infrastructure | No effects | | | | | | | | | | | | | | |
| Diversion | Lake D7 to Lake D1 | Lake D7 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | | Lake D3 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | | Lake D1 | Engineered diversion channel; Delay dewatering until after the spring | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |

**Table 7.3-36: Summary of Potential Effects – Pre Production (Year -3) (Section 7.3.3.3) (continued)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| | | | freshet | | | | | | | | | | | | |
| | Lake B45/44 to Lake B2 | Lake B45/44 | Rock armour, adaptive measures | - 35% | - 50% | -53% | -79% | +0.843 m | +0.794 m | +0.819 m | August | +0.849 m | September | No effects | Mitigated |
| | | Lake P2 | Engineered diversion channel | Increased | Increased | Increased | Increased | No effects | No effects | No effects | | No effects | | No effects | Mitigated |
| | | Lake B2 | none | -51% | -67% | -39% | -53% | -0.094 m | -0.167 m | -0.023 m | October | -0.051 m | June | No effects | Flood magnitudes will be reduced from baseline values |

**Table 7.3-37: Summary of Potential Effects – Pre-Production (Years -2 to -3) (Section 7.3.3.4)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (max) | | Effect | Rationale |
| Dewatering | Lake A6 to Lake A1 | Lake A6 | none | -46% | -60% | -36% | -39% | -0.030 m | -0.111 m | -0.014 m | October | -0.040 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake A1 | none | -32% | -43% | -21% | -23% | -0.053 m | -0.093 m | -0.012 m | October | -0.036 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| Infrastructure | Lake B6 to Lake B5 | Lake B6 | none | -79% | -79% | -99% | -100% | -0.172 m | -0.310 m | -0.012 m | May | -0.101 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake B5 | none | -27% | -1% | -60% | -62% | -0.022 m | -0.001 m | -0.014 m | May | -0.046 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| Diversion | Lake B45/44 to Lake B2 | Lake B45/44 | Rock armour, adaptive measures | -29% | -23% | -54% | -80% | +0.844 m | +0.847 m | +0.817 m | August | +0.861 m | May | No effects | Mitigated |
| | | Lake P2 | Engineered diversion channel | Increased | Increased | Increased | Increased | No effects | No effects | No effects | | No effects | | No effects | Mitigated |
| | | Lake B2 | none | -31% | -37% | -41% | -56% | -0.050 m | -0.074 m | -0.024 m | May | -0.037 m | August | No effects | Flood magnitudes will be reduced from baseline values |

**Table 7.3-38: Summary of Potential Effects – Mining Phase 1 (Years 1 to 2) (Section 7.3.3.5)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| Dewatering | Lake A1 | Lake A1 | none | -51% | -63% | +145% | +366% | -0.098 m | -0.159 m | +0.030 m | July | +0.092 m | September | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake J2 to Lake J1 | Lake J2 | none | -38% | -9% | +220% | 26 times | -0.170 m | -0.068 m | No effects | October | +0.024 m | August | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake J1 | none | -19% | -5% | +233% | 56 times | -0.044 m | -0.023 m | No effects | June | +0.018 m | September | No effects | Flood magnitudes will be reduced from baseline values |
| Infrastructure | Lake B5 | Lake B5 | none | -37 % | -34% | -71% | -75% | -0.034 m | -0.036 m | -0.021 m | May | -0.053 m | July | No effects | Flood magnitudes will be reduced from baseline values |
| Diversion | Lake B45/44 to Lake B2 | Lake B45/44 | Refer to Pre-Production (Years -2 to -1) | | | | | | | | | | | | |
| | | Lake P2 | Refer to Pre-Production (Years -2 to -1) | | | | | | | | | | | | |
| | | Lake B2 | Refer to Pre-Production (Years -2 to -1) | | | | | | | | | | | | |

**Table 7.3-39: Summary of Potential Effects – Mining Phase 2 (Years 3 to 4) (Section 7.3.3.6)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| Dewatering | Lake D7 to Lake D1 | Lake D7 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | | Lake D3 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | | Lake D1 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | Lake A1 | Lake A1 | none | -74% | -75% | -77% | -81% | -0.170 m | -0.211 m | -0.071 m | October | -0.131 m | June | No effects | Mitigated |
| Infrastructure | Lake E3 to Lake E1 | Lake E3 | none | -5% | No effects | +378% | 100 times | -0.010 m | No effects | No effects | May | +0.018 m | September | No effects | Flood magnitudes will be similar to baseline |
| | | Lake E1 | none | +17% | -5% | +227% | 25 times | +0.019 m | -0.013 m | No effects | May | +0.008 m | September | No effects | Flood magnitudes will be similar to baseline |
| | Lake J1 | Lake J1 | none | -14% | -16% | +24% | 1500 times | -0.033 m | -0.071 m | No effects | May | +0.097 m | August | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake B46 to Lake B2 | Lake B46 | none | -1% | -2% | -5% | -2% | -0.003 m | -0.008 m | No effects | | No effects | | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake B45/44 | Rock armour, adaptive measures | -36% | -47% | -55% | -83% | +0.833 m | +0.802 m | +812 m | August | +858 m | May | No effects | Mitigated |
| | | Lake P2 | Engineered diversion | Increased | Increased | Increased | Increased | No effects | No effects | No effects | | No effects | | No effects | Mitigated |

**Table 7.3-39: Summary of Potential Effects Mining Phase 2 (Years 3 to 4) (Section 7.3.3.6) (continued)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| | | | channel | | | | | | | | | | | | |
| | | Lake B2 | none | -47% | -52% | -41% | -56% | -0.082 m | -0.117 m | -0.025 m | May | -0.039 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake C10 to Lake C6 | Lake C10 | none | -7% | -3% | -11% | -20% | -0.008 m | -0.009 m | No effects | | -0.003 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake C6 | none | -10% | -7% | -23% | -50% | -0.028 m | -0.028 m | No effects | October | - 0.004 m | September | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake I1 | Lake I1 | none | No effects | -5% | No effects | -9% | No effects | -0.008 m | No effects | | No effects | | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake J1 | Lake J1 | none | -68% | -64% | -80% | -100% | -0.197 m | -0.320 m | -0.008 m August | | -0.056 m June | | No effects | Flood magnitudes will be reduced from baseline values |
| Diversion | Effects of Diversions were considered in other pathways | | | | | | | | | | | | | | |

**Table 7.3-40: Summary of Potential Effects – Mining Phase 3 (Years 5 to 8) (Section 7.3.3.7)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| Dewatering | Lake A1 | Lake A1 | none | -79% | -78% | -80% | -83% | -0.194 m | -0.227 m | -0.072 m | October | -0.154 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| Infrastructure | Lake B46 to Lake B2 | Lake B46 | none | -8% | -6% | -6% | -9% | -0.021 m | -0.026 m | No effects | | -0.005 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake B45/44 | Rock armour, adaptive | -39% | -53% | -58% | -83% | +0.829 m | +0.788 m | +0.811 m | August | +0.857 m | May | No effects | Mitigated |

**Table 7.3-40: Summary of Potential Effects – Mining Phase 3 (Years 5 to 8) (Section 7.3.3.7) (continued)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| | | | measures | | | | | | | | | | | | |
| | | Lake P2 | Engineered diversion channel | Increased | Increased | Increased | Increased | No effects | No effects | No effects | | No effects | | No effects | Mitigated |
| | | Lake B2 | none | -48% | -53% | -42% | -57% | -0.086 m | -0.118 m | -0.028 m | October | -0.041 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake C10 to Lake C6 | Refer to Mining Phase 2 (Years 3 to 4) | | | | | | | | | | | | | |
| | Lake E3 to Lake E1 | Lake E3 | none | -18% | -15% | -2% | -63% | -0.025 m | -0.042 m | No effects | | -0.020 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake E1 | none | -5% | -3% | No effects | -36% | -0.007 m | -0.007 m | No effects | May | -0.008 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake CH6 to Lake CH1 | Lake CH6 | none | -36% | -32% | -46% | -56% | -0.070 m | -0.092 m | -0.009 m | July | -0.032 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake CH1 | none | -21% | -19% | -29% | -100% | -0.050 m | -0.081 m | No effects | August | -0.021 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake I1 | Refer to Mining Phase 2 (Years 3 to 4) | | | | | | | | | | | | | |
| | Lake J1 | Refer to Mining Phase 2 (Years 3 to 4) | | | | | | | | | | | | | |
| Diversion | Effects of Diversions were considered in other pathways | | | | | | | | | | | | | | |

**Table 7.3-41: Summary of Potential Effects – Mining Phase 4 (Year 9) (Section 7.3.3.8)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | Mean Monthly (Max) | Effect | Rationale |
| Dewatering | Refer to Mining Phase 3 (Years 5 to 8) | | | | | | | | | | | | |
| Infrastructure | Refer to Mining Phase 3 (Years 5 to 8) | | | | | | | | | | | | |
| Diversion | Refer to Mining Phase 3 (Years 5 to 8) | | | | | | | | | | | | |

**Table 7.3-42: Summary of Potential Effects – Mining Phase 5 (Years 10 to 12) (Section 7.3.3.9)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | Mean Monthly (Max) | Effect | Rationale |
| Dewatering | Refer Mining Phase 3 (Years 5 to 8) and Mining Phase 4 (Year 9) | | | | | | | | | | | | |
| Infrastructure | Refer Mining Phase 3 (Years 5 to 8) and Mining Phase 4 (Year 9) | | | | | | | | | | | | |
| Diversion | Refer Mining Phase 3 (Years 5 to 8) and Mining Phase 4 (Year 9) | | | | | | | | | | | | |

**Table 7.3-43: Summary of Potential Effects – Closure (Section 7.3.3.10)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| Dewatering | Meliadine Lake | Meliadine Lake | Manage pumping rates to ensure that total annual discharge does not drop below the 10-year dry condition | -15% | -4% | -24% | -35% | -0.030 m | -0.011 m | -0.015 m | May | -0.040 m | September | No effects | Flood magnitudes will be reduced from baseline values |
| Infrastructure | Refer Mining Phase 3 (Years 5 to 8) and Mining Phase 4 (Year 9) | | | | | | | | | | | | | | |
| Diversion | Refer Mining Phase 3 (Years 5 to 8) and Mining Phase 4 (Year 9) | | | | | | | | | | | | | | |

**Table 7.3-44: Summary of Potential Effects – Post-Closure (Section 7.3.3.11)**

| Primary Pathway | Flow Pathway | Lake and Outlet | Mitigation | Flows | | | | Stages | | | | | | Channel/Bank Stability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2-Year | 100-Year | Low (Min) | Low (Max) | 2-Year | 100-Year | Mean Monthly (Min) | | Mean Monthly (Max) | | Effect | Rationale |
| Dewatering | No dewatering activities | | | | | | | | | | | | | | |
| Infrastructure | Lake A8 to Lake A1 | Lake A8 | none | -66% | -72% | -38% | -53% | -0.063 m | -0.083 m | -0.008 m | July | -0.051 m | May | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake A6 | none | -39% | -39% | -5% | -11% | -0.050 m | -0.093 m | No effects | August | -0.026 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake A1 | none | -35% | -41% | -7% | -11% | -0.059 m | -0.087 m | No effects | July | -0.029 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | **Lake B5** | **Lake B5** | **Engineered diversion channel** | **No effects** | **No effects** | **No effects** | **No effects** | **No effects** | **No effects** | **No effects** | | **No effects** | | **No effects** | **Mitigated** |
| | Lake E3 to Lake E1 | Lake E3 | Rock armour, adaptive measures | +14% | +27% | No effects | -42% | +0.018 m | +0.072 m | No effects | | +0.003 m | September | No effects | Mitigated |
| | | **Lake E1** | **Rock armour, adaptive measures** | **+6%** | **+14%** | **-5%** | **-8%** | **+0.017 m** | **+ 0.015 m** | **No effects** | | **No effects** | | **No effects** | **Mitigated** |
| | Lake H1 | Lake H1 | none | -14% | -29% | -19% | -32% | -0.046 m | -0.172 m | No effects | August | -0.022 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake J8, Lake J1 | Lake J8 | Rock armour, adaptive measures | +63% | -19% | No effects | +825% | +0.069 m | - 0.062 m | +0.005 m | August | +0.063 m | June | No effects | Mitigated |
| | | **Lake J1** | **none** | **-32%** | **-28%** | **No effects** | **-47%** | **-0.083 m** | **-0.126 m** | **No effects** | | **No effects** | | **No effects** | **Flood magnitudes will be reduced from baseline values** |
| | Lake CH6 to Lake CH1 | Lake CH6 | none | -21% | -19% | +14% | 240 times | -0.039 m | -0.050 m | -0.005 m | June | +0.007 m | July | No effects | Flood magnitudes will be reduced from baseline values |
| | | Lake CH1 | none | -13% | -13% | +2% | +35% | -0.032 m | -0.060 m | No effects | | +0.005 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| Diversion | **Lake B46 to Lake B2** | **Lake B46** | **none** | **-9%** | **-12%** | **-3%** | **-10%** | **-0.023 m** | **-0.050 m** | **No effects** | **October** | **+0.007 m** | **June** | **No effects** | **Flood magnitudes will be reduced from baseline values** |
| | | Lake B45/44 | Rock armour, adaptive measures | -39% | -55% | -52% | -81% | +0.829 m | +0.844 m | +0.816 m | August | +855 m | May | No effects | Mitigated |
| | | Lake P2 | Engineered diversion channel | Increased | Increased | Increased | Increased | No effects | No effects | No effects | | No effects | | No effects | Mitigated |
| | | Lake B2 | none | -40% | -36% | -17% | -21% | -0.068 m | -0.073 m | -0.009 m | September | -0.021 m | June | No effects | Flood magnitudes will be reduced from baseline values |
| | Lake D7 to Lake D1 | Lake D7 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | No effects | | No effects | | No effects | Mitigated |
| | | Lake D3 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |
| | | Lake D1 | Engineered diversion channel; Delay dewatering until after the spring freshet | No effects | No effects | Increased | Increased | No effects | No effects | Increased | | Increased | | No effects | Mitigated |

Residual impacts resulting from a combination of the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies are summarized in Table 7.3-45 and Table 7.3-46, and Figure 7.3-144 to Figure 7.3-154.

Dewatering of waterbodies will augment flows and water levels at receiving waterbodies. Infrastructure development will modify the configuration of a watershed, including size of the watershed, and lake to land ratio of the watershed. Diversion of waterbodies will augment flows of receiving waterbodies, and reduce flows of bypassed waterbodies.

Effects on flows, water levels, and channel/bank stability from dewatering, infrastructure, and diversions are expected to be small, diminish downstream with increase in drainage area, and negligible downstream of Meliadine Lake. Potential effects from the AWAR and Rankin Inlet bypass Road will be negligible from mitigation measures (Section 7.3.2) in the Atulik, Char River, Dry Cove, Meliadine Lake, Meliadine River, Rankin Inlet, and Thompson watersheds.

Effects of Project activities on median annual water yields of waterbodies in the LSA are summarized below:

- Water yields of Lake A1 (Figure 7.3-144) will be augmented by the dewatering of upstream waterbodies during the Pre-production Phase and Mining Phase 1, and reduced by infrastructure and low sustained pumping of Lake A6 until Closure. Permanent infrastructure (discussed below) will result in slightly reduced annual water yields at Post-Closure compared to baseline (-19.6%).
- Water yields of Lake B2 (Figure 7.3-145) will be permanently reduced from the combination of permanent reduction in drainage area (upstream of Lake B4) and diversion of the P watershed. The reduction in annual water yields will vary until Closure based on the development of infrastructure. At Post-Closure, the permanent annual water yield of Lake B2 will be slightly reduced from baseline (-19%).
- Water yields of Lake C6 (Figure 7.3-146) will be slightly reduced from the diversion of runoff from the A45-2 waste rock storage facility during Mining Phase 2 to Closure, but will return to approximately baseline conditions Post-Closure.
- Water yields of Lake D1 (Figure 7.3-147) will be augmented by the diversion of Lake B5 to Lake D7 during the Pre-production Phase and Mining Phase 1. Dewatering in the upper B watershed will further augment water yields in Lake D1 during the Pre-production Phase (Year -3). Permanent infrastructure (discussed below) and the permanent diversion of the upper B watershed to the upper D watershed will double annual water yields in Lake D1 Post-Closure compared to baseline.
- Water yields of Lake E1 (Figure 7.3-148) will slightly increase during Mining Phase 2 from the dewatering of Lake E4, and slightly decrease from Mining Phase 3 to Closure from a reduced drainage area. Permanent infrastructure (discussed below) will increase the lake to land ratio, resulting in a slight increase in annual water yields from baseline during Post-Closure (2%).
- Lake H1 (Figure 7.3-149) will be part of the water management infrastructure from the Pre-production Phase until Closure. Permanent infrastructure (discussed below) will result in slightly reduced annual water yields Post-Closure compared to baseline (-16%).
- Water yields of Lake I1 (Figure 7.3-150) will decrease slightly compared to baseline (-3%) due to the permanent infrastructure (discussed below) installed during Mining Phase 2 and through Post-Closure.
- Water yields of Lake J1 (Figure 7.3-151) will increase from the dewatering of upstream waterbodies during Mining Phase 1 and Mining Phase 2, and decrease from its isolation resulting from infrastructure following

dewatering of upstream waterbodies during Mining Phase 2 until Closure. Permanent infrastructure (discussed below) will result in slightly reduced water yields from baseline during Post-Closure (-0.4%).

- Water yields of Lake P2 (Figure 7.3-152) will be permanently increased from baseline due to the permanent diversion of Lake B44 and Lake B45 to the P watershed during the Pre-production Phase. The increase in annual water yields during the Project and through Post-Closure will vary based on upstream Project activities, including diversions, and the development of infrastructure. Water yields will increase by as much as 28 times at Post-Closure.
- Water yields of Lake CH1 (Figure 7.3-153) will be slightly reduced due to the Discovery Pit and the Discovery waste rock storage facility which will reduce the drainage area to the waterbody during Mining Phase 3 to Closure. Permanent infrastructure (discussed below) will result in slightly reduced annual water yields at Post-Closure compared to baseline (-2.6%).
- Water yields of Meliadine Lake will be slightly reduced from withdrawal for process and potable water during Pre-production and mining phases (with negligible effects on discharge and water level regimes). At Closure, water yields will be reduced (-20%) due to active refilling of the pits (based on the sum of effects of both main and west outlets – effects at each individual outlets will be less). Annual water yields of Meliadine Lake (Figure 7.3-157) are expected to be identical to baseline at Post-Closure.

Derived annual water yields for all modeled waterbodies are presented in Appendix 7.3-A for each mining phase.

**Table 7.3-45: Summary of Median Annual Water Yields for Lake A1, Lake B2, Lake C6, Lake D1, and Lake E1, during all Project Snapshots (mm)**

| Snapshot | Lake A1 | Lake B2 | Lake C6 | Lake D1 | Lake E1 |
|---|---|---|---|---|---|
| Baseline | 168 | 166 | 184 | 160 | 159 |
| Pre-production (Year -3) | 262 (55%) | 100 (-40%) | 184 (0%) | 310 (93%) | 159 (0%) |
| Pre-production (Years -2 to -1) | 121 (-28%) | 114 (-31%) | 184 (0%) | 222 (38%) | 159 (0%) |
| Mining Phase 1 | 141 (-17%) | 114 (-31%) | 184 (0%) | 215 (34%) | 159 (0%) |
| Mining Phase 2 | 43 (-75%) | 107 (-35%) | 162 (-12%) | 160 (0%) | 166 (5%) |
| Mining Phase 3 | 34 (-80%) | 105 (-37%) | 162 (-12%) | 160 (0%) | 138 (-13%) |
| Mining Phase 4 | 34 (-80%) | 105 (-37%) | 162 (-12%) | 160 (0%) | 138 (-13%) |
| Mining Phase 5 | 34 (-80%) | 105 (-37%) | 162 (-12%) | 160 (0%) | 138 (-13%) |
| Closure | 34 (-80%) | 105 (-37%) | 162 (-12%) | 160 (0%) | 138 (-13%) |
| Post-Closure | 135 (-20%) | 134 (-19%) | 184 (0%) | 313 (95%) | 163 (3%) |

Note: percentage change from baseline conditions shown in brackets

**Table 7.3-46: Summary of Median Annual Water Yields for Lake H1, Lake I2, Lake J1, Lake P2, Lake CH1, and Meliadine Lake, during all Project Snapshots (mm)**

| Snapshot | Lake H1 | Lake I1 | Lake J1 | Lake P2[a] | Lake CH1 | Meliadine Lake[b] |
|---|---|---|---|---|---|---|
| Baseline | 126 | 173 | 174 | 176 | 159 | 150 |
| Pre-production (Year -3) | n/a | 173 (0%) | 174 (0%) | 4,290 (2340%) | 159 (0%) | 150 (0%) |
| Pre-production (Years -2 to -1) | n/a | 173 (0%) | 174 (0%) | 5,020 (2750%) | 159 (0%) | 150 (0%) |
| Mining Phase 1 | n/a | 173 (0%) | 202 (16%) | 5,020 (2750%) | 159 (0%) | 147 (-2%) |
| Mining Phase 2 | n/a | 167 (-3%) | 536 (208%) | 4,880 (2680%) | 159 (0%) | 147 (-2%) |
| Mining Phase 3 | n/a | 167 (-3%) | 66 (-62%) | 4,760 (2610%) | 131 (-18%) | 147 (-2%) |
| Mining Phase 4 | n/a | 167 (-3%) | 66 (-62%) | 4,760 (2610%) | 131 (-18%) | 147 (-2%) |
| Mining Phase 5 | n/a | 167 (-3%) | 66 (-62%) | 4,760 (2610%) | 131 (-18%) | 147 (-2%) |
| Closure | n/a | 167 (-3%) | 66 (-62%) | 4,760 (2610%) | 131 (-18%) | 120 (-20%) |
| Post-Closure | 107 (-16%) | 167 (-3%) | 174 (-0.4%) | 5,140 (2830%) | 155 (-3%) | 150 (0%) |

Note: percentage change from baseline conditions shown in brackets

[a] Water yields are based on the baseline lake area of the P2 watershed

[b] Meliadine Lake at the main and west outlets

n/a = not applicable

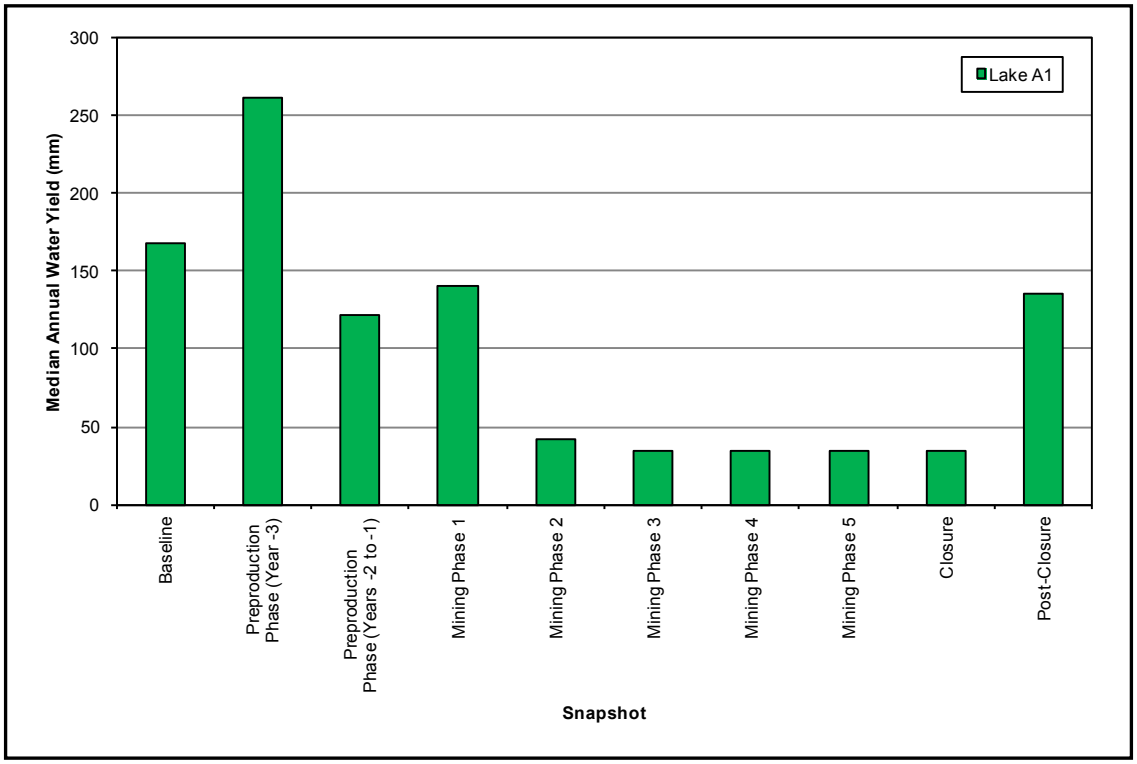



*Figure 7.3-144: Summary of Median Annual Water Yields during all Project Snapshots for Lake A1*

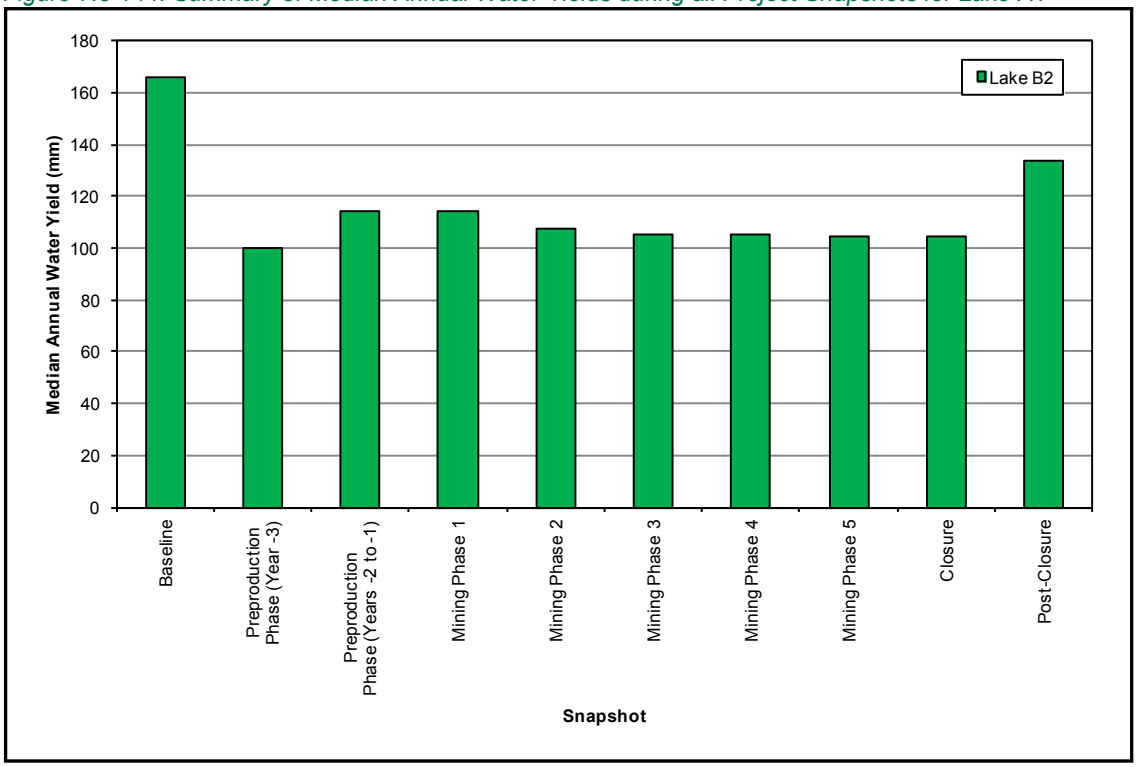



*Figure 7.3-145: Summary of Median Annual Water Yields during all Project Snapshots for Lake B2*

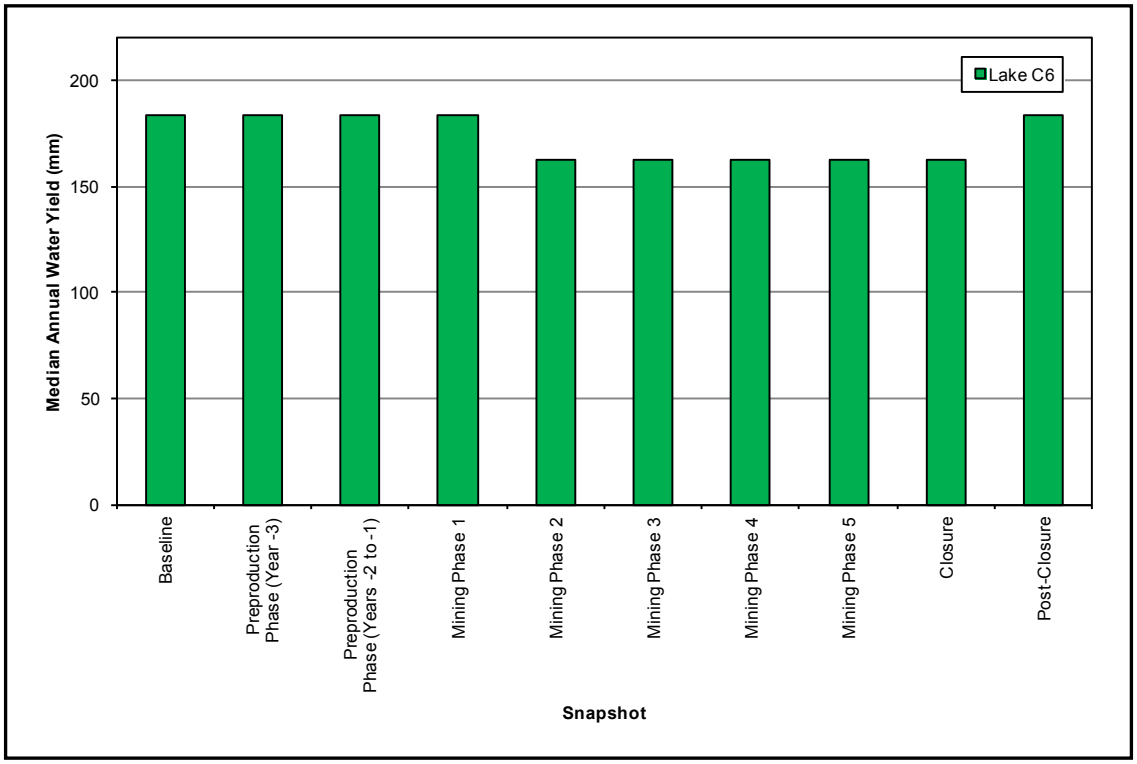



*Figure 7.3-146: Summary of Median Annual Water Yields during all Project Snapshots for Lake C6*

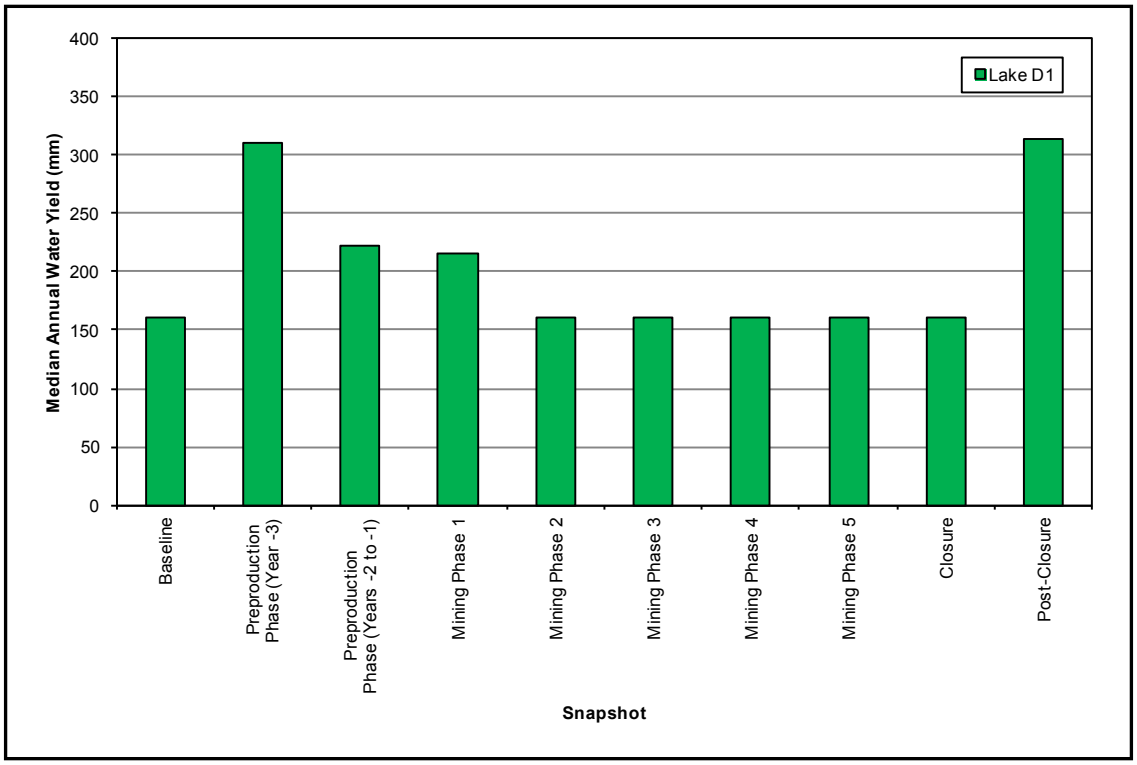



*Figure 7.3-147: Summary of Median Annual Water Yields during all Project Snapshots for Lake D1*

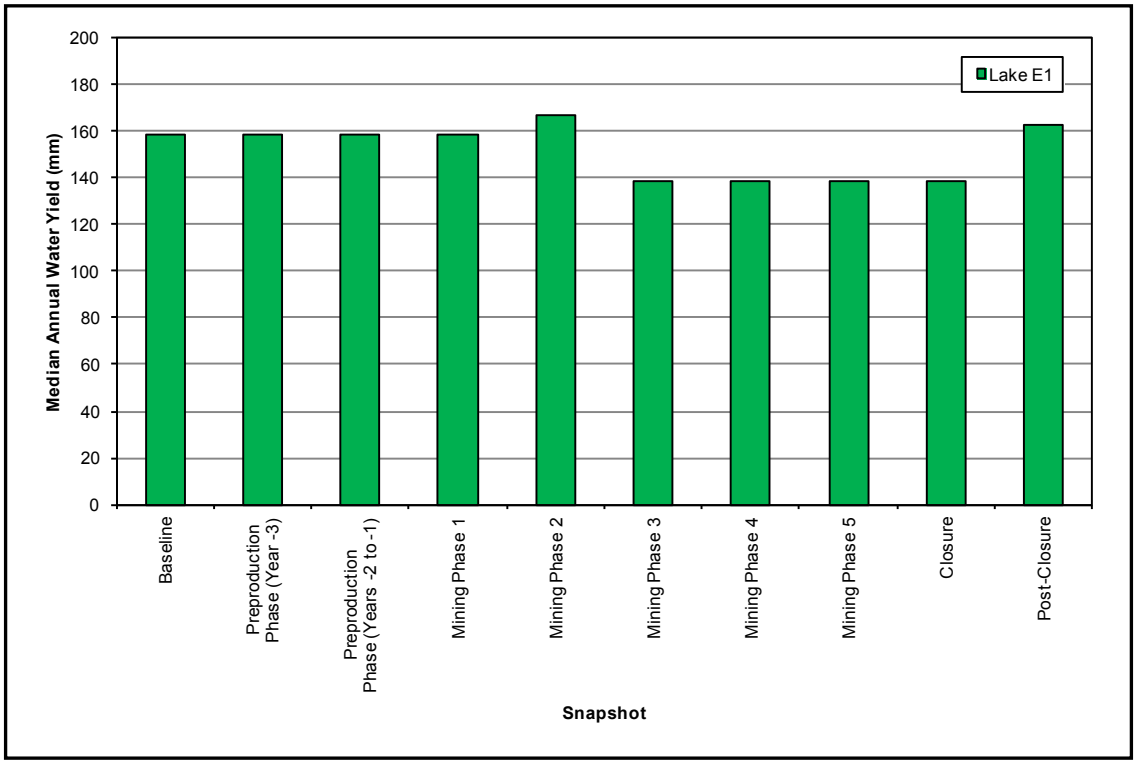



*Figure 7.3-148: Summary of Median Annual Water Yields during all Project Snapshots for Lake E1*

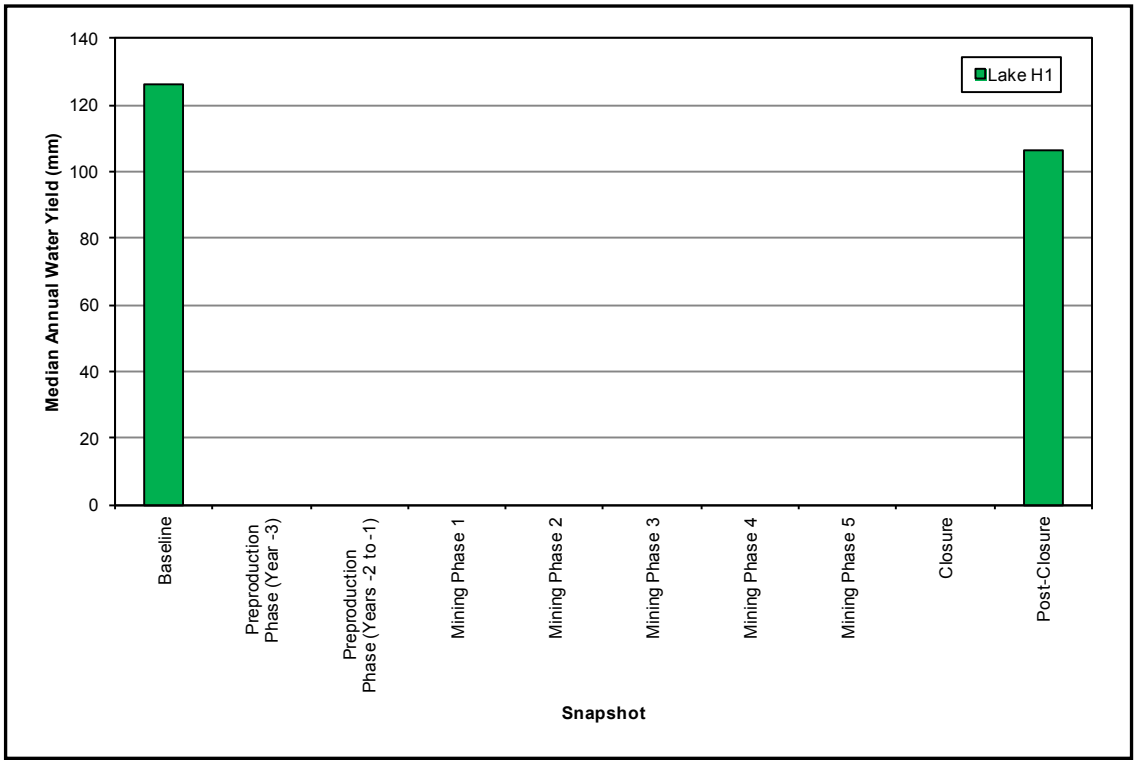



*Figure 7.3-149: Summary of Median Annual Water Yields during all Project Snapshots for Lake H1*

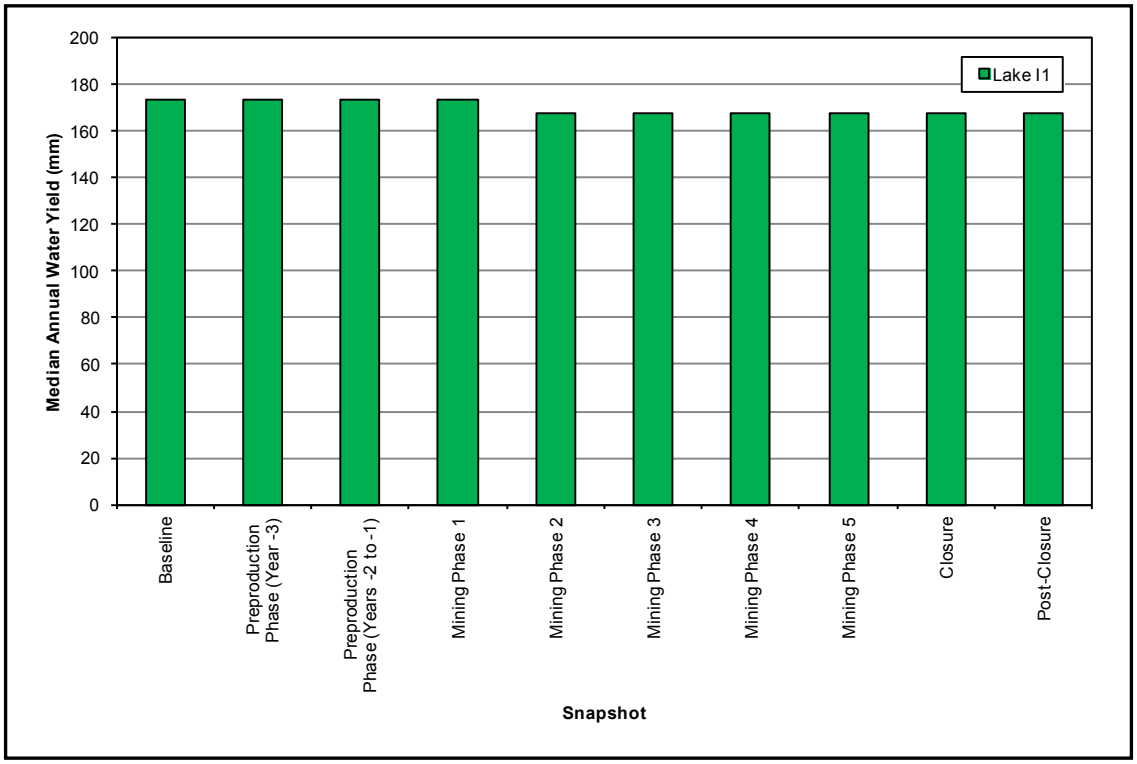



*Figure 7.3-150: Summary of Median Annual Water Yields during all Project Snapshots for Lake I1*

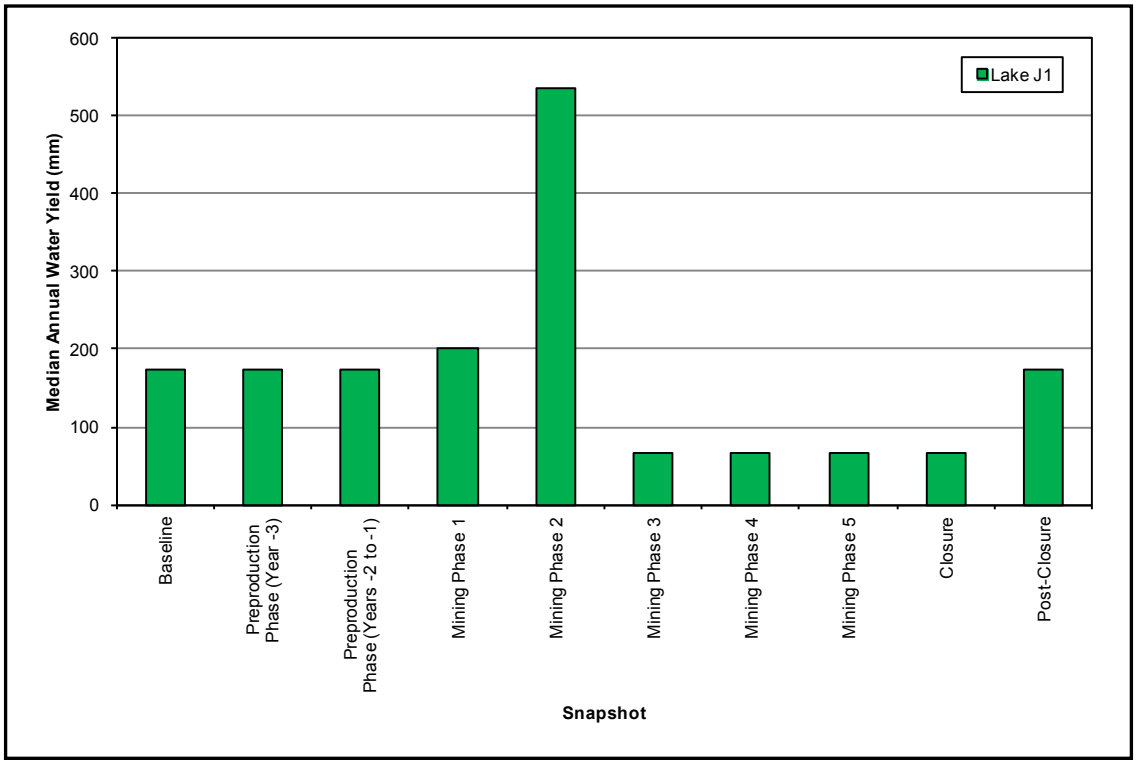



*Figure 7.3-151: Summary of Median Annual Water Yields during all Project Snapshots for Lake J1*

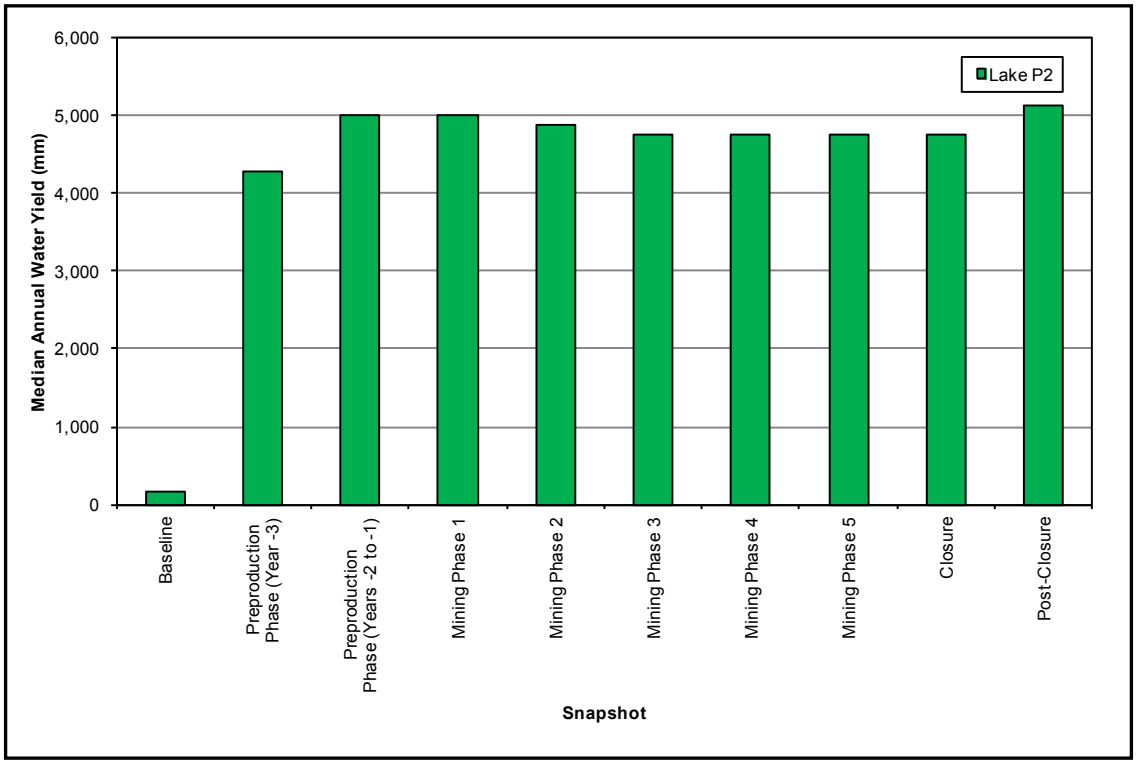



*Figure 7.3-152: Summary of Median Annual Water Yields during all Project Snapshots for Lake P2*

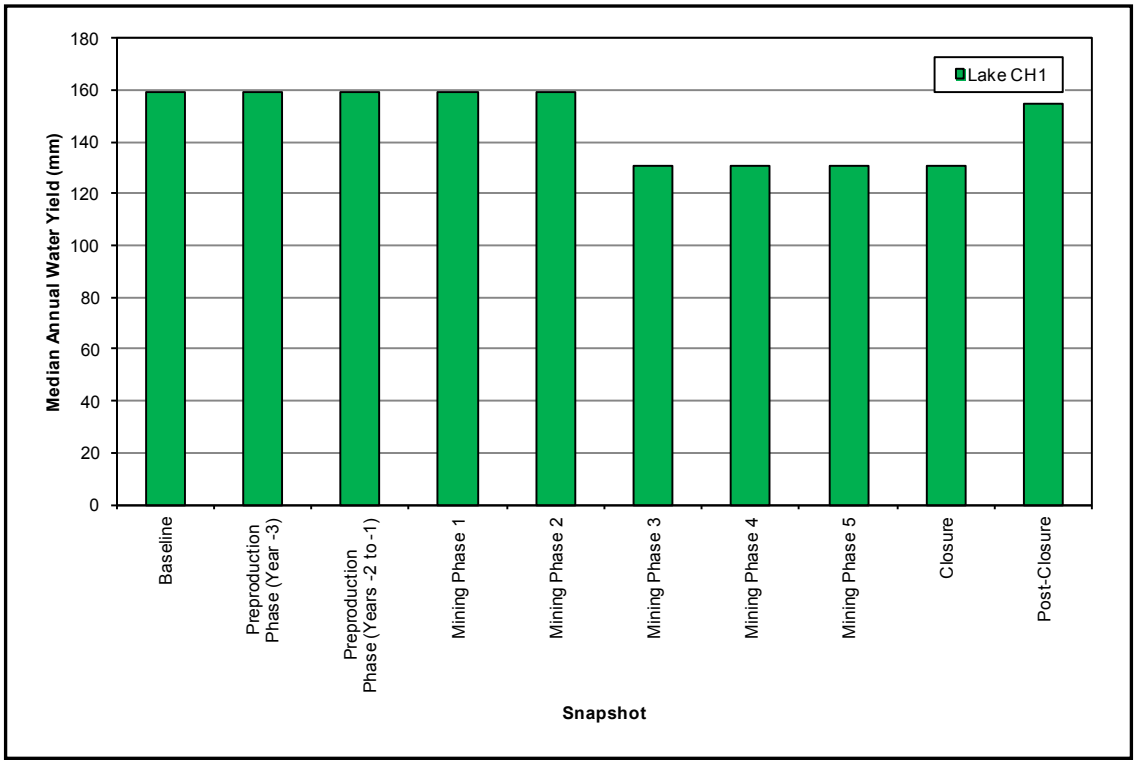



*Figure 7.3-153: Summary of Median Annual Water Yields during all Project Snapshots for Lake CH1*

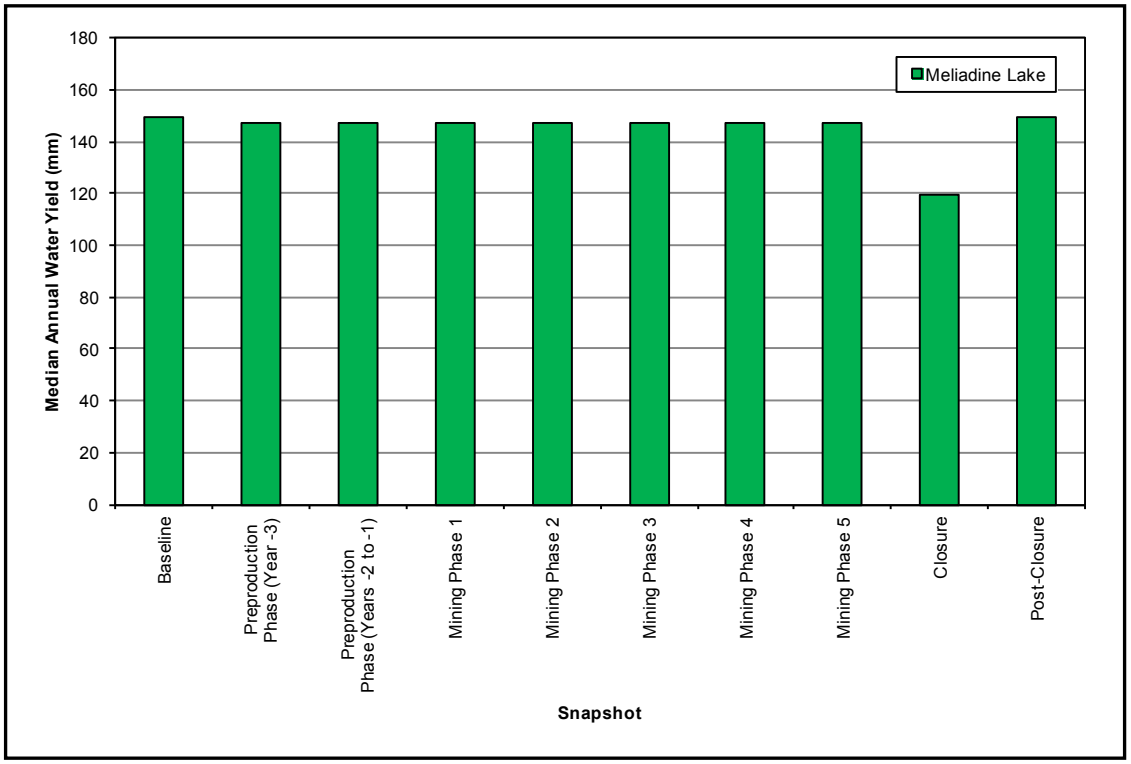



*Figure 7.3-154: Summary of Median Annual Water Yields during all Project Snapshots for Meliadine Lake*

Permanent changes to lake and land areas of sub-watersheds in the LSA at Post-Closure from permanent infrastructure are summarized in Table 7.3-47 (reproduced from Section 7.3.3.11.1) and will include:

- A net decrease in the Lake A8 sub-watershed area, including a net increase in lake area and a net decrease in land from the Tiriganiaq Pit, Wesmeg #2 Pit, Wesmeg #5 Pit, Pump #2 Pit, and associated pit waterbodies;
- A net decrease in the Lake A6 sub-watershed area, including a net decrease in lake area and a net increase in land area from the Pump Pit #1, Wesmeg #4 Pit, F Zone #3 Pit, and the constructed channel connecting Lake A6 to the filled F Zone #3 Pit, and a Lake A6 water elevation reduced by 1.5 m from baseline conditions;
- A net increase in the Lake A2 sub-watershed area, including a net increase in lake area and a net decrease in land area from the A45-2 waste rock storage facility and F Zone Pits, which will affect Lake A1;
- A net increase in the Lake B5 sub-watershed area, including a net increase in lake and land areas from the Tiriganiaq Pit, Wesmeg #1 Pit, B7 waste rock storage facility, and Tailing Storage Facility. This includes the B7 sub-watershed which will be part of the B5 sub-watershed at Post-Closure;
- A net increase in the Lake B46 sub-watershed area, including a net increase in lake and land areas from the Pump Pits, and B4 waste rock storage facility;
- A net decrease in the Lake B4 sub-watershed area, including a net decrease in lake and land areas from the B4 waste rock storage facility (part of the B46 and B2 sub-watersheds at Post-Closure);

- A net increase in the Lake B2 sub-watershed area, including a net increase in lake and land areas from the B4 waste rock storage facility;
- A net increase in Lake E3 sub-watershed area, including a net increase in lake and land areas from the B7 waste rock storage facility (portion of B7 waste rock storage facility partially covering the Lake E4 sub-watershed will drain to the E watershed through Lake E3);
- A net increase in Lake H1 sub-watershed area, including no changes in lake area and a net increase in land area from the Tiriganiaq Pit and infilled Lake H20 and Lake H19;
- A net decrease in the I sub-watershed area, including no change in lake area and a net decrease in land area from the Wesmeg #3 Pit. This effect analysis is available in Section 7.3.3.6.2 (effects of infrastructure on Lake I1 during Mining Phase 2);
- A net increase in the J sub-watershed area, including a net increase in lake and land areas from the Tiriganiaq Pit, Wesmeg #3, and infilled Lake J7 (partial), Lake J6, Lake J5, Lake J4, Lake J3, and Lake J2 draining to Lake J8;
- A net decrease in sub-watershed area, including no changes in lake area and a net decrease in land area, from the new watershed configuration from the infilled upstream lake area draining to Lake J8, and Wesmeg #3 and Tiriganiaq Pit; and
- A net increase in the Lake CH6 sub-watershed area, including a net increase in lake area and a decrease in land area from the Discovery Pit and the Discovery Pit Waste Rock Pile.

**Table 7.3-47: Net Area Gains from Permanent Project Infrastructure at Post-Closure**

| Sub-Watershed | Net Area Gain ($km^2$) | | | Permanent Project Infrastructure |
|---|---|---|---|---|
| | Lake | Land | Total | |
| Lake A8 | 0.301 | -1.501 | -1.200 | Tiriganiaq Pit, Wesmeg #2, Wesmeg #3, Pump #2 |
| Lake A6 | -0.168 | 0.077 | -0.091 | Wesmeg #4, Channel (A6 to F Zone #3) |
| Lake A1 | 0.248 | -0.224 | 0.024 | A45-2 WRF, F Zone Pits in Lake A2 sub-watershed |
| Lake B7 | -1.117 | -1.499 | -2.616 | Covered by Tailing Storage Facility |
| Lake B6 | -0.239 | -0.117 | -0.356 | B7 WRF |
| Lake B5 | 0.800 | 3.230 | 4.030 | Tiriganiaq Pit, Wesmeg #1, B7 WRF, Tailing Storage Facility |
| Lake B46 | 0.592 | 0.397 | 0.989 | Pump Pits, B4 waste rock storage facility |
| Lake B4 | -1.034 | -1.829 | -2.863 | B4 WRF |
| Lake B2 | 0.000 | 1.874 | 1.874 | B4 WRF |
| Lake E4 | -0.183 | 0.183 | 0.000 | B7 WRF |
| Lake H20 | -0.192 | -0.110 | -0.301 | Infilled |
| Lake H19 | -0.029 | -0.037 | -0.066 | Infilled |
| Lake H1 | 0.000 | 0.295 | 0.295 | Tiriganiaq Pit, Infilled Waterbodies H20 and H19 |
| Lake I1 | 0.000 | -0.008 | -0.008 | Wesmeg #3 |
| Lake J8 | 0.111 | 0.389 | 0.500 | Tiriganiaq Pit, Wesmeg #3, Infilled Waterbodies |
| Lake J1 | 0.000 | -0.210 | -0.210 | New watershed configuration |
| Lake CH6 | 0.442 | -0.422 | 0.020 | Discovery Pit, Discovery Waste Rock Pile |
| X Lakes | 0.000 | -0.020 | -0.020 | Discovery Pit |
| **Net** | **-0.468** | **0.468** | **0.000** | - |

Note: $km^2$ = square kilometres; WRF = waste rock storage facility.

### 7.3.5 Cumulative Effects

Effects to hydrology including water quantity are anticipated to be confined to the Atulik, Char River, Diana River, Dry Cove, Meliadine Lake, Meliadine River, and Thompson watersheds. Effects to hydrology including water quantity in one part of the watershed may overlap with effects to other areas of the watershed. The database of existing and historic development (FEIS Volume 4, Section 4.5.2) indicates that there have been few developments within these watersheds and no other projects, other than the proposed Manitoba to Nunavut Road that may cross the Meliadine River watershed, are reasonably foreseeable that may also affect hydrology including water quantity in these watersheds. Planned developments of the Project are anticipated to have negligible effects on surface water quantity in the Atulik, Char River, Diana River, Dry Cove, Meliadine Lake, Meliadine River, and Thompson watersheds, thus, the cumulative effect is expected to be negligible.

The Meliadine Project has been designed with some growth in mind (FEIS, Volume 2, Section 2.3). This growth will be limited to the known ore bodies and does not extend to ore bodies not yet discovered. Any further ore bodies would have to be addressed through future phases of development, which would have to undergo future environmental assessment.

The Wolf deposit, located north-west of the Tiriganiaq deposit, is currently known, but still requires some exploration work to be better defined and included in the mine plan. Currently, the Wolf deposit does not have sufficient proven reserves to be economically mined; however, there are strong possibilities that this deposit could be economically developed in the future should exploration results and the associated economic analyses be successful.

Addition of the Wolf Deposit to the Project will change the results of the hydrology (including water quantity) modeling (Section 7.3.3; Appendix 7.3-C). If the Wolf deposit becomes economically feasible to develop, the hydrology (including water quantity) models and predictions will be updated.

#### *7.3.5.1 Effects of Long-Term Warming Trends*

Climate change predictions are in their nature uncertain. The atmospheric processes involved are complex, as are the models used to develop climate change predictions. Inuit in the region have expressed concerns about warmer temperatures year-round; reduced snowfall in *ukiaq* (early winter); less rain in *upinngaaq* (spring) and *aujaq* (late summer); reduced and more compacted *Aput* (snow cover); areas of permanent ice melting; fewer thunderstorms; and later and slower freezing of lakes, river and ocean (Government of Nunavut 2005). IQ

In general, the climate in the Project region is projected to be warmer for the 2050s and 2080s time horizons when compared to the observed historic values (Section 5.4). Precipitation shows a larger per cent increase compared to historical values, but the majority of projections are not significantly different from the annual recorded precipitation values. In general, by the 2080s, the fall and winter periods show the largest projected increases in temperature, whereas the fall and summer show the largest increases in precipitation (Section 5.4).

For the relatively short duration of the Project, conditions are unlikely to deviate significantly from baseline. For the longer term, including post-closure, increases in seasonal and annual temperatures and precipitation may result in an increase in the open water season characterized by earlier outlet openings and later outlet freeze-ups, an increase in magnitude of flood discharges, and an increase in low flows. These effects are anticipated to be balanced by an increase in lake evaporation resulting from increased temperatures. The net effects of long-

term warming trends are uncertain; however effects on seasonal discharge patterns, characterized by annual peak flows during the spring and low flows during the summer months, are anticipated to be negligible.

Climate and water resources (Section 7.3.6) will be monitored for the influence of climate change to verify the conclusions outlined herein and to review operating procedures during the life of the Project, if and as required.

### 7.3.6 Monitoring and Follow-Up

Monitoring of flows and water levels at key locations in the LSA during all phases of the Project is considered necessary to determine actual runoff and discharge rates.

Hydrometric monitoring to provide measurements of lake water levels and lake outlet discharges during open water conditions at key locations, including diversion channels at lake outlets, will be undertaken using hydrometric stations or gauging collection processes similar to those used as part of the baseline program.

During the late season low flow period, in advance of the next season's spring thaw and freshet, observations will be undertaken to assess the integrity of the outlets and stream courses to monitor for the development of channel or bank erosion. Prior to the spring thaw (or snowmelt), snow surveys will be used to provide an early estimate of spring runoff. This is a reliable method to project annual watershed volumes.

All piped and/or pumped discharges to waterbodies will be monitored continuously.

Climate monitoring, including continuous measurements of rainfall and temperature, will be performed to allow validation of the hydrological model, assessment of seasonal conditions and to provide data for water management decision making.

In addition, a monitoring plan applicable to the AWAR and Rankin Inlet Road is presented in the AWAR Operation and Maintenance Manual (SD 2-9 Roads Management Plan). The monitoring plan specifically addresses hydrology monitoring prior to spring freshet and post major precipitation events.

## 7.4 Surface Water and Sediment Quality

### 7.4.1 Introduction

The purpose of this section is to describe the baseline conditions for water and sediment quality and assess the potential effects of the Project on the water and sediment quality in the LSA and the RSA. This assessment includes potential changes resulting from Project-related components and associated activities, including air quality and water quantity. The effects assessment will evaluate all Project phases, including pre-production (site preparation and construction), operation, temporary closure, final closure, and post-closure. Indirect and cumulative effects have been incorporated throughout this section, where applicable.

#### *7.4.1.1 Concordance with Guidelines*

The purpose of this section is to address Guidelines for the Preparation of an Environmental Impact Statement (Guidelines) issued by the NIRB for the Project (NIRB 2012a), and specifically relating to the effects of the Project on the water and sediment quality. The complete Guidelines for the Project, including FEIS section and page number referencing, are summarized in the main FEIS concordance table (Volume 1, Appendix 1.0-A).

Specific requirements set out in the guidelines relating to the baseline and the impact assessment for surface water and sediment quality can also be found in Volume 1, Appendix 1.0-A.

### 7.4.2 Valued Ecosystem Components

Valued ecosystem components and VSECs represent physical, biological, cultural, social, and economic properties of the environment that are either legally, politically, publically, or professional recognized as important to a particular region, community, or by society as a whole. Valued ecosystem components and VSECs were selected based on their role in the ecosystem, and value placed on them by humans for traditional use and cultural connection, where appropriate. For example, through public consultation and the Traditional Use Study (FEIS Volume 9, Section 9.3), it is known that surface water in the Project area could be used as a drinking water source by the Inuit. IQ

Water quality and sediment quality were selected as VECs for the Project (Table 7.4-1). Water and sediment quality have linkages to both ecological and human health values. Assessment of water and sediment quality can provide a basis for evaluating aquatic ecosystems to determine whether water and sediment quality during each phase of the Project meets acceptable levels for the protection of aquatic life, protection of source drinking water, and protection of water for wildlife consumption. Since changes to water and sediment quality may affect fish, wildlife, and human health, the selection of water and sediment quality as VECs is appropriate.

**Table 7.4-1: Water and Sediment Quality Valued Ecosystem Components**

| Valued Ecosystem Component | Rationale |
|---|---|
| Water Quality | Concentration of total and dissolved parameters in water (e.g., total dissolved solids, total suspended solids, nutrients, total metals, dissolved metals, etc.) strongly influence the quality of water for aquatic organisms, wildlife, and the use of water as a drinking water source for Inuit or for recreational purposes. |
| Sediment Quality | Change in sediment quality by parameters, such as metals, has the potential to change water quality beyond thresholds to support aquatic life, wildlife, drinking water, or recreational use of water. Changes in sediment quality could also affect benthic organisms that live on or in the sediments. |

IQ

Key biophysical components that influence water quality include the following:

- permafrost;
- groundwater quality and quantity;
- water levels and flow patterns;
- water chemistry; and
- sediment quality.

There is the potential for the project to both directly and indirectly affect Meliadine Lake. The Project could directly affect the lake through point source discharges (treated effluent into Meliadine east basin), alteration of natural flows, and interception and diversion of non-contact water. Disturbed and undisturbed smaller watersheds near the mine site will collect and drain water to both the southeast and southwest basins of Meliadine Lake. As mitigation to reduce potential effects on water and sediment quality in Meliadine Lake, all contact water flows will be captured and diverted to the tailings or treatment plants. Runoff and deposition of project generated dust are considered potential indirect effects.

### 7.4.3 Overview of Study Area

Meliadine Lake is a large lake with a surface area of 107 $km^2$, a highly convoluted shoreline of 465 km, and over 200 islands. There are several small watersheds on the Peninsula, forming an extensive network of lakes, ponds, and interconnecting streams. The Peninsula area drains into Meliadine Lake. The entire drainage area for Meliadine Lake, including the Peninsula, is 560 $km^2$.

Meliadine Lake watershed is drained by two outflows. The larger outflow is Meliadine River, in the southwest basin. This river flows through a series of waterbodies until it reaches Little Meliadine Lake, and then continues into Hudson Bay. There is also a second, smaller outflow in the west basin that drains into Peter Lake, and then discharges into Hudson Bay through the Diana River.

### 7.4.4 Baseline Environmental Conditions

This section provides an overview of results from baseline sampling programs conducted in support of the Project. A review of baseline surface water quality is provided in Section 7.4.4.1, and a review of baseline sediment quality is provided in Section 7.4.4.5. Information on lake bathymetry and limnology is included in the *Aquatic Synthesis Report* (SD 7-1 2009 Aquatics Synthesis Baseline). Information on fish bearing waters in the study area is provided in Section 7.5) and in various supporting documents (SD 7-1 2009 Aquatics Synthesis Baseline, SD 7-2 2011 Aquatics Baseline).

Results have been summarized by waterbody or watercourse type as follows:

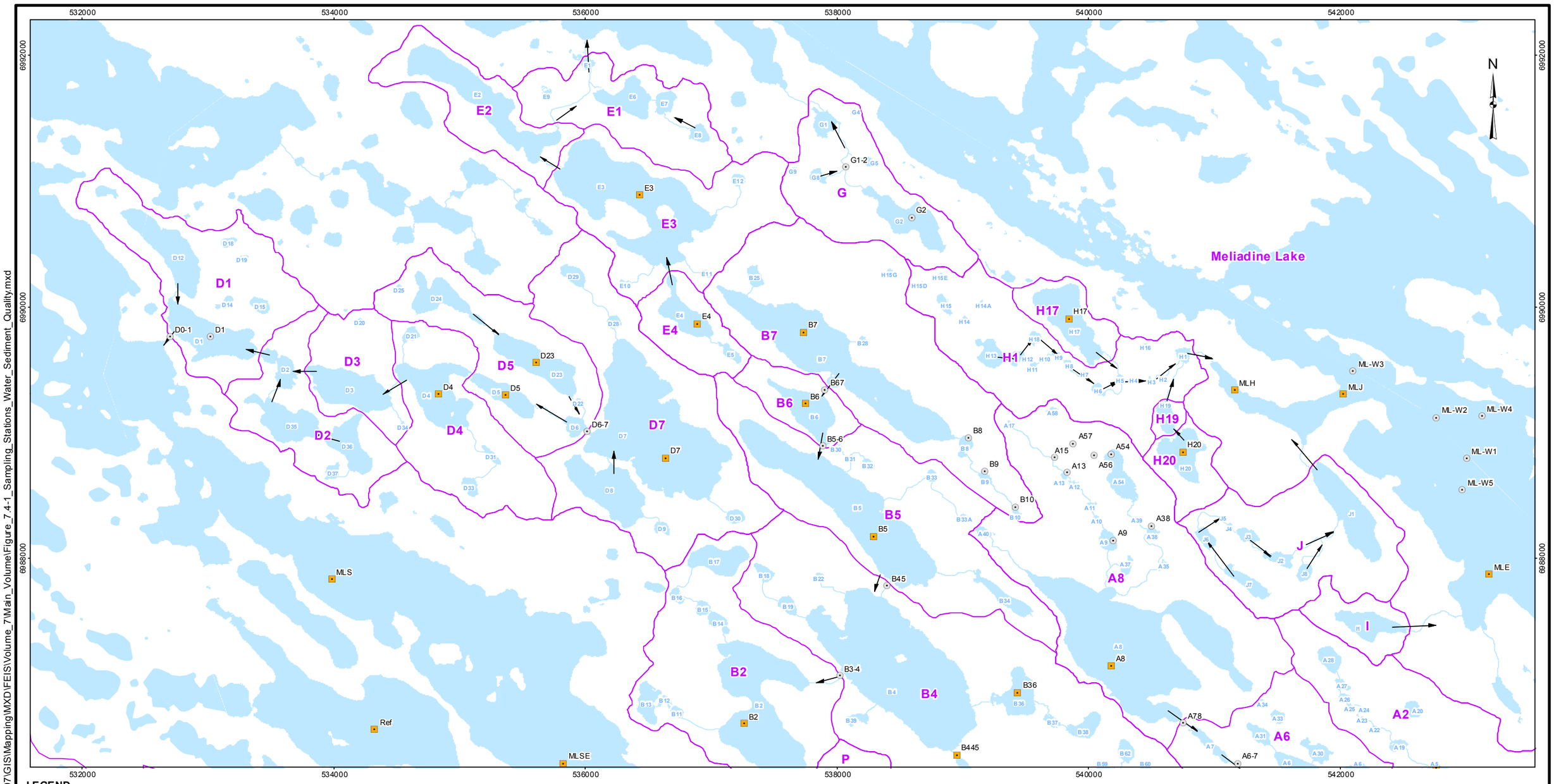
- Meliadine Lake;
- waterbodies (lakes) on the Peninsula of Meliadine Lake plus waterbodies near the Discovery area;
- larger, regional lakes (waterbodies) including the reference lake, Peter Lake, and Little Meliadine Lake;
- watercourses (streams) on the Peninsula of Meliadine Lake, lakes near the Discovery area, and streams along the AWAR; and
- watercourses (rivers) including Meliadine River and Char River.

The above grouping recognizes that size of a waterbody or watercourse can play an important role in baseline water and sediment chemistry conditions. For more details on the programs and data, also see the Aquatic Synthesis Report (SD 7-1) and the 2011 Baseline Summary Report (SD 7-2). Water quality data were collected from Meliadine Lake (13 stations), from waterbodies on the Peninsula and near the Discovery deposit (36 stations), from regional waterbodies (3 stations), from streams (27 stations), and from rivers (5 stations) during 10 studies performed between 1994 and 2013 (Figure 7.4-1 to 7.4-4).

Additional samples were collected from Meliadine Lake in August 2013 (Azimuth 2013a) in support of developing the draft aquatic effects monitoring program (AEMP) study design. Data were collected by Azimuth but provided by AEM for inclusion in the FEIS baseline summary. Samples were collected from seven stations in the east basin of Meliadine Lake in the channel near the proposed effluent outfall. A full report on these data and the sample collection methods will be provided with the draft AEMP study design (Azimuth 2013a) but a summary of the data are provided in Appendix 7.4B Table 7.4B-5.

References for the baseline data collections are provided in Table 7.4-2.

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**LEGEND**

- Water Quality Station
- Water Quality and Sediment Quality Station
- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# WATER AND SEDIMENT QUALITY SAMPLING STATIONS NORTH END OF PENINSULA

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
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| GIS | DSC | 11 Oct. 2012 | | |
| CHECK | CP | 21 Jan. 2013 | | |
| REVIEW | DW | 21 Jan. 2013 | | |

**FIGURE 7.4-1**

536000 538000 540000 542000 544000 546000

6986000 6984000 6982000

MLSE B3-4 B36 B2 B445 B12 B45 B46 A78 A6-7 A5 A5-6 A6 A01 A1 MLA

B2 P A8 A6 A2 A1 B4 C

Meliadine Lake

N

## LEGEND

- Water Quality Station
- Water Quality and Sediment Quality Station
- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

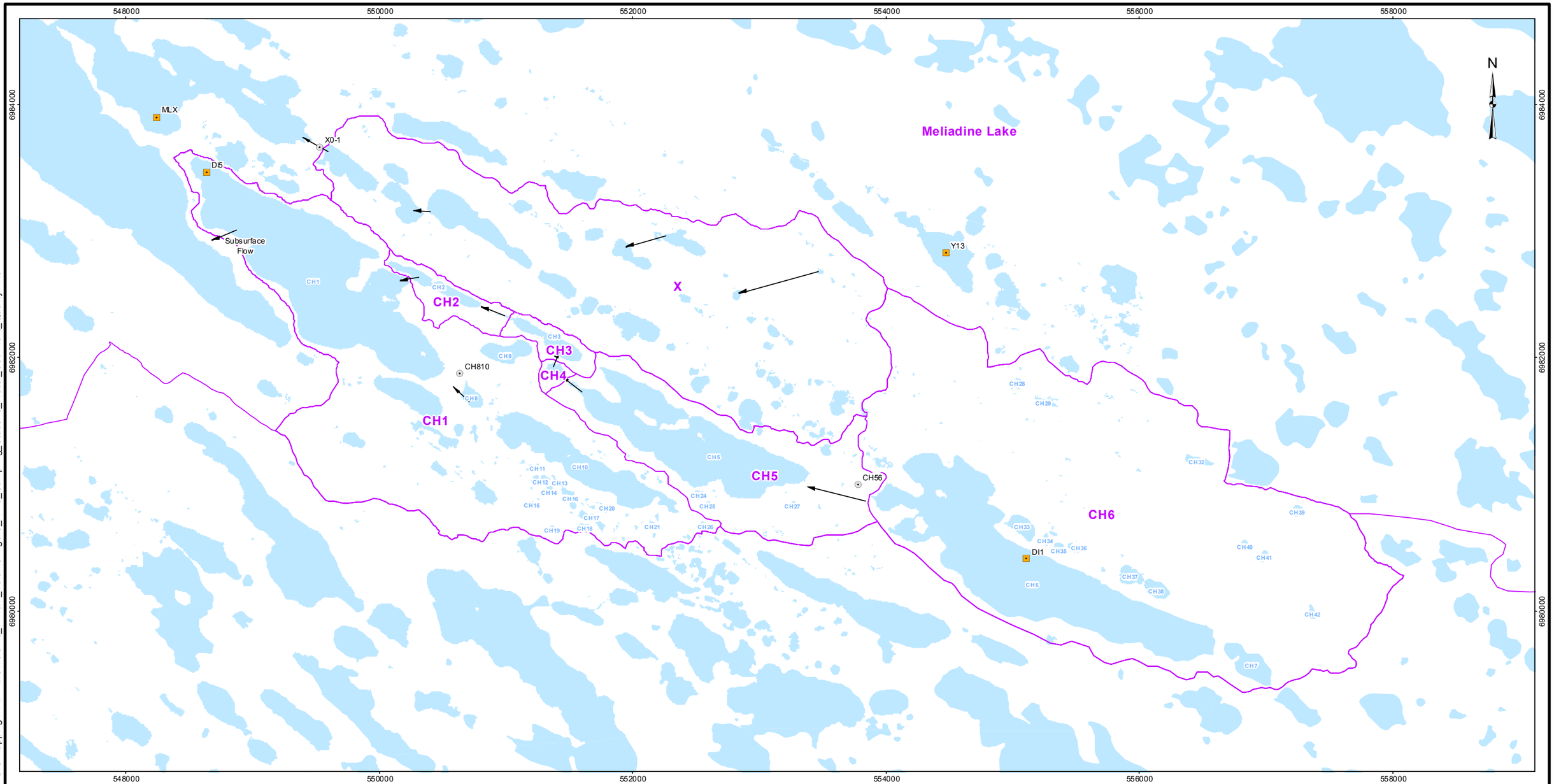
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# WATER AND SEDIMENT QUALITY SAMPLING STATIONS SOUTH END OF PENINSULA

Golder Associates

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| GIS | DSC | 12 Oct. 2012 | | |
| CHECK | CP | 21 Jan. 2013 | | |
| REVIEW | DW | 21 Jan. 2013 | | |

**FIGURE 7.4-2**

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**LEGEND**

- Water Quality Station
- Water Quality and Sediment Quality Station
- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

750 0 750
METRES

PROJECT
AGNICO EAGLE

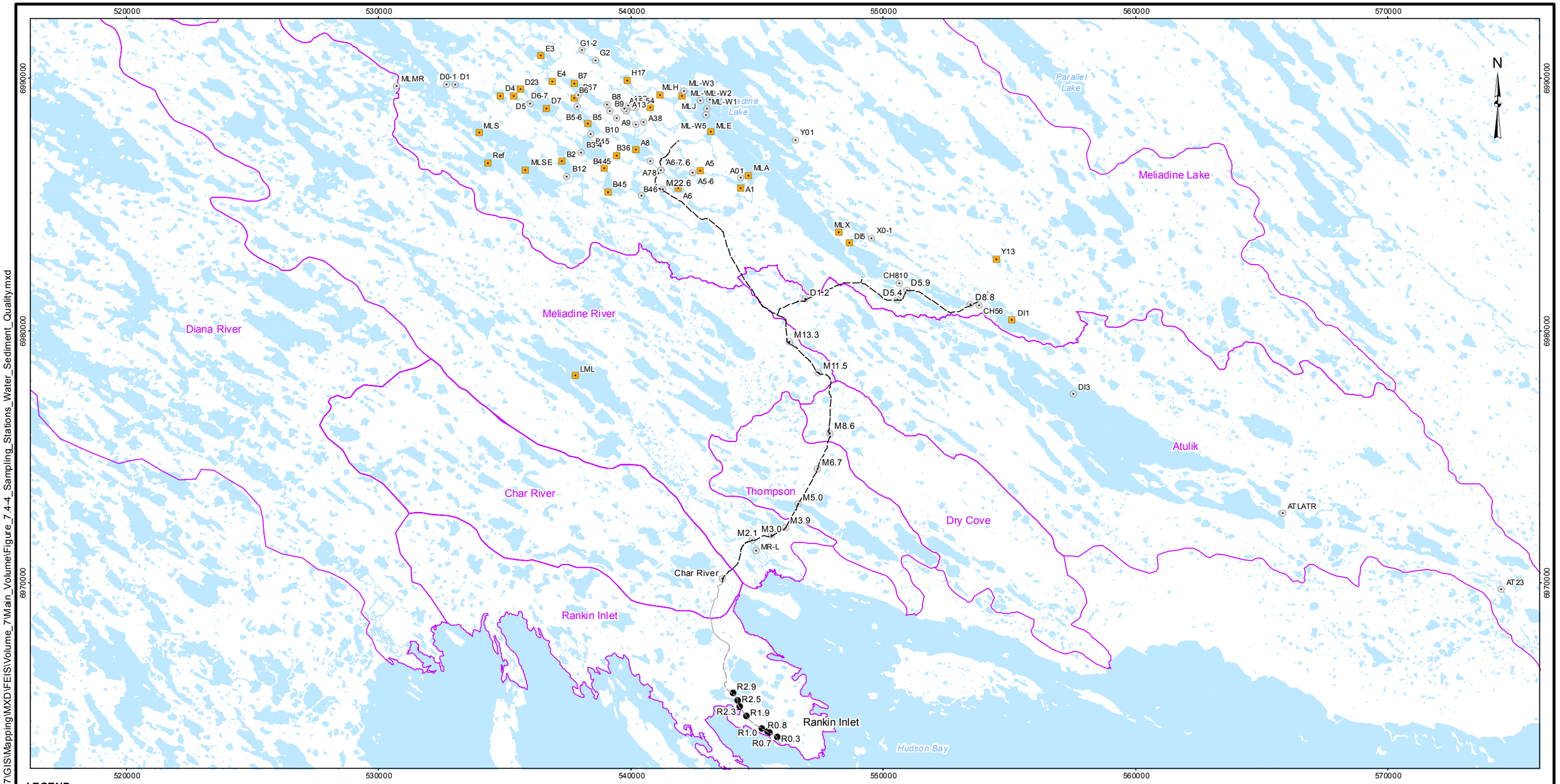
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
# WATER AND SEDIMENT QUALITY SAMPLING STATIONS FOR DISCOVERY AREA

Golder Associates

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| GIS | DSC | 12 Oct. 2012 | FIGURE 7.4-3 | |
| CHECK | CP | 21 Jan. 2013 | | |
| REVIEW | DW | 21 Jan. 2013 | | |

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**LEGEND**

- Water Quality Station
- Water Quality and Sediment Quality Station
- Watercourse Crossing
- All-weather Access Road (AWAR)
- Road - Existing
- Road - New
- Watercourse
- Watershed Boundary
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

4 0 4
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
# WATER AND SEDIMENT QUALITY SAMPLING STATIONS PENINSULA, AWAR & RANKIN INLET

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | CP | 11 Oct. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 12 Oct. 2012 | | |
| CHECK | CP | 21 Jan. 2013 | | |
| REVIEW | DW | 21 Jan. 2013 | | |

**FIGURE 7.4-4**

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**Table 7.4-2: Water and Sediment Quality Baseline Studies, 1994 to 2013**

| Report Author(s) | Sample Collection Year | Report Title | Watercourses Sampled – Water Quality | Waterbodies Sampled – Water Quality | Waterbodies Sampled – Sediment Quality |
|---|---|---|---|---|---|
| M.M. Dillon Ltd. (Dillon) | 1994 | Meliadine Project – Baseline Surface Water and Lake Sediment Sampling | None | Peninsula Basins A, B, C, D, E; Lake DI2; Atulik Lake | Peninsula Basins A, B, C, D; Atulik Lake; DI2 |
| Dillon | 1995 | Discovery Project – Rankin Inlet Area 1995 Environmental Investigations | Atulik Lake | Meliadine Lake; Lake DI1; Atulik Lake | Meliadine Lake; Atulik Lake |
| RL&L Environmental Services Ltd. (RL&L) | 1998 | Meliadine West Baseline Aquatic Studies: 1997 Data Report | Peninsula Basins A, B, D, G; Meliadine River; Peter Lake | Peninsula Basins A, B, D, G; Meliadine Lake; Peter Lake | - |
| RL&L | 1999 | Meliadine West Baseline Aquatic Studies: 1998 Data Report | Peninsula Basins A, B; Meliadine River; Peter Lake | Peninsula Basins A, B, D; Meliadine Lake; Peter Lake; Control Lake; Ocean | Peninsula Basins A, B; Meliadine Lake; Control Lake; Peter Lake; Little Meliadine Lake; Hudson Bay |
| RL&L | 2000 | Meliadine West Baseline Aquatic Studies: 1999 Data Report | Peninsula Basins A, B; Meliadine River | Peninsula Basins A, B; Meliadine Lake; Control Lake | - |
| RL&L | 2001 | Meliadine West Baseline Aquatic Studies: 2000 Data Report | Peninsula Basins A, B; Meliadine River | Peninsula Basins A, B; Meliadine Lake; Control Lake | - |
| Comaplex Minerals Corporation (Comaplex) | 2007 | Not applicable; data collected under water licence | Peninsula Basin A | Peninsula Basin A, Control Lake | - |
| Golder Associates Ltd. (Golder) | 2008 | Meliadine West Gold Project: Water Quality Baseline Studies 2008 | Peninsula Basins A, B; Meliadine River; Meliadine Lake; Atulik Lake | Peninsula Basins A, B; Meliadine Lake; Atulik Lake; Control Lake | Peninsula Basins A, B; Meliadine Lake; Control Lake; Atulik Lake |
| Golder | 2009 | Meliadine Gold Project: Aquatics Baseline Synthesis Report, 1994 to 2009 | None | Peninsula Basins A, B; Meliadine Lake; Atulik Lake; Control Lake | Peninsula Basin A |
| Golder | 2011 | Meliadine Gold Project: 2011 Aquatic Baseline Studies | Peninsula Basin B | Peninsula Basins B, D, E, H; Meliadine Lake; Control Lake | Peninsula Basins B, D, E, H; Meliadine Lake; Control Lake |
| Azimuth | 2013 | Not applicable | None | Meliadine Lake | None |

Samples have been collected during spring (May to June), summer (July to early August), fall (late August to early October), and winter (late October to April) in the various waterbody groups (Table 7.4-3). A total of 263 water quality samples have been collected between 1994 and 2013 with greatest sampling effort in the peninsula lakes and streams. Sediment quality sampling effort has been greatest in Meliadine Lake and the peninsula lakes with a total of 66 and 56 samples, respectively, and 143 samples overall collected between 1994 and

2013. Summary of effort by station and season are provided in Table 7.4-3 and detailed sampling effort by station and season are provided in Table 7.4-4.

**Table 7.4-3: Summary of Water and Sediment Quality Sampling Effort (1994 to 2013)**

| Waterbody Group | Water Quality | | | | | | Sediment Quality | |
|---|---|---|---|---|---|---|---|---|
| | Number of Stations | Number of Samples | | | | | Number of Stations | Total Samples |
| | | Winter | Spring | Summer | Fall | Total | | |
| Meliadine Lake | 13 | 8 | 0 | 29 | 5 | 42 | 9 | 66 |
| Peninsula Lakes | 36 | 24 | 0 | 60 | 20 | 104 | 23 | 56 |
| Larger Lakes Region | 3 | 3 | 0 | 8 | 2 | 13 | 3 | 20 |
| Streams | 27 | 0 | 31 | 23 | 31 | 85 | 1 | 1 |
| Rivers | 5 | 0 | 10 | 6 | 3 | 19 | 0 | 0 |
| Total | 84 | 35 | 41 | 126 | 61 | 263 | 36 | 143 |

Note: winter = late October to April; spring = May to June; summer = July to mid-August; fall = late August to early October.

Seasonal sampling was completed when environmental conditions (e.g., presence or absence of ice) were safe. The lakes have not been sampled in the spring because ice conditions were typically not safe for mid-lake sampling. In a similar manner, streams were not sampled during winter because it was assumed they would be frozen to the substrate. Streams have been sampled in the spring because this is the typical period of active runoff. Overall, a substantial number of samples have been collected from the lakes and streams, and the lack of spring samples from the lakes does not change the results of the impact assessment.

Water quality data were collected between 1994 and 2013. Field programs and data collected between 1994 and 2009 were provided in supporting document SD 7-1 (2009 Aquatic Synthesis Baseline); field programs and data collected in 2011 were provided in supporting document SD 7-2 (2011 Aquatics Baseline Report); field programs and a summary of data collected in 2013 are provided in Appendix 7.4B Tables 7.4B-3 to 7.4B-5. Collection methods and data were provided in those reports, and are summarized below.

- Supporting document SD 7-1:
  - Section 5.0 – Water Quality (Section 5.1.4, pages 70 to 71; Appendix B)
    - In 1994, 1995, and 2009, grab samples were collected in streams and lakes.
    - In all other studies, streams samples were collected at 0.1 m below the surface, and lake samples were collected at 1 m below the surface.
  - Section 6.0 – Sediment Quality (Section 6.1.4, page 126; Appendix C)
    - Surface grabs were collected in all studies, but profile depth and number of replicates varied among studies.
  - Section 7.0 – Aquatic Habitat, profiles (Section 7.1.4, page 150; appendix D)
    - Vertical profiles (temperature, conductivity, and pH) were recorded in lakes during the 1997, 1998, and 1999 field programs.
- Supporting document SD 7-2:

- Section 3.0 – Water Quality (Section 3.1.1, page19; appendix B)
  - In situ measurements of pH, conductivity, dissolved oxygen, and temperature were recorded.
  - Single composite water samples were collected from the top, middle, and bottom of the water column.
- Section 4.0 – Sediment Quality (Section 4.1.1, page 27; appendix C)

- Appendix 7.4-B:
  - Summary statistics for water quality (1994 to 2011) Table 7.4-B3;
  - summary statistics for sediment quality are provided in Table 7.4-B4; and
  - Summary statistics for Meliadine water samples collected between 1994 to 2011 and summary statistics for Meliadine water samples collected in 2013 are provided in Table 7.4-B5.
- Surface sediment grabs were collected with an Ekman sampler.

Seasonality is an important feature in lakes of northern Canada, where the seasonal production of ice can cause dissolved substances to concentrate in the unfrozen water, and in shallow systems, ice can form through the water column and freeze to the bottom in shallow waterbody and stream systems. Oxygen levels can be suppressed during the winter because oxygen is not replenished from the atmosphere and is consumed by sediments and organisms. During open water conditions, oxygen is replenished in waterbodies through exchange with the atmosphere. The open water season ranges from late May until early October, with ice cover the rest of the year.

- Water quality in winter can often be high in TDS due to the formation of ice as pure water, which increases the concentration of dissolved solids in the remaining water. In spring, runoff from snowmelt and precipitation (spring freshet) is often low in TDS, so TDS in the lakes tends to decrease in the spring. In contrast, total suspended solids (TSS) in the water tend to increase as larger freshet flows can result in erosion of bed and bank materials into the water column with higher velocities keeping solids suspended. The spring freshet can occur over a short period of time depending on the size and position of the catchment within the watershed. As flows decrease, TSS will decrease. In summer, surface flows are usually low. Lake productivity can increase in summer due to increasing nutrient concentrations, water temperature, and hours of daylight. In the fall period, lake productivity tends to decrease with decreasing nutrient supply, water temperature, and/or hours of daylight.

In northern lakes, spatial heterogeneity of water quality can be low as watersheds have little disturbance with no point and non-point source impacts. Any existing spatial heterogeneity generally is the result of the underlying geological conditions. Given the low variability between surface waterbodies with similar geological conditions, the data from a subset of waterbodies can be used to describe expected variability of surface water in an area.

**Table 7.4-4: List of Water and Sediment Quality Sampling Stations and Sampling Effort from 1994 to 2011**

| | | | | | Water Column Profiles | | | | Water Quality Samples by Year and Season | | | | | | | | | | WQ Samples by Season | | | | Total WQ Samples | Sediment Quality Samples | | | | | | Total SQ Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waterbody Group | Station | Old Station Name/Description | Shown on Figure | Station Type | 1997 | 1998 | 1999 | 2011 | 1994 | 1995 | 1997 | 1998 | 1999 | 2000 | 2007 | 2008 | 2009 | 2011 | Winter | Spring | Summer | Fall | | 1994 | 1995 | 1998 | 2008 | 2009 | 2011 | |
| Meliadine Lake | ML-A | - | Figure 7.4-2, 7.4-4* | Lake | - | - | - | - | - | - | - | - | - | - | - | - | Wi , Su | - | 1 | - | 1 | - | 2 | Su | - | Su (x5) | Su (x4) | - | - | 10 |
| Meliadine Lake | ML-B | | - | Lake | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | - | - | Su (x5) | Su (x4) | - | - | 9 |
| Meliadine Lake | ML-H | East basin of ML in the "toe of the boot" (BOOT-1) | Figure 7.4-1, 7.4-4* | Lake | - | - | - | - | - | - | - | - | - | - | - | Su | Su | - | - | - | 2 | - | 2 | - | - | - | Su (x4) | - | - | 4 |
| Meliadine Lake | ML-J | East basin of ML at the outlet of the "toe of the boot" (BOOT-2) | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | Su | Wi , Su | Su | 1 | - | 3 | - | 4 | - | - | - | Su (x4) | - | Su | 5 |
| Meliadine Lake | ML-E | - | Figure 7.4-1, 7.4-4* | Lake | Su, Fa | Wi, Su, Fa | - | Su | - | - | Su, Fa | Wi, Su, Fa | - | - | - | Su | Wi | Su | 2 | - | 4 | 2 | 8 | - | - | Su (x5) | Su (x4) | - | Su | 10 |
| Meliadine Lake | ML-W | - | - | Lake | Su, Fa | Wi , Su | - | - | - | - | Su, Fa | Wi , Su | - | - | - | Su | - | - | 1 | - | 3 | 1 | 5 | - | - | Su (x5) | Su (x4) | - | - | 9 |
| Meliadine Lake | ML-S | - | Figure 7.4-1, 7.4-4* | Lake | Su, Fa | Wi, Su | - | - | - | - | Su, Fa | Wi, Su, Fa | - | - | - | - | - | - | 1 | - | 2 | 2 | 5 | - | - | Su (x5) | Su (x4) | - | - | 9 |
| Meliadine Lake | ML-SE | - | Figure 7.4-2, 7.4-4* | Lake | - | Wi , Su | Su | Su | - | - | - | Wi , Su | Su | Su | - | Su | Wi | Su | 2 | - | 5 | - | 7 | - | - | - | Su (x4) | - | Su | 5 |
| Meliadine Lake | ML-X | DI4; in Meliadine Lake | Figure 7.4-3, 7.4-4 | Lake | - | - | - | - | - | Su | - | - | - | - | - | Su | - | - | - | - | 2 | - | 2 | - | Su | - | Su (x4) | - | - | 5 |
| Peninsula Lakes | DI3 | Atulik Lake | Figure 7.4-4 | Lake | - | - | - | - | - | Su | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | DI1 | Chickenhead Lake | Figure 7.4-3, 7.4-4 | Lake | - | - | - | - | Su | Su | - | - | - | - | - | Su | Wi | - | 1 | - | 3 | - | 4 | Su | - | - | Su (x4) | - | - | 5 |
| Peninsula Lakes | DI5 | - | Figure 7.4-3, 7.4-4 | Lake | - | - | - | - | - | Su | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - | Su | - | - | - | - | 1 |
| Peninsula Lakes | Y13 | DI2 | Figure 7.4-3, 7.4-4 | Lake | - | - | - | - | Su | Su | - | - | - | - | - | - | - | - | - | - | 2 | - | 2 | Su | - | - | - | - | - | 1 |
| Peninsula Lakes | A1 | PL-06 in Dillon 1994 | Figure 7.4-2, 7.4-4* | Lake | Fa | - | - | - | Su | - | Fa | - | - | - | - | - | - | - | - | - | 1 | 1 | 2 | Su | - | - | - | - | - | 1 |
| Peninsula Lakes | A5 | PL-05 in Dillon 1994 | Figure 7.4-2, 7.4-4* | Lake | - | - | - | - | Su | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | Su | - | - | - | - | - | 1 |
| Peninsula Lakes | A6 | Peg Lake; aka PL-03 | Figure 7.4-2, 7.4-4* | Lake | Su , Fa | Wi , Su | Su | - | Su | - | Su , Fa | Wi , Su | Su | Su | - | - | Wi , Su | - | 2 | - | 6 | 1 | 9 | Su | - | Su (x5) | - | Su | - | 7 |
| Peninsula Lakes | A8 | Lake A8; aka PL-01; Pump Lake | Figure 7.4-1, 7.4-4* | Lake | Su , Fa | Wi , Su | - | - | Su | - | Su , Fa | Wi , Su | - | - | Su , Fa | Su | Wi | - | 2 | - | 5 | 2 | 9 | Su | - | Su (x5) | Su (x4) | - | - | 10 |
| Peninsula Lakes | A9 | Pond A9 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | A13 | Pond A13 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | A15 | Pond A15 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | A38 | Pond A38 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | A54 | Pond A54 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | Su | - | - | - | - | 2 | 1 | 3 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | A56 | Pond A56; Peanut Lake | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | A57 | Pond A57 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | - | - | - | Su , Fa | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | B2 | - | Figure 7.4-1, 7.4-2, 7.4-4* | Lake | Su , Fa | Wi, Su, Fa | Su | Wi, Su | - | - | Su , Fa | Wi, Su, Fa | Su | Su | - | - | - | Wi, Su | 2 | - | 5 | 2 | 9 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | B5 | - | Figure 7.4-1, 7.4-4* | Lake | Su , Fa | Wi, Su, Fa | Su | Wi | - | - | Su , Fa | Wi, Su, Fa | Su | Su | - | Su | Wi | Wi | 3 | - | 5 | 2 | 10 | - | - | Su (x5) | Su (x4) | - | - | 9 |

| | | | | | Water Column Profiles | | | | Water Quality Samples by Year and Season | | | | | | | | | | WQ Samples by Season | | | | Total WQ Samples | Sediment Quality Samples | | | | | | Total SQ Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waterbody Group | Station | Old Station Name/Description | Shown on Figure | Station Type | 1997 | 1998 | 1999 | 2011 | 1994 | 1995 | 1997 | 1998 | 1999 | 2000 | 2007 | 2008 | 2009 | 2011 | Winter | Spring | Summer | Fall | | 1994 | 1995 | 1998 | 2008 | 2009 | 2011 | |
| Peninsula Lakes | B6 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Wi | - | - | - | - | - | - | - | Su | Wi , Su | Wi | 2 | - | 2 | - | 4 | - | - | - | Su (x4) | - | - | 4 |
| Peninsula Lakes | B7 | Woody Lake | Figure 7.4-1, 7.4-4* | Lake | Su , Fa | Wi, Su, Fa | - | Wi | - | - | Su , Fa | Wi, Su, Fa | - | - | - | Su | Wi | Wi | 3 | - | 3 | 2 | 8 | - | - | - | Su (x2) | - | - | 2 |
| Peninsula Lakes | B8 | Pond B8 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | Wi | - | - | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | B9 | Pond B9 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | Wi | - | - | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | B10 | Pond B10 | Figure 7.4-1, 7.4-4* | Pond | - | - | - | - | - | - | - | Wi | - | - | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | B36 | PL-2 in Dillon 1994 | Figure 7.4-1, 7.4-2, 7.4-4* | Lake | - | - | - | Su | Su | - | - | - | - | - | - | - | - | Su | - | - | 2 | - | 2 | Su | - | - | - | - | Su | 2 |
| Peninsula Lakes | B45 | - | Figure 7.4-2, 7.4-4* | Lake | - | - | - | Wi, Su | - | - | - | - | - | - | - | - | - | Wi, Su | 1 | - | 1 | - | 2 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | B46 | - | Figure 7.4-2, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | C5 | PL-04 in Dillon 1994 | - | Lake | - | - | - | - | Su | - | - | - | - | - | - | - | - | - | - | - | 1 | | 1 | Su | - | - | - | - | - | 1 |
| Peninsula Lakes | D1 | - | Figure 7.4-1, 7.4-4 | Lake | Fa | Wi | - | - | - | - | Fa | Wi | - | - | - | - | - | - | 1 | - | - | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | D4 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | D5 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | D7 | MB-1/MB-3 in Dillon 1994 | Figure 7.4-1, 7.4-4* | Lake | Su , Fa | Wi | - | Wi, Su | Su | - | Su , Fa | Wi | - | - | - | - | - | Wi, Su | 2 | - | 3 | 1 | 6 | Su | - | - | - | - | Su | 2 |
| Peninsula Lakes | D23 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | E3 | MB-2 in Dillon 1994 | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Wi, Su | Su | - | - | - | - | - | - | - | - | Wi, Su | 1 | - | 2 | - | 3 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | E4 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Wi, Su | - | - | - | - | - | - | - | - | - | Wi, Su | 1 | - | 1 | - | 2 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | G2 | Control Lake-1997 | Figure 7.4-1, 7.4-4 | Lake | Su, Fa | - | - | - | - | - | Su, Fa | - | - | - | - | - | - | - | - | - | 1 | 1 | 2 | - | - | - | - | - | - | 0 |
| Peninsula Lakes | H17 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Peninsula Lakes | H20 | - | Figure 7.4-1, 7.4-4* | Lake | - | - | - | Su | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Larger Lakes Region | Ref | Control Lake | Figure 7.4-1, 7.4-4* | Lake | - | Su | Su | Su | - | - | - | Su | Su | Su | Su , Fa | Su | Wi | Su | 1 | - | 6 | 1 | 8 | - | - | Su (x5) | Su (x4) | - | Su | 10 |
| Larger Lakes Region | LML | - | Figure 7.4-4 | Lake | - | - | - | - | - | - | - | Wi, Su, Fa | - | - | - | - | - | - | 1 | - | 1 | 1 | 3 | - | - | Su (x5) | - | - | - | 5 |
| Larger Lakes Region | PL | | - | Lake | - | - | - | - | - | - | - | Wi , Su | - | - | - | - | - | - | 1 | - | 1 | - | 2 | - | - | Su (x5) | - | - | | 5 |
| Streams | ATL-ATR | DI-6; Outlet of Atulik Lake | Figure 7.4-4 | Stream | - | - | - | - | - | Su | - | - | - | - | - | Sp | - | - | - | 1 | 1 | - | 2 | - | - | - | - | - | - | 0 |
| Streams | AT2-3 | DI-7; Downstream of basins below Atulik Lake on Atulik River | Figure 7.4-4 | Stream | - | - | - | - | - | Su | - | - | - | - | - | Sp | - | - | - | 1 | 1 | - | 2 | - | - | - | - | - | - | 0 |
| Streams | CH8-10 | NEW-2; Downstream of NEW-3; outlet into DI5 which flows into Meliadine Lake | Figure 7.4-3, 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | Sp | - | - | - | 1 | - | - | 1 | - | - | - | - | - | - | 0 |
| Streams | CH5-6 | NEW-3; Outlet of Chickenhead Lake | Figure 7.4-3, 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | Sp | - | - | - | 1 | - | - | 1 | - | - | - | - | - | - | 0 |

| Waterbody Group | Station | Old Station Name/Description | Shown on Figure | Station Type | Water Column Profiles | | | | Water Quality Samples by Year and Season | | | | | | | | | | WQ Samples by Season | | | | Total WQ Samples | Sediment Quality Samples | | | | | | Total SQ Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1997 | 1998 | 1999 | 2011 | 1994 | 1995 | 1997 | 1998 | 1999 | 2000 | 2007 | 2008 | 2009 | 2011 | Winter | Spring | Summer | Fall | | 1994 | 1995 | 1998 | 2008 | 2009 | 2011 | |
| Streams | X0-1 | DI-4; Outlet of DI4 Lake into Meliadine Lake | Figure 7.4-3, 7.4.4 | Stream | - | - | - | - | - | - | - | - | - | - | - | Sp | - | - | - | 1 | - | 1 | 1 | - | - | - | - | - | - | 0 |
| Streams | Y0-1 | NEW-1; east side of Meliadine Lake east basin | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | Sp , Su | - | - | - | 1 | 1 | - | 2 | - | - | - | - | - | - | 0 |
| Streams | A0-1 | Stream between Meliadine Lake and Lake A1 | Figure 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | Sp | Sp , Su | Sp | Sp | - | - | - | - | - | 4 | 1 | - | 5 | - | - | - | - | - | - | 0 |
| Streams | A5-6 | Stream between lakes A5 and A6 | Figure 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | Sp | Sp , Su | - | - | - | - | - | - | - | 2 | 1 | - | 3 | - | - | - | - | - | - | 0 |
| Streams | A6-7 | Stream between lakes A6 and A7; M23.6 | Figure 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su, Fa | - | - | 1 | 3 | 4 | - | - | - | - | - | - | 0 |
| Streams | A7-8 | Stream between lakes A7 and A8 | Figure 7.4-1, 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | Sp | Sp , Su | - | - | Su , Fa | Sp , Su | - | - | - | 3 | 3 | 1 | 7 | - | - | - | - | - | - | 0 |
| Streams | B6-7 | - | Figure 7.4-1, 7.4-4* | Stream | - | - | - | - | - | - | Sp | Sp , Su | - | - | - | Sp , Su | - | - | - | 3 | 2 | - | 5 | - | - | - | - | - | - | 0 |
| Streams | B5-6 | - | Figure 7.4-1, 7.4-4* | Stream | - | - | - | - | - | - | - | Sp , Su | - | - | - | - | - | - | - | 1 | 1 | - | 2 | - | - | - | - | - | - | 0 |
| Streams | B4-5 | - | Figure 7.4-1, 7.4-4* | Stream | - | - | - | - | - | - | Sp , Su | Sp , Su | - | - | - | Sp , Su | - | - | - | 3 | 3 | - | 6 | - | - | - | - | - | - | 0 |
| Streams | B4-45 | - | Figure 7.4-1, 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su | - | - | 1 | - | 1 | - | - | - | - | - | Su | 1 |
| Streams | B3-4 | - | Figure 7.4-1, 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | Sp | Sp , Su | - | - | - | - | - | - | - | 2 | 1 | - | 3 | - | - | - | - | - | - | 0 |
| Streams | B1-2 | - | Figure 7.4-2, 7.4-4* | Stream | - | - | - | - | - | - | Sp , Fa | Sp , Su | Sp | Sp | - | - | - | - | - | 4 | 1 | 1 | 6 | - | - | - | - | - | - | 0 |
| Streams | D6-7 | - | Figure 7.4-1, 7.4-4* | Stream | - | - | - | - | - | - | Sp , Fa | - | - | - | - | - | - | - | - | 1 | | 1 | 2 | - | - | - | - | - | - | 0 |
| Streams | D0-1 | - | Figure 7.4-1, 7.4-4 | Stream | - | - | - | - | - | - | Sp , Fa | - | - | - | - | - | - | - | - | 1 | | 1 | 2 | - | - | - | - | - | - | 0 |
| Streams | G1-2 | 1997 Control Lake, outlet to ML | Figure 7.4-1, 7.4-4 | Stream | - | - | - | - | - | - | Sp | - | - | - | - | - | - | - | - | 1 | | | 1 | - | - | - | - | - | - | 0 |
| Streams | M11.5 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su, Fa | - | | 1 | 3 | 4 | - | - | - | - | - | - | 0 |
| Streams | M13.3 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su, Fa | - | | 1 | 3 | 4 | - | - | - | - | - | - | 0 |
| Streams | M22.6 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su, Fa | - | | 1 | 3 | 4 | - | - | - | - | - | - | 0 |
| Streams | M3.0 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Fa | - | | | 3 | 3 | - | - | - | - | - | - | 0 |
| Streams | M3.9 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Fa | - | | | 3 | 3 | - | - | - | - | - | - | 0 |
| Streams | M5.0 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su, Fa | - | | 1 | 3 | 4 | - | - | - | - | - | - | 0 |
| Streams | M6.7 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Fa | - | | | 3 | 3 | - | - | - | - | - | - | 0 |
| Streams | M8.6 | | Figure 7.4-4 | Stream | - | - | - | - | - | - | - | - | - | - | - | - | - | Su, Fa | - | | 1 | 3 | 4 | - | - | - | - | - | - | 0 |
| Rivers | Char | Char River | Figure 7.4-4 | River | - | - | - | - | - | - | - | - | - | - | - | - | - | Su | - | | 1 | | 1 | - | - | - | - | - | - | 0 |
| Rivers | ML-MR | ML to Meliadine River | Figure 7.4-4 | Stream | - | - | - | - | - | - | Sp , Fa | Sp , Su | Sp | Sp | - | Sp , Su | - | - | - | 5 | 2 | 1 | 8 | - | - | - | - | - | - | 0 |
| Rivers | MR-L | Meliadine River to Ocean; M2.1 | Figure 7.4-4 | River | - | - | - | - | - | - | - | Sp , Su | - | - | - | - | - | | - | 1 | 1 | | 2 | - | - | - | - | - | - | 0 |
| Rivers | ML-PL | ML to Peter Lake | - | Stream | - | - | - | - | - | - | Sp , Fa | Sp , Su | - | - | - | - | - | - | - | 2 | 1 | 1 | 4 | - | - | - | - | - | - | 0 |
| Rivers | PL-DL | Peter Lake to Diana Lake | - | Stream | - | - | - | - | - | - | Sp , Fa | Sp , Su | - | - | - | - | - | - | - | 2 | 1 | 1 | 4 | - | - | - | - | - | - | 0 |

[a] Stations provided on Figures 7.4-1 to 7.4-4.

Note: “WQ” = water quality; “SQ” = sediment quality. Five additional stations between ML-J and ML-E were sampled in August 2013 (Azimuth 2013a); these stations are included on Figure 7.4-1

### 7.4.4.1 Methods

During various field programs, waterbodies in the study area were sampled during the late winter under-ice (March to April), spring (May to June), summer (July to early August), and/or fall periods (late August to early October). Not all waterbody stations were sampled during all seasons. Streams were sampled during the open-water periods only and usually during the late spring to summer period. Some stations were sampled multiple times during one year. Sediments were only sampled during the open-water period.

During the winter programs, a gas powered auger was used to drill a hole through the ice at the selected sampling location on each waterbody. During the open-water period, a boat was used to access the sampling locations. Attempts were made to collect water samples from the deepest part of the waterbody. In the streams, sampling locations were accessed by wading into the watercourse from shore. Where possible, samples were collected from the deepest portion of the stream.

In the earlier studies (1994 to 2001), surface grab samples were collected at stream and waterbody stations. In the 2008, 2009, and 2011 field programs, composite water samples were collected at the waterbody stations. These composite samples included water collected from the top of the water column (0.5 m below the bottom of the ice during the winter program, or 0.5 m below the surface of the water during the summer program), the middle of the water column, and 1 m above the waterbody bottom (if water depth was sufficient). At the stream stations, grab samples at 0.5 m below the water surface were collected.

Bottles provided by the analytical laboratory were filled with the grab or composite water samples in the field. Samples were kept cool (but not frozen) during shipping to an accredited analytical laboratory (e.g., ALS Environmental, Edmonton, Alberta) for analysis.

During the 2008 to 2011 field studies, in situ measurements were taken for pH (pH units), conductivity (microSiemens per centimetre [µS/cm]), dissolved oxygen concentration (mg/L and percent [%] saturation), and water temperature (°C) using a portable water quality meter (Hydrolab Datasonde). In the lakes, measurements were taken every 0.5 m through the water column, whereas in the streams, measurements were taken at approximately 50 cm below the surface. Water samples were analyzed for a variety of parameters during each field program; the general suite of parameters included conventional parameters, major ions, carbon, nutrients, metals[1], and organic compounds (Table 7.4-5).

Samples for sediment quality analysis were collected from waterbodies and, less frequently, from streams because suitable depositional areas for sampling were rare in the streams. Sediments were collected during the open-water season. Sediments were analyzed for a suite of parameters including particle size, nutrients, total metals, polycyclic aromatic hydrocarbons, organic compounds, organochlorines, and other compounds (Table 7.4-6).

[1] For brevity, metals and metalloids are referred to as metals.

**Table 7.4-5: Water Quality Parameter List**

| Group Name | Parameters |
|---|---|
| Field Measurements | Water temperature, dissolved oxygen, pH, specific conductivity |
| Conventional Parameters | pH, specific conductivity, total dissolved solids, total alkalinity, total hardness, total suspended solids, total volatile solids, turbidity |
| Major Ions | Bicarbonate, bromide, calcium, carbonate, chloride, fluoride, hydroxide, magnesium, potassium, reactive silica, silicate, sodium, sulphate, ion balance |
| Carbon | Total carbon, total organic carbon, dissolved organic carbon, total inorganic carbon, |
| Nutrients | Total ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total phosphorus, total dissolved phosphorus, orthophosphate, chlorophyll *a* |
| Total and Dissolved Metals/Metalloids | Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, cesium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, selenium, silicon, silver, strontium, thallium, tin, titanium, tungsten, uranium, vanadium, zinc |
| Organic Compounds | Benzene, ethylbenzene, toluene, xylenes (known together as BTEX), F1 (C6-C10), F1 - (BTEX), F2 (>C10-C16), F3 (C16-C34), F4 (C34-C50), oil and grease, phenols, total volatiles, total extractables |

**Table 7.4-6: Sediment Quality Parameter List**

| Group Name | Parameters |
|---|---|
| Particle Size | Percent gravel, sand, silt, and clay |
| Nutrients | Total carbon, total organic carbon, total inorganic carbon, total nitrogen, total phosphorus |
| Total Metals | Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, lead, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, selenium, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium, zinc |
| Organic Compounds | Polycyclic Aromatic Hydrocarbons (PAH), benzene, ethylbenzene, toluene, xylenes (known together as BTEX), organochlorines |

### *7.4.4.2 Guidelines*

Water quality data were compared to the most recent CCME Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life and Health Canada's Guidelines for Canadian Drinking Water Quality (CCME 2012a; Health Canada 2010) (Table 7.4-7).

Water quality guidelines are nationally endorsed indicators of environmental quality for the protection of aquatic ecosystems and designated water uses (CCME 2012a; Health Canada 2010). The aquatic life guidelines are based on the most current, scientifically defensible toxicological data and are intended to be protective of all forms and life stages of aquatic life (CCME 2012a). A guideline exceedance does not necessarily imply unacceptable or harmful conditions. Guideline exceedances observed during baseline investigations are a result of naturally occurring conditions and the local flora and fauna will be adapted to these conditions.

**Table 7.4-7: Water Quality Guidelines**

| Parameter | Unit | Canadian Council of Ministers of the Environment | | |
|---|---|---|---|---|
| | | Aquatic Life[a] | | Drinking Water[b] |
| | | Acute | Chronic | |
| **Field Measured** | | | | |
| pH | pH units | - | 6.5 - 9.0 | 6.5 - 8.5 |
| Dissolved oxygen | mg/L | - | 6.5 | - |
| **Conventional Parameters** | | | | |
| pH | pH units | - | 6.5 - 9.0 | 6.5 - 8.5 |
| Total dissolved solids | mg/L | - | - | 500 |
| Total suspended solids | mg/L | - | 5 – 25[a] | - |
| Colour | TCU | - | - | 15 |
| **Major Ions** | | | | |
| Calcium | mg/L | - | - | - |
| Sodium | mg/L | - | - | 200 |
| Chloride | mg/L | 600 | 120 | 250 |
| Sulphate | mg/L | 100 | - | 500 |
| Sulphide[c] | mg/L | - | - | 0.05 |
| Cyanide | µg/L | - | 5 | 200 |
| Fluoride[c] | mg/L | - | 0.12 | 1.5 |
| **Nutrients and Biological Indicators** | | | | |
| Nitrate + nitrite | mg-N/L | - | - | - |
| Total ammonia | mg-N/L | - | 0.2[c] | - |
| Total nitrogen (calculated) | mg-N/L | - | - | - |
| Total phosphorus | mg-P/L | - | 0.004 – 0.1[d] | - |
| Nitrate | mg-N/L | 31.3 | 2.93 | 10 |
| Nitrite | mg-N/L | - | 0.06 | 1 |
| Total nitrogen | mg-N/L | - | - | - |
| **Total Metals** | | | | |
| Aluminum[c] | mg/L | 0.1 | 0.1 | 0.1 |
| Antimony[c] | mg/L | 0.02 | - | 0.006 |
| Arsenic | mg/L | 0.005 | 0.005 | 0.01 |
| Barium | mg/L | 5 | 1 | 1 |
| Beryllium | mg/L | - | 0.0053 | - |
| Boron | mg/L | 1.2 | 1.5 | 5 |
| Cadmium[c] | mg/L | - | 0.00005 | 0.005 |
| Chromium | mg/L | - | 0.001 | 0.05 |
| Chromium VI | µg/L | - | 0.001 | - |
| Cobalt | mg/L | 0.11 | 0.004 | - |
| Copper[c] | mg/L | - | 0.004 | 1 |
| Iron | mg/L | 1 | 0.3 | 0.3 |
| Lead[c] | mg/L | - | 0.006 | 0.01 |
| Manganese[c] | mg/L | - | - | 0.05 |

**Table 7.4-7: Water Quality Guidelines (continued)**

| Parameter | Unit | Canadian Council of Ministers of the Environment | | |
|---|---|---|---|---|
| | | Aquatic Life[a] | | Drinking Water[b] |
| | | Acute | Chronic | |
| Mercury | mg/L | - | 0.000026 | 0.001 |
| Molybdenum | mg/L | 2 | 0.073 | - |
| Nickel[c] | mg/L | 0.065 | 0.1 | - |
| Selenium | mg/L | - | 0.001 | 0.01 |
| Silver[c] | mg/L | - | 0.0001 | - |
| Thallium | mg/L | 0.0003 | 0.0008 | - |
| Titanium | mg/L | 2 | - | - |
| Uranium | mg/L | 0.033 | 0.015 | 0.02 |
| Vanadium | mg/L | 0.006 | - | - |
| Zinc[c] | mg/L | - | 0.03 | 5 |
| **Organics** | | | | |
| Total phenolics | mg/L | - | 0.004 | - |
| Benzene[c] | µg/L | - | 370 | 5 |
| Ethylbenzene[c] | µg/L | - | 90 | 2.4 |
| Toluene | µg/L | - | 2 | 24 |
| Xylene | µg/L | - | - | 300 |

Note:

"-" = No data or not applicable.

[a] CCME (Canadian Council of Ministers of the Environment). 2012a. Canadian Environmental Quality Guidelines. 1999 with updates to 2012. Winnipeg, MB.

[b] Health Canada. 2010. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

[c] Guideline is dependent on pH, temperature, and/or hardness. Guidelines listed in table guidelines are for pH = 8.2, temperature = 17°C, and hardness = 140 mg/L. Measured pH, temperature, and hardness of the sample were used to evaluate if the metal concentration in the sample was above or below the guideline.

[d] The Canadian Guidance Framework for Phosphorus was developed to provide trigger ranges for phosphorus concentrations in freshwater. The trigger ranges are as follows: <4 µg/L (ultraoligotrophic); 4-10 µg/L (oligotrophic); 10-20 µg/L (mesotrophic); 20-35 µg/L (meso-eutrophic); 35-100 µg/L (eutrophic); >100 µg/L (hyper-eutrophic).

Sediment quality data were compared to the Interim Sediment Quality Guidelines (ISQG) and Probable Effect Level (PEL) guidelines for the protection of aquatic life (CCME 2012b; Table 7.4-8). The ISQG were derived solely from the threshold effects level (CCME 2001). The threshold effects level represents the concentration below which adverse biological effects are expected to rarely occur.

**Table 7.4-8: Sediment Quality Guidelines**

| Parameter | Units | Freshwater | |
|---|---|---|---|
| | | ISQG[a] | PEL[b] |
| **Total Metals/Metalloids** | | | |
| Arsenic | mg/kg dw | 5.9 | 17 |
| Cadmium | mg/kg dw | 0.6 | 3.5 |
| Chromium | mg/kg dw | 37.3 | 90 |
| Copper | mg/kg dw | 35.7 | 197 |
| Lead | mg/kg dw | 35 | 91.3 |
| Mercury | mg/kg dw | 0.17 | 0.486 |
| Zinc | mg/kg dw | 123 | 315 |
| **PAHs** | | | |
| Acenaphthene | mg/kg dw | 0.00671 | 0.0889 |
| Acenaphthylene | mg/kg dw | 0.00587 | 0.128 |
| Anthracene | mg/kg dw | 0.0469 | 0.245 |
| Benz(a)anthracene | mg/kg dw | 0.0317 | 0.385 |
| Benzo(a)pyrene | mg/kg dw | 0.0319 | 0.782 |
| Chrysene | mg/kg dw | 0.0571 | 0.862 |
| Dibenzo(a,h)anthracene | mg/kg dw | 0.00622 | 0.135 |
| Fluoranthene | mg/kg dw | 0.111 | 2.355 |
| Fluorene | mg/kg dw | 0.0212 | 0.144 |
| 2-Methylnaphthalene | mg/kg dw | 0.0202 | 0.201 |
| Naphthalene | mg/kg dw | 0.0346 | 0.391 |
| Phenanthrene | mg/kg dw | 0.0419 | 0.515 |
| Pyrene | mg/kg dw | 0.053 | 0.875 |
| **Organochlorines** | | | |
| Arochlor 1254 | mg/kg dw | 0.06 | 0.34 |
| Gamma-BHC | mg/kg dw | 0.00094 | 0.00138 |
| Chlordane (alpha) | mg/kg dw | 0.0045[c] | 0.00887[c] |
| Chlordane (gamma) | mg/kg dw | 0.0045[c] | 0.00887[c] |
| Dieldrin | mg/kg dw | 0.00285 | 0.00667 |
| Endrin | mg/kg dw | 0.00267 | 0.0624 |
| Heptachlor | mg/kg dw | 0.00060[d] | 0.00274[d] |
| Oxychlordane | mg/kg dw | 0.0045[c] | 0.00887[c] |
| pp-DDD | mg/kg dw | 0.00354[e] | 0.00851[e] |
| pp-DDE | mg/kg dw | 0.00142[e] | 0.00675[e] |
| pp-DDT | mg/kg dw | 0.00119[e] | 0.00477[e] |

[a] ISQG = Interim sediment quality guideline (CCME 2012b).

[b] PEL = Probable effect level (CCME 2012b).

[c] Guideline for chlordane.

[d] Guideline for heptachlor epoxide.

[e] Guideline is for sum of p, p', and o,p' isomers

Notes: mg/kg dw = milligrams per gram dry weight; CCME = Canadian Council of Ministers of the Environment; PAH = polycyclic aromatic hydrocarbons; gamma-BHC = benzene hexachloride; DDD = dichlorodiphenyldichloroethane; DDE = dichlorodiphenyldichloroethylene; DDT = dichlorodiphenyltrichloroethane

### 7.4.4.3 Results – Water Quality

The results are presented below and have been separated by water quality parameter groups (field measurements, conventional parameters and major ions, nutrients, metals, and organic compounds), and then reviewed with respect to waterbody types as described above (i.e., Meliadine Lake, Peninsula waterbodies, regional waterbodies [Little Meliadine Lake, Control Lake, Peter Lake], streams, and rivers). Detailed data tables for the parameters and waterbodies are provided in Appendix 7.4-B (Tables 7.4-B1 and 7.4-B2). More details on collection methods and analysis of results by sub-basin are provided in the detailed aquatic synthesis report (SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline). Summary statistics for water quality (1994 to 2011) are provided in Appendix 7.4-B Table 7.4-B3; summary statistics for sediment quality are provided in Appendix 7.4-B Table 7.4-B4. Summary statistics for Meliadine water samples collected between 1994 to 2011 and summary statistics for Meliadine water samples collected in 2013 are provided in Appendix 7.4-B Table 7.4-B5.

#### 7.4.4.3.1 Lake Bathymetry

Maps illustrating bathymetry of Meliadine Lake and the small waterbodies on the Peninsula are provided in the baseline synthesis report (SD 7-1 2009 Aquatics Synthesis Baseline, Chapter 7 and Appendix D) and in the 2011 field report (SD 7-2 2011 Aquatics Baseline, Chapter 5).

#### 7.4.4.3.2 Field Measurements

Existing conditions are described using all available data from field programs conducted from the 1990s to 2013 (Table 7.4-2).

Water quality in Meliadine Lake is described for samples collected across all stations (13), in all seasons (winter spring, summer, and fall). Limnology profiles of dissolved oxygen, temperature, pH, and conductivity have been recorded at these stations during the various field surveys. Stations sampled on Meliadine Lake ranged from 1.8 m (ML-H) to 14.7 m (ML-E) total depth. Secchi depths ranged from 1.5 to 8.5 m (average of 5.1 m). Ice thickness in late winter ranged from 1.7 to 2.3 m.

Water quality in the Peninsula waterbodies is described for samples collected across all waterbodies (37) and in all seasons (winter, spring, summer, and fall). Most of the Peninsula waterbodies are shallow (0.8 to 9.0 m; average 2.9 m), had variable Secchi depths (0.8 to 4.6 m; average of 2.7 m), and experienced ice thickness of less than 2 m in the winter (1.4 to 1.8 m thick).

Water quality in regional waterbodies is described for samples collected across all waterbodies (3) and in all seasons (winter, spring, summer, and fall). Regional waterbodies ranged in depth from 2.9 to 18.8 m at sampled locations, and variable Secchi depths observed (ranging from 1.2 to 7.5 m; average 5.3 m) were similar to Meliadine Lake. The larger waterbodies generally were well oxygenated (average 12.3 mg/L in Meliadine, 8.6 mg/L in the Peninsula waterbodies, and 11.7 mg/L in the regional waterbodies). Some of the smaller Peninsula waterbodies that were sampled in the winter showed depressed oxygen levels during ice covered conditions.

Field measured pH in all the waterbodies ranged from slightly acidic to slightly basic (5.5 to 7.8 in Meliadine Lake, 5.8 to 8.6 in the Peninsula waterbodies, and 6.3 to 7.9 in the regional waterbodies).

Water quality in the streams is described for samples collected across all stations (26) in three seasons (spring, summer, and fall). The streams and rivers were sampled only during the open water period, and to a depth and at locations that were safe for wading. Water temperatures ranged from 0.7 to 18.5 °C in the streams and 1.7 to 13.2 °C in the rivers. Water was well oxygenated in the streams (7.3 to 14.6 mg/L) and rivers (11 to 16.5 mg/L) with slightly acidic to slightly basic pH (6.5 to 8.4; 6.5 to 7.7; respectively).

#### 7.4.4.3.3 Conventional Parameters and Major Ions

Conductivity in Meliadine Lake ranged from 42 to 156 µS/cm, with a mean value of 71.2 µS/cm. Average conductivity in the large regional waterbodies (74.7 µS/cm) and Meliadine River (57.8 µS/cm) was similar to conductivity in Meliadine Lake, but average conductivity was much higher in the smaller Peninsula waterbodies (352.6 µS/cm) and in the streams (114 µS/cm). In the smaller waterbodies, conductivities were higher in the under-ice water samples, as compared to the open-water samples, suggesting concentrating of dissolved constituents in the reduced under-ice water volume. It is suspected that higher conductivity in the streams is related to natural variability and timing of sample collection (e.g., in some streams, conductivity was higher in the fall during low flow as compared to the early summer during higher flow). Total dissolved solids, a parameter strongly correlated with conductivity, showed a pattern similar to conductivity across these waterbody groups, with lower average values in Meliadine Lake (37 mg/L), regional waterbodies (31 mg/L), and Meliadine River (29 mg/L), and higher average values in the Peninsula waterbodies (167 mg/L). In addition, average TDS in the smaller waterbodies (i.e., ponds) on the Peninsula (116 mg/L) was higher as compared to average TDS in the larger waterbodies (i.e., lakes) on the Peninsula (664 mg/L). Average TDS in the streams (46 mg/L) was more similar to the larger waterbodies and rivers than the Peninsula waterbodies.

As based on the rating of acid sensitivity of waterbodies (Table 7.4-9), and average values of alkalinity in the waterbody/watercourse groups, Meliadine Lake (19.3 mg $CaCO_3$/L) and Meliadine River (15 mg $CaCO_3$/L) have moderate acid sensitivity, larger regional waterbodies (23 mg $CaCO_3$/L) and many streams (31 mg $CaCO_3$/L) have low acid sensitivity, and Peninsula waterbodies (81 mg $CaCO_3$/L) have least sensitivity to acid. Water hardness in the study area, as based on the classification in Table 7.4-10, ranged from very soft to soft in Meliadine Lake, larger waterbodies of the region, Meliadine River, and most streams, but was hard in the smaller Peninsula waterbodies.

**Table 7.4-9: Scale of Acid Sensitivity for Waterbodies Based on Alkalinity**

| Acid Sensitivity in Waterbodies | Alkalinity (mg/L as $CaCO_3$) |
|---|---|
| High | 0 to 10 |
| Moderate | >10 to 20 |
| Low | >20 to 40 |
| Least | >40 |

Note: $CaCO_3$ = calcium carbonate; >= greater than
Source: Saffran and Trew (1996)

**Table 7.4-10: Scale of Hardness in Fresh Waters**

| Degree of Hardness | Hardness (mg/L as $CaCO_3$) |
|---|---|
| Very soft | 0 to 30 |
| Soft | 31 to 60 |
| Moderately soft | 61 to 120 |
| Hard | 121 to 180 |
| Very hard | >180 |

Note: $CaCO_3$ = calcium carbonate; >= greater than
Source: as cited in McNeely et al. (1979)

Total suspended solids was generally low in all surface waterbody groups in the study area (average less than 4.1 mg/L), but highest variability was recorded in the small Peninsula waterbodies (<1 to 139 mg/L). Reported concentrations of TSS in the streams was also variable (1 to 28 mg/L). The major ions in the surface waterbodies, by microequivalents, are calcium, bicarbonate, sodium, and chloride (Figure 7.4-5). The relative proportion of ions does not seem to vary greatly between waterbody type or location, but average concentrations of these ions does vary between waterbody type, with the highest concentrations in the small waterbodies from the Peninsula and the Discovery area, and the lowest concentrations in Meliadine Lake, other large waterbodies, streams and rivers. Underlying geology or watershed size may play a role in these differences by area.

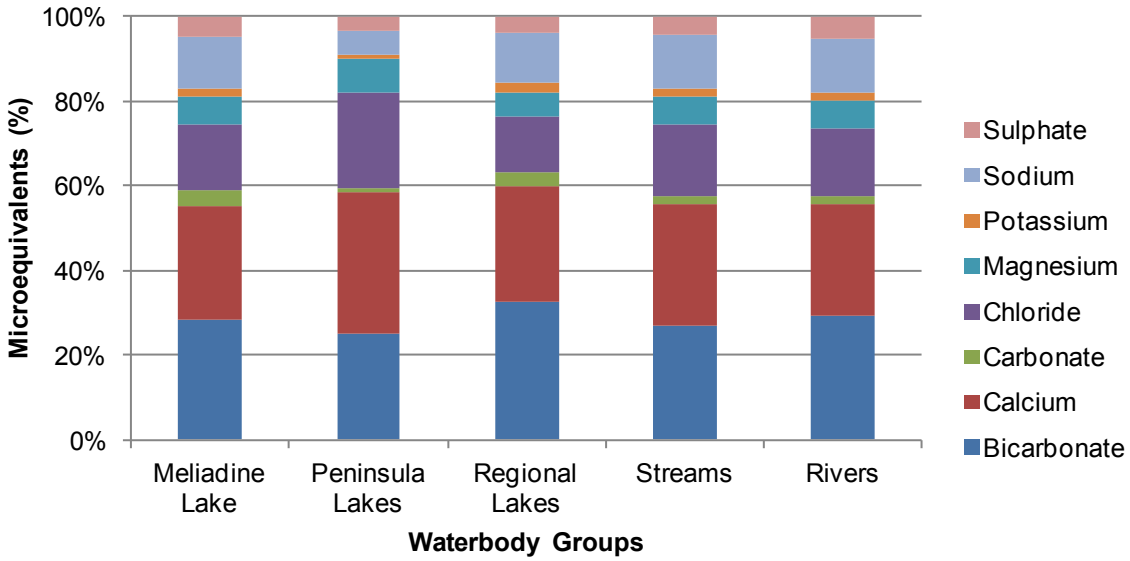



*Figure 7.4-5: Relative Proportion of Major Ions in Surface Waterbody Groups of the Study Area*

Note: Figure developed by converting mean ion concentration (mg/L) for each waterbody group to microequivalents (µEQ/L) using the conversion factors in Mitchell and Prepas (1990).

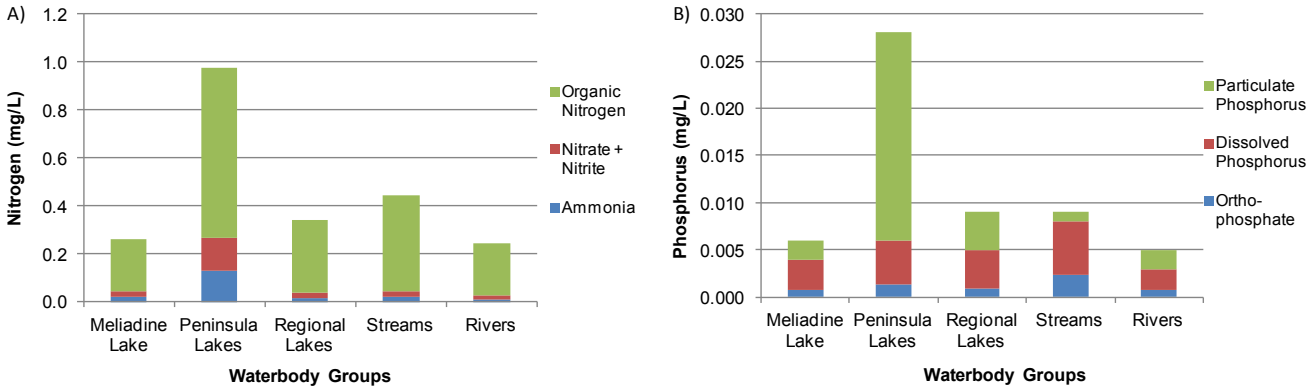
### 7.4.4.3.4 Nutrients

Total organic carbon averaged from 2.7 to 10.2 mg/L across all waterbodies, and most of the measured total organic carbon was in the form of dissolved organic carbon (3.6 to 4.8 mg/L) as opposed to particulate organic carbon. Inorganic carbon is the sum of carbonate, bicarbonate, and carbon dioxide. In most samples carbonate

was below the detection limit, and at pH more than 6.5, the predominant form of inorganic carbon in water is bicarbonate with relatively small proportions of carbon dioxide and carbonate (Wetzel 2001). Bicarbonate ranged from 7.1 mg/L to 1100 mg/L across all samples, with the highest mean value in the Peninsula waterbodies.

Concentrations of total nitrogen (sum of ammonia, nitrate, nitrite, and organic nitrogen) and total phosphorus (sum of orthophosphate, other dissolved phosphorus, and particulate phosphorus) in Meliadine Lake, large regional waterbodies, streams, and rivers were generally low, while concentrations were higher in the small Peninsula waterbodies (Figure 7.4-6). The predominant form of nitrogen in many waterbodies was organic nitrogen, while the smaller Peninsula waterbodies had, on average, measureable concentrations of ammonia and nitrate+nitrite. While the Peninsula waterbodies had the highest concentration of total phosphorus, concentrations of orthophosphate and dissolved phosphorus were similar across all waterbodies. Total phosphorus in the Peninsula waterbodies was in the particulate form, with limited biological availability. Surface waters in the study area were typically phosphorus limited, consistent with findings of Medeiros et al. (2012) for 113 lakes and ponds in the eastern Canadian Arctic.

Trophic classification based on total nitrogen and total phosphorus (TP) (Wetzel 1983) and TP trigger ranges (CCME 2004) are provided in Table 7.4-11. The ranges of TP and trophic state groupings are similar under both the Wetzel (1983) and the CCME (2004) classification schemes. Based on the trophic state classification categories (Table 7.4-11), Meliadine Lake, and the regional lakes, streams, and rivers are oligotrophic, while the Peninsula lakes are mesotrophic (Table 7.4-12).




Note: Figures developed using mean concentrations for each waterbody group.

*Figure 7.4-6: By Waterbody Group, Average Concentrations for Forms of a) Nitrogen and b) Phosphorus*

**Table 7.4-11: General Trophic Classification of Waterbodies in Relation to Total Phosphorus and Total Nitrogen**

| Trophic Status | Total Nitrogen (mg/L)[a] | | Total Phosphorus (mg/L)[a] | | Total Phosphorus Trigger Range (mg/L)[b] |
|---|---|---|---|---|---|
| | Mean | Range | Mean | Range | Range |
| Ultra-oligotrophic | - | - | - | - | <0.004 |
| Oligotrophic | 0.7 | 0.3 to 1.6 | 0.008 | 0.003 to 0.018 | 0.004 to 0.010 |
| Mesotrophic | 0.8 | 0.4 to 1.4 | 0.027 | 0.011 to 0.096 | 0.010 to 0.020 |
| Meso-eutrophic | - | - | - | - | 0.020 to 0.035 |
| Eutrophic | 1.9 | 0.4 to 6.1 | 0.084 | 0.016 to 0.386 | 0.035 to 0.100 |
| Hyper-eutrophic | - | - | - | - | >0.100 |

Sources: [a] Wetzel (1983); [b] CCME (2004).

**Table 7.4-12: Total Phosphorus Data and Trophic Classification for Meliadine Study Area Waterbodies**

| Waterbody Group | Minimum | Median | Average | Maximum | Trophic Classification (as based on Wetzel 1983 and CCME 2004) |
|---|---|---|---|---|---|
| Meliadine Lake | 0.003 | 0.004 | 0.006 | 0.033 | Oligotrophic |
| Peninsula Lakes | <0.001 | 0.011 | 0.012 | 0.100 | Mesotrophic |
| Regional Lakes | 0.003 | 0.006 | 0.009 | 0.045 | Oligotrophic |
| Streams | 0.004 | 0.008 | 0.009 | 0.020 | Oligotrophic |
| Rivers | 0.002 | 0.004 | 0.005 | 0.012 | Oligotrophic |

Note: units are mg/L

#### 7.4.4.3.5 Metals

Metals are naturally present in surface waters in small quantities (i.e., typically less than 1 mg/L). Higher metal concentrations are usually associated with suspended sediments and tend to settle out. The level at which metals are toxic varies by metal and can be dependent on modifying factors such as hardness, pH, and temperature. For example, iron and manganese enter waterways as a result of the weathering of naturally occurring minerals and generally cause no harm other than rust stains. Conversely, other metals, such as lead and mercury, can impair the health of aquatic organisms, wildlife, and humans in very small quantities. Therefore, metals are analyzed individually as part of a water quality program.

Concentrations of metals in individual samples, and by waterbody group (Meliadine Lake, Peninsula waterbodies, regional waterbodies, streams, and rivers), were compared to aquatic life and drinking water guidelines. These results are provided in Appendix 7.4-B, Tables 7.4-B1 and 7.4-B2, respectively. The guideline exceedance by waterbody group has been summarized in Table 7.4-13. This summary table includes results compared to aquatic life guidelines (acute and chronic) and drinking water guidelines. If concentrations exceed the lowest of all guidelines, they were flagged and included in the summary table. None of the metals had concentrations above acute aquatic life guidelines. Concentrations of metals relative to guidelines are summarized as follows:

- Concentrations more than aquatic life and drinking water guidelines;
  - Aluminum, arsenic, cadmium, iron, and lead;
- Concentrations more than aquatic life but less than drinking water guidelines;

- Chromium, copper, mercury, selenium, and zinc;
- Concentrations more than aquatic life guidelines and no drinking water guidelines for comparison;
  - Nickel and thallium;
- Concentrations less than aquatic life and drinking water guidelines;
  - Antimony;
- Concentrations more than drinking water guidelines and no aquatic life guidelines; and
  - Manganese.

Metals were overall very low in surface waterbodies in the study area, and in most cases, concentrations were less than guidelines. Meliadine Lake had the highest proportion of samples with cadmium concentrations above guidelines, but mean cadmium concentrations were higher in the Peninsula waterbodies. Chromium concentrations most often exceeded guidelines in samples from the larger waterbodies in the region, but mean concentrations were higher again in the Peninsula waterbodies than in any other waterbody group. Occasionally aluminum, chromium, copper, and zinc also exceeded guidelines in Meliadine Lake.

**Table 7.4-13: Summary of Samples with Metal Concentrations in Excess of Aquatic Guidelines**

| Waterbody Group | Meliadine Lake | | Peninsula Waterbodies | | Regional Waterbodies | | Streams | | Rivers | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % > GL | N | % > GL | N | % > GL | N | % > GL | N | % > GL |
| Aluminum (Al) - Total | 31 | 3% | 85 | 0% | 12 | 0% | 89 | 0% | 21 | 0% |
| Antimony (Sb) - Total | 30 | 0% | 81 | 0% | 12 | 0% | 87 | 0% | 21 | 0% |
| Arsenic (As) - Total | 31 | 0% | 85 | 1% | 12 | 0% | 89 | 0% | 21 | 0% |
| Barium (Ba) - Total | 31 | 0% | 85 | 0% | 12 | 0% | 89 | 0% | 21 | 0% |
| Beryllium (Be) - Total | 30 | 0% | 81 | 0% | 12 | 0% | 87 | 0% | 21 | 0% |
| Boron (B) - Total | 18 | 0% | 57 | 0% | 5 | 0% | 55 | 0% | 5 | 0% |
| Cadmium (Cd) - Total | 31 | 19% | 85 | 11% | 12 | 17% | 89 | 3% | 21 | 0% |
| Chromium (Cr) - Total | 31 | 10% | 85 | 9% | 12 | 25% | 89 | 4% | 21 | 0% |
| Cobalt (Co) - Total | 31 | 0% | 85 | 0% | 12 | 0% | 89 | 0% | 21 | 0% |
| Copper (Cu) - Total | 31 | 6% | 85 | 7% | 12 | 0% | 89 | 0% | 21 | 0% |
| Iron (Fe) - Total | 27 | 0% | 79 | 4% | 11 | 0% | 88 | 5% | 21 | 0% |
| Lead (Pb) - Total | 31 | 0% | 85 | 5% | 12 | 0% | 89 | 1% | 21 | 0% |
| Manganese (Mn) - Total | 31 | 0% | 85 | 9% | 12 | 0% | 89 | 1% | 21 | 0% |
| Mercury (Hg) - Total | 31 | 0% | 85 | 2% | 12 | 0% | 89 | 0% | 18 | 0% |
| Molybdenum (Mo) - Total | 31 | 0% | 85 | 0% | 12 | 0% | 89 | 0% | 21 | 0% |
| Nickel (Ni) - Total | 31 | 0% | 85 | 0% | 12 | 0% | 89 | 0% | 21 | 0% |
| Selenium (Se) - Total | 31 | 0% | 85 | 2% | 12 | 0% | 89 | 0% | 21 | 0% |
| Silver (Ag) - Total | 31 | 0% | 85 | 0% | 12 | 0% | 89 | 0% | 21 | 0% |
| Thallium (Tl) - Total | 29 | 0% | 77 | 12% | 11 | 0% | 85 | 4% | 20 | 0% |
| Titanium (Ti) - Total | 16 | 0% | 60 | 0% | 9 | 0% | 81 | 0% | 19 | 0% |
| Uranium (U) - Total | 30 | 0% | 71 | 0% | 12 | 0% | 87 | 0% | 21 | 0% |
| Vanadium (V) - Total | 30 | 0% | 81 | 0% | 12 | 0% | 87 | 0% | 21 | 0% |
| Zinc (Zn) - Total | 31 | 3% | 85 | 2% | 12 | 0% | 89 | 1% | 21 | 0% |

Note: “N” = number of samples; “GL” = guideline as listed in Table 7.4-7; “%” = percent of samples with concentrations above guideline; “waterbody group” = as listed in Table 7.4

#### 7.4.4.3.6 Organic Compounds

Water was analyzed for organic compounds including phenols, benzene, ethylbenzene, toluene, xylenes, and total and extractable hydrocarbon fractions. Concentrations of most parameters were below the detection limit. Trace occurrences of total extractable hydrocarbons, xylenes, phenols, oil and grease, and ethylbenzene were detected in some samples. Concentrations of phenols were above the chronic aquatic guideline in some samples from the shallow waterbodies and streams on the Peninsula (Appendix 7.4-B Table 7.4-B1 and 7.4-B2). A natural source of phenols in surface water is from decomposition of vegetation (CCME 2012a).

#### 7.4.4.3.7 Meliadine Lake – Additional Data

As previously noted in Section 7.4.4 above, additional water quality data were collected from Meliadine Lake in 2013 (Appendix 7.4-B Table 7.4-B5). The following compares the 2013 data set with that collected during 1995 to 2011 baseline studies.

Samples from the 1995 to 2011 dataset were collected in winter (8 samples), summer (22 samples), and fall (5 samples) for a total of 35 samples; samples from the 2013 data set were collected in the summer for a total of 7 samples.

The range of conventional parameters, except turbidity, was higher in the 1995 to 2011 dataset as compared to the 2013 summer dataset; the maximum value for conventional parameters, except turbidity, was recorded in the 1995 to 2011 dataset as compared to the 2013 dataset. Using the 2013 dataset, Meliadine Lake is still rated as moderately acid sensitive, but as very soft water as opposed to soft water using the 1995 to 2011 dataset.

The range of ions was larger in the 1995 to 2011 dataset (i.e. larger dataset) as compared to the 2013 dataset, but the major ions in Meliadine Lake (using either dataset) are bicarbonate, calcium, and chloride.

The range of nutrients was larger in the 1995 to 2011 dataset as compared to the 2013 dataset. The laboratory detection limits in the 2013 dataset were better (i.e., lower) for many parameters as compared to the 1995 to 2011 dataset, but Meliadine Lake is classified as oligotrophic using either datasets.

In the 2013 dataset, concentrations of metals were lower than in the 1995 to 2011 dataset and none of the metal concentrations were above the aquatic life or drinking water guidelines.

Overall the 2013 data are comparable to the longer-term dataset (1995 to 2011), but with the use of lower detection limits for some parameters, the 2013 data provide additional clarity on baseline conditions.

### *7.4.4.4 Results – Sediment Quality*

The results are presented below and have been separated by sediment quality parameter groups (physical parameters and nutrients, cyanide and metals, and organic compounds), and then reviewed with respect to waterbody types (Meliadine Lake, Peninsula waterbodies, and regional waterbodies [Little Meliadine Lake, Control Lake, Peter Lake]. Sediments were collected only in one stream and were not collected in the rivers. Detailed data tables for the parameters and waterbodies are provided in Appendix 7.4-B (Tables 7.4-B3 and 7.4-B4). More details on collection methods and analysis of results by sub-basin are provided in the detailed aquatic synthesis report (SD 7-1 2009 Aquatics Synthesis Baseline).

#### 7.4.4.4.1 Physical Parameters and Nutrients

Sediment samples were analyzed for particle size distribution and texture to describe the relative proportion of sand, silt, and clay in the sediment. Based on average concentrations across sampling stations, sediments in Meliadine Lake and the smaller waterbodies near Meliadine Lake had 50 to 55% sand and roughly 40 to 45% silt, with clay as the remaining fraction.

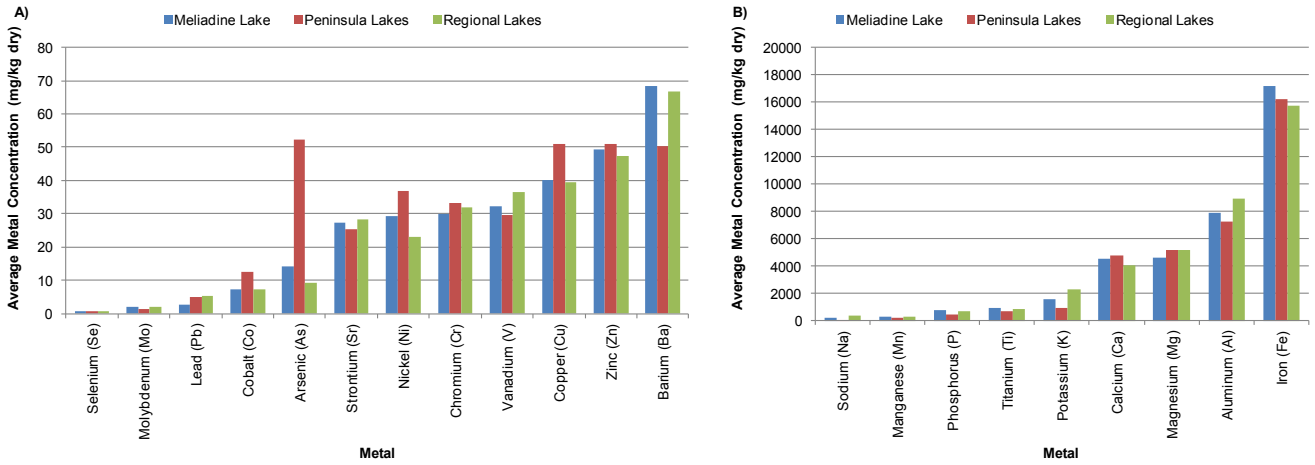
Total carbon and total organic carbon were similar in the sediments of Meliadine Lake and the regional waterbodies, but was, on average, higher in Peninsula waterbodies.

#### 7.4.4.4.2 Cyanide and Metals

Total cyanide concentrations are typically present at low levels in water and sediment not affected by anthropogenic inputs. Cyanide is a process chemical used in gold mining so it is important to have an understanding of background cyanide concentrations in waterbodies and watercourses. Cyanide was detectable in many of the samples, and the range was similar between samples collected in Meliadine Lake, waterbodies of the Peninsula, and regional waterbodies.

Sediments are sinks for metals[2] present in surface waters. Higher metal concentrations in surface water are usually associated with suspended sediments, which tend to settle out and accumulate on the lake bottom over time. Bioavailable metals in sediment can cause toxicity to aquatic organisms. Analysis of total metals in sediments does not necessarily reflect the bioavailability of metals, as often only a portion of the total metal is bioavailable. Total metal concentrations can be used to compare and assess variability between waterbodies.

Average concentrations of metals were similar between the waterbody groups (Figure 7.4-7). For some of the metals (e.g., cobalt, arsenic, nickel, chromium, copper, and zinc), mean concentration was highest in the Peninsula waterbodies, while for other metals (e.g., molybdenum, strontium, vanadium, titanium, and aluminum), mean concentrations were similar in Meliadine Lake and the larger regional waterbodies, and lower in the Peninsula waterbodies.




Note: Change of scale on the y-axis between figure A and figure B.

*Figure 7.4-7: Mean Sediment Metal Concentration by Waterbody Group for a) Mean Concentration Less than 100 mg/kg and b) Mean concentration More Than 200 mg/kg.*

[2] For brevity, metals and metalloids are referred to as metals.

Concentrations of lead, mercury, and zinc were never above guidelines. Concentrations of cadmium were occasionally above the ISQG in samples from Meliadine Lake (3 samples at ML-S) and one sample from Lake B6.

Concentrations of arsenic, chromium, and copper were above guidelines in many samples from each of the waterbody groups. Mean concentrations of arsenic from Meliadine Lake and the regional waterbodies were above the ISQG, but mean concentration of arsenic from the Peninsula waterbodies was above the PEL guideline. In addition, the 90$^{th}$ percentile concentration of arsenic from Meliadine Lake was above the PEL guideline. Mean concentrations of chromium were below the ISQG in Meliadine Lake, Peninsula waterbodies, and regional waterbodies, but the 90$^{th}$ percentile and maximum concentrations from these 3 groups of waterbodies were above the ISQG. Concentrations of chromium were never above the PEL guideline. Copper concentrations (mean and 90$^{th}$ percentile) from these three groups of waterbodies were above the ISQG. Copper concentration was never above the PEL guideline.

#### 7.4.4.4.3 Organic Compounds

Polycyclic aromatic hydrocarbons (PAHs) were measured in some samples from Meliadine Lake, and the smaller waterbodies on the Peninsula and near the proposed mine. Reported concentrations were either less than the detection limit or less than the ISQGs and PELs. Polycyclic aromatic hydrocarbons were analyzed in 3 samples from Control Lake. All results were reported as less than the detection limits.

Volatile organic compounds, such as BTEX, total volatile hydrocarbons, and total extractable hydrocarbons were measured in 6 samples from Meliadine Lake, 3 samples near the proposed mine (Lake B5), and 3 samples from Control Lake, all of which were collected in 1998. Most parameters were not detectable in the samples. Ethylbenzene and xylenes were not detectable in Meliadine Lake or in Control Lake, but were detectable in Lake B5 on the Peninsula.

Pesticides and herbicides were analyzed in 3 samples from Meliadine Lake from the 1998 survey; they were not measured in samples from any other waterbody. From the 3 samples collected in Meliadine Lake, DDD, DDE, and DDT were detected in one sample (ML-E). These substances are not naturally found in aquatic ecosystems and may enter the system through atmospheric deposition or soil erosion (CCREM 1987). No other organochlorine substances were detected.

#### 7.4.4.4.4 Sedimentation Rates and Dispersion

Baseline information on sedimentation deposition and dispersion is based on observations made during field programs. Flows of the streams, and annual variability in lake and stream elevations, are covered in Section 7.3 (Hydrology). On the basis of observed conditions of the start and end of the open water season, waterbodies in the LSA typically discharge until the end of October, and the Meliadine River sometimes discharges through the winter.

There is evidence of sediment transport in Meliadine River, as observations by field crews noted that the river was turbid during some field surveys (e.g., June 2008; SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.2). Substrate in most of the surveyed streams was dominated by organic materials, primarily grass, but substrate in the surveyed streams in Basins A, B, and D was dominated by cobble (Table 7.4-14). Coarse materials, including cobble, boulder, and gravel, were also common, and fine materials (e.g., silt and sand) were present in

small amounts. In Basin B, substrate composition ranged among streams, more so than that observed in the other basins. The streams in F, G, and J basins were dominated by organics with some cobbles. The streams in H basin contained seasonal flows, and many streams were poorly defined.

**Table 7.4-14: Summary of Habitat Characteristics in Streams in the Mine Local Study Area**

| Basin | Number of Surveys | Number of Streams Surveyed | Substrate[a] (% of total area) | | | | | Instream Cover[b] (% of total area) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | OM | Fi | Gr | Co | Bo | UC | BG | AV | OV | D/T | Total |
| A | 21 | 8 | 8 | 4 | 14 | 57 | 18 | 1 | 32 | 20 | 1 | 0 | 55 |
| B | 33 | 16 | 26 | 5 | 15 | 35 | 19 | 5 | 26 | 17 | 0 | 0 | 48 |
| D | 15 | 7 | 28 | 3 | 23 | 35 | 12 | 3 | 23 | 23 | 0 | 0 | 49 |
| E | 1 | 1 | 95 | 0 | 0 | 3 | 2 | 0 | 2 | 20 | 0 | 0 | 22 |
| F | 2 | 2 | 53 | 8 | 15 | 19 | 6 | 21 | 4 | 8 | 0 | 0 | 33 |
| G | 2 | 2 | 66 | 8 | 16 | 9 | 1 | 7 | 2 | 11 | 0 | 0 | 20 |
| H | 6 | 6 | 47 | 15 | 19 | 14 | 5 | 7 | 2 | 23 | 0 | 0 | 32 |
| J | 1 | 1 | 81 | 16 | 1 | 1 | 1 | 0 | 0 | 78 | 0 | 0 | 78 |

[a] OM=organic material; Fi=fines (silt & sand, <2 mm diameter); Gr=gravel (2 - 64 mm diameter); Co=cobble (65 - 256 mm diameter); Bo=boulder (>256 mm diameter)

[b] UC=undercut banks; BG=boulder gardens; AV=aquatic vegetation; OV=overhanging vegetation; D/T=depth and/or turbulence

Based on observations during field programs, water during freshet (Figure 7.4-8) and early summer (Figure 7.4-9) is clear, and there is no evidence of sediment transport or scouring. In general, the sediment concentrations in the smaller stream systems are low, and when sediment is moved by watercourses, it ends up in the deeper portion of waterbodies. Erosion resistance of channel banks is also likely enhanced by frozen conditions during spring snowmelt peak discharge (see Section 7.3.1.2.2). Data were collected in 2012 to describe baseline shoreline erosion and will be provided as part of the FEIS (report was in progress at the time of preparing this document).

The substrate types in Peninsula waterbodies generally were related to depth (Table 7.4-15). The shallow areas of these waterbodies (i.e., <2 m deep) were mainly covered by coarse substrates (mean 57% of area), followed by mixed (22%), and fine (21%) substrates. In contrast, the deeper portions of the waterbodies (i.e., 2 to 4 m deep) were dominated by fines (76%), followed by mixed (18%) and coarse (6%) substrates. In Peninsula waterbodies with areas greater than 4 m deep, the substrates were typically composed of fines; coarse substrates were not recorded.

More details on characteristics of stream or waterbody substrate composition and aquatic habitat are provided in Sections 7.5.4.1 and 7.5.4.2.

**Table 7.4-15: Morphometric Characteristics and Habitat Composition of Surveyed Waterbodies in the Peninsula Basins in the Mine Local Study Area**

| Basin | Lake | Bathymetry Survey Completed | Area (ha) | Volume ($m^3 \times 10^3$) | Depth (m) | | Habitat Composition[a] (% area) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Mean | Max | Hab 1 | Hab 2 | Hab 3 | Hab 4 | Hab 5 | Hab 6 | Hab 7 | Hab 8 | Hab 9 |
| A | A1 | ✓ | 16.39 | 194.1 | 1.2 | 2.5 | 16 | 12 | 58 | 12 | 1 | 1 | | | |
| | A6 | ✓ | 55.28 | 834.6 | 1.5 | 4.7 | 6 | 16 | 67 | 6 | 4 | | | | |
| | A8 | ✓ | 90.54 | 1414.8 | 1.6 | 4.2 | 5 | 8 | 55 | 14 | 10 | 7 | 1 | 1 | |
| | A46 | ✓ | 19.75 | 220.5 | 1.1 | 2.9 | 10 | 18 | 65 | 5 | 1 | 1 | | | |
| B | B2 | ✓ | 49.41 | 771.4 | 1.6 | 3.4 | | | | | | | | | |
| | B4 | ✓ | 85.82 | 759.9 | 0.9 | 2.4 | 25 | 13 | 59 | 3 | | | | | |
| | B5 | ✓ | 56.74 | 869.1 | 1.5 | 3.4 | 5 | 13 | 50 | 23 | 9 | | | | |
| | B6 | ✓ | 11.80 | 166.1 | 1.4 | 4.0 | 1 | 11 | 61 | 25 | 2 | | | | |
| | B7 | ✓ | 57.88 | 855.9 | 1.5 | 5.1 | 2 | 10 | 62 | 16 | 8 | 1 | 2 | | |
| | B34 | | 4.37 | - | - | 2.1 | 13 | 15 | 70 | 2 | | | | | |
| | B45 | ✓ | 47.37 | 591.9 | 1.2 | 2.3 | 64 | 15 | 19 | 2 | | | | | |
| | B46 | ✓ | 44.72 | 329.7 | 0.7 | 2.0 | 13 | 57 | 30 | | | | | | |
| | B52 | ✓ | 33.42 | 329.9 | 1.0 | 3.3 | 19 | 30 | 45 | 5 | 1 | | | | |
| | B53 | ✓ | 15.70 | 195.8 | 1.2 | 2.9 | 15 | 30 | 55 | | | | | | |
| | B59 | ✓ | 4.89 | 61.3 | 1.3 | 3.9 | 55 | 11 | 18 | 14 | 1 | 1 | | | |
| | B69 | ✓ | 25.03 | 406.6 | 1.6 | 5.4 | 12 | 22 | 32 | 25 | 5 | 3 | 1 | | |
| C | C10 | ✓ | 13.89 | 145.7 | 1.0 | 2.9 | 10 | 15 | 60 | 10 | 5 | | | | |
| D | D1 | ✓ | 17.77 | 217.5 | 1.2 | 2.5 | | | | | | | | | |
| | D3 | ✓ | 15.85 | 245.7 | 1.6 | 2.8 | 15 | 23 | 27 | 28 | 5 | 2 | | | |
| | D5 | ✓ | 7.31 | 81.9 | 1.1 | 2.6 | 16 | 9 | 69 | 3 | 2 | 1 | | | |
| | D7 | ✓ | 73.51 | 1163.3 | 1.6 | 2.8 | | | | | | | | | |
| | D8 | ✓ | 18.98 | 233.7 | 1.2 | 2.5 | 31 | 23 | 38 | 6 | 1 | 1 | | | |
| | D23 | ✓ | 14.04 | 225.1 | 1.6 | 3.7 | 3 | 10 | 51 | 32 | 3 | 1 | | | |
| E | E3 | ✓ | 56.82 | 880.9 | 1.6 | 4.7 | 15 | 23 | 30 | 25 | 4 | 2 | 1 | | |
| | E4 | ✓ | 8.52 | 90.0 | 1.1 | 3.7 | 10 | 16 | 60 | 10 | 3 | 2 | | | |
| | E5 | ✓ | 1.30 | 11.9 | 0.9 | 3.0 | 9 | 21 | 57 | 13 | | | | | |
| G | G2 | | 12.41 | - | - | 2.5 | | | | | | | | | |
| J | J1 | ✓ | 17.16 | 277.5 | 1.6 | 2.3 | 70 | 15 | 15 | | | | | | |

[a] Hab1=<2 m; fine substrate, Hab2=<2 m; mixed substrate, Hab3=<2 m depth; coarse substrate, Hab4=2-4 m deep; fine substrate, Hab5=2-4 m depth; mixed substrate, Hab6=2-4 m; coarse substrate, Hab7=>4 m depth; fine substrate, Hab8=>4 m; mixed substrate, Hab9=>4 m depth; coarse substrate.



*Figure 7.4-8: Outlet of Lake P2 (14 June 2012)*



*Figure 7.4-9: Outlet of Lake H17 (9 July 2012)*

### *7.4.4.5 Water Uses by Local Communities*

#### 7.4.4.5.1 Drinking Water Sources

The main drinking water source for the local community has been identified as Nipisar Lake near Rankin Inlet. Through public consultation and the Traditional Use Study (FEIS Volume 9, Section 9.3), Meliadine Lake has been identified as an important drinking water source and source of water for making tea by local residents. In addition, it is assumed that any lake or stream in the LSA could function as a drinking water source. All baseline water quality data have been compared to aquatic life guidelines and drinking water guidelines (i.e., human health guidelines) (Table 7.4-7). IQ

Parameters with concentrations above guidelines for treated drinking water include chloride, arsenic, cadmium, iron, lead, and manganese. These were observed in the Peninsula waterbodies (A6, A8, A15, A56, B5, B7, D1, D7, E3, and E4) and not in Meliadine Lake, waterbodies of the region, streams, or rivers (Appendix 7.4-B, Tables 7.4-B1 and 7.4-B2).

#### 7.4.4.5.2 Local Use for Harvesting

Based on information in the Nunavut Atlas, the Meliadine (East) road is in a larger area of high intensity use, including fishing. Camps and archaeological sites were noted as being nearby (Riewe 1992 as referenced in FEIS Volume 9, Section 9.3).

Domestic fishing is still an important part of the Inuit way of life, accounting for as much as 20% of the diet of the residents of Rankin Inlet and Chesterfield Inlet. Most of the waterbodies in the general Meliadine area, including Meliadine Lake, are fished for lake trout and Arctic char, and cabins in the study area are used as a base during fishing and hunting trips (FEIS Volume 9, Section 9.3). It is noted that the local communities identified fish resources in Meliadine Lake are important to them, but removal of fish and drainage of smaller waterbodies are of little concern (FEIS Volume 9, Section 9.3).

In addition to local communities expressing the importance to them of Meliadine Lake and fish resources within the lake, they also raised concern over discharge of contaminated water into Meliadine Lake and the effect of this on fish populations (FEIS Volume 9, Section 9.3).

### 7.4.5 Pathway Analysis

The purpose of the pathway analysis is to identify project activities that may affect the VECs. This section covers water and sediment quality, as the quality of one is linked to the quality of the other.

#### *7.4.5.1 Methods*

Pathway analysis identifies and assesses the linkages between Project components or activities, and the corresponding potential residual effects to water and sediment quality. The first part of the analysis is to produce a list of all potential effects pathways for the Project (FEIS Volume 4, Section 4.3). Each pathway is initially considered to have a linkage to potential effects on water and sediment quality. This step is followed by the development of environmental design features and mitigation that can be incorporated into the development description to remove a pathway or limit (mitigate) the effects to water and sediment quality. Environmental design features include Project design elements, environmental best practices, management policies and procedures, and social programs. Environmental design features are developed through an iterative process between the Project's engineering and environmental teams to avoid or mitigate effects.

Pathway analysis is a screening step that is used to determine the existence and magnitude of linkages from the initial list of potential effects pathways for the Project. This screening step is intended to focus the effects analysis on pathways that require a more comprehensive assessment of effects on water and sediment quality. Pathways are determined to be primary, minor, or as having no linkage using scientific and traditional knowledge, logic, and experience with similar developments and environmental design features. Each potential pathway is assessed and described as follows:

no linkage – pathway is removed by environmental design features and mitigation so that the Project results in no detectable environmental change and residual effects to water and sediment quality relative to baseline or guideline values;

- minor – pathway could result in a minor environmental change, but would have a negligible residual effect on water and sediment quality relative to baseline or guideline values; or

- primary – pathway is likely to result in a measurable environmental change that could contribute to residual effects on water and sediment quality relative to baseline or guideline values.

Pathways determined to have no linkage to water and sediment quality, or those that are considered minor, are not predicted to result in environmentally significant effects on water and sediment quality. The no linkage and minor pathways are summarized in Sections 7.4.5.2 and 7.4.5.3, respectively. These pathways are not carried through the effects assessment. Primary pathways require further effects analysis to determine the environmental significance from the Project on water and sediment quality. Analysis of primary pathways is summarized in Section 7.4.6.

Potential pathways through which the Project could affect water and sediment quality are presented in Table 7.4-16. Environmental design features and mitigation incorporated into the design of the Project to remove a pathway or limit the effects to water and sediment quality are included in Table 7.4-16 for each no linkage, minor and primary pathway. Inuit concerns were taken into consideration while developing pathways, including concerns related to lower water levels and the quality of water for drinking. The pathway is then determined to be primary, minor, or as having no linkage. The following section discusses the potential pathways relevant to water and sediment quality. IQ

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| AWAR (main access road), haul roads, and<br><br>Rankin Inlet Infrastructure | Road footprint during construction, Operations, and Closure | Project footprint, which will physically alter drainage patterns, may change downstream flows, water levels, and channel/bank stability in streams, and affect water and sediment quality. | Access roads will be as narrow as possible, while maintaining safe construction and operation practices. Minimum haul road widths will follow that defined under the Mine Health and Safety Act.<br><br>Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks), where needed.<br><br>Minimum setback distance of 31 m from the ordinary high water mark of waterbodies.<br><br>Regular road inspections to check for ponding.<br><br>Removal of snow at the culvert inlet prior to freshet.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches and diversion berms.<br><br>A site water management plan has been developed and describes designs to reduce changes to local flows, drainage | Minor<br><br>Sections 7.4.5.3.3. 7.4.5.3.8, 7.4.6.2 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | | patterns, and drainage areas. | |
| Mine, AWAR, Rankin Inlet | Mine and Supporting Infrastructure during construction, operations, and closure. | Sediment releases from infrastructure and road construction, including watercourse crossings, can affect quality of nearby surface waters and sediments. | Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks), where needed.<br><br>Instream construction work will be avoided, or limited to the minimum extent possible.<br><br>In-stream works will be constructed in winter, when possible, to avoid increased TSS and turbidity, and changes to water and sediment quality.<br><br>Where applicable, construction runoff will be captured and managed to minimize suspended solids.<br>Proposed roads will be as narrow as possible, while maintaining safe construction and operating practices. | Minor<br><br>Sections 7.4.5.3.3. 7.4.5.3.8, 7.4.6.2 |
| AWAR and Rankin Inlet bypass road | During construction and operations, air emissions from vehicles | Air emission of sulphur dioxide, nitrogen oxides and particulates may change water and sediment quality. | Construction equipment and transport trucks will be equipped with industry-standard emission control systems.<br><br>Compliance with regulatory emission requirements will be met. | Minor<br><br>Section 7.4.6.2.1 |
| Mine and Rankin Inlet | Construction and operation of camps | The construction and operation of camps may cause erosion and release of substances to surface water and could affect water and sediment quality | Best management practices for erosion and sedimentation control; and storage and use of chemicals will be implemented.<br><br>Ditches will be constructed to route any runoff water to the attenuation pond.<br><br>Sewage will be directed to the tailings storage facility and will not be released to surface water. | Minor<br><br>Section 7.4.5.3.1 |
| Mine | Mine and Supporting Infrastructure during construction and operations. | Process and potable water use resulting in reduced water levels can affect water quality in Meliadine Lake. | Manage pumping rates so total annual discharge from Meliadine Lake does not drop below the 10-year dry condition.<br><br>Water withdrawal rate(s) will be controlled to avoid effects on the source water lake(s).<br><br>Capture and reuse site water to reduce fresh water requirements. | Minor<br><br>Section 7.4.5.3.6 |
| Mine and Rankin Inlet | Mine and Supporting Infrastructure during | Spills and leaks during equipment operation can affect water and | Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers (i.e., Materials and Waste | Minor<br><br>Section 7.4.5.3.2 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | construction and operations | sediment quality of nearby surface waters. | Management Plan).<br><br>Storage tanks (e.g., fuel, engine oil, hydraulic oil, and waste oil and coolant) will be double walled, or located in lined and bermed containment areas.<br><br>Hazardous wastes will be stored on site in appropriate containers to prevent exposure until they are shipped off site to an approved facility.<br><br>Individuals working on site and handling hazardous materials will be trained in the Transportation of Dangerous Goods.<br><br>Soils from petroleum spill areas will be deposited and spread in a lined biopile for remediation.<br><br>A Spill Response Plan has been developed.<br><br>Emergency spill kits will be available wherever toxic materials or fuel are stored and transferred. | |
| Mine | Site Water Management: Seepage and Runoff during operations and closure | Runoff and leaching from the waste rock storage facilities and mine footprint may change surface water and sediment quality (i.e., metal concentrations). | A site Water Management Plan has been developed and describes the containment and management of contact water on-site.<br><br>Runoff and seepage from the Project site will be diverted to sumps and attenuation ponds (and treated if required) prior to release into Meliadine Lake.<br><br>Water quality in attenuation ponds will be monitored and managed such that the discharge entering Meliadine Lake meets discharge limits.<br><br>Potential acid generating rock and metal leaching waste rock will be segregated at source and placed into designated areas within waste rock locations. | Minor<br><br>Section 7.4.5.3.7 |
| Mine | Site Water Management: Seepage and Runoff during operations and closure | Vertical and lateral seepage from the tailings storage facility may enter nearby waterbodies and change water and sediment quality (i.e., metal | A site Water Management Plan has been developed and describes the containment and management of contact water on-site.<br><br>Seepage will be captured at sumps and diverted back to the tailings storage facility.<br><br>All ponds collecting seepage will be | Minor<br><br>Section 7.4.5.3.7 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | concentrations). | designed to prevent release into the surrounding aquatic environment.<br><br>Tailings facility discharge water will be monitored for water quality, and treated as required, prior to discharge. | |
| Mine | Site Water Management: Seepage and Runoff during operations and closure. | Seepage of pore water though, or underneath, incompletely frozen dikes to adjacent watersheds may change water and sediment quality in local watersheds. | A site Water Management Plan has been developed and describes containment and management of contact water on-site. The dikes will be designed and constructed to control seepage.<br><br>Performance of the dikes will be monitored and appropriate remediation applied if required. | Minor<br><br>Section 7.4.5.3.7 |
| Mine | Pit development and operations | Release of pit water inflows to local watersheds may affect water and sediment quality in local watersheds. | Groundwater inflow to the pits or other dewatered areas will not be directly released to local watersheds.<br><br>All pit water will be pumped to the TSF, re-used in process. Excess TSF water will be treated, if necessary, prior to release. | Minor<br><br>Section 7.4.6.1 |
| Mine | Pit development and operations | Removal of bedrock and ore material during the active mining of pits may change groundwater quantity in local watersheds, and the water level in small waterbodies in local watersheds. | Mined-out pit flooding will be augmented by fresh water diversion. | Minor<br><br>Section 7.4.6.1 |
| Mine | Pit development and operations | Removal of bedrock and ore material may change or alter existing faults and change contaminant transport processes in subsurface and surface water quality | Groundwater model results suggest a travel time of 500 to 1 000 years for water to move, via groundwater pathways, from the tailings storage facility to Meliadine Lake. A talik will have to develop beneath the tailings storage facility before water can flow along this pathway. | No Linkage<br><br>Section 7.4.5.2.1 |
| Mine | Pit Development | Removal of saline groundwater inflows during pit development to local watersheds | Water inflow to the dewatered areas will not be directly released to local watersheds; water will be treated and then diverted to a water management pond prior to release into Meliadine Lake | Minor<br><br>Section 7.4.6.1 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | may affect water and sediment quality in local watersheds | | |
| Mine, AWAR, and Rankin Inlet bypass road | Construction and operation of roads | Cross-drainage structures for the mine site roads, AWAR, and Rankin Inlet bypass Road may alter stream hydraulics and geomorphology, and alter water and sediment quality | Cross-drainage structures will be designed and constructed such that structures will not create a hydraulic barrier to fish passage and will convey peak flows corresponding to 1:25 year 24-hour rainfall event.<br><br>Minimum setback distance of 31 m from the ordinary high water mark of waterbodies.<br><br>Regular road inspections to check for ponding.<br><br>Removal of snow at the culvert inlet prior to freshet. | Minor<br><br>Sections 7.4.5.3.3 and 7.4.5.3.5 |
| Mine, AWAR, and Rankin Inlet bypass road | Construction and operation of roads | Freezing and plugging of culverts in the winter may result in over-topping and erosion of road surface releasing silt into watercourses during freshet and affect water and sediment quality | Use of staggered culvert configuration to promote drainage during spring thaw and freshet.<br><br>Regular inspection of the road to identify any areas where ponding of water along the road represents a risk, and installing additional culverts or French drains to alleviate the risk. | Minor<br><br>Sections 7.4.5.3.3 and 7.4.5.3.5 |
| Mine, AWAR, and Rankin Inlet bypass road | Construction and operation of roads | Release of potential acid generating materials from road building materials at the watercourse crossings can alter water and sediment quality | Use of non-acid generating material at all watercourse crossings. Testing will continue on new sources identified for road building.<br><br>Rock quarry activity will be at least 31 m from the high water mark of any waterbody. | Minor<br><br>Section 7.4.5.3.4 |
| Mine, AWAR, and Rankin Inlet bypass road | Construction and operation of roads | Surface water drainage through quarries and transport of blasting residuals and metals directly into watercourses can affect surface water and sediment quality | Where possible, stockpiling of rock and fill from quarries and borrow sites will be placed such that surface water is not diverted through the piles with runoff to surface waterbodies; drainage from quarries will not flow directly into any waterbodies or watercourses.<br><br>When there is seepage from a quarry that could enter a waterbody, a water quality | Minor<br><br>Section 7.4.5.3.5 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | | sample will be collected and analyzed.<br><br>Quarries will be excavated and sloped for positive drainage.<br><br>Quarries will be inspected on a regular basis to monitor water ponding, particularly at spring melt.<br>Excavations will be at least 31 m away from any watercourses.<br><br>Best management practices for erosion and sediment control. | |
| Mine | Ongoing Exploration | Ongoing exploration, and uptake and release of water, can affect surface water and sediment quality | Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks, timing and location of releases), where needed.<br><br>Best management practices for storage and treatment, if necessary, of any release water.<br><br>Testing, as required by operational licence, before release of water.<br><br>Best management practices for withdrawal rates, withdrawal volumes, and timing of withdrawals.<br><br>Reuse of water, where applicable, to reduce water usage.<br><br>More information provided in the Project Description (Section 2.6.10) | Minor<br><br>Section 7.4.5.3.9 |
| Mine, AWAR, and Rankin Inlet | Decommissioning (e.g., roads, buildings, infrastructure, underground workings) during closure | Removal of project infrastructure (e.g., roads, dikes, etc.) may change flows and cause of release sediment and contaminants and can affect water and sediment quality. | A preliminary Closure and Reclamation Plan has been developed and describes measures for permanent closure.<br><br>Best management practices for erosion and sedimentation control such as installation of rip-rap, if applicable, to prevent erosion after removal of the culverts.<br><br>Instream work will be limited to the minimum extent possible.<br><br>Instream work will follow DFO operational guidance and timing windows.<br><br>All bridges and culverts will be removed | Minor<br><br>Section 7.4.5.3.3 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | | and original drainage patterns restored. Stream crossings will be rehabilitated.<br><br>Dikes will be removed to a minimum depth of 1 m below average lake water level or back to original; removal of dikes will be timed to minimize release of sediments.<br><br>In the underground workings, seal all drill holes and openings connected to the surface.<br><br>Remove unused explosives and other chemicals from the mine site.<br><br>Roads will be scarified, allowing native plants to re-establish, and slopes will be stabilized against erosion. | |
| Mine | Decommissioning of tailings and waste rock storage facilities during closure | Activities required for covering and reclaiming the tailings and waste rock storage facilities may cause release of contaminants and can affect water and sediment quality. | A preliminary Closure and Reclamation Plan has been developed and describes measures for permanent closure.<br><br>The waste rock storage facilities have been designed for long-term stability.<br><br>A cover of non-potentially acid generating and non-metal leaching rockfill cover will be placed on the surface of the tailings to a thickness that will allow the tailings to remain frozen.<br><br>The pond in the tailings area will be drained and filled with waste rock to promote surface drainage to Tiriganiaq Pit.<br><br>The surface of the tailings and waste rock storage facilities will be graded to blend into the existing topography and to shed water from the surface. | Minor<br><br>Section 7.4.5.3.7 |
| Mine | Remediation of attenuation pond AP-01 during closure | Reconnection of attenuation pond (or Lake H17) to Meliadine lake can affect water and sediment quality. | A preliminary Closure and Reclamation Plan has been developed and describes measures for permanent closure.<br><br>Sediments will be analyzed, and if concentrations are higher than baseline or guidelines, sediments will be managed according to best practices. | Minor<br><br>Section 7.4.5.3.7 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| **Effects Statement: Changes in water and sediment quality due to water emissions** | | | | |
| Mine | Mining activities and water management during construction, operations, and closure. | Release of mine wastewater (including sewage) may cause changes to surface water quality and sediment quality (i.e., nutrient and metal concentrations). | Treated sewage will be piped to the tailings storage facility.<br><br>Mine wastewater will be treated and tested before release to Meliadine Lake. If water quality does not meet discharge limits, it will be circulated and re-treated.<br><br>Water quality will meet CCME aquatic life objectives, site-specific water quality objectives, or water licence limits at the edge of the mixing zone in Meliadine Lake.<br><br>Underground water will be collected, contained, monitored, re-used in the underground, or collected, contained, monitored, or treated, if required, to meet discharge limits for release to Meliadine Lake.<br><br>A site Water Management Plan has been developed and describes containment of contact water through the use of diversions, attenuation ponds, and treatment facilities during construction, operations, and closure.<br><br>Other applicable design features and mitigation, as identified in the project closure plan. | Primary<br><br>Section 7.4.6.1 |
| **Effects Statement: Changes in water and sediment quality due to physical alterations of the watersheds and air emissions** | | | | |
| Mine | Mine infrastructure footprint (e.g., open pits, dikes, mine pits, waste rock, mine plant, site roads, camps) during construction, operations, closure and post-closure | Project footprint, which will physically alter watershed areas and drainage patterns, rates and quantities of diverted non-contact water to new watersheds, may change downstream flows, water levels, channel/bank stability in streams and may affect water and sediment quality. | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Access roads will be as narrow as possible, while maintaining safe construction and operation practices. Minimum haul road widths will follow that defined under the Mine Health and Safety Act.<br><br>Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks, sloping of banks), where needed. | Primary<br><br>Section 7.4.6.2 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | | Minimum setback distance of 31 m from the ordinary high water mark of waterbodies.<br><br>Regular road inspections to check for ponding.<br><br>Removal of snow at the culvert inlet prior to freshet.<br><br>To reduce the potential for erosion in channels due to higher than normal water flows and levels, natural drainage courses will be surveyed to evaluate capacity and then modified if required.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches and diversion berms.<br><br>A site water management plan has been developed and describes designs to reduce changes to local flows, drainage patterns, and drainage areas.<br><br>Monitoring during activities and use of adaptive management where necessary. | |
| Mine | Site Water Management: Dewatering of Project Footprint Waterbodies to Downstream Receiving Waterbodies (e.g., to Lake A7, A1, B6, B34, Meliadine Lake) during construction and operations. | Dewatering of waterbodies may change flows, water levels, channel/bank stability, and water quality (e.g., suspended sediments, nutrients, metals) in receiving and downstream waterbodies. | During dewatering activities, TSS will be monitored, and if necessary, treated before release downstream.<br><br>Pumped water from the dewatered waterbodies will be directed through properly designed structures to the lake environment, and not to lake outlets, to prevent erosion in the receiving waterbodies and to attenuate flows.<br><br>Shoreline areas susceptible to extensive erosion will be addressed by appropriate erosion protection measures to reduce erosion and associated re-suspension of fine sediment.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms. | Primary<br><br>Section 7.4.6.2 |
| Mine, AWAR, Rankin Inlet | Mine and Supporting Infrastructure during construction and operations | Fugitive dust sources and deposition of dust (including from blasting during mining) can | Best management practices to control fugitive particulate emissions from haul roads and material handling<br><br>Use of water or dust suppressants to manage dust. Use of chemical | Primary<br><br>Section 7.4.6.2 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | change water and sediment quality. | suppressants will be in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of the Environment.<br><br>Enforcing speed limits to suppress dust production.<br><br>Design roads as narrow as possible while maintaining safe construction and operation practices.<br><br>Crossings will be perpendicular to watercourse.<br><br>The running surface of the road will be maintained thereby reducing the generation of dust.<br><br>Enclosures and covers will be used in major ore handling areas and most crushing areas.<br><br>For uncovered crushing areas, water or dust suppression will be used.<br><br>Dust control systems will be used to limit dust emissions, for example, processing equipment with high efficiency bag houses will be used.<br><br>Most personnel arriving at or leaving the site will be transported by bus, thereby reducing the amount of traffic (and dust).<br><br>Operating procedures will be developed that reduce dust generation. For example, tailings deposition will be designed to limit dust generation. | |
| Mine | Mine and Supporting Infrastructure during construction and operations | Air emission of sulphur dioxide, nitrogen oxides and particulates may change water and sediment quality. | Construction equipment and trucks will be equipped with industry-standard emission control systems.<br><br>Compliance with regulatory emission requirements will be met.<br><br>Processing equipment will use dust collectors to limit emissions of particulate matter.<br><br>Exhaust emissions from non-road vehicles will be managed through regular and | Primary<br><br>Section 7.4.6.2 |

**Table 7.4-16: Potential Pathways for Effects to Water and Sediment Quality (continued)**

| Location | Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for Further Discussion |
|---|---|---|---|---|
| | | | routine maintenance of vehicles.<br><br>$SO_2$ emissions from non-road vehicles and stationary equipment will be reduced through the use of diesel fuel with less than15 ppm of sulphur.<br><br>Operating procedures will be developed that reduce dust generation.<br><br>Generator efficiencies and equipment will be tuned for optimum fuel-energy efficiency. | |
| Mine | Pits (closure and post-closure) | Water quality in flooded pits may be higher than objectives and reconnection of drainages may affect downstream water and sediment quality. | A preliminary Closure and Reclamation Plan (SD 2-17) has been developed and describes measures for permanent closure.<br><br>The pits are designed to have stable slopes during mining and post-closure.<br><br>The pits will be progressively reclaimed as excavation is completed.<br><br>The pits will be flooded, with water from Meliadine Lake, over a 10 year period following completion of pit operations.<br><br>Water quality in the pits will be monitoring continuously during the flooding process.<br><br>All diversion dikes will be kept intact as a barrier between open pits and surrounding waterbodies until the pit water meets acceptable concentrations for release to the environment. Water will be treated if it is unacceptable for discharge. | Primary<br><br>Section 7.4.6.2 |

### *7.4.5.2 No Linkage Pathways*

A pathway may have no linkage if the pathway is removed by environmental design features and mitigation so that the Project results in no detectable environmental change and residual effects to water and sediment quality relative to baseline or guideline values. The pathway described in the following section is expected to have no linkage to water and sediment quality and will not be carried through the effects assessment.

#### 7.4.5.2.1 Removal of Ore and Bedrock May Change or Faults and Pathways to Surface Water

The underground mine at Tiriganiaq is the only mine workings that penetrate through the permafrost. Faults running through or near this mine have been found to have a similar hydraulic conductivity to that of the surrounding un-faulted bedrock. The faults have no effect on groundwater flow process. At closure the underground will be flooded. The numerical hydrogeological model predicts that the travel time from the underground mine to Meliadine Lake will be between 500 to 1000 years and the discharge rate would be about 3 $m^3$/day (Appendix 7.2-B). This groundwater discharge rate represents less than 0.002% of the average daily discharge from Meliadine Lake.

This pathway is considered to have no linkage to hydrogeology and thus it is expected to have no linkage to surface water.

### *7.4.5.3 Minor Pathways*

#### 7.4.5.3.1 Construction and Operation of Camps

- **The construction and operation of camps may cause erosion and release of substances to surface water and could affect water and sediment quality.**

This pathway does not include release of sewage or use of water, but includes activities related to the general construction and operation of the camps.

During the construction phase, the current exploration camp will first be used as temporary lodging for workers while the permanent camp is constructed. For construction of Rankin Inlet facilities (spud barge, tank farm, laydown area), employees will be accommodated in Rankin Inlet as much as possible. The permanent camp will be constructed as described in Section 2.6.11.2 of the Project Description (FEIS Volume 2). The main facilities are located about 2 km northeast of the Tiriganiaq open pit or about 1.2 km west of the current exploration camp. A minimum safety distance of 750 m from pits has been used for locating the permanent infrastructure in order to reduce the impact of vibration and fly rock caused by blasting. The camp area will have a water treatment plant for potable (domestic) water.

Best management practices will be used during the construction and operation of the camp for control and capture of runoff water, withdrawal of water from Meliadine Lake for potable water usage (see Section 7.4.5.3.2), and disposal of water. A perimeter ditch is planned around the main camp/infrastructure site. Captured water will be directed to AP-01 to settle, and will not be released unless it meets discharge criteria. Treated sewage from the camp will be diverted to the TSF and will not be directly discharged to Meliadine Lake. Through the use of best management practices to control for erosion, release of materials, and sedimentation, it was determined that this pathway would result in negligible residual effects on water and sediment quality.

#### 7.4.5.3.2 Spills (Construction, Operations, and Closure)

- **Spills on the mine site, mine site roads, bypass road, or along the AWAR can affect surface water and sediment quality.**
- **Spills and leaks during equipment operation can affect water and sediment quality of nearby surface waters.**

- **Improper handling and storage of landfill waste, runoff from biopiles, and storage and management of historical contamination (e.g., spills, releases, etc.) can affect water and sediment quality of nearby waterbodies.**

AEM has developed a conceptual spill contingency plan (SD 2-16) that is designed to minimize the likelihood of accidental spills, or if they do occur, to quickly respond and clean up any spills. AEM take all reasonable measures to prevent spills, and will not permit the deposit of chemicals, wastes, or fuels into any waterbody. In the event that a spill does occur, it will be dealt with promptly and completely, as noted by their track record. During construction, hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers. Refuelling stations in Rankin Inlet and at the mine site will be equipped with a lined area to contain any minor leaks or spills while refuelling. During operation, hazardous materials will be stored at the Meliadine site. Individuals working on the construction and operation of the Phase 2 AWAR and handling hazardous materials will be trained in the Transportation of Dangerous Goods. Emergency spill kits will be readily available.

Based on AEM's experience with the Meadowbank, accidental spills (e.g., fuel) have occurred, but most of the spill volumes have been small, and clean-up has occurred with only minor effects to the environment (AEM 2011a). Out of 78 spills at Meadowbank, 73 were within the mine site boundary and 5 were outside of the mine boundary. There were 10 spills greater than 1000 L at Meadowbank, one of which was outside the mine boundary. Contaminated material from the larger spill outside the mine boundary was completely recovered (AEM 2011a). All of the spills inside and outside the mine boundary were contained and cleaned-up (AEM 2011a). In NIRB's 2011 annual report (NIRB 2011), it was noted that Meadowbank was kept in an impressively clean state with no apparent spills on location.

The implementation of the spill contingency plan, and environmental design features, including proper equipment maintenance and driver training, are expected to reduce the frequency and severity of spills. However, it is acknowledged that accidental spills, including vehicular accidents, have the greatest potential to affect water and sediment quality if the spill occurs near a watercourse. Should a spill occur, contaminated areas will be collected and treated on-site, or shipped off-site for treatment and disposal, if it is not possible to treat on-site.

As a result of the mitigation and project design features that will be put into place to prevent spills and other sources of contaminants from entering surface waters, it was determined that this pathway would result in negligible residual effects on water and sediment quality

#### 7.4.5.3.3 All-weather Access Road Footprint (Construction, Operation, and Closure)

- **Sediment releases from road construction and land disturbance can affect surface water and sediment quality.**

- **Sediment releases from road surface disturbance during decommissioning can affect surface water and sediment quality (e.g., increased dust and suspended solids).**

Site contouring (including vegetation removal) and excavation (including cuts and fills) at or near stream crossings have the potential to increase soil erosion, suspended sediment concentrations, and deposition at and downstream of the zone of influence. Construction of the additional watercourse crossings along the new

sections of the Phase 2 AWAR (i.e., near Rankin Inlet, and from the proposed mine site to Discovery) will occur during winter when the streams are frozen or are not flowing. There will be no in-stream works except during frozen or non-flowing conditions. Any equipment used in the stream will be clean and inspected for leaks, and biodegradeable, low toxicity hydraulic fluids will be used. The road will be regularly inspected for potential areas of ponding; if continual ponding is observed, additional culverts can be installed. These procedures will minimize the potential for erosion, sediment releases, and introduction of contamination. All construction activities will be subject to a sediment control plan, and best management practices, that will include standard erosion and sediment control measures (e.g., erosion mats, silt curtains) that will be used, as needed, during construction to prevent sediment from entering watercourses.

The minimum setback distance of the road from the ordinary high water mark of waterbodies will be 31 m, to comply with Water Licence No. 2BW-MEL1215 Type 'B' for the Phase 1 of the All-Weather Access Road (Nunavut Water Board 2012).

Overall, drainage from the road is a small component of total drainage in the area, and any contribution from the road and effects on water and sediment quality should be negligible.

The use of staggered culvert configuration and regular inspection of the road during operation will alleviate the risk of freezing and plugging of culverts, which could result in ponding and overflow, which in turn could increase erosion and input of sediment into watercourses. Removal of snow at the culvert inlet and outlet prior to the freshet will promote drainage during spring thaw and freshet.

As provided in Volume 7 Section 7.3.2.4, cross-drainage structures will be implemented to provide sufficiently low flow velocity so the slowest local fish can navigate the structure under a particular design flow (i.e., 3-day delay; 1:10 year return flood condition). The structures will also provide a design conveyance for 1:25 year event without overtopping the roadway. This design will prevent channel aggradation, degradation, erosion, or changes to bankfull width or depth during periods of peak flows and elevated water velocities.

The 1:25 year rainfall event was selected as the design criterion because of the proposed use of the road for 10 to 15 years for the construction and operation of the proposed mine. Rainfall events exceeding the 1:25 year rainfall event may result in short-term surcharging of culvert head ponds and are not anticipated to represent a major environmental risk.

While, IQ suggests that there have been recent changes to water characteristics in the region, including lower water levels, thin ice conditions, later freeze-up, and earlier and more rapid melt of lakes, the cumulative effects from climate change and the Project on surface water quantity over the short duration of the Project (approximately 20 years of construction, operations and closure activities) are not expected to result in significant deviations from natural variability (see FEIS, Volume 7 Section 7.3.5.1). Therefore, the implementation of appropriate cross-drainage structures is expected to result in only minor changes to stream flow velocity in the vicinity of the structures relative to baseline conditions, and to have negligible residual effects to water quantity and water quality (e.g., fish and fish habitat).

Dust generated during construction and operation of the road can be deposited in watercourses and cause a change in water and sediment quality. These inputs could be detected as changes in total suspended solids and metals in water and sediment. Deposition of dust from road traffic into waterbodies and watercourses will be managed through best management practices, and any residual effects on surface water and sediment quality should be negligible.

Removal of culverts during road decommissioning can potentially lead to the release of sediments and associated contaminants into the watercourse.

Through the use of best management practices and monitoring during construction, operation, and decommissioning, effects to water and sediment quality are expected to be negligible; however, a water quality monitoring and reporting plan will be conducted to observe conditions. The present reclamation and closure plan for the Meliadine Exploration site includes the AWAR and will feature erosion and sedimentation protection during the decommissioning phase. Thus the residual effects on surface water and sediment quality are considered to be negligible.

#### 7.4.5.3.4 All-weather Access Road Material (Construction and Operation)

- **Release of potential acid generating materials from road building materials at the watercourse crossings can alter water and sediment quality.**

The AWAR design includes the use of rock and till materials, from identified quarry locations along the road, to be used for installation of culverts and bridges (AEM 2011b). For Phase 2 of the AWAR, and extension of the AWAR to the Discovery area, rock and till materials from identified quarry locations along the road will be used (SD 2-9 Roads Management Plan).

For the initial testing of the potential road building material, static methods were used to assess its chemical composition, its potential to generate acid rock draining (ARD), and its potential to leach metals to the receiving environment upon exposure to ambient conditions (Golder 2010d). The quarry locations identified for the AWAR show no potential to generate acid drainage. The low ARD potential is a result of the low sulphide content and high buffering capacity in the same material. Sulphide sulphur content ranges from <0.01 to 0.17% (in rock) and 0.07% (in till), and total sulphur ranges from <0.005 to 0.34% (in rock) and 0.09% (in till). Based on the low sulphide content, rock and till samples are classified as non-acid generating for the identified quarry locations along the AWAR (Table 7.4-17).

**Table 7.4-17: Summary of Rock and Till Acid Rock Drainage Potential**

| Proposed Location | | Material Type | Sample Count | Sample Count | | Median Paste pH Value | Average Sulphide (%) | Overall ARD Designation per Quarry/ Borrow Location |
|---|---|---|---|---|---|---|---|---|
| | | | | non PAG | PAG | | | |
| Rock Quarries | R2 | mafic volcanic | 3 | 3 | 0 | 9.4 | 0.06 | non PAG |
| | R5 | granite | 3 | 3 | 0 | 9.7 | <0.01 | non PAG |
| | R11 | granite | 5 | 5 | 0 | 9.8 | <0.07 | non PAG |
| | R14 | mafic volcanic | 5 | 4 | 1 | 9.4 | 0.07 | non PAG |
| | R19 | mafic volcanic | 3 | 3 | 0 | 9.0 | 0.01 | non PAG |
| Borrow Pit | B1A | glacial till | 3 | 3 | 0 | 7.4 | 0.01 | non PAG |
| | B5 | glacial till | 3 | 3 | 0 | 8.2 | <0.02 | non PAG |
| | B6A | glacial till | 3 | 3 | 0 | 8.2 | <0.01 | non PAG |
| | B10 | glacial till | 3 | 3 | 0 | 7.8 | <0.02 | non PAG |
| | B11A | glacial till | 3 | 3 | 0 | 7.6 | 0.02 | non PAG |
| | B13 | glacial till | 2 | 2 | 0 | 6.1 | 0.05 | non PAG |
| | B15 | glacial till | 3 | 3 | 0 | 8.1 | <0.03 | non PAG |
| | B19 | glacial till | 3 | 3 | 0 | 7.8 | <0.03 | non PAG |

ARD = acid rock drainage; PAG = potential to generate acid rock; quarries and borrow pit locations are included in Figure 7.1.4- LSA showing road and quarries.

Additional geochemical tests have been conducted on wasterock, tailings, and overburden with samples tested for ARD and metal leaching potential (SD 6-3 Geochemistry Baseline Report). Waste rock from the Tiriganiaq deposit could be used as construction material. All tested waste rock from Tiriganiaq is non PAG, does not require means to prevent ARD, and contact water is expected to meet MMER monthly criteria for chemical constituents.

Road and construction materials that are non PAG and non metal leaching should not cause a change in downstream water and sediment quality, and as such the residual effects on surface water and sediment quality are considered to be negligible.

#### 7.4.5.3.5 Drainage Along the All-weather Access Road (Operation)

- **Surface water drainage through quarries and transport of blasting residuals and metals directly into watercourses can affect surface water quality.**

The AWAR design includes the use of road building materials that are demonstrated to be non-acid generating through appropriate testing. Materials for road building will be extracted from identified quarry locations along the road. Although the intent is to contour the quarries to have positive drainage, there may still be some ponding of water in the quarries which may eventually drain to the environment. Drainage channels will be designed and constructed to prevent erosion and sedimentation. Water within the quarries will be in contact with rock material that may or may not have the potential to leach metals as well as blasting residuals (i.e., compounds high in nitrogen). Water release from the quarries may have a finite source of nitrogen, which would ultimately be exhausted but the potential for a long-term source of metals exists.

Using environmental design features and best practices, water from the quarries, which would be located at least 100 m from any waterbody, should not drain directly to waterbodies and thus there should be negligible effects to water quality; however, water quality at selected stream crossings will be monitored. Quarries will be inspected on a regular basis to identify any areas of water ponding, particularly during spring freshet.

However, if there is noticeable flow from a quarry that could enter a waterbody, a water quality sample will be collected. Samples will be analyzed for physical parameters, nutrients (i.e., phosphorus and nitrogen), and trace metals. Results will be reported in the annual NWB report.

- **Cross-drainage structures for roads may alter stream hydraulics and change fluvial processes and stability**

The installation of cross-drainage structures (e.g., culvert) to prevent roads from impeding water flow can result in a constriction of the stream channel, which could impact flow velocities, and affect fluvial processes and stability. Potential effects on velocities can be mitigated through the application of hydraulic design principles (Section 7.3.2.4). Cross-drainage structures will be implemented in such a way that they will provide sufficiently low flow velocity that the slowest local fish can navigate the structure under a particular design flow condition (i.e., 3-day delay; 1:10 year return flood condition). The structures will also provide a design conveyance for 1:25 year event without overtopping the roadway, which will result in minor changes in stream velocity. The implementation of appropriate cross-drainage structures is expected to result in minor changes to stream flow velocity in the vicinity of the structures relative to baseline conditions, and to have negligible residual effects on

water quantity. To protect water and sediment quality, best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management) will be used.

- **Cross-drainage structures for roads will alter stream geomorphology.**

Cross-drainage structures will be implemented in such a way that they will provide a design conveyance for 1:25 year event without overtopping the roadway, which will result in minor changes in stream velocity, and prevent channel aggradation, degradation, erosion, or changes to bankfull width or depth. The implementation of appropriate cross-drainage structures is expected to result in minor changes to stream flow velocity in the vicinity of the structures relative to baseline conditions and have negligible residual effects on geomorphology. To protect water and sediment quality, best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management) will be used.

#### 7.4.5.3.6 Process and Potable Water (Construction, Operation, and Closure)

- **Process and potable water use resulting in reduced water levels can affect water quality in Meliadine Lake.**
- **Pumping of water from Meliadine Lake to fill the pits at closure can affect water quality in Meliadine Lake.**

The source of process and potable water during pre-production through closure, and the source of water for pit flooding during closure, will be Meliadine Lake. Freshwater requirements for process and potable water during pre-production and operations are estimated at a maximum of 1.84 million $m^3$/y or an average of 5040 $m^3$/d (SD 2-6 Surface Water Management Plan). Included in the total annual requirement is the estimated annual water for potable water usage (49 640 $m^3$/y). For comparison, the annual discharge from Meliadine Lake based on mean daily outflow volumes is estimated at 84.7 million $m^3$/yr. Thus, total annual supply volumes for potable water and process make-up water are small (2%) in comparison to total Meliadine Lake outflow volume. The low water demand relative to available source water makes potential effects to water and sediment quality in Meliadine Lake as a minor pathway, with negligible residual effects expected on water and sediment quality. In addition, and where possible, process water will be reused to reduce the need for freshwater.

At closure, the source of water to fill the mine pits will be Meliadine Lake. The estimated total volume of water required for pit re-filling is 170.6 million $m^3$ (Table 7.4-18). For the purposes of the effects assessment, it has been assumed that pit refilling will occur over a 10-year period, with active pumping between June and September of each year. Based on the estimated volumes required for each pit, it is estimated that 17 060 000 $m^3$ of water will be pumped from Meliadine Lake each year. From the water balance results for Meliadine Lake, monthly mean flows from Meliadine Lake during closure and active pumping to refill the pits will decrease (Section 7.3.3.10). The 2-year flood discharge during closure will decrease by approximately 15% below the baseline value, and the 100-year flood discharge by 4%. The refilling of the pits will cause low flows to decrease by 24 to 35%. Meliadine Lake water levels are also expected to decrease during closure. The 2-year flood level is expected to decrease by approximately 0.030 m, the 100-year flood level by 0.011 m, while monthly mean stages are expected to decrease by 0.015 m (May), 0.029 m (June), 0.024 m (July), 0.030 m (August), 0.040 m (September), and 0.035 m (October), under median conditions.

Reduction in lake volume and lake level may cause more shoreline to be exposed to wave action, and thus the suspension of particles in the water. This could lead to a minor change in water quality due to concentration of constituents; however, due to the small change in volume and water levels, changes to water quality would likely be small. Once active flooding of the pits is completed, annual water balance of Meliadine Lake would return to normal.

Overall, changes to water quality during pre-production, operations, closure, and post-closure due to use of Meliadine Lake for process and potable water will be minor.

**Table 7.4-18: Volume of Water Required for Pit Re-filling**

| Pit | Volume ($m^3$) |
|---|---|
| Wesmeg (combined pits) | 31 300 000 |
| Pump (combined pits) | 21 500 000 |
| Tiriganiaq (combined pits) | 68 400 000 |
| F Zone (combined pits) | 13 700 000 |
| Discovery | 35 700 000 |
| **Total** | 170 600 000 |
| *Total per year* | *17 060 000* |
| Annual Meliadine Lake Discharge – baseline | 84 700 000 |
| Predicted Annual Meliadine Lake Discharge – during pit flooding | 67 640 000 |

### 7.4.5.3.7 Seepage and Runoff (Construction, Operations, and Closure)

- **Leaching of dissolved metals from waste rock in waste rock/overburden storage facilities may cause changes to groundwater and surface water and sediment quality.**
- **Vertical and lateral seepage from waste rock storage facilities and tailings containment facilities may cause changes to groundwater and surface water and sediment quality.**
- **Seepage of pore water though, or underneath, incompletely frozen dikes to adjacent watersheds may cause changes to water and sediment quality in local watersheds.**
- **Runoff and seepage from decommissioned waste rock storage facilities and tailings storage facility may cause changes to downstream surface water and sediment quality (i.e., metal concentrations).**

During the life of the Project, there is the potential for leachate, runoff, and seepage (e.g. metals) from the tailings storage facility, waste rock storage facilities, and dikes, to enter downstream waterbodies either directly or through groundwater to surface water connections. The mine rock storage facilities are all installed over continuous permafrost and/or waterbodies with no through taliks to the deep groundwater regime beneath the permafrost. Therefore no hydraulic connection exists between the mine rock storage facilities and the groundwater. Furthermore, geochemical testing indicates that waste rock is non-potentially acid generating and low-metal leaching. There is considered to be no linkage from the waste rock storage facilities to surface water through a groundwater pathway.

Given the risk posed by contact and non-contact water to water and sediment quality through surface water pathways, several environmental design features have been included to prevent release of untreated contact

and non-contact water into receiving waterbodies, including Meliadine Lake. A key environmental design feature during construction will be the use of separate waste management procedures for the potentially acid generating (PAG) and NAG material should any PAG waste rock be found in continuing studies. Most waste rock (98% of samples) is currently categorized as non-acid generating (NAG) type while the remaining is PAG type (FEIS Volume 2, Section 2.0; SD 2-8 Mine Waste Rock and Tailings Management Plan).

Waste rock that meets the requirements for building material will be crushed, screened, and used for the construction of tailings dikes, foundations, laydown pads, and roads. Use of the waste rock in construction will take into account that leachate draining from the waste rock may contain trace metals in concentrations that exceed CCME freshwater aquatic life guidelines. There is potential for arsenic as well as other parameters (i.e., chloride, fluoride, cadmium, lead, and selenium) to be present in the leachate. Modelling of waste rock storage facilities indicates that water leaching out of those facilities (B7 waste rock, B4 waste rock, F zone waste rock, and Discovery waste rock) will be at concentrations below Metal Mining Effluent Regulations (MMER) criteria, but will be above arsenic aquatic life guidelines at all waste rock storage facilities and above manganese aquatic life guidelines at B4 and F zone waste rock storage facilities (SD 2-6 Surface Water Management Plan; Table 7.4-19).

Separate waste management procedures are proposed for the PAG and NAG material should any PAG waste rock be found in continuing studies. All PAG and high metal leaching potential waste rock generated by open pit mining will be segregated at source and placed into designated areas within the waste rock dumps. They will then be encapsulated with NAG and low metal leaching potential waste rock so that the risk of contaminant release both during the operational and post closure phases of the mine is reduced and/or eliminated to prevent potential contamination of surrounding waterbodies, soils, and vegetation. It is predicted that permafrost conditions that are present under the waste rock storage facilities will aggrade into the waste rock storage facilities. The effects of climate change (a warming trend) will have a greater immediate impact on the active layer than on the actual thickness of permafrost, causing the active layer to deepen over time. This means that the thickness of NAG that may be required to encapsulate PAG material in permafrost will need to be enough to account for a deeper active layer in the future. During the period of annual thaw (which may be longer in the future), contact water will flow within the active layer through the waste rock, but not through the frozen waste rock below the active layer.

Runoff and lateral seepage from the waste rock/overburden facilities will not be released directly to the environment during pre-production or operations. During the pre-production and operation phases, all surface water runoff from the areas of the mine facilities or that has been in contact with any mine facilities or processes will be captured through a series of collection ditches and sumps. Contact water from open pits will be pumped to the TSF, whereas surface water from the remaining facilities will be pumped to Attenuation Pond 1. Water in the Tailing Storage Facility will be treated and discharged to Attenuation Pond 1. Furthermore, water from underground workings will be collected and treated, then directed to Attenuation Pond 1. Water collected at Attenuation Pond 1 will either be used in the mill to supplement fresh water from Meliadine Lake or be discharged as an effluent into Meliadine Lake through a diffuser outfall. Any discharge would meet MMER discharge criteria or water license discharge criteria, whichever is lower. The diffuser will be configured to promote mixing of the effluent in the lake ambient water.

Vertical seepage of tailings water to groundwater is possible for Lake B7 where there is a talik (SD 2-17 Mine Closure and Reclamation Plan includes Care and Maintenance). However, it is predicted that with the draining of Lake B7, permafrost will replace the talik over a 10 year period. Based on this scenario, groundwater modelling

indicates it would take thousands of years for the groundwater under the tailings storage facility to reach surface water through any of the waterbodies in the Project area. Further, during the life of mine operation, tailings supernatant water will be treated for parameters of potential concern prior to release to the attenuation pond. Treatment includes a process to remove TSS and associated particulate matter. At closure, the TSF will be dewatered and covered with waste rock. The TSF will be covered with 3 m of waste rock cover at closure; cover thickness will be re-visited in final design or during operation once blasted rock gradation is understood. The ditches and sumps and water treatment facilities will be maintained until it is confirmed that the runoff from the waste rock storage facilities and TSF meet requirements. It is expected that once the tailings area is dewatered and covered with waste rock, it will not be a source of contaminants (SD 2-6 Surface Water Management Plan). Runoff will also be monitored to ensure it meets the water quality standards before being discharged into the Tiriganiaq Pit. At some point during closure, it is predicted that treatment will no longer be required, and, therefore, all components of the water treatment facilities will be decommissioned.

Environmental design features and mitigations reduce the potential risk of contaminants entering surface water.

**Table 7.4-19: Estimated Waste Rock Water Seepage – Water Quality Summary**

| Parameter | Statistic | Arsenic (mg/L) | Manganese (mg/L) |
|---|---|---|---|
| CCME guideline[a] | | 0.005 | 0.05 |
| MMER Guideline[b] | | 0.5 | |
| B7 WR | Minimum | <0.0001 | <0.0001 |
| | Maximum | 0.0151 | 0.0094 |
| | Average | 0.0042 | 0.0027 |
| | Long-term (26+ years) summer average | 0.0071 | 0.0048 |
| B4 WR | Minimum | <0.0001 | <0.0001 |
| | Maximum | 0.0377 | 0.0421 |
| | Average | 0.0144 | 0.0176 |
| | Long-term (26+ years) summer average | 0.0064 | 0.0081 |
| F Zone WR | Minimum | <0.0001 | <0.0001 |
| | Maximum | 0.0103 | 0.0604 |
| | Average | 0.0055 | 0.0323 |
| | Long-term (26+ years) summer average | 0.0050 | 0.0290 |
| Discovery WR | Minimum | <0.0001 | <0.0001 |
| | Maximum | 0.0167 | 0.0019 |
| | Average | 0.0077 | 0.0008 |
| | Long-term (26+ years) summer average | 0.0098 | 0.0011 |

Note: Cells shaded in grey represent predicted concentrations above the CCME aquatic guidelines.

[a] CCME 2012a.

[b] MMER 2012.

- **Surface water runoff from the mine facilities area can affect surface water and sediment quality.**

Surface water runoff from areas of the mine facilities could potentially affect water and sediment quality of surrounding waterbodies. Several environmental design features have been included to prevent release of untreated site water into the receiving environment.

During the pre-production and operations phases, all surface water runoff from the areas of the mine facilities or that has been in contact with any mine facilities or processes will be captured through a series of collection ditches and sumps. Contact water from open pits will be pumped to the TSF, whereas surface water from the remaining facilities will be pumped to Attenuation Pond 1 (AP-01). Water in the TSF will be treated and discharged to AP-01; water from underground workings will be collected, treated, and then directed to AP-01. Water collected at AP-01 will either be used in the mill to supplement fresh water from Meliadine Lake or be discharged as an effluent into Meliadine Lake through a diffuser outfall. Any discharge would meet MMER discharge criteria or water license discharge criteria, whichever is lower. The diffuser will be configured to promote mixing of the effluent in the lake ambient water.

During the closure phase, contact water will be treated to MMER discharge limits and directed to AP-01. At some point during closure, treatment will no longer be required, and the water treatment facilities will be decommissioned.

During closure, the TSF will be dewatered and covered with a rockfill cover over a graded tailings surface. Runoff will be monitored to ensure it meets the water quality requirements before being discharged into the Tiriganiaq Pit. Dewatering of the open pits will cease at the end of operations and the open pits will be actively filled with water from Meliadine Lake over a period of 10 years. When flooded, outflows from the pits will naturally drain toward adjacent waterbodies and eventually reach Meliadine Lake. It is expected that the water quality in the flooded pits will meet the water quality guidelines for protection of aquatic life (Appendix 7.4-B; Section 7.4.6.2.2.1, Table 7.4-22). Contact water ditches and sumps associated with the waste rock storage facilities will be removed and a layer of NAG rock will be placed over any sediment in the sumps to prevent dusting and erosion.

#### 7.4.5.3.8 Dewatering of Waterbodies and Diversion of Water

- **The pumping and discharge of water to receiving waterbodies during dewatering of small waterbodies may cause erosion of shorelines and lake bottom sediment and could affect water and sediment quality.**

This pathway reviews the potential for physical erosion and not the alteration of flows and chemistry. The water management plan details the diversion, capture, and release of non-contact water during the pre-production, operations, and closure phases, with the objective to retain contact water on the mine site for treatment, and to release non-contact water through diversion channels or pumping to downstream waterbodies (SD 2-6 Surface Water Management Plan). This pathway reviews the release of non-contact water to downstream waterbodies and the potential for this activity to cause scouring, erosion, and changes in water levels.

The Project will result in residual effects to the hydrology and water quality of locations downstream of the footprint. During the dewatering of small waterbodies, as part of construction and operation phases, the active diversion of water by pumping and discharging water to receiving water bodies may cause erosion of shorelines and lake bottom sediment, and could affect water and sediment quality. Total suspended solids treatment units

can be put in place to reduce suspended solids to allow regulatory guidelines to be met, and to stay within the range of TSS in downstream waterbodies. The magnitude and direction of these effects depend on the type and timing of upstream Project activities and thus vary across sub-basins and over time. Erosion of shorelines and lake-bottom sediments combined with sedimentation of downstream location are most likely to occur in sub-basins where water quantities are projected to increase.

Water volumes, and thus discharge rates, are expected to increase in the Pre-production, mining, and post-closure phases in select watersheds (see Hydrology Section 7.3). In watershed A at Lake A1, water volumes are expected to increase in Pre-production. From mining through post-closure, water volumes are expected to be normal to less than normal. In watershed D, at waterbodies D7 through D1, water levels are expected to increase during all phases (i.e., Pre-production through post-closure). In watershed E, at waterbodies E3 through E1, water levels are expected to increase during operations and post-closure. In watershed J, water levels are expected to increase in Lake J1 in mining phase 1 and 2. In watershed B and P, water levels are expected to increase in waterbodies B45 to P2 from Pre-production through post-closure.

Diversion of relatively large volumes of water into a single discharge flow path could increase erosion causing an increase of particulate material transported to small waterbodies and to Meliadine Lake. Best management practices will be used to minimize the potential for erosion and sedimentation. In some cases, the preliminary design includes dewatering flows pumped through pipelines to the lake environment, and not directly to outlets, as a means to better attenuate flow changes. In other cases, water will be diverted to constructed channels designed to prevent erosion and to maintain stability in permafrost, and where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms. Release of water from dewatering activities will only occur while water quality discharge criteria are met. Water will be managed to prevent the release of water to the natural receiving environment if TSS concentrations exceed specific water quality criteria.

Raised lake and stream levels due to diversion of quantities of water in excess of the natural watershed could cause erosion of the new shoreline. As described in the hydrology section, water will be diverted from waterbody B45, through waterbody B44 and into the P watershed. The diversion of the B watershed into the P watershed will cause lake and stream levels to rise. New shorelines will be susceptible to erosion. The new shorelines will be armoured by cobbles and boulders, where necessary, to reduce erosion and associated re-suspension of fine sediment. Natural armouring of morainal soils, where present, is expected to limit erosion in these areas, and persistent TSS is expected to be limited, as coarse materials quickly settle out from the water column; fine sediments will settle out less quickly, but at this time the settling rate is not quantified. Low slopes in new shoreline areas are expected to minimize erosion and generation of TSS. Monitoring and adaptive management will be incorporated into planning for all receiving sub-basins.

It is expected that the diversion of water to receiving waterbodies may result in the erosion of shorelines and lake bottom sediments and affect water and sediment quality. However, effects to water and sediment quality, through potential scouring of channels and shorelines, will be negligible in magnitude, in part because potential changes will be limited by use of best management practices during construction and operation phases. The extent of effects, if any, will be localized, and over a short duration (1 to 2 years).

#### 7.4.5.3.9 Ongoing Exploration

Ongoing exploration to refine the understanding of the existing deposit and to search for new deposits will be conducted (FEIS Volume 2, Section 2.6.10). Best management practices will be followed when conducting activities near waterbodies (e.g., erosion and sedimentation control through use of ground cover, silt fences and curtains, and runoff management) and for release of water (e.g., testing for TSS). It is anticipated that applications will be made for separate land use permits to cover these future activities. In these applications, details on locations, schedule, activities, and mitigation will be provided. At this time, this activity is recognized as a minor pathway.

### 7.4.6 Primary Pathways

Analysis of effects are conducted on all primary pathways that will result in expected changes to water and sediment quality after implementing environmental design features and mitigation (as listed in Table 7.4-16). Thus, the analysis is based on the residual effects from the Project. Residual effects to water and sediment are analyzed using measurement endpoints and are expressed as effects statements. Effects statements may have more than one primary pathway that link a Project activity with a change in water and sediment quality. Effects statements for water and sediment quality, with associated project activities, include the following:

- **Changes in water and sediment quality due to water emissions (operations and closure)**
  - Release of mine wastewater and sewage may cause changes to surface water and sediment quality (i.e., nutrient and metal concentrations).
  - Sedimentation and infill from release of mine water.
- **Changes in water and sediment quality due to physical alterations of the watersheds and air emissions (construction, operations, closure)**
  - Project footprint, which will physically alter watershed areas and drainage patterns, may change downstream flows, water levels, and channel/bank stability in streams, and affect water and sediment quality.
  - Dewatering of waterbodies may change flows, water levels, and channel/bank stability in receiving and downstream waterbodies, and affect water and sediment quality.
  - Dewatering of waterbodies may change water quality (i.e., suspended sediments, major ions, metals, and nutrient concentrations) in receiving and downstream waterbodies, and affect water and sediment quality.
  - Fugitive dust sources and deposition of dust, including particulate matter and nitrogen compounds from blasting, may change water and sediment quality.
  - Air emission of sulphur dioxide, nitrogen oxides and particulates may change water and sediment quality.
  - Water quality in flooded pits may be higher than objectives and reconnection of drainages may affect downstream water and sediment quality.

The analyses of residual effects from the Project on water and sediment quality are quantitative, where possible, and included data from field studies, scientific literature, monitoring programs at existing mines, government publications, and personal communications. Traditional knowledge and community information were incorporated where available. Due to the amount and type of data available, some analyses of residual effects were qualitative and included professional judgement or experienced opinion. Analyses of each effects pathway are provided in Section 7.4.6.1 and Section 7.4.6.2.

### *7.4.6.1 Release of Mine Wastewater*

Release of treated mine wastewater and effluent may cause a change in surface water quality of Meliadine Lake.

The overall objectives of the water management strategy elaborated for the Project is to: reduce and/or optimize contact water, limit fresh water make-up, and divert non-contact water (FEIS Volume 2, Section 2.6.3.3). All contact water will be intercepted and diverted to the contact water attenuation pond (AP-01) during operations and closure (FEIS Volume 2 Section 2.6.3.3; SD 2-6 Surface Water Management Plan). The attenuation pond (AP-01) has a capacity of approximately 158,000 $m^3$; additional capacity is obtained by construction of AP-02 and WM-S-01. Water in AP-01 will be used to satisfy freshwater make-up requirements to the mill with any excess directed to the tailings storage facility (TSF) or to open pits, if available, for temporary storage prior to recycle, re-use, treatment (if necessary) and release to the environment. Upon completion of mine life, excess water will be directed to the pit lakes to assist with flooding.

Since water in the attenuation pond will have been directly affected by mine operations, water will be tested prior to release to the environment. A conceptual water quality monitoring plan is provided in SD 2-6 Surface Water Management Plan (Section 8). Two monitoring levels have been proposed: regulated monitoring and verification monitoring. The monitoring will be applied for water within the mine site and water that is released to the environment. Performance standards will be identified for each level of monitoring. Details and actions on steps to take if results do not pass performance standards will be developed during the water licencing phase of the Project.

This section provides a review of methods to predict water and sediment quality in the vicinity of the diffuser in Meliadine Lake.

#### 7.4.6.1.1 Methods

Final mine effluent will be released to Meliadine Lake via a diffuser outfall. The mixing behaviour of mine effluent in the mixing zone (100 m radius from the outfall) of the diffuser was predicted with the CORMIX model system (Appendix 7.4-A). Details about model development and assumptions used are provided in Appendix 7.4-A. The major input into the model was from the mine effluent chemistry predictions (i.e., water quality parameter concentrations in AP-01) and the mine site mass balance model (SD 2-6 Surface Water Management Plan). This model only incorporated mine effluent loads and did not incorporate air deposition loads.

Predicted mine effluent water quality and predicted water quality in the mixing zone of Meliadine Lake were evaluated to determine if they were potential contaminants of concern that required further investigation. The results were evaluated as follows:

- If average and maximum concentrations in the effluent are less than background concentrations in Meliadine Lake, no further action is required.
- If average and maximum concentrations in the effluent are more than background concentrations in Meliadine Lake, but less than aquatic life or human health guidelines, no further action is required.
- If average concentrations in the effluent are less than aquatic and human health guidelines, but maximum concentrations are more than guidelines, further evaluation as follows is required:
  - Concentrations at the edge of the mixing zone will be estimated.
  - If concentrations at the edge of the mixing zone are less than guidelines, no further action is required.
  - If concentrations at the edge of the mixing zone are more than guidelines, further evaluation is required (e.g., risk assessment or development of site-specific guidelines).
- If average and maximum concentrations in effluent are more than aquatic and human health guidelines, further evaluation as follows is required:
  - Concentrations at the edge of the mixing zone will be estimated.
  - If concentrations at the edge of the mixing zone are less than guidelines, no further action is required.

If concentrations at the edge of the mixing zone are more than guidelines, further evaluation is required (e.g., risk assessment, or development of site-specific guidelines)

Effluent mixing modelling was completed to assess and address how effluent would mix beyond the edge of the mixing zone and to assess dissolved oxygen levels within and beyond the mixing zone boundary.

#### 7.4.6.1.2 Results

Predicted end-of-pipe effluent concentrations were compared to MMER, CCME, and Health Canada guidelines, and to average background concentrations in Meliadine Lake (7.4-20). Predicted average and maximum concentrations of all parameters in the effluent are less than MMER guidelines. For all parameters, except alkalinity, predicted concentrations in the effluent are higher than background concentrations in Meliadine Lake. For all parameters, except chromium, predicted concentrations in the effluent are higher than water quality guidelines. Since chromium in the effluent is less than the guidelines, it is not a parameter of concern. At the edge of the mixing zone, all parameters, except cadmium, are less than the guidelines. All parameters, except cadmium, are not considered parameters of concern because concentrations are less than water quality guidelines. Given the hardness of Meliadine Lake, background concentrations of cadmium in Meliadine Lake are more than CCME guidelines for protection of aquatic life. The addition of effluent is not predicted to increase concentrations of cadmium at the edge of the mixing zone to higher than background. Concentrations of cadmium at the edge of the mixing zone are predicted to be the same as in background conditions. Thus, based on existing conditions in Meliadine Lake, cadmium is not considered to be a parameter of concern.

##### *7.4.6.1.2.1 Far Field Mixing*

Effluent beyond the mixing zone will be carried by currents within Meliadine Lake and further mixed with ambient water but it possible that effluent could accumulate in Meliadine Lake. Details are provided in Appendix 7.4-A

and are summarized here. A mass balance model was used to estimate the potential accumulation of TDS, chloride, and sodium; these parameters were selected because they are conservative parameters (i.e., no decay). The model time period was 40 years which covers the construction, operations, and closure phases of the mine development.

The predictions indicate that concentration levels gradually increase during the construction and operations phases of the mine; the maximum concentrations are obtained in the last year of the operations phase (i.e., 176, 66, and 19 mg/L for TDS, chloride, and sodium, respectively). These maximum concentrations do not exceed guidelines for TDS, chloride and sodium; however, they are above the range of concentrations observed in Meliadine Lake (Appendix 7.4A, Table 7.4-A11). During closure and post-closure, no effluent is discharged into Meliadine Lake and concentrations are predicted to gradually decrease to background levels.

#### *7.4.6.1.2.2 Oxygen Level*

Dissolved oxygen (DO) concentrations within Meliadine Lake were estimated to assess potential oxygen consumption from the effluent discharged into the lake. Details on the approach are provided in Appendix 7.4-A and are summarized here.

Measureable DO in water is the net result of photosynthesis, respiration, and physical processes (e.g., surface aeration from wind and currents). The model time period was 40 years which covers the construction, operations, and closure phases of the mine development and took into account these various processes which can affect DO in water.

Measurable DO concentrations are expected to be above the guideline (6.5 mg/L; CCME 2012a) in Meliadine Lake under most conditions. In the mixing zone, episodes of DO concentrations below the guideline are predicted to occur in late summer during the operations phase. During the construction, closure and post-closure phases, DO concentrations within the mixing zone are expected to be similar to those in other areas of Meliadine Lake.

### 7.4.6.1.3 Sediments

Sediment quality in Meliadine Lake can be affected through release of treated effluent from the diffuser, erosion and sedimentation at the diffuser, and erosion and sedimentation on the shore of Meliadine Lake near mining infrastructure. Erosion and sediment control measures as well as best management practices will be implemented at the site of the diffuser, and along the shore of Meliadine Lake, where appropriate, to minimize mobilization of suspended solids, and associated adsorbed chemicals, in the water column.

Loading of particulate matter from treated effluent through the diffuser will be controlled, as TSS in the end-of-pipe effluent is predicted to be no more than 15 mg/L (Table 7.4-20). In addition, the use of a diffuser aids development of a mixing ratio in Meliadine Lake so that WQ guidelines are met at the edge of the mixing zone. This includes meeting guidelines for TSS (predicted to be at background levels at the edge of the mixing zone; Table 7.4-20) through dispersing TSS in effluent over a larger area, and reducing any localized sedimentation and infill in Meliadine Lake. The diffuser also aides mixing of other effluent parameters in Meliadine Lake to meet water quality objectives at the edge of the mixing zone. If water quality at the edge of the mixing zone is the same or less than guidelines or ambient conditions, it assumed that sediment quality will also be the same or less than guidelines. There is the potential for sediment quality within the mixing zone to change. Sediments in

the mixing zone will be monitored at least every three years as part of the environmental effects monitoring (EEM) program and aquatic effects monitoring plan (AEMP) (SD 7-3).

Sediment monitoring is conducted at other mines in the north to document changes in sediment quality due to mining operations. Sediment monitoring results from these mines (Diavik, Ekati, Snap Lake, and Meadowbank) were reviewed to provide further context around the assessment of potential changes to sediment quality in Meliadine Lake due to mining operations. Data collected for sediment quality monitoring programs includes particle size, nutrients, and/or metals. Monitoring data are evaluated by comparing present data to baseline data (if sufficient baseline data exist) and to guidelines.

The Diavik Mine (operating diamond mine in the Northwest Territories) discharges treated effluent to Lac de Gras. Sediments near the effluent outfall and in a reference area are monitored for nutrient enrichment (TOC) and contaminant exposure (nutrients and trace metals). There is no evidence of nutrient enrichment based on the latest three year review of sediment monitoring results (Golder 2011). For 12 of the substances monitored for contaminant exposure, concentrations in the exposure area were significantly higher than concentrations in the reference area, but concentrations in the exposure area were still within the normal range (reference mean ± 2 standard deviations).

The Ekati Mine (operating diamond mine in the Northwest Territories) discharges treated effluent to Leslie Lake (upstream of Lac de Gras). As part of the monitoring program at Ekati, sediment samples are collected and analyzed every three years for TOC, nutrients, and metals. The results are evaluated to determine if there are changes in sediment quality parameters related to mining activities. Based on the most recent monitoring report (Rescan 2012), there are no changes in TOC, phosphorus, nitrogen, aluminum, arsenic, copper, nickel, selenium, and zinc concentrations in the sediment. Concentrations of antimony and strontium have increased in the last three monitoring cycles (i.e., 2005, 2008, and 2011), but there are no baseline data available for full comparison. Concentrations of molybdenum have also increased as a result of mining activities. There are no toxicological benchmarks available for these three parameters (i.e., antimony, molybdenum, and strontium) for comparison.

The Snap Lake Mine (operating diamond mine in the Northwest Territories) discharges treated effluent to Snap Lake (near the Lockhart River). Sediments are monitored annually in Snap Lake and a reference lake for TOC, nutrients, and metals. It was assumed that continued exposure to treated effluent could cause an increase in some parameters near the diffuser relative to reference areas. There were no clear long-term trends in the concentrations of parameters in the exposure versus mid-field areas between 2004 and 2012; some parameters showed increasing trends, while others showed decreasing trends (De Beers 2013). There were spatial patterns in sediment quality, but it was presumed that these were due to baseline variability rather than mining operations.

The Meadowbank Mine (operating gold mine in Nunavut) discharges treated effluent to Third Portage Lake. The mine conducts an annual core receiving environment monitoring program (CREMP). The most recent CREMP report provided a review of pre-mine sediment quality (obtained through sediment cores) as compared to recent sediments (Azimuth 2013b). In general, metals in sediments at Meadowbank, except zinc, do not show evidence of increasing or decreasing temporal trends between pre-mining (2008) and mining operations (2012); zinc concentrations were above a specific threshold at the furthest site. The cause of elevated zinc may be due to dike construction and follow-up studies suggested that the metals are not in a bioavailable form and are not

toxic. The lack of confirmed trends in the other metals could be due to relatively high spatial variability in sediment quality.

Predictions of contaminants of potential concern in sediments were not completed for this Project because there is often a high degree of uncertainty around such predictions, and evidence of changes to sediment quality from effluent releases at existing mines in the north is highly variable. Since water quality in Meliadine Lake is not predicted to change from background concentrations, or predicted concentrations will be lower than aquatic life or drinking water guidelines, and TSS in the effluent released from the Project will be managed to meet the regulations, it is assumed that sediment quality near the diffuser will not change from baseline concentrations (baseline data were compared to sediment quality guidelines and are summarized in Section 7.4.4.4; Appendix 7.4-B). However, potential changes to sediment quality will be monitored and addressed as part of the AEMP and EEM programs.

**Table 7.4-20: Predicted Final Effluent Concentration, Predicted Edge of Mixing Concentrations, Background Concentrations in Meliadine Lake, and Water Quality Guidelines**

| Water Quality Parameter | | Unit | Water Quality Guidelines | | End-of-Pipe Effluent Concentration | Edge of Mixing Zone Concentration | Meliadine Lake Concentration (average) |
|---|---|---|---|---|---|---|---|
| Category | Parameter | | Concentration | Source | | | |
| Physical | Total Dissolved Solids | mg/L | 500 | HC (2010) | 4685 | 68 | 35 |
| | Total Suspended Solids | mg/L | 8 | CCME (2012a) | 15 | 3.1 | 3 |
| Major ions | Chloride | mg/L | 120 | CCME (2012a) | 1142 | 14 | 6.4 |
| | Fluoride | mg/L | 0.12 | CCME (2012a) | 1.2 | 0.0084 | 0 |
| | Sodium | mg/L | 200 | HC (2010) | 295 | 5.3 | 3.2 |
| | Sulphate | mg/L | 500 | HC (2010) | 4974 | 38 | 2.9 |
| Nutrients | Total Ammonia as Nitrogen | mg/L | 7 | CCME (2012a) | 70 | 0.54 | 0.05 |
| | Nitrate as Nitrogen | mg/L | 2.9 | CCME (2012a) | 29 | 0.25 | 0.05 |
| | Nitrite as Nitrogen | mg/L | 0.06 | CCME (2012a) | 0.15 | 0.051 | 0.05 |
| | Phosphorus (total) | mg/L | 0.01 | CCME (2012a) | 0.06 | 0.0049 | 0.0045 |
| Cyanides | Total cyanide | mg/L | 0.2 | HC (2010) | 1 | 0.009 | 0.002 |
| | Free cyanide | mg/L | 0.005 | CCME (2012a) | 0.05 | 0.00035 | - |
| Metals | Aluminum | mg/L | 0.1 | CCME (2012a) | 0.98 | 0.0091 | 0.0023 |
| | Antimony | mg/L | 0.006 | HC (2010) | 0.059 | 0.00051 | 0.0001 |
| | Arsenic | mg/L | 0.005 | CCME (2012a) | 0.5 | 0.0038 | 0.00033 |
| | Barium | mg/L | 1 | HC (2010) | 9.9 | 0.077 | 0.0076 |
| | Boron | mg/L | 1.5 | CCME (2012a) | 2.7 | 0.023 | 0.0037 |
| | Cadmium | mg/L | 0.000009 | CCME (2012a) | 0.0001 | **0.00005** | **0.00005** |
| | Chromium | mg/L | 0.0089 | CCME (2012a) | 0.1 | 0.0011 | 0.00053 |
| | Copper | mg/L | 0.002 | CCME (2012a) | 0.13 | 0.002 | 0.0011 |
| | Iron | mg/L | 0.3 | CCME (2012a) | 2.8 | 0.042 | 0.023 |
| | Lead | mg/L | 0.001 | CCME (2012a) | 0.0092 | 0.00015 | 0.00009 |
| | Manganese | mg/L | 0.05 | HC (2010) | 0.48 | 0.0055 | 0.0022 |
| | Mercury | mg/L | 0.000026 | CCME (2012a) | 0.00008 | 0.00002 | 0.00002 |
| | Molybdenum | mg/L | 0.073 | CCME (2012a) | 0.73 | 0.0052 | 0.00011 |
| | Nickel | mg/L | 0.029 | CCME (2012a) | 0.29 | 0.0027 | 0.00067 |
| | Selenium | mg/L | 0.001 | CCME (2012a) | 0.0091 | 0.00016 | 0.0001 |
| | Silver | mg/L | 0.0001 | CCME (2012a) | 0.0001 | 0.0001 | 0.0001 |
| | Thallium | mg/L | 0.0008 | CCME (2012a) | 0.0076 | 0.0001 | 0.00005 |
| | Tin | mg/L | 0.015 | CCME (2012a) | 0.15 | 0.0015 | 0.0005 |
| | Uranium | mg/L | 0.015 | CCME (2012a) | 0.15 | 0.0011 | 0.00005 |
| | Zinc | mg/L | 0.03 | CCME (2012a) | 0.26 | 0.0067 | 0.005 |

Note: Cadmium values in bold are above CCME guidelines

### 7.4.6.2 Water Quality in Small Waterbodies

Physical alterations of watersheds and deposition of windborne particulates from Project facilities and exposed lake beds, and air emissions (including blasting particulates and residuals) from Project facilities, may result in a change in water and sediment quality in waterbodies and streams. Changes in flow paths that may result in changes in erosion are discussed under minor pathways, as erosion and sedimentation can be managed through best management practices. Through this pathway, a change in downstream water quality may result from diversion of water, changes in watershed size and contributing areas, natural hydrological processes, and evaporation. Deposition of fugitive particulate matter, nutrients from blasting activities, metals, and acidifying material may change downstream water and sediment quality through an increase in particulate matter, metals, and nutrients, and a decrease in buffering capacity.

In closure, the open pits will be flooded with water from Meliadine Lake (SD 2-6; Section 7.4.5.3.2; Table 7.4-18), and in post-closure, these pits will be reconnected with downstream watersheds and Meliadine Lake.

This pathway is designed to investigate potential Project activities that may cause changes in water quality downstream of project activities. As all of these activities are linked (diversion of water, changes in watershed size and contributing areas, natural hydrological processes, evaporation, deposition of aerial matter [which can include particulate matter, nutrients, and metals], and reconnection of flooded pits to downstream waterbodies), they are evaluated together under one pathway.

This pathway is separate from the release of mine wastewater pathway because this pathway covers movement and management of non-contact water, whereas the mine wastewater pathway covers release of treated contact water. It is assumed that any contact water is kept on the mine site and directed to the attenuation ponds, and that there will be no accidental releases of contact water through the small waterbodies. Since this pathway includes movement of non-contact water only, it was assumed that changes to sediment quantity could be managed mainly through best management practices for erosion and sedimentation control, while changes to sediment quality can be addressed qualitatively through the results of predicted changes in water quality.

#### 7.4.6.2.1 Methods

The focus for the small waterbodies model was to estimate flows and chemistry in the small waterbodies, and not to estimate loadings to and mixing of this water in Meliadine Lake, and resultant water quality in Meliadine Lake downstream of the small waterbodies. Details on the model development, assumptions, and results are provided in Appendix 7.4-A; a summary of the methods and results are provided in Section 7.4.6.2. Presently the watersheds on the Peninsula (e.g., watershed A) drain into Meliadine Lake. The watershed near the Discovery pit (Chickenhead Lake watershed) does not drain into Meliadine Lake via a stream channel, rather it drains into Meliadine Lake via diffuse flow through an esker (Figure 7.4-3). If concentrations in watershed A, for example, do not differ from baseline conditions, then there should be no effect on water and sediment quality in Meliadine Lake from mining activities (includes loadings from airborne particulates and alteration of flows in watersheds). While the focus of the model is on water quality within the individual small waterbodies, it does also include upstream contributing areas (includes streams), and assumes fully mixed conditions within the waterbody.

A water quality model was developed in the GoldSim™ version 10.5 modelling environment for continuous simulation of water quality in the small waterbodies on the Peninsula and near the Discovery area (Table 7.4-21). The model was set-up and calibrated with observed data collected in baseline studies. The major pathways of physical alteration of watersheds and air deposition were grouped together because both sources of

potential contaminants are included in the small waterbodies water quality model. Physical alterations of the watersheds will begin in pre-production and continue through post-closure. Deposition of aerial particulate matter from mining activities will start in the pre-production phase, increase through the active mining phases, decrease through closure, and be eliminated by the post-closure phase (FEIS Volume 5, Section 5.2 Air Quality).

**Table 7.4-21: Waterbodies Included in the Small Waterbodies Water Quality Model**

| Watershed | Waterbody | Fish[a] (y/n) | Baseline | Mine Phase | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pre-production, years: | | Operations, years: | | | | | Closure | Post-closure |
| | | | | -3 | -2 to 1 | 1 to 2 | 3 to 4 | 5 to 8 | 9 | 10 to 12 | | |
| A | A8 | y | √ | - | - | - | - | - | - | - | - | √ |
| | A6 | y | √ | √ | - | - | - | - | - | - | - | √ |
| | A1 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| B | B5 | y | √ | √ | √ | √ | - | - | - | - | - | √ |
| | B46 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | B45 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | P2 | n | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | B2 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| D | D7 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | D4 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | D3 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | D1 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| H | H17 | n | √ | - | - | - | - | - | - | - | - | √ |
| | H1 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| I | I1 | n | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| J | J8 | n | √ | √ | √ | - | - | - | - | - | - | √ |
| | J1 | n | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Discovery | CH6 | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | DS1 (CH5) | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | DS1A (CH10) | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | DS2 (CH1) | y | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

Note: "√" indicates predictions were developed for the waterbody; "-" indicates no predictions developed because the waterbody is removed;
[a] fish presence/absence as confirmed through the aquatic studies.

The small waterbodies model consists of the hydrologic model developed for the Project for the receiving aquatic environment (Section 7.3), on which a water quality module was added. Observed water quality data for each watershed were grouped together, summarized, and used to estimate observed variability for all waterbodies in the watershed. For those waterbodies without observed data, or from watersheds without observed data, summarized data from the adjacent waterbody or watershed were used as representative surrogates. The resulting small waterbodies model is a hydrology and mass balance model that was set up to account for all hydrologic inputs and processes accounted for in the hydrology model. During the pre-production through post-closure phase, the mine site will be a closed system with all contact water contained through ditches, berms, and dikes. Water running off the waste rock/overburden management areas, and any water pumped from the pits, will be collected through sumps and diverted to the TMF or attenuation ponds (SD 2-6 Surface Water Management Plan). All non-contact water that is diverted around the mine facilities will be drained through the

natural flows on the Peninsula and near Discovery, with final discharge to Meliadine Lake. All contact water during the construction and operations phases of the Project is collected, stored, treated (if necessary) prior to release to Meliadine Lake, or used to assist flooding the open pits during the closure phase (Appendix 7.4-A, Section 5.2).

The model was developed for the baseline case, 9 mine phase cases including pre-operations (3 years before mining, and one to 2 years before mining), 5 active mining phases, closure, and post-closure. The baseline case is calibrated to surface water quality conditions observed during baseline monitoring programs, and used as a benchmark, against which the mine phase cases are compared. The model uses conservative assumptions to minimize the potential for changes to be underestimated.

Additional detail on model inputs, calibration, and assumptions is provided in Appendix 7.4-A.

### Inputs from Air Quality

An air quality model was also developed to predict aerial deposition of particulate matter, metals, nitrogen compounds from blasting, waste incineration, and nitrogen dioxide (potential acid input metric) on a 1 x 1 km grid pattern over the Project area (FEIS Volume 5, Section 5.2 Air Quality). From the air model, aerial loading estimates to watersheds were calculated and added to the Goldsim “small waterbodies” model. It is assumed there will be emissions from the Project during the pre-production through closure phases, but emissions will be substantially higher during the mining phases, lower during the pre-production and closure phases, and return to background by the post-closure phase.

Results of the air quality deposition predictions (particulate matter, nitrogen, and metals) were incorporated into the small waterbodies water quality model. The air quality model was set up as phases to cover general activities (underground emissions, incinerator, processing plant, storage tanks, and power plant), and activities associated with mining each pit (FEIS Volume 5, Section 5.2 Air Quality). In the water quality model, air quality predictions from general activities were used for Pre-production years, and for each watershed, the air quality phase with the highest air deposition loading estimate was used. Thus, to be conservative, maximum air deposition expected to occur in a watershed was used.

Estimated predictions of TSS in the small waterbodies include loadings from the contributing watershed plus estimated deposition of particulate matter from the air quality model. Estimated predictions of nitrate in the small waterbodies include loadings from the contributing watershed plus estimated deposition of nitrogen from the air quality model. A source of nitrogen in the air particulate matter is from residual blasting material used in site development. Ammonium nitrate – fuel oil (ANFO) will be used as the explosive, with a blasting frequency of 2 to 4 blasts per day (FEIS Volume 2, Section 2.6.1.5). Estimated predictions of metals in the small waterbodies include loadings from the contributing watershed plus estimated areal deposition of metals. In the air quality model, metal loads are estimated from the waste rock and ore characteristics (FEIS Volume 5, Section 5.2 Air Quality).

Assumptions used in the water quality and air deposition models are highly conservative for the following reasons:

- the water quality model incorporates results from air quality modelling, which use conservative (high) assumptions for emissions of particulates, metals, and nitrogen compounds (FEIS Volume 5, Section 5.2 Air Quality);
- all deposited matter in the waterbody catchment are assumed to report to the waterbody;
- particulates were assumed to not settle through the water column to the sediments; and

- geochemistry data were used to estimate relative proportion of metals in waste rock.

### Review of Predicted Water Quality Model Results

Predicted future concentrations of individual parameters were screened to identify constituents of potential concern (COPC). This was a multi-step process as follows:

- For parameters with guidelines:
  - If predicted concentrations were less than guidelines, the parameter was excluded from the assessment.
  - If baseline and predicted concentrations were more than guidelines, but predicted concentrations were within 10% of baseline conditions, the parameter was excluded from the assessment.
  - If baseline and predicted concentrations were more than guidelines, and predicted concentrations were more than 10% higher than baseline concentrations, the parameter was identified as a COPC.
  - If baseline conditions were less than guidelines, and predicted concentrations were more than guidelines, the parameter was identified as a COPC.
- For parameters without guidelines:
  - If predicted concentrations were less than 10% higher than baseline concentrations, the parameter was excluded from the assessment.
  - If predicted concentrations were more than 10% higher than baseline concentrations, the parameter was identified as a COPC.

Water quality guidelines (Table 7.4-7) are designed to provide a high level of protection to aquatic life, or human health. Thus parameters meeting or below guidelines can be excluded as no impacts to aquatic life, or human health, are anticipated. In waterbodies where parameters are already above guidelines, it is assumed that aquatic biota in these waterbodies have adapted to these concentrations. In future conditions, if these same parameters were above guidelines, but within 10% of concentrations from baseline conditions, it was assumed that there would be no affect to aquatic life and they were excluded from further analysis. A difference of 10% from baseline was considered acceptable because analytical uncertainty can be as high as, or higher than 10%, and effects to aquatic organisms are unlikely to be detectable for a change in a parameter of less than 10%.

#### 7.4.6.2.2 Results

As pit lake chemistry during the post-closure phase is important to downstream waterbodies, predicted chemistry in the pit lakes are summarized first (Section 7.4.6.2.2.1) followed by results of the small waterbodies water quality modelling by watershed (A, B, D, H, I, J, and Chickenhead) (Sections 7.4.6.2.2.2 to 7.4.6.2.2.8). Summaries of water quality modelling predictions for all modelled constituents are presented in tables that include comparisons to Canadian Water Quality Guidelines for Protection of Aquatic Life (CCME 2012a) and drinking water guidelines (Health Canada 2010).

##### *7.4.6.2.2.1 Pit Lake Predictions*

As part of the mine water balance model, predictions were made for water quality in the pit lakes during flooding and during long-term summer conditions (Appendix 7.4-B). At the end of mining, the pit lakes will be actively flooded with water from Meliadine Lake (SD 2-6; Section 7.4.5.3.2; Table 7.4-18). Predictions of pit lake water

quality have been made assuming fully mixed conditions (Table 7.4-22). Based on the initial pit lake predictions, water quality for all parameters except copper in Tiriganiaq Pit Lake will be below CCME aquatic life guidelines. Long-term average copper in Tiriganiaq Pit Lake is predicted to be 0.0028 mg/L and is above the guideline assuming water hardness of 30 mg/L. It is possible that hardness will also increase, and thus copper at this level may or may not be above aquatic life guidelines. Total dissolved phosphorus, a surrogate for total phosphorus, is predicted to be above the threshold of 0.004 mg/L for classification as ultra-oligotrophic lake to oligotrophic lake (CCME 2004), in the Pump and Discovery pit lakes. This would likely result in increased biological productivity in these pit lakes.

**Table 7.4-22: Predicted Summer Average Long-term Water Quality in the Pit Lakes**

| Location | Units | CCME[a] | MMER[b] | Tiriganiaq Pit Lake | Wesmeg Pit Lake | F Zone Pit Lake | Pump Pit Lake | Discovery Pit Lake |
|---|---|---|---|---|---|---|---|---|
| TDS | mg/L | - | - | 32 | 20 | 36 | 37 | 36 |
| Total Alkalinity | mg/L as CaCO3 | - | - | 16 | 9.3 | 16 | 19 | 17 |
| Chloride | mg/L | 120 | - | 5.7 | 3.6 | 6.7 | 6.4 | 6.9 |
| Fluoride | mg/L | 0.12 | - | 0.00058 | 0.00001 | <0.00001 | 0.00001 | 0.00043 |
| Sulphate | mg/L | | - | 3.0 | 2.1 | 2.7 | 3.9 | 2.8 |
| Ammonia-N | mg N/L | | - | 1.0 | 0.67 | 1.3 | 0.68 | 0.68 |
| Nitrate | mg/L | 13 | - | 0.77 | 0.74 | 1.4 | 0.75 | 0.75 |
| Total Kjeldahl Nitrogen | mg/L | - | - | 0.183 | 0.12 | 0.211 | 0.25 | 0.22 |
| Total Dissolved Phosphorus[f] | mg/L | 0.004 to 0.01 | - | 0.00341 | 0.00217 | 0.00399 | 0.00419 | 0.00411 |
| Aluminum[e] | mg/L | 0.1 | - | 0.00552 | 0.00217 | 0.00221 | 0.00267 | 0.00244 |
| Arsenic | mg/L | 0.005 | 0.5 | 0.00292 | 0.00048 | 0.00028 | 0.00044 | 0.00054 |
| Boron | mg/L | 1.5 | | 0.00295 | 0.00171 | 0.00297 | 0.00633 | 0.00323 |
| Cadmium[d] | mg/L | 0.000012 | | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium[c] | mg/L | 0.001 | | 0.00054 | 0.00035 | 0.00065 | 0.00053 | 0.00066 |
| Copper[d] | mg/L | 0.002 | 0.3 | 0.00284 | 0.00063 | 0.00117 | 0.00099 | 0.00120 |
| Iron | mg/L | 0.3 | 3.0 | 0.00642 | 0.00376 | 0.00686 | 0.00860 | 0.00716 |
| Lead[d] | mg/L | 0.001 | 0.2 | 0.00014 | 0.00009 | 0.00017 | 0.00015 | 0.00017 |
| Manganese | mg/L | 0.05 | | 0.00184 | 0.00101 | 0.00140 | 0.00176 | 0.00125 |
| Mercury | mg/L | 0.000026 | | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Molybdenum | mg/L | 0.073 | | 0.00028 | 0.00015 | 0.00027 | 0.00026 | 0.00029 |
| Nickel[d] | mg/L | 0.038 | 0.5 | 0.00045 | 0.00028 | 0.00051 | 0.00045 | 0.00052 |
| Selenium | mg/L | 0.001 | | 0.00003 | <0.00001 | <0.00001 | 0.00010 | 0.00001 |
| Uranium | mg/L | 0.015 | | 0.00008 | 0.00004 | 0.00006 | 0.00005 | 0.00007 |
| Zinc | mg/L | 0.03 | 0.5 | 0.00126 | 0.00080 | 0.00147 | 0.00140 | 0.00151 |

Note: More detail provided in Appendix 7.4-B; Cells shaded in grey represent predicted concentrations above the CCME guidelines.
[a] CCME 2012a.
[b] MMER 2012.
[c] Freshwater aquatic life criteria for chromium depends on the valence of chromium ion. In the above table, the Cr(VI) criterion of 0.001 mg/L is shown.
[d] Freshwater Aquatic Life Criteria are hardness dependant; assumes a hardness of 30 mg/L.
[e] Freshwater Aquatic Life Criterion for aluminum is pH dependant; assumes pH>6.5.
[f] Guideline for total phosphorus.

#### 7.4.6.2.2.2 A Watershed Predictions

In the A watershed, 3 waterbodies were included in the small waterbodies model: A8, A6, and A1 (upstream to downstream direction). All data collected in the A watershed were used to derive the summary statistics for observed data. Observed data were used to derive baseline predictions of water quality in each of the 3 waterbodies. Observed data will be the same for these 3 waterbodies, but baseline data differ slightly based on simulation methods.

Observed maximum concentrations of TDS, TSS, chloride, nitrate, cadmium, copper, iron, lead, manganese, mercury, selenium, silver, and zinc were above guidelines, and observed median concentrations of cadmium were above guidelines. Baseline estimated concentrations in waterbodies A8, A6, and A1 were above guidelines for cadmium, copper, lead, mercury, and silver. Lake A1 is the last waterbody in the chain prior to discharge to the east basin of Meliadine Lake. Lake A1 will be downstream of F zone pits (operational by Year 3).

Water quality predictions were made for Lake A8 in baseline and post-closure only because Lake A8 will be drained during pre-production and operations. Water quality predictions were made for Lake A6 in baseline, first year of pre-production, and post-closure because it will be dewatered during pre-production, and then used as a settling pond during operations. At post-closure, Lake A8 will be refilled as the Wesmeg and Pump Pit #2 pit lakes, and will drain to Lake A6 and ultimately to Lake A1 and Meliadine Lake. Water quality predictions were made for Lake A1 in baseline, pre-production, operations, closure, and post-closure phases. During operations, water held in Lake A6 will be pumped to a constructed drainage channel to Lake A1. At post-closure, F zone Pit Lake, and water from Wesmeg/Pump Pit Lake and Lake A6 will drain to Lake A1.

Predicted post-closure phase water quality in Lake A8 and Lake A6 is expected to be similar to water quality in baseline conditions (Appendix 7.4-B). Parameters predicted to be above guidelines but within 10% of baseline include cadmium, copper, lead, manganese, mercury and silver, in Lake A8, and cadmium, copper, lead, mercury, and silver, in Lake A6 (Table 7.4-23). In Lake A1, parameters predicted to be above guidelines but within 10% of baseline include cadmium, copper, lead, mercury, and silver, in operations through closure, and cadmium, copper, and mercury, in post-closure.

In Lake A8 and Lake A6, for parameters without guidelines, concentrations are not expected to be more than 10% higher than baseline conditions (Table 7.4-23). In Lake A1, in pre-Pre-production through closure, concentrations of alkalinity, calcium, magnesium, potassium, TKN, TDP, SRP, beryllium, bismuth, cobalt, lithium, strontium, titanium, tungsten, and vanadium are expected to be more than 10% higher than baseline concentrations. These parameters are identified as COPCs (Table 7.4-30).

**Table 7.4-23: Water Quality Model Summary – A Watershed**

| | Waterbody | A8 | A6 | A1 |
|---|---|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc |
| | Above guideline in operations to closure | none | none | Cadmium, Copper, Lead, Mercury, Silver |
| | Above guideline in post-closure | Cadmium, Copper, Lead, Manganese, Mercury, Silver | Cadmium, Copper, Lead, Mercury, Silver | Cadmium, Copper, Mercury |
| | More than guideline and more than baseline? (Y/N) | no | no | during operations and closure (yes); during post-closure (no) |
| | Constituents of Potential Concern | none | none | Cadmium, Copper, Lead, Mercury, Silver |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | none | none | alkalinity, Calcium, Magnesium, Potassium, TKN, TDP, SRP, Beryllium, Bismuth, Cobalt, Lithium, Strontium, Titanium, Tungsten, Vanadium |
| | More than 10% above baseline in post-closure | none | none | none |
| | Constituents of Potential Concern | none | none | alkalinity, Calcium, Magnesium, Potassium, TKN, TDP, SRP, Beryllium, Bismuth, Cobalt, Lithium, Strontium, Titanium, Tungsten, Vanadium |

#### *7.4.6.2.2.3 B Watershed*

In the B watershed, 5 waterbodies were included in the small waterbodies model: B5, B46, B45, P2, and B2. Lake B5 drains to Lake B4, to Lake B2, to Lake B1 and then into Meliadine Lake west basin. Lake B46 drains a watershed to the southeast; there are no proposed mining activities in the contributing area above Lake B46. Lake B46 drains to Lake B45, to Lake B4, to Lake B2, to Lake B1, and then into Meliadine Lake west basin. During pre-production, Lake B4 will be drained and water will be diverted through Lake B44 and into Lake P2 of the P watershed. Lake P2 is currently in a separate watershed that empties into Meliadine Lake west basin adjacent to the B basin outlet. During the pre-production phase, a channel will be developed to allow P2 to empty into Lake B2. This connection will be maintained throughout operations to post-closure. Discharge flow from Lake P2 is predicted to be higher compared to baseline during all phases because of the increase in source contributing area (water from waterbodies B46 and B45 contributing areas) to Lake P2 (Section 7.3). In contrast, predicted discharge flows from Lake B2 are expected to be similar or lower compared to baseline due to decreased contributing areas (removal of flows from contributing areas at Lake B4 and above). Flows from Lake B5 will be diverted to the D watershed (through Lake D7) during pre-production through Mining Phase 1

(years 1 and 2 of mining). In Mining Phases 2 through 5 and closure, the connection between B5 and D7 will be closed, D5 will be drained, and the basin will become a contact water pond. During closure, B5 basin will be flooded as part of the new Tiriganiaq Pit Lake. In post-closure, water will drain from the old B5 basin into Lake D7. Lake B5 is reviewed as part of the B watershed for the baseline phase, but then as part of the D watershed for pre-production through post-closure.

Observed data were used to derive baseline predictions of water quality in each of the 5 waterbodies. Observed concentrations (maximum values) for TDS, chloride, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, and zinc were above guidelines, and observed median concentrations for cadmium were also above guidelines. Baseline estimated peak concentrations for cadmium, copper, and manganese were above guidelines in all 5 waterbodies, and baseline median concentrations for cadmium were above guidelines in all waterbodies.

Water quality predictions were made for Lake B5 in baseline, pre-production, mining operations Phase 1, and post-closure. Water quality predictions were made for waterbodies B46, B45, P2, and B2 for all phases.

In all 5 waterbodies, predicted concentrations of cadmium, copper, and manganese were above guidelines, but within 10% of baseline concentrations (Table 7.4-24). In post-closure in Lake B5, cadmium was predicted to be above guidelines but within 10% of baseline concentrations. In post-closure in waterbodies B46, B45, P2, and B2, cadmium, copper, and manganese were predicted to be above guidelines but within 10% of baseline concentrations.

For parameters without guidelines, titanium was predicted to be more than 10% higher than baseline concentrations in Lake B5, and cobalt, titanium, and vanadium were predicted to be more than 10% higher than baseline concentrations in waterbodies B46, B45, P2, and B2. In post-closure, no parameters are expected to be more than 10% higher than baseline concentrations. In the B watershed waterbodies, parameters that are identified as COPCs include cobalt, titanium, and vanadium (Table 7.4-30).

**Table 7.4-24: Water Quality Model Summary – B Watershed**

| | Waterbody | B5 | B46 | B45 | P2 | B2 |
|---|---|---|---|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | TDS, Chloride, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Zinc | TDS, Chloride, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Zinc | TDS, Chloride, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Zinc | TDS, Chloride, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Zinc | TDS, Chloride, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Zinc |
| | Above guideline in operations to closure | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese |
| | Above guideline in post-closure | Cadmium | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese |
| | More than guideline and more than baseline? | no | no | no | no | no |

**Table 7.4-24: Water Quality Model Summary – B Watershed (continued)**

| | Waterbody | B5 | B46 | B45 | P2 | B2 |
|---|---|---|---|---|---|---|
| | (Y/N) | | | | | |
| | Constituents of Potential Concern | none | none | none | none | none |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | Titanium | Cobalt, Titanium, Vanadium | Cobalt, Titanium, Vanadium | Cobalt, Titanium, Vanadium | Cobalt, Titanium, Vanadium |
| | More than 10% above baseline in post-closure | none | none | none | none | none |
| | Constituents of Potential Concern | Titanium | Cobalt, Titanium, Vanadium | Cobalt, Titanium, Vanadium | Cobalt, Titanium, Vanadium | Cobalt, Titanium, Vanadium |

#### *7.4.6.2.2.4 D Watershed*

In the D watershed, 4 waterbodies were included in the small waterbodies model: D7, D4, D3, and D1 (upstream to downstream). Water from Lake D1 drains into the west basin of Meliadine Lake, downstream of the B basin outlet, and across the basin from the lake outlet, Meliadine River (ML-MR). Water quality predictions were made for waterbodies D7, D4, D3, and D1 in all mining phases. At post-closure, and after water quality meets guidelines, Tiriganiaq Pit Lake will drain into the D watershed.

Observed data from the D watershed were used to derive baseline predictions of water quality in each of the 4 waterbodies in D watershed. Observed concentrations (maximum values) for TDS, TSS, cadmium, chromium, copper, iron, lead, manganese, selenium, and zinc were above guidelines, and observed median concentrations for cadmium were above guidelines in waterbodies D7, D4, D3, and D1.

For parameters with guidelines, cadmium, copper and manganese were predicted to be more than guidelines but within 10% of baseline concentrations in all 4 waterbodies (Table 7.4-25). In waterbodies D7 and D4, TSS and selenium were also predicted to be more than guidelines but within 10% of baseline concentrations, while in Lake D1, selenium was also predicted to be more than guidelines but within 10% of baseline concentrations. In post-closure, cadmium, copper, and manganese were predicted to be more than guidelines but within 10% of baseline concentrations in all 4 waterbodies; no other parameters were predicted to be more than guidelines in post-closure.

For parameters without guidelines, titanium was predicted to be more than 10% higher than baseline concentrations in all 4 waterbodies in all phases except post-closure. Only titanium is identified as a COPC for waterbodies in the D watershed (Table 7.4-30).

**Table 7.4-25: Water Quality Model Summary - D Watershed**

| | Waterbody | D7 | D4 | D3 | D1 |
|---|---|---|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | TDS, TSS, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Selenium, Zinc | TDS, TSS, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Selenium, Zinc | TDS, TSS, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Selenium, Zinc | TDS, TSS, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Selenium, Zinc |
| | Above guideline in operations to closure | TSS, Cadmium, Copper, Manganese, Selenium | TSS, Cadmium, Copper, Manganese, Selenium | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese, Selenium |
| | Above guideline in post-closure | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese | Cadmium, Copper, Manganese |
| | More than guideline and more than baseline? (Y/N) | no | no | no | no |
| | Constituents of Potential Concern | none | none | none | none |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | Titanium | Titanium | Titanium | Titanium |
| | More than 10% above baseline in post-closure | none | none | none | none |
| | Constituents of Potential Concern | Titanium | Titanium | Titanium | Titanium |

#### *7.4.6.2.2.5 H Watershed*

In the H watershed, 2 waterbodies were included in the small waterbodies model: H17 and H1 (upstream to downstream). H17 will become the main attenuation pond (AP-01) during operations, and water will be discharged from AP-01 via the diffuser in Meliadine Lake. Presently, H17 discharges into H1, and H1 discharges into a small bay in the east basin of Meliadine Lake. The J watershed, discussed below, also discharges into this same small bay. During operations, H1 will become part of the mine footprint. During closure, water quality in AP-01 will be treated, and sediments will be analyzed. If sediment concentrations are higher than baseline or guidelines, sediments will be managed according to best practices. More details on the closure and reclamation of AP-01 is provide in the closure and reclamation plan (SD 2-17 Mine Closure and Reclamation Plan). During closure, the former waterbody H1 will be reclaimed to a new waterbody such that in post-closure, H17 will drain into Meliadine Lake via H1. Water quality predictions were made for H17 and H1 for baseline and post-closure phases.

Observed data from the H watershed were used to derive baseline predictions of water quality in each of the 2 waterbodies. Observed concentrations (maximum values) for TDS, TSS, chloride, nitrate, cadmium, copper, iron, lead, manganese, mercury, selenium, silver, tin, and zinc were above guidelines, and observed median concentrations for cadmium and tin were also above guidelines.

In H17, baseline estimated peak concentrations for TSS, chloride, cadmium, copper, manganese, mercury, and silver were above guidelines, and baseline median cadmium, manganese, mercury, and silver were above guidelines. In Lake H1, baseline estimated peak concentrations for chloride, cadmium, copper, lead, manganese, mercury, and silver were above guidelines, whereas estimated median concentrations for cadmium, copper, lead, mercury, and silver were above guidelines.

Predicted post-closure concentrations of TSS, chloride, cadmium, copper, manganese, mercury, and silver in H17 were above guidelines but within 10% of baseline concentrations (Table 7.4-26). Predicted post-closure concentrations of chloride, cadmium, copper, lead, manganese, mercury, and silver in H1 were above guidelines but within 10% of baseline concentrations. As all predicted concentrations in both waterbodies H17 and H1 were within 10% of baseline concentrations, no COPCs are identified for waterbodies in the H watershed (Table 7.4-30).

**Table 7.4-26: Water Quality Model Summary - H Watershed**

| | Waterbody | H17 | H1 |
|---|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc |
| | Above guideline in operations to closure | None (no waterbody in operations) | None (no waterbody in operations) |
| | Above guideline in post-closure | TSS, Chloride, Cadmium, Copper, Manganese, Mercury, Silver | Chloride, Cadmium, Copper, Lead, Manganese, Mercury, Silver |
| | More than guideline and more than baseline? (Y/N) | no | no |
| | Constituents of Potential Concern | none | none |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | none | none |
| | More than 10% above baseline in post-closure | none | none |
| | Constituents of Potential Concern | none | none |

### *7.4.6.2.2.6 I Watershed*

In the I watershed, only Lake I1 was included in the small waterbodies model. Lake I1 will be close to the mine road, but will not be directly under the mining footprint. Lake I1 discharges into the east basin of Meliadine Lake north of A basin outlet and south of H and J basin outlets. The current mine plan does not include diversion of water to or from Lake I1. Water quality predictions were made for I1 for all 9 mining phases.

Observed data from H watershed were used to derive baseline predictions of water quality in Lake I1. Observed data for Lake I1 are the same as was used in the H watershed modelling, but baseline predictions differ slightly based on simulation methods.

Observed data used for Lake I1 include TDS, TSS, chloride, nitrate, cadmium, copper, iron, lead, manganese, mercury, selenium, silver, tin, and zinc with maximum concentrations above guidelines, and median concentrations for cadmium and tin also above guidelines.

Predicted concentrations of chloride, cadmium, copper, lead, manganese, mercury, and silver were above guidelines in Pre-production to post-closure but concentrations were within 10% of baseline (Table 7.4-27). Parameters without guidelines with concentrations predicted to be more than 10% higher than baseline concentrations include cobalt and titanium; these two parameters have been identified as COPC for Lake I1 (Table 7.4-30).

**Table 7.4-27: Water Quality Model Summary - I Watershed**

| | Waterbody | I1 |
|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc |
| | Above guideline in operations to closure | Chloride, Cadmium, Copper, Lead, Manganese, Mercury, Silver |
| | Above guideline in post-closure | Chloride, Cadmium, Copper, Lead, Manganese, Mercury, Silver |
| | More than guideline and more than baseline? (Y/N) | no |
| | Constituents of Potential Concern | none |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | Cobalt, Titanium |
| | More than 10% above baseline in post-closure | no |
| | Constituents of Potential Concern | Cobalt, Titanium |

### *7.4.6.2.2.7 J Watershed*

In the J watershed, 6 waterbodies were included in the small waterbodies model: J8, J7, J6, J3, J2, and J1 (upstream to downstream direction). Lake J1 is the last waterbody in the chain prior to discharge to the east basin of Meliadine Lake. The upper J waterbodies (J8 through J2) will be dewatered through the pre-production phase to mining phase 1. Baseline and pre-production water quality predictions were made for waterbodies J7, J6, J3, and J2, baseline and post-closure predictions were made for J8, and predictions from baseline through post-closure were made for J1 through all phases. Results for waterbodies J8 and J1 are included below but not for waterbodies J7, J6, J3, and J2, as they will not be reclaimed back to waterbodies at the end of the project.

Observed data from H watershed were used to derive baseline predictions of water quality in waterbodies J8 and J1. Observed data are the same as was used in the H watershed modelling, but baseline predictions differ slightly based on hydrology. Observed data used include TDS, TSS, chloride, nitrate, cadmium, copper, iron, lead, manganese, mercury, selenium, silver, tin, and zinc, with maximum concentrations above guidelines, and median concentrations for cadmium and tin also above guidelines.

In Lake J8, predicted concentrations of chloride, cadmium, and mercury were above guidelines in Pre-production to post-closure but concentrations were within 10% of baseline (Table 7.4-28). In Lake J1, predicted concentrations of chloride, cadmium, copper, lead, manganese, mercury, and silver were above guidelines in Pre-production to post-closure but concentrations were within 10% of baseline. No other parameters were

predicted to have concentrations either above guidelines, or for those parameters without guidelines, concentrations more than 10% higher than baseline. In the J watershed, no parameters are identified as COPCs (Table 7.4-30).

**Table 7.4-28: Water Quality Model Summary - J Watershed**

| | Waterbody | J8 | J1 |
|---|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc | TDS, TSS, Chloride, Nitrate, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Zinc |
| | Above guideline in operations to closure | Chloride, Cadmium, Mercury | Chloride, Cadmium, Copper, Lead, Manganese, Mercury, Silver |
| | Above guideline in post-closure | Chloride, Cadmium, Mercury | Chloride, Cadmium, Copper, Lead, Manganese, Mercury |
| | More than guideline and more than baseline? (Y/N) | no | no |
| | Constituents of Potential Concern | none | none |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | none | none |
| | More than 10% above baseline in post-closure | none | none |
| | Constituents of Potential Concern | none | none |

#### *7.4.6.2.2.8 Chickenhead Watershed*

In the Chickenhead watershed, 4 waterbodies were included in the small waterbodies model: CH6, CH5, CH10, and CH1. Water flows from CH6 to CH5 through small waterbodies and channels and then into CH1. Lake CH10 is in a separate flow path that also discharges to CH1. The proposed pit and waste rock pile are to the north of CH6 and CH5 but there are no surface water flow paths between the mine footprint and these waterbodies. Fish are present in all of the waterbodies, and predictions were made for all 4 waterbodies for all mining phases.

Observed data from waterbodies in the Chickenhead watershed were used to derive baseline predictions of water quality in the 4 waterbodies. Observed data is the same, but baseline data differ slightly between waterbodies based on simulation methods.

Observed concentrations (maximum values) for aluminum, cadmium, chromium, copper, lead, and mercury were above guidelines, and observed median concentrations of aluminum, cadmium, and copper were above guidelines. In Lake CH6, predicted concentrations of cadmium, copper, lead, mercury, and silver, were above guidelines, whereas concentrations of cadmium, copper, mercury, and silver were also more than 10% higher than baseline concentrations (Table 7.4-29). Cadmium, copper, mercury, and silver are identified as COPCs in Lake CH6 (Table 7.4-30). In Lake CH5, predicted concentrations of cadmium, copper, lead, mercury and silver, were above guidelines but within 10% of baseline concentrations, and in waterbodies CH10 and CH1, predicted concentrations of cadmium, copper, lead, and mercury, were above guidelines but within 10% of baseline

concentrations (Table 7.4-27). Of the parameters with guidelines, none are identified as COPCs in waterbodies CH5, CH10, and CH1.

For parameters without guidelines, predicted concentrations of cobalt and titanium were more than 10% higher than baseline concentrations in waterbodies CH10 and CH1. Cobalt and titanium are identified as COPCs in these two waterbodies (Table 7.4-28). Predicted concentrations of alkalinity, calcium, magnesium, potassium, TDP, SRP, cobalt, strontium, titanium, tungsten, and vanadium were more than 10% higher than baseline concentrations in Lake CH5 and are identified as COPCs. Predicted concentrations of alkalinity, calcium, magnesium, potassium, TDP, SRP, beryllium, bismuth, cobalt, strontium, titanium, tungsten, and vanadium were more than 10% higher than baseline concentrations in Lake CH6 and are identified as COPCs.

**Table 7.4-29: Water Quality Model Summary - Chickenhead Watershed**

| | Waterbody | CH6 | CH5 | CH10 | CH1 |
|---|---|---|---|---|---|
| Parameters with Guidelines | Above guideline in observed or baseline | Aluminum, Cadmium, Chromium, Copper, Lead, Mercury | Aluminum, Cadmium, Chromium, Copper, Lead, Mercury | Aluminum, Cadmium, Chromium, Copper, Lead, Mercury | Aluminum, Cadmium, Chromium, Copper, Lead, Mercury |
| | Above guideline in operations to closure | Cadmium, Copper, Lead, Mercury. Silver | Cadmium, Copper, Lead, Mercury, Silver | Cadmium, Copper, Lead, Mercury | Cadmium, Copper, Lead, Mercury |
| | Above guideline in post-closure | Cadmium, Copper, Lead, Mercury | Cadmium, Copper, Lead, Mercury | Cadmium, Copper, Lead, Mercury | Cadmium, Copper, Lead, Mercury |
| | More than guideline and more than baseline? (Y/N) | Cadmium, Copper, Mercury, Silver | no | no | no |
| | Constituents of Potential Concern | Cadmium, Copper, Mercury, Silver | none | none | none |
| Parameters without Guidelines | More than 10% above baseline in operations to closure | Alkalinity, Calcium, Magnesium, Potassium, TDP, SRP, Beryllium, Bismuth, Cobalt, Strontium, Titanium, Tungsten, Vanadium | Alkalinity, Calcium, Magnesium, Potassium, TDP, SRP, Cobalt, Strontium, Titanium, Tungsten, Vanadium | Cobalt, Titanium | Cobalt, Titanium |
| | More than 10% above baseline in post-closure | none | none | none | none |
| | Constituents of Potential Concern | Alkalinity, Calcium, Magnesium, Potassium, TDP, SRP, Beryllium, Bismuth, Cobalt, Strontium, Titanium, Tungsten, Vanadium | Alkalinity, Calcium, Magnesium, Potassium, TDP, SRP, Cobalt, Strontium, Titanium, Tungsten, Vanadium | Cobalt, Titanium | Cobalt, Titanium |

### *7.4.6.3 Sediment Quality in Small Waterbodies*

Sediment quality can be changed through erosion of channels, banks, and waterbody shorelines, change in water quality, and aerial deposition of mining particulate matter. Results of the hydrology assessment

(Sections 7.3.3 and 7.3.4) have predicted increased flows in some watersheds (e.g., B watershed), and decreased flows in other watersheds (e.g., J watershed). Environmental design features to reduce and eliminate erosion and sedimentation include the following:

- for temporary water diversions, pumped discharges will be conveyed to the waterbody environment rather than outlets;
- for permanent water diversions, the diversion outlet structure will be designed to approximate the natural hydrograph to manage the water level regime of the diverted waterbodies;
- diversion channels will be designed and constructed to prevent erosion and sedimentation (Tonn et al. 2012) and to incorporate lessons learned at the Ekati Diamond Mine (Jones et al. 2003);
- for those watersheds with predicted increased flows due to diversion of water, channels will be designed to accommodate the flows and minimize erosion by attenuating flow changes, and
- best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management) will be used.

By implementing the above measures with confirmatory monitoring, it is predicted that there will be no linkage pathway to sediment quality via erosion, and alteration of particulate size fractions and concentrations of constituents in the waterbody sediments.

Sediment quality in the waterbodies can be potentially affected by a change in water quality (i.e., change in contaminant load) and/or a change in aerial deposition. The small waterbodies model described in Section 7.4.6.2 incorporated hydrology, baseline water chemistry, and aerial deposition. Results of the model were evaluated by comparing predicted future concentrations to baseline concentrations. Constituents of potential concern were identified if 1) predicted water quality was higher than guidelines and higher than baseline or 2) predicted water quality was higher than baseline, where no guideline was available. Constituents of potential concern for mining projects can include particulate matter (changes in TSS concentrations), dissolved matter (changes in TDS concentrations), nutrients (residuals from blasting materials), and metals. Based on the water quality modelling results, TSS, TDS, and nutrients were not identified as COPCs in the water and thus they are not identified as COPCs in the sediment. There will be no linkage pathway to sediment quality for waterbodies A8, A6, H17, H1, J8, and J1 because water quality was not predicted to change from background concentrations or to concentrations above guidelines.

Between one and three water quality parameters were predicted to change in 12 waterbodies (B5, B46, B45, P2, B2, D7, D4, D3, D1, I1, CH10, and CH1). The 3 COPCs were identified as cobalt, titanium, and vanadium. Thus cobalt, titanium, and vanadium in the sediments of those 12 waterbodies (B5, B46, B45, P2, B2, D7, D4, D3, D1, I1, CH10, and CH1) could potentially change in response to the predicted water quality change.

The number of water quality parameters in waterbodies A1, CH6, and CH5 expected to increase from baseline conditions were 20, 17, and 11, respectively. Thus, those parameters could increase in the sediments of waterbodies A1, CH6, and CH5.

Monitoring for water and sediment quality has been proposed as part of the conceptual AEMP (SD 7-3). In addition to that plan, water quality at an upstream and downstream waterbody could be monitored. If there is no change in water quality from baseline conditions, it can be assumed that there is no change in sediment quality. If there is some change in water quality (e.g., to above a guideline, or more than 10% higher than baseline), then sediment quality could be monitored to confirm if there is a change in sediment quality.

#### 7.4.6.4 Mitigation Measures

Mitigation and environmental design features that will be implemented to limit changes in water quality include the following:

- Minimize site footprint and reduce alteration of natural drainage areas and watershed boundaries.
- Recycling and re-use of water where possible.
- Design of diversion channels to keep water in natural drainage paths.
- Use of best management practices and protocols for in-water construction activities.
- De-water waterbodies and discharge of this water at a rate to minimize erosion and effects to water quality.
- Application of dust suppression practices, use of covers on transportation trucks, where feasible, and enforcement of speed limits.
- Restoration of natural flow paths during decommissioning.

### 7.4.7 Residual Impact Summary

Residual effects to water quality include effects from the release of mine wastewater, and effects from alteration of watersheds and deposition of dust and metals from air emissions.

Based on the conceptual diffuser design, the predicted mine site water quality and quantity that will be discharged to Meliadine Lake, and the physical mixing attributes in Meliadine Lake in the vicinity of the diffuser, it is predicted that there will be only a minor change in water quality, but that no parameters will exceed CCME guidelines at the edge of the mixing zone. Therefore no residual impacts from the point source discharge of effluent into Meliadine Lake are anticipated. Thus, water in Meliadine Lake, outside of the mixing zone, would be the same as in baseline conditions, and would be considered safe for aquatic life, and for use as drinking water and for recreational activities.

The small waterbodies model was designed to predict changes to surface water quality in the watersheds surrounding the mine. Based on the mine design, all contact water will be contained on the site and directed through ditches and channels to attenuation ponds or the tailings storage facility. There will be no direct pathways for release of contaminated water. In the small watersheds surrounding the mine operations, changes to water quality could result from diversion of water, changes in watershed size and contributing areas, natural hydrological processes, evaporation, and aerial deposition of particulate matter (modelled as TSS), nutrients from blasting activities (modelled as nitrate), and metals (modelled by individual metal parameters). Aerial deposition from mine activities will increase from background levels during Pre-production, peak during pit development, and decrease to background levels by closure.

The water quality model predicted concentrations of TSS and nitrate in the small waterbodies during all mining operation phases, plus closure, and post-closure. Predicted future concentrations were compared to the baseline modelled concentrations. Based on the water quality models, TSS is not predicted to increase to concentrations that would affect aquatic life (i.e., concentrations will be less than guidelines, or less than a 10% difference from baseline conditions) in any waterbody. Based on the water quality model, nitrate is not predicted to increase to concentrations that would affect aquatic life (i.e., concentrations will be less than guidelines, or less than a 10% difference from baseline conditions). Changes to sediment quality as a result of sedimentation

of particulate matter (i.e., TSS), or nutrient input from blasting activities, are anticipated to be minor at most since changes to TSS and nitrate in water are not predicted.

The water quality model also predicted changes in metal concentration in the small waterbodies (Table 7.4-28). Water quality parameters are not expected to be more than background or guidelines in waterbodies A8, A6, H17, H1, J8, and J1. In waterbodies B5, D7, D4, D3, and D1, titanium is expected to be more than 10% higher than background concentrations. In waterbodies I1, CH10, and CH1, titanium and cobalt are expected to be more than 10% higher than background concentrations. In waterbodies B46, B45, P2, and B2, titanium, cobalt, and vanadium are expected to be more than 10% higher than background concentrations. In Lake CH5, 11 parameters are expected to be above guidelines or more than 10% higher than background concentrations. In waterbody CH6, 17 parameters are expected to be above guidelines or more than 10% higher than background concentrations. In waterbody A1, 20 parameters are expected to be above guidelines or more than 10% higher than background concentrations.

Parameters predicted to be above guidelines or more than 10% higher than background concentrations were identified as contaminants of potential concern. The Project will result in effects to water and sediment quality of watersheds in the LSA including watersheds A, B, D, E, H, I, J, and Discovery. The effects are projected to occur during the Pre-production phase, mining phase 1 to mining phase 5, closure, with effects that will continue after closure for the long-term. Classification of the projected effects on water and sediment quality are discussed in Section 7.5 and FEIS Volume 10, Section 10.1 (Environmental Risk Assessment), as based on a residual impact classification system.

**Table 7.4-30 Summary of Water Quality Constituents of Potential Concern**

| Parameter | Is there a WQG ? | COPC ? | A | | | B | | | | | D | | | | H | | I | J | | Discovery | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A8 | A6 | A1 | B5 | B46 | B45 | P2 | B2 | D7 | D4 | D3 | D1 | H17 | H1 | I1 | J8 | J1 | CH6 | CH5 | CH10 | CH1 |
| Total Dissolved Solids | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Alkalinity** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| Total Suspended Solids | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Calcium** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| Chloride | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Fluoride | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Magnesium** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| **Potassium** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| Sodium | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Sulphate | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Ammonia (as N) | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Nitrate (as N) | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Kjeldahl Nitrogen** | N | **Y** | | | √ | | | | | | | | | | | | | | | | | | |
| **Dissolved Phosphorus** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| **Orthophosphate** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| Cyanide | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Aluminum | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Antimony | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Arsenic | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Barium | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Beryllium** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | | | |
| **Total Bismuth** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | | | |

**Table 7.4-30: Summary of Water Quality Constituents of Potential Concern (continued)**

| Parameter | Is there a WQG ? | COPC ? | A | | | B | | | | | D | | | | H | | I | J | | Discovery | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A8 | A6 | A1 | B5 | B46 | B45 | P2 | B2 | D7 | D4 | D3 | D1 | H17 | H1 | I1 | J8 | J1 | CH6 | CH5 | CH10 | CH1 |
| Total Boron | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Cadmium** | Y | **Y** | | | √ | | | | | | | | | | | | | | | √ | | | |
| Total Chromium | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Cobalt** | N | **Y** | | | √ | | √ | √ | √ | √ | | | | | | | √ | | | √ | √ | √ | √ |
| **Total Copper** | Y | **Y** | | | √ | | | | | | | | | | | | | | | √ | | | |
| Total Iron | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Lead** | Y | **Y** | | | √ | | | | | | | | | | | | | | | | | | |
| **Total Lithium** | N | **Y** | | | √ | | | | | | | | | | | | | | | | | | |
| Total Manganese | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Mercury** | Y | **Y** | | | √ | | | | | | | | | | | | | | | √ | | | |
| Total Molybdenum | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Nickel | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Selenium | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Silver** | Y | **Y** | | | √ | | | | | | | | | | | | | | | √ | | | |
| **Total Strontium** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| Total Thallium | Y | N | | | | | | | | | | | | | | | | | | | | | |
| Total Tin | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Titanium** | N | **Y** | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | √ | | | √ | √ | √ | √ |
| **Total Tungsten** | N | **Y** | | | √ | | | | | | | | | | | | | | | √ | √ | | |
| Total Uranium | Y | N | | | | | | | | | | | | | | | | | | | | | |
| **Total Vanadium** | N | **Y** | | | √ | | √ | √ | √ | √ | | | | | | | | | | √ | √ | | |
| Total Zinc | Y | N | | | | | | | | | | | | | | | | | | | | | |

COPC = Constituent of Potential Concern

### 7.4.8 Residual Impact Classification

The purpose of the residual effect classification is to describe the residual effects from the Project on water and sediment quality using a scale of common words, rather than numbers or units. The use of common words or criteria is a requirement in the EIS Guidelines for the Project (NIRB 2012a). The following criteria were used to assess the residual effects from the Project (Table 7.4-31):

- direction;
- magnitude;
- geographic extent;
- duration;
- reversibility;
- frequency; and
- likelihood.

**Table 7.4-31: Definitions of Criteria Used in the Residual Impact Classification of Pathways**

| Direction | Geographic Extent | Duration | Frequency | Reversibility | Likelihood |
|---|---|---|---|---|---|
| **Negative:** a less favourable relative to baseline values<br><br>**Positive:** an improvement over baseline values or conditions | **Local:** small-scale direct and indirect impacts from the Project (e.g., footprint, and dust deposition)<br><br>**Regional:** the predicted maximum spatial extent of combined direct and indirect impacts from the Project that exceed local-scale effects (can include cumulative direct and indirect impacts from the Project and other developments at the regional scale)<br><br>**Beyond Regional:** cumulative local and regional impacts from the Project and other developments extend beyond the regional scale | **Short-term:** impact is reversible at end of construction<br><br>**Medium-term:** impact is reversible at end of closure<br><br>**Long-term:** impact is reversible within a defined length of time beyond closure<br><br>**Unknown**: Impact may be reversible however the length of time cannot be defined<br><br>**Permanent**: impact will last into perpetuity | **Isolated:** impact confined to a specific discrete period<br><br>**Periodic:** impact occurs intermittently but repeatedly over the assessment period<br><br>**Continuous:** impact will occur continually over the assessment period | **Reversible:** Impact will not result in a permanent change of state of the population compared to "similar" environments not influenced by the Project<br><br>**Irreversible:** impact is not reversible (i.e., duration of impact is unknown or permanent) | **Unlikely:** the impact is likely to occur less than one in 100 years<br><br>**Possible:** the impact will have at least one chance of occurring in the next 100 years<br><br>**Likely:** the impact will have at least one chance of occurring in the next 10 years<br><br>**Highly Likely:** the impact is very probable (100% chance) within a year |

Note: magnitude is determined through analysis of residual effects to aquatic biota and human use of the waterbodies

The impacts that remain following mitigation, or residual impacts, for the environmental component was classified using criteria to determine the overall effect, termed the environmental consequence.

For water and sediment quality, the measurement endpoint was concentration of a particular parameter, but the assessment endpoint is suitability of water to support a viable aquatic ecosystem. Measurement endpoints are quantifiable, while assessment endpoints are properties of the valued component that should be protected for use by future human generations or to support an aquatic ecosystem.

Each impact was first described using the following criteria: direction, magnitude, geographic extent, duration, reversibility and frequency (Table 7.4-32):

**Direction:** this may be neutral or negative with respect to the key effect (e.g., neutral could be no measureable change in water quality parameters; a negative change could be a measureable change in water quality parameters).

**Magnitude:** is the degree of change or severity in an assessment endpoint, and is classified as negligible, low, moderate, or high. The categorization of the impact magnitude was based on a set of criteria, ecological concepts and/or professional judgment pertinent to each of the discipline areas and key effects analyzed. For water quality, assessment of magnitude of effect is deferred to the aquatic and risk components to evaluate whether a magnitude of change in particular parameters can have an effect on the end receptor (aquatic biota or human use).

**Geographic extent:** refers to the area affected by the impact and was classified as local, regional, or beyond regional. A method of defining impacts within a study area, in terms of the percentage of a certain resource affected, is influenced by the size of the study areas.

**Duration:** refers to the length of time over which an environmental impact occurs. Short-term, medium-term, or long-term in duration are reversible. For impacts that are permanent, the duration is irreversible.

**Reversibility:** is an indicator of the potential for recovery following the impact.

**Frequency:** describes how often the impact occurs within a given time period and is classified as once, intermittent or continuous in occurrence. Seasonal considerations are discussed when they are important in the evaluation of the impact.

**Table 7.4-32: Summary of Residual Impact Classification for Effects on Water and Sediment Quality**

| Effects Pathway | Direction | Magnitude [a] | Geographic Extent | Duration | Frequency | Reversibility | Likelihood |
|---|---|---|---|---|---|---|---|
| Changes in water and sediment quality due to water emissions | Negative | Negligible to low | Local | Medium-term | Continuous | Reversible | Likely |
| Change in water and sediment quality due to physical alterations of the watersheds and air emissions | Negative | Negligible to low | Local | Medium-term to Permanent | Continuous | Reversible to Irreversible | Likely to Highly likely |

[a] – from fish assessment and risk assessment

The Project has considered a suite of environmental design features that will reduce impacts to water and sediment quality (SD 2-6 Surface Water Management Plan). Contact water will be contained on the site and directed through ditches and channels to attenuation ponds or the TSF. Based on the conceptual diffuser design, and the mine site water quality and quantity assessment, it is predicted that impacts from treated effluent discharge to Meliadine Lake will be negligible (Table 7.4-32). Indirect impacts to water and sediment quality from changes to downstream flows, a result of flow diversions and watershed alteration in upper regions of the LSA sub-basins, will be local in geographic extent (Table 7.4-32).

### 7.4.9 Environmental Significance

The significance of changes to water and sediment quality was assessed through evaluating how predicted changes in water and sediment quality could affect receptors including aquatic life and traditional and non-traditional uses of water (Figure 7.4-10). The evaluation of significance for biophysical VECs considers the entire set of pathways that influence, in this case, the opportunity for traditional and non-traditional use of fish, species health, and the continued opportunity for use of surface water for traditional and non-traditional uses. All pathways that impact water and sediment quality are used in these significance assessments. The relative impact from each pathway is discussed; however, pathways that are predicted to have the greatest influence on changes in opportunity for traditional and non-traditional use of fish, species health (including fish, waterbirds, benthic invertebrates, and plankton), and the continued opportunity for use of surface water for traditional and non-traditional uses, other than fishing, are assumed to contribute the most to the determination of environmental significance.

Changes in specific water and sediment quality parameters such as major ions or metals does not provide the full context to evaluate the standalone significance of the change for these VECs. For a change in a water or sediment quality parameter to be significant, it needs to be evaluated in terms of change perceived by the receptor including the ability to eat the fish (i.e., healthy invertebrate populations and healthy fish), the ability to drink the water, the continued opportunity for use of surface water for traditional and non-traditional uses, and continued healthy aquatic life.

The Project should not have a significant adverse impact on the continued opportunity for traditional and non-traditional use of fish in the local study area and beyond (Section 7.5), on the health of aquatic life (Section 10.1), or on human health (Section 10.2). Therefore, the Project will not have a significant adverse impact on water and sediment quality.

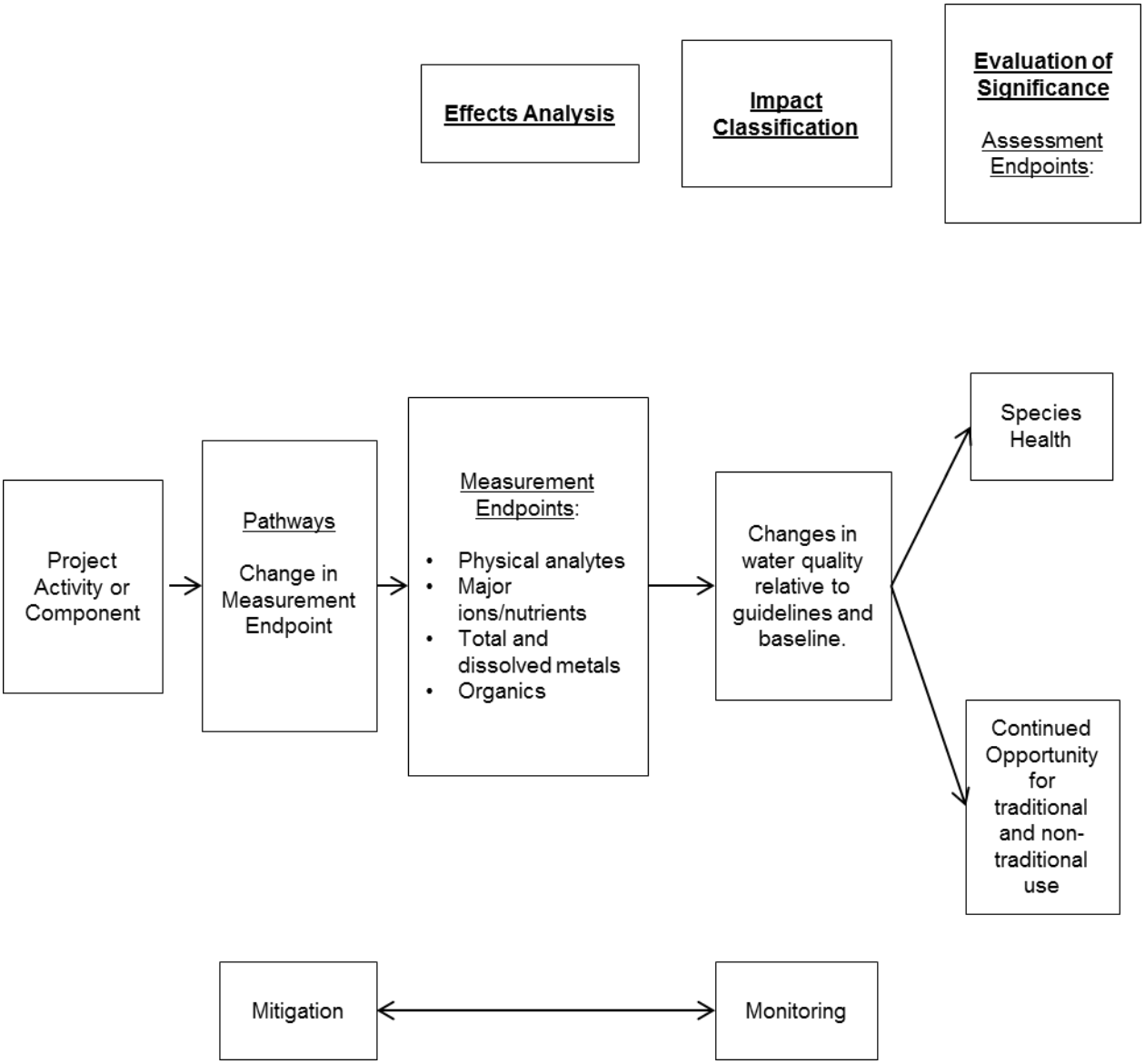



*Figure 7.4-10: Assessment Approach*

## 7.4.10 Cumulative Effects

Effects to water and sediment quality are anticipated to be confined to the Meliadine Lake watersheds. Effects to water and sediment quality in one part of the watershed may overlap with effects to other areas of the watershed. Existing and historical development (FEIS Volume 4, Section 4.5.2) indicates that there have been few developments within these watersheds, and no other projects, other than the proposed Manitoba to Nunavut Road that may cross the Meliadine River watershed, are reasonably foreseeable that may also affect water and sediment quality in these watersheds; thus, the cumulative effect is expected to be negligible.

The Meliadine Project has been designed with some growth in mind (FEIS, Section 2.3). This growth will be limited to the known ore bodies and does not extend to ore bodies not yet discovered. Any further ore bodies would have to be addressed through future phases of development, which would have to undergo future environmental assessment.

The Wolf deposit, located north-west of the Tiriganiaq deposit, is currently known, but still requires some exploration work to be better defined and included in the mine plan. Currently, the Wolf deposit does not have sufficient proven reserves to be economically mined; however, there are strong possibilities that this deposit could be economically developed in the future should exploration results and the associated economic analyses be successful.

Addition of the Wolf Deposit to the Project will change the results of water quality modelling (Section 7.4.6.2; Appendix 7.4-1). If the Wolf deposit becomes economically feasible to develop, updated water quality models and predictions would be completed.

### *7.4.10.1 Effects of Long-Term Warming Trends*

In general, the climate in the Project region is projected to be warmer for the 2050s and 2080s time horizons when compared to the observed historic values (Section 5.4). Precipitation shows a larger per cent increase compared to historical values, but the majority of projections are not significantly different from the annual recorded precipitation values. In general, by the 2080s, the fall and winter periods show the largest projected increases in temperature, whereas the fall and summer show the largest increases in precipitation (Section 5.4).

Long-term warming trends are expected to result in no measurable environmental change and no residual effects to hydrogeology and groundwater due to predicted minimal effects to permafrost and to development of permafrost below the tailings storage facility (Section 7.2.3.6). The net effects of long-term warming trends on hydrology discharge patterns are uncertain, but changes to annual peak spring high flows and summer low flows are anticipated to be negligible (Section 7.3.5.1). As the water quality predictions models are tied to baseline and predicted hydrology, long-term warming is also predicted to result in negligible changes to water and sediment quality.

Water and sediment quality will be monitored (Section 7.4.9) to verify these assumptions and to verify the water quality model predictions

## 7.4.11 Monitoring and Follow-Up

Monitoring and follow-up for water and sediment quality includes sampling programs for waterbodies and watercourses near the mine, and watercourses along the AWAR and near Rankin Inlet. It is anticipated that the sampling program for the mine will be complex in terms of sampling locations, sampling frequencies, and sampling parameters in order to appropriately monitor mining activities and potential impacts to water and sediment quality. This sampling program will be conducted as part of the AEMP. A sampling program will also be required to regularly monitor drinking water for the camps (both source water and treated water). It is also anticipated that a sampling program will be required to monitor water quality in representative watercourses crossed by the AWAR. Monitoring will be conducted during pre-development, operations, closure, and post-closure. It is anticipated that the information from baseline data collection, mine design, environmental

assessment predictions, traditional knowledge, and traditional use of the landscape will be used to determine appropriate sampling locations for future monitoring programs.

# 7.5 Fish and Fish Habitat

## 7.5.1 Introduction

The purpose of this section is to describe the baseline conditions for fish and fish habitat (i.e., aquatic habitat) and assess the effects of the Project on fish and the fish habitat environment. This assessment includes potential changes resulting from Project-related components and associated activities, including air quality, water quality, and water quantity. The effects assessment will evaluate all Project phases, including construction, operation, temporary closure, final closure, and post-closure. Indirect and cumulative effects have been incorporated throughout this section, where applicable.

### *7.5.1.1 Concordance with the Guidelines*

The purpose of this section is to address the Guidelines issued by the NIRB for the Project (NIRB 2012a), specifically relating to the impact of the proposed Project on fish and the fish habitat environment. The complete Guidelines for the Project, including FEIS section and page number referencing, are summarized in the main FEIS concordance table (FEIS Volume 1, Appendix 1.0-A).

The specific requirements set out in the guidelines relating to the baseline and the impact assessment for fish and fish habitat are also presented in Volume 1, Appendix 1.0-A.

## 7.5.2 Valued Ecosystem Components

Valued ecosystem components and VSECs represent physical, biological, cultural, social, and economic properties of the environment that are either legally, politically, publically, or professional recognized as important to a particular region, community, or by society as a whole. A range of VECs were selected for the Project for assessing fish and fish habitat (i.e., aquatic habitat) (Table 7.5-1).

**Table 7.5-1: Summary of Valued Ecosystem Components, and their Assessment and Measurement Endpoints for Fish and Fish Habitat (i.e., Aquatic Habitat)**

| Valued Ecosystem Component | Rationale for Valued Ecosystem Components | Assessment Endpoint | Measurement Endpoint |
|---|---|---|---|
| Fish habitat (as defined by DFO) | Protected under the *Fisheries Act*; changes to fish habitat have the potential to adversely affect fish health, and the persistence of self-sustaining populations; habitat characterized by all fish species, including forage species | ■ Habitat Units (as part of Offsetting Plan) | ■ Habitat units |
| Arctic char | Focus of commercial and subsistence fishery in the Hudson Bay; represents important ecosystem processes given that the species occupies top trophic positions and is relatively abundant in the region. | ■ Abundance and distribution<br>■ Continued opportunity for traditional and non-traditional use of fish | ■ Habitat quantity and fragmentation<br>■ Habitat quality, lower trophic levels<br>■ Fish health, including survival and reproduction<br>■ Access to fish |
| Lake trout | Important to communities for subsidence use and are a popular sport-fish in Nunavut; represents important ecosystem processes given that the species occupies top trophic positions and is relatively abundant in the region. | | |
| Arctic grayling | Important to communities for subsidence use and are a popular sport-fish in Nunavut; represents important ecosystem processes given that the species occupies top trophic positions and is relatively abundant in the region. | | |

DFO = Department of Fisheries and Oceans Canada

Factors considered when selecting VECs included the following (Salmo 2006):

- biophysical components identified by NIRB during Project scoping and AEM community and stakeholder consultation;
- represent important ecosystem processes;
- territorial and federal listed (COSEWIC 2012; *SARA* 2012, CESCC 2001, 2006) species;
- communities or species that reflect the interests of regulatory agencies, First Nations groups, and communities;
- can be measured or described with measurement endpoints;
- allow cumulative effects to be considered; and
- current experience with environmental assessments and effects monitoring programs in Nunavut and the Northwest Territories.

Habitat loss and alteration or contamination have the potential to adversely affect fish health, and the persistence of self-sustaining populations, while contaminants in the fish and changes to the population dynamics have the potential to adversely affect human health and traditional and non-traditional users of fish.

Fish habitat was selected as a valued component specifically for the Offsetting plan and assessment of habitat units because the federal *Fisheries Act* explicitly calls for the protection of fish habitat. The principle provision (Section 35(2)) states that no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, where 'serious harm to fish' is defined as the death of fish or any permanent alteration to, or destruction of, fish habitat. Furthermore, use of fish habitat

as a VEC in the assessment provides an assessment of the fish community and life history requirements for all species. The fish habitat VEC addresses all species of fish, including forage species, with emphasis on habitat for species that are relatively abundant and with fishery value. Forage species did not meet the criteria used to select VECs; however, they were considered as a measurement endpoint (as fish habitat) and assessed as part of the Offsetting Plan. More details are provided within the Offsetting Plan (SD 7-4).

Domestic fishing is an important part of the Inuit way of life, accounting for as much as 20% of the diet of the residents of Rankin Inlet and Chesterfield Inlet. Most of the lakes in the Meliadine area are fished for lake trout and Arctic char (Volume 9, Section 9.3.1.3.3). Fishing for both Arctic char and Arctic grayling continue to be important to the people in the region (Volume 9, Section 9.3.1.5.1.3). IQ

The selection of highly valued fish species was based on a list of fish species present in the LSA, including the Meliadine Lake Peninsula. Nine species identified during baseline studies (SD 7-1 and SD 7-2) could be considered as VECs. Of these, none were classified as federally listed species or species with a designated conservation status. Furthermore, there were no 'basin endemic' species observed in the LSA, species that would be regarded as potentially sensitive or intolerant to environmental change (Segurado et al. 2011). Thus, additional criteria were used to select highly valued fish species as VECs for the assessment and were as follows:

- economic importance to traditional and non-traditional users;
- relative abundance in the Meliadine Lake and Peninsula;
- trophic position; and
- unique life history requirements (see Appendix 7.5-H).

VEC selection identified Arctic char, lake trout, and Arctic grayling because they are species of economic and cultural importance to traditional users in Nunavut, and represent important ecosystems processes (e.g., they are relatively abundant and occupy top trophic positions in their respective food web). Domestic fishing, on the other hand, is still an important part of the Inuit lifeway, accounting for as much as 20% of the diet of the residents of Rankin Inlet and Chesterfield Inlet. Most of the lakes in the Meliadine area are fished for lake trout and Arctic char (Volume 9, Section 9.3.1.3.3). Fishing for both Arctic char and Arctic grayling continue to be important to the people in the region (Volume 9, Section 9.3.1.5.1.3). At the base of the ecosystem, phytoplankton in lake water and periphyton on shoreline rocks use nutrients and carbon sources for growth, and provide food to benthic invertebrates and zooplankton. Zooplankton feed directly on phytoplankton, while benthic invertebrates feed on periphyton and decaying organic material that settle on the bottom of waterbodies. Fish feed on zooplankton and benthic invertebrates, and predatory fish feed on smaller fish. IQ

The VECs were also selected because they are characterized by unique life history requirements. All 3 species share adfluvial and/or anadromous life history traits of migrating between lakes or rivers and streams. These life history traits may preclude a species tenacity to endure hardship in the context that if either stream habitat or lake habitat is lost because of, for example, a barrier between the two habitat types, there could be implications for the long-term maintenance (or persistence) of local fish abundance into the future. Habitat loss through habitat fragmentation can be a significant factor exacerbating population declines for species such as Arctic grayling (MacPherson et al. 2012).

Key properties of the proposed VECs, such as abundance and distribution, are assessment endpoints that should be protected for their use by future generations (Table 7.5-1). For the assessment, measurement endpoints were chosen to evaluate the assessment endpoints. Specifically the measurement endpoints were quantifiable (i.e., measurable) expressions of changes to assessment endpoints, for example, quality and quantity habitat for various life history stages. This would include foraging habitat (i.e., areas that supporting forage fish species) and the status of lower trophic levels.

## 7.5.3 Study Area

### *7.5.3.1 Local Study Area*

The extent of the LSA varies for the proposed mine site, AWAR, and Rankin Inlet Project locations. For the proposed mine site area, the LSA includes watercourses and waterbodies under the direct mine footprint, and those watercourses and waterbodies that will receive water from dewatered ponds and treated effluent discharge. The LSA in the proposed mine site area includes watercourses and waterbodies on the Peninsula (including Basins A, B, C, D, E, G, H, I, J, and P), Meliadine Lake, and the Chickenhead watershed (Table 7.5-2).

The LSA along the AWAR includes watercourses crossed by the road corridor, 100 m upstream and downstream of the crossing. The LSA in the Rankin Inlet area includes watercourses crossed by the bypass road, and other Project infrastructure (e.g., fuel storage area, storage facility) with the potential for direct impact to surface waters. No waterbodies are located in the AWAR or Rankin Inlet LSAs.

**Table 7.5-2: Abbreviations for Watercourses and Waterbodies Surveyed for the Proposed Project, 1997 to 2012**

| Location | Naming Code | Description |
|---|---|---|
| LSA | A, B, C, D, E, F, G, H, I, J, P | Watersheds within Peninsula on Meliadine Lake |
| | CH | Chickenhead Lake watershed (part of Meliadine Lake drainage) |
| | ML | Meliadine Lake |
| | ML-C | Meliadine Lake (Central Basin) |
| | ML-E | Meliadine Lake (East Basin) |
| | ML-S | Meliadine Lake (South Basin) |
| | ML-SE | Meliadine Lake (Southeast portion of South Basin) |
| | ML-W | Meliadine Lake (West Basin) |
| | Boot 2 | Meliadine Lake near the “boot”, north of Site ML-E |
| RSA | K, L, M, N, O | Watersheds within Peninsula on Meliadine Lake |
| | DR | Diana River |
| | CON | Control Lake |
| | HSL | Horseshoe Lake (part of LML drainage) |
| | LML | Little Meliadine Lake |
| | ML-MR | Meliadine Lake outlet to Meliadine River |
| | ML-PL | Meliadine Lake outlet to Peter Lake |
| | MR | Meliadine River |
| | MR-L | Lower Meliadine River (downstream of LML) |
| | MR-U | Upper Meliadine River (between LML and ML) |
| | PL | Peter Lake |
| Other | HB | Hudson Bay |
| | PAR | Parallel Lake |
| | PB | Prairie Bay (part of Hudson Bay) |

### 7.5.3.2 Regional Study Area

The RSA includes the area with the potential for direct, indirect, and/or cumulative effects impacts due to Project activities (Figure 7.1-5). In addition to the mine, AWAR, and Rankin Inlet portions of the LSA, the RSA includes watersheds within the Peninsula (Basins K, L, M, N, and O), Meliadine Lake, the Meliadine River (including Little Meliadine Lake), the Atulik River watershed, the Char River watershed, the Diana River watershed (including Peter and Diana lakes), as well as the Rankin Inlet and Hudson watersheds that drain directly into the Hudson Bay.

## 7.5.4 Baseline Environment

This section provides an overview of the baseline sampling programs conducted in support of the proposed Project (Tables 7.5-3 to 7.5-5; SD 7-1 2009 Aquatics Synthesis Baseline; SD 7-2 2011 Aquatics Baseline). Additional information on sampling activities can be located in Appendices 7.5-A to 7.5-H where all effort and data collected for the baseline have been summarized in tables.

Between 1997 and 2012, fish and fish habitat in the LSA and RSA were sampled in 10 different years. Investigations were focused on determining the distribution of fish species throughout the watersheds, movements of Arctic char, lake trout, and Arctic grayling using radio telemetry, and the timing and size of the Arctic char run in the Meliadine River. Surveys also were conducted to identify habitat features with regard to their suitability for spawning, rearing, migration, and overwintering, and to characterize lower trophic communities (including periphyton, phytoplankton, zooplankton, and benthic invertebrate).

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aquatic Habitat** | **Habitat Assessments and In-situ Water Quality** | LSA | A | Stream | A0-1 | X | X | | | | | | | |
| | | | | Lake | A1 | X | | | | | | | X | |
| | | | | Pond | A10 | | | | | | X | | | |
| | | | | Pond | A12 | | | | | | X | | | |
| | | | | Stream | A1-2 | X | X | | | | | | | |
| | | | | Pond | A13 | | | | | | X | | | |
| | | | | Pond | A17 | | X | | | | | | | |
| | | | | Pond | A19 | | | | | | | | | X |
| | | | | Pond | A2 | X | | | | | | | X | |
| | | | | Stream | A2-3 | X | X | | | | | | | |
| | | | | Pond | A3 | | | | | | | | | X |
| | | | | Stream | A3-4 | X | X | | | | | | | |
| | | | | Pond | A35 | | | | | | X | | | |
| | | | | Pond | A37 | | | | | | X | | | |
| | | | | Pond | A38 | | | | | | X | | | |
| | | | | Pond | A39 | | | | | | X | | | |
| | | | | Stream | A39-54 | | | | X | | | | | |
| | | | | Pond | A4 | | | | | | | | | X |
| | | | | Pond | A40 | | | | | | X | X | | |
| | | | | Pond | A44 | | | | | | | | X | |
| | | | | Stream | A44-45 | | X | | X | | | | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pond | A45 | | | | | | | | X | |
| | | | | Stream | A4-5 | X | X | | | | | | | |
| | | | | Stream | A45-46 | | | | | | X | | | |
| | | | | Lake | A46 | | | | | | | | X | |
| | | | | Pond | A49 | | | | | | | | X | |
| | | | | Pond | A5 | X | | | | | | X | | |
| | | | | Pond | A50 | | | | | | | X | | |
| | | | | Pond | A51 | | | | | | | X | | |
| | | | | Pond | A52 | | | | | | X | | | |
| | | | | Pond | A53 | | | | | | | X | | |
| | | | | Pond | A54 | | X | | | | X | | | |
| | | | | Stream | A5-6 | X | X | | | | | X | | |
| | | | | Pond | A58 | | X | | | | | | | |
| | | | | Lake | A6 | X | X | | | | | X | | |
| | | | | Stream | A6-7 | X | X | | X | | X | | | |
| | | | | Pond | A7 | | | | | | | | X | |
| | | | | Stream | A7-8 | X | X | | | | | | | |
| | | | | Lake | A8 | X | X | | | | | | | |
| | | | | Stream | A8-37 | | X | | | | | | | |
| | | | | Stream | A8-40 | | X | | X | | | | | |
| | | | | Stream | A8-9 | | X | | | | | | | |
| | | | | Pond | A9 | | | | | | X | | | |
| | | | AWAR | Stream | D1.2 | | | | | | X | | | |
| | | | | Stream | D5.4 | | | | | | | | | X |
| | | | | Stream | D5.8 | | | | | | X | | | |
| | | | | Stream | D8.8 | | | | | | | | | X |
| | | | | Stream | M11.5 | | | | | | X | | | |
| | | | | Stream | M11.6 | | | | | | X | | | |
| | | | | Stream | M13.3 | | | | | | X | | | |
| | | | | Stream | M2.1 | | | | | | X | | | |
| | | | | Stream | M22.6 | | | | | | X | | | |
| | | | | Stream | M23.7 | | | | | | X | | | |
| | | | | Stream | M3.0 | | | | | | X | | | |
| | | | | Stream | M3.9 | | | | | | X | | | |
| | | | | Stream | M5.0 | | | | | | X | | | |
| | | | | Stream | M8.6 | | | | | | X | | | |
| | | | B | Stream | B0-1 | X | X | | | | | | | |
| | | | | Pond | B10 | | X | | | | X | X | | |
| | | | | Stream | B1-2 | X | X | | | | | | | |
| | | | | Lake | B2 | X | X | | | | | | | |
| | | | | Pond | B25 | | | | | | | X | | |
| | | | | Pond | B28 | | | | | | | X | | |
| | | | | Pond | B30 | | | | | | X | | X | |
| | | | | Stream | B30-6 | | | | | | | | X | |
| | | | | Pond | B31 | | | | | | X | | | |
| | | | | Stream | B31-30 | | | | | | | | X | |
| | | | | Stream | B31-32 | | | | | | | | X | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pond | B32 | | | | | | X | | X | |
| | | | | Pond | B33 | | | | | | X | | | |
| | | | | Pond | B33a | | | | | | | X | | |
| | | | | Lake | B34 | | | | | | | | X | |
| | | | | Stream | B3-4 | X | X | | | | | | | |
| | | | | Pond | B36 | | | | | | | | X | |
| | | | | Lake | B4 | X | X | | | | | | X | |
| | | | | Stream | B4-36 | X | | | | | | | | |
| | | | | Stream | B4-45 | X | | | | | | | X | |
| | | | | Lake | B45 | X | | | | | | | X | |
| | | | | Stream | B4-5 | X | X | | | | | | | |
| | | | | Stream | B45-46 | X | | | | | | | | |
| | | | | Lake | B46 | X | | | | | | | X | |
| | | | | Stream | B46-66 | | X | | X | | | | | |
| | | | | Lake | B5 | X | X | | | | | | | |
| | | | | Pond | B51 | X | | | | | | | | |
| | | | | Stream | B51-52 | X | | | | | | | | |
| | | | | Lake | B52 | X | | | | | | | X | |
| | | | | Stream | B52-53 | X | | | | | | | | |
| | | | | Stream | B52-75 | | | | X | | | | | |
| | | | | Lake | B53 | | | | | | | | X | |
| | | | | Stream | B5-31 | | | | | | | | X | |
| | | | | Stream | B53-54 | | X | | X | | | | | |
| | | | | Stream | B5-6 | X | X | | | | | | | |
| | | | | Lake | B59 | | | | | | | | | X |
| | | | | Lake | B6 | X | | | | | X | | | |
| | | | | Lake | B60 | | | | | | | | | X |
| | | | | Pond | B61 | | | | | | | | | X |
| | | | | Pond | B62 | | | | | | | | | X |
| | | | | Stream | B6-7 | X | X | | | | | | | |
| | | | | Stream | B68-69 | X | X | | X | | | | | |
| | | | | Lake | B69 | | | | | | | | X | |
| | | | | Lake | B7 | X | X | | | | X | | | |
| | | | | Stream | B75-80 | | | | X | | | | | |
| | | | | Stream | B7-8 | | X | | | | | | | |
| | | | | Pond | B8 | | | | | | X | X | | |
| | | | | Pond | B9 | | X | | | | X | X | | |
| | | | C | Lake | C10 | | | | | | | | X | |
| | | | | Pond | C6 | | | | | | | | X | |
| | | | | Pond | C7 | | | | | | | | X | |
| | | | CH | Lake | CH6 | | | | | | X | | | |
| | | | D | Stream | D0-1 | X | X | | X | | | | | |
| | | | | Lake | D1 | X | X | X | X | | | X | X | |
| | | | | Stream | D1-2 | X | | | | | | | | |
| | | | | Pond | D2 | X | | | | | | | | |
| | | | | Lake | D23 | | | | | | | | X | |
| | | | | Lake | D3 | X | | | | | | | X | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Stream | D3-4 | X | | | | | | | | |
| | | | | Pond | D4 | X | | | | | | | X | |
| | | | | Stream | D4-5 | X | | | | | | | | |
| | | | | Lake | D5 | X | | | | | | | X | |
| | | | | Stream | D5-6 | X | | | | | | | | |
| | | | | Pond | D6 | | | | | | | | X | |
| | | | | Stream | D6-7 | X | | | | | | | | |
| | | | | Lake | D7 | X | | | | | | | | |
| | | | | Lake | D8 | | | | | | | | X | |
| | | | E | Lake | E3 | | | | | | | | X | |
| | | | | Lake | E4 | | | | | | | | X | |
| | | | | Stream | E4-5 | | | | | | | | X | |
| | | | F | Stream | F0-1 | X | | | | | | | | |
| | | | | Stream | F5-6 | X | | | | | | | | |
| | | | G | Stream | G0-1 | X | | | | | | X | | |
| | | | | Pond | G1 | | | | | | | X | | |
| | | | | Stream | G1-2 | X | | | | | | | | |
| | | | | Lake | G2 | X | | | | | | X | | |
| | | | H | Stream | H0-1 | | | | | | | X | | X |
| | | | | Pond | H1 | | | | | | X | X | | |
| | | | | Pond | H10 | | | | | | X | X | | |
| | | | | Pond | H11 | | | | | | X | X | | |
| | | | | Pond | H12 | | | | | | X | X | | |
| | | | | Stream | H1-2 | | | | | | | | | X |
| | | | | Pond | H13 | | | | | | X | X | | |
| | | | | Pond | H14 | | | | | | X | X | | |
| | | | | Pond | H14a | | | | | | | X | | |
| | | | | Pond | H15 | | | | | | X | X | | |
| | | | | Pond | H15d | | | | | | | X | | |
| | | | | Pond | H15e | | | | | | | X | | |
| | | | | Pond | H15g | | | | | | | X | | |
| | | | | Pond | H16 | | | | | | X | X | | |
| | | | | Pond | H17 | | | | | | X | X | X | |
| | | | | Pond | H18 | | | | | | X | X | | |
| | | | | Pond | H19 | | | | | | X | | | |
| | | | | Pond | H2 | | | | | | X | X | | |
| | | | | Pond | H20 | | | | | | X | | X | |
| | | | | Stream | H2-3 | | | | | | | | | X |
| | | | | Pond | H2a | | | | | | | X | | |
| | | | | Pond | H3 | | | | | | X | X | | |
| | | | | Stream | H3-4 | | | | | | | | | X |
| | | | | Pond | H4 | | | | | | X | X | | |
| | | | | Stream | H4-5 | | | | | | | | | X |
| | | | | Pond | H5 | | | | | | X | X | | |
| | | | | Stream | H5-17 | | | | | | | X | | X |
| | | | | Pond | H6 | | | | | | X | X | | |
| | | | | Pond | H7 | | | | | | X | X | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pond | H8 | | | | | | X | X | | |
| | | | | Pond | H9 | | | | | | X | X | | |
| | | | J | Pond | I1 | | | | | | | | | X |
| | | | | Stream | J0-1 | | | | | X | | | | |
| | | | | Lake | J1 | | | | | | | X | | X |
| | | | | Pond | J2 | | | | | | | | | X |
| | | | | Pond | J3 | | | | | | | | | X |
| | | | | Pond | J4 | | | | | | | | | X |
| | | | | Pond | J5 | | | | | | | | | X |
| | | | | Pond | J6 | | | | | | | | | X |
| | | | | Pond | J7 | | | | | | | | | X |
| | | | | Pond | J8 | | | | | | | | | X |
| | | | ML | Lake | ML-E | X | | | | | | | | |
| | | | | Lake | ML-S | X | X | | | | | | | |
| | | | | Lake | ML-W | | | X | X | | | | | |
| | | | P | Pond | P2 | | | | | | | | X | |
| | | RSA | Control | Lake | Control | | | | | | | | X | |
| | | | LML | Lake | HSL | | | | X | | | | | |
| | | | | Stream | HSL-W | | X | | X | | | | | |
| | | | | Lake | LML | X | X | X | X | | | | | |
| | | | | Lake | W | | | | X | | | | | |
| | | | | Stream | W-LML | | | | X | | | | | |
| | | | ML | Stream | ML-PL | | X | X | X | | | | | |
| | | | MR | Stream | LML-MR | | X | | | | | | | |
| | | | | Stream | ML-MR | X | X | | | | | | | |
| | | | | Stream | MR-L | X | X | X | | | | | | |
| | | | | Stream | MR-U | X | | X | | | | | | |
| | | | O | Pond | O2 | | | | | | | | X | |
| | | | | Pond | O4 | | | | | | | | X | |
| | **Bathymetry** | LSA | A | Lake | A1 | | | | | | | | X | |
| | | | | Lake | A46 | | | | | | | | X | |
| | | | | Lake | A54 | | X | | | | | | | |
| | | | | Lake | A6 | | X | | | | | | | |
| | | | | Lake | A7 | | | | | | | | X | |
| | | | | Lake | A8 | | X | | | | | | | |
| | | | B | Pond | B10 | | X | | | | | | | |
| | | | | Lake | B2 | | X | | | | | | | |
| | | | | Lake | B4 | | X | | | | | | | |
| | | | | Lake | B45 | | | | | | | | X | |
| | | | | Lake | B46 | | | | | | | | X | |
| | | | | Lake | B5 | | X | | | | | | | |
| | | | | Lake | B52 | | | | | | | | X | |
| | | | | Lake | B53 | | | | | | | | X | |
| | | | | Lake | B6 | | X | | | | | | | |
| | | | | Lake | B69 | | | | | | | | X | |
| | | | | Lake | B7 | | X | | | | | | | |
| | | | | Pond | B9 | | X | | | | | | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | Lake | C10 | | | | | | | | X | |
| | | | | Pond | C6 | | | | | | | | X | |
| | | | | Pond | C7 | | | | | | | | X | |
| | | | CH | Lake | CH1 | | | | | | | | X | |
| | | | | Lake | CH6 | | | | | | X | | X | |
| | | | D | Lake | D1 | | X | | | | | | | |
| | | | | Lake | D23 | | | | | | | | X | |
| | | | | Lake | D3 | | | | | | | | X | |
| | | | | Lake | D4 | | | | | | | | X | |
| | | | | Lake | D5 | | | | | | | | X | |
| | | | | Lake | D6 | | | | | | | | X | |
| | | | | Lake | D7 | | X | | | | | | | |
| | | | | Lake | D8 | | | | | | | | X | |
| | | | E | Lake | E3 | | | | | | | | X | |
| | | | | Lake | E4 | | | | | | | | X | |
| | | | | Lake | E5 | | | | | | | | X | |
| | | | H | Pond | H17 | | | | | | | | X | |
| | | | | Pond | H20 | | | | | | | | X | |
| | | | J | Lake | J1 | | | | | | | X | | |
| | | | ML | Lake | ML-E | X | | | | | | | | |
| | | | | Lake | ML-S | | X | | | | | | | |
| | | RSA | Control | Lake | Control | | | | | | | | X | |
| | | | O | Pond | O2 | | | | | | | | X | |
| | | | | Pond | O4 | | | | | | | | X | |
| | **Temperature Monitoring** | LSA | A | Stream | A0-1 | | X | X | X | | | | | |
| | | | | Lake | A6 | | | X | X | | | | | |
| | | | | Lake | A8 | | X | | | | | | | |
| | | | B | Stream | B1-2 | | X | X | X | | | | | |
| | | | | Lake | B2 | | X | X | X | | | | | |
| | | | | Stream | B4-5 | | X | | | | | | | |
| | | | | Lake | B5 | | X | | | | | | | |
| | | | ML | Lake | ML-E | X | X | | | | | | | |
| | | | | Lake | ML-S | | X | X | X | | | | | |
| | | RSA | Control | Lake | Control | | | X | X | | | | | |
| | | | ML | Stream | ML-MR | | X | X | X | | | | | |
| | | | | Stream | ML-PL | | X | | X | | | | | |
| | | | | Stream | MR-L | | X | X | X | | | | | |
| | | | PL | Lake | PL | | X | | | | | | | |
| **Fish Populations** | **Backpack Electrofishing** | LSA | A | Stream | A0-1 | X | X | | | | | | | |
| | | | | Pond | A10 | | | | | | X | | | |
| | | | | Pond | A12 | | | | | | X | | | |
| | | | | Stream | A1-2 | X | X | | | | | | | |
| | | | | Pond | A13 | | | | | | X | | | |
| | | | | Pond | A17 | | X | | | | | | | |
| | | | | Stream | A2-3 | X | X | | | | | | | |
| | | | | Stream | A3-4 | X | X | | | | | | | |
| | | | | Pond | A35 | | | | | | X | | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pond | A37 | | | | | | X | | | |
| | | | | Pond | A38 | | | | | | X | | | |
| | | | | Pond | A39 | | | | | | X | | | |
| | | | | Stream | A39-54 | | | | X | | | | | |
| | | | | Pond | A40 | | | | | | X | X | | |
| | | | | Stream | A44-45 | | X | | X | | | | | |
| | | | | Stream | A4-5 | X | X | | | | | | | |
| | | | | Stream | A45-46 | | | | | | X | | | |
| | | | | Pond | A5 | | | | | | | X | | |
| | | | | Pond | A50 | | | | | | | X | | |
| | | | | Pond | A51 | | | | | | | X | | |
| | | | | Pond | A53 | | | | | | | X | | |
| | | | | Pond | A54 | | | | | | X | | | |
| | | | | Stream | A5-6 | X | X | | | | | X | | |
| | | | | Pond | A58 | | X | | | | | | | |
| | | | | Stream | A6-7 | X | X | | X | | X | | | |
| | | | | Stream | A7-8 | X | X | | | | | | | |
| | | | | Stream | A8-37 | | X | | | | | | | |
| | | | | Stream | A8-40 | | X | | X | | | | | |
| | | | | Stream | A8-9 | | X | | | | | | | |
| | | | | Pond | A9 | | | | | | X | | | |
| | | | AWAR | Stream | M2.1 | | | | | | X | | | |
| | | | | Stream | M3.0 | | | | | | X | | | |
| | | | | Stream | M3.9 | | | | | | X | | | |
| | | | | Stream | M5.0 | | | | | | X | | | |
| | | | | Stream | M8.6 | | | | | | X | | | |
| | | | | Stream | M11.5 | | | | | | X | | | |
| | | | | Stream | M13.3 | | | | | | X | | | |
| | | | | Stream | M22.6 | | | | | | X | | | |
| | | | | Stream | M23.7 | | | | | | X | | | |
| | | | | Stream | D1.2 | | | | | | X | | | |
| | | | | Stream | D5.4 | | | | | | | | | X |
| | | | | Stream | D8.8 | | | | | | | | | X |
| | | | B | Stream | B0-1 | X | X | | | | | | | |
| | | | | Pond | B10 | | | | | | X | X | | |
| | | | | Stream | B1-2 | X | X | | | | | | | |
| | | | | Pond | B25 | | | | | | | X | | |
| | | | | Pond | B28 | | | | | | | X | | |
| | | | | Pond | B30 | | | | | | X | | X | |
| | | | | Pond | B31 | | | | | | X | | | |
| | | | | Pond | B32 | | | | | | X | | X | |
| | | | | Pond | B33 | | | | | | X | | | |
| | | | | Stream | B3-4 | X | X | | | | | | | |
| | | | | Stream | B4-36 | X | | | | | | | | |
| | | | | Stream | B4-45 | X | | | | | | | X | |
| | | | | Stream | B4-5 | X | X | | | | | | | |
| | | | | Stream | B45-46 | X | | | | | | | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Stream | B46-66 | | X | | X | | | | | |
| | | | | Stream | B51-52 | X | | | | | | | | |
| | | | | Stream | B52-53 | X | | | | | | | | |
| | | | | Stream | B52-75 | | | | X | | | | | |
| | | | | Stream | B53-54 | | X | | X | | | | | |
| | | | | Stream | B5-6 | X | X | | | | | | | |
| | | | | Stream | B6-7 | X | X | | | | | | | |
| | | | | Stream | B68-69 | X | X | | X | | | | | |
| | | | | Stream | B75-80 | | | | X | | | | | |
| | | | | Stream | B7-8 | | X | | | | | | | |
| | | | | Pond | B8 | | | | | | X | X | | |
| | | | | Pond | B9 | | | | | | X | X | | |
| | | | | Stream | B5-31 | | | | | | | | X | |
| | | | | Stream | B30-6 | | | | | | | | X | |
| | | | | Stream | B31-30 | | | | | | | | X | |
| | | | | Pond | B36 | | | | | | | | X | |
| | | | | Pond | B33a | | | | | | | X | | |
| | | | D | Stream | D0-1 | X | X | | | | | | | |
| | | | | Stream | D1-2 | X | | | | | | | | |
| | | | | Stream | D3-4 | X | | | | | | | | |
| | | | | Stream | D4-5 | X | | | | | | | | |
| | | | | Stream | D5-6 | X | | | | | | | | |
| | | | | Stream | D6-7 | X | | | | | | | | |
| | | | | Pond | D6 | | | | | | | | X | |
| | | | E | Stream | E4-5 | | | | | | | | X | |
| | | | F | Stream | F0-1 | X | | | | | | | | |
| | | | | Stream | F5-6 | X | | | | | | | | |
| | | | G | Stream | G0-1 | X | | | | | | X | | |
| | | | | Pond | G1 | | | | | | | X | | |
| | | | | Stream | G1-2 | X | | | | | | | | |
| | | | H | Stream | H0-1 | | | | | | | X | | X |
| | | | | Pond | H1 | | | | | | X | X | | |
| | | | | Pond | H10 | | | | | | X | X | | |
| | | | | Pond | H11 | | | | | | X | X | | |
| | | | | Pond | H12 | | | | | | X | X | | |
| | | | | Pond | H13 | | | | | | X | X | | |
| | | | | Pond | H14 | | | | | | X | X | | |
| | | | | Pond | H14a | | | | | | | X | | |
| | | | | Pond | H15 | | | | | | X | X | | |
| | | | | Pond | H15d | | | | | | | X | | |
| | | | | Pond | H15e | | | | | | | X | | |
| | | | | Pond | H15g | | | | | | | X | | |
| | | | | Pond | H16 | | | | | | X | X | | |
| | | | | Pond | H17 | | | | | | X | X | | |
| | | | | Pond | H18 | | | | | | X | X | | |
| | | | | Pond | H19 | | | | | | X | | | |
| | | | | Pond | H2 | | | | | | X | X | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pond | H20 | | | | | | X | | | |
| | | | | Pond | H2a | | | | | | | X | | |
| | | | | Pond | H3 | | | | | | X | X | | |
| | | | | Pond | H4 | | | | | | X | X | | |
| | | | | Pond | H5 | | | | | | X | X | | |
| | | | | Stream | H5-17 | | | | | | | X | | X |
| | | | | Pond | H6 | | | | | | X | X | | |
| | | | | Pond | H7 | | | | | | X | X | | |
| | | | | Pond | H8 | | | | | | X | X | | |
| | | | | Pond | H9 | | | | | | X | X | | |
| | | | | Stream | H2-3 | | | | | | | | | X |
| | | | | Stream | H1-2 | | | | | | | | | X |
| | | | | Stream | H3-4 | | | | | | | | | X |
| | | | | Stream | H4-5 | | | | | | | | | X |
| | | | J | Stream | J0-1 | | | | | X | | | | |
| | | RSA | LML | Stream | HSL-W | | X | | X | | | | | |
| | | | | Stream | W-LML | | | | X | | | | | |
| | | | ML | Stream | ML-PL | | X | | | | | | | |
| | | | MR | Stream | LML-MR | | X | | | | | | | |
| | | | | Stream | ML-MR | X | X | | | | | | | |
| | **Gill Nets** | LSA | A | Lake | A1 | X | | | | | | | X | |
| | | | | Pond | A52 | | | | | | X | | | |
| | | | | Pond | A54 | | X | | | | | | | |
| | | | | Lake | A6 | X | X | | | | | X | | |
| | | | | Lake | A8 | X | X | | | | | | | |
| | | | | Lake | A46 | | | | | | | | X | |
| | | | B | Pond | B10 | | X | | | | | | | |
| | | | | Lake | B2 | X | X | | | | | | | |
| | | | | Lake | B4 | X | X | | | | | | | |
| | | | | Lake | B45 | | | | | | | | X | |
| | | | | Lake | B46 | | | | | | | | X | |
| | | | | Lake | B5 | X | X | | | | | | | |
| | | | | Lake | B52 | | | | | | | | X | |
| | | | | Lake | B7 | X | X | | | | X | | | |
| | | | | Pond | B9 | | X | | | | | | | |
| | | | | Lake | B34 | | | | | | | | X | |
| | | | | Lake | B53 | | | | | | | | X | |
| | | | | Lake | B69 | | | | | | | | X | |
| | | | C | Pond | C7 | | | | | | | | X | |
| | | | | Lake | C10 | | | | | | | | X | |
| | | | CH | Lake | CH6 | | | | | | X | | | |
| | | | D | Lake | D1 | X | X | X | X | | | X | X | |
| | | | | Lake | D3 | X | | | | | | | X | |
| | | | | Pond | D4 | X | | | | | | | X | |
| | | | | Lake | D5 | X | | | | | | | X | |
| | | | | Lake | D7 | X | | | | | | | | |
| | | | | Lake | D8 | | | | | | | | X | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lake | D23 | | | | | | | | X | |
| | | | E | Lake | E3 | | | | | | | | X | |
| | | | | Lake | E4 | | | | | | | | X | |
| | | | G | Pond | G1 | | | | | | | X | | |
| | | | | Lake | G2 | X | | | | | | | | |
| | | | H | Pond | H17 | | | | | | X | X | X | |
| | | | | Pond | H19 | | | | | | X | | | |
| | | | | Pond | H20 | | | | | | X | | X | |
| | | | J | Lake | J1 | | | | | | | X | | |
| | | | ML | Lake | ML-E | X | | | | | | | | |
| | | | | Lake | ML-S | X | X | | | | | | | |
| | | | | Lake | ML-W | | | X | X | | | | | |
| | | RSA | Control | Lake | Control | | | | | | | | X | |
| | | | LML | Lake | HSL | | | | X | | | | | |
| | | | | Lake | LML | X | X | X | X | | | | | |
| | | | | Lake | W | | | | X | | | | | |
| | | | ML | Stream | ML-PL | | | X | | | | | | |
| | | | MR | Stream | MR-U | | | X | | | | | | |
| | | | O | Pond | O2 | | | | | | | | X | |
| | | | | Pond | O4 | | | | | | | | X | |
| | **Fish Fence** | RSA | MR | Stream | MR-L | X | X | X | | | | | | |
| | **Fyke Nets** | LSA | A | Lake | A1 | | | | | | | | X | |
| | | | | Pond | A2 | | | | | | | | X | |
| | | | | Pond | A52 | | | | | | X | | | |
| | | | | Lake | A6 | | | | | | | X | | |
| | | | | Lake | A46 | | | | | | | | X | |
| | | | B | Lake | B4 | | | | | | | | X | |
| | | | | Lake | B45 | | | | | | | | X | |
| | | | | Lake | B46 | | | | | | | | X | |
| | | | | Lake | B52 | | | | | | | | X | |
| | | | | Lake | B6 | | | | | | X | | | |
| | | | | Lake | B7 | | | | | | X | | | |
| | | | | Lake | B34 | | | | | | | | X | |
| | | | | Lake | B53 | | | | | | | | X | |
| | | | | Lake | B69 | | | | | | | | X | |
| | | | C | Pond | C6 | | | | | | | | X | |
| | | | | Pond | C7 | | | | | | | | X | |
| | | | | Lake | C10 | | | | | | | | X | |
| | | | CH | Lake | CH6 | | | | | | X | | | |
| | | | D | Stream | D0-1 | | | | X | | | | | |
| | | | | Lake | D1 | | | | X | | | X | | |
| | | | | Pond | D4 | | | | | | | | X | |
| | | | | Lake | D5 | | | | | | | | X | |
| | | | | Lake | D8 | | | | | | | | X | |
| | | | | Lake | D23 | | | | | | | | X | |
| | | | E | Lake | E3 | | | | | | | | X | |
| | | | | Lake | E4 | | | | | | | | X | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | G | Lake | G2 | | | | | | | X | | |
| | | | H | Pond | H17 | | | | | | | X | | |
| | | | J | Lake | J1 | | | | | | | | | X |
| | | | | Pond | I1 | | | | | | | | | X |
| | | | ML | Lake | ML-E | X | X | | | | | | | |
| | | | | Lake | ML-S | | X | | | | | | | |
| | | | P | Pond | P2 | | | | | | | | X | |
| | | RSA | Control | Lake | Control | | | | | | | | X | |
| | | | ML | Stream | ML-PL | | | | X | | | | | |
| | | | O | Pond | O2 | | | | | | | | X | |
| | | | | Pond | O4 | | | | | | | | X | |
| | **Angling** | LSA | A | Lake | A1 | X | | | | | | | | |
| | | | | Pond | A2 | X | | | | | | | | |
| | | | | Pond | A5 | X | | | | | | | | |
| | | | B | Lake | B2 | X | | | | | | | | |
| | | | | Lake | B4 | X | | | | | | | | |
| | | | | Lake | B45 | X | | | | | | | | |
| | | | | Lake | B46 | X | | | | | | | | |
| | | | | Lake | B5 | X | | | | | | | | |
| | | | | Pond | B51 | X | | | | | | | | |
| | | | | Lake | B52 | X | | | | | | | | |
| | | | | Lake | B6 | X | | | | | | | | |
| | | | | Lake | B7 | X | X | | | | | | | |
| | | | D | Lake | D1 | X | | | X | | | | X | |
| | | | | Pond | D2 | X | | | | | | | | |
| | | | | Lake | D3 | | | | | | | | X | |
| | | | | Pond | D4 | X | | | | | | | | |
| | | | | Lake | D7 | X | | | | | | | | |
| | | | G | Lake | G2 | X | | | | | | | | |
| | | | ML | Lake | ML-E | X | | | | | | | | |
| | | | | Lake | ML-S | X | | | | | | | | |
| | | | | Lake | ML-W | | | | X | | | | | |
| | | RSA | Control | Lake | Control | | | | | | | | X | |
| | | | LML | Lake | HSL | | | | X | | | | | |
| | | | | Lake | LML | | | | X | | | | | |
| | | | | Lake | W | | | | X | | | | | |
| | | | ML | Stream | ML-PL | | X | | | | | | | |
| | | | MR | Stream | ML-MR | | X | | | | | | | |
| | | | | Stream | MR-U | X | | | | | | | | |
| | **Minnow Traps** | LSA | A | Lake | A1 | | | | | | | | X | |
| | | | | Pond | A12 | | | | | | X | | | |
| | | | | Pond | A13 | | | | | | X | | | |
| | | | | Pond | A2 | | | | | | | | X | |
| | | | | Pond | A40 | | | | | | X | X | | |
| | | | | Pond | A5 | | | | | | | X | | |
| | | | | Pond | A50 | | | | | | | X | | |
| | | | | Pond | A51 | | | | | | | X | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pond | A52 | | | | | | X | | | |
| | | | | Pond | A53 | | | | | | | X | | |
| | | | | Lake | A6 | | | | | | | X | | |
| | | | | Pond | A7 | | | | | | | | X | |
| | | | | Pond | A44 | | | | | | | | X | |
| | | | | Pond | A45 | | | | | | | | X | |
| | | | | Lake | A46 | | | | | | | | X | |
| | | | | Pond | A49 | | | | | | | | X | |
| | | | | Pond | A19 | | | | | | | | | X |
| | | | | Pond | A4 | | | | | | | | | X |
| | | | | Pond | A3 | | | | | | | | | X |
| | | | AWAR | Stream | D5.4 | | | | | | | | | X |
| | | | | Stream | D8.8 | | | | | | | | | X |
| | | | B | Pond | B10 | | | | | | X | X | | |
| | | | | Pond | B25 | | | | | | | X | | |
| | | | | Pond | B28 | | | | | | | X | | |
| | | | | Pond | B30 | | | | | | X | | X | |
| | | | | Pond | B31 | | | | | | X | | | |
| | | | | Pond | B32 | | | | | | X | | | |
| | | | | Pond | B33 | | | | | | X | | | |
| | | | | Lake | B4 | | | | | | | | X | |
| | | | | Lake | B45 | | | | | | | | X | |
| | | | | Lake | B46 | | | | | | | | X | |
| | | | | Lake | B52 | | | | | | | | X | |
| | | | | Pond | B8 | | | | | | X | X | | |
| | | | | Pond | B9 | | | | | | X | X | | |
| | | | | Stream | B30-6 | | | | | | | | X | |
| | | | | Stream | B31-30 | | | | | | | | X | |
| | | | | Lake | B34 | | | | | | | | X | |
| | | | | Pond | B36 | | | | | | | | X | |
| | | | | Lake | B53 | | | | | | | | X | |
| | | | | Pond | B62 | | | | | | | | | X |
| | | | | Lake | B69 | | | | | | | | X | |
| | | | | Pond | B61 | | | | | | | | | X |
| | | | | Lake | B60 | | | | | | | | | X |
| | | | | Lake | B59 | | | | | | | | | X |
| | | | | Pond | B33a | | | | | | | X | | |
| | | | CH | Lake | CH6 | | | | | | X | | | |
| | | | D | Pond | D4 | | | | | | | | X | |
| | | | | Lake | D5 | | | | | | | | X | |
| | | | | Lake | D8 | | | | | | | | X | |
| | | | | Lake | D23 | | | | | | | | X | |
| | | | E | Lake | E3 | | | | | | | | X | |
| | | | | Lake | E4 | | | | | | | | X | |
| | | | | Stream | E4-5 | | | | | | | | X | |
| | | | G | Pond | G1 | | | | | | | X | | |
| | | | | Lake | G2 | | | | | | | X | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | H | Pond | H1 | | | | | | X | X | | |
| | | | | Pond | H10 | | | | | | | X | | |
| | | | | Pond | H11 | | | | | | X | X | | |
| | | | | Pond | H12 | | | | | | X | X | | |
| | | | | Pond | H13 | | | | | | X | X | | |
| | | | | Pond | H14 | | | | | | X | X | | |
| | | | | Pond | H14a | | | | | | | X | | |
| | | | | Pond | H15 | | | | | | X | X | | |
| | | | | Pond | H15d | | | | | | | X | | |
| | | | | Pond | H15e | | | | | | | X | | |
| | | | | Pond | H15g | | | | | | | X | | |
| | | | | Pond | H16 | | | | | | X | X | | |
| | | | | Pond | H17 | | | | | | X | X | | |
| | | | | Pond | H18 | | | | | | X | X | | |
| | | | | Pond | H19 | | | | | | X | | | |
| | | | | Pond | H2 | | | | | | X | X | | |
| | | | | Pond | H20 | | | | | | X | | | |
| | | | | Pond | H3 | | | | | | X | X | | |
| | | | | Pond | H4 | | | | | | X | X | | |
| | | | | Pond | H5 | | | | | | X | X | | |
| | | | | Pond | H6 | | | | | | X | X | | |
| | | | | Pond | H7 | | | | | | X | X | | |
| | | | | Pond | H8 | | | | | | X | X | | |
| | | | | Pond | H9 | | | | | | X | X | | |
| | | | J | Lake | J1 | | | | | | | X | | |
| | | | | Pond | J2 | | | | | | | | | X |
| | | | | Pond | J8 | | | | | | | | | X |
| | | | | Pond | J7 | | | | | | | | | X |
| | | | | Pond | J3 | | | | | | | | | X |
| | | | | Pond | J4 | | | | | | | | | X |
| | | | | Pond | J5 | | | | | | | | | X |
| | | | | Pond | J6 | | | | | | | | | X |
| | | RSA | Control | Lake | Control | | | | | | | | X | |
| | **Kick Sampling for Eggs** | LSA | AWAR | Stream | D5.8 | | | | | | X | | | |
| | | | | Stream | M2.1 | | | | | | X | | | |
| | | | | Stream | M5.0 | | | | | | X | | | |
| | | | | Stream | M8.6 | | | | | | X | | | |
| | | | | Stream | M11.6 | | | | | | X | | | |
| | | | B | Stream | B0-1 | X | X | | | | | | | |
| | | | | Stream | B1-2 | X | X | | | | | | | |
| | | | | Stream | B3-4 | X | X | | | | | | | |
| | | | | Stream | B4-5 | X | X | | | | | | | |
| | | | | Stream | B5-6 | X | X | | | | | | | |
| | | | | Stream | B6-7 | X | X | | | | | | | |
| | | | | Stream | B7-8 | | X | | | | | | | |
| | | | | Stream | B4-36 | X | | | | | | | | |
| | | | | Stream | B4-45 | X | | | | | | | | |

**Table 7.5-3: Sampling Periods for Waterbodies Surveyed for Habitat and Fish Populations, 1997 to 2012 (continued)**

| Component | Activity | Area | Basin | Waterbody | Site | 1997 | 1998 | 1999 | 2000 | 2004 | 2008 | 2009 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Stream | B45-46 | X | | | | | | | | |
| | | | | Stream | B46-66 | | X | | X | | | | | |
| | | | | Stream | B51-52 | X | | | | | | | | |
| | | | | Stream | B52-53 | X | | | | | | | | |
| | | | | Stream | B53-54 | | | | X | | | | | |
| | | | | Stream | B68-69 | X | | | X | | | | | |
| | | | D | Stream | D0-1 | X | X | | | | | | | |
| | | | | Stream | D1-2 | X | | | | | | | | |
| | | | | Stream | D3-4 | X | | | | | | | | |
| | | | | Stream | D4-5 | X | | | | | | | | |
| | | | | Stream | D5-6 | X | | | | | | | | |
| | | | | Stream | D6-7 | X | | | | | | | | |
| | | | F | Stream | F0-1 | X | | | | | | | | |
| | | | | Stream | F5-6 | X | | | | | | | | |
| | | | G | Stream | G0-1 | X | | | | | | | | |
| | | | | Stream | G1-2 | X | | | | | | | | |
| | | | J | Stream | J0-1 | | | | | X | | | | |
| | | RSA | LML | Stream | HSL-W | | X | | X | | | | | |
| | | | ML | Stream | ML-PL | | X | | | | | | | |
| | | | MR | Stream | LML-MR | | X | | | | | | | |
| | | | | Stream | ML-MR | X | X | | | | | | | |
| | **Fish Tissues** | LSA | ML | Lake | ML-S | | X | | | | | | | |
| | | | B | Lake | B5 | | X | | | | | | | |
| | | RSA | ML | Stream | MR-L | X | | | | | | | | |
| | | | PAR | Lake | PAR | | X | | | | | | | |
| | **Radio Telemetry and Mark-Recapture Studies** | LSA | A | Lake | A6 | X | X | X | | | | | | |
| | | | | Lake | A8 | X | X | X | | | | | | |
| | | | B | Lake | B2 | X | X | X | | | | | | |
| | | | | Lake | B5 | X | X | X | | | | | | |
| | | | | Lake | B7 | X | X | X | | | X | X | | |
| | | | D | Lake | D1 | X | X | X | | | | | | |
| | | | | Lake | D7 | X | X | X | | | | | | |
| | | | ML | Lake | ML-E | X | X | X | X | | | | | |
| | | | | Lake | ML-S | X | X | X | X | | | | | |
| | | RSA | ML | Lake | ML-W | X | X | X | X | | | | | |
| | | | | Stream | ML-PL | X | X | X | X | | | | | |
| | | | MR | Lake | LML | X | X | X | | | | | | |
| | | | | Stream | MR-U | X | X | X | | | | | | |
| | | | | Stream | MR-L | X | X | X | X | | | | | |

**Table 7.5-4: Lower Trophic Community Sampling Programs in Waterbodies, 1997 to 2011[a]**

| Location | Basin | Waterbody | 1997 | 1998 | 2011[b] |
|---|---|---|---|---|---|
| LSA | A Basin | A6 | ✓ | ✓ | - |
| | | A8 | ✓ | ✓ | - |
| | B Basin | B2 | ✓ | ✓ | ✓ |
| | | B5 | ✓ | ✓ | - |
| | | B7 | ✓ | ✓ | - |
| | | B36 | - | - | ✓ |
| | | B45 | - | - | ✓ |
| | | B46 | - | - | ✓ |
| | D Basin | D4 | - | - | ✓ |
| | | D5 | - | - | ✓ |
| | | D7 | ✓ | - | ✓ |
| | | D23 | - | - | ✓ |
| | E Basin | E3 | - | - | ✓ |
| | | E4 | - | - | ✓ |
| | G Basin | G2 | ✓ | - | - |
| | H Basin | H17 | - | - | ✓ |
| | | H20 | - | - | ✓ |
| | Meliadine Lake | ML-E | ✓ | ✓ | ✓ |
| | | ML-SE | - | ✓ | ✓ |
| | | ML-S | ✓ | ✓ | - |
| | | ML-W | ✓ | ✓ | - |
| | | BOOT 2 | - | - | ✓ |
| RSA | Little Meliadine Lake | LML | - | ✓ | - |
| | Peter Lake | PL | - | ✓ | - |
| | Control Lake | CON | - | - | ✓ |

[a] ✓ = periphyton, phytoplankton, zooplankton, and benthic invertebrates sampled.

[b] periphyton was not sampled in 2011.

**Table 7.5-5: Lower Trophic Community Sampling Programs in Watercourses, 1997 to 2011[a]**

| Location | Basin | Watercourse | 1997 | 1998 | 2011 |
|---|---|---|---|---|---|
| LSA | A Basin | A0-1 | ✓ | ✓ | - |
| | | A5-6 | ✓ | ✓ | - |
| | | A7-8 | ✓ | ✓ | - |
| | B Basin | B1-2 | ✓ | ✓ | - |
| | | B3-4 | - | ✓ | - |
| | | B4-5 | ✓ | ✓ | - |
| | | B5-6 | - | ✓ | - |
| | | B6-7 | ✓ | ✓ | - |
| | D Basin | D0-1 | ✓ | - | - |
| | | D6-7 | ✓ | - | - |
| RSA | Meliadine River | ML-MR | ✓ | ✓ | - |
| | | MR-L | - | ✓ | - |
| | Peter Lake | ML-PL | ✓ | ✓ | - |

[a] ✓ = only periphyton and benthic invertebrates were sampled in the watercourses.

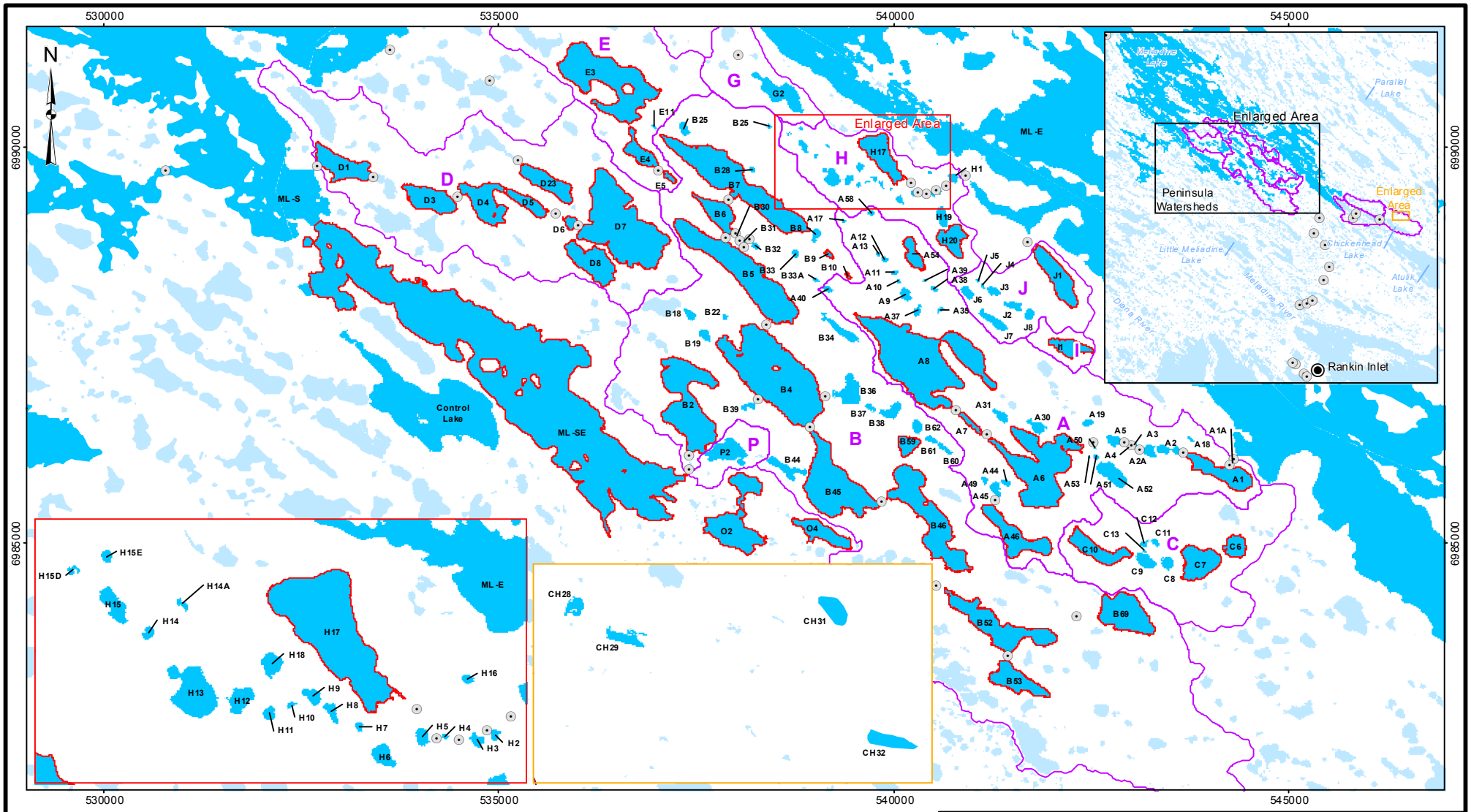
### *7.5.4.1 Methods*

#### 7.5.4.1.1 Aquatic Habitat

Aquatic habitat was surveyed at numerous watercourses (i.e., streams) and waterbodies (i.e., lakes and ponds) in the LSA and RSA from 1997 to 2012 (Figure 7.5-1; SD 7-1 2009 Aquatic Synthesis Baseline, SD 7-2 2011 Aquatic Baseline). Investigations included ground and aerial surveys to assess habitat quality of streams, bathymetric surveys of selected lakes, continuous recordings of water temperature in streams and lakes, collection of in-situ water quality data and measurements of vertical distribution of temperature, and dissolved oxygen in lakes. Most of the aquatic habitat assessments were carried out during 1997, 1998, and 2011. The sampling effort in 2004, 2008, 2009, and 2012 varied with the specific objectives of the investigations and focused on site locations in close proximity to the proposed mine development. No waterbodies are located in the AWAR or Rankin Inlet LSA.

The waterbodies in the LSA and RSA have been divided into lakes and ponds, depending on water depth. Waterbodies in the LSA and RSA less than 2 m deep were classified as ponds and waterbodies greater than 2 m deep were classified as lakes. In late winter, ice thickness commonly reaches 2 m in the region, and waterbodies that are less than 2 m deep likely freeze to the bottom and do not provide overwintering habitat for fish. Waterbodies greater than 2 m deep generally do not freeze completely, providing overwintering habitat for fish.

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.5-1_Aquatic_Habitat_Sampling_Locations_1997-2012.mxd




## LEGEND

- Sampled Watercourse
- Sampled Waterbody
- Bathymetric Survey
- Waterbody
- Watershed Boundary

1.4 0 1.4
KILOMETRES

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

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MELIADINE GOLD PROJECT
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TITLE

# AQUATIC HABITAT SAMPLING LOCATIONS, 1997 - 2012

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JP | 18 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 16 Jan. 2013 | | |
| CHECK | JP | 18 Jan. 2013 | | |
| REVIEW | DW | 18 Jan. 2013 | | |

**FIGURE 7.5-1**

#### 7.5.4.1.1.1 Streams

Within the area of the LSA around the proposed mine site, aquatic habitat surveys of streams were completed mainly in 1997 (*n*=51), 1998 (*n*=15), and 2011 (*n*=7) within Basins A, B, D, E, F, and G. Supplemental surveys were conducted in 2004 (*n*=1), 2009 (*n*=1) and 2012 (*n*=6). Stream habitat assessments were also completed in 2008 and 2012 at 14 stream crossings along the proposed AWAR (Meliadine [*n*=10] and Discovery [*n*=4]) and 5 stream crossings along the proposed bypass road in Rankin Inlet. Within the RSA, aquatic habitat surveys of streams were completed on the Meliadine River in 1997 and 1998. In total, 81 habitat assessments were completed at 43 streams.

The purpose of these surveys was to assess habitat suitability for fish use with special reference to fish movements and spawning and/or rearing potential. The RL&L Environmental Services Ltd. habitat classification and coding system was used to identify and map individual habitat types. Parameters surveyed included substrate, habitat type (e.g., riffles, pools, and runs), instream cover, channel width and depth, and presence of barriers to fish movement. Surveyed streams were subdivided into homogeneous reaches (i.e., stream sections that featured similar gradient, channel type, substrate, and habitat type distribution) with habitat parameters reflecting average conditions within each reach. Habitat conditions within lake inlets and outlets were also recorded. Detailed methods can be found in SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.1.1 and SD 7-2 2011 Aquatics Baseline, Section 5.1.1.

In addition to detailed habitat assessments performed at selected sites on the ground, a helicopter survey of 169 streams within the main Peninsula Basins (A, B, and D) was conducted on 21 June 1997. This was done to assess the potential suitability of the stream for Arctic grayling spawning and/or rearing. Streams were assessed visually from the air and classified into one of 7 categories (SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.1.1.1). Streams in Classes 0 to 2 were rated as low quality fish habitat. Class 3 streams were considered as marginal; however, small portions of these streams may provide potential spawning habitat. Streams designated as Classes 4 to 6 were considered to provide potential spawning and rearing habitat for Arctic grayling.

#### 7.5.4.1.1.2 Lake and Pond Morphometry

Bathymetric surveys of the east and south basins of Meliadine Lake, Control Lake, and selected lakes and ponds in Peninsula Basins A, B, C, D, E, O, and P were conducted in 1997, 1998, 2011, and 2012, to quantify lake volumes and the areas of littoral habitat. Additional surveys were carried out in 2008 and 2009 to estimate depth and volume characteristics of Chickenhead Lake and Lake J1. Bathymetric surveys were performed using an echo sounder, a Global Positioning System (GPS), or Garmin GPSMap 298 coupled with a depth sounder (SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.1.2.2; SD 7-2 2011 Aquatics Baseline, Section 5.1.2).

Surface area and volume calculations were obtained by using ArcGIS software. Bathymetric maps and determinations of lake areas and volumes for different isobaths were produced for each lake.

#### 7.5.4.1.1.3 Lake and Pond Substrate Composition

Substrate was evaluated in 2011 in 21 lakes and 30 ponds within the Peninsula Basins (A, B, C, D, E, O, and P) and in the Control Lake. In addition, substrate was evaluated in 2012 at 31 ponds in Peninsula Basins (A, B, I, and J) and 4 ponds near Chickenhead Lake. Lake substrates were also evaluated at Lakes A6 and B7

in 2009. Substrate composition was evaluated using a combination of visual observations, underwater surveys using an Aqua-Vu® underwater camera, and an Ekman dredge (SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.1.2.3; SD 7-2 2011 Aquatics Baseline, Section 5.1.2). Substrate composition was classified into 3 categories:

- Fine - area covered entirely by organics, silt, and/or sand;
- Mixed - coarse substrate interspersed with large patches of organic or silt material; and
- Coarse - most of the area covered by gravel, cobble and/or boulder.

The substrate data was combined with the depth information (obtained through bathymetric surveys) to classify lake and pond areas into 9 general habitat types:

- Hab 1 - less than 2 m in depth, with fine substrate;
- Hab 2 - less than 2 m in depth, with mixed substrate;
- Hab 3 - less than 2 m in depth, with coarse substrate;
- Hab 4 - between 2 and 4 m in depth, with fine substrate;
- Hab 5 - between 2 and 4 m in depth, with mixed substrate;
- Hab 6 - between 2 and 4 m in depth, with coarse substrate;
- Hab 7 - more than 4 m in depth, with fine substrate;
- Hab 8 - more than 4 m in depth, with mixed substrate; and
- Hab 9 - more than 4 m in depth, with coarse substrate.

#### *7.5.4.1.1.4 Waterbody Size Classification*

A desk-top geographical information system (GIS) exercise was conducted to characterize the size of streams, lakes, and ponds in the RSA to determine if the Peninsula waterbodies are unique in the regional context. Using baseline data from the 1:50 000 scale NTS maps, the RSA was divided into 8 separate watershed drainages:

- Peninsula watersheds – include Basins A to P and several small basins bounded by the Meliadine Lake shoreline (similar to LSA);
- Meliadine Lake – includes Meliadine Lake, Control Lake, Chickenhead Lake, and areas upstream of Meliadine Lake, but excludes the Peninsula watersheds and areas downstream of the outlets;
- Meliadine River – drainage area between Meliadine Lake south outlet and Hudson Bay;
- Char River – drains into Hudson Bay approximately 2 km southwest of the Meliadine River mouth;
- Diana River – from Meliadine Lake west outlet to Diana River mouth in Hudson Bay;
- Rankin Inlet - several small watersheds that drain separately to Hudson Bay near Rankin Inlet;
- Hudson – several small watersheds that drain to Hudson Bay between the Meliadine and Atulik river mouths; and
- Atulik – includes Atulik Lake and drains to Hudson Bay via Atulik River.

The total drainage area of each RSA watershed, as well as the number and area of lakes and ponds by 6 size categories (<1, 1 to 5, 5 to 10, 10 to 20, 20 to 100, and >100 hectares [ha]) were calculated to characterize waterbody size classes in the RSA.

#### 7.5.4.1.2 Lower Trophic Communities

Lower trophic communities were studied in 1997, 1998, and 2011 during numerous investigations at streams, ponds, and lakes within the LSA and RSA (Figure 7.5-2; SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.0; SD 7-2 2011 Aquatics Baseline, Section 6.0). To characterize the lower trophic communities within the LSA and RSA, periphyton, phytoplankton, zooplankton, and benthic invertebrate samples were collected and analyzed.

Periphyton is the community of algae, bacteria, fungi, and their secretions that grow on substrates in freshwater systems (Lock et al. 1984). Periphyton was sampled in waterbodies and watercourses in summer in 1997 and 1998. Periphyton samples consisted of scrapings from the surface of stones and samples were analyzed from chlorophyll *a* and ash-free dry mass (AFDM) concentrations.

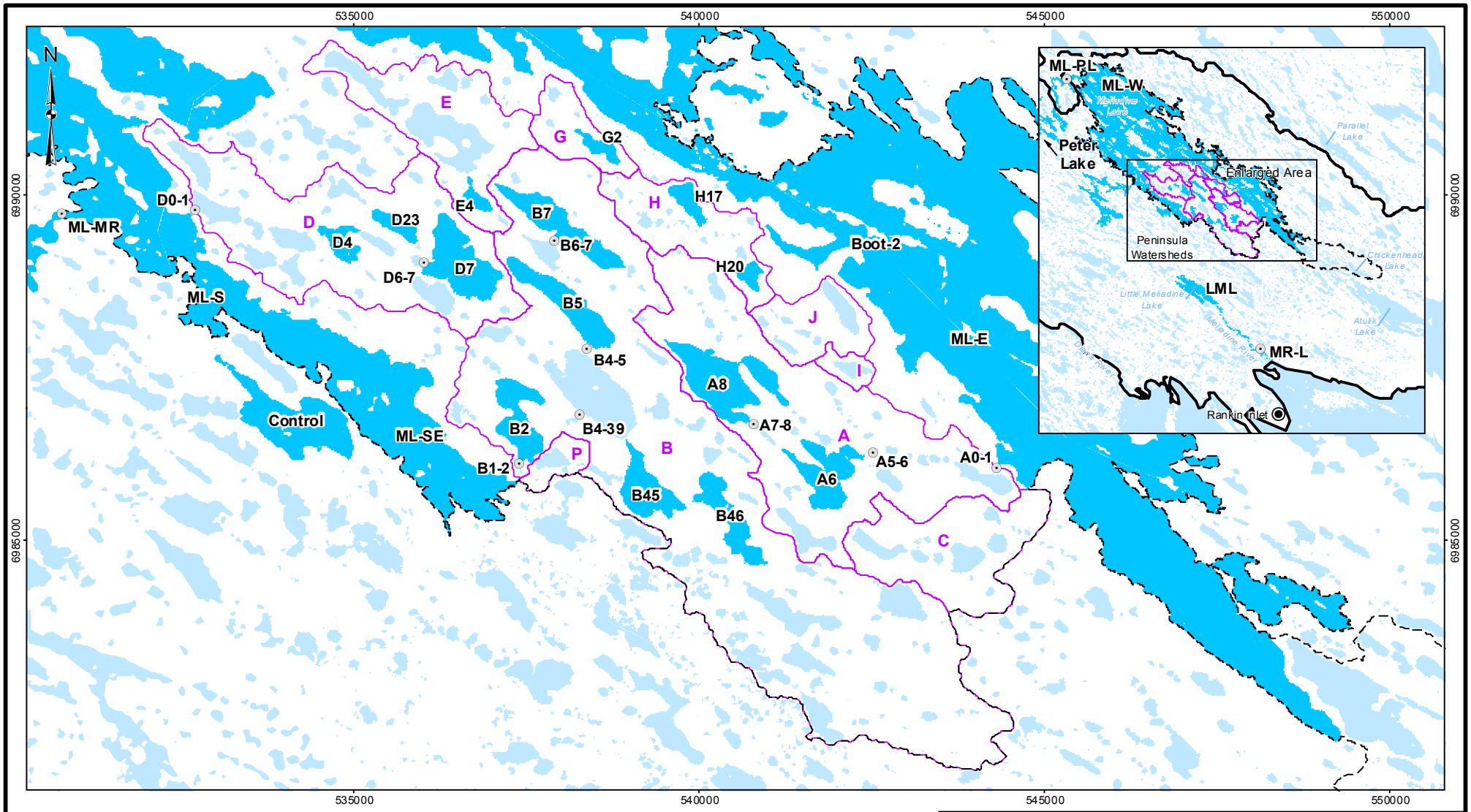
Phytoplankton are microscopic free-floating algae (Smith 1950). Phytoplankton samples were collected in lakes and ponds in 1997, 1998 and 2011; in 1997 and 1998, they were sampled during summer and fall to characterize seasonal differences in community composition, whereas in 2011 they were sampled during summer. Phytoplankton samples were collected at 2-m vertical intervals within the euphotic zone at each site. Composite samples were collected in 1997 and 1998, whereas 5 individual samples were collected in 2011. Samples were analyzed for chlorophyll *a* concentrations.

Zooplankton communities are composed of microscopic animals that live in the water column (Pennak 1989; Wetzel 1983). Zooplankton samples were collected in lakes and ponds in 1997, 1998 and 2011; in 1997 and 1998, they were sampled during summer and fall to characterize seasonal differences in community composition, whereas in 2011 they were sampled during summer. In lakes greater than 3 m deep, a vertical transect encompassed the entire water column between the surface and 1 m above the lake bottom (to avoid contamination of the sample with sediment). In waterbodies less than 3 m deep, one 6 m horizontal transect was sampled.

Benthic macroinvertebrates are animals (e.g., insects, crustaceans, molluscs, worms) that exist among bottom substrata of aquatic systems. They were sampled in waterbodies and watercourses throughout the LSA and RSA in summer (i.e., the most biologically productive season; Figure 7.5-2). Benthic invertebrates were sampled in lakes and streams in 1997 and 1998 (no ponds were sampled), and in lakes and ponds in 2011. In waterbodies, replicate samples were collected at each site using an Ekman grab of 0.023 $m^2$ bottom area. In watercourses, replicate samples were sampled using a modified (243 µm mesh) Surber$^{TM}$ sampler of 0.093 $m^2$ bottom area.

For detailed descriptions of field sampling methods, laboratory procedures and data analysis see the supporting documents (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.5; SD 7-2 2011 Aquatics Baseline, Section 6.1).

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.5-2_Lower_Trophic_Level_Sampling_Locations_1997-2012.mxd




**LEGEND**

- Sampled Watercourse
- Regional Study Area (RSA)
- Local Study Area (LSA)
- Sampled Waterbody
- Waterbody
- Watershed Boundary

1.6 0 1.6
KILOMETRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

**LOWER TROPHIC LEVEL SAMPLING LOCATIONS IN THE PROJECT AREA, 1997 - 2012**

Golder Associates

| PROJECT NO. 10-1373-0076 | | | FILE No. | |
|---|---|---|---|---|
| DESIGN | AC | 18 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | CDB | 17 Jan. 2013 | | |
| CHECK | AC | 14 Nov. 2012 | | |
| REVIEW | ZK | 14 Nov. 2012 | | |

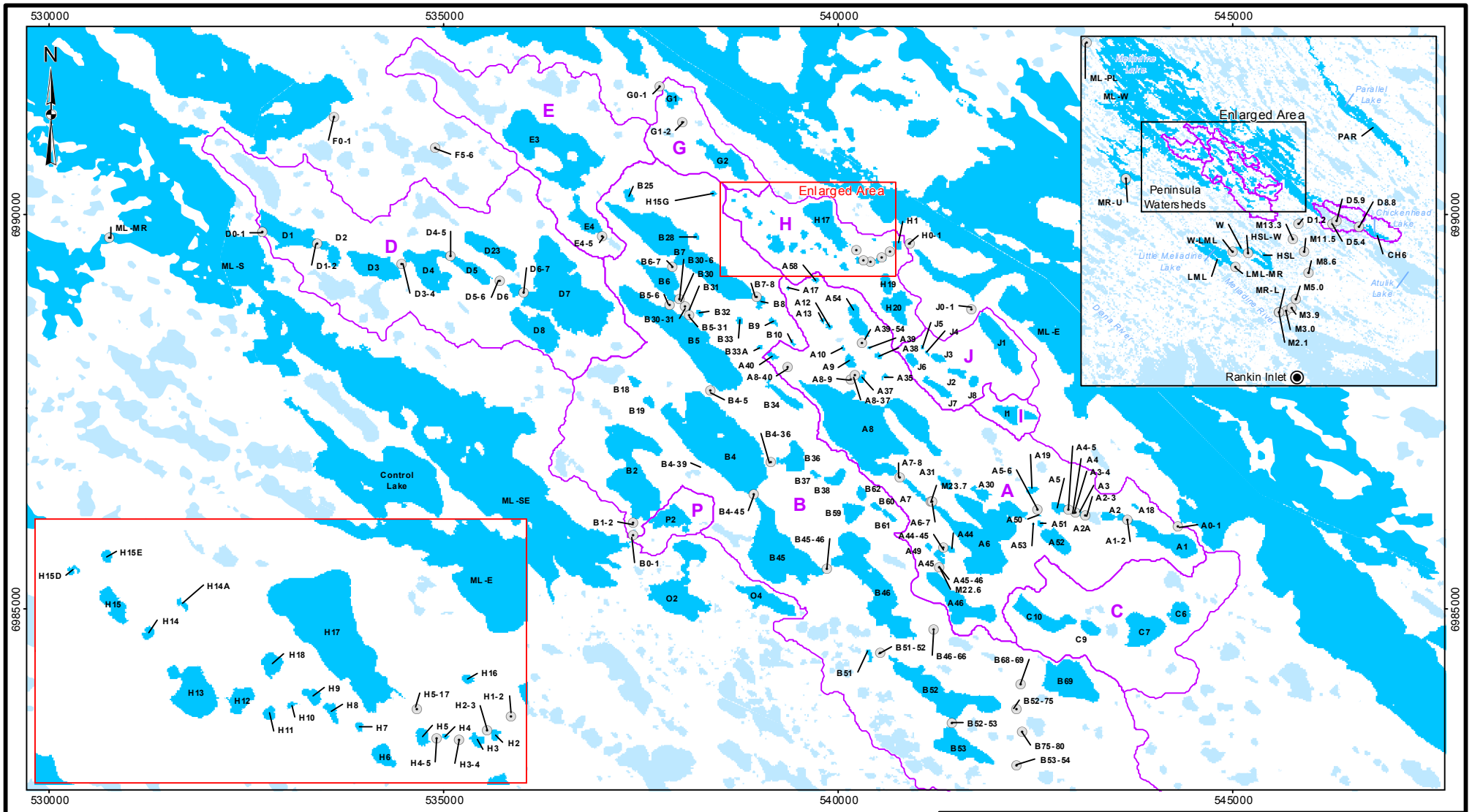
**FIGURE 7.5-2**

#### 7.5.4.1.3 Fish

Fish populations were studied in 10 different years between 1997 and 2012 during numerous investigations at streams, ponds, and lakes within the RSA (Table 7.5-3; Figure 7.5-3; SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.0; SD 7-2 2011 Aquatics Baseline, Section 7.0). To determine the abundance and distribution of different species throughout the area, biologists used a wide variety of techniques to sample fish communities and collect basic biological information. These sampling methods included backpack electrofishing, minnow trapping, gill netting, fyke netting, fish fence, angling, egg sampling, fish tissue sampling, implantation of radio transmitters, radio tracking flights, and crossing assessments (SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.1; SD 7-2 2011 Aquatics Baseline, Section 7.1). Depending on the foci of the investigations, which varied among basins and ranged from estimating population size to capturing fish for radio telemetry, techniques were often used in combination. In total, 924 sampling events were completed during investigations of fish communities for the proposed Project. No waterbodies are located in the AWAR or Rankin Inlet LSA.

Nanuk Enterprises (1999) indicated that fishing is important traditional pursuits in the Rankin Inlet area (extending towards Meliadine Lake) and Arctic char is one of the most common species fished. Therefore, more complex studies were also carried out to describe movements of Arctic char, to collect tissue samples for metal analysis, and to complete fish population estimates in selected lakes. Arctic char migrations in the Meliadine River were studied and a radio telemetry and tagging program was employed to describe seasonal movements to different areas of the LSA and RSA. To provide baseline information on the concentrations of metals in fish, tissue samples were collected from several species representing different trophic levels in the Arctic freshwater food web. Mark-recapture studies using gill nets and fyke nets were employed to estimate fish population size. Together, these studies provided a comprehensive description of fish populations in the RSA. During the sampling events, life history data were compiled and used to calculate length, weight and age statistics for fish. IQ

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.5-3_Fish_Sampling_Locations_1997-2012.mxd




## LEGEND

- Sampled Watercourse
- Sampled Waterbody
- Waterbody
- Watershed Boundary

1.4 0 1.4
KILOMETRES

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# FISH SAMPLING LOCATIONS, 1997 - 2012

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JP | 18 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 16 Jan. 2013 | | |
| CHECK | JP | 18 Jan. 2013 | | |
| REVIEW | DW | 18 Jan. 2013 | | |

**FIGURE 7.5-3**

To facilitate data recording and presentation of the results, all captured fish species were assigned a 4-letter code (Table 7.5-6). Standard $log_{10}$length (mm) - $log_{10}$weight (g) regressions were calculated for Arctic char, lake trout, Arctic grayling, round whitefish, and cisco. Regressions were completed by site, basin, and/or for the LSA and RSA when sample size was equal to or greater than 5 ($n \geq 5$). Measurement data from fish captured at all sites were used to calculate the regression.

**Table 7.5-6: Common and Scientific Names of Fish Species Captured in the Local Study Area, and their Coded Abbreviations**

| Family | Common Name | Scientific Name | Inuktitut Name | Code[a] |
|---|---|---|---|---|
| **Sportfish** | | | | |
| Salmonidae | Arctic char | *Salvelinus alpinus* (Linnaeus) | ᐃᖃᓗᓕᒃ / ᑕᓪᐅᖏᑦᑐᖅ | ARCH |
| | lake trout | *Salvelinus namaycush* (Walbaum) | ᐃᓱᖅ | LKTR |
| | Arctic grayling | *Thymallus arcticus* (Pallas) | ᐊᒥᖏᓪᓗᑐᖅ | ARGR |
| | round whitefish | *Prosopium cylindraceum* (Pennant) | ᓱᓗᒃᐸᐅᒐᓕᒃ | RNWH |
| | cisco | *Coregonus artedi* Lesueur | ᐊᒥᖏᓪᓗᑐᖅ | CISC |
| Gadidae | burbot | *Lota lota* (Linnaeus) | ᑎᑭᑕᓕᒃ | BURB |
| **Non-sportfish** | | | | |
| Cottidae | slimy sculpin | *Cottus cognatus* Richardson | ᑲᓇᕐᖅ | SLSC |
| Gasterosteidae | ninespine stickleback | *Pungitius pungitius* (Linnaeus) | ᑲᑭᓕᓴᒃ | NNST |
| | threespine stickleback | *Gasterosteus aculeatus* Linnaeus | ᑲᑭᓕᓴᒃ | THST |

[a] According to Mackay et al. (1990)

Relative weights were calculated using standard weight ($W_s$) equations for Arctic char, lake trout, Arctic grayling, round whitefish, and cisco using the 75$^{th}$ regression-line-percentile technique (Murphy et al. 1990). The regression-line-percentile technique is the currently accepted approach for development of $W_s$ equations (Pope and Cruse 2007). To determine $W_s$ equations for each species, the standard $log_{10}$length-$log_{10}$weight relationships were calculated for each site (i.e., population) where $n \geq 10$ (Murphy et al. 1990). As most of individual sites in the Peninsula Basins had fewer than 10 fish recorded, data from all sites within each Basin were combined into one “population”. Sites or basins where the $r^2$ value was <0.9 or those that were missing a major size-class (e.g., no small fish were recorded) were excluded from the calculations.

## *7.5.4.2 Aquatic Habitat Results*

### 7.5.4.2.1 Physico-Chemical Water Quality

Most lakes and ponds in the Mine LSA were generally well-oxygenated during open water conditions (Section 7.3; SD 7-1 2009 Aquatics Synthesis Baseline, Section 3.3). Lakes and ponds were not thermally stratified during the open-water sampling events (Section 7.3). Dissolved oxygen concentrations were low in the Peninsula lakes during under ice conditions, which likely limits their use by overwintering fish. In contrast, dissolved oxygen concentrations were higher during the winter in larger lakes, such as Meliadine Lake, Little Meliadine Lake, and Peter Lake. Mean daily water temperature fluctuated between years (SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.5), but mean monthly temperatures in July and August were generally between 11°C and 13°C. The maximum recorded daily temperatures in lakes did not exceed 21.4°C; however, temperatures of up to 23.7°C were recorded in small streams.

#### 7.5.4.2.2 Local Study Area

##### *7.5.4.2.2.1 Streams*

##### *Proposed Mine Site (Peninsula)*

In total, 81 habitat assessments were carried out at 43 streams on the Peninsula for Meliadine Lake (Tables 7.5-7a and b; Appendix 7.5-A; SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.2.2 and Appendices D2, D3, and D4; SD 7-2 2011 Aquatics Baseline, Section 5.2.1 and Appendix D1).

**Table 7.5-7a: Summary of Habitat Characteristics in Streams in the Peninsula Basins in the Local Study Area during Spring**

| Basin | Number of Surveys | Number of Streams Surveyed | Stream Length Surveyed (m) | | | | Channel Width (m) | | | Channel Type[a] (% of total length) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Mean | Min | Max | Mean | Min | Max | Sin | Dou | Mul | Dis |
| A | 21 | 9 | 1033 | 115 | 23 | 406 | 1.3 | 0.3 | 15.0 | 54 | 24 | 15 | 7 |
| B | 33 | 16 | 2379 | 149 | 24 | 680 | 1.9 | 0.1 | 40.0 | 44 | 10 | 41 | 5 |
| D | 15 | 6 | 604 | 101 | 29 | 268 | 6.7 | 0.4 | 30.0 | 52 | 9 | 34 | 5 |
| E | 1 | 1 | 46 | 46 | 46 | 46 | 1.1 | 0.4 | 6.1 | 10 | 70 | 20 | 0 |
| F | 2 | 2 | 246 | 123 | 78 | 168 | 0.7 | 0.2 | 1.5 | 59 | 0 | 42 | 0 |
| G | 2 | 2 | 486 | 243 | 240 | 246 | 0.9 | 0.2 | 1.2 | 77 | 0 | 23 | 0 |
| H | 6 | 6 | 730 | 122 | 35 | 175 | 1.2 | 0.1 | 15.0 | 37 | 40 | 16 | 8 |
| J | 1 | 1 | 198 | 198 | 198 | 198 | 2.3 | 0.2 | 15.0 | 8 | 9 | 57 | 27 |

**Table 7.5-7b: Summary of Habitat Characteristics in Streams in the Peninsula Basins in the Local Study Area during Spring**

| Basin | Number of Surveys | Number of Streams Surveyed | Habitat Type (% of total area) | | | | Substrate[b] (% of total area) | | | | | Instream Cover[c] (% of total area) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Riffle | Run | Pool | Flat | OM | Fi | Gr | Co | Bo | UC | BG | AV | Total |
| A | 21 | 9 | 28 | 62 | 9 | 1 | 6 | 8 | 17 | 40 | 29 | 1 | 18 | 11 | 30 |
| B | 33 | 16 | 19 | 62 | 5 | 14 | 25 | 3 | 12 | 33 | 27 | 4 | 19 | 13 | 36 |
| D | 15 | 6 | 10 | 67 | 2 | 21 | 31 | 3 | 25 | 28 | 13 | 4 | 18 | 28 | 50 |
| E | 1 | 1 | 0 | 5 | 0 | 95 | 95 | 0 | 0 | 3 | 2 | 0 | 2 | 20 | 22 |
| F | 2 | 2 | 1 | 95 | 4 | 0 | 53 | 8 | 15 | 19 | 6 | 21 | 4 | 8 | 33 |
| G | 2 | 2 | 13 | 85 | 2 | 0 | 66 | 8 | 16 | 9 | 1 | 7 | 2 | 11 | 20 |
| H | 6 | 6 | 15 | 98 | 0 | 0 | 47 | 15 | 19 | 14 | 5 | 7 | 2 | 23 | 32 |
| J | 1 | 1 | 4 | 78 | 1 | 17 | 81 | 16 | 1 | 1 | 1 | 0 | 0 | 78 | 78 |

[a] Sin=single channel; Dou=double channel; Mul=multiple (braided) channel; Dis=dispersed channel

[b] OM=organic material; Fi=fines (silt & sand, <2 mm diameter); Gr=gravel (2 - 64 mm diameter); Co=cobble (65 - 256 mm diameter); Bo=boulder (>256 mm diameter)

[c] UC=undercut banks; BG=boulder gardens; AV=aquatic vegetation; OV=overhanging vegetation; D/T=depth and/or turbulence

Stream habitat was dominated by shallow runs in terms of both frequency of occurrence and abundance. Other habitat types encountered frequently included riffles and riffle/boulder garden combinations. High quality habitats (i.e., based on water depth and availability of cover for fish) were rare and occurred only in the form of pools and deeper run habitats, indicating that the majority of the habitat was shallow (i.e., <0.5 m in depth). Substantial

portions of stream habitat (especially in the smallest streams) consisted of dispersed flow over grass suggesting limited potential to support fish through the year.

Substrate in most of the surveyed streams was dominated by organic materials, primarily grass; however, substrate in the surveyed streams in Basins A and B was dominated by cobble. Coarse materials including cobble, boulder and gravel were also common and fine materials (e.g., silt and sand) were present in small amounts. In Basin B, substrate composition ranged among streams, more so than that observed in the other basins. For example, substrates in Stream B4-36 were composed almost entirely of organics (93%) whereas 60% of the stream bed at Stream B45-46 was cobble.

Basin streams of the Peninsula of Meliadine Lake featured adequate cover for fish in approximately a third of the channel area. Several types of cover were available, with boulder gardens, aquatic vegetation, and submerged terrestrial vegetation being the most abundant. Limited amounts of undercut or overhanging bank were also available.

Streams in Basin H were unique in that they were primarily seasonal, with flows relying heavily on snowmelt or large precipitation events. The length of time that streams flow decreased with distance upstream in the watershed. Typically, ponds at higher elevations in the basin (central and west portions of the basin) were small (<1 ha), as were the connections between them. These poorly defined and shallow streams flowed over terrestrial vegetation for short periods of time and were the first to dry among basin streams. Streams lower in the watershed (e.g., H0-1 and H1-2) were more defined with some sections of gravel substrate and defined channel banks owing to longer periods of flow during snowmelt and after precipitation events. These lower streams provide spawning and rearing habitat for Arctic grayling from Meliadine Lake. Ninespine stickleback also seasonally inhabit Basin H ponds and streams; however, the extent to which they move throughout the basin likely varies annually and is a direct result of the timing of flows. If streams flow for longer periods of time, ninespine stickleback have more opportunities to move into more areas of the watershed. However, small ponds in upper area of the watershed may dry and all ponds freeze to bottom in winter. Therefore, these seasonal movements of fish into the watershed do not result in the establishment of permanent populations.

Based on data collected in June 1997 during aerial surveys of 169 streams in Basins A, B, and D, 24 streams (14%) were rated as potential spawning habitat for Arctic grayling (SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.2.2.1, Appendices D6a to D6e). Whereas 21 streams (12%) may provide marginal spawning habitat; the remaining 124 streams (73%) were rated as low quality fish habitat, with no spawning potential.

### *All-weather Access Road*

The AWAR includes 2 road corridors: the Meliadine corridor from the Char River crossing to the Mine site; and the Discovery corridor, which will branch from the Meliadine corridor to the Discovery pit. The AWAR crosses the Meliadine River near its mouth (site M2.1), and 13 shallow ephemeral watercourses (sites M3.0, M3.9, M5.0, M6.7, M8.6, M11.5, M13.3, M22.6, M23.7, D1.2, D5.4, D5.9[3], and D8.8). With the exception of the Meliadine River, the majority of the watercourses to be crossed by the proposed roads are small, ephemeral streams, often flowing through poorly defined channels (Appendix 7.5-A; SD 7-1 2009 Aquatics Synthesis Baseline, Section 10.0 and Appendices G1 and G2). The watercourses were comprised primarily of shallow-water habitats with occasional riffles and pools with moderate depth. Habitat potential for fish was typically poor to moderate and

[3] Site D5.9 was referred to as Site D5.8b in the SD 7-1 2009 Aquatics Synthesis Baseline.

use by fish is seasonal. However, habitat at some of the larger watercourses with perennial flow, such as the Meliadine River, had higher potential to support fish populations for longer periods of time.

### *All-weather Access Road - Meliadine Corridor*

Excluding the Meliadine River crossing (discussed separately at the end of this section), mean channel widths for streams along the Meliadine Road corridor ranged from 2.1 to 9.0 m and mean depths were shallow ranging from 0.1 to 0.2 m; maximum depths did not exceed 0.6 m (Appendix 7.5-A; SD 7-1 2009 Aquatics Synthesis Baseline, Section 10.2.1). A variety of channel types were encountered including single, double, multiple, and braided, as well as areas of dispersed flow (i.e., without a well-defined stream channel). Generally, individual reaches consisted of more than one channel type with braided and dispersed channels as the most common types observed (SD 7-1 2009 Aquatics Synthesis Baseline, Appendices G1 and G2).

Instream cover for fish was available in a variety of forms and was abundant in each of the streams surveyed. Given the semi-flooded conditions, aquatic and terrestrial plants provided the majority of cover ranging in proportion from 5 to 100% within individual reaches (SD 7-1 2009 Aquatics Synthesis Baseline, Section 10.2.1). Undercut banks were observed in small portions in 4 of the streams sampled. Boulder gardens provided additional cover for fish, but considerably less than vegetation. Given the small size of the watercourses, instream cover mainly provided habitat for small-bodied fish, such as ninespine stickleback and juvenile Arctic grayling.

Within the sampled section of the Meliadine River, the river was confined to a single channel with a few small rock piles scattered throughout. Wetted widths ranged from 34 to 134 m and the flooded width of the river ranged from 58 to over 200 m. At the time of visit, flows precluded safe measurement of depth; however, depths were greater than 1.5 m along the periphery. Instream habitat consisted primarily of runs, with riffles and pools also present. Substrate and instream habitat were difficult to gauge because the river was turbid; however, bank-side estimates suggested that substrates were dominated by boulder and cobble with gravel and fines present to lesser degrees.

### *All-weather Access Road- Discovery Corridor*

Based on data collected in 2008 and 2012, mean channel widths (2.4 to 15.2 m) were less variable than those along the Meliadine Road corridor section of the AWAR (Sites D1.2, D5.4, D5.9, and D8.8; Appendix 7.5-A, SD 7-1 2009 Aquatics Synthesis Baseline, Appendix G1). Mean flooded widths; however, ranged widely from 21.5 to 63 m (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix G1). Mean depths were shallow ranging from 0.2 to 0.3 m; maximum depths did not exceed 0.7 m. Single channels and dispersed channels were the main channel types observed along the Discovery road corridor.

Instream habitats consisted primarily of shallow runs and pools in 2008 and 2012. Water velocities were low as the majority of the watercourses were situated along shallow gradients. Hence, riffles were only observed occasionally and their overall contribution to the total habitat area was low. In contrast, shallow pools contributed substantially to the total surveyed area of the streams. These pools existed in areas with terrestrial vegetation and poorly defined bed and bank, indicative of ephemeral flows.

In areas without defined bed and banks, substrates in the streams consisted primarily of detritus (Appendix 7.5-A). In sections of the watercourses bounded by defined bed and banks, cobble, boulders, and fines were more common and were present in relatively equal proportions. Small patches of gravel were observed, but were less common.

Instream cover was available in a variety of forms. Aquatic and terrestrial plants provided the majority of cover, with boulders and undercut banks contributing to a lesser extent. Given the small size of the watercourses, instream cover served mainly to provide habitat for small-bodied fish. Of the 4 sites along the current road corridor, Sites D5.9 and D8.8 were rated the highest with respect to habitat quality for fish. Habitat features including coarse substrates, undercut banks, small pools, and aquatic plants contributed to this stream's high potential to support spawning and rearing fish. Overwintering was not deemed possible, given the shallow depths of the streams.

#### *Rankin Inlet*

The Rankin Inlet infrastructure crosses 7 watercourses, of which 5 were surveyed in 2012. Mean channel widths ranged from 0.3 to 4.0 m and mean depths were shallow (0.1 m); maximum depths did not exceed 0.4 m (Appendix 7.5-A). A variety of channel types were encountered including single, multiple, and braided, as well as areas of dispersed flow (i.e., without a well-defined stream channel). Instream habitat consisted primarily of shallow runs and flats. The substrates consisted of coarse materials (i.e., gravel, cobble, and boulders) near the estuary, whereas fines and organic material were located further upstream. Aquatic and terrestrial plants, boulders, and to a lesser extent, undercut banks, provided cover.

### *7.5.4.2.2.2 Lakes*

#### *Proposed Mine Site (Peninsula)*

The surveyed lakes (*n*=28) on the Peninsula of Meliadine Lake ranged from 1.3 ha (Lake E5) to 90.5 ha (Lake A8) in surface area and were shallow (mean depths ranged from 0.7 m to 1.6 m; Table 7.5-8; SD 7-2 2011 Aquatics Baseline, Appendix D3). Only 4 lakes had maximum depths of 4.0 m or greater. Most of lake volumes (85%) were contributed by the surface 2 m layer of water. When the ice cover exceeds 2 m in depth, as is often the case during late winter (Hubert and Associates Ltd. 1996), the under-ice water volume is greatly reduced and the lake may freeze to the bottom. The proportions of deep water zones in Lakes A1, A6, A8, B5, B6, B7, B69, C10, D3, D23, E3, E4, and E5 (from 10 to 36% of total lake area) appear to be sufficient to allow fish to overwinter.

The substrate types in lakes on the Peninsula of Meliadine Lake were generally related to depth (Table 7.5-8). The shallow areas of the lakes (i.e., <2 m deep) were mainly covered by coarse substrates (mean 57% of area), followed by mixed (22%) and fine (21%) substrates. In contrast, the deeper portions of the lakes (i.e., 2 to 4 m deep) were dominated by fines (76%) followed by mixed (18%) and coarse (6%) substrates. In lakes with areas greater than 4 m deep, the substrates were typically composed of fines; coarse substrates were not recorded.

**Table 7.5-8: Morphometric Characteristics and Habitat Composition of Surveyed Lakes in the Peninsula Basins in the Local Study Area**

| Basin | Lake | Bathymetry Survey Completed | Area (ha) | Volume ($m^3$ x $10^3$) | Depth (m) | | Habitat Composition[a] (% area) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Mean | Max | Hab 1 | Hab 2 | Hab 3 | Hab 4 | Hab 5 | Hab 6 | Hab 7 | Hab 8 | Hab 9 |
| A | A1 | ✓ | 16.39 | 194.1 | 1.2 | 2.5 | 16 | 12 | 58 | 12 | 1 | 1 | | | |
| | A6 | ✓ | 55.28 | 834.6 | 1.5 | 4.7 | 6 | 16 | 67 | 6 | 4 | | | | |
| | A8 | ✓ | 90.54 | 1414.8 | 1.6 | 4.2 | 5 | 8 | 55 | 14 | 10 | 7 | 1 | 1 | |
| | A46 | ✓ | 19.75 | 220.5 | 1.1 | 2.9 | 10 | 18 | 65 | 5 | 1 | 1 | | | |
| B | B2 | ✓ | 49.41 | 771.4 | 1.6 | 3.4 | | | | | | | | | |
| | B4 | ✓ | 85.82 | 759.9 | 0.9 | 2.4 | 25 | 13 | 59 | 3 | | | | | |
| | B5 | ✓ | 56.74 | 869.1 | 1.5 | 3.4 | 5 | 13 | 50 | 23 | 9 | | | | |
| | B6 | ✓ | 11.80 | 166.1 | 1.4 | 4.0 | 1 | 11 | 61 | 25 | 2 | | | | |
| | B7 | ✓ | 57.88 | 855.9 | 1.5 | 5.1 | 2 | 10 | 62 | 16 | 8 | 1 | 2 | | |
| | B34 | | 4.37 | - | - | 2.1 | 13 | 15 | 70 | 2 | | | | | |
| | B45 | ✓ | 47.37 | 591.9 | 1.2 | 2.3 | 64 | 15 | 19 | 2 | | | | | |
| | B46 | ✓ | 44.72 | 329.7 | 0.7 | 2.0 | 13 | 57 | 30 | | | | | | |
| | B52 | ✓ | 33.42 | 329.9 | 1.0 | 3.3 | 19 | 30 | 45 | 5 | 1 | | | | |
| | B53 | ✓ | 15.70 | 195.8 | 1.2 | 2.9 | 15 | 30 | 55 | | | | | | |
| | B59 | ✓ | 4.89 | 61.3 | 1.3 | 3.9 | 55 | 11 | 18 | 14 | 1 | 1 | | | |
| | B69 | ✓ | 25.03 | 406.6 | 1.6 | 5.4 | 12 | 22 | 32 | 25 | 5 | 3 | 1 | | |
| C | C10 | ✓ | 13.89 | 145.7 | 1.0 | 2.9 | 10 | 15 | 60 | 10 | 5 | | | | |
| D | D1 | ✓ | 17.77 | 217.5 | 1.2 | 2.5 | | | | | | | | | |
| | D3 | ✓ | 15.85 | 245.7 | 1.6 | 2.8 | 15 | 23 | 27 | 28 | 5 | 2 | | | |
| | D5 | ✓ | 7.31 | 81.9 | 1.1 | 2.6 | 16 | 9 | 69 | 3 | 2 | 1 | | | |
| | D7 | ✓ | 73.51 | 1163.3 | 1.6 | 2.8 | | | | | | | | | |
| | D8 | ✓ | 18.98 | 233.7 | 1.2 | 2.5 | 31 | 23 | 38 | 6 | 1 | 1 | | | |
| | D23 | ✓ | 14.04 | 225.1 | 1.6 | 3.7 | 3 | 10 | 51 | 32 | 3 | 1 | | | |
| E | E3 | ✓ | 56.82 | 880.9 | 1.6 | 4.7 | 15 | 23 | 30 | 25 | 4 | 2 | 1 | | |
| | E4 | ✓ | 8.52 | 90.0 | 1.1 | 3.7 | 10 | 16 | 60 | 10 | 3 | 2 | | | |
| | E5 | ✓ | 1.30 | 11.9 | 0.9 | 3.0 | 9 | 21 | 57 | 13 | | | | | |
| G | G2 | | 12.41 | - | - | 2.5 | | | | | | | | | |
| J | J1 | ✓ | 17.16 | 277.5 | 1.6 | 2.3 | 70 | 15 | 15 | | | | | | |

[a] Hab1 = <2 m; fine substrate, Hab2 = <2m; mixed substrate, Hab3 = <2m depth; coarse substrate, Hab4 = 2 to 4m deep; fine substrate, Hab5 = 2 to 4m depth; mixed substrate, Hab 6 = 2 to 4m; coarse substrate, Hab7 = >4m depth; fine substrate, Hab8 = >4m; mixed substrate, Hab9 = >4m depth; coarse substrate

ha = hectare; $m^3$ = cubic metre

The coarse and mixed substrates in the shallow portion of the lakes may provide rearing habitat for Arctic grayling, burbot, cisco, and ninespine stickleback. Coarse substrates (boulder/cobble reefs) in areas of sufficient depth (below the maximum extent of ice cover) may provide spawning habitat for cisco and burbot. Ninespine stickleback spawn in vegetation over fine substrates. Arctic grayling do not spawn in the Peninsula lakes, but they use the gravel substrate in the connecting streams for this purpose.

### *Meliadine Lake*

Meliadine Lake is the largest lake (10 689 ha) within the LSA (Table 7.5-9). The large number of islands (243) and bays within Meliadine Lake result in a long shoreline perimeter of 465 km (SD 7-1 2009 Aquatics Synthesis Baseline, Table 7-2).

**Table 7.5-9: Morphometric Characteristics of Meliadine and Chickenhead Lakes**

| Basin | Lake | Bathymetry Survey Completed | Area (ha) | Volume ($m^3 \times 10^3$) | Depth (m) | |
|---|---|---|---|---|---|---|
| | | | | | Mean | Max |
| ML | East basin of Meliadine Lake (ML-E) | ✓ | 2 212 | 98 851 | 4.5 | 21.3 |
| | South basin of Meliadine Lake (ML-S) | ✓ | 1 135 | 48 429 | 4.3 | 22.2 |
| | All basins of Meliadine Lake (ML) | | 10 689 | – | – | – |
| CH | Chickenhead Lake (CH6) | ✓ | 135 | 2 324 | 1.7 | 8.9 |

ha = hectare; $m^3$ = cubic metre; m = metre

The east basin of Meliadine Lake (2212 ha) contributes approximately 21% to the entire area of the lake. It is separated from the rest of the lake by a shallow and narrow area (up to 2.3 m deep, 100 to 300 m wide, and 800 m long) that features numerous rocky islands and reefs. This constriction may result in separation of the east basin from the rest of the lake if sufficient ice cover (up to 2.5 m in depth) were to impede or restrict flow between the basins during winter; which may limit movement of fish. A large esker bisects the east basin along its northwest to southeast orientation. In the area southwest of the esker, a “trench” of at least 8 m in depth follows most of the esker’s length. The area northeast of the esker is generally shallower and features numerous bays, extensive Peninsulas, and large islands.

The south basin of Meliadine Lake (1135 ha) contributes approximately 11% to the entire area of the lake. The southeast end of the basin is generally shallow (less than 4 m deep), and the northwest sections feature more extensive areas of water deeper than 8 m.

Substrate in Meliadine Lake is characterized by coarse materials consisting of a boulder/cobble mix along the shallow areas close to shore. Transition areas, consisting of fine organic materials interspersed among cobble are common throughout most of the lake. Substrates within the deep sections of the lake are composed primarily of fine organic substrates and silt.

In both basins, more than one third of the volumes in each basin are contributed by lake areas that are less than 2 m in depth (Figure 7.5-4). This indicates a considerable reduction in lake volume and overwintering potential during the winter months, when these areas may freeze to the bottom. Owing to the long shoreline perimeter and the shallow nature of the basins, the littoral zones (i.e., less than 6 m in depth) contribute approximately 66% and 72% of the east and south basins, respectively (Figure 7.5-4). Coarse and mixed substrates in these shallow, near-shore areas provide important rearing habitat for juvenile stages of all fish. Coarse substrates (boulder/cobble reefs) in areas of sufficient depth (below the maximum extent of ice cover) may provide

spawning habitat for fall and winter spawners, such as Arctic char, lake trout, round whitefish, cisco, and burbot. The fine substrates in the deeper areas provide forage habitat for round whitefish and are used as feeding areas for piscivores, such as lake trout, Arctic char, and burbot.

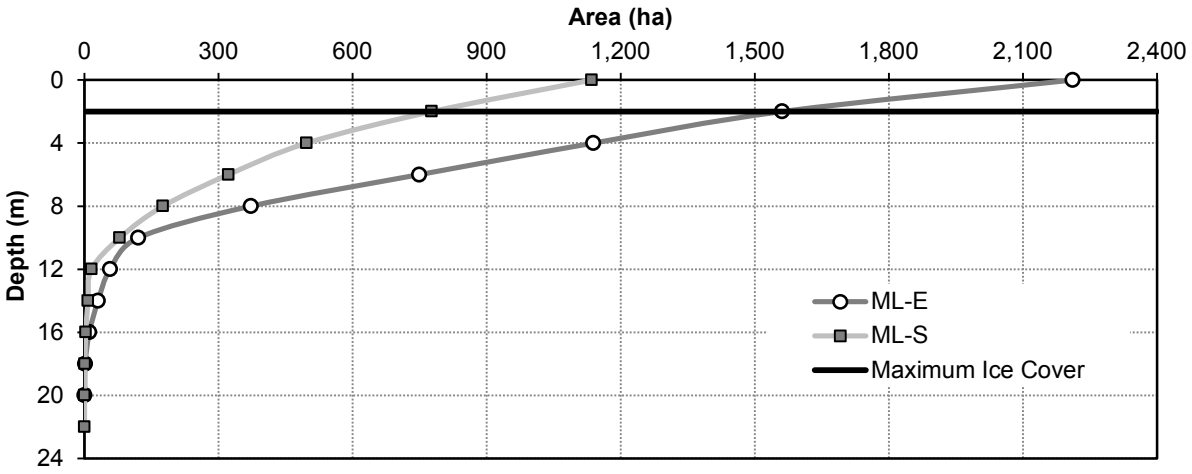



*Figure 7.5-4: Depth-Area Curves for the East (ML-E) and South (ML-S) Basins of Meliadine Lake*

### Chickenhead Lake

Chickenhead Lake is 135.5 ha in area, has a maximum surveyed depth of 8.9 m, a mean depth of 1.7 m, and contains approximately 2 324 x $10^3$ $m^3$ of water (Table 7.5-9). The bathymetric map of Chickenhead Lake (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix D7q) shows a wide variety of potential habitats for fish. Shallow areas (<1 m) are prevalent along the lake's periphery, especially in the western portion, and areas of moderate depth (1 to 4 m) are scattered throughout the lake. There is one area of substantial depth (>8 m) located in the north-central area of the lake.

### 7.5.4.2.2.3 Ponds

### Proposed Mine Site (Peninsula)

The surveyed ponds on the Peninsula (*n*=95) ranged from 0.1 ha (Pond H4) to 18.8 ha (Pond D4) in surface area. They were shallow, with maximum depths of less than 1.0 m in 62% of the surveyed ponds (Appendix 7.5-B). Using bathymetry data from 11 ponds (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix D7; SD 7-2 2011 Aquatics Baseline, Appendix D3), mean depths ranged from 0.4 m in Pond B10 to 1.0 m in Pond D4. As discussed above, when the ice cover exceeds 2 m in depth, as is often the case during late winter (Hubert and Associates Ltd. 1996), the under-ice water volume is greatly reduced and most ponds likely freeze to the bottom.

The ponds were generally dominated by fine substrates (mean of 62% of pond area), followed by coarse (23%) and mixed (15%) substrates. However, in several ponds (A4, A7, A44, A45, A49, C7, C8, C9, D4, D6, H1, H13, H17, and J6), the substrate was dominated by coarse material. Shallow zones of mixed and coarse substrates were present in most ponds, with coarse substrates observed mainly along pond margins.

Aquatic vegetation was the most common (38%) cover type available in ponds followed by overhanging shoreline (26%) and boulder gardens (18%) (SD 7-1 2009 Aquatics Synthesis Baseline, Section 7.4 and Appendix D8). Aquatic vegetation was common along pond margins and was more prevalent during early summer when water levels were higher because of recent snow and ice melt. Overhanging shoreline material resulted from eroding tundra vegetation along pond margins. Both aquatic vegetation and overhanging shoreline served as excellent cover for small forage species such and ninespine stickleback. Boulders, while present, did not contribute substantially to available cover for fish. Where overhanging vegetation was encountered, it was typically along flooded pond margins in early summer.

Pond habitat was suitable mainly for rearing and spawning by forage species, particularly ninespine stickleback. Spawning potential for Arctic grayling was limited by the lack of suitable coarse substrates. Overwintering by fish in the Peninsula is not possible because the ponds freeze to bottom during winter. Movement within ponds was unimpeded; however, movement between ponds appeared possible only during periods of increased flow (e.g., spring freshet and/or precipitation events). Given the propensity of the ponds to winterkill, they offer seasonal habitat (when accessible) and there is no potential to support fish on an annual basis.

#### *Chickenhead Lake Watershed*

The 4 surveyed ponds in the Chickenhead Lake watershed ranged from 0.5 ha (Pond CH28) to 1.1 ha (Ponds CH31 and CH32) in surface area and were relatively shallow (maximum depths ranged from 0.4 m in Pond CH28 to 1.6 m in Pond CH32; Appendix 7.5-B). Similar to the Peninsula ponds, the ponds in the Chickenhead Lake watershed were dominated by fine substrates (mean 74% of total pond area), followed by coarse (14%) and mixed (13%) substrates. Because of the poor connectivity of these ponds to Chickenhead Lake and the high gradient of the terrain that separates the ponds from the lake, it is unlikely that fish can reach these ponds during the spring freshet. Fish were not observed in the ponds during the 2012 surveys.

### 7.5.4.2.3 Regional Study Area

#### *7.5.4.2.3.1 Streams*

#### *Overview*

The total length of streams (as identified within the national topographic database specific to that region) in the RSA is approximately 1414 km. The Diana River and Meliadine Lake watersheds had the highest total length (678 and 257 km, respectively), reflecting the larger drainage area in those watersheds.

#### *Surveyed Streams*

River morphology in the Meliadine River, and hence habitat, varies greatly from its origin at the south basin of Meliadine Lake to the estuary at Hudson Bay (SD 7-1 2009 Aquatics Synthesis Baseline, Appendices D2 to D4 and G2). The outlet at Meliadine Lake (Site ML-MR) is characterized by a short channel (about 150 m in length) and high gradient (approximately 20 m/km). During field surveys, the mean wetted channel width ranged between 51 m (1997) and 72 m (1998) and flow was confined to a single channel. The outlet was shallow (mean depth of 0.6 m in June 1997 and 0.5 m in June 1998). A variety of habitat types including riffle-run-pool complexes were observed with habitat consisting primarily of riffles and shallow runs. The substrate consisted predominantly of coarse materials; boulders and cobbles accounted for 81% of substrate and gravel material was also common (19%). Because of high current velocities, fine particles were absent from the bed composition. Instream cover was limited to boulder gardens.

Downstream from the outlet at Meliadine Lake, the Meliadine River widens and slows, flowing through a series of lakes connected by short sections of riffle and rapid habitat. In the middle reaches, mid-way between Meliadine Lake and Hudson Bay, the river flows through Little Meliadine Lake, which features a deep (>14.8 m), long (about 5 km), and wide (about 1 km) basin with habitat comparable to that of Meliadine Lake.

Between Little Meliadine Lake and Hudson Bay, the river narrows and velocities increase. In June 2008, the river at Site M2.1, which is approximately 2 km upstream from the estuary, was confined to a single channel with small rock-piles scattered throughout the reach (see Section 7.5.4.2.1.1 for more information).

#### *7.5.4.2.3.2 Lakes and Ponds*

##### *Overview*

Due to the predominantly flat topography, the RSA is characterized by a large number of lakes and ponds (Table 7.5-10). The total surface area of these waterbodies comprise 27% of the total drainage area (i.e., 73% is terrestrial). The contributions of aquatic habitat to the total drainage areas of Rankin Inlet and Hudson watersheds are lower (<11%) than in the remaining watersheds. In the Meliadine Lake watershed, 35% of the area is comprised of water due to the large size of the lake itself and several mid-sized lakes in the northeast part of the watershed.

**Table 7.5-10: Number, Area, and Size of Lakes and Ponds in Regional Study Area Watersheds**

| Watershed | Drainage Area ($km^2$) | Total Lake and Pond Area ($km^2$) | Water as % of Drainage Area | Number of Lakes and Ponds | Mean Density of Lakes and Ponds (no./$km^2$) | Mean Lake and Pond Area (ha) | Median Lake and Pond Area (ha) |
|---|---|---|---|---|---|---|---|
| Meliadine Lake[a] | 559.1 | 197.5 | 35.3 | 2082 | 3.7 | 9.5 | 0.5 |
| Meliadine River | 210.2 | 52.2 | 24.8 | 843 | 4.0 | 6.2 | 0.8 |
| Atulik | 207.0 | 48.1 | 23.2 | 1067 | 5.2 | 4.5 | 0.4 |
| Char River | 72.0 | 14.5 | 20.1 | 239 | 3.3 | 6.1 | 1.2 |
| Diana River | 1682.0 | 485.2 | 28.8 | 6091 | 3.6 | 8.0 | 0.6 |
| Rankin Inlet | 101.5 | 9.5 | 9.4 | 219 | 2.2 | 4.3 | 1.1 |
| Hudson | 173.6 | 18.6 | 10.7 | 928 | 5.4 | 2.0 | 0.5 |
| **Total** | **3005.4** | **825.6** | **27.5** | **11469** | **3.8** | **7.2** | **0.6** |

$km^2$ = square kilometre; ha = hectare; Note: some of the enumerated waterbodies from the NTS database may be ephemeral and more similar to a wetland type;

[a] includes Peninsula

The mean waterbody size ranged from 2.0 ha in the Hudson watershed (i.e., the combined watershed of Thompson, Dry Cove, and smaller sub-basins along the Hudson Bay coast between the Atulik and Meliadine River watersheds) to 9.5 ha in the Meliadine Lake watershed. The median lake size was less than 0.6 ha in all watersheds in the region (Table 7.5-10 of the FEIS). The mean density of waterbodies is similar among the regional watersheds, ranging from 2.2 waterbodies per km² in the Rankin Inlet watershed to 5.4 waterbodies per km² in the Hudson watershed.

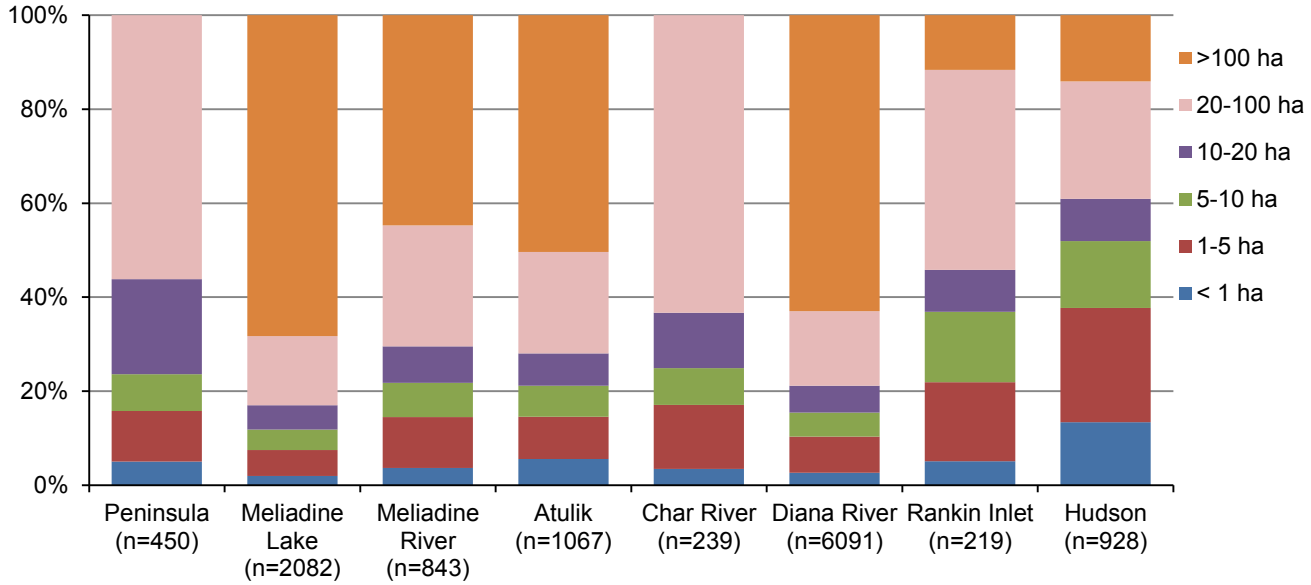



*Figure 7.5-6: Contribution of Various Sizes of Waterbodies to the Total Area of Lakes and Ponds within the 8 Watersheds in the Regional Study Area*

The above results indicate that the small and shallow ponds in the Peninsula watershed are the predominant waterbody type in the region. The similarities in the abundance and density of this habitat type between the Peninsula watershed and the other watersheds in the region suggest that the Peninsula watershed is not unique in this regard. The abundance of these small waterbodies is a characteristic shared by all watersheds in the region. Despite their numerical abundance, the value of these shallow habitats for year-round use by fish is low, In cases where these shallow ponds are used by fish, this use is seasonal in nature (i.e., no overwintering use) and limited to one species only (ninespine stickleback).

### *Surveyed Lakes*

Peter Lake was the largest (15 025 ha) and the deepest (23.5 m) lake and Control Lake was the smallest (106 ha) and shallowest lake (5.9 m maximum depth) surveyed in the RSA (Tables 7.5-9 and 7.5-11).

**Table 7.5-11: Morphometric Characteristics of the Control, Little Meliadine and Peter lakes**

| Watershed | Site | Bathymetry Survey Completed | Area (ha) | Volume ($m^3 \times 10^3$) | Depth (m) | |
|---|---|---|---|---|---|---|
| | | | | | Mean | Max |
| Meliadine Lake | Control Lake (CON) | ✓ | 106.3 | 2 364.5 | 2.2 | 5.9 |
| Meliadine River | Little Meliadine Lake (LML) | | 496.0 | – | – | >14.8 |
| Diana River | Peter Lake (PL) | | 12 025.0 | – | – | 23.5 |

ha = hectare; $m^3$ = cubic metre; m = metre

## *7.5.4.3 Lower Trophic Communities Results*

Arctic char, lake trout and Arctic grayling, the valued ecosystem components in the assessment of fish and fish habitat, occupy top trophic positions in the Meliadine Lake ecosystem. At the base of the ecosystem phytoplankton in lake water and periphyton on shoreline rocks use nutrients and carbon sources for growth, and

provide food to benthic invertebrates and zooplankton. Zooplankton feed directly on phytoplankton, while benthic invertebrates feed on periphyton and decaying organic material that settle on the bottom of waterbodies. Fish feed on zooplankton and benthic invertebrates, and predatory fish feed on smaller fish.

#### 7.5.4.3.1 Periphyton

##### *7.5.4.3.1.1 Streams*

The chlorophyll *a* and AFDM concentrations in periphyton were low in 1997 and 1998, indicating low algal biomass on stream substrates, characteristic of oligotrophic conditions (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.1.1, Appendices E1 to E3). The mean chlorophyll *a* concentrations were typically less than 4 µg/cm² and concentrations were similar in the LSA and RSA (Figure 7.5-7). Ash-free dry mass estimates were more variable (Figure 7.5-7); means ranged from 0.78 mg/cm$^2$ at Stream B1-2 (1998) to 172.32 mg/cm$^2$ at Stream ML-PL (1997). Meliadine Lake outflows (Sites ML-MR and ML-PL) in the RSA had much larger AFDM estimates compared to smaller streams sampled in the LSA, indicating that the organic content of the periphyton was higher in the larger outflows/rivers in the RSA. Variability among sites and between years was high, with no consistent trend.

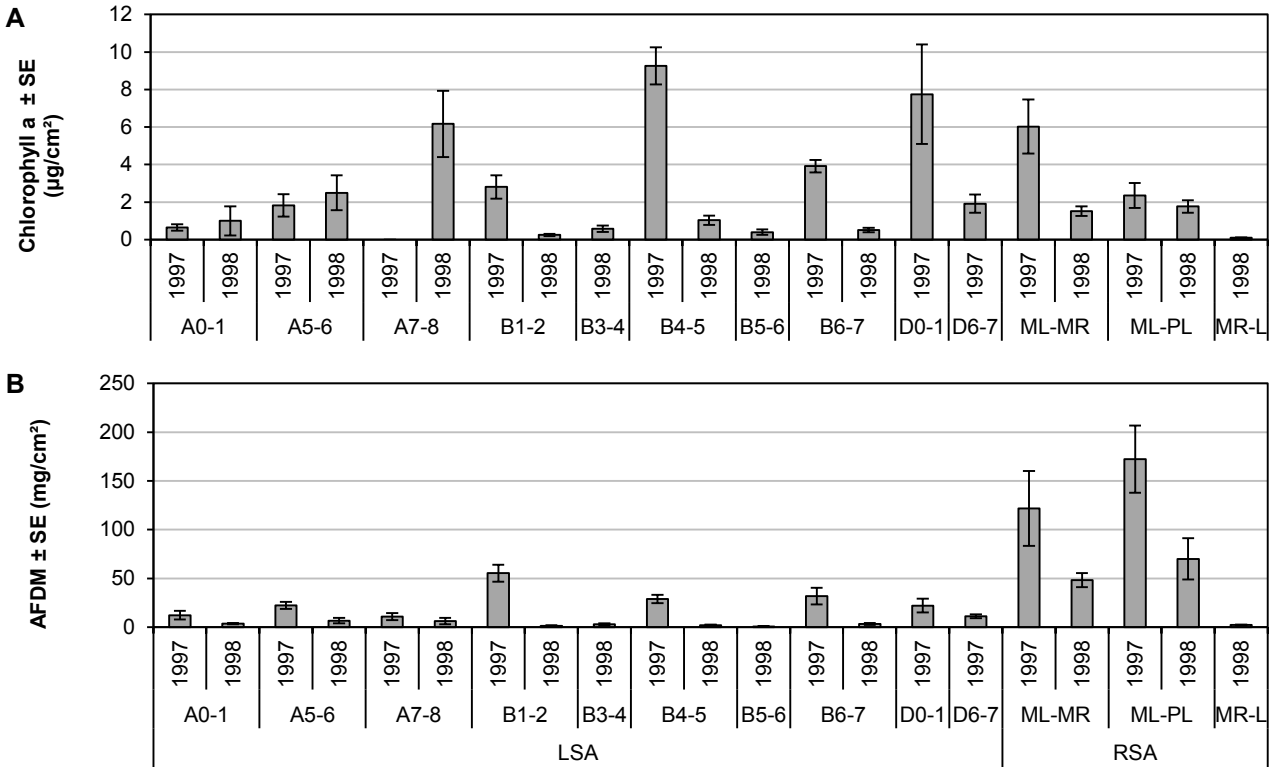



*Figure 7.5-7: Periphyton Chlorophyll a (A) and AFDM (B) Concentrations in Streams in the Local and Regional Study Areas, 1997 and 1998*

Most sites had periphyton densities between 200 000 and 900 000 cells/mL; however, densities at sites sampled in both 1997 and 1998 varied between years (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.1.1).

Densities were approximately 6 times greater during the 1998 sampling events for streams in the RSA (ML-MR and ML-PL), than in 1997 and compared to other streams within the LSA (Basins A, B and D).

A total of 337 species of algae were identified in the periphyton samples (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.1.1). Cyanophyta (cyanobacteria) was the most common group in both years, accounting for over 75% of the total density at each site (Figure 7.5-8). Bacillariophyta (diatoms) and Chlorophyta (green algae) were also common at each site, contributing between 3 and 34%, respectively, of total density. Cryptophyta (cryptophytes), Chrysophyta (golden brown algae), Pyrrophyta (dinoflagellates), and Euglenophyta (euglenoids) were present in low density at most sites in both years and are included in the "other" category in Figure 7.5-8. Variation in taxonomic composition was low between the 2 years with available data.

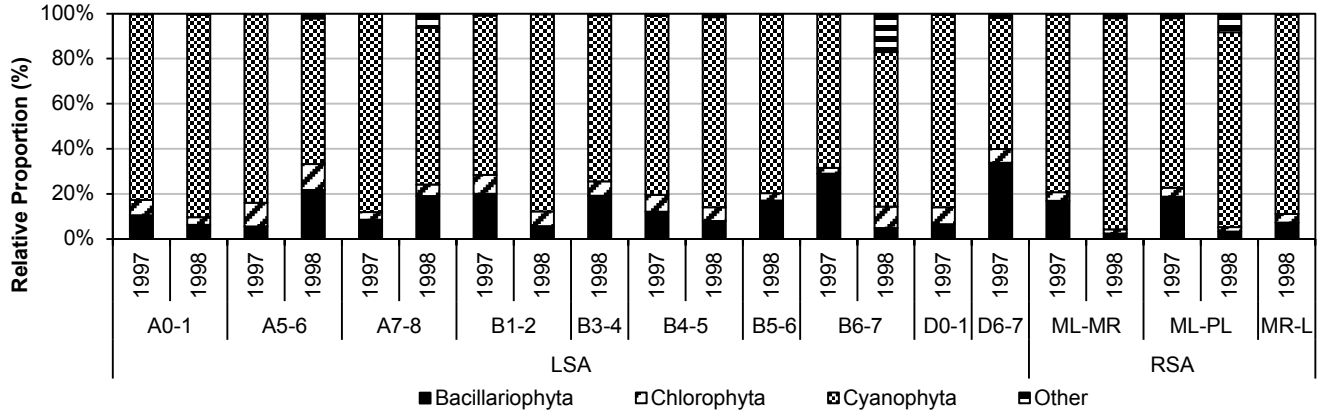



*Figure 7.5-8: Community Composition of Periphyton in Streams in the Local and Regional Study Areas, 1997 and 1998*

### *7.5.4.3.1.2 Lakes*

The chlorophyll *a* and AFDM concentrations in periphyton were low on near-shore lake substrates, indicating oligotrophic conditions (Figures 7.5-9; SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.1.2). The majority of sites had chlorophyll *a* concentrations below 4 µg/cm$^2$, with the exception of Lake A8 and Lake D7. Ash-free dry mass concentrations were below 50 µg/cm$^2$ at the majority of sites, with the exception of Lake D7. Both chlorophyll *a* and AFDM concentrations were generally higher in the smaller lakes on the Peninsula than in the larger lakes (i.e., Meliadine, Peter, and Little Meliadine). Variability between years for both chlorophyll *a* and AFDM was high; overall, concentrations were higher in 1997 than in 1998. Phytoplankton density at most sites varied between 100 000 and 800 000 cells/mL, and varied between years (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.1.2).

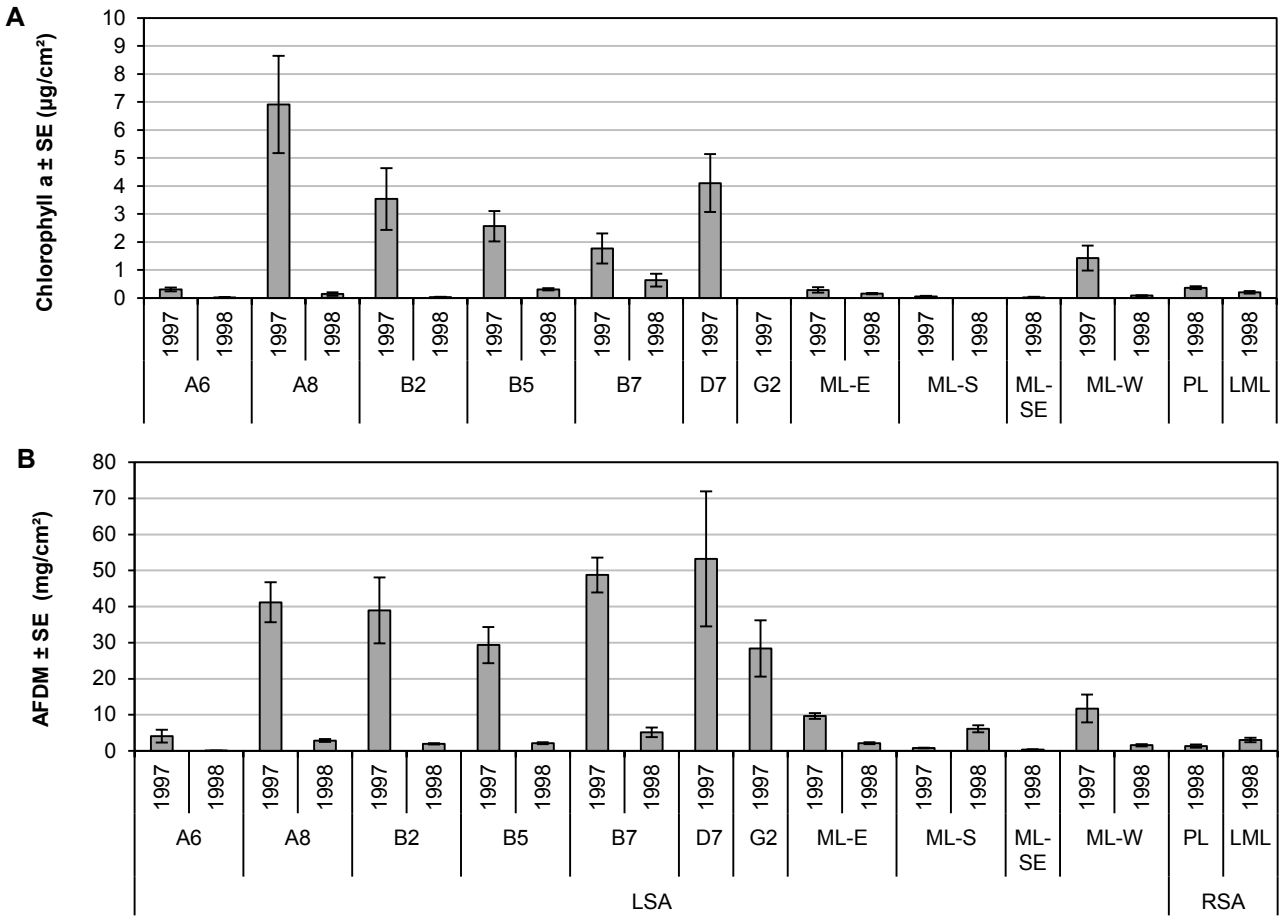



*Figure 7.5-9: Periphyton Chlorophyll a (A) and AFDM (B) Concentrations in Lakes in the Local and Regional Study Areas, 1997 and 1998*

A total of 322 species of algae were identified in the periphyton samples collected (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.1.2). Cyanophyta was the most common group in both years, contributing over 66% of the total density at each site (Figure 7.5-10). Bacillariophyta and Chlorophyta were also common at all sites, contributing between 2 and 30% of total density. Both groups were less common in 1998. Cryptophyta, Chrysophyta, and Pyrrophyta were present in low density at most sites in both years, and were included in the "other" category (Figure 7.5-10).

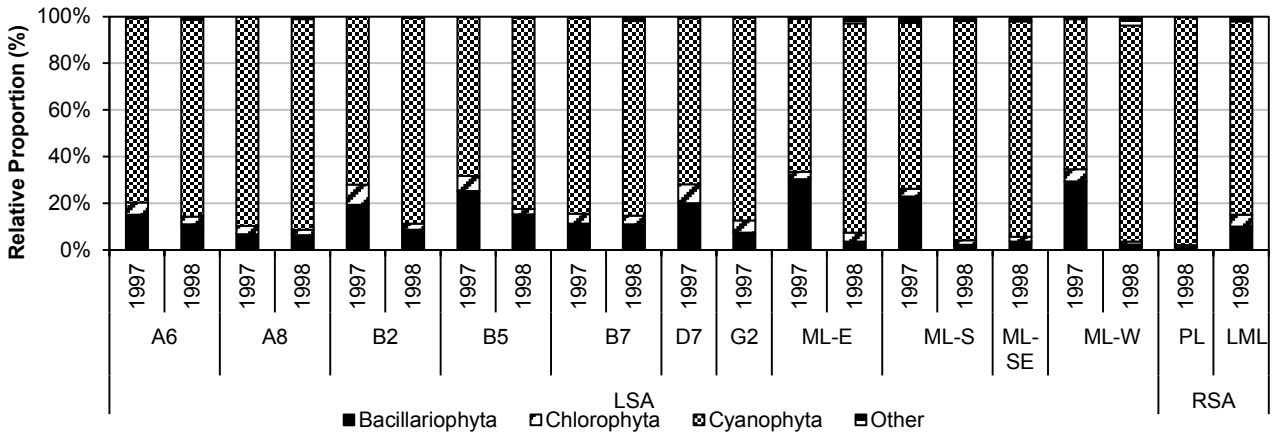



*Figure 7.5-10: Community Composition of Periphyton in Lakes in the Local and Regional Study Areas 1997 and 1998*

### 7.5.4.3.2 Phytoplankton

Chlorophyll *a* concentrations in phytoplankton in all lakes and ponds were 3.1 mg/m$^3$ or lower, indicative of oligotrophic conditions (Figure 7.5-11; SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.2; SD 7-2 2011 Aquatics Baseline, Section 6.2.2). Phytoplankton biomass in the large lakes ranged from 342 to 3107 µg/L (Figure 7.5-11), but the majority of sites had phytoplankton biomass between 500 and 2000 µg/L. Chlorophyll *a* concentrations and biomass had low among-year variability at some locations and high variability at others. Chlorophyll *a* concentrations and biomass were typically higher in 1998 than in other years. There was considerable variation of chlorophyll *a* concentrations and biomass among the 4 basins of Meliadine Lake. The Peninsula lakes and ponds typically had higher chlorophyll *a* concentrations, and greater among-year variability than the larger lakes.

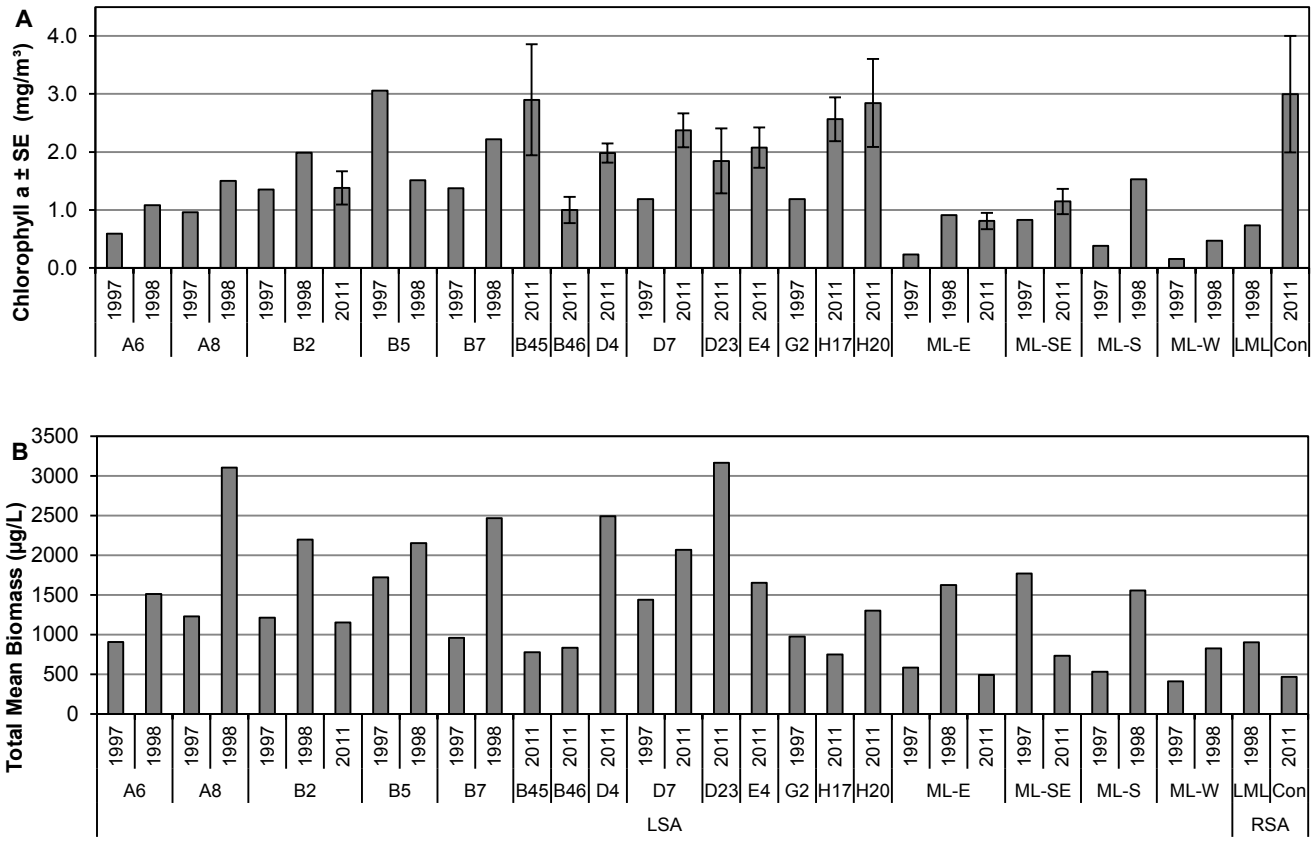



*Figure 7.5-11: Phytoplankton Chlorophyll a Concentrations (A) and Biomass (B) in Select Lakes and Ponds in the Local and Regional Study Areas, 1997, 1998, and 2011*

A total of 242 species of algae were identified in the samples collected, but the number of taxa observed at one site on a single date ranged from 46 to 83 taxa (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.6.2; SD 7-2 2011 Aquatics Baseline, Section 6.2.2). Chrysophyta were the dominant taxonomic group in terms of biomass, although Chlorophyta, Pyrrophyta, and Bacillariophyta were also abundant at most sampling sites (Figure 7.5-12). The phytoplankton community composition showed only small variations among seasons and years and was generally similar among each of the 4 basins of Meliadine Lake and the Peninsula lakes and ponds.

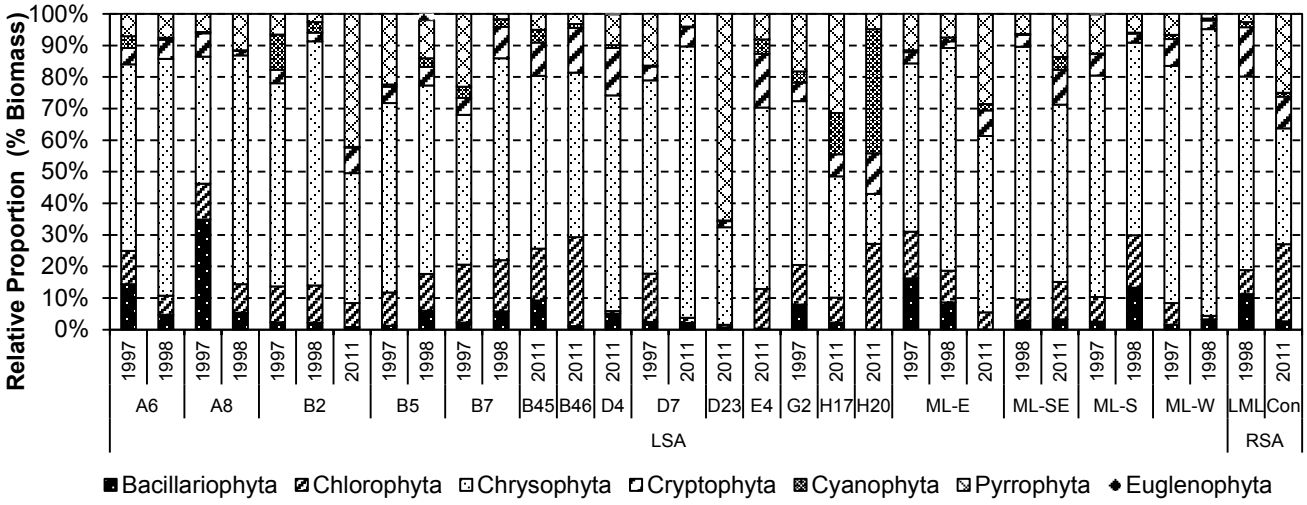



*Figure 7.5-12: Community Composition of Phytoplankton Based on Biomass in Select Lakes and Ponds in the Local and Regional Study Areas, 1997, 1998, and 2011*

#### 7.5.4.3.3 Zooplankton

In general, zooplankton biomass was similar between the large lakes (i.e., Meliadine, Peter and Little Meliadine) and the Peninsula lakes and ponds (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.7; SD 7-2 2011 Aquatics Baseline, Section 6.2.3). The biomass at most sites ranged between 50 and 400 mg/m$^3$, with the exception of Lakes B2 and B7, where biomass was exceptionally high (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.7). The factors responsible for the high biomass at these sites are not known, but may include an abundance of food (phytoplankton) or reduced grazing pressure from fish. Among-year variability of zooplankton biomass was high and biomass was generally lower in 2011 compared to other years.

A total of 42 zooplankton taxa were identified in the RSA, but the number of taxa typically identified at one sampling location on a single date ranged from 6 to 21 (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.7; SD 7-2 2011 Aquatics Baseline, Section 6.2.3). In each of the large lakes, the composition of the zooplankton community based on biomass was variable, but was generally dominated by Cladocera (cladocerans or water fleas; Figure 7.5-13). *Holopedium gibberum* (a particularly large cladoceran that possesses a large gelatinous sheath which may limit predation from fish) was the dominant species at most sites (including in Lakes B2 and B7). The zooplankton community was more variable in the small lakes and ponds and patterns were difficult to detect (Figure 7.5-13).

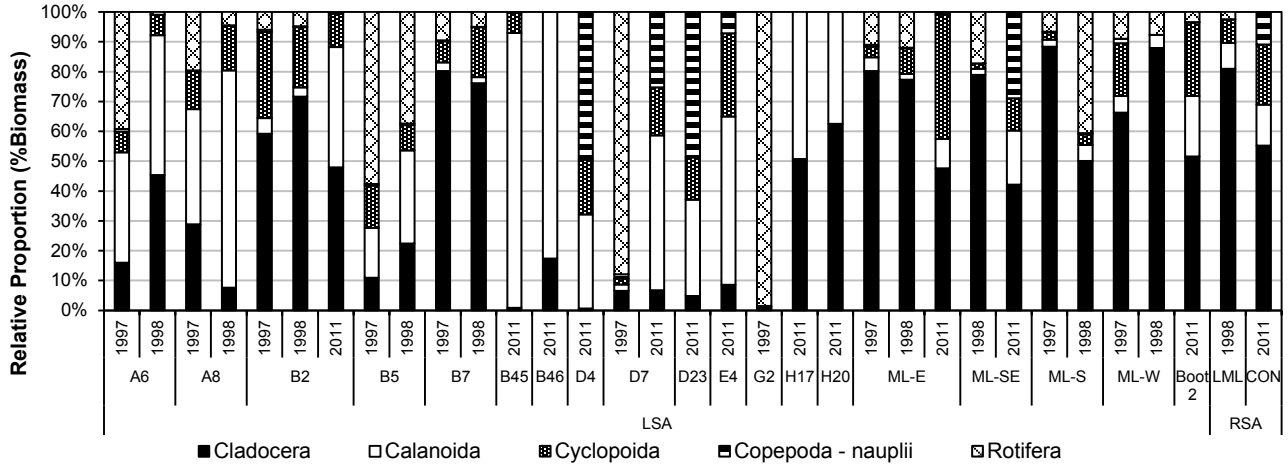



*Figure 7.5-13: Community Composition based on Zooplankton Biomass in Select Lakes and Ponds in the Local and Regional Study Areas, 1997, 1998, and 2011*

### 7.5.4.3.4 Benthic Invertebrates

#### *7.5.4.3.4.1 Streams*

Benthic invertebrate density ranged from 4700 organisms/m$^2$ to 45 000 organisms/m$^2$ (Figure 7.5-14), however, at the majority of sites, density was between 15 000 and 30 000 organisms/m$^2$ (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.8.1). In general, density was similar between years with the exception of Stream B6-7, where mean density varied about 2-fold between 1998 and 1997.

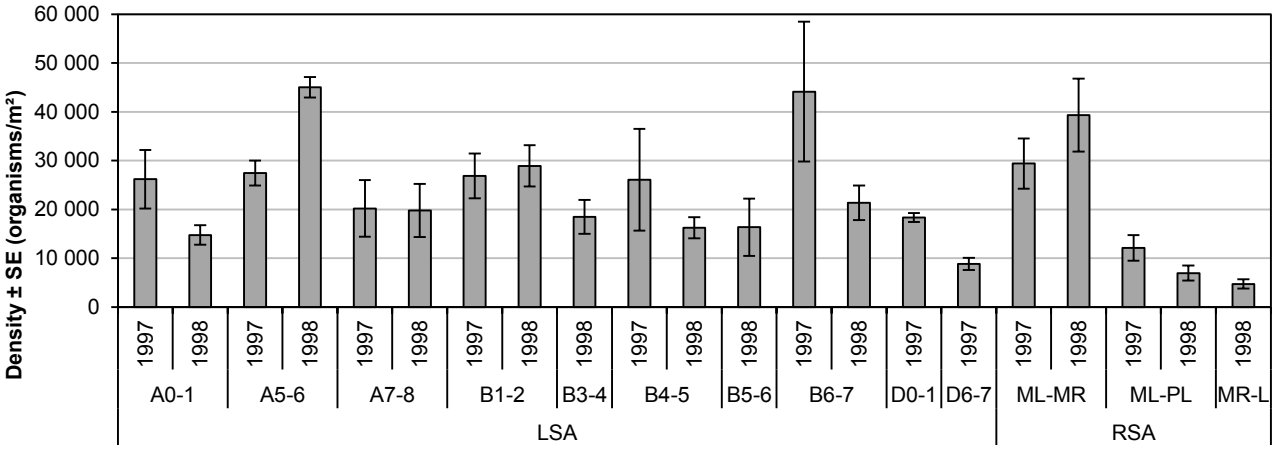



*Figure 7.5-14: Benthic Invertebrate Density in Streams in the Local and Regional Study Areas, 1997 and 1998*

Chironomidae (midges), Coelenterata (hydra), and Oligochaeta (aquatic worms) were generally the most dominant taxa (Figure 7.5-15). Nematoda (roundworms) and Ostracoda (ostracods or seed shrimp) were also common at many sites. Differences in community structure observed among the streams may be attributed largely to differences in physical habitat (i.e., as characterized by water depth, current velocity, and substrate composition) and food availability (i.e., periphyton and other organic material).

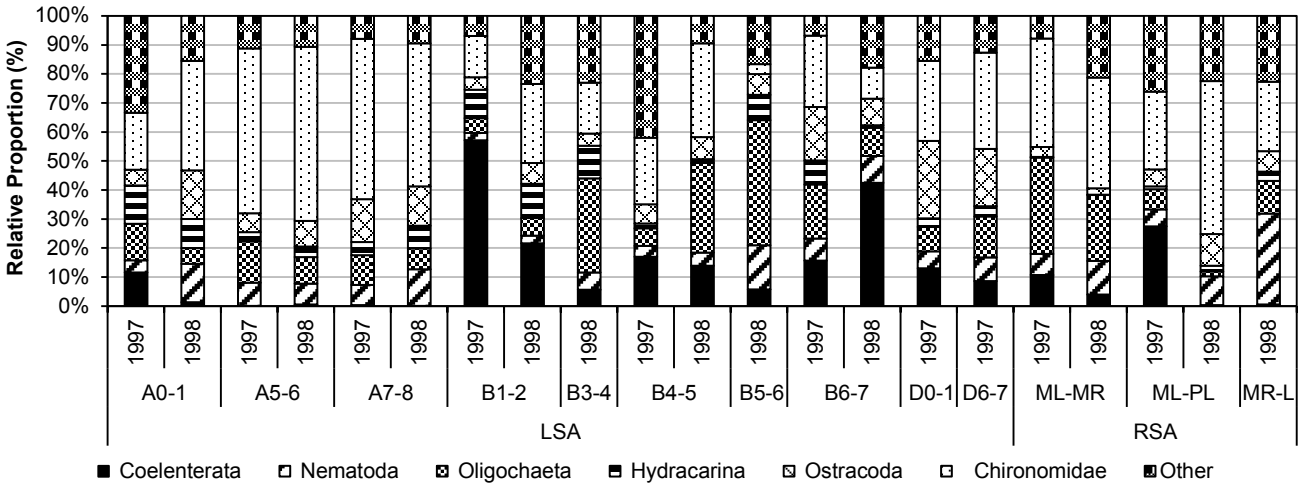



*Figure 7.5-15: Community Composition of Benthic Invertebrates in Streams in the Local and Regional Study Areas, 1997 and 1998*

Overall richness (total number of taxa present at a site) in streams/rivers in the LSA and RSA included 47 taxonomic groups at the lowest level of identification (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.8.1). Richness values in the Meliadine Lake outflows (sites ML-MR and ML-PL) and in the Lower Meladine River (Stream MR-L) were lower than in the Peninsula streams (11 to 16 taxa/site, identified at the family level versus 16 to 22 taxa/site, respectively).

### *7.5.4.3.4.2 Lakes and Ponds*

Benthic invertebrate densities in the majority of lakes and ponds in the LSA and RSA ranged from approximately 300 to 90 000 organisms/$m^2$, however, the majority of lakes and ponds had densities between 4000 and 57 000 organisms/$m^2$ (Figure 7.5-16; SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.8.2; SD 7-2 2011 Aquatics Baseline, Section 6.2.4). In 1997 and 1998, densities in Peninsula lakes and ponds were greater than those in large lakes; however, this was not apparent in 2011. Overall richness for lakes and ponds in the LSA and RSA was 28 taxa; richness was similar between sites and years (SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.8.2; SD 7-2 2011 Aquatics Baseline, Section 6.2.4).

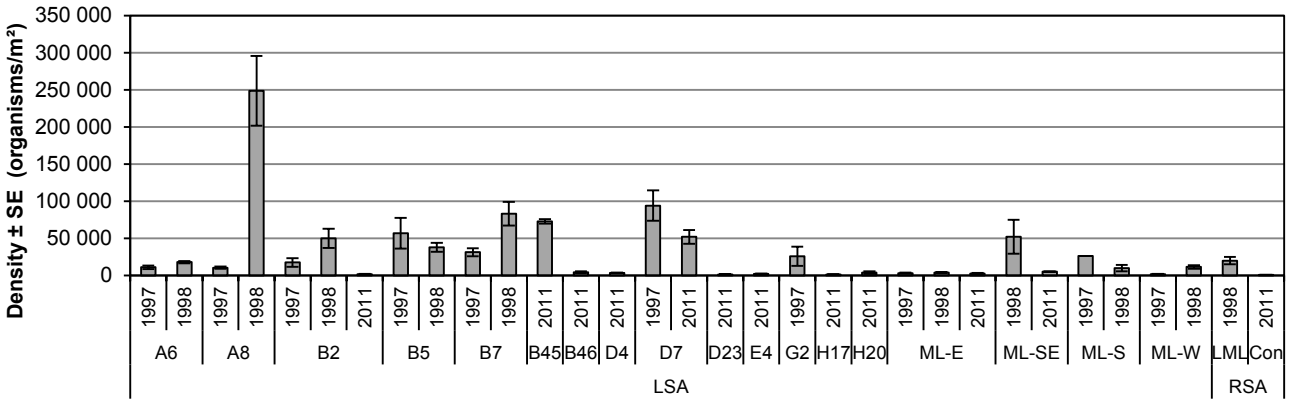



*Figure 7.5-16: Benthic Invertebrate Density in Select Lakes and Ponds in the Local and Regional Study Areas, 1997, 1998, and 2011*

In 1997 and 1998, Chironomidae, Nematoda, Ostracoda, and Copepoda were common at most sites (Figure 7.5-17; SD 7-1 2009 Aquatics Synthesis Baseline, Section 8.8.2). In 2011, Chironomidae, Ostracoda, Pelecypoda, and harpacticoid Copepoda were most common (SD 7-2 2011 Aquatics Baseline, Section 6.2.4). The benthic invertebrate community varied among sites, with Chironomidae frequently dominating the community structure at most lakes and ponds. This is consistent with the results reported for 63 lakes and ponds in the eastern Canadian Arctic by Medeiros and Quinlan (2011).

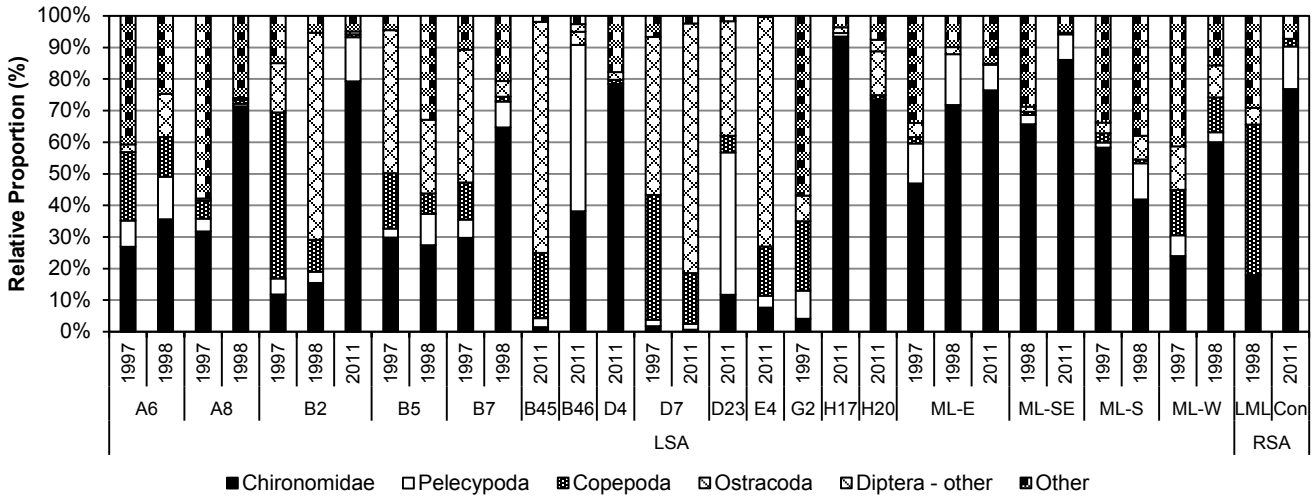



*Figure 7.5-17: Community Composition of Benthic Invertebrates in Select Lakes and Ponds in the Local and Regional Study Areas, 1997, 1998, and 2011*

## *7.5.4.4 Fish Populations Results*

### 7.5.4.4.1 Species Composition and Relative Abundance

#### *Overview*

Between 1997 and 2012, 924 sampling events were completed during investigations of fish communities for the proposed Project. In total, 198 waterbodies were sampled, including 167 small lakes, ponds and interconnecting streams on the Peninsula basins (Appendix 7.5-C). In 2012, the primary objective was to focus on collecting fish and habitat information for select small waterbodies (e.g., ponds) in the LSA that were not sampled previously. Additional information for sampling activities can be located in Appendices 7.5-C to 7.5-H where all effort and data collected for the baseline have been summarized in tables.

Backpack electrofishing was the most commonly used sampling technique followed by minnow trapping, gill netting, angling, and fyke netting (Table 7.5-12). Fish were also observed incidentally at sites where aquatic habitat surveys were completed. Although employed in a limited number of locations, fish fence effort (over 2 months) was an important part of the fish studies.

**Table 7.5-12: Summary of Fish Sampling Effort for the Proposed Project, 1997 to 2012**

| Method | Waterbodies Sampled | Number of Sampling Events | Total Effort | |
|---|---|---|---|---|
| Angling | 30 | 60 | 107 | rod-h |
| Backpack Electrofishing | 123 | 249 | 90 602 | s |
| Fyke Nets | 37 | 99 | 2 164 | h |
| Gill Nets | 48 | 245 | 302 | net-units |
| Minnow Traps | 88 | 115 | 7 100 | trap-h |
| Observed | 24 | - | | - |
| Fish Fence | 1 | 131 | 1 651 | h |

The total fish catch from surveys completed in the RSA from 1997 to 2012 (all sampling methods and locations combined) was 23 516 fish (Appendix 7.5-D). The total catch (Figure 7.5-18) was comprised of 9 species, 5 of which are members of the Salmonidae family (Arctic char, Arctic grayling, cisco, lake trout, and round whitefish). Overall, ninespine stickleback were most prevalent (28.6%) followed by threespine stickleback (28.1%), Arctic char (16.5%), cisco (11.9%), Arctic grayling (8.4%), and lake trout (3.1%). Round whitefish, slimy sculpin, and burbot comprised only a small portion of the catch (2.1%, 1.0%, and 0.3%, respectively). In 2012, the catch comprised four Arctic grayling and 17 ninespine stickleback.

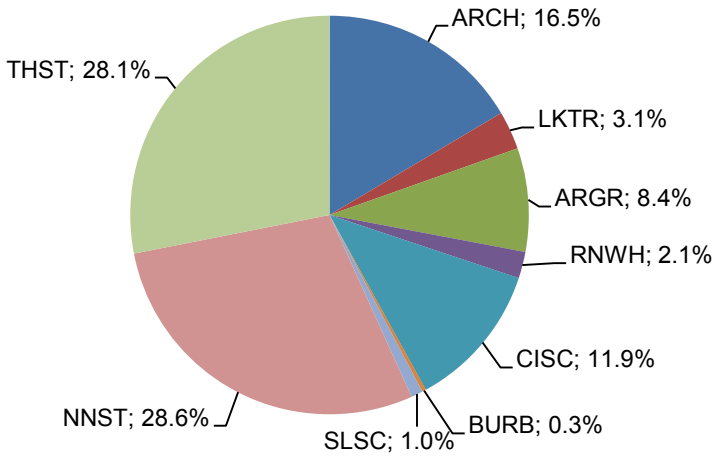



*Figure 7.5-18: Fish Species Composition in the Local and Regional Study Areas, 1997 to 2012 (all sampling methods and locations combined)*

The majority (80.4%) of fish were captured in the LSA (Table 7.5-13). Within the LSA, the fish were caught in Meliadine Lake (51.5%), the Peninsula Basins (46.3%), Chickenhead Lake (0.2%), and streams along the AWAR (2.0%). The number and species of fish captured reflected the amount and type of sampling effort used in each area. For example, the large contribution of Arctic char (71.4%) to the total catch in the RSA resulted from use of a fish fence in the lower Meliadine River during the annual fall migration of this species from Hudson Bay into freshwater systems.

**Table 7.5-13: Number and Frequency of Occurrence of Fish Species Captured in the Local and Regional Study Areas, 1997 to 2012 (all sampling methods combined)**

| Species | Peninsula Basins | | Meliadine Lake | | LSA Total[a] | | RSA[b] | |
|---|---|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | *n* | % | *n* | % |
| Arctic char | 134 | 1.5 | 462 | 4.7 | 596 | 3.2 | 3 287 | 71.4 |
| Lake trout | 88 | 1.0 | 427 | 4.4 | 532 | 2.8 | 171 | 3.7 |
| Arctic grayling | 1 395 | 15.9 | 197 | 2.0 | 1 613 | 8.5 | 365 | 7.9 |
| Round whitefish | 20 | 0.2 | 112 | 1.1 | 132 | 0.7 | 362 | 7.9 |
| Cisco | 246 | 2.8 | 2 496 | 25.6 | 2 742 | 14.5 | 47 | 1.0 |
| Burbot | 54 | 0.6 | 9 | 0.1 | 64 | 0.3 | 12 | 0.3 |
| Slimy sculpin | 199 | 2.3 | 3 | 0.0 | 205 | 1.1 | 19 | 0.4 |
| Ninespine stickleback | 6 223 | 71.1 | 0 | 0.0 | 6 592 | 34.9 | 151 | 3.3 |
| Threespine stickleback | 399 | 4.6 | 6 040 | 62.0 | 6 439 | 34.0 | 187 | 4.1 |
| **Total** | **8 758** | **100.0** | **9 746** | **100.0** | **18 915** | **100.0** | **4 601** | **100.0** |

[a] Includes waterbodies surveyed in the Mine LSA (i.e., Peninsula Basins, Meliadine Lake, and Chickenhead Lake), AWAR LSA, and Rankin Inlet LSA.
[b] Includes Meliadine River, Control Lake, Little Meliadine Lake, and Basin O. Excludes waterbodies surveyed in the LSA.

#### *7.5.4.4.1.1 Streams in the LSA*

#### *Proposed Mine Site (Peninsula)*

Fish were recorded in 49 of the 52 streams sampled in the LSA for the proposed mine site. The catch (*n*=3048) was dominated by ninespine stickleback (66.1%; Figure 7.5-43). Arctic grayling were next in abundance (16.0%), followed by threespine stickleback (6.5%), slimy sculpin (6.5%), lake trout (2.0%), Arctic char (1.7%), burbot (1.0%), cisco (0.2%), and round whitefish (0.1%). Catch-per-unit-effort (CPUE) values for Peninsula Basin streams were 3.0 fish/min for electrofishing, 1.1 fish/h for the fyke net, and 12.0 fish/24-h for minnow trapping (Appendix 7.5-C).

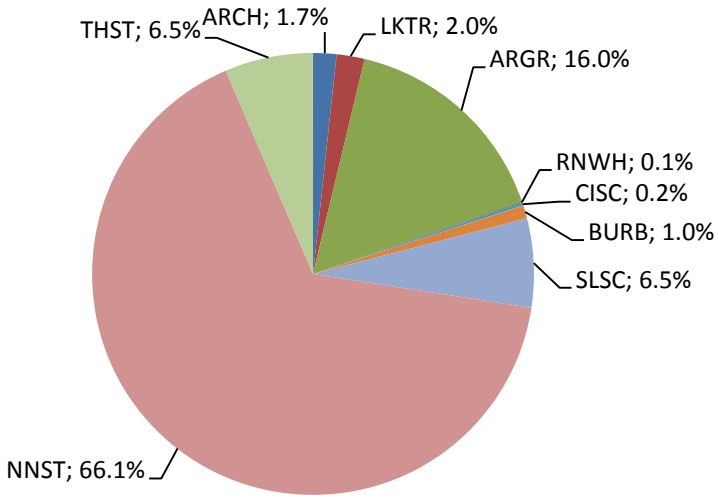



*Figure 7.5-19: Fish Species Composition in Streams in the Local Study Area for the Proposed Mine Site (all sampling methods and seasons combined)*

Electrofishing was the main method used to sample streams in the Mine LSA. Combined CPUE values are compared among the most frequently sampled streams (i.e., sampled between 4 and 8 times each) in Figure 7.5-20. Overall CPUE values ranged from 0.6 fish/min in B68-69 to 4.3 fish/min in A2-3. Generally, values were higher in streams located in the lower reaches of the watershed (e.g., A0-1, B0-1, D0-1). This is a result of larger numbers of fish, representing a variety of species, having access to streams closer to Meliadine Lake. In contrast, streams located further upstream in the watershed (e.g., A7-8, B6-7) were inhabited mainly by ninespine stickleback and Arctic grayling.

Large-bodied species such as Arctic char and lake trout were not collected or observed in streams located in upstream regions of the watersheds, suggesting limited access to these areas. Of note, however, was the presence of relatively large numbers of Arctic grayling in upstream areas of Basin B. The presence of overwintering waterbodies (Lakes B5, B6, and B7) and streams capable of providing spawning and rearing habitat for Arctic grayling in upper areas of Basin B contributes for year-round use by this species.

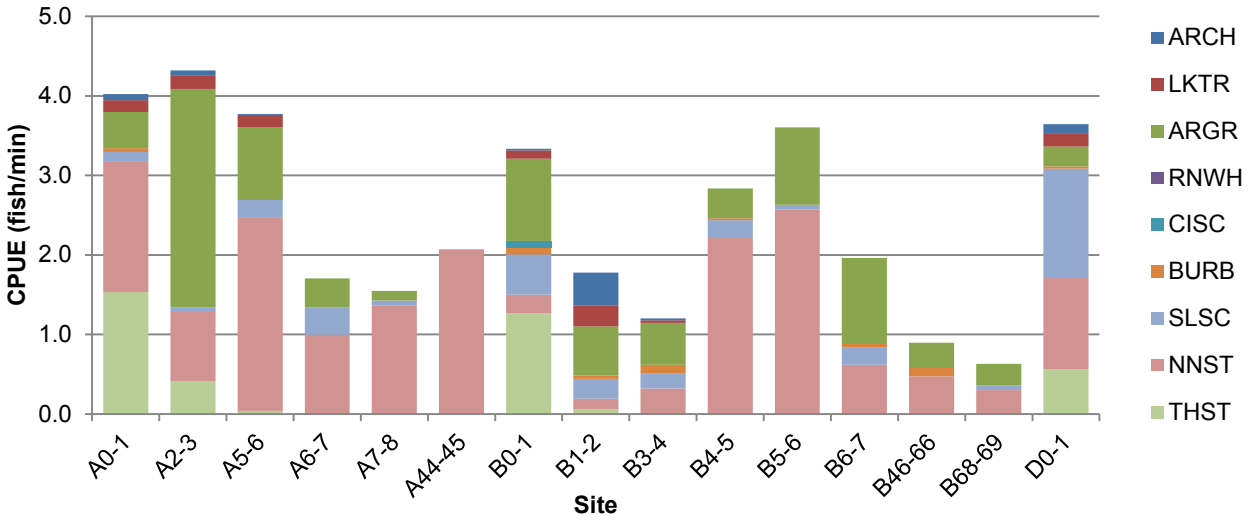



*Figure 7.5-20: Backpack Electrofishing CPUE Values for Fish Species Captured in Peninsula Streams in the Mine Local Study Area*

## *All-weather Access Road - Meliadine Corridor*

In total, 368 fish representing 3 species were captured or observed from 7 of the 10 sites surveyed (SD 7-1 2009 Aquatics Synthesis Baseline, Section 10.3.1, Table 10-1). Ninespine stickleback (*n*=357) was the most abundant species captured or observed, accounting for 97% of the catch. Slimy sculpin (*n*=3) and Arctic grayling (*n*=8) were also captured/observed. Site M5.0 yielded the highest catch; 60 ninespine stickleback were captured and over 200 were observed. CPUE values ranged considerably from 0.3 to 53.2 fish/min, demonstrating the variability in the abundance of fish in small streams along the Meliadine Road section of the AWAR. Arctic grayling juveniles were captured at Sites M2.1 (Meliadine River) and M11.5. In addition, one Arctic grayling was observed at Site M23.7 (inflow to Lake A6 from Lake A7).

Sampling for Arctic grayling eggs was conducted at 4 streams (Sites M2.1, M8.6, M11.5, and M5.0) with suitable spawning substrate (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix G3). In total, 21 individual areas were sampled; however, eggs were not found.

### *All-weather Access Road - Discovery Corridor*

Within the Discovery road corridor, ninespine stickleback (*n*=12) were observed at Sites D1.2 (*n*=2) and D5.9[4] (*n*=10; Appendix 7.5-C; SD 7-1 2009 Aquatics Synthesis Baseline, Section 10.3.1, Table 10-2). Arctic grayling spawning was documented at Site D8.8 in June 2012, the remaining sites did not feature suitable spawning substrate for Arctic grayling.

### *Rankin Inlet*

During the habitat surveys, the Rankin Inlet LSA streams were dry or had very low flows and fish were not observed during the surveys.

#### *7.5.4.4.1.2 Lakes and Ponds in the Local Study Area*

### *Proposed Mine Site (Peninsula) Overview*

In total, 27 lakes and 87 ponds were surveyed, of which all lakes and 55 ponds were found be inhabited by fish for at least a portion of the year (Appendix 7.5-C). Investigations incorporated angling, backpack electrofishing, fyke nets, gill nets, and baited minnow traps, often in combination (Table 7.5-14). Electrofishing (54 sites) and minnow traps (81 sites) were used most commonly as these techniques were most effective in the ponds. Gill nets (35 sites) were most commonly used in the lakes. Fish were observed incidentally at sites where only habitat assessments were completed.

**Table 7.5-14: Fish Sampling Effort in the Local Study Area for Lakes and Ponds on the Peninsula, 1997 to 2012**

| Method | Waterbodies Sampled | Number of Sampling Events | Total Effort | | Number of Fish Recorded |
|---|---|---|---|---|---|
| **Lakes** | | | | | |
| Angling | 13 | 23 | 30 | rod-h | 16 |
| Fyke Nets | 21 | 34 | 762 | h | 2 466 |
| Gill Nets | 25 | 120 | 100 | net-units | 411 |
| Minnow Traps | 19 | 22 | 2 035 | trap-h | 557 |
| Observed | 3 | 3 | - | | 4 |
| **Ponds** | | | | | |
| Angling | 5 | 5 | 2 | rod-h | 0 |
| Backpack Electrofishing | 54 | 78 | 21 610 | s | 201 |
| Fyke Nets | 8 | 10 | 239 | h | 1 400 |
| Gill Nets | 10 | 17 | 55 | net-units | 0 |
| Minnow Traps | 62 | 86 | 4 647 | trap-h | 501 |
| Observed | 11 | 12 | - | | 154 |

In total, 5710 fish, representing 9 fish species (lake trout, Arctic char, Arctic grayling, round whitefish, cisco, burbot, slimy sculpin, ninespine stickleback, and threespine stickleback) were captured from the lakes and ponds in the Mine LSA.

[4] Site D5.9 was referred to as Site D5.8b in the SD 7-1 2009 Aquatics Synthesis Baseline.

### *Peninsula Lakes*

In total, 3454 fish were recorded (i.e., captured or observed) from lakes on the Peninsula in the LSA. Fish were recorded from all lakes sampled. The catch was dominated by ninespine stickleback (57.5%) and Arctic grayling (26.2%). Cisco (6.9%) were next in abundance, followed by threespine stickleback (4.8%), Arctic char (2.4%), and burbot, lake trout, round whitefish, and slimy sculpin at less than 1% of the total catch (Figure 7.5-21).

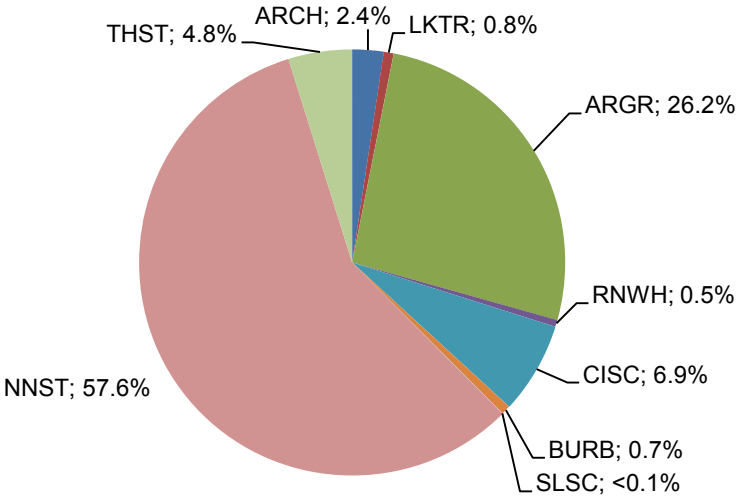



*Figure 7.5-21: Fish Species Composition in Peninsula Lakes in the Local Study Area (all sampling sites, methods, and seasons combined)*

Nine fish species (lake trout, Arctic char, Arctic grayling, round whitefish, cisco, burbot, slimy sculpin, ninespine stickleback, and threespine stickleback) were recorded in the lakes on the Peninsula. Four of these species (lake trout, Arctic char, round whitefish, and threespine stickleback) were typically found in the lower lakes in the basins that are in close proximity to Meliadine Lake. These species were generally not encountered in the upper lakes that are under the footprint of the proposed mine (Figure 7.5-22).

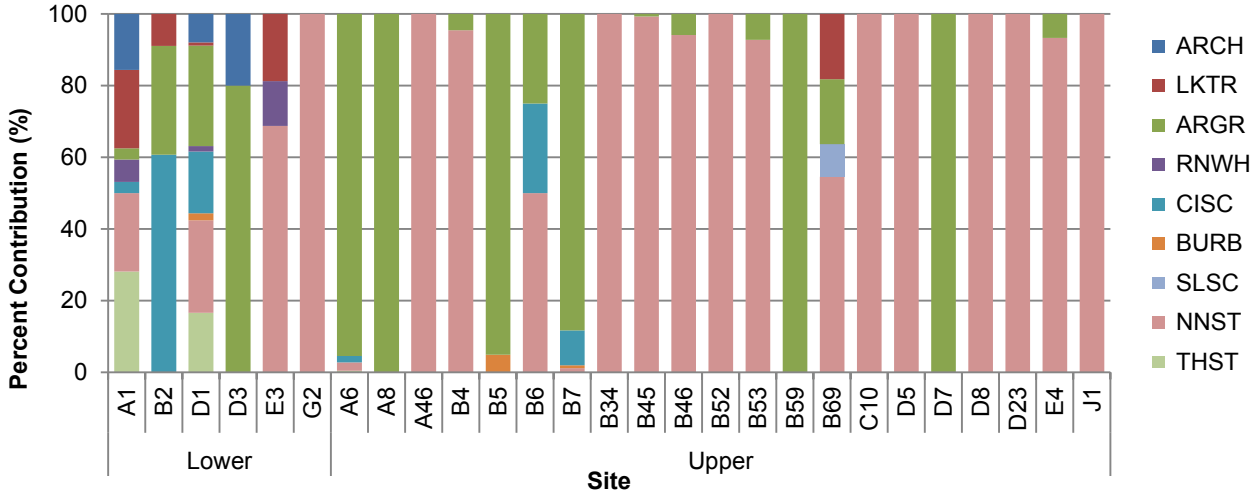



*Figure 7.5-22: Fish Species Composition in Individual Peninsula Lakes in the Local Study Area (all sampling methods and seasons combined)*

In the lower lakes, species diversity was generally high. Of the 9 species recorded on the Peninsula in the LSA, 8 were recorded in the lower lakes (slimy sculpin were not recorded; Appendix 7.5-D). Arctic char, lake trout, Arctic grayling, round whitefish, cisco, and ninespine stickleback were considered widespread in the lower lakes (i.e., recorded at 3 or 4 of the 6 lakes surveyed). Burbot were only recorded from Lake D1 and threespine stickleback were only recorded from Lakes A1 and D1.

In the upper lakes, fish species diversity was generally low and ranged from one species (in 11 of 21 surveyed lakes) to 4 species (in Lakes B7 and B69). Of the 9 species recorded in the Mine LSA, 7 were recorded in the upper lakes (Arctic char and round whitefish were not recorded; Appendix 7.5-D). Arctic grayling and ninespine stickleback were considered widespread (recorded in 13 and 17, respectively, of the 21 lakes surveyed). The remaining species were considered rare (i.e., recorded in less than 4 of 21 lakes).

Sampling techniques in the lower and upper lakes included gill nets (100 net-units), fyke nets (762 h), angling (30 rod-h), and minnow traps (2035 h). Gill net CPUE values varied among species with Arctic grayling captured most frequently, followed by cisco and Arctic char. Gill net CPUE values for all species combined ranged from 0.9 (B45) to 9.8 fish/net-unit (A6). Although species richness was generally lower in the upper lakes, the 2 highest CPUE values were recorded in the upper lakes (A6 and B53; Figure 7.5-23). Gill nets were most productive in Basin A (7.0 fish/net-unit), whereas CPUE values were lower in Basins B and D (5.1 and 5.0 fish/net-unit, respectively).

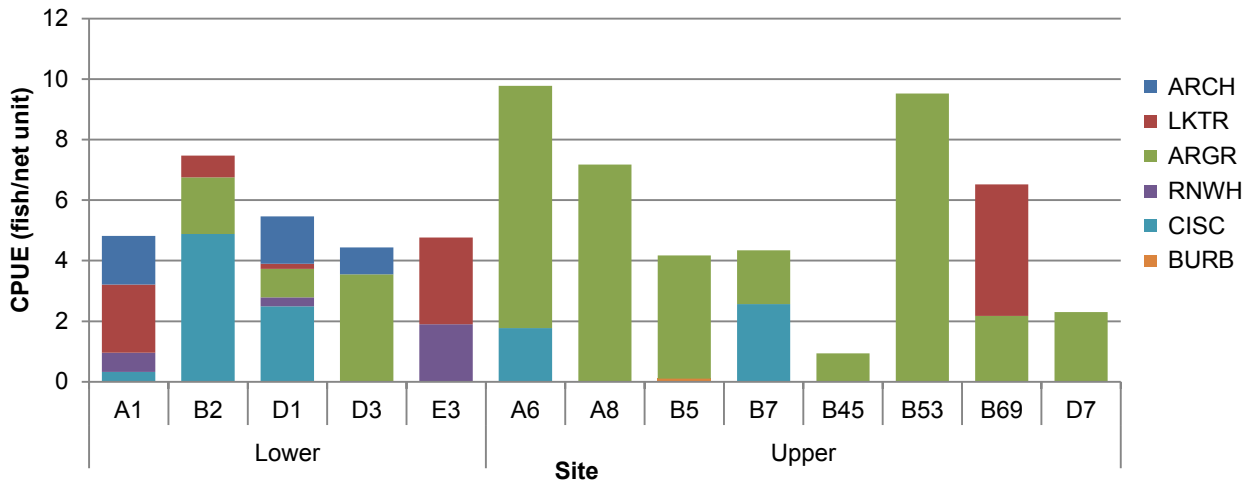



*Figure 7.5-23: Gill Net CPUE Values for Individual Peninsula Lakes in the Local Study Area (all sampling seasons combined)*

## *Peninsula Ponds*

In total, 2256 fish were recorded in 55 of the 87 ponds sampled on the Peninsula in the LSA. The catch was dominated by ninespine stickleback (98.4%), with threespine stickleback (1.6%) and Arctic grayling (0.1%) also recorded (Figure 7.5-24). Ninespine stickleback were widespread and recorded at 54 ponds. Threespine stickleback (n=35) were recorded in Ponds A2 and C7, and 2 young-of-the-year Arctic grayling were captured in Pond H2. The low abundance of threespine stickleback in Peninsula ponds is consistent with data collected from lakes and streams on the Peninsula Basin, where 6% of the catch was comprised of threespine stickleback. In

contrast, the catch in Meliadine Lake was dominated by threespine stickleback (62%) without a single ninespine stickleback captured.

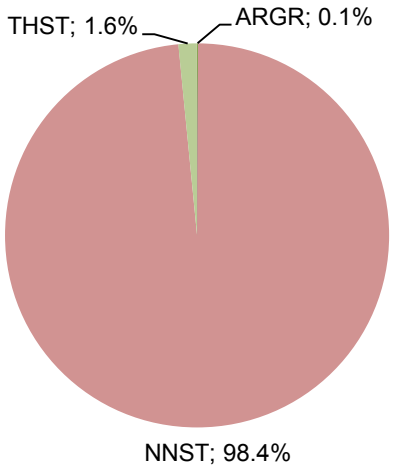



*Figure 7.5-24: Fish Species Composition in Ponds in the Local Study Area (all sampling methods and seasons combined)*

Sampling methods included backpack electrofishing (21 610 s), minnow traps (4647 trap-h), fyke nets (239 h), gill nets (55 net-units), and angling (2 rod-h), Most fish (62%) were captured in fyke nets, followed by minnow traps (22%) and backpack electrofishing (9%); no fish were captured by angling or gill nets.

### Meliadine Lake

Because of its large size (107 $km^2$), Meliadine Lake was subdivided into sub-basins; East (ML-E), South (ML-S), and West (ML-W). Meliadine Lake was sampled extensively (100 sampling events), using primarily fyke nets (738 h), gill nets (79 net-units), and angling (30 rod-h). The overall CPUE values for the entire lake were 12.8 fish/h for fyke nets, 3.8 fish/net-unit for gill nets, and 0.9 fish/rod-h for angling. Among the 3 areas of the lake, sampling effort was focused on ML-E (45 sampling events) with ML-W, and ML-S sampled less intensively (32 and 23 events, respectively). Angling and gill nets were used in all 3 areas; fyke nets were used in all areas except ML-W.

Sampling efforts resulted in a total catch of 9746 fish. The catch was comprised of 8 of 9 species present in the RSA (ninespine stickleback was not recorded). Threespine stickleback were most common (62.0%) followed by cisco (25.6%), Arctic char (4.7%), lake trout (4.4%), Arctic grayling (2.0%), round whitefish (1.1%), burbot (0.1%), and slimy sculpin (<0.1%) (Figure 7.5-25). The predominance of threespine stickleback in the catch was mainly because of the high numbers of this species caught in fyke nets set in near-shore areas of ML-E and ML-S. Ninespine stickleback were absent from the catch, despite the abundance of this species in adjacent streams, lakes, and ponds of the Peninsula basins.

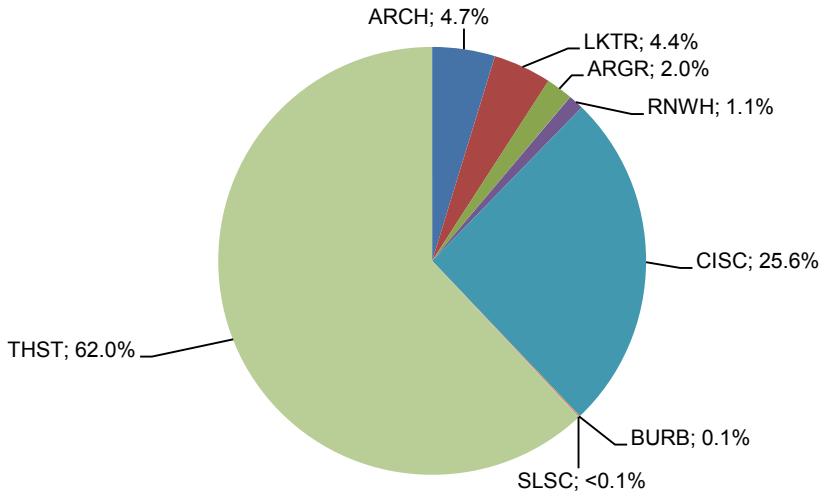



*Figure 7.5-25: Overall Fish Species Composition in Meliadine Lake in the Local Study Area (all sampling methods and locations combined)*

Fish catches differed among Meliadine Lake basins (Figure 7.5-26), reflecting the different foci of the investigations carried out in the lake. Threespine stickleback was the most common species captured in ML-E (64.2%) and ML-S (52.1%). This was due to the prevalence of threespine stickleback in shallow littoral areas where they were susceptible to capture by fyke nets. Although the overall catch (*n*=914) in ML-S was smaller than that of ML-E, relative abundance of species between the 2 basins was comparable (Figure 7.5-26).

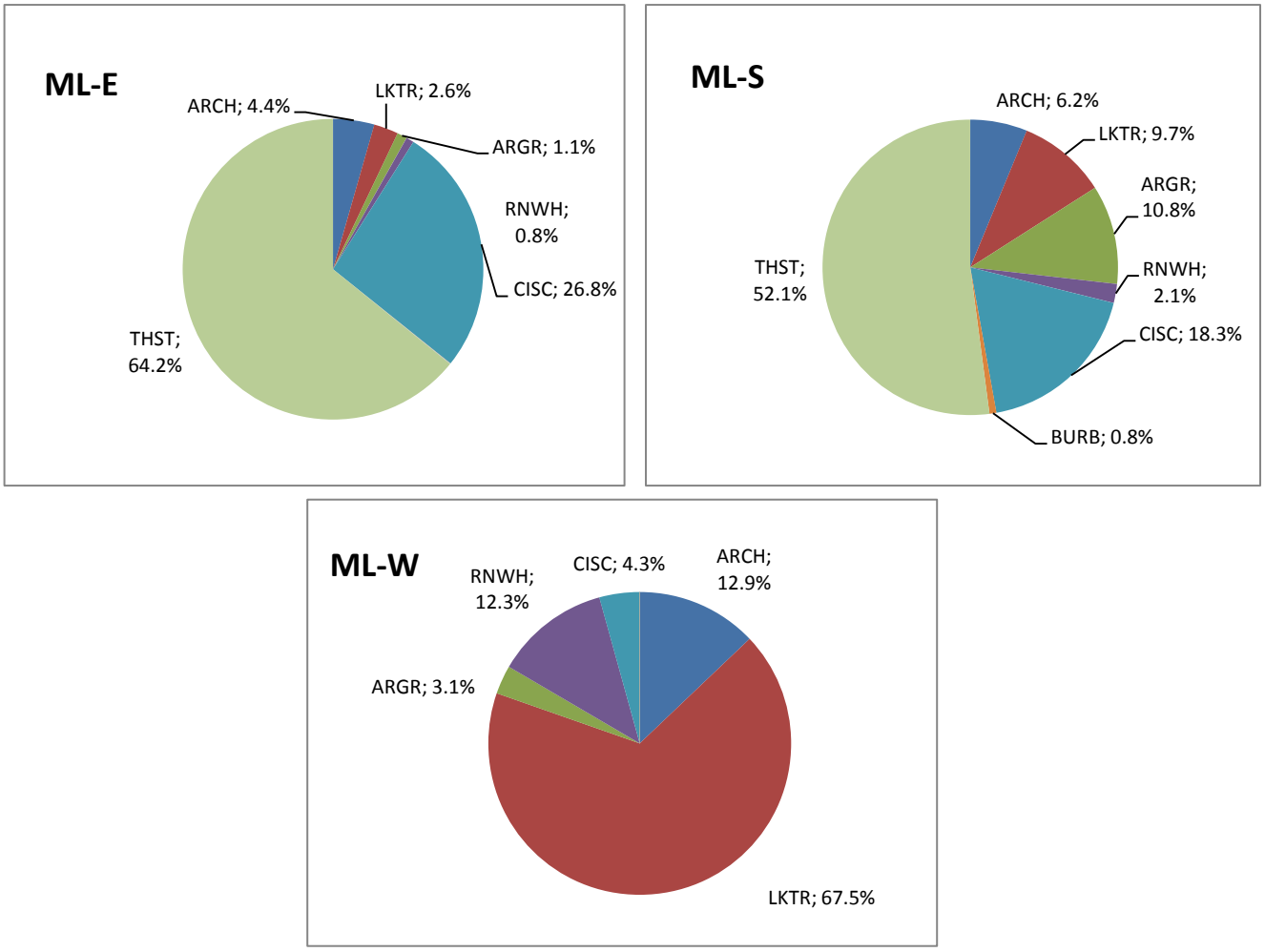



*Figure 7.5-26: Fish Species Composition in Meliadine Lake Sub-basins (all sampling methods combined)*

Fyke nets were not used in ML-W where sampling efforts (angling and gill netting) were focused on deep-water habitats to capture Arctic char for implantation of radio transmitters. Therefore, the catch (*n*=163) in ML-W was dominated by pelagic species such as lake trout (67.5%), Arctic char (12.9%), and round whitefish (12.3%).

Comparison of overall (all species combined) gill net CPUE values between individual areas of Meliadine Lake (Table 7.5-15) suggests considerably higher fish abundance in ML-E (16.6 fish/net-unit) relative to other areas (between 2.6 and 3.8 fish/net-unit). Being size selective, gill nets did not capture forage species, including threespine stickleback, and therefore CPUE values were not affected by large catches of small fish. Similar to gill nets, fyke net CPUE was higher in ML-E (6.3 fish/h) compared with ML-S (1.3 fish/h). Angling CPUE was highest in ML-W (6.0 fish/rod-h).

**Table 7.5-15: Comparison of Catch per Unit Effort in the Meliadine Lake Sub-basins, 1997 to 2000 (all species combined)**

| Sampling Method (CPUE unit) | Overall CPUE | | | |
|---|---|---|---|---|
| | ML-E | ML-S | ML-W | Combined |
| Gill nets (fish/net-unit) | 17.4 | 4.5 | 3.0 | 3.8 |
| Fyke nets (fish/h) | 6.3 | 1.3 | - | 12.8 |
| Angling (rod-h) | 0.9 | 0.0 | 6.0 | 0.9 |

CPUE = catch-per-unit-effort

Nearly all fish (8605 of 8669) captured in the ML-E basin were collected using a directional fyke net (SD 7-1 2009 Aquatics Synthesis Baseline, Table 9-7). The fyke net consisted of 2 separate traps, and was used to determine the direction of fish movement along the shore. In general, numbers of recaptured fish were low indicating that most of the fish caught in the fyke net were moving to other areas (i.e., they did not remain in the bay where the fyke net was set). In both years, movements by Arctic char indicated that most fish were travelling west (towards the central basin of Meliadine Lake). Lake trout were captured approximately half as frequently as Arctic char; they did not exhibit a directional trend in 1997 or 1998. Arctic grayling and round whitefish were also frequently captured and similar to lake trout, did not appear to display trends in movement. Cisco were abundant overall, however, this was mainly due to occasional catches of large schools of juvenile fish. Burbot and slimy sculpin were also captured in the fyke net, but in low numbers (2 and 3 fish, respectively). Threespine stickleback were equally represented in both fyke net components, suggesting that their movements were random and likely local.

#### *Chickenhead Lake*

The fish community in Chickenhead Lake was sampled in August 2008 using a fyke net (42.8 h), gill nets (1.9 net-units), and minnow traps (94 trap-h). These efforts resulted in a total catch of 30 fish. Lake trout were most prevalent (*n*=17) accounting for 57% of the catch followed closely by Arctic grayling (*n*=12, 40%). One burbot was also captured.

### *7.5.4.4.1.3 Regional Study Area*

#### *Streams*

**Meliadine Lake to Peter Lake Outflow (Site ML-PL)**

In total, 238 fish representing 8 species were captured from the Meliadine Lake outflow to Peter Lake using mainly fyke nets (192 h) and gill nets (8.3 net-units), supplemented by backpack electrofishing (912 s) and angling (1.4 rod-h). Threespine stickleback dominated the catch (72.7%), followed by lake trout (13.9%), Arctic char (4.6%), burbot (3.8%), cisco (2.9%), Arctic grayling (0.8%), round whitefish (0.8%), and slimy sculpin (0.4%).

**Meliadine River**

Meliadine River is considered a good fishing site today. There are remnants of stone fishing weirs near the mouth of the Meliadine River, and stone drying racks scattered through the river valley. “Iqalugaarjuk” translates as “the river of little fishes”, and refers to the Arctic grayling in the river. IQ

In total, 3834 fish were captured from the Meliadine River from 1997 to 1999 using angling (18.8 rod-h), backpack electrofishing (3422 s), gill nets (2.5 net-units), and an upstream fish fence (1651 h; SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.2.4; Appendix 7.5-C). Angling captured 15 fish (0.80 fish/rod-h), backpack electrofishing captured 55 fish (0.96 fish/min), and gill nets captured 3 fish (1.21 fish/net-unit). However, the fish fence was the most productive sampling method, resulting in the catch of 3761 fish (2.28 fish/h).

The fish fence was operated in 1997, 1998, and 1999 in the lower reaches of the Meliadine River (Site ML-L) to sample fish migrating into the river from Hudson Bay during late summer and early fall (from mid-August to early or mid-September). The monitoring period in 1999 (34 d) was considerably longer than in 1997 (18 d) and 1998 (17 d), and was intended to assess early and late migrants that may not have been enumerated in the previous years.

Overall, the fish fence catch (*n*=3761) was dominated by Arctic char (86.1%), followed by Arctic grayling (7.0%), round whitefish (6.0%), lake trout (0.5%), and cisco (0.4%) (Figure 7.5-27). The composition of catches at the fish fence changed through time with the relative proportions of Arctic char decreasing from 1997 to 1999 in favour of Arctic grayling and round whitefish (SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.2.4).

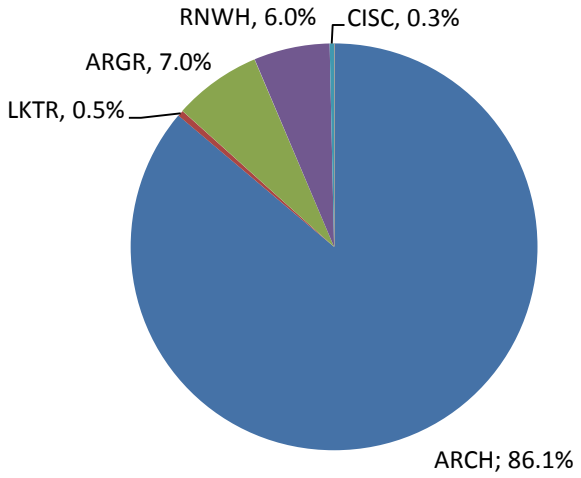



*Figure 7.5-27: Fish Species Composition from Upstream Fish Fence in the Lower Meliadine River, 1997 to 1999*

The mean CPUE values for all fish combined were consistent between 1997, 1998, and 1999 (2.41, 2.50, and 2.09 fish/h, respectively). Arctic char dominated the catch in all 3 years. Arctic char CPUE values were similar in 1997 and 1998 (2.3 fish/h), but declined to 1.6 fish/h in 1999 (Figure 7.5-28). The lower values in 1999 were likely due to a more extended trap period which monitored movements during the less productive shoulder periods of the run. In contrast, CPUE values for Arctic grayling increased from 0.03 fish/h in 1997 to 0.29 fish/h in 1999. Round whitefish CPUE values also increased consistently during this period (from 0.07 fish/h in 1997 to 0.18 fish/h in 1999). CPUE values for lake trout and cisco were low (less than 0.02 fish/h) throughout the fish fence monitoring period.

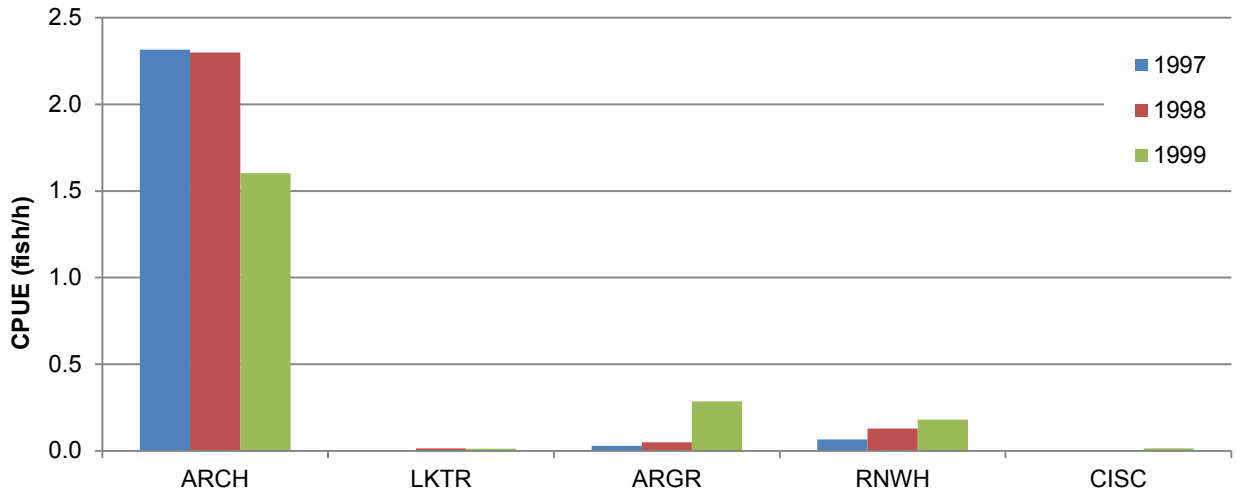



*Figure 7.5-28: CPUE Values for Species Captured in the Meliadine River Fish Fence, 1997 to 1999 (ARCH=Arctic char, LKTR=Lake Trout, ARGR=Arctic grayling, RNWH=round whitefish, CISC=Cisco)*

Arctic char CPUE values varied over the course of the sampling period in each of the sampling years, however the peak upstream movements occurred at roughly the same time in 1997, 1998 and 1999 (Figure 7.5-29). In 1997, the peak of upstream movements by Arctic char occurred between 18 and 28 August, when 829 fish were enumerated (mean CPUE of 3.2 fish/h). In 1998, the peak of Arctic char movements occurred between 18 and 24 August, when 617 fish were enumerated (mean CPUE of 3.7 fish/h). In 1999, most of the Arctic char movements occurred between 19 and 31 August, when 898 fish were enumerated (mean CPUE of 2.87 fish/h); the onset of the peak periods in 1998 and 1999 coincided with sharp decreases in water temperature.

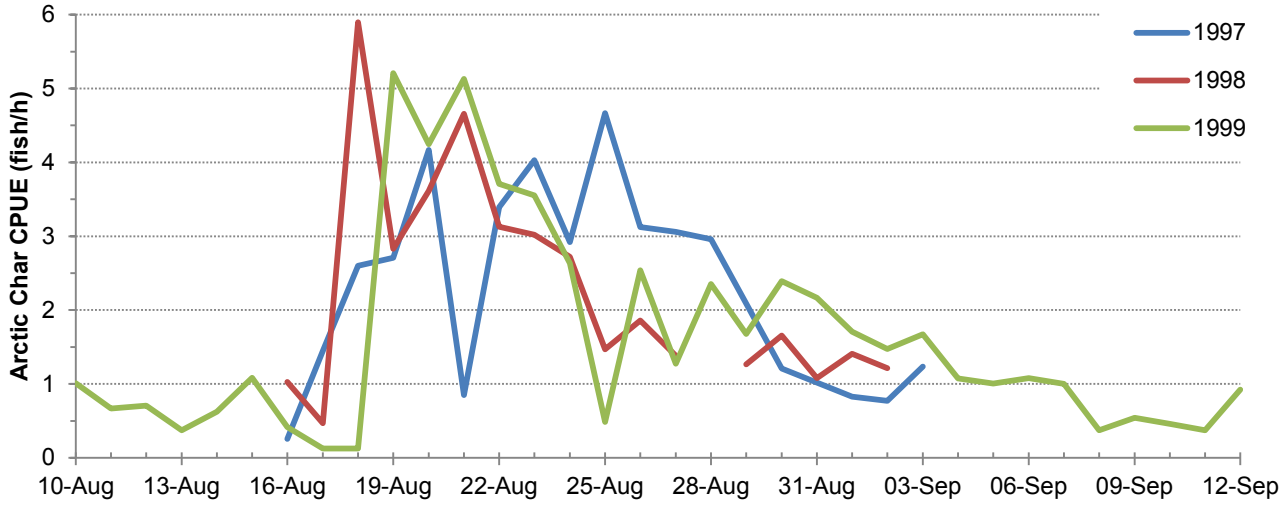



*Figure 7.5-29: Daily Catch Rates for Arctic Char in the Meliadine River Fish Fence, 1997 to 1999*

None of the Arctic char captured at the fish fence in 1997 to 1999 were in pre-spawning condition. This suggested that the current year spawners did not migrate to the sea in the spring and spent the entire year in freshwater.

**Little Meliadine Lake Tributary Streams**

In 1998 and 2000, the streams between Horseshoe Lake and Lake W (Site HSL-W), and Lake W and Little Meliadine Lake (Site W-LML) were sampled. These waterbodies were explored to assess spawning potential for Arctic char in tributary systems to Little Meliadine Lake. At both sites, backpack electrofishing was used to sample fish, however, the fishing effort was higher at Site HSL-W (2479 s) than at Site W-LML (560 s).

At Site HSL-W, 72 fish were recorded. Arctic grayling dominated the catch (*n*=46), followed by ninespine stickleback (*n*=18), slimy sculpin (*n*=6), lake trout (*n*=1), and burbot (*n*=1). At Site W-LML, 24 fish were recorded, including 19 Arctic grayling, 3 Arctic char, 1 lake trout, and 1 slimy sculpin.

### *Lakes*

**Little Meliadine Lake**

Little Meliadine Lake, located in the Meliadine River watershed, was sampled on 6 occasions between 1997 and 2000, mainly to investigate seasonal use of the area by Arctic char. Sampling methods included gill nets (34.7 net-units) and angling (11.0 rod-h) and resulted in the total catch of 208 fish. Round whitefish dominated the catch (43.8%), followed by lake trout (25.0%), Arctic char (12.9%), cisco (9.6%), and Arctic grayling (8.7%).

**Horseshoe Lake and Lake W**

Horseshoe Lake, located northeast of Little Meliadine Lake, was sampled in July 2000 by gill nets (2.8 net-units) and angling (2.0 rod-h), resulting in a total catch of 12 fish (8 lake trout and 4 cisco).

Lake W, located between Horseshoe Lake and Little Meliadine Lake, was sampled in July 2000 by gill nets (4.8 net-units) and angling (2.0 rod-h), resulting in a total catch of 24 fish (21 lake trout and 3 cisco).

**Control Lake**

Control Lake, located south of the south basin of Meliadine Lake, was sampled in July 2011 using gill nets (1.7 net-units), fyke nets (61 h), minnow traps (275 trap-h), and angling (2.5 rod-h). These efforts resulted in a total catch of 100 fish. Round whitefish was the predominant species in the catch (42%), followed by ninespine stickleback (38%), lake trout (16%), Arctic grayling (2%), burbot (1%), and slimy sculpin (1%).

**Parallel Lake**

Parallel Lake (located approximately 12 km north of Meliadine Lake and outside of the RSA) was sampled in 1998 to collect fish for monitoring metal concentrations in fish tissues. Variable-mesh gill nets (11.9 net-units) and angling (7.0 rod-h) were employed to sample deep water habitats. These efforts resulted in a total catch of 49 fish. Including 31 lake trout, 12 round whitefish, and 6 cisco.

## 7.5.4.4.2 Fish Life History

### *7.5.4.4.2.1 Arctic Char*

#### *General Life History*

Arctic char populations in Nunavut are typically andromous; spending their first years in freshwater lakes before beginning a seasonal migration to spend summers feeding and growing in salt water (Appendix 7.5-E; Scott and Crossman 1973; Evans et al. 2002; Richardson et al. 2001). Larger fish begin migrating downstream in spring when the ice breaks up on the rivers and streams, and smaller fish migrate in mid-July. In the fall (August/September), these fish return to freshwater to overwinter, with larger individuals making the trip first.

Pre-spawning fish may remain in freshwater prior to the fall that they spawn (Johnson 1980). The above agrees well with IQ collected for the Project; Chesterfield Inlet Elders stated in interviews that Arctic char migrate down to the sea from the lakes via rivers in spring and summer, and that in early fall they travel back upstream to the lakes (Volume 9, Section 9.3.1.4.2.4). IQ

Females lay eggs every 2 or 3 years, depending on their condition, typically releasing eggs over gravel or cobble shoals in lakes or rivers at depths of up to 4.5 m. Spawning occurs during daylight hours, at water temperatures around 4°C. The eggs incubate overwinter within the substrate and hatch in early April. Eggs are not suited to warmer temperatures and will die if exposed to temperatures above 7.8°C. Upon hatching, young fry remain in the substrate until ice break up when they emerge to begin feeding. Arctic char cannot leap to pass obstacles, like some of their salmonid relatives, thus an adequate flow of water is required for them to navigate rivers and streams between the sea and their overwintering habitats.

### *Size Distribution*

The length frequency distribution of the overall Arctic char catch (*n*=3881) was widespread with fork lengths ranging from 61 to 777 mm. Three distinct modes were noted (Figure 7.5-30; Appendix 7.5-Fa), indicating that all age-classes of Arctic char were well represented in the sample. The smallest mode was centred on 80 to 100 mm and consisted of fish captured in the LSA in the east and south basins of Meliadine Lake, in Peninsula streams (Basins A, B, and D) and in Lake D1 (Figure 7.5-30). The second mode (160 to 240 mm in fork length) was comprised mostly of fish captured in the LSA (Figure 7.5-30C). The third and largest mode (300 to 670 mm in fork length) consisted of large adults caught in the fish fence in the RSA at the Meliadine River when returning from the sea (Figure 7.5-30A).

The majority (99.1%) of Arctic char captured in the east and south basins of Meliadine Lake were generally smaller than the larger Arctic char caught in the west basin of Meliadine Lake. This difference is likely due to differences in sampling methods. Sampling efforts in the east and south basins of Meliadine Lake consisted primarily of fyke nets, whereas sampling efforts in the west basin (close to the outflow of Meliadine Lake to Peter Lake) used gill nets to target fish for radio transmitter implantation and resulted in the capture of the large adults in pre-spawning condition.

### *Size Distribution of Returning Adults*

The size distribution of the Arctic char run captured by the fish fence in 1997, 1998, and 1999 (*n*=3240) indicated significant differences between the early, middle, and late stages of the run (SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.3.1.1). The results indicated that the larger size-classes return from the sea earlier than the smaller size-classes and the final phases of the run are dominated by the first-year sea migrants. Similar data were reported for Arctic char upstream migrations into Nauyuk Lake on the Kent Peninsula by Johnson (1980) and Gyselman (1994).

### *Length-Weight Relationships*

The length-weight regression equation for Arctic char using all samples combined was (Appendices 7.5-G and 7.5-H):

Log Weight (g)=-5.6490 + 3.2633 log Fork Length (mm) where *n*=1093 and $r^2$=0.995.

The slope of the regression line (3.2633) indicated positive allometric growth (i.e., slope greater than 3).

Relative weights for individual fish within the RSA varied from 54 to 140. Arctic char captured in Basin D (mean=100; SD ± 12; *n*=53) and in the Meliadine River fish fence (mean=103; SD ± 9; *n*=516) had the highest

relative weight among all areas. Both samples consisted primarily of adult fish (i.e., average age 5 and 6, respectively). Within Meliadine Lake, the overall relative weight was low (mean=77; SD ± 9; *n*=448); however, relative weights differed greatly among basins. The primarily adult fish in the west basin exhibited a higher relative weight (mean=96; SD ± 7; *n*=15) than their counterparts in the east and south basins (mean=76; SD ± 7; *n*=381 and mean=75; SD ± 11; *n*=52, respectively). This is a typical trend as the amount of body fat increases as fish reach sexual maturity.

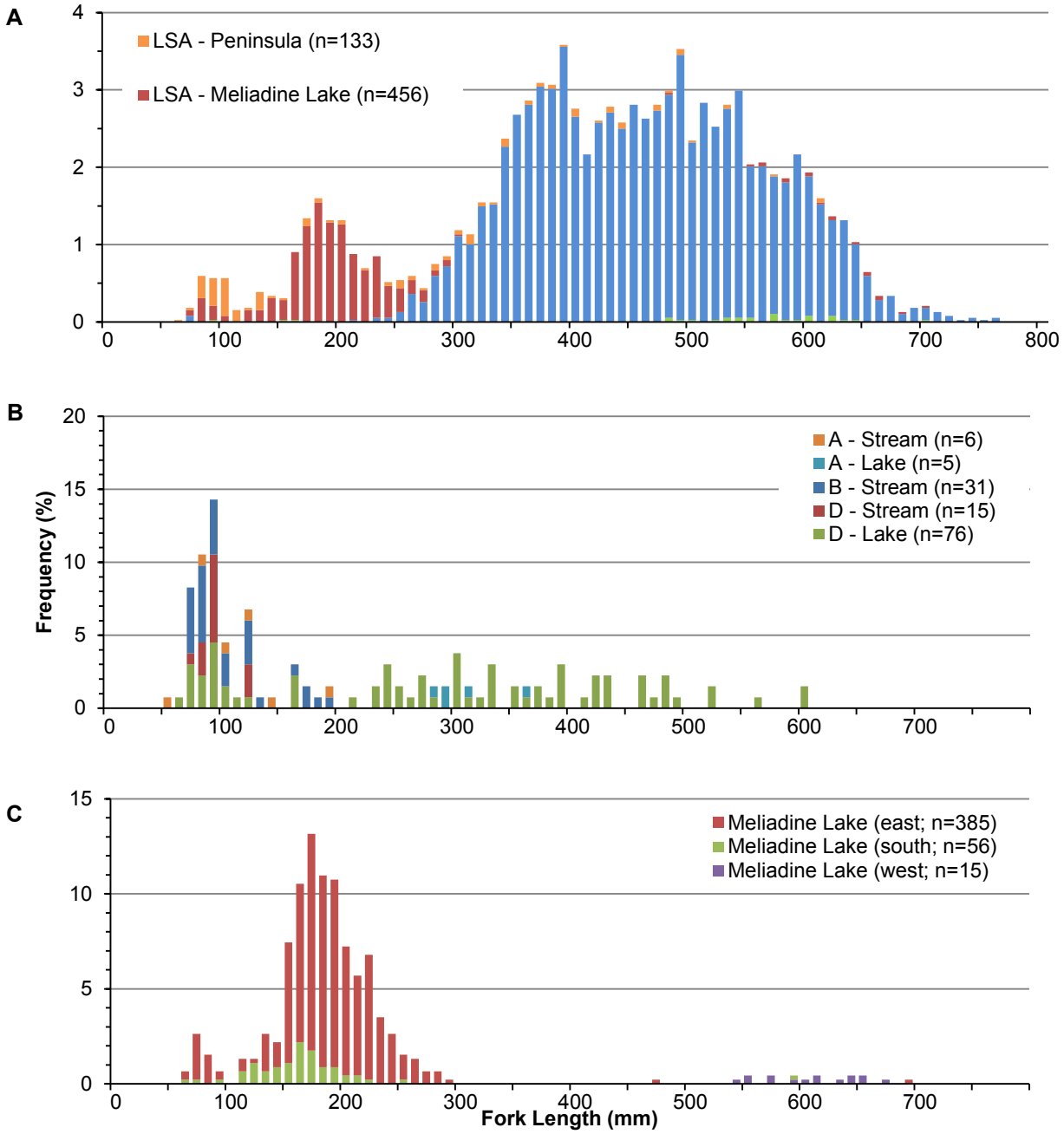



*Figure 7.5-30: Length-frequency Distribution of Arctic Char Recorded in Local and Regional Study Areas Watersheds (A), Peninsula Basins (B), and Meliadine Lake (C), 1997 to 2012*

#### *Age and Length*

Age classes between one and 10 were represented in the Arctic char sample (mean age=4.4 years; SD ± 2.3; *n*=213; SD 7-1 2009 Aquatics Synthesis Baseline, Figure 9-20 and Appendix F15). The fastest rate of growth (approximately 117 mm per year) occurred between the sixth and seventh (age 5 and 6) year of life and likely corresponds to the time that smolts make their first migration to sea. This can be directly attributed to better feeding conditions at sea (Johnson 1980; Moshenko et al 1984; Moore and Moore 2006). Growth begins to slow again in year 7 (age 6), dropping below 60 mm per year.

#### *Feeding Habits*

The majority (86%) of Arctic char stomachs examined (n=62) contained no food items; the mean fullness index was only 5.8% (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix F20). Invertebrates, consisting primarily of amphipods (49%), gastropods (4%), and unidentified taxa (29%) collectively accounted for 80% (by volume) of the Arctic char diet. Fish species, of which only ninespine stickleback (10%) could be identified to species, accounted for the remaining 20% of the diet.

### *7.5.4.4.2.2 Lake Trout*

#### *General Life History*

Lake trout primarily utilize lake habitats and remain in freshwater systems throughout their lifecycle (Appendix 7.5-E; Scott and Crossman 1973; Evans et al. 2002; Richardson et al. 2001). Meliadine Lake is fished for lake trout, and lake trout are often caught in Landing Lake, at the outlet to the Char River (Volume 9, Section 9.3.1.5.1.3). IQ

Lake trout spawn in the fall (September or October) when water temperatures fall below 10°C to 5°C. Northern populations of lake trout mature between the ages of 7 to 10 when they have reached a fork length of 310 to 425 mm. Spawning occurs in the late evening, and females lay eggs over beds of large boulder or rubble at depths up to 12.0 m. Eggs remain in the substrate overwinter, and hatch in April/May. Upon hatching young lake trout feed in shallows for several months before they are large enough to venture into deeper water. Small lake trout primarily feed on invertebrates until they reach adequate size to predate on other fish.

#### *Size Distribution*

The lake trout captured from 1997 through 2012 (*n*=773) ranged from 37 to 965 mm in fork length (mean=365 mm, SD ± 209). Two modes were observed (Figure 7.5-31A; Appendix 7.5-Fb). The smaller mode was centred on 80 to 100 mm and consisted primarily of fish captured by fyke net in Meliadine Lake (Figure 7.5-31A and B). The larger mode was centred on 300 to 450 mm and consisted of fish captured primarily in Meliadine Lake and Little Meliadine Lake (Figure 7.5-31A and B). Approximately 63% (*n*=460) of the total catch measured over 300 mm in fork length. The majority of lake trout were captured in Meliadine Lake (*n*=400) and had the most diverse representation of size classes (73 to 965 mm). All life stages were represented throughout the RSA. Seventeen lake trout were captured in Chickenhead Lake and ranged from 172 to 942 mm in fork length, though most measured less than 300 mm.

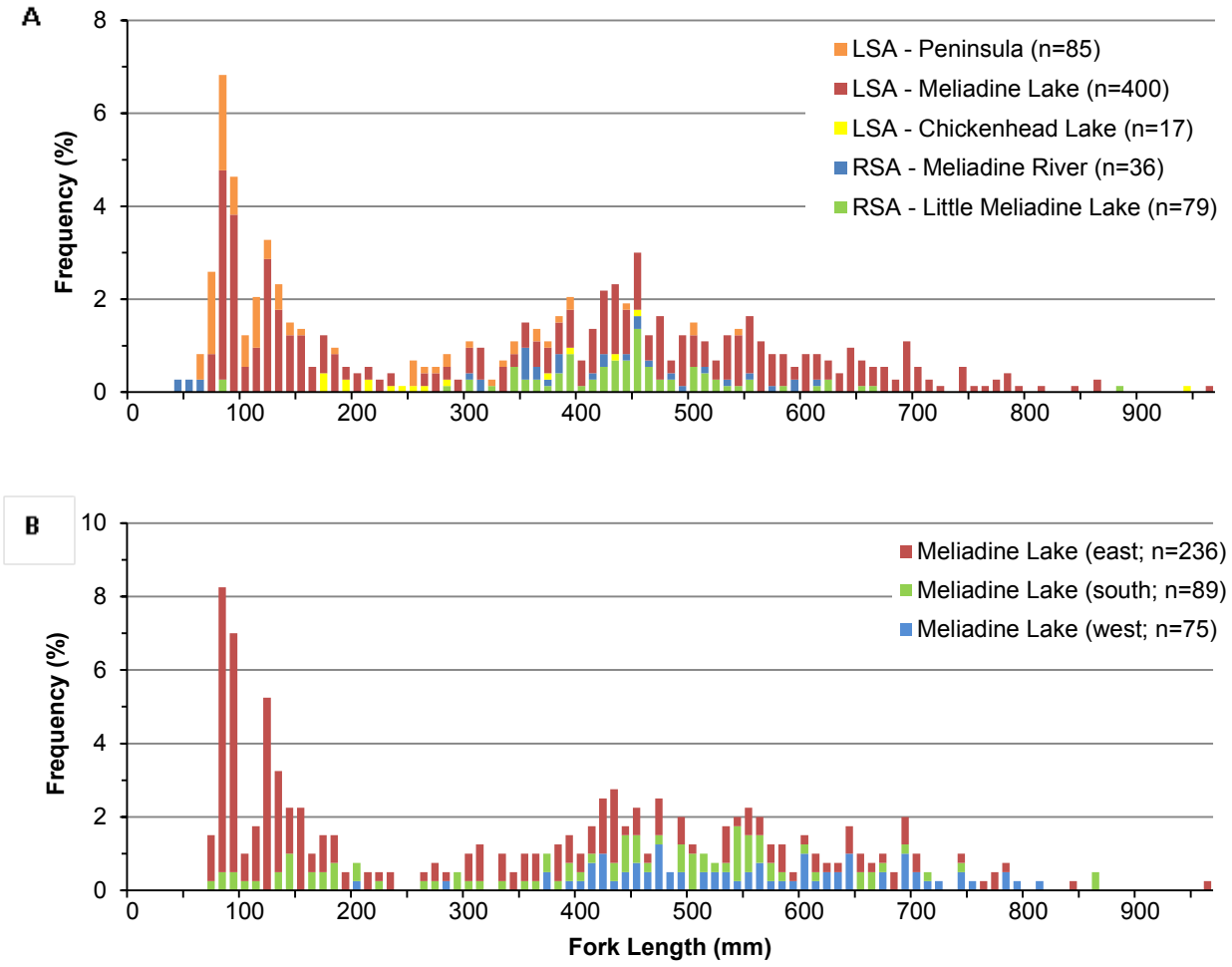



*Figure 7.5-31: Length-frequency Distribution of Lake Trout in the Local and Regional Study Areas (A) and Meliadine Lake (B), 1997 to 2012*

### *Length-Weight Relationships*

The combined length-weight regression equation for lake trout was (Appendices 7.5-G and 7.5-H):

Log Weight (g)=-5.2491 + 3.1073 log Fork Length (mm) where $n$=587 and $r^2$=0.997.

Relative weights for individual fish within the LSA and RSA ranged from 59 to 158 (mean=97; SD ± 13; $n$=587). Lake trout captured in the Peninsula Lakes ($n$=63) had the highest mean relative weight (mean=109; SD ± 20) of all of the basins. The primarily larger lake trout (356 to 611 mm; $n$=16) captured in Meliadine River also had a high mean relative weight (99; SD ± 9). Lake trout captured in Meliadine Lake had the lowest mean relative weight (95; SD ± 12).

#### *Age and Length*

Age classes between one and 30 were represented in the lake trout sample (mean age=9.1 years; SD ± 7.5; *n*=184; SD 7-1 2009 Aquatics Synthesis Baseline, Figure 9-22 and Appendix F16). The oldest fish was captured in east basin of Meliadine Lake; it was 30 years old and measured 780 mm. Growth increased consistently across year classes; however, specific patterns were difficult to predict due to low sample sizes in each size class.

#### *Feeding Habits*

Close to 50% of the 143 lake trout stomachs examined contained no food items; the mean fullness index was 22% (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix F20). Lake trout diet consisted primarily of fish (71% of the total food volume). Identifiable species detected in the diet included (in order of abundance): cisco (15%), threespine stickleback (13%), burbot (6%), ninespine stickleback (6%), lake trout (4%), and slimy sculpin (3%). Unidentified fish remains accounted for 23% of the total diet composition. Invertebrates collectively accounted for the remaining 29% of the lake trout diet, with identifiable taxa including amphipods, clams, midges, caddis flies, snails, beetles, bees, and moths.

### *7.5.4.4.2.3 Arctic Grayling*

#### *General Life History*

Arctic grayling are found in freshwater systems in Northern Canada and typically rely on a variety of habitats: lakes, rivers and streams to complete their life cycle (Appendix 7.5-E; Scott and Crossman 1973;, Evans et al. 2002; Richardson et al. 2001). Adult and juvenile fish spend the winter sheltered in lakes, or deeper pools of rivers. In spring (May/June), Arctic grayling migrate into small tributaries to spawn. They spawn during the warmer part of the day, as water temperatures reach 5°C to 10°C. Females lay eggs over small gravel and cobble to be fertilized, and then adults return to larger rivers and lakes. Eggs incubate for 13 to 18 days. Upon hatching, young fish, approximately 8 mm in length, spend the next 8 days sheltered in the substrate while absorbing their yolk sac and starting to feed. In the RSA, Arctic grayling reach maturity at age 4 to 6 when they are 285 to 353 mm long.

#### *Size Distribution*

The overall length range of Arctic grayling captured in the LSA and RSA (*n*=1953) was 20 to 435 mm (Appendix 7.5-Fc). The length frequency histogram exhibited numerous modes; patterns emerged for small (i.e., less than 100 mm in fork length), medium (i.e., 100 to 200 mm in fork length) and large size (i.e., 300 to 400 mm in fork length) classes indicating that all age-classes of Arctic grayling were well represented in the sample (Figure 7.5-32A). The largest Arctic grayling (435 mm in fork length).was captured in Basin B.

The majority (71%; *n*=1381) of Arctic grayling in the sample were captured in the Peninsula waterbodies. Within the Peninsula Basins, the majority of Arctic grayling were captured in the lakes in Basins B and D (28%, *n*=383 and 20%, *n*=281, respectively). All size classes were represented in Basins A, B, and D (Figure 7.5-32B). Of the lakes sampled in Basin B, Lake B7 had the highest Arctic grayling catch (50%; *n*=316, mean fork length=190 mm; SD ± 65.7 mm). Fish captured in the Peninsula Basins accounted for the majority of the juvenile catch, whereas the majority of the adult fish were captured primarily in the Meliadine River and Meliadine Lake (Figure 7.5-32B).

Twelve Arctic grayling were captured in Chickenhead Lake; Arctic grayling from Chickenhead Lake were represented by larger size classes ranging from 168 to 402 mm in fork length (mean=315 mm; SD ± 20 mm).

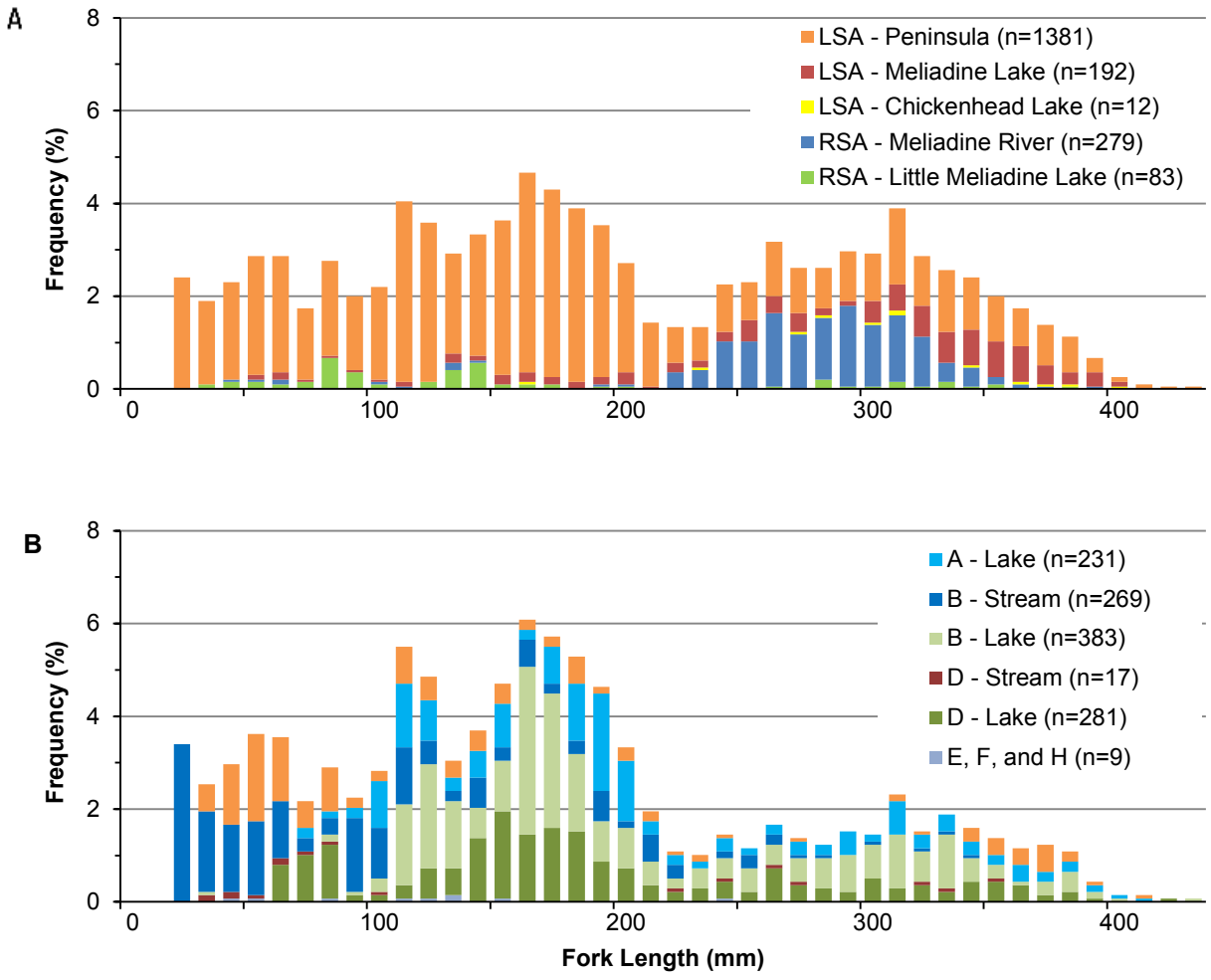



*Figure 7.5-32: Length-frequency Distribution of Arctic Grayling in the Local and Regional Study Areas (A), and the Peninsula Basins (B), 1997 to 2012*

### Length-Weight Relationships

The combined length-weight regression equation for Arctic grayling was (Appendices 7.5-G and 7.5-H):

Log Weight (g)=-5.3094 + 3.1424 log Fork Length (mm) where n=1136 and $r^2$=0.993.

Relative weights for individual fish ranged from 47 to 150. Average relative weights calculated for individual basins ranged from 80 (SD ± 11; *n*=8) along the Meliadine and Discovery road corridors to 95 (SD ± 9; *n*=106) in Basin D.

### Age and Length

Fish in the aged Arctic grayling sample (*n*=669) ranged between the ages 0 and 11 (SD 7-1 2009 Aquatics Synthesis Baseline, Figure 9-24 and Appendix F17). Growth increments during the first 5 years averaged

approximately 50 mm in length per year; the older fish grew considerably slower, averaging approximately 20 mm in length per year. Almost no growth was recorded during the last growth period (i.e., between ages 9 and 11). An ANOVA revealed significant differences in mean fork length-at-age among basins for fish in age classes 0 through 4 (SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.3.3.2). For example, age 4 fish in Basin D were significantly larger then fish of the same age in Basin A and B.

#### *Feeding Habits*

Arctic grayling diet was assessed based on data collected from 31 stomachs. In contrast to the other species examined, most (84%) Arctic grayling had at least one food item in their stomachs; the mean fullness index was 45% (SD 7-1 2009 Aquatics Synthesis Baseline, Appendix F20). This is likely because they are opportunistic in their feeding habits and their diet is extremely variable compared to other species (Bishop 1967; de Bruyn and McCart 1974). The diet consisted primarily of invertebrates (87% of the total food volume) with identifiable taxa including (in order of abundance): amphipods, caddis flies, crane flies, beetles, midges, mosquitoes, and stoneflies. In addition, ninespine stickleback accounted for 13% of the total food volume.

### *7.5.4.4.2.4 Round Whitefish*

Round whitefish utilize most habitats including lakes, rivers, and possibly brackish waters at river mouths (Appendix 7.5-E; Scott and Crossman 1973; Evans et al. 2002; Richardson et al. 2001). Round whitefish spawn in the fall (September/October) when water temperatures near 5°C. Females disperse eggs over gravel shallows of lakes, river mouths, and possibly in rivers. Eggs incubate over winter and hatch in April/May of the following spring. Round whitefish reach maturity at age 5 to 6, after reaching a fork length of 328 to 371 mm.

The round whitefish sample (*n*=486) ranged from 81 to 510 mm in fork length (Appendix 7.5-Fd). Approximately 46% (*n*=227) of all round whitefish captured were collected at the fish fence in the lower Meliadine River. Most of these fish were adults ranging from 253 to 464 mm in fork length (mean=376 mm, SD ± 56). Smaller fish (i.e., less than 250 mm) were captured primarily in Meliadine Lake (*n*=62) and the Peninsula Basins (*n*=17). Round whitefish in the aged sample (*n*=134) ranged from age 1 through age 18 (SD 7-1 2009 Aquatics Synthesis Baseline, Figure 9-26 and Appendix F18). The diet consisted entirely of aquatic invertebrates including (in order of abundance): snails, caddis flies, midges, clams, and hydroids.

The slope of the regression line from the length-weight regression equation (log Weight (g)=-5.3312 + 3.1326 log Fork Length (mm); Appendices 7.5-G and 7.5-H) indicated positive allometric growth. Relative weights for individual fish ranged from 53 to 145.

### *7.5.4.4.2.5 Cisco*

Cisco are largely a lake species, and within the LSA they were found predominantly in the large to medium lakes (Appendix 7.5-E; Scott and Crossman 1973). Cisco spawn in the fall (September/October) at water temperatures between 3 and 5°C. Females lay eggs in shallow water, typically over gravel, however any substrate can be used. Eggs incubate overwinter and hatch in the spring. Cisco reach maturity at 5 to 6 years old, at fork lengths of 290 to 325 mm. Cisco are an important prey species for larger fish in northern fish communities, especially lake trout and burbot.

The fork length range of the cisco sample (n=1827) was 72 to 456 mm (Appendix 7.5-Fe). The majority (84%) of cisco captured in the RSA were less than 200 mm in fork length. Basin D (108 to 404 mm; n=161) and Meliadine Lake (79 to 381 mm; n=1539) both had a diverse representation of all size classes. In the aged sample for cisco (*n*=265), the age ranged from 1 through 10 years (SD 7-1 2009 Aquatics Synthesis Baseline, Figure 9-28 and Appendix F19). The diet of cisco consisted entirely of aquatic invertebrates including (in order of abundance): amphipods, midges, clams, snails, zooplankton and caddis flies (SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.3.5.3 and Appendix F20).

The slope of the regression line (3.2553) from the length-weight regression equation (log Weight (g)=-5.6034 + 3.2553 log Fork Length (mm); Appendices 7.5-G and 7.5-H) indicated positive allometric growth. Relative weights for individual fish ranged from 48 to 137.

#### *7.5.4.4.2.6 Burbot*

Burbot are found in lakes, rivers, and streams. They spawn in winter beneath the ice between January and March, in water temperatures of 0.6 to 1.7°C (Appendix 7.5-E; Scott and Crossman 1973). Spawning occurs over sand or gravel at depths of up to 3 m. Burbot usually spawn in lakes, but will also spawn in shallow cobble and quiet pools of large rivers. Eggs incubate for 30 days or longer, depending on incubation temperature, and young hatch from March to June. Burbot typically reach maturity at 3 to 4 years or 280 to 480 mm in length. Burbot are predaceous and have a varied diet, typically consisting of invertebrates, cisco, sculpin, and stickleback.

Burbot captured in the RSA (*n*=76) ranged from 72 to 600 mm in total length (Appendix 7.5-Ff). Burbot were primarily encountered in the streams of Peninsula Basin B (*n*=28) and in Lake D1 (*n*=19).

#### *7.5.4.4.2.7 Slimy Sculpin*

Slimy sculpin spawn in spring (June/July) as water temperatures increase to more than 5°C (Appendix 7.5-E; Scott and Crossman 1973). Spawning habits are not well known, however sculpin will spawn in both lakes and streams, beneath large rocks and outcroppings, adhering eggs to the substrate. Sculpin typically reach maturity at age 3, at lengths of 60 mm. Slimy sculpin feed primarily on invertebrates and zooplankton.

The length of slimy sculpin captured in the RSA (*n*=206) ranged from 32 to 124 mm (Appendix 7.5-Fg). Slimy sculpin were primarily encountered by backpack electrofishing in the Peninsula streams.

#### *7.5.4.4.2.8 Ninespine Stickleback*

Ninespine stickleback are a salt tolerant species and occur in both freshwater lakes, rivers, and streams as well as estuaries and river mouths (Appendix 7.5-E; Scott and Crossman 1973). Ninespine stickleback spawn in freshwater throughout the summer. Males construct a tubular nest of aquatic vegetation and anchor the nest to vegetation, off the bottom substrates. Males may build 2 nests in one season. Ninespine stickleback reach maturity at the end of their first year. Ninespine stickleback feed on invertebrates, including insects and small crustaceans. Ninespine stickleback are important prey for all predatory fish in the LSA and RSA.

The measured sample of ninespine stickleback captured in the RSA (*n*=2006) ranged from 15 to 89 mm in total length (Appendix 7.5-Fh). Ninespine stickleback were primarily encountered in the lakes and ponds on the Peninsula.

#### *7.5.4.4.2.9 Threespine Stickleback*

Threespine stickleback are a salt tolerant species and occur in both freshwater lakes, river, and streams as well as estuaries and river mouths (Appendix 7.5-E; Scott and Crossman 1973). Threespine stickleback spawn in freshwater in the summer (June/July). The male threespine builds a tubular nest on the bottom substrate made of plant debris. Eggs are deposited and incubate for 7 days. Threespine stickleback will reach maturity in their first year. They live for approximately 2.5 years, during which they may spawn one or 2 times. Threespine stickleback feed on invertebrates, eggs, fish fry (including own species), and plankton.

The measured sample of threespine stickleback captured in the RSA (*n*=475) ranged from 24 to 76 mm in total length (Appendix 7.5-Fi). Threespine stickleback were primarily encountered in Meliadine Lake (*n*=289).

### *7.5.4.5 Fish Movements*

During the 1997 to 2008 studies, 3460 fish in the LSA and RSA were marked with Floy tags. The majority (76%) were Arctic char, followed by Arctic grayling (11%), lake trout (6%), round whitefish (5%), cisco (29%), and burbot (0.1%; SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.4). Subsequent fishing effort by the study team and tags returned by local fishermen resulted in 1740 tag recapture events. These recapture events involved 1380 fish (40% of all fish tagged), of which 1081 fish were recaptured once and 299 fish were recaptured multiple times during the course of the study. Most of the recapture events (n=1004) were based on tag returns by local fishermen during subsistence fishing in Little Meliadine Lake and several areas of Hudson Bay.

A total of 2633 Arctic char were marked with Floy tags. Almost half (49.9%) of the marked fish were recaptured at least once. The results indicated that a substantial portion of the population (998 fish or 37.9% of the marked total) had been harvested by the local fishermen. Most of the harvested fish were captured in the immediate vicinity of Rankin Inlet: Prairie Bay (*n*=242), lower Meliadine River (*n*=81), and Little Meliadine Lake (*n*=548). Other freshwater harvest locations included Meliadine Lake (*n*=13), upper Meliadine River (*n*=7), and Diana River system (*n*=11). Marine harvest locations outside of Prairie Bay (*n*=45) were widespread and ranged between Chesterfield Inlet to the north and Corbett Inlet to the south of Rankin Inlet.

The radio telemetry program was implemented in 2 phases during the study. The first phase was carried out in 1997 to 1999 and involved tracking of 68 fish (Arctic char, lake trout, and Arctic grayling) implanted with radio transmitters. The second phase was carried out in 2000 and 2001 and focused on implanting radio transmitters in 12 pre-spawning Arctic char and tracking their movements in an attempt to determine their spawning and overwintering habitats.

Radio tracking of Arctic char demonstrated movements between Hudson Bay and Meliadine Lake, with many fish overwintering in Little Meliadine Lake. Pre-spawning fish implanted with radio transmitters in the west basin of Meliadine Lake in September 2000 demonstrated extensive movements and rapid dispersal, suggesting that Arctic char spawning may occur in several areas widely distributed throughout Meliadine Lake, but appeared to be focussed on the north shores of the west and central basins. Subsequent tracking in April 2001 revealed that

all fish were within 9 km of their early winter locations, suggesting limited movements during winter. However, in summer (June 2001), at least half of the implanted fish left Meliadine Lake to undergo migrations to Hudson Bay. Some selected the seaward route through the south outlet of Meliadine Lake (Meliadine River), whereas others migrated downstream through the west outlet of Meliadine Lake into Peter Lake and the Diana River system, suggesting that both outlets of Meliadine Lake are important as migration corridors for post-spawning fish during their spring return to the sea.

Most (9 of 13) radio tagged lake trout moved less than 15 km during the 1997 to 1999 tracking program and remained within 9 km of their release locations. They demonstrated movements between Lake D1 and the upper Meliadine River and between east and central basins of Meliadine Lake. The remaining 4 lake trout exhibited more extensive movements, with 2 individuals moving a total distance of 17 and 20 km throughout the east basin of Meliadine Lake and 2 others moving between the east basin and west basins of Meliadine Lake for a total distance of 41 and 45 km.

Most (14 of 19) Arctic grayling radio tagged in 1997 exhibited limited movements and remained within the respective Peninsula lakes where they had been released. One individual tagged in Lake A6 moved to Lake A1 and back in June 1998, likely in relation to spawning activities. The 5 remaining Arctic grayling tagged in 1997 had moved out of their release lakes (D1, D7, and B2) into the south basin of Meliadine Lake by July 1997. Three of these fish stayed in the south basin of Meliadine Lake throughout the 1997 to 1998 tracking program, while 2 fish exhibited extensive movements of about 40 km each, visiting other Peninsula lakes (B4, B2, O2) and the west basin of Meliadine Lake. Four Arctic grayling radio tagged in August 1998 in Lake B5 remained within the same lake over the winter and throughout the open water period in 1999, suggesting that the upper Peninsula lakes are used by resident populations year-round.

#### *7.5.4.6 Metal Analysis*

Analyses of muscle, liver, and kidney tissues collected from Arctic char, lake trout, round whitefish, cisco and Arctic grayling indicated generally low levels of metal accumulation (SD 7-1 2009 Aquatics Synthesis Baseline, Section 9.5). Concentrations of aluminium, arsenic, lead, mercury, and zinc in lake trout tissues were higher in Meliadine Lake than in Parallel Lake, which was selected as a control basin for long-term monitoring. Mercury concentrations in lake trout tissues were strongly correlated with fish size. A small proportion (3 of 30) of lake trout muscle tissue samples from Meliadine Lake exceeded the food consumption guideline of 2.5 µg/g (dry weight). Round whitefish tissues indicated similar concentrations between Meliadine and Parallel lakes. In contrast to lake trout, mercury concentrations in round whitefish were weakly correlated with fish size and none of the muscle tissue samples exceeded the food consumption guidelines. Analytical results for cisco and Arctic grayling also documented low metal concentrations in the tissue samples collected from these species.

### 7.5.5 Pathway Analysis

Pathway analysis identifies and assesses the linkages between Project components or activities, and the correspondent potential residual effects to aquatic habitat and fish. The first part of the analysis is to produce a list of all potential effects pathways for the proposed Project. Each pathway is initially considered to have a linkage to potential effects on aquatic habitat and fish. This step is followed by the development of environmental design features and mitigation that can be incorporated into the development description to remove a pathway or

limit (mitigate) the effects. Environmental design features include Project design elements, environmental best practices, management policies and procedures, and social programs. Environmental design features are developed through an iterative process between the Project's engineering and environmental teams to avoid or mitigate effects.

Pathway analysis is a screening step that is used to determine the existence and magnitude of linkages from the initial list of potential effects pathways for the proposed Project. This screening step is intended to focus the effects analysis on pathways that require a more comprehensive assessment. Pathways are determined to be primary, minor, or as having no linkage using scientific and traditional knowledge, logic, and experience with similar developments and environmental design features. Where available, Inuit concerns and activities were taken into consideration while developing pathways. For example, Elders have suggested that mining activities may affect some fishing areas, such as those in Meliadine Lake and any damage to Meliadine Lake would elicit great concern as this lake is a popular fishing spot for Inuit. Some community members were concerned about impacts to Meliadine River as well (Volume 9, Section 9.3.1.3.2). IQ

Each potential pathway is assessed and described as follows:

- no linkage – pathway is removed by environmental design features and mitigation so that the Project results in no detectable environmental change and residual effects to fish and fish habitat relative to baseline or guideline values;
- minor – pathway could result in a minor environmental change, but would have a negligible residual effect on fish and fish habitat relative to baseline or guideline values; or
- primary – pathway is likely to result in a measurable environmental change that could contribute to residual effects on fish and fish habitat relative to baseline or guideline values; includes pathways where serious harm to fish (e.g., permanent alteration of fish habitat) may be unavoidable, as defined by Section 35(2) of the *Fisheries Act*).

Primary pathways require further effects analysis to determine the environmental significance from the proposed Project on aquatic habitat and fish. Pathways determined to have no linkage to fish and fish habitat or those that are considered minor are not predicted to result in environmentally significant effects on aquatic habitat and fish. No linkage and minor pathways are summarized, but not carried through the effects assessment.

Potential pathways through which the proposed Project could affect aquatic habitat and fish are presented in Table 7.5-16. Environmental design features and mitigation incorporated into the design of the Project to remove a pathway or limit the effects to fish and fish habitat are listed, and pathways are determined to be primary, minor, or as having no linkage. The following section discusses the potential pathways relevant to the VECs selected to represent aquatic habitat and fish, specifically fish habitat units and the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity of their use for traditional and non-traditional harvests.

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| General construction and operation of mine infrastructure including Project All-Weather Access Road (AWAR) | Project footprint will remove waterbodies and alter watershed areas and drainage patterns, change flows, and water levels and the road footprint will result in loss of fish habitat at road crossings, all of which may affect fish habitat quantity (including habitat units as defined by DFO) and the abundance and distribution of fish | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management), where needed.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches and diversion berms.<br><br>Use of design features to reduce changes to local flows, drainage patterns, and drainage areas.<br><br>Roads aligned to cross streams of low quality habitat to the extent possible.<br><br>Design roads as narrow as possible, while maintaining safe construction and operation practices, and meeting legislated requirements. For example, minimum haul road widths are defined under the *Mine Health and Safety Act, NWT (Nu)*. | Primary/Section 7.5.6.2.1 |
| | Mine footprint will affect the connectivity of fish habitat within the Meliadine Lake Peninsula(e.g., Lake A6 in upper A basin), affecting abundance and distribution of fish | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Diversion channels will be designed to provide fish habitat and conditions allowing for passage of Arctic char, lake trout, and Arctic grayling where necessary.<br><br>Habitat fragmentation will occur during construction and operation, as hydrological conditions within affected basins of the LSA will be re-connected either during later stages of operation, or at closure, as described in the Surface Water Management Plan (SD 2-6). | Minor/ Section 7.5.5.2 |
| | Crossing structures may alter stream hydraulics and geomorphology, potentially blocking or delaying fish movements on streams (e.g., roads). | Cross-drainage structures will be designed and constructed such that structures will not create a hydraulic barrier to fish passage and will convey peak flows corresponding to 1:25 year rainfall event<br><br>Single span bridges at the Char and Meliadine rivers and at the M5.0 crossing will be used to minimize blockages to fish movement.<br><br>Use of staggered culvert configuration, and removal of snow at the culvert inlet and outlet prior to the freshet to promote drainage during spring thaw and freshet. | Minor/ Section 7.5.5.2 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | | Regular inspection of the road to identify any areas where ponding of water along the road represents a risk, and installing additional culverts to alleviate the risk. | |
| | Changes in flow paths, and diversion of non-contact water to newly modified watersheds, may affect turbidity and TSS concentrations at downstream locations, affecting fish habitat quality. | Construction runoff will be captured and discharged into an attenuation pond to settle out suspended sediments.<br><br>Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>A Surface Water Management Plan (SD 2-6) will be implemented.<br><br>Best management practices will be used to control sediment releases during construction activities resulting in land disturbance (e.g., silt curtains).<br><br>Shoreline areas susceptible to extensive erosion will be addressed by appropriate erosion protection measures to reduce erosion and associated re-suspension of fine sediment. | Minor/Section 7.5.5.2 |
| | Sediment releases from land disturbance during construction and road construction, including watercourse crossings, can affect quality of nearby surface waters and fish habitat quality. | Best management practices will be used to control sediment releases during construction (e.g., silt curtains, runoff management).<br><br>Construction runoff will be captured and discharged into an attenuation pond to settle out suspended sediments.<br><br>Instream construction work will be avoided, or limited to the minimum extent possible.<br><br>Where possible, in-stream works will be constructed in winter when watercourses are frozen; no in-stream works conducted between 1 May to 15 July to avoid critical periods for fish.<br><br>Roads will be designed as narrow as possible, while maintaining safe construction and operation practices, and meeting legislated requirements. For example, minimum haul road widths are defined under the *Mine Health and Safety Act, SNWT (Nu)*.<br><br>Bridge abutment installation will occur outside of the high-water mark, and construction will occur in winter.<br><br>Disturbed areas along the streambanks will be stabilized and allowed to revegetated upon completion of work. | Minor/Section 7.5.5.2 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | Fugitive dust sources and deposition of dust may change water and sediment quality, affecting fish health and fish habitat quality. | Dust will be actively suppressed from roads (water and/or other dust suppressants). Potential use of chemical dust suppressants in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment (SD 2-9 Roads Management Plan).<br><br>Watering of roads will suppress dust production.<br><br>Enforcing speed limits will assist in reducing dust.<br><br>Road surfaces will be maintained through grading and the addition of granular material.<br><br>Equipment and vehicles will comply with relevant non-road emission criteria at the time of purchase.<br><br>Regular maintenance of equipment and vehicles to meet emission standards.<br><br>Crossings will be perpendicular to watercourse.<br><br>Sheds, enclosures and covers will be used in crushing and major ore handling areas<br><br>Operating procedures will be developed that reduce dust generation. For example, tailings deposition will be designed to limit dust generation. | Primary/Section 7.5.6.2.3 |
| | Air emission of sulphur dioxide, nitrogen oxides and particulates may change water and sediment quality, affecting fish habitat quality and fish health. | Equipment and vehicles will comply with relevant emission criteria at the time of purchase.<br><br>Regular maintenance of equipment and vehicles to meet emission standards. | Primary/Section 7.5.6.2.3 |
| | Release of mine wastewater and sewage may cause changes to surface water quality and sediment quality (i.e., nutrient and metal concentrations), affecting aquatic habitat and the survival and reproduction of fish in Meliadine Lake | Develop a Surface Water Management Plan (SD 2-6)<br><br>Contact water will be monitored and managed through the Attenuation Ponds<br><br>Surface runoff and groundwater seeping into the open pits will be collected in in-pit sumps. The collected water will be used for dust control or pumped to the TSF for use as process water.<br><br>Underground water will be re-cycled for re-use underground, where possible. Excess underground water with high salinity will be treated<br><br>Discharge quality will meet MMER at end of pipe and will meet CCME aquatic life standards within a | Primary/Section 7.5.6.2.3 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | | 100 m wide mixing zone of the diffuser in Meliadine Lake.<br><br>The rotary biological contactor sewage treatment plant for the camp facilities will be designed to meet the Nunavut effluent guidelines for wastewater discharge. | |
| | Process and potable water use resulting in reduced water levels can affect water quality and fish habitat quality in Meliadine Lake. | A Surface Water Management Plan (SD 2-6) will be implemented.<br><br>Contact water will be monitored and managed through the Attenuation Ponds.<br><br>Surface runoff and groundwater seeping into the open pits will be collected in in-pit sumps. The collected water will be used for dust control or pumped to the TSF for use as process water.<br><br>Underground water will be re-cycled for re-use underground, where possible. Excess underground water with high salinity will be treated.<br><br>Discharge quality will meet MMER at end of pipe and will meet CCME aquatic life standards within a 100 m wide mixing zone of the diffuser in Meliadine Lake. | Minor/Section 7.5.5.2 |
| | Spills and leaks can affect water and sediment quality of nearby surface waters, affecting fish habitat quality and abundance and distributions. | Equipment will be re-fueled, serviced, and washed away from stream crossings.<br><br>Emergency response (SD 2-15) and spill contingency plans (SD 2-16) will be implemented<br><br>Ready access to an emergency spill clean-up kit for cleaning up any spills.<br><br>Vehicles properly loaded and loads appropriately covered where necessary.<br><br>Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers (i.e., SD2-13 Hazardous Materials Management Plan).<br><br>Individuals working on site and handling hazardous materials will be trained in the Transportation of Dangerous Goods and Hazmat Response.<br><br>A biopile will be constructed to treat soils and rock contaminated by light hydrocarbons. The biopile will have a low permeability liner.<br><br>Soils from petroleum spill areas will be excavated, placed into appropriate containers and shipped for | Minor/ Section 7.5.5.2 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | | remediation.<br><br>Soils contaminated with heavy hydrocarbon oil spills will be excavated, placed into appropriate containers, transported for remediation at a certified hazardous materials treatment site, and disposed of appropriately.<br><br>Fuel storage tanks will be situated in a lined and bermed containment area capable of containing 110 per cent of the contents of the largest tank. The storage tanks and fuel-dispensing systems will be constructed in accordance with current regulatory requirements and fire regulations.<br><br>Fuel will be transported year-round by double-walled tanker trucks to the Meliadine tank farm.<br><br>Construction and mining equipment, machinery, and vehicles will be regularly maintained. | |
| Site Water Management: Seepage and Runoff | Runoff and leaching from the waste rock in waste rock storage facilities and mine footprint may change surface water and sediment quality (i.e., metal concentrations), and affect fish health and fish habitat quality | Contact water will be managed on-site in accordance with the Surface Water Management Plan (SD 2-6).<br><br>Runoff and seepage from waste rock storage facilities will be collected in sumps located in low topographic points around the perimeter. This water will be monitored for water quality and if necessary transferred to the mine attenuation pond before discharge.<br><br>Surface runoff and groundwater seeping into the open pits will be collected in in-pit sumps. The collected water will be used for dust control or pumped to the TSF for use as process water.<br><br>Sumps will be sized to hold water running off the waste rock storage facilities and the ore stockpiles and open pits.<br><br>Construction materials will be clean and contaminant free.<br><br>Landfill will not contain any putrescible organic matter so seepage is not expected<br><br>Design waste rock management procedures for potentially problematic waste rock material (SD Mine Waste Management Plan).<br><br>Use of non-acid generating and non-metal leaching material at all watercourses. | Minor/Section 7.5.5.2 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | | Any PAG or high metal leaching waste rock will be segregated at source and placed into designated areas within the waste rock storage facilities (SD Mine Waste Management Plan).<br><br>PAG and high metal leaching waste rock will be encapsulated with non -PAG and low metal leaching rock (SD Mine Waste Management Plan).<br><br>Over time potential PAG and high metal leaching rock will become permanently frozen with an active cover layer of non-PAG rock. | |
| | Vertical and lateral seepage from the tailings storage facility may enter nearby waterbodies, affecting water and sediment quality (i.e., metal concentrations), as well as fish health and fish habitat quality. | Contact water will be managed on-site in accordance with the Surface Water Management Plan (SD 2-6).<br><br>Excess tailings supernatant water will be treated for parameters of potential concern prior to release to the attenuation pond and Meliadine Lake.<br><br>Seepage from the TSF containment dikes will be captured at sumps and diverted back to the TSF.<br><br>At closure, the tailings storage facility will be dewatered and covered with waste rock; runoff will be collected and then treated until it is confirmed that water meets water quality criteria. | Minor/Section 7.5.5.2 |
| | Seepage of pore water though, or underneath, incompletely frozen dikes to adjacent watersheds may change water quality in local watersheds, and affect fish health and fish habitat quality | Contact water will be managed on-site in accordance with the Surface Water Management Plan (SD 2-6).<br><br>Temporary and permanent dikes will be constructed with a liner keyed into competent frozen ground (saturated inorganic permafrost) or bedrock.<br><br>Internal retention dikes will be constructed with a wide till core to control seepage.<br><br>Permafrost will be preserved in foundation beneath dikes by constructing structures during the winter when the active layer is frozen where possible.<br><br>Performance of the dikes will be monitored throughout their construction and operating life. | Minor/Section 7.5.5.2 |
| Site Water Management during Construction and Operations: Alteration of Flow Paths and Diversion of Project Footprint | The active diversion of water from lakes to other locations either within or to adjacent sub-basins will increase flows to receiving downstream waterbodies and watercourses (in Basin D and P), potentially increasing available fish | A Surface Water Management Plan (SD 2-6) will be implemented.<br><br>Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. | Minor/Section 7.5.5.2 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| Lakes to Receiving Waterbodies | habitat | | |
| | The active diversion of water from waterbodies to other locations either within or to adjacent sub-basins will decrease flows to downstream waterbodies and watercourses bypassed by the diversion, potentially affecting the availability of fish habitat (in Basin A and B) | A Surface Water Management Plan (SD 2-6) will be implemented.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms. | Primary/Section 7.5.6.2.2 |
| | Changes to the configuration of watersheds and flow paths from the Project footprint may affect downstream water quality (e.g., metals) in small lakes and streams, and affect aquatic health, and fish habitat quality. | A Surface Water Management Plan (SD 2-6) will be implemented. | Primary/Section 7.5.6.2.3 |
| | Active diversion of water from footprint lakes to receiving locations may affect channel/bank stability, and water quality (e.g., suspended sediments, nutrients, metals) in receiving and downstream waterbodies, and therefore, affect water quality, fish habitat quality and the abundance and distribution of fish | Dewatering activities will be monitored so that corrective actions can be taken to minimize sedimentation, for example, maintain lake surface at a level that limits sediments in dewatered lakes becoming suspended due to wave action.<br><br>Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes.<br><br>Lake dewatering discharge will be sampled regularly to monitor for compliance with discharge criteria, and any water not meeting the criteria will be treated or stored within the controlled Attenuation Ponds until it meets criteria<br>Pumped water from the dewatered lakes will be directed through properly designed structures to prevent erosion in the receiving waterbodies. | Minor/Section 7.5.5.2 |
| | Alteration of watershed flow paths under the Project footprint may affect channel/bank stability and water quality (e.g., suspended sediments) in downstream waterbodies, and affect aquatic health, fish habitat quality and the abundance and distribution of fish. | Shoreline areas susceptible to extensive erosion will be addressed by appropriate erosion protection measures to reduce erosion and associated re-suspension of fine sediment.<br><br>Where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms<br><br>Water quality will be monitored regularly for turbidity, and intermittently for TSS, nutrients and metals. | Minor/Section 7.5.5.2 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | The Waste Rock and tailings storage facility will physically alter the size and shape of watersheds, and alter existing flow paths within the LSA, which may decrease downstream flows, and water levels, affecting available fish habitat, and the abundance and distribution of fish (in Basin C, E, I, J, and CH) | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Use of design features to reduce changes to local flows, drainage patterns, and drainage areas. | Minor/Section 7.5.5.2 |
| | The Project footprint will physically alter the size of watersheds, and alter existing flow paths within the LSA, which may decrease downstream flows and water levels, affecting fish habitat quantity and the abundance and distribution of fish (in Basin A, B, and H) | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Use of design features to reduce changes to local flows, drainage patterns, and drainage areas. | Primary/Section 7.5.6.2.2 |
| | The active diversion of water from waterbodies to other locations either within or to adjacent sub-basins during operation phases will increase flows to receiving downstream waterbodies and watercourses, potentially increasing habitat quantity (in Basin D and P). | A Surface Water Management Plan (SD 2-6) will be implemented | Minor/Section 7.5.5.2 |
| Site Water Management during Construction and Operation: Dewatering of Project Footprint Lakes | Dewatering of Project Footprint Lakes may cause mortality and spoiling of fish | Fish salvage in Project footprint lakes will be conducted to remove fish before and during dewatering; the fish-out programs will be designed and implemented in consultation with DFO and local Inuit communities, and will follow Tyson et al. (2011). | Minor/ Section 7.5.5.2 |
| | Impingement and entrainment of fish in intake pumps during dewatering may cause injury and mortality to fish, affecting abundance and distributions | Appropriately sized fish screens, which meet DFO guidelines, will be fitted to pumps to limit fish access and to limit fish entrained to the smaller species and life stages | Minor/Section 7.5.5.2 |
| Pit development | Removal of saline groundwater inflows during pit development to local watersheds may | All of the open pits will be developed in permafrost; therefore, they are not connected to the deep groundwater regime. Groundwater inflows will be relatively fresh because of isolation from deep | No Linkage/Section 7.5.5.1 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | affect water quality in local watersheds, and affect aquatic health and fish | saline groundwater.<br><br>Water inflow to the dewatered areas will not be directly released to local watersheds; Water reporting to the pits will be directed to the reclaim pond for re-use in the milling process. | |
| | Blasting near fish-bearing waterbodies may result in pressure changes and vibrations, and affect fish mortality and reproduction | Blasting will follow recommended guidelines for use of explosives in or near fisheries waters (e.g., based on instantaneous pressure change threshold of 50 kPa; Godard et al. 2008).<br><br>Lessons learned at the Meadowbank Mine will be integrated into blasting plans. | Minor/Section 7.5.5.2 |
| Construction and operation of haul roads, AWAR and Rankin Inlet bypass road | Blasting near fish habitat may result in the physical and/or chemical alteration of the fish habitat. | Blasting will follow recommended DFO guidelines for use of explosives in or near Canadian fisheries waters.<br><br>Lessons learned at the Meadowbank Mine will be integrated into blasting plans. | Minor/Section 7.5.5.2 |
| | Release of potential acid generating materials from road building materials at the watercourse crossings can alter water quality, affecting fish health and fish habitat quantity | Use of non-acid generating and non-metal leaching material at all watercourses.<br><br>Any PAG or high metal leaching waste rock will be segregated at source and placed into designated areas within the waste rock storage facilities. | No Linkage/Section 7.5.5.1 |
| | Surface water drainage through quarries and transport of blasting residuals and metals directly into watercourses can affect surface water quality, affecting fish health and fish habitat quality | Where possible, stockpiling of rock and fill from quarries and borrow sites will be placed such that surface water is not diverted through the piles with runoff to surface waterbodies.<br><br>Drainage from quarries will not flow directly into any waterbodies or watercourses.<br><br>Excavations will be at least 30 m away from any waterbodies supporting Arctic char, lake trout and Arctic grayling.<br><br>Quarries will be excavated and sloped for positive drainage.<br><br>Quarries will be inspected on a regular basis to monitor water ponding, particularly at spring melt; when there is flow from a quarry that could enter a waterbody, a water quality sample will be collected and analyzed. | Minor/Section 7.5.5.2 |
| | Potential overexploitation of fish stocks due to improved road access can lead to changes in the abundance and distribution of fish | Mining staff will not be allowed to hunt or fish while on their work rotation. AEM will develop and enforce “no hunting, trapping, harvesting or fishing policy” for employees and contractors.<br><br>Access to the mine site from the AWAR will be | Primary/Section 7.5.6.2.5 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | | controlled (gated); public vehicles (cars, trucks) allowed only with special authorization. | |
| Decommissioning of mining infrastructure, dikes and roads at closure (e.g., AWAR, Rankin Inlet bypass road) | Sediment and contaminant releases during decommissioning activities can affect surface water quality, affecting fish habitat quality for fish. | Best management practices for erosion and sedimentation control will used.<br><br>All in-stream work will be limited to when watercourses are not flowing or when watercourses are frozen, as much possible.<br><br>Coarse rip-rap on the banks will be used to prevent erosion after removal of culverts.<br><br>Dykes will be removed during low- or no-flow periods to allow work to be completed “in the dry”; silt curtains will be used above and below dikes to control release of suspended sediments.<br><br>Watersheds will be reconnected along previous connecting streams where possible. | Minor/Section 7.5.5.2 |
| Decommissioned tailings storage facility and waste rock storage facilities during closure | Runoff and seepage from decommissioned waste rock storage facilities and tailings storage facility may change downstream surface water and sediment quality (i.e., metal concentrations), and affect fish health and fish habitat quality | A preliminary Mine Closure and Reclamation Plan (SD 2-17) has been developed and describes measures for permanent closure.<br><br>The waste rock storage facilities have been designed for long-term stability.<br><br>A cover of non-acid generating and non-metal leaching rockfill will be placed on the surface of the tailings to a thickness that will allow the tailings to remain frozen.<br><br>The pond in the tailings area will be drained and filled with waste rock to promote surface drainage to Tiriganiaq Pit.<br><br>The surface of the tailings storage facility and waste rock storage facilities will be graded to blend into the existing topography and to shed water from the surface. | Minor/Section 7.5.5.2 |
| Reclaimed Footprint | Water quality concentrations in flooded pits may exceed objectives, and if reconnected to pre-construction flow paths may affect downstream water and sediment quality, affecting fish health and habitat quality | A preliminary Mine Closure and Reclamation Plan (SD 2-17) has been developed and describes measures for permanent closure.<br><br>The pits (and borrow pits) will be progressively reclaimed as excavation is completed; slopes will be designed to be stable during pit construction and operation.<br><br>The pits will be flooded, with water from Meliadine Lake, over a 10 year period following completion of pit operations.<br><br>Pit Lakes will be designed to sequester | Primary/Section 7.5.6.2.4 |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | | contaminants of potential concern at depths so that they are biologically unavailable to higher trophic levels.<br><br>All diversion dikes will be kept intact as a barrier between open pits and surrounding lakes until the pit water meets acceptable concentrations for release to the environment.<br><br>Any acid-generating bedrock exposed in borrow pits will be covered with a minimum 2 m thick layer of non-acid generating and non-metal leaching soil or rock to direct water from the surface. | |
| | Water quality concentrations in the attenuation pond (AP-01 or H17) may exceed objectives, and if reconnected to pre-construction flow paths may affect downstream water and sediment quality, affecting fish health and habitat quality | A preliminary Mine Closure and Reclamation Plan (SD 2-17) has been developed and describes measures for permanent closure.<br><br>Sediments will be analyzed, and if concentrations are higher than baseline or guidelines, sediments will be managed according to best practices. | Minor/Section 7.5.5.2 |
| | Permanent changes to the configuration of watersheds and flow paths may affect downstream water quality (e.g., metals) in small lakes and streams, and affect aquatic health, and fish habitat quality. | None | Primary/Section 7.5.6.2.3 |
| | The permanent footprint will remove waterbodies and alter watershed areas and drainage patterns, change flows, and water levels, all of which may affect fish habitat quantity (including habitat units as defined by DFO) and the abundance and distribution of fish | Compact layout of the surface facilities within local watersheds will limit the area that is disturbed by construction and operation.<br><br>Site infrastructure will be decommissioned and removed from site.<br><br>All roads will be decommissioned and scarified.<br><br>Hydraulic connections to the natural receiving environment will be re-established once water quality monitoring demonstrates the water meets water quality guidelines for direct release without further treatment.<br><br>Drainage patterns will be re-established as close to pre-construction conditions as possible; select non-contact water diversion ditches will be retained to promote surface water drainage. | Primary/Section 7.5.6.2.1 |
| | The Project will change | Hydraulic connections to the natural receiving | Primary/ Section |

**Table 7.5-16: Potential Pathways for Effects to Fish Habitat (VEC; SD 7-4) and the Abundance and Distribution of Arctic Char, Lake Trout and Arctic Grayling (Fish Species VECs), and the Continued Opportunity for Traditional and non-Traditional Users (continued)**

| Project Activity | Effects Pathways | Environmental Design Features and Mitigation | Pathway Analysis/Section for further discussion |
|---|---|---|---|
| | the long-term hydrology of the LSA sub-basins | environment will be re-established once water quality monitoring demonstrates that water meets water quality guidelines for direct release without further treatment.<br><br>Drainage patterns will be re-established as close to pre-construction conditions as possible, select non-contact water diversion ditches will be retained to promote surface water drainage. | 7.5.6.2.1 |
| | The permanent footprint will affect the connectivity of fish habitat within the Meliadine Lake Peninsula, affecting abundance and distribution of fish | Hydraulic connections to the natural receiving environment will be re-established once water quality monitoring demonstrates the water meets water quality guidelines for direct release without further treatment.<br><br>Drainage patterns will be established as close to pre-construction conditions as possible, with drainage ditches contoured or backfilled as appropriate to remove hazards for wildlife.<br><br>Permanent diversion channels will be designed to provide fish habitat and conditions allowing for passage of Arctic char, lake trout, and Arctic grayling where necessary. | Minor/Section 7.5.5.2 |

### *7.5.5.1 No Linkage Pathways*

A pathway may have no linkage if the activity does not occur (e.g., effluent is not released), or if the pathway is removed by environmental design features so that the Project results in no detectable (measurable) environmental change and residual effects to fish and fish habitat in the Project area. The following pathways are expected to have no linkage to fish habitat (units) and the abundance and distribution of Arctic char, lake trout, and Arctic grayling and will not be carried through the effects assessment.

- **Removal of saline groundwater inflows during pit development to local watersheds may affect water quality in local watersheds, and affect aquatic health and fish**

All of the open pits will be developed in permafrost; therefore, they are not connected to the deep groundwater regime. Groundwater inflows will be relatively fresh because of isolation from deep saline groundwater (Appendix 7.-2-B). Water reporting to the open pits will be directed to the reclaim pond for re-use in the milling process (SD 2-6 Surface Water Management Plan).

Thus, the potential effect of removal of saline groundwater inflows during pit development was determined to be a no linkage pathway. There is no risk to fish health and habitat quality for Arctic char, lake trout, and Arctic grayling under this pathway.

- **Release of potential acid generating materials from road building materials at the watercourse crossings can alter water quality, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**

The AWAR Project design includes the use of rock and till materials from identified quarry locations along the road to be used for construction, including the installation of culverts and bridges (SD 2-9 Roads Management Plan; SD 2-10 Borrow Pits and Quarry Management Plan).

Initial testing using static methods to assess the chemical composition of the potential road building material, its potential to generate acid rock draining, and its potential to leach metals to the receiving environment upon exposure to ambient conditions was completed in 2010 (SD 6-3 Geochemistry Baseline Report). The quarry locations identified for the AWAR show no potential to generate acid drainage. The low acid rock draining potential is a result of the low sulphide content and high buffering capacity in the same material. Sulphide-sulphur content ranges from <0.01 to 0.17% (in rock) and 0.07% (in till), and total sulphur ranges from <0.005 to 0.34% (in rock) and 0.09% (in till). Based on the low sulphide-sulphur content, samples are classified as non-acid generating (SD 6-3 Geochemistry Baseline Report).

Thus, the potential effect of road-building buildings materials was determined to be a no linkage pathway given the chemistry of rock and till materials proposed for construction. There is no risk to fish health and habitat quality for Arctic char, lake trout, and Arctic grayling under this road-building materials pathway.

### *7.5.5.2 Minor Pathways*

In some cases, both a source and a pathway exist, but the change caused by the proposed Project is anticipated to result in a minor environmental change to fish habitat quality or quantity (e.g., lower trophic levels), and therefore would have a negligible residual effect to fish habitat units and fish relative to baseline or guideline values (e.g., a slight increase in a water quality parameter above CCME guidelines, but would not affect fish health). The following pathways are anticipated to be minor, and will not be carried through the effects assessment.

- **Spills on the mine site, mine site roads, or along the AWAR can affect surface water and sediment quality, riparian vegetation, and fish habitat quality**
- **Spills on the mine site or along the AWAR can increase risk of mortality to individual fish**

A Risk Management and Emergency Response Plan (SD 2-15), Spill Contingency Plan (SD 2-16), and Fuel Management Plan (part of SD 2-13) will be developed and implemented to minimize the likelihood of accidental spills, or if they do occur, to quickly respond and clean up any spills. AEM will not permit the deposit of chemicals, sediment, wastes, or fuels into any waterbody. During construction, hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers. Refuelling stations in Rankin Inlet and at the mine site will be equipped with a lined area to contain any minor leaks or spills while refuelling. During operation, hazardous materials will be stored at the mine site. Individuals working on the AWAR and handling hazardous materials will be trained in the Transportation of Dangerous Goods. Emergency spill kits will be readily available. Biopiles will be constructed to treat soils contaminated by light hydrocarbons, and soils contaminated with heavy hydrocarbons will be excavated, placed into appropriate containers, undergo

remediation at a certified hazardous material site and disposed of appropriately. Construction and mining equipment, machinery, and vehicles will be regularly maintained.

Based on AEM's experience with the Meadowbank Mine, accidental spills (e.g., fuel) have occurred, but most of the spill volumes have been small, and clean-up has occurred with only minor effects to the environment (AEM 2011c). Out of 78 spills at Meadowbank since the start of construction, 73 were within the mine site boundary and 5 were outside of the mine boundary. There were 10 spills greater than 1000 L at Meadowbank, one of which was outside the mine boundary. Contaminated material from the larger spill outside the mine boundary was completely recovered (AEM 2011c). All of the spills inside and outside the mine boundary were contained and cleaned-up (AEM 2011a). In NIRBs 2011 annual report (NIRB 2011), it was noted that Meadowbank Mine was kept in an impressively clean state with no apparent spills on location.

The implementation of the Risk Management and Emergency Response Plan (SD 2-15), and environmental design features, including proper equipment maintenance and driver training, are expected to reduce the frequency and severity of spills. However, it is acknowledged that accidental spills, including vehicular accidents, have the greatest potential to affect riparian soils and vegetation. However, in the event of a spill, contaminated materials will be either collected and treated on-site, or shipped off-site for treatment and disposal.

Consequently, this pathway was determined to be minor and have negligible effects on fish habitat units, the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional use of these valued fish species.

- **The Project footprint during construction and operations may alter the connectivity of habitat for Arctic char, lake trout and Arctic grayling within the Meliadine Lake Peninsula, by isolating habitat and local populations in the upper waterbodies from downstream locations such as Meliadine Lake**
- **The permanent Project footprint, post-closure, may alter the connectivity of habitat within the Meliadine Lake Peninsula**

Aquatic (dendritic) ecosystems are dynamic landscapes where fish movement, habitat patchiness, and life-stage dependent shifts in critical habitat requirements interact to influence fish populations at the watershed scale (Fausch et al. 2002). Barriers to movement have the potential to reduce the overall productivity of populations by isolating reproductive habitats from preferred foraging habitats.

In the LSA, fish susceptible to the effects of fragmentation are those that use waterbodies upstream of the Project footprint (Figures 7.5-33 and 7.5-34). Further, potential effects of fragmentation are likely restricted to fish in the Meliadine Lake Peninsula where existing stream connections between waterbodies provide corridors to downstream populations or corridors for movements as part of species life history requirements. Waterbodies in the Chickenhead Lake watershed, although supporting self-sustaining populations of Arctic grayling and lake trout, are naturally isolated and will not be fragmented by the Project footprint. No Arctic char were captured in the upper Peninsula waterbodies; however, baseline sampling showed that Arctic grayling were relatively widespread in the upper waterbodies, occurring in 62% of the upper lakes in the Peninsula; whereas lake trout were recorded in only one lake, Lake B69 (Section 7.5.4.3.2; Appendix 7.5-D).

Lake B69 supports a resident, self-sustaining population of lake trout, in part, because of the deep water depths and substrate types that characterize the lake (Table 7.5-8). Lake trout primarily use lake habitats as part of their life history strategy. Connections to downstream waterbodies, such as Lake B45 and B46, will be maintained through construction, operation, and post-closure phases. Although the connection to Meliadine Lake for

dispersal movements may be temporarily fragmented because of the modification of Lake B4 for a waste rock storage facility, and the re-routing of natural flows through P2, it is unlikely that this pathway will noticeably alter the abundance of lake trout in the LSA. Lake trout abundance and the likelihood of local extirpation of lake trout within Lake B69 will remain within baseline values for that lake. At post-closure the flow path from Lake B69 to Meliadine Lake will include a path through B46 to B44 to P2 to B2 to Meliadine Lake.

Fish most susceptible to the effects of altered connectivity of fish habitat on the Peninsula are Arctic grayling. This species uses habitat above the Project footprint and typically relies on streams, rivers and lakes to complete its life cycle (Section 7.5.4.3.2.3). Based on baseline studies, most Arctic grayling radio tagged in the LSA (14 of 19) exhibited limited long-distance movements and remained within the respective Peninsula lakes where they had been released during the 2 years of movement monitoring (Section 7.5.4.4; SD 7-1 2009 Aquatics Synthesis Baseline). Observed short-distance movements included Lake A6 to Lake A1 and back the following summer, likely in relation to spawning activities. Other fish moved from D1, D7, and B2 and into the south basin of Meliadine Lake by summer the following year. The remaining Arctic grayling that were tagged during the study moved out of their release lakes and 2 of these travelled more than 40 km each, visiting other Peninsula lakes (B4, B2, O2) and the west basin of Meliadine Lake (Section 7.5.4.5). Despite some large distance movements by some fish, the 2-year tracking study suggested that the upper Peninsula lakes and streams have the potential to support resident (year-round), self-sustaining populations.

530000 535000 540000 545000

6990000 6985000

Meliadine Lake

E1 E2 E3 E4 F1 F2 F3 F4 F5 D1 D2 D3 D4 D5 D6 D7

B7 Waste Rock Storage Facility East
B7 Waste Rock Storage Facility North
B7 Waste Rock Storage Facility West
B7 Waste Rock Storage Facility South
B7 B6 B5 B30 B31 B2 B1 B4 B44 B45 B46 B47 B48 B49 B50 B51 B52 B53 B59 B66 B67 B68 B69
H1 H2 H6 H17
Tiriganiaq Pit
Tiriganiaq Pit #2
Wesmeg #1 Wesmeg #2 Wesmeg #3 Wesmeg #4 Wesmeg #5
Pump Pit #1 Pump Pit #2
B4 Waste Rock Storage Facility
A1 A1A A2 A2A A3 A4 A5 A6 A7 A8
F Zone Pit #1 F Zone Pit #2 F Zone Pit #3
A45-2 Waste Rock Storage Facility
Control Lake

**Discovery Pit**

CH1 CH5 CH6
Discovery Waste Rock Storage Facility
Discovery Pit

2 0 2
KILOMETRES

1 0 1
KILOMETRES

N

## LEGEND

- All-weather Access Road (AWAR)
- Road - New
- Watercourse
- Local Study Area (LSA)
- Waste Rock Storage Facility

Waterbody (Pre-Construction)

- Arctic Char (ARCH), Lake Trout (LKTR), Arctic Grayling (ARGR)
- Arctic Char (ARCH), Arctic Grayling (ARGR)
- Lake Trout (LKTR), Arctic Grayling (ARGR))
- Arctic Grayling (ARGR)
- Waterbody

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
**PROJECT FOOTPRINT AND WATERBODIES SUPPORTING ARCTIC CHAR, LAKE TROUT, AND ARCTIC GRAYLING ON THE MELIADINE PENINSULA**

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | JP | 06 Nov. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | JW | 06 Nov. 2012 | | |
| CHECK | DW | 13 Jan. 2013 | | |
| REVIEW | DW | 13 Jan. 2013 | | |

**FIGURE 7.5-33**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.5-33_Project_Footprint_Waterbodies_Supporting_Fish_A.mxd

536000 538000 540000 542000 544000

6990000 6988000 6986000 6984000

N

**LEGEND**

- Diversion Channel
- Watercourse
- Watercourse - Affected by HADD
- Waste Rock Storage Facility
- Dewatered or Filled in Lake
- Pit Lake
- Waterbody

E4 E5 B7 B6-7 B6 B5-6 B30-6 B30 B31-30 B31 B5-31 B5 B4-5 B4 B2-P2 P2-B44 B44-45 B46-59 B59-PP1 B7 Waste Rock Storage Facility North B7 Waste Rock Storage Facility West B7 Waste Rock Storage Facility East B7 Waste Rock Storage Facility South B4 Waste Rock Storage Facility D7-B5 H6-17 H0-1 H1 H1-2 H2 H1-6 Tiriganiaq Pit #2 Tiriganiaq Pit Wesmeg #1 B5-WP1 Pump Pit #1 Pump Pit #2 Wesmeg #2 Wesmeg #3 Wesmeg #4 Wesmeg #5 J8-WP3 A8-WP5 A30-WP4 A7-8 A6-7 A4-5 A4 A3-4 A3 A2A-3 A2A A2-2A A5 A2 A5-6 F Zone Pit #3 F Zone Pit #2 F Zone Pit #1 FP3-A6 A45-2 Waste Rock Storage Facility Meliadine Lake (East Basin) Meliadine Lake (South Basin)

**Discovery Pit**

Discovery Pit Discovery Waste Rock Storage Facility CH6-DP

1 0 1 KILOMETRES

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

600 0 600 METRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

**PIT LAKES AND DIVERSION CHANNELS DURING POST-CLOSURE**

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | JP | 06 Nov. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | JW | 20 Nov. 2012 | | |
| CHECK | JP | 20 Nov. 2012 | **FIGURE 7.5-34** | |
| REVIEW | DW | 13 Jan. 2013 | | |

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.5-34_Pit_Lakes_Diversion_Channels_Post_Closure.mxd

Although the connection to Meliadine Lake for the upper waterbodies in the A and B watersheds may be temporarily fragmented during a construction phase for the conversion of the lower lakes for waste rock storage facilities and open pits, flows will be re-routed and hydrological connections will be maintained for fish passage. The Arctic grayling-bearing waterbodies that will be temporarily isolated because of the Project may include B45, B46, B53, and B69 (in the B Basin) and A6 (in the A Basin). Of these waterbodies, B69 and A6 are relatively deep (>3 m) and thus both should provide a reliable refuge for over wintering fish if in the event the system was disconnected through the summer and winter. Thus, the likelihood of local extirpation of Arctic grayling in the upper waterbodies of the A and B Basin during construction and operations phases of the mine are determined to be within range of baseline conditions. Effects from changes to Lake A6 were also assessed under direct effects to habitat, as part of a conservative assessment approach (Section 7.5.6.2).

In summary, the proposed Project will physically alter the size and shape of LSA sub-basins which may isolate upper waterbodies and the resident populations they support from downstream waterbodies and populations, such as those in Meliadine Lake. However, effects of fragmentation to the abundance and distribution of fish in the LSA will be primarily limited to Arctic grayling that use habitat in upper waterbodies of the A and B sub-basins. Extirpation of fish residing in the upper reaches of Basin A and B during the life of the operating mine is unlikely assuming that suitable spawning and overwinter habitat remains available, and that a high-magnitude disturbance event such as winterkill or extremely low flows (either from drought or temporary drawdown) will not occur (e.g., Vincenzi et al. 2012).

Channels will be engineered to create habitat for fish movements to overwintering areas as part of the Offsetting Plan (SD 7-4). Specifically, effects will be mitigated by maintaining a hydrologic connection to Meliadine Lake using a diversion channel(s) designed in consultation with DFO and under specifications derived from the scientific literature describing stream passage of Arctic char, lake trout, and Arctic grayling (e.g., Peake 2008). It is possible that the creation of new flow paths through diversions B45-B44, B44-P2, and P2-B2 will increase aquatic connectivity at the local scale and therefore, increase available habitat for species, such as Arctic char that currently use Lake B2 and have the potential to expand to upstream locations (Table 7.5-17; Figure 7.5-34).

**Table 7.5-17: Examples of Proposed Mitigation Channels to be Constructed for Diverting and Connecting Flows, as well as for Maintaining the Connectivity of Stream Connections between Lakes for Arctic Char, Lake Trout, and Arctic Grayling**

| Proposed Channel Location | Length (m) | Possible Function for Fish |
|---|---|---|
| Tiriganiaq Pit #2 to D7 | 163 | Access to reclaimed pit |
| Lake B44 to P2 | 332 | Habitat connectivity |
| Lake B45 to 44 | 73 | Habitat connectivity |
| Lake P2 to B2 | 87 | Habitat connectivity |
| Pump Pit #1 to B59 | 97 | Access to reclaimed pit |
| A6 to F Zone Pit #3 | 418 | Habitat connectivity |
| Wesmeg Pit #4 to A30 | 149 | Access to reclaimed pit |
| Wesmeg Pit #5 to A8 (Contact Pond) | 92 | Access to reclaimed pit |
| Wesmeg Pit #3 to J8 | 120 | Potential access to reclaimed pit |
| Wesmeg Pit #1 to Tiriganiaq Pit #1 | 71 | Access to reclaimed pit |
| Lake H17 (Contact Pond) to Lake H6 | 152 | Access to reclaimed Lake H17 |
| Lake H6 to H1 | 654 | Access to reclaimed Lake H17 |
| Discovery Pit to Lake CH1 | 70 | Access to reclaimed to pit |

m = metre

Post-closure, B45-44, B44-P2, and P2-B2 diversions will provide a permanent connection for fish access to upper waterbodies in the B Basin from Lake B2 and Meliadine Lake; whereas A6-FZP3 diversion will permanently maintain connectivity within the A basin, allowing for fish passage between the F Zone pits and Lake A6 (Table 7.5-17: Figure 7.5-34). Constructed channels within the LSA Peninsula will assist in maintaining habitat connectivity to reclaimed waterbodies in upper regions of the sub-basins at post-closure (Table 7.5-17).

Based on the above, this pathway was determined to have a minor linkage to effects on fish habitat units, the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional use of these valued fish species. The overall effects to the abundance and distribution of lake trout and Arctic grayling in the LSA will be minor and not measurable (i.e., abundance and distribution will remain within baseline values). There will be no effect from fragmentation to local populations of Arctic char because of the Project footprint.

- **Leaching of dissolved metals from waste rock in waste rock storage facilities may cause changes to groundwater and surface water and sediment quality, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Vertical and lateral seepage from the waste rock storage facilities and tailings storage facility may cause changes to groundwater and surface water and sediment quality, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Seepage of pore water though, or underneath, incompletely frozen dikes to adjacent watersheds may change water and sediment quality in local watersheds, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Runoff and seepage from decommissioned waste rock storage facilities and tailings storage facility may change downstream surface water and sediment quality (i.e., metal concentrations), and affect fish health and fish habitat quality**

During the life of the proposed Project, there is the potential for leachate, runoff, and seepage (e.g. metals) from the tailings and waste rock storage facilities, and dikes into surface water. Given the risk posed by contact water to water quality and fish health, several environmental design features have been included to prevent release of untreated contact water into receiving waterbodies, including Meliadine Lake. All waste rock is currently categorized as non-PAG type (SD 6-3 Geochemistry Baseline Report). Separate waste management procedures are proposed for the PAG and non-PAG material should any PAG waste rock be found in continuing studies (SD 2-8 Mine Waste Management Plan). All PAG and high-metal leaching potential waste rock generated by open pit mining will be segregated at source and placed into designated areas within the waste rock storage facilities. They will then be encapsulated with non-PAG and low metal leaching potential waste rock so that the risk of contaminant release both during the operational and post-closure phases of the mine is reduced and/or eliminated to prevent potential contamination of surrounding waterbodies.

Runoff and seepage from the waste rock storage facilities will not be released to the environment during construction or operations. The on-land facilities will have ditch systems to collect seepage and runoff, and all water collected will be monitored and treated, when necessary, prior to release to the environment (SD 2-6 Surface Water Management Plan). Attenuation ponds for the storage of contact water from the Project site have been designed to accommodate the total volume of runoff under the 1-in-100 wet year freshet event, and to limit the potential for seepage. Water collected at Attenuation Pond 1 will be discharged as an effluent

into Meliadine Lake through a diffuser outfall. The diffuser will be configured to promote mixing of the effluent in the lake ambient water, to meet site-specific water quality objectives, CCME guidelines for protection of aquatic life, and federal and territorial guidelines for drinking water. Tailings are expected to have arsenic concentrations that are over MMER and CCME guidelines; therefore, a provision will be made for treating tailings supernatant water to remove arsenic during the life of mine operation prior to discharge to the TSF.

Permafrost conditions are present under the waste rock storage facilities and over time will penetrate into the facility. The permafrost is anticipated to limit seepage from waste rock storage facilities over the long-term. The aggradation of permafrost into the facility is expected to occur under both current climate and future climate change scenarios (FEIS Volume 6, Section 6.3).

Currently, there is an open talik beneath Lake B7 that could be a pathway for constituents to enter the deep groundwater flow system. Thermal modelling indicates that the once B7 is dewatered it would take 20 to 50 years for the talik to freeze beneath B7. During mining, groundwater modelling suggests that groundwater from the TSF would take approximately 8 years to reach the underground mine, where it would be collected and treated if necessary prior to discharge. At closure, when flooding of the open pits and underground has occurred, any residual groundwater originating from the TSF at B7 that has not yet reached the underground will continue in the regional groundwater flow system and groundwater modelling suggests it would take 500 to 1000 years for the residual groundwater under the TSF to reach Meliadine Lake (Section 7.2.2.2).

At closure, the Reclaim Pond will be dewatered and the tailings will be covered with non-metal leaching and non-PAG rock. The rock will be tested prior to placement. The ditches and sumps and water treatment facilities will be maintained until it is confirmed that the runoff from the waste rock and tailings storage facilities meet Project discharge criteria.

The environmental design features and mitigation will reduce the potential risk of contaminants inadvertently entering surface water at downstream locations, affecting habitat (water) quality, fish health and fish habitat. As such, the effects from seepage, runoff, and leaching of dissolved metals entering downstream surface waters are anticipated to be minor for fish habitat units, the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and for the continued harvest of these species for traditional and non-traditional users.

- **Sediment releases from road construction and land disturbance during construction and operations phases can affect surface water and sediment quality, affecting fish habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Sediment releases from road surface and infrastructure disturbance during decommissioning can affect surface water and sediment quality (e.g., increased dust and suspended solids), affecting fish habitat quality for Arctic char, lake trout, and Arctic grayling**

Site contouring and excavation at stream crossings and near waterbodies, in general, have the potential to increase soil erosion which can increase suspended sediment concentrations at downstream locations supporting Arctic char, lake trout, and Arctic grayling. The sedimentation pathways are applicable at construction through closure phases, and apply to infrastructure disturbances, including roads, infrastructure pads, the plant, and camps.

To minimize the potential for sedimentation, construction of the watercourse crossings where possible will occur during winter when the streams are frozen or during late summer when they are not flowing. In-stream works will be minimal and when possible restricted during frozen or non-flowing conditions. All construction activities will be

subject to a sediment control plan, and best management practices will include standard erosion and sediment control measures (e.g., erosion mats, silt curtains). Erosion and sedimentation protection will also be implemented during the crossings decommissioning phase. During closure, watersheds will be reconnected along previous connecting streams where possible. Through the use of best management practices and monitoring during construction, operation, and decommissioning activities, effects to water quality are expected to be negligible; however, a water quality monitoring and reporting plan will be conducted to observe conditions.

The extent of effects to fish, if any, will be through local increases in TSS and sediment deposition. The nature and extent of adverse physiological effects of increased TSS is influenced by both the TSS concentrations and the duration of the exposure. For example, fish can tolerate low TSS concentrations for long periods and high concentrations for short periods without suffering adverse effects (Newcombe and Jensen 1996). The effects of sediment deposition can include infilling of interstitial spaces between substrate particles that provide habitat for rearing of fry or incubation of eggs. Fish would also show a behavioural response, moving away from the any shorelines with a high sediment load. Benthic invertebrates may also be affected by sedimentation, directly through smothering, or indirectly through interference with feeding and reductions in available habitat resulting from infilling of interstitial spaces between substrate particles (Wiederholm 1984). As in the case of fish, effects on benthic invertebrates depend on both concentration and duration of exposure (Newcombe and MacDonald 1991). The effects of sediment deposition may be exhibited in a shift in benthic community structure.

Overall the effects to fish habitat would be negligible, in large part because a sediment control plan and best management practices will be used for all construction activities. Thus, this pathway was determined to have a minor linkage to effects on fish habitat units, the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional users.

- **Surface water drainage through quarries and transport of blasting residuals and metals directly into watercourses can affect surface water quality, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**

Materials for road building will be extracted from pre-determined quarry locations along roads in the LSA that will minimize effects to surface water quality, fish health, and fish habitat. For example, quarries will be located at least 30 m from any waterbody supporting Arctic char, lake trout, and Arctic grayling, and will positioned such that they will not drain directly to nearby waterbodies. Although the intent is to contour the quarries to have positive drainage, there may still be some ponding of water in the quarries which will eventually drain to adjacent receiving environments.

Water within the quarries will be in contact with rock material that may or may not have the potential to leach metals as well as blasting residuals (i.e., compounds high in nitrogen). Based on results from the Meadowbank mine (AEM 2012), elevated concentrations of ammonia and metals are expected in quarries and pools of standing water. Water released from the quarries will have a finite source of nitrogen which would ultimately be exhausted but the potential for a long-term source of metals exists. If all drainage from the quarries is directed away from surface water, there is no potential impact; however, if some drainage from the quarries enters surface water, there is the potential for impact and change in downstream water quality.

To address uncertainty, quarries will be inspected on a regular basis to identify any areas of water ponding, particularly during spring freshet, as instructed under the AEMP (SD 7-3). If there is noticeable flow from a quarry that could enter a waterbody, a water quality sample will be collected. Water quality samples for monitoring will be collected in the quarry and in the watercourse upstream and downstream of the point source

impact. These samples will be analyzed for physical parameters, nutrients (i.e., phosphorus and nitrogen), and trace metals and summarized in monthly reports to the Nunavut Water Board.

The pathway of surface water drainage through quarries and transport of blasting residuals and metals directly into watercourses was determined to be minor. Although there may be measurable effects to water quality and fish habitat quality, effects will be negligible in magnitude for fish habitat units and the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional users.

- **Process and potable water use may result in reduced water levels in Meliadine Lake, affecting available fish habitat for Arctic char, lake trout, and Arctic grayling**

The source of potable water for the camp will be Meliadine Lake, which supports populations of Arctic char, lake trout, and Arctic grayling. The proposed Project will withdraw freshwater from Meliadine Lake for potable water, underground operations and plant operations. Freshwater requirements are estimated at a maximum of approximately 1 130 000 $m^3$/y during construction and operations. Supply volumes are small in comparison to median monthly and annual outflow volumes at Meliadine Lake (Section 7.3 Hydrology). Water level changes due to fresh water requirements are expected to be negligible.

Environmental design features that will be implemented to reduce the amount of water required for plant operations and domestic uses include the capture and reuse of site water. Water collected through use of in-pit sumps may be used for dust control, sent to the reclaim pond, and/or managed as contact water (collected, contained, monitored, and treated, if required, to meet water license discharge standards before release). Fresh water make-up quantities will be limited to the extent practicable.

Thus, given the negligible changes in water levels, the effects to fish habitat units and available habitat (e.g., benthic invertebrates) for Arctic char, lake trout, and Arctic grayling are anticipated to be minor in magnitude and only for the duration of the closure phase. This hydrological pathway to fish habitat units, the abundance and distribution of fish and the continued opportunity for traditional and non-traditional users was identified as being a minor pathway.

- **Impingement and entrainment of fish in intake pumps during dewatering may cause injury and mortality to fish, affecting abundance and distributions**

The implementation of fish screens on the intake is anticipated to reduce fish mortality resulting from impingement or entrainment. The intake for the pumps used to provide water for plant processes will be appropriately screened following DFO guidelines to prevent fish entrainment or impingement (DFO 1995). The appropriate screen mesh size will be determined in consultation with DFO for the planned pumping rates to prevent fish from entering the pump during water withdrawal. This includes the determination of a maximum approach velocity for water at the screen surface to prevent fish from being entrained or impinged on the screen. The intake screen mesh size and dimensions will be influenced by the species found within Meliadine Lake, as well as the swimming abilities of these species and the likely age-classes of fish present at the water withdrawal location. With proper design, installation, and maintenance, impingement and entrainment of fish in Meliadine Lake water intake was determined to have minor linkage to injury and mortality to fish.

- **Changes in flow paths, and diversion of non-contact water to newly modified watersheds, may affect turbidity and suspended sediment concentrations at downstream locations, affecting fish habitat quality for Arctic char, lake trout, and Arctic grayling**

- **The pumping and discharge of water to receiving waterbodies during dewatering of small lakes may cause erosion of shorelines and lake bottom sediment, affecting water and sediment quality, fish habitat quality**

The proposed Project will result in residual effects to the hydrology and water quality of locations downstream of the footprint. During the dewatering of small lakes as part of construction and operation phases, the active diversion of water by pumping and discharging water to receiving waterbodies may cause erosion of shorelines and lake bottom sediment, affecting fish habitat quality. The magnitude and direction of these effects depend on the type and timing of upstream Project activities and thus vary across sub-basins and over time. Erosion of shorelines and lake bottom sediment combined with sedimentation of downstream locations are most likely to occur in sub-basins where water quantities are projected to increase.

Water volumes, and thus discharge rates, are expected to increase in the Pre-production, mining, and post-closure phases in select watersheds (Section 7.3.3). In watershed A at Lake A1, water volumes are expected to increase in Pre-production. From mining through post-closure, water volumes are expected to be normal to less than normal. In watershed D, at lakes D7 through D1, water levels are expected to increase during all phase (i.e., Pre-production through post-closure). In watershed E, at lakes E3 through E1, water levels are expected to increase during mining and post-closure. In watershed J, water levels are expected to increase in Lake J1 in mining phase 1 and 2. In watershed B and P, water levels are expected to increase in lakes B45 to P2 from Pre-production through post-closure.

Diversion of relatively large volumes of water into a single discharge flow path could increase erosion causing an increase of particulate material transported to Meliadine Lake. To minimize impacts to habitat quality, best management practices will be used. In some cases, dewatering flows will be pumped through pipelines to the lake environment, and not directly to outlets, to attenuate flow changes. In other cases water will be diverted with constructed channels designed to prevent erosion and to maintain stability in permafrost. Where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms. However, discharge to receiving lakes will only occur while water quality discharge criteria are met. In other words, water will be managed to prevent the release of water to the natural receiving environment if TSS concentrations exceed specific water quality criteria.

It is expected that raised lakes and streams could be subject to erosion as new shorelines are established, particularly for the flow path from Lake B45 to Lake P2 outlet where increases in annual water volumes will be highest (Section 7.3.3). Here, shoreline areas susceptible to extensive erosion will be addressed by appropriate erosion protection measures to reduce erosion and associated re-suspension of fine sediment. Natural armouring of morainal soils, where present, is expected to limit erosion in these areas and persistent TSS is expected to be limited as coarse materials settle out on the lakebed to where they are mobilized. Low slopes in new shoreline areas with organic (peat) soils are expected to minimize erosion and generation of TSS. Potential changes to shoreline structure and lake sediment in Lake B34 and Lake P2 are anticipated to have no effect to habitat quality in these receiving waterbodies because they currently do not support Arctic char, lake trout and Arctic grayling (Section 7.5.4; Appendix 7.5-D).

Further, the effects of sediment deposition can include infilling of interstitial spaces between substrate particles that provide habitat for rearing of fry or incubation of eggs, as well as potential shifts in benthic communities (Section 7.5.5.2). The nature and extent of adverse physiological effects of increased TSS is influenced by both the TSS concentrations and the duration of the exposure. For example, fish can tolerate low TSS concentrations

for long periods and high concentrations for short periods with suffering adverse effects (Newcombe and Jensen 1996).

In summary, it is expected that the diversion of water to receiving waterbodies may result in the erosion of shorelines and lake bottom sediment and deposition of sediment at downstream locations. However, the extent of effects to fish, if any, will be through localized increases in TSS and sediment deposition from spring freshets or high rain events during the early years of construction and operation. Fish would also show a behavioural response, moving away from the any shorelines with a high sediment load. Thus, effects to the abundance and distribution of Arctic char, lake trout, and Arctic grayling in the LSA (and the continued opportunity for traditional and non-traditional users of fish) will be negligible in magnitude, in part because potential changes in habitat quality will be limited by use of best management practices during construction and operation phases. The practices will not only reduce erosion and sedimentation potential, but also potential increases in the bioavailability of contaminants of potential concern. Erosion and sediment monitoring under an adaptive management framework will be incorporated into planning for all receiving sub-basins.

- **The waste rock storage facilities and tailings storage facility will physically alter the size and shape of watersheds, and alter existing flow paths within the LSA during Project operations, which may decrease downstream flows, and water levels, affecting fish habitat quantity for Arctic char, lake trout, and Arctic grayling (in Basins C, E, I, J, and CH)**
- **The active diversion of water from waterbodies to other locations either within or to adjacent sub-basins during operation phases will increase flows to receiving downstream waterbodies and watercourses, potentially affecting fish habitat quantity for Arctic char, lake trout, and Arctic grayling (in Basins D and P)**
- **The permanent footprint may change the long-term hydrology of Basins C, D, E, H, I, J, CH, and P, affecting fish habitat quantity for Arctic char, lake trout, and Arctic grayling**

The proposed Project will result in residual effects to the hydrology of downstream locations in the LSA including watersheds C, D, E, I, J, CH, and P (Section 7.3.4). The effects are expected to occur during the Pre-production phase, mining phase 1 to mining phase 5, and closure, with effects that will continue after closure for the long-term (Section 7.3.4; Table 7.5-18). Effects will be a result of a combination of Project-related activities, including the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies. The magnitude and direction of these effects depend on the type and timing of upstream Project activities and thus vary across sub-basins and over time. However, at post-closure, the majority of effects to valued fish species will be non-measurable, and those that augment flow and increase water flow are likely to be positive overall for valued fish species and fish habitat.

**Table 7.5-18: Summary of Median Annual Water Yields for Lakes C6, D1, E1, I2, J1, P2, and CH1 for Baseline with Relative Changes (%) Reported for Project Snapshots (mm)**

| Snapshot | Lake C6 | Lake D1 | Lake E1 | Lake I1 | Lake J1 | Lake P2[a] | Lake CH1 |
|---|---|---|---|---|---|---|---|
| Baseline (mm) | 184 | 160 | 159 | 173 | 174 | 176 | 159 |
| Pre-production (Year -3) | 0.0% | 93.8% | 0.0% | 0.0% | 0.0% | 2338% | 0.0% |
| Pre-production (Years -2 to -1) | 0.0% | 38.8% | 0.0% | 0.0% | 0.0% | 2752% | 0.0% |
| Mining Phase 1 | 0.0% | 34.4% | 0.0% | 0.0% | 16.1% | 2752% | 0.0% |
| Mining Phase 2 | -12.0% | 0.0% | 4.4% | -3.5% | 208.0% | 2673% | 0.0% |
| Mining Phase 3 | -12.0% | 0.0% | -13.2% | -3.5% | -62.1% | 2605% | -17.5% |
| Mining Phase 4 | -12.0% | 0.0% | -13.2% | -3.5% | -62.1% | 2605% | -17.5% |
| Mining Phase 5 | -12.0% | 0.0% | -13.2% | -3.5% | -62.1% | 2605% | -17.5% |
| Closure | -12.0% | 0.0% | -13.2% | -3.5% | -62.1% | 2605% | -17.5% |
| Post-Closure | 0.0% | 95.6% | 2.5% | -3.5% | 0.0% | 2821% | -2.5% |

Note: table from Volume 7, Section 7.3.4 and adapted for the assessment of fish habitat

[a] water yields are based on the baseline area of the P2 watershed

## C Basin (Lake C10 to Lake 6 outlet)

The C-Basin is a relatively small basin covering a total area of 3.3 $km^2$. It is predicted that water yields for waterbodies in the C Basin and downstream will be slightly reduced from the diversion of runoff from the A45 waste rock storage facility during mining phase 2 to Closure (Table 7.5-18; Section 7.3.3). During construction and operations the reduction to water yields will be no greater than 12% for Lake C6 (Table 7.5-18), and the effects will be smaller in magnitude during June when Arctic grayling are spawning versus late summer (Section 7.3.3). Although Lake C6 is characterized by the highest annual peak daily discharge of all waterbodies in the C Basin (0.59 $m^3$/sec), it is anticipated that other locations in the C Basin downstream of the waste rock storage facility will show similar responses to the proposed Project. It is also anticipated that hydrological changes to waterbody and stream habitats will be within the range of, or just slightly exceed baseline values for the C Basin. Effects to waterbodies, including Lake C6, will be of medium-term duration given that water yields will be similar to baseline at post-closure.

Most waterbodies in the C Basin are relatively shallow (i.e., < 2m) and thus, do not support overwintering habitat for valued fish species in the LSA, with the exception of Lake C10 (Table 7.5-8). While Lake C10 has a maximum depth of about 2.9 m and may provide overwintering habitat during some years, baseline sampling did not record a valued fish species in waterbodies and streams in the C Basin (Section 7.5; Appendix 7.5-D). Further, all waterbodies are relatively small in size (<16 ha) and therefore are unlikely to support rearing or adult Arctic grayling. For Arctic grayling, baseline data show that occupancy rate of LSA waterbodies is strongly influenced by waterbody size and that rates are high only in waterbodies greater than 25 ha (derived from data presented in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D). Also, the C Basin waterbodies were positioned high enough above Meliadine Lake to preclude occupancy by Arctic char based on baseline observations in the LSA. Specifically, the elevations of the 12 Arctic char waterbodies in the LSA are all less than 3.2 m above Meliadine Lake; whereas the lowest elevation waterbody in the C Basin (i.e., Lake C1) is positioned at 4.8 m above Meliadine Lake (derived from data presented in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D).

Thus, given the lack of suitable habitat for Arctic char, lake trout, and Arctic grayling in the C Basin, combined with the anticipated changes in waterbody and stream hydrology, it is predicted that there will be no detectable

change from the proposed Project to fish habitat units, the abundance and distribution of valued fish species, and the continued opportunity for traditional and non-traditional users. This conclusion applies to all phases of the proposed Project, including post-closure.

### D Basin: Lake D7 to D1 Outlet

The D Basin is a moderately-sized basin in the LSA covering a total area of 7.7 $km^2$ where water yields will be augmented by the diversion of Lake B5 to Lake D7 during the Pre-production phase and mining phase 1 (by 34.4% to 93.8% from baseline) (Table 7.5-18; Section 7.3.3). Dewatering in the upper B watershed will further augment water yields in Lake D1 during the Pre-production phase (Year -3). Permanent infrastructure and the permanent diversion of the upper B watershed to the upper D watershed will result in annual water yields increasing in values from baseline to post-closure (e.g., water yield will almost double for Lake D1).

A number of waterbodies in the D Basin that will be downstream of receiving waters from the adjacent B Basin have potential to support overwintering habitat during some years: the waterbodies have maximum water depths that are in the range of 2.5 to 3.0 m (e.g., D1, D3, D5, and D7) (Section 7.5; Table 7.5-8). Their potential to provide overwintering habitat will improve with potential increases in annual water yields associated with the Project. In other words, the carry capacity of the system to provide habitat will increase, with assumed benefits for local populations of valued fish species. Based on previously completed baseline studies, Arctic char occur in Lake D1, D2, and D3; lake trout occur in Lake D1; and Arctic grayling occur throughout the D Basin from Lake D1 to Lake D7 (Section 7.5.4). The combined area of Lake D1 thru D7 is currently measured at about 140 ha, which should noticeably increase during Pre-production and mining phase 1, as well as at post-closure. This is expected to increase habitat area available for plankton and benthic invertebrates. However, actual changes to water levels should be less than predicted because modelling did not consider mitigation measures that will be used for construction through post-closure (Section 7.3.4).

Thus, given existing available habitat for Arctic char, lake trout, and Arctic grayling in the D Basin, combined with the anticipated increases to hydrological characteristics, it is predicted that there will be a measurable benefit to fish habitat units and ultimately, the abundance and distribution of valued fish species, and the continued opportunities for traditional and non-traditional users of fish. This conclusion applies to Pre-production (Year -3), Pre-production (Years -2 to -1), mining phase 1, and to post-closure. No changes are anticipated for mining phases 1 thru 5.

### E Basin: Lake E3 to E1 Outlet

The E-Basin is a relatively small basin covering a total area of 3.6 $km^2$. It is predicted that water yields for waterbodies in the E Basin (e.g., Lake E1, E2, and E3) and downstream will slightly increase during mining phase 2 from the dewatering of Lake E4, and then decrease from mining phase 3 to closure due to a reduced drainage area (Section 7.3.3). At post-closure, permanent infrastructure will increase the lake to land ratio, resulting in a slight increase in annual water yields from baseline. During mining phase 3 thru closure, the reduction to water yields will be no greater than 13.2% for Lake E1 (Table 7.5-18). Although the reduction in flow in the E1 outlet during mining phase 3 to closure may result in water levels being reduced by up to 20% during the summer months, effects to flows and water levels will be smaller in magnitude during June (-7.5% in water level) when Arctic grayling are spawning (Section 7.3.3). It is assumed that upstream locations in the E Basin will show similar responses to the Project as that of Lake E1.

Lake E3, immediately downstream of the TSF, is the largest waterbody in the E Basin at 56.8 ha. Lake E1 is the smallest (at 0.74 ha) and the lowermost waterbody in the chain of waterbodies below the TSF (Table 7.5-6).

Lake E3 is characterized by a maximum depth of about 4.7 m, and supports overwintering habitat for fish in the LSA (Table 7.5-8). Based on baseline sampling, Lake E1, E2, and E3 have been determined to support lake trout and Arctic grayling. Further, the E Basin system, specifically Lake E1, could potentially support Arctic char given that the lake is positioned just 2.7 m above Meliadine Lake, and that the elevations of the 12 Arctic char lakes in the LSA are all less than 3.2 m above Meliadine Lake (derived from data presented in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D).

Overall it is anticipated that hydrological changes to waterbody and stream habitats will be within the range of baseline for the E Basin. Further, negative effects to waterbodies, including Lake E1, will be over a short duration because water yields will be approximately identical to baseline at post-closure. Given existing available habitat for lake trout and Arctic grayling (and potentially for Arctic char) in the E Basin, combined with the anticipated changes in waterbody and stream hydrology, it is predicted that the proposed Project will result in a detectable change in available fish habitat and benthic invertebrate communities for valued fish species in the sub-basin. However, the predicted change to the distribution and abundance of fish will be negligible, with positive effects during mining phase 2 and post-closure, and negative effects between these phases (i.e., during mining phase 3 thru to closure). It is anticipated that changes to water yields in the E Basin will not noticeably affect fish habitat units, the abundance and distribution of valued fish species, and the continued opportunity for traditional and non-traditional users.

Minor effects during operations, if any, would be followed by a quick rebound to baseline during subsequent phases given the species adaptive life history strategies such as phenotypic plasticity (e.g., behavioural changes) or a tendency towards an '*r*' strategy (Scott and Crossman 1973; Richardson et al. 2001; Evans et al. 2002; Reed et al. 2010). Furthermore, individuals in populations exposed to highly variable flows can display a range of adaptations that allow them to maintain positive fitness over the long term (e.g., Morrongiello et al. 2011). Without these adaptations, local populations of valued fish species would have been extirpated long ago. At the population level, the valued ecosystem components are not only resilient because individuals are likely well adapted to variable environments, but also because demographic rescue from neighbouring populations or subpopulations is highly likely to occur in the event of an unforeseen disturbance.

### I Basin: Lake I1 and Outlet

The I Basin is the smallest basin of the LSA sub-basins, with an area of about 0.3 $km^2$ at the outlet of Lake I1. Water yields of Lake I1 and the outlet to Meliadine Lake are predicted to decrease slightly (by no more than 3.5%) due to the permanent infrastructure installed during mining phase 2 and through post-closure (Table 7.5-18). The permanent infrastructure will result in a net decrease in sub-watershed area, including no change in lake area and a net decrease in land area in the I1 sub-watershed due to Wesmeg #3 Pit.

Lake I1 is 7.5 ha in size and is characterized by a mean maximum depth of 1.8 m. Baseline studies show that the waterbody provides no habitat for valued fish species. For example, the shallow depths suggest that the waterbody has little to no potential to support overwintering habitat for valued fish species (Section 7.5.4). The small size of the waterbody suggests it is unlikely to support rearing or adult Arctic grayling. For Arctic grayling, baseline data show that occupancy rate of LSA waterbodies is strongly influenced by waterbody size and that rates are high only in waterbodies greater than 25 ha (derived from data presented in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D). The waterbody is also positioned at a relatively high elevation compared to Meliadine Lake (12 m higher), providing poor access for foraging movements of Arctic char based on the observation that the elevations (m) of the 12 Arctic char waterbodies in the LSA are all less than 3.2 m above Meliadine Lake.

Given the lack of suitable habitat for Arctic char, lake trout, and Arctic grayling in the I Basin, combined with the anticipated changes in lake and stream hydrology, it is predicted that there will be no detectable effect from the proposed Project on fish habitat units, the abundance and distribution of valued fish species, and the continued opportunity for traditional and non-traditional users of fish. This conclusion applies to all phases of the Project, including post-closure.

### J Basin: Lake J1 and Outlet

The J Basin is a small basin, with an area of about 1.4 $km^2$ at the outlet of Lake J1 (Section 7.3.3). It is predicted that water yields of Lake J1 and outlet to Meliadine Lake will increase due to the dewatering of upstream waterbodies during mining phase 1 and mining phase 2 (by 16.1 to 208%), and subsequently decrease following completion of dewatering of the upstream waterbodies until closure (-62%) (Table 7.5-18). Water yields at post-closure will be similar to baseline conditions.

Permanent changes to waterbody and land areas of the J Basin sub-watersheds in the LSA at post-closure due to permanent Project infrastructure will include the following:

- a net increase in sub-watershed area, including a net increase in waterbody and land areas in the J8 sub-watershed from the Tiriganiaq Pit; Wesmeg #3; and infilled Lake J7 (partial), Lake J6, Lake J5, Lake J4, Lake J3, and Lake J2 draining to Lake J8; and
- a net decrease in sub-watershed area, including no changes in waterbody area and a net decrease in land area due to the new watershed configuration resulting from infilled upstream lake area draining to Lake J8, and Wesmeg #3 and Tiriganiaq Pit.

Lake J1 is a small-to-moderately sized waterbody (17.2 ha) characterized by a maximum depth of about 2.1 m, and therefore has the potential to support overwintering habitat for valued fish species during some years (Section 7.5.4; Appendix 7.5-B). However, the small size of the waterbody suggests it is unlikely to support rearing or adult Arctic grayling. For Arctic grayling, baseline data show that the occupancy rate of LSA waterbodies is strongly influenced by waterbody size and that rates are high only in waterbodies greater than 25 ha (derived from data presented in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D). Lake J1 is also positioned at a relatively high elevation compared to Meliadine Lake (5.1 m higher), and so the outlet likely provides poor access for foraging movements of Arctic char. This is based on the observation that the elevations of the 12 Arctic char lakes in the LSA are less than 3.2 m above Meliadine Lake (derived from data in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D). Indeed, baseline studies show that Lake J1 does not support habitat for Arctic char, nor does it appear to support habitat for lake trout and Arctic grayling.

Given the lack of available habitat for Arctic char, lake trout, and Arctic grayling in the J Basin, combined with the anticipated changes in waterbody and stream hydrology, it is predicted that there will be no detectable effect from the proposed Project on the abundance and distribution of valued fish species in this basin. This conclusion applies to Pre-production phases, mining phase 1, mining phase 2, as well as post-closure. Although there may be measurable changes for hydrological variables for Lake J1 and outlet during Mining Phase 3 through closure, these changes are expected to be of medium-term duration (baseline conditions will return at end of closure), occur mainly during peak flows, and likely have no implications for fish habitat units and the distribution and abundance of the valued fish species because of the low habitat potential of the J1 system.

### Lake B45 to Lake P2 Outlet

Water yields of Lake B44, Lake P2, and downstream to Meliadine Lake will be permanently increased from baseline due to the permanent diversion of Lake B44 and Lake B45 to the P watershed during the Pre-production phase (Table 7.5-18). The increase in annual water yields from Pre-production through post-closure will vary based on upstream Project activities, including diversions, and the development of infrastructure.

The P Basin is one of the smallest sub-basins of the LSA Peninsula, with an area of about 0.5 $km^2$ at the point where water will be received from the adjacent B Basin (Section 7.3.3). Lake P2, the only waterbody in the P Basin, is 10.4 ha size with a maximum water depth of about 1.5 m and currently does not support valued fish species. Lake B45 to the east of the P Basin is a much larger waterbody (52.4 ha combined for Lake B44 and B45) characterized by deeper water (2.3 m maximum depths in Lake B45) that may support overwintering habitat during some years (Section 7.5.4; Appendix 7.5-B). Arctic grayling have been recorded in B45.

The constructed connection of Lake B44 to Lake P2 and then to Lake B2 could increase the potential of the system to provide overwintering habitat and foraging habitat for Arctic char, lake trout, and Arctic grayling. Lake B2 currently supports all 3 valued species of fish (Section 7.5.4; Appendix 7.5-D) and with a new upstream connection combined with anticipated increases in water yields (and related increases in water levels) at those upstream locations, the potential to provide overwintering habitat and foraging habitat is increased. In other words, the carrying capacity of the system to provide habitat will increase, with assumed benefits for local populations of valued fish species. The increase in water levels is expected to increase habitat area available for plankton and benthic invertebrates. The benefit of the constructed channel should outweigh the loss of stream habitat associated with the existing outlet of Lake P2.

Given existing available habitat for Arctic char, lake trout, and Arctic grayling in Lake B2, as well as existing available habitat for Arctic grayling in B45, combined with the anticipated increases to flows and water levels for Lake P2, Lake B44/45, and outflows, it is predicted that there will be a measurable benefit to fish habitat quantity and ultimately fish habitat units, the abundance and distribution of valued fish species, and the continued opportunity for traditional and non-traditional users. This conclusion applies to Pre-production (Year -3) thru to post-closure for both Lake P2 and Lake B44/45.

### CH Basin: Lake CH6 to Lake CH1

The CH Basin is the second largest basin in the LSA (after the B Basin), at an area of about 15.2 $km^2$. The footprints Discovery pit and the Discovery waste rock storage facility are permanent and will slightly reduce the drainage area during mining phase 3 to post-closure, reducing basin annual water yields (Section 7.3.3). For Lake CH1, annual water yields will be reduced by 17.5% from mining phase 3 thru to post-closure. At post-closure, water yields will be reduced by 2.5% compared to baseline values. It is assumed that waterbodies above of Lake CH1 in the sub-basin, specifically Lake CH5, and CH6, will show similar responses to the Project (Section 7.3.3).

Lake CH6, immediately downstream of the Discovery waste rock storage facility, is the largest waterbody in the CH Basin at about 135 ha. Downstream is Lake CH5 at 69.7 ha, followed by Lake CH1 at 124.9ha. All lakes are characterized by maximum water depths in the range of 9 to 11 m, and therefore, the lakes provide overwintering habitat for valued fish species (Section 7.5.4; Table 7.5-8). Based on baseline sampling, Lake CH1, CH5, and CH6 have been determined to support lake trout and Arctic grayling (Section 7.5.4; Appendix 7.5-D). It is unlikely that the lakes support Arctic char, in part, because Lake CH1 lacks a discernible outflow stream connection to Meliadine Lake.

Overall it is anticipated that hydrological changes to lake habitats will be within the range of baseline for the CH Basin. Further, negative effects to waterbodies, including Lake CH1, will be over a short duration given that water yields will be approximately identical to baseline at post-closure. Given existing available habitat for lake trout and Arctic grayling in the CH Basin, combined with the anticipated changes in lake hydrology, it is predicted that the Project will result in a detectable change for fish habitat for valued fish species in the sub-basin. However, the predicted change to the distribution and abundance of fish will be negligible, with most effects occurring during mining phase 3 thru to closure. It is anticipated that changes to water yields in the CH Basin will not noticeably affect the abundance and distribution of valued fish species in that basin.

Minor effects during operations, if any, would be followed by a quick rebound to baseline during subsequent phases given the species adaptive life history strategies such as phenotypic plasticity (e.g., behavioural changes) or a tendency towards an r strategy (Scott and Crossman 1973; Richardson et al. 2001; Evans et al. 2002; Reed et al. 2010). Furthermore, individuals in populations exposed to highly variable flows can display a range of adaptations that allow them to maintain positive fitness over the long term (e.g., Morrongiello et al. 2011). Without these adaptations, local populations of valued fish species would have been extirpated long ago. At the population level, the valued ecosystem components are not only resilient because individuals are likely well adapted to variable environments, but also because demographic rescue from neighbouring populations or subpopulations is highly likely to occur in the event of an unforeseen disturbance.

- **Cross-drainage structures for mine access and haul roads, the AWAR and Rankin Inlet bypass Road may alter stream hydraulics and geomorphology, affecting fish passage for Arctic char, lake trout, and Arctic grayling**

The installation of cross-drainage structures to prevent roads from impeding water flow can affect fish passage. Access roads will be as narrow as possible, while maintaining safe construction and operation practices, and most crossings will be over ephemeral streams of low-quality habitat for Arctic grayling, lake trout, and Arctic char. Major streams (Char and Meliadine rivers) will be crossed with clear-span bridges; therefore, Arctic char migrations in the Meliadine River (and seasonal movements by other documented fish species in the Meliadine and Char rivers) will not be affected. Construction at the Char River involves the installation of a new clear-span bridge, immediately adjacent to the existing bridge, with a wider base clear-span bridge.

None of the ephemeral streams crossed along the AWAR are inhabited by Arctic char; however, Arctic grayling, a species with well-documented migratory tendencies, were recorded at 2 crossings (M11.5 and M23.7). The culvert installations for the 8 ephemeral streams will be designed and constructed for unobstructed fish passage. High velocities and other potential barriers to fish will be mitigated using hydraulic design principles to allow for fish passage, and active management of ice build-up in spring. The installation will include multiple/offset stacked circular pipe culverts of appropriate dimensions to allow for both fish passage during low-flow conditions during late summer, as well as fish passage for 1:25 year return flood condition during the spring freshet such that culvert flow velocities do not exceed 0.8 metres per second during that time (e.g., Peake 2008). These specifications exceed that recommended in the literature, which considers a 3-day delay, 1:10 year return flood condition. Further, all cross-drainage structures will be configured and sized in such a way that they provide a design conveyance for 1:25 year events without overtopping the roadway. Overflow would otherwise result in increased stream velocities and geomorphological conditions that could present a barrier to fish passage.

Proper construction practices are expected to minimize negative impacts on fish habitat. In addition to specific mitigation measures outlined for the proposed Project to protect aquatic resources, any conditions and/or

mitigations outlined by regulatory agencies under the following *Acts* or licence requirements should additionally be adhered to:

- *Federal Fisheries Act;*
- *Nunavut Land Claims Agreement Act;*
- *Navigable Waters Protection Act;* and
- *Class A Water Licence and Land Use Permit.*

However, there is the potential for minor effects if connectivity between an upstream and downstream portion of a watercourse is not maintained. Inspection of the culverts, as part of weekly inspections along the road during the spring-summer time, will be undertaken to verify connectivity is maintained (SD 2-9 Roads Management Plan). If not, mitigation measures will be implemented to re-position the culvert correctly. Thus, minor effects to the local population, if any, would be followed by a quick rebound to baseline given the adaptive life history strategies of the species in question. As such, the road crossing pathway was determined to have a minor linkage to effects to fish movements and fish habitat. Effects to fish habitat for Arctic char, lake trout, and Arctic grayling are anticipated to be of negligible magnitude.

- **Blasting near fish-bearing waterbodies (i.e., lakes, and ponds) and watercourse (i.e., streams) may result in pressure changes and vibrations in the water, which can affect the survival and reproduction of Arctic char, lake trout, and Arctic grayling**
- **Blasting near fish habitat may result in the physical and/or chemical alteration of the fish habitat**

Detonation of explosives in or near water produces post-detonation compressive shock waves that can cause internal damage to the swim bladder and other soft organs of fish (Wright 1982; Wright and Hopky 1998; Faulkner et al. 2008). The severity of effects is related to the type of explosive; weight and pattern of the charge(s); method of detonation; distance from the fish to the point of detonation; water depth; and the species, size, and life stage of fish (Wright 1982). Additionally, vibrations (also termed Peak Particle Velocities [PPV]) from the detonation can disrupt the development and cause mortality of incubating fish eggs close to a blast zone (Wright 1982; Faulkner et al. 2006 and 2008). Changes in fish behaviour have also been observed in relation to exposure to shock waves (Wright and Hopky 1998).

Detonation of explosives in or near water can also result in physical and/or chemical alteration of fish habitat (Wright and Hopky 1998). Sedimentation resulting from the explosives may cover fish habitat including spawning areas. By-products, for example ammonia, from the detonation may be toxic to fish.

Fisheries and Oceans Canada Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) outline procedures to avoid harming fish. The guidelines recommend that:

- the proponent consult DFO and other relevant agencies early in the planning process to identify alternatives;
- potentially less destructive methods be used wherever possible and the use of confined or unconfined explosives in or near fisheries waters is discouraged;
- ammonium nitrate-fuel oil mixtures are not to be used in or near water due to the production of toxic by-products (e.g., ammonia);

- charge holes are back-filled with angular gravel to the level of the substrate/water interface;
- all shock-tubes and detonation wires are recovered and removed after each blast;
- no explosive is to be detonated in or near fish habitat that produces a pressure change greater than 100 kiloPascals (kPa) in the swimbladder of a fish; and
- no explosive is to be detonated that produces a PPV greater than 13 mm/s in a spawning bed during egg incubation.

Using the guidelines above, Wright and Hopky (1998) provide equations to calculate the setback distances from an explosive detonation point to fish habitat to protect fish habitat, fish, and fish eggs. For pressure changes, the guideline sets out to achieve a pressure change of less than 100 kPa for various substrate types to minimize harmful effects on fish habitat, fish, and fish eggs (Table 7.5-19). For example, to achieve the goal of 100 kPa, the most conservative setback distance to fish habitat in the guideline is 50.3 m using a 100 kg weight of explosive charge in rock substrate. For PPV, the guideline sets out to achieve a PPV of less than 13 mm/s for all types of substrate (Wright and Hopky 1998, Table 7.5-14). The guideline indicates that the most conservative setback distance from spawning habitat is 150.9 m (using a 100 kg weight of explosive charge).

**Table 7.5-19: Setback distance (m) from the centre of detonation of a confined explosive to fish habitat to achieve the pressure change and PPV guidelines**

| Substrate Type | Weight of Explosive Charge (kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.5 | 1 | 2 | 5 | 10 | 25 | 50 | 100 |
| **Pressure Change Guideline of 100 kPa** | | | | | | | | |
| Rock | 3.6 | 5.0 | 7.1 | 11.0 | 15.9 | 25.0 | 35.6 | 50.3 |
| Frozen Soil | 3.3 | 4.7 | 6.5 | 10.4 | 14.7 | 23.2 | 32.9 | 46.5 |
| Ice | 3.0 | 4.2 | 5.9 | 9.3 | 3.2 | 20.9 | 29.5 | 41.8 |
| Saturated Soil | 3.0 | 4.2 | 5.9 | 9.3 | 13.2 | 20.9 | 29.5 | 41.8 |
| Unsaturated Soil | 2.0 | 2.9 | 4.1 | 6.5 | 9.2 | 14.5 | 20.5 | 29.0 |
| **PPV Guideline of 13 mm/s** | | | | | | | | |
| All substrates | 10.7 | 15.1 | - | 33.7 | 47.8 | 75.5 | 106.7 | 150.9 |

Note: adapted from Wright and Hopky (1998)
PPV = peak particle velocities; kg = kilogram; kPa = kilopascal; mm/s = millimetre per second

However, Fisheries and Oceans Canada in northern Canada have adopted a more protective approach for the use of explosives around fish-bearing waterbodies, recommending that pressure changes be kept less than 50 kPa to prevent injury to juvenile fish (Godard et al. 2008). This threshold was used for similar projects in the region (e.g., Meadowbank, Jericho, and Doris North; NIRB 2012b).

The potential negative effects of blasting can be successfully mitigated through proper blast planning and monitoring, and by following the blasting guideline to achieve a PPV of less than 13 mm/s for all types of substrates. This approach is expected to achieve a suitable setback distance (e.g., 150 m) for an instantaneous pressure change of less than 50 kPa. Although Arctic char, lake trout, and Arctic grayling will continue to reside in nearby lakes, ponds, and streams during operations, these fish will not be affected by blasting because these waterbodies will likely be located at a considerable distance (e.g., greater than 150 m) from the detonation

points. However, in the event that Arctic char, lake trout, or Arctic grayling are within close proximity to the detonation points, a site-specific blasting would be developed with DFO to verify that the effects to valued fish species are negligible in magnitude (SD 2-14 Explosives Management Plan). Consequently, this pathway was determined to have a minor linkage to fish habitat quality, survival and reproduction. There will be no residual effect to fish habitat units, the abundance and distribution for Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional users.

- **Water quality concentrations in the attenuation pond (AP-01 or H17) at post-closure may be elevated above baseline concentrations (e.g., metals, nutrients), and if reconnected to pre-construction flow paths, may affect downstream water and sediment quality, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**

Lake H17 (in the H watershed) will be converted to an attenuation pond (AP-01) during construction and operation of the proposed Project. Lake H1 will be drained during Pre-production and returned to a waterbody at post-closure. During closure, water quality in AP-01 will be treated, and sediments will be analyzed. If sediment concentrations are higher than baseline or guidelines, sediments will be managed according to best practices. Further details on the closure and reclamation of AP-01 are provided in SD 2-6 Surface Water Management Plan and SD 2-17 Mine Closure and Reclamation Plan. During post-closure, Lake H17 will drain into Meliadine Lake via Lake H1.

To better understand impacts related to AP01, water quality predictions were made for H17 and H1 for baseline and post-closure phases (Section 7.4.6.2). Predicted post-closure concentrations of TSS, chloride, cadmium, copper, manganese, mercury, and silver in Lake H17 were above guidelines but within 10% of baseline concentrations (Section 7.4.6, Table 7.4-26). Predicted post-closure concentrations of chloride, cadmium, copper, lead, manganese, mercury, and silver in Lake H1 were above guidelines but within 10% of baseline concentrations. As all predicted concentrations in both lakes H17 and H1 were within 10% of baseline concentrations, no contaminants of potential concern are identified for lakes in the H watershed (Section 7.4.6, Table 7.4-30).

Consequently, this pathway was determined to have a minor linkage to fish habitat quality, survival and reproduction for Arctic char, lake trout, and Arctic grayling. Reconnecting the attenuation pond at post-closure will not affect fish habitat units, the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional users.

- **Dewatering of Project footprint lakes may cause mortality and spoiling of fish, affecting the continued opportunity for traditional and non-traditional users**

Proposed development activities will result in unavoidable loss of habitat and serious harm to fish by dewatering, including lake drawdowns. Where required, a fish-out program will be designed and implemented as per Fisheries Act s.35(2). The general fish-out protocol for lakes and impoundments in the Northwest Territories and Nunavut will be followed (Tyson et al. 2011). The guiding principle of the fish-out programs will be to ensure that both the ecological data and fish specimens that are collected can be used to their fullest extent. This will be achieved by recovering and distributing fish to local communities and by properly collecting, recording, and archiving the data from the fish-out program. Any fish-out would be done in consultation with DFO and the local communities.

### 7.5.5.3 Primary Pathways

The following primary pathways were determined for linking Project-related activities to effects to fish habitat (units), and on the abundance and distribution of Arctic char, lake trout, and Arctic grayling, and the continued opportunity for traditional and non-traditional users:

- **The Mine footprint, including open pits, waste rock storage facilities, and infrastructure pads will remove waterbodies and alter watershed areas and drainage patterns, change flows, and water levels, all of which may directly affect the quantity of habitat for Arctic char, lake trout, and Arctic grayling. The AWAR and Rankin Inlet bypass road will result in the direct loss of habitat at road crossings, potentially affecting Arctic char, lake trout, and Arctic grayling**
- **Residual ground and aquatic disturbances from the Project footprint can cause permanent loss and alteration of waterbodies, drainage patterns and water levels, all of which may directly affect the quantity of habitat for Arctic char, lake trout, and Arctic grayling**
- **The active diversion of water from waterbodies to other locations either within or to adjacent sub-basins during operation phases will decrease flows to downstream waterbodies and watercourses bypassed by the diversion, potentially leading to indirect (downstream) effects to habitat quantity for Arctic char, lake trout, and Arctic grayling (in Basins A and B)**
- **The Project footprint will physically alter the size of watersheds, and alter existing flow paths within the LSA during Project operation phases, which may decrease downstream flows and water levels, potentially resulting in indirect (downstream) effects to habitat quantity for Arctic char, lake trout, and Arctic grayling (in Basins A, B, and H)**
- **The permanent footprint may change the long-term hydrology of Basins A, B, and H, affecting fish habitat quantity for Arctic char, lake trout, and Arctic grayling**
- **Release of mine wastewater and sewage may cause changes to surface water quality and sediment quality (i.e., nutrient and metal concentrations), affecting habitat quality and the survival and reproduction of Arctic char, lake trout, and Arctic grayling in Meliadine Lake**
- **Air emissions (e.g., sulphur dioxide, nitrogen oxides) and fugitive dust deposition may change water and sediment quality in waterbodies of the LSA, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Changes to the configuration of watersheds and flow paths from the Project footprint may affect downstream water quality (e.g., metals, nutrients) in small lakes and streams, and affect aquatic health, and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Permanent changes to the configuration of watersheds and flow paths may affect downstream water quality (e.g., metals, nutrients) in small lakes and streams, and affect aquatic health, and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Water quality concentrations in flooded pits may be elevated above baseline concentrations for small lakes in the LSA (e.g., metals, nutrients), and if reconnected to pre-construction flow paths may affect downstream water and sediment quality, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**

- **Increased access from the AWAR may lead to increased mortality of valued fish species in the Meliadine Lake-River system, as well as for streams crossed by the AWAR**

## 7.5.6 Effects Analysis

### *7.5.6.1 General Approach*

The effects analysis considers all primary pathways that result in expected changes to fish habitat units and the abundance and distribution of Arctic char, lake trout, and Arctic grayling, after implementing environmental design features and mitigation. Thus, the analysis is based on the residual effects from the proposed Project. Residual effects to VECs are analyzed using measurement endpoints (Table 7.5-1).

The magnitude, spatial extent, and duration of changes in measurement endpoints (e.g., habitat quantity and quality, status of lower trophic levels) from the proposed Project and other developments are expected to be similar to or greater than the actual effects to the abundance and distribution of populations. Where possible, the analyses considered conservative inputs and methods such that effects would be over-estimated as an approach to reduce uncertainty in predictions.

The analyses of residual effects from the proposed Project on fish and fish habitat were quantitative, where possible, and included data from field studies, scientific literature, monitoring programs at existing mines, government publications, and personal communications. Traditional knowledge and community information were incorporated where available. Due to the amount and type of data available, some analyses were qualitative and included professional judgement or experienced opinion.

#### 7.5.6.1.1 Direct Effects Approach

The assessment to fish and aquatic habitat valued components relied on a baseline database of the LSA (Section 7.5.4; Appendix 7.5-B; Appendix 7.5-C; Appendix 7.5-D). The database was used to characterize the fish assemblage of Meliadine Lake, as well as waterbodies within the sub-basins of the LSA Peninsula and within the CH basin where the Discovery Pit will be located.

In some cases where a valued fish species was not recorded but potentially present and undetected during sampling, the waterbody under examination was deemed to support that species. Specifically, if a waterbody or stream upstream of given location supported Arctic char or lake trout, the downstream waterbodies were all characterized as Arctic char or lake trout habitat even if the species was undetected during sampling at the downstream location. The one exception to this rule applied to Lake B69 where a resident population of lake trout has been described. It was assumed that this population was self-sustaining and that the lake provided all life history habitat requirements (Section 7.5.4). It was also assumed that spawning potential for Arctic grayling, as defined by available gravel and suitable flow conditions, was a reliable predictor of a streams used by Arctic grayling.

The National Topographic System or NTS (1:50 000 scale), developed by Natural Resources Canada, was used for the general purpose of mapping watercourses and waterbodies within the LSA. Ground truthing, LiDAR (elevational) data and visual inspections of the most recent satellite imagery provided at Google Earth were used to edit and improve the reliability of the waterbody and watercourse database. Wetlands (ephemeral waterbodies) and small (ephemeral) streams were deemed as poor fish habitat for the valued species, and thus,

were excluded from the habitat calculations as part of the assessment. For the purposes of the fish assessment and calculation of habitat units for the Offsetting Plan for DFO (SD 7-4), lakes were distinguished from ponds because of the overwintering habitat potential they provide. Lakes were defined as waterbodies with maximum depths greater than 2 m; whereas ponds were defined as waterbodies with maximum depths less than 2 m. In other words, the deeper the lake, the more suitable the lake is for overwintering and the more critical that lake may be for species life histories.

The small sub-basins to the periphery of those that intersect with, or will be under, the Project footprint were also excluded from analyses given that they likely support poor quality fish habitat (e.g., because of low flows) and do not directly intersect with Project activities. Excluding the peripheral sub-basins was deemed a conservative approach that focused on key sub-basins, and ultimately, maintained a smaller denominator in the calculation of relative effects.

Direct effects were first described by presenting absolute values, for example, the footprint in Basin A will permanently remove 1.5 ha of lake/pond habitat for Arctic char. Direct effects were also described by presenting relative changes in habitat area. For example, the footprint in Basin A will permanently remove about 6% of Arctic char habitat within that sub-basin (i.e., 1.5 ha of 23.4 ha of standing water habitat that was identified as being available). The classification of impacts in subsequent sections was largely based on relative changes reported in the below effects analysis.

The classification of impacts also considered the both predicted loss of habitat units (HUs) and the estimated gains in HUs from compensation option as part of the Offsetting Plan (SD 7-4). Here, the goal was to minimize impacts to local populations by meeting the principle of compensating with a higher ratio of gains to losses.

#### 7.5.6.1.2 Indirect Effects Approach

The analyses of indirect effects to fish relied on the work completed in Section 7.3 Hydrology and Section 7.4 Surface Water and Sediment Quality.

##### Downstream Flows

Downstream changes to flows (i.e., habitat quantity) can result in changes to the abundance and distribution of fish. Details of the methods for predicting changes in downstream flows can be found in Section 7.3.3. In brief, a baseline water balance model was modified to predict the effects of the proposed Project on LSA watersheds during construction, operations, closure, and post-closure. The model was built using GoldSim™ software and considers each of LSA watersheds, which were divided into sub-watersheds including lake and land areas. Changes to the water balance model per sub-watershed were then described for each phase of the water management plan (see SD 2-6 Surface Water Management Plan).

For sub-basins where measurable (residual) effects were anticipated (e.g., Lake A1, Lake B2, and Lake H1), changes to surface areas of those waterbodies were calculated to understand potential loss of habitat for Arctic char, lake trout, and Arctic grayling. Changes in surface areas corresponded to the maximum decrease in mean monthly water levels over the period of construction to closure and post-closure from baseline. Largest decreases in water levels were always observed during the month of June. Reporting of effects based on changes in June was deemed an environmentally conservative approach, and therefore, reported effects to Arctic char, lake trout and Arctic grayling were likely overestimated.

The baseline areas of waterbody surfaces were based on the available GIS waterbody layer of the proposed Project derived from the Photosat dataset. The derived areas for the Project phase were based on bathymetric data for Lake A1 and Lake B2 and on an assumed interpolated bathymetric surface (based only on known maximum depth and a shoreline contour) for Lake H1 where no field-collected bathymetric data were available. Areas were derived using the bathymetric datasets at a depth of 0 m (A(0)) (i.e., surface area corresponding to the water surface elevation on the day surveyed), and at the predicted depth (A(P)) (from the Project). The baseline areas were multiplied by the ratio of A(P)/A(0).

### Water Quality

Downstream changes to water quality (i.e., habitat quality) can result in changes to the abundance and distribution of fish. Details of the methods for predicting changes in water quality can be found in Section 7.4.6.

During the pre-production through post-closure phase, the mine site will be a closed system with all contact water contained through ditches, berms, and dikes. This means that all water running off the waste rock storage facilities, and any water pumped from the open pits, will be collected through sumps and diverted to the TSF or attenuation ponds, treated, then discharged to Meliadine Lake (SD 2-6 Surface Water Management Plan). All non-contact water that is diverted around the mine facilities will be drained through the natural flows in the LSA.

The effects of mine effluent released from the diffuser in Meliadine Lake was predicted with the CORMIX model system (Section 7.4.6; Appendix 7.4-A). The major input into the model was from the mine effluent chemistry predictions (i.e., water quality parameter concentrations in AP-01) and the mine site mass balance model. This model incorporated mine effluent loads and did not incorporate air deposition loads.

The small lakes model was developed for the baseline case, 9 mine phase cases including pre-operations (3 years before mining, and one to 2 years before mining), 5 active mining phases, closure, and post-closure. The baseline case is calibrated to surface water quality conditions observed during baseline monitoring programs, and used as a benchmark, against which the mine phase cases are compared. The model uses conservative assumptions to minimize the potential for changes to be underestimated. Analyses of each primary pathway are summarized below (also see Section 7.4.6 and Appendix 7.4-A for more detail).

Water quality data were compared to the most recent CCME CWQG for the protection of aquatic life and Health Canada's Guidelines for Canadian Drinking Water Quality (CCME 2012a; Health Canada 2010). Water quality guidelines are nationally endorsed indicators of environmental quality for the protection of aquatic ecosystems and designated water uses (CCME 2012a; Health Canada 2010).

## *7.5.6.2 Results*

### 7.5.6.2.1 Direct Effects to Habitat

- **The Project footprint, including open pits, waste rock storage facilities, and infrastructure pads will remove waterbodies and alter watershed areas and drainage patterns, change flows, and water levels, all of which may directly affect the quantity of habitat for Arctic char, lake trout, and Arctic grayling**
- **The AWAR and Rankin Inlet bypass road will result in the direct loss of habitat at road crossings**

- **Residual ground and aquatic disturbances from the Project footprint can cause permanent loss and alteration of waterbodies, drainage patterns and water levels, all of which may directly affect the quantity of habitat for Arctic char, lake trout, and Arctic grayling.**

#### *7.5.6.2.1.1 Lake and Pond Area*

The proposed Project will directly affect 8 small lakes (>2 m deep) and 74 ponds (<2 m deep) within the LSA, affecting 6 sub-basins (A, B, CH, E, H, and J) that drain into Meliadine Lake (Figure 7.5-33; Table 7.5-20). Habitat in Meliadine Lake itself will only be directly altered by the diffuser and water intake pipes. However, the footprint from the diffuser and water intake pipes will be negligible in magnitude. At the diffuser location, the area of potentially affected habitat within the mixing zone (See Appendix 7.4-A) is characterized by fine substrate and depths greater than 4 m. This type of habitat has low suitability for spawning and rearing of the resident fish; therefore, habitat loss associated with the pipe footprint and outfall velocities is very minor given the relatively small footprint in Meliadine Lake and the type of habitat at the diffuser location. Of the lakes and ponds to be directly affected by the Project, 23 will be in the A Basin and under the Project footprint, 23 in B Basin, 4 in CH Basin, 3 in E Basin, 23 in H Basin, and 6 in the J Basin.

The total area of habitat to be directly affected because of the Project footprint is 473.8 ha, approximately half of which (53.7%) will be permanently drained (i.e., lost). Absolute effects will be largest in the A and B Basin where the majority of the Project footprint is located. Basin A and B also support the relatively large areas of lake/pond habitat on the Peninsula (Basin A lakes/ponds combined = 228 ha and B lakes/ponds combined = 609 ha of lake habitat). In Basin A, the Project will affect 173 ha of habitat, of which 26.3 ha will be permanently lost. In Basin B, the Project will affect 237.5 ha of habitat, of which 169.8 ha will be permanently lost. Absolute effects will be largest in the B Basin if considering only permanent losses. Permanent losses in the B Basin will be primarily from waste rock storage facility footprints (112.3 ha to be removed). The TSF footprint (57.5 ha to be removed) will also be located in the B Basin.

The direct effect of the Project footprint on lake/pond habitat was calculated as 3.8% of all area within the LSA. Relative losses of habitat within the LSA are higher if considering only the scale of the Peninsula, excluding Meliadine Lake. Meliadine Lake will not be directly affected by the proposed Project. The lake does not lie under a Project footprint component, with the exception of the diffuser and intake pipe footprints captured in the Offsetting Plan (SD 7-4). Direct effects will be restricted to the Peninsula waterbodies. Direct effects of the proposed Project on habitat as measured by relative habitat losses from the footprint will be highest in the H Basin (99.0% of habitat), followed by the A Basin (76.0%), B Basin (39.0%), J Basin (37.0%), E Basin (9.2%), and the CH Basin (1.0%).

However, relative habitat losses in the LSA are much lower if considering only permanently affected lake and pond areas, which are predicted to be 2.1% within the LSA and 15.0% for the LSA Peninsula (Tables 7.5-20 and 7.5-21). Permanent losses of habitat in the Peninsula sub-basin include, from highest to lowest, the H Basin (99.0% of habitat), B Basin (27.9%), J Basin (20.5%), A Basin (11.5%), E Basin (9.1%), and the CH Basin (1.0%). Relative effects to habitat will be highest in the H Basin of all sub-basins within the LSA because this small area on the landscape is where the Plant will be constructed and some of the waste rock will be permanently stored.

**Table 7.5-20: Summary of Local Study Area Waterbodies (Direct Losses) and Project Components Interacting with Small Lakes (>2 m deep) and Ponds (<2m deep) Supporting Arctic Char, Lake Trout, and Arctic Grayling**

| | | | | | | | Habitat to-be Temporarily Modified | | | | To-be Permanently Drained (or Lost) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **All LSA Lakes** | **Basin** | **# Lakes** | **# Ponds** | **ARCH Lakes/Ponds** | **LKTR Lakes/Ponds** | **ARGR Lakes/Ponds** | **Draw-down[b]** | **Open Pit** | **Draw-down, Road, Refill** | **Draw-down, Refill** | **Waste Rock** | **Attenuation Pond** | **Tailings** | **Surface Infrastructure Pads** | **Drained** | **Roads** | **Sub-Total Lost** | **Total** |
| A Basin Sub-Total | A | 2 | 21 | 5 | 5 | 7 | 34.96 | 25.04 | 7.51 | 79.09 | 6.25 | 0.00 | 0.00 | 0.00 | 17.54 | 2.36 | 26.25 | 172.96 |
| B Basin Sub-Total | B | 4 | 19 | 0 | 0 | 6 | 0.00 | 17.24 | 3.70 | 46.85 | 112.25 | 0.00 | 57.58 | 0.00 | 0.00 | 0.00 | 169.83 | 237.52 |
| CH Basin Sub-Total | CH | 0 | 4 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 3.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.44 | 3.44 |
| E Basin Sub-Total | E | 2 | 1 | 0 | 0 | 1 | 0.00 | 0.00 | 0.00 | 0.11 | 9.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.42 | 9.93 | 10.04 |
| H Basin Sub-Total | H | 0 | 23 | 0 | 0 | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 8.41 | 15.80 | 0.00 | 15.36 | 0.00 | 0.00 | 39.56 | 39.56 |
| J Basin Sub-Total | J | 0 | 6 | 0 | 0 | 0 | 0.00 | 1.44 | 0.00 | 3.11 | 0.00 | 0.00 | 0.00 | 4.90 | 0.00 | 0.75 | 5.65 | 10.20 |
| **Total** | | **8** | **74** | **5** | **5** | **16** | **34.96** | **43.73** | **11.31** | **129.16** | **139.85** | **15.80** | **57.58** | **20.26** | **17.54** | **3.53** | **254.67** | **473.82** |
| **Relative Summary** | | | | | | | **7.4%** | **9.2%** | **2.4%** | **27.3%** | **29.5%** | **3.3%** | **12.2%** | **4.3%** | **3.7%** | **0.7%** | **53.7%** | |
| **Fish-Bearing Lakes/Ponds Only[a]** | | | | | | | | | | | | | | | | | | |
| A2 | A | 0 | 0 | 1 | 1 | 1 | 0.00 | 0.00 | 0.00 | 2.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.36 |
| A2a | A | 0 | 0 | 1 | 1 | 1 | 0.00 | 0.00 | 0.00 | 1.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.41 | 0.41 | 1.95 |
| A3 | A | 0 | 0 | 1 | 1 | 1 | 0.00 | 0.00 | 0.00 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.48 |
| A4 | A | 0 | 0 | 1 | 1 | 1 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.07 |
| A5 | A | 0 | 0 | 1 | 1 | 1 | 0.00 | 0.37 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.07 | 1.07 | 2.00 |
| A6 | A | 0 | 1 | - | - | 1 | 34.96 | 2.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 17.54 | 0.00 | 17.54 | 55.28 |
| A8 | A | 0 | 1 | - | - | 1 | 0.00 | 15.65 | 7.51 | 67.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 90.54 |
| ***A Sub-Total*** | ***A*** | ***0*** | ***2*** | ***5*** | ***5*** | ***7*** | ***34.96*** | ***18.70*** | ***7.51*** | ***72.25*** | ***0.00*** | ***0.00*** | ***0.00*** | ***0.00*** | ***17.54*** | ***1.51*** | ***19.15*** | ***152.68*** |
| B4 | B | 0 | 1 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 85.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 85.82 | 85.82 |
| B5 | B | 0 | 1 | - | - | 1 | 0.00 | 5.42 | 3.70 | 41.98 | 5.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.64 | 56.74 |
| B6 | B | 0 | 1 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 11.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.80 | 11.80 |
| B7 | B | 0 | 1 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 57.58 | 0.00 | 0.00 | 0.00 | 57.88 | 57.88 |
| B30 | B | 0 | 0 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.09 |
| B31 | B | 0 | 0 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.13 |
| ***B Sub-Total*** | ***B*** | ***0*** | ***4*** | ***0*** | ***0*** | ***6*** | ***0.00*** | ***5.42*** | ***3.70*** | ***41.98*** | ***103.77*** | ***0.00*** | ***57.58*** | ***0.00*** | ***0.00*** | ***0.00*** | ***161.35*** | ***212.45*** |
| E4 | E | 1 | 0 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 8.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 8.52 | 8.52 |
| H1 | H | 0 | 1 | - | | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.14 | 0.00 | 0.00 | 0.00 | 0.00 |
| H2 | H | 0 | 1 | - | - | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.16 | 0.16 |
| **Total** | | **1** | **7** | **5** | **5** | **16** | **34.96** | **24.12** | **11.31** | **114.23** | **111.98** | **0.00** | **57.58** | **1.30** | **17.54** | **1.82** | **109.33** | **374.96** |
| **Relative Summary** | | | | | | | **9.3%** | **6.4%** | **3.0%** | **30.5%** | **29.9%** | **0.0%** | **15.4%** | **0.3%** | **4.7%** | **0.5%** | **50.6%** | |

[a] fish-bearing status based on baseline collections and various methods deployed to provide a reliable database of local distributions of valued fish species

[b] activities describe drawdowns where water levels lowered and returned to baseline at closure, or were permanently reduced through post-closure

ARCH = Arctic char, ARGR = Arctic grayling and LKTR = lake trout

**Table 7.5-21: Summary of Direct Effects to Lake and Pond Habitat Quantity (Area) within the Local Study Area**

| Local Study Area Basin | Total # of Lakes/ Ponds | Total Area | # of Footprint Lakes/ Ponds | Area under Footprint (ha) | Relative Footprint Area (%) | Area Lost (ha) | Relative Area Lost (%) |
|---|---|---|---|---|---|---|---|
| A | 45 | 227.5 | 23 | 173.0 | 76.0% | 26.2 | 11.5% |
| B | 78 | 609.2 | 23 | 237.5 | 39.0% | 169.8 | 27.9% |
| C | 15 | 50.1 | 0 | 0.0 | - | - | - |
| CH | 7 | 333.0 | 4 | 3.4 | 1.0% | 3.4 | 1.0% |
| D | 29 | 231.4 | 0 | 0.0 | - | - | - |
| E | 12 | 108.7 | 3 | 10.0 | 9.2% | 9.9 | 9.1% |
| F | 15 | 39.6 | 0 | 0.0 | - | - | - |
| G | 6 | 17.3 | 0 | 0.0 | - | - | - |
| H | 24 | 39.9 | 23 | 39.9 | 99.0% | 39.6 | 99.2% |
| I | 1 | 7.5 | 0 | 0.0 | - | - | - |
| J | 8 | 27.5 | 6 | 10.2 | 37.0% | 5.7 | 20.5% |
| Meliadine L. | 1 | 10 689.0 | 0 | 0.0 | - | - | - |
| P | 3 | 10.8 | 0 | 0.0 | - | - | - |
| **Total** | **244** | **12 391.5** | **82** | **473.8** | **3.8%** | **254.7** | **2.1%** |
| *Sub-Total*[a] | *243* | *1702.5* | *82* | *473.8* | *27.8%* | *254.7* | *15.0%* |

[a] excluding Meliadine Lake

Fifteen of the 82 waterbodies directly affected by the Project footprint support valued fish species. These waterbodies range in area from <0.1 ha (Lake A4) to 90.5 ha (Lake A8). The total area of habitat for lakes/ponds supporting a valued fish species that will be directly affected is 375 ha, approximately half of which (51%) will be permanently drained (Table 7.5-20).

There are 5 large waterbodies supporting a valued fish species that will be directly affected by the Project footprint, including Lake A6 (55.3 ha), Lake B5 (56.7 ha), Lake B7 (57.9ha), Lake B4 (85.8 ha), and Lake A8 (90.5 ha). These 5 lakes plus 11 smaller waterbodies within the Project footprint (16 in total) were identified as supporting Arctic grayling. All 3 valued species, Arctic char, lake trout, and Arctic grayling, were identified in Lake A2, A2a, A3, A4, and A5. The A waterbodies are relatively shallow (< 2m deep) and small, ranging in size from <0.1 ha to 2.4 ha. Arctic char and lake trout were not found in other lakes and ponds to be directly affected by the proposed Project.

At the scale of the RSA, which includes over 11 900 waterbodies and about 83 900 ha of lakes and ponds (Table 7.5-11), the incremental direct effect of the proposed Project on lake and pond habitat is predicted to be less than 1%. The spatial scale of the RSA includes watersheds of the Meliadine, Atulik, Char, and Diana rivers, as well as small watersheds near Rankin Inlet (Figure 7.5-35). This region likely represents the scale at which population dynamics operate for fish species given their life history characteristics.

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_7\Main_Volume\Figure_7.5-35_RSA_Water_Quality_Fish_Developments.mxd

460000 480000 500000 520000 540000 560000 580000 600000

7020000 7000000 6980000 6960000

N

Diana River

Meliadine Lake

Meliadine Lake

Parallel Lake

Mine Location

Meliadine River

Atulik

Hudson

Char River

Rankin Inlet

Rankin Inlet

Hudson Bay

## LEGEND

- Watercourse
- Watershed Boundary
- Waterbody

**Previous, Existing and Possible Future Development**

- Community
- Contaminated Site
- Mine (Inactive)
- Mineral Exploration (Active)
- Quarry (Active)
- Quarry (Inactive)
- National or Territorial Park
- All-weather Access Road (AWAR)
- Proposed All-weather Road (Future)
- Winter Road
- Proposed pipeline & powerline (Future)

10 0 10
KILOMETRES

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

**RSA FOR WATER QUALITY, FISH HABITAT AND FISH, INCLUDING HISTORICAL, EXISTING AND REASONABLY FORESEEABLE DEVELOPMENTS**

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | CS | 24 Oct. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | JW | 24 Oct. 2012 | | |
| CHECK | DW | 20 Jan. 2013 | | |
| REVIEW | DW | 20 Jan. 2013 | | |

**FIGURE 7.5-35**

The RSA supports relatively few historical, existing, and reasonably foreseeable developments. Developments in the RSA include approximately 12 contaminated sites and an abandoned (or inactive) mine near the community of Rankin Inlet (i.e., the closed Rankin Inlet Nickel and Copper Mine), the Rankin Inlet community, an active and abandoned quarry pit in the Meliadine Lake watershed, and 2 active exploration sites within the Meliadine Lake watershed. Thus, cumulative effects of historical, existing and reasonably foreseeable development on pond and lake habitat within the RSA were qualitatively assessed and conservatively predicted to be measurable, but within limits of a historical reference condition.

### *Lake and Pond Area for Arctic Char (ARCH)*

The direct effect of the Project footprint on lake/pond habitat for Arctic char was calculated to be about 0.1% of all area within the LSA (Table 7.5-22). Direct effects of the Project on lake/pond habitat for Arctic char will be restricted to the A Basin where 29.4% of habitat will be affected. However, relative losses in the LSA are much lower if considering only permanently lost habitat. Permanent losses of habitat for Arctic char will be 6.5% of all lake/pond habitat in the A basin. Key Project activities in the A Lakes supporting Arctic char include hydrological changes, such as controlled drawdowns, under the water management for construction and operations.

**Table 7.5-22: Summary of Direct Effects to Lake and Pond Habitat for Arctic Char (ARCH) within the Local Study Area**

| LSA Basin | Total # of ARCH Lakes/ Ponds | Total ARCH Area | # of ARCH Lakes/ Ponds under Footprint | ARCH Area under Footprint (ha) | Relative Footprint Area (%) | ARCH Area Lost (ha) | Relative Area Lost (%) |
|---|---|---|---|---|---|---|---|
| A | 7 | 23.4 | 5 | 6.9 | 29.4% | 1.5 | 6.5% |
| B | 2 | 49.6 | - | - | - | - | - |
| C | - | - | - | - | - | - | - |
| CH | - | - | - | - | - | - | - |
| D | 3 | 38.2 | - | - | - | - | - |
| E | 1 | 0.7 | - | - | - | - | - |
| F | 1 | 0.5 | - | - | - | - | - |
| G | - | - | - | - | - | - | - |
| H | - | - | - | - | - | - | - |
| I | - | - | - | - | - | - | - |
| J | - | - | - | - | - | - | - |
| Meliadine L. | 1 | 10 689.0 | - | - | - | - | - |
| P | - | - | - | - | - | - | - |
| **Total** | **15** | **10 801.4** | **5** | **6.9** | **0.1%** | **1.5** | **<0.1%** |
| *Sub-Total*[a] | *14* | *112.4* | *5* | *6.9* | *6.1%* | *1.5* | *1.3%* |

[a] excluding Meliadine Lake

### *Lake and Pond Area for Lake Trout (LKTR)*

The direct effect of the Project footprint on lake/pond habitat for lake trout was calculated as about 0.1% of all area within the LSA (Table 7.5-23). Direct effects of the proposed Project on habitat for lake trout will be restricted to the A Basin where 29.4% of the lake/pond habitat be affected. However, relative effects in the LSA are much lower if considering only permanently drained habitat. Permanent losses of lake/pond habitat for lake

trout in the Peninsula sub-basins include only the A Basin and will be only 6.5% of habitat in the A Basin. Key Project activities in the A Lakes supporting lake trout include hydrological changes, such as controlled drawdowns, under the water management for construction and operations.

**Table 7.5-23: Summary of Direct Effects to Lake and Pond Habitat for Lake Trout (LKTR) within the Local Study Area**

| LSA Basin | Total # of LKTR Lakes/ Ponds | Total LKTR Area | # of LKTR Lakes/ Ponds under Footprint | LKTR Area under Footprint (ha) | Relative Footprint Area (%) | LKTR Area Lost (ha) | Relative Area Lost (%) |
|---|---|---|---|---|---|---|---|
| A | 7 | 23.4 | 5 | 6.9 | 29.4% | 1.5 | 6.5% |
| B | 3 | 74.6 | - | - | - | - | - |
| C | - | - | - | - | - | - | - |
| CH | 3 | 329.5 | - | - | - | - | - |
| D | 1 | 17.8 | - | - | - | - | - |
| E | 2 | 84.9 | - | - | - | - | - |
| F | 1 | 0.5 | - | - | - | - | - |
| G | - | - | - | - | - | - | - |
| H | - | - | - | - | - | - | - |
| I | - | - | - | - | - | - | - |
| J | - | - | - | - | - | - | - |
| Meliadine Lake | 1 | 10 689.0 | - | - | - | - | - |
| P | - | - | - | - | - | - | - |
| **Total** | **18** | **11 219.7** | **5** | **6.9** | **0.1%** | **1.5** | **<0.1%** |
| *Sub-Total*[a] | *17* | *530.7* | *5* | *6.9* | *1.3%* | *1.5* | *0.3%* |

[a] excluding Meliadine Lake

### *Lake and Pond Area for Arctic Grayling (ARGR)*

The direct effect of the Project footprint on lake/pond habitat for Arctic grayling was calculated to be 3.2% of all lake area within the LSA (Table 7.5-24). Direct effects of the proposed Project on habitat for Arctic Grayling will be restricted to the H Basin (100% of habitat), A Basin (89.0%), B Basin (47.2%), and E Basin (9.2%). However, relative losses for Arctic grayling in the LSA are much lower if considering only permanently lost areas (1.6%). Permanent losses of lake/pond habitat for Arctic grayling in the Peninsula sub-basins include, from highest to lowest, the H Basin (100% habitat), B Basin (35.8%), A Basin (11.2%) and the E Basin (9.2%). A variety of Project activities will occur in the B, H, A, and E Basin.

**Table 7.5-24: Summary of Direct Effects to Lake and Pond Habitat for Arctic Grayling (ARGR) within the Local Study Area**

| LSA Basin | Total # of ARGR Lakes/ Ponds | Total ARGR Area | # of ARGR Lakes/ Ponds under Footprint | ARGR Area under Footprint (ha) | Relative Footprint Area (%) | ARGR Area Lost (ha) | Relative Area Lost (%) |
|---|---|---|---|---|---|---|---|
| A | 10 | 171.6 | 7 | 152.7 | 89.0% | 19.2 | 11.2% |
| B | 22 | 450.2 | 6 | 212.5 | 47.2% | 161.4 | 35.8% |
| C | - | - | - | - | - | - | - |
| CH | 3 | 329.5 | - | - | - | - | - |
| D | 7 | 140.0 | - | - | - | - | - |
| E | 3 | 92.7 | 1 | 8.5 | 9.2% | 8.5 | 9.2% |
| F | 5 | 18.7 | - | - | - | - | - |
| G | - | - | - | - | - | - | - |
| H | 2 | 1.3 | 2 | 1.3 | 100.0% | 1.3 | 100.0% |
| I | - | - | - | - | - | - | - |
| J | - | - | - | - | - | - | - |
| Meliadine L. | 1 | 10 689.0 | - | - | - | - | - |
| P | - | - | - | - | - | - | - |
| **Total** | **53** | **11 893.0** | **16** | **375.0** | **3.2%** | **190.3** | **1.6%** |
| Sub-Total[a] | 52 | 1204.0 | 16 | 375.0 | 31.1% | 190.3 | 15.8% |

[a] excluding Meliadine Lake

#### *7.5.6.2.1.2 Stream Habitat Length*

The proposed Project will potentially have a direct effect approximately 7.2 km of streams within the LSA, affecting 5 sub-basins (A, B, E, H, and J) that drain into Meliadine Lake (Table 7.5-25). This may include stream sections with undefined channels and undefined banks with dispersed flows. Of the 7.2 km of streams directly affected by the Project, 3.0 km will be in the A Basin, 1.7 km in B Basin, <0.1 km in E Basin, 1.4 km in H Basin, and 1.0 km in the J Basin.

Absolute losses will be largest in the A and B Basin where the majority of the Project footprint is located. Basin A and B also support a relatively large stream network on the Peninsula (A = 4.9 km and B = 9.4 km of total stream network length) where core Project activities will be located. The A Basin will potentially lose approximately 3.0 km of streams, in large part because of the development of an open pit that will be flooded post-closure; whereas, the B Basin will include a loss of approximately 1.7 km of streams where the waste rock storage facilities and TSF will be located.

The potential direct effect of the Project footprint on stream habitat was calculated as 22.2% of all stream lengths within the LSA (Table 7.5-25). Direct effects will be restricted to streams on the Peninsula. Direct effects of the Project on stream habitat as measured by relative losses of strength length will be highest in the H Basin (87.5% of stream habitat), followed by the A Basin (61.2%), J Basin (57.5%), B Basin (18.4%), and E Basin (2.7%).

**Table 7.5-25: Summary of Footprint Streams and Project Components Interacting with Streams Supporting Arctic Char, Lake Trout and Arctic Grayling**

| | | | | Valued Fish Species[a] | | | Stream Length Altered or Drained from Project Components | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Basin ID | No. of Footprint Stream Segments | Footprint Stream Length (m) | ARCH Stream (m) | LKTR Stream (m) | ARGR Stream (m) | Culvert (m) | Diverted Channel (m) | Open Pit (m) | Surface Infra-Structure Pad (m) | Waste Rock (m) | Total (m) |
| **All Footprint Streams** | | | | | | | | | | | | |
| A Basin Streams | A | 20 | 3008 | 518 | 518 | 553 | 133 | 112 | 2763 | 0 | 0 | 3008 |
| B Basin Streams | B | 15 | 1718 | -- | -- | 594 | 0 | 0 | 258 | 0 | 1461 | 1718 |
| E Basin Streams | E | 2 | 60 | -- | -- | 46 | 14 | 0 | 0 | 0 | 46 | 60 |
| H Basin Streams | H | 10 | 1350 | -- | -- | 174 | 0 | 174 | 1140 | 36 | 0 | 1350 |
| J Basin Streams | J | 6 | 1014 | -- | -- | -- | 46 | 0 | 299 | 668 | 0 | 1014 |
| **Total** | | **53** | **7150** | **518** | **518** | **1367** | **194** | **286** | **4460** | **705** | **1507** | **7150** |
| **VEC-Bearing Footprint Streams** | | | | | | | | | | | | |
| A4-5 | A | 1 | 112 | 112 | 112 | 112 | 0 | 112 | 0 | 0 | 0 | 112 |
| A5-6[b] | A | 1 | 406 | 406 | 406 | 406 | 0 | 0 | 406 | 0 | 0 | 406 |
| A6-7 | A | 1 | 35 | -- | -- | 35 | 35 | 0 | 0 | 0 | 0 | 35 |
| B30-6 | B | 1 | 24 | -- | -- | 24 | 0 | 0 | 0 | 0 | 24 | 24 |
| B31-30 | B | 1 | 102 | -- | -- | 102 | 0 | 0 | 0 | 0 | 102 | 102 |
| B4-5 | B | 1 | 146 | -- | -- | 146 | 0 | 0 | 0 | 0 | 146 | 146 |
| B5-31 | B | 1 | 108 | -- | -- | 108 | 0 | 0 | 0 | 0 | 108 | 108 |
| B5-6 | B | 1 | 98 | -- | -- | 98 | 0 | 0 | 0 | 0 | 98 | 98 |
| B6-7 | B | 1 | 116 | -- | -- | 116 | 0 | 0 | 0 | 0 | 116 | 116 |
| E4-5 | E | 1 | 46 | -- | -- | 46 | 0 | 0 | 0 | 0 | 46 | 46 |
| H1-2 | H | 1 | 174 | -- | -- | 174 | 0 | 174 | 0 | 0 | 0 | 174 |
| **Total** | | **11** | **1367** | **518** | **518** | **1367** | **35** | **112** | **406** | **174** | **640** | **1367** |

[a] fish-bearing status based on baseline collections and various methods deployed to provide a reliable database of local distributions of valued fish species

[b] only 1 of 300 fish captured was an Arctic char (157-mm juvenile), based on multiple years of baseline sampling (1997 to 2009; SD 7-1 2009 Aquatics Synthesis Baseline, SD 7-2 2011 Aquatics Baseline

ARCH = Arctic char, ARGR = Arctic grayling and LKTR = lake trout

**Table 7.5-26: Summary of Direct Effects to Stream Habitat Quantity (Length) within the Local Study Area**

| LSA Sub-Basins | No. of Segments | Total Stream Length (m) | No. of Footprint Segments | Total Footprint Length[a] (m) | Relative Effect (%) | Stream Length Lost (m) | Relative Effect (%) |
|---|---|---|---|---|---|---|---|
| A | 38 | 4913 | 20 | 3008 | 61.2% | 2763 | 56.2% |
| B | 60 | 9352 | 15 | 1718 | 18.4% | 1718 | 18.4% |
| C | 10 | 1570 | 0 | 0 | 0.0% | 0 | 0.0% |
| CH | 33 | 4638 | 0 | 0 | 0.0% | 0 | 0.0% |
| D | 20 | 2641 | 0 | 0 | 0.0% | 0 | 0.0% |
| E | 11 | 2211 | 2 | 60 | 2.7% | 46 | 2.1% |
| F | 12 | 1169 | 0 | 0 | 0.0% | 0 | 0.0% |
| G | 5 | 1454 | 0 | 0 | 0.0% | 0 | 0.0% |
| H | 12 | 1543 | 10 | 1350 | 87.5% | 1176 | 76.2% |
| I | 1 | 553 | 0 | 0 | 0.0% | 0 | 0.0% |
| J | 8 | 1762 | 6 | 1014 | 57.5% | 968 | 54.9% |
| P | 2 | 467 | 0 | 0 | 0.0% | 0 | 0.0% |
| **Total** | **212** | **32272** | **53** | **7150** | **22.2%** | **6671** | **20.7%** |

[a] some of which will be part of a constructed channel for fish passage (112 m in A Basin and 174 m in H Basin), whereas 194 m of stream habitat will be reclaimed during culvert and road decommissioning in the A, E and J basins; thus, these streams will not be permanently lost.

Of the 66 stream sections to be potentially directly affected by the Project footprint, 11 have been confirmed to support Arctic char, lake trout, or Arctic grayling (Tables 7.5-25 and 7.5-26). The total length of stream supporting a valued fish species that will be either potentially altered or destroyed is 1.4 km, approximately 47% of which will be aquatic habitat that is permanently drained for a waste rock storage facility.

Two footprint sections were deemed to support all 3 valued fish species: Stream A4-5 and Stream A5-6 (Section 7.5.4; Appendix 7.5-D). However, the characterization of Stream A5-6 as an Arctic char stream was based on only one observation (a 157 mm juvenile) on 24 July 1998. Over 300 fish were captured at that site from multiple years of sampling (1997 to 2009). Arctic char and lake trout were not identified in other stream sections directly affected by the proposed Project. Nine footprint sections in the LSA were identified as bearing Arctic grayling only.

At the scale of the RSA, which includes over 1414 kms of streams, the incremental direct effect of the proposed Project on stream habitat is predicted to be less than 1%. The spatial scale of the RSA includes watersheds of the Meliadine, Atulik, Char, and Diana rivers, as well as the small watersheds near Rankin Inlet (Figure 7.5-62). There are relatively few historical, existing, and reasonably foreseeable developments in the region. Developments in the RSA include approximately 12 contaminated sites and an abandoned (or inactive) mine near the community of Rankin Inlet, the Rankin Inlet community, an active and abandoned quarry pit in the Meliadine Lake watershed, and 2 active exploration sites within the Meliadine Lake watershed. Cumulative effects of historical, existing, and reasonably foreseeable development on stream habitat within the RSA was qualitatively assessed and conservatively predicted to be measurable, but within the range of historical baseline conditions (<10%).

### Stream Length for Arctic Char (ARCH)

The potential direct effect of the Project footprint on stream habitat for Arctic char was calculated as 19.2% of all stream lengths within the LSA (Table 7.5-27). Direct effects of the proposed Project on stream habitat for Arctic char will be restricted to the A Basin where 64.8% of stream habitat will potentially be affected. However, relative losses in the LSA are lower if considering only permanently drained or removed stream sections. Potential permanent losses of stream habitat for Arctic char in the Peninsula sub-basins will be 15.0% of all stream habitats in the LSA. Key Project activities in the A Basin streams that support Arctic char include hydrological changes, such as channel diversions, as well as the construction of an open pit and waste rock storage facility.

The reported changes are conservative in that a footprint stream was characterized as supporting Arctic char even though the use of that stream is likely rare. Specifically, Stream A5-6 was classified as a footprint stream that supports Arctic char; however, baseline data indicate that Stream A5-6 may not necessarily be frequently used by Arctic char (Section 7.5.4; Appendix 7.5-D). For example, only one of 300 fish captured over multiple years of baseline surveys (1997 to 2009) was an Arctic char (a 157-mm juvenile). At post-closure, the majority of Stream A5-6 will be flooded as part of the lake created in and around a reclaimed open pit.

**Table 7.5-27: Summary of Direct Effects to Stream Habitat for Arctic Char within the Local Study Area**

| LSA Sub-Basins | No. of Segments | Total Stream Length (m) | No. of Footprint Segments | Total Footprint Length (m)[a] | Relative Effect (%) | Stream Length Lost (m) | Relative Effect (%) |
|---|---|---|---|---|---|---|---|
| A | 8 | 799 | 2 | 518 | 64.8% | 406 | 50.8% |
| B | 3 | 541 | 0 | 0 | 0.0% | 0 | 0.0% |
| C | - | - | - | - | - | - | - |
| CH | - | - | - | - | - | - | - |
| D | 3 | 210 | 0 | 0 | 0.0% | 0 | 0.0% |
| E | 2 | 808 | 0 | 0 | 0.0% | 0 | 0.0% |
| F | 2 | 345 | 0 | 0 | 0.0% | 0 | 0.0% |
| G | - | - | - | - | - | - | - |
| H | - | - | - | - | - | - | - |
| I | - | - | - | - | - | - | - |
| J | - | - | - | - | - | - | - |
| P | - | - | - | - | - | - | - |
| **Total** | **18** | **2703** | **2** | **518** | **19.2%** | **406** | **15.0%** |
| *Sub-total*[b] | *18* | *4607* | *1* | *112* | *2.4%* | *0* | *0.0%* |

[a] Some of which will either be part of a constructed channel for fish passage (112 m), and thus, not permanently lost.
[b] Excluding Stream 5-6 where only 1 of 300 fish captured during baseline surveys was an Arctic char (157-mm juvenile) (1997 to 2009; Appendix 7.5-D)

### Stream Length for Lake Trout (LKTR)

The potential direct effect of the Project footprint on stream habitat for lake trout was calculated as 16.4% of all stream lengths within the LSA (Table 7.5-28). Direct effects of the proposed Project on stream habitat for lake trout will be restricted to the A Basin where 64.8% of stream habitat will be affected. However, relative losses in the LSA are lower if considering only permanently drained or removed stream sections. Potential permanent losses of stream habitat for lake trout in the Peninsula sub-basins will be 12.8% of all stream habitats in the LSA. Key Project activities in the A Basin streams that support lake trout include hydrological changes, such as channel diversions, as well as the construction of an open pit and waste rock storage facility.

**Table 7.5-28: Summary of Direct Effects to Stream Habitat for Lake Trout within the Local Study Area**

| LSA Sub-Basins | No. of Segments | Total Stream Length (m) | No. of Footprint Segments | Total Footprint Length[a] (m) | Relative Effect (%) | Stream Length Lost (m) | Relative Effect (%) |
|---|---|---|---|---|---|---|---|
| A | 8 | 799 | 2 | 518 | 64.8% | 406 | 50.8% |
| B | 3 | 541 | 0 | 0 | 0.0% | 0 | 0.0% |
| C | - | - | - | - | - | - | - |
| CH | - | - | - | - | - | - | - |
| D | 1 | 100 | 0 | 0 | 0.0% | 0 | 0.0% |
| E | 4 | 1036 | 0 | 0 | 0.0% | 0 | 0.0% |
| F | 2 | 345 | 0 | 0 | 0.0% | 0 | 0.0% |
| G | 1 | 340 | 0 | 0 | 0.0% | 0 | 0.0% |
| H | - | - | - | - | - | - | - |
| I | - | - | - | - | - | - | - |
| J | - | - | - | - | - | - | - |
| P | - | - | - | - | - | - | - |
| **Total** | **19** | **3161** | **2** | **518** | **16.4%** | **406** | **12.8%** |

[a] some of which (112 m) will be part of a constructed channel for fish passage and thus, not permanently lost

### *Stream Length for Arctic Grayling (ARGR)*

The potential direct effect of the Project footprint on stream habitat for Arctic grayling was calculated as 18.6% of all stream lengths within the LSA (Table 7.5-29). Direct effects of the proposed Project on stream habitat for Arctic grayling will be restricted to 4 sub-basins: 53.0% of stream habitat will be potentially affected in the A Basin, 15.9% for B Basin, 4.0% for E Basin, and 49.9% for H Basin. However, relative losses will be slightly lower if considering only permanently drained or removed stream sections. Potential permanent losses of stream habitat for Arctic grayling will be 16.6% of all stream habitats in the LSA.

**Table 7.5-29: Summary of Direct Effects to Stream Habitat for Arctic Grayling within the Local Study Area**

| LSA Sub-Basins | No. of Segments | Total Stream Length (m) | No. of Footprint Segments | Total Footprint Length[a] (m) | Relative Effect (%) | Stream Length Lost (m) | Relative Effect (%) |
|---|---|---|---|---|---|---|---|
| A | 10 | 1045 | 3 | 553 | 53.0% | 406 | 38.9% |
| B | 23 | 3735 | 6 | 594 | 15.9% | 594 | 15.9% |
| C | - | - | - | - | - | - | - |
| CH | - | - | - | - | - | - | - |
| D | 6 | 661 | 0 | 0 | 0.0% | 0 | 0.0% |
| E | 7 | 1146 | 1 | 46 | 4.0% | 46 | 4.0% |
| F | 4 | 433 | 0 | 0 | 0.0% | 0 | 0.0% |
| G | - | - | - | - | - | - | - |
| H | 2 | 349 | 2 | 174 | 49.9% | 174 | 49.9% |
| I | - | - | - | - | - | - | - |
| J | - | - | - | - | - | - | - |
| P | - | - | - | - | - | - | - |
| **Total** | **52** | **7369** | **12** | **1367** | **18.6%** | **1220** | **16.6%** |

[a] some of which will either be part of a constructed channel for fish passage (112 m), or be reclaimed as part of the road decomissoning phase (35 m), and thus, not permanently lost.

#### 7.5.6.2.1 Effects to Fish Habitat Units (HUs)

The summary of habitat losses and gains for waterbodies in the Project area is presented in more detail in SD 7-4 Offsetting Plan. Losses and gains were assessed for lakes and ponds, as well as for streams (with defined channels only) potentially to be affected in the LSA. Hydrological disruptions to waterbodies where there are no physical changes to these habitats were not part of the calculation of habitat units. These waterbodies were assessed as minor pathways (see Section 7.5.5.2), and included the C Basin (Lake C10 to Lake 6 outlet), D Basin (Lake D7 to D1 outlet), E Basin (Lake E3 to E1 outlet), I Basin (Lake I1 and outlet), and J Basin (Lake J1 and outlet).

The potential total number of calculated HUs lost through alteration and destruction of lake and pond habitat during construction and operation phases is calculated to be 73.0 HUs. The total number of calculated HUs gained through alteration of existing lake and pond habitat and development of new habitat under existing terrestrial cover during post-closure is estimated to be 138.2 HUs. Thus, the overall compensation ratio for lakes and ponds for the Project will be about 1.9 to 1.

The potential total number of calculated HUs lost through alteration and destruction of stream habitat during construction and operation phases is calculated to be 373 HUs. These losses will be compensated mainly by gains associated with construction of new diversion channels (corresponding to 614 HUs). The overall compensation ratio for streams in the proposed Project is estimated at 1.6 to 1.

#### 7.5.6.2.2 Downstream Effects to Water Quantity in LSA Sub-Basins (A and B, and H)

- **The active diversion of water from waterbodies to other locations either within or to adjacent sub-basins during the operations phases, as well as at post-closure, will decrease flows to downstream waterbodies and watercourses bypassed by the diversion, potentially resulting in indirect effects to fish habitat quantity for Arctic char, lake trout, and Arctic grayling (in Basin A and B)**
- **The Project footprint will physically alter the size of watersheds, and alter existing flow paths within the LSA during Project operation and post-closure phases, which may decrease downstream flows and water levels, potentially resulting in indirect effects to fish habitat quantity for Arctic char, lake trout, and Arctic grayling (in Basin A, B, and H)**
- **The proposed Project will change the long-term hydrology of Basins A, B, and H, potentially resulting in indirect effects to fish habitat quantity for Arctic char, lake trout, and Arctic grayling**

The proposed Project will result in residual effects to the hydrology of downstream locations in the LSA including watersheds A, B, and H (Section 7.3.4). The effects are projected to occur during the Pre-production phase, mining phase 1 to mining phase 5, and closure, with effects that will continue after closure for the long-term. Effects will be a result of a combination of Project-related activities, including the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies. The magnitude and direction of these effects depend on the type and timing of upstream Project activities, and thus, vary over time (Tables 7.5-30 and 7.5-31).

**Table 7.5-30: Summary of Median Annual Water Yields and Month Water Levels for Lake A1 and outlet for Baseline with Relative Changes (%) Reported for Project Snapshots (mm)**

| | | Predicted Median Change in Water Level From Baseline (%) | | | | | |
|---|---|---|---|---|---|---|---|
| **Snapshot** | **Lake A1 (mm)** | **May** | **Jun** | **Jul** | **Aug** | **Sept** | **Oct** |
| Baseline | 168 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pre-production (Year -3) | 56.0% | 6.3% | 1.6% | 14.2% | 38.2% | 36.9% | 42.8% |
| Pre-production (Years -2 to -1) | -28.0% | -6.6% | -5.8% | -3.8% | -4.6% | -3.6% | -3.9% |
| Mining Phase 1 | -16.1% | -12.7% | -10.7% | 7.2% | 28.5% | 25.3% | 13.8% |
| Mining Phase 2 | -74.4% | 9.2% | 0.0% | 0.7% | -13.7% | -13.5% | -9.2% |
| Mining Phase 3 | -79.8% | -24.3% | -25.0% | -26.2% | -26.5% | -22.9% | -23.7% |
| Mining Phase 4 | -79.8% | -24.3% | -25.0% | -26.2% | -26.5% | -22.9% | -23.7% |
| Mining Phase 5 | -79.8% | -24.3% | -25.0% | -26.2% | -26.5% | -22.9% | -23.7% |
| Closure | -79.8% | -24.3% | -25.0% | -26.2% | -26.5% | -22.9% | -23.7% |
| Post-Closure | -19.6% | -7.7% | -4.7% | 0.0% | -2.3% | -3.0% | -2.6% |

Note: table from Section 7.3.3 and adapted for the assessment of fish habitat

**Table 7.5-31: Summary of Median Annual Water Yields and Month Water Levels for Lake B2 and outlet for Baseline with Relative Changes (%) Reported for Project Snapshots (mm)**

| | | Predicted Median Change in Water Level From Baseline (%) | | | | | |
|---|---|---|---|---|---|---|---|
| **Snapshot** | **Lake B2 (mm)** | **May** | **Jun** | **Jul** | **Aug** | **Sept** | **Oct** |
| Baseline | 166 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pre-production (Year -3) | -39.8% | -14.2% | -9.4% | -8.6% | -12.9% | -11.3% | -9.3% |
| Pre-production (Years -2 to -1) | -31.3% | -7.8% | -6.5% | -9.2% | -13.6% | -12.1% | -11.7% |
| Mining Phase 1 | -31.3% | -7.8% | -6.5% | -9.2% | -13.6% | -12.1% | -11.7% |
| Mining Phase 2 | -35.5% | -8.1% | -7.2% | -8.9% | -14.0% | -13.5% | -10.9% |
| Mining Phase 3 | -36.7% | -8.4% | -7.5% | -9.2% | -14.3% | -13.8% | -11.3% |
| Mining Phase 4 | -36.7% | -8.4% | -7.5% | -9.2% | -14.3% | -13.8% | -11.3% |
| Mining Phase 5 | -36.7% | -8.7% | -7.5% | -9.5% | -14.3% | -14.2% | -11.7% |
| Closure | -36.7% | -8.7% | -7.5% | -9.5% | -14.3% | -14.2% | -11.7% |
| Post-Closure | -19.3% | -3.9% | -3.9% | -3.9% | -3.7% | -3.2% | -6.5% |

Note: table from Section 7.3.3 and adapted for the assessment of fish habitat

## A Basin: Lake A1 and Outlet

The A Basin is a large basin, with an area of about 9.5 $km^2$ at the outlet of Lake A1. Potential effects in this basin will be a result of a combination of Project-related activities, including the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies (Section 7.3.3). Predicted water yields of Lake A1 will initially be augmented by the dewatering of upstream lakes of the A Basin during the Pre-production phase and mining phase 1, and then reduced by almost 80% due to infrastructure and low sustained pumping out of Lake A6 until closure. Permanent infrastructure will result in reduced annual water yields to Lake A1 and outlet at post-closure (by 19.6%) compared to baseline (Table 7.5-30).

Permanent changes to LSA lake and land areas in the A Basin sub-watersheds at post-closure from permanent infrastructure include the following:

- a net decrease in sub-watershed area, including a net increase in lake area, and a net decrease in land area in the Lake A8 sub-watershed due to the Tiriganiaq Pit, Wesmeg #2 Pit, Wesmeg #3 Pit, and Pump #2 Pit;
- a net decrease in sub-watershed area, including a net decrease in lake area, and a net increase in land area in the Lake A6 sub-watershed due to the Wesmeg #4 Pit, F Zone #3 Pit, and the constructed channel connecting Lake A6 to the flooded F Zone #3 Pit at a lake elevation reduced by 1.5 m from baseline conditions; and
- a net increase in sub-watershed area, including a net increase in lake area, and a net decrease in land area in the Lake A1 sub-watershed due to the A45-2 waste rock storage facility, and the F Zone Pits.

Lake A1 is a small lake (16.4 ha), and is characterized by a mean maximum depth of 2.5 m, which indicates a potential to support overwintering habitat (Section 7.5.4). The permanent reduction in water yields is predicted to reduce water levels by 3.0% just prior to freeze-up in September and October (Table 7.5-30). The lake is also positioned at a relatively low elevation compared to Meliadine Lake (only 1.4 m higher), and therefore provides accessible habitats for upstream movements of Arctic char (derived from data in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D). Baseline studies show that the lake supports habitat for Arctic char, as well as lake trout and Arctic grayling (Section 7.5.4). Water levels at the outlet of A1 are predicted to be reduced by no more than 4.7% during the summer months (Table 7.5-30).

In summary, the permanent reduction in annual water yields will result in a measurable reduction to habitat quantity for Arctic char, lake trout and Arctic grayling in Lake A1 by no more than 3% during construction and operation phases, and by less than 1% at post-closure. It is assumed that the estimated effect to available habitat in Lake A1 will be similar to, or greater in magnitude than that estimated for the outlet stream of Lake A1.

### B Basin: Lake B2 and Outlet

The B Basin is the largest sub-basin of the LSA Peninsula sub-basins, at an area of about 22.8 $km^2$ at the outlet of Lake B2. Potential effects in this basin will be a result of a combination of Project-related activities, including the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies (Section 7.3.3). Water yields of Lake B2 will be permanently reduced from the combination of a permanent reduction in drainage area (upstream of Lake B4) and diversion of the P watershed, but reduction will typically range from -36.7% to -31.3% (Table 7.5-31; Section 7.3.3). The reduction in annual water yields will vary until closure based on the development of infrastructure. At post-closure, the permanent annual water yield of Lake B2 and outlet will be reduced by 19.3% from baseline.

Permanent changes to LSA lake and land areas of the B Basin sub-watersheds at post-closure from permanent infrastructure will include the follwing:

- a net increase in sub-watershed area, including a net increase in lake and land areas in the Lake B5 sub-watershed due to the Tiriganiaq Pit, Wesmeg #1 Pit, B7 waste rock storage facility, and TSF. This includes the B7 sub-watershed which will be part of the B5 sub-watershed at post-closure;

- a net increase in sub-watershed area, including a net increase in lake and land areas in the Lake B46 sub-watershed due to the Pump pits, and B4 waste rock storage facility;
- a net decrease in sub-watershed area, including a net decrease in lake and land areas in the B4 sub-watershed due to the B4 waste rock storage facility; and
- a net increase in sub-watershed area, including a net increase in lake and land areas in the B2 sub-watershed due to the B4 waste rock storage facility.

The B2 Lake is a relatively large lake in the LSA (49.4 ha), and is characterized by a mean maximum depth of 3.4 m, which indicates a potential to support overwintering habitat (Section 7.5.4). The permanent reduction in water yields is predicted to reduce water levels by less than 6.5% just prior to freeze-up in September and October (Table 7.5-31). The lake is also positioned at a relatively low elevation compared to Meliadine Lake (only 2.8 m higher), and therefore it is likely that the lake outlet provides adequate passage for upstream movements of Arctic char (derived from data in Section 7.5.4; Appendix 7.5-B; Appendix 7.5-D). Baseline studies show that the lake supports habitat for Arctic char, as well as lake trout and Arctic grayling (Section 7.5.4). Water levels at the outlet of Lake B2 are predicted to be reduced by no more than 3.9% during the summer months (Table 7.5-31).

In summary, the permanent reduction in annual water yields will result in a measurable reduction in habitat quantity for Arctic char, lake trout and Arctic grayling in Lake B2 by no more than 1.8% during construction and operations phases, and by 2.8% during post-closure. It is assumed that the estimated effect to habitat in Lake B2 will be similar to, or greater in magnitude than that for the outlet stream of Lake B2.

### H Basin: Lake H1 Outlet

The H Basin is a relatively small basin in the LSA, with an area of about 2.2 $km^2$ at the outlet of Lake H1. Potential effects in eth basin will be a result of a combination of Project-related activities, including the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies (Section 7.3.3). Lake H1 outlet (Stream H0-1) will be isolated from most of its contributing areas from the Pre-production phase until closure with very little flow (reduced by over 96.0%).

Lake H1 outlet is characterized by patchy areas of gravel substrate and defined channel banks owing to longer periods of flow during snowmelt and after precipitation events. The stream likely provides spawning and rearing habitat for Arctic grayling from Meliadine Lake. Arctic grayling was the only valued fish species identified during baseline sampling (Section 7.5.4). At post-closure, annual water yields are predicted to be reduced by about 37.9% during the summer months (Section 7.3.3). However, Lake H1 outlet is a relatively small stream, representing less than 0.3% of Arctic grayling streams in the LSA (i.e., the stream is only 28 m in length).

Permanent infrastructure will result in reduced annual water yields post-closure compared to baseline (by approximately 15.1%). Permanent infrastructure effects will include a net increase in sub-watershed area, including no changes in standing water area, and a net increase in land area in the H1 sub-watershed due to the Tiriganiaq Pit and infilled Lake H20 and Lake H19. Downstream changes in hydrology to Lake H1 and outlet will not affect Arctic char and lake trout, but may result in residual effects for Arctic grayling.

In summary, the permanent reduction in annual water yields will potentially result in a measurable reduction in habitat quantity for Arctic grayling in the Lake H1 stream outlet (i.e., Stream H0-1) by about 96% during

construction and operation phases, and by about 15.1% at post-closure. It was assumed that annual water yield was a reliable, but conservative surrogate for measuring Arctic grayling habitat.

#### 7.5.6.2.3 Downstream Effects to Water Quality in Local Study Area Sub-Basins

- **Release of mine wastewater and sewage may cause changes to surface water quality and sediment quality (i.e., nutrient and metal concentrations), affecting habitat quality, lower trophic communities and the survival and reproduction of Arctic char, lake trout, and Arctic grayling in Meliadine Lake**

Parameters of potential concern in the mine wastewater and sewage effluent (see Appendix 7.4-A) were assessed at the edge of the proposed mixing zone in Meliadine Lake. Predictions were compared to water quality guidelines (CCME 2012a; Health Canada 2010), as well as to baseline concentrations (Section 7.4.4). At the edge of the mixing zone, all parameters, except cadmium, are less than the guidelines. However, the exceedance of cadmium concentrations above guidelines does not automatically imply unacceptable or harmful conditions. Background concentrations of cadmium in Meliadine Lake are more than CCME guidelines for the protection of aquatic life, in part, because of the low hardness of water in Meliadine Lake. It is assumed that guideline exceedances observed during baseline investigations are a result of naturally occurring conditions and thus are not of concern as local flora and fauna will be adapted to these natural conditions in the environment. Further, it is predicted that the addition of effluent will not increase concentrations of cadmium at the edge of the mixing zone to levels higher than that recorded during baseline. Concentrations of cadmium at the edge of the mixing zone are predicted to be within the range of baseline conditions.

Based on water quality predictions at the edge of thee mixing zone (Section 7.4.4), no adverse effects to plankton or benthos are predicted in Meliadine Lake. However, some increases are predicted in concentrations of nutrients. Maximum nitrogen concentrations (ammonia and nitrate) at the edge of the mixing zone are predicted to be 5 to 10 times higher than background concentrations. Maximum phosphorus concentration is predicted to remain similar to the baseline concentration, indicating that a measurable increase in primary productivity is unlikely in Meliadine Lake near the diffuser. Phosphorus generally is the limiting nutrient for primary production in most Canadian Shield lakes (Schindler 1974), because of its scarcity in bedrock and overburden in Shield watersheds and efficient retention by upland forests and wetlands (Allan et al. 1993; Devito et al. 1989 cited in Steedman et al. 2004).

The predicted increase in nitrogen concentration beyond the mixing zone boundary may result in a phytoplankton community shift toward increased dominance by species or groups that can take advantage of the elevated nitrogen concentration. Increased dominance of cyanobacteria (usually an undesirable change in algal communities) is not expected, because in the presence of increased available nitrogen concentrations, cyanobacteria, which can fix nitrogen, do not have a competitive advantage. Overall, the increased nitrogen concentrations near the diffuser are predicted to result in a shift in phytoplankton community structure, but the community structure will remain within baseline condition and phytoplankton productivity will remain unchanged. Because of the minor predicted effect on phytoplankton, non-measurable changes are expected on zooplankton and benthic invertebrates.

- **Air emissions (e.g., sulphur dioxide, nitrogen oxides) and fugitive dust deposition may change water and sediment quality in waterbodies of the LSA, affecting fish health and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Changes to the configuration of watersheds and flow paths from the Project footprint (may affect downstream water quality (e.g., metals, nutrients) in small lakes and streams, and affect aquatic health, lower trophic communities and habitat quality for Arctic char, lake trout, and Arctic grayling**
- **Permanent changes to the configuration of watersheds and flow paths may affect downstream water quality (e.g., metals, nutrients) in small lakes and streams, and affect aquatic health, lower trophic communities and habitat quality for Arctic char, lake trout, and Arctic grayling**

Physical alterations of watersheds and deposition of windborne particulates from Project facilities and exposed lake beds may result in a change in water quality and sediment quality. Changes in flowpaths that may result in erosion and related changes in suspended sediment were discussed under minor pathways because erosion and sedimentation can be managed through best management practices and are not expected to contribute to residual effects to fish habitat or abundance and distribution of valued fish species. Through this assessment, downstream changes in water quality considered the influences from hydrological processes associated with the alteration of watershed size and evaporative processes, as well as from the deposition of fugitive particulate matter, metals and acidifying material.

The assessment of these pathways together represents the manner in which the water quality parameters were modelled. This assessment is separate from that of the pathway evaluating the release of mine wastewater because this assessment covers flow and management of non-contact water. In accordance with SD 2-6 Surface Water Management Plan, contact water will be contained on the mine site and directed to the attenuation ponds; there will be no accidental releases of contact water at downstream locations, including the small lakes.

Predictions were compared to water quality guidelines (CCME 2012a; Health Canada 2010), as well as to baseline concentrations (Section 7.4.4). Observed baseline values for a suite of parameters exceeded guidelines in a number of waterbodies in the LSA (Section 7.4.6). Observed maximum concentrations of TDS, TSS, chloride, nitrate, cadmium, copper, iron, lead, manganese, mercury, selenium, silver, tin, and zinc were above guidelines, and observed median concentrations of cadmium were above guidelines. However, it is predicted that the proposed Project will not elevate these concentrations beyond the range of baseline values for almost all of the LSA lakes during construction, operation and post-closure phases. Habitat quality for Arctic char, lake trout, and Arctic grayling will generally remain within mean baseline values (within 10%), with the exception of Lake A1, B6 and CH6 (i.e., Chickenhead Lake) where cadmium, copper, lead, mercury, and silver were identified as constituents of potential concern during the operations to closure phases. Cadmium, copper, and mercury were identified as chemicals of potential concern at post-closure (see Table 7.4-23 in Sction 7.4.6.2). However, concentrations of cadmium, lead, mercury and silver were below concentrations associated with no adverse health effects (i.e., toxicity benchmarks). That is, hazard quotients (HQs) were less than the target of one in the risk assessment (Section 10.1.8). Predictions for copper in Lake CH6 during operations and closure were greater than concentrations associated with no adverse health effects (i.e., toxicity benchmarks). In

Lake CH, potential effects to fish and fish habitat were noted because HQs were greater than one, but less than 10.

The water quality model predicted concentrations of TSS and nitrate nutrients in the small lakes during all mining operations phases, plus closure, and post-closure (Appendix 7.4-A). Predicted future concentrations were compared to the baseline modelled concentrations. Based on the water quality model results, TSS is not predicted to increase to concentrations that would affect fish habitat quality (i.e., it is predicted that concentrations will be less than guidelines, or less than a 10% difference from baseline conditions) in any lake. Similarly, nitrate is not predicted to increase to concentrations that would affect fish habitat quality (i.e., it is predicted that concentrations will be less than guidelines, or less than a 10% difference from baseline conditions). Changes to sediment quality as a result of nutrient input from blasting activities are not expected since changes to nitrate in water are not expected.

For parameters without guidelines, a number of them are predicted to increase beyond baseline values in the small waterbodies of the LSA during the construction and operations phases. Small waterbodies where changes are expected include Lakes A1, B5, B46, B45, P2, B2, D7, D4, D1, I1, CH6, CH5, CH10, and CH1 (Section 7.4.6.2). The parameters that will show changes in concentrations will include nutrient parameters such as total Kjeldahl nitrogen (TKN), total dissolved phosphorus (TDP), and soluble reactive phosphate, and metal parameters, such as beryllium, bismuth, chromium, cobalt, lithium, magnesium, strontium, titanium, tungsten, and vanadium. At post-closure, concentrations of these constituents are predicted to return to baseline conditions.

The trophic status of most of the small waterbodies is oligotrophic with an average TDP concentration of 5 µg/L. Under baseline conditions, the small waterbodies in the LSA are phosphorus-limited. Results of water quality modelling of the small waterbodies suggest that construction and operation of the proposed Project will increase the concentrations of both nitrogen and phosphorus (Appendix 7.4-A). There will be larger inputs of nitrogen, increasing the nitrogen to phosphorus ratio; however, the trophic status of the lakes will remain in the oligotrophic category. Therefore, effects to lower trophic communities are predicted to be minor, in the form of a small increase in productivity reflected in small increases in biomass of plankton and benthic invertebrates relative to baseline levels. At closure and post-closure, the concentration of phosphorus will remain similar to construction and operation, and the concentration of nitrogen will decrease to near-baseline levels, with a corresponding decline in primary productivity to the baseline level.

#### 7.5.6.2.4 Reclaimed Habitat Quality in Flooded Pits

- **Water quality concentrations in flooded pits may be elevated above baseline concentrations for small lakes in the LSA (e.g., metals, nutrients), and if reconnected to pre-construction flow paths may affect downstream water and sediment quality, affecting fish health, lower trophic communities and habitat quality for Arctic char, lake trout, and Arctic grayling**

At closure the open pits will be actively filled with water from Meliadine Lake. During filling, the reclaimed open pits will be reconnected to adjacent waterbodies by flooding and constructed channels to downstream locations (SD 2-17 Mine Closure and Reclamation Plan). As part of the mine water balance model, predictions were made for water quality in the newly reclaimed pit lakes for both the filling period at closure and for long-term summer conditions at post-closure (SD 2-6 Surface Water Management Plan). Note that predictions for reclaimed pit lake water quality have been made assuming fully mixed conditions.

Based on the initial pit lake predictions, water quality for all parameters except copper in Tiriganiaq Pit Lake will be below CCME aquatic life guidelines. Long-term average total copper levels in Tiriganiaq Pit Lake are predicted to be 0.0028 milligrams per litre (mg/L) and above the CCME guideline assuming water hardness of 30 mg/L. Predicted concentrations of copper may be approaching harmful concentrations (about 0.002 mg/L for dissolved copper) that inhibit olfaction for fish, specifically the physiological responsiveness of olfactory receptor neurons (Tierney et al. 2010). Thus, effects to survival could potentially manifest during the juvenile life stage if sensory responsiveness is impaired in copper exposed juveniles. Excessive exposure to elevated copper concentrations could result in the loss of alarm behaviour reactions to predators. In Section 10.8.1, potential effects to fish and fish habitat from elevated copper concentrations were noted given that HQs were greater than one, but less than 10.

The predicted long-term copper concentration is only slightly above the CCME guideline and is not expected to adversely influence the development of lower trophic communities. The CCME guideline is conservative and does not consider the potential for water quality characteristics other than hardness (e.g., dissolved organic carbon) to reduce bioavailability and ameliorate copper toxicity. In addition, the CCME guideline is based on toxicity tests with naïve organisms (i.e., individuals from populations naturally exposed to only low concentrations of a constituent), whereas organisms potentially inhabiting the pit lake may have some degree of tolerance to copper.

The general lack of predicted water quality guideline exceedances in pit lakes after filling indicates that the pit lakes would be suitable as aquatic habitat for benthic invertebrates, zooplankton, phytoplankton and periphyton. The low nutrient input into the pit lakes may result in slow colonization of aquatic communities, including periphyton and phytoplankton. The modelled results for phosphorus and nitrogen are low, indicating a low nutrient load and ultra-oligotrophic to oligotrophic conditions, which is typical of surrounding natural lakes and Meliadine Lake.

#### 7.5.6.2.5 Effects of Increased Access on Valued Fish Species in the Meliadine Lake-River System

- **Increased access from the AWAR may lead to increased mortality of valued fish species in the Meliadine Lake-River system, as well as for streams crossed by the AWAR, affecting their abundance and distribution, and the continued opportunities for harvesting by traditional and non-traditional users**

The Rankin Inlet community supports the AEM proposal of constructing a 2-lane, open access AWAR, as well as a spur road and boat ramp at the southeast end of Meliadine Lake (FEIS Volume 9, Appendix 9.3-A). The road and boat ramp will provide improved access to the lake. Meliadine Lake is an important lake for fishing for residents of Rankin Inlet. Meliadine Lake is a popular fishing location, particularly for Arctic char, in the late winter and springtime, and is a popular fishing spot during the local fishing derby (FEIS Volume 9, Appendix 9.3-A). The lake also supports a number of cabins identified along the shore of Meliadine Lake southeast of the F Zone deposit, and along the shore of Meliadine Lake northwest of the Tiriganiaq deposit. The proposed route has seen considerable use during the past 30 years as it follows a traditional all-terrain vehicle trail. The route includes distinct trails worn through the vegetation into the soil, especially in wetlands, along with debris left behind by travellers and those hunting or camping in the area.

Although the increased access to Meliadine Lake and region will improve continued opportunities for harvesting by traditional and non-traditional users, the increased access due to the AWAR may elevate fishing pressure on the Meliadine Lake-River system. Elevated fishing pressure (and related reductions in survival) could result in potential adverse effects on the abundance and distribution of Arctic char, and continued opportunities for harvesting. To reduce the potential for overharvesting of fish along the AWAR, AEM staff and contractors will not be permitted to fish while on rotation at the mine site. This, along with the ability of the regulators to implement management regulations to limit harvesting, should protect the fisheries resources in Meliadine Lake and River. If deemed necessary by the local Hunters' and Trappers' Organization and Fisheries and Oceans Canada, access could be controlled. There may be some non-Project related increases in fishing pressure above baseline conditions, where baseline conditions include a region currently accessible to local residents along all-terrain vehicle trails. The incremental increase in fishing harvest (and reduction in survival) for adult Arctic char from the proposed Project is expected to be measurable but within the limits of existing baseline conditions for the population.

In contrast to increment effects of the proposed Project, the cumulative impacts to fish survival from improved access due to historical, existing, and foreseeable developments in the region is much more difficult to predict. The largest potential influence could be from access provided by the proposed all season road connecting Rankin Inlet to communities to the south in Manitoba (the Manitoba to Nunavut Road). But given the relatively low level of accessibility and development in the region, and if excluding effects from the commercial fishery, cumulative effects on Arctic char survival are expected to be either within or just beyond the limit of historical baseline conditions. The prediction was assumed to be overly conservative and an overestimation of cumulative effects from harvests at the regional scale.

Impacts for valued fish species other than Arctic char are anticipated to be small in magnitude, in part because they are less sought after within the LSA waterbodies. For example, lake trout are often caught in areas outside the LSA, such as Landing Lake, and at the outlet to the Char River, which itself has been reported as offering good grayling fishing, and char fishing during the char runs (see FEIS Volume 9, Section 9.3). Although LSA Stream M23.7 contains a small, but viable self-sustaining Arctic grayling population, the stream crossing is located in close proximity to the Project footprint and non-Project related access will not be permitted without special permission. The remaining streams to be crossed by the AWAR are ephemeral in nature and of lesser concern because they do not support catchable-sized adults for consumption. Thus, it is expected that excessive fishing pressure because of the AWAR will not occur and that effects will not be measurable for the abundance and distribution of lake trout and Arctic grayling.

### *7.5.6.3 Residual Effects Summary*

#### Direct Effects to Habitat

Residual effects to habitat include direct losses from the Project footprint, as well as indirect losses related to downstream changes in flows and water quality. The majority of changes will be a direct result of the Project footprint on stream and lake habitat in Basin A, B, and H. In total, construction and operation phases of the Project will potentially result in residual effects to 82 small ponds/lakes and about 7.2 km of small streams within the LSA. The total area of lake and pond habitats to be directly altered or destroyed because of the Project is about 474 ha. Approximately half this area will be permanently affected; however the majority of the affected area consists of pond habitat (i.e., waterbodies with less than 2 m maximum depths). Most of the pond

waterbodies supported only ninespine stickleback, a species that is uncommon to Meliadine Lake, and rarely found in the diet of fish that reside there. Residual effects to Meliadine Lake are anticipated to be minimal where there will be diffuser and water intake pipes as the only components of the Project footprint that interact with Meliadine Lake.

It is anticipated that effects to stream habitats will be larger than effects to lakes and ponds. Effects to waterbodies supporting VECs, at the scale of the LSA, are anticipated to be less than 1% for Arctic char and lake trout, and 3.2% for Arctic grayling; whereas effects to streams are anticipated to be 19.2% for Arctic char, 16.4% for lake trout, and 18.6% for Arctic grayling. However, it is likely that anticipated effects to streams are overestimated because streams were characterized as footprint streams, supporting a VEC even though the use of that stream is likely rare. Further, almost half of the changes to habitat are potentially reversible by post-closure when stream connections are restored and areas are re-flooded. At the scale of the RSA, cumulative effects of the proposed Project, combined with historical, existing, and reasonably foreseeable developments on habitat was predicted to be within the limits of historical baseline conditions given that relatively low level of development in the region.

The total number of HUs lost through alteration and destruction of habitat during construction and operation phases was calculated to be 73.0 HUs for lake habitat and 373 HUs for stream habitat. The total number of lake habitat units gained through alteration of existing lake and pond habitat and development of new habitat under existing terrestrial cover during post-closure was calculated to be 138.2 HUs. The stream losses will be compensated mainly by gains associated with construction of new diversion channels (corresponding to 614 HUs). For example, effects to streams will be mitigated by maintaining a hydrological connection to Meliadine Lake using diversion channels (Table 7.5-17) designed in consultation with DFO and under specifications derived from the scientific literature describing stream passage of Arctic char, lake trout, and Arctic grayling.

### Indirect Effects to Habitat

In addition to direct habitat losses from the footprint, the construction and operations phases of the Project will result in residual effects to downstream flows, potentially affecting fish habitat quantity. Effects will be a result of a combination of Project-related activities, including the dewatering of waterbodies, infrastructure development, and the diversion of waterbodies. The magnitude and direction of these effects depend on the type and timing of upstream Project activities, and thus, vary over time. Residual effects to water quantity include reductions to water levels in Lake B2 and outlet, and Lake A1 and outlet where the majority of changes occur during construction and operations. The availability of Arctic char, lake trout, and Arctic grayling will be affected (less than 3% decrease in area per Lake B2 and Lake A1), but the majority effects should be reversible returning to the limits of baseline values for those systems at post-closure. In addition to Lake B2 and Lake A1, the Lake H1 outlet, a 28-m stream section, will essentially disappear during construction and operation, returning to a state at, or just below baseline conditions at closure. The implication of this loss should be minimal. The near complete removal of the H1 outlet, an Arctic grayling stream, represents an incremental loss of only 0.3% of streams that support Arctic grayling in the LSA.

Residual effects to habitat quality (e.g., nutrient and metal concentrations) in Meliadine Lake and small waterbodies in the LSA are also expected, but will be minimized based on the mine design. For example, all contact water will be contained on the site and directed through ditches and channels to attenuation ponds or the TSF (SD 2-6 Surface Water Management Plan). Based on the conceptual diffuser design, and the mine site water quality and quantity assessment, it is predicted that there will be a measurable change in water quality, but

that no parameters will exceed CCME guidelines and predicted values should remain within 10% of the limits of baseline conditions. Modelling showed that concentrations of nitrogen (ammonia and nitrate) are expected to increase at the edge of the mixing zone in Meliadine Lake (Appendix 7.4-A). Here, the increased nitrogen concentrations near the effluent diffuser are predicted to result in a shift in phytoplankton community structure, but the community structure will remain within the range of values for baseline conditions and phytoplankton productivity will remain unchanged.

In the small watersheds surrounding the mine operations, changes to water quality could result from diversion of water; changes in watershed size and contributing areas; natural hydrological processes; evaporation; and aerial deposition of particulate matter (modelled as TSS), nutrients from blasting activities (modelled as nitrate), and metals (modelled by individual metal parameters). Aerial deposition from mine activities will increase from background levels during Pre-production, peak during open pit development, and decrease to background levels by closure. Based on these potential inputs and changes to non-contact water, it is predicted that the proposed Project will not elevate concentrations of any metals (within CCME guidelines) beyond the range of baseline values for almost all of the LSA lakes during construction, operation and post-closure phases. Habitat quality for Arctic char, lake trout, and Arctic grayling will generally remain within the range of baseline values with the exception of Lakes A1, B6 and CH where cadmium, copper, lead, mercury, and silver were identified as constituents of potential concern during operations to closure phases. Cadmium, copper, and mercury were identified as constituents of potential concern during post-closure (see Table 7.4-23 in Section 7.4.6.2). However, concentrations of cadmium, lead, mercury and silver were below concentrations associated with no adverse health effects to fish (i.e., toxicity benchmarks). That is, HQs were less than the target of one in the risk assessment (Section 10.1.8). Predictions for copper in Lake CH6 (Chickenhead Lake) during operations and closure were greater than concentrations associated with no adverse health effects (i.e., toxicity benchmarks). HQs were greater than one, but less than 10 in the risk assessment for copper.

Water quality modelling also showed that the construction and operation of the proposed Project will increase the concentrations of both nitrogen and phosphorus. However, the trophic status of the lakes will remain in the oligotrophic category. Therefore, effects to lower trophic communities in the small lakes are predicted to be minor, in the form of a small increase in productivity, reflected in small increases in biomass of plankton and benthic invertebrates relative to baseline levels.

In summary, residual effects to fish habitat (from indirect and direct pathways combined) for Arctic char, lake trout, and Arctic grayling are expected, although changes should be either within or slightly exceed the limits of baseline values at scale of the LSA based largely on the habitat assessment (<20% magnitude). The potential increases in nutrient concentrations in waterbodies in the LSA, may contribute to the possibility that the resulting fish community composition is different than what exists currently. For example, there may be increased growth and production of forage species for Arctic char, lake trout, and Arctic grayling. The duration of the majority of effects to habitat will approximate the duration of the proposed Project and AWAR, from construction to the end of the closure phase. Some effects will be permanent, for example, those from footprints of the TSF and waste rock storage facilities. The spatial extent of effects may extend to the RSA, including the Meliadine River. However, it is predicted that there will be much smaller changes on the habitat for Arctic char, lake trout, and Arctic grayling at the population-scale (i.e., the RSA versus at the LSA level) from either the Project or the Project combined with cumulative effects from historical, existing, and reasonably foreseeable developments.

### Effects to People

Fishing is an important part of the Inuit way of life, accounting for as much as 20% of the diet of the residents of Rankin Inlet and Chesterfield Inlet. Most of the lakes in the general Meliadine Lake area are fished for lake trout and Arctic char (Nanuk Enterprises 1999). Study participants in Rankin Inlet referred to Meliadine Lake as a popular fishing location in the late winter and springtime. Holes are bored in the lake ice during spring to facilitate ice fishing. The lake is also host to family fishing events held by the Kivalliq Counselling and Support Services, and is a popular fishing spot during the local fishing derby. Elders have suggested that mining activities may affect some fishing areas, such as those in Meliadine Lake, and any damage to Meliadine Lake would elicit great concern. Some community members were concerned about impacts to Meliadine River as well (Volume 9, Section 9.3.1.3.2). IQ

A measurable change in the abundance and distribution of Arctic char, lake trout, and Arctic grayling is predicted at the scale of the LSA, which includes Meliadine Lake. This change may influence the availability of fish for harvesting for traditional and non-traditional users. The magnitude of the decrease from the Project on fish populations is expected to be either within or just exceeding the range of existing conditions. Although there will be measurable effects to fish distributions that exceed existing baseline conditions, the anticipated overall decrease in the availability of fish for harvesting is predicted to be within the range of baseline values. People that fish in the LSA should not observe a change in the availability of fish with the application of the proposed Project. Natural changes in population sizes and distributions will have an overwhelming influence on the continued opportunities for traditional and non-traditional users.

The Project will also result in improved access to waterbodies along the AWAR, as well as to Meliadine Lake; a population fishing destination for traditional and non-traditional anglers. The Discovery spur road and boat ramp at the southeast end of Meliadine Lake is supported by the local community. However, increased angler access may lead to overharvesting and effects to local populations of fish, particularly Arctic char in Meliadine Lake. To reduce the potential for overharvesting along the AWAR, AEM staff and contractors will not be permitted to fish while on rotation at the mine site. This mitigation and the ability of the regulators to implement management regulations to limit harvesting, should protect the fisheries resources in Meliadine Lake and River.

In summary, residual effects to people are expected, although incremental Project-related changes to fish abundance and distribution and opportunities for traditional and non-traditional users should be within range of baseline values at the local scale (<10% magnitude). The duration of the majority of effects will approximate the duration of the Project and AWAR, from opening to closure of the road. Effects from increased harvests could persist beyond the closure and decommissioning of the AWAR, but should diminish shortly thereafter. Although the spatial extent of Project-related effects may extend to the RSA, including the Meliadine River systems, the magnitude of the incremental or cumulative effect at the RSA-scale (i.e., at the population scale) is anticipated to be much lower than that described for incremental changes at the local level. Therefore, people that fish in the region should not observe a change in fish availability due to Project effects.

## 7.5.7 Residual Impact Classification

The purpose of the residual effect classification is to describe the residual effects from the Project on fish and fish habitat using a scale of common words, rather than numbers or units. The use of common words or criteria

is a requirement in the Guidelines (NIRB 2012a). The following criteria were used to assess the residual effects from the Project (Table 7.5-32):

- direction;
- magnitude;
- geographic extent;
- duration;
- reversibility;
- frequency; and
- likelihood.

### 7.5.7.1 Methods

The term “effect”, used in effects statements, has been changed to “impact” in this section on Residual Impact Classification. The term “impact” is only used during the classification process. Therefore, in the Residual Impact Classification section, all residual effects are discussed and classified in terms of impacts to valued ecosystem component endpoints (see Table 7.5-1). As noted in Section 7.5.2, assessment endpoints for fish habitat, Arctic char, lake trout, and Arctic grayling, include the following:

- fish habitat units;
- abundance;
- distribution; and
- continued opportunities for traditional and non-traditional users.

Generic definitions have been provided for each of the impact criteria in the Assessment Approach (FEIS Volume 4, Section 4.0). For criteria such as frequency and likelihood, the definitions can be applied consistently across all assessment endpoints (Table 7.5-32). Similarly, reversibility is defined as the likelihood and time required for a component (e.g., population) or system to recover after removal of the stressor and is a function of resilience. Reversibility is applied to all combinations of magnitude, geographic extent, and duration.

**Table 7.5-32: Definitions of Criteria Used in the Residual Impact Classification of Pathways**

| Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Likelihood |
|---|---|---|---|---|---|---|
| **Negative:** a less favourable relative to baseline values<br><br>**Positive:** an improvement over baseline values or conditions | **Negligible:** no predicted detectable change from baseline values<br><br>**Low:** impact is predicted to be within the range of baseline values<br><br>**Moderate:** impact is predicted to be at or slightly exceeds the limits of baseline values<br><br>**High:** impact is predicted to be beyond the upper or lower limit of baseline values so that there is likely a change of state from baseline conditions | **Local:** small-scale direct and indirect impacts from the Project (e.g., footprint, and dust deposition)<br><br>**Regional:** the predicted maximum spatial extent of combined direct and indirect impacts from the Project that exceed local-scale effects (can include cumulative direct and indirect impacts from the Project and other developments at the regional scale)<br><br>**Beyond Regional:** cumulative local and regional impacts from the Project and other developments extend beyond the regional scale | **Short-term:** impact is reversible at end of construction<br><br>**Medium-term:** impact is reversible at end of closure<br><br>**Long-term:** impact is reversible within a defined length of time beyond closure<br><br>**Unknown**: Impact may be reversible however the length of time cannot be defined<br><br>**Permanent**: impact will last into perpetuity | **Isolated:** impact confined to a specific discrete period<br><br>**Periodic:** impact occurs intermittently but repeatedly over the assessment period<br><br>**Continuous:** impact will occur continually over the assessment period | **Reversible:** Impact will not result in a permanent change of state of the population compared to “similar” environments not influenced by the Project<br><br>**Irreversible:** impact is not reversible (i.e., duration of impact is unknown or permanent) | **Unlikely:** the impact is likely to occur less than one in 100 years<br><br>**Possible:** the impact will have at least one chance of occurring in the next 100 years<br><br>**Likely:** the impact will have at least one chance of occurring in the next 10 years<br><br>**Highly Likely:** the impact is very probable (100% chance) within a year |

The scale of classifications for magnitude, geographic extent, and duration is dependent on the assessment endpoints for Arctic char, lake trout, and Arctic grayling, and the associated effects statement. To provide transparency in the FEIS, the definitions of these scales are specifically based on fish and fish habitat.

### Magnitude

Although professional judgement is inevitable in some cases, a strong effort was made to classify predicted changes using scientific principles, supporting evidence, and a conservative approach where uncertainties exist. Where quantitative values were available (e.g. habitat loss), the magnitude of an effects pathway for fish and fish habitat was determined as follows:

- negligible: no detectable change from the Project relative to baseline values;
- low: less than, or equal to 10% change from the Project relative to baseline values;
- moderate: 11 to 20% change from the Project relative to baseline values; and
- high: more than 20% change from the Project relative to baseline values, and there is likely a change of state from baseline conditions.

The proposed scale is consistent with the 20% rule for the severity of effects from chemical exposure on varying spatial scales of ecological effects (i.e., a 20% change in a measurement endpoint constitutes an ecological effect) (Suter et al. 1995; Munkittrick et al. 2009). The scale is also consistent with and below thresholds identified by empirical and theoretical work on the relationship between loss of suitable habitat and the likelihood of population decline (Andrén 1999; Fahrig 1997; Mönkkönen and Reunanen 1999; Flather and Bevers 2002).

### Geographic Extent

The spatial extent for the determination of percent change in measurement endpoints and the effect analysis in general represents the maximum area used for the assessment and is related to the spatial distribution and movement (i.e., population boundary) of fish. However, the geographic extent of impacts can occur on a number of scales within the spatial boundary of the assessment. Local-scale impacts mostly represent incremental (Project-specific) changes to population abundance and distribution that are directly related to the Project footprint and activities (e.g., physical disturbance to lakes [habitat], and mortality of individual animals). For fish and fish habitat, local-scale impacts also include indirect effects such as downstream sedimentation of stream substrates, and are intended to capture the predicted maximum extent of incremental impacts to the physiochemical environment.

In contrast to the local scale, the regional scale is intended to capture both incremental and cumulative impacts from the Project as well as historical, existing, and reasonably foreseeable developments on abundance and distribution at the population scale. The spatial extent of the RSA considered the potential range relevant for the dynamics of populations of Arctic char, lake trout, Arctic grayling and their movements (Section 7.5.4.4). For example, radio tracking of Arctic char demonstrated movements between Hudson Bay and Meliadine Lake, with many fish overwintering in Little Meliadine Lake. Beyond regional scale effects are associated with cumulative changes to populations that range over very large areas (e.g., barren-ground caribou), and were not considered for Arctic char, lake trout, and Arctic grayling.

### Duration

Duration has 2 components. It is the amount of time between the start and end of a Project activity plus the time required for the impact to be reversible.

By definition, impacts that are short-term, medium-term, or long-term in duration are reversible. Project activities may end at closure, but the impact on fish and fish habitat may continue beyond Project closure. Some impacts may be reversible soon after removal of the stressor, such as effects on air quality from equipment operation (e.g., medium-term impact).

For fish, the amount of time required for the impact to be reversed (i.e., duration of the effect) is presented in context of the number of life spans that may be influenced. The anticipated duration of effects can then be used to determine the number of human generations that may be affected by the related changes to traditional and non-traditional land use practices (e.g., harvesting). In this manner, the impact assessment links the duration of Project impacts on fish to the amount of time that human use of ecological resources may be influenced.

For impacts that are permanent, the duration of the effect is determined to be irreversible. An example of an irreversible impact includes the localized loss of lake habitat due to the open pits and waste rock storage facilities.

## *7.5.7.2 Results*

Direct impacts from the Project footprint will be local in geographic extent (Table 7.5-33). There are no other human developments in the LSA that will contribute a measurable change (i.e., cumulative effects) to available habitat. Effects to waterbodies supporting VECs, at the scale of the LSA, are anticipated to be moderate in magnitude for Arctic char, lake trout, and Arctic grayling, if the worst case scenario is observed. Impacts will be larger for streams than for lakes. However, it is likely that anticipated effects to streams are overestimated. Further, the majority of effects will be reversible at closure through progressive reclamation of lost aquatic habitat and the reconnection of natural flows and drainages using channels designed for fish passage. Fish habitat losses will be compensated as part of the Offsetting Plan for the Project (SD 7-4). The ratio of compensation habitat area to lost habitat area will exceed 1 and approach 1.6 to 1. Thus, the duration of the majority of direct impacts from the Project are expected to be medium to long-term. Time for a complete recovery of a population will depend on the species life history. In other words, it is expected that population recovery will be quicker for species with shorter life cycles. At the scale of the RSA, cumulative effects of the Project, combined with historical, existing and reasonably foreseeable developments on habitat was predicted to be within the limits of historical baseline conditions given the relatively low level of human development in the region. Predictions of magnitude for direct impacts to habitat are similar for those for direct and indirect impacts combined.

Indirect impacts from air emissions and non-contact water releases in the Project area will be local in geographic extent (Table 7.5-33). There are no nearby human developments that would contribute a measurable change to habitat quality in the LSA. The primary source of contaminants for the LSA lakes will be either in particulate form, as part of the accumulation of dust (i.e., total suspended particulate deposition) in runoff during construction and operations phases, or a product of natural hydrological processes, e.g., evaporation, that will follow anticipated changes to watershed areas and configuration. Effects to the abundance and distribution of Arctic char, lake trout, and Arctic grayling in the LSA will be minimized, in part because potential changes in habitat quality will be limited by the use of best management practices during the construction and operations phases.

The permanent placement of the TSF and waste rock storage facilities, and the changes to the watersheds that these developments represent, will have lasting impacts on downstream flows and water quality through post-closure. However, a key mitigation and environmental design feature commitment that will be implemented to limit changes in habitat quality will include the use of the smallest footprint deemed practical and minimal alteration of natural drainage areas and watershed boundaries. The magnitude of the impacts to water quality and fish habitat will be largest from changes to metals, specifically copper. The impacts of changes to copper concentrations will be localized to Lake CH6 (Chickenhead Lake) and Tirganiaq Pit. Predictions for copper in Lake CH6 during operations and closure, and in the Tirganiaq Pit during post-closure were greater than concentrations associated with no adverse health effects (i.e., toxicity benchmarks). HQs were greater than one, but less than 10 in the risk assessment for copper, suggesting that impacts will be low in magnitude for aquatic habitat and fish.

**Table 7.5-33: Summary of Residual Impact Classification for Incremental and Cumulative Effects on Abundance and Distribution of Arctic char, lake trout, and Arctic grayling and Related Effects to People**

| Effects Pathways | Direction | Magnitude | | Geographic Extent | | Duration | Frequency | Reversibility | Likelihood |
|---|---|---|---|---|---|---|---|---|---|
| | | Incremental | Cumulative | Incremental | Cumulative | | | | |
| Physical footprint from the mine site and AWAR decreases habitat quantity | Negative | Moderate | Negligible | Local | Regional | Medium to long-term | Continuous | Reversible to Irreversible | Highly likely |
| Permanent change in fish habitat following closure of the mine site and AWAR | Negative | Low | Negligible | Local | Regional | Permanent | Continuous | Irreversible | Highly likely |
| Improved access for harvesting fish can affect harvest and mortality rates | Negative | Negligible to low | Low to moderate | Local | Regional | Medium-term to long-term | Periodic | Reversible | Likely |
| Alteration of watershed areas and flow paths may reduce downstream flows (habitat quantity) | Negative | Low | Negligible | Local | Regional | Medium-term | Continuous | Reversible to Irreversible | Highly likely |
| Permanent alteration of watershed areas and flow paths may reduce downstream habitat quantity | Negative | Negligible | Negligible | Local | Regional | Medium-term | Continuous | Irreversible | Highly likely |
| Effluent discharge, air emissions, and changes to watershed area may affect downstream habitat quality | Negative | Negligible to low | Negligible | Local | Regional | Medium-term | Continuous | Reversible | Likely |
| Permanent changes to watershed areas may affect downstream habitat quality | Negative | Low | Negligible | Local | Regional | Permanent | Continuous | Irreversible | Likely |
| Reclaimed mine pit, flooded areas and downstream water (habitat) quality | Negative | Low | Negligible | Local | Regional | Long-term | Continuous | Reversible | Likely |
| Effects on abundance and distribution may change availability of fish for traditional use | Negative | Low | Negligible to Low | Regional | Regional | Medium-term to long-term | Periodic | Reversible | Likely |

The Project has considered a suite of environmental design features that will reduce impacts to fish and fish habitat from changes to water quality (SD 2-6 Surface Water Management Plan). Most importantly, contact water will be contained on the site and directed through ditches and channels to attenuation ponds or the TSF. Based on the conceptual diffuser design, and the mine site water quality and quantity assessment, it is predicted that impacts from treated effluent discharge to Meliadine Lake will be negligible. Fish abundances and the general condition of lakes in the LSA, including Meliadine Lake, should remain within the range of baseline values (i.e., impacts should be negligible to low). The structure and function of aquatic ecosystems, lower trophic communities and downstream ecosystems should remain intact given the low level of inputs of TSS, nutrients, and metals.

Impacts from treated effluent from the Project will be continuous over the duration of the assessment period, whereas impacts from air emission and dust deposition will be periodic (Table 7.5-33). Impacts from air emissions may be strongest and largely restricted to the period during and after the spring freshet. These impacts will be mitigated by the implementation and application of dust suppression practices, covering of active areas where feasible, and enforcement of speed limits on the Project roads. Although there is uncertainty associated with the anticipated time required for a complete recovery of aquatic habitat affected by treated effluent and fugitive dust, recovery should begin almost immediately and the condition of aquatic habitat and the abundance of fish will rapidly improve.

Indirect impacts to Arctic char, lake trout, and Arctic grayling also include those from changes to downstream flows, a result of flow diversions and watershed alteration in upper regions of the LSA sub-basins. Indirect impacts from downstream flows will be local in geographic extent (Table 7.5-33). The magnitude of impacts from changes to downstream flows to Arctic char, lake trout, and Arctic grayling will be low in magnitude at the scale of the LSA, and negligible for the cumulative impact assessment at the scale of the RSA, which includes the Meliadine River. Downstream impacts from changes to flows will be continuous over the duration of the assessment period, although the magnitude and direction of impacts vary and depend on the phase of the life cycle of the mine (Table 7.5-33). Although there is uncertainty associated with the anticipated time required for a complete recovery of the aquatic habitat in the LSA waterbodies, recovery should begin almost immediately and the condition or quality of fish habitat will rapidly improve. Almost all of the anticipated changes to fish and fish habitat from indirect impacts will be reversible at closure.

The cumulative impact assessment included existing angling pressures, and with the development of the AWAR, anglers would be able to make more use of vehicles (including snow machines) to access areas in the region. The spatial extent of incremental and cumulative impacts from the AWAR, and existing trails on fish populations in the region on changes in harvesting pressure is expected to be regional and include the Meliadine River (Table 7.5-33). But if current fishing pressure in lakes in the region is already low, as they should be given the low level of development in the RSA, then current fishing pressure is unlikely to be a significant limiting factor for populations of Arctic char, lake trout, and Arctic grayling. Should fishing on the AWAR reach a level of concern, the Rankin Inlet Hunters' and Trappers' Organization and Fisheries and Oceans Canada could enact regulations to control the harvest. Thus, it is expected that the incremental and cumulative increase in the harvest of fish due to improved access as a result of the AWAR will be similar to baseline harvesting values (negligible to low magnitude) (Table 7.5-33). The duration of impacts to fish from increased access is considered to be medium-to-long term. Recovery or reversibility of impacts on valued fish species will begin at the closure phase. However, the removal (or harvesting) of fish from the regional population may require one or two life spans prior to the full recovery of a self-sustaining population, the point at which the population reaches its maximum potential for

abundance and distribution. Impacts to fish populations from harvesting will likely be periodic (i.e., over summer and winter seasons).

Changes to the local abundance and distribution of fish populations from development may negatively influence the traditional and non-traditional harvesting of Arctic char, lake trout, and Arctic grayling. Across the identified pathways, the predicted magnitude of the incremental and cumulative impact from the Project on fish and fish habitat will generally be low in magnitude, but may range from low to moderately-sized impacts (Table 7.5-33). Therefore, the magnitude of changes to the harvesting potential of fish from the incremental and cumulative impacts from the Project and other developments are expected to be no worse than low at the scale of the RSA, but likely negligible given the low level of human developments and activities across the RSA. Although the Project may have a measurable impact on the local abundance and distribution of Arctic char, lake trout, and Arctic grayling, the increase in access from the AWAR may offset the perception of a change in the availability of fish for harvesting. Thus, people that fish in the region, should not observe a major change in the availability of fish due to impacts from the Project, relative to current natural changes in population sizes. The duration of the majority of impacts to Arctic char, lake trout, and Artic grayling is expected to be reversible in the long-term (Table 7.5-33). The closure and decommissioning of the AWAR at the end of the life of the mine will be an important influence of the timing for reversing impacts from the Project.

## 7.5.8 Environmental Significance

### 7.5.8.1 *Approach and Methods*

The evaluation of significance for biophysical VECs considers the entire set of pathways that influence a particular assessment endpoint. The relative contribution of each pathway is then used to determine the significance of the Project on assessment endpoints. For example, a pathway with a high magnitude, large geographic extent, and long-term duration would be given more weight in determining significance relative to pathways with smaller scale effects. The pathways that are predicted to have the greatest influence on changes to assessment endpoints are assumed to contribute the most to the determination of environmental significance.

Assessment endpoints for fish and fish habitat include the maintenance of the abundance and distribution of populations of Arctic char, lake trout and Arctic grayling and continued opportunity for traditional and non-traditional use of these fish species.

Quantitative and qualitative key factors were considered in the determination of environmental significance as follows:

- results from the residual impact classification of primary pathways;
  - magnitude, geographic extent, and duration (which includes reversibility) of the impact were the principal criteria used, with frequency and likelihood as modifiers; and
  - professional judgment and ecological principles, such as resilience, were used to predict the duration and associated reversibility of impacts.
- ecological or socio-economic context/value;
- historical, cultural, and archaeological significance of the geographic area likely to be affected by the Project; and

- value attached to the individual VEC, based on consultation with potentially affected communities and relevant individuals and organizations.

Environmental significance is used to identify predicted impacts that have sufficient magnitude, duration, and geographic extent to cause fundamental changes to aquatic habitat and fish. The following definitions are used for assessing the significance of impacts on fish habitat and the abundance and distribution of Arctic char, lake trout and Arctic grayling, and the associated continued opportunity for traditional use of fish.

**Not significant** – impacts are measurable at the individual level, and strong enough to be detectable at the population level, but are not likely to decrease resilience and increase the risk to population maintenance and opportunities for traditional and non-traditional use.

**Significant** – impacts are measurable at the population level and likely to decrease resilience and increase the risk to population maintenance and impact opportunities for traditional and non-traditional use. A number of high magnitude and irreversible impacts at the population level (regional scale) would likely be significant.

### 7.5.8.2 *Results*

Project pathways influencing the abundance and distribution of fish were determined to be negligible to moderate in magnitude, local to regional in geographic extent, and medium-term to permanent in duration (Table 7.5-33). The range in scales in the residual impact classification reflect the number of pathways and related mechanisms that were predicted to affect aquatic habitat and fish, specifically Arctic char, lake trout, and Arctic grayling. Pathways included direct impacts related to habitat quantity and fragmentation, indirect impacts from the Project on the quality of habitat (i.e., water quality), and direct impacts from increased harvest on survival. The probability of impacts occurring is predicted to be likely to highly likely for the Project pathways (Table 7.5-33), which does not change the expected magnitude and duration (or environmental significance). Similarly, the frequency of most impacts is anticipated to occur continuously throughout construction and operations, except for impacts associated with fish harvests. The majority of impacts will be reversible at or following closure. The HTO representatives from Rankin Inlet indicated that Meliadine Lake is an important lake for fishing for residents of Rankin Inlet. Several concerns were raised with respect to effects to fish from mining activities, and Elders expressed concern over the potential for mining activities to affect fishing in Meliadine Lake in particular. However, the incremental and cumulative impacts from the Project are predicted to not significantly influence the long-term maintenance of self-sustaining populations of Arctic char, lake trout, and Arctic grayling in the region. The scale of impacts from the Project pathways, independently or combined, should not be large enough to cause irreversible changes at the population level, nor decrease the resilience of the VECs. For example, permanent pathways, such as direct habitat loss, are associated with impacts that have a low magnitude at the local and regional scale for the incremental and cumulative cases, respectively. Downstream impacts from changes to water quantity and quality have a negligible-to low impact at the local scale, but the majority of impacts are likely to be reversible. Populations exposed to highly variable environmental conditions, such as that in the Canadian Arctic, can be characterized by individuals with a range of adaptations that allow them to maintain positive fitness over the long term. Without these adaptations, local populations of valued fish species would have been extirpated long ago. At the population level, the valued ecosystem components are not only resilient because individuals are likely well adapted to variable environments, but also because

IQ

demographic rescue from neighbouring populations or subpopulations is highly likely to occur in the event of an unforeseen disturbance.

The largest impact from the Project could be for Arctic grayling that move through and use aquatic habitats within a subset of LSA waterbodies in the A Basin, B Basin, and H Basin. As noted previously, Arctic grayling are important to communities for subsistence use. The proposed spatial extent at which the dynamics of the local population operate, based in part on baseline monitoring data that illustrate large movements of individual fish across multiple watersheds during their life history, would suggest that the impacted area is a very small proportion of the area or range for the population of species like Arctic char, lake trout, and Arctic grayling. Although there is a local change in the distribution of fish species, people that fish in the region, should not observe a major change in the availability of fish due to impacts from the Project, relative to current natural changes in population sizes. IQ

The HTO members also noted from fish migration patterns that mining did not appear to discourage Arctic char from using the Char and Meliadine rivers during the operation of the North Rankin Nickel Mine. Some community members were concerned about the potential effects of the Project on fish in the Meliadine River, while other Elders believe that the proposed location of the Project will not affect the river system, as it is not connected to the Project site. IQ

The incremental changes to the quantity, quality, and spatial distribution of habitats should not have a significant impact on the structure and function of fish populations and lower trophic communities (i.e. fish habitat) in the ecosystem relative to natural factors occurring over the same period of time and space. Therefore, the Project should not have a significant adverse impact on the continued opportunity for traditional and non-traditional use of fish in the local study area and beyond.

### *7.5.8.3 Uncertainty*

The purpose of this section is to identify the key sources of uncertainty and to discuss how uncertainty has been addressed to increase the level of confidence that impacts are not worse than predicted. Confidence in the assessment of environmental significance is related to the following elements:

- adequacy of baseline data for understanding current conditions and future changes unrelated to the Project (e.g., extent of future developments, climate change, catastrophic events);
- understanding of Project-related impacts on complex ecosystems that contain interactions across different scales of time and space (e.g., exactly how the Project will influence aquatic habitat and fish);
- water quality model inputs (see Section 7.4.4 and Appendix 7.4-A); and
- knowledge of the effectiveness of the environmental design features and mitigation for reducing or removing impacts (e.g., best management practices).

Like all scientific results and inferences, residual impact predictions must be tempered with uncertainty associated with the data and the current knowledge of the system. Ecosystems are complex, characterized by interactions across multiple scales, nonlinearity, self-organization, and emergent properties (Holling 1992; Levin 1998). These characteristics can confound our understanding of ecosystem processes and limit our capacity to make predictions, in part because of the fluctuation or variability of species population dynamics (e.g., persistence) and community assemblage structure (e.g., species turnover). Describing variation and

understanding factors that underlie variation in the ecology of valued components through time can be a common challenge in environmental assessment, particularly when there is a lack of information. Factors underlying variation might include stochastic processes (e.g., sampling effects) or deterministic processes (e.g., climate change effects, overharvesting, project-related).

Variability in fish information for the Project can be extracted and/or reviewed in Section 7.5.4, two previously completed baseline reports (SD 7-1 2009 Aquatics Synthesis Baseline; and SD 7-2 2011 Aquatics Baseline), as well as in Appendices 7.5-A to 7.5-H where all data collected for the Project have been presented in tables. In brief, fisheries data were collected during 10 years of sampling over a 16-year period from 1997 to 2012. The collection is substantial at both spatial and temporal scales and includes information on fish relative abundance, species distributions, habitat, species life history, and metals in tissue for a region where there is very little historical and existing development. There is a moderate-to-strong level of confidence that the data collected in the LSA provides the necessary baseline knowledge of species biology and environmental conditions for an environmental impact assessment. Also, the level of effort that was performed for the baseline considered both 'reliability' (i.e., confidence) in the data and the effect from sampling itself. Additional sampling efforts, particularly invasive methods (e.g., gill netting), would have resulted in more mortality, affecting the abundance and distribution of fish in the local study area (because of low productivity, slow growing populations).

With regard to the assessment for fish and fish habitat, it is important to note that all baseline information collected over the 16-year period and temporal variability in the baseline information were considered (see methods under general approach in Volume 7, Section 7.5.6.1). For example, in Lake A1, Lake A6, Lake B7, and Lake D1, the occurrences of Arctic char (ARCH), lake trout (LKTR), and Arctic grayling (ARGR) in the gill net catch were often consistent across sampling periods with some exceptions (Figure 7.5-36). Arctic char were captured in 1997, 1998, and 2000, but were not captured in 1999, 2009, and 2011. However, despite that char were absent in the catch during the most recent sampling years, Lake D1 was categorized as an Arctic char lake in the assessment (See Volume 7, Section 7.5.5.2 [minor pathways] and Section 7.5.5.3 [primary pathways]). This conservative approach took into consideration uncertainty potentially underlying baseline descriptions in making the impact predictions.

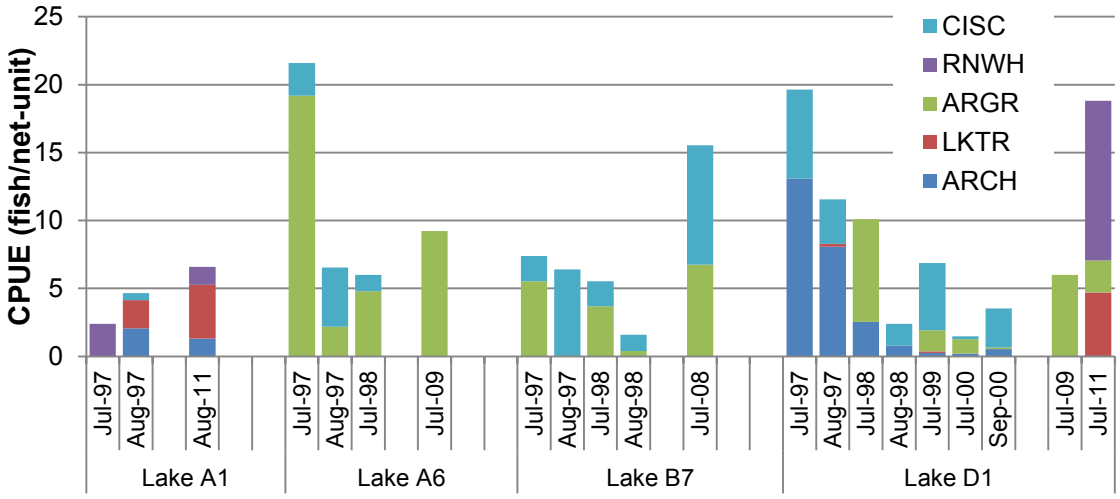



*Figure 7.5-36: Gill Netting Catch-Per-Unit Effort (CPUE) Per Species and Selected Lakes in the Local Study Area (LSA) for Sampling Periods from 1997 to 2011.*

Knowledge of fish life history requirements and local species distributions were also used in characterizing fish assemblages for the assessment (See Volume 7, Section 7.5.5.2 [minor pathways]and Section 7.5.5.3 [primary pathways]). This approach reduced uncertainty potentially underlying baseline descriptions and impact predictions. For example, in Section 7.5.6.1.1:

> "In some cases where a valued fish species was not recorded but potentially present and undetected during sampling, the waterbody under examination was deemed to support that species. Specifically, if a lake or stream upstream of given location supported Arctic char or lake trout, the downstream waterbodies were all characterized as Arctic char or lake trout habitat even if the species was undetected during sampling at the downstream location. The one exception to this rule applied to Lake B69 where a resident population of lake trout has been described. It was assumed that this population was self-sustaining and that the lake provided all life history habitat requirements (Section 7.5.4). It was also assumed that spawning potential for Arctic grayling, described as available gravel and suitable flow conditions, was a reliable predictor of streams used by Arctic grayling."

It is understood that development activities will directly and indirectly affect fish habitat, and fish behaviour and movement; however, long-term monitoring studies documenting the resilience of animals to development, and the time required to reverse impacts, are lacking. Direct disturbance from previous, existing, and future development footprints was calculated to be a small proportion of the region and the understanding of the success of mitigation policies and practices for limiting impacts to populations, communities and ecosystems has increased over the past decade; however, uncertainty remains surrounding the degree to which some effects may occur (e.g., magnitude and duration). A high degree of uncertainty also remains in the effectiveness of reclamation techniques for reversing the impact from direct changes to habitat.

While the creation of pit lakes from mining operations is common in temperate regions of Canada, this practice is relatively new to the north. To date, the only habitat compensation plans proposing re-flooding of excavated pits for use as fish habitat in the Northwest Territories or Nunavut are those proposed for the Diavik Diamond Mine (Diavik) and the Meadowbank Gold Project (Meadowbank). As a result, few observational studies examining fish populations or habitat suitability in Arctic pit lakes have been published to date. Nevertheless, the use of pit lakes for fish habitat in the north has historically been promoted (e.g., DFO 2003, DFO 2007), and Gammons et al. (2009) published a comprehensive review of considerations for the development of lakes from pits in the north.

Until further information is available from northern pit lakes, much can be interpolated from principles of limnology that apply in the south. Where pit lakes studies have been conducted, reports of the re-establishment of successful fish populations are available. For example, the ability of rehabilitated pit lakes at former coal mine pits in Alberta to support fish populations has been observed and discussed (Hatfield Consultants 2011, Brinker et al. 2011), and CEMA (2012) recently published a guidance document for developing pit lakes in the oil sands region. While the lack of information regarding the aquatic biology of northern pit lakes is recognized, a number of major factors will be considered during post-closure monitoring as part of the AEMP (SD 7-3).

Forecasting a future that may be outside the range of observable baseline environmental conditions is clearly challenging (because of climate change for example; Walther et al. 2002). Quantifying changes to habitat provides a static assessment of a species' environment, ignoring change that may occur over time as a result of ecological succession and natural disturbances such as climatic events. Thus, there is less certainty in long-term predictions of reversibility (e.g., over periods extending beyond 100 years). However, there is a high level of confidence that the regional landscape will be different with or without the Project in future decades, for example, because of climate.

Of particular concern for Arctic environments is climate change and the potential effects of climate on the ecology of the species that people rely on for cultural values and subsistence harvests. Climate has the potential to affect populations of fish directly (e.g., drought events), and the distributions of individual components of ecosystems may shift in different ways under different climate scenarios, generating potentially new combinations of species and ecosystem types (reviewed in Mawdsley et al. 2009). However, changes, particularly those from indirect effects, will be difficult to predict (e.g., bottom-up vs. top-down responses) (Krebs and Berteaux 2006).

Although there is uncertainty in the ability to forecast the course of climate change in coming decades and the ability to predict the biogeographic responses to climate change (Jackson et al. 2009), some research has suggested that climate and temperature changes have been, and will continue to be, key factors for changes in exposure to contaminant burdens for freshwater Arctic fish species (Carrie et al. 2010). Specifically, warmer temperatures combined with increases in precipitation may elevate heavy metal concentration in fish tissue (Barletta et al. 2012; Dijkstra et al. 2013). Uncertainty underlying the existing baseline for fish tissue chemistry will be addressed in future monitoring under the Aquatic Effects Monitoring Program (SD 7-3-; Table 2 and Section 7.5.9). The AEMP will be designed to address predicted impacts to the aquatic environment related to changes in surface water quantity and quality, sediment quality, aquatic life, fish habitat and fish health (including fish tissue chemistry).

The key point is that the magnitude, duration, and geographic extent of effects from the Project on the physical environment and demography of fish species are negligible relative to the temporal and spatial scales that are associated with climate change processes. The absolute magnitude of direct and indirect effects from the Project is also small and the long-term trajectory of the abundance and distribution of valued components will not be significantly affected by the Project. The relative contribution to changes may increase when environmental conditions are poor, but such events will likely be infrequent within the duration of the Project and the absolute effect size from the Project would remain negligible to low.

### 7.5.9 Monitoring and Follow-Up

Agnico Eagle Mines Limited has prepared a conceptual AEMP (SD 7-3) pursuant to the aquatic effects assessment outlined in this Volume. The currently proposed conceptual AEMP takes into account the range of Project activities and potential Project-environment interactions identified as being of concern for the aquatic ecosystem and includes effluent, water quality and biological monitoring as required under the EEM program of the MMER of the *Fisheries Act*. The AEMP will also comply with the requirements of the "Guidelines for the Preparation of an Environmental Impact Statement for Agnico Eagle Mines Limited's Meliadine Gold Project (NIRB File No. 11MN034)", Section 9.4.16.

The conceptual AEMP provides an outline of aquatic monitoring in relation to the Project effects as they are predicted in the FEIS. The AEMP will be designed to address predicted impacts to the aquatic environment related to changes in surface water quantity and quality, sediment quality, aquatic life, fish habitat and fish health due to physical alterations of the watersheds, and water and air emissions during construction, operations, and closure.

The objectives of the AEMP include the following;

- to determine the short- and long-term effects of the Project on the aquatic receiving environment;
- to evaluate the accuracy of predictions made in the FEIS;
- to assess the efficacy of planned mitigation incorporated into Project design; and
- to collect data required to identify the need for potential additional mitigation of Project effects, within a management response framework.

Sampling locations for the AEMP are anticipated to include Meliadine Lake, Lake B45, and the Pit Lakes. The Pit Lakes will be monitored at post-closure only, following flooding. Additional sampling locations are proposed to include two reference lakes. These reference lakes will be selected during the detailed AEMP design, following community consultation and confirmation of appropriate conditions in each lake for each monitoring component.

Further details on the AEMP design and reporting approach can be found in SD 7-3 Aquatic Effects Monitoring Plan.

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# APPENDIX 7.2-A

## Groundwater Quality Baseline Report

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

# TECHNICAL MEMORANDUM

**DATE** January 17, 2013 **REFERENCE No.** 236-1114280011 Ver. 0 Rev. 1

**TO** Josée Noël
Agnico-Eagle Mines Limited

**CC** Dan R. Walker

**FROM** Valérie Bertrand, Don Chorley and Dale Holtze **EMAIL** vbertrand@golder.com

**MONITORING WELL M11-1257 (WESTBAY WELL) GROUNDWATER SAMPLING RESULTS MELIADINE GOLD PROJECT, NUNAVUT**

## 1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Agnico-Eagles Mines Limited (AEM) to further develop the Westbay system installed in monitoring well M11-1257 (Westbay Well) and to obtain additional samples for characterization of groundwater quality as part of the scope of work described in Document Number 308 (Scope change 050 – 2012 Westbay Well Development and Sampling Program – Meliadine Gold Project, Nunavut). This technical memorandum summarizes the sampling procedures and groundwater quality analytical results obtained from the Westbay monitoring well, M11-1257 during the 2012 field program.

## 2.0 BACKGROUND

The Westbay system installed in monitoring well M11-1257 is a multi-level groundwater monitoring technique designed for long-term groundwater monitoring and data acquisition. It is designed for collecting subsurface groundwater data at any number of discrete positions within a single well, thereby establishing a groundwater quality depth profile. The Westbay system was installed in August 2011 by Golder in an HQ-size (96 mm outside diameter) borehole drilled by AEM to a depth of 663 m below the ground surface at a collar inclination of 88 degrees. The monitoring well is comprised of six discrete intervals as summarized in Table 1. The well location is shown on Figure 1. Appendix A further describes the well instrument, installation and development process that occurred in 2011.

**Table 1: Details of Monitoring Well M11-1257 Intervals**

| Sample Interval Number | Depth Along Hole | | Depth Below Ground Surface | | Rock Formation |
|---|---|---|---|---|---|
| | From (mAH) | To (mAH) | From (mbgs) | To (mbgs) | |
| 1 | 643.3 | 663.0 | 624.3 | 642.1 | Wesmeg Formation |
| 2A | 632.6 | 642.4 | 602.5 | 613.1 | Wesmeg Formation |
| 2 | 618.9 | 631.7 | 614.0 | 624.0 | Tiriganiaq Formation |
| 3 | 588.6 | 601.2 | 573.7 | 585.5 | Upper Oxide |
| 4 | 530.5 | 543.4 | 518.5 | 530.8 | Sam Formation |
| 5 | 457.3 | 470.1 | 448.2 | 460.7 | Sam Formation |

Notes: mAH - meters along hole; mbgs- meters below ground surface; the depths along the hole have been revised from the installation report to reflect the depths of the upper and lower packers.

Development of each interval is required to remove, to the extent possible, the fluid introduced during drilling. The drilling fluid was composed of lake water to which was added uranine (a fluorescent dye) and calcium chloride salt. Interval 5 was sufficiently developed and sampled for groundwater quality parameters in 2011 and



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re-sampled in 2012 to verify and validate the results obtained in 2011. Development of intervals 2A, 2, 3 and 4 was initiated in 2011 and continued during the 2012 field program, where development of interval 2A was given preference. Interval 1 has undergone no development.

# 3.0 METHODS

## 3.1 Westbay Well Development

The 2012 work program aimed to further develop and remove the fluid introduced into the borehole during drilling from intervals 2A, 2, 3 and 4, which were not sufficiently developed in 2011 to provide representative groundwater quality data.

Development of the intervals was carried out using Mosdax sampling canisters that were dropped to targeted intervals using a winch. The apparatus removed slugs of water of approximately 1.0 L to 1.25 L at a time.

A fluorescent dye tracer (uranine), which fluoresces under ultra violet light, was added to the drilling fluid during installation in 2011 at a concentration believed to be approximately 550 ppb. A fluorometer was used during well development to measure the amount of uranine remaining in the purge water extracted, thus measuring the amount of drilling water still present in the given interval. An interval was deemed sufficiently developed, and the water sample considered representative of the formation water, when a dye concentration of approximately 10% of the original concentration was achieved.

Due to equipment malfunction, the fluorometer was calibrated on several occasions during the 2012 work program resulting in a new reference concentration for the fluorescent dye tracer for each calibration solution used (194 ppb standard, 400 ppb standard and 50 ppb Interval 5 groundwater). Visual comparison of purge water extracted from intervals 2A, 2, 3, 4 and 5 on July 17, 2012 by AEM personnel are presented in Figure 2. At this time the fluorometer was calibrated with the 400 ppb standard manufactured by Turner Designs. As a result of the use of different calibration solution references, the fluorescence measured in the extracted purge water during 2012 cannot be compared directly to 2011 measurements. Dye concentrations measured in 2011 and 2012 are summarized in Table 2.

The estimated extracted volumes required to develop intervals 1, 2A, 2, 3 and 4 are based on the development progress for Interval 5 experienced in 2011. Representative groundwater quality from interval 5 was achieved after extracting approximately 6.6 standing well volumes as determined from the decrease and stabilization of field measured conductivity and fluorescence having achieved 10% of the initial reading (after drilling, prior to purging). The estimated extraction volumes and development record for each interval are summarized in Table 2.

**Table 2: Estimated Extraction Volumes and Development Record**

| Sample Interval Number | Depth Along Hole [1] | | Interval Length (m) | Standing Well Volume[2] (L) | Required Extraction Volume[3] (L) | Total Volume Extracted[4] (L) | 2011 Dye Concentration Measurement (ppb) | 2012 Dye Concentration Measurement[5] (ppb) |
|---|---|---|---|---|---|---|---|---|
| | From (mAH) | To (mAH) | | | | | | |
| 1 | 643.3 | 663.0 | 19.7 | 107.1 | 711 | Not Developed | | |
| 2A | 632.6 | 642.4 | 9.8 | 52.9 | 351 | 450 (374) | 486 | 1984 |
| 2 | 618.9 | 631.7 | 12.8 | 69.5 | 461 | 16 (1) | 419 | 2080 |
| 3 | 588.6 | 601.2 | 12.6 | 69.5 | 461 | 11 (7) | 467 | 625 |
| 4 | 530.5 | 543.3 | 12.8 | 69.5 | 461 | 6 (1) | 423 | 1058 |
| 5 | 457.3 | 470.1 | 12.8 | 69.5 | 461 | 470 (9) | 55 | 220 |

Note 1. mAH – metres along hole
Note 2. The stand well volume was determined by calculating the volume in the annulus between the PVC pipe and the borehole wall. The volume per meter in the annulus is approximately 5.43 L/m based on known dimensions of Schedule 80 1-1/2" PVC (Inner Diameter = 38 mm; Outer Diameter = 48 mm) and HQ outer hole diameter is 96 mm.
Note 3.The required extraction volume is estimated based on the 6.6 standing well volumes that were extracted to obtain a representative groundwater sample for interval 5 in 2011.
Note 4. ( ) denotes volume extracted during 2012 work program.
Note 5. As a result of the use of different calibration solution references, the fluorescence measured in the extracted purge water during 2012 cannot be compared directly to 2011 measurements.

The field program was carried out by Golder personnel from June 14 through to July 4, 2012, and by AEM personnel from July 5 to July 27, 2012.

The well was winterized by AEM personnel under the instruction of Golder by adding 100% propylene glycol inside the PVC pipe and capping the well on July 27, 2012.

## 3.2 Westbay Sample Collection

Groundwater quality samples were analyzed for the following suite of parameters: the major ions sodium (Na), calcium (Ca), and chloride (Cl); nutrients phosphorus (P), nitrate ($NO_3^-$) and nitrite ($NO_2^-$); ammonia; alkalinity; totals dissolved solids (TDS); pH; conductivity; total and dissolved metals at the lowest possible detection limit (salt concentrations may require sample dilution which can increase parameter detection limits); and volatile organic compounds (VOCs) (interval 5 only). One sample collected from interval 2A and from interval 5 were analyzed for the stable isotopes of water: oxygen and deuterium.

A round of samples were collected in duplicate for laboratory analysis by Golder personnel at the start of interval 2A development on June 19, 2012 to provide a reference for water quality and geochemistry for the interval. More samples were collected during development on July 4, 2012 to document water quality during the development process. A final suite of samples were collected in triplicate by AEM personnel on July 17, 2012 after a total of 374 litres were removed in the 2012 monitoring season (for a combined total of 450 litres or 8.5 well volumes including 2011 development). One sample from interval 2A was also collected for the analysis of baseline stable isotopes during the June 19, 2012 sampling session.

Intervals 2, 3 and 4 have undergone limited development. One set of samples was collected from each interval by AEM personnel at the end of the work program on July 27, 2012.

A suite of samples was collected by Golder personnel at interval 5 on June 25, 2012. This suite of samples was collected in triplicate for chemical analysis. One sample from interval 5 was also collected for the analysis of stable isotopes during the July 17, 2012 sampling session. Interval 5 was considered to be sufficiently developed in 2011 but was re-sampled in 2012 to verify and validate the 2011 results.

## 3.3 Sample Shipping

Samples from interval 2A were collected in duplicate and interval 5 in triplicate. A single or duplicate pair of samples was shipped to ALS Environmental analytical laboratory within 48 hours of sampling in a cooler with ice packs and chain-of-custody form. One sample each from interval 2A and 5 was retained in refrigeration on site for possible future analysis.

Isotope samples were shipped directly to the Golder Ottawa office and submitted to the University of Ottawa Isotopes lab for analysis on August 28, 2012.

# 4.0 LITERATURE STUDY

A literature study was carried out to identify key chemistry parameters for sub-permafrost groundwater chemistry at mine sites in North America. Total dissolved solids measurements from groundwater samples obtained from various sites in the Canadian Shield are shown in Figure 3. The Fritz and Frape profile (1987) shown in Figure 3 was developed using chemical analyses of deep saline water collected by various investigators from several sites in the Canadian Shield but not all in permafrost environments. The Diavik profile was derived from site-specific data from the Diavik mine, supplemented by information from the Lupin mine site located about 200 km

to the north near Contwoyto Lake (Kuchling *et al*. 2000). The Diavik mine is located about 300 km northeast of Yellowknife. Data for the Meadowbank profile was collected from site-specific data from the Meadowbank mine, which is located approximately 300 km west of Hudson Bay and 70 km north of Baker Lake, or approximately 250 km northwest of the Meliadine site. In general, TDS or salinity appears to increase with depth for all profiles. TDS in Meliadine groundwater consists principally of calcium, sodium and chloride.

A study carried out at the Lupin mine (Stotler, 2009) indicated that key salinity parameters at that site (chloride, sulphate, calcium, magnesium, potassium, sodium and strontium) vary with depth, source of recharge, or rock type. Generally groundwater chemistry varied with depth at the Lupin mine, which is located both near the zone of continuous permafrost in the Canadian Shield environment, and near the sea. In shallow subpermafrost water, sodium chloride appeared to be the dominant salt, whereas in deeper subpermafrost waters, calcium chloride appeared to be the dominant salt. This is typical of locations near historic or actual marine environments.

## 5.0 RESULTS

The results of the groundwater quality analyses collected during the 2011 and 2012 sampling events are presented in Tables 3 (for interval 5), 4 and 5. Laboratory data sheets are attached in Appendix B.

## 5.1 Drilling Brine Content Correction

Interval 5 is considered to have been adequately developed and representative samples of formation water were obtained in 2011 and 2012. The groundwater quality test results for Interval 5 were corrected to remove the constituents from the brine volume remaining in the samples. The volume of the brine in the sample was estimated by comparing the maximum dye concentration measured in the interval, which is assumed to be indicative of 100% brine, to the dye concentration of the purged sample in 2011, which contained about 10% brine. This calculation was not necessary for trace metals because the concentration of these parameters was generally below analytical detection limits.

The corrected groundwater quality results for Interval 5 collected in the 2011 and 2012 sampling programs are summarized for the key salinity parameters in Table 3 below, and in detail in Table 4 included at the end of the document.

### Interval 5

One groundwater sample and two duplicates were collected from interval 5 on June 25, 2012 to verify groundwater quality results obtained in 2011. Considering interval 5 was sampled in 2012 without further development, the dye concentrations in the interval were assumed to have remained the same as measured during the final sampling session in 2011. Therefore, the corrected water quality results for Interval 5 in 2011 and 2012 are summarized for the key salinity parameters in Table 3, and in detail in Table 4 and Table 5 included at the end of the document, respectively.

**Table 3: Key Groundwater Quality Parameters Corrected for Brine Concentration**

| Sample | Average Drilling Brine Solution | Standard Ocean Water (Hem 1992) | Calculated Values Corrected for Brine Volume for Interval 5 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2011 | | | 2012 | | |
| | | | Sample 1 | Sample 2 (duplicate) | Average | Sample 1 | Sample 2 (duplicate) | Average |
| Dye Concentration (ppb) | 500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **General Chemistry** | | | | | | | | |
| Total Dissolved Solids (mg/L) | 87,375 | 35,000 | 60,943 | 60,830 | 60,887 | 70,401 | 72,315 | 71,358 |
| Chloride (mg/L) | 46,500 | 19,000 | 32,425 | 31,299 | 31,862 | 32,538 | 33,777 | 33,158 |
| Sulphate (mg/L) | 10.75 | 2,700 | 3,264 | 3,489 | 3,377 | 3,669 | 3,782 | 3,726 |
| **Dissolved Metals** | | | | | | | | |
| Dissolved Calcium (mg/L) | 21,500 | 410 | 994 | 884 | 939 | 1,204 | 1,237 | 1,221 |
| Dissolved Magnesium (mg/l) | 4.5 | 1,350 | 2,204 | 2,094 | 2,149 | 2,304 | 2,359 | 2,332 |
| Dissolved Potassium (mg/l) | 805 | 410 | 325 | 325 | 325 | 354 | 377 | 366 |
| Dissolved Sodium (mg/L) | 497.5 | 10,500 | 16,486 | 16,486 | 16,486 | 17,147 | 17,808 | 17,478 |
| Dissolved Strontium (mg/L) | 352.5 | 8 | 64 | 62 | 63 | 64 | 67 | 66 |

Overall the 2012 groundwater quality results measured in interval 5 are consistent with those measured in 2011. Some variability exists, specifically for alkalinity, conductivity (lab) and total suspended solids (TSS) which have lower concentrations compared to samples collected in 2011; however, these differences are attributed to the lesser development prior to sample collection in 2011, and to settlement of particulates within the well casing. Salinity components (Ca, Cl, Mg, TDS) were slightly higher in 2012. The higher concentration of formation groundwater indicators (sodium, chloride, sulphate and magnesium), suggest that natural groundwater flow may have flushed more brine out of the sampled interval over the winter. It is inferred that the groundwater sample collected in 2012 is chemically closer to formation groundwater than the sample collected in 2011.

Metals of interest including arsenic remained below the analytical detection limit. All VOC parameters analyzed were below laboratory analytical detection limits, with the exception of chloromethane which was measured in low concentrations in the duplicate samples analyzed at 0.0112 mg/L and 0.0123 mg/L, respectively. This compound was not detected in the laboratory control samples and thus this chemical is believed to be present in groundwater albeit at a very low concentration. Chloromethane can be present in deep aquifers where the chloride of groundwater interacts with naturally occurring abiotic methane (Fritz et al, 1987; Welhan, 1987).

## Interval 2A

Interval 2A was purged of a substantial volume of water; cumulating approximately 8.5 well volumes throughout the development process in 2011 and 2012. Nonetheless, the purge water retained the dark yellow colour of the uranine dye during the program, inferring that drilling brine remained in the groundwater of this interval. The purge of this well was terminated because of time constraints, but a sample of groundwater was obtained to evaluate the progress of the purge.

Groundwater samples were also collected from Interval 2A at the start of development and during purging to document groundwater quality and the development process.

An average dye concentration of 1984 ppb was measured at the time of sampling interval 2A on July 17, 2012, compared to 220 ppb measured from interval 5 which had been adequately developed. The relative colour of the sample recovered from interval 2A was dark yellow in comparison to the sample obtained from interval 5. However, due to the re-calibration of the fluorometer using different reference standards, measured dye concentrations could not be reliably used to determine development progress or assess the volume of brine remaining in the interval.

Groundwater quality results at Interval 2A were not corrected to remove the remaining brine content because of the uncertainty of the fluorescence measurements and the inaccuracy of extrapolation of the concentration of groundwater constituents given the apparently elevated proportion of brine remaining in the samples.

Initial 2012 groundwater quality results from Interval 2A are similar to those measured in 2011, with the exception of alkalinity, ammonia, calcium, conductivity, TSS, strontium and sodium, which were lower, and TDS which was higher in 2012. Groundwater quality trends observed throughout the 2012 development program include decreasing concentrations of dissolved metals (Li, Sr), salinity parameters (Ca, K, Mg, Na, TDS), and increasing concentrations of other dissolved metals (Mn, Zn). These results indicate that more development is required in order to retrieve representative formation water at interval 2A.

### Intervals 2, 3 and 4

The results of the groundwater quality analysis conducted at Intervals 2, 3 and 4 in 2012 are presented in Appendix C. Intervals 2, 3 and 4 were not sufficiently developed to provide reliably accurate groundwater quality data. Average dye concentrations measured 2082 ppb at Interval 2, 625 ppb at Interval 3 and 1058 ppb at Interval 4 on July 17, 2012. Groundwater samples were collected at the end of the 2012 program for comparison to the groundwater quality results obtained in 2011. Groundwater chemistry obtained in 2012 from Intervals 2, 3 and 4 are not considered reliable based on consistent significant differences in reported values of the following constituents: pH (≤ 1), conductivity, sulphate, TSS, and select metals (Ca, K, Mg, Na, Sr, Zn) among the three intervals sampled on July 27, 2012 compared to previous reported results. Based on the very low pH and high sulphate measurements reported by the analytical laboratory in all three samples, it is possible that incorrect sampling procedures were followed (use of inappropriate sample preservatives given the measured parameters of interest).

For all samples, metals of interest for the environmental assessment based on Metal Mining Effluent Regulations Schedule 4 criteria (DFO 2011) are below analytical detection limits and/or are in compliance.

## 5.2 Stable Isotope Analysis

Groundwater quality at the site is saline. Dissolved salts in water have the ability to change oxygen and hydrogen isotope partitioning between water and other phases (vapour, minerals) due to the hydration of ions upon dissolution of salts in water. Oxygen ($\delta^{18}O$) and hydrogen ($\delta^{2}H$) stable isotope results from interval 5, interval 2A, Lake B5 and Lake B6 are provided in Figure 4 and Appendix D. Saline groundwater oxygen (equation 1) and hydrogen (equation 2) isotope results have been corrected for the “salt effect” given the following equations developed by Sofer & Gat (1972) and Sofer & Gat (1975), respectively:

$$\frac{\delta_0-\delta_m}{\delta_m+1000} \times 10^3 = 1.11M_{Mg} + 0.47M_{Ca} - 0.16M_K \quad (1)$$

$$\frac{\delta_0-\delta_m}{1000+\delta_m} \times 10^3 = 6.1M_{Ca} + 5.1M_{Mg} + 2.4M_K + 0.4M_{Na} \quad (2)$$

where:

$\delta_0$ = delta value on the concentration scale;

$\delta_m$ = measured activity delta of the salt solution; and

$M_i$ = molality of the dissolved salt component, 'i'.

The salt effect correction resulted in an enrichment in isotopes up to 1.7 relative percent difference (RPD) for hydrogen and 1.3 RPD for oxygen.

The isotopic composition of Interval 5 is more enriched in hydrogen and oxygen isotopes compared to water samples obtained from Lake B5, Lake B6 and Interval 2A, which plot along the local meteoric water line (Figure 4). The spread in water quality data further supports the notion that geochemical data obtained from interval 5 is representative of groundwater quality. Interval 5 is enriched in hydrogen isotopes which is a characteristic of shield brines, where the isotopic composition of brine end-member is attributed to extensive alteration of the original isotopic composition of water through mineral hydration and water-rock interaction (Fritz & Reardon, 1979; Frape & Fritz, 1982). The isotopic composition of Interval 2A is similar to the surface water samples Lake B5 and Lake B6, indicating that drilling fluid still remains in the formation which overwhelms the isotopic signature of the sample. The drilling fluid was comprised of a mixture of water from Lake B5 to which was added calcium chloride.

## 5.3 Salinity, Freezing Point Depression and Frozen Permafrost Depth Calculations

The freezing temperature of water decreases when pressure and salinity increase; as a consequence, unfrozen ground could be encountered at temperatures less than 0˚C and in isolated pockets within the permafrost. Permafrost is defined as soil or rock where temperatures remain at or below 0ºC for at least two consecutive years. Although groundwater inflows to the mine are expected to be negligible until mining extends below the depth of frozen permafrost, mine inflows below the frozen permafrost are expected to be elevated because of the high hydraulic head at depth. The depth at which these inflows may increase will depend on where the base of the frozen permafrost is encountered during mining.

This section describes the method by which frozen permafrost depth is estimated for the Meliadine site using the salinity depth profile and the ground temperature profile specific to this site (SD 6-1 Permafrost Baseline Report). The iterative method used to estimate the frozen permafrost depth consists of the following steps:

- Step 1. Estimate groundwater salinity (TDS) from field measurements at Interval 5 (S1).
- Step 2. Calculate (approximate) the effect of salinity on freezing point depression (T1).
- Step 3. Cross-reference the calculated freezing point depression (T1) to estimate the frozen permafrost depth (D1) based on the ground temperature profile.
- Step 4. Estimate a revised salinity value (S2) from depth (D1) using the salinity depth profile.
- Step 5. Calculate a revised freezing point depression (T2) based on the proportionate decrease in salinities (S1 to S2).
- Step 6. Cross-reference the revised freezing point depression (T2) to estimate the frozen permafrost depth (D2).
- Repeat steps 4 to 6 until the values for frozen depth permafrost converge.

The salinity depth profile estimated for the project site is shown on Figure 3. It is based on corrected salinity results from Interval 5 (454 m below ground surface). The profile is projected to the surface using the salinity result from previous groundwater quality testing from borehole GT09-19 samples (105 m below ground surface) (Golder 2009). As indicated in that study, there is uncertainty in the accuracy of the individual analyte results at GT09-19 although the TDS is likely conservatively high. The profile connects two points that, at site, are separated by frozen ground. Consequently, the profile is considered a best estimate at this time. The salinity of groundwater between the two intervals is an estimate that is more likely to apply at locations where unfrozen groundwater is present throughout the depth profile, such as in an open talik below a large lake.

The project profile follows the general trend shown by the Diavik profile, Meadowbank profile and the Fritz and Frape profile. In general, the salinity increases with depth; therefore, it is anticipated that the salinity of the deeper samples from intervals 4 to 1 should be higher in salinity. Further development and sampling for intervals 2, 2A, 3 and 4 must be undertaken to validate this profile.

The molality of the brine-corrected groundwater from Interval 5 was used to estimate the freezing point depression at the corresponding depth of 454 m below ground surface (the mid-point of the sample interval). The molality of a solution is used to calculate freezing point depression as follows:

$$dT = K_f * m * i$$

where

$$dT = Freezing\ point\ depression$$
$$K_f = Cryoscopic\ constant\ of\ solute\ \ water\ = 1.86 \frac{kg}{mol}$$
$$m = Molality\ of\ the\ sample\ \ solution\ \ corrected\ for\ brine\ volume$$
$$i = number\ of\ moles\ of\ the\ solute\ (i.e. NaCl = 2)$$

However, the equation is only applicable to solutions that contain a known amount of one type of solute. For complex solutions like groundwater at Meliadine, the freezing point depression is more accurately determined by direct analytical measurement. This was not possible however, because of the small proportion of brine remaining in the sample.

Based on the major ions concentration of the groundwater, including: chloride, sulphate, calcium, magnesium, potassium, sodium and strontium, the molality of the groundwater sample is 1.8 mol/kg. This is 68% higher than the molality of sea water (1.1 mol/kg based on the average sea water composition for the same elements). The concentration of other constituents was either very low or below detection limit and do not substantially affect the calculation. This corresponds to a freezing point depression of approximately 3.2 $^{o}$C (68% higher than 1.9 $^{o}$C). Thus, it is expected that groundwater may freeze to a solid state at around -3.2$^{o}$C rather than 0$^{o}$C. This implies that the base of the frozen ground is shallower than about 454 m depth below ground surface.

The freezing point depression was cross-referenced to the ground temperature depth profile for the Project site shown in Figure 5 based on measurements from thermistor M98-195 (SD 6-1 Permafrost Baseline Report). The profile shown in Figure 5 is representative of in-land ground temperatures (away from the influence of lakes) and corresponds to the anticipated temperature profile at the location of underground mine development. The ground temperature depth profile indicates a depth of approximately 300 m at -3$^{o}$C ground temperature. This depth corresponds to a salinity of 19,000 mg/L which is approximately 31% of the original salinity estimate. Through the iterative process described above, the molality was then reduced to 0.56 mol/kg and the freezing point depression to 1.04$^{o}$C, which are 31% of the respective initial values. A revised frozen permafrost depth of 420 m below ground surface was calculated based on a freezing point depression of 1.04$^{o}$C. This iterative process was continued until the values of the frozen permafrost depth converged at a depth of approximately 375 m.

Anecdotal evidence from on-site drillers indicating a loss of circulation is often encountered around 300 m to 350 m below ground surface, also supports this estimated range of permafrost depth. Therefore, the depth of the bottom of frozen permafrost considering anecdotal evidence and the iterative process, described above, is conservatively estimated at 350 m.

## 6.0 CONCLUSION AND RECOMMENDATIONS

The Westbay groundwater monitoring well successfully allowed for the collection of groundwater samples below the permafrost. A sample of formation groundwater was collected at Interval 5 (454 m below ground surface) in 2012, with results consistent to those of 2011. Groundwater at this depth is highly saline, having a TDS of 60,887 mg/L in 2011 and 71,358 mg/L in 2012. Salinity at that depth consists mainly of sodium and chloride, with lesser calcium, potassium and sulphate. This groundwater has a similar chemical signature to sea water but is comparatively more concentrated than sea water. The concentration of trace metals in groundwater was consistently low, including arsenic which was below the analytical method detection limit in all samples.

Groundwater quality results at Interval 2A indicate that the removal of more than 8.5 well volumes is required to retrieve representative formation water. This volume is much higher than that required from Interval 5. The relatively elevated fluorescence and colour observed at Interval 2A (in the Wesmeg rock Formation) closely resembles that of Interval 2 (in the Tiriganiaq rock Formation), which was has undergone limited development to date. This could indicate that there is a hydrogeological connection between the two intervals where water from the underlying Interval 2 may be short-circuiting into Interval 2A requiring that a much larger volume of water be removed to obtain a representative sample of formation water.

Intervals 2, 2A, 3 and 4 were not sufficiently developed to provide accurate groundwater quality data at these locations and therefore, the water quality results from these intervals were not corrected for brine concentration. Notwithstanding this, a trend in sodium and calcium chloride appears to be present which correlates with the trends observed elsewhere where the sodium content of the groundwater (the sea water chemical signature) continues to be present at depth at this location. However the proportion and actual concentration of calcium, sodium and other constituents cannot be determined with accuracy at that depth at this time.

The depth to bottom of the frozen permafrost was calculated to be approximately 375 m below ground surface. This was carried out through an iterative process that considered the salinity depth profile, the estimated freezing point depression and the temperature profile with depth. Anecdotal evidence from drilling activities on site indicated that depth of the bottom of frozen permafrost ranges between 300 m to 350 m. Therefore, the depth of the bottom of frozen permafrost considering anecdotal evidence and the iterative process is estimated at 350 m.

It is recommended that further well interval development and groundwater sampling be carried out as a minimum at interval 3 to assess more accurately the groundwater chemistry and salinity at one other point deeper than Interval 5 but within the anticipated depth of mining. This second formation water sample would aim to confirm or verify the salinity profile of groundwater with depth and assess the influence of mine depth on mine groundwater inflow quality.

## 7.0 CLOSURE

We trust this meets your current needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours very truly,

**GOLDER ASSOCIATES LTD.**

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Attachments: Tables 4 and 5
Figure 1 – M11-1257 Westbay Monitoring Well Location
Figure 2 – M11-1257 Westbay Purge Water Fluorescence
Figure 3 – Groundwater Salinity Profile with Depth
Figure 4 – Isotopic Composition of Meliadine Water Samples
Figure 5 – Ground Thermal Profile at Thermistor M98-195
Appendix A – Summary of 2011 Field Methods
Appendix B – Laboratory Analytical Certificates
Appendix C – Groundwater Analytical Results from Intervals Not Fully Developed
Appendix D – Isotope Results

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# Table 4: Laboratory Water Quality Results ffor M11-1257 Wesbay Well Intervals
## Meliadine Gold Project
## Agnico-Eagle Mines



| Parameter | Unit | Drilling Water | | | | | | | Interval 5 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRINE | BRINE -1 | B - 2 | BRINE + DYE | BRINE + DYE-1 | B + D - 2 | | PORT 5-1 | PORT 5-2 | I5-1 | I5-2 | PORT 5-1 | PORT 5-2 |
| | | 28/08/11 | 03/09/11 | 03/09/11 | 28/08/11 | 03/09/11 | 03/09/11 | Average Brine | 06/10/11 | 06/10/11 | 13/10/11 | 13/10/11 | 6/25/12 | 6/25/12 |
| **Depth of Interval** | mbgs | surface | | | | | | | 460.3-448.5 | | | | | |
| **Dye Concentration** | | | | | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | Not applicable | | | | | | | 581 | | | | | |
| Average Dye Concentration for General Samples | ppb | Not applicable | | | | | | | 66 | 66 | 65 | 65 | - | - |
| Average Dye Concentration for Dissovled Metals Samples | ppb | Not applicable | | | | | | | 80 | 80 | 54 | 54 | - | - |
| Average Dye Concentration | ppb | 0 | 0 | 0 | 500 | 500 | 500 | 500 | Not Applicable | | | | | |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 71 | - | 53 | 57 | - | 48 | 57.25 | 43 | 44 | 49 | 51 | 19.2 | 19 |
| Chloride | mg/l | 56 000 | - | 43 000 | 46 000 | - | 41 000 | 46 500 | 35 000 | 33 000 | 34 000 | 33 000 | 34 100 | 35 200 |
| | | | | | | | | | | | | | | |
| Conductivity (lab) | uS/cm | 89 700 | - | 73 800 | 81 000 | - | 73 900 | 79 600 | 80 100 | 80 500 | 79 000 | 79 000 | 65 000 | 68 700 |
| Fluoride | mg/l | 0.04 | - | 0.03 | 0.04 | - | 0.03 | 0.035 | <0.1 | <0.1 | <2.5 | <0.1 | <0.75 | <0.75 |
| Nitrate as N | mg/l | <0.1 | - | <0.1 | <1 | - | <1 | <1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.5 | <0.5 |
| Nitrate + Nitrite | mg/l | <0.1 | - | <0.1 | <1 | - | <1 | <1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.51 | <0.51 |
| Nitrite as N | mg/l | <0.01 | - | <0.01 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.1 | <0.1 | <0.1 |
| pH (lab) | mg/l | 9.16 | - | 8.8 | 8.72 | - | 8.64 | 8.83 | 6.88 | 6.89 | 6.98 | 6.97 | 6.62 | 6.63 |
| Sulphate | mg/l | 9 | - | 7 | 15 | - | 12 | 10.75 | 2 500 | 2 800 | 2 900 | 3 100 | 3 260 | 3 360 |
| Total Dissolved Solids | mg/l | 95 000 | - | 77 000 | 99 200 | - | 78 300 | 87 375 | 61 600 | 64 900 | 63 900 | 63 800 | 72 300 | 74 000 |
| Total Suspended Solids | mg/l | 340 | - | 290 | 410 | - | 270 | 327.5 | 280 | 250 | 110 | 120 | 21.4 | 28.4 |
| Total Ammonia-N | mg/l | 2.9 | - | 1.6 | 4.3 | - | 1.6 | 2.6 | 3.9 | 4 | 4 | 4 | 3.82 | 3.82 |
| Total Phosphorus | mg/l | <10 | - | <1 | <1 | - | <1 | <1 | 0.2 | 0.3 | 0.035 | 0.016 | 0.0181 | 0.027 |
| **Metals** | | | | | | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | - | - | - | - | - | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.000010 | <0.000010 |
| Dissolved Aluminum (Al) | mg/l | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | <0.5 | <0.5 | 0.96 | <0.5 | <0.010 | <0.010 |
| Dissolved Antimony (Sb) | mg/l | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.0021 | 0.0018 |
| Dissolved Arsenic (As) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.020 | <0.010 |
| Dissolved Barium (Ba) | mg/l | - | 0.1 | 0.1 | - | 0.1 | 0.1 | 0.1 | <0.2 | <0.2 | <0.2 | <0.2 | 0.104 | 0.0986 |
| Dissolved Beryllium (Be) | mg/l | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.0010 | <0.0010 |
| Dissolved Bismuth (Bi) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 |
| Dissolved Boron (B) | mg/l | - | 6.2 | 6.5 | - | 6.1 | 6.2 | 6.25 | 6.1 | 6.4 | 4.6 | 4.1 | 5.32 | 5.22 |
| Dissolved Cadmium (Cd) | mg/l | - | <0.005 | <0.005 | - | <0.005 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | <0.01 | 0.00038 | 0.0004 |
| Dissolved Calcium (Ca) | mg/l | - | 22 000 | 22 000 | - | 21 000 | 21 000 | 21 500 | 4 000 | 3 900 | 2 900 | 2 800 | 3 090 | 3 120 |
| Dissolved Chromium (Cr) | mg/l | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | <0.5 | <0.5 | <0.5 | <0.5 | 0.00072 | 0.0006 |
| Dissolved Cobalt (Co) | mg/l | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.00076 | 0.00074 |
| Dissolved Copper (Cu) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0054 | 0.0039 |
| Dissolved Iron (Fe) | mg/l | - | <5 | <5 | - | <5 | <5 | <5 | <10 | <10 | <10 | <10 | 8.68 | 8.36 |
| Dissolved Lead (Pb) | mg/l | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.00060 | <0.00060 |
| Dissolved Lithium (Li) | mg/l | - | 21 | 22 | - | 21 | 21 | 21.25 | 6.4 | 6.5 | 4.1 | 3.9 | 5.23 | 5.13 |
| Dissolved Magnesium (Mg) | mg/l | - | 6 | 4 | - | 4 | 4 | 4.5 | 2 000 | 2 000 | 2 000 | 1 900 | 2 090 | 2 140 |
| Dissolved Manganese (Mn) | mg/l | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | 0.65 | 0.66 | 0.74 | 0.6 | 0.827 | 0.806 |
| Dissolved Molybdenum (Mo) | mg/l | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.0078 | 0.0078 |
| Dissolved Nickel (Ni) | mg/l | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0055 | 0.0058 |
| Dissolved Phosphorus (P) | mg/l | - | <5 | <5 | - | <5 | <5 | <5 | <10 | <10 | <10 | <10 | <2.0 | <2.0 |
| Dissolved Potassium (K) | mg/l | - | 820 | 810 | - | 800 | 790 | 805 | 420 | 420 | 370 | 370 | 395 | 416 |
| Dissolved Selenium (Se) | mg/l | - | <0.002 | <0.002 | - | <0.002 | <0.002 | <0.002 | <0.2 | <0.2 | <0.2 | <0.2 | <0.0010 | <0.0010 |
| Dissolved Silicon (Si) | mg/l | - | <3 | <3 | - | <3 | <3 | <3 | 13 | 6.3 | 6.3 | <5 | 1.3 | 1.3 |
| Dissolved Silver (Ag) | mg/l | - | <0.005 | <0.005 | - | <0.005 | <0.005 | <0.005 | <0.01 | <10 | <10 | <10 | <0.00020 | <0.00020 |
| Dissolved Sodium (Na) | mg/l | - | 490 | 510 | - | 490 | 500 | 497.5 | 15 000 | 15 000 | 15 000 | 15 000 | 15 600 | 16 200 |
| Dissolved Strontium (Sr) | mg/l | - | 360 | 350 | - | 350 | 350 | 352.5 | 130 | 140 | 91 | 89 | 90.9 | 93 |
| Dissolved Tellurium (Te) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 |
| Dissolved Thallium (Tl) | mg/l | - | <0.003 | <0.003 | - | <0.003 | <0.003 | <0.003 | <0.005 | <0.005 | <0.005 | <0.005 | 0.00096 | 0.00109 |
| Dissolved Tin (Sn) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0020 | <0.0020 |
| Dissolved Titanium (Ti) | mg/l | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | <0.5 | <0.5 | <0.5 | <0.5 | <0.010 | <0.010 |
| Dissolved Tungsten (W) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0037 | 0.0039 |
| Dissolved Uranium (U) | mg/l | - | <0.005 | <0.005 | - | <0.005 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | <0.01 | 0.00075 | 0.00078 |
| Dissolved Vanadium (V) | mg/l | - | 0.08 | 0.08 | - | 0.04 | 0.04 | 0.06 | <0.05 | <0.05 | <0.05 | <0.05 | <0.0010 | <0.0010 |
| Dissolved Zinc (Zn) | mg/l | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | <0.5 | <0.5 | <0.5 | <0.5 | 0.694 | 0.661 |
| Dissolved Zirconium (Zr) | mg/l | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| Bromodichloromethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Bromoform | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Carbon Tetrachloride | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| Chlorobenzene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Dibromochloromethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Chloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Chloroform | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Chloromethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | 0.0112 | 0.0123 |
| 1,2-Dichlorobenzene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00070 | <0.00070 |
| 1,3-Dichlorobenzene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,4-Dichlorobenzene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,1-Dichloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,2-Dichloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,1-Dichloroethylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| cis-1,2-Dichloroethylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| trans-1,2-Dichloroethylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,3-Dichloropropene (cis & trans) | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0014 | <0.0014 |
| Dichloromethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0050 | <0.0050 |
| 1,2-Dichloropropane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| cis-1,3-Dichloropropylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| trans-1,3-Dichloropropylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Ethylbenzene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| Methyl t-butyl ether (MTBE) | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| Styrene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| 1,1,1,2-Tetrachloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,1,2,2-Tetrachloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Tetrachloroethylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Toluene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| 1,1,1-Trichloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| 1,1,2-Trichloroethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Trichloroethylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Trichlorofluoromethane | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| Vinyl Chloride | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.0010 | <0.0010 |
| ortho-Xylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| meta- & para-Xylene | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00050 | <0.00050 |
| Xylenes | mg/L | - | - | - | - | - | - | - | - | - | - | - | <0.00075 | <0.00075 |

Notes: ' - ' not measured;[1] dye concentration measurement following calibration of fluorometer using 194 ppb standard[2]dye concentration measurement following calibration of fluorometer using 194 ppb standard

# Table 4: Laboratory Water Quality Results ffor M11-1257 Wesbay Well Intervals
## Meliadine Gold Project
## Agnico-Eagle Mines

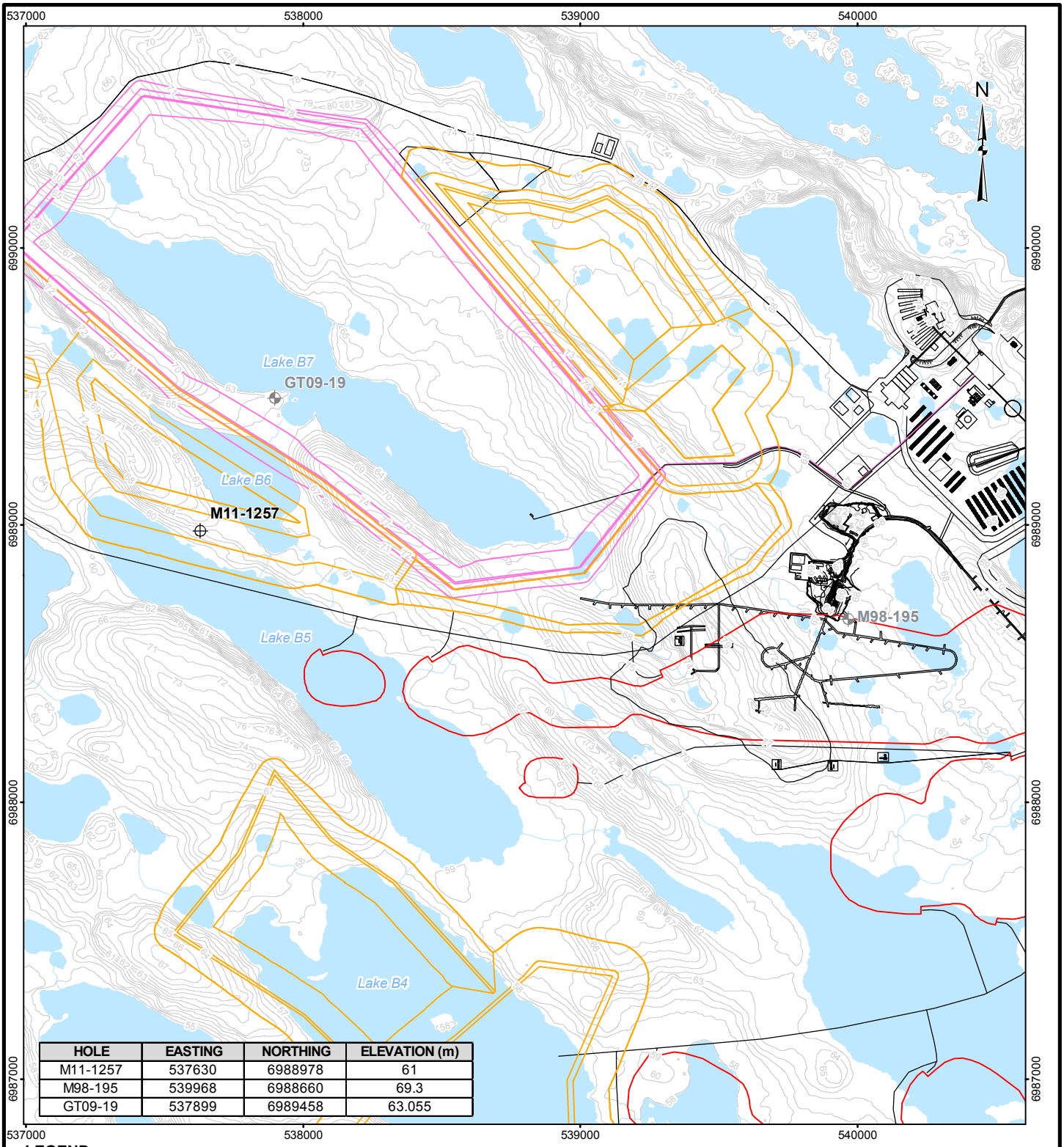


| Parameter | Unit | Interval 2A | | | | |
|---|---|---|---|---|---|---|
| | | I2A-1 | I2A-2 | PORT-2A-1 | PORT-2A-1 | PORT-2A-1 |
| | | 22/10/11 | 22/10/11 | 19/06/12 | 04/07/12 | 17/07/12 |
| **Depth of Interval** | mbgs | 623.6-614.2 | | | | |
| **Dye Concentration** | | | | | | |
| Maximum Dye Concentration for Interval | ppb | 641 | | | - | |
| Average Dye Concentration for General Samples | ppb | 534 | 567 | 495 | 146[1] | 1987[2] |
| Average Dye Concentration for Dissovled Metals Samples | ppb | 482 | 482 | 495 | 146[1] | 1987[2] |
| Average Dye Concentration | ppb | Not Applicable | | | | |
| **General Chemistry** | | | | | | |
| Alkalinity as CaCO3 | mg/l | 69 | 72 | 17.5 | - | 18.8 |
| Chloride | mg/l | 50 000 | 52 000 | 44 600 | 44 100 | 44 300 |
| | | | | | | |
| Conductivity (lab) | uS/cm | 98 300 | 99 900 | 46 400 | - | 75 300 |
| Fluoride | mg/l | <0.1 | <0.1 | <0.75 | - | <0.75 |
| Nitrate as N | mg/l | <0.1 | <0.1 | <0.50 | - | <0.50 |
| Nitrate + Nitrite | mg/l | <0.1 | <0.1 | - | - | |
| Nitrite as N | mg/l | <0.1 | <0.1 | <0.10 | - | <0.10 |
| pH (lab) | mg/l | 8.33 | 8.52 | 7.67 | - | 8.16 |
| Sulphate | mg/l | 26 | 28 | <50 | <50 | <50 |
| Total Dissolved Solids | mg/l | 83 100 | 76 700 | 91 300 | - | 82 900 |
| Total Suspended Solids | mg/l | 290 | 290 | 19.1 | - | 30 |
| Total Ammonia-N | mg/l | 2.1 | 1.7 | 0.798 | - | |
| Total Phosphorus | mg/l | <0.4 | <0.4 | <0.20 | - | <0.20 |
| **Metals** | | | | | | |
| Dissolved Mercury (Hg) | mg/l | <0.0001 | <0.0001 | <0.000010 | - | <0.000010 |
| Dissolved Aluminum (Al) | mg/l | <0.5 | <0.5 | 0.074 | - | 0.028 |
| Dissolved Antimony (Sb) | mg/l | <0.05 | <0.05 | <0.0010 | - | <0.0010 |
| Dissolved Arsenic (As) | mg/l | <0.1 | <0.1 | <0.030 | - | <0.16 |
| Dissolved Barium (Ba) | mg/l | 0.6 | 0.6 | 0.527 | - | 0.644 |
| Dissolved Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.0010 | - | <0.0010 |
| Dissolved Bismuth (Bi) | mg/l | <0.1 | <0.1 | <0.0010 | - | <0.0010 |
| Dissolved Boron (B) | mg/l | 13 | 12 | 10.6 | - | 11.1 |
| Dissolved Cadmium (Cd) | mg/l | <0.01 | <0.01 | 0.00034 | - | <0.00030 |
| Dissolved Calcium (Ca) | mg/l | 27 000 | 29 000 | 23 300 | - | 24 200 |
| Dissolved Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.0010 | - | <0.0010 |
| Dissolved Cobalt (Co) | mg/l | <0.05 | <0.05 | 0.00029 | - | 0.00032 |
| Dissolved Copper (Cu) | mg/l | <0.1 | <0.1 | 0.0055 | - | 0.0021 |
| Dissolved Iron (Fe) | mg/l | <10 | <10 | <0.020 | - | 0.067 |
| Dissolved Lead (Pb) | mg/l | <0.05 | <0.05 | <0.00060 | - | <0.00060 |
| Dissolved Lithium (Li) | mg/l | 27 | 26 | 21.9 | - | 22.7 |
| Dissolved Magnesium (Mg) | mg/l | 23 | 22 | 9.6 | - | 16.8 |
| Dissolved Manganese (Mn) | mg/l | <0.2 | <0.2 | 0.0258 | - | 0.0458 |
| Dissolved Molybdenum (Mo) | mg/l | <0.05 | <0.05 | 0.0236 | - | 0.0235 |
| Dissolved Nickel (Ni) | mg/l | <0.1 | <0.1 | 0.0031 | - | 0.0033 |
| Dissolved Phosphorus (P) | mg/l | <10 | <10 | <2.0 | - | <2.0 |
| Dissolved Potassium (K) | mg/l | 1 100 | 1 100 | 910 | - | 930 |
| Dissolved Selenium (Se) | mg/l | <0.2 | <0.2 | 0.00076 | - | 0.00063 |
| Dissolved Silicon (Si) | mg/l | <5 | <5 | <2.5 | - | <2.5 |
| Dissolved Silver (Ag) | mg/l | <0.01 | <0.01 | <0.00020 | - | <0.00020 |
| Dissolved Sodium (Na) | mg/l | 880 | 890 | 660 | - | 720 |
| Dissolved Strontium (Sr) | mg/l | 500 | 510 | 386 | - | 416 |
| Dissolved Tellurium (Te) | mg/l | <0.1 | <0.1 | <0.0010 | - | <0.0010 |
| Dissolved Thallium (Tl) | mg/l | 0.013 | 0.011 | 0.00888 | - | 0.00549 |
| Dissolved Tin (Sn) | mg/l | <0.1 | <0.1 | <0.0020 | - | <0.0020 |
| Dissolved Titanium (Ti) | mg/l | <0.5 | <0.5 | <0.010 | - | <0.010 |
| Dissolved Tungsten (W) | mg/l | <0.1 | <0.1 | 0.0087 | - | 0.0114 |
| Dissolved Uranium (U) | mg/l | <0.01 | <0.01 | <0.00010 | - | <0.00010 |
| Dissolved Vanadium (V) | mg/l | <0.05 | <0.05 | <0.0010 | - | <0.0010 |
| Dissolved Zinc (Zn) | mg/l | <0.5 | <0.5 | 0.318 | - | 0.664 |
| Dissolved Zirconium (Zr) | mg/l | <0.1 | <0.1 | <0.0010 | - | <0.0010 |
| **Volatile Organic Compounds** | | | | | | |
| Benzene | mg/L | - | - | - | - | - |
| Bromodichloromethane | mg/L | - | - | - | - | - |
| Bromoform | mg/L | - | - | - | - | - |
| Carbon Tetrachloride | mg/L | - | - | - | - | - |
| Chlorobenzene | mg/L | - | - | - | - | - |
| Dibromochloromethane | mg/L | - | - | - | - | - |
| Chloroethane | mg/L | - | - | - | - | - |
| Chloroform | mg/L | - | - | - | - | - |
| Chloromethane | mg/L | - | - | - | - | - |
| 1,2-Dichlorobenzene | mg/L | - | - | - | - | - |
| 1,3-Dichlorobenzene | mg/L | - | - | - | - | - |
| 1,4-Dichlorobenzene | mg/L | - | - | - | - | - |
| 1,1-Dichloroethane | mg/L | - | - | - | - | - |
| 1,2-Dichloroethane | mg/L | - | - | - | - | - |
| 1,1-Dichloroethylene | mg/L | - | - | - | - | - |
| cis-1,2-Dichloroethylene | mg/L | - | - | - | - | - |
| trans-1,2-Dichloroethylene | mg/L | - | - | - | - | - |
| 1,3-Dichloropropene (cis & trans) | mg/L | - | - | - | - | - |
| Dichloromethane | mg/L | - | - | - | - | - |
| 1,2-Dichloropropane | mg/L | - | - | - | - | - |
| cis-1,3-Dichloropropylene | mg/L | - | - | - | - | - |
| trans-1,3-Dichloropropylene | mg/L | - | - | - | - | - |
| Ethylbenzene | mg/L | - | - | - | - | - |
| Methyl t-butyl ether (MTBE) | mg/L | - | - | - | - | - |
| Styrene | mg/L | - | - | - | - | - |
| 1,1,1,2-Tetrachloroethane | mg/L | - | - | - | - | - |
| 1,1,2,2-Tetrachloroethane | mg/L | - | - | - | - | - |
| Tetrachloroethylene | mg/L | - | - | - | - | - |
| Toluene | mg/L | - | - | - | - | - |
| 1,1,1-Trichloroethane | mg/L | - | - | - | - | - |
| 1,1,2-Trichloroethane | mg/L | - | - | - | - | - |
| Trichloroethylene | mg/L | - | - | - | - | - |
| Trichlorofluoromethane | mg/L | - | - | - | - | - |
| Vinyl Chloride | mg/L | - | - | - | - | - |
| ortho-Xylene | mg/L | - | - | - | - | - |
| meta- & para-Xylene | mg/L | - | - | - | - | - |
| Xylenes | mg/L | - | - | - | - | - |

Notes: ' - ' not measured;[1] dye concentration measurement following cali

# Table 5: Water Quality at Interval 5 of Westbay well M11-1257
## Corrected for Brine Volume Remaining in Water Sample
## Meliadine Gold Project
## Agnico-Eagle Mines

| Parameter | Unit | Average Brine | Raw Results from Laboratory - Interval 5 | | | | | | Results Corrected for Brine Volume | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PORT 5-1 | PORT 5-2 | I5-1 | I5-2 | PORT-5-1 | PORT-5-2 | PORT 5-1 | PORT 5-2 | I5-1 | I5-2 | PORT-5-1 | PORT-5-2 |
| | | | 10/6/11 | 10/6/11 | 10/13/11 | 10/13/11 | 6/25/12 | 6/25/12 | 10/6/11 | 10/6/11 | 10/13/11 | 10/13/11 | 6/25/12 | 6/25/12 |
| **Depth of Interval** | **mbgs** | | **460.3-448.5** | | | | | | **460.3-448.5** | | | | | |
| **Dye Concentration** | | | | | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | | 581 | | | | | | Not Applicable | | | | | |
| Average Dye Concentration for General Samples | ppb | | 66 | 66 | 65 | 65 | *65* | *65* | Not Applicable | | | | | |
| Average Dye Concentration for Dissovled Metals | ppb | | 80 | 80 | 54 | 54 | *54* | *54* | Not Applicable | | | | | |
| Average Dye Concentration | ppb | 500 | Not Applicable | | | | | | Not Applicable | | | | | |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 57.25 | 43 | 44 | 49 | 51 | 19.2 | 19 | 41 | 42 | 48 | 50 | 14 | 14 |
| Chloride | mg/l | 46 500 | 35 000 | 33 000 | 34 000 | 33 000 | 34 100 | 35 200 | 33 526 | 31 270 | 32 425 | 31 299 | 32 538 | 33 777 |
| Conductivity (lab) | uS/cm | 79 600 | 80 100 | 80 500 | 79 000 | 79 000 | 65 000 | 68 700 | 80 164 | 80 615 | 78 924 | 78 924 | 63 161 | 67 327 |
| Fluoride | mg/l | 0.035 | <0.1 | <0.1 | <2.5 | <0.1 | <0.75 | <0.75 | <0.1 | <0.1 | <2.5 | <0.1 | <0.75 | <0.75 |
| Nitrate as N | mg/l | <1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.5 | <0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.5 | <0.5 |
| Nitrate + Nitrite | mg/l | <1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.51 | <0.51 | <0.1 | <0.1 | <0.1 | <0.1 | <0.51 | <0.51 |
| Nitrite as N | mg/l | <0.1 | <0.1 | <0.1 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.1 | <0.1 | <0.1 |
| pH (lab) | mg/l | 8.83 | 6.88 | 6.89 | 6.98 | 6.97 | 6.62 | 6.63 | 7 | 7 | 7 | 7 | 6.34 | 6.35 |
| Sulphate | mg/l | 10.75 | 2 500 | 2 800 | 2 900 | 3 100 | 3 260 | 3 360 | 2 819 | 3 157 | 3 264 | 3 489 | 3 669 | 3 782 |
| Total Dissolved Solids | mg/l | 87 375 | 61 600 | 64 900 | 63 900 | 63 800 | 72 300 | 74 000 | 58 297 | 62 020 | 60 943 | 60 830 | 70 401 | 72 315 |
| Total Suspended Solids | mg/l | 327.5 | 280 | 250 | 110 | 120 | 21.4 | 28.4 | 274 | 240 | 83 | 94 | | 0 |
| Total Ammonia-N | mg/l | 2.6 | 3.9 | 4 | 4 | 4 | 3.82 | 3.82 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total Phosphorus | mg/l | <1 | 0.2 | 0.3 | 0.035 | 0.016 | 0.0181 | 0.027 | 0 | 0 | 0 | 0 | 0.0181 | 0.027 |
| **Metals** | | | | | | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.000010 | <0.000010 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.000010 | <0.000010 |
| Dissolved Aluminum (Al) | mg/l | <0.3 | <0.5 | <0.5 | 0.96 | <0.5 | <0.010 | <0.010 | <0.5 | <0.5 | 0.96 | <0.5 | <0.010 | <0.010 |
| Dissolved Antimony (Sb) | mg/l | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.0021 | 0.0018 | <0.05 | <0.05 | <0.05 | <0.05 | 0.0021 | 0.0018 |
| Dissolved Arsenic (As) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.020 | <0.010 | <0.1 | <0.1 | <0.1 | <0.1 | <0.020 | <0.010 |
| Dissolved Barium (Ba) | mg/l | 0.1 | <0.2 | <0.2 | <0.2 | <0.2 | 0.104 | 0.0986 | <0.2 | <0.2 | <0.2 | <0.2 | 0.104 | 0.0985 |
| Dissolved Beryllium (Be) | mg/l | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.0010 | <0.0010 | <0.05 | <0.05 | <0.05 | <0.05 | <0.0010 | <0.0010 |
| Dissolved Bismuth (Bi) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 |
| Dissolved Boron (B) | mg/l | 6.25 | 6.1 | 6.4 | 4.6 | 4.1 | 5.32 | 5.22 | 6.1 | 6.4 | 4.4 | 3.9 | 5.2 | 5.1 |
| Dissolved Cadmium (Cd) | mg/l | <0.005 | <0.01 | <0.01 | <0.01 | <0.01 | 0.00038 | 0.0004 | <0.01 | <0.01 | <0.01 | <0.01 | 0.00038 | 0.0004 |
| Dissolved Calcium (Ca) | mg/l | 21 500 | 4 000 | 3 900 | 2 900 | 2 800 | 3 090 | 3 120 | 1 206 | 1 090 | 994 | 884 | 1204 | 1 237 |
| Dissolved Chromium (Cr) | mg/l | <0.3 | <0.5 | <0.5 | <0.5 | <0.5 | 0.00072 | 0.0006 | <0.5 | <0.5 | <0.5 | <0.5 | 0.00072 | 0.0006 |
| Dissolved Cobalt (Co) | mg/l | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.00076 | 0.00074 | <0.05 | <0.05 | <0.05 | <0.05 | 0.00076 | 0.00074 |
| Dissolved Copper (Cu) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0054 | 0.0039 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0054 | 0.0039 |
| Dissolved Iron (Fe) | mg/l | <5 | <10 | <10 | <10 | <10 | 8.68 | 8.36 | <10 | <10 | <10 | <10 | 8.68 | 8.36 |
| Dissolved Lead (Pb) | mg/l | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.00060 | <0.00060 | <0.05 | <0.05 | <0.05 | <0.05 | <0.00060 | <0.00060 |
| Dissolved Lithium (Li) | mg/l | 21.3 | 6.4 | 6.5 | 4.1 | 3.9 | 5.23 | 5.13 | 4.0 | 4.1 | 2.3 | 2.1 | 3.6 | 3.5 |
| Dissolved Magnesium (Mg) | mg/l | 4.5 | 2 000 | 2 000 | 2 000 | 1 900 | 2 090 | 2 140 | 2 319 | 2 319 | 2 204 | 2 094 | 2 304 | 2 359 |
| Dissolved Manganese (Mn) | mg/l | <0.1 | 0.65 | 0.66 | 0.74 | 0.6 | 0.827 | 0.806 | 0.65 | 0.66 | 0.74 | 0.6 | 0.827 | 0.806 |
| Dissolved Molybdenum (Mo) | mg/l | <0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.0078 | 0.0078 | <0.05 | <0.05 | <0.05 | <0.05 | 0.0078 | 0.0078 |
| Dissolved Nickel (Ni) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0055 | 0.0058 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0055 | 0.0058 |
| Dissolved Phosphorus (P) | mg/l | <5 | <10 | <10 | <10 | <10 | <2.0 | <2.0 | <10 | <10 | <10 | <10 | <2.0 | <2.0 |
| Dissolved Potassium (K) | mg/l | 805 | 420 | 420 | 370 | 370 | 395 | 416 | 359 | 359 | 325 | 325 | 354 | 377 |
| Dissolved Selenium (Se) | mg/l | <0.002 | <0.2 | <0.2 | <0.2 | <0.2 | <0.0010 | <0.0010 | <0.2 | <0.2 | <0.2 | <0.2 | <0.0010 | <0.0010 |
| Dissolved Silicon (Si) | mg/l | <3 | 13 | 6.3 | 6.3 | <5 | 1.3 | 1.3 | 13 | 6.3 | 6.3 | <5 | 1.3 | 1.3 |
| Dissolved Silver (Ag) | mg/l | <0.005 | <0.01 | <10 | <10 | <10 | <0.00020 | <0.00020 | <0.01 | <10 | <10 | <10 | <0.00020 | <0.00020 |
| Dissolved Sodium (Na) | mg/l | 487.5 | 14 400 | 14 500 | 15 000 | 15 000 | 15 600 | 16 200 | 16 620 | 16 736 | 16 486 | 16 486 | 17 147 | 17 808 |
| Dissolved Strontium (Sr) | mg/l | 352.5 | 130 | 140 | 91 | 89 | 90.9 | 93 | 94 | 106 | 64 | 62 | 64 | 67 |
| Dissolved Tellurium (Te) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 |
| Dissolved Thallium (Tl) | mg/l | <0.003 | <0.005 | <0.005 | <0.005 | <0.005 | 0.00096 | 0.00109 | <0.005 | <0.005 | <0.005 | <0.005 | 0.00096 | 0.00109 |
| Dissolved Tin (Sn) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0020 | <0.0020 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0020 | <0.0020 |
| Dissolved Titanium (Ti) | mg/l | <0.3 | <0.5 | <0.5 | <0.5 | <0.5 | <0.010 | <0.010 | <0.5 | <0.5 | <0.5 | <0.5 | <0.010 | <0.010 |
| Dissolved Tungsten (W) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0037 | 0.0039 | <0.1 | <0.1 | <0.1 | <0.1 | 0.0037 | 0.0039 |
| Dissolved Uranium (U) | mg/l | <0.005 | <0.01 | <0.01 | <0.01 | <0.01 | 0.00075 | 0.00078 | <0.01 | <0.01 | <0.01 | <0.01 | 0.00075 | 0.00078 |
| Dissolved Vanadium (V) | mg/l | 0.06 | <0.05 | <0.05 | <0.05 | <0.05 | <0.0010 | <0.0010 | <0.05 | <0.05 | <0.05 | <0.05 | <0.0010 | <0.0010 |
| Dissolved Zinc (Zn) | mg/l | <0.3 | <0.5 | <0.5 | <0.5 | <0.5 | 0.694 | 0.661 | <0.5 | <0.5 | <0.5 | <0.5 | 0.694 | 0.661 |
| Dissolved Zirconium (Zr) | mg/l | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 | <0.1 | <0.1 | <0.1 | <0.1 | <0.0010 | <0.0010 |




| HOLE | EASTING | NORTHING | ELEVATION (m) |
|---|---|---|---|
| M11-1257 | 537630 | 6988978 | 61 |
| M98-195 | 539968 | 6988660 | 69.3 |
| GT09-19 | 537899 | 6989458 | 63.055 |

## LEGEND

- West Bay Monitoring Well (M11-1257)
- Historic Geotechnical Borehole With Thermistor
- Proposed Project Infrastructure
- Proposed Tailings Storage Facility
- Proposed Open Pit
- Proposed Waste Rock Storage Facility
- Topographic Contour (1.0 m Interval above sea level)
- Watercourse
- Waterbody

500 0 500

SCALE 1:20000 METRES

## NOTE

1. Topography and bathymetry information provided by Agnico-Eagle Mines Limited. (AEM) September 23rd, 2011.
2. Lake water elevations not provided at this time.
3. All dimensions and elevations are in metres unless otherwise noted.
4. Borehole traces not shown.

## REFERENCE

Base data obtained from Agnico-Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO-EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# M11-1257 WEST BAY MONITORING WELL LOCATION

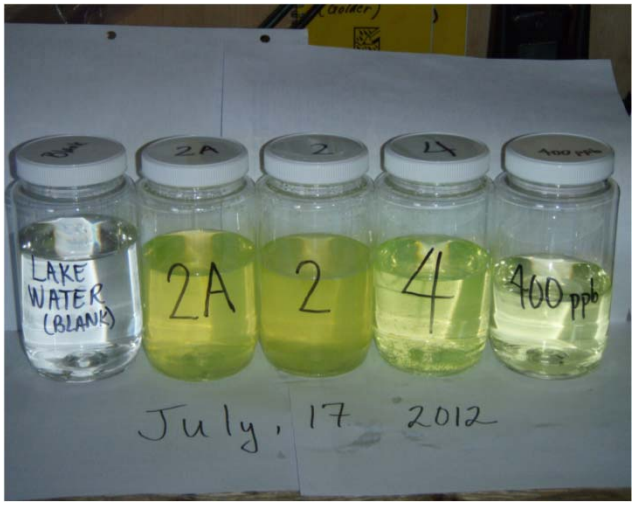
Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT | | 11-1428-0011 | FILE No. | |
| DESIGN | AS | 02 Dec. 2011 | SCALE AS SHOWN | REV. 0 |
| GIS | CDB | 15 Nov. 2012 | | |
| CHECK | AS | 15 Nov. 2012 | | |
| REVIEW | DRW | 15 Nov. 2012 | | |

**FIGURE 1**

N:\Bur-Graphics\Projects\2011\1428\11-1428-0011\GIS\projects\5000\Figure-1-M11-1257_West_Bay_Monitoring_Well_Location_Portrait_rev0.mxd







| Interval/Sample ID | Fluorescence (ppb) |
|---|---|
| **2A** | 1984 |
| **2** | 2080 |
| **3** | 625 |
| **4** | 1058 |
| **5** | 220 |
| **Turner Designs Standard** | 400* |

*Fluoromenter calibrated with 400 ppb standard solution
Photo reference:
Charline Larivière (AEM field technician) July 17, 2012.

PROJECT

**AGNICO-EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

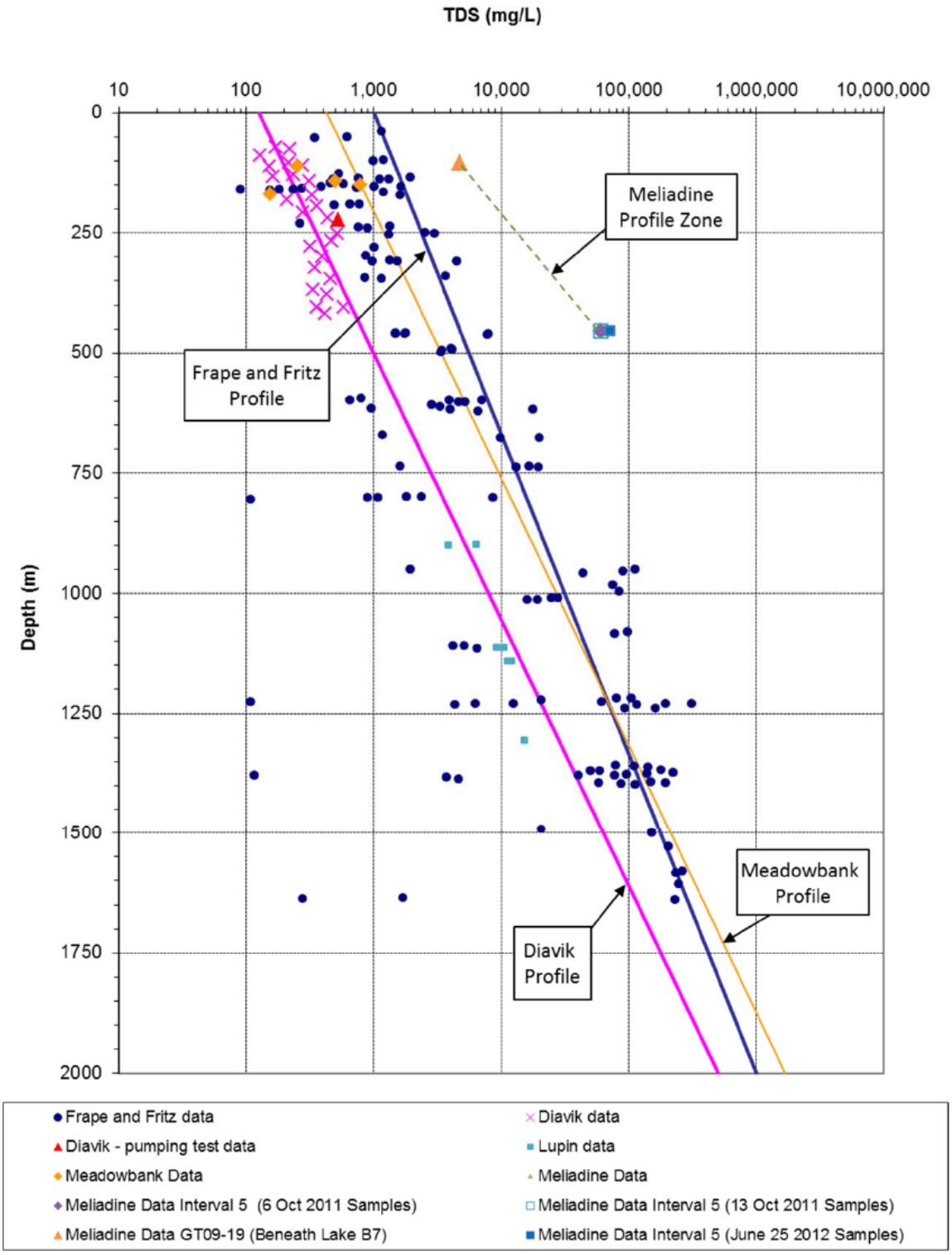
TITLE

# M11-1257 WESTBAY PURGE WATER FLUORESCENCE

Golder Associates

| | | | |
|---|---|---|---|
| PROJECT No. 11-1428-0011 | | PHASE No. 5300 | REV. 0 |
| PREPARED | DH 20Nov12 | **FIGURE 2** | |
| CHECKED | DH 20Nov12 | | |
| REVIEWED | VJB 11Dec12 | | |

N:\Active\2011\0_Mining\11-1428-0011_Meliadine Engineering Ph6000 geochem\reports\groundwater\Doc 236 Ver.2\Figures




PROJECT

**AGNICO-EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

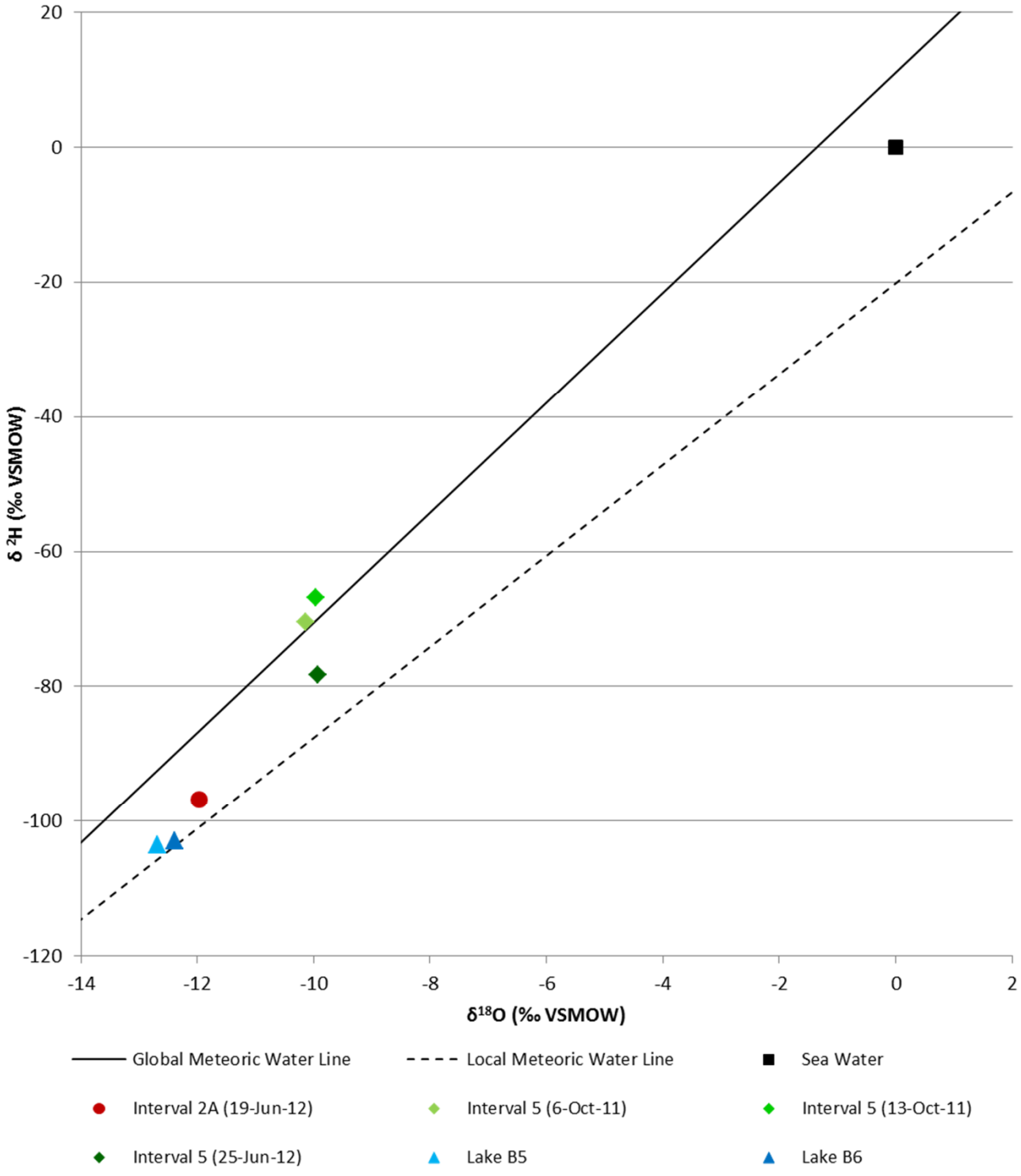
# Groundwater Salinity Profile with Depth

| | | | |
|---|---|---|---|
| PROJECT No. 11-1428-0011 | | PHASE No. 5300 | REV. 0 |
| PREPARED | DH 20Nov12 | | |
| CHECKED | DH 20Nov12 | | |
| REVIEWED | VJB 11Dec12 | | |

Figure 3

Reference:
Frape, S.K. and Fritz, P. 1987.

N:\Active\2011\0_Mining\11-1428-0011_Meliadine Engineering Ph6000 geochem\reports\groundwater\Doc 236 Ver.2\Figures




Notes:
[1]VSMOW - Vienna Standard Mean Ocean Water;
[2]Saline groundwater oxygen and hydrogen isotope results were corrected for the 'salt effect' using Sofer & Gat (1972, 1975);
[3]Global Meteoric Water Line (Rozanski et al., 1993);
[4] Local Meteoric Water Line (Moorman et al., 1996)

PROJECT

**AGNICO-EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

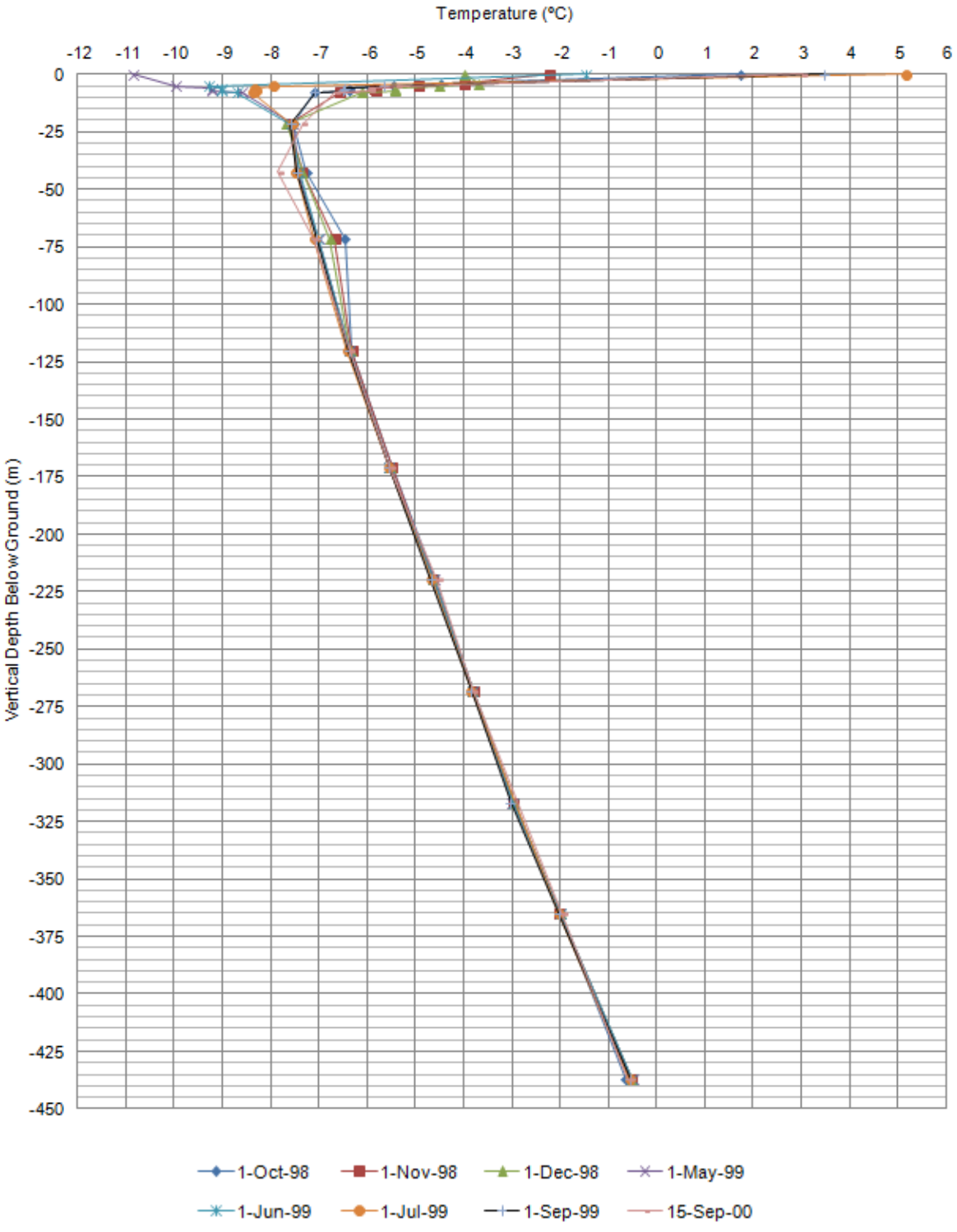
# Isotopic Composition of Meliadine Water Samples

Golder Associates

| | | | |
|---|---|---|---|
| PROJECT No. 11-1428-0011 | | PHASE No. 5300 | REV. 0 |
| PREPARED | DH 20Nov12 | | |
| CHECKED | DH 20Nov12 | | |
| REVIEWED | VJB 11Dec12 | | |

**FIGURE 4**

N:\Active\2011\0_Mining\11-1428-0011_Meliadine Engineering Ph6000 geochem\reports\groundwater\Doc 236 Ver.2\Figures




PROJECT

**AGNICO-EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

# Ground Thermal Profile at Thermistor M98-195

| | | | |
|---|---|---|---|
| PROJECT No. 11-1428-0011 | | PHASE No. 5300 | REV. 0 |
| PREPARED | AS 09Dec11 | **FIGURE 5** | |
| CHECKED | VB 25Jan12 | | |
| REVIEWED | DRW 30Jan12 | | |

Golder Associates

N:\Active\2011\0_Mining\11-1428-0011_Meliadine Engineering Ph6000 geochem\reports\groundwater\Doc 236 Ver.2\Figures

# APPENDIX A
## Summary of 2011 Field Methods

## Summary of 2011 Field Methods

The Westbay system installed in monitoring well M11-1257 is a multi-level groundwater monitoring technique designed for long-term groundwater monitoring and data acquisition. It is designed for collecting subsurface groundwater data at any number of discrete positions within a single well. The Westbay system was installed by Golder in an HQ-size (96 mm outside diameter) borehole drilled by AEM to a depth of 663 m below the ground surface at a collar inclination of -88 degrees and allows for 6 discrete intervals to be monitored.

During drilling of the HQ-size borehole, the drilling fluid was prepared by adding a high concentration of calcium chloride salt ($CaCl_2$) to lake water to form a brine, which was used to prevent liquids in the borehole from freezing during drilling and well installation. A fluorescent dye tracer (uranine) was added to the drilling fluid at a concentration of approximately 500 ppb. This compound fluoresces under ultra violet light.

The Westbay system consists of 38 mm inner diameter schedule 80 PVC pipes with regularly spaced one-way sampling ports. Intervals of interest along the borehole were isolated by inflating packers between the bedrock and the PVC pipe such that groundwater could flow freely into the annulus between the bedrock and PVC pipe. An electronic sampling probe was lowered into the PVC pipe to collect groundwater samples using the one-way sampling ports. The PVC pipes were filled with a mixture of lake water and propylene glycol to prevent freezing of fluids within the pipe. The one-way sampling ports eliminate the potential for the liquid inside the PVC pipe to mix with the groundwater in the annulus between the bedrock and PVC pipe.

Installation was completed on August 29, 2011 and development of the intervals commenced on September 2, 2011 and continued until October 24, 2011, until weather constraints, limited camp activities and site access constraints required the program be suspended.

Prior to extracting samples to analyse groundwater chemistry, development of each interval was to be carried out to remove, to the extent possible, the fluid introduced into the borehole during drilling. A fluorometer was used during well development to measure the amount of uranine remaining in the extracted water samples for each interval, thus measuring the amount of drilling water still present in the well. An interval was deemed sufficiently developed and the water sample considered representative of the formation water when a dye concentration of approximately 10% of the original concentration was achieved. Development consisted of the use of the sampling tool to remove approximately 1.0L to 1.25L at a time from each interval.

Interval 5 was developed from September 5, 2011 to October 13, 2011. Samples were obtained on October 6, 2011 at an average dye concentration of 73 ppb and on October 13, 2011 at an average dye concentration of 55 ppb. The sample at approximately 70 ppb was extracted to characterize potential trends in groundwater chemistry as the interval was developed. The target dye concentration was not achieved for intervals 2A, 2, 3 and 4 since the program was suspended due to weather constraints, limited camp activities and site access constraints. Nonetheless each interval was sampled to document possible chemical trends.

All groundwater samples for interval 5 and 2A were collected in triplicate. Duplicate samples were shipped to the analytical laboratory for analysis and the third set of samples was retained at site as extra samples. All groundwater samples for intervals 2, 3 and 4 were collected in duplicates. Both samples were shipped to the analytical laboratory for analysis. Groundwater samples were analyzed for the following suite of parameters: pH; conductivity; chloride; sulphate; nitrite and nitrrate; ammonia; phosphorous; alkalinity; total dissolved solids (TDS); total and dissolved metals and isotopes of oxygen and hydrogen (deuterium and tritium). Water quality testing of the lake water used in the brine, the brine and the brine mixed with the uranine dye were also carried out for reference.

The well was winterized prior to demobilization from site by adding 100% propylene glycol inside the PVC pipe. Sampling equipment and personnel were demobilized from site on October 25, 2011.

# APPENDIX B
## Laboratory Analytical Certificates

# APPENDIX B-1 – INTERVAL 2A

**June 19, 2012 Sampling Event – Lab Report No. L1167094**
**July 4, 2012 Sampling Event – Lab Report No. L1176479**
**July 17, 2012 Sampling Event – Lab Report No. L1184714-1**

GOLDER ASSOCIATES LTD.
ATTN: Valerie Bertrand
32 Steacie Drive
Kanata ON K2K 2A9

Date Received: 22-JUN-12
Report Date: 13-JUL-12 13:25 (MT)
Version: FINAL REV. 2

Client Phone: 613-592-9600

# Certificate of Analysis

**Lab Work Order #: L1167094**

| | |
|---|---|
| Project P.O. #: | NOT SUBMITTED |
| Job Reference: | 11-1428-0011 |
| C of C Numbers: | 08-013784 |
| Legal Site Desc: | MELIADINE |

**Comments:**

13-JUL-12: Total Phosphorus data has been added, and Selenium has been re-processed by Hydride Vapour technique.

Amber Springer
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | Sample ID | L1167094-1 | | | | |
|---|---|---|---|---|---|---|---|
| | | Description | SALINE WATER | | | | |
| | | Sampled Date | 19-JUN-12 | | | | |
| | | Sampled Time | 06:00 | | | | |
| | | Client ID | PORT-2A-1 | | | | |
| **Grouping** | **Analyte** | | | | | | |
| **SEAWATER** | | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | | 46400 | | | | |
| | Hardness (as CaCO3) (mg/L) | | 58100 | | | | |
| | pH (pH) | | 7.67 | | | | |
| | Total Suspended Solids (mg/L) | | 19.1 | | | | |
| | Total Dissolved Solids (mg/L) | | 91300 | | | | |
| | Total Solids (mg/L) | | 125000 | | | | |
| **Anions and Nutrients** | Alkalinity, Total (as CaCO3) (mg/L) | | 17.5 | | | | |
| | Ammonia, Total (as N) (mg/L) | | 0.798 | | | | |
| | Bromide (Br) (mg/L) | | 686 | | | | |
| | Chloride (Cl) (mg/L) | | 44600 | | | | |
| | Fluoride (F) (mg/L) | | <0.75 | | | | |
| | Nitrate (as N) (mg/L) | | <0.50 DLM | | | | |
| | Nitrite (as N) (mg/L) | | <0.10 DLM | | | | |
| | Phosphorus (P)-Total (mg/L) | | <0.20 DLM | | | | |
| | Sulfate (SO4) (mg/L) | | <50 DLM | | | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | | 0.177 | | | | |
| | Antimony (Sb)-Total (mg/L) | | <0.0010 | | | | |
| | Arsenic (As)-Total (mg/L) | | <0.030 DLM | | | | |
| | Barium (Ba)-Total (mg/L) | | 0.530 | | | | |
| | Beryllium (Be)-Total (mg/L) | | <0.0010 | | | | |
| | Bismuth (Bi)-Total (mg/L) | | <0.0010 | | | | |
| | Boron (B)-Total (mg/L) | | 10.3 | | | | |
| | Cadmium (Cd)-Total (mg/L) | | 0.00018 | | | | |
| | Calcium (Ca)-Total (mg/L) | | 23200 | | | | |
| | Cesium (Cs)-Total (mg/L) | | 0.108 | | | | |
| | Chromium (Cr)-Total (mg/L) | | 0.0052 | | | | |
| | Cobalt (Co)-Total (mg/L) | | 0.00053 | | | | |
| | Copper (Cu)-Total (mg/L) | | 0.0092 | | | | |
| | Gallium (Ga)-Total (mg/L) | | <0.0010 | | | | |
| | Iron (Fe)-Total (mg/L) | | 1.99 | | | | |
| | Lead (Pb)-Total (mg/L) | | 0.00488 | | | | |
| | Lithium (Li)-Total (mg/L) | | 21.4 | | | | |
| | Magnesium (Mg)-Total (mg/L) | | 9.6 | | | | |
| | Manganese (Mn)-Total (mg/L) | | 0.0442 | | | | |
| | Mercury (Hg)-Total (mg/L) | | <0.000010 | | | | |
| | Molybdenum (Mo)-Total (mg/L) | | 0.0237 | | | | |
| | Nickel (Ni)-Total (mg/L) | | 0.0050 | | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample ID** | L1167094-1 | | | | |
| | **Description** | SALINE WATER | | | | |
| | **Sampled Date** | 19-JUN-12 | | | | |
| | **Sampled Time** | 06:00 | | | | |
| | **Client ID** | PORT-2A-1 | | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Total Metals** | Phosphorus (P)-Total (mg/L) | <2.0 | | | | |
| | Potassium (K)-Total (mg/L) | 910 | | | | |
| | Rhenium (Re)-Total (mg/L) | <0.0010 | | | | |
| | Rubidium (Rb)-Total (mg/L) | 1.47 | | | | |
| | Selenium (Se)-Total (mg/L) | 0.00063 | | | | |
| | Silicon (Si)-Total (mg/L) | <2.5 DLA | | | | |
| | Silver (Ag)-Total (mg/L) | 0.00027 | | | | |
| | Sodium (Na)-Total (mg/L) | 650 | | | | |
| | Strontium (Sr)-Total (mg/L) | 385 | | | | |
| | Tellurium (Te)-Total (mg/L) | <0.0010 | | | | |
| | Thallium (Tl)-Total (mg/L) | 0.00861 | | | | |
| | Thorium (Th)-Total (mg/L) | <0.0010 | | | | |
| | Tin (Sn)-Total (mg/L) | <0.0020 | | | | |
| | Titanium (Ti)-Total (mg/L) | <0.010 | | | | |
| | Tungsten (W)-Total (mg/L) | 0.0093 | | | | |
| | Uranium (U)-Total (mg/L) | <0.00010 | | | | |
| | Vanadium (V)-Total (mg/L) | <0.0010 | | | | |
| | Yttrium (Y)-Total (mg/L) | 0.0018 | | | | |
| | Zinc (Zn)-Total (mg/L) | 0.720 | | | | |
| | Zirconium (Zr)-Total (mg/L) | <0.0010 | | | | |
| **Dissolved Metals** | Dissolved Metals Filtration Location | FIELD | | | | |
| | Aluminum (Al)-Dissolved (mg/L) | 0.074 | | | | |
| | Antimony (Sb)-Dissolved (mg/L) | <0.0010 | | | | |
| | Arsenic (As)-Dissolved (mg/L) | <0.030 DLM | | | | |
| | Barium (Ba)-Dissolved (mg/L) | 0.527 | | | | |
| | Beryllium (Be)-Dissolved (mg/L) | <0.0010 | | | | |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.0010 | | | | |
| | Boron (B)-Dissolved (mg/L) | 10.6 | | | | |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.00034 | | | | |
| | Calcium (Ca)-Dissolved (mg/L) | 23300 | | | | |
| | Cesium (Cs)-Dissolved (mg/L) | 0.108 | | | | |
| | Chromium (Cr)-Dissolved (mg/L) | <0.0010 DLM | | | | |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00029 | | | | |
| | Copper (Cu)-Dissolved (mg/L) | 0.0055 | | | | |
| | Gallium (Ga)-Dissolved (mg/L) | <0.0010 | | | | |
| | Iron (Fe)-Dissolved (mg/L) | <0.020 | | | | |
| | Lead (Pb)-Dissolved (mg/L) | <0.00060 | | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample ID** | L1167094-1 | | | | |
| | **Description** | SALINE WATER | | | | |
| | **Sampled Date** | 19-JUN-12 | | | | |
| | **Sampled Time** | 06:00 | | | | |
| | **Client ID** | PORT-2A-1 | | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Dissolved Metals** | Lithium (Li)-Dissolved (mg/L) | 21.9 | | | | |
| | Magnesium (Mg)-Dissolved (mg/L) | 9.6 | | | | |
| | Manganese (Mn)-Dissolved (mg/L) | 0.0258 | | | | |
| | Mercury (Hg)-Dissolved (mg/L) | <0.000010 | | | | |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.0236 | | | | |
| | Nickel (Ni)-Dissolved (mg/L) | 0.0031 | | | | |
| | Phosphorus (P)-Dissolved (mg/L) | <2.0 | | | | |
| | Potassium (K)-Dissolved (mg/L) | 910 | | | | |
| | Rhenium (Re)-Dissolved (mg/L) | <0.0010 | | | | |
| | Rubidium (Rb)-Dissolved (mg/L) | 1.48 | | | | |
| | Selenium (Se)-Dissolved (mg/L) | 0.00076 | | | | |
| | Silicon (Si)-Dissolved (mg/L) | <2.5 DLA | | | | |
| | Silver (Ag)-Dissolved (mg/L) | <0.00020 | | | | |
| | Sodium (Na)-Dissolved (mg/L) | 660 | | | | |
| | Strontium (Sr)-Dissolved (mg/L) | 386 | | | | |
| | Tellurium (Te)-Dissolved (mg/L) | <0.0010 | | | | |
| | Thallium (Tl)-Dissolved (mg/L) | 0.00888 | | | | |
| | Thorium (Th)-Dissolved (mg/L) | <0.0010 | | | | |
| | Tin (Sn)-Dissolved (mg/L) | <0.0020 | | | | |
| | Titanium (Ti)-Dissolved (mg/L) | <0.010 | | | | |
| | Tungsten (W)-Dissolved (mg/L) | 0.0087 | | | | |
| | Uranium (U)-Dissolved (mg/L) | <0.00010 | | | | |
| | Vanadium (V)-Dissolved (mg/L) | <0.0010 | | | | |
| | Yttrium (Y)-Dissolved (mg/L) | 0.0018 | | | | |
| | Zinc (Zn)-Dissolved (mg/L) | 0.318 | | | | |
| | Zirconium (Zr)-Dissolved (mg/L) | <0.0010 | | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# Reference Information

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLA | Detection Limit Adjusted For required dilution |
| DLM | Detection Limit Adjusted For Sample Matrix Effects |

**Test Method References:**

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **ALK-C-COL-VA** | Seawater | Alkalinity by Colourimetric (seawater) | APHA 310.2 |

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

| | | | |
|---|---|---|---|
| **ANIONS-C-BR-IC-VA** | Seawater | Bromide by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | Seawater | Chloride by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-NO2-IC-VA** | Seawater | Nitrite in Seawater by IC | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-C-NO3-IC-VA** | Seawater | Nitrate in Seawater by IC | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-C-SO4-IC-VA** | Seawater | Sulfate by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **EC-C-PCT-VA** | Seawater | Conductivity (Automated) (seawater) | APHA 2510 Auto. Conduc. |

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

| | | | |
|---|---|---|---|
| **F-ISE-VA** | Seawater | Fluoride by SIE | BASED ON APHA 4500-F FLUORIDE |

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

| | | | |
|---|---|---|---|
| **HARDNESS-CALC-VA** | Seawater | Hardness | APHA 2340B |

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

| | | | |
|---|---|---|---|
| **HG-DIS-C-CVAFS-VA** | Seawater | Diss. Mercury in Seawater by CVAFS | PUGET SOUND PROTOCOLS, EPA 245.7 |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **HG-TOT-C-CVAFS-VA** | Seawater | Total Mercury in Seawater by CVAFS | PUGET SOUND PROTOCOLS, EPA 245.7 |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **MET-D-L-HRMS-VA** | Seawater | Diss. Metals in Seawater by HR-ICPMS | EPA 200.8 |

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

| | | | |
|---|---|---|---|
| **MET-DIS-C-ICP-VA** | Seawater | Diss. Metals in Seawater by ICPOES | PUGET SOUND PROTOCOLS, EPA 6010B |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

| | | | |
|---|---|---|---|
| **MET-T-L-HRMS-VA** | Seawater | Tot. Metals in Seawater by HR-ICPMS | EPA 200.8 |

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

| | | | |
|---|---|---|---|
| **MET-TOT-C-ICP-VA** | Seawater | Total Metals in Seawater by ICPOES | PUGET SOUND PROTOCOLS, EPA 6010B |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The

# Reference Information

procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

**NH3-F-VA** Seawater Ammonia in Seawater by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

**P-T-COL-VA** Seawater Total P in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

**PH-C-PCT-VA** Seawater pH by Meter (Automated) (seawater) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

**SE-D-HVAF-VA** Seawater Dissolved Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

**SE-T-HVAF-VA** Seawater Total Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

**TDS-VA** Seawater Total Dissolved Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

**TS-VA** Seawater Total Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Solids (TS) are determined by evaporating a sample to dryness at 104 degrees celsius.

**TSS-C-VA** Seawater Total Suspended Solids by Gravimetric APHA 2540 D. / PSWQA TSS

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a 0.45um membrane filter (Puget Sound Water Quality Authority TSS Method, May 1991), TSS is determined by drying the filter at 104 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA |

**Chain of Custody Numbers:**

08-013784

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg - milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L - milligrams per litre.*
*< - Less than.*
*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# Quality Control Report

Workorder: L1167094 Report Date: 13-JUL-12 

Client: GOLDER ASSOCIATES LTD.
32 Steacie Drive
Kanata ON K2K 2A9
Contact: Valerie Bertrand

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ALK-C-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2388787** | | | | | | | | |
| **WG1496714-2 CRM** | | **VA-ALKL-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 102.2 | | % | | 85-115 | 26-JUN-12 |
| **WG1496714-5 CRM** | | **VA-ALKM-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 101.7 | | % | | 85-115 | 26-JUN-12 |
| **WG1496714-8 CRM** | | **VA-ALKH-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 101.6 | | % | | 85-115 | 26-JUN-12 |
| **WG1496714-22 DUP** | | **L1167094-1** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 17.5 | 17.5 | | mg/L | 0.1 | 25 | 26-JUN-12 |
| **WG1496714-1 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| **WG1496714-4 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| **WG1496714-7 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| **ANIONS-C-BR-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2390657** | | | | | | | | |
| **WG1498006-18 LCS** | | | | | | | | |
| Bromide (Br) | | | 89.9 | | % | | 85-115 | 28-JUN-12 |
| **WG1498006-2 LCS** | | | | | | | | |
| Bromide (Br) | | | 90.9 | | % | | 85-115 | 28-JUN-12 |
| **WG1498006-1 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUN-12 |
| **WG1498006-10 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUN-12 |
| **WG1498006-13 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUN-12 |
| **WG1498006-16 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUN-12 |
| **WG1498006-4 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUN-12 |
| **WG1498006-7 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUN-12 |
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2388947** | | | | | | | | |
| **WG1496340-18 LCS** | | | | | | | | |
| Chloride (Cl) | | | 99.99 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-2 LCS** | | | | | | | | |
| Chloride (Cl) | | | 100.0 | | % | | 85-115 | 26-JUN-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2388947** | | | | | | | | |
| **WG1496340-1 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-10 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-13 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-16 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-4 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-7 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **ANIONS-C-NO2-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2388947** | | | | | | | | |
| **WG1496340-18 LCS** | | | | | | | | |
| Nitrite (as N) | | | 97.2 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-2 LCS** | | | | | | | | |
| Nitrite (as N) | | | 96.1 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-1 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 26-JUN-12 |
| **WG1496340-10 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 26-JUN-12 |
| **WG1496340-13 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 26-JUN-12 |
| **WG1496340-16 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 26-JUN-12 |
| **WG1496340-4 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 26-JUN-12 |
| **WG1496340-7 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 26-JUN-12 |
| **ANIONS-C-NO3-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2388947** | | | | | | | | |
| **WG1496340-18 LCS** | | | | | | | | |
| Nitrate (as N) | | | 101.6 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-2 LCS** | | | | | | | | |
| Nitrate (as N) | | | 101.6 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-1 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-NO3-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2388947** | | | | | | | | |
| **WG1496340-10 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **WG1496340-13 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **WG1496340-16 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **WG1496340-4 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **WG1496340-7 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **ANIONS-C-SO4-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2388947** | | | | | | | | |
| **WG1496340-18 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.5 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-2 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.3 | | % | | 85-115 | 26-JUN-12 |
| **WG1496340-1 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-10 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-13 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-16 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-4 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **WG1496340-7 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 26-JUN-12 |
| **EC-C-PCT-VA** | **Seawater** | | | | | | | |
| **Batch R2391468** | | | | | | | | |
| **WG1499792-3 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 98.0 | | % | | 90-110 | 30-JUN-12 |
| **WG1499792-1 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 30-JUN-12 |
| **F-ISE-VA** | **Seawater** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **F-ISE-VA** | **Seawater** | | | | | | | |
| **Batch R2392132** | | | | | | | | |
| **WG1500914-2 CRM** | | **VA-F-SIE-2.0** | | | | | | |
| Fluoride (F) | | | 99.5 | | % | | 85-115 | 03-JUL-12 |
| **WG1500914-3 DUP** | | **L1167094-1** | | | | | | |
| Fluoride (F) | | <0.75 | <0.75 | RPD-NA | mg/L | N/A | 20 | 03-JUL-12 |
| **WG1500914-1 MB** | | | | | | | | |
| Fluoride (F) | | | <0.030 | | mg/L | | 0.03 | 03-JUL-12 |
| **HG-DIS-C-CVAFS-VA** | **Seawater** | | | | | | | |
| **Batch R2388209** | | | | | | | | |
| **WG1495976-1 MB** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 26-JUN-12 |
| **HG-TOT-C-CVAFS-VA** | **Seawater** | | | | | | | |
| **Batch R2389739** | | | | | | | | |
| **WG1498287-2 LCS** | | | | | | | | |
| Mercury (Hg)-Total | | | 104.3 | | % | | 80-120 | 28-JUN-12 |
| **WG1498287-1 MB** | | | | | | | | |
| Mercury (Hg)-Total | | | <0.000010 | | mg/L | | 0.00001 | 28-JUN-12 |
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2390706** | | | | | | | | |
| **WG1495976-1 MB** | | | | | | | | |
| Aluminum (Al)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 27-JUN-12 |
| Antimony (Sb)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Arsenic (As)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 27-JUN-12 |
| Barium (Ba)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 27-JUN-12 |
| Beryllium (Be)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Bismuth (Bi)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Boron (B)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 27-JUN-12 |
| Cadmium (Cd)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 27-JUN-12 |
| Cesium (Cs)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Chromium (Cr)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 27-JUN-12 |
| Cobalt (Co)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 27-JUN-12 |
| Copper (Cu)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Gallium (Ga)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Iron (Fe)-Dissolved | | | <0.010 | | mg/L | | 0.01 | 27-JUN-12 |
| Lead (Pb)-Dissolved | | | <0.00030 | | mg/L | | 0.0003 | 27-JUN-12 |
| Lithium (Li)-Dissolved | | | <0.020 | | mg/L | | 0.02 | 27-JUN-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch** **R2390706** | | | | | | | | |
| **WG1495976-1** **MB** | | | | | | | | |
| Manganese (Mn)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 27-JUN-12 |
| Molybdenum (Mo)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 27-JUN-12 |
| Nickel (Ni)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Phosphorus (P)-Dissolved | | | <1.0 | | mg/L | | 1 | 27-JUN-12 |
| Rhenium (Re)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Rubidium (Rb)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 27-JUN-12 |
| Silver (Ag)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 27-JUN-12 |
| Tellurium (Te)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Thallium (Tl)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 27-JUN-12 |
| Thorium (Th)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Tin (Sn)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 27-JUN-12 |
| Titanium (Ti)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 27-JUN-12 |
| Tungsten (W)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 27-JUN-12 |
| Uranium (U)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 27-JUN-12 |
| Vanadium (V)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Yttrium (Y)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| Zinc (Zn)-Dissolved | | | <0.0030 | | mg/L | | 0.003 | 27-JUN-12 |
| Zirconium (Zr)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUN-12 |
| **Batch** **R2393046** | | | | | | | | |
| **WG1495976-2** **CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Aluminum (Al)-Dissolved | | | 100.9 | | % | | 80-120 | 04-JUL-12 |
| Antimony (Sb)-Dissolved | | | 97.2 | | % | | 80-120 | 04-JUL-12 |
| Arsenic (As)-Dissolved | | | 96.3 | | % | | 80-120 | 04-JUL-12 |
| Barium (Ba)-Dissolved | | | 100.8 | | % | | 80-120 | 04-JUL-12 |
| Beryllium (Be)-Dissolved | | | 99.4 | | % | | 80-120 | 04-JUL-12 |
| Bismuth (Bi)-Dissolved | | | 100.7 | | % | | 80-120 | 04-JUL-12 |
| Boron (B)-Dissolved | | | 106.9 | | % | | 80-120 | 04-JUL-12 |
| Cadmium (Cd)-Dissolved | | | 107.0 | | % | | 80-120 | 04-JUL-12 |
| Cesium (Cs)-Dissolved | | | 97.6 | | % | | 80-120 | 04-JUL-12 |
| Chromium (Cr)-Dissolved | | | 108.3 | | % | | 80-120 | 04-JUL-12 |
| Cobalt (Co)-Dissolved | | | 102.0 | | % | | 80-120 | 04-JUL-12 |
| Copper (Cu)-Dissolved | | | 101.2 | | % | | 80-120 | 04-JUL-12 |
| Gallium (Ga)-Dissolved | | | 104.4 | | % | | 80-120 | 04-JUL-12 |
| Iron (Fe)-Dissolved | | | 104.9 | | % | | 80-120 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1495976-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Lead (Pb)-Dissolved | | | 99.4 | | % | | 80-120 | 04-JUL-12 |
| Lithium (Li)-Dissolved | | | 99.8 | | % | | 80-120 | 04-JUL-12 |
| Manganese (Mn)-Dissolved | | | 102.8 | | % | | 80-120 | 04-JUL-12 |
| Molybdenum (Mo)-Dissolved | | | 105.6 | | % | | 80-120 | 04-JUL-12 |
| Nickel (Ni)-Dissolved | | | 97.2 | | % | | 80-120 | 04-JUL-12 |
| Phosphorus (P)-Dissolved | | | 102.5 | | % | | 80-120 | 04-JUL-12 |
| Rhenium (Re)-Dissolved | | | 95.6 | | % | | 80-120 | 04-JUL-12 |
| Rubidium (Rb)-Dissolved | | | 103.0 | | % | | 80-120 | 04-JUL-12 |
| Silver (Ag)-Dissolved | | | 93.7 | | % | | 80-120 | 04-JUL-12 |
| Tellurium (Te)-Dissolved | | | 106.0 | | % | | 80-120 | 04-JUL-12 |
| Thallium (Tl)-Dissolved | | | 103.7 | | % | | 80-120 | 04-JUL-12 |
| Thorium (Th)-Dissolved | | | 104.0 | | % | | 80-120 | 04-JUL-12 |
| Tin (Sn)-Dissolved | | | 98.8 | | % | | 80-120 | 04-JUL-12 |
| Titanium (Ti)-Dissolved | | | 98.8 | | % | | 80-120 | 04-JUL-12 |
| Tungsten (W)-Dissolved | | | 97.8 | | % | | 80-120 | 04-JUL-12 |
| Uranium (U)-Dissolved | | | 95.2 | | % | | 80-120 | 04-JUL-12 |
| Vanadium (V)-Dissolved | | | 105.8 | | % | | 80-120 | 04-JUL-12 |
| Yttrium (Y)-Dissolved | | | 105.0 | | % | | 80-120 | 04-JUL-12 |
| Zinc (Zn)-Dissolved | | | 106.6 | | % | | 80-120 | 04-JUL-12 |
| Zirconium (Zr)-Dissolved | | | 92.3 | | % | | 80-120 | 04-JUL-12 |
| **MET-DIS-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2388499** | | | | | | | | |
| **WG1495976-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Dissolved | | | 110.3 | | % | | 80-120 | 26-JUN-12 |
| Magnesium (Mg)-Dissolved | | | 106.1 | | % | | 80-120 | 26-JUN-12 |
| Potassium (K)-Dissolved | | | 101.3 | | % | | 80-120 | 26-JUN-12 |
| Silicon (Si)-Dissolved | | | 101.8 | | % | | 80-120 | 26-JUN-12 |
| Sodium (Na)-Dissolved | | | 99.5 | | % | | 80-120 | 26-JUN-12 |
| Strontium (Sr)-Dissolved | | | 103.2 | | % | | 80-120 | 26-JUN-12 |
| **WG1495976-1 MB** | | | | | | | | |
| Calcium (Ca)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 26-JUN-12 |
| Magnesium (Mg)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 26-JUN-12 |
| Potassium (K)-Dissolved | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| Silicon (Si)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 26-JUN-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-DIS-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2388499** | | | | | | | | |
| **WG1495976-1 MB** | | | | | | | | |
| Sodium (Na)-Dissolved | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| Strontium (Sr)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2392579** | | | | | | | | |
| **WG1495862-1 MB** | | | | | | | | |
| Aluminum (Al)-Total | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Antimony (Sb)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Arsenic (As)-Total | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Barium (Ba)-Total | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Beryllium (Be)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Bismuth (Bi)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Boron (B)-Total | | | <0.10 | | mg/L | | 0.1 | 04-JUL-12 |
| Cadmium (Cd)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Cesium (Cs)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Chromium (Cr)-Total | | | <0.00010 | | mg/L | | 0.0001 | 04-JUL-12 |
| Cobalt (Co)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Copper (Cu)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Gallium (Ga)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Iron (Fe)-Total | | | <0.010 | | mg/L | | 0.01 | 04-JUL-12 |
| Lead (Pb)-Total | | | <0.00030 | | mg/L | | 0.0003 | 04-JUL-12 |
| Lithium (Li)-Total | | | <0.020 | | mg/L | | 0.02 | 04-JUL-12 |
| Manganese (Mn)-Total | | | <0.00020 | | mg/L | | 0.0002 | 04-JUL-12 |
| Molybdenum (Mo)-Total | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Nickel (Ni)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Phosphorus (P)-Total | | | <1.0 | | mg/L | | 1 | 04-JUL-12 |
| Rhenium (Re)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Rubidium (Rb)-Total | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Silver (Ag)-Total | | | <0.00010 | | mg/L | | 0.0001 | 04-JUL-12 |
| Tellurium (Te)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Thallium (Tl)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Thorium (Th)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Tin (Sn)-Total | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Titanium (Ti)-Total | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Tungsten (W)-Total | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2392579** | | | | | | | | |
| **WG1495862-1 MB** | | | | | | | | |
| Uranium (U)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Vanadium (V)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Yttrium (Y)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Zinc (Zn)-Total | | | <0.0030 | | mg/L | | 0.003 | 04-JUL-12 |
| Zirconium (Zr)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| **Batch R2393046** | | | | | | | | |
| **WG1495862-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Aluminum (Al)-Total | | | 101.0 | | % | | 80-120 | 04-JUL-12 |
| Antimony (Sb)-Total | | | 98.2 | | % | | 80-120 | 04-JUL-12 |
| Arsenic (As)-Total | | | 99.5 | | % | | 80-120 | 04-JUL-12 |
| Barium (Ba)-Total | | | 102.4 | | % | | 80-120 | 04-JUL-12 |
| Beryllium (Be)-Total | | | 104.0 | | % | | 80-120 | 04-JUL-12 |
| Bismuth (Bi)-Total | | | 103.1 | | % | | 80-120 | 04-JUL-12 |
| Boron (B)-Total | | | 107.6 | | % | | 80-120 | 04-JUL-12 |
| Cadmium (Cd)-Total | | | 114.0 | | % | | 80-120 | 04-JUL-12 |
| Cesium (Cs)-Total | | | 100.6 | | % | | 80-120 | 04-JUL-12 |
| Chromium (Cr)-Total | | | 104.6 | | % | | 80-120 | 04-JUL-12 |
| Cobalt (Co)-Total | | | 103.6 | | % | | 80-120 | 04-JUL-12 |
| Copper (Cu)-Total | | | 102.0 | | % | | 80-120 | 04-JUL-12 |
| Gallium (Ga)-Total | | | 103.6 | | % | | 80-120 | 04-JUL-12 |
| Iron (Fe)-Total | | | 109.3 | | % | | 80-120 | 04-JUL-12 |
| Lead (Pb)-Total | | | 103.2 | | % | | 80-120 | 04-JUL-12 |
| Lithium (Li)-Total | | | 101.8 | | % | | 80-120 | 04-JUL-12 |
| Manganese (Mn)-Total | | | 106.4 | | % | | 80-120 | 04-JUL-12 |
| Molybdenum (Mo)-Total | | | 105.6 | | % | | 80-120 | 04-JUL-12 |
| Nickel (Ni)-Total | | | 96.8 | | % | | 80-120 | 04-JUL-12 |
| Phosphorus (P)-Total | | | 103.6 | | % | | 80-120 | 04-JUL-12 |
| Rhenium (Re)-Total | | | 96.1 | | % | | 80-120 | 04-JUL-12 |
| Rubidium (Rb)-Total | | | 108.0 | | % | | 80-120 | 04-JUL-12 |
| Silver (Ag)-Total | | | 94.6 | | % | | 80-120 | 04-JUL-12 |
| Tellurium (Te)-Total | | | 105.0 | | % | | 80-120 | 04-JUL-12 |
| Thallium (Tl)-Total | | | 104.4 | | % | | 80-120 | 04-JUL-12 |
| Thorium (Th)-Total | | | 104.0 | | % | | 80-120 | 04-JUL-12 |
| Tin (Sn)-Total | | | 102.5 | | % | | 80-120 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1495862-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Titanium (Ti)-Total | | | 102.0 | | % | | 80-120 | 04-JUL-12 |
| Tungsten (W)-Total | | | 99.5 | | % | | 80-120 | 04-JUL-12 |
| Uranium (U)-Total | | | 95.2 | | % | | 80-120 | 04-JUL-12 |
| Vanadium (V)-Total | | | 105.4 | | % | | 80-120 | 04-JUL-12 |
| Yttrium (Y)-Total | | | 106.0 | | % | | 80-120 | 04-JUL-12 |
| Zinc (Zn)-Total | | | 110.2 | | % | | 80-120 | 04-JUL-12 |
| Zirconium (Zr)-Total | | | 91.4 | | % | | 80-120 | 04-JUL-12 |
| **MET-TOT-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2389051** | | | | | | | | |
| **WG1495862-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Total | | | 101.8 | | % | | 80-120 | 26-JUN-12 |
| Magnesium (Mg)-Total | | | 99.7 | | % | | 80-120 | 26-JUN-12 |
| Potassium (K)-Total | | | 97.6 | | % | | 80-120 | 26-JUN-12 |
| Silicon (Si)-Total | | | 101.4 | | % | | 80-120 | 26-JUN-12 |
| Sodium (Na)-Total | | | 101.5 | | % | | 80-120 | 26-JUN-12 |
| Strontium (Sr)-Total | | | 100.6 | | % | | 80-120 | 26-JUN-12 |
| **WG1495862-1 MB** | | | | | | | | |
| Calcium (Ca)-Total | | | <0.050 | | mg/L | | 0.05 | 26-JUN-12 |
| Magnesium (Mg)-Total | | | <0.10 | | mg/L | | 0.1 | 26-JUN-12 |
| Potassium (K)-Total | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| Silicon (Si)-Total | | | <0.050 | | mg/L | | 0.05 | 26-JUN-12 |
| Sodium (Na)-Total | | | <2.0 | | mg/L | | 2 | 26-JUN-12 |
| Strontium (Sr)-Total | | | <0.0050 | | mg/L | | 0.005 | 26-JUN-12 |
| **NH3-F-VA** | **Seawater** | | | | | | | |
| **Batch R2391904** | | | | | | | | |
| **WG1500187-2 CRM** | | **VA-NH3-F** | | | | | | |
| Ammonia, Total (as N) | | | 95.0 | | % | | 85-115 | 03-JUL-12 |
| **WG1500187-1 MB** | | | | | | | | |
| Ammonia, Total (as N) | | | <0.0050 | | mg/L | | 0.005 | 03-JUL-12 |
| **P-T-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2397437** | | | | | | | | |
| **WG1506246-2 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 94.6 | | % | | 80-120 | 12-JUL-12 |
| **WG1506246-3 DUP** | | **L1167094-1** | | | | | | |
| Phosphorus (P)-Total | | <0.20 | <0.20 | RPD-NA | mg/L | N/A | 20 | 12-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **P-T-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2397437** | | | | | | | | |
| **WG1506246-1 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 12-JUL-12 |
| **PH-C-PCT-VA** | **Seawater** | | | | | | | |
| **Batch R2391468** | | | | | | | | |
| **WG1499792-4 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 6.99 | | pH | | 6.9-7.1 | 30-JUN-12 |
| **TDS-VA** | **Seawater** | | | | | | | |
| **Batch R2389214** | | | | | | | | |
| **WG1496828-3 DUP** | | **L1167094-1** | | | | | | |
| Total Dissolved Solids | | 91300 | 89600 | | mg/L | 1.8 | 20 | 26-JUN-12 |
| **WG1496828-2 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 102.1 | | % | | 85-115 | 26-JUN-12 |
| **WG1496828-1 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 26-JUN-12 |
| **TS-VA** | **Seawater** | | | | | | | |
| **Batch R2389998** | | | | | | | | |
| **WG1496823-3 DUP** | | **L1167094-1** | | | | | | |
| Total Solids | | 125000 | 127000 | | mg/L | 2.0 | 25 | 27-JUN-12 |
| **WG1496823-2 LCS** | | | | | | | | |
| Total Solids | | | 98.6 | | % | | 85-115 | 27-JUN-12 |
| **WG1496823-1 MB** | | | | | | | | |
| Total Solids | | | <10 | | mg/L | | 10 | 27-JUN-12 |
| **TSS-C-VA** | **Seawater** | | | | | | | |
| **Batch R2388271** | | | | | | | | |
| **WG1495971-2 LCS** | | | | | | | | |
| Total Suspended Solids | | | 93.3 | | % | | 85-115 | 25-JUN-12 |
| **WG1495971-1 MB** | | | | | | | | |
| Total Suspended Solids | | | <2.0 | | mg/L | | 2 | 25-JUN-12 |

**Legend:**

| | |
|---|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

**Sample Parameter Qualifier Definitions:**

| Qualifier | Description |
|---|---|
| RPD-NA | Relative Percent Difference Not Available due to result(s) being less than detection limit. |

# Quality Control Report



**Hold Time Exceedances:**

| ALS Product Description | Sample ID | Sampling Date | Date Processed | Rec. HT | Actual HT | Units | Qualifier |
|---|---|---|---|---|---|---|---|
| **Physical Tests** | | | | | | | |
| Total Solids by Gravimetric | | | | | | | |
| | 1 | 19-JUN-12 06:00 | 27-JUN-12 14:16 | 7 | 8 | days | EHT |
| pH by Meter (Automated) (seawater) | | | | | | | |
| | 1 | 19-JUN-12 06:00 | 30-JUN-12 14:42 | 0.25 | 273 | hours | EHTR-FM |
| **Anions and Nutrients** | | | | | | | |
| Nitrate in Seawater by IC | | | | | | | |
| | 1 | 19-JUN-12 06:00 | 26-JUN-12 08:45 | 3 | 7 | days | EHTR |
| Nitrite in Seawater by IC | | | | | | | |
| | 1 | 19-JUN-12 06:00 | 26-JUN-12 08:45 | 3 | 7 | days | EHTR |
| Total P in Seawater by Colour | | | | | | | |
| | 1 | 19-JUN-12 06:00 | 06-JUL-12 10:15 | 3 | 17 | days | EHTR |

**Legend & Qualifier Definitions:**

| | |
|---|---|
| EHTR-FM: | Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended. |
| EHTR: | Exceeded ALS recommended hold time prior to sample receipt. |
| EHTL: | Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry. |
| EHT: | Exceeded ALS recommended hold time prior to analysis. |
| Rec. HT: | ALS recommended hold time (see units). |

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1167094 were received on 22-JUN-12 16:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

---

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**ALS Laboratory Group**
ANALYTICAL CHEMISTRY & TESTING SERVICES

**Environmental Division**

**Chain of Custody / Analytical Request Form**
**Canada Toll Free: 1 800 668 9878**
www.alsglobal.com

Amber Springer + Judy Bethune

COC # **08-013784**

Page 1 of 1

| | | |
|---|---|---|
| **Report to:** Valerie Bertrand | **Report Format / Distribution** | **Service Requested:** (rush - subject to availability) |
| Company: Golder | Standard: Other: | X Regular (Default) |
| Contact: Valerie Bertrand | Select: PDF ___ Excel ___ Digital ___ | Priority (2-3 Business Days) - 50% Surcharge |
| Address: 32 Steacie Dr, Kanata, Ontario K2K 2A9 | Email 1: Valerie_Bertrand@golder.com | Emergency (1 Business Day) - 100% Surcharge |
| Phone: 613-592-9600 Fax: 613-592-9601 | Email 2: Hugh_Carter@golder.com | For Emergency < 1 Day, ASAP or Weekend - Contact ALS |
| **Invoice To:** Same as Report ? Yes / No? | **Client / Project Information:** | **Analysis Request** (Indicate Filtered or Preserved, F/P.) |
| Company: Golder | Job #: 11-1428-0011 | |
| Contact: Hugh Carter | PO / AFE: | |
| Address: 4260 Still Creek Dr Burnaby, BC V5C 6C6 | Legal Site Description: Meliadine | |
| Phone: 604-296-4200 Fax: 604-298-5253 | Quote #: Q35060 | |
| Lab Work Order # (lab use only) | ALS Contact: Amber + Judy Bethune | Sampler: P. Maddock, J. Carter |

| Sample # | Sample Identification (This description will appear on the report) | Date | Time | Sample Type | Incl. H2SO4 Set A* Total metals | Incl. Hg, Set A* Dissolved metals | Hardness, pH+ Conductivity | TSS, TDS | Alkalinity, Anions (Cl, NO3, SO4, F) | Ammonia | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Port-2A-1 | 6/19-20/12 | 16:00 - 06:00 | Saline water. | X | X | X | X | X | X | 4 |
| 2 | Port-2A-2 | 6/19-20/12 | 16:00 - 06:00 | Saline water. | X | X | X | X | X | X | 4 |

Short Holding Time
Rush Processing

*L116794-COFC*

**Special Instructions / Regulations / Hazardous Details**

*Dissolved metals were field filtered + preserved
Please use lowest detection limits possible ** Saline water.

**Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.**

**By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.**

| SHIPMENT RELEASE (client use) | | SHIPMENT RECEPTION (lab use only) | | | SHIPMENT VERIFICATION (lab use only) | | |
|---|---|---|---|---|---|---|---|
| Released by: | Date & Time: | Received by: | Date: | Time: | Temperature: | Verified by: | Date & Time: | Observations: Yes / No ? If Yes attach SIF |
| | June 21/10:00 | | Jun 22 | 16:30 | 8.5 | | | |

GOLDER ASSOCIATES LTD.
ATTN: Valerie Bertrand
32 Steacie Drive
Kanata ON K2K 2A9

Date Received: 11-JUL-12
Report Date: 18-JUL-12 15:23 (MT)
Version: FINAL REV. 2

Client Phone: 613-592-9600

# Certificate of Analysis

**Lab Work Order #: L1176479**

| | |
|---|---|
| Project P.O. #: | NOT SUBMITTED |
| Job Reference: | 11-1428 |
| C of C Numbers: | 08-013781 |
| Legal Site Desc: | MELIADINE |

Amber Springer
Account Manager

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample ID** | L1176479-1 | | | | |
| | **Description** | SALINE WATER | | | | |
| | **Sampled Date** | 04-JUL-12 | | | | |
| | **Sampled Time** | 10:30 | | | | |
| | **Client ID** | PORT-2A-1 | | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Anions and Nutrients** | Chloride (Cl) (mg/L) | 44100 | | | | |
| | Sulfate (SO4) (mg/L) | <50 DLM | | | | |
| **Total Metals** | Calcium (Ca)-Total (mg/L) | 22400 | | | | |
| | Magnesium (Mg)-Total (mg/L) | 13.1 | | | | |
| | Potassium (K)-Total (mg/L) | 894 | | | | |
| | Sodium (Na)-Total (mg/L) | 658 | | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# Reference Information

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLM | Detection Limit Adjusted For Sample Matrix Effects |

**Test Method References:**

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | Seawater | Chloride by IC (seawater) | APHA 4110 B. |
| This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". | | | |
| **ANIONS-C-SO4-IC-VA** | Seawater | Sulfate by IC (seawater) | APHA 4110 B. |
| This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". | | | |
| **MET-TOT-C-ICP-VA** | Seawater | Total Metals in Seawater by ICPOES | PUGET SOUND PROTOCOLS, EPA 6010B |
| This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B). | | | |

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA |

**Chain of Custody Numbers:**

08-013781

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg - milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L - milligrams per litre.*
*< - Less than.*
*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# Quality Control Report



Client: GOLDER ASSOCIATES LTD.
32 Steacie Drive
Kanata ON K2K 2A9
Contact: Valerie Bertrand

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2400118** | | | | | | | | |
| **WG1508152-2 LCS** | | | | | | | | |
| Chloride (Cl) | | | 100.3 | | % | | 85-115 | 16-JUL-12 |
| **WG1508152-1 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **WG1508152-10 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **WG1508152-4 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **WG1508152-7 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **ANIONS-C-SO4-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2400118** | | | | | | | | |
| **WG1508152-2 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.7 | | % | | 85-115 | 16-JUL-12 |
| **WG1508152-1 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **WG1508152-10 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **WG1508152-4 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **WG1508152-7 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 16-JUL-12 |
| **MET-TOT-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2399624** | | | | | | | | |
| **WG1507558-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Total | | | 103.1 | | % | | 80-120 | 16-JUL-12 |
| Magnesium (Mg)-Total | | | 102.9 | | % | | 80-120 | 16-JUL-12 |
| Potassium (K)-Total | | | 102.3 | | % | | 80-120 | 16-JUL-12 |
| Sodium (Na)-Total | | | 102.6 | | % | | 80-120 | 16-JUL-12 |
| **WG1507558-1 MB** | | | | | | | | |
| Calcium (Ca)-Total | | | <0.050 | | mg/L | | 0.05 | 16-JUL-12 |
| Magnesium (Mg)-Total | | | <0.10 | | mg/L | | 0.1 | 16-JUL-12 |
| Potassium (K)-Total | | | <2.0 | | mg/L | | 2 | 16-JUL-12 |
| Sodium (Na)-Total | | | <2.0 | | mg/L | | 2 | 16-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-TOT-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2399693** | | | | | | | | |
| **WG1507558-3 DUP** | | **L1176479-1** | | | | | | |
| Calcium (Ca)-Total | | 22400 | 23300 | | mg/L | 4.0 | 20 | 16-JUL-12 |
| Magnesium (Mg)-Total | | 13.1 | 13.6 | | mg/L | 3.7 | 20 | 16-JUL-12 |
| Potassium (K)-Total | | 894 | 920 | | mg/L | 2.9 | 20 | 16-JUL-12 |
| Sodium (Na)-Total | | 658 | 680 | | mg/L | 3.3 | 20 | 16-JUL-12 |

# Quality Control Report



**Legend:**

| | |
|---|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

**Hold Time Exceedances:**

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

---

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**ALS Laboratory Group**
ANALYTICAL CHEMISTRY & TESTING SERVICES

**Environmental Division**

**Chain of Custody / Analytical Request Form**
**Canada Toll Free: 1 800 668 9878**
www.alsglobal.com

COC # **08-013781**
Page 1 of 1

| Report to: | Report Format / Distribution | Service Requested: (rush - subject to availability) |
|---|---|---|
| Company: Golder Associates | Standard: X Other: | X Regular (Default) |
| Contact: Valerie Bremond | Select: PDF X Excel Digital | Priority (2-3 Business Days) - 50% Surcharge |
| Address: 32 Steacie Drive, Kanata Ontario K2K-2A4 | Email 1: valerie_bremond@golder.com | Emergency (1 Business Day) - 100% Surcharge |
| Phone: 613-592-9600 Fax: 613-592-9601 | Email 2: hugh_carter@golder.com | For Emergency < 1 Day, ASAP or Weekend - Contact ALS |
| Invoice To: Same as Report ? (Yes) / No ? | Client / Project Information: | Analysis Request (Indicate Filtered or Preserved, F/P) |
| Company: | Job #: 11-1428 | |
| Contact: | PO / AFE: | |
| Address: | Legal Site Description: Meliadine | |
| Phone: Fax: | Quote #: | |
| Lab Work Order # (lab use only): [illegible] | ALS Contact: Jude Bethune / Amber Springer | Sampler: Hanna Musslick |

| Sample # | Sample Identification (This description will appear on the report) | Date | Time | Sample Type | Cl, SO4 | Na, Ca, Mg, K | Flourescence | Number of Containers |
|---|---|---|---|---|---|---|---|---|
| 1 | Port-2A-1 | July 4, 2012 | 10:30 | salinewater | X | X | X | |

L1176479-COFC

Special Instructions / Regulations / Hazardous Details

→ if you do not do flourescence analysis please call Hugh Carter or Valerie Bremond

* please use lowest detection limits possible
* water is saline
- I was not sure if preservation was required so one bottle has no preservative (1x1L plastic) and one has $HNO_3$ preservative (1x250ml plastic)

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

| SHIPMENT RELEASE (client use) | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|
| Released by: | Date & Time: | Received by: | Date: | Time: | Temperature: | Verified by: | Date & Time: | Observations: Yes / No If Yes at... |
| Hanna Musslick | July 5 2012 10:30 | Brittany | July 11 | 9:10 | 22.0 | | | |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF 18.0

1046

GOLDER ASSOCIATES LTD.
ATTN: Valerie Bertrand
32 Steacie Drive
Kanata ON K2K 2A9

Date Received: 26-JUL-12
Report Date: 08-AUG-12 09:38 (MT)
Version: FINAL REV. 2

Client Phone: 613-592-9600

# Certificate of Analysis

**Lab Work Order #: L1184714**

| | |
|---|---|
| Project P.O. #: | NOT SUBMITTED |
| Job Reference: | 11-1428-0011 |
| C of C Numbers: | 08-073771 |
| Legal Site Desc: | MELIADINE |

Amber Springer
Account Manager

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1184714-1 | L1184714-2 | | | |
|---|---|---|---|---|---|---|
| | Description | SALINE WATER | SALINE WATER | | | |
| | Sampled Date | 17-JUL-12 | 17-JUL-12 | | | |
| | Sampled Time | 08:30 | 18:00 | | | |
| | Client ID | PORT-2A-1 | DRILL7-1 | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 75300 | 1200 | | | |
| | Hardness (as CaCO3) | 60500 | 504 | | | |
| | pH (pH) | 8.16 | 7.80 | | | |
| | Total Suspended Solids (mg/L) | 30.0 | 32.4 | | | |
| | Total Dissolved Solids (mg/L) | 82900 | 1180 | | | |
| | Total Solids (mg/L) | 80700 | 1260 | | | |
| **Anions and Nutrients** | Alkalinity, Bicarbonate (as CaCO3) (mg/L) | 18.8 | 23.4 | | | |
| | Alkalinity, Carbonate (as CaCO3) (mg/L) | <2.0 | <2.0 | | | |
| | Alkalinity, Hydroxide (as CaCO3) (mg/L) | <2.0 | <2.0 | | | |
| | Alkalinity, Total (as CaCO3) (mg/L) | 18.8 | 23.4 | | | |
| | Bromide (Br) (mg/L) | 611 | 4.11 | | | |
| | Chloride (Cl) (mg/L) | 44300 | 351 | | | |
| | Fluoride (F) (mg/L) | <0.75 | <0.20 DLM | | | |
| | Nitrate (as N) (mg/L) | <0.50 DLM | <0.050 DLM | | | |
| | Nitrite (as N) (mg/L) | <0.10 DLM | <0.010 DLM | | | |
| | Phosphorus (P)-Total (mg/L) | <0.20 | 0.0099 | | | |
| | Sulfate (SO4) (mg/L) | <50 DLM | 11.6 | | | |
| **Dissolved Metals** | Dissolved Metals Filtration Location | FIELD | FIELD | | | |
| | Aluminum (Al)-Dissolved (mg/L) | 0.028 | <0.0050 | | | |
| | Antimony (Sb)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Arsenic (As)-Dissolved (mg/L) | <0.16 DLM | <0.0020 | | | |
| | Barium (Ba)-Dissolved (mg/L) | 0.644 | 0.101 | | | |
| | Beryllium (Be)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Boron (B)-Dissolved (mg/L) | 11.1 | <0.10 | | | |
| | Cadmium (Cd)-Dissolved (mg/L) | <0.00030 DLM | <0.000050 | | | |
| | Calcium (Ca)-Dissolved (mg/L) | 24200 | 184 | | | |
| | Cesium (Cs)-Dissolved (mg/L) | 0.126 | <0.00050 | | | |
| | Chromium (Cr)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00032 | 0.000347 | | | |
| | Copper (Cu)-Dissolved (mg/L) | 0.0021 | 0.00278 | | | |
| | Gallium (Ga)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Iron (Fe)-Dissolved (mg/L) | 0.067 | 0.680 | | | |
| | Lead (Pb)-Dissolved (mg/L) | <0.00060 DLA | <0.00030 | | | |
| | Lithium (Li)-Dissolved (mg/L) | 22.7 | 0.120 | | | |
| | Magnesium (Mg)-Dissolved (mg/L) | 16.8 | 11.0 | | | |
| | Manganese (Mn)-Dissolved (mg/L) | 0.0458 | 0.0676 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1184714-1 | L1184714-2 | | | |
|---|---|---|---|---|---|---|
| | Description | SALINE WATER | SALINE WATER | | | |
| | Sampled Date | 17-JUL-12 | 17-JUL-12 | | | |
| | Sampled Time | 08:30 | 18:00 | | | |
| | Client ID | PORT-2A-1 | DRILL7-1 | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Dissolved Metals** | Mercury (Hg)-Dissolved (mg/L) | <0.000010 | <0.000010 | | | |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.0235 | 0.0026 | | | |
| | Nickel (Ni)-Dissolved (mg/L) | 0.0033 | 0.00592 | | | |
| | Phosphorus (P)-Dissolved (mg/L) | <2.0 DLA | <1.0 | | | |
| | Potassium (K)-Dissolved (mg/L) | 930 | 7.7 | | | |
| | Rhenium (Re)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Rubidium (Rb)-Dissolved (mg/L) | 1.50 | 0.0088 | | | |
| | Selenium (Se)-Dissolved (mg/L) | 0.00063 | <0.00050 | | | |
| | Silicon (Si)-Dissolved (mg/L) | <2.5 DLA | 1.06 | | | |
| | Silver (Ag)-Dissolved (mg/L) | <0.00020 DLA | <0.00010 | | | |
| | Sodium (Na)-Dissolved (mg/L) | 720 | 17.6 | | | |
| | Strontium (Sr)-Dissolved (mg/L) | 416 | 1.97 | | | |
| | Tellurium (Te)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Thallium (Tl)-Dissolved (mg/L) | 0.00549 | <0.000050 | | | |
| | Thorium (Th)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Tin (Sn)-Dissolved (mg/L) | <0.0020 DLA | <0.0010 | | | |
| | Titanium (Ti)-Dissolved (mg/L) | <0.010 DLA | <0.0050 | | | |
| | Tungsten (W)-Dissolved (mg/L) | 0.0114 | <0.0010 | | | |
| | Uranium (U)-Dissolved (mg/L) | <0.00010 DLA | <0.000050 | | | |
| | Vanadium (V)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |
| | Yttrium (Y)-Dissolved (mg/L) | 0.0023 | <0.00050 | | | |
| | Zinc (Zn)-Dissolved (mg/L) | 0.664 | 0.0132 | | | |
| | Zirconium (Zr)-Dissolved (mg/L) | <0.0010 DLA | <0.00050 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample ID** | L1184714-3 | | | | |
| | **Description** | FRESH WATER | | | | |
| | **Sampled Date** | 18-JUL-12 | | | | |
| | **Sampled Time** | 11:00 | | | | |
| | **Client ID** | DRILL7 WATER LAKE | | | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 1200 | | | | |
| | Hardness (as CaCO3) | 500 | | | | |
| | pH (pH) | 7.66 | | | | |
| | Total Suspended Solids (mg/L) | 3.3 | | | | |
| | Total Dissolved Solids (mg/L) | 1070 | | | | |
| | Total Solids (mg/L) | 1110 | | | | |
| **Anions and Nutrients** | Alkalinity, Bicarbonate (as CaCO3) (mg/L) | 26.3 | | | | |
| | Alkalinity, Carbonate (as CaCO3) (mg/L) | <2.0 | | | | |
| | Alkalinity, Hydroxide (as CaCO3) (mg/L) | <2.0 | | | | |
| | Alkalinity, Total (as CaCO3) (mg/L) | 26.3 | | | | |
| | Bromide (Br) (mg/L) | 4.28 | | | | |
| | Chloride (Cl) (mg/L) | 358 | | | | |
| | Fluoride (F) (mg/L) | <0.20 DLM | | | | |
| | Nitrate (as N) (mg/L) | <0.050 DLM | | | | |
| | Nitrite (as N) (mg/L) | <0.010 DLM | | | | |
| | Phosphorus (P)-Total (mg/L) | 0.0074 | | | | |
| | Sulfate (SO4) (mg/L) | 12.1 | | | | |
| **Dissolved Metals** | Dissolved Metals Filtration Location | FIELD | | | | |
| | Aluminum (Al)-Dissolved (mg/L) | 0.0109 | | | | |
| | Antimony (Sb)-Dissolved (mg/L) | 0.000025 | | | | |
| | Arsenic (As)-Dissolved (mg/L) | 0.00140 | | | | |
| | Barium (Ba)-Dissolved (mg/L) | 0.118 | | | | |
| | Beryllium (Be)-Dissolved (mg/L) | <0.0000050 | | | | |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.000050 | | | | |
| | Boron (B)-Dissolved (mg/L) | 0.0262 | | | | |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.0000251 | | | | |
| | Calcium (Ca)-Dissolved (mg/L) | 181 | | | | |
| | Cesium (Cs)-Dissolved (mg/L) | 0.0000647 | | | | |
| | Chromium (Cr)-Dissolved (mg/L) | <0.00050 | | | | |
| | Cobalt (Co)-Dissolved (mg/L) | 0.000363 | | | | |
| | Copper (Cu)-Dissolved (mg/L) | 0.00134 | | | | |
| | Gallium (Ga)-Dissolved (mg/L) | <0.000050 | | | | |
| | Iron (Fe)-Dissolved (mg/L) | 0.369 | | | | |
| | Lead (Pb)-Dissolved (mg/L) | 0.000191 | | | | |
| | Lithium (Li)-Dissolved (mg/L) | 0.117 | | | | |
| | Magnesium (Mg)-Dissolved (mg/L) | 11.7 | | | | |
| | Manganese (Mn)-Dissolved (mg/L) | 0.0388 | | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | Sample ID | L1184714-3 |
|---|---|---|---|
| | | Description | FRESH WATER |
| | | Sampled Date | 18-JUL-12 |
| | | Sampled Time | 11:00 |
| | | Client ID | DRILL7 WATER LAKE |
| **Grouping** | **Analyte** | | |
| **WATER** | | | |
| **Dissolved Metals** | Mercury (Hg)-Dissolved (mg/L) | | <0.000050 |
| | Molybdenum (Mo)-Dissolved (mg/L) | | 0.000578 |
| | Nickel (Ni)-Dissolved (mg/L) | | 0.00354 |
| | Phosphorus (P)-Dissolved (mg/L) | | <0.30 |
| | Potassium (K)-Dissolved (mg/L) | | 8.0 |
| | Rhenium (Re)-Dissolved (mg/L) | | <0.0000050 |
| | Rubidium (Rb)-Dissolved (mg/L) | | 0.00736 |
| | Selenium (Se)-Dissolved (mg/L) | | <0.00050 |
| | Silicon (Si)-Dissolved (mg/L) | | 1.42 |
| | Silver (Ag)-Dissolved (mg/L) | | 0.0000070 |
| | Sodium (Na)-Dissolved (mg/L) | | 20.4 |
| | Strontium (Sr)-Dissolved (mg/L) | | 1.67 |
| | Tellurium (Te)-Dissolved (mg/L) | | <0.000010 |
| | Thallium (Tl)-Dissolved (mg/L) | | 0.0000090 |
| | Thorium (Th)-Dissolved (mg/L) | | 0.0000078 |
| | Tin (Sn)-Dissolved (mg/L) | | <0.00020 |
| | Titanium (Ti)-Dissolved (mg/L) | | 0.00022 |
| | Tungsten (W)-Dissolved (mg/L) | | 0.000240 |
| | Uranium (U)-Dissolved (mg/L) | | 0.0000302 |
| | Vanadium (V)-Dissolved (mg/L) | | 0.000101 |
| | Yttrium (Y)-Dissolved (mg/L) | | 0.0000403 |
| | Zinc (Zn)-Dissolved (mg/L) | | <0.0050 |
| | Zirconium (Zr)-Dissolved (mg/L) | | <0.000050 |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# Reference Information

**QC Samples with Qualifiers & Comments:**

| QC Type Description | Parameter | Qualifier | Applies to Sample Number(s) |
|---|---|---|---|
| Matrix Spike | Phosphorus (P)-Total | MS-B | L1184714-3 |
| Matrix Spike | Sulfate (SO4) | MS-B | L1184714-3 |

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLA | Detection Limit Adjusted For required dilution |
| DLM | Detection Limit Adjusted For Sample Matrix Effects |
| MS-B | Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. |

**Test Method References:**

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **ALK-C-SCR-VA** | Seawater | Alk. by colour or titration (seawater) | EPA 310.2 OR APHA 2320 |

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

| | | | |
|---|---|---|---|
| **ALK-SCR-VA** | Water | Alkalinity by colour or titration | EPA 310.2 OR APHA 2320 |

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

| | | | |
|---|---|---|---|
| **ANIONS-BR-IC-VA** | Water | Bromide by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-BR-IC-VA** | Seawater | Bromide by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | Seawater | Chloride by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-F-IC-VA** | Seawater | Fluoride by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-NO2-IC-VA** | Seawater | Nitrite in Seawater by IC | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-C-NO3-IC-VA** | Seawater | Nitrate in Seawater by IC | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-C-SO4-IC-VA** | Seawater | Sulfate by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-CL-IC-VA** | Water | Chloride by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-F-IC-VA** | Water | Fluoride by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-NO2-IC-VA** | Water | Nitrite in Water by Ion Chromatography | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-NO3-IC-VA** | Water | Nitrate in Water by Ion Chromatography | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

# Reference Information

| | | | |
|---|---|---|---|
| **ANIONS-SO4-IC-VA** | Water | Sulfate by Ion Chromatography | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **EC-C-PCT-VA** | Seawater | Conductivity (Automated) (seawater) | APHA 2510 Auto. Conduc. |

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

| | | | |
|---|---|---|---|
| **EC-PCT-VA** | Water | Conductivity (Automated) | APHA 2510 Auto. Conduc. |

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

| | | | |
|---|---|---|---|
| **F-ISE-VA** | Seawater | Fluoride by SIE | BASED ON APHA 4500-F FLUORIDE |

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

| | | | |
|---|---|---|---|
| **HARDNESS-CALC-VA** | Water | Hardness | APHA 2340B |

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

| | | | |
|---|---|---|---|
| **HARDNESS-CALC-VA** | Seawater | Hardness | APHA 2340B |

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

| | | | |
|---|---|---|---|
| **HG-DIS-C-CVAFS-VA** | Seawater | Diss. Mercury in Seawater by CVAFS | PUGET SOUND PROTOCOLS, EPA 245.7 |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **HG-DIS-CVAFS-VA** | Water | Dissolved Mercury in Water by CVAFS | EPA SW-846 3005A & EPA 245.7 |

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **MET-D-L-HRMS-VA** | Water | Diss. Metals in Water by HR-ICPMS | EPA 200.8 |

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration modified from APHA Method 3030B.

| | | | |
|---|---|---|---|
| **MET-D-L-HRMS-VA** | Seawater | Diss. Metals in Seawater by HR-ICPMS | EPA 200.8 |

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

| | | | |
|---|---|---|---|
| **MET-DIS-C-ICP-VA** | Seawater | Diss. Metals in Seawater by ICPOES | PUGET SOUND PROTOCOLS, EPA 6010B |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

| | | | |
|---|---|---|---|
| **MET-DIS-ICP-VA** | Water | Dissolved Metals in Water by ICPOES | EPA SW-846 3005A/6010B |

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

| | | | |
|---|---|---|---|
| **P-T-COL-VA** | Water | Total P in Water by Colour | APHA 4500-P Phosphorous |

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

| | | | |
|---|---|---|---|
| **P-T-COL-VA** | Seawater | Total P in Seawater by Colour | APHA 4500-P Phosphorous |

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

| | | | |
|---|---|---|---|
| **PH-C-PCT-VA** | Seawater | pH by Meter (Automated) (seawater) | APHA 4500-H pH Value |

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

| | | | |
|---|---|---|---|
| **PH-PCT-VA** | Water | pH by Meter (Automated) | APHA 4500-H "pH Value" |

# Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

**PH-PCT-VA** Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

**SE-D-HVAF-VA** Water Dissolved Selenium in Water by HVAFS APHA 3030B&E/ISO/CD 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Water Quality - Determination of As/Se/Sb, Part 1 - Hydride Generation Atomic Fluorescence Spectrometry (HG-AFS)", by the International Organization for Standardization (ISO). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

**SE-D-HVAF-VA** Seawater Dissolved Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

**TDS-VA** Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

**TDS-VA** Seawater Total Dissolved Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

**TS-VA** Water Total Solids by Gravimetric APHA 2540 B - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Solids (TS) are determined by evaporating a sample to dryness at 104 degrees celsius.

**TS-VA** Seawater Total Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Solids (TS) are determined by evaporating a sample to dryness at 104 degrees celsius.

**TSS-C-VA** Seawater Total Suspended Solids by Gravimetric APHA 2540 D. / PSWQA TSS

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a 0.45um membrane filter (Puget Sound Water Quality Authority TSS Method, May 1991), TSS is determined by drying the filter at 104 degrees celsius.

**TSS-VA** Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA |

**Chain of Custody Numbers:**

08-073771

# Reference Information

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg - milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L - milligrams per litre.*
*< - Less than.*
*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# Quality Control Report



Client: GOLDER ASSOCIATES LTD.
32 Steacie Drive
Kanata ON K2K 2A9
Contact: Valerie Bertrand

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ALK-SCR-VA** | **Water** | | | | | | | |
| **Batch R2406572** | | | | | | | | |
| **WG1515616-2 CRM** | | **VA-ALKL-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 100.5 | | % | | 85-115 | 26-JUL-12 |
| **WG1515616-5 CRM** | | **VA-ALKM-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 104.4 | | % | | 85-115 | 26-JUL-12 |
| **WG1515616-1 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUL-12 |
| **WG1515616-4 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUL-12 |
| **WG1515616-7 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUL-12 |
| **ANIONS-BR-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-18 LCS** | | | | | | | | |
| Bromide (Br) | | | 95.7 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-2 LCS** | | | | | | | | |
| Bromide (Br) | | | 95.1 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-1 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 30-JUL-12 |
| **WG1517083-10 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 30-JUL-12 |
| **WG1517083-13 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 30-JUL-12 |
| **WG1517083-16 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 30-JUL-12 |
| **WG1517083-4 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 30-JUL-12 |
| **WG1517083-7 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 30-JUL-12 |
| **WG1517083-11 MS** | | **L1185604-9** | | | | | | |
| Bromide (Br) | | | 94.0 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-14 MS** | | **L1185759-13** | | | | | | |
| Bromide (Br) | | | 96.4 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-5 MS** | | **L1182081-15** | | | | | | |
| Bromide (Br) | | | 103.3 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |
| Bromide (Br) | | | 96.4 | | % | | 75-125 | 30-JUL-12 |
| **ANIONS-CL-IC-VA** | **Water** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-CL-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-18 LCS** | | | | | | | | |
| Chloride (Cl) | | | 100.2 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-2 LCS** | | | | | | | | |
| Chloride (Cl) | | | 100.0 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-1 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-10 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-13 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-16 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-4 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-7 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-11 MS** | | **L1185604-9** | | | | | | |
| Chloride (Cl) | | | 99.7 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-14 MS** | | **L1185759-13** | | | | | | |
| Chloride (Cl) | | | 100.2 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-5 MS** | | **L1182081-15** | | | | | | |
| Chloride (Cl) | | | 99.4 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |
| Chloride (Cl) | | | 99.8 | | % | | 75-125 | 30-JUL-12 |
| **ANIONS-F-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-18 LCS** | | | | | | | | |
| Fluoride (F) | | | 105.1 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-2 LCS** | | | | | | | | |
| Fluoride (F) | | | 105.0 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-1 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| **WG1517083-10 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| **WG1517083-13 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| **WG1517083-16 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| **WG1517083-4 MB** | | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-F-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-4 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| **WG1517083-7 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| **WG1517083-11 MS** | | **L1185604-9** | | | | | | |
| Fluoride (F) | | | 108.0 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-14 MS** | | **L1185759-13** | | | | | | |
| Fluoride (F) | | | 106.3 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-5 MS** | | **L1182081-15** | | | | | | |
| Fluoride (F) | | | 98.1 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |
| Fluoride (F) | | | 107.1 | | % | | 75-125 | 30-JUL-12 |
| **ANIONS-NO2-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-18 LCS** | | | | | | | | |
| Nitrite (as N) | | | 106.6 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-2 LCS** | | | | | | | | |
| Nitrite (as N) | | | 103.0 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-1 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| **WG1517083-10 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| **WG1517083-13 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| **WG1517083-16 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| **WG1517083-4 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| **WG1517083-7 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| **WG1517083-11 MS** | | **L1185604-9** | | | | | | |
| Nitrite (as N) | | | 105.0 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-14 MS** | | **L1185759-13** | | | | | | |
| Nitrite (as N) | | | 105.3 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-17 MS** | | **L1185403-1** | | | | | | |
| Nitrite (as N) | | | 104.5 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-5 MS** | | **L1182081-15** | | | | | | |
| Nitrite (as N) | | | 105.6 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-NO2-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |
| Nitrite (as N) | | | 105.8 | | % | | 75-125 | 30-JUL-12 |
| **ANIONS-NO3-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-18 LCS** | | | | | | | | |
| Nitrate (as N) | | | 101.2 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-2 LCS** | | | | | | | | |
| Nitrate (as N) | | | 101.2 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-1 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| **WG1517083-10 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| **WG1517083-13 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| **WG1517083-16 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| **WG1517083-4 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| **WG1517083-7 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| **WG1517083-11 MS** | | **L1185604-9** | | | | | | |
| Nitrate (as N) | | | 100.7 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-14 MS** | | **L1185759-13** | | | | | | |
| Nitrate (as N) | | | 100.7 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-5 MS** | | **L1182081-15** | | | | | | |
| Nitrate (as N) | | | 101.6 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |
| Nitrate (as N) | | | 101.3 | | % | | 75-125 | 30-JUL-12 |
| **ANIONS-SO4-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-18 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.2 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-2 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.2 | | % | | 85-115 | 30-JUL-12 |
| **WG1517083-1 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-10 MB** | | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-SO4-IC-VA** | **Water** | | | | | | | |
| **Batch R2408083** | | | | | | | | |
| **WG1517083-10 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-13 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-16 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-4 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-7 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 30-JUL-12 |
| **WG1517083-11 MS** | | **L1185604-9** | | | | | | |
| Sulfate (SO4) | | | 101.9 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-14 MS** | | **L1185759-13** | | | | | | |
| Sulfate (SO4) | | | 102.5 | | % | | 75-125 | 30-JUL-12 |
| **WG1517083-5 MS** | | **L1182081-15** | | | | | | |
| Sulfate (SO4) | | | N/A | MS-B | % | | - | 30-JUL-12 |
| **WG1517083-8 MS** | | **L1184545-3** | | | | | | |
| Sulfate (SO4) | | | 102.3 | | % | | 75-125 | 30-JUL-12 |
| **EC-PCT-VA** | **Water** | | | | | | | |
| **Batch R2407426** | | | | | | | | |
| **WG1515996-15 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 98.0 | | % | | 90-110 | 27-JUL-12 |
| **WG1515996-16 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 97.1 | | % | | 90-110 | 27-JUL-12 |
| **WG1515996-18 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 97.3 | | % | | 90-110 | 27-JUL-12 |
| **WG1515996-19 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 97.6 | | % | | 90-110 | 27-JUL-12 |
| **WG1515996-20 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 97.8 | | % | | 90-110 | 27-JUL-12 |
| **WG1515996-21 CRM** | | **VA-EC-PCT-CONTROL** | | | | | | |
| Conductivity | | | 98.2 | | % | | 90-110 | 27-JUL-12 |
| **WG1515996-1 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 27-JUL-12 |
| **WG1515996-2 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 27-JUL-12 |
| **WG1515996-3 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 27-JUL-12 |
| **WG1515996-4 MB** | | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **EC-PCT-VA** | **Water** | | | | | | | |
| **Batch R2407426** | | | | | | | | |
| **WG1515996-4 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 27-JUL-12 |
| **WG1515996-5 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 27-JUL-12 |
| **WG1515996-6 MB** | | | | | | | | |
| Conductivity | | | <2.0 | | uS/cm | | 2 | 27-JUL-12 |
| **HG-DIS-CVAFS-VA** | **Water** | | | | | | | |
| **Batch R2408390** | | | | | | | | |
| **WG1517321-1 MB** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 31-JUL-12 |
| **WG1517321-20 MS** | | **L1185741-13** | | | | | | |
| Mercury (Hg)-Dissolved | | | 75.0 | | % | | 70-130 | 31-JUL-12 |
| **MET-D-L-HRMS-VA** | **Water** | | | | | | | |
| **Batch R2409945** | | | | | | | | |
| **WG1517321-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Aluminum (Al)-Dissolved | | | 104.5 | | % | | 80-120 | 01-AUG-12 |
| Antimony (Sb)-Dissolved | | | 103.4 | | % | | 80-120 | 01-AUG-12 |
| Arsenic (As)-Dissolved | | | 99.4 | | % | | 80-120 | 01-AUG-12 |
| Barium (Ba)-Dissolved | | | 104.8 | | % | | 80-120 | 01-AUG-12 |
| Beryllium (Be)-Dissolved | | | 115.0 | | % | | 80-120 | 01-AUG-12 |
| Bismuth (Bi)-Dissolved | | | 108.3 | | % | | 80-120 | 01-AUG-12 |
| Boron (B)-Dissolved | | | 108.7 | | % | | 80-120 | 01-AUG-12 |
| Cadmium (Cd)-Dissolved | | | 109.4 | | % | | 80-120 | 01-AUG-12 |
| Cesium (Cs)-Dissolved | | | 105.2 | | % | | 80-120 | 01-AUG-12 |
| Chromium (Cr)-Dissolved | | | 105.2 | | % | | 80-120 | 01-AUG-12 |
| Cobalt (Co)-Dissolved | | | 105.2 | | % | | 80-120 | 01-AUG-12 |
| Copper (Cu)-Dissolved | | | 108.4 | | % | | 80-120 | 01-AUG-12 |
| Gallium (Ga)-Dissolved | | | 107.6 | | % | | 80-120 | 01-AUG-12 |
| Lead (Pb)-Dissolved | | | 106.4 | | % | | 80-120 | 01-AUG-12 |
| Lithium (Li)-Dissolved | | | 105.6 | | % | | 80-120 | 01-AUG-12 |
| Manganese (Mn)-Dissolved | | | 100.8 | | % | | 80-120 | 01-AUG-12 |
| Molybdenum (Mo)-Dissolved | | | 106.8 | | % | | 80-120 | 01-AUG-12 |
| Nickel (Ni)-Dissolved | | | 108.2 | | % | | 80-120 | 01-AUG-12 |
| Rhenium (Re)-Dissolved | | | 104.0 | | % | | 80-120 | 01-AUG-12 |
| Rubidium (Rb)-Dissolved | | | 106.0 | | % | | 80-120 | 01-AUG-12 |
| Silver (Ag)-Dissolved | | | 102.0 | | % | | 80-120 | 01-AUG-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Water** | | | | | | | |
| **Batch R2409945** | | | | | | | | |
| **WG1517321-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Strontium (Sr)-Dissolved | | | 90.7 | | % | | 80-120 | 01-AUG-12 |
| Tellurium (Te)-Dissolved | | | 113.0 | | % | | 80-120 | 01-AUG-12 |
| Thallium (Tl)-Dissolved | | | 108.9 | | % | | 80-120 | 01-AUG-12 |
| Thorium (Th)-Dissolved | | | 103.0 | | % | | 80-120 | 01-AUG-12 |
| Tin (Sn)-Dissolved | | | 107.4 | | % | | 80-120 | 01-AUG-12 |
| Titanium (Ti)-Dissolved | | | 106.8 | | % | | 80-120 | 01-AUG-12 |
| Tungsten (W)-Dissolved | | | 104.0 | | % | | 80-120 | 01-AUG-12 |
| Uranium (U)-Dissolved | | | 104.8 | | % | | 80-120 | 01-AUG-12 |
| Vanadium (V)-Dissolved | | | 107.0 | | % | | 80-120 | 01-AUG-12 |
| Yttrium (Y)-Dissolved | | | 105.0 | | % | | 80-120 | 01-AUG-12 |
| Zinc (Zn)-Dissolved | | | 119.8 | | % | | 80-120 | 01-AUG-12 |
| Zirconium (Zr)-Dissolved | | | 100.0 | | % | | 80-120 | 01-AUG-12 |
| **WG1517321-1 MB** | | | | | | | | |
| Aluminum (Al)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 01-AUG-12 |
| Antimony (Sb)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 01-AUG-12 |
| Arsenic (As)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Barium (Ba)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 01-AUG-12 |
| Beryllium (Be)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Bismuth (Bi)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Boron (B)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 01-AUG-12 |
| Cadmium (Cd)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Cesium (Cs)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Chromium (Cr)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 01-AUG-12 |
| Cobalt (Co)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Copper (Cu)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 01-AUG-12 |
| Gallium (Ga)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Lead (Pb)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Lithium (Li)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 01-AUG-12 |
| Molybdenum (Mo)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Nickel (Ni)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 01-AUG-12 |
| Rhenium (Re)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Rubidium (Rb)-Dissolved | | | <0.000020 | | mg/L | | 0.00002 | 01-AUG-12 |
| Silver (Ag)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Strontium (Sr)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Water** | | | | | | | |
| **Batch R2409945** | | | | | | | | |
| **WG1517321-1 MB** | | | | | | | | |
| Tellurium (Te)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 01-AUG-12 |
| Thallium (Tl)-Dissolved | | | <0.000002C | | mg/L | | 0.000002 | 01-AUG-12 |
| Thorium (Th)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Tin (Sn)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 01-AUG-12 |
| Titanium (Ti)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 01-AUG-12 |
| Tungsten (W)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 01-AUG-12 |
| Uranium (U)-Dissolved | | | <0.000002C | | mg/L | | 0.000002 | 01-AUG-12 |
| Vanadium (V)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| Yttrium (Y)-Dissolved | | | <0.000005C | | mg/L | | 0.000005 | 01-AUG-12 |
| Zirconium (Zr)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 01-AUG-12 |
| **Batch R2411110** | | | | | | | | |
| **WG1517321-1 MB** | | | | | | | | |
| Manganese (Mn)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 02-AUG-12 |
| Zinc (Zn)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 02-AUG-12 |
| **MET-DIS-ICP-VA** | **Water** | | | | | | | |
| **Batch R2408385** | | | | | | | | |
| **WG1517321-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Dissolved | | | 100.3 | | % | | 80-120 | 31-JUL-12 |
| Iron (Fe)-Dissolved | | | 99.2 | | % | | 80-120 | 31-JUL-12 |
| Magnesium (Mg)-Dissolved | | | 100.5 | | % | | 80-120 | 31-JUL-12 |
| Phosphorus (P)-Dissolved | | | 99.4 | | % | | 80-120 | 31-JUL-12 |
| Potassium (K)-Dissolved | | | 99.3 | | % | | 80-120 | 31-JUL-12 |
| Silicon (Si)-Dissolved | | | 99.2 | | % | | 80-120 | 31-JUL-12 |
| Sodium (Na)-Dissolved | | | 97.2 | | % | | 80-120 | 31-JUL-12 |
| **WG1517321-1 MB** | | | | | | | | |
| Calcium (Ca)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 31-JUL-12 |
| Iron (Fe)-Dissolved | | | <0.030 | | mg/L | | 0.03 | 31-JUL-12 |
| Magnesium (Mg)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 31-JUL-12 |
| Phosphorus (P)-Dissolved | | | <0.30 | | mg/L | | 0.3 | 31-JUL-12 |
| Potassium (K)-Dissolved | | | <2.0 | | mg/L | | 2 | 31-JUL-12 |
| Silicon (Si)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 31-JUL-12 |
| Sodium (Na)-Dissolved | | | <2.0 | | mg/L | | 2 | 31-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-DIS-ICP-VA** | **Water** | | | | | | | |
| **Batch R2409362** | | | | | | | | |
| **WG1517321-10 MS** | | **L1185741-1** | | | | | | |
| Calcium (Ca)-Dissolved | | | 100.6 | | % | | 70-130 | 01-AUG-12 |
| Iron (Fe)-Dissolved | | | 99.1 | | % | | 70-130 | 01-AUG-12 |
| Magnesium (Mg)-Dissolved | | | 103.7 | | % | | 70-130 | 01-AUG-12 |
| Potassium (K)-Dissolved | | | 108.5 | | % | | 70-130 | 01-AUG-12 |
| Sodium (Na)-Dissolved | | | 103.9 | | % | | 70-130 | 01-AUG-12 |
| **WG1517321-20 MS** | | **L1185741-13** | | | | | | |
| Calcium (Ca)-Dissolved | | | 100.1 | | % | | 70-130 | 01-AUG-12 |
| Iron (Fe)-Dissolved | | | 95.4 | | % | | 70-130 | 01-AUG-12 |
| Magnesium (Mg)-Dissolved | | | 100.4 | | % | | 70-130 | 01-AUG-12 |
| Potassium (K)-Dissolved | | | 104.7 | | % | | 70-130 | 01-AUG-12 |
| Sodium (Na)-Dissolved | | | 97.3 | | % | | 70-130 | 01-AUG-12 |
| **Batch R2411101** | | | | | | | | |
| **WG1517321-16 MS** | | **L1186032-3** | | | | | | |
| Calcium (Ca)-Dissolved | | | 102.5 | | % | | 70-130 | 02-AUG-12 |
| Iron (Fe)-Dissolved | | | 97.7 | | % | | 70-130 | 02-AUG-12 |
| Magnesium (Mg)-Dissolved | | | 105.5 | | % | | 70-130 | 02-AUG-12 |
| Potassium (K)-Dissolved | | | 104.8 | | % | | 70-130 | 02-AUG-12 |
| Sodium (Na)-Dissolved | | | 102.2 | | % | | 70-130 | 02-AUG-12 |
| **Batch R2412053** | | | | | | | | |
| **WG1517321-8 MS** | | **L1185776-4** | | | | | | |
| Calcium (Ca)-Dissolved | | | 97.7 | | % | | 70-130 | 03-AUG-12 |
| Iron (Fe)-Dissolved | | | 93.1 | | % | | 70-130 | 03-AUG-12 |
| Magnesium (Mg)-Dissolved | | | 99.7 | | % | | 70-130 | 03-AUG-12 |
| Potassium (K)-Dissolved | | | 101.9 | | % | | 70-130 | 03-AUG-12 |
| Sodium (Na)-Dissolved | | | 106.7 | | % | | 70-130 | 03-AUG-12 |
| **Batch R2412230** | | | | | | | | |
| **WG1517321-14 MS** | | **L1186052-7** | | | | | | |
| Calcium (Ca)-Dissolved | | | 96.0 | | % | | 70-130 | 06-AUG-12 |
| Iron (Fe)-Dissolved | | | 98.5 | | % | | 70-130 | 06-AUG-12 |
| Magnesium (Mg)-Dissolved | | | 97.4 | | % | | 70-130 | 06-AUG-12 |
| Potassium (K)-Dissolved | | | 106.7 | | % | | 70-130 | 06-AUG-12 |
| Sodium (Na)-Dissolved | | | 109.6 | | % | | 70-130 | 06-AUG-12 |
| **P-T-COL-VA** | **Water** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **P-T-COL-VA** | **Water** | | | | | | | |
| **Batch R2406615** | | | | | | | | |
| **WG1515937-10 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 98.5 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-14 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 98.8 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-16 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.2 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-2 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 98.3 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-20 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 101.5 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-22 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.9 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-24 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 103.4 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-30 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 99.5 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-6 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 98.4 | | % | | 80-120 | 27-JUL-12 |
| **WG1515937-1 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-13 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-15 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-19 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-21 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-23 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-29 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-5 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-9 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **WG1515937-12 MS** | | **L1184746-2** | | | | | | |
| Phosphorus (P)-Total | | | 96.6 | | % | | 70-130 | 27-JUL-12 |
| **WG1515937-26 MS** | | **L1185022-2** | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **P-T-COL-VA** | **Water** | | | | | | | |
| **Batch R2406615** | | | | | | | | |
| **WG1515937-26 MS** | | **L1185022-2** | | | | | | |
| Phosphorus (P)-Total | | | N/A | MS-B | % | | - | 27-JUL-12 |
| **WG1515937-28 MS** | | **L1184518-2** | | | | | | |
| Phosphorus (P)-Total | | | 94.9 | | % | | 70-130 | 27-JUL-12 |
| **WG1515937-4 MS** | | **L1184612-2** | | | | | | |
| Phosphorus (P)-Total | | | 93.1 | | % | | 70-130 | 27-JUL-12 |
| **WG1515937-8 MS** | | **L1184502-2** | | | | | | |
| Phosphorus (P)-Total | | | 92.1 | | % | | 70-130 | 27-JUL-12 |
| **PH-PCT-VA** | **Water** | | | | | | | |
| **Batch R2407426** | | | | | | | | |
| **WG1515996-22 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.02 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **WG1515996-23 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.03 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **WG1515996-24 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.02 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **WG1515996-25 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.02 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **WG1515996-26 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.02 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **WG1515996-27 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.02 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **WG1515996-28 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.02 | | pH | | 6.9-7.1 | 27-JUL-12 |
| **SE-D-HVAF-VA** | **Water** | | | | | | | |
| **Batch R2409252** | | | | | | | | |
| **WG1517321-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Selenium (Se)-Dissolved | | | 96.8 | | % | | 80-120 | 31-JUL-12 |
| **WG1517321-1 MB** | | | | | | | | |
| Selenium (Se)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 31-JUL-12 |
| **TDS-VA** | **Water** | | | | | | | |
| **Batch R2407317** | | | | | | | | |
| **WG1516605-11 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 99.1 | | % | | 85-115 | 27-JUL-12 |
| **WG1516605-14 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 99.8 | | % | | 85-115 | 27-JUL-12 |
| **WG1516605-2 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 99.3 | | % | | 85-115 | 27-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **TDS-VA** | **Water** | | | | | | | |
| **Batch R2407317** | | | | | | | | |
| **WG1516605-5 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 98.4 | | % | | 85-115 | 27-JUL-12 |
| **WG1516605-8 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 99.3 | | % | | 85-115 | 27-JUL-12 |
| **WG1516605-1 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **WG1516605-10 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **WG1516605-13 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **WG1516605-4 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **WG1516605-7 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **TS-VA** | **Water** | | | | | | | |
| **Batch R2407384** | | | | | | | | |
| **WG1516650-2 LCS** | | | | | | | | |
| Total Solids | | | 100.0 | | % | | 85-115 | 27-JUL-12 |
| **WG1516650-1 MB** | | | | | | | | |
| Total Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **TSS-VA** | **Water** | | | | | | | |
| **Batch R2407328** | | | | | | | | |
| **WG1516608-11 LCS** | | | | | | | | |
| Total Suspended Solids | | | 90.7 | | % | | 85-115 | 27-JUL-12 |
| **WG1516608-14 LCS** | | | | | | | | |
| Total Suspended Solids | | | 101.3 | | % | | 85-115 | 27-JUL-12 |
| **WG1516608-2 LCS** | | | | | | | | |
| Total Suspended Solids | | | 97.3 | | % | | 85-115 | 27-JUL-12 |
| **WG1516608-5 LCS** | | | | | | | | |
| Total Suspended Solids | | | 90.7 | | % | | 85-115 | 27-JUL-12 |
| **WG1516608-8 LCS** | | | | | | | | |
| Total Suspended Solids | | | 92.0 | | % | | 85-115 | 27-JUL-12 |
| **WG1516608-1 MB** | | | | | | | | |
| Total Suspended Solids | | | <3.0 | | mg/L | | 3 | 27-JUL-12 |
| **WG1516608-10 MB** | | | | | | | | |
| Total Suspended Solids | | | <3.0 | | mg/L | | 3 | 27-JUL-12 |
| **WG1516608-13 MB** | | | | | | | | |
| Total Suspended Solids | | | <3.0 | | mg/L | | 3 | 27-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **TSS-VA** | **Water** | | | | | | | |
| **Batch R2407328** | | | | | | | | |
| **WG1516608-4 MB** | | | | | | | | |
| Total Suspended Solids | | | <3.0 | | mg/L | | 3 | 27-JUL-12 |
| **WG1516608-7 MB** | | | | | | | | |
| Total Suspended Solids | | | <3.0 | | mg/L | | 3 | 27-JUL-12 |
| **ALK-C-SCR-VA** | **Seawater** | | | | | | | |
| **Batch R2406572** | | | | | | | | |
| **WG1515616-2 CRM** | | **VA-ALKL-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 100.5 | | % | | 85-115 | 26-JUL-12 |
| **WG1515616-5 CRM** | | **VA-ALKM-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 104.4 | | % | | 85-115 | 26-JUL-12 |
| **WG1515616-13 DUP** | | **L1184714-1** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 18.8 | 18.5 | | mg/L | 1.9 | 25 | 26-JUL-12 |
| **WG1515616-1 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUL-12 |
| **WG1515616-4 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUL-12 |
| **WG1515616-7 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 26-JUL-12 |
| **ANIONS-C-BR-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2407610** | | | | | | | | |
| **WG1516865-17 LCS** | | | | | | | | |
| Bromide (Br) | | | 96.5 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-2 LCS** | | | | | | | | |
| Bromide (Br) | | | 97.1 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-1 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUL-12 |
| **WG1516865-10 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUL-12 |
| **WG1516865-13 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUL-12 |
| **WG1516865-15 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUL-12 |
| **WG1516865-4 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUL-12 |
| **WG1516865-7 MB** | | | | | | | | |
| Bromide (Br) | | | <0.050 | | mg/L | | 0.05 | 28-JUL-12 |
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2407610** | | | | | | | | |
| **WG1516865-17 LCS** | | | | | | | | |
| Chloride (Cl) | | | 99.9 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-2 LCS** | | | | | | | | |
| Chloride (Cl) | | | 99.4 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-1 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-10 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-13 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-15 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-4 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-7 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **ANIONS-C-F-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2407610** | | | | | | | | |
| **WG1516865-17 LCS** | | | | | | | | |
| Fluoride (F) | | | 105.3 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-2 LCS** | | | | | | | | |
| Fluoride (F) | | | 104.0 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-1 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 28-JUL-12 |
| **WG1516865-10 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 28-JUL-12 |
| **WG1516865-13 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 28-JUL-12 |
| **WG1516865-15 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 28-JUL-12 |
| **WG1516865-4 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 28-JUL-12 |
| **WG1516865-7 MB** | | | | | | | | |
| Fluoride (F) | | | <0.020 | | mg/L | | 0.02 | 28-JUL-12 |
| **ANIONS-C-NO2-IC-VA** | **Seawater** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-NO2-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2407610** | | | | | | | | |
| **WG1516865-17 LCS** | | | | | | | | |
| Nitrite (as N) | | | 104.8 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-2 LCS** | | | | | | | | |
| Nitrite (as N) | | | 104.5 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-1 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 28-JUL-12 |
| **WG1516865-10 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 28-JUL-12 |
| **WG1516865-13 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 28-JUL-12 |
| **WG1516865-15 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 28-JUL-12 |
| **WG1516865-4 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 28-JUL-12 |
| **WG1516865-7 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 28-JUL-12 |
| **ANIONS-C-NO3-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2407610** | | | | | | | | |
| **WG1516865-17 LCS** | | | | | | | | |
| Nitrate (as N) | | | 101.0 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-2 LCS** | | | | | | | | |
| Nitrate (as N) | | | 100.6 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-1 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 28-JUL-12 |
| **WG1516865-10 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 28-JUL-12 |
| **WG1516865-13 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 28-JUL-12 |
| **WG1516865-15 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 28-JUL-12 |
| **WG1516865-4 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 28-JUL-12 |
| **WG1516865-7 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 28-JUL-12 |
| **ANIONS-C-SO4-IC-VA** | **Seawater** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-SO4-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2407610** | | | | | | | | |
| **WG1516865-17 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.0 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-2 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 101.7 | | % | | 85-115 | 28-JUL-12 |
| **WG1516865-1 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-10 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-13 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-15 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-4 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **WG1516865-7 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 28-JUL-12 |
| **EC-C-PCT-VA** | **Seawater** | | | | | | | |
| **Batch R2407427** | | | | | | | | |
| **WG1516004-4 DUP** | | **L1184714-1** | | | | | | |
| Conductivity | | 75300 | 75100 | | uS/cm | 0.3 | 10 | 27-JUL-12 |
| **F-ISE-VA** | **Seawater** | | | | | | | |
| **Batch R2407770** | | | | | | | | |
| **WG1517727-2 CRM** | | **VA-F-SIE-2.0** | | | | | | |
| Fluoride (F) | | | 102.5 | | % | | 85-115 | 30-JUL-12 |
| **WG1517727-3 DUP** | | **L1184714-1** | | | | | | |
| Fluoride (F) | | <0.75 | <0.75 | RPD-NA | mg/L | N/A | 20 | 30-JUL-12 |
| **WG1517727-1 MB** | | | | | | | | |
| Fluoride (F) | | | <0.030 | | mg/L | | 0.03 | 30-JUL-12 |
| **HG-DIS-C-CVAFS-VA** | **Seawater** | | | | | | | |
| **Batch R2406632** | | | | | | | | |
| **WG1516450-2 LCS** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | 99.9 | | % | | 80-120 | 27-JUL-12 |
| **WG1515728-1 MB** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 27-JUL-12 |
| **WG1516450-1 MB** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 27-JUL-12 |
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2407745** | | | | | | | | |
| **WG1515728-1 MB** | | | | | | | | |
| Aluminum (Al)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| Antimony (Sb)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Arsenic (As)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Barium (Ba)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| Beryllium (Be)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Bismuth (Bi)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Boron (B)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 30-JUL-12 |
| Cadmium (Cd)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 30-JUL-12 |
| Cesium (Cs)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Chromium (Cr)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 30-JUL-12 |
| Cobalt (Co)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 30-JUL-12 |
| Copper (Cu)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Gallium (Ga)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Iron (Fe)-Dissolved | | | <0.010 | | mg/L | | 0.01 | 30-JUL-12 |
| Lead (Pb)-Dissolved | | | <0.00030 | | mg/L | | 0.0003 | 30-JUL-12 |
| Lithium (Li)-Dissolved | | | <0.020 | | mg/L | | 0.02 | 30-JUL-12 |
| Manganese (Mn)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 30-JUL-12 |
| Molybdenum (Mo)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Nickel (Ni)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Phosphorus (P)-Dissolved | | | <1.0 | | mg/L | | 1 | 30-JUL-12 |
| Rhenium (Re)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Rubidium (Rb)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| Selenium (Se)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Silver (Ag)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 30-JUL-12 |
| Tellurium (Te)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Thallium (Tl)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 30-JUL-12 |
| Thorium (Th)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Tin (Sn)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| Titanium (Ti)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 30-JUL-12 |
| Tungsten (W)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 30-JUL-12 |
| Uranium (U)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 30-JUL-12 |
| Vanadium (V)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Yttrium (Y)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| Zinc (Zn)-Dissolved | | | <0.0030 | | mg/L | | 0.003 | 30-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2407745** | | | | | | | | |
| **WG1515728-1 MB** | | | | | | | | |
| Zirconium (Zr)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 30-JUL-12 |
| **Batch R2408968** | | | | | | | | |
| **WG1515728-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Aluminum (Al)-Dissolved | | | 101.7 | | % | | 80-120 | 30-JUL-12 |
| Antimony (Sb)-Dissolved | | | 100.7 | | % | | 80-120 | 30-JUL-12 |
| Arsenic (As)-Dissolved | | | 105.7 | | % | | 80-120 | 30-JUL-12 |
| Barium (Ba)-Dissolved | | | 99.6 | | % | | 80-120 | 30-JUL-12 |
| Beryllium (Be)-Dissolved | | | 106.0 | | % | | 80-120 | 30-JUL-12 |
| Bismuth (Bi)-Dissolved | | | 106.6 | | % | | 80-120 | 30-JUL-12 |
| Boron (B)-Dissolved | | | 114.2 | | % | | 80-120 | 30-JUL-12 |
| Cadmium (Cd)-Dissolved | | | 110.4 | | % | | 80-120 | 30-JUL-12 |
| Cesium (Cs)-Dissolved | | | 93.6 | | % | | 80-120 | 30-JUL-12 |
| Chromium (Cr)-Dissolved | | | 104.0 | | % | | 80-120 | 30-JUL-12 |
| Cobalt (Co)-Dissolved | | | 106.4 | | % | | 80-120 | 30-JUL-12 |
| Copper (Cu)-Dissolved | | | 105.2 | | % | | 80-120 | 30-JUL-12 |
| Gallium (Ga)-Dissolved | | | 108.4 | | % | | 80-120 | 30-JUL-12 |
| Iron (Fe)-Dissolved | | | 109.9 | | % | | 80-120 | 30-JUL-12 |
| Lead (Pb)-Dissolved | | | 103.0 | | % | | 80-120 | 30-JUL-12 |
| Lithium (Li)-Dissolved | | | 103.8 | | % | | 80-120 | 30-JUL-12 |
| Manganese (Mn)-Dissolved | | | 105.6 | | % | | 80-120 | 30-JUL-12 |
| Molybdenum (Mo)-Dissolved | | | 111.4 | | % | | 80-120 | 30-JUL-12 |
| Nickel (Ni)-Dissolved | | | 104.8 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Dissolved | | | 111.3 | | % | | 80-120 | 30-JUL-12 |
| Rhenium (Re)-Dissolved | | | 104.0 | | % | | 80-120 | 30-JUL-12 |
| Rubidium (Rb)-Dissolved | | | 104.0 | | % | | 80-120 | 30-JUL-12 |
| Selenium (Se)-Dissolved | | | 108.2 | | % | | 80-120 | 30-JUL-12 |
| Silver (Ag)-Dissolved | | | 104.0 | | % | | 80-120 | 30-JUL-12 |
| Tellurium (Te)-Dissolved | | | 110.0 | | % | | 80-120 | 30-JUL-12 |
| Thallium (Tl)-Dissolved | | | 104.4 | | % | | 80-120 | 30-JUL-12 |
| Thorium (Th)-Dissolved | | | 101.0 | | % | | 80-120 | 30-JUL-12 |
| Tin (Sn)-Dissolved | | | 105.2 | | % | | 80-120 | 30-JUL-12 |
| Titanium (Ti)-Dissolved | | | 105.6 | | % | | 80-120 | 30-JUL-12 |
| Tungsten (W)-Dissolved | | | 102.0 | | % | | 80-120 | 30-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2408968** | | | | | | | | |
| **WG1515728-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Uranium (U)-Dissolved | | | 104.2 | | % | | 80-120 | 30-JUL-12 |
| Vanadium (V)-Dissolved | | | 110.0 | | % | | 80-120 | 30-JUL-12 |
| Yttrium (Y)-Dissolved | | | 105.0 | | % | | 80-120 | 30-JUL-12 |
| Zinc (Zn)-Dissolved | | | 113.0 | | % | | 80-120 | 30-JUL-12 |
| Zirconium (Zr)-Dissolved | | | 99.7 | | % | | 80-120 | 30-JUL-12 |
| **MET-DIS-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2406736** | | | | | | | | |
| **WG1515728-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Dissolved | | | 102.2 | | % | | 80-120 | 27-JUL-12 |
| Magnesium (Mg)-Dissolved | | | 106.3 | | % | | 80-120 | 27-JUL-12 |
| Potassium (K)-Dissolved | | | 97.6 | | % | | 80-120 | 27-JUL-12 |
| Silicon (Si)-Dissolved | | | 97.7 | | % | | 80-120 | 27-JUL-12 |
| Sodium (Na)-Dissolved | | | 100.5 | | % | | 80-120 | 27-JUL-12 |
| Strontium (Sr)-Dissolved | | | 99.7 | | % | | 80-120 | 27-JUL-12 |
| **WG1515728-1 MB** | | | | | | | | |
| Calcium (Ca)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 27-JUL-12 |
| Magnesium (Mg)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 27-JUL-12 |
| Potassium (K)-Dissolved | | | <2.0 | | mg/L | | 2 | 27-JUL-12 |
| Silicon (Si)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 27-JUL-12 |
| Sodium (Na)-Dissolved | | | <2.0 | | mg/L | | 2 | 27-JUL-12 |
| Strontium (Sr)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 27-JUL-12 |
| **P-T-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2406616** | | | | | | | | |
| **WG1515944-2 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.2 | | % | | 80-120 | 27-JUL-12 |
| **WG1515944-3 DUP** | | **L1184714-2** | | | | | | |
| Phosphorus (P)-Total | | 0.0099 | 0.0100 | | mg/L | 0.9 | 20 | 27-JUL-12 |
| **WG1515944-1 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 27-JUL-12 |
| **Batch R2407674** | | | | | | | | |
| **WG1517345-10 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.8 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 100.8 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-14 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.9 | | % | | 80-120 | 30-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **P-T-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2407674** | | | | | | | | |
| **WG1517345-14 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.9 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-18 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.6 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 100.6 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-2 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 99.7 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-22 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 97.9 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 97.9 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-26 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 102.2 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 102.2 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-30 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 101.4 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 101.4 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-34 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.8 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 100.8 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-6 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.9 | | % | | 80-120 | 30-JUL-12 |
| Phosphorus (P)-Total | | | 100.9 | | % | | 80-120 | 30-JUL-12 |
| **WG1517345-37 DUP** | | **L1184714-1** | | | | | | |
| Phosphorus (P)-Total | | <0.20 | 0.28 | RPD-NA | mg/L | N/A | 20 | 30-JUL-12 |
| **WG1517345-1 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-13 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-17 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-21 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-25 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **P-T-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2407674** | | | | | | | | |
| **WG1517345-29 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-33 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-5 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **WG1517345-9 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 30-JUL-12 |
| **PH-C-PCT-VA** | **Seawater** | | | | | | | |
| **Batch R2407427** | | | | | | | | |
| **WG1516004-4 DUP** | | **L1184714-1** | | | | | | |
| pH | | 8.16 | 8.30 | J | pH | 0.14 | 0.2 | 27-JUL-12 |
| **SE-D-HVAF-VA** | **Seawater** | | | | | | | |
| **Batch R2406779** | | | | | | | | |
| **WG1515728-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Selenium (Se)-Dissolved | | | 97.7 | | % | | 80-120 | 27-JUL-12 |
| **WG1515728-1 MB** | | | | | | | | |
| Selenium (Se)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 27-JUL-12 |
| **TDS-VA** | **Seawater** | | | | | | | |
| **Batch R2407390** | | | | | | | | |
| **WG1516649-3 DUP** | | **L1184714-1** | | | | | | |
| Total Dissolved Solids | | 82900 | 80400 | | mg/L | 3.0 | 20 | 27-JUL-12 |
| **WG1516649-2 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 100.0 | | % | | 85-115 | 27-JUL-12 |
| **WG1516649-1 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **TS-VA** | **Seawater** | | | | | | | |
| **Batch R2407383** | | | | | | | | |
| **WG1516648-3 DUP** | | **L1184714-1** | | | | | | |
| Total Solids | | 80700 | 83100 | | mg/L | 2.8 | 25 | 27-JUL-12 |
| **WG1516648-2 LCS** | | | | | | | | |
| Total Solids | | | 97.2 | | % | | 85-115 | 27-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **TS-VA** | **Seawater** | | | | | | | |
| **Batch R2407383** | | | | | | | | |
| **WG1516648-1 MB** | | | | | | | | |
| Total Solids | | | <10 | | mg/L | | 10 | 27-JUL-12 |
| **TSS-C-VA** | **Seawater** | | | | | | | |
| **Batch R2408782** | | | | | | | | |
| **WG1518600-2 LCS** | | | | | | | | |
| Total Suspended Solids | | | 101.3 | | % | | 85-115 | 31-JUL-12 |
| **WG1518600-1 MB** | | | | | | | | |
| Total Suspended Solids | | | <2.0 | | mg/L | | 2 | 31-JUL-12 |

**Legend:**

| | |
|---|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

**Sample Parameter Qualifier Definitions:**

| Qualifier | Description |
|---|---|
| J | Duplicate results and limits are expressed in terms of absolute difference. |
| MS-B | Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. |
| RPD-NA | Relative Percent Difference Not Available due to result(s) being less than detection limit. |

**Hold Time Exceedances:**

| ALS Product Description | Sample ID | Sampling Date | Date Processed | Rec. HT | Actual HT | Units | Qualifier |
|---|---|---|---|---|---|---|---|
| **Physical Tests** | | | | | | | |
| Total Dissolved Solids by Gravimetric | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 27-JUL-12 13:29 | 7 | 9 | days | EHTR |
| Total Dissolved Solids by Gravimetric | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 27-JUL-12 11:05 | 7 | 10 | days | EHTR |
| | 2 | 17-JUL-12 18:00 | 27-JUL-12 11:05 | 7 | 10 | days | EHTR |
| Total Solids by Gravimetric | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 27-JUL-12 10:49 | 7 | 9 | days | EHTR |
| Total Solids by Gravimetric | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 27-JUL-12 10:50 | 7 | 10 | days | EHTR |
| | 2 | 17-JUL-12 18:00 | 27-JUL-12 10:50 | 7 | 10 | days | EHTR |
| Total Suspended Solids by Gravimetric | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 31-JUL-12 09:35 | 7 | 14 | days | EHTR |
| | 2 | 17-JUL-12 18:00 | 31-JUL-12 09:35 | 7 | 14 | days | EHTR |
| Total Suspended Solids by Gravimetric | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 27-JUL-12 10:08 | 7 | 9 | days | EHTR |
| pH by Meter (Automated) | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 27-JUL-12 12:13 | 0.25 | 217 | hours | EHTR-FM |
| pH by Meter (Automated) (seawater) | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 27-JUL-12 12:13 | 0.25 | 244 | hours | EHTR-FM |
| | 2 | 17-JUL-12 18:00 | 27-JUL-12 12:13 | 0.25 | 234 | hours | EHTR-FM |
| **Anions and Nutrients** | | | | | | | |
| Nitrate in Seawater by IC | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 28-JUL-12 09:25 | 3 | 11 | days | EHTR |
| | 2 | 17-JUL-12 18:00 | 28-JUL-12 09:25 | 3 | 11 | days | EHTR |
| Nitrate in Water by Ion Chromatography | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 30-JUL-12 08:33 | 3 | 12 | days | EHTR |
| Nitrite in Seawater by IC | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 28-JUL-12 09:25 | 3 | 11 | days | EHTR |
| | 2 | 17-JUL-12 18:00 | 28-JUL-12 09:25 | 3 | 11 | days | EHTR |
| Nitrite in Water by Ion Chromatography | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 30-JUL-12 08:33 | 3 | 12 | days | EHTR |
| Total P in Seawater by Colour | | | | | | | |
| | 1 | 17-JUL-12 08:30 | 26-JUL-12 15:06 | 3 | 9 | days | EHTR |
| | 2 | 17-JUL-12 18:00 | 26-JUL-12 15:06 | 3 | 9 | days | EHTR |
| Total P in Water by Colour | | | | | | | |
| | 3 | 18-JUL-12 11:00 | 26-JUL-12 15:06 | 3 | 8 | days | EHTR |

**Legend & Qualifier Definitions:**

| | |
|---|---|
| EHTR-FM: | Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended. |
| EHTR: | Exceeded ALS recommended hold time prior to sample receipt. |
| EHTL: | Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry. |
| EHT: | Exceeded ALS recommended hold time prior to analysis. |
| Rec. HT: | ALS recommended hold time (see units). |

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1184714 were received on 26-JUL-12 10:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

# Quality Control Report



The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**ALS Laboratory Group**
ANALYTICAL CHEMISTRY & TESTING SERVICES

**Environmental Division**

Chain of Custody / Analytical Re
Canada Toll Free: 1 800 66
www.alsglobal.com

*L1184714-COFC*

COC # 08-073771

Page 1 of 1

| Report to: | Report Format / Distribution | Service Requested: (rush - subject to availability) |
|---|---|---|
| Company: Golder Associates | Standard: X Other: | X Regular (Default) |
| Contact: Valérie BERTRAND | Select: PDF X Excel Digital | Priority (2-3 Business Days) - 50% Surcharge |
| Address: 32 Steacie Drive, Kanata Ontario K2K-2A4 | Email 1: valerie_bertrand@golder.com | Emergency (1 Business Day) - 100% Surcharge |
| Phone: 613-592-9600 Fax: 613-592-9601 | Email 2: hugh_carter@golder.com | For Emergency < 1 Day, ASAP or Weekend - Contact ALS |
| **Invoice To:** Same as Report ? (Yes) No ? | **Client / Project Information:** | **Analysis Request** |
| Company: | Job #: 11-1428-0011 | ( Indicate Filtered or Preserved, F/P ) |
| Contact: | PO / AFE: | |
| Address: | Legal Site Description: Mediadine | |
| Phone: Fax: | Quote #: | |
| Lab Work Order # (lab use only): L1184714 | ALS Contact: Judy Bethune / Amber Springer | Sampler: Charline LARIVIÈRE et Julien DOIRON |

| Sample # | Sample Identification (This description will appear on the report) | Date | Time | Sample Type | F/P HNO3 | Dissolved metals including Hg, Se, As | Hardness, pH, TS, TSS, TDS, and conductivity | Alkalinity | Anions including Cl, NO2, F, P, SO4 | Uranium concentration | Isotopes | | | | | | | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PORT-2A-1 | 17/07/2012 | 8:30 to 14:30 | saline water | | X | X | X | X | X | X | | | | | | | |
| 2 | ~~PORT-2A-2~~ | ~~17/07/2012~~ | ~~8:30 to 14:30~~ | saline water | | X | X | X | X | X | X | | | | | | | CANCELED |
| 3 | DRILL 7-1 | 17/07/2012 | 18:00 | saline water | | X | X | X | X | | X | | | | | | | |
| 4 | ~~DRILL 7-2~~ | ~~17/07/2012~~ | ~~18:00~~ | saline water | | X | X | X | X | | X | | | | | | | CANCELED |
| 5 | DRILL 7 water lake | 18/07/2012 | 11:00 | fresh water | | X | X | X | X | | X | | | | | | | |

**Short Holding Time**

Rush Processing

**Special Instructions / Regulations / Hazardous Details**

-Please use lowest detection limit possible
*Water of sample 1-4 are saline.

-Please see individual bottles for time filled. Very low flow sampling for PORT 2A

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

| SHIPMENT RELEASE (client use) | | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|---|
| Released by: CHARLINE LARIVIÈRE | Date & Time: 19/07/2012 14:00 | | Received by: Brett | Date: July 26 | Time: 10:50 | Temperature: 19.9 | Verified by: | Date & Time: | Observations: Yes / No ? If Yes attach SIF |
| Charline Larivière | | | | | | | | | |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF 18.00 Front

# APPENDIX B-2 - INTERVAL 5

**June 25, 2012 Sampling Event – Lab Report No. L1169964**

GOLDER ASSOCIATES LTD
ATTN: Valerie Bertrand
32 Steacie Drive
Kanata ON K2K 2A9

Date Received: 28-JUN-12
Report Date: 13-JUL-12 17:17 (MT)
Version: FINAL

Client Phone: 613-592-9600

# Certificate of Analysis

**Lab Work Order #: L1169964**

| | |
|---|---|
| Project P.O. #: | NOT SUBMITTED |
| Job Reference: | 11-1428-0011 |
| C of C Numbers: | 08-013785 |
| Legal Site Desc: | MELIADINE |

Amber Springer
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1169964-1 | L1169964-2 | | | |
|---|---|---|---|---|---|---|
| | Description | saline water | saline water | | | |
| | Sampled Date | 25-JUN-12 | 25-JUN-12 | | | |
| | Sampled Time | 08:00 | 08:00 | | | |
| | Client ID | PORT-5-1 | PORT-5-2 | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 65000 | 68700 | | | |
| | Hardness (as CaCO3) (mg/L) | 16300 | 16600 | | | |
| | pH (pH) | 6.62 | 6.63 | | | |
| | Total Suspended Solids (mg/L) | 21.4 | 28.4 | | | |
| | Total Dissolved Solids (mg/L) | 72300 | 74000 | | | |
| | Total Solids (mg/L) | 78300 | 75700 | | | |
| **Anions and Nutrients** | Alkalinity, Bicarbonate (as CaCO3) (mg/L) | 19.2 | 19.0 | | | |
| | Alkalinity, Carbonate (as CaCO3) (mg/L) | <2.0 | <2.0 | | | |
| | Alkalinity, Hydroxide (as CaCO3) (mg/L) | <2.0 | <2.0 | | | |
| | Alkalinity, Total (as CaCO3) (mg/L) | 19.2 | 19.0 | | | |
| | Ammonia, Total (as N) (mg/L) | 3.82 | 3.82 | | | |
| | Chloride (Cl) (mg/L) | 34100 | 35200 | | | |
| | Fluoride (F) (mg/L) | <0.75 | <0.75 | | | |
| | Nitrate and Nitrite (as N) (mg/L) | <0.51 | <0.51 | | | |
| | Nitrate (as N) (mg/L) | <0.50 DLM | <0.50 DLM | | | |
| | Nitrite (as N) (mg/L) | <0.10 DLM | <0.10 DLM | | | |
| | Phosphorus (P)-Total (mg/L) | 0.0181 | 0.027 | | | |
| | Sulfate (SO4) (mg/L) | 3260 | 3360 | | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | <0.025 DLB | <0.025 DLB | | | |
| | Antimony (Sb)-Total (mg/L) | 0.0019 | 0.0018 | | | |
| | Arsenic (As)-Total (mg/L) | <0.020 DLM | <0.020 DLM | | | |
| | Barium (Ba)-Total (mg/L) | 0.0993 | 0.0957 | | | |
| | Beryllium (Be)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Bismuth (Bi)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Boron (B)-Total (mg/L) | 4.94 | 5.01 | | | |
| | Cadmium (Cd)-Total (mg/L) | 0.00032 | 0.00049 | | | |
| | Calcium (Ca)-Total (mg/L) | 3160 | 3110 | | | |
| | Cesium (Cs)-Total (mg/L) | 0.185 | 0.181 | | | |
| | Chromium (Cr)-Total (mg/L) | 0.00200 | 0.00433 | | | |
| | Cobalt (Co)-Total (mg/L) | 0.00108 | 0.00098 | | | |
| | Copper (Cu)-Total (mg/L) | 0.0118 | 0.0092 | | | |
| | Gallium (Ga)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Iron (Fe)-Total (mg/L) | 10.1 | 9.62 | | | |
| | Lead (Pb)-Total (mg/L) | 0.00155 | 0.00149 | | | |
| | Lithium (Li)-Total (mg/L) | 5.18 | 4.92 | | | |
| | Magnesium (Mg)-Total (mg/L) | 2140 | 2130 | | | |
| | Manganese (Mn)-Total (mg/L) | 0.809 | 0.785 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1169964-1 | L1169964-2 | | | |
|---|---|---|---|---|---|---|
| | Description | saline water | saline water | | | |
| | Sampled Date | 25-JUN-12 | 25-JUN-12 | | | |
| | Sampled Time | 08:00 | 08:00 | | | |
| | Client ID | PORT-5-1 | PORT-5-2 | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Total Metals** | Mercury (Hg)-Total (mg/L) | <0.000010 | <0.000010 | | | |
| | Molybdenum (Mo)-Total (mg/L) | 0.0080 | 0.0082 | | | |
| | Nickel (Ni)-Total (mg/L) | 0.0080 | 0.0095 | | | |
| | Phosphorus (P)-Total (mg/L) | <2.0 DLA | <2.0 DLA | | | |
| | Potassium (K)-Total (mg/L) | 407 | 403 | | | |
| | Rhenium (Re)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Rubidium (Rb)-Total (mg/L) | 0.389 | 0.387 | | | |
| | Selenium (Se)-Total (mg/L) | <0.0010 DLM | <0.0010 DLM | | | |
| | Silicon (Si)-Total (mg/L) | 1.3 | 1.3 | | | |
| | Silver (Ag)-Total (mg/L) | <0.00020 DLA | <0.00020 DLA | | | |
| | Sodium (Na)-Total (mg/L) | 16000 | 15900 | | | |
| | Strontium (Sr)-Total (mg/L) | 93.7 | 92.4 | | | |
| | Tellurium (Te)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Thallium (Tl)-Total (mg/L) | 0.00105 | 0.00099 | | | |
| | Thorium (Th)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Tin (Sn)-Total (mg/L) | <0.0020 DLA | <0.0020 DLA | | | |
| | Titanium (Ti)-Total (mg/L) | <0.010 DLA | <0.010 DLA | | | |
| | Tungsten (W)-Total (mg/L) | 0.0036 | 0.0036 | | | |
| | Uranium (U)-Total (mg/L) | 0.00098 | 0.00081 | | | |
| | Vanadium (V)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Yttrium (Y)-Total (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Zinc (Zn)-Total (mg/L) | 0.969 | 0.928 | | | |
| | Zirconium (Zr)-Total (mg/L) | 0.0029 | 0.0025 | | | |
| **Dissolved Metals** | Dissolved Metals Filtration Location | FIELD | FIELD | | | |
| | Aluminum (Al)-Dissolved (mg/L) | <0.010 DLA | <0.010 DLA | | | |
| | Antimony (Sb)-Dissolved (mg/L) | 0.0021 | 0.0018 | | | |
| | Arsenic (As)-Dissolved (mg/L) | <0.020 DLM | <0.010 DLM | | | |
| | Barium (Ba)-Dissolved (mg/L) | 0.104 | 0.0986 | | | |
| | Beryllium (Be)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Boron (B)-Dissolved (mg/L) | 5.32 | 5.22 | | | |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.00038 | 0.00040 | | | |
| | Calcium (Ca)-Dissolved (mg/L) | 3090 | 3120 | | | |
| | Cesium (Cs)-Dissolved (mg/L) | 0.195 | 0.186 | | | |
| | Chromium (Cr)-Dissolved (mg/L) | 0.00072 | 0.00060 | | | |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00076 | 0.00074 | | | |
| | Copper (Cu)-Dissolved (mg/L) | 0.0054 | 0.0039 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1169964-1 | L1169964-2 | | | |
|---|---|---|---|---|---|---|
| | Description | saline water | saline water | | | |
| | Sampled Date | 25-JUN-12 | 25-JUN-12 | | | |
| | Sampled Time | 08:00 | 08:00 | | | |
| | Client ID | PORT-5-1 | PORT-5-2 | | | |
| **Grouping** | **Analyte** | | | | | |
| **SEAWATER** | | | | | | |
| **Dissolved Metals** | Gallium (Ga)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Iron (Fe)-Dissolved (mg/L) | 8.68 | 8.36 | | | |
| | Lead (Pb)-Dissolved (mg/L) | <0.00060 DLA | <0.00060 DLA | | | |
| | Lithium (Li)-Dissolved (mg/L) | 5.23 | 5.13 | | | |
| | Magnesium (Mg)-Dissolved (mg/L) | 2090 | 2140 | | | |
| | Manganese (Mn)-Dissolved (mg/L) | 0.827 | 0.806 | | | |
| | Mercury (Hg)-Dissolved (mg/L) | <0.000010 | <0.000010 | | | |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.0078 | 0.0078 | | | |
| | Nickel (Ni)-Dissolved (mg/L) | 0.0055 | 0.0058 | | | |
| | Phosphorus (P)-Dissolved (mg/L) | <2.0 DLA | <2.0 DLA | | | |
| | Potassium (K)-Dissolved (mg/L) | 395 | 416 | | | |
| | Rhenium (Re)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Rubidium (Rb)-Dissolved (mg/L) | 0.429 | 0.412 | | | |
| | Selenium (Se)-Dissolved (mg/L) | <0.0010 DLM | <0.0010 DLM | | | |
| | Silicon (Si)-Dissolved (mg/L) | 1.3 | 1.3 | | | |
| | Silver (Ag)-Dissolved (mg/L) | <0.00020 DLA | <0.00020 DLA | | | |
| | Sodium (Na)-Dissolved (mg/L) | 15600 | 16200 | | | |
| | Strontium (Sr)-Dissolved (mg/L) | 90.9 | 93.0 | | | |
| | Tellurium (Te)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Thallium (Tl)-Dissolved (mg/L) | 0.00096 | 0.00109 | | | |
| | Thorium (Th)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Tin (Sn)-Dissolved (mg/L) | <0.0020 DLA | <0.0020 DLA | | | |
| | Titanium (Ti)-Dissolved (mg/L) | <0.010 DLA | <0.010 DLA | | | |
| | Tungsten (W)-Dissolved (mg/L) | 0.0037 | 0.0039 | | | |
| | Uranium (U)-Dissolved (mg/L) | 0.00075 | 0.00078 | | | |
| | Vanadium (V)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Yttrium (Y)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |
| | Zinc (Zn)-Dissolved (mg/L) | 0.694 | 0.661 | | | |
| | Zirconium (Zr)-Dissolved (mg/L) | <0.0010 DLA | <0.0010 DLA | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1169964-1 | L1169964-2 | | | |
|---|---|---|---|---|---|---|
| | Description | saline water | saline water | | | |
| | Sampled Date | 25-JUN-12 | 25-JUN-12 | | | |
| | Sampled Time | 08:00 | 08:00 | | | |
| | Client ID | PORT-5-1 | PORT-5-2 | | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Volatile Organic Compounds** | Benzene (mg/L) | <0.00050 | <0.00050 | | | |
| | Bromodichloromethane (mg/L) | <0.0010 | <0.0010 | | | |
| | Bromoform (mg/L) | <0.0010 | <0.0010 | | | |
| | Carbon Tetrachloride (mg/L) | <0.00050 | <0.00050 | | | |
| | Chlorobenzene (mg/L) | <0.0010 | <0.0010 | | | |
| | Dibromochloromethane (mg/L) | <0.0010 | <0.0010 | | | |
| | Chloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | Chloroform (mg/L) | <0.0010 | <0.0010 | | | |
| | Chloromethane (mg/L) | 0.0112 | 0.0123 | | | |
| | 1,2-Dichlorobenzene (mg/L) | <0.00070 | <0.00070 | | | |
| | 1,3-Dichlorobenzene (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,4-Dichlorobenzene (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,1-Dichloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,2-Dichloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,1-Dichloroethylene (mg/L) | <0.0010 | <0.0010 | | | |
| | cis-1,2-Dichloroethylene (mg/L) | <0.0010 | <0.0010 | | | |
| | trans-1,2-Dichloroethylene (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,3-Dichloropropene (cis & trans) (mg/L) | <0.0014 | <0.0014 | | | |
| | Dichloromethane (mg/L) | <0.0050 | <0.0050 | | | |
| | 1,2-Dichloropropane (mg/L) | <0.0010 | <0.0010 | | | |
| | cis-1,3-Dichloropropylene (mg/L) | <0.0010 | <0.0010 | | | |
| | trans-1,3-Dichloropropylene (mg/L) | <0.0010 | <0.0010 | | | |
| | Ethylbenzene (mg/L) | <0.00050 | <0.00050 | | | |
| | Methyl t-butyl ether (MTBE) (mg/L) | <0.00050 | <0.00050 | | | |
| | Styrene (mg/L) | <0.00050 | <0.00050 | | | |
| | 1,1,1,2-Tetrachloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,1,2,2-Tetrachloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | Tetrachloroethylene (mg/L) | <0.0010 | <0.0010 | | | |
| | Toluene (mg/L) | <0.00050 | <0.00050 | | | |
| | 1,1,1-Trichloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | 1,1,2-Trichloroethane (mg/L) | <0.0010 | <0.0010 | | | |
| | Trichloroethylene (mg/L) | <0.0010 | <0.0010 | | | |
| | Trichlorofluoromethane (mg/L) | <0.0010 | <0.0010 | | | |
| | Vinyl Chloride (mg/L) | <0.0010 | <0.0010 | | | |
| | ortho-Xylene (mg/L) | <0.00050 | <0.00050 | | | |
| | meta- & para-Xylene (mg/L) | <0.00050 | <0.00050 | | | |
| | Xylenes (mg/L) | <0.00075 | <0.00075 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1169964-1 | L1169964-2 | | | |
|---|---|---|---|---|---|---|
| | Description | saline water | saline water | | | |
| | Sampled Date | 25-JUN-12 | 25-JUN-12 | | | |
| | Sampled Time | 08:00 | 08:00 | | | |
| | Client ID | PORT-5-1 | PORT-5-2 | | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Volatile Organic Compounds** | Surrogate: 4-Bromofluorobenzene (SS) (%) | 90.8 | 88.5 | | | |
| | Surrogate: 1,4-Difluorobenzene (SS) (%) | 99.6 | 98.7 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# Reference Information

**QC Samples with Qualifiers & Comments:**

| QC Type Description | Parameter | Qualifier | Applies to Sample Number(s) |
|---|---|---|---|
| Method Blank | Aluminum (Al)-Total | MB-LOR | L1169964-1, -2 |

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLA | Detection Limit Adjusted For required dilution |
| DLB | Detection limit was raised due to detection of analyte at comparable level in Method Blank. |
| DLM | Detection Limit Adjusted For Sample Matrix Effects |
| MB-LOR | Method Blank exceeds ALS DQO. LORs adjusted for samples with positive hits below 5 times blank level. Please contact ALS if re-analysis is required. |

**Test Method References:**

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **ALK-C-SCR-VA** | Seawater | Alk. by colour or titration (seawater) | EPA 310.2 OR APHA 2320 |

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

| | | | |
|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | Seawater | Chloride by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **ANIONS-C-NO2-IC-VA** | Seawater | Nitrite in Seawater by IC | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-C-NO3-IC-VA** | Seawater | Nitrate in Seawater by IC | EPA 300.0 |

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

| | | | |
|---|---|---|---|
| **ANIONS-C-SO4-IC-VA** | Seawater | Sulfate by IC (seawater) | APHA 4110 B. |

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

| | | | |
|---|---|---|---|
| **EC-C-MAN-VA** | Seawater | Conductivity (Manual) (seawater) | APHA 2510 Conductivity |

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

| | | | |
|---|---|---|---|
| **F-ISE-VA** | Seawater | Fluoride by SIE | BASED ON APHA 4500-F FLUORIDE |

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

| | | | |
|---|---|---|---|
| **HARDNESS-CALC-VA** | Seawater | Hardness | APHA 2340B |

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

| | | | |
|---|---|---|---|
| **HG-DIS-C-CVAFS-VA** | Seawater | Diss. Mercury in Seawater by CVAFS | PUGET SOUND PROTOCOLS, EPA 245.7 |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **HG-TOT-C-CVAFS-VA** | Seawater | Total Mercury in Seawater by CVAFS | PUGET SOUND PROTOCOLS, EPA 245.7 |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

| | | | |
|---|---|---|---|
| **MET-D-L-HRMS-VA** | Seawater | Diss. Metals in Seawater by HR-ICPMS | EPA 200.8 |

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

| | | | |
|---|---|---|---|
| **MET-DIS-C-ICP-VA** | Seawater | Diss. Metals in Seawater by ICPOES | PUGET SOUND PROTOCOLS, EPA 6010B |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

# Reference Information

| | | | |
|---|---|---|---|
| **MET-T-L-HRMS-VA** | Seawater | Tot. Metals in Seawater by HR-ICPMS | EPA 200.8 |

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

| | | | |
|---|---|---|---|
| **MET-TOT-C-ICP-VA** | Seawater | Total Metals in Seawater by ICPOES | PUGET SOUND PROTOCOLS, EPA 6010B |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

| | | | |
|---|---|---|---|
| **NH3-F-VA** | Seawater | Ammonia in Seawater by Fluorescence | J. ENVIRON. MONIT., 2005, 7, 37-42, RSC |

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

| | | | |
|---|---|---|---|
| **NO2+NO3-CALC-VA** | Seawater | Nitrite & Nitrate in Seawater (Calc) | EPA 300.0 |

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

| | | | |
|---|---|---|---|
| **P-T-COL-VA** | Seawater | Total P in Seawater by Colour | APHA 4500-P Phosphorous |

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

| | | | |
|---|---|---|---|
| **PH-C-MAN-VA** | Seawater | pH by Manual Meter (seawater) | APHA 4500-H pH Value |

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

| | | | |
|---|---|---|---|
| **SE-D-HVAF-VA** | Seawater | Dissolved Selenium in Seawater by HVAFS | PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

| | | | |
|---|---|---|---|
| **SE-T-HVAF-VA** | Seawater | Total Selenium in Seawater by HVAFS | PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT |

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

| | | | |
|---|---|---|---|
| **TDS-VA** | Seawater | Total Dissolved Solids by Gravimetric | APHA 2540 Gravimetric |

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

| | | | |
|---|---|---|---|
| **TS-VA** | Seawater | Total Solids by Gravimetric | APHA 2540 Gravimetric |

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Solids (TS) are determined by evaporating a sample to dryness at 104 degrees celsius.

| | | | |
|---|---|---|---|
| **TSS-C-VA** | Seawater | Total Suspended Solids by Gravimetric | APHA 2540 D. / PSWQA TSS |

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a 0.45um membrane filter (Puget Sound Water Quality Authority TSS Method, May 1991), TSS is determined by drying the filter at 104 degrees celsius.

| | | | |
|---|---|---|---|
| **VOC-HSMS-VA** | Water | VOCs in water by Headspace GCMS | EPA8260B, 5021 |

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

| | | | |
|---|---|---|---|
| **VOC7-HSMS-VA** | Water | BTEX/MTBE/Styrene by Headspace GCMS | EPA8260B, 5021 |

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

| | | | |
|---|---|---|---|
| **VOC7/VOC-SURR-MS-VA** | Water | VOC7 and/or VOC Surrogates for Waters | EPA8260B, 5021 |
| **XYLENES-CALC-VA** | Water | Sum of Xylene Isomer Concentrations | CALCULATION |

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

# Reference Information

| Laboratory Definition Code | Laboratory Location |
|---|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA |

**Chain of Custody Numbers:**

08-013785

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg - milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L - milligrams per litre.*
*< - Less than.*
*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# Quality Control Report

Workorder: L1169964 Report Date: 13-JUL-12 

Client: GOLDER ASSOCIATES LTD
32 Steacie Drive
Kanata ON K2K 2A9
Contact: Valerie Bertrand

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **VOC-HSMS-VA** | **Water** | | | | | | | |
| **Batch R2391585** | | | | | | | | |
| **WG1502289-2 LCS** | | | | | | | | |
| Bromodichloromethane | | | 99.7 | | % | | 70-130 | 05-JUL-12 |
| Bromoform | | | 97.8 | | % | | 70-130 | 05-JUL-12 |
| Carbon Tetrachloride | | | 105.0 | | % | | 70-130 | 05-JUL-12 |
| Chlorobenzene | | | 91.8 | | % | | 70-130 | 05-JUL-12 |
| Dibromochloromethane | | | 94.6 | | % | | 70-130 | 05-JUL-12 |
| Chloroethane | | | 96.9 | | % | | 60-140 | 05-JUL-12 |
| Chloroform | | | 101.7 | | % | | 70-130 | 05-JUL-12 |
| Chloromethane | | | 90.3 | | % | | 60-140 | 05-JUL-12 |
| 1,2-Dichlorobenzene | | | 93.5 | | % | | 70-130 | 05-JUL-12 |
| 1,3-Dichlorobenzene | | | 93.5 | | % | | 70-130 | 05-JUL-12 |
| 1,4-Dichlorobenzene | | | 92.0 | | % | | 70-130 | 05-JUL-12 |
| 1,1-Dichloroethane | | | 96.3 | | % | | 70-130 | 05-JUL-12 |
| 1,2-Dichloroethane | | | 101.4 | | % | | 70-130 | 05-JUL-12 |
| 1,1-Dichloroethylene | | | 91.6 | | % | | 70-130 | 05-JUL-12 |
| cis-1,2-Dichloroethylene | | | 97.9 | | % | | 70-130 | 05-JUL-12 |
| trans-1,2-Dichloroethylene | | | 95.3 | | % | | 70-130 | 05-JUL-12 |
| Dichloromethane | | | 99.7 | | % | | 60-140 | 05-JUL-12 |
| 1,2-Dichloropropane | | | 93.6 | | % | | 70-130 | 05-JUL-12 |
| cis-1,3-Dichloropropylene | | | 90.7 | | % | | 70-130 | 05-JUL-12 |
| trans-1,3-Dichloropropylene | | | 78.3 | | % | | 70-130 | 05-JUL-12 |
| 1,1,1,2-Tetrachloroethane | | | 96.0 | | % | | 70-130 | 05-JUL-12 |
| 1,1,2,2-Tetrachloroethane | | | 92.8 | | % | | 70-130 | 05-JUL-12 |
| Tetrachloroethylene | | | 90.8 | | % | | 70-130 | 05-JUL-12 |
| 1,1,1-Trichloroethane | | | 104.3 | | % | | 70-130 | 05-JUL-12 |
| 1,1,2-Trichloroethane | | | 90.4 | | % | | 70-130 | 05-JUL-12 |
| Trichloroethylene | | | 94.8 | | % | | 70-130 | 05-JUL-12 |
| Trichlorofluoromethane | | | 124.6 | | % | | 60-140 | 05-JUL-12 |
| Vinyl Chloride | | | 96.6 | | % | | 60-140 | 05-JUL-12 |
| **WG1502289-1 MB** | | | | | | | | |
| Bromodichloromethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Bromoform | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Carbon Tetrachloride | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| Chlorobenzene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Dibromochloromethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **VOC-HSMS-VA** | **Water** | | | | | | | |
| **Batch** | **R2391585** | | | | | | | |
| **WG1502289-1** | **MB** | | | | | | | |
| Chloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Chloroform | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Chloromethane | | | <0.0050 | | mg/L | | 0.005 | 05-JUL-12 |
| 1,2-Dichlorobenzene | | | <0.00070 | | mg/L | | 0.0007 | 05-JUL-12 |
| 1,3-Dichlorobenzene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,4-Dichlorobenzene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,1-Dichloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,2-Dichloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,1-Dichloroethylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| cis-1,2-Dichloroethylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| trans-1,2-Dichloroethylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Dichloromethane | | | <0.0050 | | mg/L | | 0.005 | 05-JUL-12 |
| 1,2-Dichloropropane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| cis-1,3-Dichloropropylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| trans-1,3-Dichloropropylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,1,1,2-Tetrachloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,1,2,2-Tetrachloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Tetrachloroethylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,1,1-Trichloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| 1,1,2-Trichloroethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Trichloroethylene | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Trichlorofluoromethane | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| Vinyl Chloride | | | <0.0010 | | mg/L | | 0.001 | 05-JUL-12 |
| **VOC7-HSMS-VA** | **Water** | | | | | | | |
| **Batch** | **R2391585** | | | | | | | |
| **WG1502289-2** | **LCS** | | | | | | | |
| Benzene | | | 97.0 | | % | | 70-130 | 05-JUL-12 |
| Ethylbenzene | | | 91.2 | | % | | 70-130 | 05-JUL-12 |
| Methyl t-butyl ether (MTBE) | | | 98.0 | | % | | 70-130 | 05-JUL-12 |
| Styrene | | | 93.4 | | % | | 70-130 | 05-JUL-12 |
| Toluene | | | 88.2 | | % | | 70-130 | 05-JUL-12 |
| meta- & para-Xylene | | | 93.5 | | % | | 70-130 | 05-JUL-12 |
| ortho-Xylene | | | 91.9 | | % | | 70-130 | 05-JUL-12 |
| **WG1502289-1** | **MB** | | | | | | | |

# Quality Control Report

Workorder: L1169964 Report Date: 13-JUL-12 

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **VOC7-HSMS-VA** | **Water** | | | | | | | |
| **Batch R2391585** | | | | | | | | |
| **WG1502289-1 MB** | | | | | | | | |
| Benzene | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| Ethylbenzene | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| Methyl t-butyl ether (MTBE) | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| Styrene | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| Toluene | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| meta- & para-Xylene | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| ortho-Xylene | | | <0.00050 | | mg/L | | 0.0005 | 05-JUL-12 |
| **ALK-C-SCR-VA** | **Seawater** | | | | | | | |
| **Batch R2394043** | | | | | | | | |
| **WG1502976-2 CRM** | | **VA-ALKL-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 99.2 | | % | | 85-115 | 06-JUL-12 |
| **WG1502976-5 CRM** | | **VA-ALKM-CONTROL** | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 99.3 | | % | | 85-115 | 06-JUL-12 |
| **WG1502976-3 DUP** | | **L1169964-2** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 19.0 | 19.7 | | mg/L | 3.4 | 25 | 06-JUL-12 |
| **WG1502976-1 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 06-JUL-12 |
| **WG1502976-4 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 06-JUL-12 |
| **WG1502976-7 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <2.0 | | mg/L | | 2 | 06-JUL-12 |
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2394737** | | | | | | | | |
| **WG1503248-18 LCS** | | | | | | | | |
| Chloride (Cl) | | | 99.8 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-2 LCS** | | | | | | | | |
| Chloride (Cl) | | | 99.6 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-1 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-10 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-13 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-16 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-4 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-CL-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2394737** | | | | | | | | |
| **WG1503248-7 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **ANIONS-C-NO2-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2394737** | | | | | | | | |
| **WG1503248-18 LCS** | | | | | | | | |
| Nitrite (as N) | | | 100.0 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-2 LCS** | | | | | | | | |
| Nitrite (as N) | | | 99.5 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-1 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 07-JUL-12 |
| **WG1503248-10 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 07-JUL-12 |
| **WG1503248-13 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 07-JUL-12 |
| **WG1503248-16 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 07-JUL-12 |
| **WG1503248-4 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 07-JUL-12 |
| **WG1503248-7 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.0010 | | mg/L | | 0.001 | 07-JUL-12 |
| **ANIONS-C-NO3-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2394737** | | | | | | | | |
| **WG1503248-18 LCS** | | | | | | | | |
| Nitrate (as N) | | | 104.7 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-2 LCS** | | | | | | | | |
| Nitrate (as N) | | | 104.6 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-1 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 07-JUL-12 |
| **WG1503248-10 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 07-JUL-12 |
| **WG1503248-13 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 07-JUL-12 |
| **WG1503248-16 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 07-JUL-12 |
| **WG1503248-4 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 07-JUL-12 |
| **WG1503248-7 MB** | | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **ANIONS-C-NO3-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2394737** | | | | | | | | |
| **WG1503248-7 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.0050 | | mg/L | | 0.005 | 07-JUL-12 |
| **ANIONS-C-SO4-IC-VA** | **Seawater** | | | | | | | |
| **Batch R2394737** | | | | | | | | |
| **WG1503248-18 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.4 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-2 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 102.0 | | % | | 85-115 | 07-JUL-12 |
| **WG1503248-1 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-10 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-13 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-16 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-4 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **WG1503248-7 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 07-JUL-12 |
| **EC-C-MAN-VA** | **Seawater** | | | | | | | |
| **Batch R2395037** | | | | | | | | |
| **WG1504124-2 DUP** | | **L1169964-2** | | | | | | |
| Conductivity | | 68700 | 68600 | | uS/cm | 0.1 | 25 | 07-JUL-12 |
| **F-ISE-VA** | **Seawater** | | | | | | | |
| **Batch R2395849** | | | | | | | | |
| **WG1505022-2 CRM** | | **VA-F-SIE-2.0** | | | | | | |
| Fluoride (F) | | | 99.5 | | % | | 85-115 | 10-JUL-12 |
| **WG1505022-4 CRM** | | **VA-F-SIE-2.0** | | | | | | |
| Fluoride (F) | | | 97.5 | | % | | 85-115 | 10-JUL-12 |
| **WG1505022-5 DUP** | | **L1169964-2** | | | | | | |
| Fluoride (F) | | <0.75 | <0.75 | RPD-NA | mg/L | N/A | 20 | 10-JUL-12 |
| **WG1505022-1 MB** | | | | | | | | |
| Fluoride (F) | | | <0.030 | | mg/L | | 0.03 | 10-JUL-12 |
| **WG1505022-3 MB** | | | | | | | | |
| Fluoride (F) | | | <0.030 | | mg/L | | 0.03 | 10-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **HG-DIS-C-CVAFS-VA** | **Seawater** | | | | | | | |
| **Batch R2392548** | | | | | | | | |
| **WG1500273-1 MB** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | <0.000010 | | mg/L | | 0.00001 | 04-JUL-12 |
| **HG-TOT-C-CVAFS-VA** | **Seawater** | | | | | | | |
| **Batch R2395079** | | | | | | | | |
| **WG1504134-2 LCS** | | | | | | | | |
| Mercury (Hg)-Total | | | 99.4 | | % | | 80-120 | 09-JUL-12 |
| **WG1504134-1 MB** | | | | | | | | |
| Mercury (Hg)-Total | | | <0.000010 | | mg/L | | 0.00001 | 09-JUL-12 |
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1500273-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Aluminum (Al)-Dissolved | | | 100.6 | | % | | 80-120 | 04-JUL-12 |
| Antimony (Sb)-Dissolved | | | 98.1 | | % | | 80-120 | 04-JUL-12 |
| Arsenic (As)-Dissolved | | | 101.4 | | % | | 80-120 | 04-JUL-12 |
| Barium (Ba)-Dissolved | | | 106.0 | | % | | 80-120 | 04-JUL-12 |
| Beryllium (Be)-Dissolved | | | 98.3 | | % | | 80-120 | 04-JUL-12 |
| Bismuth (Bi)-Dissolved | | | 103.3 | | % | | 80-120 | 04-JUL-12 |
| Boron (B)-Dissolved | | | 101.3 | | % | | 80-120 | 04-JUL-12 |
| Cadmium (Cd)-Dissolved | | | 113.0 | | % | | 80-120 | 04-JUL-12 |
| Cesium (Cs)-Dissolved | | | 100.0 | | % | | 80-120 | 04-JUL-12 |
| Chromium (Cr)-Dissolved | | | 106.3 | | % | | 80-120 | 04-JUL-12 |
| Cobalt (Co)-Dissolved | | | 100.4 | | % | | 80-120 | 04-JUL-12 |
| Copper (Cu)-Dissolved | | | 104.8 | | % | | 80-120 | 04-JUL-12 |
| Gallium (Ga)-Dissolved | | | 100.8 | | % | | 80-120 | 04-JUL-12 |
| Iron (Fe)-Dissolved | | | 105.6 | | % | | 80-120 | 04-JUL-12 |
| Lead (Pb)-Dissolved | | | 104.6 | | % | | 80-120 | 04-JUL-12 |
| Lithium (Li)-Dissolved | | | 101.4 | | % | | 80-120 | 04-JUL-12 |
| Manganese (Mn)-Dissolved | | | 101.2 | | % | | 80-120 | 04-JUL-12 |
| Molybdenum (Mo)-Dissolved | | | 105.6 | | % | | 80-120 | 04-JUL-12 |
| Nickel (Ni)-Dissolved | | | 92.2 | | % | | 80-120 | 04-JUL-12 |
| Phosphorus (P)-Dissolved | | | 100.5 | | % | | 80-120 | 04-JUL-12 |
| Rhenium (Re)-Dissolved | | | 99.2 | | % | | 80-120 | 04-JUL-12 |
| Rubidium (Rb)-Dissolved | | | 108.0 | | % | | 80-120 | 04-JUL-12 |
| Selenium (Se)-Dissolved | | | 110.1 | | % | | 80-120 | 04-JUL-12 |
| Silver (Ag)-Dissolved | | | 103.0 | | % | | 80-120 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1500273-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Tellurium (Te)-Dissolved | | | 104.0 | | % | | 80-120 | 04-JUL-12 |
| Thallium (Tl)-Dissolved | | | 105.1 | | % | | 80-120 | 04-JUL-12 |
| Thorium (Th)-Dissolved | | | 105.0 | | % | | 80-120 | 04-JUL-12 |
| Tin (Sn)-Dissolved | | | 104.2 | | % | | 80-120 | 04-JUL-12 |
| Titanium (Ti)-Dissolved | | | 104.8 | | % | | 80-120 | 04-JUL-12 |
| Tungsten (W)-Dissolved | | | 99.4 | | % | | 80-120 | 04-JUL-12 |
| Uranium (U)-Dissolved | | | 95.6 | | % | | 80-120 | 04-JUL-12 |
| Vanadium (V)-Dissolved | | | 101.6 | | % | | 80-120 | 04-JUL-12 |
| Yttrium (Y)-Dissolved | | | 106.0 | | % | | 80-120 | 04-JUL-12 |
| Zinc (Zn)-Dissolved | | | 108.4 | | % | | 80-120 | 04-JUL-12 |
| Zirconium (Zr)-Dissolved | | | 90.9 | | % | | 80-120 | 04-JUL-12 |
| **WG1500273-1 MB** | | | | | | | | |
| Aluminum (Al)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Antimony (Sb)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Arsenic (As)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Barium (Ba)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Beryllium (Be)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Bismuth (Bi)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Boron (B)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 04-JUL-12 |
| Cadmium (Cd)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Cesium (Cs)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Chromium (Cr)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 04-JUL-12 |
| Cobalt (Co)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Copper (Cu)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Gallium (Ga)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Iron (Fe)-Dissolved | | | <0.010 | | mg/L | | 0.01 | 04-JUL-12 |
| Lead (Pb)-Dissolved | | | <0.00030 | | mg/L | | 0.0003 | 04-JUL-12 |
| Lithium (Li)-Dissolved | | | <0.020 | | mg/L | | 0.02 | 04-JUL-12 |
| Manganese (Mn)-Dissolved | | | <0.00020 | | mg/L | | 0.0002 | 04-JUL-12 |
| Molybdenum (Mo)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Nickel (Ni)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Phosphorus (P)-Dissolved | | | <1.0 | | mg/L | | 1 | 04-JUL-12 |
| Rhenium (Re)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Rubidium (Rb)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1500273-1 MB** | | | | | | | | |
| Selenium (Se)-Dissolved | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Silver (Ag)-Dissolved | | | <0.00010 | | mg/L | | 0.0001 | 04-JUL-12 |
| Tellurium (Te)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Thallium (Tl)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Thorium (Th)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Tin (Sn)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Titanium (Ti)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Tungsten (W)-Dissolved | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Uranium (U)-Dissolved | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Vanadium (V)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Yttrium (Y)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Zinc (Zn)-Dissolved | | | <0.0030 | | mg/L | | 0.003 | 04-JUL-12 |
| Zirconium (Zr)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| **MET-DIS-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2392580** | | | | | | | | |
| **WG1500273-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Dissolved | | | 102.4 | | % | | 80-120 | 04-JUL-12 |
| Magnesium (Mg)-Dissolved | | | 100.5 | | % | | 80-120 | 04-JUL-12 |
| Potassium (K)-Dissolved | | | 99.3 | | % | | 80-120 | 04-JUL-12 |
| Silicon (Si)-Dissolved | | | 98.4 | | % | | 80-120 | 04-JUL-12 |
| Sodium (Na)-Dissolved | | | 99.3 | | % | | 80-120 | 04-JUL-12 |
| Strontium (Sr)-Dissolved | | | 98.1 | | % | | 80-120 | 04-JUL-12 |
| **WG1500273-1 MB** | | | | | | | | |
| Calcium (Ca)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 04-JUL-12 |
| Magnesium (Mg)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 04-JUL-12 |
| Potassium (K)-Dissolved | | | <2.0 | | mg/L | | 2 | 04-JUL-12 |
| Silicon (Si)-Dissolved | | | <0.050 | | mg/L | | 0.05 | 04-JUL-12 |
| Sodium (Na)-Dissolved | | | <2.0 | | mg/L | | 2 | 04-JUL-12 |
| Strontium (Sr)-Dissolved | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1500592-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Aluminum (Al)-Total | | | 101.4 | | % | | 80-120 | 04-JUL-12 |
| Antimony (Sb)-Total | | | 103.1 | | % | | 80-120 | 04-JUL-12 |
| Arsenic (As)-Total | | | 101.7 | | % | | 80-120 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1500592-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Barium (Ba)-Total | | | 105.2 | | % | | 80-120 | 04-JUL-12 |
| Beryllium (Be)-Total | | | 101.0 | | % | | 80-120 | 04-JUL-12 |
| Bismuth (Bi)-Total | | | 105.1 | | % | | 80-120 | 04-JUL-12 |
| Boron (B)-Total | | | 106.6 | | % | | 80-120 | 04-JUL-12 |
| Cadmium (Cd)-Total | | | 111.0 | | % | | 80-120 | 04-JUL-12 |
| Cesium (Cs)-Total | | | 101.2 | | % | | 80-120 | 04-JUL-12 |
| Chromium (Cr)-Total | | | 109.5 | | % | | 80-120 | 04-JUL-12 |
| Cobalt (Co)-Total | | | 103.2 | | % | | 80-120 | 04-JUL-12 |
| Copper (Cu)-Total | | | 102.0 | | % | | 80-120 | 04-JUL-12 |
| Gallium (Ga)-Total | | | 103.6 | | % | | 80-120 | 04-JUL-12 |
| Iron (Fe)-Total | | | 107.3 | | % | | 80-120 | 04-JUL-12 |
| Lead (Pb)-Total | | | 105.8 | | % | | 80-120 | 04-JUL-12 |
| Lithium (Li)-Total | | | 101.8 | | % | | 80-120 | 04-JUL-12 |
| Manganese (Mn)-Total | | | 105.6 | | % | | 80-120 | 04-JUL-12 |
| Molybdenum (Mo)-Total | | | 106.8 | | % | | 80-120 | 04-JUL-12 |
| Nickel (Ni)-Total | | | 94.6 | | % | | 80-120 | 04-JUL-12 |
| Phosphorus (P)-Total | | | 102.9 | | % | | 80-120 | 04-JUL-12 |
| Rhenium (Re)-Total | | | 99.4 | | % | | 80-120 | 04-JUL-12 |
| Rubidium (Rb)-Total | | | 110.0 | | % | | 80-120 | 04-JUL-12 |
| Selenium (Se)-Total | | | 104.9 | | % | | 80-120 | 04-JUL-12 |
| Silver (Ag)-Total | | | 104.0 | | % | | 80-120 | 04-JUL-12 |
| Tellurium (Te)-Total | | | 105.0 | | % | | 80-120 | 04-JUL-12 |
| Thallium (Tl)-Total | | | 106.0 | | % | | 80-120 | 04-JUL-12 |
| Thorium (Th)-Total | | | 106.0 | | % | | 80-120 | 04-JUL-12 |
| Tin (Sn)-Total | | | 104.8 | | % | | 80-120 | 04-JUL-12 |
| Titanium (Ti)-Total | | | 102.8 | | % | | 80-120 | 04-JUL-12 |
| Tungsten (W)-Total | | | 101.0 | | % | | 80-120 | 04-JUL-12 |
| Uranium (U)-Total | | | 95.6 | | % | | 80-120 | 04-JUL-12 |
| Vanadium (V)-Total | | | 105.4 | | % | | 80-120 | 04-JUL-12 |
| Yttrium (Y)-Total | | | 107.0 | | % | | 80-120 | 04-JUL-12 |
| Zinc (Zn)-Total | | | 108.8 | | % | | 80-120 | 04-JUL-12 |
| Zirconium (Zr)-Total | | | 92.3 | | % | | 80-120 | 04-JUL-12 |
| **WG1500592-1 MB** | | | | | | | | |
| Antimony (Sb)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2393046** | | | | | | | | |
| **WG1500592-1 MB** | | | | | | | | |
| Arsenic (As)-Total | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Barium (Ba)-Total | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Beryllium (Be)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Bismuth (Bi)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Boron (B)-Total | | | <0.10 | | mg/L | | 0.1 | 04-JUL-12 |
| Cadmium (Cd)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Cesium (Cs)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Chromium (Cr)-Total | | | <0.00010 | | mg/L | | 0.0001 | 04-JUL-12 |
| Cobalt (Co)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Copper (Cu)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Gallium (Ga)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Iron (Fe)-Total | | | <0.010 | | mg/L | | 0.01 | 04-JUL-12 |
| Lead (Pb)-Total | | | <0.00030 | | mg/L | | 0.0003 | 04-JUL-12 |
| Lithium (Li)-Total | | | <0.020 | | mg/L | | 0.02 | 04-JUL-12 |
| Manganese (Mn)-Total | | | <0.00020 | | mg/L | | 0.0002 | 04-JUL-12 |
| Molybdenum (Mo)-Total | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Nickel (Ni)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Phosphorus (P)-Total | | | <1.0 | | mg/L | | 1 | 04-JUL-12 |
| Rhenium (Re)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Rubidium (Rb)-Total | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Selenium (Se)-Total | | | <0.0020 | | mg/L | | 0.002 | 04-JUL-12 |
| Silver (Ag)-Total | | | <0.00010 | | mg/L | | 0.0001 | 04-JUL-12 |
| Tellurium (Te)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Thallium (Tl)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Thorium (Th)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Tin (Sn)-Total | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Titanium (Ti)-Total | | | <0.0050 | | mg/L | | 0.005 | 04-JUL-12 |
| Tungsten (W)-Total | | | <0.0010 | | mg/L | | 0.001 | 04-JUL-12 |
| Uranium (U)-Total | | | <0.000050 | | mg/L | | 0.00005 | 04-JUL-12 |
| Vanadium (V)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Yttrium (Y)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |
| Zinc (Zn)-Total | | | <0.0030 | | mg/L | | 0.003 | 04-JUL-12 |
| Zirconium (Zr)-Total | | | <0.00050 | | mg/L | | 0.0005 | 04-JUL-12 |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-HRMS-VA** | **Seawater** | | | | | | | |
| **Batch R2395005** | | | | | | | | |
| **WG1500592-1 MB** | | | | | | | | |
| Aluminum (Al)-Total | | | 0.0117 | MB-LOR | mg/L | | 0.005 | 06-JUL-12 |
| **MET-TOT-C-ICP-VA** | **Seawater** | | | | | | | |
| **Batch R2392631** | | | | | | | | |
| **WG1500592-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Calcium (Ca)-Total | | | 106.7 | | % | | 80-120 | 03-JUL-12 |
| Magnesium (Mg)-Total | | | 106.7 | | % | | 80-120 | 03-JUL-12 |
| Potassium (K)-Total | | | 104.2 | | % | | 80-120 | 03-JUL-12 |
| Silicon (Si)-Total | | | 103.0 | | % | | 80-120 | 03-JUL-12 |
| Sodium (Na)-Total | | | 101.7 | | % | | 80-120 | 03-JUL-12 |
| Strontium (Sr)-Total | | | 103.9 | | % | | 80-120 | 03-JUL-12 |
| **WG1500592-1 MB** | | | | | | | | |
| Calcium (Ca)-Total | | | <0.050 | | mg/L | | 0.05 | 03-JUL-12 |
| Magnesium (Mg)-Total | | | <0.10 | | mg/L | | 0.1 | 03-JUL-12 |
| Potassium (K)-Total | | | <2.0 | | mg/L | | 2 | 03-JUL-12 |
| Silicon (Si)-Total | | | <0.050 | | mg/L | | 0.05 | 03-JUL-12 |
| Sodium (Na)-Total | | | <2.0 | | mg/L | | 2 | 03-JUL-12 |
| Strontium (Sr)-Total | | | <0.0050 | | mg/L | | 0.005 | 03-JUL-12 |
| **NH3-F-VA** | **Seawater** | | | | | | | |
| **Batch R2396919** | | | | | | | | |
| **WG1505147-2 CRM** | | **VA-NH3-F** | | | | | | |
| Ammonia, Total (as N) | | | 100.6 | | % | | 85-115 | 11-JUL-12 |
| **WG1505147-1 MB** | | | | | | | | |
| Ammonia, Total (as N) | | | <0.0050 | | mg/L | | 0.005 | 11-JUL-12 |
| **P-T-COL-VA** | **Seawater** | | | | | | | |
| **Batch R2394046** | | | | | | | | |
| **WG1502636-2 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 99.7 | | % | | 80-120 | 06-JUL-12 |
| **WG1502636-1 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 06-JUL-12 |
| **Batch R2395882** | | | | | | | | |
| **WG1504535-2 CRM** | | **VA-ERA-PO4** | | | | | | |
| Phosphorus (P)-Total | | | 100.6 | | % | | 80-120 | 10-JUL-12 |
| **WG1504535-1 MB** | | | | | | | | |
| Phosphorus (P)-Total | | | <0.0020 | | mg/L | | 0.002 | 10-JUL-12 |
| **PH-C-MAN-VA** | **Seawater** | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **PH-C-MAN-VA** | **Seawater** | | | | | | | |
| **Batch R2394705** | | | | | | | | |
| **WG1503802-1 CRM** | | **VA-PH7-BUF** | | | | | | |
| pH | | | 7.05 | | pH | | 6.9-7.1 | 07-JUL-12 |
| **WG1503802-2 DUP** | | **L1169964-2** | | | | | | |
| pH | | 6.63 | 6.66 | J | pH | 0.03 | 0.2 | 07-JUL-12 |
| **SE-D-HVAF-VA** | **Seawater** | | | | | | | |
| **Batch R2398152** | | | | | | | | |
| **WG1500273-2 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Selenium (Se)-Dissolved | | | 93.9 | | % | | 80-120 | 12-JUL-12 |
| **WG1500273-1 MB** | | | | | | | | |
| Selenium (Se)-Dissolved | | | <0.00050 | | mg/L | | 0.0005 | 12-JUL-12 |
| **SE-T-HVAF-VA** | **Seawater** | | | | | | | |
| **Batch R2398152** | | | | | | | | |
| **WG1500592-3 CRM** | | **VA-HIGH-WATRM** | | | | | | |
| Selenium (Se)-Total | | | 96.3 | | % | | 80-120 | 12-JUL-12 |
| **WG1500592-1 MB** | | | | | | | | |
| Selenium (Se)-Total | | | <0.00050 | | mg/L | | 0.0005 | 12-JUL-12 |
| **TDS-VA** | **Seawater** | | | | | | | |
| **Batch R2394671** | | | | | | | | |
| **WG1502720-3 DUP** | | **L1169964-2** | | | | | | |
| Total Dissolved Solids | | 74000 | 70500 | | mg/L | 4.9 | 20 | 06-JUL-12 |
| **WG1502720-2 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 100.5 | | % | | 85-115 | 06-JUL-12 |
| **WG1502720-1 MB** | | | | | | | | |
| Total Dissolved Solids | | | <10 | | mg/L | | 10 | 06-JUL-12 |
| **TS-VA** | **Seawater** | | | | | | | |
| **Batch R2394728** | | | | | | | | |
| **WG1502725-3 DUP** | | **L1169964-2** | | | | | | |
| Total Solids | | 75700 | 75900 | | mg/L | 0.3 | 25 | 06-JUL-12 |
| **WG1502725-2 LCS** | | | | | | | | |
| Total Solids | | | 99.0 | | % | | 85-115 | 06-JUL-12 |
| **WG1502725-1 MB** | | | | | | | | |
| Total Solids | | | <10 | | mg/L | | 10 | 06-JUL-12 |
| **TSS-C-VA** | **Seawater** | | | | | | | |
| **Batch R2394637** | | | | | | | | |
| **WG1502719-2 LCS** | | | | | | | | |
| Total Suspended Solids | | | 86.7 | | % | | 85-115 | 06-JUL-12 |
| **WG1502719-1 MB** | | | | | | | | |

# Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **TSS-C-VA** | **Seawater** | | | | | | | |
| **Batch R2394637** | | | | | | | | |
| **WG1502719-1 MB** | | | | | | | | |
| Total Suspended Solids | | | <2.0 | | mg/L | | 2 | 06-JUL-12 |

**Legend:**

| | |
|---|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

**Sample Parameter Qualifier Definitions:**

| Qualifier | Description |
|---|---|
| J | Duplicate results and limits are expressed in terms of absolute difference. |
| MB-LOR | Method Blank exceeds ALS DQO. LORs adjusted for samples with positive hits below 5 times blank level. Please contact ALS if re-analysis is required. |
| RPD-NA | Relative Percent Difference Not Available due to result(s) being less than detection limit. |

# Quality Control Report



**Hold Time Exceedances:**

| ALS Product Description | Sample ID | Sampling Date | Date Processed | Rec. HT | Actual HT | Units | Qualifier |
|---|---|---|---|---|---|---|---|
| **Physical Tests** | | | | | | | |
| Total Dissolved Solids by Gravimetric | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 06-JUL-12 09:14 | 7 | 11 | days | EHT |
| | 2 | 25-JUN-12 08:00 | 06-JUL-12 09:14 | 7 | 11 | days | EHT |
| Total Solids by Gravimetric | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 06-JUL-12 10:32 | 7 | 11 | days | EHT |
| | 2 | 25-JUN-12 08:00 | 06-JUL-12 10:32 | 7 | 11 | days | EHT |
| Total Suspended Solids by Gravimetric | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 06-JUL-12 09:49 | 7 | 11 | days | EHT |
| | 2 | 25-JUN-12 08:00 | 06-JUL-12 09:49 | 7 | 11 | days | EHT |
| pH by Manual Meter (seawater) | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 07-JUL-12 14:52 | 0.25 | 295 | hours | EHTR-FM |
| | 2 | 25-JUN-12 08:00 | 07-JUL-12 14:52 | 0.25 | 295 | hours | EHTR-FM |
| **Anions and Nutrients** | | | | | | | |
| Nitrate in Seawater by IC | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 07-JUL-12 09:14 | 3 | 12 | days | EHTR |
| | 2 | 25-JUN-12 08:00 | 07-JUL-12 09:14 | 3 | 12 | days | EHTR |
| Nitrite in Seawater by IC | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 07-JUL-12 09:14 | 3 | 12 | days | EHTR |
| | 2 | 25-JUN-12 08:00 | 07-JUL-12 09:14 | 3 | 12 | days | EHTR |
| Total P in Seawater by Colour | | | | | | | |
| | 1 | 25-JUN-12 08:00 | 05-JUL-12 11:38 | 3 | 10 | days | EHTR |
| | 2 | 25-JUN-12 08:00 | 05-JUL-12 11:38 | 3 | 10 | days | EHTR |

**Legend & Qualifier Definitions:**

| | |
|---|---|
| EHTR-FM: | Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended. |
| EHTR: | Exceeded ALS recommended hold time prior to sample receipt. |
| EHTL: | Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry. |
| EHT: | Exceeded ALS recommended hold time prior to analysis. |
| Rec. HT: | ALS recommended hold time (see units). |

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1169964 were received on 28-JUN-12 13:29.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

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The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**ALS Laboratory Group**
ANALYTICAL CHEMISTRY & TESTING SERVICES

**Environmental Division**

**Chain of Custody / Analytical Request Form**
**Canada Toll Free: 1 800 668 9878**
www.alsglobal.com

COC # 08-013785

Page 1 of 1

| Report to: | Report Format / Distribution | Service Requested: (rush - subject to availability) |
|---|---|---|
| Company: Golder Associates | Standard: X Other: | X Regular (Default) |
| Contact: Valerie Bertrand | Select: PDF X Excel Digital | Priority (2-3 Business Days) - 50% Surcharge |
| Address: 32 Steacie Drive, Kanata, Ontario, K2K-2A4 | Email 1: valerie_bertrand@golder.com | Emergency (1 Business Day) - 100% Surcharge |
| | Email 2: hugh_carter@golder.com | For Emergency < 1 Day, ASAP or Weekend - Contact ALS |
| Phone: 613-592-9600 Fax: 613-592-9601 | | |
| **Invoice To:** Same as Report ? (Yes) / No ? | **Client / Project Information:** | **Analysis Request** |
| Company: | Job #: 11-1428-0011 | ( Indicate Filtered or Preserved, F/P ) |
| Contact: | PO / AFE: | |
| Address: | Legal Site Description: Meliadine | |
| Phone: Fax: | Quote #: | |
| Lab Work Order # (lab use only) | ALS Contact: Judy Bethune (Amber Springer) Sampler: H. Musslick, JF, Aubin | |

| Sample # | Sample Identification (This description will appear on the report) | Date | Time | Sample Type | Total Metals including Hg, Se, As (P, $HNO_3$) | Dissolved Metals including Hg, Se, As (F, $HNO_3$) | Nutrients Ammonia (amberglass) ($H_2SO_4$) | Hardness, pH, TSS, TS, TDS, Conductivity | Alkalinity | Anions Including Cl, $NO_3$, F, $SO_4$ (Preserved) | VOC (P, Sodium Bisulfate) | Phosphorous | Hold (6x40 mL Vials HCl Preservative Only) | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Port-5-1 | June 25, 2012 | 800-1800 | Saline water | X | X | X | X | X | X | X | X | X | |
| 2 | Port-5-2 | June 25, 2012 | 800-1800 | Saline water | X | X | X | X | X | X | X | X | X | |

L1169964-COFC

**Special Instructions / Regulations / Hazardous Details**

- please use lowest detection limits possible
* water is saline

- bottles were filled from 08:00 – 18:00 on June 25, 2012
Please see individual bottles for time. Very low flow sampling.

**Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.**

**By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.**

| SHIPMENT RELEASE (client use) | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|
| Released by: | Date & Time: | Received by: | Date: | Time: | Temperature: | Verified by: | Date & Time: | Observations: Yes / No ? If Yes attach SIF |
| Hanna Musslick | June 26, 2012 07:00 | | | | -1 to 4°C | | | |

# Appendix B-3 - Interval 2, 3 and 4

## July 17, 2012 Sampling Event – Lab Report No. L1188345

AGNICO-EAGLE MINES LTD.
ATTN: David Frenette
Western Canada Exploration
# 400 - 543 Granville Street
Vancouver V6C 1X8

Date Received: 02-AUG-12
Report Date: 06-SEP-12 16:10 (MT)
Version: FINAL REV. 2

Client Phone: --

# Certificate of Analysis

**Lab Work Order #: L1188345**
Project P.O. #: W10547
Job Reference:
C of C Numbers:
Legal Site Desc:

**Comments:** Note: Samples are suspected to be acid preserved although the bottle indicated them to be unpreserved. In addition, duplicate samples are put on hold until further instruction.
06-SEP-12: Full Metals are reported in this report.

Selam Worku
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1188345-1 | L1188345-2 | L1188345-3 | | |
|---|---|---|---|---|---|---|
| | Description | WATER | WATER | WATER | | |
| | Sampled Date | 27-JUL-12 | 27-JUL-12 | 28-JUL-12 | | |
| | Sampled Time | 10:00 | 11:00 | 10:00 | | |
| | Client ID | #2 | #3 | #4 | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 128000 | 103000 | 130000 | | |
| | Hardness (as CaCO3) (mg/L) | 25000 | 13100 | 50400 | | |
| | pH (pH) | 0.99 | 1.23 | 1.08 | | |
| | Total Suspended Solids (mg/L) | 11700 | 1670 | 7400 | | |
| | Total Dissolved Solids (mg/L) | 75100 | 61800 | 95000 | | |
| | Total Solids (mg/L) | 97700 | 65400 | 108000 | | |
| **Anions and Nutrients** | Alkalinity, Total (as CaCO3) (mg/L) | <2.0 | <2.0 | <2.0 | | |
| | Ammonia, Total (as N) (mg/L) | 1.65 | 3.57 | 1.23 | | |
| | Chloride (Cl) (mg/L) | 35600 DLM | 33000 DLM | 49500 DLM | | |
| | Fluoride (F) (mg/L) | <2.0 | <2.0 DLM | <2.0 DLM | | |
| | Nitrate (as N) (mg/L) | 0.63 | <0.50 DLM | <0.50 DLM | | |
| | Nitrite (as N) (mg/L) | 0.11 | <0.10 DLM | <0.10 DLM | | |
| | Phosphorus (P)-Total (mg/L) | 0.023 | 0.037 | <0.020 | | |
| | Sulfate (SO4) (mg/L) | 1700 | 6060 | 5500 | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | <0.30 | <0.30 | <0.60 | | |
| | Antimony (Sb)-Total (mg/L) | <0.010 | <0.010 | <0.020 | | |
| | Arsenic (As)-Total (mg/L) | 0.034 | <0.010 DLA | <0.020 DLA | | |
| | Barium (Ba)-Total (mg/L) | 1.06 | 0.168 | 0.696 | | |
| | Beryllium (Be)-Total (mg/L) | <0.010 | <0.010 | <0.020 | | |
| | Bismuth (Bi)-Total (mg/L) | <0.050 | <0.050 | <0.10 | | |
| | Boron (B)-Total (mg/L) | 8.2 | 5.2 | 11.9 | | |
| | Cadmium (Cd)-Total (mg/L) | <0.0010 | <0.0010 | <0.0020 | | |
| | Calcium (Ca)-Total (mg/L) | 8310 | 2110 | 21700 | | |
| | Chromium (Cr)-Total (mg/L) | <0.010 | <0.010 | <0.020 | | |
| | Cobalt (Co)-Total (mg/L) | <0.010 | <0.010 | <0.020 | | |
| | Copper (Cu)-Total (mg/L) | <0.050 | <0.050 | <0.10 | | |
| | Iron (Fe)-Total (mg/L) | <1.0 | 4.0 | <2.0 | | |
| | Lead (Pb)-Total (mg/L) | <0.0050 | <0.0050 | <0.010 | | |
| | Lithium (Li)-Total (mg/L) | 16.1 | 5.68 | 23.1 | | |
| | Magnesium (Mg)-Total (mg/L) | 558 | 1860 | 163 | | |
| | Manganese (Mn)-Total (mg/L) | 0.214 | 0.695 | 0.158 | | |
| | Mercury (Hg)-Total (mg/L) | <0.000050 | <0.000050 | <0.000050 | | |
| | Molybdenum (Mo)-Total (mg/L) | 0.0159 | 0.0054 | 0.073 | | |
| | Nickel (Ni)-Total (mg/L) | <0.050 | <0.050 | <0.10 | | |
| | Phosphorus (P)-Total (mg/L) | <30 | <30 | <60 | | |
| | Potassium (K)-Total (mg/L) | 605 | 271 | 1000 | | |
| | Selenium (Se)-Total (mg/L) | <0.010 DLA | <0.010 DLA | <0.020 DLA | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID | L1188345-1 | L1188345-2 | L1188345-3 | | |
|---|---|---|---|---|---|
| Description | WATER | WATER | WATER | | |
| Sampled Date | 27-JUL-12 | 27-JUL-12 | 28-JUL-12 | | |
| Sampled Time | 10:00 | 11:00 | 10:00 | | |
| Client ID | #2 | #3 | #4 | | |
| **Grouping** / **Analyte** | | | | | |
| **WATER** | | | | | |
| **Total Metals** Silicon (Si)-Total (mg/L) | <5.0 | <5.0 | <10 | | |
| Silver (Ag)-Total (mg/L) | <0.0010 | <0.0010 | <0.0020 | | |
| Sodium (Na)-Total (mg/L) | 4770 | 14200 | 2050 | | |
| Strontium (Sr)-Total (mg/L) | 259 | 91.1 | 443 | | |
| Thallium (Tl)-Total (mg/L) | 0.0041 | 0.0019 | 0.0028 | | |
| Tin (Sn)-Total (mg/L) | <0.010 | <0.010 | <0.020 | | |
| Titanium (Ti)-Total (mg/L) | <1.0 | <1.0 | <2.0 | | |
| Uranium (U)-Total (mg/L) | <0.0010 | 0.0011 | <0.0020 | | |
| Vanadium (V)-Total (mg/L) | <0.10 | <0.10 | <0.20 | | |
| Zinc (Zn)-Total (mg/L) | 4.48 | 1.47 | 1.19 | | |
| **Dissolved Metals** Dissolved Metals Filtration Location | LAB | LAB | LAB | | |
| Aluminum (Al)-Dissolved (mg/L) | <0.10 | <0.10 | <0.20 | | |
| Antimony (Sb)-Dissolved (mg/L) | <0.010 | <0.010 | <0.020 | | |
| Arsenic (As)-Dissolved (mg/L) | 0.026 | <0.010 DLA | <0.020 DLA | | |
| Barium (Ba)-Dissolved (mg/L) | 1.05 | 0.171 | 0.683 | | |
| Beryllium (Be)-Dissolved (mg/L) | <0.010 | <0.010 | <0.020 | | |
| Bismuth (Bi)-Dissolved (mg/L) | <0.050 | <0.050 | <0.10 | | |
| Boron (B)-Dissolved (mg/L) | 9.6 | 5.3 | 11.5 | | |
| Cadmium (Cd)-Dissolved (mg/L) | <0.0010 | <0.0010 | <0.0020 | | |
| Calcium (Ca)-Dissolved (mg/L) | 9090 | 2030 | 19900 | | |
| Chromium (Cr)-Dissolved (mg/L) | <0.010 | <0.010 | <0.020 | | |
| Cobalt (Co)-Dissolved (mg/L) | <0.010 | <0.010 | <0.020 | | |
| Copper (Cu)-Dissolved (mg/L) | 0.022 | 0.026 | <0.040 | | |
| Iron (Fe)-Dissolved (mg/L) | <1.0 | 4.5 | <2.0 | | |
| Lead (Pb)-Dissolved (mg/L) | <0.0050 | <0.0050 | <0.010 | | |
| Lithium (Li)-Dissolved (mg/L) | 17.7 | 5.82 | 22.4 | | |
| Magnesium (Mg)-Dissolved (mg/L) | 550 | 1950 | 155 | | |
| Manganese (Mn)-Dissolved (mg/L) | 0.205 | 0.717 | 0.160 | | |
| Mercury (Hg)-Dissolved (mg/L) | <0.000050 | <0.000050 | <0.000050 | | |
| Molybdenum (Mo)-Dissolved (mg/L) | 0.0171 | 0.0057 | 0.070 | | |
| Nickel (Ni)-Dissolved (mg/L) | <0.050 | <0.050 | <0.10 | | |
| Phosphorus (P)-Dissolved (mg/L) | <30 | <30 | <60 | | |
| Potassium (K)-Dissolved (mg/L) | 603 | 285 | 966 | | |
| Selenium (Se)-Dissolved (mg/L) | <0.010 DLA | <0.010 DLA | <0.020 DLA | | |
| Silicon (Si)-Dissolved (mg/L) | <5.0 | <5.0 | <10 | | |
| Silver (Ag)-Dissolved (mg/L) | <0.0010 | <0.0010 | <0.0020 | | |
| Sodium (Na)-Dissolved (mg/L) | 4700 | 14700 | 1970 | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1188345-1 | L1188345-2 | L1188345-3 | | |
|---|---|---|---|---|---|---|
| | Description | WATER | WATER | WATER | | |
| | Sampled Date | 27-JUL-12 | 27-JUL-12 | 28-JUL-12 | | |
| | Sampled Time | 10:00 | 11:00 | 10:00 | | |
| | Client ID | #2 | #3 | #4 | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Dissolved Metals** | Strontium (Sr)-Dissolved (mg/L) | 288 | 90.1 | 429 | | |
| | Thallium (Tl)-Dissolved (mg/L) | 0.0047 | 0.0019 | 0.0028 | | |
| | Tin (Sn)-Dissolved (mg/L) | <0.010 | <0.010 | <0.020 | | |
| | Titanium (Ti)-Dissolved (mg/L) | <1.0 | <1.0 | <2.0 | | |
| | Uranium (U)-Dissolved (mg/L) | <0.0010 | 0.0011 | <0.0020 | | |
| | Vanadium (V)-Dissolved (mg/L) | <0.10 | <0.10 | <0.20 | | |
| | Zinc (Zn)-Dissolved (mg/L) | 4.53 | 1.48 | 1.14 | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# Reference Information

**QC Samples with Qualifiers & Comments:**

| QC Type Description | Parameter | Qualifier | Applies to Sample Number(s) |
|---|---|---|---|
| Duplicate | Cadmium (Cd)-Dissolved | DLM | L1188345-1, -2, -3 |
| Matrix Spike | Fluoride (F) | MS-B | L1188345-1, -2, -3 |
| Matrix Spike | Calcium (Ca)-Dissolved | MS-B | L1188345-1, -2, -3 |
| Matrix Spike | Magnesium (Mg)-Dissolved | MS-B | L1188345-1, -2, -3 |
| Matrix Spike | Sodium (Na)-Dissolved | MS-B | L1188345-1, -2, -3 |
| Matrix Spike | Strontium (Sr)-Dissolved | MS-B | L1188345-1, -2, -3 |

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLA | Detection Limit Adjusted For required dilution |
| DLM | Detection Limit Adjusted For Sample Matrix Effects |
| MS-B | Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. |

**Test Method References:**

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **ALK-COL-VA** | Water | Alkalinity by Colourimetric (Automated) | EPA 310.2 |

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

**ANIONS-CL-IC-VA** Water Chloride by Ion Chromatography APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

**ANIONS-F-IC-VA** Water Fluoride by Ion Chromatography APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

**ANIONS-NO2-IC-VA** Water Nitrite in Water by Ion Chromatography EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

**ANIONS-NO3-IC-VA** Water Nitrate in Water by Ion Chromatography EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

**ANIONS-SO4-IC-VA** Water Sulfate by Ion Chromatography APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

**EC-PCT-VA** Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

**HARDNESS-CALC-VA** Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

**HG-DIS-CVAFS-VA** Water Dissolved Mercury in Water by CVAFS EPA SW-846 3005A & EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

**HG-TOT-CVAFS-VA** Water Total Mercury in Water by CVAFS EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

**MET-D-CCMS-VA** Water Dissolved Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

**MET-T-CCMS-VA** Water Total Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

# Reference Information

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

| | | | |
|---|---|---|---|
| **NH3-F-VA** | Water | Ammonia in Water by Fluorescence | J. ENVIRON. MONIT., 2005, 7, 37-42, RSC |

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

| | | | |
|---|---|---|---|
| **P-T-COL-VA** | Water | Total P in Water by Colour | APHA 4500-P Phosphorous |

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

| | | | |
|---|---|---|---|
| **PH-PCT-VA** | Water | pH by Meter (Automated) | APHA 4500-H "pH Value" |

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

| | | | |
|---|---|---|---|
| **PH-PCT-VA** | Water | pH by Meter (Automated) | APHA 4500-H pH Value |

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

| | | | |
|---|---|---|---|
| **SE-D-CCMS-VA** | Water | Dissolved Selenium in Water by CRC ICPMS | APHA 3030 B&E / EPA SW-846 6020A |

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

| | | | |
|---|---|---|---|
| **SE-T-CCMS-VA** | Water | Total Selenium in Water by CRC ICPMS | APHA 3030 B&E / EPA SW-846 6020A |

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

| | | | |
|---|---|---|---|
| **TDS-VA** | Water | Total Dissolved Solids by Gravimetric | APHA 2540 C - GRAVIMETRIC |

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

| | | | |
|---|---|---|---|
| **TS-VA** | Water | Total Solids by Gravimetric | APHA 2540 B - GRAVIMETRIC |

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Solids (TS) are determined by evaporating a sample to dryness at 104 degrees celsius.

| | | | |
|---|---|---|---|
| **TSS-VA** | Water | Total Suspended Solids by Gravimetric | APHA 2540 D - GRAVIMETRIC |

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA |

**Chain of Custody Numbers:**

# Reference Information

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg - milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L - milligrams per litre.*
*< - Less than.*
*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

*L11883 45-COFC*

ALS Environmental

**Custody / Analytical Request Form**
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

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| Report To | | | Report Format / Distribution | | | | Service Requested (Rush for routine analysis subject to availability) |
|---|---|---|---|---|---|---|---|
| Company: | Agnico-Eagle | | ☑ Standard | ☐ Other | | | ◉ Regular (Standard Turnaround Times - Business Days) |
| Contact: | David Frenette / Philip Roy / Alexandre Gauthier | | ☑ PDF | ☐ Excel | ☐ Digital | ☐ Fax | ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT |
| Address: | Meliadine Gold Project, M+T Expediting | | Email 1: | philip.roy@agnico-eagle.com | | | ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT |
| | Rankin Inlet X0C 0G0 | | Email 2: | david.frenette@agnico-eagle.com | | | ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT |
| Phone: | | Fax: | Email 3: | alexandre.gauthier@agnico-eagle.com | | | Analysis Request |
| Invoice To | Same as Report ? | ☑ Yes ☐ No | Client / Project Information | | | | |
| Hardcopy of Invoice with Report? | | ☐ Yes ☐ No | Job #: | | | | |
| Company: | | | PO / AFE: | W 10547 | | | |
| Contact: | | | LSD: | | | | |
| Address: | | | | | | | |
| Phone: | | Fax: | Quote #: | Q 28906 | | | |
| Lab Work Order # (lab use only) | | L1188345 | ALS Contact: | Judy Dalmaijer | Sampler: | KONO / Micheal | |

| Sample # | Sample Identification (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | X Hardness X pH X conductivity, X tSS | X TDS X TS, X Alakalinity X Anions * | X Dissolved metals ( Hg, Se, As) | X Total metals (HG, Se, As) | X Nutrients | X Ammonia as N | Nb of containers or bottles | Field pH | Field Temperature (Celcius) | Field Conductivity (mV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #2 | 27-Jul-12 | 10:00 | water | X | X | X | X | X | X | 4 | | | |
| | #3 | 27-Jul-12 | 11:00 | water | X | X | X | X | X | X | | | | |
| | #4 | 28-Jul-12 | 10:00 | water | X | X | X | X | X | X | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

**Short Holding Time**

*Rush Processing*

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

* Anions ( Cl , F, NO, NO3, SO4, Phosphorus)

**Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.**
**By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.**
**Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.**

| SHIPMENT RELEASE (client use) | | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Released by: | Date (dd-mmm-yy) | Time (hh-mm) | Received by: | Date: | Time: | Temperature: | Verified by: | Date: | Time: | Observations: Yes / No ? If Yes add SIF |
| Philip Roy | 29-Jul-12 | 20:43 | Brittany | Aug. 2/12 | 8:40 | 17.4 °C | | | | |

GENF 18.01 Front

# APPENDIX C
## Additional Meliadine Water Quality Results

# Appendix C
## Groundwater Analytical Results From Intervals Not Fully Developed
## Westbay Well M11-1257
## Meliadine Gold Project
## Agnico-Eagle Mines

| Parameter | Unit | I4-1 | I4-2 | #4 | I3-1 | I3-2 | #3 | I2-1 | I2-2 | #2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 24/10/11 | 24/10/11 | 28/07/12 | 24/10/11 | 24/10/11 | 27/07/12 | 23/10/11 | 23/10/11 | 27/07/12 |
| **Depth of Interval** | mbgs | 530.4-518.7 | | | 585.1-573.7 | | | 613.3-602.1 | | |
| **Dye Concentration** | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | 449 | | | 486 | | | 505 | | |
| Average Dye Concentration for General Samples | ppb | 449 | 398 | - | 486 | 431 | - | 473 | 467 | - |
| Average Dye Concentration for Dissovled Metals Samples | ppb | 411 | 398 | - | 466 | 466 | - | 403 | 403 | - |
| Average Dye Concentration | ppb | Not Applicable | | | Not Applicable | | | Not Applicable | | |
| **General Chemistry** | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 83 | 84 | <2.0 | 76 | 74 | <2.0 | 52 | 66 | <2.0 |
| Chloride | mg/l | 53 000 | 53 000 | 49 500 | 51 000 | 51 000 | 33 000 | 40 000 | 43 000 | 35 600 |
| Conductivity (lab) | uS/cm | 104 000 | 103 000 | 130 000 | 102 000 | 103 000 | 103 000 | 64 600 | 74 500 | 128 000 |
| Fluoride | mg/l | <0.1 | <0.1 | <2.0 | <0.1 | <0.1 | | <0.1 | <0.1 | <2.0 |
| Nitrate as N | mg/l | <0.1 | <0.1 | <0.50 | <0.1 | <0.1 | <0.10 | <0.1 | <0.1 | 0.63 |
| Nitrate + Nitrite | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.50 | <0.1 | <0.1 | - |
| Nitrite as N | mg/l | <0.1 | <0.1 | <0.10 | <0.1 | <0.1 | 0.037 | <0.1 | <0.1 | 0.11 |
| pH (lab) | mg/l | 8.58 | 8.64 | 1.08 | 8.3 | 8.55 | 1.23 | 7.86 | 8.33 | 0.99 |
| Sulphate | mg/l | 26 | 47 | 5500 | 16 | 16 | 6060 | 15 | 15 | 1700 |
| Total Dissolved Solids | mg/l | 77 000 | 80 600 | 95 000 | 91 800 | 72 300 | 61800 | 105 000 | 113 000 | 75 100 |
| Total Suspended Solids | mg/l | 440 | 270 | 7400 | 280 | 300 | 1670 | 290 | 350 | 11700 |
| Total Ammonia-N | mg/l | 2.4 | 2.1 | 1.23 | 2.2 | 2.2 | 3.57 | 0.7 | 1.6 | 1.65 |
| Total Phosphorus | mg/l | <0.4 | <0.4 | <0.020 | <0.4 | <0.4 | 0.037 | 7.3 | 0.4 | 0.023 |
| **Metals** | | | | | | | | | | |
| Total Aluminum (Al) | mg/l | <0.5 | 0.7 | <0.60 | 0.6 | 0.7 | <0.30 | 0.8 | 0.7 | <0.30 |
| Total Antimony (Sb) | mg/l | <0.05 | <0.05 | <0.020 | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.010 |
| Total Arsenic (As) | mg/l | <0.1 | <0.1 | <0.020 | <0.1 | <0.1 | <0.010 | <0.1 | <0.1 | 0.034 |
| Total Barium (Ba) | mg/l | 0.8 | 0.7 | 0.696 | 0.6 | 0.6 | 0.168 | 0.6 | 0.6 | 1.06 |
| Total Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.020 | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.010 |
| Total Bismuth (Bi) | mg/l | 0.1 | <0.1 | <0.10 | <0.1 | <0.1 | <0.050 | <0.1 | <0.1 | <0.050 |
| Total Boron (B) | mg/l | 13 | 16 | 11.9 | 14 | 13 | 5.2 | 11 | 12 | 8.2 |
| Total Cadmium (Cd) | mg/l | <0.01 | <0.01 | <0.0020 | <0.01 | <0.01 | <0.0010 | <0.01 | <0.01 | <0.0010 |
| Total Calcium (Ca) | mg/l | 27 000 | 28 000 | 21 700 | 30 000 | 28 000 | 2 110 | 25 000 | 24 000 | 8 310 |
| Total Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.020 | <0.5 | <0.5 | <0.010 | <0.5 | <0.5 | <0.010 |
| Total Cobalt (Co) | mg/l | <0.05 | <0.05 | <0.020 | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.010 |
| Total Copper (Cu) | mg/l | <0.1 | <0.1 | <0.10 | <0.1 | <0.1 | <0.050 | <0.1 | <0.1 | <0.050 |
| Total Iron (Fe) | mg/l | <10 | 11 | <2.0 | 11 | 10 | 4 | 16 | 12 | <1.0 |
| Total Lead (Pb) | mg/l | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.0050 | <0.05 | <0.05 | <0.0050 |
| Total Lithium (Li) | mg/l | 26 | 28 | 23.1 | 28 | 26 | 5.68 | 23 | 23 | 16.1 |
| Total Magnesium (Mg) | mg/l | 27 | 57 | 163 | 8 | 8 | 1860 | 8 | 8 | 558 |
| Total Manganese (Mn) | mg/l | <0.2 | <0.2 | 0.158 | <0.2 | <0.2 | 0.695 | <0.2 | <0.2 | 0.214 |
| Total Mercury (Hg) | mg/l | - | - | <0.000050 | - | - | <0.000050 | - | - | <0.000050 |
| Total Molybdenum (Mo) | mg/l | 0.09 | 0.09 | 0.073 | <0.05 | <0.05 | 0.0054 | <0.05 | <0.05 | 0.0159 |
| Total Nickel (Ni) | mg/l | <0.1 | <0.1 | <0.10 | <0.1 | <0.1 | <0.050 | <0.1 | <0.1 | <0.050 |
| Total Phosphorus (P) | mg/l | - | - | <60 | - | - | <30 | - | - | <30 |
| Total Potassium (K) | mg/l | 1 100 | 1 100 | 1000 | 1 200 | 1 100 | 271 | 1 000 | 970 | 605 |
| Total Selenium (Se) | mg/l | <0.2 | <0.2 | <0.020 | <0.2 | <0.2 | <0.010 | <0.2 | <0.2 | <0.010 |
| Total Silicon (Si) | mg/l | <5 | <5 | <10 | <5 | <5 | <5.0 | <5 | <5 | <5.0 |
| Total Silver (Ag) | mg/l | <0.01 | <0.01 | <0.0020 | <0.01 | <0.01 | <0.0010 | <0.01 | <0.01 | <0.0010 |
| Total Sodium (Na) | mg/l | 880 | 1100 | 2050 | 800 | 770 | 14200 | 670 | 660 | 4770 |
| Total Strontium (Sr) | mg/l | 510 | 550 | 443 | 560 | 530 | 91.1 | 460 | 450 | 259 |
| Total Tellurium (Te) | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | - |
| Total Thallium (Tl) | mg/l | 0.013 | 0.01 | 0.0028 | 0.009 | 0.009 | 0.0019 | 0.012 | 0.011 | 0.0041 |
| Total Tin (Sn) | mg/l | <0.1 | <0.1 | <0.020 | <0.1 | <0.1 | <0.010 | <0.1 | <0.1 | <0.010 |
| Total Titanium (Ti) | mg/l | <0.5 | <0.5 | <2.0 | <0.5 | <0.5 | <1.0 | <0.5 | <0.5 | <1.0 |
| Total Tungsten (W) | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | - |
| Total Uranium (U) | mg/l | <0.01 | <0.01 | <0.0020 | <0.01 | <0.01 | 0.0011 | <0.01 | <0.01 | <0.0010 |
| Total Vanadium (V) | mg/l | <0.05 | <0.05 | <0.20 | <0.05 | <0.05 | <0.10 | <0.05 | <0.05 | <0.10 |
| Total Zinc (Zn) | mg/l | <0.5 | <0.5 | 1.19 | 0.7 | <0.5 | 1.47 | 1.3 | 0.7 | 4.48 |
| Total Zirconium (Zr) | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | - |
| Dissolved Mercury (Hg) | mg/l | <0.0001 | <0.0001 | <0.000050 | <0.0001 | <0.0001 | <0.000050 | <0.0001 | <0.0001 | <0.000050 |
| Dissolved Aluminum (Al) | mg/l | <0.5 | <0.5 | <0.20 | <0.5 | <0.5 | <0.10 | <0.5 | <0.5 | <0.10 |
| Dissolved Antimony (Sb) | mg/l | 0.06 | <0.05 | <0.020 | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.010 |
| Dissolved Arsenic (As) | mg/l | <0.1 | <0.1 | <0.020 | <0.1 | <0.1 | <0.010 | <0.1 | <0.1 | 0.026 |
| Dissolved Barium (Ba) | mg/l | 0.8 | 0.7 | 0.683 | 0.6 | 0.6 | 0.171 | 0.6 | 0.5 | 1.05 |
| Dissolved Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.020 | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.010 |
| Dissolved Bismuth (Bi) | mg/l | <0.1 | <0.1 | <0.10 | <0.1 | <0.1 | <0.050 | <0.1 | <0.1 | <0.050 |
| Dissolved Boron (B) | mg/l | 14 | 16 | 11.5 | 13 | 13 | 5.3 | 11 | 11 | 9.6 |
| Dissolved Cadmium (Cd) | mg/l | <0.01 | <0.01 | <0.0020 | <0.01 | <0.01 | <0.0010 | <0.01 | <0.01 | <0.0010 |
| Dissolved Calcium (Ca) | mg/l | 28000 | 29000 | 19900 | 29000 | 28000 | 2030 | 26 000 | 24 000 | 9090 |
| Dissolved Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.020 | <0.5 | <0.5 | <0.010 | <0.5 | <0.5 | <0.010 |
| Dissolved Cobalt (Co) | mg/l | <0.05 | <0.05 | <0.020 | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.010 |
| Dissolved Copper (Cu) | mg/l | <0.1 | <0.1 | <0.040 | <0.1 | <0.1 | 0.026 | <0.1 | <0.1 | 0.022 |
| Dissolved Iron (Fe) | mg/l | <10 | <10 | <2.0 | <10 | <10 | 4.5 | <10 | <10 | <1.0 |
| Dissolved Lead (Pb) | mg/l | <0.05 | <0.05 | <0.010 | <0.05 | <0.05 | <0.0050 | <0.05 | <0.05 | <0.0050 |
| Dissolved Lithium (Li) | mg/l | 26 | 29 | 22.4 | 27 | 27 | 5.82 | 22 | 22 | 17.7 |
| Dissolved Magnesium (Mg) | mg/l | 30 | 38 | 155 | 8 | 8 | 1950 | 8 | 8 | 550 |
| Dissolved Manganese (Mn) | mg/l | <0.2 | <0.2 | 0.16 | <0.2 | <0.2 | 0.717 | <0.2 | <0.2 | 0.205 |
| Dissolved Molybdenum (Mo) | mg/l | 0.13 | 0.09 | 0.07 | <0.05 | <0.05 | 0.0057 | <0.05 | <0.05 | 0.0171 |
| Dissolved Nickel (Ni) | mg/l | <0.3 | <0.1 | <0.10 | <0.1 | <0.1 | <0.050 | <0.1 | <0.1 | <0.050 |
| Dissolved Phosphorus (P) | mg/l | <10 | <10 | <60 | <10 | <10 | <30 | <10 | <10 | <30 |
| Dissolved Potassium (K) | mg/l | 1 100 | 1 200 | 966 | 1 100 | 1 100 | 285 | 1000 | 970 | 603 |
| Dissolved Selenium (Se) | mg/l | <0.02 | <0.2 | <0.020 | <0.2 | <0.2 | <0.010 | <0.2 | <0.2 | <0.010 |
| Dissolved Silicon (Si) | mg/l | <5 | <5 | <10 | <5 | <5 | <5.0 | <5 | <5 | <5.0 |
| Dissolved Silver (Ag) | mg/l | <0.01 | <0.01 | <0.0020 | <0.01 | <0.01 | <0.0010 | <0.01 | <0.01 | <0.0010 |
| Dissolved Sodium (Na) | mg/l | 940 | 990 | 1970 | 730 | 750 | 14700 | 690 | 640 | 4700 |
| Dissolved Strontium (Sr) | mg/l | 540 | 520 | 429 | 490 | 490 | 90.1 | 450 | 420 | 288 |
| Dissolved Tellurium (Te) | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | - |
| Dissolved Thallium (Tl) | mg/l | 0.012 | 0.008 | 0.0028 | 0.01 | 0.009 | 0.0019 | 0.012 | 0.012 | <0.010 |
| Dissolved Tin (Sn) | mg/l | <0.1 | <0.1 | <0.020 | <0.1 | <0.1 | <0.010 | <0.1 | <0.1 | <1.0 |
| Dissolved Titanium (Ti) | mg/l | <0.5 | <0.5 | <2.0 | <0.5 | <0.5 | <1.0 | <0.5 | <0.5 | - |
| Dissolved Tungsten (W) | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | - |
| Dissolved Uranium (U) | mg/l | <0.01 | <0.01 | <0.0020 | <0.01 | <0.01 | 0.0011 | <0.01 | <0.01 | <0.0010 |
| Dissolved Vanadium (V) | mg/l | <0.05 | 0.09 | <0.20 | 0.08 | 0.08 | <0.10 | <0.05 | 0.06 | <0.10 |
| Dissolved Zinc (Zn) | mg/l | <0.5 | <0.5 | 1.14 | <0.5 | <0.5 | 1.48 | <0.5 | <0.5 | 4.53 |
| Dissolved Zirconium (Zr) | mg/l | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | - |

Notes: nm - not measured; grey - 2012 groundwater quality results are considered unreliable, possibly related to incorrect use of preservatives (eg. pH and sulfate measurement indicators)

# APPENDIX D
## Isotope Results

**Methodology**

0.2mL of water (0.6mL for saline) is pipetted into an Exetainer. The same 0.2mL of water can be used to determine both O and D. If the samples are suspected of contamination by dissolved H2S then copper metal chips are added, for organics contamination activated carbonn is added a few day before the analysis.

Oxygen of water: samples and internal standards are flushed with a gas mixture of 2% CO2 in helium off-line. Exetainers are left to equilibrate at either 25.0C or simply room temperature for 18 hours minimum; 5 days or longer for saline samples .

Deuterium of water: samples and internal standards have Hokko beads added to the Exetainer vials before being flushed with a gas mixture of 2% H2 in helium off-line. Exetainers are left to equilibrate at 25.0C for 1.5 hours minimum.

Reference: equilibration method from Thermo Finnigan Application Flash report 30 and 32. See also chapter 5 of operating manual of GasBench II Revison A 111 8342 from Thermo Finnigan. For a good review on Stable Isotope analysis of water please see Handbook of Stable isotope Analytical Techniques, Vol 1, P.A. deGroot editor, Elsevier, 2004, Chapter 1 p 1-37.

**Accuracy and precision**

Our internal standards are (18/16O , Deuterium respectively): W-7 (-25,55, -198,5); W-9 (-5,06, 11,27); W-10 (-11,84, -85,88). They cover the natural range (and some…). The data is reported in Delta notation $\delta$, the units are per mil (‰) and defined as $\delta$ = ((Rx-Rstd))/Rstd)*1000 where R is the ratio of the abundance of the heavy to the light isotope, x denotes sample and std is an abbreviation for standard. All $\delta^{18}O$ and $\delta D$ is reported as ‰ vs. VSMOW and normalized to internal standards calibrated to International standards VSMOW (0.0), GISP(-24.8. -189.5) and SLAP (-55.5. -428.0).

Precision is evaluated by including in every sequence a water excluded from the calibration described above. The values of this water, W-20, are used for long term monitoring and statistical purposes. W-20 is reported to the user as averaged measured values, n and the standard deviation of the sequence. Typically a sequence holds 65 samples, 4 sets of internal standards (W-7,9,10) and 4 blind standards (W-20) and the standard deviation of W-20 is less than 0,15 for oxygen and 2,0 for Deuterium.

**Instrumentation**

The analysis are performed on an Isotope Ratio Mass Spectrometer (irms) Delta Plus XP (Thermo, Germany) interfaced with a GasBench II.

University of Ottawa, Faculty of Science (Earth Sciences)
G.G. Hatch Isotope Laboratories, 130 Louis Pasteur
Ottawa, Ontario, Canada K1N 6N5
Attn: P. Middlestead or W. Abdi

**Completed:**
**Cost:**
**QCD = quality control duplicate (No charge)**

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| Country: | K2K 2A9 |
| Email: | Canada |
| Telephone: | 613-592-9600 |
| Fax: | 613-592-9601 |
| Samples (& their containers) v | 0 |

| | |
|---|---|
| Submission Date: | 17 October 2011 |
| Project Title: | wt-od - Meliadine Groundwater |
| Isotope Ratios Req: | Oxygen 18 and Deuterium |
| Numeric Media Code: | 1 |
| Optional Project Comment: | Additional bottles of 'Lake B5', 'Lake B6' and 'Port 5-55 Dye' suppiled for tritium analysis at Waterloo as per communication with I. Clark and V. Bertrand - please forward to U of W and email V. Bertrand |

0.2mL of water (0.6mL for saline) is pipetted into an Exetainer. The same 0.2mL of water can be used to determine both O and D.

Oxygen of water: samples and internal standards are flushed with a gas mixture of 2% CO2 in helium off-line. Exetainers are left to equilibrate at either 25.0C or simply room temperature for 18 hours minimum; 5 days or longer for saline samples . Analytical precision is +/-0.15permil. Application Flash Report G 30

Deuterium of water: samples and internal standards have Hokko beads added to the Exetainer vials before being flushed with a gas mixture of 2% H2 in helium off-line. Exetainers are left to equilibrate at 25.0C for 1.5 hours minimum. Analytical precision is +/-2.0permil. Application Flash Report G 32

Analysis is done using the Gasbench + DeltaPlus XP isotope ratio mass spectrometer (ThermoFinnigan, Germany).

| OurLabID | Sample ID | Delta 2H (VSMOW) | Delta 2H Comment | Delta 18O (VSMOW) | Delta 18O Comment | Comment | Hatch Lab ID |
|---|---|---|---|---|---|---|---|
| W-18625 | Port 5 - 55 Dye | -71.7 | 0 | -10.28 | 0 | 0 | B1112-174-001 |
| W-18626 | Lake B5 | -103.5 | 0 | -12.69 | 0 | 0 | B1112-174-002 |
| W-18627 | Lake B6 | -103.0 | 0 | -12.38 | 0 | 0 | B1112-174-003 |
| W-18628 | Brine | | | | | CANCELLED | B1112-174-004 |
| W-18629 | Brine+Dye | 0.0 | 0 | 0.00 | 0 | To be run after hypersaline testing. | B1112-174-005 |
| W-18630 | I5-1 | -67.9 | 0 | -10.08 | 0 | 0 | B1112-174-006 |
| **W-18631** | **I5-1 QCD** | **-73.0** | **0** | **-10.06** | **0** | **0** | **B1112-174-007** |

Blind Standard: W-20

delta 18O = -7.29, n=5, st.dev.=0.04 Expected value to date: -7.29
delta 2H = -57.6, n=3, st.dev.=1.3 Expected value to date: -58.0

University of Ottawa, Faculty of Science (Earth Sciences)
G.G. Hatch Isotope Laboratories, 130 Louis Pasteur
Ottawa, Ontario, Canada K1N 6N5
Attn: P. Middlestead or W. Abdi

**Completed: Oct 4th, 2012**
**Cost: 8 samples X 45$ = 360$**
**QCD = quality control duplicate (No charge)**
one free duplicate

NB: See "Method" tab below for method details.

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| Telephone: | 1 (604) 296 2838 |
| Fax: | 1 (604) 298 5253 |

Samples (& their containers) will not be returned; plan accordingly.

| | |
|---|---|
| Submission Date: | 28 August 2012 |
| Project Title: | wt-od-sal - Seabridge Gold Courageous Lake |
| Isotope Ratios Req: | Oxygen 18 and Deuterium |
| Numeric Media Code: | 1 |
| Optional Project Comment: | valerie_bertrand@golder.com<br>dale_holtze@golder.com<br>0 |

| OurLabID | Sample ID | Delta 2H (VSMOW) | Delta 2H Comment | Delta 18O (VSMOW) | Delta 18O Comment | Comment | Hatch Lab ID |
|---|---|---|---|---|---|---|---|
| W-19788 | WB2-3-2A | -165.6 | 0 | -20.36 | 0 | Brine: see attached data, alkalinity 58.1 mg/L | B1213-151-001 |
| W-19789 | WB2-3-2C | -164.4 | 0 | -20.34 | 0 | Brine: see attached data, alkalinity 63.4 mg/L | B1213-151-002 |
| W-19790 | MC-1A | -123.1 | 0 | -16.28 | 0 | Surface water, alkalinity 12.3 mg/L | B1213-151-003 |
| W-19791 | MC-1B | -140.6 | 0 | -16.31 | 0 | Surface water, alkalinity 11.8 mg/L | B1213-151-004 |
| W-19792 | WB2-3-3B | -169.0 | 0 | -21.04 | 0 | Brine: see attached data, alkalinity 60.3 mg/L | B1213-151-005 |
| W-19793 | WB2-3-3C | -167.8 | 0 | -21.14 | 0 | Brine: see attached data, alkalinity 60.6 mg/L | B1213-151-006 |
| W-19794 | WB2-2-1A | -165.7 | 0 | -20.75 | 0 | Brine: data not yet available from analytical lab | B1213-151-007 |
| W-19795 | WB2-2-1B | -166.0 | 0 | -20.78 | 0 | Brine: data not yet available from analytical lab | B1213-151-008 |
| W-19796 | WB2-2-1B QCD | -163.4 | 0 | -20.76 | 0 | 0 | B1213-151-009 |

Blind Standard: W-20

delta 18O = -7,23 , n= 3, st.dev.=0,05 Expected value to date: -7.29
delta 2H = -57,29 , n= 3 , st.dev.= 5,2 Expected value to date: -58.0

| Parameter | Unit | Molecular Weight (g/mol) | Groundwater Chemistry | | |
|---|---|---|---|---|---|
| | | | PORT-2A-1 | Moles | Molality |
| | | | 6/19/2012 | mol | (mol/kg) |
| Dissolved Calcium (Ca) | mg/l | 40.08 | 23,300 | 0.581 | 0.583 |
| Dissolved Magnesium (Mg) | mg/l | 24.31 | 9.6 | 0.0004 | 0.0004 |
| Dissolved Potassium (K) | mg/l | 39.1 | 910 | 0.023 | 0.023 |
| Dissolved Sodium (Na) | mg/l | 22.99 | 660 | 0.029 | 0.029 |

| | | | Port 2A-1 QCD |
|---|---|---|---|
| Delta 18O x 1000 | | -12.24 | *-12.25* |
| Delta 2H x 1000 | | -100.03 | *-101.31* |
| Corrected Delta 18O x 1000 | | **-11.97** | *-11.98* |
| Corrected Delta 2H x 1000 | | **-96.77** | *-98.05* |
| Density of water at 25oC | 0.997 kg/L | | |
| Mass = density * volume | 0.997 kg | | |

# APPENDIX 7.2-B

## Hydrogeological Modelling

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

| Parameters | Molecular Weight (g/mol) | Unit | Groundwater Chemistry | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Port 5-1 | Port 5-2 | Average | Moles | Molality | I5-1 | Moles | Molality | PORT-5-1 | Moles | Molality |
| | | | 6-Oct-11 | | 6-Oct-11 | Mol | mol/kg | 10/13/11 | mol | mol/kg | 6/25/12 | mol | mol/kg |
| Dissolved Calcium (Ca) | 40.08 | mg/l | 4,000 | 3,900 | 3950 | 0.0998 | 0.1001 | 2,900 | 0.0724 | 0.0726 | 3,090 | 0.0771 | 0.0773 |
| Dissolved Magnesium (Mg) | 24.31 | mg/l | 2,000 | 2,000 | 2000 | 0.08227 | 0.08251 | 2,000 | 0.0823 | 0.0825 | 2,090 | 0.0860 | 0.0862 |
| Dissolved Potassium (K) | 39.1 | mg/l | 420 | 420 | 420 | 0.01074 | 0.01077 | 370 | 0.0095 | 0.0095 | 395 | 0.0101 | 0.0101 |
| Dissolved Sodium (Na) | 22.99 | mg/l | 14,400 | 14,500 | 14450 | 0.62636 | 0.62821 | 15,000 | 0.6525 | 0.6544 | 15,600 | 0.6786 | 0.6806 |
| | | | | | | | | | Port I5-1 QCD | | | | |
| Delta 18O x 1000 | | | | | *-10.28* | | | *-10.08* | *-10.06* | | *-10.06* | | |
| Delta 2H x 1000 | | | | | *-71.68* | | | *-67.88* | *-72.96* | | *-79.32* | | |
| Corrected Delta 18O x 1000 (Sofer & Gat, 1972) | | | | | **-10.14** | | | **-9.96** | **-9.94** | | **-9.93** | | |
| Corrected Delta 2H x 1000 (Sofer & Gat, 1975) | | | | | ***-70.47*** | | | ***-66.81*** | ***-71.90*** | | ***-78.21*** | | |
| | | | | | | RPD | | | RPD | | | RPD | |
| Delta 18O Difference | | | | | 0.14 | -1.327 | | 0.12 | -1.23 | | 0.13 | -1.29 | |
| Delta 2H Difference | | | | | 1.21 | -1.709 | | 1.07 | -1.59 | | 1.11 | -1.41 | |

Density of water at 25oC 0.997048 kg/L
Mass = density * volume 0.997048 kg
RPD = relative percent difference

# Executive Summary

Agnico Eagle Mines Limited (AEM) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit owned land. A numerical hydrogeological model was developed to assess the groundwater regime before and during mining and after mine closure in the vicinity of the planned Tiriganiaq Underground Mine and the Project open pits. The objective of the model simulations was to predict groundwater inflow quantity and quality (total dissolved solids only) to the underground mine and open pits at the Project.

The Project is located in an area of continuous permafrost with an estimated depth of permafrost of approximately 350 m. In areas of continuous permafrost there are generally two groundwater flow regimes; a deep groundwater flow regime beneath the base of the permafrost and a shallow flow regime located in an active (seasonally thawed) layer near ground surface. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Permafrost reduces the hydraulic conductivity of the rock by several orders of magnitude. The shallow groundwater flow regime, therefore, has little to no hydraulic connection with the groundwater regime located below the permafrost.

Taliks (unfrozen ground surrounded by permafrost) exist beneath lakes which have sufficient depth such that they do not freeze to the bottom over the winter. Taliks beneath larger lakes can extend down to the deep groundwater regime (open taliks). The elevations of these lakes provide the driving force for deep groundwater flow. The presence of thick permafrost beneath land masses results in negligible recharge to the deep groundwater flow regime from these areas. Generally, deep groundwater will flow from higher-elevation lakes with open taliks to lower-elevation lakes with open taliks. To a lesser degree, groundwater beneath the permafrost is influenced by density differences due to the upward diffusion of deep seated brines (density-driven flow).

The numerical hydrogeological model was used to estimate the current groundwater flow directions and hydraulic gradients. The Project is located in the area of a groundwater flow divide with groundwater in the area of the planned Tiriganiaq mine discharging predominantly to Meliadine Lake East, and to a lesser extent to Meliadine Lake West. Currently, the only lakes with open taliks in the Project area are B7, D7 and Meliadine Lake. Existing groundwater inflow to Meliadine Lake from groundwater originating from the Project area is estimated to be 7 $m^3$/day and the outflow from B7 and D7 are estimated to be 3 $m^3$/day and 1 $m^3$/day, respectively.

All of the open pits are planned to be excavated within the permafrost only; open pits do not extend into the deep groundwater regime. Therefore, groundwater inflow to these open pits will be negligible except where the pits intersect closed taliks located below lakes. Estimated inflows from these taliks are relatively small (less than 300 $m^3$/day) and the water will be low in Total Dissolved solids (TDS). The deeper portion of the Tiriganiaq deposit will be mined from underground workings that will extend below permafrost; therefore, groundwater from the deep groundwater regime will be induced to flow into the underground mine.

In the Canadian Shield in which the project is located, concentrations of TDS in groundwater increase with depth, primarily in response to upward diffusion of deep-seated brines. The chemicals that contribute to TDS in shield brines are typically chloride and calcium, with sodium to a lesser degree. By comparison, sea water is mostly composed of chloride and sodium. A TDS depth profile was developed for the Project based on water samples collected from a borehole and Westbay Installation. In this profile the TDS of the groundwater at 350 m depth (at the bottom of the frozen permafrost) is about 30,000 mg/L and this increases to a TDS of the groundwater of about 61,000 mg/L at the bottom of the proposed underground mine at a depth of 770 m.

The numerical model developed for the Tiriganiaq underground mine estimates that the groundwater inflow to the mine, once it is below the frozen portion of the permafrost, will range from approximately 420 $m^3$/day to 640 $m^3$/day. The average predicted TDS concentration of the groundwater inflow is estimated to range from 56,000 mg/L to 59,000 mg/L. Sensitivity analyses were conducted to assess the effects of decreasing and increasing the hydraulic conductivity of a fault zone and the effects of increasing and decreasing the TDS concentration profile.

At the end of mining, and before the underground mine is flooded, the numerical hydrogeological model estimates that the inflow to Meliadine Lake from the Project area will be 3 $m^3$/day. Outflow from Meliadine Lake as a result of the changes in flow direction due to the underground mine is estimated to be 37 $m^3$/day, and the outflow from Lake B7 and D7 is estimated to be 35 $m^3$/day and 11 $m^3$/day, respectively.

Following closure of the mine, near to pre-mining groundwater flow directions and gradients will be re-established once the open pits and underground are flooded. Groundwater originating from the underground mine is estimated to take from 500 to 1000 years to travel back up to Meliadine Lake and the discharge rate of this groundwater is estimated to be approximately 3 $m^3$/day. These travel times do not take into account density-driven transport of a solutes located within the groundwater; therefore, they are conservatively low (i.e., the actual travel times of a solute will be longer).

# Study Limitations

This report has been prepared for the exclusive use of Agnico Eagle Mines Limited or its agents. The factual information, descriptions, interpretations, comments, conclusion and recommendations contained herein are specific to the project described in this report and do not apply to any other project or site. Under no circumstances may this information be used for any other purposes than those specified in the scope of work unless explicitly stipulated in the text of this report or formally authorized by Golder. This report must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. As well, the final version of this report and its content supersedes any other text, opinion or preliminary version produced by Golder.

Plans, specifications, calculations, notes, electronic files and similar material used to construct the groundwater model and complete the simulations herein are instruments of service, not products. Golder shall not be held responsible for damages resulting from unpredictable or unknown underground conditions, from erroneous information provided by and/or obtained from sources other than Golder, and from ulterior changes in the site conditions unless Golder has been notified of any occurrence, activity, information or discovery, past or future, susceptible of modifying the underground conditions described herein, and have had the opportunity of revising its interpretations, comments and recommendations. Furthermore, Golder shall not be held responsible for damages resulting from any use of this report and its content by a third party, and/or for its use for other purposes than those intended.

Hydrogeological investigations and groundwater modelling are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that subsurface conditions are not known between the specific investigation locations, and there is invariably a lack of complete information both spatially and temporally about the geological and hydrogeological conditions. A groundwater model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeological system. While the model itself obviously lacks the detailed reality of the existing hydrogeological system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations, the site hydrogeology, and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of reality and the model described in this report is not an exception.

The professional groundwater modelling services performed as described in this report were conducted in a manner consistent with the level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the quantity and quality of available data, the time limits and financial and physical constraints applicable to the services. Unless otherwise specified, the results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognised and accepted professional rules and practices, and therefore deemed valid. This model provides a predictive scientific tool to evaluate the impacts on a real groundwater system of specified hydrological stresses and/or to compare various scenarios in a decision-making process. However, and despite the professional care taken during the construction of the model and in conducting the simulations, its accuracy is bound to the normal uncertainty associated to groundwater modelling and no warranty, express or implied, is made.

# Abbreviation and Acronym List

| | |
|---|---|
| AEM | Agnico Eagle Mines Limited |
| bgs | Below Ground Surface |
| DEM | Digital Elevation Model |
| DFR | Driving Force Ratio |
| FRZ | Fractured Rock Zone |
| Golder | Golder Associates Ltd. |
| LSA | Local Study Area |
| Project | Meliadine Gold Project |
| RSA | Regional Study Area |
| TDS | Total Dissolved Solids |

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# 1.0 INTRODUCTION

Agnico Eagle Mines Limited (AEM) is proposing to develop the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut (Figure 7.2-B1). Situated on the western shore of Hudson's Bay, the Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit-owned land.

This report presents the development and results of a numerical hydrogeological model to assess the groundwater regime before and during mining and after mine closure in the vicinity of the planned open pits and Tiriganiaq Underground Mine as part of the Project. The regional study area (RSA) and local study area (LSA) for groundwater are presented respectively on Figure 7.2-B2 and 7.2-B3. The objective of the model simulations was to predict groundwater inflow quantity and quality (Total dissolved solids (TDS) only) to the open pits and underground mine at the Project. This model was originally developed in 2010 and was updated in 2011 and 2012.

During mining, the underground development and mining will act as a sink for groundwater flow, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the permafrost, and to the open pits when the pits intersect unfrozen ground located within taliks beneath lakes. The average water quality of underground mine inflow will be a result of mixing of fresh groundwater from lakes in the Project area and saline groundwater (connate water) flowing up from deep bedrock.

# 2.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

A conceptual model is a pictorial representation of the groundwater regime that organizes and simplifies the site hydrogeology so that it can be readily modelled. The conceptual model must retain enough complexity so that the numerical model developed from the conceptual model adequately reproduces or simulates, to the degree required to meet project objectives, the actual groundwater flow behaviour. During the development of the conceptual model, the main hydrostratigraphic units are defined and characterized, and the dominant groundwater flow patterns are identified both prior to and during mine development. The conceptual model is then used as a basis for the construction of the numerical hydrogeological models at the site. The following presents a description of the permafrost depth, hydrostratigraphy and TDS concentrations in the groundwater. This is followed by a description of current groundwater conditions and those expected during mining.

## 2.1 Permafrost Depth

The shallow groundwater flow regime at the Project site has little or no hydraulic connection with the groundwater regime beneath permafrost. Permafrost is estimated to be about 450 m below ground surface (bgs) based on thermal data collected in the deep thermistors located near the Tiriganiaq and F Zone deposits. The freezing point of water decreases when pressure and salinity increase; as a consequence, unfrozen groundwater could be encountered at temperatures less than 0˚C, and in isolated pockets within the permafrost. Groundwater inflows to the underground mine are expected to be negligible until mining of the Tiriganiaq deposit extends below the portion of the permafrost that may contain unfrozen groundwater; at which time groundwater flows are expected to increase. The base of this portion of the permafrost is interpreted as an undulating

surface; therefore, this base may vary spatially within the overall mine workings. Shallower permafrost would result in groundwater inflows to the mine occurring at shallower depths and earlier times in the mine life.

At the Project, the portion of the permafrost where groundwater may be partially or wholly unfrozen due to the freezing point depression has been estimated to be at a depth of approximately 350 m (SD 6-1 Permafrost Baseline Report). This portion of the permafrost that may contain unfrozen groundwater due to freezing point depression is assumed to be entirely unfrozen and have a hydraulic conductivity equivalent to the unfrozen rock at that depth. In reality, isolated pockets of groundwater within this zone may be frozen, resulting in a decrease in the hydraulic conductivity of the rock compared to that of the entirely unfrozen rock. The degree of this reduction, however, is difficult to quantify; therefore, it is conservatively assumed that there is no reduction in hydraulic conductivity over this portion of the permafrost.

## 2.2 Hydrostratigraphy

The Project is located within the Archaean Rankin Inlet Greenstone Belt, within the Churchill Structural Province of the Canadian Shield. The Rankin Inlet Greenstone Belt consists of mafic volcanic rocks, felsic pyroclastic rocks, sedimentary rocks, and gabbro sills. The geology of the Tiriganiaq deposit of the Project consists of greywacke and argillite sediments (Sam Formation), Iron Formation and mixed Iron Formation, greywacke and siltstone (Upper Oxide Formation) in fault contact with underlying volcanic rocks (Wesmeg Formation). The stratigraphy of the F Zone area is dominated by mafic volcanic rocks and the east southeast striking Lower Lean Iron Formation. The stratigraphy of the Discovery area is dominated by a thick package of inter-bedded clastic sedimentary units, chemical sediments (oxide facies iron formations), and minor gabbroic dikes.

In general, hydraulic conductivity in bedrock can range in value over about 12 orders of magnitude with higher hydraulic conductivity related to sedimentary deposits derived from materials of larger grain size or from sedimentary or crystalline rocks with greater levels of fracturing due to weathering, cooling, isostatic stress relief, or tectonic forces (Domenico and Schwartz, 1998). The greywacke (sandstone) of the Sam and Upper Oxide formations could be expected to have higher hydraulic conductivity ($10^{-10}$ to $10^{-6}$ m/s, Domenico and Schwartz, 1998, Page 39) than the argillite (mudstone) of the Sam Formation or the siltstone of the Upper Oxide Formation ($10^{-13}$ to $10^{-8}$ m/s, Domenico and Schwartz, 1998, Page 39). However, these values will be highly site specific as sedimentary rocks may be fractured due to differences in stress conditions, geological structure, and weathering (Schwartz and Zhang, 2003). For mafic volcanic rocks, hydraulic conductivity is expected to be anisotropic, and heterogeneous with estimates of hydraulic conductivity generally varying from $10^{-11}$ to $10^{-7}$ m/s (Domenico and Schwartz, 1998, Page 39). For pyroclastic rocks, hydraulic conductivity is related to the degree of welding, and the development of cooling fractures with estimates of hydraulic conductivity between $10^{-11}$ and $10^{-7}$ m/s (Maidment, 1992).

The majority of hydraulic testing data collected to date has characterized the Sam Formation (6 tests in GT09-19, and M11-1257), with fewer tests intersecting the Upper Oxide (4 tests), Tiriganiaq (2 tests), and Wesmeg Formations (3 tests). The results of all hydraulic testing to date have yielded consistently low hydraulic conductivity values ranging from $5 \times 10^{-10}$ m/s to $7 \times 10^{-9}$ m/s (Table 7.2-B1). These values are at the low end of the ranges described above.

**Table 7.2-B1: Single Well Hydraulic Testing Results**

| Borehole | Test # | Transmissivity ($m^2/s$) | Hydraulic Conductivity (m/s) | Interval Top (m-bgs vertical) | Interval Bottom (m-bgs vertical) | Interval Midpoint (m-bgs vertical) | West Bay Interval | Geology |
|---|---|---|---|---|---|---|---|---|
| GT09-19 | 1 | $1 \times 10^{-7}$ | $3 \times 10^{-9}$ | 27 | 56 | 42 | - | Sam Formation |
| GT09-19 | 2 | $2 \times 10^{-7}$ | $2 \times 10^{-9}$ | 54 | 153 | 104 | - | Sam Formation |
| M11-1257 | 7 | $3 \times 10^{-8}$ | $2 \times 10^{-9}$ | 449 | 461 | 455 | Interval 5 | Sam Formation |
| M09-860 | 1 | $5 \times 10^{-7}$ | $3 \times 10^{-9}$ | 424 | 563 | 494 | - | Sam Formation, Upper Oxide Formation, Wesmeg Formation, Lower Fault |
| M11-1257 | 6 | $6 \times 10^{-8}$ | $5 \times 10^{-9}$ | 519 | 530 | 525 | Interval 4 | Sam Formation |
| M11-1257 | 1 | $7 \times 10^{-8}$ | $5 \times 10^{-10}$ | 459 | 601 | 530 | - | Sam Formation and Upper Oxide |
| M11-1257 | 5 | $8 \times 10^{-8}$ | $7 \times 10^{-9}$ | 574 | 585 | 580 | Interval 3 | Upper Oxide |
| M11-1257 | 3 | $2 \times 10^{-8}$ | $2 \times 10^{-9}$ | 602 | 613 | 608 | Interval 2 | Tiriganiaq |
| M11-1257 | 2 | $1 \times 10^{-7}$ | $3 \times 10^{-9}$ | 596 | 632 | 614 | - | Upper Oxide, Tiriganiaq, Wesmeg |
| M11-1257 | 4 | $1 \times 10^{-8}$ | $1 \times 10^{-9}$ | 615 | 623 | 619 | Interval 2A | Wesmeg |

At the Meadowbank Mine site, the results of hydraulic testing indicated that there was not a discernible difference in the hydraulic conductivity of the various rock types at the site with ultramafic volcanics at a given depth having similar hydraulic conductivity to intermediate volcanics at the same depth (Cumberland Ltd. (now AEM) 2005). This has also been the case at numerous other sites (Stober and Bucher 2007, Kuchling et al. 2000, DeBeers, 2010), where hydraulic conductivity has been found to be correlated to depth (decreasing hydraulic conductivity with increasing depth) or related to the locations of high permeability fractured zones (Stober and Bucher, 2007). However, fractured granite has been shown to have generally greater hydraulic conductivity than gneiss in the crystalline basement (Stober and Bucher, 2007). Figure 7.2-B4 presents the measured hydraulic conductivity with depth at the proposed Meliadine mine compared to other sites in the Canadian Shield together with the range in hydraulic conductivity for various rock types at the Project site as presented in the literature.

In the Canadian Shield, the uppermost zone of bedrock typically has higher hydraulic conductivity (on the order of $10^{-7}$ m/s [Kuchling et al., 2000, DeBeers 2010, Cumberland Resources Ltd. (now AEM), 2005]) as a result of the formation of stress relief joints due to isostatic rebound following glacial retreat. Consequently, the hydraulic conductivity of bedrock to 120 m depth at the Project site has been assumed to be one to two orders of magnitude greater than the values obtained from hydraulic testing. Further reduction in hydraulic

conductivity with depth is expected below the planned Tiriganiaq underground mine (Stober and Bucher, 2007); however, the hydraulic conductivity of competent bedrock has been assumed to remain constant with depth below 120 m depth to provide conservatively high estimates of groundwater inflow for this assessment.

In crystalline rocks, fault zones may act as groundwater flow conduits, barriers, or a combination of the two in different regions of the fault depending of the direction of groundwater flow and the fault zone architecture (Gleeson and Novakowski, 2009). As described previously, all fault zones in the vicinity of the proposed mine were conservatively assumed, for this assessment, to have enhanced hydraulic conductivity approximately 1.5 to 2.5 orders of magnitude greater than the surrounding rock. In addition, sensitivity analysis was performed for the most hydraulically significant fault zone (the Lower Fault Zone) in which the hydraulic conductivity of the Lower Fault Zone (for the most hydraulically significant fault zone) was increased by an additional factor of 10 to be approximately 3.5 orders of magnitude greater than the surrounding rock.

The Lower Fault Zone, which forms the fault contact between the Tiriganiaq and the Wesmeg formations, consists of a zone of graphitic, mineralized fault gouge (0.5 to 3 m in thickness) in the area of the planned Tiriganiaq underground mine. This zone intersects the underground mine (Figure 7.2-B5) and has been assumed to be associated with a fractured rock zone with a hydraulic conductivity of $1 \times 10^{-7}$ m/s, and width of 5 m. The fault passing through the north end of Lake B7, referred to as the North Fault, has also been assumed to have a hydraulic conductivity of $1 \times 10^{-7}$ m/s, and width of 5 m. The Pyke Fault, which is considered to be a larger regional feature, has been assumed to have a hydraulic conductivity of $5 \times 10^{-7}$ m/s and width of 10 m.

The hydraulic conductivities of all of the above fault zones have been assumed to be enhanced over the entire model domain. This assumption is conservative as in reality these zones are unlikely to be associated with enhanced hydraulic conductivity on the scale of several kilometres. The permeability and width of a fault zone can be heterogeneous along strike (Gleeson and Novakowski, 2009) potentially resulting potentially in zones of greater hydraulic conductivity along strike over short distances; however, the presence of zones of fractures infilled with fault gouge will act to decrease hydraulic connectivity along strike over large distances.

Data collected from the Giant Mine Site, Con Mine, and Meadowbank Mine, which are all Gold projects in the Canadian Shield, are described for reference and the range in measured fault transmissivities are presented in Figure 7.2-B6. At the Giant Mine Site, the available hydraulic testing data suggests that the conductivities of the West Bay and Townsite Faults are of the same magnitude or lower than the surrounding bedrock which has been assumed to be on the order of $1 \times 10^{-9}$ m/s below 100 depth (Steffan Robertson, and Kirsten (Canada) Inc, 2002, SRK Consulting, 2005).

At the Con Mine Site, four fault systems, the Angel, Negus, Pud, and West Bay are present. These faults have been found to act as conduits for groundwater flow. However, they are extremely heterogeneous and hydraulic testing results in the fault zones exhibit a wide range of hydraulic conductivities; therefore, the large scale hydraulic influence of these faults will be governed by an average of the high and low zones of hydraulic conductivity. Assuming a width of 1 m for each fault, the geometric means of hydraulic testing in each of these faults range from $1 \times 10^{-8}$ m/s to $1 \times 10^{-7}$ m/s (INTERA Consultants Ltd., 1997).

Two main faults, the Bay Zone Fault and Second Portage Fault are present at the Meadowbank Mine Site (Cumberland Ltd. (now AEM), 2005). Hydraulic testing in these faults suggests that the Bay Zone Fault has hydraulic conductivity similar to the surrounding rock while the Second Portage Fault is approximately 5 m wide

and has enhanced hydraulic conductivity of 5 x $10^{-6}$ m/s (approximately 2.5 orders of magnitude greater than the surrounding rock).

Based on these reference data, the assumed hydraulic conductivities of the fault zones at the Project are expected to result in conservatively high predictions of groundwater inflow and conservatively short predicted groundwater travel times from deep groundwater to surface water bodies.

Based on the above characterization of the groundwater regime, the conceptual model for the site consists of two hydrostratigraphic units comprised of competent rock, and fractured rock zones (FRZs) associated with sub-vertical faults. Relatively competent bedrock is assumed to comprise the majority of the rock domain, and the hydraulic conductivity of competent rock is assumed to decrease with depth. Areas of greater fracturing associated with fault zones are assumed to have greater hydraulic conductivity than the surrounding less disturbed rock mass.

## 2.3 Groundwater Quality

In the Canadian Shield, concentrations of Total Dissolved Solids (TDS) in groundwater increase with depth, primarily in response to upward diffusion of deep-seated brines. The chemicals that contribute to TDS in shield brines are typically chloride and calcium, with sodium to a lesser degree. By comparison, sea water is mostly composed of chloride and sodium. At Meliadine three water samples were collected as follows:

- Groundwater sample from about 100 m bgs with a TDS of about 4700 mg/L;
- Groundwater sample from about 450 m bgs with a TDS of about 60,900 mg/L; and
- Groundwater sample from about 600 m bgs with a TDS of about 61,000 mg/L.

These values are greater than has been observed at other sites in the Canadian Shield at corresponding depths (Frape and Fritz 1987; Blowes and Logsdon 1997). This difference, together with the relatively high proportion of sodium relative to calcium in the groundwater sample[1] likely indicates the presence of relict sea water in bedrock. It is known that this area was largely overlain by seawater during the last period of glaciation (Dyke et al. 2003). Occurrences of groundwater with relatively high proportion of sodium relative to calcium have been observed at other areas where land was submerged by oceans in the past (Séguin 1995).

Figure 7.2-B7 presents the TDS profile with depth from sites in the Canadian Shield and that of the Meliadine groundwater samples. The Frape and Fritz profile (1987) was developed based on chemical analyses of deep saline water collected by various investigators from several sites in the Canadian Shield. The Diavik profile is based on site-specific data from Diavik, supplemented by information from the Lupin Mine site located about 200 km north of Diavik (Blowes and Logsdon 1997). The Meadowbank profile (Golder 2004) was developed based on site specific data from the Meadowbank Mine site supplemented by the data sources discussed above (Frape and Fritz 1987; Blowes and Logsdon 1997). The Meadowbank profile is based on the highest TDS value observed in three field seasons at the site, and parallels the Diavik profile.

[1] Water chemistry data in Golder 2009

In the summer of 2013, the WestBay well ports were developed and sampled and the results, together with the three (3) sample identified above, are presented in Figure 7.2-B7. The TDS of the three groundwater samples collected in 2013 are as follows:

- Groundwater sample from about 455 m bgs with a TDS of about 54,290 mg/L;
- Groundwater sample from about 510 m bgs with a TDS of about 57,700 mg/L; and
- Groundwater sample from about 580 m bgs with a TDS of about 58,420 mg/L.

Figure 7.2-B7 presents a "Meliadine profile" based on the six samples discussed above. It is assumed that the TDS attributed to the sodium chloride of the recent incursion of seawater will decrease with depth down to the calcium chloride profile established for Meadowbank. It is expected that key salinity parameters at the Project site, namely chloride, sulphate calcium, magnesium, potassium, sodium and strontium, would vary with depth. All other parameters are expected to be relatively constant with depth.

## 2.4 Groundwater Flow – Pre-Mining

The conceptual hydrogeological model for pre-disturbance conditions is presented in Figure 7.2-B8. In areas of continuous permafrost there are generally two groundwater flow regimes; a deep groundwater flow regime beneath the base of the permafrost and a shallow flow regime located in an active (seasonally thawed) layer near ground surface. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Permafrost reduces the hydraulic conductivity of the rock by several orders of magnitude (McCauley et al. 2002; Burt and Williams 1976). The shallow groundwater flow regime, therefore, has little to no hydraulic connection with the groundwater regime located below the permafrost.

Taliks (unfrozen ground surrounded by permafrost) exist beneath lakes which have sufficient depth such that they do not freeze to the bottom over the winter. Taliks beneath larger lakes can extend down to the deep groundwater regime (open taliks). The elevations of these lakes provide the driving force for deep groundwater flow. The presence of thick permafrost beneath land masses results in negligible recharge to the deep groundwater flow regime from these areas. Consequently, recharge to the deep groundwater flow regime is predominantly limited to areas of taliks beneath large, surface water bodies. Generally, deep groundwater will flow from higher-elevation lakes to lower-elevation lakes. Essentially, these lakes are equivalent to large diameter monitoring wells with the permafrost bounding the sides of the taliks beneath the lakes equivalent to the pipe in a monitoring well. In Sykes et al (2009), it was concluded that, on a regional scale, in deep sparely fracture rock, large surface water features provide a better estimate of groundwater flow directions than widely spaced small diameter wells. To a lesser degree, groundwater beneath the permafrost is influenced by density differences due to the upward diffusion of deep seated brines (density-driven flow).

The Westbay multi-level monitoring system that was installed in borehole M11-1257 is situated between two lakes predicted to be connected to the deep groundwater flow regime through open taliks (Lake B7 and Lake D7). The multi-level sampling intervals in the Westbay system were installed beneath permafrost at vertical depths ranging from approximately 440 to 640 m below ground surface. Due to the inclination of this installation, these ports are located directly beneath Lake B5 which is a lake predicted to be underlain by a closed talik; therefore, this lake is not expected to be connected to the deep groundwater flow system.

Reliable groundwater pressures were recorded in four of the six multi-level sampling ports (Port 2, 3, 4, and 5) installed in M11-1257 in August 2011. The pressures measured in October of the same year in Ports 2, 3, 4, and 5 are presented as freshwater equivalent hydraulic head in Table 7.2-B2. Data for Port 2A are not presented as the pressure in this port was found to vary by approximately 55 m between measurements on October 13th and October 19th, 2011 and is thus not considered a reliable indication of hydraulic head in the formation.

The approximate direction of vertical groundwater flow can be estimated using the freshwater heads with a correction for the buoyancy effects, as outlined by Post et al. (2007). These calculations, as presented in Table 7.2-B2, show that the calculated direction of groundwater flow is highly dependent on the assumed TDS vs. depth profile. If the base case TDS profile indicated in Figure 7.2-B7 is assumed, the gradients for individual ports are variable, but the overall groundwater flow direction between the lake and the deep bedrock appears downward. The same is the case for the upper bound TDS profile, although the downward gradient is stronger than in the base case. For the low bound TDS profile, a weakly upward average gradient was calculated. There is no chemical or physical evidence of groundwater discharge, such as seeps, from the deep groundwater up into the surface water bodies. However, it is inferred from the elevation of water levels in lakes with open taliks that groundwater flow from Lake B7, a higher elevation lake (62 m), is towards Meliadine Lake (west), which is a lower elevation lake (51 m). Therefore, a general downward groundwater flow direction from high elevation lakes to low elevation lakes (with B7 being a high elevation lake), is supported by the measurements presented in Table 7.2-B2.

**Table 7.2-B2: Estimated Freshwater Heads, Flow Directions and Gradients**

| | | | | Low Bound | | Upper Bound | | Base Case | |
|---|---|---|---|---|---|---|---|---|---|
| Port | Vertical Depth (m)[a.] | Freshwater Head at Port (masl)[b.] | Freshwater Head at Lake B7 (masl)[c.] | Average Density (kg/m$^3$) | Gradient | Average Density (kg/m$^3$) | Gradient | Average Density (kg/m$^3$) | Gradient |
| 2 | 602.2 | 65.6 | 62 | 1010 | 0.0044 | 1031 | 0.0247 | 1023 | 0.0174 |
| 3 | 573.7 | 72.0 | 62 | 1009 | -0.0080 | 1027 | 0.0092 | 1022 | 0.0047 |
| 4 | 518.7 | 64.3 | 62 | 1008 | 0.0036 | 1021 | 0.0166 | 1020 | 0.0152 |
| 5 | 448.6 | 71.5 | 62 | 1006 | -0.0146 | 1015 | -0.0058 | 1015 | -0.0058 |
| **Average Gradient** | | | | | **-0.0036** | | **0.0112** | | **0.0079** |

Notes: Gradients calculated between each multi-level port and Lake B7.
A positive value indicates a downward gradient.

[a] Due to borehole deviation the actual depth could be +/- 1 m from the tabulated value

[b] The accuracy of the freshwater head is not known due to potential incomplete equilibration of each port with the surrounding formation after drilling and installation.

[c] Seasonal variation in lake level of Lake B7 has been measured to be up to 0.6 m.

masl = metres above mean sea level.

When the size of a lake is above a critical value, the talik beneath the lake will be an open talik, which connects to the deep groundwater flow regime beneath the permafrost (SD 6-1 Permafrost Baseline Report). Beneath smaller lakes, which do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow system will form (closed talik).

Results of thermal modeling (SD 6-1 Permafrost Baseline Report) indicate that elongate lakes with terraces (where lake depth is within the range of winter ice thickness), and a central pool(s) (where lake depth is greater

than the range of winter ice thickness) having a width of 340 m to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Project site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that near the Tiriganiaq deposit, only Meliadine Lake, Lake B7 and Lake D7 will have open taliks connected to the deep groundwater flow regime. A conceptual model of the pre-mining flow regime is presented in Figure 7.2-B8.

## 2.5 Groundwater Flow – During Mining

The conceptual hydrogeological model for groundwater flow conditions near the proposed Tiriganiaq underground during mining is presented in Figure 7.2-B9. The proposed Tiriganiaq Underground Mine is planned to extend to approximately 770 m bgs based on information provided by AEM. The base of the permafrost in this area may be as shallow as 350 m bgs based on thermal data and the estimated magnitude of freezing point depression; therefore, approximately 420 m of the mine may be in the unfrozen sub-permafrost. As shown in the conceptual model of Figure 7.2-B9, the excavations will act as a sink for groundwater flow, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the permafrost.

None of the open pits intersect the deep groundwater regime below the permafrost or through open taliks below large lakes. The Discovery Deposit is excavated entirely within permafrost using open pit mining methods and groundwater inflows are expected to be negligible. Portions of the Pump, Wesmeg, F Zone and Tiriganiaq open pits intersect dewatered lakes that have unfrozen groundwater within closed taliks. Groundwater will flow from these taliks into the open pits.

## 2.6 Groundwater Flow – Closure

The conceptual hydrogeological model for groundwater flow conditions during closure is presented in Figure 7.2-B10. All the open pits except for the Tiriganiaq pit will be filled with freshwater.

At closure, brine from the treatment process will be pumped back into the planned underground mine. In addition, saline water will continue to flow into the underground mine through the bedrock located both below the unfrozen portions of the permafrost (the cryopeg) and bedrock beneath the permafrost zone itself. Both of these sources of water will flow (density driven) down to the deep part of the mine and flood voids in backfilled and open development areas and stopes. The brine is estimated to fill approximately one-sixth of the mine below the top of the cryopeg. The water level in the underground will continue to gradually rise due to natural saline groundwater inflow. The rate of natural saline groundwater inflow will become less as the water level in the former mine openings rises. It is estimated that if the flooding of the underground mine by natural groundwater was to occur with no freshwater inputs, then it would take about 3 years to flood the underground workings to the top of the cryopeg, and over 4 years to fill from the top of the cryopeg to the final pit lake level (i.e., a total of approximately 7 years in the absence of additional freshwater inputs). .

Freshwater from Meliadine Lake will also be pumped into the underground mine at closure so that flooding of the mine will occur more rapidly and to provide a freshwater cap to the saline water. In the initial stages of flooding with freshwater, natural saline groundwater will continue to flow into the underground mine. However, as the water level in the mine rises, the pumped freshwater volumes will be much greater than the natural inflow. A

lower density freshwater layer will form on top of the high TDS water. Hydro-dynamic modelling has predicted that a 150 m cap of freshwater would be sufficient to keep concentrations in the Tiriganiaq Pit Lake below 300 mg/L (Appendix B of 7.4-B). It is expected that the freshwater cap would be thicker than 150 m.

Although some of the open pits at closure will become lakes with open taliks to the deep groundwater flow regime, near to pre-mining hydraulic gradients and groundwater flow directions will be re-established once the open pits and underground are flooded during mine closure.

# 3.0 NUMERICAL HYDROGEOLOGICAL MODEL

A numerical hydrogeologic model was constructed to estimate the quantity and quality of inflows to the proposed Tiriganiaq Underground Mine and to evaluate the hydrogeologic conditions prior to mining. In addition, analytical models were developed to estimate localised groundwater inflow from closed taliks (not connected to the deep groundwater regime) intersected by open pit walls.

## 3.1 Model Selection

The numerical model for the area near the proposed Tiriganiaq Underground Mine was constructed using FEFLOW, a finite element modelling package developed by the WASY Institute in Germany (Diersch 2008). FEFLOW is capable of simulating transient groundwater flow, solute and heat transport in a three-dimensional heterogeneous and anisotropic porous media under a variety of hydrogeologic boundaries and stresses. This, combined with FEFLOW's capability to incorporate complex hydrostratigraphy, boundary conditions and discrete high permeability structures, resulted in the selection of this modelling code for the analysis.

Table 7.2-B3 provides an overall summary of the assumptions and limitations of the modelling, including those associated with the FEFLOW code (Version 6.0).

**Table 7.2-B3: Model Assumptions and Limitations**

| |
|---|
| Groundwater flow in the bedrock was simulated as an "equivalent porous media". Flow in bedrock is assumed to be laminar and steady, and governed by Darcy's Law. Discrete features of enhanced permeability can be simulated by two-dimensional elements. |
| Horizontal and vertical mesh discretization of approximately 30 m was considered to provide sufficient spatial resolution for simulation of groundwater flow and transport near the underground mine. |
| Initial values of model input parameters were based on the results of permeability testing and, where testing results were not available, on typical values published in the literature. |
| Surface water bodies (lakes) were simulated using specified head boundaries. It was assumed that the permeability of sediments that may line the beds of these water bodies was similar to the underlying geologic strata. Thus, no restriction of flow between the surface water and individual hydrostratigraphic units was simulated |
| Groundwater flow deeper than approximately 1.5 km below ground surface was assumed to be negligible, and to have negligible influence on model predictions. |

Additional assumptions made on model hydrogeological parameters are provided in Table 7.2-B4.

## 3.2 Model Extent and Finite Element Mesh

The extent of the numerical model was based on the understanding of groundwater flow conditions near the proposed mine, with model lateral boundaries set sufficiently far from the proposed mine to allow adequate representation of pre-development conditions and potential seepage pathways during operation. The extent of the model and the finite element mesh are presented in Figures 7.2-B11 and 7.2-B12.

Horizontally, the model was centered on the Tiriganiaq Deposit and extended approximately 18 km in the east-west direction and 17 km in the north-south direction. The planar area of the model domain was approximately 165 $km^2$. In the north and west, the model follows Meliadine Lake and an inferred equipotential line along the south western boundary. In the east, the model domain extends to the Meliadine Lake and two lakes located to the northeast inferred to have open taliks. Between these two lakes, the model follows an inferred equipotential line.

The mesh consists of about one million triangular elements with a uniform node spacing of about 30 m in the area of the mine, where strong hydraulic gradients are expected to develop during operation. Elements were expanded to a size of about 1 km along the model perimeter. Overall, the mesh spacing is considered of appropriate detail for simulation of hydrogeologic conditions at the site.

Vertically, the model domain is discretized into 25 layers. The top of Layer 1 was assigned the ground surface elevation, based on the Digital Elevation Model (DEM). Ground surface ranged from about 90 m at the southeast extent to about 50 m near Meliadine Lake. The top of Layer 13 of the model corresponds to the assumed base of the permafrost at a depth of 350 m bgs. The bottom of Layer 25 was set to a constant elevation of -1,435 m, which is approximately 700 m below the ultimate depth of the planned underground mine.

## 3.3 Hydrostratigraphy and Model Parameters

The locations of regional faults near the Project area are presented in Figure 7.2-B8, based on information provided by AEM. Based on their locations, three faults were considered to be of possible hydrogeologic significance for the Tiriganiaq underground mine and are included in the conceptual model for the Project site. They are the Lower Fault Zone, the Pyke Fault Zone, and a fault trending east-west, which is roughly parallel to the Lower Fault Zone in the Project area and passes through the north end of Lake B7 to the north of the Tiriganiaq Deposit. Major faulting in the area tends to be inclined at relatively steep angles, on the order of 60 to 70 degrees, and dipping to the north or slightly northeast. Faulting is typically parallel to sub-parallel to the trend of the mineralized deposits.

Results of on-site hydraulic testing indicate that the competent rock, at all depths, is generally of low hydraulic conductivity on the order of 3 x $10^{-9}$ m/s. Based on these test results, combined with experience at the Meadowbank Mine (Golder 2004), which is similar in many respects to the Project, and reductions in hydraulic conductivity with depth observed at other sites in the Canadian Shield and presented in Figure 7.2-B4 (Stevenson et al. 1996 a, b; Ophori et al. 1996; Ophori and Chan 1994; Bieber et al. 2006; Stober and Bucher 2007), the hydraulic conductivity profile below the base of the permafrost or within taliks, presented in Table 7.2-B4, was assumed for the competent rock.

Tests conducted over intervals that included the Lower Fault Zone found that permeability was the same as that of the relatively massive rock; however, the hydraulic conductivity of this fault zone is conservatively assumed to be 1 x $10^{-7}$ m/s with a width of 5 metres. No hydraulic testing data are available for the Pyke Fault Zone or the

fault north of the Lower Fault zone that passes through the north end of Lake B7. For the fault passing through the north end of Lake B7 (hereafter referred to as the North Fault), a hydraulic conductivity of $1 \times 10^{-7}$ m/s and a width of 5 m were assumed. Based on structural geology information, the Pyke Fault is considered to be a large feature of regional significance with a higher hydraulic conductivity and width than the other two faults: therefore, a hydraulic conductivity of $5 \times 10^{-7}$ m/s (five times greater than assumed for the North Fault Zone), and a width of 10 m were assumed for this feature.

Figure 7.2-B13 illustrates the hydrostratigraphy incorporated in the hydrogeologic model and Table 7.2-B4 presents values of hydrogeologic parameters. Where uncertainty exists, conservative assumptions, as shown in Table 7.2-B3 and 7.2-B5, have been made on these parameters and others that will result in conservative predictions of groundwater quality (including travel times and saline upwelling) and quantity of inflow to the underground mine. Values of hydrogeologic parameters were obtained from in-situ testing where available. Where in-situ values were not available, typical values published in the literature were used.

**Table 7.2-B4: Model Parameters**

| Unit | Depth Interval (m) | Hydraulic Conductivity (m/s)[1)] | Specific Storage (1/m)[2)] | Effective Porosity (-)[3)] |
|---|---|---|---|---|
| Competent Rock | 0 – 60 | $3 \times 10^{-7}$ | $1 \times 10^{-6}$ | 0.001 |
| Competent Rock | 60 – 120 | $3 \times 10^{-8}$ | $1 \times 10^{-6}$ | 0.001 |
| Competent Rock | 120 – 1500 | $3 \times 10^{-9}$ | $1 \times 10^{-6}$ | 0.001 |
| FRZ Associated with the Lower Fault | 0 – 1500 | $1 \times 10^{-7}$ | $1 \times 10^{-6}$ | 0.001 |
| FRZ Associated with the North Fault | 0 – 1500 | $1 \times 10^{-7}$ | $1 \times 10^{-6}$ | 0.001 |
| FRZ Associated with Pyke Fault | 0 – 1500 | $5 \times 10^{-7}$ | $1 \times 10^{-6}$ | 0.001 |

Notes:
1) Estimated from in-situ testing and experience from other similar sites.
2) Maidment (1992)
3) Stober and Bucher (2007)
FRZ = fractured rock zone

Permafrost is assumed to be virtually impermeable; therefore, the permafrost present beneath the ground surface between lakes with open taliks was assigned hydraulic conductivity and storage values approximately four and three orders of magnitude lower, respectively, than the surrounding unfrozen rock.

**Table 7.2-B5: Conservative Hydrogeological Assumptions in Numerical Hydrogeological Model**

| Parameter | Lower Bound | Upper Bound | Value Assumed in FEIS (Volume 7, Appendix 7.2-B) | Comment |
|---|---|---|---|---|
| Porosity[1] | 0.001 | 0.023 | 0.001 | Conservative (shorter travel times and greater saline upwelling) |
| Specific storage[2] | $1 \times 10^{-7}$ 1/m | $1 \times 10^{-5}$ 1/m | $1 \times 10^{-5}$ 1/m | Conservative (greater release of water from storage in bedrock and greater calculated groundwater inflow quantity). |
| Hydraulic conductivity of shallow bedrock | $3 \times 10^{-9}$ m/s | $3 \times 10^{-7}$ m/s | $3 \times 10^{-7}$ m/s (0 to 60 m depth); and $3 \times 10^{-8}$ m/s (60 to 120 m depth) | Conservative: Two measurements of hydraulic conductivity were taken at shallow depth at Meliadine: $3 \times 10^{-9}$ m/s and $2 \times 10^{-9}$ m/s at depths of 41 m below ground surface and 104 m below ground surface, respectively. Higher hydraulic conductivities used in model results in greater underground mine inflow quantity and shorter travel times. |
| Hydraulic conductivity between the basal cryopeg and base of permafrost | $1 \times 10^{-12}$ m/s | $3 \times 10^{-9}$ m/s | $3 \times 10^{-9}$ m/s | Conservative (permafrost between basal cryopeg and the zero degree isotherm, between 350 m and 450 m depth, is assumed to have a hydraulic conductivity equivalent to unfrozen rock results in higher predicted inflow quantity). |
| Hydraulic conductivity beneath underground mine | $1 \times 10^{-13}$ m/s | $3 \times 10^{-9}$ m/s | $3 \times 10^{-9}$ m/s | Conservative: Hydraulic conductivity beneath the underground mine is assumed to remain constant to bottom of model domain (i.e., there is no reduction in hydraulic conductivity with depth). This will result in the promotion of higher saline water up into the underground mine. |
| Density effects | | | Freshwater (1000 kg/m$^3$) | Conservative (shorter travel times and more upwelling than if density effects were considered). |

Notes:

1. Maidment, David R. 1992. Handbook of Hydrology. McGraw-Hill, New York.
2. Stober, I and Bucher, K. 2007. Hydraulic Properties of the Crystalline Basement. Hydrogeology Journal. 15:213-224.

## 3.4 Model Boundaries

### 3.4.1 Flow Boundaries

Two types of boundary conditions were used in the groundwater model:

- specified head; and
- no-flow.

These boundary conditions are illustrated on Figure 7.2-B14 and summarized below.

Specified head boundaries were assigned to the top of Layer 1 of the model to represent all lakes assumed to have open taliks connected to the deep groundwater flow regime. Each of these boundaries was set to the average lake elevation derived from site topographic data. Specified head boundaries were also assigned

beneath permafrost along the northeast and southwest boundaries of the model along inferred equipotentials. Specified head boundaries were also used to represent the dewatered underground mine beneath permafrost.

No-flow boundaries were used to represent inferred groundwater flow divides and flow lines along the south-eastern model boundary, and along the north-western model boundary in layers 15 to 25 beneath Meliadine Lake. These boundaries are located sufficiently far from the mine to have only a negligible impact on model predictions. A no-flow boundary was also assigned along the bottom of the model at elevation of about 1,440 m. Flow at greater depths is expected to be negligible, and therefore to have negligible impact on model predictions.

### 3.4.2 Transport Boundaries and Initial Conditions

Initial TDS concentrations in each model layer were assigned based on the assumed concentrations of TDS versus depth shown in Figure 7.2-B7.

Three types of boundaries were used to simulate transport of TDS in groundwater:

- specified concentration boundaries;
- specified flux boundaries; and
- exit (Cauchy type) boundaries.

The locations of these boundaries are shown in Figure 7.2-B15.

Specified concentration boundaries set to 20 mg/L (SD 7-1 2009 Aquatics Synthesis Baseline) were assigned along the bottom of all lakes assumed to have open taliks connected to the deep groundwater flow regime.

Zero flux boundaries were assigned along the model bottom in Layer 25 and along the lateral model boundaries corresponding to inferred groundwater divides and flow lines. These boundaries are located sufficiently far from the mine to have negligible impact on model predictions.

Exit (Cauchy type) boundaries were assigned to the nodes representing the Tiriganiaq Underground Mine. These boundaries simulate the movement of TDS mass with groundwater inflow to the mine workings.

## 3.5 Inflow to Open Pits

Inflow of groundwater to the open pits will occur when the pits intersect dewatered lakes that have closed taliks beneath them. An analytical solution was used to estimate the amount of groundwater inflow to the open pits. This groundwater will be relatively fresh because of its isolation from the deep saline groundwater.

The solution to a one-dimensional, transient flow in response to a step-wise drop in hydraulic head at the boundary (corresponding to the height of the excavation) is provided by McWhorter and Sunada (1977) as follows:

$$Q = \frac{s_o T}{\sqrt{\pi \alpha t}}$$

Where: Q= discharge

$S_o$= change in head (depth of pit excavation adjacent to talik)

T = Transmissivity ($m^2$/day)

S = Storativity

α = Diffusivity = T / S

t = time (days)

Integration of this equation yields:

$$V_t = \int_0^{t_1} Q\, dt = \frac{2 s_o \sqrt{STt}}{\sqrt{\pi}}$$

Where: $V_t$ = Total flow from 0 to $t_1$

Predicted inflows to the open pits estimated using the above equation and the open pit plans provided by AEM. Detailed pit plans were not available for Pump pits 1 and 2 therefore inflows for these pits were estimated using an approximate mining schedule provided by AEM.

## 3.6 Model Predictions

### 3.6.1 Current Conditions

Predicted hydrogeologic conditions for the pre-mining flow field are presented in Figure 7.2-B16. The Tiriganiaq Underground Mine is located in the area of a groundwater flow divide with groundwater in the area of the planned mine discharging predominantly to Meliadine Lake East, and to a lesser extent to Meliadine Lake West. The TDS of groundwater at the site increases with depth according to the Meliadine profile (Figure 7.2-B7).

Budget analyses were performed to estimate the pre-mining groundwater inflows and outflows from Meliadine, B7 and D7 lakes. Prior to mining, groundwater flows are from the higher elevation lakes B7 and D7 through open taliks to Meliadine Lake. Estimates of these pre-mining inflows and outflows are presented in Table 7.2-B6.

**Table 7.2-B6: Pre-mining Groundwater Inflows and Outflows from Lakes**

| Lake | Inflow ($m^3$/day) | Outflow ($m^3$/day) |
|---|---|---|
| Meliadine | 7 | - |
| B7 | - | 3 |
| D7 | - | 1 |

Groundwater velocities in the deep groundwater regime were estimated from the groundwater model. Prior to mining, groundwater velocities are very low and on the order of 0.2 to 0.3 m per year. It is estimated that groundwater from Lake B7 would take thousands of years to travel in a northeast direction to Meliadine Lake (ML-E). In order to consider the potential effects of density-driven solute transport for pre-mining conditions, a driving force ratio was calculated using:

$$DFR = \frac{\Delta\rho\ |\nabla E|}{\rho_f\ |\nabla H_f|}$$

Where: DFR = driving-force ratio [dimensionless]

$\Delta\rho$ = difference between actual fluid density and relative fluid density [g/cm$^3$]

$\rho_f$ = density of fresh water [g/cm$^3$]

$|\nabla E|$ = magnitude of the gradient of elevation [dimensionless]

$|\nabla H_f|$ = magnitude of the equivalent-freshwater-head gradient [dimensionless]

A driving-force ratio greater than 0.5 is considered a threshold were density-related gravity effects may become significant (Davies 1989).

The assumed maximum TDS concentration in the vicinity of the underground mine (60,000 mg/L) and the pre-mining vertical hydraulic gradient (0.011 m/m) were used to calculate an approximate driving-force ratio for a simplified vertical flow path. A difference in fluid density of 0.05 g/cm$^3$ yields a driving-force ratio of greater than 4, indicating that density-related gravity effects on solute transport are dominant during pre-mining conditions. Density-related effects would increase the travel times of solute transport along the flow path from the higher elevation lakes with open taliks to the lower elevation lakes with open taliks. The groundwater travel times calculated using the numerical hydrogeological model do not take into account density driven transport; therefore the travel times for solutes estimated for the pre-mining condition are conservatively low (i.e., actual travel times will be longer).

## 3.6.2 During Mining

### *3.6.2.1 Underground Mine*

The proposed Tiriganiaq Underground Mine will be mined below the base of the permafrost over 14 years. The mine schedule provided by AEM indicates that the underground ramps will be advanced from the base of the permafrost to the ultimate depth during the first four years of mining (Year -2 to Year 1). The stopes from the base of the permafrost to approximately 570 m bgs will be developed over the next three years (Years 2 to 4). Finally, the stopes from the ultimate depth (770 m bgs) will be developed upwards to 570 m bgs over eight years (Years 5 to 12).

As presented in Table 7.2-B7, average groundwater inflows to the underground mine are predicted to range from 420 m$^3$/day (Years -2 to 1) to 640 m$^3$/day (Years 5 to 12). Based on the Meliadine profile presented in Figure 7.2-B7, the average predicted TDS concentration of the inflow ranges from 56,000 mg/L (Years -2 to 1) to 59,000 mg/L (Years 5 to 12).

**Table 7.2-B7: Base Case - Predicted Groundwater Inflow Quantity and TDS Concentration**

| Mine Year | Average Inflow (m3/day) | Average TDS (mg/L) |
|---|---|---|
| Years -2 to 1 | 420 | 56,000 |
| Years 2 to 4 | 540 | 58,000 |
| Years 5 to 12 | 640 | 59,000 |

Predicted hydrogeologic conditions at the end of mining, when groundwater inflows are predicted to be the greatest, are presented in Figures 7.2-B17 and 7.2-B18. Operation of the mine below permafrost will result in pressure drawdown of approximately 770 m in the immediate vicinity of the mine below the permafrost. A drawdown of greater than 1 m in the deep groundwater regime is predicted to extend from the underground mine to a radial distance of approximately 10 km.

Budget analysis was performed to estimate the groundwater inflows and outflows from Meliadine Lake, B7 and D7 at the end of mining (Year 12). As presented in Table 7.2-B8, inflow to Meliadine Lake is decreased compared to pre-mining conditions and outflow from the surface water bodies are estimated to range from 10 $m^3$/day to 40 $m^3$/day.

**Table 7.2-B8: End of Mining Groundwater Inflows and Outflows from Lakes**

| Lake | Inflow ($m^3$/day) | Outflow ($m^3$/day) |
|---|---|---|
| Meliadine | 3 | 37 |
| B7 | - | 35 |
| D7 | - | 11 |

Particle tracking was used to estimate groundwater travel times from Lake B7 to the area of the underground mine. Using the end of mining (Year 12) hydraulic gradients, and the shortest travel time as a conservative estimate, water from B7 is expected to reach the base of the permafrost in the talik below B7 in approximately 8 years.

The assumed maximum TDS concentration in the vicinity of the underground mine (60,000 mg/L), and the end of mining vertical hydraulic gradient (1 m/m), were used to calculate an approximate driving-force ratio for a simplified vertical flow path using the equation detailed in Section 3.6.1. A difference in fluid density of 0.05 g/$cm^3$ yields a driving-force ratio of 0.05, indicating that during mining, the steep hydraulic gradients will overwhelm density-related gravity effects. Consequently during mining, a solute will travel at near the same velocity as the groundwater.

### *3.6.2.2 Open Pits*

Predicted average inflows to the open pits during mining are provided in Table 7.2-B9. Estimated inflows were generally low, ranging from 1 to 80 $m^3$/day with the exception of the phase 4 Tiriganiaq pit and Pump pits 1 and 2. Predicted inflows at these locations ranged from 5 to 280 $m^3$/day. As noted above, this will be relatively fresh because of its isolation from the deep saline groundwater, and therefore the TDS of this groundwater is expected to be close to that of lake water.

**Table 7.2-B9: Predicted Average Inflow to Open Pits from Intersected Taliks ($m^3$/day)**

| Year | -1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tiriganiaq** | | | | | | | | | | | | |
| Phase 1 | 3 | 8 | 10 | 1 | - | - | - | - | - | - | - | - |
| Phase 2 | - | - | - | - | - | 14 | 18 | 8 | 3 | 3 | - | - |
| Phase 3 | - | - | - | - | - | - | - | - | - | 18 | 16 | - |
| Phase 4 | - | - | - | - | - | - | - | - | - | - | 280 | - |
| **Wesmeg** | | | | | | | | | | | | |
| Pit 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| Pit 2 | - | - | - | 83 | 20 | - | - | - | - | - | - | - |
| Pit 3 | - | - | - | 6 | 4 | 4 | 4 | 2 | - | - | - | - |
| Pit 4 | - | - | - | - | - | - | - | - | - | - | - | - |
| Pit 5 | - | - | - | - | - | - | - | - | - | - | - | - |
| **F Zone** | | | | | | | | | | | | |
| Pit 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| Pit 2 | - | - | - | 33 | 2 | - | - | - | - | - | - | - |
| Pit 3 | - | - | - | - | 94 | 1 | - | - | - | - | - | - |
| **Pump** | | | | | | | | | | | | |
| Pit 1 | - | - | - | - | - | - | 125 | 18 | - | - | - | - |
| Pit 2 | - | - | - | - | - | - | - | - | - | 5 | 130 | 26 |
| **Discovery** | | | | | | | | | | | | |
| Pit | - | - | - | - | - | - | - | - | - | - | - | - |

### 3.6.3 Closure

Near to Pre-mining hydraulic gradients and groundwater flow directions will be re-established once the open pits and underground are flooded during mine closure. The groundwater model estimates that groundwater originating from Lake B7 that has reached the area of the underground mine during mining, but did not discharge into the underground mine itself, would take approximately 500 to 1000 years to travel back up to Meliadine Lake. The groundwater model estimates that the discharge rate to Meliadine Lake of a solute originating from the tailings storage facility would be approximately 3 $m^3$/day.

As discussed for the pre-mining conditions, this range of travel times does not take into account density effects on solute transport. Density driven effects will dominate at post closure and will tend to slow down the travel times and reduce the potential discharge of solutes to Meliadine Lake.

## 3.7 Sensitivity Analyses

Where uncertainty exists, several conservative assumptions have been made in the numerical hydrogeological model as presented in Table 7.2-B3 and Table 7.2-B5. Therefore, sensitivity analyses to assess the impact of uncertainty in these parameters are not considered warranted. Sensitivity analyses were however conducted to assess the effects of the assumed hydraulic conductivity in the Lower Fault Zone and the assumed TDS

concentration profile on predictions of water quantity and quality reporting to the underground mine. This analysis involved the following three additional simulations run relative to the Base Case conditions:

- the hydraulic conductivity of FRZ associated with the Lower Fault Zone was increased by a factor of 10;
- the hydraulic conductivity of FRZ associated with the Lower Fault Zone was decreased to match the hydraulic conductivity of the surrounding bedrock ($3.0 \times 10^{-9}$ m/s); and
- the hydraulic conductivity of FRZ associated with the Lower Fault Zone was decreased to match the hydraulic conductivity of the surrounding bedrock while the TDS concentration profile was increased from that presented on Figure 7.2-B7 (considered to represent a conservative profile).

Table 7.2-B10, which presents the results of the sensitivity analyses, indicates that groundwater inflow quantity and quality are moderately sensitive to a change in hydraulic conductivity of the Lower Fault Zone. When the hydraulic conductivity was increased by a factor of 10 times to $1 \times 10^{-6}$ m/s (considered to be a reasonable upper bound for this parameter), the predicted average inflow to the mine in years 5 to 12 increased to 970 $m^3$/day. During the same period the average TDS concentration increased to 74,000 mg/L. When the hydraulic conductivity of the Lower Fault Zone was decreased to match the surrounding bedrock ($3 \times 10^{-9}$ m/s), the predicted average inflow to the mine in years 5 to 12 decreased to 360 $m^3$/day, while the average TDS concentration remained approximately the same.

Results of the sensitivity simulations indicate that the TDS concentrations at all depths in the profile are directly related to the predicted TDS of mine inflows. When the profile concentrations were increased to the higher profile shown on Figure 7.2-B7, the predicted TDS concentration of the inflows in years 5 to 12 increased to 141,000 mg/L.

**Table 7.2-B10: Results of Sensitivity Analysis**

| Year | Base Case | | Hydraulic Conductivity | | | | Hydraulic Conductivity and TDS Concentration Profile | |
|---|---|---|---|---|---|---|---|---|
| | | | Lower Fault Fractured Rock Zone | | | | Lower Fault Fractured Rock Zone | |
| | | | Hydraulic Conductivity Decreased to Match Surrounding Bedrock | | Hydraulic Conductivity Increased by Factor of 10 | | Hydraulic Conductivity Decreased to Match Surrounding Bedrock and TDS Concentration Profile Increased | |
| | Average Inflow ($m^3$/day) | Average TDS (mg/L) | Average Inflow ($m^3$/day) | Average TDS (mg/L) | Average Inflow ($m^3$/day) | Average TDS (mg/L) | Inflow ($m^3$/day) | TDS (mg/L) |
| Years -2 to 1 | 420 | 56,000 | 360 | 55,000 | 750 | 62,000 | 360 | 85,000 |
| Years 2 to 4 | 540 | 58,000 | 460 | 58,000 | 970 | 67,000 | 460 | 108,000 |
| Years 5 to 12 | 640 | 59,000 | 580 | 59,000 | 970 | 74,000 | 580 | 141,000 |

## 4.0 CONCLUSION

The proposed Tiriganiaq underground mine will extend to the deep groundwater flow regime beneath the permafrost. The current study indicates that the potential water inflows to the proposed underground mine workings extending below the base of the permafrost will range from approximately 420 $m^3$/day to 640 $m^3$/day. The average predicted TDS concentration of the inflow is estimated to range from 56,000 mg/L to 59,000 mg/L based on the Meliadine profile. Sensitivity analyses have been carried out by varying the hydraulic conductivity of the lower fault fractured rock zone and the assumed TDS concentration profile.

Groundwater inflows from closed taliks intersected by pit walls are estimated to be minor and range from less than 1 $m^3$/day to about 300 $m^3$/day. The TDS of this groundwater is expected to be close to that of lake water.

## 5.0 CLOSURE

We trust the information provided herein, satisfies your current requirements. If you have any questions or require further assistance, please do not hesitate to contact the undersigned.

Yours very truly,

**GOLDER ASSOCIATES LTD.**

ORIGINAL SIGNED

Scott McGregor, B.Sc.
Environmental Scientist

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TIRIGANIAQ OPEN PIT

WESMEG OPEN PIT

PUMP OPEN PIT

F-ZONE OPEN PIT

DISCOVERY OPEN PIT

600 0 600
SCALE 1:30,000 METRES

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**LEGEND**

- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

600 0 600
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PROJECT

AGNICO EAGLE

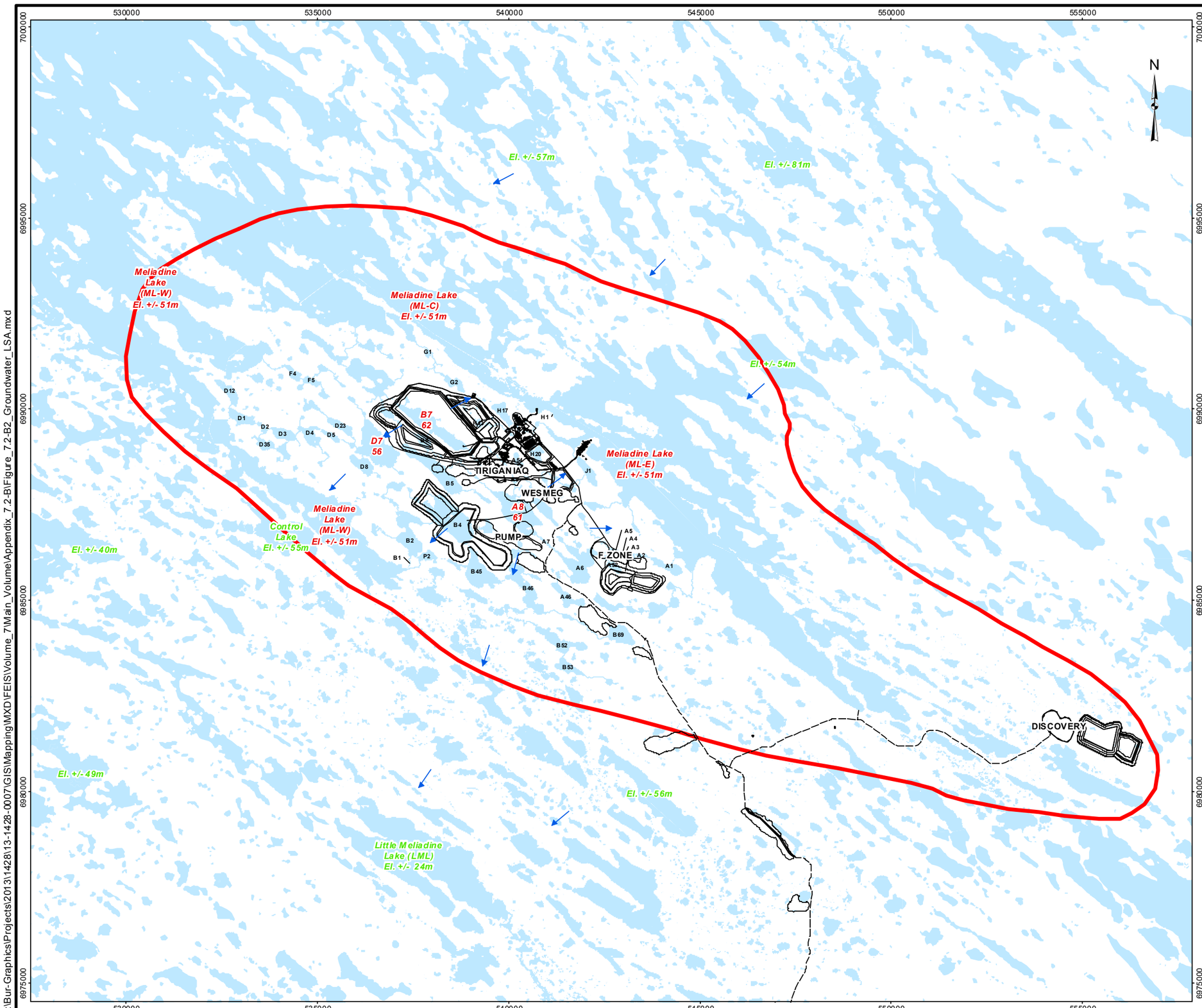
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# SITE PLAN

Golder Associates

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|---|---|---|---|
| DESIGN | DC | 02 Mar. 2012 | SCALE AS SHOWN REV. 0 |
| GIS | CDB | 02 Mar. 2012 | |
| CHECK | SM | 18 Jun. 2012 | **FIGURE 7.2-B1** |
| REVIEW | DC | 18 Jun. 2012 | |




**LEGEND**

- Groundwater Local Study Area (LSA)
- Inferred Ground Water Flow Direction
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

*Red Lake Label* — Surface Area and Depth Large Enough to Support an Open Talik

*Green Lake Label* — Surface Area Large Enough to Support an Open Talik (Bathymetry Unavailable)

**REFERENCE**

Lake elevations obtained from the Schlenker Survey where available. Otherwise, lake elevations obtained from the 1:50,000 National Topographic Data Base.
Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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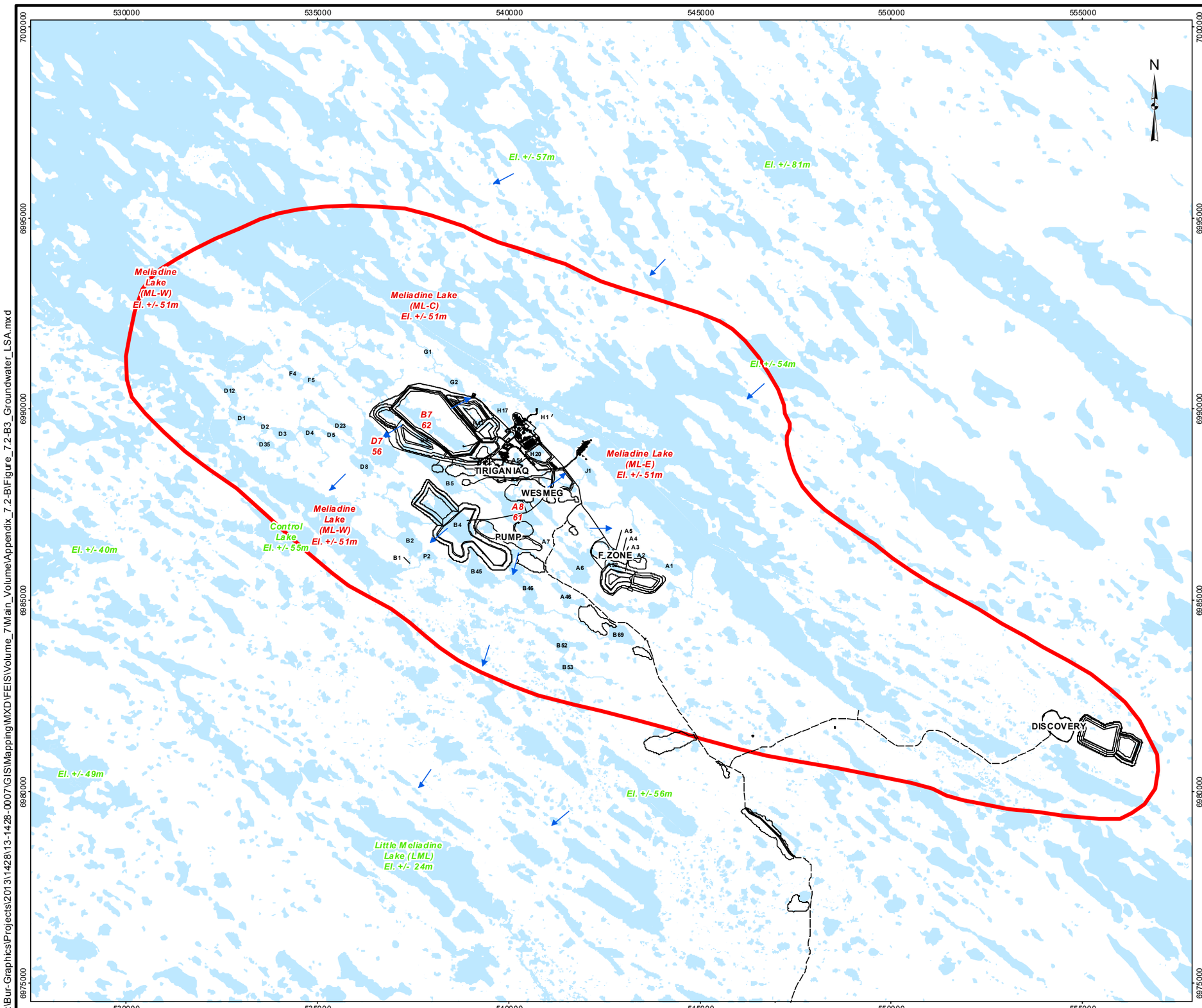
PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
**HYDROGEOLOGY AND GROUNDWATER LSA**

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
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| GIS | CDB | 02 Mar. 2012 | | |
| CHECK | SM | 18 Jun. 2012 | **FIGURE 7.2-B2** | |
| REVIEW | DC | 18 Jun. 2012 | | |

Golder Associates

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## LEGEND

- Groundwater Local Study Area (LSA)
- Inferred Ground Water Flow Direction
- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Watercourse
- Waterbody

*Red Lake Label* — Surface Area and Depth Large Enough to Support an Open Talik

*Green Lake Label* — Surface Area Large Enough to Support an Open Talik (Bathymetry Unavailable)

## REFERENCE

Lake elevations obtained from the Schlenker Survey where available. Otherwise, lake elevations obtained from the 1:50,000 National Topographic Data Base.
Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

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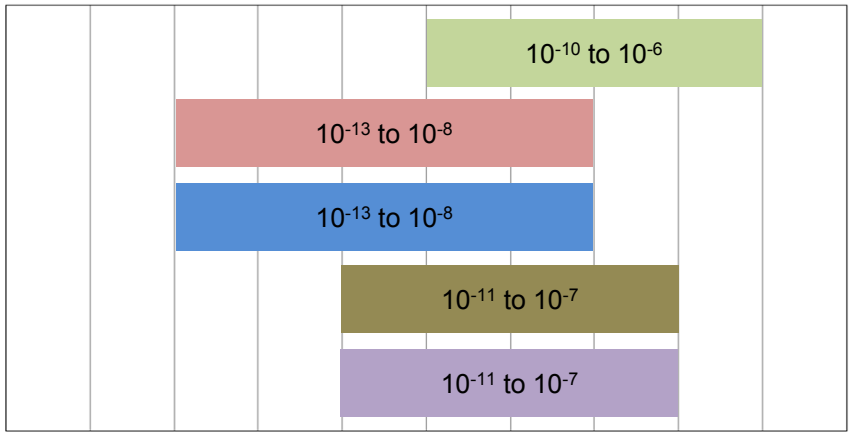
PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
# HYDROGEOLOGY AND GROUNDWATER LSA

Golder Associates

| PROJECT NO. 10-1373-0076 | | | FILE No. | |
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| GIS | CDB | 02 Mar. 2012 | | |
| CHECK | SM | 18 Jun. 2012 | **FIGURE 7.2-B3** | |
| REVIEW | DC | 18 Jun. 2012 | | |

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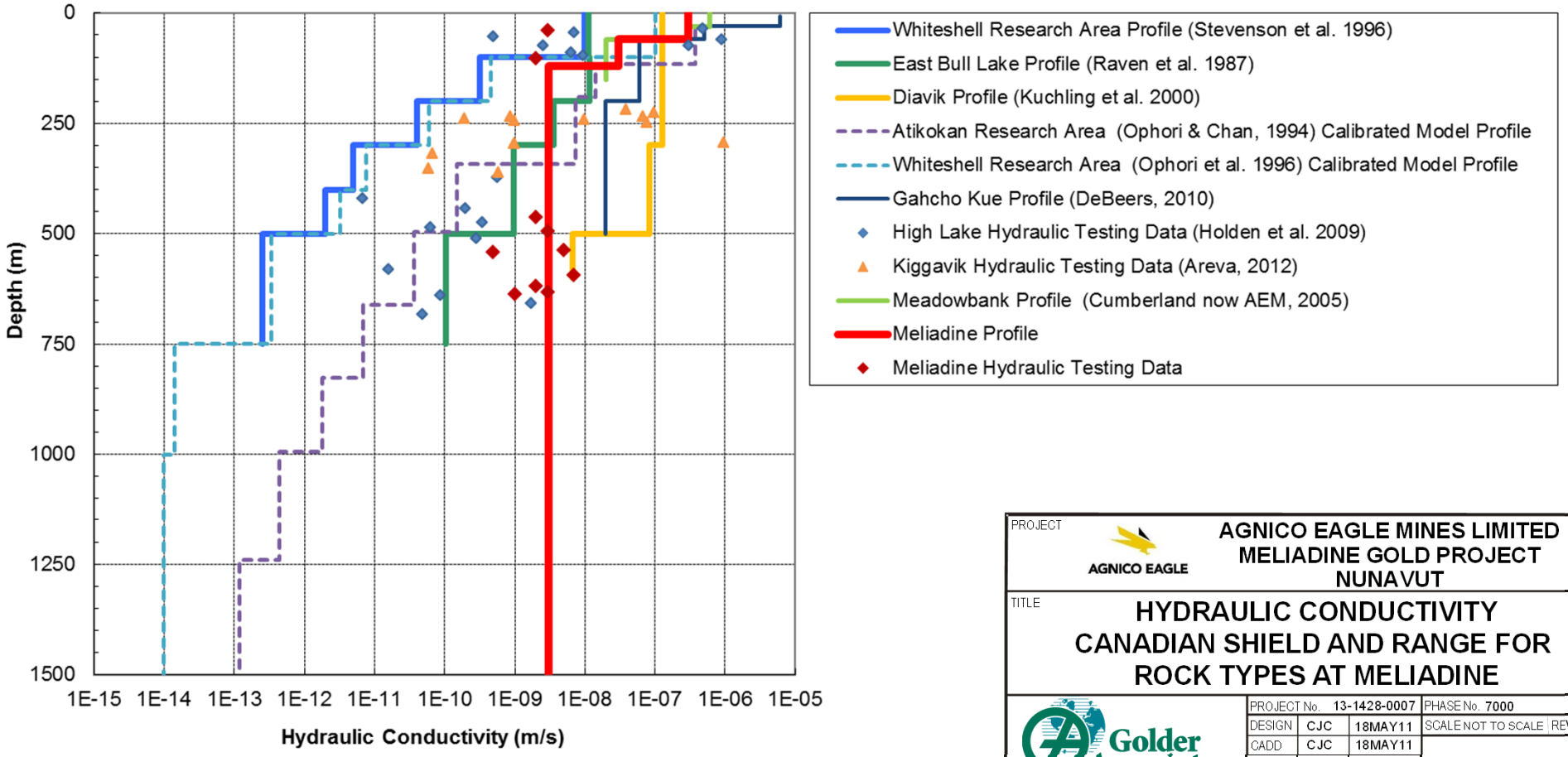

Greywacke (Sam and Upper Oxide Formation)
(Domenico and Schwartz, 1998)

Argillite (Sam Formation)
(Domenico and Schwartz, 1998)

Siltstone (Upper Oxide Formation)
(Domenico and Schwartz, 1998)

Mafic Volcanic Rocks
(Domenico and Schwartz, 1998)

Pyroclastic Rocks
(Maidment, 1992)




PROJECT

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**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

# HYDRAULIC CONDUCTIVITY CANADIAN SHIELD AND RANGE FOR ROCK TYPES AT MELIADINE

Golder Associates

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| PROJECT No. | 13-1428-0007 | | PHASE No. 7000 | |
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| CADD | CJC | 18MAY11 | | |
| CHECK | CJC | 18MAY11 | | |
| REVIEW | CJC | 18MAY11 | | |

**FIGURE 7.2-B4**

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540000
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560000
6990000
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6970000

TIRIGANIAQ
WESMEG
PUMP
F ZONE
DISCOVERY

N

**LEGEND**

- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

Regional Geology

- Quartzite
- Quartzite-Siltstone
- Pillowed Mafic Volcanic Rock
- Quartzite-Felsic Volcanic Rock
- Ultramafic Volcanic Rock
- Greywacke-Iron Formation
- Volcanic Rock
- Mafic Volcanic Rock
- Graywacke
- Gabbro
- Granitoid
- Iron Formation
- Andesitic Volcanic Rock
- Carbonated Schist
- Argillite
- Conglomerate
- Dolomite
- Intermediate Volcanic Rock
- Biotite Schist

Major Fault

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM)
Datum: NAD 83 Projection: UTM Zone 15

2500 0 2500
METRES

PROJECT
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AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

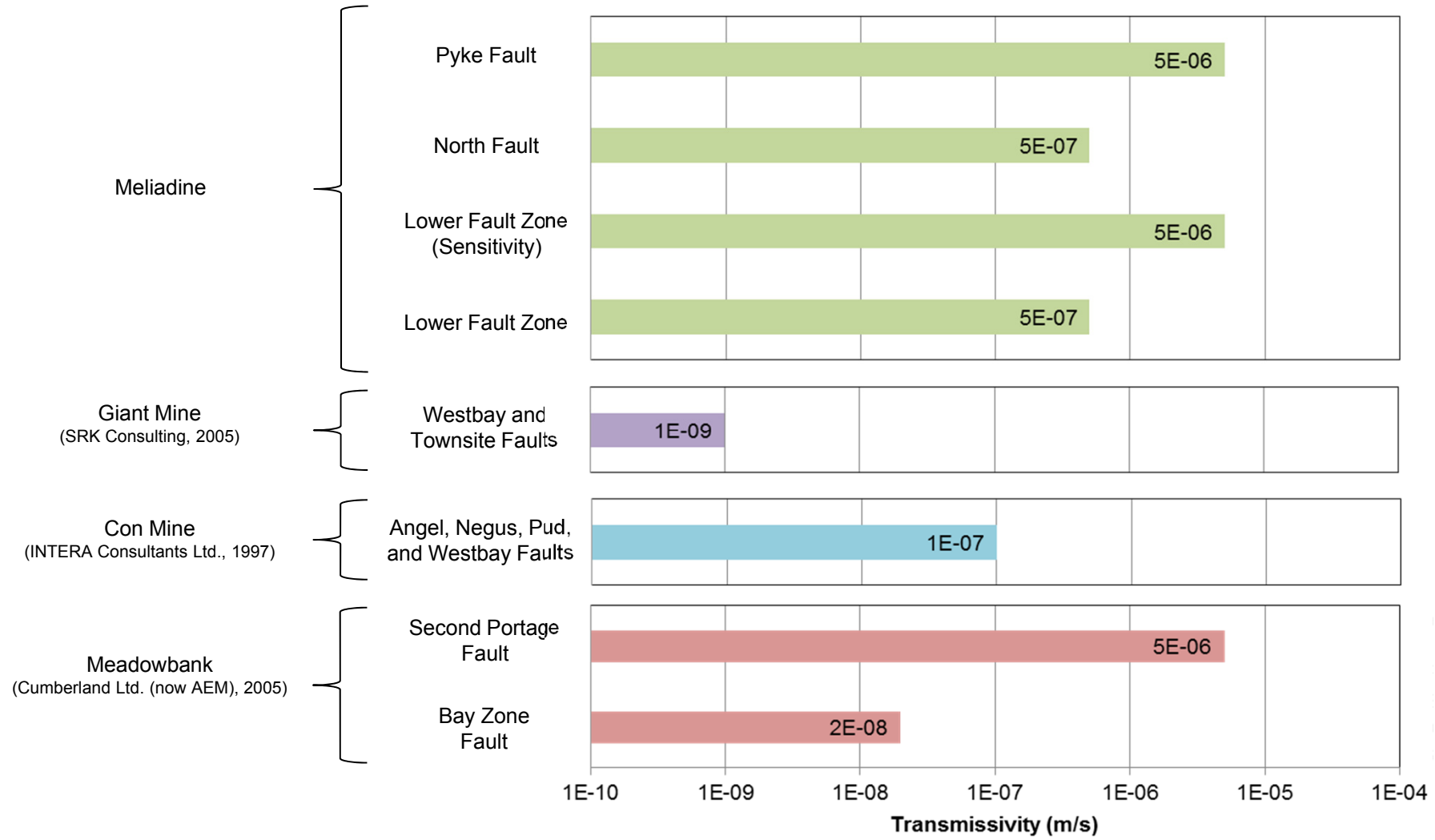
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**REGIONAL GEOLOGY**

Golder Associates

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| GIS | CDB | 01 Mar. 2012 | |
| CHECK | SM | 18 Jun. 2012 | **FIGURE 7.2-B5** |
| REVIEW | DC | 18 Jun. 2012 | |

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PROJECT

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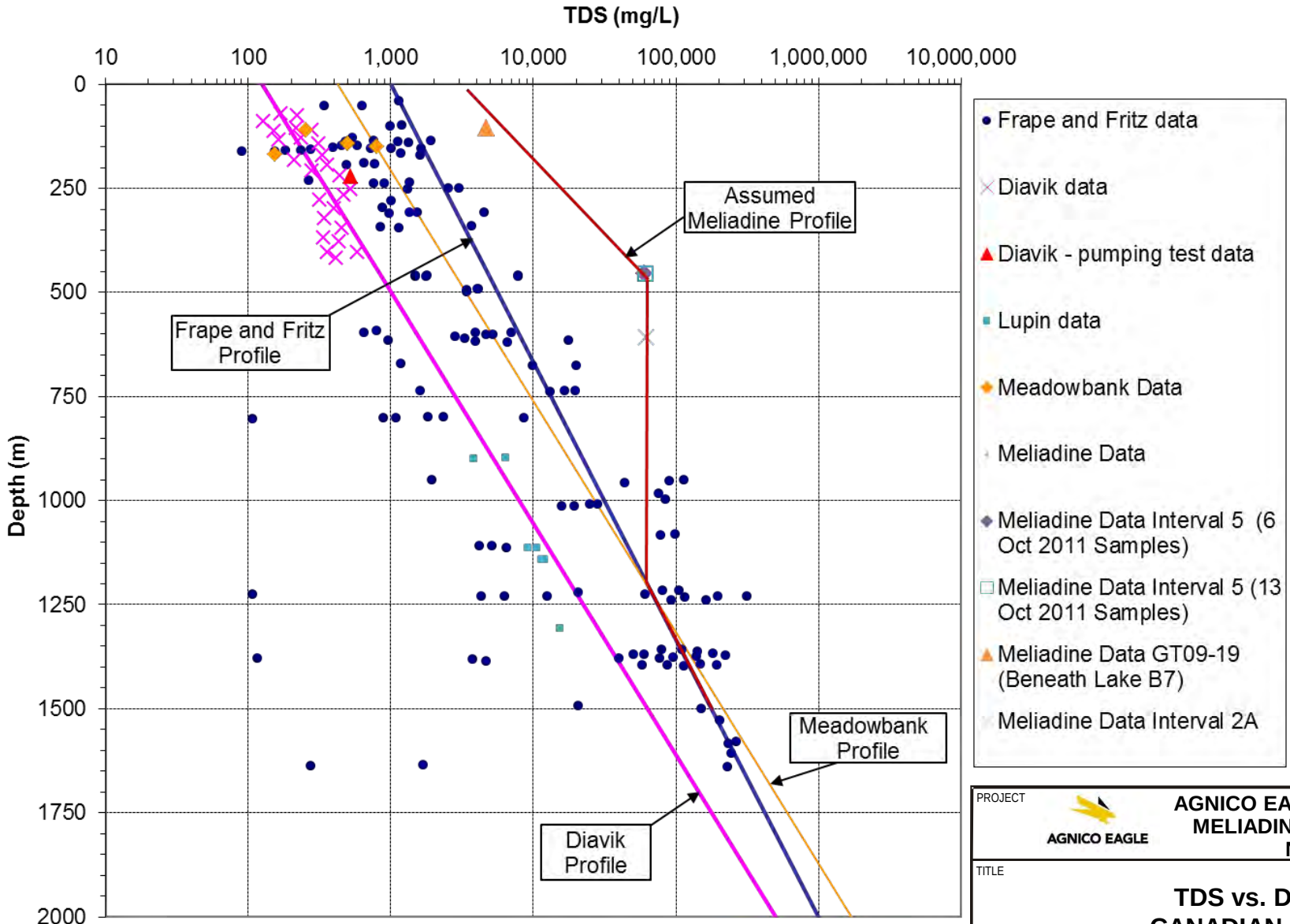
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# FAULT TRANSMISSIVITIES GOLD PROJECTS

Golder Associates

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| CHECK | CJC | 18MAY11 | **FIGURE 7.2-B6** | |
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PROJECT

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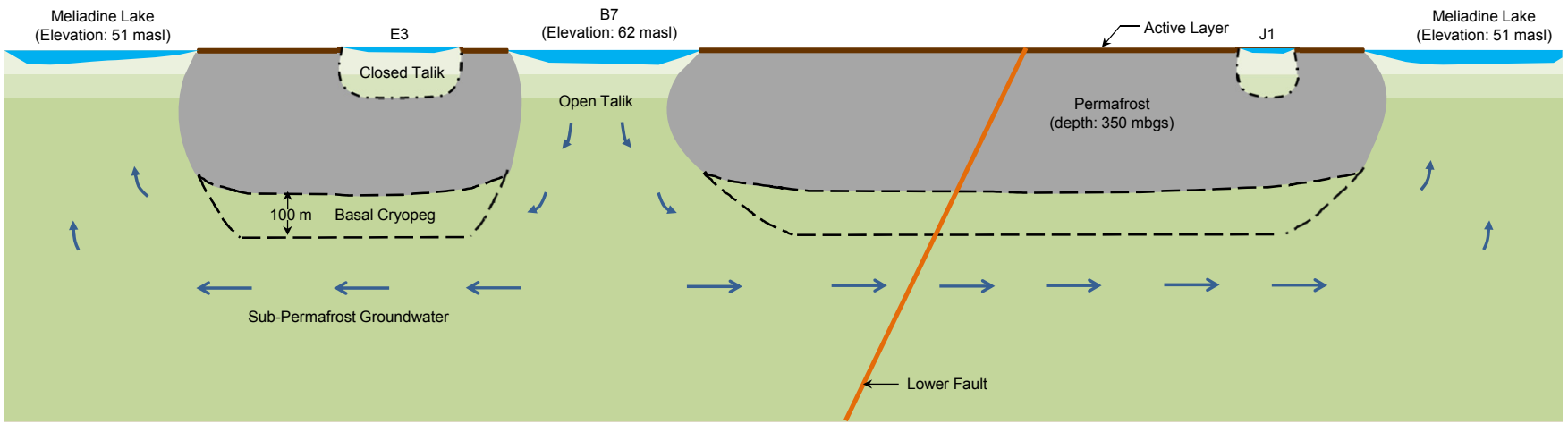
**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

# TDS vs. DEPTH
# CANADIAN SHIELD

Golder Associates

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|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | CJC | 18MAY11 | SCALE NOT TO SCALE | REV. C |
| CADD | CJC | 18MAY11 | FIGURE 7.2-B7 | |
| CHECK | CJC | 18MAY11 | | |
| REVIEW | CJC | 18MAY11 | | |




**Legend**

- Active Layer (<2 m thickness)
- Lake
- K = 3 x $10^{-7}$ m/s
- K = 3 x $10^{-8}$ m/s
- K = 3 x $10^{-9}$ m/s
- Lower Fault (K = 1 x $10^{-7}$ m/s)
- Permafrost
- Basal Cryopeg (K = 3 x $10^{-9}$ m/s)
- Closed Talik
- Inferred Groundwater Flow Direction

Note:
Size of groundwater flow arrows reflect the combined effects of hydraulic and density gradients. As such, vertical gradients are smaller to reflect density effects.

Schematic Only
Approximate vertical exaggeration of 1:3

PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

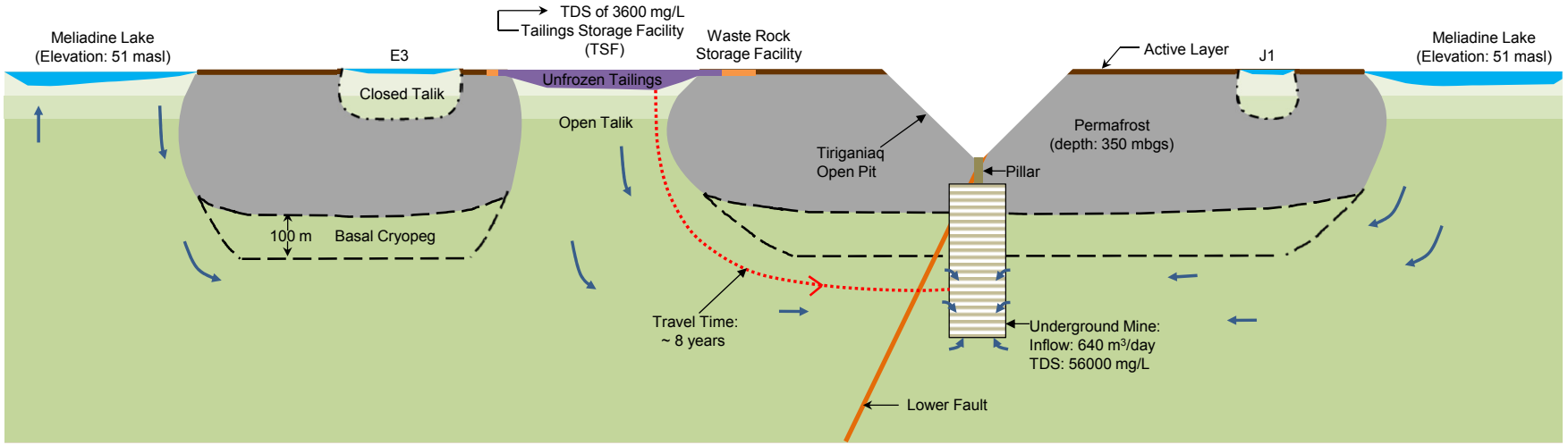
TITLE: CONCEPTUAL PERMAFROST AND GROUNDWATER FLOW MODEL PRE-MINING

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| CADD | -- | 01JAN14 | | |
| CHECK | -- | 01JAN14 | | |
| REVIEW | DC | 01JAN14 | | |

Golder Associates

FIGURE 7.2-B8

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**Legend**

- Active Layer (<2 m thickness)
- Lake
- K = 3 x $10^{-7}$ m/s
- K = 3 x $10^{-8}$ m/s
- K = 3 x $10^{-9}$ m/s
- Lower Fault (K = 1 x $10^{-7}$ m/s)
- Permafrost
- Basal Cryopeg (K = 3 x $10^{-9}$ m/s)
- Closed Talik
- Inferred Groundwater Flow Direction

Note:
Size of groundwater flow arrows reflect the combined effects of hydraulic and density gradients. As such, vertical gradients are smaller to reflect density effects.

Schematic Only
Approximate vertical exaggeration of 1:3

PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

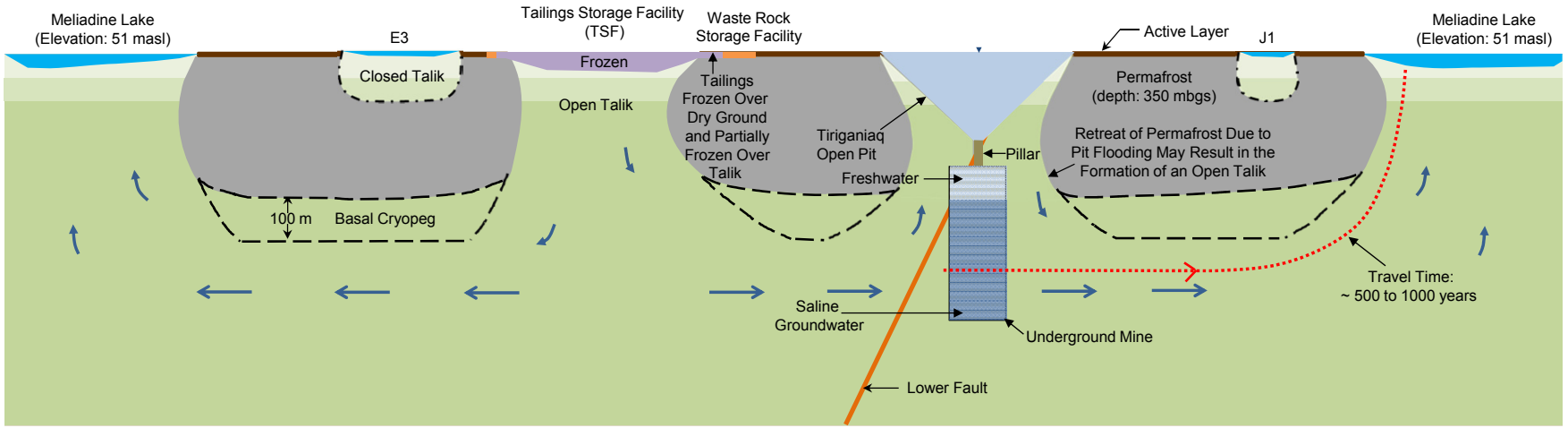
TITLE: CONCEPTUAL PERMAFROST AND GROUNDWATER FLOW MODEL DURING MINING

Golder Associates

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| CHECK | -- | 01JAN14 | | |
| REVIEW | DC | 01JAN14 | | |

FIGURE 7.2-B9

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**Legend**

- Active Layer (<2 m thickness)
- Lake
- K = 3 x $10^{-7}$ m/s
- K = 3 x $10^{-8}$ m/s
- K = 3 x $10^{-9}$ m/s
- Lower Fault (K = 1 x $10^{-7}$ m/s)
- Permafrost
- Basal Cryopeg (K = 3 x $10^{-9}$ m/s)
- Closed Talik
- Inferred Groundwater Flow Direction

Note:
Size of groundwater flow arrows reflect the combined effects of hydraulic and density gradients. As such, vertical gradients are smaller to reflect density effects.

Schematic Only
Approximate vertical exaggeration of 1:3

PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

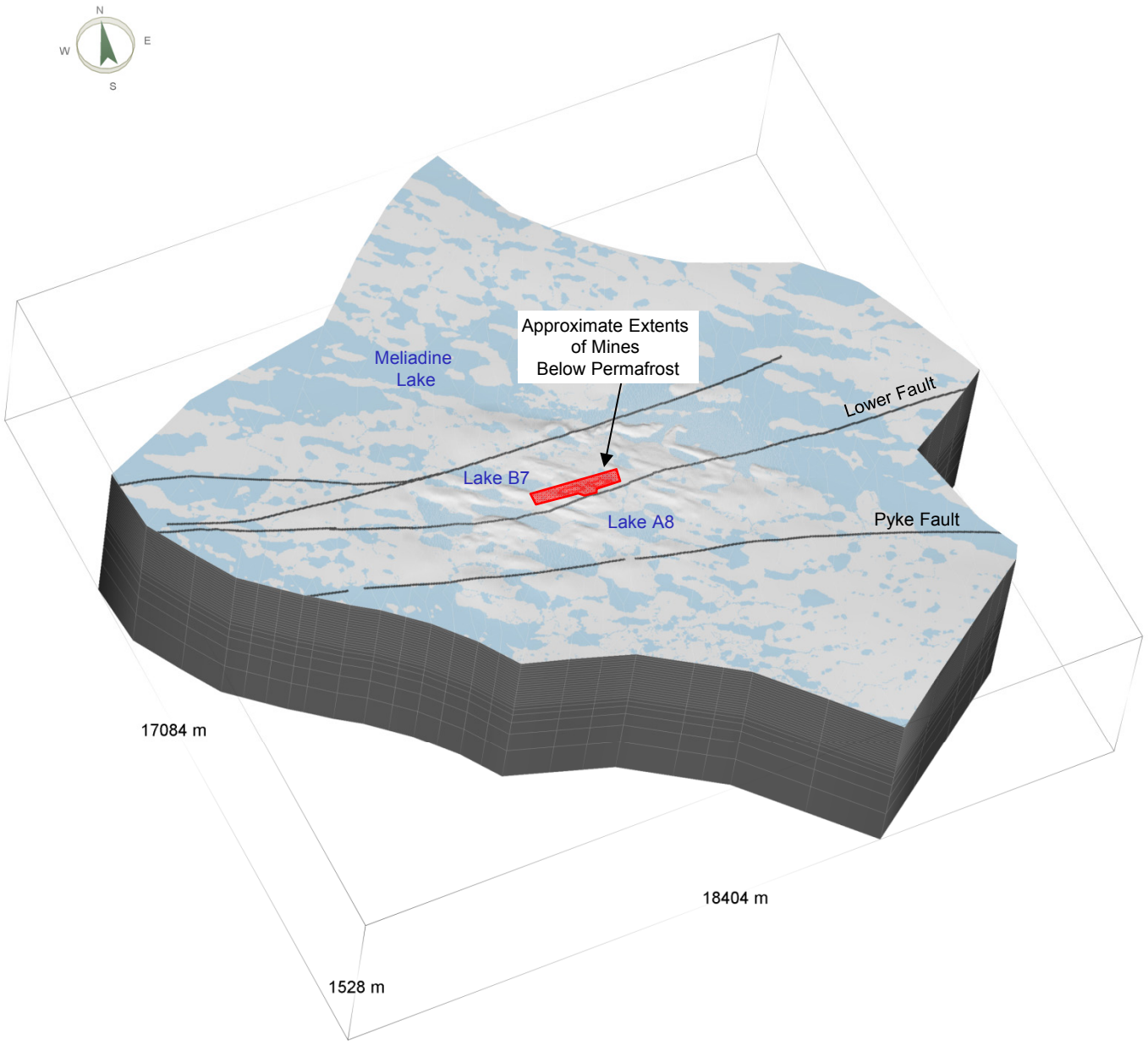
TITLE: CONCEPTUAL PERMAFROST AND GROUNDWATER FLOW MODEL CLOSURE

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| DESIGN | -- | 01JAN14 | SCALE NTS | REV. |
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| REVIEW | DC | 01JAN14 | | |

Golder Associates

FIGURE 7.2-B10

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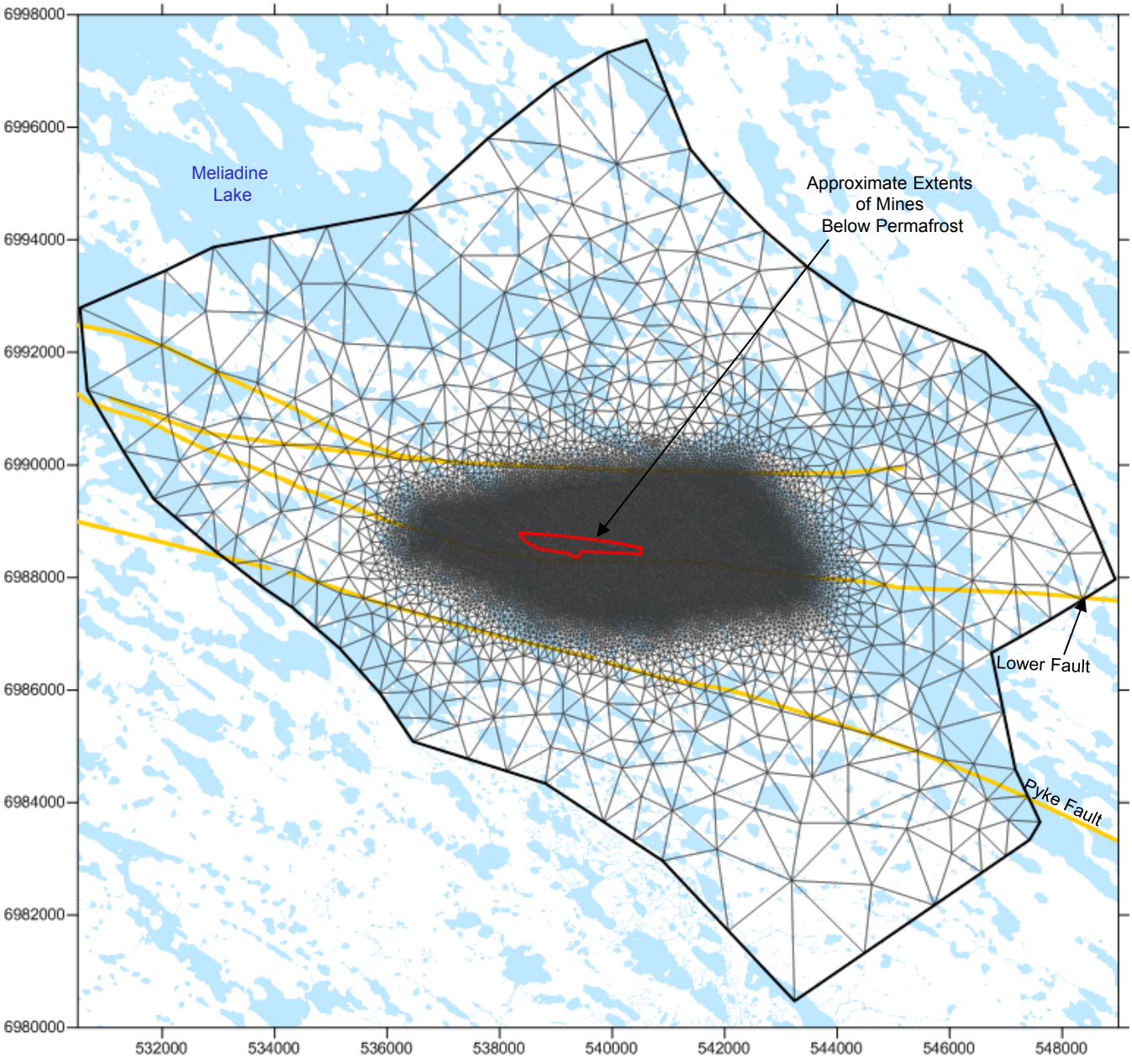
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**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

# MODEL EXTENT

Golder Associates

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| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN REV. |
| CADD | SAM | 1DEC12 | **FIGURE** |
| CHECK | SAM | 1DEC12 | **7.2-B11** |
| REVIEW | DC | 2DEC12 | |




Note:

1. Mine extents shown are the surface projection of underground mine workings below the permafrost

2. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

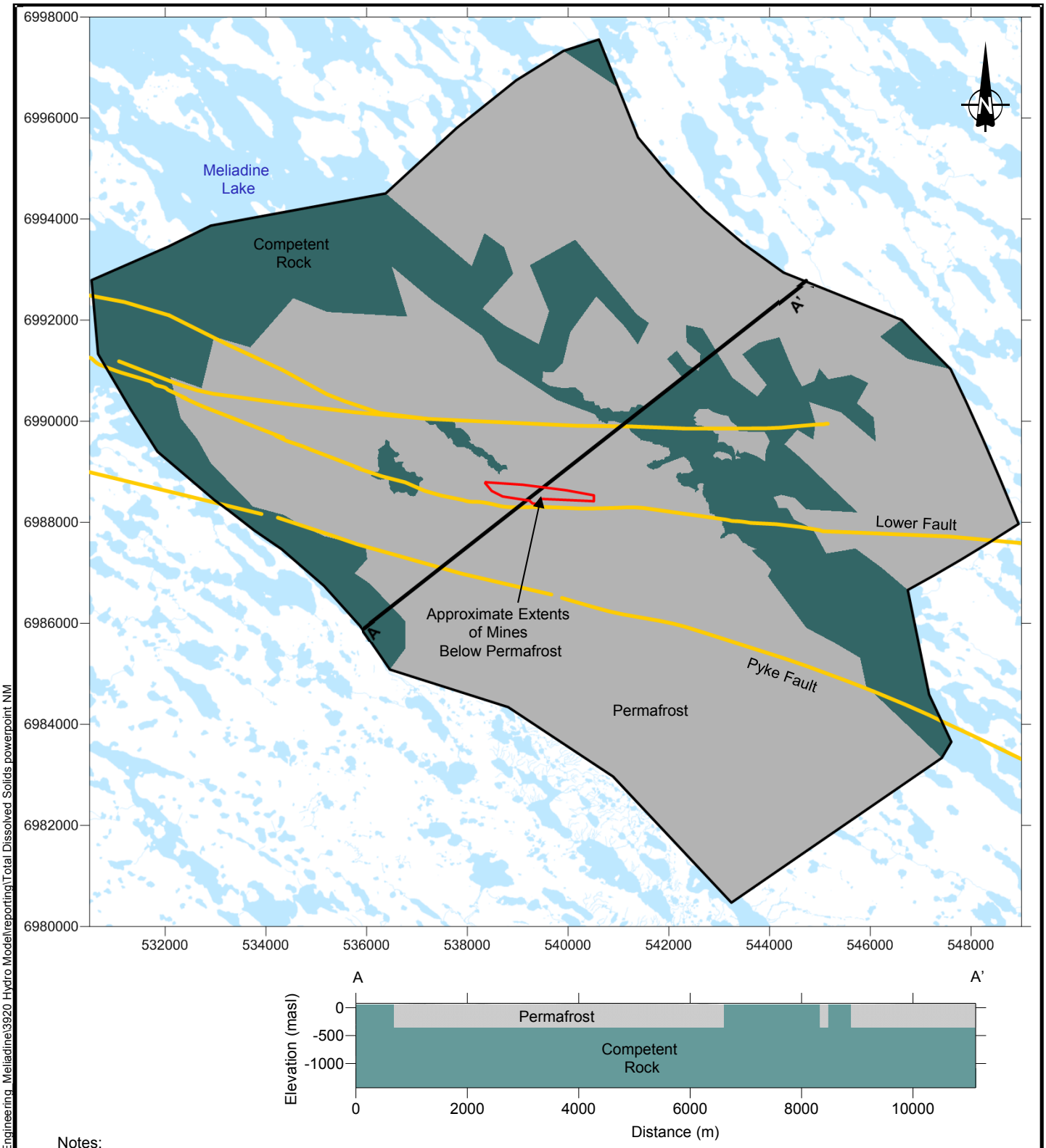
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# FINITE ELEMENT MESH

Golder Associates

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| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-B12** | |
| REVIEW | DC | 2DEC12 | | |

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Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Fractured rock zones (FRZs) assumed to be associated with faults were represented with two-dimensional discrete elements.
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

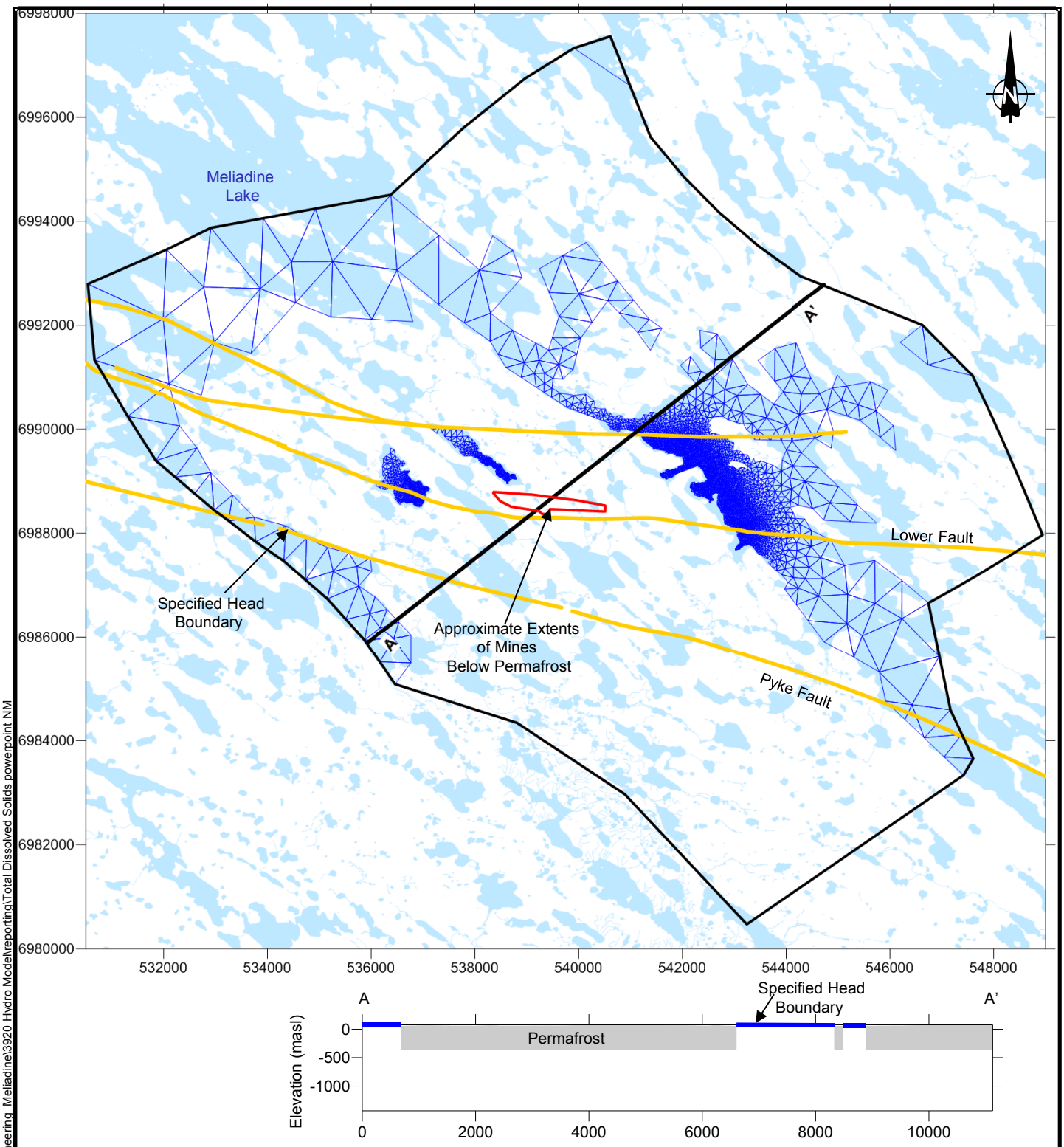
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# LOCATION AND EXTENT OF HYDROSTRATIGRAPHIC UNITS

Golder Associates

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| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-B13** | |
| REVIEW | DC | 2DEC12 | | |

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Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Boundaries shown in plan view were assigned to Layer 1 of the model.
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

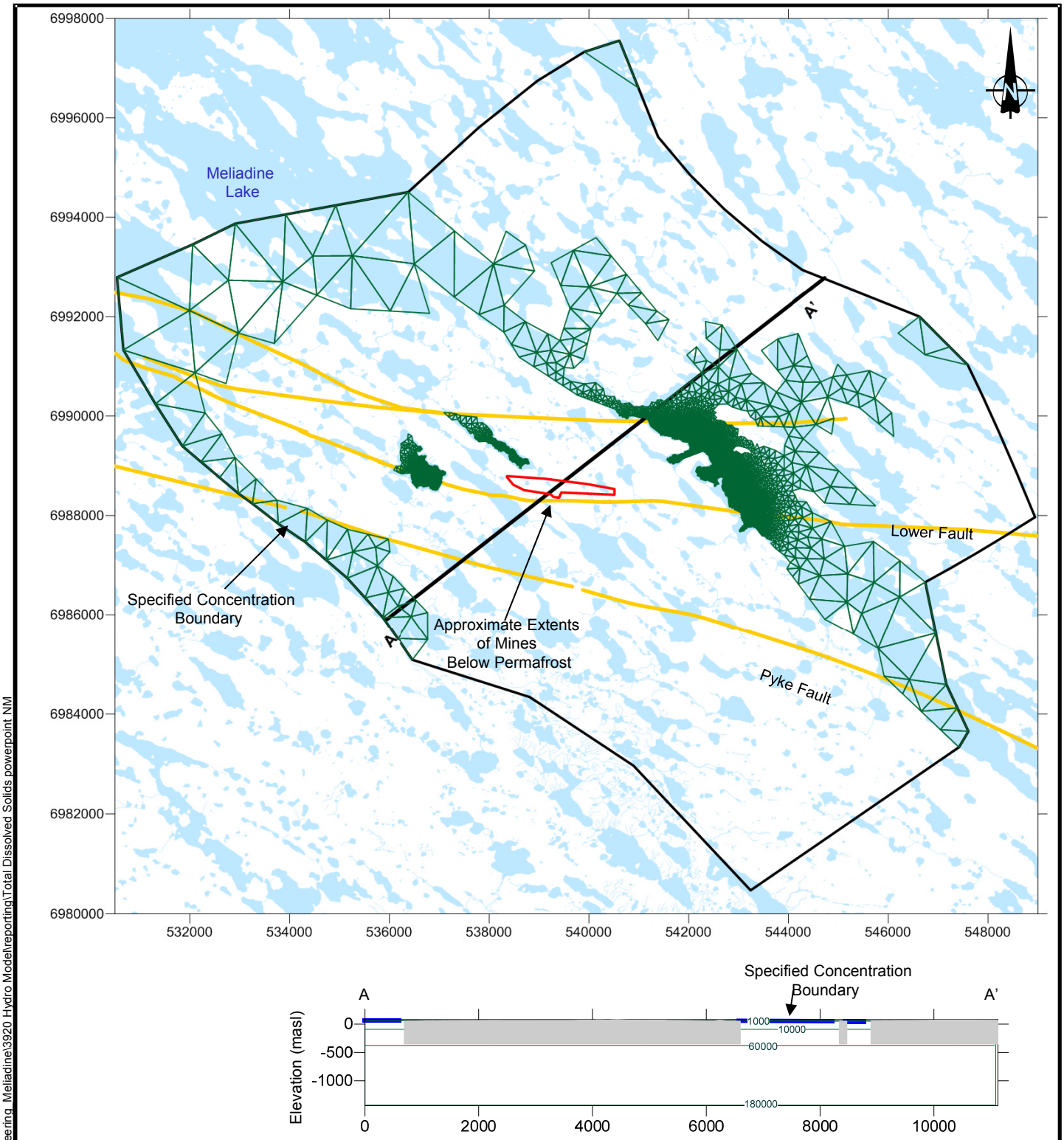
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# BOUNDARY CONDITIONS - FLOW

Golder Associates

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| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-B14** | |
| REVIEW | DC | 2DEC12 | | |

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Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Boundaries shown in plan view were assigned to Layer 1 of the model.
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

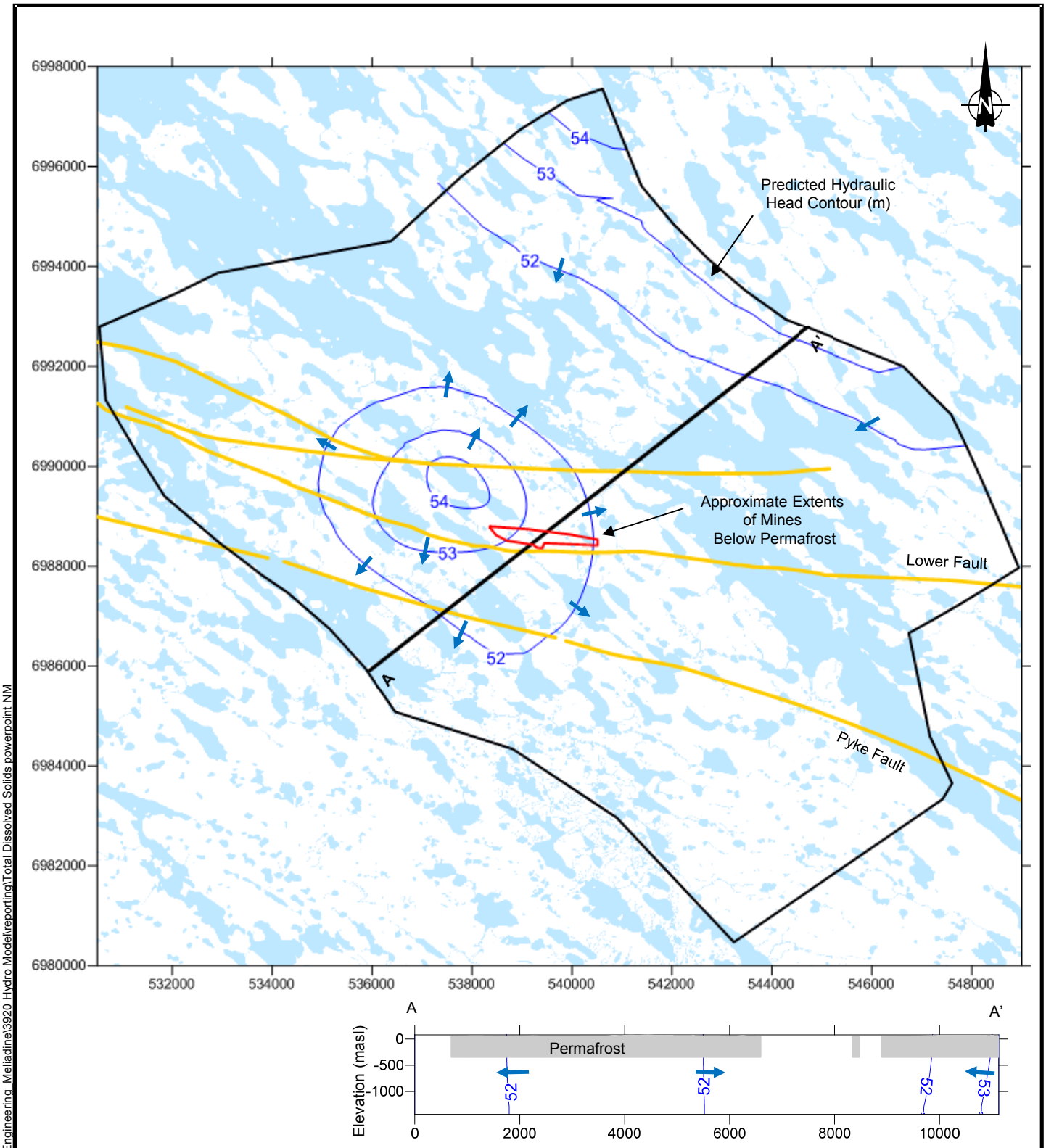
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# BOUNDARY AND INITIAL CONDITIONS TRANSPORT

Golder Associates

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|---|---|---|---|---|
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| DESIGN | CB | 8MAR10 | SCALE | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-B15** | |
| REVIEW | DC | 2DEC12 | | |

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Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Hydraulic heads plotted at -714 m above sea level near the bottom of the proposed underground mine
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

→ Predicted Groundwater Flow Direction

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

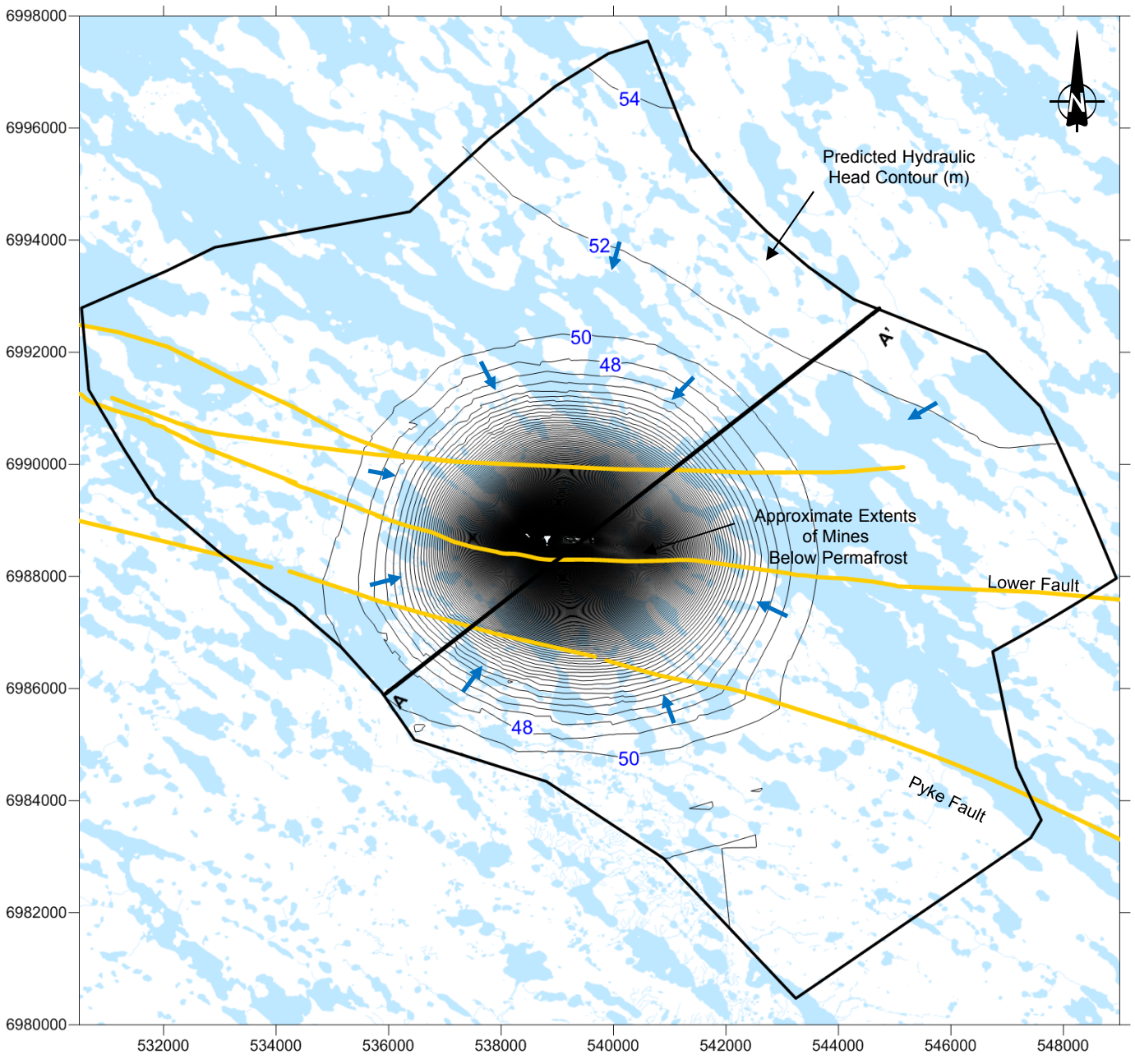
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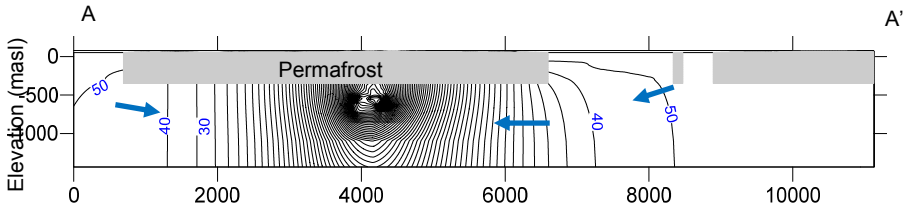
# PREDICTED HYDRAULIC HEADS PRE-MINING CONDITIONS

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
| CHECK | SAM | 1DEC12 | **7.2-B16** | |
| REVIEW | DC | 2DEC12 | | |

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Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Hydraulic heads plotted at -714 m above sea level near the bottom of the proposed underground mine
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83

→ Predicted Groundwater Flow Direction

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

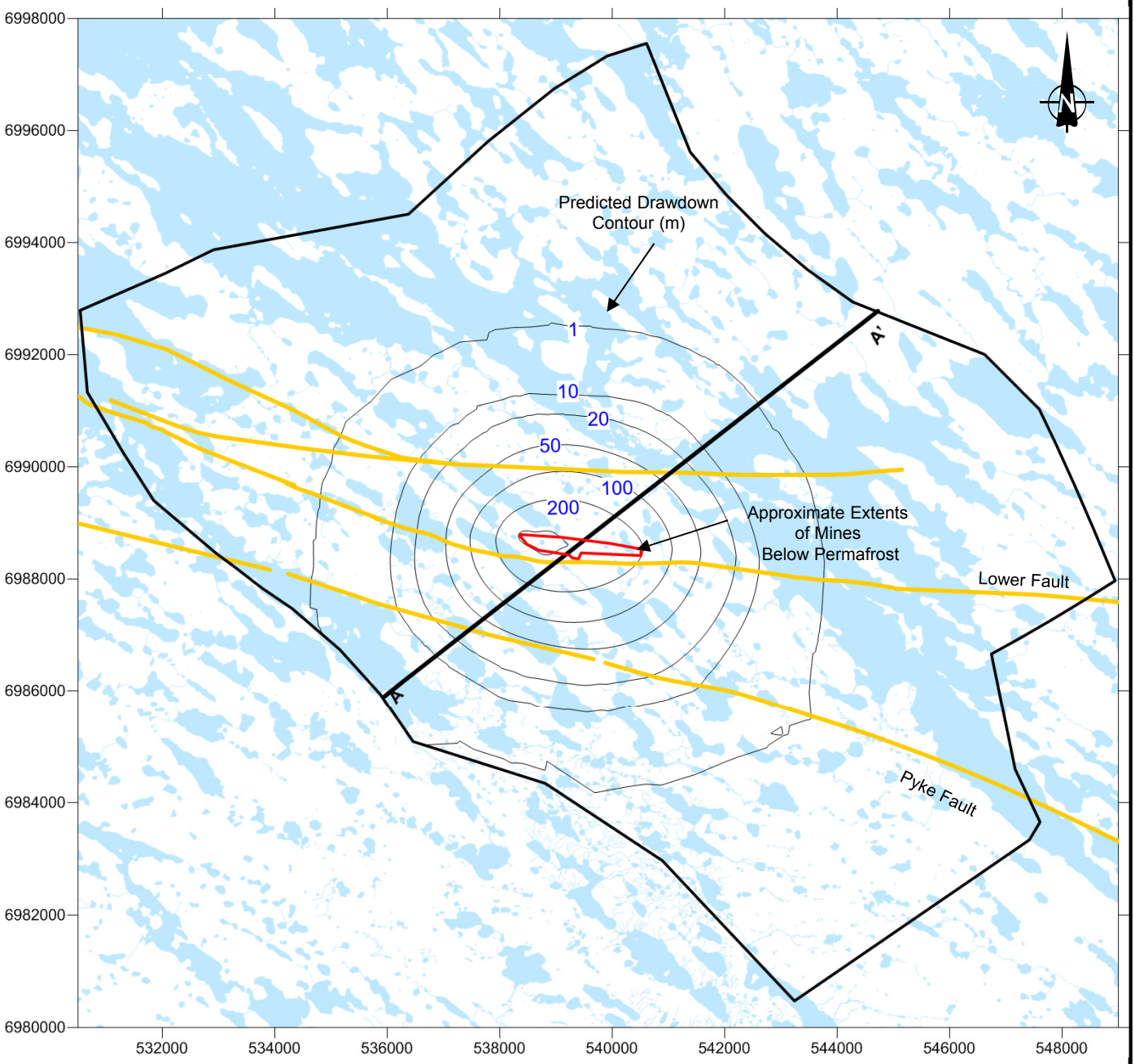
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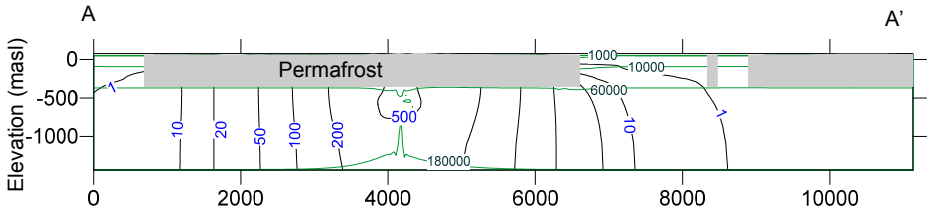
# PREDICTED HYDRAULIC HEADS END OF MINING

Golder Associates

| | | | | |
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| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
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| REVIEW | DC | 2DEC12 | | |

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Notes:

1. Mine extents shown are the surface projection of Underground mine workings below the permafrost
2. Drawdown plotted at -714 m above sea level near the bottom of the proposed underground mine
3. All distances in metres.
   Projection: UTM Zone 15 Datum: NAD 83
4. Drawdown plotted with non-linear contours (1m, 10m, 20m, 50m, 100m, 200m and 500m)

PROJECT

AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

# PREDICTED DRAWDOWN AND TDS END OF MINING

Golder Associates

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| PROJECT No. 09-1426-0015 | | | PHASE No. 3920 | |
| DESIGN | CB | 8MAR10 | SCALE AS SHOWN | REV. |
| CADD | SAM | 1DEC12 | **FIGURE** | |
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| REVIEW | DC | 2DEC12 | | |

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# APPENDIX 7.2-C

## Hydrogeological Testing and Groundwater Sampling Program

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

# Study Limitations

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# 1.0 INTRODUCTION

This document provides a summary of the hydrogeological testing and groundwater sample collection during the 2009 and 2011 field programs at the Meliadine Gold Project of Agnico Eagle Mines Limited (AEM).

# 2.0 2009 HYDROGEOLOGICAL INVESTIGATION PROGRAM

The 2009 hydrogeological field investigation program consisted of the following:

- The drilling of two boreholes – exploration borehole M09-860 and geotechnical borehole GT-19;
- Single-well response testing using pneumatic packer in the two boreholes;
- Installation of a conductivity/temperature probe in M09-860; and
- Collection of a groundwater sample and installation of a thermistor string in borehole GT-19.

The 2009 investigation program was summarized in a technical document: *Golder Associates Ltd., November 6, 2009. Hydrogeologic Investigation Program – Meliadine Project* which is presented in Appendix A. The document presents analysis protocols, laboratory analytical certificates for the groundwater samples and details on the instrumentation installed as part of the 2009 hydrogeological investigation program.

## 2.1 Drilling Program

Geotechnical borehole GT-19 (HQ diameter) was selected for hydrogeological testing, groundwater sample collection and thermistor installation. Exploration borehole M09-860 (NQ diameter) was used for hydrogeological testing and installation of an electrical conductivity/temperature probe. Table 7.2-C1 presents detailed information on the selected test holes.

**Table 7.2-C1: Test Borehole Details**

| Borehole ID# | Easting [m] | Northing [m] | Collar Elevation [masl] | Azimuth | Dip [deg] | End Depth [mbgs][a] |
|---|---|---|---|---|---|---|
| M09-860 | 539054 | 6988790 | 63.69 | 179 | 76[b] | 595.5 |
| GT-19 | 537899 | 6989458 | 63.14 | 325 | 51 | 199.5 |

Notes:

[a]metres along borehole below ground surface.

[b]Start Dip, borehole flattens with increasing depth

## 2.2 Borehole Geology

Table 7.2-C2 and Figure 7.2-C1 present the depth intervals of the main geological contacts intersected by boreholes M09-860 and GT-19. The main geological contacts were estimated using the geotechnical Surpac model developed by Golder from information provided by AEM.

**Table 7.2-C2: Geological Contact**

| Borehole | From [mbgs][a] | To [mbgs][a] | Geology |
|---|---|---|---|
| M09-860 | 0.0 | 445.0 | SAM Formation |
| | 445.0 | 580.0 | Upper Oxide Formation |
| | 580.0 | 595.5 | Wesmeg Formation |
| GT-19 | 0.0 | 199.5 | SAM Formation |

Notes:
[a]metres along borehole below ground surface.

## 2.3 Hydrogeological Testing

The hydrogeological testing program was designed to obtain information on the hydraulic conductivity of the bedrock below the permafrost and within open taliks. Table 7.2-C3 and Figure 7.2-C1 present a summary of the tests carried out in the individual boreholes.

**Table 7.2-C3: Summary of Hydraulic Testing**

| Borehole | Test Interval [mbgs][1] | Number of Tests Conducted | Date Testing Started | Date Testing Ended |
|---|---|---|---|---|
| M09-860 | 448.6 to 595.5 | 1 | 04/09/2009 | 04/09/2009 |
| GT-19 | 34.6 to 199.5 | 2 | 07/09/2009 | 12/09/2009 |

Notes:
[a]metres along borehole below ground surface.

### 2.3.1 Hydrogeological Testing Results

A total of three tests were conducted as part of the 2009 program. The hydrogeological testing consisted of four stages: a stabilization phase (PSR); a slug injection (SI) or slug withdrawal (SW); a constant rate injection test (RI) and a constant rate injection recovery (RIR), if necessary. Results were analysed with Hydrobench® (Version 1.0.3) and Interpret 2007®. A summary of the transmissivity and hydraulic conductivity values calculated for the individual test intervals is presented in Table 7.2-C4.

Hydraulic conductivity values were calculated by dividing the transmissivity by the test interval length along the borehole. The table shows the type of tests carried out in each interval, as well as the sequences with the best data record that were selected for analyses.

**Table 7.2-C4: Summary of the Hydrogeologic Testing Results**

| Borehole | Test # | Interval Top [mbgs][a] | Interval Bottom [mbgs][a] | Test Sequences Conducted | Test Sequence Analyzed[b] | Transmissivity [$m^2/s$] | Hydraulic Conductivity [m/s] |
|---|---|---|---|---|---|---|---|
| M09-860 | Test 1 | 448.63 | 595.5 | PSR, RI, RIR | RIR | 5E-7 | 4E-9 |
| GT-19 | Test 1 | 34.62 | 73.5 | PSR, SI, RI, RIR | RI, RIR | 1E-7 | 3E-9 |
| GT-19 | Test 2 | 70.9 | 199.5 | PSR, SW | SW | 2E-7 | 2E-9 |

Notes:
[a] Metres along borehole below ground surface.
[b] Most reliable test phase selected for analysis

The hydraulic conductivity values derived from the single-well pressure response tests based on the depth of the corresponding test intervals below ground surface are presented in Figure 7.2-C1 and Figure 7.2-C3. Detailed

test analytical reports are presented in Appendix A. These reports are computer generated protocols, and some values in these documents might differ from values presented above due to decimal rounding and hydrogeological judgment to select the appropriate transmissivity value.

## 2.4 Groundwater Sampling and Results

A groundwater sample was collected after completion of Test 2 in borehole GT-19. The interval over which the sample was collected was from 70.9 m to the end of the hole at 199.5 m. Laboratory analytical certificates for groundwater samples collected during this study are included in Appendix A.

## 2.5 Instrumentation

### 2.5.1 Electric Conductivity Probe

An electric conductivity probe was installed in borehole M09-860 at a depth of 550 meters below ground surface (along borehole), but failed after 18 hours of operation due to the extreme cold conditions during installation, which resulted in the severing of the cable.

### 2.5.2 Thermistor String

A 200-meter long thermistor string with 12 nodes was installed in borehole GT-19 to obtain a temperature profile along the area surrounding this borehole.

# 3.0 2011 HYDROGEOLOGICAL INVESTIGATION PROGRAM

A single borehole, M11-1257, was drilled as part of the 2011 hydrogeological field investigation program. The borehole was drilled with a diameter of 96 mm (HQ) by Boart Longyear. It was drilled over the month of August 2011 and was completed on August 27, 2011. The field investigation program included the following:

- Single-well response testing using pneumatic packers;
- Installation of Westbay system;
- Collection of groundwater samples from the Westbay system; and
- Response testing of Westbay ports.

Detailed information of the borehole such as collar coordinates, borehole inclination, azimuth and end depth is presented in Table 7.2-C5.

**Table 7.2-C5: Borehole Details**

| Borehole ID | Northing [m][a] | Easting [m][a] | Ground Surface Elevation [masl][b] | Borehole Depth [mab][c] | Average Borehole Azimuth [Degrees°] | Average Borehole Inclination [Degrees°] |
|---|---|---|---|---|---|---|
| M11-1257 | 6988978 | 537630 | 61 | 663 | 179.2 | 76.5 |

Notes:
a = UTM coordinate system – NAD83; Zone 15.
b = metres above sea level.
c = metres along borehole below ground surface.

## 3.1 M11–1257 Geology

Table 7.2-C6 and Figure 7.2-C1 presents the intercepted geology in borehole M11-1257. The core retrieved from this borehole was logged by AEM staff.

**Table 7.2-C6: Geology Intercepted by Borehole M11 – 1257**

| From (mAH) | To(mAH) | Rock Type | Geology |
|---|---|---|---|
| 0 | 11 | Overburden | Overburden |
| 11 | 214.3 | Greywacke | SAM Formation |
| 214.3 | 216 | Lamprophyric Dyke | SAM Formation/Intrusion |
| 216 | 245 | Greywacke | SAM Formation |
| 245 | 260 | Mafic Dyke | SAM Formation/Mafic Intrusion |
| 260 | 290 | Greywacke | SAM Formation |
| 290 | 296 | Mafic Dyke | Sam Formation/Mafic Intrusion |
| 296 | 506 | Greywacke | SAM Formation |
| 506 | 517 | Mafic Dyke | SAM Formation/Mafic Intrusion |
| 517 | 569 | Greywacke | SAM Formation |
| 569 | 586 | Iron Formation | Upper Oxide Formation |
| 586 | 623 | Greywacke & Chloritic Siltstone | |
| 623 | 633 | Siltstone | Tiriganiaq Formation |
| 633 | 663 | Mafic Volcanics | Wesmeg Formation |

## 3.2 Hydrogeological Testing Approach

Single-well pressure response tests were carried out to obtain information on the bulk hydraulic conductivity of the bedrock. The hydrogeological testing mainly targeted the bottom portion of the borehole below the projected permafrost level of 430 m. The hydrogeological testing was conducted using a pneumatic packer tool in a wireline single-packer configuration. The wireline single packer tool consists of two packers connected by a seating cone that keeps one packer inside the core barrel with the second packer extending into the open hole below the core bit. Figure B–1 in Appendix B shows a schematic diagram of the tool assembly. To perform a test, the drill string was pulled up to expose a section of the borehole selected for testing, and the packer tool was lowered on a wireline through the drill string into the borehole. When the packer tool was in position, it was inflated with nitrogen gas isolating the section of the borehole between the lower packer and the bottom of the borehole at that time. This set up allowed a direct connection from surface through the HQ rods drill string to the test interval. To monitor the pressure response during testing in real time a vibrating wire (VW) piezometer connected to a datalogger was lowered in the borehole below the water table. The datalogger was connected to a field laptop computer to display the pressure response of the test interval during testing. The datalogger was programmed to collect data in 5 seconds intervals. In addition to the real time pressure monitoring within the test rods, an autonomous pressure transducer was placed below the packer tool to monitor the pressure response directly in the test interval. This pressure transducer was also set to collect data in 5 second intervals.

### 3.2.1 Hydrogeological Testing Methodology

The following methodology was used for the hydrogeological testing in borehole M11-1257:

- Pressure Static Recovery Sequence – PSR; and
- Slug Injection (SI) or Slug Withdrawal (SW) Sequence.

The following provides a detailed description of the individual test sequences used, data collection, and data analysis.

#### 3.2.1.1 Pressure Static Recovery

The pressure hydrostatic recovery sequence (PSR) was carried out following packer inflation to allow the formation within the isolated interval to reach static conditions. The VW piezometer was lowered inside the test rods below the water table to monitor in real time the pressure response of the formation after packer inflation. The PSR sequence lasted between 30 minutes and 1 hour. After this time, the next test sequence was initiated, even if full hydrostatic conditions were not achieved.

#### 3.2.1.2 Slug Test

After the PSR sequence, a slug injection (SI) or slug withdrawal (SW) test was carried out. This test sequence consists of adding or removing an instantaneous slug of water into/out of the test rods. After the slug displacement, the water level inside the test rods was monitored until it recovered to the pre-test level for a maximum period of 60 minutes. After this time, the test was terminated even if full recovery was not reached.

## 3.3 Test Analysis

## 3.4 Software

The test analyses were carried out with HydroBench® (Version 3.6.2), a Golder internally developed software package designed to analyze different types of hydrogeological tests. HydroBench® is a pressure transient interpretation package using the methodology of the Bourdet Derivative (e.g., Gringarten, 2008), coupled with a library of analytical reservoir models. Further information on the HydroBench® software including a detailed documentation of the verification of the software is available on request.

### 3.4.1 Results

A summary of the transmissivity and hydraulic conductivity values calculated for the tested intervals is presented in Table 7.2-C7 below. The hydraulic conductivity values were calculated by dividing the transmissivity value by the test interval length. The table shows the type of test sequences carried out in each interval such as pressure static recovery (PSR), or slug injection (SI). The test sequence with the most reliable pressure response data set was selected for analyses.

**Table 7.2-C7: Borehole M11-1257 Summary of Test Results**

| Test # | Interval Top [mbgs][a] | Interval Bottom [mbgs][a] | Interval Length [m] | Test Sequences Conducted | Test Sequence Analyzed | T [$m^2/s$][b] | K [m/s][c] |
|---|---|---|---|---|---|---|---|
| Test 1 | 412.2 | 618.0 | 205.8 | PSR, SI | SI | $7 \times 10^{-8}$ | $5 \times 10^{-10}$ |
| Test 2 | 612.2 | 651.0 | 38.8 | PSR, SW | SW | $1 \times 10^{-7}$ | $3 \times 10^{-9}$ |

Notes:
[a]metres along borehole below ground surface.
[b]Transmissivity.
[c]Hydraulic conductivity.

The data collected during the slug test sequence were selected for analysis in both test intervals as the response of this test sequence is viewed to be more reliable than the PSR sequence due to a higher head differential created during the test.

The hydraulic conductivity values derived from the single-well pressure response tests based on the depth of the corresponding test intervals below ground surface are presented in Figure 7.2-C3. Detailed test analytical reports are presented in Appendix C. These reports are computer generated protocols, and some values in these documents might differ from values discussed within the text section of this document due to decimal rounding and hydrogeological judgment to select the appropriate transmissivity value.

## 3.5 Westbay System

Upon completion of drilling, a Westbay multi-level groundwater monitoring system was installed in borehole M11-1257. The Westbay system consists of 38 mm inner diameter schedule 80 PVC pipes; couplers made of the same material are used to connect the PVC pipes. Inflatable packers, monitoring ports and pumping ports form part of the Westbay system and are installed along with the PVC pipes.

The following provides a summary of the Westbay system design and installation, including details of hydrogeological testing and analysis carried out in the Westbay system.

### 3.5.1 Westbay System Design

The Westbay system was designed to distribute sampling intervals along borehole M11-1257 to obtain discrete representative groundwater samples at different depths and geological formations. The sampling intervals were placed below the projected permafrost level present at the site. The Westbay design was based on the geological log provided by AEM.

The Westbay system installed at the Project was designed to monitor 6 discrete intervals along the borehole. A detailed tally was prepared based on the Westbay system design. The tally specified the order of installation of each individual component such as, riser pipe, packers, monitoring ports, pumping ports and magnetic collars.

### 3.5.2 Westbay System Installation

#### *3.5.2.1 Borehole and Materials Preparation*

During the final drilling stage of borehole M11-1257, the drilling fluid was prepared by adding a high concentration of calcium chloride salt ($CaCl_2$) to lake water to form a brine to prevent liquids in the borehole from freezing during the Westbay system installation. In addition, a fluorescent dye tracer (uranine) was added to the drilling fluid at a concentration of approximately 500 ppb. The dye tracer concentration was used during well development to measure the amount of uranine remaining in the extracted water samples for each interval as a quantitative measure to judge the progress of the well development.

According to the Westbay system design, the materials were laid out and prepared between August 27 and August 28, 2011. The preparation included counting and numbering each PVC riser pipe, sampling port, pumping port, and other materials according to the order of installation.

#### *3.5.2.2 Westbay System Installation*

Once borehole preparation was completed, the drill rods were pulled to 420 m (above the estimated permafrost depth). The Westbay system PVC pipe was then lowered into the borehole thorough the drill rods following the

design and order of installation. The PVC pipe string was gradually filled with a mixture of lake water and propylene glycol to overcome buoyancy during the installation process and to prevent freezing of fluids within the pipe. The drill rods were left in place to avoid potential damage of the Westbay system during the retrieval process.

Once all the Westbay system was in place, the Westbay system packers were inflated also with a mixture of propylene glycol and lake water. Records of packer inflation for some of the packers are presented in Figures D-1 through D-5 in Appendix D.

The Westbay system installation started on August 28, 2011 and was completed on August 29, 2011. Table 7.2-C8 below provides sampling interval depths including geological formation being monitored. It should be noted that more monitoring ports were installed than the indicated in Table 7.2-C8. Monitoring ports were installed below each packer to relieve potential incremental pressure from the sample interval during the packer inflation process due to the very low hydraulic conductivity of the rock mass. The water forced out by the packer inflation could not be accommodated by the rock because of its very low hydraulic conductivity, resulting in a rise in the water pressure outside of the Westbay. If necessary, these lower ports were opened to relieve these pressures and prevent damage to the Westbay and/or insufficient packer inflation. Although these monitoring ports can be used for monitoring and groundwater collection; they were not intended for this purpose. In addition, some packers and the corresponding monitoring ports were installed in the permafrost portion of borehole MM11-1257 due to insufficient riser pipe blank sections. Figure 7.2-C2 shows the Westbay system installation details. Table D-1 in Appendix D presents a comprehensive record of installation (As-Built record). Table D-2 presents a summary of the installation depth for magnetic collars, inflatable packers, pumping ports and monitoring ports.

**Table 7.2-C8: Details of Monitoring Well M11-1257 Installation**

| Sample Interval Number | Depth Along Hole | | | Depth Below Ground Surface | | | Geology |
|---|---|---|---|---|---|---|---|
| | From (mAH) | To (mAH) | Magnetic Collar Depth (mAH) | From (mbgs) | To (mbgs) | Magnetic Collar Depth (mbgs) | |
| 1 | 643.5 | 663.0 | 644.1 | 624.5 | 642.1 | 625.0 | Wesmeg Formation |
| 2A | 632.8 | 642.0 | 633.4 | 614.7 | 624.0 | 615.2 | Wesmeg Formation |
| 2 | 619.1 | 631.3 | 619.7 | 602.1 | 613.3 | 602.7 | Tiriganiaq Formation |
| 3 | 588.6 | 600.8 | 589.2 | 573.7 | 585.1 | 574.3 | Upper Oxide |
| 4 | 530.7 | 542.9 | 531.3 | 518.7 | 530.4 | 519.3 | Sam Formation |
| 5 | 457.6 | 469.7 | 458.2 | 448.5 | 460.3 | 449.1 | Sam Formation |

Appendix 7.2-A of FEIS Volume 7 presents a technical memorandum describing the groundwater sampling methodology and results carried out in the Westbay system in 2011.

### 3.5.3 Westbay System Hydrogeological Testing

Single well pressure response tests were carried out in five sampling intervals of the Westbay system to obtain information on the bulk hydraulic conductivity of each interval. The hydrogeological testing was conducted using a sample probe (Mosdax Sampler probe Model 2531) and sampling bottles. The sample probe is fitted with a pressure transducer which allows monitoring the pressure inside the Westbay system and the sample bottles.

To perform a test, a vacuum was applied to sample bottles while on surface. The sample bottles were then attached to the sample probe and the setup was lowered inside the Westbay system. Once the sample probe reached the level of the sample interval, the pressure inside the casing was recorded. The probe was connected to the sample interval via the monitoring port and the formation pressure was monitored and recorded for approximately a five minute period. The sample valve was then opened and the bottles were allowed to fill with groundwater. The pressure was recorded as the sample bottles were being filled until the pressure was similar to the formation pressure prior to opening the sample valve. The total volume of groundwater removed was 1L to 1.25 L corresponding to four to five sampling bottles (1 sample bottle has a volume of 0.25 L). The probe was disconnected from the monitoring port and the sample probe and sample bottles were pulled out of the Westbay system.

#### *3.5.3.1 Westbay System Hydrogeological Testing Analysis*

The test analyses were carried out with HydroBench® (Version 3.6.2), a Golder internally developed software package designed to analyze different types of hydrogeological tests. HydroBench® is a pressure transient interpretation package using the methodology of the Bourdet Derivative (e.g., Gringarten, 2008), coupled with a library of analytical reservoir models. Further information on the HydroBench® software including a detailed documentation of the verification of the software is available on request.

### 3.5.4 Results

A summary of the transmissivity and hydraulic conductivity values calculated for the sample intervals tested is presented in Table 7.2-C9 below. The hydraulic conductivity values were calculated by dividing the transmissivity value by the length of the sample interval.

**Table 7.2-C9: Westbay System Hydrogeological Test Results**

| Test # | Interval Top [mbgs][a] | Interval Bottom [mbgs][a] | Sample Interval Length [m] | T [$m^2/s$][b] | K [m/s][c] |
|---|---|---|---|---|---|
| Sampling Interval 2 | 619.1 | 631.3 | 12.2 | $2 \times 10^{-8}$ | $2 \times 10^{-9}$ |
| Sampling Interval 2A | 632.8 | 642.0 | 10.4 | $1 \times 10^{-8}$ | $1 \times 10^{-9}$ |
| Sampling Interval 3 | 588.6 | 600.8 | 12.2 | $8 \times 10^{-8}$ | $7 \times 10^{-9}$ |
| Sampling Interval 4 | 530.7 | 542.9 | 12.2 | $6 \times 10^{-8}$ | $5 \times 10^{-9}$ |
| Sampling Interval 5 | 457.6 | 469.7 | 12.2 | $3 \times 10^{-8}$ | $3 \times 10^{-9}$ |

Notes:
[a]metres along borehole below ground surface.
[b]Transmissivity.
[c]Hydraulic conductivity.

The hydraulic conductivity values derived from the single-well pressure response tests based on the depth of the corresponding test intervals below ground surface are presented in Figure 7.2-C1 and Figure 7.2-C3. Detailed test analytical reports are presented in Appendix C. These reports are computer generated protocols, and some values in these documents might differ from values discussed within the text section of this document due to decimal rounding and hydrogeological judgment to select the appropriate transmissivity value.

## 4.0 CLOSURE

We trust this document meets your current requirements. Should you require any additional information or require any clarification, please do not hesitate to contact the undersigned.

**GOLDER ASSOCIATES LTD.**

ORIGINAL SIGNED

Ricardo Quevedo, P.Eng. GIT
Geological Engineer

ORIGINAL SIGNED

Don Chorley, M.Sc., P.Geo.
Principal

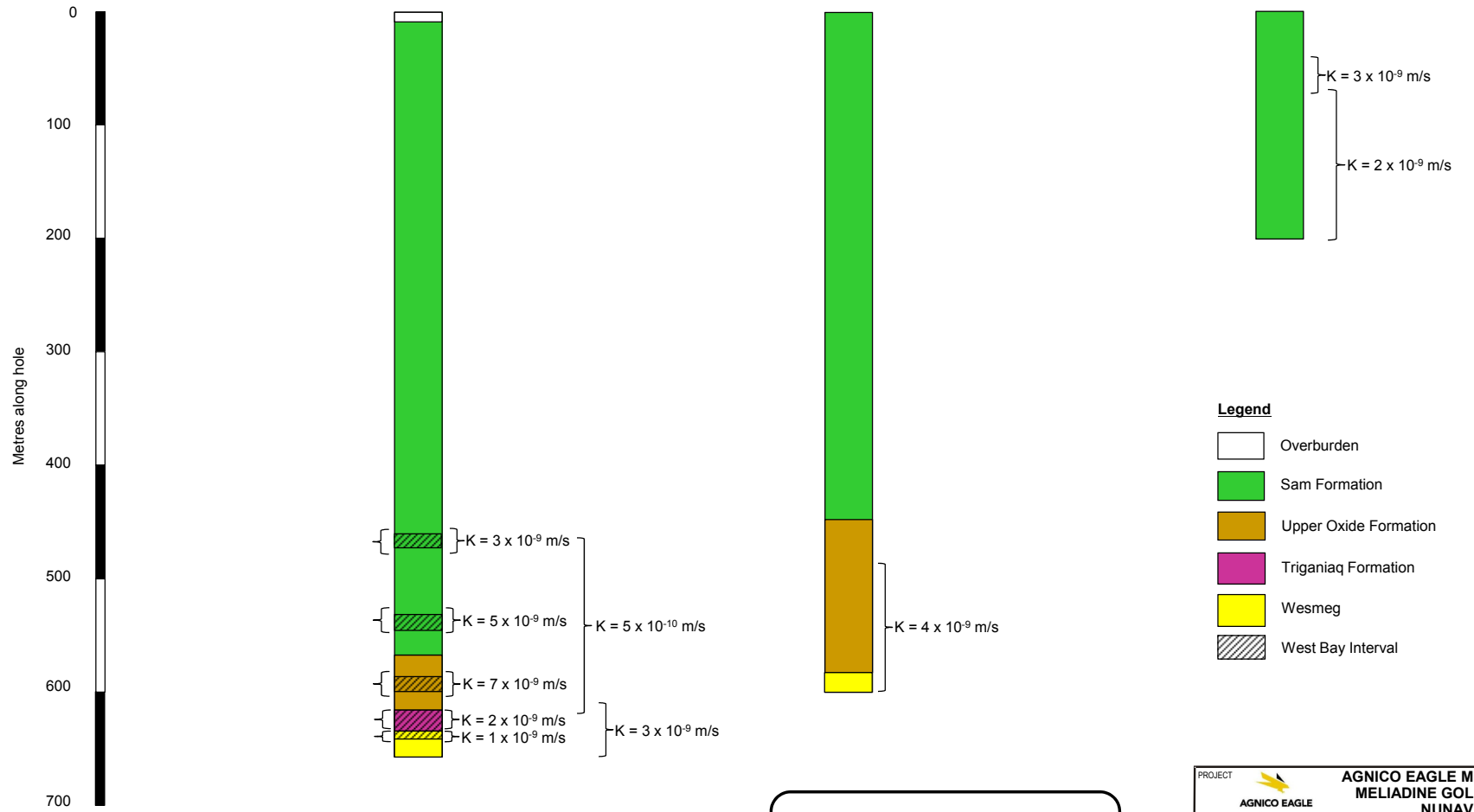
RQ/DC/rs/md/lw

o:\final\2013\1428\13-1428-0007\feis ver 0\vol 7\app 7.2-c\doc 436-1314280007 0319_14 app 7.2-c hydrog test gw smplg prgrm-mel ver 0.docx

## REFERENCE

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Not to Scale
Schematic Only

PROJECT: AGNICO EAGLE

**AGNICO EAGLE MINES LIMITED**
**MELIADINE GOLD PROJECT**
**NUNAVUT**

TITLE

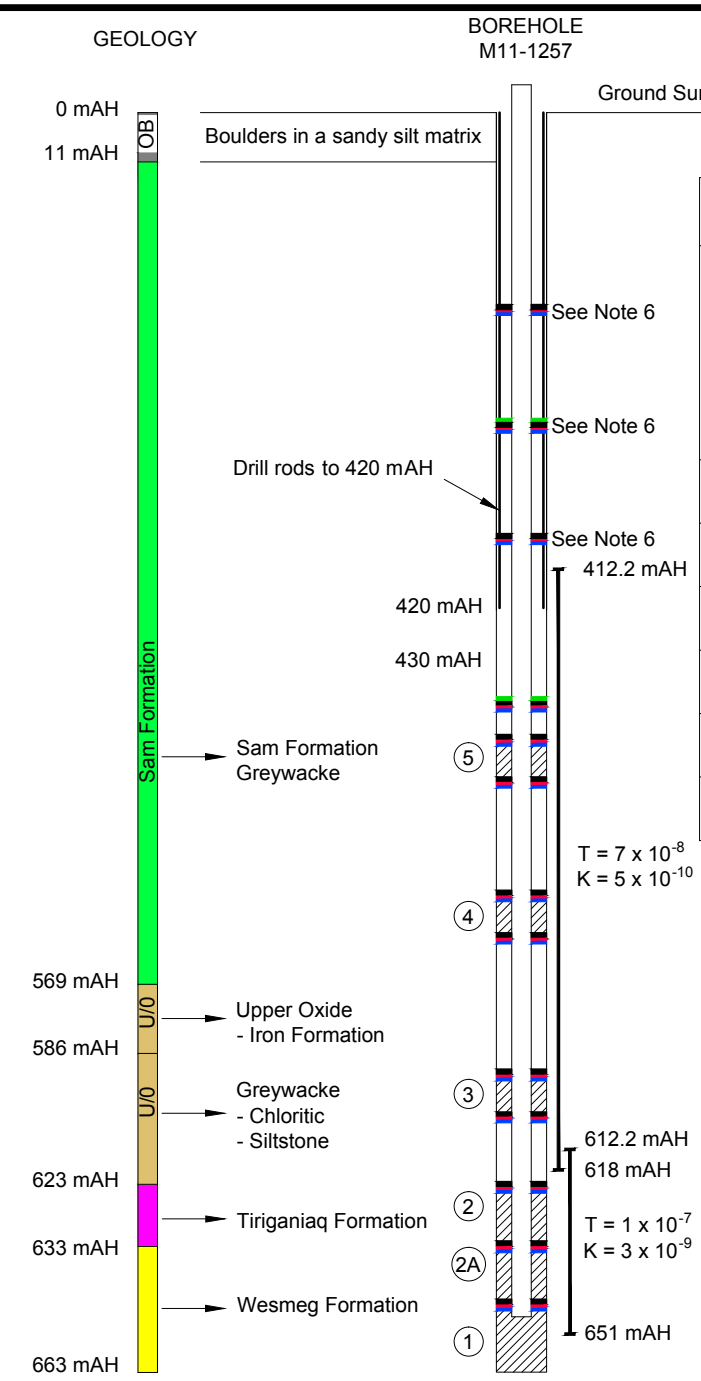
# HYDROGEOLOGICAL AND GEOLOGICAL RESULTS SUMMARY

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | NF | 01JAN14 | SCALE NTS | REV. |
| CADD | NF | 01JAN14 | | |
| CHECK | RQ | 30JAN14 | | |
| REVIEW | RQ | 30JAN14 | | |

**FIGURE 7.2-C1**

FILE: O:\Active_2008\1221 - Montréal\09-1221-3012\4000 - Temp. Shaft Support and Liner Design\SHAFT SUPPORT TO 600m DEPTH\REPORT\DRAFT REPORT\Landscape Figures for report_KLB_20 JAN 2009.ppt




SAMPLE INTERVAL DETAILS

| Sample Interval Number | Depth Along Hole | | | Vertical Depth | | | Rock Formation |
|---|---|---|---|---|---|---|---|
| | From (mAH) | To (mAH) | Magnetic Collar Depth (mAH) | From (mbgs) | To (mbgs) | Magnetic Collar Vertical Depth (mbgs) | |
| 1 | 643.5 | 663.0 | 644.1 | 624.5 | 642.1 | 625.0 | Wesmeg Formation |
| 2A | 632.8 | 642.0 | 633.4 | 614.7 | 624.0 | 615.2 | Wesmeg Formation |
| 2 | 619.1 | 631.3 | 619.7 | 602.1 | 613.3 | 602.7 | Tiriganiaq Formation |
| 3 | 588.6 | 600.8 | 589.2 | 573.7 | 585.1 | 574.3 | Upper Oxide |
| 4 | 530.7 | 542.9 | 531.3 | 518.7 | 530.4 | 519.3 | Sam Formation |
| 5 | 457.6 | 469.7 | 458.2 | 448.5 | 460.3 | 449.1 | Sam Formation |

**NOT TO SCALE**
**SCHEMATIC ONLY**

## LEGEND

- PACKERS
- MAGNETIC COLLARS (MC)
- MONITORING PORTS (MP)
- PUMPING PORTS (PP)
- (1) SAMPLE INTERVAL
- K = HYDRAULIC CONDUCTIVITY (m/s)
- T = TRANSMISSIVITY (m/s²)
- U/O UPPER OXIDE
- OB OVERBURDEN
- mAH METERS ALONG HOLE
- mbgs METERS BELOW GROUND SURFACE

## REFERENCE

GEOLOGY AS PER AGNICO EAGLE E-MAIL
DATED: SEPTEMBER 01, 2011.

## NOTES

1. PERMAFROST ASSUMED 430 m ALONG HOLE ALIGNMENT
2. DRILL RODS TO 420 m ALONG HOLE
3. NOT ALL MP AND MC INSTALLED ARE SHOWN FOR SIMPLICITY PURPOSES.
4. BOREHOLE LOCATED IN UTM ZONE 15 NAD 83 AT N 6988978, E 537630. ELEVATION 10061m.
5. INCLINATION VARIES FROM -88.5° AT COLLAR TO 70.5° AT END OF HOLE.
6. PACKERS AND THE CORRESPONDING MONITORING PORTS WERE NOT PLANNED BUT INSTALLED DUE TO INSUFFICIENT QUANTITIES OF BLANK CASING.

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

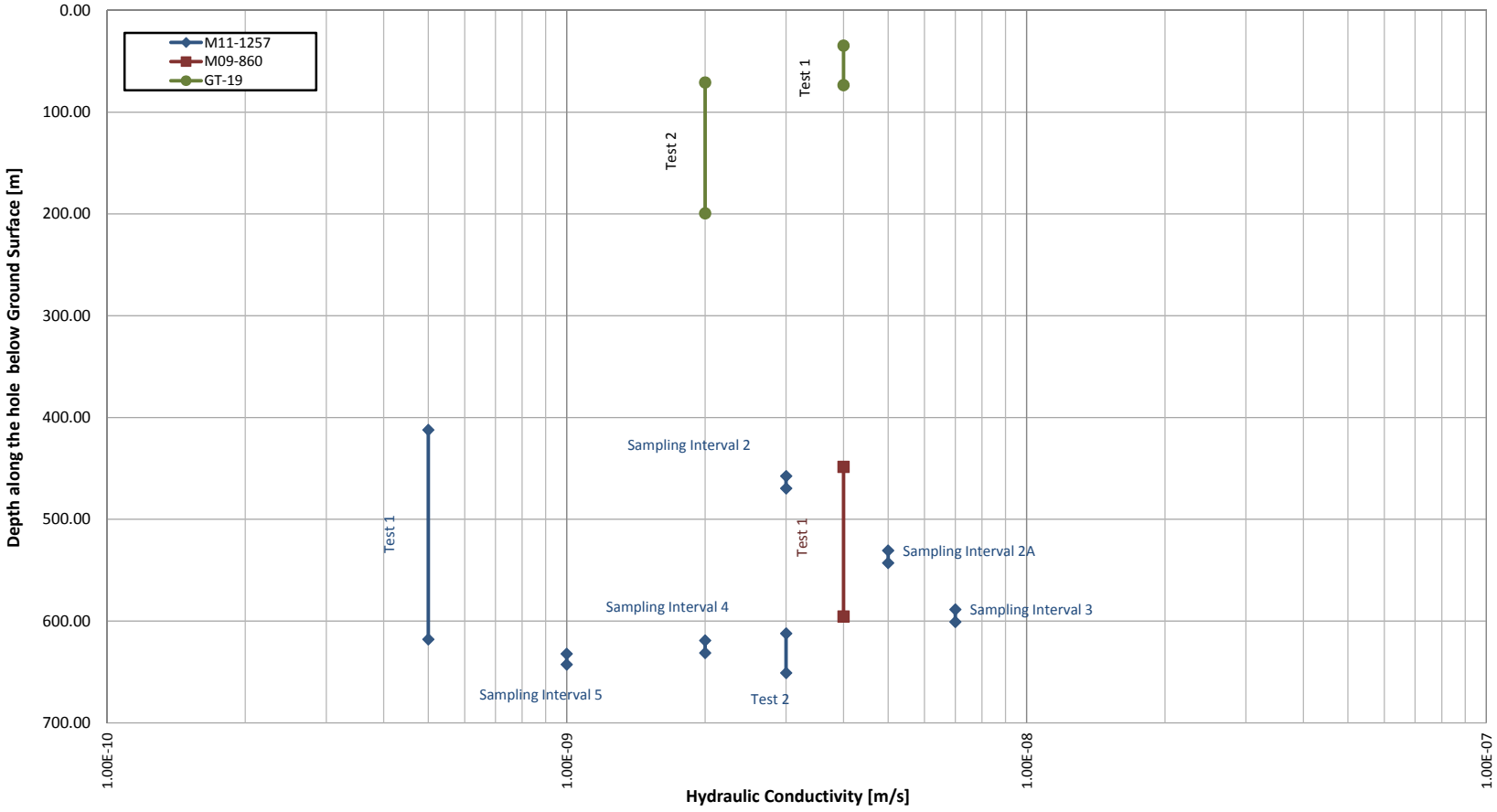
TITLE
# MONITORING WELL WESTBAY M11-1257 INSTALLATION DETAILS

Golder Associates
Greater Vancouver Office, BC

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. | 7000-7300 | |
| DESIGN | RQ | 08SEP11 | SCALE | AS SHOWN | REV. 0 |
| CADD | NS | 09SEP11 | | | |
| CHECK | AS | 25JAN12 | | | |
| REVIEW | RQ | 07FEB14 | | | |

**FIGURE 7.2-C2**

Drawing File: N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\CAD\PHASE 7000\TASK 7300\FIGURE\13-1428-0007-7000-7300-02a.dwg Friday, February 07, 2014 12:56:02 PM By: TYKlassen




PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE: 2009 and 2011 HYDRAULIC CONDUCTIVITY RESULTS SUMMARY

| | | | | |
|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | NF | 01JAN14 | SCALE NTS | REV. |
| CADD | NF | 01JAN14 | | |
| CHECK | RQ | 30JAN14 | FIGURE 7.2-C3 | |
| REVIEW | RQ | 30JAN14 | | |

Golder Associates

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# APPENDIX A

## 2009 Hydrogeological Report

# TECHNICAL MEMORANDUM

| | | | |
|---|---|---|---|
| **DATE** | November 6, 2009 | **PROJECT No.** | 09-1426-0015/3910<br>Doc. No. 039 Ver. 0 |
| **TO** | Mr. Mark Balog and Mr. John Witteman<br>Comaplex Minerals Corp. | | |
| **CC** | Mr. Tom Morrison; Mr. Doug Dumka; Mr. John Hull; Mr. Darren Kennard; Mr. Ben Wickland | | |
| **FROM** | Marc Pesendorfer; John Wozniewiz; Mike Dobr; Valerie Bertrand | **EMAIL** | mpesendorfer@golder.com |

**HYDROGEOLOGIC INVESTIGATION PROGRAM - MELIADINE PROJECT**

The following document presents a summary of the hydrogeological field investigations carried out at Comaplex Minerals Corporation's Meliadine Gold Project site between September 3 and September 13, 2009.

## 1.0 INTRODUCTION

Golder Associates has been retained by Comaplex Minerals Corp. (Comaplex) to undertake a hydrogeological testing program in support of geotechnical and environmental investigations currently being conducted at the Meliadine Project located in Nunavut, Canada. The scope of work of the hydrogeological investigations is presented in Section 2 of this report. Details of the drilling program are described in Section 3, and the hydrogeologic investigations are presented in Sections 4, 5 and 6.

## 2.0 SCOPE OF WORK

The scope of work of the hydrogeological investigations included the following activities:

- Single-well response testing in two boreholes.
- Installation of an electrical conductivity probe in a selected borehole.
- Collection of a groundwater sample from a selected borehole.
- Installation of a thermistor in a selected borehole.

Pneumatic packers were used to carry out single-well response tests in exploration borehole M09-860 and geotechnical borehole GT-19. A conductivity/temperature probe was installed in M09-860, and a groundwater sample was collected from the GT-19 borehole.

## 3.0 DRILLING PROGRAM

One exploration borehole and one geotechnical borehole were selected for hydrogeological testing. The geotechnical borehole GT-19 (HQ-3 diameter) was selected for hydrogeologic testing, groundwater sample collection and thermistor installation. The exploration borehole M09-860 (NQ diameter) was used for hydrogeologic testing and installation of an electrical conductivity/temperature probe. Table 1 presents detailed information on the selected test holes.

**Table 1: Borehole Details**

| Borehole ID# | Easting [m] | Northing [m] | Collar Elevation [masl] | Azimuth | Dip [deg] | End Depth [mbgs][1)] |
|---|---|---|---|---|---|---|
| M09-860 | 539054 | 6988790 | 63.69 | 179 | 76[2)] | 595.5 |
| GT-19 | 537899 | 6989458 | 63.14 | 325 | 51 | 199.5 |

Notes: [1)] Measured along borehole [2)] Start Dip, borehole flattens with increasing depth

## 4.0 HYDROGEOLOGICAL TESTING

The hydrogeological testing program was designed to obtain information on the hydraulic conductivity of the bedrock below the permafrost and within an open talik, which were required in support of the geotechnical and environmental programs for the project. The testing program included single-well response tests carried out in two cored boreholes.

### 4.1 Single Well Pressure Response Testing

Single-well response testing with pneumatic packers was carried out in 2 boreholes described in Section 3 of this document. A single packer tool was used to isolate sections within each borehole to obtain bulk hydraulic parameters for the individual test intervals. With a single packer tool set-up the upper boundary of a test interval is determined by the position of the packer. The bottom boundary of the test interval corresponds to the bottom of the test hole at the time of the test. Two different equipment arrangements were used:

- Single packer wireline tool; and
- Single packer tool on dedicated BQ rods.

A single wireline packer setup consists of two packers connected by a seating cone. The tool is suspended into the borehole on a wireline through the drill string until the seating cone reaches the core bit. This assembly places one packer inside the core barrel and the second in the open borehole below the core bit. The schematic diagram of a wireline tool is shown in Figure 1. A single packer tool on dedicated BQ rods consists of one packer that is lowered into an open borehole to the designated test depth on dedicated BQ rods. Figure 2 presents the tool setup.

To perform a hydrogeologic test, the drill string was lifted to expose a section of the borehole selected for testing, and the tool was lowered into the borehole. When the equipment was in place, the packers were inflated with nitrogen, isolating the section of the borehole between the lower packer and the bottom of the borehole at that time. After completion of the test, the packers were deflated and removed from the borehole. The length of the test interval in borehole M09-860 was 146.87 meters. The two test intervals in borehole GT-19 were 38.88 and 128.60 meters long. Because of the presence of permafrost, the boreholes were flushed with brine for approximately 2 hours prior to testing to prevent freezing of the drilling rods. To further limit the possibility of freezing of the rods, the test duration was limited to maximum 3 hours, including lowering and recovering of the tool.

The recovered core and geological logs were reviewed to identify possible conductive zones intercepted by the selected test holes. The individual hydrogeologic test intervals were designed to isolate the target zones identified as part of the review to determine hydraulic parameters of these features. Also, a packer seat for each test was selected to ensure the packer is not placed over a fractured zone that could damage the tool or cause a packer bypass.

The testing was carried out with H-size (96 mm) and N-Size (76 mm) pneumatic packers manufactured by RST Instruments Inc., Canada. Golder provided the following hydrogeologic testing equipment:

- N-size packers (3x).
- H-size packers (2x).
- Packer inflation line.
- High-pressure regulator.
- Surface-injection control valves.
- Flowmeter.
- Pressure Transducers and Data Loggers (Calibration sheets are presented in Appendix A).
- Water level meter.

Comaplex provided nitrogen gas for packer inflation and a pump for constant rate injection (rig pump).

A total of 3 hydrogeologic tests were carried out in 2 boreholes as part of the testing program. Table 2 presents a summary of the program. Information on the test methodology, data collection, and data analyses are presented below. A detailed hydrogeologic testing protocol is presented in Appendix B.

**Table 2: Summary of Single Well Pressure Response Tests**

| Borehole ID# | Tested Interval [m] [1)] | Number of Tests Performed | Number of Tests Analysed | Test Date |
|---|---|---|---|---|
| M09-860 | 448.63 – 595.5 | 1 | 1 | 04 Sept 2009 |
| GT-19 | 34.62 – 73.5 | 1 | 1 | 07 Sept 2009 |
| GT-19 | 70.90 – 199.5 | 1 | 1 | 12 Sept 2009 |

Notes: [1)] meters along borehole

## 4.2 Testing Procedures

The following presents the general testing procedures applied at the Meliadine Project:

- Inflate Packers – INF.
- Measure water level inside the test rods with manual water level meter.
- Pressure Static Recovery Phase – PSR.
- Slug Withdrawal or Slug Injection Phase – SW or SI.
- Constant Rate Injection Phase – RI.
- Constant Rate Injection Recovery Phase – RIR.
- Deflate Packers – DEF.

The individual phases of the hydraulic conductivity tests (SI, SW, RI and RIR) are described below. To prevent freezing of the rods and the testing equipment, the test length was kept to a minimum.

### 4.2.1 Pressure Static Recovery (PSR)

After packer inflation, a PSR phase was performed for 15 minutes to let the formation recover to static pressure. Due to limited time available because of potential for freezing of the borehole, the PSR phase was terminated after 15 minutes although the formation pressure did not reach the static level.

### 4.2.2 Slug Withdrawal (SW) / Slug Injection Test (SI)

A slug withdrawal / Injection test was carried out in two of the test intervals after a static pressure recovery phase was completed. This test method consisted of removing or adding an instantaneous slug of water from inside the test rods. Following the slug removal or injection the water level inside the rods was monitored until it recovered to the pre-test level. If the water level fully recovered within a 30 minute period the slug test was

followed by a constant rate injection test. If full recovery was not reached within 30 minutes, the test was carried out for another 30 minutes or longer if the risk of freezing was considered to be low. A slug ingestion test was conducted in the GT-19 Test-1, and a slug withdrawal test was carried out in the GT-19 Test-2 interval.

### 4.2.3 Constant Rate Injection Test (RI) and Recovery (RIR)

A water injection set-up including a pump, flow control panel with a flowmeter and a pressure transducer, and an injection header/stuffing box that connects the assembly to the top of the test rods is required to perform the constant rate injection test. The test consisted of injecting water into the test interval at a constant rate for a minimum of 20 minutes. After the pump was turned off at the end of the injection period, the water level recovery inside the test rods was monitored and recorded until it reached the pre-test level. Flow rate and injection pressure were recorded during the test with the surface monitoring equipment. The downhole memory gauge that is attached to the packer setup records the pressure changes inside the test interval during the test. Constant rate injection and a constant rate injection recovery tests were conducted in M09-860 and in the GT-19 Test-2 test intervals.

## 4.3 Analysis

### 4.3.1 Methodology

The analyses of two tests (GT-19 Test 1 and GT-19 Test 2) were carried out with HydroBench® (Version 1.0.3), an internally-developed software package designed to analyse different types of hydrogeological tests. HydroBench® allows for the analysis of constant rate, variable rate, constant head, pulse, and slug tests. Multi-step superposition is available (*e.g.,* a recovery phase following a variable rate period). The software also includes the deconvolution approach to analyse slug and pulse test data (*Chakrabarty and Enachescu 1997*). Both homogeneous and composite flow models may be used to interpret the data, and the flow geometry may also be matched to infer the local connectivity of a fracture network. HydroBench® also includes the derivative of pressure (*i.e.*, rate of pressure change) with respect to the natural logarithm of time (*e.g., Gringarten, 2008)* that has shown to significantly improve the diagnostic and quantitative analysis of slug tests and constant-rate pumping tests (*Spane and Wurstner, 1993*). Transmissivity normalised plots (*Enachescu et al., 2004*) are included in the software package and allow comparing different phases of a hydrogeological test by normalising the pressure response.

The analysis of the test conducted in borehole M09-860 (Test 1) were carried out with Interpret2007®. This software is based on the same principals as HydroBench®, but offers more aquifer models.

### 4.3.2 Results

The test results (transmissivity and hydraulic conductivity) calculated for the individual test intervals are presented in the table below. The table indicates which phase of the test was analysed such as: Pressure Static Recovery (PSR), Slug Injection (SI), Slug Withdrawal (SW), Constant Rate Injection (RI, multiple phases are indicated with a number), Constant Rate Injection Recovery (RIR).

**Table 3: Summary of the Hydrogeologic Testing Results**

| Borehole | Test # | Interval Top [mbgs] [1)] | Interval Bottom [mbgs] [1)] | Test Phases Cond. | Test Phases Analysed [2)] | Transmissivity [$m^2/s$] | Hydraulic Conductivity [m/s] |
|---|---|---|---|---|---|---|---|
| M09-860 | Test 1 | 448.63 | 595.5 | PSR, RI, RIR | RIR | 5E-7 | 4E-9 |
| GT-19 | Test 1 | 34.62 | 73.5 | PSR, SI, RI,RIR | RI, RIR | 1E-7 | 3E-9 |
| GT-19 | Test 2 | 70.9 | 199.5 | PSR, SW | SW | 2E-7 | 2E-9 |

Notes: [1)] All distances along borehole [2)] Most reliable test phase selected for analysis

A compilation of the hydraulic conductivity values derived from the single-well response tests during the 2009 field program based on the test elevation is presented in Figure 3. Figure 4 presents the test results based on the test depth below collar elevation of the borehole. Detailed analysis results are presented in Appendix C.

## 5.0 GROUNDWATER SAMPLING

After completion of the Test 2 in borehole GT-19, a groundwater sample was collected. The interval over which the sample was collected was from 70.9 m to the end of the hole at 199.5 m.

### 5.1 Well Development and Sampling Procedure

Based on the results obtained during the hydrogeological test it was decided to use a swabbing tool to develop the sampling interval. The swabbing tool was attached to the overshot and lowered on wireline into in the BQ test rods until it reached the top of the inflated packer. After that the driller pulls the swab tool with the wireline back to surface bringing a slug of water above the tool out of the rods (similar to a Slug withdrawal test). One trip of the tool down and back up is referred as a “Swab Cycle”. To prevent freezing of the BQ test rods, the annular space outside of the rods was continuously flushed with warm (50 $^{o}$C) water. The warm water was injected through a ¼” PVC tremmie pipe that was attached to the BQ rods at 21 meters below ground surface.

Swabbing started at 16:50 on 10/09/2009 and ended at 14:00 on 12/0902009. Initially, a swab cycle was conducted every 2 hours to prevent overstressing the formation. As the interval was being developed the time interval between the swab cycles was being gradually reduced to 1 hour, 45 minutes and 30 minutes. In total, 62 swab cycles were conducted, removing a total of approximately 3,700 litres of water from the interval. One interval volume (128.6 m/ HQ borehole) was calculated to be 930 litres; therefore the volume of water removed from the borehole corresponds to approximately 4 interval volumes.

Temperature, Conductivity, and pH parameters of the groundwater recovered by each swab were continuously monitored. However, the temperature measurements do not represent the true water temperature of the formation because the water was being moved through the BQ rods that were being heated up from outside by the circulated warm water. Figure 5 presents the water parameters measured during the swabbing, and the Figure 6 presents the downhole pressure response during the swabbing cycles.

For comparison with the data obtained from the sampling interval the same parameters were also monitored in the heated water being used for circulation in the borehole annulus above the packer, brine used for borehole conditioning prior to testing, and the lake water. A summary of the results is presented in Table 4.

**Table 4: Water Parameters**

| Fluid Type | Date and Time | pH | El. Conductivity [mS/cm] | Temperature [$^{o}$C] |
|---|---|---|---|---|
| Water circulating in the upper 20 m of borehole annulus | 11/09/2009 16:55 | 7.8 | 2.3 | 48 |
| Brine injected into borehole for conditioning | 10/09/2009 07:20 | 9 | 98.3 | 44.3 |
| Brine returning out of the borehole | 10/09/2009 07:20 | 8.1 | 1.68 | 22.5 |
| Lake Water | 11/09/2009 16:55 | 8.9 | 0.17 | 8.7 |

Following the development a water sample was collected and sent to ALS Laboratory in Edmonton for chemical analysis. The detailed sampling protocol is presented in Appendix B as part of the hydrogeologic testing protocol of borehole GT-19. After obtaining the water sample, the packer was deflated and the tool was removed from the borehole.

## 5.2 Groundwater Chemistry Results

Laboratory analytical certificates for groundwater samples obtained during this study are included in Appendix D. The concentration of metals in groundwater is generally low, while the concentration of major ions, principally calcium, sodium, chloride and corresponding electrical conductivity and total dissolved solids (TDS) are significantly higher than in the lake water used as drilling fluid. The occurrence of major ions may be attributable, at least in part, to the natural sodium-calcium-chloride salinity of the bedrock aquifer (Clark et al, 2000; Clark and Fritz, 1997; Séguin, 1995; Frappe and Fritz, 1987) but may also include traces of the calcium-chloride used as an additive to the drill water to prevent freezing. The concentration of sodium is likely attributed to the natural salinity of deep bedrock groundwater since it is present only in trace amounts (<2%) in the calcium-chloride drilling brine used to flush the borehole prior to hydrologic testing (DowFlake product MSDS). The relative contribution to salinity from each source and the degree of groundwater dilution with drilling water is uncertain at this time. A detailed study of talik water chemistry is beyond the scope of this study.

The natural salinity of deep bedrock groundwater will contribute to the chemical load of mine site waters. Salinity components could require attenuation (treatment) before discharge or re-use in the mill process depending on the volume of deep bedrock groundwater intercepted during mining and its relative contribution to the overall site water balance.

# 6.0 INSTRUMENTATION

## 6.1 Electric Conductivity Probe

After completing hydrogeologic testing in borehole M09-860, the borehole was conditioned with brine for 2 hours and all drill rods were removed from the borehole. An electric conductivity – temperature probe (AquaTroll 100) manufactured by In-Situ Inc was lowered on a cable to a depth of 550 meters (along borehole). The calibration sheets for the probe are presented in Appendix A. Installation of the probe started at 21:20 on 05/09/2009, and was completed at 23:20 on 05/09/2009. The internal data logger was started at 00:00 on 06/09/2009, and the logging interval was set to 6 hours. Initially, the probe was programmed to read Temperature channel only because the most up to date software required to program the other channels was unavailable.

At 15:05 on 07/09/2009 the probe was downloaded and reprogrammed to collect temperature and electric conductivity data. The downloaded data showed a temperature of approximately 1.1 $^{o}$C until 18:00 on 06/09/2009. After that, the temperature values started fluctuating and are not representative of the actual groundwater condition (*e.g.,* 26 $^{o}$C at 06:00 on 07/09/2009). At 07:28 on 09/09/2009 the probe was read and the values, both temperature and electrical conductivity, were showing changes between the individual readings suggesting that the environment had not yet reached steady-state conditions. The next attempt to download the data was made at 15:30 on 10/09/2009, but no connection with the probe could be established. Another attempt at 15:00 on 12/09/2009 provided the same results.

Although preliminary data were collected it can not be relied upon to establish trends in the equilibration of the deep groundwater regime upon the completion of drilling due to the failure of the probe under the extreme conditions of installation.

## 6.2 Thermistor String

After obtaining the water sample form borehole GT-19, all drill rods were removed and a 200 m long string with 12 thermistor nodes was installed in the borehole. The thermistor cable was attached to the outside of a PVC pipe and lowered in the borehole. After installation, the borehole was backfilled with sand. It was calculated that 7 bags of sand will be required to fill the hole, but only 4 bags were used suggesting that the sand fill bridged above the bottom of the hole. Thermistor installation was completed on 13/09/2009.

Installation details of the thermistor string, and the initial temperature readings are presented in a separate document.

# 7.0 SUMMARY

- Hydrogeological tests were carried out in two boreholes (M09-860 and GT-19).
- Three successful hydrogeologic tests were conducted.
- The test intervals varied from 38.9 to 147.9 meters in length.
- The calculated hydraulic conductivites ranged between 2E-9 m/s and 4E-9 m/s.

- An electric conductivity probe was installed in borehole M09-860 at a depth of 550 meters below ground surface (along borehole), but failed after 18 hours of operation.
- A 200 meter long thermistor string with 12 nodes was installed in borehole GT-19.
- A groundwater sample was obtained from borehole GT-19 from an interval 70.9 m and 199.5 meters (along borehole).
- The groundwater sample exhibits sodium-calcium-chloride salinity. The relative contribution to salinity from each source and the degree of groundwater dilution with drilling water is uncertain (removed bit), and so the true salinity of the deep bedrock groundwater also remains uncertain at this time. A detailed study of talik water chemistry is beyond the scope of this study.

**GOLDER ASSOCIATES LTD.**

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Principal

MP/MD/ja/mrb

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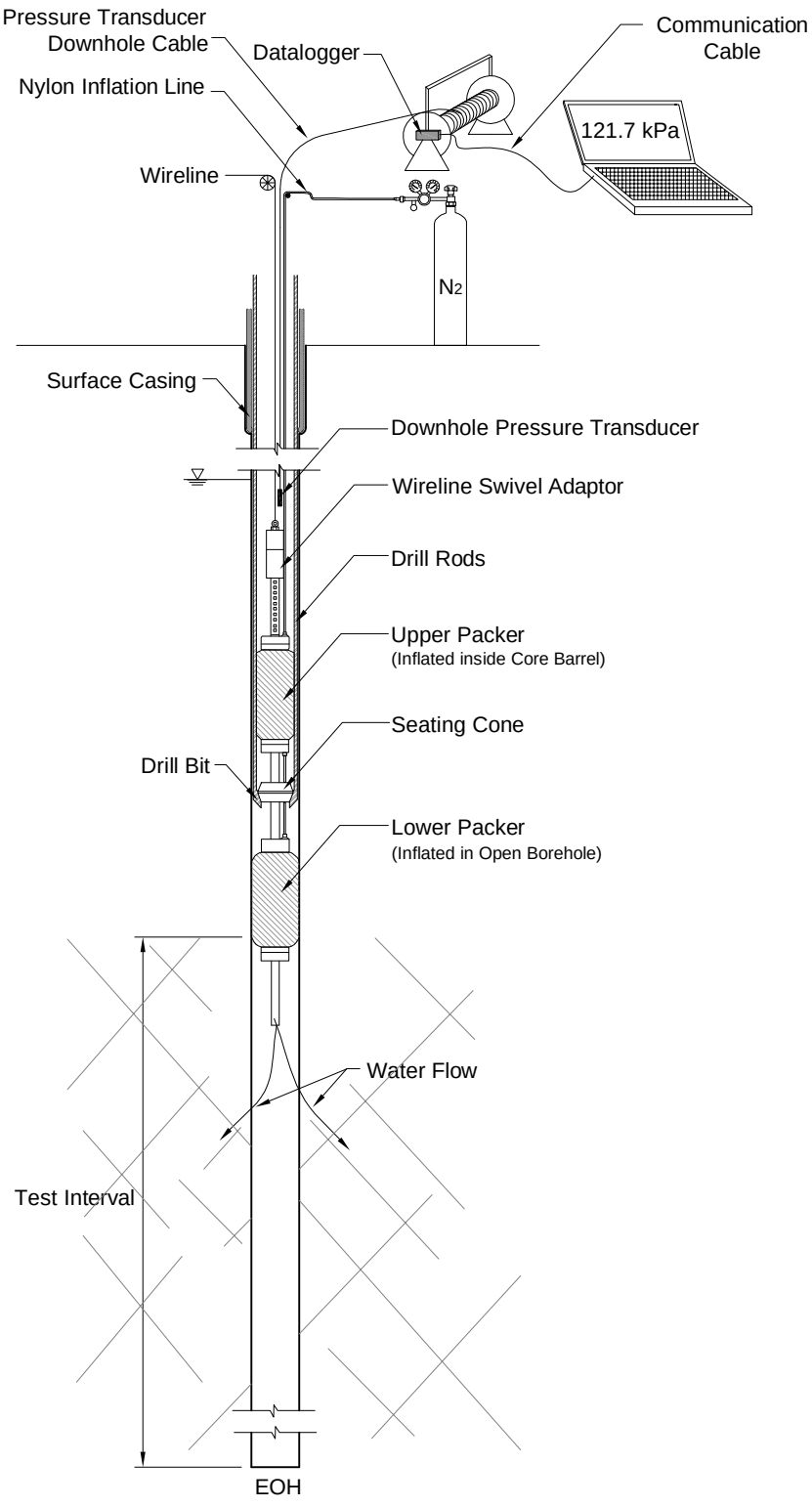
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PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

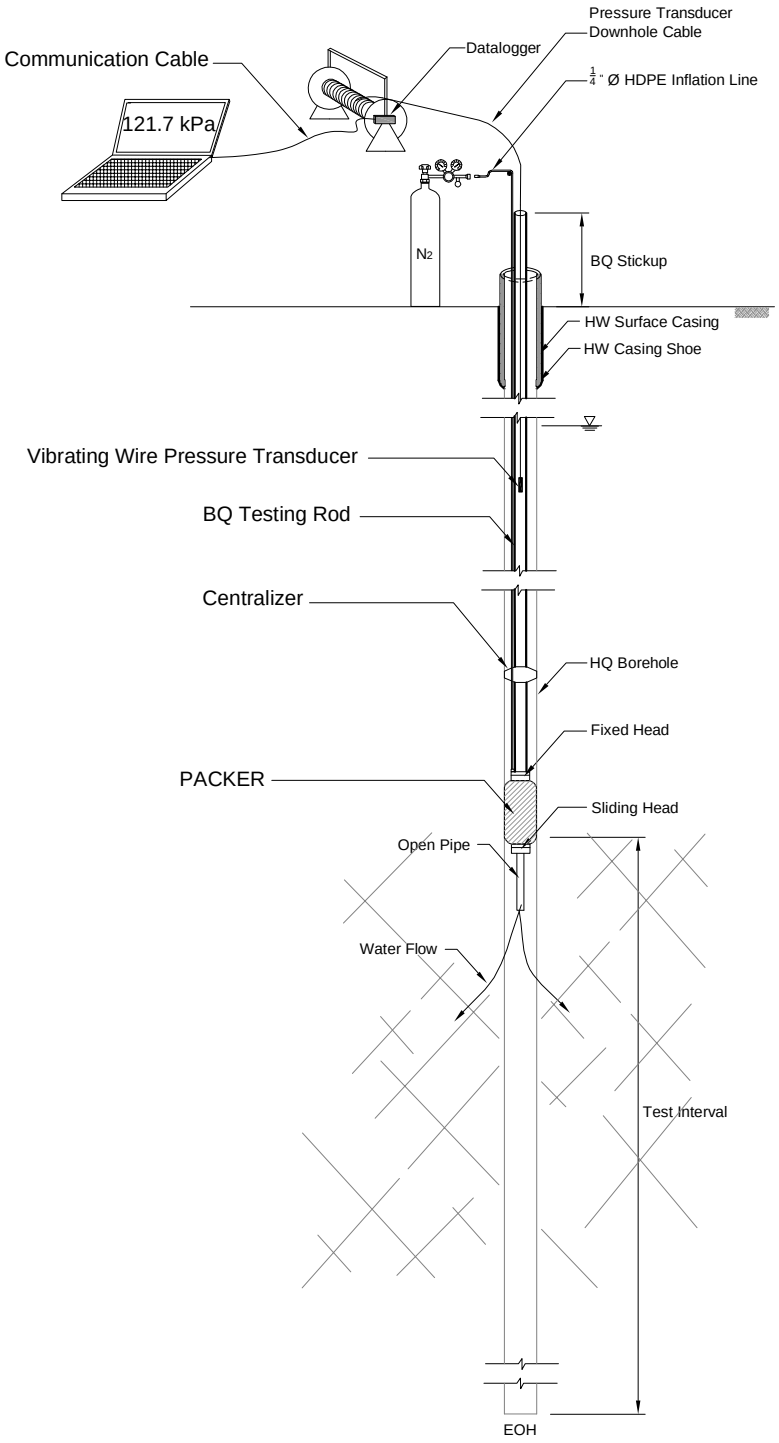
# SINGLE PACKER WIRELINE DOWNHOLE ASSEMBLY - SCHEMATIC

Golder Associates
Greater Vancouver Office, BC

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. 09-1426-0015 | | | PHASE No. | 3910-5000 | |
| DESIGN | DV | 02OCT09 | SCALE | NTS | REV. – |
| CADD | DV | 02OCT09 | | | |
| CHECK | | | | | |
| REVIEW | | | | | |

**FIGURE 1**

Drawing File: N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\Drafting\3910\0914260015-3910-A_01.dwg September 17, 2009 By: ggorczynski




# SINGLE PACKER ON DEDICATED RODS DOWNHOLE TOOL

NOT TO SCALE

PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

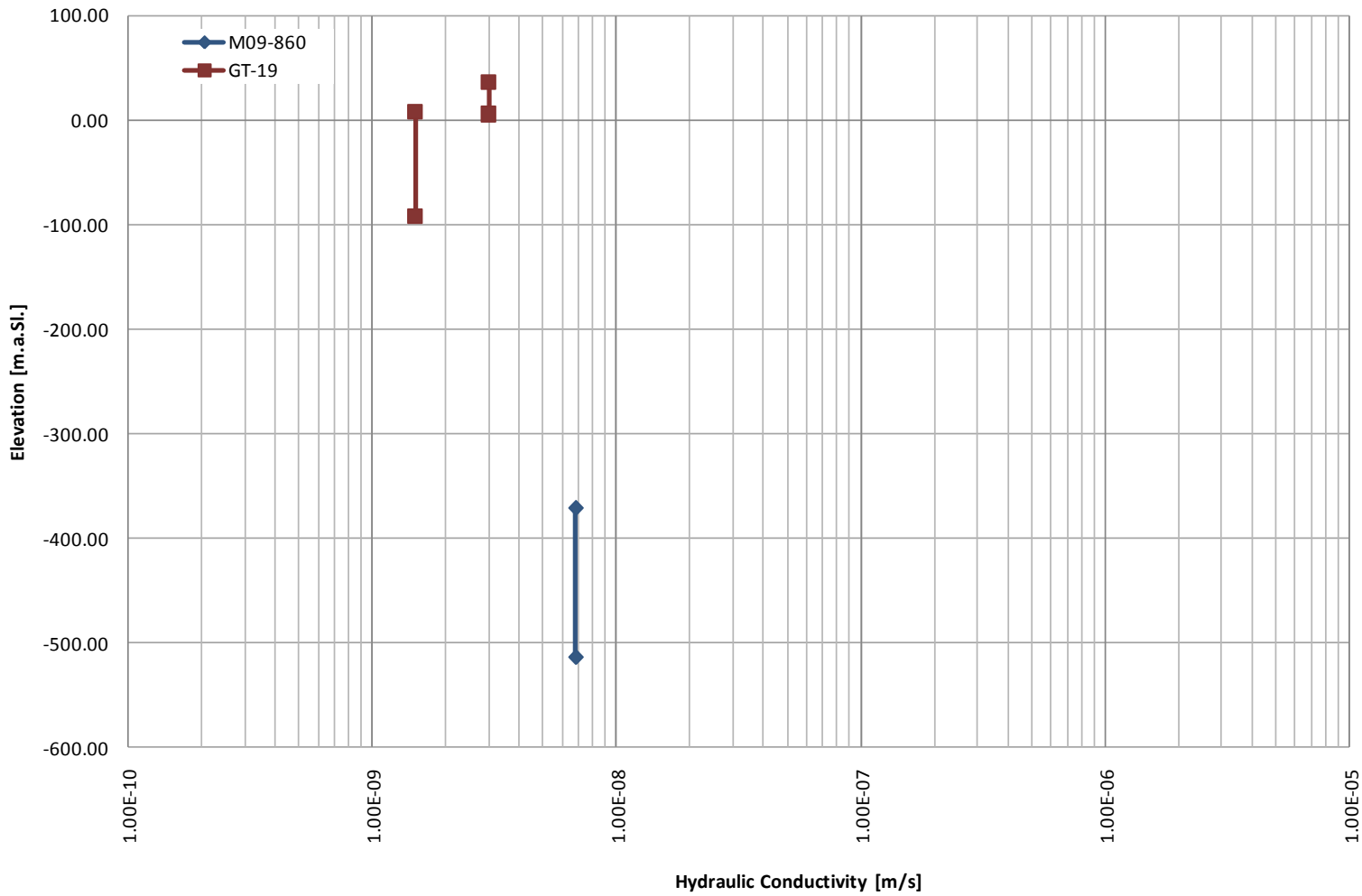
**SINGLE PACKER ON DEDICATED RODS DOWNHOLE TOOL SCHEMATIC**

Golder Associates
Greater Vancouver Office, BC

| | | | | |
|---|---|---|---|---|
| PROJECT No. 09-1426-0015 | | | PHASE No. | 3910-5000 |
| DESIGN | DV | 02OCT09 | SCALE AS SHOWN | REV. – |
| CADD | DV | 02OCT09 | **FIGURE 2** | |
| CHECK | | | | |
| REVIEW | | | | |

Drawing File: N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\Drafting\3910\0914260015-3910-A_02.dwg Friday, October 02, 2009 3:47:10 PM By: ggorczynski

REVISION DATE:17/09/2009 BY MP FileNo: N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\Drafting\3910\0914260015-3910-A_03.ppt




PROJECT

COMAPLEX MINERALS CORPORATION
MEDIADINE GOLD PROJECT
NUNAVUT

TITLE

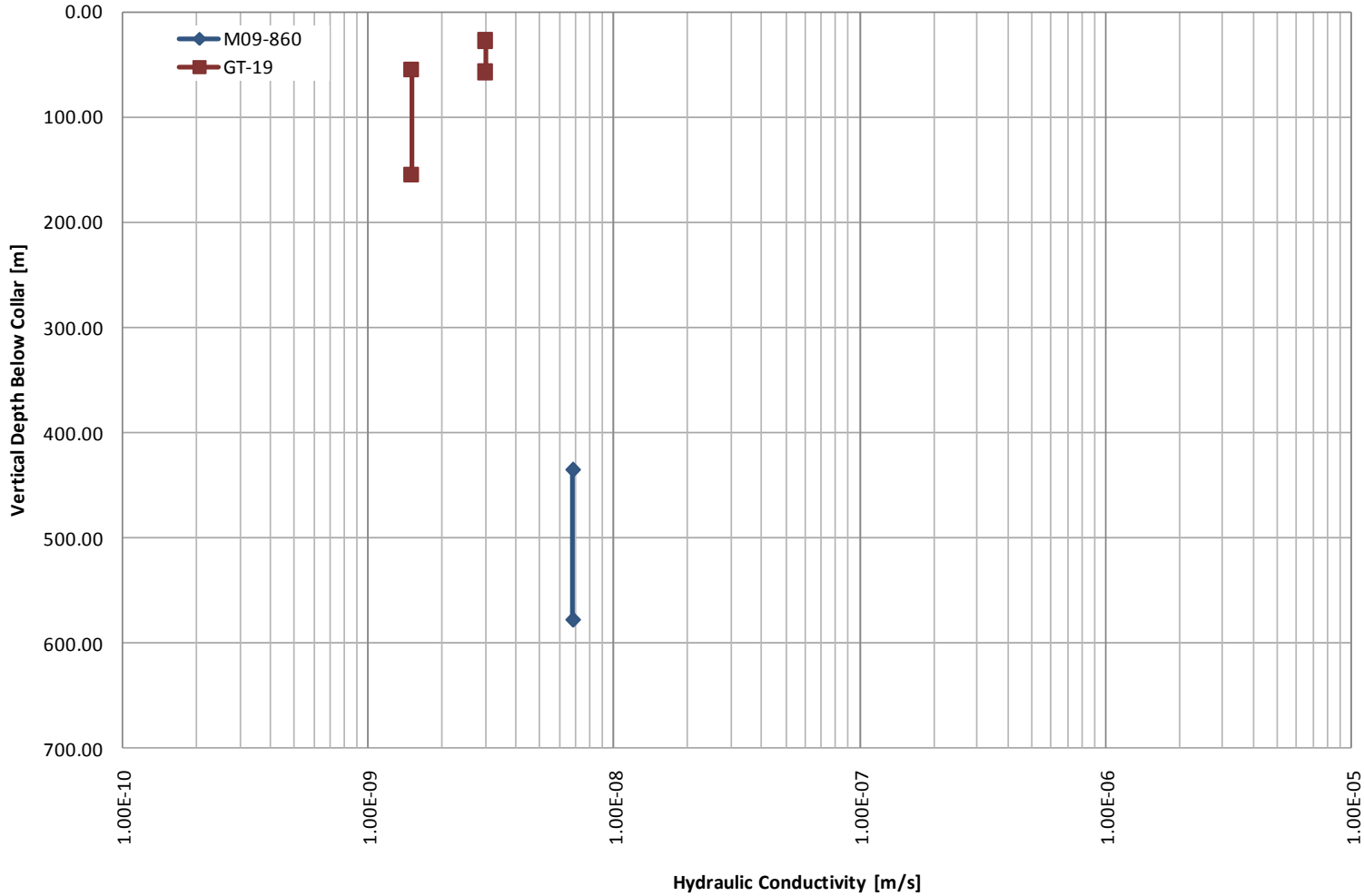
# HYDROGEOLOGIC TESTING RESULTS HYDRAULIC CONDUCTIVITY VS ELEVATION

Golder Associates

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. | 09-1426-0015 | | PHASE No. | 3910-5000 | |
| DESIGN | MP | 16SEP09 | SCALE | NTS | REV. |
| CADD | MP | 16SEP09 | | | |
| CHECK | MP | 16SEP09 | | | |
| REVIEW | | | | | |

**FIGURE 3**

REVISION DATE:17/09/2009 BY MP FileNo: N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\Drafting\3910\0914260015-3910-A 04.ppt




PROJECT

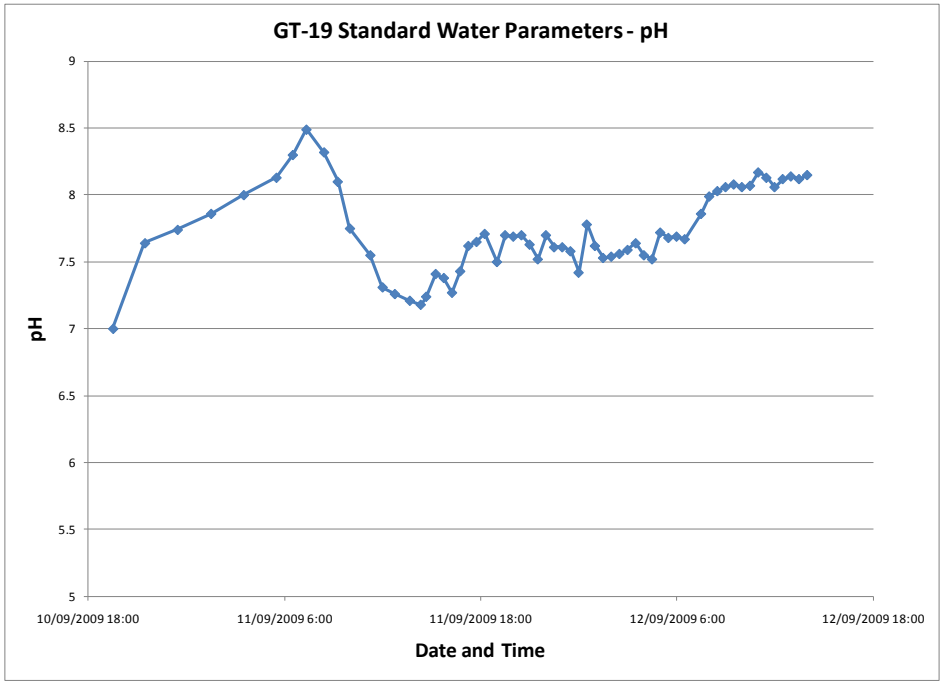
COMAPLEX MINERALS CORPORATION
MEDIADINE GOLD PROJECT
NUNAVUT

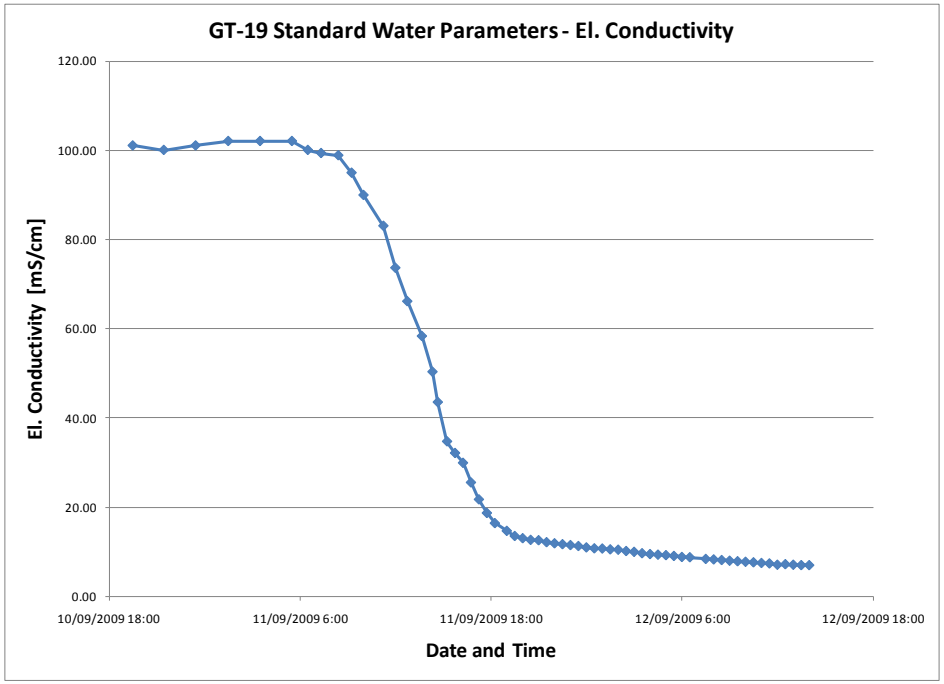
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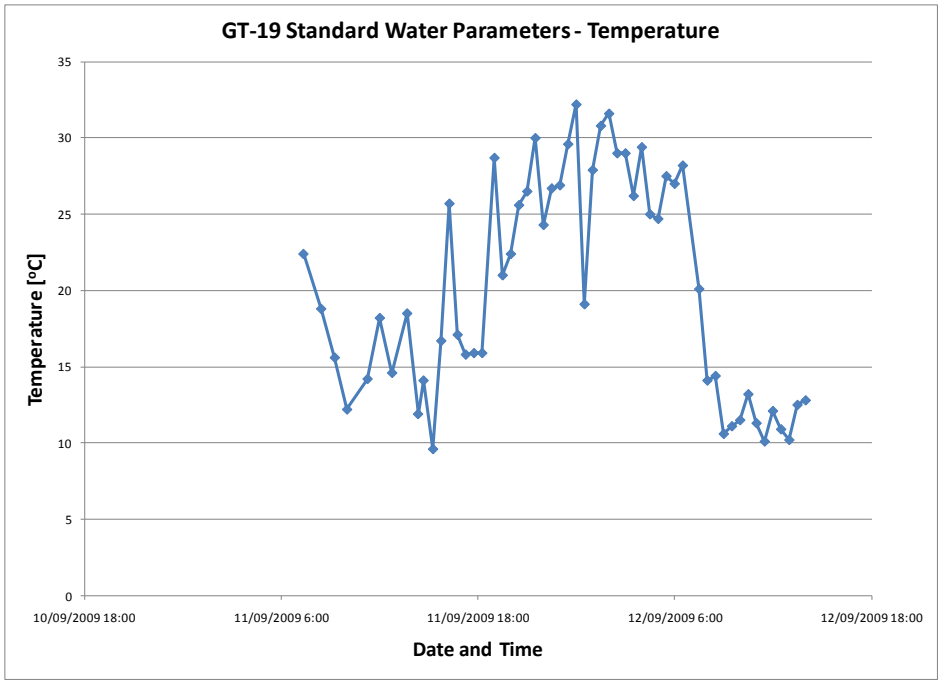
# HYDROGEOLOGIC TESTING RESULTS HYDRAULIC CONDUCTIVITY VS DEPTH BELOW COLLAR

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 09-1426-0015 | | | PHASE No. 3910-5000 | |
| DESIGN | MP | 16SEP09 | SCALE NTS | REV. |
| CADD | MP | 16SEP09 | | |
| CHECK | MP | 16SEP09 | FIGURE 4 | |
| REVIEW | | | | |




PROJECT

COMAPLEX MINERALS CORPORATION
MEDIADINE GOLD PROJECT
NUNAVUT

TITLE

# BOREHOLE GT-19
# STANDARD WATER PARAMETERS DURING SWABBING CYCLES

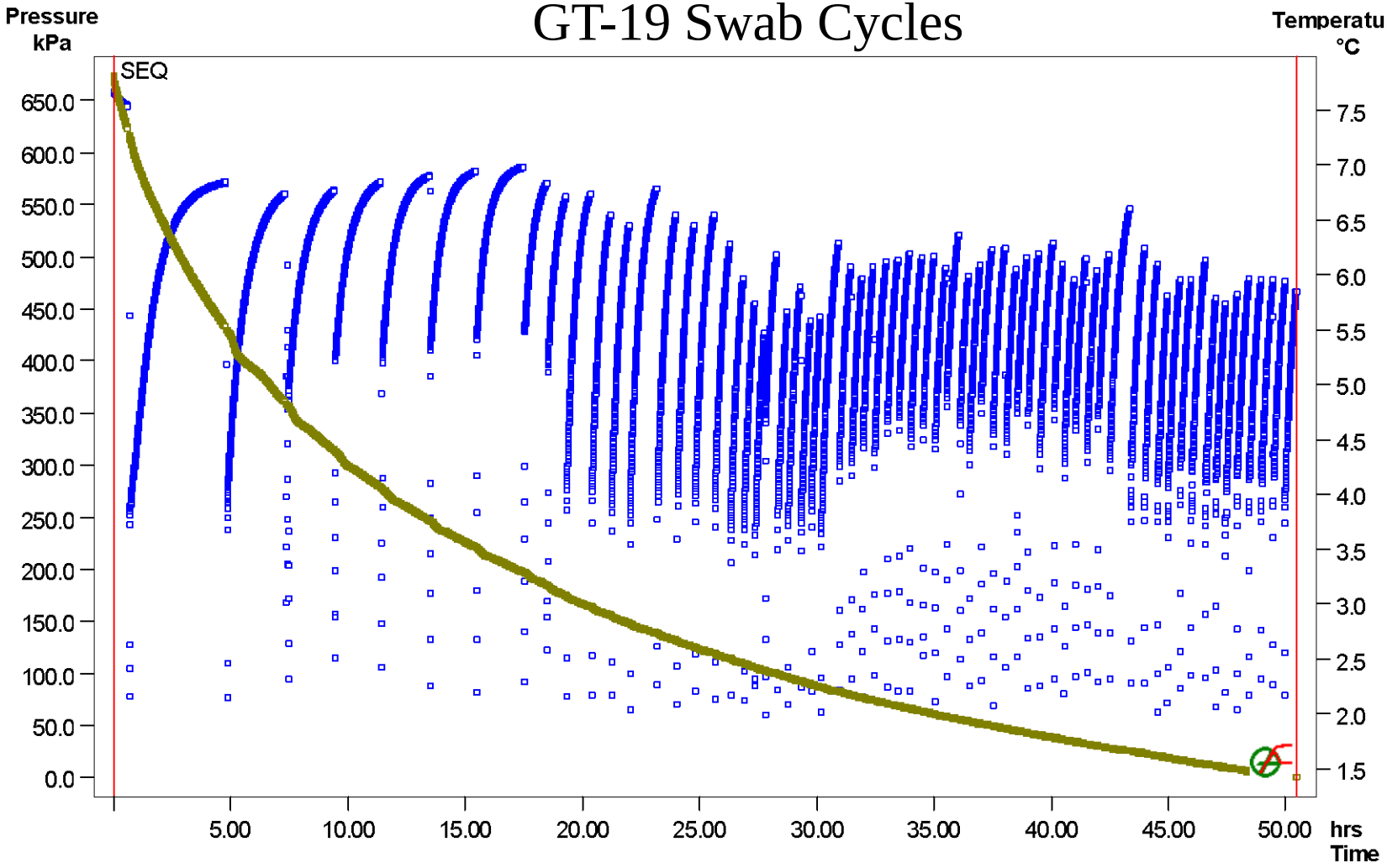
Golder Associates

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. | 09-1426-0015 | | PHASE No. | 3910-5000 | |
| DESIGN | MP | 16SEP09 | SCALE | NTS | REV. |
| CADD | MP | 16SEP09 | | | |
| CHECK | MP | 16SEP09 | | | |
| REVIEW | | | | | |

**FIGURE 5**

REVISION DATE:17/09/2009 BY MP FileNo: N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\Drafting\3910\0914260015-3910-A 06.ppt

# GT-19 Swab Cycles




PROJECT

COMAPLEX MINERALS CORPORATION
MEDIADINE GOLD PROJECT
NUNAVUT

TITLE

**BOREHOLE GT-19**
**PRESSURE RESPONSE DURING SWAB CYCLES**

Golder Associates

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. 09-1426-0015 | | | PHASE No. 3910-5000 | | |
| DESIGN | MP | 16SEP09 | SCALE NTS | REV. | |
| CADD | MP | 16SEP09 | | | |
| CHECK | MP | 16SEP09 | **FIGURE 6** | | |
| REVIEW | | | | | |

# APPENDIX A

# CALIBRATION CERTIFICATES

# In-Situ Inc.

## Calibration Report

**Report Number: 20090302231544-142042**

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

**Instrument Details:**

| | |
|---|---|
| Instrument Model: | **Level TROLL 700** |
| Full Scale Pressure Range | **3447.38 KPa (500 PSI) non-vented** |
| Serial Number: | **142042** |

**Calibration Details:**

| | |
|---|---|
| Calibration Result: | **PASS** |
| Calibration Date: | 2009-03-02 23:15:44 (UTC) |
| Nominal Range of Applied Temperature: | -5 C to +50 C |
| Temperature Accuracy Specification: | +/- 0.1 C From 0 C to +50 C |
| Nominal Range of Applied Pressure: | 48.3 KPa to 3447.4 KPa (7.0 PSI to 500.0 PSI) |
| Pressure Accuracy Specification: | +/- 0.1 %FS from -5 C to +50 C, +/- 0.05 %FS at +15 C |

**Post-Calibration Check:**

| Parameter | Applied | Reported | Deviation |
|---|---|---|---|
| Pressure | 500.0077 | 500.0310 | 0.0047 |
| Pressure | 7.0011 | 7.0060 | 0.0010 |
| Temperature | 19.8890 | 19.8931 | 0.0041 |

**Calibration Procedures and Equipment Used:**

Automated calibration procedures used.
Manu Agilent Model 34970A SerialNo MY44015965
Manu Instrulab Model 3312A-14-15-24 SerialNo 31103-(41012)
Manu Instrulab Model 406X-0031-01 SerialNo 2-31138
Manu MENSOR Model 600 SerialNo 621433
Manu Agilent Model 53131A SerialNo MY47000169
Manu MENSOR Model 600 SerialNo 620946

**Notes:**

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.
4. The post-calibration data is collected at nominal +20 C.
5. 1.0 KPa = 6.894757 PSI

**Performed By:** JBO (Manu. Cell)


Copyright © 2007 In-Situ, Inc.

# Prüfprotokoll

Calibration certificate / Fiche de calibration

| | | | | |
|---|---|---|---|---|
| Typ :<br>Type / Type: | DCX-22/0,8...101bar/80672.3 | | | |
| Serienummer :<br>Serial no./ No. de serie : | 47085 | | | Produkt Nummer : 252215.0216<br>Product no./ No. de produit : |
| Messbereich :<br>Measurement range / Etendue de mesure : | 2 | ... | 101 | bar abs |
| Komp. Temp. Bereich :<br>Comp. temp. range/Gamme de temp. comp. | 20 | ... | 120 | °C |
| Speisung :<br>Supply / Alimentation : | int. Batt. | ... | 3,6 | V |

Anschluss :
Connector / Connecteur :

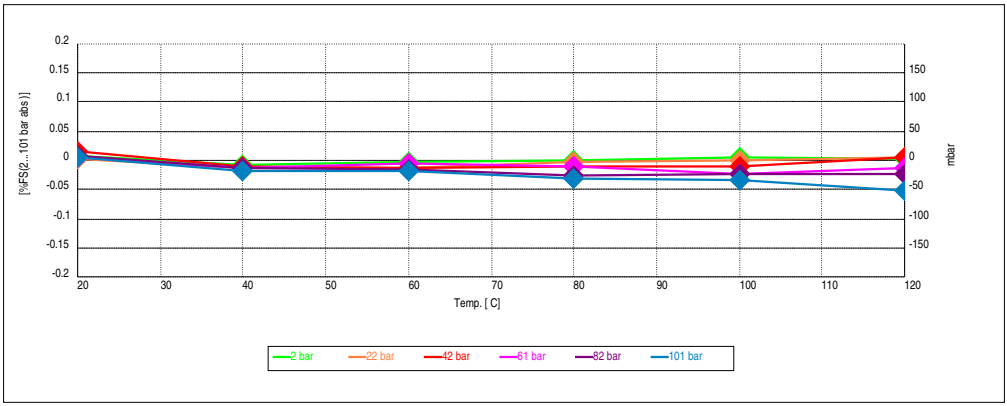
Fischer 5-p

| | | |
|---|---|---|
| 4 | : | RS 485A |
| 5 | : | RS 485B |

Bemerkung :
Remark / Remarque :

Abweichung Messbereich (digital)

Deviation measurement range / Deviation étendue de mesure




| | | | |
|---|---|---|---|
| Linearitätsfehler:<br>Linearity error / Erreur de linearité: | 0.006 | %FS(Lbfsl) | @ 20 °C |
| Totales Fehlerband :<br>Accuracy(TEB)/Erreur total : | -0.053 ... 0.016 %FS | @ 20 ... 120 | °C |

| | | | |
|---|---|---|---|
| PrüferIn :<br>Test person / Contrôlé par: | TEM | Datum :<br>Date / Date : | 16.01.2008 |

In-Situ Inc.

221 East Lincoln Avenue • Fort Collins CO 80524 USA
1 800 446 7488 • 1 970 498 1500 (Tel)
1 970 498 1598 (Fax)

WWW.IN-SITU.COM

Station Number: 1

Serial Number: 223303

Test Results: PASS

Operator Initials: MG

Sales Order: 20051241

Length(feet): 1805.0

Length(meters): 550.2

Cable Type: Vented / Lemo

Conductor Test Results: PASS

Vent Test Results: PASS: Vent OK.

# In-Situ Inc.

## Calibration Report

**Report Number: 20090819171956-149837**

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

**Instrument Details:**

| | |
|---|---|
| Instrument Model: | **Aqua TROLL 100** |
| Serial Number: | **149837** |

**Calibration Details:**

| | |
|---|---|
| Calibration Result: | **PASS** |
| Calibration Date: | 2009-08-19 17:19:56 (UTC) |
| Nominal Range of Applied Temperature: | -5 C to +50 C |
| Temperature Accuracy Specification: | +/- 0.1 C From 0 C to +50 C |
| Conductivity Calibration: | Passed with cell constant of 1.000 |

**Post-Calibration Check:**

| Parameter | Applied | Reported | Deviation |
|---|---|---|---|
| Temperature | 39.3350 | 39.3625 | 0.0275 |
| Temperature | 39.3350 | 39.3611 | 0.0261 |
| Temperature | 39.3340 | 39.3602 | 0.0262 |
| Temperature | 39.3340 | 39.3589 | 0.0249 |

**Calibration Procedures and Equipment Used:**

Automated calibration procedures used.
Calibrated in 900, 9,000, & 90,000 uS/cm conductivity solution standards.
Manu Agilent Model 34970A SerialNo MY41021734
Manu Instrulab Model 3312A-14-15-24 SerialNo 31098
Manu Instrulab Model 406X-0031-01 SerialNo 31099-2
Manu Agilent Model 53131A SerialNo MY47001136

**Notes:**

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.
4. The post-calibration data is collected at nominal +20 C.
5. 1.0 PSI = 6.894757 KPa

**Performed By:** NJH


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# APPENDIX B

# HYDROGEOLOGIC TESTING AND SAMPLING PROTOCOLS

**Client: Comaplex - Meliadine**
**Borehole: M09-860**
**Testing Period: September 04, 2009**

**Testing Logbook**

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|

**General Borehole and Testing Information**
Borehole M09-860 was drilled over the period of August 26 to September 04, 2009. Hydrogeologic (packer) testing in borehole M09-860 started on September 04, 2009 and was completed on September 04, 2009. Coordinates of the collar are 6988790.002 Northing and 539054.001 Easting. The borehole was drilled in an (starting) angle of 76 degrees (90 degrees = vertical) and an azimuth of 179 degrees. The collar elevation is at 64.06 m.a.Sl (ground surface), and the EOH is at 595.5 mbgs (along hole). The bedrock was reached after 10 meters (along borehole). All depths are measured vertically from the ground surface unless otherwise noted.

**TEST INTERVAL PLANNING:**
Boundary Permafrost – Non Permafrost at 413 mbgs. Based on core recovery, Test 1 at 448.63 mbgs (top of interval) to 595.5 mbgs

| DATE | TIME | EVENT & COMMENTS | TEST INTERVAL |
|---|---|---|---|
| 04/09/09 | 13:30 | Arrive at Borehole M09-860<br><br>Previously done: Core inspection, equipment move<br><br>Programming Downhole Gauge KELLER at 10 seconds fixed intervals with 1 second pressure event controlled interval. Reading Temperature and Pressure. Start Time: 04/09/2009 13:30 | |
| | 13:35 | Setup Packer equipment, Driller flushes hole with hot water and then with brine<br><br>Prepare flow board for injection<br><br>Bit Location at 447.63 mbgs | |
| | 14:30 | Equipment Ready: Single Packer Wireline Setup<br><br>Driller Finishes Flushing | |
| | 14:35 | Start to drive down | |
| | 15:00 | Packer Tool at depth. Did not hear seating cone “cling” in bit, although with several tries. Driller says, packer sits too deep to hear “cling”. Assuming packer seated correctly | **Test 1: 448.63 to 595.5 mbgs**<br><br>**Testers: John Wozniewiz, Marc Pesendorfer** |
| | 15:15 | Start Packer inflation at 850 psi.<br><br>Lower rst transducer in hole, cannot be started. | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 15:16 | Measuring water level with WL-meter: 7 meters below Stuffing Box | |
| | 15:35 | VW-Transducer can be started; Read out cable changed<br><br>Prepare for RI-Phase<br><br>Read Flow Meter prior to Test: 4736.0 litres | |
| | 15:40 | Start RI, increase Pressure to 70 psi<br><br>No water flux from annulus observed → Packer seated correctly | |
| | | | |
| | 16:00 | Stop RI,<br><br>Flow Meter Read Out: 4949.5 litres<br><br>Start RIS (Recovery) | |
| | 16:35 | Stop RIS | |
| | 16:36 | Start Deflating Packer | |
| | 16:45 | Packer Deflated; Start Pulling Packer Tool | |
| | 17:15 | Tool on Surface<br><br>Read out Downhole Transducer; Conduct quick analysis<br><br>Decision: No other test required in this hole<br><br>Pack Equipment and wait for Helicopter | |
| | 18:15 | Leave Borehole M09-860 | |

| Date and Time | Delta Minutes | Flowmeter Reading [l] | Delta Liters | Liter/Minute | Overpressure Reading [psi] |
|---|---|---|---|---|---|
| 04/09/2009 15:40 | | 4736 | | | 70 |
| 04/09/2009 15:45 | 5.0 | 4787 | 51 | 10.2 | 78 |
| 04/09/2009 15:48 | 3.0 | 4825 | 38 | 12.7 | 75 |
| 04/09/2009 15:50 | 2.0 | 4868 | 43 | 21.5 | 83 |
| 04/09/2009 15:52 | 2.5 | 4889 | 21 | 8.4 | 64 |
| 04/09/2009 15:55 | 3.0 | 4919 | 30 | 10.0 | 63 |
| 04/09/2009 15:58 | 2.5 | 4932 | 13 | 5.2 | 62 |
| 04/09/2009 16:00 | 2.0 | 4949.5 | 17.5 | 8.8 | |

**Client: COMAPLEX, Meliadine**
**Borehole: GT-19**
**Testing Period: September 07 to September 12, 2009**

**Testing Logbook**

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|

**General Borehole and Testing Information**
Borehole GT-19 was drilled over the period of September 06 to September 09, 2009. Hydrogeologic (packer) testing in borehole GT-19 started on September 07 2009 and was completed on September 12 2009. Coordinates of the collar are 6989458.349 Northing and 537898.806 Easting. The borehole was drilled in an (starting) angle of 51 degrees (90 degrees = vertical) and an azimuth of 325 degrees. The collar elevation is at 63.135 m.a.Sl (ground surface), and the EOH is at 199.5 mbgs (along hole). The bedrock was reached after 12.45 meters (along borehole). All depths are measured vertically from the ground surface unless otherwise noted.

| DATE | TIME | EVENT & COMMENTS | TEST INTERVAL |
|---|---|---|---|
| 07/09/09 | 07:50 | Arrive at Borehole, prepare equipment, discuss packer seat with driller.<br><br>Current depth of hole: 73.5 meters | |
| | 08:30 | Driller starts conditioning borehole with hot water and salt | |
| | 08:50 | Equipment prepared.<br><br>Start KELLER Downhole Transducer at 09:00 am. Measuring Interval 10 Seconds, Event Controlled 1 second | |
| | 09:30 | Driller mentions, that 1 tank of 30% CaCl solution was pumped, but he gets only return of 5%. CaCl must dilute somewhere. Indication that no permafrost in borehole | |
| | 09:40 | Start pulling rods to test depth | |
| | 10:25 | Bit at depth | **Test 1:**<br>**34.62 to 73.5 mbtoc**<br>**Testers:**<br>**Marc Pesendorfer, John Woz** |
| | 10:30 | Insert tool in borehole. Some size issues with overshot and Stuffing box | |
| | 10:33 | Tool at depth | |
| | 10:35 | Rst logger in borehole and started | |
| | 10:37 | INF packer at 280 psi | |
| | 10:45 | Static Pressure Reached, WL at Lake level | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 10:45 | Only little pressure difference to TOC, Fill hole with water, Start SI | |
| | 11:15 | Very little flow, pull rst transducer, prepare for RI | |
| | 11:20 | Start RI at 55 psi overpressure | |
| | | Date and Time / Delta Minutes / Flowmeter Reading [l] / Delta Liters / Liter/Minute<br>07/09/2009 11:20 — 4990.5<br>07/09/2009 11:23 — 3.0 — 4994.4 — 3.9 — 1.3<br>07/09/2009 11:24 — 1.0 — 4994.8 — 0.4 — 0.4<br>07/09/2009 11:25 — 1.0 — 4994.9 — 0.1 — 0.1<br>07/09/2009 11:26 — 1.0 — 4995.2 — 0.3 — 0.3<br>07/09/2009 11:31 — 5.5 — 4995.9 — 0.7 — 0.12727273<br>07/09/2009 11:34 — 2.7 — 4996.3 — 0.4 — 0.15<br>07/09/2009 11:38 — 3.8 — 4997 — 0.7 — 0.1826087<br>07/09/2009 11:44 — 6.8 — 4997.8 — 0.8 — 0.11707317<br>07/09/2009 11:49 — 4.3 — 4998.4 — 0.6 — 0.13846154<br>07/09/2009 11:50 — 1.1 — 4998.5 — 0.1 — 0.09090909 | |
| | 11:23 | Small leak detected at Stuffing box, fixed | |
| | 11:26 | Check casing. No leak detected. Packer seated correctly. | |
| | 11:50:16 | Shut In, Start RIR | |
| | 12:05:30 | Stop RIR | |
| | 12:15 | DEF Packer | |
| | 12:20 | Start Pulling Packer. Can not be removed from hole. Packer stuck in bit. Cut Wireline and Inflation line. Remove HQ Rods. | |
| | 12:48 | Tool on Surface | |
| | 12:50 | Start Preparing for next test. Decision: Next test on BQ rods, Single packer. | |
| | 14:45 | Equipment prepared. Leave borehole GT-19 | |
| 09/09/2009 | 10:00 | Borehole depth at 199.5 meters.<br>Can not go out today because of fog | |
| 10/09/2009 | 06:45 | Arrive at borehole GT-19 | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 07:15 | Driller starts to pump brine<br>Calibrate instrument:<br><br>pH=7.25 (should be 7)<br>EC=1466 uS/cm<br>Brine Sample:<br>pH=9.1<br>EC = 98.3 mS/cm<br>T=44.3 $^{o}$C<br><br>Prepare Packer equipment | |
| | 07:55 | Return measurement out of Casing;<br>pH=8.13<br>EC = 1678 uS/cm<br>T=22.5 $^{o}$C | |
| | 08:15 | Two tanks of brine pumped (approx 500 gal)<br>return: 0% of 30 % saline solution | |
| | 08:20 | Start pulling rods | |
| | 09:15 | Rods out of hole | |
| | 09:20 | Insert HQ casing with casing shoe to30 meters | |
| | 09:30 | At depth with casing | |
| | 10:30 | Start putting packer down | |
| | 11:50 | At depth. Circulation line to prevent freezing at 21 meters. Line difficult to insert, tangeled.<br>Lower rst transducer 15 m toc | **Test 2: 70.9 to 199.5 mbtoc**<br>**Testers: Marc Pesendorfer John Woz** |
| | 11:56 | Start INF 350 psi | |
| | 12:01 | Packer INF<br>Start PSR | |
| | 12:35 | Move Swab Cups down | |
| | 12:40 | Start Swab; SW | |
| | 12:45 | Put rst transducer down to 70 meters. Monitor recovery<br>Flow Rate approx. 0.7 l/min | |
| | 16:45 | Tubing gauge at 70 m below top of test tubing, ~45 m of head, remove gauge from tubing | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 16:50 | Swab | |
| | 16:52 | Re-install tubing gauge to 70 m below top of tubing | |
| | 18:00 | Swab | |
| | 19:00 | Lake Water:<br>pH: 7.79<br>EC: 178 uS/cm<br>Temp 6.7 $^{o}$C | |
| | 19:30 | Swab:<br>pH: 7.0<br>EC: 101 mS/cm<br>Temp 9.4 $^{o}$C (This Temp is wrong, read incorrect number) | |
| | 21:27 | Swab:<br>pH: 7.64<br>EC: 100 mS/cm<br>Temp 9.6 $^{o}$C (This Temp is wrong, read incorrect number) | |
| | 23:27 | Swab:<br>pH: 7.74<br>EC: 101 mS/cm<br>Temp 7.1 $^{o}$C (This Temp is wrong, read incorrect number) | |
| 11/09/2009 | 01:30 | Swab:<br>pH: 7.86<br>EC: 102 mS/cm<br>Temp 7.1$^{o}$C (This Temp is wrong, read incorrect number) | |
| | 03:30 | Swab:<br>pH: 8.00<br>EC: 102 mS/cm<br>Temp 7.9 $^{o}$C (This Temp is wrong, read incorrect number) | |
| | 05:30 | Swab:<br>pH: 8.13<br>EC: 102 mS/cm<br>Temp 7.0 $^{o}$C (This Temp is wrong, read incorrect number) | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 06:30 | Swab:<br>pH: 8.30<br>EC: 100 mS/cm<br>Temp 7.3 °C (This Temp is wrong, read incorrect number) | |
| | 07:00 | Arrive at GT-19<br>Check data; prepare for swab | |
| | 07:20 | Swab:<br>pH: 8.49<br>EC: 99.3 mS/cm<br>Temp 22.4 °C | |
| | 08:25 | Swab:<br>pH: 8.32<br>EC: 98.8 mS/cm<br>Temp 18.8 °C | |
| | 09:15 | Swab:<br>pH: 8.1<br>EC: 94.9 mS/cm<br>Temp 15.6 °C | |
| | 10:00 | Swab:<br>pH: 7.75<br>EC: 89.9 mS/cm<br>Temp 12.2 °C | |
| | 11:15 | Swab:<br>pH: 7.55<br>EC: 83.0 mS/cm<br>Temp 14.2 °C | |
| | 12:00 | Swab:<br>pH: 7.31<br>EC: 73.6 mS/cm<br>Temp 18.2 °C | |
| | 12:45 | Swab:<br>pH: 7.26<br>EC: 61.1 mS/cm<br>Temp 14.6 °C | |
| | 13:40 | Swab:<br>pH: 7.21<br>EC: 58.3 mS/cm<br>Temp 18.5 °C | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 14:20 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 14:40 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 15:15 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 15:45 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 16:15 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 16:45 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 17:15 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 17:45 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 18:15 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 18:45 | Leave Borehole GT-19 | |
| 12/09/09 | 06:45 | Arrive at Borehole GT-19 | |
| | 07:00 | Check parameters Drillers have measured - OK<br>Check Packer pressure – OK<br>Check hot water circulation – OK | |
| | 07:30 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 08:00 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 08:30 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 09:00 | Swab<br>(for Parameters see Water Development Excel Table) | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 09:30 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 10:00 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 10:30 | Swab<br>(for Parameters see Water Development Excel Table)<br>((It is raining like hell)) | |
| | 11:00 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 11:30 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 12:00 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 12:30 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 13:00 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 13:30 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 14:00 | Swab<br>(for Parameters see Water Development Excel Table) | |
| | 14:20 | Insert Waterra tubing | |
| | 14:35 | Start pumping with Waterra tubing | |
| | 14:48 | Sample:<br>Routine (no color code)<br>GT-19-1A<br>GT-19-1B<br>GT-19-1C | |
| | 14:50 | Sample:<br>Nutrients (purple code)<br>GT-19-2A<br>GT-19-2B<br>GT-19-2C | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 14:51 | Sample:<br>Routine (no color code)<br>GT-19-3A<br>GT-19-3B<br>GT-19-3C | |
| | 14:52 | Sample:<br>Total Cyanide (red code)<br>GT-19-4A<br>GT-19-4B<br>GT-19-4C | |
| | 14:57 | Sample:<br>Free Cyanide (red code)<br>GT-19-5A<br>GT-19-5B<br>GT-19-5C | |
| | 15:20 | Sample:<br>Nutrients (Filtered), Total Phos (purple code)<br>GT-19-6A<br>GT-19-6B<br>GT-19-6C | |
| | 15:25 | Sample:<br>Ultra Low Metals (green code)<br>GT-19-7A<br>GT-19-7B<br>GT-19-7C | |
| | 15:30 | Sample:<br>Dissolved Ultra low Metals (green code)<br>GT-19-8A<br>GT-19-8B<br>GT-19-8C | |
| | 15:35 | Sampling finished, DEF Packer | |
| | 15:45 | Start pulling out | |
| | 16:30 | Tool on surface<br>Pack equipment | |
| | 16:50 | Start preparing PVC tremmie pipe for thermistor installation | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 17:00 | 7 Pipes are damaged. Only 200 meters were delivered in total. Pipe too short to be lowered in hole. Additional pipe has to be carried on foot to rig (45 min walk one way) | |
| | 18:30 | PVC Pipe arrived | |
| | 19:00 | PVC Pipe installed | |
| | 19:05 | Start installing Thermistor String:<br>No: 200-1<br>Node 1: 0.5 m<br>Node 2: 1 m<br>Node 3: 3 m<br>Node 4: 5 m<br>Node 5: 10 m<br>Node 6 20 m | |
| | 19:30 | Thermistor stuck at 140 meters. Can not be lowered down. | |
| | 19:45 | Decide to remove Thermistor and PVC pipe. | |
| | 20:00 | Pipe on surface | |
| | 20:15 | Start circulating hole with hot water. Decide tomorrow what to do. | |
| | 20:20 | Leave GT-19 (on foot due to fog) | |
| 13/09/2009 | 09:30 | Arrive at borehole GT-19 | |
| | 09:40 | Start checking all PVC pipes with metal piece | |
| | 09:50 | Move hydrogeologic testing equipment back to camp | |
| | 10:00 | Finished checking rods. All ok | |
| | 10:15 | Start lowering PVC pipe down hole. Fill with concentrated brine to avoid floating. | |
| | 10:45 | Down hole. Start pushing Thermistor string down hole with bottom metal piece attached. | |
| | 11:00 | Thermistor string stuck at approx. 80 meters. Not mechanical problem. Seems like brine is a problem and the water that is removed by the thermistor cable. | |

| Date | Time | Events & Comments | Test Interval |
|---|---|---|---|
| | 11:05 | Several tries. Pull Thermistor string and pull PVC pipe (incredible hard, because filled with brine) | |
| | 12:15 | All on surface. | |
| | 12:45 | Cut PVC pipe at bottom (open hole) and put it down with thermistor string attached outside with duct tape. | |
| | 13:30 | Installation finished. Cable sticking 1.9 meters above ground surface. Fly back to camp to discuss with PM. | |
| | 15:00 | Back at borehole GT-19 | |
| | 15:15 | Installation finished. Start to put Sand in borehole. | |
| | 16:00 | Leave borehole on foot, no helicopter available | |
| | 17:00 | Back in camp. | |

# APPENDIX C

# ANALYSIS RESULTS FROM CONDUCTED HYDROGEOLOGIC TESTS

Paradigm Interpret 2007

# WELL TEST ANALYSIS REPORT

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

Perforations: From To
1 m m

## ANALYSIS SUMMARY

Paradigm Interpret 2007

## Results Summary

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

Near wellbore effects: Infinite Conductivity Vertical Frac. with C a
Reservoir behaviour: Homogeneous
Boundary effects: Infinite Lateral Extent

| Flow Period: 4 | | Units |
|---|---|---|
| (pav)i | 4682.823 | kPa |
| pwf | 4970.510 | kPa |
| kh | 93.61 | mD.m |
| k | 0.6374 | mD |
| C | 5.343E-05 | m3/kPa |
| xf | 2.4 | m |
| S(w) | 0.01 | |
| S(t) | -8.05 | |
| ri | 5. | m |
| PI | 0.05353 | m3/D/kPa |

| | | |
|---|---|---|
| FE | 0.9902 | fraction |
| Dp(S) | 2.828 | kPa |

Paradigm Interpret 2007

## Well & Reservoir Parameters

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

### WELL AND RESERVOIR DATA (Water)

Multiphase flow at wellbore: NO
Multiphase in reservoir : NO

| | | |
|---|---|---|
| Matrix Porosity | 0.100 | fraction |
| Reservoir Thickness | 146.87 | m |
| Wellbore Radius | 0.000 | m |
| Distance To Producing Well (*) | 0.00 | m |
| Water Formation Volume Factor | 1.000 | Rm3/m3 |
| Water Viscosity | 1.00 | cp |
| Total Compressibility | 2.000E-06 | 1/kPa |

(*) = For Interference Tests Only

Paradigm Interpret 2007

## Correlation Data

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

### Gas Equivalent Volume of Condensate

Input Data:

Separator Pressure 1284.108 kPa

Condensate gravity 30.00 deg API

Calculation:

Gas equivalent volume of condensate, Veq 0.00 Sm3/Sm3

Paradigm Interpret 2007

## Rates

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

### RATES

| Flow Period | Start hrs | End hrs | Duration hrs | Oil Sm3/D | Gas 1E3Sm3/D | Water Sm3/D |
|---|---|---|---|---|---|---|
| 1 | 0.0000 | 1.8389 | 1.8389 | 0.000 | 0.000 | 0.000 |
| 2 | 1.8389 | 2.2333 | 0.3944 | 0.000 | 0.000 | 0.000 |
| 3 | 2.2333 | 2.5097 | 0.2764 | 0.000 | 0.000 | -15.40 |
| 4 | 2.5097 | 3.1164 | 0.6067 | 0.000 | 0.000 | 0.000 |
| 5 | 3.1164 | 3.8028 | 0.6864 | 0.000 | 0.000 | 0.000 |

Paradigm Interpret 2007

## Analysis Parameters

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

### ANALYSIS MODEL, FLOW PERIOD: 4

Near wellbore effects: Infinite Conductivity Vertical Frac. with C a
Reservoir behaviour: Homogeneous
Boundary effects: Infinite Lateral Extent

ANALYSIS PARAMETERS, FLOW PERIOD: 4

| | | |
|---|---|---|
| Pressure match, PM | 3.257E-03 | 1/kPa |
| Time match, TM | 1.94 | 1/hr |
| Dimensionless fracture wellbore storage, CDf | 4.972E-02 | |
| Additional skin at well, S(w) | 0.01 | |

Paradigm Interpret 2007

## Analysis Results

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1
0.00 m MD

0.00 m TVD

ANALYSIS MODEL, FLOW PERIOD: 4

Near wellbore effects: Infinite Conductivity Vertical Frac. with C a
Reservoir behaviour: Homogeneous
Boundary effects: Infinite Lateral Extent

ANALYSIS RESULTS, FLOW PERIOD: 4

| | | |
|---|---|---|
| Initial average reservoir pressure, (pav)i | 4682.823 | kPa |
| Flowing pressure, pwf | 4970.510 | kPa |
| Permeability Thickness, kh | 93.6 | mD.m |
| Permeability, k | 0.637 | mD |
| Wellbore storage coefficient, C | 5.343E-05 | m3/kPa |
| Half length of fracture, xf | 2.4 | m |
| Additional skin at well, S(w) | 0.01 | |
| Total Skin, S(t) | -8.05 | |
| Radius of investigation (approx), ri | 5. | m |
| Measured Productivity Index, PI | 5.353E-02 | m3/D/kPa |
| Flow Efficiency, FE | 0.990 | fraction |
| Pressure drop due to skin, Dp(S) | 2.83 | kPa |

Paradigm Interpret 2007

## Correlation Data

Company: COMAPLEX
Field: Meliadine
Formation:
Zone:
Well: M09-860

Date:
Test No: Test 1
Test Date: 04/09/2009
Gauge: Gauge 1

0.00 m MD

0.00 m TVD

## GAS GRAVITY DATA

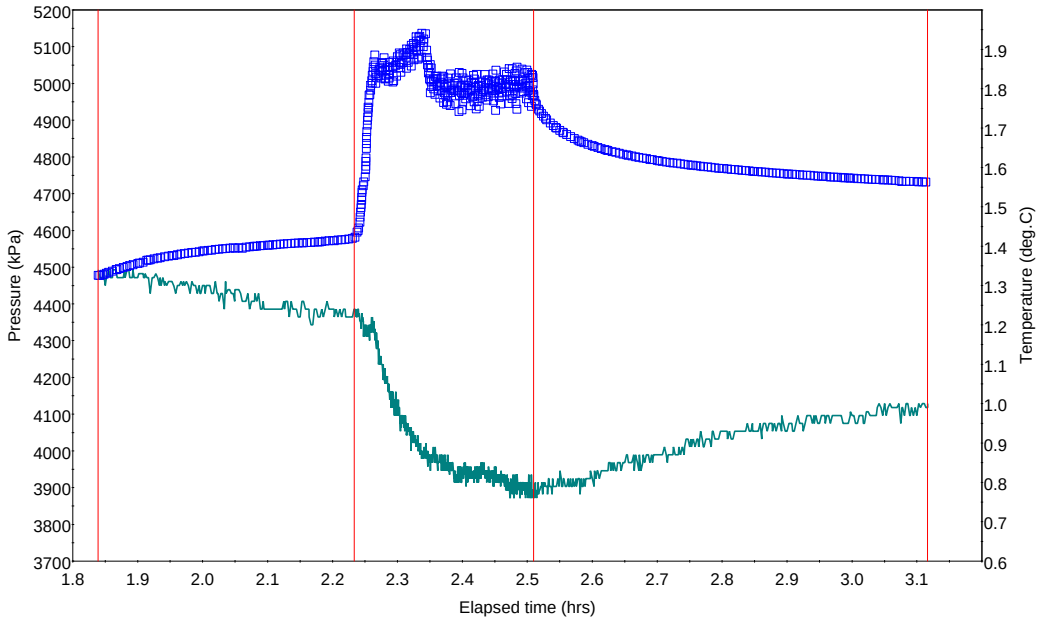
| | | | |
|---|---|---|---|
| Average Reservoir Temperature: | | 1.0 | deg.C |
| Average Reservoir Pressure | : | 5136.430 | kPa |
| Gas Gravity (air=1) | : | 0.7000 | |
| CO2 Content | : | 0.00 | percent |
| H2S Content | : | 0.00 | percent |

Gas Viscosity Correlation:

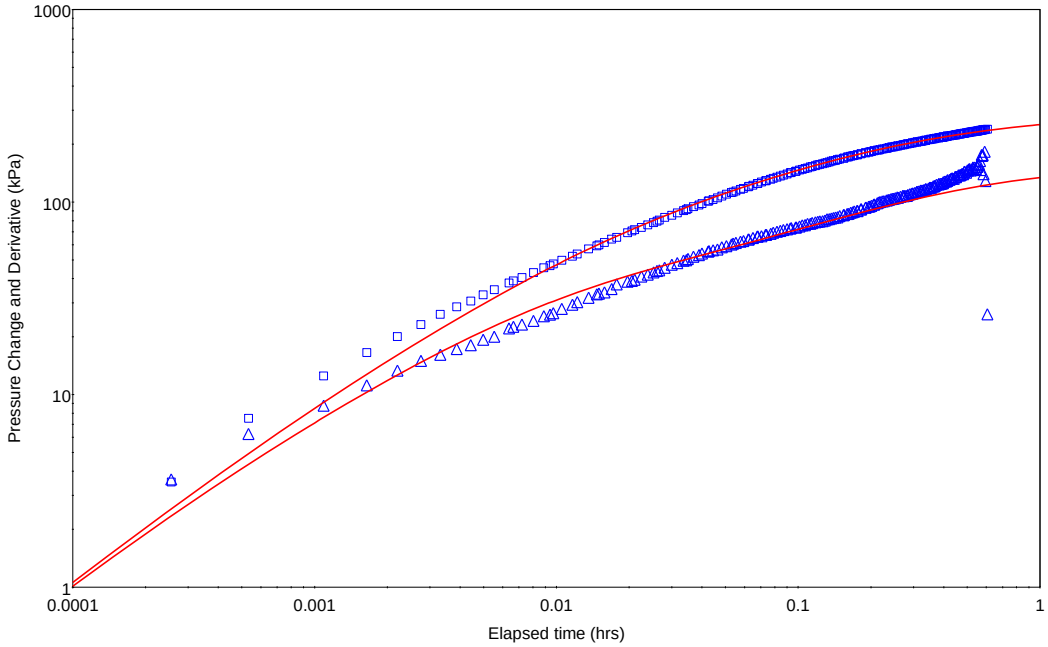
User values overwrite computed values

| | Calculated | User | |
|---|---|---|---|
| Gas Formation Volume Factor | | | Rm3/m3 |
| Gas Viscosity | | | cp |
| Gas Compressibility | | | 1/kPa |
| Z-Factor | | | fraction |

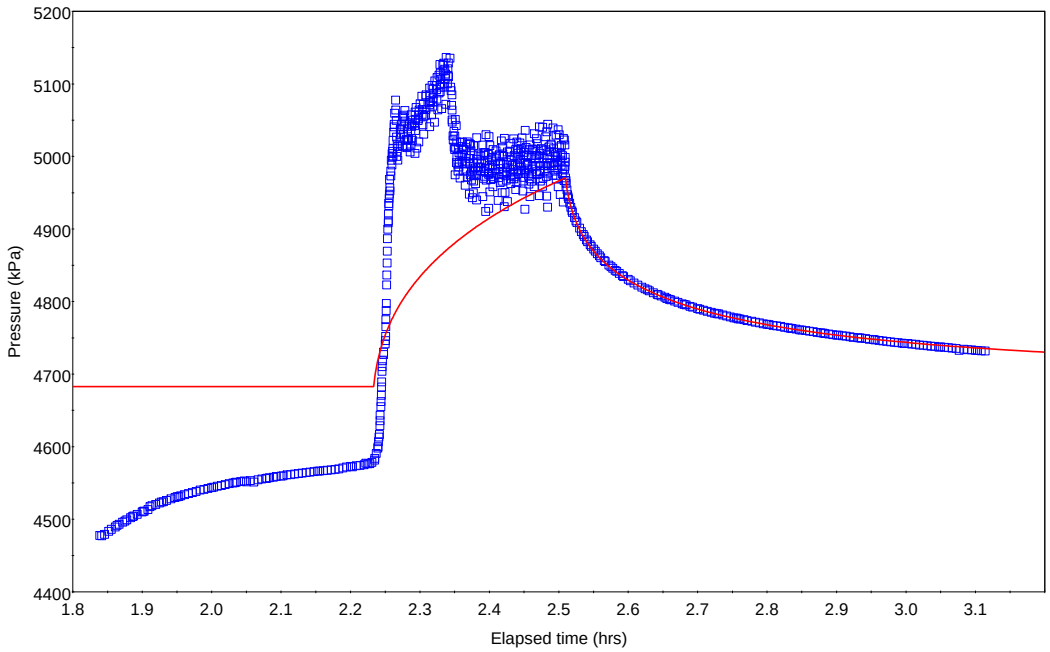
Pressure History



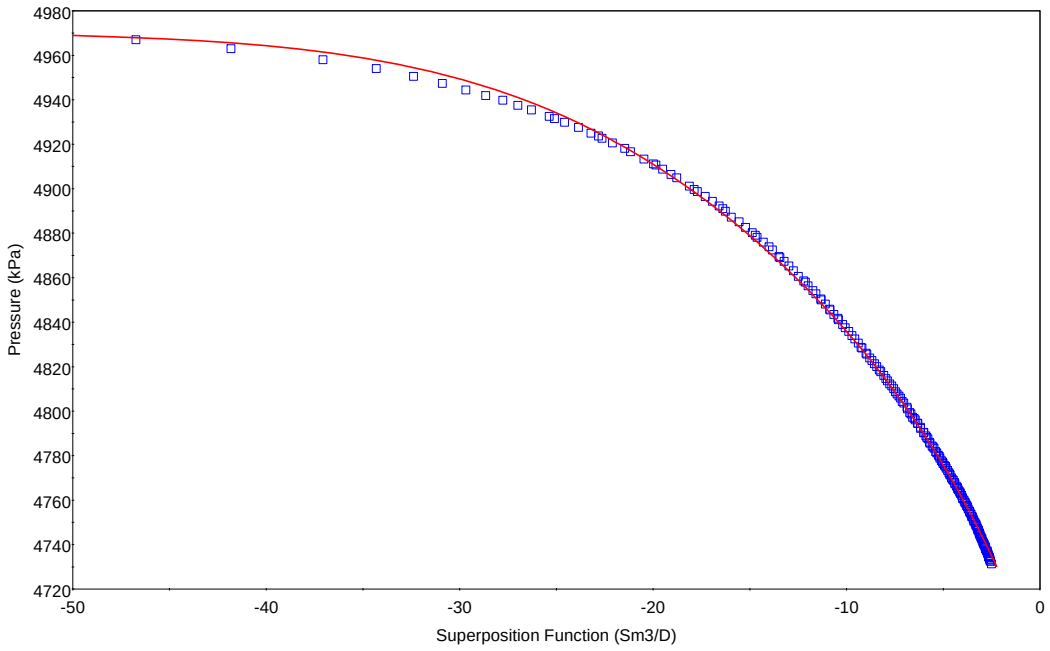

Log-Log Match - Flow Period 4



Simulation (Constant Skin) - Flow Period 4




Horner Match - Flow Period 4



# HYDROBENCH REPORT

| | |
|---|---|
| Project | COMAPLEX |
| Site | Meliadine |
| Borehole | GT-19 |
| Test Name | Test 1 |
| Test Date/Time | 07/09/2009, 10:00 |
| Interval | top: 34.62 m bottom: 73.50 m |
| Description | |

## Basic Data

| | |
|---|---|
| Test Interval | 38.88 m |
| Porosity | 0.10 |
| Well Radius | 0.048 m |
| Inclination | 39.0 deg |
| Test Volume | 281.422 l |
| Well Type | Source |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## History Definition

| Name | Category | Duration [hrs] | P(o) [kPa] | Rate [l/min] | C [m³/Pa] | Skin |
|---|---|---|---|---|---|---|

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| History | Var. Pressure | 0.00000 | 276.66 | | | 6.2e-07 |
| PSR | Recovery | 0.10278 | 275.56 | | | 6.2e-07 |
| SI-Init | dP-Event | 0.23889 | 280.57 | -18.6 * | | 6.2e-07 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SI | Slug | 0.24306 | 299.22 | 280.6 | | 6.2e-07 |
| Setup Change | Var. Pressure | 0.80278 | 295.72 | | | 1.0e-09 |
| RI | Const. Rate | 0.82639 | 296.66 | | -1.50e-01 | 1.0e-09 |
| RIR | Recovery | 1.31250 | 690.95 | | | 1.1e-09 |

## Analysis Results

### Analysis "RI-2"

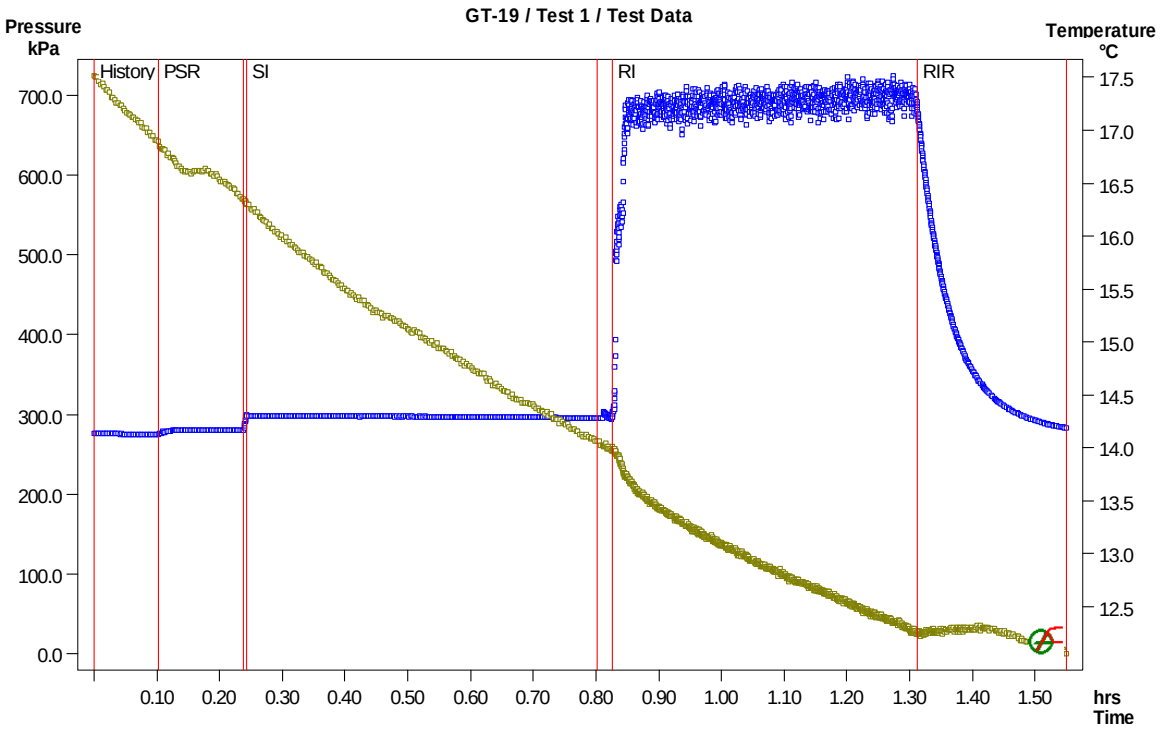
Static Pressure: 279.86 kPa

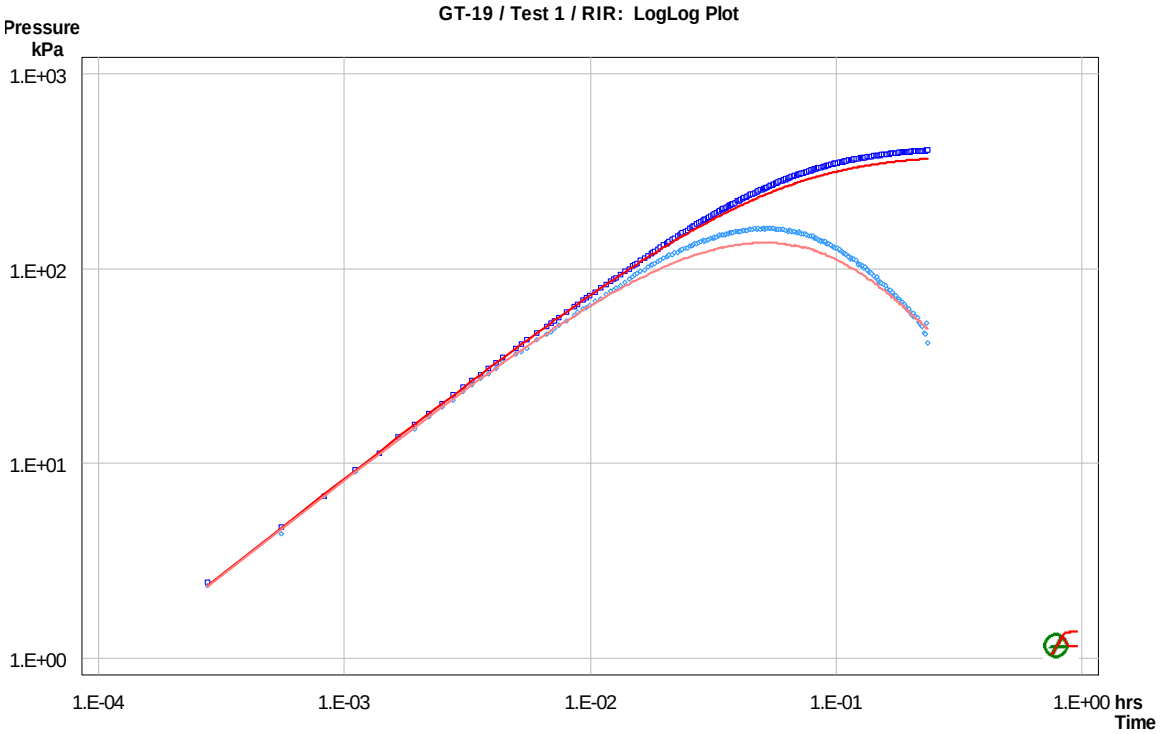
Shell Parameters:

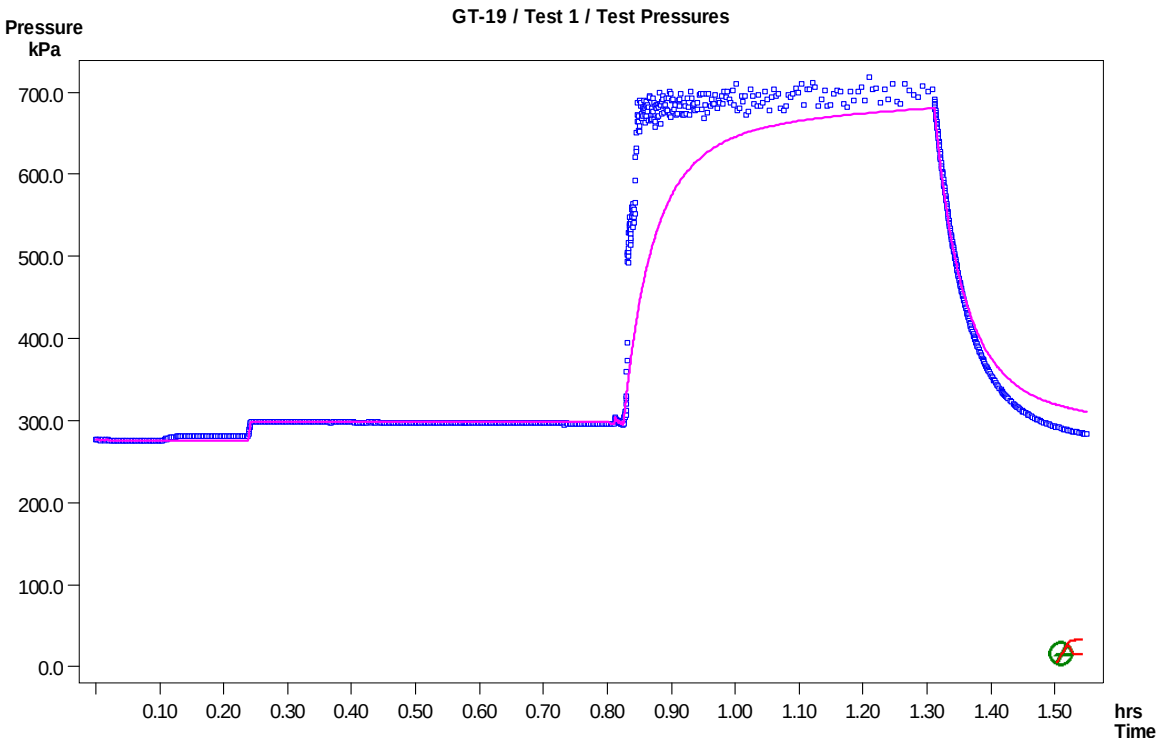
| Name | Transmiss. [$m^2/s$] | Storativity | Radius [m] | Flow Dim. |
|---|---|---|---|---|
| Shell 1 | 1.0e-08 | 7.6e-05 | 0.10 | 2.0 |
| Shell 2 | 1.1e-07 | 7.6e-05 | - - | 2.0 |

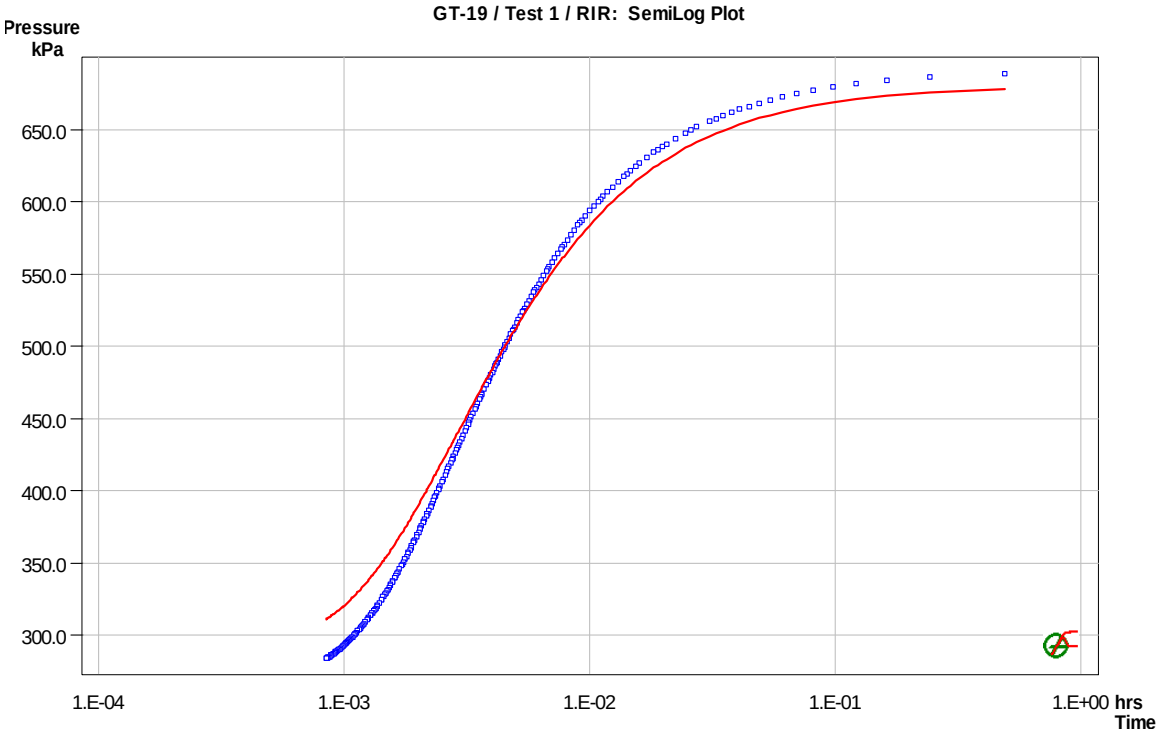
Sequence Parameters:

| Name | C [$m^3/Pa$] | Skin |
|---|---|---|
| History | 6.2e-07 | 0.0 |
| PSR | 6.2e-07 | 0.0 |
| SI | 6.2e-07 | 0.0 |
| Setup Change | 1.0e-09 | 0.0 |
| RI | 1.0e-09 | 0.0 |
| RIR | 1.0e-09 | 0.0 |


GT-19 / Test 1 / Test Data
Pressure
kPa
Temperature
°C
History
PSR
SI
RI
RIR
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
13.5
13.0
12.5
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50
hrs
Time


GT-19 / Test 1 / RIR: LogLog Plot
Pressure
kPa
1.E+03
1.E+02
1.E+01
1.E+00
1.E-04
1.E-03
1.E-02
1.E-01
1.E+00
hrs
Time


GT-19 / Test 1 / Test Pressures
Pressure
kPa
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50
hrs
Time


GT-19 / Test 1 / RIR: SemiLog Plot
Pressure
kPa
650.0
600.0
550.0
500.0
450.0
400.0
350.0
300.0
1.E-04
1.E-03
1.E-02
1.E-01
1.E+00
hrs
Time

# HYDROBENCH REPORT

| | |
|---|---|
| Project | COMAPLEX |
| Site | Meliadine |
| Borehole | GT-19 |
| Test Name | Test 2 - only first slug |
| Test Date/Time | 10/09/2009, 10:00 |
| Interval | top: 70.90 m bottom: 199.50 m |
| Description | |

## Basic Data

| | |
|---|---|
| Test Interval | 128.60 m |
| Porosity | 0.10 |
| Well Radius | 0.048 m |
| Inclination | 39.0 deg |
| Test Volume | 930.836 l |
| Well Type | Source |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## History Definition

| Name | Category | Duration [hrs] | P(o) [kPa] | Rate [l/min] | C [m³/Pa] | Skin |
|---|---|---|---|---|---|---|
| Auto_History | Const. Pressure | 1.00 | 657.98 | | | 0.00 |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| PSR | Recovery | 0.00000 | 657.98 | | | 2.2e-07 |

| | | | | | |
|---|---|---|---|---|---|
| SW-Init | dP-Event | 0.71111 | 642.11 | 397.3 * | 2.2e-07 |
| SW | Slug | 0.72500 | 244.76 | 642.1 | 2.2e-07 |

## Analysis Results

### Analysis "SW-1"

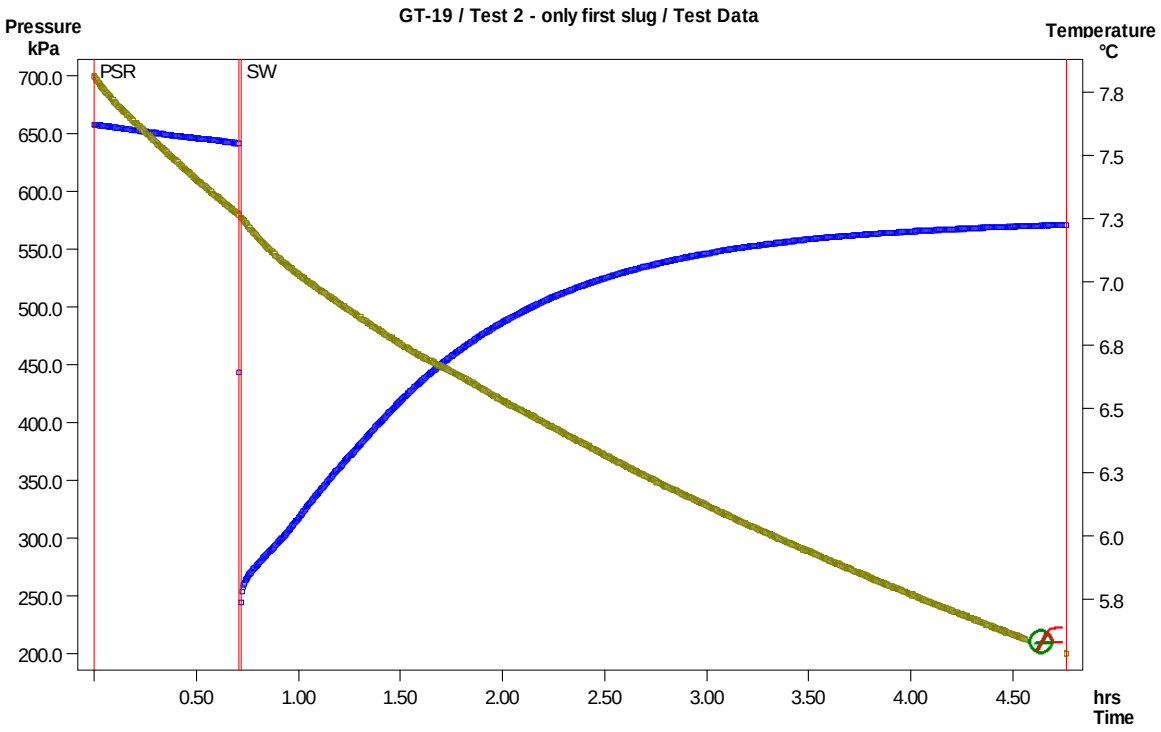
Static Pressure: 625.74 kPa

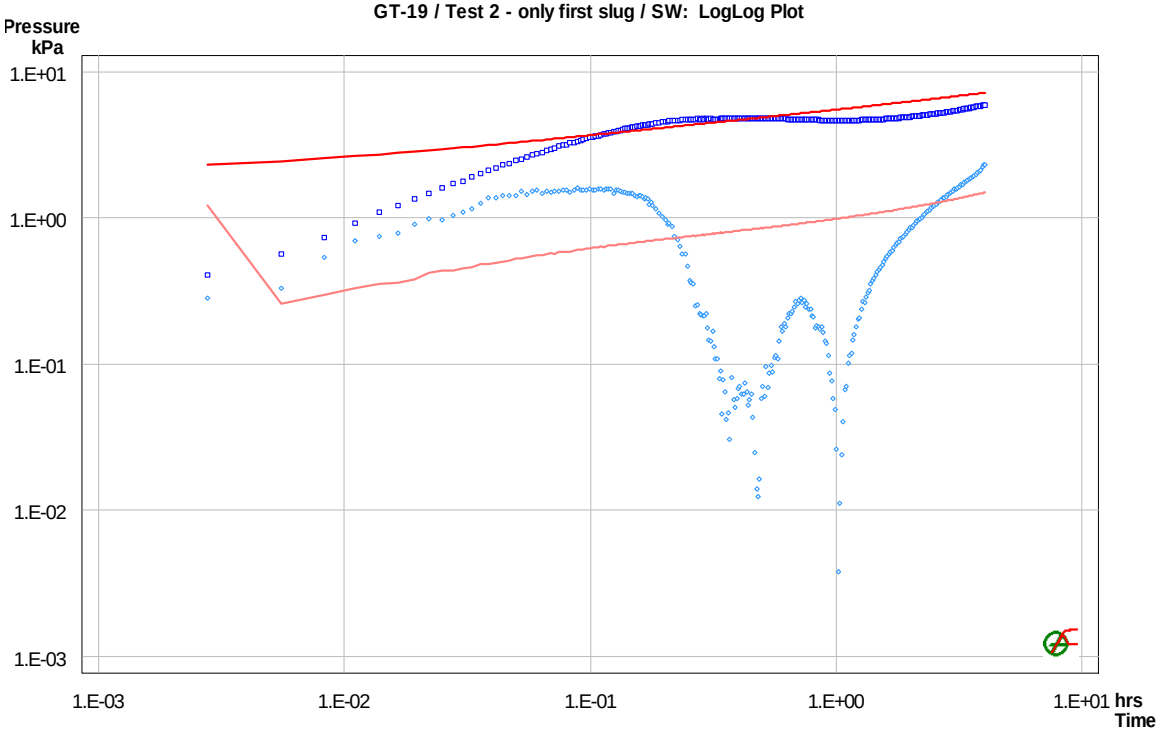
Shell Parameters:

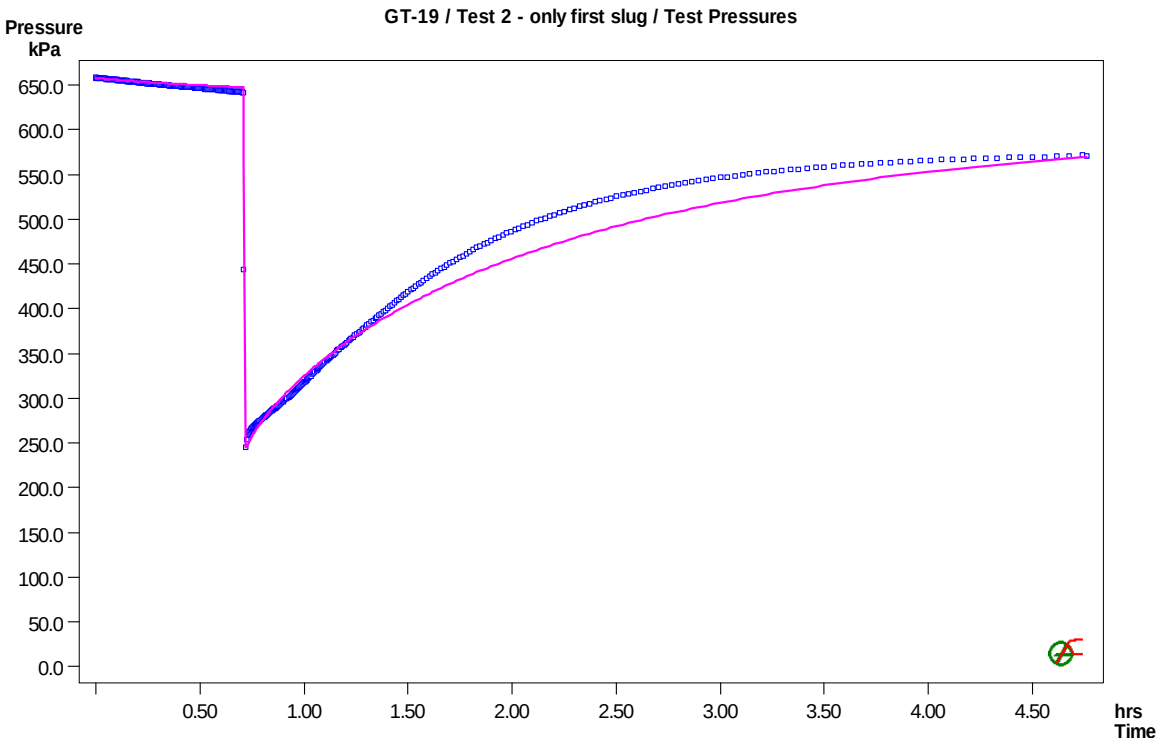
| Name | Transmiss. [m²/s] | Storativity | Radius [m] | Flow Dim. |
|---|---|---|---|---|
| Shell 1 | 2.1e-07 | 2.5e-04 | - - | 2.0 |

Sequence Parameters:

| Name | C [m³/Pa] | Skin |
|---|---|---|
| PSR | 2.2e-07 | -0.5 |
| SW | 2.2e-07 | -0.5 |


GT-19 / Test 2 - only first slug / Test Data
Pressure
kPa
Temperature
°C
PSR
SW
700.0
650.0
600.0
550.0
500.0
450.0
400.0
350.0
300.0
250.0
200.0
7.8
7.5
7.3
7.0
6.8
6.5
6.3
6.0
5.8
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
hrs
Time


GT-19 / Test 2 - only first slug / SW: LogLog Plot
Pressure
kPa
1.E+01
1.E+00
1.E-01
1.E-02
1.E-03
1.E-03
1.E-02
1.E-01
1.E+00
1.E+01
hrs
Time


GT-19 / Test 2 - only first slug / Test Pressures
Pressure
kPa
650.0
600.0
550.0
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
hrs
Time

# APPENDIX D

# LABORATORY ANALYTICAL CERTIFICATES FOR GROUNDWATER SAMPLES

# Certificate of Analysis

GOLDER ASSOCIATES LTD.
**ATTN:** VALERIE BERTRAND
32 STEACIE DRIVE
KANATA ON K2K 2A9

**Report Date:** 29-SEP-09 11:21 (MT)
**Version:** FINAL

**Lab Work Order #:** **L817948** **Date Received:** **15-SEP-09**

**Project P.O. #:** 09-1426-0015 3910 2000
**Job Reference:** 09-1426-0015 3910 2000
**Legal Site Desc:**
**CofC Numbers:**

**Other Information:**

**Comments:**

SHANNON LUCHKA
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Sample Details/Parameters | Result | Qualifier* | D.L. | Units | Extracted | Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| L817948-1 GT-19-1A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:48 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Bromide (Br) | 27.4 | DLA | 1.0 | mg/L | | 16-SEP-09 | R946120 |
| Total Dissolved Solids | 4690 | | 5.0 | mg/L | | 17-SEP-09 | R946770 |
| Total Suspended Solids | 73.0 | | 3.0 | mg/L | | 16-SEP-09 | R946110 |
| **Routine Water: Major Ions, Fluoride** | | | | | | | |
| **Chloride by IC** | | | | | | | |
| Chloride (Cl) | 2080 | DLA | 5.0 | mg/L | | 16-SEP-09 | R946120 |
| **Dissolved Metals in Water by ICPOES** | | | | | | | |
| Calcium (Ca)-Dissolved | 591 | | 0.50 | mg/L | | 16-SEP-09 | R946154 |
| Magnesium (Mg)-Dissolved | 17.5 | | 0.10 | mg/L | | 16-SEP-09 | R946154 |
| Potassium (K)-Dissolved | 55.3 | | 0.50 | mg/L | | 16-SEP-09 | R946154 |
| Sodium (Na)-Dissolved | 909 | | 1.0 | mg/L | | 16-SEP-09 | R946154 |
| **Fluoride by IC** | | | | | | | |
| Fluoride (F) | 0.941 | | 0.050 | mg/L | | 15-SEP-09 | R945484 |
| **Ion Balance Calculation** | | | | | | | |
| Ion Balance | 95.8 | | | % | | 17-SEP-09 | |
| TDS (Calculated) | 4260 | | | mg/L | | 17-SEP-09 | |
| Hardness (as CaCO3) | 1550 | | | mg/L | | 17-SEP-09 | |
| **Nitrate as N by IC** | | | | | | | |
| Nitrate (as N) | <0.050 | | 0.050 | mg/L | | 15-SEP-09 | R945484 |
| **Nitrate+Nitrite** | | | | | | | |
| Nitrate and Nitrite as N | <0.071 | | 0.071 | mg/L | | 16-SEP-09 | |
| **Nitrite as N by IC** | | | | | | | |
| Nitrite (as N) | <0.050 | | 0.050 | mg/L | | 15-SEP-09 | R945484 |
| **Sulfate by IC** | | | | | | | |
| Sulfate (SO4) | 313 | | 0.50 | mg/L | | 15-SEP-09 | R945484 |
| **pH, Conductivity and Total Alkalinity** | | | | | | | |
| pH | 7.91 | | 0.10 | pH | | 15-SEP-09 | R943543 |
| Conductivity (EC) | 7440 | | 0.20 | uS/cm | | 15-SEP-09 | R943543 |
| Bicarbonate (HCO3) | 597 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| Carbonate (CO3) | <5.0 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| Hydroxide (OH) | <5.0 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| Alkalinity, Total (as CaCO3) | 490 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| L817948-2 GT-19-1B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:48 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Bromide (Br) | 27.7 | DLA | 1.0 | mg/L | | 16-SEP-09 | R946120 |
| Total Dissolved Solids | 4720 | | 5.0 | mg/L | | 17-SEP-09 | R946770 |
| Total Suspended Solids | 76.0 | | 3.0 | mg/L | | 16-SEP-09 | R946110 |
| **Routine Water: Major Ions, Fluoride** | | | | | | | |
| **Chloride by IC** | | | | | | | |
| Chloride (Cl) | 2080 | DLA | 5.0 | mg/L | | 16-SEP-09 | R946120 |
| **Dissolved Metals in Water by ICPOES** | | | | | | | |
| Calcium (Ca)-Dissolved | 598 | | 0.50 | mg/L | | 16-SEP-09 | R946154 |
| Magnesium (Mg)-Dissolved | 18.1 | | 0.10 | mg/L | | 16-SEP-09 | R946154 |
| Potassium (K)-Dissolved | 57.7 | | 0.50 | mg/L | | 16-SEP-09 | R946154 |
| Sodium (Na)-Dissolved | 917 | | 1.0 | mg/L | | 16-SEP-09 | R946154 |
| **Fluoride by IC** | | | | | | | |
| Fluoride (F) | 0.929 | | 0.050 | mg/L | | 15-SEP-09 | R945484 |
| **Ion Balance Calculation** | | | | | | | |
| Ion Balance | 96.8 | | | % | | 17-SEP-09 | |

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Sample Details/Parameters | Result | Qualifier* | D.L. | Units | Extracted | Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| L817948-2 GT-19-1B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:48 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Ion Balance Calculation** | | | | | | | |
| TDS (Calculated) | 4280 | | | mg/L | | 17-SEP-09 | |
| Hardness (as CaCO3) | 1570 | | | mg/L | | 17-SEP-09 | |
| **Nitrate as N by IC** | | | | | | | |
| Nitrate (as N) | <0.050 | | 0.050 | mg/L | | 15-SEP-09 | R945484 |
| **Nitrate+Nitrite** | | | | | | | |
| Nitrate and Nitrite as N | <0.071 | | 0.071 | mg/L | | 16-SEP-09 | |
| **Nitrite as N by IC** | | | | | | | |
| Nitrite (as N) | <0.050 | | 0.050 | mg/L | | 15-SEP-09 | R945484 |
| **Sulfate by IC** | | | | | | | |
| Sulfate (SO4) | 312 | | 0.50 | mg/L | | 15-SEP-09 | R945484 |
| **pH, Conductivity and Total Alkalinity** | | | | | | | |
| pH | 7.91 | | 0.10 | pH | | 15-SEP-09 | R943543 |
| Conductivity (EC) | 7400 | | 0.20 | uS/cm | | 15-SEP-09 | R943543 |
| Bicarbonate (HCO3) | 604 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| Carbonate (CO3) | <5.0 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| Hydroxide (OH) | <5.0 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| Alkalinity, Total (as CaCO3) | 495 | | 5.0 | mg/L | | 15-SEP-09 | R943543 |
| L817948-3 GT-19-2A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:50 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Ammonia-N | 0.251 | | 0.050 | mg/L | | 16-SEP-09 | R945982 |
| Phosphorus, Total | 0.101 | | 0.020 | mg/L | 16-SEP-09 | 16-SEP-09 | R946459 |
| Total Kjeldahl Nitrogen | 0.82 | | 0.20 | mg/L | 17-SEP-09 | 17-SEP-09 | R946809 |
| L817948-4 GT-19-2B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:50 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Ammonia-N | 0.257 | | 0.050 | mg/L | | 16-SEP-09 | R945982 |
| Phosphorus, Total | 0.099 | | 0.020 | mg/L | 16-SEP-09 | 16-SEP-09 | R946459 |
| Total Kjeldahl Nitrogen | 0.77 | | 0.20 | mg/L | 17-SEP-09 | 17-SEP-09 | R946809 |
| L817948-7 GT-19-4A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:52 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Cyanide, Total | <0.0020 | | 0.0020 | mg/L | | 17-SEP-09 | R946958 |
| L817948-8 GT-19-4B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:52 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Cyanide, Total | <0.0020 | | 0.0020 | mg/L | | 17-SEP-09 | R946958 |
| L817948-9 GT-19-5A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:57 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Cyanide, Free | <0.0050 | | 0.0050 | mg/L | 16-SEP-09 | 16-SEP-09 | R946535 |

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Sample Details/Parameters | Result | Qualifier* | D.L. | Units | Extracted | Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| L817948-10 GT-19-5B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 14:57 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Miscellaneous Parameters** | | | | | | | |
| Cyanide, Free | <0.0050 | | 0.0050 | mg/L | 16-SEP-09 | 16-SEP-09 | R946535 |
| L817948-13 GT-19-7A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:25 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **TOT Metals CCME Fresh Water Aquatic Life** | | | | | | | |
| **Hardness (from Total Ca and Mg)** | | | | | | | |
| Hardness (as CaCO3) | 1560 | | | mg/L | | 19-SEP-09 | |
| **Mercury (Hg)** | | | | | | | |
| Mercury (Hg)-Total | <0.000020 | | 0.000020 | mg/L | | 21-SEP-09 | R951440 |
| **Total Al in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Aluminum (Al)-Total | 0.710 | RRVAP | 0.0050 | mg/L | | 18-SEP-09 | R947666 |
| **Total Cd in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Cadmium (Cd)-Total | 0.000035 | | 0.000010 | mg/L | | 18-SEP-09 | R947666 |
| **Total Metals in Water by ICPMS (Low)** | | | | | | | |
| Antimony (Sb)-Total | <0.00040 | | 0.00040 | mg/L | | 18-SEP-09 | R947666 |
| Arsenic (As)-Total | 0.00491 | | 0.00040 | mg/L | | 18-SEP-09 | R947666 |
| Barium (Ba)-Total | 0.0498 | | 0.0030 | mg/L | | 18-SEP-09 | R947666 |
| Beryllium (Be)-Total | <0.0010 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Boron (B)-Total | 1.95 | | 0.050 | mg/L | | 18-SEP-09 | R947666 |
| Chromium (Cr)-Total | 0.0293 | | 0.0050 | mg/L | | 18-SEP-09 | R947666 |
| Cobalt (Co)-Total | <0.0020 | | 0.0020 | mg/L | | 18-SEP-09 | R947666 |
| Copper (Cu)-Total | 0.0199 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Lead (Pb)-Total | 0.0720 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Lithium (Li)-Total | 0.505 | | 0.010 | mg/L | | 18-SEP-09 | R947666 |
| Molybdenum (Mo)-Total | <0.0050 | | 0.0050 | mg/L | | 18-SEP-09 | R947666 |
| Nickel (Ni)-Total | 0.0155 | | 0.0020 | mg/L | | 18-SEP-09 | R947666 |
| Selenium (Se)-Total | 0.0385 | | 0.00040 | mg/L | | 18-SEP-09 | R947666 |
| Silver (Ag)-Total | 0.00023 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Thallium (Tl)-Total | <0.00010 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Tin (Sn)-Total | <0.050 | | 0.050 | mg/L | | 18-SEP-09 | R947666 |
| Titanium (Ti)-Total | 0.0129 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Uranium (U)-Total | 0.00098 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Vanadium (V)-Total | 0.0088 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Zinc (Zn)-Total | 0.144 | | 0.0040 | mg/L | | 18-SEP-09 | R947666 |
| **Total Metals in Water by ICPOES** | | | | | | | |
| Calcium (Ca)-Total | 594 | DLM | 5.0 | mg/L | | 18-SEP-09 | R950559 |
| Iron (Fe)-Total | 2.98 | | 0.030 | mg/L | | 17-SEP-09 | R947036 |
| Magnesium (Mg)-Total | 17.8 | | 0.10 | mg/L | | 17-SEP-09 | R947036 |
| Manganese (Mn)-Total | 0.0562 | | 0.0050 | mg/L | | 17-SEP-09 | R947036 |
| Potassium (K)-Total | 58.3 | | 0.50 | mg/L | | 17-SEP-09 | R947036 |
| Sodium (Na)-Total | 921 | | 1.0 | mg/L | | 17-SEP-09 | R947036 |
| L817948-14 GT-19-7B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:25 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **TOT Metals CCME Fresh Water Aquatic Life** | | | | | | | |
| **Hardness (from Total Ca and Mg)** | | | | | | | |
| Hardness (as CaCO3) | 1650 | | | mg/L | | 19-SEP-09 | |
| **Mercury (Hg)** | | | | | | | |
| Mercury (Hg)-Total | <0.000020 | | 0.000020 | mg/L | | 21-SEP-09 | R951440 |
| **Total Al in Water by ICPMS (CCME - FAL)** | | | | | | | |

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Sample Details/Parameters | Result | Qualifier* | D.L. | Units | Extracted | Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| L817948-14 GT-19-7B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:25 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Total Al in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Aluminum (Al)-Total | 0.744 | RRVAP | 0.0050 | mg/L | | 18-SEP-09 | R947666 |
| **Total Cd in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Cadmium (Cd)-Total | 0.000035 | | 0.000010 | mg/L | | 18-SEP-09 | R947666 |
| **Total Metals in Water by ICPMS (Low)** | | | | | | | |
| Antimony (Sb)-Total | <0.00040 | | 0.00040 | mg/L | | 18-SEP-09 | R947666 |
| Arsenic (As)-Total | 0.00963 | | 0.00040 | mg/L | | 18-SEP-09 | R947666 |
| Barium (Ba)-Total | 0.0457 | | 0.0030 | mg/L | | 18-SEP-09 | R947666 |
| Beryllium (Be)-Total | <0.0010 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Boron (B)-Total | 2.10 | | 0.050 | mg/L | | 18-SEP-09 | R947666 |
| Chromium (Cr)-Total | 0.0441 | RRVAP | 0.0050 | mg/L | | 18-SEP-09 | R947666 |
| Cobalt (Co)-Total | <0.0020 | | 0.0020 | mg/L | | 18-SEP-09 | R947666 |
| Copper (Cu)-Total | 0.0220 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Lead (Pb)-Total | 0.130 | RRVAP | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Lithium (Li)-Total | 0.505 | | 0.010 | mg/L | | 18-SEP-09 | R947666 |
| Molybdenum (Mo)-Total | <0.0050 | | 0.0050 | mg/L | | 18-SEP-09 | R947666 |
| Nickel (Ni)-Total | 0.0172 | | 0.0020 | mg/L | | 18-SEP-09 | R947666 |
| Selenium (Se)-Total | 0.0422 | | 0.00040 | mg/L | | 18-SEP-09 | R947666 |
| Silver (Ag)-Total | <0.00010 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Thallium (Tl)-Total | <0.00010 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Tin (Sn)-Total | <0.050 | | 0.050 | mg/L | | 18-SEP-09 | R947666 |
| Titanium (Ti)-Total | 0.0134 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Uranium (U)-Total | 0.00093 | | 0.00010 | mg/L | | 18-SEP-09 | R947666 |
| Vanadium (V)-Total | 0.0136 | | 0.0010 | mg/L | | 18-SEP-09 | R947666 |
| Zinc (Zn)-Total | 0.205 | RRVAP | 0.0040 | mg/L | | 18-SEP-09 | R947666 |
| **Total Metals in Water by ICPOES** | | | | | | | |
| Calcium (Ca)-Total | 626 | DLM | 5.0 | mg/L | | 18-SEP-09 | R950559 |
| Iron (Fe)-Total | 3.20 | | 0.030 | mg/L | | 17-SEP-09 | R947036 |
| Magnesium (Mg)-Total | 18.5 | | 0.10 | mg/L | | 17-SEP-09 | R947036 |
| Manganese (Mn)-Total | 0.0591 | | 0.0050 | mg/L | | 17-SEP-09 | R947036 |
| Potassium (K)-Total | 60.2 | | 0.50 | mg/L | | 17-SEP-09 | R947036 |
| Sodium (Na)-Total | 944 | | 1.0 | mg/L | | 17-SEP-09 | R947036 |
| L817948-15 GT-19-8A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:30 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **TOT Metals CCME Fresh Water Aquatic Life** | | | | | | | |
| **Hardness (from Total Ca and Mg)** | | | | | | | |
| Hardness (as CaCO3) | 1660 | | | mg/L | | 28-SEP-09 | |
| **Mercury (Hg)** | | | | | | | |
| Mercury (Hg)-Total | <0.000020 | | 0.000020 | mg/L | | 22-SEP-09 | R953331 |
| **Total Al in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Aluminum (Al)-Total | 1.27 | DLM | 0.020 | mg/L | | 26-SEP-09 | R960963 |
| **Total Cd in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Cadmium (Cd)-Total | 0.000020 | DLM | 0.000020 | mg/L | | 26-SEP-09 | R960963 |
| **Total Metals in Water by ICPMS (Low)** | | | | | | | |
| Antimony (Sb)-Total | <0.0016 | DLM | 0.0016 | mg/L | | 26-SEP-09 | R960963 |
| Arsenic (As)-Total | 0.0111 | DLM | 0.0016 | mg/L | | 26-SEP-09 | R960963 |
| Barium (Ba)-Total | 0.0560 | DLM | 0.0030 | mg/L | | 26-SEP-09 | R960963 |
| Beryllium (Be)-Total | <0.0040 | DLM | 0.0040 | mg/L | | 26-SEP-09 | R960963 |
| Boron (B)-Total | 1.98 | DLM | 0.050 | mg/L | | 26-SEP-09 | R960963 |
| Chromium (Cr)-Total | 0.0066 | DLM | 0.0050 | mg/L | | 26-SEP-09 | R960963 |

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Sample Details/Parameters | Result | Qualifier* | D.L. | Units | Extracted | Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| L817948-15 GT-19-8A | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:30 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Total Metals in Water by ICPMS (Low)** | | | | | | | |
| Cobalt (Co)-Total | <0.0020 | DLM | 0.0020 | mg/L | | 26-SEP-09 | R960963 |
| Copper (Cu)-Total | 0.0344 | DLM | 0.0040 | mg/L | | 26-SEP-09 | R960963 |
| Lead (Pb)-Total | 0.286 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Lithium (Li)-Total | 0.470 | DLM | 0.024 | mg/L | | 26-SEP-09 | R960963 |
| Molybdenum (Mo)-Total | <0.0050 | DLM | 0.0050 | mg/L | | 26-SEP-09 | R960963 |
| Nickel (Ni)-Total | 0.0189 | DLM | 0.0020 | mg/L | | 26-SEP-09 | R960963 |
| Selenium (Se)-Total | 0.0075 | DLM | 0.0016 | mg/L | | 26-SEP-09 | R960963 |
| Silver (Ag)-Total | <0.00040 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Thallium (Tl)-Total | <0.00040 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Tin (Sn)-Total | <0.050 | DLM | 0.050 | mg/L | | 26-SEP-09 | R960963 |
| Titanium (Ti)-Total | 0.0210 | DLM | 0.0024 | mg/L | | 26-SEP-09 | R960963 |
| Uranium (U)-Total | 0.00101 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Vanadium (V)-Total | <0.0020 | DLM | 0.0020 | mg/L | | 26-SEP-09 | R960963 |
| Zinc (Zn)-Total | 0.238 | DLM | 0.016 | mg/L | | 26-SEP-09 | R960963 |
| **Total Metals in Water by ICPOES** | | | | | | | |
| Calcium (Ca)-Total | 630 | | 0.50 | mg/L | | 28-SEP-09 | R961610 |
| Iron (Fe)-Total | 6.25 | | 0.030 | mg/L | | 26-SEP-09 | R961059 |
| Magnesium (Mg)-Total | 19.8 | | 0.10 | mg/L | | 26-SEP-09 | R961059 |
| Manganese (Mn)-Total | 0.0795 | | 0.0050 | mg/L | | 26-SEP-09 | R961059 |
| Potassium (K)-Total | 63.1 | | 0.50 | mg/L | | 26-SEP-09 | R961059 |
| Sodium (Na)-Total | 985 | | 1.0 | mg/L | | 26-SEP-09 | R961059 |
| **Miscellaneous Parameters** | | | | | | | |
| Mercury (Hg)-Dissolved | <0.000020 | | 0.000020 | mg/L | | 22-SEP-09 | R953331 |
| L817948-16 GT-19-8B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:30 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **TOT Metals CCME Fresh Water Aquatic Life** | | | | | | | |
| **Hardness (from Total Ca and Mg)** | | | | | | | |
| Hardness (as CaCO3) | 1730 | | | mg/L | | 28-SEP-09 | |
| **Mercury (Hg)** | | | | | | | |
| Mercury (Hg)-Total | <0.000020 | | 0.000020 | mg/L | | 22-SEP-09 | R953331 |
| **Total Al in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Aluminum (Al)-Total | 1.34 | DLM | 0.020 | mg/L | | 26-SEP-09 | R960963 |
| **Total Cd in Water by ICPMS (CCME - FAL)** | | | | | | | |
| Cadmium (Cd)-Total | <0.000020 | DLM | 0.000020 | mg/L | | 26-SEP-09 | R960963 |
| **Total Metals in Water by ICPMS (Low)** | | | | | | | |
| Antimony (Sb)-Total | <0.0016 | DLM | 0.0016 | mg/L | | 26-SEP-09 | R960963 |
| Arsenic (As)-Total | 0.0124 | DLM | 0.0016 | mg/L | | 26-SEP-09 | R960963 |
| Barium (Ba)-Total | 0.0559 | DLM | 0.0030 | mg/L | | 26-SEP-09 | R960963 |
| Beryllium (Be)-Total | <0.0040 | DLM | 0.0040 | mg/L | | 26-SEP-09 | R960963 |
| Boron (B)-Total | 1.99 | DLM | 0.050 | mg/L | | 26-SEP-09 | R960963 |
| Chromium (Cr)-Total | 0.0075 | DLM | 0.0050 | mg/L | | 26-SEP-09 | R960963 |
| Cobalt (Co)-Total | <0.0020 | DLM | 0.0020 | mg/L | | 26-SEP-09 | R960963 |
| Copper (Cu)-Total | 0.0780 | DLM | 0.0040 | mg/L | | 26-SEP-09 | R960963 |
| Lead (Pb)-Total | 0.652 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Lithium (Li)-Total | 0.466 | DLM | 0.024 | mg/L | | 26-SEP-09 | R960963 |
| Molybdenum (Mo)-Total | <0.0050 | DLM | 0.0050 | mg/L | | 26-SEP-09 | R960963 |
| Nickel (Ni)-Total | 0.0188 | DLM | 0.0020 | mg/L | | 26-SEP-09 | R960963 |
| Selenium (Se)-Total | 0.0059 | DLM | 0.0016 | mg/L | | 26-SEP-09 | R960963 |
| Silver (Ag)-Total | <0.00040 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Thallium (Tl)-Total | <0.00040 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS LABORATORY GROUP ANALYTICAL REPORT

| Sample Details/Parameters | Result | Qualifier* | D.L. | Units | Extracted | Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| L817948-16 GT-19-8B | | | | | | | |
| Sampled By: M PESENDORFER on 12-SEP-09 @ 15:30 | | | | | | | |
| Matrix: WATER | | | | | | | |
| **Total Metals in Water by ICPMS (Low)** | | | | | | | |
| Tin (Sn)-Total | <0.050 | DLM | 0.050 | mg/L | | 26-SEP-09 | R960963 |
| Titanium (Ti)-Total | 0.0224 | DLM | 0.0024 | mg/L | | 26-SEP-09 | R960963 |
| Uranium (U)-Total | 0.00101 | DLM | 0.00040 | mg/L | | 26-SEP-09 | R960963 |
| Vanadium (V)-Total | <0.0020 | DLM | 0.0020 | mg/L | | 26-SEP-09 | R960963 |
| Zinc (Zn)-Total | 0.294 | DLM | 0.016 | mg/L | | 26-SEP-09 | R960963 |
| **Total Metals in Water by ICPOES** | | | | | | | |
| Calcium (Ca)-Total | 659 | | 0.50 | mg/L | | 28-SEP-09 | R961610 |
| Iron (Fe)-Total | 6.44 | | 0.030 | mg/L | | 26-SEP-09 | R961059 |
| Magnesium (Mg)-Total | 18.3 | | 0.10 | mg/L | | 26-SEP-09 | R961059 |
| Manganese (Mn)-Total | 0.0745 | | 0.0050 | mg/L | | 26-SEP-09 | R961059 |
| Potassium (K)-Total | 61.0 | | 0.50 | mg/L | | 26-SEP-09 | R961059 |
| Sodium (Na)-Total | 966 | | 1.0 | mg/L | | 26-SEP-09 | R961059 |
| **Miscellaneous Parameters** | | | | | | | |
| Mercury (Hg)-Dissolved | <0.000020 | | 0.000020 | mg/L | | 22-SEP-09 | R953331 |

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# Reference Information

## QC Samples with Qualifiers & Comments:

| QC Type Description | Parameter | Qualifier | Applies to Sample Number(s) |
|---|---|---|---|
| Duplicate | Cadmium (Cd)-Total | DLM | L817948-15, -16 |
| Matrix Spike | Calcium (Ca)-Dissolved | E | L817948-1, -2 |
| Matrix Spike | Potassium (K)-Total | E | L817948-15, -16 |

## Qualifiers for Individual Samples Listed:

| Sample Numbe | Client ID | Qualifier | Description |
|---|---|---|---|
| L817948-15 | GT-19-8A | PDM | Dissolved Hg - Particulate was observed in preserved Dissolved Metals sample. Associated results may be biased low. |
| L817948-16 | GT-19-8B | PDM | Dissolved Hg - Particulate was observed in preserved Dissolved Metals sample. Associated results may be biased low. |

## Sample Parameter Qualifier Key:

| Qualifier | Description |
|---|---|
| DLA | Detection Limit Adjusted For required dilution |
| DLM | Detection Limit Adjustment For Sample Matrix Effects |
| E | Matrix Spike recovery outside ALS DQO due to analyte background in sample. |
| RRVAP | Reported Result Verified by Alternate Process |

## Test Method References:

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| AL-T-CCME-FAL-MS-ED | Water | Total Al in Water by ICPMS (CCME - FAL) | APHA 3125-ICP-MS |
| BR-IC-ED | Water | Bromide by IC | APHA 4110 B-ION CHROMATOGRAPHY |
| CD-T-CCME-FAL-MS-ED | Water | Total Cd in Water by ICPMS (CCME - FAL) | APHA 3125-ICP-MS |
| CL-IC-ED | Water | Chloride by IC | APHA 4110 B-ION CHROMATOGRAPHY |
| CN-FREE-COL-VA | Water | Free Cyanide by Distillation | ALS IN-HOUSE METHOD |

This analysis is carried out using procedures adapted from ASTM D 4282 Standard Test Method for Determination of Free Cyanide in Water and Wastewater by Microdiffusion. ALS has adapted this method to use distillation instead of microdiffusion. Free cyanide is determined by sample distillation and analysis using the chloramine-T colourimetric method.

| | | | |
|---|---|---|---|
| CN-TOT-WP | Water | Cyanide, Total | APHA 4500 CN-O |

Total Cyanide in Water: Simple cyanides are converted to hydrogen cyanide (HCN) by distillation. Complex cyanides are not easily decomposed. Low power UV radiation is used to break down organic, metallic and alkali complexed compounds to free cyanide. The dislillation step isolates HCN from simple cyanides under specific acidic conditions. The liberated HCN is converted to cyanogen chloride with chloramine-T. This further reacts with barbituric acid and isonicotinic acid to form a highly coloured complex.

| | | | |
|---|---|---|---|
| ETL-HARDNESS-TOT-ED | Water | Hardness (from Total Ca and Mg) | APHA 2340 B-Calculation |
| F-IC-ED | Water | Fluoride by IC | APHA 4110 B-ION CHROMATOGRAPHY |
| HG-D-L-CVAA-ED | Water | Mercury (Hg) - Dissolved | EPA 245.7 / EPA 245.1 |
| HG-T-L-CVAA-ED | Water | Mercury (Hg) | EPA 245.7 / EPA 245.1 |
| IONBALANCE-ED | Water | Ion Balance Calculation | APHA 1030E |
| MET-D-ICP-ED | Water | Dissolved Metals in Water by ICPOES | APHA 3120 B-ICP-OES |
| MET-T-ICP-ED | Water | Total Metals in Water by ICPOES | APHA 3120 B-ICP-OES |
| MET-T-L-MS-ED | Water | Total Metals in Water by ICPMS (Low) | SW 846 - 6020-ICPMS |
| N-TOTKJ-ED | Water | Total Kjeldahl Nitrogen | APHA 4500N-C -Dig.-Auto-Colorimetry |
| NH4-ED | Water | Ammonia-N | APHA4500NH3F Colorimetry |
| NO2+NO3-CALC-ED | Water | Nitrate+Nitrite | CALCULATION |
| NO2-IC-ED | Water | Nitrite as N by IC | APHA 4110 B-ION CHROMATOGRAPHY |
| NO3-IC-ED | Water | Nitrate as N by IC | APHA 4110 B-ION CHROMATOGRAPHY |
| P-TOTAL-ED | Water | Phosphorus, Total | APHA 4500 P B,E-Auto-Colorimetry |

# Reference Information

| | | | |
|---|---|---|---|
| PH/EC/ALK-ED | Water | pH, Conductivity and Total Alkalinity | APHA 4500-H, 2510, 2320 |
| SO4-IC-ED | Water | Sulfate by IC | APHA 4110 B-ION CHROMATOGRAPHY |
| SOLIDS-TDS-ED | Water | Total Dissolved Solids | APHA 2540 C |
| SOLIDS-TOTSUS-ED | Water | Total Suspended Solids | APHA 2540 D-Gravimetric |

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|
| VA | ALS LABORATORY GROUP - VANCOUVER, BC, CANADA |
| ED | ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA |
| WP | ALS LABORATORY GROUP - WINNIPEG, MANITOBA, CANADA |

**Chain of Custody Numbers:**

**GLOSSARY OF REPORT TERMS**

*Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.*
*mg/kg - milligrams per kilogram based on dry weight of sample*
*mk/kg wwt - milligrams per kilogram based on wet weight of sample*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight*
*mg/L - unit of concentration based on volume, parts per million.*
*< - Less than.*
*D.L. - The reporting limit.*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# ALS Laboratory Group Quality Control Report

Workorder: L817948 Report Date: 29-SEP-09 

Client: GOLDER ASSOCIATES LTD.
32 STEACIE DRIVE
KANATA ON K2K 2A9
Contact: VALERIE BERTRAND

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **AL-T-CCME-FAL-MS-ED** | **Water** | | | | | | | |
| **Batch R947666** | | | | | | | | |
| **WG1004258-2 LCS** | | | | | | | | |
| Aluminum (Al)-Total | | | 102 | | % | | 80-120 | 17-SEP-09 |
| **WG1004258-1 MB** | | | | | | | | |
| Aluminum (Al)-Total | | | <0.0050 | | mg/L | | 0.025 | 17-SEP-09 |
| **Batch R960963** | | | | | | | | |
| **WG1009502-3 DUP** | | **L817948-16** | | | | | | |
| Aluminum (Al)-Total | | 1.34 | 1.34 | | mg/L | 0.016 | 20 | 26-SEP-09 |
| **WG1009502-2 LCS** | | | | | | | | |
| Aluminum (Al)-Total | | | 87 | | % | | 80-120 | 25-SEP-09 |
| **WG1009502-1 MB** | | | | | | | | |
| Aluminum (Al)-Total | | | <0.0050 | | mg/L | | 0.025 | 25-SEP-09 |
| **WG1009502-4 MS** | | **L817948-16** | | | | | | |
| Aluminum (Al)-Total | | | 95 | | % | | 71-127 | 26-SEP-09 |
| **BR-IC-ED** | **Water** | | | | | | | |
| **Batch R946120** | | | | | | | | |
| **WG1004180-2 LCS** | | | | | | | | |
| Bromide (Br) | | | 101 | | % | | 85-115 | 16-SEP-09 |
| **WG1004180-1 MB** | | | | | | | | |
| Bromide (Br) | | | <0.10 | | mg/L | | 0.1 | 16-SEP-09 |
| **CD-T-CCME-FAL-MS-ED** | **Water** | | | | | | | |
| **Batch R947666** | | | | | | | | |
| **WG1004258-2 LCS** | | | | | | | | |
| Cadmium (Cd)-Total | | | 96 | | % | | 80-120 | 17-SEP-09 |
| **WG1004258-1 MB** | | | | | | | | |
| Cadmium (Cd)-Total | | | <0.000010 | | mg/L | | 0.00005 | 17-SEP-09 |
| **Batch R960963** | | | | | | | | |
| **WG1009502-3 DUP** | | **L817948-16** | | | | | | |
| Cadmium (Cd)-Total | | <0.000020 | 0.000080 | DLM | mg/L | N/A | 31 | 26-SEP-09 |
| **WG1009502-2 LCS** | | | | | | | | |
| Cadmium (Cd)-Total | | | 87 | | % | | 80-120 | 25-SEP-09 |
| **WG1009502-1 MB** | | | | | | | | |
| Cadmium (Cd)-Total | | | <0.000010 | | mg/L | | 0.00005 | 25-SEP-09 |
| **WG1009502-4 MS** | | **L817948-16** | | | | | | |
| Cadmium (Cd)-Total | | | 100 | | % | | 83-114 | 26-SEP-09 |
| **CL-IC-ED** | **Water** | | | | | | | |

# ALS Laboratory Group Quality Control Report

Workorder: L817948 Report Date: 29-SEP-09 

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **CL-IC-ED** | **Water** | | | | | | | |
| **Batch R946120** | | | | | | | | |
| **WG1004180-3 DUP** | | **L817976-18** | | | | | | |
| Chloride (Cl) | | 21.0 | 21.0 | | mg/L | 0.25 | 20 | 16-SEP-09 |
| **WG1004180-5 DUP** | | **L818326-5** | | | | | | |
| Chloride (Cl) | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| **WG1004180-7 DUP** | | **L818362-9** | | | | | | |
| Chloride (Cl) | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| **WG1004180-9 DUP** | | **L818882-9** | | | | | | |
| Chloride (Cl) | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| **WG1004180-2 LCS** | | | | | | | | |
| Chloride (Cl) | | | 103 | | % | | 85-115 | 16-SEP-09 |
| **WG1004180-1 MB** | | | | | | | | |
| Chloride (Cl) | | | <0.50 | | mg/L | | 0.5 | 16-SEP-09 |
| **WG1004180-10 MS** | | **L818882-9** | | | | | | |
| Chloride (Cl) | | | 107 | | % | | 75-125 | 16-SEP-09 |
| **WG1004180-4 MS** | | **L817976-18** | | | | | | |
| Chloride (Cl) | | | 102 | | % | | 75-125 | 16-SEP-09 |
| **WG1004180-6 MS** | | **L818326-5** | | | | | | |
| Chloride (Cl) | | | 107 | | % | | 75-125 | 16-SEP-09 |
| **WG1004180-8 MS** | | **L818362-9** | | | | | | |
| Chloride (Cl) | | | 108 | | % | | 75-125 | 16-SEP-09 |
| **CN-FREE-COL-VA** | **Water** | | | | | | | |
| **Batch R946535** | | | | | | | | |
| **WG1004702-2 CRM** | | **VA-FREE-CONTROL** | | | | | | |
| Cyanide, Free | | | 86 | | % | | 80-120 | 16-SEP-09 |
| **WG1004702-3 DUP** | | **L817730-1** | | | | | | |
| Cyanide, Free | | 0.0446 | 0.0423 | J | mg/L | 0.0023 | 0.02 | 16-SEP-09 |
| **WG1004702-1 MB** | | | | | | | | |
| Cyanide, Free | | | <0.0050 | | mg/L | | 0.005 | 16-SEP-09 |
| **CN-TOT-WP** | **Water** | | | | | | | |
| **Batch R946958** | | | | | | | | |
| **WG1005220-3 CCV** | | | | | | | | |
| Cyanide, Total | | | 93 | | % | | 90-110 | 17-SEP-09 |
| **WG1005220-2 CVS** | | | | | | | | |
| Cyanide, Total | | | 95 | | % | | 80-120 | 17-SEP-09 |
| **WG1005220-4 DUP** | | **L819053-1** | | | | | | |
| Cyanide, Total | | 0.0127 | 0.0109 | J | mg/L | 0.0018 | 0.008 | 17-SEP-09 |
| **WG1005220-6 IRM** | | **61-CN** | | | | | | |

# ALS Laboratory Group Quality Control Report

Workorder: L817948 Report Date: 29-SEP-09 

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **CN-TOT-WP** | **Water** | | | | | | | |
| **Batch R946958** | | | | | | | | |
| **WG1005220-6 IRM** | | **61-CN** | | | | | | |
| Cyanide, Total | | | 87.2 | | % | | 75-125 | 17-SEP-09 |
| **WG1005220-1 MB** | | | | | | | | |
| Cyanide, Total | | | <0.0020 | | mg/L | | 0.002 | 17-SEP-09 |
| **WG1005220-5 MS** | | **L819053-1** | | | | | | |
| Cyanide, Total | | | 93 | | % | | 70-130 | 17-SEP-09 |
| **F-IC-ED** | **Water** | | | | | | | |
| **Batch R945484** | | | | | | | | |
| **WG1003754-7 DUP** | | **L817850-13** | | | | | | |
| Fluoride (F) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-2 LCS** | | | | | | | | |
| Fluoride (F) | | | 96 | | % | | 85-115 | 15-SEP-09 |
| **WG1003754-1 MB** | | | | | | | | |
| Fluoride (F) | | | <0.050 | | mg/L | | 0.05 | 15-SEP-09 |
| **WG1003754-8 MS** | | **L817850-13** | | | | | | |
| Fluoride (F) | | | 102 | | % | | 75-125 | 15-SEP-09 |
| **HG-D-L-CVAA-ED** | **Water** | | | | | | | |
| **Batch R953331** | | | | | | | | |
| **WG1007354-2 LCS** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | 108 | | % | | 80-120 | 22-SEP-09 |
| **WG1007354-3 LCSD** | | **WG1007354-2** | | | | | | |
| Mercury (Hg)-Dissolved | | 108 | 116 | | % | 7.0 | 20 | 22-SEP-09 |
| **WG1007354-1 MB** | | | | | | | | |
| Mercury (Hg)-Dissolved | | | <0.000020 | | mg/L | | 0.00002 | 22-SEP-09 |
| **HG-T-L-CVAA-ED** | **Water** | | | | | | | |
| **Batch R951440** | | | | | | | | |
| **WG1006653-8 DUP** | | **L817948-14** | | | | | | |
| Mercury (Hg)-Total | | <0.000020 | <0.000020 | RPD-NA | mg/L | N/A | 20 | 21-SEP-09 |
| **WG1006653-2 LCS** | | | | | | | | |
| Mercury (Hg)-Total | | | 99 | | % | | 80-120 | 21-SEP-09 |
| **WG1006653-3 LCSD** | | **WG1006653-2** | | | | | | |
| Mercury (Hg)-Total | | 99 | 99 | | % | 0.32 | 20 | 21-SEP-09 |
| **WG1006653-1 MB** | | | | | | | | |
| Mercury (Hg)-Total | | | <0.000020 | | mg/L | | 0.00002 | 21-SEP-09 |
| **WG1006653-9 MS** | | **L817948-14** | | | | | | |
| Mercury (Hg)-Total | | | 84 | | % | | 70-130 | 21-SEP-09 |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **HG-T-L-CVAA-ED** | **Water** | | | | | | | |
| **Batch R953331** | | | | | | | | |
| **WG1007354-6 DUP** | | **L817976-6** | | | | | | |
| Mercury (Hg)-Total | | <0.020 | <0.000020 | RPD-NA | mg/L | N/A | 20 | 23-SEP-09 |
| **WG1007354-8 DUP** | | **L817988-4** | | | | | | |
| Mercury (Hg)-Total | | <0.020 | <0.000020 | RPD-NA | mg/L | N/A | 20 | 23-SEP-09 |
| **WG1007354-2 LCS** | | | | | | | | |
| Mercury (Hg)-Total | | | 108 | | % | | 80-120 | 22-SEP-09 |
| **WG1007354-3 LCSD** | | **WG1007354-2** | | | | | | |
| Mercury (Hg)-Total | | 108 | 116 | | % | 7.0 | 20 | 22-SEP-09 |
| **WG1007354-1 MB** | | | | | | | | |
| Mercury (Hg)-Total | | | <0.000020 | | mg/L | | 0.00002 | 22-SEP-09 |
| **WG1007354-7 MS** | | **L817976-6** | | | | | | |
| Mercury (Hg)-Total | | | 83 | | % | | 70-130 | 23-SEP-09 |
| **WG1007354-9 MS** | | **L817988-4** | | | | | | |
| Mercury (Hg)-Total | | | 112 | | % | | 70-130 | 23-SEP-09 |
| **MET-D-ICP-ED** | **Water** | | | | | | | |
| **Batch R946154** | | | | | | | | |
| **WG1004341-2 CRM** | | **EU-H-3_OPTWATER** | | | | | | |
| Calcium (Ca)-Dissolved | | | 107 | | % | | 80-120 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | | 93 | | % | | 80-120 | 16-SEP-09 |
| Potassium (K)-Dissolved | | | 90 | | % | | 80-120 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | | 91 | | % | | 80-120 | 16-SEP-09 |
| **WG1004341-11 DUP** | | **L817335-66** | | | | | | |
| Calcium (Ca)-Dissolved | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | <0.10 | <0.10 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| Potassium (K)-Dissolved | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | <1.0 | <1.0 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| **WG1004341-3 DUP** | | **L817828-3** | | | | | | |
| Calcium (Ca)-Dissolved | | 53.0 | 53.1 | | mg/L | 0.033 | 20 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | 13.9 | 14.1 | | mg/L | 0.86 | 20 | 16-SEP-09 |
| Potassium (K)-Dissolved | | 1.59 | 1.69 | J | mg/L | 0.10 | 2 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | 14.4 | 14.3 | | mg/L | 1.2 | 20 | 16-SEP-09 |
| **WG1004341-5 DUP** | | **L817114-5** | | | | | | |
| Calcium (Ca)-Dissolved | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | <0.10 | <0.10 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| Potassium (K)-Dissolved | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | <1.0 | <1.0 | RPD-NA | mg/L | N/A | 20 | 16-SEP-09 |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-D-ICP-ED** | **Water** | | | | | | | |
| **Batch R946154** | | | | | | | | |
| **WG1004341-9 DUP** | | **L817335-27** | | | | | | |
| Calcium (Ca)-Dissolved | | 134 | 132 | | mg/L | 1.5 | 20 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | 36.8 | 36.8 | | mg/L | 0.15 | 20 | 16-SEP-09 |
| Potassium (K)-Dissolved | | 2.14 | 2.16 | J | mg/L | 0.02 | 2 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | 36.5 | 36.1 | | mg/L | 1.0 | 20 | 16-SEP-09 |
| **WG1004341-1 MB** | | | | | | | | |
| Calcium (Ca)-Dissolved | | | <0.50 | | mg/L | | 0.5 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | | <0.10 | | mg/L | | 0.1 | 16-SEP-09 |
| Potassium (K)-Dissolved | | | <0.50 | | mg/L | | 0.5 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | | <1.0 | | mg/L | | 1 | 16-SEP-09 |
| **WG1004341-10 MS** | | **L817335-27** | | | | | | |
| Calcium (Ca)-Dissolved | | | 86 | E | % | | 70-130 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | | 95 | | % | | 70-130 | 16-SEP-09 |
| Potassium (K)-Dissolved | | | 110 | | % | | 70-130 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | | 118 | | % | | 70-130 | 16-SEP-09 |
| **WG1004341-12 MS** | | **L817335-66** | | | | | | |
| Calcium (Ca)-Dissolved | | | 115 | | % | | 70-130 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | | 103 | | % | | 70-130 | 16-SEP-09 |
| Potassium (K)-Dissolved | | | 104 | | % | | 70-130 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | | 101 | | % | | 70-130 | 16-SEP-09 |
| **WG1004341-4 MS** | | **L817828-3** | | | | | | |
| Calcium (Ca)-Dissolved | | | 91 | | % | | 70-130 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | | 93 | | % | | 70-130 | 16-SEP-09 |
| Potassium (K)-Dissolved | | | 110 | | % | | 70-130 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | | 96 | | % | | 70-130 | 16-SEP-09 |
| **WG1004341-6 MS** | | **L817114-5** | | | | | | |
| Calcium (Ca)-Dissolved | | | 107 | | % | | 70-130 | 16-SEP-09 |
| Magnesium (Mg)-Dissolved | | | 98 | | % | | 70-130 | 16-SEP-09 |
| Potassium (K)-Dissolved | | | 102 | | % | | 70-130 | 16-SEP-09 |
| Sodium (Na)-Dissolved | | | 101 | | % | | 70-130 | 16-SEP-09 |
| **MET-T-ICP-ED** | **Water** | | | | | | | |
| **Batch R947036** | | | | | | | | |
| **WG1004258-2 LCS** | | | | | | | | |
| Iron (Fe)-Total | | | 104 | | % | | 63-138 | 17-SEP-09 |
| Magnesium (Mg)-Total | | | 101 | | % | | 63-138 | 17-SEP-09 |

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-ICP-ED** | **Water** | | | | | | | |
| **Batch R947036** | | | | | | | | |
| **WG1004258-2 LCS** | | | | | | | | |
| Manganese (Mn)-Total | | | 102 | | % | | 63-138 | 17-SEP-09 |
| Potassium (K)-Total | | | 100 | | % | | 63-138 | 17-SEP-09 |
| Sodium (Na)-Total | | | 100 | | % | | 63-138 | 17-SEP-09 |
| **WG1004258-1 MB** | | | | | | | | |
| Iron (Fe)-Total | | | <0.030 | | mg/L | | 0.03 | 17-SEP-09 |
| Magnesium (Mg)-Total | | | <0.10 | | mg/L | | 0.1 | 17-SEP-09 |
| Manganese (Mn)-Total | | | <0.0050 | | mg/L | | 0.005 | 17-SEP-09 |
| Potassium (K)-Total | | | <0.50 | | mg/L | | 0.5 | 17-SEP-09 |
| Sodium (Na)-Total | | | <1.0 | | mg/L | | 1 | 17-SEP-09 |
| **Batch R961059** | | | | | | | | |
| **WG1009502-3 DUP** | | **L817948-16** | | | | | | |
| Iron (Fe)-Total | | 6.44 | 6.01 | | mg/L | 6.9 | 26 | 26-SEP-09 |
| Magnesium (Mg)-Total | | 18.3 | 18.2 | | mg/L | 0.49 | 26 | 26-SEP-09 |
| Manganese (Mn)-Total | | 0.0745 | 0.0735 | | mg/L | 1.3 | 26 | 26-SEP-09 |
| Potassium (K)-Total | | 61.0 | 60.9 | | mg/L | 0.14 | 26 | 26-SEP-09 |
| Sodium (Na)-Total | | 966 | 946 | | mg/L | 2.0 | 26 | 26-SEP-09 |
| **WG1009502-2 LCS** | | | | | | | | |
| Iron (Fe)-Total | | | 87 | | % | | 63-138 | 26-SEP-09 |
| Magnesium (Mg)-Total | | | 88 | | % | | 63-138 | 26-SEP-09 |
| Manganese (Mn)-Total | | | 87 | | % | | 63-138 | 26-SEP-09 |
| Potassium (K)-Total | | | 87 | | % | | 63-138 | 26-SEP-09 |
| Sodium (Na)-Total | | | 86 | | % | | 63-138 | 26-SEP-09 |
| **WG1009502-1 MB** | | | | | | | | |
| Iron (Fe)-Total | | | <0.030 | | mg/L | | 0.03 | 26-SEP-09 |
| Magnesium (Mg)-Total | | | <0.10 | | mg/L | | 0.1 | 26-SEP-09 |
| Manganese (Mn)-Total | | | <0.0050 | | mg/L | | 0.005 | 26-SEP-09 |
| Potassium (K)-Total | | | <0.50 | | mg/L | | 0.5 | 26-SEP-09 |
| Sodium (Na)-Total | | | <1.0 | | mg/L | | 1 | 26-SEP-09 |
| **WG1009502-4 MS** | | **L817948-16** | | | | | | |
| Iron (Fe)-Total | | | 105 | | % | | 63-138 | 26-SEP-09 |
| Magnesium (Mg)-Total | | | 115 | | % | | 63-138 | 26-SEP-09 |
| Manganese (Mn)-Total | | | 110 | | % | | 63-138 | 26-SEP-09 |
| Potassium (K)-Total | | | 148 | E | % | | 63-138 | 26-SEP-09 |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-ICP-ED** | **Water** | | | | | | | |
| **Batch R961610** | | | | | | | | |
| **WG1009502-1 MB** | | | | | | | | |
| Calcium (Ca)-Total | | | <0.50 | | mg/L | | 0.5 | 28-SEP-09 |
| **MET-T-L-MS-ED** | **Water** | | | | | | | |
| **Batch R943963** | | | | | | | | |
| **WG1004258-2 LCS** | | | | | | | | |
| Silver (Ag)-Total | | | 82 | | % | | 80-120 | 17-SEP-09 |
| **Batch R947666** | | | | | | | | |
| **WG1004258-2 LCS** | | | | | | | | |
| Zinc (Zn)-Total | | | 92 | | % | | 80-120 | 17-SEP-09 |
| **WG1004258-1 MB** | | | | | | | | |
| Antimony (Sb)-Total | | | <0.00040 | | mg/L | | 0.002 | 17-SEP-09 |
| Arsenic (As)-Total | | | <0.00040 | | mg/L | | 0.002 | 17-SEP-09 |
| Barium (Ba)-Total | | | <0.00020 | | mg/L | | 0.001 | 17-SEP-09 |
| Beryllium (Be)-Total | | | <0.0010 | | mg/L | | 0.005 | 17-SEP-09 |
| Boron (B)-Total | | | <0.0040 | | mg/L | | 0.02 | 17-SEP-09 |
| Chromium (Cr)-Total | | | <0.00080 | | mg/L | | 0.004 | 17-SEP-09 |
| Cobalt (Co)-Total | | | <0.00020 | | mg/L | | 0.001 | 17-SEP-09 |
| Copper (Cu)-Total | | | <0.0010 | | mg/L | | 0.005 | 17-SEP-09 |
| Lead (Pb)-Total | | | <0.00010 | | mg/L | | 0.0005 | 17-SEP-09 |
| Lithium (Li)-Total | | | <0.0060 | | mg/L | | 0.006 | 17-SEP-09 |
| Molybdenum (Mo)-Total | | | <0.00010 | | mg/L | | 0.0005 | 17-SEP-09 |
| Nickel (Ni)-Total | | | <0.00020 | | mg/L | | 0.001 | 17-SEP-09 |
| Selenium (Se)-Total | | | <0.00040 | | mg/L | | 0.002 | 17-SEP-09 |
| Silver (Ag)-Total | | | <0.00010 | | mg/L | | 0.0005 | 17-SEP-09 |
| Thallium (Tl)-Total | | | <0.00010 | | mg/L | | 0.0005 | 17-SEP-09 |
| Tin (Sn)-Total | | | <0.00040 | | mg/L | | 0.002 | 17-SEP-09 |
| Titanium (Ti)-Total | | | <0.00060 | | mg/L | | 0.003 | 17-SEP-09 |
| Uranium (U)-Total | | | <0.00010 | | mg/L | | 0.0005 | 17-SEP-09 |
| Vanadium (V)-Total | | | <0.00050 | | mg/L | | 0.0025 | 17-SEP-09 |
| Zinc (Zn)-Total | | | <0.0040 | | mg/L | | 0.02 | 17-SEP-09 |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-MS-ED** | **Water** | | | | | | | |
| **Batch R960963** | | | | | | | | |
| **WG1009502-3 DUP** | | **L817948-16** | | | | | | |
| Antimony (Sb)-Total | | <0.0016 | <0.00040 | RPD-NA | mg/L | N/A | 10 | 26-SEP-09 |
| Arsenic (As)-Total | | 0.0124 | 0.0123 | | mg/L | 0.48 | 11 | 26-SEP-09 |
| Barium (Ba)-Total | | 0.0559 | 0.0570 | | mg/L | 2.0 | 10 | 26-SEP-09 |
| Beryllium (Be)-Total | | <0.0040 | <0.0010 | RPD-NA | mg/L | N/A | 26 | 26-SEP-09 |
| Boron (B)-Total | | 1.99 | 2.00 | | mg/L | 0.37 | 10 | 26-SEP-09 |
| Chromium (Cr)-Total | | 0.0075 | 0.00748 | J | mg/L | 0.00004 | 0.0032 | 26-SEP-09 |
| Cobalt (Co)-Total | | <0.0020 | 0.00177 | J | mg/L | 0.00002 | 0.0008 | 26-SEP-09 |
| Copper (Cu)-Total | | 0.0780 | 0.0779 | | mg/L | 0.12 | 17 | 26-SEP-09 |
| Lead (Pb)-Total | | 0.652 | 0.662 | | mg/L | 1.6 | 12 | 26-SEP-09 |
| Lithium (Li)-Total | | 0.466 | 0.466 | | mg/L | 0.11 | 12 | 26-SEP-09 |
| Molybdenum (Mo)-Total | | <0.0050 | 0.00060 | J | mg/L | 0.00008 | 0.0004 | 26-SEP-09 |
| Nickel (Ni)-Total | | 0.0188 | 0.0202 | | mg/L | 7.2 | 10 | 26-SEP-09 |
| Selenium (Se)-Total | | 0.0059 | 0.00535 | | mg/L | 10 | 21 | 26-SEP-09 |
| Silver (Ag)-Total | | <0.00040 | <0.00010 | RPD-NA | mg/L | N/A | 33 | 26-SEP-09 |
| Thallium (Tl)-Total | | <0.00040 | <0.00010 | RPD-NA | mg/L | N/A | 26 | 26-SEP-09 |
| Tin (Sn)-Total | | <0.050 | <0.00040 | RPD-NA | mg/L | N/A | 25 | 26-SEP-09 |
| Titanium (Ti)-Total | | 0.0224 | 0.0236 | | mg/L | 5.0 | 32 | 26-SEP-09 |
| Uranium (U)-Total | | 0.00101 | 0.00098 | J | mg/L | 0.00004 | 0.0004 | 26-SEP-09 |
| Vanadium (V)-Total | | <0.0020 | <0.00050 | RPD-NA | mg/L | N/A | 24 | 26-SEP-09 |
| Zinc (Zn)-Total | | 0.294 | 0.302 | | mg/L | 2.8 | 40 | 26-SEP-09 |
| **WG1009502-2 LCS** | | | | | | | | |
| Zinc (Zn)-Total | | | 93 | | % | | 80-120 | 25-SEP-09 |
| Antimony (Sb)-Total | | | 93 | | % | | 80-120 | 25-SEP-09 |
| Arsenic (As)-Total | | | 89 | | % | | 80-120 | 25-SEP-09 |
| Barium (Ba)-Total | | | 92 | | % | | 80-120 | 25-SEP-09 |
| Beryllium (Be)-Total | | | 87 | | % | | 80-120 | 25-SEP-09 |
| Boron (B)-Total | | | 87 | | % | | 80-120 | 25-SEP-09 |
| Chromium (Cr)-Total | | | 89 | | % | | 80-120 | 25-SEP-09 |
| Cobalt (Co)-Total | | | 82 | | % | | 80-120 | 25-SEP-09 |
| Copper (Cu)-Total | | | 82 | | % | | 80-120 | 25-SEP-09 |
| Lead (Pb)-Total | | | 93 | | % | | 80-120 | 25-SEP-09 |
| Lithium (Li)-Total | | | 85 | | % | | 80-120 | 25-SEP-09 |
| Molybdenum (Mo)-Total | | | 96 | | % | | 80-120 | 25-SEP-09 |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-MS-ED** | **Water** | | | | | | | |
| **Batch R960963** | | | | | | | | |
| **WG1009502-2 LCS** | | | | | | | | |
| Nickel (Ni)-Total | | | 82 | | % | | 80-120 | 25-SEP-09 |
| Selenium (Se)-Total | | | 84 | | % | | 80-120 | 25-SEP-09 |
| Thallium (Tl)-Total | | | 96 | | % | | 80-120 | 25-SEP-09 |
| Tin (Sn)-Total | | | 95 | | % | | 80-120 | 25-SEP-09 |
| Titanium (Ti)-Total | | | 93 | | % | | 80-120 | 25-SEP-09 |
| Uranium (U)-Total | | | 90 | | % | | 80-120 | 25-SEP-09 |
| Vanadium (V)-Total | | | 90 | | % | | 80-120 | 25-SEP-09 |
| Silver (Ag)-Total | | | 85 | | % | | 80-120 | 26-SEP-09 |
| **WG1009502-1 MB** | | | | | | | | |
| Antimony (Sb)-Total | | | <0.00040 | | mg/L | | 0.002 | 25-SEP-09 |
| Arsenic (As)-Total | | | <0.00040 | | mg/L | | 0.002 | 25-SEP-09 |
| Barium (Ba)-Total | | | <0.00020 | | mg/L | | 0.001 | 25-SEP-09 |
| Beryllium (Be)-Total | | | <0.0010 | | mg/L | | 0.005 | 25-SEP-09 |
| Boron (B)-Total | | | <0.0040 | | mg/L | | 0.02 | 25-SEP-09 |
| Chromium (Cr)-Total | | | <0.00080 | | mg/L | | 0.004 | 25-SEP-09 |
| Cobalt (Co)-Total | | | <0.00020 | | mg/L | | 0.001 | 25-SEP-09 |
| Copper (Cu)-Total | | | <0.0010 | | mg/L | | 0.005 | 25-SEP-09 |
| Lead (Pb)-Total | | | <0.00010 | | mg/L | | 0.0005 | 25-SEP-09 |
| Lithium (Li)-Total | | | <0.0060 | | mg/L | | 0.006 | 25-SEP-09 |
| Molybdenum (Mo)-Total | | | <0.00010 | | mg/L | | 0.0005 | 25-SEP-09 |
| Nickel (Ni)-Total | | | <0.00020 | | mg/L | | 0.001 | 25-SEP-09 |
| Selenium (Se)-Total | | | <0.00040 | | mg/L | | 0.002 | 25-SEP-09 |
| Silver (Ag)-Total | | | <0.00010 | | mg/L | | 0.0005 | 25-SEP-09 |
| Thallium (Tl)-Total | | | <0.00010 | | mg/L | | 0.0005 | 25-SEP-09 |
| Tin (Sn)-Total | | | <0.00040 | | mg/L | | 0.002 | 25-SEP-09 |
| Titanium (Ti)-Total | | | <0.00060 | | mg/L | | 0.003 | 25-SEP-09 |
| Uranium (U)-Total | | | <0.00010 | | mg/L | | 0.0005 | 25-SEP-09 |
| Vanadium (V)-Total | | | <0.00050 | | mg/L | | 0.0025 | 25-SEP-09 |
| Zinc (Zn)-Total | | | <0.0040 | | mg/L | | 0.02 | 25-SEP-09 |
| **WG1009502-4 MS** | | **L817948-16** | | | | | | |
| Antimony (Sb)-Total | | | 105 | | % | | 80-116 | 26-SEP-09 |
| Arsenic (As)-Total | | | 98 | | % | | 78-117 | 26-SEP-09 |
| Barium (Ba)-Total | | | 99 | | % | | 78-121 | 26-SEP-09 |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **MET-T-L-MS-ED** | **Water** | | | | | | | |
| **Batch R960963** | | | | | | | | |
| **WG1009502-4 MS** | | **L817948-16** | | | | | | |
| Beryllium (Be)-Total | | | 99 | | % | | 68-132 | 26-SEP-09 |
| Boron (B)-Total | | | 95 | | % | | 75-122 | 26-SEP-09 |
| Chromium (Cr)-Total | | | 93 | | % | | 83-113 | 26-SEP-09 |
| Cobalt (Co)-Total | | | 100 | | % | | 87-114 | 26-SEP-09 |
| Copper (Cu)-Total | | | 101 | | % | | 86-114 | 26-SEP-09 |
| Lead (Pb)-Total | | | 104 | | % | | 80-121 | 26-SEP-09 |
| Lithium (Li)-Total | | | 89 | | % | | 74-126 | 26-SEP-09 |
| Molybdenum (Mo)-Total | | | 104 | | % | | 79-117 | 26-SEP-09 |
| Nickel (Ni)-Total | | | 98 | | % | | 76-114 | 26-SEP-09 |
| Selenium (Se)-Total | | | 104 | | % | | 69-127 | 26-SEP-09 |
| Silver (Ag)-Total | | | 87 | | % | | 39-134 | 26-SEP-09 |
| Thallium (Tl)-Total | | | 101 | | % | | 80-123 | 26-SEP-09 |
| Tin (Sn)-Total | | | 104 | | % | | 81-120 | 26-SEP-09 |
| Titanium (Ti)-Total | | | 99 | | % | | 70-130 | 26-SEP-09 |
| Uranium (U)-Total | | | 99 | | % | | 81-123 | 26-SEP-09 |
| Vanadium (V)-Total | | | 95 | | % | | 80-115 | 26-SEP-09 |
| Zinc (Zn)-Total | | | 95 | | % | | 64-125 | 26-SEP-09 |
| **N-TOTKJ-ED** | **Water** | | | | | | | |
| **Batch R946809** | | | | | | | | |
| **WG1004973-2 LCS** | | | | | | | | |
| Total Kjeldahl Nitrogen | | | 100 | | % | | 81-114 | 17-SEP-09 |
| **WG1004973-3 LCS** | | | | | | | | |
| Total Kjeldahl Nitrogen | | | 85 | | % | | 69-131 | 17-SEP-09 |
| **WG1004973-4 LCS** | | | | | | | | |
| Total Kjeldahl Nitrogen | | | 96 | | % | | 83-118 | 17-SEP-09 |
| **WG1004973-1 MB** | | | | | | | | |
| Total Kjeldahl Nitrogen | | | <0.20 | | mg/L | | 0.2 | 17-SEP-09 |
| **NH4-ED** | **Water** | | | | | | | |
| **Batch R945982** | | | | | | | | |
| **WG1004128-10 DUP** | | **L817860-2** | | | | | | |
| Ammonia-N | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 10 | 16-SEP-09 |
| **WG1004128-3 DUP** | | **L817608-4** | | | | | | |
| Ammonia-N | | <0.050 | 0.066 | RPD-NA | mg/L | N/A | 10 | 16-SEP-09 |
| **WG1004128-5 DUP** | | **L817832-2** | | | | | | |

# ALS Laboratory Group Quality Control Report

Workorder: L817948 Report Date: 29-SEP-09 

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **NH4-ED** | **Water** | | | | | | | |
| **Batch R945982** | | | | | | | | |
| **WG1004128-5 DUP** | | **L817832-2** | | | | | | |
| Ammonia-N | | 0.076 | 0.075 | J | mg/L | 0.001 | 0.2 | 16-SEP-09 |
| **WG1004128-6 DUP** | | **L818538-1** | | | | | | |
| Ammonia-N | | 0.312 | 0.308 | J | mg/L | 0.004 | 0.2 | 16-SEP-09 |
| **WG1004128-8 DUP** | | **L817850-12** | | | | | | |
| Ammonia-N | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 10 | 16-SEP-09 |
| **WG1004128-2 LCS** | | | | | | | | |
| Ammonia-N | | | 96 | | % | | 91-112 | 16-SEP-09 |
| **WG1004128-1 MB** | | | | | | | | |
| Ammonia-N | | | <0.050 | | mg/L | | 0.05 | 16-SEP-09 |
| **WG1004128-11 MS** | | **L818070-2** | | | | | | |
| Ammonia-N | | | 83 | | % | | 75-122 | 16-SEP-09 |
| **WG1004128-4 MS** | | **L817666-2** | | | | | | |
| Ammonia-N | | | 100 | | % | | 75-122 | 16-SEP-09 |
| **WG1004128-7 MS** | | **L817845-5** | | | | | | |
| Ammonia-N | | | 95 | | % | | 75-122 | 16-SEP-09 |
| **WG1004128-9 MS** | | **L817850-13** | | | | | | |
| Ammonia-N | | | 98 | | % | | 75-122 | 16-SEP-09 |
| **NO2-IC-ED** | **Water** | | | | | | | |
| **Batch R945484** | | | | | | | | |
| **WG1003754-3 DUP** | | **L817619-3** | | | | | | |
| Nitrite (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-5 DUP** | | **L817828-1** | | | | | | |
| Nitrite (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-7 DUP** | | **L817850-13** | | | | | | |
| Nitrite (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-9 DUP** | | **L818077-11** | | | | | | |
| Nitrite (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-2 LCS** | | | | | | | | |
| Nitrite (as N) | | | 92 | | % | | 85-115 | 15-SEP-09 |
| **WG1003754-1 MB** | | | | | | | | |
| Nitrite (as N) | | | <0.050 | | mg/L | | 0.05 | 15-SEP-09 |
| **WG1003754-10 MS** | | **L818077-11** | | | | | | |
| Nitrite (as N) | | | 96 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-4 MS** | | **L817619-3** | | | | | | |
| Nitrite (as N) | | | 87 | | % | | 75-125 | 15-SEP-09 |
| Nitrite (as N) | | | 87 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-6 MS** | | **L817828-1** | | | | | | |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **NO2-IC-ED** | **Water** | | | | | | | |
| **Batch R945484** | | | | | | | | |
| **WG1003754-6 MS** | | **L817828-1** | | | | | | |
| Nitrite (as N) | | | 86 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-8 MS** | | **L817850-13** | | | | | | |
| Nitrite (as N) | | | 90 | | % | | 75-125 | 15-SEP-09 |
| **NO3-IC-ED** | **Water** | | | | | | | |
| **Batch R945484** | | | | | | | | |
| **WG1003754-3 DUP** | | **L817619-3** | | | | | | |
| Nitrate (as N) | | 0.085 | 0.079 | J | mg/L | 0.006 | 0.2 | 15-SEP-09 |
| **WG1003754-5 DUP** | | **L817828-1** | | | | | | |
| Nitrate (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-7 DUP** | | **L817850-13** | | | | | | |
| Nitrate (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-9 DUP** | | **L818077-11** | | | | | | |
| Nitrate (as N) | | <0.050 | <0.050 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-2 LCS** | | | | | | | | |
| Nitrate (as N) | | | 102 | | % | | 85-115 | 15-SEP-09 |
| **WG1003754-1 MB** | | | | | | | | |
| Nitrate (as N) | | | <0.050 | | mg/L | | 0.05 | 15-SEP-09 |
| **WG1003754-10 MS** | | **L818077-11** | | | | | | |
| Nitrate (as N) | | | 103 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-4 MS** | | **L817619-3** | | | | | | |
| Nitrate (as N) | | | 100 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-6 MS** | | **L817828-1** | | | | | | |
| Nitrate (as N) | | | 98 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-8 MS** | | **L817850-13** | | | | | | |
| Nitrate (as N) | | | 100 | | % | | 75-125 | 15-SEP-09 |
| **P-TOTAL-ED** | **Water** | | | | | | | |
| **Batch R946459** | | | | | | | | |
| **WG1004460-3 DUP** | | **L817850-13** | | | | | | |
| Phosphorus, Total | | <0.020 | <0.020 | RPD-NA | mg/L | N/A | 9.5 | 16-SEP-09 |
| **WG1004460-2 LCS** | | | | | | | | |
| Phosphorus, Total | | | 103 | | % | | 86-112 | 16-SEP-09 |
| **WG1004460-1 MB** | | | | | | | | |
| Phosphorus, Total | | | <0.020 | | mg/L | | 0.02 | 16-SEP-09 |
| **WG1004460-4 MS** | | **L817850-13** | | | | | | |
| Phosphorus, Total | | | 89 | | % | | 79-122 | 16-SEP-09 |
| **PH/EC/ALK-ED** | **Water** | | | | | | | |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **PH/EC/ALK-ED** | **Water** | | | | | | | |
| **Batch R943543** | | | | | | | | |
| **WG1003458-5 DUP** | | **L817335-67** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 268 | 266 | | mg/L | 0.77 | 6.5 | 15-SEP-09 |
| Bicarbonate (HCO3) | | 328 | 325 | | mg/L | 0.77 | 26 | 15-SEP-09 |
| Carbonate (CO3) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 15-SEP-09 |
| Conductivity (EC) | | 558 | 559 | | uS/cm | 0.18 | 10 | 15-SEP-09 |
| Hydroxide (OH) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 15-SEP-09 |
| pH | | 7.67 | 7.56 | J | pH | 0.11 | 0.2 | 15-SEP-09 |
| **WG1003458-6 DUP** | | **L817623-3** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 141 | 142 | | mg/L | 0.30 | 6.5 | 15-SEP-09 |
| Bicarbonate (HCO3) | | 172 | 173 | | mg/L | 0.30 | 26 | 15-SEP-09 |
| Carbonate (CO3) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 15-SEP-09 |
| Conductivity (EC) | | 289 | 289 | | uS/cm | 0.0 | 10 | 15-SEP-09 |
| Hydroxide (OH) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 15-SEP-09 |
| pH | | 8.19 | 8.22 | J | pH | 0.03 | 0.2 | 15-SEP-09 |
| **WG1003458-7 DUP** | | **L817828-1** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 146 | 145 | | mg/L | 0.41 | 6.5 | 15-SEP-09 |
| Bicarbonate (HCO3) | | 178 | 177 | | mg/L | 0.41 | 26 | 15-SEP-09 |
| Carbonate (CO3) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 15-SEP-09 |
| Conductivity (EC) | | 608 | 598 | | uS/cm | 1.7 | 10 | 15-SEP-09 |
| Hydroxide (OH) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 15-SEP-09 |
| pH | | 8.15 | 8.10 | J | pH | 0.05 | 0.2 | 15-SEP-09 |
| **WG1003458-8 DUP** | | **L818077-11** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 217 | 217 | | mg/L | 0.15 | 6.5 | 16-SEP-09 |
| Bicarbonate (HCO3) | | 260 | 260 | | mg/L | 0.010 | 26 | 16-SEP-09 |
| Carbonate (CO3) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 16-SEP-09 |
| Conductivity (EC) | | 404 | 404 | | uS/cm | 0.0 | 10 | 16-SEP-09 |
| Hydroxide (OH) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 16-SEP-09 |
| pH | | 8.33 | 8.33 | J | pH | 0.00 | 0.2 | 16-SEP-09 |
| **WG1003458-9 DUP** | | **L817976-18** | | | | | | |
| Alkalinity, Total (as CaCO3) | | 6.8 | 6.1 | J | mg/L | 0.6 | 20 | 16-SEP-09 |
| Bicarbonate (HCO3) | | 8.2 | 7.5 | J | mg/L | 0.8 | 20 | 16-SEP-09 |
| Carbonate (CO3) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 16-SEP-09 |
| Conductivity (EC) | | 102 | 101 | | uS/cm | 0.68 | 10 | 16-SEP-09 |
| Hydroxide (OH) | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 16-SEP-09 |
| pH | | 6.98 | 7.03 | | | | | |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **PH/EC/ALK-ED** | **Water** | | | | | | | |
| **Batch R943543** | | | | | | | | |
| **WG1003458-9 DUP** | | **L817976-18** | | | | | | |
| pH | | 6.98 | 7.03 | J | pH | 0.05 | 0.2 | 16-SEP-09 |
| **WG1003458-2 LCS** | | | | | | | | |
| Conductivity (EC) | | | 99 | | % | | 90-110 | 15-SEP-09 |
| **WG1003458-3 LCS** | | | | | | | | |
| pH | | | 6.98 | | pH | | 6.9-7.1 | 15-SEP-09 |
| **WG1003458-4 LCS** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | 99 | | % | | 90-110 | 15-SEP-09 |
| **WG1003458-1 MB** | | | | | | | | |
| Alkalinity, Total (as CaCO3) | | | <5.0 | | mg/L | | 5 | 15-SEP-09 |
| Bicarbonate (HCO3) | | | <5.0 | | mg/L | | 5 | 15-SEP-09 |
| Carbonate (CO3) | | | <5.0 | | mg/L | | 5 | 15-SEP-09 |
| Hydroxide (OH) | | | <5.0 | | mg/L | | 5 | 15-SEP-09 |
| **SO4-IC-ED** | **Water** | | | | | | | |
| **Batch R945484** | | | | | | | | |
| **WG1003754-3 DUP** | | **L817619-3** | | | | | | |
| Sulfate (SO4) | | 33.3 | 33.4 | | mg/L | 0.20 | 20 | 15-SEP-09 |
| **WG1003754-5 DUP** | | **L817828-1** | | | | | | |
| Sulfate (SO4) | | 141 | 139 | | mg/L | 0.86 | 20 | 15-SEP-09 |
| **WG1003754-7 DUP** | | **L817850-13** | | | | | | |
| Sulfate (SO4) | | <0.50 | <0.50 | RPD-NA | mg/L | N/A | 20 | 15-SEP-09 |
| **WG1003754-9 DUP** | | **L818077-11** | | | | | | |
| Sulfate (SO4) | | 5.74 | 5.70 | | mg/L | 0.70 | 20 | 15-SEP-09 |
| **WG1003754-2 LCS** | | | | | | | | |
| Sulfate (SO4) | | | 101 | | % | | 85-115 | 15-SEP-09 |
| **WG1003754-1 MB** | | | | | | | | |
| Sulfate (SO4) | | | <0.50 | | mg/L | | 0.5 | 15-SEP-09 |
| **WG1003754-10 MS** | | **L818077-11** | | | | | | |
| Sulfate (SO4) | | | 112 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-4 MS** | | **L817619-3** | | | | | | |
| Sulfate (SO4) | | | 102 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-6 MS** | | **L817828-1** | | | | | | |
| Sulfate (SO4) | | | 88 | | % | | 75-125 | 15-SEP-09 |
| **WG1003754-8 MS** | | **L817850-13** | | | | | | |
| Sulfate (SO4) | | | 105 | | % | | 75-125 | 15-SEP-09 |
| **SOLIDS-TDS-ED** | **Water** | | | | | | | |

# ALS Laboratory Group Quality Control Report



| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **SOLIDS-TDS-ED** | **Water** | | | | | | | |
| **Batch R946770** | | | | | | | | |
| **WG1004385-3 DUP** | | **L817976-3** | | | | | | |
| Total Dissolved Solids | | <5.0 | <5.0 | RPD-NA | mg/L | N/A | 26 | 17-SEP-09 |
| **WG1004385-4 DUP** | | **L817988-5** | | | | | | |
| Total Dissolved Solids | | 85.0 | 85.0 | | mg/L | 0.000000 | 26 | 17-SEP-09 |
| **WG1004385-2 LCS** | | | | | | | | |
| Total Dissolved Solids | | | 97 | | % | | 63-138 | 17-SEP-09 |
| **WG1004385-1 MB** | | | | | | | | |
| Total Dissolved Solids | | | <5.0 | | mg/L | | 5 | 17-SEP-09 |
| **SOLIDS-TOTSUS-ED** | **Water** | | | | | | | |
| **Batch R946110** | | | | | | | | |
| **WG1004151-3 DUP** | | **L817859-2** | | | | | | |
| Total Suspended Solids | | 8.0 | 10.0 | J | mg/L | 2.0 | 12 | 16-SEP-09 |
| **WG1004151-4 DUP** | | **L817976-3** | | | | | | |
| Total Suspended Solids | | <3.0 | <3.0 | RPD-NA | mg/L | N/A | 16 | 16-SEP-09 |
| **WG1004151-5 DUP** | | **L818073-1** | | | | | | |
| Total Suspended Solids | | 47.0 | 45.0 | | mg/L | 4.3 | 16 | 16-SEP-09 |
| **WG1004151-2 LCS** | | | | | | | | |
| Total Suspended Solids | | | 92 | | % | | 82-111 | 16-SEP-09 |
| **WG1004151-1 MB** | | | | | | | | |
| Total Suspended Solids | | | <3.0 | | mg/L | | 3 | 16-SEP-09 |

# ALS Laboratory Group Quality Control Report



**Legend:**

| | |
|---|---|
| Limit | 99% Confidence Interval (Laboratory Control Limits) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

**Sample Parameter Qualifier Definitions:**

| Qualifier | Description |
|---|---|
| E | Matrix Spike recovery outside ALS DQO due to analyte background in sample. |
| J | Duplicate results and limits are expressed in terms of absolute difference. |
| RPD-NA | Relative Percent Difference Not Available due to result(s) being less than detection limit. |

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**ALS Laboratory Group**
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

# Chain of Custody / Analytical Request Form

**Canada Toll Free: 1 800 668 9878**

**www.alsglobal.com**

COC # 0914260015-01



| Report To | | Report Format / Distribution | Service Requested (Rush for routine analysis subject to availability) |
|---|---|---|---|
| Company: | Golder Associates Ltd. | ☑ Standard ☐ Other | ◉ Regular (Default) |
| Contact: | Valérie Bertrand | ☑ PDF ☑ Excel ☐ Digital ☐ Fax | ○ Priority (Specify Date Required → → ) Surcharges apply |
| Address: | 32 Steacie Drive | Email 1: JWitteman@Comaplex.com | ○ Emergency (1 Business Day) - 100% Surcharge |
| | Kanata Ontario, K2K 2A9 | Email 2: VBertrand@Golder.com | ○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS |
| Phone: | 613 592-9600 Fax: 613-592-9601 | | |
| **Invoice To** | Same as Report ? ☐ Yes ☑ No | **Client / Project Information** | **Analysis Request** |
| Company: | Comaplex Minerals Corp | Job #: 09-1426-0015 3910 2000 | Please indicate below Filtered, Preserved or both (F, P, F/P) |
| Contact: | John Witteman | PO / AFE: 09-1426-0015 3910 2000 | |
| Address: | Suite 901, 1015 - 4th Street | LSD: | |
| | Calgary, AB T2R1J4 | | |
| Phone: | 403-265-2846 Fax: 403-232-1421 | Quote #: none. Comaplex pricing | |
| Lab Work Order # (lab use only) | L817948 | ALS Contact: Maureen Olinek | Sampler: M.Pesendorfer |

| Sample # | Sample Identification (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | ROUTINE | NUTRIENTS | TOTAL CYANIDE | FREE CYANIDE | NUTRIENTS | TOTAL PHOSPHOROUS | | | | | | | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | P | P | P | P | F/P | F/P | | | | | | | |
| | GT-19-1A | 12-Sep-09 | 14:48 | Groundwater | X | | | | | | | | | | | | 1 |
| | GT-19-1B | 12-Sep-09 | 14:48 | Groundwater | X | | | | | | | | | | | | 1 |
| | GT-19-2A | 12-Sep-09 | 14:50 | Groundwater | | X | | | | | | | | | | | 1 |
| | GT-19-2B | 12-Sep-09 | 14:50 | Groundwater | | X | | | | | | | | | | | 1 |
| | GT-19-3A | 12-Sep-09 | 14:51 | Groundwater | X | | | | | | | | | | | | 1 |
| | GT-19-3B | 12-Sep-09 | 14:51 | Groundwater | X | | | | | | | | | | | | 1 |
| | GT-19-4A | 12-Sep-09 | 14:52 | Groundwater | | | X | | | | | | | | | | 1 |
| | GT-19-4B | 12-Sep-09 | 14:52 | Groundwater | | | X | | | | | | | | | | 1 |
| | GT-19-5A | 12-Sep-09 | 14:57 | Groundwater | | | | X | | | | | | | | | 1 |
| | GT-19-5B | 12-Sep-09 | 14:57 | Groundwater | | | | X | | | | | | | | | 1 |
| | GT-19-6A | 12-Sep-09 | 15:20 | Groundwater | | | | | X | X | | | | | | | 1 |
| | GT-19-6B | 12-Sep-09 | 15:20 | Groundwater | | | | | X | X | | | | | | | 1 |

**Special Instructions / Regulations / Hazardous Details**

Not all parameters of ROUTINE and NUTRIENTS package are required. ROUTINE: speciated alkalinity (caronate, bicarbontnate, hydroxide), anions (Br, Cl, SO4, F), electrical conductivity, hardness, pH, solids (TDS, TSS). NUTRIENTS preserved bottles): ammonia-N, NO3-N, NO2-N, total P, K. NUTRIENTS (filtered/preserved) TKN only. See email from V.Bertrand to M.Olinek, dated August 31, 2009.

**Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.**

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

**Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.**

| SHIPMENT RELEASE (client use) | | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Released by: | Date (dd-mmm-yy) | Time (hh-mm) | Received by: | Date: | Time: | Temperature: | Verified by: | Date: | Time: | Observations: Yes / No ? If Yes add SIF |
| Dan Ciobotaru | 14-Sep-09 | | Roth | 15 Sep 09 | | 10 °C | 8:44. | | | |

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES
Environmental Division

**Chain of Custody / Analytical Request Form**
**Canada Toll Free: 1 800 668 9878**
**www.alsglobal.com**



| **Report To** | | **Report Format / Distribution** | **Service Requested** (Rush for routine analysis subject to availability) |
|---|---|---|---|
| Company: | Golder Associates Ltd. | ☑ Standard ☐ Other | ◉ Regular (Default) |
| Contact: | Valérie Bertrand | ☑ PDF ☑ Excel ☐ Digital ☐ Fax | ○ Priority (Specify Date Required → → ) Surcharges apply |
| Address: | 32 Steacie Drive | Email 1: JWitteman@Comaplex.com | ○ Emergency (1 Business Day) - 100% Surcharge |
| | Kanata Ontario K2K 2A9 | Email 2: VBertrand@Golder.com | ○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS |
| Phone: | 613-592-9600 Fax: 613-592-9601 | | |
| **Invoice To** | Same as Report ? ☐ Yes ☑ No | **Client / Project Information** | **Analysis Request** |
| Company: | Comaplex Minerals Corp | Job #: 09-1426-0015 3910 2000 | Please indicate below Filtered, Preserved or both (F, P, F/P) |
| Contact: | John Witteman | PO / AFE: 09-1426-0015 3910 2000 | |
| Address: | Suite 901, 1015 - 4th Street | LSD: | |
| | Calgary, AB T2R1J4 | | |
| Phone: | 403-265-2846 Fax: 403-232-1421 | Quote #: none, Comaplex pricing | |

| Lab Work Order # (lab use only) | | ALS Contact: Maureen Olinek | Sampler: M.Pesendorfer |
|---|---|---|---|

| Sample # | Sample Identification (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | P ULTRA LOW METALS | P DISS ULTRA LOW METALS | Number of Containers |
|---|---|---|---|---|---|---|---|
| | GT-19-7A | 12-Sep-09 | 15:25 | Groundwater | X | | 1 |
| | GT-19-7B | 12-Sep-09 | 15:25 | Groundwater | X | | 1 |
| | GT-19-8A | 12-Sep-09 | 15:30 | Groundwater | | X | 1 |
| | GT-19-8B | 12-Sep-09 | 15:30 | Groundwater | | X | 1 |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Special Instructions / Regulations / Hazardous Details**

Please analyze for the following metals, to CCME auatic life level detection limits: As, Al, Ag, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Sn, Se, Sr, Tl, U, V, Zn.

**Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.**

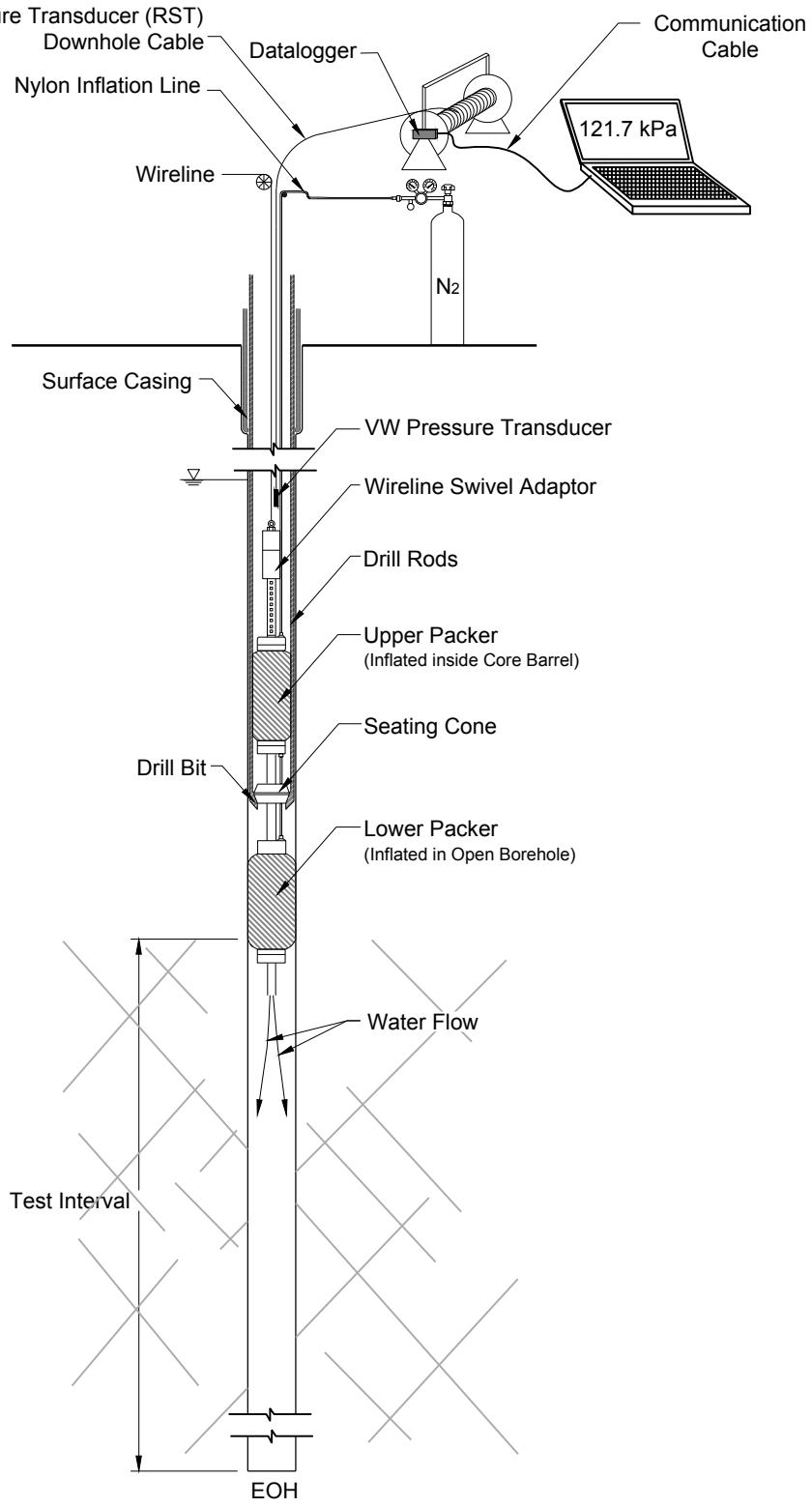
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

**Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.**

| SHIPMENT RELEASE (client use) | | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Released by: | Date (dd-mmm-yy) | Time (hh-mm) | Received by: | Date: | Time: | Temperature: | Verified by: | Date: | Time: | Observations: Yes / No ? If Yes add SIF |
| Dan Ciobotaru | 14-Sep-09 | | | | | °C | | | | |

# APPENDIX B

## Schematic of Single Packer Wireline Assembly




PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# SINGLE PACKER WIRELINE DOWNHOLE ASSEMBLY - SCHEMATIC

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. | 7000-7300 |
| DESIGN | RQ | 03FEB14 | SCALE AS SHOWN | REV. 0 |
| CADD | LR | 03FEB14 | | |
| CHECK | RQ | 03FEB14 | | |
| REVIEW | RQ | 03FEB14 | | |

**FIGURE B-1**

Drawing File: N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\CAD\PHASE 7000\TASK 7300\FIGURE\13-1428-0007-7000-7300-B-1.dwg Monday, February 03, 2014 9:48:47 AM By: lroque

# APPENDIX C

## Hydrobench Protocols

# HYDROBENCH REPORT

| | |
|---|---|
| Project | Meliadine |
| Site | AEM Tailings |
| Source Well | M11-1257 |
| Test Name | Test 1 |
| Test Date/Time | 25/08/2011, 10:30 |
| Interval | top: 468.20 m bottom: 618.00 m |
| Description | Pressure data Airpressure Corrected by -100 kPa |

## Basic Data

| | | | |
|---|---|---|---|
| Test Interval | 149.80 m | | |
| Porosity | 0.10 | | |
| Well Radius | 0.048 m | Tubing Radius | 0.038 m |
| Inclination | 7.0 deg | | |
| Test Volume | 1084.287 l | | |
| Well Type | Source | | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## History Definition

| Name | Category | Duration [hrs] | P(o) [kPa] | Rate [l/min] | C [m³/Pa] | Skin |
|---|---|---|---|---|---|---|
| Auto_History | Const. Pressure | 0.50 | 4705.66 | | | 0.00 |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| PSR | Recovery | 0.00000 | 4705.66 | | | 4.7e-07 |
| SI-Init | dP-Event | 1.24306 | 4703.71 | -89.0 * | | 4.7e-07 |
| SI | Slug | 1.25972 | 4792.67 | 4703.7 | | 4.7e-07 |
| DEF | Variable Pressure | 2.42500 | 4781.84 | | | 4.7e-07 |

## Analysis Results

**Analysis "SI (final)"**

Static Pressure: 4702.69 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 7.0e-08 | 2.9e-04 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| PSR | 6.2e-08 | 0.0 |
| SI-Init | 4.7e-07 | 0.0 |
| SI | 4.7e-07 | 0.0 |
| DEF | 3.3e-07 | 0.0 |

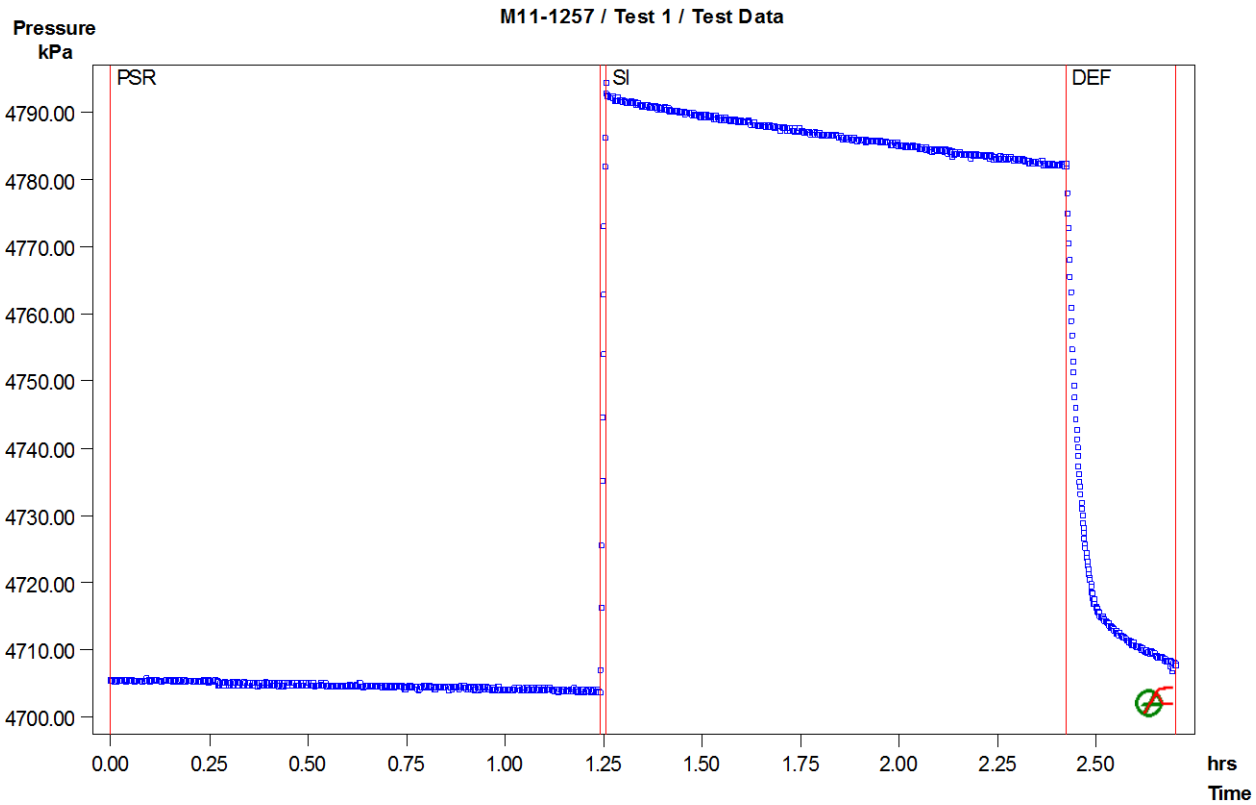



Figure 1: Pressure response and sequence definition

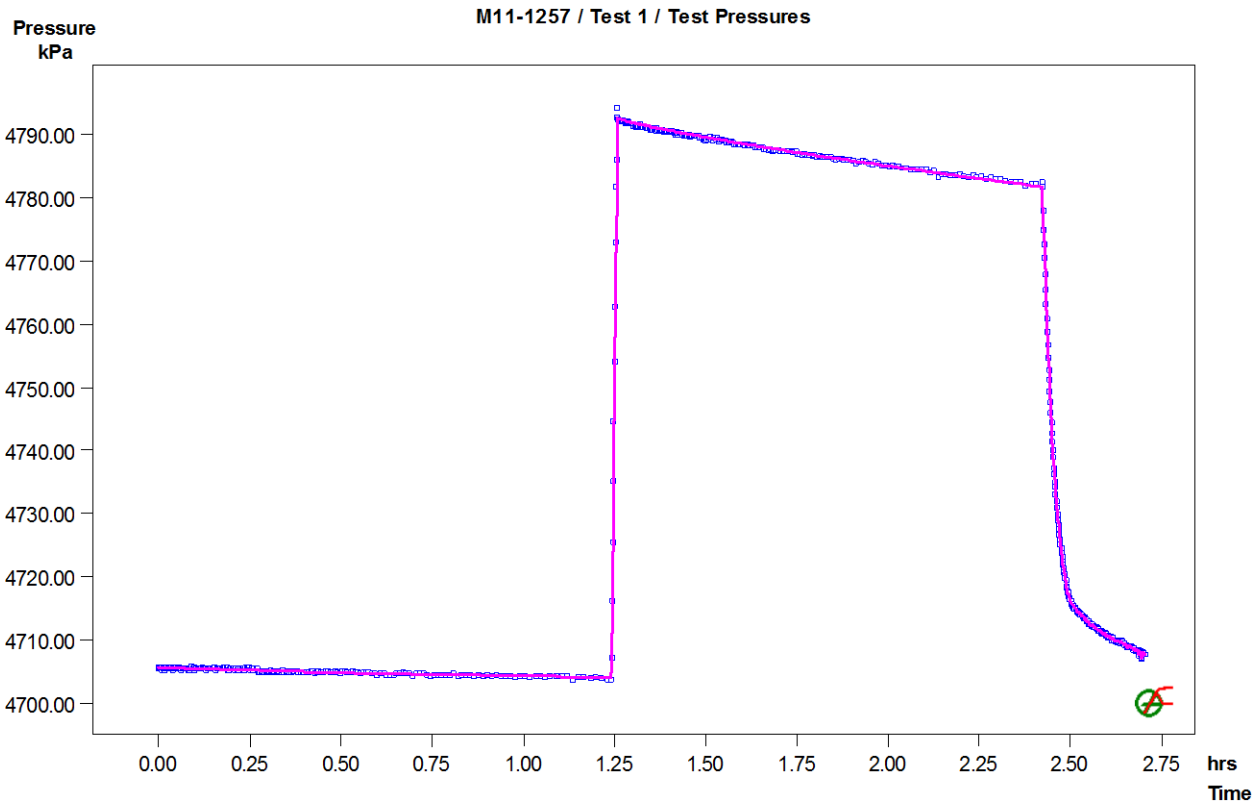



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

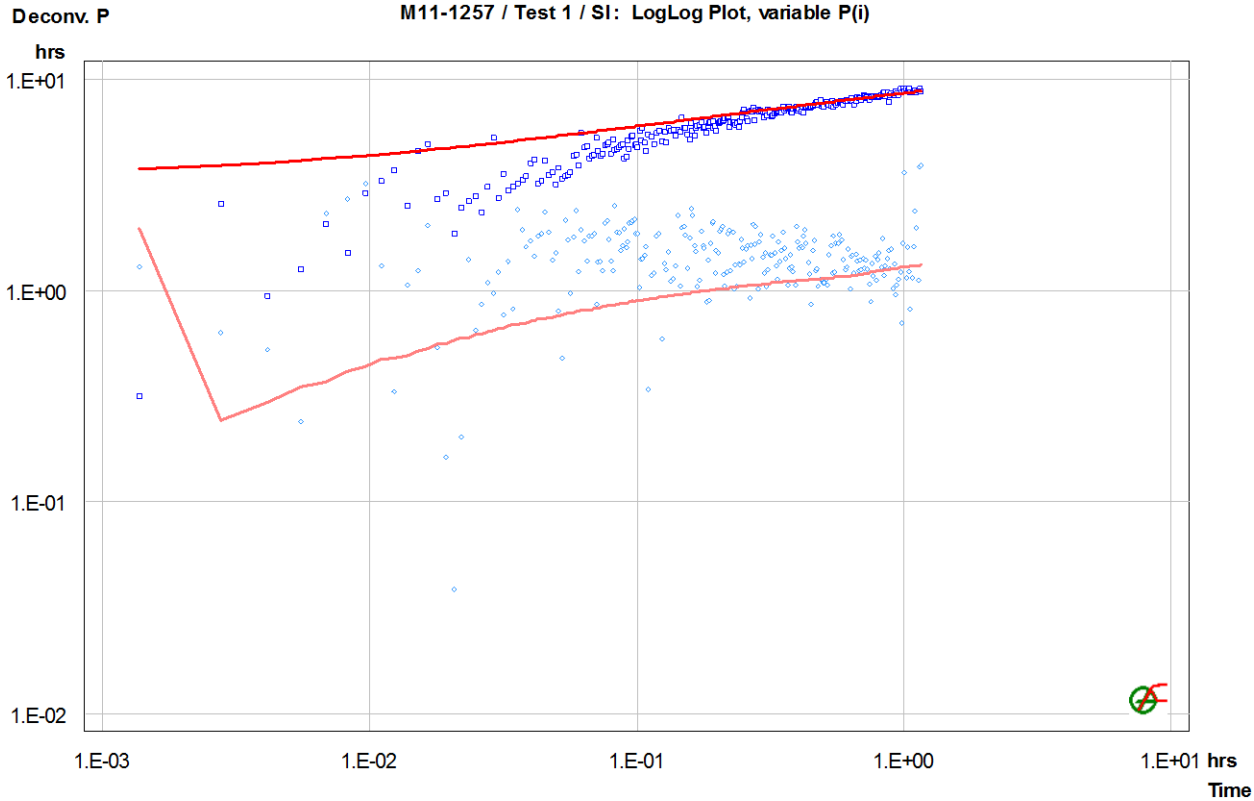



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, SW sequence

# HYDROBENCH REPORT

| | |
|---|---|
| Project | Meliadine |
| Site | |
| Source Well | M11-1257 |
| Test Name | Test 2 |
| Test Date/Time | 26/08/2011, 10:30 |
| Interval | top: 612.15 m bottom: 651.00 m |
| Description | Pressure Response Airpressure Corrected: -100 kPa |

## Basic Data

| | | | |
|---|---|---|---|
| Test Interval | 38.85 m | | |
| Porosity | 0.10 | | |
| Well Radius | 0.048 m | Tubing Radius | 0.038 m |
| Inclination | 7.0 deg | | |
| Test Volume | 281.205 l | | |
| Well Type | Source | | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| Pre-Test | Variable Pressure | 0.00000 | 6269.53 | | | 4.7e-07 |
| PSR | Recovery | 0.86528 | 6198.17 | | | 4.7e-07 |
| SW-Init | dP-Event | 1.27778 | 6200.59 | 58.8 * | | 4.7e-07 |
| SW | Slug | 1.29861 | 6141.77 | 6200.6 | | 4.7e-07 |
| DEF | Variable Pressure | 2.11806 | 6148.63 | | | 4.7e-07 |

## Analysis Results

**Analysis "SW (final)"**

Static Pressure: 6201.55 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 1.2e-07 | 7.6e-05 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| Pre-Test | 8.1e-06 | 0.0 |
| PSR | 1.3e-07 | 0.0 |
| SW-Init | 4.7e-07 | 0.0 |
| SW | 4.7e-07 | 0.0 |
| DEF | 8.1e-06 | 0.0 |

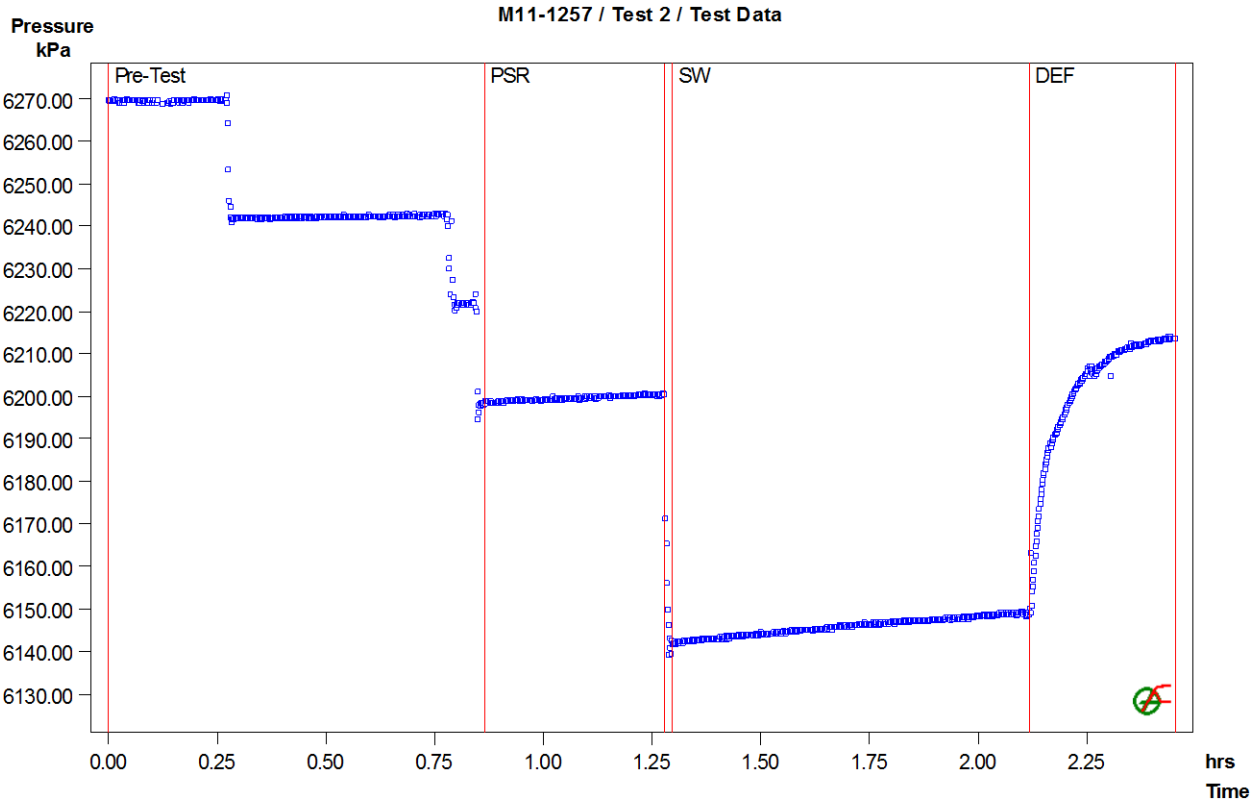



Figure 1: Pressure response and sequence definition

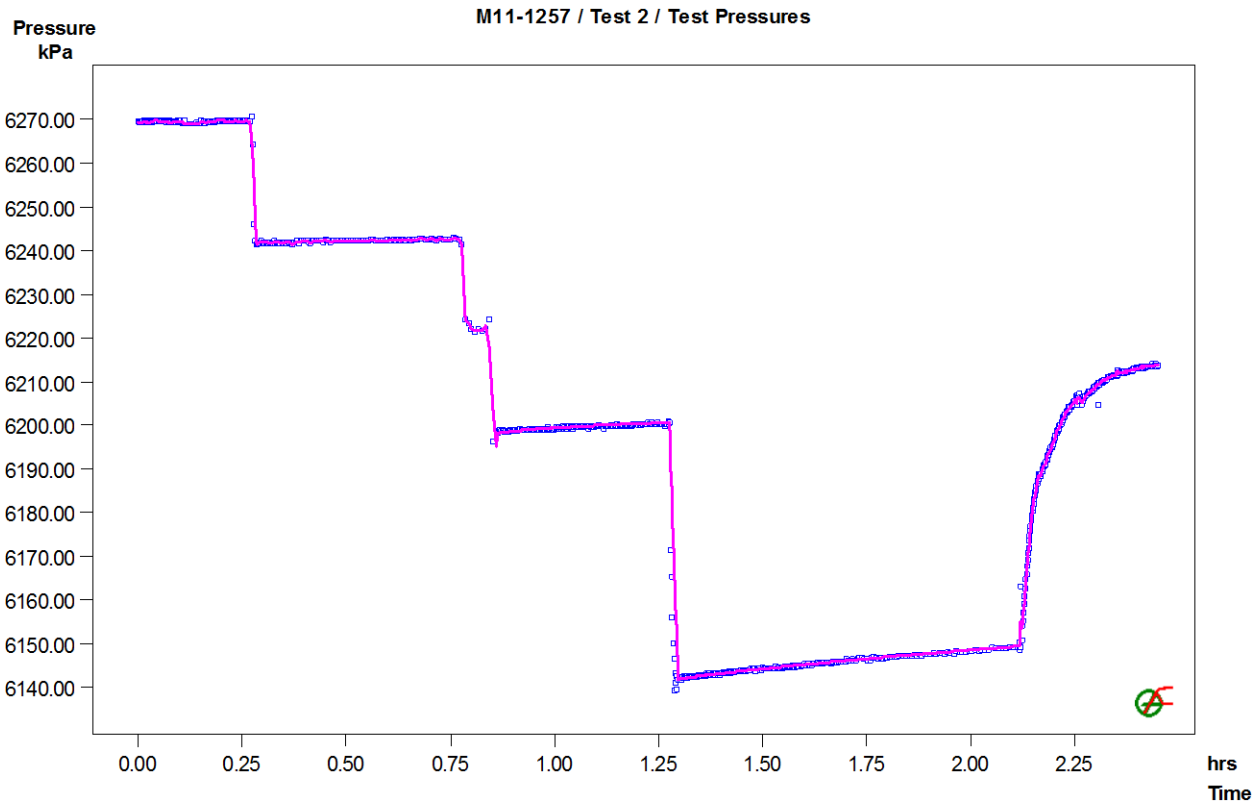



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

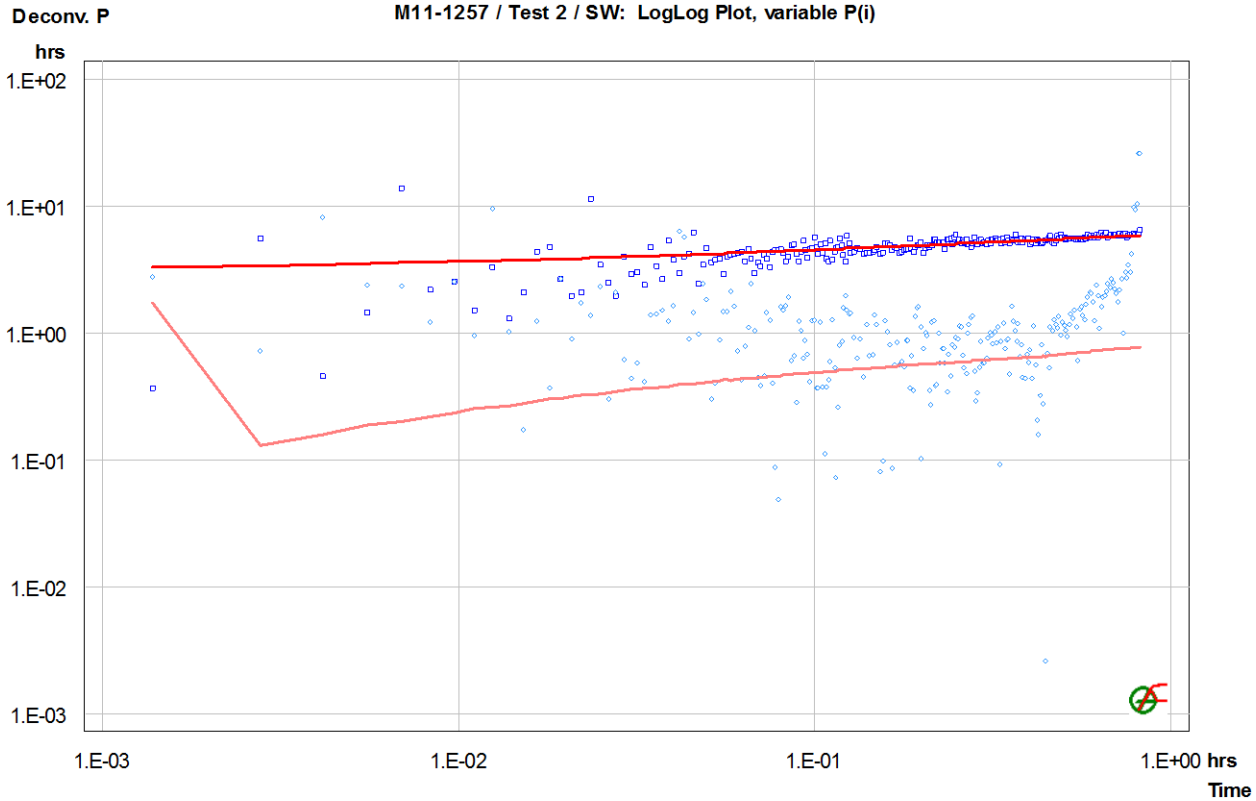



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, SW sequence

# HYDROBENCH REPORT

| | | |
|---|---|---|
| Project | Meliadine | |
| Site | | |
| Source Well | M11-1257 | |
| Test Name | Interval 2 | |
| Test Date/Time | 23/10/2011 | |
| Interval | top: 619.09 m | bottom: 631.28 m |
| Description | | |

## Basic Data

| | | |
|---|---|---|
| Test Interval | 12.19 m | |
| Porosity | 0.10 | |
| Well Radius | 0.079 m | Tubing Radius |
| Inclination | 0.0 deg | |
| Test Volume | 239.005 l | |
| Well Type | Source | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| COM | Variable Pressure | 0.00000 | 6246.58 | | | 7.4e-10 |
| PSR | Recovery | 0.07083 | 6068.14 | | | 7.4e-10 |
| PW-Init | dP-Event | 0.13333 | 6053.87 | 1698.5 * | | 7.4e-10 |
| PW | Pulse | 0.15000 | 4355.42 | 6053.9 | | 7.4e-10 |

## Analysis Results

**Analysis "PW_final"**

Static Pressure: 5987.65 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 7.2e-08 | 2.4e-05 | 0.68 | 2.0 |
| Shell 2 | 1.9e-08 | 2.4e-05 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| COM | 8.3e-10 | 0.0 |
| PSR | 8.3e-10 | 0.0 |
| PW-Init | 7.4e-10 | 0.0 |
| PW | 7.4e-10 | 0.0 |

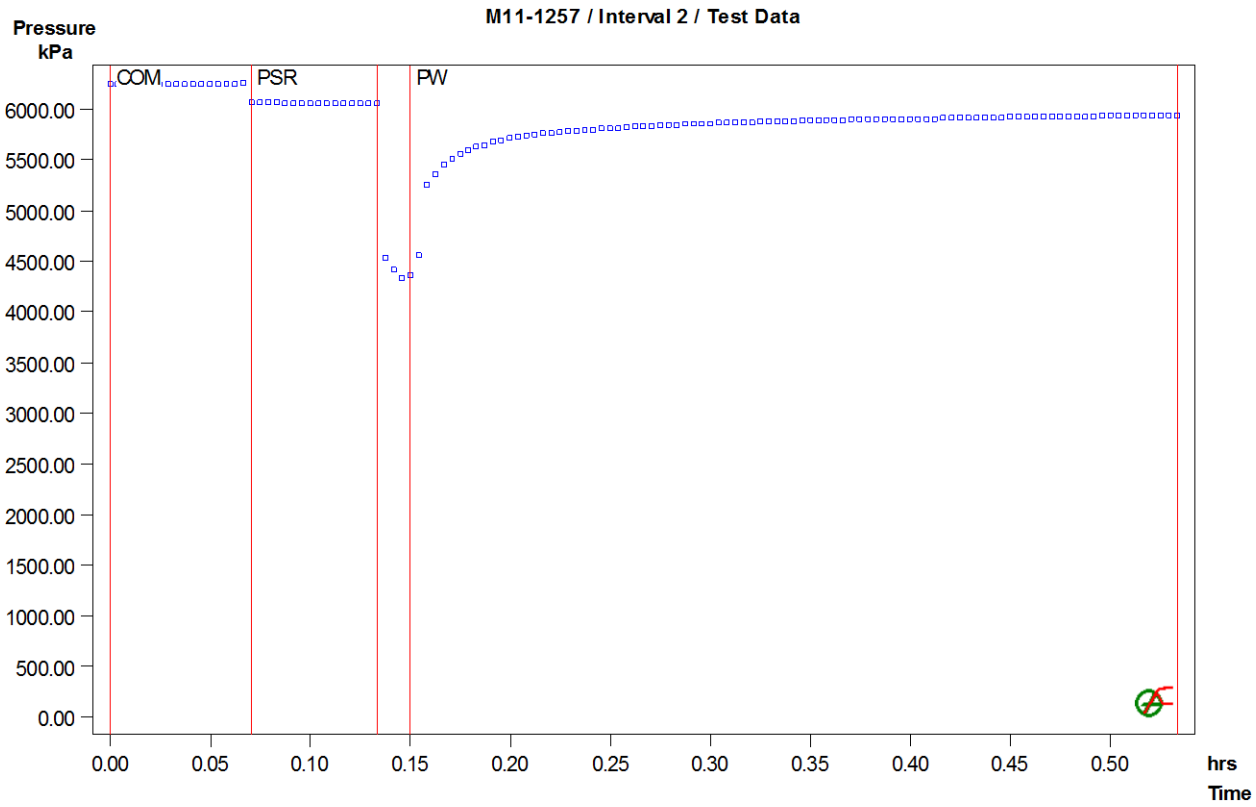



Figure 1: Pressure response and sequence definition

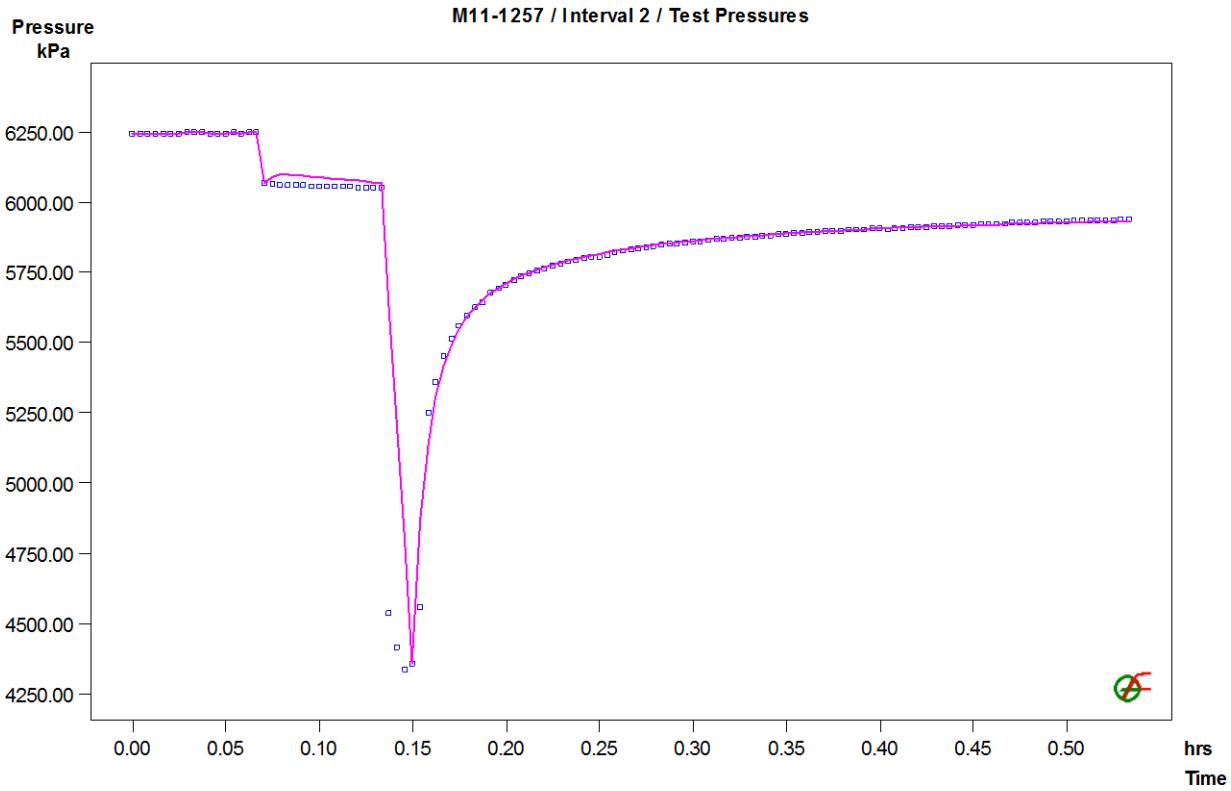



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

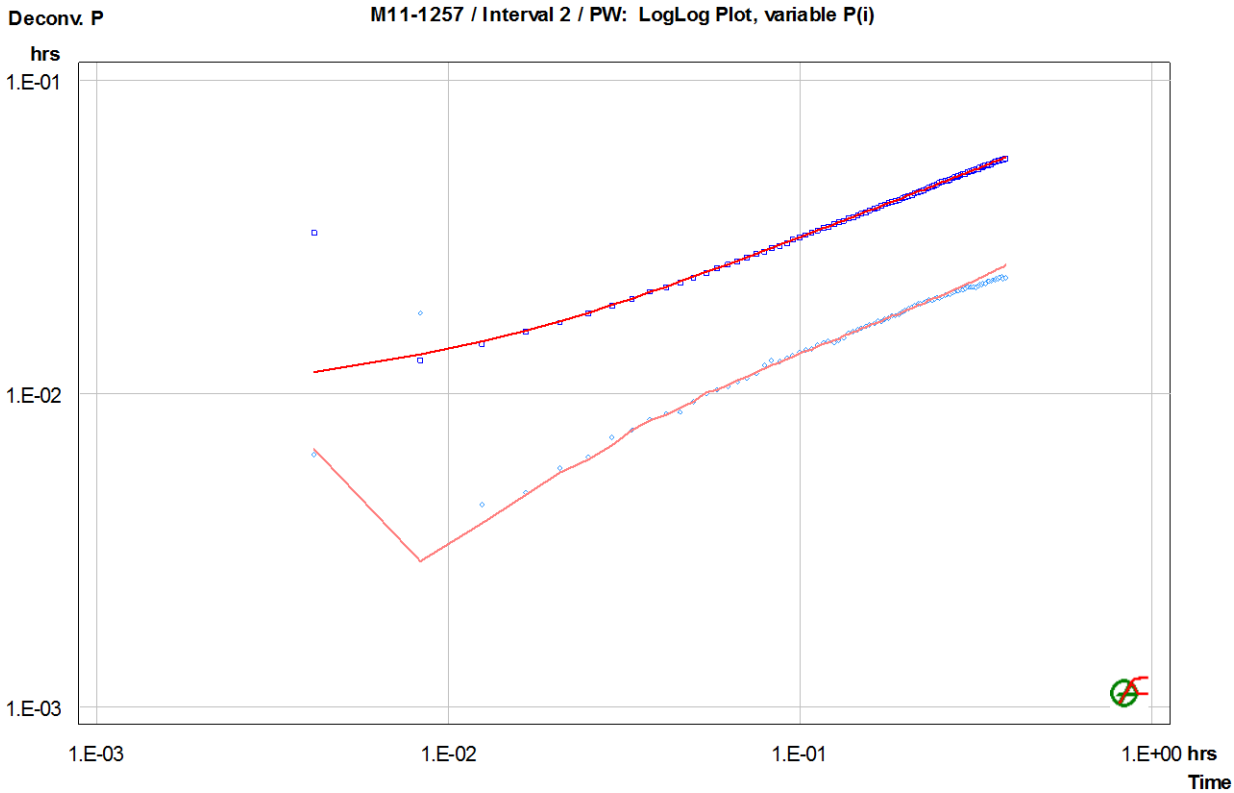



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, PW sequence

# HYDROBENCH REPORT

| | | |
|---|---|---|
| Project | Meliadine | |
| Site | | |
| Source Well | M11-1257 | |
| Test Name | Interval 2A | |
| Test Date/Time | 19/10/2011 | |
| Interval | top: 632.81 m | bottom: 641.95 m |
| Description | | |

## Basic Data

| | | |
|---|---|---|
| Test Interval | 9.14 m | |
| Porosity | 0.10 | |
| Well Radius | 0.048 m | Tubing Radius |
| Inclination | 0.0 deg | |
| Test Volume | 66.157 l | |
| Well Type | Source | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| COM | Variable Pressure | 0.00000 | 6383.44 | | | 5.7e-10 |
| PSR | Variable Pressure | 0.07083 | 6103.10 | | | 5.7e-10 |
| PW-Init | dP-Event | 0.13333 | 6105.03 | 1758.4 * | | 5.7e-10 |
| PW | Pulse | 0.14583 | 4346.59 | 6105.0 | | 5.7e-10 |

## Analysis Results

**Analysis "PW_final"**

Static Pressure: 6103.10 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 8.1e-08 | 1.8e-05 | 0.78 | 2.0 |
| Shell 2 | 1.1e-08 | 1.8e-05 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| COM | 1.7e-09 | 0.0 |
| PSR | 1.7e-09 | 0.0 |
| PW-Init | 5.7e-10 | 0.0 |
| PW | 5.7e-10 | 0.0 |

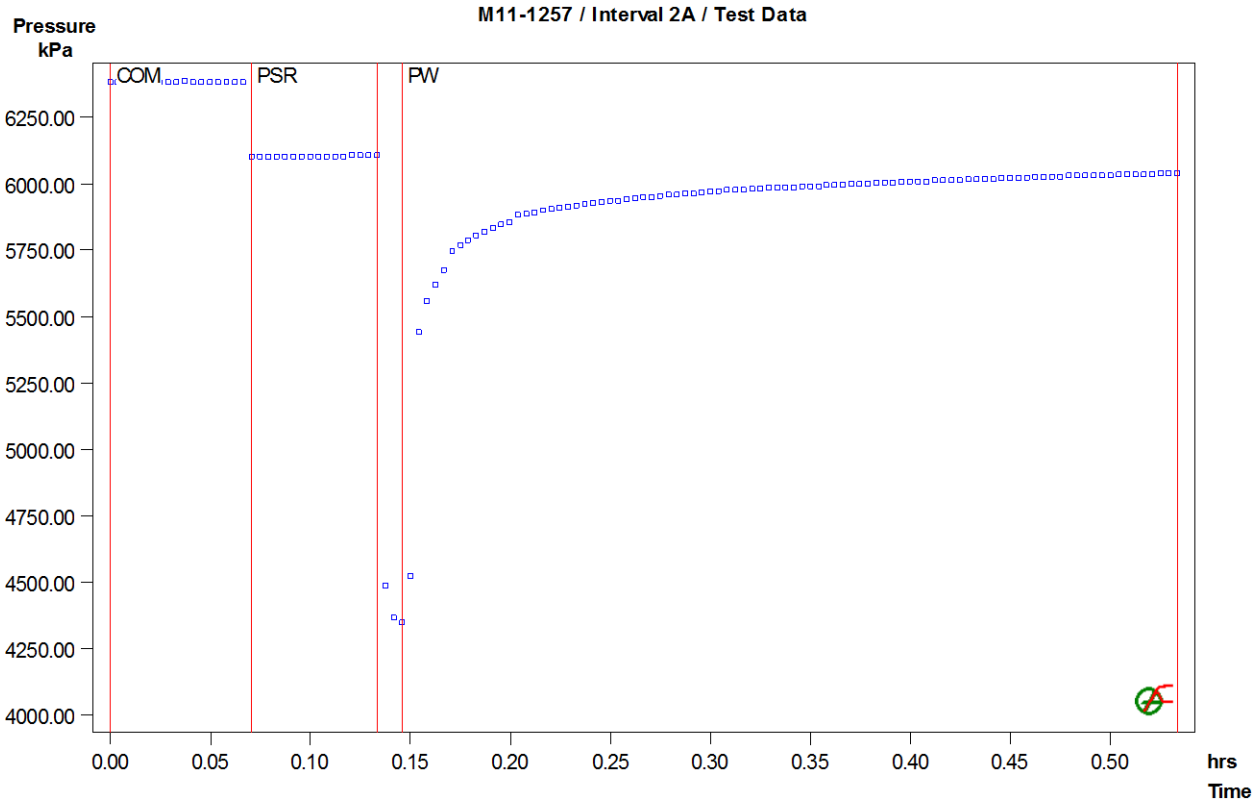



Figure 1: Pressure response and sequence definition

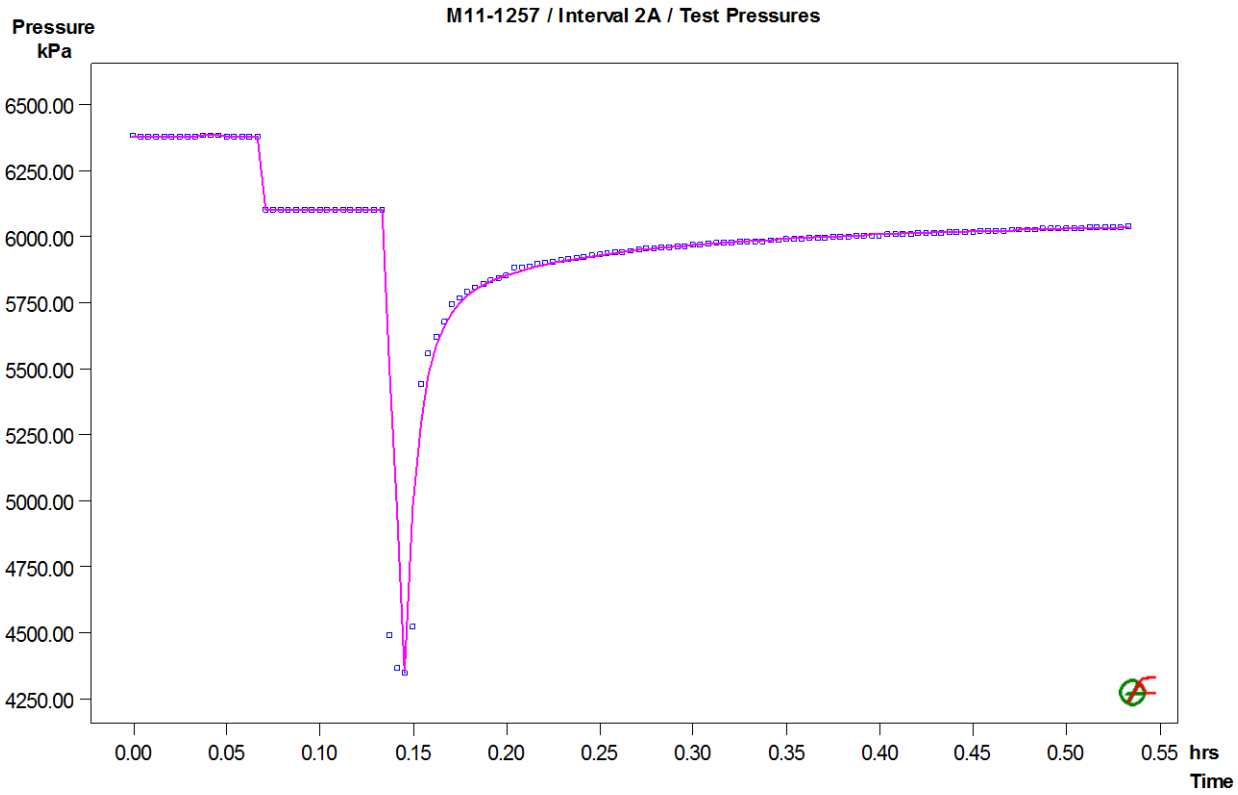



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

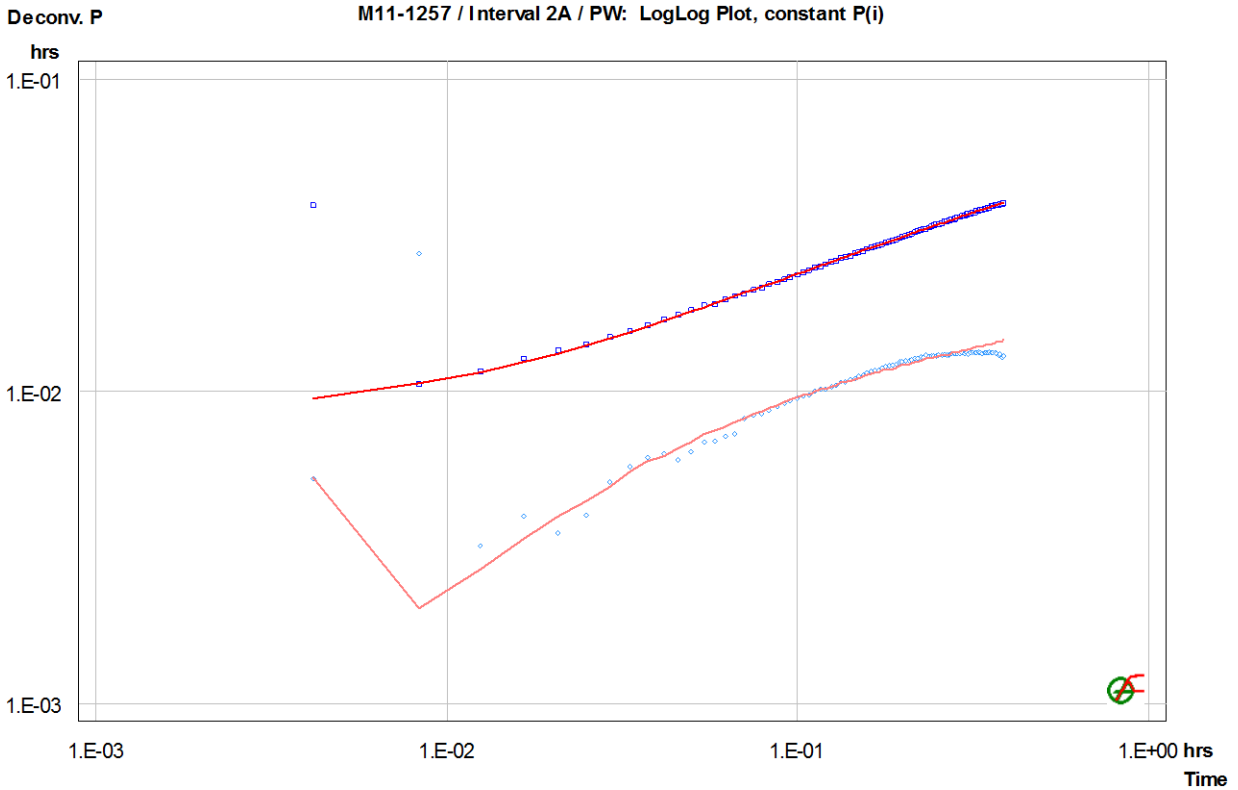



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, PW sequence

# HYDROBENCH REPORT

| | | |
|---|---|---|
| Project | Meliadine | |
| Site | | |
| Source Well | M11-1257 | |
| Test Name | Interval 3 | |
| Test Date/Time | 24/10/2011 | |
| Interval | top: 588.61 m | bottom: 600.80 m |
| Description | | |

## Basic Data

| | | |
|---|---|---|
| Test Interval | 12.19 m | |
| Porosity | 0.10 | |
| Well Radius | 0.048 m | Tubing Radius |
| Inclination | 0.0 deg | |
| Test Volume | 88.234 l | |
| Well Type | Source | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## Sequence Definition

| Name | Category | t(o) [min] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| COM | Variable Pressure | 0.00000 | 5967.14 | | | 7.2e-10 |
| PSR | Variable Pressure | 4.25000 | 5843.17 | | | 7.2e-10 |
| PW-Init | dP-Event | 8.00000 | 5836.34 | 1728.9 * | | 7.2e-10 |
| PW | Pulse | 9.25000 | 4107.41 | 5836.3 | | 7.2e-10 |

## Analysis Results

**Analysis "PW_final"**

Static Pressure: 5766.57 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 3.7e-07 | 2.4e-05 | 0.62 | 2.0 |
| Shell 2 | 8.0e-08 | 2.4e-05 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| COM | 1.2e-09 | 0.0 |
| PSR | 1.2e-09 | 0.0 |
| PW-Init | 7.2e-10 | 0.0 |
| PW | 7.2e-10 | 0.0 |

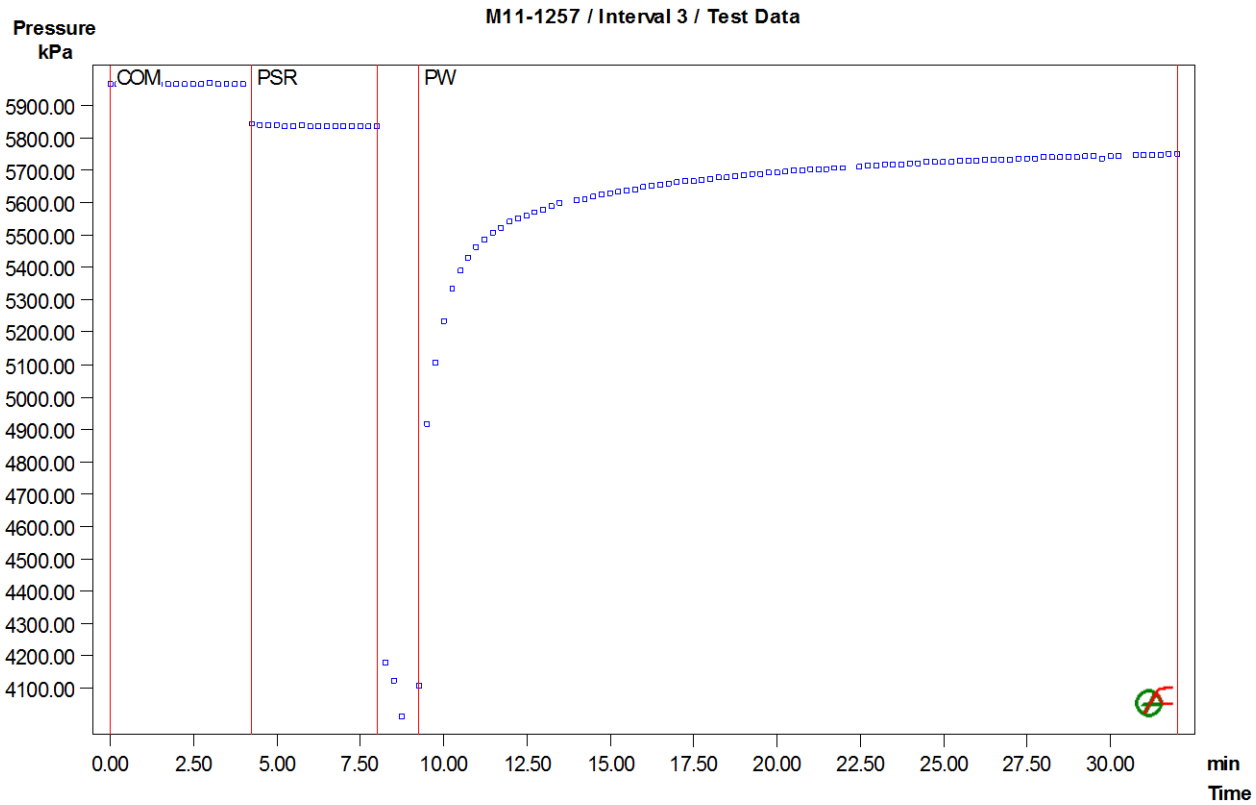



Figure 1: Pressure response and sequence definition

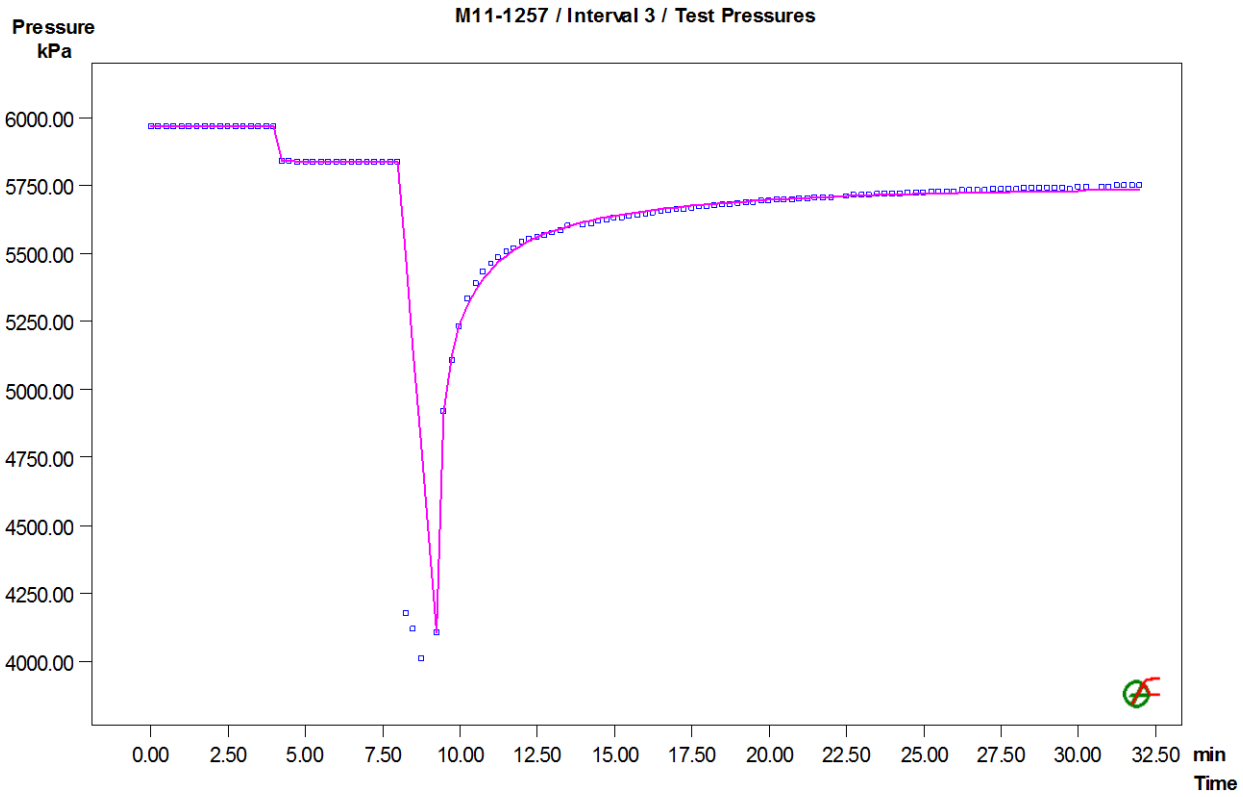



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

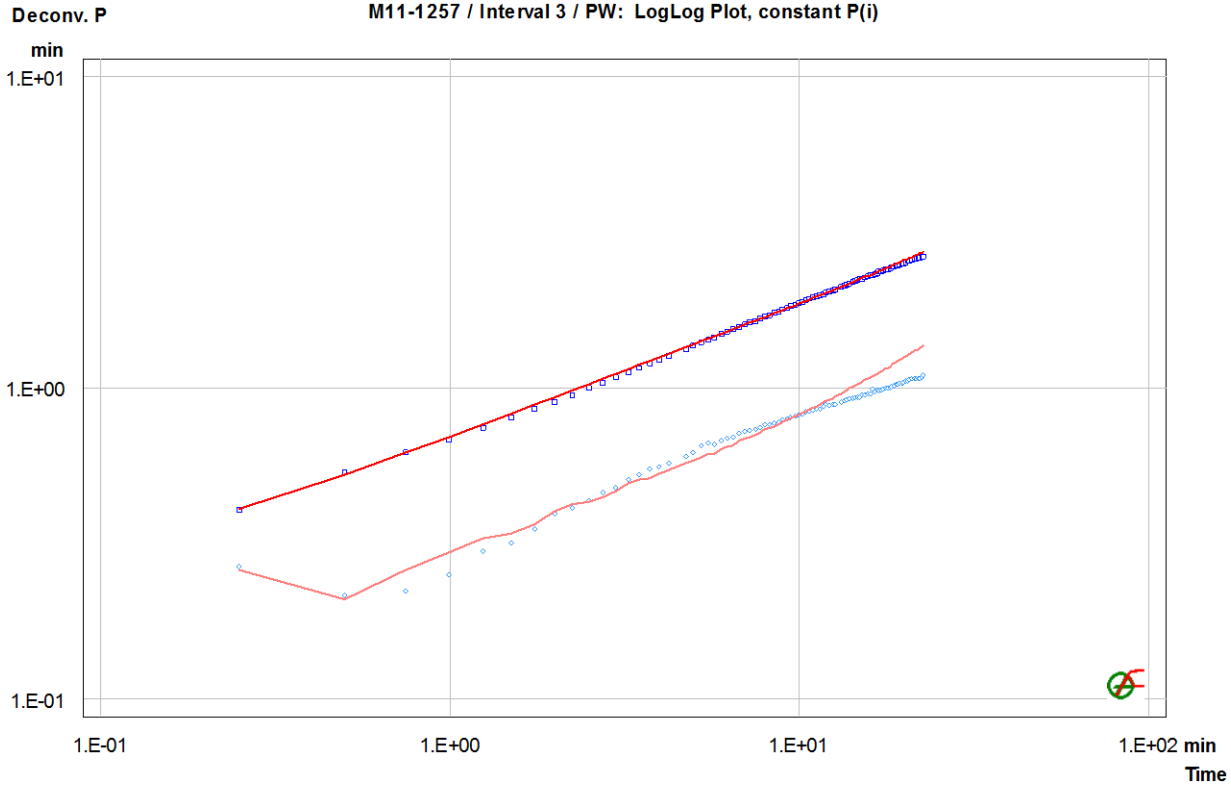



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, PW sequence

# HYDROBENCH REPORT

| | | |
|---|---|---|
| Project | Meliadine | |
| Site | | |
| Source Well | M11-1257 | |
| Test Name | Interval 4 | |
| Test Date/Time | 24/10/2011 | |
| Interval | top: 530.70 m | bottom: 542.89 m |
| Description | | |

## Basic Data

| | | |
|---|---|---|
| Test Interval | 12.19 m | |
| Porosity | 0.10 | |
| Well Radius | 0.048 m | Tubing Radius |
| Inclination | 0.0 deg | |
| Test Volume | 88.234 l | |
| Well Type | Source | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| COM | Variable Pressure | 0.00000 | 5394.18 | | | 7.7e-10 |
| PSR | Variable Pressure | 0.07083 | 5234.57 | | | 7.7e-10 |
| PW-Init | dP-Event | 0.13333 | 5221.54 | 1616.8 * | | 7.7e-10 |
| PW | Pulse | 0.15417 | 3604.72 | 5221.5 | | 7.7e-10 |

## Analysis Results

**Analysis "Analysis_1"**

Static Pressure: 5221.54 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 4.3e-08 | 2.4e-05 | 0.55 | 2.0 |
| Shell 2 | 8.0e-09 | 2.4e-05 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| COM | 7.7e-10 | 0.0 |
| PSR | 7.7e-10 | 0.0 |
| PW-Init | 7.7e-10 | 0.0 |
| PW | 7.7e-10 | 0.0 |

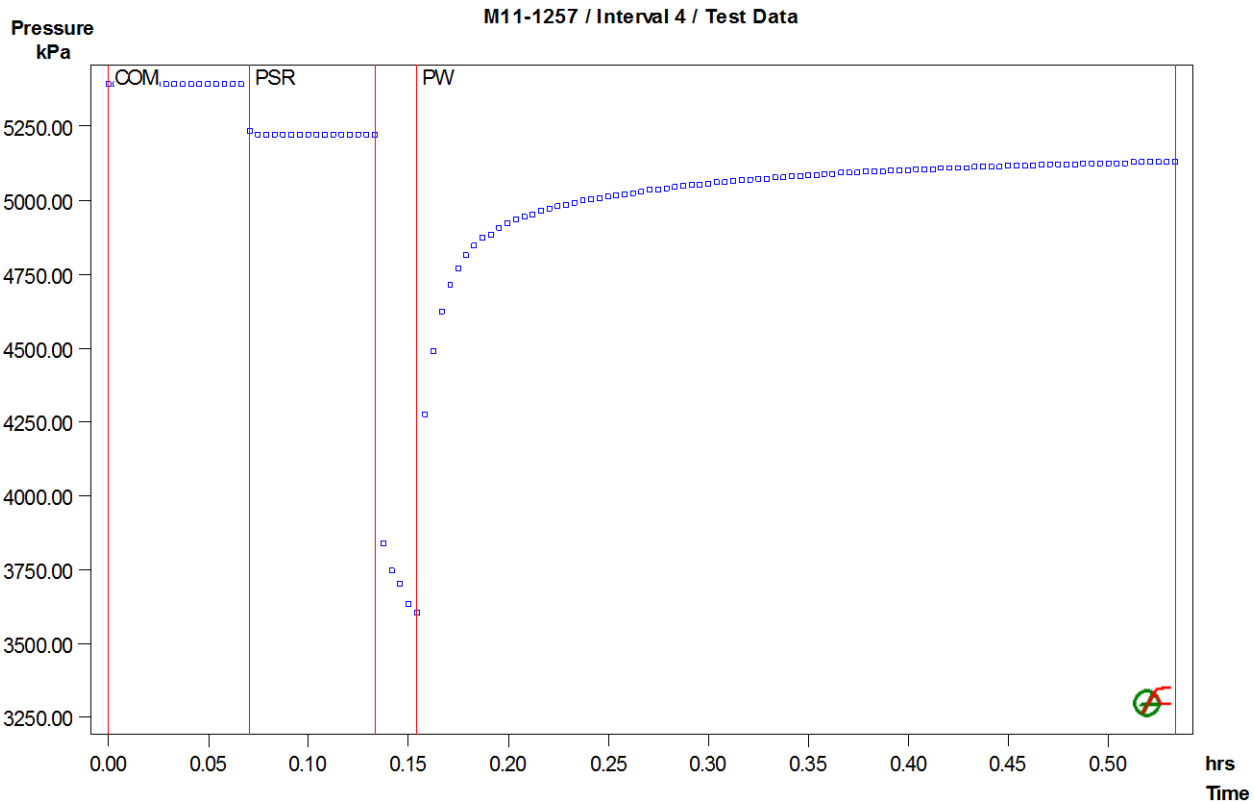



Figure 1: Pressure response and sequence definition

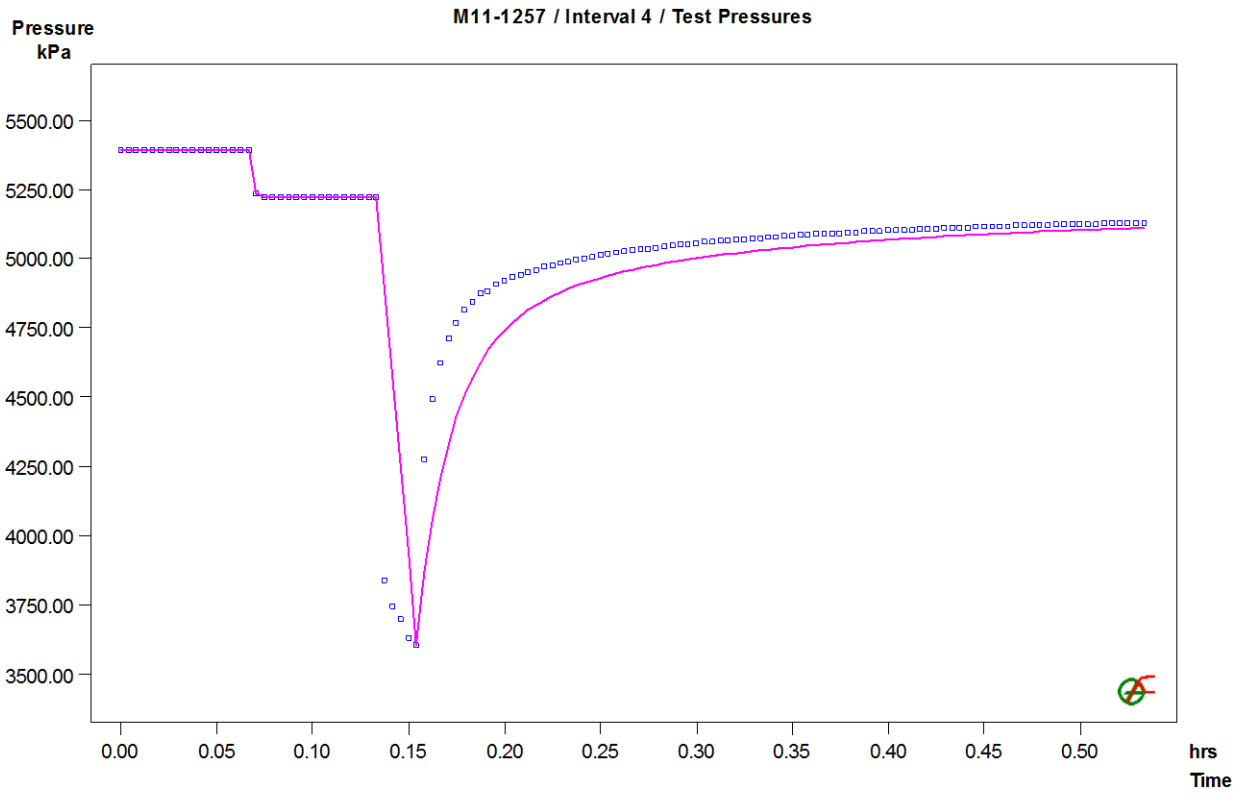



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

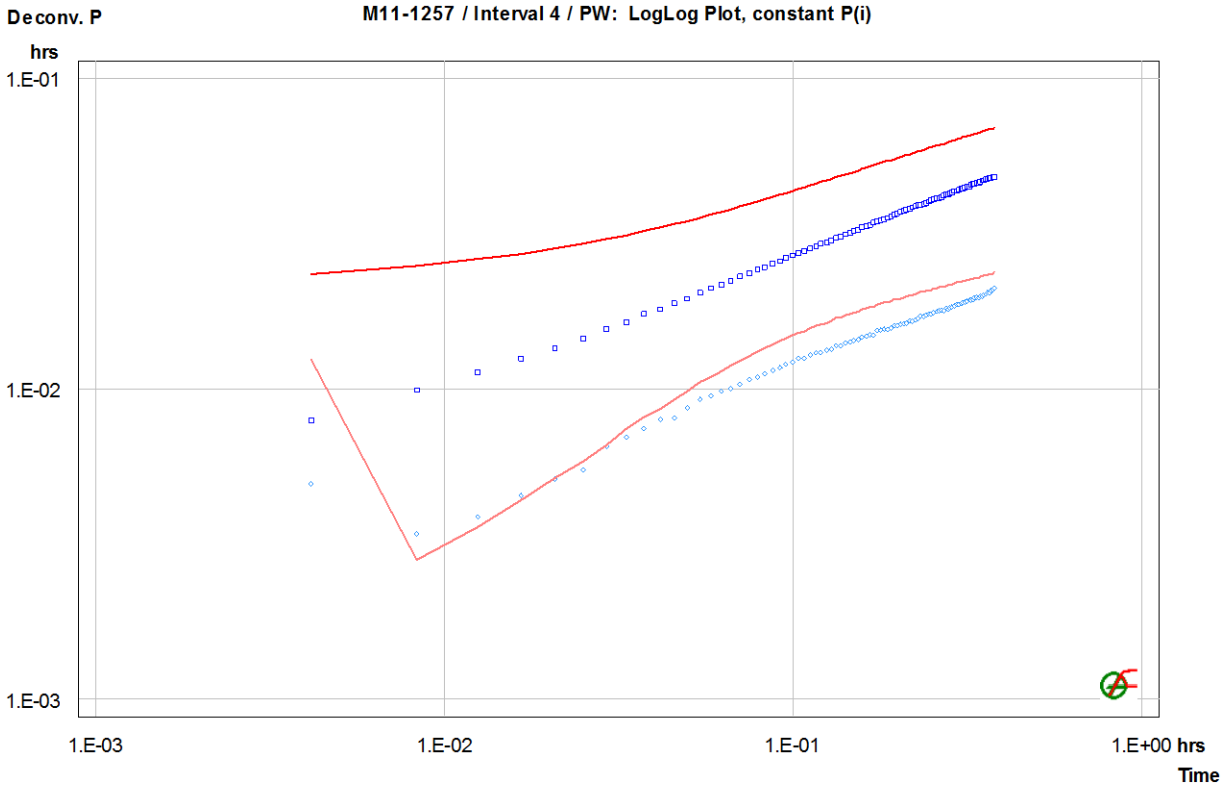



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, PW sequence

# HYDROBENCH REPORT

| | | |
|---|---|---|
| Project | Meliadine | |
| Site | | |
| Source Well | M11-1257 | |
| Test Name | Interval 5 | |
| Test Date/Time | 09/10/2011 | |
| Interval | top: 457.55 m | bottom: 469.74 m |
| Description | | |

## Basic Data

| | | |
|---|---|---|
| Test Interval | 12.19 m | |
| Porosity | 0.10 | |
| Well Radius | 0.048 m | Tubing Radius |
| Inclination | 0.0 deg | |
| Test Volume | 88.234 l | |
| Well Type | Source | |

## Fluid Properties

| | |
|---|---|
| Viscosity | 0.001 Pa*s |
| Density | 1000.0 kg/m³ |
| Compressibility | 2.0e-09 1/Pa |

## Sequence Definition

| Name | Category | t(o) [hrs] | P(o) [kPa] | P(i) [kPa] | Rate [l/min] | C [m³/Pa] |
|---|---|---|---|---|---|---|
| COM | Variable Pressure | 0.00000 | 4679.13 | | | 7.9e-10 |
| PSR | Variable Pressure | 0.07083 | 4606.39 | | | 7.9e-10 |
| PW-Init | dP-Event | 0.13333 | 4603.01 | 1264.4 * | | 7.9e-10 |
| PW | Pulse | 0.14583 | 3338.65 | 4603.0 | | 7.9e-10 |

## Analysis Results

**Analysis "PW_final"**

Static Pressure: 4606.39 kPa

Shell Parameters:

| Name | Transmissivity [m²/s] | Storativity [-] | Radius [m] | Flow Dimension [-] |
|---|---|---|---|---|
| Shell 1 | 3.2e-07 | 2.4e-05 | 0.45 | 2.0 |
| Shell 2 | 3.4e-08 | 2.4e-05 | 1.45 | 2.0 |
| Shell 3 | 1.8e-07 | 2.4e-05 | - - | 2.0 |

Sequence Parameters:

| Name | Wellbore Storage [m³/Pa] | Skin [-] |
|---|---|---|
| COM | 2.3e-09 | 0.0 |
| PSR | 2.3e-09 | 0.0 |
| PW-Init | 7.9e-10 | 0.0 |
| PW | 7.9e-10 | 0.0 |

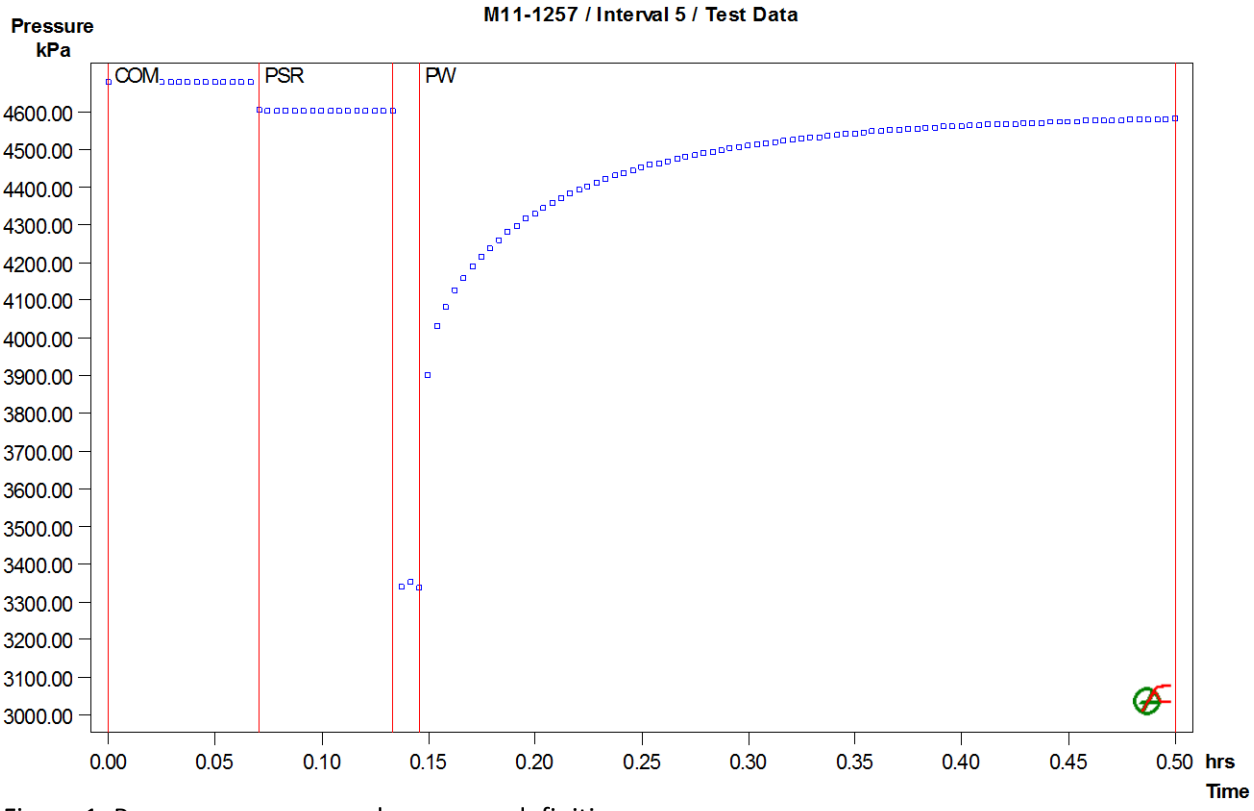



Figure 1: Pressure response and sequence definition

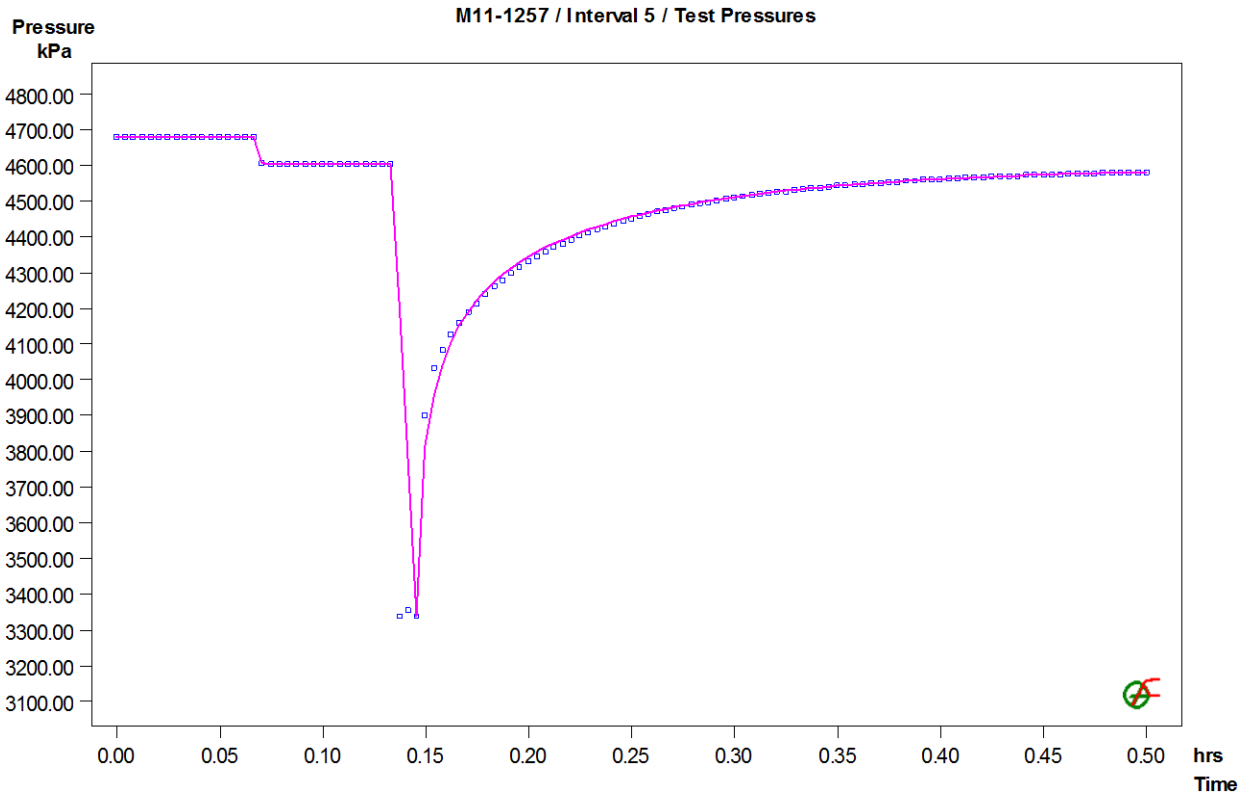



Figure 2: Pressure response (blue) and simulation (pink) cartesian plot

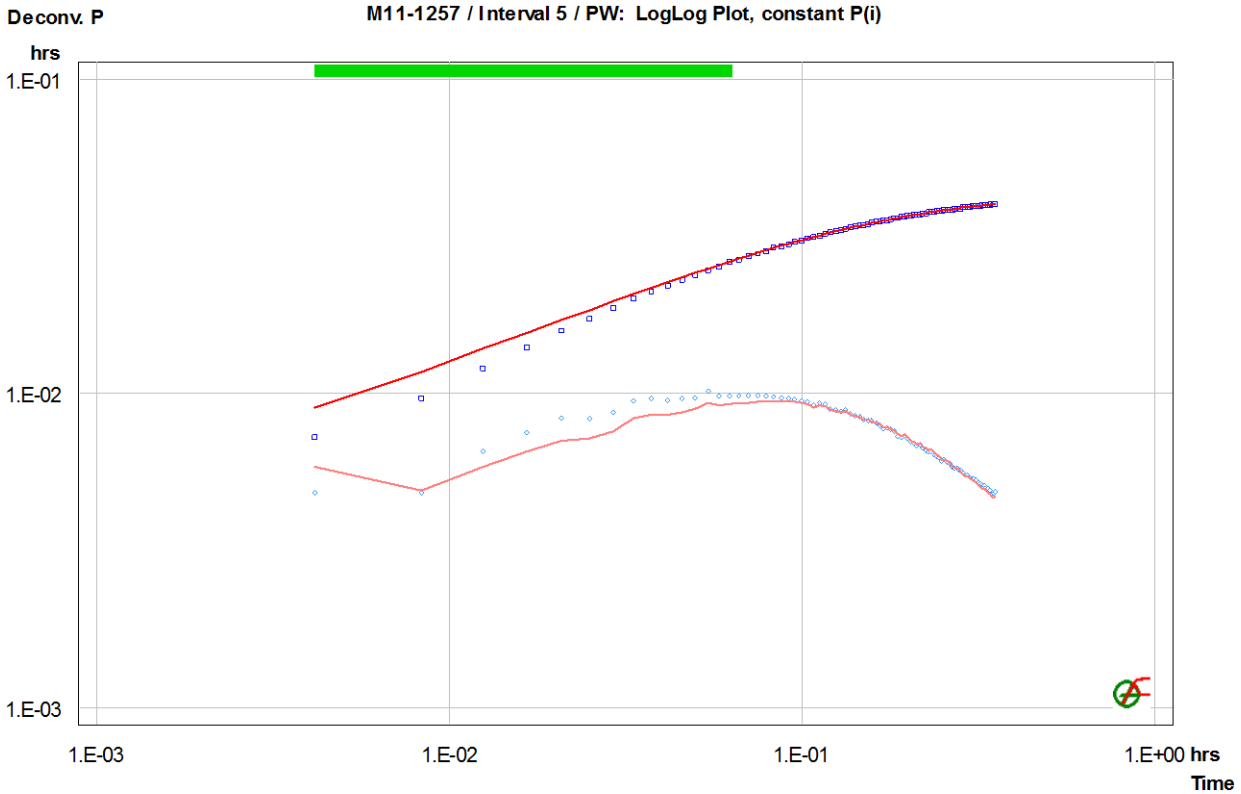
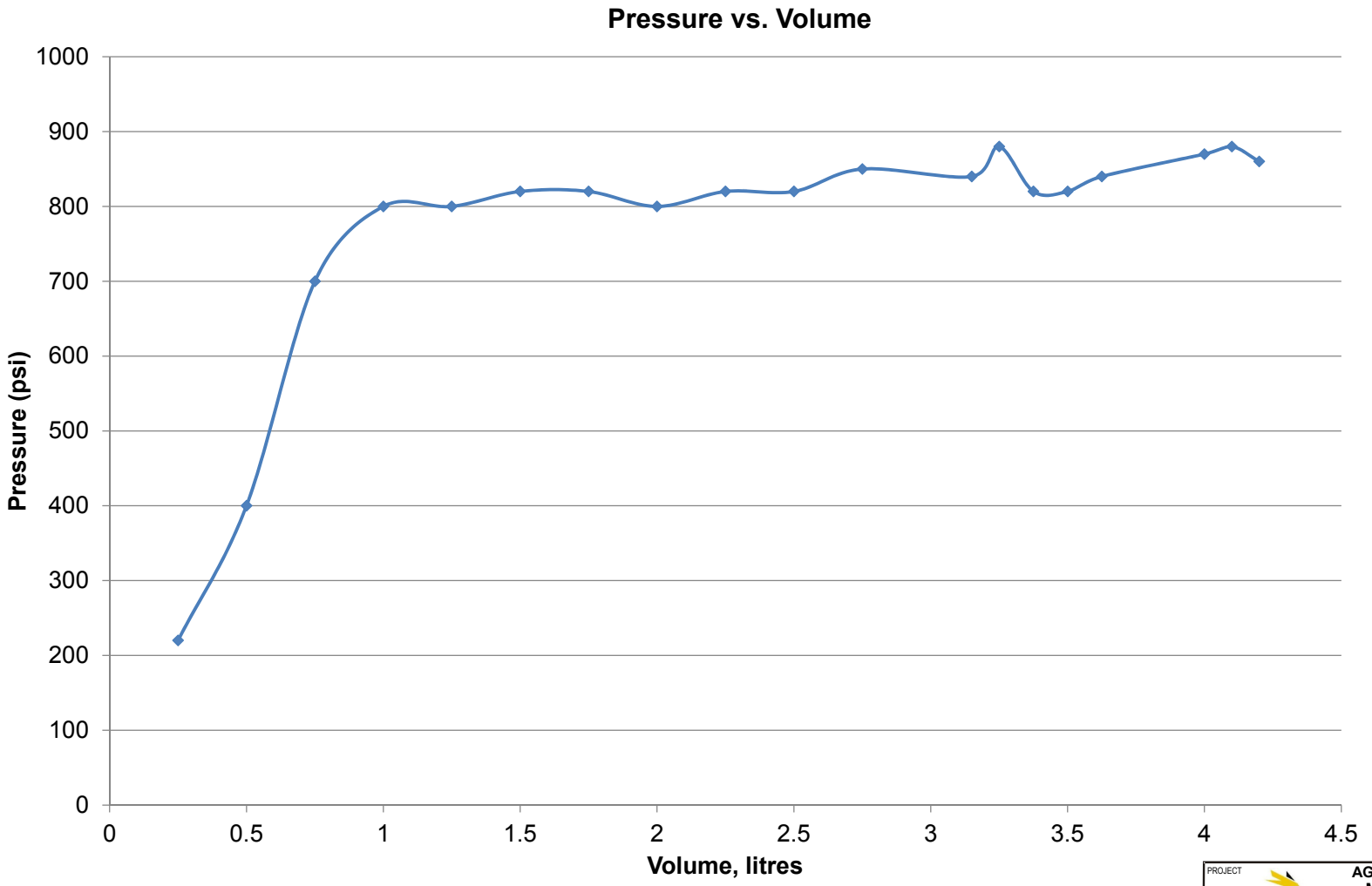



Figure 3: Deconvolved pressure response (dark blue), derivative (light blue) and simulation (red): Log-Log diagnostic plot, PW sequence

# APPENDIX D

## Westbay As-Built and Packer Inflation Records




PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

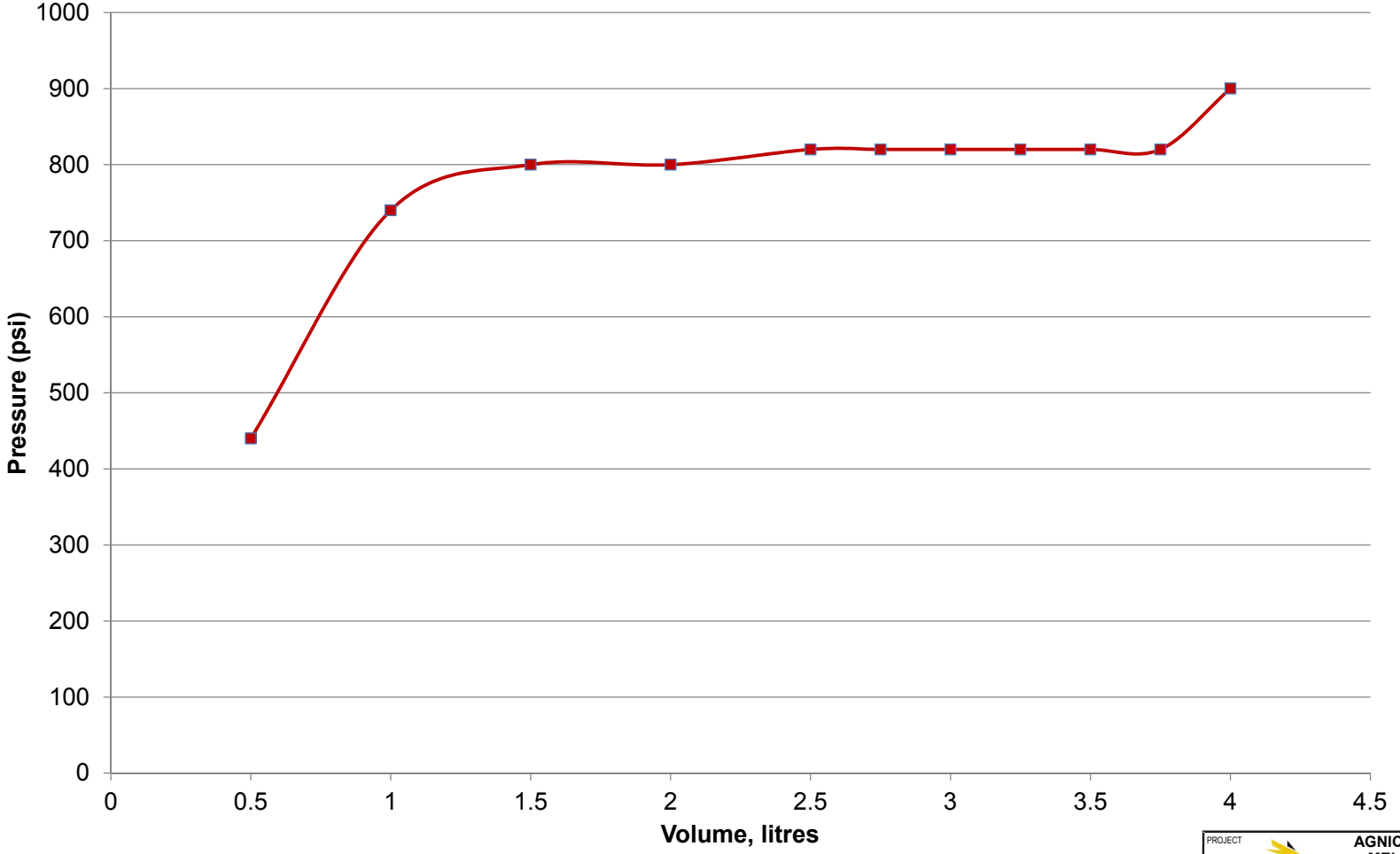
TITLE: M11-1257 WESTBAY SYSTEM
RECORD OF PACKER INFLATION
SERIAL NUMBER: 17635

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | RQ | 01JAN14 | SCALE NTS | REV. |
| CADD | RQ | 01JAN14 | | |
| CHECK | RQ | 30JAN14 | | |
| REVIEW | RQ | 30JAN14 | | |

FIGURE D-1

FILE: O:\Active_2008\1221 - Montréal\09-1221-3012\4000 - Temp. Shaft Support and Liner Design\SHAFT SUPPORT TO 600m DEPTH\REPORT\DRAFT REPORT\Landscape Figures for report_KLB_20 JAN 2009.ppt



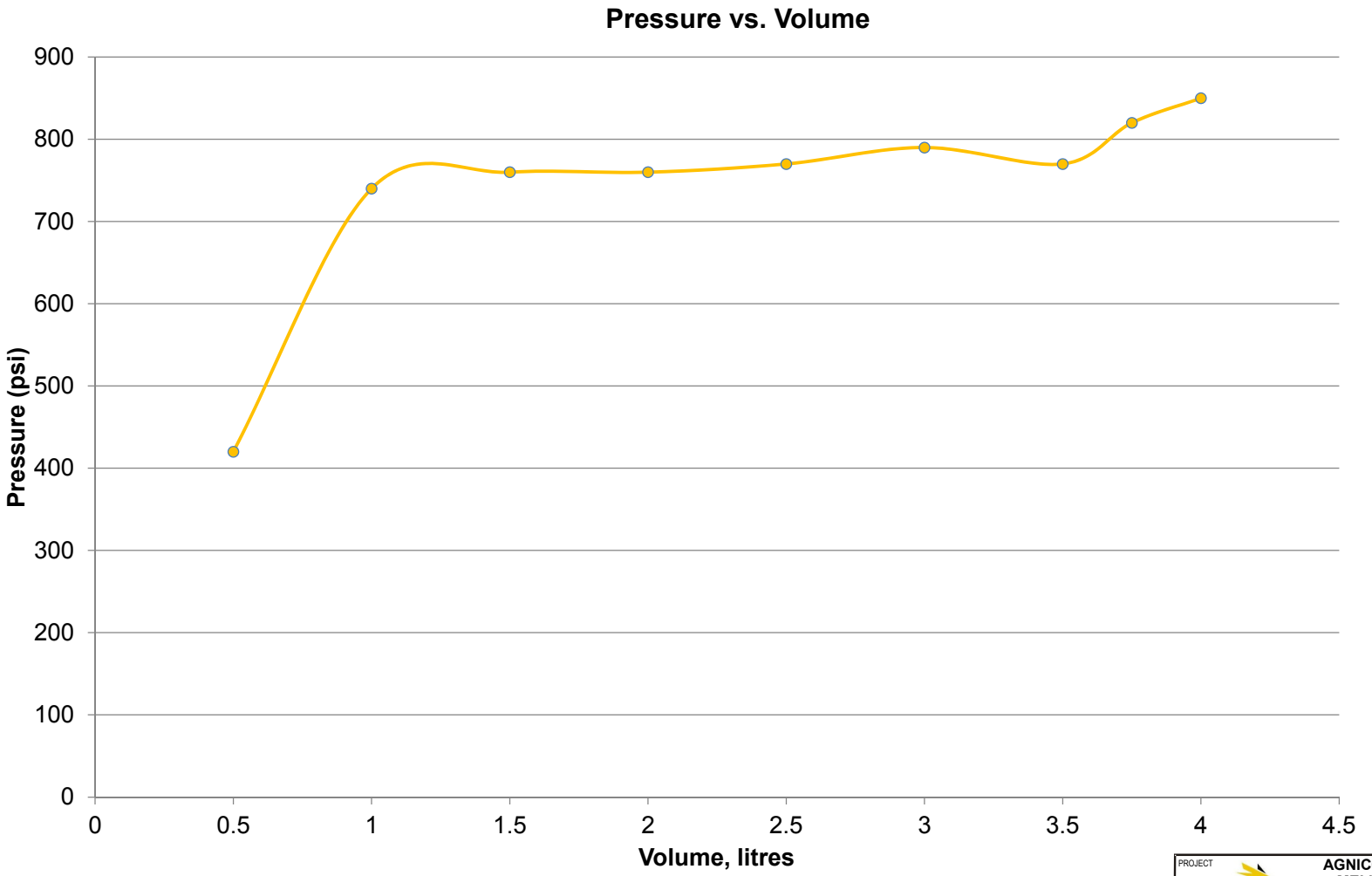

PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE: M11-1257 WESTBAY SYSTEM
RECORD OF PACKER INFLATION
SERIAL NUMBER: 17638

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | | |
| DESIGN | RQ | 01JAN14 | SCALE NTS | | REV. |
| CADD | RQ | 01JAN14 | FIGURE D-2 | | |
| CHECK | RQ | 30JAN14 | | | |
| REVIEW | RQ | 30JAN14 | | | |

Golder Associates

FILE: O:\Active_2008\1221 - Montréal\09-1221-3012\4000 - Temp. Shaft Support and Liner Design\SHAFT SUPPORT TO 600m DEPTH\REPORT\DRAFT REPORT\Landscape Figures for report_KLB_20 JAN 2009.ppt




PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

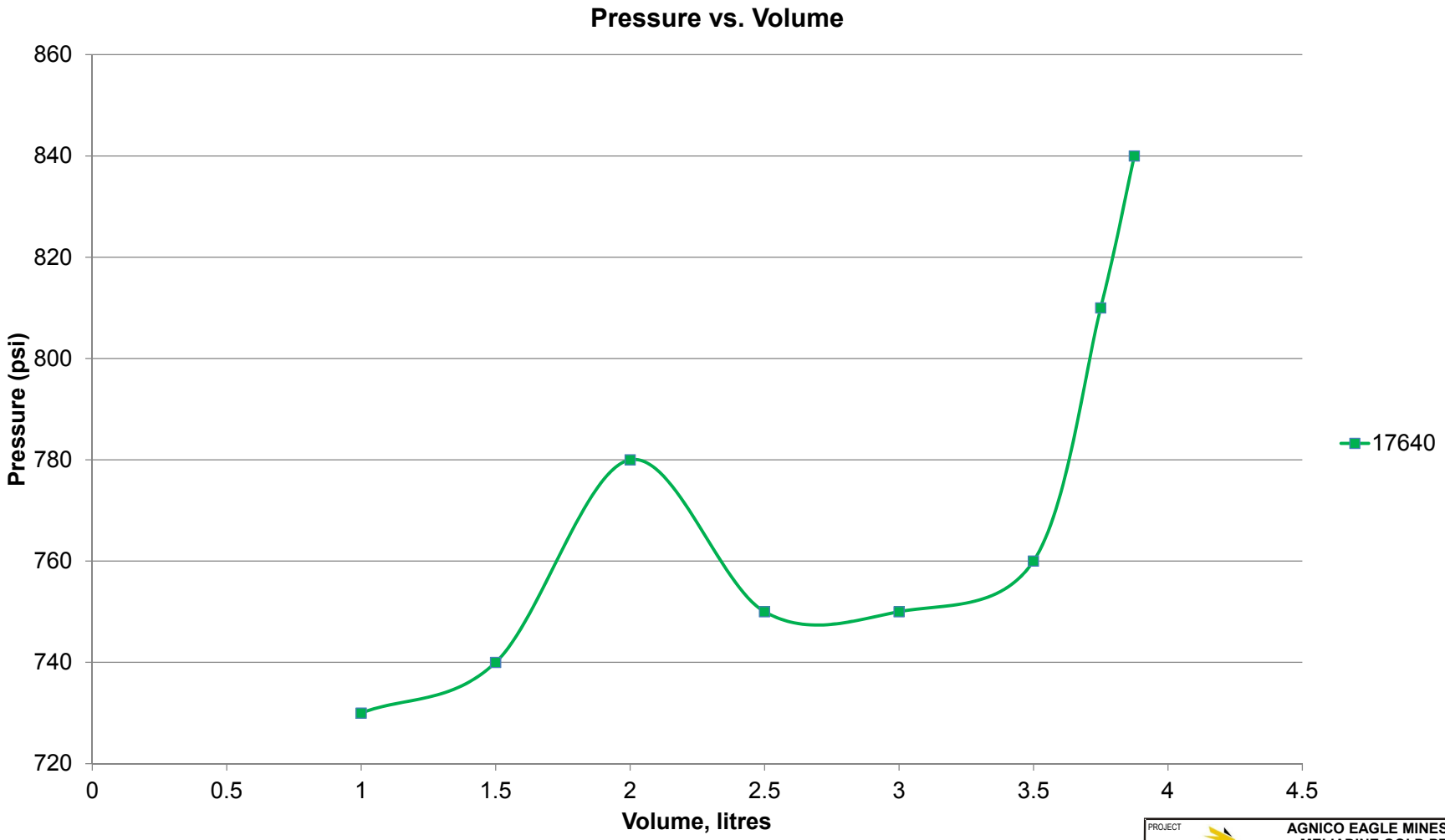
TITLE: M11-1257 WESTBAY SYSTEM
RECORD OF PACKER INFLATION
SERIAL NUMBER: 17639

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | RQ | 01JAN14 | SCALE NTS | REV. |
| CADD | RQ | 01JAN14 | | |
| CHECK | RQ | 30JAN14 | | |
| REVIEW | RQ | 30JAN14 | | |

FIGURE D-3

FILE: O:\Active_2008\1221 - Montréal\09-1221-3012\4000 - Temp. Shaft Support and Liner Design\SHAFT SUPPORT TO 600m DEPTH\REPORT\DRAFT REPORT\Landscape Figures for report_KLB_20 JAN 2009.ppt




PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

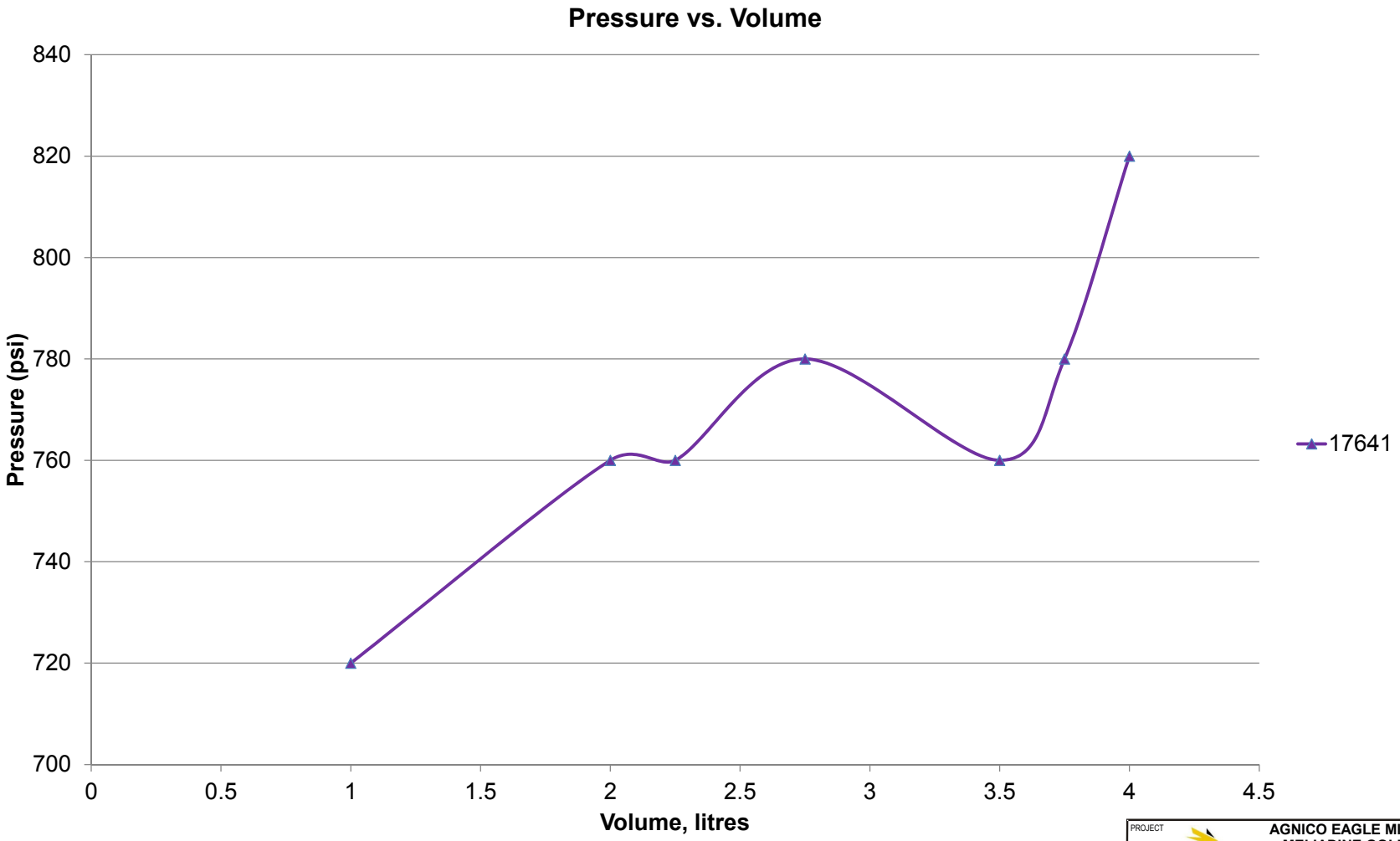
TITLE: M11-1257 WESTBAY SYSTEM
RECORD OF PACKER INFLATION
SERIAL NUMBER: 17640

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 | |
| DESIGN | RQ | 01JAN14 | SCALE NTS | REV. |
| CADD | RQ | 01JAN14 | | |
| CHECK | RQ | 30JAN14 | | |
| REVIEW | RQ | 30JAN14 | | |

FIGURE D-4

FILE: O:\Active_2008\1221 - Montréal\09-1221-3012\4000 - Temp. Shaft Support and Liner Design\SHAFT SUPPORT TO 600m DEPTH\REPORT\DRAFT REPORT\Landscape Figures for report_KLB_20 JAN 2009.ppt




PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE: M11-1257 WESTBAY SYSTEM
RECORD OF PACKER INFLATION
SERIAL NUMBER: 17641

Golder Associates

| | | | |
|---|---|---|---|
| PROJECT No. 13-1428-0007 | | | PHASE No. 7000 |
| DESIGN | RQ | 01JAN14 | SCALE NTS REV. |
| CADD | RQ | 01JAN14 | |
| CHECK | RQ | 30JAN14 | |
| REVIEW | RQ | 30JAN14 | |

FIGURE D-5

FILE: O:\Active_2008\1221 - Montréal\09-1221-3012\4000 - Temp. Shaft Support and Liner Design\SHAFT SUPPORT TO 600m DEPTH\REPORT\DRAFT REPORT\Landscape Figures for report_KLB_20 JAN 2009.ppt

**Table D-1**
**Westbay System M11-1257**
**As built Record**

Installation Date: 29-Aug-11 Installed by: RQ/DC

**645.0**

| DESCRIPTION | ID | LENGTH | Depth Along Hole (m) | |
|---|---|---|---|---|
| END CAP | 1 | 0 | **645.0** | |
| MP38 Casing 5 ft. | 1 | 5 | **643.5** | |
| MAG COLLAR | 1 | 0 | **643.5** | Magnetic Collar Depth = 644.1 |
| MP38 M-Port | 6841 | 0 | **643.5** | |
| MP38 Packer | 17634 | 5 | **642.0** | Serial Number 17634 |
| MP38 Casing 10 ft. | 1 | 10 | **638.9** | |
| MP38 Casing 10 ft. | 2 | 10 | **635.9** | |
| MP38 Casing 10 ft. | 3 | 10 | **632.8** | |
| MAG COLLAR | 2 | 0 | **632.8** | Magnetic Collar Depth = 633.4 |
| MP38 M-Port | 6842 | 0 | **632.8** | |
| MP38 Packer | 17635 | 5 | **631.3** | Serial Number 17635 |
| MP38 Casing 10 ft. | 4 | 10 | **628.2** | |
| MP38 Casing 10 ft. | 5 | 10 | **625.2** | |
| MP38 Casing 10 ft. | 6 | 10 | **622.1** | |
| MP38 Casing 10 ft. | 7 | 10 | **619.1** | |
| MAG COLLAR | 3 | 0 | **619.1** | Magnetic Collar Depth = 619.7 |
| MP38 M-Port | 6843 | 0 | **619.1** | |
| MP38 Packer | 17638 | 5 | **617.6** | Serial Number 17638 |
| MP38 Casing 10 ft. | 8 | 10 | **614.5** | |
| MP38 Casing 10 ft. | 9 | 10 | **611.5** | |
| MP38 Casing 10 ft. | 10 | 10 | **608.4** | |
| MP38 Casing 10 ft. | 11 | 10 | **605.4** | |
| MP38 Casing 10 ft. | 12 | 10 | **602.3** | |
| MAG COLLAR | 4 | 0 | **602.3** | Magnetic Collar Depth = 602.9 |
| MP38 M-Port | 6844 | 0 | **602.3** | |
| MP38 Packer | 17639 | 5 | **600.8** | Serial Number 17639 |
| MP38 Casing 10 ft. | 13 | 10 | **597.8** | |
| MP38 Casing 10 ft. | 14 | 10 | **594.7** | |
| MP38 Casing 10 ft. | 15 | 10 | **591.7** | |
| MP38 Casing 10 ft. | 16 | 10 | **588.6** | |
| MAG COLLAR | 5 | 0 | **588.6** | Magnetic Collar Depth = 589.2 |
| MP38 M-Port | 6845 | 0 | **588.6** | |
| MP38 Packer | 17640 | 5 | **587.1** | Serial Number 17640 |
| MP38 Casing 10 ft. | 17 | 10 | **584.0** | |
| MP38 Casing 10 ft. | 18 | 10 | **581.0** | |
| MP38 Casing 10 ft. | 19 | 10 | **577.9** | |
| MP38 Casing 10 ft. | 20 | 10 | **574.9** | |
| MP38 Casing 10 ft. | 21 | 10 | **571.8** | |
| MP38 Casing 10 ft. | 22 | 10 | **568.8** | |
| MP38 Casing 10 ft. | 23 | 10 | **565.8** | |
| MP38 Casing 10 ft. | 24 | 10 | **562.7** | |
| MP38 Casing 10 ft. | 25 | 10 | **559.7** | |
| MP38 Casing 10 ft. | 26 | 10 | **556.6** | |
| MP38 Casing 10 ft. | 27 | 10 | **553.6** | |
| MP38 Casing 10 ft. | 28 | 10 | **550.5** | |
| MP38 Casing 10 ft. | 29 | 10 | **547.5** | |
| MP38 Casing 10 ft. | 30 | 10 | **544.4** | |
| MAG COLLAR | 6 | 0 | **544.4** | Magnetic Collar Depth = 545.0 |
| MP38 M-Port | 6846 | 0 | **544.4** | |
| MP38 Packer | 17641 | 5 | **542.9** | Serial Number 17641 |
| MP38 Casing 10 ft. | 31 | 10 | **539.8** | |
| MP38 Casing 10 ft. | 32 | 10 | **536.8** | |
| MP38 Casing 10 ft. | 33 | 10 | **533.7** | |
| MP38 Casing 10 ft. | 34 | 10 | **530.7** | |
| MAG COLLAR | 7 | 0 | **530.7** | Magnetic Collar Depth = 531.3 |
| MP38 M-Port | 6847 | 0 | **530.7** | |
| MP38 Packer | 17642 | 5 | **529.2** | Serial Number 17642 |
| MP38 Casing 10 ft. | 35 | 10 | **526.1** | |
| MP38 Casing 10 ft. | 36 | 10 | **523.1** | |
| MP38 Casing 10 ft. | 37 | 10 | **520.0** | |
| MP38 Casing 10 ft. | 38 | 10 | **517.0** | |
| MP38 Casing 10 ft. | 39 | 10 | **513.9** | |
| MP38 Casing 10 ft. | 40 | 10 | **510.9** | |
| MP38 Casing 10 ft. | 41 | 10 | **507.8** | |
| MP38 Casing 10 ft. | 42 | 10 | **504.8** | |
| MP38 Casing 10 ft. | 43 | 10 | **501.7** | |

| | | | | |
|---|---|---|---|---|
| MP38 Casing 10 ft. | 44 | 10 | **498.7** | |
| MP38 Casing 10 ft. | 45 | 10 | **495.6** | |
| MP38 Casing 10 ft. | 46 | 10 | **492.6** | |
| MP38 Casing 10 ft. | 47 | 10 | **489.6** | |
| MP38 Casing 10 ft. | 48 | 10 | **486.5** | |
| MP38 Casing 10 ft. | 49 | 10 | **483.5** | |
| MP38 Casing 10 ft. | 50 | 10 | **480.4** | |
| MP38 Casing 10 ft. | 51 | 10 | **477.4** | |
| MP38 Casing 10 ft. | 52 | 10 | **474.3** | |
| MP38 Casing 5 ft. | 2 | 5 | **472.8** | |
| MP38 Casing 5 ft. | 3 | 5 | **471.3** | |
| MAG COLLAR | 8 | 0 | **471.3** | Magnetic Collar Depth = 471.9 |
| MP38 M-Port | 6848 | 0 | **471.3** | |
| MP38 Packer | 17643 | 5 | **469.7** | Serial Number 17643 |
| MP38 Casing 10 ft. | 53 | 10 | **466.7** | |
| MP38 Casing 10 ft. | 54 | 10 | **463.6** | |
| MP38 Casing 10 ft. | 55 | 10 | **460.6** | |
| MP38 Casing 5 ft. | 4 | 5 | **459.1** | |
| MP38 Casing 5 ft. | 5 | 5 | **457.5** | |
| MAG COLLAR | 9 | 0 | **457.5** | Magnetic Collar Depth = 458.2 |
| MP38 M-Port | 6849 | 0 | **457.5** | |
| MP38 Packer | 17703 | 5 | **456.0** | Serial Number 17703 |
| MP38 Casing 10 ft. | 56 | 10 | **453.0** | |
| MP38 Casing 10 ft. | 57 | 10 | **449.9** | |
| MP38 Casing 10 ft. | 58 | 10 | **446.9** | |
| MP38 Casing 10 ft. | 59 | 10 | **443.8** | |
| MP38 Casing 5 ft. | 6 | 5 | **442.3** | |
| MP38 Casing 5 ft. | 7 | 5 | **440.8** | |
| MAG COLLAR | 10 | 0 | **440.8** | Magnetic Collar Depth = 441.4 |
| MP38 M-Port | 6850 | 0 | **440.8** | |
| MP38 Packer | 17645 | 5 | **439.3** | Serial Number 17645 |
| MP38 Hyd. P-Port | 228 | 0 | **439.3** | |
| MP38 Casing 10 ft. | 61 | 10 | **436.2** | |
| MP38 Casing 10 ft. | 62 | 10 | **433.2** | |
| MP38 Casing 10 ft. | 63 | 10 | **430.1** | |
| MP38 Casing 10 ft. | 64 | 10 | **427.1** | |
| MP38 Casing 10 ft. | 65 | 10 | **424.0** | |
| MP38 Casing 10 ft. | 66 | 10 | **421.0** | |
| MP38 Casing 10 ft. | 67 | 10 | **417.9** | |
| MP38 Casing 10 ft. | 68 | 10 | **414.9** | |
| MP38 Casing 10 ft. | 69 | 10 | **411.8** | |
| MP38 Casing 10 ft. | 70 | 10 | **408.8** | |
| MP38 Casing 10 ft. | 71 | 10 | **405.7** | |
| MP38 Casing 10 ft. | 72 | 10 | **402.7** | |
| MP38 Casing 10 ft. | 73 | 10 | **399.6** | |
| MP38 Casing 10 ft. | 74 | 10 | **396.6** | |
| MP38 Casing 10 ft. | 75 | 10 | **393.5** | |
| MP38 Casing 10 ft. | 76 | 10 | **390.5** | |
| MP38 Casing 10 ft. | 77 | 10 | **387.4** | |
| MP38 Casing 10 ft. | 78 | 10 | **384.4** | |
| MP38 Casing 10 ft. | 79 | 10 | **381.3** | |
| MP38 Casing 10 ft. | 80 | 10 | **378.3** | |
| MP38 Casing 10 ft. | 81 | 10 | **375.3** | |
| MP38 Casing 10 ft. | 82 | 10 | **372.2** | |
| MP38 Casing 10 ft. | 83 | 10 | **369.2** | |
| MP38 Casing 10 ft. | 84 | 10 | **366.1** | |
| MP38 Casing 10 ft. | 85 | 10 | **363.1** | |
| MP38 Casing 10 ft. | 86 | 10 | **360.0** | |
| MP38 Casing 10 ft. | 87 | 10 | **357.0** | |
| MP38 Casing 10 ft. | 88 | 10 | **353.9** | |
| MP38 Casing 10 ft. | 89 | 10 | **350.9** | |
| MP38 Casing 10 ft. | 90 | 10 | **347.8** | |
| MP38 Casing 10 ft. | 91 | 10 | **344.8** | |
| MP38 Casing 10 ft. | 92 | 10 | **341.7** | |
| MP38 Casing 10 ft. | 93 | 10 | **338.7** | |
| MP38 Casing 10 ft. | 94 | 10 | **335.6** | |
| MP38 Casing 10 ft. | 95 | 10 | **332.6** | |
| MP38 Casing 10 ft. | 96 | 10 | **329.5** | |
| MP38 Casing 10 ft. | 97 | 10 | **326.5** | |
| MP38 Casing 10 ft. | 98 | 10 | **323.4** | |
| MP38 Casing 10 ft. | 99 | 10 | **320.4** | |
| MP38 Casing 10 ft. | 100 | 10 | **317.3** | |
| MP38 Casing 10 ft. | 101 | 10 | **314.3** | |

| | | | | |
|---|---|---|---|---|
| MP38 Casing 10 ft. | 102 | 10 | **311.2** | |
| MP38 Casing 5 ft. | 8 | 5 | **309.7** | |
| MP38 Casing 5 ft. | 9 | 5 | **308.2** | |
| MAG COLLAR | 11 | 0 | **308.2** | Magnetic Collar Depth = 308.8 |
| MP38 M-Port | 6851 | 0 | **308.2** | |
| MP38 Packer | 17467 | 5 | **306.7** | Serial Number 17467 |
| MP38 Casing 10 ft. | 103 | 10 | **303.6** | |
| MP38 Casing 10 ft. | 104 | 10 | **300.6** | |
| MP38 Casing 10 ft. | 105 | 10 | **297.5** | |
| MP38 Casing 10 ft. | 106 | 10 | **294.5** | |
| MP38 Casing 10 ft. | 107 | 10 | **291.4** | |
| MP38 Casing 10 ft. | 108 | 10 | **288.4** | |
| MP38 Casing 10 ft. | 109 | 10 | **285.3** | |
| MP38 Casing 10 ft. | 110 | 10 | **282.3** | |
| MP38 Casing 10 ft. | 111 | 10 | **279.2** | |
| MP38 Casing 10 ft. | 112 | 10 | **276.2** | |
| MP38 Casing 10 ft. | 113 | 10 | **273.1** | |
| MP38 Casing 10 ft. | 114 | 10 | **270.1** | |
| MP38 Casing 10 ft. | 115 | 10 | **267.0** | |
| MP38 Casing 10 ft. | 116 | 10 | **264.0** | |
| MP38 Casing 10 ft. | 117 | 10 | **261.0** | |
| MP38 Casing 10 ft. | 118 | 10 | **257.9** | |
| MP38 Casing 10 ft. | 119 | 10 | **254.9** | |
| MP38 Casing 10 ft. | 120 | 10 | **251.8** | |
| MP38 Casing 10 ft. | 121 | 10 | **248.8** | |
| MP38 Casing 10 ft. | 122 | 10 | **245.7** | |
| MP38 Casing 10 ft. | 123 | 10 | **242.7** | |
| MP38 Casing 10 ft. | 124 | 10 | **239.6** | |
| MP38 Casing 10 ft. | 125 | 10 | **236.6** | |
| MP38 Casing 10 ft. | 126 | 10 | **233.5** | |
| MP38 Casing 10 ft. | 127 | 10 | **230.5** | |
| MP38 Casing 10 ft. | 128 | 10 | **227.4** | |
| MP38 Casing 10 ft. | 129 | 10 | **224.4** | |
| MP38 Casing 10 ft. | 130 | 10 | **221.3** | |
| MP38 Casing 10 ft. | 131 | 10 | **218.3** | |
| MP38 Casing 10 ft. | 132 | 10 | **215.2** | |
| MP38 Casing 10 ft. | 133 | 10 | **212.2** | |
| MP38 Casing 10 ft. | 134 | 10 | **209.1** | |
| MP38 Casing 10 ft. | 135 | 10 | **206.1** | |
| MP38 Casing 10 ft. | 136 | 10 | **203.0** | |
| MP38 Casing 10 ft. | 137 | 10 | **200.0** | |
| MP38 Casing 10 ft. | 138 | 10 | **196.9** | |
| MP38 Casing 10 ft. | 139 | 10 | **193.9** | |
| MP38 Casing 5 ft. | 10 | 5 | **192.4** | |
| MP38 Casing 5 ft. | 11 | 5 | **190.8** | |
| MAG COLLAR | 12 | 0 | **190.8** | Magnetic Collar Depth = 191.4 |
| MP38 M-Port | 6852 | 0 | **190.8** | |
| MP38 Packer | 17647 | 5 | **189.3** | Serial Number 17647 |
| MP38 Hyd. P-Port | 229 | 0 | **189.3** | |
| MP38 Casing 10 ft. | 140 | 10 | **186.3** | |
| MP38 Casing 10 ft. | 141 | 10 | **183.2** | |
| MP38 Casing 10 ft. | 142 | 10 | **180.2** | |
| MP38 Casing 10 ft. | 143 | 10 | **177.1** | |
| MP38 Casing 10 ft. | 144 | 10 | **174.1** | |
| MP38 Casing 10 ft. | 145 | 10 | **171.0** | |
| MP38 Casing 10 ft. | 146 | 10 | **168.0** | |
| MP38 Casing 10 ft. | 147 | 10 | **164.9** | |
| MP38 Casing 10 ft. | 148 | 10 | **161.9** | |
| MP38 Casing 10 ft. | 149 | 10 | **158.8** | |
| MP38 Casing 10 ft. | 150 | 10 | **155.8** | |
| MP38 Casing 10 ft. | 151 | 10 | **152.7** | |
| MP38 Casing 10 ft. | 152 | 10 | **149.7** | |
| MP38 Casing 10 ft. | 153 | 10 | **146.7** | |
| MP38 Casing 10 ft. | 154 | 10 | **143.6** | |
| MP38 Casing 10 ft. | 155 | 10 | **140.6** | |
| MP38 Casing 10 ft. | 156 | 10 | **137.5** | |
| MP38 Casing 10 ft. | 157 | 10 | **134.5** | |
| MP38 Casing 10 ft. | 158 | 10 | **131.4** | |
| MP38 Casing 10 ft. | 159 | 10 | **128.4** | |
| MP38 Casing 10 ft. | 160 | 10 | **125.3** | |
| MP38 Casing 10 ft. | 161 | 10 | **122.3** | |
| MP38 Casing 10 ft. | 162 | 10 | **119.2** | |
| MP38 Casing 10 ft. | 163 | 10 | **116.2** | |

| | | | | |
|---|---|---|---|---|
| MP38 Casing 10 ft. | 164 | 10 | **113.1** | |
| MP38 Casing 10 ft. | 165 | 10 | **110.1** | |
| MP38 Casing 10 ft. | 166 | 10 | **107.0** | |
| MP38 Casing 10 ft. | 167 | 10 | **104.0** | |
| MP38 Casing 10 ft. | 168 | 10 | **100.9** | |
| MP38 Casing 5 ft. | 12 | 5 | **99.4** | |
| MP38 Casing 5 ft. | 13 | 5 | **97.9** | |
| MAG COLLAR | 12 | 0 | **97.9** | Magnetic Collar Depth = 98.5 |
| MP38 M-Port | 6868 | 0 | **97.9** | |
| MP38 Packer | 17648 | 5 | **96.4** | |
| MP38 Casing 10 ft. | 169 | 10 | **93.3** | |
| MP38 Casing 10 ft. | 170 | 10 | **90.3** | |
| MP38 Casing 10 ft. | 171 | 10 | **87.2** | |
| MP38 Casing 10 ft. | 172 | 10 | **84.2** | |
| MP38 Casing 10 ft. | 173 | 10 | **81.1** | |
| MP38 Casing 10 ft. | 174 | 10 | **78.1** | |
| MP38 Casing 10 ft. | 175 | 10 | **75.0** | |
| MP38 Casing 10 ft. | 176 | 10 | **72.0** | |
| MP38 Casing 10 ft. | 177 | 10 | **68.9** | |
| MP38 Casing 10 ft. | 178 | 10 | **65.9** | |
| MP38 Casing 10 ft. | 179 | 10 | **62.8** | |
| MP38 Casing 10 ft. | 180 | 10 | **59.8** | |
| MP38 Casing 10 ft. | 181 | 10 | **56.7** | |
| MP38 Casing 10 ft. | 182 | 10 | **53.7** | |
| MP38 Casing 10 ft. | 183 | 10 | **50.6** | |
| MP38 Casing 10 ft. | 184 | 10 | **47.6** | |
| MP38 Casing 10 ft. | 185 | 10 | **44.5** | |
| MP38 Casing 10 ft. | 186 | 10 | **41.5** | |
| MP38 Casing 10 ft. | 187 | 10 | **38.4** | |
| MP38 Casing 10 ft. | 188 | 10 | **35.4** | |
| MP38 Casing 10 ft. | 189 | 10 | **32.4** | |
| MP38 Casing 10 ft. | 190 | 10 | **29.3** | |
| MP38 Casing 10 ft. | 191 | 10 | **26.3** | |
| MP38 Casing 10 ft. | 192 | 10 | **23.2** | |
| MP38 Casing 5 ft. | 14 | 5 | **21.7** | |
| MP38 Casing 5 ft. | 15 | 5 | **20.2** | |
| MP38 Casing 5 ft. | 16 | 5 | **18.6** | |
| MP38 Casing 5 ft. | 17 | 5 | **17.1** | |
| MP38 Casing 5 ft. | 18 | 5 | **15.6** | |
| MP38 Casing 5 ft. | 19 | 5 | **14.1** | |
| MP38 Casing 5 ft. | 20 | 5 | **12.5** | |
| MP38 Casing 5 ft. | 21 | 5 | **11.0** | |
| MP38 Casing 5 ft. | 22 | 5 | **9.5** | |
| MP38 Casing 5 ft. | 23 | 5 | **8.0** | |
| MP38 Casing 5 ft. | 24 | 5 | **6.4** | |
| MP38 Casing 5 ft. | 25 | 5 | **4.9** | |
| MP38 Casing 5 ft. | 26 | 5 | **3.4** | |
| MP38 Casing 5 ft. | 27 | 5 | **1.9** | |
| MP38 Casing 5 ft. | 28 | 5 | **0.3** | |
| MP38 Casing 5 ft. | 29 | 5 | **-1.2** | |
| MP38 Casing 2 ft. | 1 | 2 | **-1.8** | |
| MP38 Casing 1 ft. | 1 | 1 | **-2.1** | |
| MP38 Casing 2 ft. | 1 | 2 | **-2.7** | |

**Table D-2**
**Westbay System M11-1257**
**As built Record**

Installation Date: 29-Aug-11 Installed by: RQ, DC.

| Item | Serial Number | Depth Along Hole |
|---|---|---|
| Magnetic Collar | 1 | 644.1 |
| MP38 Monitoring Port | 6841 | 643.5 |
| MP38 Packer | 17634 | 642.0 |
| Magnetic Collar | 2 | 633.4 |
| MP38 Monitoring Port | 6842 | 632.8 |
| MP38 Packer | 17635 | 631.3 |
| Magnetic Collar | 3 | 619.7 |
| MP38 Monitoring Port | 6843 | 619.1 |
| MP38 Packer | 17638 | 617.6 |
| Magnetic Collar | 4 | 602.9 |
| MP38 Monitoring Port | 6844 | 602.3 |
| MP38 Packer | 17639 | 600.8 |
| Magnetic Collar | 5 | 589.2 |
| MP38 Monitoring Port | 6845 | 588.6 |
| MP38 Packer | 17640 | 587.1 |
| Magnetic Collar | 6 | 545.0 |
| MP38 Monitoring Port | 6846 | 544.4 |
| MP38 Packer | 17641 | 542.9 |
| Magnetic Collar | 7 | 531.3 |
| MP38 Monitoring Port | 6847 | 530.7 |
| MP38 Packer | 17642 | 529.2 |
| Magnetic Collar | 8 | 471.9 |
| MP38 Monitoring Port | 6848 | 471.3 |
| MP38 Packer | 17643 | 469.7 |
| Magnetic Collar | 9 | 458.2 |
| MP38 Monitoring Port | 6849 | 457.5 |
| MP38 Packer | 17703 | 456.0 |
| Magnetic Collar | 10 | 441.4 |
| MP38 Monitoring Port | 6850 | 441.4 |
| MP38 Packer | 17645 | 439.3 |
| MP38 Pumping Port | 228 | 439.3 |
| Magnetic Collar | 11 | 308.8 |
| MP38 Monitoring Port | 6851 | 308.2 |
| MP38 Packer | 17467 | 306.7 |
| Magnetic Collar | 12 | 191.4 |
| MP38 Monitoring Port | 6852 | 190.8 |
| MP38 Packer | 17647 | 189.3 |
| MP38 Pumping Port | 229 | 189.3 |
| Magnetic Collar | 13 | 98.5 |
| MP38 Monitoring Port | 6868 | 97.9 |
| MP38 Packer | 17648 | 96.4 |

# APPENDIX 7.2-D

## Meliadine – Westbay Well 2013 Sampling Campaign

AGNICO EAGLE

# MELIADINE – WESTBAY WELL

## 2013 Sampling Campaign

**Prepared for:**

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**2014/02/09**

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# 1 Executive Summary

After Westbay well installation in 2011, the interval 5 was developed and data on groundwater quality were obtained. In order to get more information on the depth vs salinity profile, the 2012 sampling campaign was oriented towards the development of interval 2A. In 2013, more data were collected. Interval 3 was actively developed and all the other intervals were sampled. Three groundwater samples at different depths were obtained from this sampling campaign.

# 2 Methodology

Groundwater sampling at Meliadine site can be done using a long-term sampling equipment, the Westbay well, installed by Golder in 2011 into a HQ bore hole, M11-1257 (Golder, 2012) (See Westbay well drawing in Appendix A). The first step of the 2013 campaign was to do a pressure profile of the well to validate its integrity. The second step was to sample all intervals in order to figure which ones could be developed. Finally, at the end of the campaign, all intervals were sampled and analyzed.

# 3 Field Work

## 3.1 Well Integrity Validation

To establish the well pressure profile, pressure is taken at each sampling port in the well and in each interval (Figure 1). There should be a difference between both pressures, unless the casing is leaking. We noted a small difference between both pressures at each point, confirming that no significant leakage of the casing is present. Pressure profile must be done each year and be compared with previous years to reconfirm well integrity.

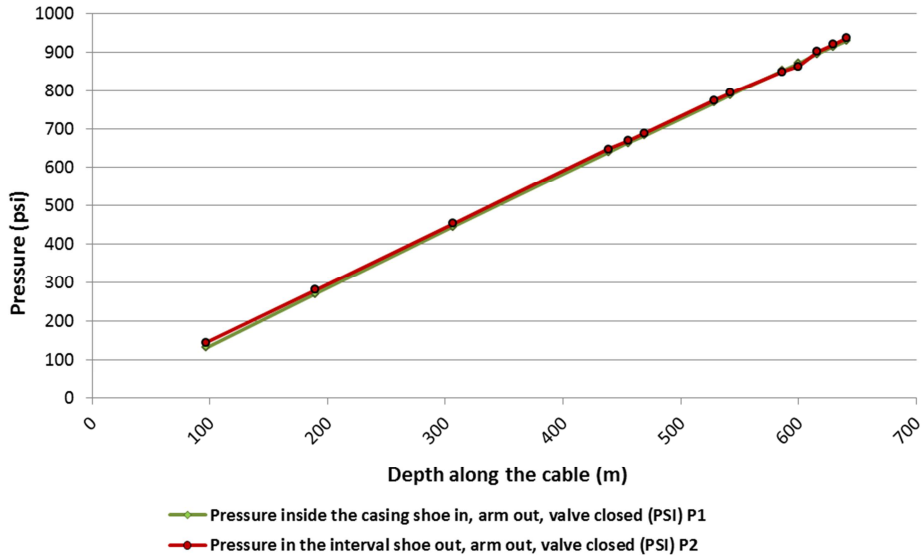



**Figure 1 : Pressure profile inside the well (Green line) and outside the well (in the interval) (Red line).**

## 3.2 Preliminary Sampling of Each Interval

This step is to confirm that interval 5 is developed. Also, it was possible to note that the intervals 2 and 3 seem to have been naturally drained since fluorescein concentrations are very low compared to other intervals (Qualitative analysis see figure 2). Samples from intervals 3, 3A, 4A and 5A are orange which indicate a difference with other Westbay zone (Unless it comes from the casing rusting but since there is no oxygen it is less likely). It is also possible to see an orange precipitate into these samples after a decantation period.

The preliminary sampling leads to the conclusion that the 2013 sampling campaign effort should be centered on interval 3 which is the deepest interval with low fluorescein level.

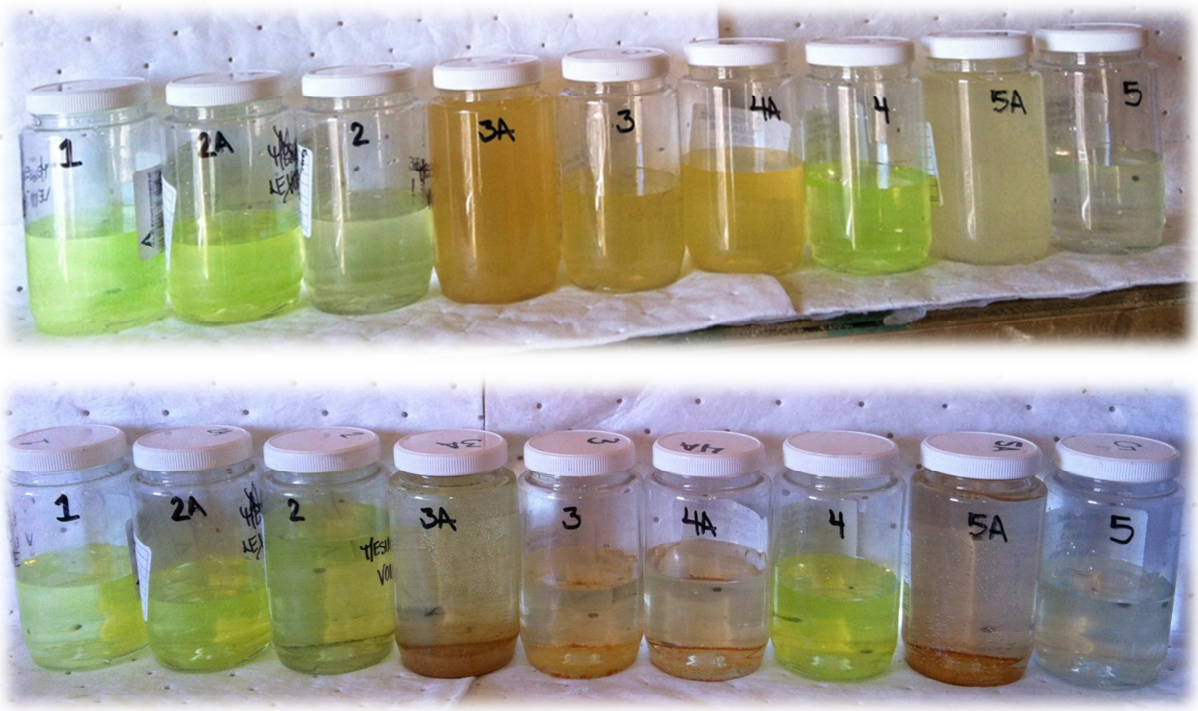



**Figure 2 : Picture of water samples at each interval on June 26, 2013 and June 27, 2013. *The upper picture was taken before* precipitation, the one below after precipitation. There is no suspended solids in samples 3A and 5A, just bubbles sticking to jar wall.**

## 3.3 Interval 3 Development and Final Sampling

During the 2013 sampling campaign, 228 liters were extracted from interval 3 over a 13-day period. The purge pace was 10-11L each 12 h. Only one 12h shut down was needed to change cable head.

Samples were taken for lab analysis (1) before beginning development of interval 3, (2) after 1 week purging, and finally (3) at the end of the campaign in order to follow components evolution. It has not been possible to monitor fluorescein concentration on site because the spectrophotometer was defective. Nevertheless, it was easy to visually note the presence of fluorescein in the samples. At the end of the campaign, all intervals were sampled and sent for laboratory analysis.

# 4 Laboratory Analysis

Water samples were sent to Multilab laboratory in Val-d'or. Certificates of analysis are presented into Appendix D and tabulated raw and corrected results are shown in Appendix C.

# 5 Results and Discussion

## 5.1 Interval 3

In figure 3, it is possible to note that chloride and calcium concentration didn't vary during interval 3 sampling. Based on data history (Figure 6), potassium and lithium were predominant in drilling water. We observed an increase in sodium and sulfate concentration which was also observed in interval 5 during the 2011 sampling campaign. The gradual increase in sodium concentration suggests that the interval is not fully developed, although fluorescein analysis shows a concentration below 50 ppb (32.5 ppb) which indicate that at least 90% of the drilling fluid has been removed and that the interval can be considered to be fully developed (Golder, 2012).

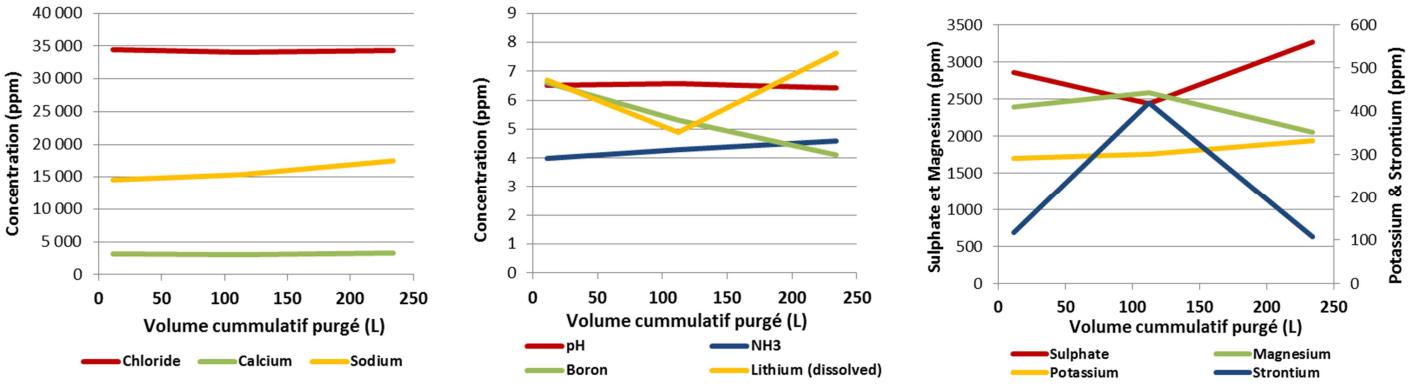



**Figure 3 : Concentration of different components in sampled groundwater from interval 3 as a function of the total volume of water withdrawn.**

## 5.2 Final Sampling of All Intervals

Data were corrected based on fluorescein concentration in samples in order to eliminate the error caused by the presence of residual drilling fluid into the groundwater sample. Only corrected results of

intervals with a fluorescein concentration below 50 ppb are presented here since the error on correction increase with fluorescein concentration. The fluorescein analyses were only done on filtered samples because of the interference of the orange precipitate. Unlike previous years, the same fluorescein data were used for the correction of all components (even if the analyses were done on unfiltered samples).

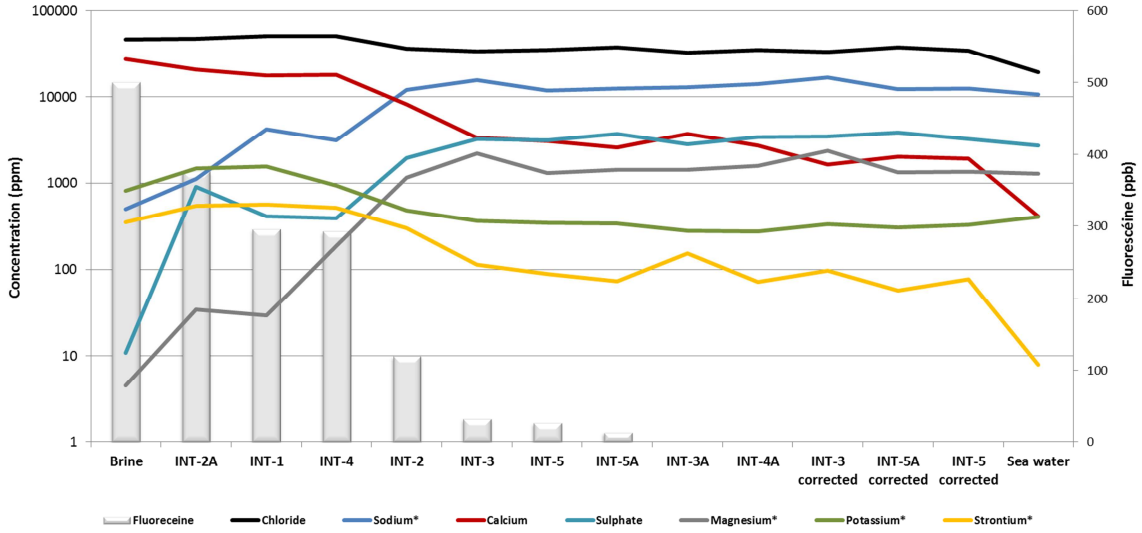



**Figure 4 : Analysis results for sampled intervals at the end of 2013 campaign. Bars referred to the right axis and indicate fluorescein concentration while curves represent components concentration. Asterix beside component name indicates that filtered data are presented for these components. It was not possible to use filtered data for calcium (see section on analysis error in appendix). Corrected data were calculated with fluorescein concentration. It is important to note that there wasn't enough water sampled from intervals 3A and 4A to run fluorescein analysis (the concentration is not zero).**

Complete sampling results of Westbay well indicate a predominance of sodium chloride in Meliadine groundwater compared to calcium chloride in the drilling fluid. Based on actual information, it is not possible to confirm that there is a variation in chemical species with depth. Sulfate, sodium and magnesium concentration in sampled groundwater are close to those observed in sea water. As in the other years, samples analysis data do not allow to calculate a ionic equilibrium in groundwater. This suggests that there is an error into an analysis or that there is an important element in the water samples that has not been analyzed.

Based on Golder criteria (below 50 ppb of fluorescein (Golder, 2012)), it seems that intervals 3, 5 and 5A are developed.

In spite of the fact that fluorescein analyses haven't been done on intervals 3A and 4A samples, we can conclude, based on comparison of component concentration with developed intervals, that those two intervals are also developed. It can be noted that intervals 5A, 3A and 4A have never been actively

purged; it suggests that ground porosity into this ground layer is higher and that hydraulic conductivity is high enough to allow diffusion and dilution of fluorescein at steady state.

# 6 2011 to 2013 Campaigns Review

**Table 1 : Summary table of corrected data from developed intervals of the Meliadine Westbay well.**

| Parameter ( mg/L) | Drilling fluid | Sea water | INT-3 Corrected 2013 | INT-5A Corrected 2013 | INT-5 Corrected 2013 | INT-5 Corrected 2012 | INT-5 Corrected 2011 | INT-5 mean[4] | Westbay Mean[4] |
|---|---|---|---|---|---|---|---|---|---|
| **TDS[1]** | 87375 | 35019 | 58420 | 57705 | 54282 | 58351 | 55208 | **55947** | **56793** |
| **Chloride** | 46500 | 19353 | 33446 | 37699 | 34659 | 33157 | 31862 | **33226** | **34165** |
| **Calcium** | 27500 | 412 | 1629 | 2011 | 1908 | 1220 | 939 | **1356** | **1541** |
| **Sodium[2]** | 498 | 10784 | 16860 | 12283 | 12536 | 17478 | 16486 | **15500** | **15129** |
| **NH3** | 3 | - | 5 | 5 | 5 | 4 | 4 | **4** | **4** |
| **Boron[2]** | 6 | - | 3 | 1 | 2 | 5 | 4 | **4** | **3** |
| **Lithium [2]** | 21 | - | 7 | 1 | 2 | 4 | 2 | **3** | **3** |
| **Bromide** | | 67 | 194 | 160 | 161 | | | **161** | **172** |
| **Sulphate** | 11 | 2712 | 3494 | 3855 | 3256 | 3726 | 3377 | **3453** | **3541** |
| **Magnesium[2]** | 5 | 1284 | 2359 | 1336 | 1357 | 2331 | 2149 | **1946** | **1907** |
| **Potassium[2]** | 805 | 399 | 330 | 302 | 324 | 365 | 325 | **338** | **329** |
| **Strontium[2]** | 353 | 8 | 97 | 57 | 77 | 65 | 63 | **68** | **72** |
| **Arsenic[3]** | <0.05[2] | - | 0.247 | 0.3 | 0.329 | <0.02 | <0.1 | **0.143** | **0.195** |
| **Copper[3]** | <0.05[2] | - | 0.25 | 0.34 | 0.32 | 0.01 | <0.1 | **0.143** | **0.204** |
| **Nickel[3]** | <0.1[2] | - | 0.18 | 0.17 | 0.23 | 0.01 | <0.1 | **0.113** | **0.138** |
| **Lead[3]** | <0.03[2] | - | <0.0003 | 0.0032 | <0.0003 | 0.002 | <0.05 | **0.017** | **0.011** |
| **Zinc[3]** | <0.3[2] | - | 0.390 | 0.361 | 0.326 | 0.996 | <0.5 | **0.607** | **0.515** |

[1] Total dissolved solids (TDS) have been calculated by doing the sum of main presented ions in the table excluding ammonia, arsenic, copper, nickel, lead and zinc. Direct analysis TDS values could not be used in 2013 because of analysis method limitation (See appendix C-1)

[2] Filtered sample analysis

[3] To correct data for these component, it has been considered that concentration into the drilling fluid was zero since detection limit were too high on data from 2011(between <20 ppm and < 1ppm).

[4] When data where below the detection limit, the limit value was used for the mean value calculation.

# 7 Conclusion

Based on data from 2011 to 2013 sampling campaigns, it seems that 3 intervals of the Meliadine Westbay well are fully developed.The chemical characteristics of groundwater do not seem to vary with depth along the well. It should to be noted that two additional intervals could already be developed, but it could not be confirmed with laboratory analysis.

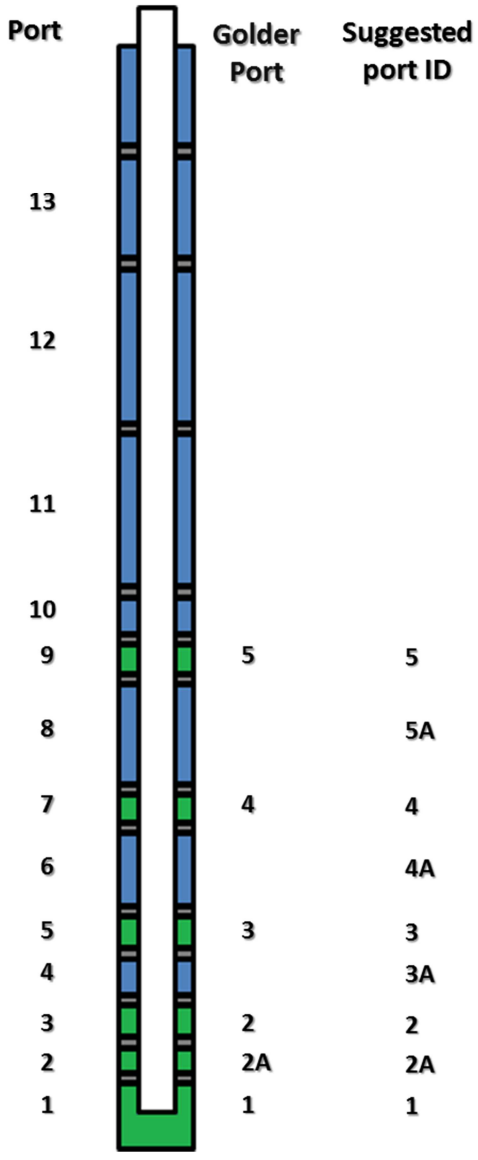
# 8 References

Golder. (2012, January 31). *Monitoring well M11-1257 Groundwater sampling results - Meliadine Gold project.* Nunavut.

Golder. (2013). *Monitoring well M11-1257 groundwater sampling results Meliadine gold project, Nunavut Rev. 1.*

# APPENDIX A :

Westbay drawing (borehole M11-1257)

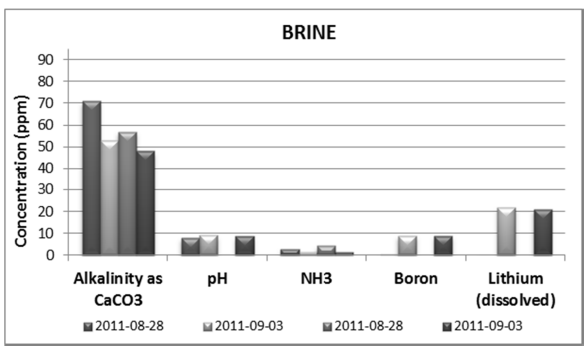


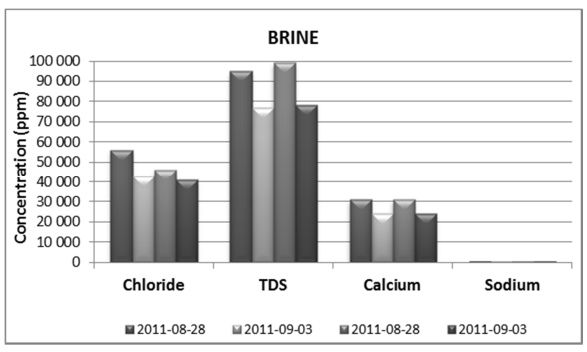

| Port No. | Interval (Golder) | Suggested interval names (2013) | Port position from log (m) | Calculated water volume (L) |
|---|---|---|---|---|
| 1 | 1 | 1 | 643.5 | 107.1 |
| 2 | 2A | 2A | 632.8 | 52.9 |
| 3 | 2 | 2 | 619.1 | 69.5 |
| 4 | | 2A | 602.3 | |
| 5 | 3 | 3 | 588.6 | 69.5 |
| 6 | | 3A | 544.4 | |
| 7 | 4 | 4 | 530.7 | 69.5 |
| 8 | | 4A | 471.3 | |
| 9 | 5 | 5 | 457.6 | 69.7 |
| 10 | | 5A | 440.8 | |
| 11 | | | 308.2 | |
| 12 | | | 190.8 | |
| 13 | | | 97.8 | |

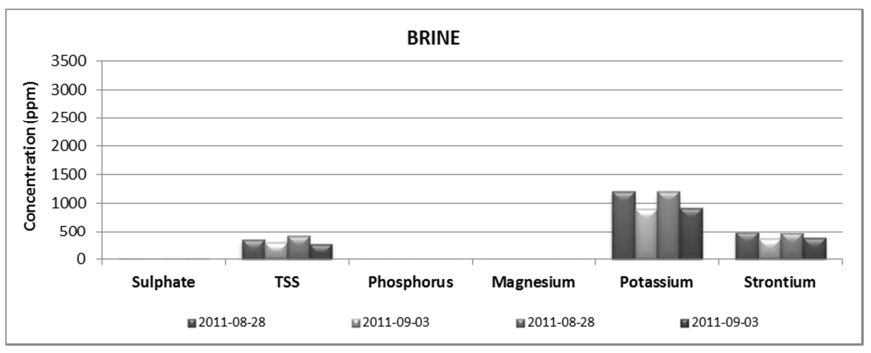
Figure 5: Westbay schematic drawing showing sampling intervals.

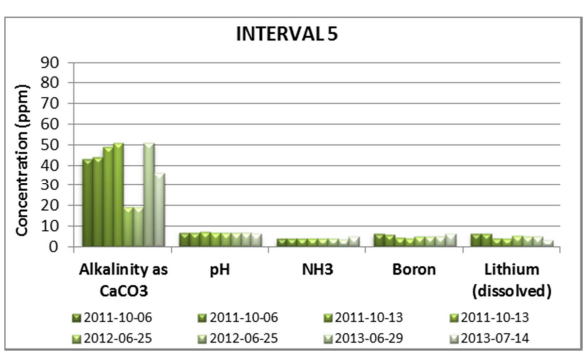
# APPENDIX B :

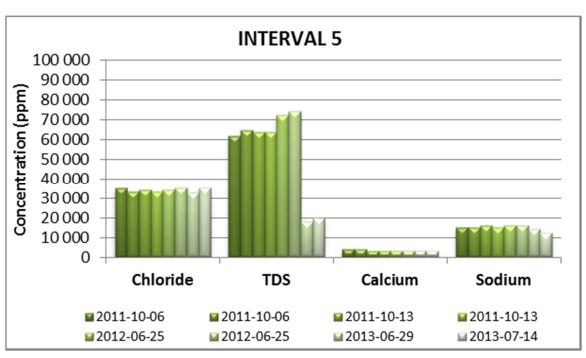
Graphic representation of raw data from 2011 to 2013 sampling campaigns

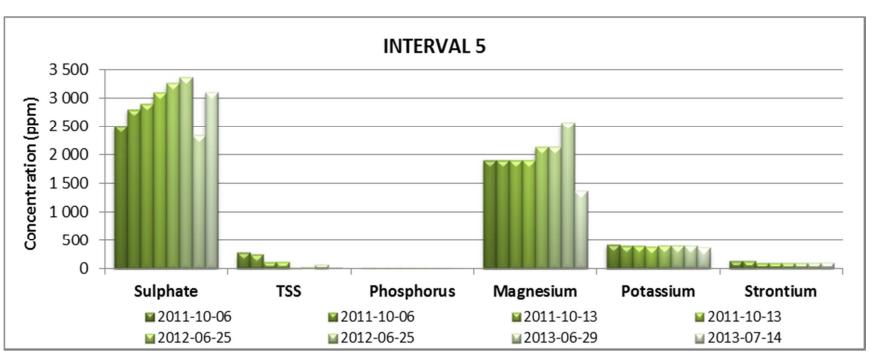


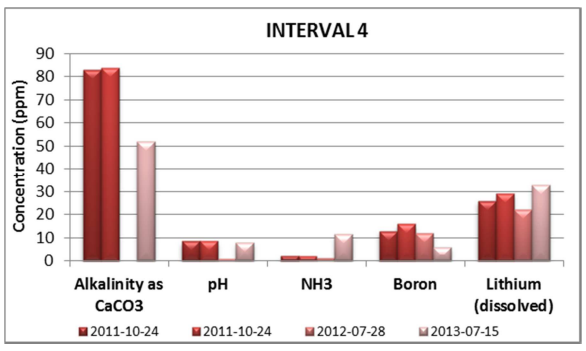



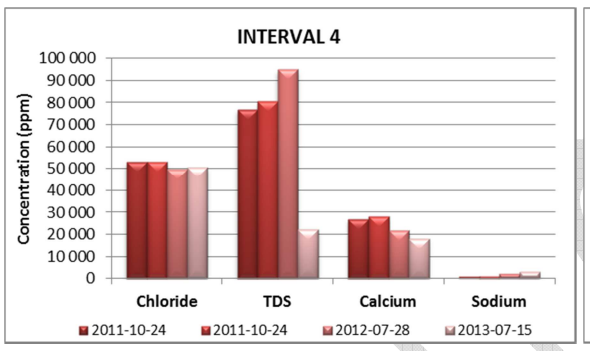



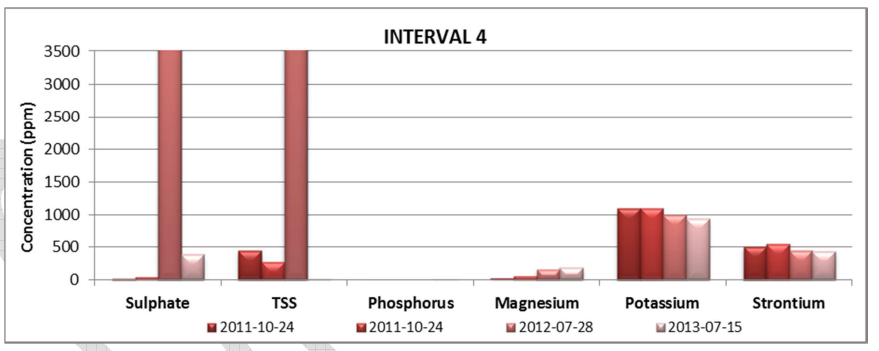



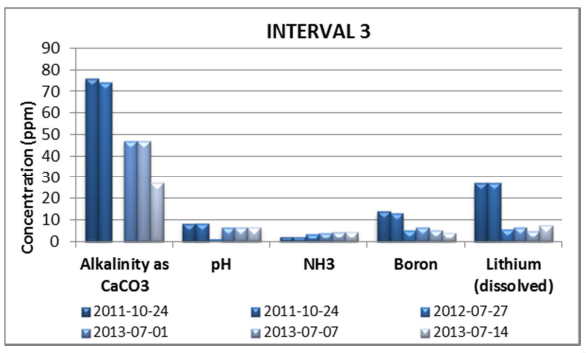



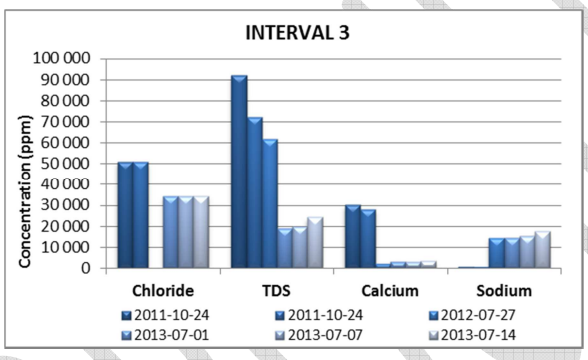



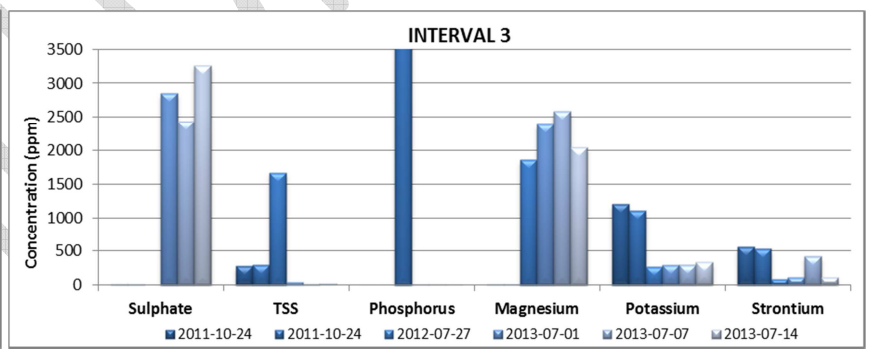



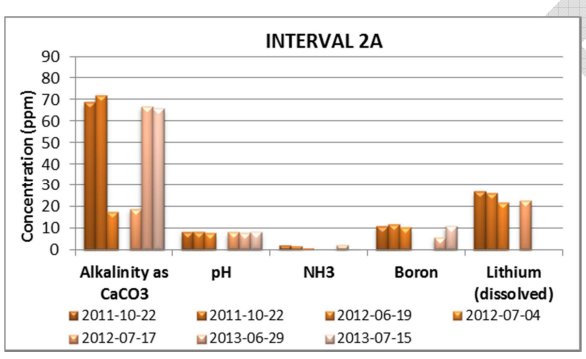



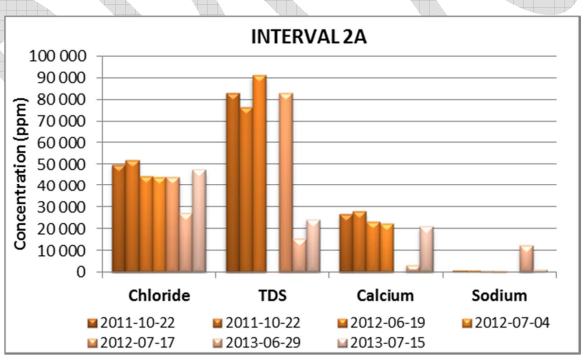



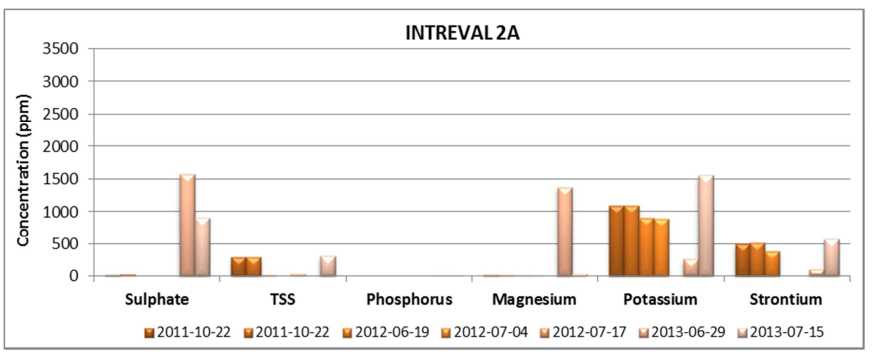



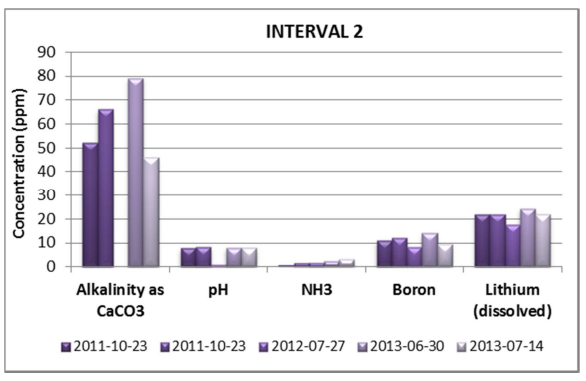



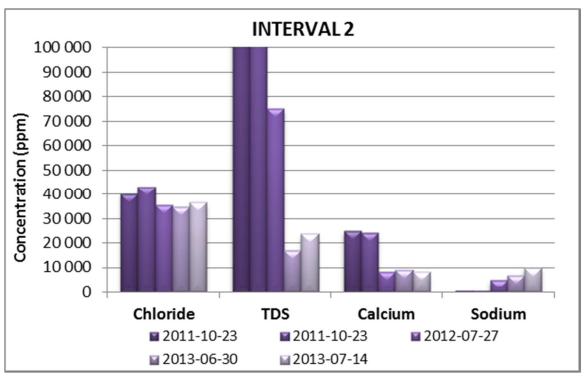



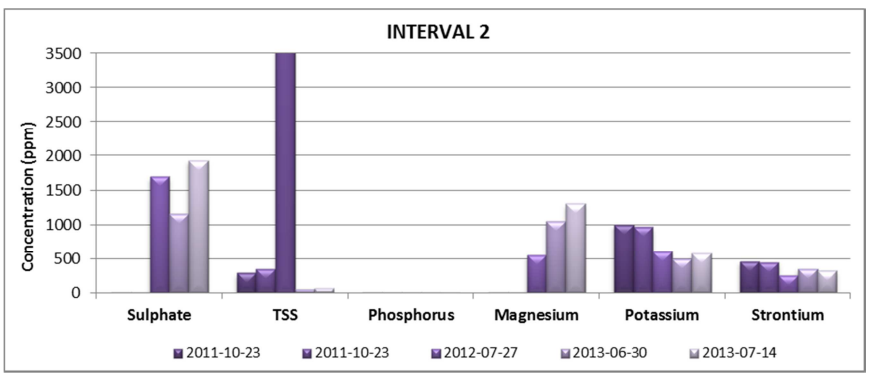




**Figure 6 : Variation of selected components for each interval vs time (Golder, 2013).**

# APPENDIX C :

Raw and corrected data

## Section C-1 : Re analysis and analysis errors

Some problems have been encountered during laboratory analysis. Lots of re analysis have been asked for calcium, ammonia, conductivity and TDS. For calcium, reanalysis could only be done on non-filtered samples, that is why dissolved calcium values in the following table are in red. Ammonia data in the table have been replaced by new analysis. In spite of reanalysis for conductivity and TDS, values cannot be used since the laboratory was using a probe with a too low detection limit for our samples.

## Section C-2 : Raw and corrected data from 2011 to 2013

| Parameter | Unit | Lake B5 | Lake B5 | BRINE | BRINE -1 | B - 2 | BRINE + DYE | BRINE + DYE-1 | B + D - 2 | Average Brine | Glycol | INT-5A | INT-5A corrected |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011-08-28 | 2011-09-03 | 2011-08-28 | 2011-09-03 | 2011-09-03 | 2011-08-28 | 2011-09-03 | 2011-09-03 | Moyenne | 2013-07-15 | 2013-07-15 | 2013-07-15 |
| **Numéro de projet** | | | | | | | | | | | | C-134141 | |
| **Depth of Interval** | mbgs | | | surface | | | | | | | | | |
| **Dye Concentration** | | | | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | | Not applicable | | | | | | | | | | |
| Average Dye Concentration for General Samples | ppb | | Not applicable | | | | | | | | | 13.4 | |
| Average Dye Concentration for Dissovled Metals Samples | ppb | | Not applicable | | | | | | | | | | |
| Average Dye Concentration | ppb | | | 0 | 0 | 0 | 500 | 500 | 500 | 500 | | | |
| **General Chemistry** | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 34 | | 71 | | 53 | 57 | | 48 | 57.25 | 100 | 46 | 45.73 |
| Chloride | mg/l | 67 | | 56 000 | | 43 000 | 46 000 | | 41 000 | 46 500 | 5 330 | 37902 | |
| Conductivity (lab) | uS/cm | 306 | | 89 700 | | 73 800 | 81 000 | | 73 900 | 79 600 | 2 620 | 26530 | 25277.11 |
| Fluoride | mg/l | 0.04 | | 0.04 | | 0.03 | 0.04 | | 0.03 | 0.035 | 0.07 | 0.11 | |
| Nitrate as N | mg/l | <0.1 | | <0.1 | | <0.1 | <1 | | <1 | <1 | 0.03 | 0.12 | |
| Nitrate + Nitrite | mg/l | <0.1 | | <0.1 | | <0.1 | <1 | | <1 | <1 | 0.14 | 0.15 | |
| Nitrite as N | mg/l | <0.01 | | <0.01 | | <0.01 | <0.1 | | <0.1 | <0.1 | 0.11 | 0.03 | |
| pH (lab) | mg/l | 7.95 | | 9.16 | | 8.8 | 8.72 | | 8.64 | 8.83 | 7.15 | 6.58 | 6.53 |
| Sulphate | mg/l | 4 | | 9 | | 7 | 15 | | 12 | 10.75 | 44 | 3766 | 3854.65 |
| Total Dissolved Solids | mg/l | 236 | | 95 000 | | 77 000 | 99 200 | | 78 300 | 87 375 | 1 746 | 23246 | 21732.03 |
| Total Suspended Solids | mg/l | <10 | | 340 | | 290 | 410 | | 270 | 327.5 | | 31 | |
| Total Ammonia-N | mg/l | <0.05 | | 2.9 | | 1.6 | 4.3 | | 1.6 | 2.6 | 0.51 | 4.9 | 4.95 |
| Total Phosphorus | mg/l | 0.02 | | <10 | | <1 | <1 | | <1 | 0 | 4.9 | 0.05 | 0.05 |
| Total Organic Carbon (TOC) | | | | | | | | | | | 26000 | 370 | |
| **Metals** | | | | | | | | | | | | | |
| Total Aluminum (Al) | mg/l | <0.1 | | <10 | | <10 | <10 | | <10 | <10 | 0.065 | <0.006 | |
| Total Antimony (Sb) | mg/l | <0.2 | | <20 | | <20 | <20 | | <20 | <20 | 0.0045 | 0.0007 | |
| Total Arsenic (As) | mg/l | <0.2 | | <20 | | <20 | <20 | | <20 | <20 | 0.1317 | 0.294 | |
| Total Barium (Ba) | mg/l | 0.02 | | <2 | | <2 | <2 | | <2 | <2 | 0.057 | 0.0318 | |
| Total Beryllium (Be) | mg/l | <0.005 | | <0.5 | | <0.5 | <0.5 | | <0.5 | <0.5 | <0.0005 | <0.0005 | |
| Total Bismuth (Bi) | mg/l | <0.2 | | <20 | | <20 | <20 | | <20 | <20 | <0.0005 | <0.0005 | |
| Total Boron (B) | mg/l | 0.02 | | 9 | | 6 | 9 | | 6 | 7.5 | 1.3 | 1.4 | 1.26 |
| Total Bromide (Br) | | | | | | | | | | | | 156 | 159.68 |
| Total Cadmium (Cd) | mg/l | <0.005 | | <0.5 | | <0.5 | <0.5 | | <0.5 | <0.5 | 0.00032 | 0.00004 | |
| Total Calcium (Ca) | mg/l | 47 | | 31000 | | 24 000 | 31 000 | | 24 000 | 27 500 | 1 631 | 2599 | 2011.13 |
| Total Chromium (Cr) | mg/l | <0.01 | | <1 | | <1 | <1 | | <1 | <1 | 1.799 | 0.0023 | |
| Total Cobalt (Co) | mg/l | <0.02 | | <2 | | <2 | <2 | | <2 | <2 | 0.0078 | 0.0065 | |
| Total Copper (Cu) | mg/l | <0.02 | | <2 | | <2 | <2 | | <2 | <2 | 0.0482 | 0.3362 | |
| Total Iron (Fe) | mg/l | 0.07 | | <2 | | <2 | <2 | | <2 | <2 | 1.8 | 9.4 | |
| Total Lead (Pb) | mg/l | <0.05 | | <5 | | <5 | <5 | | <5 | <5 | 0.1081 | 0.0031 | |
| Total Lithium (Li) | mg/l | | | 7 | | <5 | 8 | | <5 | 7.5 | 2.76 | 3.01 | 2.90 |
| Total Magnesium (Mg) | mg/l | 2.7 | | <1 | | <1 | <1 | | <1 | <1 | 21.9 | 1411 | |
| Total Manganese (Mn) | mg/l | <0.01 | | <2 | | <2 | <2 | | <2 | <2 | 0.098 | 0.7188 | |
| Total Mercury (Hg) | | | <0.1 | | | | | | | | <0.00001 | 0.0001 | |
| Total Molybdenum (Mo) | mg/l | <0.02 | | <5 | | <5 | <5 | | <5 | <5 | 0.0042 | 0.0041 | |
| Total Nickel (Ni) | mg/l | <0.05 | | <10 | | <10 | <10 | | <10 | <10 | 0.322 | 0.1657 | |
| Total Phosphorus (P) | | <0.1 | | | | | | | | | | 0.05 | |
| Total Potassium (K) | mg/l | 2 | | 1200 | | 890 | 1200 | | 920 | 1 052.5 | 81.0 | 336 | 319.08 |
| Total Selenium (Se) | mg/l | <0.2 | | <20 | | <20 | <20 | | <20 | <20 | 0.406 | 0.964 | |
| Total Silicon (Si) | mg/l | 0.4 | | <20 | | <20 | <20 | | <20 | <20 | 129 | 1.4 | |
| Total Silver (Ag) | mg/l | <0.01 | | <1 | | <1 | <1 | | <1 | <1 | <0.0002 | <0.0002 | |
| Total Sodium (Na) | mg/l | 5 | | 700 | | 600 | 620 | | 610 | 632.5 | 189 | 12489 | 12768.91 |
| Total Strontium (Sr) | mg/l | 0.48 | | 480 | | 360 | 460 | | 370 | 417.5 | 31.53 | 73.67 | 65.55 |
| Total Sulphur (S) | mg/l | 1.4 | | <50 | | <50 | <50 | | <50 | <50 | | 0.28 | |
| Total Tellurium (Te) | mg/l | | | - | | - | - | | - | - | 0.0029 | 0.0047 | |
| Total Thallium (Tl) | mg/l | | | - | | - | - | | - | - | <.005 | <0.005 | |
| Total Tin (Sn) | mg/l | <0.2 | | <20 | | <20 | <20 | | <20 | <20 | 0.012 | <0.001 | |
| Total Titanium (Ti) | mg/l | <0.01 | | <1 | | <1 | <1 | | <1 | <1 | 0.95 | 1.2 | |
| Total Tungsten (W) | mg/l | | | - | | - | - | | - | - | <0.005 | 0.014 | |
| Total Uranium (U) | mg/l | | | - | | - | - | | - | - | | | |
| Total Vanadium (V) | mg/l | <0.01 | | <1 | | <1 | <1 | | <1 | <1 | 0.4984 | <0.0005 | |
| Total Zinc (Zn) | mg/l | <0.01 | | <1 | | <1 | <1 | | <1 | <1 | 265 | 0.353 | |
| Total Zirconium (Zr) | mg/l | | | - | | - | - | | - | - | | | |
| | | | | | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | | | - | - | - | - | - | - | - | <0.0001 | 0.0001 | |
| Dissolved Aluminum (Al) | mg/l | | <0.005 | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | <0.006 | <0.006 | |
| Dissolved Antimony (Sb) | mg/l | | <0.0005 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.0001 | <0.0001 | |
| Dissolved Arsenic (As) | mg/l | | <0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | 0.1077 | 0.2514 | |
| Dissolved Barium (Ba) | mg/l | | 0.013 | - | 0.1 | 0.1 | - | 0.1 | 0.1 | 0.1 | 0.0576 | 0.0328 | |
| Dissolved Beryllium (Be) | mg/l | | <0.0005 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.0005 | <0.0005 | |
| Dissolved Bismuth (Bi) | mg/l | | <0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.0005 | <0.0005 | |
| Dissolved Boron (B) | mg/l | | <0.01 | - | 6.2 | 6.5 | - | 6.1 | 6.2 | 6.25 | 1.2 | 0.96 | 0.84 |
| Dissolved Cadmium (Cd) | mg/l | | <0.0001 | - | <0.005 | <0.005 | - | <0.005 | <0.005 | <0.005 | 0.00015 | 0.00013 | |
| Dissolved Calcium (Ca) | mg/l | | 16 | - | 22 000 | 22 000 | - | 21 000 | 21 000 | 21 500 | 1 636 | 1959 | 1497.67 |
| Dissolved Chromium (Cr) | mg/l | | <0.005 | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | 1.715 | 0.0027 | |
| Dissolved Cobalt (Co) | mg/l | | <0.0005 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | | | |
| Dissolved Copper (Cu) | mg/l | | 0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | 0.0069 | 0.3103 | |
| Dissolved Iron (Fe) | mg/l | | <0.1 | - | <5 | <5 | - | <5 | <5 | <5 | 0.04 | 0.04 | |
| Dissolved Lead (Pb) | mg/l | | <0.0005 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | <0.0003 | <0.0003 | |
| Dissolved Lithium (Li) | mg/l | | <0.005 | - | 21 | 22 | - | 21 | 21 | 21.25 | 1.61 | 1.82 | 1.36 |
| Dissolved Magnesium (Mg) | mg/l | | 1.8 | - | 6 | 4 | - | 4 | 4 | 4.5 | 23.3 | 1305 | 1335.70 |
| Dissolved Manganese (Mn) | mg/l | | 0.002 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | 0.0369 | 0.7137 | |
| Dissolved Molybdenum (Mo) | mg/l | | <0.0005 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | 0.0016 | 0.0025 | |
| Dissolved Nickel (Ni) | mg/l | | <0.001 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | 0.2367 | 0.128 | |
| Dissolved Phosphorus (P) | mg/l | | <0.1 | - | <5 | <5 | - | <5 | <5 | <5 | <0.01 | <0.01 | |
| Dissolved Potassium (K) | mg/l | | 0.9 | - | 820 | 810 | - | 800 | 790 | 805 | 82.8 | 314 | 302.41 |
| Dissolved Selenium (Se) | mg/l | | <0.002 | - | <0.002 | <0.002 | - | <0.002 | <0.002 | <0.002 | 0.392 | 0.828 | |
| Dissolved Silicon (Si) | mg/l | | 0.11 | - | <3 | <3 | - | <3 | <3 | <3 | 120 | 1 | |
| Dissolved Silver (Ag) | mg/l | | <0.0001 | - | <0.005 | <0.005 | - | <0.005 | <0.005 | <0.005 | <0.0002 | <0.0002 | |
| Dissolved Sodium (Na) | mg/l | | 3.3 | - | 490 | 510 | - | 490 | 500 | 497.5 | 209 | 12011 | 12282.81 |
| Dissolved Strontium (Sr) | mg/l | | 0.099 | - | 360 | 350 | - | 350 | 350 | 352.5 | 35.03 | 63.78 | 56.96 |
| Dissolved Tellurium (Te) | mg/l | | <0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.0005 | <0.0005 | |
| Dissolved Thallium (Tl) | mg/l | | <0.00005 | - | <0.003 | <0.003 | - | <0.003 | <0.003 | <0.003 | <0.005 | <0.005 | |
| Dissolved Tin (Sn) | mg/l | | <0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | 0.002 | <0.001 | |
| Dissolved Titanium (Ti) | mg/l | | <0.005 | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | 0.52 | 1.2 | |
| Dissolved Tungsten (W) | mg/l | | <0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.005 | <0.005 | |
| Dissolved Uranium (U) | mg/l | | <0.0001 | - | <0.005 | <0.005 | - | <0.005 | <0.005 | <0.005 | | | |
| Dissolved Vanadium (V) | mg/l | | <0.0005 | - | 0.08 | 0.08 | - | 0.04 | 0.04 | 0.06 | 0.4762 | <0.0005 | |
| Dissolved Zinc (Zn) | mg/l | | 0.012 | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | 1.24 | 0.208 | |
| Dissolved Zirconium (Zr) | mg/l | | <0.001 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | | | |

# Meliadine – Westbay

## 2013 Sampling Campaign

| Parameter | Unit | PORT 5-1 | PORT 5-2 | I5-1 | I5-2 | I5 corrected | PORT 5-1 | PORT 5-2 | PORT 5 corrected with 2011 data | PORT 5 corrected with 500 ppb in the brine | PORT 5 corrected with 2012 data | INT-5 | INT-5 | INT-5 corrected |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011-10-06 | 2011-10-06 | 2011-10-13 | 2011-10-13 | 2011-10-13 | 2012-06-25 | 2012-06-25 | 2012-06-25 | 2012-06-25 | 2012-06-25 | 2013-06-29 | 2013-07-14 | 2013-07-14 |
| **Numéro de projet** | | | | | | | | | | | | V-27843 | C-134140 | |
| **Depth of Interval** | mbgs | 460.3-448.5 | | | | | | | | | | | | |
| **Dye Concentration** | | | | | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | 581 | | | | | | | | | | | | |
| Average Dye Concentration for General Samples | ppb | 66 | 66 | 65 | 65 | | | | | | 22 | | 26.7 | |
| Average Dye Concentration for Dissovled Metals Samples | ppb | 80 | 80 | 54 | 54 | | | | | | 22 | | 26.7 | |
| Average Dye Concentration | ppb | Not Applicable | | | | | | | | | | | | |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 43 | 44 | 49 | 51 | 49.09 | 19.2 | 19 | 14.29 | 13.40 | 17.60 | 51 | 36 | 34.98 |
| Chloride | mg/l | 35 000 | 33 000 | 34 000 | 33 000 | 31862.40 | 34 100 | 35 200 | 33157.27 | 32879.31 | 34183.63 | 32728 | 35203 | 34658.84 |
| Conductivity (lab) | uS/cm | 80 100 | 80 500 | 79 000 | 79 000 | 78924.42 | 65 000 | 68 700 | 65243.90 | 64944.83 | 66348.21 | 26700 | 29350 | |
| Fluoride | mg/l | <0.1 | <0.1 | <2.5 | <0.1 | | <0.75 | <0.75 | | | | | 0.13 | 0.134576 |
| Nitrate as N | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.5 | <0.5 | | | | <0.01 | 0.01 | |
| Nitrate + Nitrite | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.51 | <0.51 | | | | 0.02 | 0.03 | |
| Nitrite as N | mg/l | <0.1 | <0.1 | <0.01 | <0.1 | | <0.1 | <0.1 | | | | 0.02 | 0.02 | |
| pH (lab) | mg/l | 6.88 | 6.89 | 6.98 | 6.97 | 6.74 | 6.62 | 6.63 | 6.35 | 6.30 | 6.54 | 6.79 | 6.48 | 6.37 |
| Sulphate | mg/l | 2 500 | 2 800 | 2 900 | 3 100 | 3376.55 | 3 260 | 3 360 | 3725.60 | 3802.99 | 3439.85 | 2338 | 3107 | 3256.14 |
| Total Dissolved Solids | mg/l | 61 600 | 64 900 | 63 900 | 63 800 | 60886.58 | 72 300 | 74 000 | 71358.09 | 71024.43 | 72590.16 | 17800 | 19566 | 16299.72 |
| Total Suspended Solids | mg/l | 280 | 250 | 110 | 120 | | 21.4 | 28.4 | | | | 74 | 26 | |
| Total Ammonia-N | mg/l | 3.9 | 4 | 4 | 4 | 4.18 | 3.82 | 3.82 | 3.97 | 4.00 | 3.87 | 3.5 | 4.7 | 4.80 |
| Total Phosphorus | mg/l | 0.2 | 0.3 | 0.035 | 0.016 | 0.03 | 0.0181 | 0.027 | 0.03 | 0.03 | 0.02 | 0.04 | <0.01 | |
| Total Organic Carbon (TOC) | | | | | | | | | | | | 13161 | 12 | 12.578026 |
| **Metals** | | | | | | | | | | | | | | |
| Total Aluminum (Al) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | <0.025 | <0.025 | | | | <0.006 | <0.006 | |
| Total Antimony (Sb) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.0019 | 0.0018 | | | | <0.0001 | 0.002 | |
| Total Arsenic (As) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.020 | <0.020 | | | | 0.1902 | 0.3137 | |
| Total Barium (Ba) | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | | 0.0993 | 0.0957 | | | | 0.0997 | 0.0894 | |
| Total Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | <0.0010 | <0.0010 | | | | <0.0005 | <0.0005 | |
| Total Bismuth (Bi) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0010 | <0.0010 | | | | <0.0005 | <0.0005 | |
| Total Boron (B) | mg/l | 6.3 | 6 | 4.3 | 4.2 | 3.84 | 4.94 | 5.01 | 4.66 | 4.60 | 4.88 | 5 | 6.1 | 6.03 |
| Total Bromide (Br) | | | | | | | | | | | | | 154 | 161.42 |
| Total Cadmium (Cd) | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | | 0.00032 | 0.00049 | | | | 0.00092 | 0.00005 | |
| Total Calcium (Ca) | mg/l | 3 900 | 3 900 | 3 000 | 3 000 | -86.24 | 3 160 | 3 110 | 65.77 | -505.75 | 2176.09 | 3258 | 3084 | 1907.91 |
| Total Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | 0.002 | 0.00433 | | | | 0.1449 | 0.0184 | |
| Total Cobalt (Co) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.00108 | 0.00098 | | | | 0.0121 | 0.0084 | |
| Total Copper (Cu) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.0118 | 0.0092 | | | | 0.2127 | 0.3054 | |
| Total Iron (Fe) | mg/l | <10 | <10 | <10 | <10 | | 10.1 | 9.62 | | | | 11 | 10.3 | |
| Total Lead (Pb) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.00155 | 0.00149 | | | | 0.0185 | <0.0003 | |
| Total Lithium (Li) | mg/l | 7.1 | 6.6 | 4.1 | 4.2 | 3.73 | 5.18 | 4.92 | 4.74 | 4.68 | 4.95 | 4.76 | 4.95 | 4.83 |
| Total Magnesium (Mg) | mg/l | 1 900 | 1 900 | 1 900 | 1 900 | | 2 140 | 2 130 | | | | 2562 | 1366 | |
| Total Manganese (Mn) | mg/l | 0.65 | 0.66 | 0.65 | 0.65 | | 0.809 | 0.785 | | | | 0.9454 | 0.6961 | |
| Total Mercury (Hg) | | | | | | | | | | | | 0.00001 | 0.0002 | 0.0002096 |
| Total Molybdenum (Mo) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.008 | 0.0082 | | | | 0.0053 | 0.0074 | |
| Total Nickel (Ni) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.008 | 0.0095 | | | | 0.1725 | 0.2161 | |
| Total Phosphorus (P) | | | | | | | | | | | | | <0.01 | |
| Total Potassium (K) | mg/l | 420 | 400 | 400 | 380 | 306.55 | 407 | 403 | 323.44 | 308.25 | 379.52 | 393 | 362 | 328.74 |
| Total Selenium (Se) | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | | <0.0010 | <0.0010 | | | | 0.642 | 1 | |
| Total Silicon (Si) | mg/l | <5 | <5 | <5 | <5 | | 1.3 | 1.3 | | | | 1.6 | 1.8 | |
| Total Silver (Ag) | mg/l | <10 | <10 | <0.01 | <0.01 | | <0.00020 | <0.00020 | | | | <0.0002 | <0.0002 | |
| Total Sodium (Na) | mg/l | 15 000 | 15 000 | 16 000 | 15 000 | 17372.84 | 16 000 | 15 900 | 17879.53 | 18238.82 | 16552.84 | 14077 | 12046 | 12595.78 |
| Total Strontium (Sr) | mg/l | 140 | 140 | 96 | 94 | 54.38 | 93.7 | 92.4 | 52.18 | 44.57 | 80.28 | 95.62 | 103 | 87.85 |
| Total Sulphur (S) | mg/l | - | - | - | - | | - | - | | | | | 0.23 | |
| Total Tellurium (Te) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0010 | <0.0010 | | | | <0.0005 | 0.008 | |
| Total Thallium (Tl) | mg/l | 0.01 | 0.007 | 0.007 | 0.008 | | 0.00105 | 0.00099 | | | | | <0.005 | |
| Total Tin (Sn) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0020 | <0.0020 | | | | <0.001 | <0.001 | |
| Total Titanium (Ti) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | <0.010 | <0.010 | | | | 3.4 | 1.2 | |
| Total Tungsten (W) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.0036 | 0.0036 | | | | | 0.025 | |
| Total Uranium (U) | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | | 0.00098 | 0.00081 | | | | | | |
| Total Vanadium (V) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | <0.0010 | <0.0010 | | | | <0.0005 | <0.0005 | |
| Total Zinc (Zn) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | 0.969 | 0.928 | | | | 1.06 | 0.311 | |
| Total Zirconium (Zr) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.0029 | 0.0025 | | | | | <0.5 | |
| | | | | | | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | <0.000010 | <0.000010 | | | | <0.0001 | 0.0001 | |
| Dissolved Aluminum (Al) | mg/l | <0.5 | <0.5 | 0.96 | <0.5 | | <0.010 | <0.010 | | | | <0.006 | <0.006 | |
| Dissolved Antimony (Sb) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.0021 | 0.0018 | | | | <0.0001 | <0.0001 | |
| Dissolved Arsenic (As) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.020 | <0.010 | | | | 0.1716 | 0.2705 | |
| Dissolved Barium (Ba) | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | | 0.104 | 0.0986 | 0.1014332 | 0.1014574 | 0.1013512 | 0.0984 | 0.0943 | 0.0940254 |
| Dissolved Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | <0.0010 | <0.0010 | | | | <0.0005 | <0.0005 | |
| Dissolved Bismuth (Bi) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0010 | <0.0010 | | | | | <0.0005 | |
| Dissolved Boron (B) | mg/l | 6.1 | 6.4 | 4.6 | 4.1 | 4.16 | 5.32 | 5.22 | 5.17 | 5.15 | 5.23 | 4.9 | 1.8 | 1.59 |
| Dissolved Cadmium (Cd) | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | | 0.00038 | 0.0004 | | | | 0.00079 | 0.00014 | |
| Dissolved Calcium (Ca) | mg/l | 4 000 | 3 900 | 2 900 | 2 800 | 938.99 | 3 090 | 3 120 | 1220.12 | 877.80 | 2381.05 | 3874 | 2614 | 1704.28 |
| Dissolved Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | 0.00072 | 0.0006 | | | | 0.0768 | 0.0166 | |
| Dissolved Cobalt (Co) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.00076 | 0.00074 | | | | 0.0113 | | |
| Dissolved Copper (Cu) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.0054 | 0.0039 | | | | 0.2112 | 0.2735 | |
| Dissolved Iron (Fe) | mg/l | <10 | <10 | <10 | <10 | | 8.68 | 8.36 | | | | 0.15 | 0.37 | |
| Dissolved Lead (Pb) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | <0.00060 | <0.00060 | | | | <0.0003 | <0.0003 | |
| Dissolved Lithium (Li) | mg/l | 6.4 | 6.5 | 4.1 | 3.9 | 2.23 | 5.23 | 5.13 | 3.53 | 3.23 | 4.55 | 4.97 | 3.1 | 2.23 |
| Dissolved Magnesium (Mg) | mg/l | 2 000 | 2 000 | 2 000 | 1 900 | 2149.35 | 2 090 | 2 140 | 2331.26 | 2370.53 | 2198.06 | 2468 | 1295 | 1357.16 |
| Dissolved Manganese (Mn) | mg/l | 0.65 | 0.66 | 0.74 | 0.6 | | 0.827 | 0.806 | | | | 0.9199 | 0.6884 | |
| Dissolved Molybdenum (Mo) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | 0.0078 | 0.0078 | | | | 0.005 | 0.0036 | |
| Dissolved Nickel (Ni) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.0055 | 0.0058 | | | | 0.1712 | 0.1644 | |
| Dissolved Phosphorus (P) | mg/l | <10 | <10 | <10 | <10 | | <2.0 | <2.0 | | | | | <0.01 | |
| Dissolved Potassium (K) | mg/l | 420 | 420 | 370 | 370 | 325.43 | 395 | 416 | 364.56 | 357.13 | 389.78 | 362 | 346 | 323.89 |
| Dissolved Selenium (Se) | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | | <0.0010 | <0.0010 | | | | 0.615 | 0.881 | |
| Dissolved Silicon (Si) | mg/l | 13 | 6.3 | 6.3 | <5 | | 1.3 | 1.3 | | | | 5.2 | 1.5 | |
| Dissolved Silver (Ag) | mg/l | <0.01 | <10 | <10 | <10 | | <0.00020 | <0.00020 | | | | <0.0002 | <0.0002 | |
| Dissolved Sodium (Na) | mg/l | 15 000 | 15 000 | 15 000 | 15 000 | 16486.02 | 15 600 | 16 200 | 17478.24 | 17764.88 | 19376.21 | 11889 | 11983 | 12536.24 |
| Dissolved Strontium (Sr) | mg/l | 130 | 140 | 91 | 89 | 63.10 | 90.9 | 93 | 65.25 | 60.40 | 33.15 | 100 | 89.44 | 76.77 |
| Dissolved Tellurium (Te) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0010 | <0.0010 | | | | <0.0005 | <0.0005 | |
| Dissolved Thallium (Tl) | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | | 0.00096 | 0.00109 | | | | | <0.005 | |
| Dissolved Tin (Sn) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0020 | <0.0020 | | | | <0.001 | <0.001 | |
| Dissolved Titanium (Ti) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | <0.010 | <0.010 | | | | 1.6 | 1.3 | |
| Dissolved Tungsten (W) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | 0.0037 | 0.0039 | | | | | <0.005 | |
| Dissolved Uranium (U) | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | | 0.00075 | 0.00078 | | | | | | |
| Dissolved Vanadium (V) | mg/l | <0.05 | <0.05 | <0.05 | <0.05 | | <0.0010 | <0.0010 | | | | <0.0005 | <0.0005 | |
| Dissolved Zinc (Zn) | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | | 0.694 | 0.661 | | | | 1.35 | 0.229 | |
| Dissolved Zirconium (Zr) | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | | <0.0010 | <0.0010 | | | | | <1 | |

| Parameter | Unit | INT-4A | I4-1 | I4-2 | #4 | INT-4 | INT-4 corrected | I3-1 | I3-2 | #3 | INT-3 | INT-3 | INT-3 | INT-3 corrected |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013-07-15 | 2011-10-24 | 2011-10-24 | 2012-07-28 | 2013-07-15 | 2013-07-15 | 2011-10-24 | 2011-10-24 | 2012-07-27 | 2013-07-01 | 2013-07-07 | 2013-07-14 | 2013-07-14 |
| **Numéro de projet** | | C-134139 | | | | C-134138 | | | | | V-27841 | V-27840 | C-134136 | |
| **Depth of Interval** | mbgs | | 530.4-518.7 | | | | | 585.1-573.7 | | | | | | |
| **Dye Concentration** | | | | | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | | 449 | | | | | 486 | | | | | | |
| Average Dye Concentration for General Samples | ppb | | 449 | 398 | | 293 | | 486 | 431 | | | | 32.5 | |
| Average Dye Concentration for Dissovled Metals Samples | ppb | | 411 | 398 | | | | 466 | 466 | | | | 32.5 | |
| Average Dye Concentration | ppb | | Not Applicable | | | | | Not Applicable | | | | | | |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 35 | 83 | 84 | <2.0 | 52 | 42.14 | 76 | 74 | <2.0 | 47 | 47 | 27 | 24.83 |
| Chloride | mg/l | 35467 | 53 000 | 53 000 | 49 500 | 50 636 | 58404.26 | 51 000 | 51 000 | <2.0 | 34 471 | 34 028 | 34319 | 33446.05 |
| Conductivity (lab) | uS/cm | 29220 | 104 000 | 103 000 | 130 000 | 33 370 | | 102 000 | 103 000 | 103 000 | 29 620 | 29 590 | 36290 | |
| Fluoride | mg/l | 0.15 | <0.1 | <0.1 | <2.0 | 0.09 | 0.1933013 | <0.1 | <0.1 | | | | 0.15 | 0.1582415 |
| Nitrate as N | mg/l | 0.03 | <0.1 | <0.1 | <0.50 | 0.85 | | <0.1 | <0.1 | <0.10 | <0.01 | <0.01 | 0.37 | |
| Nitrate + Nitrite | mg/l | 0.06 | <0.1 | <0.1 | - | 0.89 | | <0.1 | <0.1 | <0.50 | 0.01 | 0.01 | 0.40 | |
| Nitrite as N | mg/l | 0.03 | <0.1 | <0.1 | <0.10 | 0.04 | | <0.1 | <0.1 | 0.037 | 0.01 | 0.01 | 0.03 | |
| pH (lab) | mg/l | 6.83 | 8.58 | 8.64 | 1.08 | 8.03 | 6.53 | 8.3 | 8.55 | 1.23 | 6.52 | 6.57 | 6.41 | |
| Sulphate | mg/l | 3428 | 26 | 47 | 5500 | 388 | 1096.55 | 16 | 16 | - | 2852 | 2439 | 3261 | 3493.93 |
| Total Dissolved Solids | mg/l | 19480 | 77 000 | 80 600 | 95 000 | 22 246 | | 91 800 | 72 300 | 61 800 | 19 080 | 19 726 | 24 193 | 19665.07 |
| Total Suspended Solids | mg/l | 35 | 440 | 270 | 7400 | 17 | | 280 | 300 | 1670 | 43 | 19 | 23 | |
| Total Ammonia-N | mg/l | 4.7 | 2.4 | 2.1 | 1.23 | 11.5 | 28.22 | 2.2 | 2.2 | 3.57 | 4 | 4.3 | 4.6 | 4.74 |
| Total Phosphorus | mg/l | <0.01 | <0.4 | <0.4 | <0.020 | 0.49 | 1.41 | <0.4 | <0.4 | 6060 | 0.04 | 0.03 | 0.02 | 0.02 |
| Total Organic Carbon (TOC) | | 220 | | | | 3100 | 3249.3235 | | | | 1100 | 502 | 240 | 257.19956 |
| **Metals** | | | | | | | | | | | | | | |
| Total Aluminum (Al) | mg/l | 0.041 | <0.5 | 0.7 | <0.60 | 0.006 | | 0.6 | 0.7 | <0.30 | <0.006 | <0.006 | <0.006 | |
| Total Antimony (Sb) | mg/l | 0.0005 | <0.05 | <0.05 | <0.020 | 0.0031 | | <0.05 | <0.05 | <0.010 | <0.0001 | <0.0001 | 0.0005 | |
| Total Arsenic (As) | mg/l | 0.2851 | <0.1 | <0.1 | <0.020 | 1.143 | | <0.1 | <0.1 | <0.010 | 0.1773 | 0.1759 | 0.2301 | |
| Total Barium (Ba) | mg/l | 0.1069 | 0.8 | 0.7 | 0.696 | 0.5701 | | 0.6 | 0.6 | 0.168 | 0.1731 | 0.1359 | 0.1135 | |
| Total Beryllium (Be) | mg/l | <0.0005 | <0.05 | <0.05 | <0.020 | <0.0005 | | <0.05 | <0.05 | <0.010 | <0.0005 | <0.0005 | <0.0005 | |
| Total Bismuth (Bi) | mg/l | <0.0005 | 0.1 | <0.1 | <0.10 | <0.0005 | | <0.1 | <0.1 | <0.050 | <0.0005 | <0.0005 | <0.0005 | |
| Total Boron (B) | mg/l | 2 | 13 | 16 | 11.9 | 6 | 3.18 | 14 | 13 | 5.2 | 6.6 | 5.3 | 4.1 | 3.86 |
| Total Bromide (Br) | | 140 | | | | 594 | 1709.65 | | | | | | 181 | 193.97 |
| Total Cadmium (Cd) | mg/l | 0.00009 | <0.01 | <0.01 | <0.0020 | 0.00016 | | <0.01 | <0.01 | <0.0010 | 0.0002 | 0.00047 | 0.00015 | |
| Total Calcium (Ca) | mg/l | 2735 | 27 000 | 28 000 | 21 700 | 18071 | 361.40 | 30 000 | 28 000 | 2 110 | 3195 | 3 011 | 3 359 | 1628.94 |
| Total Chromium (Cr) | mg/l | 0.0062 | <0.5 | <0.5 | <0.020 | 0.0241 | | <0.5 | <0.5 | <0.010 | 0.0423 | 0.0416 | 0.0057 | |
| Total Cobalt (Co) | mg/l | 0.0084 | <0.05 | <0.05 | <0.020 | 0.0539 | | <0.05 | <0.05 | <0.010 | 0.0097 | 0.0084 | 0.0076 | |
| Total Copper (Cu) | mg/l | 0.3005 | <0.1 | <0.1 | <0.10 | 0.0533 | | <0.1 | <0.1 | <0.050 | 0.2034 | 0.2523 | 0.2299 | |
| Total Iron (Fe) | mg/l | 11.8 | <10 | 11 | <2.0 | 1 | | 11 | 10 | 4 | 5.2 | 5.1 | 9.1 | |
| Total Lead (Pb) | mg/l | <0.0003 | <0.05 | <0.05 | <0.010 | <0.0003 | | <0.05 | <0.05 | <0.0050 | <0.0003 | <0.0003 | <0.0003 | |
| Total Lithium (Li) | mg/l | 3.72 | 26 | 28 | 23.1 | 17.19 | 35.39 | 28 | 26 | 5.68 | 5.12 | 24.11 | 7.92 | 7.95 |
| Total Magnesium (Mg) | mg/l | 1570 | 27 | 57 | 163 | 187 | | 8 | 8 | 1860 | 2389 | 2583 | 2049 | |
| Total Manganese (Mn) | mg/l | 0.6621 | <0.2 | <0.2 | 0.158 | 0.1936 | | <0.2 | <0.2 | 0.695 | 0.9031 | 0.8851 | 0.854 | |
| Total Mercury (Hg) | | <0.00001 | | | <0.000050 | 0.00145 | 0.0041734 | - | - | <0.000050 | <0.00001 | 0.00007 | <0.00001 | |
| Total Molybdenum (Mo) | mg/l | 0.0042 | 0.09 | 0.09 | 0.073 | 0.0485 | | <0.05 | <0.05 | 0.0054 | 0.0086 | 0.0108 | 0.0039 | |
| Total Nickel (Ni) | mg/l | 0.2114 | <0.1 | <0.1 | <0.10 | 1.495 | | <0.1 | <0.1 | <0.050 | 0.1839 | 0.1603 | 0.17 | |
| Total Phosphorus (P) | | <0.01 | | | <60 | 0.49 | | - | - | <30 | | | 0.02 | 0.0214333 |
| Total Potassium (K) | mg/l | 275 | 1 100 | 1 100 | 1000 | 943 | 737.34 | 1 200 | 1 100 | 271 | 291 | 300 | 331 | 279.29 |
| Total Selenium (Se) | mg/l | 0.935 | <0.2 | <0.2 | <0.020 | 4.07 | | <0.2 | <0.2 | <0.010 | 0.606 | 0.638 | 0.737 | |
| Total Silicon (Si) | mg/l | 2 | <5 | <5 | <10 | 0.97 | | <5 | <5 | <5.0 | 1.9 | 2.1 | 2.2 | |
| Total Silver (Ag) | mg/l | <0.0002 | <0.01 | <0.01 | <0.0020 | <0.0002 | | <0.01 | <0.01 | <0.0010 | <0.0002 | <0.0002 | <0.0002 | |
| Total Sodium (Na) | mg/l | 14205 | 880 | 1100 | 2050 | 2965 | 7345.91 | 800 | 770 | 14200 | 14612 | 15340 | 17522 | 18732.38 |
| Total Strontium (Sr) | mg/l | 72.52 | 510 | 550 | 443 | 437 | 473.63 | 560 | 530 | 91.1 | 117 | 420 | 108 | 85.82 |
| Total Sulphur (S) | mg/l | 0.23 | - | - | - | 2.2 | | - | - | - | | | 0.35 | |
| Total Tellurium (Te) | mg/l | 0.003 | <0.1 | <0.1 | - | 0.0531 | | <0.1 | <0.1 | - | <0.0005 | <0.0005 | <0.0005 | |
| Total Thallium (Tl) | mg/l | <0.005 | 0.013 | 0.01 | 0.0028 | <0.005 | | 0.009 | 0.009 | 0.0019 | | 3.6 | <0.005 | |
| Total Tin (Sn) | mg/l | <0.001 | <0.1 | <0.1 | <0.020 | <0.001 | | <0.1 | <0.1 | <0.010 | <0.001 | <0.001 | <0.001 | |
| Total Titanium (Ti) | mg/l | 1.2 | <0.5 | <0.5 | <2.0 | 5.7 | | <0.5 | <0.5 | <1.0 | 1.9 | 3.6 | 1.2 | |
| Total Tungsten (W) | mg/l | 0.043 | <0.1 | <0.1 | - | 0.141 | | <0.1 | <0.1 | - | | | 0.038 | |
| Total Uranium (U) | mg/l | | <0.01 | <0.01 | <0.0020 | | | <0.01 | <0.01 | 0.0011 | | | | |
| Total Vanadium (V) | mg/l | <0.0005 | <0.05 | <0.05 | <0.20 | <0.0005 | | <0.05 | <0.05 | <0.10 | <0.0005 | <0.0005 | <0.0005 | |
| Total Zinc (Zn) | mg/l | 0.595 | <0.5 | <0.5 | 1.19 | 0.296 | | 0.7 | <0.5 | 1.47 | 0.504 | 0.817 | 0.364 | |
| Total Zirconium (Zr) | mg/l | <0.5 | <0.1 | <0.1 | - | <0.5 | | <0.1 | <0.1 | - | | | <0.5 | |
| | | | | | | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | 0.0001 | <0.0001 | <0.0001 | <0.000050 | 0.0015 | | <0.0001 | <0.0001 | <0.000050 | <0.0001 | <0.0001 | 0.0002 | |
| Dissolved Aluminum (Al) | mg/l | <0.006 | <0.5 | <0.5 | <0.20 | <0.006 | | <0.5 | <0.5 | <0.10 | <0.006 | <0.006 | <0.006 | |
| Dissolved Antimony (Sb) | mg/l | <0.0001 | 0.06 | <0.05 | <0.020 | <0.0001 | | <0.05 | <0.05 | <0.010 | <0.0001 | <0.0001 | 0.0001 | |
| Dissolved Arsenic (As) | mg/l | 0.2529 | <0.1 | <0.1 | <0.020 | 0.9649 | | <0.1 | <0.1 | <0.010 | 0.1605 | 0.1709 | 0.2275 | |
| Dissolved Barium (Ba) | mg/l | 0.1118 | 0.8 | 0.7 | 0.683 | 0.6188 | 1.5932128 | 0.6 | 0.6 | 0.171 | 0.1692 | 0.131 | 0.1219 | 0.1234695 |
| Dissolved Beryllium (Be) | mg/l | <0.0005 | <0.05 | <0.05 | <0.020 | <0.0005 | | <0.05 | <0.05 | <0.010 | <0.0005 | <0.0005 | <0.0005 | |
| Dissolved Bismuth (Bi) | mg/l | <0.0005 | <0.1 | <0.1 | <0.10 | <0.0005 | | <0.1 | <0.1 | <0.050 | <0.0005 | <0.0005 | <0.0005 | |
| Dissolved Boron (B) | mg/l | 1.5 | 14 | 16 | 11.5 | 5.8 | 4.95 | 13 | 13 | 5.3 | 5.9 | 4.90 | 3.6 | 3.41 |
| Dissolved Cadmium (Cd) | mg/l | 0.00011 | <0.01 | <0.01 | <0.0020 | 0.00032 | | <0.01 | <0.01 | <0.0010 | <0.00002 | <0.00002 | 0.00011 | |
| Dissolved Calcium (Ca) | mg/l | 2589 | 28000 | 29000 | 19900 | 17573 | 10197.29 | 29000 | 28000 | 2030 | 4290 | 3788 | 3609 | 2326.84 |
| Dissolved Chromium (Cr) | mg/l | 0.0033 | <0.5 | <0.5 | <0.020 | 0.0228 | | <0.5 | <0.5 | <0.010 | <0.0006 | <0.0006 | 0.0055 | |
| Dissolved Cobalt (Co) | mg/l | | <0.05 | <0.05 | <0.020 | | | <0.05 | <0.05 | <0.010 | 0.0095 | 0.0082 | | |
| Dissolved Copper (Cu) | mg/l | 0.2698 | <0.1 | <0.1 | <0.040 | 0.0486 | | <0.1 | <0.1 | 0.026 | 0.2009 | 0.1796 | 0.2097 | |
| Dissolved Iron (Fe) | mg/l | 0.06 | <10 | <10 | <2.0 | 0.4 | | <10 | <10 | 4.5 | 0.13 | 2.5 | 0.2 | |
| Dissolved Lead (Pb) | mg/l | <0.0003 | <0.05 | <0.05 | <0.010 | <0.0003 | | <0.05 | <0.05 | <0.0050 | <0.0003 | <0.0003 | <0.0003 | |
| Dissolved Lithium (Li) | mg/l | 2.42 | 26 | 29 | 22.4 | 32.74 | 54.32 | 27 | 27 | 5.82 | 6.68 | 4.89 | 7.62 | 6.64 |
| Dissolved Magnesium (Mg) | mg/l | 1453 | 30 | 38 | 155 | 186 | 526.89 | 8 | 8 | 1950 | 2343 | 2402 | 2202 | 2359.48 |
| Dissolved Manganese (Mn) | mg/l | 0.6379 | <0.2 | <0.2 | 0.16 | 0.1908 | | <0.2 | <0.2 | 0.717 | 0.8901 | 0.8687 | 0.727 | |
| Dissolved Molybdenum (Mo) | mg/l | 0.0031 | 0.13 | 0.09 | 0.07 | 0.0514 | | <0.05 | <0.05 | 0.0057 | 0.0022 | 0.0017 | 0.003 | |
| Dissolved Nickel (Ni) | mg/l | 0.1549 | <0.3 | <0.1 | <0.10 | 1.133 | | <0.1 | <0.1 | <0.050 | 0.1708 | 0.1454 | 0.0877 | |
| Dissolved Phosphorus (P) | mg/l | <0.01 | <10 | <10 | <60 | 0.46 | | <10 | <10 | <30 | | | <0.01 | |
| Dissolved Potassium (K) | mg/l | 258 | 1 100 | 1 200 | 966 | 939 | 1190.68 | 1 100 | 1 100 | 285 | 262 | 274 | 362 | 330.25 |
| Dissolved Selenium (Se) | mg/l | 0.816 | <0.02 | <0.2 | <0.020 | 3.45 | | <0.2 | <0.2 | <0.010 | 0.56 | 0.572 | 0.758 | |
| Dissolved Silicon (Si) | mg/l | 1.3 | <5 | <5 | <10 | 0.88 | | <5 | <5 | <5.0 | 1.8 | 2 | 2.3 | |
| Dissolved Silver (Ag) | mg/l | <0.0002 | <0.01 | <0.01 | <0.0020 | <0.0002 | | <0.01 | <0.01 | <0.0010 | <0.0002 | <0.0002 | <0.0002 | |
| Dissolved Sodium (Na) | mg/l | 13677 | 940 | 990 | 1970 | 3127 | 8065.74 | 730 | 750 | 14700 | 12737 | 14692 | 15766 | 16860.21 |
| Dissolved Strontium (Sr) | mg/l | 69.91 | 540 | 520 | 429 | 515 | 820.21 | 490 | 490 | 90.1 | 95.99 | 81.62 | 114 | 96.91 |
| Dissolved Tellurium (Te) | mg/l | <0.0005 | <0.1 | <0.1 | - | 0.021 | | <0.1 | <0.1 | - | <0.0005 | <0.0005 | <0.0005 | |
| Dissolved Thallium (Tl) | mg/l | <0.005 | 0.012 | 0.008 | 0.0028 | <0.005 | | 0.01 | 0.009 | 0.0019 | | | <0.005 | |
| Dissolved Tin (Sn) | mg/l | <0.001 | <0.1 | <0.1 | <0.020 | <0.001 | | <0.1 | <0.1 | <0.010 | <0.001 | <0.001 | <0.001 | |
| Dissolved Titanium (Ti) | mg/l | 1.2 | <0.5 | <0.5 | <2.0 | 6.1 | | <0.5 | <0.5 | <1.0 | 1.9 | 1.8 | 1.4 | |
| Dissolved Tungsten (W) | mg/l | 0.005 | <0.1 | <0.1 | - | <0.005 | | <0.1 | <0.1 | - | | | <0.005 | |
| Dissolved Uranium (U) | mg/l | | <0.01 | <0.01 | <0.0020 | | | <0.01 | <0.01 | 0.0011 | | | | |
| Dissolved Vanadium (V) | mg/l | <0.0005 | <0.05 | 0.09 | <0.20 | <0.0005 | | 0.08 | 0.08 | <0.10 | <0.0005 | <0.0005 | <0.0005 | |
| Dissolved Zinc (Zn) | mg/l | 0.436 | <0.5 | <0.5 | 1.14 | 0.208 | | <0.5 | <0.5 | 1.48 | 0.277 | 0.569 | 0.367 | |
| Dissolved Zirconium (Zr) | mg/l | <1 | <0.1 | <0.1 | - | <1 | | <0.1 | <0.1 | - | | | <1 | |

| Parameter | Unit | INT-3A | I2A-1 | I2A-2 | PORT-2A-1 | PORT-2A-1 | PORT-2A-1 | INT-2A | INT-2A | INT-2A corrected |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013-07-15 | 2011-10-22 | 2011-10-22 | 2012-06-19 | 2012-07-04 | 2012-07-17 | 2013-06-29 | 2013-07-15 | 2013-07-15 |
| **Numéro de projet** | | C-134137 | | | | | | V-27844 | C-134135 | |
| **Depth of Interval** | mbgs | | 623.6-614.2 | | | | | | | |
| **Dye Concentration** | | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | | 641 | | | | | | | |
| Average Dye Concentration for General Samples | ppb | | 534 | 567 | | | | | 376 | |
| Average Dye Concentration for Dissovled Metals Samples | ppb | | 482 | 482 | | | | | 376 | |
| Average Dye Concentration | ppb | | Not Applicable | | | | | | | |
| **General Chemistry** | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 26 | 69 | 72 | 17.5 | - | 18.8 | 67 | 66 | 78.42 |
| Chloride | mg/l | 32931 | 50 000 | 52 000 | 44 600 | 44 100 | 44 300 | 27196 | 47603 | 49168.01 |
| Conductivity (lab) | uS/cm | 34150 | 98 300 | 99 900 | 46 400 | - | 75 300 | 21720 | 29580 | |
| Fluoride | mg/l | 0.16 | <0.1 | <0.1 | <0.75 | - | <0.75 | | 0.06 | 0.0954717 |
| Nitrate as N | mg/l | 0.11 | <0.1 | <0.1 | <0.50 | - | <0.50 | <0.01 | 3.7 | |
| Nitrate + Nitrite | mg/l | 0.13 | <0.1 | <0.1 | - | - | | 0.02 | 3.8 | |
| Nitrite as N | mg/l | 0.02 | <0.1 | <0.1 | <0.10 | - | <0.10 | 0.02 | 0.05 | |
| pH (lab) | mg/l | 7.02 | 8.33 | 8.52 | 7.67 | - | 8.16 | 7.74 | 8.12 | |
| Sulphate | mg/l | 2818 | 26 | 28 | <50 | <50 | <50 | 1571 | 907 | 2178.66 |
| Total Dissolved Solids | mg/l | 22766 | 83 100 | 76 700 | 91 300 | - | 82 900 | 15626 | 24160 | -65533.74 |
| Total Suspended Solids | mg/l | 35 | 290 | 290 | 19.1 | - | 30 | | 311 | |
| Total Ammonia-N | mg/l | 4.2 | 2.1 | 1.7 | 0.798 | - | | 2.3 | 0.25 | -3.08 |
| Total Phosphorus | mg/l | <0.01 | <0.4 | <0.4 | <0.20 | - | <0.20 | 0.27 | 0.76 | 1.84 |
| Total Organic Carbon (TOC) | | 900 | | | | | | | 26000 | 114872.73 |
| **Metals** | | | | | | | | | | |
| Total Aluminum (Al) | mg/l | 0.023 | <0.5 | 1.4 | 0.177 | - | - | 0.126 | 0.895 | |
| Total Antimony (Sb) | mg/l | 0.0009 | <0.05 | <0.05 | <0.0010 | - | - | 0.0016 | 0.0059 | |
| Total Arsenic (As) | mg/l | 0.2657 | <0.1 | <0.1 | <0.030 | - | - | 0.2098 | 1.007 | |
| Total Barium (Ba) | mg/l | 0.209 | 0.7 | 0.6 | 0.53 | - | - | 0.1889 | 0.5464 | |
| Total Beryllium (Be) | mg/l | <0.0005 | <0.05 | <0.05 | <0.0010 | - | - | <0.0005 | <0.0005 | |
| Total Bismuth (Bi) | mg/l | <0.0005 | <0.1 | <0.1 | <0.0010 | - | - | <0.0005 | <0.0005 | |
| Total Boron (B) | mg/l | 3.8 | 11 | 12 | 10.3 | - | - | 5.8 | 11 | 15.97 |
| Total Bromide (Br) | | 176 | | | | | | | 699 | 1690.79 |
| Total Cadmium (Cd) | mg/l | 0.00005 | <0.01 | <0.01 | 0.00018 | - | - | 0.0032 | 0.00029 | |
| Total Calcium (Ca) | mg/l | 3702 | 27 000 | 28 000 | 23 200 | 22 400 | - | 3357 | 20915 | 11571.75 |
| Total Chromium (Cr) | mg/l | 0.0076 | <0.5 | <0.5 | 0.0052 | - | - | 0.2553 | 0.209 | |
| Total Cobalt (Co) | mg/l | 0.0101 | <0.05 | <0.05 | 0.00053 | - | - | 0.0085 | 0.0511 | |
| Total Copper (Cu) | mg/l | 0.2139 | <0.1 | <0.1 | 0.0092 | - | - | 0.2054 | 0.0321 | |
| Total Iron (Fe) | mg/l | 4.7 | 13 | 17 | 1.99 | - | - | 7.9 | 31.7 | |
| Total Lead (Pb) | mg/l | <0.0003 | <0.05 | <0.05 | 0.00488 | - | - | 0.0351 | 0.025 | |
| Total Lithium (Li) | mg/l | 13.92 | 26 | 26 | 21.4 | - | - | 6.5 | 45.31 | 98.96 |
| Total Magnesium (Mg) | mg/l | 1424 | 23 | 19 | 9.6 | 13.1 | - | 1376 | 37.4 | |
| Total Manganese (Mn) | mg/l | 0.7099 | <0.2 | <0.2 | 0.0442 | - | - | 0.6655 | 0.2948 | |
| Total Mercury (Hg) | | <0.00001 | | | <0.000010 | - | - | 0.00028 | 0.00095 | |
| Total Molybdenum (Mo) | mg/l | 0.007 | <0.05 | <0.05 | 0.0237 | - | - | 0.0085 | 0.0213 | |
| Total Nickel (Ni) | mg/l | 0.2502 | <0.1 | <0.1 | 0.005 | - | - | 0.1818 | 1.356 | |
| Total Phosphorus (P) | | <0.01 | | | <2.0 | - | - | | 0.76 | 1.8383396 |
| Total Potassium (K) | mg/l | 278 | 1 100 | 1 100 | 910 | 894 | - | 262 | 1557 | 2272.82 |
| Total Selenium (Se) | mg/l | 0.865 | <0.2 | <0.2 | 0.00063 | - | - | 0.678 | 3.58 | |
| Total Silicon (Si) | mg/l | 1.3 | <5 | <5 | <2.5 | - | - | 10.7 | 9.2 | |
| Total Silver (Ag) | mg/l | <0.0002 | <0.01 | <0.01 | 0.00027 | - | - | 0.0006 | 0.0004 | |
| Total Sodium (Na) | mg/l | 12886 | 860 | 850 | 650 | 658 | - | 12313 | 1256 | 2140.66 |
| Total Strontium (Sr) | mg/l | 153 | 500 | 520 | 385 | - | - | 104 | 576 | 800.89 |
| Total Sulphur (S) | mg/l | 0.4 | - | - | - | - | - | | 4 | |
| Total Tellurium (Te) | mg/l | 0.0014 | <0.1 | <0.1 | <0.0010 | - | - | | 0.0528 | |
| Total Thallium (Tl) | mg/l | <0.005 | 0.011 | 0.013 | 0.00861 | - | - | | <0.005 | |
| Total Tin (Sn) | mg/l | <0.001 | <0.1 | <0.1 | <0.0020 | - | - | 0.001 | 0.002 | |
| Total Titanium (Ti) | mg/l | 1.4 | <0.5 | <0.5 | <0.010 | - | - | 1.2 | 9.7 | |
| Total Tungsten (W) | mg/l | 0.028 | <0.1 | <0.1 | 0.0093 | - | - | | 0.1 | |
| Total Uranium (U) | mg/l | | <0.01 | <0.01 | <0.00010 | - | - | | | |
| Total Vanadium (V) | mg/l | <0.0005 | <0.05 | <0.05 | <0.0010 | - | - | 0.0283 | 0.0025 | |
| Total Zinc (Zn) | mg/l | 0.47 | <0.5 | 1.4 | 0.72 | - | - | 14.29 | 6.56 | |
| Total Zirconium (Zr) | mg/l | <0.5 | <0.1 | <0.1 | <0.0010 | - | - | | <0.5 | |
| | | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | 0.0001 | <0.0001 | <0.0001 | <0.000010 | - | <0.000010 | | 0.0005 | |
| Dissolved Aluminum (Al) | mg/l | <0.006 | <0.5 | <0.5 | 0.074 | - | 0.028 | | <0.006 | |
| Dissolved Antimony (Sb) | mg/l | <0.0001 | <0.05 | <0.05 | <0.0010 | - | <0.0010 | | 0.0059 | |
| Dissolved Arsenic (As) | mg/l | 0.2312 | <0.1 | <0.1 | <0.030 | - | <0.16 | | 0.9768 | |
| Dissolved Barium (Ba) | mg/l | 0.229 | 0.6 | 0.6 | 0.527 | - | 0.644 | | 0.5264 | 1.1314053 |
| Dissolved Beryllium (Be) | mg/l | <0.0005 | <0.05 | <0.05 | <0.0010 | - | <0.0010 | | <0.0005 | |
| Dissolved Bismuth (Bi) | mg/l | <0.0005 | <0.1 | <0.1 | <0.0010 | - | <0.0010 | | <0.0005 | |
| Dissolved Boron (B) | mg/l | 3.5 | 13 | 12 | 10.6 | - | 11.1 | | 10.8 | 17.26 |
| Dissolved Cadmium (Cd) | mg/l | 0.0002 | <0.01 | <0.01 | 0.00034 | - | <0.00030 | | 0.00021 | |
| Dissolved Calcium (Ca) | mg/l | 3702 | 27 000 | 29 000 | 23 300 | - | 24 200 | | 942 | -28227.09 |
| Dissolved Chromium (Cr) | mg/l | 0.006 | <0.5 | <0.5 | <0.0010 | - | <0.0010 | | 0.2138 | |
| Dissolved Cobalt (Co) | mg/l | | <0.05 | <0.05 | 0.00029 | - | 0.00032 | | | |
| Dissolved Copper (Cu) | mg/l | 0.2126 | <0.1 | <0.1 | 0.0055 | - | 0.0021 | | 0.0163 | |
| Dissolved Iron (Fe) | mg/l | 0.07 | <10 | <10 | <0.020 | - | 0.067 | | 0.94 | |
| Dissolved Lead (Pb) | mg/l | <0.0003 | <0.05 | <0.05 | <0.00060 | - | <0.00060 | | <0.0003 | |
| Dissolved Lithium (Li) | mg/l | 12.15 | 27 | 26 | 21.9 | - | 22.7 | | 37.01 | 90.88 |
| Dissolved Magnesium (Mg) | mg/l | 1412 | 23 | 22 | 9.6 | - | 16.8 | | 34.2 | 135.72 |
| Dissolved Manganese (Mn) | mg/l | 0.7314 | <0.2 | <0.2 | 0.0258 | - | 0.0458 | | 0.1495 | |
| Dissolved Molybdenum (Mo) | mg/l | 0.0072 | <0.05 | <0.05 | 0.0236 | - | 0.0235 | | 0.0211 | |
| Dissolved Nickel (Ni) | mg/l | 0.2067 | <0.1 | <0.1 | 0.0031 | - | 0.0033 | | 1.304 | |
| Dissolved Phosphorus (P) | mg/l | <0.01 | <10 | <10 | <2.0 | - | <2.0 | | 0.63 | |
| Dissolved Potassium (K) | mg/l | 282 | 1 100 | 1 100 | 910 | - | 930 | | 1469 | 2411.13 |
| Dissolved Selenium (Se) | mg/l | 0.788 | <0.2 | <0.2 | 0.00076 | - | 0.00063 | | 3.56 | |
| Dissolved Silicon (Si) | mg/l | 0.99 | <5 | <5 | <2.5 | - | <2.5 | | 8.3 | |
| Dissolved Silver (Ag) | mg/l | <0.0002 | <0.01 | <0.01 | <0.00020 | - | <0.00020 | | <0.0002 | |
| Dissolved Sodium (Na) | mg/l | 13289 | 880 | 890 | 660 | - | 720 | | 11109 | 26165.32 |
| Dissolved Strontium (Sr) | mg/l | 151 | 500 | 510 | 386 | - | 416 | | 544 | 815.71 |
| Dissolved Tellurium (Te) | mg/l | <0.0005 | <0.1 | <0.1 | <0.0010 | - | <0.0010 | | 0.0826 | |
| Dissolved Thallium (Tl) | mg/l | <0.005 | 0.013 | 0.011 | 0.00888 | - | 0.00549 | | <0.005 | |
| Dissolved Tin (Sn) | mg/l | <0.001 | <0.1 | <0.1 | <0.0020 | - | <0.0020 | | <0.001 | |
| Dissolved Titanium (Ti) | mg/l | 1.5 | <0.5 | <0.5 | <0.010 | - | <0.010 | | 10.1 | |
| Dissolved Tungsten (W) | mg/l | <0.005 | <0.1 | <0.1 | 0.0087 | - | 0.0114 | | <0.005 | |
| Dissolved Uranium (U) | mg/l | | <0.01 | <0.01 | <0.00010 | - | <0.00010 | | | |
| Dissolved Vanadium (V) | mg/l | <0.0005 | <0.05 | <0.05 | <0.0010 | - | <0.0010 | | 0.0031 | |
| Dissolved Zinc (Zn) | mg/l | 0.327 | <0.5 | <0.5 | 0.318 | - | 0.664 | | 0.716 | |
| Dissolved Zirconium (Zr) | mg/l | <1 | <0.1 | <0.1 | <0.0010 | - | <0.0010 | | <1 | |

| Parameter | Unit | I2-1 | I2-2 | #2 | INT-2 | INT-2 | INT-2 corrected | INT-1 | INT-2 corrected |
|---|---|---|---|---|---|---|---|---|---|
| | | 2011-10-23 | 2011-10-23 | 2012-07-27 | 2013-06-30 | 2013-07-14 | 2013-07-15 | 2013-07-15 | 2013-07-15 |
| **Numéro de projet** | | | | | V-27842 | C-134134 | | C-134133 | |
| **Depth of Interval** | mbgs | 613.3-602.1 | | | | | | | |
| **Dye Concentration** | | | | | | | | | |
| Maximum Dye Concentration for Interval | ppb | 505 | | | | | | | |
| Average Dye Concentration for General Samples | ppb | 473 | 467 | | | 120 | | 296 | |
| Average Dye Concentration for Dissovled Metals Samples | ppb | 403 | 403 | | | 120 | | 296 | |
| Average Dye Concentration | ppb | Not Applicable | | | | | | | |
| **General Chemistry** | | | | | | | | | |
| Alkalinity as CaCO3 | mg/l | 52 | 66 | <2.0 | 79 | 46 | 42.49 | 57 | 56.79 |
| Chloride | mg/l | 40 000 | 43 000 | 35 600 | 34781 | 36505 | 33389.68 | 51341 | 55494.44 |
| Conductivity (lab) | uS/cm | 64 600 | 74 500 | 128 000 | 25550 | 35370 | | 30590 | |
| Fluoride | mg/l | <0.1 | <0.1 | <2.0 | | 0.12 | 0.1464935 | 0.09 | 0.1371884 |
| Nitrate as N | mg/l | <0.1 | <0.1 | 0.63 | 0.08 | 0.66 | | 0.25 | |
| Nitrate + Nitrite | mg/l | <0.1 | <0.1 | - | 0.1 | 0.69 | | 0.29 | |
| Nitrite as N | mg/l | <0.1 | <0.1 | 0.11 | 0.02 | 0.03 | | 0.04 | |
| pH (lab) | mg/l | 7.86 | 8.33 | 0.99 | 7.91 | 7.91 | | 8.31 | |
| Sulphate | mg/l | 15 | 15 | 1700 | 1163 | 1934 | 2533.45 | 407 | 746.97 |
| Total Dissolved Solids | mg/l | 105 000 | 113 000 | 75 100 | 17033 | 23580 | 3695.84 | 20393 | -37075.61 |
| Total Suspended Solids | mg/l | 290 | 350 | 11700 | 53 | 72 | | | |
| Total Ammonia-N | mg/l | 0.7 | 1.6 | 1.65 | 2.2 | 3 | 3.12 | 13.3 | 22.48 |
| Total Phosphorus | mg/l | 7.3 | 0.4 | 0.023 | 0.24 | 0.13 | 0.17 | 0.43 | 0.80 |
| Total Organic Carbon (TOC) | | | | | 4851 | 5400 | 7170.4918 | 2300 | 5883.1579 |
| **Metals** | | | | | | | | | |
| Total Aluminum (Al) | mg/l | 0.8 | 0.7 | <0.30 | 0.07 | 0.262 | | 0.082 | |
| Total Antimony (Sb) | mg/l | <0.05 | <0.05 | <0.010 | <0.0001 | 0.0017 | | 0.0032 | |
| Total Arsenic (As) | mg/l | <0.1 | <0.1 | 0.034 | 0.3568 | 0.3311 | | 0.9322 | |
| Total Barium (Ba) | mg/l | 0.6 | 0.6 | 1.06 | 0.9439 | 0.5642 | | 0.3954 | |
| Total Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.010 | <0.0005 | <0.0005 | | <0.0005 | |
| Total Bismuth (Bi) | mg/l | <0.1 | <0.1 | <0.050 | <0.0005 | <0.0005 | | <0.0005 | |
| Total Boron (B) | mg/l | 11 | 12 | 8.2 | 13.9 | 9.3 | 9.86 | 10.7 | 13.45 |
| Total Bromide (Br) | | | | | | 247 | 323.99 | 729 | 1354.46 |
| Total Cadmium (Cd) | mg/l | <0.01 | <0.01 | <0.0010 | 0.00036 | 0.00035 | | 0.00015 | |
| Total Calcium (Ca) | mg/l | 25 000 | 24 000 | 8 310 | 9053 | 8235 | 2230.32 | 17680 | 9254.72 |
| Total Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.010 | 0.0752 | 0.0527 | | 0.0244 | |
| Total Cobalt (Co) | mg/l | <0.05 | <0.05 | <0.010 | 0.031 | 0.0184 | | 0.0465 | |
| Total Copper (Cu) | mg/l | <0.1 | <0.1 | <0.050 | 0.103 | 0.1299 | | 0.0305 | |
| Total Iron (Fe) | mg/l | 16 | 12 | <1.0 | 4.4 | 12.7 | | 1.5 | |
| Total Lead (Pb) | mg/l | <0.05 | <0.05 | <0.0050 | 0.0021 | 0.0059 | | 0.0021 | |
| Total Lithium (Li) | mg/l | 23 | 23 | 16.1 | 1403 | 29.54 | 36.41 | 42.77 | 73.03 |
| Total Magnesium (Mg) | mg/l | 8 | 8 | 558 | 1051 | 1303 | | 29.7 | |
| Total Manganese (Mn) | mg/l | <0.2 | <0.2 | 0.214 | 0.7914 | 0.7902 | | 0.195 | |
| Total Mercury (Hg) | | - | - | <0.000050 | 0.00034 | <0.00001 | | 0.0004 | |
| Total Molybdenum (Mo) | mg/l | <0.05 | <0.05 | 0.0159 | 0.0194 | 0.0124 | | 0.0182 | |
| Total Nickel (Ni) | mg/l | <0.1 | <0.1 | <0.050 | 0.5301 | 0.4294 | | 1.202 | |
| Total Phosphorus (P) | | - | - | <30 | | 0.13 | 0.1705195 | 0.43 | 0.7989275 |
| Total Potassium (K) | mg/l | 1 000 | 970 | 605 | 502 | 579 | 431.42 | 1562 | 1999.14 |
| Total Selenium (Se) | mg/l | <0.2 | <0.2 | <0.010 | 1.19 | 1.12 | | 3.36 | |
| Total Silicon (Si) | mg/l | <5 | <5 | <5.0 | 5.7 | 2.7 | | 1.2 | |
| Total Silver (Ag) | mg/l | <0.01 | <0.01 | <0.0010 | <0.0002 | <0.0002 | | <0.0002 | |
| Total Sodium (Na) | mg/l | 670 | 660 | 4 770 | 6779 | 9864 | 12741.35 | 4208 | 7275.68 |
| Total Strontium (Sr) | mg/l | 460 | 450 | 259 | 350 | 326 | 297.48 | 565 | 691.55 |
| Total Sulphur (S) | mg/l | - | - | - | | 2.1 | | 4.6 | |
| Total Tellurium (Te) | mg/l | <0.1 | <0.1 | - | <0.0005 | <0.0005 | | 0.0479 | |
| Total Thallium (Tl) | mg/l | 0.012 | 0.011 | 0.0041 | | <0.005 | | <0.005 | |
| Total Tin (Sn) | mg/l | <0.1 | <0.1 | <0.010 | <0.001 | 0.001 | | <0.001 | |
| Total Titanium (Ti) | mg/l | <0.5 | <0.5 | <1.0 | 4.5 | 2.3 | | 10.7 | |
| Total Tungsten (W) | mg/l | <0.1 | <0.1 | - | | 0.058 | | 0.087 | |
| Total Uranium (U) | mg/l | <0.01 | <0.01 | <0.0010 | | | | | |
| Total Vanadium (V) | mg/l | <0.05 | <0.05 | <0.10 | <0.0005 | <0.0005 | | <0.0005 | |
| Total Zinc (Zn) | mg/l | 1.3 | 0.7 | 4.48 | 2.46 | 1.46 | | 3.98 | |
| Total Zirconium (Zr) | mg/l | <0.1 | <0.1 | - | | <0.5 | | <0.5 | |
| | | | | | | | | | |
| Dissolved Mercury (Hg) | mg/l | <0.0001 | <0.0001 | <0.000050 | 0.0002 | 0.0003 | | 0.001 | |
| Dissolved Aluminum (Al) | mg/l | <0.5 | <0.5 | <0.10 | <0.006 | <0.006 | | 0.017 | |
| Dissolved Antimony (Sb) | mg/l | <0.05 | <0.05 | <0.010 | <0.0001 | 0.001 | | 0.0038 | |
| Dissolved Arsenic (As) | mg/l | <0.1 | <0.1 | 0.026 | 0.3381 | 0.3482 | | 0.9444 | |
| Dissolved Barium (Ba) | mg/l | 0.6 | 0.5 | 1.05 | 0.926 | 0.606 | 0.7637143 | 0.4064 | 0.6692823 |
| Dissolved Beryllium (Be) | mg/l | <0.05 | <0.05 | <0.010 | <0.0005 | <0.0005 | | <0.0005 | |
| Dissolved Bismuth (Bi) | mg/l | <0.1 | <0.1 | <0.050 | | <0.0005 | | <0.0005 | |
| Dissolved Boron (B) | mg/l | 11 | 11 | 9.6 | 11.7 | 8.7 | 9.46 | 11 | 15.08 |
| Dissolved Cadmium (Cd) | mg/l | <0.01 | <0.01 | <0.0010 | 0.00022 | 0.00018 | | 0.00018 | |
| Dissolved Calcium (Ca) | mg/l | 26 000 | 24 000 | 9 090 | 12489 | 297 | -6311.73 | 952 | -16677.59 |
| Dissolved Chromium (Cr) | mg/l | <0.5 | <0.5 | <0.010 | 0.0137 | 0.0388 | | 0.038 | |
| Dissolved Cobalt (Co) | mg/l | <0.05 | <0.05 | <0.010 | 0.03 | | | | |
| Dissolved Copper (Cu) | mg/l | <0.1 | <0.1 | 0.022 | 0.1016 | 0.12 | | 0.0296 | |
| Dissolved Iron (Fe) | mg/l | <10 | <10 | <1.0 | 0.35 | 0.29 | | 0.9 | |
| Dissolved Lead (Pb) | mg/l | <0.05 | <0.05 | <0.0050 | <0.0003 | <0.0003 | | <0.0003 | |
| Dissolved Lithium (Li) | mg/l | 22 | 22 | 17.7 | 24.3 | 21.89 | 22.09 | 29 | 35.65 |
| Dissolved Magnesium (Mg) | mg/l | 8 | 8 | 550 | 1009 | 1147 | 1503.10 | 28.7 | 49.46 |
| Dissolved Manganese (Mn) | mg/l | <0.2 | <0.2 | 0.205 | 0.7888 | 0.8469 | | 0.184 | |
| Dissolved Molybdenum (Mo) | mg/l | <0.05 | <0.05 | 0.0171 | 0.0127 | 0.0126 | | 0.0204 | |
| Dissolved Nickel (Ni) | mg/l | <0.1 | <0.1 | <0.050 | 0.5181 | 0.3412 | | 1.267 | |
| Dissolved Phosphorus (P) | mg/l | <10 | <10 | <30 | | 0.12 | | 0.2 | |
| Dissolved Potassium (K) | mg/l | 1000 | 970 | 603 | 449 | 481 | 406.37 | 1292 | 1709.83 |
| Dissolved Selenium (Se) | mg/l | <0.2 | <0.2 | <0.010 | 1.14 | 1.17 | | 3.44 | |
| Dissolved Silicon (Si) | mg/l | <5 | <5 | <5.0 | 2.2 | 2.2 | | 1.6 | |
| Dissolved Silver (Ag) | mg/l | <0.01 | <0.01 | <0.0010 | <0.0002 | <0.0002 | | <0.0002 | |
| Dissolved Sodium (Na) | mg/l | 690 | 640 | 4700 | 5527 | 12168 | 15805.56 | 4508 | 7948.89 |
| Dissolved Strontium (Sr) | mg/l | 450 | 420 | 288 | 341 | 297 | 279.70 | 545 | 710.16 |
| Dissolved Tellurium (Te) | mg/l | <0.1 | <0.1 | - | <0.0005 | <0.0005 | | 0.0774 | |
| Dissolved Thallium (Tl) | mg/l | 0.012 | 0.012 | <0.010 | | <0.005 | | 0.006 | |
| Dissolved Tin (Sn) | mg/l | <0.1 | <0.1 | <1.0 | <0.001 | <0.001 | | <0.001 | |
| Dissolved Titanium (Ti) | mg/l | <0.5 | <0.5 | - | 4.8 | 2.3 | | 8.9 | |
| Dissolved Tungsten (W) | mg/l | <0.1 | <0.1 | - | | <0.005 | | <0.005 | |
| Dissolved Uranium (U) | mg/l | <0.01 | <0.01 | <0.0010 | | | | | |
| Dissolved Vanadium (V) | mg/l | <0.05 | 0.06 | <0.10 | <0.0005 | <0.0005 | | <0.0005 | |
| Dissolved Zinc (Zn) | mg/l | <0.5 | <0.5 | 4.53 | 1.82 | 0.979 | | 1.57 | |
| Dissolved Zirconium (Zr) | mg/l | <0.1 | <0.1 | - | | <1 | | <1 | |

## APPENDIX D :

## Certificates of analysis for 2013 samples

Multilab DIRECT

# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Alkalinity mg CaCO3/L | 57 | 46 | 66 | 27 | 26 | 52 | 35 | 36 |
| Aluminium (Al) mg/L | 0.082 | 0.262 | 0.895 | <0.006 | 0.023 | 0.006 | 0.041 | <0.006 |
| Dissolved Aluminium (Al) mg/L | 0.017 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Antimony (Sb) mg/L | 0.0032 | 0.0017 | 0.0059 | 0.0005 | 0.0009 | 0.0031 | 0.0005 | 0.0020 |
| Dissolved Antimony (Sb) mg/L | 0.0038 | 0.0010 | 0.0059 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver (Ag) mg/L | <0.0002 | <0.0002 | 0.0004 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Dissolved Silver (Ag) mg/L | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic (As) mg/L | 0.9322 | 0.3311 | 1.007 | 0.2301 | 0.2657 | 1.143 | 0.2851 | 0.3137 |
| Dissolved Arsenic (As) mg/L | 0.9444 | 0.3482 | 0.9768 | 0.2275 | 0.2312 | 0.9649 | 0.2529 | 0.2705 |
| Ammonia nitrogen (NH3-NH4) mg | 13.3 | 3.0 | 0.25 | 4.6 | 4.2 | 11.5 | 4.7 | 4.7 |
| Barium (Ba) mg/L | 0.3954 | 0.5642 | 0.5464 | 0.1135 | 0.2090 | 0.5701 | 0.1069 | 0.0894 |
| Dissolved Barium (Ba) mg/L | 0.4064 | 0.6060 | 0.5264 | 0.1219 | 0.2290 | 0.6188 | 0.1118 | 0.0943 |
| Beryllium (Be) mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Dissolved Beryllium (Be) mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| dissolved bismuth mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Bismuth (Bi) mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Boron (B) mg/L | 10.7 | 9.3 | 11.0 | 4.1 | 3.8 | 6.0 | 2.0 | 6.1 |
| Dissolved Boron (B) mg/L | 11.0 | 8.7 | 10.8 | 3.6 | 3.5 | 5.8 | 1.5 | 1.8 |
| Cadmium (Cd) mg/L | 0.00015 | 0.00035 | 0.00029 | 0.00015 | 0.00005 | 0.00016 | 0.00009 | 0.00005 |
| Dissolved Cadmium (Cd) mg/L | 0.00018 | 0.00018 | 0.00021 | 0.00011 | 0.00020 | 0.00032 | 0.00011 | 0.00014 |



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Reported on: August 12, 2013

F-02-13
Version 2ième: 18/10/2006



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# Results summary

Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Calcium (Ca) mg/L | 17680 | 8235 | 20915 | 3359 | 4080 | 18071 | 2971 | 3084 |
| Dissolved Calcium (Ca) mg/L | 952 | 297 | 942 | 3609 | 3702 | 17573 | 2589 | 2614 |
| Chloride mg/L | 51341 | 36505 | 47603 | 34319 | 32931 | 50636 | 35467 | 35203 |
| Chromium (Cr) mg/L | 0.0244 | 0.0527 | 0.2090 | 0.0057 | 0.0076 | 0.0241 | 0.0062 | 0.0184 |
| Dissolved Chromium (Cr) mg/L | 0.0380 | 0.0388 | 0.2138 | 0.0055 | 0.0060 | 0.0228 | 0.0033 | 0.0166 |
| Cobalt (Co) mg/L | 0.0465 | 0.0184 | 0.0511 | 0.0076 | 0.0101 | 0.0539 | 0.0084 | 0.0084 |
| Conductivity µmhos/cm | 30590 | 35370 | 36240 | 36290 | 34150 | 33370 | 29220 | 29350 |
| Copper (Cu) mg/L | 0.0305 | 0.1299 | 0.0321 | 0.2299 | 0.2139 | 0.0533 | 0.3005 | 0.3054 |
| Dissolved Copper (Cu) mg/L | 0.0296 | 0.1200 | 0.0163 | 0.2097 | 0.2126 | 0.0486 | 0.2698 | 0.2735 |
| Tin (Sn) mg/L | <0.001 | 0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| dissolved Tin (Sn) mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Iron (Fe) mg/L | 1.5 | 12.7 | 31.7 | 9.1 | 4.7 | 1.0 | 11.8 | 10.3 |
| Dissolved Iron (Fe) mg/L | 0.90 | 0.29 | 0.94 | 0.20 | 0.07 | 0.40 | 0.06 | 0.37 |
| Fluoride (F) mg/L | 0.09 | 0.12 | 0.06 | 0.15 | 0.16 | 0.09 | 0.15 | 0.13 |
| Lithium (Li) mg/L | 42.77 | 29.54 | 45.31 | 7.92 | 13.92 | 17.19 | 3.72 | 4.95 |
| Dissolved Lithium (Li) mg/L | 29.00 | 21.89 | 37.01 | 7.62 | 12.15 | 32.74 | 2.42 | 3.10 |
| Magnesium (Mg) mg/L | 29.7 | 1296 | 37.4 | 2049 | 1424 | 187 | 1570 | 1366 |
| Dissolved Magnesium (Mg) mg/L | 28.7 | 1147 | 34.2 | 2202 | 1412 | 186 | 1453 | 1295 |
| Manganese (Mn) mg/L | 0.1950 | 0.7902 | 0.2948 | 0.8540 | 0.7099 | 0.1936 | 0.6621 | 0.6961 |
| Dissolved Manganese (Mn) mg/L | 0.1840 | 0.8469 | 0.1495 | 0.7270 | 0.7314 | 0.1908 | 0.6379 | 0.6884 |



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F-02-13
Version 2ième: 18/10/2006



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Mercury (Hg) mg/L | 0.00040 | <0.00001 | 0.00095 | <0.00001 | <0.00001 | 0.00145 | <0.00001 | 0.00020 |
| Dissolved Mercury (Hg) mg/L | 0.0005 | 0.0003 | 0.0005 | 0.0002 | 0.0001 | 0.0009 | 0.0001 | 0.0001 |
| Molybdenum (Mo) mg/L | 0.0182 | 0.0124 | 0.0213 | 0.0039 | 0.0070 | 0.0485 | 0.0042 | 0.0074 |
| Dissolved Molybdenum (Mo) mg/ | 0.0204 | 0.0126 | 0.0211 | 0.0030 | 0.0072 | 0.0514 | 0.0031 | 0.0036 |
| Nickel (Ni) mg/L | 1.202 | 0.4294 | 1.356 | 0.1700 | 0.2502 | 1.495 | 0.2114 | 0.2161 |
| Dissolved Nickel (Ni) mg/L | 1.267 | 0.3412 | 1.304 | 0.0877 | 0.2067 | 1.133 | 0.1549 | 0.1644 |
| Nitrate (NO3) mg N/L | 0.25 | 0.66 | 3.7 | 0.37 | 0.11 | 0.85 | 0.03 | 0.01 |
| Nitrite (NO2) mg N/L | 0.04 | 0.03 | 0.05 | 0.03 | 0.02 | 0.04 | 0.03 | 0.02 |
| Nitrite-Nitrate mg N/L | 0.29 | 0.69 | 3.8 | 0.40 | 0.13 | 0.89 | 0.06 | 0.03 |
| pH | 8.31 | 7.91 | 8.12 | 6.41 | 7.02 | 8.03 | 6.83 | 6.48 |
| Dissolved Phosphorus (P) mg P/L | 0.20 | 0.12 | 0.63 | <0.01 | <0.01 | 0.46 | <0.01 | <0.01 |
| Total Phosphorus (P) mg P/L | 0.43 | 0.13 | 0.76 | 0.02 | <0.01 | 0.49 | <0.01 | <0.01 |
| Lead (Pb) mg/L | 0.0021 | 0.0059 | 0.0250 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 |
| Dissolved Lead (Pb) mg/L | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 |
| Potassium (K) mg/L | 1562 | 579 | 1557 | 331 | 278 | 943 | 275 | 362 |
| Dissolved Potassium (K) mg/L | 1292 | 481 | 1469 | 362 | 282 | 939 | 258 | 346 |
| Selenium (Se) mg/L | 3.36 | 1.12 | 3.58 | 0.737 | 0.865 | 4.07 | 0.935 | 1.00 |
| Dissolved Selenium (Se) mg/L | 3.44 | 1.17 | 3.56 | 0.758 | 0.788 | 3.45 | 0.816 | 0.881 |
| Silica (Si) mg/L | 1.2 | 2.7 | 9.2 | 2.2 | 1.3 | 0.97 | 2.0 | 1.8 |
| Dissolved silica (Si) mg/L | 1.6 | 2.2 | 8.3 | 2.3 | 0.99 | 0.88 | 1.3 | 1.5 |



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# Results summary

Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Sodium (Na) mg/L | 4208 | 9864 | 1256 | 17522 | 12886 | 2965 | 14205 | 12046 |
| Dissolved Sodium (Na) mg/L | 4508 | 12168 | 11109 | 15766 | 13289 | 3127 | 13677 | 11983 |
| Dissolved Solids mg/L | 20393 | 23580 | 24160 | 24193 | 22766 | 22246 | 19480 | 19566 |
| Strontium (Sr) mg/L | 565 | 326 | 576 | 108 | 153 | 437 | 72.52 | 103 |
| Dissolved Strontium (Sr) mg/L | 545 | 297 | 544 | 114 | 151 | 515 | 69.91 | 89.44 |
| Sulfate (SO4) mg SO4/L | 407 | 1934 | 907 | 3261 | 2818 | 388 | 3428 | 3107 |
| Sulfides mg S2-/L | 4.6 | 2.1 | 4.0 | 0.35 | 0.40 | 2.2 | 0.23 | 0.23 |
| Tellurium (Te) mg/L | 0.0479 | <0.0005 | 0.0528 | <0.0005 | 0.0014 | 0.0531 | 0.0030 | 0.0080 |
| Dissolved Tellurium (Te) mg/L | 0.0774 | <0.0005 | 0.0826 | <0.0005 | <0.0005 | 0.0210 | <0.0005 | <0.0005 |
| Thallium (Tl) mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dissolved thallium (Tl) mg/L | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Titanium (Ti) mg/L | 10.7 | 2.3 | 9.7 | 1.2 | 1.4 | 5.7 | 1.2 | 1.2 |
| Dissolved titanium (Ti) mg/L | 8.9 | 2.3 | 10.1 | 1.4 | 1.5 | 6.1 | 1.2 | 1.3 |
| Vanadium (V) mg/L | <0.0005 | <0.0005 | 0.0025 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Dissolved Vanadium mg/L | <0.0005 | <0.0005 | 0.0031 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Zinc (Zn) mg/L | 3.98 | 1.46 | 6.56 | 0.364 | 0.470 | 0.296 | 0.595 | 0.311 |
| Dissolved Zinc mg/L | 1.57 | 0.979 | 0.716 | 0.367 | 0.327 | 0.208 | 0.436 | 0.229 |
| Tungsten (W) mg/L | 0.087 | 0.058 | 0.100 | 0.038 | 0.028 | 0.141 | 0.043 | 0.025 |
| Dissolved Tungsten (W) mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.005 | <0.005 |
| Total organic carbon (TOC) mg/L | 2300 | 5400 | 26000 | 240 | 900 | 3100 | 220 | 12 |



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Zirconium dissous (Zr) mg/L | <1 | <0.1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Zirconium (Zr) mg/L | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 |
| Total Suspended Solids mg/L | --- | 72 | 311 | 23 | 35 | 17 | 35 | 26 |
| Ammonia nitrogen client re-analised mg N/l | --- | --- | --- | --- | --- | --- | --- | 5.1 |

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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Alkalinity mg CaCO3/L | 46 | 100 |
| Aluminium (Al) mg/L | <0.006 | 0.065 |
| Dissolved Aluminium (Al) mg/L | <0.006 | <0.006 |
| Antimony (Sb) mg/L | 0.0007 | 0.0045 |
| Dissolved Antimony (Sb) mg/L | <0.0001 | <0.0001 |
| Silver (Ag) mg/L | <0.0002 | <0.0002 |
| Dissolved Silver (Ag) mg/L | <0.0002 | <0.0002 |
| Arsenic (As) mg/L | 0.2940 | 0.1317 |
| Dissolved Arsenic (As) mg/L | 0.2514 | 0.1077 |
| Ammonia nitrogen (NH3-NH4) mg | 4.9 | 0.51 |
| Barium (Ba) mg/L | 0.0318 | 0.0570 |
| Dissolved Barium (Ba) mg/L | 0.0328 | 0.0576 |
| Beryllium (Be) mg/L | <0.0005 | <0.0005 |
| Dissolved Beryllium (Be) mg/L | <0.0005 | <0.0005 |
| dissolved bismuth mg/L | <0.0005 | <0.0005 |
| Bismuth (Bi) mg/L | <0.0005 | <0.0005 |
| Boron (B) mg/L | 1.4 | 1.3 |
| Dissolved Boron (B) mg/L | 0.96 | 1.2 |
| Cadmium (Cd) mg/L | 0.00004 | 0.00032 |
| Dissolved Cadmium (Cd) mg/L | 0.00013 | 0.00015 |

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# Results summary

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Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Calcium (Ca) mg/L | 2599 | 1631 |
| Dissolved Calcium (Ca) mg/L | 1959 | 1936 |
| Chloride mg/L | 37902 | 5330 |
| Chromium (Cr) mg/L | 0.0023 | 1.799 |
| Dissolved Chromium (Cr) mg/L | 0.0027 | 1.715 |
| Cobalt (Co) mg/L | 0.0065 | 0.0078 |
| Conductivity µmhos/cm | 34870 | 2620 |
| Copper (Cu) mg/L | 0.3362 | 0.0482 |
| Dissolved Copper (Cu) mg/L | 0.3103 | 0.0069 |
| Tin (Sn) mg/L | <0.001 | 0.012 |
| dissolved Tin (Sn) mg/L | <0.001 | 0.002 |
| Iron (Fe) mg/L | 9.4 | 1.8 |
| Dissolved Iron (Fe) mg/L | 0.04 | 0.04 |
| Fluoride (F) mg/L | 0.11 | 0.07 |
| Lithium (Li) mg/L | 3.01 | 2.76 |
| Dissolved Lithium (Li) mg/L | 1.82 | 1.61 |
| Magnesium (Mg) mg/L | 1411 | 21.9 |
| Dissolved Magnesium (Mg) mg/L | 1305 | 23.3 |
| Manganese (Mn) mg/L | 0.7188 | 0.0980 |
| Dissolved Manganese (Mn) mg/L | 0.7137 | 0.0369 |

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# Results summary

Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
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Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Mercury (Hg) mg/L | 0.00010 | <0.00001 |
| Dissolved Mercury (Hg) mg/L | 0.0001 | <0.0001 |
| Molybdenum (Mo) mg/L | 0.0041 | 0.0042 |
| Dissolved Molybdenum (Mo) mg/ | 0.0025 | 0.0016 |
| Nickel (Ni) mg/L | 0.1657 | 0.3220 |
| Dissolved Nickel (Ni) mg/L | 0.1280 | 0.2367 |
| Nitrate (NO3) mg N/L | 0.12 | 0.03 |
| Nitrite (NO2) mg N/L | 0.03 | 0.11 |
| Nitrite-Nitrate mg N/L | 0.15 | 0.14 |
| pH | 6.58 | 7.15 |
| Dissolved Phosphorus (P) mg P/L | <0.01 | <0.01 |
| Total Phosphorus (P) mg P/L | 0.05 | 4.9 |
| Lead (Pb) mg/L | 0.0031 | 0.1081 |
| Dissolved Lead (Pb) mg/L | <0.0003 | <0.0003 |
| Potassium (K) mg/L | 336 | 81.0 |
| Dissolved Potassium (K) mg/L | 314 | 82.8 |
| Selenium (Se) mg/L | 0.964 | 0.406 |
| Dissolved Selenium (Se) mg/L | 0.828 | 0.392 |
| Silica (Si) mg/L | 1.4 | 129 |
| dissolved silica (Si) mg/L | 1.0 | 120 |



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Reported on: August 12, 2013

F-02-13
Version 2ième: 18/10/2006



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# Results summary

Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Sodium (Na) mg/L | 12489 | 189 |
| Dissolved Sodium (Na) mg/L | 12011 | 209 |
| Dissolved Solids mg/L | 23246 | 1746 |
| Strontium (Sr) mg/L | 73.67 | 31.53 |
| dissolved Strontium (Sr) mg/L | 63.78 | 35.03 |
| Sulfate (SO4) mg SO4/L | 3766 | 44 |
| Sulfides mg S2-/L | 0.28 | 0.04 |
| Tellurium (Te) mg/L | 0.0047 | 0.0029 |
| Dissolved Tellurium (Te) mg/L | <0.0005 | <0.0005 |
| Thallium (Tl) mg/L | <0.005 | <0.005 |
| Dissolved thallium (Tl) mg/L | <0.005 | <0.005 |
| Titanium (Ti) mg/L | 1.2 | 0.95 |
| Dissolved titanium (Ti) mg/L | 1.2 | 0.52 |
| Vanadium (V) mg/L | <0.0005 | 0.4984 |
| Dissolved Vanadium mg/L | <0.0005 | 0.4762 |
| Zinc (Zn) mg/L | 0.353 | 265 |
| Dissolved Zinc mg/L | 0.208 | 1.24 |
| Tungsten (W) mg/L | 0.014 | <0.005 |
| dissolved Tungsten (W) mg/L | <0.005 | <0.005 |
| Total organic carbon (TOC) mg/L | 370 | 260000 |



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Zirconium dissous (Zr) mg/L | <1 | <1 |
| Zirconium (Zr) mg/L | <0.500 | <0.500 |
| Total Suspended Solids mg/L | 31 | 689 |
| Ammonia nitrogen client re-analised mg N/l | --- | --- |

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Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit Valeur | | |
|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 |
| Aluminium (Al) | 0.006 | mg/L | M-MET-3.0 |
| Dissolved Aluminium (Al) | 0.006 | mg/L | M-MET-3.0 |
| Antimony (Sb) | 0.0001 | mg/L | M-MET-3.0 |
| Dissolved Antimony (Sb) | 0.0001 | mg/L | M-MET-3.0 |
| Silver (Ag) | 0.0001 | mg/L | M-MET-3.0 |
| Dissolved Silver (Ag) | 0.0001 | mg/L | M-MET-3.0 |
| Arsenic (As) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Arsenic (As) | 0.0005 | mg/L | M-MET-3.0 |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | M-NH3-2.0 |
| Barium (Ba) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Barium (Ba) | 0.0005 | mg/L | M-MET-3.0 |
| Beryllium (Be) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Beryllium (Be) | 0.0005 | mg/L | M-MET-3.0 |
| dissolved bismuth | 0.0005 | mg/L | M-MET-3.0 |
| Bismuth (Bi) | 0.0005 | mg/L | M-MET-3.0 |
| Boron (B) | 0.01 | mg/L | M-MET-3.0 |
| Dissolved Boron (B) | 0.01 | mg/L | M-MET-3.0 |
| Cadmium (Cd) | 0.00002 | mg/L | M-MET-3.0 |
| Dissolved Cadmium (Cd) | 0.00002 | mg/L | M-MET-3.0 |



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# Results summary

Client: **Agnico Eagle Meliadine**
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Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit Valeur | | |
|---|---|---|---|
| Calcium (Ca) | 0.03 | mg/L | M-MET-3.0 |
| Dissolved Calcium (Ca) | 0.03 | mg/L | M-MET-3.0 |
| Chloride | 0.5 | mg/L | M-CL-2.0 |
| Chromium (Cr) | 0.0006 | mg/L | M-MET-3.0 |
| Dissolved Chromium (Cr) | 0.0006 | mg/L | M-MET-3.0 |
| Cobalt (Co) | 0.0005 | mg/L | M-MET-3.0 |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 |
| Copper (Cu) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Copper (Cu) | 0.0005 | mg/L | M-MET-3.0 |
| Tin (Sn) | 0.001 | mg/L | M-MET-3.0 |
| dissolved Tin (Sn) | 0.001 | mg/L | M-MET-3.0 |
| Iron (Fe) | 0.01 | mg/L | M-MET-3.0 |
| Dissolved Iron (Fe) | 0.01 | mg/L | M-MET-3.0 |
| Fluoride (F) | 0.02 | mg/L | M-CI-1.0 |
| Lithium (Li) | 0.005 | mg/L | M-MET-3.0 |
| Dissolved Lithium (Li) | 0.005 | mg/L | M-MET-3.0 |
| Magnesium (Mg) | 0.02 | mg/L | M-MET-3.0 |
| Dissolved Magnesium (Mg) | 0.02 | mg/L | M-MET-3.0 |
| Manganese (Mn) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Manganese (Mn) | 0.0005 | mg/L | M-MET-3.0 |



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# Results summary

Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit / Valeur | | |
|---|---|---|---|
| Mercury (Hg) | 0.00001 | mg/L | M-MET-3.0 |
| Dissolved Mercury (Hg) | 0.0001 | mg/L | M-MET-3.0 |
| Molybdenum (Mo) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Molybdenum (Mo) | 0.0005 | mg/L | M-MET-3.0 |
| Nickel (Ni) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Nickel (Ni) | 0.0005 | mg/L | M-MET-3.0 |
| Nitrate (NO3) | 0.01 | mg N/L | M-NITR-2.0 |
| Nitrite (NO2) | 0.01 | mg N/L | M-NITR-2.0 |
| Nitrite-Nitrate | 0.01 | mg N/L | M-NITR-2.0 |
| pH | N.D. | | M-TIT-1.0 |
| Dissolved Phosphorus (P) | 0.01 | mg P/L | M-P-3.0 |
| Total Phosphorus (P) | 0.01 | mg P/L | M-P-3.0 |
| Lead (Pb) | 0.0003 | mg/L | M-MET-3.0 |
| Dissolved Lead (Pb) | 0.0003 | mg/L | M-MET-3.0 |
| Potassium (K) | 0.05 | mg/L | M-MET-3.0 |
| Dissolved Potassium (K) | 0.05 | mg/L | M-MET-3.0 |
| Selenium (Se) | 0.001 | mg/L | M-MET-3.0 |
| Dissolved Selenium (Se) | 0.001 | mg/L | M-MET-3.0 |
| Silica (Si) | 0.01 | mg/L | M-MET-3.0 |
| dissolved silica (Si) | 0.01 | mg/L | M-MET-3.0 |



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Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit Valeur | | |
|---|---|---|---|
| Sodium (Na) | 0.05 | mg/L | M-MET-3.0 |
| Dissolved Sodium (Na) | 0.05 | mg/L | M-MET-3.0 |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 |
| Strontium (Sr) | 0.005 | mg/L | M-MET-3.0 |
| dissolved Strontium (Sr) | 0.005 | mg/L | M-MET-3.0 |
| Sulfate (SO4) | 0.6 | mg SO4/L | M-SULF-2.0 |
| Sulfides | 0.03 | mg S2-/L | M-SULF-3.0 |
| Tellurium (Te) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Tellurium (Te) | 0.0005 | mg/L | M-MET-3.0 |
| Thallium (Tl) | 0.005 | mg/L | M-MET-3.0 |
| Dissolved thallium (Tl) | 0.005 | mg/L | M-MET-3.0 |
| Titanium (Ti) | 0.01 | mg/L | M-MET-3.0 |
| Dissolved titanium (Ti) | 0.01 | mg/L | M-MET-3.0 |
| Vanadium (V) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Vanadium | 0.0005 | mg/L | M-MET-3.0 |
| Zinc (Zn) | 0.001 | mg/L | M-MET-3.0 |
| Dissolved Zinc | 0.001 | mg/L | M-MET-3.0 |
| Tungsten (W) | 0.005 | mg/L | M-MET-3.0 |
| dissolved Tungsten (W) | 0.005 | mg/L | M-MET-3.0 |
| Total Suspended Solids | 1 | mg/L | M-SOLI-1.0 |



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# Quality control Report

Company: **Agnico Eagle Meliadine**
Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** Multiple
Date received: 17-juil-13
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Standard | | | | Sample duplicate | |
|---|---|---|---|---|---|---|
| | Limit | Nom | Obtenue | Intervalle | 1 | 2 |
| Alcalinité mg CaCO3/L | | alinité 22-02-2( | 196 | 170 - 230 | | |
| Alcalinité mg CaCO3/L | | alinité 22-02-2( | 196 | 170 - 230 | 27 | 27 |
| Aluminium (Al) mg/L | <0.006 | R-0311-2013-2 | 6.57 | 5.26 - 7.12 | | |
| Aluminium (Al) mg/L | <0.006 | R-0311-2013-2 | 7.07 | 5.26 - 7.12 | 0.041 | 0.031 |
| Aluminium (Al) mg/L | <0.006 | R-0311-2013-2 | 7.07 | 5.26 - 7.12 | | |
| Aluminium dissous (Al) mg/L | <0.006 | MR-0311-2013- | 6.77 | 5.26 - 7.12 | | |
| Aluminium dissous (Al) mg/L | <0.006 | MR-0311-2013- | 6.80 | 5.26 - 7.12 | | |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.236 | 0.188 - 0.254 | | |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.215 | 0.188 - 0.254 | 0.0005 | 0.0005 |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.196 | 0.188 - 0.254 | | |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.215 | 0.188 - 0.254 | | |
| Antimoine dissous (Sb) mg/L | <0.0001 | MR-0311-2013- | 0.206 | 0.188 - 0.254 | | |
| Antimoine dissous (Sb) mg/L | <0.0001 | MR-0311-2013- | 0.236 | 0.188 - 0.254 | | |
| Antimoine dissous (Sb) mg/L | <0.0001 | MR-0311-2013- | 0.194 | 0.188 - 0.254 | | |
| Argent (Ag) mg/L | <0.0002 | | | | <0.0002 | <0.0002 |
| Argent (Ag) mg/L | <0.0002 | | | | | |
| Argent dissous (Ag) mg/L | <0.0002 | | | | | |
| Arsenic (As) mg/L | <0.0005 | R-0311-2013-2 | 0.309 | 0.198 - 0.368 | | |
| Arsenic (As) mg/L | <0.0005 | R-0311-2013-2 | 0.317 | 0.198 - 0.368 | | |
| Arsenic (As) mg/L | <0.0005 | R-0311-2013-2 | 0.309 | 0.198 - 0.368 | 1 | 0.2979 |

Lab number: 134133:134142

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# Quality control Report

Company: **Agnico Eagle Meliadine**
Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** Multiple
Date received: 17-juil-13
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Standard | | | | Sample duplicate | |
|---|---|---|---|---|---|---|
| | Limit | Nom | Obtenue | Intervalle | 1 | 2 |
| Arsenic dissous (As) mg/L | <0.0005 | MR-0311-2013- | 0.306 | 0.236 - 0.372 | | |
| Arsenic dissous (As) mg/L | <0.0005 | MR-0311-2013- | 0.307 | 0.236 - 0.372 | | |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.10 | 4.44 - 6.00 | | |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.50 | 4.44 - 6.00 | 0.51 | 0.44 |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.10 | 4.44 - 6.00 | 19.1 | 18.6 |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.50 | 4.44 - 6.00 | | |
| Baryum (Ba) mg/L | <0.0005 | R-0311-2013-2 | 2.2 | 2.0 - 2.8 | 0.1069 | 0.1073 |
| Baryum (Ba) mg/L | <0.0005 | R-0311-2013-2 | 2.0 | 2.0 - 2.8 | | |
| Baryum (Ba) mg/L | <0.0005 | R-0311-2013-2 | 2.2 | 2.0 - 2.8 | | |
| Baryum dissous (Ba) mg/L | <0.0005 | MR-0311-2013- | 2.30 | 2.04 - 2.76 | | |
| Baryum dissous (Ba) mg/L | <0.0005 | MR-0311-2013- | 2.09 | 2.04 - 2.76 | | |
| Béryllium (Be) mg/L | <0.0005 | R-0311-2013-2 | 2.0 | 1.4 - 2.0 | | |
| Béryllium (Be) mg/L | <0.0005 | R-0311-2013-2 | 2.0 | 1.4 - 2.0 | <0.0005 | <0.0005 |
| Béryllium dissous (Be) mg/L | <0.0005 | MR-0311-2013- | 1.8 | 1.4 - 2.0 | | |
| Béryllium dissous (Be) mg/L | <0.0005 | MR-0311-2013- | 1.7 | 1.4 - 2.0 | | |
| Bismuth dissous (Bi) mg/L | <0.0005 | | | | | |
| Bismuth (Bi) mg/L | <0.0005 | | | | | |
| Bismuth (Bi) mg/L | <0.0005 | | | | <0.0005 | <0.0005 |
| Bore (B) mg/L | <0.01 | R-0311-2013-2 | 2.90 | 2.45 - 3.31 | | |
| Bore (B) mg/L | <0.01 | R-0311-2013-2 | 2.70 | 2.45 - 3.31 | | |

Lab number: 134133:134142



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# Quality control Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bore (B) mg/L | <0.01 | DMR-0311-20 | 3 | 2.45 - 3.31 | | | |
| Bore (B) mg/L | <0.01 | DMR-0311-20 | 2.7 | 2.45 - 3.31 | | 2 | 1.8 |
| Bore dissous (B) mg/L | <0.01 | DMR-0311-20 | 2.9 | 2.66 - 3.10 | | | |
| Bore dissous (B) mg/L | <0.01 | DMR-0311-20 | 2.7 | 2.66 - 3.10 | | | |
| Cadmium (Cd) mg/L | <0.00002 | DMR-0311-20 | 0.9 | 0.8 - 1.0 | | 0.00009 | 0.00004 |
| Cadmium (Cd) mg/L | <0.00002 | DMR-0311-20 | 1 | 0.8 - 1.0 | | | |
| Cadmium (Cd) mg/L | <0.00002 | DMR-0311-20 | 0.9 | 0.8 - 1.0 | | | |
| Cadmium dissous (Cd) mg/L | <0.00002 | DMR-0311-20 | 0.9 | 0.8 - 1.0 | | | |
| Calcium (Ca) mg/L | <0.03 | DMR-0311-20 | 10 | 12-sept | | 2735 | 2592 |
| Calcium (Ca) mg/L | <0.03 | DMR-0311-20 | 10 | 12-sept | | | |
| Calcium dissous (Ca) mg/L | <0.03 | DMR-0311-20 | 12 | 12-sept | | | |
| Calcium dissous (Ca) mg/L | <0.03 | DMR-0311-20 | 11 | 12-sept | | | |
| Chlorure (Cl) mg/L | <0.5 | DMR-0446-20 | 100 | 87 - 111 | | 35467 | 36902 |
| Chlorure (Cl) mg/L | <0.5 | DMR-0446-20 | 100 | 87 - 111 | | | |
| Chrome (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.08 | 3.44 - 4.66 | | 0.0062 | 0.0048 |
| Chrome (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.22 | 3.44 - 4.66 | | | |
| Chrome (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.08 | 3.44 - 4.66 | | | |
| Chrome dissous (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.12 | 3.44 - 4.66 | | | |
| Chrome dissous (Cr) mg/L | <0.0006 | DMR-0311-20 | 3.99 | 3.44 - 4.66 | | | |
| Cobalt (Co) mg/L | <0.0005 | DMR-0311-20 | 1.64 | 1.33 - 1.79 | | 0.0084 | 0.0079 |



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Alkalinity mg CaCO3/L | 57 | 46 | 66 | 27 | 26 | 52 | 35 | 36 |
| Aluminium (Al) mg/L | 0.082 | 0.262 | 0.895 | <0.006 | 0.023 | 0.006 | 0.041 | <0.006 |
| Dissolved Aluminium (Al) mg/L | 0.017 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Antimony (Sb) mg/L | 0.0032 | 0.0017 | 0.0059 | 0.0005 | 0.0009 | 0.0031 | 0.0005 | 0.0020 |
| Dissolved Antimony (Sb) mg/L | 0.0038 | 0.0010 | 0.0059 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver (Ag) mg/L | <0.0002 | <0.0002 | 0.0004 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Dissolved Silver (Ag) mg/L | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic (As) mg/L | 0.9322 | 0.3311 | 1.007 | 0.2301 | 0.2657 | 1.143 | 0.2851 | 0.3137 |
| Dissolved Arsenic (As) mg/L | 0.9444 | 0.3482 | 0.9768 | 0.2275 | 0.2312 | 0.9649 | 0.2529 | 0.2705 |
| Ammonia nitrogen (NH3-NH4) mg | 13.3 | 3.0 | 0.25 | 4.6 | 4.2 | 11.5 | 4.7 | 4.7 |
| Barium (Ba) mg/L | 0.3954 | 0.5642 | 0.5464 | 0.1135 | 0.2090 | 0.5701 | 0.1069 | 0.0894 |
| Dissolved Barium (Ba) mg/L | 0.4064 | 0.6060 | 0.5264 | 0.1219 | 0.2290 | 0.6188 | 0.1118 | 0.0943 |
| Beryllium (Be) mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Dissolved Beryllium (Be) mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| dissolved bismuth mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Bismuth (Bi) mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Boron (B) mg/L | 10.7 | 9.3 | 11.0 | 4.1 | 3.8 | 6.0 | 2.0 | 6.1 |
| Dissolved Boron (B) mg/L | 11.0 | 8.7 | 10.8 | 3.6 | 3.5 | 5.8 | 1.5 | 1.8 |
| Cadmium (Cd) mg/L | 0.00015 | 0.00035 | 0.00029 | 0.00015 | 0.00005 | 0.00016 | 0.00009 | 0.00005 |
| Dissolved Cadmium (Cd) mg/L | 0.00018 | 0.00018 | 0.00021 | 0.00011 | 0.00020 | 0.00032 | 0.00011 | 0.00014 |

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Reported on: August 27, 2013

F-02-13
Version 2ième: 18/10/2006



125, boul Industriel, Rouyn-Noranda (Québec) J9X 6P2 ● Tél: (819) 797-0550 ● Fax:(819) 797-2155 ● Courriel: multilab@cablevision.qc.ca ● www.multilab-direct.com

# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Calcium (Ca) mg/L | 17680 | 8235 | 20915 | 3359 | 4080 | 18071 | 2971 | 3084 |
| Dissolved Calcium (Ca) mg/L | 952 | 297 | 942 | 3609 | 3702 | 17573 | 2589 | 2614 |
| Chloride mg/L | 51341 | 36505 | 47603 | 34319 | 32931 | 50636 | 35467 | 35203 |
| Chromium (Cr) mg/L | 0.0244 | 0.0527 | 0.2090 | 0.0057 | 0.0076 | 0.0241 | 0.0062 | 0.0184 |
| Dissolved Chromium (Cr) mg/L | 0.0380 | 0.0388 | 0.2138 | 0.0055 | 0.0060 | 0.0228 | 0.0033 | 0.0166 |
| Cobalt (Co) mg/L | 0.0465 | 0.0184 | 0.0511 | 0.0076 | 0.0101 | 0.0539 | 0.0084 | 0.0084 |
| Conductivity µmhos/cm | 30590 | 35370 | 36240 | 36290 | 34150 | 33370 | 29220 | 29350 |
| Copper (Cu) mg/L | 0.0305 | 0.1299 | 0.0321 | 0.2299 | 0.2139 | 0.0533 | 0.3005 | 0.3054 |
| Dissolved Copper (Cu) mg/L | 0.0296 | 0.1200 | 0.0163 | 0.2097 | 0.2126 | 0.0486 | 0.2698 | 0.2735 |
| Tin (Sn) mg/L | <0.001 | 0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| dissolved Tin (Sn) mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Iron (Fe) mg/L | 1.5 | 12.7 | 31.7 | 9.1 | 4.7 | 1.0 | 11.8 | 10.3 |
| Dissolved Iron (Fe) mg/L | 0.90 | 0.29 | 0.94 | 0.20 | 0.07 | 0.40 | 0.06 | 0.37 |
| Fluoride (F) mg/L | 0.09 | 0.12 | 0.06 | 0.15 | 0.16 | 0.09 | 0.15 | 0.13 |
| Lithium (Li) mg/L | 42.77 | 29.54 | 45.31 | 7.92 | 13.92 | 17.19 | 3.72 | 4.95 |
| Dissolved Lithium (Li) mg/L | 29.00 | 21.89 | 37.01 | 7.62 | 12.15 | 32.74 | 2.42 | 3.10 |
| Magnesium (Mg) mg/L | 29.7 | 1296 | 37.4 | 2049 | 1424 | 187 | 1570 | 1366 |
| Dissolved Magnesium (Mg) mg/L | 28.7 | 1147 | 34.2 | 2202 | 1412 | 186 | 1453 | 1295 |
| Manganese (Mn) mg/L | 0.1950 | 0.7902 | 0.2948 | 0.8540 | 0.7099 | 0.1936 | 0.6621 | 0.6961 |
| Dissolved Manganese (Mn) mg/L | 0.1840 | 0.8469 | 0.1495 | 0.7270 | 0.7314 | 0.1908 | 0.6379 | 0.6884 |

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Reported on: August 27, 2013

F-02-13
Version 2ième: 18/10/2006



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Mercury (Hg) mg/L | 0.00040 | <0.00001 | 0.00095 | <0.00001 | <0.00001 | 0.00145 | <0.00001 | 0.00020 |
| Dissolved Mercury (Hg) mg/L | 0.0005 | 0.0003 | 0.0005 | 0.0002 | 0.0001 | 0.0009 | 0.0001 | 0.0001 |
| Molybdenum (Mo) mg/L | 0.0182 | 0.0124 | 0.0213 | 0.0039 | 0.0070 | 0.0485 | 0.0042 | 0.0074 |
| Dissolved Molybdenum (Mo) mg/ | 0.0204 | 0.0126 | 0.0211 | 0.0030 | 0.0072 | 0.0514 | 0.0031 | 0.0036 |
| Nickel (Ni) mg/L | 1.202 | 0.4294 | 1.356 | 0.1700 | 0.2502 | 1.495 | 0.2114 | 0.2161 |
| Dissolved Nickel (Ni) mg/L | 1.267 | 0.3412 | 1.304 | 0.0877 | 0.2067 | 1.133 | 0.1549 | 0.1644 |
| Nitrate (NO3) mg N/L | 0.25 | 0.66 | 3.7 | 0.37 | 0.11 | 0.85 | 0.03 | 0.01 |
| Nitrite (NO2) mg N/L | 0.04 | 0.03 | 0.05 | 0.03 | 0.02 | 0.04 | 0.03 | 0.02 |
| Nitrite-Nitrate mg N/L | 0.29 | 0.69 | 3.8 | 0.40 | 0.13 | 0.89 | 0.06 | 0.03 |
| pH | 8.31 | 7.91 | 8.12 | 6.41 | 7.02 | 8.03 | 6.83 | 6.48 |
| Dissolved Phosphorus (P) mg P/L | 0.20 | 0.12 | 0.63 | <0.01 | <0.01 | 0.46 | <0.01 | <0.01 |
| Total Phosphorus (P) mg P/L | 0.43 | 0.13 | 0.76 | 0.02 | <0.01 | 0.49 | <0.01 | <0.01 |
| Lead (Pb) mg/L | 0.0021 | 0.0059 | 0.0250 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 |
| Dissolved Lead (Pb) mg/L | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | <0.0003 |
| Potassium (K) mg/L | 1562 | 579 | 1557 | 331 | 278 | 943 | 275 | 362 |
| Dissolved Potassium (K) mg/L | 1292 | 481 | 1469 | 362 | 282 | 939 | 258 | 346 |
| Selenium (Se) mg/L | 3.36 | 1.12 | 3.58 | 0.737 | 0.865 | 4.07 | 0.935 | 1.00 |
| Dissolved Selenium (Se) mg/L | 3.44 | 1.17 | 3.56 | 0.758 | 0.788 | 3.45 | 0.816 | 0.881 |
| Silica (Si) mg/L | 1.2 | 2.7 | 9.2 | 2.2 | 1.3 | 0.97 | 2.0 | 1.8 |
| dissolved silica (Si) mg/L | 1.6 | 2.2 | 8.3 | 2.3 | 0.99 | 0.88 | 1.3 | 1.5 |

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F-02-13
Version 2ième: 18/10/2006



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Sodium (Na) mg/L | 4208 | 9864 | 1256 | 17522 | 12886 | 2965 | 14205 | 12046 |
| Dissolved Sodium (Na) mg/L | 4508 | 12168 | 11109 | 15766 | 13289 | 3127 | 13677 | 11983 |
| Dissolved Solids mg/L | 20393 | 23580 | 24160 | 24193 | 22766 | 22246 | 19480 | 19566 |
| Strontium (Sr) mg/L | 565 | 326 | 576 | 108 | 153 | 437 | 72.52 | 103 |
| dissolved Strontium (Sr) mg/L | 545 | 297 | 544 | 114 | 151 | 515 | 69.91 | 89.44 |
| Sulfate (SO4) mg SO4/L | 407 | 1934 | 907 | 3261 | 2818 | 388 | 3428 | 3107 |
| Sulfides mg S2-/L | 4.6 | 2.1 | 4.0 | 0.35 | 0.40 | 2.2 | 0.23 | 0.23 |
| Tellurium (Te) mg/L | 0.0479 | <0.0005 | 0.0528 | <0.0005 | 0.0014 | 0.0531 | 0.0030 | 0.0080 |
| Dissolved Tellurium (Te) mg/L | 0.0774 | <0.0005 | 0.0826 | <0.0005 | <0.0005 | 0.0210 | <0.0005 | <0.0005 |
| Thallium (Tl) mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dissolved thallium (Tl) mg/L | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Titanium (Ti) mg/L | 10.7 | 2.3 | 9.7 | 1.2 | 1.4 | 5.7 | 1.2 | 1.2 |
| Dissolved titanium (Ti) mg/L | 8.9 | 2.3 | 10.1 | 1.4 | 1.5 | 6.1 | 1.2 | 1.3 |
| Vanadium (V) mg/L | <0.0005 | <0.0005 | 0.0025 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Dissolved Vanadium mg/L | <0.0005 | <0.0005 | 0.0031 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Zinc (Zn) mg/L | 3.98 | 1.46 | 6.56 | 0.364 | 0.470 | 0.296 | 0.595 | 0.311 |
| Dissolved Zinc mg/L | 1.57 | 0.979 | 0.716 | 0.367 | 0.327 | 0.208 | 0.436 | 0.229 |
| Tungsten (W) mg/L | 0.087 | 0.058 | 0.100 | 0.038 | 0.028 | 0.141 | 0.043 | 0.025 |
| dissolved Tungsten (W) mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.005 | <0.005 |
| Total organic carbon (TOC) mg/L | 2300 | 5400 | 26000 | 240 | 900 | 3100 | 220 | 12 |

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F-02-13
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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134133 | 134134 | 134135 | 134136 | 134137 | 134138 | 134139 | 134140 |
|---|---|---|---|---|---|---|---|---|
| Sample name: | INT-1 | INT-2 | INT-2A | INT-3 | INT-3A | INT-4 | INT-4A | INT-5 |
| Sampling date: | 15-07-2013 | 14-07-2013 | 15-07-2013 | 14-07-2013 | 15-07-2013 | 15-07-2013 | 15-07-2013 | 14-07-2013 |
| Zirconium dissous (Zr) mg/L | <1 | <0.1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Zirconium (Zr) mg/L | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 | <0.500 |
| Bromides mg/L | 729 | 247 | 699 | 181 | 176 | 594 | 140 | 154 |
| Total Suspended Solids mg/L | --- | 72 | 311 | 23 | 35 | 17 | 35 | 26 |
| Azote ammoniacal (NH3-NH4) Re | --- | --- | --- | --- | --- | --- | --- | 5.1 |

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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Alkalinity mg CaCO3/L | 46 | 100 |
| Aluminium (Al) mg/L | <0.006 | 0.065 |
| Dissolved Aluminium (Al) mg/L | <0.006 | <0.006 |
| Antimony (Sb) mg/L | 0.0007 | 0.0045 |
| Dissolved Antimony (Sb) mg/L | <0.0001 | <0.0001 |
| Silver (Ag) mg/L | <0.0002 | <0.0002 |
| Dissolved Silver (Ag) mg/L | <0.0002 | <0.0002 |
| Arsenic (As) mg/L | 0.2940 | 0.1317 |
| Dissolved Arsenic (As) mg/L | 0.2514 | 0.1077 |
| Ammonia nitrogen (NH3-NH4) mg | 4.9 | 0.51 |
| Barium (Ba) mg/L | 0.0318 | 0.0570 |
| Dissolved Barium (Ba) mg/L | 0.0328 | 0.0576 |
| Beryllium (Be) mg/L | <0.0005 | <0.0005 |
| Dissolved Beryllium (Be) mg/L | <0.0005 | <0.0005 |
| dissolved bismuth mg/L | <0.0005 | <0.0005 |
| Bismuth (Bi) mg/L | <0.0005 | <0.0005 |
| Boron (B) mg/L | 1.4 | 1.3 |
| Dissolved Boron (B) mg/L | 0.96 | 1.2 |
| Cadmium (Cd) mg/L | 0.00004 | 0.00032 |
| Dissolved Cadmium (Cd) mg/L | 0.00013 | 0.00015 |

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Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Calcium (Ca) mg/L | 2599 | 1631 |
| Dissolved Calcium (Ca) mg/L | 1959 | 1936 |
| Chloride mg/L | 37902 | 5330 |
| Chromium (Cr) mg/L | 0.0023 | 1.799 |
| Dissolved Chromium (Cr) mg/L | 0.0027 | 1.715 |
| Cobalt (Co) mg/L | 0.0065 | 0.0078 |
| Conductivity µmhos/cm | 34870 | 2620 |
| Copper (Cu) mg/L | 0.3362 | 0.0482 |
| Dissolved Copper (Cu) mg/L | 0.3103 | 0.0069 |
| Tin (Sn) mg/L | <0.001 | 0.012 |
| dissolved Tin (Sn) mg/L | <0.001 | 0.002 |
| Iron (Fe) mg/L | 9.4 | 1.8 |
| Dissolved Iron (Fe) mg/L | 0.04 | 0.04 |
| Fluoride (F) mg/L | 0.11 | 0.07 |
| Lithium (Li) mg/L | 3.01 | 2.76 |
| Dissolved Lithium (Li) mg/L | 1.82 | 1.61 |
| Magnesium (Mg) mg/L | 1411 | 21.9 |
| Dissolved Magnesium (Mg) mg/L | 1305 | 23.3 |
| Manganese (Mn) mg/L | 0.7188 | 0.0980 |
| Dissolved Manganese (Mn) mg/L | 0.7137 | 0.0369 |

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Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Mercury (Hg) mg/L | 0.00010 | <0.00001 |
| Dissolved Mercury (Hg) mg/L | 0.0001 | <0.0001 |
| Molybdenum (Mo) mg/L | 0.0041 | 0.0042 |
| Dissolved Molybdenum (Mo) mg/ | 0.0025 | 0.0016 |
| Nickel (Ni) mg/L | 0.1657 | 0.3220 |
| Dissolved Nickel (Ni) mg/L | 0.1280 | 0.2367 |
| Nitrate (NO3) mg N/L | 0.12 | 0.03 |
| Nitrite (NO2) mg N/L | 0.03 | 0.11 |
| Nitrite-Nitrate mg N/L | 0.15 | 0.14 |
| pH | 6.58 | 7.15 |
| Dissolved Phosphorus (P) mg P/L | <0.01 | <0.01 |
| Total Phosphorus (P) mg P/L | 0.05 | 4.9 |
| Lead (Pb) mg/L | 0.0031 | 0.1081 |
| Dissolved Lead (Pb) mg/L | <0.0003 | <0.0003 |
| Potassium (K) mg/L | 336 | 81.0 |
| Dissolved Potassium (K) mg/L | 314 | 82.8 |
| Selenium (Se) mg/L | 0.964 | 0.406 |
| Dissolved Selenium (Se) mg/L | 0.828 | 0.392 |
| Silica (Si) mg/L | 1.4 | 129 |
| dissolved silica (Si) mg/L | 1.0 | 120 |

**Corrected certificat, replacing the multiple certificate done on august 12 2013.**

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Jean-François Bouffard
J'approuve le certificat
2013.08.27 16:16:50 -04'00'

Reported on: August 27, 2013

F-02-13
Version 2ième: 18/10/2006



125, boul Industriel, Rouyn-Noranda (Québec) J9X 6P2 ● Tél: (819) 797-0550 ● Fax:(819) 797-2155 ● Courriel: multilab@cablevision.qc.ca ● www.multilab-direct.com

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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Sodium (Na) mg/L | 12489 | 189 |
| Dissolved Sodium (Na) mg/L | 12011 | 209 |
| Dissolved Solids mg/L | 23246 | 1746 |
| Strontium (Sr) mg/L | 73.67 | 31.53 |
| dissolved Strontium (Sr) mg/L | 63.78 | 35.03 |
| Sulfate (SO4) mg SO4/L | 3766 | 44 |
| Sulfides mg S2-/L | 0.28 | 0.04 |
| Tellurium (Te) mg/L | 0.0047 | 0.0029 |
| Dissolved Tellurium (Te) mg/L | <0.0005 | <0.0005 |
| Thallium (Tl) mg/L | <0.005 | <0.005 |
| Dissolved thallium (Tl) mg/L | <0.005 | <0.005 |
| Titanium (Ti) mg/L | 1.2 | 0.95 |
| Dissolved titanium (Ti) mg/L | 1.2 | 0.52 |
| Vanadium (V) mg/L | <0.0005 | 0.4984 |
| Dissolved Vanadium mg/L | <0.0005 | 0.4762 |
| Zinc (Zn) mg/L | 0.353 | 265 |
| Dissolved Zinc mg/L | 0.208 | 1.24 |
| Tungsten (W) mg/L | 0.014 | <0.005 |
| dissolved Tungsten (W) mg/L | <0.005 | <0.005 |
| Total organic carbon (TOC) mg/L | 370 | 260000 |

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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Lab number: | 134141 | 134142 |
|---|---|---|
| Sample name: | INT-5A | Glycol |
| Sampling date: | 15-07-2013 | 15-07-2013 |
| Zirconium dissous (Zr) mg/L | <1 | <1 |
| Zirconium (Zr) mg/L | <0.500 | <0.500 |
| Bromides mg/L | 156 | --- |
| Total Suspended Solids mg/L | 31 | 689 |
| Azote ammoniacal (NH3-NH4) Re | --- | --- |

**Corrected certificat, replacing the multiple certificate done on august 12 2013.**

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Reported on: August 27, 2013

F-02-13
Version 2ième: 18/10/2006



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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit Valeur | | |
|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 |
| Aluminium (Al) | 0.006 | mg/L | M-MET-3.0 |
| Dissolved Aluminium (Al) | 0.006 | mg/L | M-MET-3.0 |
| Antimony (Sb) | 0.0001 | mg/L | M-MET-3.0 |
| Dissolved Antimony (Sb) | 0.0001 | mg/L | M-MET-3.0 |
| Silver (Ag) | 0.0001 | mg/L | M-MET-3.0 |
| Dissolved Silver (Ag) | 0.0001 | mg/L | M-MET-3.0 |
| Arsenic (As) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Arsenic (As) | 0.0005 | mg/L | M-MET-3.0 |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | M-NH3-2.0 |
| Barium (Ba) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Barium (Ba) | 0.0005 | mg/L | M-MET-3.0 |
| Beryllium (Be) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Beryllium (Be) | 0.0005 | mg/L | M-MET-3.0 |
| dissolved bismuth | 0.0005 | mg/L | M-MET-3.0 |
| Bismuth (Bi) | 0.0005 | mg/L | M-MET-3.0 |
| Boron (B) | 0.01 | mg/L | M-MET-3.0 |
| Dissolved Boron (B) | 0.01 | mg/L | M-MET-3.0 |
| Cadmium (Cd) | 0.00002 | mg/L | M-MET-3.0 |
| Dissolved Cadmium (Cd) | 0.00002 | mg/L | M-MET-3.0 |

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# Results summary

Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit / Valeur | | |
|---|---|---|---|
| Calcium (Ca) | 0.03 | mg/L | M-MET-3.0 |
| Dissolved Calcium (Ca) | 0.03 | mg/L | M-MET-3.0 |
| Chloride | 0.5 | mg/L | M-CL-2.0 |
| Chromium (Cr) | 0.0006 | mg/L | M-MET-3.0 |
| Dissolved Chromium (Cr) | 0.0006 | mg/L | M-MET-3.0 |
| Cobalt (Co) | 0.0005 | mg/L | M-MET-3.0 |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 |
| Copper (Cu) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Copper (Cu) | 0.0005 | mg/L | M-MET-3.0 |
| Tin (Sn) | 0.001 | mg/L | M-MET-3.0 |
| dissolved Tin (Sn) | 0.001 | mg/L | M-MET-3.0 |
| Iron (Fe) | 0.01 | mg/L | M-MET-3.0 |
| Dissolved Iron (Fe) | 0.01 | mg/L | M-MET-3.0 |
| Fluoride (F) | 0.02 | mg/L | M-CI-1.0 |
| Lithium (Li) | 0.005 | mg/L | M-MET-3.0 |
| Dissolved Lithium (Li) | 0.005 | mg/L | M-MET-3.0 |
| Magnesium (Mg) | 0.02 | mg/L | M-MET-3.0 |
| Dissolved Magnesium (Mg) | 0.02 | mg/L | M-MET-3.0 |
| Manganese (Mn) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Manganese (Mn) | 0.0005 | mg/L | M-MET-3.0 |

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# Results summary


Client: **Agnico Eagle Meliadine**
Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit / Valeur | | |
|---|---|---|---|
| Mercury (Hg) | 0.00001 | mg/L | M-MET-3.0 |
| Dissolved Mercury (Hg) | 0.0001 | mg/L | M-MET-3.0 |
| Molybdenum (Mo) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Molybdenum (Mo) | 0.0005 | mg/L | M-MET-3.0 |
| Nickel (Ni) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Nickel (Ni) | 0.0005 | mg/L | M-MET-3.0 |
| Nitrate (NO3) | 0.01 | mg N/L | M-NITR-2.0 |
| Nitrite (NO2) | 0.01 | mg N/L | M-NITR-2.0 |
| Nitrite-Nitrate | 0.01 | mg N/L | M-NITR-2.0 |
| pH | N.D. | | M-TIT-1.0 |
| Dissolved Phosphorus (P) | 0.01 | mg P/L | M-P-3.0 |
| Total Phosphorus (P) | 0.01 | mg P/L | M-P-3.0 |
| Lead (Pb) | 0.0003 | mg/L | M-MET-3.0 |
| Dissolved Lead (Pb) | 0.0003 | mg/L | M-MET-3.0 |
| Potassium (K) | 0.05 | mg/L | M-MET-3.0 |
| Dissolved Potassium (K) | 0.05 | mg/L | M-MET-3.0 |
| Selenium (Se) | 0.001 | mg/L | M-MET-3.0 |
| Dissolved Selenium (Se) | 0.001 | mg/L | M-MET-3.0 |
| Silica (Si) | 0.01 | mg/L | M-MET-3.0 |
| dissolved silica (Si) | 0.01 | mg/L | M-MET-3.0 |

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Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Detection limit Valeur | | |
|---|---|---|---|
| Sodium (Na) | 0.05 | mg/L | M-MET-3.0 |
| Dissolved Sodium (Na) | 0.05 | mg/L | M-MET-3.0 |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 |
| Strontium (Sr) | 0.005 | mg/L | M-MET-3.0 |
| dissolved Strontium (Sr) | 0.005 | mg/L | M-MET-3.0 |
| Sulfate (SO4) | 0.6 | mg SO4/L | M-SULF-2.0 |
| Sulfides | 0.03 | mg S2-/L | M-SULF-3.0 |
| Tellurium (Te) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Tellurium (Te) | 0.0005 | mg/L | M-MET-3.0 |
| Thallium (Tl) | 0.005 | mg/L | M-MET-3.0 |
| Dissolved thallium (Tl) | 0.005 | mg/L | M-MET-3.0 |
| Titanium (Ti) | 0.01 | mg/L | M-MET-3.0 |
| Dissolved titanium (Ti) | 0.01 | mg/L | M-MET-3.0 |
| Vanadium (V) | 0.0005 | mg/L | M-MET-3.0 |
| Dissolved Vanadium | 0.0005 | mg/L | M-MET-3.0 |
| Zinc (Zn) | 0.001 | mg/L | M-MET-3.0 |
| Dissolved Zinc | 0.001 | mg/L | M-MET-3.0 |
| Tungsten (W) | 0.005 | mg/L | M-MET-3.0 |
| dissolved Tungsten (W) | 0.005 | mg/L | M-MET-3.0 |
| Bromides | 0.01 | mg/L | M-MET-3.0 |

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# Results summary

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Company: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

Date received: July 17, 2013
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Valeur | Detection limit | | |
|---|---|---|---|---|
| Total Suspended Solids | 1 | | mg/L | M-SOLI-1.0 |
| Azote ammoniacal (NH3-NH4) Re | N.D. | | mg N/L | M-NH3-2.0 |

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# Quality control Report

Company: **Agnico Eagle Meliadine**
Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** Multiple
Date received: 17-juil-13
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Standard | | | | Sample duplicate | |
|---|---|---|---|---|---|---|
| | Limit | Nom | Obtenue | Intervalle | 1 | 2 |
| Alcalinité mg CaCO3/L | | alinité 22-02-2( | 196 | 170 - 230 | | |
| Alcalinité mg CaCO3/L | | alinité 22-02-2( | 196 | 170 - 230 | 27 | 27 |
| Aluminium (Al) mg/L | <0.006 | R-0311-2013-2 | 7.07 | 5.26 - 7.12 | | |
| Aluminium (Al) mg/L | <0.006 | R-0311-2013-2 | 7.07 | 5.26 - 7.12 | 0.041 | 0.031 |
| Aluminium (Al) mg/L | <0.006 | R-0311-2013-2 | 6.57 | 5.26 - 7.12 | | |
| Aluminium dissous (Al) mg/L | <0.006 | MR-0311-2013- | 6.77 | 5.26 - 7.12 | | |
| Aluminium dissous (Al) mg/L | <0.006 | MR-0311-2013- | 6.80 | 5.26 - 7.12 | | |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.215 | 0.188 - 0.254 | 0.0005 | 0.0005 |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.236 | 0.188 - 0.254 | | |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.215 | 0.188 - 0.254 | | |
| Antimoine (Sb) mg/L | <0.0001 | R-0311-2013-2 | 0.196 | 0.188 - 0.254 | | |
| Antimoine dissous (Sb) mg/L | <0.0001 | MR-0311-2013- | 0.206 | 0.188 - 0.254 | | |
| Antimoine dissous (Sb) mg/L | <0.0001 | MR-0311-2013- | 0.194 | 0.188 - 0.254 | | |
| Antimoine dissous (Sb) mg/L | <0.0001 | MR-0311-2013- | 0.236 | 0.188 - 0.254 | | |
| Argent (Ag) mg/L | <0.0002 | | | | | |
| Argent (Ag) mg/L | <0.0002 | | | | <0.0002 | <0.0002 |
| Argent dissous (Ag) mg/L | <0.0002 | | | | | |
| Arsenic (As) mg/L | <0.0005 | R-0311-2013-2 | 0.317 | 0.198 - 0.368 | | |
| Arsenic (As) mg/L | <0.0005 | R-0311-2013-2 | 0.309 | 0.198 - 0.368 | 0.2851 | 0.2979 |
| Arsenic (As) mg/L | <0.0005 | R-0311-2013-2 | 0.309 | 0.198 - 0.368 | | |

Lab number: 134133:134142

**Corrected certificat, replacing the multiple certificate done on august 12 2013.**

Jean-François Bouffard
J'approuve le certificat
2013.08.27 16:16:53 -04'00'

Results relate only to the sample tested.
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All samples will be disposed of after 30 days following analysis.

Reported on: August 27, 2013



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# Quality control Report

Company: **Agnico Eagle Meliadine**
Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** Multiple
Date received: 17-juil-13
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Standard | | | | Sample duplicate | |
|---|---|---|---|---|---|---|
| | Limit | Nom | Obtenue | Intervalle | 1 | 2 |
| Arsenic dissous (As) mg/L | <0.0005 | MR-0311-2013- | 0.307 | 0.236 - 0.372 | | |
| Arsenic dissous (As) mg/L | <0.0005 | MR-0311-2013- | 0.306 | 0.236 - 0.372 | | |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.10 | 4.44 - 6.00 | 19.1 | 18.6 |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.50 | 4.44 - 6.00 | 0.51 | 0.44 |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.10 | 4.44 - 6.00 | | |
| Azote ammoniacal (NH3-NH4) mg N/L | <0.01 | R-0446-2013-M | 5.50 | 4.44 - 6.00 | | |
| Baryum (Ba) mg/L | <0.0005 | R-0311-2013-2 | 2.0 | 2.0 - 2.8 | | |
| Baryum (Ba) mg/L | <0.0005 | R-0311-2013-2 | 2.2 | 2.0 - 2.8 | 0.1069 | 0.1073 |
| Baryum (Ba) mg/L | <0.0005 | R-0311-2013-2 | 2.2 | 2.0 - 2.8 | | |
| Baryum dissous (Ba) mg/L | <0.0005 | MR-0311-2013- | 2.30 | 2.04 - 2.76 | | |
| Baryum dissous (Ba) mg/L | <0.0005 | MR-0311-2013- | 2.09 | 2.04 - 2.76 | | |
| Béryllium (Be) mg/L | <0.0005 | R-0311-2013-2 | 2.0 | 1.4 - 2.0 | | |
| Béryllium (Be) mg/L | <0.0005 | R-0311-2013-2 | 2.0 | 1.4 - 2.0 | <0.0005 | <0.0005 |
| Béryllium dissous (Be) mg/L | <0.0005 | MR-0311-2013- | 1.7 | 1.4 - 2.0 | | |
| Béryllium dissous (Be) mg/L | <0.0005 | MR-0311-2013- | 1.8 | 1.4 - 2.0 | | |
| Bismuth dissous (Bi) mg/L | <0.0005 | | | | | |
| Bismuth (Bi) mg/L | <0.0005 | | | | <0.0005 | <0.0005 |
| Bismuth (Bi) mg/L | <0.0005 | | | | | |
| Bore (B) mg/L | <0.01 | R-0311-2013-2 | 3.00 | 2.45 - 3.31 | | |
| Bore (B) mg/L | <0.01 | R-0311-2013-2 | 2.70 | 2.45 - 3.31 | | |

Lab number: 134133:134142

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All samples will be disposed of after 30 days following analysis.

Reported on: August 27, 2013



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# Quality control Report

Company: **Agnico Eagle Meliadine**
Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** Multiple
Date received: 17-juil-13
Sampled by: Mélissa Tremblay
Matrix: Underground Water

| Parameter | Limit | Standard Nom | Standard Obtenue | Standard Intervalle | Sample duplicate 1 | Sample duplicate 2 |
|---|---|---|---|---|---|---|
| Bore (B) mg/L | <0.01 | DMR-0311-20 | 2.7 | 2.45 - 3.31 | 2 | 1.8 |
| Bore (B) mg/L | <0.01 | DMR-0311-20 | 2.9 | 2.45 - 3.31 | | |
| Bore dissous (B) mg/L | <0.01 | DMR-0311-20 | 2.9 | 2.66 - 3.10 | | |
| Bore dissous (B) mg/L | <0.01 | DMR-0311-20 | 2.7 | 2.66 - 3.10 | | |
| Bromures mg/L | <0.01 | DMR-0835-20 | 0.88 | 0.740 - 1.001 | | |
| Bromures mg/L | <0.01 | DMR-0835-20 | 0.86 | 0.740 - 1.001 | | |
| Cadmium (Cd) mg/L | <0.00002 | DMR-0311-20 | 0.9 | 0.8 - 1.0 | | |
| Cadmium (Cd) mg/L | <0.00002 | DMR-0311-20 | 1 | 0.8 - 1.0 | | |
| Cadmium (Cd) mg/L | <0.00002 | DMR-0311-20 | 0.9 | 0.8 - 1.0 | 0.00009 | 0.00004 |
| Cadmium dissous (Cd) mg/L | <0.00002 | DMR-0311-20 | 0.9 | 0.8 - 1.0 | | |
| Calcium (Ca) mg/L | <0.03 | DMR-0311-20 | 10 | 12-sept | 2735 | 2592 |
| Calcium (Ca) mg/L | <0.03 | DMR-0311-20 | 10 | 12-sept | | |
| Calcium dissous (Ca) mg/L | <0.03 | DMR-0311-20 | 11 | 12-sept | | |
| Calcium dissous (Ca) mg/L | <0.03 | DMR-0311-20 | 12 | 12-sept | | |
| Chlorure (Cl) mg/L | <0.5 | DMR-0446-20 | 100 | 87 - 111 | 35467 | 36902 |
| Chlorure (Cl) mg/L | <0.5 | DMR-0446-20 | 100 | 87 - 111 | | |
| Chrome (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.08 | 3.44 - 4.66 | 0.0062 | 0.0048 |
| Chrome (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.08 | 3.44 - 4.66 | | |
| Chrome (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.22 | 3.44 - 4.66 | | |
| Chrome dissous (Cr) mg/L | <0.0006 | DMR-0311-20 | 4.12 | 3.44 - 4.66 | | |

Lab number: 134133:134142

**Corrected certificat, replacing the multiple certificate done on august 12 2013.**



Jean-François Bouffard
J'approuve le certificat
2013.08.27 16:16:53 -04'00'

Results relate only to the sample tested.
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All samples will be disposed of after 30 days following analysis.

Reported on: August 27, 2013



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# Analytical Report

Company: **Agnico Eagle Meliadine**


Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000


**Lab number:** V-27840

Sampling location: Westbay
Sampling date: July 07, 2013
Sample name: Interval 3- 07/07
Sampling hour: N/D
Sampled by: N/D
Date received: July 11, 2013
Matrix: Eau souterraine
Drinking water distribution:

Reported on: August 13, 2013

Unless otherwise stated, all samples were received in acceptable condition.

Results relate only to the sample tested.

All samples will be disposed of after 30 days following analysis.

Roger Turmel , Chimiste
J'approuve le certificat
2013.08.13 17:01:48 -04'00'

Sauf indication contraire, tous les échantillons ont été reçus en bon état.

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# Analytical Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Alkalinity | 47 mg CaCO3/L | M-TIT-1.0 | July 11, 2013 |
| Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Arsenic (As) | 0.1759 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Arsenic (As) | 0.1709 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Ammonia nitrogen (NH3-NH4) | 4.3 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Barium (Ba) | 0.1359 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Barium (Ba) | 0.131 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Bismuth (Bi) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Boron (B) | 5.3 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Boron (B) | 4.9 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cadmium (Cd) | 0.00047 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cadmium (Cd) | <0.00002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Calcium (Ca) | 3011 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Dissolved Calcium (Ca) | 3788 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Carbone organique total (C.O.T. | 502 mg/L | M-COT-1.0 | July 11, 2013 |
| Chloride | 34028 mg/L | Sous-traitance\Multilab Direct | August 07, 2013 |
| Chrome (Cr) | 0.0416 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Chromium (Cr) | <0.0006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cobalt (Co) | 0.0084 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cobalt (Co) | 0.0082 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Conductivity | 31570 µmhos/cm | M-TIT-1.0 | July 11, 2013 |
| Copper (Cu) | 0.2523 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Copper (Cu) | 0.1796 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Iron (Fe) | 5.1 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Iron (Fe) | 2.5 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Fluoride (F) | 0.16 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lithium (Li) | 4.89 mg/L | Sous-traitance\Multilab Direct | July 18, 2013 |
| Magnesium (Mg) | 2583 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Magnesium (Mg) | 2402 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Manganese (Mn) | 0.8851 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Manganese (Mn) | 0.8687 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Mercury (Hg) | 0.00007 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |

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# Analytical Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Dissolved Mercury (Hg) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Molybdenum (Mo) | 0.0108 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Molybdenum (Mo) | 0.0017 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nickel (Ni) | 0.1603 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Nickel (Ni) | 0.1454 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nitrate (NO3) | <0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite (NO2) | 0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite-Nitrate | 0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| pH | 6.57 | M-TIT-1.0 | July 11, 2013 |
| Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Potassium (K) | 300 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Potassium (K) | 274 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Selenium (Se) | 0.638 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Selenium (Se) | 0.572 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silica (Si) | 2.1 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| dissolved silica (Si) | 2.0 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Sodium (Na) | 15340 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Sodium (Na) | 14692 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Solids | 21046 mg/L | M-TIT-1.0 | July 11, 2013 |
| Strontium (Sr) | 420 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Sulfate (SO4) | 2439 mg SO4/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Titanium (Ti) | 3.6 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Vanadium (V) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Vanadium | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Zinc (Zn) | 0.817 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Zinc | 0.569 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Total Suspended Solids | 19 mg/L | M-SOLI-1.0 | July 12, 2013 |
| dissolved bismuth | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| dissolved Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Dissolved Lithium (Li) | 4.89 mg/L | Sous-traitance\Multilab Direct | July 18, 2013 |
| Total Phosphorus (P) | 0.03 mg P/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| dissolved Strontium (Sr) | 81.62 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Dissolved titanium (Ti) | 1.8 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Lithium (Li) | 24.11 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Conductivité Reprise client | 29590 µmhos/cm | M-TIT-1.0 | July 29, 2013 |
| Solides dissous Reprise client | 19726 mg/L | M-TIT-1.0 | July 29, 2013 |

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# Detection limit

**Lab number:** V-27840

Sample name: Interval 3- 07/07 Sampling date: July 07, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 | |
| Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Dissolved Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | Yes |
| Dissolved Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | |
| Silver (Ag) | 0.0002 | mg/L | Sous-traitance | Yes |
| Dissolved Silver (Ag) | 0.0002 | mg/L | Sous-traitance | |
| Arsenic (As) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Arsenic (As) | 0.0005 | mg/L | Sous-traitance | |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | Sous-traitance | Yes |
| Barium (Ba) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Barium (Ba) | 0.0005 | mg/L | Sous-traitance | |
| Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Bismuth (Bi) | 0.0005 | mg/L | Sous-traitance | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Boron (B) | 0.01 | mg/L | Sous-traitance | |
| Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | Yes |
| Dissolved Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Dissolved Calcium (Ca) | 0.03 | mg/L | Sous-traitance | |
| Carbone organique total (C.O.T. | 0.2 | mg/L | M-COT-1.0 | -- |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Chrome (Cr) | 0.0006 | mg/L | Sous-traitance | Yes |
| Dissolved Chromium (Cr) | 0.0006 | mg/L | Sous-traitance | |
| Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Copper (Cu) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Copper (Cu) | 0.0005 | mg/L | Sous-traitance | |
| Tin (Sn) | 0.001 | mg/L | Sous-traitance | Yes |
| Iron (Fe) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Iron (Fe) | 0.01 | mg/L | Sous-traitance | |
| Fluoride (F) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | |
| Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | |
| Mercury (Hg) | 0.00001 | mg/L | Sous-traitance | Yes |

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# Detection limit

**Lab number:** V-27840

Sample name: Interval 3- 07/07 Sampling date: July 07, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Dissolved Mercury (Hg) | 0.0001 | mg/L | Sous-traitance | |
| Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | |
| Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | |
| Nitrate (NO3) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite (NO2) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite-Nitrate | 0.01 | mg N/L | Sous-traitance | |
| Lead (Pb) | 0.0003 | mg/L | Sous-traitance | Yes |
| Dissolved Lead (Pb) | 0.0003 | mg/L | Sous-traitance | |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Selenium (Se) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Selenium (Se) | 0.001 | mg/L | Sous-traitance | |
| Silica (Si) | 0.01 | mg/L | Sous-traitance | |
| dissolved silica (Si) | 0.01 | mg/L | Sous-traitance | |
| Sodium (Na) | 0.05 | mg/L | Sous-traitance | Yes |
| Dissolved Sodium (Na) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Sulfate (SO4) | 1 | mg SO4/L | Sous-traitance | Yes |
| Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Vanadium (V) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Vanadium | 0.0005 | mg/L | Sous-traitance | |
| Zinc (Zn) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Zinc | 0.001 | mg/L | Sous-traitance | |
| Total Suspended Solids | 1 | mg/L | M-SOLI-1.0 | Yes |
| dissolved Tin (Sn) | 0.001 | mg/L | Sous-traitance | |
| Dissolved Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Total Phosphorus (P) | 0.01 | mg P/L | Sous-traitance | Yes |
| dissolved Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Dissolved titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |

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# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Alkalinity mg CaCO3/L | Standard name | STD alcalinité |
| | Result | 152 |
| | Accuracy | 95.2% |
| | Limit | 123 - 167 |
| Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.47 |
| | Accuracy | 95.5% |
| | Limit | 5.26 - 7.12 |
| Dissolved Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.97 |
| | Accuracy | 96.4% |
| | Limit | 5.26 - 7.12 |
| Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.2111 |
| | Accuracy | 95.5% |
| | Limit | 0.188 - 0.254 |
| Dissolved Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2131 |
| | Accuracy | 96.4% |
| | Limit | 0.188 - 0.254 |
| Silver (Ag) mg/L | Blank | <0.0002 |
| Dissolved Silver (Ag) mg/L | Blank | <0.0002 |
| Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.3383 |
| | Accuracy | 80.5% |
| | Limit | 0.198 - 0.368 |
| Dissolved Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2917 |
| | Accuracy | 96% |
| | Limit | 0.236 - 0.372 |
| Ammonia nitrogen (NH3-NH4) m | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NH3 |
| | Result | 5.4 |
| | Accuracy | 96.6% |

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# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 4.44 - 6.00 |
| Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.515 |
| | Accuracy | 95.2% |
| | Limit | 2.0 - 2.8 |
| Dissolved Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.492 |
| | Accuracy | 96.2% |
| | Limit | 2.04 - 2.76 |
| Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.746 |
| | Accuracy | 97.3% |
| | Limit | 1.4 - 2.0 |
| Dissolved Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.883 |
| | Accuracy | 89.2% |
| | Limit | 1.4 - 2.0 |
| Bismuth (Bi) mg/L | Blank | <0.0005 |
| Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.2 |
| | Accuracy | 88.9% |
| | Limit | 2.45 - 3.31 |
| Dissolved Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.9 |
| | Accuracy | 99.3% |
| | Limit | 2.66 - 3.10 |
| Dissolved Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.83056 |
| | Accuracy | 92.3% |
| | Limit | 0.8 - 1.0 |
| Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.3 |

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multilab@cablevision.qc.ca

# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Dissolved Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Carbone organique total (C.O.T. | Blank | 0.2 |
| | Standard name | COT 10mg/L |
| | Result | 10 |
| | Accuracy | 100% |
| | Limit | 8 - 12 |
| Chloride mg/L | Blank | <0.5 |
| | Standard name | DMR-0404-2013-Cl |
| | Result | 96.5 |
| | Accuracy | 97.5% |
| | Limit | 87 - 111 |
| Chrome (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.610 |
| | Accuracy | 86.2% |
| | Limit | 3.44 - 4.66 |
| Dissolved Chromium (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 3.870 |
| | Accuracy | 95.6% |
| | Limit | 3.44 - 4.66 |
| Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.780 |
| | Accuracy | 85.9% |
| | Limit | 1.33 - 1.79 |
| Dissolved Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.640 |
| | Accuracy | 94.9% |
| | Limit | 1.33 - 1.79 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1417 |
| | Accuracy | 99.9% |

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# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 1203 - 1627 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1403 |
| | Accuracy | 99.2% |
| | Limit | 1203 - 1627 |
| Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.410 |
| | Accuracy | 86.3% |
| | Limit | 1.05 - 1.43 |
| Dissolved Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.210 |
| | Accuracy | 97.6% |
| | Limit | 1.05 - 1.43 |
| Tin (Sn) mg/L | Blank | <0.001 |
| dissolved Tin (Sn) mg/L | Blank | <0.001 |
| Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Dissolved Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Dissolved Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 0.914 |
| | Accuracy | 91.2% |
| | Limit | 0.714 - 0.966 |
| Total Suspended Solids mg/L | Blank | <1 |
| | Standard name | STD-MES 25mg/L |
| | Result | 25 |
| | Accuracy | 100% |
| | Limit | 19 - 31 |
| Magnesium (Mg) mg/L | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 7.0 |

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# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 87.3% |
| | Limit | 5.28 - 7.14 |
| Dissolved Magnesium (Mg) mg/l | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 6.5 |
| | Accuracy | 95.3% |
| | Limit | 5.28 - 7.14 |
| Manganese (Mn) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.340 |
| | Accuracy | 87.6% |
| | Limit | 3.28 - 4.44 |
| Dissolved Manganese (Mn) mg/l | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 4.010 |
| | Accuracy | 96.1% |
| | Limit | 3.28 - 4.44 |
| Mercury (Hg) mg/L | Blank | <0.00001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.00348 |
| | Accuracy | 87% |
| | Limit | 0.003 - 0.005 |
| Dissolved Mercury (Hg) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.0041 |
| | Accuracy | 97.5% |
| | Limit | 0.003 - 0.005 |
| Molybdenum (Mo) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.7190 |
| | Accuracy | 98% |
| | Limit | 0.599 - 0.811 |
| Dissolved Molybdenum (Mo) mg | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.7345 |
| | Accuracy | 95.8% |
| | Limit | 0.599 - 0.811 |
| Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.240 |

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# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 90.3% |
| | Limit | 0.96 - 1.30 |
| Dissolved Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.391 |
| | Accuracy | 87.8% |
| | Limit | 1.05 - 1.43 |
| Nitrate (NO3) mg N/L | Blank | <0.01 |
| Nitrite (NO2) mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2 |
| | Result | 2.5 |
| | Accuracy | 99.2% |
| | Limit | 2.14 - 2.90 |
| Nitrite-Nitrate mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2-NO3 |
| | Result | 8.7 |
| | Accuracy | 92.3% |
| | Limit | 6.87 - 9.29 |
| pH | Standard name | STD pH 7.0 |
| | Result | 7.01 |
| | Accuracy | 99.9% |
| | Limit | 6.84 - 7.16 |
| Total Phosphorus (P) mg P/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-10-Ptotal |
| | Result | 2.53 |
| | Accuracy | 88.8% |
| | Limit | 2.51 - 3.19 |
| Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.9848 |
| | Accuracy | 90.6% |
| | Limit | 0.8 - 1.0 |
| Dissolved Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.9812 |
| | Accuracy | 91% |
| | Limit | 0.8 - 1.0 |
| Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 18.3 |

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# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 97.2% |
| | Limit | 15.1 - 20.5 |
| Dissolved Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 19.9 |
| | Accuracy | 88.2% |
| | Limit | 15.1 - 20.5 |
| Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.41 |
| | Accuracy | 95.6% |
| | Limit | 1.15 - 1.55 |
| Dissolved Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.36 |
| | Accuracy | 99.3% |
| | Limit | 1.15 - 1.55 |
| Silica (Si) mg/L | Blank | <0.01 |
| dissolved silica (Si) mg/L | Blank | <0.01 |
| Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 15.6 |
| | Accuracy | 87.8% |
| | Limit | 11.8 - 16.0 |
| Dissolved Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 15.4 |
| | Accuracy | 89.2% |
| | Limit | 11.8 - 16.0 |
| Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.15 |
| | Accuracy | 92.7% |
| | Limit | 1.05 - 1.43 |
| dissolved Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.10 |
| | Accuracy | 88.7% |
| | Limit | 1.05 - 1.43 |
| Sulfate (SO4) mg SO4/L | Blank | <1 |

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F-02-06
Version 3ième: 26/10/2005

# Quality control Report

**Lab number:** V-27840

Sample name: Interval 3- 07/07 | Sampling date: July 07, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Standard name | DMR-0404-2013-SO4 |
| | Result | 109 |
| | Accuracy | 99.1% |
| | Limit | 99 - 121 |
| Dissolved Tellurium (Te) mg/L | Blank | <0.0005 |
| Titanium (Ti) mg/L | Blank | <0.01 |
| Dissolved titanium (Ti) mg/L | Blank | <0.01 |
| Vanadium (V) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.270 |
| | Accuracy | 85.9% |
| | Limit | 1.69 - 2.29 |
| Dissolved Vanadium mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.940 |
| | Accuracy | 97.5% |
| | Limit | 1.69 - 2.29 |
| Zinc (Zn) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.83 |
| | Accuracy | 92.9% |
| | Limit | 3.83 - 5.19 |
| Dissolved Zinc mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.02 |
| | Accuracy | 88.7% |
| | Limit | 3.83 - 5.19 |

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F-02-06
Version 3ième: 26/10/2005

# Additional information

**Lab number:** V-27840

Sample name: Interval 3- 07/07
Sampling location: Westbay
Sampling date: July 07, 2013
Sampling hour: N/D

| Lab method | Method reference |
|---|---|
| M-TIT-1.0 | MA.303-Titr Auto 2.0 |
| M-MET-3.0 | MA.200-Mét. 1.2 |
| M-NH3-2.0 | MA.300-N 2.0 |
| M-CL-2.0 | MA.300-Ions 1.3 |
| M-CI-1.0 | MA.300-Anions 1.0 |
| M-NITR-2.0 | MA.300-NO3 2.0 |
| M-Lix-1.0 | MA.100-Lix.com. 1.1 |
| M-SULF-2.0 | MA.300-Ions 1.3 |
| M-SOLI-1.0 | MA.104-S.S. 1.1 |
| M-P-3.0 | MA. 315-P 2.0 |

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F-02-06
Version 3ième: 26/10/2005

# Analytical Report

Company: **Agnico Eagle Meliadine**

Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** V-27841

Sampling location: Westbay
Sampling date: July 01, 2013

Sample name: Interval 3- 01/07
Sampling hour: N/D

Sampled by: N/D
Date received: July 11, 2013

Matrix: Eau souterraine

Drinking water distribution:

Reported on: August 13, 2013

Unless otherwise stated, all samples were received in acceptable condition.

Results relate only to the sample tested.

All samples will be disposed of after 30 days following analysis.



Roger Turmel , Chimiste
J'approuve le certificat
2013.08.13 17:02:16 -04'00'

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# Analytical Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Alkalinity | 47 mg CaCO3/L | M-TIT-1.0 | July 11, 2013 |
| Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Arsenic (As) | 0.1773 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Arsenic (As) | 0.1605 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Ammonia nitrogen (NH3-NH4) | 4 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Barium (Ba) | 0.1731 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Barium (Ba) | 0.1692 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Bismuth (Bi) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Boron (B) | 6.6 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Boron (B) | 5.9 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cadmium (Cd) | 0.00020 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cadmium (Cd) | <0.00002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Calcium (Ca) | 3195 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Dissolved Calcium (Ca) | 4290 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Carbone organique total (C.O.T. | 1100 mg/L | M-COT-1.0 | July 11, 2013 |
| Chloride | 34471 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Chrome (Cr) | 0.0423 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Chromium (Cr) | <0.0006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cobalt (Co) | 0.0097 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cobalt (Co) | 0.0095 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Conductivity | 30530 µmhos/cm | M-TIT-1.0 | July 11, 2013 |
| Copper (Cu) | 0.2034 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Copper (Cu) | 0.2009 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Iron (Fe) | 5.2 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Iron (Fe) | 0.13 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Fluoride (F) | 0.15 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lithium (Li) | 6.68 mg/L | Sous-traitance\Multilab Direct | July 18, 2013 |
| Magnesium (Mg) | 2389 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Magnesium (Mg) | 2343 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Manganese (Mn) | 0.9031 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Manganese (Mn) | 0.8901 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Mercury (Hg) | <0.00001 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |

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# Analytical Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Dissolved Mercury (Hg) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Molybdenum (Mo) | 0.0086 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Molybdenum (Mo) | 0.0022 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nickel (Ni) | 0.1839 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Nickel (Ni) | 0.1708 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nitrate (NO3) | <0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite (NO2) | 0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite-Nitrate | 0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| pH | 6.52 | M-TIT-1.0 | July 11, 2013 |
| Total Phosphorus (P) | 0.04 mg P/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Potassium (K) | 291 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Potassium (K) | 262 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Selenium (Se) | 0.606 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Selenium (Se) | 0.560 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silica (Si) | 1.9 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| dissolved silica (Si) | 1.8 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Sodium (Na) | 14612 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Sodium (Na) | 12737 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Solids | 20353 mg/L | M-TIT-1.0 | July 11, 2013 |
| Strontium (Sr) | 117 mg/L | Sous-traitance\Multilab Direct | July 30, 2013 |
| Sulfate (SO4) | 2852 mg SO4/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Titanium (Ti) | 1.9 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Vanadium (V) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Vanadium | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Zinc (Zn) | 0.504 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Zinc | 0.277 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Total Suspended Solids | 43 mg/L | M-SOLI-1.0 | July 12, 2013 |
| dissolved bismuth | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| dissolved Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Lithium (Li) | 5.12 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| dissolved Strontium (Sr) | 95.99 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Dissolved titanium (Ti) | 1.9 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Conductivité Reprise client | 28620 µmhos/cm | M-TIT-1.0 | July 29, 2013 |
| Solides dissous Reprise client | 19080 mg/L | M-TIT-1.0 | July 29, 2013 |

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Multilab DIRECT

# Detection limit

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 | |
| Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Dissolved Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | Yes |
| Dissolved Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | |
| Silver (Ag) | 0.0002 | mg/L | Sous-traitance | Yes |
| Dissolved Silver (Ag) | 0.0002 | mg/L | Sous-traitance | |
| Arsenic (As) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Arsenic (As) | 0.0005 | mg/L | Sous-traitance | |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | Sous-traitance | Yes |
| Barium (Ba) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Barium (Ba) | 0.0005 | mg/L | Sous-traitance | |
| Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Bismuth (Bi) | 0.0005 | mg/L | Sous-traitance | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Boron (B) | 0.01 | mg/L | Sous-traitance | |
| Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | Yes |
| Dissolved Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Dissolved Calcium (Ca) | 0.03 | mg/L | Sous-traitance | |
| Carbone organique total (C.O.T. | 0.2 | mg/L | M-COT-1.0 | -- |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Chrome (Cr) | 0.0006 | mg/L | Sous-traitance | Yes |
| Dissolved Chromium (Cr) | 0.0006 | mg/L | Sous-traitance | |
| Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Copper (Cu) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Copper (Cu) | 0.0005 | mg/L | Sous-traitance | |
| Tin (Sn) | 0.001 | mg/L | Sous-traitance | Yes |
| Iron (Fe) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Iron (Fe) | 0.01 | mg/L | Sous-traitance | |
| Fluoride (F) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | |
| Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | |
| Mercury (Hg) | 0.00001 | mg/L | Sous-traitance | Yes |

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# Detection limit

**Lab number:** V-27841

Sample name: Interval 3- 01/07 Sampling date: July 01, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Dissolved Mercury (Hg) | 0.0001 | mg/L | Sous-traitance | |
| Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | |
| Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | |
| Nitrate (NO3) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite (NO2) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite-Nitrate | 0.01 | mg N/L | Sous-traitance | |
| Total Phosphorus (P) | 0.01 | mg P/L | Sous-traitance | Yes |
| Lead (Pb) | 0.0003 | mg/L | Sous-traitance | Yes |
| Dissolved Lead (Pb) | 0.0003 | mg/L | Sous-traitance | |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Selenium (Se) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Selenium (Se) | 0.001 | mg/L | Sous-traitance | |
| Silica (Si) | 0.01 | mg/L | Sous-traitance | |
| dissolved silica (Si) | 0.01 | mg/L | Sous-traitance | |
| Sodium (Na) | 0.05 | mg/L | Sous-traitance | Yes |
| Dissolved Sodium (Na) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Sulfate (SO4) | 1 | mg SO4/L | Sous-traitance | Yes |
| Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Vanadium (V) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Vanadium | 0.0005 | mg/L | Sous-traitance | |
| Zinc (Zn) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Zinc | 0.001 | mg/L | Sous-traitance | |
| Total Suspended Solids | 1 | mg/L | M-SOLI-1.0 | Yes |
| dissolved Tin (Sn) | 0.001 | mg/L | Sous-traitance | |
| Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| dissolved Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Dissolved titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Alkalinity mg CaCO3/L | Standard name | STD alcalinité |
| | Result | 152 |
| | Accuracy | 95.2% |
| | Limit | 123 - 167 |
| Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.47 |
| | Accuracy | 95.5% |
| | Limit | 5.26 - 7.12 |
| Dissolved Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.97 |
| | Accuracy | 96.4% |
| | Limit | 5.26 - 7.12 |
| Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.2111 |
| | Accuracy | 95.5% |
| | Limit | 0.188 - 0.254 |
| Dissolved Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2131 |
| | Accuracy | 96.4% |
| | Limit | 0.188 - 0.254 |
| Silver (Ag) mg/L | Blank | <0.0002 |
| Dissolved Silver (Ag) mg/L | Blank | <0.0002 |
| Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.3383 |
| | Accuracy | 80.5% |
| | Limit | 0.198 - 0.368 |
| Dissolved Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2917 |
| | Accuracy | 96% |
| | Limit | 0.236 - 0.372 |
| Ammonia nitrogen (NH3-NH4) m | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NH3 |
| | Result | 5.4 |
| | Accuracy | 96.6% |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 4.44 - 6.00 |
| Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.515 |
| | Accuracy | 95.2% |
| | Limit | 2.0 - 2.8 |
| Dissolved Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.492 |
| | Accuracy | 96.2% |
| | Limit | 2.04 - 2.76 |
| Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.746 |
| | Accuracy | 97.3% |
| | Limit | 1.4 - 2.0 |
| Dissolved Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.883 |
| | Accuracy | 89.2% |
| | Limit | 1.4 - 2.0 |
| Bismuth (Bi) mg/L | Blank | <0.0005 |
| Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.2 |
| | Accuracy | 88.9% |
| | Limit | 2.45 - 3.31 |
| Dissolved Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.9 |
| | Accuracy | 99.3% |
| | Limit | 2.66 - 3.10 |
| Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.80911 |
| | Accuracy | 89.9% |
| | Limit | 0.8 - 1.0 |
| Dissolved Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.83056 |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 92.3% |
| | Limit | 0.8 - 1.0 |
| Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Dissolved Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Carbone organique total (C.O.T. | Blank | 0.2 |
| | Standard name | COT 10mg/L |
| | Result | 10 |
| | Accuracy | 100% |
| | Limit | 8 - 12 |
| Chloride mg/L | Blank | <0.5 |
| | Standard name | DMR-0404-2013-Cl |
| | Result | 96.5 |
| | Accuracy | 97.5% |
| | Limit | 87 - 111 |
| Chrome (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.610 |
| | Accuracy | 86.2% |
| | Limit | 3.44 - 4.66 |
| Dissolved Chromium (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 3.870 |
| | Accuracy | 95.6% |
| | Limit | 3.44 - 4.66 |
| Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.780 |
| | Accuracy | 85.9% |
| | Limit | 1.33 - 1.79 |
| Dissolved Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.640 |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 94.9% |
| | Limit | 1.33 - 1.79 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1417 |
| | Accuracy | 99.9% |
| | Limit | 1203 - 1627 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1403 |
| | Accuracy | 99.2% |
| | Limit | 1203 - 1627 |
| Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.410 |
| | Accuracy | 86.3% |
| | Limit | 1.05 - 1.43 |
| Dissolved Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.210 |
| | Accuracy | 97.6% |
| | Limit | 1.05 - 1.43 |
| Tin (Sn) mg/L | Blank | <0.001 |
| dissolved Tin (Sn) mg/L | Blank | <0.001 |
| Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Dissolved Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 0.921 |
| | Accuracy | 90.4% |
| | Limit | 0.714 - 0.966 |
| Dissolved Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 0.914 |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 91.2% |
| | Limit | 0.714 - 0.966 |
| Total Suspended Solids mg/L | Blank | <1 |
| | Standard name | STD-MES 25mg/L |
| | Result | 25 |
| | Accuracy | 100% |
| | Limit | 19 - 31 |
| Magnesium (Mg) mg/L | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 7.0 |
| | Accuracy | 87.3% |
| | Limit | 5.28 - 7.14 |
| Dissolved Magnesium (Mg) mg/l | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 6.5 |
| | Accuracy | 95.3% |
| | Limit | 5.28 - 7.14 |
| Manganese (Mn) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.340 |
| | Accuracy | 87.6% |
| | Limit | 3.28 - 4.44 |
| Dissolved Manganese (Mn) mg/l | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 4.010 |
| | Accuracy | 96.1% |
| | Limit | 3.28 - 4.44 |
| Mercury (Hg) mg/L | Blank | <0.00001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.00348 |
| | Accuracy | 87% |
| | Limit | 0.003 - 0.005 |
| Dissolved Mercury (Hg) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.0041 |
| | Accuracy | 97.5% |
| | Limit | 0.003 - 0.005 |
| Molybdenum (Mo) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.7190 |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 98% |
| | Limit | 0.599 - 0.811 |
| Dissolved Molybdenum (Mo) mg | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.7345 |
| | Accuracy | 95.8% |
| | Limit | 0.599 - 0.811 |
| Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.240 |
| | Accuracy | 90.3% |
| | Limit | 0.96 - 1.30 |
| Dissolved Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.391 |
| | Accuracy | 87.8% |
| | Limit | 1.05 - 1.43 |
| Nitrate (NO3) mg N/L | Blank | <0.01 |
| Nitrite (NO2) mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2 |
| | Result | 2.5 |
| | Accuracy | 99.2% |
| | Limit | 2.14 - 2.90 |
| Nitrite-Nitrate mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2-NO3 |
| | Result | 8.7 |
| | Accuracy | 92.3% |
| | Limit | 6.87 - 9.29 |
| pH | Standard name | STD pH 7.0 |
| | Result | 7.01 |
| | Accuracy | 99.9% |
| | Limit | 6.84 - 7.16 |
| Total Phosphorus (P) mg P/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-10-Ptotal |
| | Result | 2.53 |
| | Accuracy | 88.8% |
| | Limit | 2.51 - 3.19 |
| Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.9848 |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 90.6% |
| | Limit | 0.8 - 1.0 |
| Dissolved Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.9812 |
| | Accuracy | 91% |
| | Limit | 0.8 - 1.0 |
| Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 18.3 |
| | Accuracy | 97.2% |
| | Limit | 15.1 - 20.5 |
| Dissolved Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 19.9 |
| | Accuracy | 88.2% |
| | Limit | 15.1 - 20.5 |
| Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.41 |
| | Accuracy | 95.6% |
| | Limit | 1.15 - 1.55 |
| Dissolved Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.36 |
| | Accuracy | 99.3% |
| | Limit | 1.15 - 1.55 |
| Silica (Si) mg/L | Blank | <0.01 |
| dissolved silica (Si) mg/L | Blank | <0.01 |
| Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 15.6 |
| | Accuracy | 87.8% |
| | Limit | 11.8 - 16.0 |
| Dissolved Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 15.4 |
| | Accuracy | 89.2% |
| | Limit | 11.8 - 16.0 |
| Strontium (Sr) mg/L | Blank | <0.005 |

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# Quality control Report

**Lab number:** V-27841

Sample name: Interval 3- 01/07 | Sampling date: July 01, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.24 |
| | Accuracy | 100% |
| | Limit | 1.05 - 1.43 |
| dissolved Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.10 |
| | Accuracy | 88.7% |
| | Limit | 1.05 - 1.43 |
| Sulfate (SO4) mg SO4/L | Blank | <1 |
| | Standard name | DMR-0404-2013-SO4 |
| | Result | 109 |
| | Accuracy | 99.1% |
| | Limit | 99 - 121 |
| Dissolved Tellurium (Te) mg/L | Blank | <0.0005 |
| Titanium (Ti) mg/L | Blank | <0.01 |
| Dissolved titanium (Ti) mg/L | Blank | <0.01 |
| Vanadium (V) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.270 |
| | Accuracy | 85.9% |
| | Limit | 1.69 - 2.29 |
| Dissolved Vanadium mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.940 |
| | Accuracy | 97.5% |
| | Limit | 1.69 - 2.29 |
| Zinc (Zn) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.83 |
| | Accuracy | 92.9% |
| | Limit | 3.83 - 5.19 |
| Dissolved Zinc mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.02 |
| | Accuracy | 88.7% |
| | Limit | 3.83 - 5.19 |

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F-02-06
Version 3ième: 26/10/2005

# Additional information

**Lab number:** V-27841

Sample name: Interval 3- 01/07
Sampling location: Westbay
Sampling date: July 01, 2013
Sampling hour: N/D

| Lab method | Method reference |
|---|---|
| M-TIT-1.0 | MA.303-Titr Auto 2.0 |
| M-MET-3.0 | MA.200-Mét. 1.2 |
| M-NH3-2.0 | MA.300-N 2.0 |
| M-CL-2.0 | MA.300-Ions 1.3 |
| M-CI-1.0 | MA.300-Anions 1.0 |
| M-NITR-2.0 | MA.300-NO3 2.0 |
| M-P-3.0 | MA. 315-P 2.0 |
| M-Lix-1.0 | MA.100-Lix.com. 1.1 |
| M-SULF-2.0 | MA.300-Ions 1.3 |
| M-SOLI-1.0 | MA.104-S.S. 1.1 |

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F-02-06
Version 3ième: 26/10/2005

# Analytical Report

Company: **Agnico Eagle Meliadine**

Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** V-27842

Sampling location: Westbay
Sampling date: June 30, 2013

Sample name: Interval 2- 30/06
Sampling hour: N/D

Sampled by: N/D
Date received: July 11, 2013

Matrix: Eau souterraine

Drinking water distribution:

Reported on: August 13, 2013

Unless otherwise stated, all samples were received in acceptable condition.

Results relate only to the sample tested.

All samples will be disposed of after 30 days following analysis.

Roger Turmel , Chimiste
J'approuve le certificat
2013.08.13 17:02:35 -04'00'

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# Analytical Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Alkalinity | 79 mg CaCO3/L | M-TIT-1.0 | July 11, 2013 |
| Aluminium (Al) | 0.07 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Arsenic (As) | 0.3568 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Arsenic (As) | 0.3381 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Ammonia nitrogen (NH3-NH4) | 2.2 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Barium (Ba) | 0.9439 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Barium (Ba) | 0.926 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Bismuth (Bi) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Boron (B) | 13.9 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Boron (B) | 11.7 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cadmium (Cd) | 0.00036 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cadmium (Cd) | 0.00022 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Calcium (Ca) | 9053 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Dissolved Calcium (Ca) | 12489 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Carbone organique total (C.O.T. | 4851 mg/L | M-COT-1.0 | July 11, 2013 |
| Chloride | 34781 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Chrome (Cr) | 0.0752 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Chromium (Cr) | 0.0137 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cobalt (Co) | 0.0310 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cobalt (Co) | 0.0300 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Conductivity | 25320 µmhos/cm | M-TIT-1.0 | July 11, 2013 |
| Copper (Cu) | 0.1030 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Copper (Cu) | 0.1016 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Iron (Fe) | 4.4 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Iron (Fe) | 0.35 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Fluoride (F) | 0.11 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lithium (Li) | 24.3 mg/L | Sous-traitance\Multilab Direct | July 18, 2013 |
| Magnesium (Mg) | 1051 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Magnesium (Mg) | 1009 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Manganese (Mn) | 0.7914 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Manganese (Mn) | 0.7888 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Mercury (Hg) | 0.00034 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |

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# Analytical Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Dissolved Mercury (Hg) | 0.0002 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Molybdenum (Mo) | 0.0194 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Molybdenum (Mo) | 0.0127 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nickel (Ni) | 0.5301 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Nickel (Ni) | 0.5181 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nitrate (NO3) | 0.08 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite (NO2) | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite-Nitrate | 0.1 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| pH | 7.91 | M-TIT-1.0 | July 11, 2013 |
| Total Phosphorus (P) | 0.24 mg P/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Lead (Pb) | 0.0021 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Potassium (K) | 502 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Potassium (K) | 449 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Selenium (Se) | 1.19 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Selenium (Se) | 1.14 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silica (Si) | 5.7 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| dissolved silica (Si) | 2.2 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Sodium (Na) | 6779 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Sodium (Na) | 5527 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Solids | 16880 mg/L | M-TIT-1.0 | July 11, 2013 |
| Strontium (Sr) | 350 mg/L | Sous-traitance\Multilab Direct | July 30, 2013 |
| Sulfate (SO4) | 1163 mg SO4/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Titanium (Ti) | 4.5 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Vanadium (V) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Vanadium | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Zinc (Zn) | 2.46 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Zinc | 1.82 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Total Suspended Solids | 53 mg/L | M-SOLI-1.0 | July 12, 2013 |
| dissolved bismuth | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| dissolved Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Lithium (Li) | 1403 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| dissolved Strontium (Sr) | 341 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Dissolved titanium (Ti) | 4.8 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Conductivité Reprise client | 25550 µmhos/cm | M-TIT-1.0 | July 29, 2013 |
| Solides dissous Reprise client | 17033 mg/L | M-TIT-1.0 | July 29, 2013 |

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Multilab DIRECT

# Detection limit

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 | |
| Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Dissolved Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | Yes |
| Dissolved Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | |
| Silver (Ag) | 0.0002 | mg/L | Sous-traitance | Yes |
| Dissolved Silver (Ag) | 0.0002 | mg/L | Sous-traitance | |
| Arsenic (As) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Arsenic (As) | 0.0005 | mg/L | Sous-traitance | |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | Sous-traitance | Yes |
| Barium (Ba) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Barium (Ba) | 0.0005 | mg/L | Sous-traitance | |
| Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Bismuth (Bi) | 0.0005 | mg/L | Sous-traitance | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Boron (B) | 0.01 | mg/L | Sous-traitance | |
| Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | Yes |
| Dissolved Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Dissolved Calcium (Ca) | 0.03 | mg/L | Sous-traitance | |
| Carbone organique total (C.O.T. | 0.2 | mg/L | M-COT-1.0 | -- |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Chrome (Cr) | 0.0006 | mg/L | Sous-traitance | Yes |
| Dissolved Chromium (Cr) | 0.0006 | mg/L | Sous-traitance | |
| Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Copper (Cu) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Copper (Cu) | 0.0005 | mg/L | Sous-traitance | |
| Tin (Sn) | 0.001 | mg/L | Sous-traitance | Yes |
| Iron (Fe) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Iron (Fe) | 0.01 | mg/L | Sous-traitance | |
| Fluoride (F) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | |
| Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | |
| Mercury (Hg) | 0.00001 | mg/L | Sous-traitance | Yes |

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# Detection limit

**Lab number:** V-27842

Sample name: Interval 2- 30/06 Sampling date: June 30, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Dissolved Mercury (Hg) | 0.0001 | mg/L | Sous-traitance | |
| Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | |
| Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | |
| Nitrate (NO3) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite (NO2) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite-Nitrate | 0.01 | mg N/L | Sous-traitance | |
| Total Phosphorus (P) | 0.01 | mg P/L | Sous-traitance | Yes |
| Lead (Pb) | 0.0003 | mg/L | Sous-traitance | Yes |
| Dissolved Lead (Pb) | 0.0003 | mg/L | Sous-traitance | |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Selenium (Se) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Selenium (Se) | 0.001 | mg/L | Sous-traitance | |
| Silica (Si) | 0.01 | mg/L | Sous-traitance | |
| dissolved silica (Si) | 0.01 | mg/L | Sous-traitance | |
| Sodium (Na) | 0.05 | mg/L | Sous-traitance | Yes |
| Dissolved Sodium (Na) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Sulfate (SO4) | 1 | mg SO4/L | Sous-traitance | Yes |
| Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Vanadium (V) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Vanadium | 0.0005 | mg/L | Sous-traitance | |
| Zinc (Zn) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Zinc | 0.001 | mg/L | Sous-traitance | |
| Total Suspended Solids | 1 | mg/L | M-SOLI-1.0 | Yes |
| dissolved Tin (Sn) | 0.001 | mg/L | Sous-traitance | |
| Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| dissolved Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Dissolved titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |

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# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Alkalinity mg CaCO3/L | Standard name | STD alcalinité |
| | Result | 152 |
| | Accuracy | 95.2% |
| | Limit | 123 - 167 |
| Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.47 |
| | Accuracy | 95.5% |
| | Limit | 5.26 - 7.12 |
| Dissolved Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.97 |
| | Accuracy | 96.4% |
| | Limit | 5.26 - 7.12 |
| Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.2111 |
| | Accuracy | 95.5% |
| | Limit | 0.188 - 0.254 |
| Dissolved Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2131 |
| | Accuracy | 96.4% |
| | Limit | 0.188 - 0.254 |
| Silver (Ag) mg/L | Blank | <0.0002 |
| Dissolved Silver (Ag) mg/L | Blank | <0.0002 |
| Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.3383 |
| | Accuracy | 80.5% |
| | Limit | 0.198 - 0.368 |
| Dissolved Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2917 |
| | Accuracy | 96% |
| | Limit | 0.236 - 0.372 |
| Ammonia nitrogen (NH3-NH4) m | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NH3 |
| | Result | 5.4 |
| | Accuracy | 96.6% |

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# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 4.44 - 6.00 |
| | Sample duplicate | 2.2-2.0 |
| Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.515 |
| | Accuracy | 95.2% |
| | Limit | 2.0 - 2.8 |
| Dissolved Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.492 |
| | Accuracy | 96.2% |
| | Limit | 2.04 - 2.76 |
| Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.746 |
| | Accuracy | 97.3% |
| | Limit | 1.4 - 2.0 |
| Dissolved Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.883 |
| | Accuracy | 89.2% |
| | Limit | 1.4 - 2.0 |
| Bismuth (Bi) mg/L | Blank | <0.0005 |
| Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.2 |
| | Accuracy | 88.9% |
| | Limit | 2.45 - 3.31 |
| Dissolved Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.9 |
| | Accuracy | 99.3% |
| | Limit | 2.66 - 3.10 |
| Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.80911 |
| | Accuracy | 89.9% |
| | Limit | 0.8 - 1.0 |
| Dissolved Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23 |

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# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.83056 |
| | Accuracy | 92.3% |
| | Limit | 0.8 - 1.0 |
| Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Dissolved Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Carbone organique total (C.O.T. | Blank | 0.2 |
| | Standard name | COT 10mg/L |
| | Result | 10 |
| | Accuracy | 100% |
| | Limit | 8 - 12 |
| Chloride mg/L | Blank | <0.5 |
| | Standard name | DMR-0404-2013-Cl |
| | Result | 96.5 |
| | Accuracy | 97.5% |
| | Limit | 87 - 111 |
| Chrome (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.610 |
| | Accuracy | 86.2% |
| | Limit | 3.44 - 4.66 |
| Dissolved Chromium (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 3.870 |
| | Accuracy | 95.6% |
| | Limit | 3.44 - 4.66 |
| Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.780 |
| | Accuracy | 85.9% |
| | Limit | 1.33 - 1.79 |
| Dissolved Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |

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# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 1.640 |
| | Accuracy | 94.9% |
| | Limit | 1.33 - 1.79 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1403 |
| | Accuracy | 99.2% |
| | Limit | 1203 - 1627 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1417 |
| | Accuracy | 99.9% |
| | Limit | 1203 - 1627 |
| Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.410 |
| | Accuracy | 86.3% |
| | Limit | 1.05 - 1.43 |
| Dissolved Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.210 |
| | Accuracy | 97.6% |
| | Limit | 1.05 - 1.43 |
| Tin (Sn) mg/L | Blank | <0.001 |
| dissolved Tin (Sn) mg/L | Blank | <0.001 |
| Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Dissolved Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 0.921 |
| | Accuracy | 90.4% |
| | Limit | 0.714 - 0.966 |
| Dissolved Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |

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# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.914 |
| | Accuracy | 91.2% |
| | Limit | 0.714 - 0.966 |
| Total Suspended Solids mg/L | Blank | <1 |
| | Standard name | STD-MES 25mg/L |
| | Result | 25 |
| | Accuracy | 100% |
| | Limit | 19 - 31 |
| Magnesium (Mg) mg/L | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 7.0 |
| | Accuracy | 87.3% |
| | Limit | 5.28 - 7.14 |
| Dissolved Magnesium (Mg) mg/l | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 6.5 |
| | Accuracy | 95.3% |
| | Limit | 5.28 - 7.14 |
| Manganese (Mn) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.340 |
| | Accuracy | 87.6% |
| | Limit | 3.28 - 4.44 |
| Dissolved Manganese (Mn) mg/l | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 4.010 |
| | Accuracy | 96.1% |
| | Limit | 3.28 - 4.44 |
| Mercury (Hg) mg/L | Blank | <0.00001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.00348 |
| | Accuracy | 87% |
| | Limit | 0.003 - 0.005 |
| Dissolved Mercury (Hg) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.0041 |
| | Accuracy | 97.5% |
| | Limit | 0.003 - 0.005 |
| Molybdenum (Mo) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |

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F-02-06
Version 3ième: 26/10/2005

# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.7190 |
| | Accuracy | 98% |
| | Limit | 0.599 - 0.811 |
| Dissolved Molybdenum (Mo) mg | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.7345 |
| | Accuracy | 95.8% |
| | Limit | 0.599 - 0.811 |
| Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.240 |
| | Accuracy | 90.3% |
| | Limit | 0.96 - 1.30 |
| Dissolved Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.391 |
| | Accuracy | 87.8% |
| | Limit | 1.05 - 1.43 |
| Nitrate (NO3) mg N/L | Blank | <0.01 |
| Nitrite (NO2) mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2 |
| | Result | 2.5 |
| | Accuracy | 99.2% |
| | Limit | 2.14 - 2.90 |
| Nitrite-Nitrate mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2-NO3 |
| | Result | 8.7 |
| | Accuracy | 92.3% |
| | Limit | 6.87 - 9.29 |
| pH | Standard name | STD pH 7.0 |
| | Result | 7.01 |
| | Accuracy | 99.9% |
| | Limit | 6.84 - 7.16 |
| Total Phosphorus (P) mg P/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-10-Ptotal |
| | Result | 2.53 |
| | Accuracy | 88.8% |
| | Limit | 2.51 - 3.19 |
| Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23m |

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# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.9848 |
| | Accuracy | 90.6% |
| | Limit | 0.8 - 1.0 |
| Dissolved Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.9812 |
| | Accuracy | 91% |
| | Limit | 0.8 - 1.0 |
| Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 18.3 |
| | Accuracy | 97.2% |
| | Limit | 15.1 - 20.5 |
| Dissolved Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 19.9 |
| | Accuracy | 88.2% |
| | Limit | 15.1 - 20.5 |
| Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.41 |
| | Accuracy | 95.6% |
| | Limit | 1.15 - 1.55 |
| Dissolved Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.36 |
| | Accuracy | 99.3% |
| | Limit | 1.15 - 1.55 |
| Silica (Si) mg/L | Blank | <0.01 |
| dissolved silica (Si) mg/L | Blank | <0.01 |
| Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 15.6 |
| | Accuracy | 87.8% |
| | Limit | 11.8 - 16.0 |
| Dissolved Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 15.4 |
| | Accuracy | 89.2% |
| | Limit | 11.8 - 16.0 |

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F-02-06
Version 3ième: 26/10/2005

# Quality control Report

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.24 |
| | Accuracy | 100% |
| | Limit | 1.05 - 1.43 |
| dissolved Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.10 |
| | Accuracy | 88.7% |
| | Limit | 1.05 - 1.43 |
| Sulfate (SO4) mg SO4/L | Blank | <1 |
| | Standard name | DMR-0404-2013-SO4 |
| | Result | 109 |
| | Accuracy | 99.1% |
| | Limit | 99 - 121 |
| Dissolved Tellurium (Te) mg/L | Blank | <0.0005 |
| Titanium (Ti) mg/L | Blank | <0.01 |
| Dissolved titanium (Ti) mg/L | Blank | <0.01 |
| Vanadium (V) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.270 |
| | Accuracy | 85.9% |
| | Limit | 1.69 - 2.29 |
| Dissolved Vanadium mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.940 |
| | Accuracy | 97.5% |
| | Limit | 1.69 - 2.29 |
| Zinc (Zn) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.83 |
| | Accuracy | 92.9% |
| | Limit | 3.83 - 5.19 |
| Dissolved Zinc mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.02 |
| | Accuracy | 88.7% |
| | Limit | 3.83 - 5.19 |

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F-02-06
Version 3ième: 26/10/2005

# Additional information

**Lab number:** V-27842

Sample name: Interval 2- 30/06 | Sampling date: June 30, 2013

Sampling location: Westbay | Sampling hour: N/D

| Lab method | Method reference |
|---|---|
| M-TIT-1.0 | MA.303-Titr Auto 2.0 |
| M-MET-3.0 | MA.200-Mét. 1.2 |
| M-NH3-2.0 | MA.300-N 2.0 |
| M-CL-2.0 | MA.300-Ions 1.3 |
| M-CI-1.0 | MA.300-Anions 1.0 |
| M-NITR-2.0 | MA.300-NO3 2.0 |
| M-P-3.0 | MA. 315-P 2.0 |
| M-Lix-1.0 | MA.100-Lix.com. 1.1 |
| M-SULF-2.0 | MA.300-Ions 1.3 |
| M-SOLI-1.0 | MA.104-S.S. 1.1 |

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# Analytical Report

Company: **Agnico Eagle Meliadine**

Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** V-27843

Sampling location: Westbay
Sampling date: June 29, 2013

Sample name: Interval 5- 29/06
Sampling hour: N/D

Sampled by: N/D
Date received: July 11, 2013

Matrix: Eau souterraine

Drinking water distribution:

Reported on: August 13, 2013

Unless otherwise stated, all samples were received in acceptable condition.

Results relate only to the sample tested.

All samples will be disposed of after 30 days following analysis.



Roger Turmel , Chimiste
J'approuve le certificat
2013.08.13 17:03:04 -04'00'

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# Analytical Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Alkalinity | 51 mg CaCO3/L | M-TIT-1.0 | July 11, 2013 |
| Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Aluminium (Al) | <0.006 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Antimony (Sb) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Arsenic (As) | 0.1902 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Arsenic (As) | 0.1716 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Ammonia nitrogen (NH3-NH4) | 3.5 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Barium (Ba) | 0.0997 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Barium (Ba) | 0.0984 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Bismuth (Bi) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Boron (B) | 6.0 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Boron (B) | 4.9 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cadmium (Cd) | 0.00092 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cadmium (Cd) | 0.00079 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Calcium (Ca) | 3258 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Dissolved Calcium (Ca) | 3874 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Carbone organique total (C.O.T. | 13161 mg/L | M-COT-1.0 | July 11, 2013 |
| Chloride | 32728 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Chrome (Cr) | 0.1449 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Chromium (Cr) | 0.0768 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Cobalt (Co) | 0.0121 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Cobalt (Co) | 0.0113 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Conductivity | 28640 µmhos/cm | M-TIT-1.0 | July 11, 2013 |
| Copper (Cu) | 0.2127 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Copper (Cu) | 0.2112 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Iron (Fe) | 11.0 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Iron (Fe) | 0.15 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Fluoride (F) | 0.12 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lithium (Li) | 4.97 mg/L | Sous-traitance\Multilab Direct | July 18, 2013 |
| Magnesium (Mg) | 2562 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Magnesium (Mg) | 2468 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Manganese (Mn) | 0.9454 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Manganese (Mn) | 0.9199 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Mercury (Hg) | 0.00001 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |

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Multilab DIRECT

# Analytical Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Dissolved Mercury (Hg) | <0.0001 mg/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Molybdenum (Mo) | 0.0053 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Molybdenum (Mo) | 0.005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nickel (Ni) | 0.1725 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Nickel (Ni) | 0.1712 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Nitrate (NO3) | <0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite (NO2) | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite-Nitrate | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| pH | 6.79 | M-TIT-1.0 | July 11, 2013 |
| Total Phosphorus (P) | 0.04 mg P/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Lead (Pb) | 0.0185 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Potassium (K) | 393 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Potassium (K) | 362 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Selenium (Se) | 0.642 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Selenium (Se) | 0.615 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Silica (Si) | 1.6 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| dissolved silica (Si) | 5.2 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Sodium (Na) | 14077 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Sodium (Na) | 11889 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Solids | 19093 mg/L | M-TIT-1.0 | July 11, 2013 |
| Strontium (Sr) | 95.62 mg/L | Sous-traitance\Multilab Direct | July 30, 2013 |
| Sulfate (SO4) | 2338 mg SO4/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Titanium (Ti) | 3.4 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Vanadium (V) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Dissolved Vanadium | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Zinc (Zn) | 1.06 mg/L | Sous-traitance\Multilab Direct | July 17, 2013 |
| Dissolved Zinc | 1.35 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Total Suspended Solids | 74 mg/L | M-SOLI-1.0 | July 12, 2013 |
| dissolved bismuth | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| dissolved Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Lithium (Li) | 4.76 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| dissolved Strontium (Sr) | 100 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Dissolved titanium (Ti) | 1.6 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Conductivité Reprise client | 26700 µmhos/cm | M-TIT-1.0 | July 29, 2013 |
| Solides dissous Reprise client | 17800 mg/L | M-TIT-1.0 | July 29, 2013 |
| Boron (B) | 5 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |

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F-02-06
Version 3ième: 26/10/2005

Multilab DIRECT

# Detection limit

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 | |
| Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Dissolved Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | Yes |
| Dissolved Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | |
| Silver (Ag) | 0.0002 | mg/L | Sous-traitance | Yes |
| Dissolved Silver (Ag) | 0.0002 | mg/L | Sous-traitance | |
| Arsenic (As) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Arsenic (As) | 0.0005 | mg/L | Sous-traitance | |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | Sous-traitance | Yes |
| Barium (Ba) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Barium (Ba) | 0.0005 | mg/L | Sous-traitance | |
| Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Bismuth (Bi) | 0.0005 | mg/L | Sous-traitance | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Boron (B) | 0.01 | mg/L | Sous-traitance | |
| Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | Yes |
| Dissolved Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Dissolved Calcium (Ca) | 0.03 | mg/L | Sous-traitance | |
| Carbone organique total (C.O.T. | 0.2 | mg/L | M-COT-1.0 | -- |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Chrome (Cr) | 0.0006 | mg/L | Sous-traitance | Yes |
| Dissolved Chromium (Cr) | 0.0006 | mg/L | Sous-traitance | |
| Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Copper (Cu) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Copper (Cu) | 0.0005 | mg/L | Sous-traitance | |
| Tin (Sn) | 0.001 | mg/L | Sous-traitance | Yes |
| Iron (Fe) | 0.01 | mg/L | Sous-traitance | Yes |
| Dissolved Iron (Fe) | 0.01 | mg/L | Sous-traitance | |
| Fluoride (F) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Dissolved Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | |
| Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | |
| Mercury (Hg) | 0.00001 | mg/L | Sous-traitance | Yes |

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# Detection limit

**Lab number:** V-27843

Sample name: Interval 5- 29/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Dissolved Mercury (Hg) | 0.0001 | mg/L | Sous-traitance | |
| Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | |
| Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | |
| Nitrate (NO3) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite (NO2) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite-Nitrate | 0.01 | mg N/L | Sous-traitance | |
| Total Phosphorus (P) | 0.01 | mg P/L | Sous-traitance | Yes |
| Lead (Pb) | 0.0003 | mg/L | Sous-traitance | Yes |
| Dissolved Lead (Pb) | 0.0003 | mg/L | Sous-traitance | |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Selenium (Se) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Selenium (Se) | 0.001 | mg/L | Sous-traitance | |
| Silica (Si) | 0.01 | mg/L | Sous-traitance | |
| dissolved silica (Si) | 0.01 | mg/L | Sous-traitance | |
| Sodium (Na) | 0.05 | mg/L | Sous-traitance | Yes |
| Dissolved Sodium (Na) | 0.05 | mg/L | Sous-traitance | |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Sulfate (SO4) | 1 | mg SO4/L | Sous-traitance | Yes |
| Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Dissolved Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Vanadium (V) | 0.0005 | mg/L | Sous-traitance | Yes |
| Dissolved Vanadium | 0.0005 | mg/L | Sous-traitance | |
| Zinc (Zn) | 0.001 | mg/L | Sous-traitance | Yes |
| Dissolved Zinc | 0.001 | mg/L | Sous-traitance | |
| Total Suspended Solids | 1 | mg/L | M-SOLI-1.0 | Yes |
| dissolved Tin (Sn) | 0.001 | mg/L | Sous-traitance | |
| Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| dissolved Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Dissolved titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |

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# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Alkalinity mg CaCO3/L | Standard name | STD alcalinité |
| | Result | 152 |
| | Accuracy | 95.2% |
| | Limit | 123 - 167 |
| Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.47 |
| | Accuracy | 95.5% |
| | Limit | 5.26 - 7.12 |
| Dissolved Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.97 |
| | Accuracy | 96.4% |
| | Limit | 5.26 - 7.12 |
| Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.2111 |
| | Accuracy | 95.5% |
| | Limit | 0.188 - 0.254 |
| Dissolved Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2131 |
| | Accuracy | 96.4% |
| | Limit | 0.188 - 0.254 |
| Silver (Ag) mg/L | Blank | <0.0002 |
| Dissolved Silver (Ag) mg/L | Blank | <0.0002 |
| Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.3383 |
| | Accuracy | 80.5% |
| | Limit | 0.198 - 0.368 |
| Dissolved Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.2917 |
| | Accuracy | 96% |
| | Limit | 0.236 - 0.372 |
| Ammonia nitrogen (NH3-NH4) m | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NH3 |
| | Result | 5.4 |
| | Accuracy | 96.6% |

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# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 4.44 - 6.00 |
| Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.515 |
| | Accuracy | 95.2% |
| | Limit | 2.0 - 2.8 |
| Dissolved Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.492 |
| | Accuracy | 96.2% |
| | Limit | 2.04 - 2.76 |
| Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.746 |
| | Accuracy | 97.3% |
| | Limit | 1.4 - 2.0 |
| Dissolved Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.883 |
| | Accuracy | 89.2% |
| | Limit | 1.4 - 2.0 |
| Bismuth (Bi) mg/L | Blank | <0.0005 |
| Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.2 |
| | Accuracy | 88.9% |
| | Limit | 2.45 - 3.31 |
| Dissolved Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 2.9 |
| | Accuracy | 99.3% |
| | Limit | 2.66 - 3.10 |
| Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.80911 |
| | Accuracy | 89.9% |
| | Limit | 0.8 - 1.0 |
| Dissolved Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.83056 |

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# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 92.3% |
| | Limit | 0.8 - 1.0 |
| Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Dissolved Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 11.3 |
| | Accuracy | 87% |
| | Limit | 9 - 12 |
| Carbone organique total (C.O.T. | Blank | 0.2 |
| | Standard name | COT 10mg/L |
| | Result | 10 |
| | Accuracy | 100% |
| | Limit | 8 - 12 |
| Chloride mg/L | Blank | <0.5 |
| | Standard name | DMR-0404-2013-Cl |
| | Result | 96.5 |
| | Accuracy | 97.5% |
| | Limit | 87 - 111 |
| Chrome (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.610 |
| | Accuracy | 86.2% |
| | Limit | 3.44 - 4.66 |
| Dissolved Chromium (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 3.870 |
| | Accuracy | 95.6% |
| | Limit | 3.44 - 4.66 |
| Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.780 |
| | Accuracy | 85.9% |
| | Limit | 1.33 - 1.79 |
| Dissolved Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.640 |

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# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 94.9% |
| | Limit | 1.33 - 1.79 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1417 |
| | Accuracy | 99.9% |
| | Limit | 1203 - 1627 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1403 |
| | Accuracy | 99.2% |
| | Limit | 1203 - 1627 |
| Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.410 |
| | Accuracy | 86.3% |
| | Limit | 1.05 - 1.43 |
| Dissolved Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.210 |
| | Accuracy | 97.6% |
| | Limit | 1.05 - 1.43 |
| Tin (Sn) mg/L | Blank | <0.001 |
| dissolved Tin (Sn) mg/L | Blank | <0.001 |
| | Sample duplicate | <0.001-<0.001 |
| Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Dissolved Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 10.7 |
| | Accuracy | 98.1% |
| | Limit | 8.9 - 12.1 |
| Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 0.921 |
| | Accuracy | 90.4% |
| | Limit | 0.714 - 0.966 |
| Dissolved Lithium (Li) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |

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# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.914 |
| | Accuracy | 91.2% |
| | Limit | 0.714 - 0.966 |
| Total Suspended Solids mg/L | Blank | <1 |
| | Standard name | STD-MES 25mg/L |
| | Result | 25 |
| | Accuracy | 100% |
| | Limit | 19 - 31 |
| Magnesium (Mg) mg/L | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 7.0 |
| | Accuracy | 87.3% |
| | Limit | 5.28 - 7.14 |
| Dissolved Magnesium (Mg) mg/l | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 6.5 |
| | Accuracy | 95.3% |
| | Limit | 5.28 - 7.14 |
| Manganese (Mn) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.340 |
| | Accuracy | 87.6% |
| | Limit | 3.28 - 4.44 |
| Dissolved Manganese (Mn) mg/l | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 4.010 |
| | Accuracy | 96.1% |
| | Limit | 3.28 - 4.44 |
| Mercury (Hg) mg/L | Blank | <0.00001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.00348 |
| | Accuracy | 87% |
| | Limit | 0.003 - 0.005 |
| Dissolved Mercury (Hg) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.0041 |
| | Accuracy | 97.5% |
| | Limit | 0.003 - 0.005 |
| Molybdenum (Mo) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |

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F-02-06
Version 3ième: 26/10/2005

# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.7190 |
| | Accuracy | 98% |
| | Limit | 0.599 - 0.811 |
| Dissolved Molybdenum (Mo) mg | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.7345 |
| | Accuracy | 95.8% |
| | Limit | 0.599 - 0.811 |
| Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.240 |
| | Accuracy | 90.3% |
| | Limit | 0.96 - 1.30 |
| Dissolved Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.391 |
| | Accuracy | 87.8% |
| | Limit | 1.05 - 1.43 |
| Nitrate (NO3) mg N/L | Blank | <0.01 |
| Nitrite (NO2) mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2 |
| | Result | 2.5 |
| | Accuracy | 99.2% |
| | Limit | 2.14 - 2.90 |
| Nitrite-Nitrate mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2-NO3 |
| | Result | 8.7 |
| | Accuracy | 92.3% |
| | Limit | 6.87 - 9.29 |
| pH | Standard name | STD pH 7.0 |
| | Result | 7.01 |
| | Accuracy | 99.9% |
| | Limit | 6.84 - 7.16 |
| Total Phosphorus (P) mg P/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-10-Ptotal |
| | Result | 2.53 |
| | Accuracy | 88.8% |
| | Limit | 2.51 - 3.19 |
| Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23m |

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# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.9848 |
| | Accuracy | 90.6% |
| | Limit | 0.8 - 1.0 |
| Dissolved Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 0.9812 |
| | Accuracy | 91% |
| | Limit | 0.8 - 1.0 |
| Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 18.3 |
| | Accuracy | 97.2% |
| | Limit | 15.1 - 20.5 |
| Dissolved Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 19.9 |
| | Accuracy | 88.2% |
| | Limit | 15.1 - 20.5 |
| Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.41 |
| | Accuracy | 95.6% |
| | Limit | 1.15 - 1.55 |
| Dissolved Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.36 |
| | Accuracy | 99.3% |
| | Limit | 1.15 - 1.55 |
| Silica (Si) mg/L | Blank | <0.01 |
| dissolved silica (Si) mg/L | Blank | <0.01 |
| Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 15.6 |
| | Accuracy | 87.8% |
| | Limit | 11.8 - 16.0 |
| Dissolved Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 15.4 |
| | Accuracy | 89.2% |
| | Limit | 11.8 - 16.0 |

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F-02-06
Version 3ième: 26/10/2005

# Quality control Report

**Lab number:** V-27843

Sample name: Interval 5- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.24 |
| | Accuracy | 100% |
| | Limit | 1.05 - 1.43 |
| dissolved Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.10 |
| | Accuracy | 88.7% |
| | Limit | 1.05 - 1.43 |
| Sulfate (SO4) mg SO4/L | Blank | <1 |
| | Standard name | DMR-0404-2013-SO4 |
| | Result | 109 |
| | Accuracy | 99.1% |
| | Limit | 99 - 121 |
| Dissolved Tellurium (Te) mg/L | Blank | <0.0005 |
| Titanium (Ti) mg/L | Blank | <0.01 |
| Dissolved titanium (Ti) mg/L | Blank | <0.01 |
| | Sample duplicate | 1.6-1.7 |
| Vanadium (V) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.270 |
| | Accuracy | 85.9% |
| | Limit | 1.69 - 2.29 |
| Dissolved Vanadium mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 1.940 |
| | Accuracy | 97.5% |
| | Limit | 1.69 - 2.29 |
| Zinc (Zn) mg/L | Blank | <0.001 |
| Dissolved Zinc mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23 |
| | Result | 5.02 |
| | Accuracy | 88.7% |
| | Limit | 3.83 - 5.19 |

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F-02-06
Version 3ième: 26/10/2005

# Additional information

**Lab number:** V-27843

Sample name: Interval 5- 29/06
Sampling location: Westbay
Sampling date: June 29, 2013
Sampling hour: N/D

| Lab method | Method reference |
|---|---|
| M-TIT-1.0 | MA.303-Titr Auto 2.0 |
| M-MET-3.0 | MA.200-Mét. 1.2 |
| M-NH3-2.0 | MA.300-N 2.0 |
| M-CL-2.0 | MA.300-Ions 1.3 |
| M-CI-1.0 | MA.300-Anions 1.0 |
| M-NITR-2.0 | MA.300-NO3 2.0 |
| M-P-3.0 | MA. 315-P 2.0 |
| M-Lix-1.0 | MA.100-Lix.com. 1.1 |
| M-SULF-2.0 | MA.300-Ions 1.3 |
| M-SOLI-1.0 | MA.104-S.S. 1.1 |

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# Analytical Report

Company: **Agnico Eagle Meliadine**

Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** V-27844

Sampling location: Westbay
Sampling date: June 29, 2013

Sample name: Interval 2A- 29/06
Sampling hour: N/D

Sampled by: N/D
Date received: July 11, 2013

Matrix: Eau souterraine

Drinking water distribution:

Reported on: August 13, 2013

Unless otherwise stated, all samples were received in acceptable condition.

Results relate only to the sample tested.

All samples will be disposed of after 30 days following analysis.

Roger Turmel , Chimiste
J'approuve le certificat
2013.08.13 17:03:30 -04'00'

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# Analytical Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Alkalinity | 67 mg CaCO3/L | M-TIT-1.0 | July 11, 2013 |
| Aluminium (Al) | 0.126 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Antimony (Sb) | 0.0016 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Silver (Ag) | 0.0006 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Arsenic (As) | 0.2098 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Ammonia nitrogen (NH3-NH4) | 2.3 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Barium (Ba) | 0.1889 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Bismuth (Bi) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Boron (B) | 4.7 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Cadmium (Cd) | 0.0032 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Calcium (Ca) | 3426 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Chloride | 28008 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Chrome (Cr) | 0.2553 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Cobalt (Co) | 0.0085 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Conductivity | 23440 µmhos/cm | M-TIT-1.0 | July 11, 2013 |
| Copper (Cu) | 0.2054 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Tin (Sn) | 0.001 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Iron (Fe) | 7.9 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Fluoride (F) | 0.15 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Magnesium (Mg) | 1376 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Manganese (Mn) | 0.6655 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Mercury (Hg) | 0.00028 mg/L | Sous-traitance\Multilab Direct | July 22, 2013 |
| Molybdenum (Mo) | 0.0085 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Nickel (Ni) | 0.1818 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Nitrate (NO3) | <0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite (NO2) | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite-Nitrate | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| pH | 7.74 | M-TIT-1.0 | July 11, 2013 |
| Total Phosphorus (P) | 0.27 mg P/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Lead (Pb) | 0.0351 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Potassium (K) | 282 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Selenium (Se) | 0.678 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Silica (Si) | 10.7 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Sodium (Na) | 12313 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Dissolved Solids | 15626 mg/L | M-TIT-1.0 | July 11, 2013 |
| Strontium (Sr) | 104 mg/L | Sous-traitance\Multilab Direct | July 30, 2013 |
| Sulfate (SO4) | 1571 mg SO4/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tellurium (Te) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Titanium (Ti) | 1.2 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |

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# Analytical Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Vanadium (V) | 0.0283 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Zinc (Zn) | 14.29 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Lithium (Li) | 6.5 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |
| Conductivité Reprise client | 21720 µmhos/cm | M-TIT-1.0 | July 29, 2013 |
| Solides dissous Reprise client | 14480 mg/L | M-TIT-1.0 | July 29, 2013 |
| Chloride | 27196 mg/L | Sous-traitance\Multilab Direct | August 07, 2013 |
| Boron (B) | 5.8 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Calcium (Ca) | 3357 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Magnesium (Mg) | 1500 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |
| Potassium (K) | 262 mg/L | Sous-traitance\Multilab Direct | August 09, 2013 |

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Multilab DIRECT

# Detection limit

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 | |
| Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | Yes |
| Silver (Ag) | 0.0002 | mg/L | Sous-traitance | Yes |
| Arsenic (As) | 0.0005 | mg/L | Sous-traitance | Yes |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | Sous-traitance | Yes |
| Barium (Ba) | 0.0005 | mg/L | Sous-traitance | Yes |
| Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Bismuth (Bi) | 0.0005 | mg/L | Sous-traitance | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | Yes |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Chrome (Cr) | 0.0006 | mg/L | Sous-traitance | Yes |
| Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Copper (Cu) | 0.0005 | mg/L | Sous-traitance | Yes |
| Tin (Sn) | 0.001 | mg/L | Sous-traitance | Yes |
| Iron (Fe) | 0.01 | mg/L | Sous-traitance | Yes |
| Fluoride (F) | 0.02 | mg/L | Sous-traitance | Yes |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | Yes |
| Mercury (Hg) | 0.00001 | mg/L | Sous-traitance | Yes |
| Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | Yes |
| Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | Yes |
| Nitrate (NO3) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite (NO2) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite-Nitrate | 0.01 | mg N/L | Sous-traitance | |
| Total Phosphorus (P) | 0.01 | mg P/L | Sous-traitance | Yes |
| Lead (Pb) | 0.0003 | mg/L | Sous-traitance | Yes |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Selenium (Se) | 0.001 | mg/L | Sous-traitance | Yes |
| Silica (Si) | 0.01 | mg/L | Sous-traitance | |
| Sodium (Na) | 0.05 | mg/L | Sous-traitance | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Sulfate (SO4) | 1 | mg SO4/L | Sous-traitance | Yes |
| Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Titanium (Ti) | 0.01 | mg/L | Sous-traitance | |
| Vanadium (V) | 0.0005 | mg/L | Sous-traitance | Yes |

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# Detection limit

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Zinc (Zn) | 0.001 | mg/L | Sous-traitance | Yes |
| Lithium (Li) | 0.005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |

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# Quality control Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Alkalinity mg CaCO3/L | Standard name | STD alcalinité |
| | Result | 152 |
| | Accuracy | 95.2% |
| | Limit | 123 - 167 |
| Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.57 |
| | Accuracy | 93.9% |
| | Limit | 5.26 - 7.12 |
| Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.1968 |
| | Accuracy | 89% |
| | Limit | 0.188 - 0.254 |
| Silver (Ag) mg/L | Blank | <0.0002 |
| Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.3157 |
| | Accuracy | 88.4% |
| | Limit | 0.198 - 0.368 |
| Ammonia nitrogen (NH3-NH4) m | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NH3 |
| | Result | 5.4 |
| | Accuracy | 96.6% |
| | Limit | 4.44 - 6.00 |
| Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.200 |
| | Accuracy | 91.7% |
| | Limit | 2.0 - 2.8 |
| Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.940 |
| | Accuracy | 85.9% |
| | Limit | 1.4 - 2.0 |
| Bismuth (Bi) mg/L | Blank | <0.0005 |
| Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.3 |
| | Accuracy | 85.4% |

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# Quality control Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 2.45 - 3.31 |
| Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.98701 |
| | Accuracy | 90.3% |
| | Limit | 0.8 - 1.0 |
| Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.9 |
| | Accuracy | 81% |
| | Limit | 9 - 12 |
| Chloride mg/L | Blank | <0.5 |
| | Standard name | DMR-0404-2013-Cl |
| | Result | 96.5 |
| | Accuracy | 97.5% |
| | Limit | 87 - 111 |
| Chrome (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.007 |
| | Accuracy | 98.9% |
| | Limit | 3.44 - 4.66 |
| Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.586 |
| | Accuracy | 98.3% |
| | Limit | 1.33 - 1.79 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1403 |
| | Accuracy | 99.2% |
| | Limit | 1203 - 1627 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1417 |
| | Accuracy | 99.9% |
| | Limit | 1203 - 1627 |
| Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.304 |
| | Accuracy | 94.8% |
| | Limit | 1.05 - 1.43 |
| Tin (Sn) mg/L | Blank | <0.001 |

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# Quality control Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.8 |
| | Accuracy | 87.6% |
| | Limit | 8.9 - 12.1 |
| Magnesium (Mg) mg/L | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.6 |
| | Accuracy | 93.7% |
| | Limit | 5.28 - 7.14 |
| Manganese (Mn) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.910 |
| | Accuracy | 98.7% |
| | Limit | 3.28 - 4.44 |
| Mercury (Hg) mg/L | Blank | <0.00001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.00326 |
| | Accuracy | 81.5% |
| | Limit | 0.003 - 0.005 |
| Molybdenum (Mo) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.6324 |
| | Accuracy | 89.7% |
| | Limit | 0.599 - 0.811 |
| Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.210 |
| | Accuracy | 92.9% |
| | Limit | 0.96 - 1.30 |
| Nitrate (NO3) mg N/L | Blank | <0.01 |
| Nitrite (NO2) mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2 |
| | Result | 2.5 |
| | Accuracy | 99.2% |
| | Limit | 2.14 - 2.90 |
| Nitrite-Nitrate mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2-NO3 |
| | Result | 8.7 |
| | Accuracy | 92.3% |

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# Quality control Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 6.87 - 9.29 |
| pH | Standard name | STD pH 7.0 |
| | Result | 7.01 |
| | Accuracy | 99.9% |
| | Limit | 6.84 - 7.16 |
| Total Phosphorus (P) mg P/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-10-Ptotal |
| | Result | 2.53 |
| | Accuracy | 88.8% |
| | Limit | 2.51 - 3.19 |
| Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.9640 |
| | Accuracy | 92.9% |
| | Limit | 0.8 - 1.0 |
| Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 18.3 |
| | Accuracy | 97.2% |
| | Limit | 15.1 - 20.5 |
| Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.48 |
| | Accuracy | 90.4% |
| | Limit | 1.15 - 1.55 |
| Silica (Si) mg/L | Blank | <0.01 |
| Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 15.3 |
| | Accuracy | 89.9% |
| | Limit | 11.8 - 16.0 |
| Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.24 |
| | Accuracy | 100% |
| | Limit | 1.05 - 1.43 |
| | Sample duplicate | 104-110 |
| Sulfate (SO4) mg SO4/L | Blank | <1 |
| | Standard name | DMR-0404-2013-SO4 |
| | Result | 109 |

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# Quality control Report

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 99.1% |
| | Limit | 99 - 121 |
| Tellurium (Te) mg/L | Blank | <0.0005 |
| Titanium (Ti) mg/L | Blank | <0.01 |
| Vanadium (V) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.865 |
| | Accuracy | 93.7% |
| | Limit | 1.69 - 2.29 |
| Zinc (Zn) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.92 |
| | Accuracy | 90.9% |
| | Limit | 3.83 - 5.19 |

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F-02-06
Version 3ième: 26/10/2005

# Additional information

**Lab number:** V-27844

Sample name: Interval 2A- 29/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Lab method | Method reference |
|---|---|
| M-TIT-1.0 | MA.303-Titr Auto 2.0 |
| M-MET-3.0 | MA.200-Mét. 1.2 |
| M-NH3-2.0 | MA.300-N 2.0 |
| M-CL-2.0 | MA.300-Ions 1.3 |
| M-CI-1.0 | MA.300-Anions 1.0 |
| M-NITR-2.0 | MA.300-NO3 2.0 |
| M-P-3.0 | MA. 315-P 2.0 |
| M-Lix-1.0 | MA.100-Lix.com. 1.1 |
| M-SULF-2.0 | MA.300-Ions 1.3 |

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# Analytical Report

Company: **Agnico Eagle Meliadine**

Client: M. David Frenette
Address: Meliadine
Rankin Inlet Nunavut X0C 0A0
Phone: (867) 645-2990 (3903)
Fax: (000) 000-0000

**Lab number:** V-27845

Sampling location: Westbay
Sampling date: June 29, 2013

Sample name: Interval 4A- 20/06
Sampling hour: N/D

Sampled by: N/D
Date received: July 11, 2013

Matrix: Eau souterraine

Drinking water distribution:

Reported on: August 13, 2013

Unless otherwise stated, all samples were received in acceptable condition.

Results relate only to the sample tested.

All samples will be disposed of after 30 days following analysis.

Roger Turmel , Chimiste
J'approuve le certificat
2013.08.13 17:03:49 -04'00'

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# Analytical Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Alkalinity | 63 mg CaCO3/L | M-TIT-1.0 | July 11, 2013 |
| Aluminium (Al) | 0.062 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Antimony (Sb) | 0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Silver (Ag) | <0.0002 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Arsenic (As) | 0.2227 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Ammonia nitrogen (NH3-NH4) | 4 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Barium (Ba) | 0.0326 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Beryllium (Be) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Bismuth (Bi) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Boron (B) | 2.2 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Cadmium (Cd) | 0.00974 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Calcium (Ca) | 2639 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Carbone organique total (C.O.T. | 341 mg/L | M-COT-1.0 | July 11, 2013 |
| Chloride | 37213 mg/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Chrome (Cr) | 0.0007 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Cobalt (Co) | 0.0067 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Conductivity | 31300 µmhos/cm | M-TIT-1.0 | July 11, 2013 |
| Copper (Cu) | 0.2929 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Tin (Sn) | <0.001 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Iron (Fe) | 13.1 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Fluoride (F) | 0.11 mg/L | Sous-traitance\Multilab Direct | July 25, 2013 |
| Magnesium (Mg) | 2038 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Manganese (Mn) | 0.8786 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Mercury (Hg) | 0.00011 mg/L | Sous-traitance\Multilab Direct | July 22, 2013 |
| Molybdenum (Mo) | 0.0050 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Nickel (Ni) | 0.1216 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Nitrate (NO3) | <0.01 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite (NO2) | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| Nitrite-Nitrate | 0.02 mg N/L | Sous-traitance\Multilab Direct | July 12, 2013 |
| pH | 7.06 | M-TIT-1.0 | July 11, 2013 |
| Total Phosphorus (P) | 0.02 mg P/L | Sous-traitance\Multilab Direct | July 16, 2013 |
| Lead (Pb) | <0.0003 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Potassium (K) | 412 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Selenium (Se) | 0.731 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Silica (Si) | 2.1 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Sodium (Na) | 19247 mg/L | Sous-traitance\Multilab Direct | July 24, 2013 |
| Dissolved Solids | 20866 mg/L | M-TIT-1.0 | July 11, 2013 |
| Strontium (Sr) | 65.42 mg/L | Sous-traitance\Multilab Direct | July 30, 2013 |
| Sulfate (SO4) | 3435 mg SO4/L | Sous-traitance\Multilab Direct | July 15, 2013 |
| Tellurium (Te) | 0.0031 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |

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# Analytical Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | Result | Method name | Analysis date |
|---|---|---|---|
| Titanium (Ti) | 1.4 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Vanadium (V) | <0.0005 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Zinc (Zn) | 0.764 mg/L | Sous-traitance\Multilab Direct | July 19, 2013 |
| Lithium (Li) | 3.01 mg/L | Sous-traitance\Multilab Direct | July 23, 2013 |

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Multilab DIRECT

# Detection limit

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Alkalinity | 2 | mg CaCO3/L | M-TIT-1.0 | |
| Aluminium (Al) | 0.006 | mg/L | Sous-traitance | |
| Antimony (Sb) | 0.0001 | mg/L | Sous-traitance | Yes |
| Silver (Ag) | 0.0002 | mg/L | Sous-traitance | Yes |
| Arsenic (As) | 0.0005 | mg/L | Sous-traitance | Yes |
| Ammonia nitrogen (NH3-NH4) | 0.01 | mg N/L | Sous-traitance | Yes |
| Barium (Ba) | 0.0005 | mg/L | Sous-traitance | Yes |
| Beryllium (Be) | 0.0005 | mg/L | Sous-traitance | |
| Bismuth (Bi) | 0.0005 | mg/L | Sous-traitance | |
| Boron (B) | 0.01 | mg/L | Sous-traitance | Yes |
| Cadmium (Cd) | 0.00002 | mg/L | Sous-traitance | Yes |
| Calcium (Ca) | 0.03 | mg/L | Sous-traitance | Yes |
| Carbone organique total (C.O.T. | 0.2 | mg/L | M-COT-1.0 | -- |
| Chloride | 0.5 | mg/L | Sous-traitance | Yes |
| Chrome (Cr) | 0.0006 | mg/L | Sous-traitance | Yes |
| Cobalt (Co) | 0.0005 | mg/L | Sous-traitance | |
| Conductivity | 1 | µmhos/cm | M-TIT-1.0 | Yes |
| Copper (Cu) | 0.0005 | mg/L | Sous-traitance | Yes |
| Tin (Sn) | 0.001 | mg/L | Sous-traitance | Yes |
| Iron (Fe) | 0.01 | mg/L | Sous-traitance | Yes |
| Fluoride (F) | 0.02 | mg/L | Sous-traitance | Yes |
| Magnesium (Mg) | 0.02 | mg/L | Sous-traitance | Yes |
| Manganese (Mn) | 0.0005 | mg/L | Sous-traitance | Yes |
| Mercury (Hg) | 0.00001 | mg/L | Sous-traitance | Yes |
| Molybdenum (Mo) | 0.0005 | mg/L | Sous-traitance | Yes |
| Nickel (Ni) | 0.0005 | mg/L | Sous-traitance | Yes |
| Nitrate (NO3) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite (NO2) | 0.01 | mg N/L | Sous-traitance | Yes |
| Nitrite-Nitrate | 0.01 | mg N/L | Sous-traitance | |
| Total Phosphorus (P) | 0.01 | mg P/L | Sous-traitance | Yes |
| Lead (Pb) | 0.0003 | mg/L | Sous-traitance | Yes |
| Potassium (K) | 0.05 | mg/L | Sous-traitance | |
| Selenium (Se) | 0.001 | mg/L | Sous-traitance | Yes |
| Silica (Si) | 0.01 | mg/L | Sous-traitance | |
| Sodium (Na) | 0.05 | mg/L | Sous-traitance | Yes |
| Dissolved Solids | 1 | mg/L | M-TIT-1.0 | |
| Strontium (Sr) | 0.005 | mg/L | Sous-traitance | |
| Sulfate (SO4) | 1 | mg SO4/L | Sous-traitance | Yes |
| Tellurium (Te) | 0.0005 | mg/L | Sous-traitance | |
| Titanium (Ti) | 0.01 | mg/L | Sous-traitance | |

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# Detection limit

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | Value | Unit | Method | Accreditation |
|---|---|---|---|---|
| Vanadium (V) | 0.0005 | mg/L | Sous-traitance | Yes |
| Zinc (Zn) | 0.001 | mg/L | Sous-traitance | Yes |
| Lithium (Li) | 0.005 | mg/L | Sous-traitance | |

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# Quality control Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | | |
|---|---|---|
| Alkalinity mg CaCO3/L | Standard name | STD alcalinité |
| | Result | 152 |
| | Accuracy | 95.2% |
| | Limit | 123 - 167 |
| Aluminium (Al) mg/L | Blank | <0.006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.57 |
| | Accuracy | 93.9% |
| | Limit | 5.26 - 7.12 |
| | Sample duplicate | 0.062-0.046 |
| Antimony (Sb) mg/L | Blank | <0.0001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.1968 |
| | Accuracy | 89% |
| | Limit | 0.188 - 0.254 |
| | Sample duplicate | 0.0005-0.0005 |
| Silver (Ag) mg/L | Blank | <0.0002 |
| | Sample duplicate | <0.0002-<0.0002 |
| Arsenic (As) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.3157 |
| | Accuracy | 88.4% |
| | Limit | 0.198 - 0.368 |
| | Sample duplicate | 0.2227-0.2164 |
| Ammonia nitrogen (NH3-NH4) m | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NH3 |
| | Result | 5.4 |
| | Accuracy | 96.6% |
| | Limit | 4.44 - 6.00 |
| Barium (Ba) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 2.200 |
| | Accuracy | 91.7% |
| | Limit | 2.0 - 2.8 |
| | Sample duplicate | 0.0326-0.0309 |
| Beryllium (Be) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.940 |
| | Accuracy | 85.9% |
| | Limit | 1.4 - 2.0 |

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# Quality control Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 Sampling date: June 29, 2013

Sampling location: Westbay Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Sample duplicate | <0.0005-<0.0005 |
| Bismuth (Bi) mg/L | Blank | <0.0005 |
| | Sample duplicate | <0.0005-<0.0005 |
| Boron (B) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.3 |
| | Accuracy | 85.4% |
| | Limit | 2.45 - 3.31 |
| | Sample duplicate | 2.2-2.1 |
| Cadmium (Cd) mg/L | Blank | <0.00002 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.98701 |
| | Accuracy | 90.3% |
| | Limit | 0.8 - 1.0 |
| | Sample duplicate | 0.00974-0.00951 |
| Calcium (Ca) mg/L | Blank | <0.03 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.9 |
| | Accuracy | 81% |
| | Limit | 9 - 12 |
| | Sample duplicate | 2639-2656 |
| Carbone organique total (C.O.T. | Blank | 0.2 |
| | Standard name | COT 10mg/L |
| | Result | 10 |
| | Accuracy | 100% |
| | Limit | 8 - 12 |
| Chloride mg/L | Blank | <0.5 |
| | Standard name | DMR-0404-2013-Cl |
| | Result | 96.5 |
| | Accuracy | 97.5% |
| | Limit | 87 - 111 |
| Chrome (Cr) mg/L | Blank | <0.0006 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.007 |
| | Accuracy | 98.9% |
| | Limit | 3.44 - 4.66 |
| | Sample duplicate | 0.0007-0.0006 |
| Cobalt (Co) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.586 |

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# Quality control Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Accuracy | 98.3% |
| | Limit | 1.33 - 1.79 |
| | Sample duplicate | 0.0067-0.0066 |
| Conductivity µmhos/cm | Standard name | STD cond maison |
| | Result | 1417 |
| | Accuracy | 99.9% |
| | Limit | 1203 - 1627 |
| Copper (Cu) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.304 |
| | Accuracy | 94.8% |
| | Limit | 1.05 - 1.43 |
| | Sample duplicate | 0.2929-0.2932 |
| Tin (Sn) mg/L | Blank | <0.001 |
| | Sample duplicate | <0.001-<0.001 |
| Iron (Fe) mg/L | Blank | <0.01 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 11.8 |
| | Accuracy | 87.6% |
| | Limit | 8.9 - 12.1 |
| | Sample duplicate | 13.1-13.5 |
| Magnesium (Mg) mg/L | Blank | <0.02 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 6.6 |
| | Accuracy | 93.7% |
| | Limit | 5.28 - 7.14 |
| | Sample duplicate | 2038-2002 |
| Manganese (Mn) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 3.910 |
| | Accuracy | 98.7% |
| | Limit | 3.28 - 4.44 |
| | Sample duplicate | 0.8786-0.8855 |
| Mercury (Hg) mg/L | Blank | <0.00001 |
| | Standard name | DMR-0232-2013-14-Hg |
| | Result | 0.00326 |
| | Accuracy | 81.5% |
| | Limit | 0.003 - 0.005 |
| Molybdenum (Mo) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |

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# Quality control Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Result | 0.6324 |
| | Accuracy | 89.7% |
| | Limit | 0.599 - 0.811 |
| | Sample duplicate | 0.0050-0.0044 |
| Nickel (Ni) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.210 |
| | Accuracy | 92.9% |
| | Limit | 0.96 - 1.30 |
| | Sample duplicate | 0.1216-0.1237 |
| Nitrate (NO3) mg N/L | Blank | <0.01 |
| Nitrite (NO2) mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2 |
| | Result | 2.5 |
| | Accuracy | 99.2% |
| | Limit | 2.14 - 2.90 |
| Nitrite-Nitrate mg N/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-NO2-NO3 |
| | Result | 8.7 |
| | Accuracy | 92.3% |
| | Limit | 6.87 - 9.29 |
| pH | Standard name | STD pH 7.0 |
| | Result | 7.01 |
| | Accuracy | 99.9% |
| | Limit | 6.84 - 7.16 |
| Total Phosphorus (P) mg P/L | Blank | <0.01 |
| | Standard name | DMR-0404-2013-10-Ptotal |
| | Result | 2.53 |
| | Accuracy | 88.8% |
| | Limit | 2.51 - 3.19 |
| Lead (Pb) mg/L | Blank | <0.0003 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 0.9640 |
| | Accuracy | 92.9% |
| | Limit | 0.8 - 1.0 |
| | Sample duplicate | <0.0003-<0.0003 |
| Potassium (K) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 18.3 |
| | Accuracy | 97.2% |

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# Quality control Report

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Parameter | | |
|---|---|---|
| | Limit | 15.1 - 20.5 |
| | Sample duplicate | 412-410 |
| Selenium (Se) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.48 |
| | Accuracy | 90.4% |
| | Limit | 1.15 - 1.55 |
| | Sample duplicate | 0.731-0.699 |
| Silica (Si) mg/L | Blank | <0.01 |
| | Sample duplicate | 2.1-2.1 |
| Sodium (Na) mg/L | Blank | <0.05 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 12.3 |
| | Accuracy | 88.5% |
| | Limit | 11.8 - 16.0 |
| Strontium (Sr) mg/L | Blank | <0.005 |
| | Standard name | DMR-0773-2011-18a |
| | Result | 1.24 |
| | Accuracy | 100% |
| | Limit | 1.05 - 1.43 |
| Sulfate (SO4) mg SO4/L | Blank | <1 |
| | Standard name | DMR-0404-2013-SO4 |
| | Result | 109 |
| | Accuracy | 99.1% |
| | Limit | 99 - 121 |
| Tellurium (Te) mg/L | Blank | <0.0005 |
| Titanium (Ti) mg/L | Blank | <0.01 |
| | Sample duplicate | 1.4-1.5 |
| Vanadium (V) mg/L | Blank | <0.0005 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 1.865 |
| | Accuracy | 93.7% |
| | Limit | 1.69 - 2.29 |
| | Sample duplicate | <0.0005-<0.0005 |
| Zinc (Zn) mg/L | Blank | <0.001 |
| | Standard name | DMR-0311-2013-23m |
| | Result | 4.92 |
| | Accuracy | 90.9% |
| | Limit | 3.83 - 5.19 |
| | Sample duplicate | 0.764-0.759 |

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# Additional information

**Lab number:** V-27845

Sample name: Interval 4A- 20/06 | Sampling date: June 29, 2013

Sampling location: Westbay | Sampling hour: N/D

| Lab method | Method reference |
|---|---|
| M-TIT-1.0 | MA.303-Titr Auto 2.0 |
| M-MET-3.0 | MA.200-Mét. 1.2 |
| M-NH3-2.0 | MA.300-N 2.0 |
| M-CL-2.0 | MA.300-Ions 1.3 |
| M-CI-1.0 | MA.300-Anions 1.0 |
| M-NITR-2.0 | MA.300-NO3 2.0 |
| M-P-3.0 | MA. 315-P 2.0 |
| M-Lix-1.0 | MA.100-Lix.com. 1.1 |
| M-SULF-2.0 | MA.300-Ions 1.3 |

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# APPENDIX 7.3-A

## Baseline Flow and Water Level Regimes, Annual Water Yields

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## CONTENT

This appendix presents baseline discharge and water level regimes, and annual water yields during project phases, for all modeled lakes in the LSA.

## BASELINE DISCHARGE AND WATER LEVEL REGIMES

**Table 7.3-A1: Derived Monthly Mean Discharges at the Lake A8 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 15 000 | 37 200 | 6 470 | 4 700 | 3 670 | 2 030 |
| | 50 | 12 500 | 33 700 | 5 330 | 3 460 | 2 950 | 1 700 |
| | 20 | 9 380 | 28 900 | 3 980 | 2 190 | 2 110 | 1 260 |
| | 10 | 7 030 | 25 100 | 3 080 | 1 460 | 1 560 | 933 |
| | 5 | 4 680 | 21 000 | 2 250 | 889 | 1 080 | 622 |
| Median | 2 | 1 310 | 14 500 | 1 250 | 343 | 499 | 248 |
| Dry | 5 | 0 | 9 490 | 694 | 130 | 199 | 82 |
| | 10 | 0 | 7 310 | 513 | 77 | 105 | 44 |
| | 20 | 0 | 5 720 | 401 | 49 | 48 | 26 |
| | 50 | 0 | 4 120 | 305 | 28 | 0 | 15 |
| | 100 | 0 | 3 150 | 255 | 19 | 0 | 11 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A2: Derived Representative Discharges at the Lake A8 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 2.47 | 71 900 | 55 600 | 1 870 | 2 970 | 3 250 |
| | 50 | 2.10 | 67 000 | 52 000 | 1 470 | 2 360 | 2 750 |
| | 20 | 1.66 | 60 100 | 46 900 | 1 020 | 1 670 | 2 140 |
| | 10 | 1.35 | 54 500 | 42 700 | 741 | 1 220 | 1 710 |
| | 5 | 1.06 | 48 300 | 37 800 | 497 | 830 | 1 290 |
| Median | 2 | 0.68 | 38 000 | 29 400 | 224 | 385 | 735 |
| Dry | 5 | 0.45 | 29 400 | 22 100 | 91 | 164 | 394 |
| | 10 | 0.37 | 25 500 | 18 600 | 52 | 96 | 272 |
| | 20 | 0.32 | 22 500 | 16 000 | 29 | 57 | 192 |
| | 50 | 0.28 | 19 500 | 13 100 | 10 | 24 | 120 |
| | 100 | 0.25 | 17 600 | 11 300 | 1 | 8 | 81 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A3: Derived Monthly Mean Stages at the Lake A8 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.553 | 0.604 | 0.510 | 0.494 | 0.483 | 0.456 |
| | 50 | 0.543 | 0.598 | 0.500 | 0.480 | 0.472 | 0.448 |
| | 20 | 0.528 | 0.589 | 0.486 | 0.459 | 0.457 | 0.435 |
| | 10 | 0.514 | 0.581 | 0.474 | 0.441 | 0.444 | 0.423 |
| | 5 | 0.494 | 0.571 | 0.460 | 0.421 | 0.429 | 0.406 |
| Median | 2 | 0.437 | 0.551 | 0.435 | 0.384 | 0.398 | 0.372 |
| Dry | 5 | - | 0.529 | 0.411 | 0.349 | 0.364 | 0.334 |
| | 10 | - | 0.516 | 0.399 | 0.332 | 0.342 | 0.315 |
| | 20 | - | 0.504 | 0.390 | 0.318 | 0.317 | 0.299 |
| | 50 | - | 0.488 | 0.379 | 0.302 | - | 0.284 |
| | 100 | - | 0.475 | 0.373 | 0.290 | - | 0.275 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A4: Derived Representative Stages at the Lake A8 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.715 | 0.643 | 0.627 | 0.452 | 0.473 | 0.477 |
| | 50 | 0.703 | 0.639 | 0.623 | 0.442 | 0.462 | 0.469 |
| | 20 | 0.688 | 0.632 | 0.617 | 0.426 | 0.447 | 0.458 |
| | 10 | 0.674 | 0.626 | 0.612 | 0.413 | 0.434 | 0.448 |
| | 5 | 0.658 | 0.619 | 0.604 | 0.398 | 0.418 | 0.436 |
| Median | 2 | 0.630 | 0.605 | 0.590 | 0.368 | 0.388 | 0.413 |
| Dry | 5 | 0.606 | 0.590 | 0.574 | 0.338 | 0.357 | 0.389 |
| | 10 | 0.595 | 0.582 | 0.564 | 0.320 | 0.339 | 0.375 |
| | 20 | 0.587 | 0.575 | 0.556 | 0.302 | 0.322 | 0.363 |
| | 50 | 0.578 | 0.567 | 0.546 | 0.273 | 0.297 | 0.347 |
| | 100 | 0.573 | 0.561 | 0.538 | 0.214 | 0.266 | 0.334 |

Note: m = metre.

**Table 7.3-A5: Derived Monthly Mean Discharges at the Lake A6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 24 100 | 65 300 | 13 400 | 7 770 | 6 080 | 3 240 |
| | 50 | 19 900 | 58 900 | 11 100 | 5 920 | 4 980 | 2 780 |
| | 20 | 14 700 | 50 400 | 8 340 | 3 930 | 3 680 | 2 140 |
| | 10 | 10 800 | 43 700 | 6 490 | 2 720 | 2 790 | 1 640 |
| | 5 | 7 050 | 36 700 | 4 800 | 1 740 | 1 980 | 1 130 |
| Median | 2 | 1 740 | 26 000 | 2 710 | 728 | 964 | 472 |
| Dry | 5 | 0 | 18 100 | 1 550 | 288 | 397 | 159 |
| | 10 | 0 | 14 800 | 1 170 | 168 | 209 | 84 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 12 400 | 929 | 102 | 91 | 50 |
| | 50 | 0 | 10 100 | 724 | 52 | 0 | 29 |
| | 100 | 0 | 8 690 | 616 | 28 | 0 | 21 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A6: Derived Representative Discharges at the Lake A6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.55 | 133 000 | 98 300 | 3 550 | 5 130 | 5 970 |
| | 50 | 2.99 | 123 000 | 91 600 | 2 840 | 4 180 | 5 140 |
| | 20 | 2.35 | 109 000 | 82 300 | 2 030 | 3 060 | 4 090 |
| | 10 | 1.94 | 98 700 | 74 700 | 1 500 | 2 310 | 3 330 |
| | 5 | 1.57 | 87 000 | 66 200 | 1 030 | 1 630 | 2 580 |
| Median | 2 | 1.12 | 68 600 | 51 900 | 483 | 805 | 1 530 |
| Dry | 5 | 0.85 | 54 200 | 39 900 | 198 | 354 | 849 |
| | 10 | 0.81 | 48 100 | 34 300 | 109 | 208 | 592 |
| | 20 | 0.79 | 43 500 | 30 100 | 56 | 118 | 420 |
| | 50 | 0.79 | 39 000 | 25 800 | 11 | 41 | 260 |
| | 100 | 0.78 | 36 200 | 23 100 | 0 | 1 | 170 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A7: Derived Monthly Mean Stages at the Lake A6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.395 | 0.482 | 0.351 | 0.315 | 0.300 | 0.264 |
| | 50 | 0.380 | 0.472 | 0.338 | 0.298 | 0.288 | 0.256 |
| | 20 | 0.358 | 0.458 | 0.320 | 0.275 | 0.271 | 0.243 |
| | 10 | 0.336 | 0.445 | 0.304 | 0.255 | 0.257 | 0.231 |
| | 5 | 0.309 | 0.430 | 0.286 | 0.234 | 0.240 | 0.214 |
| Median | 2 | 0.234 | 0.401 | 0.255 | 0.196 | 0.208 | 0.180 |
| Dry | 5 | - | 0.373 | 0.228 | 0.163 | 0.174 | 0.145 |
| | 10 | - | 0.358 | 0.216 | 0.146 | 0.153 | 0.128 |
| | 20 | - | 0.346 | 0.206 | 0.132 | 0.129 | 0.115 |
| | 50 | - | 0.332 | 0.196 | 0.116 | - | 0.103 |
| | 100 | - | 0.322 | 0.190 | 0.102 | - | 0.096 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A8: Derived Representative Stages at the Lake A6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.657 | 0.556 | 0.523 | 0.269 | 0.290 | 0.299 |
| | 50 | 0.635 | 0.547 | 0.516 | 0.258 | 0.278 | 0.290 |
| | 20 | 0.605 | 0.534 | 0.505 | 0.241 | 0.261 | 0.277 |
| | 10 | 0.582 | 0.524 | 0.495 | 0.227 | 0.247 | 0.266 |
| | 5 | 0.558 | 0.511 | 0.484 | 0.210 | 0.231 | 0.253 |
| Median | 2 | 0.522 | 0.487 | 0.461 | 0.181 | 0.200 | 0.228 |
| Dry | 5 | 0.493 | 0.465 | 0.437 | 0.151 | 0.170 | 0.202 |
| | 10 | 0.489 | 0.454 | 0.424 | 0.134 | 0.153 | 0.188 |
| | 20 | 0.487 | 0.445 | 0.413 | 0.117 | 0.136 | 0.176 |
| | 50 | 0.486 | 0.435 | 0.400 | 0.085 | 0.110 | 0.160 |
| | 100 | 0.486 | 0.429 | 0.392 | - | 0.051 | 0.147 |

Note: m = metre.

**Table 7.3-A9: Derived Monthly Mean Discharges at the Lake A1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | 50 | 28 700 | 83 300 | 15 700 | 8 290 | 6 590 | 4 200 |
| | 20 | 21 200 | 71 600 | 12 100 | 6 080 | 5 340 | 3 060 |
| | 10 | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | 5 | 10 300 | 52 700 | 7 270 | 3 280 | 3 440 | 1 600 |
| Median | 2 | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| Dry | 5 | 0 | 26 000 | 2 630 | 851 | 1 070 | 355 |
| | 10 | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | 20 | 0 | 17 500 | 1 690 | 413 | 415 | 173 |
| | 50 | 0 | 14 000 | 1 370 | 273 | 159 | 126 |
| | 100 | 0 | 11 900 | 1 200 | 201 | 12 | 105 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A10: Derived Representative Discharges at the Lake A1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | 50 | 4.07 | 179 000 | 129 000 | 3 940 | 5 840 | 7 350 |
| | 20 | 3.34 | 159 000 | 117 000 | 3 160 | 4 680 | 6 120 |
| | 10 | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | 5 | 2.35 | 127 000 | 94 300 | 2 010 | 2 980 | 4 220 |
| Median | 2 | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| Dry | 5 | 1.23 | 77 900 | 57 400 | 636 | 974 | 1 730 |
| | 10 | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 1.03 | 61 500 | 43 500 | 279 | 459 | 1 010 |
| | 50 | 0.99 | 54 500 | 37 200 | 144 | 265 | 721 |
| | 100 | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A11: Derived Monthly Mean Stages at the Lake A1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | 50 | 0.586 | 0.712 | 0.525 | 0.468 | 0.449 | 0.413 |
| | 20 | 0.555 | 0.692 | 0.501 | 0.442 | 0.432 | 0.390 |
| | 10 | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | 5 | 0.487 | 0.655 | 0.457 | 0.395 | 0.399 | 0.347 |
| Median | 2 | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| Dry | 5 | - | 0.576 | 0.380 | 0.309 | 0.322 | 0.264 |
| | 10 | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | 20 | - | 0.536 | 0.350 | 0.271 | 0.271 | 0.232 |
| | 50 | - | 0.515 | 0.337 | 0.252 | 0.228 | 0.219 |
| | 100 | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |

Note: m = metre.

**Table 7.3-A12: Derived Representative Stages at the Lake A1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | 50 | 0.925 | 0.869 | 0.787 | 0.409 | 0.439 | 0.458 |
| | 20 | 0.892 | 0.836 | 0.767 | 0.393 | 0.422 | 0.443 |
| | 10 | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | 5 | 0.837 | 0.783 | 0.730 | 0.362 | 0.388 | 0.414 |
| Median | 2 | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| Dry | 5 | 0.744 | 0.703 | 0.665 | 0.293 | 0.317 | 0.352 |
| | 10 | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | 20 | 0.720 | 0.674 | 0.632 | 0.253 | 0.276 | 0.319 |
| | 50 | 0.715 | 0.659 | 0.615 | 0.224 | 0.250 | 0.300 |
| | 100 | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |

Note: m = metre.

**Table 7.3-A13: Derived Monthly Mean Discharges at the Lake B7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 6 530 | 23 700 | 7 540 | 2 840 | 2 160 | 1 340 |
| | 50 | 5 440 | 21 100 | 6 430 | 2 450 | 1 950 | 1 180 |
| | 20 | 4 040 | 17 700 | 5 070 | 1 970 | 1 670 | 949 |
| | 10 | 3 000 | 15 200 | 4 110 | 1 610 | 1 440 | 767 |
| | 5 | 1 970 | 12 700 | 3 200 | 1 250 | 1 190 | 576 |
| Median | 2 | 524 | 9 230 | 2 010 | 747 | 775 | 303 |
| Dry | 5 | 0 | 6 890 | 1 300 | 416 | 435 | 142 |
| | 10 | 0 | 6 000 | 1 050 | 290 | 283 | 92 |
| | 20 | 0 | 5 390 | 888 | 205 | 169 | 65 |
| | 50 | 0 | 4 820 | 743 | 125 | 51 | 45 |
| | 100 | 0 | 4 500 | 665 | 81 | 0 | 36 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A14: Derived Representative Discharges at the Lake B7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.71 | 42 000 | 33 200 | 1 590 | 2 080 | 2 880 |
| | 50 | 0.61 | 38 100 | 30 500 | 1 440 | 1 880 | 2 640 |
| | 20 | 0.49 | 33 000 | 26 900 | 1 220 | 1 600 | 2 290 |
| | 10 | 0.41 | 29 100 | 24 000 | 1 050 | 1 380 | 2 020 |
| | 5 | 0.34 | 25 100 | 21 000 | 864 | 1 140 | 1 710 |
| Median | 2 | 0.25 | 19 000 | 16 100 | 560 | 755 | 1 200 |
| Dry | 5 | 0.19 | 14 600 | 12 300 | 317 | 447 | 786 |
| | 10 | 0.18 | 12 800 | 10 700 | 210 | 312 | 598 |
| | 20 | 0.18 | 11 600 | 9 520 | 130 | 212 | 456 |
| | 50 | 0.17 | 10 300 | 8 330 | 49 | 110 | 310 |
| | 100 | 0.17 | 9 600 | 7 620 | 0 | 49 | 220 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A15: Derived Monthly Mean Stages at the Lake B7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.439 | 0.624 | 0.456 | 0.350 | 0.325 | 0.285 |
| | 50 | 0.418 | 0.604 | 0.437 | 0.336 | 0.316 | 0.275 |
| | 20 | 0.385 | 0.576 | 0.410 | 0.317 | 0.303 | 0.259 |
| | 10 | 0.355 | 0.552 | 0.387 | 0.300 | 0.291 | 0.245 |
| | 5 | 0.317 | 0.526 | 0.361 | 0.280 | 0.276 | 0.226 |
| Median | 2 | 0.221 | 0.482 | 0.318 | 0.243 | 0.246 | 0.190 |
| Dry | 5 | - | 0.445 | 0.283 | 0.207 | 0.210 | 0.155 |
| | 10 | - | 0.429 | 0.267 | 0.188 | 0.187 | 0.138 |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.416 | 0.255 | 0.171 | 0.162 | 0.125 |
| | 50 | - | 0.404 | 0.243 | 0.149 | 0.117 | 0.113 |
| | 100 | - | 0.396 | 0.235 | 0.133 | - | 0.107 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A16: Derived Representative Stages at the Lake B7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.807 | 0.729 | 0.684 | 0.299 | 0.321 | 0.351 |
| | 50 | 0.774 | 0.710 | 0.668 | 0.291 | 0.313 | 0.343 |
| | 20 | 0.731 | 0.682 | 0.645 | 0.278 | 0.299 | 0.330 |
| | 10 | 0.697 | 0.659 | 0.626 | 0.267 | 0.287 | 0.319 |
| | 5 | 0.662 | 0.633 | 0.603 | 0.253 | 0.273 | 0.305 |
| Median | 2 | 0.607 | 0.587 | 0.561 | 0.225 | 0.244 | 0.277 |
| Dry | 5 | 0.564 | 0.546 | 0.521 | 0.192 | 0.211 | 0.246 |
| | 10 | 0.556 | 0.527 | 0.502 | 0.172 | 0.192 | 0.229 |
| | 20 | 0.552 | 0.513 | 0.486 | 0.151 | 0.172 | 0.212 |
| | 50 | 0.550 | 0.497 | 0.469 | 0.115 | 0.144 | 0.191 |
| | 100 | 0.549 | 0.487 | 0.458 | - | 0.116 | 0.174 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A17: Derived Monthly Mean Discharges at the Lake B6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 7 760 | 26 700 | 8 320 | 3 310 | 2 530 | 1 500 |
| | 50 | 6 440 | 23 900 | 7 070 | 2 840 | 2 290 | 1 330 |
| | 20 | 4 770 | 20 200 | 5 520 | 2 240 | 1 940 | 1 100 |
| | 10 | 3 550 | 17 500 | 4 430 | 1 800 | 1 660 | 898 |
| | 5 | 2 320 | 14 700 | 3 390 | 1 360 | 1 360 | 685 |
| Median | 2 | 602 | 10 700 | 2 020 | 745 | 865 | 368 |
| Dry | 5 | 0 | 7 940 | 1 190 | 341 | 463 | 173 |
| | 10 | 0 | 6 850 | 891 | 189 | 285 | 112 |
| | 20 | 0 | 6 100 | 699 | 85 | 152 | 78 |
| | 50 | 0 | 5 390 | 527 | 0 | 16 | 54 |
| | 100 | 0 | 4 980 | 433 | 0 | 0 | 43 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A18: Derived Representative Discharges at the Lake B6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.85 | 50 100 | 38 300 | 1 710 | 2 340 | 3 160 |
| | 50 | 0.76 | 45 500 | 35 400 | 1 520 | 2 100 | 2 880 |
| | 20 | 0.64 | 39 400 | 31 500 | 1 260 | 1 770 | 2 500 |
| | 10 | 0.55 | 34 900 | 28 300 | 1 060 | 1 500 | 2 180 |
| | 5 | 0.46 | 30 100 | 24 900 | 836 | 1 220 | 1 830 |
| Median | 2 | 0.34 | 23 100 | 19 400 | 492 | 762 | 1 250 |
| Dry | 5 | 0.25 | 18 100 | 14 900 | 227 | 401 | 759 |
| | 10 | 0.23 | 16 100 | 12 900 | 113 | 244 | 536 |
| | 20 | 0.21 | 14 700 | 11 500 | 31 | 127 | 367 |
| | 50 | 0.20 | 13 300 | 10 000 | 0 | 10 | 192 |
| | 100 | 0.19 | 12 500 | 9 110 | 0 | 0 | 84 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A19: Derived Monthly Mean Stages at the Lake B6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.107 | 0.244 | 0.112 | 0.061 | 0.051 | 0.036 |
| | 50 | 0.095 | 0.227 | 0.101 | 0.055 | 0.048 | 0.033 |
| | 20 | 0.077 | 0.203 | 0.085 | 0.047 | 0.043 | 0.029 |
| | 10 | 0.064 | 0.184 | 0.074 | 0.040 | 0.038 | 0.025 |
| | 5 | 0.048 | 0.164 | 0.062 | 0.034 | 0.034 | 0.021 |
| Median | 2 | 0.019 | 0.133 | 0.044 | 0.022 | 0.025 | 0.014 |
| Dry | 5 | - | 0.109 | 0.031 | 0.013 | 0.016 | 0.008 |
| | 10 | - | 0.099 | 0.025 | 0.009 | 0.012 | 0.006 |
| | 20 | - | 0.091 | 0.022 | 0.005 | 0.008 | 0.005 |
| | 50 | - | 0.084 | 0.018 | - | 0.002 | 0.004 |
| | 100 | - | 0.080 | 0.016 | - | - | 0.003 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A20: Derived Representative Stages at the Lake B6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.480 | 0.372 | 0.311 | 0.039 | 0.048 | 0.059 |
| | 50 | 0.443 | 0.348 | 0.295 | 0.036 | 0.045 | 0.055 |
| | 20 | 0.395 | 0.317 | 0.273 | 0.032 | 0.040 | 0.050 |
| | 10 | 0.357 | 0.292 | 0.254 | 0.028 | 0.036 | 0.046 |
| | 5 | 0.319 | 0.265 | 0.233 | 0.024 | 0.031 | 0.041 |
| Median | 2 | 0.261 | 0.222 | 0.197 | 0.017 | 0.023 | 0.032 |
| Dry | 5 | 0.214 | 0.188 | 0.166 | 0.010 | 0.015 | 0.023 |
| | 10 | 0.198 | 0.174 | 0.150 | 0.006 | 0.011 | 0.018 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.188 | 0.164 | 0.139 | 0.003 | 0.007 | 0.014 |
| | 50 | 0.181 | 0.153 | 0.127 | - | 0.001 | 0.009 |
| | 100 | 0.178 | 0.147 | 0.119 | - | - | 0.005 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A21: Derived Monthly Mean Discharges at the Lake B5 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 15 700 | 48 000 | 12 200 | 6 610 | 4 770 | 2 210 |
| | 50 | 13 100 | 43 000 | 10 300 | 5 270 | 4 150 | 2 060 |
| | 20 | 9 780 | 36 300 | 8 000 | 3 750 | 3 330 | 1 770 |
| | 10 | 7 320 | 31 300 | 6 390 | 2 760 | 2 710 | 1 490 |
| | 5 | 4 860 | 26 200 | 4 860 | 1 890 | 2 080 | 1 140 |
| Median | 2 | 1 350 | 18 600 | 2 870 | 882 | 1 170 | 548 |
| Dry | 5 | 0 | 13 300 | 1 690 | 371 | 527 | 192 |
| | 10 | 0 | 11 100 | 1 280 | 214 | 273 | 99 |
| | 20 | 0 | 9 650 | 1 010 | 120 | 97 | 55 |
| | 50 | 0 | 8 220 | 774 | 43 | 0 | 29 |
| | 100 | 0 | 7 400 | 647 | 4 | 0 | 20 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A22: Derived Representative Discharges at the Lake B5 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.82 | 88 900 | 68 100 | 3 100 | 4 200 | 4 950 |
| | 50 | 1.52 | 80 400 | 62 800 | 2 590 | 3 610 | 4 460 |
| | 20 | 1.19 | 69 500 | 55 600 | 1 970 | 2 850 | 3 780 |
| | 10 | 0.99 | 61 300 | 49 900 | 1 530 | 2 290 | 3 250 |
| | 5 | 0.81 | 53 000 | 43 700 | 1 120 | 1 740 | 2 670 |
| Median | 2 | 0.60 | 41 000 | 34 000 | 577 | 969 | 1 740 |
| Dry | 5 | 0.47 | 32 700 | 26 500 | 255 | 459 | 1 010 |
| | 10 | 0.44 | 29 500 | 23 200 | 142 | 265 | 692 |
| | 20 | 0.43 | 27 200 | 20 800 | 69 | 135 | 458 |
| | 50 | 0.43 | 25 100 | 18 400 | 4 | 13 | 221 |
| | 100 | 0.43 | 23 900 | 17 000 | 0 | 0 | 78 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A23: Derived Monthly Mean Stages at the Lake B5 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.395 | 0.472 | 0.380 | 0.344 | 0.327 | 0.289 |
| | 50 | 0.384 | 0.464 | 0.370 | 0.332 | 0.320 | 0.286 |
| | 20 | 0.367 | 0.452 | 0.355 | 0.315 | 0.309 | 0.279 |
| | 10 | 0.350 | 0.441 | 0.343 | 0.300 | 0.299 | 0.272 |
| | 5 | 0.328 | 0.429 | 0.328 | 0.282 | 0.286 | 0.260 |
| Median | 2 | 0.267 | 0.406 | 0.302 | 0.250 | 0.261 | 0.232 |
| Dry | 5 | - | 0.385 | 0.277 | 0.218 | 0.230 | 0.196 |
| | 10 | - | 0.374 | 0.265 | 0.199 | 0.207 | 0.176 |
| | 20 | - | 0.366 | 0.255 | 0.182 | 0.176 | 0.161 |
| | 50 | - | 0.357 | 0.245 | 0.154 | - | 0.145 |
| | 100 | - | 0.351 | 0.238 | 0.104 | - | 0.137 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A24: Derived Representative Stages at the Lake B5 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.571 | 0.521 | 0.499 | 0.305 | 0.320 | 0.329 |
| | 50 | 0.555 | 0.513 | 0.493 | 0.297 | 0.313 | 0.323 |
| | 20 | 0.533 | 0.501 | 0.484 | 0.284 | 0.301 | 0.315 |
| | 10 | 0.518 | 0.491 | 0.475 | 0.273 | 0.291 | 0.308 |
| | 5 | 0.502 | 0.480 | 0.465 | 0.260 | 0.278 | 0.298 |
| Median | 2 | 0.478 | 0.461 | 0.447 | 0.234 | 0.254 | 0.278 |
| Dry | 5 | 0.460 | 0.444 | 0.430 | 0.205 | 0.225 | 0.255 |
| | 10 | 0.456 | 0.437 | 0.421 | 0.187 | 0.206 | 0.240 |
| | 20 | 0.454 | 0.432 | 0.413 | 0.166 | 0.185 | 0.225 |
| | 50 | 0.453 | 0.426 | 0.405 | 0.107 | 0.127 | 0.200 |
| | 100 | 0.453 | 0.423 | 0.400 | - | - | 0.170 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A25: Derived Monthly Mean Discharges at the Lake B69 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 4 890 | 10 800 | 5 290 | 1 060 | 1 070 | 630 |
| | 50 | 4 110 | 10 000 | 3 480 | 862 | 896 | 544 |
| | 20 | 3 090 | 8 890 | 1 860 | 625 | 677 | 429 |
| | 10 | 2 340 | 7 940 | 1 070 | 457 | 517 | 340 |
| | 5 | 1 570 | 6 850 | 542 | 296 | 359 | 247 |
| Median | 2 | 461 | 4 960 | 145 | 83 | 139 | 105 |
| Dry | 5 | 0 | 3 300 | 35 | 0 | 0 | 0 |
| | 10 | 0 | 2 510 | 14 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 1 900 | 5 | 0 | 0 | 0 |
| | 50 | 0 | 1 250 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 838 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A26: Derived Representative Discharges at the Lake B69 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.42 | 21 800 | 16 900 | 358 | 660 | 2 120 |
| | 50 | 0.37 | 20 300 | 15 900 | 270 | 541 | 1 510 |
| | 20 | 0.32 | 18 200 | 14 500 | 172 | 395 | 908 |
| | 10 | 0.28 | 16 700 | 13 300 | 110 | 291 | 576 |
| | 5 | 0.24 | 15 000 | 12 000 | 58 | 191 | 330 |
| Median | 2 | 0.18 | 12 500 | 9 830 | 0 | 58 | 110 |
| Dry | 5 | 0.15 | 10 600 | 8 000 | 0 | 0 | 32 |
| | 10 | 0.14 | 9 770 | 7 160 | 0 | 0 | 14 |
| | 20 | 0.13 | 9 200 | 6 530 | 0 | 0 | 5 |
| | 50 | 0.12 | 8 630 | 5 870 | 0 | 0 | 0 |
| | 100 | 0.12 | 8 300 | 5 460 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A27: Derived Monthly Mean Stages at the Lake B69 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.112 | 0.191 | 0.119 | 0.041 | 0.041 | 0.029 |
| | 50 | 0.100 | 0.181 | 0.090 | 0.035 | 0.036 | 0.026 |
| | 20 | 0.083 | 0.168 | 0.059 | 0.029 | 0.030 | 0.022 |
| | 10 | 0.069 | 0.155 | 0.041 | 0.023 | 0.025 | 0.019 |
| | 5 | 0.053 | 0.141 | 0.026 | 0.017 | 0.020 | 0.015 |
| Median | 2 | 0.023 | 0.114 | 0.011 | 0.007 | 0.010 | 0.009 |
| Dry | 5 | - | 0.087 | 0.004 | - | - | 0.000 |
| | 10 | - | 0.072 | 0.002 | - | - | - |
| | 20 | - | 0.060 | 0.001 | - | - | - |
| | 50 | - | 0.045 | - | - | - | - |
| | 100 | - | 0.035 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A28: Derived Representative Stages at the Lake B69 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.425 | 0.305 | 0.257 | 0.020 | 0.030 | 0.064 |
| | 50 | 0.394 | 0.291 | 0.247 | 0.016 | 0.026 | 0.051 |
| | 20 | 0.354 | 0.270 | 0.232 | 0.012 | 0.021 | 0.037 |
| | 10 | 0.324 | 0.255 | 0.219 | 0.009 | 0.017 | 0.027 |
| | 5 | 0.292 | 0.237 | 0.205 | 0.006 | 0.013 | 0.019 |
| Median | 2 | 0.247 | 0.210 | 0.179 | - | 0.006 | 0.009 |
| Dry | 5 | 0.216 | 0.188 | 0.156 | - | - | 0.004 |
| | 10 | 0.204 | 0.178 | 0.145 | - | - | 0.002 |
| | 20 | 0.196 | 0.171 | 0.136 | - | - | 0.001 |
| | 50 | 0.189 | 0.164 | 0.127 | - | - | - |
| | 100 | 0.185 | 0.160 | 0.121 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A29: Derived Monthly Mean Discharges at the Lake B53 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 10 500 | 20 200 | 3 260 | 2 660 | 3 460 | 2 300 |
| | 50 | 8 910 | 19 000 | 2 730 | 2 330 | 2 920 | 1 750 |
| | 20 | 6 810 | 17 200 | 2 060 | 1 870 | 2 250 | 1 160 |
| | 10 | 5 210 | 15 600 | 1 590 | 1 520 | 1 770 | 801 |
| | 5 | 3 570 | 13 600 | 1 120 | 1 140 | 1 310 | 510 |
| Median | 2 | 1 140 | 9 920 | 485 | 558 | 690 | 210 |
| Dry | 5 | 0 | 6 280 | 84 | 112 | 303 | 81 |
| | 10 | 0 | 4 380 | 0 | 0 | 163 | 46 |
| | 20 | 0 | 2 830 | 0 | 0 | 70 | 27 |
| | 50 | 0 | 1 090 | 0 | 0 | 0 | 12 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 5 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A30: Derived Representative Discharges at the Lake B53 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.28 | 47 000 | 34 500 | 957 | 1 570 | 1 870 |
| | 50 | 1.13 | 44 300 | 32 600 | 763 | 1 390 | 1 690 |
| | 20 | 0.95 | 40 500 | 29 800 | 533 | 1 130 | 1 430 |
| | 10 | 0.83 | 37 400 | 27 500 | 378 | 932 | 1 230 |
| | 5 | 0.70 | 34 000 | 24 900 | 236 | 714 | 1 000 |
| Median | 2 | 0.53 | 28 300 | 20 500 | 63 | 366 | 637 |
| Dry | 5 | 0.42 | 23 600 | 16 600 | 0 | 91 | 343 |
| | 10 | 0.39 | 21 500 | 14 900 | 0 | 0 | 213 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.37 | 19 900 | 13 500 | 0 | 0 | 116 |
| | 50 | 0.36 | 18 300 | 12 000 | 0 | 0 | 17 |
| | 100 | 0.36 | 17 200 | 11 100 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A31: Derived Monthly Mean Stages at the Lake B53 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.150 | 0.232 | 0.069 | 0.060 | 0.072 | 0.055 |
| | 50 | 0.135 | 0.223 | 0.061 | 0.055 | 0.064 | 0.045 |
| | 20 | 0.112 | 0.209 | 0.051 | 0.048 | 0.054 | 0.035 |
| | 10 | 0.094 | 0.195 | 0.043 | 0.041 | 0.046 | 0.027 |
| | 5 | 0.073 | 0.178 | 0.034 | 0.034 | 0.037 | 0.020 |
| Median | 2 | 0.034 | 0.145 | 0.019 | 0.021 | 0.024 | 0.011 |
| Dry | 5 | - | 0.107 | 0.006 | 0.007 | 0.014 | 0.006 |
| | 10 | - | 0.084 | - | - | 0.009 | 0.004 |
| | 20 | - | 0.063 | - | - | 0.005 | 0.003 |
| | 50 | - | 0.033 | - | - | - | 0.002 |
| | 100 | - | - | - | - | - | 0.001 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A32: Derived Representative Stages at the Lake B53 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.721 | 0.408 | 0.332 | 0.030 | 0.042 | 0.048 |
| | 50 | 0.664 | 0.392 | 0.319 | 0.026 | 0.039 | 0.044 |
| | 20 | 0.592 | 0.369 | 0.301 | 0.021 | 0.034 | 0.040 |
| | 10 | 0.538 | 0.350 | 0.285 | 0.016 | 0.030 | 0.036 |
| | 5 | 0.483 | 0.329 | 0.267 | 0.012 | 0.025 | 0.031 |
| Median | 2 | 0.403 | 0.291 | 0.234 | 0.005 | 0.016 | 0.023 |
| Dry | 5 | 0.342 | 0.258 | 0.204 | - | 0.006 | 0.015 |
| | 10 | 0.325 | 0.242 | 0.190 | - | - | 0.011 |
| | 20 | 0.316 | 0.230 | 0.177 | - | - | 0.007 |
| | 50 | 0.310 | 0.217 | 0.164 | - | - | 0.002 |
| | 100 | 0.308 | 0.209 | 0.156 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A33: Derived Monthly Mean Discharges at the Lake B52 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 16 300 | 35 400 | 12 700 | 4 270 | 4 000 | 2 100 |
| | 50 | 13 700 | 33 000 | 8 990 | 3 600 | 3 570 | 1 850 |
| | 20 | 10 300 | 29 600 | 5 350 | 2 730 | 2 980 | 1 510 |
| | 10 | 7 800 | 26 700 | 3 370 | 2 090 | 2 490 | 1 240 |
| | 5 | 5 240 | 23 200 | 1 910 | 1 440 | 1 950 | 945 |
| Median | 2 | 1 530 | 17 100 | 630 | 516 | 1 040 | 471 |
| Dry | 5 | 0 | 11 400 | 184 | 0 | 270 | 95 |
| | 10 | 0 | 8 550 | 84 | 0 | 0 | 0 |
| | 20 | 0 | 6 320 | 34 | 0 | 0 | 0 |
| | 50 | 0 | 3 900 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 2 330 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A34: Derived Representative Discharges at the Lake B52 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.47 | 75 500 | 57 300 | 1 500 | 2 660 | 3 660 |
| | 50 | 1.33 | 70 700 | 54 000 | 1 160 | 2 260 | 3 130 |
| | 20 | 1.15 | 64 200 | 49 300 | 768 | 1 750 | 2 460 |
| | 10 | 1.01 | 59 000 | 45 500 | 514 | 1 360 | 1 970 |
| | 5 | 0.88 | 53 400 | 41 200 | 291 | 957 | 1 480 |
| Median | 2 | 0.68 | 44 500 | 33 900 | 33 | 371 | 790 |
| Dry | 5 | 0.55 | 37 500 | 27 700 | 0 | 0 | 331 |
| | 10 | 0.50 | 34 500 | 24 900 | 0 | 0 | 156 |
| | 20 | 0.46 | 32 300 | 22 700 | 0 | 0 | 37 |
| | 50 | 0.43 | 30 000 | 20 400 | 0 | 0 | 0 |
| | 100 | 0.41 | 28 700 | 19 000 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A35: Derived Monthly Mean Stages at the Lake B52 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.157 | 0.264 | 0.133 | 0.064 | 0.062 | 0.040 |
| | 50 | 0.140 | 0.252 | 0.106 | 0.058 | 0.057 | 0.037 |
| | 20 | 0.116 | 0.234 | 0.075 | 0.048 | 0.051 | 0.032 |
| | 10 | 0.096 | 0.219 | 0.055 | 0.040 | 0.045 | 0.028 |
| | 5 | 0.074 | 0.199 | 0.038 | 0.031 | 0.038 | 0.024 |
| Median | 2 | 0.033 | 0.163 | 0.018 | 0.016 | 0.025 | 0.015 |
| Dry | 5 | - | 0.124 | 0.008 | - | 0.010 | 0.005 |
| | 10 | - | 0.102 | 0.005 | - | - | - |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.084 | 0.003 | - | - | - |
| | 50 | - | 0.061 | - | - | - | - |
| | 100 | - | 0.043 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A36: Derived Representative Stages at the Lake B52 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.619 | 0.437 | 0.364 | 0.032 | 0.047 | 0.058 |
| | 50 | 0.579 | 0.419 | 0.350 | 0.027 | 0.042 | 0.052 |
| | 20 | 0.525 | 0.393 | 0.329 | 0.021 | 0.036 | 0.045 |
| | 10 | 0.482 | 0.371 | 0.312 | 0.016 | 0.030 | 0.038 |
| | 5 | 0.438 | 0.347 | 0.292 | 0.011 | 0.024 | 0.032 |
| Median | 2 | 0.370 | 0.308 | 0.257 | 0.003 | 0.013 | 0.021 |
| Dry | 5 | 0.320 | 0.274 | 0.224 | - | - | 0.012 |
| | 10 | 0.300 | 0.260 | 0.209 | - | - | 0.007 |
| | 20 | 0.285 | 0.248 | 0.196 | - | - | 0.003 |
| | 50 | 0.271 | 0.236 | 0.183 | - | - | - |
| | 100 | 0.263 | 0.230 | 0.174 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A37: Derived Monthly Mean Discharges at the Lake BX2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 7 080 | 14 200 | 2 400 | 1 720 | 1 640 | 2 220 |
| | 50 | 5 980 | 13 300 | 1 980 | 1 470 | 1 470 | 1 580 |
| | 20 | 4 550 | 12 000 | 1 460 | 1 140 | 1 230 | 953 |
| | 10 | 3 470 | 10 800 | 1 100 | 889 | 1 030 | 606 |
| | 5 | 2 360 | 9 420 | 752 | 633 | 814 | 348 |
| Median | 2 | 733 | 6 860 | 304 | 255 | 443 | 118 |
| Dry | 5 | 0 | 4 420 | 36 | 0 | 127 | 37 |
| | 10 | 0 | 3 180 | 0 | 0 | 0 | 18 |
| | 20 | 0 | 2 170 | 0 | 0 | 0 | 9 |
| | 50 | 0 | 1 060 | 0 | 0 | 0 | 2 |
| | 100 | 0 | 335 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A38: Derived Representative Discharges at the Lake BX2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.70 | 30 700 | 23 500 | 590 | 1 030 | 1 380 |
| | 50 | 0.63 | 28 900 | 22 200 | 456 | 887 | 1 200 |
| | 20 | 0.55 | 26 500 | 20 300 | 303 | 699 | 963 |
| | 10 | 0.48 | 24 600 | 18 700 | 203 | 554 | 784 |
| | 5 | 0.42 | 22 400 | 17 000 | 116 | 402 | 602 |
| Median | 2 | 0.32 | 18 800 | 14 000 | 15 | 170 | 335 |
| Dry | 5 | 0.26 | 15 800 | 11 400 | 0 | 0 | 150 |
| | 10 | 0.24 | 14 500 | 10 200 | 0 | 0 | 76 |
| | 20 | 0.22 | 13 500 | 9 290 | 0 | 0 | 25 |
| | 50 | 0.21 | 12 500 | 8 330 | 0 | 0 | 0 |
| | 100 | 0.20 | 11 800 | 7 730 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A39: Derived Monthly Mean Stages at the Lake BX2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.132 | 0.210 | 0.064 | 0.051 | 0.050 | 0.061 |
| | 50 | 0.118 | 0.201 | 0.056 | 0.046 | 0.046 | 0.049 |
| | 20 | 0.098 | 0.188 | 0.046 | 0.039 | 0.041 | 0.035 |
| | 10 | 0.082 | 0.175 | 0.038 | 0.033 | 0.036 | 0.026 |
| | 5 | 0.063 | 0.160 | 0.030 | 0.026 | 0.031 | 0.018 |
| Median | 2 | 0.029 | 0.129 | 0.016 | 0.014 | 0.021 | 0.009 |
| Dry | 5 | - | 0.096 | 0.004 | - | 0.009 | 0.004 |
| | 10 | - | 0.077 | - | - | - | 0.002 |
| | 20 | - | 0.060 | - | - | - | 0.002 |
| | 50 | - | 0.037 | - | - | - | 0.001 |
| | 100 | - | 0.017 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A40: Derived Representative Stages at the Lake BX2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.551 | 0.351 | 0.294 | 0.025 | 0.036 | 0.044 |
| | 50 | 0.515 | 0.337 | 0.283 | 0.021 | 0.033 | 0.040 |
| | 20 | 0.467 | 0.318 | 0.266 | 0.016 | 0.028 | 0.035 |
| | 10 | 0.429 | 0.303 | 0.252 | 0.012 | 0.024 | 0.030 |
| | 5 | 0.389 | 0.284 | 0.237 | 0.009 | 0.019 | 0.026 |
| Median | 2 | 0.329 | 0.253 | 0.208 | 0.002 | 0.011 | 0.017 |
| Dry | 5 | 0.286 | 0.225 | 0.181 | - | 0.000 | 0.010 |
| | 10 | 0.269 | 0.213 | 0.168 | - | - | 0.006 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.256 | 0.203 | 0.158 | - | - | 0.003 |
| | 50 | 0.245 | 0.193 | 0.147 | - | - | - |
| | 100 | 0.238 | 0.185 | 0.140 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A41: Derived Monthly Mean Discharges at the Lake BX1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 9 450 | 20 800 | 4 220 | 2 320 | 2 240 | 1 280 |
| | 50 | 7 930 | 19 400 | 3 400 | 1 910 | 1 940 | 1 120 |
| | 20 | 5 960 | 17 300 | 2 430 | 1 400 | 1 530 | 897 |
| | 10 | 4 490 | 15 500 | 1 780 | 1 040 | 1 220 | 724 |
| | 5 | 3 010 | 13 500 | 1 180 | 684 | 902 | 538 |
| Median | 2 | 866 | 9 860 | 431 | 205 | 420 | 245 |
| Dry | 5 | 0 | 6 590 | 17 | 0 | 70 | 19 |
| | 10 | 0 | 5 000 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 3 760 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 2 420 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 1 560 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A42: Derived Representative Discharges at the Lake BX1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.83 | 44 300 | 33 500 | 790 | 1 440 | 2 910 |
| | 50 | 0.75 | 41 200 | 31 500 | 602 | 1 200 | 2 280 |
| | 20 | 0.65 | 37 200 | 28 700 | 390 | 890 | 1 570 |
| | 10 | 0.57 | 34 100 | 26 400 | 255 | 668 | 1 120 |
| | 5 | 0.49 | 30 700 | 23 900 | 138 | 450 | 736 |
| Median | 2 | 0.39 | 25 500 | 19 600 | 7 | 149 | 311 |
| Dry | 5 | 0.31 | 21 600 | 16 000 | 0 | 0 | 108 |
| | 10 | 0.28 | 20 000 | 14 400 | 0 | 0 | 48 |
| | 20 | 0.26 | 18 800 | 13 100 | 0 | 0 | 14 |
| | 50 | 0.24 | 17 600 | 11 900 | 0 | 0 | 0 |
| | 100 | 0.23 | 16 900 | 11 100 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A43: Derived Monthly Mean Stages at the Lake BX1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.139 | 0.234 | 0.081 | 0.054 | 0.053 | 0.037 |
| | 50 | 0.123 | 0.224 | 0.070 | 0.048 | 0.048 | 0.033 |
| | 20 | 0.102 | 0.207 | 0.056 | 0.039 | 0.041 | 0.029 |
| | 10 | 0.084 | 0.193 | 0.046 | 0.032 | 0.035 | 0.025 |
| | 5 | 0.065 | 0.176 | 0.035 | 0.024 | 0.029 | 0.021 |
| Median | 2 | 0.028 | 0.143 | 0.018 | 0.011 | 0.017 | 0.012 |
| Dry | 5 | - | 0.109 | 0.002 | - | 0.005 | 0.002 |
| | 10 | - | 0.091 | - | - | - | - |
| | 20 | - | 0.075 | - | - | - | - |
| | 50 | - | 0.056 | - | - | - | - |
| | 100 | - | 0.042 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A44: Derived Representative Stages at the Lake BX1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.533 | 0.388 | 0.322 | 0.026 | 0.040 | 0.063 |
| | 50 | 0.498 | 0.370 | 0.309 | 0.022 | 0.035 | 0.054 |
| | 20 | 0.452 | 0.346 | 0.291 | 0.017 | 0.029 | 0.042 |
| | 10 | 0.416 | 0.326 | 0.275 | 0.012 | 0.024 | 0.033 |
| | 5 | 0.378 | 0.304 | 0.257 | 0.008 | 0.018 | 0.025 |
| Median | 2 | 0.321 | 0.269 | 0.225 | 0.001 | 0.009 | 0.014 |
| Dry | 5 | 0.278 | 0.240 | 0.197 | - | - | 0.007 |
| | 10 | 0.261 | 0.228 | 0.184 | - | - | 0.004 |
| | 20 | 0.249 | 0.219 | 0.172 | - | - | 0.002 |
| | 50 | 0.237 | 0.210 | 0.162 | - | - | - |
| | 100 | 0.230 | 0.204 | 0.154 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A45: Derived Monthly Mean Discharges at the Lake B46 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 45 400 | 105 000 | 36 300 | 12 100 | 11 100 | 6 130 |
| | 50 | 38 000 | 97 900 | 26 400 | 10 000 | 9 760 | 5 380 |
| | 20 | 28 500 | 87 200 | 16 400 | 7 430 | 7 910 | 4 370 |
| | 10 | 21 500 | 78 200 | 10 700 | 5 560 | 6 450 | 3 560 |
| | 5 | 14 300 | 67 900 | 6 320 | 3 720 | 4 890 | 2 690 |
| Median | 2 | 4 100 | 50 000 | 2 250 | 1 210 | 2 440 | 1 290 |
| Dry | 5 | 0 | 34 100 | 710 | 0 | 561 | 185 |
| | 10 | 0 | 26 500 | 338 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 20 500 | 146 | 0 | 0 | 0 |
| | 50 | 0 | 14 200 | 8 | 0 | 0 | 0 |
| | 100 | 0 | 10 200 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A46: Derived Representative Discharges at the Lake B46 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.63 | 219 000 | 163 000 | 4 290 | 7 720 | 12 100 |
| | 50 | 3.25 | 203 000 | 154 000 | 3 310 | 6 480 | 10 100 |
| | 20 | 2.78 | 182 000 | 141 000 | 2 190 | 4 900 | 7 570 |
| | 10 | 2.44 | 165 000 | 130 000 | 1 470 | 3 740 | 5 820 |
| | 5 | 2.10 | 148 000 | 118 000 | 833 | 2 590 | 4 180 |
| Median | 2 | 1.65 | 122 000 | 97 000 | 101 | 965 | 2 070 |
| Dry | 5 | 1.35 | 102 000 | 79 300 | 0 | 0 | 820 |
| | 10 | 1.24 | 94 400 | 71 100 | 0 | 0 | 389 |
| | 20 | 1.17 | 88 700 | 64 800 | 0 | 0 | 113 |
| | 50 | 1.10 | 83 100 | 58 200 | 0 | 0 | 0 |
| | 100 | 1.07 | 79 800 | 54 100 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A47: Derived Monthly Mean Stages at the Lake B46 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.173 | 0.303 | 0.149 | 0.072 | 0.068 | 0.046 |
| | 50 | 0.154 | 0.289 | 0.121 | 0.063 | 0.062 | 0.042 |
| | 20 | 0.127 | 0.267 | 0.088 | 0.052 | 0.054 | 0.036 |
| | 10 | 0.105 | 0.249 | 0.066 | 0.043 | 0.047 | 0.032 |
| | 5 | 0.080 | 0.226 | 0.046 | 0.033 | 0.039 | 0.026 |
| Median | 2 | 0.035 | 0.185 | 0.023 | 0.015 | 0.025 | 0.016 |
| Dry | 5 | - | 0.143 | 0.011 | - | 0.009 | 0.004 |
| | 10 | - | 0.121 | 0.007 | - | - | - |
| | 20 | - | 0.102 | 0.004 | - | - | - |
| | 50 | - | 0.080 | 0.001 | - | - | - |
| | 100 | - | 0.064 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A48: Derived Representative Stages at the Lake B46 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.628 | 0.494 | 0.406 | 0.036 | 0.053 | 0.072 |
| | 50 | 0.583 | 0.470 | 0.391 | 0.030 | 0.047 | 0.064 |
| | 20 | 0.525 | 0.437 | 0.368 | 0.023 | 0.039 | 0.052 |
| | 10 | 0.482 | 0.409 | 0.349 | 0.018 | 0.033 | 0.044 |
| | 5 | 0.436 | 0.380 | 0.327 | 0.012 | 0.026 | 0.035 |
| Median | 2 | 0.371 | 0.334 | 0.287 | 0.003 | 0.013 | 0.022 |
| Dry | 5 | 0.325 | 0.297 | 0.251 | - | - | 0.012 |
| | 10 | 0.307 | 0.282 | 0.233 | - | - | 0.007 |
| | 20 | 0.295 | 0.270 | 0.219 | - | - | 0.003 |
| | 50 | 0.283 | 0.259 | 0.204 | - | - | - |
| | 100 | 0.278 | 0.252 | 0.194 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A49: Derived Monthly Mean Discharges at the Lake B44 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 530 | 2 740 | 369 | 316 | 297 | 194 |
| | 50 | 1 300 | 2 580 | 307 | 263 | 263 | 164 |
| | 20 | 1 010 | 2 330 | 228 | 197 | 216 | 125 |
| | 10 | 776 | 2 110 | 171 | 149 | 178 | 96 |
| | 5 | 537 | 1 850 | 115 | 101 | 137 | 68 |
| Median | 2 | 178 | 1 330 | 39 | 36 | 69 | 27 |
| Dry | 5 | 0 | 799 | 0 | 0 | 15 | 0 |
| | 10 | 0 | 518 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 284 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 19 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A50: Derived Representative Discharges at the Lake B44 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.23 | 6 830 | 4 830 | 88 | 173 | 221 |
| | 50 | 0.21 | 6 440 | 4 550 | 67 | 146 | 194 |
| | 20 | 0.18 | 5 910 | 4 170 | 43 | 112 | 157 |
| | 10 | 0.16 | 5 460 | 3 850 | 28 | 86 | 129 |
| | 5 | 0.13 | 4 970 | 3 480 | 15 | 60 | 99 |
| Median | 2 | 0.10 | 4 130 | 2 850 | 0 | 22 | 52 |
| Dry | 5 | 0.07 | 3 420 | 2 310 | 0 | 0 | 17 |
| | 10 | 0.06 | 3 100 | 2 050 | 0 | 0 | 2 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.05 | 2 850 | 1 850 | 0 | 0 | 0 |
| | 50 | 0.05 | 2 590 | 1 640 | 0 | 0 | 0 |
| | 100 | 0.04 | 2 430 | 1 510 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A51: Derived Monthly Mean Stages at the Lake B44 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.067 | 0.100 | 0.026 | 0.024 | 0.023 | 0.017 |
| | 50 | 0.061 | 0.096 | 0.023 | 0.021 | 0.021 | 0.015 |
| | 20 | 0.051 | 0.089 | 0.019 | 0.017 | 0.018 | 0.013 |
| | 10 | 0.043 | 0.084 | 0.016 | 0.014 | 0.016 | 0.011 |
| | 5 | 0.034 | 0.077 | 0.012 | 0.011 | 0.014 | 0.008 |
| Median | 2 | 0.016 | 0.061 | 0.006 | 0.006 | 0.009 | 0.005 |
| Dry | 5 | - | 0.044 | - | - | 0.003 | - |
| | 10 | - | 0.033 | - | - | - | - |
| | 20 | - | 0.022 | - | - | - | - |
| | 50 | - | 0.004 | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A52: Derived Representative Stages at the Lake B44 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.377 | 0.183 | 0.145 | 0.010 | 0.016 | 0.019 |
| | 50 | 0.352 | 0.176 | 0.140 | 0.008 | 0.014 | 0.017 |
| | 20 | 0.318 | 0.166 | 0.132 | 0.006 | 0.012 | 0.015 |
| | 10 | 0.289 | 0.158 | 0.125 | 0.005 | 0.010 | 0.013 |
| | 5 | 0.259 | 0.148 | 0.117 | 0.003 | 0.008 | 0.011 |
| Median | 2 | 0.210 | 0.131 | 0.102 | - | 0.004 | 0.007 |
| Dry | 5 | 0.170 | 0.115 | 0.089 | - | - | 0.003 |
| | 10 | 0.153 | 0.108 | 0.082 | - | - | 0.001 |
| | 20 | 0.140 | 0.102 | 0.077 | - | - | - |
| | 50 | 0.127 | 0.096 | 0.071 | - | - | - |
| | 100 | 0.119 | 0.092 | 0.067 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A53: Derived Monthly Mean Discharges at the Lake B4 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 70 500 | 197 000 | 52 300 | 28 200 | 26 800 | 15 700 |
| | 50 | 58 700 | 179 000 | 42 600 | 20 800 | 21 000 | 12 800 |
| | 20 | 43 600 | 154 000 | 31 300 | 13 200 | 14 500 | 9 090 |
| | 10 | 32 500 | 135 000 | 23 800 | 8 800 | 10 400 | 6 500 |
| | 5 | 21 300 | 115 000 | 17 100 | 5 400 | 6 910 | 4 140 |
| Median | 2 | 5 590 | 82 700 | 9 250 | 2 150 | 3 020 | 1 520 |
| Dry | 5 | 0 | 58 500 | 5 110 | 889 | 1 150 | 460 |
| | 10 | 0 | 48 200 | 3 800 | 576 | 602 | 234 |
| | 20 | 0 | 40 800 | 3 010 | 411 | 284 | 135 |
| | 50 | 0 | 33 400 | 2 340 | 291 | 28 | 76 |
| | 100 | 0 | 29 000 | 2 000 | 236 | 0 | 54 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A54: Derived Representative Discharges at the Lake B4 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 7.25 | 374 000 | 292 000 | 11 500 | 20 100 | 21 900 |
| | 50 | 6.15 | 345 000 | 273 000 | 9 090 | 15 800 | 18 700 |
| | 20 | 4.93 | 307 000 | 245 000 | 6 380 | 11 000 | 14 700 |
| | 10 | 4.15 | 277 000 | 223 000 | 4 640 | 7 920 | 11 800 |
| | 5 | 3.46 | 245 000 | 198 000 | 3 140 | 5 320 | 8 980 |
| Median | 2 | 2.62 | 197 000 | 158 000 | 1 450 | 2 430 | 5 170 |
| Dry | 5 | 2.12 | 161 000 | 125 000 | 614 | 1 050 | 2 770 |
| | 10 | 2.04 | 146 000 | 110 000 | 365 | 646 | 1 890 |
| | 20 | 2.01 | 135 000 | 98 900 | 219 | 411 | 1 310 |
| | 50 | 1.99 | 125 000 | 87 500 | 101 | 221 | 784 |
| | 100 | 1.99 | 118 000 | 80 500 | 42 | 128 | 492 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A55: Derived Monthly Mean Stages at the Lake B4 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.560 | 0.661 | 0.534 | 0.483 | 0.479 | 0.439 |
| | 50 | 0.544 | 0.651 | 0.516 | 0.460 | 0.460 | 0.425 |
| | 20 | 0.518 | 0.635 | 0.491 | 0.427 | 0.434 | 0.402 |
| | 10 | 0.494 | 0.622 | 0.470 | 0.400 | 0.411 | 0.381 |
| | 5 | 0.461 | 0.606 | 0.445 | 0.370 | 0.385 | 0.354 |
| Median | 2 | 0.372 | 0.575 | 0.403 | 0.319 | 0.337 | 0.301 |
| Dry | 5 | - | 0.543 | 0.366 | 0.276 | 0.288 | 0.248 |
| | 10 | - | 0.527 | 0.349 | 0.257 | 0.259 | 0.223 |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.513 | 0.336 | 0.244 | 0.230 | 0.204 |
| | 50 | - | 0.496 | 0.323 | 0.231 | 0.158 | 0.185 |
| | 100 | - | 0.485 | 0.315 | 0.223 | - | 0.176 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A56: Derived Representative Stages at the Lake B4 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.797 | 0.733 | 0.704 | 0.418 | 0.457 | 0.464 |
| | 50 | 0.776 | 0.724 | 0.697 | 0.402 | 0.440 | 0.452 |
| | 20 | 0.749 | 0.710 | 0.685 | 0.380 | 0.415 | 0.435 |
| | 10 | 0.728 | 0.698 | 0.674 | 0.361 | 0.393 | 0.419 |
| | 5 | 0.707 | 0.685 | 0.662 | 0.339 | 0.369 | 0.401 |
| Median | 2 | 0.676 | 0.661 | 0.638 | 0.299 | 0.325 | 0.367 |
| Dry | 5 | 0.653 | 0.640 | 0.614 | 0.260 | 0.284 | 0.332 |
| | 10 | 0.649 | 0.630 | 0.602 | 0.239 | 0.262 | 0.312 |
| | 20 | 0.648 | 0.622 | 0.591 | 0.220 | 0.244 | 0.294 |
| | 50 | 0.647 | 0.614 | 0.580 | 0.194 | 0.221 | 0.271 |
| | 100 | 0.647 | 0.608 | 0.572 | 0.168 | 0.202 | 0.251 |

Note: m = metre.

**Table 7.3-A57: Derived Monthly Mean Discharges at the Lake B2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | 50 | 61 200 | 193 000 | 48 400 | 20 300 | 20 200 | 13 000 |
| | 20 | 45 200 | 167 000 | 35 900 | 13 600 | 14 300 | 9 210 |
| | 10 | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | 5 | 21 700 | 124 000 | 20 100 | 6 160 | 7 110 | 4 280 |
| Median | 2 | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| Dry | 5 | 0 | 64 700 | 6 380 | 1 220 | 1 340 | 564 |
| | 10 | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | 20 | 0 | 46 300 | 3 910 | 587 | 403 | 191 |
| | 50 | 0 | 38 700 | 3 120 | 414 | 117 | 116 |
| | 100 | 0 | 34 200 | 2 710 | 332 | 0 | 87 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A58: Derived Representative Discharges at the Lake B2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | 50 | 9.56 | 376 000 | 290 000 | 10 200 | 15 800 | 20 800 |
| | 20 | 7.89 | 342 000 | 266 000 | 7 410 | 11 400 | 16 400 |
| | 10 | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | 5 | 5.56 | 283 000 | 221 000 | 3 910 | 5 950 | 10 200 |
| Median | 2 | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| Dry | 5 | 3.08 | 189 000 | 140 000 | 864 | 1 360 | 3 330 |
| | 10 | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | 20 | 2.51 | 155 000 | 107 000 | 315 | 576 | 1 710 |
| | 50 | 2.31 | 140 000 | 91 700 | 140 | 329 | 1 120 |
| | 100 | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A59: Derived Monthly Mean Stages at the Lake B2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.520 | 0.643 | 0.498 | 0.426 | 0.422 | 0.386 |
| | 50 | 0.502 | 0.631 | 0.479 | 0.404 | 0.403 | 0.370 |
| | 20 | 0.472 | 0.611 | 0.452 | 0.373 | 0.377 | 0.346 |
| | 10 | 0.445 | 0.595 | 0.429 | 0.348 | 0.355 | 0.324 |
| | 5 | 0.409 | 0.576 | 0.403 | 0.319 | 0.328 | 0.297 |
| Median | 2 | 0.309 | 0.541 | 0.359 | 0.272 | 0.282 | 0.247 |
| Dry | 5 | - | 0.507 | 0.321 | 0.232 | 0.237 | 0.200 |
| | 10 | - | 0.489 | 0.305 | 0.214 | 0.211 | 0.177 |
| | 20 | - | 0.475 | 0.292 | 0.201 | 0.187 | 0.161 |
| | 50 | - | 0.458 | 0.279 | 0.188 | 0.146 | 0.146 |
| | 100 | - | 0.447 | 0.272 | 0.180 | - | 0.138 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A60: Derived Representative Stages at the Lake B2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.859 | 0.749 | 0.696 | 0.368 | 0.401 | 0.418 |
| | 50 | 0.837 | 0.735 | 0.686 | 0.353 | 0.384 | 0.406 |
| | 20 | 0.806 | 0.716 | 0.673 | 0.331 | 0.360 | 0.387 |
| | 10 | 0.780 | 0.700 | 0.661 | 0.313 | 0.340 | 0.371 |
| | 5 | 0.752 | 0.682 | 0.647 | 0.292 | 0.317 | 0.353 |
| Median | 2 | 0.706 | 0.653 | 0.619 | 0.254 | 0.276 | 0.318 |
| Dry | 5 | 0.670 | 0.629 | 0.590 | 0.217 | 0.237 | 0.283 |
| | 10 | 0.654 | 0.613 | 0.574 | 0.197 | 0.217 | 0.264 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.643 | 0.602 | 0.560 | 0.178 | 0.200 | 0.248 |
| | 50 | 0.633 | 0.590 | 0.543 | 0.152 | 0.179 | 0.228 |
| | 100 | 0.627 | 0.582 | 0.531 | 0.123 | 0.163 | 0.214 |

Note: m = metre.

**Table 7.3-A61: Derived Monthly Mean Discharges at the Lake C10 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 050 | 6 000 | 935 | 609 | 623 | 390 |
| | 50 | 2 570 | 5 600 | 761 | 502 | 531 | 333 |
| | 20 | 1 960 | 5 020 | 550 | 369 | 412 | 259 |
| | 10 | 1 490 | 4 510 | 404 | 273 | 323 | 202 |
| | 5 | 1 020 | 3 910 | 267 | 181 | 232 | 144 |
| Median | 2 | 314 | 2 820 | 92 | 56 | 100 | 59 |
| Dry | 5 | 0 | 1 790 | 0 | 0 | 8 | 0 |
| | 10 | 0 | 1 270 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 855 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 399 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 102 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A62: Derived Representative Discharges at the Lake C10 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.29 | 12 700 | 10 000 | 199 | 360 | 459 |
| | 50 | 0.27 | 12 000 | 9 400 | 150 | 299 | 398 |
| | 20 | 0.23 | 11 000 | 8 560 | 96 | 223 | 318 |
| | 10 | 0.20 | 10 300 | 7 870 | 61 | 167 | 256 |
| | 5 | 0.18 | 9 390 | 7 110 | 32 | 112 | 191 |
| Median | 2 | 0.14 | 7 930 | 5 830 | 0 | 36 | 93 |
| Dry | 5 | 0.11 | 6 710 | 4 760 | 0 | 0 | 21 |
| | 10 | 0.10 | 6 160 | 4 270 | 0 | 0 | 0 |
| | 20 | 0.10 | 5 740 | 3 900 | 0 | 0 | 0 |
| | 50 | 0.09 | 5 310 | 3 510 | 0 | 0 | 0 |
| | 100 | 0.09 | 5 040 | 3 270 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A63: Derived Monthly Mean Stages at the Lake C10 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.095 | 0.149 | 0.043 | 0.032 | 0.033 | 0.024 |
| | 50 | 0.085 | 0.142 | 0.038 | 0.028 | 0.030 | 0.022 |
| | 20 | 0.071 | 0.132 | 0.030 | 0.023 | 0.025 | 0.018 |
| | 10 | 0.059 | 0.123 | 0.025 | 0.019 | 0.021 | 0.016 |
| | 5 | 0.046 | 0.112 | 0.019 | 0.014 | 0.017 | 0.012 |
| Median | 2 | 0.021 | 0.090 | 0.009 | 0.007 | 0.010 | 0.007 |
| Dry | 5 | - | 0.066 | - | - | 0.002 | - |
| | 10 | - | 0.053 | - | - | - | - |
| | 20 | - | 0.041 | - | - | - | - |
| | 50 | - | 0.024 | - | - | - | - |
| | 100 | - | 0.010 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A64: Derived Representative Stages at the Lake C10 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.388 | 0.245 | 0.209 | 0.015 | 0.023 | 0.027 |
| | 50 | 0.363 | 0.236 | 0.201 | 0.013 | 0.020 | 0.024 |
| | 20 | 0.330 | 0.223 | 0.189 | 0.009 | 0.017 | 0.021 |
| | 10 | 0.304 | 0.213 | 0.178 | 0.007 | 0.014 | 0.018 |
| | 5 | 0.277 | 0.201 | 0.167 | 0.005 | 0.010 | 0.015 |
| Median | 2 | 0.235 | 0.179 | 0.146 | - | 0.005 | 0.009 |
| Dry | 5 | 0.206 | 0.160 | 0.128 | - | - | 0.003 |
| | 10 | 0.194 | 0.151 | 0.119 | - | - | - |
| | 20 | 0.185 | 0.144 | 0.112 | - | - | - |
| | 50 | 0.177 | 0.137 | 0.104 | - | - | - |
| | 100 | 0.172 | 0.132 | 0.099 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A65: Derived Monthly Mean Discharges at the Lake C7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 10 700 | 21 500 | 3 660 | 2 530 | 2 420 | 1 860 |
| | 50 | 9 010 | 20 100 | 3 010 | 2 160 | 2 150 | 1 530 |
| | 20 | 6 850 | 18 100 | 2 210 | 1 670 | 1 790 | 1 100 |
| | 10 | 5 220 | 16 300 | 1 660 | 1 310 | 1 490 | 798 |
| | 5 | 3 550 | 14 200 | 1 130 | 934 | 1 160 | 517 |
| Median | 2 | 1 090 | 10 300 | 459 | 383 | 625 | 195 |
| Dry | 5 | 0 | 6 670 | 59 | 0 | 186 | 61 |
| | 10 | 0 | 4 810 | 0 | 0 | 0 | 32 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 3 310 | 0 | 0 | 0 | 19 |
| | 50 | 0 | 1 660 | 0 | 0 | 0 | 11 |
| | 100 | 0 | 578 | 0 | 0 | 0 | 8 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A66: Derived Representative Discharges at the Lake C7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.04 | 46 100 | 35 400 | 881 | 1 530 | 2 090 |
| | 50 | 0.94 | 43 500 | 33 400 | 682 | 1 310 | 1 800 |
| | 20 | 0.81 | 39 800 | 30 600 | 455 | 1 030 | 1 430 |
| | 10 | 0.71 | 36 900 | 28 200 | 307 | 818 | 1 160 |
| | 5 | 0.62 | 33 600 | 25 600 | 177 | 594 | 885 |
| Median | 2 | 0.48 | 28 300 | 21 000 | 27 | 256 | 491 |
| Dry | 5 | 0.39 | 23 800 | 17 200 | 0 | 10 | 224 |
| | 10 | 0.36 | 21 800 | 15 400 | 0 | 0 | 120 |
| | 20 | 0.33 | 20 300 | 14 000 | 0 | 0 | 49 |
| | 50 | 0.31 | 18 800 | 12 500 | 0 | 0 | 0 |
| | 100 | 0.30 | 17 800 | 11 600 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A67: Derived Monthly Mean Stages at the Lake C7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.149 | 0.237 | 0.073 | 0.057 | 0.055 | 0.046 |
| | 50 | 0.133 | 0.226 | 0.064 | 0.051 | 0.051 | 0.041 |
| | 20 | 0.110 | 0.211 | 0.052 | 0.043 | 0.045 | 0.033 |
| | 10 | 0.092 | 0.197 | 0.043 | 0.037 | 0.040 | 0.026 |
| | 5 | 0.071 | 0.180 | 0.033 | 0.029 | 0.034 | 0.020 |
| Median | 2 | 0.032 | 0.145 | 0.018 | 0.016 | 0.022 | 0.010 |
| Dry | 5 | - | 0.109 | 0.005 | - | 0.010 | 0.005 |
| | 10 | - | 0.087 | - | - | - | 0.003 |
| | 20 | - | 0.068 | - | - | - | 0.002 |
| | 50 | - | 0.043 | - | - | - | 0.001 |
| | 100 | - | 0.021 | - | - | - | 0.001 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A68: Derived Representative Stages at the Lake C7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.614 | 0.394 | 0.330 | 0.028 | 0.041 | 0.050 |
| | 50 | 0.573 | 0.379 | 0.318 | 0.024 | 0.037 | 0.045 |
| | 20 | 0.519 | 0.357 | 0.300 | 0.018 | 0.031 | 0.039 |
| | 10 | 0.477 | 0.339 | 0.284 | 0.014 | 0.027 | 0.034 |
| | 5 | 0.433 | 0.319 | 0.266 | 0.010 | 0.022 | 0.028 |
| Median | 2 | 0.367 | 0.284 | 0.233 | 0.003 | 0.012 | 0.019 |
| Dry | 5 | 0.319 | 0.253 | 0.204 | - | 0.001 | 0.011 |
| | 10 | 0.300 | 0.239 | 0.190 | - | - | 0.007 |
| | 20 | 0.286 | 0.228 | 0.178 | - | - | 0.004 |
| | 50 | 0.274 | 0.217 | 0.165 | - | - | - |
| | 100 | 0.266 | 0.209 | 0.157 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A69: Derived Monthly Mean Discharges at the Lake C6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 12 500 | 25 200 | 4 350 | 2 990 | 2 850 | 1 720 |
| | 50 | 10 600 | 23 600 | 3 570 | 2 550 | 2 540 | 1 510 |
| | 20 | 8 020 | 21 200 | 2 620 | 1 980 | 2 110 | 1 190 |
| | 10 | 6 110 | 19 100 | 1 960 | 1 550 | 1 770 | 918 |
| | 5 | 4 150 | 16 700 | 1 340 | 1 100 | 1 380 | 628 |
| Median | 2 | 1 280 | 12 200 | 545 | 449 | 746 | 243 |
| Dry | 5 | 0 | 7 880 | 74 | 0 | 221 | 69 |
| | 10 | 0 | 5 700 | 0 | 0 | 0 | 32 |
| | 20 | 0 | 3 940 | 0 | 0 | 0 | 17 |
| | 50 | 0 | 1 990 | 0 | 0 | 0 | 8 |
| | 100 | 0 | 719 | 0 | 0 | 0 | 5 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A70: Derived Representative Discharges at the Lake C6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.21 | 54 500 | 41 700 | 1 040 | 1 810 | 2 450 |
| | 50 | 1.11 | 51 400 | 39 300 | 807 | 1 550 | 2 120 |
| | 20 | 0.97 | 47 000 | 36 000 | 538 | 1 220 | 1 690 |
| | 10 | 0.86 | 43 500 | 33 200 | 364 | 968 | 1 370 |
| | 5 | 0.75 | 39 700 | 30 000 | 210 | 702 | 1 050 |
| Median | 2 | 0.59 | 33 300 | 24 700 | 32 | 301 | 583 |
| Dry | 5 | 0.47 | 28 100 | 20 200 | 0 | 9 | 265 |
| | 10 | 0.42 | 25 800 | 18 100 | 0 | 0 | 141 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.39 | 24 000 | 16 500 | 0 | 0 | 56 |
| | 50 | 0.35 | 22 200 | 14 900 | 0 | 0 | 0 |
| | 100 | 0.34 | 21 100 | 13 800 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A71: Derived Monthly Mean Stages at the Lake C6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.155 | 0.247 | 0.076 | 0.060 | 0.058 | 0.041 |
| | 50 | 0.139 | 0.236 | 0.067 | 0.054 | 0.053 | 0.038 |
| | 20 | 0.115 | 0.220 | 0.055 | 0.045 | 0.047 | 0.032 |
| | 10 | 0.096 | 0.205 | 0.045 | 0.038 | 0.042 | 0.027 |
| | 5 | 0.074 | 0.188 | 0.035 | 0.031 | 0.036 | 0.021 |
| Median | 2 | 0.034 | 0.152 | 0.019 | 0.017 | 0.024 | 0.011 |
| Dry | 5 | - | 0.114 | 0.005 | - | 0.010 | 0.005 |
| | 10 | - | 0.092 | - | - | - | 0.003 |
| | 20 | - | 0.072 | - | - | - | 0.002 |
| | 50 | - | 0.045 | - | - | - | 0.001 |
| | 100 | - | 0.023 | - | - | - | 0.001 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A72: Derived Representative Stages at the Lake C6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.637 | 0.413 | 0.345 | 0.029 | 0.043 | 0.052 |
| | 50 | 0.601 | 0.397 | 0.332 | 0.025 | 0.038 | 0.047 |
| | 20 | 0.549 | 0.374 | 0.313 | 0.019 | 0.033 | 0.041 |
| | 10 | 0.508 | 0.355 | 0.297 | 0.015 | 0.028 | 0.035 |
| | 5 | 0.464 | 0.334 | 0.277 | 0.010 | 0.023 | 0.030 |
| Median | 2 | 0.394 | 0.297 | 0.243 | 0.003 | 0.013 | 0.020 |
| Dry | 5 | 0.339 | 0.265 | 0.213 | - | 0.001 | 0.012 |
| | 10 | 0.315 | 0.251 | 0.198 | - | - | 0.008 |
| | 20 | 0.298 | 0.239 | 0.186 | - | - | 0.004 |
| | 50 | 0.281 | 0.227 | 0.174 | - | - | - |
| | 100 | 0.271 | 0.219 | 0.165 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A73: Derived Monthly Mean Discharges at the Lake C5 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 060 | 1 880 | 243 | 193 | 193 | 139 |
| | 50 | 901 | 1 770 | 200 | 157 | 165 | 116 |
| | 20 | 695 | 1 590 | 147 | 113 | 129 | 87 |
| | 10 | 536 | 1 440 | 109 | 82 | 102 | 66 |
| | 5 | 371 | 1 260 | 73 | 53 | 74 | 45 |
| Median | 2 | 122 | 897 | 23 | 16 | 33 | 16 |
| Dry | 5 | 0 | 534 | 0 | 0 | 3 | 0 |
| | 10 | 0 | 342 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 183 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 3 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A74: Derived Representative Discharges at the Lake C5 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.16 | 4 630 | 3 320 | 50 | 106 | 144 |
| | 50 | 0.15 | 4 370 | 3 130 | 38 | 88 | 124 |
| | 20 | 0.13 | 4 020 | 2 860 | 24 | 65 | 97 |
| | 10 | 0.11 | 3 730 | 2 630 | 15 | 48 | 77 |
| | 5 | 0.10 | 3 400 | 2 380 | 8 | 32 | 57 |
| Median | 2 | 0.07 | 2 830 | 1 940 | 0 | 10 | 27 |
| Dry | 5 | 0.05 | 2 350 | 1 570 | 0 | 0 | 5 |
| | 10 | 0.04 | 2 130 | 1 390 | 0 | 0 | 0 |
| | 20 | 0.04 | 1 950 | 1 260 | 0 | 0 | 0 |
| | 50 | 0.03 | 1 770 | 1 110 | 0 | 0 | 0 |
| | 100 | 0.03 | 1 660 | 1 030 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A75: Derived Monthly Mean Stages at the Lake C5 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.055 | 0.080 | 0.020 | 0.018 | 0.018 | 0.014 |
| | 50 | 0.049 | 0.077 | 0.018 | 0.015 | 0.016 | 0.013 |
| | 20 | 0.041 | 0.072 | 0.015 | 0.012 | 0.013 | 0.010 |
| | 10 | 0.035 | 0.067 | 0.012 | 0.010 | 0.011 | 0.009 |
| | 5 | 0.027 | 0.061 | 0.009 | 0.007 | 0.009 | 0.007 |
| Median | 2 | 0.013 | 0.049 | 0.004 | 0.003 | 0.005 | 0.003 |
| Dry | 5 | - | 0.035 | - | - | 0.001 | - |
| | 10 | - | 0.026 | - | - | - | - |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.017 | - | - | - | - |
| | 50 | - | 0.001 | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A76: Derived Representative Stages at the Lake C5 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.305 | 0.146 | 0.117 | 0.007 | 0.012 | 0.014 |
| | 50 | 0.286 | 0.141 | 0.113 | 0.006 | 0.010 | 0.013 |
| | 20 | 0.260 | 0.133 | 0.106 | 0.004 | 0.008 | 0.011 |
| | 10 | 0.237 | 0.126 | 0.100 | 0.003 | 0.007 | 0.010 |
| | 5 | 0.214 | 0.119 | 0.094 | 0.002 | 0.005 | 0.008 |
| Median | 2 | 0.174 | 0.105 | 0.082 | - | 0.002 | 0.005 |
| Dry | 5 | 0.141 | 0.093 | 0.071 | - | - | 0.002 |
| | 10 | 0.126 | 0.087 | 0.065 | - | - | - |
| | 20 | 0.114 | 0.082 | 0.061 | - | - | - |
| | 50 | 0.103 | 0.077 | 0.056 | - | - | - |
| | 100 | 0.095 | 0.074 | 0.054 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A77: Derived Monthly Mean Discharges at the Lake D24 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 870 | 3 770 | 533 | 335 | 369 | 238 |
| | 50 | 1 560 | 3 520 | 433 | 271 | 305 | 201 |
| | 20 | 1 170 | 3 140 | 311 | 193 | 226 | 154 |
| | 10 | 874 | 2 820 | 227 | 139 | 169 | 119 |
| | 5 | 579 | 2 440 | 148 | 88 | 113 | 83 |
| Median | 2 | 160 | 1 750 | 46 | 22 | 38 | 31 |
| Dry | 5 | 0 | 1 110 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 791 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 536 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 258 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 77 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A78: Derived Representative Discharges at the Lake D24 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.22 | 9 890 | 6 280 | 110 | 196 | 267 |
| | 50 | 0.19 | 9 030 | 5 930 | 82 | 160 | 227 |
| | 20 | 0.16 | 7 930 | 5 440 | 52 | 116 | 176 |
| | 10 | 0.14 | 7 110 | 5 020 | 32 | 84 | 138 |
| | 5 | 0.12 | 6 280 | 4 540 | 16 | 54 | 99 |
| Median | 2 | 0.09 | 5 080 | 3 710 | 0 | 14 | 41 |
| Dry | 5 | 0.07 | 4 260 | 2 970 | 0 | 0 | 1 |
| | 10 | 0.06 | 3 940 | 2 620 | 0 | 0 | 0 |
| | 20 | 0.06 | 3 720 | 2 340 | 0 | 0 | 0 |
| | 50 | 0.05 | 3 510 | 2 050 | 0 | 0 | 0 |
| | 100 | 0.05 | 3 390 | 1 860 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A79: Derived Monthly Mean Stages at the Lake D24 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.074 | 0.118 | 0.032 | 0.024 | 0.025 | 0.019 |
| | 50 | 0.066 | 0.113 | 0.028 | 0.020 | 0.022 | 0.017 |
| | 20 | 0.054 | 0.105 | 0.022 | 0.016 | 0.018 | 0.014 |
| | 10 | 0.045 | 0.098 | 0.018 | 0.013 | 0.015 | 0.012 |
| | 5 | 0.034 | 0.089 | 0.014 | 0.010 | 0.011 | 0.009 |
| Median | 2 | 0.014 | 0.071 | 0.006 | 0.004 | 0.005 | 0.005 |
| Dry | 5 | - | 0.052 | - | - | - | - |
| | 10 | - | 0.042 | - | - | - | - |
| | 20 | - | 0.032 | - | - | - | - |
| | 50 | - | 0.020 | - | - | - | - |
| | 100 | - | 0.009 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A80: Derived Representative Stages at the Lake D24 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.348 | 0.225 | 0.166 | 0.011 | 0.017 | 0.020 |
| | 50 | 0.320 | 0.212 | 0.160 | 0.009 | 0.014 | 0.018 |
| | 20 | 0.283 | 0.194 | 0.151 | 0.007 | 0.012 | 0.015 |
| | 10 | 0.255 | 0.181 | 0.143 | 0.005 | 0.009 | 0.013 |
| | 5 | 0.226 | 0.166 | 0.134 | 0.003 | 0.007 | 0.010 |
| Median | 2 | 0.186 | 0.145 | 0.117 | - | 0.003 | 0.006 |
| Dry | 5 | 0.158 | 0.129 | 0.101 | - | - | 0.001 |
| | 10 | 0.147 | 0.122 | 0.093 | - | - | - |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.140 | 0.117 | 0.086 | - | - | - |
| | 50 | 0.133 | 0.113 | 0.079 | - | - | - |
| | 100 | 0.129 | 0.110 | 0.074 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A81: Derived Monthly Mean Discharges at the Lake D23 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 570 | 8 250 | 1 390 | 682 | 743 | 434 |
| | 50 | 2 950 | 7 620 | 1 110 | 545 | 602 | 367 |
| | 20 | 2 180 | 6 730 | 779 | 380 | 430 | 280 |
| | 10 | 1 610 | 5 990 | 558 | 267 | 310 | 215 |
| | 5 | 1 050 | 5 150 | 357 | 162 | 196 | 150 |
| Median | 2 | 264 | 3 700 | 111 | 30 | 50 | 55 |
| Dry | 5 | 0 | 2 440 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 1 850 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 1 390 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 908 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 602 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A82: Derived Representative Discharges at the Lake D23 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.42 | 20 000 | 13 000 | 224 | 416 | 542 |
| | 50 | 0.36 | 18 500 | 12 300 | 166 | 332 | 461 |
| | 20 | 0.30 | 16 400 | 11 300 | 103 | 232 | 356 |
| | 10 | 0.26 | 14 800 | 10 400 | 64 | 163 | 277 |
| | 5 | 0.22 | 13 100 | 9 460 | 31 | 100 | 196 |
| Median | 2 | 0.16 | 10 500 | 7 700 | 0 | 20 | 79 |
| Dry | 5 | 0.12 | 8 520 | 6 100 | 0 | 0 | 0 |
| | 10 | 0.11 | 7 690 | 5 330 | 0 | 0 | 0 |
| | 20 | 0.11 | 7 090 | 4 710 | 0 | 0 | 0 |
| | 50 | 0.10 | 6 490 | 4 050 | 0 | 0 | 0 |
| | 100 | 0.10 | 6 140 | 3 630 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A83: Derived Monthly Mean Stages at the Lake D23 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.099 | 0.174 | 0.053 | 0.033 | 0.035 | 0.024 |
| | 50 | 0.087 | 0.165 | 0.046 | 0.028 | 0.030 | 0.022 |
| | 20 | 0.071 | 0.152 | 0.036 | 0.022 | 0.024 | 0.018 |
| | 10 | 0.058 | 0.140 | 0.029 | 0.018 | 0.019 | 0.015 |
| | 5 | 0.044 | 0.127 | 0.021 | 0.013 | 0.014 | 0.012 |
| Median | 2 | 0.017 | 0.102 | 0.010 | 0.004 | 0.006 | 0.006 |
| Dry | 5 | - | 0.077 | - | - | - | - |
| | 10 | - | 0.064 | - | - | - | - |
| | 20 | - | 0.053 | - | - | - | - |
| | 50 | - | 0.040 | - | - | - | - |
| | 100 | - | 0.030 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A84: Derived Representative Stages at the Lake D23 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.465 | 0.313 | 0.235 | 0.016 | 0.024 | 0.028 |
| | 50 | 0.424 | 0.297 | 0.227 | 0.013 | 0.020 | 0.025 |
| | 20 | 0.373 | 0.274 | 0.214 | 0.009 | 0.016 | 0.021 |
| | 10 | 0.336 | 0.256 | 0.203 | 0.007 | 0.013 | 0.018 |
| | 5 | 0.299 | 0.236 | 0.190 | 0.004 | 0.009 | 0.014 |
| Median | 2 | 0.247 | 0.204 | 0.166 | - | 0.003 | 0.008 |
| Dry | 5 | 0.207 | 0.177 | 0.142 | - | - | - |
| | 10 | 0.194 | 0.166 | 0.130 | - | - | - |
| | 20 | 0.187 | 0.157 | 0.119 | - | - | - |
| | 50 | 0.181 | 0.148 | 0.108 | - | - | - |
| | 100 | 0.180 | 0.143 | 0.100 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A85: Derived Monthly Mean Discharges at the Lake D8 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 2 110 | 5 660 | 1 010 | 358 | 407 | 248 |
| | 50 | 1 740 | 5 140 | 804 | 279 | 317 | 200 |
| | 20 | 1 280 | 4 420 | 564 | 188 | 212 | 142 |
| | 10 | 939 | 3 860 | 404 | 127 | 143 | 102 |
| | 5 | 607 | 3 250 | 258 | 72 | 82 | 65 |
| Median | 2 | 148 | 2 270 | 79 | 7 | 10 | 18 |
| Dry | 5 | 0 | 1 510 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 1 180 | 0 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 938 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 693 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 546 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A86: Derived Representative Discharges at the Lake D8 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.23 | 12 400 | 8 250 | 120 | 222 | 320 |
| | 50 | 0.20 | 11 400 | 7 800 | 88 | 172 | 269 |
| | 20 | 0.17 | 10 100 | 7 150 | 54 | 114 | 204 |
| | 10 | 0.14 | 9 010 | 6 580 | 33 | 76 | 157 |
| | 5 | 0.12 | 7 880 | 5 920 | 16 | 43 | 109 |
| Median | 2 | 0.09 | 6 090 | 4 700 | 0 | 3 | 41 |
| Dry | 5 | 0.07 | 4 710 | 3 560 | 0 | 0 | 0 |
| | 10 | 0.06 | 4 120 | 2 990 | 0 | 0 | 0 |
| | 20 | 0.06 | 3 680 | 2 540 | 0 | 0 | 0 |
| | 50 | 0.06 | 3 250 | 2 040 | 0 | 0 | 0 |
| | 100 | 0.05 | 2 990 | 1 710 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A87: Derived Monthly Mean Stages at the Lake D8 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.076 | 0.147 | 0.047 | 0.023 | 0.025 | 0.018 |
| | 50 | 0.067 | 0.138 | 0.040 | 0.020 | 0.022 | 0.016 |
| | 20 | 0.055 | 0.125 | 0.032 | 0.015 | 0.016 | 0.013 |
| | 10 | 0.044 | 0.114 | 0.025 | 0.012 | 0.013 | 0.010 |
| | 5 | 0.033 | 0.102 | 0.019 | 0.008 | 0.009 | 0.007 |
| Median | 2 | 0.013 | 0.080 | 0.009 | 0.002 | 0.002 | 0.003 |
| Dry | 5 | - | 0.061 | - | - | - | - |
| | 10 | - | 0.052 | - | - | - | - |
| | 20 | - | 0.044 | - | - | - | - |
| | 50 | - | 0.036 | - | - | - | - |
| | 100 | - | 0.031 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A88: Derived Representative Stages at the Lake D8 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.344 | 0.248 | 0.189 | 0.011 | 0.017 | 0.022 |
| | 50 | 0.314 | 0.235 | 0.182 | 0.009 | 0.014 | 0.019 |
| | 20 | 0.277 | 0.217 | 0.172 | 0.007 | 0.011 | 0.016 |
| | 10 | 0.249 | 0.201 | 0.163 | 0.005 | 0.008 | 0.013 |
| | 5 | 0.220 | 0.184 | 0.152 | 0.003 | 0.006 | 0.011 |
| Median | 2 | 0.180 | 0.155 | 0.130 | - | 0.001 | 0.005 |
| Dry | 5 | 0.148 | 0.130 | 0.108 | - | - | - |
| | 10 | 0.139 | 0.119 | 0.096 | - | - | - |
| | 20 | 0.135 | 0.110 | 0.086 | - | - | - |
| | 50 | 0.132 | 0.102 | 0.075 | - | - | - |
| | 100 | 0.131 | 0.096 | 0.066 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A89: Derived Monthly Mean Discharges at the Lake D7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 6 710 | 25 900 | 6 140 | 2 330 | 1 970 | 976 |
| | 50 | 5 480 | 22 400 | 5 030 | 1 800 | 1 560 | 829 |
| | 20 | 3 960 | 18 200 | 3 740 | 1 220 | 1 090 | 625 |
| | 10 | 2 870 | 15 200 | 2 880 | 857 | 790 | 467 |
| | 5 | 1 810 | 12 300 | 2 110 | 559 | 530 | 311 |
| Median | 2 | 392 | 8 460 | 1 180 | 243 | 237 | 119 |
| Dry | 5 | 0 | 6 110 | 674 | 100 | 92 | 36 |
| | 10 | 0 | 5 280 | 512 | 60 | 49 | 18 |
| | 20 | 0 | 4 730 | 413 | 38 | 23 | 10 |
| | 50 | 0 | 4 240 | 330 | 20 | 2 | 5 |
| | 100 | 0 | 3 970 | 286 | 12 | 0 | 4 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A90: Derived Representative Discharges at the Lake D7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.84 | 46 900 | 33 800 | 1 230 | 1 620 | 2 380 |
| | 50 | 0.74 | 43 000 | 31 400 | 978 | 1 310 | 2 030 |
| | 20 | 0.61 | 37 600 | 28 000 | 689 | 956 | 1 590 |
| | 10 | 0.52 | 33 300 | 25 200 | 503 | 719 | 1 280 |
| | 5 | 0.42 | 28 700 | 22 000 | 340 | 504 | 976 |
| Median | 2 | 0.29 | 21 200 | 16 600 | 155 | 247 | 570 |
| Dry | 5 | 0.21 | 15 400 | 12 000 | 62 | 108 | 316 |
| | 10 | 0.18 | 12 800 | 9 930 | 33 | 64 | 223 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.15 | 10 900 | 8 310 | 17 | 37 | 162 |
| | 50 | 0.13 | 8 990 | 6 610 | 3 | 14 | 107 |
| | 100 | 0.12 | 7 830 | 5 550 | 0 | 2 | 77 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A91: Derived Monthly Mean Stages at the Lake D7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.388 | 0.485 | 0.382 | 0.326 | 0.317 | 0.282 |
| | 50 | 0.375 | 0.474 | 0.370 | 0.312 | 0.305 | 0.275 |
| | 20 | 0.356 | 0.458 | 0.352 | 0.293 | 0.287 | 0.262 |
| | 10 | 0.337 | 0.444 | 0.337 | 0.276 | 0.272 | 0.250 |
| | 5 | 0.312 | 0.429 | 0.320 | 0.257 | 0.255 | 0.234 |
| Median | 2 | 0.243 | 0.403 | 0.291 | 0.224 | 0.223 | 0.199 |
| Dry | 5 | - | 0.382 | 0.265 | 0.194 | 0.191 | 0.163 |
| | 10 | - | 0.373 | 0.254 | 0.178 | 0.172 | 0.145 |
| | 20 | - | 0.366 | 0.245 | 0.165 | 0.152 | 0.132 |
| | 50 | - | 0.360 | 0.236 | 0.148 | 0.104 | 0.119 |
| | 100 | - | 0.356 | 0.230 | 0.135 | - | 0.112 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A92: Derived Representative Stages at the Lake D7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.575 | 0.535 | 0.507 | 0.293 | 0.307 | 0.327 |
| | 50 | 0.563 | 0.527 | 0.501 | 0.282 | 0.296 | 0.318 |
| | 20 | 0.546 | 0.516 | 0.491 | 0.266 | 0.281 | 0.306 |
| | 10 | 0.531 | 0.506 | 0.483 | 0.253 | 0.268 | 0.295 |
| | 5 | 0.514 | 0.493 | 0.472 | 0.237 | 0.253 | 0.282 |
| Median | 2 | 0.483 | 0.469 | 0.451 | 0.208 | 0.225 | 0.258 |
| Dry | 5 | 0.457 | 0.445 | 0.427 | 0.179 | 0.196 | 0.234 |
| | 10 | 0.444 | 0.432 | 0.414 | 0.162 | 0.180 | 0.221 |
| | 20 | 0.434 | 0.420 | 0.402 | 0.144 | 0.164 | 0.210 |
| | 50 | 0.424 | 0.407 | 0.387 | 0.108 | 0.139 | 0.196 |
| | 100 | 0.418 | 0.398 | 0.376 | - | 0.099 | 0.185 |

Note: m = metre.

**Table 7.3-A93: Derived Monthly Mean Discharges at the Lake D4 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 16 800 | 47 100 | 10 700 | 4 160 | 4 340 | 2 480 |
| | 50 | 13 900 | 42 600 | 8 640 | 3 570 | 3 640 | 2 070 |
| | 20 | 10 300 | 36 700 | 6 280 | 2 820 | 2 780 | 1 530 |
| | 10 | 7 640 | 32 000 | 4 720 | 2 250 | 2 180 | 1 150 |
| | 5 | 5 000 | 27 000 | 3 320 | 1 670 | 1 600 | 786 |
| Median | 2 | 1 310 | 19 300 | 1 640 | 820 | 837 | 345 |
| Dry | 5 | 0 | 13 300 | 755 | 231 | 377 | 134 |
| | 10 | 0 | 10 800 | 472 | 0 | 214 | 79 |
| | 20 | 0 | 9 020 | 299 | 0 | 108 | 52 |
| | 50 | 0 | 7 210 | 154 | 0 | 14 | 33 |
| | 100 | 0 | 6 130 | 79 | 0 | 0 | 26 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A94: Derived Representative Discharges at the Lake D4 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.60 | 92 200 | 67 400 | 1 920 | 3 500 | 3 360 |
| | 50 | 1.43 | 85 700 | 63 400 | 1 560 | 2 910 | 3 120 |
| | 20 | 1.22 | 76 600 | 57 700 | 1 130 | 2 180 | 2 740 |
| | 10 | 1.05 | 69 300 | 52 900 | 838 | 1 680 | 2 380 |
| | 5 | 0.89 | 61 200 | 47 300 | 567 | 1 210 | 1 930 |
| Median | 2 | 0.66 | 47 800 | 37 600 | 227 | 611 | 1 160 |
| Dry | 5 | 0.51 | 36 900 | 29 000 | 36 | 259 | 591 |
| | 10 | 0.45 | 32 000 | 24 900 | 0 | 137 | 393 |
| | 20 | 0.41 | 28 300 | 21 600 | 0 | 60 | 278 |
| | 50 | 0.37 | 24 600 | 18 200 | 0 | 0 | 192 |
| | 100 | 0.35 | 22 200 | 16 000 | 0 | 0 | 155 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A95: Derived Monthly Mean Stages at the Lake D4 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.142 | 0.283 | 0.105 | 0.056 | 0.058 | 0.040 |
| | 50 | 0.125 | 0.265 | 0.091 | 0.051 | 0.051 | 0.035 |
| | 20 | 0.103 | 0.240 | 0.074 | 0.043 | 0.043 | 0.029 |
| | 10 | 0.084 | 0.219 | 0.061 | 0.037 | 0.036 | 0.024 |
| | 5 | 0.063 | 0.195 | 0.048 | 0.031 | 0.030 | 0.018 |
| Median | 2 | 0.026 | 0.156 | 0.030 | 0.019 | 0.019 | 0.011 |
| Dry | 5 | - | 0.122 | 0.018 | 0.008 | 0.011 | 0.006 |
| | 10 | - | 0.106 | 0.013 | - | 0.008 | 0.004 |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.094 | 0.010 | - | 0.005 | 0.003 |
| | 50 | - | 0.081 | 0.006 | - | 0.001 | 0.002 |
| | 100 | - | 0.073 | 0.004 | - | - | 0.002 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A96: Derived Representative Stages at the Lake D4 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.580 | 0.443 | 0.359 | 0.034 | 0.050 | 0.049 |
| | 50 | 0.538 | 0.422 | 0.345 | 0.029 | 0.044 | 0.046 |
| | 20 | 0.484 | 0.391 | 0.324 | 0.024 | 0.036 | 0.042 |
| | 10 | 0.438 | 0.366 | 0.306 | 0.019 | 0.031 | 0.039 |
| | 5 | 0.393 | 0.337 | 0.284 | 0.015 | 0.025 | 0.034 |
| Median | 2 | 0.322 | 0.286 | 0.244 | 0.008 | 0.016 | 0.024 |
| Dry | 5 | 0.269 | 0.241 | 0.205 | 0.002 | 0.009 | 0.015 |
| | 10 | 0.248 | 0.219 | 0.185 | - | 0.006 | 0.012 |
| | 20 | 0.232 | 0.202 | 0.168 | - | 0.003 | 0.009 |
| | 50 | 0.217 | 0.184 | 0.150 | - | - | 0.007 |
| | 100 | 0.209 | 0.171 | 0.138 | - | - | 0.006 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A97: Derived Monthly Mean Discharges at the Lake D3 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 18 600 | 52 500 | 12 500 | 4 780 | 4 450 | 3 700 |
| | 50 | 15 400 | 47 700 | 10 000 | 4 100 | 3 890 | 2 880 |
| | 20 | 11 400 | 41 100 | 7 200 | 3 210 | 3 150 | 1 980 |
| | 10 | 8 400 | 36 000 | 5 330 | 2 530 | 2 570 | 1 410 |
| | 5 | 5 470 | 30 500 | 3 670 | 1 840 | 1 960 | 929 |
| Median | 2 | 1 400 | 21 800 | 1 740 | 831 | 1 020 | 398 |
| Dry | 5 | 0 | 15 200 | 734 | 119 | 327 | 147 |
| | 10 | 0 | 12 400 | 421 | 0 | 36 | 75 |
| | 20 | 0 | 10 400 | 233 | 0 | 0 | 33 |
| | 50 | 0 | 8 320 | 77 | 0 | 0 | 0 |
| | 100 | 0 | 7 090 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A98: Derived Representative Discharges at the Lake D3 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.90 | 105 000 | 76 400 | 2 130 | 3 270 | 4 630 |
| | 50 | 1.71 | 98 000 | 71 900 | 1 690 | 2 830 | 4 040 |
| | 20 | 1.46 | 87 800 | 65 500 | 1 180 | 2 260 | 3 270 |
| | 10 | 1.27 | 79 500 | 60 200 | 838 | 1 820 | 2 690 |
| | 5 | 1.08 | 70 300 | 54 000 | 531 | 1 360 | 2 090 |
| Median | 2 | 0.80 | 55 400 | 43 100 | 162 | 675 | 1 220 |
| Dry | 5 | 0.60 | 43 100 | 33 400 | 0 | 179 | 609 |
| | 10 | 0.52 | 37 700 | 28 800 | 0 | 0 | 364 |
| | 20 | 0.47 | 33 500 | 25 100 | 0 | 0 | 193 |
| | 50 | 0.42 | 29 300 | 21 200 | 0 | 0 | 30 |
| | 100 | 0.39 | 26 700 | 18 700 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A99: Derived Monthly Mean Stages at the Lake D3 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.144 | 0.287 | 0.110 | 0.058 | 0.055 | 0.049 |
| | 50 | 0.127 | 0.269 | 0.095 | 0.052 | 0.051 | 0.041 |
| | 20 | 0.104 | 0.244 | 0.076 | 0.045 | 0.044 | 0.032 |
| | 10 | 0.085 | 0.223 | 0.062 | 0.038 | 0.038 | 0.026 |
| | 5 | 0.064 | 0.200 | 0.049 | 0.031 | 0.032 | 0.019 |
| Median | 2 | 0.026 | 0.160 | 0.030 | 0.018 | 0.021 | 0.011 |
| Dry | 5 | - | 0.126 | 0.017 | 0.005 | 0.010 | 0.006 |
| | 10 | - | 0.110 | 0.012 | - | 0.002 | 0.004 |
| | 20 | - | 0.098 | 0.008 | - | - | 0.002 |
| | 50 | - | 0.084 | 0.004 | - | - | - |
| | 100 | - | 0.076 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A100: Derived Representative Stages at the Lake D3 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.614 | 0.456 | 0.369 | 0.034 | 0.045 | 0.057 |
| | 50 | 0.572 | 0.435 | 0.354 | 0.029 | 0.041 | 0.052 |
| | 20 | 0.515 | 0.405 | 0.333 | 0.023 | 0.035 | 0.045 |
| | 10 | 0.469 | 0.379 | 0.315 | 0.018 | 0.031 | 0.040 |
| | 5 | 0.421 | 0.349 | 0.293 | 0.013 | 0.025 | 0.033 |
| Median | 2 | 0.345 | 0.298 | 0.252 | 0.006 | 0.016 | 0.023 |
| Dry | 5 | 0.285 | 0.252 | 0.212 | - | 0.007 | 0.015 |
| | 10 | 0.260 | 0.230 | 0.192 | - | - | 0.010 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.242 | 0.213 | 0.176 | - | - | 0.007 |
| | 50 | 0.224 | 0.195 | 0.157 | - | - | 0.002 |
| | 100 | 0.213 | 0.183 | 0.144 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A101: Derived Monthly Mean Discharges at the Lake D36 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 710 | 3 550 | 505 | 282 | 328 | 204 |
| | 50 | 1 430 | 3 290 | 407 | 226 | 266 | 171 |
| | 20 | 1 060 | 2 910 | 290 | 159 | 190 | 129 |
| | 10 | 792 | 2 600 | 209 | 112 | 137 | 98 |
| | 5 | 523 | 2 230 | 134 | 69 | 87 | 67 |
| Median | 2 | 141 | 1 590 | 40 | 14 | 22 | 23 |
| Dry | 5 | 0 | 1 010 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 733 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 514 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 280 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 131 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A102: Derived Representative Discharges at the Lake D36 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.17 | 8 140 | 5 770 | 94 | 167 | 235 |
| | 50 | 0.15 | 7 600 | 5 440 | 70 | 135 | 198 |
| | 20 | 0.13 | 6 860 | 4 980 | 43 | 95 | 151 |
| | 10 | 0.12 | 6 280 | 4 580 | 27 | 68 | 116 |
| | 5 | 0.10 | 5 650 | 4 140 | 13 | 42 | 81 |
| Median | 2 | 0.08 | 4 650 | 3 370 | 0 | 9 | 31 |
| Dry | 5 | 0.06 | 3 870 | 2 690 | 0 | 0 | 0 |
| | 10 | 0.05 | 3 540 | 2 370 | 0 | 0 | 0 |
| | 20 | 0.05 | 3 290 | 2 120 | 0 | 0 | 0 |
| | 50 | 0.05 | 3 040 | 1 860 | 0 | 0 | 0 |
| | 100 | 0.04 | 2 890 | 1 690 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A103: Derived Monthly Mean Stages at the Lake D36 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.071 | 0.115 | 0.031 | 0.021 | 0.024 | 0.017 |
| | 50 | 0.063 | 0.110 | 0.027 | 0.018 | 0.020 | 0.015 |
| | 20 | 0.051 | 0.101 | 0.022 | 0.015 | 0.016 | 0.013 |
| | 10 | 0.042 | 0.094 | 0.017 | 0.012 | 0.013 | 0.011 |
| | 5 | 0.032 | 0.085 | 0.013 | 0.008 | 0.010 | 0.008 |
| Median | 2 | 0.013 | 0.067 | 0.006 | 0.003 | 0.004 | 0.004 |
| Dry | 5 | - | 0.050 | - | - | - | - |
| | 10 | - | 0.040 | - | - | - | - |
| | 20 | - | 0.032 | - | - | - | - |
| | 50 | - | 0.021 | - | - | - | - |
| | 100 | - | 0.013 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A104: Derived Representative Stages at the Lake D36 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.294 | 0.200 | 0.159 | 0.010 | 0.015 | 0.019 |
| | 50 | 0.274 | 0.191 | 0.153 | 0.008 | 0.013 | 0.017 |
| | 20 | 0.250 | 0.179 | 0.144 | 0.006 | 0.010 | 0.014 |
| | 10 | 0.230 | 0.169 | 0.137 | 0.004 | 0.008 | 0.012 |
| | 5 | 0.209 | 0.157 | 0.128 | 0.003 | 0.006 | 0.009 |
| Median | 2 | 0.176 | 0.138 | 0.111 | - | 0.002 | 0.005 |
| Dry | 5 | 0.150 | 0.122 | 0.096 | - | - | - |
| | 10 | 0.139 | 0.115 | 0.088 | - | - | - |
| | 20 | 0.132 | 0.110 | 0.082 | - | - | - |
| | 50 | 0.124 | 0.104 | 0.075 | - | - | - |
| | 100 | 0.119 | 0.100 | 0.070 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A105: Derived Monthly Mean Discharges at the Lake D35 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 010 | 7 020 | 1 160 | 534 | 598 | 355 |
| | 50 | 2 490 | 6 450 | 925 | 422 | 477 | 293 |
| | 20 | 1 830 | 5 650 | 647 | 290 | 332 | 217 |
| | 10 | 1 350 | 5 000 | 460 | 200 | 233 | 162 |
| | 5 | 880 | 4 270 | 291 | 118 | 142 | 108 |
| Median | 2 | 219 | 3 040 | 86 | 16 | 28 | 36 |
| Dry | 5 | 0 | 2 000 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 1 530 | 0 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 1 170 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 792 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 558 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A106: Derived Representative Discharges at the Lake D35 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.30 | 15 500 | 10 800 | 176 | 324 | 435 |
| | 50 | 0.27 | 14 500 | 10 200 | 130 | 256 | 367 |
| | 20 | 0.24 | 13 100 | 9 370 | 80 | 175 | 279 |
| | 10 | 0.21 | 12 000 | 8 660 | 49 | 120 | 214 |
| | 5 | 0.18 | 10 800 | 7 840 | 24 | 71 | 149 |
| Median | 2 | 0.14 | 8 750 | 6 380 | 0 | 10 | 55 |
| Dry | 5 | 0.11 | 7 110 | 5 040 | 0 | 0 | 0 |
| | 10 | 0.10 | 6 380 | 4 390 | 0 | 0 | 0 |
| | 20 | 0.09 | 5 830 | 3 870 | 0 | 0 | 0 |
| | 50 | 0.09 | 5 270 | 3 310 | 0 | 0 | 0 |
| | 100 | 0.09 | 4 920 | 2 960 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A107: Derived Monthly Mean Stages at the Lake D35 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.092 | 0.162 | 0.049 | 0.029 | 0.031 | 0.022 |
| | 50 | 0.081 | 0.153 | 0.042 | 0.025 | 0.027 | 0.019 |
| | 20 | 0.066 | 0.140 | 0.033 | 0.019 | 0.021 | 0.016 |
| | 10 | 0.054 | 0.129 | 0.026 | 0.015 | 0.017 | 0.013 |
| | 5 | 0.040 | 0.116 | 0.019 | 0.011 | 0.012 | 0.010 |
| Median | 2 | 0.016 | 0.093 | 0.009 | 0.003 | 0.004 | 0.005 |
| Dry | 5 | - | 0.070 | - | - | - | - |
| | 10 | - | 0.059 | - | - | - | - |
| | 20 | - | 0.049 | - | - | - | - |
| | 50 | - | 0.038 | - | - | - | - |
| | 100 | - | 0.030 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A108: Derived Representative Stages at the Lake D35 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.390 | 0.274 | 0.215 | 0.014 | 0.021 | 0.025 |
| | 50 | 0.364 | 0.262 | 0.207 | 0.011 | 0.018 | 0.023 |
| | 20 | 0.328 | 0.245 | 0.196 | 0.008 | 0.014 | 0.019 |
| | 10 | 0.301 | 0.231 | 0.186 | 0.006 | 0.011 | 0.016 |
| | 5 | 0.272 | 0.215 | 0.174 | 0.004 | 0.008 | 0.012 |
| Median | 2 | 0.227 | 0.187 | 0.152 | - | 0.002 | 0.006 |
| Dry | 5 | 0.192 | 0.163 | 0.130 | - | - | - |
| | 10 | 0.180 | 0.152 | 0.118 | - | - | - |
| | 20 | 0.174 | 0.143 | 0.109 | - | - | - |
| | 50 | 0.170 | 0.134 | 0.098 | - | - | - |
| | 100 | 0.168 | 0.128 | 0.091 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A109: Derived Monthly Mean Discharges at the Lake D12 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 4 430 | 9 800 | 1 670 | 1 030 | 1 020 | 604 |
| | 50 | 3 690 | 9 120 | 1 360 | 857 | 881 | 520 |
| | 20 | 2 740 | 8 140 | 987 | 640 | 702 | 410 |
| | 10 | 2 050 | 7 300 | 728 | 482 | 564 | 325 |
| | 5 | 1 350 | 6 340 | 487 | 326 | 419 | 237 |
| Median | 2 | 361 | 4 620 | 181 | 108 | 198 | 103 |
| Dry | 5 | 0 | 3 060 | 5 | 0 | 34 | 5 |
| | 10 | 0 | 2 300 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 1 700 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 1 050 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 642 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A110: Derived Representative Discharges at the Lake D12 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.47 | 23 400 | 15 700 | 345 | 623 | 1 160 |
| | 50 | 0.42 | 21 700 | 14 900 | 263 | 523 | 924 |
| | 20 | 0.36 | 19 400 | 13 700 | 169 | 395 | 658 |
| | 10 | 0.31 | 17 600 | 12 700 | 110 | 301 | 483 |
| | 5 | 0.27 | 15 700 | 11 500 | 59 | 207 | 328 |
| Median | 2 | 0.20 | 12 800 | 9 480 | 2 | 73 | 148 |
| Dry | 5 | 0.16 | 10 500 | 7 640 | 0 | 0 | 54 |
| | 10 | 0.14 | 9 520 | 6 750 | 0 | 0 | 25 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.13 | 8 820 | 6 060 | 0 | 0 | 8 |
| | 50 | 0.12 | 8 110 | 5 310 | 0 | 0 | 0 |
| | 100 | 0.12 | 7 690 | 4 840 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A111: Derived Monthly Mean Stages at the Lake D12 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.109 | 0.185 | 0.057 | 0.041 | 0.041 | 0.029 |
| | 50 | 0.096 | 0.176 | 0.049 | 0.036 | 0.037 | 0.026 |
| | 20 | 0.079 | 0.163 | 0.040 | 0.030 | 0.032 | 0.022 |
| | 10 | 0.065 | 0.152 | 0.033 | 0.025 | 0.028 | 0.019 |
| | 5 | 0.049 | 0.138 | 0.025 | 0.019 | 0.023 | 0.015 |
| Median | 2 | 0.020 | 0.112 | 0.013 | 0.009 | 0.014 | 0.009 |
| Dry | 5 | - | 0.085 | 0.001 | - | 0.004 | 0.001 |
| | 10 | - | 0.070 | - | - | - | - |
| | 20 | - | 0.057 | - | - | - | - |
| | 50 | - | 0.042 | - | - | - | - |
| | 100 | - | 0.030 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A112: Derived Representative Stages at the Lake D12 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.474 | 0.330 | 0.253 | 0.020 | 0.029 | 0.045 |
| | 50 | 0.441 | 0.314 | 0.244 | 0.017 | 0.026 | 0.038 |
| | 20 | 0.397 | 0.291 | 0.231 | 0.012 | 0.022 | 0.030 |
| | 10 | 0.363 | 0.273 | 0.219 | 0.009 | 0.018 | 0.025 |
| | 5 | 0.327 | 0.253 | 0.205 | 0.006 | 0.014 | 0.019 |
| Median | 2 | 0.273 | 0.221 | 0.181 | 0.001 | 0.007 | 0.011 |
| Dry | 5 | 0.233 | 0.193 | 0.156 | - | - | 0.006 |
| | 10 | 0.216 | 0.181 | 0.144 | - | - | 0.003 |
| | 20 | 0.205 | 0.172 | 0.134 | - | - | 0.002 |
| | 50 | 0.194 | 0.163 | 0.123 | - | - | - |
| | 100 | 0.187 | 0.157 | 0.115 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A113: Derived Monthly Mean Discharges at the Lake D1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 27 000 | 73 800 | 19 000 | 7 030 | 6 500 | 15 300 |
| | 50 | 22 300 | 67 400 | 14 900 | 5 860 | 5 630 | 9 840 |
| | 20 | 16 400 | 58 700 | 10 400 | 4 390 | 4 470 | 5 080 |
| | 10 | 12 100 | 51 700 | 7 490 | 3 330 | 3 590 | 2 820 |
| | 5 | 7 780 | 44 200 | 5 030 | 2 270 | 2 660 | 1 380 |
| Median | 2 | 1 830 | 32 100 | 2 280 | 824 | 1 280 | 347 |
| Dry | 5 | 0 | 22 500 | 955 | 0 | 273 | 82 |
| | 10 | 0 | 18 400 | 565 | 0 | 0 | 35 |
| | 20 | 0 | 15 300 | 339 | 0 | 0 | 15 |
| | 50 | 0 | 12 200 | 156 | 0 | 0 | 3 |
| | 100 | 0 | 10 300 | 66 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A114: Derived Representative Discharges at the Lake D1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.92 | 152 000 | 111 000 | 2 860 | 4 680 | 7 160 |
| | 50 | 3.45 | 143 000 | 105 000 | 2 230 | 3 970 | 6 060 |
| | 20 | 2.87 | 129 000 | 95 800 | 1 510 | 3 050 | 4 700 |
| | 10 | 2.45 | 118 000 | 88 300 | 1 030 | 2 370 | 3 720 |
| | 5 | 2.05 | 106 000 | 79 800 | 619 | 1 690 | 2 770 |
| Median | 2 | 1.51 | 87 400 | 65 000 | 137 | 718 | 1 470 |
| Dry | 5 | 1.18 | 72 200 | 51 900 | 0 | 66 | 656 |
| | 10 | 1.06 | 65 400 | 45 600 | 0 | 0 | 358 |
| | 20 | 0.98 | 60 500 | 40 800 | 0 | 0 | 160 |
| | 50 | 0.91 | 55 400 | 35 600 | 0 | 0 | 0 |
| | 100 | 0.87 | 52 300 | 32 300 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A115: Derived Monthly Mean Stages at the Lake D1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.228 | 0.377 | 0.191 | 0.116 | 0.112 | 0.172 |
| | 50 | 0.207 | 0.361 | 0.170 | 0.106 | 0.104 | 0.138 |
| | 20 | 0.178 | 0.337 | 0.142 | 0.092 | 0.093 | 0.099 |
| | 10 | 0.153 | 0.316 | 0.120 | 0.080 | 0.083 | 0.074 |
| | 5 | 0.123 | 0.292 | 0.099 | 0.066 | 0.072 | 0.052 |
| Median | 2 | 0.059 | 0.249 | 0.066 | 0.040 | 0.050 | 0.026 |
| Dry | 5 | - | 0.208 | 0.043 | - | 0.023 | 0.013 |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 10 | - | 0.188 | 0.033 | - | - | 0.008 |
| | 20 | - | 0.172 | 0.026 | - | - | 0.005 |
| | 50 | - | 0.153 | 0.017 | - | - | 0.002 |
| | 100 | - | 0.141 | 0.011 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A116: Derived Representative Stages at the Lake D1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.808 | 0.541 | 0.463 | 0.074 | 0.095 | 0.118 |
| | 50 | 0.758 | 0.525 | 0.450 | 0.066 | 0.088 | 0.108 |
| | 20 | 0.692 | 0.499 | 0.430 | 0.054 | 0.077 | 0.095 |
| | 10 | 0.639 | 0.477 | 0.413 | 0.045 | 0.068 | 0.085 |
| | 5 | 0.585 | 0.452 | 0.392 | 0.035 | 0.057 | 0.073 |
| Median | 2 | 0.502 | 0.411 | 0.354 | 0.016 | 0.037 | 0.053 |
| Dry | 5 | 0.443 | 0.373 | 0.316 | - | 0.011 | 0.036 |
| | 10 | 0.420 | 0.355 | 0.297 | - | - | 0.026 |
| | 20 | 0.404 | 0.342 | 0.281 | - | - | 0.018 |
| | 50 | 0.389 | 0.327 | 0.262 | - | - | - |
| | 100 | 0.380 | 0.318 | 0.250 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A117: Derived Monthly Mean Discharges at the Lake E4 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 750 | 4 040 | 762 | 600 | 422 | 244 |
| | 50 | 1 470 | 3 720 | 634 | 452 | 355 | 207 |
| | 20 | 1 100 | 3 260 | 482 | 296 | 273 | 158 |
| | 10 | 833 | 2 890 | 377 | 202 | 214 | 121 |
| | 5 | 558 | 2 480 | 280 | 128 | 158 | 83 |
| Median | 2 | 162 | 1 780 | 158 | 52 | 82 | 36 |
| Dry | 5 | 0 | 1 190 | 89 | 20 | 36 | 13 |
| | 10 | 0 | 925 | 65 | 12 | 19 | 7 |
| | 20 | 0 | 719 | 50 | 7 | 8 | 5 |
| | 50 | 0 | 505 | 38 | 3 | 0 | 3 |
| | 100 | 0 | 372 | 31 | 2 | 0 | 2 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A118: Derived Representative Discharges at the Lake E4 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.23 | 7 770 | 6 170 | 231 | 365 | 371 |
| | 50 | 0.19 | 7 280 | 5 800 | 186 | 298 | 324 |
| | 20 | 0.15 | 6 610 | 5 280 | 134 | 219 | 263 |
| | 10 | 0.12 | 6 070 | 4 840 | 100 | 165 | 217 |
| | 5 | 0.10 | 5 460 | 4 350 | 70 | 117 | 171 |
| Median | 2 | 0.07 | 4 470 | 3 500 | 33 | 58 | 104 |
| Dry | 5 | 0.05 | 3 660 | 2 780 | 14 | 26 | 57 |
| | 10 | 0.05 | 3 300 | 2 440 | 8 | 15 | 39 |
| | 20 | 0.05 | 3 020 | 2 180 | 4 | 9 | 27 |
| | 50 | 0.04 | 2 740 | 1 900 | 1 | 3 | 15 |
| | 100 | 0.04 | 2 560 | 1 730 | 0 | 0 | 8 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A119: Derived Monthly Mean Stages at the Lake E4 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.447 | 0.503 | 0.397 | 0.383 | 0.365 | 0.337 |
| | 50 | 0.436 | 0.498 | 0.386 | 0.368 | 0.356 | 0.329 |
| | 20 | 0.418 | 0.488 | 0.372 | 0.347 | 0.343 | 0.317 |
| | 10 | 0.402 | 0.480 | 0.359 | 0.328 | 0.331 | 0.305 |
| | 5 | 0.379 | 0.470 | 0.344 | 0.307 | 0.317 | 0.289 |
| Median | 2 | 0.318 | 0.448 | 0.317 | 0.270 | 0.289 | 0.257 |
| Dry | 5 | - | 0.423 | 0.292 | 0.236 | 0.256 | 0.222 |
| | 10 | - | 0.408 | 0.279 | 0.218 | 0.234 | 0.204 |
| | 20 | - | 0.393 | 0.269 | 0.203 | 0.206 | 0.191 |
| | 50 | - | 0.374 | 0.258 | 0.183 | - | 0.178 |
| | 100 | - | 0.358 | 0.251 | 0.167 | - | 0.170 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A120: Derived Representative Stages at the Lake E4 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.630 | 0.553 | 0.535 | 0.335 | 0.357 | 0.358 |
| | 50 | 0.615 | 0.548 | 0.530 | 0.324 | 0.347 | 0.351 |
| | 20 | 0.595 | 0.540 | 0.523 | 0.310 | 0.332 | 0.341 |
| | 10 | 0.578 | 0.534 | 0.517 | 0.297 | 0.319 | 0.332 |
| | 5 | 0.560 | 0.526 | 0.509 | 0.282 | 0.304 | 0.320 |
| Median | 2 | 0.532 | 0.511 | 0.493 | 0.254 | 0.275 | 0.299 |
| Dry | 5 | 0.513 | 0.496 | 0.477 | 0.224 | 0.244 | 0.274 |
| | 10 | 0.505 | 0.489 | 0.469 | 0.207 | 0.227 | 0.260 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.501 | 0.483 | 0.461 | 0.189 | 0.209 | 0.246 |
| | 50 | 0.496 | 0.476 | 0.452 | 0.157 | 0.180 | 0.225 |
| | 100 | 0.494 | 0.472 | 0.446 | - | 0.101 | 0.206 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A121: Derived Monthly Mean Discharges at the Lake E3 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 6 670 | 19 000 | 7 270 | 1 600 | 1 560 | 857 |
| | 50 | 5 560 | 17 200 | 5 380 | 1 270 | 1 260 | 737 |
| | 20 | 4 140 | 14 800 | 3 420 | 884 | 896 | 579 |
| | 10 | 3 090 | 13 000 | 2 280 | 620 | 645 | 457 |
| | 5 | 2 050 | 11 000 | 1 390 | 379 | 410 | 329 |
| Median | 2 | 557 | 7 930 | 521 | 79 | 111 | 134 |
| Dry | 5 | 0 | 5 590 | 177 | 0 | 0 | 0 |
| | 10 | 0 | 4 600 | 90 | 0 | 0 | 0 |
| | 20 | 0 | 3 890 | 44 | 0 | 0 | 0 |
| | 50 | 0 | 3 170 | 10 | 0 | 0 | 0 |
| | 100 | 0 | 2 750 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A122: Derived Representative Discharges at the Lake E3 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.52 | 35 300 | 26 900 | 602 | 1 070 | 4 920 |
| | 50 | 0.46 | 32 200 | 25 200 | 451 | 849 | 3 360 |
| | 20 | 0.39 | 28 100 | 22 700 | 284 | 592 | 1 890 |
| | 10 | 0.34 | 25 000 | 20 700 | 180 | 418 | 1 130 |
| | 5 | 0.29 | 21 800 | 18 500 | 93 | 259 | 605 |
| Median | 2 | 0.22 | 17 000 | 14 700 | 0 | 64 | 179 |
| Dry | 5 | 0.17 | 13 600 | 11 400 | 0 | 0 | 48 |
| | 10 | 0.15 | 12 200 | 9 950 | 0 | 0 | 21 |
| | 20 | 0.14 | 11 300 | 8 820 | 0 | 0 | 9 |
| | 50 | 0.13 | 10 300 | 7 650 | 0 | 0 | 0 |
| | 100 | 0.12 | 9 770 | 6 910 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A123: Derived Monthly Mean Stages at the Lake E3 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.115 | 0.231 | 0.122 | 0.044 | 0.044 | 0.029 |
| | 50 | 0.102 | 0.216 | 0.100 | 0.038 | 0.038 | 0.026 |
| | 20 | 0.084 | 0.196 | 0.074 | 0.030 | 0.030 | 0.023 |
| | 10 | 0.069 | 0.179 | 0.056 | 0.024 | 0.024 | 0.019 |
| | 5 | 0.052 | 0.161 | 0.040 | 0.017 | 0.018 | 0.015 |
| Median | 2 | 0.022 | 0.129 | 0.021 | 0.006 | 0.007 | 0.008 |
| Dry | 5 | - | 0.102 | 0.010 | - | - | - |
| | 10 | - | 0.090 | 0.007 | - | - | - |
| | 20 | - | 0.080 | 0.004 | - | - | - |
| | 50 | - | 0.070 | 0.002 | - | - | - |
| | 100 | - | 0.064 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A124: Derived Representative Stages at the Lake E3 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.409 | 0.349 | 0.291 | 0.023 | 0.034 | 0.094 |
| | 50 | 0.380 | 0.328 | 0.279 | 0.019 | 0.029 | 0.073 |
| | 20 | 0.340 | 0.300 | 0.260 | 0.014 | 0.023 | 0.050 |
| | 10 | 0.310 | 0.277 | 0.245 | 0.010 | 0.018 | 0.035 |
| | 5 | 0.278 | 0.253 | 0.227 | 0.007 | 0.013 | 0.023 |
| Median | 2 | 0.230 | 0.215 | 0.195 | - | 0.005 | 0.010 |
| Dry | 5 | 0.196 | 0.185 | 0.164 | - | - | 0.004 |
| | 10 | 0.182 | 0.172 | 0.150 | - | - | 0.002 |
| | 20 | 0.172 | 0.163 | 0.139 | - | - | 0.001 |
| | 50 | 0.163 | 0.154 | 0.126 | - | - | 0.000 |
| | 100 | 0.158 | 0.148 | 0.118 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A125: Derived Monthly Mean Discharges at the Lake E2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 8 600 | 25 800 | 10 400 | 2 140 | 2 050 | 1 130 |
| | 50 | 7 160 | 23 300 | 7 690 | 1 690 | 1 650 | 967 |
| | 20 | 5 320 | 20 000 | 4 890 | 1 160 | 1 160 | 752 |
| | 10 | 3 970 | 17 400 | 3 260 | 808 | 824 | 588 |
| | 5 | 2 610 | 14 700 | 1 990 | 485 | 514 | 418 |
| Median | 2 | 699 | 10 600 | 749 | 90 | 125 | 164 |
| Dry | 5 | 0 | 7 530 | 256 | 0 | 0 | 0 |
| | 10 | 0 | 6 270 | 132 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 5 370 | 66 | 0 | 0 | 0 |
| | 50 | 0 | 4 490 | 18 | 0 | 0 | 0 |
| | 100 | 0 | 3 970 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A126: Derived Representative Discharges at the Lake E2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.64 | 46 900 | 36 400 | 795 | 1 430 | 6 470 |
| | 50 | 0.58 | 42 700 | 33 900 | 594 | 1 130 | 4 440 |
| | 20 | 0.50 | 37 200 | 30 500 | 373 | 776 | 2 520 |
| | 10 | 0.44 | 33 000 | 27 700 | 235 | 542 | 1 520 |
| | 5 | 0.37 | 28 700 | 24 600 | 120 | 330 | 821 |
| Median | 2 | 0.28 | 22 300 | 19 300 | 0 | 73 | 247 |
| Dry | 5 | 0.22 | 17 700 | 15 000 | 0 | 0 | 67 |
| | 10 | 0.20 | 15 800 | 13 000 | 0 | 0 | 30 |
| | 20 | 0.18 | 14 500 | 11 500 | 0 | 0 | 12 |
| | 50 | 0.17 | 13 300 | 9 940 | 0 | 0 | 1 |
| | 100 | 0.16 | 12 500 | 8 970 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A127: Derived Monthly Mean Stages at the Lake E2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.121 | 0.251 | 0.137 | 0.048 | 0.046 | 0.031 |
| | 50 | 0.107 | 0.235 | 0.112 | 0.041 | 0.040 | 0.028 |
| | 20 | 0.088 | 0.212 | 0.083 | 0.032 | 0.032 | 0.024 |
| | 10 | 0.072 | 0.193 | 0.063 | 0.025 | 0.025 | 0.020 |
| | 5 | 0.055 | 0.173 | 0.046 | 0.018 | 0.018 | 0.016 |
| Median | 2 | 0.023 | 0.139 | 0.024 | 0.006 | 0.007 | 0.009 |
| Dry | 5 | - | 0.111 | 0.012 | - | - | - |
| | 10 | - | 0.098 | 0.007 | - | - | - |
| | 20 | - | 0.088 | 0.005 | - | - | - |
| | 50 | - | 0.078 | 0.002 | - | - | - |
| | 100 | - | 0.072 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A128: Derived Representative Stages at the Lake E2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.420 | 0.374 | 0.316 | 0.025 | 0.037 | 0.100 |
| | 50 | 0.391 | 0.352 | 0.302 | 0.020 | 0.031 | 0.078 |
| | 20 | 0.353 | 0.321 | 0.281 | 0.015 | 0.024 | 0.053 |
| | 10 | 0.323 | 0.296 | 0.264 | 0.011 | 0.019 | 0.038 |
| | 5 | 0.292 | 0.270 | 0.243 | 0.007 | 0.014 | 0.025 |
| Median | 2 | 0.242 | 0.228 | 0.207 | - | 0.005 | 0.011 |
| Dry | 5 | 0.206 | 0.195 | 0.175 | - | - | 0.005 |
| | 10 | 0.191 | 0.181 | 0.159 | - | - | 0.003 |
| | 20 | 0.181 | 0.171 | 0.147 | - | - | 0.002 |
| | 50 | 0.170 | 0.162 | 0.133 | - | - | 0.000 |
| | 100 | 0.164 | 0.155 | 0.124 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A129: Derived Monthly Mean Discharges at the Lake E6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 300 | 6 290 | 951 | 714 | 691 | 413 |
| | 50 | 2 800 | 5 910 | 783 | 600 | 610 | 354 |
| | 20 | 2 140 | 5 340 | 575 | 453 | 498 | 277 |
| | 10 | 1 640 | 4 840 | 429 | 345 | 409 | 218 |
| | 5 | 1 120 | 4 230 | 289 | 237 | 313 | 158 |
| Median | 2 | 355 | 3 070 | 105 | 85 | 158 | 68 |
| Dry | 5 | 0 | 1 920 | 0 | 0 | 34 | 5 |
| | 10 | 0 | 1 330 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 836 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 285 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A130: Derived Representative Discharges at the Lake E6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.38 | 15 100 | 10 800 | 231 | 413 | 511 |
| | 50 | 0.35 | 14 100 | 10 200 | 176 | 350 | 450 |
| | 20 | 0.30 | 12 800 | 9 320 | 114 | 269 | 367 |
| | 10 | 0.26 | 11 800 | 8 600 | 74 | 208 | 302 |
| | 5 | 0.22 | 10 700 | 7 790 | 40 | 146 | 233 |
| Median | 2 | 0.17 | 8 820 | 6 390 | 1 | 55 | 125 |
| Dry | 5 | 0.13 | 7 360 | 5 190 | 0 | 0 | 42 |
| | 10 | 0.12 | 6 710 | 4 620 | 0 | 0 | 7 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.11 | 6 230 | 4 190 | 0 | 0 | 0 |
| | 50 | 0.10 | 5 740 | 3 730 | 0 | 0 | 0 |
| | 100 | 0.09 | 5 440 | 3 450 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A131: Derived Monthly Mean Stages at the Lake E6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.099 | 0.152 | 0.043 | 0.036 | 0.035 | 0.025 |
| | 50 | 0.089 | 0.146 | 0.038 | 0.032 | 0.032 | 0.022 |
| | 20 | 0.074 | 0.136 | 0.031 | 0.026 | 0.028 | 0.019 |
| | 10 | 0.062 | 0.128 | 0.025 | 0.022 | 0.025 | 0.016 |
| | 5 | 0.048 | 0.117 | 0.019 | 0.017 | 0.021 | 0.013 |
| Median | 2 | 0.022 | 0.094 | 0.010 | 0.009 | 0.013 | 0.007 |
| Dry | 5 | - | 0.069 | - | - | 0.005 | 0.001 |
| | 10 | - | 0.054 | - | - | - | - |
| | 20 | - | 0.040 | - | - | - | - |
| | 50 | - | 0.019 | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A132: Derived Representative Stages at the Lake E6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.460 | 0.272 | 0.218 | 0.017 | 0.025 | 0.028 |
| | 50 | 0.428 | 0.260 | 0.210 | 0.014 | 0.022 | 0.026 |
| | 20 | 0.386 | 0.244 | 0.197 | 0.010 | 0.019 | 0.023 |
| | 10 | 0.353 | 0.231 | 0.187 | 0.008 | 0.016 | 0.020 |
| | 5 | 0.318 | 0.216 | 0.175 | 0.005 | 0.012 | 0.017 |
| Median | 2 | 0.265 | 0.190 | 0.153 | 0.000 | 0.006 | 0.011 |
| Dry | 5 | 0.226 | 0.169 | 0.134 | - | - | 0.005 |
| | 10 | 0.210 | 0.159 | 0.124 | - | - | 0.002 |
| | 20 | 0.199 | 0.151 | 0.116 | - | - | - |
| | 50 | 0.188 | 0.143 | 0.107 | - | - | - |
| | 100 | 0.181 | 0.138 | 0.102 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A133: Derived Monthly Mean Discharges at the Lake E1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 12 800 | 34 500 | 13 500 | 2 930 | 2 940 | 1 620 |
| | 50 | 10 700 | 31 500 | 9 830 | 2 350 | 2 390 | 1 390 |
| | 20 | 8 010 | 27 300 | 6 110 | 1 650 | 1 720 | 1 090 |
| | 10 | 6 010 | 24 000 | 4 000 | 1 170 | 1 250 | 860 |
| | 5 | 4 000 | 20 400 | 2 380 | 727 | 810 | 620 |
| Median | 2 | 1 120 | 14 700 | 852 | 165 | 241 | 256 |
| Dry | 5 | 0 | 10 200 | 274 | 0 | 0 | 0 |
| | 10 | 0 | 8 280 | 133 | 0 | 0 | 0 |
| | 20 | 0 | 6 840 | 60 | 0 | 0 | 0 |
| | 50 | 0 | 5 390 | 8 | 0 | 0 | 0 |
| | 100 | 0 | 4 510 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A134: Derived Representative Discharges at the Lake E1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.17 | 67 500 | 49 700 | 1 080 | 1 930 | 7 760 |
| | 50 | 1.01 | 61 200 | 46 600 | 810 | 1 550 | 5 400 |
| | 20 | 0.82 | 53 100 | 42 100 | 509 | 1 090 | 3 140 |
| | 10 | 0.69 | 47 000 | 38 500 | 321 | 779 | 1 930 |
| | 5 | 0.57 | 40 800 | 34 400 | 163 | 491 | 1 070 |
| Median | 2 | 0.42 | 32 000 | 27 500 | 0 | 130 | 337 |
| Dry | 5 | 0.34 | 25 900 | 21 600 | 0 | 0 | 95 |
| | 10 | 0.31 | 23 500 | 18 900 | 0 | 0 | 42 |
| | 20 | 0.30 | 21 800 | 16 900 | 0 | 0 | 17 |
| | 50 | 0.28 | 20 300 | 14 700 | 0 | 0 | 0 |
| | 100 | 0.27 | 19 400 | 13 300 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A135: Derived Monthly Mean Stages at the Lake E1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.096 | 0.185 | 0.099 | 0.036 | 0.036 | 0.024 |
| | 50 | 0.085 | 0.175 | 0.080 | 0.031 | 0.031 | 0.022 |
| | 20 | 0.070 | 0.159 | 0.058 | 0.024 | 0.025 | 0.019 |
| | 10 | 0.058 | 0.146 | 0.044 | 0.019 | 0.020 | 0.016 |
| | 5 | 0.044 | 0.131 | 0.031 | 0.014 | 0.015 | 0.013 |
| Median | 2 | 0.019 | 0.105 | 0.016 | 0.005 | 0.007 | 0.007 |
| Dry | 5 | - | 0.082 | 0.007 | - | - | - |
| | 10 | - | 0.072 | 0.005 | - | - | - |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.063 | 0.003 | - | - | - |
| | 50 | - | 0.054 | 0.001 | - | - | - |
| | 100 | - | 0.048 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A136: Derived Representative Stages at the Lake E1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.380 | 0.290 | 0.237 | 0.018 | 0.027 | 0.069 |
| | 50 | 0.344 | 0.272 | 0.227 | 0.015 | 0.023 | 0.054 |
| | 20 | 0.299 | 0.247 | 0.212 | 0.011 | 0.019 | 0.038 |
| | 10 | 0.267 | 0.228 | 0.200 | 0.008 | 0.015 | 0.027 |
| | 5 | 0.235 | 0.207 | 0.185 | 0.005 | 0.011 | 0.018 |
| Median | 2 | 0.192 | 0.176 | 0.159 | - | 0.004 | 0.008 |
| Dry | 5 | 0.166 | 0.153 | 0.136 | - | - | 0.004 |
| | 10 | 0.157 | 0.144 | 0.124 | - | - | 0.002 |
| | 20 | 0.152 | 0.137 | 0.115 | - | - | 0.001 |
| | 50 | 0.146 | 0.130 | 0.105 | - | - | - |
| | 100 | 0.144 | 0.126 | 0.098 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A137: Derived Monthly Mean Discharges at the Lake G2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 2 220 | 4 440 | 680 | 375 | 423 | 258 |
| | 50 | 1 870 | 4 140 | 547 | 302 | 345 | 218 |
| | 20 | 1 410 | 3 710 | 390 | 213 | 249 | 167 |
| | 10 | 1 070 | 3 330 | 281 | 152 | 181 | 128 |
| | 5 | 725 | 2 880 | 182 | 94 | 117 | 89 |
| Median | 2 | 219 | 2 070 | 56 | 21 | 33 | 33 |
| Dry | 5 | 0 | 1 300 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 919 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 614 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 279 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 62 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A138: Derived Representative Discharges at the Lake G2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.25 | 10 900 | 7 470 | 124 | 225 | 305 |
| | 50 | 0.22 | 9 950 | 7 010 | 92 | 182 | 259 |
| | 20 | 0.18 | 8 740 | 6 370 | 57 | 129 | 200 |
| | 10 | 0.15 | 7 840 | 5 840 | 36 | 92 | 155 |
| | 5 | 0.13 | 6 920 | 5 250 | 18 | 58 | 110 |
| Median | 2 | 0.10 | 5 610 | 4 260 | 0 | 13 | 44 |
| Dry | 5 | 0.08 | 4 710 | 3 420 | 0 | 0 | 0 |
| | 10 | 0.07 | 4 360 | 3 030 | 0 | 0 | 0 |
| | 20 | 0.07 | 4 120 | 2 730 | 0 | 0 | 0 |
| | 50 | 0.06 | 3 890 | 2 430 | 0 | 0 | 0 |
| | 100 | 0.06 | 3 760 | 2 230 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A139: Derived Monthly Mean Stages at the Lake G2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.081 | 0.129 | 0.037 | 0.025 | 0.027 | 0.019 |
| | 50 | 0.072 | 0.123 | 0.032 | 0.021 | 0.023 | 0.017 |
| | 20 | 0.060 | 0.114 | 0.025 | 0.017 | 0.019 | 0.014 |
| | 10 | 0.050 | 0.106 | 0.020 | 0.014 | 0.015 | 0.012 |
| | 5 | 0.039 | 0.097 | 0.015 | 0.010 | 0.011 | 0.010 |
| Median | 2 | 0.017 | 0.078 | 0.007 | 0.004 | 0.005 | 0.005 |
| Dry | 5 | - | 0.057 | - | - | - | - |
| | 10 | - | 0.045 | - | - | - | - |
| | 20 | - | 0.034 | - | - | - | - |
| | 50 | - | 0.020 | - | - | - | - |
| | 100 | - | 0.007 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A140: Derived Representative Stages at the Lake G2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.370 | 0.235 | 0.182 | 0.012 | 0.018 | 0.022 |
| | 50 | 0.338 | 0.221 | 0.175 | 0.010 | 0.015 | 0.019 |
| | 20 | 0.296 | 0.203 | 0.164 | 0.007 | 0.012 | 0.016 |
| | 10 | 0.266 | 0.188 | 0.155 | 0.005 | 0.010 | 0.014 |
| | 5 | 0.236 | 0.173 | 0.144 | 0.003 | 0.007 | 0.011 |
| Median | 2 | 0.194 | 0.151 | 0.125 | - | 0.003 | 0.006 |
| Dry | 5 | 0.168 | 0.134 | 0.108 | - | - | - |
| | 10 | 0.158 | 0.127 | 0.100 | - | - | - |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.152 | 0.123 | 0.093 | - | - | - |
| | 50 | 0.146 | 0.118 | 0.086 | - | - | - |
| | 100 | 0.143 | 0.115 | 0.081 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A141: Derived Monthly Mean Discharges at the Lake G1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 5 200 | 9 980 | 3 900 | 1 520 | 1 250 | 1 260 |
| | 50 | 4 410 | 9 370 | 2 630 | 1 230 | 1 050 | 912 |
| | 20 | 3 370 | 8 450 | 1 460 | 887 | 802 | 558 |
| | 10 | 2 580 | 7 640 | 861 | 659 | 629 | 359 |
| | 5 | 1 770 | 6 660 | 453 | 454 | 463 | 210 |
| Median | 2 | 566 | 4 810 | 129 | 208 | 245 | 72 |
| Dry | 5 | 0 | 2 980 | 32 | 75 | 112 | 22 |
| | 10 | 0 | 2 030 | 13 | 33 | 66 | 10 |
| | 20 | 0 | 1 250 | 4 | 7 | 35 | 4 |
| | 50 | 0 | 376 | 0 | 0 | 8 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A142: Derived Representative Discharges at the Lake G1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.93 | 24 100 | 16 700 | 389 | 854 | 857 |
| | 50 | 0.82 | 22 600 | 15 900 | 306 | 698 | 750 |
| | 20 | 0.69 | 20 500 | 14 600 | 210 | 513 | 611 |
| | 10 | 0.59 | 18 800 | 13 600 | 146 | 388 | 506 |
| | 5 | 0.49 | 16 900 | 12 300 | 90 | 273 | 399 |
| Median | 2 | 0.34 | 13 800 | 10 100 | 22 | 132 | 243 |
| Dry | 5 | 0.24 | 11 300 | 8 040 | 0 | 53 | 133 |
| | 10 | 0.20 | 10 100 | 7 020 | 0 | 28 | 90 |
| | 20 | 0.17 | 9 270 | 6 210 | 0 | 12 | 60 |
| | 50 | 0.15 | 8 390 | 5 340 | 0 | 0 | 31 |
| | 100 | 0.13 | 7 850 | 4 770 | 0 | 0 | 14 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A143: Derived Monthly Mean Stages at the Lake G1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.120 | 0.185 | 0.099 | 0.053 | 0.046 | 0.047 |
| | 50 | 0.107 | 0.178 | 0.076 | 0.046 | 0.041 | 0.038 |
| | 20 | 0.090 | 0.166 | 0.051 | 0.037 | 0.034 | 0.027 |
| | 10 | 0.075 | 0.155 | 0.036 | 0.030 | 0.029 | 0.020 |
| | 5 | 0.058 | 0.141 | 0.024 | 0.024 | 0.024 | 0.014 |
| Median | 2 | 0.027 | 0.114 | 0.010 | 0.014 | 0.016 | 0.007 |
| Dry | 5 | - | 0.083 | 0.004 | 0.007 | 0.009 | 0.003 |
| | 10 | - | 0.064 | 0.002 | 0.004 | 0.006 | 0.002 |
| | 20 | - | 0.046 | 0.001 | 0.001 | 0.004 | 0.001 |
| | 50 | - | 0.021 | - | - | 0.002 | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A144: Derived Representative Stages at the Lake G1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.742 | 0.333 | 0.261 | 0.021 | 0.036 | 0.036 |
| | 50 | 0.685 | 0.319 | 0.253 | 0.018 | 0.031 | 0.033 |
| | 20 | 0.608 | 0.299 | 0.239 | 0.014 | 0.026 | 0.029 |
| | 10 | 0.548 | 0.282 | 0.228 | 0.011 | 0.021 | 0.025 |
| | 5 | 0.483 | 0.263 | 0.213 | 0.008 | 0.017 | 0.022 |
| Median | 2 | 0.380 | 0.230 | 0.187 | 0.003 | 0.010 | 0.016 |
| Dry | 5 | 0.301 | 0.201 | 0.160 | - | 0.006 | 0.010 |
| | 10 | 0.268 | 0.187 | 0.146 | - | 0.004 | 0.008 |
| | 20 | 0.243 | 0.176 | 0.135 | - | 0.002 | 0.006 |
| | 50 | 0.219 | 0.165 | 0.122 | - | - | 0.004 |
| | 100 | 0.204 | 0.158 | 0.113 | - | - | 0.002 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A145: Derived Monthly Mean Discharges at the Lake H20 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 900 | 3 040 | 675 | 295 | 230 | 147 |
| | 50 | 745 | 2 670 | 569 | 243 | 199 | 125 |
| | 20 | 550 | 2 210 | 441 | 181 | 160 | 96 |
| | 10 | 407 | 1 870 | 353 | 140 | 130 | 74 |
| | 5 | 265 | 1 530 | 271 | 102 | 101 | 53 |
| Median | 2 | 68 | 1 050 | 166 | 55 | 59 | 25 |
| Dry | 5 | 0 | 729 | 106 | 29 | 30 | 11 |
| | 10 | 0 | 607 | 85 | 21 | 19 | 7 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 524 | 72 | 16 | 12 | 5 |
| | 50 | 0 | 447 | 60 | 11 | 5 | 3 |
| | 100 | 0 | 403 | 54 | 9 | 1 | 2 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A146: Derived Representative Discharges at the Lake H20 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.13 | 5 510 | 4 260 | 157 | 212 | 280 |
| | 50 | 0.11 | 5 020 | 3 920 | 136 | 184 | 249 |
| | 20 | 0.08 | 4 360 | 3 450 | 109 | 147 | 208 |
| | 10 | 0.06 | 3 840 | 3 070 | 90 | 121 | 176 |
| | 5 | 0.05 | 3 290 | 2 650 | 70 | 94 | 144 |
| Median | 2 | 0.03 | 2 430 | 1 980 | 41 | 56 | 95 |
| Dry | 5 | 0.02 | 1 780 | 1 430 | 22 | 31 | 60 |
| | 10 | 0.02 | 1 510 | 1 190 | 15 | 22 | 45 |
| | 20 | 0.02 | 1 310 | 1 010 | 10 | 15 | 35 |
| | 50 | 0.02 | 1 110 | 828 | 5 | 9 | 25 |
| | 100 | 0.02 | 994 | 716 | 2 | 6 | 19 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A147: Derived Monthly Mean Stages at the Lake H20 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.775 | 0.868 | 0.754 | 0.697 | 0.681 | 0.653 |
| | 50 | 0.761 | 0.858 | 0.742 | 0.685 | 0.672 | 0.643 |
| | 20 | 0.739 | 0.843 | 0.724 | 0.666 | 0.658 | 0.627 |
| | 10 | 0.719 | 0.830 | 0.709 | 0.650 | 0.646 | 0.612 |
| | 5 | 0.690 | 0.814 | 0.692 | 0.631 | 0.631 | 0.593 |
| Median | 2 | 0.607 | 0.786 | 0.661 | 0.596 | 0.599 | 0.554 |
| Dry | 5 | - | 0.759 | 0.633 | 0.561 | 0.563 | 0.510 |
| | 10 | - | 0.746 | 0.620 | 0.543 | 0.540 | 0.489 |
| | 20 | - | 0.736 | 0.611 | 0.529 | 0.515 | 0.473 |
| | 50 | - | 0.725 | 0.601 | 0.512 | 0.474 | 0.454 |
| | 100 | - | 0.718 | 0.595 | 0.501 | 0.403 | 0.442 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A148: Derived Representative Stages at the Lake H20 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.982 | 0.918 | 0.896 | 0.657 | 0.676 | 0.694 |
| | 50 | 0.963 | 0.910 | 0.889 | 0.648 | 0.667 | 0.686 |
| | 20 | 0.937 | 0.898 | 0.879 | 0.635 | 0.653 | 0.675 |
| | 10 | 0.917 | 0.888 | 0.869 | 0.623 | 0.641 | 0.664 |
| | 5 | 0.896 | 0.875 | 0.857 | 0.609 | 0.626 | 0.652 |
| Median | 2 | 0.864 | 0.850 | 0.834 | 0.579 | 0.597 | 0.627 |
| Dry | 5 | 0.838 | 0.826 | 0.809 | 0.547 | 0.565 | 0.600 |
| | 10 | 0.835 | 0.813 | 0.795 | 0.526 | 0.546 | 0.585 |
| | 20 | 0.833 | 0.802 | 0.783 | 0.506 | 0.528 | 0.571 |
| | 50 | 0.833 | 0.790 | 0.768 | 0.476 | 0.503 | 0.553 |
| | 100 | 0.833 | 0.782 | 0.758 | 0.444 | 0.482 | 0.540 |

Note: m = metre.

**Table 7.3-A149: Derived Monthly Mean Discharges at the Lake H19 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 220 | 3 710 | 795 | 306 | 288 | 155 |
| | 50 | 1 020 | 3 290 | 650 | 261 | 252 | 138 |
| | 20 | 758 | 2 740 | 479 | 203 | 204 | 115 |
| | 10 | 567 | 2 330 | 363 | 159 | 167 | 96 |
| | 5 | 376 | 1 920 | 259 | 115 | 128 | 76 |
| Median | 2 | 105 | 1 320 | 130 | 50 | 68 | 42 |
| Dry | 5 | 0 | 914 | 60 | 5 | 23 | 14 |
| | 10 | 0 | 754 | 37 | 0 | 4 | 2 |
| | 20 | 0 | 644 | 22 | 0 | 0 | 0 |
| | 50 | 0 | 540 | 10 | 0 | 0 | 0 |
| | 100 | 0 | 480 | 4 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A150: Derived Representative Discharges at the Lake H19 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.15 | 6 660 | 5 260 | 164 | 230 | 328 |
| | 50 | 0.12 | 6 090 | 4 840 | 132 | 198 | 285 |
| | 20 | 0.09 | 5 330 | 4 270 | 94 | 156 | 230 |
| | 10 | 0.08 | 4 720 | 3 820 | 68 | 124 | 188 |
| | 5 | 0.06 | 4 080 | 3 320 | 44 | 91 | 146 |
| Median | 2 | 0.04 | 3 080 | 2 530 | 14 | 43 | 83 |
| Dry | 5 | 0.03 | 2 310 | 1 890 | 0 | 10 | 40 |
| | 10 | 0.03 | 1 980 | 1 610 | 0 | 0 | 22 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.03 | 1 740 | 1 400 | 0 | 0 | 10 |
| | 50 | 0.03 | 1 500 | 1 190 | 0 | 0 | 0 |
| | 100 | 0.03 | 1 360 | 1 060 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A151: Derived Monthly Mean Stages at the Lake H19 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.056 | 0.118 | 0.042 | 0.022 | 0.021 | 0.014 |
| | 50 | 0.050 | 0.109 | 0.037 | 0.020 | 0.020 | 0.013 |
| | 20 | 0.041 | 0.096 | 0.030 | 0.017 | 0.017 | 0.012 |
| | 10 | 0.034 | 0.087 | 0.025 | 0.014 | 0.015 | 0.010 |
| | 5 | 0.026 | 0.076 | 0.020 | 0.012 | 0.013 | 0.009 |
| Median | 2 | 0.011 | 0.059 | 0.013 | 0.007 | 0.008 | 0.006 |
| Dry | 5 | - | 0.046 | 0.008 | 0.001 | 0.004 | 0.003 |
| | 10 | - | 0.041 | 0.005 | - | 0.001 | 0.001 |
| | 20 | - | 0.037 | 0.004 | - | - | - |
| | 50 | - | 0.033 | 0.002 | - | - | - |
| | 100 | - | 0.030 | 0.001 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A152: Derived Representative Stages at the Lake H19 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.275 | 0.174 | 0.149 | 0.015 | 0.018 | 0.023 |
| | 50 | 0.239 | 0.164 | 0.141 | 0.013 | 0.017 | 0.021 |
| | 20 | 0.200 | 0.150 | 0.130 | 0.010 | 0.014 | 0.018 |
| | 10 | 0.173 | 0.138 | 0.120 | 0.008 | 0.012 | 0.016 |
| | 5 | 0.149 | 0.126 | 0.110 | 0.006 | 0.010 | 0.014 |
| Median | 2 | 0.118 | 0.104 | 0.091 | 0.003 | 0.006 | 0.009 |
| Dry | 5 | 0.099 | 0.086 | 0.075 | - | 0.002 | 0.006 |
| | 10 | 0.097 | 0.078 | 0.068 | - | - | 0.004 |
| | 20 | 0.096 | 0.071 | 0.062 | - | - | 0.002 |
| | 50 | 0.095 | 0.064 | 0.055 | - | - | - |
| | 100 | 0.095 | 0.060 | 0.051 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A153: Derived Monthly Mean Discharges at the Lake H17 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 310 | 3 580 | 568 | 152 | 200 | 103 |
| | 50 | 1 080 | 3 190 | 449 | 115 | 150 | 82 |
| | 20 | 797 | 2 670 | 311 | 73 | 94 | 56 |
| | 10 | 588 | 2 280 | 218 | 47 | 59 | 39 |
| | 5 | 382 | 1 860 | 135 | 24 | 30 | 23 |
| Median | 2 | 97 | 1 240 | 34 | 0 | 0 | 3 |
| Dry | 5 | 0 | 780 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 592 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 459 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 328 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 252 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A154: Derived Representative Discharges at the Lake H17 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.11 | 6 010 | 4 550 | 51 | 93 | 159 |
| | 50 | 0.10 | 5 650 | 4 350 | 38 | 70 | 132 |
| | 20 | 0.08 | 5 130 | 4 030 | 23 | 44 | 98 |
| | 10 | 0.07 | 4 690 | 3 750 | 14 | 28 | 73 |
| | 5 | 0.06 | 4 180 | 3 390 | 7 | 14 | 48 |
| Median | 2 | 0.05 | 3 280 | 2 680 | 0 | 0 | 15 |
| Dry | 5 | 0.03 | 2 460 | 1 910 | 0 | 0 | 0 |
| | 10 | 0.03 | 2 060 | 1 490 | 0 | 0 | 0 |
| | 20 | 0.02 | 1 750 | 1 130 | 0 | 0 | 0 |
| | 50 | 0.02 | 1 420 | 719 | 0 | 0 | 0 |
| | 100 | 0.02 | 1 200 | 436 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A155: Derived Monthly Mean Stages at the Lake H17 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.060 | 0.117 | 0.034 | 0.014 | 0.017 | 0.011 |
| | 50 | 0.052 | 0.108 | 0.029 | 0.012 | 0.014 | 0.009 |
| | 20 | 0.043 | 0.096 | 0.023 | 0.009 | 0.010 | 0.007 |
| | 10 | 0.035 | 0.086 | 0.018 | 0.006 | 0.008 | 0.006 |
| | 5 | 0.026 | 0.075 | 0.013 | 0.004 | 0.005 | 0.004 |
| Median | 2 | 0.011 | 0.058 | 0.005 | - | - | 0.001 |
| Dry | 5 | - | 0.042 | - | - | - | - |
| | 10 | - | 0.035 | - | - | - | - |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.030 | - | - | - | - |
| | 50 | - | 0.024 | - | - | - | - |
| | 100 | - | 0.020 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A156: Derived Representative Stages at the Lake H17 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.221 | 0.165 | 0.137 | 0.007 | 0.010 | 0.015 |
| | 50 | 0.206 | 0.158 | 0.133 | 0.006 | 0.008 | 0.013 |
| | 20 | 0.187 | 0.148 | 0.126 | 0.004 | 0.006 | 0.011 |
| | 10 | 0.171 | 0.140 | 0.120 | 0.003 | 0.005 | 0.009 |
| | 5 | 0.154 | 0.129 | 0.112 | 0.002 | 0.003 | 0.007 |
| Median | 2 | 0.125 | 0.110 | 0.096 | - | - | 0.003 |
| Dry | 5 | 0.101 | 0.091 | 0.077 | - | - | - |
| | 10 | 0.091 | 0.081 | 0.065 | - | - | - |
| | 20 | 0.083 | 0.072 | 0.054 | - | - | - |
| | 50 | 0.074 | 0.063 | 0.040 | - | - | - |
| | 100 | 0.069 | 0.056 | 0.029 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A157: Derived Monthly Mean Discharges at the Lake H1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 960 | 9 880 | 2 160 | 694 | 878 | 445 |
| | 50 | 3 360 | 8 970 | 1 660 | 588 | 708 | 370 |
| | 20 | 2 580 | 7 740 | 1 120 | 453 | 509 | 273 |
| | 10 | 1 990 | 6 750 | 788 | 353 | 378 | 203 |
| | 5 | 1 390 | 5 690 | 511 | 252 | 261 | 137 |
| Median | 2 | 513 | 3 980 | 215 | 110 | 121 | 58 |
| Dry | 5 | 0 | 2 640 | 82 | 15 | 47 | 22 |
| | 10 | 0 | 2 060 | 45 | 0 | 24 | 13 |
| | 20 | 0 | 1 620 | 23 | 0 | 9 | 8 |
| | 50 | 0 | 1 190 | 7 | 0 | 0 | 5 |
| | 100 | 0 | 927 | 0 | 0 | 0 | 4 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A158: Derived Representative Discharges at the Lake H1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.34 | 18 200 | 14 000 | 302 | 475 | 750 |
| | 50 | 0.30 | 16 800 | 13 100 | 237 | 404 | 636 |
| | 20 | 0.25 | 14 800 | 11 800 | 162 | 313 | 495 |
| | 10 | 0.22 | 13 300 | 10 700 | 113 | 246 | 393 |
| | 5 | 0.18 | 11 700 | 9 550 | 70 | 179 | 294 |
| Median | 2 | 0.14 | 9 280 | 7 560 | 19 | 85 | 160 |
| Dry | 5 | 0.11 | 7 420 | 5 860 | 0 | 22 | 76 |
| | 10 | 0.10 | 6 630 | 5 080 | 0 | 0 | 46 |
| | 20 | 0.09 | 6 070 | 4 490 | 0 | 0 | 25 |
| | 50 | 0.09 | 5 510 | 3 860 | 0 | 0 | 7 |
| | 100 | 0.08 | 5 170 | 3 480 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A159: Derived Monthly Mean Stages at the Lake H1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.203 | 0.374 | 0.136 | 0.064 | 0.074 | 0.047 |
| | 50 | 0.182 | 0.351 | 0.114 | 0.057 | 0.065 | 0.042 |
| | 20 | 0.153 | 0.318 | 0.088 | 0.048 | 0.052 | 0.034 |
| | 10 | 0.129 | 0.290 | 0.069 | 0.041 | 0.042 | 0.028 |
| | 5 | 0.101 | 0.259 | 0.052 | 0.032 | 0.033 | 0.022 |
| Median | 2 | 0.052 | 0.204 | 0.029 | 0.019 | 0.020 | 0.012 |
| Dry | 5 | - | 0.155 | 0.015 | 0.005 | 0.011 | 0.006 |
| | 10 | - | 0.131 | 0.010 | - | 0.007 | 0.004 |
| | 20 | - | 0.112 | 0.007 | - | 0.004 | 0.003 |
| | 50 | - | 0.091 | 0.003 | - | - | 0.002 |
| | 100 | - | 0.077 | - | - | - | 0.002 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A160: Derived Representative Stages at the Lake H1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.778 | 0.562 | 0.472 | 0.037 | 0.049 | 0.067 |
| | 50 | 0.716 | 0.533 | 0.451 | 0.031 | 0.044 | 0.060 |
| | 20 | 0.637 | 0.490 | 0.421 | 0.024 | 0.037 | 0.051 |
| | 10 | 0.575 | 0.456 | 0.394 | 0.019 | 0.032 | 0.044 |
| | 5 | 0.514 | 0.419 | 0.366 | 0.014 | 0.026 | 0.036 |
| Median | 2 | 0.424 | 0.359 | 0.313 | 0.006 | 0.016 | 0.024 |
| Dry | 5 | 0.364 | 0.309 | 0.264 | - | 0.006 | 0.015 |
| | 10 | 0.341 | 0.287 | 0.240 | - | - | 0.010 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.325 | 0.270 | 0.221 | - | - | 0.007 |
| | 50 | 0.310 | 0.253 | 0.200 | - | - | 0.003 |
| | 100 | 0.302 | 0.243 | 0.187 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A161: Derived Monthly Mean Discharges at the Lake I1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 610 | 3 000 | 409 | 271 | 300 | 198 |
| | 50 | 1 360 | 2 810 | 333 | 219 | 248 | 167 |
| | 20 | 1 040 | 2 530 | 241 | 156 | 184 | 127 |
| | 10 | 797 | 2 290 | 176 | 112 | 137 | 98 |
| | 5 | 545 | 1 990 | 115 | 71 | 92 | 68 |
| Median | 2 | 172 | 1 430 | 35 | 18 | 31 | 25 |
| Dry | 5 | 0 | 872 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 584 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 349 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 85 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A162: Derived Representative Discharges at the Lake I1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.20 | 7 550 | 5 260 | 89 | 156 | 217 |
| | 50 | 0.18 | 7 010 | 4 940 | 66 | 128 | 184 |
| | 20 | 0.15 | 6 280 | 4 490 | 42 | 92 | 142 |
| | 10 | 0.13 | 5 710 | 4 120 | 26 | 67 | 111 |
| | 5 | 0.11 | 5 110 | 3 710 | 13 | 43 | 79 |
| Median | 2 | 0.08 | 4 190 | 3 010 | 0 | 11 | 32 |
| Dry | 5 | 0.07 | 3 490 | 2 430 | 0 | 0 | 0 |
| | 10 | 0.06 | 3 200 | 2 160 | 0 | 0 | 0 |
| | 20 | 0.05 | 2 990 | 1 950 | 0 | 0 | 0 |
| | 50 | 0.05 | 2 790 | 1 740 | 0 | 0 | 0 |
| | 100 | 0.05 | 2 670 | 1 610 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A163: Derived Monthly Mean Stages at the Lake I1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.069 | 0.104 | 0.028 | 0.021 | 0.022 | 0.017 |
| | 50 | 0.062 | 0.100 | 0.024 | 0.018 | 0.020 | 0.015 |
| | 20 | 0.051 | 0.093 | 0.019 | 0.015 | 0.016 | 0.013 |
| | 10 | 0.043 | 0.087 | 0.016 | 0.012 | 0.013 | 0.011 |
| | 5 | 0.033 | 0.079 | 0.012 | 0.009 | 0.010 | 0.008 |
| Median | 2 | 0.016 | 0.064 | 0.005 | 0.003 | 0.005 | 0.004 |
| Dry | 5 | - | 0.046 | - | - | - | - |
| | 10 | - | 0.035 | - | - | - | - |
| | 20 | - | 0.025 | - | - | - | - |
| | 50 | - | 0.010 | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A164: Derived Representative Stages at the Lake I1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.334 | 0.193 | 0.152 | 0.010 | 0.015 | 0.018 |
| | 50 | 0.309 | 0.184 | 0.146 | 0.008 | 0.013 | 0.016 |
| | 20 | 0.278 | 0.171 | 0.137 | 0.006 | 0.010 | 0.014 |
| | 10 | 0.253 | 0.160 | 0.129 | 0.004 | 0.008 | 0.012 |
| | 5 | 0.226 | 0.149 | 0.120 | 0.003 | 0.006 | 0.009 |
| Median | 2 | 0.187 | 0.130 | 0.105 | - | 0.003 | 0.005 |
| Dry | 5 | 0.159 | 0.115 | 0.091 | - | - | 0.000 |
| | 10 | 0.147 | 0.109 | 0.084 | - | - | - |
| | 20 | 0.139 | 0.104 | 0.078 | - | - | - |
| | 50 | 0.131 | 0.099 | 0.073 | - | - | - |
| | 100 | 0.127 | 0.097 | 0.069 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A165: Derived Monthly Mean Discharges at the Lake J7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 852 | 1 500 | 190 | 142 | 151 | 111 |
| | 50 | 726 | 1 410 | 156 | 114 | 126 | 93 |
| | 20 | 559 | 1 280 | 114 | 80 | 95 | 69 |
| | 10 | 431 | 1 160 | 84 | 57 | 73 | 52 |
| | 5 | 298 | 1 010 | 55 | 36 | 50 | 35 |
| Median | 2 | 98 | 725 | 16 | 9 | 19 | 12 |
| Dry | 5 | 0 | 428 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 268 | 0 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 135 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A166: Derived Representative Discharges at the Lake J7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.15 | 4 020 | 2 680 | 35 | 78 | 111 |
| | 50 | 0.13 | 3 760 | 2 530 | 26 | 64 | 94 |
| | 20 | 0.11 | 3 390 | 2 310 | 17 | 46 | 73 |
| | 10 | 0.10 | 3 100 | 2 140 | 11 | 34 | 57 |
| | 5 | 0.08 | 2 780 | 1 930 | 5 | 22 | 40 |
| Median | 2 | 0.06 | 2 270 | 1 570 | 0 | 6 | 17 |
| Dry | 5 | 0.04 | 1 870 | 1 260 | 0 | 0 | 1 |
| | 10 | 0.03 | 1 690 | 1 110 | 0 | 0 | 0 |
| | 20 | 0.03 | 1 560 | 990 | 0 | 0 | 0 |
| | 50 | 0.03 | 1 430 | 865 | 0 | 0 | 0 |
| | 100 | 0.02 | 1 350 | 785 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A167: Derived Monthly Mean Stages at the Lake J7 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.048 | 0.070 | 0.018 | 0.015 | 0.015 | 0.012 |
| | 50 | 0.043 | 0.067 | 0.015 | 0.013 | 0.013 | 0.011 |
| | 20 | 0.036 | 0.063 | 0.013 | 0.010 | 0.011 | 0.009 |
| | 10 | 0.030 | 0.059 | 0.010 | 0.008 | 0.009 | 0.007 |
| | 5 | 0.024 | 0.054 | 0.008 | 0.006 | 0.007 | 0.006 |
| Median | 2 | 0.011 | 0.043 | 0.003 | 0.002 | 0.004 | 0.003 |
| Dry | 5 | - | 0.030 | - | - | - | - |
| | 10 | - | 0.022 | - | - | - | - |
| | 20 | - | 0.014 | - | - | - | - |
| | 50 | - | - | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A168: Derived Representative Stages at the Lake J7 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.290 | 0.135 | 0.103 | 0.006 | 0.010 | 0.012 |
| | 50 | 0.270 | 0.129 | 0.099 | 0.005 | 0.009 | 0.011 |
| | 20 | 0.242 | 0.120 | 0.093 | 0.003 | 0.007 | 0.009 |
| | 10 | 0.220 | 0.113 | 0.089 | 0.003 | 0.006 | 0.008 |
| | 5 | 0.196 | 0.105 | 0.083 | 0.002 | 0.004 | 0.006 |
| Median | 2 | 0.157 | 0.092 | 0.072 | - | 0.002 | 0.004 |
| Dry | 5 | 0.125 | 0.081 | 0.062 | - | - | 0.000 |
| | 10 | 0.111 | 0.076 | 0.057 | - | - | - |
| | 20 | 0.101 | 0.072 | 0.053 | - | - | - |
| | 50 | 0.090 | 0.068 | 0.048 | - | - | - |
| | 100 | 0.084 | 0.065 | 0.045 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A169: Derived Monthly Mean Discharges at the Lake J6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 1 350 | 2 300 | 291 | 226 | 225 | 159 |
| | 50 | 1 150 | 2 170 | 239 | 179 | 188 | 133 |
| | 20 | 882 | 1 970 | 175 | 124 | 140 | 100 |
| | 10 | 678 | 1 790 | 129 | 86 | 106 | 76 |
| | 5 | 467 | 1 570 | 84 | 52 | 72 | 52 |
| Median | 2 | 151 | 1 120 | 24 | 11 | 25 | 18 |
| Dry | 5 | 0 | 663 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 414 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 204 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A170: Derived Representative Discharges at the Lake J6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.25 | 6 360 | 4 270 | 52 | 123 | 169 |
| | 50 | 0.23 | 5 950 | 4 000 | 39 | 99 | 143 |
| | 20 | 0.20 | 5 370 | 3 620 | 24 | 70 | 109 |
| | 10 | 0.18 | 4 910 | 3 310 | 15 | 50 | 85 |
| | 5 | 0.15 | 4 400 | 2 970 | 8 | 32 | 60 |
| Median | 2 | 0.11 | 3 580 | 2 420 | 0 | 8 | 24 |
| Dry | 5 | 0.07 | 2 920 | 1 960 | 0 | 0 | 0 |
| | 10 | 0.06 | 2 630 | 1 760 | 0 | 0 | 0 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.05 | 2 410 | 1 600 | 0 | 0 | 0 |
| | 50 | 0.04 | 2 190 | 1 450 | 0 | 0 | 0 |
| | 100 | 0.00 | 0 | 0 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A171: Derived Monthly Mean Stages at the Lake J6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.063 | 0.090 | 0.023 | 0.019 | 0.019 | 0.015 |
| | 50 | 0.057 | 0.087 | 0.020 | 0.016 | 0.017 | 0.014 |
| | 20 | 0.048 | 0.081 | 0.016 | 0.013 | 0.014 | 0.011 |
| | 10 | 0.040 | 0.076 | 0.013 | 0.010 | 0.012 | 0.009 |
| | 5 | 0.031 | 0.070 | 0.010 | 0.007 | 0.009 | 0.007 |
| Median | 2 | 0.015 | 0.056 | 0.004 | 0.003 | 0.004 | 0.004 |
| Dry | 5 | - | 0.039 | - | - | - | - |
| | 10 | - | 0.029 | - | - | - | - |
| | 20 | - | 0.018 | - | - | - | - |
| | 50 | - | - | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A172: Derived Representative Stages at the Lake J6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.401 | 0.178 | 0.136 | 0.007 | 0.013 | 0.016 |
| | 50 | 0.378 | 0.170 | 0.131 | 0.006 | 0.011 | 0.014 |
| | 20 | 0.347 | 0.159 | 0.122 | 0.004 | 0.009 | 0.012 |
| | 10 | 0.318 | 0.150 | 0.115 | 0.003 | 0.007 | 0.010 |
| | 5 | 0.287 | 0.139 | 0.107 | 0.002 | 0.005 | 0.008 |
| Median | 2 | 0.231 | 0.121 | 0.093 | - | 0.002 | 0.004 |
| Dry | 5 | 0.179 | 0.106 | 0.081 | - | - | - |
| | 10 | 0.153 | 0.099 | 0.076 | - | - | - |
| | 20 | 0.132 | 0.093 | 0.071 | - | - | - |
| | 50 | 0.108 | 0.087 | 0.066 | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A173: Derived Monthly Mean Discharges at the Lake J3 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 2 170 | 4 160 | 603 | 453 | 686 | 264 |
| | 50 | 1 830 | 3 870 | 494 | 376 | 530 | 221 |
| | 20 | 1 400 | 3 440 | 361 | 281 | 359 | 167 |
| | 10 | 1 070 | 3 070 | 266 | 213 | 253 | 128 |
| | 5 | 731 | 2 640 | 176 | 147 | 165 | 89 |
| Median | 2 | 231 | 1 840 | 58 | 59 | 69 | 35 |
| Dry | 5 | 0 | 1 090 | 0 | 4 | 26 | 0 |
| | 10 | 0 | 707 | 0 | 0 | 13 | 0 |
| | 20 | 0 | 402 | 0 | 0 | 6 | 0 |
| | 50 | 0 | 68 | 0 | 0 | 1 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A174: Derived Representative Discharges at the Lake J3 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.50 | 11 000 | 7 530 | 116 | 248 | 404 |
| | 50 | 0.44 | 10 100 | 6 990 | 89 | 209 | 333 |
| | 20 | 0.36 | 8 840 | 6 240 | 59 | 160 | 247 |
| | 10 | 0.30 | 7 900 | 5 640 | 40 | 124 | 189 |
| | 5 | 0.25 | 6 930 | 4 980 | 23 | 87 | 136 |
| Median | 2 | 0.17 | 5 510 | 3 920 | 3 | 36 | 69 |
| Dry | 5 | 0.12 | 4 520 | 3 070 | 0 | 1 | 31 |
| | 10 | 0.10 | 4 120 | 2 690 | 0 | 0 | 19 |
| | 20 | 0.09 | 3 840 | 2 410 | 0 | 0 | 11 |
| | 50 | 0.08 | 3 580 | 2 130 | 0 | 0 | 4 |
| | 100 | 0.07 | 3 420 | 1 950 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A175: Derived Monthly Mean Stages at the Lake J3 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.081 | 0.126 | 0.035 | 0.029 | 0.038 | 0.020 |
| | 50 | 0.073 | 0.120 | 0.030 | 0.025 | 0.032 | 0.018 |
| | 20 | 0.061 | 0.111 | 0.025 | 0.021 | 0.025 | 0.015 |
| | 10 | 0.051 | 0.103 | 0.020 | 0.017 | 0.019 | 0.012 |
| | 5 | 0.039 | 0.093 | 0.015 | 0.014 | 0.015 | 0.010 |
| Median | 2 | 0.018 | 0.073 | 0.007 | 0.007 | 0.008 | 0.005 |
| Dry | 5 | - | 0.051 | - | 0.001 | 0.004 | - |
| | 10 | - | 0.039 | - | - | 0.003 | - |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.026 | - | - | 0.002 | - |
| | 50 | - | 0.008 | - | - | 0.000 | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A176: Derived Representative Stages at the Lake J3 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.598 | 0.240 | 0.187 | 0.012 | 0.019 | 0.027 |
| | 50 | 0.548 | 0.227 | 0.178 | 0.010 | 0.017 | 0.023 |
| | 20 | 0.481 | 0.208 | 0.165 | 0.007 | 0.014 | 0.019 |
| | 10 | 0.430 | 0.193 | 0.154 | 0.006 | 0.012 | 0.016 |
| | 5 | 0.375 | 0.177 | 0.142 | 0.004 | 0.010 | 0.013 |
| Median | 2 | 0.293 | 0.152 | 0.121 | 0.001 | 0.005 | 0.008 |
| Dry | 5 | 0.234 | 0.133 | 0.103 | - | 0.001 | 0.005 |
| | 10 | 0.209 | 0.125 | 0.094 | - | - | 0.003 |
| | 20 | 0.192 | 0.119 | 0.087 | - | - | 0.002 |
| | 50 | 0.176 | 0.114 | 0.080 | - | - | 0.001 |
| | 100 | 0.167 | 0.110 | 0.076 | - | - | 0.000 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A177: Derived Monthly Mean Discharges at the Lake J2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 4 070 | 8 220 | 1 030 | 708 | 569 | 301 |
| | 50 | 3 410 | 7 490 | 821 | 589 | 490 | 249 |
| | 20 | 2 560 | 6 450 | 574 | 439 | 386 | 185 |
| | 10 | 1 930 | 5 600 | 408 | 329 | 306 | 139 |
| | 5 | 1 290 | 4 650 | 255 | 220 | 223 | 94 |
| Median | 2 | 388 | 3 050 | 67 | 69 | 98 | 33 |
| Dry | 5 | 0 | 1 700 | 0 | 0 | 8 | 0 |
| | 10 | 0 | 1 080 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 602 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 108 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A178: Derived Representative Discharges at the Lake J2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.31 | 20 600 | 13 000 | 68 | 368 | 391 |
| | 50 | 1.21 | 19 400 | 12 100 | 51 | 309 | 347 |
| | 20 | 1.06 | 17 700 | 10 900 | 33 | 233 | 286 |
| | 10 | 0.94 | 16 200 | 9 910 | 21 | 177 | 238 |
| | 5 | 0.80 | 14 500 | 8 820 | 11 | 121 | 184 |
| Median | 2 | 0.56 | 11 500 | 7 000 | 0 | 41 | 98 |
| Dry | 5 | 0.35 | 8 780 | 5 490 | 0 | 0 | 28 |
| | 10 | 0.24 | 7 460 | 4 810 | 0 | 0 | 0 |
| | 20 | 0.17 | 6 410 | 4 290 | 0 | 0 | 0 |
| | 50 | 0.08 | 5 290 | 3 760 | 0 | 0 | 0 |
| | 100 | 0.03 | 4 570 | 3 440 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A179: Derived Monthly Mean Stages at the Lake J2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.119 | 0.190 | 0.048 | 0.037 | 0.032 | 0.021 |
| | 50 | 0.106 | 0.178 | 0.041 | 0.033 | 0.029 | 0.018 |
| | 20 | 0.087 | 0.162 | 0.032 | 0.027 | 0.025 | 0.015 |
| | 10 | 0.072 | 0.147 | 0.026 | 0.022 | 0.021 | 0.013 |
| | 5 | 0.055 | 0.130 | 0.019 | 0.017 | 0.017 | 0.010 |
| Median | 2 | 0.025 | 0.098 | 0.008 | 0.008 | 0.010 | 0.005 |
| Dry | 5 | - | 0.066 | - | - | 0.002 | - |
| | 10 | - | 0.049 | - | - | - | - |
| | 20 | - | 0.033 | - | - | - | - |
| | 50 | - | 0.011 | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A180: Derived Representative Stages at the Lake J2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 1.091 | 0.350 | 0.258 | 0.008 | 0.024 | 0.025 |
| | 50 | 1.034 | 0.337 | 0.246 | 0.006 | 0.021 | 0.023 |
| | 20 | 0.947 | 0.317 | 0.229 | 0.005 | 0.018 | 0.020 |
| | 10 | 0.875 | 0.298 | 0.215 | 0.004 | 0.015 | 0.018 |
| | 5 | 0.786 | 0.277 | 0.199 | 0.002 | 0.011 | 0.015 |
| Median | 2 | 0.619 | 0.237 | 0.171 | - | 0.006 | 0.010 |
| Dry | 5 | 0.449 | 0.198 | 0.145 | - | - | 0.004 |
| | 10 | 0.356 | 0.178 | 0.133 | - | - | - |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.274 | 0.161 | 0.123 | - | - | - |
| | 50 | 0.171 | 0.142 | 0.113 | - | - | - |
| | 100 | 0.084 | 0.128 | 0.106 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A181: Derived Monthly Mean Discharges at the Lake J8 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 875 | 942 | 184 | 213 | 246 | 58 |
| | 50 | 594 | 884 | 122 | 140 | 170 | 34 |
| | 20 | 343 | 796 | 68 | 78 | 100 | 17 |
| | 10 | 216 | 716 | 42 | 48 | 65 | 9 |
| | 5 | 124 | 618 | 24 | 27 | 38 | 5 |
| Median | 2 | 37 | 423 | 7 | 8 | 13 | 1 |
| Dry | 5 | 0 | 221 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 112 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 20 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A182: Derived Representative Discharges at the Lake J8 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.36 | 3 010 | 1 650 | 3 | 113 | 104 |
| | 50 | 0.30 | 2 750 | 1 560 | 2 | 75 | 87 |
| | 20 | 0.22 | 2 410 | 1 420 | 1 | 42 | 66 |
| | 10 | 0.17 | 2 140 | 1 310 | 0 | 26 | 51 |
| | 5 | 0.13 | 1 860 | 1 180 | 0 | 15 | 37 |
| Median | 2 | 0.08 | 1 440 | 952 | 0 | 4 | 18 |
| Dry | 5 | 0.05 | 1 130 | 749 | 0 | 0 | 4 |
| | 10 | 0.04 | 1 010 | 652 | 0 | 0 | 0 |
| | 20 | 0.03 | 914 | 576 | 0 | 0 | 0 |
| | 50 | 0.03 | 825 | 494 | 0 | 0 | 0 |
| | 100 | 0.02 | 772 | 442 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A183: Derived Monthly Mean Stages at the Lake J8 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.041 | 0.043 | 0.015 | 0.016 | 0.018 | 0.007 |
| | 50 | 0.032 | 0.042 | 0.011 | 0.012 | 0.014 | 0.005 |
| | 20 | 0.022 | 0.039 | 0.008 | 0.008 | 0.010 | 0.003 |
| | 10 | 0.016 | 0.036 | 0.005 | 0.006 | 0.007 | 0.002 |
| | 5 | 0.011 | 0.033 | 0.004 | 0.004 | 0.005 | 0.001 |
| Median | 2 | 0.005 | 0.025 | 0.002 | 0.002 | 0.002 | 0.000 |
| Dry | 5 | - | 0.016 | - | - | - | - |
| | 10 | - | 0.010 | - | - | - | - |
| | 20 | - | 0.003 | - | - | - | - |
| | 50 | - | - | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A184: Derived Representative Stages at the Lake J8 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.446 | 0.094 | 0.063 | 0.001 | 0.011 | 0.010 |
| | 50 | 0.392 | 0.088 | 0.061 | 0.001 | 0.008 | 0.009 |
| | 20 | 0.324 | 0.081 | 0.057 | 0.000 | 0.005 | 0.007 |
| | 10 | 0.273 | 0.075 | 0.054 | 0.000 | 0.004 | 0.006 |
| | 5 | 0.225 | 0.068 | 0.050 | 0.000 | 0.003 | 0.005 |
| Median | 2 | 0.157 | 0.057 | 0.044 | 0.000 | 0.001 | 0.003 |
| Dry | 5 | 0.113 | 0.049 | 0.037 | - | - | 0.001 |
| | 10 | 0.097 | 0.045 | 0.034 | - | - | - |
| | 20 | 0.087 | 0.042 | 0.031 | - | - | - |
| | 50 | 0.078 | 0.040 | 0.028 | - | - | - |
| | 100 | 0.073 | 0.038 | 0.026 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A185: Derived Monthly Mean Discharges at the Lake J1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 6 620 | 13 000 | 2 010 | 1 470 | 1 490 | 751 |
| | 50 | 5 580 | 12 100 | 1 650 | 1 230 | 1 270 | 649 |
| | 20 | 4 240 | 10 900 | 1 210 | 918 | 990 | 512 |
| | 10 | 3 230 | 9 830 | 902 | 690 | 776 | 407 |
| | 5 | 2 190 | 8 560 | 605 | 463 | 557 | 296 |
| Median | 2 | 673 | 6 190 | 211 | 146 | 237 | 126 |
| Dry | 5 | 0 | 3 900 | 0 | 0 | 13 | 0 |
| | 10 | 0 | 2 740 | 0 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 1 800 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 764 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 81 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A186: Derived Representative Discharges at the Lake J1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.86 | 30 600 | 22 600 | 230 | 1 200 | 1 180 |
| | 50 | 0.76 | 28 700 | 21 300 | 127 | 829 | 979 |
| | 20 | 0.64 | 26 100 | 19 400 | 57 | 493 | 735 |
| | 10 | 0.56 | 24 000 | 17 700 | 29 | 317 | 568 |
| | 5 | 0.48 | 21 600 | 15 900 | 14 | 187 | 410 |
| Median | 2 | 0.37 | 17 800 | 12 800 | 3 | 60 | 201 |
| Dry | 5 | 0.29 | 14 900 | 10 200 | 0 | 0 | 51 |
| | 10 | 0.27 | 13 600 | 8 980 | 0 | 0 | 0 |
| | 20 | 0.25 | 12 800 | 8 060 | 0 | 0 | 0 |
| | 50 | 0.24 | 12 000 | 7 200 | 0 | 0 | 0 |
| | 100 | 0.24 | 11 600 | 6 730 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A187: Derived Monthly Mean Stages at the Lake J1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.129 | 0.203 | 0.058 | 0.047 | 0.048 | 0.030 |
| | 50 | 0.115 | 0.193 | 0.051 | 0.042 | 0.043 | 0.027 |
| | 20 | 0.096 | 0.180 | 0.042 | 0.035 | 0.036 | 0.023 |
| | 10 | 0.080 | 0.168 | 0.034 | 0.029 | 0.031 | 0.020 |
| | 5 | 0.062 | 0.153 | 0.026 | 0.022 | 0.025 | 0.016 |
| Median | 2 | 0.028 | 0.124 | 0.013 | 0.010 | 0.014 | 0.009 |
| Dry | 5 | - | 0.091 | - | - | 0.002 | 0.000 |
| | 10 | - | 0.072 | - | - | - | - |
| | 20 | - | 0.054 | - | - | - | - |
| | 50 | - | 0.031 | - | - | - | - |
| | 100 | - | 0.007 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A188: Derived Representative Stages at the Lake J1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.648 | 0.358 | 0.293 | 0.014 | 0.041 | 0.041 |
| | 50 | 0.597 | 0.343 | 0.282 | 0.009 | 0.032 | 0.036 |
| | 20 | 0.532 | 0.322 | 0.265 | 0.005 | 0.023 | 0.030 |
| | 10 | 0.484 | 0.305 | 0.249 | 0.003 | 0.017 | 0.025 |
| | 5 | 0.437 | 0.284 | 0.232 | 0.002 | 0.012 | 0.020 |
| Median | 2 | 0.368 | 0.250 | 0.201 | 0.001 | 0.006 | 0.013 |
| Dry | 5 | 0.317 | 0.222 | 0.172 | - | - | 0.005 |
| | 10 | 0.298 | 0.209 | 0.158 | - | - | - |
| | 20 | 0.286 | 0.201 | 0.147 | - | - | - |
| | 50 | 0.279 | 0.192 | 0.137 | - | - | - |
| | 100 | 0.275 | 0.188 | 0.131 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A189: Derived Monthly Mean Discharges at the Lake P2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 2 310 | 4 420 | 650 | 431 | 453 | 293 |
| | 50 | 1 950 | 4 140 | 529 | 352 | 382 | 249 |
| | 20 | 1 490 | 3 730 | 382 | 256 | 291 | 191 |
| | 10 | 1 140 | 3 360 | 280 | 187 | 224 | 148 |
| | 5 | 775 | 2 930 | 184 | 122 | 157 | 104 |
| Median | 2 | 242 | 2 110 | 60 | 35 | 63 | 40 |
| Dry | 5 | 0 | 1 320 | 0 | 0 | 0 | 0 |
| | 10 | 0 | 909 | 0 | 0 | 0 | 0 |
| | 20 | 0 | 577 | 0 | 0 | 0 | 0 |
| | 50 | 0 | 207 | 0 | 0 | 0 | 0 |
| | 100 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A190: Derived Representative Discharges at the Lake P2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.26 | 10 700 | 7 590 | 140 | 251 | 331 |
| | 50 | 0.23 | 9 930 | 7 140 | 105 | 208 | 285 |
| | 20 | 0.20 | 8 930 | 6 500 | 67 | 153 | 224 |
| | 10 | 0.17 | 8 140 | 5 980 | 42 | 114 | 178 |
| | 5 | 0.15 | 7 310 | 5 390 | 22 | 75 | 131 |
| Median | 2 | 0.11 | 6 020 | 4 400 | 0 | 22 | 60 |
| Dry | 5 | 0.09 | 5 040 | 3 560 | 0 | 0 | 9 |
| | 10 | 0.08 | 4 630 | 3 180 | 0 | 0 | 0 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.07 | 4 340 | 2 880 | 0 | 0 | 0 |
| | 50 | 0.07 | 4 040 | 2 570 | 0 | 0 | 0 |
| | 100 | 0.07 | 3 870 | 2 380 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A191: Derived Monthly Mean Stages at the Lake P2 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.034 | 0.044 | 0.021 | 0.017 | 0.018 | 0.015 |
| | 50 | 0.032 | 0.043 | 0.019 | 0.016 | 0.017 | 0.014 |
| | 20 | 0.029 | 0.041 | 0.017 | 0.014 | 0.015 | 0.013 |
| | 10 | 0.026 | 0.040 | 0.015 | 0.012 | 0.013 | 0.011 |
| | 5 | 0.022 | 0.037 | 0.012 | 0.010 | 0.012 | 0.010 |
| Median | 2 | 0.014 | 0.033 | 0.008 | 0.006 | 0.008 | 0.007 |
| Dry | 5 | - | 0.027 | - | - | - | - |
| | 10 | - | 0.023 | - | - | - | - |
| | 20 | - | 0.020 | - | - | - | - |
| | 50 | - | 0.013 | - | - | - | - |
| | 100 | - | - | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A192: Derived Representative Stages at the Lake P2 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.085 | 0.063 | 0.055 | 0.011 | 0.014 | 0.016 |
| | 50 | 0.081 | 0.061 | 0.053 | 0.010 | 0.013 | 0.015 |
| | 20 | 0.076 | 0.058 | 0.051 | 0.008 | 0.011 | 0.013 |
| | 10 | 0.072 | 0.056 | 0.050 | 0.007 | 0.010 | 0.012 |
| | 5 | 0.067 | 0.054 | 0.048 | 0.005 | 0.009 | 0.011 |
| Median | 2 | 0.060 | 0.050 | 0.044 | - | 0.005 | 0.008 |
| Dry | 5 | 0.055 | 0.047 | 0.040 | - | - | 0.004 |
| | 10 | 0.053 | 0.045 | 0.039 | - | - | - |
| | 20 | 0.051 | 0.044 | 0.037 | - | - | - |
| | 50 | 0.050 | 0.043 | 0.036 | - | - | - |
| | 100 | 0.049 | 0.042 | 0.034 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A193: Derived Monthly Mean Discharges at the Lake CH6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 28 200 | 71 800 | 16 700 | 7 760 | 7 050 | 9 600 |
| | 50 | 23 400 | 66 300 | 13 400 | 6 530 | 6 280 | 6 960 |
| | 20 | 17 300 | 58 600 | 9 720 | 4 960 | 5 200 | 4 290 |
| | 10 | 12 900 | 52 200 | 7 260 | 3 810 | 4 340 | 2 780 |
| | 5 | 8 420 | 45 100 | 5 060 | 2 660 | 3 390 | 1 640 |
| Median | 2 | 2 180 | 33 100 | 2 450 | 1 040 | 1 840 | 581 |
| Dry | 5 | 0 | 23 000 | 1 080 | 0 | 572 | 188 |
| | 10 | 0 | 18 400 | 651 | 0 | 8 | 94 |
| | 20 | 0 | 14 900 | 388 | 0 | 0 | 45 |
| | 50 | 0 | 11 200 | 168 | 0 | 0 | 11 |
| | 100 | 0 | 8 930 | 55 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A194: Derived Representative Discharges at the Lake CH6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.08 | 158 000 | 109 000 | 3 330 | 5 300 | 6 970 |
| | 50 | 2.78 | 147 000 | 103 000 | 2 670 | 4 560 | 6 090 |
| | 20 | 2.39 | 133 000 | 94 900 | 1 890 | 3 590 | 4 950 |
| | 10 | 2.10 | 121 000 | 87 900 | 1 360 | 2 850 | 4 070 |
| | 5 | 1.79 | 108 000 | 79 800 | 870 | 2 090 | 3 170 |
| Median | 2 | 1.34 | 86 500 | 65 400 | 264 | 958 | 1 830 |
| Dry | 5 | 1.03 | 69 300 | 52 200 | 0 | 147 | 872 |
| | 10 | 0.90 | 61 700 | 45 800 | 0 | 0 | 486 |
| | 20 | 0.81 | 56 000 | 40 700 | 0 | 0 | 214 |
| | 50 | 0.73 | 50 200 | 35 200 | 0 | 0 | 0 |
| | 100 | 0.68 | 46 600 | 31 700 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A195: Derived Monthly Mean Stages at the Lake CH6 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.194 | 0.300 | 0.152 | 0.106 | 0.102 | 0.117 |
| | 50 | 0.178 | 0.289 | 0.137 | 0.098 | 0.096 | 0.101 |
| | 20 | 0.155 | 0.273 | 0.118 | 0.086 | 0.088 | 0.081 |
| | 10 | 0.135 | 0.259 | 0.103 | 0.076 | 0.081 | 0.066 |
| | 5 | 0.111 | 0.241 | 0.087 | 0.065 | 0.072 | 0.052 |
| Median | 2 | 0.059 | 0.209 | 0.062 | 0.042 | 0.054 | 0.032 |
| Dry | 5 | - | 0.176 | 0.042 | - | 0.032 | 0.019 |
| | 10 | - | 0.159 | 0.034 | - | 0.004 | 0.014 |

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | - | 0.144 | 0.026 | - | - | 0.010 |
| | 50 | - | 0.126 | 0.018 | - | - | 0.005 |
| | 100 | - | 0.114 | 0.011 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A196: Derived Representative Stages at the Lake CH6 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.552 | 0.433 | 0.364 | 0.072 | 0.089 | 0.101 |
| | 50 | 0.526 | 0.419 | 0.355 | 0.065 | 0.083 | 0.095 |
| | 20 | 0.490 | 0.400 | 0.341 | 0.055 | 0.074 | 0.086 |
| | 10 | 0.462 | 0.382 | 0.330 | 0.047 | 0.067 | 0.079 |
| | 5 | 0.429 | 0.363 | 0.315 | 0.038 | 0.058 | 0.070 |
| Median | 2 | 0.375 | 0.327 | 0.287 | 0.022 | 0.040 | 0.054 |
| Dry | 5 | 0.331 | 0.295 | 0.259 | - | 0.017 | 0.038 |
| | 10 | 0.311 | 0.279 | 0.243 | - | - | 0.029 |
| | 20 | 0.297 | 0.267 | 0.230 | - | - | 0.020 |
| | 50 | 0.282 | 0.254 | 0.215 | - | - | - |
| | 100 | 0.273 | 0.245 | 0.205 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A197: Derived Monthly Mean Discharges at the Lake CH5 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 32 100 | 91 300 | 27 300 | 9 530 | 8 740 | 4 950 |
| | 50 | 26 500 | 83 600 | 20 900 | 7 830 | 7 580 | 4 370 |
| | 20 | 19 400 | 73 100 | 14 100 | 5 720 | 6 040 | 3 580 |
| | 10 | 14 300 | 64 700 | 9 840 | 4 220 | 4 860 | 2 940 |
| | 5 | 9 230 | 55 600 | 6 350 | 2 770 | 3 620 | 2 240 |
| Median | 2 | 2 210 | 40 900 | 2 650 | 839 | 1 740 | 1 090 |
| Dry | 5 | 0 | 29 200 | 1 000 | 0 | 362 | 169 |
| | 10 | 0 | 24 100 | 543 | 0 | 0 | 0 |
| | 20 | 0 | 20 300 | 286 | 0 | 0 | 0 |
| | 50 | 0 | 16 400 | 85 | 0 | 0 | 0 |
| | 100 | 0 | 14 100 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A198: Derived Representative Discharges at the Lake CH5 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 3.80 | 201 000 | 138 000 | 3 780 | 6 440 | 10 900 |
| | 50 | 3.41 | 187 000 | 130 000 | 2 930 | 5 370 | 8 970 |
| | 20 | 2.92 | 168 000 | 119 000 | 1 960 | 4 030 | 6 640 |
| | 10 | 2.54 | 152 000 | 110 000 | 1 330 | 3 060 | 5 040 |
| | 5 | 2.17 | 135 000 | 99 800 | 768 | 2 100 | 3 570 |
| Median | 2 | 1.61 | 108 000 | 81 300 | 113 | 779 | 1 730 |
| Dry | 5 | 1.23 | 86 700 | 64 600 | 0 | 0 | 684 |
| | 10 | 1.08 | 77 200 | 56 600 | 0 | 0 | 334 |
| | 20 | 0.98 | 70 200 | 50 200 | 0 | 0 | 114 |
| | 50 | 0.88 | 63 000 | 43 400 | 0 | 0 | 0 |
| | 100 | 0.82 | 58 700 | 39 100 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A199: Derived Monthly Mean Stages at the Lake CH5 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.137 | 0.276 | 0.123 | 0.061 | 0.058 | 0.040 |
| | 50 | 0.121 | 0.260 | 0.103 | 0.054 | 0.053 | 0.036 |
| | 20 | 0.098 | 0.238 | 0.079 | 0.044 | 0.045 | 0.032 |
| | 10 | 0.080 | 0.219 | 0.062 | 0.036 | 0.039 | 0.028 |
| | 5 | 0.060 | 0.198 | 0.047 | 0.027 | 0.032 | 0.023 |
| Median | 2 | 0.023 | 0.162 | 0.026 | 0.012 | 0.020 | 0.014 |
| Dry | 5 | - | 0.129 | 0.014 | - | 0.007 | 0.004 |
| | 10 | - | 0.114 | 0.009 | - | - | - |
| | 20 | - | 0.101 | 0.006 | - | - | - |
| | 50 | - | 0.088 | 0.003 | - | - | - |
| | 100 | - | 0.079 | - | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A200: Derived Representative Stages at the Lake CH5 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.648 | 0.467 | 0.363 | 0.033 | 0.047 | 0.067 |
| | 50 | 0.603 | 0.445 | 0.349 | 0.028 | 0.042 | 0.059 |
| | 20 | 0.543 | 0.414 | 0.329 | 0.021 | 0.034 | 0.048 |
| | 10 | 0.495 | 0.388 | 0.312 | 0.016 | 0.029 | 0.040 |
| | 5 | 0.446 | 0.358 | 0.293 | 0.011 | 0.022 | 0.032 |
| Median | 2 | 0.365 | 0.309 | 0.255 | 0.003 | 0.012 | 0.020 |
| Dry | 5 | 0.305 | 0.267 | 0.219 | - | - | 0.011 |
| | 10 | 0.280 | 0.247 | 0.201 | - | - | 0.007 |

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| | 20 | 0.262 | 0.232 | 0.185 | - | - | 0.003 |
| | 50 | 0.243 | 0.215 | 0.168 | - | - | - |
| | 100 | 0.233 | 0.206 | 0.157 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A201: Derived Monthly Mean Discharges at the Lake CH10 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 3 510 | 15 700 | 7 190 | 911 | 869 | 495 |
| | 50 | 2 880 | 13 500 | 5 150 | 705 | 670 | 403 |
| | 20 | 2 090 | 10 900 | 3 110 | 468 | 442 | 290 |
| | 10 | 1 520 | 8 970 | 1 990 | 313 | 294 | 211 |
| | 5 | 969 | 7 200 | 1 150 | 176 | 164 | 135 |
| Median | 2 | 218 | 4 890 | 395 | 18 | 14 | 37 |
| Dry | 5 | 0 | 3 520 | 125 | 0 | 0 | 0 |
| | 10 | 0 | 3 040 | 63 | 0 | 0 | 0 |
| | 20 | 0 | 2 730 | 32 | 0 | 0 | 0 |
| | 50 | 0 | 2 450 | 10 | 0 | 0 | 0 |
| | 100 | 0 | 2 310 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A202: Derived Representative Discharges at the Lake CH10 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.38 | 26 600 | 19 900 | 320 | 602 | 3 410 |
| | 50 | 0.34 | 24 100 | 18 300 | 237 | 463 | 2 310 |
| | 20 | 0.29 | 20 700 | 16 200 | 146 | 305 | 1 290 |
| | 10 | 0.25 | 18 100 | 14 500 | 90 | 202 | 765 |
| | 5 | 0.21 | 15 400 | 12 600 | 43 | 113 | 406 |
| Median | 2 | 0.15 | 11 300 | 9 420 | 0 | 11 | 118 |
| Dry | 5 | 0.11 | 8 300 | 6 840 | 0 | 0 | 31 |
| | 10 | 0.10 | 7 060 | 5 680 | 0 | 0 | 14 |
| | 20 | 0.08 | 6 170 | 4 810 | 0 | 0 | 6 |
| | 50 | 0.08 | 5 300 | 3 920 | 0 | 0 | 0 |
| | 100 | 0.07 | 4 790 | 3 370 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A203: Derived Monthly Mean Stages at the Lake CH10 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.085 | 0.231 | 0.137 | 0.035 | 0.034 | 0.023 |
| | 50 | 0.074 | 0.209 | 0.110 | 0.029 | 0.028 | 0.020 |
| | 20 | 0.060 | 0.181 | 0.078 | 0.022 | 0.021 | 0.016 |
| | 10 | 0.049 | 0.159 | 0.058 | 0.017 | 0.016 | 0.013 |
| | 5 | 0.036 | 0.137 | 0.040 | 0.012 | 0.011 | 0.010 |
| Median | 2 | 0.013 | 0.106 | 0.020 | 0.002 | 0.002 | 0.004 |
| Dry | 5 | - | 0.085 | 0.009 | - | - | - |
| | 10 | - | 0.077 | 0.006 | - | - | - |
| | 20 | - | 0.072 | 0.004 | - | - | - |
| | 50 | - | 0.067 | 0.002 | - | - | - |
| | 100 | - | 0.064 | 0.000 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A204: Derived Representative Stages at the Lake CH10 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.379 | 0.328 | 0.270 | 0.017 | 0.026 | 0.083 |
| | 50 | 0.351 | 0.307 | 0.256 | 0.014 | 0.022 | 0.064 |
| | 20 | 0.313 | 0.277 | 0.236 | 0.010 | 0.017 | 0.044 |
| | 10 | 0.283 | 0.254 | 0.219 | 0.007 | 0.013 | 0.031 |
| | 5 | 0.252 | 0.228 | 0.199 | 0.005 | 0.009 | 0.020 |
| Median | 2 | 0.202 | 0.185 | 0.164 | - | 0.002 | 0.009 |
| Dry | 5 | 0.165 | 0.151 | 0.133 | - | - | 0.004 |
| | 10 | 0.150 | 0.135 | 0.117 | - | - | 0.002 |
| | 20 | 0.139 | 0.124 | 0.105 | - | - | 0.001 |
| | 50 | 0.128 | 0.112 | 0.091 | - | - | 0.000 |
| | 100 | 0.122 | 0.105 | 0.083 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A205: Derived Monthly Mean Discharges at the Lake CH1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 40 100 | 148 000 | 59 200 | 13 700 | 12 500 | 7 010 |
| | 50 | 32 900 | 133 000 | 44 500 | 10 900 | 10 400 | 6 150 |
| | 20 | 24 000 | 113 000 | 29 000 | 7 610 | 7 700 | 4 980 |
| | 10 | 17 500 | 98 200 | 19 800 | 5 370 | 5 790 | 4 040 |
| | 5 | 11 200 | 83 100 | 12 400 | 3 300 | 3 930 | 3 030 |
| Median | 2 | 2 550 | 61 000 | 4 920 | 731 | 1 420 | 1 410 |
| Dry | 5 | 0 | 45 500 | 1 800 | 0 | 0 | 132 |
| | 10 | 0 | 35 200 | 538 | 0 | 0 | 0 |

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| | 20 | 0 | 39 400 | 983 | 0 | 0 | 0 |
| | 50 | 0 | 31 100 | 202 | 0 | 0 | 0 |
| | 100 | 0 | 28 800 | 45 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A206: Derived Representative Discharges at the Lake CH1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 4.74 | 305 000 | 213 000 | 5 170 | 9 390 | 26 600 |
| | 50 | 4.22 | 280 000 | 200 000 | 3 930 | 7 580 | 20 000 |
| | 20 | 3.56 | 246 000 | 181 000 | 2 550 | 5 400 | 13 000 |
| | 10 | 3.08 | 219 000 | 166 000 | 1 660 | 3 900 | 8 800 |
| | 5 | 2.61 | 191 000 | 148 000 | 909 | 2 510 | 5 460 |
| Median | 2 | 1.95 | 148 000 | 118 000 | 65 | 740 | 2 110 |
| Dry | 5 | 1.53 | 116 000 | 92 200 | 0 | 0 | 711 |
| | 10 | 1.37 | 103 000 | 80 100 | 0 | 0 | 344 |
| | 20 | 1.26 | 93 200 | 70 900 | 0 | 0 | 145 |
| | 50 | 1.17 | 83 800 | 61 100 | 0 | 0 | 0 |
| | 100 | 1.11 | 78 100 | 55 000 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A207: Derived Monthly Mean Stages at the Lake CH1 Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.133 | 0.318 | 0.173 | 0.065 | 0.061 | 0.042 |
| | 50 | 0.117 | 0.296 | 0.143 | 0.056 | 0.054 | 0.038 |
| | 20 | 0.095 | 0.266 | 0.107 | 0.044 | 0.044 | 0.033 |
| | 10 | 0.077 | 0.242 | 0.083 | 0.035 | 0.037 | 0.029 |
| | 5 | 0.057 | 0.216 | 0.061 | 0.025 | 0.028 | 0.024 |
| Median | 2 | 0.021 | 0.176 | 0.033 | 0.009 | 0.014 | 0.014 |
| Dry | 5 | - | 0.145 | 0.017 | - | - | 0.003 |
| | 10 | - | 0.122 | 0.008 | - | - | - |
| | 20 | - | 0.132 | 0.011 | - | - | - |
| | 50 | - | 0.112 | 0.004 | - | - | - |
| | 100 | - | 0.107 | 0.001 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A208: Derived Representative Stages at the Lake CH1 Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.626 | 0.515 | 0.405 | 0.034 | 0.051 | 0.101 |
| | 50 | 0.580 | 0.486 | 0.388 | 0.028 | 0.044 | 0.084 |
| | 20 | 0.518 | 0.446 | 0.363 | 0.021 | 0.035 | 0.063 |
| | 10 | 0.470 | 0.413 | 0.343 | 0.016 | 0.028 | 0.048 |
| | 5 | 0.421 | 0.377 | 0.318 | 0.011 | 0.021 | 0.035 |
| Median | 2 | 0.347 | 0.318 | 0.273 | 0.002 | 0.009 | 0.019 |
| Dry | 5 | 0.295 | 0.270 | 0.232 | - | - | 0.009 |
| | 10 | 0.274 | 0.250 | 0.211 | - | - | 0.006 |
| | 20 | 0.259 | 0.234 | 0.195 | - | - | 0.003 |
| | 50 | 0.247 | 0.218 | 0.176 | - | - | - |
| | 100 | 0.238 | 0.208 | 0.164 | - | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A209: Derived Monthly Mean Discharges at the Meliadine Lake Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 653 000 | 4 720 000 | 2 170 000 | 519 000 | 349 000 | 235 000 |
| | 50 | 538 000 | 3 830 000 | 1 820 000 | 472 000 | 320 000 | 199 000 |
| | 20 | 393 000 | 2 840 000 | 1 400 000 | 407 000 | 279 000 | 154 000 |
| | 10 | 289 000 | 2 220 000 | 1 120 000 | 354 000 | 245 000 | 122 000 |
| | 5 | 186 000 | 1 690 000 | 854 000 | 296 000 | 206 000 | 90 500 |
| Median | 2 | 45 200 | 1 110 000 | 523 000 | 200 000 | 139 000 | 48 900 |
| Dry | 5 | 0 | 828 000 | 336 000 | 120 000 | 80 400 | 23 000 |
| | 10 | 0 | 747 000 | 273 000 | 84 800 | 52 700 | 13 600 |
| | 20 | 0 | 700 000 | 234 000 | 58 000 | 31 200 | 7 440 |
| | 50 | 0 | 662 000 | 200 000 | 30 500 | 8 540 | 1 850 |
| | 100 | 0 | 644 000 | 181 000 | 13 500 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-A210: Derived Representative Discharges at the Meliadine Lake Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 95.30 | 7 320 000 | 6 230 000 | 333 000 | 393 000 | 790 000 |
| | 50 | 80.20 | 6 190 000 | 5 290 000 | 306 000 | 364 000 | 708 000 |
| | 20 | 62.60 | 4 840 000 | 4 170 000 | 266 000 | 322 000 | 598 000 |
| | 10 | 50.80 | 3 910 000 | 3 390 000 | 233 000 | 287 000 | 513 000 |
| | 5 | 39.90 | 3 060 000 | 2 670 000 | 196 000 | 245 000 | 424 000 |
| Median | 2 | 26.10 | 1 980 000 | 1 760 000 | 132 000 | 172 000 | 286 000 |
| Dry | 5 | 18.00 | 1 370 000 | 1 230 000 | 76 200 | 105 000 | 182 000 |
| | 10 | 15.40 | 1 160 000 | 1 060 000 | 50 000 | 72 000 | 139 000 |

| Condition | Return Period (years) | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|
| | 20 | 13.90 | 1 030 000 | 944 000 | 29 800 | 46 200 | 108 000 |
| | 50 | 12.60 | 921 000 | 846 000 | 8 550 | 18 200 | 77 500 |
| | 100 | 11.90 | 861 000 | 793 000 | 0 | 256 | 59 400 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-A211: Derived Monthly Mean Stages at the Meliadine Lake Outlet - Baseline**

| Condition | Return Period (years) | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | 0.454 | 0.786 | 0.633 | 0.426 | 0.381 | 0.342 |
| | 50 | 0.430 | 0.742 | 0.603 | 0.415 | 0.372 | 0.326 |
| | 20 | 0.394 | 0.683 | 0.561 | 0.398 | 0.358 | 0.304 |
| | 10 | 0.362 | 0.637 | 0.527 | 0.383 | 0.346 | 0.285 |
| | 5 | 0.320 | 0.591 | 0.489 | 0.364 | 0.329 | 0.262 |
| Median | 2 | 0.216 | 0.526 | 0.427 | 0.327 | 0.295 | 0.221 |
| Dry | 5 | - | 0.485 | 0.377 | 0.283 | 0.254 | 0.179 |
| | 10 | - | 0.471 | 0.356 | 0.257 | 0.226 | 0.155 |
| | 20 | - | 0.463 | 0.341 | 0.232 | 0.195 | 0.131 |
| | 50 | - | 0.455 | 0.327 | 0.194 | 0.136 | 0.089 |
| | 100 | - | 0.452 | 0.318 | 0.154 | - | - |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-A212: Derived Representative Stages at the Meliadine Lake Outlet - Baseline**

| Condition | Return Period (years) | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|
| Wet | 100 | 0.917 | 0.888 | 0.849 | 0.376 | 0.394 | 0.478 |
| | 50 | 0.874 | 0.847 | 0.811 | 0.368 | 0.386 | 0.464 |
| | 20 | 0.816 | 0.791 | 0.759 | 0.354 | 0.373 | 0.443 |
| | 10 | 0.770 | 0.746 | 0.717 | 0.341 | 0.361 | 0.424 |
| | 5 | 0.720 | 0.697 | 0.671 | 0.325 | 0.346 | 0.402 |
| Median | 2 | 0.640 | 0.617 | 0.598 | 0.291 | 0.313 | 0.361 |
| Dry | 5 | 0.577 | 0.557 | 0.541 | 0.250 | 0.273 | 0.318 |
| | 10 | 0.553 | 0.532 | 0.519 | 0.222 | 0.246 | 0.295 |
| | 20 | 0.537 | 0.515 | 0.503 | 0.192 | 0.217 | 0.275 |
| | 50 | 0.523 | 0.499 | 0.488 | 0.136 | 0.168 | 0.251 |
| | 100 | 0.515 | 0.490 | 0.479 | - | 0.051 | 0.233 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

# ANNUAL WATER YIELDS DURING PROJECT PHASES

**Table 7.3-A213: Derived Annual Water Yields at the A8 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 362 | - | - | - | - | - | - | - | - | 236 |
| | 50 | 330 | - | - | - | - | - | - | - | - | 212 |
| | 20 | 288 | - | - | - | - | - | - | - | - | 179 |
| | 10 | 254 | - | - | - | - | - | - | - | - | 153 |
| | 5 | 219 | - | - | - | - | - | - | - | - | 126 |
| Median | 2 | 163 | - | - | - | - | - | - | - | - | 84 |
| Dry | 5 | 121 | - | - | - | - | - | - | - | - | 52 |
| | 10 | 103 | - | - | - | - | - | - | - | - | 39 |
| | 20 | 89 | - | - | - | - | - | - | - | - | 29 |
| | 50 | 76 | - | - | - | - | - | - | - | - | 20 |
| | 100 | 69 | - | - | - | - | - | - | - | - | 14 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A214: Derived Annual Water Yields at the A6 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 356.2 | 410.3 | 175.2 | - | - | - | - | - | - | 286 |
| | 50 | 324.9 | 393.6 | 163.0 | - | - | - | - | - | - | 259 |
| | 20 | 283.1 | 370.8 | 146.4 | - | - | - | - | - | - | 222 |
| | 10 | 250.4 | 352.5 | 133.0 | - | - | - | - | - | - | 194 |
| | 5 | 215.9 | 332.5 | 118.4 | - | - | - | - | - | - | 164 |
| Median | 2 | 162.5 | 300.3 | 94.9 | - | - | - | - | - | - | 120 |
| Dry | 5 | 122.4 | 274.5 | 75.9 | - | - | - | - | - | - | 87 |
| | 10 | 105.5 | 263.2 | 67.6 | - | - | - | - | - | - | 74 |
| | 20 | 93.3 | 254.7 | 61.4 | - | - | - | - | - | - | 65 |
| | 50 | 81.2 | 246.2 | 55.1 | - | - | - | - | - | - | 55 |
| | 100 | 74.1 | 241.0 | 51.3 | - | - | - | - | - | - | 50 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A215: Derived Annual Water Yields at the A1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 355 | 393 | 229 | 195 | 71 | 62 | 62 | 62 | 62 | 310 |
| | 50 | 325 | 372 | 213 | 187 | 66 | 58 | 58 | 58 | 58 | 281 |
| | 20 | 285 | 344 | 190 | 176 | 61 | 52 | 52 | 52 | 52 | 243 |
| | 10 | 254 | 322 | 172 | 167 | 56 | 47 | 47 | 47 | 47 | 214 |
| | 5 | 220 | 298 | 153 | 157 | 51 | 42 | 42 | 42 | 42 | 183 |
| Median | 2 | 168 | 262 | 121 | 141 | 43 | 34 | 34 | 34 | 34 | 135 |
| Dry | 5 | 129 | 234 | 96 | 128 | 36 | 27 | 27 | 27 | 27 | 100 |
| | 10 | 112 | 222 | 85 | 122 | 33 | 24 | 24 | 24 | 24 | 86 |
| | 20 | 100 | 213 | 77 | 117 | 31 | 22 | 22 | 22 | 22 | 75 |
| | 50 | 88 | 204 | 69 | 113 | 28 | 20 | 20 | 20 | 20 | 65 |
| | 100 | 81 | 199 | 64 | 110 | 27 | 18 | 18 | 18 | 18 | 59 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure.

**Table 7.3-A216: Derived Annual Water Yields at the B7 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 351 | - | - | - | - | - | - | - | - | - |
| | 50 | 323 | - | - | - | - | - | - | - | - | - |
| | 20 | 284 | - | - | - | - | - | - | - | - | - |
| | 10 | 254 | - | - | - | - | - | - | - | - | - |
| | 5 | 221 | - | - | - | - | - | - | - | - | - |
| Median | 2 | 170 | - | - | - | - | - | - | - | - | - |
| Dry | 5 | 130 | - | - | - | - | - | - | - | - | - |
| | 10 | 113 | - | - | - | - | - | - | - | - | - |
| | 20 | 101 | - | - | - | - | - | - | - | - | - |
| | 50 | 89 | - | - | - | - | - | - | - | - | - |
| | 100 | 81 | - | - | - | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A217: Derived Annual Water Yields at the B6 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 349 | 288 | 37 | - | - | - | - | - | - | - |
| | 50 | 321 | 282 | 34 | - | - | - | - | - | - | - |
| | 20 | 283 | 272 | 29 | - | - | - | - | - | - | - |
| | 10 | 253 | 265 | 25 | - | - | - | - | - | - | - |
| | 5 | 220 | 256 | 21 | - | - | - | - | - | - | - |
| Median | 2 | 169 | 240 | 15 | - | - | - | - | - | - | - |
| Dry | 5 | 128 | 225 | 11 | - | - | - | - | - | - | - |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| | 10 | 111 | 218 | 9 | - | - | - | - | - | - | - |
| | 20 | 98 | 213 | 8 | - | - | - | - | - | - | - |
| | 50 | 85 | 207 | 6 | - | - | - | - | - | - | - |
| | 100 | 78 | 203 | 6 | - | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A218: Derived Annual Water Yields at the B5 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 352 | 303 | 187 | 170 | - | - | - | - | - | 438 |
| | 50 | 0 | 289 | 172 | 155 | - | - | - | - | - | 402 |
| | 20 | 0 | 270 | 151 | 135 | - | - | - | - | - | 354 |
| | 10 | 0 | 254 | 134 | 119 | - | - | - | - | - | 316 |
| | 5 | 0 | 237 | 117 | 102 | - | - | - | - | - | 275 |
| Median | 2 | 0 | 207 | 89 | 77 | - | - | - | - | - | 211 |
| Dry | 5 | 0 | 181 | 68 | 58 | - | - | - | - | - | 160 |
| | 10 | 0 | 170 | 58 | 50 | - | - | - | - | - | 139 |
| | 20 | 0 | 161 | 52 | 44 | - | - | - | - | - | 123 |
| | 50 | 0 | 151 | 45 | 38 | - | - | - | - | - | 107 |
| | 100 | 0 | 146 | 41 | 35 | - | - | - | - | - | 98 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A219: Derived Annual Water Yields at the B69 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 352 | 352 | 352 | 352 | 352 | 352 | 352 | 352 | 352 | 352 |
| | 50 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 |
| | 20 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| | 10 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 |
| | 5 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 |
| Median | 2 | 169 | 169 | 169 | 169 | 169 | 169 | 169 | 169 | 169 | 169 |
| Dry | 5 | 129 | 129 | 129 | 129 | 129 | 129 | 129 | 129 | 129 | 129 |
| | 10 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 |
| | 20 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | 50 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| | 100 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure.

**Table 7.3-A220: Derived Annual Water Yields at the B53 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 358 | 358 | 358 | 358 | 358 | 358 | 358 | 358 | 358 | 358 |
| | 50 | 333 | 333 | 333 | 333 | 333 | 333 | 333 | 333 | 333 | 333 |
| | 20 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 |
| | 10 | 271 | 271 | 271 | 271 | 271 | 271 | 271 | 271 | 271 | 271 |
| | 5 | 241 | 241 | 241 | 241 | 241 | 241 | 241 | 241 | 241 | 241 |
| Median | 2 | 191 | 191 | 191 | 191 | 191 | 191 | 191 | 191 | 191 | 191 |
| Dry | 5 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| | 10 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |
| | 20 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 |
| | 50 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 |
| | 100 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure.

**Table 7.3-A221: Derived Annual Water Yields at the B52 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 |
| | 50 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| | 20 | 291 | 291 | 291 | 291 | 291 | 291 | 291 | 291 | 291 | 291 |
| | 10 | 263 | 263 | 263 | 263 | 263 | 263 | 263 | 263 | 263 | 263 |
| | 5 | 232 | 232 | 232 | 232 | 232 | 232 | 232 | 232 | 232 | 232 |
| Median | 2 | 181 | 181 | 181 | 181 | 181 | 181 | 181 | 181 | 181 | 181 |
| Dry | 5 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 |
| | 10 | 121 | 121 | 121 | 121 | 121 | 121 | 121 | 121 | 121 | 121 |
| | 20 | 107 | 107 | 107 | 107 | 107 | 107 | 107 | 107 | 107 | 107 |
| | 50 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | 100 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure.

**Table 7.3-A222: Derived Annual Water Yields at the BX2 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 354 | 354 | 354 | 354 | 354 | 354 | 354 | 354 | 354 | 354 |
| | 50 | 328 | 328 | 328 | 328 | 328 | 328 | 328 | 328 | 328 | 328 |
| | 20 | 294 | 294 | 294 | 294 | 294 | 294 | 294 | 294 | 294 | 294 |
| | 10 | 266 | 266 | 266 | 266 | 266 | 266 | 266 | 266 | 266 | 266 |
| | 5 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 |
| Median | 2 | 184 | 184 | 184 | 184 | 184 | 184 | 184 | 184 | 184 | 184 |
| Dry | 5 | 143 | 143 | 143 | 143 | 143 | 143 | 143 | 143 | 143 | 143 |
| | 10 | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 124 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| | 20 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| | 50 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| | 100 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure.

**Table 7.3-A223: Derived Annual Water Yields at the BX1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 |
| | 50 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 |
| | 20 | 287 | 287 | 287 | 287 | 287 | 287 | 287 | 287 | 287 | 287 |
| | 10 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 | 257 |
| | 5 | 226 | 226 | 226 | 226 | 226 | 226 | 226 | 226 | 226 | 226 |
| Median | 2 | 175 | 175 | 175 | 175 | 175 | 175 | 175 | 175 | 175 | 175 |
| Dry | 5 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 |
| | 10 | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 |
| | 20 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 |
| | 50 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| | 100 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure.

**Table 7.3-A224: Derived Annual Water Yields at the B46 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 349 | 349 | 349 | 349 | 368 | 336 | 336 | 336 | 336 | 381 |
| | 50 | 323 | 323 | 323 | 323 | 334 | 311 | 311 | 311 | 311 | 351 |
| | 20 | 287 | 287 | 287 | 287 | 290 | 277 | 277 | 277 | 277 | 310 |
| | 10 | 259 | 259 | 259 | 259 | 256 | 249 | 249 | 249 | 249 | 278 |
| | 5 | 227 | 227 | 227 | 227 | 221 | 219 | 219 | 219 | 219 | 243 |
| Median | 2 | 177 | 177 | 177 | 177 | 170 | 170 | 170 | 170 | 170 | 187 |
| Dry | 5 | 136 | 136 | 136 | 136 | 134 | 130 | 130 | 130 | 130 | 143 |
| | 10 | 118 | 118 | 118 | 118 | 119 | 113 | 113 | 113 | 113 | 124 |
| | 20 | 104 | 104 | 104 | 104 | 109 | 100 | 100 | 100 | 100 | 110 |
| | 50 | 91 | 91 | 91 | 91 | 99 | 87 | 87 | 87 | 87 | 96 |
| | 100 | 82 | 82 | 82 | 82 | 94 | 79 | 79 | 79 | 79 | 88 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A225: Derived Annual Water Yields at the B44 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 356 | 211 | 212 | 212 | 204 | 199 | 199 | 199 | 199 | 217 |
| | 50 | 330 | 195 | 195 | 195 | 187 | 183 | 183 | 183 | 183 | 200 |
| | 20 | 296 | 172 | 173 | 173 | 165 | 161 | 161 | 161 | 161 | 176 |
| | 10 | 267 | 154 | 155 | 155 | 147 | 144 | 144 | 144 | 144 | 157 |
| | 5 | 236 | 135 | 135 | 135 | 128 | 125 | 125 | 125 | 125 | 137 |
| Median | 2 | 185 | 104 | 104 | 104 | 98 | 96 | 96 | 96 | 96 | 105 |
| Dry | 5 | 143 | 80 | 80 | 80 | 75 | 74 | 74 | 74 | 74 | 81 |
| | 10 | 124 | 70 | 70 | 70 | 65 | 64 | 64 | 64 | 64 | 71 |
| | 20 | 110 | 62 | 62 | 62 | 58 | 57 | 57 | 57 | 57 | 63 |
| | 50 | 95 | 54 | 54 | 54 | 51 | 50 | 50 | 50 | 50 | 55 |
| | 100 | 86 | 50 | 50 | 50 | 47 | 46 | 46 | 46 | 46 | 51 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A226: Derived Annual Water Yields at the B4 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 357 | 211 | 212 | 212 | 204 | 199 | 199 | 199 | 199 | 217 |
| | 50 | 326 | 195 | 195 | 195 | 187 | 183 | 183 | 183 | 183 | 200 |
| | 20 | 286 | 172 | 173 | 173 | 165 | 161 | 161 | 161 | 161 | 176 |
| | 10 | 254 | 154 | 155 | 155 | 147 | 144 | 144 | 144 | 144 | 157 |
| | 5 | 220 | 135 | 135 | 135 | 128 | 125 | 125 | 125 | 125 | 137 |
| Median | 2 | 167 | 104 | 104 | 104 | 98 | 96 | 96 | 96 | 96 | 105 |
| Dry | 5 | 127 | 80 | 80 | 80 | 75 | 74 | 74 | 74 | 74 | 81 |
| | 10 | 110 | 70 | 70 | 70 | 65 | 64 | 64 | 64 | 64 | 71 |
| | 20 | 98 | 62 | 62 | 62 | 58 | 57 | 57 | 57 | 57 | 63 |
| | 50 | 85 | 54 | 54 | 54 | 51 | 50 | 50 | 50 | 50 | 55 |
| | 100 | 78 | 50 | 50 | 50 | 47 | 46 | 46 | 46 | 46 | 51 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A227: Derived Annual Water Yields at the B2 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 356 | 222 | 233 | 233 | 228 | 222 | 222 | 222 | 222 | 268 |
| | 50 | 325 | 203 | 214 | 214 | 208 | 203 | 203 | 203 | 203 | 247 |
| | 20 | 285 | 176 | 189 | 189 | 182 | 178 | 178 | 178 | 178 | 219 |
| | 10 | 253 | 156 | 169 | 169 | 162 | 158 | 158 | 158 | 158 | 197 |
| | 5 | 219 | 134 | 148 | 148 | 140 | 137 | 137 | 137 | 137 | 172 |
| Median | 2 | 166 | 100 | 114 | 114 | 107 | 105 | 105 | 105 | 105 | 134 |
| Dry | 5 | 126 | 74 | 88 | 88 | 82 | 81 | 81 | 81 | 81 | 104 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| | 10 | 109 | 63 | 77 | 77 | 72 | 70 | 70 | 70 | 70 | 90 |
| | 20 | 97 | 55 | 68 | 68 | 64 | 63 | 63 | 63 | 63 | 81 |
| | 50 | 85 | 47 | 60 | 60 | 57 | 56 | 56 | 56 | 56 | 71 |
| | 100 | 78 | 42 | 55 | 55 | 52 | 51 | 51 | 51 | 51 | 65 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A228: Derived Annual Water Yields at the C10 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 353 | 353 | 353 | 353 | 338 | 338 | 338 | 338 | 338 | 353 |
| | 50 | 326 | 326 | 326 | 326 | 311 | 311 | 311 | 311 | 311 | 326 |
| | 20 | 288 | 288 | 288 | 288 | 275 | 275 | 275 | 275 | 275 | 288 |
| | 10 | 258 | 258 | 258 | 258 | 246 | 246 | 246 | 246 | 246 | 258 |
| | 5 | 226 | 226 | 226 | 226 | 215 | 215 | 215 | 215 | 215 | 226 |
| Median | 2 | 175 | 175 | 175 | 175 | 165 | 165 | 165 | 165 | 165 | 175 |
| Dry | 5 | 134 | 134 | 134 | 134 | 127 | 127 | 127 | 127 | 127 | 134 |
| | 10 | 117 | 117 | 117 | 117 | 110 | 110 | 110 | 110 | 110 | 117 |
| | 20 | 104 | 104 | 104 | 104 | 98 | 98 | 98 | 98 | 98 | 104 |
| | 50 | 91 | 91 | 91 | 91 | 86 | 86 | 86 | 86 | 86 | 91 |
| | 100 | 83 | 83 | 83 | 83 | 79 | 79 | 79 | 79 | 79 | 83 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A229: Derived Annual Water Yields at the C7 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 354 | 354 | 354 | 354 | 322 | 322 | 322 | 322 | 322 | 354 |
| | 50 | 328 | 328 | 328 | 328 | 299 | 299 | 299 | 299 | 299 | 328 |
| | 20 | 293 | 293 | 293 | 293 | 266 | 266 | 266 | 266 | 266 | 293 |
| | 10 | 265 | 265 | 265 | 265 | 240 | 240 | 240 | 240 | 240 | 265 |
| | 5 | 233 | 233 | 233 | 233 | 211 | 211 | 211 | 211 | 211 | 233 |
| Median | 2 | 183 | 183 | 183 | 183 | 165 | 165 | 165 | 165 | 165 | 183 |
| Dry | 5 | 142 | 142 | 142 | 142 | 127 | 127 | 127 | 127 | 127 | 142 |
| | 10 | 124 | 124 | 124 | 124 | 111 | 111 | 111 | 111 | 111 | 124 |
| | 20 | 110 | 110 | 110 | 110 | 98 | 98 | 98 | 98 | 98 | 110 |
| | 50 | 96 | 96 | 96 | 96 | 86 | 86 | 86 | 86 | 86 | 96 |
| | 100 | 88 | 88 | 88 | 88 | 78 | 78 | 78 | 78 | 78 | 88 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A230: Derived Annual Water Yields at the C6 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 363 | 363 | 363 | 363 | 317 | 317 | 317 | 317 | 317 | 363 |
| | 50 | 336 | 336 | 336 | 336 | 294 | 294 | 294 | 294 | 294 | 336 |
| | 20 | 299 | 299 | 299 | 299 | 262 | 262 | 262 | 262 | 262 | 299 |
| | 10 | 269 | 269 | 269 | 269 | 236 | 236 | 236 | 236 | 236 | 269 |
| | 5 | 236 | 236 | 236 | 236 | 208 | 208 | 208 | 208 | 208 | 236 |
| Median | 2 | 184 | 184 | 184 | 184 | 162 | 162 | 162 | 162 | 162 | 184 |
| Dry | 5 | 142 | 142 | 142 | 142 | 126 | 126 | 126 | 126 | 126 | 142 |
| | 10 | 124 | 124 | 124 | 124 | 109 | 109 | 109 | 109 | 109 | 124 |
| | 20 | 110 | 110 | 110 | 110 | 97 | 97 | 97 | 97 | 97 | 110 |
| | 50 | 97 | 97 | 97 | 97 | 85 | 85 | 85 | 85 | 85 | 97 |
| | 100 | 88 | 88 | 88 | 88 | 78 | 78 | 78 | 78 | 78 | 88 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A231: Derived Annual Water Yields at the C5 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 358 | 358 | 358 | 358 | 228 | 228 | 228 | 228 | 228 | 358 |
| | 50 | 331 | 331 | 331 | 331 | 206 | 206 | 206 | 206 | 206 | 331 |
| | 20 | 294 | 294 | 294 | 294 | 177 | 177 | 177 | 177 | 177 | 294 |
| | 10 | 265 | 265 | 265 | 265 | 155 | 155 | 155 | 155 | 155 | 265 |
| | 5 | 233 | 233 | 233 | 233 | 132 | 132 | 132 | 132 | 132 | 233 |
| Median | 2 | 181 | 181 | 181 | 181 | 97 | 97 | 97 | 97 | 97 | 181 |
| Dry | 5 | 139 | 139 | 139 | 139 | 72 | 72 | 72 | 72 | 72 | 139 |
| | 10 | 121 | 121 | 121 | 121 | 62 | 62 | 62 | 62 | 62 | 121 |
| | 20 | 108 | 108 | 108 | 108 | 55 | 55 | 55 | 55 | 55 | 108 |
| | 50 | 94 | 94 | 94 | 94 | 48 | 48 | 48 | 48 | 48 | 94 |
| | 100 | 85 | 85 | 85 | 85 | 44 | 44 | 44 | 44 | 44 | 85 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A232: Derived Annual Water Yields at the D24 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 |
| | 50 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 |
| | 20 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 |
| | 10 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 255 |
| | 5 | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| Median | 2 | 171 | 171 | 171 | 171 | 171 | 171 | 171 | 171 | 171 | 171 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 |
| | 10 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 |
| | 20 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | 50 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| | 100 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A233: Derived Annual Water Yields at the D23 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 354 | 354 | 354 | 354 | 354 | 354 | 354 | 354 | 354 | 354 |
| | 50 | 324 | 324 | 324 | 324 | 324 | 324 | 324 | 324 | 324 | 324 |
| | 20 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| | 10 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| | 5 | 218 | 218 | 218 | 218 | 218 | 218 | 218 | 218 | 218 | 218 |
| Median | 2 | 166 | 166 | 166 | 166 | 166 | 166 | 166 | 166 | 166 | 166 |
| Dry | 5 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| | 10 | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 |
| | 20 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| | 50 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| | 100 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A234: Derived Annual Water Yields at the D8 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 366 | 366 | 366 | 366 | 366 | 366 | 366 | 366 | 366 | 366 |
| | 50 | 330 | 330 | 330 | 330 | 330 | 330 | 330 | 330 | 330 | 330 |
| | 20 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| | 10 | 248 | 248 | 248 | 248 | 248 | 248 | 248 | 248 | 248 | 248 |
| | 5 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 |
| Median | 2 | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 |
| Dry | 5 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 |
| | 10 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| | 20 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| | 50 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| | 100 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A235: Derived Annual Water Yields at the D7 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 356 | 980 | 742 | 712 | 356 | 356 | 356 | 356 | 356 | 1287 |
| | 50 | 321 | 919 | 674 | 645 | 321 | 321 | 321 | 321 | 321 | 1172 |
| | 20 | 275 | 836 | 584 | 555 | 275 | 275 | 275 | 275 | 275 | 1019 |
| | 10 | 239 | 768 | 515 | 486 | 239 | 239 | 239 | 239 | 239 | 900 |
| | 5 | 202 | 694 | 441 | 414 | 202 | 202 | 202 | 202 | 202 | 775 |
| Median | 2 | 147 | 574 | 329 | 306 | 147 | 147 | 147 | 147 | 147 | 581 |
| Dry | 5 | 107 | 477 | 246 | 226 | 107 | 107 | 107 | 107 | 107 | 436 |
| | 10 | 91 | 434 | 211 | 194 | 91 | 91 | 91 | 91 | 91 | 376 |
| | 20 | 79 | 401 | 187 | 171 | 79 | 79 | 79 | 79 | 79 | 332 |
| | 50 | 68 | 369 | 162 | 148 | 68 | 68 | 68 | 68 | 68 | 289 |
| | 100 | 62 | 348 | 148 | 135 | 62 | 62 | 62 | 62 | 62 | 264 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A236: Derived Annual Water Yields at the D4 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 351 | 653 | 542 | 529 | 351 | 351 | 351 | 351 | 351 | 803 |
| | 50 | 321 | 611 | 496 | 483 | 321 | 321 | 321 | 321 | 321 | 735 |
| | 20 | 281 | 554 | 435 | 421 | 281 | 281 | 281 | 281 | 281 | 644 |
| | 10 | 249 | 508 | 386 | 373 | 249 | 249 | 249 | 249 | 249 | 573 |
| | 5 | 216 | 458 | 335 | 322 | 216 | 216 | 216 | 216 | 216 | 497 |
| Median | 2 | 163 | 376 | 254 | 243 | 163 | 163 | 163 | 163 | 163 | 379 |
| Dry | 5 | 123 | 309 | 193 | 183 | 123 | 123 | 123 | 123 | 123 | 290 |
| | 10 | 106 | 279 | 167 | 158 | 106 | 106 | 106 | 106 | 106 | 252 |
| | 20 | 94 | 257 | 148 | 140 | 94 | 94 | 94 | 94 | 94 | 225 |
| | 50 | 81 | 235 | 129 | 122 | 81 | 81 | 81 | 81 | 81 | 197 |
| | 100 | 74 | 221 | 118 | 111 | 74 | 74 | 74 | 74 | 74 | 181 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A237: Derived Annual Water Yields at the D3 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 350 | 651 | 523 | 512 | 350 | 350 | 350 | 350 | 350 | 759 |
| | 50 | 321 | 611 | 479 | 467 | 321 | 321 | 321 | 321 | 321 | 700 |
| | 20 | 281 | 555 | 420 | 407 | 281 | 281 | 281 | 281 | 281 | 618 |
| | 10 | 250 | 509 | 373 | 361 | 250 | 250 | 250 | 250 | 250 | 553 |
| | 5 | 216 | 459 | 323 | 311 | 216 | 216 | 216 | 216 | 216 | 482 |
| Median | 2 | 164 | 377 | 245 | 234 | 164 | 164 | 164 | 164 | 164 | 369 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 123 | 309 | 185 | 176 | 123 | 123 | 123 | 123 | 123 | 280 |
| | 10 | 106 | 278 | 160 | 152 | 106 | 106 | 106 | 106 | 106 | 240 |
| | 20 | 93 | 255 | 141 | 134 | 93 | 93 | 93 | 93 | 93 | 211 |
| | 50 | 80 | 231 | 123 | 117 | 80 | 80 | 80 | 80 | 80 | 182 |
| | 100 | 73 | 217 | 112 | 106 | 73 | 73 | 73 | 73 | 73 | 165 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A238: Derived Annual Water Yields at the D36 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 356 | 356 | 356 | 356 | 356 | 356 | 356 | 356 | 356 | 356 |
| | 50 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| | 20 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| | 10 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| | 5 | 217 | 217 | 217 | 217 | 217 | 217 | 217 | 217 | 217 | 217 |
| Median | 2 | 165 | 165 | 165 | 165 | 165 | 165 | 165 | 165 | 165 | 165 |
| Dry | 5 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| | 10 | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 |
| | 20 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| | 50 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| | 100 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A239: Derived Annual Water Yields at the D35 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 359 | 359 | 359 | 359 | 359 | 359 | 359 | 359 | 359 | 359 |
| | 50 | 326 | 326 | 326 | 326 | 326 | 326 | 326 | 326 | 326 | 326 |
| | 20 | 282 | 282 | 282 | 282 | 282 | 282 | 282 | 282 | 282 | 282 |
| | 10 | 248 | 248 | 248 | 248 | 248 | 248 | 248 | 248 | 248 | 248 |
| | 5 | 213 | 213 | 213 | 213 | 213 | 213 | 213 | 213 | 213 | 213 |
| Median | 2 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 | 159 |
| Dry | 5 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| | 10 | 104 | 104 | 104 | 104 | 104 | 104 | 104 | 104 | 104 | 104 |
| | 20 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | 50 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| | 100 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A240: Derived Annual Water Yields at the D12 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 348 | 348 | 348 | 348 | 348 | 348 | 348 | 348 | 348 | 348 |
| | 50 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 | 323 |
| | 20 | 288 | 288 | 288 | 288 | 288 | 288 | 288 | 288 | 288 | 288 |
| | 10 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| | 5 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 |
| Median | 2 | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 |
| Dry | 5 | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 |
| | 10 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 |
| | 20 | 104 | 104 | 104 | 104 | 104 | 104 | 104 | 104 | 104 | 104 |
| | 50 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| | 100 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A241: Derived Annual Water Yields at the D1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 373 | 541 | 464 | 461 | 373 | 373 | 373 | 373 | 373 | 836 |
| | 50 | 335 | 508 | 426 | 422 | 335 | 335 | 335 | 335 | 335 | 742 |
| | 20 | 286 | 462 | 375 | 370 | 286 | 286 | 286 | 286 | 286 | 621 |
| | 10 | 249 | 424 | 335 | 328 | 249 | 249 | 249 | 249 | 249 | 532 |
| | 5 | 213 | 382 | 291 | 284 | 213 | 213 | 213 | 213 | 213 | 442 |
| Median | 2 | 160 | 310 | 222 | 215 | 160 | 160 | 160 | 160 | 160 | 313 |
| Dry | 5 | 125 | 250 | 169 | 162 | 125 | 125 | 125 | 125 | 125 | 227 |
| | 10 | 112 | 222 | 145 | 139 | 112 | 112 | 112 | 112 | 112 | 193 |
| | 20 | 102 | 201 | 128 | 123 | 102 | 102 | 102 | 102 | 102 | 170 |
| | 50 | 94 | 179 | 111 | 106 | 94 | 94 | 94 | 94 | 94 | 148 |
| | 100 | 89 | 165 | 101 | 96 | 89 | 89 | 89 | 89 | 89 | 136 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A242: Derived Annual Water Yields at the E4 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 354 | 354 | 354 | 354 | - | - | - | - | - | 354 |
| | 50 | 326 | 326 | 326 | 326 | - | - | - | - | - | 325 |
| | 20 | 287 | 287 | 287 | 287 | - | - | - | - | - | 287 |
| | 10 | 257 | 257 | 257 | 257 | - | - | - | - | - | 257 |
| | 5 | 224 | 224 | 224 | 224 | - | - | - | - | - | 224 |
| Median | 2 | 173 | 173 | 173 | 173 | - | - | - | - | - | 173 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 133 | 133 | 133 | 133 | - | - | - | - | - | 133 |
| | 10 | 115 | 115 | 115 | 115 | - | - | - | - | - | 115 |
| | 20 | 103 | 103 | 103 | 103 | - | - | - | - | - | 103 |
| | 50 | 90 | 90 | 90 | 90 | - | - | - | - | - | 90 |
| | 100 | 82 | 82 | 82 | 82 | - | - | - | - | - | 82 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A243: Derived Annual Water Yields at the E3 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 357 | 357 | 357 | 357 | 309 | 285 | 285 | 285 | 285 | 352 |
| | 50 | 324 | 324 | 324 | 324 | 289 | 257 | 257 | 257 | 257 | 322 |
| | 20 | 280 | 280 | 280 | 280 | 262 | 220 | 220 | 220 | 220 | 282 |
| | 10 | 246 | 246 | 246 | 246 | 239 | 192 | 192 | 192 | 192 | 251 |
| | 5 | 210 | 210 | 210 | 210 | 213 | 163 | 163 | 163 | 163 | 217 |
| Median | 2 | 157 | 157 | 157 | 157 | 170 | 119 | 119 | 119 | 119 | 165 |
| Dry | 5 | 117 | 117 | 117 | 117 | 133 | 88 | 88 | 88 | 88 | 125 |
| | 10 | 100 | 100 | 100 | 100 | 116 | 75 | 75 | 75 | 75 | 108 |
| | 20 | 89 | 89 | 89 | 89 | 103 | 66 | 66 | 66 | 66 | 95 |
| | 50 | 77 | 77 | 77 | 77 | 89 | 57 | 57 | 57 | 57 | 83 |
| | 100 | 71 | 71 | 71 | 71 | 81 | 52 | 52 | 52 | 52 | 76 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A244: Derived Annual Water Yields at the E2 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 359 | 359 | 359 | 359 | 316 | 305 | 305 | 305 | 305 | 356 |
| | 50 | 325 | 325 | 325 | 325 | 294 | 275 | 275 | 275 | 275 | 324 |
| | 20 | 280 | 280 | 280 | 280 | 264 | 236 | 236 | 236 | 236 | 282 |
| | 10 | 245 | 245 | 245 | 245 | 239 | 206 | 206 | 206 | 206 | 249 |
| | 5 | 209 | 209 | 209 | 209 | 211 | 174 | 174 | 174 | 174 | 214 |
| Median | 2 | 155 | 155 | 155 | 155 | 166 | 127 | 127 | 127 | 127 | 161 |
| Dry | 5 | 115 | 115 | 115 | 115 | 127 | 94 | 94 | 94 | 94 | 121 |
| | 10 | 99 | 99 | 99 | 99 | 110 | 80 | 80 | 80 | 80 | 104 |
| | 20 | 87 | 87 | 87 | 87 | 97 | 70 | 70 | 70 | 70 | 92 |
| | 50 | 76 | 76 | 76 | 76 | 84 | 60 | 60 | 60 | 60 | 80 |
| | 100 | 69 | 69 | 69 | 69 | 75 | 55 | 55 | 55 | 55 | 73 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A245: Derived Annual Water Yields at the E6 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 | 351 |
| | 50 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 |
| | 20 | 292 | 292 | 292 | 292 | 292 | 292 | 292 | 292 | 292 | 292 |
| | 10 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 |
| | 5 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 |
| Median | 2 | 183 | 183 | 183 | 183 | 183 | 183 | 183 | 183 | 183 | 183 |
| Dry | 5 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 |
| | 10 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| | 20 | 109 | 109 | 109 | 109 | 109 | 109 | 109 | 109 | 109 | 109 |
| | 50 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 |
| | 100 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A246: Derived Annual Water Yields at the E1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 359 | 359 | 359 | 359 | 326 | 318 | 318 | 318 | 318 | 356 |
| | 50 | 326 | 326 | 326 | 326 | 302 | 288 | 288 | 288 | 288 | 325 |
| | 20 | 282 | 282 | 282 | 282 | 269 | 249 | 249 | 249 | 249 | 283 |
| | 10 | 248 | 248 | 248 | 248 | 243 | 218 | 218 | 218 | 218 | 251 |
| | 5 | 213 | 213 | 213 | 213 | 214 | 187 | 187 | 187 | 187 | 216 |
| Median | 2 | 159 | 159 | 159 | 159 | 166 | 138 | 138 | 138 | 138 | 163 |
| Dry | 5 | 119 | 119 | 119 | 119 | 128 | 103 | 103 | 103 | 103 | 123 |
| | 10 | 102 | 102 | 102 | 102 | 111 | 88 | 88 | 88 | 88 | 106 |
| | 20 | 91 | 91 | 91 | 91 | 98 | 78 | 78 | 78 | 78 | 94 |
| | 50 | 79 | 79 | 79 | 79 | 85 | 68 | 68 | 68 | 68 | 82 |
| | 100 | 72 | 72 | 72 | 72 | 77 | 62 | 62 | 62 | 62 | 75 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A247: Derived Annual Water Yields at the G2 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 356 | 356 | 356 | 356 | 356 | 356 | 356 | 356 | 356 | 356 |
| | 50 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 |
| | 20 | 286 | 286 | 286 | 286 | 286 | 286 | 286 | 286 | 286 | 286 |
| | 10 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 255 |
| | 5 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 |
| Median | 2 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 128 |
| | 10 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 |
| | 20 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| | 50 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| | 100 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A248: Derived Annual Water Yields at the G1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 352 | 352 | 352 | 352 | 352 | 352 | 352 | 352 | 352 | 352 |
| | 50 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 | 327 |
| | 20 | 293 | 293 | 293 | 293 | 293 | 293 | 293 | 293 | 293 | 293 |
| | 10 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 |
| | 5 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 |
| Median | 2 | 185 | 185 | 185 | 185 | 185 | 185 | 185 | 185 | 185 | 185 |
| Dry | 5 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 |
| | 10 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |
| | 20 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 |
| | 50 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| | 100 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A249: Derived Annual Water Yields at the H20 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 362 | - | - | - | - | - | - | - | - | - |
| | 50 | 328 | - | - | - | - | - | - | - | - | - |
| | 20 | 283 | - | - | - | - | - | - | - | - | - |
| | 10 | 248 | - | - | - | - | - | - | - | - | - |
| | 5 | 212 | - | - | - | - | - | - | - | - | - |
| Median | 2 | 156 | - | - | - | - | - | - | - | - | - |
| Dry | 5 | 115 | - | - | - | - | - | - | - | - | - |
| | 10 | 98 | - | - | - | - | - | - | - | - | - |
| | 20 | 86 | - | - | - | - | - | - | - | - | - |
| | 50 | 74 | - | - | - | - | - | - | - | - | - |
| | 100 | 67 | - | - | - | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A250: Derived Annual Water Yields at the H19 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 355 | - | - | - | - | - | - | - | - | - |
| | 50 | 323 | - | - | - | - | - | - | - | - | - |
| | 20 | 279 | - | - | - | - | - | - | - | - | - |
| | 10 | 246 | - | - | - | - | - | - | - | - | - |
| | 5 | 210 | - | - | - | - | - | - | - | - | - |
| Median | 2 | 155 | - | - | - | - | - | - | - | - | - |
| Dry | 5 | 113 | - | - | - | - | - | - | - | - | - |
| | 10 | 96 | - | - | - | - | - | - | - | - | - |
| | 20 | 83 | - | - | - | - | - | - | - | - | - |
| | 50 | 71 | - | - | - | - | - | - | - | - | - |
| | 100 | 63 | - | - | - | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A251: Derived Annual Water Yields at the H17 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 373 | - | - | - | - | - | - | - | - | - |
| | 50 | 332 | - | - | - | - | - | - | - | - | - |
| | 20 | 279 | - | - | - | - | - | - | - | - | - |
| | 10 | 238 | - | - | - | - | - | - | - | - | - |
| | 5 | 197 | - | - | - | - | - | - | - | - | - |
| Median | 2 | 136 | - | - | - | - | - | - | - | - | - |
| Dry | 5 | 93 | - | - | - | - | - | - | - | - | - |
| | 10 | 76 | - | - | - | - | - | - | - | - | - |
| | 20 | 63 | - | - | - | - | - | - | - | - | - |
| | 50 | 52 | - | - | - | - | - | - | - | - | - |
| | 100 | 45 | - | - | - | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A252: Derived Annual Water Yields at the H1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 284 | - | - | - | - | - | - | - | - | 227 |
| | 50 | 258 | - | - | - | - | - | - | - | - | 208 |
| | 20 | 224 | - | - | - | - | - | - | - | - | 182 |
| | 10 | 197 | - | - | - | - | - | - | - | - | 162 |
| | 5 | 169 | - | - | - | - | - | - | - | - | 140 |
| Median | 2 | 126 | - | - | - | - | - | - | - | - | 107 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 94 | - | - | - | - | - | - | - | - | 81 |
| | 10 | 81 | - | - | - | - | - | - | - | - | 70 |
| | 20 | 71 | - | - | - | - | - | - | - | - | 62 |
| | 50 | 61 | - | - | - | - | - | - | - | - | 55 |
| | 100 | 56 | - | - | - | - | - | - | - | - | 50 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A253: Derived Annual Water Yields at the I1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 354 | 354 | 354 | 354 | 346 | 346 | 346 | 346 | 346 | 346 |
| | 50 | 326 | 326 | 326 | 326 | 318 | 318 | 318 | 318 | 318 | 318 |
| | 20 | 288 | 288 | 288 | 288 | 280 | 280 | 280 | 280 | 280 | 280 |
| | 10 | 257 | 257 | 257 | 257 | 250 | 250 | 250 | 250 | 250 | 250 |
| | 5 | 225 | 225 | 225 | 225 | 218 | 218 | 218 | 218 | 218 | 218 |
| Median | 2 | 173 | 173 | 173 | 173 | 167 | 167 | 167 | 167 | 167 | 167 |
| Dry | 5 | 133 | 133 | 133 | 133 | 128 | 128 | 128 | 128 | 128 | 128 |
| | 10 | 116 | 116 | 116 | 116 | 112 | 112 | 112 | 112 | 112 | 112 |
| | 20 | 103 | 103 | 103 | 103 | 99 | 99 | 99 | 99 | 99 | 99 |
| | 50 | 90 | 90 | 90 | 90 | 87 | 87 | 87 | 87 | 87 | 87 |
| | 100 | 82 | 82 | 82 | 82 | 80 | 80 | 80 | 80 | 80 | 80 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A254: Derived Annual Water Yields at the J8 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 379 | 379 | 379 | 379 | - | - | - | - | - | 2276 |
| | 50 | 347 | 347 | 347 | 347 | - | - | - | - | - | 2108 |
| | 20 | 305 | 305 | 305 | 305 | - | - | - | - | - | 1878 |
| | 10 | 272 | 272 | 272 | 272 | - | - | - | - | - | 1692 |
| | 5 | 238 | 238 | 238 | 238 | - | - | - | - | - | 1490 |
| Median | 2 | 185 | 185 | 185 | 185 | - | - | - | - | - | 1160 |
| Dry | 5 | 146 | 146 | 146 | 146 | - | - | - | - | - | 894 |
| | 10 | 130 | 130 | 130 | 130 | - | - | - | - | - | 776 |
| | 20 | 119 | 119 | 119 | 119 | - | - | - | - | - | 688 |
| | 50 | 107 | 107 | 107 | 107 | - | - | - | - | - | 599 |
| | 100 | 100 | 100 | 100 | 100 | - | - | - | - | - | 544 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A255: Derived Annual Water Yields at the J7 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 354 | 354 | 354 | - | - | - | - | - | - | - |
| | 50 | 328 | 328 | 328 | - | - | - | - | - | - | - |
| | 20 | 291 | 291 | 291 | - | - | - | - | - | - | - |
| | 10 | 262 | 262 | 262 | - | - | - | - | - | - | - |
| | 5 | 230 | 230 | 230 | - | - | - | - | - | - | - |
| Median | 2 | 179 | 179 | 179 | - | - | - | - | - | - | - |
| Dry | 5 | 138 | 138 | 138 | - | - | - | - | - | - | - |
| | 10 | 120 | 120 | 120 | - | - | - | - | - | - | - |
| | 20 | 106 | 106 | 106 | - | - | - | - | - | - | - |
| | 50 | 92 | 92 | 92 | - | - | - | - | - | - | - |
| | 100 | 84 | 84 | 84 | - | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A256: Derived Annual Water Yields at the J6 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 386 | 386 | 386 | 270 | - | - | - | - | - | - |
| | 50 | 353 | 353 | 353 | 262 | - | - | - | - | - | - |
| | 20 | 309 | 309 | 309 | 250 | - | - | - | - | - | - |
| | 10 | 274 | 274 | 274 | 239 | - | - | - | - | - | - |
| | 5 | 239 | 239 | 239 | 225 | - | - | - | - | - | - |
| Median | 2 | 185 | 185 | 185 | 198 | - | - | - | - | - | - |
| Dry | 5 | 145 | 145 | 145 | 172 | - | - | - | - | - | - |
| | 10 | 129 | 129 | 129 | 158 | - | - | - | - | - | - |
| | 20 | 117 | 117 | 117 | 147 | - | - | - | - | - | - |
| | 50 | 106 | 106 | 106 | 136 | - | - | - | - | - | - |
| | 100 | 99 | 99 | 99 | 128 | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A257: Derived Annual Water Yields at the J3 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 342 | 342 | 342 | 239 | - | - | - | - | - | - |
| | 50 | 317 | 317 | 317 | 235 | - | - | - | - | - | - |
| | 20 | 282 | 282 | 282 | 228 | - | - | - | - | - | - |
| | 10 | 254 | 254 | 254 | 221 | - | - | - | - | - | - |
| | 5 | 224 | 224 | 224 | 211 | - | - | - | - | - | - |
| Median | 2 | 175 | 175 | 175 | 188 | - | - | - | - | - | - |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 136 | 136 | 136 | 161 | - | - | - | - | - | - |
| | 10 | 119 | 119 | 119 | 146 | - | - | - | - | - | - |
| | 20 | 106 | 106 | 106 | 133 | - | - | - | - | - | - |
| | 50 | 93 | 93 | 93 | 119 | - | - | - | - | - | - |
| | 100 | 85 | 85 | 85 | 110 | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A258: Derived Annual Water Yields at the J2 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 591 | 591 | 591 | 414 | - | - | - | - | - | - |
| | 50 | 525 | 525 | 525 | 390 | - | - | - | - | - | - |
| | 20 | 442 | 442 | 442 | 358 | - | - | - | - | - | - |
| | 10 | 383 | 383 | 383 | 333 | - | - | - | - | - | - |
| | 5 | 325 | 325 | 325 | 306 | - | - | - | - | - | - |
| Median | 2 | 246 | 246 | 246 | 264 | - | - | - | - | - | - |
| Dry | 5 | 197 | 197 | 197 | 232 | - | - | - | - | - | - |
| | 10 | 179 | 179 | 179 | 219 | - | - | - | - | - | - |
| | 20 | 167 | 167 | 167 | 209 | - | - | - | - | - | - |
| | 50 | 156 | 156 | 156 | 199 | - | - | - | - | - | - |
| | 100 | 150 | 150 | 150 | 193 | - | - | - | - | - | - |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A259: Derived Annual Water Yields at the J1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 338 | 338 | 338 | 354 | 634 | 146 | 146 | 146 | 146 | 343 |
| | 50 | 314 | 314 | 314 | 332 | 620 | 133 | 133 | 133 | 133 | 317 |
| | 20 | 281 | 281 | 281 | 301 | 600 | 115 | 115 | 115 | 115 | 282 |
| | 10 | 254 | 254 | 254 | 276 | 584 | 102 | 102 | 102 | 102 | 254 |
| | 5 | 224 | 224 | 224 | 248 | 566 | 88 | 88 | 88 | 88 | 224 |
| Median | 2 | 174 | 174 | 174 | 202 | 536 | 66 | 66 | 66 | 66 | 174 |
| Dry | 5 | 133 | 133 | 133 | 163 | 512 | 50 | 50 | 50 | 50 | 134 |
| | 10 | 115 | 115 | 115 | 146 | 501 | 43 | 43 | 43 | 43 | 116 |
| | 20 | 101 | 101 | 101 | 132 | 493 | 38 | 38 | 38 | 38 | 103 |
| | 50 | 86 | 86 | 86 | 119 | 484 | 33 | 33 | 33 | 33 | 89 |
| | 100 | 77 | 77 | 77 | 110 | 479 | 30 | 30 | 30 | 30 | 81 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A260: Derived Annual Water Yields at the Meliadine Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 341 | 374 |
| | 50 | 332 | 332 | 332 | 332 | 332 | 332 | 332 | 332 | 299 | 332 |
| | 20 | 279 | 279 | 279 | 279 | 279 | 279 | 279 | 279 | 246 | 279 |
| | 10 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 208 | 240 |
| | 5 | 202 | 202 | 202 | 202 | 202 | 202 | 202 | 202 | 171 | 202 |
| Median | 2 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 120 | 150 |
| Dry | 5 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 87 | 115 |
| | 10 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 75 | 102 |
| | 20 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 67 | 94 |
| | 50 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 59 | 86 |
| | 100 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 55 | 81 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A261: Derived Annual Water Yields at the Lake P2 Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 353 | 9639 | 10115 | 10115 | 9932 | 9714 | 9714 | 9714 | 9714 | 10970 |
| | 50 | 325 | 8788 | 9330 | 9330 | 9153 | 8948 | 8948 | 8948 | 8948 | 10033 |
| | 20 | 289 | 7643 | 8260 | 8260 | 8093 | 7906 | 7906 | 7906 | 7906 | 8778 |
| | 10 | 259 | 6744 | 7409 | 7409 | 7249 | 7078 | 7078 | 7078 | 7078 | 7797 |
| | 5 | 227 | 5786 | 6488 | 6488 | 6337 | 6185 | 6185 | 6185 | 6185 | 6756 |
| Median | 2 | 176 | 4290 | 5016 | 5016 | 4881 | 4762 | 4762 | 4762 | 4762 | 5143 |
| Dry | 5 | 135 | 3146 | 3856 | 3856 | 3737 | 3645 | 3645 | 3645 | 3645 | 3922 |
| | 10 | 117 | 2660 | 3351 | 3351 | 3239 | 3160 | 3160 | 3160 | 3160 | 3407 |
| | 20 | 104 | 2308 | 2979 | 2979 | 2873 | 2803 | 2803 | 2803 | 2803 | 3035 |
| | 50 | 91 | 1957 | 2603 | 2603 | 2503 | 2444 | 2444 | 2444 | 2444 | 2667 |
| | 100 | 83 | 1747 | 2376 | 2376 | 2280 | 2228 | 2228 | 2228 | 2228 | 2448 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A262: Derived Annual Water Yields at the CH6 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 264 | 264 | 264 | 264 | 264 | 194 | 194 | 194 | 194 | 265 |
| | 50 | 245 | 245 | 245 | 245 | 245 | 178 | 178 | 178 | 178 | 244 |
| | 20 | 219 | 219 | 219 | 219 | 219 | 157 | 157 | 157 | 157 | 216 |
| | 10 | 198 | 198 | 198 | 198 | 198 | 140 | 140 | 140 | 140 | 194 |
| | 5 | 174 | 174 | 174 | 174 | 174 | 122 | 122 | 122 | 122 | 169 |
| Median | 2 | 136 | 136 | 136 | 136 | 136 | 93 | 93 | 93 | 93 | 130 |

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Dry | 5 | 105 | 105 | 105 | 105 | 105 | 71 | 71 | 71 | 71 | 99 |
| | 10 | 91 | 91 | 91 | 91 | 91 | 61 | 61 | 61 | 61 | 85 |
| | 20 | 80 | 80 | 80 | 80 | 80 | 54 | 54 | 54 | 54 | 75 |
| | 50 | 69 | 69 | 69 | 69 | 69 | 46 | 46 | 46 | 46 | 65 |
| | 100 | 63 | 63 | 63 | 63 | 63 | 42 | 42 | 42 | 42 | 59 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A263: Derived Annual Water Yields at the CH5 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 289 | 289 | 289 | 289 | 289 | 230 | 230 | 230 | 230 | 291 |
| | 50 | 267 | 267 | 267 | 267 | 267 | 210 | 210 | 210 | 210 | 268 |
| | 20 | 237 | 237 | 237 | 237 | 237 | 184 | 184 | 184 | 184 | 236 |
| | 10 | 213 | 213 | 213 | 213 | 213 | 163 | 163 | 163 | 163 | 210 |
| | 5 | 187 | 187 | 187 | 187 | 187 | 141 | 141 | 141 | 141 | 183 |
| Median | 2 | 145 | 145 | 145 | 145 | 145 | 107 | 107 | 107 | 107 | 140 |
| Dry | 5 | 111 | 111 | 111 | 111 | 111 | 81 | 81 | 81 | 81 | 106 |
| | 10 | 96 | 96 | 96 | 96 | 96 | 69 | 69 | 69 | 69 | 91 |
| | 20 | 85 | 85 | 85 | 85 | 85 | 61 | 61 | 61 | 61 | 80 |
| | 50 | 73 | 73 | 73 | 73 | 73 | 53 | 53 | 53 | 53 | 70 |
| | 100 | 67 | 67 | 67 | 67 | 67 | 48 | 48 | 48 | 48 | 63 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A264: Derived Annual Water Yields at the CH10 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 377 | 377 | 377 | 377 | 377 | 377 | 377 | 377 | 377 | 377 |
| | 50 | 335 | 335 | 335 | 335 | 335 | 335 | 335 | 335 | 335 | 335 |
| | 20 | 280 | 280 | 280 | 280 | 280 | 280 | 280 | 280 | 280 | 280 |
| | 10 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| | 5 | 198 | 198 | 198 | 198 | 198 | 198 | 198 | 198 | 198 | 198 |
| Median | 2 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 |
| Dry | 5 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| | 10 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 |
| | 20 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 |
| | 50 | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| | 100 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

**Table 7.3-A265: Derived Annual Water Yields at the CH1 Lake Outlet**

| Condition | Return Period (years) | Annual Water Yield (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BAS | P-3 | P-2-1 | MP1 | MP2 | MP3 | MP4 | MP5 | CL | PC |
| Wet | 100 | 341 | 341 | 341 | 341 | 341 | 300 | 300 | 300 | 300 | 343 |
| | 50 | 312 | 312 | 312 | 312 | 312 | 272 | 272 | 272 | 272 | 313 |
| | 20 | 273 | 273 | 273 | 273 | 273 | 235 | 235 | 235 | 235 | 272 |
| | 10 | 242 | 242 | 242 | 242 | 242 | 206 | 206 | 206 | 206 | 240 |
| | 5 | 210 | 210 | 210 | 210 | 210 | 176 | 176 | 176 | 176 | 207 |
| Median | 2 | 159 | 159 | 159 | 159 | 159 | 131 | 131 | 131 | 131 | 155 |
| Dry | 5 | 120 | 120 | 120 | 120 | 120 | 97 | 97 | 97 | 97 | 116 |
| | 10 | 104 | 104 | 104 | 104 | 104 | 83 | 83 | 83 | 83 | 100 |
| | 20 | 92 | 92 | 92 | 92 | 92 | 73 | 73 | 73 | 73 | 88 |
| | 50 | 80 | 80 | 80 | 80 | 80 | 64 | 64 | 64 | 64 | 76 |
| | 100 | 73 | 73 | 73 | 73 | 73 | 58 | 58 | 58 | 58 | 70 |

Note: mm = millimetre; BAS = Baseline; P-3 = Preproduction (Year -3); P-2-1 = Preproduction (Years -2 to -1); MP1 = Mining Phase 1; MP2 = Mining Phase 2; MP3 = Mining Phase 3; MP4 = Mining Phase 4; MP5 = Mining Phase 5; CL= Closure; PC = Post-Closure; - = Not Applicable.

# APPENDIX 7.3-B

## Baseline Model Calibration

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

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**APPENDICES**

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# 1.0 INTRODUCTION

A water balance model was developed for Lakes A1, B2, B7 and Chickenhead Lake and presented in the Aquatics Baseline Synthesis Report (SD 7-1 2009 Aquatics Synthesis Baseline) to assess mean characteristics and natural variability of discharges and water levels at lake outlets of the Project. This model was updated to include additional lakes in watersheds potentially affected by the mine development, based on available baseline data collected up to 2011 (SD 7-2 2011 Aquatics Baseline). This appendix describes the water balance model in detail, including input data, model setup, calibration, validation and results.

The water balance model was set up using GoldSim™ software on a daily time step for the period of 1982 to 2011. This time period was selected to correspond with the climate data derived for the site, based on long-term data from the Environment Canada Rankin Inlet A climate station (Station 2303401). While data are available starting in 1981 at the climate station, the model is comprised of a snowmelt sub-model based on a hydrological year basis, which would require available data starting in October 1980 to allow the model to run from 1981. The basic water balance for each sub-watershed considered rainfall and snowmelt runoff, changes in lake storage, lake evaporation and outlet to downstream watersheds.

The model was calibrated using runoff coefficients for land surfaces, lake outlet stage-discharge rating curves, and degree-day models for snowmelt and spring ice melt in outlet channels. These parameters were selected to calibrate the model using site-specific climate and hydrometric data collected in 1999. Site specific data from 1997, 1998, 2000, 2008, 2009 and 2011 were used to validate the results.

The calibrated model was used to generate daily time series of flows for the LSA, which includes the A, B, C, D, E, G, H, I, J, P, CH, and Meliadine Lake watersheds. Frequency analyses were performed on these data sets to define key discharge parameters.

# 2.0 MODEL STRUCTURE

Each lake was modeled as a reservoir as described in the schematic diagram shown on Figure 7.3-B-1. Inflows to the reservoir consisted of local watershed rainfall and snowfall, separated into land and lake components to account for runoff losses, plus inflow from upstream watersheds. Outflows consisted of evaporation and lake outlet discharges. Lake storage is also considered in the model, and evapotranspiration and sublimation are implicit in runoff losses. A key assumption of the model is that losses to deep percolation and changes to shallow groundwater storage are not significant. This is based on the northern location and permafrost conditions at the Project.

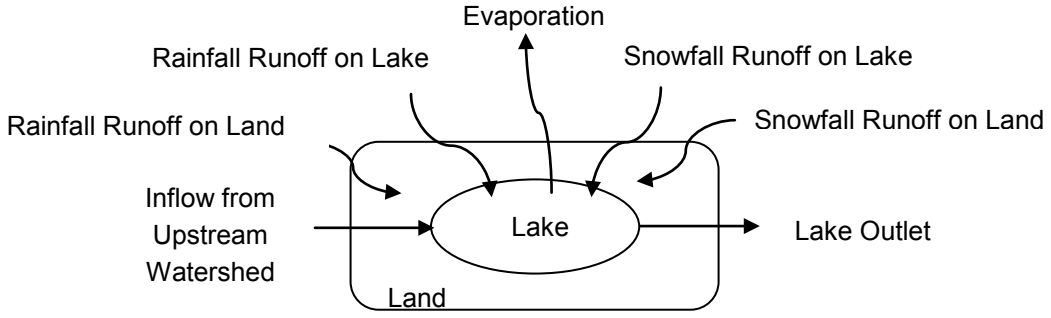



*Figure 7.3-B-1: Schematic Diagram of Typical Watersheds in the Model*

Inflows and outflows were calculated according to the flowchart provided on Figure 7.3-B-2 (runoff losses were modeled using runoff coefficients are not shown on the figure).

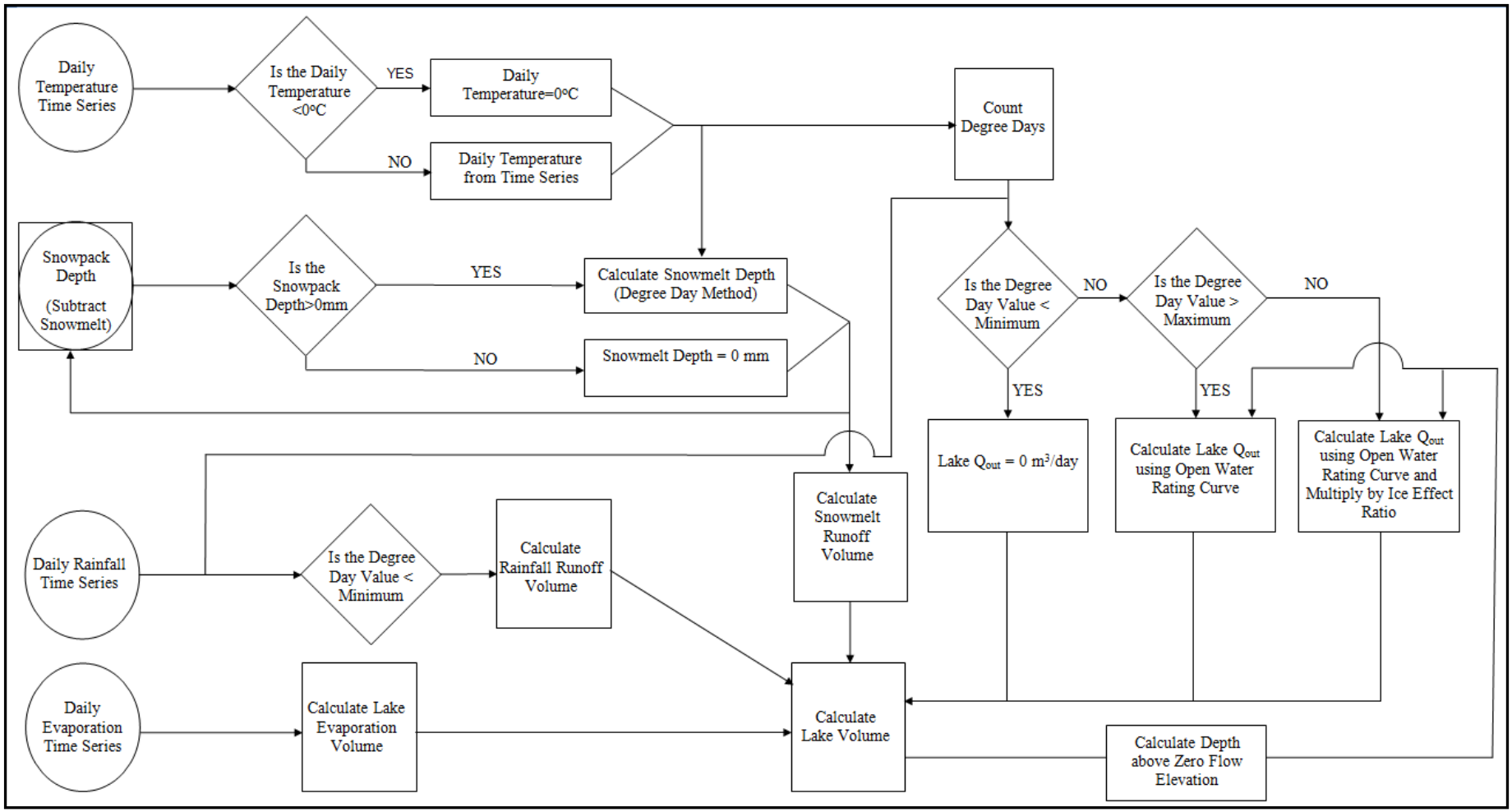



*Figure 7.3-B-2: Watershed Water Balance Model Logic*

# 2.1 Model Components

## 2.1.1 Lake Evaporation

Evaporation of water from lakes, ponds, and other open water surfaces is one of the primary mechanisms for moisture loss from a watershed. Evaporation is influenced by air and water temperatures, solar radiation, relative humidity, and wind. Evaporation from waterbodies is difficult to measure directly. It is typically estimated by using a local evaporation pan measurement and applying a coefficient (the "pan" coefficient), or by using energy budget relationships and computations based on the net energy input to the evaporation process. A net lake evaporation time series was derived based on locally collected data.

### *2.1.1.1 Meteorological Data*

Local gross lake evaporation data were available from June to September in 1997 to 1999 and from July to September in 2000. During each field program of these years, data were collected on a daily basis when possible.

### *2.1.1.2 Method*

Gross lake evaporation data were compiled for all years and monthly averages were calculated for the summer months of June to September, as shown in Table 7.3-B-1. A daily time series was developed by dividing the resulting values by the number of days per month for the months of July and August. It was assumed that the gross lake evaporation was nil at the start of June and at the end of September. As such, the evaporation was assumed to increase linearly from the start of June to mid-June, and decrease linearly from mid-September to the end of September. It was also assumed that the evaporation stayed constant for each month, with the exception of the first half of the month of June and the second half of the month of September, as previously stated.

**Table 7.3-B-1: Gross Lake Evaporation (mm), 1997 to 2000**

| Year | Month | | | | |
|---|---|---|---|---|---|
| | **June** | **July** | **August** | **September** | **Annual** |
| 1997 | 46.9 | 142 | 97.3 | 41.3 | 328 |
| 1998 | 76.9 | 113 | 96.5 | 34.9 | 322 |
| 1999 | 81.3 | 110 | 89.8 | 44.6 | 326 |
| 2000 | 36.2 | 132 | 98.8 | 49.9 | 317 |
| **Mean** | **60.4** | **124** | **95.6** | **42.7** | **323** |

### *2.1.1.3 Results and Discussion*

The derived daily gross lake evaporation is shown in Figure 7.3-B-3.

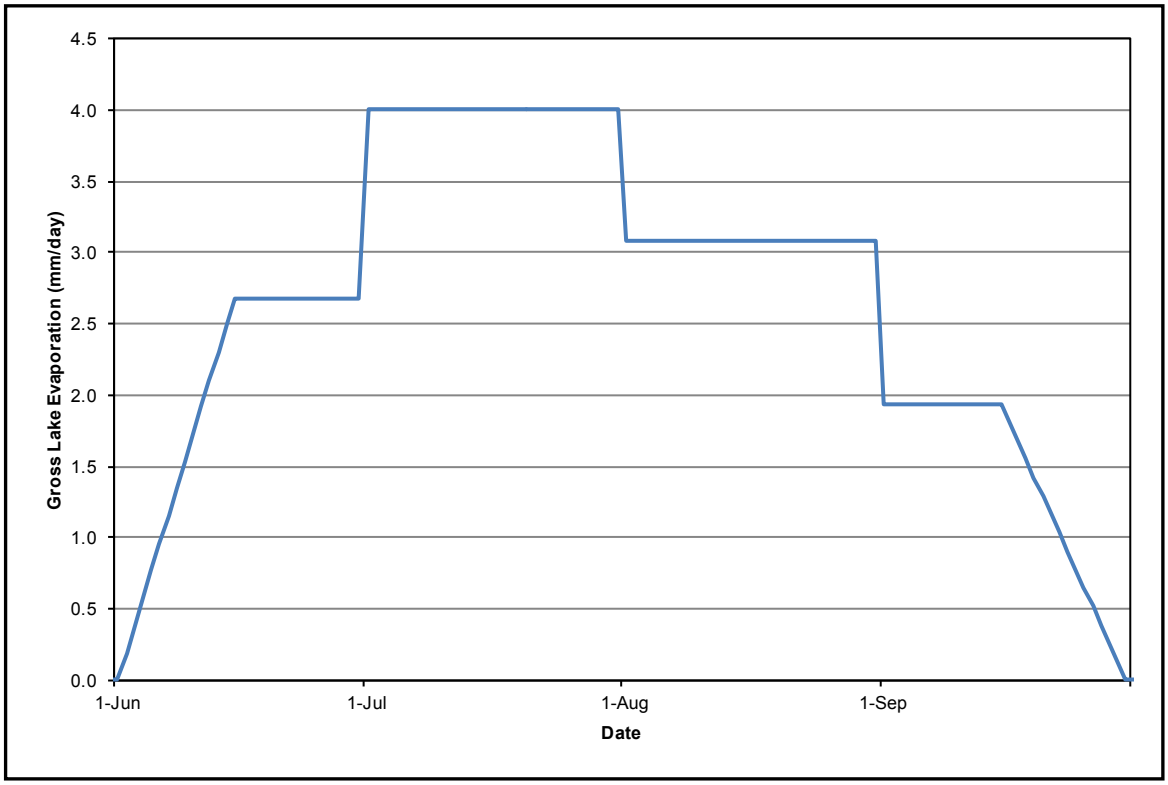



*Figure 7.3-B-3: Derived Daily Gross Lake Evaporation*

As discussed in the Aquatics Baseline Synthesis Report (SD 7-1 2009 Aquatics Synthesis Baseline), it is likely that the mean annual lake evaporation value of 323 mm derived from local data for the period of 1997 to 2000 may be slightly greater than the actual long-term lake evaporation value at the Project area. However, these losses can be balanced during the calibration stage. This approach was taken because solar radiation data required to derive evaporation are not available from Environment Canada climate station 2303401 (Rankin Inlet Airport).

This time series was applied for all modeled years from 1982 to 2011.

## 2.1.2 Watershed Characteristics

Physical characteristics of the watersheds required for the water balance model included lake and land areas of each sub-watershed, and stage-discharge rating curves of each modeled lake outlet.

### *2.1.2.1 Lake and Land Areas*

Derived drainage areas based on digital elevation data (PhotoSat 2011) broken down into lake and land areas for each modeled watershed are presented below in Table 7.3-B-2.

**Table 7.3-B-2: Drainage Areas of Modeled Watersheds**

| Lake | Total Drainage Area ($km^2$) | | | Local Drainage Area ($km^2$) | | |
|---|---|---|---|---|---|---|
| | Total | Land | Lake | Total | Land | Lake |
| A1 | 9.472 | 7.151 | 2.321 | 2.834 | 2.440 | 0.394 |
| A6 | 6.638 | 4.711 | 1.927 | 2.974 | 2.100 | 0.873 |
| A8 | 3.665 | 2.611 | 1.054 | 3.665 | 2.611 | 1.054 |
| B2 | 22.771 | 16.829 | 5.942 | 2.084 | 1.413 | 0.671 |
| B4_B45[a] | 20.687 | 15.416 | 5.271 | 4.113 | 2.605 | 1.508 |
| B44 | 0.283 | 0.233 | 0.050 | 0.283 | 0.233 | 0.050 |
| B46 | 11.234 | 8.915 | 2.319 | 4.109 | 3.233 | 0.876 |
| BX1 | 2.209 | 1.731 | 0.478 | 0.704 | 0.470 | 0.234 |
| BX2 | 1.505 | 1.261 | 0.244 | 1.505 | 1.261 | 0.244 |
| B52 | 3.783 | 3.108 | 0.675 | 1.626 | 1.204 | 0.422 |
| B53 | 2.157 | 1.904 | 0.253 | 2.157 | 1.904 | 0.253 |
| B69 | 1.133 | 0.843 | 0.290 | 1.133 | 0.843 | 0.290 |
| B5 | 5.057 | 3.663 | 1.394 | 2.085 | 1.451 | 0.634 |
| B6 | 2.972 | 2.212 | 0.760 | 0.356 | 0.235 | 0.121 |
| B7 | 2.616 | 1.977 | 0.639 | 2.616 | 1.977 | 0.639 |
| C5 | 0.191 | 0.152 | 0.040 | 0.191 | 0.152 | 0.040 |
| C6 | 2.669 | 2.222 | 0.447 | 0.394 | 0.331 | 0.063 |
| C7 | 2.275 | 1.891 | 0.384 | 1.651 | 1.406 | 0.245 |
| C10 | 0.624 | 0.485 | 0.139 | 0.624 | 0.485 | 0.139 |
| D1 | 7.710 | 5.449 | 2.261 | 0.380 | 0.202 | 0.178 |
| D12 | 1.007 | 0.795 | 0.212 | 1.007 | 0.795 | 0.212 |
| D2 | 6.323 | 4.452 | 1.871 | 0.203 | 0.157 | 0.046 |
| D35 | 0.694 | 0.477 | 0.218 | 0.338 | 0.221 | 0.117 |
| D36 | 0.356 | 0.256 | 0.100 | 0.356 | 0.256 | 0.100 |
| D3 | 5.426 | 3.818 | 1.608 | 0.585 | 0.423 | 0.162 |
| D4_D5[a] | 4.841 | 3.395 | 1.446 | 1.586 | 1.360 | 0.226 |
| D23 | 0.821 | 0.584 | 0.237 | 0.439 | 0.298 | 0.140 |
| D24 | 0.383 | 0.286 | 0.096 | 0.383 | 0.286 | 0.096 |
| D7 | 2.434 | 1.451 | 0.983 | 1.896 | 1.114 | 0.783 |
| D8 | 0.538 | 0.338 | 0.201 | 0.538 | 0.338 | 0.201 |
| E1 | 3.584 | 2.381 | 1.203 | 0.279 | 0.151 | 0.128 |
| E6 | 0.660 | 0.538 | 0.122 | 0.660 | 0.538 | 0.122 |
| E2 | 2.645 | 1.692 | 0.953 | 0.685 | 0.417 | 0.269 |
| E3 | 1.960 | 1.276 | 0.684 | 1.531 | 0.950 | 0.582 |
| E4 | 0.429 | 0.326 | 0.103 | 0.429 | 0.326 | 0.103 |
| G1 | 1.051 | 0.875 | 0.176 | 0.595 | 0.545 | 0.050 |
| G2 | 0.456 | 0.330 | 0.126 | 0.456 | 0.330 | 0.126 |
| H1[b] | 1.283 | 0.968 | 0.190 | 0.586 | 0.556 | 0.030 |
| H17 | 0.331 | 0.172 | 0.160 | 0.331 | 0.172 | 0.160 |
| H19 | 0.366 | 0.240 | 0.126 | 0.066 | 0.037 | 0.029 |
| H20 | 0.300 | 0.203 | 0.097 | 0.300 | 0.203 | 0.097 |
| I1 | 0.309 | 0.232 | 0.076 | 0.309 | 0.232 | 0.076 |
| J1 | 1.387 | 1.112 | 0.275 | 0.769 | 0.597 | 0.172 |
| J2 | 0.528 | 0.438 | 0.090 | 0.124 | 0.105 | 0.019 |
| J3 | 0.404 | 0.333 | 0.071 | 0.179 | 0.160 | 0.019 |
| J6 | 0.225 | 0.173 | 0.053 | 0.072 | 0.055 | 0.018 |
| J7 | 0.153 | 0.118 | 0.035 | 0.153 | 0.118 | 0.035 |

| Lake | Total Drainage Area ($km^2$) | | | Local Drainage Area ($km^2$) | | |
|---|---|---|---|---|---|---|
| | Total | Land | Lake | Total | Land | Lake |
| J8 | 0.090 | 0.077 | 0.014 | 0.090 | 0.077 | 0.014 |
| P2 | 0.458 | 0.352 | 0.106 | 0.458 | 0.352 | 0.106 |
| CH1 | 15.175 | 10.388 | 4.788 | 2.575 | 1.208 | 1.367 |
| CH5 | 11.223 | 8.449 | 2.775 | 1.361 | 0.658 | 0.703 |
| CH6 | 9.862 | 7.791 | 2.072 | 9.862 | 7.791 | 2.072 |
| CH10 | 1.377 | 0.731 | 0.646 | 1.377 | 0.731 | 0.646 |
| Meliadine | 560 | 361 | 199 | 560 | 361 | 199 |

Note: a= Lake B4 and Lake B45 form one lake, Lake D4 and Lake D5 form one lake; b= contributing areas only

### 2.1.2.2 Outlet Rating Curves

Lake outlet rating curves for each modeled outlet were developed using one of two methods:

1 – Stage-discharge rating curves were developed from baseline data, when available;

2 – Stage-discharge rating curves were assumed for lake outlets with no available data based on the assumption that in erodible soils, the lake outlet geometry would be related to the flood flow regime, and that flood peak discharges would be roughly proportional to watershed areas. A weir equation of the following form was used to estimate the rating curve based on the watershed area at the lake outlet:

$$Q = w\, y^{1.5}$$

where: $Q$ = discharge ($m^3/s$)
$w$ = 0.574 A + 0.8504
$y$ = depth above zero-flow elevation (m)
$A$ = watershed area ($km^2$)

The value of $w$ was based on an analysis of stage-discharge rating curves at lake outlets monitored by the hydrometric programs using the highest recorded discharges. The exponent of the equation was specified based on the broad-crested weir equation, and values of $w$ for each lake outlet were estimated to best fit the theoretical equation to each set of stage-discharge data. The coefficient $w$ is presented in Figure 7.3-B-4 as a function of drainage area. It must be noted that recent field observations in 2012 showed that Lake CH1 drains through an esker (i.e., sub-surface) and not through a lake outlet as assumed for this model. As such, additional modeling of Lake CH1 is recommended, though conclusions of the effect assessment are not expected to change.

Coefficient and exponents of the rating curve were adjusted accordingly during the calibration stage when required (Section 2.2 of this appendix).

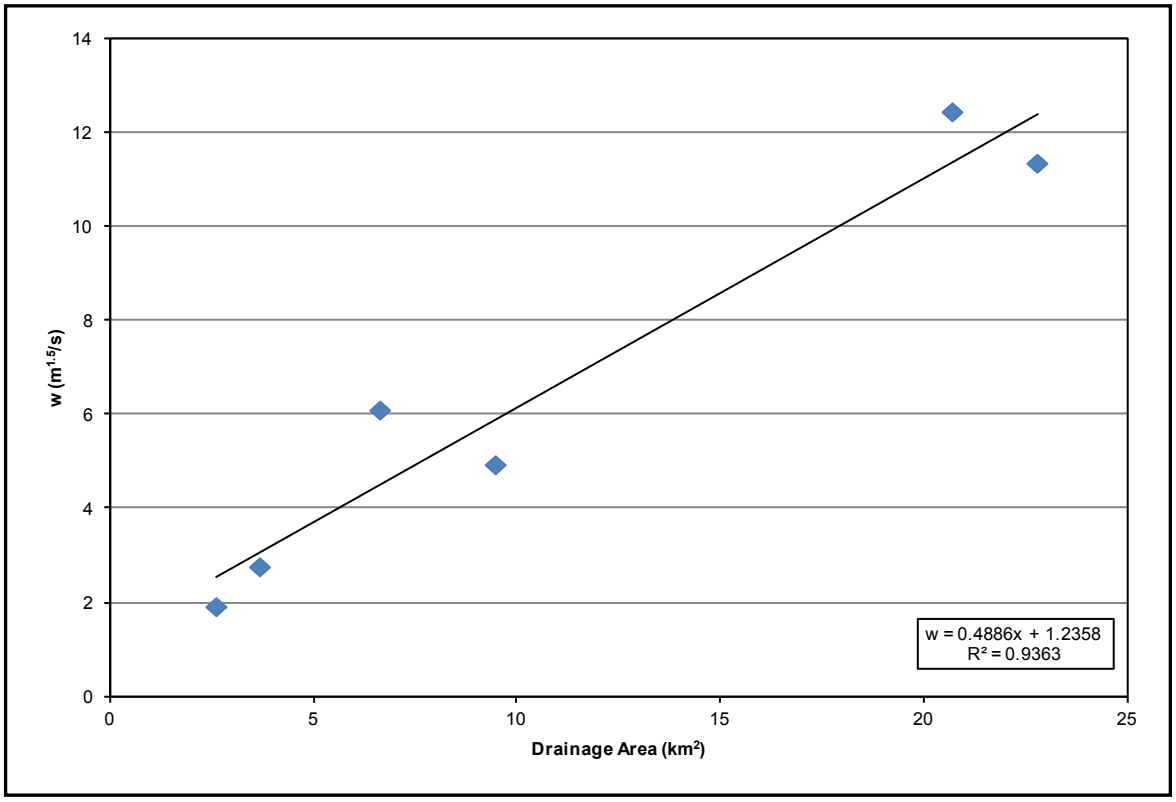



*Figure 7.3-B-4: Lake Outlet Rating Curve Coefficient (w) Relationship*

### 2.1.3 Lake Outlet Melt Period

During the end of May and the beginning of June, as temperatures rise above freezing and the cumulative degree-days increase, frozen lake outlets thaw and water begins to flow. During the early portion of the snowmelt season, ice effects have been observed to reduce the discharge to a fraction of the discharge that would be observed under ice-free conditions, for identical water surface elevations. As described in the following sections, a numerical relationship between lake outlet discharge and cumulative degree days was developed to account for ice effects in the melt period in hydrological modeling.

#### *2.1.3.1 Hydrometric and Meteorological Data*

Relevant observations were available during the outlet opening periods in 1999, 2000, and 2009 at Lake A1, Lake B2 and Lake B7. At the start of each open water season, lake outlets were visited to install hydrometric stations during the outlet opening period. Discharges were measured, and ice conditions were recorded. Annual hydrographs are also available for these years at these stations.

Daily photographs of lake outlets A1, B2, B7, and B4 were available from April to June 2009 to provide additional observations of ice conditions during spring melt (SD 7-1 2009 Aquatics Synthesis Baseline).

Additional observations were available at lake outlets A1, B2, B7 and B4 from April to June 2009 as daily photographs, and at lake outlets A6, A8, B2, B7, D1, D7, E1, E3, H1, H20, and CH6 in June 2011 (SD 7-2 2011 Aquatics Baseline).

Environment Canada climate station 2303401 was operated at the Rankin Inlet Airport with available data from 1981 to 2011. Reported hourly data allow determination of the daily minimum, maximum, and mean temperatures.

### 2.1.3.2 Method

A degree-day method was chosen to assess the effect of ice conditions on discharge at each lake outlet. Degree-days were added above a base temperature of 0°C, based on mean daily temperatures, which typically begin to exceed 0°C in late May.

The effect of the ice on discharge was quantified by the following ratio:

$$\text{Ice Effect Ratio} = Q_{actual} / Q_{predicted}$$

where $Q_{actual}$ = Discharge measured at the outlet under ice conditions; and
$Q_{predicted}$ = Discharge predicted using an open water rating curve for the specific outlet.

Opening of lake outlets is generally a rapid process. This is related to snowmelt runoff into the lake upstream of the outlet, as well as thaw of ice in the lake outlet. Flowing water provides additional thermal input and melted or saturated snow on the outlet channel surface lowers its albedo and increases absorption of solar energy, which further accelerates melt. The change in conditions from frozen solid to fully open was observed to typically occur up to a span of approximately one week. Lake outlets and borders are generally the first areas of open water during spring melt, while a floating ice cover may persist in the body of the lake for days or weeks after the outlet opens.

Logistical considerations during the field program meant that hydrographs were not acquired during the melt period, though observations of zero flow and fully open flow were available. Therefore, the analysis focused on identifying dates of zero flow (Ice Effect Ratio = 0) and fully open flow (Ice Effect Ratio = 1).

In the 1999 and 2000 datasets, there is some uncertainty in the cumulative degree-day values corresponding to these assigned values due to the limited number of visits at lake outlets in the early season. This uncertainty was addressed by assuming that the last day of zero flow at the site (Ice Effect Ratio = 0) was the last day that zero flow was observed (the actual date could have been any day between then and the first day of observed flow), and by assuming that the first day with no ice effects (Ice Effect Ratio = 1) was the day after the last day that any ice effects were observed (the actual date could have been any day between the last day of observed ice effects and the first day of observed ice-free conditions).

Cumulative degree-day and ice effect ratio data were examined. The melting process of each lake outlet was found to behave differently:

- in 1999, the last day of zero flow was common to all outlets;
- in 2000, the last day of zero flow was different at all outlets;
- in 2000, the first day without ice effects was common to all outlets;

- in 2000, the duration of the outlet opening period was approximately 15.1 degree days at Lake A1, 9.8 degree days at Lake B2, and 6.5 degree days at Lake B7;
- in 2009, the last day of zero flow at Lake A1 was observed later than in 2000 and 1999; and
- in 2009, the first day without ice effects was observed later than in 2000 at Lake A1.

Differences are possibly due to late winter ice characteristics, upstream flow conditions, and solar exposure.

### 2.1.3.3 Results and Discussion

Values of cumulative degree-days and the ice effect ratios were plotted to examine the observed relationships at each lake outlet. These data, featured in Table 7.3-B-3, Table 7.3-B-4, and Table 7.3-B-5 along with their source, were plotted together as shown in Figure 7.3-B-5. Observations from June 2011, available following the development of the baseline model, are presented in Table 7.3-B-6 for validation purposes.

Lake outlets A1 and B2 were fully opened on the same date in 2000. Lake outlets A1, B2, and B7 also shared a common date for snowmelt peaks in 2000 as shown by their hydrographs (AMEC 2000). Based on these data, it was assumed that in 2000 Lake Outlet B7 was fully opened on the same day as lake outlets A1 and B2.

Outlet openings began to melt later in 2000 and 2009 (dry years) than in 1999 (wet year). It was also noticed that outlet opening durations at Lake A1 were similar in 2000 and 2009 with respective durations of 15.1 and 15.6 degree-days. Based on these data, it was assumed that duration remained constant at all outlets for all years. The outlet openings were separated between dry and wet years, with data from 2000 representing the dry years and 1999 representing the wet years, as presented in Figure 7.3-B-6 and Figure 7.3-B-7.

**Table 7.3-B-3: Lake Outlet Ice Effect Ratios for Melt Period, 1999**

| Cumulative Degree-Days (°C•d) | Ice Effect Ratio | Source of Data |
|---|---|---|
| Lake A1 Outlet | | |
| 4.6 | 0.0 | Hydrograph |
| - | 1.0 | No observation available |
| Lake B2 Outlet | | |
| 4.6 | 0.0 | Hydrograph |
| - | 1.0 | No observation available |
| Lake B7 Outlet | | |
| 4.6 | 0.0 | Hydrograph |
| - | 1.0 | No observation available |

**Table 7.3-B-4: Lake Outlet Ice Effect Ratios for Melt Period, 2000**

| Cumulative Degree-Days (°C•d) | Ice Effect Ratio | Source of Data |
|---|---|---|
| Lake A1 Outlet | | |
| 6.6 | 0.0 | Hydrograph + photos |
| 21.7 | 1.0 | Hydrograph + photos |
| Lake B2 Outlet | | |
| 11.9 | 0.0 | Hydrograph |
| 21.7 | 1.0 | Hydrograph |
| Lake B7 Outlet | | |
| 15.2 | 0.0 | Hydrograph + photos |
| 21.7 | 1.0 | Assumed based on other stations |

**Table 7.3-B-5: Lake Outlet Ice Effect Ratios for Melt Period, 2009**

| Cumulative Degree-Days (°C•d) | Ice Effect Ratio | Source of Data |
|---|---|---|
| Lake A1 Outlet | | |
| 8.4 | 0.0 | Daily photos |
| 24 | 1.0 | Daily photos |

**Table 7.3-B-6: Observations of Lake Outlets, June 2011**

| Lake | Cumulative Degree-Days (°C•d) | Observation |
|---|---|---|
| A6 | 21.4 | Fully open |
| A8 | 19.3 | Fully open, several days prior to visit |
| B2 | 19.3 | Almost fully open |
| B6 | 19.3 | Fully open |
| B7 | 21.4 | Fully open, several days prior to visit |
| D1 | 17.7 | Fully open |
| D7 | 19.3 | Fully open, several days prior to visit |
| E1 | 17.7 | Fully open |
| E3 | 19.3 | Fully open |
| H1 | 21.4 | Fully open |
| H20 | 21.4 | Fully open |
| CH6 | 19.3 | Fully open |

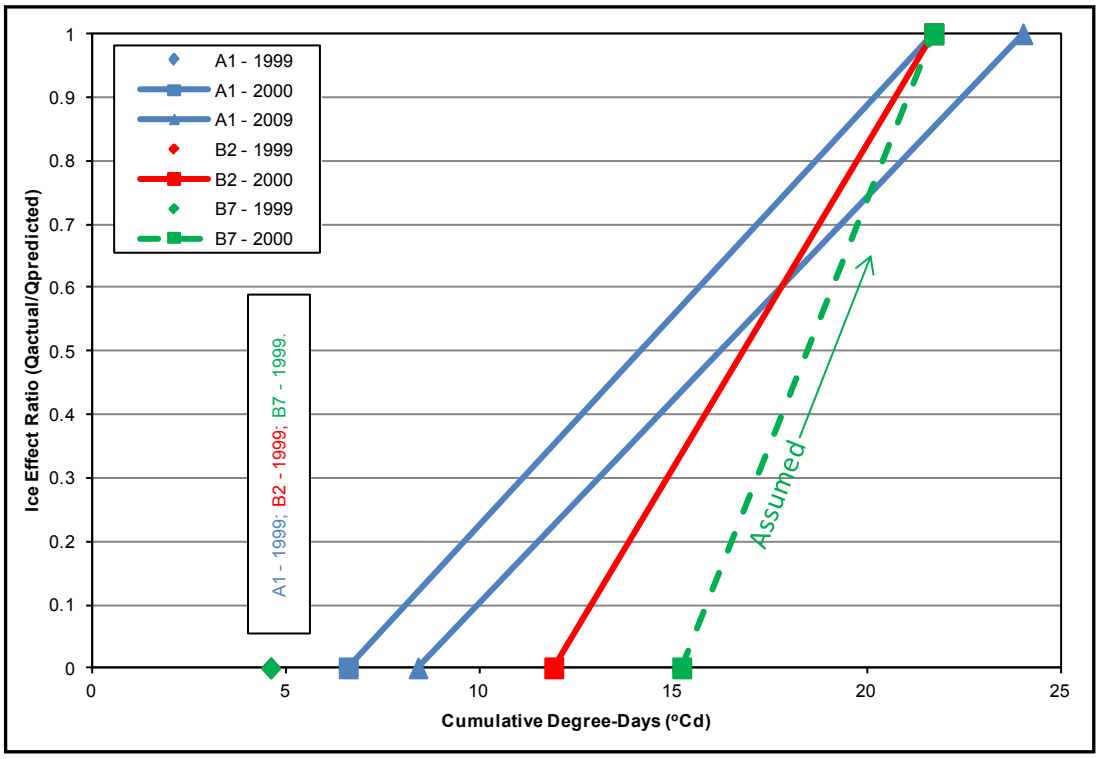



*Figure 7.3-B-5: Melt Period Ice Effect Ratios and Cumulative Degree-Days at the Peninsula Lake Outlets*

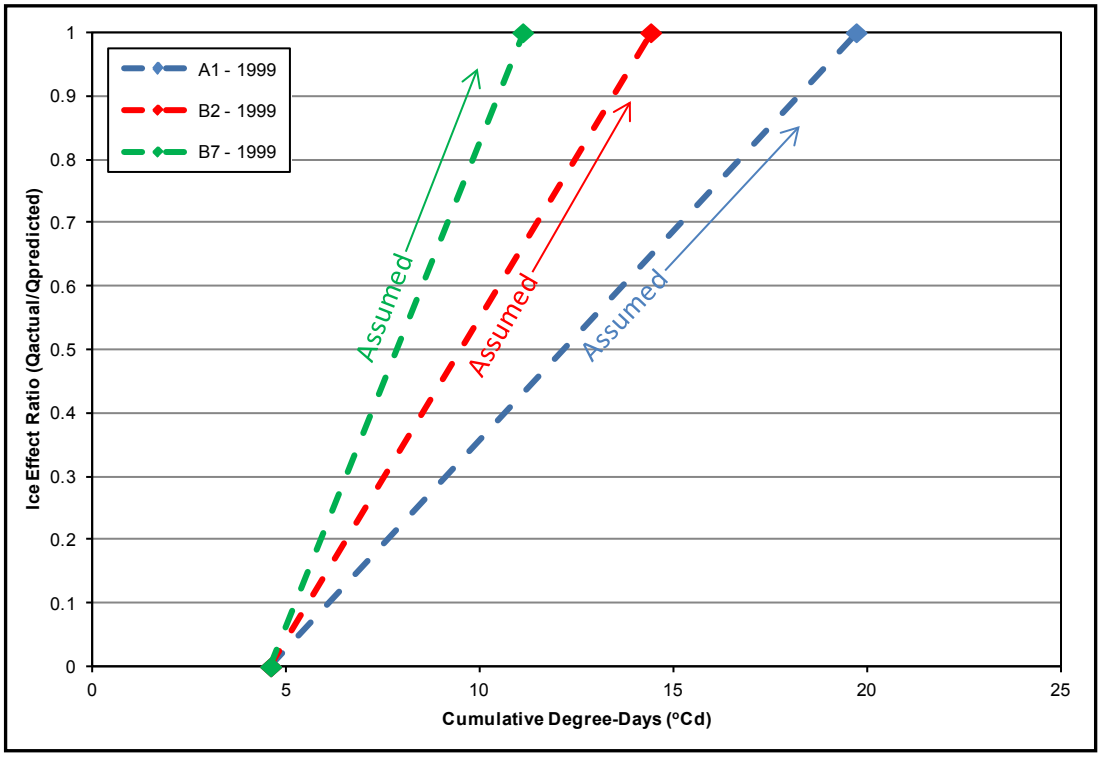



*Figure 7.3-B-6: Melt Period Ice Effect Ratios and Cumulative Degree-Days at the Peninsula Lake Outlets, 1999*

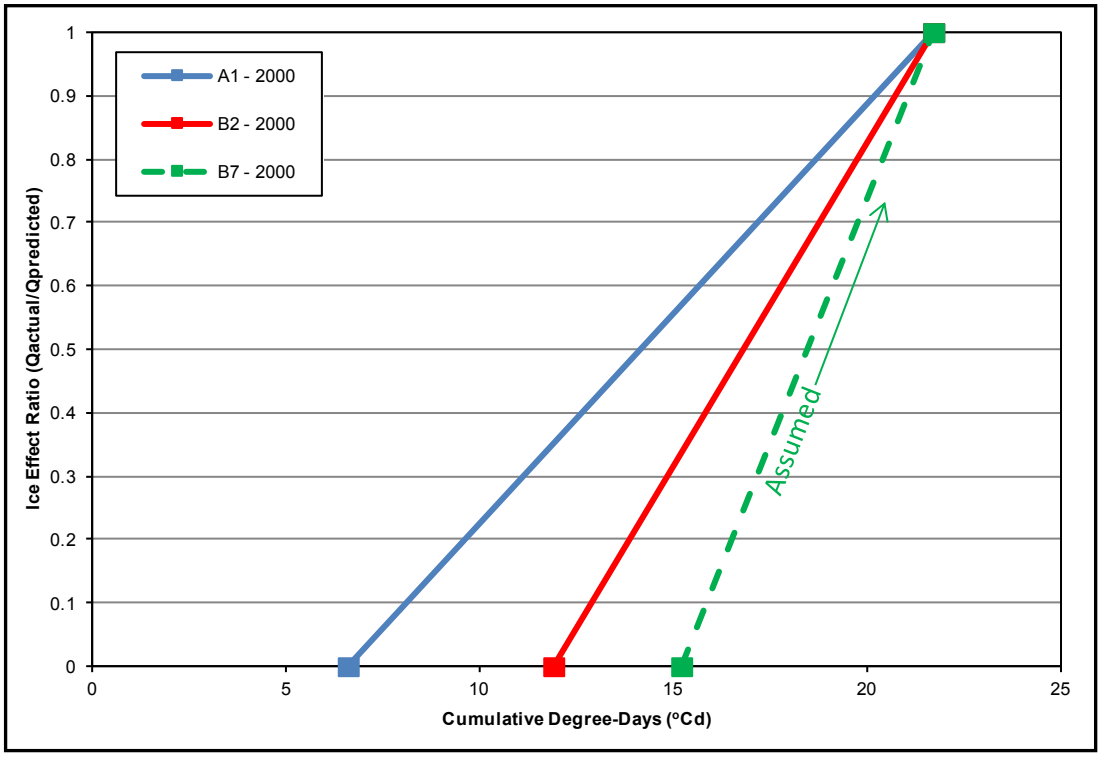



*Figure 7.3-B-7: Melt Period Ice Effect Ratios and Cumulative Degree-Days at the Peninsula Lake Outlets, 2000*

Data from the daily photographs at outlets B2, B4, and B7 in 2009 were not reliable and were discarded from the analysis. The photographs were not clear enough to accurately estimate outlet opening dates.

Based on available data, outlet openings of Lakes A1, B2 and B7 were treated separately. Outlet openings of other lakes modeled were based on derived outlet opening parameters of Lakes A1, B2, and B7 using observations from June 2011 (dry year) and adjusted during the calibration stage of the model. Outlet openings for other lakes modeled without observations were based on Lake B7. In 2011, the outlet of Lake B7 was estimated to be fully open several days prior to the field visit (i.e., well prior to 21.4 °C•d, as presented in Table 7.3-B-6) based on observations, consistent with estimated outlet opening parameters for wet years and inconsistent with estimated outlet opening parameters of dry years. As such, outlet opening parameters for dry years were adjusted to match those estimated for wet years.

Table 7.3-B-7 and Table 7.3-B-8 present the results of the analysis. Durations vary from 6.5 °C•d for the outlet of Lake B7 (approximately equivalent to 4 days in 2000) to 15.1 °C•d for the outlet of Lake A1 (approximately equivalent to seven days in 2000). These relationships were used in the water balance modeling to incorporate ice effects at lake outlets, which control the timing of the snowmelt peaks and in turn affect their magnitudes.

Relationships presented in Figure 7.3-B-6 were used to estimate the opening of lake outlets for wet years and relationships presented in Figure 7.3-B-7 were used to estimate the opening of lake outlets for dry years (with the exception of Lake B7, for which parameters were not estimated to change from wet years). Outlet opening parameters of all modeled lakes were based on derived parameters of Lakes A1, B2 and B7, and are presented in Table 7.3-B-9. Collection of additional data from future monitoring programs is, however, recommended to improve this estimate.

**Table 7.3-B-7: Derived Lake Outlet Ice Effect Ratios for Melt Period, Wet Years**

| Cumulative Degree-Days (°C•d) | Ice Effect Ratio |
|---|---|
| Lake A1 Outlet | |
| 4.6 | 0.0 |
| 19.7 | 1.0 |
| Lake B2 Outlet | |
| 4.6 | 0.0 |
| 14.4 | 1.0 |
| Lake B7 Outlet | |
| 4.6 | 0.0 |
| 11.1 | 1.0 |

**Table 7.3-B-8: Lake Outlet Ice Effect Ratios for Melt Period, Dry Years**

| Cumulative Degree-Days (°C•d) | Ice Effect Ratio |
|---|---|
| Lake A1 Outlet | |
| 6.6 | 0.0 |
| 21.7 | 1.0 |
| Lake B2 Outlet | |
| 11.9 | 0.0 |
| 21.7 | 1.0 |
| Lake B7 Outlet | |
| 4.6 | 0.0 |
| 11.1 | 1.0 |

**Table 7.3-B-9: Model Outlet Opening Parameters for All Modeled Lakes**

| Lake | Basis for Parameters |
|---|---|
| A1 | A1 |
| A6 | A1 |
| A8 | B7 |
| B2 | B2 |
| B4_B45 | B7 |
| B5 | B7 |
| B6 | B7 |
| B7 | B7 |
| B52 | B7 |
| B53 | B7 |
| B69 | B7 |
| C5 | B7 |
| C6 | B7 |
| C7 | B7 |
| C10 | B7 |
| D1 | A1 |
| D2 | A1 |
| D3 | A1 |
| D4_D5 | A1 |
| D6 | A1 |
| D7 | A1 |
| D12 | A1 |
| D35 | A1 |
| D36 | A1 |
| E1 | B7 |
| E2 | B7 |
| E3 | B7 |
| E4 | B7 |
| E6 | B7 |
| G1 | B7 |
| G2 | B7 |
| H1 | B7 (modified based on model calibration) |
| H17 | B7 |
| H19 | B7 |
| H20 | B7 |
| I1 | B7 |
| J1 | B7 |
| J2 | B7 |
| J3 | B7 |
| J6 | B7 |
| J7 | B7 |
| J8 | B7 |
| P2 | B7 |
| CH1 | A1 |
| CH5 | A1 |
| CH6 | A1 |
| CH10 | A1 |
| Meliadine | A1 |

### 2.1.4 Lake Outlet Freeze-Up Period

During the beginning of September, as temperatures fall and the cumulative negative degree-days increase, lake outlets freeze and discharge decreases to zero for small lakes. During the late portion of the open water season, ice effects have been observed to reduce the discharge to a fraction of the discharge that would be observed under ice-free conditions. As described in the following sections, a numerical relationship between lake outlet discharge and cumulative degree days was developed to account for ice effects in the freezing period in water balance modeling.

#### *2.1.4.1 Hydrometric and Meteorological Data*

Ice observations were available at the Peninsula Lakes in 1997, and at Lake A54 and at Meliadine River in mid-September 2008.

Lake outlet freeze-up date estimates were available for the Peninsula Lakes in 1998, 1999 (AEE 1998b, 1999), and in 2000 (AMEC 2000). Environment Canada climate station 2303401 was operated at the Rankin Inlet Airport with available data from 1981 to 2011. Reported hourly data allow determination of the daily minimum, maximum, and mean temperatures.

#### *2.1.4.2 Method*

A degree-day method was chosen to assess the effect of ice conditions on discharge at each lake outlet. Negative degree-days were added below a base temperature of 0°C based on daily mean temperatures, which typically begin to fall below 0°C in September.

A graphical approach was selected for the analysis by plotting ice observations as a function of cumulative degree-days. A corresponding cumulative degree-day value was assigned to the first day of ice observation, indicating the first day of freeze-up (Ice Effect Ratio = 1). A corresponding cumulative degree-day value was assigned to the estimated date of permanent frozen conditions (Ice Effect Ratio = 0), as reported by AEE (1998, 1999) and AMEC (2000).

The effect of the ice on discharge was quantified by the following ratio:

$$\text{Ice Effect Ratio} = Q_{actual} / Q_{predicted}$$

Where $Q_{actual}$ = Discharge measured at the outlet under ice conditions; and
$Q_{predicted}$ = Discharge predicted using an open water rating curve for the specific outlet.

Flows during the freeze-up period are assumed to be smaller than the discharge predicted using an open water rating curve, resulting in ice effect ratios varying between 0 and 1. Values of 0 indicate the first day of complete freeze up of the outlet, and values of 1 indicate the last day of open water conditions.

Curves were fitted to the cumulative degree-day vs. ice effect ratio data to examine the relationships.

### 2.1.4.3 Results and Discussion

All observations at the Project area were plotted as a function of degree-days and are presented in Table 7.3-B-10 and Figure 7.3-B-8.

**Table 7.3-B-10: Ice Observations at the Project Area**

| Cumulative Degree-Days (°C•d) | Corresponding Ice Effect Ratio | Notes |
|---|---|---|
| -0.7 | 1.0 | Thin ice cover on Lake A54. |
| -1.4 | 1.0 | Ice on banks of the Meliadine River near Rankin. |
| -5.6 | 0.0 | 1997 report. Frozen outlets observed at the end of September. |
| -76.5 | 0.0 | 1998 report. Estimated at the end of October. |
| -152.7 | 0.0 | 1999 report. Estimated at the end of October. |
| -202.5 | 0.0 | 2000 report. Estimated at the end of October. |

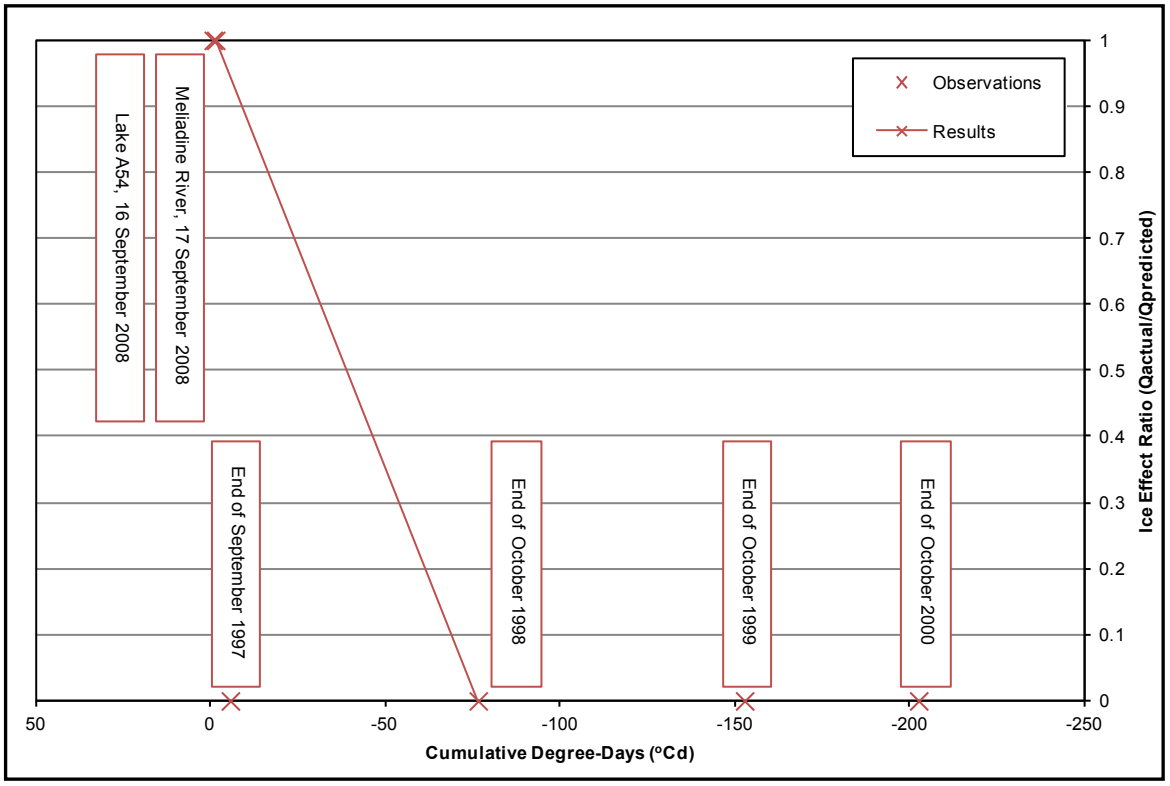



*Figure 7.3-B-8: Freeze-up Period Ice Effect Ratios and Cumulative Degree-Days*

The first day of freeze up was estimated using ice observations at the Meliadine River in early September 2008. Based on the available data, the recorded observation at the Meliadine River was used to estimate the first day of freeze-up. It is thought that Lake A54 would start freezing slightly earlier than most other lake outlets in the Project area.

Earlier studies (AEE 1998b, 1999; AMEC 2000) estimated the complete freeze-up date at the end of October. The smallest degree-day value associated with these dates was picked to represent the complete freeze-up date in the model. Lake outlet freeze-up occurred unexpectedly early in 1997 (AEE 1998a) possibly due to an unusually dry year, and therefore was treated as an outlier.

These results are presented in Table 7.3-B-11. The relationship presented in Figure 7.3-B-8 is used in the water balance modeling to incorporate ice effects at all lake outlets.

**Table 7.3-B-11: Derived Lake Outlet Ice Effect Ratios for Melt Period**

| Cumulative Degree-Days ($^{o}$C•d) | Ice Effect Ratio |
|---|---|
| -1.4 | 1.0 |
| -76.5 | 0.0 |

## 2.1.5 Snowmelt

During the snowmelt period, which typically occurs in the month of June, runoff flows, water levels and discharges rise to a peak. The following sections describe the method used to quantify snowmelt runoff in hydrological modeling.

### *2.1.5.1 Hydrometric and Meteorological Data*

Hydrometric data were available in watersheds A, B, D, E, H, and CH from field programs conducted between 1997 and 2011, including water levels and corresponding discharges for the open water season.

Spring snow water equivalent data were available from 1997, 1998, 1999, 2000, 2008 and 2009 from snow course surveys.

Environment Canada climate station 2303401 was operated at the Rankin Inlet Airport with available data from 1981 to 2011. Available data include daily minimum, maximum, and average temperature, rainfall runoff, and derived lake evaporation.

### *2.1.5.2 Method*

A water balance method was selected to estimate the snowmelt runoff parameters. The snowmelt runoff was quantified using the following equation:

$$\text{Daily Snowmelt Runoff} = R_{cs} \times M_f \times (T - T_b)$$

Where $R_{cs}$= Snowmelt runoff coefficient (dimensionless);

$M_f$ = Melt factor (mm/°C);

$T$ = Mean daily air temperature (°C); and

$T_b$ = Base temperature (°C).

A water balance model for each watershed was set up as illustrated in Figure 7.3-B-9.

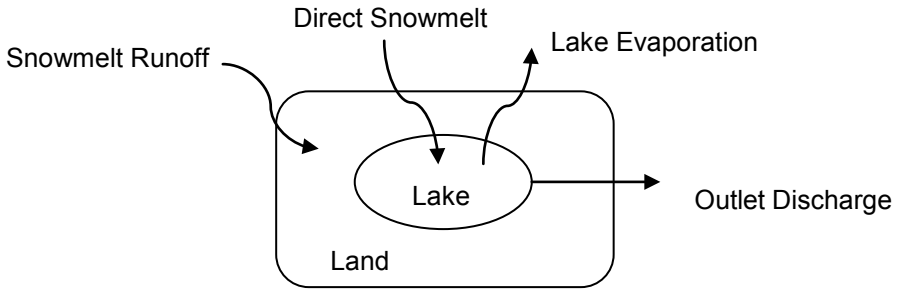



*Figure 7.3-B-9: Schematic Diagram for Snowmelt Water Balance Analysis*

The water balance for each watershed considered snowmelt runoff (snowfall runoff on land), direct snowmelt (snowfall runoff on lake), lake evaporation, lake outlet discharge (based lake outlet rating curves), and the lake outlet opening during the melt period.

During the calibration, the model was run on a daily time step using a trial and error method to estimate each parameter contributing to the snowmelt runoff ($M_f$, $T_b$ and $R_{cs}$). Simulated and measured hydrographs were plotted for comparison, and parameters were adjusted accordingly to fit the measured hydrographs.

For accurate results, the model must be calibrated using datasets with minimal rainfall events prior to the snowmelt runoff and a well defined snowmelt peak. In order to avoid flow routing effects, only stations without upstream lake storage are applicable. As such, Lake B7 is the only station meeting this criterion. Datasets from years 1998, 2008 and 2009 were discarded from the analysis due to late field measurements, missing the snowmelt peaks. Hydrometric data from years 1999 and 2011 were also discarded due to high rain events prior to the snowmelt. Year 2000 was a dry year with very little rain before the snowmelt, with good quality data, and therefore was chosen for the analysis.

### 2.1.5.3 Results and Discussion

The 2000 Lake B7 hydrograph was analyzed. The simulated hydrographs (i.e., water balance results) was plotted with the measured hydrograph for comparison, and the following observations were noted:

- the melt factor, $M_f$, affects the duration of the snowmelt peak;
- the base temperature, $T_b$, shifts the snowmelt curve in time and affects the magnitude of the peak; and
- the runoff coefficient, $R_{cs}$, affects the magnitude of the peak.

Simulated and measured hydrographs using the snowmelt parameters that were adopted are presented in Figure 7.3-B-10.

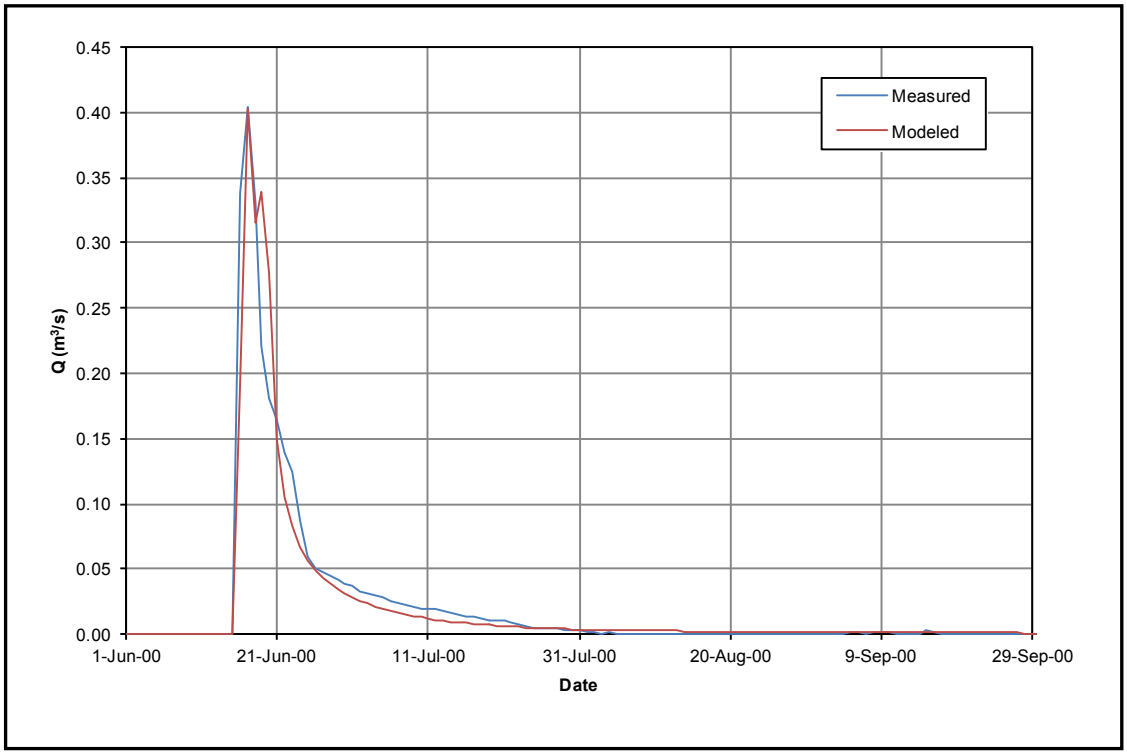



*Figure 7.3-B-10: Measured and Modeled Snowmelt Hydrographs at Lake B7, 2000*

The model assumes a uniform snow depth throughout the watershed. This induces some uncertainty due to snow quantity variations for all watersheds. In actuality, the snowfall value that is measured by the climate station and used in the model may be different than the snow accumulated in individual watersheds due to areal differences in snow redistribution. This results in an overestimated duration of the modeled snowmelt peak runoff when the actual amount of snow in the watershed is less than that modeled, and an underestimated duration when the actual amount of snow is greater than that modeled. However, the modeled hydrograph matches the maximum measured Lake B7 snowmelt discharge in 2000 and reasonably represents the snow peak width.

The parameters that define the snowmelt runoff are presented in Table 7.3-B-12. These parameters are thought to represent the general conditions at the Project area and were used in the hydrological modeling to incorporate snowmelt runoff in the water balance for all watersheds. These parameters were calibrated based on one lake from one watershed, and the quality of calibration is further evaluated in the validation section provided below in this appendix.

**Table 7.3-B-12: Derived Snowmelt Parameters**

| Parameter | Value |
|---|---|
| $R_{cs}$ | 0.7 |
| $M_f$ | 1.5 mm/°C |
| $T_b$ | -4.0°C |

## 2.2 Model Calibration and Validation

The model structure described in Section 2.0 of this document includes calibrated sub-models for lake outlet melt, lake outlet freeze-up, and snowmelt, with consideration of watershed physical characteristics (land and lake areas; lake outlet stage-discharge rating curves). Additional calibration was required to define the runoff coefficient for rainfall to account for losses to vegetation interception or soil infiltration, leading to evapotranspiration and evaporation, which do not contribute to the basin's runoff. This calibration also accounts for the area-elevation-storage relationship which was not considered in the model (i.e., the model assumes a vertical shoreline, with no change in area resulting from water level fluctuations).

### 2.2.1 Model

Hydrometric data including water levels and corresponding discharges for the open water season were available from 1997 to 2011 for lakes presented in Table 7.3-B-13 below.

Spring snow water equivalent data were available from 1997 to 2000 and 2008 to 2009 from snow course surveys.

A meteorology station was operated at the Rankin Inlet airport from 1981 to 2011. Available data include daily minimum, maximum, and mean temperatures, rainfall runoff, and derived lake evaporation.

**Table 7.3-B-13: Available Hydrometric Data**

| Lake | Years with Available Data (Continuous (C), Manual (M), None (blank)) | | | | | | | Period of Record (Years) |
|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2008 | 2009 | 2011 | |
| A1 | C | C | C | C | C | C | | 6 |
| A6 | C | C | | | | | | 2 |
| A8 | | | | | C | M | M | 3 |
| B2 | | C | C | C | | C | M | 5 |
| B4 | C | C | | | | | | 2 |
| B5 | | C | | | | | | 1 |
| B6 | | | | | | | C | 1 |
| B7 | | C | C | C | C | C | | 5 |
| D1 | | | | | | C | C | 2 |
| D5 | C | C | | | | | | 2 |
| D7 | | | | | | | M | 1 |
| E1 | | | | | | | C | 1 |
| E4 | | | | | | | M | 1 |
| H1 | | | | | | | C | 1 |
| H20 | | | | | | | M | 1 |
| CH6 | | | | | | C | M | 2 |
| Meliadine[a] | C | C | C | | | | | 3 |

Note: a= data available at both West and Main outlets.

### 2.2.2 Model Calibration and Validation

For best results, the model must be calibrated using datasets with well defined snow peaks and frequent rainfall events. Hydrometric data from years 1997, 1998, 2008 and 2009 were not considered in the calibration due to late measurements, missing the snowmelt peaks (data were available at Lake B2 in 2009 but were insufficient to use the whole year for calibration). Year 2000 was a dry hydrological year with little rainfall and was also not

considered in the calibration. Year 1999 was a wet year with good quality data, and was therefore chosen for the calibration.

For best results, the model must also be validated using complete annual datasets (including snowcourse, meteorological and hydrometric data for the complete hydrological year). Since most datasets collected during past baseline studies have some data gaps, the model was validated using all available data.

#### 2.2.2.1 Method

The water balance was set up using the configuration for each watershed as described in Figure 7.3-B-11.

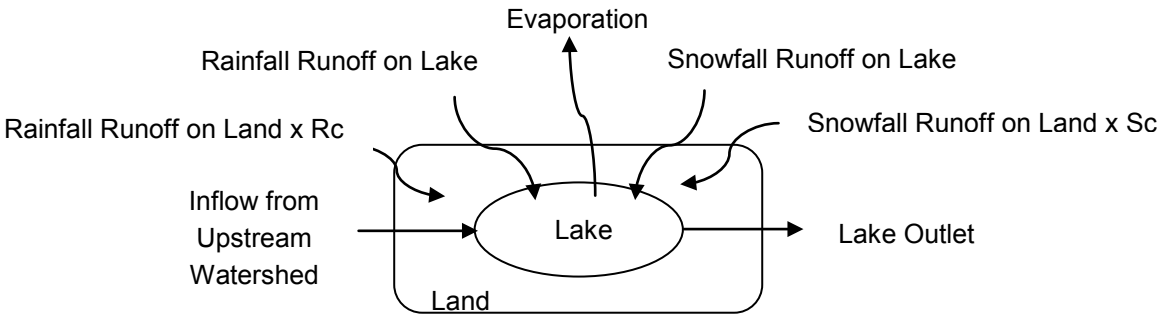



*Figure 7.3-B-11: Schematic of Water Balance Model Components*

$R_c$ is a runoff coefficient applied to rainfall runoff to account for evapotranspiration and evaporation that occurs in local storage. Sc is a snowmelt coefficient applied to snowmelt runoff to account for sublimation. For rainfall and snowfall on lakes, these coefficients were set to 1.0. Rainfall and snowfall input were based on available precipitation data from the Environment Canada climate station 2303401 at the Rankin Inlet Airport. The outlet discharges were modeled using applicable lake outlet rating curves (Section 2.1.2.2 of this document), in conjunction with the lake outlet melt, lake outlet freeze-up and snowmelt runoff sub-models, previously described. A detailed diagram of this process is provided in Figure 7.3-B-2.

The calibration process was performed as follows:

- ***Calibration:*** The model was set up, as shown in Figure 7.3-B-11 above, on a daily time step for the year 1999. The runoff coefficient was calibrated using a trial and error method with an initial value of 1 and was reduced in increments of 0.05 to examine the model response. The modeled outlet discharges and water levels were plotted, along with the measured data for comparison, and the runoff coefficient was adjusted to best match modeled and measured hydrographs.
- ***Validation:*** The model was validated using all available datasets, climate input for each corresponding year and calibrated parameters from previous stages. Resulting hydrographs were plotted along with measured hydrographs for comparison.

### 2.2.3 Results and Discussion

All years were analysed using common parameters. Model results were plotted against measured data for comparison.

## Calibration

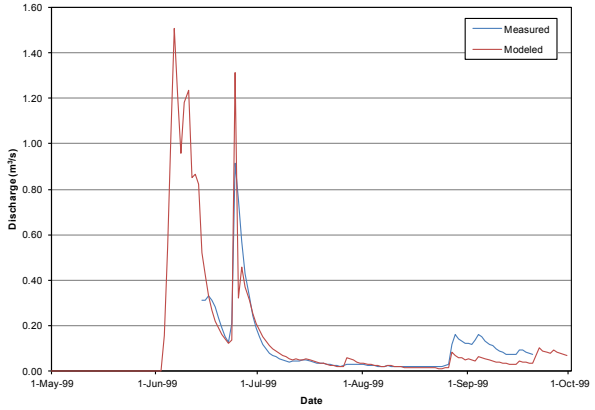



Figure 7.3-B-12: Lake A1 – 1999 – Discharge

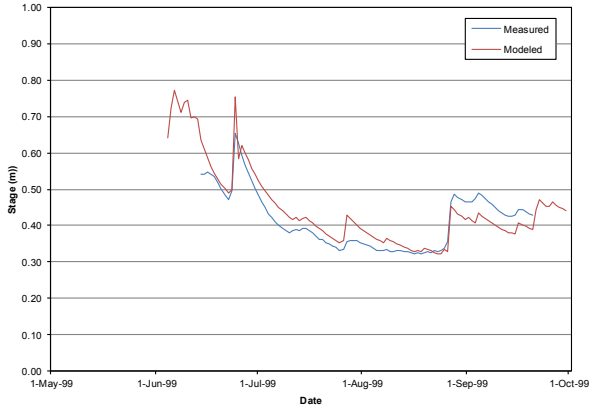



Figure 7.3-B-13: Lake A1 – 1999 – Stage

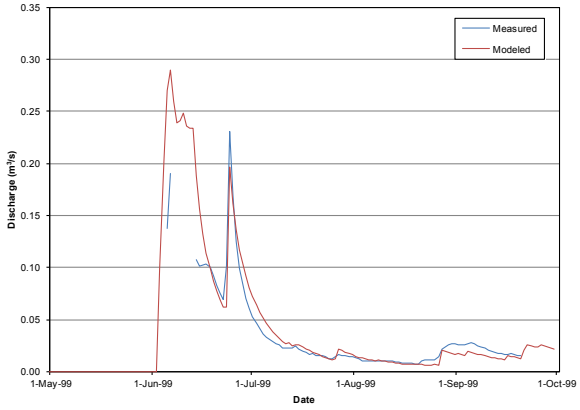



Figure 7.3-B-14: Lake B7 – 1999 – Discharge

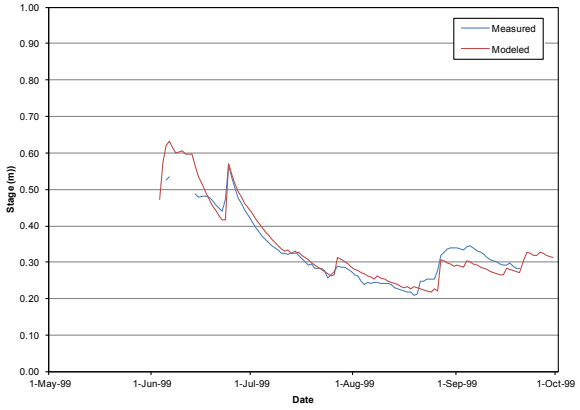



Figure 7.3-B-15: Lake B7 – 1999 – Stage

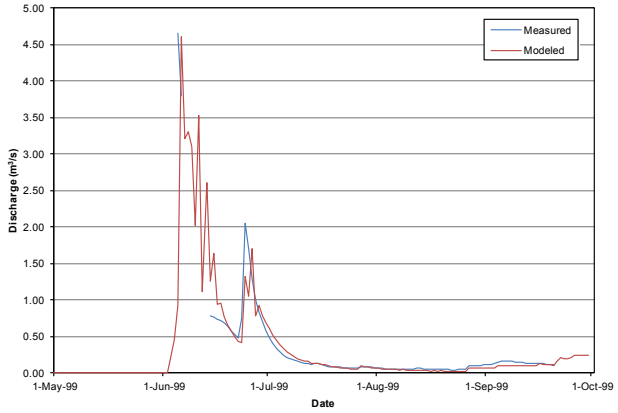



Figure 7.3-B-16: Lake B2 – 1999 – Discharge

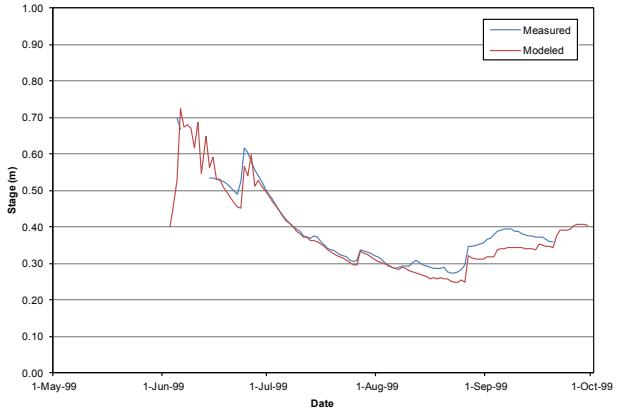



Figure 7.3-B-17: Lake B2 – 1999 – Stage

## Validation

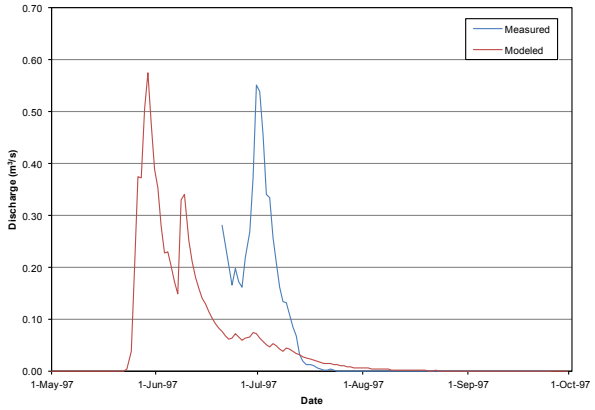



Figure 7.3-B-18: Lake A1 – 1997 – Discharge

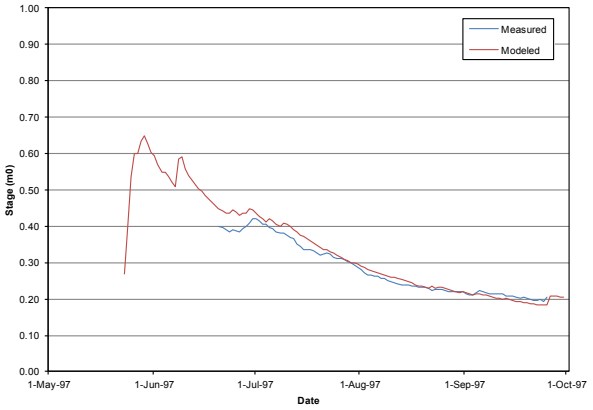



Figure 7.3-B-19: Lake A1 – 1997 – Stage

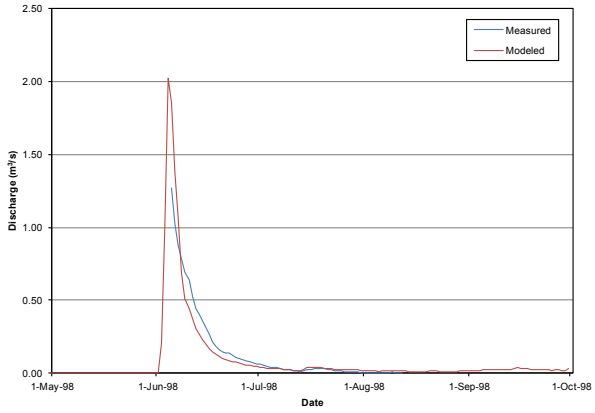



Figure 7.3-B-20: Lake A1 – 1998 – Discharge

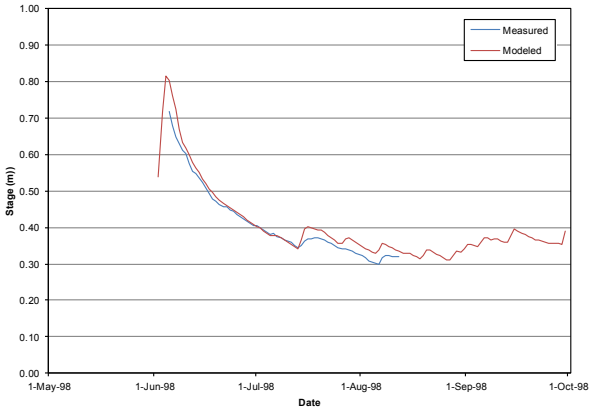



Figure 7.3-B-21: Lake A1 – 1998 – Stage

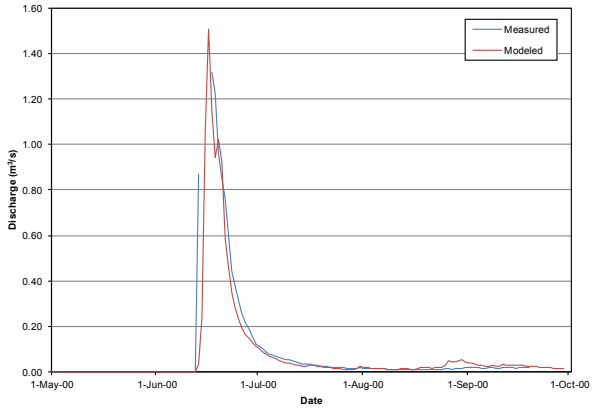



Figure 7.3-B-22: Lake A1 – 2000 – Discharge

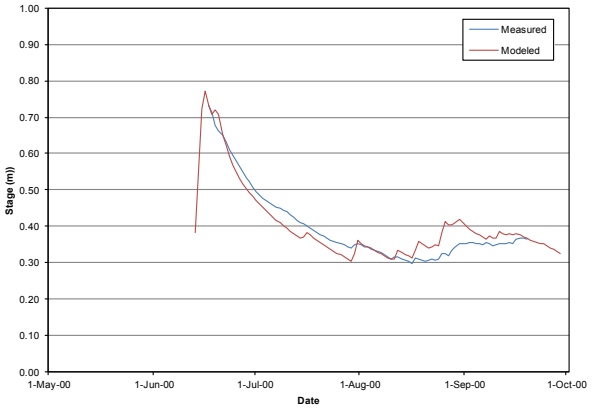



Figure 7.3-B-23: Lake A1 – 2000 – Stage

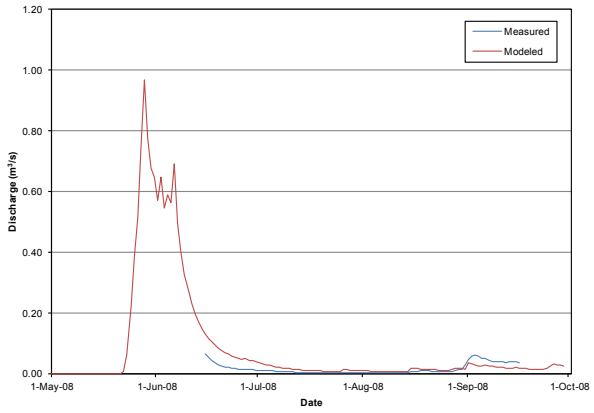



*Figure 7.3-B-24: Lake A1 – 2008 – Discharge*

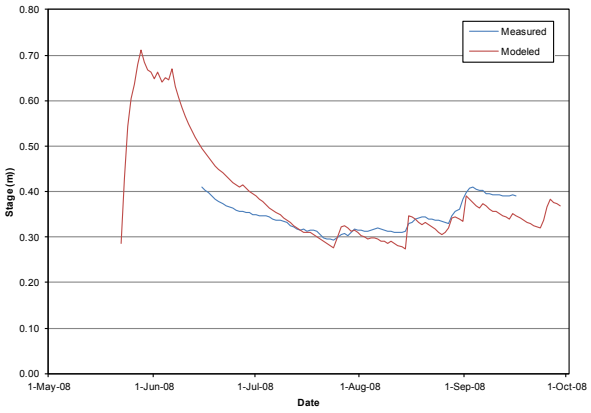



*Figure 7.3-B-25: Lake A1 – 2008 – Stage*

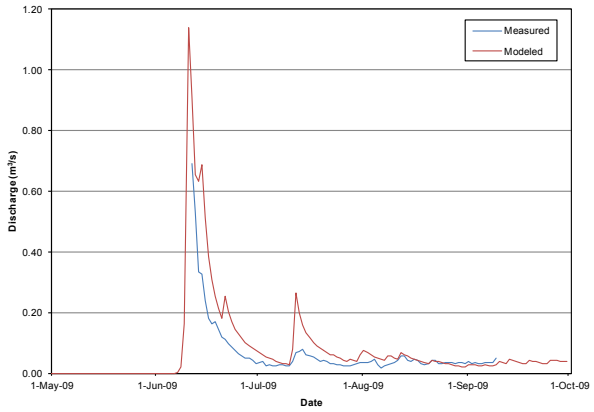



*Figure 7.3-B-26: Lake A1 – 2009 – Discharge*

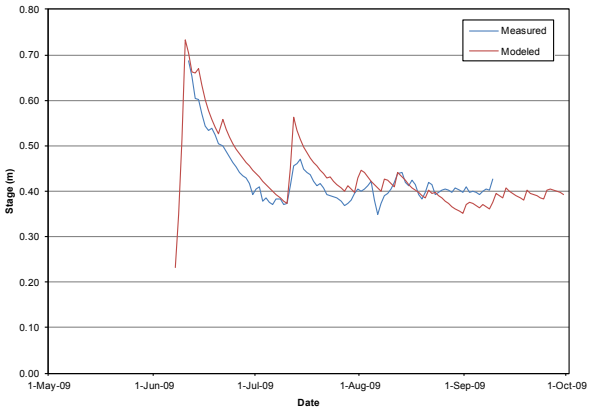



*Figure 7.3-B-27: Lake A1 – 2009 – Stage*

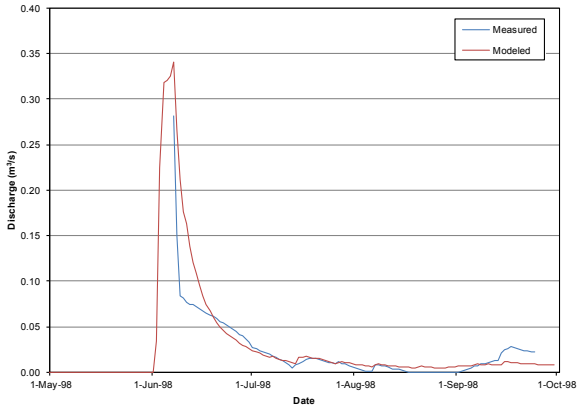



*Figure 7.3-B-28: Lake B7 – 1998 – Discharge*

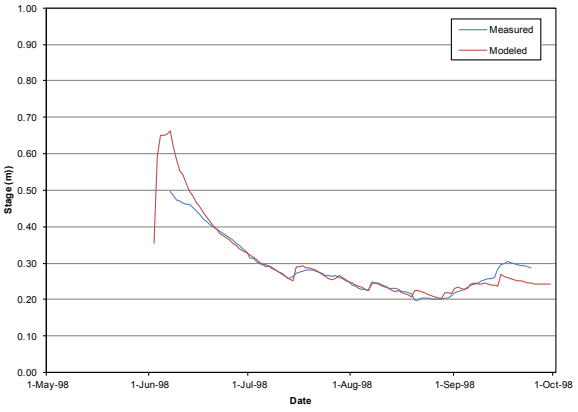



*Figure 7.3-B-29: Lake B7 – 1998 – Stage*

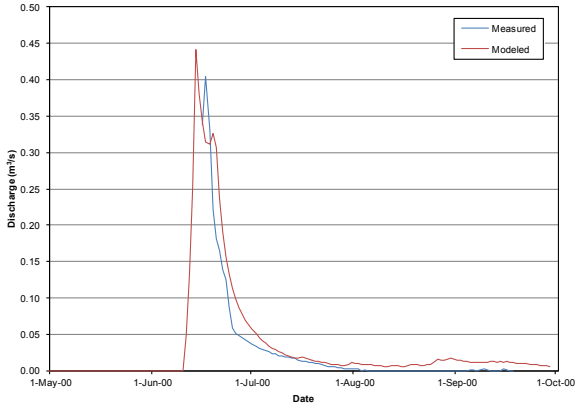



*Figure 7.3-B-30: Lake B7 – 2000 – Discharge*

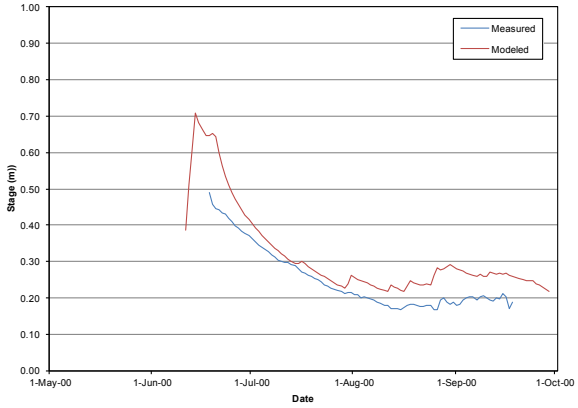



*Figure 7.3-B-31: Lake B7 – 2000 – Stage*

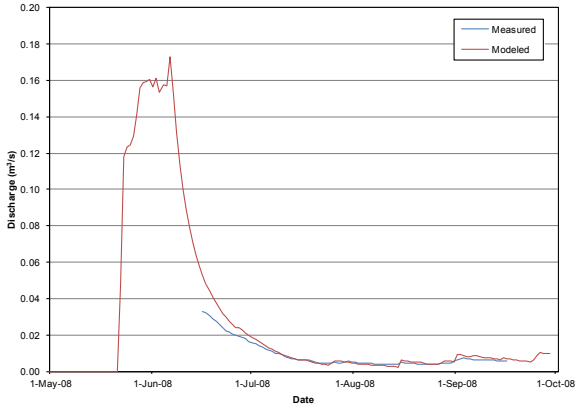



*Figure 7.3-B-32: Lake B7 – 2008 – Discharge*

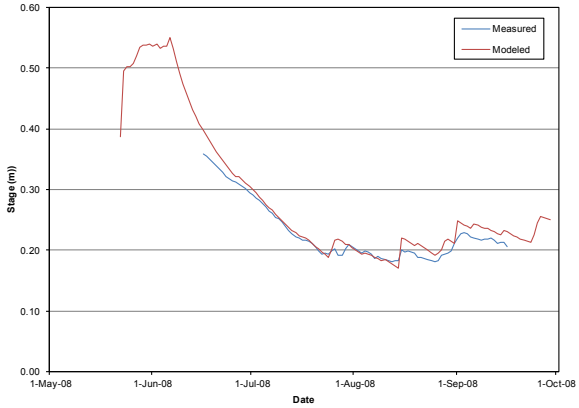



*Figure 7.3-B-33: Lake B7 – 2008 – Stage*

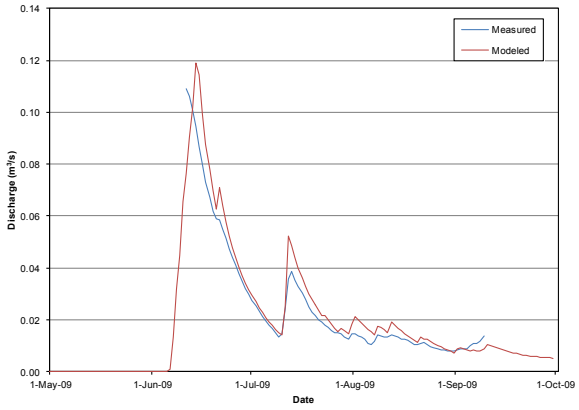



*Figure 7.3-B-34: Lake B7 – 2009 – Discharge*

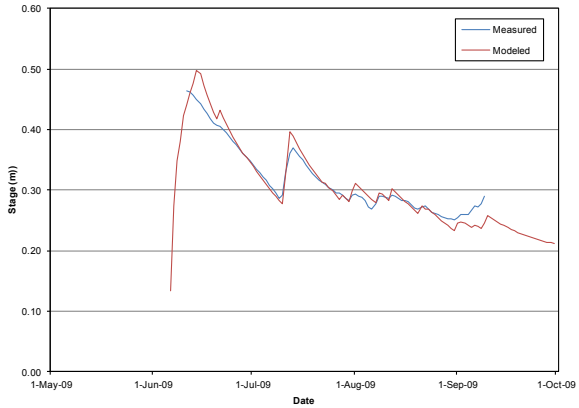



*Figure 7.3-B-35: Lake B7 – 2009 – Stage*

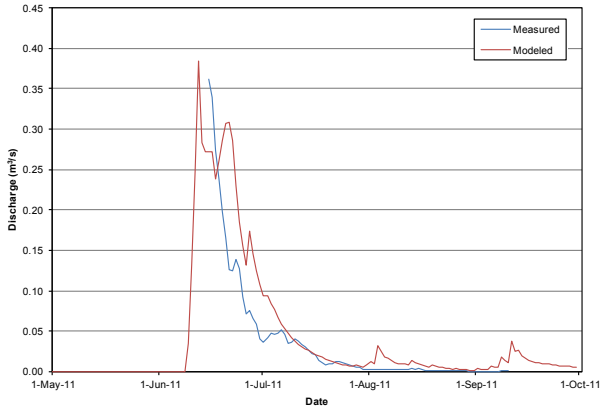



*Figure 7.3-B-36: Lake B6 – 2011 – Discharge*

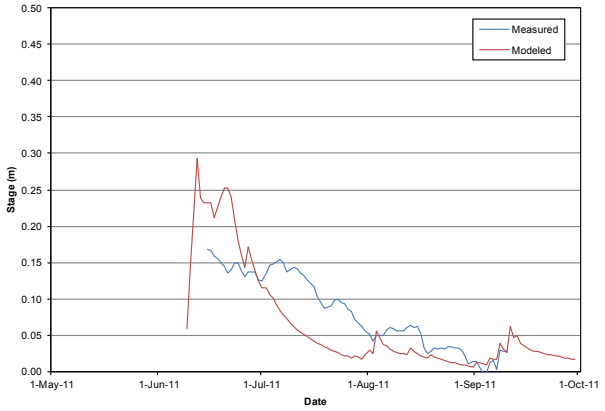



*Figure 7.3-B-37: Lake B6 – 2011 – Stage*

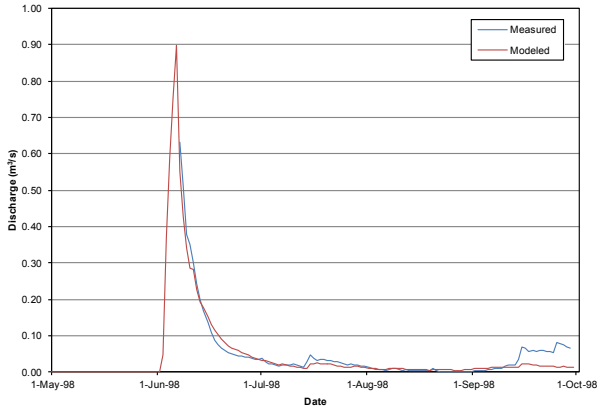



*Figure 7.3-B-38: Lake B5 – 1998 – Discharge*

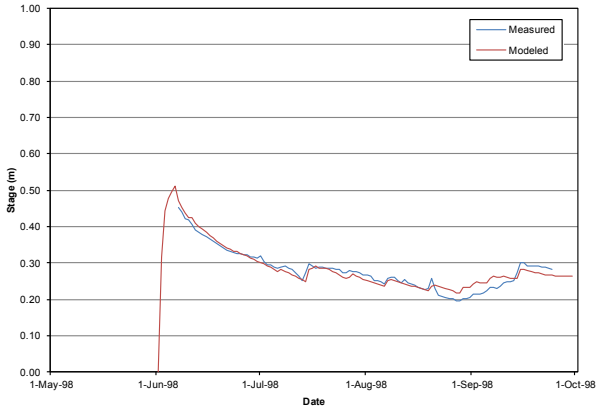



*Figure 7.3-B-39: Lake B5 – 1998 – Stage*

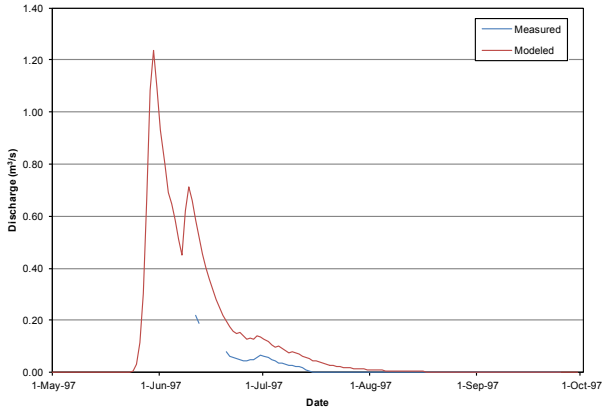



*Figure 7.3-B-40: Lake B4 – 1997 – Discharge*

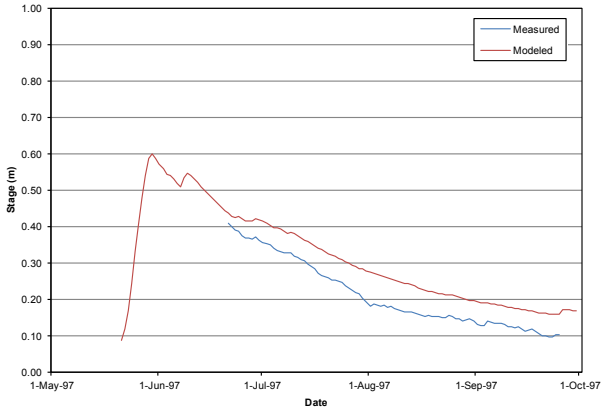



*Figure 7.3-B-41: Lake B4 – 1997 – Stage*

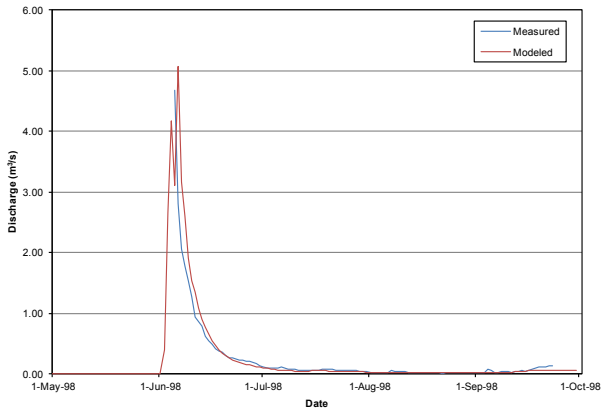



*Figure 7.3-B-42: Lake B4 – 1998 – Discharge*

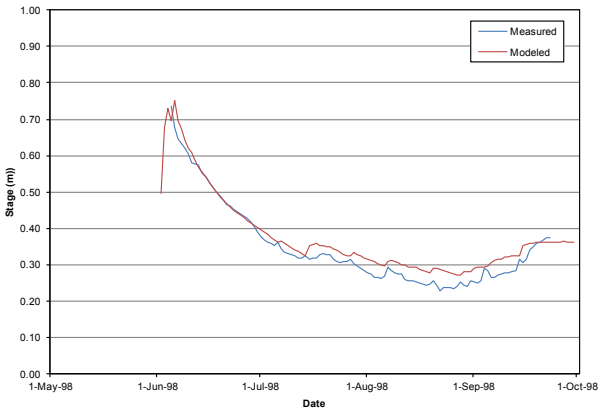



*Figure 7.3-B-43: Lake B4 – 1998 – Stage*

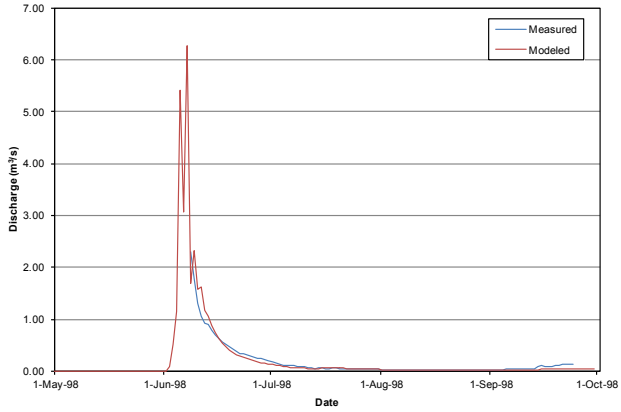



*Figure 7.3-B-44: Lake B2 – 1998 – Discharge*

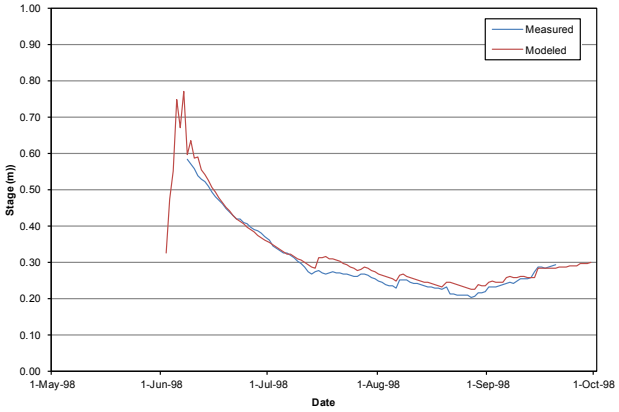



*Figure 7.3-B-45: Lake B2 – 1998 – Stage*

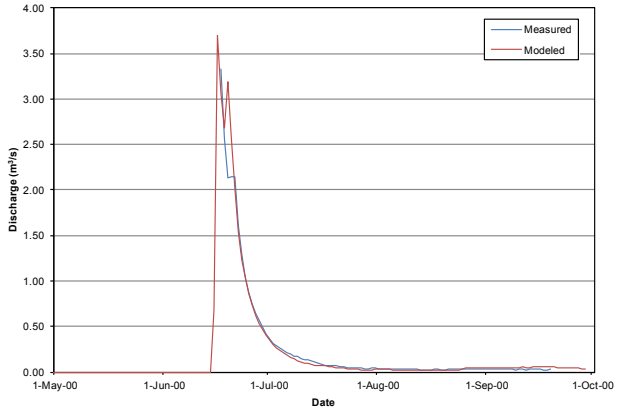



*Figure 7.3-B-46: Lake B2 – 2000 – Discharge*

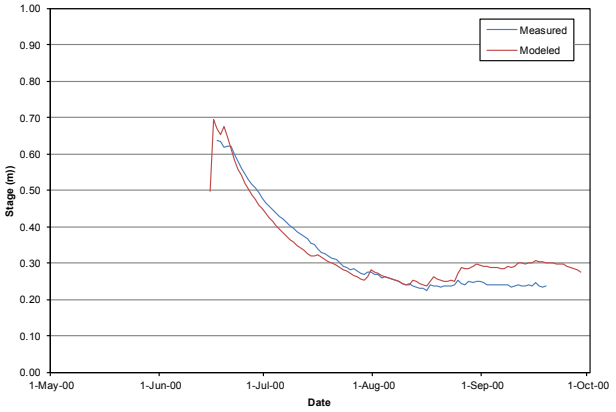



*Figure 7.3-B-47: Lake B2 – 2000 – Stage*

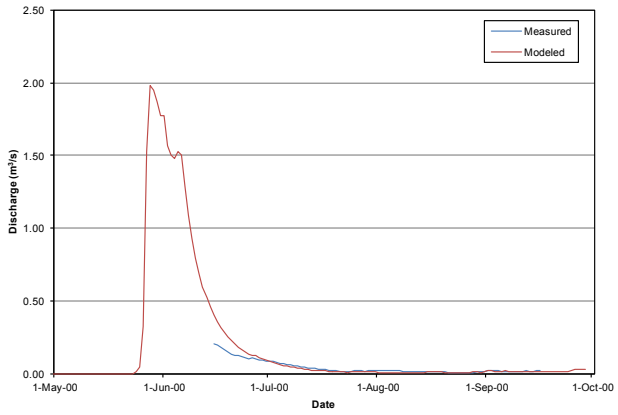



Figure 7.3-B-48: Lake B2 – 2008 – Discharge

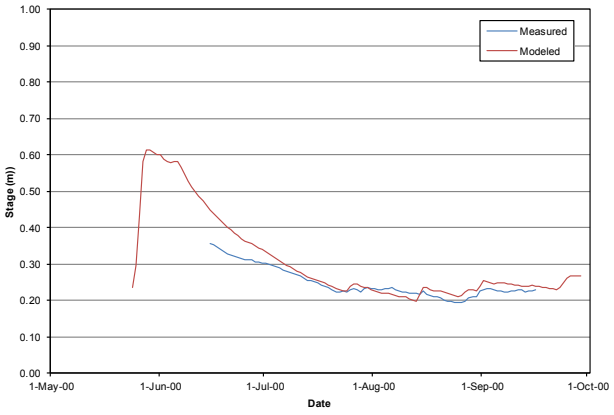



Figure 7.3-B-49: Lake B2 – 2008 – Stage

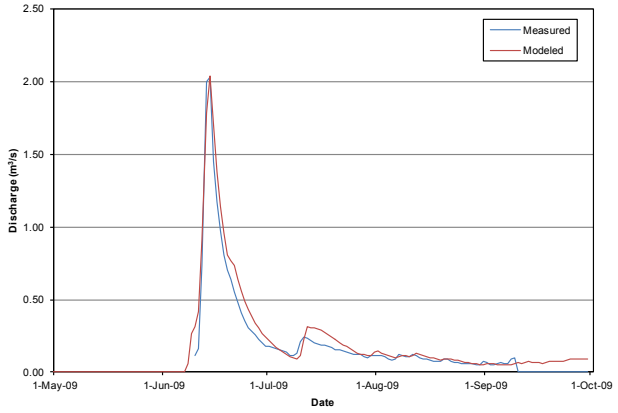



Figure 7.3-B-50: Lake B2 – 2009 – Discharge

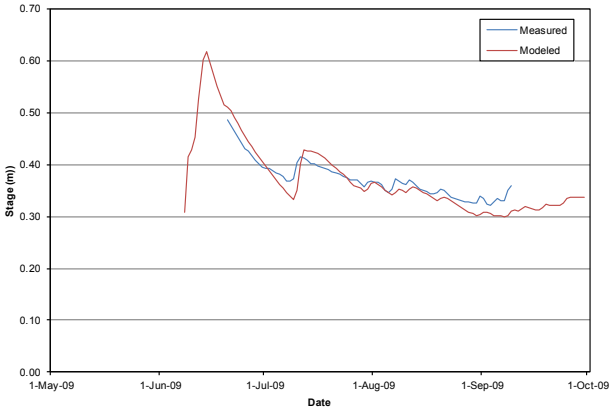



Figure 7.3-B-51: Lake B2 – 2009 – Stage

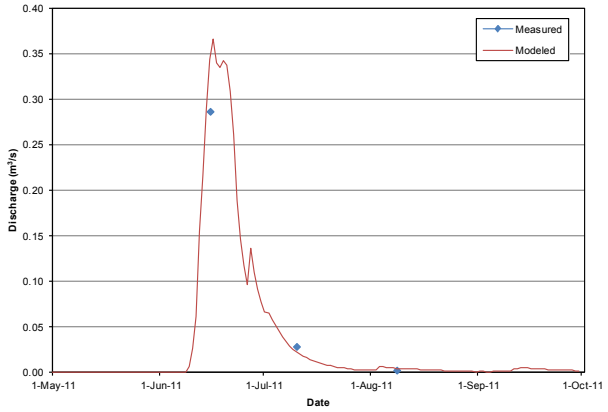



Figure 7.3-B-52: Lake D7 – 2011 – Discharge

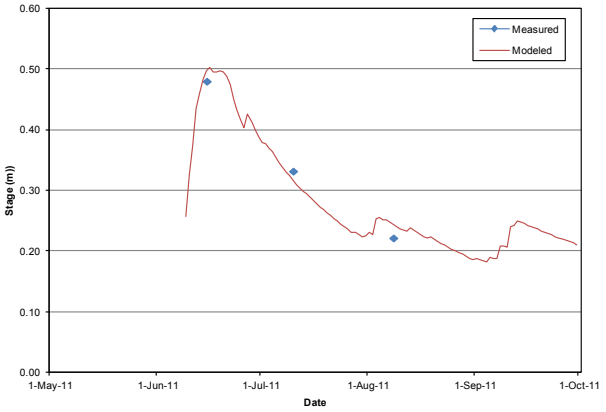



Figure 7.3-B-53: Lake D7 – 2011 – Stage

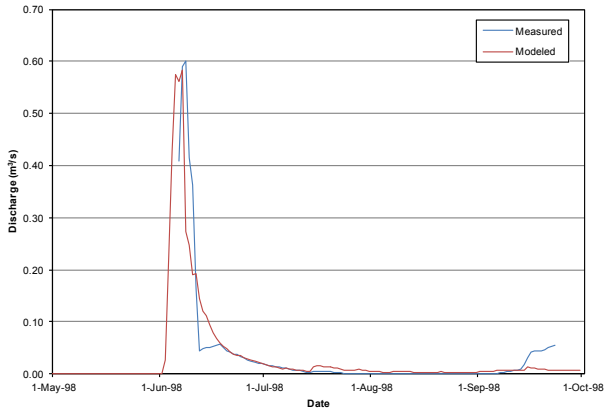



Figure 7.3-B-54: Lake D5 – 1998 – Discharge

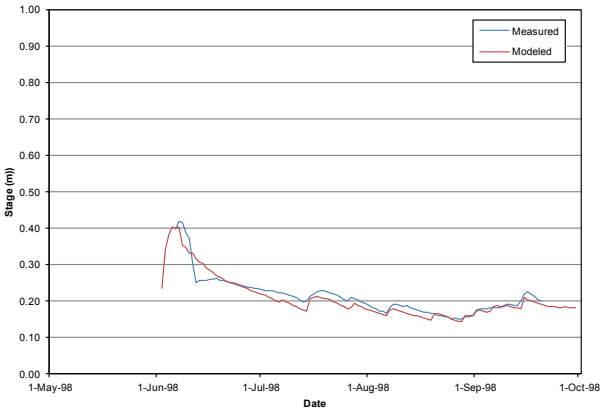



Figure 7.3-B-55: Lake D5 – 1998 – Stage

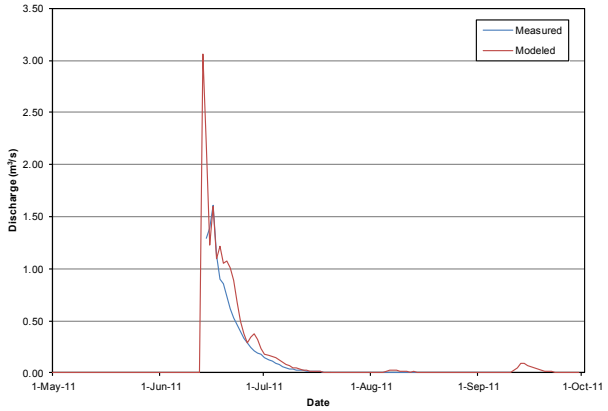



Figure 7.3-B-56: Lake D1 – 2011 – Discharge

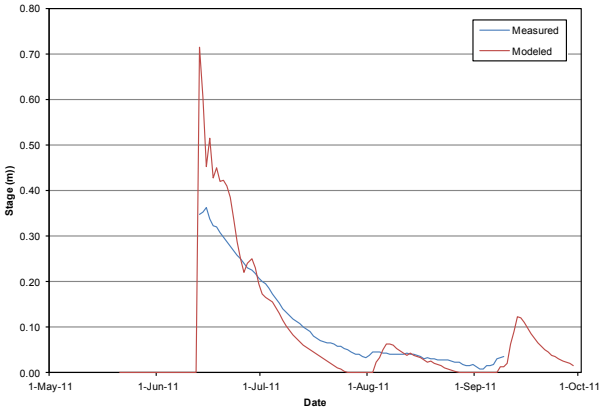



Figure 7.3-B-57: Lake D1 – 2001 – Stage

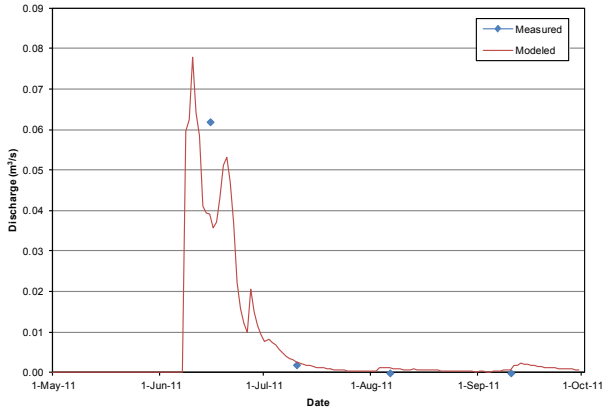



Figure 7.3-B-58: Lake E4 – 2011 – Discharge

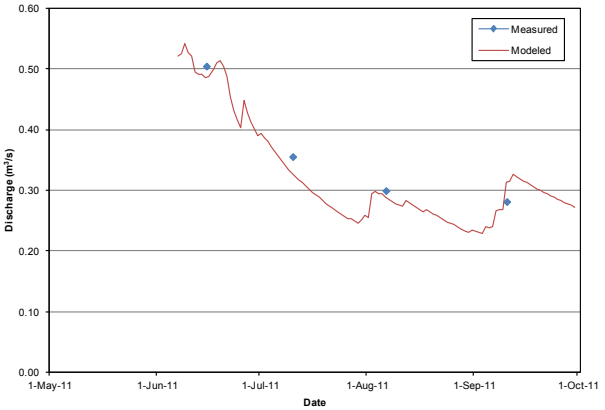



Figure 7.3-B-59: Lake E4 – 2001 – Stage

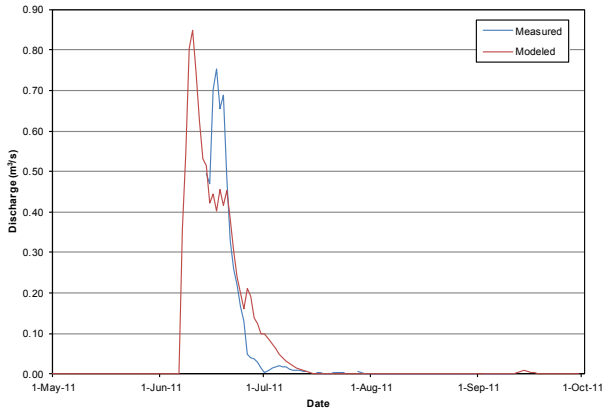



*Figure 7.3-B-60: Lake E1 – 2011 – Discharge*

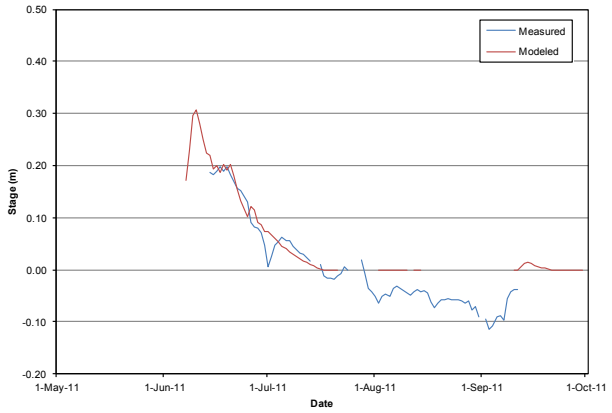



*Figure 7.3-B-61: Lake E1 – 2001 – Stage*

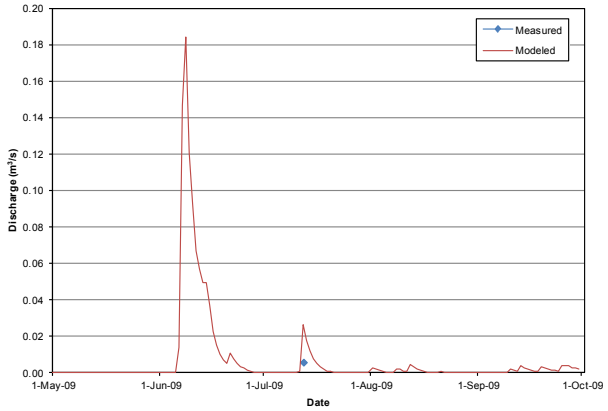



*Figure 7.3-B-62: Lake G2 – 2009 – Discharge*

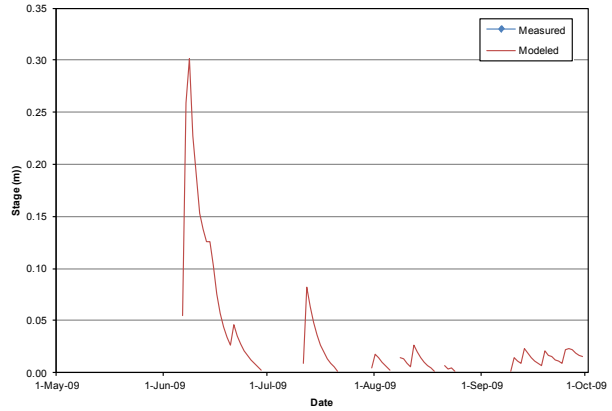



*Figure 7.3-B-63: Lake G2 – 2009 – Stage*

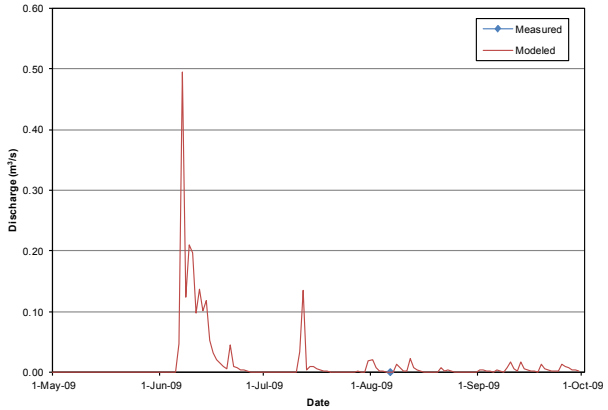



*Figure 7.3-B-64: Lake G1 – 2009 – Discharge*

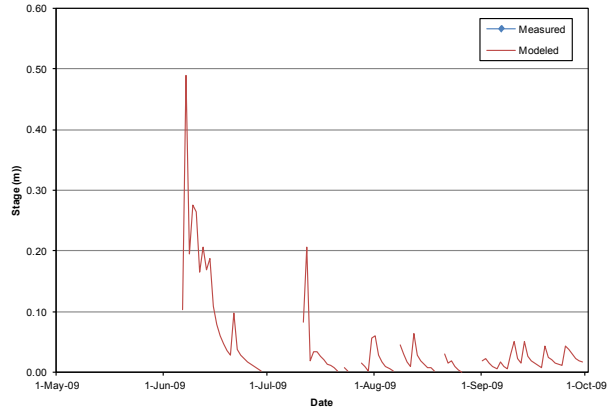



*Figure 7.3-B-65: Lake G1 – 2009 – Stage*

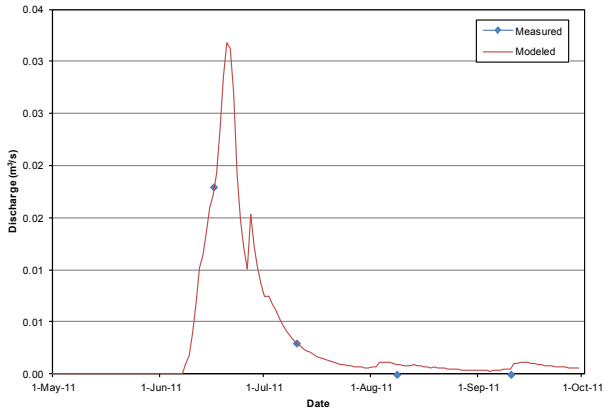



*Figure 7.3-B-66: Lake H20 – 2011 – Discharge*

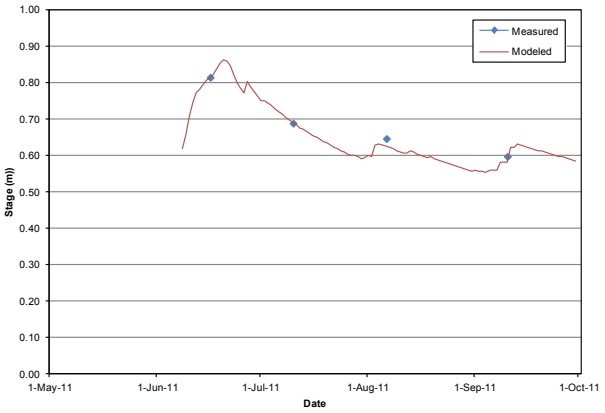



*Figure 7.3-B-67: Lake H20 – 2011 – Stage*

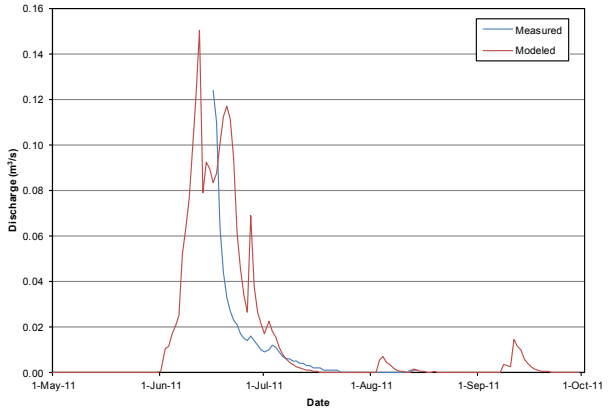



*Figure 7.3-B-68: Lake H1 – 2011 – Discharge*

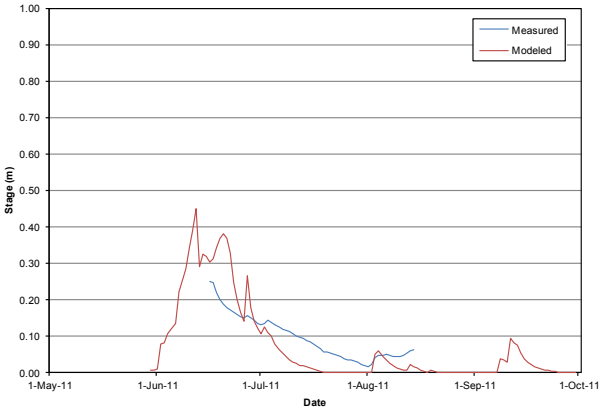



*Figure 7.3-B-69: Lake H1 – 2011 – Stage*

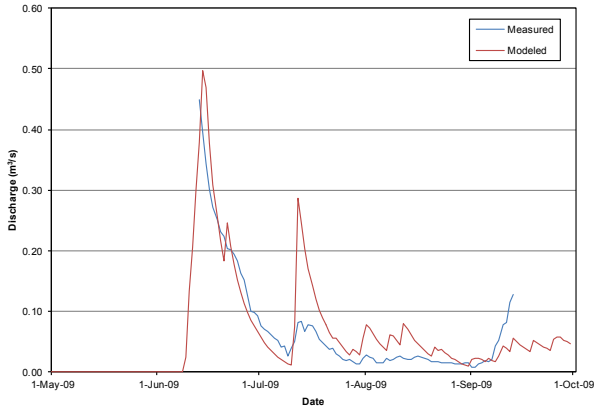



*Figure 7.3-B-70: Lake CH6 – 2009 – Discharge*

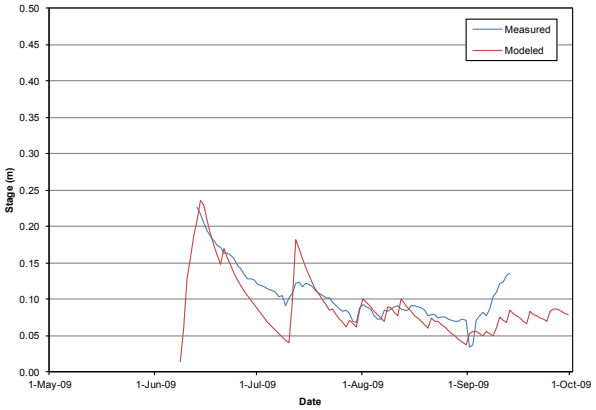



*Figure 7.3-B-71: Lake CH6 – 2009 – Stage*

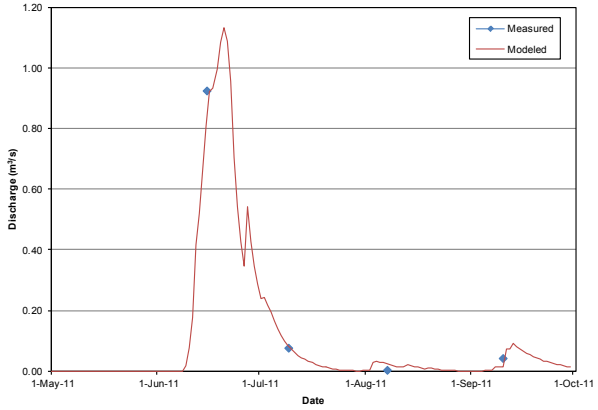



*Figure 7.3-B-72: Lake CH6 – 2011 – Discharge*

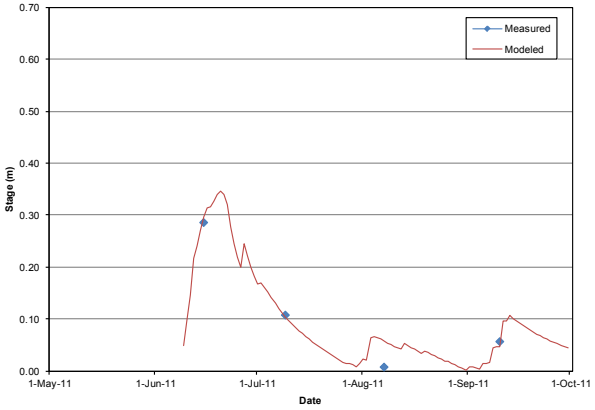



*Figure 7.3-B-73: Lake CH6 – 2011 – Stage*

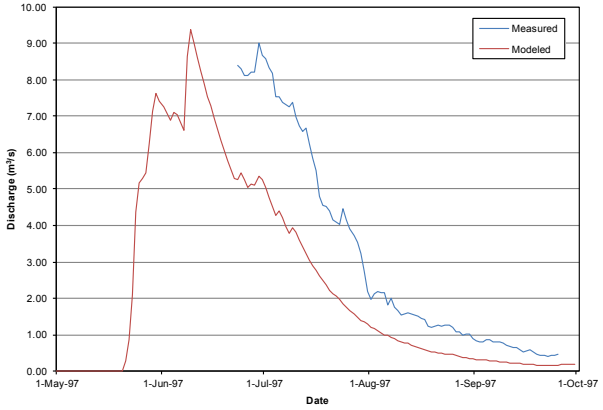



*Figure 7.3-B-74: Meliadine Lake – 1997 – Discharge*

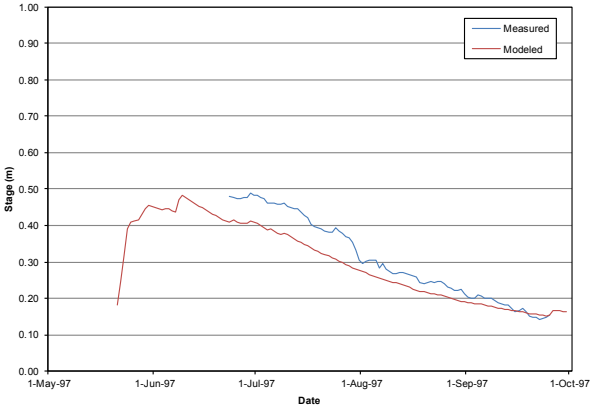



*Figure 7.3-B-75: Meliadine Lake – 1997 – Stage*

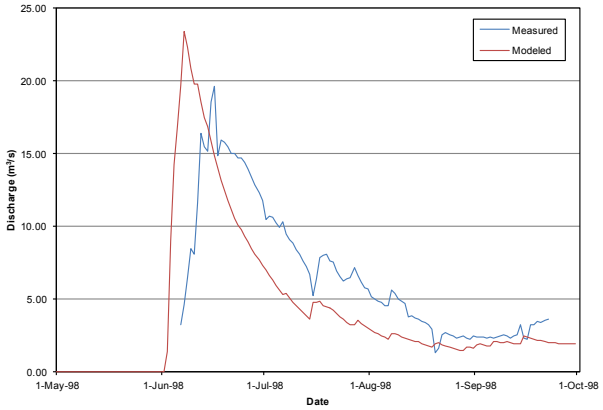



*Figure 7.3-B-76: Meliadine Lake – 1998 – Discharge*

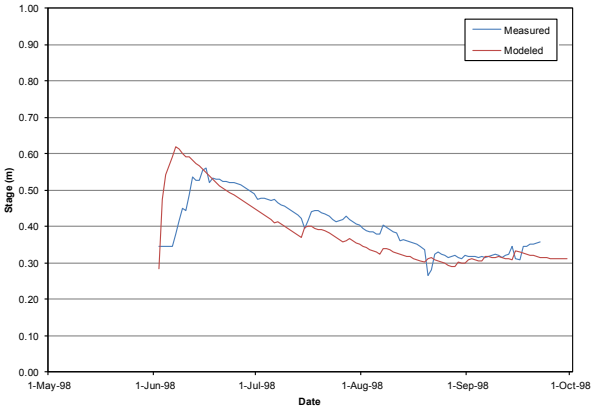



*Figure 7.3-B-77: Meliadine Lake – 1998 – Stage*

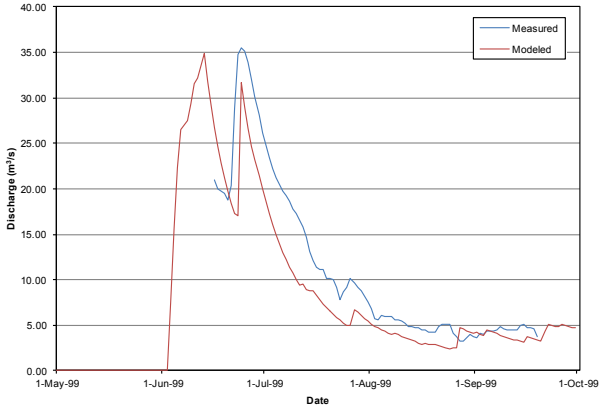



*Figure 7.3-B-78: Meliadine Lake – 1999 – Discharge*

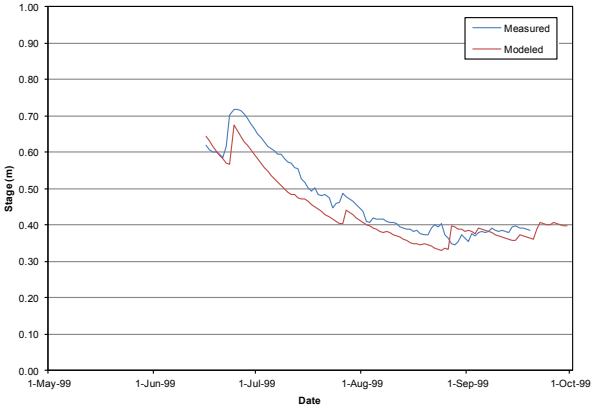



*Figure 7.3-B-79: Meliadine Lake – 1999 – Stage*

During the calibration process, the runoff coefficient was reduced following the month of June (on a degree day basis) to reduce overestimated rainfall responses which could be attributed to a change in water yield as a function of ground temperature. Using this split runoff coefficient approach, the modeled hydrographs agree reasonably to the measured data with well-matched magnitude and timing of discharge.

This calibration agrees with most data measured during other years, with some apparent differences:

- Measured stages and discharges at Lake A1 in 1997 were poorly estimated by the model. The rating curve was reported as mediocre (AEE 1998b) and this dataset should be treated as an outlier. Other years were well estimated.
- Measured stages at Lake B6 in 2011 were poorly estimated by the model. The reported hydrograph at Lake B6 (SD 7-2 2011 Aquatics Baseline) shows a high variation in discharges on a daily basis (not shown on the validation figures, which only show an average function for the purpose of clarity) indicating that the measured hydrograph may not be reliable. As such, the rating curve was estimated by considering available data at Lake B7 (upstream) and Lake B5 (downstream). The current estimated rating curve at Lake B6 was validated using available hydrographs at Lakes B7 and B5, but additional hydrometric measurements are recommended.
- Measured stages and discharges at Lake B4 in 1997 were consistently lower than the modeled estimates, while the hydrographs were of similar shapes. This may be caused by an overestimation of snowpack in the Lake B4 watershed for that particular year. Calibration parameters seem plausible.
- Measured stages at Lakes D1, E1 and H1 in 2011 were poorly estimated by the model due to poor correlations between measured discharges and stages in 2011 (SD 7-2 2011 Aquatics Baseline). Rating curves used in the model were based on theoretical rating curves for these lakes and differ from the derived rating curves from field measurements which were rated as poor (SD 7-2 2011 Aquatics Baseline). This results in poor stage estimates, while discharges are well estimated. While stages are poorly estimated on a daily basis, the annual ranges are similar to measured data for concurrent periods of record. Additional hydrometric measurements are however recommended for these lakes.

- The Meliadine Lake outlet was modeled independently of other modeled lake outlets (i.e., the Meliadine Lake outlet discharge is not a function of other lake outlets in the model) due to lack of available data in surrounding sub-watersheds. Specifically, a coarse water balance method was used; the Meliadine Lake watershed was divided into lake and land components, including the sum of all lake and land areas upstream of the main and west outlets. The resulting modeled hydrographs have reasonably well matched annual peak and water level fluctuation magnitudes, but early responses, as would be expected from such a coarse model.

Based on calibration and validation, derived parameters summarized in Table 7.3-B-14 reasonably agree with collected baseline data. Additional hydrometric measurements are recommended for watersheds with poor rating curves, and watersheds without available data, to validate assumptions.

**Table 7.3-B-14: Calibration Parameters**

| Parameter | Value |
|---|---|
| Rc (before 135 °C•d) | 0.7 |
| Rc (after 135 °C•d) | 0.3 |

## 3.0 REFERENCES

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Golder Associates Ltd. (SD 7-2 2011 Aquatics Baseline) (2011). 2011 Aquatics Baseline.

PhotoSat 2011. High Definition Elevation data collected for Agnico Eagle, 1m contour interval.

# APPENDIX 7.3-C

## Effect Analysis Results

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**FIGURES**

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**APPENDICES**

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# CONTENT

This appendix presents derived flow and water level regimes in a tabulated format corresponding to Figures 7.3-16 to 7.3-143 presented in the main body of Section 7.3 (Hydrology including Surface Water Quantity) for all assessed mining phases including Preproduction Phase (Year -3), Preproduction Phase (Years -2 to -1), Mining Phase 1 to Mining Phase 5, Closure, and Post-Closure. Following the format of the main body of Section 7.3, derived flows and water level regimes are presented by mining phase and by primary pathway within each mining phase.

# 1.0 EFFECT ANALYSIS RESULTS - PREPRODUCTION PHASE (YEAR -3)

## 1.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake A6 to Lake A1

**Table 7.3-C1: Monthly Mean Discharges at the Lake A6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 24 100 | 65 300 | 13 400 | 7 770 | 6 080 | 3 240 |
| | | Year -3 | 24 300 | 40 600 | 14 400 | 13 600 | 14 700 | 11 800 |
| | 10 | Baseline | 10 800 | 43 700 | 6 490 | 2 720 | 2 790 | 1 640 |
| | | Year -3 | 12 100 | 35 800 | 10 900 | 11 500 | 12 500 | 8 650 |
| Median | 2 | Baseline | 1 740 | 26 000 | 2 710 | 728 | 964 | 472 |
| | | Year -3 | 2 660 | 27 800 | 8 660 | 9 540 | 10 600 | 5 340 |
| Dry | 10 | Baseline | 0 | 14 800 | 1 170 | 168 | 209 | 84 |
| | | Year -3 | 0 | 16 900 | 7 520 | 8 130 | 9 330 | 2 490 |
| | 100 | Baseline | 0 | 8 690 | 616 | 28 | 0 | 21 |
| | | Year -3 | 0 | 5 020 | 7 030 | 7 260 | 8 630 | 465 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C2: Derived Representative Discharges at the Lake A6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.55 | 133 000 | 98 300 | 3 550 | 5 130 | 5 970 |
| | | Year -3 | 3.54 | 106 000 | 78 300 | 11 500 | 11 600 | 11 700 |
| | 10 | Baseline | 1.94 | 98 700 | 74 700 | 1 500 | 2 310 | 3 330 |
| | | Year -3 | 2.36 | 91 300 | 63 800 | 9 290 | 10 200 | 10 700 |
| Median | 2 | Baseline | 1.12 | 68 600 | 51 900 | 483 | 805 | 1 530 |
| | | Year -3 | 1.44 | 72 300 | 49 600 | 7 800 | 8 910 | 9 700 |
| Dry | 10 | Baseline | 0.81 | 48 100 | 34 300 | 109 | 208 | 592 |
| | | Year -3 | 0.88 | 51 500 | 38 800 | 7 020 | 7 970 | 8 770 |
| | 100 | Baseline | 0.78 | 36 200 | 23 100 | 0 | 1 | 170 |
| | | Year -3 | 0.58 | 33 100 | 31 800 | 6 670 | 7 390 | 8 070 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C3: Monthly Mean Stages at the Lake A6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.482 | 0.351 | 0.315 | 0.300 | 0.264 |
| | | Year -3 | 0.396 | 0.439 | 0.356 | 0.352 | 0.358 | 0.342 |
| | 10 | Baseline | 0.336 | 0.445 | 0.304 | 0.255 | 0.257 | 0.231 |
| | | Year -3 | 0.344 | 0.428 | 0.337 | 0.341 | 0.346 | 0.322 |
| Median | 2 | Baseline | 0.234 | 0.401 | 0.255 | 0.196 | 0.208 | 0.180 |
| | | Year -3 | 0.254 | 0.407 | 0.322 | 0.328 | 0.335 | 0.292 |
| Dry | 10 | Baseline | - | 0.358 | 0.216 | 0.146 | 0.153 | 0.128 |
| | | Year -3 | - | 0.368 | 0.313 | 0.318 | 0.327 | 0.251 |
| | 100 | Baseline | - | 0.322 | 0.190 | 0.102 | - | 0.096 |
| | | Year -3 | - | 0.289 | 0.309 | 0.311 | 0.322 | 0.179 |

Note: m = metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C4: Derived Representative Stages at the Lake A6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.657 | 0.556 | 0.523 | 0.269 | 0.290 | 0.299 |
| | | Year -3 | 0.657 | 0.531 | 0.500 | 0.341 | 0.341 | 0.342 |
| | 10 | Baseline | 0.582 | 0.524 | 0.495 | 0.227 | 0.247 | 0.266 |
| | | Year -3 | 0.606 | 0.516 | 0.480 | 0.326 | 0.333 | 0.336 |
| Median | 2 | Baseline | 0.522 | 0.487 | 0.461 | 0.181 | 0.200 | 0.228 |
| | | Year -3 | 0.549 | 0.492 | 0.456 | 0.315 | 0.324 | 0.329 |
| Dry | 10 | Baseline | 0.489 | 0.454 | 0.424 | 0.134 | 0.153 | 0.188 |
| | | Year -3 | 0.497 | 0.460 | 0.435 | 0.309 | 0.317 | 0.323 |
| | 100 | Baseline | 0.486 | 0.429 | 0.392 | - | 0.051 | 0.147 |
| | | Year -3 | 0.458 | 0.421 | 0.418 | 0.306 | 0.312 | 0.317 |

Note: m = metre.

**Table 7.3-C5: Monthly Mean Discharges at the Lake A1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | | Year -3 | 38 100 | 67 500 | 19 200 | 17 200 | 18 600 | 12 500 |
| | 10 | Baseline | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | | Year -3 | 18 300 | 56 500 | 13 100 | 13 500 | 14 800 | 9 120 |
| Median | 2 | Baseline | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| | | Year -3 | 3 660 | 41 000 | 9 050 | 10 100 | 11 500 | 5 460 |
| Dry | 10 | Baseline | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | | Year -3 | 0 | 23 300 | 7 070 | 7 690 | 9 290 | 2 270 |
| | 100 | Baseline | 0 | 11 900 | 1 200 | 201 | 12 | 105 |
| | | Year -3 | 0 | 6 760 | 6 220 | 6 200 | 8 040 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C6: Derived Representative Discharges at the Lake A1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | | Year -3 | 5.39 | 179 000 | 132 000 | 12 800 | 13 600 | 13 800 |
| | 10 | Baseline | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | | Year -3 | 3.76 | 145 000 | 102 000 | 9 740 | 11 300 | 12 200 |
| Median | 2 | Baseline | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| | | Year -3 | 2.35 | 112 000 | 76 100 | 7 450 | 9 210 | 10 400 |
| Dry | 10 | Baseline | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | | Year -3 | 1.41 | 84 700 | 59 800 | 6 110 | 7 570 | 8 800 |
| | 100 | Baseline | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |
| | | Year -3 | 0.88 | 66 600 | 51 000 | 5 450 | 6 540 | 7 560 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C7: Monthly Mean Stages at the Lake A1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | | Year -3 | 0.617 | 0.685 | 0.545 | 0.534 | 0.542 | 0.504 |
| | 10 | Baseline | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | | Year -3 | 0.540 | 0.663 | 0.508 | 0.511 | 0.520 | 0.476 |
| Median | 2 | Baseline | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| | | Year -3 | 0.403 | 0.626 | 0.475 | 0.485 | 0.497 | 0.434 |
| Dry | 10 | Baseline | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | | Year -3 | - | 0.565 | 0.455 | 0.462 | 0.478 | 0.370 |
| | 100 | Baseline | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |
| | | Year -3 | - | 0.451 | 0.444 | 0.444 | 0.465 | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C8: Derived Representative Stages at the Lake A1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | | Year -3 | 0.973 | 0.869 | 0.792 | 0.506 | 0.512 | 0.513 |
| | 10 | Baseline | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | | Year -3 | 0.912 | 0.813 | 0.743 | 0.482 | 0.495 | 0.502 |
| Median | 2 | Baseline | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| | | Year -3 | 0.837 | 0.759 | 0.700 | 0.459 | 0.477 | 0.488 |
| Dry | 10 | Baseline | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | | Year -3 | 0.763 | 0.714 | 0.670 | 0.443 | 0.460 | 0.473 |
| | 100 | Baseline | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |
| | | Year -3 | 0.700 | 0.683 | 0.651 | 0.434 | 0.448 | 0.460 |

Note: m= metre.

## Lake B6 to Lake B5

**Table 7.3-C9: Monthly Mean Discharges at the Lake B6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 7 760 | 26 700 | 8 320 | 3 310 | 2 530 | 1 500 |
| | | Year -3 | 5 090 | 13 000 | 3 650 | 3 320 | 4 150 | 3 950 |
| | 10 | Baseline | 3 550 | 17 500 | 4 430 | 1 800 | 1 660 | 898 |
| | | Year -3 | 2 570 | 12 500 | 3 130 | 3 040 | 3 890 | 2 900 |
| Median | 2 | Baseline | 602 | 10 700 | 2 020 | 745 | 865 | 368 |
| | | Year -3 | 582 | 11 300 | 2 800 | 2 790 | 3 650 | 1 840 |
| Dry | 10 | Baseline | 0 | 6 850 | 891 | 189 | 285 | 112 |
| | | Year -3 | 0 | 9 150 | 2 650 | 2 610 | 3 490 | 986 |
| | 100 | Baseline | 0 | 4 980 | 433 | 0 | 0 | 43 |
| | | Year -3 | 0 | 6 240 | 2 580 | 2 500 | 3 400 | 407 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C10: Derived Representative Discharges at the Lake B6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.85 | 50 100 | 38 300 | 1 710 | 2 340 | 3 160 |
| | | Year -3 | 1.63 | 42 000 | 27 100 | 2 890 | 3 050 | 3 290 |
| | 10 | Baseline | 0.55 | 34 900 | 28 300 | 1 060 | 1 500 | 2 180 |
| | | Year -3 | 0.98 | 32 700 | 22 200 | 2 670 | 2 870 | 3 170 |
| Median | 2 | Baseline | 0.34 | 23 100 | 19 400 | 492 | 762 | 1 250 |
| | | Year -3 | 0.52 | 22 500 | 16 400 | 2 500 | 2 690 | 3 030 |
| Dry | 10 | Baseline | 0.23 | 16 100 | 12 900 | 113 | 244 | 536 |
| | | Year -3 | 0.26 | 13 300 | 10 800 | 2 390 | 2 560 | 2 910 |
| | 100 | Baseline | 0.19 | 12 500 | 9 110 | 0 | 0 | 84 |
| | | Year -3 | 0.14 | 6 520 | 6 450 | 2 330 | 2 480 | 2 830 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C11: Monthly Mean Stages at the Lake B6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.107 | 0.244 | 0.112 | 0.061 | 0.051 | 0.036 |
| | | Year -3 | 0.081 | 0.151 | 0.065 | 0.061 | 0.071 | 0.068 |
| | 10 | Baseline | 0.064 | 0.184 | 0.074 | 0.040 | 0.038 | 0.025 |
| | | Year -3 | 0.051 | 0.147 | 0.059 | 0.057 | 0.068 | 0.056 |
| Median | 2 | Baseline | 0.019 | 0.133 | 0.044 | 0.022 | 0.025 | 0.014 |
| | | Year -3 | 0.019 | 0.138 | 0.054 | 0.054 | 0.065 | 0.041 |
| Dry | 10 | Baseline | - | 0.099 | 0.025 | 0.009 | 0.012 | 0.006 |
| | | Year -3 | - | 0.120 | 0.052 | 0.052 | 0.063 | 0.027 |
| | 100 | Baseline | - | 0.080 | 0.016 | - | - | 0.003 |
| | | Year -3 | - | 0.093 | 0.051 | 0.050 | 0.062 | 0.015 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C12: Derived Representative Stages at the Lake B6 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.480 | 0.372 | 0.311 | 0.039 | 0.048 | 0.059 |
| | | Year -3 | 0.740 | 0.330 | 0.247 | 0.055 | 0.058 | 0.060 |
| | 10 | Baseline | 0.357 | 0.292 | 0.254 | 0.028 | 0.036 | 0.046 |
| | | Year -3 | 0.528 | 0.280 | 0.216 | 0.053 | 0.055 | 0.059 |
| Median | 2 | Baseline | 0.261 | 0.222 | 0.197 | 0.017 | 0.023 | 0.032 |
| | | Year -3 | 0.344 | 0.218 | 0.176 | 0.050 | 0.053 | 0.057 |
| Dry | 10 | Baseline | 0.198 | 0.174 | 0.150 | 0.006 | 0.011 | 0.018 |
| | | Year -3 | 0.218 | 0.153 | 0.134 | 0.049 | 0.051 | 0.056 |
| | 100 | Baseline | 0.178 | 0.147 | 0.119 | - | - | 0.005 |
| | | Year -3 | 0.144 | 0.095 | 0.095 | 0.048 | 0.050 | 0.055 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C13: Monthly Mean Discharges at the Lake B5 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 15 700 | 48 000 | 12 200 | 6 610 | 4 770 | 2 210 |
| | | Year -3 | 15 700 | 32 800 | 8 360 | 5 900 | 6 700 | 4 630 |
| | 10 | Baseline | 7 320 | 31 300 | 6 390 | 2 760 | 2 710 | 1 490 |
| | | Year -3 | 7 900 | 27 600 | 5 090 | 3 970 | 5 280 | 3 370 |
| Median | 2 | Baseline | 1 350 | 18 600 | 2 870 | 882 | 1 170 | 548 |
| | | Year -3 | 1 760 | 20 600 | 3 320 | 2 410 | 3 830 | 2 010 |
| Dry | 10 | Baseline | 0 | 11 100 | 1 280 | 214 | 273 | 99 |
| | | Year -3 | 0 | 9 150 | 2 650 | 2 610 | 3 490 | 986 |
| | 100 | Baseline | 0 | 7 400 | 647 | 4 | 0 | 20 |
| | | Year -3 | 0 | 6 240 | 2 580 | 2 500 | 3 400 | 407 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C14: Derived Representative Discharges at the Lake B5 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.82 | 88 900 | 68 100 | 3 100 | 4 200 | 4 950 |
| | | Year -3 | 3.05 | 78 400 | 60 100 | 3 820 | 4 480 | 4 810 |
| | 10 | Baseline | 0.99 | 61 300 | 49 900 | 1 530 | 2 290 | 3 250 |
| | | Year -3 | 1.72 | 65 800 | 48 300 | 2 670 | 3 430 | 4 040 |
| Median | 2 | Baseline | 0.60 | 41 000 | 34 000 | 577 | 969 | 1 740 |
| | | Year -3 | 0.94 | 50 200 | 35 900 | 1 750 | 2 430 | 3 200 |
| Dry | 10 | Baseline | 0.44 | 29 500 | 23 200 | 142 | 265 | 692 |
| | | Year -3 | 0.59 | 34 400 | 25 500 | 1 180 | 1 660 | 2 460 |
| | 100 | Baseline | 0.43 | 23 900 | 17 000 | 0 | 0 | 78 |
| | | Year -3 | 0.46 | 21 200 | 18 100 | 871 | 1 170 | 1 910 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C15: Monthly Mean Stages at the Lake B5 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.472 | 0.380 | 0.344 | 0.327 | 0.289 |
| | | Year -3 | 0.395 | 0.445 | 0.358 | 0.338 | 0.345 | 0.325 |
| | 10 | Baseline | 0.350 | 0.441 | 0.343 | 0.300 | 0.299 | 0.272 |
| | | Year -3 | 0.354 | 0.433 | 0.330 | 0.318 | 0.332 | 0.309 |
| Median | 2 | Baseline | 0.267 | 0.406 | 0.302 | 0.250 | 0.261 | 0.232 |
| | | Year -3 | 0.279 | 0.413 | 0.309 | 0.293 | 0.316 | 0.285 |
| Dry | 10 | Baseline | - | 0.374 | 0.265 | 0.199 | 0.207 | 0.176 |
| | | Year -3 | - | 0.363 | 0.298 | 0.297 | 0.311 | 0.254 |
| | 100 | Baseline | - | 0.351 | 0.238 | 0.104 | - | 0.137 |
| | | Year -3 | - | 0.341 | 0.296 | 0.295 | 0.310 | 0.221 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C16: Derived Representative Stages at the Lake B5 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.571 | 0.521 | 0.499 | 0.305 | 0.320 | 0.329 |
| | | Year -3 | 0.620 | 0.511 | 0.490 | 0.316 | 0.324 | 0.327 |
| | 10 | Baseline | 0.518 | 0.491 | 0.475 | 0.273 | 0.291 | 0.308 |
| | | Year -3 | 0.566 | 0.497 | 0.473 | 0.298 | 0.310 | 0.318 |
| Median | 2 | Baseline | 0.478 | 0.461 | 0.447 | 0.234 | 0.254 | 0.278 |
| | | Year -3 | 0.514 | 0.476 | 0.451 | 0.279 | 0.294 | 0.307 |
| Dry | 10 | Baseline | 0.456 | 0.437 | 0.421 | 0.187 | 0.206 | 0.240 |
| | | Year -3 | 0.477 | 0.448 | 0.427 | 0.262 | 0.276 | 0.294 |
| | 100 | Baseline | 0.453 | 0.423 | 0.400 | - | - | 0.170 |
| | | Year -3 | 0.458 | 0.415 | 0.404 | 0.249 | 0.261 | 0.283 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## 1.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake H1

**Table 7.3-C17: Monthly Mean Discharges at the Lake H1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 3 960 | 9 880 | 2 160 | 694 | 878 | 445 |
| | | Year -3 | 233 | 623 | 61 | 7 | 11 | 3 |
| | 10 | Baseline | 1 990 | 6 750 | 788 | 353 | 378 | 203 |
| | | Year -3 | 101 | 367 | 21 | 2 | 3 | 1 |
| Median | 2 | Baseline | 513 | 3 980 | 215 | 110 | 121 | 58 |
| | | Year -3 | 17 | 178 | 2 | 0 | 0 | 0 |
| Dry | 10 | Baseline | 0 | 2 060 | 45 | 0 | 24 | 13 |
| | | Year -3 | 0 | 71 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 927 | 0 | 0 | 0 | 4 |
| | | Year -3 | 0 | 18 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C18: Derived Representative Discharges at the Lake H1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.34 | 18 200 | 14 000 | 302 | 475 | 750 |
| | | Year -3 | 0.02 | 1 100 | 761 | 2 | 3 | 13 |
| | 10 | Baseline | 0.22 | 13 300 | 10 700 | 113 | 246 | 393 |
| | | Year -3 | 0.01 | 793 | 609 | 0 | 1 | 5 |
| Median | 2 | Baseline | 0.14 | 9 280 | 7 560 | 19 | 85 | 160 |
| | | Year -3 | 0.01 | 513 | 410 | 0 | 0 | 1 |
| Dry | 10 | Baseline | 0.10 | 6 630 | 5 080 | 0 | 0 | 46 |
| | | Year -3 | 0.00 | 311 | 196 | 0 | 0 | 0 |
| | 100 | Baseline | 0.08 | 5 170 | 3 480 | 0 | 0 | 0 |
| | | Year -3 | 0.00 | 189 | 10 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C19: Monthly Mean Stages at the Lake H1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.203 | 0.374 | 0.136 | 0.064 | 0.074 | 0.047 |
| | | Year -3 | 0.031 | 0.059 | 0.013 | 0.003 | 0.004 | 0.002 |
| | 10 | Baseline | 0.129 | 0.290 | 0.069 | 0.041 | 0.042 | 0.028 |
| | | Year -3 | 0.018 | 0.042 | 0.006 | 0.001 | 0.002 | 0.001 |
| Median | 2 | Baseline | 0.052 | 0.204 | 0.029 | 0.019 | 0.020 | 0.012 |
| | | Year -3 | 0.005 | 0.026 | 0.001 | - | - | - |
| Dry | 10 | Baseline | - | 0.131 | 0.010 | - | 0.007 | 0.004 |
| | | Year -3 | - | 0.014 | - | - | - | - |
| | 100 | Baseline | - | 0.077 | - | - | - | 0.002 |
| | | Year -3 | - | 0.006 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C20: Derived Representative Stages at the Lake H1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.778 | 0.562 | 0.472 | 0.037 | 0.049 | 0.067 |
| | | Year -3 | 0.120 | 0.087 | 0.068 | 0.001 | 0.002 | 0.004 |
| | 10 | Baseline | 0.575 | 0.456 | 0.394 | 0.019 | 0.032 | 0.044 |
| | | Year -3 | 0.089 | 0.070 | 0.058 | 0.000 | 0.001 | 0.003 |
| Median | 2 | Baseline | 0.424 | 0.359 | 0.313 | 0.006 | 0.016 | 0.024 |
| | | Year -3 | 0.062 | 0.052 | 0.045 | - | - | 0.001 |
| Dry | 10 | Baseline | 0.341 | 0.287 | 0.240 | - | - | 0.010 |
| | | Year -3 | 0.046 | 0.037 | 0.027 | - | - | - |
| | 100 | Baseline | 0.302 | 0.243 | 0.187 | - | - | - |
| | | Year -3 | 0.037 | 0.027 | 0.004 | - | - | - |

Note: m= metre.

## 1.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake D7 to Lake D1

**Table 7.3-C21: Monthly Mean Discharges at the Lake D7 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 710 | 25 900 | 6 140 | 2 330 | 1 970 | 976 |
| | | Year -3 | 24 000 | 56 400 | 12 600 | 8 900 | 7 640 | 5 950 |
| | 10 | Baseline | 2 870 | 15 200 | 2 880 | 857 | 790 | 467 |
| | | Year -3 | 11 200 | 44 100 | 7 840 | 4 320 | 5 660 | 3 810 |
| Median | 2 | Baseline | 392 | 8 460 | 1 180 | 243 | 237 | 119 |
| | | Year -3 | 2 060 | 30 500 | 4 740 | 1 790 | 3 450 | 1 950 |
| Dry | 10 | Baseline | 0 | 5 280 | 512 | 60 | 49 | 18 |
| | | Year -3 | 0 | 18 400 | 3 210 | 753 | 1 490 | 679 |
| | 100 | Baseline | 0 | 3 970 | 286 | 12 | 0 | 4 |
| | | Year -3 | 0 | 9 420 | 2 570 | 380 | 37 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C22: Derived Representative Discharges at the Lake D7 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.84 | 46 900 | 33 800 | 1 230 | 1 620 | 2 380 |
| | | Year -3 | 2.70 | 119 000 | 93 800 | 4 520 | 5 990 | 6 640 |
| | 10 | Baseline | 0.52 | 33 300 | 25 200 | 503 | 719 | 1 280 |
| | | Year -3 | 1.92 | 99 500 | 75 300 | 2 800 | 3 880 | 4 940 |
| Median | 2 | Baseline | 0.29 | 21 200 | 16 600 | 155 | 247 | 570 |
| | | Year -3 | 1.25 | 76 600 | 56 300 | 1 460 | 2 140 | 3 320 |
| Dry | 10 | Baseline | 0.18 | 12 800 | 9 930 | 33 | 64 | 223 |
| | | Year -3 | 0.80 | 55 000 | 40 800 | 648 | 1 020 | 2 090 |
| | 100 | Baseline | 0.12 | 7 830 | 5 550 | 0 | 2 | 77 |
| | | Year -3 | 0.54 | 38 500 | 30 200 | 235 | 405 | 1 320 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C23: Monthly Mean Stages at the Lake D7 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.388 | 0.485 | 0.382 | 0.326 | 0.317 | 0.282 |
| | | Year -3 | 0.479 | 0.552 | 0.431 | 0.407 | 0.396 | 0.380 |
| | 10 | Baseline | 0.337 | 0.444 | 0.337 | 0.276 | 0.272 | 0.250 |
| | | Year -3 | 0.422 | 0.530 | 0.398 | 0.361 | 0.377 | 0.353 |
| Median | 2 | Baseline | 0.243 | 0.403 | 0.291 | 0.224 | 0.223 | 0.199 |
| | | Year -3 | 0.319 | 0.498 | 0.366 | 0.312 | 0.348 | 0.316 |
| Dry | 10 | Baseline | - | 0.373 | 0.254 | 0.178 | 0.172 | 0.145 |
| | | Year -3 | - | 0.458 | 0.343 | 0.270 | 0.303 | 0.266 |
| | 100 | Baseline | - | 0.356 | 0.230 | 0.135 | - | 0.112 |
| | | Year -3 | - | 0.410 | 0.331 | 0.241 | 0.164 | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C24: Derived Representative Stages at the Lake D7 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.575 | 0.535 | 0.507 | 0.293 | 0.307 | 0.327 |
| | | Year -3 | 0.698 | 0.624 | 0.600 | 0.363 | 0.381 | 0.387 |
| | 10 | Baseline | 0.531 | 0.506 | 0.483 | 0.253 | 0.268 | 0.295 |
| | | Year -3 | 0.659 | 0.606 | 0.579 | 0.336 | 0.354 | 0.369 |
| Median | 2 | Baseline | 0.483 | 0.469 | 0.451 | 0.208 | 0.225 | 0.258 |
| | | Year -3 | 0.614 | 0.580 | 0.551 | 0.302 | 0.321 | 0.345 |
| Dry | 10 | Baseline | 0.444 | 0.432 | 0.414 | 0.162 | 0.180 | 0.221 |
| | | Year -3 | 0.570 | 0.549 | 0.523 | 0.264 | 0.284 | 0.320 |
| | 100 | Baseline | 0.418 | 0.398 | 0.376 | - | 0.099 | 0.185 |
| | | Year -3 | 0.535 | 0.518 | 0.498 | 0.223 | 0.244 | 0.297 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C25: Monthly Mean Discharges at the Lake D3 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 18 600 | 52 500 | 12 500 | 4 780 | 4 450 | 3 700 |
| | | Year -3 | 35 200 | 85 300 | 20 000 | 12 400 | 10 400 | 7 710 |
| | 10 | Baseline | 8 400 | 36 000 | 5 330 | 2 530 | 2 570 | 1 410 |
| | | Year -3 | 16 100 | 65 100 | 10 900 | 6 010 | 7 250 | 4 620 |
| Median | 2 | Baseline | 1 400 | 21 800 | 1 740 | 831 | 1 020 | 398 |
| | | Year -3 | 2 690 | 43 900 | 5 590 | 2 260 | 4 040 | 2 200 |
| Dry | 10 | Baseline | 0 | 12 400 | 421 | 0 | 36 | 75 |
| | | Year -3 | 0 | 25 900 | 3 240 | 623 | 1 480 | 725 |
| | 100 | Baseline | 0 | 7 090 | 0 | 0 | 0 | 0 |
| | | Year -3 | 0 | 13 400 | 2 330 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C26: Derived Representative Discharges at the Lake D3 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.90 | 105 000 | 76 400 | 2 130 | 3 270 | 4 630 |
| | | Year -3 | 4.52 | 201 000 | 140 000 | 5 880 | 8 110 | 9 150 |
| | 10 | Baseline | 1.27 | 79 500 | 60 200 | 838 | 1 820 | 2 690 |
| | | Year -3 | 3.13 | 156 000 | 112 000 | 3 310 | 5 030 | 6 510 |
| Median | 2 | Baseline | 0.80 | 55 400 | 43 100 | 162 | 675 | 1 220 |
| | | Year -3 | 1.99 | 115 000 | 83 700 | 1 430 | 2 510 | 4 040 |
| Dry | 10 | Baseline | 0.52 | 37 700 | 28 800 | 0 | 0 | 364 |
| | | Year -3 | 1.26 | 84 800 | 60 700 | 380 | 914 | 2 210 |
| | 100 | Baseline | 0.39 | 26 700 | 18 700 | 0 | 0 | 0 |
| | | Year -3 | 0.86 | 66 200 | 45 200 | 0 | 52 | 1 080 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C27: Monthly Mean Stages at the Lake D3 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.144 | 0.287 | 0.110 | 0.058 | 0.055 | 0.049 |
| | | Year -3 | 0.220 | 0.397 | 0.151 | 0.110 | 0.098 | 0.080 |
| | 10 | Baseline | 0.085 | 0.223 | 0.062 | 0.038 | 0.038 | 0.026 |
| | | Year -3 | 0.131 | 0.331 | 0.101 | 0.068 | 0.077 | 0.057 |
| Median | 2 | Baseline | 0.026 | 0.160 | 0.030 | 0.018 | 0.021 | 0.011 |
| | | Year -3 | 0.040 | 0.255 | 0.064 | 0.035 | 0.052 | 0.035 |
| Dry | 10 | Baseline | - | 0.110 | 0.012 | - | 0.002 | 0.004 |
| | | Year -3 | - | 0.179 | 0.045 | 0.015 | 0.027 | 0.017 |
| | 100 | Baseline | - | 0.076 | - | - | - | - |
| | | Year -3 | - | 0.116 | 0.036 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C28: Derived Representative Stages at the Lake D3 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.614 | 0.456 | 0.369 | 0.034 | 0.045 | 0.057 |
| | | Year -3 | 1.094 | 0.703 | 0.552 | 0.067 | 0.083 | 0.090 |
| | 10 | Baseline | 0.469 | 0.379 | 0.315 | 0.018 | 0.031 | 0.040 |
| | | Year -3 | 0.856 | 0.593 | 0.476 | 0.045 | 0.060 | 0.071 |
| Median | 2 | Baseline | 0.345 | 0.298 | 0.252 | 0.006 | 0.016 | 0.023 |
| | | Year -3 | 0.633 | 0.484 | 0.392 | 0.026 | 0.038 | 0.052 |
| Dry | 10 | Baseline | 0.260 | 0.230 | 0.192 | - | - | 0.010 |
| | | Year -3 | 0.467 | 0.395 | 0.316 | 0.011 | 0.019 | 0.035 |
| | 100 | Baseline | 0.213 | 0.183 | 0.144 | - | - | - |
| | | Year -3 | 0.363 | 0.335 | 0.260 | - | 0.003 | 0.022 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C29: Monthly Mean Discharges at the Lake D1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 27 000 | 73 800 | 19 000 | 7 030 | 6 500 | 15 300 |
| | | Year -3 | 43 600 | 107 000 | 25 300 | 18 000 | 13 000 | 11 000 |
| | 10 | Baseline | 12 100 | 51 700 | 7 490 | 3 330 | 3 590 | 2 820 |
| | | Year -3 | 19 700 | 80 700 | 13 300 | 7 020 | 8 290 | 5 500 |
| Median | 2 | Baseline | 1 830 | 32 100 | 2 280 | 824 | 1 280 | 347 |
| | | Year -3 | 3 080 | 54 100 | 6 290 | 2 020 | 4 160 | 2 180 |
| Dry | 10 | Baseline | 0 | 18 400 | 565 | 0 | 0 | 35 |
| | | Year -3 | 0 | 32 100 | 3 280 | 381 | 1 290 | 662 |
| | 100 | Baseline | 0 | 10 300 | 66 | 0 | 0 | 0 |
| | | Year -3 | 0 | 16 900 | 2 150 | 0 | 0 | 59 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C30: Derived Representative Discharges at the Lake D1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.92 | 152 000 | 111 000 | 2 860 | 4 680 | 7 160 |
| | | Year -3 | 6.08 | 250 000 | 175 000 | 7 470 | 10 300 | 11 300 |
| | 10 | Baseline | 2.45 | 118 000 | 88 300 | 1 030 | 2 370 | 3 720 |
| | | Year -3 | 4.35 | 195 000 | 140 000 | 3 470 | 5 630 | 7 520 |
| Median | 2 | Baseline | 1.51 | 87 400 | 65 000 | 137 | 718 | 1 470 |
| | | Year -3 | 2.93 | 149 000 | 106 000 | 1 200 | 2 420 | 4 300 |
| Dry | 10 | Baseline | 1.06 | 65 400 | 45 600 | 0 | 0 | 358 |
| | | Year -3 | 2.01 | 118 000 | 79 800 | 239 | 747 | 2 170 |
| | 100 | Baseline | 0.87 | 52 300 | 32 300 | 0 | 0 | 0 |
| | | Year -3 | 1.51 | 101 000 | 63 100 | 0 | 0 | 985 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C31: Monthly Mean Stages at the Lake D1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.228 | 0.377 | 0.191 | 0.116 | 0.112 | 0.172 |
| | | Year -3 | 0.290 | 0.454 | 0.221 | 0.186 | 0.158 | 0.146 |
| | 10 | Baseline | 0.153 | 0.316 | 0.120 | 0.080 | 0.083 | 0.074 |
| | | Year -3 | 0.195 | 0.395 | 0.160 | 0.116 | 0.126 | 0.103 |
| Median | 2 | Baseline | 0.059 | 0.249 | 0.066 | 0.040 | 0.050 | 0.026 |
| | | Year -3 | 0.077 | 0.323 | 0.110 | 0.062 | 0.090 | 0.065 |
| Dry | 10 | Baseline | - | 0.188 | 0.033 | - | - | 0.008 |
| | | Year -3 | - | 0.249 | 0.080 | 0.027 | 0.050 | 0.036 |
| | 100 | Baseline | - | 0.141 | 0.011 | - | - | - |
| | | Year -3 | - | 0.181 | 0.064 | - | - | 0.011 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C32: Derived Representative Stages at the Lake D1 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.808 | 0.541 | 0.463 | 0.074 | 0.095 | 0.118 |
| | | Year -3 | 1.007 | 0.694 | 0.581 | 0.120 | 0.141 | 0.148 |
| | 10 | Baseline | 0.639 | 0.477 | 0.413 | 0.045 | 0.068 | 0.085 |
| | | Year -3 | 0.851 | 0.613 | 0.520 | 0.082 | 0.104 | 0.120 |
| Median | 2 | Baseline | 0.502 | 0.411 | 0.354 | 0.016 | 0.037 | 0.053 |
| | | Year -3 | 0.699 | 0.536 | 0.452 | 0.048 | 0.068 | 0.091 |
| Dry | 10 | Baseline | 0.420 | 0.355 | 0.297 | - | - | 0.026 |
| | | Year -3 | 0.579 | 0.477 | 0.392 | 0.021 | 0.038 | 0.065 |
| | 100 | Baseline | 0.380 | 0.318 | 0.250 | - | - | - |
| | | Year -3 | 0.502 | 0.441 | 0.349 | - | - | 0.044 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake B45 to Lake B2

**Table 7.3-C33: Monthly Mean Discharges at the Lake B4 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 70 500 | 197 000 | 52 300 | 28 200 | 26 800 | 15 700 |
| | | Year -3 | 34 600 | 115 000 | 32 300 | 33 300 | 12 100 | 13 500 |
| | 10 | Baseline | 32 500 | 135 000 | 23 800 | 8 800 | 10 400 | 6 500 |
| | | Year -3 | 15 500 | 75 900 | 12 600 | 5 350 | 7 450 | 4 800 |
| Median | 2 | Baseline | 5 590 | 82 700 | 9 250 | 2 150 | 3 020 | 1 520 |
| | | Year -3 | 2 320 | 45 000 | 3 950 | 588 | 1 660 | 720 |
| Dry | 10 | Baseline | 0 | 48 200 | 3 800 | 576 | 602 | 234 |
| | | Year -3 | 0 | 25 800 | 1 180 | 85 | 96 | 52 |
| | 100 | Baseline | 0 | 29 000 | 2 000 | 236 | 0 | 54 |
| | | Year -3 | 0 | 15 800 | 401 | 35 | 6 | 6 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C34: Derived Representative Discharges at the Lake B4 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 7.25 | 374 000 | 292 000 | 11 500 | 20 100 | 21 900 |
| | | Year -3 | 3.59 | 223 000 | 178 000 | 7 800 | 13 100 | 11 200 |
| | 10 | Baseline | 4.15 | 277 000 | 223 000 | 4 640 | 7 920 | 11 800 |
| | | Year -3 | 2.51 | 171 000 | 135 000 | 1 830 | 4 340 | 6 600 |
| Median | 2 | Baseline | 2.62 | 197 000 | 158 000 | 1 450 | 2 430 | 5 170 |
| | | Year -3 | 1.70 | 122 000 | 92 300 | 305 | 819 | 2 450 |
| Dry | 10 | Baseline | 2.04 | 146 000 | 110 000 | 365 | 646 | 1 890 |
| | | Year -3 | 1.23 | 85 500 | 59 700 | 46 | 112 | 606 |
| | 100 | Baseline | 1.99 | 118 000 | 80 500 | 42 | 128 | 492 |
| | | Year -3 | 1.01 | 63 000 | 38 800 | 5 | 25 | 190 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C35: Monthly Mean Stages at the Lake B4 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.560 | 0.661 | 0.534 | 0.483 | 0.479 | 0.439 |
| | | Year -3 | 1.379 | 1.486 | 1.374 | 1.376 | 1.301 | 1.309 |
| | 10 | Baseline | 0.494 | 0.622 | 0.470 | 0.400 | 0.411 | 0.381 |
| | | Year -3 | 1.318 | 1.447 | 1.304 | 1.249 | 1.269 | 1.243 |
| Median | 2 | Baseline | 0.372 | 0.575 | 0.403 | 0.319 | 0.337 | 0.301 |
| | | Year -3 | 1.202 | 1.401 | 1.231 | 1.138 | 1.186 | 1.147 |
| Dry | 10 | Baseline | - | 0.527 | 0.349 | 0.257 | 0.259 | 0.223 |
| | | Year -3 | - | 1.356 | 1.169 | 1.069 | 1.073 | 1.054 |
| | 100 | Baseline | - | 0.485 | 0.315 | 0.223 | - | 0.176 |
| | | Year -3 | - | 1.320 | 1.123 | 1.044 | 1.003 | 1.003 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C36: Derived Representative Stages at the Lake B4 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.797 | 0.733 | 0.704 | 0.418 | 0.457 | 0.464 |
| | | Year -3 | 1.591 | 1.554 | 1.530 | 1.272 | 1.307 | 1.296 |
| | 10 | Baseline | 0.728 | 0.698 | 0.674 | 0.361 | 0.393 | 0.419 |
| | | Year -3 | 1.551 | 1.526 | 1.502 | 1.190 | 1.237 | 1.262 |
| Median | 2 | Baseline | 0.676 | 0.661 | 0.638 | 0.299 | 0.325 | 0.367 |
| | | Year -3 | 1.510 | 1.492 | 1.465 | 1.112 | 1.153 | 1.205 |
| Dry | 10 | Baseline | 0.649 | 0.630 | 0.602 | 0.239 | 0.262 | 0.312 |
| | | Year -3 | 1.478 | 1.458 | 1.425 | 1.051 | 1.078 | 1.140 |
| | 100 | Baseline | 0.647 | 0.608 | 0.572 | 0.168 | 0.202 | 0.251 |
| | | Year -3 | 1.460 | 1.430 | 1.388 | 1.000 | 1.035 | 1.095 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C37: Monthly Mean Discharges at the Lake P2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 2 310 | 4 420 | 650 | 431 | 453 | 293 |
| | | Year -3 | 32 300 | 122 000 | 38 200 | 27 700 | 30 700 | 13 700 |
| | 10 | Baseline | 1 140 | 3 360 | 280 | 187 | 224 | 148 |
| | | Year -3 | 14 400 | 79 400 | 15 600 | 5 570 | 8 270 | 4 590 |
| Median | 2 | Baseline | 242 | 2 110 | 60 | 35 | 63 | 40 |
| | | Year -3 | 2 200 | 47 500 | 5 070 | 760 | 1 570 | 851 |
| Dry | 10 | Baseline | 0 | 909 | 0 | 0 | 0 | 0 |
| | | Year -3 | 0 | 28 900 | 1 540 | 82 | 215 | 112 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Year -3 | 0 | 19 700 | 482 | 0 | 0 | 24 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C38: Derived Representative Discharges at the Lake P2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.26 | 10 700 | 7 590 | 140 | 251 | 331 |
| | | Year -3 | 3.34 | 219 000 | 177 000 | 5 500 | 17 500 | 12 700 |
| | 10 | Baseline | 0.17 | 8 140 | 5 980 | 42 | 114 | 178 |
| | | Year -3 | 2.39 | 169 000 | 135 000 | 2 330 | 4 900 | 7 490 |
| Median | 2 | Baseline | 0.11 | 6 020 | 4 400 | 0 | 22 | 60 |
| | | Year -3 | 1.62 | 120 000 | 93 500 | 546 | 988 | 2 880 |
| Dry | 10 | Baseline | 0.08 | 4 630 | 3 180 | 0 | 0 | 0 |
| | | Year -3 | 1.14 | 82 900 | 60 800 | 0 | 157 | 777 |
| | 100 | Baseline | 0.07 | 3 870 | 2 380 | 0 | 0 | 0 |
| | | Year -3 | 0.88 | 59 000 | 39 400 | 0 | 0 | 266 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C39: Monthly Mean Stages at the Lake P2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.034 | 0.044 | 0.021 | 0.017 | 0.018 | 0.015 |
| | | Year -3 | 0.098 | 0.166 | 0.105 | 0.092 | 0.096 | 0.069 |
| | 10 | Baseline | 0.026 | 0.040 | 0.015 | 0.012 | 0.013 | 0.011 |
| | | Year -3 | 0.071 | 0.140 | 0.073 | 0.048 | 0.057 | 0.045 |
| Median | 2 | Baseline | 0.014 | 0.033 | 0.008 | 0.006 | 0.008 | 0.007 |
| | | Year -3 | 0.033 | 0.114 | 0.047 | 0.022 | 0.029 | 0.023 |
| Dry | 10 | Baseline | - | 0.023 | - | - | - | - |
| | | Year -3 | - | 0.094 | 0.029 | 0.009 | 0.013 | 0.010 |
| | 100 | Baseline | - | - | - | - | - | - |
| | | Year -3 | - | 0.080 | 0.018 | - | - | 0.006 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C40: Derived Representative Stages at the Lake P2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.085 | 0.063 | 0.055 | 0.011 | 0.014 | 0.016 |
| | | Year -3 | 0.235 | 0.210 | 0.193 | 0.048 | 0.077 | 0.067 |
| | 10 | Baseline | 0.072 | 0.056 | 0.050 | 0.007 | 0.010 | 0.012 |
| | | Year -3 | 0.205 | 0.190 | 0.173 | 0.034 | 0.046 | 0.055 |
| Median | 2 | Baseline | 0.060 | 0.050 | 0.044 | - | 0.005 | 0.008 |
| | | Year -3 | 0.176 | 0.165 | 0.150 | 0.019 | 0.024 | 0.037 |
| Dry | 10 | Baseline | 0.053 | 0.045 | 0.039 | - | - | - |
| | | Year -3 | 0.153 | 0.143 | 0.126 | - | 0.012 | 0.022 |
| | 100 | Baseline | 0.049 | 0.042 | 0.034 | - | - | - |
| | | Year -3 | 0.138 | 0.124 | 0.106 | - | - | 0.014 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C41: Monthly Mean Discharges at the Lake B2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | | Year -3 | 36 800 | 143 000 | 45 300 | 20 400 | 23 100 | 11 400 |
| | 10 | Baseline | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | | Year -3 | 16 300 | 91 300 | 19 600 | 6 020 | 7 500 | 4 640 |
| Median | 2 | Baseline | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| | | Year -3 | 2 400 | 54 500 | 7 120 | 1 360 | 1 790 | 1 020 |
| Dry | 10 | Baseline | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | | Year -3 | 0 | 34 200 | 2 710 | 317 | 323 | 144 |
| | 100 | Baseline | 0 | 34 200 | 2 710 | 332 | 0 | 87 |
| | | Year -3 | 0 | 24 700 | 1 330 | 105 | 0 | 31 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C42: Derived Representative Discharges at the Lake B2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | | Year -3 | 3.65 | 260 000 | 206 000 | 9 290 | 15 100 | 17 600 |
| | 10 | Baseline | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | | Year -3 | 2.78 | 196 000 | 154 000 | 3 330 | 5 490 | 8 900 |
| Median | 2 | Baseline | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| | | Year -3 | 1.95 | 136 000 | 105 000 | 900 | 1 530 | 3 630 |
| Dry | 10 | Baseline | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | | Year -3 | 1.31 | 90 000 | 68 700 | 191 | 366 | 1 250 |
| | 100 | Baseline | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |
| | | Year -3 | 0.89 | 61 200 | 45 700 | 6 | 62 | 311 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C43: Monthly Mean Stages at the Lake B2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.520 | 0.643 | 0.498 | 0.426 | 0.422 | 0.386 |
| | | Year -3 | 0.454 | 0.593 | 0.473 | 0.404 | 0.414 | 0.360 |
| | 10 | Baseline | 0.445 | 0.595 | 0.429 | 0.348 | 0.355 | 0.324 |
| | | Year -3 | 0.387 | 0.543 | 0.401 | 0.318 | 0.332 | 0.302 |
| Median | 2 | Baseline | 0.309 | 0.541 | 0.359 | 0.272 | 0.282 | 0.247 |
| | | Year -3 | 0.265 | 0.490 | 0.328 | 0.237 | 0.250 | 0.224 |
| Dry | 10 | Baseline | - | 0.489 | 0.305 | 0.214 | 0.211 | 0.177 |
| | | Year -3 | - | 0.447 | 0.272 | 0.178 | 0.179 | 0.153 |
| | 100 | Baseline | - | 0.447 | 0.272 | 0.180 | - | 0.138 |
| | | Year -3 | - | 0.420 | 0.236 | 0.143 | - | 0.112 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C44: Derived Representative Stages at the Lake B2 Outlet - Preproduction Phase (Year -3)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.859 | 0.749 | 0.696 | 0.368 | 0.401 | 0.418 |
| | | Year -3 | 0.692 | 0.669 | 0.639 | 0.346 | 0.381 | 0.392 |
| | 10 | Baseline | 0.780 | 0.700 | 0.661 | 0.313 | 0.340 | 0.371 |
| | | Year -3 | 0.656 | 0.633 | 0.601 | 0.283 | 0.312 | 0.343 |
| Median | 2 | Baseline | 0.706 | 0.653 | 0.619 | 0.254 | 0.276 | 0.318 |
| | | Year -3 | 0.612 | 0.587 | 0.558 | 0.219 | 0.243 | 0.288 |
| Dry | 10 | Baseline | 0.654 | 0.613 | 0.574 | 0.197 | 0.217 | 0.264 |
| | | Year -3 | 0.566 | 0.541 | 0.513 | 0.161 | 0.183 | 0.233 |
| | 100 | Baseline | 0.627 | 0.582 | 0.531 | 0.123 | 0.163 | 0.214 |
| | | Year -3 | 0.525 | 0.502 | 0.474 | 0.083 | 0.129 | 0.177 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

# 2.0 EFFECT ANALYSIS RESULTS – PREPRODUCTION PHASE (YEARS -2 TO -1)

## 2.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake A6 to Lake A1

**Table 7.3-C45: Monthly Mean Discharges at the Lake A6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 24 100 | 65 300 | 13 400 | 7 770 | 6 080 | 3 240 |
| | | Yr -2 to -1 | 11 000 | 32 300 | 6 200 | 4 100 | 2 890 | 1 980 |
| | 10 | Baseline | 10 800 | 43 700 | 6 490 | 2 720 | 2 790 | 1 640 |
| | | Yr -2 to -1 | 4 970 | 23 500 | 3 540 | 1 510 | 1 580 | 989 |
| Median | 2 | Baseline | 1 740 | 26 000 | 2 710 | 728 | 964 | 472 |
| | | Yr -2 to -1 | 817 | 15 400 | 1 890 | 434 | 661 | 315 |
| Dry | 10 | Baseline | 0 | 14 800 | 1 170 | 168 | 209 | 84 |
| | | Yr -2 to -1 | 0 | 9 610 | 1 130 | 115 | 164 | 72 |
| | 100 | Baseline | 0 | 8 690 | 616 | 28 | 0 | 21 |
| | | Yr -2 to -1 | 0 | 6 110 | 814 | 30 | 0 | 23 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C46: Derived Representative Discharges at the Lake A6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.55 | 133 000 | 98 300 | 3 550 | 5 130 | 5 970 |
| | | Yr -2 to -1 | 1.41 | 68 100 | 48 600 | 1 770 | 2 620 | 2 940 |
| | 10 | Baseline | 1.94 | 98 700 | 74 700 | 1 500 | 2 310 | 3 330 |
| | | Yr -2 to -1 | 0.96 | 52 900 | 39 300 | 820 | 1 290 | 1 820 |
| Median | 2 | Baseline | 1.12 | 68 600 | 51 900 | 483 | 805 | 1 530 |
| | | Yr -2 to -1 | 0.60 | 37 500 | 28 700 | 293 | 500 | 982 |
| Dry | 10 | Baseline | 0.81 | 48 100 | 34 300 | 109 | 208 | 592 |
| | | Yr -2 to -1 | 0.38 | 25 000 | 18 900 | 76 | 149 | 505 |
| | 100 | Baseline | 0.78 | 36 200 | 23 100 | 0 | 1 | 170 |
| | | Yr -2 to -1 | 0.26 | 16 700 | 11 500 | 0 | 14 | 272 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C47: Monthly Mean Stages at the Lake A6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.482 | 0.351 | 0.315 | 0.300 | 0.264 |
| | | Yr -2 to -1 | 0.338 | 0.419 | 0.301 | 0.277 | 0.258 | 0.240 |
| | 10 | Baseline | 0.336 | 0.445 | 0.304 | 0.255 | 0.257 | 0.231 |
| | | Yr -2 to -1 | 0.288 | 0.393 | 0.269 | 0.227 | 0.229 | 0.209 |
| Median | 2 | Baseline | 0.234 | 0.401 | 0.255 | 0.196 | 0.208 | 0.180 |
| | | Yr -2 to -1 | 0.201 | 0.361 | 0.237 | 0.177 | 0.192 | 0.166 |
| Dry | 10 | Baseline | - | 0.358 | 0.216 | 0.146 | 0.153 | 0.128 |
| | | Yr -2 to -1 | - | 0.329 | 0.214 | 0.136 | 0.146 | 0.124 |
| | 100 | Baseline | - | 0.322 | 0.190 | 0.102 | - | 0.096 |
| | | Yr -2 to -1 | - | 0.300 | 0.201 | 0.104 | - | 0.098 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C48: Derived Representative Stages at the Lake A6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.657 | 0.556 | 0.523 | 0.269 | 0.290 | 0.299 |
| | | Yr -2 to -1 | 0.546 | 0.486 | 0.455 | 0.234 | 0.253 | 0.259 |
| | 10 | Baseline | 0.582 | 0.524 | 0.495 | 0.227 | 0.247 | 0.266 |
| | | Yr -2 to -1 | 0.506 | 0.462 | 0.436 | 0.201 | 0.220 | 0.236 |
| Median | 2 | Baseline | 0.522 | 0.487 | 0.461 | 0.181 | 0.200 | 0.228 |
| | | Yr -2 to -1 | 0.460 | 0.432 | 0.409 | 0.164 | 0.182 | 0.208 |
| Dry | 10 | Baseline | 0.489 | 0.454 | 0.424 | 0.134 | 0.153 | 0.188 |
| | | Yr -2 to -1 | 0.419 | 0.398 | 0.376 | 0.125 | 0.143 | 0.182 |
| | 100 | Baseline | 0.486 | 0.429 | 0.392 | - | 0.051 | 0.147 |
| | | Yr -2 to -1 | 0.389 | 0.367 | 0.341 | - | 0.089 | 0.161 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C49: Monthly Mean Discharges at the Lake A1 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | | Yr -2 to -1 | 22 100 | 58 700 | 11 300 | 7 360 | 5 280 | 3 630 |
| | 10 | Baseline | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | | Yr -2 to -1 | 10 200 | 42 300 | 6 590 | 3 410 | 3 350 | 1 730 |
| Median | 2 | Baseline | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| | | Yr -2 to -1 | 1 780 | 26 900 | 3 520 | 1 310 | 1 690 | 617 |
| Dry | 10 | Baseline | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | | Yr -2 to -1 | 0 | 15 500 | 2 010 | 487 | 587 | 200 |
| | 100 | Baseline | 0 | 11 900 | 1 200 | 201 | 12 | 105 |
| | | Yr -2 to -1 | 0 | 8 330 | 1 370 | 202 | 0 | 90 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C50: Derived Representative Discharges at the Lake A1 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | | Yr -2 to -1 | 2.66 | 125 000 | 90 100 | 3 130 | 4 720 | 5 500 |
| | 10 | Baseline | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | | Yr -2 to -1 | 1.82 | 96 600 | 71 600 | 1 870 | 2 830 | 3 700 |
| Median | 2 | Baseline | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| | | Yr -2 to -1 | 1.15 | 68 900 | 51 800 | 917 | 1 400 | 2 200 |
| Dry | 10 | Baseline | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | | Yr -2 to -1 | 0.75 | 46 900 | 34 800 | 354 | 570 | 1 220 |
| | 100 | Baseline | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |
| | | Yr -2 to -1 | 0.53 | 32 400 | 22 800 | 72 | 155 | 680 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C51: Monthly Mean Stages at the Lake A1 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | | Yr -2 to -1 | 0.559 | 0.668 | 0.495 | 0.458 | 0.431 | 0.403 |
| | 10 | Baseline | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | | Yr -2 to -1 | 0.486 | 0.629 | 0.449 | 0.398 | 0.397 | 0.352 |
| Median | 2 | Baseline | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| | | Yr -2 to -1 | 0.354 | 0.580 | 0.400 | 0.335 | 0.350 | 0.292 |
| Dry | 10 | Baseline | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | | Yr -2 to -1 | - | 0.524 | 0.362 | 0.279 | 0.289 | 0.238 |
| | 100 | Baseline | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |
| | | Yr -2 to -1 | - | 0.468 | 0.337 | 0.238 | - | 0.206 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C52: Derived Representative Stages at the Lake A1 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | | Yr -2 to -1 | 0.856 | 0.780 | 0.723 | 0.392 | 0.422 | 0.434 |
| | 10 | Baseline | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | | Yr -2 to -1 | 0.799 | 0.734 | 0.692 | 0.357 | 0.385 | 0.404 |
| Median | 2 | Baseline | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| | | Yr -2 to -1 | 0.735 | 0.688 | 0.653 | 0.314 | 0.339 | 0.368 |
| Dry | 10 | Baseline | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | | Yr -2 to -1 | 0.679 | 0.641 | 0.607 | 0.264 | 0.288 | 0.330 |
| | 100 | Baseline | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |
| | | Yr -2 to -1 | 0.639 | 0.599 | 0.562 | 0.197 | 0.227 | 0.297 |

Note: m= metre.

## 2.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake B6 to Lake B5

**Table 7.3-C53: Monthly Mean Discharges at the Lake B6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 7 760 | 26 700 | 8 320 | 3 310 | 2 530 | 1 500 |
| | | Yr -2 to -1 | 1 520 | 3 130 | 344 | 109 | 220 | 151 |
| | 10 | Baseline | 3 550 | 17 500 | 4 430 | 1 800 | 1 660 | 898 |
| | | Yr -2 to -1 | 692 | 2 210 | 139 | 38 | 67 | 54 |
| Median | 2 | Baseline | 602 | 10 700 | 2 020 | 745 | 865 | 368 |
| | | Yr -2 to -1 | 119 | 1 270 | 18 | 1 | 0 | 3 |
| Dry | 10 | Baseline | 0 | 6 850 | 891 | 189 | 285 | 112 |
| | | Yr -2 to -1 | 0 | 499 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 4 980 | 433 | 0 | 0 | 43 |
| | | Yr -2 to -1 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C54: Derived Representative Discharges at the Lake B6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.85 | 50 100 | 38 300 | 1 710 | 2 340 | 3 160 |
| | | Yr -2 to -1 | 0.18 | 7 470 | 4 810 | 40 | 71 | 147 |
| | 10 | Baseline | 0.55 | 34 900 | 28 300 | 1 060 | 1 500 | 2 180 |
| | | Yr -2 to -1 | 0.11 | 5 660 | 3 970 | 11 | 24 | 60 |
| Median | 2 | Baseline | 0.34 | 23 100 | 19 400 | 492 | 762 | 1 250 |
| | | Yr -2 to -1 | 0.07 | 3 960 | 2 880 | 0 | 1 | 9 |
| Dry | 10 | Baseline | 0.23 | 16 100 | 12 900 | 113 | 244 | 536 |
| | | Yr -2 to -1 | 0.04 | 2 720 | 1 700 | 0 | 0 | 0 |
| | 100 | Baseline | 0.19 | 12 500 | 9 110 | 0 | 0 | 84 |
| | | Yr -2 to -1 | 0.03 | 1 950 | 668 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C55: Monthly Mean Stages at the Lake B6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.107 | 0.244 | 0.112 | 0.061 | 0.051 | 0.036 |
| | | Yr -2 to -1 | 0.036 | 0.059 | 0.013 | 0.006 | 0.010 | 0.008 |
| | 10 | Baseline | 0.064 | 0.184 | 0.074 | 0.040 | 0.038 | 0.025 |
| | | Yr -2 to -1 | 0.021 | 0.046 | 0.007 | 0.003 | 0.005 | 0.004 |
| Median | 2 | Baseline | 0.019 | 0.133 | 0.044 | 0.022 | 0.025 | 0.014 |
| | | Yr -2 to -1 | 0.007 | 0.032 | 0.002 | 0.000 | - | 0.001 |
| Dry | 10 | Baseline | - | 0.099 | 0.025 | 0.009 | 0.012 | 0.006 |
| | | Yr -2 to -1 | - | 0.017 | - | - | - | - |
| | 100 | Baseline | - | 0.080 | 0.016 | - | - | 0.003 |
| | | Yr -2 to -1 | - | - | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C56: Derived Representative Stages at the Lake B6 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.480 | 0.372 | 0.311 | 0.039 | 0.048 | 0.059 |
| | | Yr -2 to -1 | 0.170 | 0.104 | 0.078 | 0.003 | 0.005 | 0.008 |
| | 10 | Baseline | 0.357 | 0.292 | 0.254 | 0.028 | 0.036 | 0.046 |
| | | Yr -2 to -1 | 0.126 | 0.087 | 0.069 | 0.001 | 0.002 | 0.004 |
| Median | 2 | Baseline | 0.261 | 0.222 | 0.197 | 0.017 | 0.023 | 0.032 |
| | | Yr -2 to -1 | 0.089 | 0.068 | 0.055 | - | 0.000 | 0.001 |
| Dry | 10 | Baseline | 0.198 | 0.174 | 0.150 | 0.006 | 0.011 | 0.018 |
| | | Yr -2 to -1 | 0.067 | 0.053 | 0.039 | - | - | - |
| | 100 | Baseline | 0.178 | 0.147 | 0.119 | - | - | 0.005 |
| | | Yr -2 to -1 | 0.056 | 0.043 | 0.021 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C57: Monthly Mean Discharges at the Lake B5 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 15 700 | 48 000 | 12 200 | 6 610 | 4 770 | 2 210 |
| | | Yr -2 to -1 | 10 800 | 25 800 | 5 020 | 3 600 | 2 540 | 1 500 |
| | 10 | Baseline | 7 320 | 31 300 | 6 390 | 2 760 | 2 710 | 1 490 |
| | | Yr -2 to -1 | 5 090 | 18 000 | 2 470 | 1 310 | 1 250 | 708 |
| Median | 2 | Baseline | 1 350 | 18 600 | 2 870 | 882 | 1 170 | 548 |
| | | Yr -2 to -1 | 964 | 10 800 | 1 020 | 367 | 461 | 203 |
| Dry | 10 | Baseline | 0 | 11 100 | 1 280 | 214 | 273 | 99 |
| | | Yr -2 to -1 | 0 | 5 540 | 409 | 89 | 103 | 41 |
| | 100 | Baseline | 0 | 7 400 | 647 | 4 | 0 | 20 |
| | | Yr -2 to -1 | 0 | 2 360 | 183 | 15 | 0 | 12 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C58: Derived Representative Discharges at the Lake B5 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.82 | 88 900 | 68 100 | 3 100 | 4 200 | 4 950 |
| | | Yr -2 to -1 | 1.80 | 53 700 | 40 500 | 1 320 | 2 190 | 2 340 |
| | 10 | Baseline | 0.99 | 61 300 | 49 900 | 1 530 | 2 290 | 3 250 |
| | | Yr -2 to -1 | 0.86 | 39 200 | 30 700 | 620 | 1 040 | 1 380 |
| Median | 2 | Baseline | 0.60 | 41 000 | 34 000 | 577 | 969 | 1 740 |
| | | Yr -2 to -1 | 0.44 | 27 500 | 21 500 | 222 | 383 | 669 |
| Dry | 10 | Baseline | 0.44 | 29 500 | 23 200 | 142 | 265 | 692 |
| | | Yr -2 to -1 | 0.31 | 20 200 | 14 700 | 54 | 105 | 258 |
| | 100 | Baseline | 0.43 | 23 900 | 17 000 | 0 | 0 | 78 |
| | | Yr -2 to -1 | 0.27 | 16 400 | 10 600 | 0 | 2 | 55 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C59: Monthly Mean Stages at the Lake B5 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.472 | 0.380 | 0.344 | 0.327 | 0.289 |
| | | Yr -2 to -1 | 0.372 | 0.428 | 0.330 | 0.313 | 0.296 | 0.272 |
| | 10 | Baseline | 0.350 | 0.441 | 0.343 | 0.300 | 0.299 | 0.272 |
| | | Yr -2 to -1 | 0.330 | 0.404 | 0.294 | 0.266 | 0.264 | 0.241 |
| Median | 2 | Baseline | 0.267 | 0.406 | 0.302 | 0.250 | 0.261 | 0.232 |
| | | Yr -2 to -1 | 0.253 | 0.372 | 0.256 | 0.217 | 0.225 | 0.198 |
| Dry | 10 | Baseline | - | 0.374 | 0.265 | 0.199 | 0.207 | 0.176 |
| | | Yr -2 to -1 | - | 0.335 | 0.221 | 0.173 | 0.177 | 0.153 |
| | 100 | Baseline | - | 0.351 | 0.238 | 0.104 | - | 0.137 |
| | | Yr -2 to -1 | - | 0.292 | 0.194 | 0.131 | - | 0.125 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C60: Derived Representative Stages at the Lake B5 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.571 | 0.521 | 0.499 | 0.305 | 0.320 | 0.329 |
| | | Yr -2 to -1 | 0.570 | 0.481 | 0.460 | 0.266 | 0.289 | 0.292 |
| | 10 | Baseline | 0.518 | 0.491 | 0.475 | 0.273 | 0.291 | 0.308 |
| | | Yr -2 to -1 | 0.507 | 0.457 | 0.440 | 0.236 | 0.256 | 0.268 |
| Median | 2 | Baseline | 0.478 | 0.461 | 0.447 | 0.234 | 0.254 | 0.278 |
| | | Yr -2 to -1 | 0.456 | 0.432 | 0.416 | 0.201 | 0.219 | 0.239 |
| Dry | 10 | Baseline | 0.456 | 0.437 | 0.421 | 0.187 | 0.206 | 0.240 |
| | | Yr -2 to -1 | 0.430 | 0.412 | 0.391 | 0.160 | 0.178 | 0.205 |
| | 100 | Baseline | 0.453 | 0.423 | 0.400 | - | - | 0.170 |
| | | Yr -2 to -1 | 0.421 | 0.398 | 0.371 | - | 0.093 | 0.161 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## 2.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake B45 to Lake B2

**Table 7.3-C61: Monthly Mean Discharges at the Lake B4 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 70 500 | 197 000 | 52 300 | 28 200 | 26 800 | 15 700 |
| | | Yr -2 to -1 | 47 900 | 118 000 | 32 700 | 33 100 | 12 300 | 13 600 |
| | 10 | Baseline | 32 500 | 135 000 | 23 800 | 8 800 | 10 400 | 6 500 |
| | | Yr -2 to -1 | 22 400 | 85 500 | 12 500 | 5 200 | 7 400 | 4 840 |
| Median | 2 | Baseline | 5 590 | 82 700 | 9 250 | 2 150 | 3 020 | 1 520 |
| | | Yr -2 to -1 | 4 040 | 54 200 | 3 810 | 556 | 1 600 | 720 |
| Dry | 10 | Baseline | 0 | 48 200 | 3 800 | 576 | 602 | 234 |
| | | Yr -2 to -1 | 0 | 29 800 | 1 120 | 79 | 90 | 51 |
| | 100 | Baseline | 0 | 29 000 | 2 000 | 236 | 0 | 54 |
| | | Yr -2 to -1 | 0 | 14 000 | 379 | 33 | 6 | 6 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C62: Derived Representative Discharges at the Lake B4 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 7.25 | 374 000 | 292 000 | 11 500 | 20 100 | 21 900 |
| | | Yr -2 to -1 | 5.60 | 250 000 | 182 000 | 7 720 | 13 400 | 11 400 |
| | 10 | Baseline | 4.15 | 277 000 | 223 000 | 4 640 | 7 920 | 11 800 |
| | | Yr -2 to -1 | 3.16 | 184 000 | 143 000 | 1 780 | 4 240 | 6 610 |
| Median | 2 | Baseline | 2.62 | 197 000 | 158 000 | 1 450 | 2 430 | 5 170 |
| | | Yr -2 to -1 | 1.87 | 133 000 | 105 000 | 288 | 772 | 2 400 |
| Dry | 10 | Baseline | 2.04 | 146 000 | 110 000 | 365 | 646 | 1 890 |
| | | Yr -2 to -1 | 1.37 | 103 000 | 76 300 | 42 | 106 | 581 |
| | 100 | Baseline | 1.99 | 118 000 | 80 500 | 42 | 128 | 492 |
| | | Yr -2 to -1 | 1.19 | 87 300 | 57 800 | 5 | 24 | 180 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C63: Monthly Mean Stages at the Lake B4 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.560 | 0.661 | 0.534 | 0.483 | 0.479 | 0.439 |
| | | Yr -2 to -1 | 1.406 | 1.488 | 1.375 | 1.376 | 1.302 | 1.309 |
| | 10 | Baseline | 0.494 | 0.622 | 0.470 | 0.400 | 0.411 | 0.381 |
| | | Yr -2 to -1 | 1.345 | 1.458 | 1.303 | 1.247 | 1.269 | 1.243 |
| Median | 2 | Baseline | 0.372 | 0.575 | 0.403 | 0.319 | 0.337 | 0.301 |
| | | Yr -2 to -1 | 1.233 | 1.417 | 1.229 | 1.136 | 1.184 | 1.147 |
| Dry | 10 | Baseline | - | 0.527 | 0.349 | 0.257 | 0.259 | 0.223 |
| | | Yr -2 to -1 | - | 1.367 | 1.167 | 1.067 | 1.071 | 1.054 |
| | 100 | Baseline | - | 0.485 | 0.315 | 0.223 | - | 0.176 |
| | | Yr -2 to -1 | - | 1.311 | 1.121 | 1.042 | 1.002 | 1.002 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C64: Derived Representative Stages at the Lake B4 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.797 | 0.733 | 0.704 | 0.418 | 0.457 | 0.464 |
| | | Yr -2 to -1 | 1.644 | 1.567 | 1.533 | 1.272 | 1.308 | 1.297 |
| | 10 | Baseline | 0.728 | 0.698 | 0.674 | 0.361 | 0.393 | 0.419 |
| | | Yr -2 to -1 | 1.577 | 1.534 | 1.508 | 1.189 | 1.235 | 1.262 |
| Median | 2 | Baseline | 0.676 | 0.661 | 0.638 | 0.299 | 0.325 | 0.367 |
| | | Yr -2 to -1 | 1.520 | 1.500 | 1.477 | 1.110 | 1.150 | 1.204 |
| Dry | 10 | Baseline | 0.649 | 0.630 | 0.602 | 0.239 | 0.262 | 0.312 |
| | | Yr -2 to -1 | 1.489 | 1.475 | 1.447 | 1.049 | 1.076 | 1.138 |
| | 100 | Baseline | 0.647 | 0.608 | 0.572 | 0.168 | 0.202 | 0.251 |
| | | Yr -2 to -1 | 1.475 | 1.460 | 1.422 | 0.999 | 1.034 | 1.093 |

Note: m= metre.

**Table 7.3-C65: Monthly Mean Discharges at the Lake P2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 2 310 | 4 420 | 650 | 431 | 453 | 293 |
| | | Yr -2 to -1 | 45 500 | 125 000 | 38 600 | 28 500 | 32 300 | 13 900 |
| | 10 | Baseline | 1 140 | 3 360 | 280 | 187 | 224 | 148 |
| | | Year -3 | 20 800 | 89 600 | 15 400 | 5 500 | 8 310 | 4 630 |
| Median | 2 | Baseline | 242 | 2 110 | 60 | 35 | 63 | 40 |
| | | Yr -2 to -1 | 3 490 | 57 200 | 4 880 | 714 | 1 500 | 856 |
| Dry | 10 | Baseline | 0 | 909 | 0 | 0 | 0 | 0 |
| | | Yr -2 to -1 | 0 | 33 600 | 1 440 | 74 | 201 | 112 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Yr -2 to -1 | 0 | 19 300 | 442 | 0 | 0 | 24 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C66: Derived Representative Discharges at the Lake P2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.26 | 10 700 | 7 590 | 140 | 251 | 331 |
| | | Yr -2 to -1 | 5.58 | 257 000 | 195 000 | 5 460 | 17 600 | 13 000 |
| | 10 | Baseline | 0.17 | 8 140 | 5 980 | 42 | 114 | 178 |
| | | Yr -2 to -1 | 3.21 | 192 000 | 151 000 | 2 280 | 4 800 | 7 500 |
| Median | 2 | Baseline | 0.11 | 6 020 | 4 400 | 0 | 22 | 60 |
| | | Yr -2 to -1 | 1.90 | 139 000 | 110 000 | 514 | 940 | 2 810 |
| Dry | 10 | Baseline | 0.08 | 4 630 | 3 180 | 0 | 0 | 0 |
| | | Yr -2 to -1 | 1.36 | 105 000 | 78 500 | 0 | 146 | 744 |
| | 100 | Baseline | 0.07 | 3 870 | 2 380 | 0 | 0 | 0 |
| | | Yr -2 to -1 | 1.17 | 85 800 | 58 800 | 0 | 0 | 253 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C67: Monthly Mean Stages at the Lake P2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.034 | 0.044 | 0.021 | 0.017 | 0.018 | 0.015 |
| | | Yr -2 to -1 | 0.112 | 0.168 | 0.105 | 0.093 | 0.098 | 0.070 |
| | 10 | Baseline | 0.026 | 0.040 | 0.015 | 0.012 | 0.013 | 0.011 |
| | | Yr -2 to -1 | 0.082 | 0.147 | 0.073 | 0.048 | 0.057 | 0.045 |
| Median | 2 | Baseline | 0.014 | 0.033 | 0.008 | 0.006 | 0.008 | 0.007 |
| | | Yr -2 to -1 | 0.040 | 0.123 | 0.046 | 0.021 | 0.029 | 0.023 |
| Dry | 10 | Baseline | - | 0.023 | - | - | - | - |
| | | Yr -2 to -1 | - | 0.099 | 0.028 | 0.009 | 0.013 | 0.010 |
| | 100 | Baseline | - | - | - | - | - | - |
| | | Yr -2 to -1 | - | 0.080 | 0.018 | - | - | 0.005 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C68: Derived Representative Stages at the Lake P2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.085 | 0.063 | 0.055 | 0.011 | 0.014 | 0.016 |
| | | Yr -2 to -1 | 0.288 | 0.224 | 0.201 | 0.048 | 0.077 | 0.068 |
| | 10 | Baseline | 0.072 | 0.056 | 0.050 | 0.007 | 0.010 | 0.012 |
| | | Yr -2 to -1 | 0.231 | 0.200 | 0.181 | 0.034 | 0.046 | 0.055 |
| Median | 2 | Baseline | 0.060 | 0.050 | 0.044 | - | 0.005 | 0.008 |
| | | Yr -2 to -1 | 0.187 | 0.175 | 0.160 | 0.019 | 0.024 | 0.037 |
| Dry | 10 | Baseline | 0.053 | 0.045 | 0.039 | - | - | - |
| | | Yr -2 to -1 | 0.164 | 0.157 | 0.140 | - | 0.011 | 0.022 |
| | 100 | Baseline | 0.049 | 0.042 | 0.034 | - | - | - |
| | | Yr -2 to -1 | 0.154 | 0.145 | 0.124 | - | - | 0.014 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C69: Monthly Mean Discharges at the Lake B2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | | Yr -2 to -1 | 49 600 | 141 000 | 45 900 | 20 500 | 23 600 | 22 500 |
| | 10 | Baseline | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | | Yr -2 to -1 | 22 400 | 99 800 | 19 400 | 5 910 | 7 430 | 5 270 |
| Median | 2 | Baseline | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| | | Yr -2 to -1 | 3 480 | 63 900 | 6 900 | 1 300 | 1 710 | 885 |
| Dry | 10 | Baseline | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | | Yr -2 to -1 | 0 | 39 000 | 2 580 | 296 | 302 | 143 |
| | 100 | Baseline | 0 | 34 200 | 2 710 | 332 | 0 | 87 |
| | | Yr -2 to -1 | 0 | 24 600 | 1 270 | 99 | 0 | 28 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C70: Derived Representative Discharges at the Lake B2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | | Yr -2 to -1 | 6.91 | 263 000 | 201 000 | 9 240 | 15 300 | 18 300 |
| | 10 | Baseline | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | | Yr -2 to -1 | 4.45 | 213 000 | 167 000 | 3 250 | 5 410 | 8 960 |
| Median | 2 | Baseline | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| | | Yr -2 to -1 | 2.78 | 163 000 | 127 000 | 858 | 1 460 | 3 550 |
| Dry | 10 | Baseline | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | | Yr -2 to -1 | 1.92 | 122 000 | 89 000 | 179 | 345 | 1 210 |
| | 100 | Baseline | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |
| | | Yr -2 to -1 | 1.53 | 94 500 | 59 700 | 6 | 62 | 322 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C71: Monthly Mean Stages at the Lake B2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.520 | 0.643 | 0.498 | 0.426 | 0.422 | 0.386 |
| | | Yr -2 to -1 | 0.481 | 0.591 | 0.474 | 0.404 | 0.416 | 0.412 |
| | 10 | Baseline | 0.445 | 0.595 | 0.429 | 0.348 | 0.355 | 0.324 |
| | | Yr -2 to -1 | 0.412 | 0.552 | 0.400 | 0.317 | 0.331 | 0.310 |
| Median | 2 | Baseline | 0.309 | 0.541 | 0.359 | 0.272 | 0.282 | 0.247 |
| | | Yr -2 to -1 | 0.285 | 0.506 | 0.326 | 0.235 | 0.248 | 0.218 |
| Dry | 10 | Baseline | - | 0.489 | 0.305 | 0.214 | 0.211 | 0.177 |
| | | Yr -2 to -1 | - | 0.459 | 0.269 | 0.176 | 0.176 | 0.152 |
| | 100 | Baseline | - | 0.447 | 0.272 | 0.180 | - | 0.138 |
| | | Yr -2 to -1 | - | 0.419 | 0.234 | 0.142 | - | 0.111 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C72: Derived Representative Stages at the Lake B2 Outlet - Preproduction Phase (Years -2 to -1)**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.859 | 0.749 | 0.696 | 0.368 | 0.401 | 0.418 |
| | | Yr -2 to -1 | 0.785 | 0.671 | 0.636 | 0.346 | 0.382 | 0.396 |
| | 10 | Baseline | 0.780 | 0.700 | 0.661 | 0.313 | 0.340 | 0.371 |
| | | Yr -2 to -1 | 0.720 | 0.643 | 0.611 | 0.282 | 0.311 | 0.344 |
| Median | 2 | Baseline | 0.706 | 0.653 | 0.619 | 0.254 | 0.276 | 0.318 |
| | | Yr -2 to -1 | 0.656 | 0.608 | 0.579 | 0.217 | 0.241 | 0.286 |
| Dry | 10 | Baseline | 0.654 | 0.613 | 0.574 | 0.197 | 0.217 | 0.264 |
| | | Yr -2 to -1 | 0.610 | 0.574 | 0.540 | 0.159 | 0.181 | 0.232 |
| | 100 | Baseline | 0.627 | 0.582 | 0.531 | 0.123 | 0.163 | 0.214 |
| | | Yr -2 to -1 | 0.584 | 0.546 | 0.499 | 0.082 | 0.129 | 0.179 |

Note: m= metre.

# 3.0 EFFECT ANALYSIS RESULTS – MINING PHASE 1 (YEARS 1 TO 2)

## 3.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake A1

**Table 7.3-C73: Monthly Mean Discharges at the Lake A1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | | Phase 1 | 12 900 | 34 700 | 10 900 | 9 690 | 10 200 | 2 810 |
| | 10 | Baseline | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | | Phase 1 | 6 180 | 27 800 | 8 090 | 8 190 | 8 510 | 2 260 |
| Median | 2 | Baseline | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| | | Phase 1 | 1 230 | 20 100 | 6 340 | 6 770 | 7 100 | 1 570 |
| Dry | 10 | Baseline | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | | Phase 1 | 0 | 13 200 | 5 510 | 5 700 | 6 200 | 842 |
| | 100 | Baseline | 0 | 11 900 | 1 200 | 201 | 12 | 105 |
| | | Phase 1 | 0 | 8 150 | 5 170 | 5 020 | 5 700 | 231 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C74: Derived Representative Discharges at the Lake A1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | | Phase 1 | 1.71 | 72 100 | 56 800 | 7 490 | 7 990 | 8 250 |
| | 10 | Baseline | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | | Phase 1 | 1.25 | 62 400 | 47 000 | 6 430 | 7 160 | 7 560 |
| Median | 2 | Baseline | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| | | Phase 1 | 0.82 | 47 900 | 35 200 | 5 540 | 6 310 | 6 800 |
| Dry | 10 | Baseline | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | | Phase 1 | 0.48 | 30 100 | 23 500 | 4 960 | 5 620 | 6 110 |
| | 100 | Baseline | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |
| | | Phase 1 | 0.27 | 12 600 | 14 100 | 4 630 | 5 150 | 5 610 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C75: Monthly Mean Stages at the Lake A1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | | Phase 1 | 0.507 | 0.607 | 0.492 | 0.481 | 0.486 | 0.384 |
| | 10 | Baseline | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | | Phase 1 | 0.444 | 0.583 | 0.466 | 0.467 | 0.470 | 0.369 |
| Median | 2 | Baseline | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| | | Phase 1 | 0.331 | 0.550 | 0.446 | 0.451 | 0.455 | 0.346 |
| Dry | 10 | Baseline | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | | Phase 1 | - | 0.509 | 0.434 | 0.437 | 0.444 | 0.309 |
| | 100 | Baseline | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |
| | | Phase 1 | - | 0.466 | 0.429 | 0.427 | 0.437 | 0.244 |

Note: m= metre.

**Table 7.3-C76: Derived Representative Stages at the Lake A1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | | Phase 1 | 0.790 | 0.693 | 0.664 | 0.459 | 0.465 | 0.467 |
| | 10 | Baseline | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | | Phase 1 | 0.746 | 0.675 | 0.641 | 0.447 | 0.456 | 0.460 |
| Median | 2 | Baseline | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| | | Phase 1 | 0.690 | 0.644 | 0.609 | 0.435 | 0.445 | 0.451 |
| Dry | 10 | Baseline | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | | Phase 1 | 0.628 | 0.591 | 0.565 | 0.426 | 0.436 | 0.443 |
| | 100 | Baseline | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |
| | | Phase 1 | 0.565 | 0.505 | 0.515 | 0.421 | 0.429 | 0.436 |

Note: m= metre.

## Lake J2 to Lake J1

**Table 7.3-C77: Monthly Mean Discharges at the Lake J2 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 4 070 | 8 220 | 1 030 | 708 | 569 | 301 |
| | | Phase 1 | 4 600 | 5 290 | 987 | 980 | 1 300 | 318 |
| | 10 | Baseline | 1 930 | 5 600 | 408 | 329 | 306 | 139 |
| | | Phase 1 | 1 060 | 3 970 | 733 | 747 | 799 | 136 |
| Median | 2 | Baseline | 388 | 3 050 | 67 | 69 | 98 | 33 |
| | | Phase 1 | 173 | 2 400 | 510 | 556 | 571 | 48 |
| Dry | 10 | Baseline | 0 | 1 080 | 0 | 0 | 0 | 0 |
| | | Phase 1 | 0 | 1 030 | 356 | 434 | 496 | 5 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Phase 1 | 0 | 168 | 266 | 367 | 474 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C78: Derived Representative Discharges at the Lake J2 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.31 | 20 600 | 13 000 | 68 | 368 | 391 |
| | | Phase 1 | 1.19 | 16 800 | 9 510 | 487 | 803 | 784 |
| | 10 | Baseline | 0.94 | 16 200 | 9 910 | 21 | 177 | 238 |
| | | Phase 1 | 0.69 | 11 500 | 7 190 | 463 | 600 | 666 |
| Median | 2 | Baseline | 0.56 | 11 500 | 7 000 | 0 | 41 | 98 |
| | | Phase 1 | 0.35 | 7 450 | 5 030 | 418 | 485 | 559 |
| Dry | 10 | Baseline | 0.24 | 7 460 | 4 810 | 0 | 0 | 0 |
| | | Phase 1 | 0.13 | 5 040 | 3 440 | 343 | 436 | 483 |
| | 100 | Baseline | 0.03 | 4 570 | 3 440 | 0 | 0 | 0 |
| | | Phase 1 | 0.05 | 3 820 | 2 460 | 246 | 418 | 437 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C79: Monthly Mean Stages at the Lake J2 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.119 | 0.190 | 0.048 | 0.037 | 0.032 | 0.021 |
| | | Phase 1 | 0.129 | 0.142 | 0.046 | 0.046 | 0.056 | 0.022 |
| | 10 | Baseline | 0.072 | 0.147 | 0.026 | 0.022 | 0.021 | 0.013 |
| | | Phase 1 | 0.048 | 0.117 | 0.038 | 0.038 | 0.040 | 0.012 |
| Median | 2 | Baseline | 0.025 | 0.098 | 0.008 | 0.008 | 0.010 | 0.005 |
| | | Phase 1 | 0.014 | 0.084 | 0.030 | 0.032 | 0.032 | 0.006 |
| Dry | 10 | Baseline | - | 0.049 | - | - | - | - |
| | | Phase 1 | - | 0.048 | 0.023 | 0.027 | 0.029 | 0.001 |
| | 100 | Baseline | - | - | - | - | - | - |
| | | Phase 1 | - | 0.014 | 0.019 | 0.024 | 0.028 | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C80: Derived Representative Stages at the Lake J2 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.091 | 0.350 | 0.258 | 0.008 | 0.024 | 0.025 |
| | | Phase 1 | 1.023 | 0.306 | 0.209 | 0.029 | 0.040 | 0.040 |
| | 10 | Baseline | 0.875 | 0.298 | 0.215 | 0.004 | 0.015 | 0.018 |
| | | Phase 1 | 0.713 | 0.237 | 0.174 | 0.028 | 0.033 | 0.036 |
| Median | 2 | Baseline | 0.619 | 0.237 | 0.171 | - | 0.006 | 0.010 |
| | | Phase 1 | 0.449 | 0.178 | 0.137 | 0.026 | 0.029 | 0.032 |
| Dry | 10 | Baseline | 0.356 | 0.178 | 0.133 | - | - | - |
| | | Phase 1 | 0.237 | 0.137 | 0.106 | 0.023 | 0.027 | 0.029 |
| | 100 | Baseline | 0.084 | 0.128 | 0.106 | - | - | - |
| | | Phase 1 | 0.120 | 0.114 | 0.085 | 0.018 | 0.026 | 0.027 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C81: Monthly Mean Discharges at the Lake J1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 620 | 13 000 | 2 010 | 1 470 | 1 490 | 751 |
| | | Phase 1 | 9 220 | 12 000 | 3 570 | 2 320 | 2 450 | 1 200 |
| | 10 | Baseline | 3 230 | 9 830 | 902 | 690 | 776 | 407 |
| | | Phase 1 | 2 200 | 9 620 | 1 290 | 1 310 | 1 500 | 574 |
| Median | 2 | Baseline | 673 | 6 190 | 211 | 146 | 237 | 126 |
| | | Phase 1 | 369 | 6 130 | 358 | 585 | 809 | 231 |
| Dry | 10 | Baseline | 0 | 2 740 | 0 | 0 | 0 | 0 |
| | | Phase 1 | 0 | 2 690 | 83 | 180 | 420 | 90 |
| | 100 | Baseline | 0 | 81 | 0 | 0 | 0 | 0 |
| | | Phase 1 | 0 | 271 | 11 | 0 | 233 | 39 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C82: Derived Representative Discharges at the Lake J1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.86 | 30 600 | 22 600 | 230 | 1 200 | 1 180 |
| | | Phase 1 | 0.82 | 29 600 | 20 600 | 972 | 1 330 | 1 380 |
| | 10 | Baseline | 0.56 | 24 000 | 17 700 | 29 | 317 | 568 |
| | | Phase 1 | 0.50 | 22 900 | 16 600 | 508 | 854 | 1 030 |
| Median | 2 | Baseline | 0.37 | 17 800 | 12 800 | 3 | 60 | 201 |
| | | Phase 1 | 0.30 | 16 800 | 12 400 | 172 | 443 | 670 |
| Dry | 10 | Baseline | 0.27 | 13 600 | 8 980 | 0 | 0 | 0 |
| | | Phase 1 | 0.21 | 12 600 | 8 880 | 0 | 167 | 365 |
| | 100 | Baseline | 0.24 | 11 600 | 6 730 | 0 | 0 | 0 |
| | | Phase 1 | 0.17 | 10 000 | 6 410 | 0 | 11 | 153 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C83: Monthly Mean Stages at the Lake J1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.129 | 0.203 | 0.058 | 0.047 | 0.048 | 0.030 |
| | | Phase 1 | 0.161 | 0.192 | 0.086 | 0.064 | 0.067 | 0.041 |
| | 10 | Baseline | 0.080 | 0.168 | 0.034 | 0.029 | 0.031 | 0.020 |
| | | Phase 1 | 0.062 | 0.166 | 0.043 | 0.044 | 0.048 | 0.025 |
| Median | 2 | Baseline | 0.028 | 0.124 | 0.013 | 0.010 | 0.014 | 0.009 |
| | | Phase 1 | 0.019 | 0.123 | 0.018 | 0.026 | 0.032 | 0.014 |
| Dry | 10 | Baseline | - | 0.072 | - | - | - | - |
| | | Phase 1 | - | 0.071 | 0.007 | 0.012 | 0.021 | 0.007 |
| | 100 | Baseline | - | 0.007 | - | - | - | - |
| | | Phase 1 | - | 0.015 | 0.002 | - | 0.014 | 0.004 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C84: Derived Representative Stages at the Lake J1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.648 | 0.358 | 0.293 | 0.014 | 0.041 | 0.041 |
| | | Phase 1 | 0.625 | 0.351 | 0.275 | 0.036 | 0.044 | 0.045 |
| | 10 | Baseline | 0.484 | 0.305 | 0.249 | 0.003 | 0.017 | 0.025 |
| | | Phase 1 | 0.453 | 0.296 | 0.238 | 0.023 | 0.033 | 0.037 |
| Median | 2 | Baseline | 0.368 | 0.250 | 0.201 | 0.001 | 0.006 | 0.013 |
| | | Phase 1 | 0.324 | 0.240 | 0.196 | 0.011 | 0.021 | 0.028 |
| Dry | 10 | Baseline | 0.298 | 0.209 | 0.158 | - | - | - |
| | | Phase 1 | 0.252 | 0.198 | 0.157 | - | 0.011 | 0.019 |
| | 100 | Baseline | 0.275 | 0.188 | 0.131 | - | - | - |
| | | Phase 1 | 0.219 | 0.170 | 0.126 | - | 0.002 | 0.010 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## 3.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake B5

**Table 7.3-C85: Monthly Mean Discharges at the Lake B5 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 15 700 | 48 000 | 12 200 | 6 610 | 4 770 | 2 210 |
| | | Phase 1 | 9 450 | 23 800 | 4 590 | 3 160 | 2 390 | 1 180 |
| | 10 | Baseline | 7 320 | 31 300 | 6 390 | 2 760 | 2 710 | 1 490 |
| | | Phase 1 | 4 390 | 16 100 | 2 170 | 1 010 | 997 | 581 |
| Median | 2 | Baseline | 1 350 | 18 600 | 2 870 | 882 | 1 170 | 548 |
| | | Phase 1 | 793 | 9 490 | 859 | 240 | 309 | 155 |
| Dry | 10 | Baseline | 0 | 11 100 | 1 280 | 214 | 273 | 99 |
| | | Phase 1 | 0 | 5 000 | 336 | 50 | 59 | 24 |
| | 100 | Baseline | 0 | 7 400 | 647 | 4 | 0 | 20 |
| | | Phase 1 | 0 | 2 440 | 153 | 7 | 0 | 5 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C86: Derived Representative Discharges at the Lake B5 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.82 | 88 900 | 68 100 | 3 100 | 4 200 | 4 950 |
| | | Phase 1 | 1.21 | 47 500 | 36 500 | 1 240 | 1 940 | 2 130 |
| | 10 | Baseline | 0.99 | 61 300 | 49 900 | 1 530 | 2 290 | 3 250 |
| | | Phase 1 | 0.67 | 34 600 | 27 400 | 487 | 813 | 1 150 |
| Median | 2 | Baseline | 0.60 | 41 000 | 34 000 | 577 | 969 | 1 740 |
| | | Phase 1 | 0.38 | 24 000 | 18 900 | 143 | 260 | 505 |
| Dry | 10 | Baseline | 0.44 | 29 500 | 23 200 | 142 | 265 | 692 |
| | | Phase 1 | 0.25 | 17 300 | 12 600 | 29 | 62 | 181 |
| | 100 | Baseline | 0.43 | 23 900 | 17 000 | 0 | 0 | 78 |
| | | Phase 1 | 0.21 | 13 600 | 8 780 | 0 | 0 | 41 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C87: Monthly Mean Stages at the Lake B5 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.472 | 0.380 | 0.344 | 0.327 | 0.289 |
| | | Phase 1 | 0.365 | 0.422 | 0.325 | 0.306 | 0.293 | 0.262 |
| | 10 | Baseline | 0.350 | 0.441 | 0.343 | 0.300 | 0.299 | 0.272 |
| | | Phase 1 | 0.323 | 0.397 | 0.288 | 0.255 | 0.255 | 0.234 |
| Median | 2 | Baseline | 0.267 | 0.406 | 0.302 | 0.250 | 0.261 | 0.232 |
| | | Phase 1 | 0.246 | 0.365 | 0.249 | 0.203 | 0.211 | 0.189 |
| Dry | 10 | Baseline | - | 0.374 | 0.265 | 0.199 | 0.207 | 0.176 |
| | | Phase 1 | - | 0.329 | 0.214 | 0.158 | 0.163 | 0.141 |
| | 100 | Baseline | - | 0.351 | 0.238 | 0.104 | - | 0.137 |
| | | Phase 1 | - | 0.294 | 0.189 | 0.115 | - | 0.110 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C88: Derived Representative Stages at the Lake B5 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.571 | 0.521 | 0.499 | 0.305 | 0.320 | 0.329 |
| | | Phase 1 | 0.535 | 0.472 | 0.452 | 0.264 | 0.283 | 0.288 |
| | 10 | Baseline | 0.518 | 0.491 | 0.475 | 0.273 | 0.291 | 0.308 |
| | | Phase 1 | 0.487 | 0.448 | 0.432 | 0.227 | 0.247 | 0.261 |
| Median | 2 | Baseline | 0.478 | 0.461 | 0.447 | 0.234 | 0.254 | 0.278 |
| | | Phase 1 | 0.444 | 0.423 | 0.407 | 0.187 | 0.206 | 0.229 |
| Dry | 10 | Baseline | 0.456 | 0.437 | 0.421 | 0.187 | 0.206 | 0.240 |
| | | Phase 1 | 0.417 | 0.401 | 0.382 | 0.145 | 0.163 | 0.194 |
| | 100 | Baseline | 0.453 | 0.423 | 0.400 | - | - | 0.170 |
| | | Phase 1 | 0.405 | 0.386 | 0.360 | - | - | 0.153 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## 3.3 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake D7 to Lake D1

**Table 7.3-C89: Monthly Mean Discharges at the Lake D7 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 710 | 25 900 | 6 140 | 2 330 | 1 970 | 976 |
| | | Phase 1 | 15 400 | 49 600 | 11 300 | 4 860 | 4 070 | 2 250 |
| | 10 | Baseline | 2 870 | 15 200 | 2 880 | 857 | 790 | 467 |
| | | Phase 1 | 6 740 | 31 000 | 5 300 | 1 770 | 1 670 | 999 |
| Median | 2 | Baseline | 392 | 8 460 | 1 180 | 243 | 237 | 119 |
| | | Phase 1 | 991 | 17 900 | 2 160 | 503 | 514 | 254 |
| Dry | 10 | Baseline | 0 | 5 280 | 512 | 60 | 49 | 18 |
| | | Phase 1 | 0 | 10 800 | 947 | 133 | 112 | 43 |
| | 100 | Baseline | 0 | 3 970 | 286 | 12 | 0 | 4 |
| | | Phase 1 | 0 | 7 560 | 539 | 37 | 0 | 10 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C90: Derived Representative Discharges at the Lake D7 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.84 | 46 900 | 33 800 | 1 230 | 1 620 | 2 380 |
| | | Phase 1 | 1.66 | 93 800 | 68 900 | 2 420 | 3 380 | 4 540 |
| | 10 | Baseline | 0.52 | 33 300 | 25 200 | 503 | 719 | 1 280 |
| | | Phase 1 | 1.07 | 68 500 | 52 200 | 1 030 | 1 490 | 2 420 |
| Median | 2 | Baseline | 0.29 | 21 200 | 16 600 | 155 | 247 | 570 |
| | | Phase 1 | 0.65 | 46 000 | 35 600 | 336 | 512 | 1 070 |
| Dry | 10 | Baseline | 0.18 | 12 800 | 9 930 | 33 | 64 | 223 |
| | | Phase 1 | 0.42 | 30 300 | 22 500 | 79 | 139 | 421 |
| | 100 | Baseline | 0.12 | 7 830 | 5 550 | 0 | 2 | 77 |
| | | Phase 1 | 0.32 | 21 100 | 13 800 | 0 | 14 | 151 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C91: Monthly Mean Stages at the Lake D7 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.388 | 0.485 | 0.382 | 0.326 | 0.317 | 0.282 |
| | | Phase 1 | 0.445 | 0.540 | 0.423 | 0.368 | 0.357 | 0.324 |
| | 10 | Baseline | 0.337 | 0.444 | 0.337 | 0.276 | 0.272 | 0.250 |
| | | Phase 1 | 0.388 | 0.500 | 0.373 | 0.311 | 0.308 | 0.283 |
| Median | 2 | Baseline | 0.243 | 0.403 | 0.291 | 0.224 | 0.223 | 0.199 |
| | | Phase 1 | 0.283 | 0.456 | 0.322 | 0.253 | 0.254 | 0.226 |
| Dry | 10 | Baseline | - | 0.373 | 0.254 | 0.178 | 0.172 | 0.145 |
| | | Phase 1 | - | 0.420 | 0.281 | 0.203 | 0.197 | 0.168 |
| | 100 | Baseline | - | 0.356 | 0.230 | 0.135 | - | 0.112 |
| | | Phase 1 | - | 0.396 | 0.256 | 0.164 | - | 0.133 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C92: Derived Representative Stages at the Lake D7 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.575 | 0.535 | 0.507 | 0.293 | 0.307 | 0.327 |
| | | Phase 1 | 0.644 | 0.600 | 0.570 | 0.328 | 0.346 | 0.364 |
| | 10 | Baseline | 0.531 | 0.506 | 0.483 | 0.253 | 0.268 | 0.295 |
| | | Phase 1 | 0.599 | 0.570 | 0.545 | 0.285 | 0.303 | 0.328 |
| Median | 2 | Baseline | 0.483 | 0.469 | 0.451 | 0.208 | 0.225 | 0.258 |
| | | Phase 1 | 0.551 | 0.533 | 0.511 | 0.237 | 0.254 | 0.286 |
| Dry | 10 | Baseline | 0.444 | 0.432 | 0.414 | 0.162 | 0.180 | 0.221 |
| | | Phase 1 | 0.514 | 0.498 | 0.474 | 0.186 | 0.204 | 0.246 |
| | 100 | Baseline | 0.418 | 0.398 | 0.376 | - | 0.099 | 0.185 |
| | | Phase 1 | 0.490 | 0.469 | 0.437 | - | 0.140 | 0.207 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C93: Monthly Mean Discharges at the Lake D3 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 18 600 | 52 500 | 12 500 | 4 780 | 4 450 | 3 700 |
| | | Phase 1 | 26 000 | 76 900 | 18 200 | 6 890 | 6 890 | 4 760 |
| | 10 | Baseline | 8 400 | 36 000 | 5 330 | 2 530 | 2 570 | 1 410 |
| | | Phase 1 | 11 600 | 51 500 | 8 110 | 3 510 | 3 390 | 1 870 |
| Median | 2 | Baseline | 1 400 | 21 800 | 1 740 | 831 | 1 020 | 398 |
| | | Phase 1 | 1 830 | 31 100 | 2 860 | 1 170 | 1 270 | 551 |
| Dry | 10 | Baseline | 0 | 12 400 | 421 | 0 | 36 | 75 |
| | | Phase 1 | 0 | 18 300 | 844 | 0 | 300 | 115 |
| | 100 | Baseline | 0 | 7 090 | 0 | 0 | 0 | 0 |
| | | Phase 1 | 0 | 11 500 | 161 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C94: Derived Representative Discharges at the Lake D3 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.90 | 105 000 | 76 400 | 2 130 | 3 270 | 4 630 |
| | | Phase 1 | 3.15 | 157 000 | 111 000 | 3 270 | 6 060 | 5 790 |
| | 10 | Baseline | 1.27 | 79 500 | 60 200 | 838 | 1 820 | 2 690 |
| | | Phase 1 | 1.93 | 117 000 | 86 700 | 1 440 | 2 740 | 3 960 |
| Median | 2 | Baseline | 0.80 | 55 400 | 43 100 | 162 | 675 | 1 220 |
| | | Phase 1 | 1.13 | 79 700 | 61 400 | 383 | 927 | 1 850 |
| Dry | 10 | Baseline | 0.52 | 37 700 | 28 800 | 0 | 0 | 364 |
| | | Phase 1 | 0.72 | 53 200 | 40 500 | 0 | 194 | 599 |
| | 100 | Baseline | 0.39 | 26 700 | 18 700 | 0 | 0 | 0 |
| | | Phase 1 | 0.55 | 37 200 | 26 400 | 0 | 0 | 229 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C95: Monthly Mean Stages at the Lake D3 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.144 | 0.287 | 0.110 | 0.058 | 0.055 | 0.049 |
| | | Phase 1 | 0.180 | 0.370 | 0.142 | 0.074 | 0.074 | 0.058 |
| | 10 | Baseline | 0.085 | 0.223 | 0.062 | 0.038 | 0.038 | 0.026 |
| | | Phase 1 | 0.105 | 0.283 | 0.083 | 0.047 | 0.046 | 0.031 |
| Median | 2 | Baseline | 0.026 | 0.160 | 0.030 | 0.018 | 0.021 | 0.011 |
| | | Phase 1 | 0.031 | 0.203 | 0.041 | 0.023 | 0.024 | 0.014 |
| Dry | 10 | Baseline | - | 0.110 | 0.012 | - | 0.002 | 0.004 |
| | | Phase 1 | - | 0.142 | 0.018 | - | 0.009 | 0.005 |
| | 100 | Baseline | - | 0.076 | - | - | - | - |
| | | Phase 1 | - | 0.104 | 0.006 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C96: Derived Representative Stages at the Lake D3 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.614 | 0.456 | 0.369 | 0.034 | 0.045 | 0.057 |
| | | Phase 1 | 0.860 | 0.596 | 0.473 | 0.045 | 0.068 | 0.066 |
| | 10 | Baseline | 0.469 | 0.379 | 0.315 | 0.018 | 0.031 | 0.040 |
| | | Phase 1 | 0.620 | 0.490 | 0.401 | 0.026 | 0.040 | 0.051 |
| Median | 2 | Baseline | 0.345 | 0.298 | 0.252 | 0.006 | 0.016 | 0.023 |
| | | Phase 1 | 0.434 | 0.379 | 0.319 | 0.011 | 0.019 | 0.031 |
| Dry | 10 | Baseline | 0.260 | 0.230 | 0.192 | - | - | 0.010 |
| | | Phase 1 | 0.323 | 0.290 | 0.241 | - | 0.007 | 0.015 |
| | 100 | Baseline | 0.213 | 0.183 | 0.144 | - | - | - |
| | | Phase 1 | 0.269 | 0.228 | 0.182 | - | - | 0.008 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C97: Monthly Mean Discharges at the Lake D1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 27 000 | 73 800 | 19 000 | 7 030 | 6 500 | 15 300 |
| | | Phase 1 | 34 000 | 97 700 | 24 800 | 9 150 | 8 080 | 8 730 |
| | 10 | Baseline | 12 100 | 51 700 | 7 490 | 3 330 | 3 590 | 2 820 |
| | | Phase 1 | 15 000 | 67 000 | 10 400 | 4 340 | 4 430 | 2 730 |
| Median | 2 | Baseline | 1 830 | 32 100 | 2 280 | 824 | 1 280 | 347 |
| | | Phase 1 | 2 220 | 41 300 | 3 470 | 1 170 | 1 630 | 626 |
| Dry | 10 | Baseline | 0 | 18 400 | 565 | 0 | 0 | 35 |
| | | Phase 1 | 0 | 24 400 | 1 000 | 0 | 0 | 110 |
| | 100 | Baseline | 0 | 10 300 | 66 | 0 | 0 | 0 |
| | | Phase 1 | 0 | 15 100 | 231 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C98: Derived Representative Discharges at the Lake D1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.92 | 152 000 | 111 000 | 2 860 | 4 680 | 7 160 |
| | | Phase 1 | 4.21 | 208 000 | 149 000 | 4 040 | 6 340 | 6 820 |
| | 10 | Baseline | 2.45 | 118 000 | 88 300 | 1 030 | 2 370 | 3 720 |
| | | Phase 1 | 2.93 | 156 000 | 115 000 | 1 620 | 3 240 | 4 970 |
| Median | 2 | Baseline | 1.51 | 87 400 | 65 000 | 137 | 718 | 1 470 |
| | | Phase 1 | 1.89 | 111 000 | 82 900 | 334 | 1 080 | 2 200 |
| Dry | 10 | Baseline | 1.06 | 65 400 | 45 600 | 0 | 0 | 358 |
| | | Phase 1 | 1.22 | 81 100 | 57 700 | 0 | 0 | 544 |
| | 100 | Baseline | 0.87 | 52 300 | 32 300 | 0 | 0 | 0 |
| | | Phase 1 | 0.87 | 64 000 | 41 400 | 0 | 0 | 149 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C99: Monthly Mean Stages at the Lake D1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.228 | 0.377 | 0.191 | 0.116 | 0.112 | 0.172 |
| | | Phase 1 | 0.256 | 0.434 | 0.219 | 0.133 | 0.125 | 0.130 |
| | 10 | Baseline | 0.153 | 0.316 | 0.120 | 0.080 | 0.083 | 0.074 |
| | | Phase 1 | 0.170 | 0.360 | 0.142 | 0.091 | 0.092 | 0.073 |
| Median | 2 | Baseline | 0.059 | 0.249 | 0.066 | 0.040 | 0.050 | 0.026 |
| | | Phase 1 | 0.065 | 0.282 | 0.082 | 0.048 | 0.056 | 0.035 |
| Dry | 10 | Baseline | - | 0.188 | 0.033 | - | - | 0.008 |
| | | Phase 1 | - | 0.217 | 0.044 | - | - | 0.015 |
| | 100 | Baseline | - | 0.141 | 0.011 | - | - | - |
| | | Phase 1 | - | 0.171 | 0.021 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C100: Derived Representative Stages at the Lake D1 Outlet – Mining Phase 1**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.808 | 0.541 | 0.463 | 0.074 | 0.095 | 0.118 |
| | | Phase 1 | 0.838 | 0.633 | 0.536 | 0.088 | 0.111 | 0.115 |
| | 10 | Baseline | 0.639 | 0.477 | 0.413 | 0.045 | 0.068 | 0.085 |
| | | Phase 1 | 0.699 | 0.549 | 0.471 | 0.056 | 0.079 | 0.098 |
| Median | 2 | Baseline | 0.502 | 0.411 | 0.354 | 0.016 | 0.037 | 0.053 |
| | | Phase 1 | 0.561 | 0.463 | 0.400 | 0.025 | 0.046 | 0.065 |
| Dry | 10 | Baseline | 0.420 | 0.355 | 0.297 | - | - | 0.026 |
| | | Phase 1 | 0.451 | 0.396 | 0.334 | - | - | 0.032 |
| | 100 | Baseline | 0.380 | 0.318 | 0.250 | - | - | - |
| | | Phase 1 | 0.381 | 0.351 | 0.283 | - | - | 0.017 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

# 4.0 EFFECT ANALYSIS RESULTS – MINING PHASE 2 (YEARS 3 TO 4)

## 4.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake A1

**Table 7.3-C101: Monthly Mean Discharges at the Lake A1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | | Phase 2 | 6 450 | 18 300 | 3 590 | 2 140 | 1 510 | 990 |
| | 10 | Baseline | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | | Phase 2 | 3 030 | 14 200 | 1 910 | 951 | 992 | 490 |
| Median | 2 | Baseline | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| | | Phase 2 | 565 | 10 100 | 1 120 | 341 | 513 | 180 |
| Dry | 10 | Baseline | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | | Phase 2 | 0 | 6 630 | 843 | 110 | 162 | 58 |
| | 100 | Baseline | 0 | 11 900 | 1 200 | 201 | 12 | 105 |
| | | Phase 2 | 0 | 4 280 | 759 | 33 | 0 | 26 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C102: Derived Representative Discharges at the Lake A1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | | Phase 2 | 1.18 | 37 100 | 28 900 | 828 | 1 290 | 1 480 |
| | 10 | Baseline | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | | Phase 2 | 0.76 | 31 600 | 23 900 | 482 | 772 | 1 010 |
| Median | 2 | Baseline | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| | | Phase 2 | 0.44 | 24 000 | 17 800 | 225 | 377 | 633 |
| Dry | 10 | Baseline | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | | Phase 2 | 0.26 | 15 400 | 11 600 | 78 | 142 | 392 |
| | 100 | Baseline | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |
| | | Phase 2 | 0.18 | 7 700 | 6 560 | 6 | 23 | 263 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C103: Monthly Mean Stages at the Lake A1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | | Phase 2 | 0.447 | 0.540 | 0.402 | 0.366 | 0.343 | 0.318 |
| | 10 | Baseline | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | | Phase 2 | 0.390 | 0.516 | 0.358 | 0.316 | 0.318 | 0.280 |
| Median | 2 | Baseline | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| | | Phase 2 | 0.287 | 0.485 | 0.325 | 0.262 | 0.282 | 0.233 |
| Dry | 10 | Baseline | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | | Phase 2 | - | 0.449 | 0.309 | 0.213 | 0.229 | 0.190 |
| | 100 | Baseline | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |
| | | Phase 2 | - | 0.415 | 0.303 | 0.172 | - | 0.164 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C104: Derived Representative Stages at the Lake A1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | | Phase 2 | 0.738 | 0.614 | 0.587 | 0.308 | 0.334 | 0.342 |
| | 10 | Baseline | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | | Phase 2 | 0.681 | 0.597 | 0.567 | 0.279 | 0.304 | 0.319 |
| Median | 2 | Baseline | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| | | Phase 2 | 0.618 | 0.568 | 0.538 | 0.243 | 0.267 | 0.293 |
| Dry | 10 | Baseline | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | | Phase 2 | 0.562 | 0.524 | 0.497 | 0.200 | 0.223 | 0.269 |
| | 100 | Baseline | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |
| | | Phase 2 | 0.522 | 0.462 | 0.448 | 0.127 | 0.161 | 0.250 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake E3 to Lake E1

**Table 7.3-C105: Monthly Mean Discharges at the Lake E3 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 670 | 19 000 | 7 270 | 1 600 | 1 560 | 857 |
| | | Phase 2 | 5 800 | 15 400 | 4 600 | 2 390 | 2 610 | 1 750 |
| | 10 | Baseline | 3 090 | 13 000 | 2 280 | 620 | 645 | 457 |
| | | Phase 2 | 2 750 | 11 500 | 2 140 | 1 270 | 1 530 | 793 |
| Median | 2 | Baseline | 557 | 7 930 | 521 | 79 | 111 | 134 |
| | | Phase 2 | 532 | 7 580 | 775 | 409 | 660 | 279 |
| Dry | 10 | Baseline | 0 | 4 600 | 90 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 4 470 | 216 | 0 | 117 | 75 |
| | 100 | Baseline | 0 | 2 750 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 2 420 | 15 | 0 | 0 | 3 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C106: Derived Representative Discharges at the Lake E3 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.52 | 35 300 | 26 900 | 602 | 1 070 | 4 920 |
| | | Phase 2 | 0.52 | 32 000 | 23 200 | 1 050 | 3 870 | 1 860 |
| | 10 | Baseline | 0.34 | 25 000 | 20 700 | 180 | 418 | 1 130 |
| | | Phase 2 | 0.32 | 23 000 | 18 500 | 450 | 1 150 | 1 260 |
| Median | 2 | Baseline | 0.22 | 17 000 | 14 700 | 0 | 64 | 179 |
| | | Phase 2 | 0.21 | 16 100 | 13 700 | 101 | 242 | 671 |
| Dry | 10 | Baseline | 0.15 | 12 200 | 9 950 | 0 | 0 | 21 |
| | | Phase 2 | 0.15 | 12 100 | 9 800 | 0 | 34 | 214 |
| | 100 | Baseline | 0.12 | 9 770 | 6 910 | 0 | 0 | 0 |
| | | Phase 2 | 0.14 | 10 000 | 7 150 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C107: Monthly Mean Stages at the Lake E3 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.115 | 0.231 | 0.122 | 0.044 | 0.044 | 0.029 |
| | | Phase 2 | 0.105 | 0.201 | 0.090 | 0.058 | 0.062 | 0.047 |
| | 10 | Baseline | 0.069 | 0.179 | 0.056 | 0.024 | 0.024 | 0.019 |
| | | Phase 2 | 0.064 | 0.165 | 0.054 | 0.038 | 0.043 | 0.028 |
| Median | 2 | Baseline | 0.022 | 0.129 | 0.021 | 0.006 | 0.007 | 0.008 |
| | | Phase 2 | 0.021 | 0.125 | 0.027 | 0.018 | 0.025 | 0.014 |
| Dry | 10 | Baseline | - | 0.090 | 0.007 | - | - | - |
| | | Phase 2 | - | 0.088 | 0.012 | - | 0.008 | 0.006 |
| | 100 | Baseline | - | 0.064 | - | - | - | - |
| | | Phase 2 | - | 0.058 | 0.002 | - | - | 0.001 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C108: Derived Representative Stages at the Lake E3 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.409 | 0.349 | 0.291 | 0.023 | 0.034 | 0.094 |
| | | Phase 2 | 0.409 | 0.327 | 0.264 | 0.034 | 0.080 | 0.049 |
| | 10 | Baseline | 0.310 | 0.277 | 0.245 | 0.010 | 0.018 | 0.035 |
| | | Phase 2 | 0.295 | 0.262 | 0.227 | 0.019 | 0.036 | 0.038 |
| Median | 2 | Baseline | 0.230 | 0.215 | 0.195 | - | 0.005 | 0.010 |
| | | Phase 2 | 0.220 | 0.207 | 0.186 | 0.007 | 0.013 | 0.025 |
| Dry | 10 | Baseline | 0.182 | 0.172 | 0.150 | - | - | 0.002 |
| | | Phase 2 | 0.181 | 0.171 | 0.149 | - | 0.003 | 0.012 |
| | 100 | Baseline | 0.158 | 0.148 | 0.118 | - | - | - |
| | | Phase 2 | 0.167 | 0.151 | 0.120 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C109: Monthly Mean Discharges at the Lake E1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 12 800 | 34 500 | 13 500 | 2 930 | 2 940 | 1 620 |
| | | Phase 2 | 12 500 | 31 200 | 10 300 | 3 770 | 3 710 | 2 260 |
| | 10 | Baseline | 6 010 | 24 000 | 4 000 | 1 170 | 1 250 | 860 |
| | | Phase 2 | 5 930 | 22 800 | 3 610 | 1 710 | 2 100 | 1 330 |
| Median | 2 | Baseline | 1 120 | 14 700 | 852 | 165 | 241 | 256 |
| | | Phase 2 | 1 150 | 14 600 | 942 | 348 | 771 | 489 |
| Dry | 10 | Baseline | 0 | 8 280 | 133 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 8 140 | 181 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 4 510 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 3 900 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C110: Derived Representative Discharges at the Lake E1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.17 | 67 500 | 49 700 | 1 080 | 1 930 | 7 760 |
| | | Phase 2 | 1.11 | 64 200 | 48 200 | 1 490 | 2 510 | 2 290 |
| | 10 | Baseline | 0.69 | 47 000 | 38 500 | 321 | 779 | 1 930 |
| | | Phase 2 | 0.74 | 46 200 | 37 500 | 502 | 1 200 | 1 880 |
| Median | 2 | Baseline | 0.42 | 32 000 | 27 500 | 0 | 130 | 337 |
| | | Phase 2 | 0.49 | 33 000 | 27 400 | 26 | 299 | 764 |
| Dry | 10 | Baseline | 0.31 | 23 500 | 18 900 | 0 | 0 | 42 |
| | | Phase 2 | 0.36 | 25 400 | 19 800 | 0 | 0 | 102 |
| | 100 | Baseline | 0.27 | 19 400 | 13 300 | 0 | 0 | 0 |
| | | Phase 2 | 0.30 | 21 700 | 15 100 | 0 | 0 | 12 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C111: Monthly Mean Stages at the Lake E1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.096 | 0.185 | 0.099 | 0.036 | 0.036 | 0.024 |
| | | Phase 2 | 0.094 | 0.173 | 0.083 | 0.042 | 0.042 | 0.030 |
| | 10 | Baseline | 0.058 | 0.146 | 0.044 | 0.019 | 0.020 | 0.016 |
| | | Phase 2 | 0.057 | 0.141 | 0.041 | 0.025 | 0.029 | 0.021 |
| Median | 2 | Baseline | 0.019 | 0.105 | 0.016 | 0.005 | 0.007 | 0.007 |
| | | Phase 2 | 0.019 | 0.105 | 0.017 | 0.009 | 0.015 | 0.011 |
| Dry | 10 | Baseline | - | 0.072 | 0.005 | - | - | - |
| | | Phase 2 | - | 0.071 | 0.006 | - | - | - |
| | 100 | Baseline | - | 0.048 | - | - | - | - |
| | | Phase 2 | - | 0.043 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C112: Derived Representative Stages at the Lake E1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.380 | 0.290 | 0.237 | 0.018 | 0.027 | 0.069 |
| | | Phase 2 | 0.367 | 0.281 | 0.232 | 0.023 | 0.032 | 0.030 |
| | 10 | Baseline | 0.267 | 0.228 | 0.200 | 0.008 | 0.015 | 0.027 |
| | | Phase 2 | 0.279 | 0.225 | 0.196 | 0.011 | 0.020 | 0.027 |
| Median | 2 | Baseline | 0.192 | 0.176 | 0.159 | - | 0.004 | 0.008 |
| | | Phase 2 | 0.211 | 0.180 | 0.159 | 0.002 | 0.008 | 0.015 |
| Dry | 10 | Baseline | 0.157 | 0.144 | 0.124 | - | - | 0.002 |
| | | Phase 2 | 0.173 | 0.151 | 0.128 | - | - | 0.004 |
| | 100 | Baseline | 0.144 | 0.126 | 0.098 | - | - | - |
| | | Phase 2 | 0.154 | 0.136 | 0.107 | - | - | 0.001 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake J1

**Table 7.3-C113: Monthly Mean Discharges at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 620 | 13 000 | 2 010 | 1 470 | 1 490 | 751 |
| | | Phase 2 | 3 910 | 12 000 | 6 210 | 5 960 | 6 190 | 1 120 |
| | 10 | Baseline | 3 230 | 9 830 | 902 | 690 | 776 | 407 |
| | | Phase 2 | 1 940 | 10 300 | 5 270 | 5 480 | 5 700 | 872 |
| Median | 2 | Baseline | 673 | 6 190 | 211 | 146 | 237 | 126 |
| | | Phase 2 | 421 | 8 210 | 4 690 | 5 020 | 5 260 | 639 |
| Dry | 10 | Baseline | 0 | 2 740 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 6 090 | 4 410 | 4 690 | 4 960 | 462 |
| | 100 | Baseline | 0 | 81 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 4 360 | 4 300 | 4 480 | 4 790 | 350 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C114: Derived Representative Discharges at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.86 | 30 600 | 22 600 | 230 | 1 200 | 1 180 |
| | | Phase 2 | 0.72 | 28 900 | 20 400 | 5 360 | 5 430 | 5 490 |
| | 10 | Baseline | 0.56 | 24 000 | 17 700 | 29 | 317 | 568 |
| | | Phase 2 | 0.52 | 23 800 | 17 500 | 4 860 | 5 110 | 5 260 |
| Median | 2 | Baseline | 0.37 | 17 800 | 12 800 | 3 | 60 | 201 |
| | | Phase 2 | 0.32 | 17 100 | 13 200 | 4 520 | 4 820 | 5 020 |
| Dry | 10 | Baseline | 0.27 | 13 600 | 8 980 | 0 | 0 | 0 |
| | | Phase 2 | 0.16 | 9 780 | 7 980 | 4 340 | 4 600 | 4 800 |
| | 100 | Baseline | 0.24 | 11 600 | 6 730 | 0 | 0 | 0 |
| | | Phase 2 | 0.06 | 3 360 | 2 840 | 4 250 | 4 470 | 4 650 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C115: Monthly Mean Stages at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.129 | 0.203 | 0.058 | 0.047 | 0.048 | 0.030 |
| | | Phase 2 | 0.091 | 0.192 | 0.124 | 0.120 | 0.124 | 0.040 |
| | 10 | Baseline | 0.080 | 0.168 | 0.034 | 0.029 | 0.031 | 0.020 |
| | | Phase 2 | 0.057 | 0.173 | 0.111 | 0.114 | 0.117 | 0.033 |
| Median | 2 | Baseline | 0.028 | 0.124 | 0.013 | 0.010 | 0.014 | 0.009 |
| | | Phase 2 | 0.021 | 0.149 | 0.103 | 0.107 | 0.111 | 0.027 |
| Dry | 10 | Baseline | - | 0.072 | - | - | - | - |
| | | Phase 2 | - | 0.122 | 0.099 | 0.103 | 0.107 | 0.022 |
| | 100 | Baseline | - | 0.007 | - | - | - | - |
| | | Phase 2 | - | 0.098 | 0.097 | 0.100 | 0.104 | 0.018 |

Note: m= metre.

**Table 7.3-C116: Derived Representative Stages at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.648 | 0.358 | 0.293 | 0.014 | 0.041 | 0.041 |
| | | Phase 2 | 0.577 | 0.345 | 0.274 | 0.112 | 0.113 | 0.114 |
| | 10 | Baseline | 0.484 | 0.305 | 0.249 | 0.003 | 0.017 | 0.025 |
| | | Phase 2 | 0.463 | 0.303 | 0.247 | 0.105 | 0.109 | 0.111 |
| Median | 2 | Baseline | 0.368 | 0.250 | 0.201 | 0.001 | 0.006 | 0.013 |
| | | Phase 2 | 0.335 | 0.243 | 0.205 | 0.100 | 0.105 | 0.107 |
| Dry | 10 | Baseline | 0.298 | 0.209 | 0.158 | - | - | - |
| | | Phase 2 | 0.214 | 0.168 | 0.146 | 0.097 | 0.101 | 0.104 |
| | 100 | Baseline | 0.275 | 0.188 | 0.131 | - | - | - |
| | | Phase 2 | 0.110 | 0.082 | 0.073 | 0.096 | 0.099 | 0.102 |

Note: m= metre.

## 4.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake B46 to Lake B2

**Table 7.3-C117: Monthly Mean Discharges at the Lake B46 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3$/d) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 45 400 | 105 000 | 36 300 | 12 100 | 11 100 | 6 130 |
| | | Phase 2 | 44 700 | 104 000 | 36 700 | 11 900 | 10 900 | 6 050 |
| | 10 | Baseline | 21 500 | 78 200 | 10 700 | 5 560 | 6 450 | 3 560 |
| | | Phase 2 | 21 200 | 77 200 | 10 600 | 5 400 | 6 270 | 3 510 |
| Median | 2 | Baseline | 4 100 | 50 000 | 2 250 | 1 210 | 2 440 | 1 290 |
| | | Phase 2 | 4 020 | 49 400 | 2 190 | 1 150 | 2 340 | 1 260 |
| Dry | 10 | Baseline | 0 | 26 500 | 338 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 26 100 | 324 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 10 200 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 9 980 | 0 | 0 | 0 | 0 |

Note: $m^3$/d= cubic metres per day.

**Table 7.3-C118: Derived Representative Discharges at the Lake B46 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3$/s) | 7-Day Mean Peak Q ($m^3$/d) | 14-Day Mean Peak Q ($m^3$/d) | 30-Day Low Flow Q ($m^3$/d) | 60-Day Low Flow Q ($m^3$/d) | 90-Day Low Flow Q ($m^3$/d) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.63 | 219 000 | 163 000 | 4 290 | 7 720 | 12 100 |
| | | Phase 2 | 3.56 | 215 000 | 160 000 | 4 190 | 7 570 | 12 300 |
| | 10 | Baseline | 2.44 | 165 000 | 130 000 | 1 470 | 3 740 | 5 820 |
| | | Phase 2 | 2.42 | 163 000 | 128 000 | 1 430 | 3 630 | 5 730 |
| Median | 2 | Baseline | 1.65 | 122 000 | 97 000 | 101 | 965 | 2 070 |
| | | Phase 2 | 1.63 | 121 000 | 95 900 | 92 | 917 | 1 970 |
| Dry | 10 | Baseline | 1.24 | 94 400 | 71 100 | 0 | 0 | 389 |
| | | Phase 2 | 1.22 | 93 100 | 70 200 | 0 | 0 | 364 |
| | 100 | Baseline | 1.07 | 79 800 | 54 100 | 0 | 0 | 0 |
| | | Phase 2 | 1.04 | 78 100 | 53 100 | 0 | 0 | 0 |

Note: Q= discharge; $m^3$/s= cubic metres per second; $m^3$/d= cubic metres per day.

**Table 7.3-C119: Monthly Mean Stages at the Lake B46 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.173 | 0.303 | 0.149 | 0.072 | 0.068 | 0.046 |
| | | Phase 2 | 0.171 | 0.301 | 0.150 | 0.071 | 0.067 | 0.045 |
| | 10 | Baseline | 0.105 | 0.249 | 0.066 | 0.043 | 0.047 | 0.032 |
| | | Phase 2 | 0.104 | 0.247 | 0.066 | 0.042 | 0.046 | 0.031 |
| Median | 2 | Baseline | 0.035 | 0.185 | 0.023 | 0.015 | 0.025 | 0.016 |
| | | Phase 2 | 0.034 | 0.183 | 0.023 | 0.015 | 0.024 | 0.016 |
| Dry | 10 | Baseline | - | 0.121 | 0.007 | - | - | - |
| | | Phase 2 | - | 0.120 | 0.006 | - | - | - |
| | 100 | Baseline | - | 0.064 | - | - | - | - |
| | | Phase 2 | - | 0.063 | - | - | - | - |

Note: m= metre.

**Table 7.3-C120: Derived Representative Stages at the Lake B46 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.628 | 0.494 | 0.406 | 0.036 | 0.053 | 0.072 |
| | | Phase 2 | 0.620 | 0.488 | 0.401 | 0.035 | 0.052 | 0.072 |
| | 10 | Baseline | 0.482 | 0.409 | 0.349 | 0.018 | 0.033 | 0.044 |
| | | Phase 2 | 0.479 | 0.406 | 0.345 | 0.017 | 0.032 | 0.044 |
| Median | 2 | Baseline | 0.371 | 0.334 | 0.287 | 0.003 | 0.013 | 0.022 |
| | | Phase 2 | 0.368 | 0.333 | 0.285 | 0.003 | 0.013 | 0.021 |
| Dry | 10 | Baseline | 0.307 | 0.282 | 0.233 | - | - | 0.007 |
| | | Phase 2 | 0.303 | 0.279 | 0.231 | - | - | 0.007 |
| | 100 | Baseline | 0.278 | 0.252 | 0.194 | - | - | - |
| | | Phase 2 | 0.273 | 0.248 | 0.192 | - | - | - |

Note: m= metre.

**Table 7.3-C121: Monthly Mean Discharges at the Lake B4 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 70 500 | 197 000 | 52 300 | 28 200 | 26 800 | 15 700 |
| | | Phase 2 | 45 700 | 113 000 | 32 100 | 32 000 | 13 000 | 13 300 |
| | 10 | Baseline | 32 500 | 135 000 | 23 800 | 8 800 | 10 400 | 6 500 |
| | | Phase 2 | 21 300 | 81 900 | 12 400 | 4 850 | 7 160 | 4 750 |
| Median | 2 | Baseline | 5 590 | 82 700 | 9 250 | 2 150 | 3 020 | 1 520 |
| | | Phase 2 | 3 860 | 52 000 | 3 800 | 496 | 1 360 | 646 |
| Dry | 10 | Baseline | 0 | 48 200 | 3 800 | 576 | 602 | 234 |
| | | Phase 2 | 0 | 28 900 | 1 130 | 70 | 68 | 36 |
| | 100 | Baseline | 0 | 29 000 | 2 000 | 236 | 0 | 54 |
| | | Phase 2 | 0 | 14 100 | 391 | 31 | 4 | 3 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C122: Derived Representative Discharges at the Lake B4 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 7.25 | 374 000 | 292 000 | 11 500 | 20 100 | 21 900 |
| | | Phase 2 | 3.84 | 226 000 | 170 000 | 8 230 | 13 100 | 11 300 |
| | 10 | Baseline | 4.15 | 277 000 | 223 000 | 4 640 | 7 920 | 11 800 |
| | | Phase 2 | 2.52 | 172 000 | 136 000 | 1 720 | 4 050 | 6 460 |
| Median | 2 | Baseline | 2.62 | 197 000 | 158 000 | 1 450 | 2 430 | 5 170 |
| | | Phase 2 | 1.67 | 126 000 | 101 000 | 249 | 704 | 2 310 |
| Dry | 10 | Baseline | 2.04 | 146 000 | 110 000 | 365 | 646 | 1 890 |
| | | Phase 2 | 1.26 | 96 300 | 73 000 | 34 | 90 | 553 |
| | 100 | Baseline | 1.99 | 118 000 | 80 500 | 42 | 128 | 492 |
| | | Phase 2 | 1.09 | 79 700 | 54 200 | 4 | 20 | 171 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C123: Monthly Mean Stages at the Lake B4 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.560 | 0.661 | 0.534 | 0.483 | 0.479 | 0.439 |
| | | Phase 2 | 1.402 | 1.484 | 1.373 | 1.373 | 1.306 | 1.308 |
| | 10 | Baseline | 0.494 | 0.622 | 0.470 | 0.400 | 0.411 | 0.381 |
| | | Phase 2 | 1.341 | 1.454 | 1.303 | 1.243 | 1.267 | 1.242 |
| Median | 2 | Baseline | 0.372 | 0.575 | 0.403 | 0.319 | 0.337 | 0.301 |
| | | Phase 2 | 1.230 | 1.413 | 1.229 | 1.131 | 1.176 | 1.142 |
| Dry | 10 | Baseline | - | 0.527 | 0.349 | 0.257 | 0.259 | 0.223 |
| | | Phase 2 | - | 1.365 | 1.167 | 1.063 | 1.062 | 1.045 |
| | 100 | Baseline | - | 0.485 | 0.315 | 0.223 | - | 0.176 |
| | | Phase 2 | - | 1.312 | 1.122 | 1.040 | 0.995 | 0.991 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C124: Derived Representative Stages at the Lake B4 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.797 | 0.733 | 0.704 | 0.418 | 0.457 | 0.464 |
| | | Phase 2 | 1.599 | 1.556 | 1.525 | 1.276 | 1.307 | 1.297 |
| | 10 | Baseline | 0.728 | 0.698 | 0.674 | 0.361 | 0.393 | 0.419 |
| | | Phase 2 | 1.552 | 1.527 | 1.503 | 1.187 | 1.233 | 1.261 |
| Median | 2 | Baseline | 0.676 | 0.661 | 0.638 | 0.299 | 0.325 | 0.367 |
| | | Phase 2 | 1.509 | 1.495 | 1.473 | 1.105 | 1.146 | 1.202 |
| Dry | 10 | Baseline | 0.649 | 0.630 | 0.602 | 0.239 | 0.262 | 0.312 |
| | | Phase 2 | 1.481 | 1.469 | 1.443 | 1.043 | 1.071 | 1.136 |
| | 100 | Baseline | 0.647 | 0.608 | 0.572 | 0.168 | 0.202 | 0.251 |
| | | Phase 2 | 1.467 | 1.451 | 1.417 | 0.996 | 1.029 | 1.092 |

Note: m= metre.

**Table 7.3-C125: Monthly Mean Discharges at the Lake P2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 2 310 | 4 420 | 650 | 431 | 453 | 293 |
| | | Phase 2 | 43 100 | 119 000 | 38 000 | 29 900 | 40 700 | 11 900 |
| | 10 | Baseline | 1 140 | 3 360 | 280 | 187 | 224 | 148 |
| | | Phase 2 | 19 800 | 84 800 | 15 200 | 5 220 | 8 430 | 4 370 |
| Median | 2 | Baseline | 242 | 2 110 | 60 | 35 | 63 | 40 |
| | | Phase 2 | 3 350 | 54 200 | 4 870 | 602 | 1 190 | 792 |
| Dry | 10 | Baseline | 0 | 909 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 32 300 | 1 460 | 56 | 134 | 84 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 19 100 | 458 | 0 | 0 | 14 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C126: Derived Representative Discharges at the Lake P2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.26 | 10 700 | 7 590 | 140 | 251 | 331 |
| | | Phase 2 | 3.49 | 229 000 | 180 000 | 5 210 | 18 600 | 12 800 |
| | 10 | Baseline | 0.17 | 8 140 | 5 980 | 42 | 114 | 178 |
| | | Phase 2 | 2.43 | 174 000 | 141 000 | 2 160 | 4 640 | 7 340 |
| Median | 2 | Baseline | 0.11 | 6 020 | 4 400 | 0 | 22 | 60 |
| | | Phase 2 | 1.66 | 127 000 | 103 000 | 469 | 818 | 2 710 |
| Dry | 10 | Baseline | 0.08 | 4 630 | 3 180 | 0 | 0 | 0 |
| | | Phase 2 | 1.24 | 96 300 | 73 900 | 0 | 115 | 702 |
| | 100 | Baseline | 0.07 | 3 870 | 2 380 | 0 | 0 | 0 |
| | | Phase 2 | 1.04 | 78 800 | 55 400 | 0 | 0 | 234 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C127: Monthly Mean Stages at the Lake P2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.034 | 0.044 | 0.021 | 0.017 | 0.018 | 0.015 |
| | | Phase 2 | 0.110 | 0.165 | 0.104 | 0.095 | 0.107 | 0.066 |
| | 10 | Baseline | 0.026 | 0.040 | 0.015 | 0.012 | 0.013 | 0.011 |
| | | Phase 2 | 0.080 | 0.144 | 0.072 | 0.047 | 0.057 | 0.044 |
| Median | 2 | Baseline | 0.014 | 0.033 | 0.008 | 0.006 | 0.008 | 0.007 |
| | | Phase 2 | 0.040 | 0.120 | 0.046 | 0.020 | 0.026 | 0.022 |
| Dry | 10 | Baseline | - | 0.023 | - | - | - | - |
| | | Phase 2 | - | 0.098 | 0.028 | 0.008 | 0.011 | 0.009 |
| | 100 | Baseline | - | - | - | - | - | - |
| | | Phase 2 | - | 0.079 | 0.018 | - | - | 0.004 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C128: Derived Representative Stages at the Lake P2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.085 | 0.063 | 0.055 | 0.011 | 0.014 | 0.016 |
| | | Phase 2 | 0.239 | 0.214 | 0.194 | 0.047 | 0.078 | 0.068 |
| | 10 | Baseline | 0.072 | 0.056 | 0.050 | 0.007 | 0.010 | 0.012 |
| | | Phase 2 | 0.207 | 0.192 | 0.176 | 0.033 | 0.045 | 0.054 |
| Median | 2 | Baseline | 0.060 | 0.050 | 0.044 | - | 0.005 | 0.008 |
| | | Phase 2 | 0.178 | 0.169 | 0.156 | 0.018 | 0.022 | 0.036 |
| Dry | 10 | Baseline | 0.053 | 0.045 | 0.039 | - | - | - |
| | | Phase 2 | 0.158 | 0.151 | 0.136 | - | 0.010 | 0.021 |
| | 100 | Baseline | 0.049 | 0.042 | 0.034 | - | - | - |
| | | Phase 2 | 0.147 | 0.140 | 0.121 | - | - | 0.014 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C129: Monthly Mean Discharges at the Lake B2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | | Phase 2 | 47 600 | 138 000 | 45 000 | 18 900 | 21 900 | 11 000 |
| | 10 | Baseline | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | | Phase 2 | 21 600 | 96 600 | 19 300 | 5 620 | 6 840 | 4 310 |
| Median | 2 | Baseline | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| | | Phase 2 | 3 370 | 61 400 | 6 940 | 1 280 | 1 570 | 924 |
| Dry | 10 | Baseline | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | | Phase 2 | 0 | 37 900 | 2 640 | 301 | 280 | 129 |
| | 100 | Baseline | 0 | 34 200 | 2 710 | 332 | 0 | 87 |
| | | Phase 2 | 0 | 24 600 | 1 320 | 102 | 0 | 28 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C130: Derived Representative Discharges at the Lake B2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | | Phase 2 | 5.20 | 263 000 | 200 000 | 8 950 | 14 300 | 17 900 |
| | 10 | Baseline | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | | Phase 2 | 3.38 | 205 000 | 161 000 | 3 180 | 5 120 | 8 830 |
| Median | 2 | Baseline | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| | | Phase 2 | 2.15 | 151 000 | 120 000 | 846 | 1 410 | 3 530 |
| Dry | 10 | Baseline | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | | Phase 2 | 1.51 | 113 000 | 84 300 | 178 | 341 | 1 220 |
| | 100 | Baseline | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |
| | | Phase 2 | 1.23 | 89 200 | 59 400 | 6 | 64 | 346 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C131: Monthly Mean Stages at the Lake B2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.520 | 0.643 | 0.498 | 0.426 | 0.422 | 0.386 |
| | | Phase 2 | 0.477 | 0.588 | 0.472 | 0.398 | 0.410 | 0.358 |
| | 10 | Baseline | 0.445 | 0.595 | 0.429 | 0.348 | 0.355 | 0.324 |
| | | Phase 2 | 0.409 | 0.549 | 0.400 | 0.314 | 0.326 | 0.298 |
| Median | 2 | Baseline | 0.309 | 0.541 | 0.359 | 0.272 | 0.282 | 0.247 |
| | | Phase 2 | 0.284 | 0.502 | 0.327 | 0.234 | 0.244 | 0.220 |
| Dry | 10 | Baseline | - | 0.489 | 0.305 | 0.214 | 0.211 | 0.177 |
| | | Phase 2 | - | 0.456 | 0.270 | 0.176 | 0.174 | 0.149 |
| | 100 | Baseline | - | 0.447 | 0.272 | 0.180 | - | 0.138 |
| | | Phase 2 | - | 0.419 | 0.236 | 0.143 | - | 0.110 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C132: Derived Representative Stages at the Lake B2 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.859 | 0.749 | 0.696 | 0.368 | 0.401 | 0.418 |
| | | Phase 2 | 0.742 | 0.671 | 0.635 | 0.344 | 0.377 | 0.394 |
| | 10 | Baseline | 0.780 | 0.700 | 0.661 | 0.313 | 0.340 | 0.371 |
| | | Phase 2 | 0.682 | 0.638 | 0.607 | 0.280 | 0.308 | 0.343 |
| Median | 2 | Baseline | 0.706 | 0.653 | 0.619 | 0.254 | 0.276 | 0.318 |
| | | Phase 2 | 0.624 | 0.599 | 0.573 | 0.216 | 0.239 | 0.286 |
| Dry | 10 | Baseline | 0.654 | 0.613 | 0.574 | 0.197 | 0.217 | 0.264 |
| | | Phase 2 | 0.582 | 0.566 | 0.534 | 0.159 | 0.181 | 0.232 |
| | 100 | Baseline | 0.627 | 0.582 | 0.531 | 0.123 | 0.163 | 0.214 |
| | | Phase 2 | 0.559 | 0.540 | 0.499 | 0.082 | 0.130 | 0.181 |

Note: m= metre.

## Lake C10 to Lake C6

**Table 7.3-C133: Monthly Mean Discharges at the Lake C10 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 3 050 | 6 000 | 935 | 609 | 623 | 390 |
| | | Phase 2 | 2 910 | 5 730 | 889 | 554 | 586 | 370 |
| | 10 | Baseline | 1 490 | 4 510 | 404 | 273 | 323 | 202 |
| | | Phase 2 | 1 420 | 4 300 | 382 | 245 | 291 | 191 |
| Median | 2 | Baseline | 314 | 2 820 | 92 | 56 | 100 | 59 |
| | | Phase 2 | 297 | 2 690 | 85 | 47 | 83 | 54 |
| Dry | 10 | Baseline | 0 | 1 270 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 1 210 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 102 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 98 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C134: Derived Representative Discharges at the Lake C10 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.29 | 12 700 | 10 000 | 199 | 360 | 459 |
| | | Phase 2 | 0.28 | 12 000 | 9 490 | 185 | 330 | 428 |
| | 10 | Baseline | 0.20 | 10 300 | 7 870 | 61 | 167 | 256 |
| | | Phase 2 | 0.19 | 9 750 | 7 500 | 56 | 150 | 234 |
| Median | 2 | Baseline | 0.14 | 7 930 | 5 830 | 0 | 36 | 93 |
| | | Phase 2 | 0.13 | 7 540 | 5 560 | 0 | 30 | 81 |
| Dry | 10 | Baseline | 0.10 | 6 160 | 4 270 | 0 | 0 | 0 |
| | | Phase 2 | 0.10 | 5 830 | 4 050 | 0 | 0 | 0 |
| | 100 | Baseline | 0.09 | 5 040 | 3 270 | 0 | 0 | 0 |
| | | Phase 2 | 0.08 | 4 720 | 3 080 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C135: Monthly Mean Stages at the Lake C10 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.095 | 0.149 | 0.043 | 0.032 | 0.033 | 0.024 |
| | | Phase 2 | 0.092 | 0.144 | 0.042 | 0.030 | 0.032 | 0.023 |
| | 10 | Baseline | 0.059 | 0.123 | 0.025 | 0.019 | 0.021 | 0.016 |
| | | Phase 2 | 0.057 | 0.119 | 0.024 | 0.018 | 0.020 | 0.015 |
| Median | 2 | Baseline | 0.021 | 0.090 | 0.009 | 0.007 | 0.010 | 0.007 |
| | | Phase 2 | 0.020 | 0.087 | 0.009 | 0.006 | 0.009 | 0.006 |
| Dry | 10 | Baseline | - | 0.053 | - | - | - | - |
| | | Phase 2 | - | 0.051 | - | - | - | - |
| | 100 | Baseline | - | 0.010 | - | - | - | - |
| | | Phase 2 | - | 0.010 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C136: Derived Representative Stages at the Lake C10 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.388 | 0.245 | 0.209 | 0.015 | 0.023 | 0.027 |
| | | Phase 2 | 0.379 | 0.236 | 0.202 | 0.015 | 0.022 | 0.026 |
| | 10 | Baseline | 0.304 | 0.213 | 0.178 | 0.007 | 0.014 | 0.018 |
| | | Phase 2 | 0.294 | 0.206 | 0.173 | 0.007 | 0.013 | 0.017 |
| Median | 2 | Baseline | 0.235 | 0.179 | 0.146 | - | 0.005 | 0.009 |
| | | Phase 2 | 0.227 | 0.173 | 0.141 | - | 0.004 | 0.008 |
| Dry | 10 | Baseline | 0.194 | 0.151 | 0.119 | - | - | - |
| | | Phase 2 | 0.186 | 0.146 | 0.114 | - | - | - |
| | 100 | Baseline | 0.172 | 0.132 | 0.099 | - | - | - |
| | | Phase 2 | 0.166 | 0.127 | 0.095 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C137: Monthly Mean Discharges at the Lake C6 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 12 500 | 25 200 | 4 350 | 2 990 | 2 850 | 1 720 |
| | | Phase 2 | 11 100 | 22 700 | 3 950 | 2 560 | 2 460 | 1 340 |
| | 10 | Baseline | 6 110 | 19 100 | 1 960 | 1 550 | 1 770 | 918 |
| | | Phase 2 | 5 400 | 17 200 | 1 750 | 1 270 | 1 470 | 749 |
| Median | 2 | Baseline | 1 280 | 12 200 | 545 | 449 | 746 | 243 |
| | | Phase 2 | 1 120 | 10 900 | 459 | 330 | 582 | 267 |
| Dry | 10 | Baseline | 0 | 5 700 | 0 | 0 | 0 | 32 |
| | | Phase 2 | 0 | 5 140 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 719 | 0 | 0 | 0 | 5 |
| | | Phase 2 | 0 | 744 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C138: Derived Representative Discharges at the Lake C6 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.21 | 54 500 | 41 700 | 1 040 | 1 810 | 2 450 |
| | | Phase 2 | 1.13 | 49 000 | 37 800 | 884 | 1 550 | 2 300 |
| | 10 | Baseline | 0.86 | 43 500 | 33 200 | 364 | 968 | 1 370 |
| | | Phase 2 | 0.79 | 39 100 | 29 800 | 295 | 796 | 1 180 |
| Median | 2 | Baseline | 0.59 | 33 300 | 24 700 | 32 | 301 | 583 |
| | | Phase 2 | 0.53 | 29 900 | 22 200 | 16 | 223 | 448 |
| Dry | 10 | Baseline | 0.42 | 25 800 | 18 100 | 0 | 0 | 141 |
| | | Phase 2 | 0.37 | 23 100 | 16 300 | 0 | 0 | 89 |
| | 100 | Baseline | 0.34 | 21 100 | 13 800 | 0 | 0 | 0 |
| | | Phase 2 | 0.30 | 18 800 | 12 500 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C139: Monthly Mean Stages at the Lake C6 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.155 | 0.247 | 0.076 | 0.060 | 0.058 | 0.041 |
| | | Phase 2 | 0.143 | 0.230 | 0.072 | 0.054 | 0.052 | 0.035 |
| | 10 | Baseline | 0.096 | 0.205 | 0.045 | 0.038 | 0.042 | 0.027 |
| | | Phase 2 | 0.088 | 0.191 | 0.042 | 0.034 | 0.037 | 0.024 |
| Median | 2 | Baseline | 0.034 | 0.152 | 0.019 | 0.017 | 0.024 | 0.011 |
| | | Phase 2 | 0.031 | 0.141 | 0.017 | 0.014 | 0.020 | 0.012 |
| Dry | 10 | Baseline | - | 0.092 | - | - | - | 0.003 |
| | | Phase 2 | - | 0.085 | - | - | - | - |
| | 100 | Baseline | - | 0.023 | - | - | - | 0.001 |
| | | Phase 2 | - | 0.024 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C140: Derived Representative Stages at the Lake C6 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.637 | 0.413 | 0.345 | 0.029 | 0.043 | 0.052 |
| | | Phase 2 | 0.609 | 0.384 | 0.323 | 0.026 | 0.038 | 0.050 |
| | 10 | Baseline | 0.508 | 0.355 | 0.297 | 0.015 | 0.028 | 0.035 |
| | | Phase 2 | 0.479 | 0.331 | 0.276 | 0.013 | 0.025 | 0.032 |
| Median | 2 | Baseline | 0.394 | 0.297 | 0.243 | 0.003 | 0.013 | 0.020 |
| | | Phase 2 | 0.366 | 0.277 | 0.227 | 0.002 | 0.011 | 0.017 |
| Dry | 10 | Baseline | 0.315 | 0.251 | 0.198 | - | - | 0.008 |
| | | Phase 2 | 0.291 | 0.233 | 0.185 | - | - | 0.006 |
| | 100 | Baseline | 0.271 | 0.219 | 0.165 | - | - | - |
| | | Phase 2 | 0.249 | 0.203 | 0.155 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake I1

**Table 7.3-C141: Monthly Mean Discharges at the Lake I1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 1 610 | 3 000 | 409 | 271 | 300 | 198 |
| | | Phase 2 | 1 560 | 2 920 | 396 | 251 | 289 | 189 |
| | 10 | Baseline | 797 | 2 290 | 176 | 112 | 137 | 98 |
| | | Phase 2 | 772 | 2 220 | 170 | 103 | 129 | 93 |
| Median | 2 | Baseline | 172 | 1 430 | 35 | 18 | 31 | 25 |
| | | Phase 2 | 166 | 1 380 | 33 | 15 | 27 | 23 |
| Dry | 10 | Baseline | 0 | 584 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 567 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C142: Derived Representative Discharges at the Lake I1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.20 | 7 550 | 5 260 | 89 | 156 | 217 |
| | | Phase 2 | 0.19 | 7 260 | 5 060 | 85 | 145 | 206 |
| | 10 | Baseline | 0.13 | 5 710 | 4 120 | 26 | 67 | 111 |
| | | Phase 2 | 0.13 | 5 510 | 3 990 | 25 | 62 | 104 |
| Median | 2 | Baseline | 0.08 | 4 190 | 3 010 | 0 | 11 | 32 |
| | | Phase 2 | 0.08 | 4 050 | 2 920 | 0 | 10 | 30 |
| Dry | 10 | Baseline | 0.06 | 3 200 | 2 160 | 0 | 0 | 0 |
| | | Phase 2 | 0.06 | 3 090 | 2 080 | 0 | 0 | 0 |
| | 100 | Baseline | 0.05 | 2 670 | 1 610 | 0 | 0 | 0 |
| | | Phase 2 | 0.05 | 2 550 | 1 530 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C143: Monthly Mean Stages at the Lake I1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.069 | 0.104 | 0.028 | 0.021 | 0.022 | 0.017 |
| | | Phase 2 | 0.067 | 0.102 | 0.027 | 0.020 | 0.022 | 0.017 |
| | 10 | Baseline | 0.043 | 0.087 | 0.016 | 0.012 | 0.013 | 0.011 |
| | | Phase 2 | 0.042 | 0.085 | 0.015 | 0.011 | 0.013 | 0.010 |
| Median | 2 | Baseline | 0.016 | 0.064 | 0.005 | 0.003 | 0.005 | 0.004 |
| | | Phase 2 | 0.015 | 0.062 | 0.005 | 0.003 | 0.005 | 0.004 |
| Dry | 10 | Baseline | - | 0.035 | - | - | - | - |
| | | Phase 2 | - | 0.034 | - | - | - | - |
| | 100 | Baseline | - | - | - | - | - | - |
| | | Phase 2 | - | - | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C144: Derived Representative Stages at the Lake I1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.334 | 0.193 | 0.152 | 0.010 | 0.015 | 0.018 |
| | | Phase 2 | 0.326 | 0.188 | 0.148 | 0.010 | 0.014 | 0.017 |
| | 10 | Baseline | 0.253 | 0.160 | 0.129 | 0.004 | 0.008 | 0.012 |
| | | Phase 2 | 0.248 | 0.157 | 0.126 | 0.004 | 0.008 | 0.011 |
| Median | 2 | Baseline | 0.187 | 0.130 | 0.105 | - | 0.003 | 0.005 |
| | | Phase 2 | 0.184 | 0.127 | 0.102 | - | 0.002 | 0.005 |
| Dry | 10 | Baseline | 0.147 | 0.109 | 0.084 | - | - | - |
| | | Phase 2 | 0.144 | 0.106 | 0.082 | - | - | - |
| | 100 | Baseline | 0.127 | 0.097 | 0.069 | - | - | - |
| | | Phase 2 | 0.124 | 0.094 | 0.067 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake J1

**Table 7.3-C145: Monthly Mean Discharges at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 620 | 13 000 | 2 010 | 1 470 | 1 490 | 751 |
| | | Phase 2 | 2 730 | 5 510 | 807 | 399 | 489 | 300 |
| | 10 | Baseline | 3 230 | 9 830 | 902 | 690 | 776 | 407 |
| | | Phase 2 | 1 310 | 4 090 | 328 | 153 | 191 | 136 |
| Median | 2 | Baseline | 673 | 6 190 | 211 | 146 | 237 | 126 |
| | | Phase 2 | 263 | 2 510 | 60 | 15 | 24 | 29 |
| Dry | 10 | Baseline | 0 | 2 740 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 1 090 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 81 | 0 | 0 | 0 | 0 |
| | | Phase 2 | 0 | 47 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C146: Derived Representative Discharges at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.86 | 30 600 | 22 600 | 230 | 1 200 | 1 180 |
| | | Phase 2 | 0.31 | 13 300 | 9 170 | 138 | 241 | 346 |
| | 10 | Baseline | 0.56 | 24 000 | 17 700 | 29 | 317 | 568 |
| | | Phase 2 | 0.19 | 9 690 | 7 210 | 39 | 92 | 167 |
| Median | 2 | Baseline | 0.37 | 17 800 | 12 800 | 3 | 60 | 201 |
| | | Phase 2 | 0.12 | 6 870 | 5 220 | 0 | 9 | 41 |
| Dry | 10 | Baseline | 0.27 | 13 600 | 8 980 | 0 | 0 | 0 |
| | | Phase 2 | 0.08 | 5 180 | 3 600 | 0 | 0 | 0 |
| | 100 | Baseline | 0.24 | 11 600 | 6 730 | 0 | 0 | 0 |
| | | Phase 2 | 0.07 | 4 330 | 2 510 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C147: Monthly Mean Stages at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.129 | 0.203 | 0.058 | 0.047 | 0.048 | 0.030 |
| | | Phase 2 | 0.072 | 0.114 | 0.032 | 0.020 | 0.023 | 0.016 |
| | 10 | Baseline | 0.080 | 0.168 | 0.034 | 0.029 | 0.031 | 0.020 |
| | | Phase 2 | 0.044 | 0.094 | 0.017 | 0.010 | 0.012 | 0.010 |
| Median | 2 | Baseline | 0.028 | 0.124 | 0.013 | 0.010 | 0.014 | 0.009 |
| | | Phase 2 | 0.015 | 0.068 | 0.006 | 0.002 | 0.003 | 0.003 |
| Dry | 10 | Baseline | - | 0.072 | - | - | - | - |
| | | Phase 2 | - | 0.039 | - | - | - | - |
| | 100 | Baseline | - | 0.007 | - | - | - | - |
| | | Phase 2 | - | 0.005 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C148: Derived Representative Stages at the Lake J1 Outlet – Mining Phase 2**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.648 | 0.358 | 0.293 | 0.014 | 0.041 | 0.041 |
| | | Phase 2 | 0.328 | 0.206 | 0.161 | 0.010 | 0.014 | 0.018 |
| | 10 | Baseline | 0.484 | 0.305 | 0.249 | 0.003 | 0.017 | 0.025 |
| | | Phase 2 | 0.238 | 0.167 | 0.137 | 0.004 | 0.007 | 0.011 |
| Median | 2 | Baseline | 0.368 | 0.250 | 0.201 | 0.001 | 0.006 | 0.013 |
| | | Phase 2 | 0.171 | 0.132 | 0.110 | - | 0.002 | 0.004 |
| Dry | 10 | Baseline | 0.298 | 0.209 | 0.158 | - | - | - |
| | | Phase 2 | 0.135 | 0.110 | 0.086 | - | - | - |
| | 100 | Baseline | 0.275 | 0.188 | 0.131 | - | - | - |
| | | Phase 2 | 0.118 | 0.097 | 0.068 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

# 5.0 EFFECT ANALYSIS RESULTS – MINING PHASE 3 (YEARS 5 TO 8)

## 5.1 Effects of Dewatering on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake A1

**Table 7.3-C149: Monthly Mean Discharges at the Lake A1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | | Phase 3 | 6 440 | 15 800 | 2 790 | 2 190 | 1 520 | 993 |
| | 10 | Baseline | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | | Phase 3 | 3 020 | 11 800 | 1 540 | 927 | 979 | 488 |
| Median | 2 | Baseline | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| | | Phase 3 | 563 | 7 760 | 812 | 312 | 496 | 177 |
| Dry | 10 | Baseline | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | | Phase 3 | 0 | 4 380 | 491 | 93 | 153 | 56 |
| | 100 | Baseline | 0 | 11 900 | 1 200 | 201 | 12 | 105 |
| | | Phase 3 | 0 | 2 060 | 368 | 23 | 0 | 25 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C150: Derived Representative Discharges at the Lake A1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | | Phase 3 | 1.04 | 33 900 | 25 500 | 806 | 1 280 | 1 390 |
| | 10 | Baseline | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | | Phase 3 | 0.62 | 26 900 | 20 200 | 450 | 737 | 933 |
| Median | 2 | Baseline | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| | | Phase 3 | 0.36 | 19 900 | 14 700 | 201 | 342 | 550 |
| Dry | 10 | Baseline | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | | Phase 3 | 0.24 | 14 300 | 10 100 | 66 | 122 | 298 |
| | 100 | Baseline | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |
| | | Phase 3 | 0.19 | 10 500 | 6 830 | 4 | 18 | 157 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C151: Monthly Mean Stages at the Lake A1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | | Phase 3 | 0.447 | 0.526 | 0.384 | 0.367 | 0.344 | 0.318 |
| | 10 | Baseline | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | | Phase 3 | 0.389 | 0.499 | 0.345 | 0.314 | 0.317 | 0.280 |
| Median | 2 | Baseline | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| | | Phase 3 | 0.287 | 0.462 | 0.307 | 0.258 | 0.280 | 0.232 |
| Dry | 10 | Baseline | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | | Phase 3 | - | 0.417 | 0.280 | 0.207 | 0.226 | 0.189 |
| | 100 | Baseline | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |
| | | Phase 3 | - | 0.363 | 0.266 | 0.161 | - | 0.162 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C152: Derived Representative Stages at the Lake A1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | | Phase 3 | 0.722 | 0.604 | 0.574 | 0.306 | 0.333 | 0.338 |
| | 10 | Baseline | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | | Phase 3 | 0.656 | 0.580 | 0.550 | 0.275 | 0.301 | 0.315 |
| Median | 2 | Baseline | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| | | Phase 3 | 0.594 | 0.549 | 0.519 | 0.238 | 0.262 | 0.286 |
| Dry | 10 | Baseline | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | | Phase 3 | 0.552 | 0.517 | 0.485 | 0.194 | 0.217 | 0.256 |
| | 100 | Baseline | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |
| | | Phase 3 | 0.530 | 0.488 | 0.452 | 0.117 | 0.153 | 0.227 |

Note: m= metre.

## 5.2 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake B46 to Lake B52

**Table 7.3-C153: Monthly Mean Discharges at the Lake B46 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3$/d) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 45 400 | 105 000 | 36 300 | 12 100 | 11 100 | 6 130 |
| | | Phase 3 | 43 600 | 101 000 | 35 100 | 11 500 | 10 700 | 5 900 |
| | 10 | Baseline | 21 500 | 78 200 | 10 700 | 5 560 | 6 450 | 3 560 |
| | | Phase 3 | 20 700 | 75 100 | 10 400 | 5 260 | 6 140 | 3 410 |
| Median | 2 | Baseline | 4 100 | 50 000 | 2 250 | 1 210 | 2 440 | 1 290 |
| | | Phase 3 | 3 990 | 48 000 | 2 190 | 1 130 | 2 300 | 1 220 |
| Dry | 10 | Baseline | 0 | 26 500 | 338 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 25 400 | 331 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 10 200 | 0 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 9 790 | 0 | 0 | 0 | 0 |

Note: $m^3$/d= cubic metres per day.

**Table 7.3-C154: Derived Representative Discharges at the Lake B46 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3$/s) | 7-Day Mean Peak Q ($m^3$/d) | 14-Day Mean Peak Q ($m^3$/d) | 30-Day Low Flow Q ($m^3$/d) | 60-Day Low Flow Q ($m^3$/d) | 90-Day Low Flow Q ($m^3$/d) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.63 | 219 000 | 163 000 | 4 290 | 7 720 | 12 100 |
| | | Phase 3 | 3.41 | 205 000 | 155 000 | 4 070 | 7 260 | 11 700 |
| | 10 | Baseline | 2.44 | 165 000 | 130 000 | 1 470 | 3 740 | 5 820 |
| | | Phase 3 | 2.25 | 155 000 | 124 000 | 1 390 | 3 530 | 5 530 |
| Median | 2 | Baseline | 1.65 | 122 000 | 97 000 | 101 | 965 | 2 070 |
| | | Phase 3 | 1.51 | 115 000 | 92 500 | 92 | 908 | 1 920 |
| Dry | 10 | Baseline | 1.24 | 94 400 | 71 100 | 0 | 0 | 389 |
| | | Phase 3 | 1.14 | 88 500 | 67 900 | 0 | 0 | 356 |
| | 100 | Baseline | 1.07 | 79 800 | 54 100 | 0 | 0 | 0 |
| | | Phase 3 | 0.99 | 74 400 | 51 600 | 0 | 0 | 0 |

Note: Q= discharge; $m^3$/s= cubic metres per second; $m^3$/d= cubic metres per day.

**Table 7.3-C155: Monthly Mean Stages at the Lake B46 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.173 | 0.303 | 0.149 | 0.072 | 0.068 | 0.046 |
| | | Phase 3 | 0.168 | 0.295 | 0.146 | 0.069 | 0.066 | 0.044 |
| | 10 | Baseline | 0.105 | 0.249 | 0.066 | 0.043 | 0.047 | 0.032 |
| | | Phase 3 | 0.103 | 0.242 | 0.065 | 0.041 | 0.046 | 0.031 |
| Median | 2 | Baseline | 0.035 | 0.185 | 0.023 | 0.015 | 0.025 | 0.016 |
| | | Phase 3 | 0.034 | 0.180 | 0.023 | 0.015 | 0.024 | 0.016 |
| Dry | 10 | Baseline | - | 0.121 | 0.007 | - | - | - |
| | | Phase 3 | - | 0.117 | 0.007 | - | - | - |
| | 100 | Baseline | - | 0.064 | - | - | - | - |
| | | Phase 3 | - | 0.062 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C156: Derived Representative Stages at the Lake B46 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.628 | 0.494 | 0.406 | 0.036 | 0.053 | 0.072 |
| | | Phase 3 | 0.602 | 0.473 | 0.392 | 0.035 | 0.051 | 0.070 |
| | 10 | Baseline | 0.482 | 0.409 | 0.349 | 0.018 | 0.033 | 0.044 |
| | | Phase 3 | 0.456 | 0.392 | 0.338 | 0.017 | 0.032 | 0.043 |
| Median | 2 | Baseline | 0.371 | 0.334 | 0.287 | 0.003 | 0.013 | 0.022 |
| | | Phase 3 | 0.350 | 0.322 | 0.278 | 0.003 | 0.013 | 0.021 |
| Dry | 10 | Baseline | 0.307 | 0.282 | 0.233 | - | - | 0.007 |
| | | Phase 3 | 0.290 | 0.270 | 0.226 | - | - | 0.007 |
| | 100 | Baseline | 0.278 | 0.252 | 0.194 | - | - | - |
| | | Phase 3 | 0.263 | 0.241 | 0.188 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C157: Monthly Mean Discharges at the Lake B4 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 70 500 | 197 000 | 52 300 | 28 200 | 26 800 | 15 700 |
| | | Phase 3 | 44 800 | 110 000 | 31 400 | 30 600 | 12 700 | 13 200 |
| | 10 | Baseline | 32 500 | 135 000 | 23 800 | 8 800 | 10 400 | 6 500 |
| | | Phase 3 | 20 900 | 80 200 | 12 100 | 4 650 | 6 900 | 4 640 |
| Median | 2 | Baseline | 5 590 | 82 700 | 9 250 | 2 150 | 3 020 | 1 520 |
| | | Phase 3 | 3 770 | 50 800 | 3 690 | 479 | 1 290 | 624 |
| Dry | 10 | Baseline | 0 | 48 200 | 3 800 | 576 | 602 | 234 |
| | | Phase 3 | 0 | 28 300 | 1 100 | 68 | 65 | 35 |
| | 100 | Baseline | 0 | 29 000 | 2 000 | 236 | 0 | 54 |
| | | Phase 3 | 0 | 13 800 | 383 | 30 | 4 | 3 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C158: Derived Representative Discharges at the Lake B4 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 7.25 | 374 000 | 292 000 | 11 500 | 20 100 | 21 900 |
| | | Phase 3 | 3.40 | 216 000 | 170 000 | 7 870 | 12 700 | 10 800 |
| | 10 | Baseline | 4.15 | 277 000 | 223 000 | 4 640 | 7 920 | 11 800 |
| | | Phase 3 | 2.34 | 165 000 | 133 000 | 1 650 | 3 890 | 6 140 |
| Median | 2 | Baseline | 2.62 | 197 000 | 158 000 | 1 450 | 2 430 | 5 170 |
| | | Phase 3 | 1.61 | 122 000 | 97 700 | 241 | 671 | 2 170 |
| Dry | 10 | Baseline | 2.04 | 146 000 | 110 000 | 365 | 646 | 1 890 |
| | | Phase 3 | 1.22 | 93 800 | 70 800 | 32 | 86 | 512 |
| | 100 | Baseline | 1.99 | 118 000 | 80 500 | 42 | 128 | 492 |
| | | Phase 3 | 1.05 | 77 900 | 53 800 | 4 | 19 | 156 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C159: Monthly Mean Stages at the Lake B4 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.560 | 0.661 | 0.534 | 0.483 | 0.479 | 0.439 |
| | | Phase 3 | 1.400 | 1.482 | 1.371 | 1.369 | 1.304 | 1.307 |
| | 10 | Baseline | 0.494 | 0.622 | 0.470 | 0.400 | 0.411 | 0.381 |
| | | Phase 3 | 1.340 | 1.452 | 1.301 | 1.241 | 1.265 | 1.241 |
| Median | 2 | Baseline | 0.372 | 0.575 | 0.403 | 0.319 | 0.337 | 0.301 |
| | | Phase 3 | 1.229 | 1.411 | 1.228 | 1.130 | 1.173 | 1.141 |
| Dry | 10 | Baseline | - | 0.527 | 0.349 | 0.257 | 0.259 | 0.223 |
| | | Phase 3 | - | 1.363 | 1.166 | 1.062 | 1.061 | 1.044 |
| | 100 | Baseline | - | 0.485 | 0.315 | 0.223 | - | 0.176 |
| | | Phase 3 | - | 1.310 | 1.121 | 1.040 | 0.995 | 0.991 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C160: Derived Representative Stages at the Lake B4 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.797 | 0.733 | 0.704 | 0.418 | 0.457 | 0.464 |
| | | Phase 3 | 1.585 | 1.551 | 1.525 | 1.273 | 1.304 | 1.293 |
| | 10 | Baseline | 0.728 | 0.698 | 0.674 | 0.361 | 0.393 | 0.419 |
| | | Phase 3 | 1.544 | 1.522 | 1.500 | 1.185 | 1.231 | 1.257 |
| Median | 2 | Baseline | 0.676 | 0.661 | 0.638 | 0.299 | 0.325 | 0.367 |
| | | Phase 3 | 1.505 | 1.492 | 1.470 | 1.104 | 1.144 | 1.199 |
| Dry | 10 | Baseline | 0.649 | 0.630 | 0.602 | 0.239 | 0.262 | 0.312 |
| | | Phase 3 | 1.477 | 1.466 | 1.440 | 1.042 | 1.069 | 1.133 |
| | 100 | Baseline | 0.647 | 0.608 | 0.572 | 0.168 | 0.202 | 0.251 |
| | | Phase 3 | 1.463 | 1.449 | 1.416 | 0.995 | 1.028 | 1.088 |

Note: m= metre.

**Table 7.3-C161: Monthly Mean Discharges at the Lake P2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 2 310 | 4 420 | 650 | 431 | 453 | 293 |
| | | Phase 3 | 42 200 | 116 000 | 37 200 | 29 100 | 39 300 | 11 500 |
| | 10 | Baseline | 1 140 | 3 360 | 280 | 187 | 224 | 148 |
| | | Phase 3 | 19 400 | 83 100 | 14 900 | 5 060 | 8 120 | 4 250 |
| Median | 2 | Baseline | 242 | 2 110 | 60 | 35 | 63 | 40 |
| | | Phase 3 | 3 280 | 53 100 | 4 740 | 582 | 1 140 | 772 |
| Dry | 10 | Baseline | 0 | 909 | 0 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 31 600 | 1 410 | 54 | 128 | 82 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 18 700 | 443 | 0 | 0 | 14 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C162: Derived Representative Discharges at the Lake P2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.26 | 10 700 | 7 590 | 140 | 251 | 331 |
| | | Phase 3 | 3.34 | 226 000 | 175 000 | 5 050 | 18 100 | 12 200 |
| | 10 | Baseline | 0.17 | 8 140 | 5 980 | 42 | 114 | 178 |
| | | Phase 3 | 2.44 | 172 000 | 138 000 | 2 090 | 4 480 | 6 960 |
| Median | 2 | Baseline | 0.11 | 6 020 | 4 400 | 1 | 22 | 60 |
| | | Phase 3 | 1.64 | 126 000 | 101 000 | 454 | 782 | 2 550 |
| Dry | 10 | Baseline | 0.08 | 4 630 | 3 180 | 0 | 0 | 0 |
| | | Phase 3 | 1.07 | 94 500 | 72 600 | 0 | 109 | 649 |
| | 100 | Baseline | 0.07 | 3 870 | 2 380 | 0 | 0 | 0 |
| | | Phase 3 | 0.74 | 76 600 | 54 000 | 0 | 0 | 214 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C163: Monthly Mean Stages at the Lake P2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.034 | 0.044 | 0.021 | 0.017 | 0.018 | 0.015 |
| | | Phase 3 | 0.109 | 0.163 | 0.103 | 0.094 | 0.106 | 0.065 |
| | 10 | Baseline | 0.026 | 0.040 | 0.015 | 0.012 | 0.013 | 0.011 |
| | | Phase 3 | 0.080 | 0.143 | 0.072 | 0.047 | 0.056 | 0.043 |
| Median | 2 | Baseline | 0.014 | 0.033 | 0.008 | 0.006 | 0.008 | 0.007 |
| | | Phase 3 | 0.039 | 0.119 | 0.045 | 0.020 | 0.026 | 0.022 |
| Dry | 10 | Baseline | - | 0.023 | - | - | - | - |
| | | Phase 3 | - | 0.097 | 0.028 | 0.008 | 0.011 | 0.009 |
| | 100 | Baseline | - | - | - | - | - | - |
| | | Phase 3 | - | 0.079 | 0.018 | - | - | 0.004 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C164: Derived Representative Stages at the Lake P2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.085 | 0.063 | 0.055 | 0.011 | 0.014 | 0.016 |
| | | Phase 3 | 0.235 | 0.213 | 0.192 | 0.047 | 0.078 | 0.066 |
| | 10 | Baseline | 0.072 | 0.056 | 0.050 | 0.007 | 0.010 | 0.012 |
| | | Phase 3 | 0.207 | 0.191 | 0.175 | 0.033 | 0.044 | 0.053 |
| Median | 2 | Baseline | 0.060 | 0.050 | 0.044 | - | 0.005 | 0.008 |
| | | Phase 3 | 0.177 | 0.169 | 0.154 | 0.018 | 0.022 | 0.035 |
| Dry | 10 | Baseline | 0.053 | 0.045 | 0.039 | - | - | - |
| | | Phase 3 | 0.149 | 0.150 | 0.135 | - | 0.010 | 0.020 |
| | 100 | Baseline | 0.049 | 0.042 | 0.034 | - | - | - |
| | | Phase 3 | 0.128 | 0.138 | 0.120 | - | - | 0.013 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C165: Monthly Mean Discharges at the Lake B2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | | Phase 3 | 46 800 | 136 000 | 44 300 | 18 400 | 21 100 | 10 700 |
| | 10 | Baseline | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | | Phase 3 | 21 200 | 94 900 | 18 900 | 5 490 | 6 620 | 4 180 |
| Median | 2 | Baseline | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| | | Phase 3 | 3 310 | 60 200 | 6 800 | 1 250 | 1 530 | 896 |
| Dry | 10 | Baseline | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | | Phase 3 | 0 | 37 200 | 2 590 | 295 | 273 | 126 |
| | 100 | Baseline | 0 | 34 200 | 2 710 | 332 | 0 | 87 |
| | | Phase 3 | 0 | 24 200 | 1 290 | 98 | 0 | 27 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C166: Derived Representative Discharges at the Lake B2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | | Phase 3 | 5.14 | 259 000 | 201 000 | 8 700 | 13 800 | 14 500 |
| | 10 | Baseline | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | | Phase 3 | 3.28 | 201 000 | 159 000 | 3 100 | 4 970 | 8 300 |
| Median | 2 | Baseline | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| | | Phase 3 | 2.09 | 148 000 | 117 000 | 828 | 1 370 | 3 450 |
| Dry | 10 | Baseline | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | | Phase 3 | 1.52 | 111 000 | 82 800 | 174 | 329 | 1 160 |
| | 100 | Baseline | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |
| | | Phase 3 | 1.28 | 88 300 | 60 100 | 5 | 59 | 508 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C167: Monthly Mean Stages at the Lake B2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.520 | 0.643 | 0.498 | 0.426 | 0.422 | 0.386 |
| | | Phase 3 | 0.476 | 0.587 | 0.471 | 0.396 | 0.407 | 0.356 |
| | 10 | Baseline | 0.445 | 0.595 | 0.429 | 0.348 | 0.355 | 0.324 |
| | | Phase 3 | 0.407 | 0.547 | 0.398 | 0.312 | 0.324 | 0.296 |
| Median | 2 | Baseline | 0.309 | 0.541 | 0.359 | 0.272 | 0.282 | 0.247 |
| | | Phase 3 | 0.283 | 0.500 | 0.326 | 0.233 | 0.243 | 0.219 |
| Dry | 10 | Baseline | - | 0.489 | 0.305 | 0.214 | 0.211 | 0.177 |
| | | Phase 3 | - | 0.455 | 0.269 | 0.176 | 0.173 | 0.149 |
| | 100 | Baseline | - | 0.447 | 0.272 | 0.180 | - | 0.138 |
| | | Phase 3 | - | 0.418 | 0.235 | 0.142 | - | 0.110 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C168: Derived Representative Stages at the Lake B2 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.859 | 0.749 | 0.696 | 0.368 | 0.401 | 0.418 |
| | | Phase 3 | 0.741 | 0.669 | 0.636 | 0.342 | 0.374 | 0.378 |
| | 10 | Baseline | 0.780 | 0.700 | 0.661 | 0.313 | 0.340 | 0.371 |
| | | Phase 3 | 0.678 | 0.636 | 0.605 | 0.279 | 0.306 | 0.339 |
| Median | 2 | Baseline | 0.706 | 0.653 | 0.619 | 0.254 | 0.276 | 0.318 |
| | | Phase 3 | 0.620 | 0.597 | 0.570 | 0.215 | 0.238 | 0.285 |
| Dry | 10 | Baseline | 0.654 | 0.613 | 0.574 | 0.197 | 0.217 | 0.264 |
| | | Phase 3 | 0.583 | 0.564 | 0.532 | 0.158 | 0.179 | 0.230 |
| | 100 | Baseline | 0.627 | 0.582 | 0.531 | 0.123 | 0.163 | 0.214 |
| | | Phase 3 | 0.563 | 0.539 | 0.500 | 0.079 | 0.128 | 0.195 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake E3 to Lake E1

**Table 7.3-C169: Monthly Mean Discharges at the Lake E3 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 670 | 19 000 | 7 270 | 1 600 | 1 560 | 857 |
| | | Phase 3 | 5 410 | 15 300 | 7 100 | 1 130 | 1 140 | 648 |
| | 10 | Baseline | 3 090 | 13 000 | 2 280 | 620 | 645 | 457 |
| | | Phase 3 | 2 490 | 10 400 | 1 720 | 412 | 423 | 303 |
| Median | 2 | Baseline | 557 | 7 930 | 521 | 79 | 111 | 134 |
| | | Phase 3 | 442 | 6 190 | 289 | 35 | 44 | 69 |
| Dry | 10 | Baseline | 0 | 4 600 | 90 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 3 440 | 37 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 2 750 | 0 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 1 910 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C170: Derived Representative Discharges at the Lake E3 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.52 | 35 300 | 26 900 | 602 | 1 070 | 4 920 |
| | | Phase 3 | 0.44 | 29 700 | 22 000 | 391 | 737 | 1 100 |
| | 10 | Baseline | 0.34 | 25 000 | 20 700 | 180 | 418 | 1 130 |
| | | Phase 3 | 0.29 | 20 600 | 16 800 | 110 | 263 | 575 |
| Median | 2 | Baseline | 0.22 | 17 000 | 14 700 | 0 | 64 | 179 |
| | | Phase 3 | 0.18 | 13 700 | 11 700 | 0 | 24 | 182 |
| Dry | 10 | Baseline | 0.15 | 12 200 | 9 950 | 0 | 0 | 21 |
| | | Phase 3 | 0.13 | 9 690 | 7 700 | 0 | 0 | 0 |
| | 100 | Baseline | 0.12 | 9 770 | 6 910 | 0 | 0 | 0 |
| | | Phase 3 | 0.10 | 7 700 | 5 060 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C171: Monthly Mean Stages at the Lake E3 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.115 | 0.231 | 0.122 | 0.044 | 0.044 | 0.029 |
| | | Phase 3 | 0.100 | 0.200 | 0.120 | 0.035 | 0.035 | 0.024 |
| | 10 | Baseline | 0.069 | 0.179 | 0.056 | 0.024 | 0.024 | 0.019 |
| | | Phase 3 | 0.060 | 0.155 | 0.047 | 0.018 | 0.018 | 0.015 |
| Median | 2 | Baseline | 0.022 | 0.129 | 0.021 | 0.006 | 0.007 | 0.008 |
| | | Phase 3 | 0.019 | 0.109 | 0.014 | 0.003 | 0.004 | 0.005 |
| Dry | 10 | Baseline | - | 0.090 | 0.007 | - | - | - |
| | | Phase 3 | - | 0.074 | 0.004 | - | - | - |
| | 100 | Baseline | - | 0.064 | - | - | - | - |
| | | Phase 3 | - | 0.050 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C172: Derived Representative Stages at the Lake E3 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.409 | 0.349 | 0.291 | 0.023 | 0.034 | 0.094 |
| | | Phase 3 | 0.367 | 0.311 | 0.255 | 0.017 | 0.026 | 0.035 |
| | 10 | Baseline | 0.310 | 0.277 | 0.245 | 0.010 | 0.018 | 0.035 |
| | | Phase 3 | 0.278 | 0.244 | 0.213 | 0.007 | 0.013 | 0.022 |
| Median | 2 | Baseline | 0.230 | 0.215 | 0.195 | - | 0.005 | 0.010 |
| | | Phase 3 | 0.205 | 0.186 | 0.167 | - | 0.003 | 0.010 |
| Dry | 10 | Baseline | 0.182 | 0.172 | 0.150 | - | - | 0.002 |
| | | Phase 3 | 0.159 | 0.147 | 0.127 | - | - | - |
| | 100 | Baseline | 0.158 | 0.148 | 0.118 | - | - | - |
| | | Phase 3 | 0.136 | 0.127 | 0.096 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C173: Monthly Mean Discharges at the Lake E1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 12 800 | 34 500 | 13 500 | 2 930 | 2 940 | 1 620 |
| | | Phase 3 | 11 800 | 31 200 | 13 900 | 2 440 | 2 500 | 1 380 |
| | 10 | Baseline | 6 010 | 24 000 | 4 000 | 1 170 | 1 250 | 860 |
| | | Phase 3 | 5 530 | 21 600 | 3 340 | 948 | 1 010 | 694 |
| Median | 2 | Baseline | 1 120 | 14 700 | 852 | 165 | 241 | 256 |
| | | Phase 3 | 1 030 | 13 000 | 558 | 117 | 165 | 188 |
| Dry | 10 | Baseline | 0 | 8 280 | 133 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 7 030 | 69 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 4 510 | 0 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 3 480 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C174: Derived Representative Discharges at the Lake E1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.17 | 67 500 | 49 700 | 1 080 | 1 930 | 7 760 |
| | | Phase 3 | 1.14 | 63 200 | 46 700 | 852 | 1 580 | 9 300 |
| | 10 | Baseline | 0.69 | 47 000 | 38 500 | 321 | 779 | 1 930 |
| | | Phase 3 | 0.66 | 43 800 | 35 600 | 244 | 610 | 1 740 |
| Median | 2 | Baseline | 0.42 | 32 000 | 27 500 | 0 | 130 | 337 |
| | | Phase 3 | 0.40 | 29 700 | 25 000 | 0 | 84 | 216 |
| Dry | 10 | Baseline | 0.31 | 23 500 | 18 900 | 0 | 0 | 42 |
| | | Phase 3 | 0.29 | 21 800 | 17 000 | 0 | 0 | 21 |
| | 100 | Baseline | 0.27 | 19 400 | 13 300 | 0 | 0 | 0 |
| | | Phase 3 | 0.25 | 18 000 | 12 000 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C175: Monthly Mean Stages at the Lake E1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.096 | 0.185 | 0.099 | 0.036 | 0.036 | 0.024 |
| | | Phase 3 | 0.091 | 0.173 | 0.101 | 0.032 | 0.032 | 0.022 |
| | 10 | Baseline | 0.058 | 0.146 | 0.044 | 0.019 | 0.020 | 0.016 |
| | | Phase 3 | 0.055 | 0.136 | 0.039 | 0.017 | 0.018 | 0.014 |
| Median | 2 | Baseline | 0.019 | 0.105 | 0.016 | 0.005 | 0.007 | 0.007 |
| | | Phase 3 | 0.018 | 0.097 | 0.012 | 0.004 | 0.005 | 0.006 |
| Dry | 10 | Baseline | - | 0.072 | 0.005 | - | - | - |
| | | Phase 3 | - | 0.064 | 0.003 | - | - | - |
| | 100 | Baseline | - | 0.048 | - | - | - | - |
| | | Phase 3 | - | 0.040 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C176: Derived Representative Stages at the Lake E1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.380 | 0.290 | 0.237 | 0.018 | 0.027 | 0.069 |
| | | Phase 3 | 0.373 | 0.278 | 0.227 | 0.016 | 0.024 | 0.077 |
| | 10 | Baseline | 0.267 | 0.228 | 0.200 | 0.008 | 0.015 | 0.027 |
| | | Phase 3 | 0.259 | 0.217 | 0.189 | 0.007 | 0.013 | 0.025 |
| Median | 2 | Baseline | 0.192 | 0.176 | 0.159 | - | 0.004 | 0.008 |
| | | Phase 3 | 0.185 | 0.168 | 0.150 | - | 0.003 | 0.006 |
| Dry | 10 | Baseline | 0.157 | 0.144 | 0.124 | - | - | 0.002 |
| | | Phase 3 | 0.150 | 0.137 | 0.116 | - | - | 0.001 |
| | 100 | Baseline | 0.144 | 0.126 | 0.098 | - | - | - |
| | | Phase 3 | 0.137 | 0.120 | 0.092 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake CH6 to Lake CH1

**Table 7.3-C177: Monthly Mean Discharges at the Lake CH6 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 28 200 | 71 800 | 16 700 | 7 760 | 7 050 | 9 600 |
| | | Phase 3 | 19 100 | 53 700 | 14 000 | 5 010 | 4 680 | 2 500 |
| | 10 | Baseline | 12 900 | 52 200 | 7 260 | 3 810 | 4 340 | 2 780 |
| | | Phase 3 | 8 600 | 37 400 | 5 630 | 2 190 | 2 380 | 1 440 |
| Median | 2 | Baseline | 2 180 | 33 100 | 2 450 | 1 040 | 1 840 | 581 |
| | | Phase 3 | 1 380 | 23 200 | 1 750 | 440 | 743 | 514 |
| Dry | 10 | Baseline | 0 | 18 400 | 651 | 0 | 8 | 94 |
| | | Phase 3 | 0 | 13 400 | 444 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 8 930 | 55 | 0 | 0 | 0 |
| | | Phase 3 | 0 | 7 810 | 55 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C178: Derived Representative Discharges at the Lake CH6 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.08 | 158 000 | 109 000 | 3 330 | 5 300 | 6 970 |
| | | Phase 3 | 2.08 | 114 000 | 78 700 | 2 100 | 3 480 | 4 300 |
| | 10 | Baseline | 2.10 | 121 000 | 87 900 | 1 360 | 2 850 | 4 070 |
| | | Phase 3 | 1.38 | 84 900 | 62 700 | 749 | 1 630 | 2 780 |
| Median | 2 | Baseline | 1.34 | 86 500 | 65 400 | 1 | 958 | 1 830 |
| | | Phase 3 | 0.86 | 58 900 | 45 500 | 85 | 426 | 994 |
| Dry | 10 | Baseline | 0.90 | 61 700 | 45 800 | 0 | 0 | 486 |
| | | Phase 3 | 0.57 | 40 700 | 30 800 | 0 | 0 | 185 |
| | 100 | Baseline | 0.68 | 46 600 | 31 700 | 0 | 0 | 0 |
| | | Phase 3 | 0.43 | 30 000 | 20 300 | 0 | 0 | 41 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C179: Monthly Mean Stages at the Lake CH6 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.194 | 0.300 | 0.152 | 0.106 | 0.102 | 0.117 |
| | | Phase 3 | 0.162 | 0.262 | 0.140 | 0.087 | 0.084 | 0.063 |
| | 10 | Baseline | 0.135 | 0.259 | 0.103 | 0.076 | 0.081 | 0.066 |
| | | Phase 3 | 0.112 | 0.221 | 0.092 | 0.059 | 0.061 | 0.049 |
| Median | 2 | Baseline | 0.059 | 0.209 | 0.062 | 0.042 | 0.054 | 0.032 |
| | | Phase 3 | 0.048 | 0.177 | 0.053 | 0.028 | 0.036 | 0.030 |
| Dry | 10 | Baseline | - | 0.159 | 0.034 | - | 0.004 | 0.014 |
| | | Phase 3 | - | 0.137 | 0.028 | - | - | - |
| | 100 | Baseline | - | 0.114 | 0.011 | - | - | - |
| | | Phase 3 | - | 0.107 | 0.011 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C180: Derived Representative Stages at the Lake CH6 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.552 | 0.433 | 0.364 | 0.072 | 0.089 | 0.101 |
| | | Phase 3 | 0.460 | 0.372 | 0.313 | 0.058 | 0.073 | 0.081 |
| | 10 | Baseline | 0.462 | 0.382 | 0.330 | 0.047 | 0.067 | 0.079 |
| | | Phase 3 | 0.380 | 0.324 | 0.282 | 0.036 | 0.051 | 0.066 |
| Median | 2 | Baseline | 0.375 | 0.327 | 0.287 | 0.022 | 0.040 | 0.054 |
| | | Phase 3 | 0.305 | 0.273 | 0.242 | 0.013 | 0.028 | 0.041 |
| Dry | 10 | Baseline | 0.311 | 0.279 | 0.243 | - | - | 0.029 |
| | | Phase 3 | 0.252 | 0.230 | 0.202 | - | - | 0.019 |
| | 100 | Baseline | 0.273 | 0.245 | 0.205 | - | - | - |
| | | Phase 3 | 0.220 | 0.200 | 0.167 | - | - | 0.009 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C181: Monthly Mean Discharges at the Lake CH1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 40 100 | 148 000 | 59 200 | 13 700 | 12 500 | 7 010 |
| | | Phase 3 | 34 100 | 133 000 | 53 400 | 10 600 | 9 830 | 5 490 |
| | 10 | Baseline | 17 500 | 98 200 | 19 800 | 5 370 | 5 790 | 4 040 |
| | | Phase 3 | 14 800 | 84 400 | 17 200 | 4 000 | 4 020 | 2 900 |
| Median | 2 | Baseline | 2 550 | 61 000 | 4 920 | 731 | 1 420 | 1 410 |
| | | Phase 3 | 2 140 | 50 600 | 4 110 | 445 | 674 | 842 |
| Dry | 10 | Baseline | 0 | 35 200 | 538 | 0 | 0 | 0 |
| | | Phase 3 | 14 800 | 84 400 | 17 200 | 4 000 | 4 020 | 2 900 |
| | 100 | Baseline | 0 | 28 800 | 45 | 0 | 0 | 0 |
| | | Phase 3 | 34 100 | 133 000 | 53 400 | 10 600 | 9 830 | 5 490 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C182: Derived Representative Discharges at the Lake CH1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.74 | 305 000 | 213 000 | 5 170 | 9 390 | 26 600 |
| | | Phase 3 | 3.85 | 261 000 | 183 000 | 3 970 | 7 240 | 26 000 |
| | 10 | Baseline | 3.08 | 219 000 | 166 000 | 1 660 | 3 900 | 8 800 |
| | | Phase 3 | 2.48 | 183 000 | 141 000 | 1 200 | 2 770 | 7 370 |
| Median | 2 | Baseline | 1.95 | 148 000 | 118 000 | 65 | 740 | 2 110 |
| | | Phase 3 | 1.55 | 120 000 | 97 900 | 0 | 396 | 1 490 |
| Dry | 10 | Baseline | 1.37 | 103 000 | 80 100 | 0 | 0 | 344 |
| | | Phase 3 | 1.07 | 80 500 | 64 000 | 0 | 0 | 214 |
| | 100 | Baseline | 1.11 | 78 100 | 55 000 | 0 | 0 | 0 |
| | | Phase 3 | 0.86 | 59 600 | 41 500 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C183: Monthly Mean Stages at the Lake CH1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.133 | 0.318 | 0.173 | 0.065 | 0.061 | 0.042 |
| | | Phase 3 | 0.119 | 0.296 | 0.161 | 0.055 | 0.052 | 0.035 |
| | 10 | Baseline | 0.077 | 0.242 | 0.083 | 0.035 | 0.037 | 0.029 |
| | | Phase 3 | 0.068 | 0.219 | 0.076 | 0.029 | 0.029 | 0.023 |
| Median | 2 | Baseline | 0.021 | 0.176 | 0.033 | 0.009 | 0.014 | 0.014 |
| | | Phase 3 | 0.019 | 0.155 | 0.029 | 0.007 | 0.009 | 0.010 |
| Dry | 10 | Baseline | - | 0.122 | 0.008 | - | - | - |
| | | Phase 3 | 0.068 | 0.219 | 0.076 | 0.029 | 0.029 | 0.023 |
| | 100 | Baseline | - | 0.107 | 0.001 | - | - | - |
| | | Phase 3 | 0.119 | 0.296 | 0.161 | 0.055 | 0.052 | 0.035 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C184: Derived Representative Stages at the Lake CH1 Outlet – Mining Phase 3**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.626 | 0.515 | 0.405 | 0.034 | 0.051 | 0.101 |
| | | Phase 3 | 0.545 | 0.464 | 0.366 | 0.028 | 0.043 | 0.100 |
| | 10 | Baseline | 0.470 | 0.413 | 0.343 | 0.016 | 0.028 | 0.048 |
| | | Phase 3 | 0.407 | 0.366 | 0.308 | 0.013 | 0.022 | 0.043 |
| Median | 2 | Baseline | 0.347 | 0.318 | 0.273 | 0.002 | 0.009 | 0.019 |
| | | Phase 3 | 0.297 | 0.276 | 0.241 | - | 0.006 | 0.015 |
| Dry | 10 | Baseline | 0.274 | 0.250 | 0.211 | - | - | 0.006 |
| | | Phase 3 | 0.232 | 0.212 | 0.182 | - | - | 0.004 |
| | 100 | Baseline | 0.238 | 0.208 | 0.164 | - | - | - |
| | | Phase 3 | 0.200 | 0.173 | 0.136 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

# 6.0 EFFECT ANALYSIS RESULTS – CLOSURE

## 6.1 Effects of Dewatering (Refilling) Activities on Flows, Water Levels, and Channel/Bank Stability on Meliadine Lake

### Meliadine Lake

**Table 7.3-C185: Monthly Mean Discharges at the Meliadine Lake Outlets – Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 773 000 | 4 770 000 | 2 240 000 | 628 000 | 462 000 | 293 000 |
| | | Closure | 653 000 | 4 720 000 | 2 170 000 | 519 000 | 349 000 | 235 000 |
| | 10 | Baseline | 348 000 | 2 470 000 | 1 240 000 | 450 000 | 347 000 | 175 000 |
| | | Closure | 289 000 | 2 220 000 | 1 120 000 | 354 000 | 245 000 | 122 000 |
| Median | 2 | Baseline | 57 700 | 1 350 000 | 637 000 | 275 000 | 219 000 | 83 100 |
| | | Closure | 45 200 | 1 110 000 | 523 000 | 200 000 | 139 000 | 48 900 |
| Dry | 10 | Baseline | 0 | 957 000 | 364 000 | 137 000 | 104 000 | 28 100 |
| | | Closure | 0 | 747 000 | 273 000 | 84 800 | 52 700 | 13 600 |
| | 100 | Baseline | 0 | 834 000 | 257 000 | 47 800 | 19 300 | 43 |
| | | Closure | 0 | 644 000 | 181 000 | 13 500 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C186: Derived Representative Discharges at the Meliadine Lake Outlets – Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 99.5 | 7 230 000 | 6 180 000 | 428 000 | 496 000 | 864 000 |
| | | Closure | 95.3 | 7 320 000 | 6 230 000 | 333 000 | 393 000 | 790 000 |
| | 10 | Baseline | 56.7 | 4 270 000 | 3 710 000 | 323 000 | 382 000 | 610 000 |
| | | Closure | 50.8 | 3 910 000 | 3 390 000 | 233 000 | 287 000 | 513 000 |
| Median | 2 | Baseline | 30.8 | 2 390 000 | 2 130 000 | 204 000 | 250 000 | 377 000 |
| | | Closure | 26.1 | 1 980 000 | 1 760 000 | 132 000 | 172 000 | 286 000 |
| Dry | 10 | Baseline | 19.1 | 1 490 000 | 1 360 000 | 96 900 | 126 000 | 207 000 |
| | | Closure | 15.4 | 1 160 000 | 1 060 000 | 50 000 | 72 000 | 139 000 |
| | 100 | Baseline | 14.4 | 1 120 000 | 1 040 000 | 16 600 | 32 000 | 104 000 |
| | | Closure | 11.9 | 861 000 | 793 000 | 0 | 256 | 59 400 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C187: Monthly Mean Stages at the Meliadine Lake Outlets – Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.475 | 0.788 | 0.639 | 0.449 | 0.412 | 0.363 |
| | | Closure | 0.454 | 0.786 | 0.633 | 0.426 | 0.381 | 0.342 |
| | 10 | Baseline | 0.381 | 0.657 | 0.542 | 0.409 | 0.381 | 0.315 |
| | | Closure | 0.362 | 0.637 | 0.527 | 0.383 | 0.346 | 0.285 |
| Median | 2 | Baseline | 0.231 | 0.555 | 0.451 | 0.357 | 0.335 | 0.256 |
| | | Closure | 0.216 | 0.526 | 0.427 | 0.327 | 0.295 | 0.221 |
| Dry | 10 | Baseline | - | 0.505 | 0.386 | 0.294 | 0.272 | 0.189 |
| | | Closure | - | 0.471 | 0.356 | 0.257 | 0.226 | 0.155 |
| | 100 | Baseline | - | 0.486 | 0.350 | 0.219 | 0.171 | 0.031 |
| | | Closure | - | 0.452 | 0.318 | 0.154 | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C188: Derived Representative Stages at the Meliadine Lake Outlets – Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.928 | 0.885 | 0.847 | 0.403 | 0.420 | 0.490 |
| | | Closure | 0.917 | 0.888 | 0.849 | 0.376 | 0.394 | 0.478 |
| | 10 | Baseline | 0.794 | 0.764 | 0.735 | 0.373 | 0.391 | 0.445 |
| | | Closure | 0.770 | 0.746 | 0.717 | 0.341 | 0.361 | 0.424 |
| Median | 2 | Baseline | 0.670 | 0.651 | 0.630 | 0.328 | 0.348 | 0.390 |
| | | Closure | 0.640 | 0.617 | 0.598 | 0.291 | 0.313 | 0.361 |
| Dry | 10 | Baseline | 0.587 | 0.571 | 0.556 | 0.267 | 0.287 | 0.330 |
| | | Closure | 0.553 | 0.532 | 0.519 | 0.222 | 0.246 | 0.295 |
| | 100 | Baseline | 0.543 | 0.527 | 0.516 | 0.164 | 0.196 | 0.272 |
| | | Closure | 0.515 | 0.490 | 0.479 | - | 0.051 | 0.233 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

# 7.0 EFFECT ANALYSIS RESULTS – POST-CLOSURE

## 7.1 Effects of Project Infrastructure on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake A8 to Lake A1

**Table 7.3-C189: Monthly Mean Discharges at the Lake A8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3$/d) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 15 000 | 37 200 | 6 470 | 4 700 | 3 670 | 2 030 |
| | | PC | 6 520 | 23 000 | 6 070 | 1 960 | 1 890 | 1 020 |
| | 10 | Baseline | 7 030 | 25 100 | 3 080 | 1 460 | 1 560 | 933 |
| | | PC | 2 730 | 14 300 | 2 670 | 697 | 637 | 394 |
| Median | 2 | Baseline | 1 310 | 14 500 | 1 250 | 343 | 499 | 248 |
| | | PC | 364 | 7 410 | 1 040 | 192 | 159 | 82 |
| Dry | 10 | Baseline | 0 | 7 310 | 513 | 77 | 105 | 44 |
| | | PC | 0 | 3 150 | 464 | 49 | 30 | 11 |
| | 100 | Baseline | 0 | 3 150 | 255 | 19 | 0 | 11 |
| | | PC | 0 | 919 | 287 | 13 | 0 | 2 |

Note: $m^3$/d= cubic metres per day.

**Table 7.3-C190: Derived Representative Discharges at the Lake A8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3$/s) | 7-Day Mean Peak Q ($m^3$/d) | 14-Day Mean Peak Q ($m^3$/d) | 30-Day Low Flow Q ($m^3$/d) | 60-Day Low Flow Q ($m^3$/d) | 90-Day Low Flow Q ($m^3$/d) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 2.47 | 71 900 | 55 600 | 1 870 | 2 970 | 3 250 |
| | | PC | 0.70 | 42 700 | 33 000 | 1 210 | 1 490 | 2 350 |
| | 10 | Baseline | 1.35 | 54 500 | 42 700 | 741 | 1 220 | 1 710 |
| | | PC | 0.44 | 29 300 | 23 400 | 433 | 593 | 1 120 |
| Median | 2 | Baseline | 0.68 | 38 000 | 29 400 | 224 | 385 | 735 |
| | | PC | 0.23 | 16 600 | 13 600 | 116 | 181 | 453 |
| Dry | 10 | Baseline | 0.37 | 25 500 | 18 600 | 52 | 96 | 272 |
| | | PC | 0.10 | 7 000 | 5 710 | 24 | 45 | 180 |
| | 100 | Baseline | 0.25 | 17 600 | 11 300 | 1 | 8 | 81 |
| | | PC | 0.03 | 956 | 408 | 0 | 6 | 83 |

Note: Q= discharge; $m^3$/s= cubic metres per second; $m^3$/d= cubic metres per day.

**Table 7.3-C191: Monthly Mean Stages at the Lake A8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.553 | 0.604 | 0.510 | 0.494 | 0.483 | 0.456 |
| | | PC | 0.510 | 0.576 | 0.507 | 0.454 | 0.453 | 0.426 |
| | 10 | Baseline | 0.514 | 0.581 | 0.474 | 0.441 | 0.444 | 0.423 |
| | | PC | 0.469 | 0.550 | 0.468 | 0.411 | 0.407 | 0.389 |
| Median | 2 | Baseline | 0.437 | 0.551 | 0.435 | 0.384 | 0.398 | 0.372 |
| | | PC | 0.386 | 0.516 | 0.427 | 0.363 | 0.356 | 0.334 |
| Dry | 10 | Baseline | - | 0.516 | 0.399 | 0.332 | 0.342 | 0.315 |
| | | PC | - | 0.475 | 0.395 | 0.318 | 0.304 | 0.275 |
| | 100 | Baseline | - | 0.475 | 0.373 | 0.290 | - | 0.275 |
| | | PC | - | 0.422 | 0.377 | 0.279 | - | 0.237 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C192: Derived Representative Stages at the Lake A8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.715 | 0.643 | 0.627 | 0.452 | 0.473 | 0.477 |
| | | PC | 0.632 | 0.612 | 0.597 | 0.433 | 0.442 | 0.462 |
| | 10 | Baseline | 0.674 | 0.626 | 0.612 | 0.413 | 0.434 | 0.448 |
| | | PC | 0.604 | 0.590 | 0.577 | 0.392 | 0.405 | 0.430 |
| Median | 2 | Baseline | 0.630 | 0.605 | 0.590 | 0.368 | 0.388 | 0.413 |
| | | PC | 0.567 | 0.558 | 0.548 | 0.346 | 0.361 | 0.394 |
| Dry | 10 | Baseline | 0.595 | 0.582 | 0.564 | 0.320 | 0.339 | 0.375 |
| | | PC | 0.522 | 0.514 | 0.504 | 0.297 | 0.316 | 0.361 |
| | 100 | Baseline | 0.573 | 0.561 | 0.538 | 0.214 | 0.266 | 0.334 |
| | | PC | 0.460 | 0.424 | 0.390 | 0.162 | 0.258 | 0.334 |

Note: m= metre.

**Table 7.3-C193: Monthly Mean Discharges at the Lake A6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 24 100 | 65 300 | 13 400 | 7 770 | 6 080 | 3 240 |
| | | PC | 16 700 | 53 200 | 11 200 | 5 660 | 4 170 | 2 320 |
| | 10 | Baseline | 10 800 | 43 700 | 6 490 | 2 720 | 2 790 | 1 640 |
| | | PC | 7 440 | 32 900 | 5 560 | 2 290 | 2 210 | 1 190 |
| Median | 2 | Baseline | 1 740 | 26 000 | 2 710 | 728 | 964 | 472 |
| | | PC | 1 190 | 18 500 | 2 380 | 711 | 892 | 371 |
| Dry | 10 | Baseline | 0 | 14 800 | 1 170 | 168 | 209 | 84 |
| | | PC | 0 | 10 700 | 1 050 | 174 | 218 | 78 |
| | 100 | Baseline | 0 | 8 690 | 616 | 28 | 0 | 21 |
| | | PC | 0 | 6 980 | 572 | 12 | 0 | 22 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C194: Derived Representative Discharges at the Lake A6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.55 | 133 000 | 98 300 | 3 550 | 5 130 | 5 970 |
| | | PC | 1.66 | 95 500 | 74 500 | 2 610 | 3 650 | 4 610 |
| | 10 | Baseline | 1.94 | 98 700 | 74 700 | 1 500 | 2 310 | 3 330 |
| | | PC | 1.11 | 68 900 | 54 300 | 1 250 | 1 890 | 2 750 |
| Median | 2 | Baseline | 1.12 | 68 600 | 51 900 | 483 | 805 | 1 530 |
| | | PC | 0.68 | 45 700 | 35 800 | 458 | 764 | 1 360 |
| Dry | 10 | Baseline | 0.81 | 48 100 | 34 300 | 109 | 208 | 592 |
| | | PC | 0.43 | 29 700 | 22 400 | 113 | 215 | 559 |
| | 100 | Baseline | 0.78 | 36 200 | 23 100 | 0 | 1 | 170 |
| | | PC | 0.30 | 20 500 | 14 200 | 0 | 0 | 160 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C195: Monthly Mean Stages at the Lake A6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.482 | 0.351 | 0.315 | 0.300 | 0.264 |
| | | PC | 0.367 | 0.463 | 0.339 | 0.296 | 0.278 | 0.247 |
| | 10 | Baseline | 0.336 | 0.445 | 0.304 | 0.255 | 0.257 | 0.231 |
| | | PC | 0.312 | 0.420 | 0.295 | 0.247 | 0.245 | 0.216 |
| Median | 2 | Baseline | 0.234 | 0.401 | 0.255 | 0.196 | 0.208 | 0.180 |
| | | PC | 0.216 | 0.375 | 0.249 | 0.195 | 0.204 | 0.171 |
| Dry | 10 | Baseline | - | 0.358 | 0.216 | 0.146 | 0.153 | 0.128 |
| | | PC | - | 0.336 | 0.211 | 0.147 | 0.154 | 0.126 |
| | 100 | Baseline | - | 0.322 | 0.190 | 0.102 | - | 0.096 |
| | | PC | - | 0.308 | 0.187 | 0.086 | - | 0.098 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C196: Derived Representative Stages at the Lake A6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.657 | 0.556 | 0.523 | 0.269 | 0.290 | 0.299 |
| | | PC | 0.564 | 0.520 | 0.495 | 0.253 | 0.271 | 0.284 |
| | 10 | Baseline | 0.582 | 0.524 | 0.495 | 0.227 | 0.247 | 0.266 |
| | | PC | 0.521 | 0.487 | 0.465 | 0.219 | 0.237 | 0.256 |
| Median | 2 | Baseline | 0.522 | 0.487 | 0.461 | 0.181 | 0.200 | 0.228 |
| | | PC | 0.472 | 0.449 | 0.428 | 0.179 | 0.198 | 0.222 |
| Dry | 10 | Baseline | 0.489 | 0.454 | 0.424 | 0.134 | 0.153 | 0.188 |
| | | PC | 0.430 | 0.412 | 0.389 | 0.135 | 0.154 | 0.186 |
| | 100 | Baseline | 0.486 | 0.429 | 0.392 | - | 0.051 | 0.147 |
| | | PC | 0.400 | 0.382 | 0.355 | - | - | 0.145 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C197: Monthly Mean Discharges at the Lake A1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 34 600 | 92 000 | 18 800 | 10 200 | 7 550 | 5 150 |
| | | PC | 24 800 | 81 800 | 18 200 | 8 190 | 6 160 | 3 970 |
| | 10 | Baseline | 15 700 | 62 400 | 9 600 | 4 610 | 4 400 | 2 290 |
| | | PC | 11 000 | 50 900 | 9 400 | 3 890 | 3 660 | 1 950 |
| Median | 2 | Baseline | 2 610 | 37 500 | 4 330 | 1 700 | 2 040 | 767 |
| | | PC | 1 690 | 29 000 | 4 330 | 1 510 | 1 720 | 666 |
| Dry | 10 | Baseline | 0 | 21 100 | 2 060 | 579 | 683 | 238 |
| | | PC | 0 | 17 100 | 2 150 | 538 | 554 | 184 |
| | 100 | Baseline | 0 | 11 900 | 1 200 | 201 | 12 | 105 |
| | | PC | 0 | 11 600 | 1 330 | 188 | 0 | 71 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C198: Derived Representative Discharges at the Lake A1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.68 | 193 000 | 138 000 | 4 550 | 6 740 | 8 280 |
| | | PC | 2.77 | 154 000 | 115 000 | 4 070 | 5 720 | 7 370 |
| | 10 | Baseline | 2.83 | 143 000 | 106 000 | 2 590 | 3 830 | 5 190 |
| | | PC | 1.81 | 111 000 | 84 700 | 2 370 | 3 330 | 4 710 |
| Median | 2 | Baseline | 1.69 | 99 400 | 74 400 | 1 190 | 1 780 | 2 770 |
| | | PC | 1.10 | 73 500 | 56 300 | 1 110 | 1 580 | 2 560 |
| Dry | 10 | Baseline | 1.10 | 68 500 | 49 500 | 424 | 668 | 1 310 |
| | | PC | 0.70 | 48 100 | 35 400 | 389 | 591 | 1 200 |
| | 100 | Baseline | 0.97 | 50 200 | 33 200 | 67 | 155 | 553 |
| | | PC | 0.50 | 33 600 | 22 600 | 37 | 115 | 479 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C199: Monthly Mean Stages at the Lake A1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.607 | 0.726 | 0.543 | 0.486 | 0.460 | 0.429 |
| | | PC | 0.571 | 0.709 | 0.540 | 0.467 | 0.443 | 0.409 |
| | 10 | Baseline | 0.525 | 0.675 | 0.481 | 0.421 | 0.417 | 0.370 |
| | | PC | 0.493 | 0.651 | 0.479 | 0.408 | 0.403 | 0.360 |
| Median | 2 | Baseline | 0.379 | 0.616 | 0.416 | 0.351 | 0.363 | 0.304 |
| | | PC | 0.350 | 0.587 | 0.416 | 0.343 | 0.352 | 0.296 |
| Dry | 10 | Baseline | - | 0.554 | 0.363 | 0.288 | 0.297 | 0.245 |
| | | PC | - | 0.534 | 0.366 | 0.285 | 0.286 | 0.234 |
| | 100 | Baseline | - | 0.500 | 0.329 | 0.238 | 0.143 | 0.211 |
| | | PC | - | 0.497 | 0.335 | 0.235 | - | 0.197 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C200: Derived Representative Stages at the Lake A1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.949 | 0.892 | 0.801 | 0.420 | 0.451 | 0.468 |
| | | PC | 0.862 | 0.828 | 0.764 | 0.411 | 0.437 | 0.458 |
| | 10 | Baseline | 0.866 | 0.810 | 0.749 | 0.379 | 0.407 | 0.430 |
| | | PC | 0.798 | 0.757 | 0.714 | 0.373 | 0.396 | 0.422 |
| Median | 2 | Baseline | 0.788 | 0.738 | 0.697 | 0.329 | 0.354 | 0.383 |
| | | PC | 0.729 | 0.696 | 0.663 | 0.325 | 0.346 | 0.378 |
| Dry | 10 | Baseline | 0.729 | 0.687 | 0.647 | 0.272 | 0.296 | 0.335 |
| | | PC | 0.671 | 0.644 | 0.609 | 0.268 | 0.289 | 0.329 |
| | 100 | Baseline | 0.713 | 0.649 | 0.602 | 0.195 | 0.227 | 0.286 |
| | | PC | 0.631 | 0.603 | 0.561 | 0.175 | 0.215 | 0.279 |

Note: m= metre.

## Lake B5

**Table 7.3-C201: Monthly Mean Discharges at the Lake B5 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 15 700 | 48 000 | 12 200 | 6 610 | 4 770 | 2 210 |
| | | PC | 25 000 | 59 300 | 11 200 | 8 670 | 6 040 | 3 510 |
| | 10 | Baseline | 7 320 | 31 300 | 6 390 | 2 760 | 2 710 | 1 490 |
| | | PC | 11 900 | 41 700 | 5 590 | 3 020 | 3 170 | 1 770 |
| Median | 2 | Baseline | 1 350 | 18 600 | 2 870 | 882 | 1 170 | 548 |
| | | PC | 2 320 | 25 300 | 2 370 | 796 | 1 260 | 542 |
| Dry | 10 | Baseline | 0 | 11 100 | 1 280 | 214 | 273 | 99 |
| | | PC | 0 | 13 100 | 981 | 178 | 293 | 114 |
| | 100 | Baseline | 0 | 7 400 | 647 | 4 | 0 | 20 |
| | | PC | 0 | 5 560 | 459 | 24 | 0 | 33 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C202: Derived Representative Discharges at the Lake B5 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.82 | 88 900 | 68 100 | 3 100 | 4 200 | 4 950 |
| | | PC | 3.47 | 116 000 | 90 500 | 3 370 | 5 290 | 5 390 |
| | 10 | Baseline | 0.99 | 61 300 | 49 900 | 1 530 | 2 290 | 3 250 |
| | | PC | 1.76 | 87 400 | 69 800 | 1 500 | 2 460 | 3 210 |
| Median | 2 | Baseline | 0.60 | 41 000 | 34 000 | 577 | 969 | 1 740 |
| | | PC | 0.95 | 62 800 | 49 700 | 509 | 888 | 1 560 |
| Dry | 10 | Baseline | 0.44 | 29 500 | 23 200 | 142 | 265 | 692 |
| | | PC | 0.66 | 46 100 | 34 100 | 123 | 234 | 598 |
| | 100 | Baseline | 0.43 | 23 900 | 17 000 | 0 | 0 | 78 |
| | | PC | 0.58 | 36 500 | 24 100 | 0 | 0 | 115 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C203: Monthly Mean Stages at the Lake B5 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.395 | 0.472 | 0.380 | 0.344 | 0.327 | 0.289 |
| | | PC | 0.426 | 0.489 | 0.375 | 0.360 | 0.339 | 0.311 |
| | 10 | Baseline | 0.350 | 0.441 | 0.343 | 0.300 | 0.299 | 0.272 |
| | | PC | 0.378 | 0.462 | 0.335 | 0.304 | 0.306 | 0.279 |
| Median | 2 | Baseline | 0.267 | 0.406 | 0.302 | 0.250 | 0.261 | 0.232 |
| | | PC | 0.291 | 0.427 | 0.292 | 0.246 | 0.264 | 0.231 |
| Dry | 10 | Baseline | - | 0.374 | 0.265 | 0.199 | 0.207 | 0.176 |
| | | PC | - | 0.384 | 0.254 | 0.194 | 0.210 | 0.180 |
| | 100 | Baseline | - | 0.351 | 0.238 | 0.104 | - | 0.137 |
| | | PC | - | 0.335 | 0.225 | 0.140 | - | 0.148 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C204: Derived Representative Stages at the Lake B5 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.571 | 0.521 | 0.499 | 0.305 | 0.320 | 0.329 |
| | | PC | 0.633 | 0.544 | 0.523 | 0.309 | 0.332 | 0.333 |
| | 10 | Baseline | 0.518 | 0.491 | 0.475 | 0.273 | 0.291 | 0.308 |
| | | PC | 0.568 | 0.520 | 0.501 | 0.272 | 0.294 | 0.307 |
| Median | 2 | Baseline | 0.478 | 0.461 | 0.447 | 0.234 | 0.254 | 0.278 |
| | | PC | 0.514 | 0.493 | 0.475 | 0.229 | 0.250 | 0.274 |
| Dry | 10 | Baseline | 0.456 | 0.437 | 0.421 | 0.187 | 0.206 | 0.240 |
| | | PC | 0.486 | 0.469 | 0.447 | 0.183 | 0.202 | 0.235 |
| | 100 | Baseline | 0.453 | 0.423 | 0.400 | - | - | 0.170 |
| | | PC | 0.475 | 0.452 | 0.423 | - | - | 0.181 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake E3 to Lake E1

**Table 7.3-C205: Monthly Mean Discharges at the Lake E3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 670 | 19 000 | 7 270 | 1 600 | 1 560 | 857 |
| | | PC | 7 220 | 18 700 | 7 030 | 1 740 | 1 700 | 947 |
| | 10 | Baseline | 3 090 | 13 000 | 2 280 | 620 | 645 | 457 |
| | | PC | 3 390 | 13 300 | 2 120 | 715 | 766 | 518 |
| Median | 2 | Baseline | 557 | 7 930 | 521 | 79 | 111 | 134 |
| | | PC | 631 | 8 320 | 460 | 113 | 174 | 163 |
| Dry | 10 | Baseline | 0 | 4 600 | 90 | 0 | 0 | 0 |
| | | PC | 0 | 4 640 | 73 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 2 750 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 2 370 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C206: Derived Representative Discharges at the Lake E3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.52 | 35 300 | 26 900 | 602 | 1 070 | 4 920 |
| | | PC | 0.66 | 38 500 | 27 700 | 616 | 1 140 | 3 710 |
| | 10 | Baseline | 0.34 | 25 000 | 20 700 | 180 | 418 | 1 130 |
| | | PC | 0.39 | 26 700 | 21 600 | 188 | 481 | 1 060 |
| Median | 2 | Baseline | 0.22 | 17 000 | 14 700 | 0 | 64 | 179 |
| | | PC | 0.25 | 18 400 | 15 600 | 0 | 91 | 216 |
| Dry | 10 | Baseline | 0.15 | 12 200 | 9 950 | 0 | 0 | 21 |
| | | PC | 0.19 | 13 900 | 11 000 | 0 | 0 | 29 |
| | 100 | Baseline | 0.12 | 9 770 | 6 910 | 0 | 0 | 0 |
| | | PC | 0.16 | 11 900 | 7 920 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C207: Monthly Mean Stages at the Lake E3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.115 | 0.231 | 0.122 | 0.044 | 0.044 | 0.029 |
| | | PC | 0.121 | 0.229 | 0.119 | 0.047 | 0.046 | 0.031 |
| | 10 | Baseline | 0.069 | 0.179 | 0.056 | 0.024 | 0.024 | 0.019 |
| | | PC | 0.073 | 0.182 | 0.054 | 0.026 | 0.027 | 0.021 |
| Median | 2 | Baseline | 0.022 | 0.129 | 0.021 | 0.006 | 0.007 | 0.008 |
| | | PC | 0.024 | 0.133 | 0.019 | 0.008 | 0.010 | 0.010 |
| Dry | 10 | Baseline | - | 0.090 | 0.007 | - | - | - |
| | | PC | - | 0.090 | 0.006 | - | - | - |
| | 100 | Baseline | - | 0.064 | - | - | - | - |
| | | PC | - | 0.058 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C208: Derived Representative Stages at the Lake E3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.409 | 0.349 | 0.291 | 0.023 | 0.034 | 0.094 |
| | | PC | 0.481 | 0.370 | 0.297 | 0.023 | 0.035 | 0.078 |
| | 10 | Baseline | 0.310 | 0.277 | 0.245 | 0.010 | 0.018 | 0.035 |
| | | PC | 0.340 | 0.290 | 0.252 | 0.011 | 0.020 | 0.034 |
| Median | 2 | Baseline | 0.230 | 0.215 | 0.195 | - | 0.005 | 0.010 |
| | | PC | 0.248 | 0.226 | 0.203 | 0.000 | 0.007 | 0.012 |
| Dry | 10 | Baseline | 0.182 | 0.172 | 0.150 | - | - | 0.002 |
| | | PC | 0.206 | 0.188 | 0.161 | - | - | 0.003 |
| | 100 | Baseline | 0.158 | 0.148 | 0.118 | - | - | - |
| | | PC | 0.190 | 0.169 | 0.129 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C209: Monthly Mean Discharges at the Lake E1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 12 800 | 34 500 | 13 500 | 2 930 | 2 940 | 1 620 |
| | | PC | 13 400 | 34 600 | 13 800 | 3 090 | 3 100 | 1 750 |
| | 10 | Baseline | 6 010 | 24 000 | 4 000 | 1 170 | 1 250 | 860 |
| | | PC | 6 280 | 24 500 | 3 830 | 1 240 | 1 350 | 936 |
| Median | 2 | Baseline | 1 120 | 14 700 | 852 | 165 | 241 | 256 |
| | | PC | 1 170 | 15 200 | 755 | 172 | 271 | 283 |
| Dry | 10 | Baseline | 0 | 8 280 | 133 | 0 | 0 | 0 |
| | | PC | 0 | 8 400 | 108 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 4 510 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 4 230 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C210: Derived Representative Discharges at the Lake E1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.17 | 67 500 | 49 700 | 1 080 | 1 930 | 7 760 |
| | | PC | 1.24 | 72 900 | 52 200 | 1 090 | 2 020 | 9 600 |
| | 10 | Baseline | 0.69 | 47 000 | 38 500 | 321 | 779 | 1 930 |
| | | PC | 0.76 | 49 900 | 40 200 | 323 | 822 | 2 090 |
| Median | 2 | Baseline | 0.42 | 32 000 | 27 500 | 0 | 130 | 337 |
| | | PC | 0.48 | 34 100 | 28 800 | 0 | 136 | 310 |
| Dry | 10 | Baseline | 0.31 | 23 500 | 18 900 | 0 | 0 | 42 |
| | | PC | 0.36 | 25 900 | 20 200 | 0 | 0 | 35 |
| | 100 | Baseline | 0.27 | 19 400 | 13 300 | 0 | 0 | 0 |
| | | PC | 0.31 | 22 200 | 14 800 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C211: Monthly Mean Stages at the Lake E1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.096 | 0.185 | 0.099 | 0.036 | 0.036 | 0.024 |
| | | PC | 0.099 | 0.186 | 0.101 | 0.037 | 0.037 | 0.025 |
| | 10 | Baseline | 0.058 | 0.146 | 0.044 | 0.019 | 0.020 | 0.016 |
| | | PC | 0.060 | 0.148 | 0.043 | 0.020 | 0.021 | 0.017 |
| Median | 2 | Baseline | 0.019 | 0.105 | 0.016 | 0.005 | 0.007 | 0.007 |
| | | PC | 0.019 | 0.107 | 0.015 | 0.005 | 0.007 | 0.008 |
| Dry | 10 | Baseline | - | 0.072 | 0.005 | - | - | - |
| | | PC | - | 0.072 | 0.004 | - | - | - |
| | 100 | Baseline | - | 0.048 | - | - | - | - |
| | | PC | - | 0.046 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C212: Derived Representative Stages at the Lake E1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.380 | 0.290 | 0.237 | 0.018 | 0.027 | 0.069 |
| | | PC | 0.395 | 0.305 | 0.244 | 0.019 | 0.028 | 0.079 |
| | 10 | Baseline | 0.267 | 0.228 | 0.200 | 0.008 | 0.015 | 0.027 |
| | | PC | 0.284 | 0.237 | 0.205 | 0.008 | 0.015 | 0.029 |
| Median | 2 | Baseline | 0.192 | 0.176 | 0.159 | - | 0.004 | 0.008 |
| | | PC | 0.209 | 0.184 | 0.164 | - | 0.005 | 0.008 |
| Dry | 10 | Baseline | 0.157 | 0.144 | 0.124 | - | - | 0.002 |
| | | PC | 0.172 | 0.153 | 0.130 | - | - | 0.002 |
| | 100 | Baseline | 0.144 | 0.126 | 0.098 | - | - | - |
| | | PC | 0.157 | 0.138 | 0.105 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake J8, Lake J1

**Table 7.3-C213: Monthly Mean Discharges at the Lake J8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 875 | 942 | 184 | 213 | 246 | 58 |
| | | PC | 2 900 | 5 600 | 839 | 585 | 598 | 372 |
| | 10 | Baseline | 216 | 716 | 42 | 48 | 65 | 9 |
| | | PC | 1 430 | 4 280 | 373 | 270 | 324 | 192 |
| Median | 2 | Baseline | 37 | 423 | 7 | 8 | 13 | 1 |
| | | PC | 305 | 2 710 | 88 | 59 | 109 | 56 |
| Dry | 10 | Baseline | 0 | 112 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 1 190 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 0 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C214: Derived Representative Discharges at the Lake J8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.36 | 3 010 | 1 650 | 3 | 113 | 104 |
| | | PC | 0.29 | 13 100 | 9 380 | 192 | 337 | 431 |
| | 10 | Baseline | 0.17 | 2 140 | 1 310 | 0 | 26 | 51 |
| | | PC | 0.20 | 10 000 | 7 490 | 60 | 161 | 244 |
| Median | 2 | Baseline | 0.08 | 1 440 | 952 | 0 | 4 | 18 |
| | | PC | 0.13 | 7 480 | 5 580 | 0 | 37 | 92 |
| Dry | 10 | Baseline | 0.04 | 1 010 | 652 | 0 | 0 | 0 |
| | | PC | 0.09 | 5 790 | 4 040 | 0 | 0 | 0 |
| | 100 | Baseline | 0.02 | 772 | 442 | 0 | 0 | 0 |
| | | PC | 0.07 | 4 840 | 3 010 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C215: Monthly Mean Stages at the Lake J8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.041 | 0.043 | 0.015 | 0.016 | 0.018 | 0.007 |
| | | PC | 0.092 | 0.142 | 0.040 | 0.032 | 0.032 | 0.023 |
| | 10 | Baseline | 0.016 | 0.036 | 0.005 | 0.006 | 0.007 | 0.002 |
| | | PC | 0.057 | 0.119 | 0.023 | 0.019 | 0.021 | 0.015 |
| Median | 2 | Baseline | 0.005 | 0.025 | 0.002 | 0.002 | 0.002 | 0.000 |
| | | PC | 0.020 | 0.088 | 0.009 | 0.007 | 0.010 | 0.007 |
| Dry | 10 | Baseline | - | 0.010 | - | - | - | - |
| | | PC | - | 0.051 | - | - | - | - |
| | 100 | Baseline | - | - | - | - | - | - |
| | | PC | - | - | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C216: Derived Representative Stages at the Lake J8 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.446 | 0.094 | 0.063 | 0.001 | 0.011 | 0.010 |
| | | PC | 0.384 | 0.250 | 0.200 | 0.015 | 0.022 | 0.026 |
| | 10 | Baseline | 0.273 | 0.075 | 0.054 | 0.000 | 0.004 | 0.006 |
| | | PC | 0.297 | 0.209 | 0.172 | 0.007 | 0.013 | 0.018 |
| Median | 2 | Baseline | 0.157 | 0.057 | 0.044 | 0.000 | 0.001 | 0.003 |
| | | PC | 0.226 | 0.172 | 0.142 | - | 0.005 | 0.009 |
| Dry | 10 | Baseline | 0.097 | 0.045 | 0.034 | - | - | - |
| | | PC | 0.180 | 0.145 | 0.114 | - | - | - |
| | 100 | Baseline | 0.073 | 0.038 | 0.026 | - | - | - |
| | | PC | 0.156 | 0.129 | 0.094 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C217: Monthly Mean Discharges at the Lake J1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 620 | 13 000 | 2 010 | 1 470 | 1 490 | 751 |
| | | PC | 6 280 | 12 900 | 2 200 | 1 350 | 1 360 | 800 |
| | 10 | Baseline | 3 230 | 9 830 | 902 | 690 | 776 | 407 |
| | | PC | 3 040 | 9 760 | 954 | 619 | 727 | 431 |
| Median | 2 | Baseline | 673 | 6 190 | 211 | 146 | 237 | 126 |
| | | PC | 623 | 6 220 | 232 | 131 | 240 | 134 |
| Dry | 10 | Baseline | 0 | 2 740 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 2 920 | 0 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 81 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 397 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C218: Derived Representative Discharges at the Lake J1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.86 | 30 600 | 22 600 | 230 | 1 200 | 1 180 |
| | | PC | 0.62 | 29 400 | 20 900 | 458 | 812 | 999 |
| | 10 | Baseline | 0.56 | 24 000 | 17 700 | 29 | 317 | 568 |
| | | PC | 0.39 | 22 100 | 16 800 | 145 | 383 | 574 |
| Median | 2 | Baseline | 0.37 | 17 800 | 12 800 | 3 | 60 | 201 |
| | | PC | 0.25 | 16 300 | 12 500 | 3 | 88 | 221 |
| Dry | 10 | Baseline | 0.27 | 13 600 | 8 980 | 0 | 0 | 0 |
| | | PC | 0.18 | 12 600 | 9 080 | 0 | 0 | 0 |
| | 100 | Baseline | 0.24 | 11 600 | 6 730 | 0 | 0 | 0 |
| | | PC | 0.16 | 10 700 | 6 760 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C219: Monthly Mean Stages at the Lake J1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.129 | 0.203 | 0.058 | 0.047 | 0.048 | 0.030 |
| | | PC | 0.125 | 0.202 | 0.062 | 0.045 | 0.045 | 0.032 |
| | 10 | Baseline | 0.080 | 0.168 | 0.034 | 0.029 | 0.031 | 0.020 |
| | | PC | 0.077 | 0.167 | 0.036 | 0.027 | 0.030 | 0.021 |
| Median | 2 | Baseline | 0.028 | 0.124 | 0.013 | 0.010 | 0.014 | 0.009 |
| | | PC | 0.027 | 0.124 | 0.014 | 0.009 | 0.014 | 0.010 |
| Dry | 10 | Baseline | - | 0.072 | - | - | - | - |
| | | PC | - | 0.075 | - | - | - | - |
| | 100 | Baseline | - | 0.007 | - | - | - | - |
| | | PC | - | 0.020 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C220: Derived Representative Stages at the Lake J1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.648 | 0.358 | 0.293 | 0.014 | 0.041 | 0.041 |
| | | PC | 0.522 | 0.349 | 0.278 | 0.022 | 0.032 | 0.037 |
| | 10 | Baseline | 0.484 | 0.305 | 0.249 | 0.003 | 0.017 | 0.025 |
| | | PC | 0.384 | 0.289 | 0.240 | 0.010 | 0.019 | 0.025 |
| Median | 2 | Baseline | 0.368 | 0.250 | 0.201 | 0.001 | 0.006 | 0.013 |
| | | PC | 0.285 | 0.236 | 0.197 | 0.001 | 0.007 | 0.013 |
| Dry | 10 | Baseline | 0.298 | 0.209 | 0.158 | - | - | - |
| | | PC | 0.232 | 0.198 | 0.159 | - | - | - |
| | 100 | Baseline | 0.275 | 0.188 | 0.131 | - | - | - |
| | | PC | 0.208 | 0.178 | 0.131 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake H1

**Table 7.3-C221: Monthly Mean Discharges at the Lake H1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 3 960 | 9 880 | 2 160 | 694 | 878 | 445 |
| | | PC | 3 650 | 7 750 | 1 740 | 498 | 583 | 224 |
| | 10 | Baseline | 1 990 | 6 750 | 788 | 353 | 378 | 203 |
| | | PC | 1 990 | 5 590 | 505 | 283 | 293 | 133 |
| Median | 2 | Baseline | 513 | 3 980 | 215 | 110 | 121 | 58 |
| | | PC | 611 | 3 360 | 103 | 109 | 113 | 37 |
| Dry | 10 | Baseline | 0 | 2 060 | 45 | 0 | 24 | 13 |
| | | PC | 0 | 1 520 | 13 | 0 | 30 | 4 |
| | 100 | Baseline | 0 | 927 | 0 | 0 | 0 | 4 |
| | | PC | 0 | 269 | 0 | 0 | 0 | 1 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C222: Derived Representative Discharges at the Lake H1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.34 | 18 200 | 14 000 | 302 | 475 | 750 |
| | | PC | 0.24 | 13 700 | 10 700 | 189 | 306 | 441 |
| | 10 | Baseline | 0.22 | 13 300 | 10 700 | 113 | 246 | 393 |
| | | PC | 0.17 | 10 700 | 8 700 | 72 | 173 | 257 |
| Median | 2 | Baseline | 0.14 | 9 280 | 7 560 | 19 | 85 | 160 |
| | | PC | 0.12 | 7 950 | 6 490 | 13 | 69 | 121 |
| Dry | 10 | Baseline | 0.10 | 6 630 | 5 080 | 0 | 0 | 46 |
| | | PC | 0.09 | 5 900 | 4 510 | 0 | 6 | 44 |
| | 100 | Baseline | 0.08 | 5 170 | 3 480 | 0 | 0 | 0 |
| | | PC | 0.07 | 4 620 | 3 050 | 0 | 0 | 6 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C223: Monthly Mean Stages at the Lake H1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.203 | 0.374 | 0.136 | 0.064 | 0.074 | 0.047 |
| | | PC | 0.193 | 0.318 | 0.118 | 0.051 | 0.057 | 0.030 |
| | 10 | Baseline | 0.129 | 0.290 | 0.069 | 0.041 | 0.042 | 0.028 |
| | | PC | 0.129 | 0.256 | 0.052 | 0.035 | 0.036 | 0.021 |
| Median | 2 | Baseline | 0.052 | 0.204 | 0.029 | 0.019 | 0.020 | 0.012 |
| | | PC | 0.058 | 0.182 | 0.018 | 0.019 | 0.019 | 0.009 |
| Dry | 10 | Baseline | - | 0.131 | 0.010 | - | 0.007 | 0.004 |
| | | PC | - | 0.107 | 0.005 | 0.001 | 0.008 | 0.002 |
| | 100 | Baseline | - | 0.077 | - | - | - | 0.002 |
| | | PC | - | 0.034 | - | - | - | 0.001 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C224: Derived Representative Stages at the Lake H1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.778 | 0.562 | 0.472 | 0.037 | 0.049 | 0.067 |
| | | PC | 0.606 | 0.465 | 0.394 | 0.027 | 0.037 | 0.047 |
| | 10 | Baseline | 0.575 | 0.456 | 0.394 | 0.019 | 0.032 | 0.044 |
| | | PC | 0.481 | 0.394 | 0.344 | 0.014 | 0.025 | 0.033 |
| Median | 2 | Baseline | 0.424 | 0.359 | 0.313 | 0.006 | 0.016 | 0.024 |
| | | PC | 0.378 | 0.324 | 0.283 | 0.004 | 0.014 | 0.020 |
| Dry | 10 | Baseline | 0.341 | 0.287 | 0.240 | - | - | 0.010 |
| | | PC | 0.311 | 0.265 | 0.222 | - | 0.003 | 0.010 |
| | 100 | Baseline | 0.302 | 0.243 | 0.187 | - | - | - |
| | | PC | 0.276 | 0.225 | 0.171 | - | - | 0.003 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake CH6 to Lake CH1

**Table 7.3-C225: Monthly Mean Discharges at the Lake CH6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 28 200 | 71 800 | 16 700 | 7 760 | 7 050 | 9 600 |
| | | PC | 24 700 | 72 000 | 19 400 | 7 230 | 6 550 | 3 430 |
| | 10 | Baseline | 12 900 | 52 200 | 7 260 | 3 810 | 4 340 | 2 780 |
| | | PC | 11 100 | 50 200 | 8 650 | 3 360 | 3 640 | 2 050 |
| Median | 2 | Baseline | 2 180 | 33 100 | 2 450 | 1 040 | 1 840 | 581 |
| | | PC | 1 810 | 31 500 | 3 050 | 822 | 1 340 | 783 |
| Dry | 10 | Baseline | 0 | 18 400 | 651 | 0 | 8 | 94 |
| | | PC | 0 | 18 900 | 901 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 8 930 | 55 | 0 | 0 | 0 |
| | | PC | 0 | 11 700 | 172 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C226: Derived Representative Discharges at the Lake CH6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.08 | 158 000 | 109 000 | 3 330 | 5 300 | 6 970 |
| | | PC | 2.51 | 146 000 | 104 000 | 3 190 | 5 080 | 7 610 |
| | 10 | Baseline | 2.10 | 121 000 | 87 900 | 1 360 | 2 850 | 4 070 |
| | | PC | 1.68 | 110 000 | 82 900 | 1 290 | 2 610 | 4 140 |
| Median | 2 | Baseline | 1.34 | 86 500 | 65 400 | 1 | 958 | 1 830 |
| | | PC | 1.06 | 76 800 | 60 300 | 242 | 826 | 1 730 |
| Dry | 10 | Baseline | 0.90 | 61 700 | 45 800 | 0 | 0 | 486 |
| | | PC | 0.72 | 53 300 | 41 200 | 0 | 0 | 448 |
| | 100 | Baseline | 0.68 | 46 600 | 31 700 | 0 | 0 | 0 |
| | | PC | 0.55 | 39 100 | 27 800 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C227: Monthly Mean Stages at the Lake CH6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.194 | 0.300 | 0.152 | 0.106 | 0.102 | 0.117 |
| | | PC | 0.182 | 0.300 | 0.163 | 0.103 | 0.098 | 0.073 |
| | 10 | Baseline | 0.135 | 0.259 | 0.103 | 0.076 | 0.081 | 0.066 |
| | | PC | 0.126 | 0.254 | 0.112 | 0.072 | 0.075 | 0.057 |
| Median | 2 | Baseline | 0.059 | 0.209 | 0.062 | 0.042 | 0.054 | 0.032 |
| | | PC | 0.054 | 0.204 | 0.069 | 0.037 | 0.047 | 0.037 |
| Dry | 10 | Baseline | - | 0.159 | 0.034 | - | 0.004 | 0.014 |
| | | PC | - | 0.161 | 0.039 | - | - | - |
| | 100 | Baseline | - | 0.114 | 0.011 | - | - | - |
| | | PC | - | 0.129 | 0.018 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C228: Derived Representative Stages at the Lake CH6 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.552 | 0.433 | 0.364 | 0.072 | 0.089 | 0.101 |
| | | PC | 0.502 | 0.417 | 0.356 | 0.070 | 0.087 | 0.105 |
| | 10 | Baseline | 0.462 | 0.382 | 0.330 | 0.047 | 0.067 | 0.079 |
| | | PC | 0.416 | 0.366 | 0.321 | 0.046 | 0.064 | 0.079 |
| Median | 2 | Baseline | 0.375 | 0.327 | 0.287 | 0.022 | 0.040 | 0.054 |
| | | PC | 0.336 | 0.309 | 0.276 | 0.021 | 0.037 | 0.053 |
| Dry | 10 | Baseline | 0.311 | 0.279 | 0.243 | - | - | 0.029 |
| | | PC | 0.280 | 0.261 | 0.232 | - | - | 0.028 |
| | 100 | Baseline | 0.273 | 0.245 | 0.205 | - | - | - |
| | | PC | 0.248 | 0.226 | 0.193 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C229: Monthly Mean Discharges at the Lake CH1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 40 100 | 148 000 | 59 200 | 13 700 | 12 500 | 7 010 |
| | | PC | 37 800 | 149 000 | 59 000 | 13 000 | 12 000 | 6 490 |
| | 10 | Baseline | 17 500 | 98 200 | 19 800 | 5 370 | 5 790 | 4 040 |
| | | PC | 16 600 | 95 800 | 21 500 | 5 210 | 5 410 | 3 690 |
| Median | 2 | Baseline | 2 550 | 61 000 | 4 920 | 731 | 1 420 | 1 410 |
| | | PC | 2 460 | 58 400 | 5 940 | 774 | 1 260 | 1 240 |
| Dry | 10 | Baseline | 0 | 35 200 | 538 | 0 | 0 | 0 |
| | | PC | 0 | 38 400 | 1 370 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 28 800 | 45 | 0 | 0 | 0 |
| | | PC | 0 | 29 200 | 161 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C230: Derived Representative Discharges at the Lake CH1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 4.74 | 305 000 | 213 000 | 5 170 | 9 390 | 26 600 |
| | | PC | 4.07 | 285 000 | 208 000 | 5 140 | 9 050 | 23 400 |
| | 10 | Baseline | 3.08 | 219 000 | 166 000 | 1 660 | 3 900 | 8 800 |
| | | PC | 2.66 | 201 000 | 158 000 | 1 680 | 3 800 | 8 740 |
| Median | 2 | Baseline | 1.95 | 148 000 | 118 000 | 65 | 740 | 2 110 |
| | | PC | 1.69 | 133 000 | 110 000 | 88 | 756 | 2 400 |
| Dry | 10 | Baseline | 1.37 | 103 000 | 80 100 | 0 | 0 | 344 |
| | | PC | 1.19 | 90 600 | 73 400 | 0 | 0 | 428 |
| | 100 | Baseline | 1.11 | 78 100 | 55 000 | 0 | 0 | 0 |
| | | PC | 0.96 | 67 700 | 50 000 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C231: Monthly Mean Stages at the Lake CH1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.133 | 0.318 | 0.173 | 0.065 | 0.061 | 0.042 |
| | | PC | 0.128 | 0.319 | 0.172 | 0.063 | 0.060 | 0.040 |
| | 10 | Baseline | 0.077 | 0.242 | 0.083 | 0.035 | 0.037 | 0.029 |
| | | PC | 0.074 | 0.238 | 0.088 | 0.034 | 0.035 | 0.027 |
| Median | 2 | Baseline | 0.021 | 0.176 | 0.033 | 0.009 | 0.014 | 0.014 |
| | | PC | 0.021 | 0.171 | 0.037 | 0.010 | 0.013 | 0.013 |
| Dry | 10 | Baseline | - | 0.122 | 0.008 | - | - | - |
| | | PC | - | 0.129 | 0.014 | - | - | - |
| | 100 | Baseline | - | 0.107 | 0.001 | - | - | - |
| | | PC | - | 0.108 | 0.003 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C232: Derived Representative Stages at the Lake CH1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.626 | 0.515 | 0.405 | 0.034 | 0.051 | 0.101 |
| | | PC | 0.566 | 0.492 | 0.399 | 0.034 | 0.049 | 0.093 |
| | 10 | Baseline | 0.470 | 0.413 | 0.343 | 0.016 | 0.028 | 0.048 |
| | | PC | 0.426 | 0.390 | 0.332 | 0.016 | 0.028 | 0.048 |
| Median | 2 | Baseline | 0.347 | 0.318 | 0.273 | 0.002 | 0.009 | 0.019 |
| | | PC | 0.315 | 0.296 | 0.261 | 0.002 | 0.009 | 0.020 |
| Dry | 10 | Baseline | 0.274 | 0.250 | 0.211 | - | - | 0.006 |
| | | PC | 0.249 | 0.229 | 0.199 | - | - | 0.006 |
| | 100 | Baseline | 0.238 | 0.208 | 0.164 | - | - | - |
| | | PC | 0.216 | 0.189 | 0.154 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## 7.2 Effects of Watershed Diversions on Flows, Water Levels, and Channel/Bank Stability in Downstream Waterbodies and Streams

### Lake B46 to Lake B2

**Table 7.3-C233: Monthly Mean Discharges at the Lake B46 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 45 400 | 105 000 | 36 300 | 12 100 | 11 100 | 6 130 |
| | | PC | 44 500 | 114 000 | 41 800 | 12 500 | 11 500 | 6 450 |
| | 10 | Baseline | 21 500 | 78 200 | 10 700 | 5 560 | 6 450 | 3 560 |
| | | PC | 20 900 | 83 000 | 13 500 | 5 390 | 6 160 | 3 760 |
| Median | 2 | Baseline | 4 100 | 50 000 | 2 250 | 1 210 | 2 440 | 1 290 |
| | | PC | 3 850 | 53 000 | 3 170 | 987 | 2 050 | 1 340 |
| Dry | 10 | Baseline | 0 | 26 500 | 338 | 0 | 0 | 0 |
| | | PC | 0 | 30 200 | 552 | 0 | 0 | 0 |
| | 100 | Baseline | 0 | 10 200 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 15 800 | 0 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C234: Derived Representative Discharges at the Lake B46 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.63 | 219 000 | 163 000 | 4 290 | 7 720 | 12 100 |
| | | PC | 3.21 | 218 000 | 169 000 | 4 490 | 8 180 | 15 900 |
| | 10 | Baseline | 2.44 | 165 000 | 130 000 | 1 470 | 3 740 | 5 820 |
| | | PC | 2.20 | 163 000 | 134 000 | 1 510 | 3 760 | 6 610 |
| Median | 2 | Baseline | 1.65 | 122 000 | 97 000 | 101 | 965 | 2 070 |
| | | PC | 1.50 | 119 000 | 99 100 | 91 | 890 | 2 010 |
| Dry | 10 | Baseline | 1.24 | 94 400 | 71 100 | 0 | 0 | 389 |
| | | PC | 1.14 | 90 600 | 72 300 | 0 | 0 | 348 |
| | 100 | Baseline | 1.07 | 79 800 | 54 100 | 0 | 0 | 0 |
| | | PC | 0.98 | 75 700 | 54 800 | 0 | 0 | 0 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C235: Monthly Mean Stages at the Lake B46 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.173 | 0.303 | 0.149 | 0.072 | 0.068 | 0.046 |
| | | PC | 0.171 | 0.320 | 0.164 | 0.073 | 0.069 | 0.047 |
| | 10 | Baseline | 0.105 | 0.249 | 0.066 | 0.043 | 0.047 | 0.032 |
| | | PC | 0.103 | 0.259 | 0.077 | 0.042 | 0.046 | 0.033 |
| Median | 2 | Baseline | 0.035 | 0.185 | 0.023 | 0.015 | 0.025 | 0.016 |
| | | PC | 0.033 | 0.192 | 0.029 | 0.013 | 0.022 | 0.017 |
| Dry | 10 | Baseline | - | 0.121 | 0.007 | - | - | - |
| | | PC | - | 0.132 | 0.009 | - | - | - |
| | 100 | Baseline | - | 0.064 | - | - | - | - |
| | | PC | - | 0.086 | - | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C236: Derived Representative Stages at the Lake B46 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.628 | 0.494 | 0.406 | 0.036 | 0.053 | 0.072 |
| | | PC | 0.578 | 0.493 | 0.416 | 0.037 | 0.055 | 0.086 |
| | 10 | Baseline | 0.482 | 0.409 | 0.349 | 0.018 | 0.033 | 0.044 |
| | | PC | 0.450 | 0.406 | 0.356 | 0.018 | 0.033 | 0.048 |
| Median | 2 | Baseline | 0.371 | 0.334 | 0.287 | 0.003 | 0.013 | 0.022 |
| | | PC | 0.348 | 0.329 | 0.291 | 0.003 | 0.013 | 0.022 |
| Dry | 10 | Baseline | 0.307 | 0.282 | 0.233 | - | - | 0.007 |
| | | PC | 0.290 | 0.274 | 0.236 | - | - | 0.007 |
| | 100 | Baseline | 0.278 | 0.252 | 0.194 | - | - | - |
| | | PC | 0.261 | 0.243 | 0.196 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C237: Monthly Mean Discharges at the Lake B4 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 70 500 | 197 000 | 52 300 | 28 200 | 26 800 | 15 700 |
| | | PC | 45 600 | 124 000 | 40 300 | 26 400 | 14 900 | 15 300 |
| | 10 | Baseline | 32 500 | 135 000 | 23 800 | 8 800 | 10 400 | 6 500 |
| | | PC | 21 000 | 87 800 | 15 500 | 4 500 | 6 660 | 4 910 |
| Median | 2 | Baseline | 5 590 | 82 700 | 9 250 | 2 150 | 3 020 | 1 520 |
| | | PC | 3 640 | 55 500 | 4 820 | 536 | 1 100 | 625 |
| Dry | 10 | Baseline | 0 | 48 200 | 3 800 | 576 | 602 | 234 |
| | | PC | 0 | 32 800 | 1 490 | 86 | 64 | 37 |
| | 100 | Baseline | 0 | 29 000 | 2 000 | 236 | 0 | 54 |
| | | PC | 0 | 19 500 | 562 | 38 | 5 | 4 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C238: Derived Representative Discharges at the Lake B4 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 7.25 | 374 000 | 292 000 | 11 500 | 20 100 | 21 900 |
| | | PC | 3.27 | 234 000 | 185 000 | 8 100 | 14 000 | 12 900 |
| | 10 | Baseline | 4.15 | 277 000 | 223 000 | 4 640 | 7 920 | 11 800 |
| | | PC | 2.32 | 175 000 | 144 000 | 1 800 | 4 080 | 7 090 |
| Median | 2 | Baseline | 2.62 | 197 000 | 158 000 | 1 450 | 2 430 | 5 170 |
| | | PC | 1.61 | 126 000 | 104 000 | 280 | 708 | 2 470 |
| Dry | 10 | Baseline | 2.04 | 146 000 | 110 000 | 365 | 646 | 1 890 |
| | | PC | 1.21 | 95 400 | 75 000 | 40 | 99 | 598 |
| | 100 | Baseline | 1.99 | 118 000 | 80 500 | 42 | 128 | 492 |
| | | PC | 1.01 | 78 800 | 56 600 | 5 | 24 | 190 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C239: Monthly Mean Stages at the Lake B4 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.560 | 0.661 | 0.534 | 0.483 | 0.479 | 0.439 |
| | | PC | 1.402 | 1.493 | 1.392 | 1.358 | 1.316 | 1.317 |
| | 10 | Baseline | 0.494 | 0.622 | 0.470 | 0.400 | 0.411 | 0.381 |
| | | PC | 1.340 | 1.460 | 1.318 | 1.239 | 1.262 | 1.244 |
| Median | 2 | Baseline | 0.372 | 0.575 | 0.403 | 0.319 | 0.337 | 0.301 |
| | | PC | 1.227 | 1.419 | 1.243 | 1.135 | 1.166 | 1.141 |
| Dry | 10 | Baseline | - | 0.527 | 0.349 | 0.257 | 0.259 | 0.223 |
| | | PC | - | 1.375 | 1.180 | 1.069 | 1.060 | 1.045 |
| | 100 | Baseline | - | 0.485 | 0.315 | 0.223 | - | 0.176 |
| | | PC | - | 1.335 | 1.136 | 1.046 | 1.000 | 0.994 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C240: Derived Representative Stages at the Lake B4 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.797 | 0.733 | 0.704 | 0.418 | 0.457 | 0.464 |
| | | PC | 1.581 | 1.560 | 1.534 | 1.275 | 1.311 | 1.306 |
| | 10 | Baseline | 0.728 | 0.698 | 0.674 | 0.361 | 0.393 | 0.419 |
| | | PC | 1.543 | 1.528 | 1.508 | 1.190 | 1.233 | 1.266 |
| Median | 2 | Baseline | 0.676 | 0.661 | 0.638 | 0.299 | 0.325 | 0.367 |
| | | PC | 1.505 | 1.495 | 1.476 | 1.109 | 1.146 | 1.206 |
| Dry | 10 | Baseline | 0.649 | 0.630 | 0.602 | 0.239 | 0.262 | 0.312 |
| | | PC | 1.477 | 1.468 | 1.446 | 1.047 | 1.074 | 1.139 |
| | 100 | Baseline | 0.647 | 0.608 | 0.572 | 0.168 | 0.202 | 0.251 |
| | | PC | 1.460 | 1.450 | 1.420 | 0.999 | 1.034 | 1.095 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C241: Monthly Mean Discharges at the Lake P2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 2 310 | 4 420 | 650 | 431 | 453 | 293 |
| | | PC | 42 500 | 130 000 | 47 100 | 23 700 | 35 000 | 12 700 |
| | 10 | Baseline | 1 140 | 3 360 | 280 | 187 | 224 | 148 |
| | | PC | 19 300 | 90 300 | 18 900 | 4 910 | 7 400 | 4 340 |
| Median | 2 | Baseline | 242 | 2 110 | 60 | 35 | 63 | 40 |
| | | PC | 3 180 | 57 400 | 6 110 | 692 | 1 070 | 768 |
| Dry | 10 | Baseline | 0 | 909 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 36 100 | 1 940 | 77 | 126 | 87 |
| | 100 | Baseline | 0 | 0 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 24 400 | 723 | 0 | 0 | 16 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C242: Derived Representative Discharges at the Lake P2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.26 | 10 700 | 7 590 | 140 | 251 | 331 |
| | | PC | 3.23 | 233 000 | 190 000 | 5 550 | 17 200 | 18 800 |
| | 10 | Baseline | 0.17 | 8 140 | 5 980 | 42 | 114 | 178 |
| | | PC | 2.33 | 177 000 | 148 000 | 2 310 | 4 570 | 8 210 |
| Median | 2 | Baseline | 0.11 | 6 020 | 4 400 | 1 | 22 | 60 |
| | | PC | 1.64 | 129 000 | 107 000 | 525 | 866 | 2 820 |
| Dry | 10 | Baseline | 0.08 | 4 630 | 3 180 | 0 | 0 | 0 |
| | | PC | 1.22 | 95 900 | 76 000 | 0 | 131 | 808 |
| | 100 | Baseline | 0.07 | 3 870 | 2 380 | 0 | 0 | 0 |
| | | PC | 1.01 | 76 800 | 56 200 | 0 | 0 | 148 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C243: Monthly Mean Stages at the Lake P2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.034 | 0.044 | 0.021 | 0.017 | 0.018 | 0.015 |
| | | PC | 0.109 | 0.171 | 0.114 | 0.086 | 0.101 | 0.067 |
| | 10 | Baseline | 0.026 | 0.040 | 0.015 | 0.012 | 0.013 | 0.011 |
| | | PC | 0.080 | 0.148 | 0.079 | 0.046 | 0.054 | 0.044 |
| Median | 2 | Baseline | 0.014 | 0.033 | 0.008 | 0.006 | 0.008 | 0.007 |
| | | PC | 0.039 | 0.123 | 0.050 | 0.021 | 0.025 | 0.022 |
| Dry | 10 | Baseline | - | 0.023 | - | - | - | - |
| | | PC | - | 0.102 | 0.032 | 0.009 | 0.011 | 0.009 |
| | 100 | Baseline | - | - | - | - | - | - |
| | | PC | - | 0.087 | 0.021 | - | - | 0.005 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C244: Derived Representative Stages at the Lake P2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.085 | 0.063 | 0.055 | 0.011 | 0.014 | 0.016 |
| | | PC | 0.232 | 0.216 | 0.199 | 0.048 | 0.076 | 0.079 |
| | 10 | Baseline | 0.072 | 0.056 | 0.050 | 0.007 | 0.010 | 0.012 |
| | | PC | 0.203 | 0.193 | 0.180 | 0.034 | 0.045 | 0.057 |
| Median | 2 | Baseline | 0.060 | 0.050 | 0.044 | - | 0.005 | 0.008 |
| | | PC | 0.177 | 0.170 | 0.158 | 0.019 | 0.023 | 0.037 |
| Dry | 10 | Baseline | 0.053 | 0.045 | 0.039 | - | - | - |
| | | PC | 0.157 | 0.151 | 0.138 | - | 0.011 | 0.022 |
| | 100 | Baseline | 0.049 | 0.042 | 0.034 | - | - | - |
| | | PC | 0.146 | 0.138 | 0.122 | - | - | 0.011 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C245: Monthly Mean Discharges at the Lake B2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 73 800 | 213 000 | 59 200 | 26 600 | 25 500 | 16 100 |
| | | PC | 57 500 | 166 000 | 53 500 | 20 400 | 16 900 | 13 300 |
| | 10 | Baseline | 33 400 | 146 000 | 27 600 | 9 490 | 10 500 | 6 610 |
| | | PC | 26 100 | 116 000 | 24 100 | 7 630 | 7 820 | 4 660 |
| Median | 2 | Baseline | 5 230 | 90 100 | 11 200 | 2 720 | 3 260 | 1 660 |
| | | PC | 4 240 | 73 900 | 9 190 | 2 240 | 2 790 | 1 190 |
| Dry | 10 | Baseline | 0 | 54 000 | 4 850 | 812 | 750 | 310 |
| | | PC | 0 | 45 700 | 3 640 | 615 | 719 | 291 |
| | 100 | Baseline | 0 | 34 200 | 2 710 | 332 | 0 | 87 |
| | | PC | 0 | 29 800 | 1 810 | 175 | 0 | 113 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C246: Derived Representative Discharges at the Lake B2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 10.90 | 401 000 | 307 000 | 12 600 | 19 600 | 24 300 |
| | | PC | 6.97 | 309 000 | 234 000 | 9 130 | 13 600 | 19 800 |
| | 10 | Baseline | 6.70 | 314 000 | 245 000 | 5 570 | 8 510 | 13 300 |
| | | PC | 3.99 | 234 000 | 188 000 | 4 240 | 6 460 | 10 800 |
| Median | 2 | Baseline | 4.02 | 231 000 | 179 000 | 1 930 | 2 930 | 5 990 |
| | | PC | 2.41 | 170 000 | 139 000 | 1 530 | 2 430 | 4 850 |
| Dry | 10 | Baseline | 2.74 | 170 000 | 122 000 | 523 | 872 | 2 360 |
| | | PC | 1.79 | 126 000 | 98 100 | 419 | 746 | 1 930 |
| | 100 | Baseline | 2.20 | 131 000 | 81 800 | 49 | 203 | 797 |
| | | PC | 1.58 | 101 000 | 69 400 | 17 | 128 | 676 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C247: Monthly Mean Stages at the Lake B2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.520 | 0.643 | 0.498 | 0.426 | 0.422 | 0.386 |
| | | PC | 0.495 | 0.610 | 0.488 | 0.404 | 0.389 | 0.371 |
| | 10 | Baseline | 0.445 | 0.595 | 0.429 | 0.348 | 0.355 | 0.324 |
| | | PC | 0.424 | 0.569 | 0.418 | 0.333 | 0.335 | 0.302 |
| Median | 2 | Baseline | 0.309 | 0.541 | 0.359 | 0.272 | 0.282 | 0.247 |
| | | PC | 0.297 | 0.520 | 0.345 | 0.262 | 0.273 | 0.231 |
| Dry | 10 | Baseline | - | 0.489 | 0.305 | 0.214 | 0.211 | 0.177 |
| | | PC | - | 0.474 | 0.288 | 0.203 | 0.209 | 0.175 |
| | 100 | Baseline | - | 0.447 | 0.272 | 0.180 | - | 0.138 |
| | | PC | - | 0.435 | 0.251 | 0.158 | - | 0.145 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C248: Derived Representative Stages at the Lake B2 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.859 | 0.749 | 0.696 | 0.368 | 0.401 | 0.418 |
| | | PC | 0.786 | 0.697 | 0.655 | 0.345 | 0.373 | 0.402 |
| | 10 | Baseline | 0.780 | 0.700 | 0.661 | 0.313 | 0.340 | 0.371 |
| | | PC | 0.705 | 0.655 | 0.629 | 0.297 | 0.322 | 0.357 |
| Median | 2 | Baseline | 0.706 | 0.653 | 0.619 | 0.254 | 0.276 | 0.318 |
| | | PC | 0.638 | 0.613 | 0.589 | 0.243 | 0.266 | 0.305 |
| Dry | 10 | Baseline | 0.654 | 0.613 | 0.574 | 0.197 | 0.217 | 0.264 |
| | | PC | 0.602 | 0.578 | 0.550 | 0.188 | 0.211 | 0.254 |
| | 100 | Baseline | 0.627 | 0.582 | 0.531 | 0.123 | 0.163 | 0.214 |
| | | PC | 0.587 | 0.553 | 0.514 | 0.100 | 0.149 | 0.207 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

## Lake D7 to Lake D1

**Table 7.3-C249: Monthly Mean Discharges at the Lake D7 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 6 710 | 25 900 | 6 140 | 2 330 | 1 970 | 976 |
| | | PC | 30 900 | 84 300 | 18 300 | 9 760 | 8 450 | 4 660 |
| | 10 | Baseline | 2 870 | 15 200 | 2 880 | 857 | 790 | 467 |
| | | PC | 14 000 | 56 900 | 8 880 | 3 470 | 3 670 | 2 230 |
| Median | 2 | Baseline | 392 | 8 460 | 1 180 | 243 | 237 | 119 |
| | | PC | 2 290 | 34 200 | 3 760 | 969 | 1 200 | 608 |
| Dry | 10 | Baseline | 0 | 5 280 | 512 | 60 | 49 | 18 |
| | | PC | 0 | 19 500 | 1 680 | 267 | 266 | 105 |
| | 100 | Baseline | 0 | 3 970 | 286 | 12 | 0 | 4 |
| | | PC | 0 | 11 500 | 941 | 90 | 0 | 26 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C250: Derived Representative Discharges at the Lake D7 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.84 | 46 900 | 33 800 | 1 230 | 1 620 | 2 380 |
| | | PC | 3.90 | 166 000 | 125 000 | 4 780 | 6 860 | 8 220 |
| | 10 | Baseline | 0.52 | 33 300 | 25 200 | 503 | 719 | 1 280 |
| | | PC | 2.37 | 124 000 | 96 000 | 2 050 | 3 040 | 4 540 |
| Median | 2 | Baseline | 0.29 | 21 200 | 16 600 | 155 | 247 | 570 |
| | | PC | 1.37 | 87 800 | 67 500 | 679 | 1 060 | 2 080 |
| Dry | 10 | Baseline | 0.18 | 12 800 | 9 930 | 33 | 64 | 223 |
| | | PC | 0.88 | 62 400 | 45 200 | 170 | 296 | 825 |
| | 100 | Baseline | 0.12 | 7 830 | 5 550 | 0 | 2 | 77 |
| | | PC | 0.67 | 47 500 | 30 700 | 4 | 39 | 276 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C251: Monthly Mean Stages at the Lake D7 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.388 | 0.485 | 0.382 | 0.326 | 0.317 | 0.282 |
| | | PC | 0.499 | 0.590 | 0.458 | 0.413 | 0.403 | 0.365 |
| | 10 | Baseline | 0.337 | 0.444 | 0.337 | 0.276 | 0.272 | 0.250 |
| | | PC | 0.438 | 0.552 | 0.406 | 0.348 | 0.351 | 0.323 |
| Median | 2 | Baseline | 0.243 | 0.403 | 0.291 | 0.224 | 0.223 | 0.199 |
| | | PC | 0.325 | 0.508 | 0.353 | 0.282 | 0.292 | 0.261 |
| Dry | 10 | Baseline | - | 0.373 | 0.254 | 0.178 | 0.172 | 0.145 |
| | | PC | - | 0.463 | 0.309 | 0.228 | 0.228 | 0.195 |
| | 100 | Baseline | - | 0.356 | 0.230 | 0.135 | - | 0.112 |
| | | PC | - | 0.424 | 0.280 | 0.190 | - | 0.154 |

Note: m= metre, - = stage below the lake outlet during zero discharge.

**Table 7.3-C252: Derived Representative Stages at the Lake D7 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.575 | 0.535 | 0.507 | 0.293 | 0.307 | 0.327 |
| | | PC | 0.741 | 0.659 | 0.629 | 0.367 | 0.389 | 0.401 |
| | 10 | Baseline | 0.531 | 0.506 | 0.483 | 0.253 | 0.268 | 0.295 |
| | | PC | 0.683 | 0.628 | 0.602 | 0.319 | 0.340 | 0.364 |
| Median | 2 | Baseline | 0.483 | 0.469 | 0.451 | 0.208 | 0.225 | 0.258 |
| | | PC | 0.624 | 0.593 | 0.568 | 0.266 | 0.286 | 0.320 |
| Dry | 10 | Baseline | 0.444 | 0.432 | 0.414 | 0.162 | 0.180 | 0.221 |
| | | PC | 0.579 | 0.561 | 0.532 | 0.211 | 0.232 | 0.274 |
| | 100 | Baseline | 0.418 | 0.398 | 0.376 | - | 0.099 | 0.185 |
| | | PC | 0.553 | 0.536 | 0.499 | 0.113 | 0.166 | 0.229 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C253: Monthly Mean Discharges at the Lake D3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 18 600 | 52 500 | 12 500 | 4 780 | 4 450 | 3 700 |
| | | PC | 40 300 | 113 000 | 26 500 | 10 800 | 9 760 | 6 750 |
| | 10 | Baseline | 8 400 | 36 000 | 5 330 | 2 530 | 2 570 | 1 410 |
| | | PC | 18 100 | 77 200 | 12 200 | 5 240 | 5 080 | 2 970 |
| Median | 2 | Baseline | 1 400 | 21 800 | 1 740 | 831 | 1 020 | 398 |
| | | PC | 2 880 | 47 200 | 4 650 | 1 700 | 2 040 | 906 |
| Dry | 10 | Baseline | 0 | 12 400 | 421 | 0 | 36 | 75 |
| | | PC | 0 | 27 600 | 1 660 | 0 | 539 | 233 |
| | 100 | Baseline | 0 | 7 090 | 0 | 0 | 0 | 0 |
| | | PC | 0 | 16 700 | 631 | 0 | 0 | 87 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C254: Derived Representative Discharges at the Lake D3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 1.90 | 105 000 | 76 400 | 2 130 | 3 270 | 4 630 |
| | | PC | 6.11 | 244 000 | 173 000 | 5 300 | 8 720 | 10 700 |
| | 10 | Baseline | 1.27 | 79 500 | 60 200 | 838 | 1 820 | 2 690 |
| | | PC | 3.58 | 179 000 | 133 000 | 2 580 | 4 210 | 6 100 |
| Median | 2 | Baseline | 0.80 | 55 400 | 43 100 | 162 | 675 | 1 220 |
| | | PC | 1.99 | 124 000 | 93 500 | 848 | 1 560 | 2 820 |
| Dry | 10 | Baseline | 0.52 | 37 700 | 28 800 | 0 | 0 | 364 |
| | | PC | 1.25 | 88 100 | 63 400 | 18 | 385 | 1 040 |
| | 100 | Baseline | 0.39 | 26 700 | 18 700 | 0 | 0 | 0 |
| | | PC | 0.94 | 68 000 | 44 000 | 0 | 0 | 203 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C255: Monthly Mean Stages at the Lake D3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.144 | 0.287 | 0.110 | 0.058 | 0.055 | 0.049 |
| | | PC | 0.241 | 0.479 | 0.182 | 0.100 | 0.094 | 0.073 |
| | 10 | Baseline | 0.085 | 0.223 | 0.062 | 0.038 | 0.038 | 0.026 |
| | | PC | 0.141 | 0.371 | 0.109 | 0.062 | 0.061 | 0.042 |
| Median | 2 | Baseline | 0.026 | 0.160 | 0.030 | 0.018 | 0.021 | 0.011 |
| | | PC | 0.041 | 0.267 | 0.057 | 0.029 | 0.033 | 0.019 |
| Dry | 10 | Baseline | - | 0.110 | 0.012 | - | 0.002 | 0.004 |
| | | PC | - | 0.187 | 0.029 | - | 0.014 | 0.008 |
| | 100 | Baseline | - | 0.076 | - | - | - | - |
| | | PC | - | 0.134 | 0.015 | - | - | 0.004 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C256: Derived Representative Stages at the Lake D3 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.614 | 0.456 | 0.369 | 0.034 | 0.045 | 0.057 |
| | | PC | 1.338 | 0.800 | 0.636 | 0.062 | 0.087 | 0.099 |
| | 10 | Baseline | 0.469 | 0.379 | 0.315 | 0.018 | 0.031 | 0.040 |
| | | PC | 0.937 | 0.650 | 0.534 | 0.039 | 0.053 | 0.068 |
| Median | 2 | Baseline | 0.345 | 0.298 | 0.252 | 0.006 | 0.016 | 0.023 |
| | | PC | 0.633 | 0.509 | 0.422 | 0.018 | 0.028 | 0.041 |
| Dry | 10 | Baseline | 0.260 | 0.230 | 0.192 | - | - | 0.010 |
| | | PC | 0.464 | 0.405 | 0.326 | 0.001 | 0.011 | 0.021 |
| | 100 | Baseline | 0.213 | 0.183 | 0.144 | - | - | - |
| | | PC | 0.385 | 0.341 | 0.255 | - | - | 0.007 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C257: Monthly Mean Discharges at the Lake D1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Discharge ($m^3/d$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 27 000 | 73 800 | 19 000 | 7 030 | 6 500 | 15 300 |
| | | PC | 47 900 | 134 000 | 32 900 | 13 000 | 14 000 | 10 500 |
| | 10 | Baseline | 12 100 | 51 700 | 7 490 | 3 330 | 3 590 | 2 820 |
| | | PC | 21 400 | 92 300 | 14 800 | 6 080 | 6 360 | 3 770 |
| Median | 2 | Baseline | 1 830 | 32 100 | 2 280 | 824 | 1 280 | 347 |
| | | PC | 3 230 | 57 200 | 5 350 | 1 730 | 2 150 | 1 010 |
| Dry | 10 | Baseline | 0 | 18 400 | 565 | 0 | 0 | 35 |
| | | PC | 0 | 33 900 | 1 770 | 0 | 418 | 203 |
| | 100 | Baseline | 0 | 10 300 | 66 | 0 | 0 | 0 |
| | | PC | 0 | 20 700 | 568 | 0 | 0 | 0 |

Note: $m^3/d$= cubic metres per day.

**Table 7.3-C258: Derived Representative Discharges at the Lake D1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Q ($m^3/s$) | 7-Day Mean Peak Q ($m^3/d$) | 14-Day Mean Peak Q ($m^3/d$) | 30-Day Low Flow Q ($m^3/d$) | 60-Day Low Flow Q ($m^3/d$) | 90-Day Low Flow Q ($m^3/d$) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 3.92 | 152 000 | 111 000 | 2 860 | 4 680 | 7 160 |
| | | PC | 6.76 | 291 000 | 210 000 | 6 130 | 12 400 | 13 200 |
| | 10 | Baseline | 2.45 | 118 000 | 88 300 | 1 030 | 2 370 | 3 720 |
| | | PC | 4.43 | 215 000 | 160 000 | 2 750 | 5 010 | 7 210 |
| Median | 2 | Baseline | 1.51 | 87 400 | 65 000 | 137 | 718 | 1 470 |
| | | PC | 2.75 | 154 000 | 114 000 | 752 | 1 500 | 3 140 |
| Dry | 10 | Baseline | 1.06 | 65 400 | 45 600 | 0 | 0 | 358 |
| | | PC | 1.80 | 117 000 | 81 000 | 0 | 292 | 1 030 |
| | 100 | Baseline | 0.87 | 52 300 | 32 300 | 0 | 0 | 0 |
| | | PC | 1.35 | 97 900 | 61 300 | 0 | 0 | 96 |

Note: Q= discharge; $m^3/s$= cubic metres per second; $m^3/d$= cubic metres per day.

**Table 7.3-C259: Monthly Mean Stages at the Lake D1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Monthly Mean Stage (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | May | Jun | Jul | Aug | Sep | Oct |
| Wet | 100 | Baseline | 0.228 | 0.377 | 0.191 | 0.116 | 0.112 | 0.172 |
| | | PC | 0.304 | 0.508 | 0.252 | 0.158 | 0.164 | 0.142 |
| | 10 | Baseline | 0.153 | 0.316 | 0.120 | 0.080 | 0.083 | 0.074 |
| | | PC | 0.203 | 0.422 | 0.169 | 0.108 | 0.111 | 0.085 |
| Median | 2 | Baseline | 0.059 | 0.249 | 0.066 | 0.040 | 0.050 | 0.026 |
| | | PC | 0.079 | 0.332 | 0.102 | 0.058 | 0.064 | 0.044 |
| Dry | 10 | Baseline | - | 0.188 | 0.033 | - | - | 0.008 |
| | | PC | - | 0.256 | 0.058 | - | 0.028 | 0.020 |
| | 100 | Baseline | - | 0.141 | 0.011 | - | - | - |
| | | PC | - | 0.200 | 0.033 | - | - | - |

Note: m= metre; - = stage below the lake outlet during zero discharge.

**Table 7.3-C260: Derived Representative Stages at the Lake D1 Outlet – Post-Closure**

| Condition | Return Period (years) | Snapshot | Peak Daily Stage (m) | 7-Day Mean Peak Stage (m) | 14-Day Mean Peak Stage (m) | 30-Day Low Flow Stage (m) | 60-Day Low Flow Stage (m) | 90-Day Low Flow Stage (m) |
|---|---|---|---|---|---|---|---|---|
| Wet | 100 | Baseline | 0.808 | 0.541 | 0.463 | 0.074 | 0.095 | 0.118 |
| | | PC | 1.061 | 0.749 | 0.636 | 0.109 | 0.155 | 0.160 |
| | 10 | Baseline | 0.639 | 0.477 | 0.413 | 0.045 | 0.068 | 0.085 |
| | | PC | 0.859 | 0.644 | 0.556 | 0.073 | 0.098 | 0.118 |
| Median | 2 | Baseline | 0.502 | 0.411 | 0.354 | 0.016 | 0.037 | 0.053 |
| | | PC | 0.677 | 0.545 | 0.469 | 0.038 | 0.054 | 0.078 |
| Dry | 10 | Baseline | 0.420 | 0.355 | 0.297 | - | - | 0.026 |
| | | PC | 0.548 | 0.475 | 0.395 | - | 0.024 | 0.045 |
| | 100 | Baseline | 0.380 | 0.318 | 0.250 | - | - | - |
| | | PC | 0.474 | 0.435 | 0.344 | - | - | 0.014 |

Note: m= metre; - = stage below the lake outlet during zero discharge.

# APPENDIX 7.3-D

## 2012 Shoreline and Channel Erosion Assessment

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

# Executive Summary

The Meliadine Gold Project (Project) is a proposed gold mine located north of Rankin Inlet in the Kivalliq region of Nunavut. The mine site of the Project is located on the Meliadine peninsula, part of the Meliadine Lake watershed. The purpose of this report is to support the hydrology section (Section 7.3 - Hydrology including Water Quantity) of Final Environmental Impact Assessment (FEIS) that addresses the Guidelines issued by the Nunavut Impact Review Board for the Project, specifically relating to the impact of the Project on hydrology including water quantity.

This document presents the results of the field studies conducted in 2012 to evaluate the potential for Lake Shoreline and outlet channel erosion arising from predicted changes to hydrological flows related to the Project. More specifically, erosion is anticipated to develop lake shorelines at the new water levels that will be created, and to modify Lake Outlet channels that will be subject to increased flows following dike construction and diversion of existing streams.

This report focuses on only those lake and channel shorelines that are predicted to be affected by changes in hydrological flows resulting from the Project. Shoreline assessment and identification of potential mitigation measures were only carried out for those areas potentially affected based on the Project description. In general, the assessment indicates:

- Lakes B44 and B45 will have the water levels increased permanently by disconnecting Lake B45 from Lake B4, and diverting the flows to Lake B2 through Lakes P3 and P2. While the development of the new shoreline on Lakes B44 and B45 is expected to occur over several years to decades, some areas with high erosion potential may experience erosion more quickly. Mitigation of these areas could include armouring or resloping in advance of raising the water levels, or monitoring and installing erosion protection as required. Shoreline areas which are identified as being less susceptible to erosion should be monitored and mitigation measures installed as required. Monitoring of the lake shorelines should be ongoing on an annual basis for at least 10 years. Proactive measures should be implemented if required to prevent erosion.
- Lake Outlet channels for Lake A1, A7, B6, D7, D6, D5, D4, and J1 may experience temporarily increased flows during the initial phase of dewatering. Pumping for dewatering will be delayed until after the spring freshet as a mitigation measure to keep the peak flows at or below baseline conditions, which will likely minimize the potential for erosion. However, the lake outlet channels should be monitored for erosion during the dewatering phase.
- The remaining lakes and outlet channels affected by the Project footprint will not require mitigation measures because they will either be covered by Project facilities and infrastructure, or the natural runoff and contact water reporting to them will be managed as part of the Project site water management system.

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**APPENDICES**

**APPENDIX A**
Shoreline and Channel Erosion Assessment Photographs

**APPENDIX B**
Shoreline and Channel Erosion Assessment Methods and Scores

# 1.0 INTRODUCTION

The Meliadine Gold Project (Project) is a proposed gold mine located north of Rankin Inlet in the Kivalliq region of Nunavut. The mine site of the Project is located on the Meliadine peninsula, part of the Meliadine Lake watershed.

This report presents the results of the shoreline field data collection program conducted in 2012 to evaluate the potential for shoreline and outlet channel erosion, based on predicted changes to hydrological flows from the Project. The data contained in this report was collected in support of the hydrology section (Section 7.3 - Hydrology including Water Quantity) of Final Environmental Impact Assessment (FEIS). The FEIS address the Guidelines issued by the Nunavut Impact Review Board for the Project, and specifically those to the impact of the Project on hydrology including water quantity. Based on the Guidelines, erosion is anticipated along new lake shorelines that will be created and within modified lake outlet channels that will be subject to increased flows following dike constructions and diversion of existing streams.

The dike construction and stream diversions will occur at different times throughout the Project life depending on the mine plan. For reference purposes, the main project phases and their respective mine years are presented below in Table 7.3-D1:

**Table 7.3-D1: Project Phases and Years**

| Project Phase | Mine Years |
|---|---|
| Pre-Production Phase | Years -3, -2, -1 |
| Mining Phase 1 | Years 1, 2 |
| Mining Phase 2 | Years 3, 4 |
| Mining Phase 3 | Years 5, 6, 7, 8 |
| Mining Phase 4 | Year 9 |
| Mining Phase 5 | Year 10, 11, 12 |
| Mining Post-Closure | After Year 12 |

## 1.1 Methods

The 2012 hydrological field data, wind data, terrain data, and available baseline soils information for the Project were reviewed to evaluate the susceptibility of the future lake shorelines to erosion and future lake outlets to impacts from increased flows. Lake and channel shorelines for those watersheds that will be impacted by the proposed mine were surveyed between 6 and 9 July, 2012.

The surveys included lake shoreline surveys where changes in lake water level are proposed (i.e., Lakes B45 and B44), and lake outlet channel surveys for lakes with flow diversions (i.e., Lakes A7, B2, B5, D7, D6, D5, D4, P3). Lake Outlet characterization surveys were also undertaken for the outlets of Lakes A1, A2, A3, A4, A5, B6, H1, J2, J8, and J1 which could be affected by other project works.

Methods used in the lake shoreline surveys were as follows:

- Initial lakeshore survey locations were determined based on existing baseline information, with reference to the soil and terrain types surrounding the lakes. Preliminary shore-normal survey transects lengths were identified based on existing water levels and the proposed raised water level. Each shore-normal survey transect was surveyed to represent homogeneous sections of shoreline with similar slope, soil and wave exposure.
- The actual length and location of each transect was determined in the field based on the preliminary identifications. At each transect, a shoreline topographic profile was measured using a SOKKIA GPS RTK system to provide accurate position and elevation data. Depending on the proposed lake water level conditions, the profiles typically extended from existing water level to above the anticipated high water level of the new proposed lake elevation.
- Shoreline sections were delineated in the field based on the visually observable characteristics of aspect, wave exposure (a combination of prevailing wind and fetch length), slope, and terrain and sediment types (gradation and origin). Ice thrust effects (e.g., ice-push berms at the shoreline) were considered as evidence of thermal and physical erosion at existing water level elevations.

The geomorphological characterization of Lake Outlet channels (Lake Outlet channel surveys) was assessed in the field based on measured data of the cross-sectional profiles, slope measurements of the channel, water level, bed and bank material, bank vegetation type, and active erosion or depositional areas if present.

Photographic documentation was carried out simultaneously with the field surveys for each homogeneous section of the shoreline and along each lake outlet channel (Appendix A).

To evaluate Lake Shoreline erosion potential, a series of parameters were assessed and applied within a shoreline erosion classification system. The classification system was based on a modified version of the Alberta Sustainable Resource Development tool for calculating lakeshore erosion potential (Government of Alberta 2013). The shoreline erosion potential was classified into a five-class system, ranking from Very Low to Very High (Appendix B).

The lake shoreline characteristics and parameters considered in the analysis were divided into three categories: bank and shoreline features, exposure characteristics, and attenuation characteristics (Table 7.3-D2); more detailed information on the categories is presented in Appendix B. Each category contains different parameters with different classes and assigned scores. The final score for the erosion potential class was calculated using a weighted average method of all the parameters as described in Appendix B.

**Table 7.3-D2: Categories for the Lake Shoreline Characteristics and Parameters**

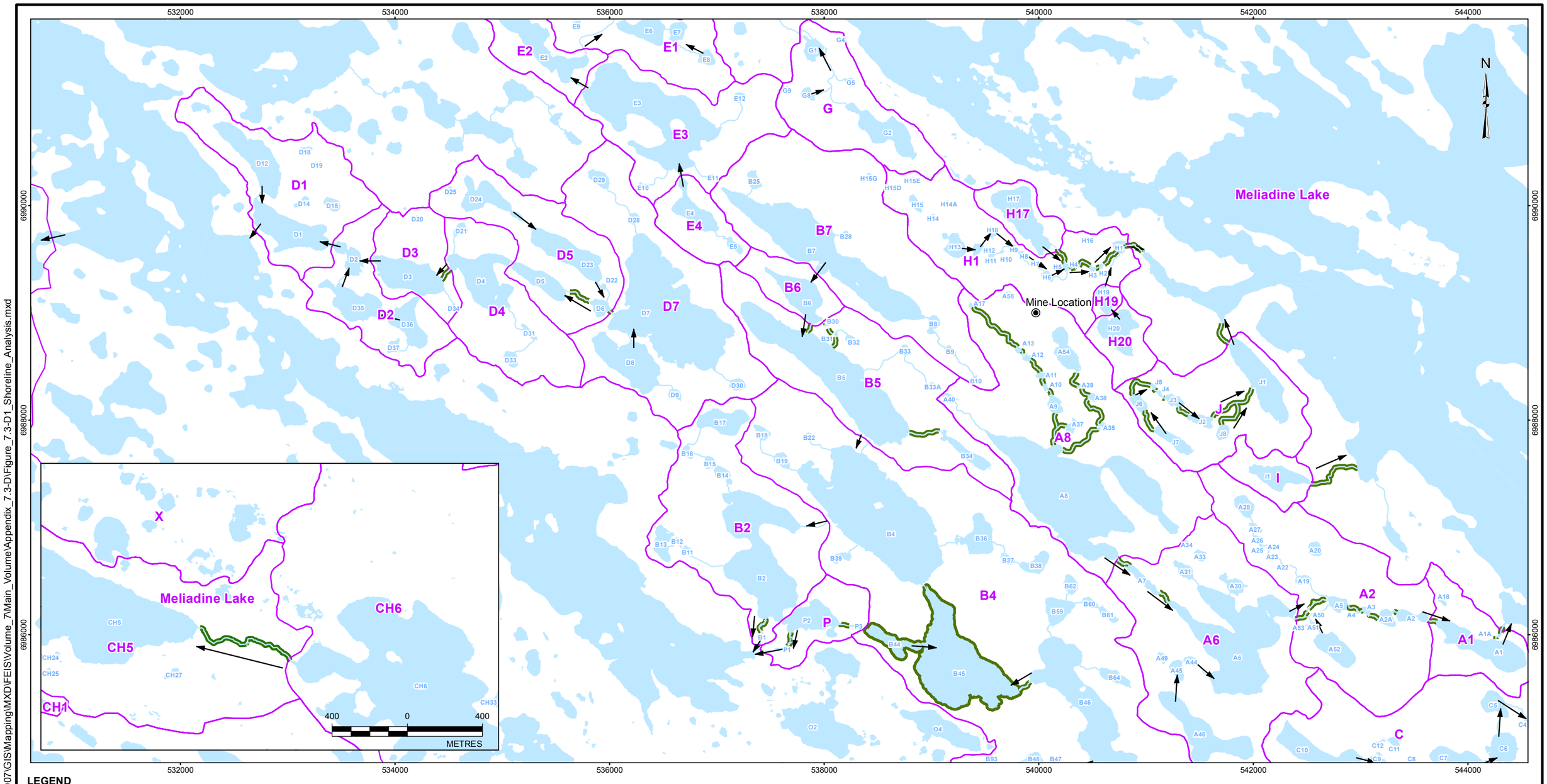
| Bank and Shoreline Features | Exposure Characteristics | Attenuation Characteristics |
|---|---|---|
| Bank Height | Shore Orientation (wind direction) | Bank Composition |
| Bank Vegetation | Fetch Length | Bank Slope |
| Bank Stability | Depth at 6 m from shore | — |
| Shoreline Geometry | Depth at 30 m from shore | — |

m = metre; — = not applicable.

# 2.0 REVIEW OF EXISTING DATA

## 2.1 Study Area

Various lakes and outlet channels were assessed for shoreline erosion potential in 2012. The field survey covered the shoreline of the proposed lakes with increased water level elevations associated with proposed water diversions (Lake B44 and Lake B45), as well as lake outlet channels where flows will be increased as a result of proposed flow diversions during Project construction and operation (Figure 7.3-D1).




**LEGEND**

**SURVEYED AREA**
- SURVEYED SHORELINE
- SURVEYED WATERBODY
- MINE LOCATION
- DIRECTION OF FLOW
- WATERCOURSE
- SUB-WATERSHED BOUNDARY
- WATERBODY

**REFERENCE**

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM).
DATUM: NAD 83 PROJECTION: UTM ZONE 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# SHORELINE ANALYSIS
# LAKE AND OUTLET CHANNEL SURVEYS

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | DC | 10 Jun. 2013 | SCALE AS SHOWN | REV. 0 |
| GIS | KLN | 10 Jun. 2013 | | |
| CHECK | RA | 16 Sep. 2013 | | |
| REVIEW | DRW | 16 Sep. 2013 | | |

**FIGURE 7.3-D1**

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\EIS\Volume_7\Main_Volume\Appendix_7.3-D\Figure_7.3-D1_Shoreline_Analysis.mxd

The lakes assessed for shoreline erosion potential in 2012 included Lake B44 and Lake B45. The lake outlet channels that were surveyed for erosion potential included the following:

- A Watershed Lakes from Lake A1 upstream to Lake A8, and A31;
- B Watershed Lakes B2, B6, and B46;
- D Watershed Lakes D7, D6, D5 and D4;
- H Watershed Lakes H1, H2, H3, H4, H5 and H17;
- I Watershed Lake I1;
- J Watershed Lakes J1, J2, J4, J7 and J8; and
- P Watershed Lakes P2 and P3.

The surveyed lakes and outlet channels will be affected at various stages during the proposed mine life as follows:

- A Watershed: a) non-contact water will be pumped from Lake A8 and upstream to Lake A7; b) non-contact water will be pumped from Lake A6 to an artificial channel that will convey the water to Lake A1;
- B Watershed: a) non-contact water will to be pumped from Lake B7 to Lake B6; b) non-contact water will be diverted from Lake B5 to Lake D7 through a new channel; c) non-contact water will be pumped from Lake B4 to Lake B2; d) Lake B45 will be disconnected from Lake B4 and water diverted to Lake B44 by permanently raising the water level; e) Lake B44 will be flooded and diverted to the P Watershed;
- D Watershed: Flows will increase downstream of Lake D7 due to flow augmentation from Lake B5 diversion;
- H Watershed: Lake H1 will be isolated from upstream and will be part of the closed mine site water management plan;
- J Watershed: non-contact water from Lake J7 will be diverted to Lake J2; and
- P Watershed: a) non-contact water from Lake B44 will be diverted to Lake P3; b) non-contact water from Lake P2 will be diverted to Lake B2.

## 2.2 Meteorology – 2012 Shoreline Meliadine

The main meteorological parameters that affect shoreline erosion potential are wind speed and wind direction. This is because wind blowing over open water generates waves. As wind speed and fetch increase for a given water depth, wave height typically increases; the height of the waves is related to the strength of the wind and the length of open water (fetch) over which the wind blows. As wave height increases, the erosive power of the waves increase. Water depth serves to modify this general relationship by limiting wave growth in shallow water.

The closest wind station with a suitable dataset to the Project site is the Rankin Inlet A climate station, located in close proximity of Rankin Inlet Airport. This provides hourly mean data for wind speed and wind direction (Environment Canada 2012), and daily maximum wind gust data if the maximum gust speed exceeds 29 km/h, for the period 1981-2011.

The shoreline erosion potential analysis used the wind data for the open water season, defined as the period from June to October for each year of record. Table 7.3-D3 presents the directions and the wind classes frequency distribution measured at the Rankin Inlet A climate station for the open water season over 31 years of record. The recorded prevailing winds are from north-northwest, followed by winds from the north sector. The calm frequency, defined as wind with less than 1.0 m/s, is 1.93% of the time and the least frequent wind direction is the west-southwest sector (Figure 7.3-D2). The mean values for wind speed show that the strongest winds tend to be from the north-northwest and from the north sectors.

The wind class frequency distribution shows that the most frequent winds have velocities of 4.0 to 8.0 m/s and occur approximately 50% of the time (Figure 7.3-D3). However, strong winds with velocities higher than 8 m/s are also frequent, occurring approximately 24% of the time. Strong winds tend to be more frequent than winds with velocities of 1.0 to 2.0 m/s, which occur 7 % of the time. This suggests that the strong winds are expected to be more persistent during the open water season.

**Table 7.3-D3: Rankin Inlet A Wind Rose and Directions Frequencies, 1981 to 2011**

| Direction | | Wind Classes (m/s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Cardinal or Intermediate | Sector Midpoint (degrees) | 1.0 - 2.0 | 2.0 - 4.0 | 4.0 - 6.0 | 6.0 - 8.0 | 8.0 - 10.0 | 10.0 - 15.0 | >= 15.0 | Total (%) |
| N | 0.0 | 0.75 | 1.41 | 2.96 | 3.25 | 2.00 | 1.87 | 1.87 | 0.23 |
| NNE | 22.5 | 0.42 | 0.62 | 0.97 | 0.99 | 0.52 | 0.53 | 0.53 | 0.07 |
| NE | 45.0 | 0.30 | 0.52 | 0.94 | 0.97 | 0.45 | 0.45 | 0.45 | 0.06 |
| ENE | 67.5 | 0.29 | 0.59 | 0.98 | 0.91 | 0.4 | 0.33 | 0.33 | 0.07 |
| E | 90.0 | 0.51 | 1.07 | 2.03 | 2.12 | 0.84 | 0.51 | 0.51 | 0.04 |
| ESE | 112.5 | 0.35 | 1.03 | 2.22 | 2.01 | 0.67 | 0.32 | 0.32 | 0.02 |
| SE | 135.0 | 0.38 | 0.97 | 1.78 | 1.22 | 0.41 | 0.36 | 0.36 | 0.02 |
| SSE | 157.5 | 0.44 | 1.17 | 1.85 | 1.07 | 0.45 | 0.44 | 0.44 | 0.02 |
| S | 180.0 | 0.75 | 1.57 | 2.30 | 1.82 | 0.80 | 0.55 | 0.55 | 0.02 |
| SSW | 202.5 | 0.60 | 1.11 | 1.17 | 0.92 | 0.41 | 0.22 | 0.22 | 0.01 |
| SW | 225.0 | 0.47 | 0.84 | 0.83 | 0.48 | 0.17 | 0.11 | 0.11 | 0.01 |
| WSW | 247.5 | 0.37 | 0.75 | 0.78 | 0.40 | 0.11 | 0.08 | 0.08 | 0.00 |
| W | 270.0 | 0.49 | 1.21 | 1.94 | 1.07 | 0.38 | 0.32 | 0.32 | 0.03 |
| WNW | 292.5 | 0.25 | 0.70 | 1.49 | 1.23 | 0.57 | 0.57 | 0.57 | 0.09 |

| Direction | | Wind Classes (m/s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Cardinal or Intermediate | Sector Midpoint (degrees) | 1.0 - 2.0 | 2.0 - 4.0 | 4.0 - 6.0 | 6.0 - 8.0 | 8.0 - 10.0 | 10.0 - 15.0 | >= 15.0 | Total (%) |
| NW | 315.0 | 0.30 | 0.85 | 2.00 | 2.39 | 1.45 | 1.45 | 1.45 | 0.22 |
| NNW | 337.5 | 0.42 | 1.08 | 2.81 | 3.70 | 2.37 | 2.42 | 2.42 | 0.44 |
| Sub-Total | | 7.05 | 15.36 | 26.85 | 24.36 | 11.89 | 10.46 | 10.46 | 1.34 |
| **Calms** | | | | | | | | | 1.93 |
| **Missing/ Incomplete** | | | | | | | | | 0.76 |
| **Total** | | | | | | | | | 100.0 |

N = north; NNE = north-northeast; NE = northeast; ENE = east – northeast; E = east; ESE = east-southeast; SE = southeast; SSE = south-southeast; S = south; SSW = south-southwest; SW = southwest; WSW = west-southwest; W = west; WNW = west-northwest; NW = northwest; NNW = north-northwest; m/s= metres per second; > greater than; % = percent.

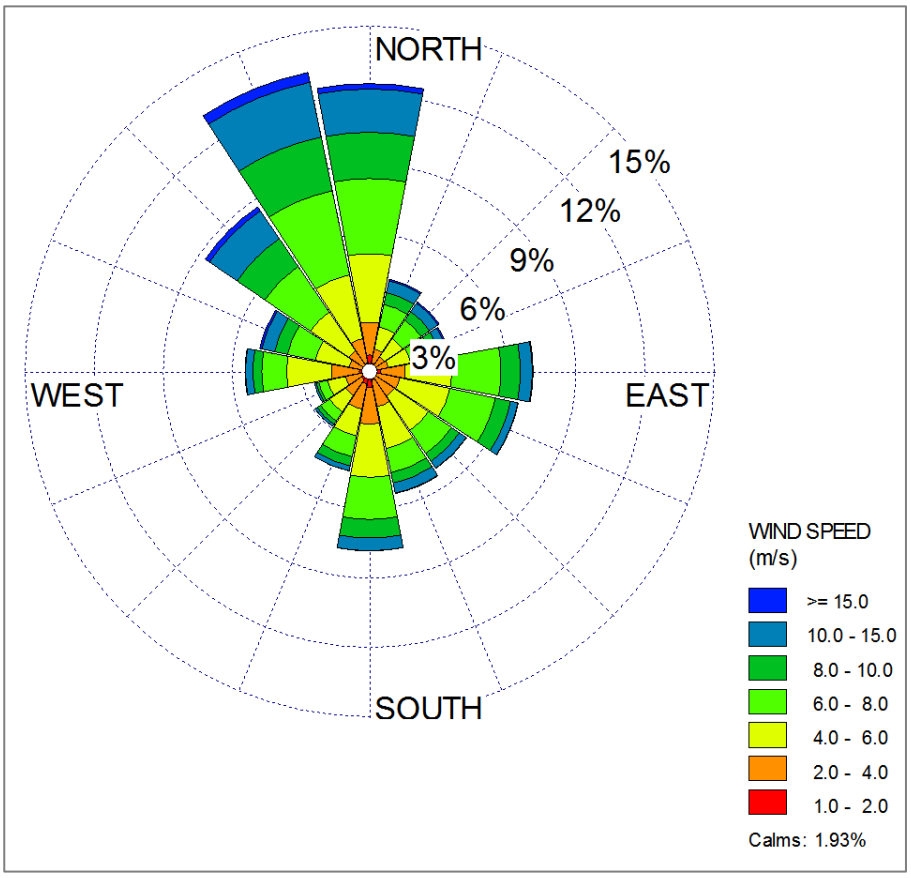



*Figure 7.3-D2: Rankin Inlet A, Mean Wind Speed and Direction Frequency Rose, June to October 1981 to 2011*

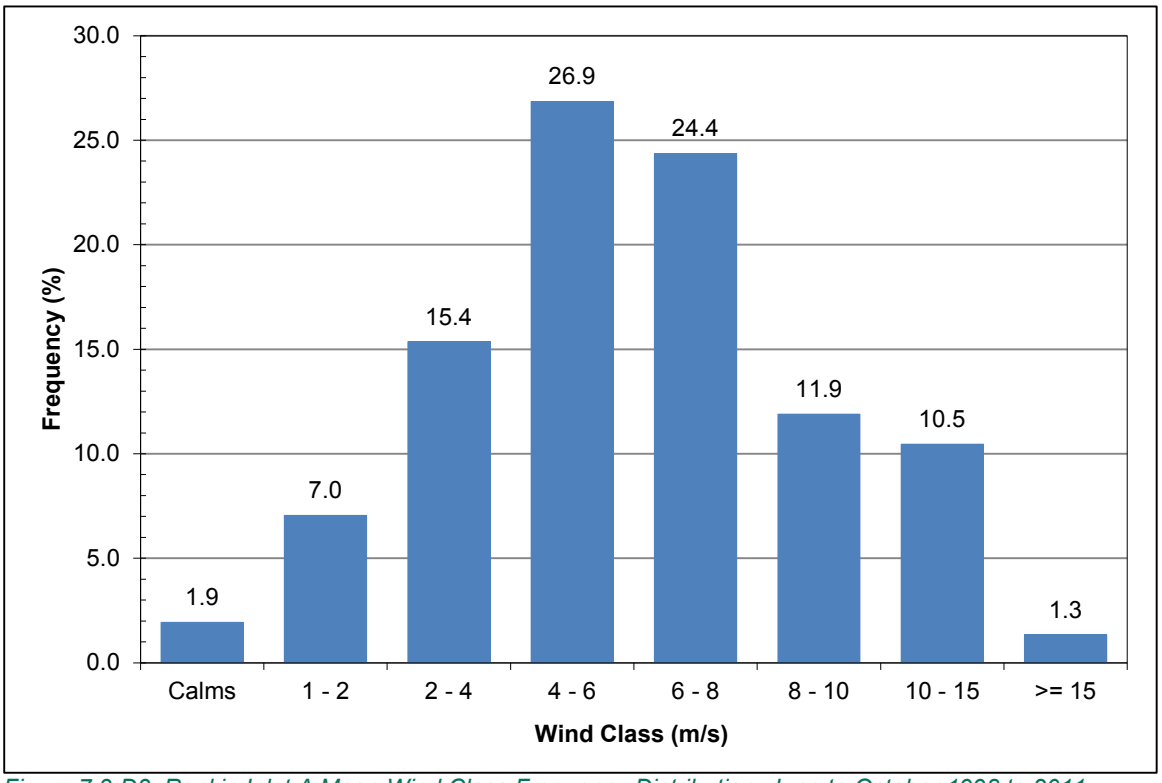



*Figure 7.3-D3: Rankin Inlet A Mean Wind Class Frequency Distribution, June to October 1998 to 2011*

## 2.3 Terrain and Soils

### 2.3.1 Terrain

"Terrain" is a comprehensive term used to describe a tract of landscape and the associated natural physical features. Terrain maps typically show surficial materials, material texture, surface expression, relief, elevation, drainage, or material modifying processes. A detailed terrain and soil analysis was presented in Volume 6, Section 6.4 – Soil and Terrain of the FEIS, and was referred to for the geomorphological analysis for the shorelines and outlet channels carried out for this report.

Surficial materials in the study area are typically geologically recent sediments (Holocene age) deposited around the end of the last glaciation, supplemented by more recent fluvial and organic deposits, which have accumulated in the last few thousand years. The major surficial materials include alluvium and marine sediments, nearshore sediments, bedrock and weathered bedrock, morainal deposits, and organic accumulations. For a more detailed discussion, please refer to Volume 6 of the FEIS.

Table 7.3-D4 shows a summary of the terrain units defined and mapped for the Local Study Area (LSA) of the FEIS as presented in Volume 6, Section 6.4 of the FEIS.

Elevations within the area surveyed for the lake shoreline and outlet channel study range from approximately 52 metres above sea level (masl) at the Meliadine Lake water level to approximately 80 masl at the crest of the highest hills in the Lake B7 watershed. Local relief is commonly in the range of 15 to 20 metres (m), but slopes

are mainly gentle (i.e., slopes typically less than 10%), resulting in undulating to rolling topography associated in many areas with hummocky topography.

**Table 7.3-D4: Terrain Map Units Mapped for the LSA**

| Terrain Map Unit | Terrain Map Unit Description |
|---|---|
| Am | Alluvium and marine sediments |
| DL | Disturbed land |
| Gh | Glaciofluvial and morainal deposits |
| Gk | Ice contact stratified sediments |
| Mm | Nearshore sediments |
| Mr | Littoral sediments |
| Mt | Tidal flat sediments |
| O | Organic |
| R | Bedrock |
| R-Mr | Bedrock-littoral sediments |
| R-Tw | Bedrock-till |
| Tbv | Till blanket/veneer |
| Th | Till hummocky |
| Tm | Till and marine sediments |
| Tx | Till |
| W | Water |

### 2.3.2 Soils

The FEIS report presents the soil baseline assessment with soil maps and descriptions for the study areas (Volume 6 Section 6.4, FEIS). Within the LSA, 6 soil map units were described and mapped and are summarized in Table 7.3-D5.

**Table 7.3-D5: Soil Map Units in the LSA**

| Soil Map Unit | Area (ha) | Area (%) |
|---|---|---|
| Bedrock-Regosols | 233 | 2 |
| Disturbed | < 1 | < 1 |
| Organic Cryosols | 317 | 3 |
| Organic and Turbic Cryosols | 2,449 | 23 |
| Static Cryosols | 1,341 | 13 |
| Turbic Cryosols-Regosols | 4,035 | 38 |
| Water | 2,221 | 21 |
| **Total** | **10,598** | **100** |

Note: Numbers are rounded for presentation purposes; therefore, it may appear that the totals do not equal the sum of the individual values; ha = hectare; < = less than.

The most common soil map unit in the LSA are the Turbic Cryosols-Regosols followed by Organic and Turbic Cryosols, which account for 4035 ha (38%) and 2449 ha (23%) of the LSA, respectively. The remaining soil map units represent less than 15% of the LSA each. Water covers 2221 ha (21%) of the LSA.

The soil erosion risk on land was characterized and presented in the FEIS with an overall sensitivity rating for each soil map unit; the overall sensitivity ratings on land are presented in Table 7.3-D6. However, wave action on soils is considered to have higher erosion sensitivity ratings for soils with organic materials. Using the soil units identified in the FEIS for the LSA, a wave action rating class was determined for each soil unit as shown in Table 7.3-D6.

**Table 7.3-D6: Erosion Sensitivity of Soil Map Units in the Local Study Area**

| Soil Map Unit | Soil Erosion Sensitivity Rating on Land | Soil Erosion Sensitivity Rating for Wave Action |
|---|---|---|
| Bedrock-Regosols | Low | Low |
| Disturbed | Moderate | Moderate |
| Organic Cryosols | Low | Moderate-High |
| Organic and Turbic Cryosols | Low-Moderate | Moderate |
| Static Cryosols | Moderate | Moderate |
| Turbic Cryosols-Regosols | Low-Moderate | Moderate |
| Water | Not Applicable | Not Applicable |

# 3.0 LAKE SHORELINE AND CHANNEL EROSION SURVEY RESULTS

This section presents the survey results for each surveyed lake (shoreline and outlet channel) at a watershed level. The detailed photography survey for each lake is presented in Appendix A, and the methods and calculations for each shore-normal survey transect (lake shoreline survey only) are presented in Appendix B. As mentioned above, Section 2.1, shore-normal shoreline transects were only collected on lakes B44 and B45.

## 3.1 A Watershed

The A watershed is located south of the existing camp and has an area of approximately 9.31 square kilometres ($km^2$) of which 4.5 $km^2$ is lake water surface.

### 3.1.1 Lake A8 Outlet Channel Survey

Lake A8 is located west of the existing camp and has an area of approximately 90.5 ha (0.905 $km^2$). Lake A8 is the main lake in the A8 watershed and drains into Lake A7. At the time of the survey, the average water level elevations of lakes A8 and A7 were approximately 62.08 masl and 60.99 masl, respectively. During the Project's proposed operational phase (Mining Phase 1 to 5), Lake A8 will be dewatered but the outlet channel will not be affected by augmented flows because the diversion will not take place through the existing channel.

The Lake A8 outlet channel was surveyed downstream from the outlet to Lake A7. The channel slope varies from 0.5 to 2% (Figure 7.3-D4). The outlet channel flows into Lake A7 through a relatively flat terrain, with surficial materials consisting of mixed boulder moraine and organics.

The typical outlet is typically less than 0.3 m deep relative to the surrounding terrain, with a braided channel planform. The outlet lacks a well-defined main channel. The channel banks were observed to be a mixture of cobble with boulders. Small localized boulder steps were observed where the boulders predominate within the channel along the longitudinal profile.

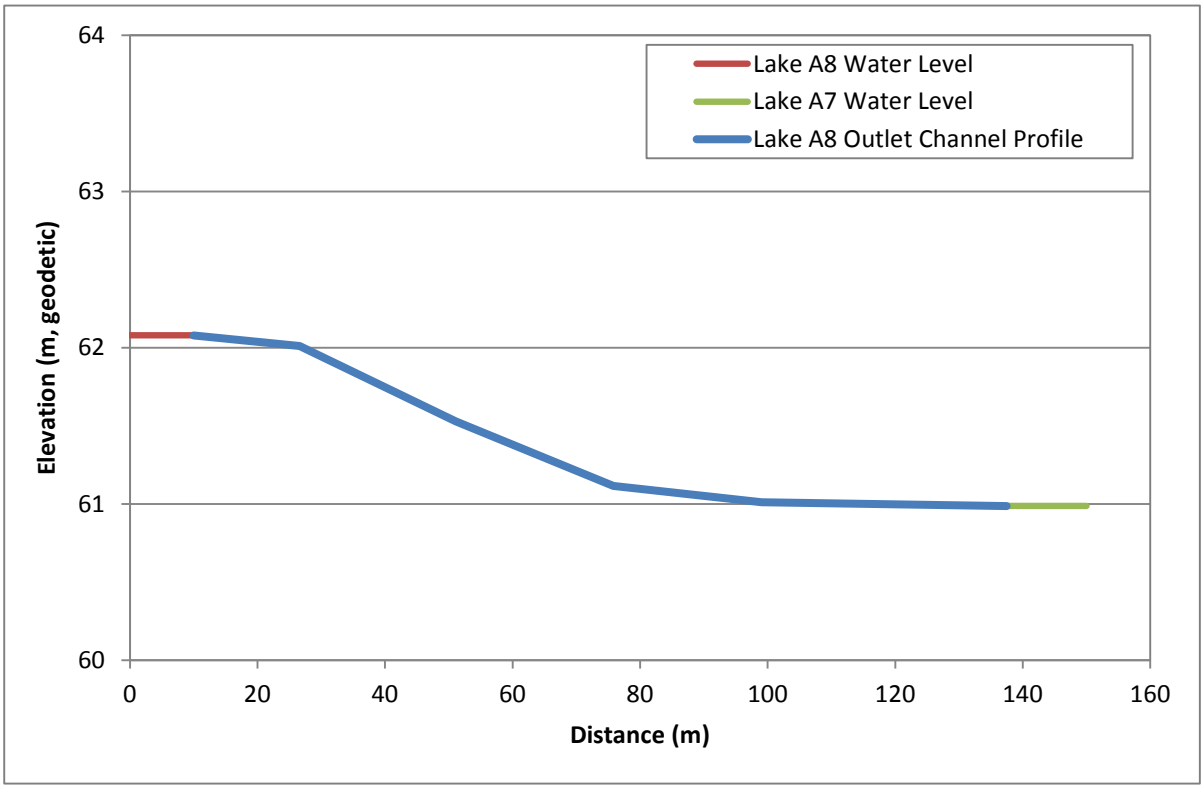



*Figure 7.3-D4: Lake A8 Outlet Channel Profile (m = metres)*

### 3.1.1.1 A8 Outlet Channel Mitigation

The A8 Outlet channel will not carry the pumped flows from Lake A8. During the first year of the Project Pre-production phase (i.e., Year -3), the flows will be conveyed directly by pipe to the Lake A7 environment (Section 7.3.3.3.1, FEIS).

During the subsequent phases of the Project, additional pumping from Lake A8 will be required to maintain Lake A8 in a dewatered condition throughout the open water season. This is expected to be at a reduced rate relative to the existing natural conditions after first year of the Project Pre-production (i.e., Year -3).

Based on the above, no erosion mitigation works are anticipated to be required for the A8 Outlet channel.

### 3.1.2 Lake A7 Outlet Channel Survey

Lake A7 is located southwest of the existing camp and has an area of approximately 2.38 ha. Lake A7 drains southeast into Lake A6. The average water level elevation of Lake A7 at the time of the survey was approximately 60.99 masl and the average water level elevation of Lake A6 at the time of the survey was approximately 59.60 masl. During the Project's proposed operational phase, Lake A7 will not be affected by rising water levels (See Section 3.1.2.1) but it will carry the augmented flows from the dewatering of Lake A8.

The Lake A7 outlet channel was surveyed downstream from the outlet to Lake A6. The channel slope varies from 1 to 2% (Figure 7.3-D5). The outlet channel flows into Lake A6 through a relatively flat terrain, with surficial materials consisting of mixed cobble and organics.

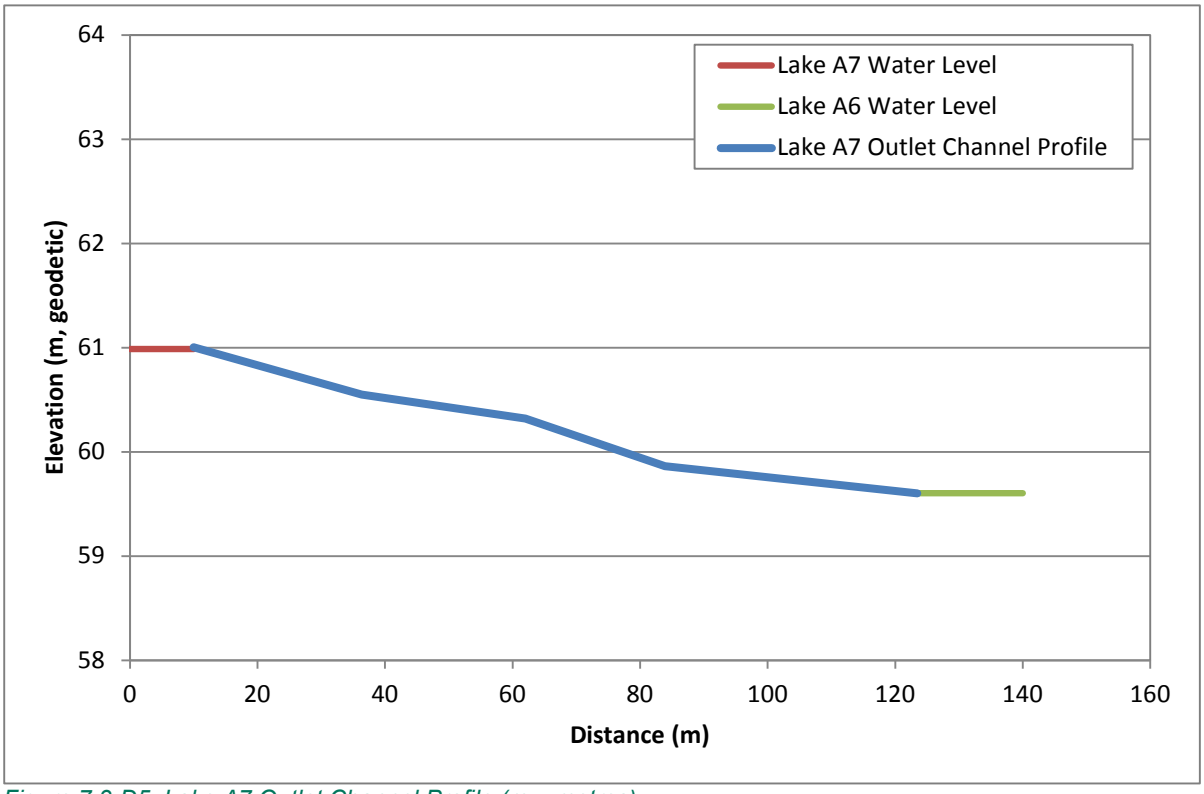



*Figure 7.3-D5: Lake A7 Outlet Channel Profile (m = metres)*

The typical outlet cross-section is wide (Figure 7.3-D6) and less than 0.3 m deep relative to the surrounding terrain with a braided channel planform. The outlet lacks a well-defined main channel. The channel banks were observed to be a mixture of cobble with organics. Small boulder steps were observed where the cobble predominates within the channel along the longitudinal profile.

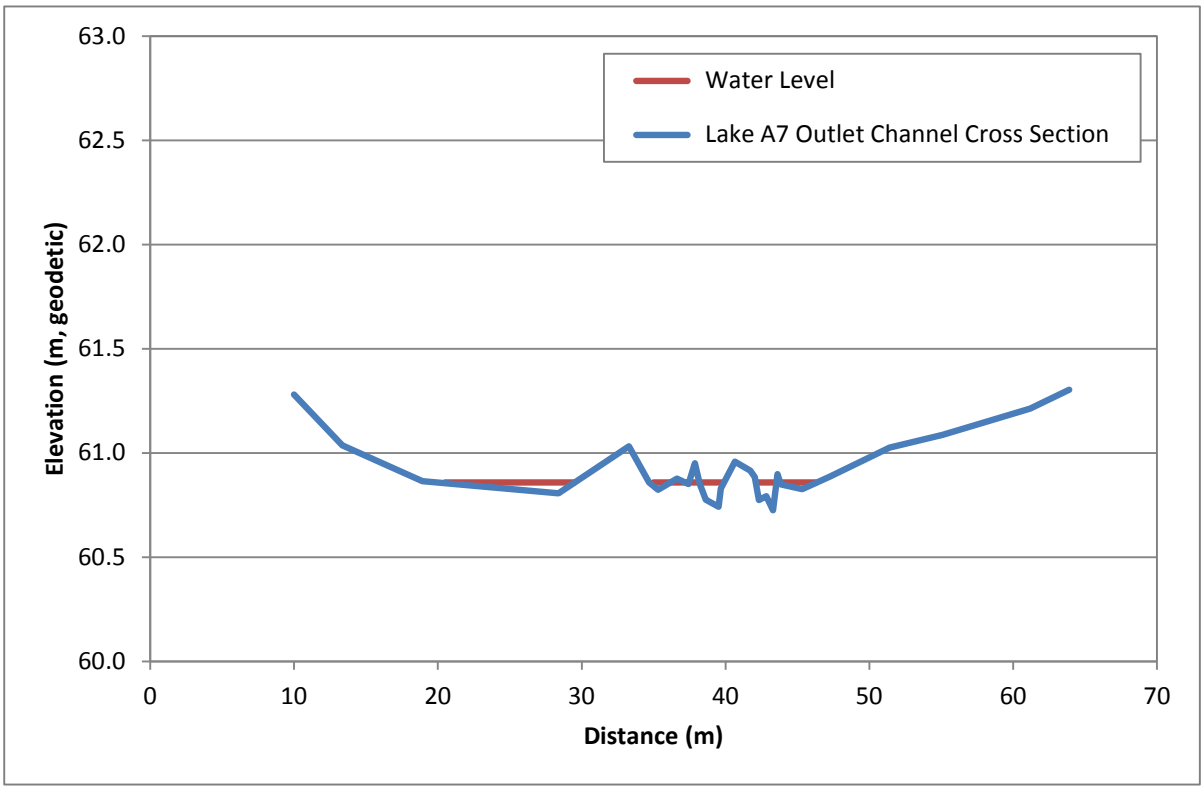



*Figure 7.3-D6: Lake A7 Outlet Channel Cross-Section (m = metres)*

#### *3.1.2.1 A7 Outlet Channel Mitigation*

The A7 Outlet channel will carry the augmented flows from Lake A8 during the dewatering phase of the Project (Section 7.3.3.3.1, FEIS). However, no effects on Lake A7 Outlet channel or bank stability are expected because flood magnitudes are not sustained and will only exceed baseline values for a small period of time, typically a couple days during the freshet. Therefore no erosion mitigation works are anticipated to be required for the A7 Outlet channel.

### 3.1.3 Lake A6 to Lake A2 Outlet Channel Surveys

#### *3.1.3.1 Lake A6 Outlet Channel Survey*

The existing outlet channel from Lake A6 to Lake A5 was surveyed and the longitudinal profile is shown in Figure 7.3-D7. The average water level elevation of Lake A6 at the time of the survey was approximately 59.60 masl and the average water level elevation of Lake A5 at the time of the survey was approximately 54.79 masl. The channel slope varies from 0.5% at the outlet of Lake A6 to between 1.5 and 3.0% along the channel. Wetlands with reduced slope (less than 0.5%) are present along the channel. The outlet channel flows into Lake A5 through a low slope terrain, with surficial materials consisting of mostly organics overlying cobble and gravel.

The typical outlet cross-section is up to 0.5 m deep relative to the surrounding terrain, with a stream bed consisting of mostly gravel with some cobble material and organics. The channel banks were observed to be

mostly organics on top of cobble. Small boulder steps were observed along the channel. At the lake outlet the channel has a single thread planform and is well-defined with flows overtopping the banks during freshet. At high flows, part of the flow is diverted south of the main channel, connecting with the outlet channel of Lake A51 before discharging to Lake A5. This section of the channel is less well-defined with water flowing over banks through grass at high flows.

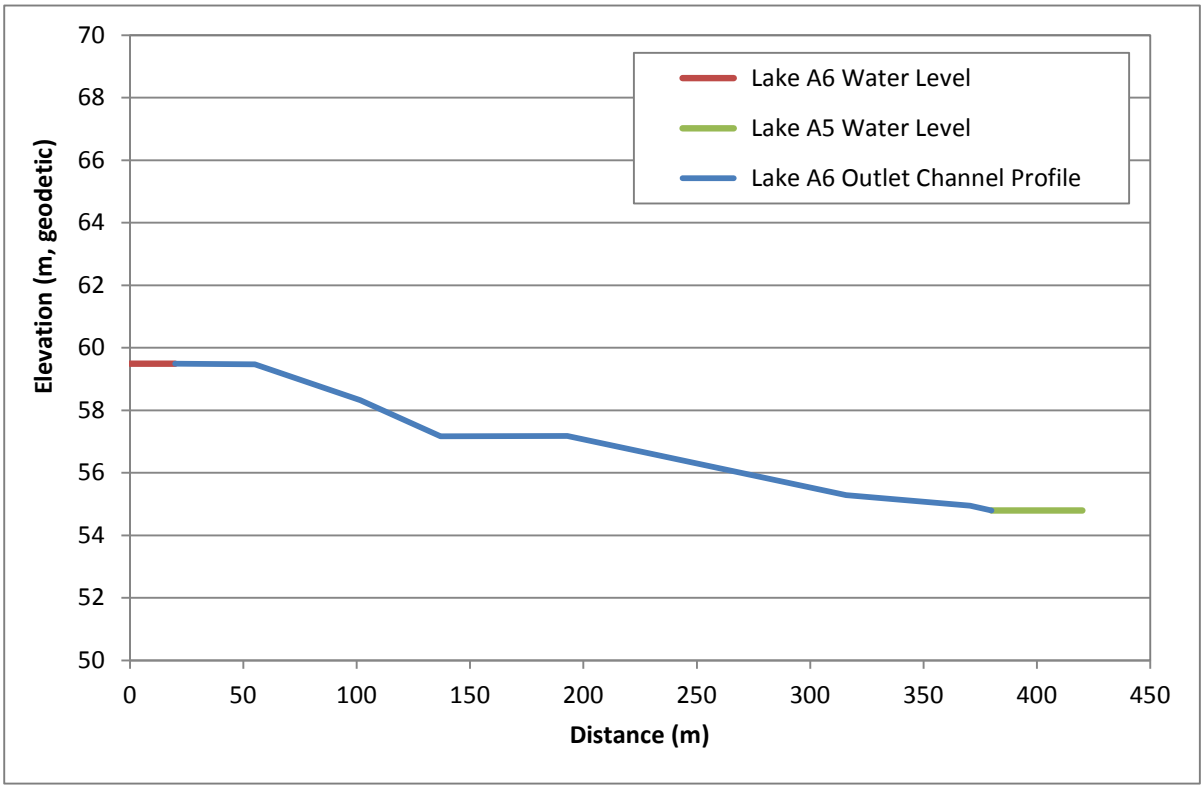



*Figure 7.3-D7: Lake A6 Outlet Channel Profile (m = metres)*

#### 3.1.3.1.1 A6 Outlet Channel Mitigation

The Lake A6 outlet channel will be removed during the Project operations (Mining Phase 1) and therefore no erosion assessment was undertaken.

### *3.1.3.2 Lake A5 Outlet Channel Survey*

The surveyed longitudinal profile of the outlet channel from Lake A5 to Lake A4 is shown in Figure 7.3-D8. The average water level elevation of Lake A5 at the time of the survey was approximately 54.79 masl and the average water level elevation of Lake A4 at the time of the survey was approximately 54.17 masl. The channel slope varies from 0.5 to 1.0% along the channel. The outlet channel flows into Lake A4 through a low slope terrain, with surficial materials consisting of mostly organics overlying cobble and gravel.

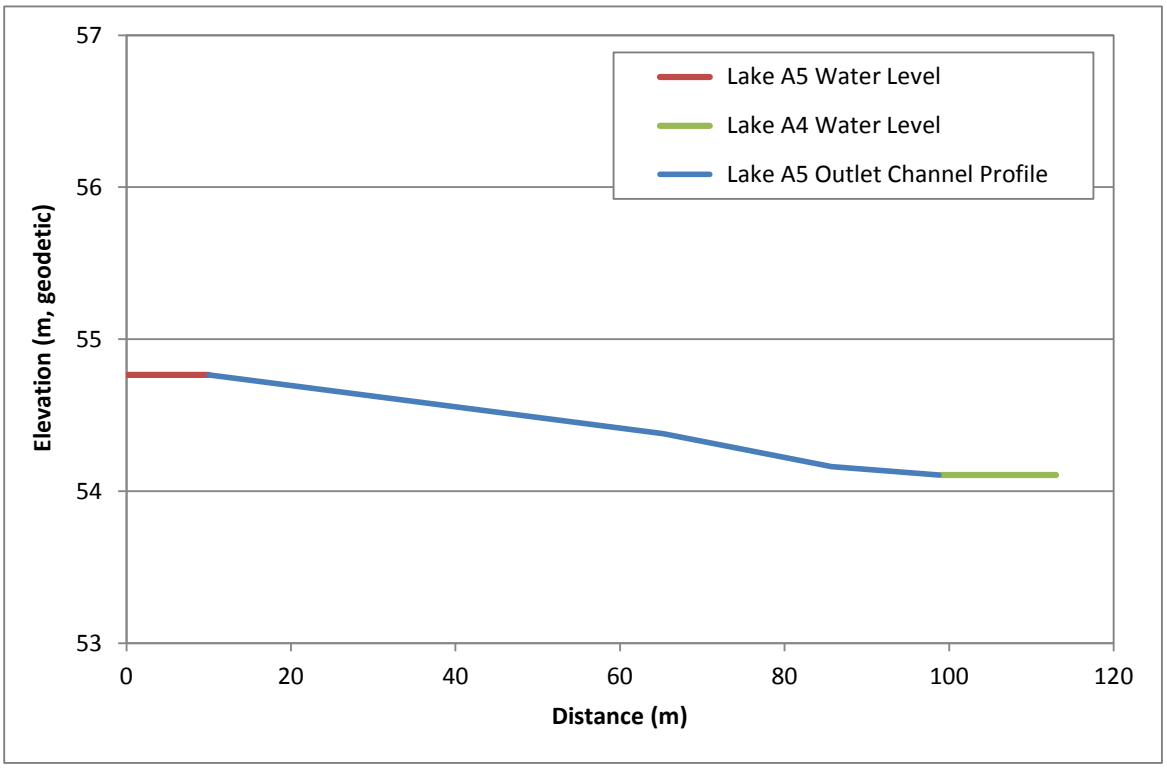



*Figure 7.3-D8: Lake A5 Outlet Channel Profile (m = metres)*

The typical outlet channel cross-section (Figure 7.3-D9) is less than 0.5 m deep relative to the surrounding terrain and flows through a well-defined channel. At high flows the banks are overtopped and water flows through grass. The channel bank materials were observed to consist of organics overlying gravel and cobble, and the streambed was observed to be a mix of gravel and cobble.

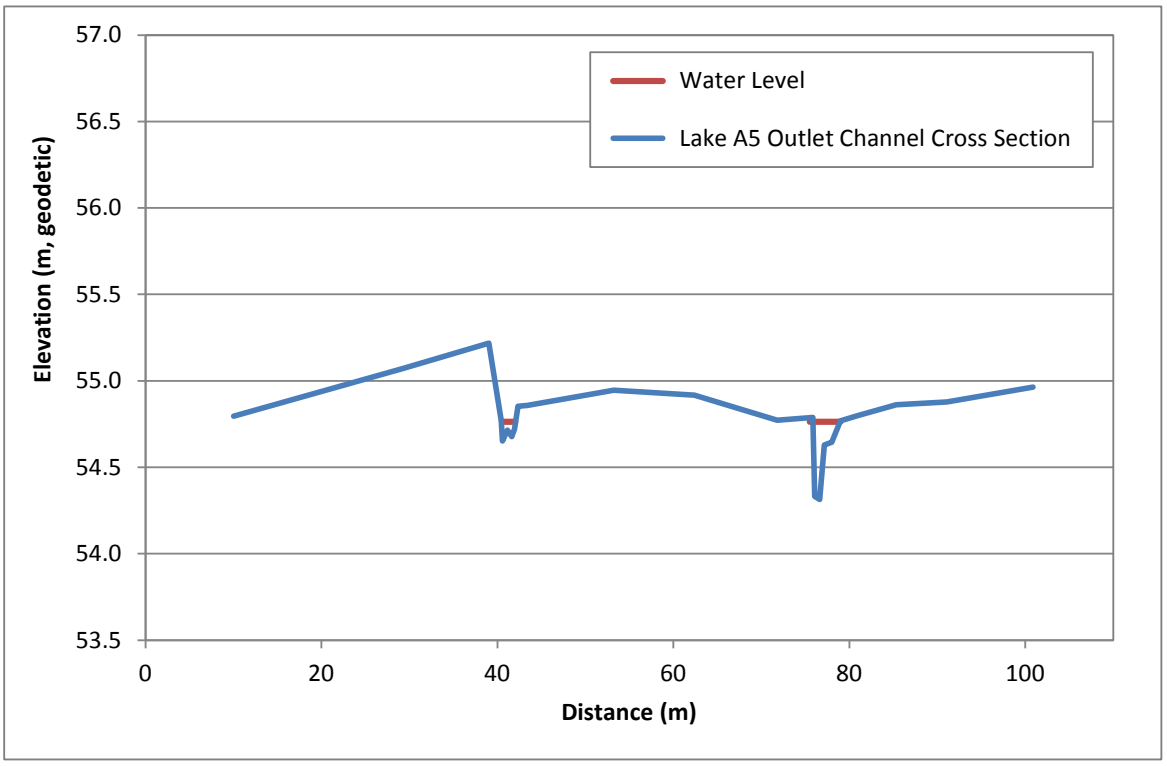



*Figure 7.3-D9: Lake A5 Outlet Channel Cross-Section (m = metres)*

#### 3.1.3.2.1 A5 Outlet Channel Mitigation

The Lake A5 outlet channel will be removed during the Project operations (Mining Phase 1) and therefore no erosion assessment was undertaken.

### *3.1.3.3 Lake A4 Outlet Channel Survey*

The existing outlet channel of Lake A4 is a short channel approximately 20 m long, with an average slope of 0.6% along the channel. The channel maintains flows through surficial materials consisting of mostly organics overlying gravel and cobble. The main channel materials in the streambed are gravel and cobbles, and at high flows during spring freshet the channel is overtopped, flooding the surrounding areas.

#### 3.1.3.3.1 A4 Outlet Channel Mitigation

The Lake A4 outlet channel will be removed during the Project operations Mining Phase 1 and therefore no erosion assessment was undertaken.

### 3.1.3.4 Lake A3 Outlet Channel Survey

The existing outlet channel from Lake A3 to Lake A2 was surveyed and the longitudinal profile is shown in Figure 7.3-D10. The average water level elevation of Lake A3 at the time of the survey was approximately 53.93 masl and the average water level elevation of Lake A2 at the time of the survey was approximately 53.75 masl. The average channel slope is 0.3% along the main channel.

The typical outlet channel cross-section (Figure 7.3-D11) is well-defined with an average width of up to 5 m and a typical depth of less than 0.5 m relative to the surrounding terrain. The streambed was observed to be a mix of gravel and cobble. At high flows the banks are overtopped and water flows through grass. The channel banks were observed to be organics overlying gravel and cobble.

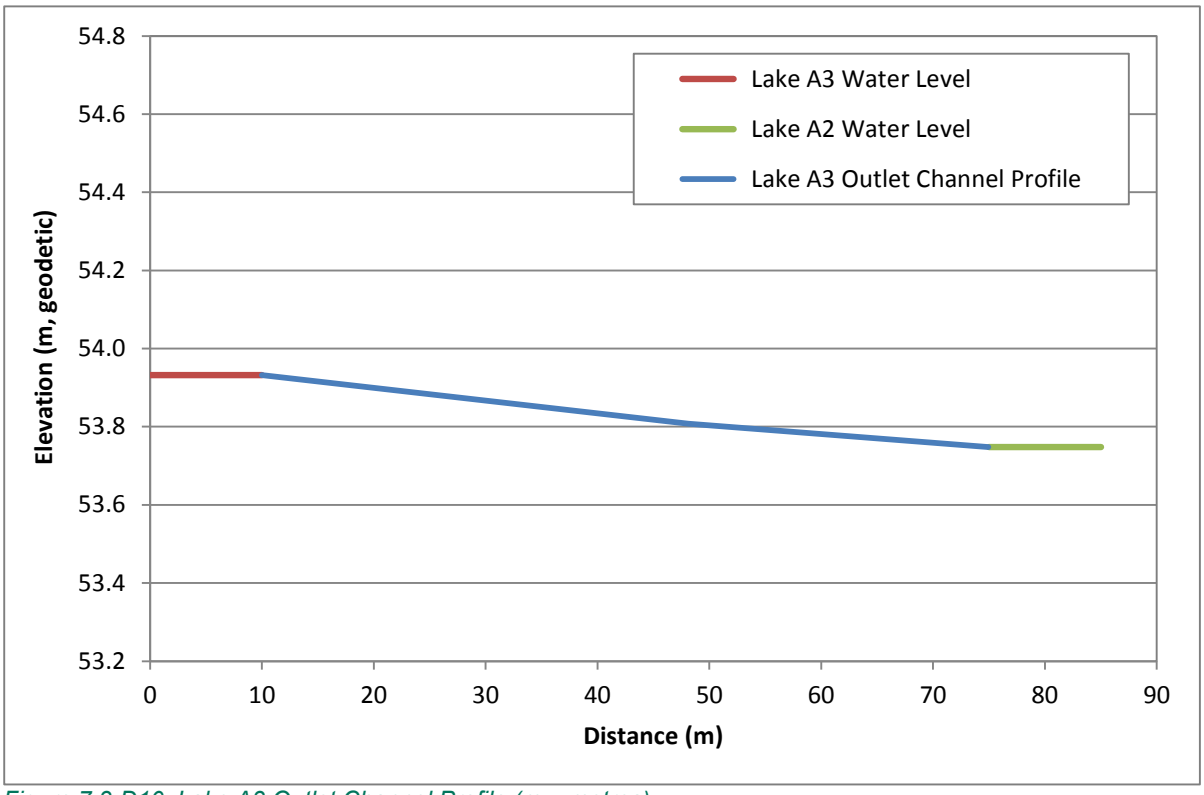



*Figure 7.3-D10: Lake A3 Outlet Channel Profile (m = metres)*

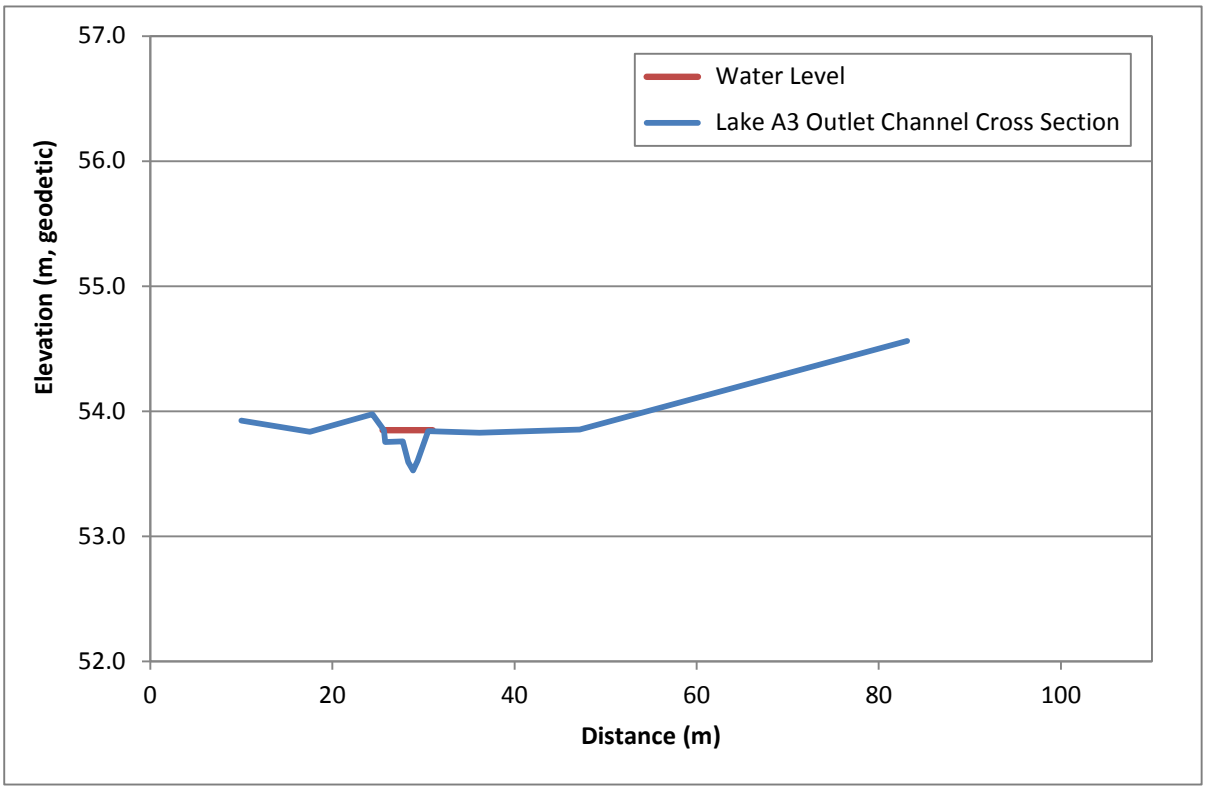



*Figure 7.3-D11: Lake A3 Outlet Channel Cross-Section (m = metres)*

#### 3.1.3.4.1 A3 Outlet Channel Mitigation

The Lake A3 outlet channel will be removed during the Project operations (Mining Phase 1) and therefore no erosion assessment was undertaken.

### *3.1.3.5 Lake A2 Outlet Channel Survey*

The existing outlet channel from Lake A2 to Lake A1 was surveyed and the longitudinal profile is shown in Figure 7.3-D12. The average water level elevation of Lake A2 at the time of the survey was approximately 53.53 masl and the average water level elevation of Lake A1 at the time of the survey was approximately 53.01 masl. The average channel slope is 0.7% along the main channel.

The typical outlet channel cross-section is well-defined (Figure 7.3-D13) with an average width of 1.5 m and a typical depth of less than 0.3 m relative to the surrounding terrain. The streambed was observed to be a mix of gravel and cobble. At high flows the banks are overtopped and water flows through grass. The channel banks were observed to be organics overlying gravel and cobble.

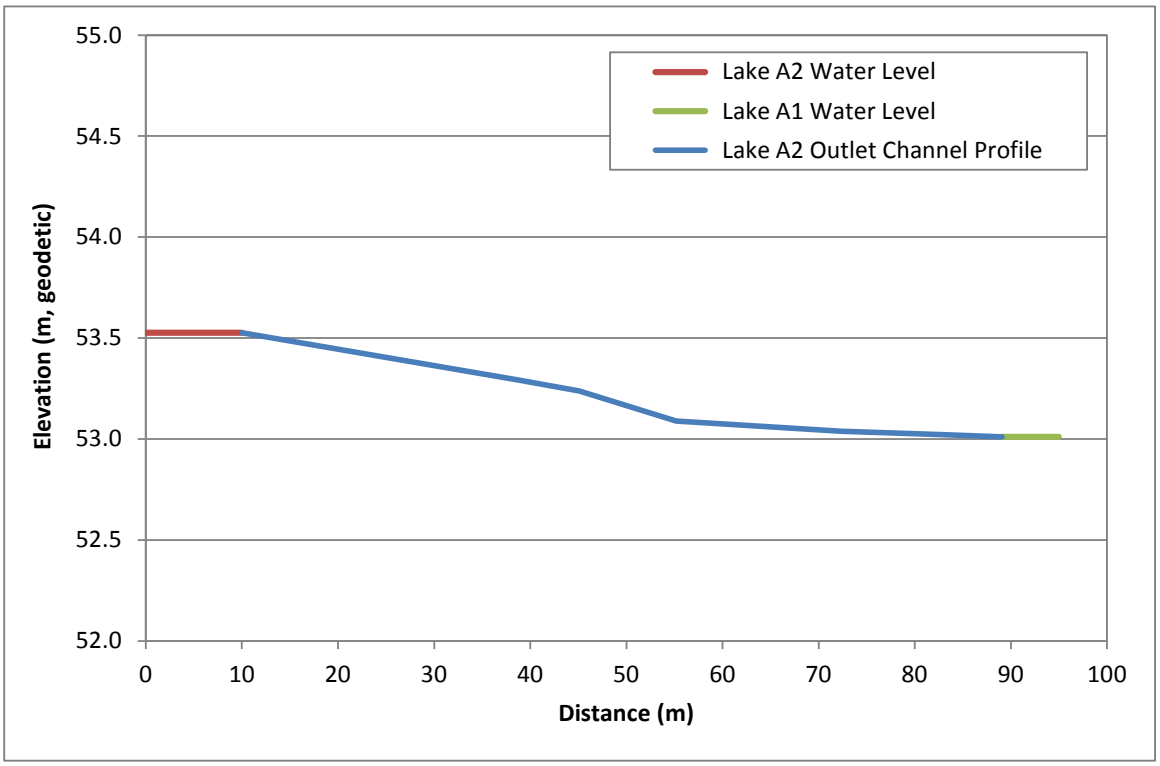



*Figure 7.3-D12: Lake A2 Outlet Channel Profile (m = metres)*

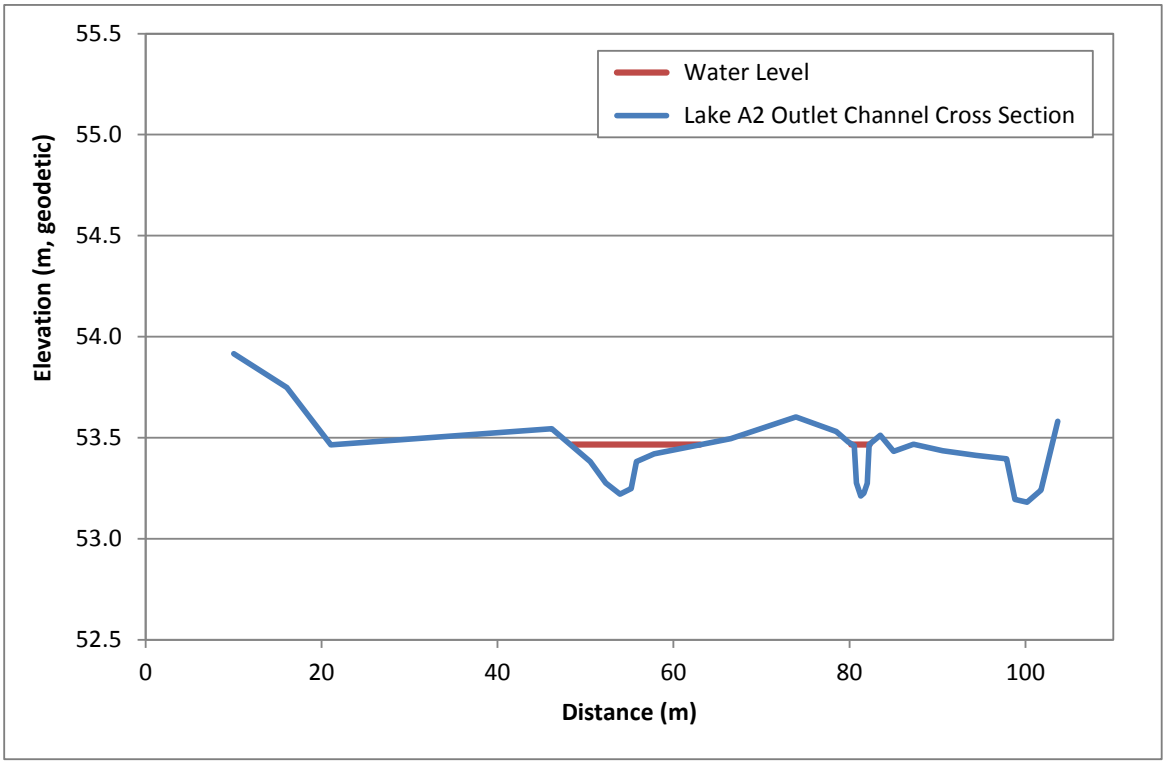



*Figure 7.3-D13: Lake A2 Outlet Channel Cross-Section (m = metres)*

#### 3.1.3.5.1 A2 Outlet Channel Mitigation

The Lake A2 outlet channel will be removed during the Project operations (Mining Phase 1) and therefore no erosion assessment was undertaken.

### 3.1.4 Lake A1 Outlet Channel Survey

The existing outlet channel from Lake A1 to Meliadine Lake was surveyed and the longitudinal profile is shown in Figure 7.3-D14. The average water level elevation of Lake A1 at the time of the survey was approximately 59.90 masl and the average water level elevation of Meliadine Lake at the time of the survey was approximately 52.11 masl. The channel slope is gentle on the upstream section of the channel at 0.5%, and steeper on the downstream half of the channel at 2.6%.

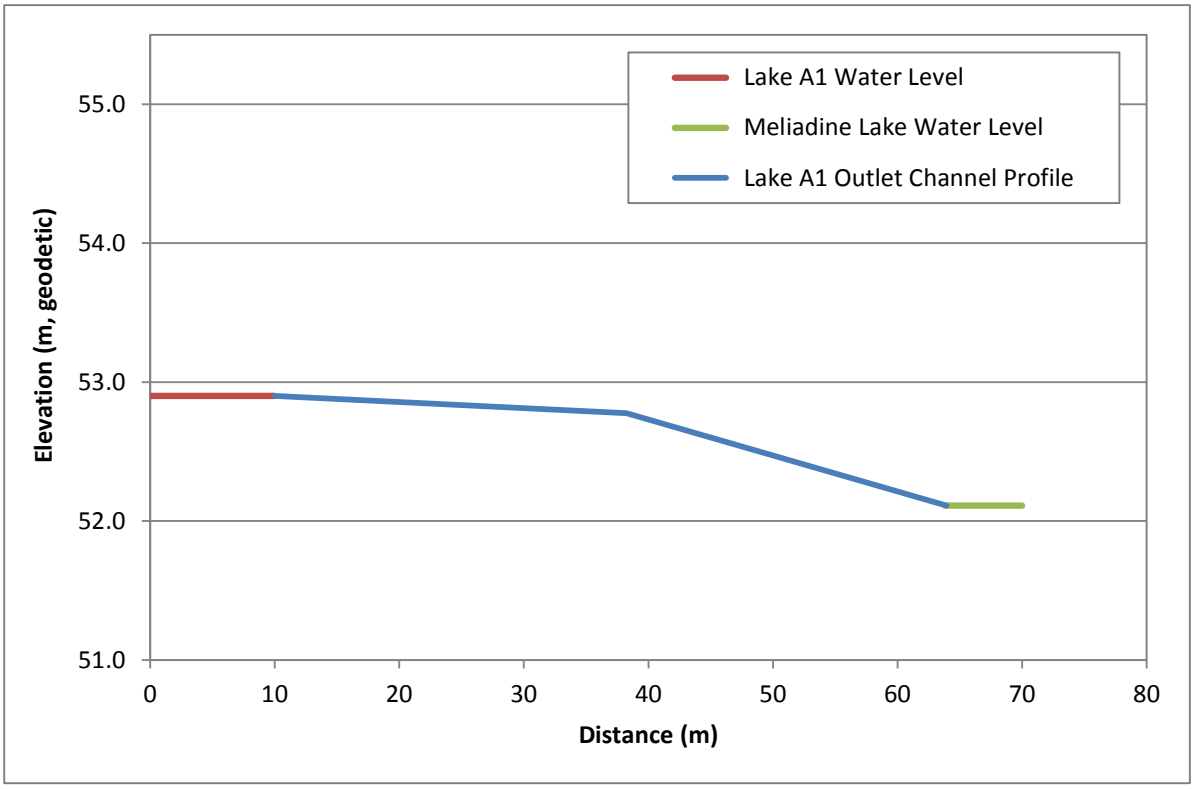



*Figure 7.3-D14: Lake A1 Outlet Channel Profile (m = metres)*

The typical outlet channel cross-section is well-defined (Figure 7.3-D15) with an average width of 2 m and a typical depth of less than 0.3 m relative to the surrounding terrain. The streambed was observed to be a mix of gravel and cobble. At high flows the banks are overtopped and water flows through grass. The channel banks were observed to be organics overlying gravel and cobble.

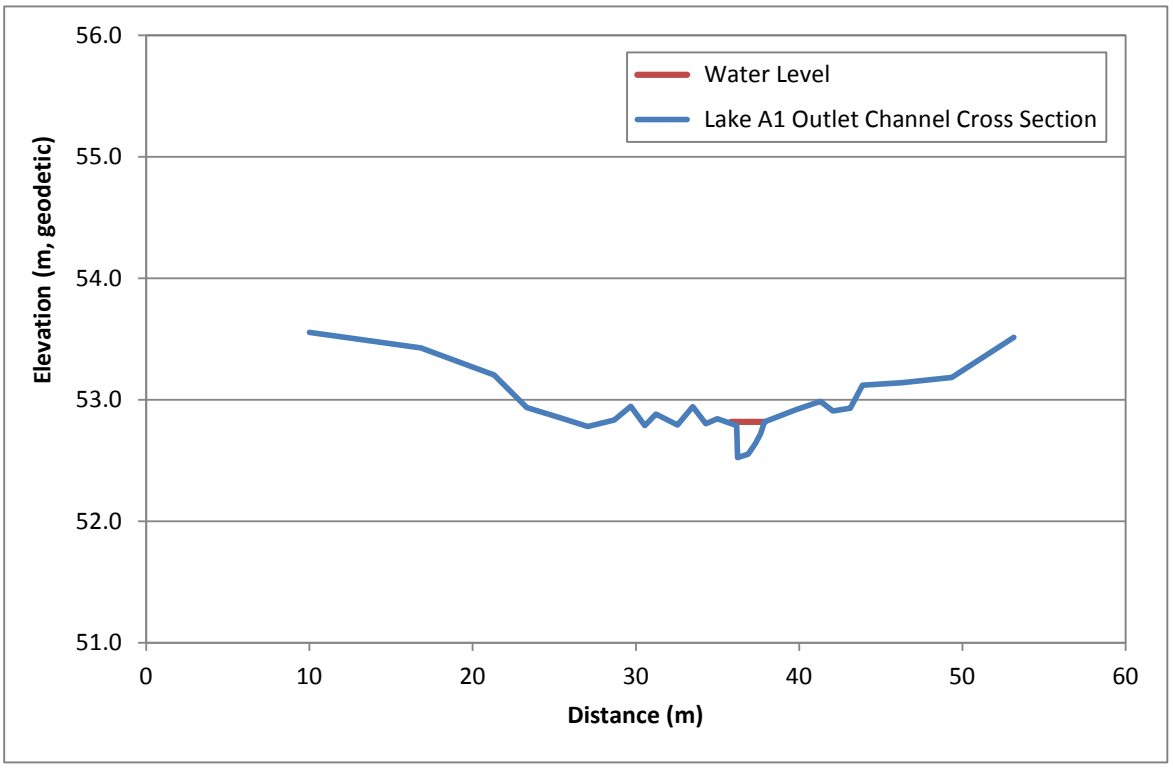



*Figure 7.3-D15: Lake A1 Outlet Channel Cross-Section (m = metres)*

### *3.1.4.1 A1 Outlet Channel Mitigation*

During the Lake A8 dewatering phase (Pre-production Phase), the A1 outlet channel will carry augmented flows (Section 7.3.3.3.1, FEIS); however, no effects on Lake A1 Outlet channel or bank stability are expected because the augmented flood magnitudes will only exceed baseline values for a small period of time, and are not sustained (typically a couple days during the freshet).

## 3.1.5 Other Waterbodies in A Watershed

A series of small lakes and unnamed waterbodies in the A Watershed (the two tributaries on the northeast shore of Lake A8) will also be affected by the Project. These waterbodies include: Lake A17, A13, A12, A11, A10, and A9 for the first tributary; and Lake A54, A39, A38, and A35 for the second tributary. The waterbodies do not have defined outlet channels, and outflows occur only during freshet or rain events, and mostly through vegetation.

Two longitudinal profiles between these lakes were extracted from the existing digital elevation model and are presented in Figure 7.3-D16 as follows:

- From Lake A17 to Lake A8, through Lakes A13, A12, A11, A10 and A9; and
- From Lake A54 to Lake A8, through Lakes A39, A38 and A35.

The typical slope along the main channel from Lake A17 to Lake A8 is less than 2% with only a few locations with slopes between 4 and 10%. The typical slope along the main channel from Lake A54 to Lake A8 is less than 2.5% with only a few locations with slopes of approximately 5%.

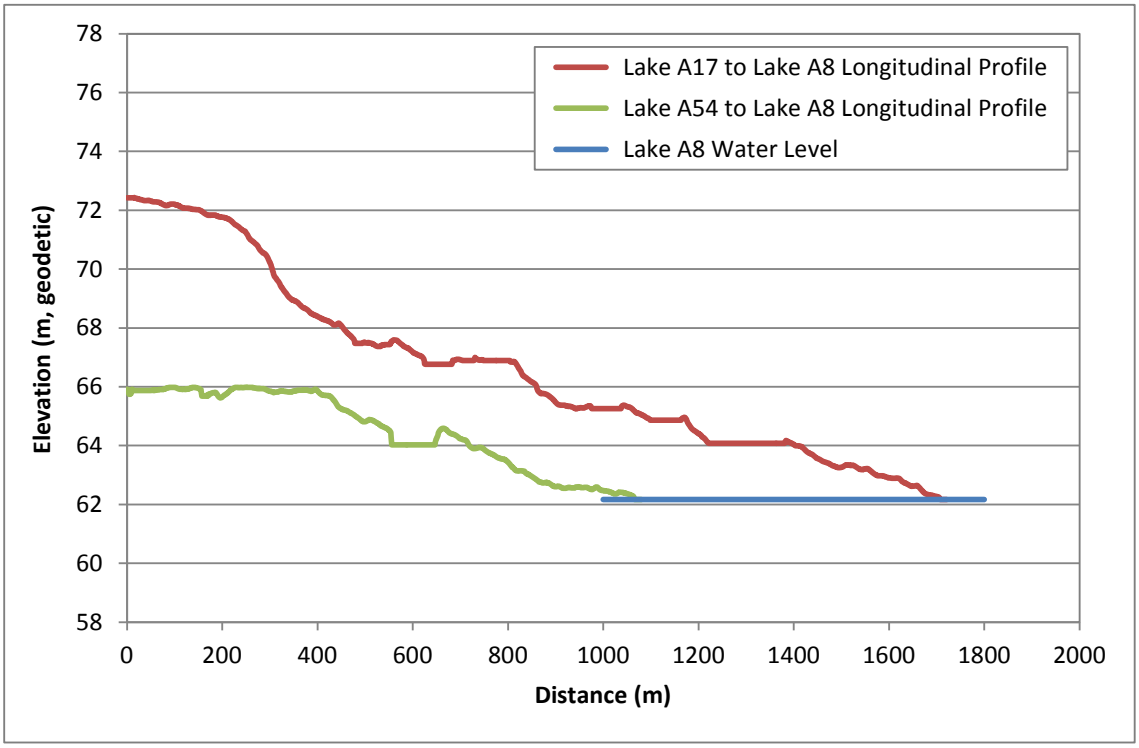



*Figure 7.3-D16: Longitudinal Profile from Lake A17 to A8 and from Lake A54 to A8 (m = metres)*

## 3.2 B Watershed

The B watershed is located west of the existing camp and has an area of approximately 9.31 $km^2$ of which 4.5 $km^2$ is lake water surface.

### 3.2.1 Lake B6 Outlet Channel Survey

Lake B6 is located west of the existing camp, has an area of approximately 11.8 ha (equivalent to 0.118 $km^2$) and is the main lake in the B6 sub-watershed. During the field surveys, it was observed that Lake B6 has two outlet channels at the south end, one flowing southwest directly into Lake B5, and the second channel flowing southeast into Lake B30 and then Lake B31 before reaching Lake B5. The average water level elevation of Lake B6 at the time of the survey was approximately 61.92 masl and the average water level elevation of Lake B5 at the time of the survey was approximately 58.17 masl.

The southwest outlet channel was surveyed and the longitudinal profile is shown in Figure 7.3-D17. The channel slope varies from low slopes at the beginning and the end of the channel, to high slopes in the mid-section of approximately 10%. The typical outlet cross-section (Figure 7.3-D18) indicates a well-defined channel cross-section approximately 0.4 m wide that is used only during high flows when the Lake B6 water levels elevations are higher than the invert of the cross-section.

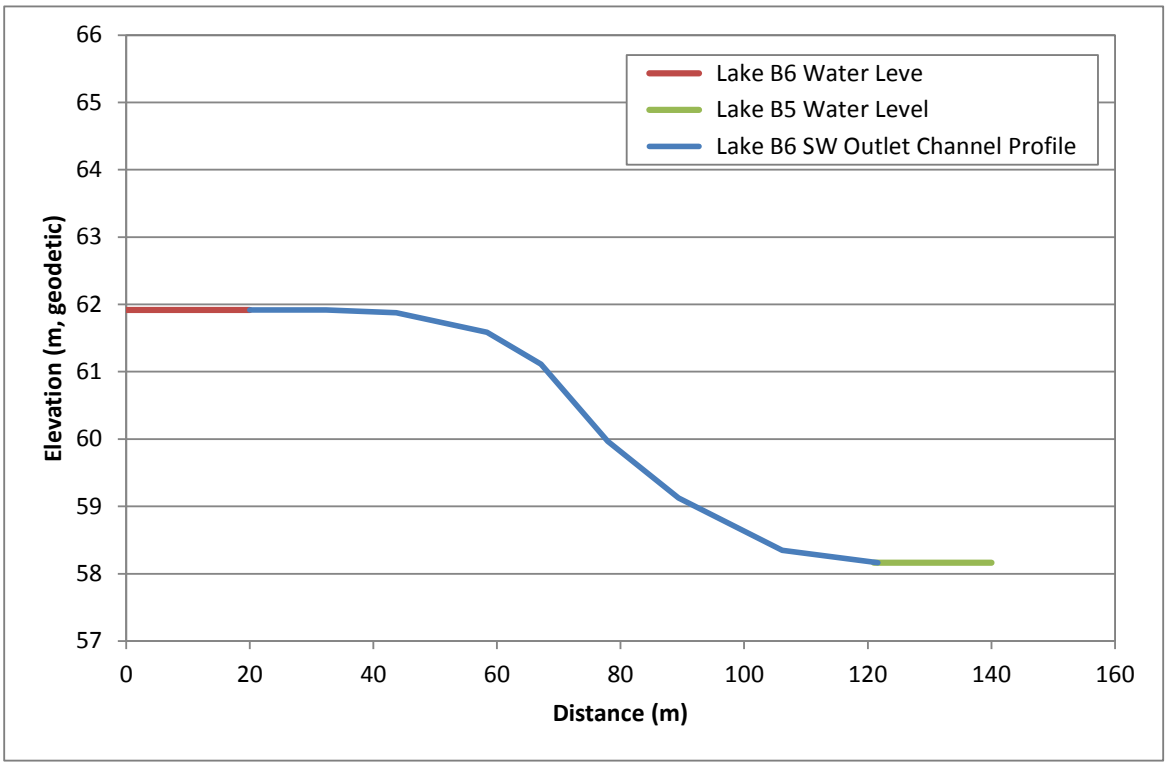



*Figure 7.3-D17: Lake B6 Southwest Outlet Channel Profile (m = metres)*

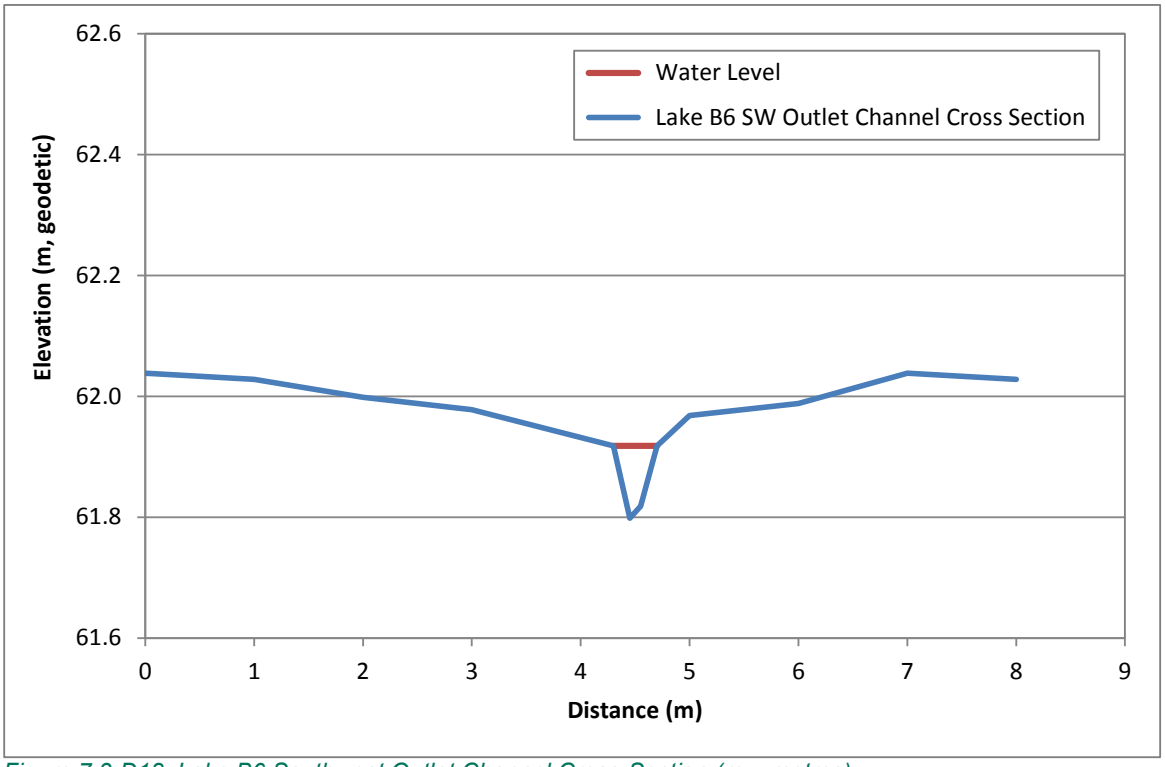



*Figure 7.3-D18: Lake B6 Southwest Outlet Channel Cross-Section (m = metres)*

The surveyed data collected for Lake B6 outlet channel will provide field information for redesigning the outlet channels of lakes D7, D6, D5 and D4 at Post-Closure when Lake B5 will be permanently diverted to the D watershed (Section 3.3 D Watershed).

A longitudinal profile along the southeast outlet channel through lakes B30 and B31 was extracted from the existing digital elevation model and is presented in Figure 7.3-D19. The typical slope along this channel is between 1 and 3%. The typical outlet cross-section (Figure 7.3-D20) has a larger cross-section that is the main channel in the outlet with an average channel depth of 0.3 m relative to the surrounding terrain. The streambed was observed to be a mix of gravel and cobble. At high flows the banks are overtopped and water flows through grass. The channel banks were observed to be organics overlying gravel and cobble.

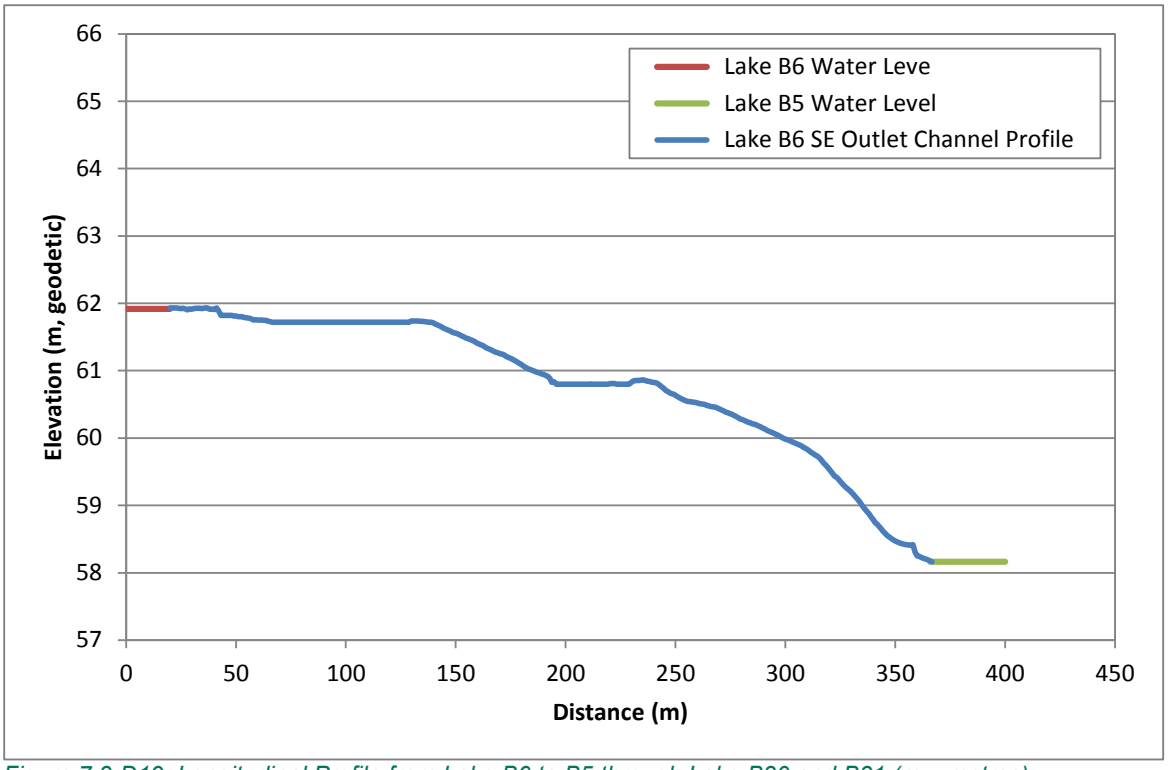



*Figure 7.3-D19: Longitudinal Profile from Lake B6 to B5 through Lake B30 and B31 (m = metres)*

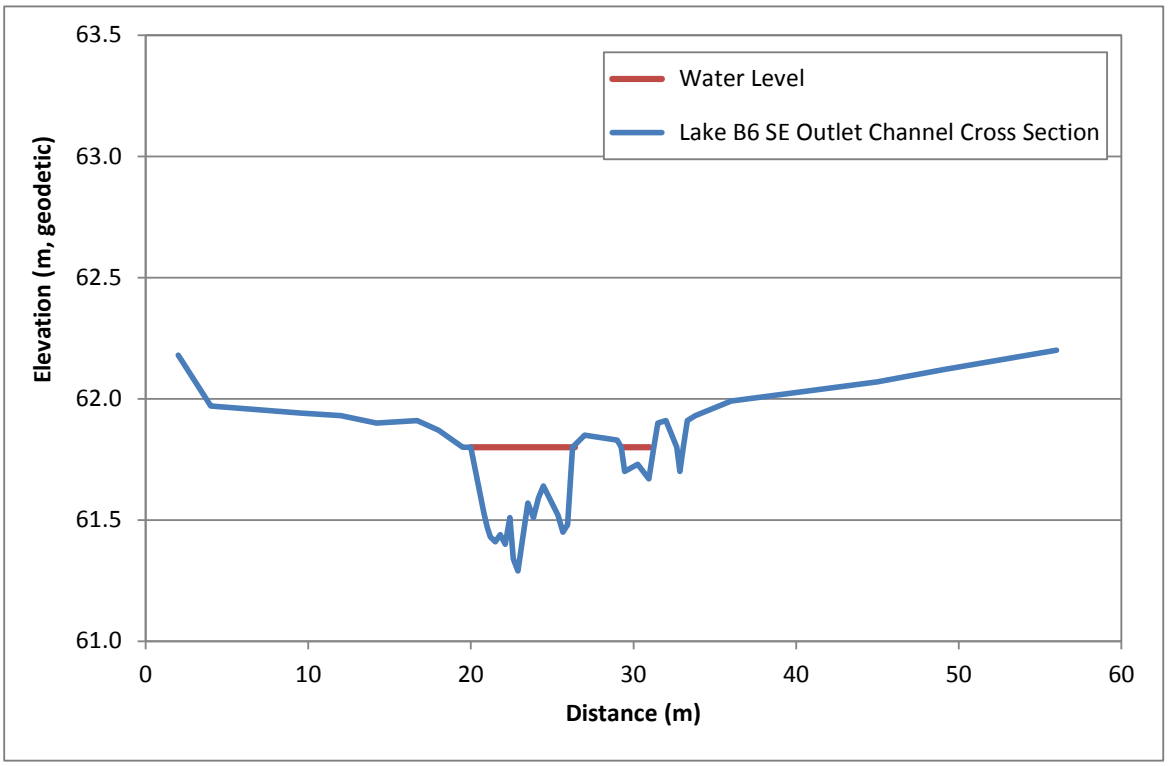



*Figure 7.3-D20: Lake B6 Southeast Outlet Channel Cross-Section (m = metres)*

#### *3.2.1.1 Lake B6 Outlet Channel Mitigation*

Lake B6 will transfer the dewatering flows of Lake B7 to Lake B5 during the Project Pre-production phase (Section 7.3.3.3.1, FEIS). To minimize potential stream erosion, dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping to Lake B6 will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows low relative to the peak flow baseline condition. This approach is expected to minimize the potential for increased channel erosion.

During the Project's second operational phase (Mining Phase 2), Lake B6 will be dewatered and covered by the B7 Waste Rock Storage Facility.

### 3.2.2 Lake B34 Outlet Channel Survey

Lake B34 is located west of the existing camp, has an area of approximately 4.4 ha, and flows into Lake B5. During the Pre-production phase and Mining Phases 1 and 2 the lake will receive the pumped flows from Lake B36.

The outlet channel from Lake B34 to Lake B5 was surveyed and the average water level elevations of lakes B34 and B5 at the time of the survey were approximately 61.13 masl and 58.17 masl, respectively.

The longitudinal profile of the Lake B34 outlet channel was surveyed and is shown in Figure 7.3-D21. The channel slope is generally low at the outlet of Lake B34 and at the inlet of Lake B5, and with a higher slope in the mid-section of up to 2.6% locally. The outlet channel flows into Lake B5 through a low slope terrain with surficial materials consisting of mostly soils and organics.

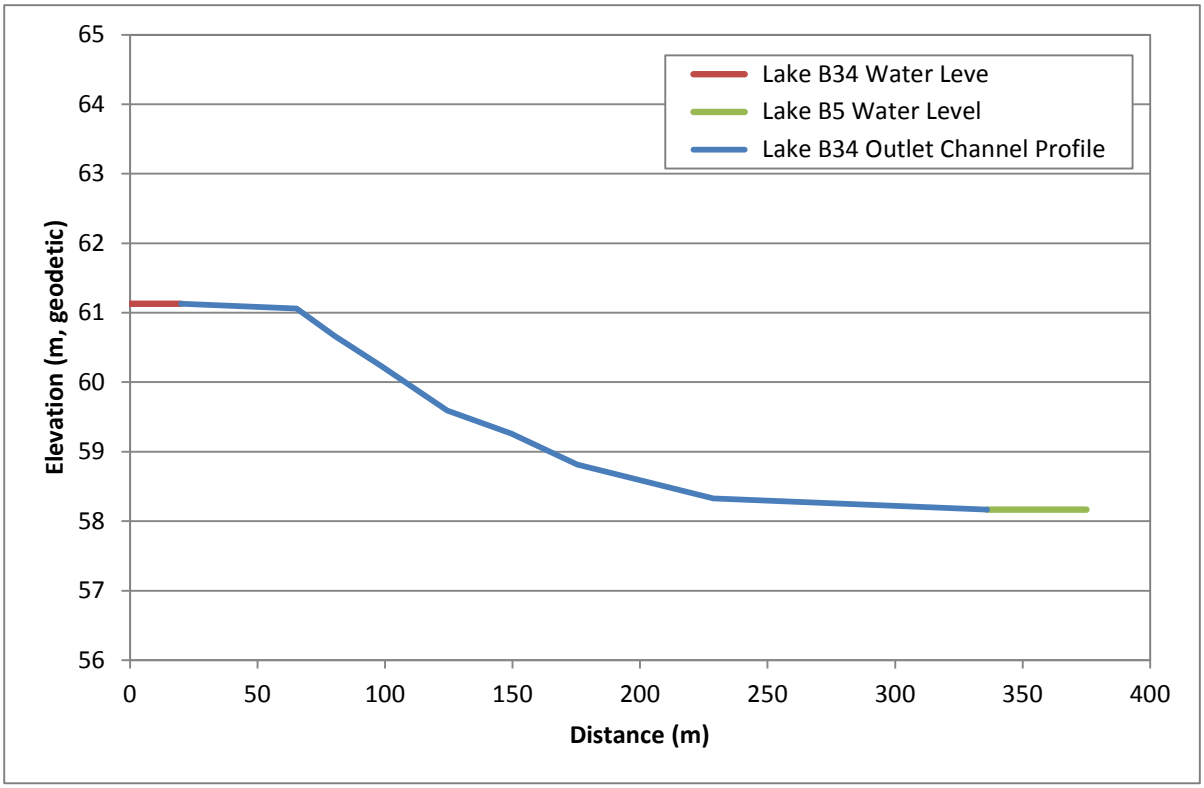



*Figure 7.3-D21: Lake B34 Outlet Channel Profile (m = metres)*

The typical channel cross-section (Figure 7.3-D22) has a relatively shallow channel, up to 0.2 m deep relative to the surrounding terrain, which is undefined at times. It appears to carry flow during the freshet and rain events. The outlet channel flows into Lake B5 through a relatively flat terrain, with surficial materials consisting of mostly soils and organics.

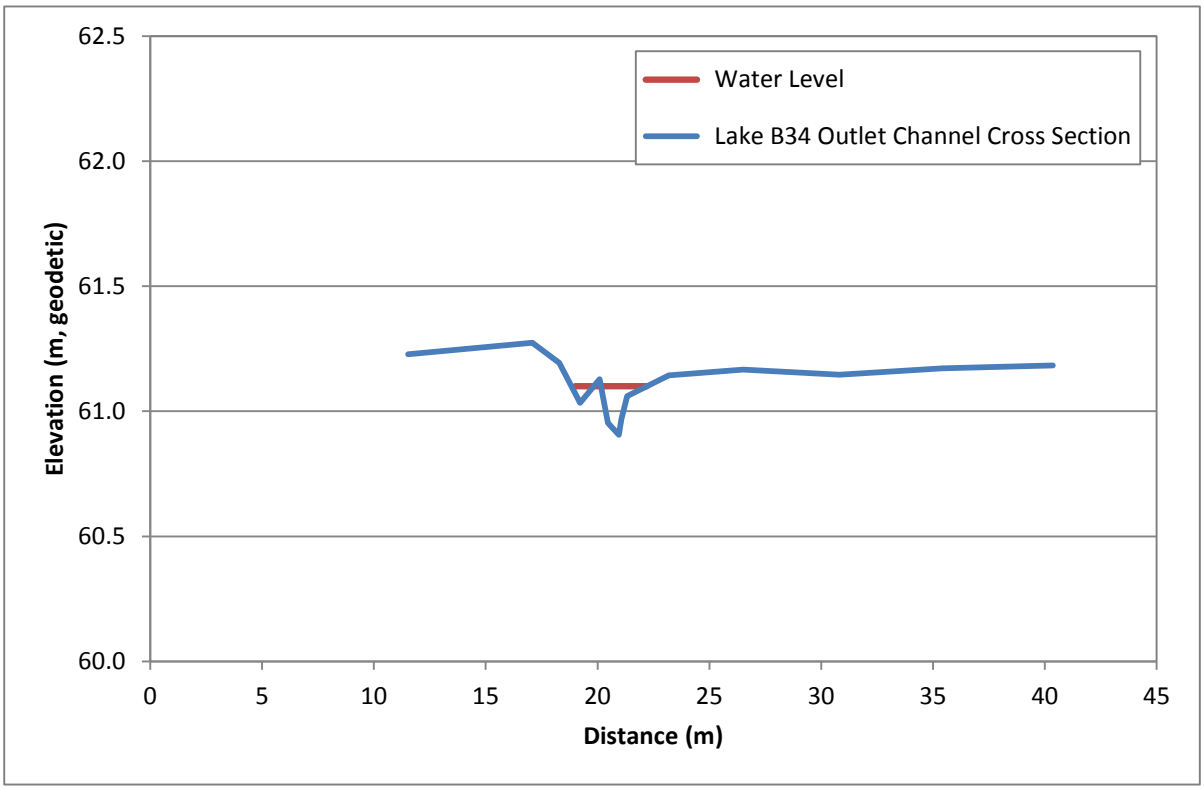



*Figure 7.3-D22: Lake B34 Outlet Channel Cross-Section (m = metres)*

#### *3.2.2.1 Lake B34 Outlet Channel Mitigation*

Lake B34 will not be directly affected by the Project footprint; however, it will receive pumped flows during the Pre-production phase and Mining Phases 1 and 2 from the Lake B36 flow diversion. To minimize potential channel erosion, dewatering of Lake B36 will be delayed until after the spring freshet. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at or below peak flow baseline conditions. This approach is expected to minimize the potential for increased channel erosion.

### 3.2.3 Lake B2 Outlet Channel Survey

Lake B2 is located southwest of the existing camp, has an area of approximately 49.4 ha, and drains to Lake B1.

The average water level elevation of Lake B2 at the time of the survey was approximately 54.29 masl and the average water level elevation of Lake B1 at the time of the survey was approximately 53.25 masl.

The existing outlet channel from Lake B2 to Lake B1 was surveyed and the longitudinal profile is shown in Figure 7.3-D23. The channel slope is generally low with an approximate maximum slope of up to 1.3% locally. The outlet channel flows into Lake B1 through a low slope terrain, with surficial materials consisting of mostly organics overlying cobble and gravel.

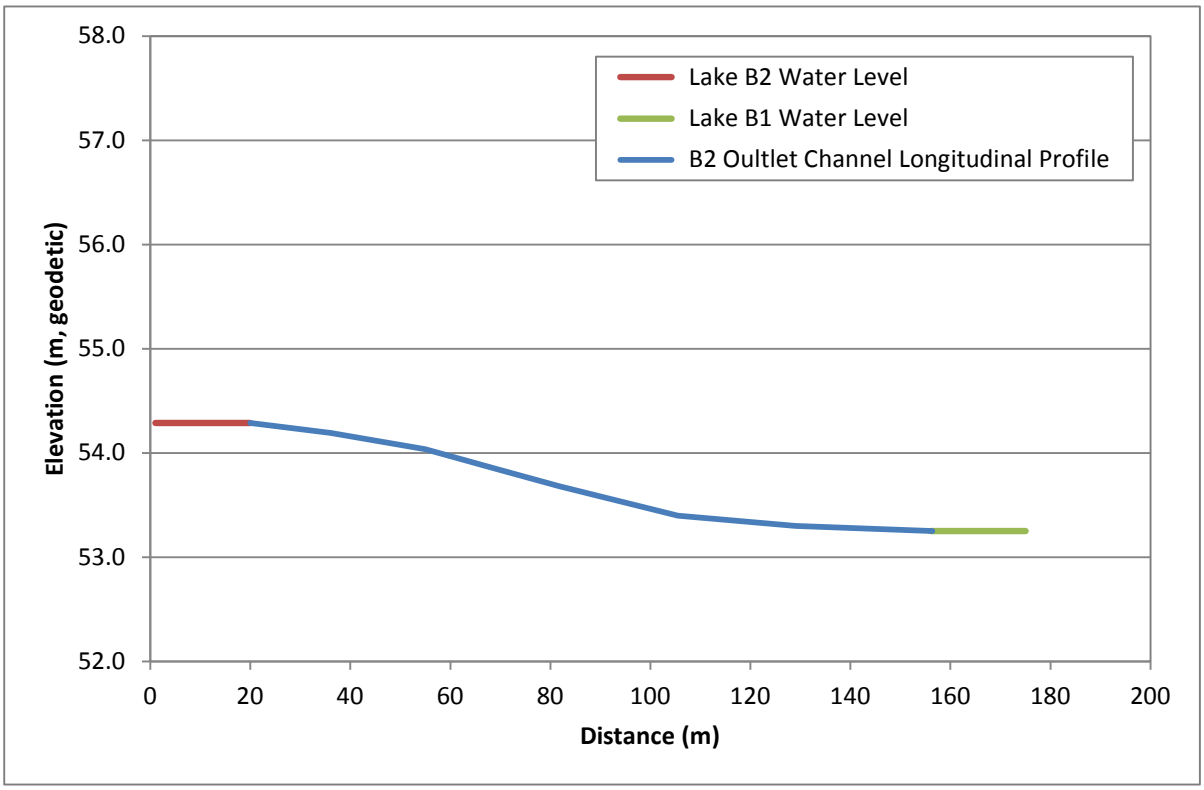



*Figure 7.3-D23: Lake B2 Outlet Channel Profile (m = metres)*

The typical channel cross-section (Figure 7.3-D24) is up to 0.5 m deep relative to the surrounding terrain, with a stream bed of mostly gravel and cobble material. The channel banks were observed to be mostly organics overlying cobble. The outlet is a well-defined channel with flows on top of the banks during freshet.

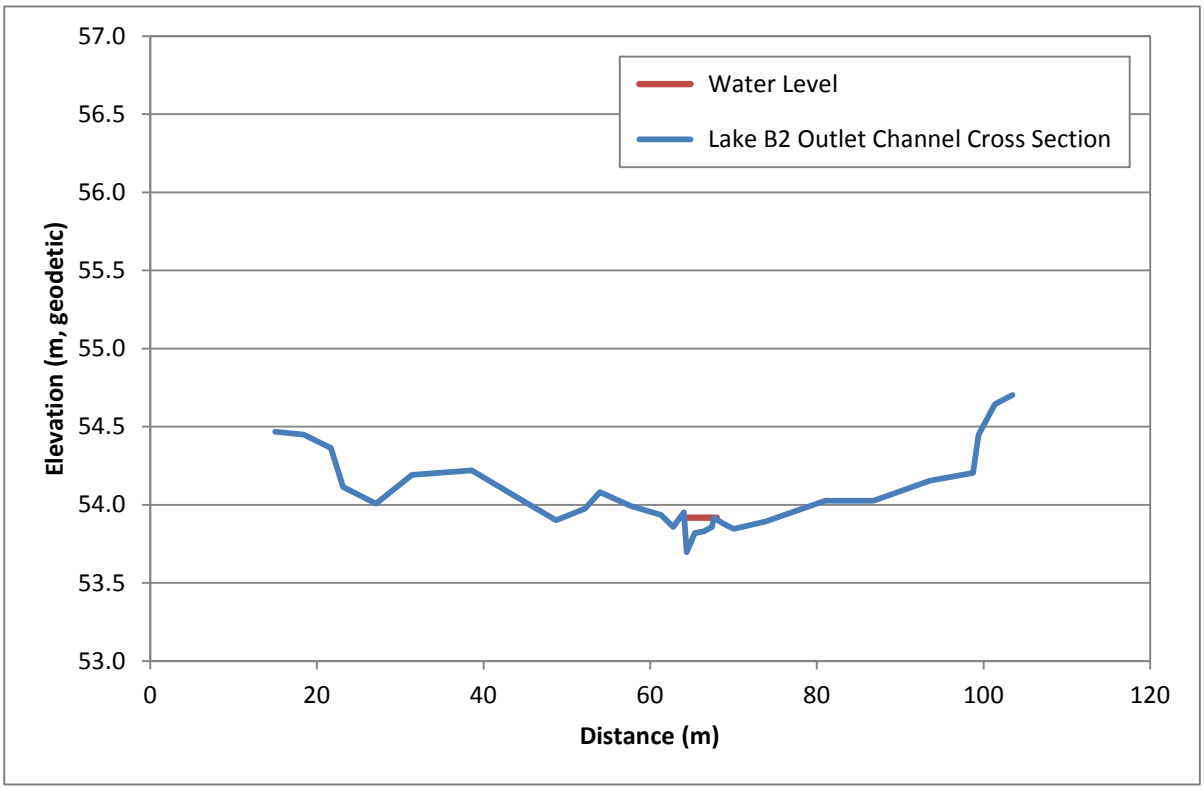



*Figure 7.3-D24: Lake B2 Outlet Channel Cross-Section (m = metres)*

### 3.2.3.1 Lake B2 Outlet Channel Mitigation

During the Project, Lake B2 will not be affected by the Project footprint; however, it will have reduced flows because of the disconnected upstream lakes. Therefore no erosion mitigation is anticipated to be required on the outlet channel as flow volumes and velocities are expected to be reduced.

## 3.2.4 Lake B45 Shoreline Surveys

Lake B45 is located southwest of the existing camp and has an area of approximately 47.3 ha. The lake drains into Lake B4 through a wide channel (approximately 5 m) with low slope that result in similar water surface elevations in both lakes. The average water level elevation of Lake B45 at the time of the survey was approximately 56.30 masl.

Lake B45 will be permanently disconnected from Lake B4 as a result of the construction of a small dike at the existing lake outlet. The construction of the dike will raise the water level in Lake B45 by approximately 0.9 m, resulting in flooding of the existing shoreline and diversion of lake outflows to Lake B44 and further to the P watershed from where it will reconnect to B watershed through Lake B2.

The surveyed Lake B45 outlet channel cross-section is shown in Figure 7.3-D25. The channel that connects Lake B45 and B4 was flooded at the time of visit resulting in lakes B45 and B4 forming a single waterbody with similar water level elevations. The outlet channel stream bed consists mostly of gravel and some cobble mixed

with organics. The channel banks were observed to be mostly organics overlying cobble, with flows typically spreading out over the banks during freshet.

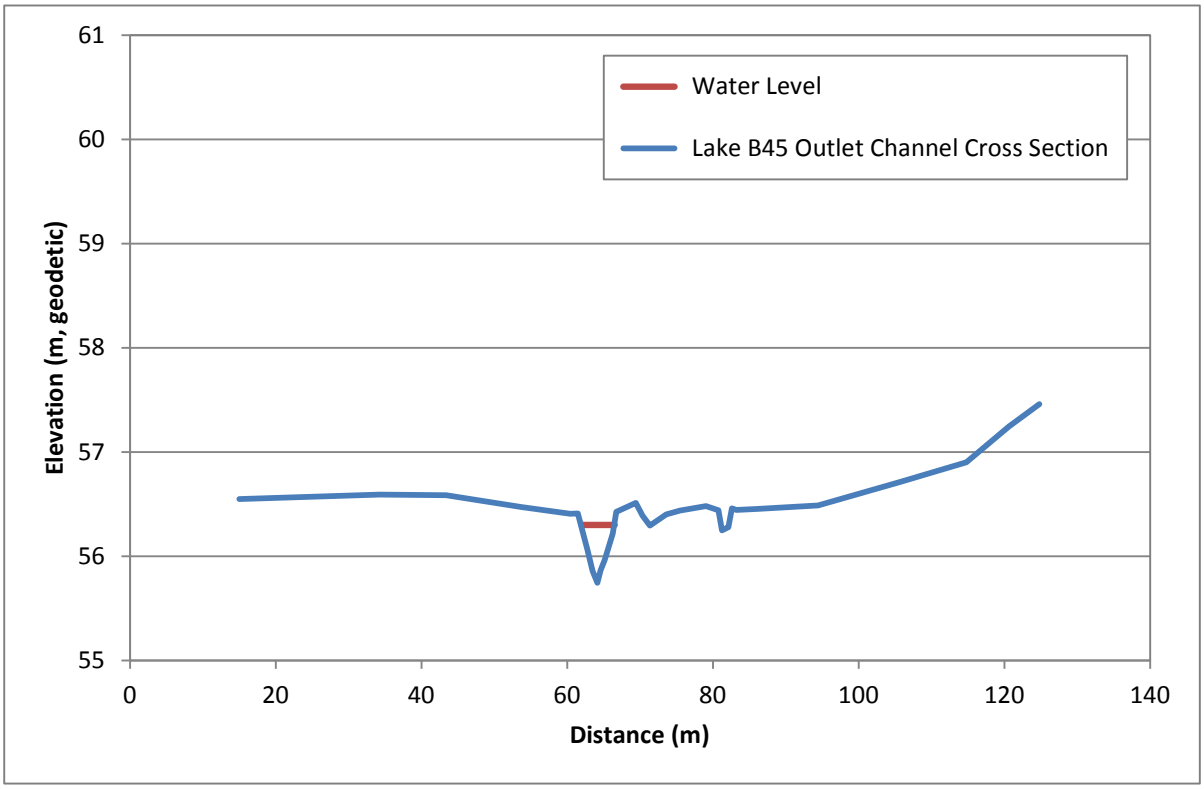



*Figure 7.3-D25: Lake B45 Outlet Channel Cross-Section (m = metres)*

A total of 27 transects (Table 7.3-D7) were surveyed around the perimeter of Lake B45 to evaluate the shoreline erosion potential after dike construction and increased water level elevations. The transect locations are shown in Figure 7.3-D26. Lake B45 is oriented northwest to southeast, and has small sections of moderately sloped banks on the northeast and south banks (typical slopes between 15 and 40%) but the majority of the shoreline is characterized by shallow to gentle slopes (typically less than 15%).

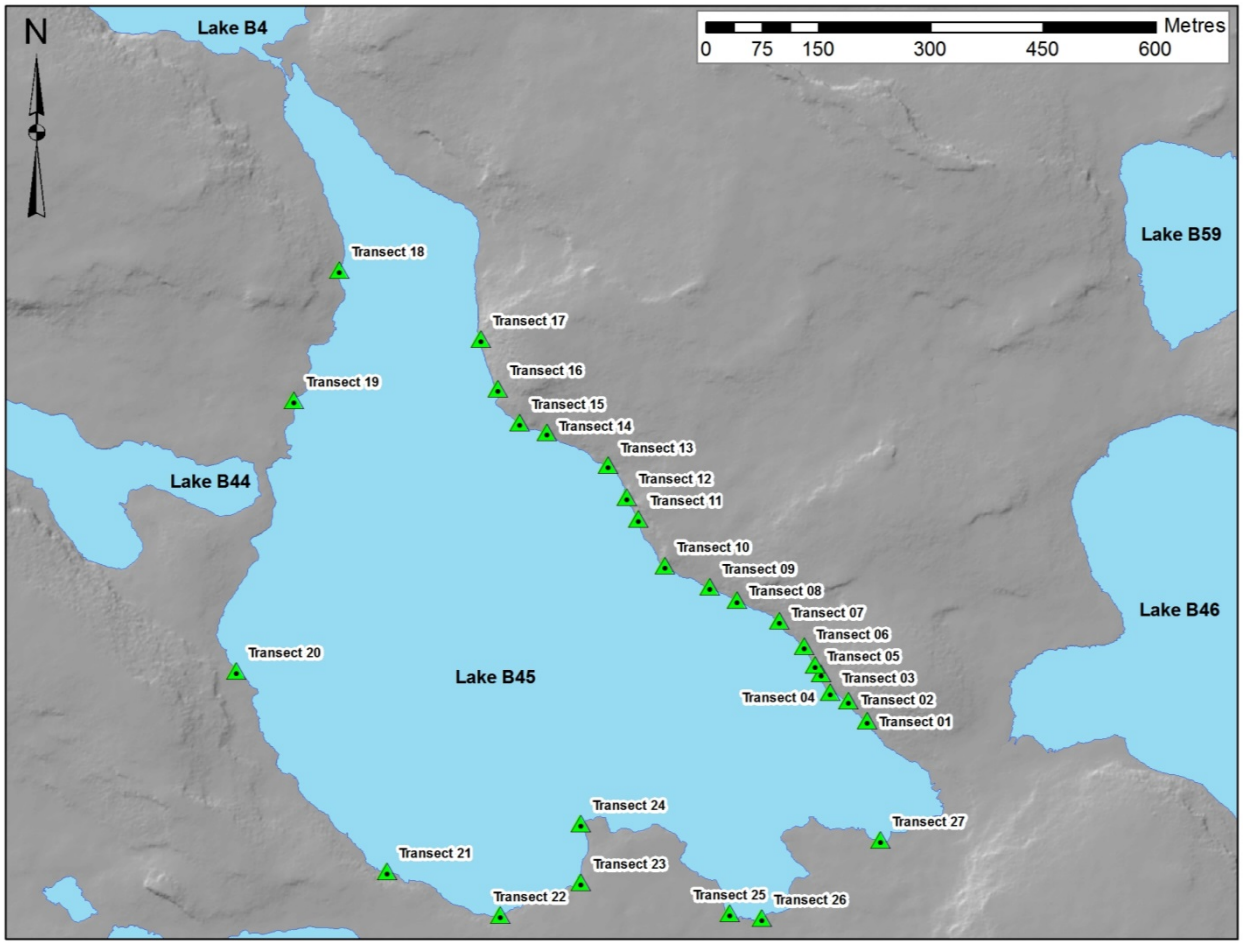



*Figure 7.3-D26: Lake B45 Shoreline Transect Locations*

**Table 7.3-D7: Lake B45 Surveyed Transect Parameters**

| Transect | Maximum Elevation (masl, geodetic) | Minimum Elevation (masl, geodetic) | Length (m) |
|---|---|---|---|
| Transect 1 | 60.215 | 56.027 | 44.5 |
| Transect 2 | 60.408 | 55.873 | 45.3 |
| Transect 3 | 60.254 | 55.873 | 53.6 |
| Transect 4 | 59.704 | 55.807 | 50.2 |
| Transect 5 | 58.977 | 55.826 | 46.4 |
| Transect 6 | 58.867 | 55.874 | 44.5 |
| Transect 7 | 61.809 | 55.817 | 76.6 |
| Transect 8 | 58.989 | 55.677 | 29.1 |
| Transect 9 | 58.846 | 55.901 | 53.4 |
| Transect 10 | 58.625 | 55.886 | 48.2 |
| Transect 11 | 59.286 | 55.893 | 29.7 |
| Transect 12 | 57.933 | 55.693 | 39.7 |
| Transect 13 | 58.558 | 56.046 | 28.4 |
| Transect 14 | 59.199 | 55.830 | 43.3 |
| Transect 15 | 61.272 | 55.963 | 54.4 |

Table 7: Lake B45 Surveyed Transect Parameters (continued)

| Transect | Maximum Elevation (masl, geodetic) | Minimum Elevation (masl, geodetic) | Length (m) |
|---|---|---|---|
| Transect 16 | 61.379 | 55.940 | 41.9 |
| Transect 17 | 60.741 | 55.881 | 31.3 |
| Transect 18 | 58.395 | 55.950 | 32.2 |
| Transect 19 | 57.348 | 56.000 | 46.7 |
| Transect 20 | 59.256 | 56.502 | 41.7 |
| Transect 21 | 58.305 | 55.985 | 33.0 |
| Transect 22 | 57.980 | 56.023 | 33.1 |
| Transect 23 | 57.585 | 55.972 | 39.7 |
| Transect 24 | 57.568 | 55.992 | 63.4 |
| Transect 25 | 56.898 | 56.034 | 36.6 |
| Transect 26 | 56.695 | 56.309 | 32.6 |
| Transect 27 | 56.907 | 55.758 | 31.9 |

The majority of the shoreline is composed of morainal materials consisting of till veneers to blankets and marine sediments. Limited sections of alluvium and marine sediments are present on the west shore. Figure 7.3-D27 and Figure 7.3-D28 present the cross-sections profiles of the surveyed transects.

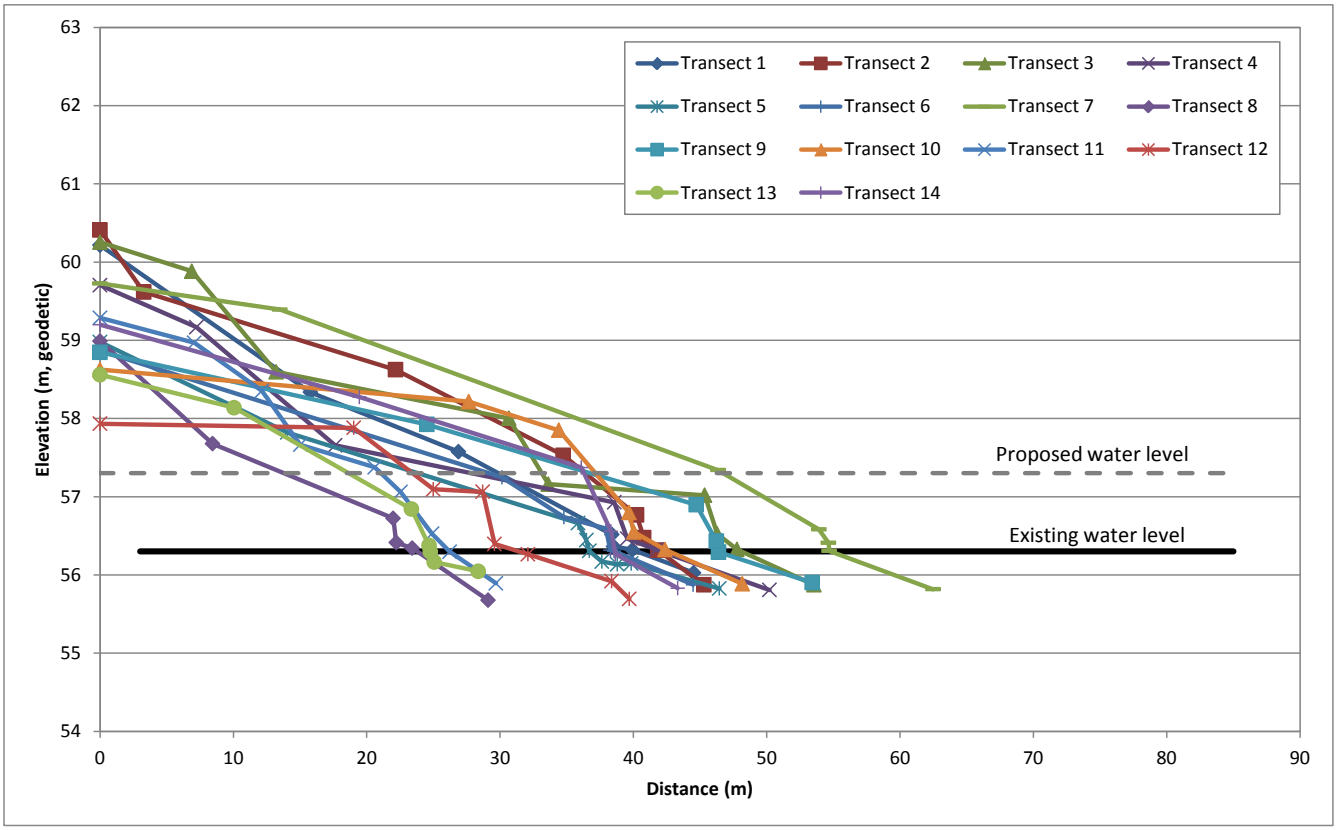



*Figure 7.3-D27: Lake B45 Shoreline Transect Profiles (m = metres)*

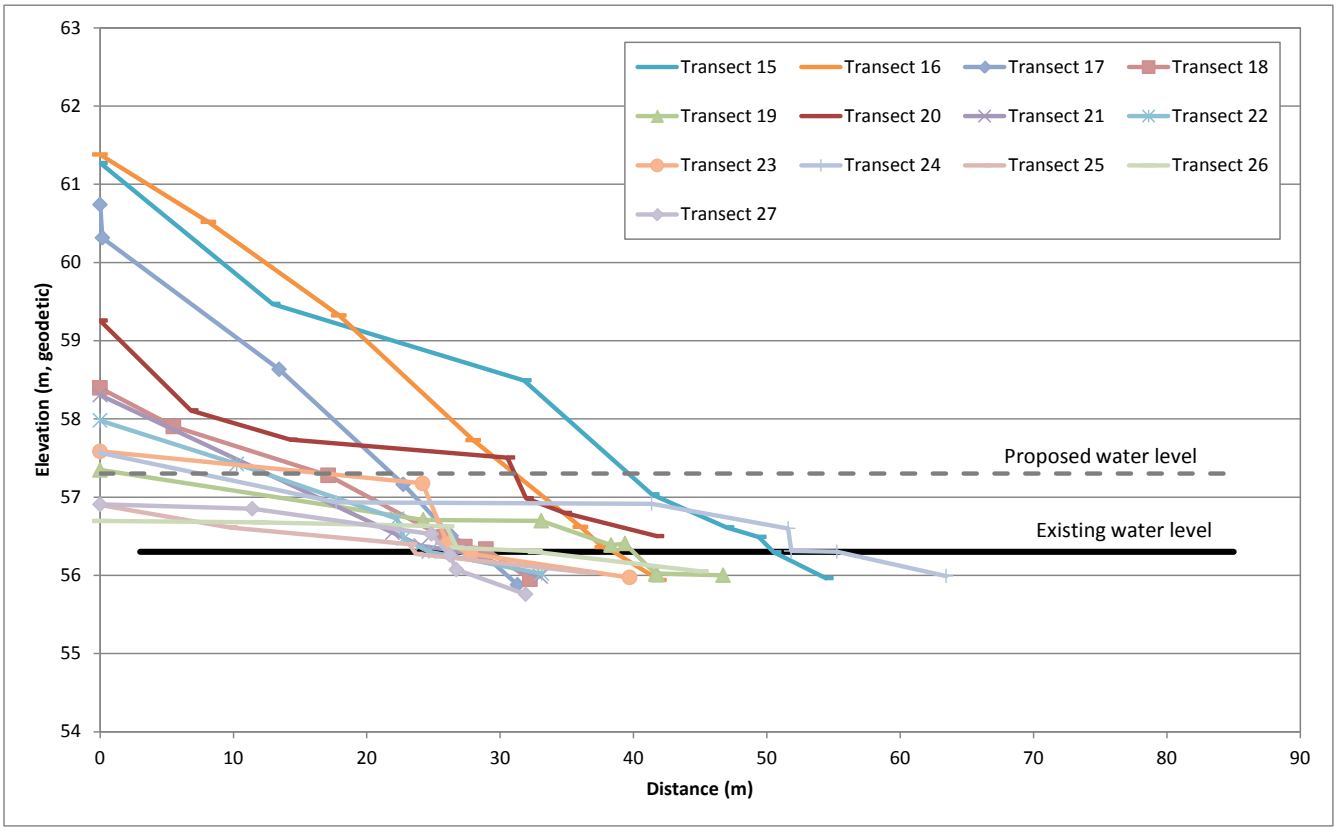



*Figure 7.3-D28: Lake B45 Shoreline Transect Profiles (m = metres)*

Table 7.3-D8 presents the parameters derived from the transects that were used to estimate the lake shoreline erosion potential. Each parameter was weighted according to methods presented in Appendix B. An erosion potential class (5 classes from Very Low to Very High) was determined for each surveyed transect.

**Table 7.3-D8: Lake B45 Main Transect Parameters**

| Transect | Direction (degrees-cardinal) | Average Bank Slope (%) | Fetch Length (m) | Bank Materials | Erosion Potential Class |
|---|---|---|---|---|---|
| Transect 1 | 218° - SSW | 8.0 | 850 | CBV | Very Low |
| Transect 2 | 223° - SSW | 15.7 | 850 | CBV | Very Low |
| Transect 3 | 226° - SW | 14.0 | 850 | CBV | Very Low |
| Transect 4 | 246° - SW | 19.2 | 820 | CBV | Very Low |
| Transect 5 | 219° - SSW | 6.7 | 800 | CBV | Very Low |
| Transect 6 | 223° - SSW | 11.4 | 780 | CBV | Very Low |
| Transect 7 | 219° - SSW | 12.4 | 750 | CBV | Very Low |
| Transect 8 | 220° - SSW | 8.9 | 700 | CBV | Very Low |
| Transect 9 | 215° - SSW | 7.5 | 650 | CBV | Very Low |
| Transect 10 | 216° - SSW | 19.2 | 600 | CBV | Very Low |
| Transect 11 | 237° - SW | 19.2 | 580 | CBV | Very Low |
| Transect 12 | 232° - SW | 14.1 | 580 | CBV | Very Low |
| Transect 13 | 212° - SSW | 13.2 | 620 | STE | Low |
| Transect 14 | 201° - S | 43.4 | 650 | STE | Low |

| Transect | Direction (degrees-cardinal) | Average Bank Slope (%) | Fetch Length (m) | Bank Materials | Erosion Potential Class |
|---|---|---|---|---|---|
| Transect 15 | 214° - SSW | 8.1 | 660 | CBV | Very Low |
| Transect 16 | 242° - SW | 13.6 | 620 | CBV | Very Low |
| Transect 17 | 245° - SW | 15.4 | 750 | CBV | Very Low |
| Transect 18 | 136° - SE | 8.0 | 1060 | SO | High |
| Transect 19 | 172° - SSE | 7.9 | 1000 | SO | High |
| Transect 20 | 66° - NE | 5.7 | 950 | CBV | Very Low |
| Transect 21 | 22° - N | 5.0 | 1020 | CBV | Very Low |
| Transect 22 | 355° - NNW | 7.8 | 1100 | SO | Very High |
| Transect 23 | 311° - WNW | 24.9 | 1100 | SO | Very High |
| Transect 24 | 316° - NW | 1.8 | 1100 | CBV | Moderate |
| Transect 25 | 32° - NNE | 0.0 | 480 | SO | Low |
| Transect 26 | 346° - NNW | 4.8 | 500 | SO | High |
| Transect 27 | 17° - N | 8.8 | 1000 | SO | Moderate |

Note: CBV = Boulders and cobble with vegetation on top; STE = Soils with thermo-erosion processes and no outcrops occurring; SO = soils and organics.

For the High (Transects 18, 19, and 26) and Very High (Transects 22 and 23) erosion potential classes the following should be noted:

- Transects 18 and 19 are located on the west shore (i.e., not exposed to the dominant winds) in areas with a fetch length of more than 1 km and with organics as the predominant substrate. However, no evidence of erosion was observed during the survey at the existing lake water level. Transect 26 is located on the south shore in areas exposed to the dominant winds and with organics as the predominant substrate with signs of erosion observed during the survey at the existing lake water level.
- Transects 22 and 23 are located on the south shore in areas with the dominant winds along the greatest fetch on the lake, and with organics as the predominant substrate. Signs of local erosion were observed during the survey at the existing lake water levels.

#### *3.2.4.1 Lake B45 Lake Shoreline Mitigation*

Management of the lake shoreline erosion potential at Lake B45 includes two possible mitigation options for areas with High and Very High erosion potential scores:

- Preventative mitigation – the shoreline is modified by armouring or resloping such that the erosion potential is minimized by increasing the resistance of the shoreline to erosion. It is anticipated that this would be carried out prior to the onset of increased lake levels. This would mean constructing the shoreline so that it has either a low slope that will extend approximately 5 m from shore into the lake, or has boulders and cobble as the main shoreline material. Regular monitoring of the modified shoreline will be required, and additional armouring placed if required.

- Monitoring and Response mitigation – instead of disturbing the existing terrain prior to flooding, the new shorelines are monitored during field inspections after the lake rises to the proposed elevation. Should erosion be observed, then boulder and cobble berms may be used to reinforce impacted areas of shoreline. The monitoring period should occur annually and last for a minimum of 10 years after the onset of the increased water level.

The preferred mitigation option for the High and Very High erosion potential areas should be decided following a cost-benefit analysis.

It is recommended that the remainder of the shoreline (Very Low to moderate erosion potential areas) also be monitored regularly, with additional mitigation measures implemented as required. Monitoring should occur annually for a period of at least 10 years following the onset of the increased water level.

#### *3.2.4.2 Lake B45 Outlet Channel Mitigation*

Because Lake B45 has similar water surface elevations with Lake B4 and therefore no proper outlet channel, the outlet channel of the next lake upstream (i.e. Lake B46) was surveyed to provide field information for redesigning the outlet channel of Lake P3 after the Lake B45 will be disconnected and diverted to the P watershed (Section 3.7 P Watershed).

### 3.2.5 Lake B44 Shoreline Surveys

Lake B44 is located southwest of the existing camp and west of Lake B45, and has an area of approximately 5 ha. The lake drains eastwards into Lake B45 through a short and narrow channel with a generally low slope. The average water level elevation of Lake B44 at the time of the survey was approximately 56.74 masl.

Lake B44 flows are proposed to be permanently diverted westwards to Lake P3 by increasing the lake water levels by approximately 0.5 m.

The existing Lake B44 outlet channel cross-section is shown in Figure 7.3-D29. The outlet channel is not well-defined and the stream bed and channel banks consist mostly of soils and organics. The longitudinal profile of the outlet channel is shown in Figure 7.3-D30.

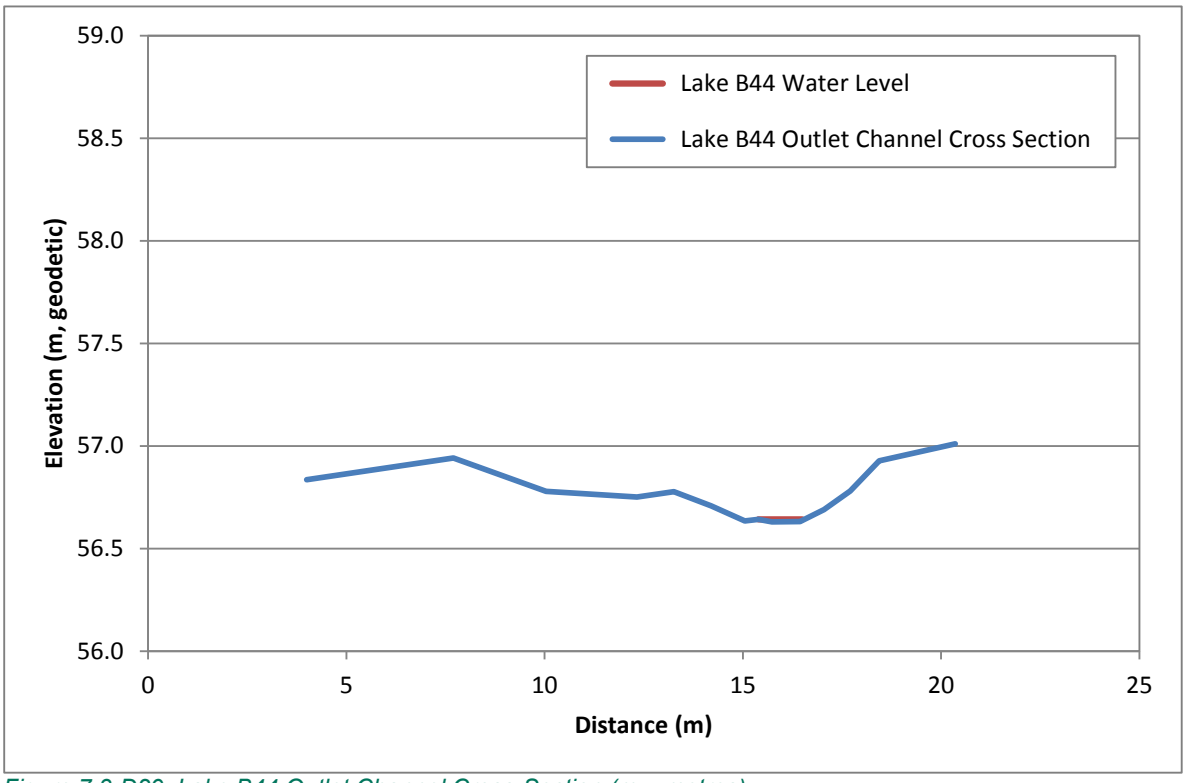



*Figure 7.3-D29: Lake B44 Outlet Channel Cross-Section (m = metres)*

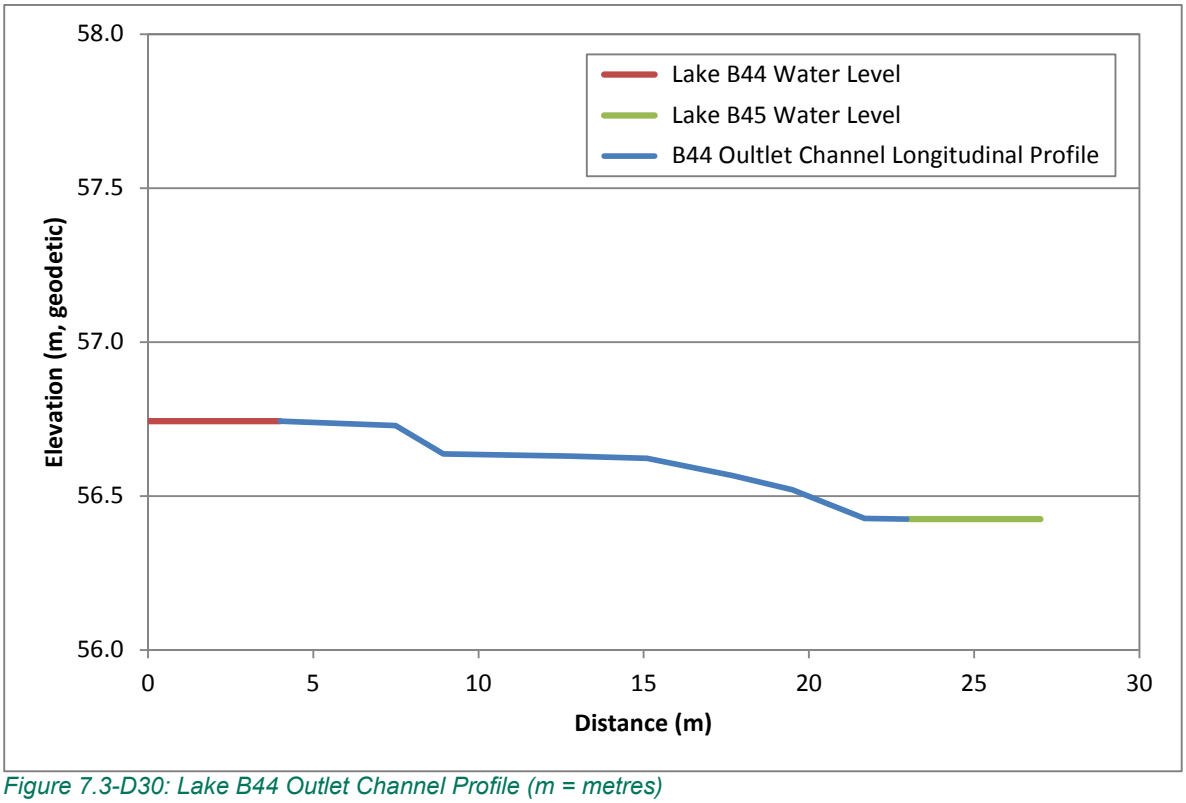



*Figure 7.3-D30: Lake B44 Outlet Channel Profile (m = metres)*

Seven transects (Table 7.3-D9) were surveyed around the perimeter of Lake B44 to evaluate the lake shoreline erosion potential following the proposed increase in lake water levels. The transect locations are shown in Figure 7.3-D31. Lake B44 is oriented east to west, and has small sections of moderately sloped banks on the south side (typical slopes between 15 and 30%). The remainder of the shoreline is characterized by shallow to gentle slopes (typically less than 10%).

**Table 7.3-D9: Lake B45 Surveyed Transect Parameters**

| Transect | Maximum Elevation (masl, geodetic) | Minimum Elevation (masl, geodetic) | Length (m) |
|---|---|---|---|
| Transect 1 | 57.358 | 56.365 | 14.5 |
| Transect 2 | 57.931 | 56.418 | 46.9 |
| Transect 3 | 57.214 | 56.431 | 16.2 |
| Transect 4 | 58.568 | 56.451 | 19.7 |
| Transect 5 | 58.110 | 56.495 | 22.5 |
| Transect 6 | 57.385 | 56.535 | 40.7 |
| Transect 7 | 58.250 | 56.463 | 50.1 |

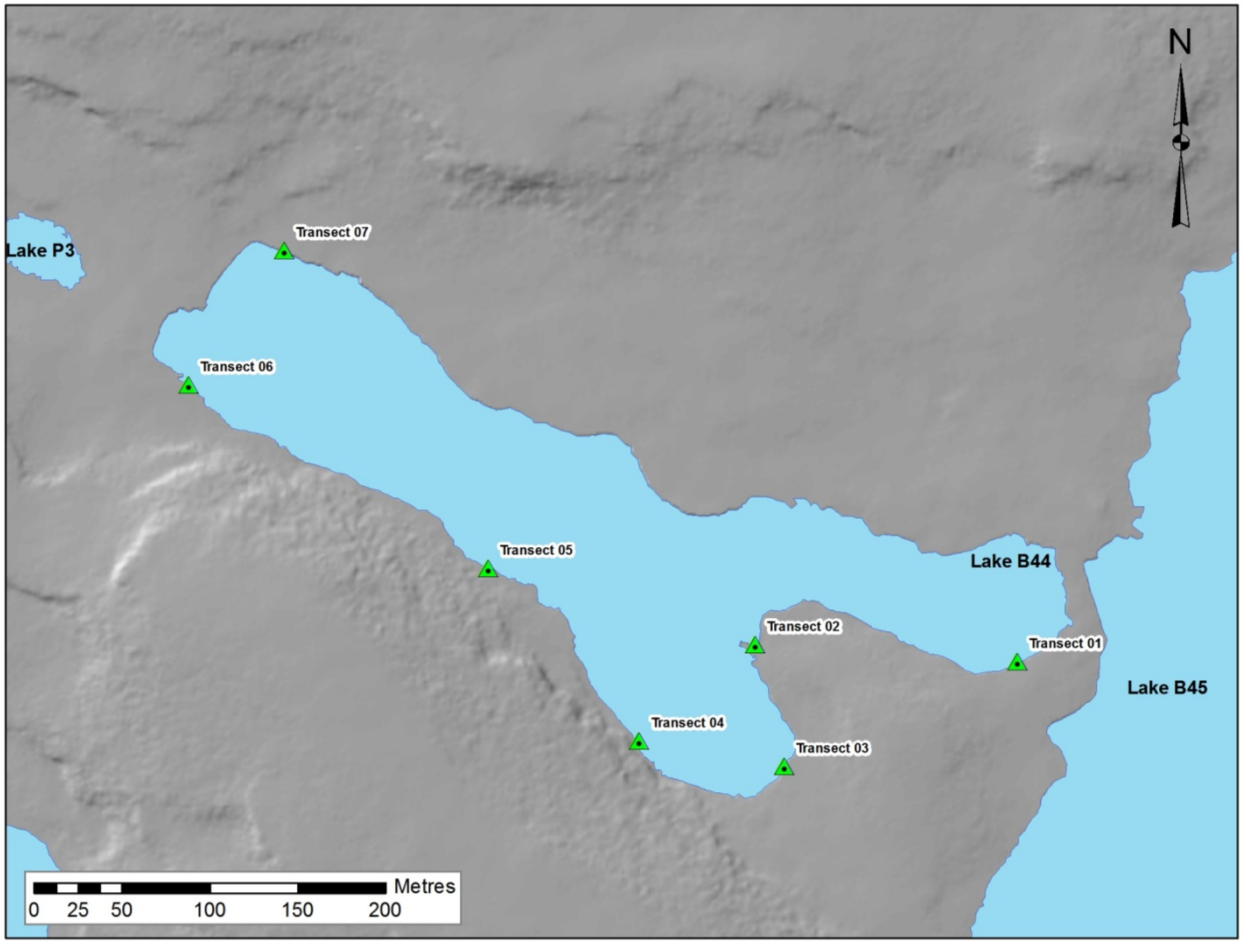



*Figure 7.3-D31: Lake B44 Shoreline Transects Locations*

The majority of the south shoreline is composed of morainal materials consisting of till veneers to blankets, and alluvium and marine sediments and marine sediments for the rest of the shoreline. Figure 7.3-D32 presents the cross-section profiles of the surveyed transects.

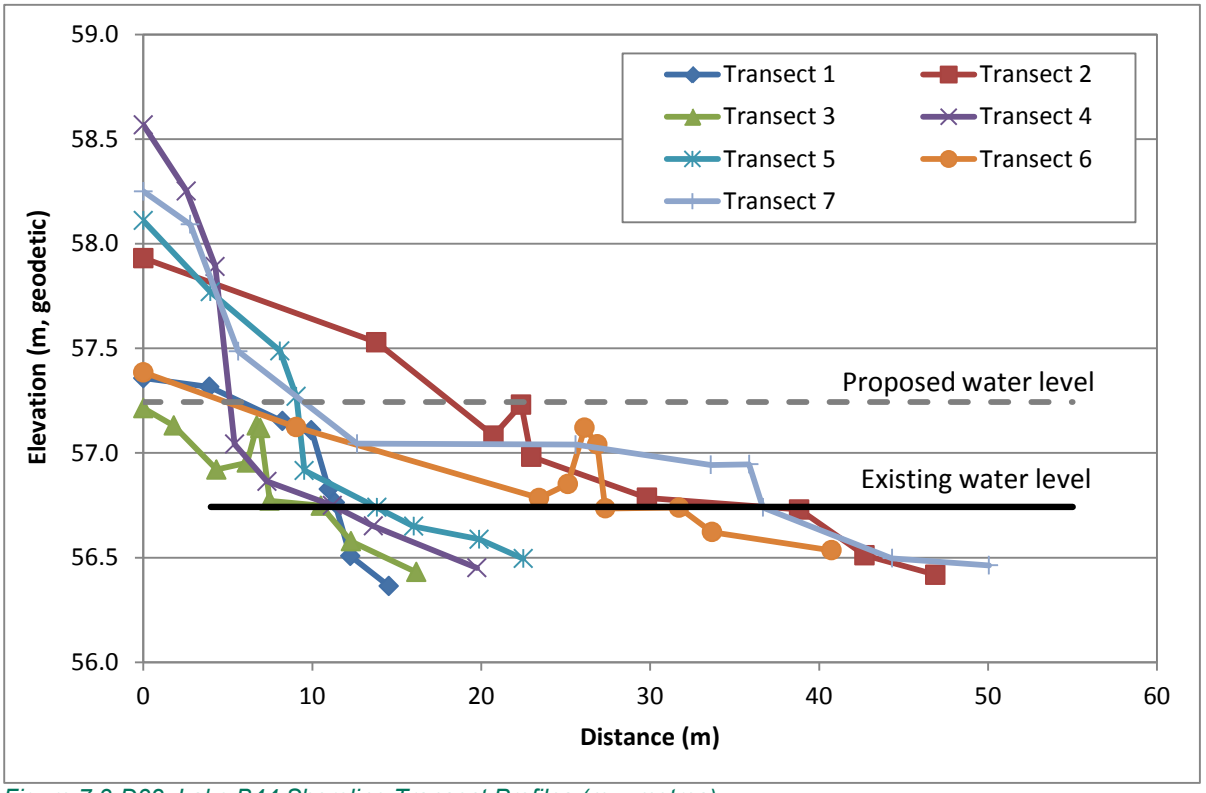



*Figure 7.3-D32: Lake B44 Shoreline Transect Profiles (m = metres)*

Table 7.3-D10 presents the parameters derived from the transects that were used to estimate the shoreline erosion potential. Each parameter was weighted according to methods presented in Appendix B. An erosion potential class (5 classes from Very Low to Very High) was determined for each surveyed transect.

**Table 7.3-D10: Lake B44 Main Transect Parameters**

| Transect | Direction (degrees-cardinal) | Average Bank Slope (%) | Fetch Length (m) | Bank Materials | Erosion Potential Class |
|---|---|---|---|---|---|
| Transect 1 | 157° - SE | 26.1 | 75 | STE | Low |
| Transect 2 | 113° - ESE | 4.6 | 380 | CBV | Very Low |
| Transect 3 | 125° - ESE | 2.8 | 430 | CBV | Low |
| Transect 4 | 226° - SW | 29.1 | 160 | CBV | Very Low |
| Transect 5 | 206° - SSW | 15.4 | 85 | CBV | Very Low |
| Transect 6 | 217° - SSW | 2.1 | 90 | CBV | Very Low |
| Transect 7 | 20° - N | 9.5 | 90 | CBV | Very Low |

#### 3.2.5.1 Lake B44 Lake Shoreline Mitigation

Because of the small size of Lake B44 the majority of the shoreline was classified as Low and Very Low erosion potential, therefore it is recommended that the new shoreline be monitored regularly, with additional mitigation measures implemented as required. Monitoring should occur for a period of at least 10 years following the onset of the increased water level.

#### 3.2.5.2 Lake B44 Outlet Channel Mitigation

The outlet channel of Lake B44 will be flooded after the flow diversion from Lake B45 to Lake B44 and therefore no erosion assessment was undertaken.

### 3.2.6 Lake B46 Outlet Channel Survey

Lake B46 is located southwest of the existing camp, has an area of approximately 45 ha and flows into Lake B45. The average water level elevation of Lake B46 at the time of the survey was approximately 58.66 masl.

The existing outlet channel of Lake B46 was surveyed and the longitudinal profile is shown in Figure 7.3-D33. The channel slope is lower on the upstream section (typically 1.3%), and higher on the downstream section (typically 3 to 4%). The outlet channel flows into Lake B45 through a terrain with surficial materials consisting of mostly organics overlying cobble and boulders.

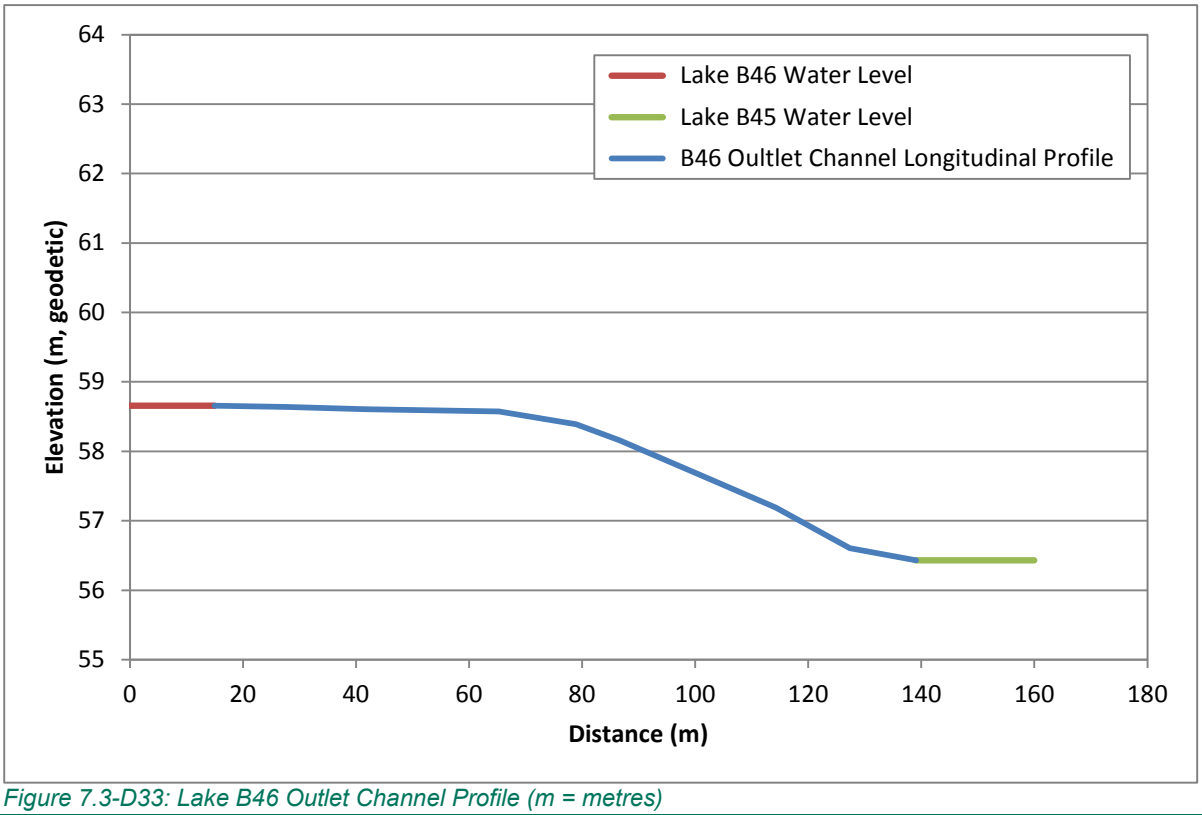



*Figure 7.3-D33: Lake B46 Outlet Channel Profile (m = metres)*

The typical channel cross-section (Figure 7.3-D34) is up to 0.25 m deep relative to the surrounding terrain with a stream bed of mostly gravel and cobble material. The channel banks were observed to be of mostly organics overlying cobble. The outlet has a main channel that varies in width between 0.5 and 1.5 m, and smaller side channels that convey flows mostly during freshet only.

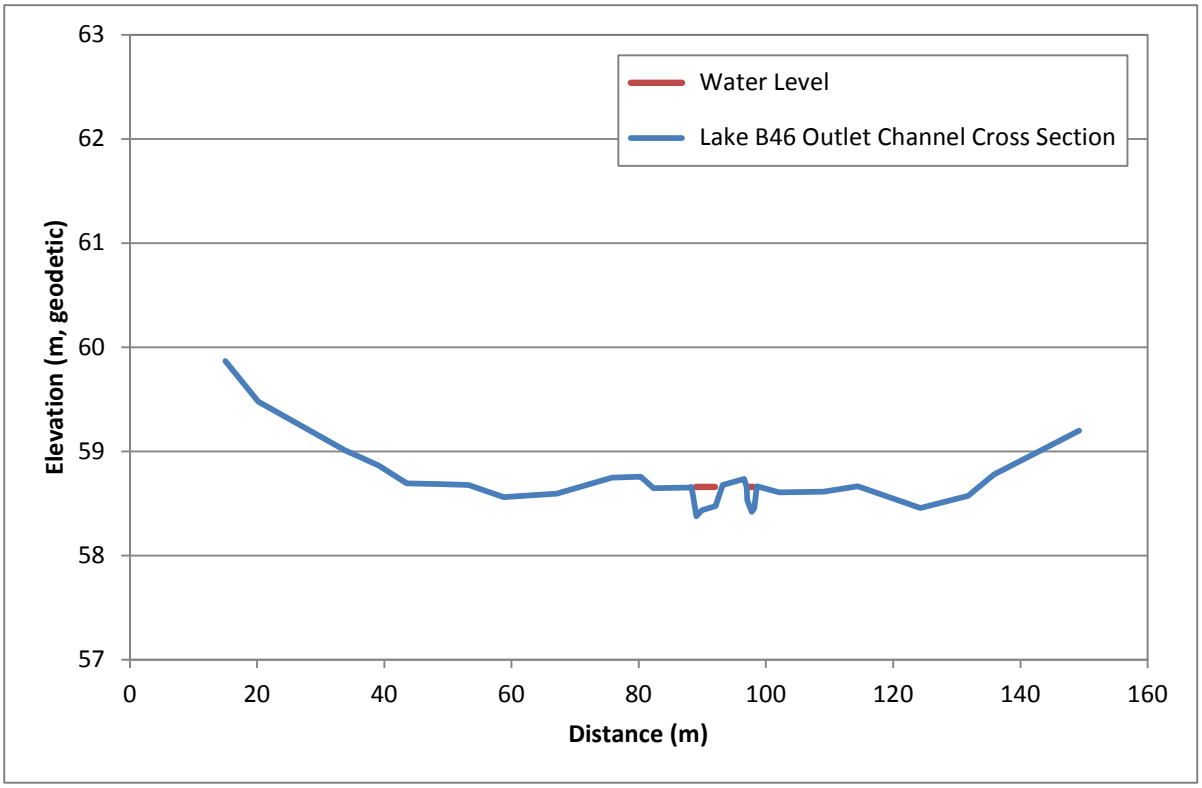



*Figure 7.3-D34: Lake B46 Outlet Channel Cross-Section (m = metres)*

Lake B46 will not be affected by the Project footprint or water diversion. The surveyed data was collected to provide field information for redesigning the outlet channel of Lake P3 after the Lake B45 will be disconnected and diverted to the P watershed (Section 3.7 P Watershed).

## 3.3 D Watershed

The D watershed is located west of the existing camp and has an area of approximately 7.7 $km^2$, of which 2.1 $km^2$ is lake water surface. The D watershed will be permanently affected in the Post-Closure phase due to the permanent diversion of Lake B5 flows to Lake D7 and further downstream to Lake D1.

### 3.3.1 Lake D7 Outlet Channel Survey

Lake D7 is located west of the existing camp, has an area of approximately 73.5 ha (0.735 $km^2$) and is the largest lake in the D watershed. Lake D7 drains to Lake D6.

During the Pre-production and Ming Phase 1 phases of the Project, flows from Lake B5 will be diverted (pumped through a pipe) to Lake D7 to allow for dewatering of Lake B7 upstream and Lake B4 downstream. Lake B5 flows will be permanently diverted to Lake D7 watershed during the Post-Closure phase.

The existing watershed boundary between Lake B5 and Lake D7 was surveyed and the cross-section is shown in

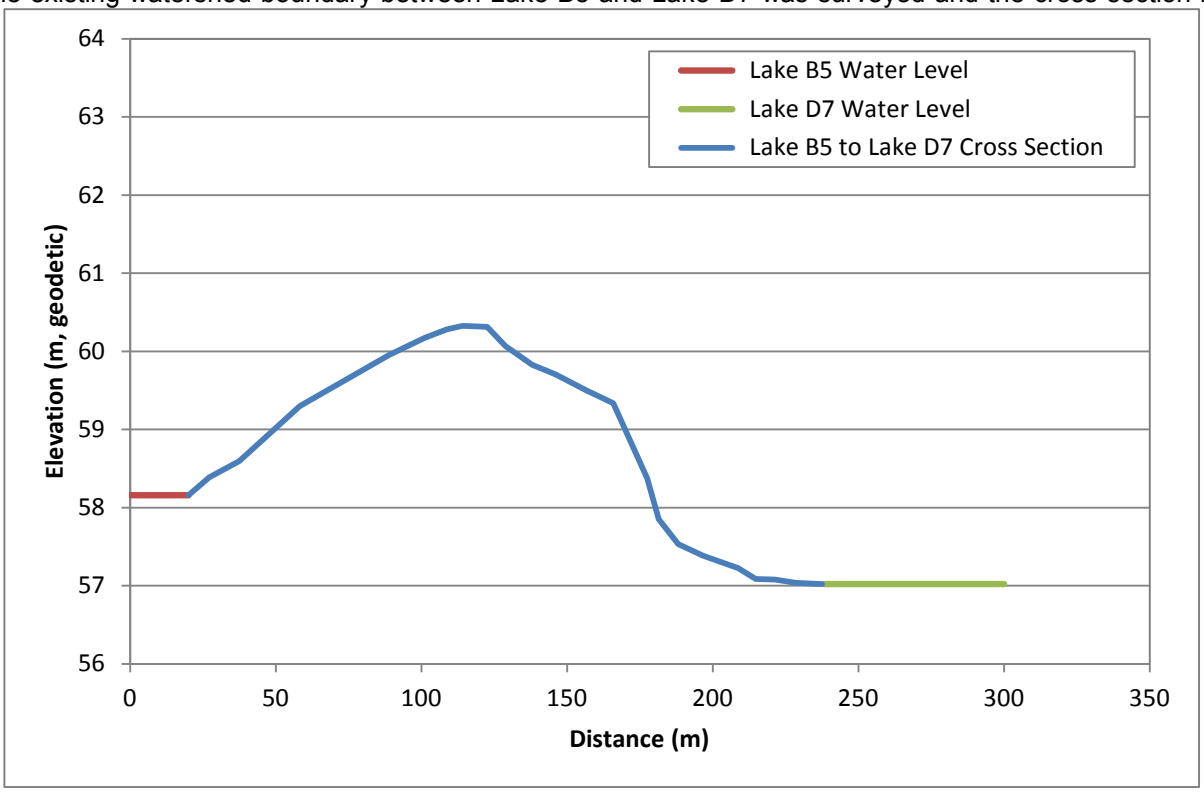



Figure 7.3-D35. The average water level elevations of lakes D7, D6 and B5 at the time of the survey were approximately 57.02 masl, 56.69 masl and 58.16 masl, respectively.

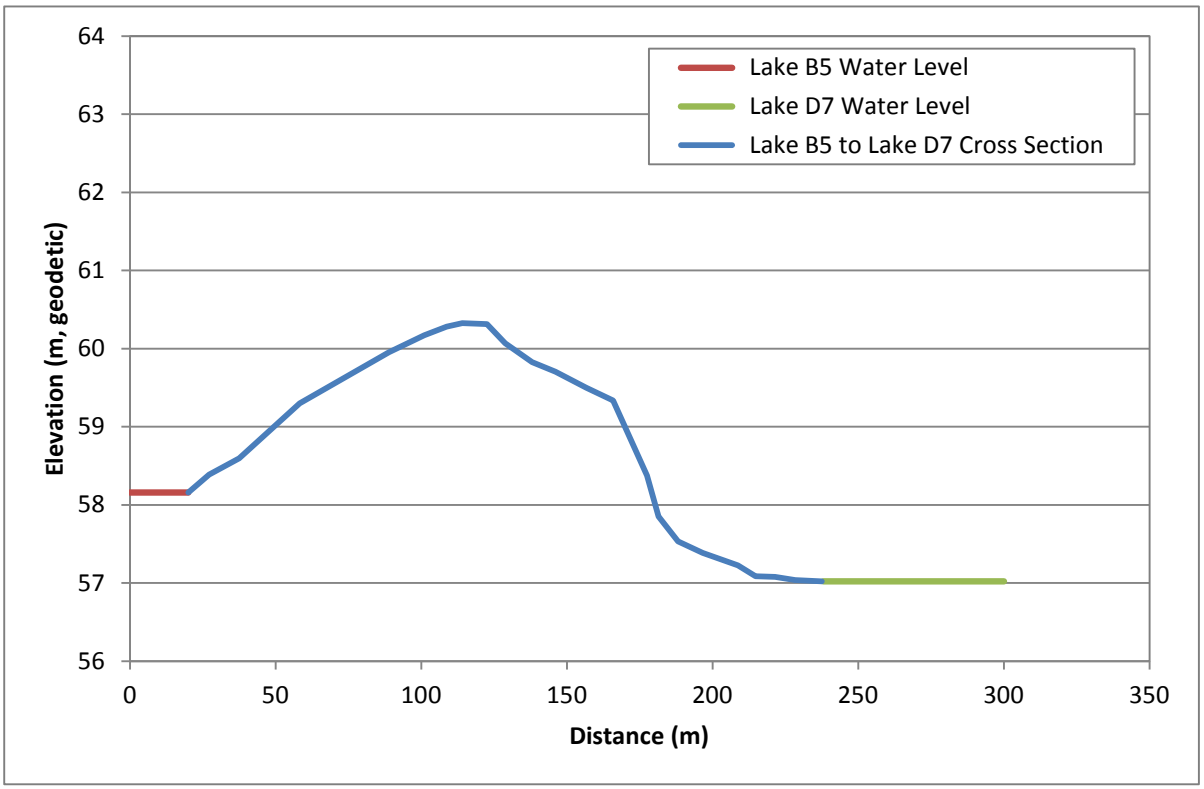



*Figure 7.3-D35: Lake B5 to Lake D7 Watershed Boundary Cross-Section (m = metres)*

The existing outlet channel from Lake D7 to Lake D6 was surveyed and the longitudinal profile is shown in Figure 7.3-D36. The channel slope is low with up to 1.3% slope. The outlet channel flows into Lake D6 through a low slope terrain, with surficial materials consisting of mostly organics.

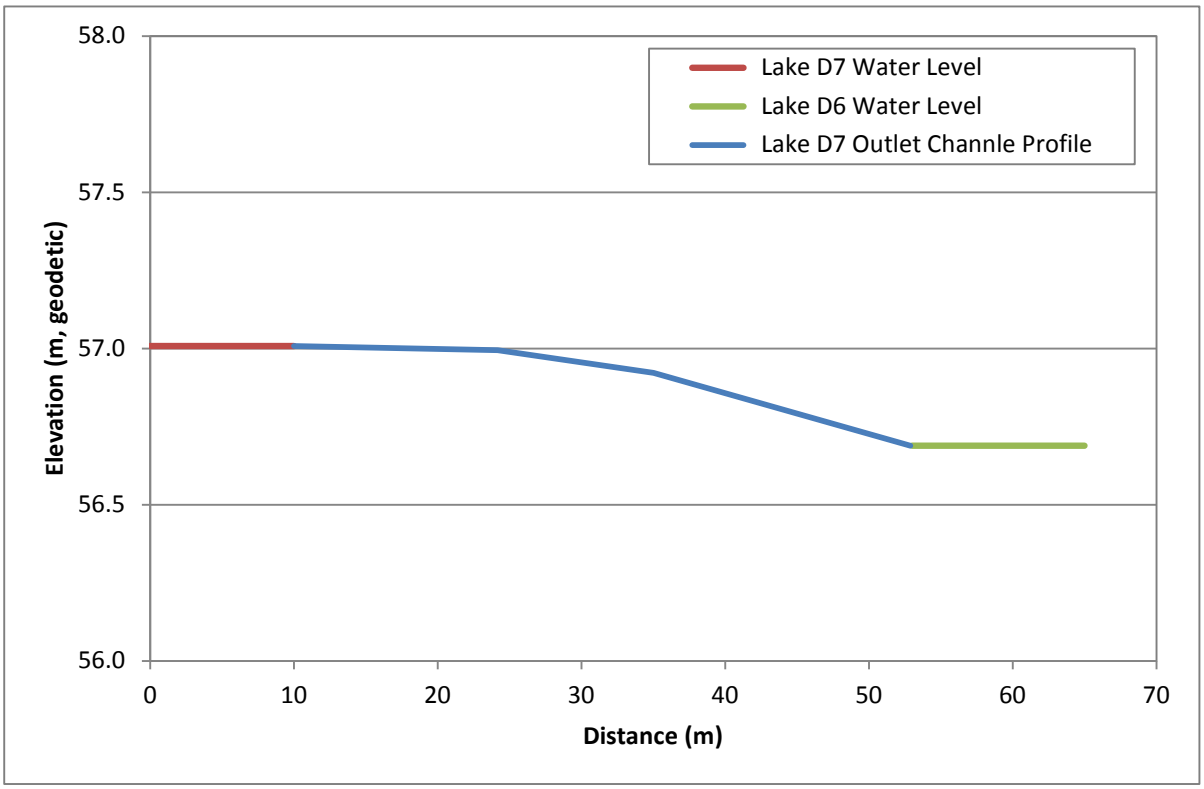



*Figure 7.3-D36: Lake D7 Outlet Channel Profile (m = metres)*

The typical channel cross-section (Figure 7.3-D37) has a shallow and well-defined outlet channel, which is up to 0.3 m deep relative to the surrounding terrain. The stream bed and channel banks are mostly soils and organics with some gravel in the main outlet channel. During freshet the outflow is observed to overtop the banks flowing through vegetation.

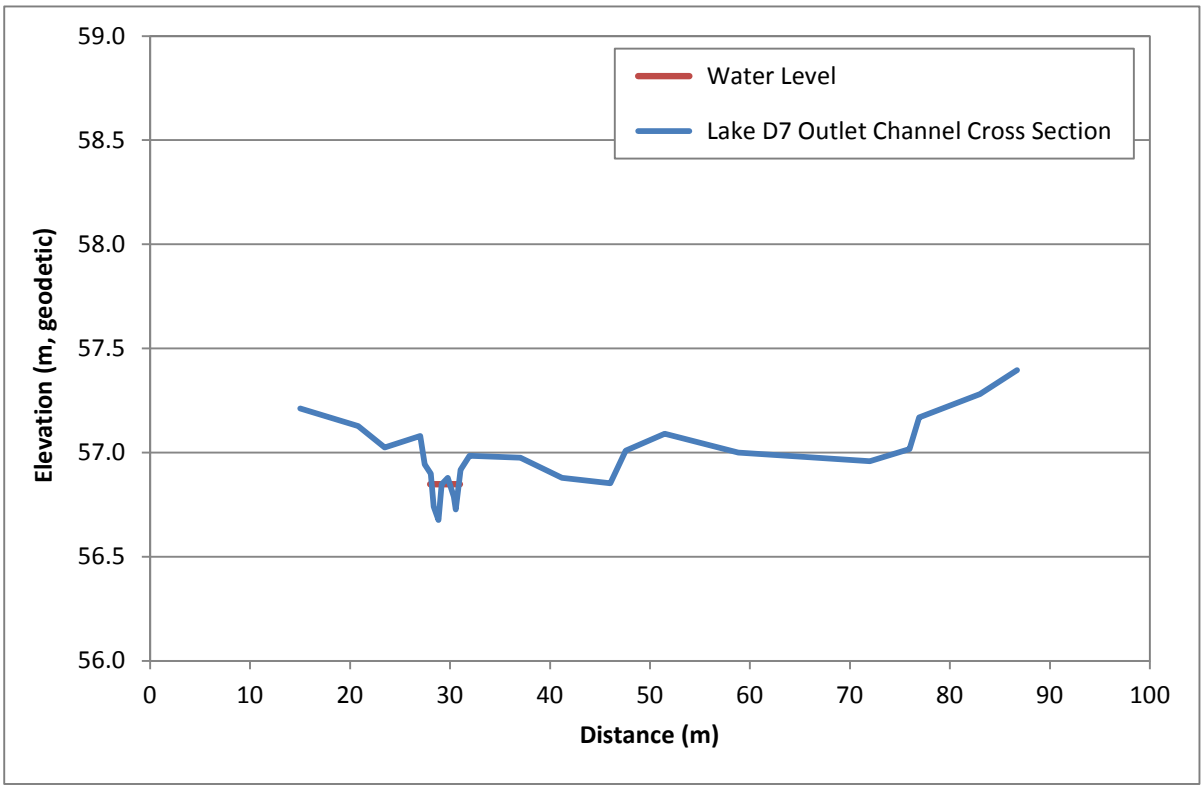



*Figure 7.3-D37: Lake D7 Outlet Channel Cross-Section (m = metres)*

### 3.3.1.1 Lake D7 Outlet Channel Mitigation

Lake D7 will not be directly affected by the Project footprint; however, it will have increased flows as follows:

- During the Pre-production phase, Lake D7 will receive diverted flows from Lake B5 and the dewatering of Lake B7.
- During Mining Phase 1, Lake D7 will receive pumped diverted flows from Lake B5.
- During Post-Closure, Lake D7 will receive the permanent diversion of Lake B5 flows through a channel.

The increased flood regimes from the dewatering of Lake B7 and upstream waterbodies, and the diversion of Lake B5 to Lake D7 are expected to increase erosion potential during the pre-production and Mining Phase 1 phases of the Project. As such, the onset of dewatering of Lake B7 and upstream waterbodies will be delayed until after the spring freshet. Pumping of Lake B7 to Lake B6, and Lake B5 to Lake D7, will begin at the start of July, and end in late October, before freeze-up. This mitigation measure is expected to increase low flows only, below the existing flood regimes, and keep peak flows at or below the peak flow baseline condition.

At Post-Closure Lake B5 will be permanently diverted to Lake D7 through a channel. The diversion will increase flows and water levels at Lake D7. Therefore the following are recommended:

- Lake B6 be used as a design guideline for the new channel between Lake B5 and Lake D7 as the new channel will carry similar flows to what presently exits from Lake B6; and
- Channel enhancement (i.e. increase capacity) of the Lake D7 outlet channel is completed such that the lake water levels remain similar to baseline condition.

### 3.3.2 Lake D6 Outlet Channel Survey

Lake D6 is located west of the existing camp, has an area of approximately 2.1 ha and drains into Lake D5. The average water level elevation of Lake D6 at the time of the survey was approximately 56.69 masl and the average water level elevation of Lake D5 at the time of the survey was approximately 55.58 masl. During the Pre-production, Mining Phase 1, and Post-Closure phases of the Project, Lake D6 will receive the augmented flows from the upstream Lake D7.

The existing outlet channel of Lake D6 was surveyed and the longitudinal profile is shown in Figure 7.3-D38. The channel slope is low with up to 2% slope in the mid-section of the channel. The outlet channel flows into Lake D5 through a low slope terrain, with surficial materials consisting of mostly organics.

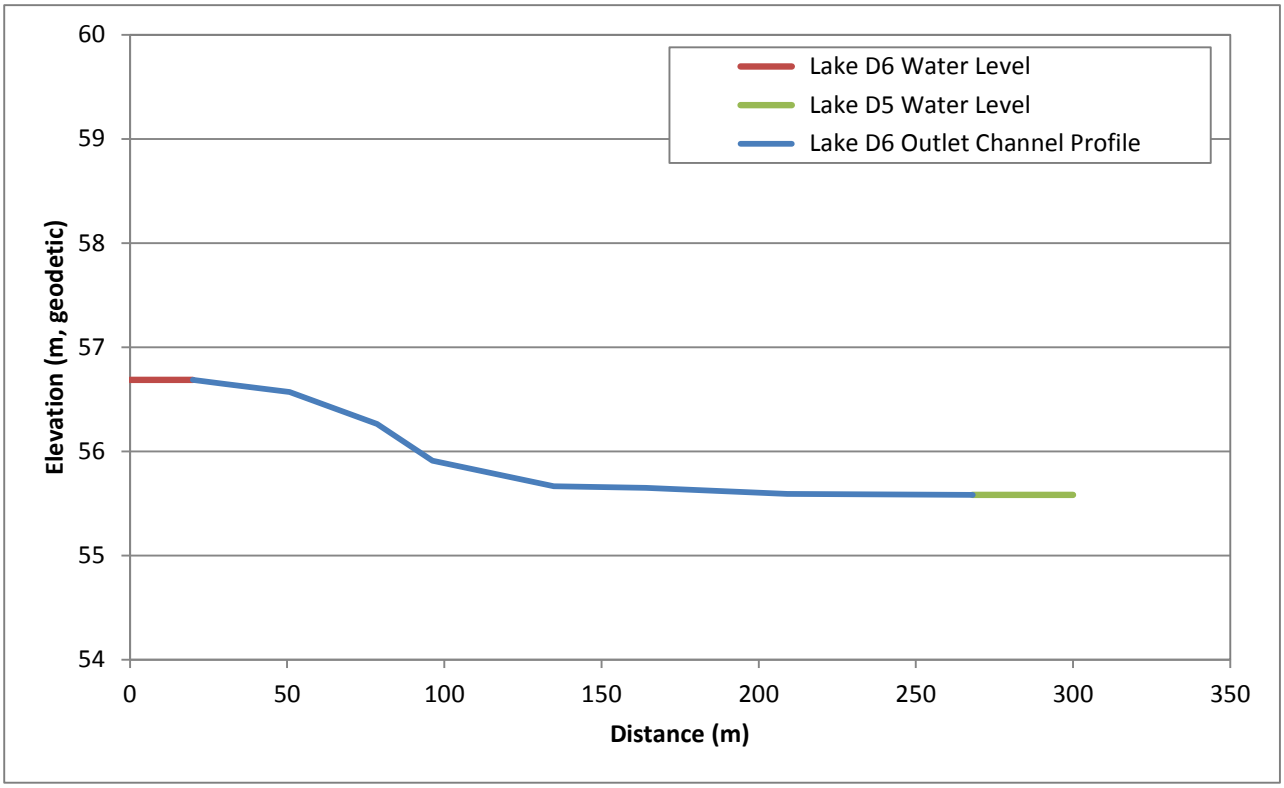



*Figure 7.3-D38: Lake D6 Outlet Channel Profile (m = metres)*

The typical channel cross-section (Figure 7.3-D39) has a shallow and well-defined outlet channel, which is up to 0.3 m deep relative to the surrounding terrain. The stream bed and channel banks are mostly soils and organics with some gravel in the main outlet channel. During freshet, the outflow is observed to overtop the banks with flows passing through the channel margin vegetation.

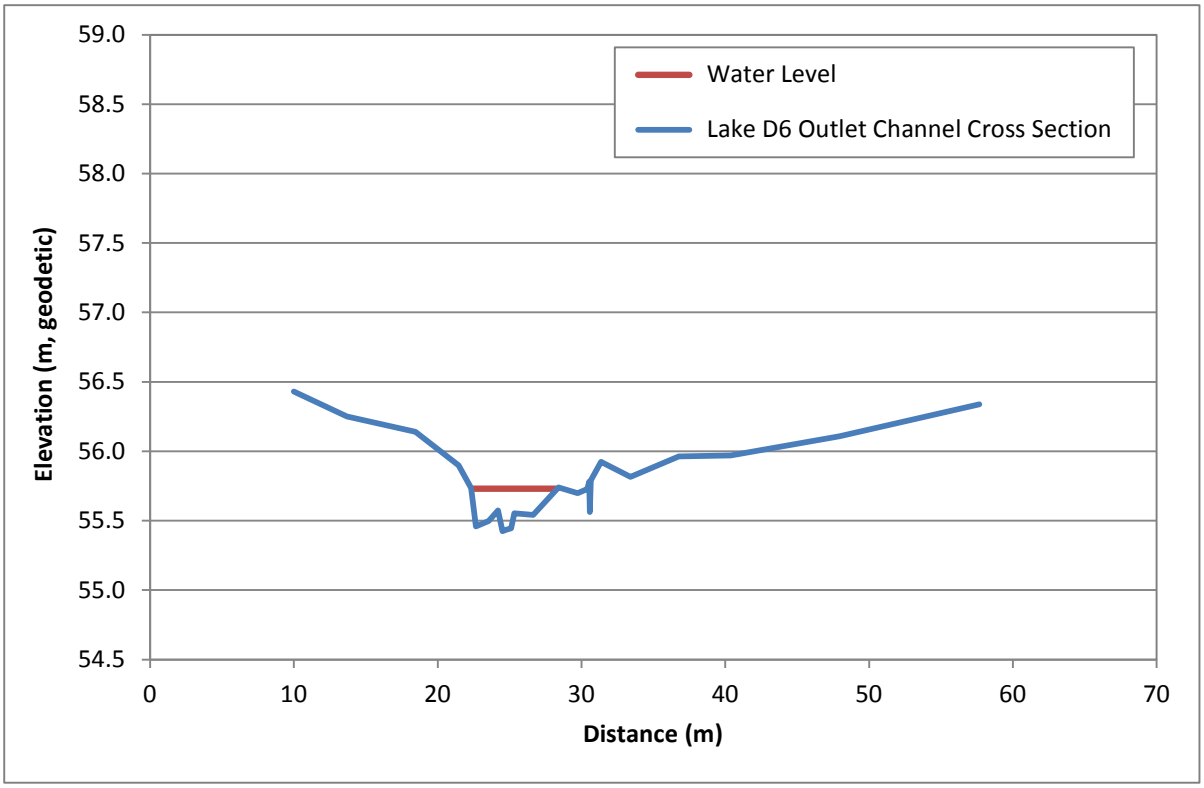



*Figure 7.3-D39: Lake D6 Outlet Channel Cross-Section (m = metres)*

### 3.3.2.1 Lake D6 Outlet Channel Mitigation

Lake D6 will not be directly affected by the Project footprint; however, it will convey the increased flows from the upstream Lake D7 during the Pre-production, Mining Phase 1, and Post-Closure phases of the Project.

The increased flood regimes from Lake D7 are expected to increase erosion potential within the Lake D6 outlet channel. The mitigation measures proposed during the Pre-production and Mining Phase 1 for water surcharges within the upstream Lake D7 (i.e. delayed dewatering until after the spring freshet) are expected to increase Lake D6 outlet channel low flows only, below the existing flood regimes, and keep peak flows at or below the peak flow baseline condition. Therefore, no additional mitigation measures for the Lake D6 outlet channel are proposed during these phases.

The mitigation measures proposed during the Post-Closure for the outlet of Lake D6 are to enlarge the existing channel (width and depth) to accommodate the expected increased flow from diverted water from Lake B5, through Lake D7. The diversion of water will require enhancement of the existing outlet channel (i.e. increase channel capacity of Lake D6) such that the channel will carry the augmented flows without increasing the Lake D6 water levels (i.e. maintain the lake water levels at baseline condition in Lake D6).

### 3.3.3 Lake D5 Outlet Channel Survey

Lake D5 is located west of the existing camp, has an area of approximately 7.3 ha and drains west into Lake D4. The channel that connects Lake D5 and Lake D4 is a broad channel, approximately 10 m long and 6 to 8 m wide. The channel was flooded at the time of visit with the two lakes essentially forming a single waterbody.

The average water level elevation of Lake D5 at the time of the survey was approximately 55.58 masl, and of Lake D4 was 55.57 masl. During the Pre-production, Mining Phase 1, and Post-Closure phases, Lake D5 will convey the augmented flows from Lake D6.

The typical channel cross-section (Figure 7.3-D40) has a well-defined outlet channel, up to 0.5 m deep relative to the surrounding terrain and 6 to 8 m wide. The stream bed and channel banks are mostly soils and organics with some gravel. The outflow is observed to overtop the banks during freshet with flows passing through the channel margin vegetation.

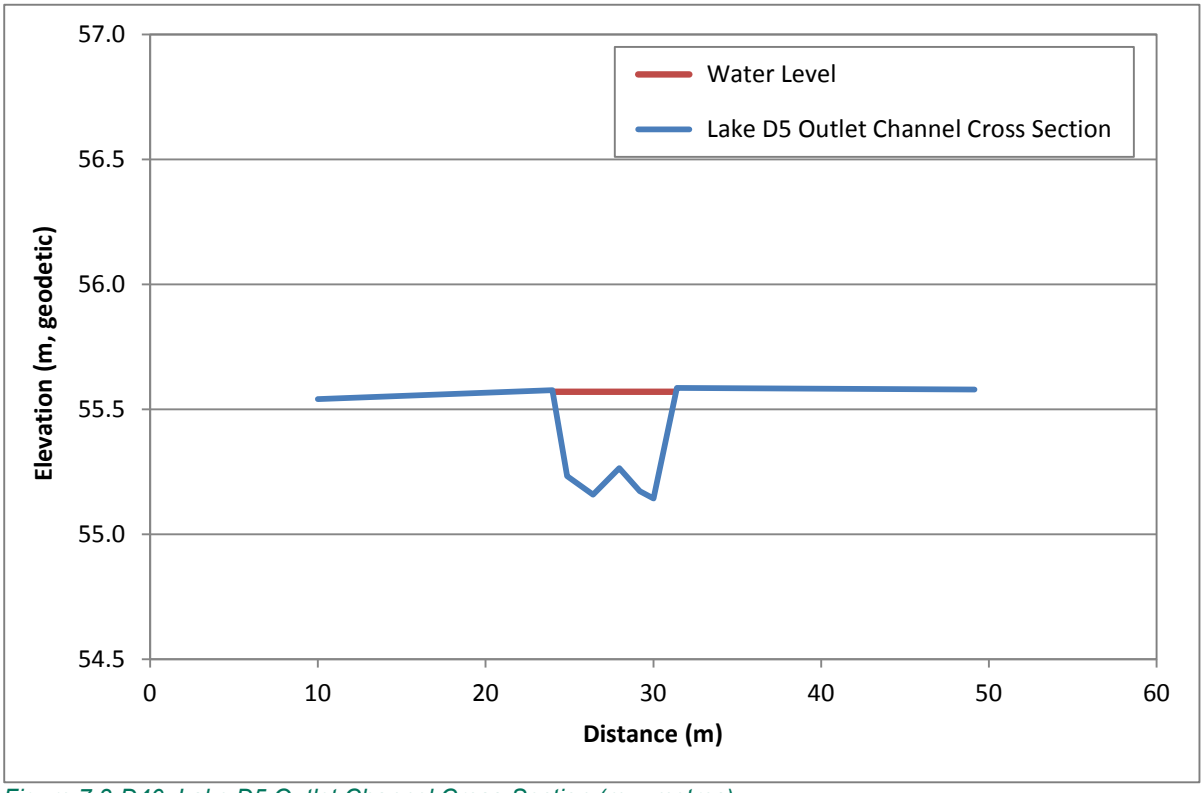



*Figure 7.3-D40: Lake D5 Outlet Channel Cross-Section (m = metres)*

#### *3.3.3.1 Lake D5 Outlet Channel Mitigation*

Lake D5 will not be directly affected by the Project footprint; however, it will convey the increased flows from Lake D6 upstream during the Pre-production, Mining Phase 1, and Post-Closure phases of the Project.

The mitigation measures proposed during the Pre-production and Mining Phase 1 for water surcharges from upstream (i.e. delayed dewatering until after the spring freshet) are expected to increase Lake D5 outlet channel low flows only, below the existing flood regimes, and keep peak flows at or below the peak flow baseline condition. Therefore, no additional mitigation measures for the Lake D5 outlet channel are proposed during these phases.

The mitigation measures proposed during Post-Closure for the outlet of Lake D5 are to enlarge the existing channel (width and depth) to accommodate the expected increased flow from water surcharges within the upstream Lake D6. The upstream diversion of water will require enhancement of the existing outlet channel (i.e. increase channel capacity of Lake D5) such that the channel will carry the augmented flows without increasing the Lake D5 water levels (i.e. maintain the lake water levels at baseline condition in Lake D5).

### 3.3.4 Lake D4 Outlet Channel Survey

Lake D4 is located west of the existing camp, has an area of approximately 18.9 ha and flows southwest into Lake D3. The average water level elevation of Lake D4 at the time of the survey was approximately 55.57 masl and the average water level elevation of Lake D3 at the time of the survey was approximately 53.98 masl. During the Pre-production, Mining Phase 1, and Post-Closure phases, Lake D4 will convey the augmented flows from Lake D5.

The typical channel cross-section (Figure 7.3-D41) has a well-defined outlet channel, up to 0.4 m deep relative to the surrounding terrain and 7 to 10 m wide. The stream bed and channel banks are mostly soils and organics with some gravel in the main outlet channel. During freshet the outflow overtops the left bank flowing through the low vegetated area in the middle of the cross-section.

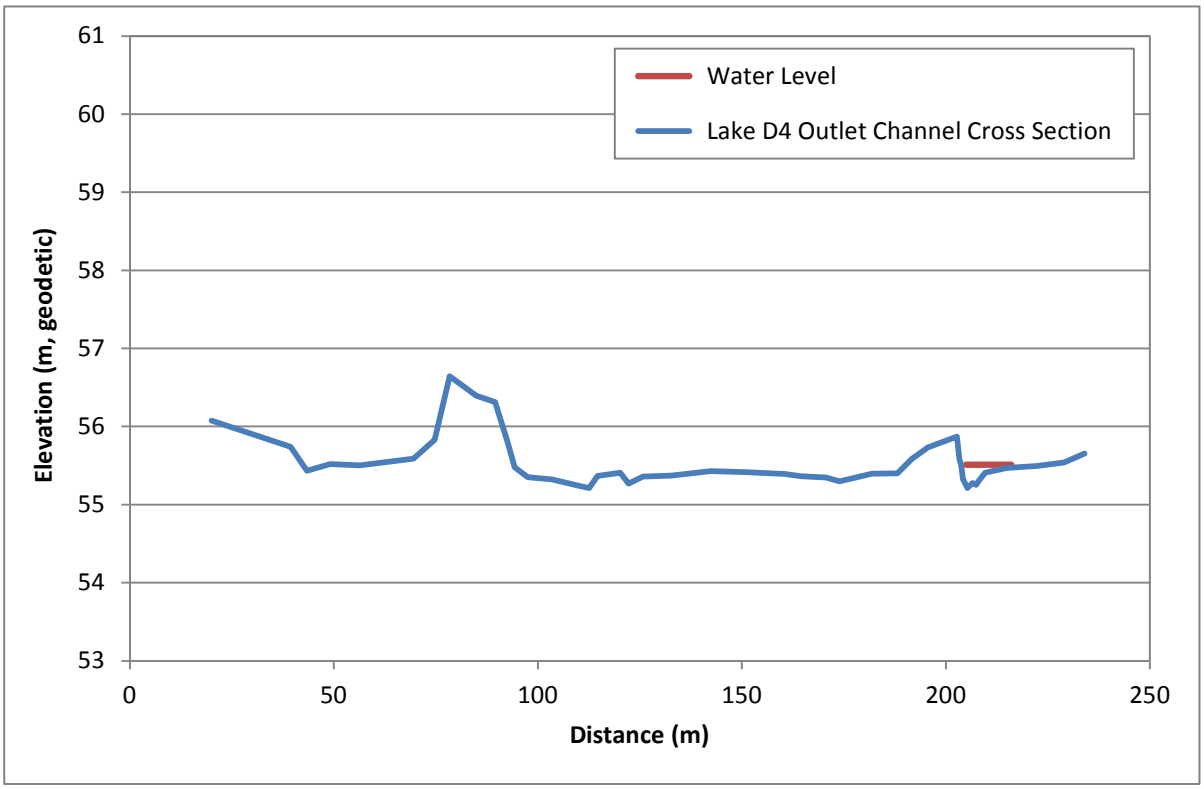



*Figure 7.3-D41: Lake D4 Outlet Channel Cross-Section (m = metres)*

### 3.3.4.1 Lake D4 Outlet Channel Mitigation

Lake D4 will not be directly affected by the Project footprint; however, it will convey increased flows from Lake D5 during the Pre-production and Mining Phase 1 phases of the Project.

Given the wide cross-section of the D4 Outlet channel, the increased flood regimes from Lake D5 during the pre-production and Mining Phase 1 phases of the Project are expected to have minimal impact on erosion potential. The mitigation measures proposed at Lake D7 (i.e. delayed dewatering until after the spring freshet) are expected to increase low flows only in downstream lakes, below the existing flood regimes, and keep peak flows at or below peak flow baseline conditions. Therefore, no additional mitigation measures are anticipated to be required at this outlet.

The mitigation measures proposed during Post-Closure for the outlet of Lake D4 are to enlarge the existing channel (width and depth) to accommodate the expected increased flow from water surcharges within the upstream Lake D5. The upstream diversion of water will require enhancement of the existing outlet channel (i.e. increase channel capacity of Lake D4) such that the channel will carry the augmented flows without increasing the Lake D4 water levels (i.e. maintain the lake water levels at baseline condition in Lake D4.

## 3.4 H Watershed

The H watershed is located northwest of the existing camp and has an area of approximately 2.2 $km^2$ of which 0.4 $km^2$is lake water surface. The H watershed will be directly affected by the mining operations and it will contain the main mine infrastructure buildings and B7 Waste Rock Storage Facility East.

### 3.4.1 Lake H1 Outlet Channel Survey

Lake H1 is located northwest of the existing camp, has an area of approximately 1.1 ha (0.011 $km^2$) and drains into Meliadine Lake. The average water level elevation of Lake H1 at the time of the survey was approximately 55.82 masl and the average water level elevation of Meliadine Lake at the time of the survey was approximately 52.11 masl.

The existing outlet channel of Lake H1 was surveyed and the longitudinal profile is shown in Figure 7.3-D42. The channel slope is lower on the upstream section with a typical value of 1%, and higher on the downstream section with typical values of 3 to 5%. The outlet channel flows into Meliadine Lake through a terrain with surficial materials consisting of mostly organics overlying cobble and gravel.

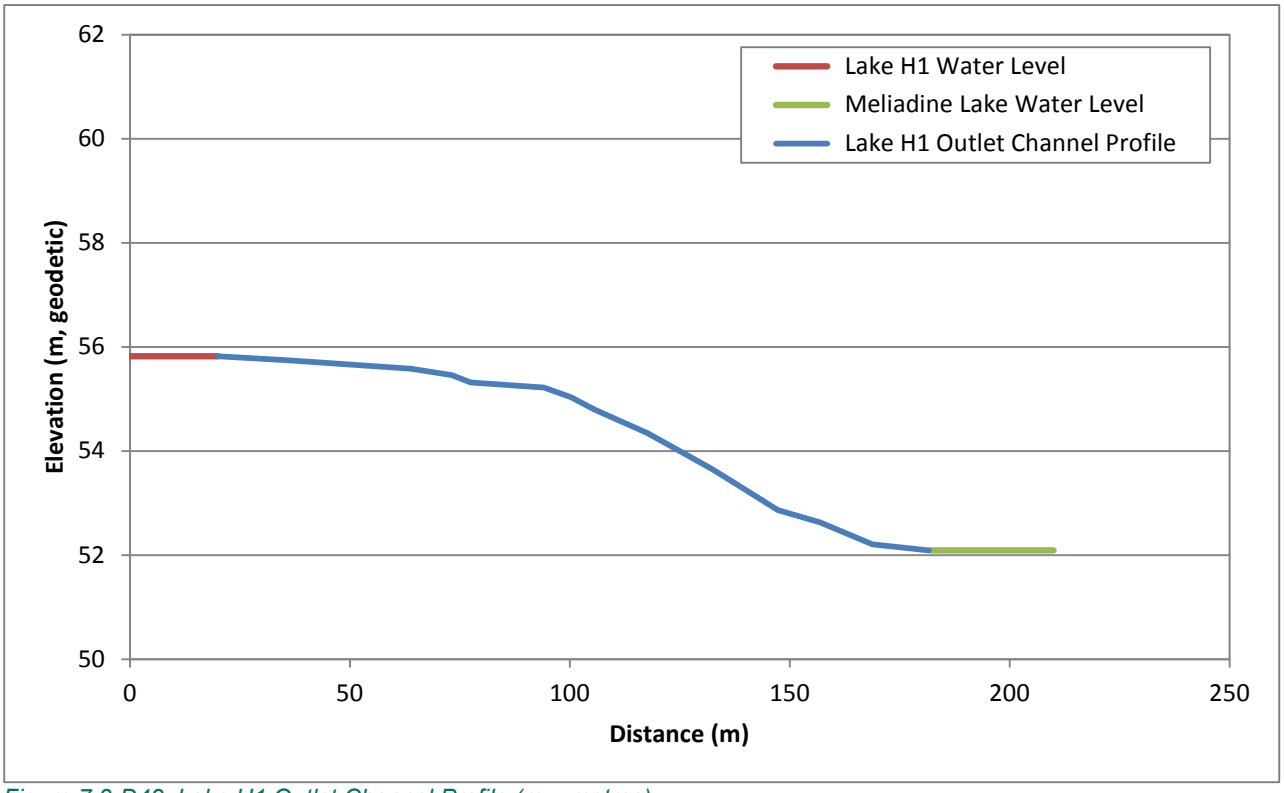



*Figure 7.3-D42: Lake H1 Outlet Channel Profile (m = metres)*

The typical channel cross-section (Figure 7.3-D43) is up to 0.3 m deep relative to the surrounding terrain with a stream bed of mostly organics and some gravel and cobble material. The channel banks were observed to be mostly organics overlying cobble. It is a well-defined channel with observed flows during freshet conveyed in the main channel and limited flows overtopping the banks.

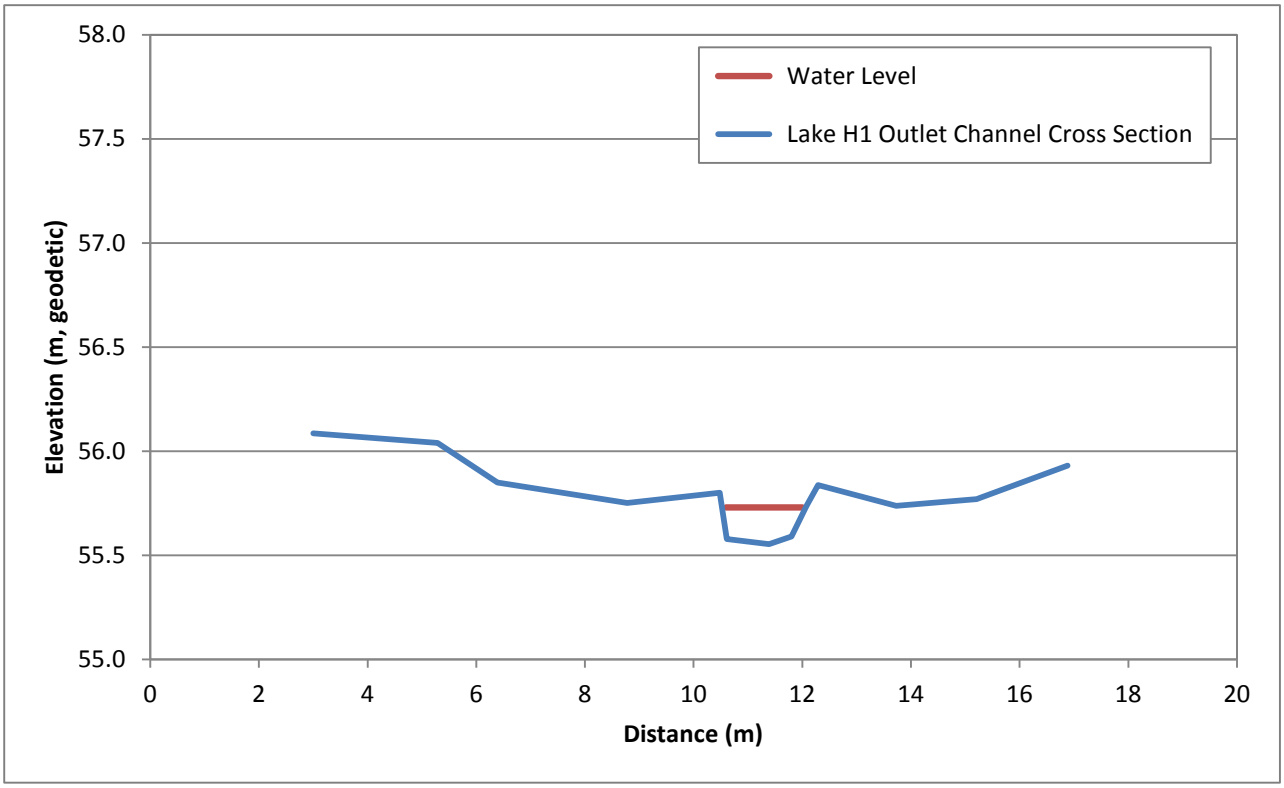



*Figure 7.3-D43: Lake H1 Outlet Channel Cross-Section (m = metres)*

### *3.4.1.1 Lake H1 Outlet Channel Mitigation*

During the Project, Lake H1 will be disconnected by a small dike at the existing lake outlet from the downstream Meliadine Lake and its flow regime will be part of the site water management plan. Therefore, no mitigation measures are anticipated to be required.

## 3.4.2 Lake H2 to Lake H17 Outlet Channel Surveys

Lakes H2, H3, H4 and H5 located upstream of Lake H1 will be covered by the plant site pad during Project operations. The existing outlet channels that connect these lakes were surveyed and a longitudinal profile is presented in Figure 7.3-D44.

The channel flows through relatively low slope terrain, with surficial materials consisting of mostly soil and organics. The channel banks have soils consisting of primarily organic materials with traces of gravel and cobble and the occasional boulder. The channel is typically up to 0.2 m deep relative to the surrounding terrain and varies in width between 0.5 and 1 m. The channel slope is low with a typical value of 2% and small

nickpoints where observed within the channel along the profile. The channel is typically well-defined, with small sections of braided channel found between lakes H2 and H3.

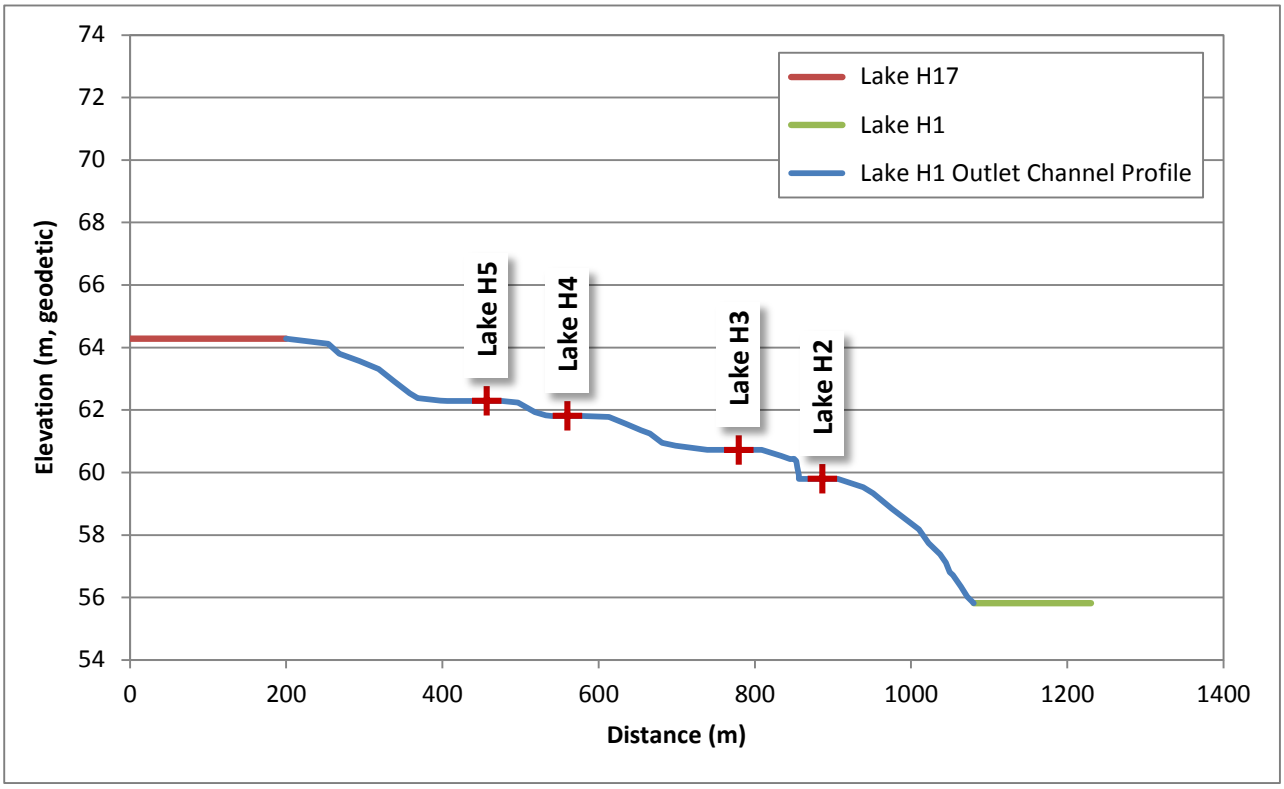



*Figure 7.3-D44: Lake H17 to Lake H1 Outlet Channel Profile (m = metres)*

The typical outlet channel cross-section of Lake H17 is shown in Figure 7.3-D45 for reference. The outlet channel at this location is well-defined and up to 0.3 m deep relative to the surrounding terrain. The stream bed consists of mostly gravel-sized material. The channel banks were observed to be mostly organics. During freshet most of the flow is conveyed within the main channel with limited flow overtopping of the banks.

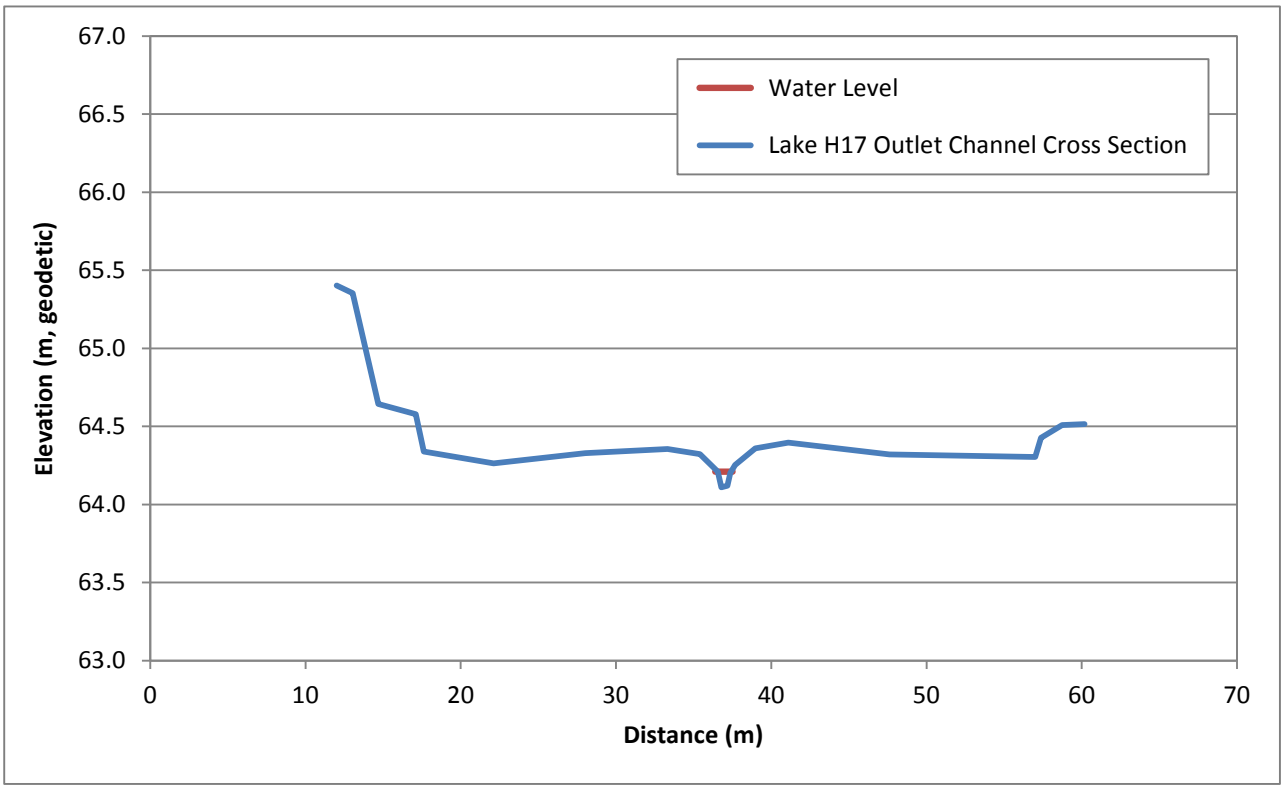



*Figure 7.3-D45: Lake H17 Outlet Channel Cross-Section (m = metres)*

#### *3.4.2.1 Lake H2 to Lake H17 Outlet Channel Mitigation*

The outlet channel from Lake H2 to Lake H17 will be removed during Project operations and therefore no erosion assessment was undertaken.

## 3.5 I Watershed

The I watershed is located south of the existing camp and has an area of approximately 0.3 $km^2$. The I watershed will be affected by mining operations on the northwest section where the Wesmeg #3 Open Pit will be located, and by mine infrastructures (i.e. roads) that will cross the western part of the watershed.

### 3.5.1 Lake I1 Outlet Channel Survey

Lake I1 is the only lake in the I watershed, has an area of approximately 7.6 ha (0.076 $km^2$), and drains into Meliadine Lake. The average water level elevation of Lake I1 at the time of the survey was approximately 63.44 masl and the average water level elevation of Meliadine Lake at the time of the survey was approximately 52.11 masl.

The existing outlet channel from Lake I1 to Meliadine Lake was surveyed and the longitudinal profile is shown in Figure 7.3-D46. The channel slope is low with typical values of 2 to 3% and with a small section in the middle where the slope is high, up to 7%. The outlet channel is not defined and flows into Meliadine Lake through a braided channel in a terrain with surficial materials consisting of mostly organics. The channel cross-section is shown in Figure 7.3-D47.

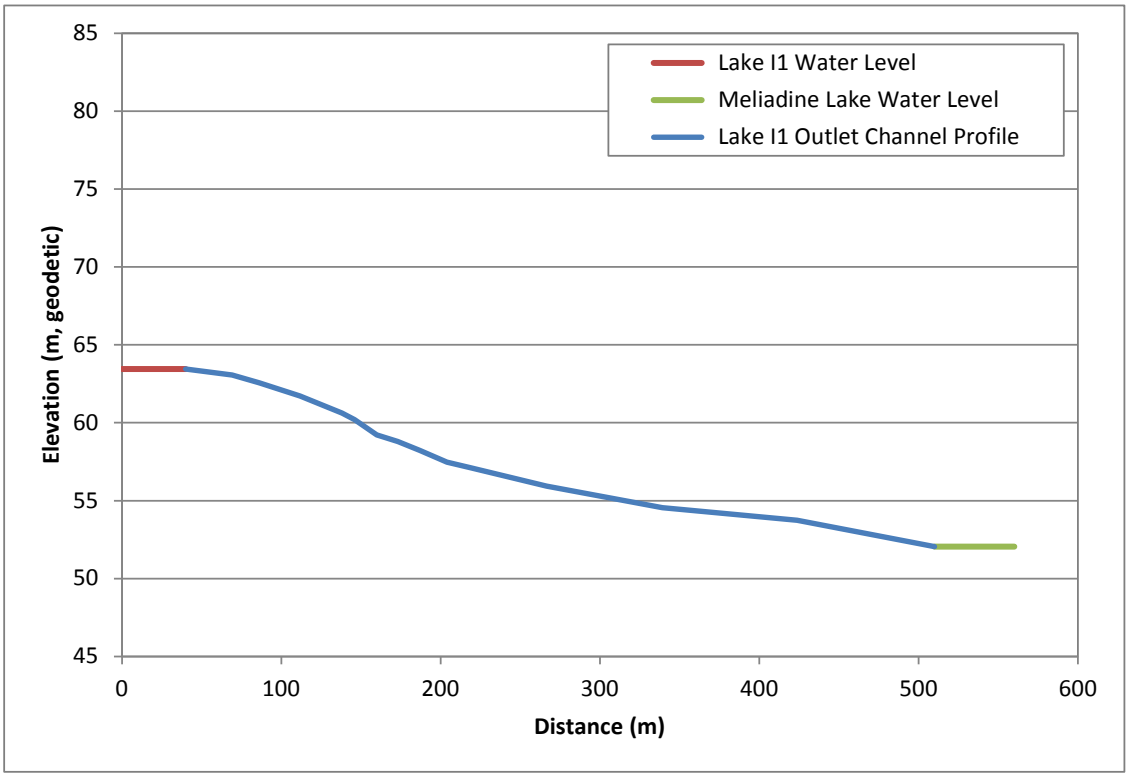



*Figure 7.3-D46: Lake I1 Outlet Channel Profile (m = metres)*

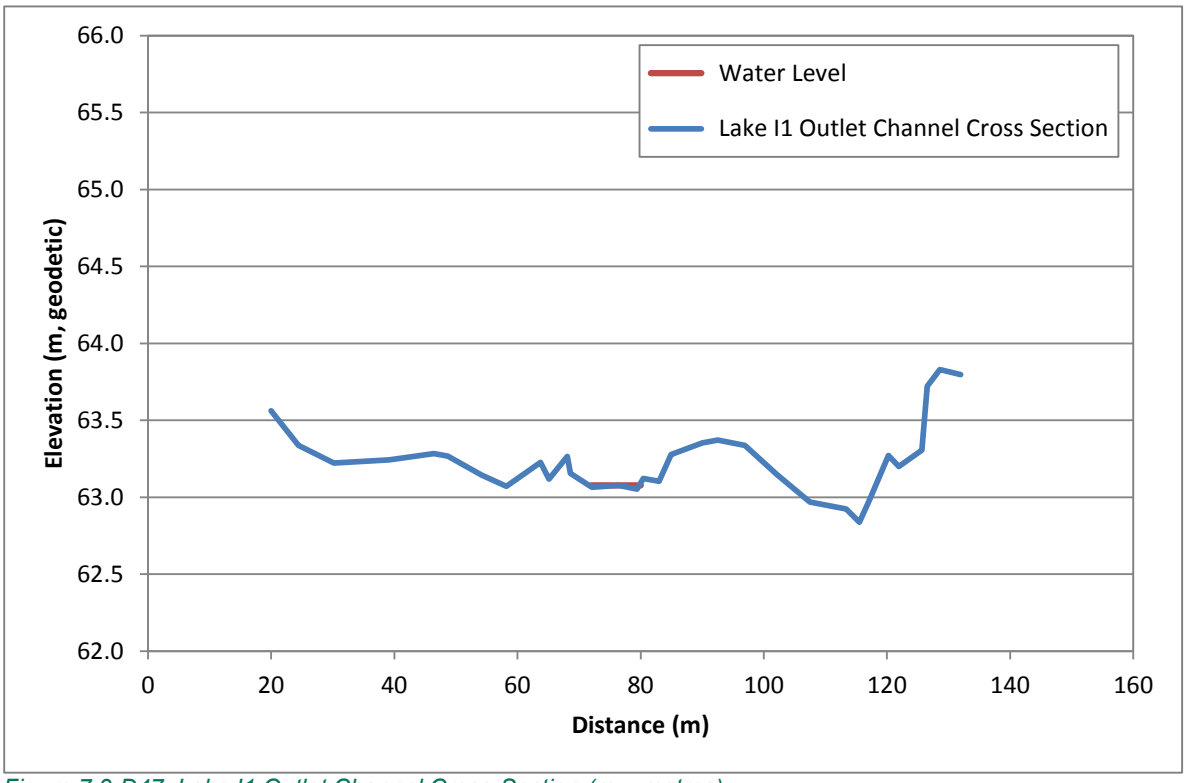



*Figure 7.3-D47: Lake I1 Outlet Channel Cross-Section (m = metres)*

### 3.5.1.1 Lake I1 Outlet Channel Mitigation

Following Mining Phase 1, Lake I1 will have reduced flows because of the Wesmeg #3 Pit drainage area being diverted out of the watershed. Therefore no erosion effects are expected on the outlet channel as a result of the Project.

## 3.6 J Watershed

The J watershed is located west of the existing camp and has an area of approximately 1.4 $km^2$ of which 0.3 $km^2$ is lake water surface. J watershed will be affected by the mining operations as follows:

- During Mining Phase 1: dewatering of Lake J7 to Lake J2;
- During Mining Phase 2: dewatering of all lakes upstream of Lake J1, and adding the Open Pit Wesmeg #3, the Low Grade Ore Stockpile, and contact water pond WM-S-02;
- During the Mining Phase 3: extending the Tiriganiaq Pit into the northwest part of J watershed; and
- During Post-Closure: the reconfiguration of J watershed will include an increase in the drainage area to Lake J8 from the Wesmeg #3 Pit and a change in drainage patterns draining former waterbodies (now infilled) J7, J6, J5, J4, J3, and J2 to Lake J8.

### 3.6.1 Lake J1 Outlet Channel Survey

Lake J1 is located northwest of the existing camp, has an area of approximately 1.7 ha and flows into Meliadine Lake. The average water level elevation of Lake J1 at the time of the survey was approximately 56.99 masl and the average water level elevation of Meliadine Lake at the time of the survey was approximately 52.05 masl.

The existing outlet channel of Lake J1 was surveyed and the longitudinal profile is shown in Figure 7.3-D48. The channel slope is low with a typical value of 2 to 3%, flowing mostly through organic surface materials with an undefined channel. The channel is up to 0.2 m deep relative to the surrounding terrain. Small steps were observed where cobble predominate within the channel along the profile. The outlet channel flows into Meliadine Lake through a terrain with surficial materials consisting of mostly organics overlying cobble and gravel. The Lake J1 natural outlet channel has been modified by an existing mine road.

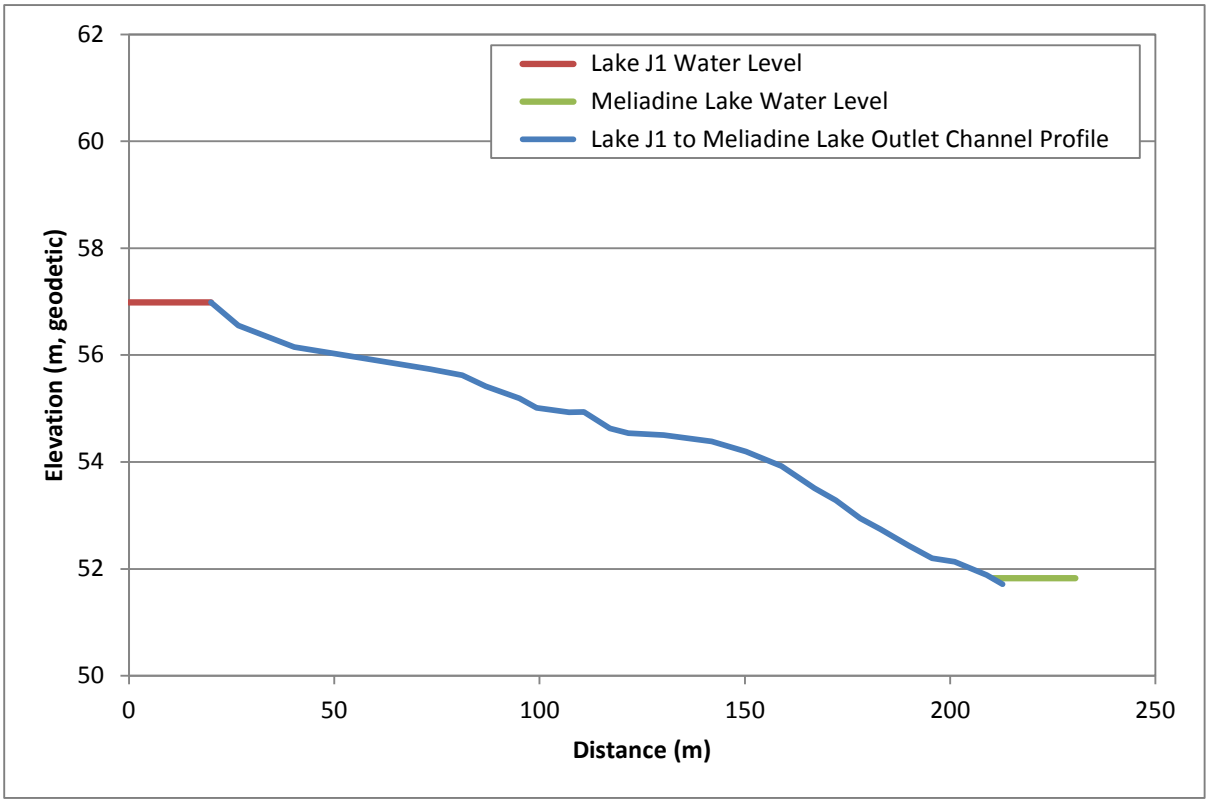



*Figure 7.3-D48: Lake J1 Outlet Channel Profile (m = metres)*

#### *3.6.1.1 Lake J1 Outlet Channel Mitigation*

Starting with Mining Phase 2, Lake J1 will be disconnected from upstream flow because of mining activities. Therefore no erosion effects are expected on the outlet channel as flow volumes and velocities are expected to be reduced.

During Post-Closure J1 Watershed will maintain a similar total watershed area, but will change its configuration by changing the land to lake area ratio. This will include adding lake area from the Wesmeg #3 Pit and land area

from former waterbodies J7, J6, J5, J4, J3, and J2, now infilled. These changes will have minimum effects and flows at Lake J1 outlet will be similar to baseline conditions. Therefore no erosion effects are expected on the outlet channel.

### 3.6.2 Lake J8 to Lake J2 Outlet Channel Surveys

Lakes J2, J3, J4, J5, J6, J7 and J8 located upstream of Lake J1 will be dewatered and gradually affected by mine operations (i.e. given over to the mine open pit and low grade ore stockpile areas) starting from the Mining Phase 1 to Mining Phase 3.

At the time of field visit, no discernible flows were observed at the outlets of Lake J7, J6, J5, J4, J3 and J8. The outlet channels were not defined and are mostly soils and organics, with flows expected only for the short period during freshet or rain events. The lake water levels measured at the time of survey are presented below in Table 7.3-D11.

**Table 7.3-D11: J Watershed Lake Water Levels, 2012**

| Lake Name | Water Level Elevation (m) |
|---|---|
| Lake J1 | 56.99 |
| Lake J2 | 62.60 |
| Lake J3 | 66.78 |
| Lake J4 | 66.91 |
| Lake J5 | 66.95 |
| Lake J6 | 68.23 |
| Lake J7 | 69.43 |
| Lake J8 | 64.82 |

The outlet channel of Lake J2 was surveyed and the channel cross-section is shown in Figure 7.3-D49. The channel flows through relative low slope terrain, with surficial materials consisting of soil and organics. The channel slope is typically 2% on the upstream section and 3 to 5% on the downstream section (Figure 7.3-D50). The channel banks have soils consisting of primarily organic materials with traces of gravel and cobble. The channel is typically up to 0.2 m deep relative to the surrounding terrain and varies in width between 0.5 and 1 m.

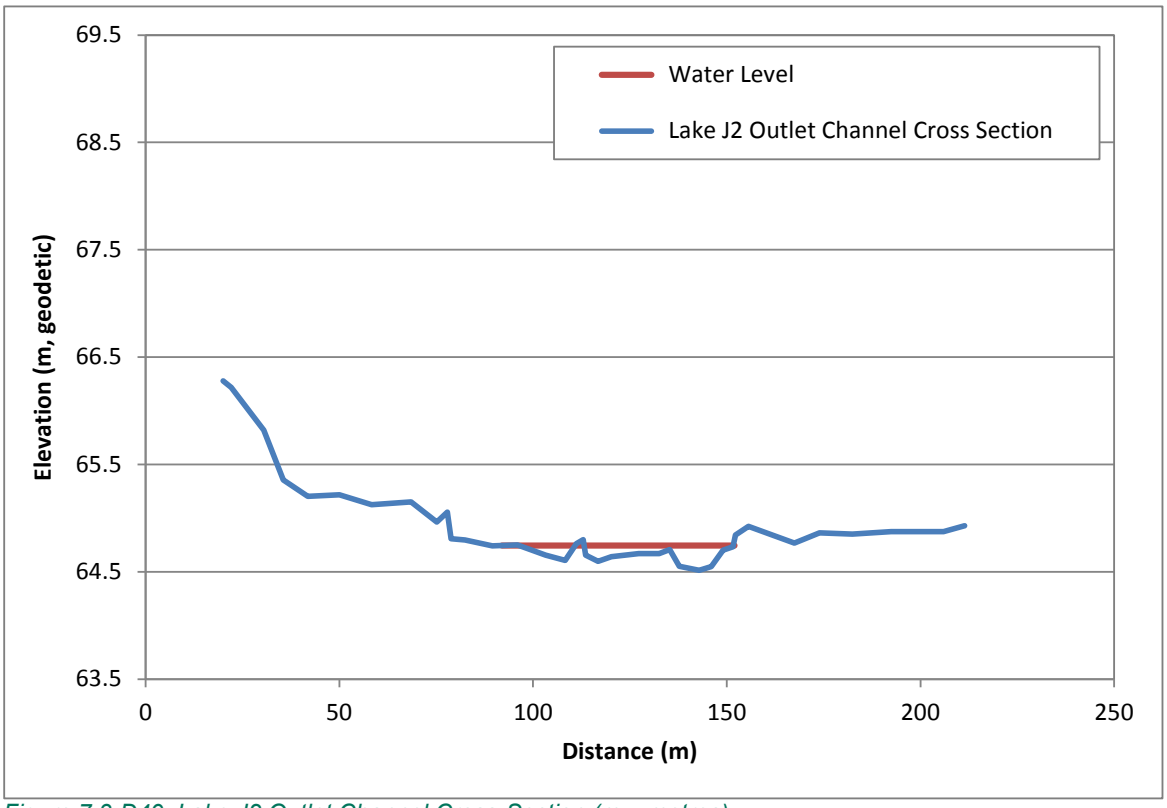



*Figure 7.3-D49: Lake J2 Outlet Channel Cross-Section (m = metres)*

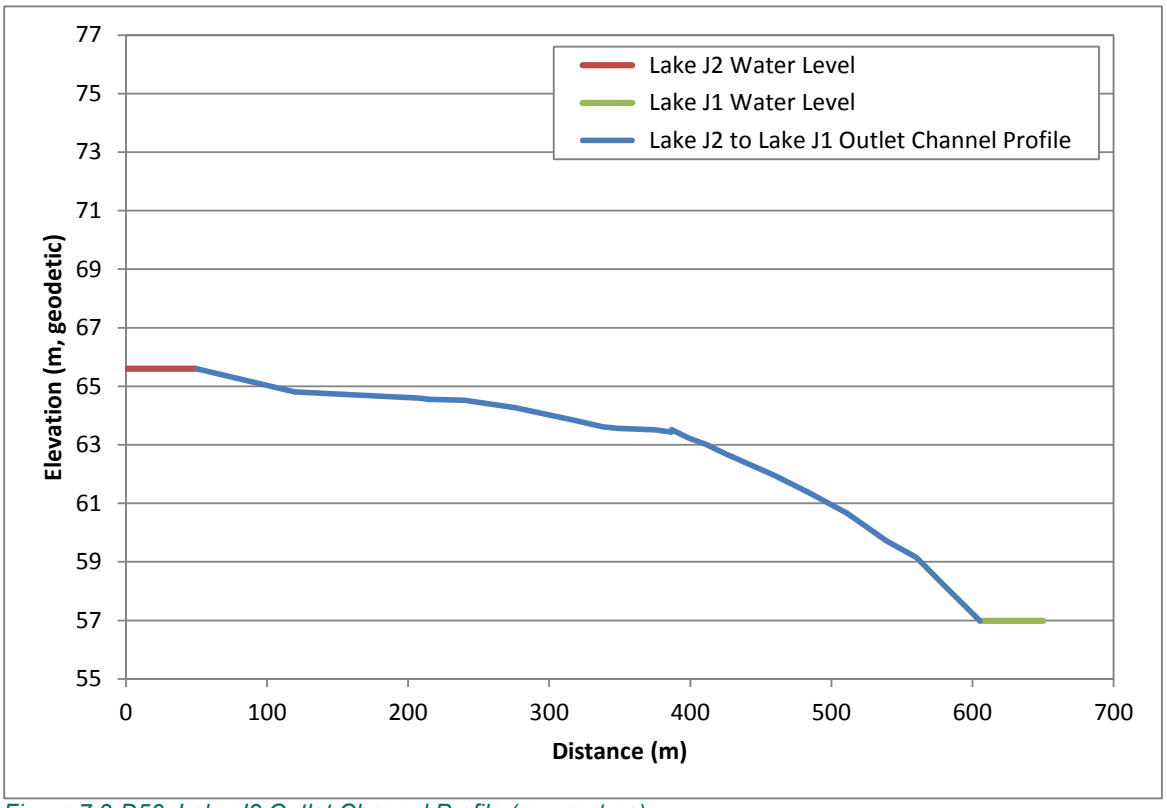



*Figure 7.3-D50: Lake J2 Outlet Channel Profile (m = metres)*

### 3.6.2.1 Lake J8 to Lake J2 Outlet Channel Mitigation

Lakes J2, J3, J4, J5, J6, J7 and J8 located upstream of Lake J1 will be dewatered and gradually affected by mine operations (by the construction of Wesmeg Open Pit #3, the Ore Stockpile, and the water management pond WM-S-02) starting from the Mining Phase 1 to Mining Phase 3 therefore no erosion assessment was undertaken.

At Post-Closure, Lakes J2, J3, J4, J4, J6 and J7 will have been infilled therefore no erosion assessment was undertaken. The J8 Watershed area will increase with inclusion of the Wesmeg #3 Pit area which will increase the outflows of Lake J8. The Lake J8 outlet channel is short (approximately 15 m long) and connects with the existing Lake J2 outlet channel. During Post-Closure, the existing Lake J2 outlet channel will only be carrying the augmented discharge from Lake J8, but this is expected to be less than the baseline discharge from Lake J2, therefore potential erosion is not anticipated. For the outlet channel from Lake J8 to confluence with Lake J2 outlet channel, the design of this channel should mimic characteristics similar to the existing Lake J2 outlet channel. The existing channel from Lake J2 may be used as a design guideline because it is expected to have excess capacity than will be needed.

## 3.7 P Watershed

The P watershed is located southwest of the existing camp and has an area of approximately 0.5 $km^2$ of which 0.1 $km^2$ is lake water surface. The P watershed will be affected permanently starting in the Pre-production phase due to the diversion of Lake B45 flows to Lake B44 and further to Lake P3.

### 3.7.1 Lake P3 Outlet Channel Survey

Lake P3 is located southwest of the existing camp, has an area of approximately 0.3 ha and flows into Lake P2. The average water level elevation of Lake P3 at the time of the survey was approximately 56.97 masl and 55.15 masl at Lake P2.

Starting with the Pre-production phase, Lake P3 will convey the diverted flows from the B45 watershed to Lake P2.

The outlet channel of Lake P3 is not defined and no flows were observed at the time of visit. It is expected that flows happen only during freshet and extended periods of rain. The outlet channel of Lake P3 was surveyed and the longitudinal profile is shown in Figure 7.3-D51. The channel slope is between 2 and 4% and flows into Lake P2 through terrain with surficial materials consisting of mostly organics.

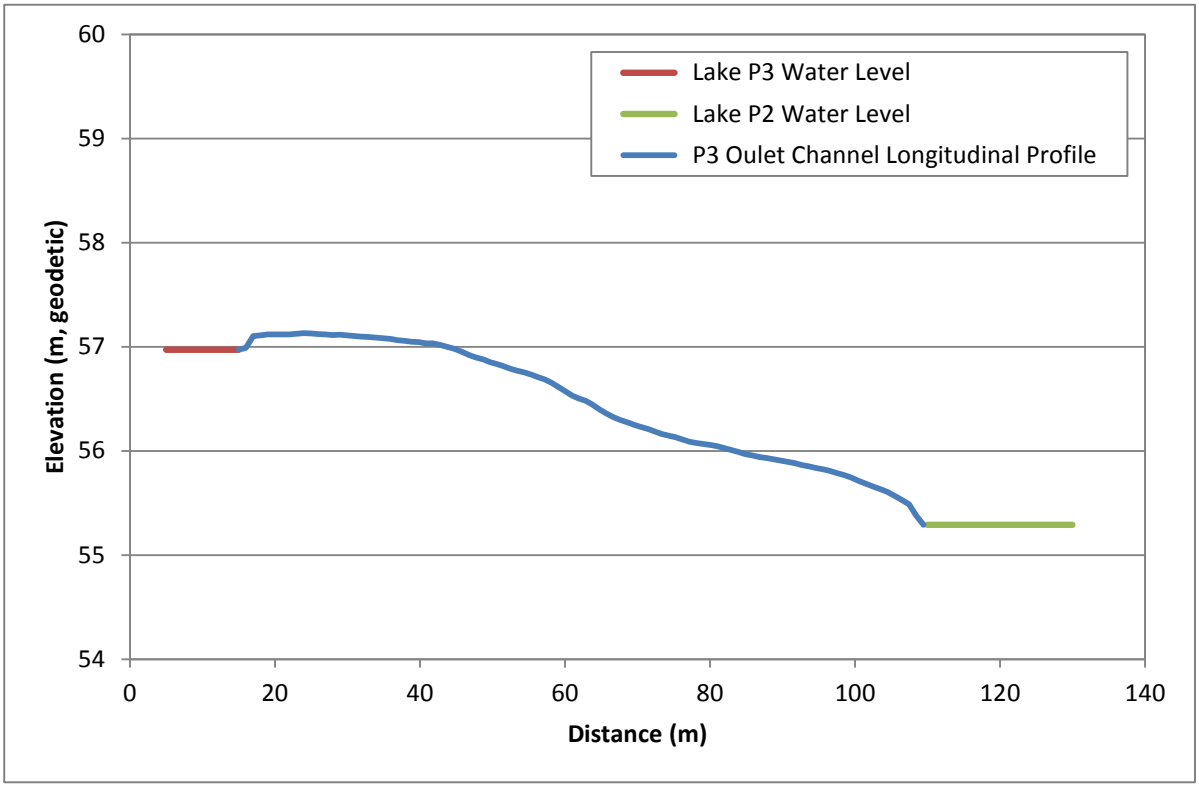



*Figure 7.3-D51: Lake P3 Outlet Channel Profile (m = metres)*

### 3.7.1.1 Lake B44 to Lake P3 Channel Mitigation

A new channel will be constructed from Lake B44 to Lake P3 that will allow the flow from Lake B45 to bypass Lake B4 and flow to Lake B2 through Lakes P3 and P2.

The existing watershed boundary between Lake P3 and Lake B44 was surveyed and the cross-section is shown in Figure 7.3-D52. It was observed at the time of survey, that the water level in Lake B44 was approximately 0.05 m lower than in Lake P3.

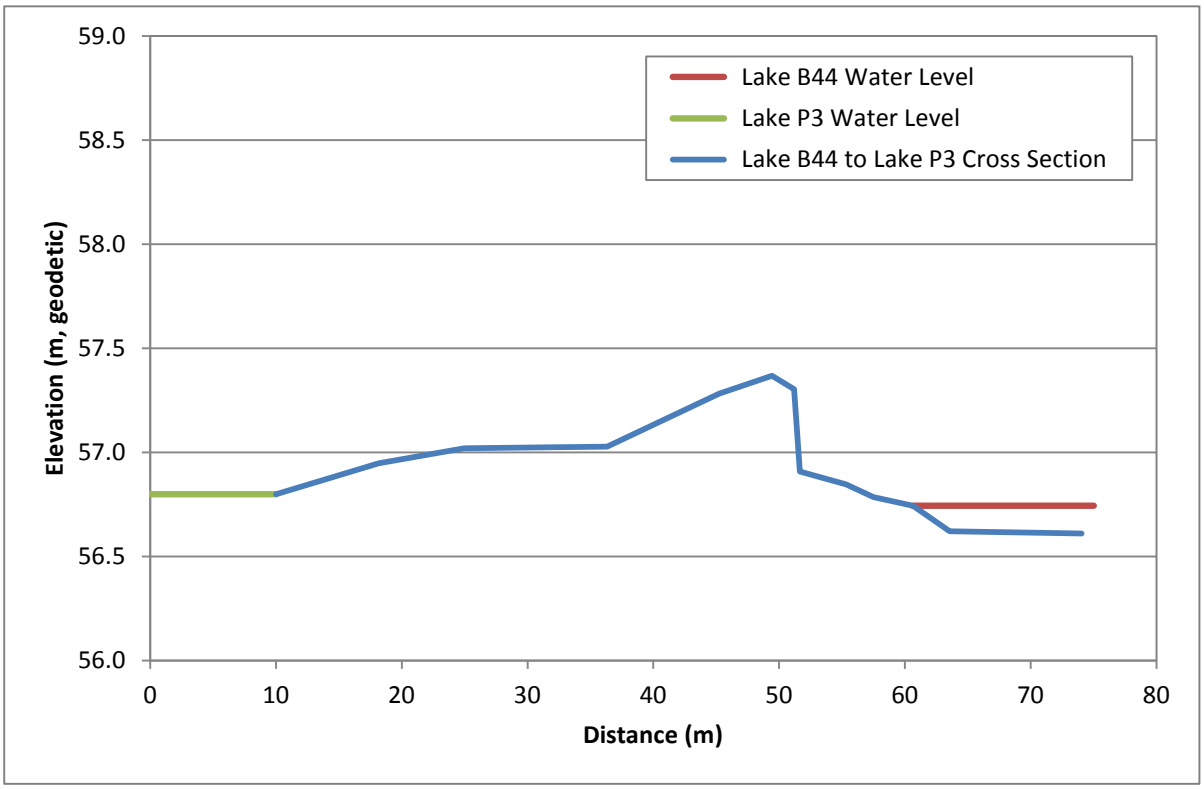



*Figure 7.3-D52: Lake B44 to Lake P3 Watershed Boundary Cross-section (m = metres)*

Similar characteristics within the existing outlet channel of Lake B46 (Section 3.2.4.2 and Section 3.2.6) should be used as a design guideline and recreated between Lake B44 and Lake P3 as the new channel will carry similar flows to what presently exits from Lake B46 (Lake B45 has similar water surface elevations with Lake B4 and therefore no proper outlet channel that can be used as an analogue). It is recommended that the same cobble-armoured channel banks and bed be recreated to limit instream erosion.

### 3.7.1.2 Lake P3 Outlet Channel Mitigation

The Lake P3 outlet channel will permanently convey the flow from the diverted B45 watershed. Following the diversion, the existing outlet channel of P3 will be redesigned to support the flow increase. It is recommended that similar characteristics within the existing outlet channel of Lake B46 be used as a design guideline and recreated at the outlet from Lake P3 as the new channel will carry similar flows to what presently exits from

Lake B46. It is recommended that the same cobble-armoured channel banks and bed be recreated to limit instream erosion.

### 3.7.2 Lake P2 Outlet Channel Survey

Lake P2 is located southwest of the existing camp, has an area of approximately 10.3 ha and flows into Lake P1. The average water level elevation of Lake P2 at the time of the survey was approximately 55.15 masl.

Starting with the Pre-production phase, Lake P2 will convey the diverted flows from B45 watershed through Lake P3 to Lake B2. A new channel will connect Lake P2 to B2; the existing outlet from P2 to P1 will also be maintained.

#### *3.7.2.1 Lake P2 Outlet Channel Mitigation*

The existing watershed boundary between Lake P2 and Lake B2 was surveyed and a typical cross-section is shown in Figure 7.3-D53. It was observed that at the time of surveys the water level in Lake P2 was approximately 0.8 m higher than in Lake B2 with 54.29 masl water level elevation at the time of survey.

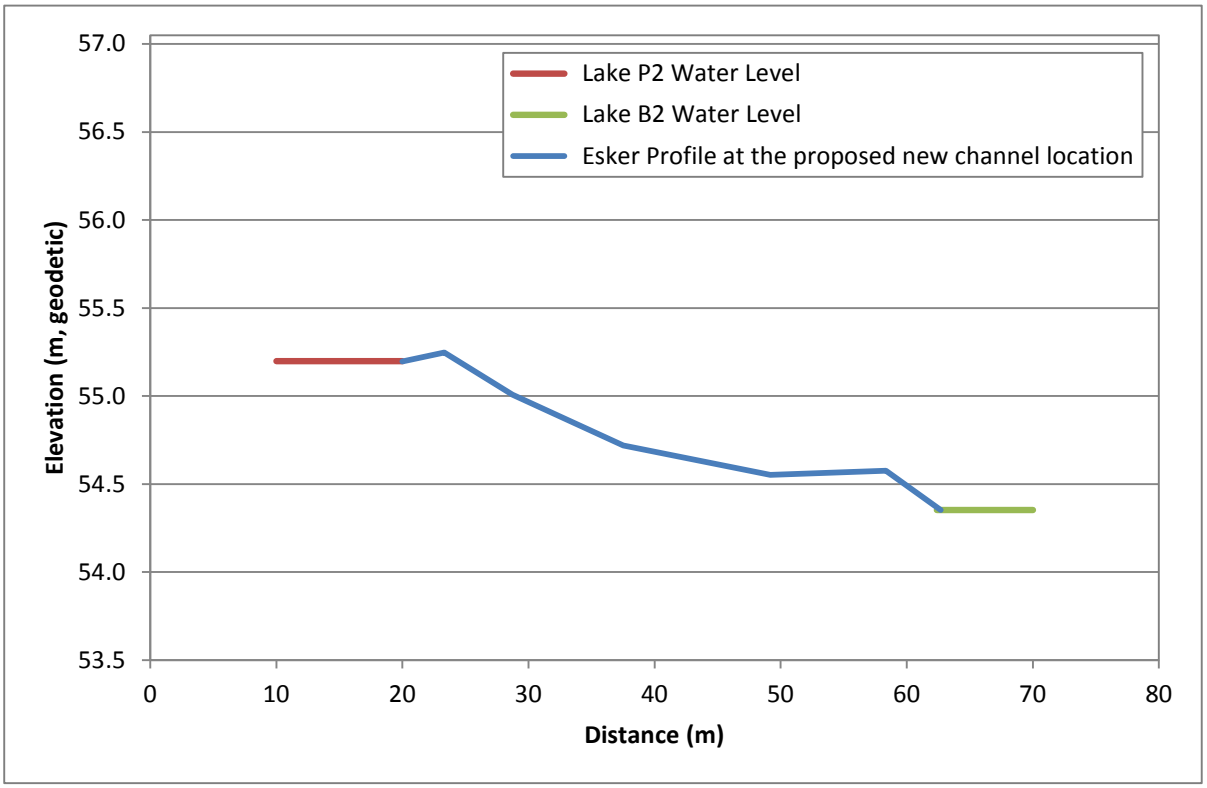



*Figure 7.3-D53: Lake P2 to Lake B2 Watershed Boundary Cross-section (m = metres)*

No effects on Lake P2 and the existing outlet channel or bank stability are expected during the Pre-production phase because the potential effects will be mitigated by the diversion channel, designed and constructed to prevent erosion and sedimentation. It is recommended that similar characteristics within the existing outlet

channel of Lake B46 be used a design guide and recreated at the outlet to Lake P2 as the new channel will have similar flows to what presently exits from Lake B45 (Section 3.2.4.2). It is recommended that the same cobble-armoured channel banks and bed be recreated to limit instream erosion.

## 3.8 Chickenhead Watershed

The Chickenhead watershed is located approximately 15 km southeast of the existing camp and has an area of approximately 7.7 $km^2$ of which 1.5 $km^2$ is lake water surface. Chickenhead watershed will be affected by the mining operations starting with Mining Phase 3 when the Discovery Pit will be constructed in the north section of the watershed. The catchment of the Discovery Pit will be diverted out of Chickenhead watershed.

### 3.8.1 Chickenhead Lake Outlet Channel Survey

Chickenhead Lake is the main lake within the watershed, has an area of approximately 132 ha and flows into Lake CH5. The average water level elevation in Chickenhead Lake at the time of the survey was approximately 63.86 masl.

The existing outlet channel of Chickenhead Lake was surveyed and the typical channel cross-section is shown in Figure 7.3-D54. The outlet channel is well-defined and up to 0.3 m deep relative to the surrounding terrain. The stream bed consists of mostly gravel and cobble. The channel banks were observed to be mostly organics overlying cobble. The main channel varies in width between 1 m and 3 m with smaller side channels that convey flows mostly during freshet.

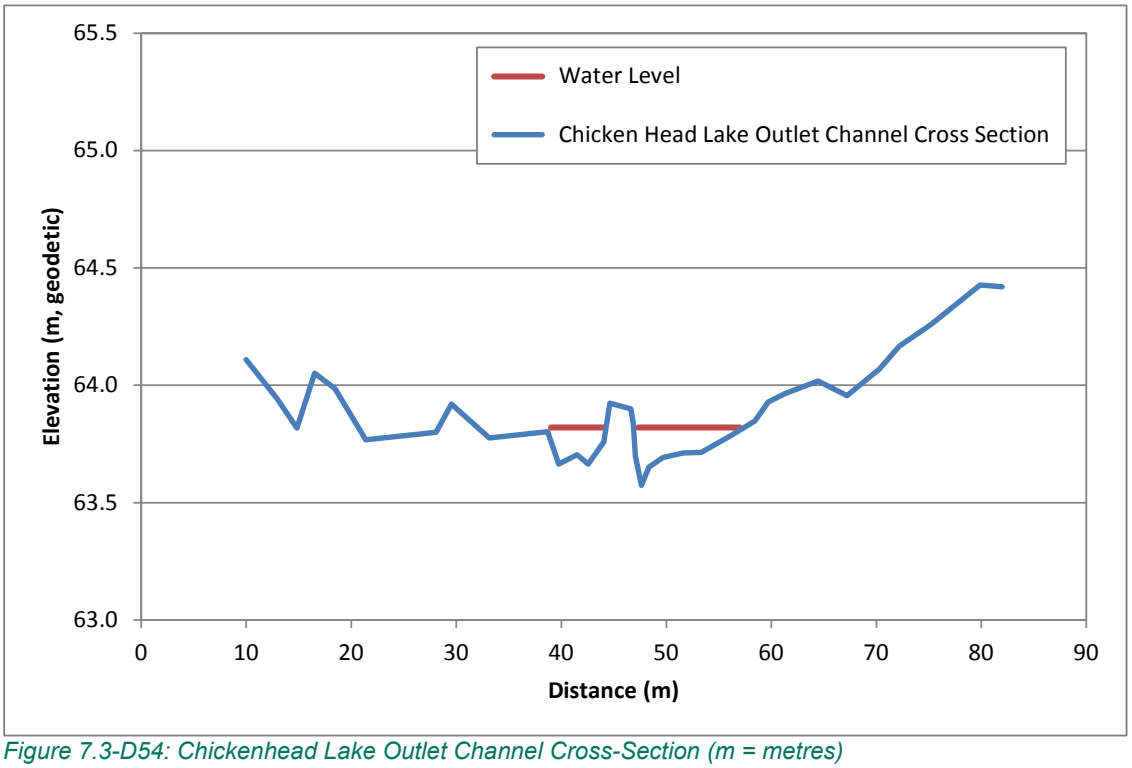



*Figure 7.3-D54: Chickenhead Lake Outlet Channel Cross-Section (m = metres)*

### 3.8.1.1 Chickenhead Lake Outlet Channel Mitigation

Starting Mining Phase 3, Chickenhead Lake will have reduced flows because of the Discovery Pit drainage area being diverted out of the watershed. The flood magnitudes are expected to remain reduced during Closure and Post-Closure due to an increase in lake area from the Discovery Pit (i.e., due to flow attenuation). Therefore, no erosion effects are expected on the outlet channel as flow volumes and velocities are expected to be reduced.

## 4.0 SUMMARY AND RECOMMENDATIONS

In 2012, Lake Shoreline and outlet channels were surveyed in the watersheds predicted to be affected by the Project development. This survey provides an assessment of the shoreline and the lake outlet channels that are part of those watersheds. Table 7.3-D12 presents a summary of the 2012 lake shoreline and lake outlet channel survey results.

**Table 7.3-D12: Summary of 2012 Lake Shoreline and Lake Outlet Channel Survey Results**

| Surveyed Watershed | Lake Shoreline / Outlet Channel | Affected by Project Development | Erosion Mitigation | Status at Closure |
|---|---|---|---|---|
| A1 Watershed | Lake A1 | Not affected | Not required | Not affected |
| | A1 Outlet Channel | Flow diversion from upstream lakes. | Not required | Not affected |
| A6 to A2 Watershed | Streams A2, A3, A4, A5, A6 | Disconnected from Lake A6 | Not required, disconnected from upstream flow | Reconnected with upstream flow |
| A7 Watershed | A7 Outlet Channel | Yes – increased flows during initial phase of dewatering from Lake A8 | Monitor the dewatering schedule with dewatering flows less than average freshet flows | Reconnected with Lake A8 |
| A8 Watershed | Lake A8 | Yes – dewatered | Not required – the lake will be dry | Reconnected with the upstream lakes |
| | A8 Outlet Channel | Not affected - dewatered flows from Lake A8 will be transferred directly to Lake A7 environment. | Not required | Channel flows will return to pre-mining conditions |
| Other waterbodies in A Watershed | Lake A17, A13, A12, A11, A10, A9, A54, A39, A38 and A35 | Yes – dewatered and covered by open pits | Not required | Reconnected with the rest of the watershed. |
| | Outlet Channels for Lake A17, A13, A12, A11, A10, A9, A54, A39, A38 and A35 | Yes – dewatered and covered by open pits | Not required | Channel flows will return to pre-mining conditions for the section not covered by open pits |
| B Watershed | B6 Outlet Channel | Yes – will receive increased flows from upstream lakes during the initial dewatering phase | Not required – dewatering flows not to exceed average freshet flows | Covered by waste rock storage facilities |
| | B34 Outlet Channel | | | Channel flows will return to pre-mining conditions |
| | B2 Outlet Channel | | | Channel flows will be reduced due to permanent watershed diversions upstream |
| | B46 Outlet Channel | Not affected | Not required | Not affected |

**Table 7.3-D12: Summary of 2012 Lake Shoreline and Lake Outlet Channel Survey Results (cont'd)**

| Surveyed Watershed | Lake Shoreline / Outlet Channel | Affected by Project Development | Erosion Mitigation | Status at Closure |
|---|---|---|---|---|
| | Lake B45 | Yes - disconnected from Lake B4 with flow diverted to Lake P3 | Required - minimum mitigation because of low erosion risk | Permanently diverted to P Watershed |
| | B45 Outlet Channel | Yes – permanently covered by a dike | Not required | Permanently diverted to P Watershed |
| | Lake B44 | Yes – permanently diverted to Lake P3 with raised water level | Required - minimum mitigation because of low erosion risk | Permanently diverted to P Watershed |
| | B44 Outlet Channel | Yes – flooded by raised water level in Lake B45 | Not required | Permanently diverted to P Watershed |
| New Channel B44 to P3 | New diversion Channel | Yes - will convey flows from Lake B44 | Required - new channel redesign and construction | Permanently diverted to P Watershed |
| D Watershed | D7 Outlet Channel | Yes - will receive permanently diverted flows from Lake B5 | Not required – dewatering flows not to exceed average freshet flows | Permanently diverted from B5 Watershed |
| | D6 Outlet Channel | Yes - will receive permanently diverted flows from Lake B5 | Not required – dewatering flows not to exceed average freshet flows | Permanently diverted from B5 Watershed |
| | D5 Outlet Channel | Yes - will receive permanently diverted flows from Lake B5 | Not required – dewatering flows not to exceed average freshet flows | Permanently diverted from B5 Watershed |
| | D4 Outlet Channel | Yes - will receive permanently diverted flows from Lake B5 | Not required | Permanently diverted from B5 Watershed |
| H1 Watershed | Lake H1 | Yes - disconnected from upstream lakes | Not required | Reconnected with the upstream lakes |
| | H1 Outlet Channel | Yes - disconnected from upstream lakes | Not required | Reconnected with the upstream lakes |
| H17 to H2 Lakes | Lake H2, H3, H4, and H5 | Yes – disconnected from Lake H1 and covered by plant site pad during Project operations | Not required - covered by plant site pad during Project operations | Reconnected with the upstream lakes |
| | Outlet Channels for Lake H2, H3, H4, and H5 | Yes – disconnected from Lake H1 and covered by plant site pad during Project operations | Not required - covered by plant site pad during Project operations | Reconnected with the upstream lakes |
| | Lake H17 | Yes - disconnected from upstream lakes | Not required – part of the site water management | Reconnected with the upstream lakes |
| | H17 Outlet Channel | Yes - disconnected from upstream lakes | Not required | Reconnected with the upstream lakes |
| I1 Watershed | Lake I1 | Not affected by Project footprint. Watershed will be reduced. | Not required | Not affected |
| | I1 Outlet Channel | Not affected | Not required | Not affected |
| J1 Watershed | Lake J1 | Yes - disconnected from upstream lakes | Not required | Reconnected with the upstream lakes |

**Table 7.3-D12: Summary of 2012 Lake Shoreline and Lake Outlet Channel Survey Results (cont'd)**

| Surveyed Watershed | Lake Shoreline / Outlet Channel | Affected by Project Development | Erosion Mitigation | Status at Closure |
|---|---|---|---|---|
| | J1 Outlet Channel | Yes - disconnected from upstream lakes | Not required | Reconnected with the upstream lakes |
| J8 to J2 Lakes | Lake J2, J3, J4, J5, J6, J7 and J8 | Yes – disconnected from Lake J1 and covered by open pit and ore stockpile during Project operations | Not required - covered by open pit and ore stockpile during Project operations | Reconnected with the upstream lakes |
| | Outlet Channels for Lake J2, J3, J4, J5, J6, J7 and J8 | Yes – disconnected from Lake J1 and covered by open pit and ore stockpile during Project operations | Not required - covered by open pit and ore stockpile during Project operations | Reconnected with the upstream lakes |
| P Watershed | Lake P2 and P3 | Yes – flow diversion from B45 watershed | Not required | Permanently diverted from B45 Watershed |
| | P2 and P3 Outlet Channel | Yes – flow diversion from B45 watershed | Required - new channel redesign and construction | Permanently diverted from B45 Watershed |
| New Channel P2 to B2 | New diversion Channel | Yes - will convey flows from Lake B45 | Required - new channel redesign and construction | Permanently diverted from B45 Watershed |

The key aspects of the shoreline assessment are based on the following anticipated Project impacts:

- Lakes B44 and B45 will have water levels increased permanently by disconnecting the Lake B45 from the downstream Lake B4, and diverting the flows to Lake B2 through Lakes P3 and P2. New shorelines will develop over several years to decades, likely developing more quickly on the High and Very High shoreline areas on Lakes B44 and B45.
- Lake Outlet channels for Lakes A1, A7, B6, D7, D6, D5, D4, and J1 may experience temporary increased flows during the initial phase of dewatering.
- Lake B5 watershed will be permanently diverted to Lake D7 watershed at Post-Closure and will require a new channel between Lake B5 and Lake D7, and outlet channel enhancement (i.e. increased capacity) for lakes D7, D6, D5, and D4.
- The remaining lakes and outlet channels affected by the Project footprint will be either covered by Project facilities and infrastructure or the natural runoff and contact water will be part of a closed system within the site water management plan.

On the basis of the results presented in Table 7.3-D12, and the project impacts summarized above, the following is recommended:

- For High and Very High erosion potential areas on Lakes B44 and B45, it is recommended that these shoreline areas be either armoured and/or re-sloped prior to raising the water level, or monitoring the shorelines post development of the new lake level and implementing erosion protection as required.

**Table 7.3-D12: Summary of 2012 Lake Shoreline and Lake Outlet Channel Survey Results (cont'd)**

Monitoring in either case should occur annually for a period of at least 10 years. Determination of the preferred option requires a detailed cost/benefit analysis.

- For the remaining shoreline areas with lower erosion potential (Moderate to Very Low), it is recommended that the shorelines be monitored post development of the new lake level and erosion protection implemented as required. Monitoring should occur annually for at least 10 years.
- For the outlet channels from the new Lake B44/45 to Lake B2, it is recommended that similar characteristics within the existing outlet channel of Lake B46 be used as a design guideline and recreated as the new channels will carry similar flows to what presently exits from Lake B46. It is recommended that the same cobble-armoured channel banks and bed be recreated to limit in-stream erosion.
- For outlet channels from Lakes A1, A7, B6, D7, D6, D5, D4, and J1, it is recommend that during mining activities the proposed mitigation measure of pumping for dewatering only after the spring freshet has passed be followed in order to keep the peak flows at or below baseline peak flow conditions. This will serve to minimize the potential for erosion.
- It is recommended that the outlet channel of Lake B6 be used as a design guideline for the new channel between Lake B5 and Lake D7 as the flows will be similar to what presently exits Lake B6.
- It is recommended that the lake B5, D7, D6, D5 and D4 outlet channel flow capacity be increased by channel enhancement (i.e. increase capacity) at Post-Closure such that water levels remain at baseline conditions in each of the lakes.
- It is recommended that other lake outlet channels affected by dewatering during the Pre-production phase, but not covered by Project infrastructure or incorporated within the site water management system, should be monitored and erosion protection implemented as required.

# 5.0 CLOSURE

We trust that the factual information provided in this report is sufficient for your present needs. Should you have any questions regarding the above information or require additional information please do not hesitate to contact the undersigned.

Yours very truly,

**GOLDER ASSOCIATES LTD.**

ORIGINAL SIGNED

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# APPENDIX A

## Shoreline and Channel Erosion Assessment Photographs

# 1.1 A Watershed: Channel Erosion Assessment

## 1.1.1 Lake A1 Outlet Channel



*Photograph 1: Lake A1 Outlet Channel Looking Upstream*



*Photograph 2: Lake A1 Outlet Channel Looking Downstream*

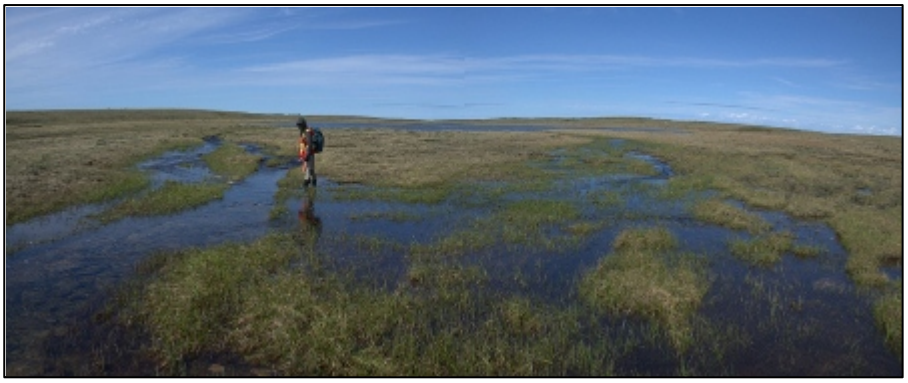


*Photograph 3: Lake A1 Outlet Channel, Panoramic View to Meliadine Lake Looking Downstream*



*Photograph 4: Lake A1 Outlet Channel Panoramic View Looking Upstream*

### 1.1.2 Lake A6 to Lake A1 Outlet Channel



*Photograph 5: Lake A2 Outlet Channel Looking Upstream*



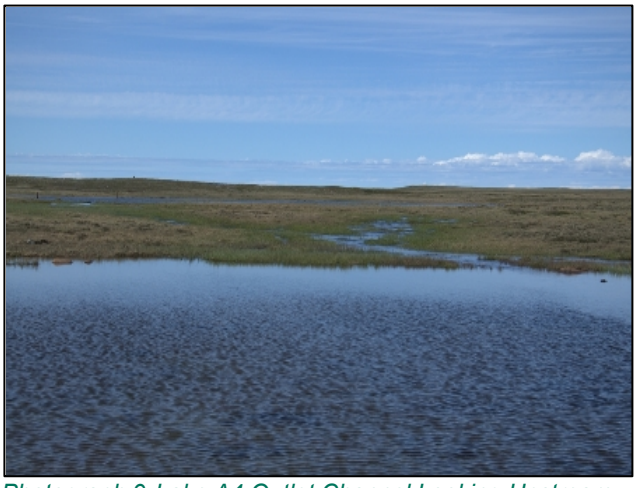
*Photograph 6: Lake A2 Outlet Channel Substrate Detail*



*Photograph 7: Lake A3 Outlet Channel Substrate*



*Photograph 8: Lake A3 Outlet Channel View Upstream*



*Photograph 9: Lake A4 Outlet Channel Looking Upstream*



*Photograph 10: Lake A4 Outlet Channel Looking Upstream*



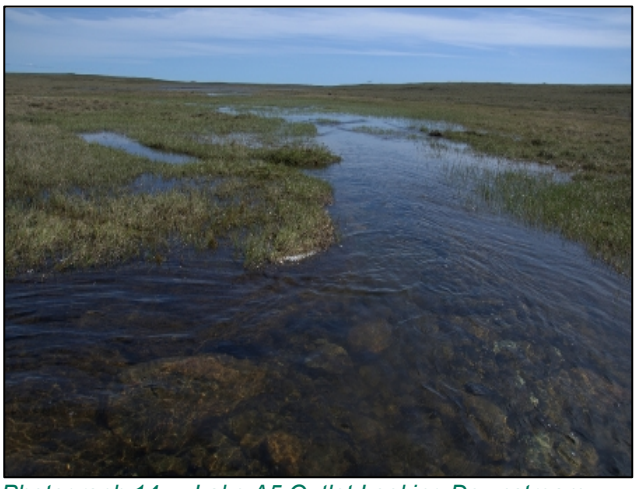
*Photograph 11: Lake A5 Outlet Channel Looking Downstream.*



*Photograph 12: Lake A5 Side Outlet Channel Looking Upstream*



*Photograph 13: Lake A5 Outlet Looking Upstream*



*Photograph 14: Lake A5 Outlet Looking Downstream*



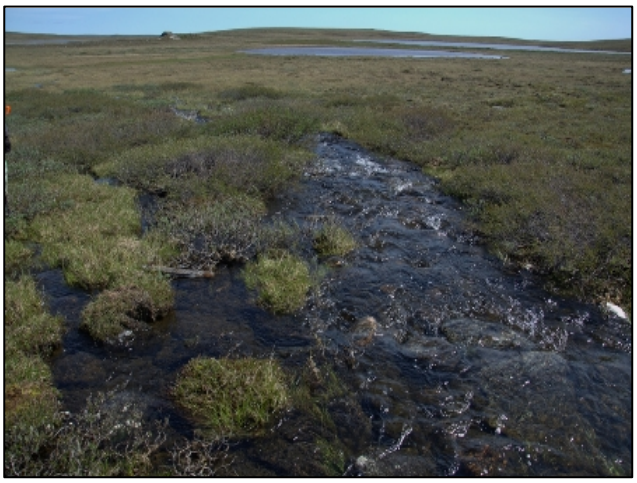
*Photograph 15: Lake A6 Outlet Channel Looking Upstream*



*Photograph 16: Lake A6 Outlet Channel Substrate Detail*



*Photograph 17: Lake A6 Outlet Channel Looking Upstream*



*Photograph 18: Lake A6 Outlet Channel Looking Downstream*



*Photograph 19: Lake A7 Outlet Looking Downstream*



*Photograph 20: Lake A7 Outlet Channel Looking Downstream*



*Photograph 21: Lake A7 Outlet Channel Looking Downstream*



*Photograph 22: Lake A8 Outlet Channel Substrate Detail*



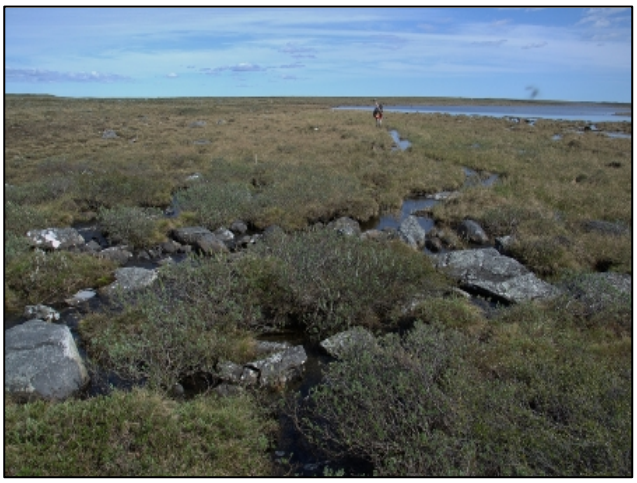
*Photograph 23: Lake A8 Outlet Channel Looking Upstream*



*Photograph 24: Lake A8 Outlet Channel Looking Downstream Towards Lake A7*



*Photograph 25: Lake A8 Outlet Channel Looking Upstream*



*Photograph 26: Lake A8 Outlet Channel Looking Downstream*



*Photograph 27: Lake A8 Outlet Channel Looking Upstream*

## 1.2 B Watershed: Channel Erosion Assessment

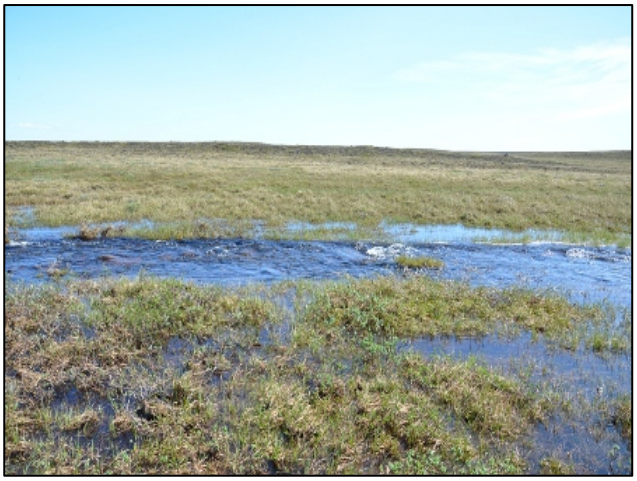
### 1.2.1 Lake B2 Outlet Channel



*Photograph 28: Lake B2 Outlet Channel Looking Upstream*

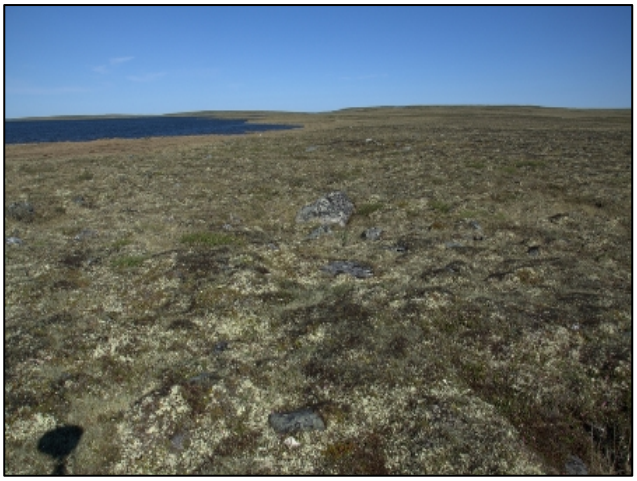


*Photograph 29: Lake B2 Outlet Channel Looking Downstream*

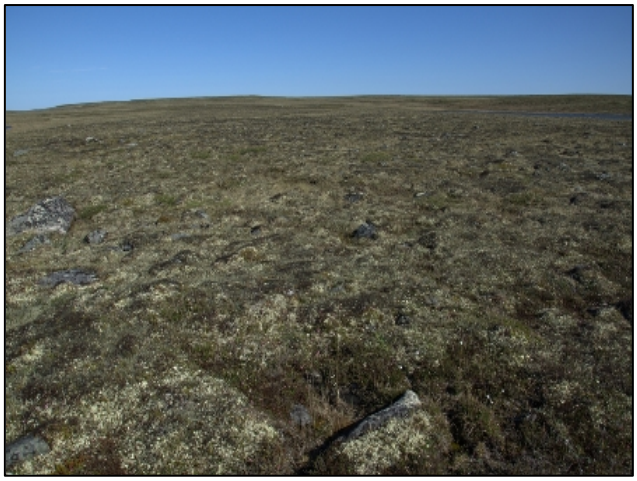


*Photograph 30: Lake B2 Outlet Channel Looking West Towards Left Bank*

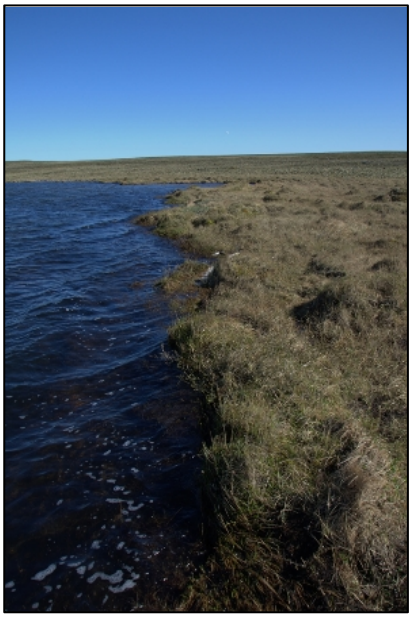
### 1.2.2 Watershed Boundary Lake B5 to Lake D7



*Photograph 31: View Towards Lake D7 from the D Watershed Boundary*



*Photograph 32: View North, along the D Watershed Boundary*



*Photograph 33: Lake D7 at the Proposed Water Channel Approximate Location, Looking East*



*Photograph 34: Lake D7 at the Proposed Water Channel Approximate Location, Looking West*

### 1.2.3 Lake B34 Outlet Channel



*Photograph 35: Lake B34 Looking Southwest at Outlet*



*Photograph 36: Lake B34 Outlet Channel Looking Upstream*



*Photograph 37: Lake B34 Outlet Channel Terrain Detail*

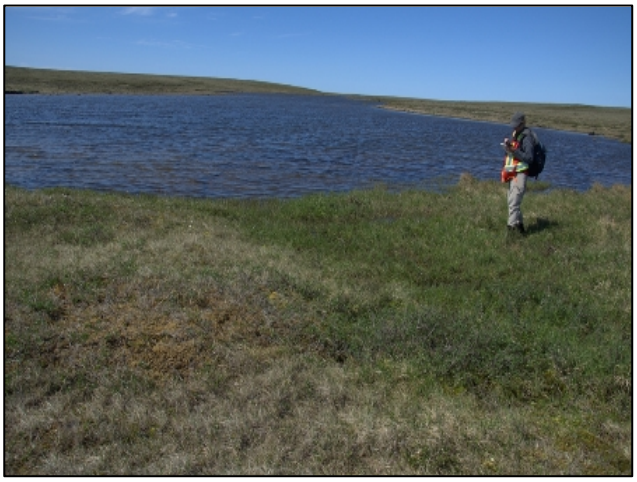


*Photograph 38: Lake B34 Outlet Channel Looking*



*Photograph 39: Lake B34 Outlet Channel Looking Downstream*

### 1.2.4 Lake B44 Outlet Channel



*Photograph 40: Lake B44 Outlet Channel Looking Upstream*



*Photograph 41: Lake B44 Outlet Channel Looking Downstream*

### 1.2.5 Lake B44 Shoreline Surveys



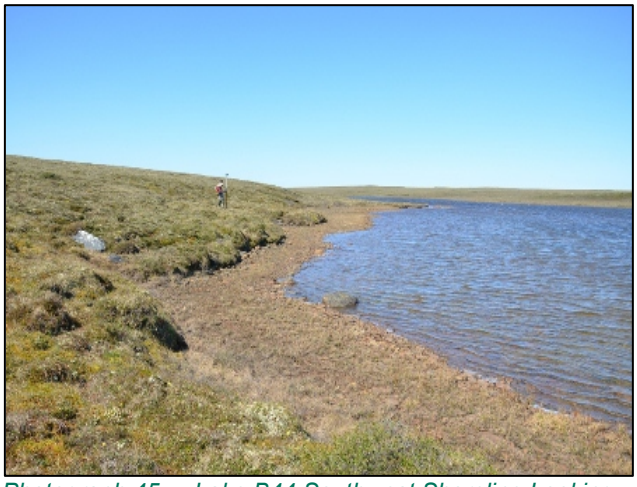
*Photograph 42: Lake B44 Southeast Shoreline Looking West*



*Photograph 43: Lake B44 South Shoreline Looking Southeast*



*Photograph 44: Lake B44 South Shoreline Looking South*



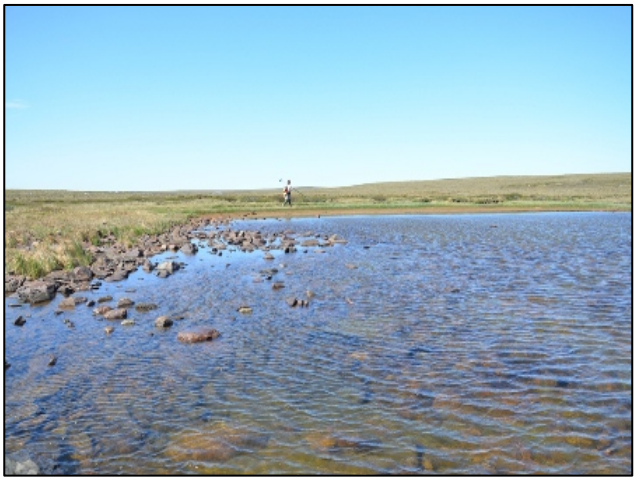
*Photograph 45: Lake B44 Southwest Shoreline Looking Northwest*



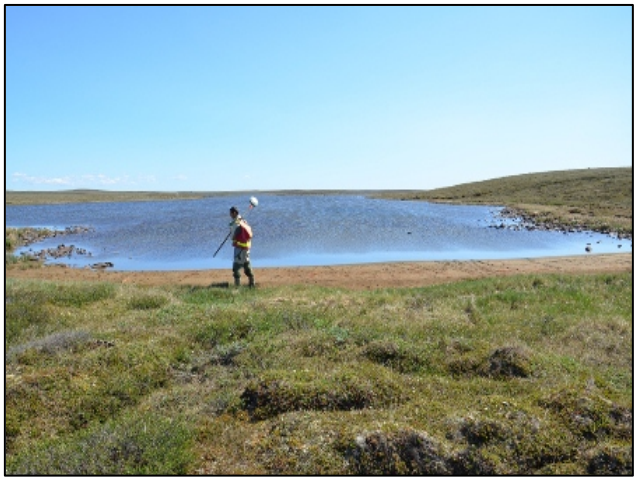
*Photograph 46: Lake B44 Southwest Shoreline Looking Southwest*



*Photograph 47: Lake B44 Southwest Shoreline Looking South*



*Photograph 48: Lake B44 West Shoreline Looking North*



*Photograph 49: Lake B44 West Shoreline Looking Southeast.*

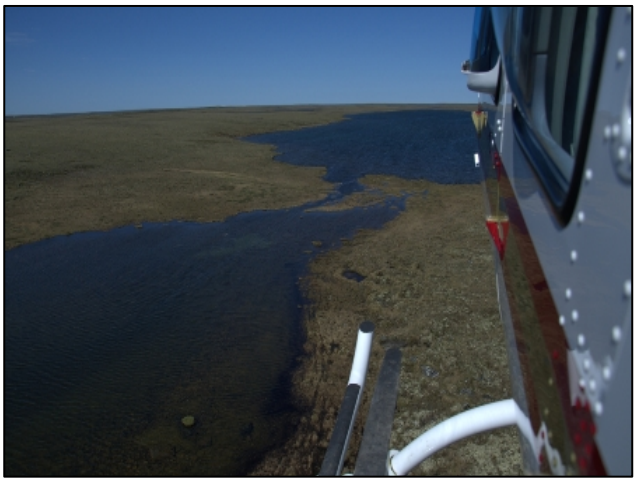


*Photograph 50: Lake B44 West Shoreline Looking Northwest*

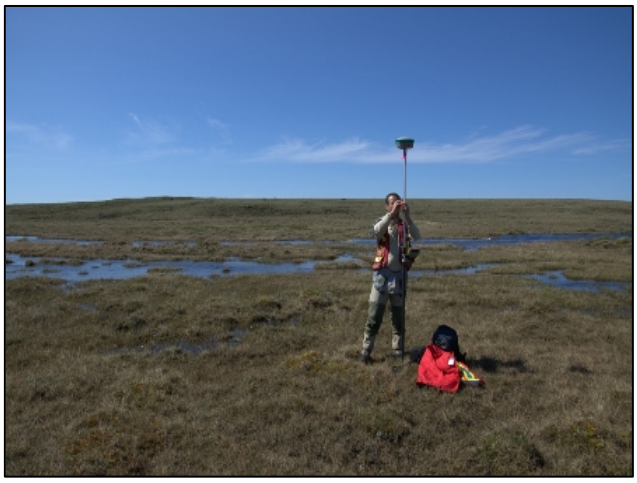


*Photograph 51: Lake B44 West Shoreline Looking West*

### 1.2.6 Lake B45 Outlet Channel



*Photograph 52: Lake B45 Outlet Channel Looking Downstream to Lake B4*



*Photograph 53: Lake B45 Outlet Channel Looking Towards Left Bank*



*Photograph 54: Lake B45 Outlet Channel Looking Downstream*



*Photograph 55 Lake B45 Outlet Channel Looking Upstream*



*Photograph 56: Lake B45 Outlet Channel Looking Upstream*

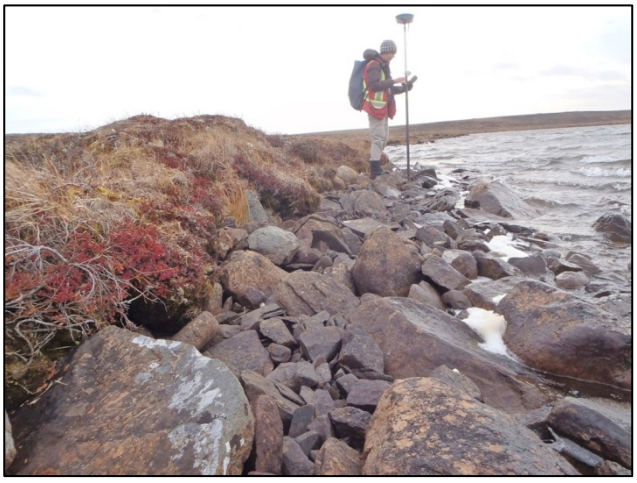
### 1.2.7 Lake B46 Shoreline Surveys



*Photograph 57: Lake B46 Shoreline Transect 1 Looking Northwest*



*Photograph 58: Lake B46 Shoreline Transect 2 Looking Southeast*



*Photograph 59: Lake B46 Shoreline Transect 3 Looking Northwest*



*Photograph 60: Lake B46 Shoreline Transect 4 Looking Southeast*



*Photograph 61: Lake B46 Shoreline Transect 5 Looking Southeast*



*Photograph 62: Lake B46 Shoreline Transect 6 Looking Southeast*



*Photograph 63: Lake B46 Shoreline Transect 7 Looking Southeast*



*Photograph 64: Lake B46 Shoreline Transect 8 Looking Northeast*



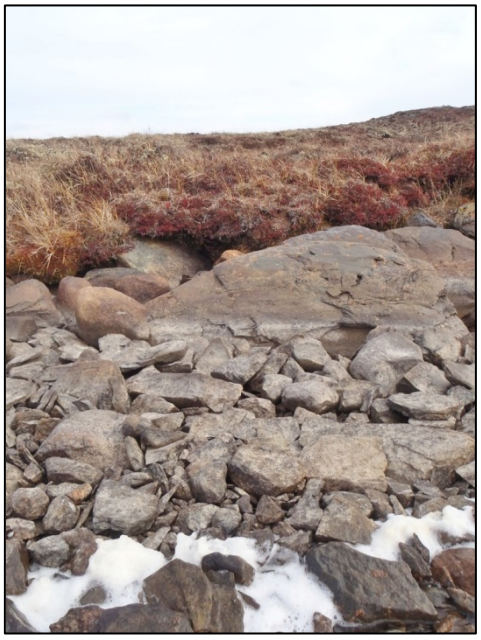
*Photograph 65: Lake B46 Shoreline Transect 9 Looking Southeast*



*Photograph 66: Lake B46 Shoreline Transect 10 Looking Northwest*



*Photograph 67: Lake B46 Shoreline Transect 11 Looking Northeast*



*Photograph 68: Lake B46 Shoreline Transect 12 Looking Northeast*



*Photograph 69: Lake B46 Shoreline Transect 13 Looking Southeast*



*Photograph 70: Lake B46 Shoreline Transect 14 Looking Southeast*



*Photograph 71: Lake B46 Shoreline Transect 15 Looking Northwest*



*Photograph 72: Lake B46 Shoreline Transect 16 Looking Northwest*



*Photograph 73: Lake B46 Shoreline Transect 17 Looking East*



*Photograph 74: Lake B46 Shoreline Transect 18 Looking South*



*Photograph 75: Lake B46 Shoreline Transect 19 Looking North*



*Photograph 76: Lake B46 Shoreline Transect 20 Looking North*



*Photograph 77: Lake B46 Shoreline Transect 21 Looking Northwest*



*Photograph 78: Lake B46 Shoreline Transect 22 Looking East*



*Photograph 79: Lake B46 Shoreline Transect 23 Looking Southeast*



*Photograph 80: Lake B46 Shoreline Transect 24 Looking Northeast*



*Photograph 81: Lake B46 Shoreline Transect 25 Looking East*



*Photograph 82: Lake B46 Shoreline Transect 26 Looking West*



*Photograph 83: Lake B46 Shoreline Transect 27 Looking East*

### 1.2.8 Lake B46 Outlet Channel



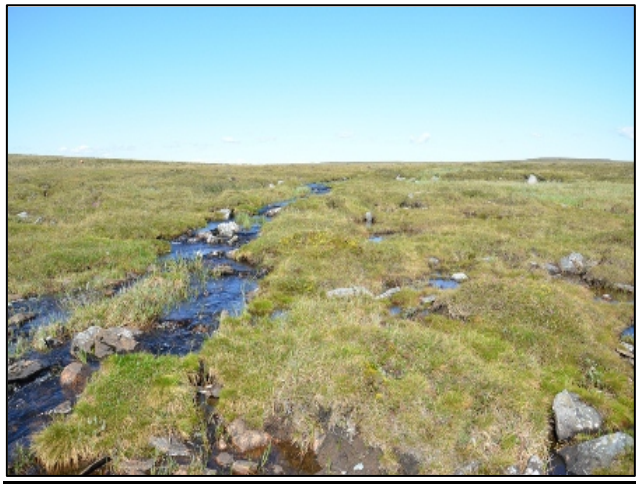
*Photograph 84: Lake B46 Outlet Channel Looking Upstream*



*Photograph 85: Lake B46 Outlet Channel Looking Upstream*



*Photograph 86: Lake B45 Outlet Channel Looking Upstream*



*Photograph 87: Lake B45 Outlet Channel Looking Upstream*



*Photograph 88: Lake B46 Inlet Channel Looking Downstream*

### 1.2.9 Lake CH1 Outlet Survey



*Photograph 89: Lake CH1 at the Infiltration Location*



*Photograph 90: Lake CH1 Shoreline Detail at the Infiltration Location*



*Photograph 91: Meliadine Lake with Flows at the Base of the Esker, Looking Northwest*



*Photograph 92: Meliadine Lake with Flows at the Base of the Esker, Looking North*



*Photograph 93: Meliadine Lake with Flows at the Base of the Esker, at South End*



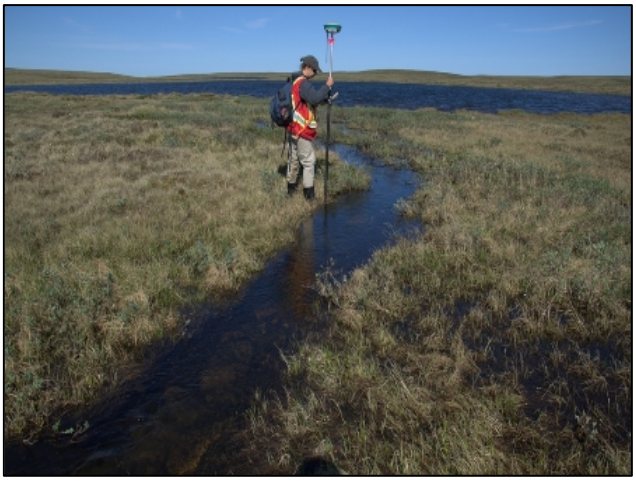
*Photograph 94: Meliadine Lake with Flows at the Base of the Esker, at North End*

## 1.3 D Watershed: Channel Erosion Assessment

### 1.3.1 Lake D7 Outlet Channel



*Photograph 95: Lake D7 Outlet Channel Looking Downstream*



*Photograph 96: Lake D7 Outlet Channel Looking Downstream, Substrate Detail*



*Photograph 97: Lake D7 Outlet Channel Looking Downstream*



*Photograph 98: Lake D7 Outlet Channel at Lake D6 Inlet*

### 1.3.2 Lake D6 Outlet Survey



*Photograph 99: Lake D6 Outlet Channel Looking Downstream at Lake Outlet*



*Photograph 100: Lake D6 Outlet Channel Looking Downstream*



*Photograph 101: Lake D6 Outlet Channel Looking Upstream*



*Photograph 102: Lake D6 Outlet Channel Looking Downstream*



*Photograph 103: Lake D6 Outlet Channel at Lake D5 Inlet*



*Photograph 104: Lake D6 Outlet Channel at Lake D5*

### 1.3.3 Lake D5 to Lake D4 Outlet Channel

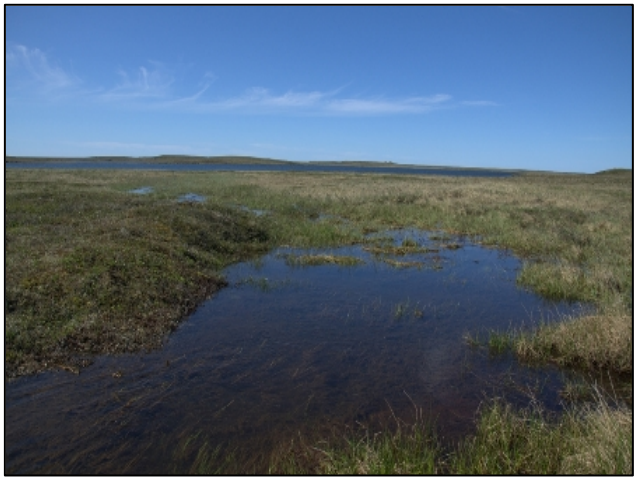


*Photograph 105: Lake D5 to Lake D4 Outlet Channel Looking Upstream. The two Lakes are Forming Almost One Single Waterbody with the Same Elevation*

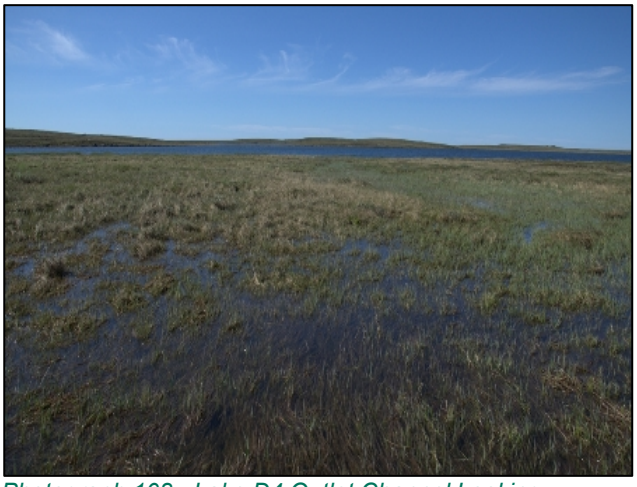
### 1.3.4 Lake D4 Outlet Survey



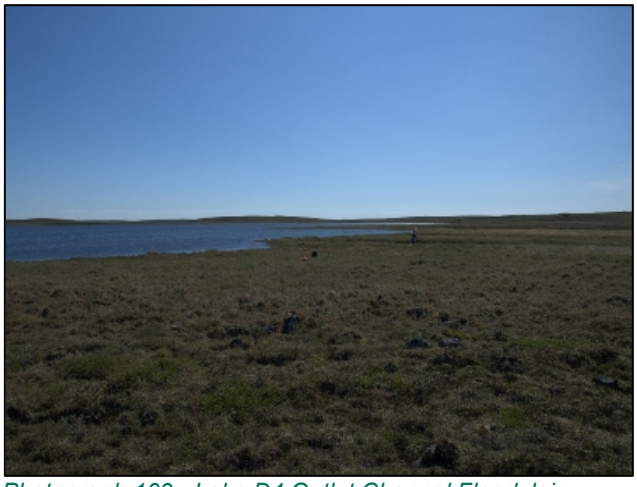
*Photograph 106: Lake D4 Outlet Channel Looking Upstream at Lake Outlet*



*Photograph 107: Lake D4 Outlet Channel Looking Downstream*



*Photograph 108: Lake D4 Outlet Channel Looking Downstream*



*Photograph 109: Lake D4 Outlet Channel Floodplain*

## 1.4 H Watershed: Channel Erosion Assessment

### 1.4.1 Lake H1 Outlet Survey



*Photograph 110: Lake H1 Outlet Channel Looking Upstream at Lake Outlet*



*Photograph 111: Lake H1 Outlet Channel Looking Upstream*



*Photograph 112: Lake H1 Outlet Channel Substrate Detail*



*Photograph 113: Lake H1 Outlet Channel Looking Upstream*



*Photograph 114: Lake H1 Outlet Channel Looking Downstream at Meliadine Lake Inlet*

### 1.4.2 Lake H17 to Lake H1 Outlet Channel Surveys



*Photograph 115: Lake H16 Outlet Channel to Lake H1 Looking Upstream*



*Photograph 116: Lake H16 Outlet Channel Substrate Detail*



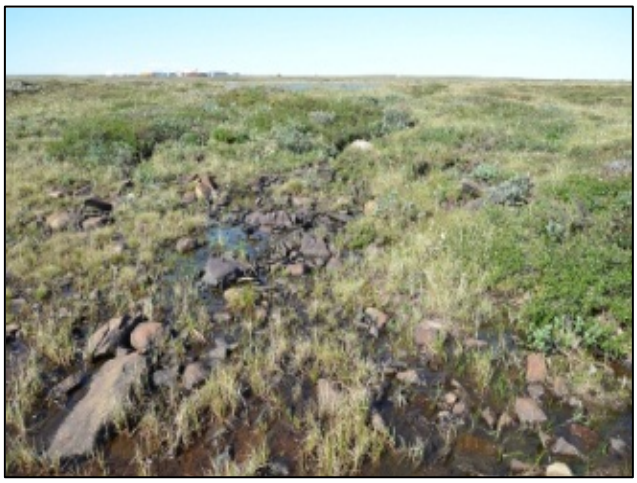
*Photograph 117: Lake H2 Outlet Channel Looking Upstream*



*Photograph 118: Lake H2 Outlet Channel Substrate Detail*



*Photograph 119: Lake H2 Outlet*



*Photograph 120: Lake H2 Inlet Channel*



*Photograph 121: Lake H3 Outlet Channel Looking Upstream*



*Photograph 122: Lake H3 Inlet Channel*



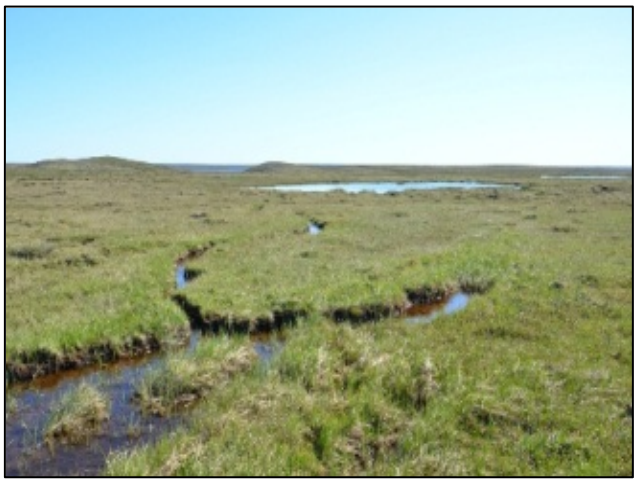
*Photograph 123: Lake H3 Inlet Channel Looking Upstream*



*Photograph 124: Lake H4 Outlet Channel Looking Upstream*



*Photograph 125: Lake H5 Outlet Channel Substrate Detail*



*Photograph 126: Lake H5 Outlet Channel Looking Downstream*



*Photograph 127: Lake H5 Side Outlet Channel Looking Downstream*



*Photograph 128: Lake H17 Outlet Channel Looking Towards Lake H5*

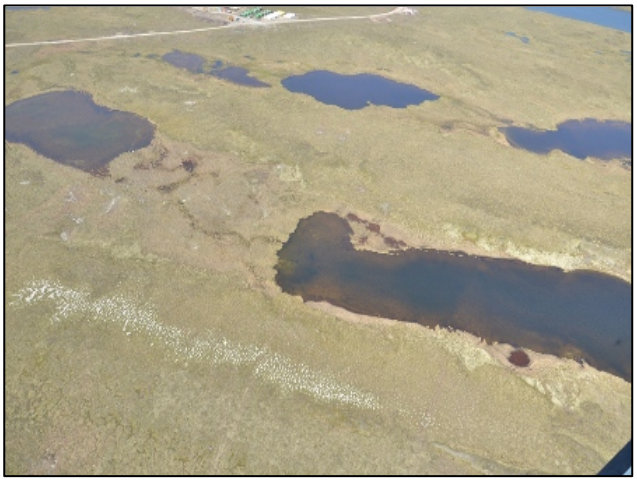


*Photograph 129: Lake H17 Outlet Channel Looking Upstream*

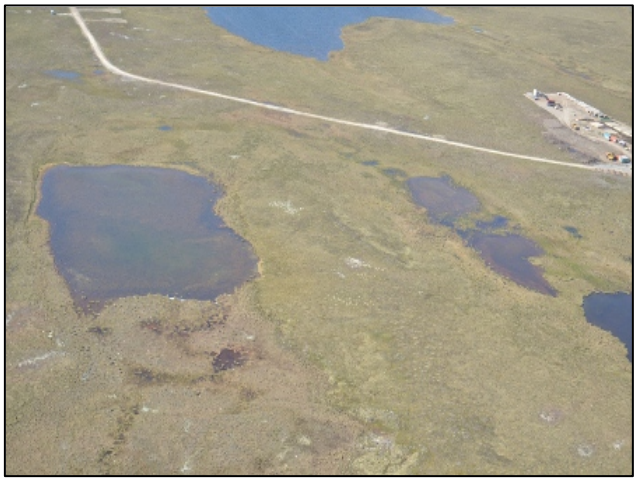


*Photograph 130: Lake H17 Outlet Channel Looking Upstream at the Outlet*

## 1.5 J Watershed: Channel Erosion Assessment



*Photograph 131: Aerial View Of Lake J2 (Partially), J3, J4, J5, J6 and J7 (Partially)*



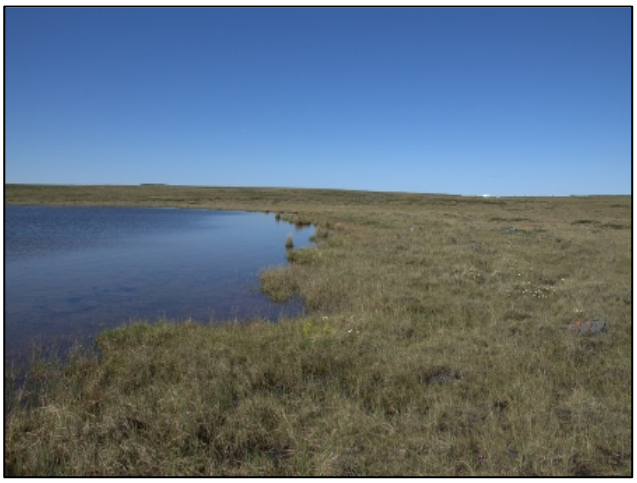
*Photograph 132: Aerial View Of Lake J4, J5 and J6*



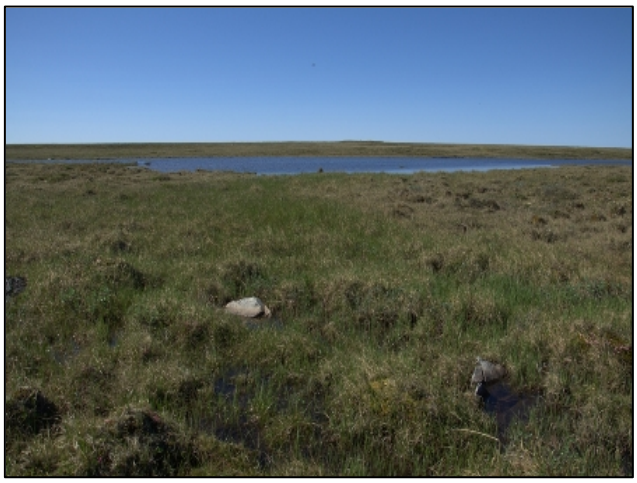
*Photograph 133: Aerial View of Lake J2 (Partially), J3, J4 and J5*



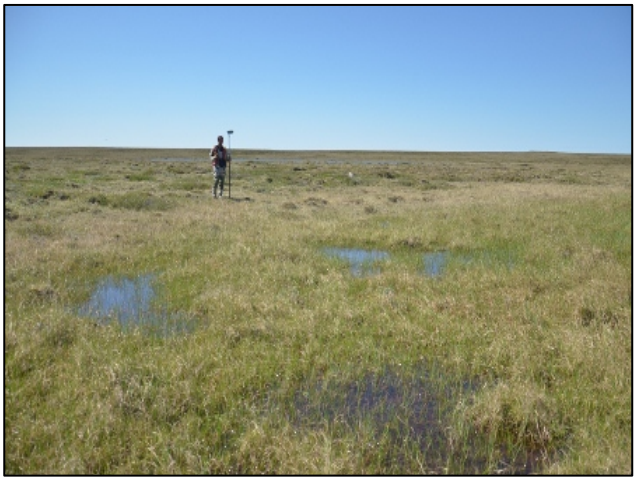
*Photograph 134: Aerial View of Lake J2*



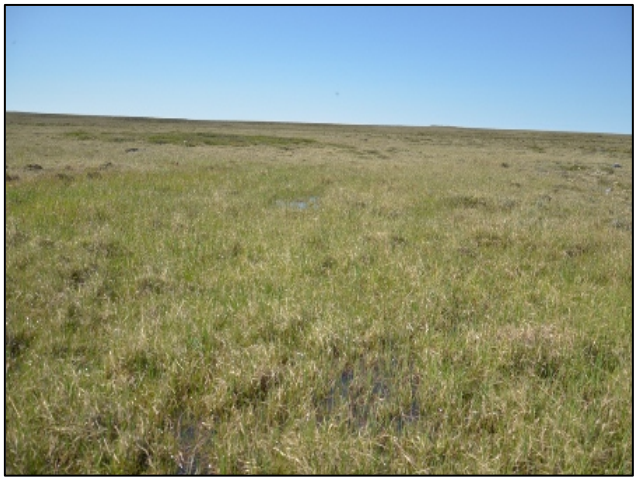
*Photograph 135: Lake J2 Shoreline at Outlet*



*Photograph 136: Lake J2 Outlet Channel, Looking Towards Lake J8*



*Photograph 137: Lake J2 Outlet Channel Looking Upstream*



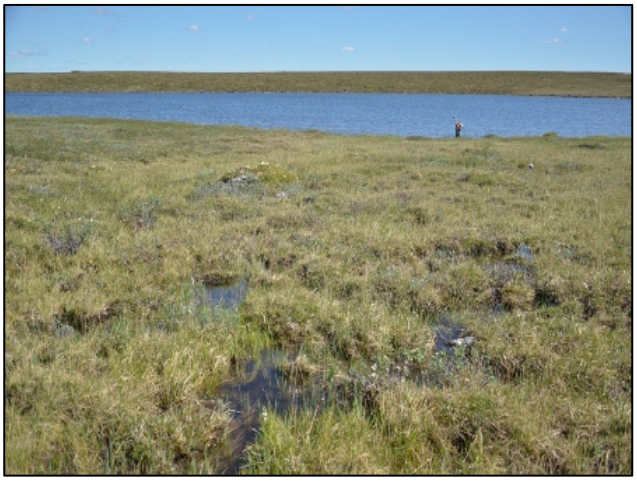
*Photograph 138: Lake J2 Outlet Channel Terrain Detail*



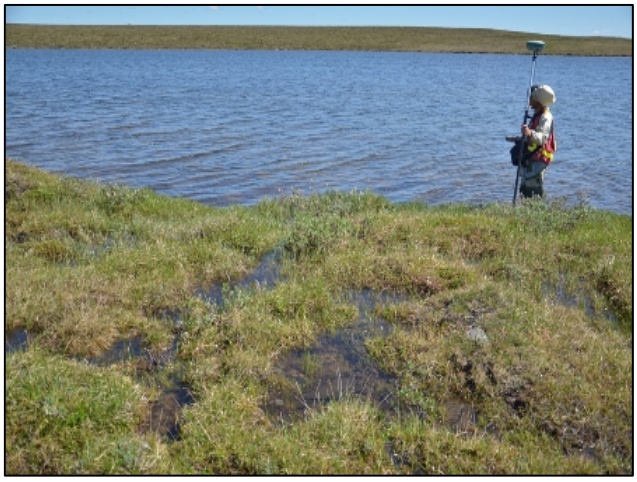
*Photograph 139: Lake J2 Outlet Channel Looking Downstream*



*Photograph 140: Lake J2 Outlet Channel Substrate Detail*



*Photograph 141: Lake J2 Outlet Channel Looking Downstream to Lake J1*



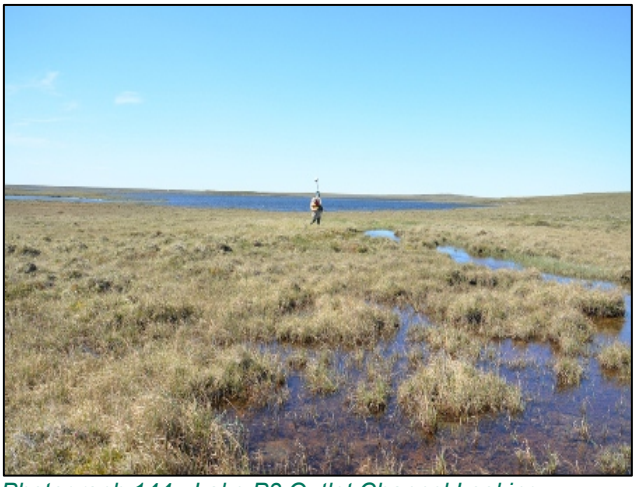
*Photograph 142: Lake J1 Inlet Channel*

# 1.6 P Watershed: Channel Erosion Assessment

## 1.6.1 Lake P3 Outlet Channel



*Photograph 143: Lake P3 Outlet*

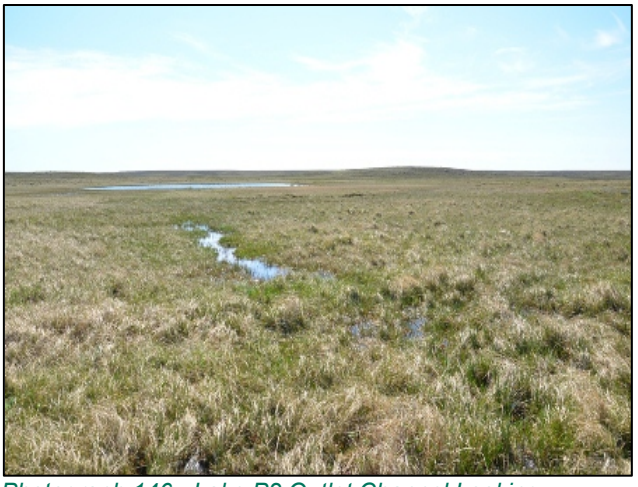


*Photograph 144: Lake P3 Outlet Channel Looking Downstream*

## 1.6.2 Lake P2 Outlet Channel



*Photograph 145: Lake P2 Outlet Channel Looking Upstream*



*Photograph 146: Lake P2 Outlet Channel Looking Downstream*

### 1.6.3 Lake P2 Shoreline Surveys



*Photograph 147: Lake P2 Shoreline at Inlet Channel*



*Photograph 148: Lake P2 South Shoreline Looking North*



*Photograph 149: Lake P2 South Shoreline Looking East*



*Photograph 150: Lake P2 East Shoreline Looking West*



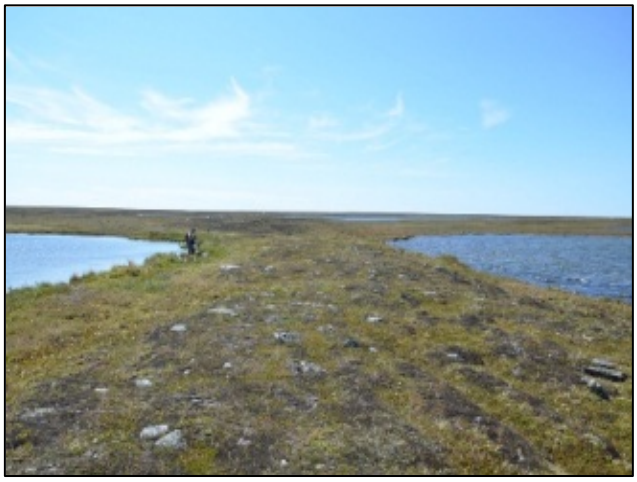
*Photograph 151: Lake P2 East Shoreline Looking South*



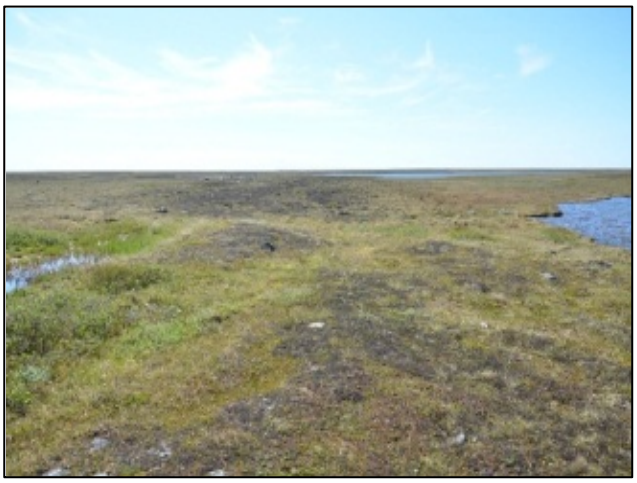
*Photograph 152: Lake P2 East Shoreline Looking Northwest*



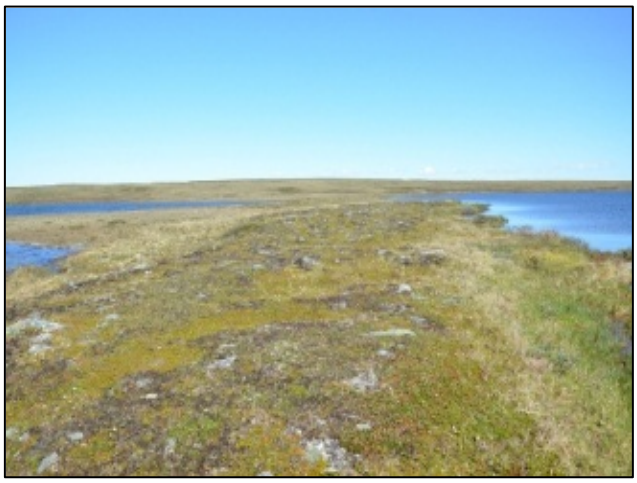
*Photograph 153: Lake P2 North Shoreline Looking East*



*Photograph 154: Lake P2 North Shoreline Looking East Along the Boundary of Watershed B and P*

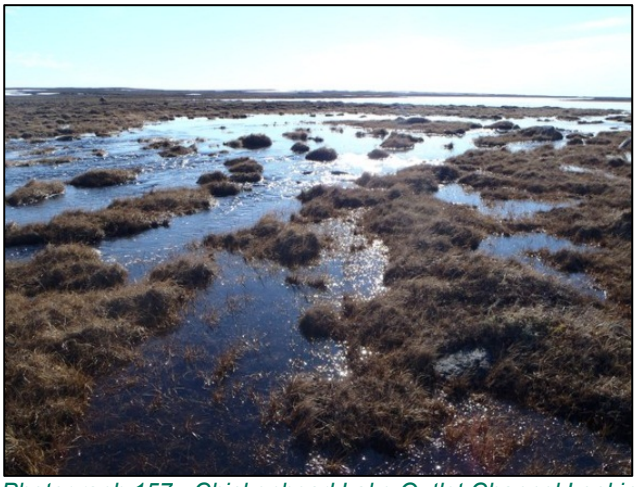


*Photograph 155: Lake P2 South Shoreline Looking West Along the Boundary of Watershed B and P*



*Photograph 156: Lake P2 South Shoreline Looking East at Approximate Location of Proposed Diversion from P to B Watershed*

## 1.7 Chickenhead Watershed: Channel Erosion Assessment



*Photograph 157: Chickenhead Lake Outlet Channel Looking Upstream*



*Photograph 158: Chickenhead Lake Outlet Channel Looking Downstream*



*Photgrapho 159: Chickenhead Lake Outlet Channel Looking Upstream on a Side Channel*



*Photograph 160: Chickenhead Lake Outlet Channel Looking Downstream*



*Photograph 161: Chickenhead Lake Outlet Channel Looking Downstream*



*Photograph 162: Chickenhead Lake Outlet Channel Looking Upstream*

# APPENDIX B

## Shoreline and Channel Erosion Assessment Methods and Scores

This Appendix presents the methods used to derive the erosion potential class for the lake shoreline erosion assessment at Lake B44 and Lake B45, as well as the scores at each survey transect in each lake for all parameters.

## 1.0 EROSION POTENTIAL METHODS

To estimate the lake shoreline erosion potential class, the parameters used were separated into three categories: bank and shoreline features, exposure characteristics, and attenuation characteristics, with each category having its own parameters (Table B.1). The lake shoreline erosion potential was classified into a five-class system, ranking from Very Low to Very High based on a modified version of tool developed to calculate Lakeshore erosion potential for Alberta Sustainable Resource Development (Government of Alberta).

**Table B.1: Categories for Shoreline Characteristics and their Parameters**

| Categories | Parameters |
|---|---|
| Bank and Shoreline Features | Bank Height<br>Bank Vegetation<br>Bank Stability<br>Shoreline Geometry |
| Exposure Characteristics | Shore Orientation (wind direction)<br>Fetch Length<br>Depth at 6 m from shore<br>Depth at 30 m from shore |
| Attenuation Characteristics | Aquatic Vegetation<br>Bank Composition<br>Bank Slope |

For each parameter, a score was derived from a specified range of values (Table B.2). The ranges of values for each parameter were determined based on field observations at site, including the following:

- bank height (collected at existing lake levels; it was assumed that these values will apply for the new shoreline in the same area);
- bank vegetation;
- bank stability;
- shoreline geometry;
- shore orientation (wind directions scores and class were calculated based on wind data collected at Rankin Inlet Airport weather station and presented in the main report);
- fetch length (based on maps measurements in GIS);

- lake depth at 6 m and 30 m from shore (determined from site cross-section profiles and proposed lake water surface elevations). For transects shorter than 30 m, a lake depth of 2 metres was used in the analysis;
- aquatic vegetation; and
- bank slope (calculated from cross-section profiles).

**Table B.2: Score and Range for Shoreline Parameters**

<table>
<tr><th colspan="2">Lake Bank and Shoreline Features</th></tr>
<tr><th>Parameter</th><th>Score and Range</th></tr>
<tr><td>Bank Height (BH)</td><td>1 = <0.3 m<br>2 = 0.3-1.0 m<br>3 = 1.0-2.0 m<br>4 = 2.0-4.0 m<br>5 = >4.0 m</td></tr>
<tr><td>Bank Vegetation (BV)</td><td>0 = bedrock and weathered bedrock<br>1 = mixed boulders and cobbles with little vegetation<br>4 = vegetation on top of boulder and cobble<br>7 = soils and organic materials with no rocky materials</td></tr>
<tr><td>Bank Stability (BSt)</td><td>0 = bedrock and weathered bedrock<br>1 = boulders or bedrock with small patches of vegetation<br>2 = boulders and cobbles with patches of vegetation 50%<br>4 = boulders and cobbles with vegetation on top<br>6 = soils with thermo-erosion processes and no outcrops occurring<br>7 = soil and organic materials with no rocky materials</td></tr>
<tr><td>Shoreline Geometry (SG)</td><td>1 = coves or bays<br>4 = irregular or straight shorelines<br>8 = headland or islands</td></tr>
<tr><td colspan="2">Exposure Characteristics</td></tr>
<tr><td>Shore Orientation (SO)<br>(wind direction)</td><td>0 = 213° to 259°<br>1 = 11° to 79°; 191° to 214°<br>2 = 124° to 169°; 259° to 304°<br>3 = 79° to 124°; 169° to 191°; 304° to 326°<br>4 = 326° to 11°</td></tr>
<tr><td>Fetch Length (m) (FL)</td><td>0 = < 50 m<br>1 = 50 to 100 m<br>2 = 100 to 200 m<br>3 = 200 to 400 m<br>4 = 400 to 800 m<br>5 = 800 to 1000 m<br>6 = > 1000 m</td></tr>
<tr><td>Lake Depth (LD)<br>at 6 m and 30 m<br>from shore</td><td>
<table>
<tr><th></th><th colspan="5">Depth at 30 m</th></tr>
<tr><th>Depth at 6 m</th><th>0</th><th>0.3</th><th>0.9</th><th>1.8</th><th>3.7</th></tr>
<tr><td>0</td><td>-1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>0.3</td><td>-1</td><td>-1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>0.9</td><td>-1</td><td>-1</td><td>-1</td><td>0</td><td>0</td></tr>
<tr><td>1.8</td><td>-2</td><td>-2</td><td>-1</td><td>-1</td><td>-1</td></tr>
<tr><td>3.7</td><td>-2</td><td>-2</td><td>-1</td><td>-1</td><td>-1</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th colspan="2">Lake Bank and Shoreline Features</th></tr>
<tr><th>Parameter</th><th>Score and Range</th></tr>
<tr><td colspan="2">Attenuation Characteristics</td></tr>
<tr><td>Aquatic Vegetation (AV)</td><td>0 = no vegetation, spares or submerged<br>-1 = moderate<br>-2 = dense or abundant</td></tr>
<tr><td>Bank Slope (BSp)</td><td>0 = < 5 degrees<br>1 = 5 to 25 degrees<br>2 = 25 to 45 degrees<br>4 = > 45 degrees</td></tr>
<tr><td>Modified Bank Composition (MBC)</td><td>Bank Composition Scores (BC)<br>0 = bedrock and weather bedrock<br>1 = boulders or bedrock with small patches of vegetation<br>2 = boulders and cobbles with patches of vegetation 50%<br>3 = boulders and cobbles with vegetation on top<br>4 = soils with thermo-erosion processes and no outcrops occurring<br>5 = soil and organic materials with no rocky materials<br><br>Modified Bank Composition (MBC)<br><br>
<table>
<tr><th></th><th colspan="4">Bank Slope Score (BSp)</th></tr>
<tr><th>Bank Composition Score (BC)</th><th>0</th><th>1</th><th>2</th><th>4</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>-1</td><td>0</td><td>0</td><td>+3</td></tr>
<tr><td>2</td><td>-1</td><td>0</td><td>+1</td><td>+3</td></tr>
<tr><td>3</td><td>-1</td><td>0</td><td>+1</td><td>+4</td></tr>
<tr><td>4</td><td>0</td><td>+1</td><td>+1</td><td>+4</td></tr>
<tr><td>5</td><td>0</td><td>+1</td><td>+2</td><td>+4</td></tr>
</table>
</td></tr>
</table>

A single score was calculated for each of the three categories, and the final score was determined from the three combined scores indicating the erosion potential class. The methods used to calculate the final score and associated classes are presented in Table B.3.

**Table B.3: Final Score Calculation**

| Category | Score Description and Formulas |
|---|---|
| Bank and Shoreline Features (BSF) | The sum of score of all parameters<br>BSF = BH + BV +BSt + SG |
| Exposure and Attenuation Characteristics (EAC) | The final score is the sum of the modified fetch length with the wind scores (MFLW) and the modified score of the bank composition modified score (BCMS)<br>EAC = MFLW + BCMS<br>where<br>MFLW = SO * (FL + LD + AV)<br>BCMS = BC + MBC<br>MBC = BC & BSp |
| Erosion Potential (EP) | EP = BSF + EAC<br>EP Class: |

| EP Class | EP Score |
|---|---|
| Very Low | < 30 |
| Low | 30 to 50 |
| Moderate | 50 to 70 |
| High | 70 to 120 |
| Very High | > 120 |

## 2.0 SCORES FOR CONTRIBUTING PARAMETERS

Table B.4 presents the scores for each parameter measured at the transects surveyed in 2012 at Lake B44 and Lake B45 within Meliadine peninsula. These lakes will have water levels permanently raised during the Project and after the Project Closure.

**Table B.4: Scores for Each Parameter Measured by Survey Transect**

| Lake | Transect | BH Score | BV Score | BSt Score | SG Score | BSF Score | SO Score | FL Score | LD Score | AV Score | MFLW Score | BSp Score | BC Score | MBC Score | BCMS Score | EAC Score | EP Score | EP Class |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B45 | Transect 1 | 2 | 4 | 4 | 4 | 14 | 0 | 5 | 1 | 0 | 0 | 0 | 3 | -1 | 2 | 0 | 14 | Very Low |
| B45 | Transect 2 | 2 | 4 | 4 | 4 | 14 | 0 | 5 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 3 | 2 | 4 | 4 | 4 | 14 | 0 | 5 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 4 | 2 | 4 | 4 | 4 | 14 | 0 | 5 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 5 | 2 | 4 | 4 | 4 | 14 | 0 | 5 | 1 | 0 | 0 | 0 | 3 | -1 | 2 | 0 | 14 | Very Low |
| B45 | Transect 6 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 7 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 8 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 9 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 0 | 3 | -1 | 2 | 0 | 14 | Very Low |
| B45 | Transect 10 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 11 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 12 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 14 | Very Low |
| B45 | Transect 13 | 2 | 7 | 6 | 4 | 19 | 1 | 4 | 1 | 0 | 5 | 1 | 4 | 1 | 5 | 25 | 44 | Low |
| B45 | Transect 14 | 3 | 7 | 6 | 4 | 20 | 1 | 4 | 1 | 0 | 5 | 1 | 4 | 1 | 5 | 25 | 45 | Low |
| B45 | Transect 15 | 2 | 4 | 4 | 4 | 14 | 0 | 4 | 1 | 0 | 0 | 0 | 3 | -1 | 2 | 0 | 14 | Very Low |
| B45 | Transect 16 | 3 | 4 | 4 | 4 | 15 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 15 | Very Low |
| B45 | Transect 17 | 3 | 4 | 4 | 4 | 15 | 0 | 4 | 1 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | 15 | Very Low |
| B45 | Transect 18 | 2 | 4 | 7 | 4 | 17 | 2 | 6 | 1 | 0 | 14 | 0 | 5 | 0 | 5 | 70 | 87 | High |
| B45 | Transect 19 | 2 | 7 | 7 | 4 | 20 | 2 | 6 | 1 | 0 | 14 | 0 | 5 | 0 | 5 | 70 | 90 | High |
| B45 | Transect 20 | 2 | 4 | 4 | 4 | 14 | 1 | 5 | 1 | 0 | 6 | 0 | 3 | -1 | 2 | 12 | 26 | Very Low |
| B45 | Transect 21 | 2 | 4 | 4 | 4 | 14 | 1 | 6 | 1 | 0 | 7 | 0 | 3 | -1 | 2 | 14 | 28 | Very Low |
| B45 | Transect 22 | 2 | 7 | 7 | 4 | 20 | 4 | 6 | 1 | 0 | 28 | 0 | 5 | 0 | 5 | 140 | 160 | Very High |
| B45 | Transect 23 | 2 | 7 | 7 | 4 | 20 | 3 | 6 | 1 | 0 | 21 | 1 | 5 | 1 | 6 | 126 | 146 | Very High |
| B45 | Transect 24 | 2 | 4 | 4 | 4 | 14 | 3 | 6 | 1 | 0 | 21 | 0 | 3 | -1 | 2 | 42 | 56 | Moderate |
| B45 | Transect 25 | 2 | 7 | 7 | 1 | 17 | 1 | 4 | 1 | 0 | 5 | 0 | 5 | 0 | 5 | 25 | 42 | Low |
| B45 | Transect 26 | 2 | 7 | 7 | 1 | 17 | 4 | 4 | 1 | 0 | 20 | 0 | 5 | 0 | 5 | 100 | 117 | High |
| B45 | Transect 27 | 1 | 7 | 7 | 1 | 16 | 1 | 6 | 1 | 0 | 7 | 1 | 5 | 1 | 6 | 42 | 58 | Moderate |
| B44 | Transect 1 | 2 | 7 | 6 | 4 | 19 | 2 | 1 | 1 | 0 | 4 | 2 | 4 | 1 | 5 | 20 | 39 | Low |
| B44 | Transect 2 | 2 | 1 | 4 | 1 | 8 | 3 | 3 | 0 | 0 | 9 | 0 | 3 | -1 | 2 | 18 | 26 | Very Low |
| B44 | Transect 3 | 2 | 4 | 4 | 1 | 11 | 2 | 4 | 1 | 0 | 10 | 0 | 3 | -1 | 2 | 20 | 31 | Low |
| B44 | Transect 4 | 3 | 4 | 4 | 1 | 12 | 0 | 2 | 1 | 0 | 0 | 2 | 3 | 1 | 4 | 0 | 12 | Very Low |
| B44 | Transect 5 | 3 | 4 | 4 | 4 | 15 | 1 | 1 | 1 | 0 | 2 | 1 | 3 | 0 | 3 | 6 | 21 | Very Low |
| B44 | Transect 6 | 2 | 1 | 4 | 1 | 8 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | -1 | 2 | 0 | 8 | Very Low |
| B44 | Transect 7 | 3 | 4 | 4 | 1 | 12 | 1 | 1 | 0 | 0 | 1 | 1 | 3 | 0 | 3 | 3 | 15 | Very Low |

# APPENDIX 7.4-A

## Water Quality Predictions Report

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

# Abbreviation and Acronym List

| | |
|---|---|
| AEM | Agnico Eagle Mines Limited |
| AEP | Alberta Environment Protection |
| Ag | Silver |
| Al | Aluminum |
| Alk | Total alkalinity |
| ANC | Acid neutralizing capacity |
| AP01 | Attenuation pond 1 |
| AP02 | Attenuation pond 2 |
| As | Arsenic |
| AWAR | All-weather Access Road |
| B | Boron |
| Ba | Barium |
| BC | Base cation concentration |
| Be | Beryllium |
| BG | Background concentration |
| Bi | Bismuth |
| Ca | Calcium |
| Cd | Cadmium |
| Cl | Chloride |
| CL | Critical load |
| CNRL | Canadian Natural Resources Limited |
| Co | Cobalt |
| Cr | Chromium |
| Cu | Copper |
| CCME | Canadian Council for Ministers of the Environment |
| CN | Total cyanide |
| CWQG | Canadian Water Quality Guidelines |
| EPA | US Environmental Protection Agency |
| F | Flouride |
| Fe | Iron |
| FEIS | Final Environmental Impact Statement |
| GCDWQ | Guidelines for Canadian Drinking Water Quality |
| Golder | Golder Associates Ltd. |
| HC | Health Canada |
| Hg | Mercury |
| ISQGs | Interim Sediment Quality Guidelines |
| K | Potassium |

| | |
|---|---|
| Li | Lithium |
| MAEC | Maximum allowable effluent concentrations |
| Mg | Magnesium |
| MDDEP | Ministère du Développement Durable, de l'Environnement et des Parcs |
| MMER | Metal Mining Effluent Regulations |
| Mn | Manganese |
| Mo | Molybdenum |
| MR | Mixing ratio |
| Na | Sodium |
| $NH_3$ | Total ammonia |
| Ni | Nickel |
| $NO_3$ | Nitrate |
| P | Total dissolved phosphorus |
| Pb | Lead |
| PEL | Probable Effect Level |
| $PO_4$ | Orthophosphate |
| Q | Average annual runoff |
| RMCC | Research and Monitoring Committee of Canada |
| Sb | Antimony |
| Se | Selenium |
| Sn | Tin |
| $SO_4$ | Sulphate |
| Sr | Strontium |
| TDS | Total dissolved solids |
| Ti | Titanium |
| TKN | Total Kjeldahl nitrogen |
| Tl | Thalium |
| TSF | Tailings Storage Facility |
| TSS | Total suspended solids |
| U | Uranium |
| V | Vanadium |
| W | Tungsten |
| WHO | World Health Organization |
| WMO | World Meteorological Organization |
| WQC | Water quality criteria |
| WRSF | Waste Rock Storage Facility |
| Zn | Zinc |
| 3σ | Three times standard deviation |

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**APPENDICES**

**APPENDIX A**
Predictions of Water Quality Guideline Exceedence

**APPENDIX B**
Pit Lakes – Stability of Brine at Depth

# 1.0 INTRODUCTION

Agnico Eagle Mines Limited (AEM) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°01'23.8"N, 92°13'6.42"W), on Inuit owned land.

The Project is composed of five gold deposits that are located in relatively close proximity to one another: Tiriganiaq (open pits and underground), F Zone (pits), Pump (pits), Wesmeg (pits) and Discovery (pit). The current mining plan indicates that approximately 38 million tonnes of ore will be mined over a nominal mine life of approximately 13 years. The deposits will be mined using conventional open pit mining methods with additional underground mining for some deposits (Tiriganiaq). Approximately 8,500 tonnes of ore will be processed per day.

Proposed mining facilities in the area include a plant site (with ore stockpiles), a tailings storage facility (TSF), waste rock storage facilities (WRSFs) and diversion and containment dikes. A general location plan of the proposed Project mine area is shown in Figure 7.4-A1.

This report presents the modelling implementation and results for the characterization of surface water and sediment quality in the receiving aquatic environment of the Project. This characterization consists of predictions of surface water and sediment chemistry in waterbodies in the mining area of the Project. These predictions are associated with the phases of the project (i.e., construction, operations, closure and post-closure).

The modelling effort presented in this report is intended to evaluate the following:

- changes in substance concentrations in surface water and sediment of waterbodies during all phases of mine development and after closure;
- mitigation measures to reduce Project effects on surface water and sediment quality;
- attainment of relevant water and sediment quality guidelines;
- acidification of surface waters resulting from air emissions; and
- confidence in model predictions.

The report is structured as follows:

- presentation of the modelling methodology, including spatial extent and time period modelled, surface water and sediment quality parameters modelled, water and sediment guidelines considered, models used and data sources (Section 2);
- brief description of the settings of the receiving aquatic environment (Section 3); and
- presentation and discussion of the following results:
  - surface water quality in Meliadine Lake (Section 4);
  - surface water quality in waterbodies in the mine area (Section 5);
  - sediment quality (Section 6); and
  - acid deposition (section 7).

This report has been prepared in accordance with the **"Study Limitations of this report"** which are presented at the beginning of this report. The reader's attention is specifically drawn to this information for reference during the use of this report.

520000
530000
540000
550000
6990000
6980000
6970000

Discovery Pit

Tiriganiaq Pit

Wesmeg Pit

Pump Pit

F Zone Pits

Meliadine Lake

Parallel Lake

Meliadine River

Hudson Bay

Rankin Inlet

N

**LEGEND**

- Proposed Project Infrastructure
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

3 0 3
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# MINE SITE OVERVIEW

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | MP | 11 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 19 Dec. 2012 | | |
| CHECK | DW | 14 Jan. 2013 | | |
| REVIEW | DW | 14 Jan. 2013 | | |

**FIGURE: 7.4-A1**

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# 2.0 METHODOLOGY

This section describes the framework for modelling surface water and sediment quality in the receiving aquatic environment. This framework defines: the spatial extent covered by the models (Section 2.1); the time period considered by the models (Section 2.2); the list of parameters (i.e., constituents or substances) included in the modelling effort to characterize surface water and sediment chemistry (Section 2.3); the list of guidelines used to assess predicted concentrations by the models (Section 2.4); the models used for predicting parameter concentrations in the receiving aquatic environment for the various phases of the Project (Section 2.5); and the data used as inputs to the models (Section 2.6).

## 2.1 Spatial Considerations

Figure 7.4-A1 presents the extent of the footprint of the mine area of the Project, while Table 7.4-A1 lists the major mine infrastructure of the Project. Table 7.4-A1 also presents the period (in Project mine years) within which activities are undertaken at each of the infrastructure.

**Table 7.4-A1: Major Mine Infrastructure of the Project**

| Infrastructure | Period of activities (Project mine years)[(a)] |
|---|---|
| **Ore processing area** | |
| Plant site, including the ore stockpile and low grade ore stockpile | Years -3 to 13 |
| Tailings storage facility (TSF) | Years -3 to 13 |
| **Waste rock storage facility (WRSF)** | |
| B7 WRSF (North, East, South and West) | Years -3 to 11 |
| B4 WRSF (East and West) | Years 3 to 12 |
| A45-2 WRSF | Years 3 to 5 |
| Discovery WRSF | Years 6 to 11 |
| **Underground mine workings** | |
| Tiriganiaq underground | Years -3 to 13 |
| **Open pits** | |
| Tiriganiaq Pit 1 (phases 1 to 3) | Years -1 to 10 |
| Tiriganiaq Pit 2 (phase 4) | Years 9 to 11 |
| Wesmeg Pit 1 | Years 3 to 6 |
| Wesmeg Pit 2 | Years 3 to 7 |
| Wesmeg Pit 3 | Year 12 |
| Wesmeg Pit 4 | Years 10 to 12 |
| Wesmeg Pit 5 | Year 6 |
| Pump Pit 1 | Years 6 to 7 |
| Pump Pit 2 | Years 9 to 11 |
| F Zone Pit 1 | Years 4 to 7 |
| F Zone Pit 2 | Years 3 to 4 |
| F Zone Pit 3 | Years 4 to 5 |
| Discovery Pit | Years 6 to 11 |
| **Attenuation ponds** | |
| Attenuation pond 1 (AP01) | Years -3 to 13 |
| Attenuation pond 2 (AP02) | Years 3 to 13 |

a) Periods of activities extracted from FEIS Volume 2.

The spatial extent that must be covered by the models used in this report consists of waterbodies in the region encompassing the mine footprint of the project (see Figure 7.4-A2 for a general view). A waterbody is considered for the modelling effort if it is potentially impacted by mine activities through:

- changes in the watershed area of the waterbody as a result of the implementation of mine infrastructure (e.g. pits, waste rock and tailings storage facilities); and
- release of water affected by mine processes (referred to as contact water) to the waterbody.

Meliadine Lake was selected as part of the spatial domain, since this waterbody will receive treated effluent from the mine. Two groups of small waterbodies were also selected, since their watershed area would change as a result of mine activities. These two groups are:

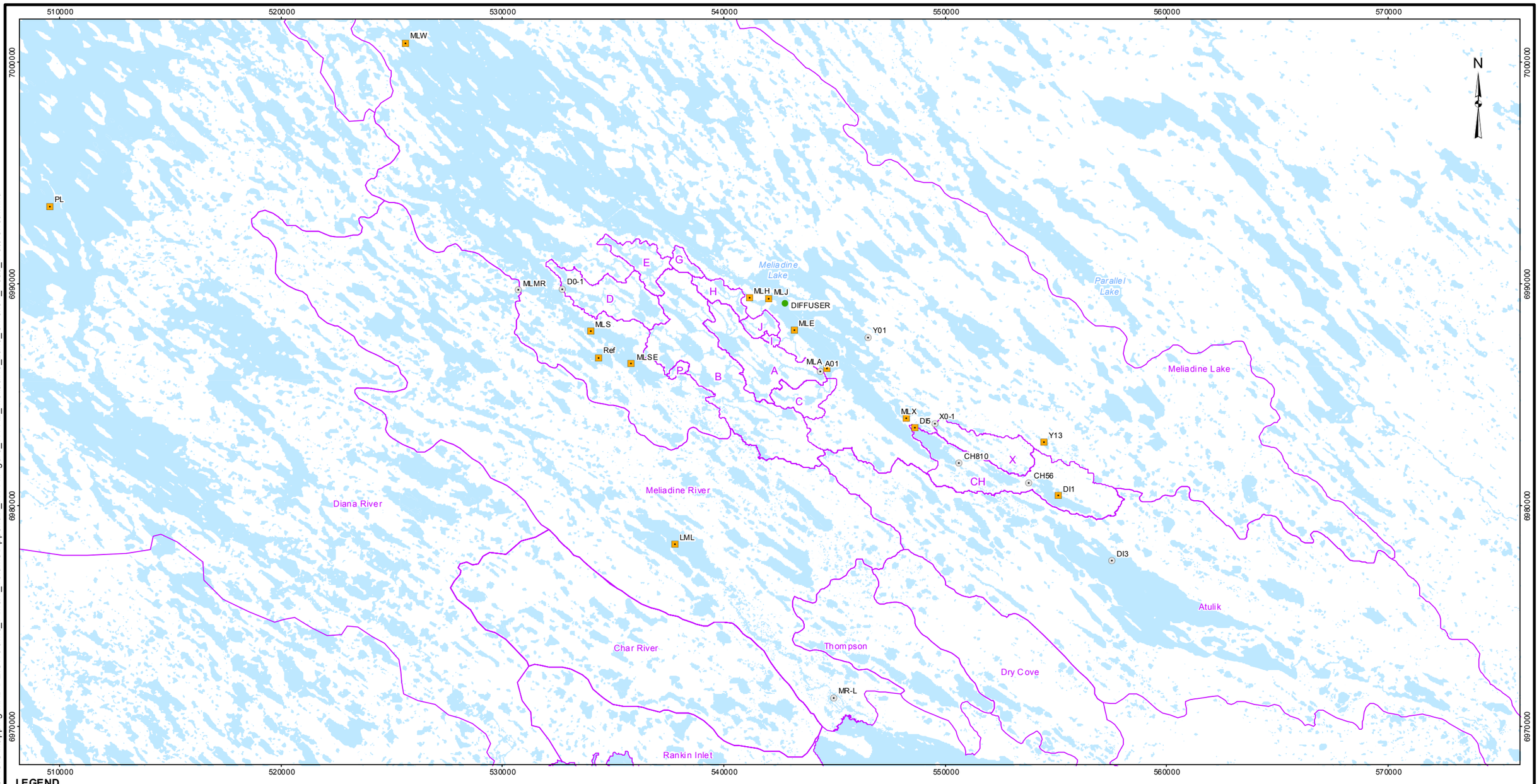
- waterbodies impacted by the development of the Discovery pit and WRSF in the Chicken Head Lake watershed (identified in Figure 7.4-A2); and
- waterbodies in the peninsula of Meliadine Lake (identified in Figure 7.4-A3), and which are impacted by the development of the Tiriganiaq, Wesmeg, Pump and F Zone pits, three WRSFs (B7 WRSF, B4 WRSF and A45-2 WRSF), the TSF, attenuation ponds 1 and 2 (AP01 and AP02, respectively), and the plant site area.

The list of selected waterbodies is provided in Table 7.4-A2, and is subdivided according to the main watershed area defined in SD 7-1 2009 Aquatics Synthesis Baseline.

**Table 7.4-A2: Inventory of Waterbodies**

| Watershed | Waterbody | Baseline | Mine phase | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Construction Years | | Operations Years | | | | | Closure | Post-closure |
| | | | -3 | -2 to -1 | 1 to 2 | 3 to 4 | 5 to 8 | 9 | 10 to 12 | | |
| A | A8 | √ | | | | | | | | | √ |
| | A6 | √ | √ | | | | | | | | √ |
| | A1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| B | B6 | √ | √ | √ | √ | | | | | | |
| | B5 | √ | √ | √ | √ | | | | | | √ |
| | B46 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | B4 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | P2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | B2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| D | D7 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | D4 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | D3 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | D1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| H | H17 | √ | | | | | | | | | √ |
| | H1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| I | I1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

| Watershed | Waterbody | Baseline | Mine phase | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Construction Years | | Operations Years | | | | | Closure | Post-closure |
| | | | -3 | -2 to -1 | 1 to 2 | 3 to 4 | 5 to 8 | 9 | 10 to 12 | | |
| J | J8 | √ | √ | √ | | | | | | | √ |
| | J7 | √ | √ | | | | | | | | |
| | J6 | √ | √ | √ | | | | | | | |
| | J3 | √ | √ | √ | | | | | | | |
| | J2 | √ | √ | √ | | | | | | | |
| | J1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Chicken Head | CH6 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | CH5 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | CH10 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | CH1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |




**LEGEND**

- Water Quality Station
- Water Quality and Sediment Quality Station
- Diffuser
- Watercourse
- Watershed Boundary
- Waterbody

**REFERENCE**

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

4.5 0 4.5
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
**WATER AND SEDIMENT SAMPLING STATIONS MELIADINE LAKE AND CHICKEN HEAD WATERSHED**

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. 10-1373-0076 | | | FILE No. | |
| DESIGN | MP | 11 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 19 Dec. 2012 | **FIGURE 7.4-A2** | |
| CHECK | DW | 14 Jan. 2013 | | |
| REVIEW | DW | 14 Jan. 2013 | | |

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530000 532000 534000 536000 538000 540000 542000 544000 546000 548000

6992000 6990000 6988000 6986000 6984000

N

Meliadine Lake

MLMR MLS Ref MLSE MLH MLJ MLE MLA MLX

DIFFUSER ML-W1 ML-W2 ML-W3 ML-W4 ML-W5

Y01 X0-1 DI5 CH1

D0-1 D1 D2 D3 D4 D5 D6-7 D23

E1 E2 E3 E4

G1-2 G2

B2 B3-4 B5 B5-6 B6 B67 B7 B12 B36 B45 B445 B46

A1 A2 A5 A5-6 A6 A6-7 A78 A8 A9 A13 A15 A38 A54 A56 A57

H1 H17 H19 H20

B1 B4 B5 B7 B8 B9 B10 C C1 C2 C3 C4 C6 C7 C8 C9 C10 C11 C12 C14 C15 CH1 D1 D2 D3 D4 D5 D6 D7 E1 E2 E3 E4 G G1 G2 H1 H17 H19 H20 I J P X

1.25 0 1.25

KILOMETRES

## LEGEND

- Water Quality Station
- Water Quality and Sediment Quality Station
- Diffuser
- Direction of Flow
- Watercourse
- Sub-Watershed Boundary
- Waterbody

## REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

# WATER AND SEDIMENT SAMPLING STATIONS MELIADINE PENINSULA

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT NO. | 10-1373-0076 | | FILE No. | |
| DESIGN | MP | 11 Dec. 2012 | SCALE AS SHOWN | REV. 0 |
| GIS | DSC | 18 Dec. 2012 | | |
| CHECK | DW | 14 Jan. 2013 | | |
| REVIEW | DW | 14 Jan. 2013 | | |

**FIGURE 7.4-A3**

## 2.2 Temporal Considerations

The mine development of the Project comprises the following phases:

- construction, spanning from mine years -3 to -1, when activities are primarily focused on construction of infrastructure, with some mining occurring (i.e., Tiriganiaq pit and underground);
- operations, spanning from mine years 1 to 13, when activities are primarily focused on mining, with construction activities occurring as needed;
- closure, occurring following completion of mining, assumed to span a period of 10 years for the filling of all open pits (with water); and
- post-closure, which is the period when pit lakes discharge water to the receiving environment.

The modelling effort encompassed all of these phases and a phase referred to as baseline, which consists of the existing receiving aquatic environment (i.e., prior to mine development). Furthermore, the construction and operations phases where subdivided to reflect the progression of water management and mining activities at the mine site (SD 2-6 Surface Water Management Plan). Two construction and five operations sub-phases were considered for the modelling effort, and are summarized in Table 7.4-A3. Table 7.4-A2 lists the phases for which model predictions are produced for each of the waterbodies included in the spatial extent of the modelling effort.

**Table 7.4-A3: Description of Construction and Operations Sub-Phases**

| Sub-phase | Major water management activities | Major mining activities |
|---|---|---|
| **Construction** | | |
| Year -3 | Dewatering of waterbodies A8, B4 and B7. Outflows from Lake B5 directed to Lake D7. Outflows from Lake B45 directed to waterbodies B44, P2, then B2. Initiation of effluent discharge to Meliadine Lake (summer months). | Establishment of AP01. Construction of the TSF and plant site. Initiation of Tiriganiaq underground and B7 WRSF East. |
| Years -2 to -1 | Desalination of water from underground workings that is stored in Lake B4. Sole instances of effluent discharge to Meliadine Lake during winter. | Initiation of Tiriganiaq Pit 1 |
| **Operations** | | |
| Years 1 to 2 | Dewatering of Lake A6 | Initiation of B7 WRSF South |
| Years 3 to 4 | Dewatering of Lake B5 | Establishment of AP02. Initiation of B7 WRSF West and North, B4 WRSF East, A45-2 WRSF, Wesmeg Pits 1 and 2, and F Zone Pits 1 to 3. End of mining at F Zone Pit 2. |
| Years 5 to 8 | | Initiation of Discovery WRSF and Pit, Pump Pit 1 and Wesmeg Pit 5. End of mining at F Zone Pits 1 and 3, Pump Pit 1, and Wesmeg Pits 1, 2 and 5 |
| Year 9 | | Initiation of Tiriganiaq Pit 2, and Pump Pit 2. |
| Yeats 10 to 13 | | Initiation of B4 WRSF West, and Wesmeg Pits 3 and 4. End of mining at Tiriganiaq Pits 1 and 2 and underground, Discovery Pit, Pump Pit 2, and Wesmeg Pits 3 and 4. |

## 2.3 Water and Sediment Quality Parameters

The selected water and sediment quality parameters are respectively listed in Tables 7.4-A4 and 7.4-A5. The selected parameters are typical chemical signature of mine developments in the Canadian northern regions, and include:

- major ions, which may be found in high concentrations in water pumped to the surface from underground workings;
- nutrients, for which concentrations of phosphorus and nitrogen compounds can be impacted by blasting activities and domestics wastewaters;
- cyanide, a substance found in nature and mine processes; and
- metals, for which concentrations can be impacted by mine processes.

**Table 7.4-A4: Water Quality Parameter List**

| Parameter Group | Parameters |
|---|---|
| Conventional | Total dissolved solids (TDS), total alkalinity (Alk), total suspended solids (TSS) |
| Major ions | Calcium (Ca), chloride (Cl), fluoride (F), magnesium (Mg), potassium (K), sodium (Na), sulphate ($SO_4$) |
| Nutrients | Total ammonia ($NH_3$), nitrate ($NO_3$), total Kjeldahl nitrogen (TKN), total dissolved phosphorus (P), orthophosphate ($PO_4$) |
| Cyanides | Total cyanide (CN) |
| Metals | Aluminum (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), tin (Sn), titanium (Ti), tungsten (W), uranium (U), vanadium (V), zinc (Zn) |

**Table 7.4-A5: Sediment Quality Parameter List**

| Parameter Group | Parameters |
|---|---|
| Major ions | Calcium (Ca), magnesium (Mg), potassium (K), sodium (Na) |
| Nutrients | Total phosphorus (P) |
| Cyanides | Total cyanide (CN) |
| Metals | Aluminum (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), tin (Sn), titanium (Ti), uranium (U), vanadium (V), zinc (Zn) |

## 2.4 Water and Sediment Quality Objectives

Predictions of concentrations for each phase of the mine development are compared against 1) those of the baseline (i.e., existing conditions); and 2) guidelines for the protection of aquatic life and human health. The guidelines considered for surface water are as follows (see Table 7.4-A6 for the threshold concentrations applicable to water quality parameters listed in Table 7.4-A4):

- Canadian Water Quality Guidelines (CWQG) for the protection of freshwater aquatic life (Canadian Council of Ministers for the Environment [CCME] 2012a); and
- Guidelines for Canadian Drinking Water Quality (GCDWQ, Health Canada [HC] 2010).

The guidelines considered for sediment are as follows (see Table 7.4-A7 for the threshold concentrations applicable to sediment quality parameters listed in Table 7.4-A5):

- the Interim Sediment Quality Guidelines (ISQGs; CCME 2012b); and
- the Probable Effect Level (PEL; CCME 2012b).

**Table 7.4-A6: Concentration Thresholds from Regulatory Water Quality Guidelines**

| Parameter | Unit[a] | Freshwater CWQG[b][c] | GCDWQ[b][d] |
|---|---|---|---|
| **Conventional** | | | |
| Total dissolved solids (TDS) | mg/L | - | 500[e] |
| Total suspended solids (TSS) | mg/L | 8[f] | - |
| Dissolved oxygen | mg/L | 6.5 | - |
| **Major Ions** | | | |
| Chloride (Cl) | mg/L | 120 | 250[e] |
| Fluoride (F) | mg/L | - | 1.5 |
| Sodium (Na) | mg/L | - | 200[e] |
| Sulphate ($SO_4$) | mg/L | - | 500[e] |
| **Nutrients** | | | |
| Total Ammonia (as nitrogen) ($NH_3$) | mg/L | 7[g] | - |
| Nitrate (as nitrogen) ($NO_3$) | mg/L | 2.9[h] | 10 |
| Phosphorus (total) (P) | mg/L | Variable[i] | - |
| **Cyanides** | | | |
| Cyanide (total) (CN) | µg/L | - | 200 |
| **Metals** | | | |
| Aluminum (Al) | µg/L | 100[j] | - |
| Antimony (Sb) | µg/L | - | 6 |
| Arsenic (As) | µg/L | 5 | 10 |
| Barium (Ba) | µg/L | - | 1000 |
| Boron (B) | µg/L | 1500 | 5000 |
| Cadmium (Cd) | µg/L | 0.009[k] | 5 |
| Chromium (Cr) | µg/L | 8.9 | 50 |
| Copper (Cu) | µg/L | 2[k] | 1000[e] |
| Iron (Fe) | µg/L | 300 | 300[e] |
| Lead (Pb) | µg/L | 1[k] | 10 |
| Manganese (Mn) | µg/L | - | 50[e] |
| Mercury (Hg) | µg/L | 0.026[v] | 1 |
| Molybdenum (Mo) | µg/L | 73 | - |
| Nickel (Ni) | µg/L | 29[k] | - |

**Table 7.4-A6: Concentration Thresholds from Regulatory Water Quality Guidelines (cont'd)**

| Parameter | Unit[a] | Freshwater CWQG[b][c] | GCDWQ[b][d] |
|---|---|---|---|
| Selenium (Se) | µg/L | 1 | 10 |
| Silver (Ag) | µg/L | 0.1 | - |
| Thallium (Tl) | µg/L | 0.8 | - |
| Tin (Sn) | µg/L | 15 | |
| Uranium (U) | µg/L | 15 | 20 |
| Zinc (Zn) | µg/L | 30 | 5000[e] |

a) mg/L= milligrams per litre and µg/L= micrograms per litre.
b) - = No guideline available.
c) Canadian water quality guidelines for the protection of aquatic life - freshwater (CWQG; CCME 2012a).
d) Guidelines for Canadian Drinking Water Quality (GCDWQ; HC 2010).
e) Aesthetic objective.
f) Equal to ambient average concentration plus 5 mg/L (CCME 2012a).
g) Established based on ambient pH and water temperature.
h) Guideline is for protection from direct toxic effects and does not consider effects due to eutrophication.
i) The following trigger values can be applied to interpret the data but not for screening: ultra-oligotrophic <4 µg/L; oligotrophic 4-10 µg/L; mesotrophic 10-20 µg/L; meso-eutrophic 20-35 µg/L; eutrophic 35-100 µg/L; hyper-eutrophic >100 µg/L.
j) Established based on ambient pH.
k) Established based on ambient hardness.
l) Mercury freshwater guideline is for inorganic mercury.

**Table 7.4-A7: Concentration Thresholds from Regulatory Sediment Quality Guidelines**

| Parameter | Unit[a] | ISQG[b] | PEL[c] |
|---|---|---|---|
| **Metals** | | | |
| Arsenic (As) | mg/kg dw | 5.9 | 17 |
| Cadmium (Cd) | mg/kg dw | 0.6 | 3.5 |
| Chromium (Cr) | mg/kg dw | 37.3 | 90 |
| Copper (Cu) | mg/kg dw | 35.7 | 197 |
| Lead (Pb) | mg/kg dw | 35 | 91.3 |
| Mercury (Hg) | mg/kg dw | 0.17 | 0.486 |
| Zinc (Zn) | mg/kg dw | 123 | 315 |

a) mg/kg dw= milligrams per litre, dry weight.
b) Interim Sediment Quality Guidelines (ISQGs; CCME 2012b).
c) Probable Effect Level (PEL; CCME 2012b).

## 2.5 Models

This section provides a brief description of the models employed for water quality modelling in the receiving aquatic environment. Modelling approaches and assumptions are provided respectively in the sections addressing water quality in Meliadine Lake (Section 4) and waterbodies (Section 5), and acid deposition (Section 7). Sediment quality modelling is based on a mass balance assuming saturated sediment pores, as described in Section 6.

### 2.5.1 Effluent Mixing Model

As part of mine activities, effluent will be discharged to Meliadine Lake through a diffuser outfall. The CORMIX model system (Doneker and Jirka 2007) was used to provide numerical simulations of the mixing behaviour of the mine effluent in the near-field in Meliadine Lake. CORMIX is one of the most extensively used models for predicting plume mixing of both conservative and non-conservative substances in surface waterbodies. This model has been used for conceptual design and analysis of effluent outfalls in other northern Canadian lakes. The mine effluent chemistry (i.e., water quality parameter concentrations) was estimated from the mine site water and mass balance model developed as part of the mine site water management plan for the Project (SD 2-6 Surface Water Management Plan).

### 2.5.2 Waterbodies Model

The waterbodies model was developed using GoldSim version 10.5. GoldSim is a graphical, object-oriented mathematical model where all input parameters and functions are defined by the user and are built as individual objects or elements linked together by mathematical expressions. The object-based nature of the model is designed to facilitate understanding of the various factors, which control an engineered or natural system and predict the future performance of the system.

The waterbodies model consists of the hydrologic model developed for the receiving aquatic environment (FEIS Volume 7, Section 7.3), on which a water quality module was added. In general, the resulting waterbodies model is a water and mass balance model that was set up to account for all hydrologic inputs and processes accounted for in the impact assessment for hydrology including water quantity (FEIS Volume 7, Section 7.3). Chemistry was defined for all water sources and served as input to the mass balance to predict concentrations in the waterbodies.

### 2.5.3 Acidification Model

The assessment of possible effects from acid deposition relied on the use of critical loads of acidity, calculated based on the steady-state water chemistry model described by Henriksen and Posch (2001). This model is based on the input of acid neutralizing chemicals from the watershed area of the waterbody and the minimum acid neutralizing capacity (ANC) required to protect aquatic ecosystems. It assumes acid input from atmospheric deposition that is below the input of acid neutralizing chemicals, minus the required minimum ANC, will result in no adverse effects on aquatic life.

## 2.6 Data Sources

The implementation of the effluent mixing model and waterbodies models (Section 4 and 5, respectively) required results from the following:

- The mine site water and mass balance model developed as part of the mine site water management plan (SD 2-6 Surface Water Management Plan); and

  The hydrologic (water balance) model of the receiving aquatic environment (FEIS Volume 7, Section 7.3).

The data sources required to operate these two models are described in SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline.

Water and sediment samples collected in the mine area of the Project were also considered for the waterbodies model (Section 5) and the estimation of sediment quality (Section 6). Water samples were used to establish the chemistry of natural water sources (i.e., not affected by mine activities) for the watebodies models. The sediment samples were used to characterize the chemistry of dry sediment (i.e., with pores devoid of natural or contact water). Sample station locations and years of collection are listed in Tables 8 and 9 for waterbodies and streams, respectively. Figures 7.4-A2 and 7.4-A3 illustrate the sample station locations. The timing of the sampling within each year is provided in Table 7.4-A10.

Atmospheric loadings from the air quality assessment of the Project were also considered. These atmospheric loadings include:

- Total suspended particles and associated fractions for metals, which were incorporated as input into the waterbodies models; and
- Nitrate ($NO_3$) and sulphate ($SO_4$) for the assessment of potential acid input to waterbodies described in Section 7.

Modelling approaches, inputs, assumptions and results are provided in the air quality assessment of the Project (FEIS Volume 5, Section 5.2).

**Table 7.4-A8: Water and Sediment Sampling in the Project Area Waterbodies (1994 to 2011)**

| Sample station | Water quality[(a)] | Sediment quality[(a)] |
|---|---|---|
| **Meliadine Lake** | | |
| BOOT-1 | 2008, 2009 | 2008 |
| BOOT-2 | 2008, 2009, 2011 | 2008, 2011 |
| ML-A | 2009 | 1994, 1998, 2008 |
| ML-B | | 1998, 2008 |
| ML-E | 1997, 1998, 2008, 2009 | 1998, 2008, 2011 |
| ML-S | 1997, 1998 | 1998, 2008 |
| ML-SE | 1998, 1999, 2000, 2008, 2009, 2011 | 2008, 2011 |
| ML-W | 1997, 1998, 2008 | 1998, 2008 |
| **Waterbodies in Meliadine Lake peninsula** | | |
| A1 | 1994, 1997 | 1994 |
| A5 | 1994 | 1994 |
| A6 | 1994, 1997, 1998, 1999, 2000, 2009 | 1994, 1998, 2009 |
| A8 | 1994, 1997, 1998, 2007, 2008, 2009 | 1994, 1998, 2008 |
| A9 | 2007 | |
| A13 | 2007 | |
| A15 | 2007 | |
| A38 | 2007 | |
| A54 | 2007, 2008 | |
| A56 | 2007 | |
| A57 | 2007 | |

**Table 7.4-A8: Water and Sediment Sampling in the Project Area Waterbodies (1994 to 2011) (cont'd)**

| Sample station | Water quality[(a)] | Sediment quality[(a)] |
|---|---|---|
| B2 | 1997, 1998, 1999, 2000, 2011 | 2011 |
| B5 | 1997, 1998, 1999, 2000, 2008, 2009, 2011 | 1998, 2008 |
| B6 | 2008, 2009, 2011 | 2008 |
| B7 | 1997, 1998, 2008, 2009, 2011 | 2008 |
| B8 | 1998 | |
| B9 | 1998 | |
| B10 | 1998 | |
| B36 | 1994, 2011 | 1994, 2011 |
| B45 | 2011 | 2011 |
| B46 | 2011 | 2011 |
| C5 | 1994 | 1994 |
| D1 | 1997, 1998 | |
| D4 | 2011 | 2011 |
| D5 | 2011 | 2011 |
| D7 | 1994, 1997, 1998, 2011 | 1994, 2011 |
| D23 | 2011 | 2011 |
| E3 | 1994, 2011 | 2011 |
| E4 | 2011 | 2011 |
| G2 | 1997 | |
| H17 | 2011 | 2011 |
| H20 | 2011 | 2011 |
| **Waterbodies in the area of Discovery Pit (Chicken Head watershed)** | | |
| DI1 | 1994, 1995, 2008, 2009 | 1994, 2008 |
| DI3 | 1995 | |
| DI5 | 1995 | 1995 |
| **Others (Waterbodies surrounding Meliadine Lake, and Little Meliadine, Peter and Control lakes)** | | |
| DI2 | 1994, 1995 | 1994 |
| DI4 | 1995, 2008 | 1995, 2008 |
| LML | 1998 | 1998 |
| PL | 1998 | 1998 |
| Control | 1998, 1999, 2000, 2007, 2008, 2009, 2011 | 1998, 2008, 2011 |

(a) Sampling data obtained from SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline.

**Table 7.4-A9: Water and Sediment Sampling in the Project Area Streams (1997 to 2011)**

| Sample station | Water quality[(a)] |
|---|---|
| **Streams in Meliadine Lake drainage area** | |
| NEW-1 | 2008 |
| DI-4 | 2008 |
| **Streams in Meliadine Lake peninsula** | |
| A0-1 | 1997, 1998, 1999, 2000 |
| A5-6 | 1997, 1998 |

**Table 7.4-A9: Water and Sediment Sampling in the Project Area Streams (1997 to 2011) (cont'd)**

| Sample station | Water quality[(a)] |
|---|---|
| A7-8 | 1997, 1998, 2007, 2008 |
| B1-2 | 1997, 1998, 1999, 2000 |
| B3-4 | 1997, 1998 |
| B4-5 | 1997, 1998, 2008 |
| B4-45[(b)] | 2011 |
| B5-6 | 1998 |
| B6-7 | 1997, 1998, 2008 |
| D0-1 | 1997 |
| D6-7 | 1997 |
| G1-2 | 1997 |
| **Streams in the area of Discovery Pit (Chicken Head watershed)** | |
| DI-6 | 1995, 2008 |
| DI-7 | 1995, 2008 |
| NEW-2 | 2008 |
| NEW-3 | 2008 |
| **Others (Meliadine River, and streams in Peter Lake drainage)** | |
| ML-MR | 1997, 1998, 1999, 2000, 2008 |
| MR-L | 1998 |
| ML-PL | 1997, 1998 |
| PL-DL | 1997, 1998 |

(a) Sampling data obtained from SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline.
(b) Samples for sediment quality analysis were only collected from B4-45 in July 2011.

**Table 7.4-A10: Timing of Water Quality Sampling (1994 to 2011)**

| Year | Sampling location | Timing of sampling |
|---|---|---|
| 1994 | Waterbodies | Summer (i.e., base flow conditions) |
| 1995 | Waterbodies and streams | Summer |
| 1997 | Streams | Spring (i.e., freshet conditions) and Summer |
| | Waterbodies | Summer |
| 1998 | Streams | Spring and Summer |
| | Waterbodies | Late Winter and Summer |
| 1999 | Streams | Spring |
| | Waterbodies | Summer |
| 2000 | Streams | Spring |
| | Waterbody | Summer |
| 2007 | Streams | Summer and Fall |
| | Waterbodies | Summer and Fall |
| 2008 | Streams | Spring and Summer |
| | Waterbodies | Summer |
| 2009 | Waterbodies | Late Winter and Summer |
| 2011 | Waterbodies and streams | Late Winter and Summer |

(a) Sampling data obtained from SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline.

# 3.0 ENVIRONMENTAL SETTING

A summary of water and sediment quality samples used in the modelling effort is presented in this section. Water and sediment quality characteristics for Meliadine Lake are presented in Section 3.1, followed by those of waterbodies in the mining area in Section 3.2

## 3.1 Meliadine Lake

Statistics of the water samples collected in Meliadine Lake, for the parameters listed in Table 7.4-A4, are given in Table 7.4-A11. Guidelines (i.e., CWQG and GCDWQ) are also presented in Table 7.4-A11 to allow comparison with the parameter concentration levels. The observed concentrations for parameters with guidelines are below these guidelines, except for:

- Cadmium, where all 29 observations are above the guideline threshold for that parameter, since the detection limits for these observations are all above the guideline threshold; and
- Zinc, where only one observations among 29 (i.e., the maximum observed concentration) is above the guideline threshold for that parameter.

Observed concentrations in water samples, including for parameters with no guidelines, are frequently non-detectable (i.e., below detection limits). Parameters with more than 50% of the water samples with non-detectable concentrations are: total suspended solids, total ammonia, nitrate, orthophosphate, total cyanide, antimony, beryllium (100%), bismuth (100%), cadmium, chromium, cobalt (100%), lead, lithium, mercury (100%), selenium, silver (100%), thallium (100%), tin, titanium, uranium, vanadium and zinc.

Table 7.4-A12 presents the statistics of sediment samples collected in Meliadine Lake for the parameters listed in Table 7.4-A5, and the guidelines applicable to sediment (ISQG and PEL). Observed concentrations are below the guideline thresholds except for the following parameters:

- Arsenic, where 38 of the 63 observations (60%) exceed the ISQG threshold for that parameter, and 19 observations (30%) also exceed the PEL threshold;
- Chromium, where the ISQG thresholds is exceeded by 20 of the 63 observations (32%) for that parameter; and
- Copper, where the ISQG thresholds is exceeded by 14 of the 63 observations (22%) for that parameter.

Observed concentrations in sediment samples, including for parameters with no guidelines, are frequently non-detectable (i.e., below detection limits). Parameters with more than 50% of the sediment samples with non-detectable concentrations are: antimony, beryllium (100%), bismuth (100%), boron, cadmium, mercury, silver (100%), thallium (100%), tin (100%) and uranium.

**Table 7.4-A11: Statistics of the Water Samples Collected at Meliadine Lake**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| **Conventional Parameters** | | | | | | | | |
| Total Dissolved Solids (TDS) | mg/L | - | 500 | 25 | 0 | 21 | 35 | 91 |
| Total Alkalinity (Alk) | mg $CaCO_3$/L | - | - | 29 | 0 | 12 | 16 | 50 |
| Total Suspended Solids (TSS) | mg/L | 8 | - | 29 | 22 | <2 | <3 | 8 |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/L | - | - | 26 | 0 | 4.3 | 6.4 | 17 |
| Chloride (Cl) | mg/L | 120 | 250 | 29 | 0 | 3.8 | 6.4 | 25 |
| Fluoride (F) | mg/L | - | 1.5 | 0 | 0 | - | - | - |
| Magnesium (Mg) | mg/L | - | - | 26 | 0 | 0.65 | 0.95 | 2.4 |
| Potassium (K) | mg/L | - | - | 26 | 3 | 0.64 | 0.86 | <2 |
| Sodium (Na) | mg/L | - | 200 | 26 | 0 | 1.7 | 3.2 | 7.5 |
| Sulphate ($SO_4$) | mg/L | - | 500 | 29 | 4 | 1.6 | 2.9 | 8.9 |
| **Nutrients** | | | | | | | | |
| Total Ammonia as Nitrogen ($NH_3$) | mg N/L | 7 | - | 29 | 18 | 0.002 | <0.05 | 0.052 |
| Nitrate as Nitrogen ($NO_3$) | mg N/L | 2.9 | 10 | 29 | 28 | <0.006 | <0.05 | <0.1 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | - | - | 29 | 7 | 0.14 | 0.23 | 0.94 |
| Phosphorus, Total Dissolved (P) | mg/L | - | - | 29 | 0 | 0.002 | 0.003 | 0.012 |
| Orthophosphate as Phosphorus ($PO_4$) | mg P/L | - | - | 29 | 25 | <0.001 | <0.001 | 0.004 |
| **Cyanides** | | | | | | | | |
| Total Cyanide (CN) | µg/L | - | 200 | 25 | 24 | <0.002 | <2 | 3 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | µg/L | 100 | - | 29 | 10 | <0.3 | 2.3 | 11 |
| Antimony (Sb) | µg/L | - | 6 | 29 | 18 | <0.03 | 0.1 | <0.5 |
| Arsenic (As) | µg/L | 5 | 10 | 29 | 9 | 0.13 | 0.33 | 0.58 |
| Barium (Ba) | µg/L | - | 1000 | 29 | 4 | <0.05 | 7.6 | <20 |
| Beryllium (Be) | µg/L | - | - | 29 | 29 | <0.1 | <0.2 | <1 |
| Bismuth (Bi) | µg/L | - | - | 20 | 20 | <0.03 | <0.05 | <1 |
| Boron (B) | µg/L | 1500 | 5000 | 16 | 7 | <0.1 | 3.7 | <100 |
| Cadmium (Cd) | µg/L | 0.009 | 5 | 29 | 23 | **<0.01** | **<0.05** | **4.8** |
| Chromium (Cr) | µg/L | 8.9 | 50 | 29 | 21 | <0.06 | 0.53 | 2.2 |
| Cobalt (Co) | µg/L | - | - | 29 | 29 | <0.1 | <0.1 | <0.3 |
| Copper (Cu) | µg/L | 2 | 1000 | 29 | 1 | 0.7 | 1.1 | 3.1 |
| Iron (Fe) | µg/L | 300 | 300 | 25 | 5 | <5 | 23 | 85 |
| Lead (Pb) | µg/L | 1 | 10 | 29 | 23 | <0.05 | 0.09 | 0.71 |
| Lithium (Li) | µg/L | - | - | 23 | 16 | <0.1 | 1.1 | <5 |
| Manganese (Mn) | µg/L | - | 50 | 29 | 1 | <0.1 | 2.2 | 7.7 |
| Mercury (Hg) | µg/L | 0.026 | 1 | 29 | 29 | <0.01 | <0.02 | <0.02 |
| Molybdenum (Mo) | µg/L | 73 | - | 29 | 10 | <0.06 | 0.11 | <1 |
| Nickel (Ni) | µg/L | 29 | - | 29 | 8 | <0.1 | 0.67 | 5.4 |
| Selenium (Se) | µg/L | 1 | 10 | 29 | 26 | <0.1 | <0.1 | <10 |

**Table 7.4-A11: Statistics of the Water Samples Collected at Meliadine Lake (cont'd)**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| Silver (Ag) | µg/L | 0.1 | - | 29 | 29 | <0.01 | <0.1 | <0.1 |
| Strontium (Sr) | µg/L | - | - | 26 | 1 | <0.1 | 32 | 73 |
| Thallium (Tl) | µg/L | 0.8 | - | 28 | 28 | <0.03 | <0.05 | <0.2 |
| Tin (Sn) | µg/L | 15 | - | 10 | 7 | <0.1 | <0.5 | 1.7 |
| Titanium (Ti) | µg/L | - | - | 16 | 13 | <0.1 | <0.1 | 0.6 |
| Tungsten (W) | µg/L | - | - | 0 | 0 | - | - | - |
| Uranium (U) | µg/L | 15 | 20 | 29 | 25 | 0.015 | <0.05 | <0.2 |
| Vanadium (V) | µg/L | - | - | 29 | 19 | <0.01 | <0.1 | <1 |
| Zinc (Zn) | µg/L | 30 | 5000 | 29 | 16 | <0.8 | <5 | **37** |

[a]bolded values exceed CWQG; underlined values exceed GCDWQ

**Table 7.4-A12: Statistics of the Sediment Samples Collected at Meliadine Lake**

| Parameter | Units | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG | PEL | Total | Non-detectable | Minimum | Median | Maximum |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/kg dw | - | - | 26 | 0 | 2300 | 4715 | 6460 |
| Magnesium (Mg) | mg/kg dw | - | - | 26 | 0 | 2150 | 4455 | 7930 |
| Potassium (K) | mg/kg dw | - | - | 26 | 0 | 509 | 1720 | 2680 |
| Sodium (Na) | mg/kg dw | - | - | 26 | 2 | <100 | 266 | 482 |
| **Nutrients** | | | | | | | | |
| Phosphorus (P) | mg/kg dw | - | - | 26 | 0 | 393 | 822 | 1190 |
| **Cyanides** | | | | | | | | |
| Total Cyanide | mg/kg dw | - | - | 61 | 11 | <0.5 | 1.7 | 7 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | 26 | 0 | 3300 | 8905 | 11900 |
| Antimony (Sb) | mg/kg dw | - | - | 37 | 37 | <0.2 | <0.2 | <25 |
| Arsenic (As) | mg/kg dw | 5.9 | 17 | 63 | 0 | 1.6 | **7.6** | **<u>68</u>** |
| Barium (Ba) | mg/kg dw | - | - | 63 | 0 | 19 | 66 | 141 |
| Beryllium (Be) | mg/kg dw | - | - | 62 | 62 | <0.5 | <1 | <1 |
| Bismuth (Bi) | mg/kg dw | - | - | 26 | 26 | <1 | <1 | <10 |
| Boron (B) | mg/kg dw | - | - | 25 | 19 | <5 | <5 | 11 |
| Cadmium (Cd) | mg/kg dw | 0.6 | 3.5 | 63 | 55 | 0.34 | <0.5 | <2 |
| Chromium (Cr) | mg/kg dw | 37.3 | 90 | 63 | 0 | 13 | 30 | **53** |
| Cobalt (Co) | mg/kg dw | - | - | 63 | 0 | 2 | 6 | 21 |
| Copper (Cu) | mg/kg dw | 35.7 | 197 | 63 | 0 | 6 | 34 | **92** |
| Iron (Fe) | mg/kg dw | - | - | 26 | 0 | 5790 | 15700 | 40800 |
| Lead (Pb) | mg/kg dw | 35 | 91.3 | 63 | 27 | 2 | 6 | 14 |
| Lithium (Li) | mg/kg dw | - | - | 1 | 0 | 6.3 | 6.3 | 6.3 |
| Manganese (Mn) | mg/kg dw | - | - | 26 | 0 | 79 | 211 | 615 |
| Mercury (Hg) | mg/kg dw | 0.17 | 0.486 | 63 | 35 | <0.005 | <0.05 | 0.14 |
| Molybdenum (Mo) | mg/kg dw | - | - | 63 | 15 | <1 | 2 | 7 |

**Table 7.4-A12: Statistics of the Sediment Samples Collected at Meliadine Lake (cont'd)**

| Parameter | Units | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG | PEL | Total | Non-detectable | Minimum | Median | Maximum |
| Nickel (Ni) | mg/kg dw | - | - | 63 | 0 | 7 | 25 | 73 |
| Selenium (Se) | mg/kg dw | - | - | 63 | 7 | <0.1 | 0.4 | 1.3 |
| Silver (Ag) | mg/kg dw | - | - | 63 | 63 | <1 | <1 | <2 |
| Strontium (Sr) | mg/kg dw | - | - | 25 | 0 | 13 | 27 | 42 |
| Thallium (Tl) | mg/kg dw | - | - | 61 | 61 | <1 | <1 | <1 |
| Tin (Sn) | mg/kg dw | - | - | 63 | 63 | <5 | <5 | <30 |
| Titanium (Ti) | mg/kg dw | - | - | 25 | 0 | 480 | 970 | 1230 |
| Uranium (U) | mg/kg dw | - | - | 61 | 55 | <2 | 2 | <40 |
| Vanadium (V) | mg/kg dw | - | - | 62 | 0 | 12 | 32 | 61 |
| Zinc (Zn) | mg/kg dw | 123 | 315 | 63 | 0 | 20 | 46 | 100 |

[a]bolded values exceed ISQG; underlined values exceed PEL

## 3.2 Waterbodies

Samples collected in waterbodies and streams, other than Meliadine Lake, were grouped into areas that include the A watershed, B watershed, D watershed, and Chicken Head watershed. This grouping provided larger sample sizes for the evaluation of water and sediment quality. Table 7.4-A13 lists, for each area, the parameters for which exceedence of guidelines and/or more than 50% of samples with non-detectable concentrations were observed. Table 7.4-A13 was built from the statistics on:

- Water samples for the A, B, D and Chicken Head watersheds (Tables 7.4-A14 to 7.4-A17, respectively); and
- Sediment samples for the A, B, D and Chicken Head watersheds (Tables 7.4-A18 to 7.4-A21, respectively).

Observations made from the compilation of the water samples were as follows:

- Exceedences of guidelines typically occurred only with the highest observed parameter concentrations (i.e., above the median and up to the maximum concentrations);
- Exceedences of the CWQG guideline for cadmium occurred for the entire range of concentrations (i.e., from minimum to maximum) at all areas as a result of detection limits for that parameter that are higher than the guideline;
- Exceedences of guidelines occurred from the range of median observations up to maximum concentrations for aluminum, chromium, copper, mercury, silver and tin as a result of detection limits for these parameters that are higher than their respective guidelines;
- The number of samples available to characterize the D and Chicken Head watersheds is limited (i.e., 14 samples or less), and there are frequent occurrences of parameters for which all observations of concentrations were non-detectable;

- Concentration levels in larger waterbodies (e.g., waterbodies A8, A6, A1, B7, B6, B5, B4, D7 or D5) were typically lower than those in smaller waterbodies (e.g., waterbodies A38, A54, A56, B36, or D23); nevertheless, it is assumed that high concentrations observed in smaller waterbodies can possibly occur in large waterbodies (i.e., outflows from small waterbodies typically feed larger waterbodies); and
- Concentration levels in larger waterbodies are consistently higher during the winter, while they can be high at any time of the year in smaller waterbodies.

Observations made from the compilation of the sediment samples were as follows:

- No exceedence of guidelines were observed in the D watershed; however, only one sample was available to characterize that area;
- The number of samples available to characterize the Chicken Head watershed is limited (i.e., 6 samples or less);
- Exceedences of guidelines with the highest observed concentrations (i.e., above the median and up to the maximum concentrations) occurred only for chromium (B and Chicken Head watersheds); and
- Exceedences of guidelines occurred from the range of median observations up to maximum concentrations for arsenic (A, B and Chicken Head watersheds), chromium (A watershed) and copper (A and B watersheds).

**Table 7.4-A13: Summary of Guideline Exceedences and Non-Detectable Observations for Water and Sediment Samples (Waterbodies)**

| Sample | Area | Parameter exceeding guidelines | Parameter with more than 50% samples with non-detectable concentrations |
|---|---|---|---|
| Water | A watershed | TDS, TSS, Ca, NO3, Cd, Cr, Fe, Pb, Mn, Hg, Se, Ag, Zn | NO3, PO4, CN, Be (100%), Bi (100%), B, Cd, Cr, Co, Pb, Hg, Se, Ag, Tl, Sn (100%), Ti, W (100%), U |
| | B watershed | TDS, TSS, Ca, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Zn | NO3, PO4, CN, Be, Bi, Cd, Cr, Co, Pb, Hg (100%), Se, Ag, Tl, Sn, Ti, W (100%), U |
| | D watershed | TDS, TSS, Ca, Cd, Cr, Fe, Pb, Mn, Hg, Se, Zn | TSS, NO3, PO4, CN, Sb, Be, Bi (100%), Cd, Cr, Co, Pb, Hg, Se, Ag (100%), Tl (100%), Sn (100%), W (100%), Zn |
| | Chicken Head watershed | Al, Sb, Cd, Cr, Cu, Pb, Hg, Ag, Tl, Sn | TSS, NH3, NO3 (100%), TKN, PO4 (100%), CN (100%), Al, Sb (100%), Be (100%), Bi (100%), B, Cd, Cr (100%), Co (100%), Cu, Pb (100%), Mn, Hg (100%), Mo (100%), Ni, Se (100%), Ag (100%), Tl (100%), Sn (100%), Ti (100%), W (100%), U (100%), V, Zn |
| Sediment | A watershed | As, Cr, Cu | Be (100%), Bi, B (100%), Cd, Ag (100%), Tl (100%), Sn (100%), U (100%) |
| | B watershed | As, Cr, Cu | Sb (100%), Be (100%), Bi (100%), B, Cd, Ag (100%), Tl (100%), Sn (100%), U |
| | D watershed | No parameter exceeds guidelines | Na (100%), Sb (100%), Be (100%), Cd (100%), Hg (100%), Mo (100%), Se (100%), Ag (100%), Sn (100%)[(a)] |
| | Chicken Head watershed | As, Cr | Na (100%), Sb (100%), Be (100%), Bi (100%), Cd (100%), Pb (100%), Hg (100%), Mo, Ag (100%), Tl (100%), Sn (100%), U (100%)[(b)] |

a) Observations of CN, B, Sr, Tl, Ti and U were not available in sediment samples collected in the D watershed.
b) Observations of Sr and Tl were not available in sediment samples collected in the Chicken Head watershed.

**Table 7.4-A14: Statistics of the Water Samples Collected in the A Watershed**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| **Conventional Parameters** | | | | | | | | |
| Total Dissolved Solids (TDS) | mg/L | - | 500 | 33 | 0 | 26 | 49 | 1440 |
| Total Alkalinity (Alk) | mg $CaCO_3$/L | - | - | 49 | 0 | 16 | 33 | 167 |
| Total Suspended Solids (TSS) | mg/L | 8 | - | 44 | 21 | <1 | <3 | **17** |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/L | 120 | 250 | 49 | 0 | 6.3 | 15 | **346** |
| Chloride (Cl) | mg/L | - | - | 49 | 0 | 2 | 12 | 716 |
| Fluoride (F) | mg/L | - | 1.5 | 5 | 1 | <0.02 | 0.04 | 0.05 |
| Magnesium (Mg) | mg/L | - | - | 48 | 0 | 0.84 | 1.8 | 38 |
| Potassium (K) | mg/L | - | - | 49 | 2 | 0.49 | 0.95 | 9.6 |
| Sodium (Na) | mg/L | - | 200 | 49 | 0 | 1.1 | 2.5 | 87 |
| Sulphate ($SO_4$) | mg/L | - | 500 | 49 | 3 | 1.5 | 3.2 | 141 |
| **Nutrients** | | | | | | | | |
| Total Ammonia as Nitrogen ($NH_3$) | mg N/L | 7 | - | 40 | 17 | <0.005 | <0.05 | 1.32 |
| Nitrate as Nitrogen ($NO_3$) | mg N/L | 2.9 | 10 | 49 | 33 | <0.006 | <0.04 | **4.9** |
| Total Kjeldahl Nitrogen (TKN) | mg/L | - | - | 40 | 0 | 0.12 | 0.405 | 2.2 |
| Phosphorus, Total Dissolved (P) | mg/L | - | - | 36 | 11 | 0.0015 | 0.0055 | <0.02 |
| Orthophosphate as Phosphorus ($PO_4$) | mg P/L | - | - | 40 | 38 | <0.001 | <0.0015 | <0.01 |
| **Cyanides** | | | | | | | | |
| Total Cyanide (CN) | µg/L | - | 200 | 22 | 19 | <1 | <2 | <5 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | µg/L | 100 | - | 32 | 8 | <0.3 | 2 | 40 |
| Antimony (Sb) | µg/L | - | 6 | 32 | 12 | <0.03 | <0.2 | 0.61 |
| Arsenic (As) | µg/L | 5 | 10 | 36 | 1 | <0.03 | 1.8 | 4.2 |
| Barium (Ba) | µg/L | - | 1000 | 36 | 6 | <0.05 | 11 | 123 |
| Beryllium (Be) | µg/L | - | - | 36 | 36 | <0.1 | <0.2 | <5 |
| Bismuth (Bi) | µg/L | - | - | 20 | 20 | <0.03 | <0.05 | <1 |
| Boron (B) | µg/L | 1500 | 5000 | 18 | 14 | <0.6 | <50 | <100 |
| Cadmium (Cd) | µg/L | 0.009 | 5 | 36 | 29 | **<0.01** | **<0.1** | **1.1** |
| Chromium (Cr) | µg/L | 8.9 | 50 | 36 | 22 | <0.06 | <1 | **<15** |
| Cobalt (Co) | µg/L | - | - | 32 | 26 | <0.1 | <0.1 | <2 |
| Copper (Cu) | µg/L | 2 | 1000 | 36 | 7 | <0.6 | 1.2 | 27 |
| Iron (Fe) | µg/L | 300 | 300 | 33 | 3 | 4.6 | 72 | **695** |
| Lead (Pb) | µg/L | 1 | 10 | 36 | 23 | <0.05 | 0.1 | **63** |
| Lithium (Li) | µg/L | - | - | 31 | 11 | <0.1 | 1.6 | 40 |
| Manganese (Mn) | µg/L | - | 50 | 36 | 2 | 0.1 | 7.3 | 416 |
| Mercury (Hg) | µg/L | 0.026 | 1 | 36 | 34 | <0.01 | <0.02 | **0.5** |
| Molybdenum (Mo) | µg/L | 73 | - | 32 | 9 | 0.1 | 0.2 | <5 |
| Nickel (Ni) | µg/L | 29 | - | 36 | 8 | 0.27 | 1 | <20 |
| Selenium (Se) | µg/L | 1 | 10 | 36 | 24 | <0.1 | 0.35 | **<10** |
| Silver (Ag) | µg/L | 0.1 | - | 32 | 31 | <0.02 | <0.1 | **<0.4** |
| Strontium (Sr) | µg/L | - | - | 29 | 1 | <0.1 | 48 | 830 |

**Table 7.4-A14: Statistics of the Water Samples Collected in the A Watershed (cont'd)**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| Thallium (Tl) | µg/L | 0.8 | - | 30 | 28 | <0.03 | <0.05 | 0.2 |
| Tin (Sn) | µg/L | 15 | - | 13 | 13 | <0.05 | <50 | <300 |
| Titanium (Ti) | µg/L | - | - | 29 | 22 | <0.1 | 0.3 | <10 |
| Tungsten (W) | µg/L | - | - | 7 | 7 | <1 | <100 | <100 |
| Uranium (U) | µg/L | 15 | 20 | 32 | 26 | <0.05 | 0.066 | 0.26 |
| Vanadium (V) | µg/L | - | - | 32 | 10 | <0.05 | 0.25 | 1 |
| Zinc (Zn) | µg/L | 30 | 5000 | 36 | 17 | <0.5 | <5 | **32** |

[a]bolded values exceed CWQG; underlined values exceed GCDWQ

**Table 7.4-A15: Statistics of the Water Samples Collected in the B Watershed**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| **Conventional Parameters** | | | | | | | | |
| Total Dissolved Solids (TDS) | mg/L | - | 500 | 58 | 0 | 18 | 49 | 602 |
| Total Alkalinity (Alk) | mg CaCO3/L | - | - | 62 | 0 | 14 | 29 | 362 |
| Total Suspended Solids (TSS) | mg/L | 8 | - | 62 | 32 | 1 | <3 | **11** |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/L | 120 | 250 | 52 | 0 | 4.8 | 11 | **154** |
| Chloride (Cl) | mg/L | - | - | 62 | 0 | 1.9 | 5.6 | 241 |
| Fluoride (F) | mg/L | - | 1.5 | 3 | 1 | <0.02 | 0.02 | 0.07 |
| Magnesium (Mg) | mg/L | - | - | 52 | 0 | 0.67 | 1.3 | 33 |
| Potassium (K) | mg/L | - | - | 52 | 4 | 0.51 | 0.79 | 6.2 |
| Sodium (Na) | mg/L | - | 200 | 52 | 0 | 1.1 | 2.4 | 30 |
| Sulphate ($SO_4$) | mg/L | - | 500 | 62 | 6 | 1 | 3 | 44 |
| **Nutrients** | | | | | | | | |
| Total Ammonia as Nitrogen ($NH_3$) | mg N/L | 7 | - | 59 | 19 | 0.003 | 0.022 | 0.46 |
| Nitrate as Nitrogen ($NO_3$) | mg N/L | 2.9 | 10 | 62 | 43 | <0.005 | 0.011 | 0.2 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | - | - | 59 | 1 | 0.13 | 0.37 | 1.8 |
| Phosphorus, Total Dissolved (P) | mg/L | - | - | 61 | 3 | <0.001 | 0.005 | 0.024 |
| Orthophosphate as Phosphorus ($PO_4$) | mg P/L | - | - | 61 | 54 | <0.001 | <0.001 | 0.005 |
| **Cyanides** | | | | | | | | |
| Total Cyanide (CN) | µg/L | - | 200 | 51 | 44 | <0.002 | 1 | 43 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | µg/L | 100 | - | 61 | 21 | <0.3 | 2.9 | 36 |
| Antimony (Sb) | µg/L | - | 6 | 61 | 29 | <0.03 | 0.12 | 3.2 |
| Arsenic (As) | µg/L | 5 | 10 | 62 | 3 | 0.3 | 1.2 | 11 |
| Barium (Ba) | µg/L | - | 1000 | 62 | 8 | <0.05 | 11 | 232 |
| Beryllium (Be) | µg/L | - | - | 61 | 58 | <0.1 | <0.2 | <1 |
| Bismuth (Bi) | µg/L | - | - | 48 | 46 | <0.03 | <0.05 | <1 |
| Boron (B) | µg/L | 1500 | 5000 | 27 | 8 | 2 | 6.8 | <100 |
| Cadmium (Cd) | µg/L | 0.009 | 5 | 62 | 45 | **<0.01** | **<0.05** | 22 |
| Chromium (Cr) | µg/L | 8.9 | 50 | 62 | 36 | <0.06 | 0.49 | **<15** |

**Table 7.4-A15: Statistics of the Water Samples Collected in the B Watershed (cont'd)**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| Cobalt (Co) | µg/L | - | - | 61 | 42 | <0.1 | <0.1 | 0.8 |
| Copper (Cu) | µg/L | 2 | 1000 | 62 | 9 | <0.6 | 1.2 | **<10** |
| Iron (Fe) | µg/L | 300 | 300 | 59 | 1 | 3.9 | 103 | **610** |
| Lead (Pb) | µg/L | 1 | 10 | 62 | 45 | <0.05 | 0.063 | **3.1** |
| Lithium (Li) | µg/L | - | - | 53 | 14 | <0.1 | 1.1 | 32 |
| Manganese (Mn) | µg/L | - | 50 | 62 | 3 | <0.1 | 9.2 | 432 |
| Mercury (Hg) | µg/L | 0.026 | 1 | 62 | 62 | <0.01 | <0.02 | **<0.05** |
| Molybdenum (Mo) | µg/L | 73 | - | 61 | 10 | <0.06 | 0.2 | <1 |
| Nickel (Ni) | µg/L | 29 | - | 62 | 8 | <0.1 | 0.95 | <20 |
| Selenium (Se) | µg/L | 1 | 10 | 52 | 37 | <0.1 | <0.1 | <1 |
| Silver (Ag) | µg/L | 0.1 | - | 61 | 59 | <0.01 | <0.01 | 0.1 |
| Strontium (Sr) | µg/L | - | - | 58 | 5 | <0.1 | 50 | 892 |
| Thallium (Tl) | µg/L | 0.8 | - | 57 | 53 | <0.03 | <0.05 | <0.2 |
| Tin (Sn) | µg/L | 15 | - | 17 | 15 | <0.1 | <0.1 | 1.6 |
| Titanium (Ti) | µg/L | - | - | 45 | 31 | <0.1 | <0.3 | <10 |
| Tungsten (W) | µg/L | - | - | 1 | 1 | <100 | <100 | <100 |
| Uranium (U) | µg/L | 15 | 20 | 61 | 39 | 0.026 | 0.066 | 0.57 |
| Vanadium (V) | µg/L | - | - | 61 | 19 | <0.05 | 0.3 | 2.4 |
| Zinc (Zn) | µg/L | 30 | 5000 | 62 | 26 | <0.5 | <3 | **50** |

[a]bolded values exceed CWQG; underlined values exceed GCDWQ

**Table 7.4-A16: Statistics of the Water Samples Collected in the D Watershed**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| **Conventional Parameters** | | | | | | | | |
| Total Dissolved Solids (TDS) | mg/L | - | 500 | 10 | 0 | 39 | 72 | 1100 |
| Total Alkalinity (Alk) | mg CaCO3/L | - | - | 13 | 0 | 26 | 47 | 905 |
| Total Suspended Solids (TSS) | mg/L | 8 | - | 13 | 9 | <1 | <3 | **139** |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/L | 120 | 250 | 8 | 0 | 10 | 15 | **304** |
| Chloride (Cl) | mg/L | - | - | 13 | 0 | 3.3 | 8.1 | 107 |
| Fluoride (F) | mg/L | - | 1.5 | 1 | 0 | 0.04 | 0.04 | 0.04 |
| Magnesium (Mg) | mg/L | - | - | 8 | 0 | 1.1 | 2.2 | 42 |
| Potassium (K) | mg/L | - | - | 8 | 0 | 0.58 | 1.1 | 14 |
| Sodium (Na) | mg/L | - | 200 | 8 | 0 | 1.8 | 4 | 61 |
| Sulphate ($SO_4$) | mg/L | - | 500 | 13 | 3 | 2.1 | 3.9 | 29 |
| **Nutrients** | | | | | | | | |
| Total Ammonia as Nitrogen ($NH_3$) | mg N/L | 7 | - | 12 | 4 | 0.003 | <0.05 | 1.4 |
| Nitrate as Nitrogen ($NO_3$) | mg N/L | 2.9 | 10 | 13 | 10 | <0.005 | 0.044 | 0.08 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | - | - | 12 | 0 | 0.26 | 0.42 | 7.8 |
| Phosphorus, Total Dissolved (P) | mg/L | - | - | 11 | 0 | 0.0021 | 0.007 | 0.018 |
| Orthophosphate as Phosphorus ($PO_4$) | mg P/L | - | - | 12 | 11 | <0.001 | <0.001 | 0.003 |

**Table 7.4-A16: Statistics of the Water Samples Collected in the D Watershed (cont'd)**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| **Cyanides** | | | | | | | | |
| Total Cyanide (CN) | µg/L | - | 200 | 7 | 5 | <0.002 | <0.002 | 4 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | µg/L | 100 | - | 12 | 2 | <1 | 5.3 | 21 |
| Antimony (Sb) | µg/L | - | 6 | 12 | 7 | <0.03 | <0.13 | 0.5 |
| Arsenic (As) | µg/L | 5 | 10 | 13 | 0 | 0.3 | 1.1 | 3.8 |
| Barium (Ba) | µg/L | - | 1000 | 13 | 0 | 1 | 16 | 222 |
| Beryllium (Be) | µg/L | - | - | 13 | 10 | <0.1 | <0.5 | 2 |
| Bismuth (Bi) | µg/L | - | - | 13 | 13 | <0.05 | <0.1 | <100 |
| Boron (B) | µg/L | 1500 | 5000 | 5 | 0 | 2.8 | 9.3 | 25 |
| Cadmium (Cd) | µg/L | 0.009 | 5 | 13 | 11 | **<0.01** | **<0.1** | **<0.5** |
| Chromium (Cr) | µg/L | 8.9 | 50 | 13 | 8 | <0.1 | 0.9 | **20** |
| Cobalt (Co) | µg/L | - | - | 13 | 8 | <0.1 | <0.1 | <15 |
| Copper (Cu) | µg/L | 2 | 1000 | 13 | 1 | 0.63 | 1.5 | 18 |
| Iron (Fe) | µg/L | 300 | 300 | 13 | 1 | 11 | 113 | **660** |
| Lead (Pb) | µg/L | 1 | 10 | 13 | 9 | <0.05 | <0.2 | **1.4** |
| Lithium (Li) | µg/L | - | - | 13 | 6 | 1 | <5 | 24 |
| Manganese (Mn) | µg/L | - | 50 | 13 | 0 | 6.8 | 17 | 1520 |
| Mercury (Hg) | µg/L | 0.026 | 1 | 13 | 12 | <0.01 | <0.02 | **<0.05** |
| Molybdenum (Mo) | µg/L | 73 | - | 13 | 1 | 0.1 | 0.44 | <30 |
| Nickel (Ni) | µg/L | 29 | - | 13 | 3 | <0.1 | 1.1 | <20 |
| Selenium (Se) | µg/L | 1 | 10 | 13 | 10 | <0.1 | <0.5 | **<10** |
| Silver (Ag) | µg/L | 0.1 | - | 13 | 13 | <0.01 | <0.1 | <15 |
| Strontium (Sr) | µg/L | - | - | 13 | 0 | 42 | 76 | 1260 |
| Thallium (Tl) | µg/L | 0.8 | - | 13 | 13 | <0.05 | <0.1 | <100 |
| Tin (Sn) | µg/L | 15 | - | 6 | 6 | <0.1 | <0.1 | <300 |
| Titanium (Ti) | µg/L | - | - | 13 | 5 | <0.3 | 0.7 | <10 |
| Tungsten (W) | µg/L | - | - | 1 | 1 | <100 | <100 | <100 |
| Uranium (U) | µg/L | 15 | 20 | 12 | 1 | 0.017 | 0.1 | 1.7 |
| Vanadium (V) | µg/L | - | - | 13 | 6 | <0.1 | 0.1 | <30 |
| Zinc (Zn) | µg/L | 30 | 5000 | 13 | 8 | <0.5 | <3 | **123** |

[a]bolded values exceed CWQG; underlined values exceed GCDWQ

**Table 7.4-A17: Statistics of the Water Samples Collected in the Chicken Head Watershed**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| **Conventional Parameters** | | | | | | | | |
| Total Dissolved Solids (TDS) | mg/L | - | 500 | 9 | 0 | 24 | 31 | 43 |
| Total Alkalinity (Alk) | mg CaCO3/L | - | - | 12 | 0 | 11 | 14 | 40 |
| Total Suspended Solids (TSS) | mg/L | 8 | - | 8 | 7 | <1 | <3 | <3 |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/L | 120 | 250 | 14 | 0 | 3.9 | 4.8 | 15 |
| Chloride (Cl) | mg/L | - | - | 14 | 0 | 2.9 | 5.3 | 12 |

**Table 7.4-A18: Statistics of the Water Samples Collected in the Chicken Head Watershed (cont'd)**

| Parameter | Unit | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | CWQG | GCDWQ | Total | Non-detectable | Minimum | Median | Maximum |
| Fluoride (F) | mg/L | - | 1.5 | 12 | 4 | 0.04 | <0.05 | 0.06 |
| Magnesium (Mg) | mg/L | - | - | 14 | 0 | 0.62 | 0.8 | 2.3 |
| Potassium (K) | mg/L | - | - | 14 | 6 | 0.63 | <2 | 3.4 |
| Sodium (Na) | mg/L | - | 200 | 14 | 0 | 1.7 | 3.9 | 11 |
| Sulphate ($SO_4$) | mg/L | - | 500 | 14 | 0 | 2.2 | 2.8 | 7.4 |
| **Nutrients** | | | | | | | | |
| Total Ammonia as Nitrogen ($NH_3$) | mg N/L | 7 | - | 6 | 5 | <0.05 | <0.05 | 0.054 |
| Nitrate as Nitrogen ($NO_3$) | mg N/L | 2.9 | 10 | 8 | 8 | <0.005 | <0.1 | <0.1 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | - | - | 6 | 4 | <0.2 | <0.2 | 0.51 |
| Phosphorus, Total Dissolved (P) | mg/L | - | - | 6 | 0 | 0.002 | 0.002 | 0.0078 |
| Orthophosphate as Phosphorus ($PO_4$) | mg P/L | - | - | 6 | 6 | <0.001 | <0.001 | <0.001 |
| **Cyanides** | | | | | | | | |
| Total Cyanide (CN) | µg/L | - | 200 | 6 | 6 | <2 | <2 | <2 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | µg/L | 100 | - | 14 | 9 | <0.2 | **<104** | **<200** |
| Antimony (Sb) | µg/L | - | 6 | 8 | 8 | <0.03 | <0.4 | <u><200</u> |
| Arsenic (As) | µg/L | 5 | 10 | 14 | 2 | 0.0003 | 0.25 | 1.2 |
| Barium (Ba) | µg/L | - | 1000 | 14 | 7 | <0.01 | <10 | 19 |
| Beryllium (Be) | µg/L | - | - | 8 | 8 | <0.2 | <1 | <5 |
| Bismuth (Bi) | µg/L | - | - | 3 | 3 | <1 | <10 | <100 |
| Boron (B) | µg/L | 1500 | 5000 | 14 | 13 | 2 | <100 | <100 |
| Cadmium (Cd) | µg/L | 0.009 | 5 | 14 | 13 | **<0.017** | **<0.2** | **<2** |
| Chromium (Cr) | µg/L | 8.9 | 50 | 14 | 14 | <0.06 | **<15** | **<15** |
| Cobalt (Co) | µg/L | - | - | 14 | 14 | <0.1 | <15 | <15 |
| Copper (Cu) | µg/L | 2 | 1000 | 14 | 10 | <1 | **<10** | **<100** |
| Iron (Fe) | µg/L | 300 | 300 | 13 | 3 | 13 | 46 | 112 |
| Lead (Pb) | µg/L | 1 | 10 | 14 | 14 | <0.05 | <1 | **<10** |
| Lithium (Li) | µg/L | - | - | 7 | 7 | <5 | <10 | <15 |
| Manganese (Mn) | µg/L | - | 50 | 14 | 8 | 1 | <5 | 18 |
| Mercury (Hg) | µg/L | 0.026 | 1 | 14 | 14 | <0.02 | **<0.05** | **<1** |
| Molybdenum (Mo) | µg/L | 73 | - | 14 | 14 | <0.06 | <30 | <30 |
| Nickel (Ni) | µg/L | 29 | - | 14 | 12 | 1. | <20 | <20 |
| Selenium (Se) | µg/L | 1 | 10 | 14 | 14 | <0.1 | <0.5 | <0.5 |
| Silver (Ag) | µg/L | 0.1 | - | 14 | 14 | <0.02 | **<15** | **<15** |
| Strontium (Sr) | µg/L | - | - | 4 | 0 | 22 | 36 | 81 |
| Thallium (Tl) | µg/L | 0.8 | - | 8 | 8 | <0.03 | <0.1 | **<100** |
| Tin (Sn) | µg/L | 15 | - | 13 | 13 | <0.5 | **<300** | **<300** |
| Titanium (Ti) | µg/L | - | - | 6 | 6 | <1 | <1 | <10 |
| Tungsten (W) | µg/L | - | - | 1 | 1 | <100 | <100 | <100 |
| Uranium (U) | µg/L | 15 | 20 | 6 | 6 | <0.05 | <0.1 | <0.2 |
| Vanadium (V) | µg/L | - | - | 8 | 7 | 0.08 | <1 | <30 |
| Zinc (Zn) | µg/L | 30 | 5000 | 14 | 12 | 1.1 | <5 | 7.9 |

[a]bolded values exceed CWQG; underlined values exceed GCDWQ

**Table 7.4-A18: Statistics of Sediment Quality Samples Collected in the A Watershed**

| Parameter | Units | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG | PEL | Total | Non-detectable | Minimum | Median | Maximum |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/kg dw | - | - | 14 | 0 | 3490 | 4385 | 9680 |
| Magnesium (Mg) | mg/kg dw | - | - | 14 | 0 | 3100 | 4610 | 12000 |
| Potassium (K) | mg/kg dw | - | - | 15 | 0 | 610 | 783 | 1800 |
| Sodium (Na) | mg/kg dw | - | - | 14 | 4 | 119 | 188 | 424 |
| **Nutrients** | | | | | | | | |
| Phosphorus (P) | mg/kg dw | - | - | 14 | 0 | 421 | 486 | 609 |
| **Cyanides** | | | | | | | | |
| Total Cyanide | mg/kg dw | - | - | 15 | 0 | 1.5 | 4.1 | 5 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | 14 | 0 | 4800 | 6305 | 18200 |
| Antimony (Sb) | mg/kg dw | - | - | 9 | 8 | <0.2 | 0.2 | <25 |
| Arsenic (As) | mg/kg dw | 5.9 | 17 | 19 | 0 | 3.4 | **52** | **173** |
| Barium (Ba) | mg/kg dw | - | - | 19 | 0 | 22 | 52 | 78 |
| Beryllium (Be) | mg/kg dw | - | - | 19 | 19 | <0.5 | <1 | <1 |
| Bismuth (Bi) | mg/kg dw | - | - | 14 | 12 | <1 | <1 | 20 |
| Boron (B) | mg/kg dw | - | - | 10 | 10 | <5 | <5 | <5 |
| Cadmium (Cd) | mg/kg dw | 0.6 | 3.5 | 19 | 14 | <0.5 | <0.5 | 0.5 |
| Chromium (Cr) | mg/kg dw | 37.3 | 90 | 19 | 0 | 14 | **40** | **62** |
| Cobalt (Co) | mg/kg dw | - | - | 19 | 0 | 4 | 17 | 29 |
| Copper (Cu) | mg/kg dw | 35.7 | 197 | 19 | 0 | 12 | **61** | **123** |
| Iron (Fe) | mg/kg dw | - | - | 14 | 0 | 9140 | 20450 | 29500 |
| Lead (Pb) | mg/kg dw | 35 | 91.3 | 19 | 0 | 2.1 | 8 | 13 |
| Lithium (Li) | mg/kg dw | - | - | 4 | 0 | 7.1 | 18 | 20 |
| Manganese (Mn) | mg/kg dw | - | - | 14 | 0 | 121 | 188 | 423 |
| Mercury (Hg) | mg/kg dw | 0.17 | 0.486 | 19 | 3 | <0.005 | 0.03 | 0.09 |
| Molybdenum (Mo) | mg/kg dw | - | - | 19 | 4 | 2 | 4 | 5 |
| Nickel (Ni) | mg/kg dw | - | - | 19 | 0 | 12 | 41 | 60 |
| Selenium (Se) | mg/kg dw | - | - | 19 | 2 | <0.1 | 0.5 | 1 |
| Silver (Ag) | mg/kg dw | - | - | 19 | 19 | <1 | <1 | <2 |
| Strontium (Sr) | mg/kg dw | - | - | 10 | 0 | 19 | 26 | 35 |
| Thallium (Tl) | mg/kg dw | - | - | 15 | 15 | <1 | <1 | <1 |
| Tin (Sn) | mg/kg dw | - | - | 19 | 19 | <5 | <5 | <30 |
| Titanium (Ti) | mg/kg dw | - | - | 10 | 0 | 594 | 719 | 924 |
| Uranium (U) | mg/kg dw | - | - | 15 | 15 | <2 | <40 | <40 |
| Vanadium (V) | mg/kg dw | - | - | 19 | 0 | 15 | 32 | 61 |
| Zinc (Zn) | mg/kg dw | 123 | 315 | 19 | 0 | 22 | 58 | 85 |

**Table 7.4-A19: Statistics of Sediment Quality Samples Collected in the B Watershed**

| Parameter | Units | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG | PEL | Total | Non-detectable | Minimum | Median | Maximum |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/kg dw | - | - | 6 | 0 | 3720 | 3990 | 13700 |
| Magnesium (Mg) | mg/kg dw | - | - | 6 | 0 | 3360 | 3655 | 4700 |
| Potassium (K) | mg/kg dw | - | - | 6 | 0 | 621 | 1040 | 1150 |
| Sodium (Na) | mg/kg dw | - | - | 6 | 1 | 183 | 196 | <250 |
| **Nutrients** | | | | | | | | |
| Phosphorus (P) | mg/kg dw | - | - | 6 | 0 | 403 | 518 | 549 |
| **Cyanides** | | | | | | | | |
| Total Cyanide | mg/kg dw | - | - | 15 | 1 | <0.5 | 2.1 | 7.7 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | 6 | 0 | 5000 | 5240 | 6440 |
| Antimony (Sb) | mg/kg dw | - | - | 11 | 11 | <0.2 | <0.2 | <25 |
| Arsenic (As) | mg/kg dw | 5.9 | 17 | 16 | 0 | 3.6 | **51** | **111** |
| Barium (Ba) | mg/kg dw | - | - | 16 | 0 | 29 | 47 | 105 |
| Beryllium (Be) | mg/kg dw | - | - | 16 | 16 | <1 | <1 | <0.5 |
| Bismuth (Bi) | mg/kg dw | - | - | 6 | 6 | <1 | <1 | <10 |
| Boron (B) | mg/kg dw | - | - | 5 | 4 | <5 | <5 | 5 |
| Cadmium (Cd) | mg/kg dw | 0.6 | 3.5 | 16 | 14 | <0.1 | <0.5 | 0.6 |
| Chromium (Cr) | mg/kg dw | 37.3 | 90 | 16 | 0 | 19 | 28 | **39** |
| Cobalt (Co) | mg/kg dw | - | - | 16 | 0 | 4.5 | 11 | 32 |
| Copper (Cu) | mg/kg dw | 35.7 | 197 | 16 | 0 | 15 | **42** | **155** |
| Iron (Fe) | mg/kg dw | - | - | 6 | 0 | 10400 | 12750 | 14500 |
| Lead (Pb) | mg/kg dw | 35 | 91.3 | 16 | 0 | 2.1 | 6 | 14 |
| Lithium (Li) | mg/kg dw | - | - | 1 | 0 | 7.6 | 7.6 | 7.6 |
| Manganese (Mn) | mg/kg dw | - | - | 6 | 0 | 115 | 121 | 149 |
| Mercury (Hg) | mg/kg dw | 0.17 | 0.486 | 16 | 7 | <0.005 | <0.05 | 0.08 |
| Molybdenum (Mo) | mg/kg dw | - | - | 16 | 1 | 2 | 4 | 7 |
| Nickel (Ni) | mg/kg dw | - | - | 16 | 0 | 15 | 36 | 81 |
| Selenium (Se) | mg/kg dw | - | - | 16 | 1 | <0.1 | 0.7 | 1.9 |
| Silver (Ag) | mg/kg dw | - | - | 16 | 16 | <1 | <1 | <2 |
| Strontium (Sr) | mg/kg dw | - | - | 5 | 0 | 23 | 24 | 24 |
| Thallium (Tl) | mg/kg dw | - | - | 15 | 15 | <1 | <1 | <1 |
| Tin (Sn) | mg/kg dw | - | - | 16 | 16 | <5 | <5 | <30 |
| Titanium (Ti) | mg/kg dw | - | - | 5 | 0 | 657 | 676 | 709 |
| Uranium (U) | mg/kg dw | - | - | 15 | 11 | <2 | 2 | <40 |
| Vanadium (V) | mg/kg dw | - | - | 16 | 0 | 18 | 27 | 38 |
| Zinc (Zn) | mg/kg dw | 123 | 315 | 16 | 0 | 22 | 48 | 100 |

[a]bolded values exceed ISQG; underlined values exceed PEL

**Table 7.4-A20: Statistics of Sediment Quality Samples Collected in the D Watershed**

| Parameter | Units | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG | PEL | Total | Non-detectable | Minimum | Median | Maximum |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/kg dw | - | - | 1 | 0 | 4190 | 4190 | 4190 |
| Magnesium (Mg) | mg/kg dw | - | - | 1 | 0 | 6780 | 6780 | 6780 |
| Potassium (K) | mg/kg dw | - | - | 1 | 0 | 752 | 752 | 752 |
| Sodium (Na) | mg/kg dw | - | - | 1 | 1 | <250 | <250 | <250 |
| **Nutrients** | | | | | | | | |
| Phosphorus (P) | mg/kg dw | - | - | 1 | 0 | 552 | 552 | 552 |
| **Cyanides** | | | | | | | | |
| Total Cyanide | mg/kg dw | - | - | 0 | 0 | - | - | - |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | 1 | 0 | 8800 | 8800 | 8800 |
| Antimony (Sb) | mg/kg dw | - | - | 1 | 1 | <25 | <25 | <25 |
| Arsenic (As) | mg/kg dw | 5.9 | 17 | 1 | 0 | 4 | 4 | 4 |
| Barium (Ba) | mg/kg dw | - | - | 1 | 0 | 25 | 25 | 25 |
| Beryllium (Be) | mg/kg dw | - | - | 1 | 1 | <0.5 | <0.5 | <0.5 |
| Bismuth (Bi) | mg/kg dw | - | - | 1 | 0 | 11 | 11 | 11 |
| Boron (B) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Cadmium (Cd) | mg/kg dw | 0.6 | 3.5 | 1 | 1 | <0.1 | <0.1 | <0.1 |
| Chromium (Cr) | mg/kg dw | 37.3 | 90 | 1 | 0 | 27 | 27 | 27 |
| Cobalt (Co) | mg/kg dw | - | - | 1 | 0 | 5.7 | 5.7 | 5.7 |
| Copper (Cu) | mg/kg dw | 35.7 | 197 | 1 | 0 | 13 | 13 | 13 |
| Iron (Fe) | mg/kg dw | - | - | 1 | 0 | 14800 | 14800 | 14800 |
| Lead (Pb) | mg/kg dw | 35 | 91.3 | 1 | 0 | 3.2 | 3.2 | 3.2 |
| Lithium (Li) | mg/kg dw | - | - | 1 | 0 | 9.9 | 9.9 | 9.9 |
| Manganese (Mn) | mg/kg dw | - | - | 1 | 0 | 167 | 167 | 167 |
| Mercury (Hg) | mg/kg dw | 0.17 | 0.486 | 1 | 1 | <0.005 | <0.005 | <0.005 |
| Molybdenum (Mo) | mg/kg dw | - | - | 1 | 1 | <4 | <4 | <4 |
| Nickel (Ni) | mg/kg dw | - | - | 1 | 0 | 23 | 23 | 23 |
| Selenium (Se) | mg/kg dw | - | - | 1 | 1 | <0.1 | <0.1 | <0.1 |
| Silver (Ag) | mg/kg dw | - | - | 1 | 1 | <2 | <2 | <2 |
| Strontium (Sr) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Thallium (Tl) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Tin (Sn) | mg/kg dw | - | - | 1 | 1 | <30 | <30 | <30 |
| Titanium (Ti) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Uranium (U) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Vanadium (V) | mg/kg dw | - | - | 1 | 0 | 25 | 25 | 25 |
| Zinc (Zn) | mg/kg dw | 123 | 315 | 1 | 0 | 30 | 30 | 30 |

[a]bolded values exceed ISQG; underlined values exceed PEL

**Table 7.4-A21: Statistics of Sediment Quality Samples Collected in the Chicken Head Watershed**

| Parameter | Units | Guidelines | | Samples | | Concentration[a] | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG | PEL | Total | Non-detectable | Minimum | Median | Maximum |
| **Major Ions** | | | | | | | | |
| Calcium (Ca) | mg/kg dw | - | - | 1 | 0 | 1650 | 1650 | 1650 |
| Magnesium (Mg) | mg/kg dw | - | - | 1 | 0 | 4800 | 4800 | 4800 |
| Potassium (K) | mg/kg dw | - | - | 1 | 0 | 1200 | 1200 | 1200 |
| Sodium (Na) | mg/kg dw | - | - | 1 | 1 | <250 | <250 | <250 |
| **Nutrients** | | | | | | | | |
| Phosphorus (P) | mg/kg dw | - | - | 1 | 0 | 381 | 381 | 381 |
| **Cyanides** | | | | | | | | |
| Total Cyanide | mg/kg dw | - | - | 4 | 0 | 1 | 1.4 | 1.8 |
| **Total Metals** | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | 1 | 0 | 7020 | 7020 | 7020 |
| Antimony (Sb) | mg/kg dw | - | - | 5 | 5 | <0.2 | <0.2 | <25 |
| Arsenic (As) | mg/kg dw | 5.9 | 17 | 6 | 0 | 5.2 | **7.1** | **10** |
| Barium (Ba) | mg/kg dw | - | - | 6 | 0 | 23 | 44 | 49 |
| Beryllium (Be) | mg/kg dw | - | - | 5 | 5 | <0.5 | <1 | <1 |
| Bismuth (Bi) | mg/kg dw | - | - | 1 | 1 | <10 | <10 | <10 |
| Boron (B) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Cadmium (Cd) | mg/kg dw | 0.6 | 3.5 | 6 | 6 | <0.1 | <0.5 | <2 |
| Chromium (Cr) | mg/kg dw | 37.3 | 90 | 6 | 0 | 22 | 23 | **40** |
| Cobalt (Co) | mg/kg dw | - | - | 6 | 0 | 4 | 5 | 5.5 |
| Copper (Cu) | mg/kg dw | 35.7 | 197 | 6 | 0 | 5 | 21 | 22 |
| Iron (Fe) | mg/kg dw | - | - | 1 | 0 | 13600 | 13600 | 13600 |
| Lead (Pb) | mg/kg dw | 35 | 91.3 | 6 | 6 | <2 | <5 | <10 |
| Lithium (Li) | mg/kg dw | - | - | 1 | 0 | 11 | 11 | 11 |
| Manganese (Mn) | mg/kg dw | - | - | 1 | 0 | 119 | 119 | 119 |
| Mercury (Hg) | mg/kg dw | 0.17 | 0.486 | 6 | 6 | <0.005 | <0.05 | <0.05 |
| Molybdenum (Mo) | mg/kg dw | - | - | 6 | 5 | <1 | <1 | <4 |
| Nickel (Ni) | mg/kg dw | - | - | 6 | 0 | 16 | 20 | 23 |
| Selenium (Se) | mg/kg dw | - | - | 6 | 2 | <0.1 | 0.2 | 0.3 |
| Silver (Ag) | mg/kg dw | - | - | 6 | 6 | <1 | <1 | <2 |
| Strontium (Sr) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Thallium (Tl) | mg/kg dw | - | - | 4 | 4 | <1 | <1 | <1 |
| Tin (Sn) | mg/kg dw | - | - | 6 | 6 | <5 | <5 | <30 |
| Titanium (Ti) | mg/kg dw | - | - | 0 | 0 | - | - | - |
| Uranium (U) | mg/kg dw | - | - | 4 | 4 | <2 | <2 | <2 |
| Vanadium (V) | mg/kg dw | - | - | 5 | 0 | 18 | 20 | 22 |
| Zinc (Zn) | mg/kg dw | 123 | 315 | 6 | 0 | 28 | 30 | 39 |

[a]bolded values exceed ISQG; underlined values exceed PEL

# 4.0 WATER QUALITY AT MELIADINE LAKE

## 4.1 Approach

The objective of this section is to provide an analysis of effluent mixing characteristics within Meliadine Lake. Water management at the mine site (SD 2-6 Surface Water Management Plan) includes discharge of treated mine effluent into Meliadine Lake. It is expected that the mine effluent will be discharged through a diffuser outfall. The analysis of mixing characteristics of the mine effluent into Meliadine Lakes herein, including the design of the effluent outfall as a necessity of that analysis, was performed at a preliminary level. A final determination of mixing characteristics will be part of the detailed design of the effluent outfall. It is intended that water quality parameter concentrations of the mixed effluent must meet water quality criteria for the protection of aquatic life and human health beyond a mixing zone around the outfall, within Meliadine Lake.

A mixing zone is an area of the aquatic environment where the effluent is mixed with ambient water and outside of which must meet the water quality guidelines. The mixing zone for this Project was defined from the following guides:

- EPA (1995): which indicates that the mixing zone should have a radius from the outfall that is 66 m or less or have an area that is 5% or less than the lake surface area; and
- State of Oregon (2012): which indicates that the maximum mixing zone should have a radius from the outfall that is 100 m or less.

As part of the preliminary analysis of effluent mixing characteristics herein, a mixing zone with a radius of 100 m was used, satisfying the guidance from the State of Oregon (State of Oregon 2012) and that of the EPA (EPA 1995) with regard to a zone area that is 5% or less than Meliadine Lake surface area.

The water quality criteria that should be met by the mixed effluent beyond the mixing zone are the guidelines presented in Section 2.4, and include:

- Canadian Water Quality Guidelines (CWQG) for the protection of freshwater aquatic life (CCME 2012a); and
- Guidelines for Canadian Drinking Water Quality (GCDWQ, HC 2010).

Table 7.4-A6 presents the guideline concentrations applicable to water quality parameters listed in Table 7.4-A4. There may however be instances of water quality parameter background concentrations in Meliadine Lake that are higher than the guidelines. In such instances, the water quality criterion at the edge of the mixing zone was set at the background concentration plus 10%.

The CORMIX model system (Doneker and Jirka 2007) was used to provide numerical simulations of the mixing behaviour of the mine effluent in Meliadine Lake (Section 2.5). CORMIX is one of the most extensively used models for predicting plume mixing and dilution of substances in surface waterbodies. This model has been used for conceptual design and analysis of effluent outfalls in other northern Canadian waterbodies. Ambient and effluent water characteristics required to implement the mixing model are presented in Section 4.2. As a preliminary analysis, a multiport diffuser was considered as the endpoint of the effluent outfall. Mixing results from CORMIX are presented in Section 4.3.

A preliminary estimation of the maximum allowable effluent concentrations at the outfall (i.e., at end of pipe) was also undertaken, and the results are presented in Section 4.3. The estimation followed the approach applied in the province of Quebec (Ministère du Développement Durable, de l'Environnement et des Parcs [MDDEP] 2007), where the mixing ratio in a lake is set a value of 10 to 1. The calculation of the maximum allowable effluent concentrations *MAEC* is dependent on the background concentrations *BG* in the lake, the water quality criteria *WQC* (i.e., the guidelines or background concentration plus 10%), and the set mixing ratio *MR*, as established by the following equation:

$$MAEC = MR(WQC - BG) + BG$$

The following exceptions were made as needed to the results of the above equation:

- If the value of *MAEC* is higher than the Metal Mining Effluent Regulation (MMER 2002) for the associated water quality parameter, then *MAEC* was set equal to that guideline value;
- If, for a given water quality parameter, the mixing ratio required to meet the water quality criteria for the protection of aquatic life and human at the edge of the mixing zone is higher than 10, *MR* was set to the mixing ratio predicted by the mixing model at the edge of the mixing zone; and
- If the value of *MAEC* is higher than the threshold concentration required to keep a concentration in sediment saturated with effluent to background level plus 10% (Section 6), then the *MAEC* was set to that threshold concentration.

## 4.2 Model Inputs

### 4.2.1 Ambient Water

Ambient conditions (i.e., for Meliadine Lake) are summarized in Table 7.4-A22. Typically, for a given characteristic, a range of values is provided representing the possible conditions in the lake. Details on the information referenced to establish these characteristics are provided in Table 7.4-A22 and discussed below.

**Table 7.4-A22: Summary of Meliadine Lake Water Characteristics**

| Characteristic | Adopted values | Comment |
|---|---|---|
| Average ambient depth (m) | 9.0 and 7.0 | Respectively for the open water and ice cover periods. Derived from the bathymetry of the Meliadine Lake (SD 7-1 2009 Aquatics Synthesis Baseline) at the selected location of the diffuser in Figure 7.4-A3, assuming a 2 m thick ice cover. |
| Average ambient velocity (m/s) | 0.005, 0.18, 0.45 | A range of velocities representing near stagnant conditions, an assumed average condition generated from the hourly average wind speed, and an extreme case generated from the observed hourly maximum wind speed. Observed wind speeds are from the Environment Canada climate station of Rankin Inlet A (SD 7-1 2009 Aquatics Synthesis Baseline). Lake ambient velocities are equal to 3% of the wind speed, based on shear stress at the interface of the lake water surface with the atmosphere (Coles and Wells 2003). |
| Ambient temperature (˚C) | Un-stratified: 0.3, 7.5<br>Stratified: 11.5, 13 | Un-stratified: average temperatures during the ice cover and open water periods, respectively. Un-stratified conditions during the open water period are expected to occur during the freshet (June and July) and at other times due to wind induced mixing<br>Stratified (at 4 m depth): average temperatures in the lower and upper |

**Table 7.4-A22: Summary of the Meliadine Lake Water Characteristics (cont'd)**

| Characteristic | Adopted values | Comment |
|---|---|---|
| | | water layers of the lake, respectively. Potential weakly stratified conditions may occur in the later stages of the open water period. Stratified conditions were used as a conservative mixing scenario. Temperatures are derived from observations in Meliadine Lake (SD 7-1 2009 Aquatics Synthesis Baseline). |
| Ambient total dissolved solids (mg/L) | 35 | Median of observations in Meliadine Lake (Table 7.4-A11). |
| Ambient total suspended solids (mg/L) | 3 | Median of observations in Meliadine Lake (Table 7.4-A11). |
| Water density (kg/m$^3$) | Un-stratified: 999.9, 999.9<br>Stratified: 999.2, 999.4 | Calculated from water temperature, total dissolved solids and total suspended solids (Coles and Wells 2003), respectively for un-stratified ice cover and open water periods and for the stratified case during the open water period. |
| Manning's coefficient | 0.015 | Assumed; typical value for waterbodies |

The location of the effluent outfall was selected as per the available bathymetry for Meliadine Lake (SD 7-1 2009 Aquatics Synthesis Baseline), based on the following:

- The diffuser location must be at a reasonable distance from Attenuation Pond 1 for ease of construction and operation of the pipeline conveying mine effluent from that pond to the outfall;
- The location must have a high water depth to promote mixing of the effluent;
- The location must not be within a deep, narrow bowl in the lake, where the effluent may possibly be trapped and accumulate; and
- The location must not be within a constrained area, such as a bay within the lake, where the effluent may also be possibly trapped and accumulate.

Under winter conditions, the ambient depth must be reduced to account for the presence of an ice cover on the lake. A thickness of 2 m was considered for this analysis, yielding an average ambient depth of 7 m (Table 7.4-A22) during the ice cover period.

Effluent mixing will be dependent on ambient currents in Meliadine Lake, which are expected to be driven mainly by wind conditions during the open water period. Wind observations from Environment Canada climate station at Rankin Inlet A were compiled and analyzed in SD 7-1 2009 Aquatics Synthesis Baseline. These observations were used to estimate ambient currents in Meliadine Lake during the open water period. Shear stress at the air-water interface theoretically leads to near water surface lake currents equal to approximately 3% of wind speed (Cole and Wells 2003). That percentage was used in this work to translate the average and maximum observed wind speed into the estimated average and maximum ambient current in Meliadine Lake for modelling purposes.

During the ice cover period, winds are not expected to impact current velocities in the lake. It is assumed that ambient currents are near stagnant, and a low velocity (0.005 m/s, Table 7.4-A22) was therefore considered in the mixing model for that period. That low velocity was also considered in the mixing model during the open water period to account for days with no winds.

Water density affects mixing and is dependent on water temperature and concentrations of total dissolved and suspended solids. Water temperature observations in Meliadine Lake were reported in SD 7-1 2009 Aquatics Synthesis Baseline. The following ambient temperatures were considered in the mixing model (Table 7.4-A22):

- The average water temperature during the ice cover period (November to May); and
- The average water temperature during the early stage of the open water period (June and July).

Temperature profiles measured during the open water period indicated a lack of thermal stratification in all of the surveyed waterbodies (SD 7-1 2009 Aquatics Synthesis Baseline). Among the 44 temperature profiles measured during baseline studies, 36 profiles registered less than one Celsius degree temperature difference between surface and bottom layers. The largest difference between surface and bottom temperatures (4.1 Celsius degree) was recorded in the east basin of Meliadine Lake in August 1997, when the surface layer (up to 2 m in depth) was considerably warmer than the underlying waters. This observation was attributed in part to the unusually warm and calm conditions on that day. More commonly, wind induced mixing resulted in uniform water temperatures throughout the water column, even in the deepest lake (Peter Lake in July 1998) when the surface layer was 2.4 Celsius degree warmer than the waters at 18 m depth. Nevertheless, the temperature observations from the baseline studies (SD 7-1 2009 Aquatics Synthesis Baseline) indicate a gradually decreasing average temperature as a function of depth in the late stage of the open water period. The decrease was notably pronounced at depths around 4 m, indicating the potential for a thermocline (thermal stratification) to form at this depth. Therefore, a conservative mixing scenario simulating a thermocline at 4 m depth was considered in the mixing model, using the average temperatures in the lower and upper layers of the lake based on water temperature observations in Meliadine Lake during the later open water periods.

Observed total dissolved and suspended solids in Meliadine Lake were relatively low and would have little impact on water density. The median values for these two water quality parameters (i.e., 35 and 3 mg/L, respectively for total dissolved and suspended solids, Table 7.4-A22) were considered in the model to calculate ambient water density.

### 4.2.2 Effluent Water

Effluent characteristics are summarized in Table 7.4-A23. Discharge rates were estimated from the mine site water balance (SD 2-6 Surface Water Management Plan). The maximum and average monthly discharge rates were used as inputs to the mixing model. Attenuation Pond 1 would be an open waterbody subject to the same climatic elements as any other waterbody in the Meliadine peninsula. Observed water temperatures in the waterbodies of the Meliadine peninsula (SD 7-1 2009 Aquatics Synthesis Baseline) are assumed to be representative of the range of temperatures expected at AP01, and were therefore considered to characterize the mine effluent. The effluent water temperatures used as inputs to the mixing model were the average temperatures in the waterbodies of Meliadine peninsula for the ice cover period, and the open water period temperatures under un-stratified conditions and stratified conditions in Meliadine Lake. The total dissolved and suspended solids levels presented in Table 7.4-A23 represent the estimated maximum observed concentration in the mine effluent during discharge to Meliadine Lake, and the maximum allowable concentration from a mine effluent discharge (MMER 2002), respectively.

**Table 7.4-A23: Summary of Effluent Water Characteristics**

| Characteristic | Adopted Values | Comment |
|---|---|---|
| Discharge rate ($m^3/s$) | 0.43, 0.094 | Estimated maximum and average effluent discharge rates from AP01 to Meliadine Lake, respectively (SD 2-6 Surface Water Management Plan). |
| Discharge temperature (˚C) | 0.5, 13.5, 15.5 | Average temperatures for the ice cover period, and the open water period under un-stratified and stratified conditions in Meliadine Lake. Temperatures are derived from observations in the waterbodies of the Meliadine peninsula (SD 7-1 2009 Aquatics Synthesis Baseline). |
| Discharge total dissolved solids (mg/L) | 2400 | The estimated maximum concentration during discharge from AP01 to Meliadine Lake (SD 2-6 Surface Water Management Plan). |
| Discharge total suspended solids (mg/L) | 15 | The maximum allowable concentration from a mine effluent discharge (MMER 2002). |
| Density ($kg/m^3$) | 1003.7, 1002.8, 1002.4 | Calculated from water temperature, total dissolved solids and total suspended solids (Coles and Wells 2003) for the ice cover period, and the open water period under un-stratified and stratified conditions in Meliadine Lake, respectively. |

## 4.3 Results

An outfall geometry must be defined in CORMIX in order to model the effluent mixing potential in the receiving waterbody. As a preliminary analysis, a multiport diffuser was considered to promote mixing from high discharge velocity in an aquatic environment such as a lake, where current velocities are typically low. An effluent diffuser is a hydraulic structure intended to promote rapid mixing of an effluent in close proximity to the structure using high discharge velocities. A multiport diffuser may include several discharge ports on a main pipeline to achieve the required effluent mixing. Diffusers are often used for the discharge of mine effluents into aquatic environments.

The port diameter was set in the model to develop an effluent discharge velocity of 10 m/s. The port height was set at 1 m above the lake bottom to minimize entrainment of bottom sediment by the effluent discharge jets. Two port angles were tested (30 and 45° from horizontal) as an angle is typically required to minimize erosion of the ice cover from the effluent discharge jets during the winter. The following effluent-current alignments were also considered in the model:

- Co-flowing: with the effluent and current velocities flowing in the same direction; and
- Cross-flowing: with the effluent and current velocities flowing at a 90° angle.

The distance between the diffuser ports was set so that the plume jets do not laterally overlap at effluent concentrations at the jet centerline higher than that estimated at the edge of the mixing zone.

Predictions of effluent mixing within the mixing zone using CORMIX are discussed in Section 4.3.1. These predictions were then used to establish maximum allowable effluent concentrations at the end of the effluent outfall (i.e., end of pipe), presented in Section 4.3.2. To complete the assessment of potential effects of the mixing of effluent in Meliadine Lake, the following two topics are addressed:

- Effluent mixing beyond the mixing zone, within Meliadine Lake (Section 4.3.3); and
- Dissolved oxygen levels within the mixing zone and Meliadine Lake (Section 4.3.4).

Confidence in the predictions presented in Sections 4.3.1 to 4.3.4 is discussed in Section 4.3.5.

### 4.3.1 Effluent Mixing

The combination of the range of ambient and effluent characteristics and diffuser configurations resulted in the analysis of 112 test runs with the mixing model. These runs cover the anticipated range of possible conditions of Meliadine Lake and the effluent. Figure 7.4-A4 presents the results of the model run with the lowest predicted mixing ratio (i.e., near stagnant current velocity with a thermocline present in Meliadine Lake). The increasing ratio as a function of the distance from the diffuser outfall indicates the gradual mixing of the effluent with ambient water. At the edge of the mixing zone (i.e., 100 m radius from the outfall), the mixing ratio is estimated at 145 to 1. Other conclusions from the modelling results are as follows:

- The 30˚ and 45˚ angled ports provide similar mixing ratios; however a 30˚ angle would be preferred to minimize the interaction of the effluent plume jets with ice at the lake surface during the ice cover period.
- When no thermocline is present in the lake, the plume jets from the ports are predicted to make contact with the water surface or the bottom of the ice cover.
- The assumed thermocline in the lake is predicted to constitute the equivalent of a barrier that would deflect the effluent plume jets. This deflection is however predicted to induce a lateral spreading of the plume, allowing mixing.

The model results were obtained with a diffuser geometry that include 14 ports, each with a diameter of 0.064 m (2.5 inches), and a distance between ports of 5.1 m. The total length of the diffuser (i.e., from the first to the last port) with this geometry would be 66.3 m. The construction and operation of a diffuser with such a geometry is deemed feasible; however, this geometry was established at a preliminary design level, and other geometries may also be feasible. The final geometry of the diffuser will be determined during the detailed design phase of the Project, and will be established to meet water quality criteria for the protection of aquatic life and human health beyond the mixing zone.

### 4.3.2 Preliminary Maximum Allowable Effluent Concentrations at End of Pipe

The maximum allowable effluent concentrations at the end of pipe of the outfall were calculated based on the approached described in Section 4.1. The results of the calculation are presented in Table 7.4-A24. A mixing ratio of 10 to 1 (Section 4.1) was applied for the calculation of the maximum allowable effluent concentrations for all water quality parameters, except for:

- Total suspended solids, total cyanide and arsenic, where the maximum allowable effluent concentrations were set equal to the Metal Mining Effluent Regulation (MMER 2002);
- Copper, where the maximum allowable effluent concentration was calculated using the mixing ratio predicted by the mixing model at the edge of the mixing zone to meet the water quality criteria for the protection of aquatic life and human health (i.e., 143 to 1); and
- Sodium and boron, where the maximum allowable effluent concentration where set to threshold values that would allow concentrations of sediment saturated with effluent water to be equal to background sediment concentrations plus 10%.

Water quality guidelines for the protection of aquatic life and human health (CCME, 2012a and HC, 2010) are met at the edge of the mixing zone if effluent concentrations at the end of pipe are equal to or lower than the maximum allowable concentrations presented in Table 7.4-A24. The preliminary predictions of the effluent concentrations are provided in the mine site water management plan (SD 2-6 Surface Water Management Plan). The predicted maximum concentrations when an effluent discharge occurs are lower than the maximum allowable effluent concentrations presented in Table 7.4-A24.

Discharge criteria at the end of pipe of the effluent outfall will be established during the water licensing process for the Project. The maximum allowable effluent concentrations presented in Table 7.4-A24 consist of levels that must not be exceeded when establishing these discharge criteria.

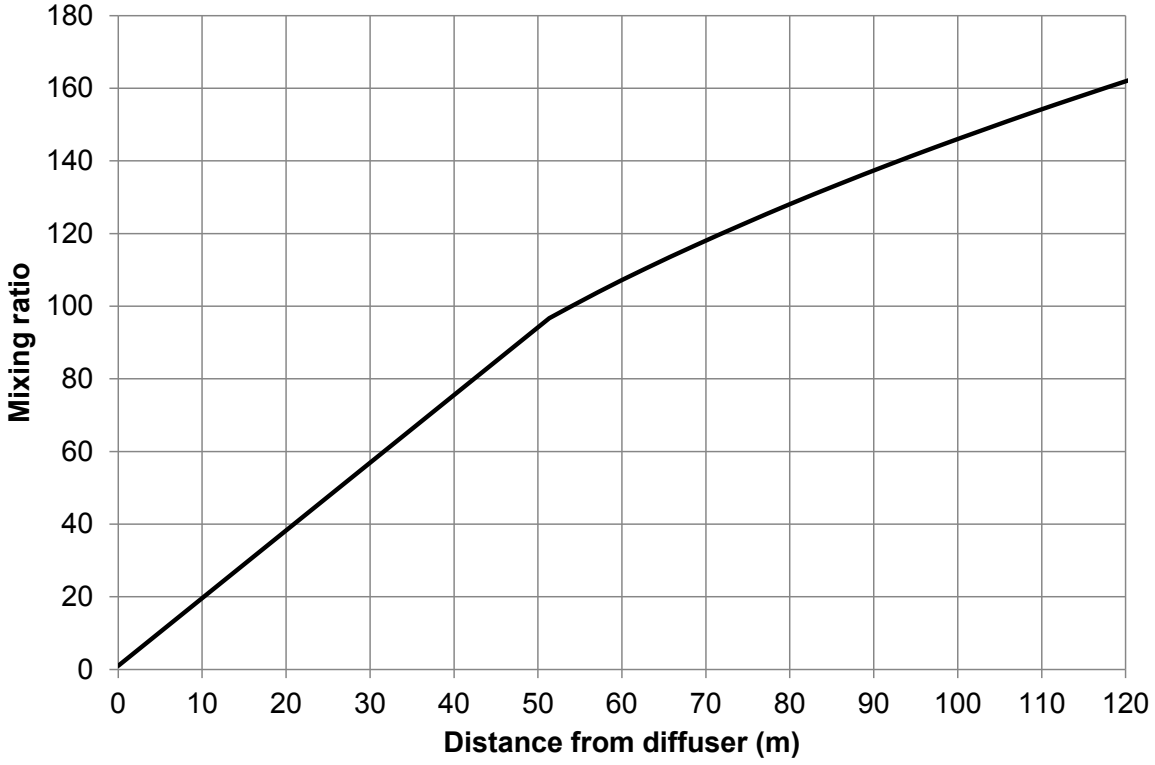



*Figure 7.4-A4: Modelled Worst Case Effluent Mixing Ratio in Meliadine Lake*

**Table 7.4-A24: Preliminary Maximum Allowable Effluent Concentrations**

| Water quality parameter | | Unit | Ambient environment | | | Effluent concentration | |
|---|---|---|---|---|---|---|---|
| | | | Water quality standard | | Meliadine Lake average background concentration | At end of pipe | At edge of mixing zone |
| Category | Name | | Concentration | Source | | | |
| Physical | Total Dissolved Solids (TDS) | mg/L | 500 | HC (2010) | 35 | 4685 | 68 |
| | Total Suspended Solids (TSS) | mg/L | 8 | CCME (2012a) | 3 | 15 | 3.1 |
| Major ions | Chloride (Cl) | mg/L | 120 | CCME (2012a) | 6.4 | 1142 | 14 |
| | Fluoride (F) | mg/L | 0.12 | CCME (2012a) | 0 | 1.2 | 0.0084 |
| | Sodium (Na) | mg/L | 200 | HC (2010) | 3.2 | 295 | 5.3 |
| | Sulphate ($SO_{4)}$ | mg/L | 500 | HC (2010) | 2.9 | 4974 | 38 |
| Nutrients | Total Ammonia as Nitrogen ($NH_3$) | mg/L | 7.0 | CCME (2012a) | 0.05 | 70 | 0.54 |
| | Nitrate as Nitrogen ($NO_3$) | mg/L | 2.9 | CCME (2012a) | 0.05 | 29 | 0.25 |
| | Nitrite as Nitrogen | mg/L | 0.06 | CCME (2012a) | 0.05 | 0.15 | 0.051 |
| | Phosphorus (total) (P) | mg/L | 0.01 | CCME (2012a) | 0.0045 | 0.06 | 0.0049 |
| Cyanides | Total cyanide (CN) | mg/L | 0.2 | HC (2010) | 0.002 | 1 | 0.009 |
| | Free cyanide | mg/L | 0.005 | CCME (2012a) | - | 0.05 | 0.00035 |
| Metals | Aluminum (Al) | mg/L | 0.1 | CCME (2012a) | 0.0023 | 0.98 | 0.0091 |
| | Antimony (Sb) | mg/L | 0.006 | HC (2010) | 0.0001 | 0.059 | 0.00051 |
| | Arsenic (As) | mg/L | 0.005 | CCME (2012a) | 0.00033 | 0.5 | 0.0038 |
| | Barium (B) | mg/L | 1 | HC (2010) | 0.0076 | 9.9 | 0.077 |
| | Boron (Bo) | mg/L | 1.5 | CCME (2012a) | 0.0037 | 2.7 | 0.023 |
| | Cadmium (Cd) | mg/L | 0.000009 | CCME (2012a) | **0.00005** | 0.0001 | 0.00005 |
| | Chromium (Cr) | mg/L | 0.0089 | CCME (2012a) | 0.00053 | 0.1 | 0.0011 |
| | Copper (Cu) | mg/L | 0.002 | CCME (2012a) | 0.0011 | 0.13 | 0.002 |
| | Iron (Fe) | mg/L | 0.3 | CCME (2012a) | 0.023 | 2.8 | 0.042 |
| | Lead (Lb) | mg/L | 0.001 | CCME (2012a) | 0.00009 | 0.0092 | 0.00015 |
| | Manganese (Mn) | mg/L | 0.05 | HC (2010) | 0.0022 | 0.48 | 0.0055 |
| | Mercury (Hg) | mg/L | 0.000026 | CCME (2012a) | 0.00002 | 0.00008 | 0.00002 |
| | Molybdenum (Mo) | mg/L | 0.073 | CCME (2012a) | 0.00011 | 0.73 | 0.0052 |
| | Nickel (Ni) | mg/L | 0.029 | CCME (2012a) | 0.00067 | 0.29 | 0.0027 |
| | Selenium (Se) | mg/L | 0.001 | CCME (2012a) | 0.0001 | 0.0091 | 0.00016 |
| | Silver (Ag) | mg/L | 0.0001 | CCME (2012a) | 0.0001 | 0.0001 | 0.0001 |
| | Thallium (Tl) | mg/L | 0.0008 | CCME (2012a) | 0.00005 | 0.0076 | 0.0001 |
| | Tin (Sn) | mg/L | 0.015 | CCME (2012a) | 0.0005 | 0.15 | 0.0015 |
| | Uranium (U) | mg/L | 0.015 | CCME (2012a) | 0.00005 | 0.15 | 0.0011 |
| | Zinc (Zn) | mg/L | 0.03 | CCME (2012a) | 0.005 | 0.26 | 0.0067 |

### 4.3.3 Far Field Mixing

Effluent beyond the mixing zone will be carried by currents within Meliadine Lake and further mixed with ambient water. Based on the bathymetry of Meliadine Lake (FEIS Volume 7, SD 7-1, Appendix D7b), the location of the effluent diffuser outfall (Figure 2) is within the expected main flow channel of the lake, which will act to convey the effluent toward the lake outlet. Nevertheless, effluent may possibly accumulate within Meliadine Lake.

A mass balance was established to estimate the increase in concentration of water quality parameters as a result of the potential accumulation of effluent in Meliadine Lake. The mass balance was performed with total dissolved solids (TDS), chloride (Cl), and sodium (Na), since these water quality parameters are conservative substances (i.e., no decay) and therefore establishes the maximum extent of potential effluent accumulation in the lake. The mass balance, which considers full mixing of the effluent within Meliadine Lake, was performed under the following assumptions:

- Accumulation occurs only in the east basin of Meliadine Lake, based on the characteristics of this basin provided in FEIS Volume 7, SD 7-1, Table 7-3 (a conservative assumption since a smaller lake volume is considered in the mass balance, which would yield higher calculated concentrations);
- Background TDS, Cl, and Na concentrations in Meliadine Lake are set to the median concentrations presented in Table 7.4-A11 (i.e., 35, 6.4 and 3.2 mg/L, respectively); and
- Effluent flows and concentrations are those predicted in FEIS Volume 2, SD 2-6, Table C2.2.

The mass balance was run for a period of 40 years, to cover the construction, operations, and closure phases of the mine development, and into post-closure. Predicted TDS, Cl, and Na concentrations in Meliadine Lake are presented in Figure 7.4-A5. The predictions indicate that concentration levels gradually increase during the construction and operations phases of the mine (Year 1 in Figure 7.4-A5 corresponds to the first year of the construction phase). A decrease in concentration typically occurs during freshet in June. The maximum concentrations are obtained in the last year of the operations phase (i.e., 176, 66, and 19 mg/L for TDS, Cl and Na, respectively). These maximum concentrations do not exceed guidelines for TDS, Cl and Na; however, they are above the range of concentrations observed in Meliadine Lake (Table 7.4-A11). During closure and post-closure, no effluent is discharged into Meliadine Lake and concentrations are predicted to gradually decrease to background levels.

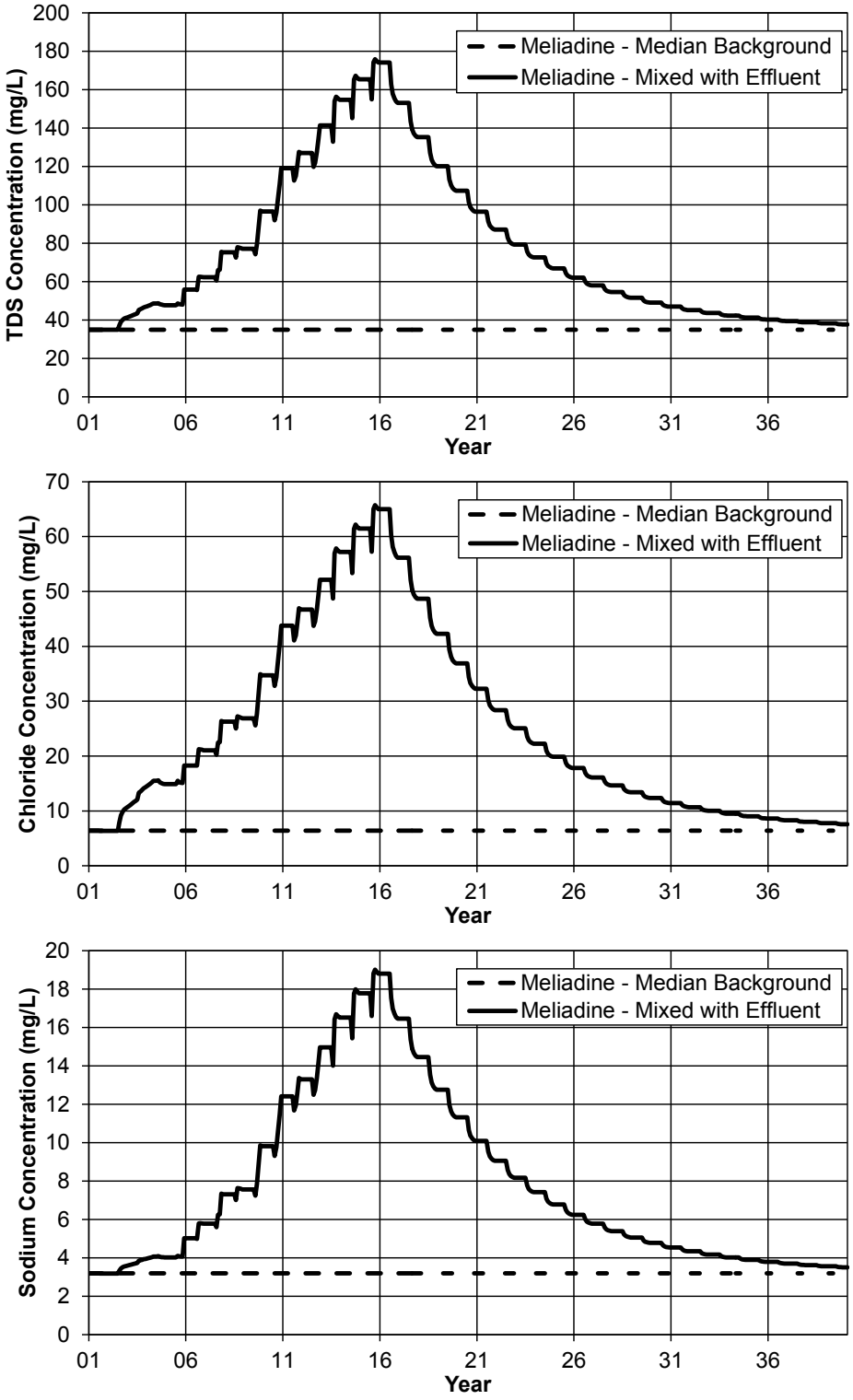



*Figure 7.4-A5: Predicted TDS, Cl, and Na Concentrations in Meliadine Lake with Fully Mixed Effluent*

### 4.3.4 Oxygen Level

Dissolved oxygen (DO) concentrations within Meliadine Lake were estimated to assess potential oxygen consumption from the effluent discharged into the lake. DO concentrations were predicted:

- for Meliadine Lake using the same lake area as in Section 4.3.3 (i.e., east basin), assuming full mixing within that area; and
- specifically within the mixing zone, assuming full mixing within that zone.

The DO concentration in a water column is the net result of a number of opposing physical and biological processes. Surface aeration (driven by winds and currents) and photosynthesis supply oxygen to the water column, while processes such as carbonaceous and nitrogenous consumption, algae and fish respiration, and sediment oxygen demand remove oxygen from the water column. A mass balance within Meliadine Lake and the effluent mixing zone was therefore conducted by considering:

- lake inflows and mine effluent discharges (oxygen contribution);
- surface aeration (oxygen contribution for DO concentration in water below saturation, and oxygen removal for DO concentration in water above saturation); and
- lake outflows and carbonaceous and nitrogenous consumption (oxygen removal).

Photosynthesis, algae and fish respiration and sediment oxygen demand were considered negligible in the mass balance.

Carbonaceous consumption is the result of bacterial metabolism of dissolved organic species, while the nitrogenous consumption is due to the conversion of ammonia to nitrate (*via* nitrite) in the nitrification process. These two consumption processes were incorporated in the mass balance using the formulation proposed in Lee *et. al.* (1991). Carbonaceous and nitrogenous consumption rates were adjusted based on water temperature, using the formulations in Ambrose *et. al.* (1988). Surface aeration in the mass balance was established using the O'Connor Banks formula presented in Thomann and Mueller (1987), considering an oxygen saturation level estimated from an empirical formulation based on water temperature and salinity by Maskell and Odd (1977).

Assumptions used in the mass balance include the following:

- the mixing zone is assumed to be cylindrical in shape, completely mixed with a 100m radius (Section 4.1) and 9 m depth (Table 7.4-A22);
- the open water season is from June to October and a 2m ice layer (Table 7.4-A22) is assumed for the remainder of the year;
- the volume of the Meliadine Lake east basin is 98,851,000 $m^3$ (from the basin characteristics of Meliadine Lake in FEIS Volume 7, SD 7-1);
- a residual DO of 4 mg/L is present in the mine effluent;

- based on the lake bathymetry (FEIS Volume 7, SD 7-1), 66% of Meliadine Lake current is assumed to pass through the mixing zone;
- the wind data, lake salinity, and water temperature were determined from observations reported in the aquatic baseline synthesis (FEIS Volume 7, SD 7-1); and
- predicted effluent ammonia concentrations were obtained from the Surface Water Management Plan (FEIS Volume 2, SD 2-6).

The mass balance was run for a period of 40 year to cover the construction, operations and closure phases of the mine development, and into post-closure. The results obtained from that mass balance are presented in Figures 7.4-A6 and 7.4-A7 (Year 1 corresponds to the first year of the construction phase). A time series graph is presented in Figure 7.4-A6 to demonstrate how oxygen demand from nitrogen and carbon compounds in the mine effluent varies. These demands are a direct result of the load of these compounds in the effluent. Figure 7.4-A7 displays the resulting DO concentrations within the mixing zone and Meliadine Lake. The DO guideline of 6.5mg/L (CCME 2012a) is included as a reference in Figure 7.4-A7.

DO concentrations are expected to be above the guideline in Meliadine Lake. Within the mixing zone, episodes of DO concentrations below the guideline are predicted to occur in late summer during the operations phase. During the construction, closure and post-closure phases, DO concentrations within the mixing zone are expected to be similar to those in other areas of Meliadine Lake.

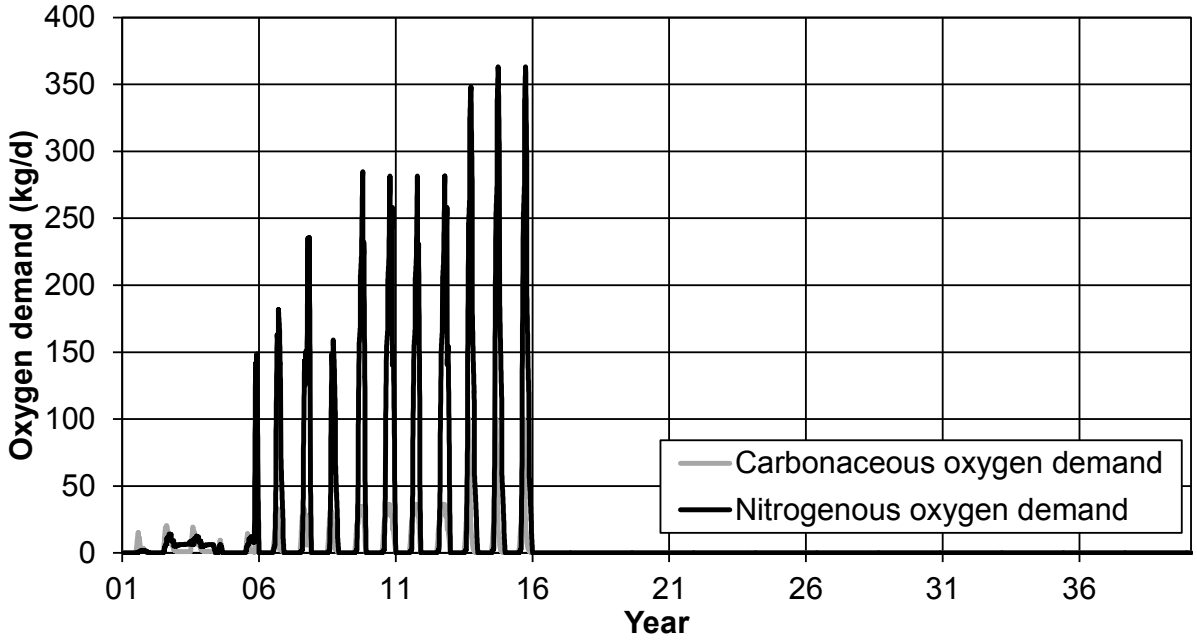



*Figure 7.4-A6: Estimated Carbonaceous and Nitrogenous Oxygen Demand from the Mine Effluent*

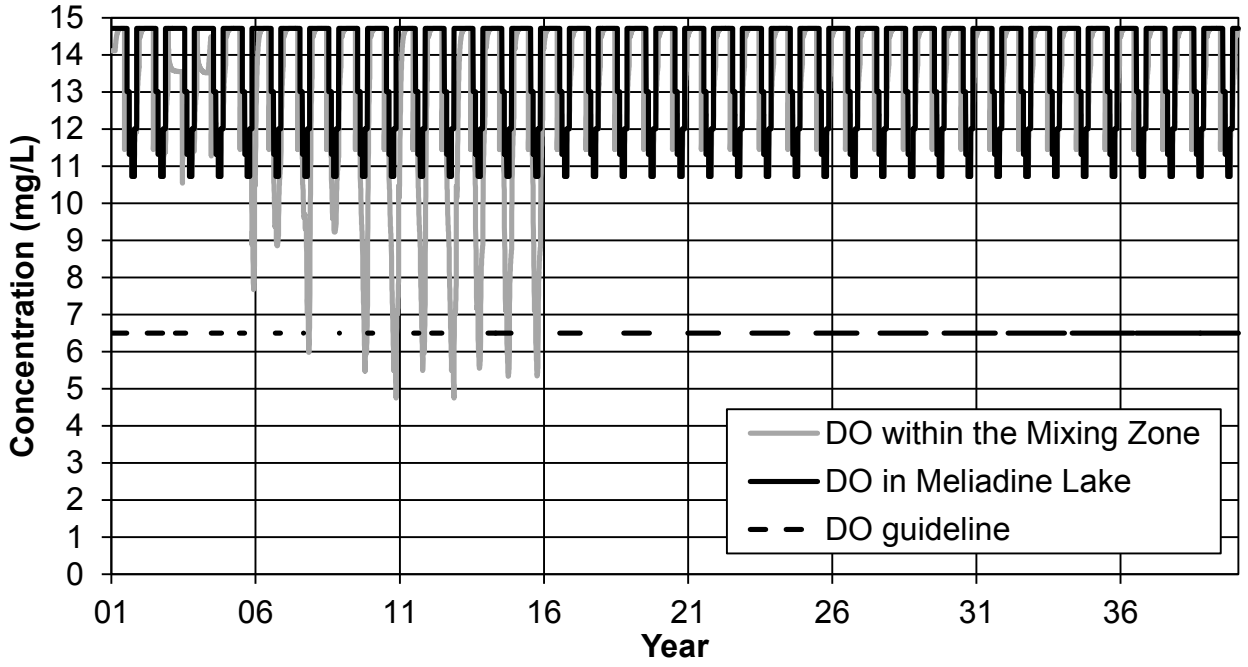



*Figure 7.4-A7: Predicted DO Concentrations in Meliadine Lake and Within the Mixing Zone with Fully Mixed Effluent*

### 4.3.5 Confidence in the Results

Density difference between the ambient and effluent waters, the depth and current velocity of the ambient environment, and the effluent discharge volume and velocity are the main variables that influence effluent mixing in a receiving body of water. The maximum predicted total dissolved solids concentration and maximum allowable total suspended solids concentration were used to define effluent water and hence to produce the largest density difference possible from ambient water. The range of possible ambient current velocities was tested in the modelling effort. In addition, a high ice cover thickness was considered in order to provide a low water depth for mixing during the ice cover period, and the maximum monthly effluent discharge was used. The selected effluent discharge velocity was within the range typically used for diffusers. These assumptions lead to conservative model predictions of effluent mixing (i.e., under-estimated mixing ratio).

Confidence in the results is dependent on the validity of application of the mixing model and on the effluent water inputs provided to that model. The validity of the model results decreases as a function of the distance from the outfall. Higher uncertainty should be considered on mixing predictions after a plume makes contact with a barrier or interface (i.e., the water surface, the lake bottom, the ice cover or a thermocline). Contact with an interface is expected between a 10 and 20 m distance from the outfall, which is less than the radius of the mixing zone (100 m). Observations of actual effluent chemistry (i.e., water quality parameter concentrations) from the Project were not available; however conservative assumptions were used in the definition of the effluent in the mixing model (Table 7.4-A22, Sections 4.2.2 and 4.3). Therefore, confidence in the results is moderate and sufficient for a preliminary level analysis.

Confidence in the results from the mass balances (Section 4.3.3 and 4.3.4) is driven by the assumptions used to support the predictions of TDS, Cl, Na, and DO in Meliadine Lake. The assumptions were intended to limit the volume of ambient water available for mixing while using conservative predictions of effluent discharge and concentrations. The combination of assumptions would therefore yield concentration predictions that should be higher than expected. Therefore, confidence in the results is considered sufficient for the identification of potential impacts from the release mine effluent in Meliadine Lake.

# 5.0 WATER QUALITY IN WATERBODIES

## 5.1 Approach

The development of the Project will not involve the discharge of the water affected by mine activities and processes during the construction, operations and closure phases, except at Meliadine Lake (Section 4). However, the development of mine infrastructure will change drainage areas and pathways of some of the waterbodies in the Meliadine peninsula and Chicken Head watershed. The changes in drainage areas and pathways, as well as atmospheric loadings from the mine development itself, may potentially change water quality in these waterbodies during the mine life. At post-closure, water releases from the flooded pit lakes to the receiving environment will occur and may potentially affect the water quality of some of the waterbodies.

Closure to post-closure predictions of water quality in waterbodies in the Meliadine peninsula and Chicken Head watershed that may potentially be affected by the mine development (Table 7.4-A2) were made using the model described in Section 2.5. The model required that chemistry be defined for all water sources as input to the mass balance to predict concentrations in the waterbodies. The method for developing the chemistry of the waters sources is presented in Section 5.2. The model was also calibrated on all waterbodies under existing conditions (referred to as baseline) using the methodology described in Section 5.3. Inclusion of estimated atmospheric loadings from the Project is described in Section 5.4.

Model predictions of concentrations for the water quality parameters listed in Table 7.4-A4 are presented in Section 5.5. Predictions provided in this section are the median and peak concentrations for all water quality parameters. The peak concentration is equal to the 99.91 percentile of the predicted concentrations and is considered as the predicted equivalent of the maximum observed concentration for a water quality parameter (EPA 1991). Predicted baseline concentrations (medians and/or peaks) were highlighted if they exceeded the regulatory water quality guidelines provided in Table 7.4-A6. Predictions of concentrations (median and/or peaks) during construction to post-closure were also highlighted if they were identified to meet the following conditions:

- The water quality parameter has guidelines, which are not exceeded by the predicted baseline concentrations, but are exceeded by the predicted concentrations for a particular Project phase; and
- The water quality parameter has guidelines which are exceeded by the predicted baseline concentrations, and predicted concentration for a given phase; furthermore, exceed the predicted baseline concentrations by more than 10%.

The following topics are also discussed as part of the waterbodies modelling effort:

- Mixing characteristics in pit lakes (Section 5.6); and
- Model prediction confidence (Section 5.7).

## 5.2 Source Water Chemistry

The hydrologic component of the waterbodies model provides predictions on a daily basis from 1983 to 2011 (i.e., 29 years). Daily time series of water quality parameter concentrations for all water sources were therefore required for input into the mass balance module. Two types of water sources were accounted for in the model:

- Water from areas affected by mine activities and process, and consisting of contributions from the tailings storage facility and waste rock storage facilities (contact water); and
- Water from drainage areas of waterbodies that have been left undisturbed by mining activities and processes (non-contact water).

All contact water during the construction and operations phases of the Project is collected, stored, and treated and discharged as needed to Meliadine Lake, and is used to assist flooding the open pits during the closure phase. Contact waters are therefore not discharged to the waterbodies of Meliadine peninsula and Chicken head watershed during the construction to the closure phases.

The chemistry of all contact water sources were estimated in the mine site water management plan (SD 2-6 Surface Water Management Plan). The estimated long term concentrations were used to define the chemistry of the contact water sources (i.e., a 29-year, daily, constant concentration time series was defined for each water quality parameter and each contact water source) post-closure in the waterbodies model (Section 5.5), and in the pit lake analysis (Section 5.6).

For non-contact waters, unique statistical distributions were assigned to each water quality parameter modelled. The available baseline water quality data (SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline) were compiled and used to describe distributions for these source waters. Daily time series were then generated for each water quality parameter and each non-contact water source by randomly selecting values from the distribution. The following standardized screening process was used to develop a statistical distribution for each water quality parameter:

- Step 1: remove outliers from the observed concentrations;
- Step 2: fit suitable statistical distributions to the remaining observed concentrations;
- Step 3: assess the goodness of fit for all applicable distributions to determine the most appropriate distribution type;
- Step 4: process any special cases (e.g., datasets with less than 10 values); and
- Step 5: determine the minimum and maximum bounds to define a reasonable range for the chosen distribution.

A discussion on these steps is given in the following sections. Due to the limited data available for each of the waterbodies, distributions were developed on a watershed basis. Consequently, distributions for the water quality parameters were established for the A, B, D and Chicken Head watersheds using the baseline concentrations observed in all the streams and waterbodies within each watershed. The non-contact source water of a given waterbody was then assigned the distributions associated to the watershed to which it belongs. Distributions assigned to the H, I, J watersheds were those of the B watershed.

### 5.2.1 Outlier Detection

"Outlier" is a collective term that refers to either a contaminant or discordant observation (Beckman and Cook 1983). A discordant observation appears surprising or discrepant, but the origin of the result is unknown. A contaminant observation is an observation that may induce bias to the fitted statistical distribution, and the reason for its characteristics can be explained.

Outlier detection tests (World Meteorological Organization [WMO] 1985) were performed on the baseline dataset to identify potential outliers. If a measurement was identified as an outlier, the origin of the result was investigated. Outliers of explainable origins (i.e., there was a reason for the anomalous result) were considered contaminants and were removed from the dataset without further consideration. Outliers of unknown origin were considered discordant observations and were retained in the dataset for further investigation.

Three statistical tests were used to identify outliers. These included the three times standard deviation (3σ) rule, the Hampel identifier and the combined Rosner - Dixon test, descriptions of which are presented below. An observation was considered an outlier only if it was flagged by all three outlier tests. By using multiple tests, the possibility of misdiagnoses was reduced (Jain 1981, Beckman and Cook 1983, WMO 1985, Pearson 2001, Kottegoda 1984). Misdiagnosis is often referred to as (1) swamping or Type I error, when a normal datum is falsely identified as an outlier, or (2) masking or Type II error, when an outlier is falsely identified as a normal datum (Jain 1981; Beckman and Cook 1983).

The 3σ rule is the most common of the outlier tests because it is simple to implement and uses well-known statistical properties, namely the mean and standard deviation (Pearson 2001). The 3σ rule test is a single-outlier detection test, so consecutive testing for many-outlier detection in the dataset was required for the analysis (Beckman and Cook 1983). The consecutive approach used was similar to the method used in Golder (2003), Golder and Cantox (2002) and CNRL (2002). The mean and standard deviation were calculated for the dataset, and if the maximum value was identified as an outlier based 3σ rule criteria, it was removed from the dataset. A new mean and standard deviation were then calculated for the remaining data, and the maximum observed value was again tested. This iterative process continued until no outliers were detected.

The Hampel identifier is a more recent test, and was developed to address some of the masking issues that can affect the 3σ rule (Pearson 2001). Hampel (1985) first proposed this test, and it was evaluated further by Davies and Gather (1993) and Pearson (2001). Although this test has not yet been used systematically on water quality data, its resemblance with the 3σ rule makes it suitable for that purpose. The Hampel identifier can be considered as a many-outlier detection test, so an iterative process was not needed.

The Rosner test was specifically designed to reduce the masking effect encountered in other outlier detection tests (Rosner 1975, 1983). The Rosner test is considered a suitable test for outliers in water quality data (Gilbert 1987; Jain 1981), but is only applicable when the sample size is greater or equal to 25. An evaluation performed by Jain (1981) validated the efficiency of the test. However, Jain noted the importance of carefully selecting the number of outliers expected in the dataset, since the test will only analyze as many outliers as specified by the user. The number of outliers was set at 30 percent of the sample size for this analysis, since it was unlikely that more than 30 percent of the dataset were outlier values.

When the sample size was less than 25, the Dixon test was used in place of the Rosner test (Dixon 1950, 1951, 1953; Sokal and Rohlf 1981; Gilbert 1987). Because it is a single-outlier detection test, consecutive testing was performed to account for the possible presence of multiple outliers, as described for the 3σ rule.

### 5.2.2 Distribution Fitting and Goodness of Fit

The statistical distributions considered for the water quality data were normal, lognormal and delta-lognormal. These three types of distributions can generally be used to describe water quality information in any receiving waterbody (AEP 1995, EPA 1991). To identify which distribution best described a water quality parameter, all three distributions were initially fitted to the available measured data for the parameter. Statistical goodness of fit tests, consisting of the Chi-square test, the Kolmogorov-Smirnov test and the squared correlation coefficient (Sokal and Rohlf 1981) were used to determine which distribution type was most appropriate.

The Chi-square test at a 5 percent statistical significance level was employed only to provide support in selecting the most appropriate distributions. The test can be difficult to apply to water quality data. Datasets may often be too small, or contain too many replicates for the test to provide useful results. Consequently, the Kolmogorov-Smirnov test was used as a decision criterion. It was required that the statistical distribution pass this test at the 5 percent statistical significance level to be selected as a candidate for the best distribution for a given dataset. However, if none of the available distributions passed this test, the final criterion for selecting the most appropriate distribution was the squared correlation coefficient.

The squared correlation coefficient is a standard statistical measure (Stedinger et al. 1993), which allows the available statistical distributions to be ranked in terms of goodness of fit. In general, the statistical distribution with the highest squared correlation coefficient was considered the most appropriate for the dataset. The statistical significance level of the squared correlation was also evaluated to ensure that the relationship was not obtained by chance or random fluctuations (Walpole and Myers 1978).

### 5.2.3 Special Cases

Three special cases may occur during the statistical distribution fitting process. These include 1) datasets with less than ten observations; 2) datasets with all observations at a single, constant value or below the analytical detection limit; and 3) no data are available for the water quality parameter.

When there were less than ten observations in the dataset, and less than 50 percent of the observations were reported as less than the analytical detection limit, a lognormal distribution was selected. Otherwise, a delta-

lognormal distribution was selected. Both distributions were described using a coefficient of variation equal to 0.6, consistent with Alberta Environment Protection (AEP) guidelines (AEP 1995).

When the dataset consisted of many observations of the same value, expert judgment was used to assign a distribution. In some cases, a surrogate statistical distribution was derived from the fitted distribution of another related water quality parameter or the distribution of the parameter for another source water type. In other cases, the selected distribution was a constant value (a Dirac function), or a uniform distribution with assigned minimum and maximum bounds.

For cases in which no observed data exists for a given water quality parameter, professional judgement was used to derive distributions that will provide conservative predictions.

### 5.2.4 Bounding the Distribution

If left unbounded, distributions can produce exceptionally high concentrations that are not realistic to the aquatic environment. Therefore, each distribution was assigned a minimum and maximum value. The minimum value of the distribution was set to zero for the normal distribution, a value very close to zero (e.g., 0.00000001) for the lognormal distribution, and half the detection limit for the delta-lognormal distribution. The maximum bound was most often set to either three standard deviations from the mean or the maximum value observed, whichever was the largest.

In some cases, the maximum observed value was an outlier, but the value corresponding to three standard deviations from the mean was too high to be reasonable. If appropriate, the extreme value produced by the distribution was replaced with the maximum observed value multiplied by a weighting factor that ranged from 1 to 3. The larger the weighting factor was applied to datasets with a smaller number of data points and larger standard deviation.

## 5.3 Model Calibration

The calibration of the water quality module of the waterbodies model involved comparing predicted water quality parameter concentrations with observations from the water quality samples. The calibration parameters consisted of weighting factors applied to the non-contact source water concentration time series (i.e., one factor for each water source and each water quality parameter for each waterbodies). The calibration parameters were adjusted until:

- The statistical distributions of the predicted water quality parameter concentration for each water body were a reasonable likeliness of the distribution of the observed data of the corresponding watershed; and
- The averages of the predicted water quality parameter concentrations for each waterbody matched the averages of the observed data of the corresponding watershed.

The results of the calibration defined the baseline concentration model predictions.

## 5.4 Atmospheric Loadings

Predictions of atmospheric loadings (i.e., average annual mass per surface area) were produced for water quality parameters as part of the atmospheric environment and impact assessment for the Project (FEIS Volume 5, Section 5.2). Loadings were calculated on a grid encompassing the area of the mine development. The loadings were averaged on a watershed basis and provided as inputs to the mass balance module of the waterbodies model.

The atmospheric loadings used in the analysis were predicted for several scenarios during the construction to the operation phases of the Project (FEIS Volume 5, Section 5.2). For each watershed, the scenario with the largest loadings was considered for the water quality modelling.

The loadings were distributed as follows:

- Loadings from October to June were assume to accumulate in the snow cover, and this accumulation was released evenly during the days of June; and
- Loadings from July to September were release evenly on a daily basis.

Atmospheric loadings that infiltrate in the ground, as established by the runoff coefficient defined in the mine site water management plan (SD 2-6 Surface Water Management Plan), are considered to be absorbed to the ground and do not contribute to concentrations in waterbodies. Atmospheric loadings assigned to surface water runoff contribute entirely to concentrations in waterbodies.

## 5.5 Waterbodies Model Results

Predictions (medians and peaks) of water quality parameter concentrations are presented as follows:

- A watershed: Tables 7.4-A25 to 7.4-A27 for Lakes A8, A6 and A1, respectively;
- B watershed: Tables 7.4-A28 to 7.4-A33 for Lakes B6, B5, B46, B45, P2 and B2, respectively;
- D watershed: Tables 7.4-A34 to 7.4-A37 for Lakes D7, D4, D3 and D1, respectively;
- H watershed: Tables 7.4-A38 and 7.4-A39 for Lakes H17 and H1, respectively;
- I watershed: Table 7.4-A40 for Lake I1;
- J watershed: Tables 7.4-A41 to 7.4-A46 for Lakes J8, J7, J6, J3, J2 and J1; and
- Chicken Head watershed: Tables 7.4-A47 to 7.4-A50 for Lakes CH6, CH5, CH10 and CH1, respectively.

As described above, the predicted concentrations provided in Tables 7.4-A25 to 7.4-A50 are highlighted if the following conditions were met:

- Baseline: concentrations exceeding the guidelines (bold);
- Construction to post-closure: concentrations exceeding the guidelines (bold); and
- Construction to post-closure: concentrations exceeding the guidelines and exceeding baseline concentrations by more than 10% (bold and underlined).

The frequency of exceedence of guidelines was also compiled. This compilation is summarized for each phase of the Project and each waterbody in Appendix A.

Changes in concentrations from baseline levels can be the result of atmospheric loadings contributions. Potential changes in concentrations due to atmospheric loadings are indicated in all watersheds except the H watershed, which is not a receiving environment during the construction to the operation phases. However, these changes vary depending on the water quality parameters. Atmospheric loadings for nitrate, aluminum, iron and titanium were large and produced appreciable increases in concentrations (i.e., higher than 10% from baseline) for the waterbodies. Increases in waterbody concentrations due to atmospheric loadings were negligible for other water quality parameters (i.e., increase of 10% or less from baseline).

During the construction to closure phase of the Project, changes in waterbody concentrations from baseline levels may occur from:

- Reduction in drainage area as a result of the development of mine infrastructure and consequent reduction in flows to a waterbody (construction and operations phases);
- Reduction of flows to a waterbody as a result of the flooding of pit lakes upstream (closure phase);
- Increase in flows to a waterbody as a result of the dewatering activities at an upstream waterbody (construction phase); and
- Increase in flows to a waterbody as a result of a diversion (operations, for example from Lake B5 to Lake D7).

Reduction of flows would imply lower loadings to a waterbody; however, higher concentrations may result nonetheless due to evaporation of the reduced water volume contributing to the waterbody.

In the A watershed, Lakes A8 and A6 are not used as a receiving environment during the construction and operations phases, with the exception of year -3 of the construction phase for A6 which receives dewatering flows from A8 (see Tables 7.4-A25 and 7.4-A26). The predicted water quality parameter concentrations in A6 during dewatering are similar to baseline levels (i.e., less than 10% difference) (Table 7.4-A26). Lake A1 is part of the receiving environment during the construction to the closure phases and would be affected by increased flows during construction due dewatering of A8 and A6, and reduced flows during operations and closure due to mine infrastructure development and pit lake flooding. Increases in water quality parameter concentrations by more than 10% from baseline levels are predicted at A1 for the duration of the operations and closure phases (Table 7.4-A27).

Reduction of flows is expected in the B watershed from the development of the TSF and the B4 WRSF, and from the diversion of water from Lake B5 to Lake D7. Potential changes in water quality parameter concentrations from baseline levels are predicted to be higher than 10% at Lake B6 (Table 7.4-A28, years -2 to -1 in the construction phase and years 1 to 2 in the operations phase) following completion of the dewatering of Lake B7 and the construction of the TSF. Water quality parameter concentrations of the other waterbodies of the B watershed (i.e., B5, B46, B45, P2 and B2, Tables 7.4-A29 to 7.4-A33) are predicted to be similar to baseline levels (i.e., less than 10% difference).

The D watershed is expected to receive an increase in flows from Lake B5 during the construction, operations (years 1 to 2) and post-closure phases; however, this increase is predicted to result in little change to water

quality parameter concentrations in the waterbodies of the D watershed. Water quality parameter concentrations in Lakes D7, D4, D3 and D1 (Tables 7.4-A34 to 7.4-A37) are predicted to be similar to baseline levels (i.e., less than 10% difference).

Lakes H17 and H1 are not expected to be part of the receiving environment from the construction to the closure phases (Tables 7.4-A38 and 7.4-A39). Lakes I1, J8, and J1 (Tables 7.4-A40, 7.4-A41 and 7.4-A46) are expected to be affected by a reduction in flows due to the development of mine infrastructure. Lake J8 would not be part of the receiving environment during the operations and closure phases. Lakes J7, J6, J3 and J2 (Tables 7.4-A42 to 7.4-A45) would not be part of the receiving environment during the operations to post-closure phases. When part of the receiving environment, the waterbodies in the I and J watersheds are predicted to see little change to water quality parameter concentrations, with levels similar to baseline (i.e., less than 10% difference).

The Chicken Head watershed is not expected to be affected by mining activities until year 4 of the operations phase. Water quality parameter concentrations in the waterbodies of this watershed are therefore predicted to be similar to baseline levels from the construction phase to year 4 of the operations phase. Starting in year 5, a potential reduction in flows is expected in the watershed as a result of the Discovery pit and waste rock storage facility developments. From year 5 of the operations phase to the closure phase, changes of slightly more than 10% (13% on average) in water quality parameter concentrations from baseline levels are predicted in Lake CH6 (Table 7.4-A47). Water quality parameter concentrations are predicted to be less than 10% from baseline levels in all remain waterbodies in the Chicken Head watershed (CH5, CH10 and CH1, in Tables 7.4-A48 to 7.4-A50).

At post-closure, water quality parameter concentrations in all waterbodies in all watesheds are predicted to be similar to the baseline level. Therefore, discharges from pit lakes to the receiving environment, as well as direct surface runoff to the receiving environment from waste rock storage facilities, are predicted to result in negligible changes in waterbody concentrations post-closure compared to baseline.

**Table 7.4-A25: Observed and Predicted Concentrations at Lake A8**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 162 | 246 | 162 | 246 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 51 | 68 | 51 | 68 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 2.9 | 3.6 | 2.9 | 3.6 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 47 | 84 | 47 | 84 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 74 | **190** | 74 | 190 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.038 | 0.051 | 0.038 | 0.051 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 6.9 | 9.8 | 6.9 | 9.8 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.3 | 3.4 | 2.3 | 3.4 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 8.3 | 14.2 | 8.3 | 14.2 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.6 | 20.5 | 11.6 | 20.5 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.118 | 0.206 | 0.118 | 0.206 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.20 | 0.355 | 0.20 | 0.355 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.58 | 0.72 | 0.58 | 0.72 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.006 | 0.0079 | 0.006 | 0.0079 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.00215 | 0.00338 | 0.00215 | 0.00338 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.6 | 2.1 | 1.62 | 2 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 4.6 | 7.8 | 4.6 | 7.8 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.2 | 0.25 | 0.2 | 0.25 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.7 | 2.3 | 1.7 | 2.3 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 23 | 33 | 23 | 33 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.47 | 0.6 | 0.47 | 0.6 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.076 | 0.101 | 0.076 | 0.101 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 27 | 37 | 27 | 37 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.083** | **0.155** | 0.083 | 0.155 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 1.87 | 3.4 | 1.87 | 3.4 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.24 | 0.34 | 0.24 | 0.34 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.7** | **3.7** | 2.7 | 3.7 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 96 | 136 | 96 | 136 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **2.0** | **3.41** | 1.97 | 3.41 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 5.3 | 10 | 5.3 | 10 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 30 | **64** | 30 | 64 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.040** | **0.069** | 0.04 | 0.069 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.59 | 0.73 | 0.59 | 0.73 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.3 | 3.4 | 2.3 | 3.4 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.16 | 0.32 | 0.16 | 0.32 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.068 | **0.104** | 0.068 | 0.104 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 101 | 184 | 101 | 184 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.047 | 0.062 | 0.047 | 0.062 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.26 | 0.36 | 0.26 | 0.36 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.25 | 1.9 | 1.25 | 1.85 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 29 | 38 | 29.35 | 37.62 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.061 | 0.076 | 0.061 | 0.076 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.35 | 0.48 | 0.35 | 0.48 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.1 | 7.6 | 5.1 | 7.6 |

**Table 7.4-A26: Observed and Predicted Concentrations at Lake A6**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 115 | 177 | 58 | 108 | 115 | 177 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 45 | 63 | 22 | 38 | 45 | 63 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 2.5 | 3.2 | 1.2 | 2.3 | 2.5 | 3.2 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 34 | 65 | 17 | 33 | 34 | 65 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 47 | 103 | 25 | 112 | 47 | 103 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.041 | 0.057 | 0.018 | 0.033 | 0.041 | 0.057 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 4.8 | 6.5 | 2.6 | 4.3 | 4.8 | 6.5 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 1.8 | 2.6 | 0.9 | 1.5 | 1.8 | 2.6 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 6.0 | 10.8 | 3.3 | 5.7 | 6.0 | 10.8 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 8.6 | 15.3 | 4.3 | 9.0 | 8.6 | 15.3 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.081 | 0.129 | 0.04 | 0.086 | 0.081 | 0.13 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.134 | 0.214 | 0.07 | 0.177 | 0.1 | 0.2 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.52 | 0.67 | 0.25 | 0.42 | 0.52 | 0.67 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.006 | 0.0085 | 0.0029 | 0.0045 | 0.006 | 0.0085 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0016 | 0.0024 | 0.0008 | 0.0015 | 0.0016 | 0.0024 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.4 | 2.0 | 0.7 | 1.1 | 1.4 | 2.0 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 3.8 | 6.6 | 1.8 | 3.8 | 3.8 | 6.6 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.2 | 0.26 | 0.1 | 0.16 | 0.2 | 0.26 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.8 | 2.5 | 0.8 | 1.7 | 1.8 | 2.5 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 18 | 28 | 9 | 21 | 18 | 28 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.3 | 0.44 | 0.16 | 0.25 | 0.3 | 0.44 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.054 | 0.075 | 0.026 | 0.047 | 0.054 | 0.075 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 27 | 40 | 13 | 19 | 27 | 40 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.071** | **0.13** | 0.071 | 0.13 | 0.071 | 0.13 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 1.52 | 2.9 | 0.79 | 2.7 | 1.52 | 2.9 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.16 | 0.23 | 0.08 | 0.13 | 0.16 | 0.23 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.0** | **3.1** | 1.0 | 1.7 | 2.0 | 3.1 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 89 | 128 | 42 | 91 | 89 | 128 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.2** | **1.8** | 0.63 | 1.3 | 1.17 | 1.84 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 3.9 | 7 | 1.9 | 4 | 3.9 | 7 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 22 | 39 | 12 | 30 | 22 | 39 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.028** | **0.046** | 0.028 | 0.046 | 0.028 | 0.046 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.42 | 0.56 | 0.21 | 0.39 | 0.42 | 0.56 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 1.8 | 2.7 | 0.9 | 1.8 | 1.8 | 2.7 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.18 | 0.32 | 0.08 | 0.18 | 0.18 | 0.32 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.064 | **0.103** | 0.029 | 0.057 | 0.064 | 0.103 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 79 | 149 | 38 | 93 | 79 | 149 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.039 | 0.054 | 0.018 | 0.029 | 0.039 | 0.054 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.26 | 0.36 | 0.26 | 0.36 | 0.26 | 0.36 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 0.81 | 1.2 | 0.42 | 0.74 | 0.81 | 1.22 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 22 | 31 | 11 | 18 | 22 | 31 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.058 | 0.078 | 0.028 | 0.048 | 0.058 | 0.078 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.32 | 0.46 | 0.16 | 0.33 | 0.32 | 0.46 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 4.1 | 6.0 | 2.0 | 3.9 | 4.1 | 6.0 |

**Table 7.4-A27: Observed and Predicted Concentrations at Lake A1**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 104 | 161 | 66 | 103 | 113 | 175 | 123 | 190 | 135 | 209 | 135 | 209 | 135 | 209 | 135 | 209 | 135 | 209 | 85 | 126 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 46 | 61 | 26 | 39 | 50 | 66 | 54 | 72 | 60 | 79 | 60 | 79 | 60 | 79 | 60 | 79 | 60 | 79 | 39 | 52 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 2.5 | 3.1 | 1.5 | 2.4 | 2.8 | 3.4 | 3.0 | 3.7 | 3.3 | 4.1 | 3.3 | 4.1 | 3.3 | 4.1 | 3.3 | 4.1 | 3.3 | 4.1 | 1.6 | 2.3 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 33 | 57 | 20 | 36 | 36 | 63 | 39 | 68 | 42 | 75 | 42 | 75 | 42 | 75 | 42 | 75 | 42 | 75 | 25 | 44 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 43 | 90 | 27 | 89 | 46 | 98 | 50 | 106 | 55 | 116 | 55 | 116 | 55 | 116 | 55 | 116 | 55 | 116 | 43 | 90 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.042 | 0.06 | 0.023 | 0.036 | 0.046 | 0.065 | 0.05 | 0.071 | 0.055 | 0.078 | 0.055 | 0.078 | 0.055 | 0.078 | 0.055 | 0.078 | 0.055 | 0.078 | 0.022 | 0.03 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 4.4 | 6.6 | 2.9 | 4.4 | 4.8 | 7.1 | 5.2 | 7.7 | 5.8 | 8.5 | 5.8 | 8.5 | 5.8 | 8.5 | 5.8 | 8.5 | 5.8 | 8.5 | 4.0 | 5.7 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 1.7 | 2.9 | 1.0 | 1.6 | 1.9 | 3.1 | 2.0 | 3.4 | 2.2 | 3.7 | 2.2 | 3.7 | 2.2 | 3.7 | 2.2 | 3.7 | 2.2 | 3.7 | 1.5 | 2.1 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 5.8 | 9.9 | 3.7 | 6.0 | 6.3 | 10.8 | 6.8 | 11.7 | 7.5 | 12.9 | 7.5 | 12.9 | 7.5 | 12.9 | 7.5 | 12.9 | 7.5 | 12.9 | 4.8 | 9.1 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 7.3 | 13.0 | 4.8 | 8.5 | 8.0 | 14.1 | 8.6 | 15.3 | 9.5 | 16.8 | 9.5 | 16.8 | 9.5 | 16.8 | 9.5 | 16.8 | 9.5 | 16.8 | 6.6 | 11.0 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.07 | 0.13 | 0.044 | 0.086 | 0.076 | 0.141 | 0.082 | 0.153 | 0.091 | 0.168 | 0.091 | 0.168 | 0.091 | 0.168 | 0.091 | 0.168 | 0.091 | 0.168 | 0.07 | 0.13 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.103 | 0.167 | 0.07 | 0.149 | 0.113 | 0.181 | 0.124 | 0.194 | 1.3 | 1.8 | 1.3 | 1.8 | 1.3 | 1.8 | 1.3 | 1.8 | 0.1 | 0.2 | 0.1 | 0.2 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.54 | 0.73 | 0.31 | 0.48 | 0.59 | 0.79 | 0.64 | 0.86 | 0.7 | 0.95 | 0.7 | 0.95 | 0.7 | 0.95 | 0.7 | 0.95 | 0.7 | 0.95 | 0.46 | 0.56 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0062 | 0.0083 | 0.0036 | 0.0049 | 0.0068 | 0.0091 | 0.0074 | 0.0099 | 0.0081 | 0.0109 | 0.0081 | 0.0109 | 0.0081 | 0.0109 | 0.0081 | 0.0109 | 0.0081 | 0.0109 | 0.0061 | 0.0079 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.00153 | 0.00249 | 0.00093 | 0.0017 | 0.00166 | 0.00272 | 0.0018 | 0.00294 | 0.00198 | 0.00324 | 0.00198 | 0.00324 | 0.00198 | 0.00324 | 0.00198 | 0.00324 | 0.00198 | 0.00324 | 0.00115 | 0.00197 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 2 | 2.8 | 1.1 | 1.7 | 2.3 | 3.0 | 2.4 | 3.3 | 2.7 | 3.6 | 2.7 | 3.6 | 2.7 | 3.6 | 2.7 | 3.6 | 2.7 | 3.6 | 0.6 | 1.0 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 3.8 | 6.8 | 2.1 | 4.4 | 4.2 | 7.5 | 5.4 | 9.5 | 18.3 | 43.2 | 18.3 | 43.2 | 18.3 | 43.2 | 18.3 | 43.2 | 5.0 | 8.9 | 3.8 | 6.8 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.21 | 0.29 | 0.12 | 0.2 | 0.23 | 0.31 | 0.25 | 0.34 | 0.28 | 0.37 | 0.28 | 0.37 | 0.28 | 0.37 | 0.28 | 0.37 | 0.28 | 0.37 | 0.16 | 0.23 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.8 | 2.5 | 1.0 | 1.8 | 2.0 | 2.7 | 2.2 | 2.9 | 2.4 | 3.2 | 2.4 | 3.2 | 2.4 | 3.2 | 2.4 | 3.2 | 2.4 | 3.2 | 1.7 | 2.2 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 19 | 34 | 10 | 25 | 20 | 37 | 22 | 40 | 24 | 44 | 24 | 44 | 24 | 44 | 24 | 44 | 24 | 44 | 20 | 34 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.24 | 0.34 | 0.16 | 0.23 | 0.27 | 0.37 | 0.29 | 0.4 | 0.32 | 0.44 | 0.32 | 0.44 | 0.32 | 0.44 | 0.32 | 0.44 | 0.32 | 0.44 | 0.1 | 0.16 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.046 | 0.062 | 0.028 | 0.043 | 0.05 | 0.068 | 0.054 | 0.073 | 0.059 | 0.081 | 0.059 | 0.081 | 0.059 | 0.081 | 0.059 | 0.081 | 0.059 | 0.081 | 0.017 | 0.024 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 28 | 39 | 16 | 24 | 31 | 43 | 33 | 46 | 37 | 51 | 37 | 51 | 37 | 51 | 37 | 51 | 37 | 51 | 19 | 27 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.071** | **0.17** | 0.071 | 0.17 | 0.077 | 0.19 | **0.083** | **0.20** | **0.092** | **0.23** | **0.092** | **0.23** | **0.092** | **0.23** | **0.092** | **0.23** | **0.092** | **0.23** | 0.071 | 0.17 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 1.62 | 3.1 | 0.98 | 3.1 | 1.77 | 3.4 | 1.97 | 3.9 | 4.4 | 8.6 | 4.3 | 8.5 | 4.3 | 8.5 | 4.3 | 8.5 | 2.1 | 4.1 | 1.62 | 3.1 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.13 | 0.19 | 0.08 | 0.13 | 0.14 | 0.21 | 0.32 | 0.63 | 0.43 | 0.81 | 0.4 | 0.79 | 0.4 | 0.79 | 0.4 | 0.79 | 0.17 | 0.24 | 0.06 | 0.08 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | 2.0 | **2.8** | 1.2 | 1.7 | **2.1** | 3.0 | **2.3** | **3.3** | **2.5** | **3.6** | **2.5** | **3.6** | **2.5** | **3.6** | **2.5** | **3.6** | **2.5** | **3.6** | 1.8 | 2.5 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 92 | 135 | 53 | 101 | 100 | 148 | 167 | 274 | 167 | 274 | 167 | 274 | 167 | 274 | 167 | 274 | 119 | 176 | 59 | 114 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | 0.816 | **1.3** | 0.59 | 1.1 | 0.89 | 1.42 | 0.96 | **1.53** | **1.06** | **1.69** | **1.06** | **1.69** | **1.06** | **1.69** | **1.06** | **1.69** | **1.06** | **1.69** | 0.43 | 0.62 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 3.7 | 7 | 2.2 | 4 | 4.0 | 8 | 4.3 | 8 | 4.8 | 9 | 4.8 | 9 | 4.8 | 9 | 4.8 | 9 | 4.8 | 9 | 3.2 | 7 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 20 | 37 | 13 | 30 | 21 | 41 | 23 | 44 | 25 | 49 | 25 | 49 | 25 | 49 | 25 | 49 | 25 | 49 | 17 | 35 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.024 | **0.039** | 0.024 | 0.039 | **0.026** | 0.043 | **0.028** | **0.047** | **0.031** | **0.051** | **0.031** | **0.051** | **0.031** | **0.051** | **0.031** | **0.051** | **0.031** | **0.051** | 0.014 | 0.027 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.36 | 0.45 | 0.22 | 0.36 | 0.39 | 0.49 | 0.42 | 0.53 | 0.47 | 0.59 | 0.47 | 0.59 | 0.47 | 0.59 | 0.47 | 0.59 | 0.47 | 0.59 | 0.38 | 0.48 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 1.7 | 2.6 | 1.0 | 1.7 | 1.8 | 2.8 | 1.9 | 3.0 | 2.1 | 3.3 | 2.1 | 3.3 | 2.1 | 3.3 | 2.1 | 3.3 | 2.1 | 3.3 | 1.2 | 1.5 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.18 | 0.32 | 0.1 | 0.21 | 0.2 | 0.34 | 0.21 | 0.37 | 0.24 | 0.41 | 0.24 | 0.41 | 0.24 | 0.41 | 0.24 | 0.41 | 0.24 | 0.41 | 0.19 | 0.3 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.065 | **0.112** | 0.038 | 0.064 | 0.07 | 0.122 | 0.076 | **0.132** | 0.084 | **0.145** | 0.084 | **0.145** | 0.084 | **0.145** | 0.084 | **0.145** | 0.084 | **0.145** | 0.039 | 0.06 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 80 | 168 | 47 | 104 | 87 | 183 | 94 | 198 | 104 | 218 | 104 | 218 | 104 | 218 | 104 | 218 | 104 | 218 | 70 | 128 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.039 | 0.052 | 0.023 | 0.036 | 0.042 | 0.056 | 0.046 | 0.061 | 0.05 | 0.067 | 0.05 | 0.067 | 0.05 | 0.067 | 0.05 | 0.067 | 0.05 | 0.067 | 0.026 | 0.039 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.26 | 0.36 | 0.26 | 0.36 | 0.28 | 0.4 | 0.3 | 0.43 | 0.33 | 0.47 | 0.33 | 0.47 | 0.33 | 0.47 | 0.33 | 0.47 | 0.33 | 0.47 | 0.26 | 0.36 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 0.62 | 0.9 | 0.42 | 0.65 | 0.68 | 1.03 | 0.81 | 1.21 | 13.05 | 24.39 | 12.17 | 24.16 | 12.17 | 24.16 | 12.17 | 24.16 | 0.81 | 1.22 | 0.15 | 0.26 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 17 | 22 | 11 | 16 | 18 | 24 | 19 | 26 | 21 | 29 | 21 | 29 | 21 | 29 | 21 | 29 | 21 | 29 | 0 | 0 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.059 | 0.078 | 0.036 | 0.052 | 0.06 | 0.08 | 0.07 | 0.09 | 0.077 | 0.101 | 0.077 | 0.101 | 0.077 | 0.101 | 0.077 | 0.101 | 0.077 | 0.101 | 0.059 | 0.078 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.33 | 0.53 | 0.19 | 0.38 | 0.36 | 0.58 | 0.46 | 0.71 | 1.37 | 2.4 | 1.31 | 2.38 | 1.31 | 2.38 | 1.31 | 2.38 | 0.43 | 0.69 | 0.33 | 0.53 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 4.2 | 7.9 | 2.5 | 5.5 | 4.5 | 8.6 | 4.9 | 9.3 | 5.4 | 10.2 | 5.4 | 10.2 | 5.4 | 10.2 | 5.4 | 10.2 | 5.4 | 10.2 | 3.8 | 6.0 |

**Table 7.4-A28: Observed and Predicted Concentrations at Lake B6**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 18 | 49 | **602** | 114 | 188 | 103 | 169 | 135 | 222 | 135 | 222 |
| Total Alkalinity | mg/L | | 14 | 29 | 362 | 63 | 99 | 57 | 89 | 74 | 116 | 74 | 116 |
| Total Suspended Solids | mg/L | 8 | 1 | <3 | 11 | 2.9 | 4.1 | 2.6 | 3.7 | 3.4 | 4.8 | 3.4 | 4.8 |
| Calcium | mg/L | | 4.8 | 11 | 154 | 23 | 34 | 21 | 31 | 28 | 41 | 28 | 41 |
| Chloride | mg/L | 120 | 1.9 | 5.6 | **241** | 21 | 30 | 19 | 27 | 24 | 35 | 24 | 35 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.02 | 0.07 | 0.036 | 0.05 | 0.033 | 0.045 | 0.043 | 0.059 | 0.043 | 0.059 |
| Magnesium | mg/L | | 0.67 | 1.3 | 33 | 3.4 | 4.8 | 3.0 | 4.3 | 4.0 | 5.7 | 4.0 | 5.7 |
| Potassium | mg/L | | 0.51 | 0.79 | 6.3 | 1.5 | 2.2 | 1.3 | 2.0 | 1.7 | 2.6 | 1.7 | 2.6 |
| Sodium | mg/L | 200 | 1.1 | 2.4 | 30 | 4.9 | 7.0 | 4.4 | 6.3 | 5.8 | 8.2 | 5.8 | 8.2 |
| Sulphate | mg/L | 500 | 1 | 3 | 44 | 5.8 | 9.5 | 5.2 | 8.5 | 6.8 | 11.2 | 6.8 | 11.2 |
| Ammonia (as N) | mg/L | 7 | 0.003 | 0.02 | 0.46 | 0.051 | 0.078 | 0.046 | 0.07 | 0.06 | 0.091 | 0.06 | 0.091 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.2 | 0.019 | 0.027 | 0.017 | 0.025 | 0.022 | 0.032 | 1.2 | 1.6 |
| Total Kjeldahl Nitrogen | mg/L | | 0.13 | 0.37 | 1.8 | 0.56 | 0.85 | 0.5 | 0.77 | 0.66 | 1.0 | 0.66 | 1.0 |
| Dissolved Phosphorus | mg/L | | <0.001 | 0.01 | 0.02 | 0.0058 | 0.0084 | 0.0052 | 0.0075 | 0.0068 | 0.0099 | 0.0068 | 0.0099 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00078 | 0.00118 | 0.00071 | 0.00107 | 0.00093 | 0.0014 | 0.00093 | 0.0014 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.8 | 2.6 | 2 | 2 | 2 | 3 | 2 | 3 |
| Total Aluminum | µg/L | 100 | <0.3 | 2.9 | 36 | 3.5 | 5.2 | 3.1 | 4.7 | 4.1 | 6.1 | 54 | 92 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.17 | 0.29 | 0.16 | 0.26 | 0.2 | 0.34 | 0.2 | 0.34 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.2 | **11** | 1.5 | 2.1 | 1.4 | 1.9 | 1.8 | 2.5 | 1.8 | 2.5 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 232 | 28 | 64 | 26 | 58 | 33 | 75 | 33 | 75 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.18 | 0.25 | 0.16 | 0.23 | 0.21 | 0.3 | 0.21 | 0.3 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.065 | 0.097 | 0.058 | 0.088 | 0.076 | 0.115 | 0.076 | 0.115 |
| Total Boron | µg/L | 1500 | 2 | 6.8 | <100 | 17 | 24 | 15 | 22 | 20 | 29 | 20 | 29 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.05** | **22** | **0.47** | **0.72** | 0.47 | 0.72 | **0.56** | **0.85** | **0.56** | **0.85** |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 1.06 | 2.4 | 0.95 | 2.1 | 1.25 | 2.8 | 1.25 | 2.8 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.15 | 0.21 | 0.14 | 0.19 | 0.18 | 0.25 | 0.18 | 0.25 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **<10** | 1.8 | **2.5** | 1.6 | 2.2 | **2.1** | **2.9** | **2.1** | **2.9** |
| Total Iron | µg/L | 300 | 3.9 | 103 | **610** | 124 | 159 | 112 | 143 | 146 | 188 | 164 | 229 |
| Total Lead | µg/L | 1 | <0.05 | 0.06 | **3.1** | 0.201 | 0.29 | 0.18 | 0.26 | 0.24 | 0.34 | 0.24 | 0.34 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 3.8 | 12 | 3.4 | 11 | 4.5 | 14 | 4.5 | 14 |
| Total Manganese | µg/L | 50 | <0.1 | 9.2 | **432** | 39 | **121** | 35 | 109 | 46 | **143** | 46 | **143** |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.010 | 0.025 | 0.009 | 0.023 | 0.012 | **0.03** | 0.012 | **0.03** |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.27 | 0.39 | 0.24 | 0.35 | 0.32 | 0.46 | 0.32 | 0.46 |
| Total Nickel | µg/L | 29 | <0.1 | 0.95 | <20 | 2.0 | 2.7 | 1.8 | 2.4 | 2.3 | 3.1 | 2.3 | 3.1 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.16 | 0.24 | 0.14 | 0.21 | 0.19 | 0.28 | 0.19 | 0.28 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.042 | 0.059 | 0.037 | 0.053 | 0.049 | 0.07 | 0.049 | 0.07 |
| Total Strontium | µg/L | | <0.1 | 50 | 892 | 157 | 266 | 142 | 239 | 186 | 313 | 186 | 313 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.043 | 0.063 | 0.039 | 0.057 | 0.051 | 0.075 | 0.051 | 0.075 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.26 | 0.36 | 0.23 | 0.33 | 0.3 | 0.43 | 0.3 | 0.43 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.66 | 1.2 | 0.6 | 1.09 | 0.78 | 1.43 | 4.26 | 8.82 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 54 | 77 | 49 | 70 | 64 | 91 | 64 | 91 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.075 | 0.111 | 0.068 | 0.099 | 0.09 | 0.13 | 0.089 | 0.13 |
| Total Vanadium | µg/L | | <0.05 | 0.3 | 2.4 | 0.36 | 0.56 | 0.33 | 0.51 | 0.43 | 0.67 | 0.43 | 0.67 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **50** | 5.1 | 8.9 | 4.6 | 8.0 | 6.0 | 10.5 | 6.0 | 10.5 |

**Table 7.4-A29: Observed and Predicted Concentrations at Lake B5**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 18 | 49 | **602** | 102 | 156 | 79 | 133 | 88 | 131 | 92 | 136 | 52 | 70 |
| Total Alkalinity | mg/L | | 14 | 29 | 362 | 56 | 81 | 41 | 69 | 42 | 58 | 44 | 63 | 26 | 40 |
| Total Suspended Solids | mg/L | 8 | 1 | <3 | 11 | 2.7 | 3.5 | 1.9 | 3.2 | 2.1 | 2.7 | 2.3 | 3.0 | 0.0 | 1.2 |
| Calcium | mg/L | | 4.8 | 11 | 154 | 21 | 28 | 16 | 31 | 18 | 24 | 19 | 26 | 4 | 11 |
| Chloride | mg/L | 120 | 1.9 | 5.6 | **241** | 16 | 23 | 12 | 23 | 9 | 15 | 10 | 13 | 9 | 12 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.02 | 0.07 | 0.033 | 0.043 | 0.026 | 0.044 | 0.029 | 0.036 | 0.031 | 0.04 | 0.001 | 0.015 |
| Magnesium | mg/L | | 0.67 | 1.3 | 33 | 3.0 | 4.0 | 2.3 | 3.8 | 2.4 | 3.1 | 2.6 | 3.5 | 0.8 | 1.6 |
| Potassium | mg/L | | 0.51 | 0.79 | 6.3 | 1.4 | 1.9 | 1.0 | 1.8 | 1.2 | 1.6 | 1.3 | 1.8 | 0.7 | 1.0 |
| Sodium | mg/L | 200 | 1.1 | 2.4 | 30 | 4.5 | 5.9 | 3.4 | 4.9 | 3.7 | 4.9 | 4.0 | 5.4 | 2.4 | 3.1 |
| Sulphate | mg/L | 500 | 1 | 3 | 44 | 4.9 | 7.4 | 3.9 | 6.8 | 3.4 | 5.1 | 3.7 | 5.4 | 4.9 | 6.3 |
| Ammonia (as N) | mg/L | 7 | 0.003 | 0.02 | 0.46 | 0.046 | 0.066 | 0.035 | 0.071 | 0.036 | 0.053 | 0.039 | 0.057 | 0.046 | 0.066 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.2 | 0.016 | 0.022 | 0.012 | 0.018 | 0.012 | 0.018 | 1.2 | 1.6 | 0.0 | 0.0 |
| Total Kjeldahl Nitrogen | mg/L | | 0.13 | 0.37 | 1.8 | 0.51 | 0.73 | 0.4 | 0.66 | 0.44 | 0.6 | 0.47 | 0.66 | 0.3 | 0.39 |
| Dissolved Phosphorus | mg/L | | <0.001 | 0.01 | 0.02 | 0.0054 | 0.0072 | 0.0041 | 0.0073 | 0.0045 | 0.0057 | 0.0048 | 0.0063 | 0.0056 | 0.0073 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00069 | 0.00097 | 0.00053 | 0.00097 | 0.00052 | 0.0007 | 0.00053 | 0.00075 | 0.0000 | 0.00032 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.5 | 1.9 | 1 | 2 | 1 | 1 | 1 | 2 | 0 | 0 |
| Total Aluminum | µg/L | 100 | <0.3 | 2.9 | 36 | 3.5 | 5.2 | 2.6 | 4.2 | 2.7 | 4.0 | 54 | 92 | 2.7 | 4.0 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.14 | 0.21 | 0.11 | 0.18 | 0.11 | 0.16 | 0.09 | 0.13 | 0.15 | 0.19 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.2 | **11** | 1.4 | 1.7 | 1.1 | 1.8 | 1.2 | 1.6 | 1.2 | 1.5 | 1.4 | 1.7 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 232 | 29 | 64 | 21 | 64 | 25 | 64 | 27 | 49 | 9 | 34 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.16 | 0.22 | 0.12 | 0.2 | 0.14 | 0.19 | 0.14 | 0.19 | 0.0 | 0.07 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.052 | 0.071 | 0.04 | 0.071 | 0.034 | 0.047 | 0.038 | 0.052 | 0.00 | 0.013 |
| Total Boron | µg/L | 1500 | 2 | 6.8 | <100 | 12 | 17 | 9 | 16 | 7 | 9 | 7 | 10 | 5 | 6 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.05** | **22** | **0.298** | **0.422** | 0.298 | 0.422 | 0.298 | 0.422 | 0.298 | 0.422 | 0.298 | 0.422 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.97 | 1.8 | 0.65 | 1.7 | 0.65 | 1.7 | 0.81 | 1.8 | 0.89 | 1.2 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.13 | 0.18 | 0.1 | 0.18 | 0.1 | 0.18 | 0.12 | 0.16 | 0.04 | 0.08 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **<10** | 1.6 | **2.0** | 1.2 | 2.1 | 1.2 | 1.6 | 1.3 | 1.7 | 1.3 | 1.7 |
| Total Iron | µg/L | 300 | 3.9 | 103 | **610** | 124 | 159 | 124 | 159 | 124 | 159 | 164 | 229 | 11 | 66 |
| Total Lead | µg/L | 1 | <0.05 | 0.06 | **3.1** | 0.15 | 0.2 | 0.11 | 0.22 | 0.11 | 0.22 | 0.09 | 0.12 | 0.11 | 0.22 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 3.9 | 11 | 2.9 | 10 | 3.7 | 11 | 3.9 | 11 | 0.0 | 2 |
| Total Manganese | µg/L | 50 | <0.1 | 9.2 | **432** | 35 | **88** | 27 | 89 | 23 | 72 | 24 | 74 | 3 | 33 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.0115 | 0.025 | 0.009 | 0.025 | 0.012 | 0.025 | 0.012 | 0.025 | 0.00 | 0.011 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.25 | 0.33 | 0.2 | 0.36 | 0.21 | 0.3 | 0.23 | 0.31 | 0.23 | 0.31 |
| Total Nickel | µg/L | 29 | <0.1 | 0.95 | <20 | 1.7 | 2.1 | 1.3 | 2.3 | 1.4 | 1.7 | 1.4 | 1.7 | 0.7 | 1.3 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.14 | 0.19 | 0.11 | 0.19 | 0.13 | 0.17 | 0.13 | 0.18 | 0.04 | 0.08 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.04 | 0.052 | 0.03 | 0.045 | 0.036 | 0.046 | 0.037 | 0.049 | 0.00 | 0.018 |
| Total Strontium | µg/L | | <0.1 | 50 | 892 | 144 | 231 | 104 | 196 | 123 | 196 | 131 | 216 | 39 | 77 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.04 | 0.055 | 0.031 | 0.052 | 0.038 | 0.052 | 0.038 | 0.052 | 0.00 | 0.018 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.23 | 0.3 | 0.18 | 0.3 | 0.2 | 0.26 | 0.21 | 0.28 | 0.03 | 0.11 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.53 | 0.9 | 0.41 | 0.81 | 0.33 | 0.55 | 2.94 | 5.03 | 0.01 | 0.14 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 34 | 45 | 25 | 49 | 8 | 11 | 9 | 12 | 0 | 0 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.065 | 0.09 | 0.051 | 0.068 | 0.05 | 0.07 | 0.051 | 0.068 | 0.051 | 0.068 |
| Total Vanadium | µg/L | | <0.05 | 0.3 | 2.4 | 0.33 | 0.49 | 0.25 | 0.43 | 0.27 | 0.41 | 0.27 | 0.41 | 0.27 | 0.41 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **50** | 4.2 | 6.7 | 3.3 | 6.8 | 2.3 | 4.7 | 2.5 | 4.7 | 2.1 | 3.3 |

**Table 7.4-A30: Observed Predicted Concentrations at Lake B46**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 18 | 49 | **602** | 101 | 182 | 100 | 183 | 101 | 183 | 100 | 175 | 101 | 186 | 102 | 181 | 102 | 181 | 102 | 181 | 102 | 181 | 105 | 179 |
| Total Alkalinity | mg/L | | 14 | 29 | 362 | 52 | 77 | 52 | 76 | 52 | 76 | 51 | 78 | 51 | 78 | 51 | 79 | 51 | 79 | 51 | 79 | 51 | 79 | 53 | 79 |
| Total Suspended Solids | mg/L | 8 | 1 | <3 | 11 | 2.5 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.5 | 3.5 | 2.5 | 3.6 | 2.5 | 3.6 | 2.5 | 3.6 | 2.5 | 3.6 | 2.6 | 3.7 |
| Calcium | mg/L | | 4.8 | 11 | 154 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 33 | 21 | 33 | 21 | 33 | 21 | 32 | 22 | 34 |
| Chloride | mg/L | 120 | 1.9 | 5.6 | **241** | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 20 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.02 | 0.07 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.047 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.033 | 0.049 |
| Magnesium | mg/L | | 0.67 | 1.3 | 33 | 2.8 | 4.1 | 2.8 | 4.1 | 2.8 | 4.1 | 2.8 | 4.1 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.3 |
| Potassium | mg/L | | 0.51 | 0.79 | 6.3 | 1.3 | 2.1 | 1.3 | 2.1 | 1.3 | 2.1 | 1.3 | 2.1 | 1.4 | 2.3 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 |
| Sodium | mg/L | 200 | 1.1 | 2.4 | 30 | 4.3 | 6.5 | 4.3 | 6.5 | 4.3 | 6.5 | 4.3 | 6.5 | 4.4 | 6.6 | 4.4 | 6.6 | 4.4 | 6.6 | 4.4 | 6.6 | 4.4 | 6.6 | 4.5 | 6.7 |
| Sulphate | mg/L | 500 | 1 | 3 | 44 | 4.3 | 7.3 | 4.3 | 7.3 | 4.3 | 7.3 | 4.2 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.4 | 7.4 |
| Ammonia (as N) | mg/L | 7 | 0.003 | 0.02 | 0.46 | 0.043 | 0.066 | 0.043 | 0.066 | 0.043 | 0.066 | 0.043 | 0.068 | 0.043 | 0.068 | 0.043 | 0.069 | 0.043 | 0.069 | 0.043 | 0.069 | 0.043 | 0.069 | 0.044 | 0.071 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.2 | 0.014 | 0.024 | 0.015 | 0.024 | 0.015 | 0.025 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 0.014 | 0.024 | 0.015 | 0.024 |
| Total Kjeldahl Nitrogen | mg/L | | 0.13 | 0.37 | 1.8 | 0.49 | 0.79 | 0.49 | 0.79 | 0.49 | 0.79 | 0.49 | 0.79 | 0.49 | 0.8 | 0.49 | 0.81 | 0.49 | 0.81 | 0.49 | 0.81 | 0.49 | 0.81 | 0.51 | 0.83 |
| Dissolved Phosphorus | mg/L | | <0.001 | 0.01 | 0.02 | 0.0051 | 0.0075 | 0.0051 | 0.0075 | 0.0051 | 0.0075 | 0.005 | 0.0075 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0052 | 0.0079 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00063 | 0.00095 | 0.00063 | 0.00095 | 0.00063 | 0.00095 | 0.00062 | 0.00095 | 0.00062 | 0.00096 | 0.00063 | 0.00096 | 0.00063 | 0.00096 | 0.00063 | 0.00096 | 0.00063 | 0.00096 | 0.00065 | 0.001 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.1 |
| Total Aluminum | µg/L | 100 | <0.3 | 2.9 | 36 | 3.1 | 5.0 | 3.1 | 5.0 | 3.3 | 5.3 | 54 | 92 | 54 | 92 | 54 | 92 | 54 | 92 | 54 | 92 | 3.0 | 5.0 | 3.2 | 5.2 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.11 | 0.2 | 0.11 | 0.19 | 0.11 | 0.19 | 0.12 | 0.2 | 0.12 | 0.2 | 0.12 | 0.21 | 0.12 | 0.21 | 0.12 | 0.21 | 0.11 | 0.2 | 0.12 | 0.21 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.2 | **11** | 1.2 | 1.8 | 1.2 | 1.8 | 1.2 | 1.8 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.2 | 1.8 | 1.3 | 1.8 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 232 | 25 | 64 | 25 | 64 | 25 | 64 | 24 | 62 | 25 | 62 | 25 | 62 | 25 | 62 | 25 | 62 | 25 | 61 | 26 | 62 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.23 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.048 | 0.075 | 0.048 | 0.075 | 0.048 | 0.076 | 0.048 | 0.076 | 0.049 | 0.076 | 0.049 | 0.077 | 0.049 | 0.077 | 0.049 | 0.077 | 0.049 | 0.077 | 0.049 | 0.076 |
| Total Boron | µg/L | 1500 | 2 | 6.8 | <100 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.05** | **22** | **0.066** | **0.092** | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.76 | 2.5 | 0.75 | 2.5 | 0.75 | 2.5 | 0.85 | 2.5 | 0.9 | 2.6 | 0.9 | 2.5 | 0.9 | 2.5 | 0.9 | 2.5 | 0.73 | 2.4 | 0.79 | 2.3 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.12 | 0.17 | 0.12 | 0.17 | 0.12 | 0.17 | 0.14 | 0.2 | 0.14 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.12 | 0.18 | 0.12 | 0.18 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **<10** | 1.4 | **2.0** | 1.4 | 2.0 | 1.5 | 2.1 | 1.5 | 2.1 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.4 | 2.1 | 1.5 | 2.2 |
| Total Iron | µg/L | 300 | 3.9 | 103 | **610** | 115 | 172 | 116 | 171 | 116 | 171 | 168 | 260 | 168 | 260 | 168 | 260 | 168 | 260 | 168 | 260 | 116 | 173 | 120 | 174 |
| Total Lead | µg/L | 1 | <0.05 | 0.06 | **3.1** | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.11 | 0.17 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 3.7 | 15 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 4.1 | 14 |
| Total Manganese | µg/L | 50 | <0.1 | 9.2 | **432** | 25 | **101** | 24 | 101 | 25 | 102 | 24 | 101 | 25 | 101 | 25 | 101 | 25 | 101 | 25 | 101 | 24 | 100 | 27 | 98 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.0108 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.01 | 0.025 | 0.01 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.011 | 0.026 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.25 | 0.38 |
| Total Nickel | µg/L | 29 | <0.1 | 0.95 | <20 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.6 | 2.3 | 1.6 | 2.3 | 1.6 | 2.3 | 1.6 | 2.3 | 1.5 | 2.2 | 1.6 | 2.3 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.037 | 0.054 | 0.037 | 0.054 | 0.039 | 0.057 | 0.038 | 0.055 | 0.037 | 0.056 | 0.038 | 0.056 | 0.038 | 0.056 | 0.038 | 0.056 | 0.037 | 0.055 | 0.038 | 0.058 |
| Total Strontium | µg/L | | <0.1 | 50 | 892 | 139 | 249 | 140 | 249 | 141 | 249 | 140 | 255 | 141 | 250 | 142 | 259 | 142 | 259 | 142 | 259 | 142 | 259 | 147 | 273 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.039 | 0.06 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.059 | 0.041 | 0.062 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.34 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.49 | 1.0 | 0.48 | 1.03 | 0.49 | 1.03 | 2.96 | 6.38 | 3.98 | 8.5 | 3.99 | 8.5 | 3.99 | 8.5 | 3.99 | 8.5 | 0.5 | 1.05 | 0.49 | 1.01 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 23 | 35 | 23 | 35 | 23 | 35 | 23 | 35 | 23 | 35 | 24 | 36 | 24 | 36 | 24 | 36 | 24 | 36 | 22 | 33 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.059 | 0.092 | 0.058 | 0.092 | 0.06 | 0.09 | 0.057 | 0.093 | 0.058 | 0.094 | 0.058 | 0.094 | 0.058 | 0.094 | 0.058 | 0.094 | 0.057 | 0.093 | 0.06 | 0.095 |
| Total Vanadium | µg/L | | <0.05 | 0.3 | 2.4 | 0.29 | 0.5 | 0.29 | 0.5 | 0.3 | 0.53 | 0.38 | 0.67 | 0.42 | 0.74 | 0.42 | 0.75 | 0.42 | 0.75 | 0.42 | 0.75 | 0.29 | 0.49 | 0.3 | 0.52 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **50** | 3.3 | 6.4 | 3.3 | 6.4 | 3.3 | 6.4 | 3.3 | 6.7 | 3.4 | 6.7 | 3.4 | 6.7 | 3.4 | 6.7 | 3.4 | 6.7 | 3.3 | 6.4 | 3.4 | 6.6 |

**Table 7.4-A31: Observed Predicted Concentrations at Lake B45**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 18 | 49 | **602** | 101 | 182 | 100 | 183 | 101 | 183 | 100 | 175 | 101 | 186 | 102 | 181 | 102 | 181 | 102 | 181 | 102 | 181 | 105 | 179 |
| Total Alkalinity | mg/L | | 14 | 29 | 362 | 52 | 77 | 52 | 76 | 52 | 76 | 51 | 78 | 51 | 78 | 51 | 79 | 51 | 79 | 51 | 79 | 51 | 79 | 53 | 79 |
| Total Suspended Solids | mg/L | 8 | 1 | <3 | 11 | 2.5 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.5 | 3.5 | 2.5 | 3.6 | 2.5 | 3.6 | 2.5 | 3.6 | 2.5 | 3.6 | 2.6 | 3.7 |
| Calcium | mg/L | | 4.8 | 11 | 154 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 33 | 21 | 33 | 21 | 33 | 21 | 32 | 22 | 34 |
| Chloride | mg/L | 120 | 1.9 | 5.6 | **241** | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 20 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.02 | 0.07 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.047 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.032 | 0.048 | 0.033 | 0.049 |
| Magnesium | mg/L | | 0.67 | 1.3 | 33 | 2.8 | 4.1 | 2.8 | 4.1 | 2.8 | 4.1 | 2.8 | 4.1 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.9 | 4.3 |
| Potassium | mg/L | | 0.51 | 0.79 | 6.3 | 1.3 | 2.1 | 1.3 | 2.1 | 1.3 | 2.1 | 1.3 | 2.1 | 1.4 | 2.3 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 |
| Sodium | mg/L | 200 | 1.1 | 2.4 | 30 | 4.3 | 6.5 | 4.3 | 6.5 | 4.3 | 6.5 | 4.3 | 6.5 | 4.4 | 6.6 | 4.4 | 6.6 | 4.4 | 6.6 | 4.4 | 6.6 | 4.4 | 6.6 | 4.5 | 6.7 |
| Sulphate | mg/L | 500 | 1 | 3 | 44 | 4.3 | 7.3 | 4.3 | 7.3 | 4.3 | 7.3 | 4.2 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.3 | 7.2 | 4.4 | 7.4 |
| Ammonia (as N) | mg/L | 7 | 0.003 | 0.02 | 0.46 | 0.043 | 0.066 | 0.043 | 0.066 | 0.043 | 0.066 | 0.043 | 0.068 | 0.043 | 0.068 | 0.043 | 0.069 | 0.043 | 0.069 | 0.043 | 0.069 | 0.043 | 0.069 | 0.044 | 0.071 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.2 | 0.014 | 0.024 | 0.015 | 0.024 | 0.015 | 0.025 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 0.014 | 0.024 | 0.015 | 0.024 |
| Total Kjeldahl Nitrogen | mg/L | | 0.13 | 0.37 | 1.8 | 0.49 | 0.79 | 0.49 | 0.79 | 0.49 | 0.79 | 0.49 | 0.79 | 0.49 | 0.8 | 0.49 | 0.81 | 0.49 | 0.81 | 0.49 | 0.81 | 0.49 | 0.81 | 0.51 | 0.83 |
| Dissolved Phosphorus | mg/L | | <0.001 | 0.01 | 0.02 | 0.0051 | 0.0075 | 0.0051 | 0.0075 | 0.0051 | 0.0075 | 0.005 | 0.0075 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0051 | 0.0076 | 0.0052 | 0.0079 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00063 | 0.00095 | 0.00063 | 0.00095 | 0.00063 | 0.00095 | 0.00062 | 0.00095 | 0.00062 | 0.00096 | 0.00063 | 0.00096 | 0.00063 | 0.00096 | 0.00063 | 0.00096 | 0.00063 | 0.00096 | 0.00065 | 0.001 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.1 |
| Total Aluminum | µg/L | 100 | <0.3 | 2.9 | 36 | 3.1 | 5.0 | 3.1 | 5.0 | 3.3 | 5.3 | 54 | 92 | 54 | 92 | 54 | 92 | 54 | 92 | 54 | 92 | 3.0 | 5.0 | 3.2 | 5.2 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.11 | 0.2 | 0.11 | 0.19 | 0.11 | 0.19 | 0.12 | 0.2 | 0.12 | 0.2 | 0.12 | 0.21 | 0.12 | 0.21 | 0.12 | 0.21 | 0.11 | 0.2 | 0.12 | 0.21 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.2 | **11** | 1.2 | 1.8 | 1.2 | 1.8 | 1.2 | 1.8 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.2 | 1.8 | 1.3 | 1.8 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 232 | 25 | 64 | 25 | 64 | 25 | 64 | 24 | 62 | 25 | 62 | 25 | 62 | 25 | 62 | 25 | 62 | 25 | 61 | 26 | 62 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.22 | 0.16 | 0.23 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.048 | 0.075 | 0.048 | 0.075 | 0.048 | 0.076 | 0.048 | 0.076 | 0.049 | 0.076 | 0.049 | 0.077 | 0.049 | 0.077 | 0.049 | 0.077 | 0.049 | 0.077 | 0.049 | 0.076 |
| Total Boron | µg/L | 1500 | 2 | 6.8 | <100 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 | 11 | 18 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.05** | **22** | **0.066** | **0.092** | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 | 0.067 | 0.092 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.76 | 2.5 | 0.75 | 2.5 | 0.75 | 2.5 | 0.85 | 2.5 | 0.9 | 2.6 | 0.9 | 2.5 | 0.9 | 2.5 | 0.9 | 2.5 | 0.73 | 2.4 | 0.79 | 2.3 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.12 | 0.17 | 0.12 | 0.17 | 0.12 | 0.17 | 0.14 | 0.2 | 0.14 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.12 | 0.18 | 0.12 | 0.18 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **<10** | 1.4 | **2.0** | 1.4 | 2.0 | 1.5 | 2.1 | 1.5 | 2.1 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.4 | 2.1 | 1.5 | 2.2 |
| Total Iron | µg/L | 300 | 3.9 | 103 | **610** | 115 | 172 | 116 | 171 | 116 | 171 | 168 | 260 | 168 | 260 | 168 | 260 | 168 | 260 | 168 | 260 | 116 | 173 | 120 | 174 |
| Total Lead | µg/L | 1 | <0.05 | 0.06 | **3.1** | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.1 | 0.16 | 0.11 | 0.17 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 3.7 | 15 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 3.8 | 15 | 4.1 | 14 |
| Total Manganese | µg/L | 50 | <0.1 | 9.2 | **432** | 25 | **101** | 24 | 101 | 25 | 102 | 24 | 101 | 25 | 101 | 25 | 101 | 25 | 101 | 25 | 101 | 24 | 100 | 27 | 98 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.0108 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.01 | 0.025 | 0.01 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.011 | 0.025 | 0.011 | 0.026 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.25 | 0.38 |
| Total Nickel | µg/L | 29 | <0.1 | 0.95 | <20 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.5 | 2.2 | 1.6 | 2.3 | 1.6 | 2.3 | 1.6 | 2.3 | 1.6 | 2.3 | 1.5 | 2.2 | 1.6 | 2.3 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 | 0.14 | 0.23 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.037 | 0.054 | 0.037 | 0.054 | 0.039 | 0.057 | 0.038 | 0.055 | 0.037 | 0.056 | 0.038 | 0.056 | 0.038 | 0.056 | 0.038 | 0.056 | 0.037 | 0.055 | 0.038 | 0.058 |
| Total Strontium | µg/L | | <0.1 | 50 | 892 | 139 | 249 | 140 | 249 | 141 | 249 | 140 | 255 | 141 | 250 | 142 | 259 | 142 | 259 | 142 | 259 | 142 | 259 | 147 | 273 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.039 | 0.06 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.059 | 0.041 | 0.062 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.33 | 0.23 | 0.34 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.49 | 1.0 | 0.48 | 1.03 | 0.49 | 1.03 | 2.96 | 6.38 | 3.98 | 8.5 | 3.99 | 8.5 | 3.99 | 8.5 | 3.99 | 8.5 | 0.5 | 1.05 | 0.49 | 1.01 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 23 | 35 | 23 | 35 | 23 | 35 | 23 | 35 | 23 | 35 | 24 | 36 | 24 | 36 | 24 | 36 | 24 | 36 | 22 | 33 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.059 | 0.092 | 0.058 | 0.092 | 0.06 | 0.09 | 0.057 | 0.093 | 0.058 | 0.094 | 0.058 | 0.094 | 0.058 | 0.094 | 0.058 | 0.094 | 0.057 | 0.093 | 0.06 | 0.095 |
| Total Vanadium | µg/L | | <0.05 | 0.3 | 2.4 | 0.29 | 0.5 | 0.29 | 0.5 | 0.3 | 0.53 | 0.38 | 0.67 | 0.42 | 0.74 | 0.42 | 0.75 | 0.42 | 0.75 | 0.42 | 0.75 | 0.29 | 0.49 | 0.3 | 0.52 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **50** | 3.3 | 6.4 | 3.3 | 6.4 | 3.3 | 6.4 | 3.3 | 6.7 | 3.4 | 6.7 | 3.4 | 6.7 | 3.4 | 6.7 | 3.4 | 6.7 | 3.3 | 6.4 | 3.4 | 6.6 |

**Table 7.4-A32: Observed and Predicted Concentrations at Lake P2**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Year 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 18 | 49 | **602** | 108 | 200 | 99 | 165 | 99 | 165 | 99 | 159 | 101 | 170 | 102 | 166 | 102 | 166 | 102 | 166 | 102 | 166 | 108 | 200 |
| Total Alkalinity | mg/L | | 14 | 29 | 362 | 52 | 77 | 49 | 72 | 49 | 72 | 48 | 73 | 49 | 75 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 52 | 77 |
| Total Suspended Solids | mg/L | 8 | 1 | <3 | 11 | 2.5 | 3.6 | 2.4 | 3.3 | 2.4 | 3.3 | 2.4 | 3.3 | 2.4 | 3.4 | 2.4 | 3.4 | 2.4 | 3.4 | 2.4 | 3.4 | 2.4 | 3.4 | 2.5 | 3.6 |
| Calcium | mg/L | | 4.8 | 11 | 154 | 22 | 35 | 20 | 30 | 20 | 30 | 20 | 30 | 21 | 30 | 21 | 31 | 21 | 31 | 21 | 31 | 21 | 30 | 22 | 35 |
| Chloride | mg/L | 120 | 1.9 | 5.6 | **241** | 13 | 19 | 13 | 18 | 13 | 18 | 12 | 18 | 13 | 18 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.02 | 0.07 | 0.034 | 0.052 | 0.031 | 0.044 | 0.031 | 0.044 | 0.031 | 0.043 | 0.032 | 0.044 | 0.032 | 0.045 | 0.032 | 0.045 | 0.032 | 0.045 | 0.032 | 0.045 | 0.034 | 0.052 |
| Magnesium | mg/L | | 0.67 | 1.3 | 33 | 3.1 | 4.7 | 2.8 | 3.9 | 2.8 | 3.9 | 2.8 | 3.9 | 2.8 | 4.0 | 2.9 | 4.1 | 2.9 | 4.1 | 2.9 | 4.1 | 2.8 | 4.0 | 3.1 | 4.7 |
| Potassium | mg/L | | 0.51 | 0.79 | 6.3 | 1.4 | 2.2 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 2.0 | 1.3 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.3 | 2.1 | 1.4 | 2.2 |
| Sodium | mg/L | 200 | 1.1 | 2.4 | 30 | 4.6 | 7.2 | 4.3 | 5.9 | 4.2 | 5.9 | 4.3 | 5.9 | 4.4 | 6.1 | 4.4 | 6.2 | 4.4 | 6.2 | 4.4 | 6.2 | 4.4 | 6.1 | 4.6 | 7.2 |
| Sulphate | mg/L | 500 | 1 | 3 | 44 | 4.4 | 7.6 | 4.2 | 6.6 | 4.2 | 6.5 | 4.2 | 6.7 | 4.3 | 6.6 | 4.3 | 6.6 | 4.3 | 6.6 | 4.3 | 6.6 | 4.3 | 6.6 | 4.4 | 7.6 |
| Ammonia (as N) | mg/L | 7 | 0.003 | 0.02 | 0.46 | 0.044 | 0.068 | 0.042 | 0.067 | 0.042 | 0.067 | 0.041 | 0.068 | 0.042 | 0.069 | 0.042 | 0.069 | 0.042 | 0.069 | 0.042 | 0.069 | 0.042 | 0.069 | 0.044 | 0.068 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.2 | 0.015 | 0.025 | 0.014 | 0.022 | 0.014 | 0.022 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 0.014 | 0.022 | 0.015 | 0.025 |
| Total Kjeldahl Nitrogen | mg/L | | 0.13 | 0.37 | 1.8 | 0.51 | 0.84 | 0.48 | 0.74 | 0.48 | 0.74 | 0.48 | 0.73 | 0.48 | 0.76 | 0.49 | 0.76 | 0.49 | 0.76 | 0.49 | 0.76 | 0.49 | 0.76 | 0.51 | 0.84 |
| Dissolved Phosphorus | mg/L | | <0.001 | 0.01 | 0.02 | 0.0052 | 0.0078 | 0.0049 | 0.007 | 0.005 | 0.007 | 0.0049 | 0.007 | 0.005 | 0.0071 | 0.005 | 0.0072 | 0.005 | 0.0072 | 0.005 | 0.0072 | 0.005 | 0.0072 | 0.0052 | 0.0078 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00064 | 0.00096 | 0.0006 | 0.0009 | 0.00061 | 0.0009 | 0.0006 | 0.0009 | 0.00061 | 0.00093 | 0.00061 | 0.00093 | 0.00061 | 0.00093 | 0.00061 | 0.00093 | 0.00061 | 0.00093 | 0.00064 | 0.00096 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.7 | 2.7 | 1.7 | 2.8 | 1.6 | 2.8 | 1.7 | 2.8 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 |
| Total Aluminum | µg/L | 100 | <0.3 | 2.9 | 36 | 2.9 | 4.9 | 3.0 | 4.6 | 3.0 | 4.6 | 51 | 94 | 51 | 94 | 51 | 94 | 51 | 94 | 51 | 94 | 3.0 | 4.9 | 2.9 | 4.9 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.11 | 0.2 | 0.11 | 0.17 | 0.11 | 0.17 | 0.11 | 0.18 | 0.12 | 0.19 | 0.12 | 0.19 | 0.12 | 0.19 | 0.12 | 0.19 | 0.11 | 0.18 | 0.11 | 0.2 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.2 | **11** | 1.2 | 1.8 | 1.2 | 1.7 | 1.2 | 1.7 | 1.3 | 1.8 | 1.3 | 1.8 | 1.3 | 1.8 | 1.3 | 1.8 | 1.3 | 1.8 | 1.2 | 1.7 | 1.2 | 1.8 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 232 | 21 | 64 | 21 | 64 | 21 | 64 | 21 | 50 | 21 | 50 | 21 | 50 | 21 | 50 | 21 | 50 | 21 | 50 | 21 | 64 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.16 | 0.23 | 0.15 | 0.2 | 0.15 | 0.2 | 0.15 | 0.2 | 0.15 | 0.21 | 0.15 | 0.21 | 0.15 | 0.21 | 0.15 | 0.21 | 0.15 | 0.21 | 0.16 | 0.23 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.06 | 0.098 | 0.047 | 0.071 | 0.047 | 0.072 | 0.047 | 0.072 | 0.049 | 0.073 | 0.049 | 0.074 | 0.049 | 0.074 | 0.049 | 0.074 | 0.049 | 0.074 | 0.06 | 0.098 |
| Total Boron | µg/L | 1500 | 2 | 6.8 | <100 | 16 | 24 | 11 | 17 | 11 | 17 | 11 | 17 | 11 | 17 | 11 | 17 | 11 | 17 | 11 | 17 | 11 | 17 | 16 | 24 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.05** | **22** | **0.061** | **0.091** | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 | 0.061 | 0.091 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.68 | 2.3 | 0.74 | 2.2 | 0.74 | 2.2 | 0.83 | 2.3 | 0.9 | 2.3 | 0.9 | 2.0 | 0.9 | 2.0 | 0.9 | 2.0 | 0.75 | 1.9 | 0.68 | 2.3 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.12 | 0.18 | 0.12 | 0.16 | 0.12 | 0.16 | 0.13 | 0.19 | 0.14 | 0.2 | 0.14 | 0.21 | 0.14 | 0.21 | 0.14 | 0.21 | 0.12 | 0.17 | 0.12 | 0.18 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **<10** | 1.5 | **2.1** | 1.4 | 1.9 | 1.4 | 1.9 | 1.5 | 2.0 | 1.5 | 2.0 | 1.5 | 2.1 | 1.5 | 2.1 | 1.5 | 2.1 | 1.4 | 2.0 | 1.5 | 2.1 |
| Total Iron | µg/L | 300 | 3.9 | 103 | **610** | 119 | 183 | 116 | 160 | 116 | 160 | 164 | 236 | 191 | 274 | 192 | 276 | 192 | 276 | 192 | 276 | 116 | 160 | 119 | 183 |
| Total Lead | µg/L | 1 | <0.05 | 0.06 | **3.1** | 0.098 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 3.7 | 14 | 3.6 | 14 | 3.7 | 14 | 3.7 | 14 | 3.7 | 13 | 3.8 | 13 | 3.8 | 13 | 3.8 | 13 | 3.7 | 13 | 3.7 | 14 |
| Total Manganese | µg/L | 50 | <0.1 | 9.2 | **432** | 21 | **85** | 21 | 81 | 21 | 82 | 21 | 84 | 21 | 82 | 21 | 82 | 21 | 82 | 21 | 82 | 21 | 81 | 21 | 85 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.0092 | 0.025 | 0.009 | 0.025 | 0.009 | 0.025 | 0.009 | 0.023 | 0.009 | 0.023 | 0.009 | 0.023 | 0.009 | 0.023 | 0.009 | 0.023 | 0.009 | 0.023 | 0.009 | 0.025 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.24 | 0.39 | 0.23 | 0.34 | 0.23 | 0.34 | 0.23 | 0.34 | 0.24 | 0.34 | 0.24 | 0.34 | 0.24 | 0.34 | 0.24 | 0.34 | 0.24 | 0.34 | 0.24 | 0.39 |
| Total Nickel | µg/L | 29 | <0.1 | 0.95 | <20 | 1.5 | 2.2 | 1.4 | 1.9 | 1.5 | 2.0 | 1.5 | 2.0 | 1.5 | 2.1 | 1.5 | 2.0 | 1.5 | 2.0 | 1.5 | 2.0 | 1.5 | 1.9 | 1.5 | 2.2 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.15 | 0.25 | 0.14 | 0.2 | 0.14 | 0.21 | 0.14 | 0.2 | 0.14 | 0.21 | 0.14 | 0.21 | 0.14 | 0.21 | 0.14 | 0.21 | 0.14 | 0.21 | 0.15 | 0.25 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.039 | 0.057 | 0.037 | 0.052 | 0.038 | 0.055 | 0.037 | 0.053 | 0.038 | 0.054 | 0.038 | 0.054 | 0.038 | 0.054 | 0.038 | 0.054 | 0.037 | 0.054 | 0.039 | 0.057 |
| Total Strontium | µg/L | | <0.1 | 50 | 892 | 147 | 271 | 140 | 232 | 140 | 233 | 139 | 238 | 143 | 239 | 143 | 246 | 143 | 246 | 143 | 246 | 143 | 245 | 147 | 271 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.041 | 0.065 | 0.039 | 0.055 | 0.039 | 0.055 | 0.039 | 0.055 | 0.04 | 0.057 | 0.04 | 0.057 | 0.04 | 0.057 | 0.04 | 0.057 | 0.039 | 0.056 | 0.041 | 0.065 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.25 | 0.38 | 0.22 | 0.3 | 0.22 | 0.3 | 0.22 | 0.3 | 0.22 | 0.3 | 0.22 | 0.3 | 0.22 | 0.3 | 0.22 | 0.3 | 0.22 | 0.3 | 0.25 | 0.38 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.62 | 1.3 | 0.49 | 0.93 | 0.49 | 0.93 | 2.87 | 5.4 | 3.87 | 7.16 | 3.88 | 7.19 | 3.88 | 7.19 | 3.88 | 7.19 | 0.5 | 0.96 | 0.62 | 1.32 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 51 | 77 | 24 | 35 | 24 | 35 | 24 | 35 | 25 | 37 | 25 | 38 | 25 | 38 | 25 | 38 | 25 | 38 | 51 | 77 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.059 | 0.093 | 0.057 | 0.085 | 0.06 | 0.08 | 0.056 | 0.086 | 0.058 | 0.088 | 0.059 | 0.088 | 0.059 | 0.088 | 0.059 | 0.088 | 0.058 | 0.087 | 0.059 | 0.093 |
| Total Vanadium | µg/L | | <0.05 | 0.3 | 2.4 | 0.29 | 0.5 | 0.29 | 0.48 | 0.3 | 0.5 | 0.37 | 0.61 | 0.41 | 0.68 | 0.42 | 0.68 | 0.42 | 0.68 | 0.42 | 0.68 | 0.29 | 0.47 | 0.29 | 0.5 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **50** | 3.1 | 6.1 | 3.1 | 5.8 | 3.1 | 5.8 | 3.2 | 5.9 | 3.2 | 6.0 | 3.3 | 6.0 | 3.3 | 6.0 | 3.3 | 6.0 | 3.1 | 5.8 | 3.1 | 6.1 |

**Table 7.4-A33: Observed and Predicted Concentrations at Lake B2**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 18 | 49 | **602** | 109 | 200 | 108 | 200 | 110 | 200 | 108 | 191 | 108 | 203 | 108 | 195 | 108 | 195 | 108 | 195 | 108 | 195 | 108 | 191 |
| Total Alkalinity | mg/L | | 14 | 29 | 362 | 51 | 72 | 50 | 72 | 50 | 72 | 50 | 73 | 50 | 73 | 50 | 73 | 50 | 73 | 50 | 73 | 50 | 73 | 50 | 74 |
| Total Suspended Solids | mg/L | 8 | 1 | <3 | 11 | 2.5 | 3.5 | 2.5 | 3.5 | 2.5 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.4 | 3.5 | 2.5 | 3.5 |
| Calcium | mg/L | | 4.8 | 11 | 154 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 | 22 | 35 |
| Chloride | mg/L | 120 | 1.9 | 5.6 | **241** | 13 | 19 | 13 | 20 | 13 | 20 | 13 | 20 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 | 13 | 19 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.02 | 0.07 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 | 0.033 | 0.052 |
| Magnesium | mg/L | | 0.67 | 1.3 | 33 | 3.1 | 4.6 | 3.1 | 4.6 | 3.2 | 4.6 | 3.2 | 4.6 | 3.2 | 4.7 | 3.2 | 4.7 | 3.2 | 4.7 | 3.2 | 4.7 | 3.2 | 4.6 | 3.1 | 4.6 |
| Potassium | mg/L | | 0.51 | 0.79 | 6.3 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.4 | 1.4 | 2.3 | 1.4 | 2.3 | 1.4 | 2.3 | 1.4 | 2.3 | 1.4 | 2.3 |
| Sodium | mg/L | 200 | 1.1 | 2.4 | 30 | 4.5 | 7.3 | 4.5 | 7.3 | 4.5 | 7.3 | 4.5 | 7.4 | 4.5 | 7.4 | 4.5 | 7.4 | 4.5 | 7.4 | 4.5 | 7.4 | 4.5 | 7.4 | 4.5 | 7.4 |
| Sulphate | mg/L | 500 | 1 | 3 | 44 | 4.3 | 7.6 | 4.3 | 7.6 | 4.2 | 7.6 | 4.2 | 7.5 | 4.2 | 7.5 | 4.2 | 7.4 | 4.2 | 7.4 | 4.2 | 7.4 | 4.2 | 7.4 | 4.2 | 7.6 |
| Ammonia (as N) | mg/L | 7 | 0.003 | 0.02 | 0.46 | 0.043 | 0.071 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 | 0.042 | 0.072 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.2 | 0.014 | 0.027 | 0.014 | 0.027 | 0.015 | 0.028 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 1.2 | 1.6 | 0.014 | 0.027 | 0.014 | 0.027 |
| Total Kjeldahl Nitrogen | mg/L | | 0.13 | 0.37 | 1.8 | 0.51 | 0.83 | 0.5 | 0.83 | 0.5 | 0.83 | 0.5 | 0.83 | 0.5 | 0.84 | 0.5 | 0.84 | 0.5 | 0.84 | 0.5 | 0.84 | 0.5 | 0.84 | 0.5 | 0.84 |
| Dissolved Phosphorus | mg/L | | <0.001 | 0.01 | 0.02 | 0.0052 | 0.0079 | 0.0052 | 0.0079 | 0.0052 | 0.0079 | 0.0052 | 0.0079 | 0.0052 | 0.0079 | 0.0051 | 0.0079 | 0.0051 | 0.0079 | 0.0051 | 0.0079 | 0.0051 | 0.0079 | 0.0051 | 0.0078 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00063 | 0.00091 | 0.00063 | 0.00091 | 0.00063 | 0.00091 | 0.00062 | 0.00091 | 0.00062 | 0.00092 | 0.00062 | 0.00091 | 0.00062 | 0.00091 | 0.00062 | 0.00091 | 0.00062 | 0.00091 | 0.00062 | 0.00091 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.7 | 2.8 | 1.7 | 2.8 | 1.6 | 2.8 | 1.7 | 2.8 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 | 1.7 | 2.7 | 1.6 | 2.7 |
| Total Aluminum | µg/L | 100 | <0.3 | 2.9 | 36 | 2.8 | 5.4 | 2.8 | 5.3 | 3.1 | 5.7 | 51 | 94 | 51 | 94 | 51 | 94 | 51 | 94 | 51 | 94 | 2.8 | 5.4 | 2.8 | 5.4 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.11 | 0.2 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.2 | 0.12 | 0.2 | 0.12 | 0.2 | 0.12 | 0.2 | 0.12 | 0.2 | 0.11 | 0.2 | 0.11 | 0.21 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.2 | **11** | 1.2 | 1.8 | 1.2 | 1.8 | 1.2 | 1.8 | 1.3 | 2.0 | 1.3 | 2.0 | 1.3 | 2.0 | 1.3 | 2.0 | 1.3 | 2.0 | 1.2 | 1.9 | 1.2 | 1.9 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 232 | 21 | 64 | 20 | 64 | 20 | 64 | 19 | 52 | 19 | 52 | 19 | 52 | 19 | 52 | 19 | 52 | 19 | 51 | 19 | 51 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.16 | 0.23 | 0.16 | 0.23 | 0.16 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.097 | 0.06 | 0.096 | 0.06 | 0.096 |
| Total Boron | µg/L | 1500 | 2 | 6.8 | <100 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.05** | **22** | **0.059** | **0.091** | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 | 0.059 | 0.092 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.68 | 2.6 | 0.67 | 2.6 | 0.67 | 2.6 | 0.76 | 2.9 | 0.8 | 3.0 | 0.8 | 2.5 | 0.8 | 2.5 | 0.8 | 2.5 | 0.63 | 2.4 | 0.63 | 2.5 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.12 | 0.18 | 0.12 | 0.18 | 0.12 | 0.18 | 0.14 | 0.21 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.12 | 0.19 | 0.12 | 0.18 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **<10** | 1.5 | **2.1** | 1.4 | 2.1 | 1.5 | 2.1 | 1.5 | 2.2 | 1.5 | 2.3 | 1.5 | 2.3 | 1.5 | 2.3 | 1.5 | 2.3 | 1.4 | 2.2 | 1.4 | 2.1 |
| Total Iron | µg/L | 300 | 3.9 | 103 | **610** | 116 | 200 | 117 | 193 | 117 | 193 | 172 | 271 | 172 | 271 | 172 | 271 | 172 | 271 | 172 | 271 | 114 | 201 | 114 | 203 |
| Total Lead | µg/L | 1 | <0.05 | 0.06 | **3.1** | 0.096 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 3.7 | 17 | 3.7 | 17 | 3.7 | 18 | 3.5 | 17 | 3.5 | 17 | 3.5 | 17 | 3.5 | 17 | 3.5 | 17 | 3.5 | 17 | 3.6 | 17 |
| Total Manganese | µg/L | 50 | <0.1 | 9.2 | **432** | 19 | **98** | 19 | 85 | 19 | 86 | 19 | 86 | 19 | 85 | 19 | 85 | 19 | 85 | 19 | 85 | 18 | 84 | 19 | 98 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.0087 | 0.025 | 0.009 | 0.025 | 0.009 | 0.025 | 0.008 | 0.02 | 0.008 | 0.02 | 0.008 | 0.02 | 0.008 | 0.02 | 0.008 | 0.02 | 0.008 | 0.02 | 0.008 | 0.02 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.24 | 0.43 | 0.24 | 0.43 | 0.24 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 |
| Total Nickel | µg/L | 29 | <0.1 | 0.95 | <20 | 1.4 | 2.2 | 1.4 | 2.2 | 1.4 | 2.4 | 1.4 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.4 | 2.4 | 1.4 | 2.3 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.15 | 0.26 | 0.15 | 0.26 | 0.15 | 0.27 | 0.15 | 0.27 | 0.15 | 0.27 | 0.15 | 0.27 | 0.15 | 0.27 | 0.15 | 0.27 | 0.15 | 0.26 | 0.15 | 0.26 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.039 | 0.055 | 0.038 | 0.055 | 0.04 | 0.057 | 0.038 | 0.055 | 0.038 | 0.056 | 0.038 | 0.055 | 0.038 | 0.055 | 0.038 | 0.055 | 0.038 | 0.055 | 0.038 | 0.055 |
| Total Strontium | µg/L | | <0.1 | 50 | 892 | 142 | 258 | 143 | 258 | 143 | 258 | 141 | 262 | 142 | 257 | 142 | 262 | 142 | 262 | 142 | 262 | 141 | 261 | 141 | 265 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.041 | 0.064 | 0.041 | 0.063 | 0.042 | 0.063 | 0.042 | 0.063 | 0.041 | 0.063 | 0.041 | 0.063 | 0.041 | 0.063 | 0.041 | 0.063 | 0.041 | 0.063 | 0.041 | 0.062 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.25 | 0.38 | 0.25 | 0.38 | 0.25 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.37 | 0.24 | 0.37 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.6 | 1.3 | 0.6 | 1.32 | 0.6 | 1.32 | 3.09 | 6.83 | 4.11 | 9.03 | 4.11 | 9.03 | 4.11 | 9.03 | 4.11 | 9.03 | 0.58 | 1.3 | 0.59 | 1.3 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 | 50 | 76 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.058 | 0.093 | 0.058 | 0.093 | 0.06 | 0.09 | 0.056 | 0.094 | 0.057 | 0.094 | 0.057 | 0.094 | 0.057 | 0.094 | 0.057 | 0.094 | 0.056 | 0.093 | 0.057 | 0.093 |
| Total Vanadium | µg/L | | <0.05 | 0.3 | 2.4 | 0.29 | 0.5 | 0.29 | 0.51 | 0.3 | 0.53 | 0.38 | 0.66 | 0.41 | 0.74 | 0.41 | 0.74 | 0.41 | 0.74 | 0.41 | 0.74 | 0.29 | 0.49 | 0.28 | 0.5 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **50** | 3.2 | 6.2 | 3.1 | 6.2 | 3.1 | 6.2 | 3.2 | 6.4 | 3.2 | 6.5 | 3.2 | 6.5 | 3.2 | 6.5 | 3.2 | 6.5 | 3.0 | 6.1 | 3.0 | 6.1 |

**Table 7.4-A34: Observed and Predicted Concentrations at Lake D7**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 39 | 72 | **1100** | 187 | 280 | 106 | 158 | 131 | 187 | 136 | 197 | 186 | 279 | 186 | 279 | 186 | 279 | 186 | 279 | 186 | 279 | 84 | 125 |
| Total Alkalinity | mg/L | | 26 | 47 | 905 | 125 | 163 | 63 | 114 | 80 | 114 | 83 | 110 | 124 | 163 | 125 | 164 | 125 | 164 | 125 | 164 | 125 | 164 | 51 | 76 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **139** | 8.0 | **11.7** | 3.5 | 4.2 | 4.8 | 6.7 | 5.1 | 7.2 | 8.0 | 11.7 | 8.0 | 11.7 | 8.0 | 11.7 | 8.0 | 11.7 | 8.0 | 11.7 | 2.1 | 3.0 |
| Calcium | mg/L | | 10 | 15 | 304 | 56 | 72 | 26 | 61 | 35 | 61 | 36 | 51 | 55 | 72 | 55 | 72 | 55 | 72 | 55 | 72 | 55 | 72 | 17 | 37 |
| Chloride | mg/L | 120 | 3.3 | 8.1 | 107 | 21 | 31 | 15 | 21 | 15 | 23 | 15 | 24 | 21 | 31 | 20 | 31 | 20 | 31 | 20 | 31 | 20 | 31 | 12 | 21 |
| Fluoride | mg/L | 0.12 | 0.04 | 0.04 | 0.04 | 0.041 | 0.054 | 0.031 | 0.039 | 0.036 | 0.045 | 0.036 | 0.047 | 0.041 | 0.054 | 0.041 | 0.054 | 0.041 | 0.054 | 0.041 | 0.054 | 0.041 | 0.054 | 0.012 | 0.029 |
| Magnesium | mg/L | | 1.1 | 2.2 | 42 | 8.0 | 10.9 | 3.7 | 8.8 | 5.0 | 8.8 | 5.2 | 7.1 | 7.9 | 10.9 | 7.9 | 10.9 | 7.9 | 10.9 | 7.9 | 10.9 | 7.9 | 11 | 2.7 | 5 |
| Potassium | mg/L | | 0.58 | 1.1 | 14 | 3.3 | 4.3 | 1.6 | 3.5 | 2.2 | 3.5 | 2.3 | 3.0 | 3.3 | 4.3 | 3.3 | 4.3 | 3.3 | 4.3 | 3.3 | 4.3 | 3.3 | 4.3 | 1.4 | 2.2 |
| Sodium | mg/L | 200 | 1.8 | 4 | 61 | 12.6 | 18 | 5.7 | 14 | 7.8 | 14 | 8.1 | 11 | 12.5 | 18 | 12.5 | 18 | 12.5 | 18 | 12.5 | 18 | 12 | 18 | 5 | 8 |
| Sulphate | mg/L | 500 | 2.1 | 3.9 | 29 | 7.3 | 10.5 | 4.8 | 7.1 | 5.3 | 7.4 | 5.5 | 7.8 | 7.2 | 10.3 | 7.2 | 10.3 | 7.2 | 10.3 | 7.2 | 10.3 | 7.2 | 10 | 5.4 | 8 |
| Ammonia (as N) | mg/L | 7 | 0.003 | <0.05 | 1.4 | 0.126 | 0.28 | 0.061 | 0.14 | 0.083 | 0.15 | 0.086 | 0.16 | 0.126 | 0.28 | 0.125 | 0.28 | 0.125 | 0.28 | 0.125 | 0.28 | 0.13 | 0.28 | 0.13 | 0.28 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.04 | 0.08 | 0.023 | 0.035 | 0.016 | 0.027 | 0.017 | 0.027 | 1.2 | 2.0 | 0.5 | 0.9 | 0.5 | 0.9 | 0.5 | 0.9 | 0.5 | 0.9 | 0.023 | 0.035 | 0.023 | 0.035 |
| Total Kjeldahl Nitrogen | mg/L | | 0.26 | 0.42 | 7.8 | 1.3 | 1.8 | 0.62 | 1.3 | 0.84 | 1.3 | 0.88 | 1.3 | 1.29 | 1.8 | 1.29 | 1.7 | 1.29 | 1.7 | 1.29 | 1.7 | 1.3 | 1.7 | 0.5 | 1.1 |
| Dissolved Phosphorus | mg/L | | 0.0021 | 0.007 | 0.02 | 0.0095 | 0.013 | 0.0056 | 0.0079 | 0.0069 | 0.0089 | 0.0071 | 0.0094 | 0.0095 | 0.013 | 0.0095 | 0.013 | 0.0095 | 0.013 | 0.0095 | 0.013 | 0.0095 | 0.013 | 0.0066 | 0.009 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.003 | 0.00088 | 0.0012 | 0.00065 | 0.00082 | 0.0007 | 0.00091 | 0.00072 | 0.001 | 0.00088 | 0.0012 | 0.00088 | 0.0012 | 0.00088 | 0.0012 | 0.00088 | 0.0012 | 0.00088 | 0.0012 | 0.00023 | 0.0006 |
| Cyanide | µg/L | 200 | <0.002 | <0.002 | 4 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.78 | 1.3 | 0.21 | 0.8 |
| Total Aluminum | µg/L | 100 | <1 | 5.3 | 21 | 5.6 | 7.7 | 3.4 | 5.9 | 4.1 | 5.9 | 37 | 61 | 24 | 40 | 24 | 40 | 24 | 40 | 24 | 40 | 5.5 | 7.7 | 5.5 | 7.7 |
| Total Antimony | µg/L | 6 | <0.03 | <0.13 | 0.5 | 0.17 | 0.25 | 0.13 | 0.17 | 0.15 | 0.21 | 0.13 | 0.19 | 0.17 | 0.25 | 0.17 | 0.25 | 0.17 | 0.25 | 0.17 | 0.25 | 0.17 | 0.25 | 0.15 | 0.21 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.1 | 3.8 | 1.3 | 1.9 | 1.1 | 1.5 | 1.3 | 1.8 | 1.3 | 1.7 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 |
| Total Barium | µg/L | 1000 | 1 | 16 | 222 | 38 | 68 | 27 | 45 | 33 | 49 | 34 | 52 | 38 | 69 | 38 | 69 | 38 | 69 | 38 | 69 | 38 | 69 | 17 | 39 |
| Total Beryllium | µg/L | | <0.1 | <0.5 | 2 | 0.41 | 0.65 | 0.19 | 0.43 | 0.34 | 0.53 | 0.26 | 0.49 | 0.39 | 0.65 | 0.4 | 0.65 | 0.4 | 0.65 | 0.4 | 0.65 | 0.4 | 0.65 | 0.1 | 0.31 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.037 | 0.052 | 0.04 | 0.053 | 0.036 | 0.05 | 0.037 | 0.052 | 0.037 | 0.052 | 0.036 | 0.052 | 0.036 | 0.052 | 0.036 | 0.052 | 0.036 | 0.052 | 0.01 | 0.0 |
| Total Boron | µg/L | 1500 | 2.8 | 9.3 | 25 | 12 | 16 | 11 | 13 | 10 | 12 | 10 | 13 | 12 | 16 | 12 | 16 | 12 | 16 | 12 | 16 | 12 | 16 | 7 | 9 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **<0.5** | **0.071** | **0.11** | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 |
| Total Chromium | µg/L | 8.9 | <0.1 | 0.9 | **20** | 2.6 | 5.0 | 1.2 | 4.5 | 1.4 | 4.5 | 1.6 | 3.5 | 2.6 | 5.2 | 2.6 | 5.2 | 2.6 | 5.2 | 2.6 | 5.2 | 2.5 | 5.1 | 1.3 | 2.5 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <15 | 0.54 | 1.05 | 0.22 | 0.41 | 0.33 | 0.59 | 0.33 | 0.59 | 0.54 | 1.06 | 0.55 | 1.06 | 0.55 | 1.06 | 0.55 | 1.06 | 0.54 | 1.05 | 0.17 | 0.38 |
| Total Copper | µg/L | 2 | 0.63 | 1.5 | **18** | **2.7** | **4.2** | 1.7 | 2.2 | 2.0 | 2.7 | 2.1 | 2.9 | 2.7 | 4.2 | 2.7 | 4.2 | 2.7 | 4.2 | 2.7 | 4.2 | 2.7 | 4.2 | 2.7 | 4.2 |
| Total Iron | µg/L | 300 | 11 | 113 | **660** | 174 | 230 | 115 | 187 | 115 | 187 | 175 | 242 | 191 | 266 | 191 | 266 | 191 | 266 | 191 | 266 | 174 | 233 | 51 | 135 |
| Total Lead | µg/L | 1 | <0.05 | <0.2 | **1.4** | 0.2 | 0.25 | 0.13 | 0.24 | 0.13 | 0.24 | 0.14 | 0.21 | 0.21 | 0.26 | 0.21 | 0.26 | 0.21 | 0.26 | 0.21 | 0.26 | 0.2 | 0.25 | 0.2 | 0.25 |
| Total Lithium | µg/L | | 1 | <5 | 24 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 4.9 | 6.5 | 1.3 | 3.7 |
| Total Manganese | µg/L | 50 | 6.8 | 17 | **1520** | **111** | **179** | 51 | 109 | 65 | 116 | 67 | 118 | 111 | 178 | 111 | 179 | 111 | 179 | 111 | 179 | 111 | 179 | 29 | 72 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | <0.05 | 0.0113 | 0.017 | 0.0099 | 0.017 | 0.012 | 0.016 | 0.012 | 0.016 | 0.0112 | 0.017 | 0.0112 | 0.017 | 0.0112 | 0.017 | 0.0112 | 0.017 | 0.011 | 0.017 | 0.003 | 0.013 |
| Total Molybdenum | µg/L | 73 | 0.10 | 0.44 | <30 | 1.0 | 1.36 | 0.39 | 0.48 | 0.58 | 0.74 | 0.61 | 0.79 | 1.0 | 1.36 | 1.0 | 1.36 | 1.0 | 1.36 | 1.0 | 1.36 | 0.99 | 1.4 | 0.59 | 0.8 |
| Total Nickel | µg/L | 29 | <0.1 | 1.1 | <20 | 3.6 | 5.7 | 1.8 | 5.4 | 2 | 5 | 2.3 | 3.9 | 3.5 | 6.0 | 3.5 | 6.0 | 3.5 | 6.0 | 3.5 | 6.0 | 3.5 | 6.0 | 1.4 | 3.0 |
| Total Selenium | µg/L | 1 | <0.1 | <0.5 | **<10** | 0.85 | **1.31** | 0.29 | 0.4 | 0.46 | 0.65 | 0.48 | 0.7 | 0.85 | 1.3 | 0.85 | 1.3 | 0.85 | 1.3 | 0.85 | 1.3 | 0.85 | 1.3 | 0.25 | 0.4 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.026 | 0.039 | 0.025 | 0.034 | 0.025 | 0.034 | 0.025 | 0.034 | 0.025 | 0.034 | 0.025 | 0.034 | 0.025 | 0.034 | 0.025 | 0.034 | 0.025 | 0.034 | 0.01 | 0.03 |
| Total Strontium | µg/L | | 42 | 76 | 1260 | 200 | 379 | 141 | 224 | 158 | 263 | 162 | 276 | 199 | 380 | 200 | 380 | 200 | 380 | 200 | 380 | 200 | 380 | 80 | 143 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.04 | 0.059 | 0.035 | 0.048 | 0.035 | 0.048 | 0.039 | 0.056 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.059 | 0.04 | 0.059 | 0.01 | 0.0 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.21 | 0.29 | 0.19 | 0.25 | 0.2 | 0.27 | 0.21 | 0.28 | 0.21 | 0.29 | 0.21 | 0.29 | 0.21 | 0.29 | 0.21 | 0.29 | 0.2 | 0.29 | 0.08 | 0.2 |
| Total Titanium | µg/L | | <0.3 | 0.7 | <10 | 1.03 | 1.7 | 0.58 | 0.79 | 0.68 | 1.0 | 2.38 | 3.9 | 1.92 | 3.3 | 1.92 | 3.3 | 1.92 | 3.3 | 1.92 | 3.3 | 1.04 | 1.6 | 0.27 | 0.6 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 16 | 23 | 12 | 16 | 12 | 16 | 13 | 17 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 16 | 23 | 4 | 5 |
| Total Uranium | µg/L | 15 | 0.02 | 0.1 | 1.7 | 0.21 | 0.28 | 0.088 | 0.24 | 0.09 | 0.24 | 0.13 | 0.17 | 0.22 | 0.28 | 0.21 | 0.28 | 0.21 | 0.28 | 0.21 | 0.28 | 0.21 | 0.28 | 0.14 | 0.18 |
| Total Vanadium | µg/L | | <0.1 | 0.1 | <30 | 1.1 | 2.5 | 0.45 | 1.1 | 0.61 | 1.5 | 0.71 | 1.6 | 1.13 | 2.6 | 1.13 | 2.6 | 1.13 | 2.6 | 1.13 | 2.6 | 1.1 | 2.6 | 0.57 | 1.2 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **123** | 8.8 | 12.1 | 4.7 | 6.1 | 5.4 | 7.0 | 5.8 | 7.6 | 8.9 | 12.3 | 8.9 | 12.3 | 8.9 | 12.3 | 8.9 | 12.3 | 8.8 | 12.2 | 3.9 | 4.9 |

**Table 7.4-A35: Observed and Predicted Concentrations at Lake D4**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 39 | 72 | **1100** | 140 | 240 | 105 | 158 | 117 | 190 | 120 | 198 | 138 | 239 | 139 | 239 | 139 | 239 | 139 | 239 | 139 | 239 | 83 | 124 |
| Total Alkalinity | mg/L | | 26 | 47 | 905 | 86 | 132 | 60 | 114 | 66 | 114 | 68 | 102 | 86 | 131 | 86 | 132 | 86 | 132 | 86 | 132 | 86 | 132 | 48 | 64 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **139** | 5.2 | **9.1** | 3.3 | 4.3 | 3.8 | 6.4 | 3.9 | 6.7 | 5.2 | 9.1 | 5.2 | 9.1 | 5.2 | 9.1 | 5.2 | 9.1 | 5.2 | 9.1 | 1.9 | 2.9 |
| Calcium | mg/L | | 10 | 15 | 304 | 38 | 61 | 25 | 61 | 29 | 61 | 30 | 44 | 38 | 57 | 38 | 57 | 38 | 57 | 38 | 57 | 38 | 57 | 17 | 32 |
| Chloride | mg/L | 120 | 3.3 | 8.1 | 107 | 16 | 27 | 14 | 24 | 13 | 25 | 14 | 26 | 16 | 27 | 16 | 27 | 16 | 27 | 16 | 27 | 16 | 27 | 12 | 24 |
| Fluoride | mg/L | 0.12 | 0.04 | 0.04 | 0.04 | 0.037 | 0.053 | 0.031 | 0.04 | 0.033 | 0.048 | 0.034 | 0.05 | 0.036 | 0.053 | 0.036 | 0.053 | 0.036 | 0.053 | 0.036 | 0.053 | 0.036 | 0.053 | 0.016 | 0.03 |
| Magnesium | mg/L | | 1.1 | 2.2 | 42 | 5.5 | 8.8 | 3.6 | 8.8 | 4.2 | 8.8 | 4.3 | 6.7 | 5.5 | 8.8 | 5.5 | 8.8 | 5.5 | 8.8 | 5.5 | 8.8 | 5.5 | 9 | 2.6 | 4 |
| Potassium | mg/L | | 0.58 | 1.1 | 14 | 2.3 | 3.5 | 1.6 | 3.5 | 1.8 | 3.5 | 1.9 | 2.8 | 2.3 | 3.5 | 2.3 | 3.5 | 2.3 | 3.5 | 2.3 | 3.5 | 2.3 | 3.5 | 1.3 | 1.9 |
| Sodium | mg/L | 200 | 1.8 | 4 | 61 | 8.7 | 14 | 5.4 | 14 | 6.3 | 14 | 6.5 | 11 | 8.5 | 15 | 8.5 | 15 | 8.5 | 15 | 8.5 | 15 | 9 | 15 | 5 | 7 |
| Sulphate | mg/L | 500 | 2.1 | 3.9 | 29 | 5.6 | 9.4 | 4.7 | 7.8 | 4.8 | 7.8 | 4.9 | 8.1 | 5.5 | 9.3 | 5.5 | 9.4 | 5.5 | 9.4 | 5.5 | 9.4 | 5.5 | 9 | 4.9 | 8 |
| Ammonia (as N) | mg/L | 7 | 0.003 | <0.05 | 1.4 | 0.085 | 0.22 | 0.06 | 0.14 | 0.066 | 0.15 | 0.067 | 0.15 | 0.084 | 0.22 | 0.084 | 0.22 | 0.084 | 0.22 | 0.084 | 0.22 | 0.08 | 0.22 | 0.08 | 0.22 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.04 | 0.08 | 0.018 | 0.034 | 0.015 | 0.027 | 0.015 | 0.029 | 1.0 | 2.0 | 0.5 | 1.2 | 0.5 | 1.2 | 0.5 | 1.2 | 0.5 | 1.2 | 0.017 | 0.034 | 0.017 | 0.034 |
| Total Kjeldahl Nitrogen | mg/L | | 0.26 | 0.42 | 7.8 | 0.9 | 1.4 | 0.58 | 1.3 | 0.7 | 1.3 | 0.72 | 1.1 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 0.5 | 0.9 |
| Dissolved Phosphorus | mg/L | | 0.0021 | 0.007 | 0.02 | 0.0071 | 0.011 | 0.0054 | 0.0079 | 0.0059 | 0.0089 | 0.006 | 0.0093 | 0.007 | 0.011 | 0.007 | 0.011 | 0.007 | 0.011 | 0.007 | 0.011 | 0.007 | 0.011 | 0.006 | 0.009 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.003 | 0.00074 | 0.0011 | 0.00064 | 0.00082 | 0.00064 | 0.00095 | 0.00066 | 0.001 | 0.00073 | 0.0011 | 0.00073 | 0.0011 | 0.00073 | 0.0011 | 0.00073 | 0.0011 | 0.00073 | 0.0011 | 0.0003 | 0.0006 |
| Cyanide | µg/L | 200 | <0.002 | <0.002 | 4 | 1.1 | 2.2 | 1.1 | 2.0 | 1.1 | 2.0 | 1.1 | 2.1 | 1.1 | 2.1 | 1.1 | 2.1 | 1.1 | 2.1 | 1.1 | 2.1 | 1.07 | 2.1 | 0.47 | 1.5 |
| Total Aluminum | µg/L | 100 | <1 | 5.3 | 21 | 4.0 | 6.4 | 3.3 | 5.9 | 3.5 | 5.9 | 32 | 64 | 22 | 46 | 22 | 46 | 22 | 46 | 22 | 46 | 4.0 | 6.4 | 4.0 | 6.4 |
| Total Antimony | µg/L | 6 | <0.03 | <0.13 | 0.5 | 0.14 | 0.22 | 0.12 | 0.17 | 0.14 | 0.22 | 0.12 | 0.18 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.21 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.1 | 3.8 | 1.2 | 1.9 | 1.1 | 1.6 | 1.3 | 1.9 | 1.2 | 1.8 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 |
| Total Barium | µg/L | 1000 | 1 | 16 | 222 | 29 | 57 | 27 | 45 | 27 | 48 | 28 | 50 | 27 | 58 | 27 | 58 | 27 | 58 | 27 | 58 | 27 | 57 | 17 | 32 |
| Total Beryllium | µg/L | | <0.1 | <0.5 | 2 | 0.28 | 0.5 | 0.18 | 0.43 | 0.29 | 0.52 | 0.21 | 0.4 | 0.27 | 0.51 | 0.27 | 0.51 | 0.27 | 0.51 | 0.27 | 0.51 | 0.27 | 0.5 | 0.1 | 0.26 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.022 | 0.038 | 0.022 | 0.038 | 0.022 | 0.038 | 0.022 | 0.038 | 0.022 | 0.038 | 0.022 | 0.038 | 0.022 | 0.038 | 0.022 | 0.038 | 0.02 | 0.0 | 0.01 | 0.0 |
| Total Boron | µg/L | 1500 | 2.8 | 9.3 | 25 | 14 | 20 | 11 | 15 | 11 | 16 | 12 | 17 | 14 | 20 | 14 | 20 | 14 | 20 | 14 | 20 | 14 | 20 | 9 | 12 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **<0.5** | **0.06** | **0.14** | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 | 0.06 | 0.14 |
| Total Chromium | µg/L | 8.9 | <0.1 | 0.9 | **20** | 1.7 | 4.5 | 1.1 | 4.5 | 1.2 | 4.5 | 1.2 | 2.7 | 1.8 | 3.6 | 1.8 | 3.6 | 1.8 | 3.6 | 1.8 | 3.6 | 1.7 | 3.5 | 1.1 | 2.1 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <15 | 0.36 | 0.82 | 0.21 | 0.34 | 0.26 | 0.56 | 0.26 | 0.56 | 0.36 | 0.83 | 0.37 | 0.83 | 0.37 | 0.83 | 0.37 | 0.83 | 0.36 | 0.82 | 0.16 | 0.35 |
| Total Copper | µg/L | 2 | 0.63 | 1.5 | **18** | 2.0 | **3.5** | 1.6 | 2.3 | 1.7 | 2.6 | 1.7 | 2.8 | 2.0 | 3.5 | 2.0 | 3.5 | 2.0 | 3.5 | 2.0 | 3.5 | 2.0 | 3.4 | 2.0 | 3.4 |
| Total Iron | µg/L | 300 | 11 | 113 | **660** | 142 | 234 | 115 | 187 | 115 | 187 | 159 | 253 | 160 | 267 | 161 | 268 | 161 | 268 | 161 | 268 | 141 | 238 | 62 | 133 |
| Total Lead | µg/L | 1 | <0.05 | <0.2 | **1.4** | 0.14 | 0.24 | 0.12 | 0.24 | 0.12 | 0.24 | 0.12 | 0.18 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.14 | 0.21 | 0.14 | 0.21 |
| Total Lithium | µg/L | | 1 | <5 | 24 | 4.2 | 6.7 | 3.5 | 7.2 | 4.0 | 7.2 | 4.2 | 6.7 | 4.2 | 6.7 | 4.2 | 6.7 | 4.2 | 6.7 | 4.2 | 6.7 | 4.2 | 6.7 | 1.7 | 3.6 |
| Total Manganese | µg/L | 50 | 6.8 | 17 | **1520** | **69** | **138** | 46 | 97 | 50 | 97 | 51 | 102 | 69 | 139 | 69 | 139 | 69 | 139 | 69 | 139 | 69 | 139 | 27 | 52 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | <0.05 | 0.0097 | 0.016 | 0.0096 | 0.015 | 0.01 | 0.015 | 0.01 | 0.015 | 0.0095 | 0.016 | 0.0095 | 0.016 | 0.0095 | 0.016 | 0.0095 | 0.016 | 0.01 | 0.016 | 0.004 | 0.011 |
| Total Molybdenum | µg/L | 73 | 0.10 | 0.44 | <30 | 0.64 | 1.04 | 0.37 | 0.5 | 0.45 | 0.7 | 0.46 | 0.74 | 0.64 | 1.04 | 0.64 | 1.04 | 0.64 | 1.04 | 0.64 | 1.04 | 0.64 | 1.0 | 0.49 | 0.7 |
| Total Nickel | µg/L | 29 | <0.1 | 1.1 | <20 | 2.4 | 5.4 | 1.7 | 5.4 | 2 | 5 | 1.9 | 3.5 | 2.5 | 5.0 | 2.5 | 4.8 | 2.5 | 4.8 | 2.5 | 4.8 | 2.4 | 4.8 | 1.3 | 2.5 |
| Total Selenium | µg/L | 1 | <0.1 | <0.5 | **<10** | 0.54 | **1.01** | 0.28 | 0.39 | 0.36 | 0.62 | 0.38 | 0.66 | 0.55 | 1.01 | 0.55 | 1.01 | 0.55 | 1.01 | 0.55 | 1.01 | 0.55 | 1.0 | 0.23 | 0.4 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.019 | 0.039 | 0.019 | 0.031 | 0.019 | 0.031 | 0.019 | 0.031 | 0.019 | 0.031 | 0.019 | 0.031 | 0.019 | 0.031 | 0.019 | 0.031 | 0.019 | 0.03 | 0.007 | 0.021 |
| Total Strontium | µg/L | | 42 | 76 | 1260 | 159 | 342 | 138 | 241 | 145 | 274 | 147 | 285 | 157 | 343 | 157 | 343 | 157 | 343 | 157 | 343 | 157 | 343 | 86 | 170 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.026 | 0.045 | 0.026 | 0.04 | 0.026 | 0.045 | 0.026 | 0.045 | 0.026 | 0.045 | 0.026 | 0.045 | 0.026 | 0.045 | 0.026 | 0.045 | 0.026 | 0.045 | 0.01 | 0.02 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.1 | 0.2 | 0.1 | 0.1 |
| Total Titanium | µg/L | | <0.3 | 0.7 | <10 | 0.79 | 1.4 | 0.58 | 0.84 | 0.62 | 1.0 | 2.04 | 4.0 | 1.68 | 3.4 | 1.68 | 3.4 | 1.68 | 3.4 | 1.68 | 3.4 | 0.78 | 1.4 | 0.31 | 0.5 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 17 | 26 | 14 | 20 | 14 | 20 | 14 | 21 | 17 | 26 | 17 | 26 | 17 | 26 | 17 | 26 | 17 | 26 | 7 | 10 |
| Total Uranium | µg/L | 15 | 0.02 | 0.1 | 1.7 | 0.14 | 0.24 | 0.082 | 0.24 | 0.08 | 0.24 | 0.1 | 0.15 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.12 | 0.17 |
| Total Vanadium | µg/L | | <0.1 | 0.1 | <30 | 0.7 | 1.8 | 0.42 | 1.1 | 0.46 | 1.3 | 0.53 | 1.4 | 0.72 | 1.9 | 0.72 | 1.9 | 0.72 | 1.9 | 0.72 | 1.9 | 0.7 | 1.8 | 0.46 | 1.0 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **123** | 5.6 | 9.3 | 4.3 | 6.3 | 4.2 | 6.6 | 4.4 | 7.1 | 5.7 | 9.5 | 5.7 | 9.5 | 5.7 | 9.5 | 5.7 | 9.5 | 5.6 | 9.3 | 3.3 | 4.6 |

**Table 7.4-A36: Observed and Predicted Concentrations at Lake D3**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 39 | 72 | **1100** | 148 | 241 | 107 | 161 | 124 | 204 | 126 | 211 | 144 | 240 | 144 | 240 | 144 | 240 | 144 | 240 | 144 | 240 | 89 | 139 |
| Total Alkalinity | mg/L | | 26 | 47 | 905 | 84 | 129 | 60 | 114 | 67 | 114 | 68 | 105 | 84 | 130 | 84 | 130 | 84 | 130 | 84 | 130 | 84 | 130 | 48 | 68 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **139** | 4.9 | **8.4** | 3.2 | 4.6 | 3.7 | 6.6 | 3.8 | 6.9 | 4.9 | 8.4 | 4.9 | 8.4 | 4.9 | 8.4 | 4.9 | 8.4 | 4.9 | 8.4 | 1.9 | 3.2 |
| Calcium | mg/L | | 10 | 15 | 304 | 38 | 61 | 25 | 61 | 29 | 61 | 30 | 47 | 38 | 59 | 38 | 59 | 38 | 59 | 38 | 59 | 38 | 59 | 17 | 35 |
| Chloride | mg/L | 120 | 3.3 | 8.1 | 107 | 16 | 28 | 14 | 22 | 14 | 23 | 14 | 23 | 16 | 28 | 16 | 28 | 16 | 28 | 16 | 28 | 16 | 28 | 12 | 21 |
| Fluoride | mg/L | 0.12 | 0.04 | 0.04 | 0.04 | 0.037 | 0.053 | 0.031 | 0.041 | 0.034 | 0.049 | 0.035 | 0.051 | 0.036 | 0.053 | 0.036 | 0.053 | 0.036 | 0.053 | 0.036 | 0.053 | 0.036 | 0.053 | 0.017 | 0.031 |
| Magnesium | mg/L | | 1.1 | 2.2 | 42 | 5.3 | 8.8 | 3.6 | 8.8 | 4.1 | 8.8 | 4.3 | 6.9 | 5.3 | 8.4 | 5.3 | 8.4 | 5.3 | 8.4 | 5.3 | 8.4 | 5.3 | 8 | 2.6 | 5 |
| Potassium | mg/L | | 0.58 | 1.1 | 14 | 2.3 | 3.5 | 1.6 | 3.5 | 1.9 | 3.5 | 1.9 | 2.9 | 2.3 | 3.5 | 2.3 | 3.5 | 2.3 | 3.5 | 2.3 | 3.5 | 2.3 | 3.5 | 1.3 | 2.1 |
| Sodium | mg/L | 200 | 1.8 | 4 | 61 | 8.7 | 14 | 5.5 | 14 | 6.7 | 14 | 6.6 | 11 | 8.5 | 14 | 8.6 | 14 | 8.6 | 14 | 8.6 | 14 | 9 | 14 | 5 | 8 |
| Sulphate | mg/L | 500 | 2.1 | 3.9 | 29 | 5.7 | 9.4 | 4.6 | 7.9 | 4.9 | 8.1 | 4.9 | 8.5 | 5.6 | 9.2 | 5.6 | 9.5 | 5.6 | 9.5 | 5.6 | 9.5 | 5.6 | 10 | 5.0 | 8 |
| Ammonia (as N) | mg/L | 7 | 0.003 | <0.05 | 1.4 | 0.088 | 0.21 | 0.061 | 0.14 | 0.068 | 0.15 | 0.069 | 0.16 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.08 | 0.21 | 0.08 | 0.21 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.04 | 0.08 | 0.018 | 0.032 | 0.015 | 0.027 | 0.016 | 0.027 | 1.0 | 2.0 | 0.5 | 1.1 | 0.5 | 1.1 | 0.5 | 1.1 | 0.5 | 1.1 | 0.018 | 0.032 | 0.018 | 0.032 |
| Total Kjeldahl Nitrogen | mg/L | | 0.26 | 0.42 | 7.8 | 0.89 | 1.4 | 0.6 | 1.3 | 0.7 | 1.3 | 0.72 | 1.2 | 0.89 | 1.4 | 0.89 | 1.4 | 0.89 | 1.4 | 0.89 | 1.4 | 0.9 | 1.4 | 0.5 | 1.0 |
| Dissolved Phosphorus | mg/L | | 0.0021 | 0.007 | 0.02 | 0.0071 | 0.012 | 0.0054 | 0.0079 | 0.006 | 0.0092 | 0.0061 | 0.0096 | 0.0071 | 0.012 | 0.0071 | 0.012 | 0.0071 | 0.012 | 0.0071 | 0.012 | 0.0071 | 0.012 | 0.006 | 0.009 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.003 | 0.00075 | 0.0011 | 0.00063 | 0.00084 | 0.00066 | 0.00098 | 0.00067 | 0.001 | 0.00074 | 0.0011 | 0.00074 | 0.0011 | 0.00074 | 0.0011 | 0.00074 | 0.0011 | 0.00074 | 0.0011 | 0.00032 | 0.0006 |
| Cyanide | µg/L | 200 | <0.002 | <0.002 | 4 | 1.1 | 2.2 | 1.2 | 1.8 | 1.1 | 1.9 | 1.2 | 2.0 | 1.1 | 2.2 | 1.1 | 2.2 | 1.1 | 2.2 | 1.1 | 2.2 | 1.11 | 2.2 | 0.47 | 1.4 |
| Total Aluminum | µg/L | 100 | <1 | 5.3 | 21 | 4.0 | 6.3 | 3.3 | 5.9 | 3.5 | 5.9 | 32 | 64 | 22 | 45 | 22 | 45 | 22 | 45 | 22 | 45 | 4.0 | 6.3 | 4.0 | 6.3 |
| Total Antimony | µg/L | 6 | <0.03 | <0.13 | 0.5 | 0.14 | 0.22 | 0.12 | 0.17 | 0.14 | 0.23 | 0.12 | 0.19 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.22 | 0.14 | 0.23 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.1 | 3.8 | 1.2 | 1.9 | 1.1 | 1.6 | 1.3 | 1.9 | 1.2 | 1.8 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 |
| Total Barium | µg/L | 1000 | 1 | 16 | 222 | 29 | 55 | 26 | 45 | 28 | 50 | 29 | 52 | 28 | 56 | 28 | 56 | 28 | 56 | 28 | 56 | 28 | 56 | 17 | 33 |
| Total Beryllium | µg/L | | <0.1 | <0.5 | 2 | 0.27 | 0.48 | 0.19 | 0.43 | 0.19 | 0.43 | 0.22 | 0.41 | 0.27 | 0.48 | 0.27 | 0.48 | 0.27 | 0.48 | 0.27 | 0.48 | 0.27 | 0.48 | 0.1 | 0.27 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.022 | 0.035 | 0.022 | 0.035 | 0.022 | 0.035 | 0.022 | 0.035 | 0.022 | 0.035 | 0.022 | 0.035 | 0.022 | 0.035 | 0.022 | 0.035 | 0.02 | 0.0 | 0.01 | 0.0 |
| Total Boron | µg/L | 1500 | 2.8 | 9.3 | 25 | 14 | 22 | 12 | 16 | 12 | 18 | 12 | 18 | 14 | 22 | 14 | 22 | 14 | 22 | 14 | 22 | 14 | 22 | 9 | 14 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **<0.5** | **0.063** | **0.12** | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 | 0.063 | 0.12 |
| Total Chromium | µg/L | 8.9 | <0.1 | 0.9 | **20** | 1.8 | 4.5 | 1.1 | 4.5 | 1.2 | 4.5 | 1.3 | 2.9 | 1.7 | 3.4 | 1.7 | 3.4 | 1.7 | 3.4 | 1.7 | 3.4 | 1.7 | 3.3 | 1.1 | 2.3 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <15 | 0.35 | 0.78 | 0.2 | 0.38 | 0.26 | 0.57 | 0.26 | 0.57 | 0.36 | 0.79 | 0.36 | 0.79 | 0.36 | 0.79 | 0.36 | 0.79 | 0.35 | 0.77 | 0.16 | 0.38 |
| Total Copper | µg/L | 2 | 0.63 | 1.5 | **18** | 2.0 | **3.4** | 1.6 | 2.3 | 1.7 | 2.8 | 1.8 | 2.9 | 2.0 | 3.4 | 2.0 | 3.4 | 2.0 | 3.4 | 2.0 | 3.4 | 2.0 | 3.3 | 2.0 | 3.3 |
| Total Iron | µg/L | 300 | 11 | 113 | **660** | 145 | 243 | 116 | 187 | 116 | 187 | 160 | 265 | 164 | 277 | 164 | 279 | 164 | 279 | 164 | 279 | 145 | 248 | 65 | 138 |
| Total Lead | µg/L | 1 | <0.05 | <0.2 | **1.4** | 0.14 | 0.24 | 0.12 | 0.24 | 0.12 | 0.24 | 0.13 | 0.19 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.15 | 0.22 | 0.14 | 0.21 | 0.14 | 0.21 |
| Total Lithium | µg/L | | 1 | <5 | 24 | 4.2 | 6.6 | 3.6 | 7.1 | 4.0 | 7.1 | 4.2 | 6.6 | 4.2 | 6.6 | 4.3 | 6.6 | 4.3 | 6.6 | 4.3 | 6.6 | 4.2 | 6.6 | 1.8 | 3.7 |
| Total Manganese | µg/L | 50 | 6.8 | 17 | **1520** | **71** | **130** | 47 | 97 | 51 | 102 | 51 | 107 | 68 | 132 | 68 | 131 | 68 | 131 | 68 | 131 | 68 | 131 | 27 | 54 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | <0.05 | 0.0098 | 0.016 | 0.0096 | 0.015 | 0.01 | 0.015 | 0.01 | 0.015 | 0.0098 | 0.016 | 0.0098 | 0.016 | 0.0098 | 0.016 | 0.0098 | 0.016 | 0.01 | 0.016 | 0.004 | 0.012 |
| Total Molybdenum | µg/L | 73 | 0.10 | 0.44 | <30 | 0.62 | 0.98 | 0.37 | 0.5 | 0.45 | 0.73 | 0.47 | 0.76 | 0.62 | 0.98 | 0.62 | 0.98 | 0.62 | 0.98 | 0.62 | 0.98 | 0.62 | 1.0 | 0.49 | 0.8 |
| Total Nickel | µg/L | 29 | <0.1 | 1.1 | <20 | 2.5 | 5.4 | 1.7 | 5.4 | 2 | 5 | 2.1 | 3.8 | 2.5 | 5.4 | 2.5 | 5.2 | 2.5 | 5.2 | 2.5 | 5.2 | 2.5 | 5.1 | 1.3 | 2.9 |
| Total Selenium | µg/L | 1 | <0.1 | <0.5 | **<10** | 0.54 | 0.94 | 0.28 | 0.41 | 0.38 | 0.65 | 0.38 | 0.69 | 0.54 | 0.94 | 0.54 | 0.94 | 0.54 | 0.94 | 0.54 | 0.94 | 0.54 | 0.94 | 0.23 | 0.4 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.019 | 0.039 | 0.018 | 0.03 | 0.018 | 0.03 | 0.018 | 0.03 | 0.018 | 0.03 | 0.018 | 0.03 | 0.018 | 0.03 | 0.018 | 0.03 | 0.018 | 0.03 | 0.007 | 0.023 |
| Total Strontium | µg/L | | 42 | 76 | 1260 | 160 | 338 | 139 | 242 | 144 | 286 | 147 | 296 | 157 | 338 | 157 | 338 | 157 | 338 | 157 | 338 | 157 | 338 | 88 | 177 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.025 | 0.044 | 0.025 | 0.044 | 0.025 | 0.044 | 0.025 | 0.044 | 0.025 | 0.044 | 0.025 | 0.043 | 0.025 | 0.043 | 0.025 | 0.043 | 0.025 | 0.043 | 0.01 | 0.022 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.14 | 0.22 | 0.14 | 0.21 | 0.14 | 0.21 | 0.14 | 0.21 | 0.14 | 0.21 | 0.13 | 0.21 | 0.13 | 0.21 | 0.13 | 0.21 | 0.1 | 0.2 | 0.1 | 0.1 |
| Total Titanium | µg/L | | <0.3 | 0.7 | <10 | 0.78 | 1.4 | 0.59 | 0.88 | 0.62 | 1.1 | 2.04 | 4.1 | 1.66 | 3.3 | 1.66 | 3.3 | 1.66 | 3.3 | 1.66 | 3.3 | 0.77 | 1.4 | 0.32 | 0.6 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 16 | 25 | 13 | 20 | 13 | 20 | 14 | 21 | 16 | 25 | 16 | 25 | 16 | 25 | 16 | 25 | 16 | 25 | 7 | 10 |
| Total Uranium | µg/L | 15 | 0.02 | 0.1 | 1.7 | 0.14 | 0.24 | 0.085 | 0.24 | 0.08 | 0.24 | 0.11 | 0.16 | 0.14 | 0.2 | 0.14 | 0.2 | 0.14 | 0.2 | 0.14 | 0.2 | 0.14 | 0.2 | 0.12 | 0.18 |
| Total Vanadium | µg/L | | <0.1 | 0.1 | <30 | 0.69 | 1.7 | 0.41 | 1.1 | 0.49 | 1.3 | 0.55 | 1.5 | 0.72 | 1.8 | 0.72 | 1.8 | 0.72 | 1.8 | 0.72 | 1.8 | 0.68 | 1.7 | 0.46 | 1.0 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **123** | 5.4 | 8.7 | 4.2 | 6.0 | 4.1 | 6.8 | 4.3 | 7.3 | 5.4 | 8.8 | 5.4 | 8.8 | 5.4 | 8.8 | 5.4 | 8.8 | 5.4 | 8.7 | 3.3 | 5.0 |

**Table 7.4-A37: Observed and Predicted Concentrations at Lake D1**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 39 | 72 | **1100** | 156 | 239 | 116 | 165 | 136 | 213 | 138 | 218 | 155 | 243 | 155 | 243 | 155 | 243 | 155 | 243 | 155 | 243 | 101 | 210 |
| Total Alkalinity | mg/L | | 26 | 47 | 905 | 96 | 145 | 67 | 114 | 80 | 119 | 82 | 121 | 95 | 142 | 94 | 142 | 94 | 142 | 94 | 142 | 94 | 142 | 59 | 118 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **139** | 5.8 | **8.7** | 3.8 | 5.2 | 4.7 | 7.3 | 4.9 | 7.6 | 5.8 | 8.8 | 5.8 | 8.8 | 5.8 | 8.8 | 5.8 | 8.8 | 5.8 | 8.8 | 2.8 | 5.9 |
| Calcium | mg/L | | 10 | 15 | 304 | 44 | 67 | 29 | 61 | 36 | 61 | 37 | 55 | 43 | 66 | 43 | 66 | 43 | 66 | 43 | 66 | 43 | 66 | 23 | 53 |
| Chloride | mg/L | 120 | 3.3 | 8.1 | 107 | 17 | 29 | 15 | 22 | 16 | 24 | 16 | 25 | 17 | 29 | 17 | 29 | 17 | 29 | 17 | 29 | 17 | 29 | 14 | 26 |
| Fluoride | mg/L | 0.12 | 0.04 | 0.04 | 0.04 | 0.039 | 0.053 | 0.033 | 0.043 | 0.037 | 0.051 | 0.037 | 0.052 | 0.039 | 0.054 | 0.039 | 0.054 | 0.039 | 0.054 | 0.039 | 0.054 | 0.039 | 0.054 | 0.02 | 0.041 |
| Magnesium | mg/L | | 1.1 | 2.2 | 42 | 6.4 | 9.5 | 4.1 | 8.8 | 5.1 | 8.8 | 5.3 | 7.7 | 6.2 | 9.3 | 6.2 | 9.3 | 6.2 | 9.3 | 6.2 | 9.3 | 6.2 | 9 | 3.4 | 7 |
| Potassium | mg/L | | 0.58 | 1.1 | 14 | 2.7 | 3.8 | 1.8 | 3.5 | 2.2 | 3.5 | 2.2 | 3.2 | 2.7 | 3.8 | 2.6 | 3.8 | 2.6 | 3.8 | 2.6 | 3.8 | 2.6 | 3.7 | 1.6 | 3.3 |
| Sodium | mg/L | 200 | 1.8 | 4 | 61 | 9.9 | 14 | 6.3 | 14 | 7.9 | 14 | 8.1 | 12 | 9.7 | 14 | 9.7 | 14 | 9.7 | 14 | 9.7 | 14 | 10 | 14 | 6 | 12 |
| Sulphate | mg/L | 500 | 2.1 | 3.9 | 29 | 6.1 | 10.5 | 5.0 | 8.2 | 5.5 | 9.0 | 5.6 | 9.4 | 6.1 | 9.8 | 6.1 | 10.4 | 6.1 | 10.4 | 6.1 | 10.4 | 6.1 | 10 | 5.4 | 10 |
| Ammonia (as N) | mg/L | 7 | 0.003 | <0.05 | 1.4 | 0.102 | 0.22 | 0.069 | 0.14 | 0.085 | 0.18 | 0.087 | 0.18 | 0.096 | 0.22 | 0.096 | 0.22 | 0.096 | 0.22 | 0.096 | 0.22 | 0.1 | 0.22 | 0.1 | 0.22 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.04 | 0.08 | 0.02 | 0.035 | 0.016 | 0.027 | 0.018 | 0.03 | 0.9 | 1.8 | 0.5 | 1.0 | 0.5 | 1.0 | 0.5 | 1.0 | 0.5 | 1.0 | 0.019 | 0.034 | 0.019 | 0.034 |
| Total Kjeldahl Nitrogen | mg/L | | 0.26 | 0.42 | 7.8 | 1.0 | 1.6 | 0.68 | 1.3 | 0.84 | 1.3 | 0.87 | 1.3 | 0.99 | 1.6 | 0.99 | 1.6 | 0.99 | 1.6 | 0.99 | 1.6 | 1.0 | 1.6 | 0.6 | 1.5 |
| Dissolved Phosphorus | mg/L | | 0.0021 | 0.007 | 0.02 | 0.0078 | 0.013 | 0.0059 | 0.0084 | 0.0068 | 0.0103 | 0.0069 | 0.0107 | 0.0076 | 0.012 | 0.0076 | 0.012 | 0.0076 | 0.012 | 0.0076 | 0.012 | 0.0076 | 0.012 | 0.0066 | 0.012 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.003 | 0.0008 | 0.0011 | 0.00067 | 0.00091 | 0.00075 | 0.00104 | 0.00074 | 0.0011 | 0.00079 | 0.0011 | 0.00079 | 0.0011 | 0.00079 | 0.0011 | 0.00079 | 0.0011 | 0.00079 | 0.0011 | 0.0004 | 0.0009 |
| Cyanide | µg/L | 200 | <0.002 | <0.002 | 4 | 1.1 | 2.2 | 1.1 | 1.7 | 1.1 | 1.9 | 1.1 | 2.0 | 1.1 | 2.2 | 1.1 | 2.2 | 1.1 | 2.2 | 1.1 | 2.2 | 1.13 | 2.2 | 0.53 | 1.3 |
| Total Aluminum | µg/L | 100 | <1 | 5.3 | 21 | 4.6 | 6.9 | 3.6 | 5.9 | 4.1 | 6.2 | 31 | 58 | 23 | 41 | 23 | 41 | 23 | 41 | 23 | 41 | 4.5 | 6.8 | 4.5 | 6.8 |
| Total Antimony | µg/L | 6 | <0.03 | <0.13 | 0.5 | 0.15 | 0.22 | 0.13 | 0.18 | 0.15 | 0.24 | 0.13 | 0.21 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 | 0.15 | 0.23 |
| Total Arsenic | µg/L | 5 | 0.3 | 1.1 | 3.8 | 1.3 | 1.9 | 1.2 | 1.7 | 1.4 | 2.0 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 | 1.3 | 1.9 |
| Total Barium | µg/L | 1000 | 1 | 16 | 222 | 32 | 56 | 29 | 45 | 32 | 53 | 31 | 54 | 30 | 57 | 30 | 57 | 30 | 57 | 30 | 57 | 30 | 57 | 20 | 49 |
| Total Beryllium | µg/L | | <0.1 | <0.5 | 2 | 0.32 | 0.58 | 0.21 | 0.43 | 0.33 | 0.58 | 0.26 | 0.49 | 0.31 | 0.55 | 0.31 | 0.55 | 0.31 | 0.55 | 0.31 | 0.55 | 0.31 | 0.55 | 0.14 | 0.39 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.028 | 0.041 | 0.028 | 0.041 | 0.028 | 0.041 | 0.028 | 0.041 | 0.027 | 0.039 | 0.027 | 0.039 | 0.027 | 0.039 | 0.027 | 0.039 | 0.027 | 0.039 | 0.013 | 0.031 |
| Total Boron | µg/L | 1500 | 2.8 | 9.3 | 25 | 14 | 22 | 12 | 17 | 12 | 18 | 12 | 19 | 14 | 21 | 14 | 21 | 14 | 21 | 14 | 21 | 14 | 21 | 10 | 19 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **<0.5** | **0.069** | **0.12** | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 | 0.069 | 0.12 |
| Total Chromium | µg/L | 8.9 | <0.1 | 0.9 | **20** | 2.1 | 4.5 | 1.2 | 4.5 | 1.5 | 4.5 | 1.7 | 3.7 | 2.1 | 4.3 | 2.1 | 4.3 | 2.1 | 4.3 | 2.1 | 4.3 | 2.1 | 4.2 | 1.4 | 3.9 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <15 | 0.47 | 0.84 | 0.26 | 0.47 | 0.36 | 0.68 | 0.36 | 0.68 | 0.45 | 0.87 | 0.46 | 0.87 | 0.46 | 0.87 | 0.46 | 0.87 | 0.45 | 0.85 | 0.23 | 0.69 |
| Total Copper | µg/L | 2 | 0.63 | 1.5 | **18** | **2.2** | **3.6** | 1.7 | 2.5 | 2.0 | 3.1 | 2.0 | 3.2 | 2.2 | 3.5 | 2.2 | 3.5 | 2.2 | 3.5 | 2.2 | 3.5 | 2.2 | 3.5 | 2.2 | 3.5 |
| Total Iron | µg/L | 300 | 11 | 113 | **660** | 157 | 261 | 124 | 187 | 124 | 187 | 174 | 277 | 174 | 287 | 174 | 289 | 174 | 289 | 174 | 289 | 154 | 260 | 80 | 183 |
| Total Lead | µg/L | 1 | <0.05 | <0.2 | **1.4** | 0.17 | 0.24 | 0.13 | 0.24 | 0.13 | 0.24 | 0.15 | 0.22 | 0.17 | 0.24 | 0.17 | 0.24 | 0.17 | 0.24 | 0.17 | 0.24 | 0.16 | 0.23 | 0.16 | 0.23 |
| Total Lithium | µg/L | | 1 | <5 | 24 | 4.5 | 7.1 | 3.8 | 7.1 | 4.3 | 7.1 | 4.4 | 7.3 | 4.5 | 6.9 | 4.6 | 6.9 | 4.6 | 6.9 | 4.6 | 6.9 | 4.6 | 6.9 | 2.2 | 5.5 |
| Total Manganese | µg/L | 50 | 6.8 | 17 | **1520** | **85** | **161** | 54 | 107 | 67 | 117 | 68 | 121 | 85 | 141 | 85 | 141 | 85 | 141 | 85 | 141 | 85 | 141 | 38 | 96 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | <0.05 | 0.0103 | 0.015 | 0.0101 | 0.015 | 0.01 | 0.015 | 0.01 | 0.015 | 0.0102 | 0.016 | 0.0102 | 0.016 | 0.0102 | 0.016 | 0.0102 | 0.016 | 0.01 | 0.016 | 0.005 | 0.012 |
| Total Molybdenum | µg/L | 73 | 0.10 | 0.44 | <30 | 0.8 | 1.14 | 0.45 | 0.67 | 0.6 | 0.85 | 0.62 | 0.88 | 0.77 | 1.11 | 0.77 | 1.11 | 0.77 | 1.11 | 0.77 | 1.11 | 0.77 | 1.1 | 0.6 | 1.2 |
| Total Nickel | µg/L | 29 | <0.1 | 1.1 | <20 | 2.8 | 5.8 | 2.0 | 5.4 | 2 | 5 | 2.4 | 4.6 | 2.8 | 6.0 | 2.8 | 6.0 | 2.8 | 6.0 | 2.8 | 6.0 | 2.8 | 6.0 | 1.6 | 3.8 |
| Total Selenium | µg/L | 1 | <0.1 | <0.5 | **<10** | 0.7 | **1.06** | 0.36 | 0.61 | 0.52 | 0.81 | 0.54 | 0.84 | 0.69 | 1.08 | 0.69 | 1.08 | 0.69 | 1.08 | 0.69 | 1.08 | 0.69 | 1.08 | 0.36 | 0.8 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.029 | 0.04 | 0.029 | 0.039 | 0.029 | 0.039 | 0.028 | 0.04 | 0.028 | 0.04 | 0.028 | 0.04 | 0.028 | 0.04 | 0.028 | 0.04 | 0.028 | 0.04 | 0.013 | 0.036 |
| Total Strontium | µg/L | | 42 | 76 | 1260 | 170 | 345 | 146 | 254 | 156 | 307 | 157 | 314 | 168 | 350 | 168 | 350 | 168 | 350 | 168 | 350 | 168 | 350 | 102 | 204 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.033 | 0.053 | 0.032 | 0.048 | 0.032 | 0.048 | 0.033 | 0.054 | 0.031 | 0.05 | 0.031 | 0.05 | 0.031 | 0.05 | 0.031 | 0.05 | 0.031 | 0.049 | 0.016 | 0.042 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.17 | 0.26 | 0.17 | 0.25 | 0.18 | 0.26 | 0.18 | 0.27 | 0.16 | 0.24 | 0.16 | 0.24 | 0.16 | 0.24 | 0.16 | 0.24 | 0.16 | 0.24 | 0.1 | 0.21 |
| Total Titanium | µg/L | | <0.3 | 0.7 | <10 | 0.85 | 1.4 | 0.64 | 0.96 | 0.71 | 1.2 | 2.03 | 3.8 | 1.73 | 3.2 | 1.73 | 3.2 | 1.73 | 3.2 | 1.73 | 3.2 | 0.85 | 1.4 | 0.42 | 1.0 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 22 | 32 | 23 | 33 | 17 | 25 | 18 | 26 | 21 | 31 | 21 | 31 | 21 | 31 | 21 | 31 | 21 | 31 | 10 | 24 |
| Total Uranium | µg/L | 15 | 0.02 | 0.1 | 1.7 | 0.17 | 0.24 | 0.10 | 0.24 | 0.1 | 0.24 | 0.14 | 0.19 | 0.17 | 0.24 | 0.17 | 0.24 | 0.17 | 0.24 | 0.17 | 0.24 | 0.17 | 0.24 | 0.17 | 0.24 |
| Total Vanadium | µg/L | | <0.1 | 0.1 | <30 | 0.8 | 2.3 | 0.49 | 1.4 | 0.61 | 1.6 | 0.68 | 1.8 | 0.83 | 2.2 | 0.83 | 2.2 | 0.83 | 2.2 | 0.83 | 2.2 | 0.8 | 2.1 | 0.57 | 1.4 |
| Total Zinc | µg/L | 30 | <0.5 | <3 | **123** | 6.3 | 9.4 | 4.6 | 6.3 | 5.1 | 7.5 | 5.4 | 7.9 | 6.4 | 9.5 | 6.4 | 9.5 | 6.4 | 9.5 | 6.4 | 9.5 | 6.3 | 9.4 | 4.1 | 8.2 |

**Table 7.4-A38: Observed and Predicted Concentrations at Lake H17**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 112 | 211 | 111 | 211 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 42 | 67 | 41 | 67 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 7.8 | **12.6** | 7.8 | 12.6 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 105 | 245 | 108 | 245 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 64 | **159** | 64 | 164 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.043 | 0.072 | 0.043 | 0.072 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 4.3 | 6.5 | 4.3 | 6.5 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 5.4 | 10.6 | 5.4 | 10.7 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 10.5 | 22.4 | 10.4 | 22.4 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 8.7 | 18.6 | 8.6 | 18.6 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.877 | 1.826 | 0.886 | 1.881 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.081 | 0.133 | 0.08 | 0.131 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.75 | 1.1 | 0.75 | 1.1 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0109 | 0.0188 | 0.011 | 0.0188 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0053 | 0.0088 | 0.0053 | 0.0087 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 2.0 | 3.4 | 2.0 | 3.4 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 8.5 | 17.8 | 8.6 | 18.1 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.24 | 0.37 | 0.24 | 0.37 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.9 | 3.2 | 1.9 | 3.2 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 33 | 52 | 32 | 52 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 43.44 | 74.48 | 43.77 | 73.89 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.147 | 0.251 | 0.146 | 0.25 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 72 | 130 | 72 | 129 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.178** | **0.308** | 0.174 | 0.307 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 3.14 | 5.6 | 3.09 | 5.4 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.09 | 0.17 | 0.09 | 0.17 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | 1.9 | **3.5** | 1.9 | 3.5 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 118 | 195 | 118 | 196 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | 0.22 | 0.46 | 0.22 | 0.47 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 6.2 | 14 | 6.2 | 14 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | **67** | **140** | 66 | 140 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.0577** | **0.108** | 0.057 | 0.106 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.22 | 0.34 | 0.22 | 0.34 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 1.5 | 2.8 | 1.5 | 2.8 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.31 | 0.49 | 0.31 | 0.48 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | **0.514** | **1.029** | 0.518 | 1.038 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 107 | 244 | 107 | 253 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.058 | 0.098 | 0.058 | 0.097 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.24 | 0.39 | 0.24 | 0.39 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 0.24 | 0.4 | 0.24 | 0.38 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 1 | 1 | 1 | 1 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.058 | 0.093 | 0.058 | 0.093 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.33 | 0.54 | 0.31 | 0.54 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 4.9 | 8.6 | 4.9 | 8.5 |

**Table 7.4-A39: Observed and Predicted Concentrations at Lake H1**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 160 | 298 | 160 | 298 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 56 | 86 | 56 | 86 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.9 | 5.9 | 3.9 | 5.9 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 59 | 120 | 59 | 120 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 81 | **182** | 81 | 182 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.043 | 0.067 | 0.043 | 0.067 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 7.2 | 13.6 | 7.2 | 13.6 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.9 | 5.7 | 2.9 | 5.7 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 9.5 | 22.0 | 9.5 | 22.0 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.8 | 24.1 | 11.8 | 24.1 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.236 | 0.483 | 0.236 | 0.483 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.162 | 0.341 | 0.162 | 0.341 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.66 | 1.06 | 0.66 | 1.06 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0073 | 0.0116 | 0.0073 | 0.0116 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.00275 | 0.00532 | 0.00275 | 0.00532 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.3 | 2.0 | 1.3 | 2.0 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 5.6 | 11.6 | 5.6 | 11.6 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.23 | 0.34 | 0.23 | 0.34 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.9 | 3.0 | 1.9 | 3.0 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 28 | 50 | 28 | 50 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 7.62 | 17.49 | 7.62 | 17.49 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.077 | 0.13 | 0.077 | 0.13 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 29 | 52 | 29 | 52 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.11** | **0.26** | 0.11 | 0.26 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 2.59 | 6.0 | 2.59 | 6.0 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.2 | 0.37 | 0.2 | 0.37 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.7** | **4.5** | 2.7 | 4.5 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 112 | 175 | 112 | 175 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.173** | **2.32** | 1.17 | 2.32 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 6.0 | 15 | 6.0 | 15 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 39 | **92** | 39 | 92 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.042** | **0.088** | 0.042 | 0.088 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.5 | 0.68 | 0.5 | 0.68 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.2 | 4.5 | 2.2 | 4.5 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.53 | 0.85 | 0.53 | 0.85 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | **0.141** | **0.254** | 0.141 | 0.254 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 112 | 296 | 112 | 296 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.053 | 0.083 | 0.053 | 0.083 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.24 | 0.39 | 0.24 | 0.39 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 0.84 | 1.3 | 0.84 | 1.25 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 14 | 21 | 14 | 21 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.067 | 0.10 | 0.067 | 0.10 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.39 | 0.68 | 0.39 | 0.68 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.6 | 13.4 | 5.6 | 13.4 |

**Table 7.4-A40: Observed and Predicted Concentrations at Lake I1**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 157 | 306 | 157 | 306 | 157 | 305 | 156 | 306 | 158 | 307 | 158 | 307 | 158 | 307 | 158 | 307 | 158 | 307 | 160 | 307 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 53 | 85 | 53 | 85 | 53 | 85 | 53 | 86 | 53 | 84 | 53 | 86 | 53 | 86 | 53 | 86 | 53 | 86 | 53 | 86 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.0 | 4.3 | 3.0 | 4.3 | 3.0 | 4.3 | 3.0 | 4.3 | 3.0 | 4.4 | 3.0 | 4.4 | 3.0 | 4.4 | 3.0 | 4.4 | 3.0 | 4.4 | 3.0 | 4.4 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 48 | 104 | 48 | 104 | 48 | 105 | 48 | 106 | 48 | 106 | 48 | 108 | 48 | 108 | 48 | 108 | 48 | 108 | 48 | 104 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 75 | **296** | 75 | 296 | 75 | 297 | 75 | 297 | 76 | 295 | 75 | 295 | 75 | 295 | 75 | 295 | 75 | 295 | 75 | 308 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.039 | 0.062 | 0.039 | 0.062 | 0.039 | 0.062 | 0.039 | 0.063 | 0.039 | 0.063 | 0.039 | 0.062 | 0.039 | 0.062 | 0.039 | 0.062 | 0.039 | 0.062 | 0.039 | 0.062 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 7.0 | 13.2 | 7.0 | 13.2 | 7.1 | 13.2 | 7.0 | 13.3 | 7.1 | 13.4 | 7.1 | 13.4 | 7.1 | 13.4 | 7.1 | 13.4 | 7.1 | 13.4 | 7.2 | 13.2 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.3 | 4.9 | 2.3 | 4.9 | 2.3 | 4.8 | 2.3 | 4.9 | 2.4 | 4.7 | 2.4 | 4.9 | 2.4 | 4.9 | 2.4 | 4.9 | 2.3 | 4.8 | 2.3 | 4.9 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 8.9 | 20.2 | 8.9 | 20.2 | 8.8 | 19.8 | 8.8 | 19.8 | 8.9 | 20.4 | 8.9 | 20.2 | 8.9 | 20.2 | 8.9 | 20.2 | 8.9 | 20.2 | 9.0 | 20.3 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.7 | 24.1 | 11.7 | 24.1 | 11.6 | 24.0 | 11.7 | 23.8 | 11.8 | 23.9 | 11.9 | 23.9 | 11.9 | 23.9 | 11.9 | 23.9 | 11.9 | 23.8 | 11.8 | 24.3 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.115 | 0.282 | 0.115 | 0.282 | 0.117 | 0.28 | 0.115 | 0.285 | 0.117 | 0.288 | 0.117 | 0.287 | 0.117 | 0.287 | 0.117 | 0.287 | 0.117 | 0.287 | 0.117 | 0.292 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.205 | 0.44 | 0.205 | 0.44 | 0.209 | 0.434 | 1.16 | 2.75 | 1.16 | 2.75 | 1.16 | 2.75 | 1.16 | 2.75 | 1.16 | 2.75 | 0.21 | 0.42 | 0.208 | 0.422 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.59 | 0.89 | 0.59 | 0.89 | 0.59 | 0.88 | 0.58 | 0.89 | 0.59 | 0.91 | 0.59 | 0.9 | 0.59 | 0.9 | 0.59 | 0.9 | 0.59 | 0.9 | 0.59 | 0.9 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0061 | 0.010 | 0.0061 | 0.010 | 0.0061 | 0.010 | 0.006 | 0.0099 | 0.0061 | 0.010 | 0.0061 | 0.010 | 0.0061 | 0.010 | 0.0061 | 0.010 | 0.0061 | 0.010 | 0.0061 | 0.0101 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0022 | 0.0039 | 0.0022 | 0.0039 | 0.0022 | 0.0039 | 0.0022 | 0.0039 | 0.0022 | 0.0040 | 0.0022 | 0.0040 | 0.0022 | 0.0040 | 0.0022 | 0.0040 | 0.0022 | 0.0040 | 0.0022 | 0.0039 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 4.7 | 12.0 | 4.7 | 12.0 | 4.7 | 12.0 | 18.3 | 43.2 | 18.3 | 43.2 | 18.3 | 43.2 | 18.3 | 43.2 | 18.3 | 43.2 | 4.8 | 12.0 | 4.8 | 12.3 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.21 | 0.29 | 0.21 | 0.29 | 0.21 | 0.29 | 0.21 | 0.3 | 0.22 | 0.31 | 0.21 | 0.31 | 0.21 | 0.31 | 0.21 | 0.31 | 0.21 | 0.3 | 0.21 | 0.3 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.7 | 1.7 | 2.7 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 23 | 40 | 23 | 40 | 23 | 41 | 23 | 41 | 23 | 41 | 23 | 41 | 23 | 41 | 23 | 41 | 23 | 41 | 23 | 40 | 22 | 39 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.48 | 0.71 | 0.48 | 0.71 | 0.48 | 0.71 | 0.48 | 0.71 | 0.49 | 0.71 | 0.49 | 0.71 | 0.49 | 0.71 | 0.49 | 0.71 | 0.49 | 0.71 | 0.48 | 0.71 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.075 | 0.122 | 0.075 | 0.122 | 0.075 | 0.122 | 0.075 | 0.122 | 0.076 | 0.124 | 0.075 | 0.124 | 0.075 | 0.124 | 0.075 | 0.124 | 0.075 | 0.123 | 0.075 | 0.123 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 27 | 44 | 27 | 44 | 27 | 44 | 27 | 44 | 27 | 45 | 27 | 45 | 27 | 45 | 27 | 45 | 27 | 45 | 27 | 45 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.083** | **0.20** | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 | 0.083 | 0.20 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 1.86 | 4.7 | 1.86 | 4.7 | 1.86 | 4.7 | 2.1 | 5.1 | 2.1 | 5.0 | 2.1 | 5.0 | 2.1 | 5.0 | 2.1 | 5.0 | 1.84 | 4.8 | 1.82 | 4.0 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.24 | 0.45 | 0.24 | 0.45 | 0.24 | 0.45 | 0.28 | 0.51 | 0.29 | 0.5 | 0.29 | 0.51 | 0.29 | 0.51 | 0.29 | 0.51 | 0.24 | 0.45 | 0.24 | 0.45 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.8** | **4.6** | 2.8 | 4.6 | 2.8 | 4.7 | 2.9 | 4.8 | 2.9 | 5.0 | 2.9 | 4.9 | 2.9 | 4.9 | 2.9 | 4.9 | 2.8 | 4.8 | 2.8 | 4.8 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 96 | 168 | 96 | 168 | 58 | 148 | 167 | 274 | 167 | 274 | 167 | 274 | 167 | 274 | 167 | 274 | 96 | 168 | 96 | 172 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.9** | **4.7** | 1.93 | 4.73 | 2.01 | 4.83 | 2.01 | 4.83 | 2.02 | 4.96 | 2.01 | 4.96 | 2.01 | 4.96 | 2.01 | 4.96 | 1.97 | 4.87 | 1.96 | 4.86 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 5.0 | 15 | 5.0 | 15 | 5.0 | 14 | 4.9 | 15 | 4.9 | 15 | 4.9 | 15 | 4.9 | 15 | 4.9 | 15 | 4.9 | 15 | 5.0 | 15 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 29 | **83** | 29 | 83 | 32 | 86 | 29 | 84 | 29 | 85 | 29 | 85 | 29 | 85 | 29 | 85 | 28 | 83 | 29 | 83 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.0413** | **0.091** | 0.041 | 0.091 | 0.041 | 0.091 | 0.04 | 0.091 | 0.041 | 0.091 | 0.041 | 0.091 | 0.041 | 0.091 | 0.041 | 0.091 | 0.041 | 0.091 | 0.041 | 0.09 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.6 | 0.84 | 0.6 | 0.84 | 0.6 | 0.84 | 0.59 | 0.84 | 0.6 | 0.86 | 0.6 | 0.86 | 0.6 | 0.86 | 0.6 | 0.86 | 0.6 | 0.86 | 0.6 | 0.86 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.4 | 4.7 | 2.4 | 4.7 | 2.5 | 4.8 | 2.5 | 4.8 | 2.5 | 4.9 | 2.5 | 4.9 | 2.5 | 4.9 | 2.5 | 4.9 | 2.4 | 4.7 | 2.4 | 4.7 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.58 | 1.0 | 0.58 | 1.0 | 0.6 | 0.96 | 0.6 | 0.96 | 0.6 | 0.96 | 0.6 | 0.96 | 0.6 | 0.96 | 0.6 | 0.96 | 0.6 | 0.95 | 0.6 | 0.96 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.07 | **0.14** | 0.07 | 0.14 | 0.074 | 0.144 | 0.071 | 0.142 | 0.071 | 0.142 | 0.071 | 0.143 | 0.071 | 0.143 | 0.071 | 0.143 | 0.071 | 0.142 | 0.071 | 0.142 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 98 | 288 | 98 | 288 | 99 | 291 | 98 | 292 | 98 | 304 | 98 | 304 | 98 | 304 | 98 | 304 | 98 | 304 | 100 | 304 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.048 | 0.08 | 0.048 | 0.08 | 0.048 | 0.081 | 0.048 | 0.081 | 0.048 | 0.08 | 0.049 | 0.08 | 0.049 | 0.08 | 0.049 | 0.08 | 0.048 | 0.079 | 0.048 | 0.08 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.25 | 2.2 | 1.25 | 2.18 | 1.26 | 2.15 | 6.73 | 12.95 | 6.8 | 13.04 | 6.8 | 13.04 | 6.8 | 13.04 | 6.8 | 13.04 | 1.28 | 2.19 | 1.27 | 2.21 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 | 29 | 45 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.063 | 0.093 | 0.063 | 0.093 | 0.06 | 0.09 | 0.065 | 0.096 | 0.065 | 0.096 | 0.065 | 0.097 | 0.065 | 0.097 | 0.065 | 0.097 | 0.063 | 0.094 | 0.063 | 0.095 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.37 | 0.59 | 0.37 | 0.59 | 0.37 | 0.59 | 0.37 | 0.59 | 0.37 | 0.59 | 0.37 | 0.59 | 0.37 | 0.59 | 0.37 | 0.59 | 0.36 | 0.6 | 0.37 | 0.62 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.1 | 9.7 | 5.1 | 9.7 | 5.2 | 10.0 | 5.3 | 10.5 | 5.4 | 10.5 | 5.4 | 10.5 | 5.4 | 10.5 | 5.4 | 10.5 | 5.1 | 10.1 | 5.1 | 10.1 |

**Table 7.4-A41: Observed and Predicted Concentrations at Lake J8**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 48 | 134 | 48 | 134 | 48 | 134 | 50 | 96 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 11 | 48 | 11 | 48 | 11 | 48 | 12 | 26 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 0.8 | 2.7 | 0.8 | 2.7 | 0.8 | 2.7 | 0.9 | 1.6 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 9 | 43 | 9 | 43 | 9 | 43 | 10 | 23 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 32 | **213** | 32 | 213 | 32 | 213 | 32 | 158 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.024 | 0.045 | 0.024 | 0.045 | 0.024 | 0.045 | 0.026 | 0.041 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 1.3 | 6.5 | 1.3 | 6.5 | 1.3 | 6.5 | 1.4 | 3.3 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 0.5 | 2.1 | 0.5 | 2.1 | 0.5 | 2.1 | 0.5 | 1.2 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 1.3 | 7.3 | 1.3 | 7.3 | 1.3 | 7.3 | 1.3 | 3.8 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 4.0 | 15.3 | 4.0 | 15.3 | 4.0 | 15.3 | 4.1 | 8.3 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.012 | 0.093 | 0.012 | 0.093 | 0.012 | 0.093 | 0.012 | 0.04 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.031 | 0.089 | 0.031 | 0.089 | 0.031 | 0.089 | 0.03 | 0.066 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.12 | 0.53 | 0.12 | 0.53 | 0.12 | 0.53 | 0.13 | 0.3 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0025 | 0.0061 | 0.0025 | 0.0061 | 0.0025 | 0.0061 | 0.0027 | 0.0043 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.00127 | 0.00341 | 0.00127 | 0.00341 | 0.00127 | 0.00341 | 0.00134 | 0.00239 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.8 | 3.8 | 1.8 | 3.8 | 1.8 | 3.8 | 2 | 3 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 1.4 | 4.3 | 1.4 | 4.3 | 1.4 | 4.3 | 1.5 | 4.0 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.12 | 0.23 | 0.12 | 0.23 | 0.12 | 0.23 | 0.13 | 0.18 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.4 | 3.0 | 1.4 | 3.0 | 1.4 | 3.0 | 1.5 | 2.3 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 8 | 28 | 8 | 28 | 8 | 28 | 8 | 19 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.03 | 0.16 | 0.03 | 0.16 | 0.03 | 0.16 | 0.03 | 0.08 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.00 | 0.029 | 0.00 | 0.029 | 0.00 | 0.029 | 0.00 | 0.011 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 32 | 78 | 32 | 78 | 32 | 78 | 34 | 56 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.036** | **0.1** | 0.036 | 0.1 | 0.04 | 0.1 | 0.037 | 0.094 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 0.27 | 2.9 | 0.27 | 2.9 | 0.27 | 2.9 | 0.27 | 1.5 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.01 | 0.09 | 0.01 | 0.09 | 0.01 | 0.09 | 0.01 | 0.04 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | 0.7 | 1.9 | 0.7 | 1.9 | 0.7 | 1.9 | 0.8 | 1.3 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 45 | 111 | 45 | 111 | 45 | 111 | 48 | 95 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | 0.051 | 0.24 | 0.05 | 0.24 | 0.05 | 0.24 | 0.05 | 0.13 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 3.3 | 34 | 3.3 | 34 | 3.3 | 34 | 3.6 | 11 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 2 | 26 | 2 | 26 | 2 | 26 | 2 | 12 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.0154 | **0.037** | 0.015 | 0.037 | 0.015 | 0.037 | 0.015 | 0.034 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.03 | 0.23 | 0.03 | 0.23 | 0.03 | 0.23 | 0.03 | 0.11 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 0.2 | 1.3 | 0.2 | 1.3 | 0.2 | 1.3 | 0.2 | 0.7 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.03 | 0.32 | 0.03 | 0.32 | 0.03 | 0.32 | 0.03 | 0.14 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.003 | 0.07 | 0.003 | 0.07 | 0.003 | 0.07 | 0.003 | 0.029 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 57 | 187 | 57 | 187 | 57 | 187 | 58 | 185 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.001 | 0.044 | 0.001 | 0.044 | 0.001 | 0.044 | 0.001 | 0.017 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.08 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 0.14 | 0.3 | 0.14 | 0.34 | 0.14 | 0.34 | 0.15 | 0.27 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 8 | 15 | 8 | 15 | 8 | 15 | 8 | 12 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.006 | 0.056 | 0.006 | 0.056 | 0.01 | 0.06 | 0.007 | 0.025 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.05 | 0.38 | 0.05 | 0.38 | 0.05 | 0.38 | 0.06 | 0.17 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 2.7 | 6.8 | 2.7 | 6.8 | 2.7 | 6.8 | 3.0 | 6.0 |

**Table 7.4-A42: Observed and Predicted Concentrations at Lake J7**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 158 | 310 | 160 | 309 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 53 | 87 | 53 | 87 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.0 | 4.4 | 3.0 | 4.4 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 49 | 104 | 49 | 105 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 74 | **325** | 75 | 325 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.039 | 0.062 | 0.039 | 0.063 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 7.0 | 13.5 | 7.0 | 13.4 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.3 | 5.0 | 2.3 | 5.0 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 9.2 | 20.9 | 8.9 | 20.5 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.9 | 24 | 11.9 | 24.3 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.11 | 0.3 | 0.12 | 0.29 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.2 | 0.46 | 0.21 | 0.45 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.6 | 0.92 | 0.6 | 0.92 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0061 | 0.0102 | 0.0061 | 0.0102 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0022 | 0.004 | 0.0022 | 0.0039 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.0 | 1.7 | 1.0 | 1.7 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 4.8 | 12.6 | 4.8 | 12.8 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.21 | 0.3 | 0.22 | 0.31 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.7 | 2.6 | 1.7 | 2.6 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 24 | 41 | 23 | 41 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.48 | 0.71 | 0.48 | 0.71 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.076 | 0.124 | 0.076 | 0.124 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 27 | 44 | 27 | 44 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.083** | **0.21** | 0.084 | 0.21 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 1.8 | 5.0 | 1.8 | 5.0 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.24 | 0.45 | 0.24 | 0.45 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.8** | **4.6** | 2.8 | 4.6 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 97 | 175 | 96 | 175 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.95** | **4.9** | 1.96 | 4.9 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 4.9 | 16.3 | 4.9 | 15.5 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 29 | **87** | 30 | 87 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.042** | **0.093** | 0.042 | 0.093 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.61 | 0.84 | 0.61 | 0.84 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.4 | 4.9 | 2.4 | 4.9 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.59 | **1.01** | 0.59 | 1.06 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.07 | **0.14** | 0.071 | 0.14 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 98 | 298 | 98 | 300 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.049 | 0.082 | 0.048 | 0.082 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.26 | 2.3 | 1.27 | 2.24 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 29 | 45 | 29 | 45 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.062 | 0.092 | 0.063 | 0.092 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.37 | 0.59 | 0.37 | 0.65 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.2 | 10.1 | 5.2 | 10.8 |

**Table 7.4-A43: Observed and Predicted Concentrations at Lake J6**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 164 | 253 | 164 | 253 | 164 | 253 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 55 | 70 | 55 | 70 | 55 | 70 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.1 | 3.9 | 3.1 | 3.9 | 3.1 | 3.9 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 48 | 87 | 48 | 87 | 48 | 87 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 76 | **271** | 76 | 271 | 76 | 271 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.041 | 0.057 | 0.041 | 0.057 | 0.041 | 0.057 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 7.4 | 11.5 | 7.4 | 11.5 | 7.4 | 11.5 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.4 | 3.8 | 2.4 | 3.8 | 2.4 | 3.8 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 8.8 | 16.1 | 8.8 | 16.1 | 8.8 | 16.1 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.7 | 22 | 11.7 | 22.4 | 11.7 | 22.4 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.122 | 0.24 | 0.122 | 0.241 | 0.122 | 0.241 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.18 | 0.4 | 0.183 | 0.4 | 0.183 | 0.4 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.61 | 0.79 | 0.61 | 0.79 | 0.61 | 0.79 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0064 | 0.0084 | 0.0064 | 0.0084 | 0.0064 | 0.0084 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0023 | 0.0039 | 0.00226 | 0.0039 | 0.00226 | 0.0039 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.1 | 1.4 | 1.1 | 1.4 | 1.1 | 1.4 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 5.0 | 9.6 | 5.0 | 9.6 | 5.0 | 9.6 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.23 | 0.31 | 0.23 | 0.31 | 0.23 | 0.31 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.8 | 2.3 | 1.8 | 2.3 | 1.8 | 2.3 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 26 | 40 | 26 | 40 | 26 | 40 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.44 | 0.59 | 0.44 | 0.59 | 0.44 | 0.59 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.071 | 0.094 | 0.071 | 0.094 | 0.071 | 0.094 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 29 | 39 | 29 | 39 | 29 | 39 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.088** | **0.18** | 0.088 | 0.18 | 0.088 | 0.18 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 2.0 | 5.0 | 2.03 | 5.0 | 2.03 | 5.0 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.23 | 0.32 | 0.23 | 0.32 | 0.23 | 0.32 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.8** | **3.7** | 2.8 | 3.7 | 2.8 | 3.7 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 102 | 161 | 102 | 161 | 102 | 161 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.55** | **2.8** | 1.55 | 2.8 | 1.55 | 2.8 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 5.3 | 12.7 | 5.3 | 12.7 | 5.3 | 12.7 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 29 | **80** | 29 | 80 | 29 | 80 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.041** | **0.081** | 0.041 | 0.081 | 0.041 | 0.081 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.55 | 0.69 | 0.55 | 0.69 | 0.55 | 0.69 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.3 | 3.3 | 2.3 | 3.3 | 2.3 | 3.3 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.58 | 0.88 | 0.582 | 0.88 | 0.582 | 0.88 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.073 | **0.11** | 0.073 | 0.111 | 0.073 | 0.111 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 104 | 223 | 104 | 223 | 104 | 223 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.05 | 0.067 | 0.05 | 0.067 | 0.05 | 0.067 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.04 | 1.8 | 1.04 | 1.81 | 1.04 | 1.81 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 19 | 24 | 19 | 24 | 19 | 24 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.065 | 0.08 | 0.065 | 0.08 | 0.065 | 0.08 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.38 | 0.57 | 0.38 | 0.57 | 0.38 | 0.57 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.4 | 9.0 | 5.4 | 9.0 | 5.4 | 9.0 |

**Table 7.4-A44: Observed and Predicted Concentrations at Lake J3**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 163 | 322 | 163 | 322 | 163 | 322 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 55 | 87 | 55 | 87 | 55 | 87 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.1 | 5.5 | 3.1 | 5.5 | 3.1 | 5.5 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 51 | 100 | 51 | 100 | 51 | 100 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 75 | **319** | 75 | 319 | 75 | 319 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.04 | 0.067 | 0.04 | 0.067 | 0.04 | 0.067 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 7.4 | 15.6 | 7.4 | 15.6 | 7.4 | 15.6 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.4 | 5.5 | 2.4 | 5.5 | 2.4 | 5.5 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 8.9 | 24.0 | 8.9 | 24.0 | 8.9 | 24.0 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.9 | 40 | 11.9 | 40.3 | 11.9 | 40.3 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.111 | 0.34 | 0.111 | 0.341 | 0.111 | 0.341 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.19 | 0.5 | 0.185 | 0.5 | 0.185 | 0.5 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.61 | 1.08 | 0.61 | 1.08 | 0.61 | 1.08 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0064 | 0.0101 | 0.0064 | 0.0101 | 0.0064 | 0.0101 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0022 | 0.0052 | 0.00224 | 0.0052 | 0.00224 | 0.0052 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 4.8 | 12.3 | 4.8 | 12.3 | 4.8 | 12.3 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.22 | 0.35 | 0.22 | 0.35 | 0.22 | 0.35 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.8 | 3.5 | 1.8 | 3.5 | 1.8 | 3.5 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 25 | 57 | 25 | 57 | 25 | 57 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.42 | 0.69 | 0.42 | 0.69 | 0.42 | 0.69 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.07 | 0.113 | 0.07 | 0.113 | 0.07 | 0.113 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 29 | 49 | 29 | 49 | 29 | 49 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.085** | **0.26** | 0.085 | 0.26 | 0.085 | 0.26 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 2.0 | 5.3 | 2.03 | 5.3 | 2.03 | 5.3 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.23 | 0.43 | 0.227 | 0.43 | 0.227 | 0.43 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.8** | **4.6** | 2.8 | 4.6 | 2.8 | 4.6 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 102 | 178 | 102 | 178 | 102 | 178 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.32** | **3.4** | 1.32 | 3.4 | 1.32 | 3.4 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 5.5 | 20.4 | 5.5 | 20.4 | 5.5 | 20.4 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 32 | **126** | 32 | 126 | 32 | 126 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.041** | **0.102** | 0.041 | 0.102 | 0.041 | 0.102 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.54 | 0.79 | 0.54 | 0.79 | 0.54 | 0.79 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.3 | 5.0 | 2.3 | 5.0 | 2.3 | 5.0 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.56 | **1.03** | 0.56 | 1.03 | 0.56 | 1.03 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.073 | **0.16** | 0.073 | 0.163 | 0.073 | 0.163 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 107 | 331 | 107 | 331 | 107 | 331 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.049 | 0.081 | 0.049 | 0.081 | 0.049 | 0.081 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.0 | 2.1 | 1.0 | 2.08 | 1.0 | 2.08 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 13 | 25 | 13 | 25 | 13 | 25 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.064 | 0.105 | 0.064 | 0.105 | 0.064 | 0.105 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.37 | 0.67 | 0.37 | 0.67 | 0.37 | 0.67 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.2 | 13.4 | 5.2 | 13.4 | 5.2 | 13.4 |

**Table 7.4-A45: Observed and Predicted Concentrations at Lake J2**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 163 | 322 | 163 | 322 | 163 | 322 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 55 | 87 | 55 | 87 | 55 | 87 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.1 | 5.5 | 3.1 | 5.5 | 3.1 | 5.5 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 51 | 100 | 51 | 100 | 51 | 100 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 75 | **319** | 75 | 319 | 75 | 319 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.04 | 0.067 | 0.04 | 0.067 | 0.04 | 0.067 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 7.4 | 15.6 | 7.4 | 15.6 | 7.4 | 15.6 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.4 | 5.5 | 2.4 | 5.5 | 2.4 | 5.5 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 8.9 | 24.0 | 8.9 | 24.0 | 8.9 | 24 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.9 | 40 | 11.9 | 40.3 | 12 | 40 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.111 | 0.34 | 0.111 | 0.341 | 0.111 | 0.34 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.19 | 0.5 | 0.185 | 0.5 | 0.19 | 0.5 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.61 | 1.08 | 0.61 | 1.08 | 0.61 | 1.08 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0064 | 0.0101 | 0.0064 | 0.0101 | 0.0064 | 0.01 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0022 | 0.0052 | 0.00224 | 0.0052 | 0.0022 | 0.0052 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 4.8 | 12.3 | 4.8 | 12.3 | 4.8 | 12.3 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.22 | 0.35 | 0.22 | 0.35 | 0.22 | 0.35 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.8 | 3.5 | 1.8 | 3.5 | 1.8 | 3.5 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 25 | 57 | 25 | 57 | 25 | 57 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.42 | 0.69 | 0.42 | 0.69 | 0.42 | 0.69 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.07 | 0.113 | 0.07 | 0.113 | 0.07 | 0.113 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 29 | 49 | 29 | 49 | 29 | 49 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.085** | **0.26** | 0.085 | 0.26 | 0.1 | 0.3 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 2.0 | 5.3 | 2.0 | 5.3 | 2.0 | 5.3 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.23 | 0.43 | 0.23 | 0.43 | 0.23 | 0.43 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.8** | **4.6** | 2.8 | 4.6 | 2.8 | 4.6 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 102 | 178 | 102 | 178 | 102 | 178 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.32** | **3.4** | 1.32 | 3.4 | 1.3 | 3.4 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 5.5 | 20.4 | 5.5 | 20.4 | 5.5 | 20.4 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 32 | **126** | 32 | 126 | 32 | 126 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.041** | **0.102** | 0.041 | 0.102 | 0.041 | 0.102 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.54 | 0.79 | 0.54 | 0.79 | 0.54 | 0.79 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.3 | 5.0 | 2.3 | 5.0 | 2 | 5 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.56 | **1.03** | 0.56 | 1.03 | 0.56 | 1.03 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.073 | **0.16** | 0.073 | 0.163 | 0.073 | 0.16 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 107 | 331 | 107 | 331 | 107 | 331 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.049 | 0.081 | 0.049 | 0.081 | 0.0 | 0 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.0 | 2.1 | 1.0 | 2.08 | 1.0 | 2.08 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 13 | 25 | 13 | 25 | 13 | 25 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.064 | 0.105 | 0.064 | 0.105 | 0.06 | 0.11 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.37 | 0.67 | 0.37 | 0.67 | 0.37 | 0.67 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.2 | 13.4 | 5.2 | 13.4 | 5.2 | 13.4 |

**Table 7.4-A46: Observed and Predicted Concentrations at Lake J1**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 26 | 49 | **1440** | 155 | 302 | 157 | 304 | 154 | 307 | 128 | 217 | 128 | 217 | 128 | 217 | 128 | 217 | 128 | 217 | 128 | 217 | 157 | 304 |
| Total Alkalinity | mg/L | | 16 | 33 | 167 | 52 | 84 | 52 | 84 | 52 | 83 | 42 | 69 | 42 | 69 | 42 | 69 | 42 | 69 | 42 | 69 | 42 | 69 | 52 | 84 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | **17** | 3.0 | 4.2 | 2.9 | 4.2 | 2.9 | 4.2 | 2.3 | 3.6 | 2.3 | 3.6 | 2.3 | 3.6 | 2.3 | 3.6 | 2.3 | 3.6 | 2.3 | 3.6 | 2.9 | 4.2 |
| Calcium | mg/L | | 6.3 | 15 | 346 | 47 | 99 | 46 | 102 | 47 | 100 | 37 | 81 | 37 | 81 | 37 | 81 | 37 | 81 | 37 | 81 | 37 | 81 | 46 | 102 |
| Chloride | mg/L | 120 | 2.0 | 12 | **716** | 74 | **312** | 73 | 310 | 74 | 317 | 58 | 299 | 58 | 299 | 58 | 299 | 58 | 299 | 58 | 299 | 58 | 299 | 73 | 310 |
| Fluoride | mg/L | 0.12 | <0.02 | 0.04 | 0.05 | 0.039 | 0.062 | 0.039 | 0.062 | 0.038 | 0.063 | 0.031 | 0.049 | 0.031 | 0.049 | 0.031 | 0.049 | 0.031 | 0.049 | 0.031 | 0.049 | 0.031 | 0.049 | 0.039 | 0.062 |
| Magnesium | mg/L | | 0.84 | 1.8 | 38 | 6.8 | 13.3 | 6.9 | 13.0 | 6.8 | 13.9 | 5.6 | 10.9 | 5.6 | 10.9 | 5.6 | 10.9 | 5.6 | 10.9 | 5.6 | 10.9 | 5.6 | 10.9 | 6.9 | 13.0 |
| Potassium | mg/L | | 0.49 | 0.95 | 9.6 | 2.3 | 5.0 | 2.3 | 4.9 | 2.3 | 5.0 | 1.9 | 4.1 | 1.9 | 4.1 | 1.9 | 4.1 | 1.9 | 4.1 | 1.9 | 4.1 | 1.9 | 4.1 | 2.3 | 4.9 |
| Sodium | mg/L | 200 | 1.1 | 2.5 | 87 | 8.8 | 20.2 | 8.6 | 19.9 | 8.4 | 20 | 6.8 | 16 | 6.8 | 16 | 6.8 | 16 | 6.8 | 16 | 6.8 | 16 | 6.8 | 16 | 8.6 | 20 |
| Sulphate | mg/L | 500 | 1.5 | 3.2 | 141 | 11.6 | 23 | 11.7 | 23.3 | 11 | 24 | 9.4 | 19 | 9.4 | 19 | 9.4 | 19 | 9.4 | 19 | 9.4 | 19 | 9.4 | 19 | 11.7 | 23 |
| Ammonia (as N) | mg/L | 7 | <0.01 | <0.05 | 1.3 | 0.108 | 0.29 | 0.112 | 0.28 | 0.11 | 0.29 | 0.084 | 0.24 | 0.084 | 0.24 | 0.084 | 0.24 | 0.084 | 0.24 | 0.084 | 0.24 | 0.084 | 0.24 | 0.112 | 0.28 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | <0.04 | **4.9** | 0.2 | 0.45 | 0.201 | 0.45 | 0.2 | 0.46 | 0.2 | 0.46 | 1.16 | 2.75 | 1.16 | 2.75 | 1.16 | 2.75 | 1.16 | 2.75 | 0.2 | 0.46 | 0.2 | 0.45 |
| Total Kjeldahl Nitrogen | mg/L | | 0.12 | 0.41 | 2.2 | 0.58 | 0.9 | 0.57 | 0.88 | 0.58 | 0.91 | 0.45 | 0.71 | 0.45 | 0.71 | 0.45 | 0.71 | 0.45 | 0.71 | 0.45 | 0.71 | 0.45 | 0.71 | 0.57 | 0.88 |
| Dissolved Phosphorus | mg/L | | 0.0015 | 0.01 | <0.02 | 0.0061 | 0.010 | 0.006 | 0.010 | 0.006 | 0.01 | 0.0049 | 0.0079 | 0.0049 | 0.0079 | 0.0049 | 0.0079 | 0.0049 | 0.0079 | 0.0049 | 0.0079 | 0.0049 | 0.0079 | 0.006 | 0.010 |
| Orthophosphate | mg/L | | <0.001 | <0.002 | <0.01 | 0.0022 | 0.004 | 0.0022 | 0.004 | 0.0022 | 0.004 | 0.0017 | 0.0034 | 0.0017 | 0.0034 | 0.0017 | 0.0034 | 0.0017 | 0.0034 | 0.0017 | 0.0034 | 0.0017 | 0.0034 | 0.0022 | 0.004 |
| Cyanide | µg/L | 200 | <1 | <2 | <5 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 0.9 | 1.4 | 1.1 | 1.8 |
| Total Aluminum | µg/L | 100 | <0.3 | 2 | 40 | 4.7 | 12.3 | 4.7 | 12.4 | 4.7 | 12.4 | 4.7 | 12.4 | 18.3 | 43.2 | 14.6 | 34.5 | 14.6 | 34.5 | 14.6 | 34.5 | 4.7 | 12.4 | 4.7 | 12.4 |
| Total Antimony | µg/L | 6 | <0.03 | <0.2 | 0.61 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 | 0.21 | 0.3 |
| Total Arsenic | µg/L | 5 | <0.03 | 1.8 | 4.2 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 |
| Total Barium | µg/L | 1000 | <0.05 | 11 | 123 | 23 | 41 | 23 | 41 | 23 | 41 | 18 | 38 | 18 | 38 | 18 | 38 | 18 | 38 | 18 | 38 | 18 | 38 | 23 | 41 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.47 | 0.69 | 0.46 | 0.69 | 0.46 | 0.69 | 0.36 | 0.54 | 0.36 | 0.54 | 0.36 | 0.54 | 0.36 | 0.54 | 0.36 | 0.54 | 0.36 | 0.54 | 0.46 | 0.69 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.074 | 0.119 | 0.074 | 0.12 | 0.074 | 0.123 | 0.06 | 0.09 | 0.06 | 0.09 | 0.06 | 0.09 | 0.06 | 0.09 | 0.06 | 0.09 | 0.06 | 0.09 | 0.07 | 0.12 |
| Total Boron | µg/L | 1500 | <0.6 | <50 | <100 | 28 | 46 | 28 | 46 | 28 | 46 | 23 | 36 | 23 | 36 | 23 | 36 | 23 | 36 | 23 | 36 | 23 | 36 | 28 | 46 |
| Total Cadmium | µg/L | 0.009 | **<0.01** | **<0.1** | **1.1** | **0.083** | **0.21** | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 | 0.083 | 0.21 |
| Total Chromium | µg/L | 8.9 | <0.06 | <1 | <15 | 1.8 | 4.8 | 1.79 | 5.2 | 1.8 | 5.2 | 1.6 | 5.2 | 1.6 | 5.2 | 1.6 | 5.2 | 1.6 | 5.2 | 1.6 | 5.2 | 1.6 | 5.2 | 1.8 | 5.2 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | <2 | 0.24 | 0.44 | 0.237 | 0.45 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.24 | 0.45 |
| Total Copper | µg/L | 2 | <0.6 | 1.2 | **27** | **2.7** | **4.5** | 2.7 | 4.5 | 2.8 | 4.5 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.7 | 4.5 |
| Total Iron | µg/L | 300 | 4.6 | 72 | **695** | 95 | 173 | 95 | 172 | 95 | 172 | 95 | 172 | 95 | 172 | 95 | 172 | 95 | 172 | 95 | 172 | 95 | 172 | 95 | 172 |
| Total Lead | µg/L | 1 | <0.05 | 0.1 | **63** | **1.91** | **5.0** | 1.9 | 5.0 | 1.9 | 5.0 | 1.62 | 3.4 | 1.62 | 3.4 | 1.62 | 3.4 | 1.62 | 3.4 | 1.62 | 3.4 | 1.62 | 3.4 | 1.9 | 5.0 |
| Total Lithium | µg/L | | <0.1 | 1.6 | 40 | 5.0 | 14.4 | 5.0 | 13.5 | 5.0 | 14.1 | 4 | 12 | 4 | 12 | 4 | 12 | 4 | 12 | 4 | 12 | 4 | 12 | 5 | 14 |
| Total Manganese | µg/L | 50 | 0.1 | 7.3 | **416** | 28 | **84** | 29 | 84 | 29 | 88 | 22 | 78 | 22 | 78 | 22 | 78 | 22 | 78 | 22 | 78 | 22 | 78 | 29 | 84 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.042** | **0.096** | 0.041 | 0.095 | 0.041 | 0.099 | 0.033 | 0.084 | 0.033 | 0.084 | 0.033 | 0.084 | 0.033 | 0.084 | 0.033 | 0.084 | 0.033 | 0.084 | 0.041 | 0.095 |
| Total Molybdenum | µg/L | 73 | 0.1 | 0.2 | <5 | 0.58 | 0.81 | 0.58 | 0.81 | 0.58 | 0.83 | 0.46 | 0.65 | 0.46 | 0.65 | 0.46 | 0.65 | 0.46 | 0.65 | 0.46 | 0.65 | 0.46 | 0.65 | 0.58 | 0.81 |
| Total Nickel | µg/L | 29 | 0.27 | 1 | <20 | 2.3 | 4.8 | 2.3 | 4.8 | 2.3 | 4.8 | 2.0 | 3.9 | 2.0 | 3.9 | 2.0 | 3.9 | 2.0 | 3.9 | 2.0 | 3.9 | 2.0 | 3.9 | 2.3 | 4.8 |
| Total Selenium | µg/L | 1 | <0.1 | 0.35 | **<10** | 0.56 | 0.99 | 0.56 | 0.99 | 0.56 | 0.99 | 0.45 | 0.93 | 0.45 | 0.93 | 0.45 | 0.93 | 0.45 | 0.93 | 0.45 | 0.93 | 0.45 | 0.93 | 0.56 | 0.99 |
| Total Silver | µg/L | 0.1 | <0.02 | <0.1 | **<0.4** | 0.069 | **0.14** | 0.068 | 0.138 | 0.072 | 0.14 | 0.056 | 0.11 | 0.056 | 0.11 | 0.056 | 0.11 | 0.056 | 0.11 | 0.056 | 0.11 | 0.056 | 0.11 | 0.068 | 0.14 |
| Total Strontium | µg/L | | <0.1 | 48 | 830 | 98 | 295 | 99 | 298 | 99 | 303 | 79 | 251 | 79 | 251 | 79 | 251 | 79 | 251 | 79 | 251 | 79 | 251 | 99 | 298 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | 0.2 | 0.048 | 0.078 | 0.047 | 0.079 | 0.047 | 0.079 | 0.037 | 0.063 | 0.037 | 0.063 | 0.037 | 0.063 | 0.037 | 0.063 | 0.037 | 0.063 | 0.037 | 0.063 | 0.047 | 0.079 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 | 0.01 | 0.21 |
| Total Titanium | µg/L | | <0.1 | 0.3 | <10 | 1.24 | 2.3 | 1.25 | 2.23 | 1.23 | 2.33 | 1.23 | 2.33 | 1.23 | 2.33 | 1.23 | 2.33 | 1.23 | 2.33 | 1.23 | 2.33 | 1.23 | 2.33 | 1.25 | 2.23 |
| Total Tungsten | µg/L | | <1 | <100 | <100 | 33 | 51 | 33 | 51 | 33 | 50 | 26 | 38 | 26 | 38 | 26 | 38 | 26 | 38 | 26 | 38 | 26 | 38 | 33 | 51 |
| Total Uranium | µg/L | 15 | <0.05 | 0.07 | 0.26 | 0.061 | 0.09 | 0.062 | 0.091 | 0.06 | 0.09 | 0.05 | 0.075 | 0.05 | 0.075 | 0.05 | 0.075 | 0.05 | 0.075 | 0.05 | 0.075 | 0.05 | 0.075 | 0.062 | 0.091 |
| Total Vanadium | µg/L | | <0.05 | 0.25 | 1 | 0.35 | 0.57 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 | 0.35 | 0.62 |
| Total Zinc | µg/L | 30 | <0.5 | <5 | **32** | 5.0 | 10.2 | 5.1 | 10.4 | 5.1 | 11.0 | 4.2 | 9.2 | 4.2 | 9.2 | 4.2 | 9.2 | 4.2 | 9.2 | 4.2 | 9.2 | 4.2 | 9.2 | 5.1 | 10.4 |

**Table 7.4-A47: Observed and Predicted Concentrations at Lake CH6**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 24 | 31 | 43 | 50 | 94 | 50 | 93 | 50 | 93 | 51 | 93 | 50 | 93 | 57 | 103 | 57 | 103 | 57 | 103 | 57 | 103 | 49 | 86 |
| Total Alkalinity | mg/L | | 11 | 14 | 40 | 28 | 40 | 28 | 40 | 28 | 40 | 28 | 40 | 28 | 40 | 32 | 47 | 32 | 47 | 32 | 47 | 32 | 47 | 28 | 40 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | <3 | 2.1 | 3.2 | 2.1 | 3.2 | 2.1 | 3.2 | 2.1 | 3.2 | 2.1 | 3.2 | 2.4 | 3.6 | 2.4 | 3.6 | 2.4 | 3.6 | 2.4 | 3.6 | 1.9 | 2.9 |
| Calcium | mg/L | | 3.9 | 4.8 | 15 | 9.3 | 14 | 9.4 | 14 | 9.4 | 14 | 9.4 | 14 | 9.4 | 14 | 10.7 | 16 | 10.7 | 16 | 10.7 | 16 | 10.7 | 16 | 9.3 | 14 |
| Chloride | mg/L | 120 | 2.9 | 5.3 | 12 | 8.3 | 14 | 8.3 | 14 | 8.3 | 14 | 8.3 | 14 | 8.3 | 14 | 9.3 | 16 | 9.3 | 16 | 9.3 | 16 | 9.3 | 16 | 7.7 | 13 |
| Fluoride | mg/L | 0.12 | 0.04 | <0.05 | 0.06 | 0.062 | 0.09 | 0.062 | 0.089 | 0.062 | 0.089 | 0.062 | 0.09 | 0.062 | 0.089 | 0.069 | 0.102 | 0.069 | 0.102 | 0.069 | 0.102 | 0.069 | 0.102 | 0.062 | 0.091 |
| Magnesium | mg/L | | 0.62 | 0.8 | 2.3 | 1.4 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.3 | 2.0 |
| Potassium | mg/L | | 0.63 | <2 | 3.4 | 1.9 | 2.6 | 1.9 | 2.6 | 1.9 | 2.7 | 1.9 | 2.6 | 1.9 | 2.6 | 2.1 | 3.1 | 2.1 | 3.1 | 2.1 | 3.1 | 2.1 | 3.1 | 2.0 | 2.8 |
| Sodium | mg/L | 200 | 1.7 | 3.9 | 11 | 7.1 | 10.6 | 7.1 | 11 | 7.1 | 11 | 7.0 | 11 | 7.0 | 11 | 7.8 | 12 | 7.8 | 12 | 7.8 | 12 | 7.8 | 12 | 6.5 | 10 |
| Sulphate | mg/L | 500 | 2.2 | 2.8 | 7.4 | 4.6 | 6.9 | 4.6 | 6.9 | 4.6 | 6.9 | 4.6 | 6.9 | 4.6 | 6.9 | 5.2 | 7.9 | 5.2 | 7.9 | 5.2 | 7.9 | 5.2 | 7.9 | 5.0 | 7.5 |
| Ammonia (as N) | mg/L | 7 | <0.05 | <0.05 | 0.05 | 0.032 | 0.05 | 0.032 | 0.05 | 0.032 | 0.05 | 0.032 | 0.05 | 0.032 | 0.05 | 0.037 | 0.058 | 0.037 | 0.058 | 0.037 | 0.058 | 0.037 | 0.058 | 0.032 | 0.05 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.20 | 0.026 | 0.044 | 0.027 | 0.044 | 0.027 | 0.045 | 0.03 | 0.04 | 0.0 | 0.0 | 0.3 | 0.6 | 0.3 | 0.6 | 0.3 | 0.6 | 0.029 | 0.046 | 0.027 | 0.044 |
| Total Kjeldahl Nitrogen | mg/L | | <0.20 | <0.20 | 0.51 | 0.24 | 0.42 | 0.24 | 0.42 | 0.24 | 0.42 | 0.25 | 0.42 | 0.24 | 0.42 | 0.28 | 0.45 | 0.28 | 0.45 | 0.28 | 0.45 | 0.28 | 0.45 | 0.23 | 0.38 |
| Dissolved Phosphorus | mg/L | | 0.002 | 0.002 | 0.01 | 0.0049 | 0.0068 | 0.0049 | 0.0068 | 0.0049 | 0.0068 | 0.0049 | 0.0069 | 0.0049 | 0.0068 | 0.0056 | 0.008 | 0.0056 | 0.008 | 0.0056 | 0.008 | 0.0056 | 0.008 | 0.0046 | 0.0065 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00111 | 0.0016 | 0.0011 | 0.0016 | 0.0011 | 0.0016 | 0.0011 | 0.0016 | 0.0011 | 0.0016 | 0.00125 | 0.0019 | 0.00125 | 0.0019 | 0.00125 | 0.0019 | 0.0013 | 0.0019 | 0.001 | 0.0016 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.6 | 2.5 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.8 | 2.7 | 1.8 | 2.7 | 1.8 | 2.7 | 1.8 | 2.7 | 1.5 | 2.2 |
| Total Aluminum | µg/L | 100 | <0.2 | **<104** | **<200** | 5.6 | 8.3 | 5.7 | 8.3 | 5.7 | 8.3 | 6 | 8 | 6 | 8 | 10 | 16 | 10 | 16 | 10 | 16 | 6.4 | 9.8 | 5.7 | 8.3 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.21 | 0.35 | 0.21 | 0.34 | 0.21 | 0.35 | 0.21 | 0.35 | 0.21 | 0.35 | 0.24 | 0.4 | 0.24 | 0.4 | 0.24 | 0.4 | 0.24 | 0.4 | 0.21 | 0.36 |
| Total Arsenic | µg/L | 5 | 0.0003 | 0.25 | 1.2 | 0.68 | 1.02 | 0.68 | 1.01 | 0.69 | 1.04 | 0.68 | 1.02 | 0.68 | 1.0 | 0.77 | 1.2 | 0.77 | 1.2 | 0.77 | 1.2 | 0.77 | 1.17 | 0.68 | 1.01 |
| Total Barium | µg/L | 1000 | <0.01 | <10 | 19 | 11.4 | 19 | 11 | 19 | 11 | 19 | 11 | 19 | 11 | 19 | 13.0 | 22 | 13.0 | 22 | 13.0 | 22 | 13 | 22 | 12 | 19 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.27 | 0.38 | 0.26 | 0.38 | 0.27 | 0.39 | 0.27 | 0.38 | 0.27 | 0.38 | 0.3 | 0.44 | 0.3 | 0.44 | 0.3 | 0.44 | 0.3 | 0.44 | 0.24 | 0.35 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.05 | 0.07 | 0.05 | 0.07 | 0.05 | 0.07 | 0.05 | 0.07 | 0.05 | 0.07 | 0.05 | 0.1 | 0.05 | 0.1 | 0.05 | 0.1 | 0.05 | 0.08 | 0.04 | 0.07 |
| Total Boron | µg/L | 1500 | 2 | <100 | <100 | 70 | 112 | 70 | 112 | 70 | 112 | 70 | 114 | 70 | 113 | 78 | 131 | 78 | 131 | 78 | 131 | 78 | 131 | 65 | 106 |
| Total Cadmium | µg/L | 0.009 | **<0.02** | **<0.2** | **<2** | **0.09** | **0.17** | 0.09 | 0.17 | 0.09 | 0.17 | 0.09 | 0.17 | 0.09 | 0.17 | **0.1** | **0.19** | **0.1** | **0.19** | **0.1** | **0.19** | **0.1** | **0.19** | 0.09 | 0.17 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 | 0.04 | 0.07 | 0.04 | 0.07 | 0.04 | 0.07 | 0.03 | 0.05 | 0.03 | 0.04 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.23 | 0.3 | 0.21 | 0.3 |
| Total Copper | µg/L | 2 | <1 | **<10** | **<100** | **5.4** | **8.8** | 5.4 | 8.9 | 5.4 | 8.8 | 5.4 | 8.9 | 5.4 | 8.8 | **6.1** | **9.9** | **6.1** | **9.9** | **6.1** | **9.9** | **6.1** | **9.9** | 5.1 | 7.9 |
| Total Iron | µg/L | 300 | 13 | 46 | 112 | 87 | 126 | 87 | 127 | 92 | 136 | 90 | 132 | 91 | 132 | 101 | 156 | 101 | 156 | 101 | 156 | 98 | 149 | 81 | 120 |
| Total Lead | µg/L | 1 | <0.05 | <0.1 | **106** | 0.27 | **15** | 0.27 | 15 | 0.27 | 15 | 0.26 | 7 | 0.27 | 7 | 0.31 | 8 | 0.31 | 8 | 0.31 | 8 | 0.31 | 8 | 0.26 | 8 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 7.5 | 32 | 7.6 | 32 | 7.6 | 32 | 7.6 | 31 | 7.6 | 31 | 8.9 | 30 | 8.9 | 30 | 8.9 | 30 | 8.9 | 30 | 7.4 | 26 |
| Total Manganese | µg/L | 50 | 1 | <5 | 18 | 5.6 | 7.9 | 5.6 | 7.9 | 5.7 | 8.0 | 5.7 | 7.9 | 5.7 | 7.9 | 6.4 | 8.9 | 6.4 | 8.9 | 6.4 | 8.9 | 6.4 | 8.9 | 5.5 | 7.7 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.038** | **0.084** | 0.038 | 0.083 | 0.038 | 0.083 | 0.037 | 0.084 | 0.037 | 0.083 | **0.042** | **0.094** | **0.042** | **0.094** | **0.042** | **0.094** | **0.042** | **0.094** | 0.034 | 0.071 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.4 | 0.7 | 0.4 | 0.7 | 0.4 | 0.7 | 0.4 | 0.7 | 0.4 | 0.7 | 0.5 | 0.7 | 0.5 | 0.7 | 0.5 | 0.7 | 0.5 | 0.7 | 0.5 | 0.7 |
| Total Nickel | µg/L | 29 | 1 | <20 | <20 | 1.7 | 2.6 | 1.7 | 2.6 | 1.8 | 2.6 | 1.8 | 2.6 | 1.7 | 2.6 | 2.0 | 2.9 | 2.0 | 2.9 | 2.0 | 2.9 | 2.0 | 2.9 | 1.7 | 2.4 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.21 | 0.35 | 0.21 | 0.34 | 0.21 | 0.34 | 0.21 | 0.34 | 0.21 | 0.34 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.24 | 0.38 | 0.2 | 0.31 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.064 | 0.092 | 0.065 | 0.092 | 0.065 | 0.092 | 0.064 | 0.092 | 0.065 | 0.093 | 0.072 | **0.10** | 0.072 | **0.10** | 0.072 | **0.10** | 0.072 | **0.10** | 0.059 | 0.088 |
| Total Strontium | µg/L | | 22 | 36 | 81 | 70 | 99 | 70 | 98 | 70 | 98 | 71 | 98 | 71 | 98 | 79 | 116 | 79 | 116 | 79 | 116 | 79 | 116 | 68 | 97 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.064 | 0.095 | 0.064 | 0.094 | 0.06 | 0.09 | 0.064 | 0.094 | 0.064 | 0.094 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.071 | 0.11 | 0.058 | 0.088 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.34 | 0.51 | 0.34 | 0.5 | 0.34 | 0.5 | 0.34 | 0.5 | 0.34 | 0.5 | 0.38 | 0.57 | 0.38 | 0.57 | 0.38 | 0.57 | 0.38 | 0.57 | 0.33 | 0.48 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.44 | 0.89 | 0.44 | 0.88 | 0.44 | 0.88 | 0.44 | 0.88 | 0.44 | 0.88 | 0.66 | 1.29 | 0.66 | 1.29 | 0.66 | 1.29 | 0.49 | 0.97 | 0.42 | 0.79 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 0.8 | 1 | 0.8 | 1.2 | 0.8 | 1.2 | 0.8 | 1.2 | 0.8 | 1.2 | 0.9 | 1 | 0.9 | 1 | 0.9 | 1 | 0.9 | 1.4 | 0.8 | 1.1 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.105 | 0.16 | 0.105 | 0.16 | 0.11 | 0.18 | 0.106 | 0.16 | 0.106 | 0.16 | 0.121 | 0.18 | 0.121 | 0.18 | 0.121 | 0.18 | 0.121 | 0.18 | 0.105 | 0.16 |
| Total Vanadium | µg/L | | 0.08 | <1 | <30 | 0.68 | 1.0 | 0.68 | 0.99 | 0.68 | 1.0 | 0.69 | 1.0 | 0.69 | 1.0 | 0.79 | 1.15 | 0.79 | 1.15 | 0.79 | 1.15 | 0.78 | 1.14 | 0.67 | 0.96 |
| Total Zinc | µg/L | 30 | 1.1 | <5 | 7.9 | 4.3 | 6.0 | 4.3 | 6.0 | 4.3 | 6.0 | 4.3 | 6.0 | 4.3 | 6.0 | 4.9 | 6.8 | 4.9 | 6.8 | 4.9 | 6.8 | 4.9 | 6.8 | 4.1 | 5.7 |

**Table 7.4-A48: Observed and Predicted Concentrations at Lake CH5**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 24 | 31 | 43 | 50 | 91 | 51 | 93 | 51 | 93 | 51 | 93 | 51 | 93 | 54 | 97 | 54 | 97 | 54 | 97 | 54 | 97 | 48 | 84 |
| Total Alkalinity | mg/L | | 11 | 14 | 40 | 27 | 39 | 28 | 41 | 28 | 41 | 28 | 41 | 28 | 41 | 29 | 44 | 29 | 44 | 29 | 44 | 29 | 44 | 26 | 39 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | <3 | 2.1 | 3.3 | 2.2 | 3.3 | 2.2 | 3.3 | 2.2 | 3.3 | 2.2 | 3.3 | 2.3 | 3.6 | 2.3 | 3.6 | 2.3 | 3.6 | 2.3 | 3.6 | 2.0 | 3.0 |
| Calcium | mg/L | | 3.9 | 4.8 | 15 | 9.1 | 14 | 9.5 | 15 | 9.4 | 15 | 9.4 | 15 | 9.5 | 15 | 9.8 | 16 | 9.8 | 16 | 9.8 | 16 | 9.8 | 16 | 8.9 | 14 |
| Chloride | mg/L | 120 | 2.9 | 5.3 | 12 | 8.1 | 14 | 8.4 | 14 | 8.4 | 14 | 8.4 | 14 | 8.4 | 14 | 8.9 | 15 | 8.9 | 15 | 8.9 | 15 | 8.9 | 15 | 7.6 | 13 |
| Fluoride | mg/L | 0.12 | 0.04 | <0.05 | 0.06 | 0.061 | 0.091 | 0.062 | 0.093 | 0.062 | 0.093 | 0.062 | 0.093 | 0.063 | 0.092 | 0.067 | 0.10 | 0.067 | 0.10 | 0.067 | 0.10 | 0.067 | 0.10 | 0.061 | 0.091 |
| Magnesium | mg/L | | 0.62 | 0.8 | 2.3 | 1.3 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | 1.5 | 2.3 | 1.5 | 2.3 | 1.5 | 2.3 | 1.5 | 2.3 | 1.3 | 2.0 |
| Potassium | mg/L | | 0.63 | <2 | 3.4 | 1.8 | 2.7 | 1.9 | 2.7 | 1.9 | 2.7 | 1.9 | 2.8 | 1.9 | 2.8 | 2.0 | 3.0 | 2.0 | 3.0 | 2.0 | 3.0 | 2.0 | 3.0 | 1.9 | 2.8 |
| Sodium | mg/L | 200 | 1.7 | 3.9 | 11 | 6.7 | 10.8 | 7.0 | 11 | 7.0 | 11 | 7.0 | 11 | 7.0 | 11 | 7.3 | 12 | 7.3 | 12 | 7.3 | 12 | 7.3 | 12 | 6.4 | 10 |
| Sulphate | mg/L | 500 | 2.2 | 2.8 | 7.4 | 4.5 | 6.9 | 4.6 | 7.1 | 4.6 | 7.1 | 4.6 | 7.1 | 4.6 | 7.1 | 4.9 | 7.6 | 4.9 | 7.6 | 4.9 | 7.6 | 4.9 | 7.6 | 4.8 | 7.3 |
| Ammonia (as N) | mg/L | 7 | <0.05 | <0.05 | 0.05 | 0.034 | 0.052 | 0.034 | 0.053 | 0.034 | 0.053 | 0.033 | 0.053 | 0.034 | 0.053 | 0.037 | 0.059 | 0.037 | 0.059 | 0.037 | 0.059 | 0.037 | 0.059 | 0.034 | 0.053 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.20 | 0.031 | 0.053 | 0.031 | 0.051 | 0.031 | 0.051 | 0.03 | 0.05 | 0.0 | 0.1 | 0.3 | 0.6 | 0.3 | 0.6 | 0.3 | 0.6 | 0.035 | 0.057 | 0.031 | 0.051 |
| Total Kjeldahl Nitrogen | mg/L | | <0.20 | <0.20 | 0.51 | 0.23 | 0.36 | 0.24 | 0.37 | 0.24 | 0.37 | 0.25 | 0.38 | 0.25 | 0.37 | 0.25 | 0.38 | 0.25 | 0.38 | 0.25 | 0.38 | 0.25 | 0.38 | 0.22 | 0.32 |
| Dissolved Phosphorus | mg/L | | 0.002 | 0.002 | 0.01 | 0.0046 | 0.0066 | 0.0049 | 0.0069 | 0.0049 | 0.0069 | 0.0048 | 0.007 | 0.0048 | 0.0069 | 0.005 | 0.0075 | 0.005 | 0.0075 | 0.005 | 0.0075 | 0.005 | 0.0075 | 0.0043 | 0.0063 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00105 | 0.0017 | 0.0011 | 0.0017 | 0.0011 | 0.0017 | 0.0011 | 0.0017 | 0.0011 | 0.0017 | 0.00112 | 0.0019 | 0.00112 | 0.0019 | 0.00112 | 0.0019 | 0.0011 | 0.0019 | 0.001 | 0.0016 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.6 | 1.7 | 2.5 | 1.9 | 2.8 | 1.9 | 2.8 | 1.9 | 2.8 | 1.9 | 2.8 | 1.6 | 2.4 |
| Total Aluminum | µg/L | 100 | <0.2 | **<104** | **<200** | 5.6 | 8.5 | 5.8 | 8.6 | 5.8 | 8.6 | 6 | 9 | 6 | 9 | 9 | 16 | 9 | 16 | 9 | 16 | 6.2 | 9.7 | 5.8 | 8.6 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.22 | 0.38 | 0.22 | 0.38 | 0.22 | 0.38 | 0.22 | 0.38 | 0.22 | 0.38 | 0.24 | 0.43 | 0.24 | 0.43 | 0.24 | 0.43 | 0.24 | 0.43 | 0.22 | 0.39 |
| Total Arsenic | µg/L | 5 | 0.0003 | 0.25 | 1.2 | 0.63 | 0.97 | 0.67 | 1.02 | 0.68 | 1.04 | 0.67 | 1.02 | 0.67 | 1.0 | 0.69 | 1.1 | 0.69 | 1.1 | 0.69 | 1.1 | 0.69 | 1.1 | 0.67 | 1.02 |
| Total Barium | µg/L | 1000 | <0.01 | <10 | 19 | 10.9 | 19 | 11 | 19 | 11 | 19 | 11 | 19 | 11 | 19 | 11.8 | 20 | 11.8 | 20 | 11.8 | 20 | 12 | 20 | 11 | 19 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.32 | 0.46 | 0.3 | 0.45 | 0.31 | 0.46 | 0.31 | 0.45 | 0.31 | 0.44 | 0.34 | 0.5 | 0.34 | 0.5 | 0.34 | 0.5 | 0.34 | 0.5 | 0.3 | 0.44 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.08 | 0.14 | 0.07 | 0.12 | 0.07 | 0.12 | 0.07 | 0.12 | 0.07 | 0.12 | 0.09 | 0.1 | 0.09 | 0.1 | 0.09 | 0.1 | 0.09 | 0.15 | 0.08 | 0.13 |
| Total Boron | µg/L | 1500 | 2 | <100 | <100 | 70 | 117 | 71 | 119 | 71 | 119 | 71 | 121 | 71 | 120 | 76 | 132 | 76 | 132 | 76 | 132 | 76 | 132 | 66 | 111 |
| Total Cadmium | µg/L | 0.009 | **<0.02** | **<0.2** | **<2** | **0.1** | **0.17** | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.05 | 0.1 | 0.04 | 0.1 | 0.04 | 0.1 | 0.05 | 0.1 | 0.05 | 0.1 | 0.07 | 0.1 | 0.07 | 0.1 | 0.07 | 0.1 | 0.06 | 0.1 | 0.05 | 0.1 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.38 | 0.6 | 0.33 | 0.5 | 0.33 | 0.5 | 0.33 | 0.5 | 0.33 | 0.5 | 0.5 | 0.7 | 0.5 | 0.7 | 0.5 | 0.7 | 0.45 | 0.7 | 0.39 | 0.6 |
| Total Copper | µg/L | 2 | <1 | **<10** | **<100** | **5.4** | **9.0** | 5.5 | 9.3 | 5.5 | 9.2 | 5.5 | 9.3 | 5.5 | 9.2 | 5.5 | 9.2 | 5.5 | 9.2 | 5.5 | 9.2 | 5.5 | 9.2 | 5.2 | 8.1 |
| Total Iron | µg/L | 300 | 13 | 46 | 112 | 83 | 129 | 87 | 133 | 87 | 133 | 90 | 138 | 90 | 138 | 93 | 152 | 93 | 152 | 93 | 152 | 89 | 145 | 77 | 121 |
| Total Lead | µg/L | 1 | <0.05 | <0.1 | **106** | 0.23 | **15** | 0.25 | 15 | 0.25 | 15 | 0.25 | 8 | 0.25 | 8 | 0.26 | 9 | 0.26 | 9 | 0.26 | 9 | 0.26 | 9 | 0.23 | 9 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 7.6 | 22 | 7.8 | 23 | 7.8 | 23 | 7.8 | 24 | 7.8 | 23 | 8.4 | 23 | 8.4 | 23 | 8.4 | 23 | 8.4 | 23 | 7.2 | 21 |
| Total Manganese | µg/L | 50 | 1 | <5 | 18 | 5.3 | 7.4 | 5.6 | 7.8 | 5.6 | 7.8 | 5.6 | 7.8 | 5.6 | 7.8 | 5.8 | 8.1 | 5.8 | 8.1 | 5.8 | 8.1 | 5.7 | 8.0 | 5.2 | 7.1 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.037** | **0.08** | 0.04 | 0.083 | 0.04 | 0.083 | 0.038 | 0.083 | 0.038 | 0.082 | 0.04 | 0.079 | 0.04 | 0.079 | 0.04 | 0.079 | 0.04 | 0.079 | 0.034 | 0.069 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 0.8 | 1.6 | 0.7 | 1.4 | 0.7 | 1.4 | 0.7 | 1.4 | 0.7 | 1.4 | 0.9 | 1.7 | 0.9 | 1.7 | 0.9 | 1.7 | 0.9 | 1.7 | 0.9 | 1.6 |
| Total Nickel | µg/L | 29 | 1 | <20 | <20 | 2.6 | 3.9 | 2.4 | 3.6 | 2.4 | 3.6 | 2.4 | 3.5 | 2.4 | 3.6 | 2.8 | 4.2 | 2.8 | 4.2 | 2.8 | 4.2 | 2.8 | 4.2 | 2.5 | 3.7 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.19 | 0.28 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.17 | 0.26 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.065 | 0.098 | 0.066 | 0.099 | 0.067 | 0.10 | 0.067 | 0.10 | 0.066 | 0.10 | 0.066 | 0.10 | 0.066 | 0.10 | 0.066 | 0.10 | 0.066 | 0.10 | 0.061 | 0.093 |
| Total Strontium | µg/L | | 22 | 36 | 81 | 67 | 97 | 70 | 101 | 70 | 101 | 70 | 101 | 70 | 100 | 73 | 111 | 73 | 111 | 73 | 111 | 73 | 111 | 65 | 96 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.059 | 0.094 | 0.062 | 0.098 | 0.06 | 0.1 | 0.062 | 0.098 | 0.062 | 0.097 | 0.064 | 0.103 | 0.064 | 0.103 | 0.064 | 0.103 | 0.064 | 0.103 | 0.055 | 0.086 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.29 | 0.41 | 0.31 | 0.44 | 0.31 | 0.44 | 0.31 | 0.44 | 0.31 | 0.44 | 0.3 | 0.46 | 0.3 | 0.46 | 0.3 | 0.46 | 0.3 | 0.46 | 0.28 | 0.41 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.48 | 0.98 | 0.48 | 0.97 | 0.48 | 0.97 | 0.48 | 0.97 | 0.48 | 0.97 | 0.71 | 1.37 | 0.71 | 1.37 | 0.71 | 1.37 | 0.53 | 1.04 | 0.47 | 0.88 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 0.9 | 1 | 0.9 | 1.3 | 0.9 | 1.3 | 0.9 | 1.3 | 0.9 | 1.3 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1.5 | 0.8 | 1.2 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.101 | 0.16 | 0.105 | 0.16 | 0.1 | 0.16 | 0.104 | 0.16 | 0.106 | 0.16 | 0.108 | 0.18 | 0.108 | 0.18 | 0.108 | 0.18 | 0.108 | 0.18 | 0.105 | 0.16 |
| Total Vanadium | µg/L | | 0.08 | <1 | <30 | 0.69 | 1.02 | 0.71 | 1.04 | 0.71 | 1.04 | 0.71 | 1.04 | 0.72 | 1.04 | 0.77 | 1.15 | 0.77 | 1.15 | 0.77 | 1.15 | 0.77 | 1.14 | 0.67 | 0.99 |
| Total Zinc | µg/L | 30 | 1.1 | <5 | 7.9 | 4.2 | 5.9 | 4.3 | 6.1 | 4.3 | 6.1 | 4.4 | 6.1 | 4.3 | 6.0 | 4.6 | 6.5 | 4.6 | 6.5 | 4.6 | 6.5 | 4.5 | 6.5 | 4.0 | 5.6 |

**Table 7.4-A49: Observed and Predicted Concentrations at Lake CH10**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 24 | 31 | 43 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 55 | 32 | 54 |
| Total Alkalinity | mg/L | | 11 | 14 | 40 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 | 14 | 23 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | <3 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 | 1.5 | 2.4 |
| Calcium | mg/L | | 3.9 | 4.8 | 15 | 5.2 | 8 | 5.2 | 8 | 5.2 | 8 | 5.1 | 8 | 5.1 | 8 | 5.1 | 8 | 5.1 | 8 | 5.1 | 8 | 5.1 | 8 | 5.1 | 8 |
| Chloride | mg/L | 120 | 2.9 | 5.3 | 12 | 5.5 | 9 | 5.5 | 9 | 5.5 | 9 | 5.4 | 9 | 5.4 | 9 | 5.4 | 9 | 5.4 | 9 | 5.4 | 9 | 5.4 | 9 | 5.4 | 9 |
| Fluoride | mg/L | 0.12 | 0.04 | <0.05 | 0.06 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 |
| Magnesium | mg/L | | 0.62 | 0.8 | 2.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 | 0.8 | 1.3 |
| Potassium | mg/L | | 0.63 | <2 | 3.4 | 1.1 | 1.7 | 1.1 | 1.7 | 1.1 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 | 1.1 | 1.7 | 1.1 | 1.7 | 1.1 | 1.7 | 1.0 | 1.7 | 1.0 | 1.7 |
| Sodium | mg/L | 200 | 1.7 | 3.9 | 11 | 4.3 | 6.9 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 | 4.3 | 7 |
| Sulphate | mg/L | 500 | 2.2 | 2.8 | 7.4 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 | 2.9 | 4.5 |
| Ammonia (as N) | mg/L | 7 | <0.05 | <0.05 | 0.05 | 0.026 | 0.044 | 0.026 | 0.044 | 0.025 | 0.044 | 0.025 | 0.044 | 0.026 | 0.044 | 0.026 | 0.044 | 0.026 | 0.044 | 0.026 | 0.044 | 0.026 | 0.044 | 0.026 | 0.044 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.20 | 0.05 | 0.08 | 0.05 | 0.082 | 0.051 | 0.082 | 0.05 | 0.08 | 0.1 | 0.1 | 0.4 | 0.8 | 0.4 | 0.8 | 0.4 | 0.8 | 0.05 | 0.08 | 0.05 | 0.081 |
| Total Kjeldahl Nitrogen | mg/L | | <0.20 | <0.20 | 0.51 | 0.11 | 0.17 | 0.11 | 0.17 | 0.11 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 |
| Dissolved Phosphorus | mg/L | | 0.002 | 0.002 | 0.01 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 | 0.0021 | 0.0031 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00053 | 0.0009 | 0.0005 | 0.0009 | 0.0005 | 0.0009 | 0.0005 | 0.0009 | 0.0005 | 0.0009 | 0.00053 | 0.0009 | 0.00053 | 0.0009 | 0.00053 | 0.0009 | 0.0005 | 0.0009 | 0.0005 | 0.0009 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 | 2.3 | 3.7 |
| Total Aluminum | µg/L | 100 | <0.2 | **<104** | **<200** | 3.9 | 6.5 | 3.9 | 6.5 | 3.9 | 6.5 | 4 | 7 | 4 | 7 | 8 | 15 | 8 | 15 | 8 | 15 | 3.9 | 6.5 | 3.9 | 6.5 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.2 | 0.35 | 0.2 | 0.34 | 0.21 | 0.35 | 0.2 | 0.35 | 0.2 | 0.35 | 0.2 | 0.35 | 0.2 | 0.35 | 0.2 | 0.35 | 0.2 | 0.35 | 0.2 | 0.35 |
| Total Arsenic | µg/L | 5 | 0.0003 | 0.25 | 1.2 | 0.27 | 0.44 | 0.27 | 0.44 | 0.29 | 0.47 | 0.27 | 0.44 | 0.27 | 0.4 | 0.27 | 0.4 | 0.27 | 0.4 | 0.27 | 0.4 | 0.27 | 0.43 | 0.27 | 0.43 |
| Total Barium | µg/L | 1000 | <0.01 | <10 | 19 | 6.0 | 10 | 6 | 10 | 6 | 10 | 6 | 10 | 6 | 10 | 5.9 | 10 | 5.9 | 10 | 5.9 | 10 | 6 | 10 | 6 | 10 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.5 | 0.81 | 0.51 | 0.81 | 0.52 | 0.82 | 0.5 | 0.81 | 0.5 | 0.81 | 0.5 | 0.81 | 0.5 | 0.81 | 0.5 | 0.81 | 0.5 | 0.81 | 0.5 | 0.81 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 4.99 | 8.34 | 4.98 | 8.34 | 5.0 | 8.34 | 4.97 | 8.35 | 4.97 | 8.34 | 4.94 | 8.3 | 4.94 | 8.3 | 4.94 | 8.3 | 4.94 | 8.34 | 4.97 | 8.33 |
| Total Boron | µg/L | 1500 | 2 | <100 | <100 | 52 | 90 | 52 | 89 | 52 | 89 | 51 | 91 | 51 | 89 | 51 | 90 | 51 | 90 | 51 | 90 | 51 | 90 | 51 | 89 |
| Total Cadmium | µg/L | 0.009 | **<0.02** | **<0.2** | **<2** | **0.1** | **0.17** | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 | 0.1 | 0.17 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.62 | 1.1 | 0.57 | 1.1 | 0.57 | 1.1 | 0.58 | 1.1 | 0.58 | 1.1 | 0.77 | 1.4 | 0.77 | 1.4 | 0.77 | 1.4 | 0.61 | 1.1 | 0.61 | 1.1 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.9 | 1.3 | 0.84 | 1.3 | 0.84 | 1.3 | 0.84 | 1.3 | 0.83 | 1.3 | 1.1 | 1.6 | 1.1 | 1.6 | 1.1 | 1.6 | 0.91 | 1.3 | 0.91 | 1.3 |
| Total Copper | µg/L | 2 | <1 | **<10** | **<100** | **3.8** | **6.0** | 3.8 | 6.0 | 3.8 | 6.0 | 3.8 | 6.0 | 3.8 | 6.0 | 3.8 | 6.0 | 3.8 | 6.0 | 3.8 | 6.0 | 3.8 | 5.9 | 3.8 | 5.9 |
| Total Iron | µg/L | 300 | 13 | 46 | 112 | 47 | 76 | 47 | 76 | 47 | 76 | 47 | 76 | 47 | 76 | 51 | 84 | 51 | 84 | 51 | 84 | 47 | 75 | 47 | 75 |
| Total Lead | µg/L | 1 | <0.05 | <0.1 | **106** | 0.08 | **15** | 0.08 | 15 | 0.08 | 15 | 0.08 | 11 | 0.08 | 11 | 0.08 | 11 | 0.08 | 11 | 0.08 | 11 | 0.08 | 11 | 0.08 | 11 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 5.1 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 | 5.0 | 13 |
| Total Manganese | µg/L | 50 | 1 | <5 | 18 | 2.7 | 3.9 | 2.7 | 3.9 | 2.8 | 4.0 | 2.7 | 4.0 | 2.7 | 4.0 | 2.7 | 4.0 | 2.7 | 4.0 | 2.7 | 4.0 | 2.6 | 3.9 | 2.6 | 3.9 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | 0.026 | **0.045** | 0.026 | 0.045 | 0.026 | 0.045 | 0.025 | 0.045 | 0.025 | 0.045 | 0.025 | 0.045 | 0.025 | 0.045 | 0.025 | 0.045 | 0.025 | 0.045 | 0.025 | 0.044 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 14.6 | 23.8 | 14.7 | 23.9 | 14.7 | 23.9 | 14.6 | 23.9 | 14.6 | 23.8 | 14.6 | 23.8 | 14.6 | 23.8 | 14.6 | 23.8 | 14.6 | 23.8 | 14.6 | 23.7 |
| Total Nickel | µg/L | 29 | 1 | <20 | <20 | 10.0 | 16.3 | 10.0 | 16.3 | 10.0 | 16.3 | 10.1 | 16.3 | 10.0 | 16.3 | 10.0 | 16.4 | 10.0 | 16.4 | 10.0 | 16.4 | 10.0 | 16.3 | 10.0 | 16.3 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.05 | 0.13 | 0.06 | 0.13 | 0.06 | 0.13 | 0.05 | 0.12 | 0.05 | 0.12 | 0.05 | 0.12 | 0.05 | 0.12 | 0.05 | 0.12 | 0.05 | 0.12 | 0.05 | 0.12 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.052 | 0.085 | 0.052 | 0.084 | 0.052 | 0.085 | 0.052 | 0.084 | 0.052 | 0.085 | 0.052 | 0.084 | 0.052 | 0.084 | 0.052 | 0.084 | 0.052 | 0.084 | 0.052 | 0.084 |
| Total Strontium | µg/L | | 22 | 36 | 81 | 37 | 58 | 37 | 58 | 37 | 58 | 36 | 58 | 36 | 58 | 36 | 58 | 36 | 58 | 36 | 58 | 36 | 58 | 37 | 58 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.027 | 0.042 | 0.027 | 0.042 | 0.03 | 0.04 | 0.027 | 0.042 | 0.027 | 0.042 | 0.027 | 0.042 | 0.027 | 0.042 | 0.027 | 0.042 | 0.027 | 0.042 | 0.027 | 0.042 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.05 | 0.21 | 0.05 | 0.21 | 0.05 | 0.21 | 0.05 | 0.18 | 0.05 | 0.18 | 0.05 | 0.18 | 0.05 | 0.18 | 0.05 | 0.18 | 0.05 | 0.18 | 0.05 | 0.18 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.5 | 0.93 | 0.5 | 0.93 | 0.5 | 0.93 | 0.5 | 0.93 | 0.5 | 0.93 | 0.72 | 1.34 | 0.72 | 1.34 | 0.72 | 1.34 | 0.5 | 0.92 | 0.5 | 0.92 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 49.9 | 81 | 49.9 | 81.0 | 49.9 | 81.0 | 49.9 | 81.0 | 49.9 | 81.0 | 50.0 | 81 | 50.0 | 81 | 50.0 | 81 | 50.0 | 81.0 | 49.9 | 81.0 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.057 | 0.09 | 0.056 | 0.09 | 0.06 | 0.09 | 0.056 | 0.09 | 0.056 | 0.09 | 0.056 | 0.09 | 0.056 | 0.09 | 0.056 | 0.09 | 0.056 | 0.09 | 0.056 | 0.09 |
| Total Vanadium | µg/L | | 0.08 | <1 | <30 | 0.5 | 0.78 | 0.5 | 0.78 | 0.5 | 0.78 | 0.51 | 0.8 | 0.51 | 0.8 | 0.51 | 0.8 | 0.51 | 0.8 | 0.51 | 0.8 | 0.5 | 0.78 | 0.5 | 0.78 |
| Total Zinc | µg/L | 30 | 1.1 | <5 | 7.9 | 2.6 | 3.8 | 2.6 | 3.8 | 2.6 | 3.8 | 2.6 | 3.8 | 2.5 | 3.8 | 2.5 | 3.8 | 2.5 | 3.8 | 2.5 | 3.8 | 2.5 | 3.8 | 2.5 | 3.8 |

**Table 7.4-A50: Observed and Predicted Concentrations at Lake CH1**

| Parameter | Units | Water Quality Standard | Observed | | | Baseline | | Construction (Years -3) | | Construction (Years -2 to -1) | | Operations (Years 1 to 2) | | Operations (Years 3 to 4) | | Operations (Years 5 to 8) | | Operations (Years 9) | | Operations (Years 10 to 13) | | Closure | | Post-Closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak | Median | Peak |
| Total Dissolved Solids | mg/L | 500 | 24 | 31 | 43 | 43 | 74 | 43 | 74 | 43 | 74 | 43 | 74 | 43 | 74 | 44 | 76 | 44 | 76 | 44 | 76 | 44 | 76 | 41 | 71 |
| Total Alkalinity | mg/L | | 11 | 14 | 40 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 32 | 21 | 32 | 22 | 34 | 22 | 34 | 22 | 34 | 22 | 34 | 21 | 33 |
| Total Suspended Solids | mg/L | 8 | <1 | <3 | <3 | 1.8 | 2.7 | 1.8 | 2.7 | 1.8 | 2.7 | 1.8 | 2.7 | 1.8 | 2.7 | 1.8 | 2.8 | 1.8 | 2.8 | 1.8 | 2.8 | 1.8 | 2.8 | 1.7 | 2.6 |
| Calcium | mg/L | | 3.9 | 4.8 | 15 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.4 | 12 | 7.2 | 12 |
| Chloride | mg/L | 120 | 2.9 | 5.3 | 12 | 7.6 | 13 | 7.6 | 13 | 7.6 | 13 | 7.6 | 13 | 7.6 | 13 | 8.0 | 14 | 8.0 | 14 | 8.0 | 14 | 8.0 | 14 | 7.2 | 12 |
| Fluoride | mg/L | 0.12 | 0.04 | <0.05 | 0.06 | 0.059 | 0.09 | 0.059 | 0.09 | 0.059 | 0.09 | 0.059 | 0.09 | 0.059 | 0.09 | 0.063 | 0.096 | 0.063 | 0.096 | 0.063 | 0.096 | 0.063 | 0.096 | 0.06 | 0.09 |
| Magnesium | mg/L | | 0.62 | 0.8 | 2.3 | 1.1 | 1.7 | 1.1 | 1.7 | 1.1 | 1.7 | 1.1 | 1.7 | 1.1 | 1.7 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.6 |
| Potassium | mg/L | | 0.63 | <2 | 3.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.4 | 1.6 | 2.6 | 1.6 | 2.6 | 1.6 | 2.6 | 1.6 | 2.6 | 1.6 | 2.5 |
| Sodium | mg/L | 200 | 1.7 | 3.9 | 11 | 5.9 | 9.8 | 5.9 | 10 | 5.9 | 10 | 5.9 | 10 | 5.9 | 10 | 6.1 | 10 | 6.1 | 10 | 6.1 | 10 | 6.1 | 10 | 5.6 | 9 |
| Sulphate | mg/L | 500 | 2.2 | 2.8 | 7.4 | 4.2 | 6.4 | 4.2 | 6.4 | 4.2 | 6.4 | 4.2 | 6.4 | 4.2 | 6.4 | 4.4 | 6.8 | 4.4 | 6.8 | 4.4 | 6.8 | 4.4 | 6.8 | 4.4 | 6.7 |
| Ammonia (as N) | mg/L | 7 | <0.05 | <0.05 | 0.05 | 0.03 | 0.047 | 0.03 | 0.047 | 0.03 | 0.047 | 0.03 | 0.047 | 0.03 | 0.047 | 0.03 | 0.051 | 0.03 | 0.051 | 0.03 | 0.051 | 0.03 | 0.051 | 0.03 | 0.047 |
| Nitrate (as N) | mg/L | 2.9 | <0.01 | 0.01 | 0.20 | 0.041 | 0.065 | 0.041 | 0.065 | 0.041 | 0.065 | 0.04 | 0.06 | 0.0 | 0.1 | 0.3 | 0.7 | 0.3 | 0.7 | 0.3 | 0.7 | 0.042 | 0.071 | 0.041 | 0.065 |
| Total Kjeldahl Nitrogen | mg/L | | <0.20 | <0.20 | 0.51 | 0.18 | 0.28 | 0.18 | 0.28 | 0.18 | 0.28 | 0.18 | 0.28 | 0.18 | 0.28 | 0.18 | 0.29 | 0.18 | 0.29 | 0.18 | 0.29 | 0.18 | 0.29 | 0.17 | 0.26 |
| Dissolved Phosphorus | mg/L | | 0.002 | 0.002 | 0.01 | 0.0039 | 0.0057 | 0.0039 | 0.0057 | 0.0039 | 0.0057 | 0.0039 | 0.0057 | 0.0039 | 0.0057 | 0.0039 | 0.006 | 0.0039 | 0.006 | 0.0039 | 0.006 | 0.0039 | 0.006 | 0.0036 | 0.0054 |
| Orthophosphate | mg/L | | <0.001 | <0.001 | 0.01 | 0.00095 | 0.0016 | 0.0009 | 0.0016 | 0.0009 | 0.0016 | 0.0009 | 0.0016 | 0.0009 | 0.0016 | 0.00096 | 0.0016 | 0.00096 | 0.0016 | 0.00096 | 0.0016 | 0.001 | 0.0016 | 0.0009 | 0.0015 |
| Cyanide | µg/L | 200 | <0.002 | 1 | 43 | 1.9 | 2.9 | 1.9 | 2.9 | 1.9 | 2.9 | 1.9 | 2.9 | 1.9 | 2.9 | 2.0 | 3.1 | 2.0 | 3.1 | 2.0 | 3.1 | 2.0 | 3.1 | 1.8 | 2.7 |
| Total Aluminum | µg/L | 100 | <0.2 | **<104** | **<200** | 5.4 | 8.5 | 5.4 | 8.5 | 5.4 | 8.5 | 5 | 8 | 5 | 8 | 9 | 16 | 9 | 16 | 9 | 16 | 5.6 | 9.1 | 5.4 | 8.5 |
| Total Antimony | µg/L | 6 | <0.03 | 0.12 | 3.2 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.23 | 0.4 | 0.25 | 0.44 | 0.25 | 0.44 | 0.25 | 0.44 | 0.25 | 0.44 | 0.23 | 0.41 |
| Total Arsenic | µg/L | 5 | 0.0003 | 0.25 | 1.2 | 0.54 | 0.85 | 0.54 | 0.85 | 0.54 | 0.85 | 0.54 | 0.85 | 0.54 | 0.8 | 0.55 | 0.9 | 0.55 | 0.9 | 0.55 | 0.9 | 0.54 | 0.89 | 0.54 | 0.85 |
| Total Barium | µg/L | 1000 | <0.01 | <10 | 19 | 9.0 | 15 | 9 | 15 | 9 | 15 | 9 | 15 | 9 | 15 | 9.2 | 16 | 9.2 | 16 | 9.2 | 16 | 9 | 16 | 9 | 15 |
| Total Beryllium | µg/L | | <0.1 | <0.2 | <1 | 0.37 | 0.56 | 0.37 | 0.56 | 0.37 | 0.56 | 0.37 | 0.56 | 0.37 | 0.56 | 0.41 | 0.58 | 0.41 | 0.58 | 0.41 | 0.58 | 0.41 | 0.58 | 0.36 | 0.54 |
| Total Bismuth | µg/L | | <0.03 | <0.05 | <1 | 0.51 | 0.84 | 0.51 | 0.84 | 0.51 | 0.84 | 0.51 | 0.84 | 0.51 | 0.84 | 0.52 | 0.9 | 0.52 | 0.9 | 0.52 | 0.9 | 0.52 | 0.86 | 0.49 | 0.83 |
| Total Boron | µg/L | 1500 | 2 | <100 | <100 | 75 | 127 | 75 | 127 | 75 | 127 | 75 | 127 | 75 | 127 | 79 | 138 | 79 | 138 | 79 | 138 | 79 | 138 | 72 | 122 |
| Total Cadmium | µg/L | 0.009 | **<0.02** | **<0.2** | **<2** | **0.11** | **0.19** | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 | 0.11 | 0.19 |
| Total Chromium | µg/L | 8.9 | <0.06 | 0.49 | **<15** | 0.62 | 1.1 | 0.62 | 1.1 | 0.62 | 1.1 | 0.62 | 1.1 | 0.62 | 1.1 | 0.77 | 1.4 | 0.77 | 1.4 | 0.77 | 1.4 | 0.64 | 1.2 | 0.61 | 1.1 |
| Total Cobalt | µg/L | | <0.1 | <0.1 | 0.8 | 0.9 | 1.3 | 0.9 | 1.3 | 0.9 | 1.3 | 0.9 | 1.3 | 0.9 | 1.3 | 1.1 | 1.6 | 1.1 | 1.6 | 1.1 | 1.6 | 0.93 | 1.4 | 0.91 | 1.3 |
| Total Copper | µg/L | 2 | <1 | **<10** | **<100** | **5.5** | **9.0** | 5.5 | 9.0 | 5.5 | 9.0 | 5.5 | 9.0 | 5.5 | 9.0 | 5.8 | 9.3 | 5.8 | 9.3 | 5.8 | 9.3 | 5.8 | 9.3 | 5.3 | 8.3 |
| Total Iron | µg/L | 300 | 13 | 46 | 112 | 73 | 117 | 73 | 117 | 73 | 117 | 73 | 117 | 73 | 117 | 78 | 130 | 78 | 130 | 78 | 130 | 75 | 122 | 69 | 111 |
| Total Lead | µg/L | 1 | <0.05 | <0.1 | **106** | 0.2 | **15** | 0.2 | 15 | 0.2 | 15 | 0.2 | 15 | 0.2 | 15 | 0.19 | 10 | 0.19 | 10 | 0.19 | 10 | 0.19 | 10 | 0.19 | 10 |
| Total Lithium | µg/L | | <0.1 | 1.1 | 32 | 7.6 | 22 | 7.6 | 22 | 7.6 | 22 | 7.6 | 22 | 7.6 | 22 | 7.9 | 23 | 7.9 | 23 | 7.9 | 23 | 7.9 | 23 | 7.2 | 22 |
| Total Manganese | µg/L | 50 | 1 | <5 | 18 | 3.9 | 5.5 | 3.9 | 5.5 | 3.9 | 5.5 | 3.9 | 5.5 | 3.9 | 5.5 | 3.9 | 5.7 | 3.9 | 5.7 | 3.9 | 5.7 | 3.8 | 5.6 | 3.8 | 5.4 |
| Total Mercury | µg/L | 0.026 | <0.01 | <0.02 | **0.5** | **0.037** | **0.076** | 0.037 | 0.076 | 0.037 | 0.076 | 0.037 | 0.076 | 0.037 | 0.076 | 0.04 | 0.076 | 0.04 | 0.076 | 0.04 | 0.076 | 0.04 | 0.076 | 0.036 | 0.07 |
| Total Molybdenum | µg/L | 73 | <0.06 | 0.2 | <1 | 2.8 | 4.5 | 2.8 | 4.5 | 2.8 | 4.5 | 2.8 | 4.5 | 2.8 | 4.5 | 2.9 | 4.7 | 2.9 | 4.7 | 2.9 | 4.7 | 2.9 | 4.7 | 2.8 | 4.5 |
| Total Nickel | µg/L | 29 | 1 | <20 | <20 | 3.0 | 4.6 | 3.0 | 4.6 | 3.0 | 4.6 | 3.0 | 4.6 | 3.0 | 4.6 | 3.1 | 4.8 | 3.1 | 4.8 | 3.1 | 4.8 | 3.1 | 4.8 | 3.0 | 4.6 |
| Total Selenium | µg/L | 1 | <0.1 | <0.1 | <1 | 0.14 | 0.2 | 0.14 | 0.2 | 0.14 | 0.2 | 0.14 | 0.2 | 0.14 | 0.2 | 0.13 | 0.2 | 0.13 | 0.2 | 0.13 | 0.2 | 0.13 | 0.2 | 0.13 | 0.19 |
| Total Silver | µg/L | 0.1 | <0.01 | <0.01 | 0.1 | 0.053 | 0.084 | 0.053 | 0.084 | 0.053 | 0.084 | 0.053 | 0.084 | 0.053 | 0.084 | 0.055 | 0.088 | 0.055 | 0.088 | 0.055 | 0.088 | 0.055 | 0.088 | 0.05 | 0.08 |
| Total Strontium | µg/L | | 22 | 36 | 81 | 56 | 85 | 56 | 85 | 56 | 85 | 56 | 85 | 56 | 85 | 57 | 91 | 57 | 91 | 57 | 91 | 57 | 90 | 55 | 84 |
| Total Thallium | µg/L | 0.8 | <0.03 | <0.05 | <0.2 | 0.042 | 0.069 | 0.042 | 0.069 | 0.04 | 0.07 | 0.042 | 0.069 | 0.042 | 0.069 | 0.041 | 0.07 | 0.041 | 0.07 | 0.041 | 0.07 | 0.041 | 0.07 | 0.039 | 0.065 |
| Total Tin | µg/L | 15 | <0.1 | <0.1 | 1.6 | 0.22 | 0.31 | 0.22 | 0.31 | 0.22 | 0.31 | 0.22 | 0.31 | 0.22 | 0.31 | 0.2 | 0.31 | 0.2 | 0.31 | 0.2 | 0.31 | 0.2 | 0.31 | 0.2 | 0.31 |
| Total Titanium | µg/L | | <0.1 | <0.3 | <10 | 0.49 | 0.96 | 0.49 | 0.96 | 0.49 | 0.96 | 0.49 | 0.96 | 0.49 | 0.96 | 0.7 | 1.35 | 0.7 | 1.35 | 0.7 | 1.35 | 0.52 | 0.99 | 0.47 | 0.9 |
| Total Tungsten | µg/L | | <100 | <100 | <100 | 6.4 | 11 | 6.4 | 10.6 | 6.4 | 10.6 | 6.4 | 10.6 | 6.4 | 10.6 | 6.6 | 11 | 6.6 | 11 | 6.6 | 11 | 6.6 | 10.9 | 6.4 | 10.4 |
| Total Uranium | µg/L | 15 | 0.03 | 0.07 | 0.57 | 0.085 | 0.14 | 0.085 | 0.14 | 0.08 | 0.14 | 0.085 | 0.14 | 0.085 | 0.14 | 0.084 | 0.14 | 0.084 | 0.14 | 0.084 | 0.14 | 0.084 | 0.14 | 0.085 | 0.14 |
| Total Vanadium | µg/L | | 0.08 | <1 | <30 | 0.62 | 0.92 | 0.62 | 0.92 | 0.62 | 0.92 | 0.62 | 0.92 | 0.62 | 0.92 | 0.65 | 0.99 | 0.65 | 0.99 | 0.65 | 0.99 | 0.64 | 0.98 | 0.6 | 0.9 |
| Total Zinc | µg/L | 30 | 1.1 | <5 | 7.9 | 3.6 | 5.1 | 3.6 | 5.1 | 3.6 | 5.1 | 3.6 | 5.1 | 3.6 | 5.1 | 3.7 | 5.4 | 3.7 | 5.4 | 3.7 | 5.4 | 3.6 | 5.4 | 3.4 | 4.9 |

## 5.6 Pit Lake Mixing

Several possible surface water sources may be used to flood the open pits during the closure phase; namely, Meliadine Lake, non-contact surface runoff (i.e., from watersheds), and contact runoff (i.e., WRSF) and discharge (TSF). Mixing of these sources within each pit would be dependent on their respective density. A source with a density that is much higher than the others may not mix, and may sink to the bottom of the pit lake promoting the possible development of a chemocline (i.e., a stratification of a waterbody as a result of a difference in water chemistry between the water layers). A thermocline (i.e., a stratification of a waterbody as a result of the difference in water temperature between water layers) may develop in the pit lake in the late stage of the open water period; however, it is anticipated that the thermocline would only be seasonal.

Water density is mainly dependent on water temperature and total dissolved and suspended solids concentrations. Table 7.4-A51 summarizes the average total dissolved and suspended solids concentrations of surface water sources for the Project, and provides the results of the calculation of water density for all of the pit lake water sources, assuming water temperatures of 4 and 20 °C. Total dissolved and suspended solids concentrations are low and induce little changes in the source water densities. For any given water temperature (4 or 20 °C), the differences between the source water densities are negligible, at less than 0.1 kg/m$^3$. Therefore any combination of surface source waters used to flood the pit lakes is anticipated to produce fully mixed conditions in these waterbodies.

The predicted water quality parameter concentrations in the pit lakes once completely flooded are presented in the mine site water management plan (SD 2-6 Surface Water Management Plan).

**Table 7.4-A51: Surface Source Water Densities**

| Water source | Total dissolved solids (mg/L)[(a)] | Total suspended solids (mg/L)[(a)] | Water density (kg/m$^3$)[(b)] | |
|---|---|---|---|---|
| | | | Water at 4 °C | Water at 20 °C |
| Meliadine Lake | 35 | <3 | 1000.00 | 997.66 |
| A watershed | 49 | <3 | 1000.01 | 997.67 |
| B watershed | 49 | <3 | 1000.01 | 997.67 |
| D watershed | 72 | <3 | 1000.03 | 997.69 |
| Chicken Head watershed | 31 | <3 | 1000.00 | 997.65 |
| Tailings storage facility | 88 | 15 | 1000.05 | 997.71 |
| B7 waste rock storage facility | 15 | <3 | 999.99 | 997.64 |
| B4 waste rock storage facility | 93 | <3 | 1000.05 | 997.70 |
| A45 waste rock storage facility | 8 | <3 | 999.98 | 997.64 |
| Discovery waste rock storage facility | 11 | <3 | 999.98 | 997.64 |

(a) Concentrations for Meliadine Lake and watersheds are medians values from Tables 7.4-A11 and 7.4-A14 to 7.4-A17. Total dissolved solids concentrations for the TSF and WRSFs are averages at closure (SD 2-6 Surface Water Management Plan). Total suspended solids concentrations reporting from the mine infrastructure is assumed.
(b) Density calculated from formulations in Cole and Wells (2003).

Groundwater from the Tiriganiaq underground workings is expected to have a high total dissolved solids concentration; in the order of 60,000 mg/L (SD 2-6 Surface Water Management Plan). Groundwater, if used as a source for pit filling, would therefore be anticipated to promote the formation of a chemocline.

A preliminary analysis to evaluate the potential capping of groundwater with fresh water within the open pits as a closure management option was undertaken using the hydrodynamic and water quality model CE-QUAL-W2 (Cole and Wells 2003). This analysis, which investigated the presence of a chemocline between a fresh water top layer and a groundwater bottom layer in the Tiriganiaq Pit and F Zone Pit 3, is presented in Appendix B. The results of the analysis are summarized as follows:

- Post-closure disposal of saline groundwater at the bottom of the open pits appears to be feasible;
- The minimum fresh water cap depths required to minimize the potential for the underlying groundwater to become mixed with surface waters to an extent that could result in surface water TDS concentrations above the regulatory limit for TDS of 500 mg/L (HC 2010) are 150 m at Tiriganiaq Pit, and 100 m at F Zone Pit 3.
- Further hydrodynamic simulation of mixing characteristics over the long term is required to confirm the analysis results.

## 5.7 Confidence in the Model Predictions

Confidence in the water quality parameter predictions is dependent on the model inputs and approach. The largest water sources to the waterbodies in the Meliadine Peninsula and Chicken Head watershed were non-contact water from the drainage areas to these waterbodies. Chemistry of these water sources were defined from the baseline water quality samples collected at each of the waterbodies; however, only a limited number of samples were available for each waterbody. To reduce uncertainty resulting from small sample numbers, chemistry of water sources were defined on a watershed basis. Specifically, all samples collected for a given watershed were used to define water chemistry, which was then applied to non-contact water draining to each waterbody within that watershed. A conservative approach was also used in defining the bounds of the probability distributions defining the range of concentrations of water quality parameters, allowing the possibility of assigning high concentrations as inputs to the model and as a result minimizing under-estimation of potential water quality concentrations within the waterbodies.

Other water sources considered in the model consisted of contact water, namely releases from the TSF and runoff from the WRSF. The chemistry of the water sources were estimated from geochemical analyses described in SD 2-6 Surface Water Management Plan (Appendix C). As described therein, conservative assumptions were used to minimize the possibility of under-estimating water quality parameter concentrations of these water sources.

The hydrologic component of the model was essential for water quality predictions, since it calculated the volume of all non-contact water sources. The structure of the model and the analysis of its results, particularly its calibration to baseline conditions, are discussed in FEIS Volume 7, Appendix 7.3-B. The results of the hydrologic component of the model are representative of baseline conditions and are deemed adequate to represent conditions under all phases of Project development.

The water quality module of the model was based on the assumption of full mixing of water in each of the waterbodies. This assumption generally agrees with baseline observations (SD 7-1 2009 Aquatics Synthesis Baseline) and is considered reasonable since the waterbodies are shallow. The assumption is also applicable for pit lakes (Section 5.6), since the chemistry of the water sources are anticipated to have similar total dissolved and suspended solids concentration levels. Water quality monitoring will be completed over the life of the Project to verify the predicted water quality trends and conduct adaptive management should differing trends be observed (SD 2-6 Surface Water Management Plan).

As a summary, the model inputs and approach provides a moderate degree of confidence that water quality predictions represent baseline conditions as well as those under all phases of the project development. The conservative assumptions used to define the chemistry of water sources minimize the possibility of under-estimating concentration levels within the waterbodies potentially affected by the Project.

# 6.0 SEDIMENT QUALITY

## 6.1 Approach

Water potentially affected by mine activities and processes will be discharged through an outfall to Meliadine Lake. The potential increase in concentrations within sediments in Meliadine Lake due to the release of mine effluent water were conservatively estimated assuming that the pores of the sediment were entirely filled with effluent water having the maximum allowable concentrations for all water quality parameters (Section 4).

## 6.2 Results

### 6.2.1 Predictions

Table 7.4-A52 presents a comparison of predicted sediment and effluent water concentrations in Meliadine Lake (see Tables 7.4-A12 and 7.4-A24). The concentrations for sediment and effluent water are provided in comparable units.

Observed sediment concentrations (median and maximum) are higher than estimated effluent water concentrations (at end of pipe and at the edge of the mixing zone) for all parameters except sodium, for which the effluent concentration at end of pipe is higher than the median sediment concentration. Therefore, only sediment sodium concentrations would be expected to increase from observed concentrations if sediment pores were to be filled with effluent water. The estimated sediment concentrations for sodium when saturated with effluent are provided in Table 7.4-A53. The resulting concentrations in Table 7.4-A53 are higher than observed concentrations in Table 7.4-A52 by 10% or less.

**Table 7.4-A52: Comparison between Sediment and Effluent Water Concentration in Meliadine Lake**

| Parameter | Observed sediment concentration | | | Estimated effluent water concentration | | |
|---|---|---|---|---|---|---|
| | Unit | Median | Maximum | Unit | At end of pipe | At edge of mixing zone |
| **Major Ions** | | | | | | |
| Calcium (Ca) | mg/kg dw | 4715 | 6460 | mg/L | 472 | 11 |
| Magnesium (Mg) | mg/kg dw | 4455 | 7930 | mg/L | 28 | 1 |
| Potassium (K) | mg/kg dw | 1720 | 2680 | mg/L | 46 | 1 |
| Sodium (Na) | mg/kg dw | 265.5 | 482 | mg/L | 295 | 5 |
| **Nutrients** | | | | | | |
| Phosphorus (P) | mg/kg dw | 822 | 1190 | mg/L | 0.060 | 0.0049 |
| **Cyanides** | | | | | | |
| Total Cyanide (CN) | mg/kg dw | 1.7 | 7 | mg/L | 1 | 0.009 |
| **Total Metals** | | | | | | |
| Aluminum (Al) | mg/kg dw | 8905 | 11900 | mg/L | 0.98 | 0.0091 |
| Antimony (Sb) | mg/kg dw | <0.2 | <25 | mg/L | 0.059 | 0.00051 |
| Arsenic (As) | mg/kg dw | 7.6 | 67.8 | mg/L | 0.5 | 0.0038 |
| Barium (Ba) | mg/kg dw | 65.5 | 141 | mg/L | 9.9 | 0.077 |
| Beryllium (Be) | mg/kg dw | <1 | <1 | mg/L | 0 | 0 |
| Bismuth (Bi) | mg/kg dw | <1 | <10 | mg/L | 0.000088 | 2.6E-08 |
| Boron (B) | mg/kg dw | <5 | 11 | mg/L | 2.7 | 0.023 |

**Table 7.4-A52: Comparison between Sediment and Effluent Water Concentration in Meliadine Lake**

| Parameter | Observed sediment concentration | | | Estimated effluent water concentration | | |
|---|---|---|---|---|---|---|
| Cadmium (Cd) | mg/kg dw | <0.5 | <2 | mg/L | 0.0001 | 0.00005 |
| Chromium (Cr) | mg/kg dw | 29.6 | 53.4 | mg/L | 0.1 | 0.0011 |
| Cobalt (Co) | mg/kg dw | 6 | 21 | mg/L | 0.032 | 0.000022 |
| Copper (Cu) | mg/kg dw | 34 | 92 | mg/L | 0.13 | 0.002 |
| Iron (Fe) | mg/kg dw | 15700 | 40800 | mg/L | 2.8 | 0.042 |
| Lead (Pb) | mg/kg dw | 6 | 14 | mg/L | 0.0092 | 0.00015 |
| Lithium (Li) | mg/kg dw | 6.3 | 6.3 | mg/L | 0.39 | 0.24 |
| Manganese (Mn) | mg/kg dw | 210.5 | 615 | mg/L | 0.48 | 0.0055 |
| Mercury (Hg) | mg/kg dw | <0.05 | 0.14 | mg/L | 0.00008 | 0.00002 |
| Molybdenum (Mo) | mg/kg dw | 2 | 7 | mg/L | 0.73 | 0.0052 |
| Nickel (Ni) | mg/kg dw | 25 | 73 | mg/L | 0.29 | 0.0027 |
| Selenium (Se) | mg/kg dw | 0.4 | 1.3 | mg/L | 0.0091 | 0.00016 |
| Silver (Ag) | mg/kg dw | <1 | <2 | mg/L | 0.0001 | 0.0001 |
| Strontium (Sr) | mg/kg dw | 27 | 42 | mg/L | 6.6 | 4.2 |
| Thallium (Tl) | mg/kg dw | <1 | <1 | mg/L | 0.0076 | 0.0001 |
| Tin (Sn) | mg/kg dw | <5 | <30 | mg/L | 0.15 | 0.0015 |
| Titanium (Ti) | mg/kg dw | 970 | 1230 | mg/L | 0.00025 | 3.6E-06 |
| Uranium (U) | mg/kg dw | 2 | <40 | mg/L | 0.15 | 0.0011 |
| Vanadium (V) | mg/kg dw | 31.5 | 61 | mg/L | 0.0014 | 0.00091 |
| Zinc (Zn) | mg/kg dw | 46.2 | 100 | mg/L | 0.26 | 0.0067 |

**Table 7.4-A53: Estimated Meliadine Sediment Sodium Concentrations if Saturated with Effluent Water**

| Parameter | Unit | At end of Pipe location | |
|---|---|---|---|
| | | Median | Maximum |
| Sodium (Na) | mg/kg dw | 295 | 482 |

### 6.2.2 Confidence in the Predictions

Observations of actual effluent chemistry (i.e., water quality parameter concentrations) from the Project are not available; however conservative assumptions were used in the mixing model to estimate effluent water quality. Observed sediment concentrations are typically higher than the estimated effluent water quality, with the exception being sodium. The calculation of potential sediment sodium concentrations assumes that all pores would be entirely filled with effluent water; however the effluent outfall at Meliadine Lake is assumed to discharge at height of 1 m above the lake bottom to minimize contact with sediment. Therefore, there is a moderate to high confidence that predicted sediment concentrations are not under-estimations.

# 7.0 ACID DEPOSITION

## 7.1 Approach

The potential for acidification of standing waters was evaluated by comparing critical loads of acidity with the corresponding estimated atmospheric acid deposition rates from FEIS Volume 5, Section 5.2 for each of the waterbodies listed in Table 7.4-A2.

Critical loads of acidity can be used to evaluate the likelihood of lake acidification (CASA 1999, Henriksen et al. 1992, Kamari et al. 1992a and b, Posch et al. 1992, Rihm 1995, RMCC 1990, World Health Organization [WHO] 1994, Henriksen and Posch 2001). The critical load has been defined in general terms as “a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge” (Nilsson and Grennfelt 1988). For evaluating the effects of acid deposition, the critical load can be thought of as an estimate of the amount of acidic deposition below which no significant harmful effects occur to a specified component of a waterbody’s ecosystem (e.g., a valued fish species) (Sullivan 2000).

The formula used to calculate critical loads *CL* was obtained from Henriksen et al. (1992):

$$CL = (BC - ANC)Q$$

where:

- *BC* is the base cation concentration (keq/L [kiloequivalent per litre]), assumed to correspond to the current values in the waterbodies, because they are considered unaffected by acidification at the present;
- *ANC* is the critical value for acid neutralizing capacity (75 µeq/L [microequivalent per litre] = 7.5 × 10-8 keq/L) based on the generally accepted pH effects threshold of 6, which is intended to protect the entire aquatic ecosystem; and
- *Q* is the average annual runoff to the waterbody (L/ha/y [litre per hectare per year]).

The BCs used in the analysis were the sum of the median sodium, potassium, calcium and magnesium concentrations observed at each of the waterbodies (SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline). The average annual runoff *Q* for each of the waterbodies was obtained from the hydrologic modelling of the receiving environment (FEIS Volume 7, Section 7.3).

A prediction of atmospheric acid deposition rates above the critical load for a given waterbody was considered an indication that the buffering capacity of the waterbody may be exceeded by acid deposition, with a subsequent drop in pH below 6. Comparisons were made using the highest atmospheric acid deposition (i.e., the sum of nitrate and sulphate emissions) predicted as part of the atmospheric environment and impact assessment for the Project (FEIS Volume 5, Section 5.2). A predicted atmospheric acid deposition in excess of the critical load was considered to represent a potential effect.

The use of critical loads as applied in this assessment does not specifically incorporate conservatism; however, the results of the assessment are conservative because of the approach used to model acid deposition as described in FEIS Volume 5, Section 5.2. Consequently, acid deposition rates above critical loads are not considered to be an indication of imminent acidification. Rather, they identify lakes that are at risk of acidification and should therefore be monitored for trends in acidity-related variables.

## 7.2 Results

### 7.2.1 Predictions

The results of calculation of waterbody CL and atmospheric acid deposition are presented in Table 7.4-A54. Atmospheric acid depositions are estimated to be lower than the corresponding critical loads for all waterbodies. Potential for acidification is therefore not expected for any of the waterbodies in the main site area.

**Table 7.4-A54: Estimated Waterbody Acidification Potential**

| Watershed | Waterbody | Potential acid input load (keq/ha/yr) | | Expected acidification potential[(a)] |
|---|---|---|---|---|
| | | Waterbody critical load | Atmospheric load | |
| A | A8 | 2.58 | 0.161 | No |
| | A6 | 2.58 | 0.161 | No |
| | A1 | 2.60 | 0.161 | No |
| B | B6 | 1.86 | 0.875 | No |
| | B5 | 1.85 | 0.875 | No |
| | B46 | 1.88 | 0.875 | No |
| | B45 | 1.83 | 0.875 | No |
| | P2 | 1.83 | 0.875 | No |
| | B2 | 1.84 | 0.875 | No |
| D | D7 | 2.71 | 0.161 | No |
| | D4 | 2.77 | 0.161 | No |
| | D3 | 2.77 | 0.161 | No |
| | D1 | 2.78 | 0.161 | No |
| H | H17 | 2.62 | 0.161 | No |
| | H1 | 2.62 | 0.161 | No |
| I | I1 | 2.60 | 0.161 | No |
| J | J8 | 2.61 | 0.161 | No |
| | J7 | 2.62 | 0.161 | No |
| | J6 | 2.62 | 0.161 | No |
| | J3 | 2.62 | 0.161 | No |
| | J2 | 2.62 | 0.161 | No |
| | J1 | 2.62 | 0.161 | No |
| Chicken Head | CH6 | 1.14 | 0.089 | No |
| | CH5 | 1.13 | 0.089 | No |
| | CH10 | 1.08 | 0.089 | No |
| | CH1 | 1.12 | 0.089 | No |

(a) Waterbody acidification potential is expected if the atmospheric load is higher than the waterbody critical load.

### 7.2.2 Confidence in the Results

The degree of confidence in the result of the analysis of acidification potential is dependent on:

- The amount of water quality data available for each waterbody (this amount is limited and the data were grouped on a watershed basis to increase confidence in the calculation of the CL);
- The degree of confidence in the air quality model used to predict atmospheric acid depositions (see FEIS Volume 5, Section 5.2); and
- The application of the critical load method to Canadian northern lakes (examples of the application of this method is limited).

Based on the above information, predictions for acid deposition are subject to a moderate degree of certainty. Despite the moderate degree of certainty, the analysis of air emission effects is conservative in the protective sense owing to the conservative approach used to model acid deposition.

## 8.0 CLOSURE

We trust that the information presented in this report meets your current requirements. Should you have any questions or concerns, please do not hesitate to contact us.

Yours very truly,

**GOLDER ASSOCIATES LTD.**

ORIGINAL SIGNED

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# APPENDIX A

## Predictions of Water Quality Guideline Exceedence

**Table A.1: Frequency of Exceedence of Water Quality Guidelines at Lake A8**

| Parameter | Guidelines | Baseline | Post-Closure |
|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% |
| Total Alkalinity | No | | |
| Total Suspended Solids | Yes | 0% | 0% |
| Calcium | No | | |
| Chloride | Yes | **8%** | **8%** |
| Fluoride | Yes | 0% | 0% |
| Magnesium | No | | |
| Potassium | No | | |
| Sodium | Yes | 0% | 0% |
| Sulphate | Yes | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | |
| Dissolved Phosphorus | No | | |
| Orthophosphate | No | | |
| Cyanide | Yes | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% |
| Total Antimony | Yes | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% |
| Total Barium | Yes | 0% | 0% |
| Total Beryllium | No | | |
| Total Bismuth | No | | |
| Total Boron | Yes | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% |
| Total Cobalt | No | | |
| Total Copper | Yes | **90%** | **90%** |
| Total Iron | Yes | 0% | 0% |
| Total Lead | Yes | **97%** | **97%** |
| Total Lithium | No | | |
| Total Manganese | Yes | **9%** | **9%** |
| Total Mercury | Yes | **100%** | **100%** |
| Total Molybdenum | Yes | 0% | 0% |
| Total Nickel | Yes | 0% | 0% |
| Total Selenium | Yes | 0% | 0% |
| Total Silver | Yes | **0.2%** | **0.2%** |
| Total Strontium | No | | |
| Total Thallium | Yes | 0% | 0% |
| Total Tin | Yes | 0% | 0% |
| Total Titanium | No | | |
| Total Tungsten | No | | |
| Total Uranium | Yes | 0% | 0% |
| Total Vanadium | No | | |
| Total Zinc | Yes | 0% | 0% |

**Table A.2: Frequency of Exceedence of Water Quality Guidelines at Lake A6**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Post-Closure |
|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% |
| Total Alkalinity | No | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% |
| Calcium | No | | | |
| Chloride | Yes | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% |
| Magnesium | No | | | |
| Potassium | No | | | |
| Sodium | Yes | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | |
| Dissolved Phosphorus | No | | | |
| Orthophosphate | No | | | |
| Cyanide | Yes | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% |
| Total Beryllium | No | | | |
| Total Bismuth | No | | | |
| Total Boron | Yes | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% |
| Total Cobalt | No | | | |
| Total Copper | Yes | **53%** | 0% | **53%** |
| Total Iron | Yes | 0% | 0% | 0% |
| Total Lead | Yes | **75%** | **5%** | **75%** |
| Total Lithium | No | | | |
| Total Manganese | Yes | 0% | 0% | 0% |
| Total Mercury | Yes | **57%** | **57%** | **57%** |
| Total Molybdenum | Yes | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% |
| Total Silver | Yes | **0.2%** | 0% | **0.2%** |
| Total Strontium | No | | | |
| Total Thallium | Yes | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% |
| Total Titanium | No | | | |
| Total Tungsten | No | | | |
| Total Uranium | Yes | 0% | 0% | 0% |
| Total Vanadium | No | | | |
| Total Zinc | Yes | 0% | 0% | 0% |

**Table A.3: Frequency of Exceedence of Water Quality Guidelines at Lake A1**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **43%** | 0% | **47%** | **51%** | **55%** | **55%** | **55%** | **55%** | **55%** | **33%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **17%** | **2%** | **19%** | **45%** | **55%** | **55%** | **55%** | **55%** | **55%** | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Mercury | Yes | **34%** | **34%** | **37%** | **55%** | **60%** | **60%** | **60%** | **60%** | **60%** | **23%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | **0.5%** | 0% | 0% | **1%** | **5%** | **7%** | **7%** | **7%** | **7%** | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.4: Frequency of Exceedence of Water Quality Guidelines at Lake B6**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) |
|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% |
| Calcium | No | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | |
| Potassium | No | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | |
| Dissolved Phosphorus | No | | | | |
| Orthophosphate | No | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | |
| Total Bismuth | No | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | |
| Total Copper | Yes | **18%** | **5%** | **51%** | **51%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | |
| Total Manganese | Yes | **32%** | **7%** | **38%** | **38%** |
| Total Mercury | Yes | 0% | 0% | **5%** | **5%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | |
| Total Tungsten | No | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% |

**Table A.5: Frequency of Exceedence of Water Quality Guidelines at Lake B5**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Post-Closure |
|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | |
| Potassium | No | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | |
| Dissolved Phosphorus | No | | | | | |
| Orthophosphate | No | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | |
| Total Bismuth | No | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | |
| Total Copper | Yes | **1%** | **0.3%** | 0% | 0% | 0% |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | |
| Total Manganese | Yes | **28%** | **14%** | **14%** | **13%** | 0% |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | |
| Total Tungsten | No | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% |

**Table A.6: Frequency of Exceedence of Water Quality Guidelines at Lake B46**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **0.3%** | **0.2%** | **0.4%** | **0.7%** | **4%** | **4%** | **4%** | **4%** | **3%** | **3%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **18%** | **18%** | **18%** | **14%** | **14%** | **14%** | **14%** | **14%** | **14%** | **15%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | **0%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.7: Frequency of Exceedence of Water Quality Guidelines at Lake B45**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **0.3%** | **0.2%** | **0.4%** | **0.7%** | **4%** | **4%** | **4%** | **4%** | **3%** | **3%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **18%** | **18%** | **18%** | **14%** | **14%** | **14%** | **14%** | **14%** | **14%** | **15%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | **0%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.8: Frequency of Exceedence of Water Quality Guidelines at Lake P2**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **3%** | 0% | 0% | 0% | 0% | **3%** | **3%** | **3%** | 0% | **3%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **17%** | **18%** | **18%** | **14%** | **14%** | **14%** | **14%** | **14%** | **14%** | **14%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.9: Frequency of Exceedence of Water Quality Guidelines at Lake B2**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **3%** | **3%** | **3%** | **6%** | **7%** | **7%** | **7%** | **7%** | **3%** | **3%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **17%** | **17%** | **17%** | **14%** | **14%** | **14%** | **14%** | **14%** | **13%** | **14%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.10: Frequency of Exceedence of Water Quality Guidelines at Lake D7**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | **1%** | 0% | 0% | 0% | **1%** | **1%** | **1%** | **1%** | **1%** | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **96%** | **5%** | **43%** | **54%** | **96%** | **96%** | **96%** | **96%** | **96%** | **97%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **96%** | **51%** | **86%** | **84%** | **96%** | **96%** | **96%** | **96%** | **96%** | **9%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | **18%** | 0% | 0% | 0% | **18%** | **18%** | **18%** | **18%** | **18%** | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.11: Frequency of Exceedence of Water Quality Guidelines at Lake D4**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | **1%** | 0% | 0% | 0% | **1%** | **1%** | **1%** | **1%** | **1%** | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0.0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **45%** | **2%** | **9%** | **12%** | **44%** | **45%** | **45%** | **45%** | **41%** | **41%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **84%** | **46%** | **52%** | **49%** | **78%** | **78%** | **78%** | **78%** | **78%** | **0.2%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | **0.1%** | 0% | 0% | 0% | **0.1%** | **0.1%** | **0.1%** | **0.1%** | **0.1%** | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.12: Frequency of Exceedence of Water Quality Guidelines at Lake D3**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0.0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **45%** | **3%** | **13%** | **15%** | **44%** | **44%** | **44%** | **44%** | **42%** | **42%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **84%** | **40%** | **53%** | **51%** | **79%** | **79%** | **79%** | **79%** | **79%** | **2%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.13: Frequency of Exceedence of Water Quality Guidelines at Lake D1**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | **0%** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **80%** | **7%** | **43%** | **49%** | **76%** | **76%** | **76%** | **76%** | **96%** | **96%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **89%** | **59%** | **83%** | **78%** | **82%** | **83%** | **83%** | **83%** | **82%** | **31%** |
| Total Mercury | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | **0.3%** | 0% | 0% | 0% | **0.3%** | **0.3%** | **0.3%** | **0.3%** | **0.3%** | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.14: Frequency of Exceedence of Water Quality Guidelines at Lake H17**

| Parameter | Guidelines | Baseline | Post-Closure |
|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% |
| Total Alkalinity | No | | |
| Total Suspended Solids | Yes | **2%** | **2%** |
| Calcium | No | | |
| Chloride | Yes | **6%** | **6%** |
| Fluoride | Yes | 0% | 0% |
| Magnesium | No | | |
| Potassium | No | | |
| Sodium | Yes | 0% | 0% |
| Sulphate | Yes | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | |
| Dissolved Phosphorus | No | | |
| Orthophosphate | No | | |
| Cyanide | Yes | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% |
| Total Antimony | Yes | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% |
| Total Barium | Yes | 0% | 0% |
| Total Beryllium | No | | |
| Total Bismuth | No | | |
| Total Boron | Yes | 0% | 0% |
| Total Cadmium | Yes | **97%** | **97%** |
| Total Chromium | Yes | 0% | 0% |
| Total Cobalt | No | | |
| Total Copper | Yes | **44%** | **43%** |
| Total Iron | Yes | 0% | 0% |
| Total Lead | Yes | 0% | 0% |
| Total Lithium | No | | |
| Total Manganese | Yes | **80%** | **80%** |
| Total Mercury | Yes | **97%** | **97%** |
| Total Molybdenum | Yes | 0% | 0% |
| Total Nickel | Yes | 0% | 0% |
| Total Selenium | Yes | 0% | 0% |
| Total Silver | Yes | **97%** | **97%** |
| Total Strontium | No | | |
| Total Thallium | Yes | 0% | 0% |
| Total Tin | Yes | 0% | 0% |
| Total Titanium | No | | |
| Total Tungsten | No | | |
| Total Uranium | Yes | 0% | 0% |
| Total Vanadium | No | | |
| Total Zinc | Yes | 0% | 0% |

**Table A.15: Frequency of Exceedence of Water Quality Guidelines at Lake H1**

| Parameter | Guidelines | Baseline | Post-Closure |
|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% |
| Total Alkalinity | No | | |
| Total Suspended Solids | Yes | 0% | 0% |
| Calcium | No | | |
| Chloride | Yes | **17%** | **17%** |
| Fluoride | Yes | 0% | 0% |
| Magnesium | No | | |
| Potassium | No | | |
| Sodium | Yes | 0% | 0% |
| Sulphate | Yes | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | |
| Dissolved Phosphorus | No | | |
| Orthophosphate | No | | |
| Cyanide | Yes | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% |
| Total Antimony | Yes | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% |
| Total Barium | Yes | 0% | 0% |
| Total Beryllium | No | | |
| Total Bismuth | No | | |
| Total Boron | Yes | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% |
| Total Cobalt | No | | |
| Total Copper | Yes | **91%** | **91%** |
| Total Iron | Yes | 0% | 0% |
| Total Lead | Yes | **70%** | **70%** |
| Total Lithium | No | | |
| Total Manganese | Yes | **24%** | **24%** |
| Total Mercury | Yes | **100%** | **100%** |
| Total Molybdenum | Yes | 0% | 0% |
| Total Nickel | Yes | 0% | 0% |
| Total Selenium | Yes | 0% | 0% |
| Total Silver | Yes | **91%** | **91%** |
| Total Strontium | No | | |
| Total Thallium | Yes | 0% | 0% |
| Total Tin | Yes | 0% | 0% |
| Total Titanium | No | | |
| Total Tungsten | No | | |
| Total Uranium | Yes | 0% | 0% |
| Total Vanadium | No | | |
| Total Zinc | Yes | 0% | 0% |

**Table A.16: Frequency of Exceedence of Water Quality Guidelines at Lake I1**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | **18%** | **18%** | **18%** | **18%** | **17%** | **17%** | **17%** | **17%** | **17%** | **17%** |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **89%** | **89%** | **90%** | **89%** | **91%** | **91%** | **91%** | **91%** | **85%** | **85%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **98%** | **98%** | **100%** | **96%** | **96%** | **96%** | **96%** | **96%** | **95%** | **94%** |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **17%** | **17%** | **22%** | **16%** | **15%** | **17%** | **17%** | **17%** | **15%** | **17%** |
| Total Mercury | Yes | **99%** | **99%** | **99%** | **93%** | **94%** | **94%** | **94%** | **94%** | **94%** | **94%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | **6%** | **6%** | **9%** | **8%** | **8%** | **6%** | **6%** | **6%** | **6%** | **6%** |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.17: Frequency of Exceedence of Water Quality Guidelines at Lake J8**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Post-Closure |
|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% |
| Calcium | No | | | | |
| Chloride | Yes | **5%** | **5%** | **5%** | **3%** |
| Fluoride | Yes | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | |
| Potassium | No | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | |
| Dissolved Phosphorus | No | | | | |
| Orthophosphate | No | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | |
| Total Bismuth | No | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | |
| Total Copper | Yes | 0% | 0% | 0% | 0% |
| Total Iron | Yes | 0% | 0% | 0% | 0% |
| Total Lead | Yes | 0% | 0% | 0% | 0% |
| Total Lithium | No | | | | |
| Total Manganese | Yes | 0% | 0% | 0% | 0% |
| Total Mercury | Yes | **4%** | **4%** | **4%** | **4%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | |
| Total Tungsten | No | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% |

**Table A.18: Frequency of Exceedence of Water Quality Guidelines at Lake J7**

| Parameter | Guidelines | Baseline | Construction (Years -3) |
|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% |
| Total Alkalinity | No | | |
| Total Suspended Solids | Yes | 0% | 0% |
| Calcium | No | | |
| Chloride | Yes | **18%** | **18%** |
| Fluoride | Yes | 0% | 0% |
| Magnesium | No | | |
| Potassium | No | | |
| Sodium | Yes | 0% | 0% |
| Sulphate | Yes | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | |
| Dissolved Phosphorus | No | | |
| Orthophosphate | No | | |
| Cyanide | Yes | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% |
| Total Antimony | Yes | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% |
| Total Barium | Yes | 0% | 0% |
| Total Beryllium | No | | |
| Total Bismuth | No | | |
| Total Boron | Yes | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% |
| Total Cobalt | No | | |
| Total Copper | Yes | **89%** | **89%** |
| Total Iron | Yes | 0% | 0% |
| Total Lead | Yes | **100%** | **100%** |
| Total Lithium | No | | |
| Total Manganese | Yes | **17%** | **17%** |
| Total Mercury | Yes | **99%** | **99%** |
| Total Molybdenum | Yes | 0% | 0% |
| Total Nickel | Yes | 0% | 0% |
| Total Selenium | Yes | **0.1%** | **0.1%** |
| Total Silver | Yes | **4%** | **4%** |
| Total Strontium | No | | |
| Total Thallium | Yes | 0% | 0% |
| Total Tin | Yes | 0% | 0% |
| Total Titanium | No | | |
| Total Tungsten | No | | |
| Total Uranium | Yes | 0% | 0% |
| Total Vanadium | No | | |
| Total Zinc | Yes | 0% | 0% |

**Table A.19: Frequency of Exceedence of Water Quality Guidelines at Lake J6**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) |
|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% |
| Total Alkalinity | No | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% |
| Calcium | No | | | |
| Chloride | Yes | **16%** | **16%** | **16%** |
| Fluoride | Yes | 0% | 0% | 0% |
| Magnesium | No | | | |
| Potassium | No | | | |
| Sodium | Yes | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | |
| Dissolved Phosphorus | No | | | |
| Orthophosphate | No | | | |
| Cyanide | Yes | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% |
| Total Beryllium | No | | | |
| Total Bismuth | No | | | |
| Total Boron | Yes | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% |
| Total Cobalt | No | | | |
| Total Copper | Yes | **92%** | **92%** | **92%** |
| Total Iron | Yes | 0% | 0% | 0% |
| Total Lead | Yes | **93%** | **93%** | **93%** |
| Total Lithium | No | | | |
| Total Manganese | Yes | **19%** | **19%** | **19%** |
| Total Mercury | Yes | **100%** | **100%** | **100%** |
| Total Molybdenum | Yes | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% |
| Total Silver | Yes | **6%** | **6%** | **6%** |
| Total Strontium | No | | | |
| Total Thallium | Yes | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% |
| Total Titanium | No | | | |
| Total Tungsten | No | | | |
| Total Uranium | Yes | 0% | 0% | 0% |
| Total Vanadium | No | | | |
| Total Zinc | Yes | 0% | 0% | 0% |

**Table A.20: Frequency of Exceedence of Water Quality Guidelines at Lake J3**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) |
|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% |
| Total Alkalinity | No | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% |
| Calcium | No | | | |
| Chloride | Yes | **20%** | **20%** | **20%** |
| Fluoride | Yes | 0% | 0% | 0% |
| Magnesium | No | | | |
| Potassium | No | | | |
| Sodium | Yes | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | |
| Dissolved Phosphorus | No | | | |
| Orthophosphate | No | | | |
| Cyanide | Yes | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% |
| Total Beryllium | No | | | |
| Total Bismuth | No | | | |
| Total Boron | Yes | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% |
| Total Cobalt | No | | | |
| Total Copper | Yes | **94%** | **94%** | **94%** |
| Total Iron | Yes | 0% | 0% | 0% |
| Total Lead | Yes | **83%** | **83%** | **83%** |
| Total Lithium | No | | | |
| Total Manganese | Yes | **14%** | **14%** | **14%** |
| Total Mercury | Yes | **95%** | **95%** | **95%** |
| Total Molybdenum | Yes | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% |
| Total Selenium | Yes | **0.4%** | **0.4%** | **0.4%** |
| Total Silver | Yes | **10%** | **10%** | **10%** |
| Total Strontium | No | | | |
| Total Thallium | Yes | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% |
| Total Titanium | No | | | |
| Total Tungsten | No | | | |
| Total Uranium | Yes | 0% | 0% | 0% |
| Total Vanadium | No | | | |
| Total Zinc | Yes | 0% | 0% | 0% |

**Table A.21: Frequency of Exceedence of Water Quality Guidelines at Lake J2**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) |
|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% |
| Total Alkalinity | No | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% |
| Calcium | No | | | |
| Chloride | Yes | **20%** | **20%** | **20%** |
| Fluoride | Yes | 0% | 0% | 0% |
| Magnesium | No | | | |
| Potassium | No | | | |
| Sodium | Yes | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | |
| Dissolved Phosphorus | No | | | |
| Orthophosphate | No | | | |
| Cyanide | Yes | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% |
| Total Beryllium | No | | | |
| Total Bismuth | No | | | |
| Total Boron | Yes | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** |
| Total Chromium | Yes | **0.3%** | **0.3%** | **0.3%** |
| Total Cobalt | No | | | |
| Total Copper | Yes | **90%** | **90%** | **90%** |
| Total Iron | Yes | 0% | 0% | 0% |
| Total Lead | Yes | **90%** | **90%** | **90%** |
| Total Lithium | No | | | |
| Total Manganese | Yes | **18%** | **18%** | **18%** |
| Total Mercury | Yes | **95%** | **95%** | **95%** |
| Total Molybdenum | Yes | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% |
| Total Selenium | Yes | **3%** | **3%** | **3%** |
| Total Silver | Yes | **11%** | **11%** | **11%** |
| Total Strontium | No | | | |
| Total Thallium | Yes | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% |
| Total Titanium | No | | | |
| Total Tungsten | No | | | |
| Total Uranium | Yes | 0% | 0% | 0% |
| Total Vanadium | No | | | |
| Total Zinc | Yes | 0% | 0% | 0% |

**Table A.22: Frequency of Exceedence of Water Quality Guidelines at Lake J1**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | **18%** | **18%** | **18%** | **5%** | **0.3%** | **0.2%** | **0.2%** | **0.2%** | **0.2%** | **0.3%** |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **86%** | **85%** | **88%** | **67%** | **67%** | **67%** | **67%** | **67%** | **37%** | **86%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **99%** | **100%** | **100%** | **91%** | **91%** | **91%** | **91%** | **91%** | **91%** | **99%** |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | **14%** | **14%** | **19%** | **4%** | **4%** | **4%** | **4%** | **4%** | **4%** | **14%** |
| Total Mercury | Yes | **98%** | **98%** | **98%** | **75%** | **75%** | **75%** | **75%** | **75%** | **75%** | **98%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | **1%** | **1%** | **9%** | **0.3%** | **0.3%** | **0.3%** | **0.3%** | **0.3%** | **0.3%** | **1%** |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.23: Frequency of Exceedence of Water Quality Guidelines at Lake CH6**

| Parameter | Guidelines | Baseline | Construction ( Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **12%** | **12%** | **12%** | **8%** | **8%** | **9%** | **9%** | **9%** | **9%** | **9%** |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Mercury | Yes | **92%** | **92%** | **92%** | **87%** | **87%** | **95%** | **95%** | **95%** | **95%** | **81%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.24: Frequency of Exceedence of Water Quality Guidelines at Lake CH5**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction ( Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **97%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **12%** | **12%** | **12%** | **8%** | **8%** | **12%** | **12%** | **12%** | **12%** | **9%** |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Mercury | Yes | **92%** | **98%** | **98%** | **92%** | **92%** | **95%** | **95%** | **95%** | **95%** | **84%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.25: Frequency of Exceedence of Water Quality Guidelines at Lake CH10**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **97%** | **97%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **20%** | **20%** | **20%** | **15%** | **15%** | **15%** | **15%** | **15%** | **15%** | **15%** |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Mercury | Yes | **50%** | **50%** | **50%** | **50%** | **50%** | **50%** | **50%** | **50%** | **50%** | **47%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

**Table A.26: Frequency of Exceedence of Water Quality Guidelines at Lake CH1**

| Parameter | Guidelines | Baseline | Construction (Years -3) | Construction (Years -2 to -1) | Operations (Years 1 to 2) | Operations (Years 3 to 4) | Operations (Years 5 to 8) | Operations (Years 9) | Operations (Years 10 to 13) | Closure | Post-Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Alkalinity | No | | | | | | | | | | |
| Total Suspended Solids | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Calcium | No | | | | | | | | | | |
| Chloride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Fluoride | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Magnesium | No | | | | | | | | | | |
| Potassium | No | | | | | | | | | | |
| Sodium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Sulphate | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Ammonia (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Nitrate (as N) | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Kjeldahl Nitrogen | No | | | | | | | | | | |
| Dissolved Phosphorus | No | | | | | | | | | | |
| Orthophosphate | No | | | | | | | | | | |
| Cyanide | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Aluminum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Antimony | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Arsenic | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Barium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Beryllium | No | | | | | | | | | | |
| Total Bismuth | No | | | | | | | | | | |
| Total Boron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cadmium | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| Total Chromium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Cobalt | No | | | | | | | | | | |
| Total Copper | Yes | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **97%** |
| Total Iron | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Lead | Yes | **20%** | **20%** | **20%** | **15%** | **15%** | **15%** | **15%** | **15%** | **15%** | **15%** |
| Total Lithium | No | | | | | | | | | | |
| Total Manganese | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Mercury | Yes | **92%** | **92%** | **92%** | **92%** | **92%** | **92%** | **92%** | **92%** | **92%** | **84%** |
| Total Molybdenum | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Nickel | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Selenium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Silver | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Strontium | No | | | | | | | | | | |
| Total Thallium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Tin | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Titanium | No | | | | | | | | | | |
| Total Tungsten | No | | | | | | | | | | |
| Total Uranium | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Total Vanadium | No | | | | | | | | | | |
| Total Zinc | Yes | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

# APPENDIX B

## Pit Lakes – Stability of Brine at Depth

# TECHNICAL MEMORANDUM

**DATE** January 19, 2013 **REFERENCE No.** Doc 376-1114280011 Ver 0

**TO** Josée Noël, Coordonnateur Environnement
Agnico-Eagle Mines Limited

**CC** Dan Walker

**FROM** Jason Parviainen and Gerard Van Arkel **EMAIL** jason.parviainen@golder.com

**PROJECT PIT LAKES – STABILITY OF BRINE AT DEPTH – MELIADINE GOLD PROJECT, NUNAVUT**

## 1.0 INTRODUCTION

Agnico-Eagle Mines Limited (AEM) is proposing to develop the Meliadine Gold Project (Meliadine) near Rankin Inlet in Nunavut. The proposed development includes open pit and underground mining operations. During operations, saline groundwater (brine) seeping into the underground works will need to be dewatered and contained and managed at the surface. Management of this brine may include re-use in underground drilling activities and active treatment to reduce total dissolved solids (TDS) concentrations prior to use in the extraction process. As open pit mining progresses, empty mine pits may become available to potentially use for temporary storage of brine prior to treatment and reuse, or for longer term storage for disposal at the bottom of the deepest open pits and capping with fresh water at closure.

This memorandum provides information on analyses completed to examine the feasibility of capping brine with fresh water as a closure management option. The analyses included hydrodynamic modelling to determine the mixing characteristics of Meliadine pit lakes with brine placed at depth, which were used as a basis for deriving mass balance predictions of long term TDS concentrations. The objective of the analyses was to provide preliminary recommendations regarding minimum fresh water cap depths to minimize potential for brine to become mixed with surface waters to an extent that could result in surface water TDS concentrations above the regulatory limit for TDS of 500 mg/L (HC 2010).

This memorandum is organized into six sections, including the introduction (Section 1). The methods used to predict mixing characteristics during the open water season and long-term surface water TDS concentrations are discussed in Section 2. Prediction results are summarized in Section 3, followed by conclusions and recommendations in Section 4. A list of cited references is provided in Section 5, followed by a closure statement and signatures of study authors in Section 6.

## 2.0 METHODS

The following sections describe the hydrodynamic modelling (Section 2.1) and mass balance water quality prediction methods (Section 2.2).



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## 2.1 Hydrodynamic Modelling

Hydrodynamic modelling of the Meliadine pit lakes was completed using CE-QUAL-W2 (W2) (Cole and Wells 2008). The W2 model is a 2-dimensional, laterally averaged, hydrodynamic and water quality model maintained and supported by the U.S. Army Corp. of Engineers Waterways Experiment Station. The model simulates the interaction of physical and chemical processes, including flow, thermal and substance mass loading regimes, meteorological forcing conditions (e.g., air temperature, wind, solar radiation, precipitation, evaporation, etc.) and lake-bottom interactions. The model has been extensively used to simulate the behaviour of natural and constructed lakes, including mine pit lakes (Cole and Wells 2008; Castendyk and Eary 2009).

Two Meliadine pit configurations were selected for hydrodynamic modelling analysis. Tiriganiaq Pit 1 was selected as it has a long fetch and has the largest storage volume and depth. The F Zone Pit 3 was selected as it is the largest and deepest of five Meliadine open pits with similar fetch (i.e., around 500 metres). Wesmeg Pit 3 is among these five pits and does not receive flows from or contribute flow to Tiriganiaq Pit 1 or F Zone Pit 3, so hydrodynamic modelling results for F Zone Pit 3 could be extrapolated to Wesmeg Pit 3 to examine its potential for brine storage. A summary of physical characteristics of the two modelled pit lakes are provided in Table 1.

**Table 1: Physical Characteristics of Tiriganiaq Pit 1 and F Zone Pit 3**

| Mine Pit | Fetch | Surface Area | Average Depth | Maximum Depth | Volume |
|---|---|---|---|---|---|
| Tiriganiaq Pit #1 | 2,756 m | 1.03 $km^2$ | 83 m | 195 m | 85 $Mm^3$ |
| F Zone Pit #3 | 478 m | 0.17 $km^2$ | 54 m | 145 m | 9.34 $Mm^3$ |

### 2.1.1 W2 Model Inputs, Setup and Assumptions

**Model Inputs**

Inputs for the Meliadine pit lake hydrodynamic models include:

- Pit lake bathymetry;
- Meteorological data (i.e., air temperature, dew point, wind speed and direction, and solar radiation); and
- Initial vertical profiles of temperature and TDS concentration.

***Bathymetry***

Contour plots of Tiriganiaq Pit 1 and F Zone Pit 3 at the end of operations (DEIS Volume 2) were used to define bathymetry inputs for the W2 model. Each pit was represented as a series of segments as follows:

- Tiriganiaq Pit 1 was represented in the W2 model as a series of 10 segments with west to east orientation and individually defined lengths that approximate the pit shape and water surface area.
- The F Zone Pit 3 was similarly represented as a series of 6 segments oriented in line with the direction of most frequent strong winds (i.e., 300°).

Each segment was composed of multiple layers that are defined with independent widths, which facilitate definition of changes in the pit lake cross-sectional areas with depth. The vertical layer depths were 0.5 metres (m) from top to bottom to minimize potential for numerical instability with a large range in TDS concentrations within the modelling domain. The depth-storage characteristics of the modelling grids is consistent with volumes calculated from the Tiriganiaq Pit and F Zone Pit #3 contours.

### *Meteorological Data*

Hourly meteorological data were obtained for the Meteorological Service of Canada long-term climate monitoring station at Rankin Inlet Airport (Rankin Inlet A, Climate Identifier 2303401). Hourly air temperature, dew point, wind speed and direction were available for the period of record (i.e., 1981 through 2012). Solar radiation data were not available from the Rankin Inlet station, and was estimated hourly based on the latitude and longitude of the Meliadine Project.

Three open water periods (i.e., from June 1 through September 30) were selected from the period of record for hourly data to incorporate inter-annual variability in meteorological conditions into the hydrodynamic modelling analysis. These included 1984, which had the highest observed sustained wind and wind gust during the open water period; 1992, which had the coolest average air temperatures; and 1996, which had the warmest average air temperatures.

Simulation of mixing characteristics under extreme wind conditions was a critical part of the hydrodynamic modelling analysis. This required the scaling of a single wind event containing the highest observed sustained wind speed and maximum wind gust in each of the three open water periods to simulate a storm that could include the estimated 1 in 1000 year gust of 168.65 km/h (estimated from a frequency analysis of hourly winds observed at Rankin Inlet Airport climate station). This was done by multiplying the hourly observed winds greater than 15 m/s during the selected storm events by the ratio between the estimated 1 in 1000 year gust and the largest wind gust observed during each storm. The duration of and winds associated with the three selected storms are provided in Table 2.

**Table 2: Observed Storm Statistics and Scaling to Simulate 1 in 1000 Year Storm**

| Dates | Storm Duration | Observed Wind Gust Maximum | Observed Hourly Wind Maximum | Wind Gust Scaling Ratio | Scaled Hourly Wind Maximum |
|---|---|---|---|---|---|
| August 3, 1984 | 8 hours | 124 km/h | 93 km/h | 1.36008 | 126.5 km/h |
| September 26, 1992 | 7 hours | 104 km/h | 83 km/h | 1.62163 | 134.6 km/h |
| September 28-29, 1996 | 15 hours | 109 km/h | 70 km/h | 1.54275 | 108.3 km/h |

### *Vertical Profiles*

Initial vertical profile inputs for temperature and TDS concentration were based on the following assumptions:

- the water column is isothermal at 4°C at the beginning of the open water season (June 1);
- concentrations of TDS are 60 mg/L in the water cap and 60,000 mg/L in the underlying brine;
- the chemocline has a slope of 5000 mg/L per metre of depth, with a concentration of 30,000 mg/L at the water cap depth specified for each scenario described in further detail in Section 2.1.2.

The assumed water cap TDS concentration of 60 mg/L is within the range of observed baseline concentrations in Meliadine Lake and surrounding watersheds (SD 7-1 2009 Aquatics Synthesis Baseline and SD 7-2 2011 Aquatics Baseline), but higher than the modelling predictions for long term pit lake water quality (i.e., ranging from 20 to 37 mg/L) presented in the mine site water management plan (SD 2-6 Surface Water Management Plan). The assumed brine TDS concentration of 60,000 mg/L is representative of TDS concentrations observed in groundwater samples collected at depth within the range of the underground works (SD 7-1 Physical Hydrogeology Baseline and DEIS Volume 7, Section 7.2).

**Setup and Assumptions**

The pit lake hydrodynamic models were set up as closed systems, with constant water volumes and no inflows or outflows, so that predicted changes in surface water concentrations over the open water period would be solely due to mixing of brine with surface waters under the meteorological conditions input to the simulations. Although evaporation was not included as a water balance term, it was included as part of the energy balance calculations used in the simulation of water temperature. Each simulation runs over a single open water season for scenarios described in Section 2.1.2.

The W2 model includes default parameters for momentum and heat transfer and recommended settings for model application to a lake or reservoir environment. These default and recommended settings were generally applied to the Meliadine pit lake models with the exception of longitudinal eddy viscosity, as the default value was higher than the range recommended based on the minimum segment lengths.

### 2.1.2 Hydrodynamic Modelling Scenarios

Multiple modelling scenarios were used to evaluate stability of brine stored at depth in Meliadine pit lakes at closure. These scenarios were combinations of:

- Water cap depths varying in 10 metre intervals for Tiriganiaq Pit 1 and in 5 metre intervals for F Zone Pit 3;
- Meteorological conditions for the three selected open water seasons, with wind speeds as observed throughout each simulation and with a single event scaled up to simulate the estimated 1 in 1000 year wind gust as described above; and
- For Tiriganiaq Pit, oriented normally (i.e., west to east) for the observed wind simulations and in line with the direction of the most frequent strong winds (i.e., 300°) for simulations including an extreme wind event.

Preliminary screening of scenario results was completed to exclude sets of water cap depths from the mass balance analysis. Simulated water cap depths that did not result in surface water TDS concentration increases greater than 100 mg/L at the end of the open water season were carried forward to the mass balance analysis.

## 2.2 Mass Balance Predictions

The following mass balance equation was used to predict annual surface water TDS concentrations in the Meliadine pit lakes:

$$C_i = \frac{C_{i-1} * V_{cap} + C_{sfc} * Q_{sfc} + L_i}{V_{cap} + Q_{sfc}} \quad (1)$$

where:

$C_i$ = TDS concentration in water cap at the end of year ‘i’ (g/m$^3$);

$C_{i-1}$ = TDS concentration in water cap at the end of year ‘i-1’ (g/m$^3$);

$V_{cap}$ = volume of the water cap (m$^3$).

$C_{sfc}$ = TDS concentration in surface inflow (g/m$^3$);

$Q_{sfc}$ = net annual surface inflow (m$^3$);

$L_i$ = TDS mass load from brine during the open water season in year ‘i’ (g).

The approach assumes constant water cap volume, calculated for each water cap depth, and non-variable surface inflow volume and concentration over time. Net average annual inflows were calculated from average monthly total inflows and evaporation for Tiriganiaq Pit 1 and F Zone Pit 3 used in the surface water quality modelling presented in SD 2-6 Surface Water Management Plan. The calculated net annual average inflow volumes are 901,764 $m^3$ for Tiriganiaq Pit 1 and 199,085 $m^3$ for F Zone Pit 3.

Inflow and outflow volumes are small relative to the water cap volumes, so explicitly accounting for changes in outflow concentration and mass removal during the year would make a very small difference in the rate of change in TDS concentration in the pit lakes.

Mass loading inputs from brine were calculated from results of the hydrodynamic modelling simulations. For each water cap depth carried forward to the mass balance analysis, the average concentration change from the three open water season simulations based on observed wind speed was multiplied by the volume of the water cap to calculate an average annual load ($L_i$) to the water cap.

Two approaches were used to simulate changes in water cap TDS concentrations over time. The first approach ignored source depletion (i.e., assumed no change in the loading rate over time) to predict a steady state concentration upper limit, while the other accounted for source depletion/load attenuation by reducing the loading rate based on the fraction of mass remaining relative to the previous time step. For example, if the average TDS load from the single season hydrodynamic modelling accounted for 0.5 percent of the total mass of TDS in the brine, the TDS load for the second year would be reduced to 99.5 percent of the initial load; the load for each year thereafter would be reduced to 99.5 percent of the load from the previous year. The second approach is a simplified means of predicting possible peak concentration. The two approaches provide a range. Both approaches assume that the average loading rate derived from the single season simulations will not increase, with the exception of an extreme wind event occurrence.

To account for potential changes in surface water concentrations with an extreme wind event, the largest concentration change from the three open water season simulations with scaled up winds for one storm event were added to maximum predictions from the two mass balance projections to estimate worst case conditions.

# 3.0 RESULTS

## 3.1 Hydrodynamic Modelling

Predicted increases in water cap TDS concentrations in Tiriganiaq Pit 1 Lake and F Zone Pit 3 Lake from the W2 models are provided in Tables 3 and 4, respectively. Predicted TDS increases decline with greater water cap depth, and were consistently largest in the 1992 simulations with the coolest average air temperatures. Concentration increases were lowest in the 1996 simulations with observed winds and in the 1984 simulations with extreme wind events.

The largest simulated concentration increases during the coolest open water season and lower concentration increases during warmer open water seasons indicate that thermal stratification during the open water season reduces the vertical extent of wind driven mixing in the water cap, limiting advective mixing of brine with the water cap. The smallest concentration increases in the warmest season simulations with observed wind speeds further support this, although the extreme wind simulation results further indicate that the storm duration and conditions at the time of such an event (e.g., extent of thermal stratification prior to and ambient temperatures during the storm) will affect the extent of vertical mixing in the water cap and associated potential for increased advective mixing of brine with the water cap. The August 1984 event was seven hours long and had warmer air

temperatures (i.e., 14 °C average) relative to the September 1996 event, which was 15 hours long with air temperatures below zero for most of the storm.

**Table 3: Summary of Predicted Increases in Water Cap TDS Concentrations (mg/L) in Tiriganiaq Pit 1 Lake at the End of Each Open Water Season Simulation**

| Water Cap Depth (m) | Simulations with Observed Wind Speeds and Normal Pit Alignment (West to East) | | | Simulations with Extreme Wind Event and Pit Aligned with Strong Winds (~NW to SE) | | |
|---|---|---|---|---|---|---|
| | 1984 | 1992 | 1996 | 1984 | 1992 | 1996 |
| 130 | 4.2 | 6.4 | 2.1 | 21.7 | 71.2 | 32.3 |
| 140 | 3.5 | 6.3 | 2.2 | 16.6 | 59.8 | 32.1 |
| 150 | 2.0 | 3.7 | 0.9 | 10.0 | 41.0 | 20.4 |

**Table 4: Summary of Predicted Increases in Water Cap TDS Concentrations (mg/L) in F Zone Pit 3 Lake at the End of Each Open Water Simulation**

| Water Cap Depth (m) | Simulations with Observed Wind Speeds | | | Simulations with Extreme Wind Event | | |
|---|---|---|---|---|---|---|
| | 1984 | 1992 | 1996 | 1984 | 1992 | 1996 |
| 80 | 9.1 | 26.6 | 4.2 | 18.4 | 99.2 | 33.5 |
| 85 | 7.0 | 22.7 | 1.6 | 13.4 | 87.2 | 28.0 |
| 90 | 6.0 | 21.6 | 1.9 | 10.4 | 84.1 | 24.7 |
| 95 | 5.9 | 20.3 | 0.8 | 10.0 | 61.6 | 20.1 |
| 100 | 1.7 | 10.2 | <0.1 | 2.5 | 31.8 | 9.7 |

## 3.2 Mass Balance Predictions

Derived inputs for and results of mass balance based predictions of long term TDS concentrations for Tiriganiaq Pit 1 Lake for three water cap depths are summarized in Table 5. The steady state and associated worst case concentration predictions for water cap depths of 140 and 150 metres are below 500 mg/L. Predictions that consider potential reductions in loading rates over time with source depletion indicate that peak concentrations could be lower. However, due to the long residence times expected for Tiriganiaq Pit 1, there is some potential for more than one major storm event to occur during the post-closure period that could further increase concentrations beyond the projected worst case values presented.

Derived inputs for and results of mass balance based predictions of long term TDS concentrations for F Zone Pit 3 Lake for five water cap depths are summarized in Table 6. The steady state and associated worst case concentration predictions are both less than 500 mg/L for the 100 metre water cap depth only. Predictions that consider potential reductions in loading rates over time with source depletion indicate that peak and worst case peak concentrations could remain below 500 mg/L for 90 and 95 metre water cap depths as well. Although the residence times for the F Zone Pit 3 are lower than for Tiriganiaq Pit 1, there is some potential for more than one major storm event to occur during the post-closure period that could further increase concentrations beyond the projected worst case values presented.

**Table 5: Summary of Long Term Mass Balance Parameters and Predictions for Tiriganiaq Pit 1 Lake**

| Water Cap Depth Scenario: | 130 m | 140 m | 150 m |
|---|---|---|---|
| **Scenario Specific Parameters** | | | |
| Water Cap Volume ($Mm^3$) | 78.2 | 79.8 | 81.3 |
| Initial Water Cap Residence Time (years) | 86.7 | 88.5 | 90.1 |
| Brine Volume ($Mm^3$) | 6.8 | 5.2 | 3.7 |
| Total TDS Mass in Brine (tonnes) | 407,256 | 308,509 | 222,345 |
| Average TDS Increase from Observed Wind Hydrodynamic Simulations (mg/L) | 4.3 | 4.0 | 2.2 |
| Average Annual TDS load (tonnes) | 336 | 319 | 180 |
| Maximum TDS Increase from Extreme Wind Hydrodynamic Simulations (mg/L) | 71.2 | 59.7 | 41.0 |
| **Predictions Without Source Depletion** | | | |
| Steady State TDS Concentration (mg/L) | 433 | 414 | 259 |
| Time to Reach Steady State (years) | 512 | 519 | 483 |
| Worst Case TDS Concentration (mg/L) | **504** | 474 | 300 |
| Time to Return to Steady State (years) | 368 | 360 | 340 |
| **Predictions With Source Depletion** | | | |
| Peak TDS Concentration (mg/L) | 364 | 338 | 222 |
| Time to Reach Peak Concentration (years) | 245 | 232 | 253 |
| Worst Case TDS Concentration (mg/L) | 435 | 398 | 263 |

**Table 6: Summary of Long Term Mass Balance Input Parameters and Predictions for F Zone Pit 3 Lake**

| Water Cap Depth: | 80 m | 85 m | 90 m | 95 m | 100 m |
|---|---|---|---|---|---|
| **Projection Specific Input Parameters** | | | | | |
| Water Cap Volume ($Mm^3$) | 7.96 | 8.19 | 8.38 | 8.55 | 8.67 |
| Initial Water Cap Residence Time (years) | 40.0 | 41.1 | 42.1 | 42.9 | 43.5 |
| Brine Volume ($Mm^3$) | 1.38 | 1.15 | 0.96 | 0.79 | 0.67 |
| Total TDS Mass in Brine (tonnes) | 82,588 | 69,210 | 57,387 | 47,671 | 40,246 |
| Average TDS Increase from Observed Wind Hydrodynamic Simulations (mg/L) | 13.3 | 10.4 | 9.8 | 9.0 | 4.0 |
| Average Annual TDS load (tonnes) | 106 | 85.3 | 82.4 | 76.8 | 34.4 |
| Maximum TDS Increase from Extreme Wind Hydrodynamic Simulations (mg/L) | 99.2 | 87.2 | 84.1 | 61.6 | 31.8 |
| **Predictions Without Source Depletion** | | | | | |
| Steady State TDS Concentration (mg/L) | **591** | 488 | 474 | 446 | 233 |
| Time to Reach Steady State (years) | 254 | 252 | 257 | 259 | 227 |
| Worst Case TDS Concentration (mg/L) | **690** | **576** | **558** | **508** | 265 |
| Time to Return to Steady State (years) | 186 | 185 | 189 | 179 | 152 |
| **Predictions With Source Depletion** | | | | | |
| Peak TDS Concentration (mg/L) | **512** | 425 | 405 | 376 | 212 |
| Time to Reach Peak Concentration (years) | 115 | 118 | 115 | 112 | 127 |
| Worst Case TDS Concentration (mg/L) | **611** | **512** | 489 | 438 | 244 |

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

Post-closure disposal of saline groundwater at the bottom of mine pits does appear to be feasible based on the results presented in Section 3. However, these results should be considered preliminary and it is recommended that hydrodynamic simulation of mixing characteristics over the long term (e.g., using hourly meteorological data over the entire period of record available from the Rankin Inlet station) be completed to confirm these results should AEM want to consider this closure management option further.

It is recommended that water cap depths of no less than 150 metres for Tiriganiaq Pit #1 and 100 metres for F Zone Pit #3 be considered for preliminary closure planning purposes, which represents a maximum brine volume of 4.38 million cubic metres between the two pit lakes.

Application of the F Zone Pit #3 water cap depth of 100 metres to other similarly shaped pits is not recommended. Wesmeg Pit #3 is only 100 metres deep and does not appear to be suitable on that basis. Pump Pit #2, which is the only pit greater than 100 metres deep with similar fetch, is not suitable on the basis that it discharges to F Zone Pit #3 and would contribute additional TDS loads to the prediction results presented above.

## 5.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

Yours very truly,

**GOLDER ASSOCIATES LTD.**

ORIGINAL SIGNED

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# APPENDIX 7.4-B

## Water and Sediment Quality Baseline Data

| Waterbody | | DI4 | DI4 | ML-E | ML-E | ML-E | ML-E | ML-E | ML-E | ML-E | ML-E | ML-A | ML-A | BOOT-1 | BOOT-1 | BOOT-2 | BOOT-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Date Sampled** | | 20-Jul-95 | 20-Jul-08 | 19-Jul-97 | 17-Aug-97 | 25-Apr-98 | 17-Jul-98 | 4-Sep-98 | 17-Jul-08 | 28-Apr-09 | 1-Aug-11 | 29-Apr-09 | 28-Jul-09 | 15-Jul-08 | 28-Jul-09 | 16-Jul-08 | 28-Apr-09 |
| **Source** | | Dillon 1995 | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 12.2 | 14.9 | 13.9 | 13.6 | 0 | 9.9 | 9.7 | 11.1 | 0.9 | 14.9 | 0.5 | 12.7 | 13.2 | 15.4 | 11.3 | 0.3 |
| Dissolved Oxygen - field | mg/L | 8.5 | 12.51 | 10.2 | 11.3 | 17.4 | 12.9 | 11.2 | 13.19 | 14.15 | 9.4 | 14.62 | 8.8 | 13.23 | 8.33 | 13.32 | 15.63 |
| pH - field | pH | 7.84 | 6.77 | 7.3 | 7.39 | **6.17**[C,W] | 7.3 | 7.04 | 6.94 | 6.66 | 7.4 | 6.68 | **6.49**[C,W] | 6.97 | 6.91 | 7.17 | 6.87 |
| Specific Conductivity - field | µS/cm | 20.6 | 71 | 59.3 | 59.4 | 100.5 | 56.8 | 62.2 | 50 | 87.3 | 67 | 87.5 | 63 | 71 | 69 | 49 | 90.6 |
| Secchi Disk Depth | m | - | 2.3 | 7.5 | 6.7 | - | 5 | 4.5 | 3 | - | 7.8 | - | 5.4 | 1.8 | 2 | 6.3 | - |
| Ice Depth | m | - | - | - | - | 1.8 | - | - | - | 1.7 | - | 1.8 | - | - | - | - | 1.9 |
| Total Lake Depth | m | - | 2.3 | 14.7 | 13 | 11.5 | 11.2 | 13.7 | 6.1 | 5.36 | 7.8 | 5.14 | 5.4 | 1.8 | 2 | 10.1 | 10.12 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 6.99 | 7.5 | 7.31 | - | 6.9 | 7.1 | - | 7.4 | 7.45 | 7.69 | 7.45 | 7.42 | 7.4 | 7.46 | 7.4 | 7.46 |
| Specific Conductivity - laboratory | µS/cm | 42.5 | 71.8 | 49.1 | - | 79.7 | 47.4 | - | 56.9 | 97.3 | 69.6 | 96.4 | 62 | 58.6 | 67.5 | 56.6 | 104 |
| Total Dissolved Solids | mg/L | 24 | 46 | 25 | - | 36 | 21 | - | 37 | - | 43 | - | 34 | 29 | 39 | 38 | - |
| Total Dissolved Solids (Calculated) | mg/L | - | 34 | - | - | - | - | - | 28 | 50 | 35 | 49 | 30 | 29 | 33 | 27 | 54 |
| Total Alkalinity | mg $CaCO_3$/L | 13 | 16 | 13 | - | 20 | 13 | - | 13 | 25 | 18 | 24 | 14 | 12 | 16 | 12 | 26 |
| Total Hardness | mg $CaCO_3$/L | 13 | 21 | 15 | - | 22 | 13 | - | 18 | 30 | 21 | 30 | 19 | 19 | 21 | 17 | 32 |
| Total Suspended Solids | mg/L | - | < 3 | < 3 | - | < 2 | < 2 | - | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | 3 | < 3 | 4 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | 16 | - | 21 | 29 | - | 39 | - | 19 |
| Turbidity - laboratory | NTU | 0.33 | - | 0.5 | - | 0.1 | 0.3 | - | - | - | - | - | - | - | - | - | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | 19 | 13.2 | - | 25 | 15 | - | 15 | 30.3 | 21.5 | 28.9 | 17.5 | 15 | 19.6 | 14 | 32 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 4.42 | 6.38 | 4.53 | - | 6.6 | 4.33 | - | 4.98 | 9.05 | - | 8.97 | 6.06 | 5.18 | 6.76 | 4.88 | 9.32 |
| Carbonate | mg/L | - | < 5 | < 0.3 | - | < 1 | < 1 | - | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Chloride | mg/L | 2.7 | 7 | 5.34 | - | 7.33 | 3.99 | - | 6 | 11.7 | 7.89 | 11.6 | 7.64 | 7 | 8.29 | 6 | 12.6 |
| Fluoride | mg/L | 0.03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydroxide | mg/L | - | < 5 | - | - | < 1 | < 1 | - | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Magnesium | mg/L | 0.583 | 0.913 | 0.79 | - | 1.24 | 0.65 | - | 0.804 | 1.65 | - | 1.64 | 1.06 | 0.814 | 1.16 | 0.782 | 1.78 |
| Potassium | mg/L | < 2 | 0.75 | 0.671 | - | 1.07 | 0.67 | - | 0.66 | 1.27 | - | 1.24 | < 2 | 0.7 | < 2 | 0.65 | 1.35 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | 0.354 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 2.1 | 4 | 2.94 | - | 4.8 | 2.4 | - | 3.14 | 6.03 | - | 6.01 | 3.9 | 3.44 | 4.2 | 3.07 | 6.59 |
| Sulphate | mg/L | 2 | 3.5 | < 3 | - | 2.85 | 1.58 | - | 2.9 | 4.79 | 3.1 | 4.86 | 2.83 | 2.9 | 2.94 | 2.8 | 5.17 |
| Ion Balance | % | - | - | 8.9 | - | 99 | 100 | - | - | - | - | - | - | - | - | - | 98.5 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | - | 7 | 5 | - | 9 | 6 | - | 5 | - | 25.1 | - | 6.3 | 6 | 7.3 | 5 | - |
| Total Organic Carbon | mg/L | - | 3 | 2.4 | - | 4.1 | 2.7 | - | 3 | - | 5.3 | - | 3 | 3 | 3.5 | 3 | - |
| Dissolved Organic Carbon | mg/L | - | 3.9 | - | - | - | - | - | 3.3 | - | - | - | 3 | 3.3 | 3.3 | 3.2 | - |
| Total Inorganic Carbon | mg/L | - | - | 3 | - | 5 | 3.3 | - | 3 | - | 4.5 | - | 3.8 | - | 4.3 | 3 | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | 4 | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | - | < 0.05 | 0.006 | - | 0.013 | 0.024 | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate as Nitrogen | mg/L | - | < 0.1 | < 0.008 | - | 0.011 | < 0.006 | - | < 0.1 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.1 | < 0.05 | < 0.1 | < 0.05 |
| Nitrite as Nitrogen | mg/L | - | < 0.05 | - | - | - | - | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.005 | < 0.1 | < 0.008 | - | 0.011 | < 0.006 | - | < 0.1 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.1 | < 0.071 | < 0.1 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | - | < 0.2 | 0.2 | - | 0.168 | 0.27 | - | < 0.2 | 0.34 | < 0.2 | 0.41 | 0.28 | < 0.2 | 0.3 | < 0.2 | 0.36 |
| Phosphorus, Total | mg/L | - | 0.005 | 0.009 | - | 0.003 | 0.004 | - | 0.004 | 0.006 | 0.003 | 0.007 | 0.005 | 0.003 | 0.004 | 0.004 | 0.011 |
| Phosphorus, Total Dissolved | mg/L | - | 0.003 | 0.007 | - | 0.003 | 0.003 | - | 0.002 | 0.005 | 0.002 | 0.007 | 0.002 | 0.003 | 0.003 | 0.002 | 0.008 |
| Orthophosphate (PO4-P) | mg/L | - | < 0.001 | 0.004 | - | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | - | < 1 | < 0.01 | 0.46 | - | < 0.01 | 1.82 | < 1 | - | - | - | - | 15 | - | < 1 | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | - | < 0.002 | - | - | < 0.001 | < 0.001 | - | < 0.002 | < 0.002 | < 0.000002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | <0.2[D>C,W] | 0.0056 | 0.0014 | - | < 0.0003 | < 0.0003 | - | 0.0022 | < 0.005 | < 0.003 | 0.0111 | **0.0071**[C] | 0.003 | < 0.005 | 0.0028 | < 0.005 |
| Antimony (Sb) - Total | mg/L | - | < 0.00003 | 0.0002 | - | < 0.00003 | 0.0001 | - | < 0.00003 | < 0.0002 | < 0.0001 | < 0.0002 | < 0.0005 | < 0.00003 | < 0.0005 | < 0.00003 | 0.0003 |
| Arsenic (As) - Total | mg/L | 0.0003 | 0.0009 | 0.0003 | - | 0.0003 | 0.0002 | - | 0.0003 | < 0.0005 | 0.0004 | < 0.0005 | < 0.0005 | 0.0003 | < 0.0005 | 0.0003 | < 0.0005 |
| Barium (Ba) - Total | mg/L | < 0.01 | 0.0065 | 0.0054 | - | 0.0079 | < 0.00005 | - | 0.006 | 0.0095 | 0.0074 | 0.0096 | < 0.02 | 0.0059 | < 0.02 | 0.0059 | 0.0103 |
| Beryllium (Be) - Total | mg/L | - | < 0.0002 | < 0.0001 | - | < 0.0002 | < 0.0002 | - | < 0.0002 | < 0.001 | < 0.0005 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.0002 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | - | - | < 0.0001 | - | < 0.00005 | < 0.00003 | - | - | < 0.001 | < 0.00005 | < 0.001 | - | - | - | - | < 0.001 |
| Boron (B) - Total | mg/L | < 0.1 | 0.004 | - | - | - | - | - | 0.003 | < 0.05 | 0.009 | < 0.05 | < 0.1 | 0.003 | < 0.1 | 0.003 | < 0.05 |
| Cadmium (Cd) - Total | mg/L | <0.0002[D>C] | <0.00005[D>C] | <0.0001[D>C] | - | **0.0002**[C] | <0.00005[D>C] | - | <0.00005[D>C] | < 0.00001 | <0.00001[D>C] | < 0.00001 | **0.00001**[C] | <0.00005[D>C] | <0.00001[D>C] | <0.00005[D>C] | < 0.00001 |
| Cesium (Cs) - Total | mg/L | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Total | mg/L | <0.015[D>C] | < 0.00006 | <0.002[D>C] | - | 0.0002 | < 0.00006 | - | < 0.00006 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.00006 | < 0.001 | < 0.00006 | < 0.001 |
| Cobalt (Co) - Total | mg/L | < 0.015 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0003 | < 0.0003 | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0003 |
| Copper (Cu) - Total | mg/L | <0.01[D>C] | 0.0013 | 0.0008 | - | 0.002 | 0.0008 | - | 0.001 | 0.0014 | 0.0008 | 0.0017 | 0.0012 | 0.0015 | 0.001 | 0.0007 | 0.0017 |

| Waterbody | | DI4 | DI4 | ML-E | ML-E | ML-E | ML-E | ML-E | ML-E | ML-E | ML-E | ML-A | ML-A | BOOT-1 | BOOT-1 | BOOT-2 | BOOT-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Date Sampled** | | 20-Jul-95 | 20-Jul-08 | 19-Jul-97 | 17-Aug-97 | 25-Apr-98 | 17-Jul-98 | 4-Sep-98 | 17-Jul-08 | 28-Apr-09 | 1-Aug-11 | 29-Apr-09 | 28-Jul-09 | 15-Jul-08 | 28-Jul-09 | 16-Jul-08 | 28-Apr-09 |
| **Source** | | Dillon 1995 | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder |
| Iron (Fe) - Total | mg/L | < 0.03 | 0.061 | 0.031 | - | 0.02 | 0.005 | - | 0.014 | - | 0.024 | - | 0.031 | 0.023 | 0.038 | 0.017 | - |
| Lead (Pb) - Total | mg/L | < 0.001 | < 0.00005 | < 0.0002 | - | < 0.00005 | < 0.00005 | - | < 0.00005 | < 0.0005 | < 0.00005 | < 0.0005 | < 0.0005 | < 0.00005 | < 0.0005 | 0.00005 | < 0.0005 |
| Lithium (Li) - Total | mg/L | - | - | < 0.0001 | - | 0.0007 | 0.0007 | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | < 0.005 | - | < 0.005 |
| Manganese (Mn) - Total | mg/L | < 0.005 | 0.0034 | 0.0025 | - | < 0.0001 | 0.0003 | - | 0.0021 | 0.0011 | 0.0038 | 0.0022 | 0.0036 | 0.0029 | 0.0046 | 0.0021 | 0.0016 |
| Mercury (Hg) - Total | mg/L | <0.00005$^{D>C}$ | < 0.00002 | < 0.00001 | - | < 0.00001 | < 0.00002 | - | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | < 0.03 | 0.0001 | 0.0001 | - | 0.0001 | 0.00007 | - | < 0.00006 | < 0.001 | 0.0001 | < 0.001 | < 0.001 | 0.00007 | < 0.001 | < 0.00006 | < 0.001 |
| Nickel (Ni) - Total | mg/L | < 0.02 | 0.0007 | 0.0006 | - | < 0.0001 | 0.0003 | - | 0.0054 | < 0.001 | 0.0007 | < 0.001 | < 0.001 | 0.0005 | < 0.001 | 0.0053 | < 0.001 |
| Selenium (Se) - Total | mg/L | < 0.0005 | 0.0001 | <0.01$^{D>C}$ | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.0001 | < 0.001 |
| Silver (Ag) - Total | mg/L | <0.015$^{D>C}$ | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.00002 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.0001 | < 0.00002 | < 0.0001 | < 0.00002 |
| Strontium (Sr) - Total | mg/L | - | 0.0341 | 0.0211 | - | 0.0336 | < 0.0001 | - | 0.0246 | 0.0443 | 0.0314 | 0.0449 | - | 0.0253 | - | 0.0243 | 0.0458 |
| Thallium (Tl) - Total | mg/L | - | < 0.00003 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | < 0.00003 | < 0.0002 | < 0.00005 | < 0.0002 | < 0.0002 | < 0.00003 | < 0.0002 | < 0.00003 | < 0.0002 |
| Tin (Sn) - Total | mg/L | < 0.3 | - | - | - | - | - | - | - | < 0.0005 | < 0.0001 | < 0.0005 | 0.0017 | - | 0.0014 | - | < 0.0005 |
| Titanium (Ti) - Total | mg/L | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | - | - | - | < 0.0003 | - | - | - | - | - | - |
| Uranium (U) - Total | mg/L | - | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00005 | - | < 0.00005 | < 0.0002 | 0.00002 | < 0.0002 | < 0.0002 | < 0.00005 | < 0.0002 | < 0.00005 | < 0.0002 |
| Vanadium (V) - Total | mg/L | - | 0.0001 | < 0.0001 | - | < 0.0001 | 0.0002 | - | 0.0001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | 0.0001 | < 0.001 | 0.00009 | < 0.001 |
| Zinc (Zn) - Total | mg/L | < 0.005 | < 0.0008 | < 0.005 | - | 0.007 | < 0.0008 | - | < 0.0008 | < 0.005 | < 0.003 | 0.0112 | < 0.005 | < 0.0008 | < 0.005 | < 0.0008 | 0.0054 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | - | 0.0024 | - | - | - | - | - | 0.0018 | < 0.005 | < 0.003 | < 0.005 | < 0.005 | 0.0017 | < 0.005 | 0.0021 | < 0.005 |
| Antimony (Sb) - Dissolved | mg/L | - | < 0.00003 | - | - | - | - | - | < 0.00003 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.00003 | < 0.0005 | < 0.00003 | < 0.0005 |
| Arsenic (As) - Dissolved | mg/L | - | 0.00077 | - | - | - | - | - | 0.00025 | < 0.0005 | 0.00038 | < 0.0005 | < 0.0005 | 0.00026 | 0.00071 | 0.00026 | < 0.0005 |
| Barium (Ba) - Dissolved | mg/L | - | 0.00634 | - | - | - | - | - | 0.00615 | - | 0.00735 | - | < 0.02 | 0.00581 | < 0.02 | 0.00611 | - |
| Beryllium (Be) - Dissolved | mg/L | - | < 0.0002 | - | - | - | - | - | < 0.0002 | < 0.001 | < 0.0005 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.0002 | < 0.001 |
| Boron (B) - Dissolved | mg/L | - | 0.004 | - | - | - | - | - | 0.003 | - | 0.0047 | - | < 0.1 | 0.003 | < 0.1 | 0.004 | - |
| Cadmium (Cd) - Dissolved | mg/L | - | < 0.00005 | - | - | - | - | - | < 0.00005 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00005 | < 0.00001 | < 0.00005 | < 0.00001 |
| Calcium (Ca) - Dissolved | mg/L | - | 6.38 | - | - | - | - | - | 0.498 | 9.49 | 6.1 | 9.33 | 6 | 0.519 | 7 | 0.501 | 9.93 |
| Chromium (Cr) - Dissolved | mg/L | - | < 0.00006 | - | - | - | - | - | < 0.00006 | 0.0013 | < 0.0001 | 0.001 | < 0.001 | < 0.00006 | < 0.001 | 0.00008 | 0.0016 |
| Cobalt (Co) - Dissolved | mg/L | - | < 0.0001 | - | - | - | - | - | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0003 | < 0.0003 | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0003 |
| Copper (Cu) - Dissolved | mg/L | - | 0.001 | - | - | - | - | - | 0.0009 | 0.0015 | 0.00071 | 0.0014 | < 0.001 | 0.001 | 0.0011 | 0.0023 | 0.0014 |
| Iron (Fe) - Dissolved | mg/L | - | 0.025 | - | - | - | - | - | 0.007 | - | 0.012 | - | < 0.03 | 0.01 | < 0.03 | 0.008 | - |
| Lead (Pb) - Dissolved | mg/L | - | < 0.00005 | - | - | - | - | - | 0.00009 | < 0.0005 | < 0.00005 | < 0.0005 | < 0.0005 | < 0.00005 | < 0.0005 | 0.00049 | < 0.0005 |
| Lithium (Li) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | < 0.005 | - | < 0.005 |
| Magnesium (Mg) - Dissolved | mg/L | - | - | - | - | - | - | - | 0.805 | 1.54 | 1.18 | 1.51 | 1 | 0.817 | 1 | 0.817 | 1.64 |
| Manganese (Mn) - Dissolved | mg/L | - | 0.0034 | - | - | - | - | - | 0.0014 | 0.001 | 0.0013 | 0.00138 | 0.00038 | 0.0022 | 0.00115 | 0.0018 | 0.00167 |
| Mercury (Hg) - Dissolved | mg/L | - | < 0.00002 | - | - | - | - | - | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | - | 0.00013 | - | - | - | - | - | 0.00006 | < 0.001 | 0.000072 | < 0.001 | < 0.001 | < 0.00006 | < 0.001 | 0.00007 | < 0.001 |
| Nickel (Ni) - Dissolved | mg/L | - | 0.00072 | - | - | - | - | - | 0.00054 | < 0.001 | 0.00065 | < 0.001 | < 0.001 | 0.00051 | < 0.001 | 0.00079 | < 0.001 |
| Potassium (K) - Dissolved | mg/L | - | - | - | - | - | - | - | 0.67 | 1.38 | 0.902 | 1.28 | 1 | 0.69 | 1 | 0.75 | 1.48 |
| Selenium (Se) - Dissolved | mg/L | - | 0.0001 | - | - | - | - | - | < 0.0001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.0001 | < 0.001 |
| Silver (Ag) - Dissolved | mg/L | - | < 0.0001 | - | - | - | - | - | < 0.0001 | < 0.00002 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.0001 | < 0.00002 | < 0.0001 | < 0.00002 |
| Sodium (Na) - Dissolved | mg/L | - | - | - | - | - | - | - | 3.19 | 6.6 | 4.29 | 6.3 | 3.7 | 3.39 | 4 | 3.34 | 7 |
| Strontium (Sr) - Dissolved | mg/L | - | 0.0341 | - | - | - | - | - | 0.0249 | - | 0.0323 | - | - | 0.026 | - | 0.0251 | - |
| Thallium (Tl) - Dissolved | mg/L | - | < 0.00003 | - | - | - | - | - | < 0.00003 | < 0.0002 | < 0.00005 | < 0.0002 | < 0.0002 | < 0.00003 | < 0.0002 | < 0.00003 | < 0.0002 |
| Tin (Sn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.0005 | < 0.0001 | < 0.0005 | 0.00111 | - | 0.0013 | - | < 0.0005 |
| Uranium (U) - Dissolved | mg/L | - | < 0.00005 | - | - | - | - | - | < 0.00005 | < 0.0002 | 0.000015 | < 0.0002 | < 0.0002 | < 0.00005 | < 0.0002 | < 0.00005 | < 0.0002 |
| Vanadium (V) - Dissolved | mg/L | - | 0.00012 | - | - | - | - | - | 0.00009 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | 0.00009 | < 0.001 | < 0.00005 | < 0.001 |
| Zinc (Zn) - Dissolved | mg/L | - | < 0.0008 | - | - | - | - | - | 0.0015 | - | < 0.003 | - | < 0.005 | < 0.0008 | < 0.005 | 0.0117 | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | 2 | - | < 1 | 2 | - | - | - | - | - | - | 1 | - | 2 | - |
| Benzene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - | - | < 0.5 | - | < 0.5 | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - | - | < 0.5 | - | < 0.5 | - |
| Toluene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - | - | 0.59 | - | 0.59 | - |
| Xylenes | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - | - | < 0.5 | - | < 0.5 | - |
| Total Volatiles | µg/L | - | - | < 100 | - | - | < 100 | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | < 50 | - | - | < 50 | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detection limits higher than guidelines.
(A) = Concentration higher than the relevant acute aquatic life guideline.
(C) = Concentration higher than the relevant chronic aquatic life guideline.
(W) = Concentration higher than the relevant drinking water guideline.
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | BOOT-2 | Boot-2 | ML-W | ML-W | ML-W | ML-W | ML-W | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-SE | ML-SE | ML-SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Date Sampled** | | 28-Jul-09 | 31-Jul-11 | 20-Jul-97 | 16-Aug-97 | 24-Apr-98 | 27-Jul-98 | 19-Jul-08 | 20-Jul-97 | 20-Jul-97 | 16-Aug-97 | 27-Apr-98 | 25-Jul-98 | 1-Sep-98 | 26-Apr-98 | 22-Jul-98 | 19-Jul-99 |
| **Source** | | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | Golder | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 13.9 | 14.8 | 14.3 | 13.3 | 0.3 | 12.7 | 11 | 14.6 | 14.6 | 12.8 | 0 | 12.9 | - | 0 | 11.2 | 11.4 |
| Dissolved Oxygen - field | mg/L | 8.81 | 9.5 | 9.9 | 11.2 | 19.4 | 11 | 15.07 | 10.2 | 10.2 | 11.5 | 19.6 | 12 | - | 15.9 | 13.7 | 11.3 |
| pH - field | pH | 6.97 | 7.3 | 7.24 | 7.1 | 6.68 | - | 6.78 | 7.14 | 7.14 | 6.97 | 6.79 | 7.05 | - | 6.75 | - | 7.25 |
| Specific Conductivity - field | µS/cm | 62 | 66 | 51.4 | 52.5 | 68.3 | 51.8 | 58 | 58.4 | 58.4 | 55.5 | 104.9 | 57.6 | - | 170.4 | 69.4 | 85.3 |
| Secchi Disk Depth | m | 5.2 | 8.5 | 7.9 | 8.5 | - | 6.5 | 5.5 | 6.3 | 6.3 | 6.2 | - | 5.2 | 4.1 | - | 3 | 2.6 |
| Ice Depth | m | - | - | - | - | 2.3 | - | - | - | - | - | 1.8 | - | - | 1.8 | - | - |
| Total Lake Depth | m | 8.8 | 10 | 8.1 | 8.5 | 4.2 | 6.5 | 5.5 | 6.3 | 6.3 | 6.2 | 5 | 5.8 | - | 3 | 3 | 3.1 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.41 | 7.66 | 7.26 | - | 6.9 | 7.4 | 7.5 | 7.31 | 7.3 | - | 7.1 | 7.5 | - | 6.7 | 7.4 | 7.2 |
| Specific Conductivity - laboratory | µS/cm | 60.9 | 66.8 | 42.1 | - | 82.8 | 51.9 | 61.3 | 48.4 | 47.6 | - | 83.4 | 56.2 | - | 156 | 66.4 | 76 |
| Total Dissolved Solids | mg/L | 34 | 45 | 28 | - | 38 | 24 | 40 | 26 | 29 | - | 37 | 26 | - | 91 | 32 | 22 |
| Total Dissolved Solids (Calculated) | mg/L | 29 | 32 | - | - | - | - | 27 | - | - | - | - | - | - | - | - | - |
| Total Alkalinity | mg $CaCO_3$/L | 13 | 15 | 13 | - | 23 | 14 | 13 | 15 | 15 | - | 23 | 16 | - | 50 | 21 | 24 |
| Total Hardness | mg $CaCO_3$/L | 18 | 21 | 14 | - | 24 | 17 | 17 | 16 | 16 | - | 24 | 19 | - | 49 | 24 | 27 |
| Total Suspended Solids | mg/L | < 3 | < 3 | < 3 | - | 8 | < 2 | < 3 | < 3 | < 3 | - | < 2 | 2 | - | 3 | 7 | 3 |
| Total Volatile Solids | mg/L | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | - | 0.4 | - | < 0.1 | 0.2 | - | 0.4 | 0.3 | - | 0.1 | 0.3 | - | 0.1 | 0.3 | 0.43 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 15.5 | 18.4 | 12.6 | - | 28 | 18 | 16 | 15.3 | 15.1 | - | 27 | 20 | - | 31 | 25 | 30 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 5.78 | - | 4.36 | - | 7.61 | 5.42 | 5.13 | 5.24 | 5.15 | - | 7.65 | 6.22 | - | 16.2 | 8.12 | 8.96 |
| Carbonate | mg/L | < 5 | < 5 | < 0.3 | - | < 1 | < 1 | < 5 | < 0.3 | < 0.3 | - | < 1 | < 1 | - | < 1 | < 1 | < 1 |
| Chloride | mg/L | 7.55 | 7.74 | 3.8 | - | 6.6 | 3.81 | 5 | 4.1 | 4.08 | - | 6.42 | 4.2 | - | 25.2 | 4.72 | 4.91 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydroxide | mg/L | < 5 | < 5 | - | - | < 1 | < 1 | < 5 | - | - | - | < 1 | < 1 | - | < 1 | < 1 | < 1 |
| Magnesium | mg/L | 1.01 | - | 0.66 | - | 1.26 | 0.74 | 0.775 | 0.73 | 0.73 | - | 1.12 | 0.82 | - | 2.12 | 0.82 | 1.12 |
| Potassium | mg/L | < 2 | - | 0.642 | - | 1.24 | 0.77 | 0.7 | 0.668 | 0.668 | - | 1.08 | 0.83 | - | 1.87 | 0.89 | 0.92 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | 0.196 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 3.9 | - | 2.26 | - | 4.6 | 2.7 | 2.96 | 2.44 | 2.4 | - | 4.1 | 2.9 | - | 7.1 | 1.7 | 3.3 |
| Sulphate | mg/L | 2.75 | 2.9 | < 3 | - | 2.9 | 1.66 | 2.9 | < 3 | < 3 | - | 2.85 | 1.67 | - | 8.91 | 1.67 | 2.67 |
| Ion Balance | % | - | - | 20.2 | - | 102 | 107 | - | 16.8 | 10 | - | 100 | 109 | - | 96 | 108 | 103 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 6.6 | 8 | 5 | - | 10 | 6.3 | 5 | 6 | 6 | - | 9 | 6.4 | - | 19 | 8.1 | 9.7 |
| Total Organic Carbon | mg/L | 3 | 4.4 | 2.1 | - | 3.9 | 3.3 | 3 | 2.1 | 2.2 | - | 4.9 | 2.7 | - | 5.2 | 3.1 | 3.9 |
| Dissolved Organic Carbon | mg/L | 3.3 | - | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 3.6 | 5.1 | 3 | - | 5.9 | 3.1 | - | 4 | 4 | - | 5.6 | 3.8 | - | 13.8 | 5 | 5.8 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | 0.004 | - | 0.04 | < 0.005 | < 0.05 | 0.003 | 0.002 | - | 0.008 | 0.008 | - | 0.052 | 0.009 | < 0.005 |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.008 | - | < 0.006 | < 0.006 | < 0.1 | < 0.008 | < 0.008 | - | < 0.006 | < 0.006 | - | < 0.006 | < 0.006 | < 0.006 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | - | - | - | - | < 0.05 | - | - | - | - | - | - | - | - | - |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | < 0.071 | < 0.008 | - | < 0.006 | < 0.006 | < 0.1 | < 0.008 | < 0.008 | - | < 0.006 | < 0.006 | - | < 0.006 | < 0.006 | < 0.006 |
| Total Kjeldahl Nitrogen | mg/L | 0.36 | < 0.2 | 0.15 | - | 0.23 | 0.26 | < 0.2 | 0.17 | 0.19 | - | 0.19 | 0.28 | - | 0.34 | 0.31 | 0.24 |
| Phosphorus, Total | mg/L | 0.005 | 0.004 | 0.033 | - | 0.003 | 0.008 | 0.004 | 0.01 | 0.01 | - | 0.004 | 0.004 | - | 0.004 | 0.006 | 0.004 |
| Phosphorus, Total Dissolved | mg/L | 0.003 | 0.003 | 0.008 | - | 0.003 | 0.005 | 0.002 | 0.008 | 0.008 | - | 0.003 | 0.004 | - | 0.004 | 0.006 | 0.002 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | 0.002 | - | < 0.001 | < 0.001 | < 0.001 | 0.002 | 0.003 | - | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | - | - | 0.06 | 0.25 | - | 0.47 | < 1 | 0.43 | - | 0.33 | - | 0.63 | 2.43 | - | 0.83 | 0.94 |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | < 0.000002 | - | - | < 0.001 | < 0.001 | < 0.002 | - | - | - | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | < 0.005 | < 0.003 | 0.0008 | - | 0.0046 | 0.001 | 0.0016 | 0.0006 | 0.0015 | - | < 0.0003 | 0.0016 | - | 0.0023 | 0.0007 | 0.0023 |
| Antimony (Sb) - Total | mg/L | < 0.0005 | < 0.0001 | 0.0003 | - | < 0.00003 | 0.0001 | < 0.00003 | 0.0001 | 0.0003 | - | 0.00004 | 0.0002 | - | < 0.00003 | 0.0001 | < 0.00003 |
| Arsenic (As) - Total | mg/L | < 0.0005 | 0.0003 | < 0.0003 | - | 0.0001 | 0.0002 | 0.0002 | < 0.0003 | < 0.0003 | - | 0.0003 | 0.0003 | - | 0.0004 | 0.0004 | 0.0005 |
| Barium (Ba) - Total | mg/L | < 0.02 | 0.0071 | 0.0058 | - | 0.0108 | 0.0071 | 0.0066 | 0.0059 | 0.0057 | - | 0.0098 | 0.0072 | - | 0.0177 | 0.0076 | 0.0085 |
| Beryllium (Be) - Total | mg/L | < 0.001 | < 0.0005 | < 0.0001 | - | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0001 | < 0.0001 | - | < 0.0002 | < 0.0002 | - | < 0.0002 | < 0.0002 | < 0.0002 |
| Bismuth (Bi) - Total | mg/L | - | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | < 0.0001 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | < 0.00005 | < 0.00003 | < 0.00003 |
| Boron (B) - Total | mg/L | < 0.0001 | 0.0031 | - | - | - | - | 0.003 | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) - Total | mg/L | <0.00001[D>C] | <0.00001[D>C] | <0.0001[D>C] | - | <0.0001[D>C] | **0.00005**[C] | <0.00005[D>C] | <0.0001[D>C] | <0.0001[D>C] | - | <0.0001[D>C] | **0.0048**[C] | - | <0.0001[D>C] | **0.0036**[C] | <0.00002[D>C] |
| Cesium (Cs) - Total | mg/L | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 |
| Chromium (Cr) - Total | mg/L | < 0.001 | < 0.0001 | <0.002[D>C] | - | 0.0004 | 0.0002 | < 0.00006 | <0.002[D>C] | <0.002[D>C] | - | < 0.00006 | **0.0014**[C] | - | 0.0003 | **0.0022**[C] | 0.0005 |
| Cobalt (Co) - Total | mg/L | < 0.0003 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 |
| Copper (Cu) - Total | mg/L | < 0.001 | 0.0008 | 0.0016 | - | **0.0031**[C] | 0.0008 | 0.0007 | 0.0011 | 0.0009 | - | 0.0014 | 0.0011 | - | **0.0031**[C] | 0.0008 | 0.001 |

| Waterbody | | BOOT-2 | Boot-2 | ML-W | ML-W | ML-W | ML-W | ML-W | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-SE | ML-SE | ML-SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Date Sampled** | | 28-Jul-09 | 31-Jul-11 | 20-Jul-97 | 16-Aug-97 | 24-Apr-98 | 27-Jul-98 | 19-Jul-08 | 20-Jul-97 | 20-Jul-97 | 16-Aug-97 | 27-Apr-98 | 25-Jul-98 | 1-Sep-98 | 26-Apr-98 | 22-Jul-98 | 19-Jul-99 |
| **Source** | | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | Golder | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 |
| Iron (Fe) - Total | mg/L | < 0.03 | 0.024 | < 0.012 | - | 0.03 | 0.008 | 0.006 | 0.026 | 0.019 | - | < 0.01 | < 0.005 | - | 0.02 | < 0.005 | 0.034 |
| Lead (Pb) - Total | mg/L | < 0.0005 | < 0.00005 | 0.0002 | - | < 0.00005 | < 0.00005 | 0.0002 | < 0.0002 | < 0.0002 | - | < 0.00005 | 0.00009 | - | < 0.00005 | < 0.00005 | 0.0002 |
| Lithium (Li) - Total | mg/L | < 0.005 | < 0.005 | < 0.0001 | - | 0.0007 | < 0.0001 | - | < 0.0001 | 0.0002 | - | 0.0015 | < 0.0001 | - | 0.0011 | < 0.0001 | 0.0006 |
| Manganese (Mn) - Total | mg/L | 0.0029 | 0.0043 | 0.0019 | - | 0.0005 | 0.0014 | 0.0013 | 0.0029 | 0.0028 | - | 0.0011 | 0.0028 | - | 0.0008 | 0.001 | 0.0071 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00001 | - | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00001 | - | < 0.00001 | < 0.00002 | - | < 0.00001 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | < 0.001 | 0.00007 | < 0.0001 | - | 0.0001 | 0.00007 | 0.00006 | 0.0001 | 0.0001 | - | 0.0001 | 0.00008 | - | 0.0002 | 0.0001 | 0.0002 |
| Nickel (Ni) - Total | mg/L | < 0.001 | 0.0007 | 0.0007 | - | 0.0001 | 0.0006 | 0.0035 | 0.0006 | 0.0005 | - | 0.0002 | 0.0006 | - | 0.0005 | 0.0007 | 0.0007 |
| Selenium (Se) - Total | mg/L | < 0.001 | < 0.0001 | <0.01 D>C | - | < 0.0001 | < 0.0001 | < 0.0001 | <0.01 D>C | <0.01 D>C | - | < 0.0001 | < 0.0001 | - | 0.0001 | < 0.0001 | 0.0001 |
| Silver (Ag) - Total | mg/L | < 0.00002 | < 0.00001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 |
| Strontium (Sr) - Total | mg/L | - | 0.031 | 0.0205 | - | 0.0371 | 0.0258 | 0.0256 | 0.0225 | 0.023 | - | 0.0337 | 0.0278 | - | 0.0641 | 0.0329 | 0.0361 |
| Thallium (Tl) - Total | mg/L | < 0.0002 | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00003 | < 0.00003 | < 0.0001 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | < 0.00005 | < 0.00003 | < 0.00003 |
| Tin (Sn) - Total | mg/L | 0.0008 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Titanium (Ti) - Total | mg/L | - | < 0.0003 | 0.0006 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | 0.0003 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | 0.0002 |
| Uranium (U) - Total | mg/L | < 0.0002 | 0.00002 | < 0.0001 | - | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.0001 | - | < 0.00005 | < 0.00005 | - | < 0.00005 | < 0.00005 | < 0.00005 |
| Vanadium (V) - Total | mg/L | < 0.001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.00005 | 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | 0.00007 | - | < 0.0001 | 0.00008 | 0.00006 |
| Zinc (Zn) - Total | mg/L | < 0.005 | < 0.003 | 0.0064 | - | 0.007 | 0.0008 | < 0.0008 | 0.0065 | 0.0147 | - | < 0.0008 | 0.0033 | - | 0.005 | < 0.0008 | 0.0025 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | < 0.005 | < 0.003 | - | - | - | - | 0.0017 | - | - | - | - | - | - | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.0005 | < 0.0001 | - | - | - | - | < 0.00003 | - | - | - | - | - | - | - | - | - |
| Arsenic (As) - Dissolved | mg/L | 0.00067 | 0.00035 | - | - | - | - | 0.00016 | - | - | - | - | - | - | - | - | - |
| Barium (Ba) - Dissolved | mg/L | < 0.02 | 0.00706 | - | - | - | - | 0.00662 | - | - | - | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.001 | < 0.0005 | - | - | - | - | < 0.0002 | - | - | - | - | - | - | - | - | - |
| Boron (B) - Dissolved | mg/L | < 0.1 | 0.0045 | - | - | - | - | 0.003 | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00001 | < 0.00001 | - | - | - | - | < 0.00005 | - | - | - | - | - | - | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | 5.76 | 6.04 | - | - | - | - | 0.524 | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.001 | < 0.0001 | - | - | - | - | < 0.00006 | - | - | - | - | - | - | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.0003 | < 0.0001 | - | - | - | - | < 0.0001 | - | - | - | - | - | - | - | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.0011 | 0.00076 | - | - | - | - | 0.0008 | - | - | - | - | - | - | - | - | - |
| Iron (Fe) - Dissolved | mg/L | < 0.03 | 0.011 | - | - | - | - | < 0.005 | - | - | - | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | < 0.0005 | < 0.00005 | - | - | - | - | < 0.00005 | - | - | - | - | - | - | - | - | - |
| Lithium (Li) - Dissolved | mg/L | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | 0.94 | 1.18 | - | - | - | - | 0.787 | - | - | - | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.0006 | 0.00133 | - | - | - | - | 0.0008 | - | - | - | - | - | - | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | - | - | - | - | < 0.00002 | - | - | - | - | - | - | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | < 0.001 | 0.000069 | - | - | - | - | 0.00006 | - | - | - | - | - | - | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | < 0.001 | 0.00069 | - | - | - | - | 0.00036 | - | - | - | - | - | - | - | - | - |
| Potassium (K) - Dissolved | mg/L | 0.71 | 0.913 | - | - | - | - | 0.72 | - | - | - | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.001 | < 0.0001 | - | - | - | - | 0.0001 | - | - | - | - | - | - | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.00002 | < 0.00001 | - | - | - | - | < 0.0001 | - | - | - | - | - | - | - | - | - |
| Sodium (Na) - Dissolved | mg/L | 3.5 | 4.28 | - | - | - | - | 3.07 | - | - | - | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | 0.0311 | - | - | - | - | 0.0255 | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.0002 | < 0.00005 | - | - | - | - | < 0.00003 | - | - | - | - | - | - | - | - | - |
| Tin (Sn) - Dissolved | mg/L | 0.00073 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.0002 | 0.000015 | - | - | - | - | < 0.00005 | - | - | - | - | - | - | - | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.001 | < 0.0001 | - | - | - | - | 0.0001 | - | - | - | - | - | - | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | < 0.005 | < 0.003 | - | - | - | - | < 0.0008 | - | - | - | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | < 2 | - | < 1 | < 1 | - | < 2 | < 2 | - | < 1 | 2 | - | < 1 | 1 | 1 |
| Benzene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Toluene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Xylenes | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Total Volatiles | µg/L | - | - | < 100 | - | - | < 100 | - | < 100 | < 100 | - | - | < 100 | - | - | < 100 | - |
| Total Extractables | µg/L | - | - | 190 | - | - | < 50 | - | 64 | 83 | - | - | < 50 | - | - | < 50 | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | ML-SE | ML-SE | ML-SE | ML-SE | A1 | A1 | A5 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 19-Jul-00 | 18-Jul-08 | 28-Apr-09 | 27-Jul-11 | 11-Aug-94 | 23-Aug-97 | 11-Aug-94 | 11-Aug-94 | 23-Jul-97 | 17-Aug-97 | 25-Apr-98 | 24-Jul-98 | 18-Jul-99 | 18-Jul-99 | 18-Jul-00 | 29-Apr-09 |
| **Source** | | RL&L 2001 | Golder | Golder | Golder | Dillon 1994 | RL&L 1998 | Dillon 1994 | Dillon 1994 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2000 | RL&L 2001 | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 13.4 | 14.5 | 0.3 | 17.8 | 9.1 | 14.8 | 9.3 | 9 | 18.7 | 15.3 | 0.9 | 14.4 | 9.8 | 9.8 | 13.6 | 0.5 |
| Dissolved Oxygen - field | mg/L | - | 12.3 | 12.41 | 9.3 | - | 9.8 | - | - | 10.3 | 11.5 | **2.9**[C] | 12.9 | 11.2 | 11.2 | - | **2.82**[C] |
| pH - field | pH | 7.62 | - | **5.5**[C,W] | 7.8 | 7.12 | 8.09 | 7.17 | 7.09 | 7.85 | 7.86 | 6.83 | 7.37 | 6.56 | 6.56 | 8.01 | 6.76 |
| Specific Conductivity - field | µS/cm | 76.5 | 69 | 138 | 92 | - | 150.3 | - | - | 92.8 | 101.9 | 300 | 84.8 | 110.7 | 110.7 | 98.3 | 394.4 |
| Secchi Disk Depth | m | 2.8 | 1.5 | - | 4.5 | - | 1.8 | - | - | 2.5 | 2.5 | - | 3.8 | 2.5 | 2.5 | 4 | - |
| Ice Depth | m | - | - | 1.7 | - | - | - | - | - | - | - | 1.7 | - | - | - | - | 1.7 |
| Total Lake Depth | m | 2.8 | 3 | 3.14 | 4.5 | - | 1.8 | - | - | 2.5 | 2.5 | 3.8 | 3.8 | 4 | 4 | 4 | 4.16 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.3 | 7.6 | 7.67 | 7.95 | 7.14 | - | 7.51 | 7.55 | 7.64 | - | 6.9 | 7.7 | 7.3 | 7.4 | 7.5 | 7.87 |
| Specific Conductivity - laboratory | µS/cm | 72 | 75.5 | 151 | 94.7 | 53.4 | - | 114 | 54 | 79.2 | - | 328 | 80.8 | 96.4 | 95.5 | 93.7 | 412 |
| Total Dissolved Solids | mg/L | 35 | 51 | - | 63 | 31 | - | 67 | 33 | 50 | - | 165 | 37 | 26 | 27 | 45 | - |
| Total Dissolved Solids (Calculated) | mg/L | - | 37 | 79 | 47 | - | - | - | - | - | - | - | - | - | - | - | 223 |
| Total Alkalinity | mg $CaCO_3$/L | 23 | 23 | 47 | 29 | 16 | - | 33 | 22 | 33 | - | 137 | 30 | 33 | 32 | 32 | 145 |
| Total Hardness | mg $CaCO_3$/L | 25 | 25 | 54 | 32 | 19 | - | 46 | 23 | 32 | - | 137 | 30 | 38 | 39 | 36 | 181 |
| Total Suspended Solids | mg/L | < 3 | < 3 | < 3 | < 3 | 1 | - | < 1 | 4 | < 3 | - | < 2 | < 2 | 5 | < 3 | < 3 | < 3 |
| Total Volatile Solids | mg/L | - | - | 26 | - | - | - | - | - | - | - | - | - | - | - | - | 76 |
| Turbidity - laboratory | NTU | 0.2 | - | - | - | 0.63 | - | 0.69 | 0.51 | 0.5 | - | 0.9 | 0.4 | 0.38 | 0.36 | 0.31 | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 28 | 28 | 57.1 | 35.9 | - | - | - | - | 32.9 | - | 167 | 37 | 40 | 40 | 38 | 176 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 8.6 | 7.54 | 16.8 | - | 6.29 | - | 15.4 | 7.83 | 10.7 | - | 45.5 | 10 | 12.7 | 13 | 12.6 | 55.3 |
| Carbonate | mg/L | < 5 | < 5 | < 5 | < 5 | - | - | - | - | < 0.3 | - | < 1 | < 1 | < 1 | < 1 | < 5 | < 5 |
| Chloride | mg/L | 4 | 6 | 14.2 | 8.83 | 4.4 | - | 12.1 | 2 | 3.47 | - | 14.6 | 3.69 | 5.67 | 5.64 | 6 | 40.3 |
| Fluoride | mg/L | - | - | - | - | 0.05 | - | 0.05 | 0.04 | - | - | - | - | - | - | - | - |
| Hydroxide | mg/L | < 5 | < 5 | < 5 | < 5 | - | - | - | - | - | - | < 1 | < 1 | < 1 | < 1 | < 5 | < 5 |
| Magnesium | mg/L | 0.974 | 0.922 | 2.36 | - | 0.842 | - | 1.77 | 0.942 | 1.34 | - | 5.65 | 1.15 | 1.55 | 1.64 | 1.49 | 6.93 |
| Potassium | mg/L | 0.83 | 0.76 | 1.8 | - | 0.71 | - | 0.78 | 0.49 | 0.679 | - | 2.73 | 0.68 | 0.78 | 0.81 | 0.787 | 2.98 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | - | - | - | - | - | 0.816 | - | 7.3 | 0.7 | 0.8 | 0.7 | 0.4 | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | < 1 | - | 1 | < 1 | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 2.67 | 3.14 | 7.51 | - | 2.39 | - | 1.99 | 1.11 | 1.89 | - | 8.2 | 1.7 | 2.1 | 2.2 | 2 | 10.2 |
| Sulphate | mg/L | 2.73 | 2.8 | 5.93 | 2.86 | 1.5 | - | 3.7 | 2.3 | < 3 | - | 5.66 | 1.75 | 3.24 | 3.21 | 3.1 | 12.7 |
| Ion Balance | % | 99.8 | - | 102 | - | - | - | - | - | 7.8 | - | 96 | 92 | 99 | 102 | 95.6 | 98.6 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 8.6 | 8 | - | 12.4 | - | - | - | - | 19 | - | 44 | 11.3 | 12.2 | 12.1 | 10.8 | - |
| Total Organic Carbon | mg/L | 3.6 | 4 | - | 4.6 | - | - | - | - | 4 | - | 9 | 4.1 | 4.7 | 4.7 | 4 | - |
| Dissolved Organic Carbon | mg/L | - | 3.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 5 | - | - | 7.9 | - | - | - | - | 15 | - | 33.6 | 7.1 | 7.5 | 7.4 | 6.8 | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.005 | < 0.05 | < 0.05 | < 0.05 | - | - | - | - | 0.013 | - | 0.244 | 0.008 | < 0.005 | < 0.005 | < 0.005 | 0.404 |
| Nitrate as Nitrogen | mg/L | < 0.006 | < 0.1 | < 0.05 | < 0.05 | 0.005 | - | < 0.005 | < 0.005 | < 0.008 | - | 0.305 | < 0.006 | 0.009 | < 0.006 | < 0.006 | 0.062 |
| Nitrite as Nitrogen | mg/L | - | < 0.05 | < 0.05 | < 0.05 | 0.001 | - | 0.001 | 0.002 | - | - | - | - | - | - | - | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.006 | < 0.1 | < 0.071 | < 0.071 | - | - | - | - | < 0.008 | - | 0.31 | < 0.006 | 0.009 | < 0.006 | < 0.006 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | 0.14 | < 0.2 | 0.94 | 0.25 | - | - | - | - | 0.23 | - | 0.88 | 0.47 | 0.49 | 0.21 | 0.25 | 1.28 |
| Phosphorus, Total | mg/L | 0.012 | 0.006 | 0.005 | 0.006 | < 0.3 | - | < 0.3 | < 0.3 | 0.009 | - | 0.007 | 0.005 | 0.004 | 0.004 | 0.026 | 0.008 |
| Phosphorus, Total Dissolved | mg/L | 0.012 | 0.003 | 0.005 | 0.003 | - | - | - | - | < 0.002 | - | 0.005 | 0.005 | 0.003 | 0.002 | 0.011 | 0.009 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | < 0.002 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | 0.8 | < 1 | - | - | - | - | - | - | < 0.01 | 1.18 | - | 1.08 | 0.51 | - | 0.4 | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | 0.003 | < 0.002 | < 0.002 | < 0.000002 | - | - | - | - | - | - | 0.002 | < 0.001 | < 0.002 | < 0.002 | 0.002 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.002 | 0.0029 | < 0.005 | 0.0047 | $<0.2^{D>C,W}$ | - | $<0.2^{D>C,W}$ | $<0.2^{D>C,W}$ | < 0.0005 | - | 0.0049 | 0.0007 | 0.0039 | 0.0036 | 0.0028 | 0.0055 |
| Antimony (Sb) - Total | mg/L | 0.00006 | < 0.00003 | < 0.0002 | < 0.0001 | $<0.2^{D>W}$ | - | $<0.2^{D>W}$ | $<0.2^{D>W}$ | 0.0003 | - | < 0.00003 | 0.00009 | 0.0006 | 0.0006 | 0.0001 | 0.0002 |
| Arsenic (As) - Total | mg/L | 0.0002 | 0.0004 | 0.0005 | 0.0006 | 0.0006 | - | 0.001 | 0.001 | 0.0021 | - | 0.0018 | 0.0018 | 0.0021 | 0.0022 | 0.0016 | 0.0021 |
| Barium (Ba) - Total | mg/L | 0.0093 | 0.0074 | 0.0171 | 0.0096 | < 0.01 | - | 0.013 | < 0.01 | 0.0076 | - | 0.0451 | 0.0084 | 0.0098 | 0.01 | 0.011 | 0.0602 |
| Beryllium (Be) - Total | mg/L | < 0.0002 | < 0.0002 | < 0.001 | < 0.0005 | < 0.005 | - | < 0.005 | < 0.005 | < 0.0001 | - | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | - | - | < 0.001 | < 0.00005 | < 0.1 | - | < 0.1 | < 0.1 | < 0.0001 | - | < 0.00005 | < 0.00003 | < 0.00003 | < 0.00003 | - | < 0.001 |
| Boron (B) - Total | mg/L | 0.003 | 0.003 | < 0.05 | 0.0043 | < 0.1 | - | < 0.1 | < 0.1 | - | - | - | - | - | - | 0.002 | < 0.05 |
| Cadmium (Cd) - Total | mg/L | **0.0004**[C] | $<0.00005^{D>C}$ | < 0.00001 | < 0.00001 | $<0.0002^{D>C}$ | - | $<0.0002^{D>C}$ | $<0.0002^{D>C}$ | $<0.0001^{D>C}$ | - | $<0.0001^{D>C}$ | **0.0011**[C] | $<0.00002^{D>C}$ | $<0.00002^{D>C}$ | **0.0003**[C] | 0.00003 |
| Cesium (Cs) - Total | mg/L | - | - | - | - | - | - | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | - |
| Chromium (Cr) - Total | mg/L | **0.0014**[C] | < 0.00006 | < 0.001 | < 0.0001 | $<0.015^{D>C}$ | - | $<0.015^{D>C}$ | $<0.015^{D>C}$ | $<0.002^{D>C}$ | - | 0.0005 | **0.0028**[C] | 0.0001 | 0.0001 | **0.0019**[C] | < 0.001 |
| Cobalt (Co) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0003 | < 0.0001 | < 0.015 | - | < 0.015 | < 0.015 | < 0.0001 | - | 0.0006 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0003 |
| Copper (Cu) - Total | mg/L | 0.0017 | 0.0018 | 0.0016 | 0.0007 | $<0.01^{D>C}$ | - | $<0.01^{D>C}$ | $<0.01^{D>C}$ | **0.0271**[C] | - | 0.0028 | 0.0009 | 0.0013 | 0.0012 | **0.0065**[C] | 0.0031 |

| Waterbody | | ML-SE | ML-SE | ML-SE | ML-SE | A1 | A1 | A5 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 19-Jul-00 | 18-Jul-08 | 28-Apr-09 | 27-Jul-11 | 11-Aug-94 | 23-Aug-97 | 11-Aug-94 | 11-Aug-94 | 23-Jul-97 | 17-Aug-97 | 25-Apr-98 | 24-Jul-98 | 18-Jul-99 | 18-Jul-99 | 18-Jul-00 | 29-Apr-09 |
| **Source** | | RL&L 2001 | Golder | Golder | Golder | Dillon 1994 | RL&L 1998 | Dillon 1994 | Dillon 1994 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2000 | RL&L 2001 | Golder |
| Iron (Fe) - Total | mg/L | 0.085 | 0.033 | - | 0.041 | 0.106 | - | 0.106 | 0.042 | 0.044 | - | 0.29 | < 0.005 | 0.069 | 0.073 | 0.143 | - |
| Lead (Pb) - Total | mg/L | 0.0007 | < 0.00005 | < 0.0005 | < 0.00005 | < 0.001 | - | < 0.001 | < 0.001 | < 0.0002 | - | < 0.00005 | < 0.00005 | 0.00009 | < 0.00005 | **0.0022**[C] | **0.063**[C,W] |
| Lithium (Li) - Total | mg/L | - | - | < 0.005 | < 0.005 | < 0.015 | - | < 0.015 | < 0.015 | 0.0011 | - | 0.003 | < 0.0001 | 0.0012 | 0.0012 | - | 0.0057 |
| Manganese (Mn) - Total | mg/L | 0.0067 | 0.0033 | 0.0018 | 0.0077 | 0.006 | - | 0.007 | < 0.005 | 0.0058 | - | **0.416**[W] | 0.0004 | 0.0102 | 0.0106 | 0.012 | **0.258**[W] |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | <0.00005[D>C] | - | <0.00005[D>C] | <0.00005[D>C] | < 0.00001 | - | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | 0.0001 | 0.0001 | < 0.001 | 0.0002 | < 0.03 | - | < 0.03 | < 0.03 | 0.0002 | - | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0001 | < 0.001 |
| Nickel (Ni) - Total | mg/L | 0.0007 | 0.0025 | < 0.001 | 0.0005 | < 0.02 | - | < 0.02 | < 0.02 | 0.0008 | - | 0.0028 | 0.0009 | 0.0009 | 0.0009 | 0.002 | 0.0026 |
| Selenium (Se) - Total | mg/L | 0.0001 | < 0.0001 | < 0.001 | < 0.0001 | < 0.0005 | - | < 0.0005 | < 0.0005 | <0.01[D>C] | - | 0.0002 | < 0.0001 | 0.0001 | < 0.0001 | 0.0002 | < 0.001 |
| Silver (Ag) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.00002 | < 0.00001 | <0.015[D>C] | - | <0.015[D>C] | <0.015[D>C] | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.00002 |
| Strontium (Sr) - Total | mg/L | 0.0335 | 0.0319 | 0.0729 | 0.0473 | 0.026 | - | 0.063 | 0.03 | 0.043 | - | 0.195 | 0.0477 | 0.0495 | 0.0503 | 0.0495 | 0.245 |
| Thallium (Tl) - Total | mg/L | - | < 0.00003 | < 0.0002 | < 0.00005 | <0.1[D>C] | - | <0.1[D>C] | <0.1[D>C] | < 0.0001 | - | < 0.00005 | < 0.00003 | < 0.00003 | < 0.00003 | - | < 0.0002 |
| Tin (Sn) - Total | mg/L | - | - | < 0.0005 | < 0.0001 | < 0.3 | - | < 0.3 | < 0.3 | - | - | - | - | - | - | - | < 0.0005 |
| Titanium (Ti) - Total | mg/L | - | - | - | < 0.0003 | < 0.01 | - | < 0.01 | < 0.01 | < 0.0001 | - | 0.0006 | < 0.0001 | 0.0003 | 0.0002 | - | - |
| Uranium (U) - Total | mg/L | < 0.00005 | < 0.00005 | 0.00003 | 0.00003 | - | - | - | - | < 0.0001 | - | 0.00007 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0002 |
| Vanadium (V) - Total | mg/L | 0.0004 | 0.0001 | < 0.001 | < 0.0001 | < 0.03 | - | < 0.03 | < 0.03 | < 0.0001 | - | 0.0001 | 0.00007 | 0.00006 | 0.00007 | 0.0006 | < 0.001 |
| Zinc (Zn) - Total | mg/L | **0.0372**[C] | < 0.0008 | 0.0057 | < 0.003 | < 0.005 | - | < 0.005 | < 0.005 | 0.0097 | - | 0.005 | < 0.0008 | 0.0097 | 0.0062 | **0.0319**[C] | 0.0152 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | - | 0.0015 | 0.0077 | < 0.003 | - | - | - | - | - | - | - | - | - | - | - | < 0.005 |
| Antimony (Sb) - Dissolved | mg/L | - | < 0.00003 | < 0.0005 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Arsenic (As) - Dissolved | mg/L | - | 0.00036 | 0.00054 | 0.00054 | - | - | - | - | - | - | - | - | - | - | - | 0.00241 |
| Barium (Ba) - Dissolved | mg/L | - | 0.00728 | - | 0.00934 | - | - | - | - | - | - | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | - | < 0.0002 | < 0.001 | < 0.0005 | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Boron (B) - Dissolved | mg/L | - | 0.003 | - | 0.0053 | - | - | - | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | - | < 0.00005 | 0.000011 | < 0.00001 | - | - | - | - | - | - | - | - | - | - | - | 0.000015 |
| Calcium (Ca) - Dissolved | mg/L | - | 0.768 | 17.8 | 11.5 | - | - | - | - | - | - | - | - | - | - | - | 61.4 |
| Chromium (Cr) - Dissolved | mg/L | - | < 0.00006 | 0.0018 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | 0.003 |
| Cobalt (Co) - Dissolved | mg/L | - | < 0.0001 | < 0.0003 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | < 0.0003 |
| Copper (Cu) - Dissolved | mg/L | - | 0.0007 | 0.0014 | 0.00072 | - | - | - | - | - | - | - | - | - | - | - | 0.0016 |
| Iron (Fe) - Dissolved | mg/L | - | 0.012 | - | 0.021 | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | - | 0.00007 | < 0.0005 | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Lithium (Li) - Dissolved | mg/L | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - | - | - | - | 0.006 |
| Magnesium (Mg) - Dissolved | mg/L | - | 0.936 | 2.23 | 1.53 | - | - | - | - | - | - | - | - | - | - | - | 6.76 |
| Manganese (Mn) - Dissolved | mg/L | - | 0.0009 | 0.00155 | 0.00175 | - | - | - | - | - | - | - | - | - | - | - | 0.252 |
| Mercury (Hg) - Dissolved | mg/L | - | < 0.00002 | < 0.00002 | < 0.00002 | - | - | - | - | - | - | - | - | - | - | - | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | - | 0.0001 | < 0.001 | 0.000162 | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Nickel (Ni) - Dissolved | mg/L | - | 0.0003 | < 0.001 | 0.00044 | - | - | - | - | - | - | - | - | - | - | - | 0.0021 |
| Potassium (K) - Dissolved | mg/L | - | 0.76 | 1.93 | 1.1 | - | - | - | - | - | - | - | - | - | - | - | 3.21 |
| Selenium (Se) - Dissolved | mg/L | - | < 0.0001 | < 0.001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Silver (Ag) - Dissolved | mg/L | - | < 0.0001 | < 0.00002 | < 0.00001 | - | - | - | - | - | - | - | - | - | - | - | < 0.00002 |
| Sodium (Na) - Dissolved | mg/L | - | 3.16 | 8.3 | 4.71 | - | - | - | - | - | - | - | - | - | - | - | 11.5 |
| Strontium (Sr) - Dissolved | mg/L | - | 0.0322 | - | 0.046 | - | - | - | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | - | < 0.00003 | < 0.0002 | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Tin (Sn) - Dissolved | mg/L | - | - | < 0.0005 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Uranium (U) - Dissolved | mg/L | - | < 0.00005 | < 0.0002 | 0.000035 | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Vanadium (V) - Dissolved | mg/L | - | 0.00013 | < 0.001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Zinc (Zn) - Dissolved | mg/L | - | 0.0009 | - | < 0.003 | - | - | - | - | - | - | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | < 1 | - | - | - | - | - | - | - | < 2 | - | < 1 | 2 | 2 | 1 | < 1 | - |
| Benzene | µg/L | < 0.5 | - | - | - | - | - | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Ethylbenzene | µg/L | < 0.5 | - | - | - | - | - | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Toluene | µg/L | < 0.5 | - | - | - | - | - | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Xylenes | µg/L | < 0.5 | - | - | - | - | - | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - |
| Total Volatiles | µg/L | < 100 | - | - | - | < 1000 | - | < 1000 | - | < 100 | - | - | < 100 | - | - | < 100 | - |
| Total Extractables | µg/L | < 50 | - | - | - | < 1000 | - | < 1000 | - | 210 | - | - | < 50 | - | - | < 50 | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[(A)] = Concentration higher than the relevant acute aquatic life gui
[(C)] = Concentration higher than the relevant chronic aquatic life g
[(W)] = Concentration higher than the relevant drinking water guide
[(D>A)] = Detection limit higher than acute aquatic life guideline.
[(D>C)] = Detection limit higher than chronic aquatic life guideline.
[(D>W)] = Detection limit higher than drinking water guideline.

| Waterbody | | A6 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | B2 | B2 | B2 | B2 | B2 | B2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 29-Jul-09 | 11-Aug-94 | 22-Jul-97 | 18-Aug-97 | 26-Apr-98 | 23-Jul-98 | 18-Jul-07 | 8-Oct-07 | 15-Jul-08 | 27-Apr-09 | 21-Jul-97 | 18-Aug-97 | 26-Apr-98 | 21-Jul-98 | 30-Aug-98 | 18-Jul-99 |
| **Source** | | Golder | Dillon 1994 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | Comaplex | Comaplex | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 14.8 | - | 17.7 | 14.3 | 0.5 | 12.4 | 17.6 | 0.5 | 14.1 | 0.1 | 17 | 14.9 | 0.1 | 9.7 | 8.9 | 11 |
| Dissolved Oxygen - field | mg/L | 8.18 | - | 9.9 | 10.9 | **3.8**[C] | 13.7 | - | - | 11.87 | **4.29**[C] | 9.7 | 11.2 | **3.6**[C] | 13.4 | 11.1 | 11.9 |
| pH - field | pH | 7.45 | 7.09 | 8.38 | 7.87 | 7.73 | 7.73 | 8.06 | 7.81 | 7.8 | **6.41**[C,W] | 8.07 | 7.84 | 6.92 | - | 7.13 | 7.2 |
| Specific Conductivity - field | µS/cm | 115 | - | 95.5 | 103.7 | 320 | 93.3 | - | - | 101 | 489 | 101.7 | 109.9 | 433 | 71.5 | 87 | 97.1 |
| Secchi Disk Depth | m | 3.1 | - | 3.6 | 3.4 | - | 2.8 | - | - | 3 | - | 2.6 | 2.5 | - | 3 | 2.8 | 2.5 |
| Ice Depth | m | - | - | - | - | 1.8 | - | - | - | - | 1.6 | - | - | 1.8 | - | - | - |
| Total Lake Depth | m | 3.1 | - | 3.6 | 3.4 | 3 | 2.8 | - | - | 3 | 2.73 | 2.6 | 2.5 | 2.5 | 3 | 2.8 | 3 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.82 | 7.64 | 7.75 | - | 6.9 | 7.7 | 7.8 | 7.7 | 7.7 | 7.76 | 7.7 | - | 6.8 | 7.2 | - | 7.3 |
| Specific Conductivity - laboratory | µS/cm | 114 | 59.3 | 76.6 | - | 354 | 85.1 | 106 | 134 | 117 | 514 | 83.7 | - | 465 | 64.2 | - | 84.8 |
| Total Dissolved Solids | mg/L | 72 | 35 | 49 | - | 170 | 39 | - | - | 83 | - | 49 | - | 230 | 31 | - | 24 |
| Total Dissolved Solids (Calculated) | mg/L | 57 | - | - | - | - | - | 51 | 64 | 57 | 261 | - | - | - | - | - | - |
| Total Alkalinity | mg $CaCO_3$/L | 35 | 23 | 32 | - | 141 | 31 | 30 | 33 | 28 | 125 | 33 | - | 180 | 22 | - | 29 |
| Total Hardness | mg $CaCO_3$/L | 49 | 26 | 32 | - | 139 | 31 | 41 | 51 | 49 | 216 | 33 | - | 178 | 24 | - | 33 |
| Total Suspended Solids | mg/L | < 3 | < 1 | < 3 | - | 2 | 4 | - | < 3 | 17 | 5 | < 3 | - | 3 | < 2 | - | 7 |
| Total Volatile Solids | mg/L | 64 | - | - | - | - | - | - | - | - | 103 | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | 0.41 | 0.5 | - | 1.3 | 0.4 | - | 0.5 | - | - | 0.6 | - | 1.1 | 0.4 | - | 0.31 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 42.4 | - | 32 | - | 172 | 38 | 37 | 40 | 34 | 153 | 33.3 | - | 220 | 27 | - | 35 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 15.5 | 8.38 | 10.3 | - | 45 | 10.3 | 13.7 | 16.9 | 15.4 | 66.2 | 11 | - | 59.9 | 8.1 | - | 10.9 |
| Carbonate | mg/L | < 5 | - | < 0.3 | - | < 1 | < 1 | < 5 | < 5 | < 5 | < 5 | < 0.3 | - | < 1 | < 1 | - | < 1 |
| Chloride | mg/L | 11.5 | 2.2 | 4.26 | - | 17.7 | 4.54 | 12 | 17 | 16 | 78.4 | 5.2 | - | 25.2 | 3.68 | - | 4.41 |
| Fluoride | mg/L | - | 0.04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydroxide | mg/L | < 5 | - | - | - | < 1 | < 1 | < 5 | < 5 | < 5 | < 5 | - | - | < 1 | < 1 | - | < 1 |
| Magnesium | mg/L | 1.9 | - | 1.58 | - | 6.39 | 1.37 | 1.7 | 2.2 | 1.82 | 9.72 | 1.35 | - | 7.01 | 0.99 | - | 1.3 |
| Potassium | mg/L | < 2 | 0.53 | 0.709 | - | 2.79 | 0.71 | 0.8 | 1 | 0.92 | 3.62 | 0.868 | - | 4.36 | 0.73 | - | 0.84 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | 1.07 | - | 8.8 | 1 | - | 1.3 | - | - | 0.589 | - | 4.8 | 0.6 | - | 0.5 |
| Silicate ($SiO_2$) | mg/L | - | < 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 3.1 | 1.21 | 1.87 | - | 7.5 | 1.7 | 2 | 3 | 2.54 | 11.5 | 3.05 | - | 16.7 | 2.4 | - | 2.9 |
| Sulphate | mg/L | 2.69 | 2 | < 3 | - | 5.84 | 1.59 | 3.2 | 4.1 | 2.1 | 9.82 | < 3 | - | 8.95 | 1.62 | - | 3.48 |
| Ion Balance | % | 104 | - | 6.8 | - | 92 | 92 | 91.2 | 96.7 | 107 | 102 | - | - | 98 | 105 | - | 104 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 11.1 | - | 11 | - | 48 | 11.9 | - | 11 | 9 | - | 12 | - | 64 | 8.7 | - | 11 |
| Total Organic Carbon | mg/L | 3.8 | - | 3.6 | - | 10 | 4.6 | - | - | 4 | - | 3.8 | - | 13.3 | 3.3 | - | 4.3 |
| Dissolved Organic Carbon | mg/L | 4.1 | - | - | - | - | - | - | - | 3.6 | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 8.5 | - | 7 | - | 36.7 | 7.3 | - | 7 | - | - | 8 | - | 49.9 | 5.4 | - | 6.7 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | - | 0.004 | - | 0.448 | 0.007 | - | < 0.05 | < 0.05 | 0.212 | 0.014 | - | 0.048 | 0.017 | - | < 0.005 |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.005 | < 0.008 | - | 0.03 | < 0.006 | < 0.1 | < 0.1 | < 0.1 | 0.052 | < 0.008 | - | < 0.006 | < 0.006 | - | < 0.006 |
| Nitrite as Nitrogen | mg/L | < 0.05 | 0.001 | - | - | - | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | - | - | - | - | - | - |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | - | < 0.008 | - | 0.03 | < 0.006 | < 0.1 | < 0.1 | < 0.1 | < 0.071 | < 0.008 | - | < 0.006 | < 0.006 | - | < 0.006 |
| Total Kjeldahl Nitrogen | mg/L | 0.35 | - | 0.25 | - | 1.21 | 0.4 | - | 0.2 | 0.2 | 1.01 | 0.34 | - | 1.03 | 0.39 | - | 0.23 |
| Phosphorus, Total | mg/L | 0.006 | < 0.3 | 0.004 | - | 0.007 | 0.007 | - | < 0.02 | 0.005 | 0.007 | 0.01 | - | 0.01 | 0.007 | - | 0.009 |
| Phosphorus, Total Dissolved | mg/L | 0.002 | - | 0.004 | - | 0.004 | 0.005 | - | < 0.02 | 0.003 | 0.007 | 0.004 | - | 0.008 | 0.005 | - | 0.002 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | - | < 0.002 | - | 0.003 | < 0.001 | - | < 0.01 | < 0.001 | < 0.001 | < 0.002 | - | 0.001 | < 0.001 | - | < 0.001 |
| Chlorophyll a | µg/L | - | - | 0.96 | 0.96 | - | 1.5 | - | - | 13 | - | 1.49 | 1.22 | - | 2.08 | 1.89 | 0.73 |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | - | - | - | < 0.001 | < 0.001 | - | - | < 0.002 | < 0.002 | - | - | 0.002 | 0.001 | - | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | < 0.005 | <0.2[D>C,W] | < 0.005 | - | 0.0015 | 0.0003 | 0.01 | - | 0.0018 | < 0.005 | < 0.005 | - | 0.0064 | 0.0019 | - | 0.0032 |
| Antimony (Sb) - Total | mg/L | < 0.0005 | <0.2[D>W] | 0.0005 | - | < 0.00003 | 0.0001 | < 0.0004 | - | < 0.00003 | < 0.0002 | 0.0006 | - | < 0.00003 | 0.00006 | - | 0.00005 |
| Arsenic (As) - Total | mg/L | 0.0019 | 0.0012 | 0.0021 | - | 0.0019 | 0.0022 | 0.0024 | - | 0.0021 | 0.0033 | 0.0012 | - | 0.0017 | 0.001 | - | 0.0012 |
| Barium (Ba) - Total | mg/L | < 0.02 | < 0.01 | 0.0094 | - | 0.0496 | 0.0096 | 0.014 | - | 0.0128 | 0.077 | 0.0094 | - | 0.0561 | 0.0076 | - | 0.0097 |
| Beryllium (Be) - Total | mg/L | < 0.001 | < 0.005 | < 0.0001 | - | < 0.0002 | < 0.0002 | < 0.001 | - | < 0.0002 | < 0.001 | < 0.0001 | - | < 0.0002 | < 0.0002 | - | < 0.0002 |
| Bismuth (Bi) - Total | mg/L | - | < 0.1 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | - | - | < 0.001 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | 0.00006 |
| Boron (B) - Total | mg/L | < 0.1 | < 0.1 | - | - | - | - | < 0.05 | - | 0.002 | < 0.05 | - | - | - | - | - | - |
| Cadmium (Cd) - Total | mg/L | **0.00002**[C] | <0.0002[D>C] | **0.0001**[C] | - | <0.0001[D>C] | **0.0001**[C] | <0.0002[D>C] | - | <0.00005[D>C] | < 0.00001 | 0.0001 | - | < 0.0001 | **0.0049**[C] | - | 0.00003 |
| Cesium (Cs) - Total | mg/L | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Chromium (Cr) - Total | mg/L | < 0.001 | <0.015[D>C] | <0.002[D>C] | - | 0.001 | **0.0035**[C] | <0.005[D>C] | - | < 0.00006 | < 0.004 | < 0.002 | - | 0.0018 | 0.0024 | - | 0.0005 |
| Cobalt (Co) - Total | mg/L | < 0.0003 | < 0.015 | 0.0001 | - | 0.0003 | 0.0001 | < 0.002 | - | < 0.0001 | < 0.0003 | < 0.0001 | - | 0.0003 | < 0.0001 | - | < 0.0001 |
| Copper (Cu) - Total | mg/L | < 0.001 | <0.01[D>C] | 0.0011 | - | 0.0026 | 0.0008 | 0.002 | - | 0.0017 | 0.0013 | 0.0016 | - | 0.0031 | 0.0011 | - | 0.0012 |

| Waterbody | | A6 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | B2 | B2 | B2 | B2 | B2 | B2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 29-Jul-09 | 11-Aug-94 | 22-Jul-97 | 18-Aug-97 | 26-Apr-98 | 23-Jul-98 | 18-Jul-07 | 8-Oct-07 | 15-Jul-08 | 27-Apr-09 | 21-Jul-97 | 18-Aug-97 | 26-Apr-98 | 21-Jul-98 | 30-Aug-98 | 18-Jul-99 |
| **Source** | | Golder | Dillon 1994 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | Comaplex | Comaplex | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 |
| Iron (Fe) - Total | mg/L | 0.07 | 0.0046 | 0.051 | - | 0.162 | < 0.005 | 0.16 | - | 0.072 | - | 0.085 | - | 0.25 | 0.052 | - | 0.09 |
| Lead (Pb) - Total | mg/L | < 0.0005 | < 0.001 | < 0.0002 | - | < 0.00005 | < 0.00005 | 0.0007 | - | 0.00006 | < 0.005 | < 0.0002 | - | < 0.00005 | 0.00005 | - | 0.00009 |
| Lithium (Li) - Total | mg/L | < 0.005 | < 0.015 | 0.0016 | - | 0.0038 | < 0.0001 | < 0.01 | - | - | 0.0136 | 0.0011 | - | 0.0041 | < 0.0001 | - | 0.0007 |
| Manganese (Mn) - Total | mg/L | 0.0141 | < 0.005 | 0.003 | - | **0.189**[W] | 0.0007 | 0.012 | - | 0.0069 | 0.0855 | 0.0049 | - | 0.0783 | 0.0015 | - | 0.0074 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | <0.00005[D>C] | < 0.00001 | - | < 0.00001 | < 0.00002 | <0.0002[D>C] | - | < 0.00002 | < 0.00002 | < 0.00001 | - | < 0.00001 | < 0.00002 | - | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | < 0.001 | < 0.03 | 0.0004 | - | 0.0003 | 0.0002 | < 0.005 | - | 0.0002 | < 0.001 | 0.0004 | - | 0.0004 | 0.0002 | - | 0.0003 |
| Nickel (Ni) - Total | mg/L | < 0.001 | < 0.02 | 0.001 | - | 0.0035 | 0.0011 | < 0.002 | - | 0.0004 | 0.0025 | 0.0007 | - | 0.0039 | 0.0007 | - | 0.0009 |
| Selenium (Se) - Total | mg/L | < 0.001 | < 0.0005 | <0.01[D>C] | - | < 0.0001 | < 0.0001 | 0.0008 | - | 0.0003 | < 0.0005 | < 0.01 | - | 0.0003 | < 0.0001 | - | 0.0001 |
| Silver (Ag) - Total | mg/L | < 0.00002 | <0.015[D>C] | < 0.0001 | - | < 0.0001 | < 0.0001 | <0.0004[D>C] | - | < 0.0001 | < 0.00002 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Strontium (Sr) - Total | mg/L | - | 0.0036 | 0.0271 | - | 0.208 | 0.0581 | - | - | 0.082 | 0.408 | 0.0478 | - | 0.249 | 0.0357 | - | 0.045 |
| Thallium (Tl) - Total | mg/L | < 0.0002 | <0.1[D>C,A] | < 0.0001 | - | < 0.00005 | < 0.00003 | < 0.0001 | - | < 0.00003 | < 0.0002 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | < 0.00003 |
| Tin (Sn) - Total | mg/L | < 0.0005 | < 0.3 | - | - | - | - | < 0.05 | - | - | < 0.0005 | - | - | - | - | - | - |
| Titanium (Ti) - Total | mg/L | < 0.01 | < 0.01 | 0.0005 | - | < 0.0001 | < 0.0001 | < 0.001 | - | - | - | < 0.0001 | - | 0.001 | < 0.0001 | - | 0.0002 |
| Uranium (U) - Total | mg/L | < 0.0002 | - | < 0.0001 | - | 0.00008 | < 0.00005 | < 0.0001 | - | < 0.00005 | 0.00006 | < 0.0001 | - | 0.0001 | < 0.00005 | - | < 0.00005 |
| Vanadium (V) - Total | mg/L | < 0.001 | < 0.03 | < 0.0001 | - | 0.0002 | 0.00007 | < 0.001 | - | 0.0002 | < 0.001 | < 0.0001 | - | 0.0005 | 0.00008 | - | 0.00008 |
| Zinc (Zn) - Total | mg/L | < 0.005 | < 0.005 | < 0.005 | - | 0.005 | < 0.0008 | 0.009 | - | < 0.0008 | 0.0104 | 0.0076 | - | 0.003 | 0.0009 | - | 0.004 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | < 0.005 | - | - | - | - | - | - | < 0.01 | 0.0012 | 0.0086 | - | - | - | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.0005 | - | - | - | - | - | - | 0.0017 | < 0.00003 | < 0.0005 | - | - | - | - | - | - |
| Arsenic (As) - Dissolved | mg/L | 0.00168 | - | - | - | - | - | - | 0.0016 | 0.00162 | 0.00309 | - | - | - | - | - | - |
| Barium (Ba) - Dissolved | mg/L | < 0.02 | - | - | - | - | - | - | 0.013 | 0.0124 | - | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.001 | - | - | - | - | - | - | < 0.001 | < 0.0002 | < 0.001 | - | - | - | - | - | - |
| Boron (B) - Dissolved | mg/L | < 0.1 | - | - | - | - | - | - | < 0.05 | 0.002 | - | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00001 | - | - | - | - | - | - | < 0.0001 | < 0.00005 | 0.000018 | - | - | - | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | 17.1 | - | - | - | - | - | - | - | 14.8 | 71.8 | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.001 | - | - | - | - | - | - | < 0.005 | < 0.00006 | < 0.007 | - | - | - | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.0003 | - | - | - | - | - | - | < 0.002 | < 0.0001 | < 0.0003 | - | - | - | - | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.001 | - | - | - | - | - | - | < 0.001 | 0.0007 | 0.0016 | - | - | - | - | - | - |
| Iron (Fe) - Dissolved | mg/L | < 0.03 | - | - | - | - | - | - | 0.033 | 0.025 | - | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | < 0.0005 | - | - | - | - | - | - | < 0.0001 | 0.00008 | < 0.0005 | - | - | - | - | - | - |
| Lithium (Li) - Dissolved | mg/L | < 0.005 | - | - | - | - | - | - | 0.004 | - | 0.014 | - | - | - | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | 1.95 | - | - | - | - | - | - | - | 1.75 | 8.95 | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.00195 | - | - | - | - | - | - | 0.003 | 0.0019 | 0.0829 | - | - | - | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | - | - | - | - | - | - | < 0.0001 | < 0.00002 | < 0.00002 | - | - | - | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | < 0.001 | - | - | - | - | - | - | < 0.005 | 0.00014 | < 0.001 | - | - | - | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | < 0.001 | - | - | - | - | - | - | < 0.002 | 0.00044 | 0.0026 | - | - | - | - | - | - |
| Potassium (K) - Dissolved | mg/L | < 0.2 | - | - | - | - | - | - | - | 0.87 | 4.07 | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.001 | - | - | - | - | - | - | < 0.0004 | 0.0002 | < 0.001 | - | - | - | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.00002 | - | - | - | - | - | - | < 0.0001 | < 0.0001 | < 0.00002 | - | - | - | - | - | - |
| Sodium (Na) - Dissolved | mg/L | 3.1 | - | - | - | - | - | - | - | 2.42 | 13 | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.0792 | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.0002 | - | - | - | - | - | - | < 0.0001 | < 0.00003 | < 0.0002 | - | - | - | - | - | - |
| Tin (Sn) - Dissolved | mg/L | 0.00081 | - | - | - | - | - | - | < 0.05 | - | < 0.0005 | - | - | - | - | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.0002 | - | - | - | - | - | - | < 0.0001 | < 0.00005 | < 0.0002 | - | - | - | - | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.001 | - | - | - | - | - | - | < 0.001 | 0.00012 | < 0.001 | - | - | - | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | < 0.005 | - | - | - | - | - | - | < 0.002 | 0.001 | - | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | **6**[C] | - | < 1 | 2 | - | - | 2 | - | < 2 | - | < 1 | < 1 | - | 1 |
| Benzene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | - | - | < 0.5 | - | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | - | - | < 0.5 | - | - |
| Toluene | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | - | - | < 0.5 | - | - |
| Xylenes | µg/L | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | < 0.5 | - | - | < 0.5 | - | - |
| Total Volatiles | µg/L | - | < 1000 | < 100 | - | - | < 100 | - | - | - | - | < 100 | - | - | < 100 | - | - |
| Total Extractables | µg/L | - | < 1000 | < 50 | - | - | < 50 | - | - | - | - | 330 | - | - | < 50 | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[A] = Concentration higher than the relevant acute aquatic life gui
[C] = Concentration higher than the relevant chronic aquatic life g
[W] = Concentration higher than the relevant drinking water guide
[D>A] = Detection limit higher than acute aquatic life guideline.
[D>C] = Detection limit higher than chronic aquatic life guideline.
[D>W] = Detection limit higher than drinking water guideline.

| Waterbody | | B2 | B2 | B2 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B6 | B6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 19-Jul-00 | 11-Apr-11 | 20-Jul-11 | 19-Jul-97 | 18-Aug-97 | 26-Apr-98 | 20-Jul-98 | 28-Aug-98 | 18-Jul-99 | 18-Jul-00 | 18-Jul-00 | 14-Jul-08 | 27-Apr-09 | 9-Apr-11 | 12-Jul-08 | 27-Apr-09 |
| **Source** | | RL&L 2001 | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2001 | RL&L 2001 | Golder | Golder | Golder | Golder | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 13.6 | 0.5 | 14.2 | 15.1 | 15.1 | 0 | 9.9 | 8.9 | 10.4 | 14.6 | 14.6 | 13.8 | 0.3 | 0.6 | 15.4 | 0.3 |
| Dissolved Oxygen - field | mg/L | - | **3.2**[C] | 9.8 | 10.5 | 10.8 | **2.6**[C] | 13.9 | 10.8 | 11.7 | - | - | 11.53 | **2.91**[C] | **4.3**[C] | 12.23 | **2.66**[C] |
| pH - field | pH | 7.79 | 6.7 | 7.5 | 7.54 | 7.67 | 6.84 | - | 7.36 | 6.51 | 7.76 | 7.76 | 6.94 | 6.6 | 6.9 | 7.33 | **6.45**[C,W] |
| Specific Conductivity - field | µS/cm | 74 | 452 | 87 | 81.8 | 89.5 | 674 | 73.8 | 94.8 | 87.4 | 80.3 | 80.3 | 86 | 354 | 420 | 112 | 455 |
| Secchi Disk Depth | m | 3 | - | 3.6 | 2.7 | 2.3 | - | 2 | 3 | 2 | 2.4 | 2.4 | 2.7 | - | - | 4 | - |
| Ice Depth | m | - | 1.7 | - | - | - | 1.8 | - | - | - | - | - | - | 1.6 | 1.6 | - | 1.7 |
| Total Lake Depth | m | 3 | 3.2 | 3.6 | 2.7 | 2.3 | 2.2 | 2 | 3 | 2 | 2.4 | 2.4 | 3 | 2.63 | 2.8 | 4 | 3.48 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.3 | 7.72 | 7.65 | 7.63 | - | 6.8 | 7.1 | - | 7.2 | 7.3 | 7.4 | 7.6 | 7.79 | 7.63 | 7.6 | 7.78 |
| Specific Conductivity - laboratory | µS/cm | 70.7 | 451 | 91.5 | 67.5 | - | 712 | 73.2 | - | 75.7 | 80.2 | 79.6 | 85.3 | 373 | 480 | 105 | 480 |
| Total Dissolved Solids | mg/L | 32 | 283 | 42 | 47 | - | 373 | 34 | - | 20 | 37 | 37 | 49 | - | 313 | 69 | - |
| Total Dissolved Solids (Calculated) | mg/L | - | 241 | 46 | - | - | - | - | - | - | - | - | 43 | 199 | 247 | 51 | 256 |
| Total Alkalinity | mg $CaCO_3$/L | 24 | 162 | 29 | 27 | - | 298 | 25 | - | 27 | 27 | 27 | 28 | 131 | 143 | 27 | 140 |
| Total Hardness | mg $CaCO_3$/L | 24 | 190 | 34 | 27 | - | 303 | 29 | - | 30 | 29 | 29 | 36 | 159 | 203 | 42 | 222 |
| Total Suspended Solids | mg/L | < 3 | < 3 | < 3 | < 3 | - | < 2 | 3 | - | < 3 | 3 | < 3 | 3 | 11 | < 3 | < 3 | 3 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | 73 | - | - | 92 |
| Turbidity - laboratory | NTU | 0.44 | - | - | 1.1 | - | 1.1 | 0.5 | - | 0.22 | 0.42 | 0.33 | - | - | - | - | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 29 | 197 | 35.7 | 27 | - | 364 | 31 | - | 32 | 33 | 34 | 34 | 160 | 174 | 33 | 171 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 8.75 | - | - | 8.65 | - | 97.7 | 9.34 | - | 9.58 | 9.54 | 9.69 | 10.9 | 49.3 | - | 13.9 | 66.2 |
| Carbonate | mg/L | < 5 | < 5 | < 5 | < 0.3 | - | < 1 | < 1 | - | < 1 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Chloride | mg/L | 3 | 35.5 | 8.43 | 3.6 | - | 36.6 | 3.52 | - | 3.64 | 4 | 4 | 7 | 31.4 | 56.5 | 12 | 60.2 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydroxide | mg/L | < 5 | < 5 | < 5 | - | - | < 1 | < 1 | - | < 1 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Magnesium | mg/L | 0.977 | - | - | 1.29 | - | 14.4 | 1.37 | - | 1.37 | 1.29 | 1.32 | 1.32 | 7.28 | - | 1.46 | 8.18 |
| Potassium | mg/L | 0.695 | - | - | 0.667 | - | 6.07 | 0.7 | - | 0.67 | 0.646 | 0.648 | 0.71 | 2.99 | - | 0.9 | 3.94 |
| Reactive Silica (as $SiO_2$) | mg/L | 0.3 | - | - | 0.422 | - | 7.5 | 0.5 | - | 0.4 | 0.2 | 0.3 | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 2.02 | - | - | 1.94 | - | 21.5 | 2.2 | - | 2.1 | 1.93 | 1.97 | 2.58 | 11.3 | - | 2.46 | 11.3 |
| Sulphate | mg/L | 2.82 | 14.6 | 2.69 | < 3 | - | 17.7 | 2.04 | - | 3.13 | 3.15 | 3.22 | 2.6 | 12.5 | 11.9 | 3 | 9.53 |
| Ion Balance | % | 93.3 | 104 | - | - | - | 97 | 107 | - | 101 | 94.7 | 91 | - | 102 | 101 | 106 | 111 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 9.5 | 52 | 25.6 | 10 | - | 108 | 9.9 | - | 10.7 | 10.8 | 9.9 | 10 | - | 48.2 | 11 | - |
| Total Organic Carbon | mg/L | 4.3 | 13 | 5.1 | 3.8 | - | 24.9 | 3.7 | - | 4.5 | 5 | 4 | 4 | - | 13.4 | 5 | - |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | 4.3 | - | - | 4.9 | - |
| Total Inorganic Carbon | mg/L | 5.2 | 40.3 | 5.1 | 6 | - | 80.2 | 6.2 | - | 6.2 | 5.8 | 5.9 | - | - | 36.4 | - | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | 6 | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.005 | 0.128 | < 0.05 | 0.012 | - | 0.087 | 0.027 | - | 0.008 | < 0.005 | < 0.005 | < 0.05 | 0.204 | 0.092 | < 0.05 | 0.459 |
| Nitrate as Nitrogen | mg/L | < 0.006 | < 0.05 | < 0.05 | 0.011 | - | 0.033 | < 0.006 | - | < 0.006 | < 0.006 | < 0.006 | < 0.1 | < 0.05 | < 0.05 | < 0.1 | < 0.05 |
| Nitrite as Nitrogen | mg/L | - | < 0.05 | < 0.05 | - | - | - | - | - | - | - | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.006 | < 0.071 | < 0.071 | 0.011 | - | 0.033 | < 0.006 | - | < 0.006 | < 0.006 | < 0.006 | < 0.1 | < 0.071 | < 0.071 | < 0.1 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | 0.24 | 0.87 | < 0.2 | 0.3 | - | 1.77 | 0.55 | - | 0.35 | 0.2 | 0.14 | 0.2 | 1.15 | 0.8 | 0.4 | 1.46 |
| Phosphorus, Total | mg/L | 0.035 | 0.009 | 0.009 | 0.015 | - | 0.014 | 0.01 | - | 0.005 | 0.016 | 0.01 | 0.009 | 0.025 | 0.007 | 0.008 | 0.009 |
| Phosphorus, Total Dissolved | mg/L | 0.009 | 0.005 | 0.006 | 0.01 | - | 0.008 | 0.006 | - | 0.002 | 0.003 | < 0.001 | 0.003 | 0.024 | 0.004 | 0.004 | 0.009 |
| Orthophosphate (PO4-P) | mg/L | 0.002 | < 0.001 | < 0.001 | 0.005 | - | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | 0.53 | - | - | 3.03 | 3.08 | - | 1.46 | 1.56 | 0.94 | 0.44 | - | 6 | - | - | 5 | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | 0.002 | < 0.000002 | < 0.000002 | - | - | < 0.001 | 0.001 | - | < 0.002 | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.000002 | < 0.002 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.002 | < 0.001 | 0.0058 | 0.0043 | - | 0.0059 | 0.0026 | - | 0.0023 | 0.0043 | 0.0026 | 0.0037 | 0.0134 | < 0.001 | 0.0029 | < 0.005 |
| Antimony (Sb) - Total | mg/L | 0.00008 | < 0.0001 | < 0.0001 | 0.0005 | - | < 0.00003 | 0.00005 | - | 0.00006 | 0.00008 | 0.00009 | < 0.00003 | < 0.0002 | < 0.0001 | < 0.0002 | < 0.0002 |
| Arsenic (As) - Total | mg/L | 0.0008 | 0.0015 | 0.0012 | 0.0013 | - | 0.0031 | 0.0013 | - | 0.0016 | 0.0012 | 0.0012 | 0.0015 | **0.0114**[C,W] | 0.0028 | 0.0012 | < 0.003 |
| Barium (Ba) - Total | mg/L | 0.0092 | 0.0592 | 0.0107 | 0.0083 | - | 0.103 | 0.0091 | - | 0.0096 | 0.0108 | 0.011 | 0.0104 | 0.0633 | 0.0725 | 0.0132 | 0.0867 |
| Beryllium (Be) - Total | mg/L | < 0.0002 | < 0.0005 | < 0.0005 | 0.0001 | - | < 0.0002 | < 0.0002 | - | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.001 | < 0.0005 | < 0.0002 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | - | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | 0.0001 | - | - | - | < 0.001 | < 0.00005 | - | < 0.001 |
| Boron (B) - Total | mg/L | 0.003 | 0.0114 | 0.0055 | - | - | - | - | - | - | 0.002 | 0.002 | 0.002 | < 0.05 | 0.0069 | 0.002 | < 0.05 |
| Cadmium (Cd) - Total | mg/L | 0.0003 | < 0.00001 | < 0.00001 | < 0.0001 | - | < 0.0001 | 0.0003 | - | < 0.00002 | 0.0007 | 0.0005 | < 0.00005 | 0.00002 | < 0.00001 | < 0.00005 | 0.00003 |
| Cesium (Cs) - Total | mg/L | - | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | - | - | - | - | - | - | - |
| Chromium (Cr) - Total | mg/L | 0.0013 | < 0.0001 | 0.0019 | < 0.002 | - | 0.0036 | 0.0029 | - | 0.0005 | 0.0015 | 0.0016 | < 0.00006 | 0.0012 | < 0.0001 | < 0.00006 | < 0.001 |
| Cobalt (Co) - Total | mg/L | < 0.0001 | 0.0004 | < 0.0001 | < 0.0001 | - | 0.0008 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0003 | 0.0007 | < 0.0001 | 0.0005 |
| Copper (Cu) - Total | mg/L | 0.0025 | 0.0019 | 0.001 | 0.0014 | - | 0.0051 | 0.0008 | - | 0.0009 | 0.0022 | 0.002 | 0.0012 | 0.0019 | 0.0013 | 0.0012 | 0.0037 |

| Waterbody | | B2 | B2 | B2 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B5 | B6 | B6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 19-Jul-00 | 11-Apr-11 | 20-Jul-11 | 19-Jul-97 | 18-Aug-97 | 26-Apr-98 | 20-Jul-98 | 28-Aug-98 | 18-Jul-99 | 18-Jul-00 | 18-Jul-00 | 14-Jul-08 | 27-Apr-09 | 9-Apr-11 | 12-Jul-08 | 27-Apr-09 |
| **Source** | | RL&L 2001 | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2001 | RL&L 2001 | Golder | Golder | Golder | Golder | Golder |
| Iron (Fe) - Total | mg/L | 0.132 | 0.579 | 0.139 | 0.075 | - | 0.38 | 0.026 | - | 0.089 | 0.151 | 0.152 | 0.118 | - | 0.61 | 0.083 | - |
| Lead (Pb) - Total | mg/L | 0.0015 | < 0.00005 | < 0.00005 | < 0.0002 | - | < 0.00005 | < 0.00005 | - | < 0.00005 | 0.0009 | 0.0012 | < 0.00005 | < 0.0005 | < 0.00005 | 0.0001 | < 0.0005 |
| Lithium (Li) - Total | mg/L | - | < 0.005 | < 0.005 | 0.0004 | - | 0.0076 | < 0.0001 | - | 0.0007 | - | - | - | 0.0057 | 0.0115 | - | 0.0125 |
| Manganese (Mn) - Total | mg/L | 0.0105 | 0.378 | 0.0095 | 0.0118 | - | 0.205 | 0.0005 | - | 0.0156 | 0.0148 | 0.0149 | 0.0112 | 0.277 | 0.276 | 0.0072 | 0.383 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | - | < 0.00001 | < 0.00002 | - | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | 0.0002 | 0.0007 | 0.0007 | 0.0004 | - | 0.0002 | 0.0002 | - | 0.0002 | 0.00009 | 0.0001 | 0.0001 | < 0.001 | 0.0002 | 0.0001 | < 0.001 |
| Nickel (Ni) - Total | mg/L | 0.0007 | 0.002 | 0.0007 | 0.0011 | - | 0.0089 | 0.001 | - | 0.001 | 0.0014 | 0.0008 | 0.0005 | 0.0031 | 0.0026 | 0.0006 | 0.0044 |
| Selenium (Se) - Total | mg/L | < 0.0001 | 0.0001 | < 0.0001 | < 0.01 | - | 0.0006 | 0.0001 | - | 0.0001 | < 0.0001 | 0.0001 | 0.0001 | < 0.001 | < 0.0001 | 0.0002 | < 0.0005 |
| Silver (Ag) - Total | mg/L | < 0.0001 | < 0.00001 | 0.00001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.00002 | < 0.00001 | < 0.0001 | < 0.00002 |
| Strontium (Sr) - Total | mg/L | 0.0354 | 0.248 | 0.0548 | 0.0476 | - | 0.542 | 0.0496 | - | 0.0498 | 0.0477 | 0.0487 | 0.0506 | 0.275 | 0.364 | 0.0749 | 0.408 |
| Thallium (Tl) - Total | mg/L | - | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00003 | - | < 0.00003 | - | - | < 0.00003 | < 0.0002 | < 0.00005 | < 0.00003 | < 0.0002 |
| Tin (Sn) - Total | mg/L | - | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | < 0.0005 | < 0.0001 | - | < 0.0005 |
| Titanium (Ti) - Total | mg/L | - | < 0.0003 | < 0.0003 | 0.0002 | - | - | - | - | - | - | - | - | - | < 0.0003 | - | - |
| Uranium (U) - Total | mg/L | < 0.00005 | 0.0003 | 0.00003 | < 0.0001 | - | 0.0002 | < 0.00005 | - | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | 0.00007 | 0.0001 | < 0.00005 | 0.00008 |
| Vanadium (V) - Total | mg/L | 0.0005 | < 0.0001 | 0.0003 | < 0.0001 | - | 0.001 | 0.00005 | - | < 0.00005 | 0.0005 | 0.0005 | 0.0001 | < 0.001 | < 0.0001 | 0.0001 | < 0.001 |
| Zinc (Zn) - Total | mg/L | 0.0413 | 0.0012 | < 0.003 | 0.0128 | - | 0.01 | 0.0011 | - | 0.0027 | 0.0496 | 0.0482 | 0.0009 | 0.0091 | < 0.001 | < 0.0008 | 0.0147 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | - | < 0.003 | < 0.003 | - | - | - | - | - | - | - | - | 0.0022 | 0.0057 | < 0.003 | 0.002 | < 0.005 |
| Antimony (Sb) - Dissolved | mg/L | - | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.00003 | < 0.0005 | < 0.0001 | < 0.00003 | < 0.0005 |
| Arsenic (As) - Dissolved | mg/L | - | 0.00132 | 0.00101 | - | - | - | - | - | - | - | - | 0.00115 | 0.00449 | 0.00156 | 0.00101 | < 0.003 |
| Barium (Ba) - Dissolved | mg/L | - | 0.0608 | 0.0104 | - | - | - | - | - | - | - | - | 0.00995 | - | 0.0746 | 0.0127 | - |
| Beryllium (Be) - Dissolved | mg/L | - | < 0.0005 | < 0.0005 | - | - | - | - | - | - | - | - | < 0.0002 | < 0.001 | < 0.0005 | < 0.0002 | < 0.001 |
| Boron (B) - Dissolved | mg/L | - | 0.0123 | 0.0072 | - | - | - | - | - | - | - | - | 0.0003 | - | 0.007 | 0.0002 | - |
| Cadmium (Cd) - Dissolved | mg/L | - | < 0.00001 | < 0.00001 | - | - | - | - | - | - | - | - | < 0.00005 | 0.00002 | < 0.00001 | < 0.00005 | 0.000023 |
| Calcium (Ca) - Dissolved | mg/L | - | 65.9 | 11.8 | - | - | - | - | - | - | - | - | 10.8 | 52 | 71.1 | 13.8 | 75 |
| Chromium (Cr) - Dissolved | mg/L | - | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.00006 | < 0.004 | < 0.0001 | < 0.00006 | 0.0041 |
| Cobalt (Co) - Dissolved | mg/L | - | 0.0004 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.0001 | < 0.0003 | 0.00054 | < 0.0001 | 0.00047 |
| Copper (Cu) - Dissolved | mg/L | - | 0.00202 | 0.00077 | - | - | - | - | - | - | - | - | 0.001 | 0.0015 | 0.00136 | 0.0022 | 0.0017 |
| Iron (Fe) - Dissolved | mg/L | - | 0.208 | 0.033 | - | - | - | - | - | - | - | - | 0.038 | - | 0.073 | 0.034 | - |
| Lead (Pb) - Dissolved | mg/L | - | < 0.00005 | < 0.00005 | - | - | - | - | - | - | - | - | 0.00007 | < 0.0005 | < 0.00005 | 0.00019 | < 0.0005 |
| Lithium (Li) - Dissolved | mg/L | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - | - | 0.0055 | 0.0123 | - | 0.0127 |
| Magnesium (Mg) - Dissolved | mg/L | - | 7.94 | 1.38 | - | - | - | - | - | - | - | - | 1.32 | 7 | 8.88 | 1.43 | 8 |
| Manganese (Mn) - Dissolved | mg/L | - | 0.393 | 0.000917 | - | - | - | - | - | - | - | - | 0.0015 | 0.237 | 0.241 | 0.0026 | 0.367 |
| Mercury (Hg) - Dissolved | mg/L | - | < 0.00002 | < 0.00002 | - | - | - | - | - | - | - | - | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | - | 0.000667 | 0.000263 | - | - | - | - | - | - | - | - | 0.00011 | < 0.001 | 0.000181 | 0.00011 | < 0.001 |
| Nickel (Ni) - Dissolved | mg/L | - | 0.00197 | 0.00056 | - | - | - | - | - | - | - | - | 0.00046 | 0.0025 | 0.00256 | 0.00061 | 0.0039 |
| Potassium (K) - Dissolved | mg/L | - | 3.88 | 0.852 | - | - | - | - | - | - | - | - | 0.69 | 3.75 | 3.69 | 0.9 | 5.18 |
| Selenium (Se) - Dissolved | mg/L | - | 0.00011 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.0001 | < 0.001 | < 0.0001 | < 0.0001 | < 0.001 |
| Silver (Ag) - Dissolved | mg/L | - | < 0.00001 | < 0.00001 | - | - | - | - | - | - | - | - | < 0.0001 | < 0.00002 | < 0.00001 | < 0.0001 | < 0.00002 |
| Sodium (Na) - Dissolved | mg/L | - | 18.4 | 3.4 | - | - | - | - | - | - | - | - | 2.56 | 13 | 13.8 | 2.43 | 14 |
| Strontium (Sr) - Dissolved | mg/L | - | 0.249 | 0.052 | - | - | - | - | - | - | - | - | 0.0506 | - | 0.357 | 0.0745 | - |
| Thallium (Tl) - Dissolved | mg/L | - | < 0.00005 | < 0.00005 | - | - | - | - | - | - | - | - | < 0.00003 | < 0.0002 | < 0.00005 | < 0.00003 | < 0.0002 |
| Tin (Sn) - Dissolved | mg/L | - | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | < 0.0005 | < 0.0001 | - | < 0.0005 |
| Uranium (U) - Dissolved | mg/L | - | 0.000251 | 0.00004 | - | - | - | - | - | - | - | - | < 0.00005 | < 0.0002 | 0.000116 | < 0.00005 | < 0.0002 |
| Vanadium (V) - Dissolved | mg/L | - | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.00005 | < 0.001 | < 0.0001 | < 0.00005 | < 0.001 |
| Zinc (Zn) - Dissolved | mg/L | - | < 0.003 | < 0.003 | - | - | - | - | - | - | - | - | 0.0046 | - | < 0.003 | 0.0015 | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | 2 | - | - | 9[C] | - | < 1 | < 1 | - | < 1 | < 1 | < 1 | 2 | - | - | - | - |
| Benzene | µg/L | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | < 0.5 | < 0.5 | - | - | - | - |
| Ethylbenzene | µg/L | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | < 0.5 | < 0.5 | - | - | - | - |
| Toluene | µg/L | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | - | 0.7 | < 0.5 | < 0.5 | - | - | - | - |
| Xylenes | µg/L | < 0.5 | - | - | < 0.5 | - | - | < 0.5 | - | - | 3.9 | < 0.5 | < 0.5 | - | - | - | - |
| Total Volatiles | µg/L | < 100 | - | - | < 100 | - | - | < 100 | - | - | < 100 | < 100 | - | - | - | - | - |
| Total Extractables | µg/L | < 50 | - | - | < 50 | - | - | < 50 | - | - | < 50 | < 50 | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[A] = Concentration higher than the relevant acute aquatic life gui
[C] = Concentration higher than the relevant chronic aquatic life g
[W] = Concentration higher than the relevant drinking water guide
[D>A] = Detection limit higher than acute aquatic life guideline.
[D>C] = Detection limit higher than chronic aquatic life guideline.
[D>W] = Detection limit higher than drinking water guideline.

| Waterbody | | B6 | B6 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B36 | B36 | B45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 28-Jul-09 | 28-Jul-09 | 9-Apr-11 | 18-Jul-97 | 19-Aug-97 | 27-Apr-98 | 27-Apr-98 | 19-Jul-98 | 22-Aug-98 | 8-Nov-98 | 12-Jul-08 | 27-Apr-09 | 9-Apr-11 | 11-Aug-94 | 24-Jul-11 | 11-Apr-11 |
| **Source** | | Golder | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Dillon 1994 | Golder | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 16.2 | 16.2 | 0.4 | 14.3 | 14.7 | 0.6 | 0.6 | 9.7 | 9.9 | < 0.5 | 14.8 | 0.6 | 0.1 | 9.4 | 17.5 | 0.2 |
| Dissolved Oxygen - field | mg/L | 8.44 | 8.44 | **5.6**[C] | 10.8 | 10.7 | **3.5**[C] | **3.5**[C] | 12.7 | 10.4 | - | 11.52 | **4**[C] | **5.3**[C] | - | 9.3 | **1**[C] |
| pH - field | pH | 6.98 | 6.98 | 7.3 | 7.41 | 7.94 | 7 | 7 | - | 7.67 | 7.48 | 7.28 | **5.84**[C,W] | 7.4 | 7.16 | 8 | 6.5 |
| Specific Conductivity - field | µS/cm | 141 | 141 | 669 | 84 | 92.2 | 278 | 278 | 76 | 84.7 | 138.7 | 108 | 408 | 559 | - | 264 | 840 |
| Secchi Disk Depth | m | 3.8 | 3.8 | - | 3.2 | 3.8 | - | - | 3.5 | 3 | - | 4.2 | - | - | - | 0.8 | - |
| Ice Depth | m | - | - | 1.7 | - | - | 1.8 | 1.8 | - | - | - | - | 1.8 | 1.7 | - | - | 1.5 |
| Total Lake Depth | m | 3.8 | 3.8 | 3 | 3.2 | 3.8 | 3.2 | 3.2 | 3.5 | 3.8 | - | 4.6 | 3.82 | 2.3 | - | 0.8 | 1.6 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.71 | 7.7 | 7.64 | 7.5 | - | 6.8 | 6.8 | 7.2 | - | 7.4 | 7.6 | 7.77 | 7.64 | 8.08 | 8.39 | 7.73 |
| Specific Conductivity - laboratory | µS/cm | 140 | 139 | 672 | 70.3 | - | 306 | 302 | 68.5 | - | 108 | 103 | 435 | 617 | 206 | 276 | 864 |
| Total Dissolved Solids | mg/L | 96 | 91 | 448 | 38 | - | 145 | 163 | 33 | - | 53 | 75 | - | 423 | 134 | 170 | **556**[W] |
| Total Dissolved Solids (Calculated) | mg/L | 68 | 64 | 332 | - | - | - | - | - | - | - | 53 | 222 | 300 | - | 143 | 482 |
| Total Alkalinity | mg $CaCO_3$/L | 33 | 31 | 137 | 29 | - | 119 | 151 | 26 | - | 40 | 26 | 108 | 110 | 92 | 97 | 362 |
| Total Hardness | mg $CaCO_3$/L | 55 | 51 | 280 | 29 | - | 119 | 118 | 28 | - | 42 | 43 | 185 | 253 | 98 | 115 | 394 |
| Total Suspended Solids | mg/L | 4 | < 3 | < 3 | < 3 | - | 4 | 2 | < 2 | - | 3 | 3 | 4 | < 3 | 1 | < 3 | 5 |
| Total Volatile Solids | mg/L | 65 | 81 | - | - | - | - | - | - | - | - | - | 84 | - | - | - | - |
| Turbidity - laboratory | NTU | - | - | - | 0.6 | - | 0.7 | 1 | 0.5 | - | 0.52 | - | - | - | 0.58 | - | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 39.8 | 37.8 | 167 | 29 | - | 145 | 144 | 31 | - | 49 | 32 | 132 | 134 | - | 115 | 442 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 19.4 | 19.2 | - | 9.31 | - | 39.6 | 38.5 | 9.32 | - | 14 | 12.8 | 57.7 | - | 32.9 | - | - |
| Carbonate | mg/L | < 5 | < 5 | < 5 | < 0.3 | - | < 1 | < 1 | < 1 | - | < 1 | < 5 | < 5 | < 5 | - | < 5 | < 5 |
| Chloride | mg/L | 21.3 | 20.2 | 116 | 3.22 | - | 12.6 | 12.4 | 2.77 | - | 5.36 | 13 | 63.5 | 114 | 7.8 | 13.3 | 50.6 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.07 | - | - |
| Hydroxide | mg/L | < 5 | < 5 | < 5 | - | - | < 1 | < 1 | < 1 | - | < 1 | < 5 | < 5 | < 5 | - | < 5 | < 5 |
| Magnesium | mg/L | 2.1 | 2.09 | - | 1.29 | - | 5 | 5.23 | 1.22 | - | 1.75 | 1.29 | 6.8 | - | 3.83 | - | - |
| Potassium | mg/L | < 2 | < 2 | - | 0.787 | - | 2.81 | 2.83 | 0.79 | - | 1.13 | 0.85 | 3.22 | - | 1.72 | - | - |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | 0.702 | - | 7 | 6.8 | 0.9 | - | 1.1 | - | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | < 1 | - | - |
| Sodium | mg/L | 3.2 | 3.2 | - | 1.9 | - | 7.4 | 7.5 | 1.8 | - | 2.7 | 1.99 | 8.24 | - | 3.82 | - | - |
| Sulphate | mg/L | 2.22 | 2.09 | 9.83 | < 3 | - | 5.66 | 5.44 | 1.45 | - | 3.83 | 4.1 | 9.08 | 8.19 | 6.9 | 21.2 | 28.1 |
| Ion Balance | % | 96.9 | 94.4 | 102 | - | - | 98 | 98 | 108 | - | 96 | 104 | 102 | 102 | - | - | 101 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 11.9 | 12.3 | 48.4 | 12 | - | 46 | 46 | 10.8 | - | 17 | 11 | - | 38.6 | - | 31.9 | 106 |
| Total Organic Carbon | mg/L | 5.2 | 5.2 | 14.2 | 4.5 | - | 12.2 | 12 | 4.5 | - | 8.1 | 6 | - | 12 | - | 12.2 | 28.3 |
| Dissolved Organic Carbon | mg/L | 5.1 | 5 | - | - | - | - | - | - | - | - | 4.5 | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 7.7 | 8 | 34.6 | 7 | - | 36.2 | 36 | 6.3 | - | 9.1 | - | - | 28.3 | - | 22.6 | 92.1 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | 0.182 | 0.011 | - | 0.203 | 0.233 | 0.019 | - | - | < 0.05 | 0.23 | 0.214 | - | < 0.05 | 0.082 |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.008 | - | 0.041 | 0.032 | < 0.006 | - | 0.011 | < 0.1 | 0.196 | < 0.05 | < 0.005 | < 0.05 | < 0.05 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | - | - | - | - | - | - | - | < 0.05 | < 0.05 | < 0.05 | 0.001 | < 0.05 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | < 0.071 | < 0.071 | < 0.008 | - | 0.044 | 0.035 | < 0.006 | - | 0.014 | < 0.1 | 0.196 | < 0.071 | - | < 0.071 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | 0.43 | 0.39 | 0.99 | 0.29 | - | 1.45 | 1.46 | 0.47 | - | - | 0.3 | 1.01 | 0.91 | - | 0.84 | 1.64 |
| Phosphorus, Total | mg/L | 0.007 | 0.008 | 0.008 | 0.1 | - | 0.011 | 0.009 | 0.012 | - | - | 0.013 | 0.008 | 0.008 | < 0.3 | 0.015 | 0.015 |
| Phosphorus, Total Dissolved | mg/L | 0.003 | 0.002 | 0.005 | 0.009 | - | 0.009 | 0.008 | 0.007 | - | 0.008 | 0.004 | 0.007 | 0.004 | - | 0.003 | 0.008 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.001 | 0.002 | - | < 0.001 | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | - | - | - | 1.08 | 1.67 | - | - | - | 2.22 | - | 5 | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | < 0.002 | < 0.000002 | - | - | < 0.001 | < 0.001 | 0.002 | - | < 0.002 | < 0.002 | < 0.002 | < 0.000002 | - | < 0.000002 | < 0.000002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | < 0.005 | < 0.005 | < 0.001 | 0.0017 | - | < 0.0003 | < 0.0003 | 0.001 | - | 0.0008 | 0.0015 | < 0.008 | 0.0025 | < 0.2 | 0.0259 | 0.0099 |
| Antimony (Sb) - Total | mg/L | < 0.0002 | < 0.0002 | < 0.0001 | < 0.0002 | - | < 0.0002 | < 0.0002 | < 0.0002 | - | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0001 | < 0.2 | < 0.0001 | < 0.0001 |
| Arsenic (As) - Total | mg/L | 0.0011 | 0.0012 | 0.0016 | 0.0009 | - | 0.0017 | 0.0018 | 0.0013 | - | 0.0017 | 0.0012 | < 0.003 | 0.0015 | 0.001 | 0.0041 | 0.0028 |
| Barium (Ba) - Total | mg/L | < 0.02 | < 0.02 | 0.104 | 0.0082 | - | 0.0435 | 0.0437 | 0.0092 | - | 0.0149 | 0.0116 | 0.0638 | 0.0841 | 0.0018 | 0.0288 | 0.119 |
| Beryllium (Be) - Total | mg/L | < 0.001 | < 0.001 | < 0.0005 | < 0.0001 | - | < 0.0002 | < 0.0002 | < 0.0002 | - | < 0.0002 | < 0.0002 | < 0.001 | < 0.0005 | < 0.005 | < 0.0005 | < 0.0005 |
| Bismuth (Bi) - Total | mg/L | - | - | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00005 | < 0.00003 | - | < 0.00003 | - | < 0.001 | < 0.00005 | < 0.1 | < 0.00005 | < 0.00005 |
| Boron (B) - Total | mg/L | < 0.1 | < 0.1 | 0.0069 | - | - | - | - | - | - | - | 0.002 | < 0.05 | 0.0068 | < 0.1 | 0.0044 | 0.0159 |
| Cadmium (Cd) - Total | mg/L | < 0.00001 | < 0.00001 | < 0.00001 | < 0.0001 | - | < 0.0001 | < 0.0001 | **0.0218**[C,W] | - | 0.00007 | < 0.00005 | 0.00002 | < 0.00001 | < 0.0002 | < 0.00001 | 0.00001 |
| Cesium (Cs) - Total | mg/L | - | - | - | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | - | - | - | - | - | - |
| Chromium (Cr) - Total | mg/L | < 0.001 | < 0.001 | < 0.0001 | < 0.002 | - | 0.0037 | 0.003 | 0.0028 | - | 0.0007 | < 0.00006 | < 0.001 | < 0.0001 | < 0.015 | 0.0002 | 0.0002 |
| Cobalt (Co) - Total | mg/L | < 0.0003 | < 0.0003 | 0.0002 | < 0.0001 | - | 0.0003 | 0.0003 | < 0.0001 | - | 0.0002 | < 0.0001 | < 0.0003 | 0.0001 | < 0.015 | 0.0001 | 0.0008 |
| Copper (Cu) - Total | mg/L | 0.001 | 0.0011 | 0.0016 | 0.0008 | - | 0.0024 | 0.0017 | 0.0013 | - | 0.0062 | 0.0027 | 0.002 | 0.0012 | < 0.01 | 0.0035 | 0.0047 |

| Waterbody | | B6 | B6 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B36 | B36 | B45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 28-Jul-09 | 28-Jul-09 | 9-Apr-11 | 18-Jul-97 | 19-Aug-97 | 27-Apr-98 | 27-Apr-98 | 19-Jul-98 | 22-Aug-98 | 8-Nov-98 | 12-Jul-08 | 27-Apr-09 | 9-Apr-11 | 11-Aug-94 | 24-Jul-11 | 11-Apr-11 |
| **Source** | | Golder | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Dillon 1994 | Golder | Golder |
| Iron (Fe) - Total | mg/L | 0.117 | 0.118 | 0.211 | 0.063 | - | 0.192 | 0.22 | 0.056 | - | 0.02 | 0.064 | - | 0.196 | 0.0039 | 0.115 | 0.461 |
| Lead (Pb) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.00005 | < 0.0002 | - | < 0.00005 | < 0.00005 | 0.0001 | - | 0.0003 | < 0.00005 | < 0.0005 | < 0.00005 | < 0.001 | 0.00008 | < 0.00005 |
| Lithium (Li) - Total | mg/L | 0.0054 | 0.0052 | 0.0301 | < 0.0001 | - | 0.003 | 0.0028 | < 0.0001 | - | < 0.0001 | - | 0.0168 | 0.032 | < 0.015 | < 0.005 | 0.0068 |
| Manganese (Mn) - Total | mg/L | 0.0116 | 0.0128 | 0.142 | 0.0024 | - | 0.0651 | 0.079 | 0.0007 | - | 0.0003 | 0.004 | 0.111 | 0.0775 | < 0.005 | 0.0225 | 0.432 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | - | < 0.00001 | < 0.00001 | < 0.00002 | - | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00005 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | < 0.001 | < 0.001 | 0.0002 | 0.0001 | - | 0.0002 | 0.0002 | 0.0001 | - | 0.0002 | 0.0001 | < 0.001 | 0.0003 | < 0.03 | 0.0006 | 0.0009 |
| Nickel (Ni) - Total | mg/L | < 0.001 | < 0.001 | 0.0037 | 0.0011 | - | 0.0033 | 0.0035 | 0.0011 | - | 0.0019 | 0.0006 | 0.0029 | 0.0032 | < 0.02 | 0.0021 | 0.005 |
| Selenium (Se) - Total | mg/L | < 0.001 | < 0.001 | < 0.0001 | < 0.01 | - | < 0.0001 | < 0.0001 | 0.0002 | - | < 0.0001 | 0.0002 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0001 | 0.0002 |
| Silver (Ag) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.00002 | < 0.00001 | < 0.015 | < 0.00001 | < 0.00001 |
| Strontium (Sr) - Total | mg/L | - | - | 0.649 | 0.0479 | - | 0.196 | 0.211 | 0.051 | - | 0.0853 | 0.0752 | 0.394 | 0.721 | 0.121 | 0.166 | 0.55 |
| Thallium (Tl) - Total | mg/L | < 0.0002 | < 0.0002 | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00005 | < 0.00003 | - | 0.00005 | < 0.00003 | < 0.0002 | < 0.00005 | < 0.1 | < 0.00005 | < 0.00005 |
| Tin (Sn) - Total | mg/L | 0.0006 | 0.0016 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.0005 | < 0.0001 | < 0.3 | < 0.0001 | < 0.0001 |
| Titanium (Ti) - Total | mg/L | - | - | < 0.0003 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | - | - | < 0.0003 | < 0.01 | 0.0015 | 0.0006 |
| Uranium (U) - Total | mg/L | < 0.0002 | < 0.0002 | 0.0001 | < 0.0001 | - | 0.00009 | 0.00009 | < 0.00005 | - | < 0.00005 | < 0.00005 | 0.00007 | 0.0001 | - | 0.0002 | 0.0006 |
| Vanadium (V) - Total | mg/L | < 0.001 | < 0.001 | < 0.0001 | < 0.0001 | - | 0.001 | 0.0008 | 0.00007 | - | 0.00008 | 0.0002 | < 0.001 | < 0.0001 | < 0.03 | 0.0003 | 0.0001 |
| Zinc (Zn) - Total | mg/L | < 0.005 | < 0.005 | < 0.001 | < 0.005 | - | < 0.0008 | < 0.0008 | 0.0069 | - | 0.0145 | < 0.0008 | 0.0065 | 0.0027 | < 0.005 | < 0.003 | 0.0071 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | < 0.005 | < 0.005 | < 0.003 | - | - | - | - | - | - | - | 0.0019 | 0.013 | < 0.003 | - | < 0.003 | < 0.003 |
| Antimony (Sb) - Dissolved | mg/L | < 0.0005 | < 0.0005 | < 0.0001 | - | - | - | - | - | - | - | < 0.00003 | < 0.0005 | < 0.0001 | - | < 0.0001 | < 0.0001 |
| Arsenic (As) - Dissolved | mg/L | 0.00108 | 0.00112 | 0.00148 | - | - | - | - | - | - | - | 0.00107 | < 0.003 | 0.00135 | - | 0.00391 | 0.00246 |
| Barium (Ba) - Dissolved | mg/L | < 0.02 | < 0.02 | 0.106 | - | - | - | - | - | - | - | 0.0123 | - | 0.0865 | - | 0.0287 | 0.125 |
| Beryllium (Be) - Dissolved | mg/L | < 0.001 | < 0.001 | < 0.0005 | - | - | - | - | - | - | - | < 0.0002 | < 0.001 | < 0.0005 | - | < 0.0005 | < 0.0005 |
| Boron (B) - Dissolved | mg/L | < 0.1 | < 0.1 | 0.0065 | - | - | - | - | - | - | - | 0.0002 | - | 0.0065 | - | 0.004 | 0.0151 |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00001 | < 0.00001 | < 0.00001 | - | - | - | - | - | - | - | < 0.00005 | 0.000014 | < 0.00001 | - | < 0.00001 | 0.00011 |
| Calcium (Ca) - Dissolved | mg/L | 18.8 | 17.2 | 102 | - | - | - | - | - | - | - | 13.9 | 63.8 | 94.6 | - | 41 | 139 |
| Chromium (Cr) - Dissolved | mg/L | < 0.001 | < 0.001 | < 0.0001 | - | - | - | - | - | - | - | < 0.00006 | 0.0054 | < 0.0001 | - | 0.00011 | 0.00014 |
| Cobalt (Co) - Dissolved | mg/L | < 0.0003 | < 0.0003 | 0.00013 | - | - | - | - | - | - | - | < 0.0001 | < 0.0003 | < 0.0001 | - | < 0.0001 | 0.00071 |
| Copper (Cu) - Dissolved | mg/L | < 0.001 | < 0.001 | 0.00161 | - | - | - | - | - | - | - | 0.0008 | 0.0015 | 0.00123 | - | 0.00175 | 0.00454 |
| Iron (Fe) - Dissolved | mg/L | 0.038 | < 0.03 | 0.071 | - | - | - | - | - | - | - | 0.025 | - | 0.038 | - | 0.023 | 0.101 |
| Lead (Pb) - Dissolved | mg/L | < 0.0005 | < 0.0005 | < 0.00005 | - | - | - | - | - | - | - | 0.00012 | < 0.0005 | < 0.00005 | - | < 0.00005 | < 0.00005 |
| Lithium (Li) - Dissolved | mg/L | 0.0053 | < 0.005 | 0.0297 | - | - | - | - | - | - | - | - | 0.0158 | 0.0308 | - | < 0.005 | 0.0064 |
| Magnesium (Mg) - Dissolved | mg/L | 1.91 | 1.86 | 9.8 | - | - | - | - | - | - | - | 1.38 | 6.19 | 8.36 | - | 5.72 | 14.1 |
| Manganese (Mn) - Dissolved | mg/L | 0.00274 | 0.00291 | 0.118 | - | - | - | - | - | - | - | 0.0019 | 0.105 | 0.0639 | - | 0.00132 | 0.4 |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | - | - | - | - | - | - | - | < 0.00002 | < 0.00002 | < 0.00002 | - | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | < 0.001 | < 0.001 | 0.000178 | - | - | - | - | - | - | - | 0.00012 | < 0.001 | 0.000237 | - | 0.000537 | 0.000801 |
| Nickel (Ni) - Dissolved | mg/L | < 0.001 | < 0.001 | 0.00372 | - | - | - | - | - | - | - | 0.00052 | 0.0025 | 0.00327 | - | 0.00185 | 0.00508 |
| Potassium (K) - Dissolved | mg/L | 1.11 | 1.03 | 4.86 | - | - | - | - | - | - | - | 0.9 | 4 | 4.39 | - | 2.16 | 9.21 |
| Selenium (Se) - Dissolved | mg/L | < 0.001 | < 0.001 | < 0.0001 | - | - | - | - | - | - | - | < 0.0001 | < 0.001 | < 0.0001 | - | < 0.0001 | 0.00028 |
| Silver (Ag) - Dissolved | mg/L | < 0.00002 | < 0.00002 | < 0.00001 | - | - | - | - | - | - | - | < 0.0001 | < 0.00002 | < 0.00001 | - | < 0.00001 | < 0.00001 |
| Sodium (Na) - Dissolved | mg/L | 3.1 | 2.9 | 13.8 | - | - | - | - | - | - | - | 2.11 | 9.5 | 11.2 | - | 6.25 | 27.9 |
| Strontium (Sr) - Dissolved | mg/L | - | - | 0.64 | - | - | - | - | - | - | - | 0.0818 | - | 0.651 | - | 0.168 | 0.506 |
| Thallium (Tl) - Dissolved | mg/L | < 0.0002 | < 0.0002 | < 0.00005 | - | - | - | - | - | - | - | < 0.00003 | < 0.0002 | < 0.00005 | - | < 0.00005 | < 0.00005 |
| Tin (Sn) - Dissolved | mg/L | 0.00068 | 0.00187 | < 0.0001 | - | - | - | - | - | - | - | - | < 0.0005 | < 0.0001 | - | < 0.0001 | < 0.0001 |
| Uranium (U) - Dissolved | mg/L | < 0.0002 | < 0.0002 | 0.000106 | - | - | - | - | - | - | - | < 0.00005 | < 0.0002 | 0.000102 | - | 0.000197 | 0.000494 |
| Vanadium (V) - Dissolved | mg/L | < 0.001 | < 0.001 | < 0.0001 | - | - | - | - | - | - | - | < 0.00005 | < 0.001 | < 0.0001 | - | 0.00017 | 0.0001 |
| Zinc (Zn) - Dissolved | mg/L | < 0.005 | < 0.005 | < 0.003 | - | - | - | - | - | - | - | 0.0016 | - | < 0.003 | - | < 0.003 | < 0.003 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | **10**[C] | - | < 1 | < 1 | < 1 | - | 4 | 3 | - | - | - | - | - |
| Benzene | µg/L | - | - | - | < 0.5 | - | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - |
| Ethylbenzene | µg/L | - | - | - | < 0.5 | - | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - |
| Toluene | µg/L | - | - | - | < 0.5 | - | - | - | < 0.5 | - | - | < 0.5 | - | - | - | - | - |
| Xylenes | µg/L | - | - | - | < 0.5 | - | - | - | 0.6 | - | - | < 0.5 | - | - | - | - | - |
| Total Volatiles | µg/L | - | - | - | < 100 | - | - | - | < 100 | - | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | - | 62 | - | - | - | < 50 | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[A] = Concentration higher than the relevant acute aquatic life gui
[C] = Concentration higher than the relevant chronic aquatic life g
[W] = Concentration higher than the relevant drinking water guide
[D>A] = Detection limit higher than acute aquatic life guideline.
[D>C] = Detection limit higher than chronic aquatic life guideline.
[D>W] = Detection limit higher than drinking water guideline.

| Waterbody | | B45 | B46 | C5 | D1 | D1 | D4 | D5 | D7 | D7 | D7 | D7 | D7 | D7 | D23 | E3 | E3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 21-Jul-11 | 24-Jul-11 | 11-Aug-94 | 19-Aug-97 | 27-Apr-98 | 17-Jul-11 | 17-Jul-11 | 11-Aug-94 | 17-Jul-97 | 19-Aug-97 | 27-Apr-98 | 9-Apr-11 | 22-Jul-11 | 18-Jul-11 | 11-Aug-94 | 9-Apr-11 |
| **Source** | | Golder | Golder | Dillon 1994 | RL&L 1998 | RL&L 1999 | Golder | Golder | Dillon 1994 | RL&L 1998 | RL&L 1998 | RL&L 1999 | Golder | Golder | Golder | Dillon 1994 | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 15.2 | 19.1 | 8.8 | 16.1 | < 0.2 | 14.6 | 17.1 | 9.6 | 14.1 | 15.4 | 0.3 | 0.7 | 15.1 | 14.3 | 9.9 | 1.6 |
| Dissolved Oxygen - field | mg/L | 10.1 | 9.4 | - | 10.6 | **0.2**[C] | 9.8 | 9.5 | - | 10.8 | 10.8 | **1.5**[C] | **1.7**[C] | 9.8 | 9.9 | - | **6.3**[C] |
| pH - field | pH | 7.3 | 7.9 | 7.15 | 8.14 | 7.05 | 7.7 | 7.4 | 7.13 | 7.97 | 8.1 | 7.16 | 7.1 | 8 | 7.5 | 7.1 | 7.3 |
| Specific Conductivity - field | µS/cm | 76 | 124 | - | 134.9 | 1816 | 153 | 131 | - | 136.4 | 150.6 | 845 | 545 | 134 | 80 | - | 242 |
| Secchi Disk Depth | m | 2.4 | 2.1 | - | 2.2 | 2.2 | 1.6 | 2.4 | - | 2.2 | 2.2 | - | - | 2.8 | 3 | - | - |
| Ice Depth | m | - | - | - | - | 1.5 | - | - | - | - | - | 1.8 | 1.4 | - | - | - | 1.7 |
| Total Lake Depth | m | 2.4 | 2.1 | - | 2.2 | 2.2 | 1.6 | 2.4 | - | 2.2 | 2.2 | 2.3 | 2.7 | 2.8 | 3 | - | 4.2 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.93 | 8.16 | 7.51 | - | 7 | 8.1 | 8.07 | 6.92 | 7.83 | - | 7.1 | 7.73 | 8.15 | 7.98 | 6.84 | 7.74 |
| Specific Conductivity - laboratory | µS/cm | 79.9 | 129 | 63.5 | - | 1980 | 161 | 138 | 91.8 | 144 | - | 902 | 542 | 139 | 83.8 | 46.6 | 242 |
| Total Dissolved Solids | mg/L | 32 | 70 | 41 | - | **1100**[W] | 97 | 75 | 56 | - | - | - | 329 | 72 | 42 | 29 | 143 |
| Total Dissolved Solids (Calculated) | mg/L | 40 | 65 | - | - | - | 80 | 69 | - | 69 | - | 462 | 292 | 69 | 42 | - | 125 |
| Total Alkalinity | mg $CaCO_3$/L | 31 | 50 | 26 | - | 905 | 51 | 47 | 37 | 46 | - | 363 | 208 | 51 | 34 | 20 | 98 |
| Total Hardness | mg $CaCO_3$/L | 30 | 49 | 28 | - | 930 | 56 | 50 | 38 | 45 | - | 358 | 219 | 47 | 32 | 20 | 103 |
| Total Suspended Solids | mg/L | < 3 | < 3 | < 1 | - | 139 | < 3 | < 3 | < 1 | 3 | - | 2 | < 3 | < 3 | < 3 | < 1 | < 3 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | - | 0.37 | - | 210 | - | - | 0.65 | 1.1 | - | 1 | - | - | - | 0.58 | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 37.2 | 61 | - | - | 1100 | 62.2 | 57.5 | - | 45.8 | - | 443 | 254 | 61.9 | 40.9 | - | 119 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | - | - | 9.66 | - | 304 | - | - | 12.1 | 13.9 | - | 112 | - | - | - | 6.71 | - |
| Carbonate | mg/L | < 5 | < 5 | - | - | < 1 | < 5 | < 5 | - | < 0.3 | - | < 1 | < 5 | < 5 | < 5 | - | < 5 |
| Chloride | mg/L | 4.32 | 6.66 | 2.1 | - | 107 | 13.7 | 10.3 | 4.7 | 7.43 | - | 50.8 | 38.8 | 9.85 | 4.16 | 1.8 | 12.7 |
| Fluoride | mg/L | - | - | 0.05 | - | - | - | - | 0.04 | - | - | - | - | - | - | 0.03 | - |
| Hydroxide | mg/L | < 5 | < 5 | - | - | < 1 | < 5 | < 5 | - | - | - | < 1 | < 5 | < 5 | < 5 | - | < 5 |
| Magnesium | mg/L | - | - | 0.994 | - | 41.6 | - | - | 1.95 | 2.39 | - | 19 | - | - | - | 0.73 | - |
| Potassium | mg/L | - | - | 0.84 | - | 14.2 | - | - | 0.91 | 1.14 | - | 8.27 | - | - | - | 0.5 | - |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | - | 2.9 | - | - | - | 0.3 | - | 6 | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | < 1 | - | - | - | - | < 1 | - | - | - | - | - | - | < 1 | - |
| Sodium | mg/L | - | - | 1.42 | - | 60.7 | - | - | 3.15 | 4.57 | - | 36.7 | - | - | - | 1.1 | - |
| Sulphate | mg/L | 2.82 | 4.39 | 3.6 | - | 29.4 | 6.64 | 5.22 | 2.1 | < 3 | - | 17.6 | 15.6 | 3.89 | 2.33 | 1.4 | 5.55 |
| Ion Balance | % | - | - | - | - | 100 | - | - | - | - | - | 99 | 103 | - | - | - | 100 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 14.6 | 28.7 | - | - | 324 | 18.3 | 17 | - | 15 | - | 119 | 64 | 21.9 | 12.1 | - | 32.1 |
| Total Organic Carbon | mg/L | 6.1 | 6.8 | - | - | 64.9 | 7.6 | 6.4 | - | 4.2 | - | 23.2 | 15.9 | 5.4 | 4.7 | - | 9.4 |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 3.8 | 12 | - | - | 264 | 9.6 | 14.7 | - | 11 | - | 103 | 52 | 12.2 | 9.2 | - | 24.2 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | - | - | 1.35 | < 0.05 | < 0.05 | - | 0.028 | - | 0.305 | 0.254 | < 0.05 | < 0.05 | - | 0.128 |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.05 | 0.008 | - | < 0.006 | < 0.05 | < 0.05 | < 0.005 | < 0.008 | - | 0.044 | < 0.05 | < 0.05 | < 0.05 | 0.006 | < 0.05 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | 0.001 | - | - | < 0.05 | < 0.05 | < 0.001 | - | - | - | < 0.05 | < 0.05 | < 0.05 | 0.001 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | < 0.071 | - | - | < 0.006 | < 0.071 | < 0.071 | - | < 0.008 | - | 0.044 | < 0.071 | < 0.071 | < 0.071 | - | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | 0.26 | 0.39 | - | - | 5.95 | 0.53 | 0.45 | - | 0.31 | - | 7.78 | 1.21 | 0.28 | 0.33 | - | 0.7 |
| Phosphorus, Total | mg/L | 0.013 | 0.005 | < 0.3 | - | 0.045 | 0.011 | 0.01 | < 0.3 | 0.018 | - | 0.014 | 0.025 | 0.007 | 0.007 | < 0.3 | 0.01 |
| Phosphorus, Total Dissolved | mg/L | 0.007 | 0.001 | - | - | 0.018 | 0.004 | 0.004 | - | 0.008 | - | 0.011 | 0.035 | 0.003 | 0.002 | - | 0.004 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | - | - | < 0.001 | < 0.001 | < 0.001 | - | 0.003 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | < 0.001 |
| Chlorophyll a | µg/L | - | - | - | - | - | - | - | - | 1.68 | 1.27 | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.000002 | < 0.000002 | - | - | 0.004 | < 0.000002 | < 0.000002 | - | - | - | 0.001 | < 0.000002 | < 0.000002 | < 0.000002 | - | < 0.000002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.0065 | 0.0071 | <0.2[D>C,W] | - | 0.0205 | 0.0093 | 0.0078 | <0.2[D>C,W] | 0.0069 | - | 0.0019 | < 0.001 | 0.0055 | 0.0064 | <0.2[D>C,W] | < 0.001 |
| Antimony (Sb) - Total | mg/L | < 0.0001 | < 0.0001 | <0.2[D>W] | - | < 0.0002 | < 0.0001 | < 0.0001 | <0.2[D>W] | 0.0003 | - | < 0.00003 | < 0.0001 | < 0.0001 | < 0.0001 | <0.2[D>W] | < 0.0001 |
| Arsenic (As) - Total | mg/L | 0.001 | 0.0014 | 0.0006 | - | 0.0038 | 0.0017 | 0.0011 | 0.0005 | 0.0007 | - | 0.0028 | 0.0012 | 0.0011 | 0.0013 | 0.0004 | 0.001 |
| Barium (Ba) - Total | mg/L | 0.0114 | 0.017 | < 0.01 | - | 0.222 | 0.0186 | 0.0181 | 0.001 | 0.0151 | - | 0.133 | 0.0803 | 0.0164 | 0.0104 | < 0.01 | 0.0317 |
| Beryllium (Be) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.005 | - | 0.002 | < 0.0005 | < 0.0005 | < 0.005 | < 0.0001 | - | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.005 | < 0.0005 |
| Bismuth (Bi) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.1 | - | < 0.0003 | < 0.00005 | < 0.00005 | < 0.1 | < 0.0001 | - | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.1 | < 0.00005 |
| Boron (B) - Total | mg/L | 0.0057 | 0.0056 | < 0.1 | - | - | 0.0093 | 0.0072 | < 0.1 | - | - | - | 0.0253 | 0.01 | 0.0028 | < 0.1 | 0.0036 |
| Cadmium (Cd) - Total | mg/L | < 0.00001 | < 0.00001 | <0.0002[D>C] | - | <0.0005[D>C] | < 0.00001 | < 0.00001 | <0.0002[D>C] | **0.0002**[C] | - | <0.0001[D>C] | < 0.00001 | < 0.00001 | < 0.00001 | <0.0002[D>C] | < 0.00001 |
| Cesium (Cs) - Total | mg/L | - | - | - | - | < 0.0005 | - | - | - | < 0.0001 | - | < 0.0001 | - | - | - | - | - |
| Chromium (Cr) - Total | mg/L | < 0.0001 | < 0.0001 | <0.015[D>C] | - | **0.0202**[C] | 0.0001 | < 0.0001 | <0.015[D>C] | <0.002[D>C] | - | **0.0126**[C] | < 0.0001 | < 0.0001 | < 0.0001 | <0.015[D>C] | < 0.0001 |
| Cobalt (Co) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.01 | - | 0.0047 | < 0.0001 | < 0.0001 | < 0.015 | < 0.0001 | - | 0.0008 | 0.0001 | < 0.0001 | < 0.0001 | < 0.015 | < 0.0001 |
| Copper (Cu) - Total | mg/L | 0.0013 | 0.0014 | <0.01[D>C] | - | 0.003 | 0.001 | 0.0009 | <0.01[D>C] | **0.0026**[C] | - | **0.0178**[C] | 0.0019 | 0.0009 | 0.0006 | <0.01[D>C] | 0.0012 |

| Waterbody | | B45 | B46 | C5 | D1 | D1 | D4 | D5 | D7 | D7 | D7 | D7 | D7 | D7 | D23 | E3 | E3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 21-Jul-11 | 24-Jul-11 | 11-Aug-94 | 19-Aug-97 | 27-Apr-98 | 17-Jul-11 | 17-Jul-11 | 11-Aug-94 | 17-Jul-97 | 19-Aug-97 | 27-Apr-98 | 9-Apr-11 | 22-Jul-11 | 18-Jul-11 | 11-Aug-94 | 9-Apr-11 |
| **Source** | | Golder | Golder | Dillon 1994 | RL&L 1998 | RL&L 1999 | Golder | Golder | Dillon 1994 | RL&L 1998 | RL&L 1998 | RL&L 1999 | Golder | Golder | Golder | Dillon 1994 | Golder |
| Iron (Fe) - Total | mg/L | 0.108 | 0.103 | 0.0044 | - | < 0.05 | 0.289 | 0.233 | 0.062 | 0.113 | - | **0.66**[C,W] | 0.011 | 0.084 | 0.184 | 0.074 | 0.15 |
| Lead (Pb) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.001 | - | < 0.0003 | < 0.00005 | < 0.00005 | < 0.001 | 0.0004 | - | 0.0014 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.001 | 0.0005 |
| Lithium (Li) - Total | mg/L | < 0.005 | < 0.005 | < 0.015 | - | 0.0238 | < 0.005 | < 0.005 | < 0.015 | 0.001 | - | 0.0108 | < 0.005 | < 0.005 | < 0.005 | < 0.015 | < 0.005 |
| Manganese (Mn) - Total | mg/L | 0.0096 | 0.0073 | < 0.005 | - | **1.52**[W] | 0.0159 | 0.0183 | 0.007 | 0.0108 | - | **0.368**[W] | **0.195**[W] | 0.0105 | 0.0194 | 0.005 | **0.0503**[W] |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | <0.00005[D>C] | - | <0.00005[D>C] | < 0.00002 | < 0.00002 | <0.00005[D>C] | 0.00002 | - | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 | <0.00005[D>C] | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | 0.0003 | 0.0003 | < 0.03 | - | 0.0011 | 0.0004 | 0.0004 | < 0.03 | 0.0004 | - | 0.0008 | 0.0007 | 0.0004 | 0.0001 | < 0.03 | 0.0003 |
| Nickel (Ni) - Total | mg/L | 0.0009 | 0.001 | < 0.02 | - | 0.0181 | 0.0011 | 0.001 | < 0.02 | 0.0041 | - | 0.0084 | 0.0024 | 0.0009 | 0.0008 | < 0.02 | 0.002 |
| Selenium (Se) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0005 | - | 0.0009 | < 0.0001 | < 0.0001 | < 0.0005 | <0.01[D>C] | - | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | <0.005[D>C] | < 0.0001 |
| Silver (Ag) - Total | mg/L | < 0.00001 | < 0.00001 | <0.015[D>C] | - | <0.0005[D>C] | < 0.00001 | < 0.00001 | <0.015[D>C] | < 0.0001 | - | < 0.0001 | < 0.00001 | < 0.00001 | < 0.00001 | <0.015[D>C] | < 0.00001 |
| Strontium (Sr) - Total | mg/L | 0.0436 | 0.0696 | - | - | 1.26 | 0.0895 | 0.079 | 0.054 | 0.065 | - | 0.549 | 0.311 | 0.0763 | 0.0526 | 0.031 | 0.171 |
| Thallium (Tl) - Total | mg/L | < 0.00005 | < 0.00005 | <0.1[D>C] | - | < 0.0003 | < 0.00005 | < 0.00005 | <0.1[D>C,A] | < 0.0001 | - | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | <0.1[D>C,A] | < 0.00005 |
| Tin (Sn) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.3 | - | - | < 0.0001 | < 0.0001 | < 0.3 | - | - | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.3 | < 0.0001 |
| Titanium (Ti) - Total | mg/L | < 0.0003 | < 0.0003 | < 0.01 | - | 0.0029 | 0.0004 | < 0.0003 | < 0.01 | 0.0007 | - | 0.0009 | < 0.0003 | < 0.0003 | < 0.0003 | < 0.01 | < 0.0003 |
| Uranium (U) - Total | mg/L | 0.00003 | 0.00004 | - | - | 0.0017 | 0.00008 | 0.00006 | - | 0.0001 | - | 0.0006 | 0.0004 | 0.0001 | 0.00002 | - | 0.00007 |
| Vanadium (V) - Total | mg/L | 0.0001 | 0.0002 | < 0.03 | - | 0.0061 | 0.0003 | < 0.0001 | < 0.03 | < 0.0001 | - | 0.0032 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.03 | < 0.0001 |
| Zinc (Zn) - Total | mg/L | 0.0033 | < 0.003 | < 0.005 | - | < 0.004 | < 0.003 | < 0.003 | < 0.005 | **0.123**[C] | - | < 0.0008 | 0.0021 | 0.0033 | < 0.003 | < 0.005 | < 0.001 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | < 0.003 | < 0.003 | - | - | - | < 0.003 | < 0.003 | - | - | - | - | < 0.003 | < 0.003 | < 0.003 | - | < 0.003 |
| Antimony (Sb) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Arsenic (As) - Dissolved | mg/L | 0.00091 | 0.00131 | - | - | - | 0.00131 | 0.00091 | - | - | - | - | 0.00157 | 0.0009 | 0.001 | - | 0.00089 |
| Barium (Ba) - Dissolved | mg/L | 0.0114 | 0.018 | - | - | - | 0.0191 | 0.0189 | - | - | - | - | 0.0846 | 0.0159 | 0.0108 | - | 0.0325 |
| Beryllium (Be) - Dissolved | mg/L | < 0.0005 | < 0.0005 | - | - | - | < 0.0005 | < 0.0005 | - | - | - | - | < 0.0005 | < 0.0005 | < 0.0005 | - | < 0.0005 |
| Boron (B) - Dissolved | mg/L | 0.0048 | 0.0045 | - | - | - | 0.0101 | 0.0085 | - | - | - | - | 0.0256 | 0.0088 | 0.0039 | - | 0.0034 |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00001 | < 0.00001 | - | - | - | < 0.00001 | < 0.00001 | - | - | - | - | < 0.00001 | < 0.00001 | < 0.00001 | - | < 0.00001 |
| Calcium (Ca) - Dissolved | mg/L | 11.1 | 18.6 | - | - | - | 19.1 | 16.7 | - | - | - | - | 72.2 | 16.8 | 11.9 | - | 36.7 |
| Chromium (Cr) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Cobalt (Co) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | < 0.0001 | < 0.0001 | - | - | - | - | 0.00021 | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Copper (Cu) - Dissolved | mg/L | 0.00103 | 0.00135 | - | - | - | 0.00087 | 0.00068 | - | - | - | - | 0.00225 | 0.00066 | 0.00048 | - | 0.00111 |
| Iron (Fe) - Dissolved | mg/L | 0.033 | 0.034 | - | - | - | 0.102 | 0.094 | - | - | - | - | 0.175 | 0.024 | 0.064 | - | 0.065 |
| Lead (Pb) - Dissolved | mg/L | < 0.00005 | < 0.00005 | - | - | - | < 0.00005 | < 0.00005 | - | - | - | - | < 0.00005 | < 0.00005 | < 0.00005 | - | 0.000096 |
| Lithium (Li) - Dissolved | mg/L | < 0.005 | < 0.005 | - | - | - | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | < 0.005 | - | < 0.005 |
| Magnesium (Mg) - Dissolved | mg/L | 1.14 | 2.03 | - | - | - | 3.27 | 2.81 | - | - | - | - | 12 | 2.89 | 1.46 | - | 3.96 |
| Manganese (Mn) - Dissolved | mg/L | 0.00226 | 0.00139 | - | - | - | 0.00319 | 0.00516 | - | - | - | - | 0.22 | 0.002 | 0.0056 | - | 0.036 |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | - | - | - | < 0.00002 | < 0.00002 | - | - | - | - | < 0.00002 | < 0.00002 | < 0.00002 | - | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | 0.000234 | 0.000278 | - | - | - | 0.000428 | 0.000348 | - | - | - | - | 0.000693 | 0.000392 | 0.000119 | - | 0.000277 |
| Nickel (Ni) - Dissolved | mg/L | 0.00065 | 0.00101 | - | - | - | 0.00103 | 0.0009 | - | - | - | - | 0.00255 | 0.0007 | 0.00071 | - | 0.00208 |
| Potassium (K) - Dissolved | mg/L | 0.969 | 1.59 | - | - | - | 1.31 | 1.13 | - | - | - | - | 4.88 | 1.2 | 0.665 | - | 2.2 |
| Selenium (Se) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | < 0.0001 | < 0.0001 | - | - | - | - | 0.00014 | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Silver (Ag) - Dissolved | mg/L | < 0.00001 | < 0.00001 | - | - | - | < 0.00001 | < 0.00001 | - | - | - | - | < 0.00001 | < 0.00001 | < 0.00001 | - | < 0.00001 |
| Sodium (Na) - Dissolved | mg/L | 2.83 | 3.95 | - | - | - | 7.38 | 6.37 | - | - | - | - | 28 | 7.58 | 2.59 | - | 7.06 |
| Strontium (Sr) - Dissolved | mg/L | 0.0426 | 0.0717 | - | - | - | 0.0846 | 0.0772 | - | - | - | - | 0.305 | 0.0724 | 0.0521 | - | 0.17 |
| Thallium (Tl) - Dissolved | mg/L | < 0.00005 | < 0.00005 | - | - | - | < 0.00005 | < 0.00005 | - | - | - | - | < 0.00005 | < 0.00005 | < 0.00005 | - | < 0.00005 |
| Tin (Sn) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Uranium (U) - Dissolved | mg/L | 0.000022 | 0.00004 | - | - | - | 0.000073 | 0.000049 | - | - | - | - | 0.00041 | 0.000086 | 0.000015 | - | 0.000066 |
| Vanadium (V) - Dissolved | mg/L | < 0.0001 | 0.00012 | - | - | - | 0.00011 | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 |
| Zinc (Zn) - Dissolved | mg/L | < 0.003 | < 0.003 | - | - | - | < 0.003 | < 0.003 | - | - | - | - | < 0.003 | < 0.003 | < 0.003 | - | < 0.003 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | - | < 1 | - | - | - | **9**[C] | - | < 1 | - | - | - | - | - |
| Benzene | µg/L | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - | - |
| Ethylbenzene | µg/L | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - | - |
| Toluene | µg/L | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - | - |
| Xylenes | µg/L | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - | - |
| Total Volatiles | µg/L | - | - | - | - | - | - | - | - | < 100 | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | - | - | - | - | - | - | < 50 | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[(A)] = Concentration higher than the relevant acute aquatic life gui
[(C)] = Concentration higher than the relevant chronic aquatic life g
[(W)] = Concentration higher than the relevant drinking water guide
[(D>A)] = Detection limit higher than acute aquatic life guideline.
[(D>C)] = Detection limit higher than chronic aquatic life guideline.
[(D>W)] = Detection limit higher than drinking water guideline.

| Waterbody | | E3 | E4 | E4 | G2 | G2 | H17 | H20 | DI2 | DI2 | DI1 | DI1 | DI1 | DI1 | DI3 | DI5 | A9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 19-Jul-11 | 9-Apr-11 | 19-Jul-11 | 24-Jul-97 | 22-Aug-97 | 27-Jul-11 | 26-Jul-11 | 11-Aug-94 | 10-Jul-95 | 11-Aug-94 | 16-Jul-95 | 20-Jul-08 | 29-Apr-09 | 20-Jul-95 | 20-Jul-95 | 18-Jul-07 |
| **Source** | | Golder | Golder | Golder | RL&L 1998 | RL&L 1998 | Golder | Golder | Dillon 1994 | Dillon 1995 | Dillon 1994 | Dillon 1995 | Golder | Golder | Dillon 1995 | Dillon 1995 | Comaplex |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 14.3 | 0.5 | 14.4 | 17.4 | 16 | 17.2 | 18.4 | 9.4 | 12.5 | 8.7 | 12.3 | 14.9 | 0.9 | 9.7 | 14.2 | 21.7 |
| Dissolved Oxygen - field | mg/L | 9.7 | **1**[C] | 10 | 9.9 | 10.3 | 8.8 | 9.5 | - | 9.7 | - | 10.5 | 12.13 | 9.07 | 10.3 | 9.4 | - |
| pH - field | pH | 7.5 | 7.3 | 7.7 | 7.83 | 7.91 | 7.8 | 7.9 | 7.1 | 7.76 | 7.1 | 7.55 | - | **6.3**[C,W] | 7.68 | 7.64 | **8.6**[W] |
| Specific Conductivity - field | µS/cm | 76 | 564 | 99 | 67.4 | 74.5 | 98 | 173 | - | 30.2 | - | 21.4 | 59 | 120 | 30.6 | 28.2 | - |
| Secchi Disk Depth | m | 4.6 | - | 3.9 | 2.3 | 2.1 | 1.7 | 1.6 | - | - | - | < 5 | 1.9 | - | - | - | - |
| Ice Depth | m | - | 1.6 | - | - | - | - | - | - | - | - | - | - | 1.7 | - | - | - |
| Total Lake Depth | m | 4.6 | 2.8 | 3.9 | 2.25 | 2.1 | 1.7 | 1.6 | - | - | - | - | 1.9 | 8.98 | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.96 | 7.74 | 8.06 | 7.47 | - | 8.03 | 8.04 | 6.54 | 6.91 | **6.17**[C,W] | 6.68 | 7.4 | 7.49 | 6.92 | 6.9 | 7.9 |
| Specific Conductivity - laboratory | µS/cm | 80 | 583 | 105 | 56.6 | - | 101 | 179 | 68 | 53.6 | 38.6 | 39.4 | 51.1 | 135 | 53 | 49.9 | 759 |
| Total Dissolved Solids | mg/L | 40 | 359 | 61 | 44 | - | 63 | 136 | 43 | 38 | 24 | 25 | 36 | - | 24 | 31 | - |
| Total Dissolved Solids (Calculated) | mg/L | 40 | 306 | 52 | - | - | 50 | 85 | - | - | - | - | 24 | 69 | - | - | 353 |
| Total Alkalinity | mg $CaCO_3$/L | 32 | 248 | 40 | 24 | - | 38 | 41 | 24 | - | 12 | - | 13 | 40 | 14 | 13 | 52 |
| Total Hardness | mg $CaCO_3$/L | 31 | 247 | 40 | 22 | - | 36 | 59 | 25 | 18 | 13 | 12 | 17 | 48 | 14 | 14 | 300 |
| Total Suspended Solids | mg/L | < 3 | < 3 | < 3 | < 3 | - | < 3 | < 3 | < 1 | - | 1 | - | < 3 | < 3 | - | - | - |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | 29 | - | - | - |
| Turbidity - laboratory | NTU | - | - | - | 0.5 | - | - | - | 0.52 | 0.65 | 0.36 | 0.4 | - | - | 0.27 | 0.51 | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 38.6 | 302 | 48.6 | 23.7 | - | 46.2 | 50.1 | - | - | - | - | 16 | 48.5 | - | - | 64 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | - | - | - | 7.23 | - | - | - | 8.02 | 5.65 | 4.13 | 3.94 | 5.07 | 14.5 | 4.37 | 4.54 | 95.1 |
| Carbonate | mg/L | < 5 | < 5 | < 5 | < 0.3 | - | < 5 | < 5 | - | 18.2 | - | 11.2 | < 5 | < 5 | - | - | < 5 |
| Chloride | mg/L | 4.59 | 32.2 | 6.6 | 2.31 | - | 6.33 | 25.4 | 4.4 | 3.7 | 2.9 | 2.9 | 3 | 11.7 | 5.6 | 4.9 | **182**[C] |
| Fluoride | mg/L | - | - | - | - | - | - | - | 0.05 | 0.06 | 0.04 | 0.05 | - | - | 0.04 | 0.04 | - |
| Hydroxide | mg/L | < 5 | < 5 | < 5 | - | - | < 5 | < 5 | - | - | - | - | < 5 | < 5 | - | - | < 5 |
| Magnesium | mg/L | - | - | - | 0.84 | - | - | - | 1.25 | 0.884 | 0.64 | 0.618 | 0.728 | 2.3 | 0.813 | 0.695 | 11.6 |
| Potassium | mg/L | - | - | - | 0.755 | - | - | - | 0.92 | < 2 | 0.63 | < 2 | 0.71 | 1.85 | < 2 | < 2 | 4 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | 0.501 | - | - | - | - | - | - | - | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | < 1 | - | < 1 | - | - | - | - | - | - |
| Sodium | mg/L | - | - | - | 1.53 | - | - | - | 3.16 | 3 | 1.71 | 2.2 | 2.14 | 5.87 | 3.8 | 3.2 | 10 |
| Sulphate | mg/L | 1.7 | 10.4 | 2.21 | < 3 | - | 1.95 | 3.67 | 3.4 | 2.9 | 2.8 | 2.3 | 2.8 | 7.38 | 2.2 | 2.7 | 13.3 |
| Ion Balance | % | - | 96.6 | - | - | - | - | - | - | - | - | - | - | 101 | - | - | 101 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 12 | 89.6 | 14.9 | 10 | - | 19.9 | 28.2 | - | - | - | - | 7 | - | - | - | - |
| Total Organic Carbon | mg/L | 4.8 | 26.9 | 6.3 | 3.8 | - | 7.1 | 12.9 | - | - | - | - | 4 | - | - | - | - |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | 3.8 | - | - | - | - |
| Total Inorganic Carbon | mg/L | 13.9 | 62.1 | 11.3 | 6 | - | 10.3 | 10.8 | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | 0.529 | < 0.05 | 0.012 | - | < 0.05 | < 0.05 | - | - | - | - | < 0.05 | 0.054 | - | - | - |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.008 | - | < 0.05 | < 0.05 | < 0.005 | - | < 0.005 | - | < 0.1 | < 0.05 | - | - | < 0.1 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | - | - | < 0.05 | < 0.05 | 0.003 | - | 0.001 | - | < 0.05 | < 0.05 | - | - | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | < 0.071 | < 0.071 | < 0.008 | - | < 0.071 | < 0.071 | - | < 0.005 | - | < 0.005 | < 0.1 | < 0.071 | < 0.005 | < 0.005 | < 0.1 |
| Total Kjeldahl Nitrogen | mg/L | 0.27 | 1.88 | 0.42 | 0.34 | - | 0.44 | 0.75 | - | - | - | - | < 0.2 | 0.51 | - | - | - |
| Phosphorus, Total | mg/L | < 0.001 | 0.012 | 0.008 | 0.004 | - | 0.01 | 0.012 | < 0.3 | - | < 0.3 | - | 0.004 | 0.009 | - | - | - |
| Phosphorus, Total Dissolved | mg/L | < 0.001 | 0.006 | 0.002 | < 0.002 | - | 0.004 | 0.006 | - | - | - | - | 0.002 | 0.008 | - | - | - |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.002 | - | < 0.001 | < 0.001 | - | - | - | - | < 0.001 | < 0.001 | - | - | - |
| Chlorophyll a | µg/L | - | - | - | 1.01 | 1.36 | - | - | - | - | - | - | < 1 | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.000002 | < 0.000002 | < 0.000002 | - | - | < 0.000002 | < 0.000002 | - | - | - | - | < 0.002 | < 0.002 | - | - | - |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | < 0.003 | 0.0015 | 0.0073 | < 0.0005 | - | 0.0074 | 0.0172 | <0.2[D>C,W] | <0.2[D>C,W] | <0.2[D>C,W] | < 0.0002 | 0.0038 | <0.006[D>C] | <0.2[D>C,W] | <0.2[D>C,W] | 0.01 |
| Antimony (Sb) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | 0.0002 | - | < 0.0001 | < 0.0001 | <0.2[D>W] | - | <0.2[D>W] | - | < 0.00003 | < 0.0002 | - | - | < 0.0004 |
| Arsenic (As) - Total | mg/L | 0.0008 | 0.0027 | 0.0011 | 0.0009 | - | 0.0023 | 0.002 | 0.0004 | 0.0002 | 0.0003 | 0.0000003 | 0.0005 | 0.0007 | 0.0001 | 0.0005 | 0.0041 |
| Barium (Ba) - Total | mg/L | 0.0097 | 0.108 | 0.0161 | 0.0123 | - | 0.0179 | 0.0192 | < 0.01 | < 0.01 | < 0.01 | < 0.00001 | 0.0061 | 0.0186 | < 0.01 | < 0.01 | 0.099 |
| Beryllium (Be) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | - | < 0.0005 | < 0.0005 | < 0.005 | - | < 0.005 | - | < 0.0002 | < 0.001 | - | - | < 0.001 |
| Bismuth (Bi) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00005 | < 0.01 | - | < 0.1 | - | - | < 0.001 | - | - | - |
| Boron (B) - Total | mg/L | 0.0052 | 0.0105 | 0.0044 | - | - | 0.0201 | 0.0064 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 0.002 | < 0.05 | < 0.1 | < 0.1 | < 0.05 |
| Cadmium (Cd) - Total | mg/L | < 0.00001 | < 0.00001 | < 0.00001 | <0.0001[D>C] | - | < 0.00001 | < 0.00001 | <0.0002[D>C] | <0.0002[D>C] | <0.0002[D>C] | <0.0002[D>C] | <0.00005[D>C] | **0.00003**[C] | <0.002[D>C] | <0.002[D>C] | <0.0002[D>C] |
| Cesium (Cs) - Total | mg/L | - | - | - | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Total | mg/L | < 0.0001 | 0.0001 | < 0.0001 | <0.002[D>C] | - | < 0.0001 | 0.0005 | <0.015[D>C] | <0.015[D>C] | <0.015[D>C] | <0.015[D>C] | < 0.00006 | < 0.001 | <0.015[D>C] | <0.015[D>C] | <0.005[D>C] |
| Cobalt (Co) - Total | mg/L | < 0.0001 | 0.0007 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.015 | < 0.015 | < 0.015 | < 0.015 | < 0.0001 | < 0.0003 | < 0.015 | < 0.015 | < 0.002 |
| Copper (Cu) - Total | mg/L | 0.0006 | 0.0024 | 0.0009 | 0.0011 | - | 0.001 | 0.0018 | <0.01[D>C] | <0.01[D>C] | <0.1[D>C] | <0.1[D>C] | 0.0018 | **0.0023**[C] | <0.01[D>C] | <0.01[D>C] | 0.004 |

| Waterbody | | E3 | E4 | E4 | G2 | G2 | H17 | H20 | DI2 | DI2 | DI1 | DI1 | DI1 | DI1 | DI3 | DI5 | A9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 19-Jul-11 | 9-Apr-11 | 19-Jul-11 | 24-Aug-97 | 22-Aug-97 | 27-Jul-11 | 26-Jul-11 | 11-Aug-94 | 10-Jul-95 | 11-Aug-94 | 16-Jul-95 | 20-Jul-08 | 29-Apr-09 | 20-Jul-95 | 20-Jul-95 | 18-Jul-07 |
| **Source** | | Golder | Golder | Golder | RL&L 1998 | RL&L 1998 | Golder | Golder | Dillon 1994 | Dillon 1995 | Dillon 1994 | Dillon 1995 | Golder | Golder | Dillon 1995 | Dillon 1995 | Comaplex |
| Iron (Fe) - Total | mg/L | 0.094 | **0.692**$^{C,W}$ | 0.156 | 0.067 | - | 0.148 | 0.24 | 0.112 | 0.096 | 0.046 | 0.055 | 0.046 | - | < 0.03 | < 0.03 | 0.179 |
| Lead (Pb) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0002 | - | < 0.00005 | 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.00005 | < 0.00005 | <0.01$^{D>C}$ | <0.01$^{D>C}$ | 0.0004 |
| Lithium (Li) - Total | mg/L | < 0.005 | 0.0055 | < 0.005 | 0.001 | - | < 0.005 | < 0.005 | < 0.015 | - | < 0.015 | - | - | < 0.005 | - | - | 0.04 |
| Manganese (Mn) - Total | mg/L | 0.0134 | **0.48**$^{W}$ | 0.0194 | 0.0019 | - | 0.0073 | 0.0086 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 0.0015 | 0.018 | < 0.005 | < 0.005 | 0.013 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | - | < 0.00002 | < 0.00002 | <0.00005$^{D>C}$ | <0.00005$^{D>C}$ | <0.00005$^{D>C}$ | <0.00005$^{D>C}$ | < 0.00002 | <0.001$^{D>C}$ | <0.00005$^{D>C}$ | <0.00005$^{D>C}$ | **0.0005**$^{C}$ |
| Molybdenum (Mo) - Total | mg/L | 0.0002 | 0.0004 | 0.0002 | 0.0001 | - | 0.0006 | 0.0006 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.00006 | < 0.001 | < 0.03 | < 0.03 | < 0.005 |
| Nickel (Ni) - Total | mg/L | 0.0007 | 0.0062 | 0.0012 | 0.0005 | - | 0.0007 | 0.0018 | < 0.02 | < 0.02 | < 0.02 | <0.02$^{D>C}$ | 0.001 | 0.0031 | < 0.02 | < 0.02 | 0.005 |
| Selenium (Se) - Total | mg/L | < 0.0001 | 0.0002 | < 0.0001 | <0.01$^{D>C}$ | - | < 0.0001 | < 0.0001 | < 0.0005 | < 0.0005 | <0.005$^{D>C}$ | <0.005$^{D>C}$ | < 0.0001 | < 0.0001 | < 0.0005 | < 0.0005 | **0.0022**$^{C}$ |
| Silver (Ag) - Total | mg/L | < 0.00001 | < 0.00001 | < 0.00001 | < 0.0001 | - | < 0.00001 | < 0.00001 | <0.015$^{D>C}$ | <0.015$^{D>C}$ | <0.015$^{D>C}$ | <0.015$^{D>C}$ | < 0.0001 | < 0.00002 | <0.015$^{D>C}$ | <0.015$^{D>C}$ | <0.0004$^{D>C}$ |
| Strontium (Sr) - Total | mg/L | 0.0527 | 0.39 | 0.0673 | 0.0422 | - | 0.0845 | 0.114 | 0.042 | - | 0.022 | - | 0.0291 | 0.0811 | - | - | - |
| Thallium (Tl) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.00005 | < 0.00005 | <0.1$^{D>C,A}$ | - | <0.1$^{D>C,A}$ | - | < 0.00003 | < 0.0002 | - | - | < 0.0001 |
| Tin (Sn) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | - | < 0.0001 | < 0.0001 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | - | < 0.0005 | < 0.3 | < 0.3 | < 0.05 |
| Titanium (Ti) - Total | mg/L | < 0.0003 | < 0.0003 | < 0.0003 | < 0.0001 | - | < 0.0003 | 0.0005 | < 0.01 | - | < 0.01 | - | - | - | - | - | < 0.001 |
| Uranium (U) - Total | mg/L | 0.00004 | 0.0002 | 0.00003 | < 0.0001 | - | 0.00004 | 0.00007 | - | - | - | - | < 0.00005 | < 0.0002 | - | - | < 0.0001 |
| Vanadium (V) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | 0.0002 | 0.0003 | < 0.03 | - | < 0.03 | - | 0.00008 | < 0.001 | - | - | 0.001 |
| Zinc (Zn) - Total | mg/L | < 0.003 | < 0.001 | < 0.003 | < 0.005 | - | < 0.003 | < 0.003 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 0.0011 | 0.0079 | < 0.005 | < 0.005 | 0.008 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | < 0.003 | < 0.003 | < 0.003 | - | - | 0.0058 | 0.0099 | - | - | - | - | 0.0024 | 0.0061 | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.00003 | < 0.0005 | - | - | - |
| Arsenic (As) - Dissolved | mg/L | 0.0007 | 0.00215 | 0.00092 | - | - | 0.0019 | 0.00176 | - | - | - | - | 0.00045 | 0.00069 | - | - | - |
| Barium (Ba) - Dissolved | mg/L | 0.0102 | 0.108 | 0.0169 | - | - | 0.0173 | 0.0201 | - | - | - | - | 0.00615 | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | - | - | < 0.0005 | < 0.0005 | - | - | - | - | < 0.0002 | < 0.001 | - | - | - |
| Boron (B) - Dissolved | mg/L | 0.0033 | 0.01 | 0.0052 | - | - | 0.0205 | 0.0065 | - | - | - | - | 0.002 | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00001 | < 0.00001 | < 0.00001 | - | - | < 0.00001 | < 0.00001 | - | - | - | - | < 0.00005 | 0.000029 | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | 11.3 | 87.4 | 14.3 | - | - | 11.6 | 19.3 | - | - | - | - | 5.1 | 15.5 | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | - | < 0.0001 | 0.00015 | - | - | - | - | < 0.00006 | 0.0019 | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.0001 | 0.00061 | < 0.0001 | - | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0003 | - | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.00048 | 0.00245 | 0.00076 | - | - | 0.00097 | 0.00143 | - | - | - | - | 0.0012 | 0.0024 | - | - | - |
| Iron (Fe) - Dissolved | mg/L | 0.048 | 0.182 | 0.058 | - | - | 0.083 | 0.096 | - | - | - | - | 0.021 | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | - | - | < 0.00005 | < 0.00005 | - | - | - | - | < 0.00005 | < 0.0005 | - | - | - |
| Lithium (Li) - Dissolved | mg/L | < 0.005 | 0.0056 | < 0.005 | - | - | < 0.005 | < 0.005 | - | - | - | - | - | < 0.005 | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | 1.23 | 11.7 | 1.88 | - | - | 2.47 | 3.82 | - | - | - | - | 0.72 | 2.19 | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.00316 | 0.468 | 0.00367 | - | - | 0.00161 | 0.00537 | - | - | - | - | 0.0011 | 0.0173 | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | - | - | < 0.00002 | < 0.00002 | - | - | - | - | < 0.00002 | < 0.00002 | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | 0.000159 | 0.000352 | 0.000201 | - | - | 0.000566 | 0.000527 | - | - | - | - | < 0.00006 | < 0.001 | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | 0.00074 | 0.0061 | 0.00114 | - | - | 0.00071 | 0.00148 | - | - | - | - | 0.00102 | 0.003 | - | - | - |
| Potassium (K) - Dissolved | mg/L | 0.744 | 4.96 | 0.899 | - | - | 1.73 | 1.59 | - | - | - | - | 0.72 | 2.03 | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.0001 | 0.00015 | < 0.0001 | - | - | < 0.0001 | < 0.0001 | - | - | - | - | < 0.0001 | < 0.001 | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.00001 | < 0.00001 | < 0.00001 | - | - | < 0.00001 | < 0.00001 | - | - | - | - | < 0.0001 | < 0.00002 | - | - | - |
| Sodium (Na) - Dissolved | mg/L | 2.54 | 19.2 | 3.7 | - | - | 4.64 | 9.26 | - | - | - | - | 2.1 | 6.5 | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | 0.0552 | 0.382 | 0.0662 | - | - | 0.0832 | 0.116 | - | - | - | - | 0.0289 | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | - | - | < 0.00005 | < 0.00005 | - | - | - | - | < 0.00003 | < 0.0002 | - | - | - |
| Tin (Sn) - Dissolved | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | - | < 0.0001 | < 0.0001 | - | - | - | - | - | < 0.0005 | - | - | - |
| Uranium (U) - Dissolved | mg/L | 0.000022 | 0.000227 | 0.00003 | - | - | 0.00004 | 0.000061 | - | - | - | - | < 0.00005 | < 0.0002 | - | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | - | 0.00014 | 0.00021 | - | - | - | - | 0.00007 | < 0.001 | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | < 0.003 | < 0.003 | < 0.003 | - | - | < 0.003 | < 0.003 | - | - | - | - | < 0.0008 | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | < 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzene | µg/L | - | - | - | < 0.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | µg/L | - | - | - | < 0.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | µg/L | - | - | - | < 0.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | µg/L | - | - | - | < 0.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | µg/L | - | - | - | < 100 | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | - | 79 | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | A9 | A13 | A13 | A15 | A15 | A38 | A38 | A54 | A54 | A54 | A56 | A56 | A57 | A57 | B8 | B9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 7-Oct-07 | 12-Aug-07 | 7-Oct-07 | 18-Jul-07 | 7-Oct-07 | 18-Jul-07 | 7-Oct-07 | 12-Aug-07 | 7-Oct-07 | 15-Jul-08 | 12-Aug-07 | 7-Oct-07 | 12-Aug-07 | 7-Oct-07 | 8-Nov-98 | 8-Nov-98 |
| **Source** | | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Golder | Comaplex | Comaplex | Comaplex | Comaplex | RL&L 1999 | RL&L 1999 |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 0.7 | 10.4 | 0.3 | 23.8 | 1.9 | 20.4 | 0.9 | 11.2 | 0.3 | 13.8 | 10.7 | 1.1 | 10.4 | 1.2 | < 0.5 | < 0.5 |
| Dissolved Oxygen - field | mg/L | - | - | - | - | - | - | - | - | - | 12.86 | - | - | - | - | - | - |
| pH - field | pH | 7.79 | 7.56 | 7.66 | 8.29 | 7.04 | 8.49 | 7.68 | 8.11 | 8.17 | 6.94 | 8.1 | 8.01 | 8.29 | 7.61 | - | 7.06 |
| Specific Conductivity - field | µS/cm | - | - | - | - | - | - | - | - | - | 895 | - | - | - | - | - | 314 |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | 0.8 | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | 0.8 | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.8 | 7.5 | 7.7 | 7.7 | 7.5 | 8.2 | 7.8 | 7.8 | 7.9 | 8 | 7.9 | 8 | 8.1 | 8 | 7.2 | 7.4 |
| Specific Conductivity - laboratory | µS/cm | 1100 | 2370 | 1460 | 807 | 1020 | 456 | 609 | 618 | 720 | 944 | 1680 | 1470 | 294 | 386 | 454 | 491 |
| Total Dissolved Solids | mg/L | - | **1440**[W] | - | - | - | - | - | 386 | - | **696**[W] | **1090**[W] | - | 191 | - | - | 247 |
| Total Dissolved Solids (Calculated) | mg/L | 518 | 1170 | 719 | 368 | 471 | 221 | 294 | 291 | 348 | 469 | 859 | 783 | 156 | 204 | 229 | - |
| Total Alkalinity | mg $CaCO_3$/L | 60 | 30 | 51 | 36 | 51 | 76 | 76 | 49 | 68 | 47 | 78 | 124 | 123 | 167 | 94 | 96 |
| Total Hardness | mg $CaCO_3$/L | 422 | 1020 | 487 | 317 | 384 | 179 | 224 | 236 | 258 | 337 | 709 | 456 | 142 | 181 | 181 | 194 |
| Total Suspended Solids | mg/L | < 3 | 4 | 3 | - | 4 | - | 6 | 4 | 3 | 5 | < 3 | 5 | 3 | 8 | 3 | < 2 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | 0.5 | 1.9 | 3.6 | - | 1.6 | - | 1.9 | < 0.1 | 0.65 | - | 0.3 | 5.6 | 1.9 | 2.9 | 0.8 | 1.9 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 74 | 37 | 62 | 44 | 62 | 93 | 92 | 60 | 83 | 57 | 95 | 151 | 151 | 204 | 115 | 117 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 140 | 346 | 142 | 96.2 | 122 | 59.3 | 70.2 | 74.5 | 78.8 | 90.9 | 236 | 127 | 47.6 | 61.5 | 57 | 61.4 |
| Carbonate | mg/L | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 1 | < 1 |
| Chloride | mg/L | **282**[C,W] | **716**[A,C,W] | **372**[C,W] | **210**[C] | **267**[C,W] | 86 | 118 | **134**[C] | **151**[C] | **214**[C] | **444**[C,W] | **297**[C,W] | 14 | 12 | 69.7 | 80 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hydroxide | mg/L | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 1 | < 1 |
| Magnesium | mg/L | 17.7 | 38.1 | 32.2 | 14.6 | 19.2 | 7.5 | 11.8 | 12.2 | 14.8 | 13.9 | 29.1 | 33.8 | 5.5 | 6.6 | 9.34 | 9.98 |
| Potassium | mg/L | 4 | 8.8 | 5.5 | 3 | 2.9 | 3.5 | 3.9 | 6.1 | 4.9 | 7.95 | 9.6 | 8.6 | 3 | 1.8 | 1.98 | 2.38 |
| Reactive Silica (as $SiO_2$) | mg/L | 5.3 | - | 5.9 | - | 6.6 | - | 2.9 | - | 1.8 | - | - | 4.6 | - | 6.6 | 9.3 | 7.3 |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 17 | 26 | 57 | 9 | 12 | 8 | 16 | 15 | 20 | 34.2 | 22 | 87 | 8 | 6 | 12.5 | 12.2 |
| Sulphate | mg/L | 21.6 | 14.3 | 77.2 | 6.8 | 16.8 | 11.4 | 28.2 | 19.8 | 37.2 | 39.9 | 69.2 | 141 | 4.5 | 15.8 | 22.4 | 23.2 |
| Ion Balance | % | 96.5 | 103 | 94.1 | 100 | 92.9 | 95.7 | 97.2 | 107 | 96.1 | 103 | 98.8 | 94.3 | 110 | 97.8 | 98 | 96 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 23 | 16 | 20 | - | 19 | - | 28 | 22 | 26 | 20 | 34 | 41 | 51 | 53 | 49 | 40 |
| Total Organic Carbon | mg/L | - | 10 | - | - | - | - | - | 12 | - | 10 | 17 | - | 25 | - | 28 | 18.5 |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | 9.5 | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 14 | 7 | 12 | - | 13 | - | 18 | 11 | 16 | - | 18 | 30 | 30 | 41 | 21.1 | 21.9 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | 10 | 10 | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | 0.06 | 0.31 | - | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | 1.11 | < 0.05 | 1.32 | 0.08 | 0.07 | - | 0.029 |
| Nitrate as Nitrogen | mg/L | < 0.1 | < 0.1 | 0.5 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | **4.9**[C] | 0.5 | 2.9 | < 0.1 | < 0.1 | 0.012 | 0.009 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | **0.08**[C] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | **0.14**[C] | < 0.05 | **0.31**[C] | < 0.05 | < 0.05 | - | - |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.1 | < 0.1 | 0.6 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 5.1 | 0.5 | 3.2 | < 0.1 | < 0.1 | 0.019 | 0.017 |
| Total Kjeldahl Nitrogen | mg/L | 0.3 | 0.6 | 0.6 | - | 0.6 | - | 0.6 | 0.7 | 0.5 | 2.2 | 1 | 1.8 | 1.5 | 0.6 | - | 0.82 |
| Phosphorus, Total | mg/L | < 0.02 | < 0.02 | < 0.02 | - | < 0.02 | - | < 0.02 | < 0.02 | < 0.02 | 0.009 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | 0.017 |
| Phosphorus, Total Dissolved | mg/L | < 0.02 | - | < 0.02 | - | < 0.02 | - | < 0.02 | - | < 0.02 | 0.004 | - | < 0.02 | - | < 0.02 | 0.007 | 0.005 |
| Orthophosphate (PO4-P) | mg/L | < 0.01 | < 0.01 | < 0.01 | - | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | < 0.001 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.001 | 0.001 |
| Chlorophyll a | µg/L | - | - | - | - | - | - | - | - | - | 17 | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | - | - | - | - | - | - | - | - | - | < 0.002 | - | - | - | - | < 0.002 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | - | - | - | 0.04 | - | 0.02 | - | - | - | 0.0024 | - | - | - | - | 0.0082 | 0.0031 |
| Antimony (Sb) - Total | mg/L | - | - | - | < 0.0004 | - | < 0.0004 | - | - | - | 0.0002 | - | - | - | - | 0.0001 | 0.0001 |
| Arsenic (As) - Total | mg/L | - | - | - | 0.0032 | - | 0.0042 | - | - | - | 0.0009 | - | - | - | - | 0.0038 | 0.0039 |
| Barium (Ba) - Total | mg/L | - | - | - | 0.123 | - | 0.042 | - | - | - | 0.0618 | - | - | - | - | 0.0639 | 0.0677 |
| Beryllium (Be) - Total | mg/L | - | - | - | < 0.001 | - | < 0.001 | - | - | - | < 0.0002 | - | - | - | - | < 0.0002 | < 0.0002 |
| Bismuth (Bi) - Total | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.00003 | < 0.00003 |
| Boron (B) - Total | mg/L | - | - | - | < 0.05 | - | < 0.05 | - | - | - | 0.0006 | - | - | - | - | - | - |
| Cadmium (Cd) - Total | mg/L | - | - | - | <0.0002[D>C] | - | <0.0002[D>C] | - | - | - | < 0.00005 | - | - | - | - | **0.0003**[C] | 0.00005 |
| Cesium (Cs) - Total | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.0001 |
| Chromium (Cr) - Total | mg/L | - | - | - | <0.005[D>C] | - | <0.005[D>C] | - | - | - | < 0.00006 | - | - | - | - | **0.0041**[C] | **0.0043**[C] |
| Cobalt (Co) - Total | mg/L | - | - | - | < 0.002 | - | < 0.002 | - | - | - | < 0.0001 | - | - | - | - | 0.0003 | 0.0003 |
| Copper (Cu) - Total | mg/L | - | - | - | 0.003 | - | 0.003 | - | - | - | 0.001 | - | - | - | - | **0.0052**[C] | 0.0032 |

| Waterbody | | A9 | A13 | A13 | A15 | A15 | A38 | A38 | A54 | A54 | A54 | A56 | A56 | A57 | A57 | B8 | B9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Date Sampled** | | 7-Oct-07 | 12-Aug-07 | 7-Oct-07 | 18-Jul-07 | 7-Oct-07 | 18-Jul-07 | 7-Oct-07 | 12-Aug-07 | 7-Oct-07 | 15-Jul-08 | 12-Aug-07 | 7-Oct-07 | 12-Aug-07 | 7-Oct-07 | 8-Nov-98 | 8-Nov-98 |
| **Source** | | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Comaplex | Golder | Comaplex | Comaplex | Comaplex | Comaplex | RL&L 1999 | RL&L 1999 |
| Iron (Fe) - Total | mg/L | - | - | - | **0.695**[C,W] | - | 0.17 | - | - | - | 0.022 | - | - | - | - | 0.145 | 0.26 |
| Lead (Pb) - Total | mg/L | - | - | - | 0.0001 | - | 0.0003 | - | - | - | 0.00006 | - | - | - | - | 0.00008 | 0.0002 |
| Lithium (Li) - Total | mg/L | - | - | - | 0.03 | - | 0.02 | - | - | - | - | - | - | - | - | 0.0062 | 0.0051 |
| Manganese (Mn) - Total | mg/L | - | - | - | 0.006 | - | 0.009 | - | - | - | 0.0017 | - | - | - | - | 0.0054 | 0.0009 |
| Mercury (Hg) - Total | mg/L | - | - | - | **0.0004**[C] | - | <0.0002[D>C] | - | - | - | < 0.00002 | - | - | - | - | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | - | - | - | < 0.005 | - | < 0.005 | - | - | - | 0.0005 | - | - | - | - | 0.0003 | 0.0002 |
| Nickel (Ni) - Total | mg/L | - | - | - | 0.006 | - | 0.004 | - | - | - | 0.001 | - | - | - | - | 0.0084 | 0.0067 |
| Selenium (Se) - Total | mg/L | - | - | - | **0.0012**[C] | - | 0.0007 | - | - | - | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0001 |
| Silver (Ag) - Total | mg/L | - | - | - | <0.0004[D>C] | - | <0.0004[D>C] | - | - | - | < 0.0001 | - | - | - | - | < 0.0001 | < 0.0001 |
| Strontium (Sr) - Total | mg/L | - | - | - | - | - | - | - | - | - | 0.83 | - | - | - | - | 0.327 | 0.377 |
| Thallium (Tl) - Total | mg/L | - | - | - | 0.0002 | - | < 0.0001 | - | - | - | < 0.00003 | - | - | - | - | 0.0001 | 0.0001 |
| Tin (Sn) - Total | mg/L | - | - | - | < 0.05 | - | < 0.05 | - | - | - | - | - | - | - | - | - | - |
| Titanium (Ti) - Total | mg/L | - | - | - | < 0.001 | - | < 0.001 | - | - | - | - | - | - | - | - | 0.0009 | 0.0006 |
| Uranium (U) - Total | mg/L | - | - | - | 0.0002 | - | 0.0002 | - | - | - | 0.0003 | - | - | - | - | 0.00007 | < 0.00005 |
| Vanadium (V) - Total | mg/L | - | - | - | 0.001 | - | 0.001 | - | - | - | < 0.00005 | - | - | - | - | 0.0011 | 0.0011 |
| Zinc (Zn) - Total | mg/L | - | - | - | < 0.004 | - | 0.012 | - | - | - | < 0.0008 | - | - | - | - | 0.0082 | 0.0105 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 0.02 | 0.02 | < 0.01 | - | 0.02 | - | < 0.01 | < 0.01 | < 0.01 | - | 0.03 | 0.03 | 0.01 | < 0.01 | - | - |
| Antimony (Sb) - Dissolved | mg/L | 0.0015 | < 0.0004 | 0.0018 | - | 0.0015 | - | 0.0017 | < 0.0004 | 0.0019 | - | < 0.0004 | 0.0011 | < 0.0004 | 0.0015 | - | - |
| Arsenic (As) - Dissolved | mg/L | 0.0038 | 0.0036 | 0.0028 | - | 0.0019 | - | 0.0021 | 0.0037 | 0.0028 | - | 0.0048 | 0.0032 | 0.0067 | 0.002 | - | - |
| Barium (Ba) - Dissolved | mg/L | 0.133 | 0.345 | 0.145 | - | 0.103 | - | 0.049 | 0.05 | 0.047 | - | 0.154 | 0.085 | 0.032 | 0.038 | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.001 | < 0.001 | < 0.001 | - | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - |
| Boron (B) - Dissolved | mg/L | < 0.05 | < 0.05 | < 0.05 | - | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | - | < 0.05 | < 0.05 | < 0.00005 | < 0.00005 | - | - |
| Cadmium (Cd) - Dissolved | mg/L | < 0.0001 | < 0.0002 | < 0.0001 | - | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | - |
| Calcium (Ca) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.005 | < 0.005 | 0.007 | - | < 0.005 | - | < 0.005 | < 0.005 | < 0.005 | - | < 0.005 | 0.007 | 0.006 | < 0.005 | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.002 | < 0.002 | < 0.002 | - | < 0.002 | - | < 0.002 | < 0.002 | < 0.002 | - | < 0.002 | < 0.002 | < 0.002 | < 0.002 | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.002 | 0.002 | 0.002 | - | 0.001 | - | 0.002 | 0.001 | 0.001 | - | 0.003 | 0.004 | 0.004 | 0.003 | - | - |
| Iron (Fe) - Dissolved | mg/L | 0.302 | 1.28 | 0.724 | - | 2.36 | - | 0.054 | 0.055 | 0.031 | - | 0.182 | 0.138 | 0.286 | 0.118 | - | - |
| Lead (Pb) - Dissolved | mg/L | 0.0002 | < 0.0001 | < 0.0001 | - | 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | 0.0003 | < 0.0001 | 0.0004 | - | - |
| Lithium (Li) - Dissolved | mg/L | 0.048 | 0.139 | 0.04 | - | 0.023 | - | 0.027 | 0.032 | 0.033 | - | 0.102 | 0.025 | < 0.003 | 0.003 | - | - |
| Magnesium (Mg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.051 | 0.12 | 0.174 | - | 0.066 | - | 0.005 | 0.003 | 0.003 | - | 0.022 | 0.101 | 0.008 | 0.007 | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.0001 | 0.0002 | < 0.0001 | - | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | < 0.005 | < 0.005 | < 0.005 | - | < 0.005 | - | < 0.005 | < 0.005 | < 0.005 | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - |
| Nickel (Ni) - Dissolved | mg/L | 0.007 | 0.015 | 0.011 | - | 0.006 | - | 0.005 | 0.004 | 0.005 | - | 0.011 | 0.011 | 0.006 | 0.006 | - | - |
| Potassium (K) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | 0.001 | 0.0021 | 0.0013 | - | 0.0007 | - | 0.0007 | 0.0007 | 0.0008 | - | 0.0015 | 0.0017 | 0.0005 | 0.0005 | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | - |
| Sodium (Na) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | 2.48 | - | - | - | - | - | 0.674 | - | - | 1.93 | - | 0.291 | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.0001 | 0.0002 | < 0.0001 | - | < 0.0001 | - | 0.0002 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | - |
| Tin (Sn) - Dissolved | mg/L | < 0.05 | < 0.05 | < 0.05 | - | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.0001 | < 0.0001 | 0.0013 | - | < 0.0001 | - | 0.0002 | < 0.0001 | 0.0005 | - | 0.0028 | 0.0036 | 0.0004 | 0.0004 | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.001 | 0.008 | 0.002 | - | 0.001 | - | < 0.001 | 0.004 | < 0.001 | - | 0.008 | 0.002 | 0.002 | < 0.001 | - | - |
| Zinc (Zn) - Dissolved | mg/L | 0.011 | 0.009 | 0.003 | - | 0.013 | - | 0.007 | 0.005 | 0.005 | - | 0.059 | 0.006 | 0.005 | 0.026 | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - | **12**[C] | **9**[C] |
| Benzene | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - |
| Ethylbenzene | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - |
| Toluene | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - |
| Xylenes | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | - | - | - | - | - | - |
| Total Volatiles | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[(A)] = Concentration higher than the relevant acute aquatic life gui
[(C)] = Concentration higher than the relevant chronic aquatic life g
[(W)] = Concentration higher than the relevant drinking water guide
[(D>A)] = Detection limit higher than acute aquatic life guideline.
[(D>C)] = Detection limit higher than chronic aquatic life guideline.
[(D>W)] = Detection limit higher than drinking water guideline.

| Waterbody | | B10 | LML | LML | LML | Control | Control | Control | Control | Control | Control | Control | Control | PL | PL | PL | NEW-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Streamnear mine |
| **Date Sampled** | | 8-Nov-98 | 24-Apr-98 | 29-Jul-98 | 2-Sep-98 | 26-Jul-98 | 19-Jul-99 | 19-Jul-00 | 18-Jul-07 | 7-Oct-07 | 18-Jul-08 | 28-Apr-09 | 29-Jul-11 | 24-Apr-98 | 28-Jul-98 | 28-Jul-98 | 23-Jun-08 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 | R&L 2001 | Comaplex | Comaplex | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | < 0.5 | 0.4 | 13.8 | 10.4 | 14.7 | 12.4 | 14.6 | 16.4 | 0.2 | 14.1 | 1.1 | 16.7 | 0.8 | 11.7 | 11.7 | 15.2 |
| Dissolved Oxygen - field | mg/L | - | 14.6 | 9.6 | 10.7 | 10.5 | 11.4 | - | - | - | 12.47 | 8.76 | 9.2 | 17.3 | 12 | 12 | 11.37 |
| pH - field | pH | - | 6.83 | **6.35**[C,W] | 6.71 | 6.9 | 7.24 | 7.7 | 7.83 | 7.92 | - | **6.26**[C,W] | 7.7 | 6.5 | - | - | 7.91 |
| Specific Conductivity - field | µS/cm | - | 116.1 | 76.2 | 69.8 | 79.7 | 73.1 | 83.5 | - | - | 64 | 175 | 80 | 68.9 | 52.2 | 52.2 | 80 |
| Secchi Disk Depth | m | - | - | 6.6 | 7.5 | 4.3 | 3 | 3.5 | - | - | 1.2 | - | 5.6 | 6.5 | 7.5 | 7.5 | - |
| Ice Depth | m | - | 1.5 | - | - | - | - | - | - | - | - | 1.8 | - | 2.4 | - | - | - |
| Total Lake Depth | m | - | 14.4 | 14.5 | 14.8 | 4.3 | 4.2 | 3.5 | - | - | 2.9 | 3.01 | 5.6 | 17.4 | 18.8 | 18.8 | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.5 | 7 | 7.3 | - | 7.6 | 7.2 | 7.4 | 7.6 | 7.5 | 7.5 | 7.65 | 7.84 | 6.6 | 7.1 | 7 | 7.6 |
| Specific Conductivity - laboratory | µS/cm | 1030 | 90.9 | 64.2 | - | 67.5 | 71.6 | 79.6 | 60.3 | 76.5 | 68.2 | 193 | 81.4 | 44.5 | 37.3 | 36.6 | 94.3 |
| Total Dissolved Solids | mg/L | **602**[W] | 42 | 28 | - | 31 | 21 | 37 | - | - | 46 | - | 55 | 20 | 16 | 16 | - |
| Total Dissolved Solids (Calculated) | mg/L | - | - | - | - | - | - | - | 35 | 38 | 35 | 99 | 41 | - | - | - | 49 |
| Total Alkalinity | mg $CaCO_3$/L | 157 | 25 | 18 | - | 21 | 22 | 24 | 21 | 22 | 22 | 62 | 26 | 11 | 9 | 9 | 23 |
| Total Hardness | mg $CaCO_3$/L | 518 | 26 | 17 | - | 21 | 24 | 26 | 17 | 24 | 22 | 69 | 27 | 12 | 10 | 10 | 29 |
| Total Suspended Solids | mg/L | 4 | < 2 | < 2 | - | < 2 | < 3 | < 3 | - | 5 | < 3 | < 3 | < 3 | < 2 | < 2 | < 2 | < 3 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - |
| Turbidity - laboratory | NTU | 1.27 | < 0.1 | 0.2 | - | 0.2 | 0.39 | 0.2 | - | 1.6 | - | - | - | < 0.1 | 0.1 | 0.1 | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 192 | 31 | 22 | - | 26 | 27 | 30 | 26 | 27 | 26 | 76.2 | 32.1 | 13 | 11 | 11 | 28 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.1 |
| Calcium | mg/L | 154 | 8.16 | 5.4 | - | 6.99 | 8.09 | 9.27 | 6.7 | 8.2 | 7.19 | 21.6 | - | 3.5 | 3.12 | 3.12 | 8.5 |
| Carbonate | mg/L | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 1 | < 1 | < 1 | < 5 |
| Chloride | mg/L | **241**[C] | 7.98 | 5.3 | - | 5.15 | 5.17 | 6 | 6 | 7 | 6 | 18.1 | 8.21 | 3.49 | 2.72 | 2.72 | 13 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.05 |
| Hydroxide | mg/L | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 1 | < 1 | < 1 | < 5 |
| Magnesium | mg/L | 32.5 | 1.32 | 0.78 | - | 0.75 | 0.94 | 1.01 | 0.8 | 0.8 | 0.778 | 2.59 | - | 0.79 | 0.59 | 0.59 | 1.5 |
| Potassium | mg/L | 6.29 | 1.24 | 0.81 | - | 0.89 | 0.97 | 1.03 | 1 | 1.2 | 0.81 | 2.36 | - | 0.84 | 0.66 | 0.66 | 0.9 |
| Reactive Silica (as $SiO_2$) | mg/L | 6.8 | 0.7 | 0.6 | - | 0.2 | 0.4 | < 0.1 | - | 0.3 | - | - | - | 0.4 | 0.3 | 0.3 | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 30.3 | 5.1 | 3 | - | 2.8 | 3.5 | 3.69 | 5 | 4 | 3.3 | 9.17 | - | 2.7 | 2 | 2 | 7 |
| Sulphate | mg/L | 43.9 | 2.92 | 1.91 | - | 1.3 | 2.08 | 2.58 | 3.9 | 3.6 | 2.2 | 4.71 | 1.76 | 2.47 | 1.84 | 1.83 | 3.6 |
| Ion Balance | % | 109 | 97 | 89 | - | 93 | 104 | 92.5 | - | - | - | 103 | - | 105 | 105 | 105 | - |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 62 | 10 | 7.1 | - | 8.6 | 9.2 | 9 | - | 9 | 8 | - | 10.1 | 7 | 4.6 | 4.5 | 11 |
| Total Organic Carbon | mg/L | 27 | 3.8 | 3.2 | - | 3.7 | 4 | 3.8 | - | - | 4 | - | 4.7 | 2.3 | 2.8 | 2.6 | 5 |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | 3.7 | - | - | - | - | - | 5 |
| Total Inorganic Carbon | mg/L | 35.6 | 6.3 | 3.9 | - | 5 | 5.2 | 5.2 | - | 5 | - | - | 7 | 3.5 | 1.9 | 1.9 | 5 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | 0.025 | 0.02 | < 0.005 | - | 0.011 | < 0.005 | < 0.005 | - | < 0.05 | < 0.05 | 0.075 | < 0.05 | 0.012 | < 0.005 | < 0.005 | < 0.05 |
| Nitrate as Nitrogen | mg/L | < 0.006 | 0.014 | < 0.006 | - | < 0.006 | < 0.006 | < 0.006 | < 0.1 | < 0.1 | < 0.1 | < 0.05 | < 0.05 | < 0.006 | < 0.006 | < 0.006 | < 0.1 |
| Nitrite as Nitrogen | mg/L | - | - | - | - | - | - | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | - | - | - | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | 0.013 | 0.014 | < 0.006 | - | < 0.006 | < 0.006 | < 0.006 | < 0.1 | < 0.1 | < 0.1 | < 0.071 | < 0.071 | < 0.006 | < 0.006 | < 0.006 | < 0.1 |
| Total Kjeldahl Nitrogen | mg/L | 1.3 | 0.17 | 0.36 | - | 0.4 | 0.31 | 0.21 | - | 0.3 | 0.3 | 0.73 | 0.25 | 0.174 | 0.33 | 0.3 | 0.4 |
| Phosphorus, Total | mg/L | 0.021 | 0.003 | 0.005 | - | 0.006 | 0.003 | 0.045 | - | < 0.02 | 0.009 | 0.006 | 0.004 | 0.003 | 0.005 | 0.007 | 0.012 |
| Phosphorus, Total Dissolved | mg/L | 0.007 | 0.003 | 0.004 | - | 0.006 | 0.002 | 0.012 | - | < 0.02 | 0.003 | 0.006 | 0.003 | 0.002 | 0.003 | 0.002 | 0.003 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | - | < 0.01 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | - | - | 0.57 | 0.9 | 1.52 | 0.44 | 0.75 | - | - | < 1 | - | - | - | 0.3 | - | 3 |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | **0.043**[C] | < 0.001 | < 0.001 | - | 0.001 | < 0.002 | 0.002 | - | - | < 0.002 | < 0.002 | < 0.000002 | < 0.001 | < 0.001 | < 0.001 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.005 | 0.0028 | 0.0026 | - | 0.0016 | 0.0046 | 0.0051 | 0.02 | - | 0.0036 | < 0.005 | 0.006 | 0.0047 | 0.0026 | 0.0019 | 0.0052 |
| Antimony (Sb) - Total | mg/L | 0.0001 | < 0.00003 | 0.0001 | - | 0.0001 | < 0.00003 | 0.0002 | < 0.0004 | - | < 0.00003 | < 0.0002 | < 0.0001 | < 0.00003 | 0.0002 | 0.0001 | < 0.0004 |
| Arsenic (As) - Total | mg/L | **0.0058**[C] | 0.0002 | 0.0002 | - | 0.0005 | 0.0005 | 0.0002 | < 0.0004 | - | 0.0004 | 0.0012 | 0.0006 | < 0.00003 | 0.00008 | 0.00006 | 0.0011 |
| Barium (Ba) - Total | mg/L | 0.232 | 0.0103 | 0.0085 | - | 0.0073 | 0.0075 | 0.0096 | 0.008 | - | 0.0069 | 0.0241 | 0.0078 | 0.0096 | 0.0089 | 0.0088 | 0.009 |
| Beryllium (Be) - Total | mg/L | < 0.0002 | < 0.0002 | < 0.0002 | - | < 0.0002 | < 0.0002 | < 0.0002 | < 0.001 | - | < 0.0002 | < 0.001 | < 0.0005 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | < 0.00003 | < 0.00005 | < 0.00003 | - | < 0.00003 | < 0.00003 | - | - | - | - | < 0.001 | < 0.00005 | < 0.00005 | < 0.00003 | < 0.00003 | - |
| Boron (B) - Total | mg/L | - | - | - | - | - | - | 0.004 | < 0.05 | - | 0.004 | < 0.05 | 0.0052 | - | - | - | < 0.05 |
| Cadmium (Cd) - Total | mg/L | **0.0004**[C] | <0.0001[D>C] | **0.00006**[C] | - | **0.0002**[C] | <0.00002[D>C] | <0.00005[D>C] | <0.0002[D>C] | - | <0.00005[D>C] | < 0.00001 | < 0.00001 | < 0.0001 | 0.00007 | 0.00006 | <0.00002[D>C] |
| Cesium (Cs) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | - | - | - | - | 0.0216 | - | < 0.0001 | < 0.0001 | < 0.0001 | - |
| Chromium (Cr) - Total | mg/L | **0.0094**[C] | 0.0002 | **0.0018**[C] | - | **0.0023**[C] | 0.0004 | 0.0004 | <0.005[D>C] | - | < 0.00006 | **0.0022**[C] | < 0.0001 | 0.0003 | 0.0009 | 0.001 | < 0.00006 |
| Cobalt (Co) - Total | mg/L | 0.0005 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.002 | - | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.002 |
| Copper (Cu) - Total | mg/L | 0.0087 | **0.0022**[C] | 0.0009 | - | 0.0009 | 0.0013 | 0.0019 | 0.002 | - | 0.0008 | 0.0017 | 0.0009 | 0.0037 | 0.0008 | 0.0008 | 0.001 |

| Waterbody | | B10 | LML | LML | LML | Control | Control | Control | Control | Control | Control | Control | Control | PL | PL | PL | NEW-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Streamnear mine |
| **Date Sampled** | | 8-Nov-98 | 24-Apr-98 | 29-Jul-98 | 2-Sep-98 | 26-Jul-98 | 19-Jul-99 | 19-Jul-00 | 18-Jul-07 | 7-Oct-07 | 18-Jul-08 | 28-Apr-09 | 29-Jul-11 | 24-Apr-98 | 28-Jul-98 | 28-Jul-98 | 23-Jun-08 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 2000 | R&L 2001 | Comaplex | Comaplex | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder |
| Iron (Fe) - Total | mg/L | 0.156 | 0.02 | 0.017 | - | < 0.005 | 0.028 | 0.084 | 0.049 | - | 0.024 | - | 0.052 | 0.02 | 0.006 | 0.007 | 0.207 |
| Lead (Pb) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | - | < 0.00005 | 0.0001 | 0.0005 | 0.0004 | - | < 0.00005 | < 0.0005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 |
| Lithium (Li) - Total | mg/L | 0.0113 | 0.0008 | < 0.0001 | - | < 0.0001 | 0.0006 | - | < 0.01 | - | - | < 0.005 | < 0.005 | 0.0006 | < 0.0001 | < 0.0001 | < 0.01 |
| Manganese (Mn) - Total | mg/L | 0.004 | < 0.0001 | 0.0054 | - | 0.0008 | 0.0033 | 0.0054 | 0.007 | - | 0.003 | 0.0042 | 0.004 | < 0.0001 | 0.002 | 0.0015 | 0.003 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00001 | < 0.00002 | - | < 0.00002 | < 0.00002 | < 0.00002 | <0.0002$^{D>C}$ | - | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | 0.0007 | 0.0002 | 0.0001 | - | 0.0002 | 0.0002 | 0.0001 | < 0.005 | - | 0.0001 | < 0.001 | 0.0002 | 0.00007 | < 0.00006 | < 0.00006 | < 0.005 |
| Nickel (Ni) - Total | mg/L | 0.0134 | < 0.0001 | 0.0007 | - | 0.0008 | 0.0008 | 0.001 | < 0.002 | - | 0.0004 | 0.0013 | 0.0006 | < 0.0001 | 0.0006 | 0.0005 | < 0.002 |
| Selenium (Se) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | 0.0001 | < 0.0001 | 0.0009 | - | < 0.0001 | < 0.001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0004 |
| Silver (Ag) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | <0.0004$^{D>C}$ | - | < 0.0001 | < 0.00002 | < 0.00001 | < 0.0001 | < 0.0001 | < 0.0001 | <0.0004$^{D>C}$ |
| Strontium (Sr) - Total | mg/L | 0.892 | 0.0406 | 0.0332 | - | 0.0279 | 0.0267 | 0.0294 | - | - | 0.0245 | 0.0759 | 0.0328 | 0.0201 | 0.0174 | 0.0174 | - |
| Thallium (Tl) - Total | mg/L | 0.0001 | < 0.00005 | < 0.00003 | - | < 0.00003 | < 0.00003 | - | < 0.0001 | - | < 0.00003 | < 0.0002 | < 0.00005 | < 0.00005 | < 0.00003 | < 0.00003 | < 0.0001 |
| Tin (Sn) - Total | mg/L | - | - | - | - | - | - | - | < 0.05 | - | - | < 0.0005 | < 0.0001 | - | - | - | < 0.05 |
| Titanium (Ti) - Total | mg/L | 0.0008 | < 0.0001 | < 0.0001 | - | < 0.0001 | 0.0002 | - | < 0.001 | - | - | - | < 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.001 |
| Uranium (U) - Total | mg/L | 0.0004 | < 0.00005 | < 0.00005 | - | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.00005 | 0.00002 | 0.00002 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 |
| Vanadium (V) - Total | mg/L | 0.0024 | < 0.0001 | 0.00007 | - | 0.00009 | 0.00007 | 0.0001 | < 0.001 | - | 0.0001 | < 0.001 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.001 |
| Zinc (Zn) - Total | mg/L | 0.0058 | 0.01 | < 0.0008 | - | < 0.0008 | 0.0042 | 0.0057 | 0.01 | - | < 0.0008 | < 0.005 | < 0.003 | 0.02 | 0.0009 | < 0.0008 | < 0.004 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.02 | 0.0021 | < 0.005 | 0.0034 | - | - | - | 0.0033 |
| Antimony (Sb) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.0015 | < 0.00003 | < 0.0005 | < 0.0001 | - | - | - | < 0.0004 |
| Arsenic (As) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.0005 | 0.00037 | 0.00112 | 0.00056 | - | - | - | 0.0009 |
| Barium (Ba) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.008 | 0.00668 | - | 0.00799 | - | - | - | 0.009 |
| Beryllium (Be) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.001 | < 0.0002 | < 0.001 | < 0.0005 | - | - | - | < 0.001 |
| Boron (B) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.05 | 0.003 | - | 0.0053 | - | - | - | < 0.05 |
| Cadmium (Cd) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.0002 | < 0.00005 | < 0.00001 | < 0.00001 | - | - | - | < 0.000017 |
| Calcium (Ca) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | 7.02 | 23.6 | 8.51 | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.005 | < 0.00006 | 0.0031 | < 0.0001 | - | - | - | < 0.00006 |
| Cobalt (Co) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.002 | < 0.0001 | < 0.0003 | < 0.0001 | - | - | - | < 0.002 |
| Copper (Cu) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.002 | 0.0008 | 0.0016 | 0.00074 | - | - | - | 0.001 |
| Iron (Fe) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.044 | 0.009 | - | 0.015 | - | - | - | 0.149 |
| Lead (Pb) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.0008 | 0.0001 | < 0.0005 | < 0.00005 | - | - | - | < 0.0001 |
| Lithium (Li) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.003 | - | < 0.005 | < 0.005 | - | - | - | < 0.003 |
| Magnesium (Mg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | 0.765 | 2.46 | 1.13 | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.008 | 0.0006 | 0.00424 | 0.001 | - | - | - | 0.002 |
| Mercury (Hg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.0001 | < 0.00002 | < 0.00002 | < 0.00002 | - | - | - | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.005 | 0.00012 | < 0.001 | 0.000144 | - | - | - | < 0.005 |
| Nickel (Ni) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.002 | 0.0004 | 0.0013 | 0.00054 | - | - | - | < 0.002 |
| Potassium (K) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | 0.79 | 2.47 | 1.11 | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.0004 | < 0.0001 | < 0.001 | < 0.0001 | - | - | - | < 0.0004 |
| Silver (Ag) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.0001 | < 0.0001 | < 0.00002 | < 0.00001 | - | - | - | < 0.0001 |
| Sodium (Na) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | 3.25 | 10.5 | 4.72 | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | 0.024 | - | 0.0313 | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.0001 | < 0.00003 | < 0.0002 | < 0.00005 | - | - | - | < 0.0001 |
| Tin (Sn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.05 | - | < 0.0005 | < 0.0001 | - | - | - | < 0.05 |
| Uranium (U) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.0001 | < 0.00005 | < 0.0002 | 0.000021 | - | - | - | < 0.0001 |
| Vanadium (V) - Dissolved | mg/L | - | - | - | - | - | - | - | - | < 0.001 | 0.00012 | < 0.001 | < 0.0001 | - | - | - | < 0.001 |
| Zinc (Zn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | 0.013 | 0.0011 | - | < 0.003 | - | - | - | < 0.002 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | **11**$^{C}$ | < 1 | < 1 | - | 2 | 2 | < 1 | - | - | - | - | - | < 1 | < 1 | < 1 | - |
| Benzene | µg/L | - | - | < 0.5 | - | < 0.5 | - | < 0.5 | - | - | - | - | - | - | < 0.5 | < 0.5 | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | - | < 0.5 | - | < 0.5 | - | - | - | - | - | - | < 0.5 | < 0.5 | - |
| Toluene | µg/L | - | - | < 0.5 | - | < 0.5 | - | < 0.5 | - | - | - | - | - | - | < 0.5 | < 0.5 | - |
| Xylenes | µg/L | - | - | < 0.5 | - | < 0.5 | - | < 0.5 | - | - | - | - | - | - | < 0.5 | < 0.5 | - |
| Total Volatiles | µg/L | - | - | < 100 | - | < 100 | - | < 100 | - | - | - | - | - | - | < 100 | < 100 | - |
| Total Extractables | µg/L | - | - | < 50 | - | < 50 | - | < 50 | - | - | - | - | - | - | < 50 | < 50 | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | NEW-1 | DI-4 | A0-1 | A0-1 | A0-1 | A0-1 | A0-1 | A5-6 | A5-6 | A5-6 | A7-8 | A7-8 | A7-8 | A7-8 | A7-8 | A7-8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 20-Jul-08 | 24-Jun-08 | 15-Jun-97 | 12-Jun-98 | 17-Jul-98 | 19-Jun-99 | 21-Jun-00 | 15-Jun-97 | 12-Jun-98 | 18-Jul-98 | 15-Jun-97 | 12-Jun-98 | 20-Jul-98 | 18-Jul-07 | 7-Oct-07 | 21-Jun-08 |
| **Source** | | Golder | Golder | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2001 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1999 | RL&L 1999 | Comaplex | Comaplex | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 12.8 | 11.5 | 4 | 2.5 | 11.7 | 5 | 4 | 6 | 1.9 | 9.9 | 4.8 | 1.5 | 10.2 | 17.8 | 1.9 | 6.9 |
| Dissolved Oxygen - field | mg/L | 12.34 | 11.61 | 12.5 | - | - | - | - | 12.8 | - | - | 12.9 | - | - | - | - | 13.3 |
| pH - field | pH | 6.95 | 8.11 | 7.64 | 7.1 | - | 7.79 | 7.2 | 7.78 | 7.04 | - | 7.6 | 7.13 | - | 8.12 | 8.02 | - |
| Specific Conductivity - field | µS/cm | 137 | 72 | 102 | 80.6 | - | - | 82.3 | 91.3 | 77.5 | - | 93.3 | 84.7 | - | - | - | 74 |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.6 | 7.7 | 7.66 | 7.2 | 7.7 | 7.2 | 7.1 | 7.65 | 7.2 | 7.5 | 7.62 | 7.3 | 7.3 | 7.7 | 7.7 | 7.11 |
| Specific Conductivity - laboratory | µS/cm | 151 | 92 | 80.4 | 70.9 | 121 | 94.8 | 74.4 | 72.4 | 68 | 80.5 | 74.3 | 74 | 86.4 | 106 | 135 | 113 |
| Total Dissolved Solids | mg/L | 99 | - | 53 | 33 | 57 | 45 | 35 | 48 | 32 | 37 | 52 | 34 | 41 | - | - | 70 |
| Total Dissolved Solids (Calculated) | mg/L | - | 50 | - | - | - | - | - | - | - | - | - | - | - | 51 | 64 | - |
| Total Alkalinity | mg $CaCO_3$/L | 39 | 26 | 33 | 24 | 41 | 31 | 25 | 31 | 25 | 29 | 30 | 26 | 31 | 30 | 33 | 25 |
| Total Hardness | mg $CaCO_3$/L | 47 | 37 | 37 | 27 | 47 | 36 | 28 | 38 | 26 | 31 | 36 | 28 | 37 | 41 | 52 | 46 |
| Total Suspended Solids | mg/L | < 3 | < 3 | 4 | < 2 | < 2 | < 3 | < 3 | 3 | 3 | < 2 | 3 | 2 | 2 | - | < 3 | < 3 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | - | 0.64 | 0.5 | 0.6 | 1.5 | 0.78 | 0.63 | 0.3 | 0.4 | 1.95 | 0.4 | 0.5 | - | 0.45 | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 47 | 32 | 33.4 | 30 | 50 | 38 | 31 | 30.9 | 31 | 35 | 30.4 | 31 | 38 | 37 | 40 | 24.8 |
| Bromide | mg/L | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.05 |
| Calcium | mg/L | 13.7 | 11.3 | 12.6 | 9.1 | 16.1 | 12.2 | 8.04 | 13.1 | 8.69 | 10.5 | 12 | 9.07 | 11.9 | 13.6 | 17.1 | 15.8 |
| Carbonate | mg/L | < 5 | < 5 | < 0.3 | < 1 | < 1 | < 1 | < 5 | < 0.3 | < 1 | < 1 | < 0.3 | < 1 | < 1 | < 5 | < 5 | < 2 |
| Chloride | mg/L | 18 | 9 | 4.38 | 4 | 7.72 | 6.3 | 4 | 3.24 | 3.2 | 3.79 | 4.24 | 4.2 | 4.57 | 12 | 17 | 16.9 |
| Fluoride | mg/L | - | < 0.05 | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 |
| Hydroxide | mg/L | < 5 | < 5 | - | < 1 | < 1 | < 1 | < 5 | - | < 1 | < 1 | - | < 1 | < 1 | < 5 | < 5 | < 2 |
| Magnesium | mg/L | 2.27 | 1.4 | 1.27 | 1.05 | 1.74 | 1.4 | 0.954 | 1.2 | 1.07 | 1.26 | 1.44 | 1.3 | 1.7 | 1.7 | 2.2 | 2.03 |
| Potassium | mg/L | 1.03 | 3.1 | 0.676 | 0.75 | 0.95 | 0.72 | 0.591 | 0.632 | 0.73 | 0.68 | 0.643 | 0.77 | 0.8 | 0.8 | 1 | < 2 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | 0.972 | 1 | 1.1 | 0.8 | 0.7 | 0.87 | 1.1 | 0.9 | 0.977 | 1.3 | 1.1 | - | 1.3 | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 9.69 | 11 | 2.13 | 1.6 | 2.8 | 2.3 | 1.36 | 1.79 | 1.5 | 1.9 | 1.84 | 1.6 | 2.1 | 2 | 3 | 2.5 |
| Sulphate | mg/L | 4.4 | 6.7 | < 3 | 1.8 | 2.62 | 3.08 | 3.2 | 4 | 1.5 | 1.74 | 4 | 1.6 | 1.67 | 3.2 | 4.1 | 2.78 |
| Ion Balance | % | 106 | - | - | 98 | 100 | 98 | 95.2 | - | 96 | 102 | - | 98 | 108 | 90.5 | 97.5 | - |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 8 | 11 | 11 | 11 | 15.9 | 10.7 | 9.3 | 10 | 11 | 11.2 | 10 | 11 | 11.5 | - | 11 | 8 |
| Total Organic Carbon | mg/L | 9 | 5 | 3.4 | 5.7 | 5.9 | 3.8 | 3.6 | 2.8 | 5 | 3.9 | 2.8 | 5.3 | 3.9 | - | - | 2.7 |
| Dissolved Organic Carbon | mg/L | 8.4 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.9 |
| Total Inorganic Carbon | mg/L | 17 | 6 | 8 | 5.7 | 10 | 6.9 | 5.7 | 7 | 6 | 7.3 | 7 | 6.2 | 7.5 | - | 8 | 5.4 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | 0.004 | 0.013 | 0.008 | < 0.005 | 0.011 | 0.004 | 0.024 | < 0.005 | 0.005 | 0.028 | 0.016 | - | < 0.05 | < 0.02 |
| Nitrate as Nitrogen | mg/L | < 0.1 | < 0.1 | < 0.008 | 0.007 | < 0.006 | 0.009 | 0.007 | < 0.008 | 0.011 | < 0.006 | < 0.008 | 0.011 | < 0.006 | < 0.1 | < 0.1 | 0.017 |
| Nitrite as Nitrogen | mg/L | < 0.05 | **0.09**[C] | - | - | - | - | - | - | - | - | - | - | - | < 0.05 | < 0.05 | 0.001 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.1 | < 0.1 | < 0.008 | 0.007 | < 0.006 | 0.009 | 0.008 | < 0.008 | 0.011 | < 0.006 | < 0.008 | 0.011 | < 0.006 | < 0.1 | < 0.1 | - |
| Total Kjeldahl Nitrogen | mg/L | 0.4 | 0.4 | 0.3 | 0.21 | 0.41 | 0.29 | 0.12 | 0.27 | 0.22 | 0.77 | 0.3 | 0.25 | 0.52 | - | 0.2 | 0.208 |
| Phosphorus, Total | mg/L | 0.009 | 0.01 | 0.009 | 0.008 | 0.007 | 0.005 | 0.008 | 0.009 | 0.006 | 0.004 | 0.008 | 0.005 | 0.006 | - | < 0.02 | 0.004 |
| Phosphorus, Total Dissolved | mg/L | 0.004 | 0.003 | 0.006 | 0.007 | 0.006 | 0.002 | 0.004 | 0.007 | 0.006 | 0.004 | 0.006 | 0.004 | 0.005 | - | < 0.02 | < 0.002 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.002 | < 0.001 | < 0.001 | < 0.001 | 0.005 | < 0.002 | < 0.001 | < 0.001 | < 0.002 | < 0.001 | < 0.001 | - | < 0.01 | < 0.001 |
| Chlorophyll a | µg/L | < 1 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.012 |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | < 0.002 | - | < 0.001 | < 0.001 | < 0.002 | < 0.002 | - | < 0.001 | < 0.001 | - | < 0.001 | 0.002 | - | - | < 0.005 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.0077 | 0.005 | 0.0044 | 0.0018 | < 0.0003 | 0.0022 | 0.0056 | 0.0014 | 0.0017 | < 0.0003 | 0.0009 | 0.0023 | 0.0005 | < 0.01 | - | < 0.005 |
| Antimony (Sb) - Total | mg/L | < 0.00003 | < 0.0004 | 0.0005 | 0.0001 | 0.00007 | 0.00004 | 0.00007 | 0.0005 | 0.0002 | 0.00008 | 0.0002 | 0.0002 | 0.00007 | < 0.0004 | - | < 0.0005 |
| Arsenic (As) - Total | mg/L | 0.0017 | 0.0009 | 0.0004 | 0.0007 | < 0.00003 | 0.0009 | 0.0008 | 0.0007 | 0.0008 | 0.0001 | 0.0009 | 0.001 | 0.0025 | 0.0023 | - | 0.0012 |
| Barium (Ba) - Total | mg/L | 0.0111 | 0.012 | 0.0107 | 0.0087 | < 0.00005 | 0.0111 | 0.0091 | 0.0098 | 0.0091 | 0.0008 | 0.0107 | 0.0109 | 0.0092 | 0.014 | - | < 0.02 |
| Beryllium (Be) - Total | mg/L | < 0.0002 | < 0.001 | < 0.0001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0001 | < 0.0002 | < 0.0002 | < 0.0001 | < 0.0002 | < 0.0002 | < 0.001 | - | < 0.001 |
| Bismuth (Bi) - Total | mg/L | - | - | < 0.0001 | < 0.00005 | < 0.00003 | < 0.00003 | - | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.00005 | < 0.00003 | - | - | - |
| Boron (B) - Total | mg/L | 0.008 | < 0.05 | - | - | - | - | < 0.001 | - | - | - | - | - | - | < 0.05 | - | < 0.1 |
| Cadmium (Cd) - Total | mg/L | <0.00005[D>C] | <0.00002[D>C] | <0.0001[D>C] | <0.00005[D>C] | <0.00005[D>C] | <0.00002[D>C] | <0.00005[D>C] | <0.0001[D>C] | <0.00005[D>C] | <0.00005[D>C] | **0.0001**[C] | <0.00005[D>C] | <0.00005[D>C] | <0.0002[D>C] | - | <0.00002[D>C] |
| Cesium (Cs) - Total | mg/L | - | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | - | - |
| Chromium (Cr) - Total | mg/L | 0.0002 | < 0.00006 | 0.0007 | < 0.00006 | < 0.00006 | **0.0014**[C] | 0.0005 | 0.0005 | < 0.00006 | < 0.00006 | 0.0004 | < 0.00006 | **0.0033**[C] | <0.005[D>C] | - | < 0.001 |
| Cobalt (Co) - Total | mg/L | 0.0002 | < 0.002 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.002 | - | < 0.0003 |
| Copper (Cu) - Total | mg/L | 0.0014 | 0.001 | 0.0008 | 0.0009 | 0.0009 | 0.0006 | < 0.0006 | 0.0007 | 0.0011 | 0.0008 | 0.001 | 0.0013 | 0.0008 | 0.001 | - | < 0.001 |

| Waterbody | | NEW-1 | DI-4 | A0-1 | A0-1 | A0-1 | A0-1 | A0-1 | A5-6 | A5-6 | A5-6 | A7-8 | A7-8 | A7-8 | A7-8 | A7-8 | A7-8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 20-Jul-08 | 24-Jun-08 | 15-Jun-97 | 12-Jun-98 | 17-Jul-98 | 19-Jun-99 | 21-Jun-00 | 15-Jun-97 | 12-Jun-98 | 18-Jul-98 | 15-Jun-97 | 12-Jun-98 | 20-Jul-98 | 18-Jul-07 | 7-Oct-07 | 21-Jun-08 |
| **Source** | | Golder | Golder | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2001 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1999 | RL&L 1999 | Comaplex | Comaplex | Golder |
| Iron (Fe) - Total | mg/L | **0.587**[C,W] | 0.095 | 0.136 | 0.02 | < 0.005 | 0.087 | 0.106 | 0.088 | 0.01 | 0.008 | 0.109 | 0.02 | 0.028 | - | - | 0.067 |
| Lead (Pb) - Total | mg/L | < 0.00005 | < 0.0001 | < 0.0002 | < 0.00005 | < 0.00005 | 0.00006 | 0.00008 | < 0.0002 | 0.00007 | < 0.00005 | < 0.0002 | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.0005 |
| Lithium (Li) - Total | mg/L | - | < 0.01 | 0.0009 | 0.0009 | < 0.0001 | 0.0012 | - | 0.0007 | 0.0007 | 0.0007 | 0.001 | 0.0011 | 0.0002 | < 0.01 | - | < 0.005 |
| Manganese (Mn) - Total | mg/L | 0.0099 | 0.005 | 0.0076 | 0.0017 | 0.0001 | 0.0125 | 0.0181 | 0.0128 | 0.0014 | 0.0002 | 0.0135 | 0.0016 | 0.0012 | 0.014 | - | 0.0065 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00002 | < 0.00002 | <0.0002[D>C] | - | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | 0.0003 | < 0.005 | 0.0002 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | < 0.005 | - | < 0.001 |
| Nickel (Ni) - Total | mg/L | 0.0018 | 0.002 | 0.0008 | 0.0005 | 0.0003 | 0.0007 | 0.0005 | 0.0007 | 0.0005 | 0.0003 | 0.0016 | 0.0008 | 0.001 | < 0.002 | - | < 0.001 |
| Selenium (Se) - Total | mg/L | 0.0002 | < 0.0004 | < 0.001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.001 | < 0.0001 | < 0.0001 | < 0.001 | < 0.0001 | 0.0002 | 0.0004 | - | < 0.001 |
| Silver (Ag) - Total | mg/L | < 0.0001 | <0.0004[D>C] | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | <0.0004[D>C] | - | < 0.00002 |
| Strontium (Sr) - Total | mg/L | 0.0702 | - | 0.0419 | 0.0351 | < 0.0001 | 0.0487 | 0.031 | 0.0384 | 0.0338 | 0.0004 | 0.047 | 0.0428 | 0.0562 | - | - | - |
| Thallium (Tl) - Total | mg/L | < 0.00003 | < 0.0001 | 0.0001 | < 0.00005 | < 0.00003 | < 0.00003 | - | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | - | < 0.0002 |
| Tin (Sn) - Total | mg/L | - | < 0.05 | - | - | - | - | - | - | - | - | - | - | - | < 0.00005 | - | < 0.0005 |
| Titanium (Ti) - Total | mg/L | - | < 0.001 | 0.0005 | < 0.0003 | 0.0001 | < 0.0001 | - | 0.0001 | < 0.0003 | < 0.0001 | < 0.0001 | < 0.0003 | < 0.0001 | < 0.001 | - | < 0.01 |
| Uranium (U) - Total | mg/L | 0.00006 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.0001 | - | < 0.0002 |
| Vanadium (V) - Total | mg/L | 0.0004 | < 0.001 | 0.0003 | 0.0005 | 0.0007 | 0.00005 | < 0.00005 | 0.0002 | 0.0005 | 0.0005 | 0.0002 | 0.0006 | 0.00006 | < 0.001 | - | < 0.001 |
| Zinc (Zn) - Total | mg/L | < 0.0008 | < 0.004 | < 0.0005 | 0.0029 | < 0.0008 | 0.0151 | < 0.0008 | 0.001 | 0.0043 | < 0.0008 | 0.0008 | 0.0042 | < 0.0008 | 0.006 | - | < 0.005 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 0.0037 | 0.0026 | - | - | - | - | - | - | - | - | - | - | - | - | 0.01 | < 0.005 |
| Antimony (Sb) - Dissolved | mg/L | < 0.00003 | < 0.0004 | - | - | - | - | - | - | - | - | - | - | - | - | 0.0018 | < 0.0005 |
| Arsenic (As) - Dissolved | mg/L | 0.00141 | 0.0009 | - | - | - | - | - | - | - | - | - | - | - | - | 0.0016 | 0.00098 |
| Barium (Ba) - Dissolved | mg/L | 0.0108 | 0.013 | - | - | - | - | - | - | - | - | - | - | - | - | 0.013 | < 0.02 |
| Beryllium (Be) - Dissolved | mg/L | < 0.0002 | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | < 0.001 |
| Boron (B) - Dissolved | mg/L | 0.009 | < 0.05 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.05 | < 0.1 |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00005 | < 0.000017 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.000017 |
| Calcium (Ca) - Dissolved | mg/L | 13.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 15.1 |
| Chromium (Cr) - Dissolved | mg/L | 0.00015 | < 0.00006 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.005 | < 0.001 |
| Cobalt (Co) - Dissolved | mg/L | 0.0002 | < 0.002 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.002 | < 0.0003 |
| Copper (Cu) - Dissolved | mg/L | 0.0013 | 0.002 | - | - | - | - | - | - | - | - | - | - | - | - | 0.001 | < 0.001 |
| Iron (Fe) - Dissolved | mg/L | 0.269 | 0.061 | - | - | - | - | - | - | - | - | - | - | - | 0.142 | 0.04 | 0.043 |
| Lead (Pb) - Dissolved | mg/L | < 0.00005 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.0005 |
| Lithium (Li) - Dissolved | mg/L | - | < 0.003 | - | - | - | - | - | - | - | - | - | - | - | - | 0.004 | < 0.005 |
| Magnesium (Mg) - Dissolved | mg/L | 2.23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.03 |
| Manganese (Mn) - Dissolved | mg/L | 0.0087 | 0.004 | - | - | - | - | - | - | - | - | - | - | - | - | 0.005 | 0.00492 |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | 0.00025 | < 0.005 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.005 | < 0.001 |
| Nickel (Ni) - Dissolved | mg/L | 0.0018 | 0.002 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.002 | < 0.001 |
| Potassium (K) - Dissolved | mg/L | 1.04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 2 |
| Selenium (Se) - Dissolved | mg/L | 0.0002 | < 0.0004 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0004 | < 0.001 |
| Silver (Ag) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.00002 |
| Sodium (Na) - Dissolved | mg/L | 9.51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.5 |
| Strontium (Sr) - Dissolved | mg/L | 0.0699 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.00003 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.0002 |
| Tin (Sn) - Dissolved | mg/L | - | < 0.05 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.00005 | < 0.0005 |
| Uranium (U) - Dissolved | mg/L | 0.00006 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 | < 0.0002 |
| Vanadium (V) - Dissolved | mg/L | 0.00038 | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | < 0.001 |
| Zinc (Zn) - Dissolved | mg/L | < 0.0008 | < 0.002 | - | - | - | - | - | - | - | - | - | - | - | - | 0.009 | < 0.005 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | < 2 | 2 | 3 | 2 | 2 | < 2 | 1 | 3 | < 2 | 1 | 1 | - | - | - |
| Benzene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | - |
| Toluene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | - |
| Xylenes | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | - | < 0.6 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | - |
| Total Volatiles | µg/L | - | - | < 100 | < 100 | < 100 | - | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | - | - | - |
| Total Extractables | µg/L | - | - | < 50 | < 50 | < 50 | - | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[A] = Concentration higher than the relevant acute aquatic life gui
[C] = Concentration higher than the relevant chronic aquatic life g
[W] = Concentration higher than the relevant drinking water guide
[D>A] = Detection limit higher than acute aquatic life guideline.
[D>C] = Detection limit higher than chronic aquatic life guideline.
[D>W] = Detection limit higher than drinking water guideline.

| Waterbody | | A7-8 | B1-2 | B1-2 | B1-2 | B1-2 | B1-2 | B1-2 | B3-4 | B3-4 | B3-4 | B3-4 | B4-5 | B4-5 | B4-5 | B4-5 | B4-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 14-Jul-08 | 16-Jun-97 | 25-Aug-97 | 12-Jun-98 | 18-Jul-98 | 19-Jun-99 | 22-Jun-00 | 16-Jun-97 | 16-Jun-97 | 13-Jun-98 | 18-Jul-98 | 16-Jun-97 | 25-Aug-97 | 13-Jun-98 | 18-Jul-98 | 21-Jun-08 |
| **Source** | | Golder | Dillon 1994 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2001 | RL&L 2001 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 16.7 | 2.5 | 10.2 | 1.3 | 10.1 | 5.6 | 2 | 5.5 | 5.5 | 0.7 | 10.4 | 7.5 | 12.8 | 0.7 | 10.5 | 5.8 |
| Dissolved Oxygen - field | mg/L | 10.97 | 13.5 | 10 | - | - | - | - | 12.7 | 12.7 | - | - | 12.8 | 10.4 | - | - | 13.52 |
| pH - field | pH | 6.53 | 6.83 | 7.05 | 7 | - | 6.81 | 7.21 | 7.2 | 7.2 | 7.23 | - | 7.28 | 7.14 | 6.85 | - | - |
| Specific Conductivity - field | µS/cm | 109 | 100.9 | 114.7 | 75.4 | - | - | 90.1 | 107.3 | 107.3 | 68.3 | - | 85.7 | 96.5 | 49.5 | - | 50 |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.6 | 7.65 | 7.53 | 7.2 | 7.3 | 7.2 | 7 | 7.73 | 7.71 | 7.2 | 7.2 | 7.62 | 7.74 | 7 | 7.3 | 7.14 |
| Specific Conductivity - laboratory | µS/cm | 118 | 80 | 94.7 | 64.6 | 61.1 | 78.4 | 82.1 | 85.3 | 85.9 | 61.1 | 84.4 | 70.7 | 75.7 | 41.8 | 71.3 | 80.1 |
| Total Dissolved Solids | mg/L | 82 | 54 | 66 | 30 | 28 | 37 | 39 | 57 | 60 | 26 | 39 | 49 | 61 | 19 | 32 | 47 |
| Total Dissolved Solids (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Alkalinity | mg $CaCO_3$/L | 27 | 32 | 35 | 22 | 21 | 27 | 28 | 34 | 34 | 20 | 26 | 29 | 28 | 14 | 24 | 25 |
| Total Hardness | mg $CaCO_3$/L | 49 | 36 | 37 | 23 | 21 | 29 | 31 | 41 | 38 | 20 | 28 | 36 | 32 | 15 | 26 | 33 |
| Total Suspended Solids | mg/L | < 3 | 5 | < 3 | 5 | 5 | 4 | < 3 | 3 | 8 | < 2 | 6 | 7 | < 3 | < 2 | 2 | < 3 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | 1.15 | 0.8 | 0.4 | 0.5 | 1.1 | 0.48 | 0.7 | 1.48 | 0.4 | 0.8 | 0.7 | 0.7 | 0.6 | 0.6 | - |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 33 | 32.1 | 34.7 | 27 | 25 | 33 | 35 | 34.1 | 34.2 | 25 | 32 | 28.8 | 28.4 | 17 | 30 | 24.7 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.05 |
| Calcium | mg/L | 15.3 | 12.4 | 12.4 | 7.85 | 7.19 | 9.61 | 8.84 | 14.3 | 13.2 | 6.63 | 9.2 | 12.4 | 10.3 | 4.81 | 8.54 | 10.9 |
| Carbonate | mg/L | < 5 | < 0.3 | < 0.3 | < 1 | < 1 | < 1 | < 5 | < 0.3 | < 0.3 | < 1 | < 1 | < 0.3 | < 0.3 | < 1 | < 1 | < 2 |
| Chloride | mg/L | 17 | 4.69 | 5.9 | 3.3 | 3.48 | 4.03 | 4 | 5.01 | 5.04 | 3 | 5.84 | 3.66 | 4.11 | 2.1 | 3.62 | 7.27 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 |
| Hydroxide | mg/L | < 5 | - | - | < 1 | < 1 | < 1 | < 5 | - | - | < 1 | < 1 | - | - | < 1 | < 1 | - |
| Magnesium | mg/L | 1.8 | 1.19 | 1.47 | 0.92 | 0.83 | 1.12 | 0.989 | 1.31 | 1.32 | 0.87 | 1.23 | 1.25 | 1.43 | 0.69 | 1.22 | 1.48 |
| Potassium | mg/L | 0.95 | 0.79 | 0.952 | 0.87 | 0.66 | 0.83 | 0.803 | 0.844 | 0.84 | 0.72 | 0.84 | 0.636 | 0.734 | 0.51 | 0.63 | < 2 |
| Reactive Silica (as $SiO_2$) | mg/L | - | 0.454 | 0.772 | 0.6 | 0.5 | 0.5 | 0.5 | 0.413 | 0.419 | 0.6 | 0.5 | 0.45 | 0.609 | 0.5 | 0.4 | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 2.6 | 2.76 | 3.48 | 1.9 | 2.1 | 2.5 | 1.9 | 3 | 2.98 | 1.7 | 3.6 | 2.02 | 2.28 | 1.1 | 2 | 2.5 |
| Sulphate | mg/L | 2.1 | < 3 | 4 | 1.6 | 1.5 | 2.81 | 4.2 | < 3 | 4 | 1.5 | 2.45 | 4 | < 3 | 1.1 | 2.04 | 2.81 |
| Ion Balance | % | 106 | - | - | 101 | 99 | 98 | 93.4 | - | - | 94 | 100 | - | - | 99 | 99 | - |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 10 | 11 | 12.9 | 11 | 9 | 10 | 10.8 | 11 | 11 | 10 | 10.7 | 10 | 11.7 | 8 | 10.1 | 8 |
| Total Organic Carbon | mg/L | 4 | 2.8 | 3.9 | 5.6 | 4 | 3.7 | 4.1 | 3.2 | 3 | 4.8 | 4 | 3.2 | 4.7 | 4.2 | 3.9 | 2.5 |
| Dissolved Organic Carbon | mg/L | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.9 |
| Total Inorganic Carbon | mg/L | 6 | 8 | 9 | 5.5 | 4.9 | 6.3 | 6.7 | 8 | 8 | 4.8 | 6.7 | 7 | 7 | 3.7 | 6.2 | 5.5 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | 0.008 | 0.009 | 0.014 | 0.007 | < 0.005 | 0.022 | 0.007 | 0.008 | 0.021 | 0.007 | 0.008 | 0.003 | 0.046 | 0.01 | < 0.02 |
| Nitrate as Nitrogen | mg/L | < 0.1 | < 0.008 | 0.027 | 0.01 | < 0.006 | 0.024 | 0.014 | < 0.008 | < 0.008 | 0.008 | < 0.006 | < 0.008 | 0.023 | 0.009 | < 0.006 | < 0.005 |
| Nitrite as Nitrogen | mg/L | < 0.05 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.1 | < 0.008 | 0.027 | 0.01 | < 0.006 | 0.024 | 0.015 | < 0.008 | < 0.008 | 0.008 | < 0.006 | < 0.008 | 0.023 | 0.009 | < 0.006 | - |
| Total Kjeldahl Nitrogen | mg/L | 0.4 | 0.3 | 0.27 | 0.3 | 0.32 | 0.24 | 0.35 | 0.36 | 0.3 | 0.14 | 0.37 | 0.28 | 0.4 | 0.13 | 0.41 | 0.202 |
| Phosphorus, Total | mg/L | 0.007 | 0.014 | 0.014 | 0.006 | 0.006 | 0.006 | 0.008 | 0.02 | 0.019 | 0.006 | 0.007 | 0.008 | 0.017 | 0.006 | 0.006 | 0.004 |
| Phosphorus, Total Dissolved | mg/L | 0.004 | 0.008 | 0.014 | 0.006 | 0.005 | 0.002 | 0.003 | 0.007 | 0.011 | 0.006 | 0.006 | 0.005 | 0.004 | 0.005 | 0.006 | < 0.002 |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.002 | < 0.002 | < 0.001 | < 0.001 | 0.001 | 0.005 | < 0.002 | < 0.002 | < 0.001 | < 0.001 | < 0.002 | < 0.002 | < 0.001 | < 0.001 | < 0.001 |
| Chlorophyll a | µg/L | 17 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.062 |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | - | - | < 0.001 | < 0.001 | < 0.002 | < 0.002 | - | - | < 0.001 | < 0.001 | - | - | < 0.001 | < 0.001 | < 0.005 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.0023 | < 0.0005 | < 0.0005 | 0.0021 | < 0.0003 | 0.0051 | 0.0073 | 0.0029 | 0.0025 | 0.0019 | < 0.0003 | < 0.005 | 0.0011 | 0.0021 | < 0.0003 | < 0.005 |
| Antimony (Sb) - Total | mg/L | < 0.00003 | 0.0003 | 0.0003 | 0.0002 | 0.0001 | 0.00003 | 0.0001 | 0.0002 | 0.0003 | 0.0002 | 0.00008 | 0.0004 | 0.0002 | 0.0002 | 0.00009 | < 0.0005 |
| Arsenic (As) - Total | mg/L | 0.003 | 0.0003 | 0.0012 | 0.0006 | 0.0007 | 0.0007 | 0.0006 | 0.0004 | 0.0004 | 0.0006 | 0.0007 | 0.0004 | 0.0013 | 0.0006 | 0.0009 | < 0.0008 |
| Barium (Ba) - Total | mg/L | 0.0143 | 0.0104 | 0.0099 | 0.0086 | 0.0007 | 0.011 | 0.0115 | 0.0115 | 0.0117 | 0.0081 | < 0.00005 | 0.0104 | 0.0071 | 0.0067 | < 0.00005 | < 0.02 |
| Beryllium (Be) - Total | mg/L | < 0.0002 | < 0.0001 | 0.0003 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0001 | < 0.0001 | < 0.0002 | < 0.0002 | < 0.0001 | 0.0001 | < 0.0002 | < 0.0002 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | - | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.00003 | - | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | - |
| Boron (B) - Total | mg/L | 0.002 | - | - | - | - | - | 0.002 | - | - | - | - | - | - | - | - | < 0.1 |
| Cadmium (Cd) - Total | mg/L | <0.00005 D>C | <0.0001 D>C | <0.0001 D>C | <0.00005 D>C | **0.0002** C | <0.00002 D>C | <0.00005 D>C | <0.0001 D>C | <0.0001 D>C | <0.00005 D>C | <0.00005 D>C | <0.0001 D>C | <0.0001 D>C | <0.00005 D>C | <0.00005 D>C | <0.00002 D>C |
| Cesium (Cs) - Total | mg/L | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - |
| Chromium (Cr) - Total | mg/L | 0.0003 | 0.0002 | <0.002 D>C | < 0.00006 | < 0.00006 | **0.0012** C | 0.0008 | < 0.0002 | < 0.0002 | < 0.00006 | < 0.00006 | 0.0003 | <0.002 D>C | < 0.00006 | < 0.00006 | < 0.001 |
| Cobalt (Co) - Total | mg/L | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | 0.0002 | < 0.0001 | < 0.0001 | < 0.0003 |
| Copper (Cu) - Total | mg/L | 0.0009 | 0.0012 | 0.0017 | 0.0006 | 0.0008 | 0.0007 | 0.0007 | 0.0007 | 0.0012 | < 0.0006 | 0.0009 | 0.0008 | 0.0009 | < 0.0006 | < 0.0006 | < 0.001 |

| Waterbody | | A7-8 | B1-2 | B1-2 | B1-2 | B1-2 | B1-2 | B1-2 | B3-4 | B3-4 | B3-4 | B3-4 | B4-5 | B4-5 | B4-5 | B4-5 | B4-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 14-Jul-08 | 16-Jun-97 | 25-Aug-97 | 12-Jun-98 | 18-Jul-98 | 19-Jun-99 | 22-Jun-00 | 16-Jun-97 | 16-Jun-97 | 13-Jun-98 | 18-Jul-98 | 16-Jun-97 | 25-Aug-97 | 13-Jun-98 | 18-Jul-98 | 21-Jun-08 |
| **Source** | | Golder | Dillon 1994 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2001 | RL&L 2001 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder |
| Iron (Fe) - Total | mg/L | 0.138 | 0.066 | 0.143 | 0.03 | 0.007 | 0.084 | 0.121 | 0.087 | 0.113 | 0.02 | 0.007 | 0.095 | 0.117 | 0.02 | 0.007 | 0.107 |
| Lead (Pb) - Total | mg/L | 0.0001 | < 0.0002 | **0.0031**[C] | < 0.00005 | < 0.00005 | 0.00005 | 0.0001 | < 0.0002 | < 0.0002 | < 0.00005 | 0.00009 | < 0.0002 | 0.0002 | < 0.00005 | < 0.00005 | < 0.0005 |
| Lithium (Li) - Total | mg/L | - | 0.0009 | 0.0008 | 0.0006 | 0.0004 | 0.0006 | - | 0.001 | 0.0011 | 0.0005 | 0.0009 | 0.0009 | 0.0009 | 0.0004 | 0.0006 | < 0.005 |
| Manganese (Mn) - Total | mg/L | 0.0241 | 0.009 | 0.0262 | 0.0045 | 0.0003 | 0.02 | 0.0269 | 0.0089 | 0.0086 | 0.0033 | 0.0001 | 0.0143 | 0.0138 | 0.0082 | < 0.0001 | 0.0126 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00001 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | 0.0002 | 0.0002 | 0.0005 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0002 | 0.0002 | 0.0001 | 0.0003 | 0.0001 | 0.0002 | 0.00007 | 0.0001 | < 0.001 |
| Nickel (Ni) - Total | mg/L | 0.0005 | < 0.0001 | 0.0007 | 0.0005 | 0.0005 | 0.0008 | 0.0007 | < 0.0001 | < 0.0001 | 0.0006 | 0.0003 | 0.0008 | 0.0008 | 0.0006 | 0.0014 | < 0.001 |
| Selenium (Se) - Total | mg/L | 0.0002 | <0.01[D>C] | <0.01[D>C] | < 0.0001 | < 0.0001 | 0.0001 | 0.0002 | <0.01[D>C] | <0.01[D>C] | < 0.0001 | < 0.0001 | <0.01[D>C] | <0.01[D>C] | < 0.0001 | < 0.0001 | < 0.001 |
| Silver (Ag) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.00002 |
| Strontium (Sr) - Total | mg/L | 0.0837 | 0.0413 | 0.048 | 0.0323 | < 0.0001 | 0.04 | 0.0364 | 0.0483 | 0.0508 | 0.0307 | < 0.0001 | 0.0465 | 0.0503 | 0.0258 | < 0.0001 | - |
| Thallium (Tl) - Total | mg/L | < 0.00003 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.00003 | - | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0002 |
| Tin (Sn) - Total | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Titanium (Ti) - Total | mg/L | - | < 0.0001 | 0.0007 | < 0.0003 | < 0.0001 | 0.0002 | - | 0.0001 | 0.0012 | < 0.0003 | < 0.0001 | < 0.0001 | 0.0006 | < 0.0003 | < 0.0001 | < 0.01 |
| Uranium (U) - Total | mg/L | < 0.00005 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | 0.00007 | < 0.00005 | 0.0001 | 0.0001 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.0002 |
| Vanadium (V) - Total | mg/L | 0.0002 | < 0.0001 | 0.0004 | 0.0004 | 0.0004 | < 0.00005 | < 0.00005 | 0.0001 | 0.0001 | 0.0005 | 0.0005 | 0.0003 | 0.0001 | 0.0004 | 0.0005 | < 0.001 |
| Zinc (Zn) - Total | mg/L | 0.0028 | < 0.0005 | 0.0011 | 0.0018 | < 0.0008 | 0.0158 | 0.0012 | 0.0008 | 0.0007 | 0.0024 | < 0.0008 | < 0.005 | 0.0008 | 0.0026 | < 0.0008 | < 0.005 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 0.0014 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.005 |
| Antimony (Sb) - Dissolved | mg/L | < 0.00003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Arsenic (As) - Dissolved | mg/L | 0.00224 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00059 |
| Barium (Ba) - Dissolved | mg/L | 0.0134 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 |
| Beryllium (Be) - Dissolved | mg/L | < 0.0002 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Boron (B) - Dissolved | mg/L | 0.002 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.1 |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.000017 |
| Calcium (Ca) - Dissolved | mg/L | 15.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10.9 |
| Chromium (Cr) - Dissolved | mg/L | < 0.00006 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Cobalt (Co) - Dissolved | mg/L | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0003 |
| Copper (Cu) - Dissolved | mg/L | 0.0007 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Iron (Fe) - Dissolved | mg/L | 0.044 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.037 |
| Lead (Pb) - Dissolved | mg/L | 0.00005 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Lithium (Li) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.005 |
| Magnesium (Mg) - Dissolved | mg/L | 1.79 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.47 |
| Manganese (Mn) - Dissolved | mg/L | 0.0079 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00484 |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.00002 |
| Molybdenum (Mo) - Dissolved | mg/L | 0.00015 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Nickel (Ni) - Dissolved | mg/L | 0.00052 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Potassium (K) - Dissolved | mg/L | 0.93 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 2 |
| Selenium (Se) - Dissolved | mg/L | 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Silver (Ag) - Dissolved | mg/L | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.00002 |
| Sodium (Na) - Dissolved | mg/L | 2.61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.5 |
| Strontium (Sr) - Dissolved | mg/L | 0.0822 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.00003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Tin (Sn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0005 |
| Uranium (U) - Dissolved | mg/L | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Vanadium (V) - Dissolved | mg/L | 0.00015 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Zinc (Zn) - Dissolved | mg/L | 0.0015 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.005 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | < 2 | < 2 | < 1 | 4 | 3 | < 1 | < 2 | < 2 | 2 | 3 | < 2 | < 2 | **5**[C] | 3 | - |
| Benzene | µg/L | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Ethylbenzene | µg/L | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Toluene | µg/L | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Xylenes | µg/L | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Total Volatiles | µg/L | - | < 100 | < 100 | < 100 | < 100 | - | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | - |
| Total Extractables | µg/L | - | < 50 | < 50 | < 50 | < 50 | - | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[(A)] = Concentration higher than the relevant acute aquatic life gui
[(C)] = Concentration higher than the relevant chronic aquatic life g
[(W)] = Concentration higher than the relevant drinking water guide
[(D>A)] = Detection limit higher than acute aquatic life guideline.
[(D>C)] = Detection limit higher than chronic aquatic life guideline.
[(D>W)] = Detection limit higher than drinking water guideline.

| Waterbody | | B4-5 | B4-45 | B5-6 | B5-6 | B6-7 | B6-7 | B6-7 | B6-7 | B6-7 | B6-7 | D0-1 | D0-1 | D6-7 | D6-7 | G1-2 | DI-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 14-Jul-08 | 23-Jul-11 | 13-Jun-98 | 18-Jul-98 | 17-Jun-97 | 13-Jun-98 | 13-Jun-98 | 18-Jul-98 | 21-Jun-08 | 13-Jul-08 | 18-Jun-97 | 25-Aug-97 | 18-Jun-97 | 26-Aug-97 | 17-Jun-97 | 20-Jul-95 |
| **Source** | | Golder | Golder | RL&L 1999 | RL&L 1999 | R&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1998 | Dillon 1995 |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 14 | 15.9 | 1.2 | 10.2 | 10 | 1.9 | 1.9 | 10 | 10.9 | 16.7 | 7 | 12.7 | 7.2 | 8.9 | 18.5 | 13.6 |
| Dissolved Oxygen - field | mg/L | 11.63 | 9.4 | - | - | 12.7 | - | - | - | 11.85 | 11.66 | 12.7 | 11.3 | 12.7 | 10.8 | 10.4 | 7.3 |
| pH - field | pH | 6.86 | 6.8 | 6.61 | - | 7.55 | 7 | 7 | - | 8.28 | 7.02 | 7.55 | 7.49 | 7.31 | 7.14 | 8.12 | 7.52 |
| Specific Conductivity - field | µS/cm | 89 | 104 | 47.9 | - | 81.9 | 53.8 | 53.8 | - | 78 | 116 | 79.4 | 138 | 95.2 | 157 | 72.3 | 29.9 |
| Secchi Disk Depth | m | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.6 | 7.92 | 7 | 7.4 | 7.56 | 7 | 7 | 7.3 | 7.08 | 7.6 | 7.57 | 7.78 | 7.55 | 7.89 | 7.67 | 6.87 |
| Specific Conductivity - laboratory | µS/cm | 86.2 | 112 | 40.5 | 68.4 | 66.7 | 46.1 | 46.2 | 66.9 | 104 | 106 | 64 | 113 | 82.8 | 135 | 59.1 | 53.7 |
| Total Dissolved Solids | mg/L | 62 | 68 | 18 | 32 | 42 | 21 | 21 | 31 | 79 | 78 | 39 | 72 | 49 | - | 34 | 26 |
| Total Dissolved Solids (Calculated) | mg/L | 43 | 55 | - | - | - | - | - | - | - | 51 | - | - | - | - | - | - |
| Total Alkalinity | mg $CaCO_3$/L | 28 | 34 | 14 | 25 | 28 | 16 | 16 | 24 | 23 | 26 | 26 | 45 | 34 | 50 | 25 | 14 |
| Total Hardness | mg $CaCO_3$/L | 35 | 38 | 15 | 26 | 31 | 17 | 17 | 25 | 45 | 42 | 30 | 48 | 37 | 51 | 28 | 14 |
| Total Suspended Solids | mg/L | 3 | 5 | < 2 | 3 | < 3 | < 2 | < 2 | 6 | < 3 | < 3 | < 3 | < 3 | 3 | < 3 | < 3 | - |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | - | 0.4 | 0.5 | 0.55 | 0.5 | 0.3 | 0.5 | - | - | 0.78 | 1.7 | 0.83 | 0.5 | 0.57 | 0.31 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 34 | 41.4 | 18 | 30 | 27.8 | 19 | 19 | 29 | 22.7 | 31 | 26.1 | 44.6 | 33.7 | 49.9 | 24.9 | - |
| Bromide | mg/L | - | - | - | - | - | - | - | - | < 0.05 | - | - | - | - | - | - | - |
| Calcium | mg/L | 10.9 | - | 4.79 | 8.7 | 10.5 | 5.52 | 5.66 | 8.41 | 15.2 | 14 | 10.3 | 15.8 | 12.2 | 16.1 | 9.57 | 4.32 |
| Carbonate | mg/L | < 5 | < 5 | < 1 | < 1 | < 0.3 | < 1 | < 1 | < 1 | < 2 | < 5 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | 13.7 |
| Chloride | mg/L | 7 | 10.8 | 1.9 | 3.11 | 3.01 | 2.1 | 2.1 | 2.83 | 14.5 | 14 | 3.3 | 6.21 | 5 | 8.09 | 2.74 | 5.6 |
| Fluoride | mg/L | - | - | - | - | - | - | - | - | 0.02 | - | - | - | - | - | - | 0.04 |
| Hydroxide | mg/L | < 5 | < 5 | < 1 | < 1 | - | < 1 | < 1 | < 1 | < 2 | < 5 | - | - | - | - | - | - |
| Magnesium | mg/L | 1.35 | - | 0.67 | 1.13 | 1.15 | 0.75 | 0.75 | 1.09 | 1.63 | 1.39 | 1.11 | 2.1 | 1.59 | 2.71 | 0.879 | 0.805 |
| Potassium | mg/L | 0.71 | - | 0.54 | 0.7 | 0.66 | 0.61 | 0.62 | 0.69 | < 2 | 0.89 | 0.579 | 0.978 | 0.764 | 2.52 | 0.806 | < 2 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | 0.6 | 0.5 | 0.648 | 0.6 | 0.6 | 0.7 | - | - | 0.31 | 0.875 | 0.194 | 0.289 | 0.33 | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 2.59 | - | 1.1 | 1.8 | 1.83 | 1.1 | 1.1 | 1.7 | 2.2 | 2.14 | 1.78 | 3.43 | 3.24 | 5.09 | 1.74 | 4 |
| Sulphate | mg/L | 2.6 | 3.99 | 1 | 1.44 | 5 | 1.6 | 1.6 | 1.39 | 3.02 | 2.9 | 4 | 3 | < 3 | < 3 | < 3 | 2.7 |
| Ion Balance | % | - | - | 96 | 102 | - | 99 | 101 | 103 | - | 99 | - | - | - | - | - | - |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 10 | 12.1 | 8 | 11 | 10 | 9 | 9 | 10.9 | 8.6 | 11 | 8 | 18.2 | 10 | 16.5 | 11 | - |
| Total Organic Carbon | mg/L | 4 | 5.5 | 4.7 | 4.8 | 3.4 | 5.2 | 5.3 | 4.9 | 3.6 | 5 | 2.3 | 7.2 | 2.3 | 4.5 | 4.6 | - |
| Dissolved Organic Carbon | mg/L | 4.1 | - | - | - | - | - | - | - | 3.6 | 5 | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 6 | 8.6 | 3.6 | 6.2 | 7 | 3.9 | 3.9 | 6 | 5.1 | 6 | 6 | 11 | 8 | 12 | 6 | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | 0.078 | 0.009 | 0.006 | 0.01 | 0.01 | 0.008 | < 0.02 | < 0.05 | 0.004 | 0.02 | 0.003 | 0.006 | 0.006 | - |
| Nitrate as Nitrogen | mg/L | < 0.1 | < 0.05 | 0.008 | < 0.006 | 0.011 | 0.007 | 0.008 | < 0.006 | < 0.005 | < 0.1 | < 0.008 | 0.08 | < 0.008 | 0.025 | 0.012 | - |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | - | - | - | - | - | - | < 0.001 | < 0.05 | - | - | - | - | - | - |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.1 | < 0.071 | 0.008 | < 0.006 | 0.011 | 0.007 | 0.008 | < 0.006 | - | < 0.1 | < 0.008 | 0.08 | < 0.008 | 0.025 | 0.012 | 0.012 |
| Total Kjeldahl Nitrogen | mg/L | 0.3 | 0.38 | 0.19 | 0.5 | 0.35 | 0.39 | 0.3 | 0.39 | 0.252 | 0.4 | 0.26 | 0.55 | 0.3 | 0.38 | 0.41 | - |
| Phosphorus, Total | mg/L | 0.008 | 0.016 | 0.007 | 0.004 | 0.006 | 0.007 | 0.006 | 0.006 | 0.005 | 0.009 | 0.007 | 0.019 | 0.006 | 0.02 | 0.006 | - |
| Phosphorus, Total Dissolved | mg/L | 0.003 | 0.002 | 0.004 | 0.005 | 0.004 | 0.005 | 0.005 | 0.005 | < 0.002 | 0.004 | 0.007 | 0.011 | 0.004 | 0.016 | 0.004 | - |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.002 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | - |
| Chlorophyll a | µg/L | 17 | - | - | - | - | - | - | - | 0.595 | 9 | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | < 0.000002 | < 0.001 | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.005 | < 0.002 | - | - | - | - | - | - |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.0039 | 0.0364 | 0.0021 | < 0.0003 | < 0.005 | 0.002 | 0.0021 | < 0.0003 | < 0.005 | 0.0037 | < 0.005 | 0.0036 | 0.005 | 0.002 | < 0.005 | <0.2[D>C,W] |
| Antimony (Sb) - Total | mg/L | < 0.00003 | < 0.0001 | 0.0002 | 0.00009 | 0.0032 | 0.0001 | 0.0002 | 0.00007 | < 0.0005 | < 0.00003 | 0.0004 | 0.0003 | 0.0005 | 0.0003 | 0.0008 | - |
| Arsenic (As) - Total | mg/L | 0.0016 | 0.0024 | 0.0004 | 0.0008 | 0.0006 | 0.0006 | 0.0006 | 0.0009 | 0.0007 | 0.0016 | 0.0003 | 0.0006 | 0.0003 | 0.0005 | 0.0003 | 0.0001 |
| Barium (Ba) - Total | mg/L | 0.0105 | 0.0142 | 0.0068 | < 0.00005 | 0.0101 | 0.0076 | 0.0078 | < 0.00005 | < 0.02 | 0.013 | 0.0086 | 0.0144 | 0.0137 | 0.0167 | 0.0135 | 0.01 |
| Beryllium (Be) - Total | mg/L | < 0.0002 | < 0.0005 | < 0.0002 | < 0.0002 | < 0.0001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.001 | < 0.0002 | < 0.0001 | 0.0002 | < 0.0001 | 0.0002 | < 0.0001 | - |
| Bismuth (Bi) - Total | mg/L | - | < 0.00005 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.00003 | - | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - |
| Boron (B) - Total | mg/L | 0.002 | 0.0069 | - | - | - | - | - | - | < 0.1 | 0.002 | - | - | - | - | - | < 0.1 |
| Cadmium (Cd) - Total | mg/L | <0.00005[D>C] | < 0.00001 | <0.00005[D>C] | <0.00005[D>C] | <0.0001[D>C] | <0.00005[D>C] | <0.00005[D>C] | <0.00005[D>C] | <0.00002[D>C] | <0.00005[D>C] | <0.0001[D>C] | <0.0001[D>C] | <0.0001[D>C] | **0.0001**[C] | <0.0001[D>C] | <0.0002[D>C] |
| Cesium (Cs) - Total | mg/L | - | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - |
| Chromium (Cr) - Total | mg/L | < 0.00006 | 0.0002 | < 0.00006 | < 0.00006 | 0.0004 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.001 | < 0.00006 | < 0.0002 | <0.002[D>C] | 0.0009 | **0.002**[C] | 0.0007 | <0.015[D>C] |
| Cobalt (Co) - Total | mg/L | < 0.0001 | 0.0002 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0001 | 0.0002 | < 0.0001 | 0.0002 | < 0.0001 | < 0.015 |
| Copper (Cu) - Total | mg/L | 0.0006 | 0.0016 | < 0.0006 | 0.0008 | 0.0008 | < 0.0006 | < 0.0006 | 0.0006 | < 0.001 | 0.0008 | 0.0015 | 0.0016 | 0.0012 | 0.001 | 0.0016 | <0.01[D>C] |

| Waterbody | | B4-5 | B4-45 | B5-6 | B5-6 | B6-7 | B6-7 | B6-7 | B6-7 | B6-7 | B6-7 | D0-1 | D0-1 | D6-7 | D6-7 | G1-2 | DI-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 14-Jul-08 | 23-Jul-11 | 13-Jun-98 | 18-Jul-98 | 17-Jun-97 | 13-Jun-98 | 13-Jun-98 | 18-Jul-98 | 21-Jun-08 | 13-Jul-08 | 18-Jun-97 | 25-Aug-97 | 18-Jun-97 | 26-Aug-97 | 17-Jun-97 | 20-Jul-95 |
| **Source** | | Golder | Golder | RL&L 1999 | RL&L 1999 | R&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1998 | Dillon 1995 |
| Iron (Fe) - Total | mg/L | 0.143 | **0.421**$^{C,W}$ | 0.02 | < 0.005 | 0.066 | 0.02 | 0.02 | 0.009 | 0.065 | 0.122 | 0.133 | **0.305**$^{C,W}$ | 0.086 | 0.084 | 0.074 | < 0.03 |
| Lead (Pb) - Total | mg/L | < 0.00005 | 0.00008 | < 0.00005 | < 0.00005 | < 0.0002 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0005 | < 0.00005 | < 0.0002 | 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | < 0.001 |
| Lithium (Li) - Total | mg/L | - | < 0.005 | 0.0004 | 0.0007 | 0.0008 | 0.0004 | 0.0004 | 0.0005 | < 0.005 | - | 0.0012 | 0.0012 | 0.0014 | 0.002 | 0.001 | - |
| Manganese (Mn) - Total | mg/L | 0.0177 | 0.0385 | 0.0059 | < 0.0001 | 0.0046 | 0.005 | 0.0053 | 0.0001 | 0.0052 | 0.0072 | 0.0068 | **0.0615**$^{W}$ | 0.0167 | 0.0163 | 0.0017 | < 0.005 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | <0.00005$^{D>C}$ |
| Molybdenum (Mo) - Total | mg/L | 0.0001 | 0.0004 | < 0.00006 | < 0.00006 | 0.0001 | 0.00007 | 0.00008 | < 0.00006 | < 0.001 | 0.0001 | 0.0001 | 0.0005 | 0.0002 | 0.0005 | 0.0001 | < 0.03 |
| Nickel (Ni) - Total | mg/L | 0.0005 | 0.001 | 0.0006 | 0.0006 | 0.0001 | 0.0008 | 0.0008 | 0.0005 | < 0.001 | 0.0007 | < 0.0001 | 0.0011 | < 0.0001 | 0.001 | < 0.0001 | < 0.02 |
| Selenium (Se) - Total | mg/L | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | <0.01$^{D>C}$ | < 0.0001 | < 0.0001 | < 0.0001 | < 0.001 | 0.0002 | <0.01$^{D>C}$ | <0.01$^{D>C}$ | <0.01$^{D>C}$ | 0.001 | <0.01$^{D>C}$ | < 0.0005 |
| Silver (Ag) - Total | mg/L | < 0.0001 | < 0.00001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.00002 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | <0.015$^{D>C}$ |
| Strontium (Sr) - Total | mg/L | 0.051 | 0.0612 | 0.0255 | < 0.0001 | 0.0501 | 0.0293 | 0.0297 | < 0.0001 | - | 0.0818 | 0.0415 | 0.0701 | 0.0516 | 0.0862 | 0.0468 | - |
| Thallium (Tl) - Total | mg/L | < 0.00003 | < 0.00005 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.00003 | < 0.0002 | < 0.00003 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - |
| Tin (Sn) - Total | mg/L | - | < 0.0001 | - | - | - | - | - | - | < 0.0005 | - | - | - | - | - | - | < 0.3 |
| Titanium (Ti) - Total | mg/L | - | 0.0021 | < 0.0003 | < 0.0001 | < 0.0001 | < 0.0003 | < 0.0003 | < 0.0001 | < 0.01 | - | 0.0009 | 0.0013 | 0.0004 | 0.0013 | 0.0004 | - |
| Uranium (U) - Total | mg/L | < 0.00005 | 0.00006 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0002 | < 0.00005 | < 0.0001 | 0.0001 | 0.0001 | 0.0001 | < 0.0001 | - |
| Vanadium (V) - Total | mg/L | 0.0001 | 0.0004 | 0.0004 | 0.0004 | < 0.0001 | 0.0005 | 0.0005 | 0.0004 | < 0.001 | 0.0002 | 0.0003 | 0.0004 | 0.0001 | 0.0002 | 0.0002 | - |
| Zinc (Zn) - Total | mg/L | < 0.0008 | < 0.003 | 0.0045 | < 0.0008 | < 0.0005 | 0.0043 | 0.002 | < 0.0008 | < 0.005 | < 0.0008 | < 0.0005 | 0.0016 | 0.0227 | < 0.005 | 0.0162 | < 0.005 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 0.0019 | < 0.003 | - | - | - | - | - | - | < 0.005 | 0.0023 | - | - | - | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.00003 | < 0.0001 | - | - | - | - | - | - | < 0.0005 | < 0.00003 | - | - | - | - | - | - |
| Arsenic (As) - Dissolved | mg/L | 0.00121 | 0.00154 | - | - | - | - | - | - | 0.00069 | 0.00144 | - | - | - | - | - | - |
| Barium (Ba) - Dissolved | mg/L | 0.0101 | 0.0135 | - | - | - | - | - | - | < 0.02 | 0.0126 | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.0002 | < 0.0005 | - | - | - | - | - | - | < 0.001 | < 0.0002 | - | - | - | - | - | - |
| Boron (B) - Dissolved | mg/L | 0.002 | 0.0062 | - | - | - | - | - | - | < 0.1 | 0.002 | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00005 | < 0.00001 | - | - | - | - | - | - | < 0.000017 | < 0.00005 | - | - | - | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | 10.9 | 13.9 | - | - | - | - | - | - | 15.1 | 14.1 | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.00006 | < 0.0001 | - | - | - | - | - | - | < 0.001 | < 0.00006 | - | - | - | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | - | - | - | < 0.0003 | < 0.0001 | - | - | - | - | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.0007 | 0.00097 | - | - | - | - | - | - | < 0.001 | 0.0008 | - | - | - | - | - | - |
| Iron (Fe) - Dissolved | mg/L | 0.05 | 0.088 | - | - | - | - | - | - | 0.039 | 0.059 | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | 0.00009 | < 0.00005 | - | - | - | - | - | - | < 0.0005 | 0.00005 | - | - | - | - | - | - |
| Lithium (Li) - Dissolved | mg/L | - | < 0.005 | - | - | - | - | - | - | < 0.005 | - | - | - | - | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | 1.36 | 1.76 | - | - | - | - | - | - | 1.64 | 1.42 | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.007 | 0.017 | - | - | - | - | - | - | 0.00395 | 0.0046 | - | - | - | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | - | - | - | - | - | - | < 0.00002 | < 0.00002 | - | - | - | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | 0.00011 | 0.000349 | - | - | - | - | - | - | < 0.001 | 0.00013 | - | - | - | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | 0.00048 | 0.00067 | - | - | - | - | - | - | < 0.001 | 0.00068 | - | - | - | - | - | - |
| Potassium (K) - Dissolved | mg/L | 0.71 | 1.04 | - | - | - | - | - | - | < 2 | 0.91 | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.0001 | < 0.0001 | - | - | - | - | - | - | < 0.001 | 0.0002 | - | - | - | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.0001 | < 0.00001 | - | - | - | - | - | - | < 0.00002 | < 0.0001 | - | - | - | - | - | - |
| Sodium (Na) - Dissolved | mg/L | 2.61 | 4.93 | - | - | - | - | - | - | 2.3 | 2.21 | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | 0.0509 | 0.0612 | - | - | - | - | - | - | - | 0.0829 | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.00003 | < 0.00005 | - | - | - | - | - | - | < 0.0002 | < 0.00003 | - | - | - | - | - | - |
| Tin (Sn) - Dissolved | mg/L | - | < 0.0001 | - | - | - | - | - | - | < 0.0005 | - | - | - | - | - | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.00005 | 0.000038 | - | - | - | - | - | - | < 0.0002 | < 0.00005 | - | - | - | - | - | - |
| Vanadium (V) - Dissolved | mg/L | 0.0001 | 0.00011 | - | - | - | - | - | - | < 0.001 | 0.00014 | - | - | - | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | 0.0015 | < 0.003 | - | - | - | - | - | - | < 0.005 | 0.0012 | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | 2 | 3 | < 2 | 4 | **5**$^{C}$ | 4 | - | - | < 2 | < 2 | < 2 | < 2 | < 2 | - |
| Benzene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | 1 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Toluene | µg/L | - | - | < 0.5 | 1.1 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Xylenes | µg/L | - | - | < 0.5 | 5.4 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - |
| Total Volatiles | µg/L | - | - | < 100 | < 100 | < 100 | - | < 100 | < 100 | - | - | < 100 | < 100 | < 100 | < 100 | < 100 | - |
| Total Extractables | µg/L | - | - | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | - | - | < 50 | < 50 | < 50 | < 50 | < 50 | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | DI-6 | DI-7 | DI-7 | NEW-2 | NEW-3 | M3.0 | M3.0 | M3.0 | M3.9 | M3.9 | M3.9 | M5.0 | M5.0 | M5.0 | M5.0 | M6.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 23-Jun-08 | 20-Jul-95 | 23-Jun-08 | 23-Jun-08 | 24-Jun-08 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 29-Aug-11 |
| **Source** | | Golder | Dillon 1995 | Golder | Golder | Golder | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 5.5 | 14.1 | 7.8 | 18.2 | 11 | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Oxygen - field | mg/L | 14.57 | 9.7 | 13.43 | 9.59 | 11.83 | - | - | - | - | - | - | - | - | - | - | - |
| pH - field | pH | - | 7.83 | 7.59 | 8.35 | 7.55 | - | - | - | - | - | - | - | - | - | - | - |
| Specific Conductivity - field | µS/cm | 34 | 40.5 | 37 | 82 | 37 | - | - | - | - | - | - | - | - | - | - | - |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.4 | 7.03 | 7.4 | 7.8 | 7.4 | 8.15 | 8.12 | 7.99 | 8.03 | 7.97 | 7.88 | 7.9 | 7.99 | 7.89 | 7.82 | 7.46 |
| Specific Conductivity - laboratory | µS/cm | 51.7 | 67.6 | 53.3 | 91.3 | 50.1 | 279 | 278 | 297 | 401 | 415 | 424 | 168 | 233 | 243 | 216 | 81.1 |
| Total Dissolved Solids | mg/L | - | 34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Calculated) | mg/L | 26 | - | 27 | 49 | 27 | 170 | 157 | 172 | 216 | 213 | 225 | 89 | 137 | 136 | 116 | 44 |
| Total Alkalinity | mg $CaCO_3$/L | 11 | 16 | 12 | 33 | 14 | 63 | 58 | 60 | 50 | 47 | 48 | 33 | 44 | 41 | 37 | 18 |
| Total Hardness | mg $CaCO_3$/L | 15 | 18 | 16 | 37 | 18 | 92 | 91 | 98 | 89 | 99 | 99 | 48 | 75 | 82 | 63 | 29 |
| Total Suspended Solids | mg/L | < 3 | - | < 3 | < 3 | < 3 | - | - | 9 | - | - | < 5 | < 5 | - | - | 6 | - |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | 0.42 | - | - | - | 0.69 | 1.21 | 2.7 | 2.2 | 1.17 | 3.52 | 1.36 | 1.45 | 1.38 | 2.21 | 4.55 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 14 | - | 15 | 41 | 17 | 76.2 | 71.1 | 73 | 61.3 | 57.9 | 58.1 | 40.5 | 53.5 | 49.7 | 45.2 | 21.5 |
| Bromide | mg/L | < 0.1 | - | 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 4.4 | 5.26 | 4.5 | 12.2 | 5.7 | 28.3 | 25.5 | 27.1 | 22.6 | 22.1 | 24.4 | - | 21.6 | 22.2 | 19.2 | 8.76 |
| Carbonate | mg/L | < 5 | 15.5 | < 5 | < 5 | < 5 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Chloride | mg/L | 6 | 7.4 | 7 | 6 | 4 | 58 | 53.9 | 56.2 | 94.7 | 91.6 | 90.9 | 28 | 45.4 | 43.1 | 35.8 | 7.68 |
| Fluoride | mg/L | < 0.05 | 0.04 | < 0.05 | < 0.05 | < 0.05 | 0.11 | < 0.1 | < 0.1 | 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Hydroxide | mg/L | < 5 | - | < 5 | < 5 | < 5 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 |
| Magnesium | mg/L | 0.8 | 1.07 | 0.8 | 1.3 | 0.8 | 4.6 | 4.5 | 4.93 | 7.13 | 7.26 | 7.83 | - | 4.25 | 4.44 | 3.68 | 1.3 |
| Potassium | mg/L | 0.7 | < 2 | 0.8 | 3.4 | 3.3 | 3.35 | 2.78 | 2.8 | 3.72 | 3.54 | 3.77 | - | 2.47 | 2.47 | 2.38 | 1.86 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 4 | 5.4 | 4 | 10 | 11 | 30.8 | 28.1 | 28.8 | 47.4 | 47.7 | 47.8 | - | 22.3 | 20.8 | 17.7 | 5.15 |
| Sulphate | mg/L | 2.3 | 3.3 | 2.4 | 4.1 | 3.4 | 7.87 | 7.62 | 8.86 | 10.4 | 12.4 | 16.5 | 8.66 | 14.2 | 18.1 | 15.7 | 8.84 |
| Ion Balance | % | - | - | - | - | - | 105 | - | 104 | 99.3 | - | 105 | - | 100 | - | 101 | - |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 5 | - | 6 | 12 | 7 | - | - | - | - | - | - | - | - | - | - | - |
| Total Organic Carbon | mg/L | 2 | - | 3 | 5 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Organic Carbon | mg/L | 2 | - | 2 | 4 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 3 | - | 3 | 7 | 4 | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate as Nitrogen | mg/L | < 0.1 | - | < 0.1 | < 0.1 | < 0.1 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrite as Nitrogen | mg/L | **0.07**[C] | - | 0.06 | < 0.05 | **0.08**[C] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.1 | < 0.005 | < 0.1 | < 0.1 | < 0.1 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | < 0.2 | - | < 0.2 | 0.3 | < 0.2 | 0.85 | 0.81 | 0.72 | 0.51 | 0.47 | 0.5 | - | 0.55 | 0.56 | 0.46 | 1.57 |
| Phosphorus, Total | mg/L | 0.007 | - | 0.01 | 0.01 | 0.009 | - | - | 0.013 | - | - | 0.016 | 0.015 | - | - | < 0.01 | - |
| Phosphorus, Total Dissolved | mg/L | 0.002 | - | 0.002 | 0.002 | 0.003 | - | - | - | - | - | - | - | - | - | - | - |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Chlorophyll a | µg/L | 3 | - | 5 | 10 | 31 | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.002 | - | < 0.002 | < 0.002 | < 0.002 | - | - | - | - | - | - | - | - | - | - | - |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.0021 | <0.2[D>C,W] | 0.0075 | 0.0058 | 0.0038 | 0.036 | 0.022 | 0.072 | 0.118 | 0.029 | 0.11 | 0.0145 | 0.05 | 0.039 | 0.066 | 0.091 |
| Antimony (Sb) - Total | mg/L | < 0.0004 | - | < 0.0004 | < 0.0004 | < 0.0004 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Arsenic (As) - Total | mg/L | < 0.0004 | 0.0001 | < 0.0004 | 0.0012 | 0.0005 | 0.0012 | 0.001 | 0.0011 | < 0.001 | < 0.001 | < 0.001 | 0.0004 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Barium (Ba) - Total | mg/L | 0.006 | < 0.01 | 0.006 | 0.014 | 0.008 | 0.0247 | 0.0251 | 0.0267 | 0.0236 | 0.0255 | 0.0267 | 0.0221 | 0.0262 | 0.0284 | 0.0231 | 0.0176 |
| Beryllium (Be) - Total | mg/L | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | - | - | - | - | - | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Boron (B) - Total | mg/L | < 0.05 | < 0.1 | < 0.05 | < 0.05 | < 0.05 | 0.042 | < 0.03 | < 0.03 | 0.056 | 0.033 | < 0.03 | 0.014 | 0.035 | < 0.03 | < 0.03 | < 0.03 |
| Cadmium (Cd) - Total | mg/L | <0.00002[D>C] | <0.0002[D>C] | <0.00002[D>C] | <0.00002[D>C] | <0.00002[D>C] | <0.0002[D>C] | <0.0002[D>C] | <0.0002[D>C] | < 0.0002 | < 0.0002 | < 0.0002 | < 0.00001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Cesium (Cs) - Total | mg/L | - | - | - | - | - | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Chromium (Cr) - Total | mg/L | < 0.00006 | <0.015[D>C] | < 0.00006 | < 0.00006 | < 0.00006 | <0.002[D>C] | <0.002[D>C] | <0.002[D>C] | < 0.002 | < 0.002 | < 0.002 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Cobalt (Co) - Total | mg/L | < 0.002 | < 0.015 | < 0.002 | < 0.002 | < 0.002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Copper (Cu) - Total | mg/L | < 0.001 | <0.01[D>C] | < 0.001 | 0.001 | 0.001 | < 0.002 | < 0.002 | < 0.002 | 0.005 | < 0.002 | 0.002 | 0.0012 | < 0.002 | < 0.002 | < 0.002 | 0.0032 |

| Waterbody | | DI-6 | DI-7 | DI-7 | NEW-2 | NEW-3 | M3.0 | M3.0 | M3.0 | M3.9 | M3.9 | M3.9 | M5.0 | M5.0 | M5.0 | M5.0 | M6.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 23-Jun-08 | 20-Jul-95 | 23-Jun-08 | 23-Jun-08 | 24-Jun-08 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 29-Aug-11 |
| **Source** | | Golder | Dillon 1995 | Golder | Golder | Golder | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM |
| Iron (Fe) - Total | mg/L | 0.013 | 0.059 | 0.044 | 0.094 | 0.059 | < 0.1 | 0.2 | **0.34**[C,W] | 0.19 | 0.18 | 0.34 | 0.3 | 0.17 | 0.23 | 0.24 | 0.56 |
| Lead (Pb) - Total | mg/L | < 0.0001 | < 0.001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.00009 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Lithium (Li) - Total | mg/L | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | 0.0222 | 0.0035 | 0.0027 | 0.0205 | 0.0035 | 0.0025 | < 0.002 | 0.0161 | < 0.002 | < 0.002 | 0.0127 |
| Manganese (Mn) - Total | mg/L | 0.002 | < 0.005 | 0.001 | 0.007 | 0.002 | 0.0042 | 0.0062 | 0.0101 | 0.0046 | 0.0035 | 0.0045 | 0.0086 | 0.0047 | 0.0053 | 0.0041 | 0.005 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | <0.00005[D>C] | < 0.00002 | < 0.00002 | < 0.00002 | <0.00005[D>C] | <0.00005[D>C] | <0.00005[D>C] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Molybdenum (Mo) - Total | mg/L | < 0.005 | < 0.03 | < 0.005 | < 0.005 | < 0.005 | 0.0013 | 0.0008 | 0.0007 | 0.0017 | 0.0015 | 0.0013 | 0.0005 | 0.0006 | 0.0006 | < 0.0005 | < 0.0005 |
| Nickel (Ni) - Total | mg/L | < 0.002 | < 0.02 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.0021 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.0022 |
| Selenium (Se) - Total | mg/L | < 0.0004 | < 0.0005 | < 0.0004 | < 0.0004 | < 0.0004 | <0.005[D>C] | <0.005[D>C] | <0.005[D>C] | < 0.005 | < 0.005 | < 0.005 | < 0.001 | < 0.005 | < 0.005 | < 0.005 | < 0.005 |
| Silver (Ag) - Total | mg/L | <0.0004[D>C] | <0.015[D>C] | <0.0004[D>C] | <0.0004[D>C] | <0.0004[D>C] | <0.001[D>C] | <0.001[D>C] | <0.001[D>C] | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Strontium (Sr) - Total | mg/L | - | - | - | - | - | 0.168 | 0.158 | 0.168 | 0.149 | 0.152 | 0.155 | 0.0792 | 0.12 | 0.128 | 0.0982 | 0.0437 |
| Thallium (Tl) - Total | mg/L | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | <0.005[D>C,A] | <0.005[D>C,A] | <0.005[D>C,A] | <0.005[D>C,A] | <0.005[D>C,A] | <0.005[D>C,A] | < 0.0001 | <0.005[D>C,A] | <0.005[D>C,A] | <0.005[D>C,A] | <0.005[D>C,A] |
| Tin (Sn) - Total | mg/L | < 0.05 | < 0.3 | < 0.05 | < 0.05 | < 0.05 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0006 |
| Titanium (Ti) - Total | mg/L | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.0014 | 0.0042 | 0.0017 | 0.0014 | 0.0072 | 0.0008 | < 0.001 | 0.0022 | 0.0039 | 0.003 |
| Uranium (U) - Total | mg/L | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Vanadium (V) - Total | mg/L | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.0003 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Zinc (Zn) - Total | mg/L | < 0.004 | < 0.005 | < 0.004 | < 0.004 | < 0.004 | < 0.02 | < 0.02 | **0.106**[C] | < 0.02 | < 0.02 | 0.03 | < 0.005 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 0.0094 | - | 0.0036 | 0.0042 | 0.0025 | - | - | - | - | - | - | - | - | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.0004 | - | < 0.0004 | < 0.0004 | < 0.0004 | - | - | - | - | - | - | - | - | - | - | - |
| Arsenic (As) - Dissolved | mg/L | < 0.0004 | - | < 0.0004 | 0.001 | 0.0005 | - | - | - | - | - | - | - | - | - | - | - |
| Barium (Ba) - Dissolved | mg/L | 0.007 | - | 0.006 | 0.014 | 0.008 | - | - | - | - | - | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - | - |
| Boron (B) - Dissolved | mg/L | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | - | - | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | 0.000028 | - | < 0.000017 | < 0.000017 | < 0.000017 | - | - | - | - | - | - | - | - | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | 0.00024 | - | < 0.00006 | < 0.00006 | < 0.00006 | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.002 | - | < 0.002 | < 0.002 | < 0.002 | - | - | - | - | - | - | - | - | - | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.006 | - | < 0.001 | 0.001 | 0.001 | - | - | - | - | - | - | - | - | - | - | - |
| Iron (Fe) - Dissolved | mg/L | 0.048 | - | 0.032 | 0.04 | 0.023 | - | - | - | - | - | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | 0.106 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - |
| Lithium (Li) - Dissolved | mg/L | < 0.003 | - | < 0.003 | < 0.003 | < 0.003 | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.002 | - | 0.001 | 0.003 | 0.001 | - | - | - | - | - | - | - | - | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | - | < 0.00002 | < 0.00002 | < 0.00002 | - | - | - | - | - | - | - | - | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | < 0.005 | - | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | < 0.002 | - | < 0.002 | < 0.002 | < 0.002 | - | - | - | - | - | - | - | - | - | - | - |
| Potassium (K) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.0004 | - | < 0.0004 | < 0.0004 | < 0.0004 | - | - | - | - | - | - | - | - | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - |
| Sodium (Na) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - |
| Tin (Sn) - Dissolved | mg/L | < 0.05 | - | < 0.05 | < 0.05 | < 0.05 | - | - | - | - | - | - | - | - | - | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.0001 | - | < 0.0001 | < 0.0001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.001 | - | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | 0.0035 | - | < 0.002 | < 0.002 | < 0.002 | - | - | - | - | - | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzene | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
[A] = Concentration higher than the relevant acute aquatic life gui
[C] = Concentration higher than the relevant chronic aquatic life g
[W] = Concentration higher than the relevant drinking water guide
[D>A] = Detection limit higher than acute aquatic life guideline.
[D>C] = Detection limit higher than chronic aquatic life guideline.
[D>W] = Detection limit higher than drinking water guideline.

| Waterbody | | M6.7 | M6.7 | M6.7 | M8.6 | M8.6 | M8.6 | M8.6 | M11.5 | M11.5 | M11.5 | M11.5 | M13.3 | M13.3 | M13.3 | M13.3 | M13.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 14-Sep-11 | 11-Oct-11 |
| **Source** | | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Oxygen - field | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pH - field | pH | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Specific Conductivity - field | µS/cm | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.47 | 7.45 | 7.29 | 7.76 | 7.89 | 7.74 | 7.75 | 7.49 | 7.59 | 7.56 | 7.54 | 7.8 | 7.81 | 7.79 | 7.79 | 7.74 |
| Specific Conductivity - laboratory | µS/cm | 81 | 79 | 85.1 | 77.4 | 124 | 111 | 137 | 46.6 | 55.4 | 63 | 69.9 | 75.5 | 81.5 | 87.6 | 88.1 | 102 |
| Total Dissolved Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Calculated) | mg/L | 44 | 41 | 44 | 39 | 73 | 60 | 76 | 23 | 30 | 33 | 37 | 38 | 44 | 46 | 46 | 54 |
| Total Alkalinity | mg $CaCO_3$/L | 18 | 16 | 17 | 24 | 34 | 26 | 33 | 16 | 17 | 18 | 20 | 29 | 28 | 28 | 28 | 31 |
| Total Hardness | mg $CaCO_3$/L | 28 | 29 | 27 | 24 | 52 | 45 | 52 | 16 | 21 | 25 | 26 | 28 | 33 | 36 | 37 | 39 |
| Total Suspended Solids | mg/L | - | - | < 5 | < 5 | - | - | < 5 | 28 | - | - | 6 | < 5 | - | - | - | - |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | 4.88 | 2.23 | 2.69 | 0.65 | 0.65 | 0.63 | 0.67 | 0.78 | 0.51 | 0.48 | 0.56 | 1 | 0.63 | 0.74 | 0.7 | 0.68 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 21.4 | 20 | 20.3 | 29 | 41.4 | 31.7 | 39.7 | 19.2 | 21.1 | 21.6 | 23.5 | 35.3 | 34.1 | 33.6 | 33.5 | 37.4 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 8.55 | 8.24 | 8.66 | - | 17.7 | 12.6 | 15 | - | 7.13 | 7.61 | 8.23 | - | 10.4 | 10.9 | 10.9 | 11.8 |
| Carbonate | mg/L | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Chloride | mg/L | 7.7 | 7 | 8.5 | 6.79 | 11 | 8.26 | 11.1 | 2.66 | 3.41 | 3.66 | 4.06 | 4.29 | 5.86 | 5.75 | 5.76 | 6.87 |
| Fluoride | mg/L | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Hydroxide | mg/L | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 |
| Magnesium | mg/L | 1.26 | 1.26 | 1.34 | - | 2.18 | 1.86 | 2.24 | - | 0.776 | 0.943 | 0.994 | - | 1.3 | 1.5 | 1.5 | 1.73 |
| Potassium | mg/L | 1.79 | 1.47 | 1.47 | - | 2.46 | 1.94 | 2.01 | - | 0.96 | 0.96 | 0.856 | - | 1.49 | 1.3 | 1.27 | 1.31 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 4.93 | 4.49 | 4.99 | - | 6.52 | 5.19 | 6.02 | - | 2.03 | 2.23 | 2.37 | - | 3.11 | 3.34 | 3.35 | 4.02 |
| Sulphate | mg/L | 8.85 | 9.1 | 9.2 | 3.89 | 13.3 | 14.8 | 17.3 | 2.5 | 4.93 | 7.26 | 7.48 | 2.59 | 4.57 | 6.33 | 6.37 | 8.46 |
| Ion Balance | % | - | - | - | - | 111 | - | 94.1 | - | - | - | - | - | - | - | - | 95.6 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | 1.37 | 0.73 | 0.53 | - | 0.65 | 0.38 | 0.31 | - | 0.34 | 0.37 | 0.33 | - | 0.58 | 0.52 | 0.52 | 0.42 |
| Phosphorus, Total | mg/L | - | - | < 0.01 | 0.016 | - | - | < 0.01 | 0.013 | - | - | < 0.01 | 0.016 | - | - | - | < 0.01 |
| Phosphorus, Total Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.1 |
| Orthophosphate (PO4-P) | mg/L | < 0.01 | < 0.01 | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Chlorophyll a | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 0.075 | 0.068 | 0.036 | 0.0109 | 0.024 | 0.023 | < 0.02 | 0.0168 | 0.024 | < 0.02 | 0.026 | 0.01 | 0.025 | < 0.02 | < 0.02 | < 0.02 |
| Antimony (Sb) - Total | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Arsenic (As) - Total | mg/L | < 0.001 | < 0.001 | < 0.001 | 0.0002 | < 0.001 | < 0.001 | < 0.001 | 0.0003 | < 0.001 | < 0.001 | < 0.001 | 0.0007 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Barium (Ba) - Total | mg/L | 0.0169 | 0.0169 | 0.0147 | 0.0127 | 0.0192 | 0.0202 | 0.0218 | 0.0112 | 0.0102 | 0.0117 | 0.0129 | 0.0239 | 0.019 | 0.02 | 0.0201 | 0.0215 |
| Beryllium (Be) - Total | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Bismuth (Bi) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Boron (B) - Total | mg/L | < 0.03 | < 0.03 | < 0.03 | < 0.01 | < 0.03 | < 0.03 | < 0.03 | < 0.01 | < 0.03 | < 0.03 | < 0.03 | < 0.01 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Cadmium (Cd) - Total | mg/L | < 0.0002 | < 0.0002 | < 0.0002 | < 0.00001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.00001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.00001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Cesium (Cs) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Chromium (Cr) - Total | mg/L | < 0.002 | < 0.002 | < 0.002 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Cobalt (Co) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Copper (Cu) - Total | mg/L | 0.0031 | 0.0025 | < 0.002 | 0.0018 | 0.0021 | 0.0028 | < 0.002 | 0.0027 | < 0.002 | 0.0021 | 0.0023 | 0.0021 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Waterbody | | M6.7 | M6.7 | M6.7 | M8.6 | M8.6 | M8.6 | M8.6 | M11.5 | M11.5 | M11.5 | M11.5 | M13.3 | M13.3 | M13.3 | M13.3 | M13.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine |
| **Date Sampled** | | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 14-Sep-11 | 11-Oct-11 |
| **Source** | | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM |
| Iron (Fe) - Total | mg/L | 0.55 | 0.46 | 0.37 | 0.18 | 0.14 | 0.17 | 0.15 | 0.24 | < 0.1 | < 0.1 | 0.15 | 0.41 | 0.17 | 0.21 | 0.2 | 0.13 |
| Lead (Pb) - Total | mg/L | < 0.001 | < 0.001 | < 0.001 | 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.00009 | < 0.001 | < 0.001 | < 0.001 | < 0.00009 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Lithium (Li) - Total | mg/L | 0.011 | < 0.002 | < 0.002 | < 0.002 | 0.0164 | < 0.002 | < 0.002 | < 0.002 | 0.0082 | < 0.002 | < 0.002 | < 0.002 | 0.0121 | < 0.002 | < 0.002 | < 0.002 |
| Manganese (Mn) - Total | mg/L | 0.0045 | 0.0067 | 0.0054 | 0.0109 | 0.0094 | 0.0059 | 0.0078 | 0.0188 | 0.0033 | 0.003 | 0.0101 | 0.0273 | 0.0045 | 0.0076 | 0.0088 | 0.0039 |
| Mercury (Hg) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Molybdenum (Mo) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Nickel (Ni) - Total | mg/L | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Selenium (Se) - Total | mg/L | < 0.005 | < 0.005 | < 0.005 | < 0.001 | < 0.005 | < 0.005 | < 0.005 | < 0.001 | < 0.005 | < 0.005 | < 0.005 | < 0.001 | < 0.005 | < 0.005 | < 0.005 | < 0.005 |
| Silver (Ag) - Total | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Strontium (Sr) - Total | mg/L | 0.0399 | 0.0379 | 0.0364 | 0.0269 | 0.0535 | 0.0426 | 0.0484 | 0.0192 | 0.0269 | 0.0275 | 0.0285 | 0.0434 | 0.0473 | 0.0477 | 0.047 | 0.0529 |
| Thallium (Tl) - Total | mg/L | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | < 0.0001 | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | < 0.0001 | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | < 0.0001 | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ |
| Tin (Sn) - Total | mg/L | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0006 |
| Titanium (Ti) - Total | mg/L | 0.003 | 0.0031 | 0.002 | 0.0002 | < 0.001 | < 0.001 | < 0.001 | 0.0003 | < 0.001 | < 0.001 | 0.0015 | 0.0004 | < 0.001 | < 0.001 | 0.001 | < 0.001 |
| Uranium (U) - Total | mg/L | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Vanadium (V) - Total | mg/L | < 0.002 | < 0.002 | < 0.002 | < 0.0002 | < 0.002 | < 0.002 | < 0.002 | < 0.0002 | < 0.002 | < 0.002 | < 0.002 | < 0.0002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Zinc (Zn) - Total | mg/L | < 0.02 | < 0.02 | < 0.02 | < 0.005 | < 0.02 | < 0.02 | < 0.02 | < 0.005 | < 0.02 | < 0.02 | < 0.02 | < 0.005 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.0024 |
| Antimony (Sb) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Arsenic (As) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00029 |
| Barium (Ba) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.0211 |
| Beryllium (Be) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Boron (B) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 |
| Cadmium (Cd) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.00001 |
| Calcium (Ca) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.002 |
| Cobalt (Co) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Copper (Cu) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00151 |
| Iron (Fe) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.1 |
| Lead (Pb) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.00009 |
| Lithium (Li) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.002 |
| Magnesium (Mg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00136 |
| Mercury (Hg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Molybdenum (Mo) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 |
| Nickel (Ni) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Potassium (K) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 |
| Silver (Ag) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 |
| Sodium (Na) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.0511 |
| Thallium (Tl) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 |
| Tin (Sn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Uranium (U) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0001 |
| Vanadium (V) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 |
| Zinc (Zn) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.002 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzene | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | M13.3 | M22.6 | M22.6 | M22.6 | M22.6 | M23.6 | M23.6 | M23.6 | M23.6 | ML-MR | ML-MR | ML-MR | ML-MR | ML-MR | ML-MR | ML-MR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver |
| **Date Sampled** | | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 19-Jun-97 | 24-Aug-97 | 24-Aug-97 | 12-Jun-98 | 18-Jul-98 | 20-Jun-99 | 22-Jun-00 |
| **Source** | | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2000 |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | | |
| Water Temperature - field | °C | - | - | - | - | - | - | - | - | - | 6.9 | 11.6 | 11.6 | 1.7 | 9.8 | 6 | 3 |
| Dissolved Oxygen - field | mg/L | - | - | - | - | - | - | - | - | - | 14.1 | 11.1 | 11.1 | - | - | - | - |
| pH - field | pH | - | - | - | - | - | - | - | - | - | 7.15 | 7.48 | 7.48 | - | - | 6.89 | 7.11 |
| Specific Conductivity - field | µS/cm | - | - | - | - | - | - | - | - | - | 62 | 61.6 | 61.6 | 79.8 | - | - | 72.9 |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.75 | 7.87 | 8.25 | 8.2 | 8.03 | 7.99 | 8.13 | 8.12 | 7.83 | 7.22 | 7.32 | 7.36 | 7.1 | 7.2 | 7 | 6.9 |
| Specific Conductivity - laboratory | µS/cm | 102 | 92.4 | 165 | 168 | 168 | 176 | 213 | 229 | 161 | 50.3 | 50.4 | 49.9 | 62.4 | 52.4 | 62.4 | 68 |
| Total Dissolved Solids | mg/L | - | - | - | - | - | - | - | - | - | 38 | 38 | 39 | 29 | 24 | 30 | 32 |
| Total Dissolved Solids (Calculated) | mg/L | 54 | 50 | 94 | 93 | 94 | 93 | 119 | 123 | 85 | - | - | - | - | - | - | - |
| Total Alkalinity | mg $CaCO_3$/L | 31 | 42 | 73 | 70 | 68 | 38 | 53 | 59 | 42 | 16 | 15 | 15 | 18 | 15 | 19 | 20 |
| Total Hardness | mg $CaCO_3$/L | 40 | 45 | 80 | 84 | 81 | 78 | 101 | 111 | 70 | 20 | 17 | 16 | 20 | 16 | 19 | 20 |
| Total Suspended Solids | mg/L | - | < 5 | - | - | - | < 5 | - | - | - | < 3 | < 3 | < 3 | < 2 | 2 | < 3 | < 3 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | 0.8 | 0.3 | 0.83 | 1.32 | 1.04 | 0.56 | 0.5 | 0.57 | 1.14 | 0.2 | 0.9 | 0.3 | 0.3 | 0.2 | 0.1 | 0.23 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 37.6 | 51 | 89.2 | 84.8 | 82.7 | 46.5 | 64 | 72 | 51.1 | 16.2 | 15.2 | 14.8 | 22 | 18 | 23 | 25 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 11.3 | - | 25.7 | 25.9 | 26.3 | - | 32.4 | 33.1 | 20 | 6.86 | 5.43 | 5.17 | 6.47 | 5.23 | 6.3 | 5.93 |
| Carbonate | mg/L | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.3 | < 0.3 | < 0.3 | < 1 | < 1 | < 1 | < 5 |
| Chloride | mg/L | 6.86 | 3.68 | 11 | 9.88 | 8.34 | 31.4 | 40.2 | 36.9 | 21.3 | 4.24 | 4.25 | 4.24 | 4.7 | 4.19 | 4.67 | 5 |
| Fluoride | mg/L | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - |
| Hydroxide | mg/L | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | < 0.4 | - | - | - | < 1 | < 1 | < 1 | < 5 |
| Magnesium | mg/L | 1.56 | - | 2.71 | 2.89 | 2.72 | - | 3.99 | 4.38 | 2.41 | 0.743 | 0.77 | 0.76 | 0.88 | 0.71 | 0.9 | 0.816 |
| Potassium | mg/L | 1.25 | - | 1.87 | 1.63 | 1.33 | - | 1.82 | 1.63 | 0.98 | 1.71 | 0.725 | 0.702 | 0.9 | 0.7 | 0.81 | 0.74 |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | 0.297 | 0.385 | 0.388 | 0.6 | 0.3 | 0.2 | 0.2 |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 3.67 | - | 5.65 | 5.19 | 4.33 | - | 6.03 | 5.99 | 3.93 | 2.53 | 2.59 | 2.57 | 2.9 | 2.6 | 3.2 | 2.61 |
| Sulphate | mg/L | 8.49 | 1.17 | 3.21 | 5.54 | 8.22 | 3.42 | 3.12 | 5.29 | 6.4 | 5 | < 3 | < 3 | 2.1 | 1.69 | 2.37 | 3.2 |
| Ion Balance | % | 89.6 | - | 97.8 | - | 99.8 | - | 100 | - | 88.6 | - | - | - | 102 | 101 | 99 | 90.6 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | - | - | - | - | - | - | - | - | - | 6 | 6.1 | 6 | 9 | 6.7 | 7.1 | 7.4 |
| Total Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | 1.6 | 2.1 | 2 | 4.5 | 2.9 | 2.7 | 2.9 |
| Dissolved Organic Carbon | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | - | - | - | - | - | - | - | - | - | 4 | 4 | 4 | 4.6 | 3.8 | 4.4 | 4.5 |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.005 | 0.01 | 0.008 | < 0.005 | < 0.005 | < 0.005 | < 0.005 |
| Nitrate as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.008 | 0.024 | 0.032 | < 0.006 | < 0.006 | 0.012 | < 0.006 |
| Nitrite as Nitrogen | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | - | - | - | - | - | - | - |
| Nitrate+Nitrite as Nitrogen | mg/L | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.071 | < 0.008 | 0.024 | 0.032 | < 0.006 | < 0.006 | 0.012 | < 0.006 |
| Total Kjeldahl Nitrogen | mg/L | 0.52 | - | 0.77 | 0.57 | 0.47 | - | 0.39 | 0.42 | 0.36 | 0.25 | 0.28 | 0.2 | 0.43 | 0.28 | 0.16 | 0.11 |
| Phosphorus, Total | mg/L | < 0.01 | < 0.01 | - | - | < 0.01 | 0.014 | - | - | < 0.01 | 0.004 | 0.009 | 0.009 | 0.004 | 0.005 | 0.002 | 0.004 |
| Phosphorus, Total Dissolved | mg/L | < 0.1 | - | - | - | < 0.1 | - | - | - | < 0.1 | 0.004 | 0.005 | 0.002 | 0.004 | 0.003 | 0.001 | 0.003 |
| Orthophosphate (PO4-P) | mg/L | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | - | < 0.01 | < 0.01 | < 0.01 | < 0.002 | < 0.002 | < 0.002 | < 0.001 | < 0.001 | < 0.001 | 0.002 |
| Chlorophyll a | µg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | < 0.001 | < 0.002 | < 0.002 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | < 0.02 | < 0.005 | 0.02 | < 0.02 | < 0.02 | < 0.005 | 0.022 | < 0.02 | < 0.02 | < 0.0005 | < 0.0005 | < 0.0005 | 0.0014 | < 0.0003 | 0.0022 | 0.003 |
| Antimony (Sb) - Total | mg/L | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | 0.0003 | 0.0003 | 0.0002 | 0.0003 | 0.0002 | < 0.00003 | 0.0002 |
| Arsenic (As) - Total | mg/L | < 0.001 | 0.0007 | 0.0044 | 0.0024 | 0.0015 | 0.0026 | 0.0041 | 0.0029 | 0.0021 | < 0.0003 | < 0.0002 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Barium (Ba) - Total | mg/L | 0.0228 | 0.0212 | 0.0325 | 0.0307 | 0.0274 | 0.0242 | 0.0255 | 0.0244 | 0.0175 | 0.0068 | 0.0063 | 0.0061 | 0.0083 | 0.0007 | 0.0084 | 0.0082 |
| Beryllium (Be) - Total | mg/L | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | 0.0002 | 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Bismuth (Bi) - Total | mg/L | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.00003 | - |
| Boron (B) - Total | mg/L | < 0.03 | < 0.01 | < 0.03 | < 0.03 | < 0.03 | < 0.01 | < 0.03 | < 0.03 | < 0.03 | - | - | - | - | - | - | 0.002 |
| Cadmium (Cd) - Total | mg/L | < 0.0002 | < 0.00001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.00001 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0001 | 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.00002 | < 0.00005 |
| Cesium (Cs) - Total | mg/L | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | - |
| Chromium (Cr) - Total | mg/L | < 0.002 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | < 0.001 | < 0.002 | < 0.002 | < 0.002 | 0.0009 | 0.002 | < 0.002 | < 0.00006 | < 0.00006 | 0.0011 | 0.0002 |
| Cobalt (Co) - Total | mg/L | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | 0.0002 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Copper (Cu) - Total | mg/L | < 0.002 | 0.0008 | < 0.002 | < 0.002 | < 0.002 | 0.001 | < 0.002 | < 0.002 | < 0.002 | 0.0014 | 0.001 | 0.001 | 0.0008 | < 0.0006 | 0.0008 | 0.0008 |

| Waterbody | | M13.3 | M22.6 | M22.6 | M22.6 | M22.6 | M23.6 | M23.6 | M23.6 | M23.6 | ML-MR | ML-MR | ML-MR | ML-MR | ML-MR | ML-MR | ML-MR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamnear mine | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver |
| **Date Sampled** | | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 12-Jul-11 | 29-Aug-11 | 14-Sep-11 | 11-Oct-11 | 19-Jun-97 | 24-Aug-97 | 24-Aug-97 | 12-Jun-98 | 18-Jul-98 | 20-Jun-99 | 22-Jun-00 |
| **Source** | | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | AEM | RL&L 1998 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 2000 | RL&L 2000 |
| Iron (Fe) - Total | mg/L | 0.12 | < 0.1 | 0.24 | 0.29 | 0.3 | 0.12 | 0.21 | 0.16 | 0.14 | 0.013 | 0.021 | 0.025 | < 0.01 | 0.005 | 0.006 | 0.039 |
| Lead (Pb) - Total | mg/L | < 0.001 | < 0.00009 | < 0.001 | < 0.001 | < 0.001 | < 0.00009 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.0002 | 0.0002 | < 0.00005 | < 0.00005 | 0.00005 | < 0.00005 |
| Lithium (Li) - Total | mg/L | < 0.002 | < 0.002 | 0.0126 | < 0.002 | < 0.002 | 0.0075 | 0.0235 | 0.0058 | 0.0042 | 0.0006 | 0.0005 | 0.0004 | 0.0006 | 0.0003 | 0.0005 | - |
| Manganese (Mn) - Total | mg/L | 0.0039 | 0.0251 | 0.0212 | 0.0218 | 0.0114 | 0.0176 | 0.0261 | 0.0159 | 0.0217 | 0.0026 | 0.0028 | 0.0029 | 0.0035 | 0.0002 | 0.0051 | 0.0072 |
| Mercury (Hg) - Total | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | - | < 0.00001 | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 |
| Molybdenum (Mo) - Total | mg/L | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0002 | < 0.0005 | < 0.0005 | < 0.0005 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.00007 | 0.00008 | 0.00008 |
| Nickel (Ni) - Total | mg/L | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.0001 | 0.0006 | 0.0003 | 0.0004 | 0.0001 | 0.0005 | 0.0005 |
| Selenium (Se) - Total | mg/L | < 0.005 | 0.0015 | < 0.005 | < 0.005 | < 0.005 | < 0.001 | < 0.005 | < 0.005 | < 0.005 | < 0.01 | < 0.01 | < 0.01 | < 0.0001 | < 0.0001 | 0.0001 | 0.0002 |
| Silver (Ag) - Total | mg/L | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Strontium (Sr) - Total | mg/L | 0.0554 | 0.058 | 0.103 | 0.0974 | 0.0844 | 0.154 | 0.194 | 0.178 | 0.106 | 0.0267 | 0.0263 | 0.0251 | 0.0274 | 0.0002 | 0.0278 | 0.0269 |
| Thallium (Tl) - Total | mg/L | <0.005$^{D>C,A}$ | < 0.0001 | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | < 0.0001 | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | <0.005$^{D>C,A}$ | < 0.0001 | 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.00003 | - |
| Tin (Sn) - Total | mg/L | < 0.0006 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0006 | < 0.0002 | < 0.0006 | < 0.0006 | < 0.0006 | - | - | - | - | - | - | - |
| Titanium (Ti) - Total | mg/L | 0.0012 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0002 | < 0.001 | < 0.001 | < 0.001 | < 0.0001 | 0.0006 | < 0.0001 | < 0.0003 | < 0.0001 | < 0.0001 | - |
| Uranium (U) - Total | mg/L | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Vanadium (V) - Total | mg/L | < 0.002 | < 0.0002 | < 0.002 | < 0.002 | < 0.002 | < 0.0002 | < 0.002 | < 0.002 | < 0.002 | 0.0002 | 0.0001 | 0.0001 | 0.0004 | 0.0003 | < 0.00005 | < 0.00005 |
| Zinc (Zn) - Total | mg/L | < 0.02 | 0.0092 | < 0.02 | < 0.02 | < 0.02 | < 0.005 | < 0.02 | < 0.02 | < 0.02 | < 0.0005 | 0.0014 | 0.001 | 0.0019 | < 0.0008 | 0.0131 | < 0.0008 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 0.0023 | - | - | - | < 0.002 | - | - | - | < 0.002 | - | - | - | - | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.0002 | - | - | - | < 0.0002 | - | - | - | < 0.0002 | - | - | - | - | - | - | - |
| Arsenic (As) - Dissolved | mg/L | 0.0003 | - | - | - | 0.00119 | - | - | - | 0.0012 | - | - | - | - | - | - | - |
| Barium (Ba) - Dissolved | mg/L | 0.021 | - | - | - | 0.0267 | - | - | - | 0.0152 | - | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.0002 | - | - | - | < 0.0002 | - | - | - | < 0.0002 | - | - | - | - | - | - | - |
| Boron (B) - Dissolved | mg/L | < 0.01 | - | - | - | < 0.01 | - | - | - | < 0.01 | - | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | < 0.00001 | - | - | - | < 0.00001 | - | - | - | < 0.00001 | - | - | - | - | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.002 | - | - | - | < 0.002 | - | - | - | < 0.002 | - | - | - | - | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.0002 | - | - | - | < 0.0002 | - | - | - | < 0.0002 | - | - | - | - | - | - | - |
| Copper (Cu) - Dissolved | mg/L | 0.00101 | - | - | - | 0.00111 | - | - | - | 0.00069 | - | - | - | - | - | - | - |
| Iron (Fe) - Dissolved | mg/L | < 0.1 | - | - | - | < 0.1 | - | - | - | < 0.1 | - | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | < 0.00009 | - | - | - | < 0.00009 | - | - | - | < 0.00009 | - | - | - | - | - | - | - |
| Lithium (Li) - Dissolved | mg/L | < 0.002 | - | - | - | < 0.002 | - | - | - | 0.004 | - | - | - | - | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.00135 | - | - | - | 0.00697 | - | - | - | 0.00319 | - | - | - | - | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | 0 | - | - | - | 0 | - | - | - | 0 | - | - | - | - | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | 0.0001 | - | - | - | 0.00019 | - | - | - | 0.00014 | - | - | - | - | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | < 0.001 | - | - | - | 0.0011 | - | - | - | < 0.001 | - | - | - | - | - | - | - |
| Potassium (K) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.001 | - | - | - | < 0.001 | - | - | - | < 0.001 | - | - | - | - | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.0001 | - | - | - | < 0.0001 | - | - | - | < 0.0001 | - | - | - | - | - | - | - |
| Sodium (Na) - Dissolved | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | 0.0509 | - | - | - | 0.0787 | - | - | - | 0.0926 | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.0001 | - | - | - | < 0.0001 | - | - | - | < 0.0001 | - | - | - | - | - | - | - |
| Tin (Sn) - Dissolved | mg/L | < 0.0002 | - | - | - | < 0.0002 | - | - | - | < 0.0002 | - | - | - | - | - | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.0001 | - | - | - | < 0.0001 | - | - | - | < 0.0001 | - | - | - | - | - | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.0002 | - | - | - | 0.00029 | - | - | - | < 0.0002 | - | - | - | - | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | 0.0025 | - | - | - | 0.0036 | - | - | - | < 0.002 | - | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | - | - | - | - | - | - | - | 10$^{C}$ | < 2 | < 2 | < 1 | 2 | 2 | 2 |
| Benzene | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 |
| Ethylbenzene | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 |
| Toluene | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 |
| Xylenes | µg/L | - | - | - | - | - | - | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.5 |
| Total Volatiles | µg/L | - | - | - | - | - | - | - | - | - | < 100 | < 100 | < 100 | < 100 | < 100 | - | < 100 |
| Total Extractables | µg/L | - | - | - | - | - | - | - | - | - | < 50 | < 50 | 75 | < 50 | < 50 | - | < 50 |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

| Waterbody | | ML-MR | ML-MR | MR-L | MR-L | ML-PL | ML-PL | ML-PL | ML-PL | PL-DL | PL-DL | PL-DL | PL-DL | Char River | Meliadine River (M2.1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver |
| **Date Sampled** | | 21-Jun-08 | 19-Jul-08 | 12-Jun-98 | 20-Jul-98 | 19-Jun-97 | 24-Aug-97 | 12-Jun-98 | 18-Jul-98 | 19-Jun-97 | 24-Aug-97 | 12-Jun-98 | 20-Jul-98 | 12-Jul-11 | 12-Jul-11 |
| **Source** | | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | AEM | AEM |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | |
| Water Temperature - field | °C | 5.6 | 12.7 | 3.2 | 10.8 | 4.9 | 12.5 | 2.1 | 9.8 | 5.1 | 13.2 | 2.4 | - | - | - |
| Dissolved Oxygen - field | mg/L | 16.54 | 16.03 | - | - | 13.9 | 11.2 | - | - | 14.3 | 11 | - | - | - | - |
| pH - field | pH | - | 6.78 | 7.7 | - | 7.02 | 7.5 | 6.54 | - | 6.75 | 7.35 | 6.5 | - | - | - |
| Specific Conductivity - field | µS/cm | 42 | 63 | 85.5 | - | 50.6 | 52.3 | 68.8 | - | 38.5 | 34.7 | 52.3 | - | - | - |
| Secchi Disk Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ice Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Lake Depth | m | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | |
| pH - laboratory | pH | 7.06 | 7.5 | 7.2 | 7.1 | 7.2 | 7.37 | 7 | 7.1 | 6.92 | 7.19 | 6.8 | 6.9 | 7.83 | 7.74 |
| Specific Conductivity - laboratory | µS/cm | 68.8 | 64.2 | 72.4 | 80 | 42.1 | 42.3 | 57.3 | 55 | 31 | 28.9 | 41.1 | 35.5 | 120 | 80.3 |
| Total Dissolved Solids | mg/L | 34 | 40 | 33 | 38 | 26 | 34 | 26 | 25 | 15 | 19 | 18 | 16 | - | - |
| Total Dissolved Solids (Calculated) | mg/L | - | 30 | - | - | - | - | - | - | - | - | - | - | 64 | 40 |
| Total Alkalinity | mg $CaCO_3$/L | 18 | 16 | 19 | 18 | 12 | 12 | 15 | 13 | 8 | 7 | 9 | 9 | 27 | 22 |
| Total Hardness | mg $CaCO_3$/L | 24 | 20 | 21 | 22 | 16 | 13 | 17 | 15 | 10 | 8 | 11 | 9 | 35 | 23 |
| Total Suspended Solids | mg/L | < 3 | < 3 | < 2 | 2 | < 3 | < 3 | < 2 | < 2 | < 3 | < 3 | < 2 | 4 | < 5 | < 5 |
| Total Volatile Solids | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity - laboratory | NTU | - | - | 0.5 | 0.3 | 0.3 | 0.2 | 0.2 | 0.4 | 0.3 | 0.2 | 0.2 | 0.2 | 0.51 | 1.2 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 17.8 | 19 | 23 | 22 | 12.4 | 11.9 | 18 | 16 | 7.9 | 7.1 | 10 | 11 | 33 | 26.2 |
| Bromide | mg/L | < 0.05 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 7.59 | 5.97 | 6.9 | 6.94 | 5.38 | 4.06 | 5.45 | 4.62 | 3.18 | 2.44 | 3.3 | 2.78 | - | - |
| Carbonate | mg/L | < 2 | < 5 | < 1 | < 1 | < 0.3 | < 0.3 | < 1 | < 1 | < 0.3 | < 0.3 | < 1 | < 1 | < 0.6 | < 0.6 |
| Chloride | mg/L | 6.91 | 5 | 6.3 | 9.6 | 3.66 | 3.93 | 4.6 | 5.45 | 2.74 | 2.56 | 3.4 | 2.78 | 18.2 | 9.55 |
| Fluoride | mg/L | 0.021 | - | - | - | - | - | - | - | - | - | - | - | < 0.1 | < 0.1 |
| Hydroxide | mg/L | < 2 | < 5 | < 1 | < 1 | - | - | < 1 | < 1 | - | - | < 1 | < 1 | < 0.4 | < 0.4 |
| Magnesium | mg/L | 1.12 | 0.865 | 0.97 | 1.23 | 0.593 | 0.64 | 0.8 | 0.79 | 0.52 | 0.52 | 0.64 | 0.55 | - | - |
| Potassium | mg/L | < 2 | 0.76 | 1.14 | 1.04 | 0.598 | 0.651 | 0.87 | 0.74 | 0.562 | 0.554 | 0.74 | 0.61 | - | - |
| Reactive Silica (as $SiO_2$) | mg/L | - | - | 0.5 | 0.6 | 0.18 | 0.269 | 0.3 | 0.4 | 0.273 | 0.218 | 0.3 | 0.3 | - | - |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium | mg/L | 4 | 3.22 | 3.7 | 5.6 | 2.19 | 2.43 | 2.9 | 3.2 | 1.82 | 1.75 | 2.1 | 1.8 | - | - |
| Sulphate | mg/L | 3.11 | 2.8 | 2.7 | 2.48 | < 3 | 3 | 2.1 | 1.96 | 4 | < 3 | 2.4 | 1.86 | 4.99 | 3.32 |
| Ion Balance | % | - | - | 101 | 105 | - | - | 104 | 100 | - | - | 105 | 94 | - | - |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 6 | 3 | 10 | 7 | 4 | 4.8 | 8 | 6.3 | 4 | 3.2 | 6 | 4.9 | - | - |
| Total Organic Carbon | mg/L | 2.6 | 3 | 5.1 | 2.9 | 1.4 | 1.8 | 3.9 | 3 | 1.6 | 1.2 | 4 | 2.8 | - | - |
| Dissolved Organic Carbon | mg/L | 2.5 | 2.8 | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Inorganic Carbon | mg/L | 3.3 | 6 | 4.5 | 4.2 | 3 | 3 | 3.9 | 3.3 | 2 | 2 | 2.4 | 2 | - | - |
| Total Inorganic Carbon (Calculated) | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | < 0.02 | < 0.05 | 0.023 | 0.015 | 0.005 | 0.011 | 0.015 | < 0.005 | 0.012 | 0.006 | < 0.005 | 0.008 | < 0.05 | < 0.05 |
| Nitrate as Nitrogen | mg/L | < 0.005 | < 0.1 | 0.008 | 0.008 | < 0.008 | 0.023 | < 0.006 | < 0.006 | < 0.008 | 0.015 | < 0.006 | < 0.006 | < 0.05 | < 0.05 |
| Nitrite as Nitrogen | mg/L | < 0.001 | < 0.05 | - | - | - | - | - | - | - | - | - | - | < 0.05 | < 0.05 |
| Nitrate+Nitrite as Nitrogen | mg/L | - | < 0.1 | 0.008 | 0.008 | < 0.008 | 0.023 | < 0.006 | < 0.006 | < 0.008 | 0.015 | < 0.006 | < 0.006 | < 0.071 | < 0.071 |
| Total Kjeldahl Nitrogen | mg/L | 0.167 | < 0.2 | 0.3 | 0.29 | 0.26 | 0.22 | 0.14 | 0.23 | 0.25 | 0.18 | 0.31 | 0.25 | - | - |
| Phosphorus, Total | mg/L | 0.003 | 0.004 | 0.005 | 0.004 | 0.005 | 0.008 | 0.002 | 0.003 | 0.004 | 0.007 | 0.002 | 0.004 | 0.012 | < 0.01 |
| Phosphorus, Total Dissolved | mg/L | < 0.002 | 0.002 | 0.004 | 0.003 | 0.004 | 0.005 | 0.002 | 0.003 | 0.004 | 0.007 | 0.002 | 0.002 | - | - |
| Orthophosphate (PO4-P) | mg/L | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.002 | < 0.002 | < 0.001 | < 0.001 | < 0.002 | < 0.002 | < 0.001 | < 0.001 | - | - |
| Chlorophyll a | µg/L | 0.355 | < 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | |
| Cyanide, Total | mg/L | < 0.005 | < 0.002 | < 0.001 | < 0.001 | - | - | < 0.001 | < 0.001 | - | - | < 0.001 | 0.001 | - | - |
| **Total Metals** | **Units** | | | | | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | < 0.005 | 0.0019 | 0.0033 | 0.0037 | < 0.0005 | 0.0008 | 0.0017 | < 0.0003 | < 0.0005 | 0.0015 | 0.0039 | 0.003 | 0.0114 | 0.0434 |
| Antimony (Sb) - Total | mg/L | < 0.0005 | < 0.00003 | 0.0002 | 0.00009 | 0.0002 | 0.0003 | 0.0002 | 0.00007 | 0.0003 | 0.0003 | 0.0004 | 0.0002 | < 0.0002 | < 0.0002 |
| Arsenic (As) - Total | mg/L | < 0.0005 | 0.0002 | 0.0003 | 0.0003 | < 0.0003 | < 0.00002 | 0.0002 | 0.0003 | < 0.0003 | < 0.0002 | 0.00009 | 0.0001 | 0.0003 | 0.0003 |
| Barium (Ba) - Total | mg/L | < 0.02 | 0.0069 | 0.0103 | 0.0089 | 0.0054 | 0.0048 | 0.0079 | < 0.00005 | 0.0083 | 0.0063 | 0.0112 | 0.0081 | 0.0145 | 0.0102 |
| Beryllium (Be) - Total | mg/L | < 0.001 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0003 | 0.0003 | < 0.0002 | < 0.0002 | < 0.0001 | 0.0005 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Bismuth (Bi) - Total | mg/L | - | - | < 0.00005 | < 0.00003 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0002 | < 0.0002 |
| Boron (B) - Total | mg/L | < 0.1 | 0.003 | - | - | - | - | - | - | - | - | - | - | 0.014 | < 0.01 |
| Cadmium (Cd) - Total | mg/L | < 0.00002 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | 0.0001 | < 0.00005 | < 0.00005 | < 0.0001 | 0.0001 | < 0.00005 | 0.00005 | < 0.00001 | < 0.00001 |
| Cesium (Cs) - Total | mg/L | - | - | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Chromium (Cr) - Total | mg/L | < 0.001 | < 0.00006 | < 0.00006 | 0.0019 | < 0.0002 | < 0.002 | < 0.00006 | < 0.00006 | 0.0007 | < 0.002 | < 0.00006 | 0.0009 | < 0.001 | < 0.001 |
| Cobalt (Co) - Total | mg/L | < 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0002 | < 0.0002 |
| Copper (Cu) - Total | mg/L | < 0.001 | 0.0007 | 0.001 | 0.001 | 0.001 | 0.0009 | 0.0008 | < 0.0006 | 0.0016 | 0.0011 | 0.0008 | 0.001 | 0.0012 | 0.0009 |

| Waterbody | | ML-MR | ML-MR | MR-L | MR-L | ML-PL | ML-PL | ML-PL | ML-PL | PL-DL | PL-DL | PL-DL | PL-DL | Char River | Meliadine River (M2.1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver | Streamriver |
| **Date Sampled** | | 21-Jun-08 | 19-Jul-08 | 12-Jun-98 | 20-Jul-98 | 19-Jun-97 | 24-Aug-97 | 12-Jun-98 | 18-Jul-98 | 19-Jun-97 | 24-Aug-97 | 12-Jun-98 | 20-Jul-98 | 12-Jul-11 | 12-Jul-11 |
| **Source** | | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | RL&L 1998 | RL&L 1998 | RL&L 1999 | RL&L 1999 | AEM | AEM |
| Iron (Fe) - Total | mg/L | < 0.03 | 0.01 | 0.01 | 0.012 | 0.019 | 0.019 | < 0.01 | 0.005 | 0.041 | 0.022 | < 0.01 | < 0.005 | < 0.1 | < 0.1 |
| Lead (Pb) - Total | mg/L | < 0.0005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0002 | < 0.0002 | < 0.00005 | 0.00006 | 0.0002 | < 0.0002 | < 0.00005 | < 0.00005 | < 0.00009 | < 0.00009 |
| Lithium (Li) - Total | mg/L | < 0.005 | - | 0.0006 | < 0.0001 | 0.0006 | 0.0005 | 0.0005 | 0.0008 | 0.0007 | 0.0003 | 0.0005 | < 0.0001 | < 0.002 | < 0.002 |
| Manganese (Mn) - Total | mg/L | 0.002 | 0.0018 | 0.0015 | 0.0003 | 0.0015 | 0.0017 | 0.0016 | 0.0008 | 0.0019 | 0.0009 | 0.0032 | 0.001 | 0.0032 | 0.0038 |
| Mercury (Hg) - Total | mg/L | < 0.00002 | < 0.00002 | < 0.00002 | < 0.00002 | - | < 0.00001 | < 0.00002 | < 0.00002 | - | < 0.00001 | < 0.00002 | < 0.00002 | < 0.00005 | < 0.00005 |
| Molybdenum (Mo) - Total | mg/L | < 0.001 | < 0.00006 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.00009 | 0.00009 | < 0.0001 | < 0.0001 | 0.00009 | < 0.00006 | 0.0003 | < 0.0002 |
| Nickel (Ni) - Total | mg/L | < 0.001 | 0.0003 | 0.0006 | 0.0007 | < 0.0001 | 0.0004 | 0.0005 | 0.0005 | < 0.0001 | 0.0004 | 0.0004 | 0.0006 | < 0.002 | < 0.002 |
| Selenium (Se) - Total | mg/L | < 0.001 | < 0.0001 | < 0.0001 | 0.0003 | < 0.01 | < 0.01 | < 0.0001 | < 0.0001 | < 0.01 | < 0.01 | < 0.0001 | 0.0002 | < 0.001 | < 0.001 |
| Silver (Ag) - Total | mg/L | < 0.00002 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Strontium (Sr) - Total | mg/L | - | 0.028 | 0.0324 | 0.0364 | 0.021 | 0.0189 | 0.0252 | < 0.0001 | 0.0174 | 0.0132 | 0.0177 | 0.0165 | 0.055 | 0.0348 |
| Thallium (Tl) - Total | mg/L | < 0.0002 | < 0.00003 | < 0.00005 | 0.00005 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00003 | < 0.0001 | < 0.0001 |
| Tin (Sn) - Total | mg/L | < 0.0005 | - | - | - | - | - | - | - | - | - | - | - | < 0.0002 | < 0.0002 |
| Titanium (Ti) - Total | mg/L | < 0.01 | - | < 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0003 | < 0.0001 | 0.0004 | 0.0005 | < 0.0003 | < 0.0001 | 0.0006 | 0.0025 |
| Uranium (U) - Total | mg/L | < 0.0002 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.0001 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.0001 |
| Vanadium (V) - Total | mg/L | < 0.001 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0001 | 0.0003 | 0.0002 | 0.0001 | 0.0002 | 0.0002 | 0.00008 | < 0.0002 | 0.0002 |
| Zinc (Zn) - Total | mg/L | < 0.005 | < 0.0008 | 0.0033 | < 0.0008 | < 0.0005 | < 0.0005 | 0.0048 | < 0.0008 | < 0.0005 | 0.0005 | 0.0045 | 0.0025 | < 0.005 | < 0.005 |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | < 0.005 | 0.0016 | - | - | - | - | - | - | - | - | - | - | - | - |
| Antimony (Sb) - Dissolved | mg/L | < 0.0005 | < 0.00003 | - | - | - | - | - | - | - | - | - | - | - | - |
| Arsenic (As) - Dissolved | mg/L | < 0.0005 | 0.0002 | - | - | - | - | - | - | - | - | - | - | - | - |
| Barium (Ba) - Dissolved | mg/L | < 0.02 | 0.00691 | - | - | - | - | - | - | - | - | - | - | - | - |
| Beryllium (Be) - Dissolved | mg/L | < 0.001 | < 0.0002 | - | - | - | - | - | - | - | - | - | - | - | - |
| Boron (B) - Dissolved | mg/L | < 0.1 | 0.003 | - | - | - | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) - Dissolved | mg/L | 0.000065 | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium (Ca) - Dissolved | mg/L | 7.76 | 5.96 | - | - | - | - | - | - | - | - | - | - | - | - |
| Chromium (Cr) - Dissolved | mg/L | < 0.001 | < 0.00006 | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt (Co) - Dissolved | mg/L | < 0.0003 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Copper (Cu) - Dissolved | mg/L | < 0.001 | < 0.0006 | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron (Fe) - Dissolved | mg/L | < 0.03 | < 0.005 | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead (Pb) - Dissolved | mg/L | < 0.0005 | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | - |
| Lithium (Li) - Dissolved | mg/L | < 0.005 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) - Dissolved | mg/L | 1.13 | 0.853 | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese (Mn) - Dissolved | mg/L | 0.00283 | 0.0011 | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury (Hg) - Dissolved | mg/L | < 0.00002 | < 0.00002 | - | - | - | - | - | - | - | - | - | - | - | - |
| Molybdenum (Mo) - Dissolved | mg/L | < 0.001 | 0.00007 | - | - | - | - | - | - | - | - | - | - | - | - |
| Nickel (Ni) - Dissolved | mg/L | < 0.001 | 0.00032 | - | - | - | - | - | - | - | - | - | - | - | - |
| Potassium (K) - Dissolved | mg/L | < 2 | 0.75 | - | - | - | - | - | - | - | - | - | - | - | - |
| Selenium (Se) - Dissolved | mg/L | < 0.001 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Silver (Ag) - Dissolved | mg/L | < 0.00002 | < 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Sodium (Na) - Dissolved | mg/L | 3.9 | 3.2 | - | - | - | - | - | - | - | - | - | - | - | - |
| Strontium (Sr) - Dissolved | mg/L | - | 0.028 | - | - | - | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) - Dissolved | mg/L | < 0.0002 | < 0.00003 | - | - | - | - | - | - | - | - | - | - | - | - |
| Tin (Sn) - Dissolved | mg/L | < 0.0005 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Uranium (U) - Dissolved | mg/L | < 0.0002 | < 0.00005 | - | - | - | - | - | - | - | - | - | - | - | - |
| Vanadium (V) - Dissolved | mg/L | < 0.001 | 0.0001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Zinc (Zn) - Dissolved | mg/L | < 0.005 | < 0.0008 | - | - | - | - | - | - | - | - | - | - | - | - |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | |
| Phenols | µg/L | - | - | < 1 | 2 | < 2 | < 2 | < 1 | 2 | 5C | < 2 | 2 | 3 | - | - |
| Benzene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - |
| Ethylbenzene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - |
| Toluene | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - |
| Xylenes | µg/L | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - |
| Total Volatiles | µg/L | - | - | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | - | - |
| Total Extractables | µg/L | - | - | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detec
(A) = Concentration higher than the relevant acute aquatic life gui
(C) = Concentration higher than the relevant chronic aquatic life g
(W) = Concentration higher than the relevant drinking water guide
(D>A) = Detection limit higher than acute aquatic life guideline.
(D>C) = Detection limit higher than chronic aquatic life guideline.
(D>W) = Detection limit higher than drinking water guideline.

NOTES:
N/A = not applicable
- = not available
n = number of samples
C = concentration is higher than the relevant chronic aquatic life guideline or outside the recommended pH or DO range
W = concentration is higher than the relevant drinking water guideline or outside the recommended pH or DO range
NTU = nephelometric turbidity unit
D>W = analytical detection limit is higher than the relevant drinking water guideline (W)
D>W = analytical detection limit is higher than the relevant drinking water guideline (W)
D>W = analytical detection limit is higher than the relevant drinking water guideline (W)
Boldface indicates values exceed water quality guideline levels
SOURCES:

| Station Type | | Meliadine Lake | | | | | Lakenear mine | | | | | Lakeregion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter/Summary Statistic** | | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** |
| **Field Measurements** | **Units** | | | | | | | | | | | | | | | |
| Water Temperature field | °C | 35 | 0 | 10.24 | 14.86 | 17.8 | 108 | 0 | 9.57 | 17.13 | 23.8 | 14 | 0.2 | 9.93 | 15.89 | 16.7 |
| Dissolved Oxygen field | mg/L | 34 | 8.33 | 12.29 | 15.82 | 19.6 | 75 | **0.2**[C] | 8.56 | 12.04 | 13.9 | 11 | 8.76 | 11.68 | 14.6 | 17.3 |
| pH field | pH | 32 | 5.5 | 7.00 | 7.399 | 7.84 | 103 | 5.84 | 7.44 | 8.086 | 8.6 | 11 | 6.26 | 7.09 | 7.83 | 7.92 |
| Specific Conductivity field | µS/cm | 35 | 20.6 | 71.70 | 97.1 | 170.4 | 81 | 21.4 | 226.50 | 545 | 1816 | 12 | 52.2 | 82.60 | 112.8 | 175 |
| Secchi Disk Depth | m | 27 | 1.5 | 5.10 | 7.8 | 8.5 | 55 | 0.8 | 2.70 | 3.8 | 4.6 | 10 | 1.2 | 5.30 | 7.5 | 7.5 |
| Ice Depth | m | 8 | 1.7 | 1.90 | 2 | 2.3 | 22 | 1.4 | 1.70 | 1.8 | 1.8 | 3 | 1.5 | 1.90 | 2.3 | 2.4 |
| Total Lake Depth | m | 34 | 1.8 | 6.59 | 11.41 | 14.7 | 75 | 0.8 | 2.94 | 4 | 8.98 | 12 | 2.9 | 10.18 | 18.66 | 18.8 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | |
| pH laboratory | pH | 31 | 6.7 | 7.36 | 7.66 | 7.95 | 97 | 6.17 | 7.55 | 8.034 | 8.39 | 13 | 6.6 | 7.33 | 7.64 | 7.84 |
| Specific Conductivity laboratory | µS/cm | 31 | 42.1 | 72.70 | 97.3 | 156 | 97 | 38.6 | 352.60 | 879.2 | 2370 | 13 | 36.6 | 74.70 | 89 | 193 |
| Total Dissolved Solids | mg/L | 27 | 21 | 37.00 | 48 | 91 | 76 | 20 | 167.00 | 405 | **1440**[W] | 10 | 16 | 31.00 | 47 | 55 |
| Total Dissolved Solids (Calculated | mg/L | 16 | 27 | 39.00 | 52 | 79 | 54 | 24 | 238.00 | 479 | 1170 | 5 | 35 | 50.00 | 76 | 99 |
| Total Alkalinity | mg $CaCO_3$/L | 31 | 12 | 20.00 | 26 | 50 | 95 | 12 | 81.00 | 155 | 905 | 13 | 9 | 23.00 | 26 | 62 |
| Total Hardness | mg $CaCO_3$/L | 31 | 13 | 22.95 | 31.5 | 53.6 | 97 | 12.4 | 142.23 | 345.4 | 1020 | 13 | 10 | 23.45 | 26.56 | 69.1 |
| Total Suspended Solids | mg/L | 30 | 1 | 2.10 | 3.1 | 8 | 89 | 0.5 | 4.10 | 5 | 139 | 12 | 1 | 1.50 | 1.5 | 5 |
| Total Volatile Solids | mg/L | 7 | 16 | 27.00 | 39 | 40 | 9 | 29 | 74.00 | 94 | 103 | 1 | 21 | 21 | 21 | 21 |
| Turbidity laboratory | NTU | 15 | 0.05 | 0.27 | 0.42 | 0.5 | 58 | 0.05 | 4.48 | 1.9 | 210 | 9 | 0.05 | 0.32 | 0.63 | 1.6 |
| **Major Ions** | **Units** | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | 30 | 12.6 | 22.9 | 31.1 | 57.1 | 83 | 16 | 106.7 | 196 | 1100 | 13 | 11 | 27.6 | 31.9 | 76.2 |
| Bromide | mg/L | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Calcium | mg/L | 28 | 4.33 | 7.15 | 9.13 | 16.8 | 77 | 3.94 | 46.79 | 116 | 346 | 12 | 3.12 | 7.61 | 9.16 | 21.6 |
| Carbonate | mg/L | 30 | 0.15 | 1.59 | 2.5 | 2.5 | 85 | 0.15 | 2.1 | 2.5 | 18.2 | 13 | 0.5 | 1.42 | 2.5 | 2.5 |
| Chloride | mg/L | 31 | 2.7 | 7.3 | 11.7 | 25.2 | 97 | 1.8 | 54.7 | **163.4**[C] | **716**[A,C,W] | 13 | 2.72 | 6.45 | 8.16 | 18.1 |
| Fluoride | mg/L | 1 | 0.03 | 0.03 | 0.03 | 0.03 | 14 | 0.03 | 0.046 | 0.057 | 0.07 | - | - | - | - | - |
| Hydroxide | mg/L | 26 | 0.5 | 1.81 | 2.5 | 2.5 | 76 | 0.5 | 1.95 | 2.5 | 2.5 | 13 | 0.5 | 1.42 | 2.5 | 2.5 |
| Magnesium | mg/L | 28 | 0.583 | 1.072 | 1.689 | 2.36 | 76 | 0.618 | 6.939 | 18.35 | 41.6 | 12 | 0.59 | 0.978 | 1.289 | 2.59 |
| Potassium | mg/L | 28 | 0.642 | 0.954 | 1.294 | 1.87 | 77 | 0.49 | 2.442 | 6.082 | 14.2 | 12 | 0.66 | 1.039 | 1.236 | 2.36 |
| Reactive Silica (as $SiO_2$) | mg/L | 2 | 0.196 | 0.275 | 0.338 | 0.354 | 40 | 0.2 | 3.058 | 7.3 | 9.3 | 9 | 0.05 | 0.361 | 0.62 | 0.7 |
| Silicate ($SiO_2$) | mg/L | - | - | - | - | - | 10 | 0.5 | 0.6 | 0.6 | 1.2 | - | - | - | - | - |
| Sodium | mg/L | 28 | 1.7 | 3.8 | 6.2 | 7.51 | 77 | 1.1 | 9.52 | 21.7 | 87 | 12 | 2 | 3.86 | 5.09 | 9.17 |
| Sulphate | mg/L | 31 | 1.5 | 3.01 | 4.86 | 8.91 | 97 | 1.4 | 10.76 | 22.72 | 141 | 13 | 1.3 | 2.55 | 3.84 | 4.71 |
| Ion Balance | % | 16 | 8.9 | 80.01 | 107.5 | 109 | 64 | 6.8 | 96.72 | 106.7 | 111 | 9 | 89 | 99.28 | 105 | 105 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | | | | | | |
| Total Carbon | mg/L | 26 | 5 | 8.3 | 11.2 | 25.1 | 72 | 7 | 32.7 | 61.1 | 324 | 11 | 4.5 | 7.9 | 10 | 10.1 |
| Total Organic Carbon | mg/L | 26 | 2.1 | 3.4 | 4.8 | 5.3 | 65 | 3.3 | 10.2 | 24.2 | 64.9 | 10 | 2.3 | 3.5 | 4.1 | 4.7 |
| Dissolved Organic Carbon | mg/L | 9 | 2.9 | 3.3 | 3.4 | 3.9 | 9 | 3.6 | 5 | 6 | 9.5 | 1 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Inorganic Carbon | mg/L | 22 | 3 | 4.8 | 5.9 | 13.8 | 67 | 3.8 | 24.1 | 44.6 | 264 | 10 | 1.9 | 4.5 | 6.4 | 7 |
| Total Inorganic Carbon (Calculate | mg/L | 4 | 2 | 3 | 4 | 4 | 7 | 3 | 6.4 | 10 | 10 | 1 | 4 | 4 | 4 | 4 |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | 30 | 0.002 | 0.019 | 0.025 | 0.052 | 77 | 0.003 | 0.129 | 0.307 | 1.35 | 12 | 0.003 | 0.017 | 0.025 | 0.075 |
| Nitrate as Nitrogen | mg/L | 30 | 0.003 | 0.02 | 0.05 | 0.05 | 93 | 0.003 | 0.122 | 0.05 | **4.9**[C] | 13 | 0.003 | 0.018 | 0.05 | 0.05 |
| Nitrite as Nitrogen | mg/L | 16 | 0.025 | 0.025 | 0.025 | 0.025 | 61 | 0.0005 | 0.029 | 0.025 | **0.31**[C] | 5 | 0.025 | 0.025 | 0.025 | 0.025 |
| Nitrate+Nitrite as Nitrogen | mg/L | 31 | 0.003 | 0.023 | 0.05 | 0.05 | 87 | 0.003 | 0.14 | 0.05 | 5.1 | 13 | 0.003 | 0.02 | 0.05 | 0.05 |
| Total Kjeldahl Nitrogen | mg/L | 30 | 0.1 | 0.239 | 0.36 | 0.94 | 77 | 0.1 | 0.833 | 1.476 | 7.78 | 12 | 0.17 | 0.32 | 0.396 | 0.73 |
| Phosphorus, Total | mg/L | 30 | 0.003 | 0.006 | 0.01 | 0.033 | 86 | 0.0005 | 0.028 | 0.15 | 0.15 | 12 | 0.003 | 0.009 | 0.01 | 0.045 |
| Phosphorus, Total Dissolved | mg/L | 30 | 0.002 | 0.004 | 0.008 | 0.012 | 74 | 0.0005 | 0.006 | 0.01 | 0.024 | 12 | 0.002 | 0.005 | 0.01 | 0.012 |
| Orthophosphate (PO4P) | mg/L | 30 | 0.0005 | 0.0008 | 0.002 | 0.004 | 79 | 0.0005 | 0.0014 | 0.005 | 0.005 | 12 | 0.0005 | 0.0009 | 0.0005 | 0.005 |
| Chlorophyll a | µg/L | 20 | 0.005 | 1.348 | 1.881 | 15 | 33 | 0.005 | 2.48 | 5 | 17 | 7 | 0.3 | 0.711 | 1.148 | 1.52 |
| **Cyanides** | **Units** | | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | | 1 | 0 | 0 | 0 | 0 |
| Cyanide, Total | mg/L | 26 | 0.000001 | 0.00081 | 0.001 | 0.003 | 60 | 0.000001 | 0.00147 | 0.002 | **0.043**[C] | 11 | 0.000001 | 0.00077 | 0.001 | 0.002 |

| Station Type | | Meliadine Lake | | | | | Lakenear mine | | | | | Lakeregion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter/Summary Statistic** | | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | |
| Aluminum (Al) Total | mg/L | 31 | 0.0002 | 0.0057 | 0.0056 | 0.1 | 85 | 0.0001 | 0.0196 | 0.1 | 0.1 | 12 | 0.0016 | 0.0048 | 0.0059 | 0.02 |
| Antimony (Sb) Total | mg/L | 30 | 0.00002 | 0.0001 | 0.0003 | 0.0003 | 81 | 0.00002 | **0.0125**$^{D>W}$ | **0.1**$^{D>W}$ | **0.1**$^{D>W}$ | 12 | 0.00002 | 0.0001 | 0.0002 | 0.0002 |
| Arsenic (As) Total | mg/L | 31 | 0.0001 | 0.0003 | 0.0005 | 0.0009 | 85 | 0.0000003 | 0.0018 | 0.0032 | **0.0114**$^{C,W}$ | 12 | 0.00002 | 0.0003 | 0.0006 | 0.0012 |
| Barium (Ba) Total | mg/L | 31 | 0.00003 | 0.008 | 0.0103 | 0.0177 | 85 | 0.000005 | 0.0346 | 0.0941 | 0.232 | 12 | 0.0069 | 0.0098 | 0.0102 | 0.0241 |
| Beryllium (Be) Total | mg/L | 30 | 0.00005 | 0.0002 | 0.0005 | 0.0005 | 81 | 0.00005 | 0.0005 | 0.0025 | 0.0025 | 12 | 0.0001 | 0.0002 | 0.0005 | 0.0005 |
| Bismuth (Bi) Total | mg/L | 20 | 0.00002 | 0.0001 | 0.0005 | 0.0005 | 64 | 0.00002 | 0.0001 | 0.0005 | 0.0005 | 9 | 0.00002 | 0.00007 | 0.0001 | 0.0005 |
| Boron (B) Total | mg/L | 18 | 0.00005 | 0.0028 | 0.0041 | 0.009 | 57 | 0.0005 | 0.004 | 0.0096 | 0.0253 | 5 | 0.0025 | 0.0036 | 0.0047 | 0.0052 |
| Cadmium (Cd) Total | mg/L | 31 | 0.000005 | **0.0003**$^{C}$ | **0.0002**$^{C}$ | **0.0048**$^{C}$ | 85 | 0.000005 | **0.0004**$^{C}$ | **0.0003**$^{C}$ | **0.0218**$^{C,W}$ | 12 | 0.000005 | **0.00006**$^{C}$ | **0.0001**$^{C}$ | **0.0002**$^{C}$ |
| Calcium (Ca) Total | mg/L | 3 | 6.13 | 7.9433 | 10.08 | 10.9 | 20 | 11.1 | 40.925 | 89.11 | 131 | 1 | 9.28 | 9.28 | 9.28 | 9.28 |
| Cesium (Cs) Total | mg/L | 13 | 0.00005 | 0.00005 | 0.00005 | 0.00005 | 28 | 0.00005 | 0.00006 | 0.00005 | 0.0003 | 8 | 0.00005 | 0.0027 | 0.0065 | 0.0216 |
| Chromium (Cr) Total | mg/L | 31 | 0.00003 | 0.0005 | 0.001 | **0.0022**$^{C}$ | 85 | 0.00003 | **0.0014**$^{C}$ | **0.0029**$^{C}$ | **0.0202**$^{C}$ | 12 | 0.00003 | 0.001 | **0.0023**$^{C}$ | **0.0025**$^{C}$ |
| Cobalt (Co) Total | mg/L | 31 | 0.00005 | 0.00009 | 0.0002 | 0.0006 | 85 | 0.00005 | 0.0003 | 0.0007 | 0.0047 | 12 | 0.00005 | 0.0001 | 0.0001 | 0.001 |
| Copper (Cu) Total | mg/L | 31 | 0.0005 | 0.0013 | 0.0018 | **0.0031**$^{C}$ | 85 | 0.0005 | 0.0023 | **0.0039**$^{C}$ | **0.0271**$^{C}$ | 12 | 0.0008 | 0.0015 | **0.0022**$^{C}$ | **0.0037**$^{C}$ |
| Iron (Fe) Total | mg/L | 27 | 0.0005 | 0.0222 | 0.0392 | 0.085 | 79 | 0.0015 | 0.1482 | 0.2892 | **0.695**$^{C,W}$ | 11 | 0.0025 | 0.0281 | 0.052 | 0.084 |
| Lead (Pb) Total | mg/L | 31 | 0.00003 | 0.0001 | 0.0003 | 0.0007 | 85 | 0.00003 | 0.001 | 0.0005 | **0.063**$^{C,W}$ | 12 | 0.00003 | 0.0001 | 0.0004 | 0.0005 |
| Lithium (Li) Total | mg/L | 23 | 0.00005 | 0.0013 | 0.0025 | 0.0025 | 71 | 0.00005 | 0.0054 | 0.0136 | 0.04 | 10 | 0.00005 | 0.0008 | 0.0025 | 0.0025 |
| Magnesium (Mg) Total | mg/L | 6 | 1.01 | 1.155 | 1.31 | 1.46 | 20 | 1.15 | 5.2095 | 11.52 | 13.7 | 1 | 1.17 | 1.17 | 1.17 | 1.17 |
| Manganese (Mn) Total | mg/L | 31 | 0.00005 | 0.0027 | 0.0046 | 0.0077 | 85 | 0.0003 | **0.0771**$^{W}$ | **0.2688**$^{W}$ | **1.52**$^{W}$ | 12 | 0.00005 | 0.0031 | 0.0054 | 0.007 |
| Mercury (Hg) Total | mg/L | 31 | 0.000005 | 0.000009 | 0.00001 | **0.00003**$^{C}$ | 85 | 0.000005 | **0.00003**$^{C}$ | **0.00003**$^{C}$ | **0.0005**$^{C}$ | 12 | 0.000005 | 0.00002 | 0.00001 | **0.0001**$^{C}$ |
| Molybdenum (Mo) Total | mg/L | 31 | 0.00003 | 0.0002 | 0.0005 | 0.0015 | 85 | 0.00003 | 0.0006 | 0.0015 | 0.0025 | 12 | 0.00003 | 0.0003 | 0.0005 | 0.0025 |
| Nickel (Ni) Total | mg/L | 31 | 0.00005 | 0.0013 | 0.0035 | 0.01 | 85 | 0.0004 | 0.0038 | 0.01 | 0.0181 | 12 | 0.00005 | 0.0006 | 0.001 | 0.0013 |
| Potassium (K) Total | mg/L | 3 | 0.837 | 0.9427 | 1.0522 | 1.09 | 20 | 0.628 | 2.6157 | 4.982 | 9.07 | 1 | 1.07 | 1.07 | 1.07 | 1.07 |
| Rubidium (Rb) Total | mg/L | 0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Selenium (Se) Total | mg/L | 31 | 0.00005 | 0.0002 | 0.0005 | 0.0005 | 85 | 0.00005 | 0.0003 | 0.0006 | **0.0025**$^{C}$ | 12 | 0.00005 | 0.0002 | 0.0005 | 0.0009 |
| Silicon (Si) Total | mg/L | 3 | 0.233 | 0.26 | 0.2936 | 0.307 | 29 | 0.062 | 0.8928 | 2.46 | 4.61 | 1 | 0.119 | 0.119 | 0.119 | 0.119 |
| Silver (Ag) Total | mg/L | 31 | 0.000005 | 0.00005 | 0.00005 | **0.0006**$^{C}$ | 85 | 0.000005 | 0.0001 | **0.0006**$^{C}$ | **0.0006**$^{C}$ | 12 | 0.000005 | 0.00006 | 0.00005 | **0.0002**$^{C}$ |
| Sodium (Na) Total | mg/L | 3 | 4.29 | 4.37 | 4.464 | 4.5 | 22 | 2.66 | 9.3505 | 19.3 | 28.5 | 1 | 4.85 | 4.85 | 4.85 | 4.85 |
| Strontium (Sr) Total | mg/L | 27 | 0.00005 | 0.0332 | 0.0464 | 0.0729 | 72 | 0.022 | 0.1906 | 0.5286 | 1.26 | 11 | 0.0174 | 0.0314 | 0.0406 | 0.0759 |
| Thallium (Tl) Total | mg/L | 29 | 0.00002 | 0.00004 | 0.0001 | 0.0001 | 77 | 0.00002 | 0.0001 | 0.0005 | 0.0005 | 11 | 0.00002 | 0.00003 | 0.00005 | 0.0001 |
| Tin (Sn) Total | mg/L | 11 | 0.00005 | 0.0006 | 0.0015 | 0.0017 | 47 | 0.00005 | 0.0008 | 0.0015 | 0.0025 | 3 | 0.00005 | 0.0009 | 0.0021 | 0.0025 |
| Titanium (Ti) Total | mg/L | 16 | 0.00005 | 0.0001 | 0.0003 | 0.0006 | 60 | 0.00005 | 0.0004 | 0.0007 | 0.0029 | 9 | 0.00005 | 0.0001 | 0.0003 | 0.0005 |
| Tungsten (W) Total | mg/L | 0 | - | - | - | - | 12 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | - | - | - | - | - |
| Uranium (U) Total | mg/L | 30 | 0.00002 | 0.00004 | 0.0001 | 0.0001 | 71 | 0.00002 | 0.0001 | 0.0002 | 0.0017 | 12 | 0.00002 | 0.00003 | 0.00003 | 0.00005 |
| Vanadium (V) Total | mg/L | 30 | 0.00003 | 0.0002 | 0.0005 | 0.0005 | 81 | 0.00003 | 0.0006 | 0.0015 | 0.0061 | 12 | 0.00003 | 0.0001 | 0.0005 | 0.0005 |
| Zinc (Zn) Total | mg/L | 31 | 0.0004 | 0.0044 | 0.007 | **0.0372**$^{C}$ | 85 | 0.0004 | 0.0071 | 0.0125 | **0.123**$^{C}$ | 12 | 0.0004 | 0.0047 | 0.01 | 0.02 |

| Station Type | | Meliadine Lake | | | | | Lakenear mine | | | | | Lakeregion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter/Summary Statistic** | | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** |
| **Dissolved Metals** | **Units** | | | | | | | | | | | | | | | |
| Aluminum (Al) Dissolved | mg/L | 16 | 0.0015 | 0.0024 | 0.0025 | 0.0077 | 46 | 0.0005 | 0.005028 | 0.0165 | 0.03 | 4 | 0.0021 | 0.007 | 0.01502 | 0.02 |
| Antimony (Sb) Dissolved | mg/L | 16 | 0.000015 | 0.000124 | 0.00025 | 0.00025 | 46 | 0.000015 | 0.000366 | 0.0015 | 0.0019 | 4 | 0.000015 | 0.000454 | 0.001125 | 0.0015 |
| Arsenic (As) Dissolved | mg/L | 16 | 0.00016 | 0.000391 | 0.00069 | 0.00077 | 46 | 0.00045 | 0.001982 | 0.00375 | 0.0067 | 4 | 0.00037 | 0.000638 | 0.000952 | 0.00112 |
| Barium (Ba) Dissolved | mg/L | 12 | 0.00581 | 0.007672 | 0.01 | 0.01 | 40 | 0.00615 | 0.05383 | 0.1258 | 0.345 | 3 | 0.00668 | 0.007557 | 0.007998 | 0.008 |
| Beryllium (Be) Dissolved | mg/L | 16 | 0.0001 | 0.000303 | 0.0005 | 0.0005 | 46 | 0.0001 | 0.000348 | 0.0005 | 0.0005 | 4 | 0.0001 | 0.000338 | 0.0005 | 0.0005 |
| Bismuth (Bi) Dissolved | mg/L | 3 | 0.000025 | 0.000025 | 0.000025 | 0.000025 | 20 | 0.000025 | 0.000025 | 0.000025 | 0.000025 | 1 | 0.000025 | 0.000025 | 0.000025 | 0.000025 |
| Boron (B) Dissolved | mg/L | 12 | 0.0005 | 0.003 | 0.00468 | 0.0053 | 40 | 0.000025 | 0.005124 | 0.01032 | 0.0256 | 3 | 0.0025 | 0.0036 | 0.00484 | 0.0053 |
| Cadmium (Cd) Dissolved | mg/L | 16 | 0.000005 | 0.000013 | 0.000025 | 0.000025 | 46 | 0.000005 | 0.000022 | 0.00005 | 0.0001 | 4 | 0.000005 | 0.000059 | 0.000148 | 0.0002 |
| Calcium (Ca) Dissolved | mg/L | 16 | 0.498 | 6.13375 | 10.715 | 17.8 | 34 | 5.1 | 38.923529 | 83.68 | 139 | 3 | 7.02 | 13.043333 | 20.582 | 23.6 |
| Chromium (Cr) Dissolved | mg/L | 16 | 0.00003 | 0.000474 | 0.00145 | 0.0018 | 46 | 0.00003 | 0.00142 | 0.0038 | 0.007 | 4 | 0.00003 | 0.00142 | 0.00292 | 0.0031 |
| Cobalt (Co) Dissolved | mg/L | 16 | 0.00005 | 0.000094 | 0.00015 | 0.00015 | 46 | 0.00005 | 0.000374 | 0.001 | 0.001 | 4 | 0.00005 | 0.000313 | 0.000745 | 0.001 |
| Copper (Cu) Dissolved | mg/L | 16 | 0.0005 | 0.001081 | 0.00145 | 0.0023 | 46 | 0.00048 | 0.001554 | 0.002725 | 0.00454 | 4 | 0.00074 | 0.001285 | 0.00188 | 0.002 |
| Iron (Fe) Dissolved | mg/L | 12 | 0.0015 | 0.009417 | 0.0201 | 0.025 | 40 | 0.0015 | 0.1838 | 0.2876 | 2.36 | 3 | 0.009 | 0.022667 | 0.0382 | 0.044 |
| Lead (Pb) Dissolved | mg/L | 16 | 0.000025 | 0.000159 | 0.00025 | 0.00049 | 46 | 0.000025 | 0.000102 | 0.00025 | 0.0004 | 4 | 0.000025 | 0.000294 | 0.000635 | 0.0008 |
| Lithium (Li) Dissolved | mg/L | 10 | 0.0025 | 0.0025 | 0.0025 | 0.0025 | 41 | 0.0015 | 0.016259 | 0.033 | 0.139 | 3 | 0.0015 | 0.002167 | 0.0025 | 0.0025 |
| Magnesium (Mg) Dissolved | mg/L | 15 | 0.787 | 1.194133 | 1.6 | 2.23 | 34 | 0.72 | 4.654412 | 9.545 | 14.1 | 3 | 0.765 | 1.451667 | 2.194 | 2.46 |
| Manganese (Mn) Dissolved | mg/L | 16 | 0.00038 | 0.001413 | 0.002 | 0.0034 | 46 | 0.000917 | 0.078616 | 0.2465 | 0.468 | 4 | 0.0006 | 0.00346 | 0.006872 | 0.008 |
| Mercury (Hg) Dissolved | mg/L | 16 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 46 | 0.00001 | 0.000026 | 0.00005 | 0.0002 | 4 | 0.00001 | 0.00002 | 0.000038 | 0.00005 |
| Molybdenum (Mo) Dissolved | mg/L | 16 | 0.00003 | 0.000266 | 0.0005 | 0.0005 | 46 | 0.00003 | 0.000923 | 0.0025 | 0.0025 | 4 | 0.00012 | 0.000816 | 0.0019 | 0.0025 |
| Nickel (Ni) Dissolved | mg/L | 16 | 0.0003 | 0.000531 | 0.000705 | 0.00079 | 46 | 0.00044 | 0.003217 | 0.00655 | 0.015 | 4 | 0.0004 | 0.00081 | 0.00121 | 0.0013 |
| Potassium (K) Dissolved | mg/L | 15 | 0.67 | 1.019 | 1.44 | 1.93 | 34 | 0.1 | 2.396147 | 4.874 | 9.21 | 3 | 0.79 | 1.456667 | 2.198 | 2.47 |
| Selenium (Se) Dissolved | mg/L | 16 | 0.00005 | 0.000253 | 0.0005 | 0.0005 | 46 | 0.00005 | 0.000393 | 0.0009 | 0.0021 | 4 | 0.00005 | 0.0002 | 0.00041 | 0.0005 |
| Silver (Ag) Dissolved | mg/L | 16 | 0.000005 | 0.000024 | 0.00005 | 0.00005 | 46 | 0.000005 | 0.000023 | 0.00005 | 0.00005 | 4 | 0.000005 | 0.000029 | 0.00005 | 0.00005 |
| Sodium (Na) Dissolved | mg/L | 15 | 3.07 | 4.588667 | 6.84 | 8.3 | 34 | 2.1 | 8.472647 | 17.08 | 28 | 3 | 3.25 | 6.156667 | 9.344 | 10.5 |
| Strontium (Sr) Dissolved | mg/L | 9 | 0.0249 | 0.0308 | 0.03648 | 0.046 | 29 | 0.0289 | 0.341076 | 0.6556 | 2.48 | 2 | 0.024 | 0.02765 | 0.03057 | 0.0313 |
| Thallium (Tl) Dissolved | mg/L | 16 | 0.000015 | 0.000054 | 0.0001 | 0.0001 | 46 | 0.000015 | 0.000052 | 0.0001 | 0.0002 | 4 | 0.000015 | 0.000048 | 0.000085 | 0.0001 |
| Tin (Sn) Dissolved | mg/L | 10 | 0.00005 | 0.000429 | 0.001129 | 0.0013 | 41 | 0.00005 | 0.000875 | 0.0025 | 0.0025 | 3 | 0.00005 | 0.000933 | 0.00205 | 0.0025 |
| Titanium (Ti) Dissolved | mg/L | 3 | 0.00015 | 0.00015 | 0.00015 | 0.00015 | 33 | 0.00015 | 0.000288 | 0.0005 | 0.0005 | 2 | 0.00015 | 0.000325 | 0.000465 | 0.0005 |
| Tungsten (W) Dissolved | mg/L | 0 | - | - | - | - | 7 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | - | - | - | - | - |
| Uranium (U) Dissolved | mg/L | 16 | 0.000015 | 0.000057 | 0.0001 | 0.0001 | 46 | 0.000015 | 0.000281 | 0.000452 | 0.0036 | 4 | 0.000021 | 0.000049 | 0.000085 | 0.0001 |
| Vanadium (V) Dissolved | mg/L | 16 | 0.000025 | 0.000263 | 0.0005 | 0.0005 | 46 | 0.000025 | 0.000779 | 0.002 | 0.008 | 4 | 0.00005 | 0.000293 | 0.0005 | 0.0005 |
| Zinc (Zn) Dissolved | mg/L | 12 | 0.0004 | 0.002275 | 0.0025 | 0.0117 | 40 | 0.0004 | 0.004915 | 0.0092 | 0.059 | 3 | 0.0011 | 0.0052 | 0.0107 | 0.013 |
| **Organic Compounds** | **Units** | | | | | | | | | | | | | | | |
| Oil and Grease | µg/L | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 13 | 0.5 | 154.38 | 580 | 900 | - | - | - | - | - |
| Phenols | µg/L | 16 | 0.5 | 1.06 | 2 | 2 | 36 | 0.5 | 2.82 | **9**[C] | **12**[C] | 8 | 0.5 | 0.88 | 2 | 2 |
| Benzene | µg/L | 11 | 0.25 | 0.25 | 0.25 | 0.25 | 20 | 0.25 | 0.25 | 0.25 | 0.25 | 5 | 0.25 | 0.25 | 0.25 | 0.25 |
| Ethylbenzene | µg/L | 11 | 0.25 | 0.25 | 0.25 | 0.25 | 20 | 0.25 | 0.25 | 0.25 | 0.25 | 5 | 0.25 | 0.25 | 0.25 | 0.25 |
| Toluene | µg/L | 11 | 0.25 | 0.31 | 0.59 | 0.59 | 20 | 0.25 | 0.27 | 0.25 | 0.7 | 5 | 0.25 | 0.25 | 0.25 | 0.25 |
| Xylenes | µg/L | 11 | 0.25 | 0.25 | 0.25 | 0.25 | 20 | 0.25 | 0.45 | 0.29 | 3.9 | 5 | 0.25 | 0.25 | 0.25 | 0.25 |
| F1 (C6-C10) | µg/L | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 4 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | - |
| F1 -BTEX | µg/L | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 4 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | - |
| F2 (>C10-C16) | µg/L | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 4 | 2.5 | 2.5 | 2.5 | 2.5 | - | - | - | - | - |
| F3 (C16-C34) | µg/L | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 4 | 2.5 | 2.5 | 2.5 | 2.5 | - | - | - | - | - |
| F4 (C34-C50) | µg/L | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 4 | 2.5 | 2.5 | 2.5 | 2.5 | - | - | - | - | - |
| Total Volatiles | µg/L | 9 | 0.5 | 0.5 | 0.5 | 0.5 | 19 | 0.5 | 0.5 | 0.5 | 0.5 | 5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Total Extractables | µg/L | 9 | 2.5 | 39.11 | 104.4 | 190 | 19 | 0.5 | 37.5 | 105.2 | 330 | 5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Total Extractable Hydrocarbons (C | µg/L | - | - | - | - | - | 2 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | - |
| Total Extractable Hydrocarbons (C | µg/L | - | - | - | - | - | 2 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | - |
| **Other** | **Units** | | | | | | | | | | | | | | | |
| Biological Oxygen Demand (BOD) | mg/L | - | - | - | - | - | 8 | 1 | 1.25 | 2 | 2 | - | - | - | - | - |
| Fecal Coliforms | CFU/100 mL | - | - | - | - | - | 1 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or detection limits higher than guidelines.

[A] = Concentration higher than the relevant acute aquatic life guideline.

[C] = Concentration higher than the relevant chronic aquatic life guideline.

[W] = Concentration higher than the relevant drinking water guideline.

| Station Type | Streamnear mine | | | | | Streamriver | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter/Summary Statistic** | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** |
| **Field Measurements** | | | | | | | | | | |
| Water Temperature field | 54 | 0.7 | 8.38 | 15.69 | 18.5 | 18 | 1.7 | 7.385 | 12.56 | 13.2 |
| Dissolved Oxygen field | 31 | 7.3 | 11.77 | 13.43 | 14.57 | 9 | 11 | 13.25 | 16.13 | 16.54 |
| pH field | 43 | 6.53 | 7.36 | 8.092 | 8.35 | 13 | 6.5 | 7.10 | 7.496 | 7.7 |
| Specific Conductivity field | 42 | 29.9 | 82.30 | 114.1 | 157 | 14 | 34.7 | 59.00 | 77.7 | 85.5 |
| Secchi Disk Depth | 1 | 0.5 | 0.50 | 0.5 | 0.5 | 0 | - | - | - | - |
| Ice Depth | - | - | - | - | - | 0 | - | - | - | - |
| Total Lake Depth | 1 | 0.5 | 0.50 | 0.5 | 0.5 | 0 | - | - | - | - |
| **Conventional Parameters** | | | | | | | | | | |
| pH laboratory | 90 | 6.87 | 7.58 | 7.99 | 8.25 | 21 | 6.8 | 7.19 | 7.5 | 7.83 |
| Specific Conductivity laboratory | 90 | 40.5 | 114.00 | 217.3 | 424 | 21 | 28.9 | 57.80 | 80 | 120 |
| Total Dissolved Solids | 45 | 18 | 46.00 | 71 | 99 | 19 | 15 | 29.00 | 38 | 40 |
| Total Dissolved Solids (Calculated | 47 | 23 | 79.00 | 162 | 225 | 3 | 30 | 45.00 | 59 | 64 |
| Total Alkalinity | 90 | 11 | 31.00 | 50 | 73 | 21 | 7 | 15.00 | 20 | 27 |
| Total Hardness | 90 | 14.1 | 42.12 | 82.17 | 111 | 21 | 8.23 | 17.69 | 22.7 | 34.8 |
| Total Suspended Solids | 63 | 1 | 3.10 | 6 | 28 | 21 | 1 | 1.60 | 2.5 | 4 |
| Total Volatile Solids | - | - | - | - | - | - | - | - | - | - |
| Turbidity laboratory | 75 | 0.3 | 1 | 2.1 | 4.88 | 19 | 0.1 | 0.35 | 0.59 | 1.2 |
| **Major Ions** | | | | | | | | | | |
| Bicarbonate | 88 | 14 | 36.9 | 59.1 | 89.2 | 21 | 7.1 | 17.6 | 25 | 33 |
| Bromide | 9 | 0.03 | 0.06 | 0.1 | 0.1 | 1 | 0.03 | 0.03 | 0.03 | 0.03 |
| Calcium | 83 | 4.32 | 13.08 | 24.04 | 33.1 | 19 | 2.44 | 5.26 | 6.91 | 7.59 |
| Carbonate | 90 | 0.15 | 1.03 | 2.5 | 15.5 | 21 | 0.15 | 0.58 | 1 | 2.5 |
| Chloride | 90 | 1.9 | 13.53 | 37.23 | 94.7 | 21 | 2.56 | 5.52 | 9.55 | 18.2 |
| Fluoride | 47 | 0.01 | 0.046 | 0.05 | 0.11 | 3 | 0.021 | 0.04 | 0.05 | 0.05 |
| Hydroxide | 72 | 0.2 | 0.78 | 2.5 | 2.5 | 14 | 0.2 | 0.78 | 2.05 | 2.5 |
| Magnesium | 83 | 0.67 | 1.903 | 4.198 | 7.83 | 19 | 0.52 | 0.78 | 1 | 1.23 |
| Potassium | 83 | 0.51 | 1.32 | 2.728 | 3.77 | 19 | 0.554 | 0.819 | 1.06 | 1.71 |
| Reactive Silica (as $SiO_2$) | 37 | 0.194 | 0.675 | 1.1 | 1.3 | 17 | 0.18 | 0.336 | 0.54 | 0.6 |
| Silicate ($SiO_2$) | - | - | - | - | - | - | - | - | - | - |
| Sodium | 83 | 1.1 | 6.6 | 16.36 | 47.8 | 19 | 1.75 | 2.83 | 3.76 | 5.6 |
| Sulphate | 90 | 1 | 4.95 | 9.32 | 18.1 | 21 | 1.5 | 2.62 | 4 | 5 |
| Ion Balance | 40 | 88.6 | 99.24 | 105.1 | 111 | 10 | 90.6 | 100.16 | 105 | 105 |
| **Organic/Inorganic Carbon** | | | | | | | | | | |
| Total Carbon | 51 | 5 | 10.4 | 12 | 18.2 | 19 | 3 | 6.1 | 8.2 | 10 |
| Total Organic Carbon | 50 | 2 | 4.2 | 5.5 | 9 | 19 | 1.2 | 2.7 | 4.1 | 5.1 |
| Dissolved Organic Carbon | 13 | 2 | 4 | 5 | 8.4 | 2 | 2.5 | 2.7 | 2.8 | 2.8 |
| Total Inorganic Carbon | 51 | 3 | 6.6 | 8.6 | 17 | 19 | 2 | 3.6 | 4.5 | 6 |
| Total Inorganic Carbon (Calculate | - | - | - | - | - | - | - | - | - | - |
| **Nutrients and Chlorophyll a** | | | | | | | | | | |
| Total Ammonia as Nitrogen | 87 | 0.003 | 0.019 | 0.025 | 0.078 | 21 | 0.003 | 0.01 | 0.025 | 0.025 |
| Nitrate as Nitrogen | 88 | 0.003 | 0.022 | 0.05 | 0.08 | 21 | 0.003 | 0.012 | 0.025 | 0.05 |
| Nitrite as Nitrogen | 52 | 0.0005 | 0.027 | 0.025 | **0.09**[C] | 4 | 0.0005 | 0.019 | 0.025 | 0.025 |
| Nitrate+Nitrite as Nitrogen | 87 | 0.003 | 0.027 | 0.05 | 0.08 | 20 | 0.003 | 0.014 | 0.036 | 0.05 |
| Total Kjeldahl Nitrogen | 81 | 0.1 | 0.414 | 0.65 | 1.57 | 19 | 0.1 | 0.232 | 0.302 | 0.43 |
| Phosphorus, Total | 67 | 0.004 | 0.009 | 0.016 | 0.02 | 21 | 0.002 | 0.005 | 0.009 | 0.012 |
| Phosphorus, Total Dissolved | 55 | 0.001 | 0.008 | 0.013 | 0.05 | 19 | 0.001 | 0.003 | 0.005 | 0.007 |
| Orthophosphate (PO4P) | 81 | 0.0005 | 0.0024 | 0.005 | 0.005 | 19 | 0.0005 | 0.0008 | 0.001 | 0.002 |
| Chlorophyll a | 13 | 0.012 | 7.628 | 17 | 31 | 2 | 0.355 | 0.428 | 0.486 | 0.5 |
| **Cyanides** | 1 | 0 | 0 | 0 | 0 | 0 | | | | |
| Cyanide, Total | 35 | 0.000001 | 0.0009 | 0.0016 | 0.0025 | 12 | 0.0005 | 0.00083 | 0.001 | 0.0025 |

| Station Type | Streamnear mine | | | | | Streamriver | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter/Summary Statistic** | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** |
| **Total Metals** | | | | | | | | | | |
| Aluminum (Al) Total | 89 | 0.0002 | 0.0168 | 0.0532 | **0.118**[C,W] | 21 | 0.0002 | 0.0041 | 0.0039 | 0.0434 |
| Antimony (Sb) Total | 87 | 0.00002 | 0.0003 | 0.0005 | 0.0032 | 21 | 0.00002 | 0.0002 | 0.0003 | 0.0004 |
| Arsenic (As) Total | 89 | 0.00002 | 0.0009 | 0.0021 | 0.0044 | 21 | 0.00001 | 0.0002 | 0.0003 | 0.0003 |
| Barium (Ba) Total | 89 | 0.00003 | 0.0139 | 0.0252 | 0.0325 | 21 | 0.00003 | 0.0075 | 0.0103 | 0.0145 |
| Beryllium (Be) Total | 87 | 0.00005 | 0.0003 | 0.0005 | 0.0005 | 21 | 0.00005 | 0.0002 | 0.0003 | 0.0005 |
| Bismuth (Bi) Total | 71 | 0.00002 | 0.0001 | 0.0003 | 0.0003 | 18 | 0.00002 | 0.00004 | 0.00007 | 0.0001 |
| Boron (B) Total | 55 | 0.0005 | 0.0048 | 0.0076 | 0.056 | 5 | 0.0005 | 0.004 | 0.0096 | 0.014 |
| Cadmium (Cd) Total | 89 | 0.000005 | **0.00006**[C] | **0.0001**[C] | **0.0002**[C] | 21 | 0.000005 | **0.00004**[C] | **0.0001**[C] | **0.0001**[C] |
| Calcium (Ca) Total | 37 | 5.24 | 17.9051 | 28.16 | 36.4 | 2 | 7.24 | 8.87 | 10.174 | 10.5 |
| Cesium (Cs) Total | 70 | 0.00005 | 0.0001 | 0.0003 | 0.0003 | 18 | 0.00005 | 0.00005 | 0.00005 | 0.00005 |
| Chromium (Cr) Total | 89 | 0.00003 | 0.0006 | 0.001 | **0.0033**[C] | 21 | 0.00003 | 0.0006 | **0.0011**[C] | **0.002**[C] |
| Cobalt (Co) Total | 89 | 0.00005 | 0.0002 | 0.0003 | 0.001 | 21 | 0.00005 | 0.00008 | 0.0002 | 0.0003 |
| Copper (Cu) Total | 89 | 0.0003 | 0.0011 | **0.0021**[C] | **0.005**[C] | 21 | 0.0003 | 0.0009 | 0.0012 | 0.0016 |
| Iron (Fe) Total | 88 | 0.0005 | 0.1413 | **0.3155**[C,W] | **0.587**[C,W] | 21 | 0.0005 | 0.0121 | 0.025 | 0.041 |
| Lead (Pb) Total | 89 | 0.00003 | 0.0003 | 0.0005 | **0.0031**[C] | 21 | 0.00003 | 0.00008 | 0.0002 | 0.0003 |
| Lithium (Li) Total | 81 | 0.00005 | 0.003 | 0.011 | 0.0235 | 19 | 0.00005 | 0.0006 | 0.001 | 0.0025 |
| Magnesium (Mg) Total | 52 | 0.576 | 2.5236 | 5.114 | 8.51 | 4 | 0.865 | 1.2988 | 1.799 | 2.09 |
| Manganese (Mn) Total | 89 | 0.00005 | 0.0097 | 0.0217 | **0.0615**[W] | 21 | 0.0002 | 0.0024 | 0.0038 | 0.0072 |
| Mercury (Hg) Total | 89 | 0.000005 | 0.00002 | **0.00003**[C] | **0.0001**[C] | 18 | 0.000005 | 0.00001 | 0.00001 | **0.00003**[C] |
| Molybdenum (Mo) Total | 89 | 0.00003 | 0.0005 | 0.0015 | 0.0025 | 21 | 0.00003 | 0.0001 | 0.0002 | 0.0005 |
| Nickel (Ni) Total | 89 | 0.00005 | 0.001 | 0.001 | 0.01 | 21 | 0.00005 | 0.0004 | 0.0007 | 0.001 |
| Potassium (K) Total | 52 | 0.393 | 1.7527 | 3.291 | 4.08 | 4 | 0.76 | 1.0325 | 1.357 | 1.51 |
| Rubidium (Rb) Total | 43 | 0.0007 | 0.0023 | 0.0039 | 0.0043 | 5 | 0.001 | 0.0014 | 0.0018 | 0.002 |
| Selenium (Se) Total | 89 | 0.00005 | 0.001 | **0.0025**[C] | **0.0025**[C] | 21 | 0.00005 | 0.0003 | 0.0005 | 0.0005 |
| Silicon (Si) Total | 37 | 0.0015 | 0.7409 | 1.446 | 1.86 | 2 | 0.229 | 0.23 | 0.2308 | 0.231 |
| Silver (Ag) Total | 89 | 0.000005 | **0.0002**[C] | **0.0005**[C] | **0.0006**[C] | 21 | 0.00001 | 0.00005 | 0.00005 | 0.00005 |
| Sodium (Na) Total | 52 | 1.71 | 10.1738 | 30.73 | 51.9 | 4 | 3.22 | 5.575 | 8.754 | 10.5 |
| Strontium (Sr) Total | 77 | 0.00005 | 0.0608 | 0.1502 | 0.194 | 20 | 0.00005 | 0.0238 | 0.035 | 0.055 |
| Thallium (Tl) Total | 85 | 0.00002 | **0.0009**[C] | **0.0025**[C] | **0.0025**[C] | 20 | 0.00002 | 0.00004 | 0.00006 | 0.0001 |
| Tin (Sn) Total | 49 | 0.00003 | 0.0006 | 0.0025 | 0.0025 | 3 | 0.0001 | 0.0002 | 0.0002 | 0.0003 |
| Titanium (Ti) Total | 81 | 0.00005 | 0.0008 | 0.002 | 0.0072 | 19 | 0.00005 | 0.0003 | 0.0006 | 0.0025 |
| Tungsten (W) Total | 36 | 0.0005 | 0.0009 | 0.001 | 0.001 | 2 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Uranium (U) Total | 87 | 0.00003 | 0.0001 | 0.0003 | 0.0003 | 21 | 0.00003 | 0.00004 | 0.00005 | 0.0001 |
| Vanadium (V) Total | 87 | 0.00003 | 0.0005 | 0.001 | 0.001 | 21 | 0.00003 | 0.0002 | 0.0004 | 0.0005 |
| Zinc (Zn) Total | 89 | 0.0003 | 0.0066 | 0.01 | **0.106**[C] | 21 | 0.0003 | 0.0021 | 0.0045 | 0.0131 |

| Station Type | Streamnear mine | | | | | Streamriver | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter/Summary Statistic** | **N** | **MIN** | **MEAN** | **90th** | **MAX** | **N** | **MIN** | **MEAN** | **90th** | **MAX** |
| **Dissolved Metals** | | | | | | | | | | |
| Aluminum (Al) Dissolved | 19 | 0.001 | 0.003189 | 0.00524 | 0.01 | 2 | 0.0016 | 0.00205 | 0.00241 | 0.0025 |
| Antimony (Sb) Dissolved | 19 | 0.000015 | 0.000224 | 0.00025 | 0.0018 | 2 | 0.000015 | 0.000133 | 0.000227 | 0.00025 |
| Arsenic (As) Dissolved | 19 | 0.0002 | 0.000967 | 0.001552 | 0.00224 | 2 | 0.0002 | 0.000225 | 0.000245 | 0.00025 |
| Barium (Ba) Dissolved | 19 | 0.006 | 0.012863 | 0.02102 | 0.0267 | 2 | 0.00691 | 0.008455 | 0.009691 | 0.01 |
| Beryllium (Be) Dissolved | 19 | 0.0001 | 0.000318 | 0.0005 | 0.0005 | 2 | 0.0001 | 0.0003 | 0.00046 | 0.0005 |
| Bismuth (Bi) Dissolved | 5 | 0.000025 | 0.000085 | 0.0001 | 0.0001 | - | - | - | - | - |
| Boron (B) Dissolved | 19 | 0.0005 | 0.002221 | 0.00324 | 0.009 | 2 | 0.0005 | 0.00175 | 0.00275 | 0.003 |
| Cadmium (Cd) Dissolved | 19 | 0.000005 | 0.000013 | 0.000026 | 0.00005 | 2 | 0.000025 | 0.000045 | 0.000061 | 0.000065 |
| Calcium (Ca) Dissolved | 8 | 10.9 | 13.65 | 15.19 | 15.4 | 2 | 5.96 | 6.86 | 7.58 | 7.76 |
| Chromium (Cr) Dissolved | 19 | 0.00003 | 0.000457 | 0.001 | 0.0025 | 2 | 0.00003 | 0.000265 | 0.000453 | 0.0005 |
| Cobalt (Co) Dissolved | 19 | 0.00005 | 0.000434 | 0.001 | 0.001 | 2 | 0.00005 | 0.0001 | 0.00014 | 0.00015 |
| Copper (Cu) Dissolved | 19 | 0.0005 | 0.001199 | 0.001608 | 0.006 | 2 | 0.0003 | 0.0004 | 0.00048 | 0.0005 |
| Iron (Fe) Dissolved | 20 | 0.0005 | 0.0583 | 0.1427 | 0.269 | 2 | 0.0015 | 0.002 | 0.0024 | 0.0025 |
| Lead (Pb) Dissolved | 19 | 0.000025 | 0.005656 | 0.00025 | 0.106 | 2 | 0.000025 | 0.000138 | 0.000228 | 0.00025 |
| Lithium (Li) Dissolved | 15 | 0.001 | 0.002 | 0.0034 | 0.004 | 1 | 0.0025 | 0.0025 | 0.0025 | 0.0025 |
| Magnesium (Mg) Dissolved | 8 | 1.36 | 1.7125 | 2.09 | 2.23 | 2 | 0.853 | 0.9915 | 1.1023 | 1.13 |
| Manganese (Mn) Dissolved | 19 | 0.001 | 0.004725 | 0.00806 | 0.017 | 2 | 0.0011 | 0.001965 | 0.002657 | 0.00283 |
| Mercury (Hg) Dissolved | 19 | 0 | 0.00001 | 0.00001 | 0.00005 | 2 | 0.00001 | 0.00001 | 0.00001 | 0.00001 |
| Molybdenum (Mo) Dissolved | 19 | 0.00005 | 0.001077 | 0.0025 | 0.0025 | 2 | 0.00007 | 0.000285 | 0.000457 | 0.0005 |
| Nickel (Ni) Dissolved | 19 | 0.00048 | 0.000855 | 0.00124 | 0.002 | 2 | 0.00032 | 0.00041 | 0.000482 | 0.0005 |
| Potassium (K) Dissolved | 8 | 0.71 | 0.95375 | 1.04 | 1.04 | 2 | 0.75 | 0.875 | 0.975 | 1 |
| Selenium (Se) Dissolved | 19 | 0.00005 | 0.000289 | 0.0005 | 0.0005 | 2 | 0.00005 | 0.000275 | 0.000455 | 0.0005 |
| Silver (Ag) Dissolved | 19 | 0.000005 | 0.000041 | 0.00005 | 0.00005 | 2 | 0.00001 | 0.00003 | 0.000046 | 0.00005 |
| Sodium (Na) Dissolved | 8 | 2.21 | 3.64625 | 6.304 | 9.51 | 2 | 3.2 | 3.55 | 3.83 | 3.9 |
| Strontium (Sr) Dissolved | 9 | 0.0509 | 0.068933 | 0.08484 | 0.0926 | 1 | 0.028 | 0.028 | 0.028 | 0.028 |
| Thallium (Tl) Dissolved | 19 | 0.000015 | 0.000049 | 0.0001 | 0.0001 | 2 | 0.000015 | 0.000058 | 0.000092 | 0.0001 |
| Tin (Sn) Dissolved | 15 | 0.000025 | 0.001082 | 0.0025 | 0.0025 | 1 | 0.00025 | 0.00025 | 0.00025 | 0.00025 |
| Titanium (Ti) Dissolved | 15 | 0.0001 | 0.00037 | 0.0005 | 0.0005 | 1 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Tungsten (W) Dissolved | 4 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | - | - | - | - | - |
| Uranium (U) Dissolved | 19 | 0.000025 | 0.000054 | 0.0001 | 0.0001 | 2 | 0.000025 | 0.000063 | 0.000093 | 0.0001 |
| Vanadium (V) Dissolved | 19 | 0.0001 | 0.000341 | 0.0005 | 0.0005 | 2 | 0.0001 | 0.0003 | 0.00046 | 0.0005 |
| Zinc (Zn) Dissolved | 19 | 0.0004 | 0.002063 | 0.00352 | 0.009 | 2 | 0.0004 | 0.00145 | 0.00229 | 0.0025 |
| **Organic Compounds** | | | | | | | | | | |
| Oil and Grease | - | - | - | - | - | - | - | - | - | - |
| Phenols | 36 | 0.5 | 1.92 | 4 | **5**[C] | 17 | 0.5 | 2.15 | 3.8 | **10**[C] |
| Benzene | 34 | 0.25 | 0.25 | 0.25 | 0.25 | 16 | 0.25 | 0.25 | 0.25 | 0.25 |
| Ethylbenzene | 34 | 0.25 | 0.27 | 0.25 | 1 | 16 | 0.25 | 0.25 | 0.25 | 0.25 |
| Toluene | 34 | 0.25 | 0.28 | 0.25 | 1.1 | 16 | 0.25 | 0.25 | 0.25 | 0.25 |
| Xylenes | 34 | 0.25 | 0.4 | 0.25 | 5.4 | 16 | 0.25 | 0.25 | 0.25 | 0.25 |
| F1 (C6-C10) | - | - | - | - | - | - | - | - | - | - |
| F1 -BTEX | - | - | - | - | - | - | - | - | - | - |
| F2 (>C10-C16) | - | - | - | - | - | - | - | - | - | - |
| F3 (C16-C34) | - | - | - | - | - | - | - | - | - | - |
| F4 (C34-C50) | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | 33 | 0.5 | 0.5 | 0.5 | 0.5 | 16 | 0.5 | 0.5 | 0.5 | 0.5 |
| Total Extractables | 34 | 2.5 | 2.5 | 2.5 | 2.5 | 16 | 2.5 | 7.03 | 2.5 | 75 |
| Total Extractable Hydrocarbons (C | - | - | - | - | - | - | - | - | - | - |
| Total Extractable Hydrocarbons (C | - | - | - | - | - | - | - | - | - | - |
| **Other** | | | | | | | | | | |
| Biological Oxygen Demand (BOD) | 6 | 1.2 | 1.4 | 1.65 | 1.7 | 2 | 0.5 | 0.9 | 1.22 | 1.3 |
| Fecal Coliforms | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quali
[A] = Concentration higher than the rele
[C] = Concentration higher than the rele
[W] = Concentration higher than the rele

| Waterbody/Sample ID | | ML-W | ML-W | ML-W | BOOT-1 | BOOT-1 | BOOT-1 | BOOT-1 | BOOT-2 | BOOT-2 | BOOT-2 | BOOT-2 | BOOT-2 | ML-A | ML-A | ML-A | ML-A | ML-A | ML-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | N/A | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 4 | 5 |
| **Date Sampled** | | Jul-98 | Jul-98 | Jul-98 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 31-Jul-11 | 11-Aug-94 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Dillon 1994 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 88 | 71 | 82 | 55 | 41 | 48 | 37 | 84 | 85 | 83 | 83 | 84.3 | 51.9 | 75 | 69.3 | 66 | 73 | 64 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | < 0.1 | - | - | - | - | - | - |
| Sand (2.0 mm - 0.05 mm) | % | 32.7 | 33.6 | 31.8 | 79 | 80 | 78 | 82 | 56 | 56 | 52 | 58 | | - | 29.5 | 27 | 31.4 | 34.2 | 27 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | 1.05 | - | - | - | - | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | - | - | - | - | - | - | - | 7.01 | - | - | - | - | - | - |
| Silt (0.05 mm - 2 µm) | % | 64.7 | 64.7 | 66.1 | 19 | 18 | 20 | 17 | 39 | 37 | 42 | 37 | | - | 68.6 | 71.7 | 67.1 | 64.9 | 71.1 |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | - | - | - | - | | | | 68.8 | - | - | - | - | - | - |
| Clay (<2 µm) | % | 2.4 | 1.6 | 1.9 | 2 | 2 | 2 | 2 | 5 | 7 | 6 | 5 | | - | 2.1 | 1.3 | 1.5 | 1.1 | 1.7 |
| Clay (<4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | 23.1 | - | - | - | - | - | - |
| Texture | - | - | - | - | Loamy sand | Loamy sand | Loamy sand | Loamy sand | Sandy loam | Sandy loam | Sandy loam | Sandy loam | - | - | - | - | - | - | - |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 7.94 | 7.44 | 3.28 | 1.6 | 0.8 | 1.6 | 0.8 | 6.4 | 6.2 | 5.8 | 5.4 | 7.2 | - | 2.54 | 2.62 | 3.21 | 3.15 | 2.56 |
| Total Organic Carbon | % | 7.88 | 7.33 | 3.25 | 1.6 | 0.8 | 1.6 | 0.8 | 6.4 | 6.1 | 5.8 | 5.4 | 7.18 | - | 2.47 | 2.56 | 3.15 | 3.08 | 2.48 |
| Total Inorganic Carbon | % | 0.06 | 0.11 | 0.03 | < 0.09 | < 0.09 | < 0.09 | < 0.09 | < 0.09 | 0.1 | < 0.09 | < 0.09 | < 0.1 | - | 0.07 | 0.06 | 0.06 | 0.07 | 0.08 |
| Total Nitrogen | % | 0.76 | 0.67 | 0.33 | - | - | - | - | - | - | - | - | - | - | 0.23 | 0.25 | 0.3 | 0.3 | 0.24 |
| Total Nitrogen by LECO | % | - | - | - | 0.15 | 0.08 | 0.13 | 0.07 | 0.64 | 0.61 | 0.53 | 0.55 | - | - | - | - | - | - | - |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | 4.3 | 2.7 | 2.7 | 0.6 | < 0.5 | 0.8 | < 0.5 | 3.3 | 3.3 | 2.5 | 1.3 | - | - | 0.8 | 0.7 | 0.9 | 1.2 | 0.7 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | 9320 | 9060 | 8750 | - | - | - | - | - | - | - | - | - | 5450 | 7040 | 6280 | 8410 | 7840 | 6540 |
| Antimony (Sb) | mg/kg dw | - | - | - | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | - | < 25 | - | - | - | - | - |
| Arsenic (As) | mg/kg dw | **13.4(b)** | **7.6**[a] | 5.3 | 5.3 | 2.6 | 4.6 | 2.8 | **65.1(b)** | **52.6(b)** | **40.5(b)** | **28.7(b)** | - | 3.4 | **6.1(a)** | **8.4(a)** | **9.2(a)** | **11.6(a)** | **6.7(a)** |
| Barium (Ba) | mg/kg dw | 74.4 | 90.7 | 85.3 | 34 | 24 | 32 | 28 | 124 | 112 | 118 | 111 | - | 29.1 | 68.4 | 60.3 | 81.1 | 77.6 | 63.8 |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | < 0.5 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Bismuth (Bi) | mg/kg dw | < 1 | < 1 | < 1 | - | - | - | - | - | - | - | - | - | < 10 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Boron (B) | mg/kg dw | 8 | 9 | < 5 | - | - | - | - | - | - | - | - | - | - | < 5 | < 5 | 6 | < 5 | < 5 |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | 0.34 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Calcium (Ca) | mg/kg dw | 5170 | 6170 | 6100 | - | - | - | - | - | - | - | - | - | 4440 | 4400 | 3700 | 5030 | 4900 | 3790 |
| Chromium (Cr) | mg/kg dw | 33.6 | 35.1 | 32.1 | 20.3 | 15.4 | 19.3 | 17.2 | **51.1(a)** | **46(a)** | **53.4(a)** | **48.9(a)** | - | 14.4 | 31.9 | 29.6 | **38.4** | 35.6 | 31.5 |
| Cobalt (Co) | mg/kg dw | 13 | 6 | 6 | 4 | 3 | 4 | 3 | 18 | 14 | 19 | 17 | - | 4 | 5 | 5 | 6 | 6 | 5 |
| Copper (Cu) | mg/kg dw | **81(a)** | **71(a)** | **67(a)** | 9 | 6 | 9 | 7 | **72(a)** | **63(a)** | **76(a)** | **67(a)** | - | 10.4 | 34 | 31 | **42(a)** | **37(a)** | 34 |
| Iron (Fe) | mg/kg dw | 18500 | 16400 | 15000 | - | - | - | - | - | - | - | - | - | 8100 | 11300 | 11200 | 13900 | 13900 | 11300 |
| Lead (Pb) | mg/kg dw | 7 | 8 | 7 | < 5 | < 5 | < 5 | < 5 | 14 | 14 | 13 | 12 | - | 2 | 6 | 6 | 8 | 8 | 7 |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | 6.3 | - | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | 3890 | 3840 | 4060 | - | - | - | - | - | - | - | - | - | 3490 | 4400 | 4160 | 4890 | 4750 | 4350 |
| Manganese (Mn) | mg/kg dw | 241 | 217 | 214 | - | - | - | - | - | - | - | - | - | 166 | 170 | 162 | 201 | 207 | 169 |
| Mercury (Hg) | mg/kg dw | 0.09 | 0.05 | 0.06 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | - | 0.006 | 0.06 | 0.04 | 0.06 | 0.03 | 0.02 |
| Molybdenum (Mo) | mg/kg dw | 6 | 4 | 3 | 2 | < 1 | 2 | < 1 | 5 | 4 | 5 | 4 | - | < 4 | 2 | 1 | 2 | 2 | 1 |
| Nickel (Ni) | mg/kg dw | 44 | 34 | 33 | 13 | 9 | 13 | 10 | 66 | 57 | 70 | 63 | - | 12.3 | 25 | 24 | 31 | 28 | 26 |
| Phosphorus (P) | mg/kg dw | 840 | 899 | 788 | - | - | - | - | - | - | - | - | - | 437 | 702 | 678 | 804 | 774 | 705 |
| Potassium (K) | mg/kg dw | 1720 | 1700 | 1600 | - | - | - | - | - | - | - | - | - | 718 | 1570 | 1340 | 1920 | 1760 | 1410 |
| Selenium (Se) | mg/kg dw | 1.3 | 1.2 | 1 | 0.2 | < 0.2 | 0.2 | < 0.2 | 1.3 | 1.1 | 1.2 | 1.1 | - | < 0.1 | 0.4 | 0.5 | 0.6 | 0.7 | 0.4 |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | < 2 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Sodium (Na) | mg/kg dw | 482 | < 100 | 270 | - | - | - | - | - | - | - | - | - | < 250 | 281 | 237 | 332 | 324 | 241 |
| Strontium (Sr) | mg/kg dw | 38 | 42 | 36 | - | - | - | - | - | - | - | - | - | - | 27 | 21 | 34 | 31 | 22 |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | - | < 30 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Titanium (Ti) | mg/kg dw | 963 | 958 | 861 | - | - | - | - | - | - | - | - | - | - | 970 | 878 | 1060 | 1040 | 887 |
| Uranium (U) | mg/kg dw | < 40 | < 40 | < 40 | < 2 | < 2 | < 2 | < 2 | 4 | 3 | 4 | 3 | - | - | < 40 | < 40 | < 40 | < 40 | < 40 |
| Vanadium (V) | mg/kg dw | 39 | 38 | 38 | 19 | 14 | 17 | 16 | 56 | 50 | 58 | 53 | - | 14.5 | 34 | 31 | 40 | 37 | 32 |
| Zinc (Zn) | mg/kg dw | 69 | 61.2 | 63.9 | 30 | 20 | 30 | 20 | 100 | 90 | 100 | 90 | - | 23.1 | 50.4 | 44.4 | 56.6 | 53.3 | 48.8 |

| Waterbody/Sample ID | | ML-W | ML-W | ML-W | BOOT-1 | BOOT-1 | BOOT-1 | BOOT-1 | BOOT-2 | BOOT-2 | BOOT-2 | BOOT-2 | BOOT-2 | ML-A | ML-A | ML-A | ML-A | ML-A | ML-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | N/A | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 4 | 5 |
| **Date Sampled** | | Jul-98 | Jul-98 | Jul-98 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 31-Jul-11 | 11-Aug-94 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Dillon 1994 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Acenaphthylene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Acridine | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Benzo(a)pyrene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Benzo(ghi)perylene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Benzo(k)fluoranthene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 0.005 | < 0.005 | 0.005 | < 0.005 | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 0.008 | 0.01 | < 0.005 | 0.007 | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Dibenzothiophene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Fluorene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Methyl acenaphthene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | - | - | - | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| 1-Methylnaphthalene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | - | - | - | 0.005 | 0.005 | 0.005 | < 0.005 | 0.01 | 0.02 | 0.01 | 0.02 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Phenanthrene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 0.006 | 0.005 | 0.006 | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Pyrene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | < 0.02 | < 0.02 | < 0.02 | - | - |
| Quinoline | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |
| Retene | mg/kg dw | - | - | - | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | ML-W | ML-W | ML-W | BOOT-1 | BOOT-1 | BOOT-1 | BOOT-1 | BOOT-2 | BOOT-2 | BOOT-2 | BOOT-2 | BOOT-2 | ML-A | ML-A | ML-A | ML-A | ML-A | ML-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | N/A | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 4 | 5 |
| **Date Sampled** | | Jul-98 | Jul-98 | Jul-98 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 16-Jul-08 | 31-Jul-11 | 11-Aug-94 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Dillon 1994 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | < 40 | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | < 40 | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 5 | < 5 | < 5 | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.5 | 0.6 | 0.7 | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | < 0.002 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | 0.16 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or detection limits higher than guidelines.

(A) = Concentration higher than the interim sediment quality guideline.

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | ML-A | ML-A | ML-A | ML-A | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-E | ML-E | ML-E | ML-E | ML-E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | 5 |
| **Date Sampled** | | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 75 | 73 | 75 | 75 | 43.7 | 50.1 | 55.3 | 51 | 45 | 42 | 40 | 43 | 43 | 79 | 75 | 77 | 78 | 75 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sand (2.0 mm - 0.05 mm) | % | 54 | 53 | 47 | 45 | 67.8 | 70.4 | 69.3 | 68.5 | 64.2 | 82 | 80 | 76 | 75 | 31.9 | 29.3 | 35.1 | 22.1 | 22.9 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silt (0.05 mm - 2 µm) | % | 43 | 44 | 50 | 50 | 32.2 | 29.6 | 30.7 | 31.5 | 35.8 | 16 | 17 | 22 | 21 | 66.4 | 68.9 | 62.8 | 74.8 | 73.6 |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Clay (<2 µm) | % | 3 | 3 | 3 | 6 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 4 | 1.8 | 2.1 | 2.1 | 3 | 3.3 |
| Clay (<4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Texture | - | Sandy loam | Sandy loam | Silt loam / Sandy loam | Silt loam | - | - | - | - | - | Loamy sand | Loamy sand | Loamy sand | Loamy sand | - | - | - | - | - |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 3.8 | 3.7 | 3.7 | 3.7 | 1.24 | 1.08 | 1.11 | 1.13 | 0.99 | 0.8 | 0.7 | 0.9 | 0.8 | 4.02 | 3.95 | 3.83 | 4.01 | 4.12 |
| Total Organic Carbon | % | 3.8 | 3.5 | 3.7 | 3.7 | 1.17 | 1.03 | 1.04 | 1.06 | 0.94 | 0.8 | 0.7 | 0.9 | 0.8 | 3.96 | 3.88 | 3.76 | 3.94 | 4.03 |
| Total Inorganic Carbon | % | 0.09 | 0.1 | < 0.09 | < 0.09 | 0.07 | 0.05 | 0.07 | 0.07 | 0.05 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 0.06 | 0.07 | 0.07 | 0.07 | 0.09 |
| Total Nitrogen | % | - | - | - | - | 0.15 | 0.14 | 0.13 | 0.14 | 0.13 | - | - | - | - | 0.35 | 0.36 | 0.35 | 0.37 | 0.38 |
| Total Nitrogen by LECO | % | 0.4 | 0.4 | 0.38 | 0.36 | - | - | - | - | - | 0.08 | 0.08 | 0.19 | 0.08 | - | - | - | - | - |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | 1.7 | 1.5 | 2.3 | 2 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.6 | < 0.5 | 0.6 | 0.6 | 1.3 | 1.3 | 1.3 | 1.5 | 1.7 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | - | - | 4090 | 3360 | 3300 | 4120 | 3370 | - | - | - | - | 9460 | 11000 | 9290 | 9280 | 10600 |
| Antimony (Sb) | mg/kg dw | < 0.2 | < 0.2 | < 0.2 | < 0.2 | - | - | - | - | - | < 0.2 | < 0.2 | < 0.2 | < 0.2 | - | - | - | - | - |
| Arsenic (As) | mg/kg dw | **38(b)** | **55.1(b)** | **21.4(b)** | **26.8(b)** | 2.1 | 1.7 | 1.8 | 2.5 | 1.6 | 2 | 1.8 | 2.2 | 2 | **12.6(a)** | **13(a)** | **16.9(a)** | **18.2(b)** | **14.1(a)** |
| Barium (Ba) | mg/kg dw | 87 | 81 | 87 | 81 | 81.9 | 25.4 | 24.2 | 29.6 | 24 | 21 | 19 | 27 | 26 | 94.9 | 108 | 101 | 96.8 | 108 |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Bismuth (Bi) | mg/kg dw | - | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Boron (B) | mg/kg dw | - | - | - | - | < 5 | < 5 | < 5 | < 5 | < 5 | - | - | - | - | < 5 | < 5 | < 5 | < 5 | 8 |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.5 | < 0.5 | 0.5 | < 0.5 | < 0.5 |
| Calcium (Ca) | mg/kg dw | - | - | - | - | 3120 | 2450 | 2300 | 3220 | 2520 | - | - | - | - | 4720 | 6120 | 4740 | 5070 | 5380 |
| Chromium (Cr) | mg/kg dw | 34.1 | 31.6 | 36 | 34.2 | 17.3 | 15.2 | 15.2 | 17.5 | 14.4 | 14.6 | 13.2 | 16 | 16.3 | **44.7(a)** | **49.4(a)** | **43.1(a)** | **43.4(a)** | **47.3(a)** |
| Cobalt (Co) | mg/kg dw | 8 | 8 | 8 | 8 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 9 | 10 | 9 | 9 | 9 |
| Copper (Cu) | mg/kg dw | **39(a)** | **36(a)** | **44(a)** | **42(a)** | **36(a)** | 12 | 23 | 11 | 12 | 10 | 7 | 12 | 12 | **63(a)** | **68(a)** | **62(a)** | **62(a)** | **67(a)** |
| Iron (Fe) | mg/kg dw | - | - | - | - | 6800 | 5890 | 5860 | 6830 | 5790 | - | - | - | - | 16800 | 18100 | 17500 | 18200 | 17500 |
| Lead (Pb) | mg/kg dw | 9 | 9 | 8 | 7 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | 10 | 12 | 10 | 10 | 10 |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | - | - | - | - | 2530 | 2300 | 2230 | 2490 | 2150 | - | - | - | - | 5620 | 6530 | 5960 | 5910 | 6060 |
| Manganese (Mn) | mg/kg dw | - | - | - | - | 94.5 | 78.9 | 81.5 | 95.4 | 78.7 | - | - | - | - | 277 | 308 | 326 | 363 | 312 |
| Mercury (Hg) | mg/kg dw | 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.05 | 0.03 | 0.04 | 0.07 | 0.05 |
| Molybdenum (Mo) | mg/kg dw | 3 | 3 | 3 | 3 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 3 | 3 | 3 | 3 | 3 |
| Nickel (Ni) | mg/kg dw | 35 | 33 | 36 | 33 | 10 | 8 | 9 | 10 | 8 | 8 | 7 | 9 | 10 | 48 | 51 | 47 | 46 | 48 |
| Phosphorus (P) | mg/kg dw | - | - | - | - | 393 | 414 | 402 | 400 | 439 | - | - | - | - | 945 | 1020 | 951 | 957 | 994 |
| Potassium (K) | mg/kg dw | - | - | - | - | 680 | 526 | 509 | 662 | 532 | - | - | - | - | 2270 | 2680 | 2150 | 2180 | 2500 |
| Selenium (Se) | mg/kg dw | 0.7 | 0.6 | 0.7 | 0.7 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | < 0.2 | < 0.2 | 0.2 | < 0.2 | 1 | 1 | 1 | 0.9 | 0.9 |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Sodium (Na) | mg/kg dw | - | - | - | - | 142 | 116 | 110 | 150 | 118 | - | - | - | - | 355 | 419 | 318 | 339 | 407 |
| Strontium (Sr) | mg/kg dw | - | - | - | - | 20 | 14 | 13 | 20 | 15 | - | - | - | - | 30 | 36 | 26 | 28 | 35 |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Titanium (Ti) | mg/kg dw | - | - | - | - | 574 | 491 | 480 | 555 | 508 | - | - | - | - | 1100 | 1230 | 1020 | 1040 | 1160 |
| Uranium (U) | mg/kg dw | < 2 | < 2 | 2 | 2 | < 40 | < 40 | < 40 | < 40 | < 40 | < 2 | < 2 | < 2 | < 2 | < 40 | < 40 | < 40 | < 40 | < 40 |
| Vanadium (V) | mg/kg dw | 36 | 34 | 39 | 37 | 18 | 14 | 14 | 17 | 14 | 13 | 12 | 15 | 15 | 48 | 55 | 47 | 48 | 52 |
| Zinc (Zn) | mg/kg dw | 50 | 50 | 60 | 50 | 26.3 | 25.3 | 24.1 | 27.2 | 22.9 | 20 | 20 | 20 | 20 | 76.3 | 88.6 | 81.3 | 80.8 | 88 |

| Waterbody/Sample ID | | ML-A | ML-A | ML-A | ML-A | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-E | ML-E | ML-E | ML-E | ML-E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | 5 |
| **Date Sampled** | | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Acenaphthylene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Acridine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(ghi)perylene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Methyl acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| 1-Methylnaphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | ML-A | ML-A | ML-A | ML-A | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-B | ML-E | ML-E | ML-E | ML-E | ML-E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | 5 |
| **Date Sampled** | | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg dw | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | < 5 | < 5 | < 5 | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | < 0.5 | < 0.5 | 2.1 | - | - | - | - | - | - | - | - | - | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.002 | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.001 | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | **0.008** | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | **0.002** | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | **0.07** | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.005 | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.03 | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | ML-E | ML-E | ML-E | ML-E | ML-E | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-SE | ML-SE | ML-SE | ML-SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm |
| **Replicate** | | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| **Date Sampled** | | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 1-Aug-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 |
| **Source** | | Golder | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 50 | 54 | 54 | 63 | 42.7 | 85 | 86 | 86 | 88 | 81 | 77 | 83 | 75 | 80 | 75 | 78 | 72 | 75 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | < 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sand (2.0 mm - 0.05 mm) | % | 70 | 74 | 67 | 74 | | 30.7 | 30.7 | 32.3 | 31.4 | 34.6 | 79 | 80 | 76 | 76 | 56 | 56 | 58 | 66 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | 17.6 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | 46.1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silt (0.05 mm - 2 µm) | % | 27 | 23 | 30 | 17 | - | 66.1 | 66.2 | 64.5 | 64.9 | 62.9 | 16 | 14 | 18 | 17 | 36 | 39 | 37 | 31 |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | 33.3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Clay (<2 µm) | % | 3 | 4 | 3 | 9 | | 3.3 | 3.1 | 3.1 | 3.5 | 2.6 | 5 | 6 | 6 | 7 | 9 | 6 | 5 | 4 |
| Clay (<4 µm) | % | - | - | - | - | 3.08 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Texture | - | Sandy loam | Sandy loam / Loamy sand | Sandy loam | Sandy loam | - | - | - | - | - | - | Loamy sand | Loamy sand | Loamy sand | Sandy loam | Sandy loam | Sandy loam | Sandy loam | Sandy loam |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 1.1 | 1.5 | 1.1 | 1.9 | 0.9 | 7.51 | 6.41 | 7.19 | 7.53 | 7.73 | 4 | 5 | 3.3 | 4 | 3.8 | 4.9 | 2.9 | 3.1 |
| Total Organic Carbon | % | 1.1 | 1.5 | 1.1 | 1.9 | 0.77 | 7.4 | 6.26 | 7.1 | 7.45 | 7.65 | 4 | 5 | 3.3 | 4 | 3.8 | 4.9 | 2.9 | 3.1 |
| Total Inorganic Carbon | % | < 0.09 | 0.1 | < 0.09 | < 0.09 | 0.11 | 0.11 | 0.15 | 0.09 | 0.08 | 0.08 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Total Nitrogen | % | - | - | - | - | - | 0.61 | 0.52 | 0.6 | 0.64 | 0.67 | - | - | - | - | - | - | - | - |
| Total Nitrogen by LECO | % | 0.1 | 0.16 | 0.1 | 0.21 | - | - | - | - | - | - | 0.31 | 0.41 | 0.29 | 0.29 | 0.39 | 0.51 | 0.29 | 0.3 |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | 0.9 | < 0.5 | < 0.5 | < 0.5 | - | 6.2 | 6.1 | 6.8 | 7 | 2.5 | 2.4 | 2.1 | 2.3 | 1.8 | 1.7 | 2.9 | 1.7 | 2.1 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | - | - | - | 10200 | 10300 | 10000 | 10500 | 11900 | - | - | - | - | - | - | - | - |
| Antimony (Sb) | mg/kg dw | < 0.2 | < 0.2 | < 0.2 | < 0.2 | - | - | - | - | - | - | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Arsenic (As) | mg/kg dw | 5.2 | **7.8(a)** | 4.5 | **6.5(a)** | - | **38.5(b)** | **47.1(b)** | **39.4(b)** | **49.7(b)** | **36.4(b)** | 5.8 | 4.9 | 4.8 | 4.9 | **7.5(a)** | **8.2(a)** | **7.6(a)** | **7.6(b)** |
| Barium (Ba) | mg/kg dw | 27 | 49 | 35 | 52 | - | 122 | 125 | 141 | 138 | 131 | 59 | 50 | 52 | 50 | 45 | 51 | 50 | 49 |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Bismuth (Bi) | mg/kg dw | - | - | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | - | - | - | - | - | - |
| Boron (B) | mg/kg dw | - | - | - | - | - | < 5 | < 5 | < 5 | < 5 | 11 | - | - | - | - | - | - | - | - |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | 0.5 | **0.6(a)** | 0.5 | **0.6(a)** | **0.6(a)** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Calcium (Ca) | mg/kg dw | - | - | - | - | - | 4390 | 4710 | 4580 | 4970 | 5320 | - | - | - | - | - | - | - | - |
| Chromium (Cr) | mg/kg dw | 13.8 | 18.5 | 18 | 21.6 | - | **51.2(a)** | **50.9(a)** | **49.8(a)** | **51.1(a)** | **53.1(a)** | 28.6 | 24.4 | 26 | 25.6 | 26.6 | 29.2 | 28.1 | 29.4 |
| Cobalt (Co) | mg/kg dw | 3 | 4 | 3 | 4 | - | 21 | 17 | 19 | 21 | 19 | 6 | 5 | 6 | 6 | 5 | 5 | 6 | 6 |
| Copper (Cu) | mg/kg dw | 11 | 18 | 16 | 23 | - | **91(a)** | **87(a)** | **92(a)** | **91(a)** | **90(a)** | 34 | 29 | 32 | 34 | 20 | 24 | 23 | 25 |
| Iron (Fe) | mg/kg dw | - | - | - | - | - | 33800 | 33600 | 33700 | 40800 | 36700 | - | - | - | - | - | - | - | - |
| Lead (Pb) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | - | 11 | 11 | 12 | 13 | 12 | < 5 | 5 | < 5 | < 5 | < 5 | 5 | < 5 | 5 |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | - | - | - | - | - | 6040 | 6000 | 5940 | 6010 | 7930 | - | - | - | - | - | - | - | - |
| Manganese (Mn) | mg/kg dw | - | - | - | - | - | 560 | 615 | 583 | 615 | 571 | - | - | - | - | - | - | - | - |
| Mercury (Hg) | mg/kg dw | < 0.05 | < 0.05 | < 0.05 | < 0.05 | - | 0.06 | 0.09 | 0.09 | 0.09 | 0.14 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Molybdenum (Mo) | mg/kg dw | < 1 | 1 | < 1 | 1 | - | 7 | 6 | 6 | 7 | 6 | 4 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Nickel (Ni) | mg/kg dw | 10 | 16 | 14 | 18 | - | 67 | 62 | 64 | 73 | 64 | 23 | 20 | 20 | 21 | 17 | 19 | 18 | 20 |
| Phosphorus (P) | mg/kg dw | - | - | - | - | - | 1020 | 1020 | 1030 | 1190 | 1120 | - | - | - | - | - | - | - | - |
| Potassium (K) | mg/kg dw | - | - | - | - | - | 1940 | 2020 | 1930 | 2070 | 2260 | - | - | - | - | - | - | - | - |
| Selenium (Se) | mg/kg dw | 0.3 | 0.3 | 0.2 | 0.4 | - | 1 | 1.1 | 1.1 | 1.2 | 1.1 | 0.4 | 0.3 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Sodium (Na) | mg/kg dw | - | - | - | - | - | 251 | 262 | 269 | 283 | 259 | - | - | - | - | - | - | - | - |
| Strontium (Sr) | mg/kg dw | - | - | - | - | - | 24 | 26 | 25 | 27 | 24 | - | - | - | - | - | - | - | - |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | - | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| Titanium (Ti) | mg/kg dw | - | - | - | - | - | 1030 | 1070 | 971 | 1060 | 1000 | - | - | - | - | - | - | - | - |
| Uranium (U) | mg/kg dw | < 2 | < 2 | < 2 | < 2 | - | < 40 | < 40 | < 40 | < 40 | < 40 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Vanadium (V) | mg/kg dw | 14 | 19 | 19 | 22 | - | 60 | 60 | 59 | 60 | 61 | 28 | 24 | 27 | 26 | 26 | 27 | 29 | 29 |
| Zinc (Zn) | mg/kg dw | 20 | 30 | 30 | 30 | - | 83.3 | 82.4 | 84 | 84.1 | 87.6 | 40 | 30 | 40 | 40 | 30 | 40 | 40 | 40 |

| Waterbody/Sample ID | | ML-E | ML-E | ML-E | ML-E | ML-E | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-SE | ML-SE | ML-SE | ML-SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm |
| **Replicate** | | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| **Date Sampled** | | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 1-Aug-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 |
| **Source** | | Golder | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Acenaphthylene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Acridine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(ghi)perylene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1-Methylnaphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | ML-E | ML-E | ML-E | ML-E | ML-E | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-S | ML-SE | ML-SE | ML-SE | ML-SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel |
| **Profile Depth** | | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm |
| **Replicate** | | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| **Date Sampled** | | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 17-Jul-08 | 1-Aug-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 |
| **Source** | | Golder | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | < 0.002 | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | < 0.001 | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | < 0.03 | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | ML-SE | ML-W | ML-W | ML-W | ML-W | ML-W | ML-W | A1 | A5 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A8 | A8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-5 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | N/A | N/A | N/A | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | top 5-10 cm | N/A | top 5-10 cm |
| **Replicate** | | 1 | 4 | 5 | 1 | 2 | 1 | 2 | | | 1 | 1 | 3 | 4 | 5 | 1 | 2 | 1 | 4 |
| **Date Sampled** | | 27-Jul-11 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 11-Aug-94 | 11-Aug-94 | 11-Aug-94 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 29-Jul-09 | Jul-98 | 11-Aug-94 | Jul-98 |
| **Source** | | Golder | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Dillon 1994 | Dillon 1994 | Dillon 1994 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | RL&L 1999 | Dillon 1994 | RL&L 1999 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 83 | 88 | 74 | 70 | 69 | 75 | 72 | 51.9 | 53.4 | 16.5 | 91 | 82 | 87 | 88 | 91.9 | 97 | 19.6 | 84 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | < 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sand (2.0 mm - 0.05 mm) | % | | 23.3 | 55.5 | 83 | 81 | 79 | 82 | - | - | - | 36.7 | 35.8 | 41.3 | 46.6 | 81.6 | 40.1 | - | 59.2 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | 3.44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | 25.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Silt (0.05 mm - 2 µm) | % | | 73.7 | 42.7 | 14 | 15 | 16 | 14 | - | - | - | 62.5 | 63.3 | 57.9 | 52.7 | 14.6 | 59.3 | - | 40.2 |
| Silt (0.63 mm - 4 µm) | % | 60.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Clay (<2 µm) | % | | 2.8 | 1.7 | 2 | 4 | 5 | 3 | - | - | - | 0.7 | 1 | 0.8 | 0.8 | 3.8 | 0.8 | - | 0.4 |
| Clay (<4 µm) | % | 11.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Texture | - | - | - | - | Loamy sand | Loamy sand | Loamy sand | Loamy sand | - | - | - | - | - | - | - | Loamy sand | - | - | - |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 5.8 | 8.19 | 4.04 | 2.6 | 2.4 | 2.9 | 2.4 | - | - | - | 13.3 | 5.64 | 12.5 | 10.1 | - | 12.8 | - | 5.77 |
| Total Organic Carbon | % | 5.8 | 8.14 | 4.01 | 2.6 | 2.4 | 2.9 | 2.4 | - | - | - | 13.3 | 5.57 | 12.5 | 10.9 | 8.27 | 12.7 | - | 5.72 |
| Total Inorganic Carbon | % | < 0.1 | 0.05 | 0.03 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | - | - | - | 0.06 | 0.07 | 0.06 | 0.1 | - | 0.07 | - | 0.05 |
| Total Nitrogen | % | - | 0.78 | 0.4 | - | - | - | - | - | - | - | 0.92 | 0.41 | 0.9 | 0.78 | - | 0.9 | - | 0.47 |
| Total Nitrogen by LECO | % | - | - | - | 0.23 | 0.2 | 0.24 | 0.22 | - | - | - | - | - | - | - | 0.789 | - | - | - |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 407 | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | - | 4.5 | 3.1 | 1.9 | 1.8 | 1.6 | 1.7 | - | - | - | 4.3 | 4.1 | 4.7 | 5 | 2.75 | 4.6 | - | 4 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | 9580 | 6840 | - | - | - | - | 5450 | 18200 | 13200 | 9160 | 5890 | 8840 | 8620 | - | 8570 | 6470 | 4800 |
| Antimony (Sb) | mg/kg dw | - | - | - | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 25 | < 25 | < 25 | - | - | - | - | 0.2 | - | < 25 | - |
| Arsenic (As) | mg/kg dw | - | **8.4(a)** | **7.5(a)** | 4.5 | 3.6 | 4.3 | 3.2 | 3.4 | **25(b)** | **51.8(b)** | **121(b)** | **75.1(b)** | **105(b)** | **111(b)** | **31.4(b)** | **105(b)** | **11.1(a)** | **33.3(b)** |
| Barium (Ba) | mg/kg dw | - | 99.2 | 65.5 | 62 | 57 | 67 | 53 | 29.1 | 58.2 | 30 | 76.3 | 37.8 | 78.3 | 68.5 | 53 | 67.8 | 21.6 | 32.1 |
| Beryllium (Be) | mg/kg dw | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 0.5 | < 0.5 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 |
| Bismuth (Bi) | mg/kg dw | - | < 1 | < 1 | - | - | - | - | < 10 | 20 | 11 | < 1 | < 1 | < 1 | < 1 | - | < 1 | < 10 | < 1 |
| Boron (B) | mg/kg dw | - | 7 | < 5 | - | - | - | - | - | - | - | < 5 | < 5 | < 5 | < 5 | - | < 5 | | < 5 |
| Cadmium (Cd) | mg/kg dw | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.34 | 0.21 | 0.1 | 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.11 | < 0.5 |
| Calcium (Ca) | mg/kg dw | - | 6460 | 4380 | - | - | - | - | 4440 | 6020 | 9680 | 6320 | 3510 | 5410 | 5360 | | 5520 | 3490 | 3730 |
| Chromium (Cr) | mg/kg dw | - | 35.3 | 25.6 | 19.9 | 18.9 | 22.2 | 18.3 | 14.4 | **61.5(a)** | **58.7(a)** | **47(a)** | 28.8 | **41.4(a)** | **46.4(a)** | **46.7(a)** | **42(a)** | 23.3 | 23.7 |
| Cobalt (Co) | mg/kg dw | - | 7 | 7 | 5 | 4 | 5 | 4 | 4 | 19.6 | 11.6 | 29 | 17 | 27 | 29 | 9 | 28 | 4.6 | 7 |
| Copper (Cu) | mg/kg dw | - | **83(a)** | **39(a)** | 30 | 27 | **38(a)** | 30 | 25.3 | 25.3 | 24.2 | **123(a)** | **67(a)** | **106(a)** | **105(a)** | **52.9(a)** | **103(a)** | 12.1 | **38(a)** |
| Iron (Fe) | mg/kg dw | - | 17600 | 11300 | - | - | - | - | 29500 | 29500 | 24800 | 25600 | 18700 | 22600 | 23100 | - | 22200 | 11700 | 9140 |
| Lead (Pb) | mg/kg dw | - | 8 | 6 | < 5 | < 5 | < 5 | < 5 | 2.4 | 2.4 | 2.1 | 9 | 5 | 9 | 9 | 6.8 | 9 | 2.1 | 7 |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | 19.9 | 19.9 | 15.3 | - | - | - | - | - | - | 7.1 | - |
| Magnesium (Mg) | mg/kg dw | - | 4510 | 3050 | - | - | - | - | 12000 | 12000 | 9710 | 5990 | 3960 | 5210 | 5780 | - | 5500 | 4010 | 3100 |
| Manganese (Mn) | mg/kg dw | - | 206 | 162 | - | - | - | - | 423 | 423 | 405 | 276 | 154 | 221 | 235 | - | 223 | 136 | 121 |
| Mercury (Hg) | mg/kg dw | - | 0.07 | 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.007 | 0.007 | < 0.005 | 0.06 | 0.02 | 0.06 | 0.05 | < 0.05 | 0.05 | < 0.005 | 0.02 |
| Molybdenum (Mo) | mg/kg dw | - | 4 | 4 | 1 | 1 | 2 | 1 | < 4 | < 4 | < 4 | 5 | 4 | 4 | 4 | 3.2 | 4 | < 4 | 2 |
| Nickel (Ni) | mg/kg dw | - | 38 | 33 | 19 | 18 | 22 | 17 | 41.3 | 41.3 | 29.8 | 60 | 38 | 55 | 60 | 38.8 | 57 | 12.2 | 23 |
| Phosphorus (P) | mg/kg dw | - | 936 | 626 | - | - | - | - | 609 | 609 | 451 | 528 | 421 | 447 | 441 | | 484 | 462 | 479 |
| Potassium (K) | mg/kg dw | - | 1720 | 1460 | - | - | - | - | 735 | 735 | 1040 | 1420 | 833 | 1350 | 1230 | 1800 | 1260 | 729 | 610 |
| Selenium (Se) | mg/kg dw | - | 1.2 | 0.8 | 0.4 | 0.4 | 0.5 | 0.4 | 0.15 | 0.15 | < 0.1 | 0.9 | 0.5 | 0.7 | 1 | 0.51 | 0.9 | < 0.1 | 0.2 |
| Silver (Ag) | mg/kg dw | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 2 | < 2 | < 2 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 2 | < 1 |
| Sodium (Na) | mg/kg dw | - | 306 | 212 | - | - | - | - | < 250 | < 250 | < 250 | 214 | 121 | 424 | 195 | - | 181 | < 250 | 119 |
| Strontium (Sr) | mg/kg dw | - | 36 | 30 | - | - | - | - | - | - | - | 33 | 19 | 35 | 28 | - | 28 | - | 21 |
| Thallium (Tl) | mg/kg dw | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | < 1 |
| Tin (Sn) | mg/kg dw | - | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 30 | < 30 | < 30 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 30 | < 5 |
| Titanium (Ti) | mg/kg dw | - | 911 | 836 | - | - | - | - | - | - | - | 924 | 596 | 781 | 842 | - | 773 | - | 594 |
| Uranium (U) | mg/kg dw | - | < 40 | < 40 | < 2 | < 2 | < 2 | < 2 | - | - | - | < 40 | < 40 | < 40 | < 40 | < 2 | < 40 | - | < 40 |
| Vanadium (V) | mg/kg dw | - | 41 | 36 | 21 | 21 | 25 | 21 | 14.5 | 60.8 | 44.6 | 47 | 28 | 43 | 45 | 25.8 | 41 | 23.3 | 21 |
| Zinc (Zn) | mg/kg dw | - | 65.8 | 46.7 | 30 | 30 | 40 | 30 | 23.1 | 71 | 46.3 | 79.5 | 45.8 | 74.7 | 84.5 | 40 | 72.7 | 22.2 | 57.5 |

| Waterbody/Sample ID | | ML-SE | ML-W | ML-W | ML-W | ML-W | ML-W | ML-W | A1 | A5 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A8 | A8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-5 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | N/A | N/A | N/A | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | top 5-10 cm | N/A | top 5-10 cm |
| **Replicate** | | 1 | 4 | 5 | 1 | 2 | 1 | 2 | | | 1 | 1 | 3 | 4 | 5 | 1 | 2 | 1 | 4 |
| **Date Sampled** | | 27-Jul-11 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 11-Aug-94 | 11-Aug-94 | 11-Aug-94 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 29-Jul-09 | Jul-98 | 11-Aug-94 | Jul-98 |
| **Source** | | Golder | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Dillon 1994 | Dillon 1994 | Dillon 1994 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | RL&L 1999 | Dillon 1994 | RL&L 1999 |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Acenaphthylene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Acridine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(ghi)perylene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1-Methylnaphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | ML-SE | ML-W | ML-W | ML-W | ML-W | ML-W | ML-W | A1 | A5 | A6 | A6 | A6 | A6 | A6 | A6 | A6 | A8 | A8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lake-Mel | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-5 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | N/A | N/A | N/A | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | top 5-10 cm | N/A | top 5-10 cm |
| **Replicate** | | 1 | 4 | 5 | 1 | 2 | 1 | 2 | | | 1 | 1 | 3 | 4 | 5 | 1 | 2 | 1 | 4 |
| **Date Sampled** | | 27-Jul-11 | Jul-98 | Jul-98 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 19-Jul-08 | 11-Aug-94 | 11-Aug-94 | 11-Aug-94 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 29-Jul-09 | Jul-98 | 11-Aug-94 | Jul-98 |
| **Source** | | Golder | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Dillon 1994 | Dillon 1994 | Dillon 1994 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | RL&L 1999 | Dillon 1994 | RL&L 1999 |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | < 40 | 124 | - | - | - | - | - | - | - | < 40 | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | < 40 | 121 | - | - | - | - | - | - | - | < 40 | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | B2 | B36 | B36 | B45 | B46 | B5 | B5 | B5 | B5 | B5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-5 cm | N/A | 0-5 cm | 0-5 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 1 | 2 | 1 | 2 | 3 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 2 | 5 |
| **Date Sampled** | | 15-Jul-08 | 15-Jul-08 | 15-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 15-Jul-08 | 20-Jul-11 | 11-Aug-94 | 24-Jul-11 | 21-Jul-11 | 24-Jul-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Dillon 1994 | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 89 | 86 | 88 | 83 | 86 | 77 | 81 | 95 | 89.6 | 21.2 | 65.4 | 75.4 | 81.2 | 78.9 | 72.7 | 65 | 83.9 | 70 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | - | - | - | - | < 0.1 | - | < 0.1 | 0.47 | < 0.1 | - | - | - | - | - |
| Sand (2.0 mm - 0.05 mm) | % | 70 | 61 | 42 | 54 | 57.3 | 56.3 | 54.1 | 33 | - | - | - | - | - | 49 | 56.6 | 47.3 | 52.8 | 42.7 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | - | - | - | - | 1.32 | - | 2.23 | 7.38 | 1.76 | - | - | - | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | - | - | - | - | 17 | - | 17.4 | 23.4 | 8.69 | - | - | - | - | - |
| Silt (0.05 mm - 2 µm) | % | 22 | 34 | 52 | 45.4 | 42.3 | 43.1 | 45.2 | 56 | - | - | - | - | - | 50.3 | 42.8 | 51.5 | 46.8 | 56.1 |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | - | - | - | - | 68.3 | - | 69.2 | 61.9 | 75 | - | - | - | - | - |
| Clay (<2 µm) | % | 7 | 5 | 6 | 0.5 | 0.4 | 0.4 | 0.5 | 11 | - | - | - | - | - | 0.7 | 0.5 | 1 | 0.5 | 1.1 |
| Clay (<4 µm) | % | - | - | - | - | - | - | - | - | 13.3 | - | 11.2 | 6.88 | 14.6 | - | - | - | - | - |
| Texture | - | Sandy loam | Sandy loam | Silt loam | - | - | - | - | Silt loam | - | - | - | - | - | - | - | - | - | - |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 7.7 | 8 | 7.9 | 5.58 | 6.83 | 6.04 | 6.13 | 12.5 | 10.1 | - | 8.3 | 5.9 | 11.5 | 5.75 | 4.98 | 4.92 | 5.95 | 4.81 |
| Total Organic Carbon | % | 7.7 | 8 | 7.9 | 5.52 | 6.74 | 5.97 | 6.07 | 12.5 | 9.9 | - | 7.64 | 5.87 | 11.3 | 5.65 | 4.91 | 4.85 | 5.89 | 4.73 |
| Total Inorganic Carbon | % | < 0.1 | < 0.1 | < 0.1 | 0.06 | 0.09 | 0.07 | 0.06 | < 0.1 | 0.15 | - | 0.67 | < 0.1 | 0.23 | 0.1 | 0.07 | 0.07 | 0.06 | 0.08 |
| Total Nitrogen | % | - | - | - | 0.45 | 0.55 | 0.49 | 0.49 | - | - | - | - | - | - | 0.45 | 0.4 | 0.39 | 0.46 | 0.38 |
| Total Nitrogen by LECO | % | 0.82 | 0.72 | 0.78 | - | - | - | - | 1.23 | - | - | - | - | - | - | - | - | - | - |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | 4 | 1.5 | 2.3 | 4.4 | 4.5 | 4.7 | 4.1 | 3.4 | - | - | - | - | - | 1.4 | 1.3 | 1 | 1.3 | 1.4 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | - | 6140 | 5630 | 5460 | 5590 | - | - | 6440 | - | - | - | 5590 | 5140 | 5040 | 5340 | 5000 |
| Antimony (Sb) | mg/kg dw | < 0.2 | < 0.2 | < 0.2 | - | - | - | - | < 0.2 | - | < 25 | - | - | - | - | - | - | - | - |
| Arsenic (As) | mg/kg dw | **151(b)** | **173(b)** | **149(b)** | **50.9(b)** | **48.9(b)** | **42.8(b)** | **47.1(b)** | **117(b)** | - | 3.58 | - | - | - | **54(b)** | **45.7(b)** | **44.9(b)** | **54.8(b)** | **46.1(b)** |
| Barium (Ba) | mg/kg dw | 60 | 55 | 52 | 40.5 | 35.5 | 34.8 | 36.7 | 70 | - | 29.4 | - | - | - | 42.2 | 38.5 | 36.1 | 41 | 39.8 |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | < 0.5 | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Bismuth (Bi) | mg/kg dw | - | - | - | < 1 | < 1 | < 1 | < 1 | - | - | < 10 | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Boron (B) | mg/kg dw | - | - | - | < 5 | < 5 | < 5 | < 5 | - | - | | - | - | - | < 5 | < 5 | < 5 | < 5 | 5 |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | < 0.1 | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Calcium (Ca) | mg/kg dw | - | - | - | 4330 | 4090 | 3960 | 4070 | - | - | 13700 | - | - | - | 4130 | 3810 | 3720 | 4040 | 3940 |
| Chromium (Cr) | mg/kg dw | **39.9(a)** | **41.1(a)** | 37 | 30.5 | 27.9 | 26.5 | 27.5 | **40.2(a)** | - | 24 | - | - | - | 27.2 | 24.5 | 24.8 | 25.8 | 24.8 |
| Cobalt (Co) | mg/kg dw | 20 | 19 | 18 | 9 | 9 | 8 | 8 | 18 | - | 4.5 | - | - | - | 11 | 9 | 8 | 10 | 9 |
| Copper (Cu) | mg/kg dw | **77(a)** | **78(a)** | **68(a)** | **47(a)** | **61(a)** | **37(a)** | **41(a)** | **75(a)** | - | 15.4 | - | - | - | **41(a)** | **38(a)** | 34 | **41(a)** | **41(a)** |
| Iron (Fe) | mg/kg dw | - | - | - | 11300 | 10800 | 9900 | 10600 | - | - | 10400 | - | - | - | 14500 | 12900 | 12500 | 13800 | 12600 |
| Lead (Pb) | mg/kg dw | 11 | 10 | 10 | 8 | 8 | 7 | 7 | 13 | - | 2.1 | - | - | - | 6 | 6 | 5 | 6 | 6 |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | - | - | 7.6 | - | - | - | - | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | - | - | - | 3890 | 3630 | 3450 | 3540 | - | - | 4700 | - | - | - | 3920 | 3550 | 3360 | 3760 | 3370 |
| Manganese (Mn) | mg/kg dw | - | - | - | 144 | 133 | 130 | 142 | - | - | 149 | - | - | - | 126 | 117 | 115 | 120 | 122 |
| Mercury (Hg) | mg/kg dw | 0.09 | 0.08 | 0.06 | 0.03 | 0.03 | 0.03 | 0.03 | 0.08 | - | < 0.005 | - | - | - | 0.04 | 0.03 | 0.05 | 0.05 | 0.04 |
| Molybdenum (Mo) | mg/kg dw | 5 | 5 | 5 | 2 | 2 | 2 | 2 | 5 | - | < 4 | - | - | - | 2 | 2 | 2 | 2 | 2 |
| Nickel (Ni) | mg/kg dw | 49 | 46 | 44 | 30 | 29 | 27 | 28 | 51 | - | 14.6 | - | - | - | 34 | 30 | 27 | 34 | 30 |
| Phosphorus (P) | mg/kg dw | - | - | - | 495 | 515 | 488 | 494 | - | - | 403 | - | - | - | 549 | 499 | 511 | 525 | 540 |
| Potassium (K) | mg/kg dw | - | - | - | 783 | 738 | 666 | 692 | - | - | 621 | - | - | - | 1150 | 1040 | 1040 | 1090 | 1030 |
| Selenium (Se) | mg/kg dw | 1 | 0.9 | 0.9 | 0.4 | 0.3 | 0.5 | 0.3 | 0.9 | - | < 0.1 | - | - | - | 0.6 | 0.4 | 0.4 | 0.5 | 0.5 |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | < 2 | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Sodium (Na) | mg/kg dw | - | - | - | 162 | 168 | 142 | 145 | - | - | < 250 | - | - | - | 205 | 188 | 183 | 196 | 195 |
| Strontium (Sr) | mg/kg dw | - | - | - | 27 | 24 | 24 | 24 | - | - | - | - | - | - | 24 | 23 | 23 | 24 | 24 |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | - | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | - | < 30 | - | - | - | < 5 | < 5 | < 5 | < 5 | < 5 |
| Titanium (Ti) | mg/kg dw | - | - | - | 746 | 692 | 687 | 681 | - | - | - | - | - | - | 709 | 657 | 667 | 684 | 676 |
| Uranium (U) | mg/kg dw | < 2 | < 2 | < 2 | < 40 | < 40 | < 40 | < 40 | < 2 | - | - | - | - | - | < 40 | < 40 | < 40 | < 40 | < 40 |
| Vanadium (V) | mg/kg dw | 34 | 35 | 32 | 27 | 25 | 23 | 24 | 34 | - | 19.2 | - | - | - | 25 | 23 | 23 | 24 | 23 |
| Zinc (Zn) | mg/kg dw | 70 | 70 | 60 | 52 | 51.3 | 44.7 | 43.6 | 70 | - | 21.6 | - | - | - | 48.9 | 44.6 | 40.9 | 47.2 | 42.1 |

| Waterbody/Sample ID | | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | B2 | B36 | B36 | B45 | B46 | B5 | B5 | B5 | B5 | B5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-5 cm | N/A | 0-5 cm | 0-5 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 1 | 1 | 2 | 1 | 2 | 3 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 2 | 5 |
| **Date Sampled** | | 15-Jul-08 | 15-Jul-08 | 15-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 15-Jul-08 | 20-Jul-11 | 11-Aug-94 | 24-Jul-11 | 21-Jul-11 | 24-Jul-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Dillon 1994 | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Acenaphthylene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Acridine | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | < 0.01 | 0.005 | < 0.01 | - | - | - | - | 0.01 | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Benzo(a)pyrene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Benzo(b&j)fluoranthene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Benzo(ghi)perylene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Benzo(k)fluoranthene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | < 0.01 | 0.006 | 0.01 | - | - | - | - | 0.03 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Dibenzothiophene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Fluorene | mg/kg dw | < 0.01 | 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Indeno(c,d-123)pyrene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Methyl acenaphthene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | < 0.04 | < 0.02 | < 0.04 | - | - | - | - | < 0.04 | - | - | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| 1-Methylnaphthalene | mg/kg dw | < 0.01 | 0.007 | < 0.01 | - | - | - | - | 0.02 | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | 0.03 | 0.03 | 0.03 | - | - | - | - | **0.06** | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Phenanthrene | mg/kg dw | < 0.01 | 0.005 | < 0.01 | - | - | - | - | 0.01 | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Pyrene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | < 0.04 | < 0.03 | - | < 0.05 | - |
| Quinoline | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | < 0.01 | < 0.005 | < 0.01 | - | - | - | - | < 0.01 | - | - | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | A8 | A8 | A8 | A8 | A8 | A8 | A8 | A8 | B2 | B36 | B36 | B45 | B46 | B5 | B5 | B5 | B5 | B5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station Type | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| Profile Depth | | 0-2 cm | 0-10 cm | 0-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-5 cm | N/A | 0-5 cm | 0-5 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| Replicate | | 1 | 1 | 2 | 1 | 2 | 3 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 2 | 5 |
| Date Sampled | | 15-Jul-08 | 15-Jul-08 | 15-Jul-08 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 15-Jul-08 | 20-Jul-11 | 11-Aug-94 | 24-Jul-11 | 21-Jul-11 | 24-Jul-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| Source | | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Dillon 1994 | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | - | < 0.01 | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | - | 0.15 | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | - | 3.2 | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.01 | < 0.01 | - | < 0.01 | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 | 17 | - | 16 | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.8 | < 0.5 | - | 15 | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | B5 | B5 | B5 | B5 | B6 | B6 | B6 | B6 | B7 | B7 | C5 | D23 | D4 | D5 | D7 | D7 | DI1 | DI1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-10 cm | N/A | 0-5 cm | 0-5 cm | 0-5 cm | N/A | 0-5 cm | Surface | 0-2 cm |
| **Replicate** | | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Date Sampled** | | 14-Jul-08 | 14-Jul-08 | 14-Jul-08 | 14-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 11-Aug-94 | 18-Jul-11 | 17-Jul-11 | 17-Jul-11 | 11-Aug-94 | 22-Jul-11 | 11-Aug-94 | 20-Jul-08 |
| **Source** | | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Dillon 1994 | Golder | Golder | Golder | Dillon 1994 | Golder | Dillon 1994 | Golder |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 83 | 82 | 78 | 85 | 89 | 94 | 90 | 90 | 77 | 79 | 18.9 | 89.8 | 69.6 | 76.1 | 20 | 71.8 | 13.7 | 58 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | < 0.1 | - | - |
| Sand (2.0 mm - 0.05 mm) | % | 49 | 24 | 69 | 27 | 46 | 35 | 74 | 33 | 37 | 60 | - | - | - | - | - | - | - | 76 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | 4.81 | 0.82 | 8.58 | - | 6.27 | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | - | - | - | - | - | - | - | 16.8 | 0.41 | 18.8 | - | 24.2 | - | - |
| Silt (0.05 mm - 2 µm) | % | 44 | 67 | 28 | 62 | 42 | 51 | 22 | 56 | 56 | 33 | - | - | - | - | - | - | - | 20 |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | 72.6 | 83.2 | 57.7 | - | 63.6 | - | - |
| Clay (<2 µm) | % | 7 | 8 | 3 | 11 | 12 | 14 | 4 | 11 | 7 | 7 | - | - | - | - | - | - | - | 4 |
| Clay (<4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | 5.86 | 15.5 | 15 | - | 5.98 | - | - |
| Texture | - | Loam / Sandy loam | Silt loam | Sandy loam | Silt loam | Loam | Silt loam | Sandy loam | Silt loam | Silt loam | Sandy loam | - | - | - | - | - | - | - | Loamy sand |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 6.9 | 6.5 | 4.9 | 9 | 15.2 | 16.9 | 16.3 | 16.1 | 6 | 4.3 | - | 11.7 | 6.9 | 11.9 | - | 5.1 | - | 1.5 |
| Total Organic Carbon | % | 6.9 | 6.5 | 4.9 | 9 | 15.2 | 16.9 | 16.3 | 16.1 | 6 | 4.3 | - | 11.7 | 6.7 | 11.1 | - | 4.94 | - | 1.5 |
| Total Inorganic Carbon | % | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | - | < 0.1 | 0.18 | 0.74 | - | 0.15 | - | < 0.1 |
| Total Nitrogen | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Nitrogen by LECO | % | 0.65 | 0.58 | 0.43 | 0.9 | 1.31 | 1.44 | 1.37 | 1.37 | 0.58 | 0.4 | - | - | - | - | - | - | - | 0.14 |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | 2.1 | 2.4 | 2.2 | 3.3 | 4 | 7.7 | 3.7 | 3.6 | < 0.5 | 1.2 | - | - | - | - | - | - | - | 1 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 10200 | - | - | - | 8800 | - | 7020 | - |
| Antimony (Sb) | mg/kg dw | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 25 | - | - | - | < 25 | - | < 25 | < 0.2 |
| Arsenic (As) | mg/kg dw | **23.8(b)** | **92.2(b)** | **22(b)** | **66.5(b)** | **51.4(b)** | **76.8(b)** | **111(b)** | **50.4 (b)** | **35.6(b)** | **55.4(b)** | **11.1(a)** | - | - | - | 4.02 | - | 5.22 | **6.6(a)** |
| Barium (Ba) | mg/kg dw | 37 | 58 | 36 | 62 | 76 | 105 | 93 | 72 | 52 | 57 | 34 | - | - | - | 25.4 | - | 28.6 | 45 |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 0.5 | - | - | - | < 0.5 | - | < 0.5 | < 1 |
| Bismuth (Bi) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | 11 | - | < 10 | - |
| Boron (B) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | | - | - | - | - | - | | - |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | **0.6(a)** | 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.1 | - | - | - | < 0.1 | - | < 0.1 | < 0.5 |
| Calcium (Ca) | mg/kg dw | | - | - | - | - | - | - | - | - | - | 3810 | - | - | - | 4190 | - | 1650 | - |
| Chromium (Cr) | mg/kg dw | 18.9 | **39.4 (a)** | 21.6 | **39.2(a)** | 28.1 | 33.6 | 36.2 | 28.3 | 28.7 | 31.6 | **42.4(a)** | - | - | - | 26.7 | - | 24 | 22.6 |
| Cobalt (Co) | mg/kg dw | 5 | 18 | 6 | 14 | 14 | 27 | 32 | 12 | 11 | 14 | 7.4 | - | - | - | 5.7 | - | 4.7 | 5 |
| Copper (Cu) | mg/kg dw | 28 | **58(a)** | 32 | **56(a)** | **103(a)** | **154(a)** | **155(a)** | **104(a)** | **43(a)** | **48(a)** | 17.4 | - | - | - | 13.3 | - | 15.8 | 22 |
| Iron (Fe) | mg/kg dw | | | - | - | - | - | - | - | - | - | 18500 | - | - | - | 14800 | - | 13600 | - |
| Lead (Pb) | mg/kg dw | 6 | 9 | 5 | 10 | 10 | 14 | 14 | 10 | 6 | 7 | 2.1 | - | - | - | 3.2 | - | < 2 | < 5 |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 13.3 | - | - | - | 9.9 | - | 11.1 | - |
| Magnesium (Mg) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 7150 | - | - | - | 6780 | - | 4800 | - |
| Manganese (Mn) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 179 | - | - | - | 167 | - | 119 | - |
| Mercury (Hg) | mg/kg dw | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.07 | 0.08 | 0.07 | 0.06 | < 0.05 | < 0.05 | < 0.005 | - | - | - | < 0.005 | - | < 0.005 | < 0.05 |
| Molybdenum (Mo) | mg/kg dw | 2 | 5 | 2 | 4 | 4 | 6 | 7 | 5 | 5 | 6 | < 4 | - | - | - | < 4 | - | < 4 | 1 |
| Nickel (Ni) | mg/kg dw | 19 | 48 | 20 | 44 | 53 | 74 | 81 | 50 | 37 | 46 | 22.4 | - | - | - | 22.6 | - | 15.5 | 21 |
| Phosphorus (P) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 456 | - | - | - | 552 | - | 381 | - |
| Potassium (K) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | 1430 | - | - | - | 752 | - | 1200 | - |
| Selenium (Se) | mg/kg dw | 0.4 | 0.9 | 0.5 | 0.9 | 1.3 | 1.8 | 1.9 | 1.4 | 0.8 | 0.9 | < 0.1 | - | - | - | < 0.1 | - | < 0.1 | 0.2 |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 2 | - | - | - | < 2 | - | < 2 | < 1 |
| Sodium (Na) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | < 250 | - | - | - | < 250 | - | < 250 | - |
| Strontium (Sr) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | - | - | - | - | - | < 1 |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 30 | - | - | - | < 30 | - | < 30 | < 5 |
| Titanium (Ti) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Uranium (U) | mg/kg dw | < 2 | < 2 | < 2 | < 2 | < 2 | 3 | 3 | 2 | < 2 | 2 | - | - | - | - | - | - | - | < 2 |
| Vanadium (V) | mg/kg dw | 18 | 38 | 21 | 35 | 29 | 34 | 37 | 29 | 28 | 31 | 34.4 | - | - | - | 25 | - | 17.9 | 20 |
| Zinc (Zn) | mg/kg dw | 30 | 60 | 30 | 60 | 70 | 100 | 100 | 70 | 40 | 50 | 37.8 | - | - | - | 29.5 | - | 28.4 | 30 |

| Waterbody/Sample ID | | B5 | B5 | B5 | B5 | B6 | B6 | B6 | B6 | B7 | B7 | C5 | D23 | D4 | D5 | D7 | D7 | DI1 | DI1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station Type | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| Profile Depth | | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-10 cm | N/A | 0-5 cm | 0-5 cm | 0-5 cm | N/A | 0-5 cm | Surface | 0-2 cm |
| Replicate | | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Date Sampled | | 14-Jul-08 | 14-Jul-08 | 14-Jul-08 | 14-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 11-Aug-94 | 18-Jul-11 | 17-Jul-11 | 17-Jul-11 | 11-Aug-94 | 22-Jul-11 | 11-Aug-94 | 20-Jul-08 |
| Source | | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Dillon 1994 | Golder | Golder | Golder | Dillon 1994 | Golder | Dillon 1994 | Golder |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Acenaphthylene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Acridine | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(ghi)perylene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Benzo(k)fluoranthene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | 0.005 | < 0.005 | < 0.005 | 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Dibenzothiophene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Methyl acenaphthene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.02 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | < 0.02 | < 0.02 | < 0.02 | < 0.04 | - | - | - | - | < 0.02 | < 0.02 | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1-Methylnaphthalene | mg/kg dw | 0.009 | 0.005 | 0.007 | 0.009 | - | - | - | - | 0.007 | < 0.005 | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | 0.02 | 0.005 | 0.01 | 0.021 | - | - | - | - | 0.01 | 0.008 | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | < 0.005 | < 0.005 | < 0.005 | < 0.005 | - | - | - | - | < 0.005 | < 0.005 | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | B5 | B5 | B5 | B5 | B6 | B6 | B6 | B6 | B7 | B7 | C5 | D23 | D4 | D5 | D7 | D7 | DI1 | DI1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-2 cm | 0-10 cm | N/A | 0-5 cm | 0-5 cm | 0-5 cm | N/A | 0-5 cm | Surface | 0-2 cm |
| **Replicate** | | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Date Sampled** | | 14-Jul-08 | 14-Jul-08 | 14-Jul-08 | 14-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 13-Jul-08 | 11-Aug-94 | 18-Jul-11 | 17-Jul-11 | 17-Jul-11 | 11-Aug-94 | 22-Jul-11 | 11-Aug-94 | 20-Jul-08 |
| **Source** | | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Golder | Dillon 1994 | Golder | Golder | Golder | Dillon 1994 | Golder | Dillon 1994 | Golder |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | DI1 | DI1 | DI1 | DI2 | DI4 | DI4 | DI4 | DI4 | DI4 | DI5 | E3 | E4 | H17 | H20 | LML | LML | LML | LML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakeregion | Lakeregion | Lakeregion | Lakeregion |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | N/A | N/A | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | Surface | 0-5 cm | 0-5 cm | 0-5 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 2 | 1 | 2 | 1 | | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 1 | 3 |
| **Date Sampled** | | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 11-Aug-94 | 20-Jul-95 | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 20-Jul-95 | 19-Jul-11 | 19-Jul-11 | 27-Jul-11 | 26-Jul-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | Dillon 1994 | Dillon 1995 | Golder | Golder | Golder | Golder | Dillon 1995 | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | | |
| Moisture | % | 59 | 56 | 59 | 27.9 | 22.9 | 76 | 79 | 66 | 74 | 19.6 | 85.5 | 79.1 | 74.2 | 70 | 73 | 72 | 78 | 78 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | - | - | - | - | - | - | < 0.1 | 0.33 | 0.16 | < 0.1 | - | - | - | - |
| Sand (2.0 mm - 0.05 mm) | % | 78 | 77 | 76 | - | - | 40 | 49 | 38 | 48 | - | - | - | - | - | 14.2 | 13.1 | 12.5 | 15.5 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | - | - | - | - | - | - | 8.87 | 16.8 | 2.79 | 1.55 | - | - | - | - |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | - | - | - | - | - | - | 33.2 | 27.1 | 14.1 | 5.26 | - | - | - | - |
| Silt (0.05 mm - 2 µm) | % | 21 | 19 | 21 | - | - | 54 | 46 | 55 | 47 | - | - | - | - | - | 81.9 | 83.2 | 83.7 | 81.2 |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | - | - | - | - | - | - | 52.6 | 51.3 | 63.7 | 70.4 | - | - | - | - |
| Clay (<2 µm) | % | 2 | 3 | 3 | - | - | 6 | 5 | 8 | 6 | - | - | - | - | - | 4 | 3.5 | 3.6 | 3.4 |
| Clay (<4 µm) | % | - | - | - | - | - | - | - | - | - | - | 5.4 | 4.56 | 19.2 | 22.8 | - | - | - | - |
| Texture | - | Loamy sand | Loamy sand | Loamy sand | - | - | Silt loam | Sandy loam | Silt loam | Sandy loam | - | - | - | - | - | - | - | - | - |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 1.6 | 1.2 | 1.6 | - | - | 4.1 | 4.8 | 2.9 | 3.9 | - | 8.4 | 5.7 | 15.2 | 12 | 6.02 | 3.61 | 3.47 | 3.58 |
| Total Organic Carbon | % | 1.6 | 1.2 | 1.6 | - | - | 4.1 | 4.8 | 2.9 | 3.9 | - | 8.37 | 5.72 | 15.2 | 11.9 | 5.99 | 3.57 | 3.43 | 3.53 |
| Total Inorganic Carbon | % | < 0.1 | < 0.1 | < 0.1 | - | - | < 0.1 | < 0.1 | < 0.1 | < 0.1 | - | < 0.1 | < 0.1 | < 0.1 | 0.15 | 0.03 | 0.04 | 0.04 | 0.05 |
| Total Nitrogen | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.55 | 0.39 | 0.37 | 0.39 |
| Total Nitrogen by LECO | % | 0.15 | 0.1 | 0.14 | - | - | 0.4 | 0.49 | 0.28 | 0.37 | - | - | - | - | - | - | - | - | - |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | 1.8 | 1.2 | 1.5 | - | - | 3 | 4.2 | 2.3 | 3.3 | - | - | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | - | - | - | 3390 | - | - | - | - | - | - | - | - | - | - | 11000 | 12600 | 12400 | 11000 |
| Antimony (Sb) | mg/kg dw | < 0.2 | < 0.2 | < 0.2 | < 25 | - | < 0.2 | < 0.2 | < 0.2 | < 0.2 | - | - | - | - | - | - | - | - | - |
| Arsenic (As) | mg/kg dw | **7.2(a)** | **6.9(a)** | **7.5(a)** | 4.03 | **22.8(b)** | **33(b)** | **43.5(b)** | **42.5(b)** | **67.8(b)** | **10.4(a)** | - | - | - | - | **21.6(b)** | 5.6 | 5.3 | 4.7 |
| Barium (Ba) | mg/kg dw | 46 | 43 | 49 | 13.3 | 30 | 78 | 88 | 70 | 85 | 23.2 | - | - | - | - | 122 | 110 | 106 | 102 |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 0.5 | - | < 1 | < 1 | < 1 | < 1 | - | - | - | - | - | < 1 | < 1 | < 1 | < 1 |
| Bismuth (Bi) | mg/kg dw | - | - | - | < 10 | - | - | - | - | - | - | - | - | - | - | < 1 | < 1 | < 1 | < 1 |
| Boron (B) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | 6 | 9 | < 5 |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.1 | < 2 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 2 | - | - | - | - | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Calcium (Ca) | mg/kg dw | - | - | - | 1320 | - | - | - | - | - | - | - | - | - | - | 3910 | 4690 | 5600 | 4110 |
| Chromium (Cr) | mg/kg dw | 22.4 | 21.9 | 24 | 9.5 | **46.3(a)** | **42.9(a)** | **46.4(a)** | **40.9(a)** | **48.5(a)** | **40.4(a)** | - | - | - | - | **42.4(a)** | **47.2(a)** | **51.7(a)** | **41.5(a)** |
| Cobalt (Co) | mg/kg dw | 5 | 4 | 5 | 2.2 | 8.9 | 13 | 16 | 14 | 21 | 5.5 | - | - | - | - | 10 | 9 | 9 | 8 |
| Copper (Cu) | mg/kg dw | 22 | 20 | 22 | 2.5 | 11.8 | **44(a)** | **51(a)** | **42(a)** | **59(a)** | 5 | - | - | - | - | **58(a)** | **48(a)** | **46(a)** | **44(a)** |
| Iron (Fe) | mg/kg dw | - | - | - | 5770 | - | - | - | - | - | - | - | - | - | - | 29600 | 18700 | 18000 | 17000 |
| Lead (Pb) | mg/kg dw | < 5 | < 5 | < 5 | < 2 | < 10 | 7 | 8 | 6 | 8 | < 10 | - | - | - | - | 10 | 9 | 10 | 9 |
| Lithium (Li) | mg/kg dw | - | - | - | 4.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | - | - | - | 1940 | - | - | - | - | - | - | - | - | - | - | 6050 | 7120 | 9240 | 6300 |
| Manganese (Mn) | mg/kg dw | - | - | - | 68.9 | - | - | - | - | - | - | - | - | - | - | 468 | 226 | 262 | 211 |
| Mercury (Hg) | mg/kg dw | < 0.05 | < 0.05 | < 0.05 | < 0.005 | < 0.005 | < 0.05 | < 0.05 | < 0.05 | 0.06 | < 0.005 | - | - | - | - | 0.06 | 0.06 | 0.01 | 0.05 |
| Molybdenum (Mo) | mg/kg dw | < 1 | < 1 | < 1 | < 4 | < 4 | 2 | 2 | 2 | 3 | < 4 | - | - | - | - | 4 | 2 | 2 | 2 |
| Nickel (Ni) | mg/kg dw | 21 | 19 | 23 | 6.5 | 26.5 | 42 | 52 | 47 | 66 | 18.2 | - | - | - | - | 34 | 28 | 27 | 26 |
| Phosphorus (P) | mg/kg dw | - | - | - | 170 | - | - | - | - | - | - | - | - | - | - | 1360 | 708 | 1300 | 656 |
| Potassium (K) | mg/kg dw | - | - | - | 332 | - | - | - | - | - | - | - | - | - | - | 2820 | 3350 | 4000 | 2950 |
| Selenium (Se) | mg/kg dw | 0.3 | 0.2 | 0.2 | < 0.1 | < 0.1 | 0.6 | 0.7 | 0.6 | 0.7 | < 0.1 | - | - | - | - | 1.2 | 0.9 | 0.8 | 0.6 |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 2 | < 2 | < 1 | < 1 | < 1 | < 1 | < 2 | - | - | - | - | < 1 | < 1 | < 1 | < 1 |
| Sodium (Na) | mg/kg dw | - | - | - | < 250 | - | - | - | - | - | - | - | - | - | - | 419 | 654 | 932 | 536 |
| Strontium (Sr) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 31 | 37 | 36 | 29 |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | - | | < 1 | < 1 | < 1 | < 1 | - | - | - | - | - | < 1 | < 1 | < 1 | < 1 |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 30 | < 30 | < 5 | < 5 | < 5 | < 5 | < 30 | - | - | - | - | < 5 | < 5 | < 5 | < 5 |
| Titanium (Ti) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 934 | 1100 | 1290 | 962 |
| Uranium (U) | mg/kg dw | < 2 | < 2 | < 2 | - | - | < 2 | < 2 | < 2 | < 2 | - | - | - | - | - | < 40 | < 40 | < 40 | < 40 |
| Vanadium (V) | mg/kg dw | 20 | 20 | 22 | 6.5 | - | 39 | 42 | 38 | 43 | - | - | - | - | - | 46 | 47 | 52 | 41 |
| Zinc (Zn) | mg/kg dw | 30 | 30 | 30 | 14.3 | 46.2 | 60 | 60 | 50 | 70 | 39.4 | - | - | - | - | 63.8 | 64 | 71 | 61.2 |

| Waterbody/Sample ID | | DI1 | DI1 | DI1 | DI2 | DI4 | DI4 | DI4 | DI4 | DI4 | DI5 | E3 | E4 | H17 | H20 | LML | LML | LML | LML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakeregion | Lakeregion | Lakeregion | Lakeregion |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | N/A | N/A | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | Surface | 0-5 cm | 0-5 cm | 0-5 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 2 | 1 | 2 | 1 | | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 1 | 3 |
| **Date Sampled** | | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 11-Aug-94 | 20-Jul-95 | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 20-Jul-95 | 19-Jul-11 | 19-Jul-11 | 27-Jul-11 | 26-Jul-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | Dillon 1994 | Dillon 1995 | Golder | Golder | Golder | Golder | Dillon 1995 | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Acenaphthylene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Acridine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(ghi)perylene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1-Methylnaphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | DI1 | DI1 | DI1 | DI2 | DI4 | DI4 | DI4 | DI4 | DI4 | DI5 | E3 | E4 | H17 | H20 | LML | LML | LML | LML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakenear mine | Lakeregion | Lakeregion | Lakeregion | Lakeregion |
| **Profile Depth** | | 0-2 cm | 0-10 cm | 0-10 cm | N/A | N/A | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | Surface | 0-5 cm | 0-5 cm | 0-5 cm | 0-5 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm |
| **Replicate** | | 2 | 1 | 2 | 1 | | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 1 | 3 |
| **Date Sampled** | | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 11-Aug-94 | 20-Jul-95 | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 20-Jul-08 | 20-Jul-95 | 19-Jul-11 | 19-Jul-11 | 27-Jul-11 | 26-Jul-11 | Jul-98 | Jul-98 | Jul-98 | Jul-98 |
| **Source** | | Golder | Golder | Golder | Dillon 1994 | Dillon 1995 | Golder | Golder | Golder | Golder | Dillon 1995 | Golder | Golder | Golder | Golder | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Waterbody/Sample ID | | LML | PL | PL | PL | PL | PL | Control | Control | Control | Control | Control | Control | Control | Control | Control | Control | B4-45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | treamnear mir |
| **Profile Depth** | | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | 0-5 cm |
| **Replicate** | | 5 | 1 | 2 | 5 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 1 |
| **Date Sampled** | | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 29-Jul-11 | 23-Jul-11 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder |
| **Conventional Parameters** | **Units** | | | | | | | | | | | | | | | | | |
| Moisture | % | 76 | 31 | 41 | 38 | 32 | 37 | 88 | 89.6 | 86.4 | 88 | 85 | 80 | 82 | 76 | 77 | 90.5 | 87.2 |
| **Particle Size** | **Units** | | | | | | | | | | | | | | | | | |
| Gravel (>2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | < 0.1 | < 0.1 |
| Sand (2.0 mm - 0.05 mm) | % | 11.5 | 45.4 | 35.2 | 46.3 | 38.3 | 44.8 | 45.4 | 43.4 | 46.1 | 43.3 | 48.9 | 79 | 74 | 76 | 70 | - | - |
| Coarse Sand (2.0 mm - 0.2 mm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.84 | 2.89 |
| Fine Sand (0.2 mm - 0.063 mm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 28 | 9.64 |
| Silt (0.05 mm - 2 µm) | % | 84.5 | 45.9 | 54.6 | 46.1 | 52.8 | 46.6 | 53.9 | 55.8 | 53.1 | 56 | 50.1 | 17 | 19 | 19 | 24 | - | - |
| Silt (0.63 mm - 4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 59 | 73.8 |
| Clay (<2 µm) | % | 3.9 | 8.6 | 10.3 | 7.5 | 8.7 | 8.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 4 | 7 | 5 | 6 | - | - |
| Clay (<4 µm) | % | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9.18 | 13.7 |
| Texture | - | - | - | - | - | - | - | - | - | - | - | - | Loamy sand | Sandy loam | Sandy loam / Loamy sand | Sandy loam | - | - |
| **Nutrients** | **Units** | | | | | | | | | | | | | | | | | |
| Total Carbon | % | 3.69 | 0.52 | 0.54 | 0.42 | 0.54 | 0.42 | 8.24 | 8.48 | 8.16 | 7.79 | 7.33 | 4.5 | 5.4 | 3.6 | 3.8 | 9.1 | 17 |
| Total Organic Carbon | % | 3.62 | 0.49 | 0.51 | 0.38 | 0.51 | 0.36 | 8.11 | 8.39 | 8.06 | 7.68 | 7.26 | 4.5 | 5.4 | 3.6 | 3.8 | 9.08 | 16.7 |
| Total Inorganic Carbon | % | 0.07 | 0.03 | 0.03 | 0.04 | 0.03 | 0.06 | 0.13 | 0.09 | 0.1 | 0.11 | 0.07 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 0.31 |
| Total Nitrogen | % | 0.41 | 0.04 | 0.05 | 0.03 | 0.03 | 0.03 | 0.61 | 0.64 | 0.62 | 0.61 | 0.56 | - | - | - | - | - | - |
| Total Nitrogen by LECO | % | - | - | - | - | - | - | - | - | - | - | - | 0.34 | 0.39 | 0.29 | 0.3 | - | - |
| Total Phosphorus | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | | | | | | | | | | |
| Cyanide, Total | mg/kg dw | < 0.5 | 2.1 | 2.7 | < 0.5 | 2.5 | 2.9 | 1.2 | 1.3 | 1.2 | 1.2 | 1.1 | 1.6 | 3.6 | 2.2 | 2.6 | - | - |
| **Total Metals** | **Units** | | | | | | | | | | | | | | | | | |
| Aluminum (Al) | mg/kg dw | 12100 | 6050 | 7790 | 7150 | 7200 | 5990 | 8060 | 8730 | 7810 | 7850 | 8360 | - | - | - | - | - | - |
| Antimony (Sb) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | < 0.2 | < 0.2 | < 0.2 | < 0.2 | - | - |
| Arsenic (As) | mg/kg dw | 5.5 | **6.2(a)** | **8(a)** | **7.4(a)** | **6.8(a)** | **6.3(a)** | **12.1(a)** | **15.5(a)** | **16(a)** | **15.7(a)** | **12(a)** | **6.3(a)** | **7.2(a)** | **7.3(a)** | **6.8(a)** | - | - |
| Barium (Ba) | mg/kg dw | 109 | 48.5 | 62.2 | 51.4 | 54.9 | 45.9 | 51.2 | 96.2 | 54.9 | 50.1 | 51.8 | 37 | 41 | 39 | 38 | - | - |
| Beryllium (Be) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - |
| Bismuth (Bi) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - | - | - | - | - |
| Boron (B) | mg/kg dw | 7 | < 5 | < 5 | < 5 | < 5 | < 5 | 8 | 7 | 7 | 6 | 6 | - | - | - | - | - | - |
| Cadmium (Cd) | mg/kg dw | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | - | - |
| Calcium (Ca) | mg/kg dw | 4690 | 2530 | 3040 | 3640 | 3170 | 2670 | 4550 | 4890 | 4480 | 4400 | 4570 | - | - | - | - | - | - |
| Chromium (Cr) | mg/kg dw | **46.1(a)** | 18.3 | 23.1 | 23.8 | 20.4 | 17.7 | 34.6 | 36.8 | 32.8 | 33.6 | 34.5 | 23.6 | 25.4 | 26.6 | 25.6 | - | - |
| Cobalt (Co) | mg/kg dw | 9 | 4 | 5 | 5 | 4 | 4 | 9 | 10 | 10 | 10 | 9 | 6 | 6 | 7 | 6 | - | - |
| Copper (Cu) | mg/kg dw | **48(a)** | 15 | 18 | 16 | 15 | 14 | **60(a)** | **61(a)** | **60(a)** | **65(a)** | **58(a)** | 26 | 30 | 35 | 35 | - | - |
| Iron (Fe) | mg/kg dw | 18600 | 12300 | 16100 | 15000 | 13700 | 12400 | 12700 | 13900 | 12500 | 13000 | 12600 | - | - | - | - | - | - |
| Lead (Pb) | mg/kg dw | 10 | 7 | 8 | 8 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | < 5 | < 5 | < 5 | < 5 | - | - |
| Lithium (Li) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | 7050 | 2390 | 2890 | 4140 | 2640 | 2350 | 5450 | 5710 | 5220 | 5410 | 5410 | - | - | - | - | - | - |
| Manganese (Mn) | mg/kg dw | 224 | 355 | 735 | 418 | 336 | 267 | 163 | 175 | 156 | 159 | 161 | - | - | - | - | - | - |
| Mercury (Hg) | mg/kg dw | 0.06 | 0.03 | 0.04 | < 0.01 | 0.03 | 0.03 | 0.12 | 0.12 | 0.11 | 0.11 | 0.09 | < 0.05 | < 0.05 | 0.06 | < 0.05 | - | - |
| Molybdenum (Mo) | mg/kg dw | 2 | 2 | 3 | 4 | 2 | 2 | < 1 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | - | - |
| Nickel (Ni) | mg/kg dw | 28 | 12 | 14 | 13 | 13 | 12 | 29 | 31 | 30 | 30 | 28 | 18 | 21 | 21 | 20 | - | - |
| Phosphorus (P) | mg/kg dw | 708 | 546 | 589 | 610 | 560 | 528 | 524 | 545 | 526 | 520 | 497 | - | - | - | - | - | - |
| Potassium (K) | mg/kg dw | 3240 | 1640 | 2090 | 2580 | 1970 | 1570 | 1560 | 1730 | 1560 | 1530 | 1620 | - | - | - | - | - | - |
| Selenium (Se) | mg/kg dw | 0.9 | 0.4 | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.6 | 0.5 | 0.6 | 0.5 | 0.3 | 0.3 | 0.4 | 0.3 | - | - |
| Silver (Ag) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - |
| Sodium (Na) | mg/kg dw | 673 | 159 | 210 | 336 | 203 | 160 | 205 | 228 | 290 | 211 | 225 | - | - | - | - | - | - |
| Strontium (Sr) | mg/kg dw | 34 | 27 | 34 | 30 | 35 | 28 | 20 | 23 | 20 | 19 | 22 | - | - | - | - | - | - |
| Thallium (Tl) | mg/kg dw | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | - | - |
| Tin (Sn) | mg/kg dw | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | - | - |
| Titanium (Ti) | mg/kg dw | 1080 | 619 | 690 | 808 | 571 | 596 | 818 | 893 | 764 | 768 | 851 | - | - | - | - | - | - |
| Uranium (U) | mg/kg dw | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 2 | < 2 | < 2 | < 2 | - | - |
| Vanadium (V) | mg/kg dw | 46 | 35 | 45 | 52 | 39 | 34 | 32 | 35 | 31 | 31 | 33 | 21 | 24 | 26 | 24 | - | - |
| Zinc (Zn) | mg/kg dw | 66.4 | 30.3 | 41 | 37 | 31.7 | 30 | 51.3 | 57.9 | 65 | 53.4 | 54.3 | 30 | 30 | 30 | 30 | - | - |

| Waterbody/Sample ID | | LML | PL | PL | PL | PL | PL | Control | Control | Control | Control | Control | Control | Control | Control | Control | Control | B4-45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | treamnear mir |
| **Profile Depth** | | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | 0-5 cm |
| **Replicate** | | 5 | 1 | 2 | 5 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 1 |
| **Date Sampled** | | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 29-Jul-11 | 23-Jul-11 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Acenaphthylene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Acridine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Benzo(b&j)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Benzo(ghi)perylene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Benzo(k)fluoranthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Indeno(c,d-123)pyrene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Methyl acenaphthene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| 1-Methylnaphthalene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg dw | - | - | - | - | - | - | < 0.1 | < 0.1 | < 0.1 | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Retene | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| Waterbody/Sample ID | | LML | PL | PL | PL | PL | PL | Control | Control | Control | Control | Control | Control | Control | Control | Control | Control | B4-45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | Lakeregion | treamnear mir |
| **Profile Depth** | | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | top 5-10 cm | 0-2 cm | 0-2 cm | 0-10 cm | 0-10 cm | 0-5 cm | 0-5 cm |
| **Replicate** | | 5 | 1 | 2 | 5 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 1 |
| **Date Sampled** | | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | Jul-98 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 18-Jul-08 | 29-Jul-11 | 23-Jul-11 |
| **Source** | | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | RL&L 1999 | Golder | Golder | Golder | Golder | Golder | Golder |
| **Other Organic Compounds** | **Units** | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg dw | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg dw | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - |
| Xylenes | mg/kg dw | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - |
| Toluene | mg/kg dw | - | - | - | - | - | - | < 0.01 | < 0.01 | < 0.01 | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Extractables | mg/kg dw | - | - | - | - | - | - | 7 | 9 | 15 | - | - | - | - | - | - | - | - |
| Total Volatiles | mg/kg dw | - | - | - | - | - | - | < 0.5 | < 0.5 | 1.4 | - | - | - | - | - | - | - | - |
| **Organochlorines** | **Units** | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**

- = No data or not applicable.

Bold values are higher than water quality guidelines and/or dete

(A) = Concentration higher than the interim sediment quality guic

(b) = Concentration higher than the probable effects level.

| Station Type | | Meliadine Lake | | | | | Lakenear mine | | | | | Lakeregion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter/Summary Statistic | | N | MIN | MEAN | 90% | MAX | N | MIN | MEAN | 90% | MAX | N | MIN | MEAN | 90% | MAX |
| **Conventional Parameters** | **Units** | | | | | | | | - | | | | | | | |
| Moisture | % | 61 | 37 | 68.4 | 85 | 88 | 61 | 13.7 | 69.9 | 90 | 97 | 20 | 31 | 69.9 | 88.16 | 90.5 |
| **Particle Size** | **Units** | | | | | | | | - | | | | | | | |
| Gravel (>2 mm) | % | 3 | < 0.1 | -0.1 | < 0.1 | < 0.1 | 12 | < 0.1 | 0.0 | 0.313 | 0.47 | 1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Sand (2.0 mm - 0.05 mm) | % | 57 | 22.1 | 55.7 | 80 | 83 | 38 | 24 | 51.4 | 76 | 81.6 | 19 | 11.5 | 42.3 | 74.4 | 79 |
| Coarse Sand (2.0 mm - 0.2 mm) | % | 3 | 1.05 | 7.4 | 14.768 | 17.6 | 12 | 0.82 | 5.3 | 8.841 | 16.8 | 1 | 3.84 | 3.8 | 3.84 | 3.84 |
| Fine Sand (0.2 mm - 0.063 mm) | % | 3 | 7.01 | 26.1 | 41.94 | 46.1 | 12 | 0.41 | 17.2 | 26.81 | 33.2 | 1 | 28 | 28.0 | 28 | 28 |
| Silt (0.05 mm - 2 µm) | % | 57 | 14 | 41.1 | 68.7 | 74.8 | 38 | 14.6 | 44.3 | 60.1 | 67 | 19 | 17 | 53.1 | 83.3 | 84.5 |
| Silt (0.63 mm - 4 µm) | % | 3 | 33.3 | 54.1 | 67.06 | 68.8 | 12 | 51.3 | 65.8 | 74.76 | 83.2 | 1 | 59 | 59.0 | 59 | 59 |
| Clay (<2 µm) | % | 57 | 0 | 3.2 | 6 | 9 | 38 | 0.4 | 4.3 | 11 | 14 | 19 | 0.7 | 4.6 | 8.72 | 10.3 |
| Clay (<4 µm) | % | 3 | 3.08 | 12.5 | 20.72 | 23.1 | 12 | 4.56 | 11.7 | 18.83 | 22.8 | 1 | 9.18 | 9.2 | 9.18 | 9.18 |
| Texture | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Nutrients** | **Units** | | | | | | | | - | | | | | | | |
| Total Carbon | % | 60 | 0.7 | 3.6 | 7.2 | 8.19 | 49 | 1.2 | 7.8 | 13.7 | 16.9 | 20 | 0.42 | 4.5 | 8.26 | 9.1 |
| Total Organic Carbon | % | 60 | 0.7 | 3.5 | 7.2 | 8.14 | 50 | 1.2 | 7.8 | 13.5 | 16.9 | 20 | 0.36 | 4.4 | 8.14 | 9.08 |
| Total Inorganic Carbon | % | 60 | < 0.1 | < 0.1 | 0.1 | 0.15 | 49 | < 0.1 | < 0.1 | 0.2 | 0.74 | 20 | < 0.1 | < 0.1 | 0.10 | 0.13 |
| Total Nitrogen | % | 25 | 0.13 | 0.4 | 0.67 | 0.78 | 15 | 0.38 | 0.6 | 0.9 | 0.92 | 15 | 0.03 | 0.4 | 0.62 | 0.64 |
| Total Nitrogen by LECO | % | 32 | 0.07 | 0.3 | 0.5 | 0.64 | 23 | 0.1 | 0.7 | 1.4 | 1.44 | 4 | 0.29 | 0.3 | 0.38 | 0.39 |
| Total Phosphorus | mg/kg dw | 0 | - | - | - | - | 1 | 407 | 407.0 | 407 | 407 | 0 | - | - | - | - |
| **Cyanides** | **Units** | | | | | | | | - | | | | | | | |
| Cyanide, Total | mg/kg dw | 57 | < 0.5 | 1.7 | 3.7 | 7 | 38 | < 0.5 | 3.0 | 4.63 | 7.7 | 19 | < 0.5 | 1.2 | 2.74 | 3.6 |
| **Total Metals** | **Units** | | | | | | | | - | | | | | | | |
| Aluminum (Al) | mg/kg dw | 26 | 3300 | 7918.5 | 10550 | 11900 | 24 | 3390 | 7249.2 | 9888 | 18200 | 15 | 5990 | 8939.3 | 12280 | 12600 |
| Antimony (Sb) | mg/kg dw | 33 | < 25 | < 1 | < 0.2 | < 0.2 | 32 | < 25 | < 7.2 | < 0.2 | 0.2 | 4 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Arsenic (As) | mg/kg dw | 58 | 1.6 | **14.23(a)** | **39.73(b)** | **65.1(b)** | 49 | 3.4 | **52.2(b)** | **112.2(b)** | **173(b)** | 19 | 4.7 | **9.3(a)** | **15.76(a)** | **21.6(b)** |
| Barium (Ba) | mg/kg dw | 58 | 19 | 68.4 | 119.2 | 141 | 49 | 13.3 | 50.4 | 78.06 | 105 | 19 | 37 | 66.9 | 109.2 | 122 |
| Beryllium (Be) | mg/kg dw | 58 | < 1 | < 1 | < 1 | < 1 | 47 | < 1 | < 0.90 | < 0.5 | < 0.5 | 19 | < 1 | < 1 | < 1 | < 1 |
| Bismuth (Bi) | mg/kg dw | 26 | < 10 | < 1.3 | < 1 | < 1 | 24 | < 10 | -0.5 | 10.7 | 20 | 15 | < 1 | < 1 | < 1 | < 1 |
| Boron (B) | mg/kg dw | 25 | < 5 | < 1.84 | 8 | 11 | 15 | < 5 | -4.3 | < 5 | 5 | 15 | < 5 | 2.5 | 8.6 | 11 |
| Cadmium (Cd) | mg/kg dw | 58 | < 0.5 | < 0.4 | 0.5 | **0.6(a)** | 49 | < 2 | -0.4 | 0.13 | **0.6(a)** | 19 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Calcium (Ca) | mg/kg dw | 26 | 2300 | 4544.2 | 6110 | 6460 | 24 | 1320 | 4760 | 6230 | 13700 | 15 | 2530 | 4062.7 | 4810 | 5600 |
| Chromium (Cr) | mg/kg dw | 58 | 13.2 | 30.1 | **50.13(a)** | **53.4(a)** | 49 | 9.5 | 33.1 | **46.46(a)** | **61.5(a)** | 19 | 17.7 | 31.9 | **46.32(a)** | **51.7(a)** |
| Cobalt (Co) | mg/kg dw | 58 | 2 | 7.4 | 17.3 | 21 | 49 | 2.2 | 12.6 | 27 | 32 | 19 | 4 | 7.4 | 10 | 10 |
| Copper (Cu) | mg/kg dw | 58 | 6 | **40.0(a)** | **81.6(a)** | **92(a)** | 49 | 2.5 | **51.1(a)** | **104.2(a)** | **155(a)** | 19 | 14 | **39.6(a)** | **60.2(a)** | **65(a)** |
| Iron (Fe) | mg/kg dw | 26 | 5790 | 17168.1 | 33750 | 40800 | 24 | 5770 | 16200.4 | 25360 | 29500 | 15 | 12300 | 15740.0 | 18660 | 29600 |
| Lead (Pb) | mg/kg dw | 58 | < 5 | 2.7 | 12 | 14 | 49 | < 10 | 5.1 | 10 | 14 | 19 | < 5 | 5.2 | 10 | 10 |
| Lithium (Li) | mg/kg dw | 1 | 6.3 | 6.3 | 6.3 | 6.3 | 9 | 4.7 | 12.09 | 19.9 | 19.9 | 0 | - | - | - | - |
| Magnesium (Mg) | mg/kg dw | 26 | 2150 | 4580.4 | 6050 | 7930 | 24 | 1940 | 5212.5 | 8942 | 12000 | 15 | 2350 | 5158.0 | 7092 | 9240 |
| Manganese (Mn) | mg/kg dw | 26 | 78.7 | 272.1 | 577 | 615 | 24 | 68.9 | 185.4 | 366.3 | 423 | 15 | 156 | 287.7 | 448 | 735 |
| Mercury (Hg) | mg/kg dw | 58 | < 0.05 | < 0.003 | 0.07 | 0.14 | 49 | < 0.05 | 0.0 | 0.07 | 0.09 | 19 | < 0.05 | 0.0 | 0.112 | 0.12 |
| Molybdenum (Mo) | mg/kg dw | 58 | < 4 | 1.9 | 5.3 | 7 | 49 | < 4 | 1.5 | 5 | 7 | 19 | < 1 | 2.2 | 3.2 | 4 |
| Nickel (Ni) | mg/kg dw | 58 | 7 | 29.4 | 63.3 | 73 | 49 | 6.5 | 36.8 | 57.6 | 81 | 19 | 12 | 22.9 | 30.2 | 34 |
| Phosphorus (P) | mg/kg dw | 26 | 393 | 787.8 | 1025 | 1190 | 24 | 170 | 479.5 | 551.1 | 609 | 15 | 497 | 678.5 | 1063.2 | 1360 |
| Potassium (K) | mg/kg dw | 26 | 509 | 1608.7 | 2265 | 2680 | 25 | 332 | 972.2 | 1392 | 1800 | 15 | 1530 | 2280.7 | 3306 | 4000 |
| Selenium (Se) | mg/kg dw | 58 | < 0.2 | 0.6 | 1.13 | 1.3 | 49 | < 0.1 | 0.5 | 1 | 1.9 | 19 | 0.3 | 0.5 | 0.9 | 1.2 |
| Silver (Ag) | mg/kg dw | 58 | < 2 | < 1 | < 1 | < 1 | 49 | < 2 | -1.2 | < 1 | < 1 | 19 | < 1 | < 1 | < 1 | < 1 |
| Sodium (Na) | mg/kg dw | 26 | < 250 | 235.9 | 381 | 482 | 24 | < 250 | 24.5 | 202.3 | 424 | 15 | 159 | 362.7 | 665.4 | 932 |
| Strontium (Sr) | mg/kg dw | 25 | 13 | 27.2 | 36 | 42 | 15 | 19 | 25.4 | 31 | 35 | 15 | 19 | 28.3 | 35.6 | 37 |
| Thallium (Tl) | mg/kg dw | 57 | < 1 | < 1 | < 1 | < 1 | 38 | < 1 | < 1 | < 1 | < 1 | 19 | < 1 | < 1 | < 1 | < 1 |
| Tin (Sn) | mg/kg dw | 58 | < 30 | < 5.4 | < 5 | < 5 | 49 | < 30 | < 10.6 | < 5 | < 5 | 19 | < 5 | < 5 | < 5 | < 5 |
| Titanium (Ti) | mg/kg dw | 25 | 480 | 906.1 | 1088 | 1230 | 15 | 594 | 713.9 | 817.6 | 924 | 15 | 571 | 849.6 | 1092 | 1290 |
| Uranium (U) | mg/kg dw | 57 | < 40 | < 18.1 | < 0.4 | 4 | 38 | < 40 | -16.5 | < 0.8 | 3 | 19 | < 40 | < 32 | < 2 | < 2 |
| Vanadium (V) | mg/kg dw | 58 | 12 | 32.2 | 56.6 | 61 | 47 | 6.5 | 29.6 | 43 | 60.8 | 19 | 21 | 36.5 | 48 | 52 |
| Zinc (Zn) | mg/kg dw | 58 | 20 | 49.2 | 87.72 | 100 | 49 | 14.3 | 50.8 | 73.1 | 100 | 19 | 30 | 47.3 | 65.28 | 71 |

| Station Type | | Meliadine Lake | | | | | Lakenear mine | | | | | Lakeregion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter/Summary Statistic | | N | MIN | MEAN | 90% | MAX | N | MIN | MEAN | 90% | MAX | N | MIN | MEAN | 90% | MAX |
| **Polycyclic Aromatic Hydrocarbons** | **Units** | | | | | | | | - | | | | | | | |
| Acenaphthene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acenaphthylene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acridine | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Anthracene | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Benz(a)anthracene | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0025 | 0.0055 | 0.01 | - | - | - | - | - |
| Benz(a)anthracene/Chrysene | mg/kg dw | 6 | < 0.02 | < 0.015 | < 0.01 | < 0.01 | 3 | < 0.05 | < 0.04 | < 0.032 | < 0.03 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(a)pyrene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(b&j)fluoranthene | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Benzo(b or k)fluoranthene | mg/kg dw | 6 | < 0.02 | < 0.015 | < 0.01 | < 0.01 | 3 | < 0.05 | < 0.04 | < 0.032 | < 0.03 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(ghi)perylene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(k)fluoranthene | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Biphenyl | mg/kg dw | 8 | < 0.005 | < 0.003 | 0.005 | 0.005 | 10 | < 0.01 | 0.0026 | 0.012 | 0.03 | - | - | - | - | - |
| C2 sub'd B(a)A/chrysene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd B(b&k)F/B(a)P | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd biphenyl | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd dibenzothiophene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd fluoranthene/pyrene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd fluorene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd naphthalene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C2 sub'd phenanthrene/anth. | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C3 sub'd dibenzothiophene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C3 sub'd fluoranthene/pyrene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C3 sub'd fluorene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C3 sub'd naphthalene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C3 sub'd phenanthrene/anth. | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C4 sub'd dibenzothiophene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C4 sub'd naphthalene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| C4 sub'd phenanthrene/anth. | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Chrysene | mg/kg dw | 8 | < 0.005 | < 0.005 | 0.0086 | 0.01 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Dibenzo(a,h)anthracene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Dibenzothiophene | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Fluoranthene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Fluorene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01346 | < 0.005 | 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Indeno(c,d-123)pyrene | mg/kg dw | 14 | < 0.02 | < 0.009 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Methyl acenaphthene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl B(a)A/chrysene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl B(b&k)F/B(a)P | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl biphenyl | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl dibenzothiophene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl fluoranthene/pyrene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl fluorene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.026 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl phenanthrene/anthracene | mg/kg dw | 8 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 10 | < 0.04 | < 0.028 | < 0.02 | < 0.02 | - | - | - | - | - |
| Methyl naphthalenes | mg/kg dw | 6 | < 0.02 | < 0.015 | < 0.01 | < 0.01 | 3 | < 0.05 | < 0.04 | < 0.032 | < 0.03 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 1-Methylnaphthalene | mg/kg dw | 8 | < 0.005 | < 0.00375 | < 0.002 | 0.005 | 10 | < 0.01 | 0.0039 | 0.0101 | 0.02 | - | - | - | - | - |
| Naphthalene | mg/kg dw | 14 | < 0.02 | < 0.00143 | 0.017 | 0.02 | 13 | < 0.05 | 0.008 | 0.03 | 0.06 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Phenanthrene | mg/kg dw | 8 | < 0.005 | < 0.001 | 0.006 | 0.006 | 10 | < 0.01 | < 0.0025 | 0.0055 | 0.01 | - | - | - | - | - |
| Phenanthrene/Anthracene | mg/kg dw | 6 | < 0.02 | < 0.015 | < 0.01 | < 0.01 | 3 | < 0.05 | < 0.04 | < 0.032 | < 0.03 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Pyrene | mg/kg dw | 14 | < 0.02 | < 0.00929 | < 0.005 | < 0.005 | 13 | < 0.05 | < 0.01423 | < 0.005 | < 0.005 | 3 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Quinoline | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |
| Retene | mg/kg dw | 8 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | 10 | < 0.01 | < 0.0065 | < 0.005 | < 0.005 | - | - | - | - | - |

| Station Type | | Meliadine Lake | | | | | Lakenear mine | | | | | Lakeregion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter/Summary Statistic | | N | MIN | MEAN | 90% | MAX | N | MIN | MEAN | 90% | MAX | N | MIN | MEAN | 90% | MAX |
| **Other Organic Compounds** | **Units** | | | | | | | | - | | | | | | | |
| Benzene | mg/kg dw | 6 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 3 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 3 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Ethylbenzene | mg/kg dw | 6 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 3 | < 0.01 | 0.04 | 0.118 | 0.15 | 3 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Xylenes | mg/kg dw | 6 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 3 | < 0.01 | 1.06 | 2.558 | 3.2 | 3 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Toluene | mg/kg dw | 6 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 3 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 3 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Total Extr. Hydrocarbons (C9-40) | mg/kg dw | 1 | < 40 | < 40 | < 40 | < 40 | 3 | < 40 | 91.2 | 91.2 | 124 | - | - | - | - | - |
| Total Extr. Hydrocarbons (C10-30) | mg/kg dw | 1 | < 40 | < 40 | < 40 | < 40 | 3 | < 40 | 88.8 | 88.8 | 121 | - | - | - | - | - |
| Total Extractables | mg/kg dw | 6 | < 5 | < 5 | < 5 | < 5 | 3 | 13 | 15.33 | 16.8 | 17 | 3 | 7 | 10.33 | 13.8 | 15 |
| Total Volatiles | mg/kg dw | 6 | < 0.5 | 0.32 | 1.4 | 2.1 | 3 | < 0.5 | 5.10 | 12.16 | 15 | 3 | < 0.5 | 1.02 | 1.02 | 1.4 |
| **Organochlorines** | **Units** | | | | | | | | - | | | | | | | |
| Aldrin | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Alpha-BHC | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Beta-BHC | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Gamma-BHC (Lindane) | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Chlordane (alpha) | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Chlordane (gamma) | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Dieldrin | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Endosulfan I | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Endosulfan II | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Endrin | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Heptachlor | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Methoxychlor | mg/kg dw | 3 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | - | - | - | - | - | - | - | - | - | - |
| Mirex | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Nonachlor | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| Oxychlordane | mg/kg dw | 3 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | - | - | - | - | - | - | - | - | - | - |
| pp-DDD | mg/kg dw | 3 | < 0.001 | 0.0020 | **0.0062(a)** | **0.008(a)** | - | - | - | - | - | - | - | - | - | - |
| pp-DDE | mg/kg dw | 3 | < 0.001 | 0.0000 | **0.0014(a)** | **0.002(a)** | - | - | - | - | - | - | - | - | - | - |
| pp-DDT | mg/kg dw | 3 | < 0.001 | **0.0227(b)** | **0.0558(b)** | **0.07(b)** | - | - | - | - | - | - | - | - | - | - |
| Quintozine | mg/kg dw | 3 | < 0.001 | 0.0010 | 0.0038 | 0.005 | - | - | - | - | - | - | - | - | - | - |
| All Aroclors | mg/kg dw | 3 | < 0.03 | 0.0333 | 0.122 | 0.16 | - | - | - | - | - | - | - | - | - | - |

**Notes:**
- = No data or not applicable.
Bold values are higher than water quality guidelines and/or detection limits higher than guidelines.
(A) = Concentration higher than the interim sediment quality guideline.
(b) = Concentration higher than the probable effects level.

| Waterbody | | N | MIN | MEAN | 90th | MAX | N | MIN | MEAN | 90th | MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | **Meliadine Lake (1995 to 2011)** | | | | | **Meliadine Lake (Azimuth 2013)** | | | | |
| **Conventional Parameters** | **Units** | | | | | | | | | | |
| pH - laboratory | pH | 31 | 6.7 | 7.36 | 7.66 | 7.95 | 7 | 7.37 | 7.49 | 7.568 | 7.58 |
| Specific Conductivity - laboratory | µS/cm | 31 | 42.1 | 72.66 | 97.30 | 156 | 7 | 64.30 | 64.53 | 64.74 | 64.80 |
| Total Dissolved Solids | mg/L | 27 | 21 | 36.78 | 48.00 | 91 | 7 | 38.2 | 39.757143 | 41.9 | 44.3 |
| Total Alkalinity | mg $CaCO_3$/L | 31 | 12 | 19.74 | 26.00 | 50 | 7 | 16.5 | 17.071429 | 17.68 | 17.8 |
| Total Hardness | mg $CaCO_3$/L | 31 | 13 | 23 | 32.00 | 54 | 7 | 18.90 | 19.37 | 19.58 | 19.70 |
| Total Suspended Solids | mg/L | 30 | <3 | <1.17 | 3.10 | 8 | 7 | <1 | <1 | <1 | <1 |
| Turbidity - laboratory | NTU | 15 | <0.1 | 0.26 | 0.418 | 0.5 | 7 | 0.44 | 0.63 | 0.834 | 0.93 |
| **Major Ions** | **Units** | | | | | | | | | | |
| Bicarbonate | mg/L | 30 | 12.6 | 22.90 | 31.1 | 57.1 | 7 | 16.5 | 17.071429 | 17.68 | 17.8 |
| Calcium (Ca) - Dissolved | mg/L | 16 | 0.498 | 6.13 | 10.715 | 17.8 | 7 | 5.92 | 6.0771429 | 6.14 | 6.17 |
| Chloride | mg/L | 31 | 2.7 | 7.30 | 11.7 | 25.2 | 7 | 7.52 | 7.5642857 | 7.606 | 7.63 |
| Fluoride | mg/L | 1 | 0.03 | 0.03 | 0.03 | 0.03 | 7 | 0.022 | 0.0228571 | 0.023 | 0.023 |
| Magnesium (Mg) - Dissolved | mg/L | 15 | 0.787 | 1.19 | 1.6 | 2.23 | 7 | 1 | 1.0242857 | 1.034 | 1.04 |
| Potassium (K) - Dissolved | mg/L | 15 | 0.67 | 1.02 | 1.44 | 1.93 | 7 | 0.75 | 0.7742857 | 0.794 | 0.8 |
| Sodium (Na) - Dissolved | mg/L | 15 | 3.07 | 4.59 | 6.84 | 8.3 | 7 | 3.84 | 3.88 | 3.92 | 3.92 |
| Sulphate | mg/L | 31 | <3 | 2.43 | 4.86 | 8.91 | 7 | 3.24 | 3.2657143 | 3.292 | 3.31 |
| **Organic/Inorganic Carbon** | **Units** | | | | | | | | | | |
| Total Organic Carbon | mg/L | 26 | 2.1 | 3.42 | 4.75 | 5.3 | 7 | 2.45 | 2.8742857 | 3.12 | 3.21 |
| Dissolved Organic Carbon | mg/L | 9 | 2.9 | 3.27 | 3.42 | 3.9 | 7 | 2.61 | 2.7242857 | 2.826 | 2.94 |
| **Nutrients and Chlorophyll a** | **Units** | | | | | | | | | | |
| Total Ammonia as Nitrogen | mg/L | 30 | <0.05 | <0.02 | 0.0141 | 0.052 | 7 | <0.005 | <0.005 | <0.005 | <0.005 |
| Nitrate as Nitrogen | mg/L | 30 | <0.1 | <0.04 | <0.006 | 0.011 | 7 | <0.005 | <0.005 | <0.005 | <0.005 |
| Nitrite as Nitrogen | mg/L | 16 | <0.05 | <0.05 | <0.05 | <0.05 | 7 | <0.001 | <0.001 | <0.001 | <0.001 |
| Total Kjeldahl Nitrogen | mg/L | 30 | <0.2 | 0.16 | 0.36 | 0.94 | 7 | 0.193 | 0.2042857 | 0.2128 | 0.214 |
| Phosphorus, Total | mg/L | 30 | 0.003 | 0.01 | 0.0101 | 0.033 | 7 | 0.0033 | 0.0037286 | 0.0041 | 0.0041 |
| Phosphorus, Total Dissolved | mg/L | 30 | 0.002 | 0.004 | 0.008 | 0.012 | 7 | <0.001 | <0.001 | <0.001 | <0.001 |
| Orthophosphate (PO4-P) | mg/L | 30 | <0.001 | <0.001 | 0.002 | 0.004 | 7 | <0.002 | <0.0014 | <0.00032 | 0.0022 |
| Chlorophyll a | µg/L | 20 | <1 | 0.97 | 1.881 | 15 | 7 | 0.129 | 0.2461429 | 0.3264 | 0.348 |
| **Total Metals** | **Units** | | | | | | | | | | |
| Aluminum (Al) - Total | mg/L | 30 | <0.005 | 0.0009 | 0.0048 | 0.0111 | 7 | 0.004 | 0.0044857 | 0.00474 | 0.0048 |
| Antimony (Sb) - Total | mg/L | 30 | <0.0005 | 0.0000 | 0.0002 | 0.0003 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Arsenic (As) - Total | mg/L | 31 | <0.0005 | 0.0001 | 0.0005 | 0.0009 | 7 | 0.00041 | 0.0004271 | 0.000444 | 0.00045 |
| Barium (Ba) - Total | mg/L | 31 | 0.0177 | 0.0048 | 0.0103 | <0.02 | 7 | 0.00644 | 0.0066071 | 0.0067 | 0.00676 |
| Beryllium (Be) - Total | mg/L | 30 | <0.0001 | <0.0004 | <0.0001 | <0.001 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Bismuth (Bi) - Total | mg/L | 20 | <0.00003 | <0.00025 | <0.00003 | <0.001 | 7 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Boron (B) - Total | mg/L | 18 | 0.009 | <0.02565 | 0.00409 | <0.1 | 7 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium (Cd) - Total | mg/L | 11 | <0.00001 | 0.0008 | 0.00360 | 0.0048 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium (Cr) - Total | mg/L | 26 | <0.001 | <0.00005 | 0.00095 | 0.0022 | 7 | <0.0001 | 0.0001057 | 0.000176 | 0.0002 |
| Cobalt (Co) - Total | mg/L | 31 | <0.0001 | <0.00063 | <0.0001 | <0.015 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper (Cu) - Total | mg/L | 30 | <0.001 | 0.0012 | 0.00182 | 0.0031 | 7 | 0.00078 | 0.00109 | 0.001244 | 0.00128 |

| Waterbody | | N | MIN | MEAN | 90th | MAX | N | MIN | MEAN | 90th | MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Type** | | **Meliadine Lake (1995 to 2011)** | | | | | **Meliadine Lake (Azimuth 2013)** | | | | |
| Iron (Fe) - Total | mg/L | 27 | <0.03 | 0.0184 | 0.03920 | 0.085 | 7 | 0.023 | 0.0242857 | 0.025 | 0.025 |
| Lead (Pb) - Total | mg/L | 31 | 0.0007 | <0.00014 | 0.00020 | <0.001 | 7 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Lithium (Li) - Total | mg/L | 23 | 0.0015 | <0.002 | 0.00070 | <0.005 | 7 | 0.00066 | 0.0007171 | 0.000764 | 0.00077 |
| Manganese (Mn) - Total | mg/L | 31 | <0.005 | 0.0024 | 0.00460 | 0.0077 | 7 | 0.00309 | 0.0033257 | 0.003692 | 0.00431 |
| Mercury (Hg) - Total | mg/L | 30 | <0.00001 | <0.000017 | <0.00001 | <0.00002 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Molybdenum (Mo) - Total | mg/L | 31 | 0.0002 | <0.001 | 0.00010 | <0.03 | 7 | 0.000086 | 0.0001014 | 0.0001254 | 0.000129 |
| Nickel (Ni) - Total | mg/L | 31 | 0.0054 | <0.000016 | 0.00250 | <0.02 | 7 | 0.00057 | 0.0006657 | 0.000806 | 0.00107 |
| Selenium (Se) - Total | mg/L | 27 | 0.0001 | <0.00031 | <0.0001 | <0.001 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silicon (Si) - Total | mg/L | 3 | 0.233 | 0.2600 | 0.29360 | 0.307 | 7 | 0.241 | 0.2445714 | 0.2484 | 0.249 |
| Silver (Ag) - Total | mg/L | 30 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Strontium (Sr) - Total | mg/L | 27 | <0.0001 | 0.0331 | 0.04640 | 0.0729 | 7 | 0.0287 | 0.0290429 | 0.02932 | 0.0295 |
| Thallium (Tl) - Total | mg/L | 29 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Tin (Sn) - Total | mg/L | 10 | < 0.0005 | 0.00016 | 0.00143 | 0.0017 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium (Ti) - Total | mg/L | 16 | <0.0003 | <0.00005 | 0.00025 | 0.0006 | 7 | <0.01 | <0.01 | <0.01 | <0.01 |
| Uranium (U) - Total | mg/L | 30 | 0.00003 | <0.00008 | 0.00002 | <0.0002 | 7 | 0.000016 | 1.686E-05 | 0.0000174 | 0.000018 |
| Vanadium (V) - Total | mg/L | 30 | 0.0004 | <0.000225 | 0.00010 | <0.001 | 7 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc (Zn) - Total | mg/L | 31 | <0.005 | 0.0021 | 0.00700 | 0.0372 | 7 | <0.003 | <0.003 | <0.003 | <0.003 |
| **Dissolved Metals** | **Units** | | | | | | | | | | |
| Aluminum (Al) - Dissolved | mg/L | 16 | <0.005 | <0.0013 | 0.00225 | 0.0077 | 7 | 0.0012 | 0.0018286 | 0.00236 | 0.0029 |
| Antimony (Sb) - Dissolved | mg/L | 16 | <0.00003 | <0.00025 | <0.00003 | <0.0005 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Arsenic (As) - Dissolved | mg/L | 16 | <0.0005 | 0.00020 | 0.00069 | 0.00077 | 7 | 0.00039 | 0.0004057 | 0.000424 | 0.00043 |
| Barium (Ba) - Dissolved | mg/L | 12 | 0.00934 | 0.00017 | 0.007343 | <0.02 | 7 | 0.00659 | 0.0066514 | 0.006704 | 0.00671 |
| Beryllium (Be) - Dissolved | mg/L | 16 | <0.0002 | <0.0006 | <0.0002 | <0.001 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Bismuth (Bi) - Dissolved | mg/L | 3 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | 7 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Boron (B) - Dissolved | mg/L | 12 | 0.0053 | <0.022125 | 0.00468 | <0.1 | 7 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium (Cd) - Dissolved | mg/L | 16 | 0.000011 | <0.000024 | <0.00001 | < 0.00005 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium (Cr) - Dissolved | mg/L | 16 | <0.001 | 0.00013625 | 0.00145 | 0.0018 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt (Co) - Dissolved | mg/L | 16 | <0.0001 | <0.0001875 | <0.0001 | <0.0003 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper (Cu) - Dissolved | mg/L | 16 | <0.001 | 0.000986875 | 0.00145 | 0.0023 | 7 | 0.00067 | 0.0007743 | 0.000994 | 0.00106 |
| Iron (Fe) - Dissolved | mg/L | 12 | 0.025 | 0.000916667 | 0.0201 | <0.03 | 7 | <0.01 | 0.0055714 | 0.013 | 0.013 |
| Lead (Pb) - Dissolved | mg/L | 16 | 0.00049 | <0.000196875 | 0.00008 | <0.0005 | 7 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Lithium (Li) - Dissolved | mg/L | 10 | <0.005 | <0.005 | <0.005 | <0.005 | 7 | 0.00076 | 0.0008129 | 0.000848 | 0.00089 |
| Manganese (Mn) - Dissolved | mg/L | 16 | 0.00038 | 0.0014 | 0.002 | 0.0034 | 7 | 0.000834 | 0.0010939 | 0.001428 | 0.00156 |
| Mercury (Hg) - Dissolved | mg/L | 16 | <0.00002 | <0.00002 | <0.00002 | <0.00002 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |

| Waterbody | | N | MIN | MEAN | 90th | MAX | N | MIN | MEAN | 90th | MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station Type | | Meliadine Lake (1995 to 2011) | | | | | Meliadine Lake (Azimuth 2013) | | | | |
| Molybdenum (Mo) - Dissolved | mg/L | 16 | 0.000162 | <0.000396063 | 0.000115 | <0.001 | 7 | 0.000077 | 0.000084 | 0.0000884 | 0.000089 |
| Nickel (Ni) - Dissolved | mg/L | 16 | 0.00079 | <0.000125 | 0.000705 | <0.001 | 7 | 0.00056 | 0.0005757 | 0.00059 | 0.00059 |
| Selenium (Se) - Dissolved | mg/L | 16 | 0.0001 | <0.00046875 | <0.0001 | <0.001 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver (Ag) - Dissolved | mg/L | 16 | <0.00001 | <0.00001 | <0.00001 | <0.0001 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Strontium (Sr) - Dissolved | mg/L | 9 | 0.0249 | 0.0308 | 0.03648 | 0.046 | 7 | 0.0285 | 0.0286714 | 0.02874 | 0.0288 |
| Thallium (Tl) - Dissolved | mg/L | 16 | <0.00003 | <0.0001 | <0.00003 | <0.0002 | 7 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Tin (Sn) - Dissolved | mg/L | 10 | <0.0005 | 0.000084 | 0.001129 | 0.0013 | 7 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium (Ti) - Dissolved | mg/L | 3 | <0.0003 | <0.0003 | <0.0003 | <0.0003 | 7 | <0.01 | <0.01 | <0.01 | <0.01 |
| Uranium (U) - Dissolved | mg/L | 16 | 0.000035 | <0.0001 | 0.000015 | <0.0002 | 7 | 0.000014 | 0.000015 | 0.000016 | 0.000016 |
| Vanadium (V) - Dissolved | mg/L | 16 | 0.00013 | <0.0004 | 0.00011 | <0.001 | 7 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc (Zn) - Dissolved | mg/L | 12 | < 0.005 | < 0.001 | 0.00144 | 0.0117 | 7 | <0.001 | <0.001 | <0.001 | <0.001 |

# APPENDIX 7.5-A

## Habitat Characteristics of Streams in the LSA and RSA, 1997-2012

April 2014
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Appendix 7.5-A. Habitat Characteristics of Streams in the LSA and RSA, 1997-2012

| Area | Stream | Survey Date | Domin. Habitat Type | Stream Size | | | | | | Depth >0.5 m (% length) | Channel Type[a] (% length) | | | | Habitat Type (% area) | | | | Substrate[b] (% area) | | | | | Instream Cover[c] (% area) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Length (m) | Channel Width (m) | | | Depth (m) | | | | | | | | | | | | | | | | | | | |
| | | | | | Mean | Min. | Max. | Mean | Max. | | Sin | Dou | Mul | Dis | Riffle | Run | Pool | Flat | OM | Fi | Gr | Co | Bo | UC | BG | AV |
| LSA-Mine | A0-1a | 14-Jun-98 | Run | 55 | 1.0 | 0.6 | 1.5 | 0.4 | 0.6 | 2 | 42 | | 58 | | 47 | 48 | 6 | | | 7 | 11 | 38 | 43 | | 10 | 7 |
| LSA-Mine | A1a-1 | 14-Jun-98 | Run | 23 | 1.5 | 0.8 | 2.0 | 0.6 | 0.7 | 5 | 10 | | 90 | | | 90 | 10 | | | 5 | 5 | 60 | 30 | | 25 | 10 |
| LSA-Mine | A1-2 | 14-Jun-98 | Riffle | 78 | 1.2 | 0.8 | 1.7 | 0.5 | 0.6 | 1 | 80 | 20 | | | 90 | | 10 | | | 5 | 35 | 40 | 20 | | 15 | 10 |
| LSA-Mine | A2a-3 | 14-Jun-98 | Run | 83 | 0.8 | 0.5 | 1.5 | 0.5 | 0.6 | 2 | 90 | 10 | | | | 85 | 15 | | 5 | 10 | 25 | 45 | 15 | | 5 | 15 |
| LSA-Mine | A3-4 | 14-Jun-98 | Run | 26 | 0.7 | 0.5 | 1.0 | 0.5 | 0.6 | 1 | 100 | | | | | 95 | 5 | | 10 | 15 | 20 | 50 | 5 | | | 15 |
| LSA-Mine | A4-5 | 14-Jun-98 | Run | 112 | 1.3 | 0.8 | 1.8 | 0.5 | 0.6 | 2 | 90 | 10 | | | 15 | 80 | 5 | | 5 | 10 | 25 | 35 | 25 | | 15 | 10 |
| LSA-Mine | A5-6 | 15-Jun-98 | Run | 406 | 2.1 | 0.3 | 15 | 0.4 | 0.7 | 2 | 49 | 18 | 22 | 11 | 26 | 56 | 8 | 10 | 29 | 18 | 10 | 30 | 13 | | 1 | 20 |
| LSA-Mine | A6-7 | 15-Jun-98 | Run | 113 | 1.9 | 0.6 | 8.0 | 0.4 | 0.6 | 1 | 16 | | 84 | | 46 | 50 | 4 | | | 2 | 14 | 27 | 57 | | 44 | 2 |
| LSA-Mine | A7-8 | 15-Jun-98 | Run | 137 | 1.1 | 0.4 | 1.8 | 0.3 | 0.7 | 3 | 30 | 12 | 58 | | 24 | 54 | 22 | | 3 | | 11 | 31 | 55 | 4 | 29 | 13 |
| LSA-Mine | B0-1 | 17-Jun-98 | Run | 113 | 5.6 | 0.5 | 18 | 0.3 | 0.6 | 10 | 65 | | 35 | | 24 | 66 | 10 | | | 4 | 26 | 31 | 39 | 0 | 10 | 7 |
| LSA-Mine | B1-2 | 13-Jun-98 | Run | 152 | 2.2 | 0.7 | 4.0 | 0.6 | 0.7 | 55 | 67 | 10 | 23 | | 5 | 93 | 2 | | | 5 | 5 | 41 | 49 | | 19 | 5 |
| LSA-Mine | B3-4 | 14-Jun-98 | Run | 158 | 1.1 | 0.2 | 2.5 | 0.3 | 1.0 | 12 | 15 | 5 | 81 | | 36 | 40 | 24 | | 20 | | 9 | 28 | 44 | 2 | 15 | 19 |
| LSA-Mine | B4-5 | 14-Jun-98 | Run | 146 | 0.9 | 0.5 | 1.6 | 0.2 | 0.4 | 0 | 62 | 7 | 31 | | | 100 | | | 72 | 2 | 7 | 15 | 5 | 1 | 3 | 17 |
| LSA-Mine | B4-36 | 20-Jun-97 | Flat | 163 | 0.8 | 0.8 | 40 | 0.1 | 0.3 | 0 | 5 | | 25 | 71 | | 4 | | 96 | 93 | 3 | 3 | | | | | 63 |
| LSA-Mine | B4-45 | 23-Jul-11 | Run | 30 | 4.0 | 3.5 | 4.5 | 0.3 | 0.5 | 0 | 100 | | | | | 45 | 10 | 45 | 15 | 5 | 5 | 45 | 30 | | 10 | |
| LSA-Mine | B5-6 | 14-Jun-98 | Riffle | 98 | 0.9 | 0.2 | 2.5 | 0.2 | 0.5 | 0 | 26 | 40 | 33 | | 47 | 45 | 8 | | 6 | | 9 | 45 | 40 | 1 | 15 | 4 |
| LSA-Mine | B5-31 | 14-Jul-11 | Run | 108 | 0.7 | 0.1 | 4.5 | 0.2 | 0.5 | 0 | 30 | 13 | 56 | | 34 | 56 | 10 | | 24 | 5 | 29 | 34 | 9 | 6 | 9 | 16 |
| LSA-Mine | B6-7 | 13-Jun-98 | Run | 116 | 0.8 | 0.5 | 1.5 | 0.3 | 0.5 | 0 | 94 | 4 | 2 | | 24 | 73 | 3 | | | 1 | 15 | 48 | 36 | | 16 | 4 |
| LSA-Mine | B30-6 | 14-Jul-11 | Run | 24 | 0.6 | 0.3 | 1.9 | 0.3 | 0.4 | 0 | 60 | | 40 | | 10 | 90 | | | 75 | | 5 | 15 | 5 | 5 | | 25 |
| LSA-Mine | B31-30 | 14-Jul-11 | Run | 122 | 0.4 | 0.1 | 1.7 | 0.2 | 0.5 | 0 | 40 | 20 | 40 | | 20 | 75 | 5 | | 30 | 5 | 15 | 45 | 5 | 15 | 5 | 15 |
| LSA-Mine | B31-32 | 14-Jul-11 | Dry | 163 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| LSA-Mine | B45-46 | 17-Jun-97 | Run | 110 | 2.1 | 1.3 | 5.2 | 0.3 | 0.3 | 0 | 59 | 14 | 27 | | 44 | 56 | | | | 2 | 8 | 60 | 30 | 3 | 77 | 2 |
| LSA-Mine | B51-52 | 17-Jun-97 | Run | 95 | 1.7 | 0.6 | 2.1 | 0.1 | 0.2 | 0 | 74 | | 26 | | 5 | 26 | | 68 | | 13 | 25 | 43 | 20 | 20 | 40 | 10 |
| LSA-Mine | B52-53 | 22-Jun-97 | Run | 101 | 2.6 | 1.2 | 13 | 0.1 | 0.2 | 0 | 33 | | 67 | | 28 | 72 | | | 3 | | 15 | 25 | 57 | 2 | 50 | |
| LSA-Mine | B68-69 | 22-Jun-97 | Run | 680 | 4.0 | 0.6 | 3.0 | 0.2 | 0.2 | 0 | | | 100 | | 13 | 87 | | | 43 | | 10 | 18 | 30 | | 20 | 3 |
| LSA-Mine | D0-1 | 15-Jun-98 | Riffle | 100 | 7.9 | 1.0 | 30 | 0.4 | 0.8 | 25 | 75 | 15 | 10 | | 44 | 17 | 9 | 30 | 15 | 4 | 28 | 30 | 23 | | 14 | 8 |
| LSA-Mine | D1-2 | 18-Jun-97 | Run | 32 | 0.6 | 0.6 | 0.6 | 0.2 | 0.2 | 0 | 100 | | | | | 100 | | | | 5 | 35 | 50 | 10 | 2 | 30 | 20 |
| LSA-Mine | D3-4 | 18-Jun-97 | Run | 29 | 5.7 | 2.0 | 20 | 0.2 | 0.2 | 0 | | | 62 | 38 | | 62 | | 38 | 100 | | | | | | | 90 |
| LSA-Mine | D5-6 | 18-Jun-97 | Run | 268 | 15.4 | 0.7 | 25 | 0.5 | 0.9 | 3 | 28 | | 72 | | 1 | 98 | 1 | | 40 | 5 | 26 | 11 | 18 | 15 | 28 | 20 |
| LSA-Mine | D6-7 | 18-Jun-97 | Run | 46 | 3.9 | 0.4 | 1.2 | 0.1 | 0.3 | 0 | 89 | 11 | | | 5 | 57 | | 38 | | | 35 | 50 | 15 | 3 | 20 | |
| LSA-Mine | D23-24 | 18-Jul-11 | Dry | 129 | - | - | - | - | - | 0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| LSA-Mine | E4-5 | 15-Jul-11 | Flat | 46 | 1.1 | 0.4 | 6.1 | 0.1 | 0.3 | 0 | 10 | 70 | 20 | | | 5 | | 95 | 95 | | | 3 | 2 | | 2 | 20 |
| LSA-Mine | F0-1 | 21-Jun-97 | Run | 168 | 1.0 | 0.4 | 1.5 | 0.6 | 1.4 | 5 | 17 | | 83 | | | 92 | 8 | | 55 | 5 | 13 | 20 | 8 | 20 | 4 | 13 |
| LSA-Mine | F5-6 | 21-Jun-97 | Run | 78 | 0.3 | 0.2 | 0.5 | 0.1 | 0.1 | 0 | 100 | | | | 1 | 99 | | | 50 | 10 | 18 | 18 | 5 | 23 | 5 | 3 |
| LSA-Mine | G0-1 | 18-Jun-97 | Run | 246 | 0.4 | 0.2 | 1.2 | 0.3 | 0.6 | 1 | 100 | | | | 9 | 87 | 5 | | 66 | 4 | 21 | 9 | | 11 | 1 | 3 |
| LSA-Mine | G1-2 | 17-Jun-97 | Run | 240 | 1.3 | 0.4 | 0.5 | 0.1 | 0.1 | 0 | 46 | | 54 | | 17 | 83 | | | 65 | 13 | 10 | 10 | 3 | 3 | 3 | 20 |

Appendix 7.5-A. Habitat Characteristics of Streams in the LSA and RSA, 1997-2012

| Area | Stream | Survey Date | Domin. Habitat Type | Stream Size | | | | | | Depth >0.5 m (% length) | Channel Type[a] (% length) | | | | Habitat Type (% area) | | | | Substrate[b] (% area) | | | | | Instream Cover[c] (% area) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Length (m) | Channel Width (m) | | | Depth (m) | | | | | | | | | | | | | | | | | | | |
| | | | | | Mean | Min. | Max. | Mean | Max. | | Sin | Dou | Mul | Dis | Riffle | Run | Pool | Flat | OM | Fi | Gr | Co | Bo | UC | BG | AV |
| LSA-Mine | H0-1 | 17-Jun-12 | Run | 175 | 1 | 0.4 | 5.0 | 0.3 | 0.6 | 5 | 90 | 10 | | | | 100 | | | 30 | 5 | 30 | 25 | 10 | 10 | 5 | 25 |
| LSA-Mine | H1-2 | 17-Jun-12 | Run | 174 | 1 | 0.2 | 2.0 | 0.4 | 0.6 | 5 | | 80 | 15 | 5 | 15 | 85 | | | 60 | 30 | 10 | | | 5 | | 50 |
| LSA-Mine | H2-3 | 17-Jun-12 | Run | 35 | 1.9 | 0.1 | 3.0 | 0.4 | 0.6 | 3 | 36 | 36 | 29 | | | 100 | | | 23 | 12 | 21 | 32 | 11 | 4 | 6 | 10 |
| LSA-Mine | H3-4 | 17-Jun-12 | Run | 141 | 1.5 | 0.2 | 15 | 0.4 | 0.6 | 2 | | 55 | 25 | 20 | | 100 | | | 45 | 25 | 20 | 5 | 5 | 5 | | 10 |
| LSA-Mine | H4-5 | 17-Jun-12 | Run | 55 | 1 | 0.4 | 2.0 | 0.3 | 0.4 | 0 | 20 | 60 | | 20 | | 100 | | | 50 | 5 | 25 | 15 | 5 | 10 | | 25 |
| LSA-Mine | H5-17 | 17-Jun-12 | Run | 150 | 0.75 | 0.2 | 2.0 | 0.2 | 0.5 | 0 | 75 | | 25 | | | 100 | | | 75 | 10 | 10 | 5 | | 10 | | 15 |
| LSA-Mine | J0-1 | 07-Jul-04 | Run | 198 | 2.3 | 0.2 | 15 | 0.1 | 0.8 | 2 | 8 | 9 | 57 | 27 | 4 | 78 | 1 | 17 | 81 | 16 | 1 | 1 | 1 | | 0.2 | 78 |
| LSA-AWAR | M2.1 | Jun-08 | Run | 690 | 85 | 34 | 134 | 0.8 | >1.0 | 65 | 100 | | | | 20 | 72 | 8 | | | 8 | 14 | 23 | 56 | 1 | 97 | 1 |
| LSA-AWAR | M3.0 | Jun-08 | Pool | 200 | 2.1 | 0.1 | 10 | 0.1 | 0.2 | 0 | 18 | | 31 | 51 | 10 | 30 | 60 | | 75 | 14 | 4 | 5 | 3 | | 15 | 85 |
| LSA-AWAR | M3.9 | Jun-08 | Run | 200 | 2.6 | 0.8 | 6.4 | 0.1 | 0.2 | 0 | 44 | 1 | 18 | 38 | | 50 | 50 | | 39 | 50 | 5 | 5 | 1 | | | 50 |
| LSA-AWAR | M6.7 | Jun-08 | Dry | 150 | - | - | - | - | - | 0 | | | 57 | 43 | | 40 | | 60 | 28 | 62 | 5 | 2 | 3 | - | - | - |
| LSA-AWAR | M8.6 | Jun-08 | Pool | 120 | 2.7 | 0.3 | 9.0 | 0.1 | 0.2 | 0 | 13 | | | 88 | | 5 | 95 | | 94 | | | | 6 | | 6 | 94 |
| LSA-AWAR | M11.5 | Jun-08 | Run | 300 | 4.7 | 0.4 | 16 | 0.1 | 0.4 | 0 | 20 | 7 | 53 | 20 | 46 | 48 | 6 | | 53 | 12 | 10 | 12 | 13 | 23 | 8 | 68 |
| LSA-AWAR | M13.3 | Jun-08 | Pool | 300 | 4.8 | 0.5 | 16 | 0.1 | 0.6 | 3 | 33 | | 32 | 35 | | 80 | | 20 | 73 | 18 | 2 | 3 | 3 | 23 | 10 | 67 |
| LSA-AWAR | M22.6 | Jun-08 | Pool | 150 | 9.0 | 0.1 | 15 | 0.1 | 0.4 | 0 | 20 | | 40 | 40 | | 30 | 70 | | 38 | 27 | 7 | 17 | 12 | 13 | 17 | 70 |
| LSA-AWAR | M23.7 | Jun-08 | Run | 100 | 2.2 | 1.2 | 5.2 | 0.2 | 0.4 | 0 | | | 100 | | | 82 | 18 | | 5 | 10 | 10 | 25 | 50 | 15 | 55 | 30 |
| LSA-AWAR | D1.2 | Jun-08 | Pool | 400 | 2.4 | 0.4 | 40 | 0.2 | 0.4 | 0 | 68 | 8 | 9 | 17 | | 48 | 52 | | 86 | 10 | 1 | 1 | 1 | | 1 | 99 |
| LSA-AWAR | D5.4 | 18-Jun-12 | Pool | 270 | 5.9 | 0.2 | 30 | 0.2 | 0.5 | 0 | 7 | | | 93 | | 7 | | 93 | 86 | 9 | 4 | | 1 | | | 41 |
| LSA-AWAR | D5.9 | Jun-08 | Flat | 200 | 3.2 | 1.5 | 5.0 | 0.2 | 0.5 | 0 | 77 | 3 | | 20 | | 20 | | 80 | 38 | 5 | 10 | 28 | 20 | 13 | 23 | 65 |
| LSA-AWAR | D8.8 | 18-Jun-12 | Run | 475 | 15.2 | 2.0 | 50 | 0.3 | 0.7 | 20 | 42 | 3 | 55 | | 19 | 36 | 18 | 27 | 21 | 3 | 13 | 30 | 34 | 1 | 14 | 6 |
| LSA-Rankin | R0.3 | 15-Jul-12 | Run | 235 | 0.6 | 0.4 | 1.2 | 0.1 | 0.3 | 0 | 100 | | | | 10 | 80 | | 10 | 25 | 5 | 40 | 20 | 10 | 2 | 20 | 10 |
| LSA-Rankin | R0.7 | 15-Jul-12 | Run | 135 | 0.3 | 0.1 | 1.0 | 0.1 | 0.2 | 0 | 80 | | 10 | 10 | | 100 | | | 20 | 10 | 40 | 20 | 10 | 5 | 20 | 5 |
| LSA-Rankin | R1.0 | 15-Jul-12 | Run | 120 | 0.6 | 0.3 | 5.0 | 0.1 | 0.3 | 0 | 60 | | 10 | 30 | | 80 | | 20 | 20 | 20 | 30 | 20 | 10 | 2 | 25 | 25 |
| LSA-Rankin | R2.5 | 15-Jul-12 | Flat | 190 | 4.0 | 0.3 | 15 | 0.1 | 0.4 | 0 | 15 | | 15 | 70 | | 30 | | 70 | 80 | 20 | | | | | | 70 |
| LSA-Rankin | R2.9 | 15-Jul-12 | Flat | 290 | 0.8 | 0.2 | 12 | 0.1 | 0.3 | 0 | 20 | | 10 | 70 | | 30 | | 70 | 75 | 15 | 2 | 5 | 3 | | | 80 |
| RSA | ML-MR | 17-Jun-98 | Riffle | 150 | 72.0 | 60.0 | 80 | 0.5 | 4.0 | 21 | 100 | | | | 57 | 32 | 11 | | | | 19 | 34 | 47 | | 35 | |
| RSA | ML-PL | 17-Jun-98 | Riffle | 110 | 39.1 | 5.0 | 60 | 0.4 | 0.7 | 6 | 45 | | 55 | | 49 | 32 | 19 | | | | 8 | 22 | 70 | | 27 | |

[a] Sin = single channel; Dou = double channel; Mul = multiple (braided) channel; Dis = dispersed channel

[b] OM = organic material; Fi = fines (silt & sand, <2 mm diameter); Gr = gravel (2 - 64 mm diameter); Co = cobble (65 - 256 mm diameter); Bo = boulder (>256 mm diameter)

[c] UC = undercut banks; BG = boulder gardens; AV = aquatic vegetation

# APPENDIX 7.5-B

## Morphometric Characteristics of Ponds in the LSA and RSA

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Appendix 7.5-B: Morphometric Characteristics of Ponds in the LSA and RSA

| Area | Pond | Area (ha) | Volume ($m^3x10^3$) | Depth (m) | | Elevation (masl) | Habitat[a] Composition (% area) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean | Maximum | | Hab 1 | Hab 2 | Hab 3 |
| LSA | A1a | 0.12 | - | - | 0.84 | 53.03 | 45 | 25 | 30 |
| LSA | A2 | 2.36 | - | - | 0.70 | 53.51 | 65 | 15 | 20 |
| LSA | A2a | 1.95 | - | - | 0.80 | 53.61 | 75 | 10 | 15 |
| LSA | A3 | 0.48 | - | - | 0.96 | 54.06 | 70 | 15 | 15 |
| LSA | A4 | 0.07 | - | - | 0.53 | 54.24 | 30 | 25 | 45 |
| LSA | A5 | 2.00 | - | - | 1.20 | 54.78 | 80 | 10 | 10 |
| LSA | A7 | 2.38 | 13.7 | 0.57 | 1.50 | 61.05 | 15 | 10 | 75 |
| LSA | A9 | 1.76 | - | - | 0.47 | 64.08 | 65 | 15 | 20 |
| LSA | A10 | 0.26 | - | - | 0.67 | 64.86 | 70 | 15 | 15 |
| LSA | A11 | 0.40 | - | - | 0.45 | 65.26 | 45 | 25 | 30 |
| LSA | A12 | 0.47 | - | - | 0.87 | 66.89 | 50 | 10 | 40 |
| LSA | A13 | 0.26 | - | - | 0.31 | 66.77 | 60 | 15 | 25 |
| LSA | A17 | 0.16 | - | - | 0.30 | 72.42 | 85 | 10 | 5 |
| LSA | A18 | 0.33 | - | - | 0.50 | 58.03 | 55 | 10 | 35 |
| LSA | A19 | 1.01 | - | - | 0.94 | 57.48 | 45 | 15 | 40 |
| LSA | A30 | 2.52 | - | - | 1.70 | 59.88 | 40 | 25 | 35 |
| LSA | A31 | 1.88 | - | - | 1.60 | 60.84 | 45 | 20 | 35 |
| LSA | A35 | 0.36 | - | - | 0.58 | 64.03 | 85 | 10 | 5 |
| LSA | A37 | 0.92 | - | - | 1.10 | 63.56 | 65 | 15 | 20 |
| LSA | A38 | 0.54 | - | - | 0.74 | 65.82 | 50 | 20 | 30 |
| LSA | A39 | 0.12 | - | - | 0.48 | 65.68 | 80 | 10 | 10 |
| LSA | A40 | 0.81 | - | - | 1.04 | 65.96 | 75 | 15 | 10 |
| LSA | A44 | 0.82 | - | - | 0.80 | 60.95 | 40 | 10 | 50 |
| LSA | A45 | 1.70 | - | - | 0.70 | 60.95 | 25 | 15 | 60 |
| LSA | A49 | 0.59 | - | - | 0.50 | 62.41 | 30 | 15 | 55 |
| LSA | A50 | 0.08 | - | - | 0.60 | 57.18 | 65 | 15 | 20 |
| LSA | A51 | 0.44 | - | - | 0.66 | 57.42 | 80 | 10 | 10 |
| LSA | A52 | 7.07 | - | - | 2.00 | 58.08 | 75 | 15 | 10 |
| LSA | A53 | 0.06 | - | - | 0.40 | 57.94 | 45 | 25 | 30 |
| LSA | A54 | 5.99 | 36.9 | 0.62 | 1.30 | 65.75 | 70 | 10 | 20 |
| LSA | A58 | 0.43 | - | - | 0.50 | 67.60 | 80 | 10 | 10 |
| LSA | B8 | 1.43 | - | - | 0.82 | 63.45 | 60 | 20 | 20 |
| LSA | B9 | 0.64 | 5.0 | 0.78 | 1.40 | 66.98 | 80 | 5 | 15 |
| LSA | B10 | 0.33 | 1.5 | 0.44 | 0.80 | 74.70 | 60 | 10 | 30 |
| LSA | B18 | 1.42 | - | - | 1.75 | 58.91 | 75 | 10 | 15 |
| LSA | B19 | 1.57 | - | - | 1.30 | 58.15 | 60 | 15 | 25 |
| LSA | B22 | 0.35 | - | - | 0.77 | 59.13 | 90 | 5 | 5 |
| LSA | B25 | 1.58 | - | - | 1.05 | 64.13 | 50 | 15 | 35 |
| LSA | B28 | 0.45 | - | - | 0.55 | 64.15 | 75 | 10 | 15 |
| LSA | B30 | 0.09 | - | - | 1.10 | 61.72 | 80 | 10 | 10 |
| LSA | B31 | 0.13 | - | - | 1.20 | 60.80 | 75 | 15 | 10 |
| LSA | B32 | 0.60 | - | - | 0.90 | 60.52 | 65 | 15 | 20 |
| LSA | B33 | 0.67 | - | - | 1.20 | 65.14 | 85 | 5 | 10 |
| LSA | B33a | 0.35 | - | - | 0.98 | 65.87 | 80 | 5 | 15 |
| LSA | B36 | 7.93 | - | - | 0.80 | 57.86 | 60 | 15 | 25 |
| LSA | B37 | 0.85 | - | - | 0.55 | 59.28 | 85 | 10 | 5 |
| LSA | B38 | 3.30 | - | - | 1.50 | 60.32 | 50 | 20 | 30 |
| LSA | B39 | 1.18 | - | - | 0.80 | 65.00 | 50 | 15 | 35 |
| LSA | B44 | 4.99 | - | - | 0.55 | 56.98 | 45 | 30 | 25 |
| LSA | B60 | 0.98 | - | - | 1.85 | 62.79 | 80 | 10 | 10 |
| LSA | B61 | 1.16 | - | - | 0.90 | 62.79 | 70 | 10 | 20 |
| LSA | B62 | 1.79 | - | - | 1.30 | 60.92 | 75 | 15 | 10 |
| LSA | C6 | 6.29 | 39.1 | 0.62 | 1.40 | 59.32 | 80 | 15 | 5 |
| LSA | C7 | 15.96 | 150.3 | 0.94 | 1.20 | 60.89 | 30 | 20 | 50 |
| LSA | C8 | 1.99 | - | - | 1.60 | 62.40 | 25 | 20 | 55 |
| LSA | C9 | 3.43 | - | - | 1.70 | 62.77 | 10 | 20 | 70 |
| LSA | C11 | 0.76 | - | - | ≤2 | 62.96 | 75 | 15 | 10 |

Appendix 7.5-B: Morphometric Characteristics of Ponds in the LSA and RSA

| Area | Pond | Area (ha) | Volume ($m^3x10^3$) | Depth (m) | | Elevation (masl) | Habitat[a] Composition (% area) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean | Maximum | | Hab 1 | Hab 2 | Hab 3 |
| LSA | C12 | 0.55 | - | - | ≤2 | 62.96 | 75 | 15 | 10 |
| LSA | C13 | 0.14 | - | - | ≤2 | 62.95 | 80 | 10 | 10 |
| LSA | D4 | 18.82 | 190.8 | 1.01 | 1.60 | 55.50 | 17 | 22 | 61 |
| LSA | D6 | 2.14 | 16.4 | 0.76 | 1.70 | 56.69 | 9 | 45 | 46 |
| LSA | E11 | 0.22 | - | - | 0.82 | 62.68 | 40 | 50 | 10 |
| LSA | H1 | 1.14 | - | - | 1.31 | 55.74 | 30 | 15 | 55 |
| LSA | H2 | 0.16 | - | - | 0.26 | 59.76 | 70 | 10 | 20 |
| LSA | H3 | 0.27 | - | - | 0.36 | 60.68 | 50 | 20 | 30 |
| LSA | H4 | 0.06 | - | - | 0.55 | 61.90 | 90 | 5 | 5 |
| LSA | H5 | 0.37 | - | - | 0.62 | 62.35 | 40 | 25 | 35 |
| LSA | H6 | 0.75 | - | - | 0.58 | 63.39 | 70 | 10 | 20 |
| LSA | H7 | 0.11 | - | - | 0.67 | 64.29 | 80 | 10 | 10 |
| LSA | H8 | 0.38 | - | - | 0.59 | 65.29 | 90 | 5 | 5 |
| LSA | H9 | 0.42 | - | - | 0.42 | 65.32 | 70 | 10 | 20 |
| LSA | H10 | 0.10 | - | - | 0.11 | 65.78 | 65 | 15 | 20 |
| LSA | H11 | 0.28 | - | - | 0.27 | 66.56 | 85 | 5 | 10 |
| LSA | H12 | 0.97 | - | - | 0.81 | 67.43 | 45 | 20 | 35 |
| LSA | H13 | 3.49 | - | - | 1.04 | 67.51 | 35 | 20 | 45 |
| LSA | H14 | 0.23 | - | - | 0.61 | 67.89 | 80 | 10 | 10 |
| LSA | H14a | 0.15 | - | - | 0.37 | 69.23 | 65 | 10 | 25 |
| LSA | H15 | 1.10 | - | - | 0.83 | 68.67 | 50 | 20 | 30 |
| LSA | H15d | 0.15 | - | - | 0.34 | 68.95 | 90 | 5 | 5 |
| LSA | H15e | 0.21 | - | - | 0.48 | 69.71 | 85 | 5 | 10 |
| LSA | H15g | 0.38 | - | - | 0.44 | 69.63 | 85 | 5 | 10 |
| LSA | H16 | 0.18 | - | - | 0.36 | 60.37 | 50 | 30 | 20 |
| LSA | H17 | 15.80 | 139.5 | 0.88 | 1.70 | 64.13 | 35 | 15 | 50 |
| LSA | H18 | 0.74 | - | - | 0.67 | 66.86 | 60 | 15 | 25 |
| LSA | H19 | 2.91 | - | - | 1.40 | 63.53 | 75 | 15 | 10 |
| LSA | H20 | 9.58 | 87.1 | 0.91 | 1.60 | 64.23 | 55 | 20 | 25 |
| LSA | I1 | 7.63 | 59.2 | 0.78 | 1.80 | 63.60 | 65 | 15 | 20 |
| LSA | J2 | 1.89 | - | - | 1.30 | 56.67 | 75 | 15 | 10 |
| LSA | J3 | 1.47 | - | - | 1.20 | 65.68 | 80 | 10 | 10 |
| LSA | J4 | 0.22 | - | - | 0.50 | 66.94 | 90 | 5 | 5 |
| LSA | J5 | 0.18 | - | - | 0.35 | 67.03 | 85 | 10 | 5 |
| LSA | J6 | 1.75 | - | - | 0.69 | 67.00 | 35 | 25 | 40 |
| LSA | J7 | 3.51 | - | - | 1.75 | 68.26 | 65 | 15 | 20 |
| LSA | J8 | 1.35 | - | - | 1.00 | 69.59 | 80 | 10 | 10 |
| LSA | P2 | 10.36 | - | - | 1.50 | 64.91 | 70 | 15 | 15 |
| LSA | CH28 | 0.52 | - | - | 0.42 | 83.59 | 85 | 5 | 10 |
| LSA | CH29 | 0.75 | - | - | 0.46 | 81.05 | 60 | 15 | 25 |
| LSA | CH31 | 1.09 | - | - | 0.68 | 84.57 | 70 | 20 | 10 |
| LSA | CH32 | 1.08 | - | - | 1.58 | 83.21 | 80 | 10 | 10 |
| RSA | O2 | 32.67 | 305.5 | 0.93 | 1.60 | 53.81 | 72 | 12 | 16 |
| RSA | O4 | 12.73 | 103.3 | 0.81 | 1.80 | 57.77 | 25 | 30 | 45 |

[a] Hab 1 = <2 m depth, fine substrate; Hab 2 = <2 m depth, mixed substrate; Hab 3 = <2 m depth, coarse substrate.
- = not determined

# APPENDIX 7.5-C

## Summary of Fish Sampling Effort and Catch Data for the Project, 1997-2012

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| A | Stream A0-1 | EF | 1 | Jun-97 | 532 s | | 2 | 5 | | | | 3 | 47 | 29 | 86 | *9.70 fish/min* |
| A | Stream A0-1 | EF | 1 | Jul-97 | 222 s | | | | | | | 2 | 17 | 5 | 24 | *6.49 fish/min* |
| A | Stream A0-1 | EF | 2 | Jun-98 | 915 s | 3 | | | | | | | 1 | 7 | 11 | *0.72 fish/min* |
| A | Stream A0-1 | EF | 1 | Jul-98 | 412 s | | 3 | 7 | | | 2 | | | 12 | 24 | *3.50 fish/min* |
| A | Stream A0-1 | EF | 1 | Aug-98 | 305 s | | 1 | 6 | | | | | | 8 | 15 | *2.95 fish/min* |
| A | Lake A1 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| A | Lake A1 | GN | 2 | Jul-97 | 0.42 net-units | | | | 1 | | | | | | 1 | *2.40 fish/net-unit* |
| A | Lake A1 | GN | 3 | Aug-97 | 1.94 net-units | 4 | 4 | | | 1 | | | | | 9 | *4.65 fish/net-unit* |
| A | Lake A1 | FN | 1 | Aug-11 | 24.0 h | | | 1 | | | | | 7 | 9 | 17 | *0.71 fish/h* |
| A | Lake A1 | GN | 1 | Aug-11 | 0.76 net-units | 1 | 3 | | 1 | | | | | | 5 | *6.58 fish/net-unit* |
| A | Lake A1 | MT | 1 | Aug-11 | 71.1 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Stream A1-2 | EF | 1 | Jun-97 | 324 s | 1 | 1 | 8 | | | | | 33 | 2 | 45 | *8.33 fish/min* |
| A | Stream A1-2 | EF | 1 | Jun-98 | 177 s | | | 2 | | | | | | | 2 | *0.68 fish/min* |
| A | Pond A2 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| A | Pond A2 | FN | 1 | Aug-11 | 26.1 h | | | | | | | | 59 | 25 | 84 | *3.22 fish/h* |
| A | Pond A2 | MT | 1 | Aug-11 | 76.3 trap-h | | | | | | | | 5 | 5 | 10 | *3.15 fish/24h* |
| A | Stream A2-3 | EF | 1 | Jun-97 | 320 s | | 1 | 12 | | | | | 5 | | 18 | *3.38 fish/min* |
| A | Stream A2-3 | EF | 1 | Jun-98 | 174 s | | | 9 | | | | | | | 9 | *3.10 fish/min* |
| A | Stream A2-3 | EF | 1 | Jul-98 | 304 s | 1 | 1 | 6 | | | | 1 | 5 | 4 | 18 | *3.55 fish/min* |
| A | Stream A2-3 | EF | 1 | Aug-98 | 230 s | | 1 | 20 | | | | | 5 | 3 | 29 | *7.57 fish/min* |
| A | Pond A3 | MT | 1 | Jul-12 | 99.4 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Stream A3-4 | EF | 1 | Jun-97 | 135 s | | | 1 | | | | | 2 | | 3 | *1.33 fish/min* |
| A | Stream A3-4 | EF | 1 | Jun-98 | 109 s | | | 1 | | | | | | | 1 | *0.55 fish/min* |
| A | Pond A4 | MT | 1 | Jul-12 | 52.7 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Stream A4-5 | EF | 1 | Jun-97 | 411 s | | | 14 | | | | | 4 | | 18 | *2.63 fish/min* |
| A | Stream A4-5 | EF | 1 | Jun-98 | 320 s | | | 3 | | | | | | | 3 | *0.56 fish/min* |
| A | Pond A5 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| A | Pond A5 | EF | 1 | Jul-09 | 596 s | | | | | | | | 3 | | 3 | *0.30 fish/min* |
| A | Pond A5 | MT | 1 | Jul-09 | 120.0 trap-h | | | | | | | | 4 | | 4 | *0.80 fish/24h* |
| A | Stream A5-6 | EF | 1 | Jun-97 | 800 s | | | 13 | | | | | 80 | | 93 | *6.98 fish/min* |
| A | Stream A5-6 | EF | 1 | Jul-97 | 461 s | | 8 | | | | | 9 | 29 | | 46 | *5.99 fish/min* |
| A | Stream A5-6 | EF | 3 | Jun-98 | 2008 s | | | 23 | | | | | 19 | | 42 | *1.25 fish/min* |
| A | Stream A5-6 | EF | 1 | Jul-98 | 540 s | 1 | 4 | 11 | | | | | 7 | | 23 | *2.56 fish/min* |
| A | Stream A5-6 | EF | 1 | Aug-98 | 315 s | | | 16 | | | | | 5 | 1 | 22 | *4.19 fish/min* |
| A | Stream A5-6 | EF | 1 | Jul-09 | 648 s | | | 10 | | | | 9 | 53 | 2 | 74 | *6.85 fish/min* |
| A | Lake A6 | FN | 2 | Jul-09 | 41.3 h | | | 193 | | | | | 4 | 1 | 198 | *4.80 fish/h* |
| A | Lake A6 | GN | 1 | Jul-97 | 0.42 net-units | | | 8 | | 1 | | | | | 9 | *21.60 fish/net-unit* |
| A | Lake A6 | GN | 1 | Aug-97 | 0.46 net-units | | | 1 | | 2 | | | | | 3 | *6.55 fish/net-unit* |
| A | Lake A6 | GN | 2 | Jul-98 | 0.83 net-units | | | 4 | | 1 | | | | | 5 | *6.00 fish/net-unit* |
| A | Lake A6 | GN | 1 | Jul-09 | 0.54 net-units | | | 5 | | | | | | | 5 | *9.23 fish/net-unit* |
| A | Lake A6 | MT | 3 | Jul-09 | 235.8 trap-h | | | | | | | | 1 | | 1 | *0.10 fish/24h* |
| A | Stream A6-7 | EF | 1 | Jun-97 | 829 s | | | 17 | | | | 6 | 5 | | 28 | *2.03 fish/min* |
| A | Stream A6-7 | EF | 1 | Jul-97 | 313 s | | | | | | | 4 | 2 | | 6 | *1.15 fish/min* |
| A | Stream A6-7 | EF | 1 | Jun-98 | 624 s | | | 4 | | | | 2 | 1 | | 7 | *0.67 fish/min* |
| A | Stream A6-7 | EF | 1 | Jun-00 | 640 s | | | | | | | 1 | 3 | | 4 | *0.38 fish/min* |
| A | Stream A6-7 | EF | 1 | Jul-00 | 450 s | | | | | | | 5 | 8 | | 13 | *1.73 fish/min* |
| A | Stream A6-7 | EF | 1 | Sep-00 | 533 s | | | 1 | | | | 1 | 26 | | 28 | *3.15 fish/min* |
| A | Stream A6-7 | EF | 1 | Jun-08 | 409 s | | | 1 | | | | 3 | 18 | | 22 | *3.23 fish/min* |
| A | Pond A7 | MT | 1 | Aug-11 | 142.7 trap-h | | | | | | | | 257 | | 257 | *43.22 fish/24h* |
| A | Stream A7-8 | EF | 1 | Jun-97 | 345 s | | | 4 | | | | 2 | 10 | | 16 | *2.78 fish/min* |
| A | Stream A7-8 | EF | 1 | Jul-97 | 203 s | | | | | | | | 8 | | 8 | *2.36 fish/min* |
| A | Stream A7-8 | EF | 2 | Jun-98 | 1971 s | | | | | | | 1 | 30 | | 31 | *0.94 fish/min* |
| A | Stream A7-8 | EF | 1 | Jul-98 | 300 s | | | 1 | | | | | 12 | | 13 | *2.60 fish/min* |
| A | Stream A7-8 | EF | 1 | Aug-98 | 125 s | | | 1 | | | | | 7 | | 8 | *3.84 fish/min* |
| A | Lake A8 | GN | 3 | Jul-97 | 1.10 net-units | | | 14 | | | | | | | 14 | *12.68 fish/net-unit* |
| A | Lake A8 | GN | 1 | Aug-97 | 0.58 net-units | | | 4 | | | | | | | 4 | *6.86 fish/net-unit* |
| A | Lake A8 | GN | 2 | Jul-98 | 0.96 net-units | | | 1 | | | | | | | 1 | *1.04 fish/net-unit* |
| A | Stream A8-9 | EF | 1 | Jun-98 | 360 s | | | | | | | | 6 | | 6 | *1.00 fish/min* |
| A | Stream A8-37 | EF | 1 | Jun-98 | 106 s | | | | | | | | 4 | | 4 | *2.26 fish/min* |
| A | Stream A8-40 | EF | 1 | Jun-98 | 221 s | | | | | | | | 5 | | 5 | *1.36 fish/min* |
| A | Stream A8-40 | EF | 1 | Jun-00 | 406 s | | | | | | | | 5 | | 5 | *0.74 fish/min* |
| A | Stream A8-40 | EF | 1 | Sep-00 | 294 s | | | | | | | | 4 | | 4 | *0.82 fish/min* |
| A | Pond A9 | EF | 1 | Jul-08 | 162 s | | | | | | | | | | 0 | *0 fish/min* |

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| A | Pond A10 | EF | 1 | Jul-08 | 119 s | | | | | | | | 1 | | 1 | *0.50 fish/min* |
| A | Pond A12 | EF | 1 | Jul-08 | 185 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A12 | MT | 1 | Jul-08 | 42.0 trap-h | | | | | | | | 5 | | 5 | *2.86 fish/24h* |
| A | Pond A13 | EF | 1 | Jul-08 | 166 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A13 | MT | 1 | Jul-08 | 21.0 trap-h | | | | | | | | 1 | | 1 | *1.14 fish/24h* |
| A | Pond A17 | EF | 1 | Aug-98 | 180 s | | | | | | | | 7 | | 7 | *2.33 fish/min* |
| A | Pond A18 | OB | 1 | Aug-11 | - - | | | | | | | | 1 | | 1 | - - |
| A | Pond A19 | MT | 1 | Jul-12 | 186.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Pond A30 | OB | 1 | Aug-11 | - - | | | | | | | | 30 | | 30 | - - |
| A | Pond A31 | OB | 1 | Aug-11 | - - | | | | | | | | 15 | | 15 | - - |
| A | Pond A35 | EF | 1 | Jul-08 | 127 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A37 | EF | 1 | Jul-08 | 126 s | | | | | | | | 1 | | 1 | *0.48 fish/min* |
| A | Pond A38 | EF | 1 | Jul-08 | 107 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A39 | EF | 1 | Jul-08 | 144 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A39 | OB | 1 | Jul-12 | - - | | | | | | | | 1 | | 1 | - - |
| A | Stream A39-54 | EF | 1 | Jun-00 | 342 s | | | | | | | | 7 | | 7 | *1.23 fish/min* |
| A | Stream A39-54 | EF | 1 | Sep-00 | 225 s | | | | | | | | 11 | | 11 | *2.93 fish/min* |
| A | Pond A40 | EF | 1 | Jul-08 | 212 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A40 | EF | 1 | Jul-09 | 225 s | | | | | | | | 2 | | 2 | *0.53 fish/min* |
| A | Pond A40 | MT | 1 | Jul-08 | 42.3 trap-h | | | | | | | | 4 | | 4 | *2.27 fish/24h* |
| A | Pond A40 | MT | 1 | Jul-09 | 36.0 trap-h | | | | | | | | 2 | | 2 | *1.33 fish/24h* |
| A | Pond A44 | MT | 1 | Aug-11 | 22.4 trap-h | | | | | | | | 1 | | 1 | *1.07 fish/24h* |
| A | Stream A44-45 | EF | 1 | Jul-98 | 100 s | | | | | | | | 7 | | 7 | *4.20 fish/min* |
| A | Stream A44-45 | EF | 1 | Jun-00 | 136 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Stream A44-45 | EF | 1 | Jul-00 | 80 s | | | | | | | | 5 | | 5 | *3.75 fish/min* |
| A | Stream A44-45 | EF | 1 | Sep-00 | 176 s | | | | | | | | 5 | | 5 | *1.70 fish/min* |
| A | Pond A45 | MT | 1 | Aug-11 | 22.7 trap-h | | | | | | | | 23 | | 23 | *24.32 fish/24h* |
| A | Stream A45-46 | EF | 1 | Jun-08 | 398 s | | | | | | | | 27 | | 27 | *4.07 fish/min* |
| A | Lake A46 | FN | 1 | Aug-11 | 22.8 h | | | | | | | | 11 | | 11 | *0.48 fish/h* |
| A | Lake A46 | GN | 1 | Aug-11 | 0.19 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| A | Lake A46 | MT | 1 | Aug-11 | 66.9 trap-h | | | | | | | | 17 | | 17 | *6.10 fish/24h* |
| A | Pond A49 | MT | 1 | Aug-11 | 22.6 trap-h | | | | | | | | 1 | | 1 | *1.06 fish/24h* |
| A | Pond A50 | EF | 1 | Jul-09 | 120 s | | | | | | | | | | 0 | *0 fish/min* |
| A | Pond A50 | MT | 1 | Jul-09 | 20.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Pond A51 | EF | 1 | Jul-09 | 273 s | | | | | | | | 2 | | 2 | *0.44 fish/min* |
| A | Pond A51 | MT | 1 | Jul-09 | 41.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Pond A52 | FN | 2 | Aug-08 | 46.3 h | | | | | | | | 556 | | 556 | *12.02 fish/h* |
| A | Pond A52 | GN | 1 | Aug-08 | 3.28 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| A | Pond A52 | MT | 1 | Aug-08 | 144.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| A | Pond A53 | EF | 1 | Jul-09 | 133 s | | | | | | | | 11 | | 11 | *4.96 fish/min* |
| A | Pond A53 | MT | 1 | Jul-09 | 21.0 trap-h | | | | | | | | 2 | | 2 | *2.29 fish/24h* |
| A | Pond A54 | EF | 1 | Jul-08 | 411 s | | | | | | | | 2 | | 2 | *0.29 fish/min* |
| A | Pond A54 | GN | 2 | Aug-98 | 12.71 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| A | Pond A58 | EF | 1 | Aug-98 | 650 s | | | | | | | | 5 | | 5 | *0.46 fish/min* |
| B | Stream B0-1 | EF | 1 | Jun-97 | 974 s | | 3 | 25 | | 3 | | 9 | 7 | 14 | 61 | *3.76 fish/min* |
| B | Stream B0-1 | EF | 1 | Jul-97 | 500 s | 1 | 2 | 12 | | | 3 | 11 | 1 | 23 | 53 | *6.36 fish/min* |
| B | Stream B0-1 | EF | 1 | Jun-98 | 638 s | | | | | | 1 | | 1 | | 2 | *0.19 fish/min* |
| B | Stream B0-1 | EF | 1 | Jul-98 | 450 s | | | 2 | | 1 | | 3 | 2 | 9 | 17 | *2.27 fish/min* |
| B | Stream B0-1 | EF | 1 | Aug-98 | 280 s | | | 10 | | | | 1 | | 14 | 25 | *5.36 fish/min* |
| B | Stream B1-2 | EF | 1 | Jun-97 | 717 s | | | 9 | | | | 1 | 2 | | 12 | *1.00 fish/min* |
| B | Stream B1-2 | EF | 1 | Jul-97 | 419 s | | 10 | 21 | | | | 1 | 1 | 1 | 34 | *4.87 fish/min* |
| B | Stream B1-2 | EF | 1 | Aug-97 | 358 s | 17 | | 2 | | | | 2 | 3 | | 24 | *4.02 fish/min* |
| B | Stream B1-2 | EF | 2 | Jun-98 | 1439 s | | | | | | | 5 | 3 | | 8 | *0.33 fish/min* |
| B | Stream B1-2 | EF | 1 | Jul-98 | 699 s | 3 | 5 | 2 | | | 1 | 7 | | | 18 | *1.55 fish/min* |
| B | Stream B1-2 | EF | 1 | Aug-98 | 451 s | 8 | 3 | 8 | | | 2 | 1 | | 3 | 25 | *3.33 fish/min* |
| B | Lake B2 | AL | 1 | Jun-97 | 1.5 rod-h | | | 4 | | | | | | | 4 | *2.67 fish/rod-h* |
| B | Lake B2 | GN | 2 | Jul-97 | 0.92 net-units | | 1 | | | 6 | | | | | 7 | *7.64 fish/net-unit* |
| B | Lake B2 | GN | 3 | Aug-97 | 1.63 net-units | | | 6 | | 10 | | | | | 16 | *9.85 fish/net-unit* |
| B | Lake B2 | GN | 1 | Jul-98 | 0.94 net-units | | 1 | 5 | | 4 | | | | | 10 | *10.67 fish/net-unit* |
| B | Lake B2 | GN | 4 | Aug-98 | 3.48 net-units | | 3 | 2 | | 14 | | | | | 19 | *5.46 fish/net-unit* |
| B | Stream B3-4 | EF | 1 | Jun-97 | 1025 s | | | 10 | | | 2 | 1 | 10 | | 23 | *1.35 fish/min* |
| B | Stream B3-4 | EF | 1 | Jul-97 | 605 s | 1 | 2 | 3 | | | 4 | 15 | 2 | | 27 | *2.68 fish/min* |
| B | Stream B3-4 | EF | 1 | Aug-97 | 141 s | | | 2 | | | | | | | 2 | *0.85 fish/min* |
| B | Stream B3-4 | EF | 3 | Jun-98 | 2500 s | | | 14 | | | | | 12 | | 26 | *0.62 fish/min* |
| B | Stream B3-4 | EF | 1 | Jul-98 | 693 s | 1 | 1 | 13 | | | 3 | | 1 | | 19 | *1.65 fish/min* |
| B | Stream B3-4 | EF | 1 | Aug-98 | 280 s | | | 4 | | | | 1 | 3 | | 8 | *1.71 fish/min* |
| B | Lake B4 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| B | Lake B4 | GN | 3 | Jul-97 | 1.65 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Lake B4 | GN | 2 | Jul-98 | 1.13 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Lake B4 | FN | 1 | Jul-11 | 16.3 h | | | 1 | | | | | 19 | | 20 | *1.23 fish/h* |
| B | Lake B4 | MT | 1 | Jul-11 | 50.1 trap-h | | | | | | | | 2 | | 2 | *0.96 fish/24h* |
| B | Stream B4-5 | EF | 1 | Jun-97 | 310 s | | | | | | | | 19 | | 19 | *3.68 fish/min* |
| B | Stream B4-5 | EF | 1 | Jul-97 | 471 s | | | 5 | | | | 5 | 32 | | 42 | *5.35 fish/min* |
| B | Stream B4-5 | EF | 1 | Aug-97 | 164 s | | | 1 | | | | 1 | 12 | | 14 | *5.12 fish/min* |
| B | Stream B4-5 | EF | 2 | Jun-98 | 852 s | | | | | | | 2 | 16 | | 18 | *1.27 fish/min* |
| B | Stream B4-5 | EF | 1 | Jul-98 | 400 s | | | 2 | | | 1 | 1 | 7 | | 11 | *1.65 fish/min* |
| B | Stream B4-5 | EF | 1 | Aug-98 | 215 s | | | 7 | | | | | 3 | | 10 | *2.79 fish/min* |
| B | Stream B4-36 | EF | 1 | Jun-97 | 332 s | | | | | | | | 6 | | 6 | *1.08 fish/min* |
| B | Stream B4-45 | EF | 1 | Jun-97 | 172 s | | | | | | | | 6 | | 6 | *2.09 fish/min* |
| B | Stream B4-45 | EF | 1 | Jul-11 | 634 s | | | | | | | | 3 | | 3 | *0.28 fish/min* |
| B | Lake B5 | AL | 2 | Jun-97 | 1.0 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| B | Lake B5 | AL | 1 | Jul-97 | 0.5 rod-h | | | 1 | | | | | | | 1 | *2.00 fish/rod-h* |
| B | Lake B5 | GN | 1 | Jul-97 | 0.31 net-units | | | 9 | | | | | | | 9 | *28.80 fish/net-unit* |
| B | Lake B5 | GN | 1 | Aug-97 | 0.63 net-units | | | 4 | | | | | | | 4 | *6.40 fish/net-unit* |
| B | Lake B5 | GN | 1 | Jul-98 | 1.27 net-units | | | 14 | | | | | | | 14 | *11.02 fish/net-unit* |
| B | Lake B5 | GN | 1 | Aug-98 | 7.13 net-units | | | 11 | | | 1 | | | | 12 | *1.68 fish/net-unit* |
| B | Lake B5 | FD | 1 | Jun-98 | - - | | | | | | 1 | | | | 1 | - - |
| B | Stream B5-6 | EF | 1 | Jun-97 | 276 s | | | | | | | 1 | 34 | | 35 | *7.61 fish/min* |

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| B | Stream B5-6 | EF | 1 | Jul-97 | 248 s | | | 19 | | | | | 21 | | 40 | *9.68 fish/min* |
| B | Stream B5-6 | EF | 2 | Jun-98 | 1103 s | | | 1 | | | | | 24 | | 25 | *1.36 fish/min* |
| B | Stream B5-6 | EF | 1 | Jul-98 | 220 s | | | 11 | | | | 1 | 8 | | 20 | *5.45 fish/min* |
| B | Stream B5-6 | EF | 1 | Aug-98 | 184 s | | | 2 | | | | | | | 2 | *0.65 fish/min* |
| B | Stream B5-31 | EF | 1 | Jul-11 | 474 s | | | 2 | | | | 1 | 13 | | 16 | *2.03 fish/min* |
| B | Lake B6 | AL | 1 | Jul-97 | 1.0 rod-h | | | 2 | | | | | | | 2 | *2.00 fish/rod-h* |
| B | Lake B6 | FN | 1 | Jul-08 | 22.5 h | | | 1 | | 3 | | | 6 | | 10 | *0.44 fish/h* |
| B | Lake B6 | FN | 1 | Jul-08 | 21.0 h | | | | | | | | | | 0 | *0 fish/h* |
| B | Stream B6-7 | EF | 1 | Jun-97 | 543 s | | | 8 | | | | 1 | 4 | | 13 | *1.44 fish/min* |
| B | Stream B6-7 | EF | 1 | Jul-97 | 162 s | | | 26 | | | | | 4 | | 30 | *11.11 fish/min* |
| B | Stream B6-7 | EF | 1 | Aug-97 | 115 s | | | 1 | | | | | 3 | | 4 | *2.09 fish/min* |
| B | Stream B6-7 | EF | 1 | Jun-98 | 971 s | | | | | | 2 | 2 | 13 | | 17 | *1.05 fish/min* |
| B | Stream B6-7 | EF | 1 | Jun-98 | 466 s | | | 3 | | | | | 1 | | 4 | *0.52 fish/min* |
| B | Stream B6-7 | EF | 1 | Jul-98 | 438 s | | | 8 | | | | 6 | 6 | | 20 | *2.74 fish/min* |
| B | Stream B6-7 | EF | 1 | Aug-98 | 304 s | | | 8 | | | | 2 | | | 10 | *1.97 fish/min* |
| B | Lake B7 | AL | 1 | Jun-97 | 1.0 rod-h | | | 3 | | | | | | | 3 | *3.00 fish/rod-h* |
| B | Lake B7 | AL | 1 | Jul-97 | 0.8 rod-h | | | 2 | | | | | | | 2 | *2.67 fish/rod-h* |
| B | Lake B7 | AL | 1 | Aug-98 | 5.0 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| B | Lake B7 | FD | 1 | Jul-98 | - - | | | | | | 1 | | | | 1 | - - |
| B | Lake B7 | FN | 4 | Jul-08 | 75.0 h | | | 215 | | | 1 | | 4 | | 220 | *2.93 fish/h* |
| B | Lake B7 | FN | 3 | Aug-08 | 63.5 h | | | 77 | | 6 | 1 | | | | 84 | *1.32 fish/h* |
| B | Lake B7 | GN | 1 | Jul-97 | 0.54 net-units | | | 3 | | 1 | | | | | 4 | *7.38 fish/net-unit* |
| B | Lake B7 | GN | 1 | Aug-97 | 0.63 net-units | | | | | 4 | | | | | 4 | *6.40 fish/net-unit* |
| B | Lake B7 | GN | 2 | Jul-98 | 1.08 net-units | | | 4 | | 2 | | | | | 6 | *5.54 fish/net-unit* |
| B | Lake B7 | GN | 11 | Aug-98 | 7.55 net-units | | | 3 | | 9 | | | | | 12 | *1.59 fish/net-unit* |
| B | Lake B7 | GN | 5 | Jul-08 | 1.48 net-units | | | 10 | | 13 | | | | | 23 | *15.55 fish/net-unit* |
| B | Stream B7-8 | EF | 1 | Jun-98 | 348 s | | | | | | | | 1 | | 1 | *0.17 fish/min* |
| B | Pond B8 | EF | 1 | Jul-08 | 279 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B8 | EF | 1 | Jul-09 | 217 s | | | | | | | | 2 | | 2 | *0.55 fish/min* |
| B | Pond B8 | MT | 1 | Jul-08 | 43.5 trap-h | | | | | | | | 1 | | 1 | *0.55 fish/24h* |
| B | Pond B8 | MT | 1 | Jul-09 | 40.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B9 | EF | 1 | Jul-08 | 230 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B9 | EF | 1 | Jul-09 | 248 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B9 | GN | 1 | Oct-98 | 5.13 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Pond B9 | MT | 1 | Jul-08 | 42.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B9 | MT | 1 | Jul-09 | 39.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B10 | EF | 1 | Jul-08 | 223 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B10 | EF | 1 | Jul-09 | 373 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B10 | GN | 1 | Oct-98 | 5.08 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Pond B10 | MT | 1 | Jul-08 | 42.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B10 | MT | 1 | Jul-09 | 31.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B18 | OB | 1 | Jul-12 | - - | | | | | | | | 1 | | 1 | - - |
| B | Pond B19 | OB | 1 | Jul-12 | - - | | | | | | | | 2 | | 2 | - - |
| B | Pond B25 | EF | 1 | Jul-09 | 481 s | | | | | | | | 3 | | 3 | *0.37 fish/min* |
| B | Pond B25 | MT | 1 | Jul-09 | 73.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B28 | EF | 1 | Jul-09 | 192 s | | | | | | | | 1 | | 1 | *0.31 fish/min* |
| B | Pond B28 | MT | 1 | Jul-09 | 44.0 trap-h | | | | | | | | 2 | | 2 | *1.09 fish/24h* |
| B | Pond B30 | EF | 1 | Jul-08 | 156 s | | | | | | | | 10 | | 10 | *3.85 fish/min* |
| B | Pond B30 | MT | 1 | Jul-08 | 44.2 trap-h | | | | | | | | 4 | | 4 | *2.17 fish/24h* |
| B | Pond B30 | EF | 1 | Jul-11 | 140 s | | | | | | | | 3 | | 3 | *1.29 fish/min* |
| B | Pond B30 | MT | 1 | Jul-11 | 11.8 trap-h | | | | | | | | 20 | | 20 | *40.68 fish/24h* |
| B | Stream B30-6 | EF | 1 | Jul-11 | 197 s | | | | | | | 3 | 6 | | 9 | *2.74 fish/min* |
| B | Stream B30-6 | MT | 1 | Jul-11 | 5.8 trap-h | | | | | | | | 9 | | 9 | *37.24 fish/24h* |
| B | Pond B31 | EF | 1 | Jul-08 | 125 s | | | | | | | | 25 | | 25 | *12.00 fish/min* |
| B | Pond B31 | MT | 1 | Jul-08 | 44.2 trap-h | | | | | | | | 2 | | 2 | *1.09 fish/24h* |
| B | Stream B31-30 | EF | 1 | Jul-11 | 460 s | | | 2 | | | | | 2 | | 4 | *0.52 fish/min* |
| B | Stream B31-30 | MT | 1 | Jul-11 | 5.4 trap-h | | | | | | | | 5 | | 5 | *22.22 fish/24h* |
| B | Pond B32 | EF | 1 | Jul-11 | 302 s | | | | | | | | 1 | | 1 | *0.20 fish/min* |
| B | Pond B32 | EF | 1 | Jul-08 | 294 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B32 | MT | 1 | Jul-08 | 43.5 trap-h | | | | | | | | 1 | | 1 | *0.55 fish/24h* |
| B | Pond B33 | EF | 1 | Jul-08 | 285 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B33 | MT | 1 | Jul-08 | 43.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B33a | EF | 1 | Jul-09 | 143 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Pond B33a | MT | 1 | Jul-09 | 36.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Lake B34 | FN | 1 | Jul-11 | 16.4 h | | | | | | | | 282 | | 282 | *17.20 fish/h* |
| B | Lake B34 | GN | 1 | Jul-11 | 0.13 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Lake B34 | MT | 1 | Jul-11 | 50.1 trap-h | | | | | | | | 56 | | 56 | *26.83 fish/24h* |
| B | Pond B36 | EF | 1 | Jul-11 | 517 s | | | | | | | | 5 | | 5 | *0.58 fish/min* |
| B | Pond B36 | MT | 1 | Jul-11 | 50.4 trap-h | | | | | | | | 138 | | 138 | *65.71 fish/24h* |
| B | Pond B37 | OB | 1 | Aug-11 | - - | | | | | | | | 8 | | 8 | - - |
| B | Pond B38 | OB | 1 | Aug-11 | - - | | | | | | | | 20 | | 20 | - - |
| B | Lake B45 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| B | Lake B45 | FN | 1 | Jul-11 | 16.0 h | | | 1 | | | | | 295 | | 296 | *18.50 fish/h* |
| B | Lake B45 | GN | 1 | Jul-11 | 1.07 net-units | | | 1 | | | | | | | 1 | *0.93 fish/net-unit* |
| B | Lake B45 | MT | 1 | Jul-11 | 48.9 trap-h | | | | | | | | 3 | | 3 | *1.47 fish/24h* |
| B | Stream B45-46 | EF | 1 | Jun-97 | 362 s | | | 2 | | | | | 24 | | 26 | *4.31 fish/min* |
| B | Lake B46 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| B | Lake B46 | FN | 1 | Jul-11 | 18.8 h | | | 1 | | | | | 14 | | 15 | *0.80 fish/h* |
| B | Lake B46 | GN | 1 | Jul-11 | 0.42 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Lake B46 | MT | 1 | Jul-11 | 69.9 trap-h | | | | | | | | 2 | | 2 | *0.69 fish/24h* |
| B | Stream B46-66 | EF | 1 | Jun-98 | 803 s | | | | | | | | 4 | | 4 | *0.30 fish/min* |
| B | Stream B46-66 | EF | 1 | Jul-98 | 340 s | | | 4 | | | | | 7 | | 11 | *1.94 fish/min* |
| B | Stream B46-66 | EF | 1 | Jun-00 | 605 s | | | | | | | | 2 | | 2 | *0.20 fish/min* |
| B | Stream B46-66 | EF | 1 | Jul-00 | 140 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Stream B46-66 | EF | 1 | Sep-00 | 392 s | | | 8 | | | 4 | | 5 | | 17 | *2.60 fish/min* |
| B | Pond B51 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| B | Stream B51-52 | EF | 1 | Jun-97 | 470 s | | | 3 | | | | | 6 | | 9 | *1.15 fish/min* |
| B | Lake B52 | AL | 1 | Jun-97 | 0.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| B | Lake B52 | FN | 1 | Jul-11 | 17.8 h | | | | | | | | 198 | | 198 | *11.12 fish/h* |
| B | Lake B52 | GN | 1 | Jul-11 | 0.45 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| B | Lake B52 | MT | 1 | Jul-11 | 53.4 trap-h | | | | | | | | 130 | | 130 | *58.43 fish/24h* |
| B | Stream B52-53 | EF | 1 | Jun-97 | 247 s | | | | | | | | 23 | | 23 | *5.59 fish/min* |
| B | Stream B52-75 | EF | 1 | Jun-00 | 440 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Stream B52-75 | EF | 1 | Sep-00 | 166 s | | | | | | | | 1 | | 1 | *0.36 fish/min* |
| B | Lake B53 | GN | 1 | Jul-11 | 0.42 net-units | | | 4 | | | | | | | 4 | *9.52 fish/net-unit* |
| B | Lake B53 | FN | 1 | Jul-11 | 17.5 h | | | 1 | | | | | 42 | | 43 | *2.46 fish/h* |
| B | Lake B53 | MT | 1 | Jul-11 | 52.8 trap-h | | | | | | | | 22 | | 22 | *10.00 fish/24h* |
| B | Stream B53-54 | EF | 1 | Jul-98 | 220 s | | | | | | | | 12 | | 12 | *3.27 fish/min* |
| B | Stream B53-54 | EF | 1 | Jun-00 | 440 s | | | | | | | | 3 | | 3 | *0.41 fish/min* |
| B | Stream B53-54 | EF | 1 | Sep-00 | 176 s | | | | | | | | 12 | | 12 | *4.09 fish/min* |
| B | Lake B59 | MT | 1 | Jul-12 | 68.9 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Lake B59 | OB | 1 | Jul-12 | - - | | | 2 | | | | | | | 2 | *- -* |
| B | Lake B60 | MT | 1 | Jul-12 | 103.2 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B61 | MT | 1 | Jul-12 | 121.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B62 | MT | 1 | Jul-12 | 81.1 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| B | Pond B62 | OB | 1 | Aug-11 | - - | | | | | | | | 15 | | 15 | *- -* |
| B | Pond B62 | OB | 1 | Jul-12 | - - | | | | | | | | 1 | | 1 | *- -* |
| B | Stream B68-69 | EF | 1 | Jun-97 | 526 s | | | 1 | | | | 1 | 6 | | 8 | *0.91 fish/min* |
| B | Stream B68-69 | EF | 1 | Jul-98 | 232 s | | | 8 | | | | | | | 8 | *2.07 fish/min* |
| B | Stream B68-69 | EF | 1 | Jun-00 | 506 s | | | | | | | | 1 | | 1 | *0.12 fish/min* |
| B | Stream B68-69 | EF | 1 | Jul-00 | 390 s | | | | | | | 1 | 3 | | 4 | *0.62 fish/min* |
| B | Stream B68-69 | EF | 1 | Sep-00 | 350 s | | | | | | | | | | 0 | *0 fish/min* |
| B | Lake B69 | FN | 1 | Jul-11 | 17.8 h | | | 1 | | | | | 2 | | 3 | *0.17 fish/h* |
| B | Lake B69 | GN | 1 | Jul-11 | 0.46 net-units | | 2 | 1 | | | | | | | 3 | *6.52 fish/net-unit* |
| B | Lake B69 | MT | 1 | Jul-11 | 54.3 trap-h | | | | | | | 1 | 4 | | 5 | *2.21 fish/24h* |
| B | Stream B75-80 | EF | 1 | Jun-00 | 400 s | | | | | | | | 3 | | 3 | *0.45 fish/min* |
| B | Stream B75-80 | EF | 1 | Sep-00 | 232 s | | | | | | | | | | 0 | *0 fish/min* |
| C | Pond C6 | FN | 1 | Aug-11 | 16.7 h | | | | | | | | 69 | | 69 | *4.13 fish/h* |
| C | Pond C7 | FN | 1 | Aug-11 | 16.5 h | | | | | | | | 228 | 5 | 233 | *14.12 fish/h* |
| C | Pond C7 | GN | 1 | Aug-11 | 0.13 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| C | Pond C9 | OB | 1 | Aug-11 | - - | | | | | | | | 40 | | 40 | *- -* |
| C | Lake C10 | FN | 1 | Aug-11 | 19.7 h | | | | | | | | 12 | | 12 | *0.61 fish/h* |
| C | Lake C10 | GN | 1 | Aug-11 | 0.09 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Stream D0-1 | EF | 1 | Jun-97 | 610 s | | 2 | 2 | | | | 29 | 26 | | 59 | *5.80 fish/min* |
| D | Stream D0-1 | EF | 1 | Jul-97 | 568 s | | 4 | 5 | | | 1 | 14 | 2 | 3 | 29 | *3.06 fish/min* |
| D | Stream D0-1 | EF | 1 | Aug-97 | 187 s | 1 | | | | | | 3 | 10 | | 14 | *4.49 fish/min* |
| D | Stream D0-1 | EF | 1 | Jun-98 | 471 s | 3 | | 1 | | | | 1 | 3 | 6 | 14 | *1.78 fish/min* |
| D | Stream D0-1 | EF | 1 | Aug-98 | 304 s | | | 1 | | | | 2 | | 11 | 14 | *2.76 fish/min* |
| D | Stream D0-1 | FN | 3 | Sep-00 | 94.2 h | 11 | | 2 | 2 | 2 | 4 | 3 | 54 | 27 | 105 | *1.12 fish/h* |
| D | Lake D1 | AL | 2 | Jun-97 | 1.8 rod-h | | 1 | | | | | | | | 1 | *0.56 fish/rod-h* |
| D | Lake D1 | AL | 1 | Aug-97 | 2.0 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Lake D1 | AL | 1 | Jul-00 | 3.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Lake D1 | AL | 1 | Aug-00 | 3.0 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Lake D1 | FN | 3 | Sep-00 | 58.5 h | 21 | | 101 | 4 | 78 | 19 | | 233 | 155 | 611 | *10.44 fish/h* |
| D | Lake D1 | FN | 2 | Jul-09 | 69.0 h | 1 | 2 | 133 | | | | | 12 | 2 | 150 | *2.17 fish/h* |
| D | Lake D1 | GN | 1 | Jul-97 | 0.46 net-units | 6 | | | | 3 | | | | | 9 | *19.64 fish/net-unit* |
| D | Lake D1 | GN | 10 | Aug-97 | 4.58 net-units | 37 | 1 | | | 15 | | | | | 53 | *11.56 fish/net-unit* |
| D | Lake D1 | GN | 1 | Jul-98 | 0.40 net-units | 1 | | 3 | | | | | | | 4 | *10.11 fish/net-unit* |
| D | Lake D1 | GN | 2 | Aug-98 | 1.25 net-units | 1 | | | | 2 | | | | | 3 | *2.40 fish/net-unit* |
| D | Lake D1 | GN | 6 | Jul-99 | 8.29 net-units | 2 | 1 | 13 | | 41 | | | | | 57 | *6.87 fish/net-unit* |
| D | Lake D1 | GN | 10 | Jul/Aug-00 | 10.24 net-units | 2 | | 11 | | 2 | | | | | 15 | *1.46 fish/net-unit* |
| D | Lake D1 | GN | 5 | Sep-00 | 7.65 net-units | 4 | | 1 | | 22 | | | | | 27 | *3.53 fish/net-unit* |
| D | Lake D1 | GN | 1 | Jul-09 | 0.33 net-units | | | 2 | | | | | | | 2 | *6.00 fish/net-unit* |
| D | Lake D1 | GN | 1 | Jul-11 | 0.85 net-units | | 4 | 2 | 10 | | | | | | 16 | *18.82 fish/net-unit* |
| D | Lake D1 | AL | 1 | Jul-11 | 1.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Stream D1-2 | EF | 1 | Jun-97 | 164 s | | | 6 | | | | | 76 | | 82 | *30.00 fish/min* |
| D | Stream D1-2 | EF | 1 | Jul-97 | 166 s | | | | | | | 10 | 17 | 2 | 29 | *10.48 fish/min* |
| D | Stream D1-2 | EF | 1 | Aug-97 | 94 s | | | | | | | | 11 | | 11 | *7.02 fish/min* |
| D | Pond D2 | AL | 1 | Jun-97 | 0.4 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Lake D3 | GN | 2 | Aug-97 | 1.54 net-units | 2 | | 7 | | | | | | | 9 | *5.84 fish/net-unit* |
| D | Lake D3 | GN | 1 | Jul-11 | 0.71 net-units | | | 1 | | | | | | | 1 | *1.41 fish/net-unit* |
| D | Lake D3 | AL | 1 | Jul-11 | 1.5 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Stream D3-4 | EF | 1 | Jun-97 | 297 s | | | | | | | | 45 | | 45 | *9.09 fish/min* |
| D | Pond D4 | AL | 1 | Jun-97 | 0.4 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Pond D4 | GN | 2 | Jul-97 | 5.73 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Pond D4 | FN | 1 | Jul-11 | 17.9 h | | | | | | | | 186 | | 186 | *10.39 fish/h* |
| D | Pond D4 | MT | 1 | Jul-11 | 53.1 trap-h | | | | | | | | 10 | | 10 | *4.52 fish/24h* |
| D | Pond D4 | GN | 1 | Jul-11 | 0.29 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Stream D4-5 | EF | 1 | Jun-97 | 132 s | | | | | | | | 3 | | 3 | *1.36 fish/min* |
| D | Lake D5 | GN | 1 | Jul-97 | 4.50 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Lake D5 | FN | 1 | Jul-11 | 22.7 h | | | | | | | | 55 | | 55 | *2.42 fish/h* |
| D | Lake D5 | MT | 1 | Jul-11 | 58.2 trap-h | | | | | | | | 20 | | 20 | *8.25 fish/24h* |
| D | Lake D5 | GN | 1 | Jul-11 | 0.38 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Stream D5-6 | EF | 1 | Jun-97 | 415 s | | | | | | | | 28 | | 28 | *4.05 fish/min* |
| D | Stream D5-6 | EF | 1 | Jul-97 | 296 s | | | | | | | | 343 | | 343 | *69.53 fish/min* |
| D | Pond D6 | EF | 1 | Jul-11 | 437 s | | | | | | | | 13 | | 13 | *1.78 fish/min* |
| D | Stream D6-7 | EF | 1 | Jun-97 | 125 s | | | | | | | | 61 | | 61 | *29.28 fish/min* |
| D | Stream D6-7 | EF | 1 | Jul-97 | 110 s | | | | | | | | 79 | | 79 | *43.09 fish/min* |
| D | Stream D6-7 | EF | 1 | Aug-97 | 79 s | | | | | | | | 8 | | 8 | *6.08 fish/min* |
| D | Lake D7 | AL | 1 | Jun-97 | 0.6 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| D | Lake D7 | AL | 1 | Jul-97 | 2.0 rod-h | | | 3 | | | | | | | 3 | *1.50 fish/rod-h* |
| D | Lake D7 | GN | 3 | Jul-97 | 1.96 net-units | | | 6 | | | | | | | 6 | *3.06 fish/net-unit* |
| D | Lake D7 | GN | 1 | Aug-97 | 0.65 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Lake D8 | FN | 1 | Jul-11 | 26.2 h | | | | | | | | 183 | | 183 | *6.98 fish/h* |
| D | Lake D8 | GN | 1 | Jul-11 | 0.76 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| D | Lake D8 | MT | 1 | Jul-11 | 78.5 trap-h | | | | | | | | 132 | | 132 | *40.36 fish/24h* |

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| D | Lake D23 | FN | 1 | Jul-11 | 40.2 h | | | | | | | | 37 | | 37 | *0.92 fish/h* |
| D | Lake D23 | MT | 1 | Jul-11 | 131.3 trap-h | | | | | | | | 109 | | 109 | *19.92 fish/24h* |
| D | Lake D23 | GN | 1 | Jul-11 | 0.73 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| E | Lake E3 | GN | 1 | Jul-11 | 1.05 net-units | | 3 | | 2 | | | | | | 5 | *4.76 fish/net-unit* |
| E | Lake E3 | MT | 1 | Jul-11 | 61.3 trap-h | | | | | | | | 11 | | 11 | *4.31 fish/24h* |
| E | Lake E3 | FN | 1 | Jul-11 | 14.1 h | | | | | | | | | | 0 | *0 fish/h* |
| E | Lake E4 | FN | 1 | Jul-11 | 15.5 h | | | 3 | | | | | 10 | | 13 | *0.84 fish/h* |
| E | Lake E4 | MT | 1 | Jul-11 | 38.6 trap-h | | | | | | | | 32 | | 32 | *19.90 fish/24h* |
| E | Lake E4 | GN | 1 | Jul-11 | 0.32 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| E | Stream E4-5 | EF | 1 | Jul-11 | 268 s | | | | | | | | 4 | | 4 | *0.90 fish/min* |
| E | Stream E4-5 | MT | 1 | Jul-11 | 22.8 trap-h | | | | | | | | 3 | | 3 | *3.16 fish/24h* |
| F | Stream F0-1 | EF | 1 | Jun-97 | 347 s | | 4 | 4 | | | | 1 | 14 | 9 | 32 | *5.53 fish/min* |
| F | Stream F5-6 | EF | 1 | Jun-97 | 137 s | | | | | | | | 22 | | 22 | *9.64 fish/min* |
| G | Stream G0-1 | EF | 1 | Jun-97 | 350 s | | 4 | | | | | | 30 | 2 | 36 | *6.17 fish/min* |
| G | Stream G0-1 | EF | 1 | Jul-09 | 442 s | | | | | | | | 55 | | 55 | *7.47 fish/min* |
| G | Pond G1 | EF | 1 | Jul-09 | 485 s | | | | | | | | 77 | | 77 | *9.53 fish/min* |
| G | Pond G1 | GN | 1 | Jul-09 | 3.92 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| G | Pond G1 | MT | 1 | Jul-09 | 190.0 trap-h | | | | | | | | 1 | | 1 | *0.13 fish/24h* |
| G | Stream G1-2 | EF | 1 | Jun-97 | 399 s | | | | | | | | 15 | | 15 | *2.26 fish/min* |
| G | Lake G2 | AL | 1 | Jun-97 | 0.8 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| G | Lake G2 | FN | 2 | Jul-09 | 89.0 h | | | | | | | | 7 | | 7 | *0.08 fish/h* |
| G | Lake G2 | GN | 4 | Jul-97 | 4.44 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| G | Lake G2 | GN | 1 | Aug-97 | 0.52 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| G | Lake G2 | MT | 2 | Jul-09 | 546.0 trap-h | | | | | | | | 1 | | 1 | *0.04 fish/24h* |
| H | Stream H0-1 | EF | 1 | Jul-09 | 382 s | | | | | | | | 50 | | 50 | *7.85 fish/min* |
| H | Stream H0-1 | EF | 1 | Jun-12 | 132 s | | | 1 | | | | | 2 | | 3 | *1.36 fish/min* |
| H | Pond H1 | EF | 1 | Aug-08 | 396 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H1 | EF | 1 | Jul-09 | 435 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H1 | MT | 1 | Aug-08 | 42.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H1 | MT | 1 | Jul-09 | 48.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Stream H1-2 | EF | 1 | Jun-12 | 156 s | | | | | | | | 2 | | 2 | *0.77 fish/min* |
| H | Pond H2 | EF | 1 | Aug-08 | 120 s | | | 1 | | | | | | | 1 | *0.50 fish/min* |
| H | Pond H2 | EF | 1 | Jul-09 | 254 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H2 | MT | 1 | Aug-08 | 21.5 trap-h | | | 1 | | | | | | | 1 | *1.12 fish/24h* |
| H | Pond H2 | MT | 1 | Jul-09 | 34.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H2a | EF | 1 | Jul-09 | 254 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Stream H2-3 | EF | 1 | Jun-12 | 123 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H3 | EF | 1 | Aug-08 | 169 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H3 | EF | 1 | Jul-09 | 285 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H3 | MT | 1 | Aug-08 | 18.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H3 | MT | 1 | Jul-09 | 35.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Stream H3-4 | EF | 1 | Jun-12 | 162 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H4 | EF | 1 | Aug-08 | 130 s | | | | | | | | 3 | | 3 | *1.38 fish/min* |
| H | Pond H4 | EF | 1 | Jul-09 | 129 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H4 | MT | 1 | Aug-08 | 18.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H4 | MT | 1 | Jul-09 | 19.3 trap-h | | | | | | | | 1 | | 1 | *1.25 fish/24h* |
| H | Stream H4-5 | EF | 1 | Jun-12 | 143 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H5 | EF | 1 | Aug-08 | 142 s | | | | | | | | 5 | | 5 | *2.11 fish/min* |
| H | Pond H5 | EF | 1 | Jul-09 | 299 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H5 | MT | 1 | Aug-08 | 17.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H5 | MT | 1 | Jul-09 | 40.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Stream H5-17 | EF | 1 | Jul-09 | 393 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Stream H5-17 | EF | 1 | Jun-12 | 136 s | | | | | | | | 3 | | 3 | *1.32 fish/min* |
| H | Pond H6 | EF | 1 | Aug-08 | 226 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H6 | EF | 1 | Jul-09 | 344 s | | | | | | | | 4 | | 4 | *0.70 fish/min* |
| H | Pond H6 | MT | 1 | Aug-08 | 17.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H6 | MT | 1 | Jul-09 | 90.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H7 | EF | 1 | Aug-08 | 117 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H7 | EF | 1 | Jul-09 | 124 s | | | | | | | | 3 | | 3 | *1.45 fish/min* |
| H | Pond H7 | MT | 1 | Aug-08 | 18.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H7 | MT | 1 | Jul-09 | 45.0 trap-h | | | | | | | | 2 | | 2 | *1.07 fish/24h* |
| H | Pond H8 | EF | 1 | Aug-08 | 149 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H8 | EF | 1 | Jul-09 | 276 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H8 | MT | 1 | Aug-08 | 18.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H8 | MT | 1 | Jul-09 | 57.0 trap-h | | | | | | | | 1 | | 1 | *0.42 fish/24h* |
| H | Pond H9 | EF | 1 | Aug-08 | 212 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H9 | EF | 1 | Jul-09 | 238 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H9 | MT | 1 | Aug-08 | 18.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H9 | MT | 1 | Jul-09 | 38.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H10 | EF | 1 | Aug-08 | 100 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H10 | EF | 1 | Jul-09 | 124 s | | | | | | | | 2 | | 2 | *0.97 fish/min* |
| H | Pond H10 | MT | 1 | Jul-09 | 19.8 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H11 | EF | 1 | Aug-08 | 147 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H11 | EF | 1 | Jul-09 | 157 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H11 | MT | 1 | Aug-08 | 19.8 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H11 | MT | 1 | Jul-09 | 40.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H12 | EF | 1 | Aug-08 | 164 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H12 | EF | 1 | Jul-09 | 497 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H12 | MT | 1 | Aug-08 | 20.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H12 | MT | 1 | Jul-09 | 43.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H13 | EF | 1 | Aug-08 | 221 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H13 | EF | 1 | Jul-09 | 1231 s | | | | | | | | 1 | | 1 | *0.05 fish/min* |
| H | Pond H13 | MT | 1 | Aug-08 | 20.8 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H13 | MT | 1 | Jul-09 | 136.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H14 | EF | 1 | Aug-08 | 101 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H14 | EF | 1 | Jul-09 | 115 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H14 | MT | 1 | Aug-08 | 21.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H14 | MT | 1 | Jul-09 | 48.5 trap-h | | | | | | | | | | 0 | *0 fish/24h* |

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| H | Pond H14a | EF | 1 | Jul-09 | 257 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H14a | MT | 1 | Jul-09 | 50.7 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H15 | EF | 1 | Aug-08 | 287 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H15 | EF | 1 | Jul-09 | 673 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H15 | MT | 1 | Aug-08 | 22.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H15 | MT | 1 | Jul-09 | 115.0 trap-h | | | | | | | | 1 | | 1 | *0.21 fish/24h* |
| H | Pond H15d | EF | 1 | Jul-09 | 180 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H15d | MT | 1 | Jul-09 | 62.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H15e | EF | 1 | Jul-09 | 192 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H15e | MT | 1 | Jul-09 | 60.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H15g | EF | 1 | Jul-09 | 361 s | | | | | | | | 1 | | 1 | *0.17 fish/min* |
| H | Pond H15g | MT | 1 | Jul-09 | 34.5 trap-h | | | | | | | | 1 | | 1 | *0.70 fish/24h* |
| H | Pond H16 | EF | 1 | Aug-08 | 120 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H16 | EF | 1 | Jul-09 | 217 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H16 | MT | 1 | Aug-08 | 20.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H16 | MT | 1 | Jul-09 | 17.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H17 | EF | 1 | Aug-08 | 444 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H17 | EF | 1 | Jul-09 | 1395 s | | | | | | | | 7 | | 7 | *0.30 fish/min* |
| H | Pond H17 | FN | 2 | Jul-09 | 50.0 h | | | | | | | | 4 | | 4 | *0.08 fish/h* |
| H | Pond H17 | GN | 1 | Aug-08 | 2.09 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| H | Pond H17 | GN | 2 | Jul-09 | 4.38 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| H | Pond H17 | MT | 1 | Aug-08 | 17.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H17 | MT | 1 | Jul-09 | 200.0 trap-h | | | | | | | | 1 | | 1 | *0 fish/24h* |
| H | Pond H17 | GN | 1 | Jul-11 | 0.36 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| H | Pond H18 | EF | 1 | Aug-08 | 221 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H18 | EF | 1 | Jul-09 | 380 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H18 | MT | 1 | Aug-08 | 19.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H18 | MT | 1 | Jul-09 | 41.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H19 | EF | 1 | Aug-08 | 266 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H19 | GN | 1 | Aug-08 | 6.00 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| H | Pond H19 | MT | 3 | Aug-08 | 436.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H20 | EF | 1 | Aug-08 | 398 s | | | | | | | | | | 0 | *0 fish/min* |
| H | Pond H20 | GN | 1 | Aug-08 | 5.50 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| H | Pond H20 | MT | 1 | Aug-08 | 259.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| H | Pond H20 | GN | 1 | Jul-11 | 0.12 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| J | Pond I1 | FN | 1 | Jul-12 | 15.4 h | | | | | | | | | | 0 | *0 fish/h* |
| J | Stream J0-1 | EF | 1 | Jul-04 | 1728 s | | | | | | | | 102 | | 102 | *3.54 fish/min* |
| J | Lake J1 | GN | 1 | Jul-09 | 6.50 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| J | Lake J1 | MT | 1 | Jul-09 | 195.3 trap-h | | | | | | | | 14 | | 14 | *1.72 fish/24h* |
| J | Lake J1 | FN | 1 | Jul-12 | 16.3 h | | | | | | | | 1 | | 1 | *0.06 fish/h* |
| J | Pond J2 | OB | 1 | Aug-11 | - - | | | | | | | | 20 | | 20 | - - |
| J | Pond J2 | MT | 1 | Jul-12 | 28.9 trap-h | | | | | | | | 1 | | 1 | *1 fish/24h* |
| J | Pond J3 | MT | 1 | Jul-12 | 13.7 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| J | Pond J4 | MT | 1 | Jul-12 | 13.4 trap-h | | | | | | | | 1 | | 1 | *2 fish/24h* |
| J | Pond J5 | MT | 1 | Jul-12 | 13.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| J | Pond J6 | MT | 1 | Jul-12 | 13.3 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| J | Pond J7 | MT | 1 | Jul-12 | 28.0 trap-h | | | | | | | | 1 | | 1 | *1 fish/24h* |
| J | Pond J8 | MT | 1 | Jul-12 | 29.0 trap-h | | | | | | | | 1 | | 1 | *1 fish/24h* |
| O | Pond O2 | GN | 6 | Aug-11 | 0.68 net-units | 1 | | | | | | | | | 1 | *1.47 fish/net-unit* |
| O | Pond O2 | FN | 1 | Aug-11 | 18.4 h | | | | | | | | 55 | | 55 | *2.99 fish/h* |
| O | Pond O4 | FN | 1 | Aug-11 | 17.8 h | | | | | | | | 33 | | 33 | *1.85 fish/h* |
| O | Pond O4 | GN | 1 | Aug-11 | 0.21 net-units | | | | | | | | | | 0 | *0 fish/net-unit* |
| P | Pond P2 | FN | 1 | Aug-11 | 50.5 h | | | | | | | | 268 | | 268 | *5.31 fish/h* |
| CH | Lake CH6 | FN | 2 | Aug-08 | 42.8 h | | 4 | 10 | | | 1 | | | | 15 | *0.35 fish/h* |
| CH | Lake CH6 | GN | 3 | Aug-08 | 1.92 net-units | | 13 | 2 | | | | | | | 15 | *7.83 fish/net-unit* |
| CH | Lake CH6 | MT | 1 | Aug-08 | 94.0 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| Control | Lake Control | GN | 1 | Jul-11 | 0.34 net-units | | 3 | | | | | | | | 3 | *8.82 fish/net-unit* |
| Control | Lake Control | FN | 1 | Jul-11 | 18.0 h | | 1 | | | | 1 | | 30 | | 32 | *1.78 fish/h* |
| Control | Lake Control | AL | 1 | Jul-11 | 2.5 rod-h | | 5 | | | | | | | | 5 | *2.00 fish/rod-h* |
| Control | Lake Control | FN | 1 | Jul-11 | 42.9 h | | 4 | 2 | | | | | 7 | | 13 | *0.30 fish/h* |
| Control | Lake Control | GN | 1 | Jul-11 | 1.33 net-units | | 3 | | 42 | | | | | | 45 | *33.83 fish/net-unit* |
| Control | Lake Control | MT | 1 | Jul-11 | 274.5 trap-h | | | | | | | 1 | 1 | | 2 | *0.17 fish/24h* |
| ML | Lake ML-E | AL | 2 | Jun-97 | 2.3 rod-h | | 2 | | | | | | | | 2 | *0.87 fish/rod-h* |
| ML | Lake ML-E | AL | 8 | Jul-97 | 24.0 rod-h | | 21 | | | | | | | | 21 | *0.88 fish/rod-h* |
| ML | Lake ML-E | FN | 23 | Jul-97 | 358.5 h | 297 | 154 | 67 | 61 | 1811 | 2 | 3 | | 1499 | 3894 | *10.86 fish/h* |
| ML | Lake ML-E | FN | 5 | Jul-98 | 120.8 h | 87 | 33 | 26 | 10 | 490 | | | | 4065 | 4711 | *39.01 fish/h* |
| ML | Lake ML-E | GN | 7 | Jul-97 | 2.35 net-units | | 18 | | 2 | 21 | | | | | 41 | *17.42 fish/net-unit* |
| ML | Lake ML-S | AL | 3 | Jun-97 | 3.1 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| ML | Lake ML-S | FN | 6 | Jul-98 | 144.3 h | 55 | 33 | 83 | 10 | 85 | | | | 306 | 572 | *3.97 fish/h* |
| ML | Lake ML-S | FN | 5 | Aug/Sep-98 | 114.0 h | 1 | 8 | 16 | 3 | 36 | 7 | | | 170 | 241 | *2.11 fish/h* |
| ML | Lake ML-S | GN | 2 | Aug-97 | 1.35 net-units | | 2 | | | | | | | | 2 | *1.48 fish/net-unit* |
| ML | Lake ML-S | GN | 6 | Jul-98 | 15.56 net-units | | 34 | | 6 | 41 | | | | | 81 | *5.20 fish/net-unit* |
| ML | Lake ML-S | GN | 1 | Aug-98 | 5.63 net-units | 1 | 12 | | | 5 | | | | | 18 | *3.20 fish/net-unit* |
| ML | Lake ML-W | AL | 2 | Sep-00 | 0.5 rod-h | | 3 | | | | | | | | 3 | *6.00 fish/rod-h* |
| ML | Lake ML-W | GN | 9 | Oct-99 | 16.76 net-units | 4 | 29 | 1 | 5 | 4 | | | | | 43 | *2.57 fish/net-unit* |
| ML | Lake ML-W | GN | 21 | Sep-00 | 36.89 net-units | 17 | 78 | 4 | 15 | 3 | | | | | 117 | *3.17 fish/net-unit* |
| ML | Stream ML-PL | AL | 1 | Jun-98 | 1.4 rod-h | | 2 | | | | | | | | 2 | *1.43 fish/rod-h* |
| ML | Stream ML-PL | FN | 7 | Sep-00 | 191.8 h | 3 | 8 | 2 | 2 | 6 | 9 | 1 | | 172 | 203 | *1.06 fish/h* |
| ML | Stream ML-PL | GN | 3 | Sep/Oct-99 | 8.34 net-units | 8 | 23 | | | 1 | | | | | 32 | *3.84 fish/net-unit* |
| ML | Stream ML-PL | EF | 1 | Jun-98 | 912 s | | | | | | | | | 1 | 1 | *0.07 fish/min* |
| MR | Stream ML-MR | AL | 1 | Jun-98 | 2.0 rod-h | | 1 | | | | | | | | 1 | *0.50 fish/rod-h* |
| MR | Stream ML-MR | AL | 1 | Jul-98 | 1.0 rod-h | | 2 | | | | | | | | 2 | *2.00 fish/rod-h* |
| MR | Stream ML-MR | EF | 1 | Jun-97 | 522 s | | | 2 | | | | 1 | 1 | 5 | 9 | *1.03 fish/min* |
| MR | Stream ML-MR | EF | 1 | Jul-97 | 558 s | 3 | 1 | 2 | | | | 6 | 1 | | 13 | *1.40 fish/min* |
| MR | Stream ML-MR | EF | 1 | Aug-97 | 525 s | | 5 | 3 | | | | 1 | 2 | | 11 | *1.26 fish/min* |
| MR | Stream ML-MR | EF | 1 | Jun-98 | 637 s | | | | | | | 1 | 1 | | 2 | *0.19 fish/min* |
| MR | Stream ML-MR | EF | 1 | Jul-98 | 620 s | | | 2 | | | | 1 | | 9 | 12 | *1.16 fish/min* |
| MR | Stream MR-U | AL | 2 | Jun-97 | 6.0 rod-h | | 5 | | | | | | | | 5 | *0.83 fish/rod-h* |

Appendix 7.5-C. Summary of fish sampling effort and catch data for the Meliadine Gold Project, 1997-2012

| Basin | Site | Sampling Method[a] | No. of Sampling Events | Month | Sampling Effort | Number of Fish Captured | | | | | | | | | | *Total CPUE* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total | |
| MR | Stream MR-U | AL | 1 | Jul-97 | 2.0 rod-h | | 4 | | | | | | | | 4 | *2.00 fish/rod-h* |
| MR | Stream MR-U | GN | 1 | Oct-99 | 2.48 net-units | | 2 | 1 | | | | | | | 3 | *1.21 fish/net-unit* |
| LML | Lake LML | AL | 4 | Jul-00 | 11.0 rod-h | | 11 | | | | | | | | 11 | *1.00 fish/rod-h* |
| LML | Lake LML | GN | 3 | Sep-97 | 2.17 net-units | 5 | 4 | | 9 | | | | | | 18 | *8.31 fish/net-unit* |
| LML | Lake LML | GN | 2 | Jul-98 | 0.92 net-units | 2 | 2 | 1 | 3 | | | | | | 8 | *8.73 fish/net-unit* |
| LML | Lake LML | GN | 8 | Sep-98 | 8.94 net-units | 19 | 2 | 2 | 24 | | | | | | 47 | *5.26 fish/net-unit* |
| LML | Lake LML | GN | 11 | Jul-99 | 12.40 net-units | | 15 | 7 | 50 | 11 | | | | | 83 | *6.69 fish/net-unit* |
| LML | Lake LML | GN | 8 | Jul-00 | 10.24 net-units | 1 | 18 | 8 | 5 | 9 | | | | | 41 | *4.00 fish/net-unit* |
| LML | Lake HSL | AL | 1 | Jul-00 | 2.0 rod-h | | 1 | | | | | | | | 1 | *0.50 fish/rod-h* |
| LML | Lake HSL | GN | 3 | Jul-00 | 2.78 net-units | | 7 | | | 4 | | | | | 11 | *3.96 fish/net-unit* |
| LML | Stream HSL-W | EF | 1 | Jun-98 | 649 s | | | 2 | | | | | | | 2 | *0.18 fish/min* |
| LML | Stream HSL-W | EF | 1 | Jul-98 | 210 s | | | 5 | | | | | 6 | | 11 | *3.14 fish/min* |
| LML | Stream HSL-W | EF | 1 | Jun-00 | 626 s | | | | | | | 1 | 6 | | 7 | *0.67 fish/min* |
| LML | Stream HSL-W | EF | 1 | Jul-00 | 473 s | | 1 | 11 | | | 1 | 2 | | | 15 | *1.90 fish/min* |
| LML | Stream HSL-W | EF | 1 | Sep-00 | 521 s | | | 28 | | | | 3 | 6 | | 37 | *4.26 fish/min* |
| LML | Lake W | AL | 1 | Jul-00 | 2.0 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| LML | Lake W | GN | 6 | Jul-00 | 4.76 net-units | | 21 | | | 3 | | | | | 24 | *5.04 fish/net-unit* |
| LML | Stream W-LML | EF | 1 | Jul-00 | 346 s | 3 | 1 | 19 | | | | 1 | | | 24 | *4.16 fish/min* |
| MR | Stream LML-MR | EF | 1 | Jun-98 | 560 s | 2 | | 3 | | | 1 | | 2 | | 8 | *0.86 fish/min* |
| MR | Stream MR-L | AL | 1 | Jun-97 | 7.0 rod-h | | 1 | 2 | | | | | | | 3 | *0.43 fish/rod-h* |
| MR | Stream MR-L | AL | 1 | Jun-98 | 0.8 rod-h | | | | | | | | | | 0 | *0 fish/rod-h* |
| MR | Stream MR-L | TU | 37 | Aug/Sep-97 | 441.5 h | 1022 | 2 | 13 | 29 | | | | | | 1066 | *2.41 fish/h* |
| MR | Stream MR-L | TU | 27 | Sep-98 | 402.8 h | 926 | 6 | 20 | 52 | 2 | | | | | 1006 | *2.50 fish/h* |
| MR | Stream MR-L | TU | 67 | Sep-99 | 806.5 h | 1292 | 10 | 230 | 146 | 11 | | | | | 1689 | *2.09 fish/h* |
| PAR | Lake PAR | AL | 2 | Aug-98 | 7.0 rod-h | | 4 | | | | | | | | 4 | *0.57 fish/rod-h* |
| PAR | Lake PAR | GN | 5 | Aug-98 | 11.92 net-units | | 27 | | 12 | 6 | | | | | 45 | *3.78 fish/net-unit* |
| AWAR | Stream M2.1 | EF | 1 | Jun-08 | 557 s | | | 1 | | | | | | | 1 | *0.11 fish/min* |
| AWAR | Stream M2.1 | OB | 1 | Jun-08 | - - | | | | | | | | 2 | | 2 | - - |
| AWAR | Stream M3.0 | EF | 1 | Jun-08 | 211 s | | | | | | | | | | 0 | *0 fish/min* |
| AWAR | Stream M3.0 | OB | 1 | Jun-08 | - - | | | | | | | | 2 | | 2 | - - |
| AWAR | Stream M3.9 | EF | 1 | Jun-08 | 185 s | | | | | | | | | | 0 | *0 fish/min* |
| AWAR | Stream M5.0 | EF | 1 | Jun-08 | 293 s | | | | | | | | 60 | | 60 | *12.29 fish/min* |
| AWAR | Stream M5.0 | OB | 1 | Jun-08 | - - | | | | | | | | 200 | | 200 | - - |
| AWAR | Stream M8.6 | EF | 1 | Jun-08 | 262 s | | | | | | | | | | 0 | *0 fish/min* |
| AWAR | Stream M11.5 | EF | 1 | Jun-08 | 520 s | | | 1 | | | | | 18 | | 19 | *2.19 fish/min* |
| AWAR | Stream M11.5 | OB | 1 | Jun-08 | - - | | | 5 | | | | | 20 | | 25 | - - |
| AWAR | Stream M13.3 | EF | 1 | Jun-08 | 222 s | | | | | | | | | | 0 | *0 fish/min* |
| AWAR | Stream M13.3 | OB | 1 | Jun-08 | - - | | | | | | | | 10 | | 10 | - - |
| AWAR | Stream M22.6 | EF | 1 | Jun-08 | 398 s | | | | | | | | 2 | | 2 | *0.30 fish/min* |
| AWAR | Stream M22.6 | OB | 1 | Jun-08 | - - | | | | | | | | 25 | | 25 | - - |
| AWAR | Stream M23.7 | EF | 1 | Jun-08 | 409 s | | | | | | | 3 | 18 | | 21 | *3.08 fish/min* |
| AWAR | Stream M23.7 | OB | 1 | Jun-08 | - - | | | 1 | | | | | | | 1 | - - |
| AWAR | Stream D1.2 | EF | 1 | Jun-08 | 211 - | | | | | | | | | | 0 | *0 fish/min* |
| AWAR | Stream D1.2 | OB | 1 | Jun-08 | - - | | | | | | | | 2 | | 2 | - - |
| AWAR | Stream D5.4 | EF | 1 | Jun-12 | 127 s | | | | | | | | | | 0 | *0 fish/h* |
| AWAR | Stream D5.4 | MT | 1 | Jun-12 | 9.3 h | | | | | | | | | | 0 | *0 fish/h* |
| AWAR | Stream D5.9 | OB | 1 | Jul-09 | - - | | | | | | | | 10 | | 10 | - - |
| AWAR | Stream D8.8 | MT | 1 | Jun-12 | 6.7 trap-h | | | | | | | | | | 0 | *0 fish/24h* |
| AWAR | Stream D8.8 | EF | 1 | Jun-12 | 209 s | | | | | | | | | | 0 | *0 fish/min* |
| AWAR | Stream D8.8 | OB | 1 | Jun-12 | - - | | | 1 | | | | | | | 1 | - - |
| **All Methods/Sites Combined** | | | **924** | **1997-2012** | **-** | **3883** | **734** | **1978** | **506** | **2795** | **76** | **224** | **6743** | **6626** | **23565** | **-** |

[a] AL = angling; EF = backpack electrofishing; FD = found dead; FN = fyke net; GN = gill nets; MT = minnow traps; OB = observed; TU = fish fence (upstream trap)

# APPENDIX 7.5-D

## Fish Catch Summary (all methods combined) for the LSA and RSA, 1997-2012

# APPENDIX 7.5-D
## Fish at each Site

Appendix 7.5-D. Fish catch summary (all methods combined) for the LSA and RSA, 1997-2012

| Study Area | Habitat Type | Site | Number of Fish Recorded | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total |
| LSA | Stream - lower | A0-1 | 3 | 6 | 18 | | | 2 | 5 | 65 | 61 | **160** |
| LSA | Stream - lower | A1-2 | 1 | 1 | 10 | | | | | 33 | 2 | **47** |
| LSA | Stream - lower | A2-3 | 1 | 3 | 47 | | | | 1 | 15 | 7 | **74** |
| LSA | Stream - lower | A3-4 | | | 2 | | | | | 2 | | **4** |
| LSA | Stream - lower | A4-5 | | | 17 | | | | | 4 | | **21** |
| LSA | Stream - lower | A5-6 | 1 | 12 | 73 | | | | 18 | 193 | 3 | **300** |
| LSA | Stream - upper | A6-7 | | | 23 | | | | 22 | 63 | | **108** |
| LSA | Stream - upper | A7-8 | | | 6 | | | | 3 | 67 | | **76** |
| LSA | Stream - upper | A8-9 | | | | | | | | 6 | | **6** |
| LSA | Stream - upper | A8-37 | | | | | | | | 4 | | **4** |
| LSA | Stream - upper | A8-40 | | | | | | | | 14 | | **14** |
| LSA | Stream - upper | A39-54 | | | | | | | | 18 | | **18** |
| LSA | Stream - upper | A44-45 | | | | | | | | 17 | | **17** |
| LSA | Stream - upper | A45-46 | | | | | | | | 27 | | **27** |
| LSA | Stream - lower | B0-1 | 1 | 5 | 49 | | 4 | 4 | 24 | 11 | 60 | **158** |
| LSA | Stream - lower | B1-2 | 28 | 18 | 42 | | | 3 | 17 | 9 | 4 | **121** |
| LSA | Stream - lower | B3-4 | 2 | 3 | 46 | | | 9 | 17 | 28 | | **105** |
| LSA | Stream - upper | B4-5 | | | 15 | | | 1 | 9 | 89 | | **114** |
| LSA | Stream - upper | B4-36 | | | | | | | | 6 | | **6** |
| LSA | Stream - upper | B4-45 | | | | | | | | 9 | | **9** |
| LSA | Stream - upper | B5-6 | | | 33 | | | | 2 | 87 | | **122** |
| LSA | Stream - upper | B6-7 | | | 54 | | | 2 | 11 | 31 | | **98** |
| LSA | Stream - upper | B7-8 | | | | | | | | 1 | | **1** |
| LSA | Stream - upper | B5-31 | | | 2 | | | | 1 | 13 | | **16** |
| LSA | Stream - upper | B30-6 | | | | | | | 3 | 15 | | **18** |
| LSA | Stream - upper | B31-30 | | | 2 | | | | | 7 | | **9** |
| LSA | Stream - upper | B45-46 | | | 2 | | | | | 24 | | **26** |
| LSA | Stream - upper | B46-66 | | | 12 | | | 4 | | 18 | | **34** |
| LSA | Stream - upper | B51-52 | | | 3 | | | | | 6 | | **9** |
| LSA | Stream - upper | B52-53 | | | | | | | | 23 | | **23** |
| LSA | Stream - upper | B52-75 | | | | | | | | 1 | | **1** |
| LSA | Stream - upper | B53-54 | | | | | | | | 27 | | **27** |
| LSA | Stream - upper | B68-69 | | | 9 | | | | 2 | 10 | | **21** |
| LSA | Stream - upper | B75-80 | | | | | | | | 3 | | **3** |
| LSA | Stream - lower | D0-1 | 15 | 6 | 11 | 2 | 2 | 5 | 52 | 95 | 47 | **235** |
| LSA | Stream - lower | D1-2 | | | 6 | | | | 10 | 104 | 2 | **122** |
| LSA | Stream - upper | D3-4 | | | | | | | | 45 | | **45** |
| LSA | Stream - upper | D4-5 | | | | | | | | 3 | | **3** |
| LSA | Stream - upper | D5-6 | | | | | | | | 371 | | **371** |
| LSA | Stream - upper | D6-7 | | | | | | | | 148 | | **148** |
| LSA | Stream - upper | E4-5 | | | | | | | | 7 | | **7** |
| LSA | Stream - lower | F0-1 | | 4 | 4 | | | | 1 | 14 | 9 | **32** |
| LSA | Stream - upper | F5-6 | | | | | | | | 22 | | **22** |
| LSA | Stream - lower | G0-1 | | 4 | | | | | | 85 | 2 | **91** |
| LSA | Stream - lower | G1-2 | | | | | | | | 15 | | **15** |
| LSA | Stream - lower | H0-1 | | | 1 | | | | | 52 | | **53** |
| LSA | Stream - lower | H1-2 | | | | | | | | 2 | | **2** |
| LSA | Stream - lower | H2-3 | | | | | | | | | | **0** |
| LSA | Stream - lower | H3-4 | | | | | | | | | | **0** |
| LSA | Stream - lower | H4-5 | | | | | | | | | | **0** |

# APPENDIX 7.5-D
## Fish at each Site

Appendix 7.5-D. Fish catch summary (all methods combined) for the LSA and RSA, 1997-2012

| Study Area | Habitat Type | Site | Number of Fish Recorded | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total |
| LSA | Stream - upper | H5-17 | | | | | | | | 3 | | **3** |
| LSA | Stream - lower | J0-1 | | | | | | | | 102 | | **102** |
| LSA | Stream - AWAR | M2.1 | | | 1 | | | | | 2 | | **3** |
| LSA | Stream - AWAR | M3.0 | | | | | | | | 2 | | **2** |
| LSA | Stream - AWAR | M3.9 | | | | | | | | | | **0** |
| LSA | Stream - AWAR | M5.0 | | | | | | | | 260 | | **260** |
| LSA | Stream - AWAR | M8.6 | | | | | | | | | | **0** |
| LSA | Stream - AWAR | M11.5 | | | 6 | | | | | 38 | | **44** |
| LSA | Stream - AWAR | M13.3 | | | | | | | | 10 | | **10** |
| LSA | Stream - AWAR | M22.6 | | | | | | | | 27 | | **27** |
| LSA | Stream - AWAR | M23.7 | | | 1 | | | | 3 | 18 | | **22** |
| LSA | Stream - AWAR | D1.2 | | | | | | | | 2 | | **2** |
| LSA | Stream - AWAR | D5.4 | | | | | | | | | | **0** |
| LSA | Stream - AWAR | D5.9 | | | | | | | | 10 | | **10** |
| LSA | Stream - AWAR | D8.8 | | | 1 | | | | | | | **1** |
| LSA | Lake - lower | A1 | 5 | 7 | 1 | 2 | 1 | | | 7 | 9 | **32** |
| LSA | Lake - lower | B2 | | 5 | 17 | | 34 | | | | | **56** |
| LSA | Lake - lower | D1 | 75 | 9 | 266 | 14 | 163 | 19 | | 245 | 157 | **948** |
| LSA | Lake - lower | D3 | 2 | | 8 | | | | | | | **10** |
| LSA | Lake - lower | E3 | | 3 | | 2 | | | | 11 | | **16** |
| LSA | Lake - lower | G2 | | | | | | | | 8 | | **8** |
| LSA | Lake - upper | A6 | | | 211 | | 4 | | | 5 | 1 | **221** |
| LSA | Lake - upper | A8 | | | 19 | | | | | | | **19** |
| LSA | Lake - upper | A46 | | | | | | | | 28 | | **28** |
| LSA | Lake - upper | B4 | | | 1 | | | | | 21 | | **22** |
| LSA | Lake - upper | B5 | | | 39 | | | 2 | | | | **41** |
| LSA | Lake - upper | B6 | | | 3 | | 3 | | | 6 | | **12** |
| LSA | Lake - upper | B7 | | | 317 | | 35 | 3 | | 4 | | **359** |
| LSA | Lake - upper | B34 | | | | | | | | 338 | | **338** |
| LSA | Lake - upper | B45 | | | 2 | | | | | 298 | | **300** |
| LSA | Lake - upper | B46 | | | 1 | | | | | 16 | | **17** |
| LSA | Lake - upper | B52 | | | | | | | | 328 | | **328** |
| LSA | Lake - upper | B53 | | | 5 | | | | | 64 | | **69** |
| LSA | Lake - upper | B59 | | | 2 | | | | | | | **2** |
| LSA | Lake - upper | B69 | | 2 | 2 | | | | 1 | 6 | | **11** |
| LSA | Lake - upper | C10 | | | | | | | | 12 | | **12** |
| LSA | Lake - upper | D5 | | | | | | | | 75 | | **75** |
| LSA | Lake - upper | D7 | | | 9 | | | | | | | **9** |
| LSA | Lake - upper | D8 | | | | | | | | 315 | | **315** |
| LSA | Lake - upper | D23 | | | | | | | | 146 | | **146** |
| LSA | Lake - upper | E4 | | | 3 | | | | | 42 | | **45** |
| LSA | Lake - upper | J1 | | | | | | | | 15 | | **15** |
| LSA | Pond - lower | A2 | | | | | | | | 64 | 30 | **94** |
| LSA | Pond - lower | A3 | | | | | | | | | | **0** |
| LSA | Pond - lower | A4 | | | | | | | | | | **0** |
| LSA | Pond - lower | A5 | | | | | | | | 7 | | **7** |
| LSA | Pond - lower | A18 | | | | | | | | 1 | | **1** |
| LSA | Pond - lower | A50 | | | | | | | | | | **0** |
| LSA | Pond - lower | A51 | | | | | | | | 2 | | **2** |
| LSA | Pond - lower | A53 | | | | | | | | 13 | | **13** |

# APPENDIX 7.5-D
## Fish at each Site

Appendix 7.5-D. Fish catch summary (all methods combined) for the LSA and RSA, 1997-2012

| Study Area | Habitat Type | Site | Number of Fish Recorded | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total |
| LSA | Pond - lower | D2 | | | | | | | | | | **0** |
| LSA | Pond - lower | G1 | | | | | | | | 78 | | **78** |
| LSA | Pond - lower | P2 | | | | | | | | 268 | | **268** |
| LSA | Pond - upper | A7 | | | | | | | | 257 | | **257** |
| LSA | Pond - upper | A9 | | | | | | | | | | **0** |
| LSA | Pond - upper | A10 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | A12 | | | | | | | | 5 | | **5** |
| LSA | Pond - upper | A13 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | A17 | | | | | | | | 7 | | **7** |
| LSA | Pond - upper | A19 | | | | | | | | | | **0** |
| LSA | Pond - upper | A30 | | | | | | | | 30 | | **30** |
| LSA | Pond - upper | A31 | | | | | | | | 15 | | **15** |
| LSA | Pond - upper | A35 | | | | | | | | | | **0** |
| LSA | Pond - upper | A37 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | A38 | | | | | | | | | | **0** |
| LSA | Pond - upper | A39 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | A40 | | | | | | | | 8 | | **8** |
| LSA | Pond - upper | A44 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | A45 | | | | | | | | 23 | | **23** |
| LSA | Pond - upper | A49 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | A52 | | | | | | | | 556 | | **556** |
| LSA | Pond - upper | A54 | | | | | | | | 2 | | **2** |
| LSA | Pond - upper | A58 | | | | | | | | 5 | | **5** |
| LSA | Pond - upper | B8 | | | | | | | | 3 | | **3** |
| LSA | Pond - upper | B9 | | | | | | | | | | **0** |
| LSA | Pond - upper | B10 | | | | | | | | | | **0** |
| LSA | Pond - upper | B18 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | B19 | | | | | | | | 2 | | **2** |
| LSA | Pond - upper | B25 | | | | | | | | 3 | | **3** |
| LSA | Pond - upper | B28 | | | | | | | | 3 | | **3** |
| LSA | Pond - upper | B30 | | | | | | | | 37 | | **37** |
| LSA | Pond - upper | B31 | | | | | | | | 27 | | **27** |
| LSA | Pond - upper | B32 | | | | | | | | 2 | | **2** |
| LSA | Pond - upper | B33 | | | | | | | | | | **0** |
| LSA | Pond - upper | B33a | | | | | | | | | | **0** |
| LSA | Pond - upper | B36 | | | | | | | | 143 | | **143** |
| LSA | Pond - upper | B37 | | | | | | | | 8 | | **8** |
| LSA | Pond - upper | B38 | | | | | | | | 20 | | **20** |
| LSA | Pond - upper | B51 | | | | | | | | | | **0** |
| LSA | Pond - upper | B60 | | | | | | | | | | **0** |
| LSA | Pond - upper | B61 | | | | | | | | | | **0** |
| LSA | Pond - upper | B62 | | | | | | | | 16 | | **16** |
| LSA | Pond - upper | C6 | | | | | | | | 69 | | **69** |
| LSA | Pond - upper | C7 | | | | | | | | 228 | 5 | **233** |
| LSA | Pond - upper | C9 | | | | | | | | 40 | | **40** |
| LSA | Pond - upper | D4 | | | | | | | | 196 | | **196** |
| LSA | Pond - upper | D6 | | | | | | | | 13 | | **13** |
| LSA | Pond - lower | H1 | | | | | | | | | | **0** |
| LSA | Pond - lower | H2 | | | 2 | | | | | | | **2** |
| LSA | Pond - lower | H3 | | | | | | | | | | **0** |

# APPENDIX 7.5-D
## Fish at each Site

Appendix 7.5-D. Fish catch summary (all methods combined) for the LSA and RSA, 1997-2012

| Study Area | Habitat Type | Site | Number of Fish Recorded | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ARCH | LKTR | ARGR | RNWH | CISC | BURB | SLSC | NNST | THST | Total |
| LSA | Pond - lower | H4 | | | | | | | | 4 | | **4** |
| LSA | Pond - lower | H5 | | | | | | | | 5 | | **5** |
| LSA | Pond - upper | H6 | | | | | | | | 4 | | **4** |
| LSA | Pond - upper | H7 | | | | | | | | 5 | | **5** |
| LSA | Pond - upper | H8 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | H9 | | | | | | | | | | **0** |
| LSA | Pond - upper | H10 | | | | | | | | 2 | | **2** |
| LSA | Pond - upper | H11 | | | | | | | | | | **0** |
| LSA | Pond - upper | H12 | | | | | | | | | | **0** |
| LSA | Pond - upper | H13 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | H14 | | | | | | | | | | **0** |
| LSA | Pond - upper | H14a | | | | | | | | | | **0** |
| LSA | Pond - upper | H15 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | H15d | | | | | | | | | | **0** |
| LSA | Pond - upper | H15e | | | | | | | | | | **0** |
| LSA | Pond - upper | H15g | | | | | | | | 2 | | **2** |
| LSA | Pond - upper | H16 | | | | | | | | | | **0** |
| LSA | Pond - upper | H17 | | | | | | | | 12 | | **12** |
| LSA | Pond - upper | H18 | | | | | | | | | | **0** |
| LSA | Pond - upper | H19 | | | | | | | | | | **0** |
| LSA | Pond - upper | H20 | | | | | | | | | | **0** |
| LSA | Pond - upper | I1 | | | | | | | | | | **0** |
| LSA | Pond - upper | J2 | | | | | | | | 21 | | **21** |
| LSA | Pond - upper | J3 | | | | | | | | | | **0** |
| LSA | Pond - upper | J4 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | J5 | | | | | | | | | | **0** |
| LSA | Pond - upper | J6 | | | | | | | | | | **0** |
| LSA | Pond - upper | J7 | | | | | | | | 1 | | **1** |
| LSA | Pond - upper | J8 | | | | | | | | 1 | | **1** |
| LSA | Lake | CH6 | | 17 | 12 | | | 1 | | | | **30** |
| LSA | Lake | ML-E | 384 | 228 | 93 | 73 | 2322 | 2 | 3 | | 5564 | **8669** |
| LSA | Lake | ML-S | 57 | 89 | 99 | 19 | 167 | 7 | | | 476 | **914** |
| LSA | Lake | ML-W | 21 | 110 | 5 | 20 | 7 | | | | | **163** |
| RSA | Stream | ML-MR | 3 | 9 | 9 | | | | 10 | 5 | 14 | **50** |
| RSA | Stream | ML-PL | 11 | 33 | 2 | 2 | 7 | 9 | 1 | | 173 | **238** |
| RSA | Stream | MR-L | 3240 | 19 | 265 | 227 | 13 | | | | | **3764** |
| RSA | Stream | MR-U | | 11 | 1 | | | | | | | **12** |
| RSA | Stream | LML-MR | 2 | | 3 | | | 1 | | 2 | | **8** |
| RSA | Stream | HSL-W | | 1 | 46 | | | 1 | 6 | 18 | | **72** |
| RSA | Stream | W-LML | 3 | 1 | 19 | | | | 1 | | | **24** |
| RSA | Lake | Control | | 16 | 2 | 42 | | 1 | 1 | 38 | | **100** |
| RSA | Lake | W | | 21 | | | 3 | | | | | **24** |
| RSA | Lake | HSL | | 8 | | | 4 | | | | | **12** |
| RSA | Lake | LML | 27 | 52 | 18 | 91 | 20 | | | | | **208** |
| RSA | Pond - lower | O2 | 1 | | | | | | | 55 | | **56** |
| RSA | Pond - lower | O4 | | | | | | | | 33 | | **33** |
| Other | Lake | PAR | | 31 | | 12 | 6 | | | | | **49** |
| **Total** | | | **3883** | **734** | **1978** | **506** | **2795** | **76** | **224** | **6743** | **6626** | **23565** |

# APPENDIX 7.5-E

## General Life History Characteristics of Fish Species Recorded in the LSA

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

**Appendix 7.5-E: General Life Hisotry Characteristics of Fish Species Recorded in the LSA**

| Species[a] | Spawning Time | Spawning Temperature (°C) | Years to Sexual Maturity | Spawning Location | | Suitable Spawning Substrate | Rearing Location | Food Preference | Feeding Location |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lake | Stream | | | | |
| ARCH | Fall (September/October); females may spawn every 2 or 3 years; spawn during day. | ~4 | 5-6[b] (340-450mm) | √ | √ | In Lake: Gravel and cobble shoals; In River: pools (depth of 1-4.5m); eggs overwinter in substrate, hatch early April | In lakes from emergence (25mm) till first downstream migration (152-203mm, 5-6 years) | Invertebrates; smaller fish, especially NNST[b] | Streams and Lakes, |
| LKTR | Fall (September/October); spawn at night (19:00-22:00) | 5.5-10 (likely photo influence as well) | 7-10 (310-425mm) | Rocky shallows throughout lakes | | Large Boulder or Rubble (depth 0.5< >12m); eggs incubate 4-5 months, hatch April/May | Young fish will utilize warm in-land shallows for several months before moving to deeper water | Fish, especially CISC: aquatic invertebrates[b] | In northern lakes will remain in surface waters throughout the summer |
| ARGR | Spring (May/June); peak spawning activity at mid-day as temperature increases | 5-10 (as ice breaks on smaller streams) | 4-6[b] (285-353mm) | | Small tributaries associated with lakes and larger rivers where ARGR live | Small gravel, cobble; eggs hatch at 13-18 days | Stream, river, and lake: rapid growth of young. Yolk absorbed at 8 days take food at 3 days. | Invertebrates, terrestrial insects, NNST[b] | Large rivers or lakes, in areas <10m depth |
| RNWH | Fall (October) | ~5 | 5-6 (328-371mm) | Lake shallows | River mouths, infrequently in river | Gravel (depth 3.5-15m) | Lakes | Benthic Invertebrates, also know to feed on eggs especiallyLKTR | Lakes |
| CISC | Fall (September/October) | 3-5 (peak at 3.5) | 5-6[b] (290-325mm) | Shallow water | | Often gravel, but nearly any substrate could be used (depth 1-3m); eggs hatch May/June | Lakes | Invertebrates | Lakes |
| BURB | Winter (January to March); spawn at night | 0.6-1.7 | 3-4 (280-480mm) | Shallow bays and shoals | Shallow cobble, quiet pools | Gravel or sand (depth 0.25-3m) | Rocky shallows of lakes and streams | Invertebrates, cisco, sculpin, stickleback | Lakes and streams |
| SLSC | Spring (June/July) | ~5 | 3+ | √ | √ | Cobble and large rocks in lakes and streams | Rocky bottom of lakes and streams | Invertebrates (esp. insect larvae) | Rocky bottom of lakes and streams |
| NNST | Summer | throughout season | 1+ | √ | | Vegetation | Nest and vegetation | Invertebrates, plankton | Lakes, streams, estuaries |
| THST | Summer (June/July) | unknown | 1+ | Shallow water in lakes | | Sand | Nest, twig and plant debris | Invertebrates, eggs, fish fry (including THST), plankton | Lakes, streams, estuaries |

[a] ARCH = Arctic Char, LKTR = Lake Trout, ARGR = Arctic Grayling, RNWH = Round Whitefish, CISC = Cisco, BURB = Burbot, SLSC = Slimy Sculpin, NNST = Ninespine Stickleback, THST = Threespine Stickleback

[b] site specific information (SD AQ Syn Rep). Remainder of information collated from a literature review (Scott and Crossman 1973, Nelson and Paetz 1992)

# APPENDIX 7.5-F

## Length-frequency (count) Captured for the Project, 1997 to 2012

Appendix 7.5-Fa. Length-frequency (count) of Arctic Char captured for the Project, 1997 to 2012

| Fork Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML | | | | | A | | | | | | B | | | | D | | | | O | LML | | | MR | | | | Total |
| | ML-E | ML-S | ML-W | ML-PL | Subtotal | A0-1 | A1 | A1-2 | A2-3 | A5-6 | Subtotal | B0-1 | B1-2 | B3-4 | Subtotal | D0-1 | D1 | D3 | Subtotal | O2 | LML | W-LML | Subtotal | LML-MR | ML-MR | MR-L | Subtotal | |
| 60 - 69 | | | | | | 1 | | | | | 1 | | | | | | | | | | | | | | | | | **1** |
| 70 - 79 | 2 | 1 | | | 3 | | | | | | | | | | | | 1 | | 1 | | | | | | 3 | | 3 | **7** |
| 80 - 89 | 11 | 1 | | | 12 | | | | | | | | 5 | 1 | 6 | 1 | 4 | | 5 | | | | | | | | | **23** |
| 90 - 99 | 7 | | | | 7 | 1 | | | | | 1 | | 7 | | 7 | 3 | 3 | | 6 | | | 1 | 1 | | | | | **22** |
| 100 - 109 | 2 | 1 | | | 3 | | | | | | | | 5 | | 5 | 8 | 6 | | 14 | | | | | | | | | **22** |
| 110 - 119 | | | | 1 | 1 | 1 | | | | | 1 | | 3 | | 3 | | 1 | 1 | 2 | | | | | | | | | **7** |
| 120 - 129 | 3 | 3 | | 1 | 7 | | | | | | | | | | | | 1 | | 1 | | | | | | | | | **8** |
| 130 - 139 | 1 | 5 | | | 6 | | | | 1 | | 1 | | 4 | | 4 | 3 | 1 | | 4 | | | | | | | | | **15** |
| 140 - 149 | 9 | 3 | | | 12 | | | | | | | | 1 | | 1 | | | | | | | | | | | | | **13** |
| 150 - 159 | 6 | 4 | | | 10 | | | | | 1 | 1 | | | | | | | | | | | 1 | 1 | | | | | **12** |
| 160 - 169 | 29 | 5 | | | 34 | | | | | | | | | | | | | | | | | 1 | 1 | | | | | **35** |
| 170 - 179 | 38 | 10 | | | 48 | | | | | | | | | 1 | 1 | | 3 | | 3 | | | | | | | | | **52** |
| 180 - 189 | 52 | 8 | | | 60 | | | | | | | | 2 | | 2 | | | | | | | | | | | | | **62** |
| 190 - 199 | 46 | 4 | | | 50 | | | | | | | | 1 | | 1 | | | | | | | | | | | | | **51** |
| 200 - 209 | 45 | 4 | | | 49 | | | 1 | | | 1 | 1 | | | 1 | | | | | 1 | | | | | | | | **52** |
| 210 - 219 | 31 | 2 | | | 33 | | | | | | | | | | | | | | | | | | | | | 1 | 1 | **34** |
| 220 - 229 | 24 | 2 | | | 26 | | | | | | | | | | | | 1 | | 1 | | | | | | | | | **27** |
| 230 - 239 | 30 | 1 | | | 31 | | | | | | | | | | | | | | | | | | | | | 2 | 2 | **33** |
| 240 - 249 | 16 | | | | 16 | | | | | | | | | | | | 2 | | 2 | | | | | | | 2 | 2 | **20** |
| 250 - 259 | 12 | | | | 12 | | | | | | | | | | | | 4 | | 4 | | | | | | | 5 | 5 | **21** |
| 260 - 269 | 6 | 1 | | | 7 | | | | | | | | | | | | 2 | | 2 | | | | | | | 14 | 14 | **23** |
| 270 - 279 | 6 | | | | 6 | | | | | | | | | | | | 1 | | 1 | | | | | | | 10 | 10 | **17** |
| 280 - 289 | 3 | | | | 3 | | | | | | | | | | | | 3 | | 3 | | | | | | | 23 | 23 | **29** |
| 290 - 299 | 3 | | | | 3 | | 1 | | | | 1 | | | | | | 1 | | 1 | | | | | | | 28 | 28 | **33** |
| 300 - 309 | 1 | | | | 1 | | 2 | | | | 1 | | | | | | | | | | | | | | | 43 | 43 | **46** |
| 310 - 319 | | | | | | | | | | | | | | | | | 4 | 1 | 5 | | | | | | | 39 | 39 | **44** |
| 320 - 329 | | | | | | | 1 | | | | 1 | | | | | | 1 | | 1 | | | | | | | 58 | 58 | **60** |
| 330 - 339 | | | | | | | | | | | | | | | | | 1 | | 1 | | | | | | | 59 | 59 | **60** |
| 340 - 349 | | | | | | | | | | | | | | | | | 4 | | 4 | | | | | | | 88 | 88 | **92** |
| 350 - 359 | | | | | | | | | | | | | | | | | | | | | | | | | | 104 | 104 | **104** |
| 360 - 369 | | | | | | | | | | | | | | | | | 2 | | 2 | | | | | | | 109 | 109 | **111** |
| 370 - 379 | | | | | | | 1 | | | | 1 | | | | | | 1 | | 1 | | | | | | | 118 | 118 | **120** |
| 380 - 389 | | | | | | | | | | | | | | | | | 2 | | 2 | | | | | | | 117 | 117 | **119** |
| 390 - 399 | | | | | | | | | | | | | | | | | 1 | | 1 | | | | | | | 138 | 138 | **139** |
| 400 - 409 | | | | | | | | | | | | | | | | | 4 | | 4 | | | | | | | 103 | 103 | **107** |
| 410 - 419 | | | | | | | | | | | | | | | | | | | | | | | | | | 84 | 84 | **84** |
| 420 - 429 | | | | | | | | | | | | | | | | | 1 | | 1 | | | | | | | 100 | 100 | **101** |
| 430 - 439 | | | | | | | | | | | | | | | | | 3 | | 3 | | | | | | | 105 | 105 | **108** |
| 440 - 449 | | | | | | | | | | | | | | | | | 3 | | 3 | | | | | | | 97 | 97 | **100** |
| 450 - 459 | | | | | | | | | | | | | | | | | | | | | | | | | | 109 | 109 | **109** |
| 460 - 469 | | | | | | | | | | | | | | | | | | | | | | | | | | 102 | 102 | **102** |
| 470 - 479 | | | | | | | | | | | | | | | | | 3 | | 3 | | | | | | | 106 | 106 | **109** |
| 480 - 489 | 1 | | | | 1 | | | | | | | | | | | | 1 | | 1 | | 2 | | 2 | | | 112 | 112 | **116** |
| 490 - 499 | | | | | | | | | | | | | | | | | 3 | | 3 | | 1 | | 1 | | | 133 | 133 | **137** |
| 500 - 509 | | | | | | | | | | | | | | | | | 1 | | 1 | | 1 | | 1 | | | 89 | 89 | **91** |
| 510 - 519 | | | | | | | | | | | | | | | | | | | | | | | | | | 110 | 110 | **110** |
| 520 - 529 | | | | | | | | | | | | | | | | | | | | | 1 | | 1 | | | 97 | 97 | **98** |
| 530 - 539 | | | | | | | | | | | | | | | | | 2 | | 2 | | 2 | | 2 | 1 | | 104 | 105 | **109** |
| 540 - 549 | | | | | | | | | | | | | | | | | | | | | 2 | | 2 | | | 114 | 114 | **116** |
| 550 - 559 | | | 1 | | 1 | | | | | | | | | | | | | | | | 2 | | 2 | 1 | | 75 | 76 | **79** |
| 560 - 569 | | | 2 | | 2 | | | | | | | | | | | | | | | | | | | | | 78 | 78 | **80** |
| 570 - 579 | | | | | | | | | | | | | | | | | 1 | | 1 | | 4 | | 4 | | | 69 | 69 | **74** |
| 580 - 589 | | | 2 | | 2 | | | | | | | | | | | | | | | | 1 | | 1 | | | 69 | 69 | **72** |
| 590 - 599 | | | | | | | | | | | | | | | | | | | | | 1 | | 1 | | | 83 | 83 | **84** |
| 600 - 609 | | 1 | 1 | | 2 | | | | | | | | | | | | | | | | 3 | | 3 | | | 70 | 70 | **75** |
| 610 - 619 | | | 1 | | 1 | | | | | | | | | | | | 2 | | 2 | | | | | | | 59 | 59 | **62** |
| 620 - 629 | | | 2 | | 2 | | | | | | | | | | | | | | | | 3 | | 3 | | | 48 | 48 | **53** |
| 630 - 639 | | | | 3 | 3 | | | | | | | | | | | | | | | | 1 | | 1 | | | 50 | 50 | **54** |
| 640 - 649 | | | 1 | | 1 | | | | | | | | | | | | | | | | 1 | | 1 | | | 38 | 38 | **40** |
| 650 - 659 | | | 2 | 2 | 4 | | | | | | | | | | | | | | | | | | | | | 23 | 23 | **27** |
| 660 - 669 | | | 2 | 2 | 4 | | | | | | | | | | | | | | | | | | | | | 11 | 11 | **15** |
| 670 - 679 | | | | 2 | 2 | | | | | | | | | | | | | | | | | | | | | 13 | 13 | **15** |
| 680 - 689 | | | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | 4 | 4 | **5** |
| 690 - 699 | | | | | | | | | | | | | | | | | | | | | | | | | | 7 | 7 | **7** |
| 700 - 709 | 1 | | | | 1 | | | | | | | | | | | | | | | | 1 | | 1 | | | 6 | 6 | **8** |
| 710 - 719 | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | 5 | 5 | **6** |
| 720 - 729 | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | **3** |
| 730 - 739 | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | **1** |
| 740 - 749 | | | | 2 | 2 | | | | | | | | | | | | | | | | | | | | | 2 | 2 | **4** |
| 750 - 759 | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | 1 | 1 | **2** |
| 760 - 769 | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | 2 | 2 | **3** |
| 770 - 779 | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | **1** |
| **Total** | **385** | **56** | **15** | **17** | **473** | **4** | **4** | **1** | **1** | **1** | **10** | **1** | **28** | **2** | **31** | **15** | **74** | **2** | **91** | **1** | **26** | **3** | **29** | **2** | **3** | **3240** | **3245** | **3881** |

Appendix 7.5-Fb. Length-frequency (count) of Lake Trout captured for the Project, 1997 to 2012

| Fork Length (mm) | Number of Fish Captured per Basin/Site | | |

Appendix 7.5-Fc. Length-frequency (count) of Arctic Grayling captured for the Project, 1997 to 201

| Fork Length (mm) | Number of Fish Captured per Basin/Site | | |

Appendix 7.5-Fd. Length-frequency (count) of Round Whitefish captured for the Project, 1997 to 2012

| Fork Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML | | | | | A | D | | | E | LML | MR | Control | | Total |
| | ML-E | ML-S | ML-W | ML-PL | Subtotal | A1 | D0-1 | D1 | Subtotal | E3 | LML | MR-L | PAR | CON | |
| 80 - 89 | 5 | | | | 5 | | | | | | | | | | **5** |
| 90 - 99 | 18 | | | | 18 | | | | | | | | | | **18** |
| 100 - 109 | 10 | | | | 10 | | | | | | | | | 9 | **19** |
| 110 - 119 | 1 | | | | 1 | | | | | | | | | 11 | **12** |
| 120 - 129 | | | | | | | 1 | | 1 | | | | | | **1** |
| 130 - 139 | 1 | | | | 1 | | 1 | 3 | 4 | | | | | | **5** |
| 140 - 149 | 6 | 1 | | | 7 | | | 1 | 1 | | | | | | **8** |
| 150 - 159 | 6 | | | | 6 | 1 | | 3 | 4 | | | | | | **10** |
| 160 - 169 | 5 | | | | 5 | | | | | | | | | 2 | **7** |
| 170 - 179 | 1 | | | | 1 | | | | | | | | | 9 | **10** |
| 180 - 189 | 1 | 1 | | | 2 | | | 1 | 1 | | | | | 3 | **6** |
| 190 - 199 | 1 | | | 1 | 2 | | | | | | | | | | **2** |
| 200 - 209 | 1 | 1 | | 1 | 3 | | | 4 | 4 | | | | | | **7** |
| 210 - 219 | | 1 | | | 1 | 1 | | 1 | 2 | | | | | | **3** |
| 220 - 229 | | | | | | | | | | | 1 | | | 1 | **2** |
| 230 - 239 | | 2 | | | 2 | | | | | | | | 1 | 2 | **5** |
| 240 - 249 | | | | | | | | | | | | | | 1 | **1** |
| 250 - 259 | | | | | | | | | | | | 3 | | | **3** |
| 260 - 269 | 2 | | | | 2 | | | 1 | 1 | | | 7 | | | **10** |
| 270 - 279 | | 1 | | | 1 | | | | | | | 7 | | | **8** |
| 280 - 289 | | 1 | | | 1 | | | | | 1 | | 3 | | 1 | **6** |
| 290 - 299 | 1 | 1 | | | 2 | | | | | | 1 | 7 | | 2 | **12** |
| 300 - 309 | | | 1 | | 1 | | | | | | | 10 | | | **11** |
| 310 - 319 | | | | | | | | | | | 2 | 16 | | 1 | **19** |
| 320 - 329 | | | | | | | | | | | 1 | 5 | | | **6** |
| 330 - 339 | 1 | | | 1 | 2 | | | | | | 2 | 6 | | | **10** |
| 340 - 349 | 1 | 2 | | 4 | 7 | | | | | 1 | 5 | 6 | 1 | | **20** |
| 350 - 359 | | 1 | 1 | | 2 | | | | | | 6 | 8 | 2 | | **18** |
| 360 - 369 | 3 | | 2 | 1 | 6 | | | | | | 7 | 15 | | | **28** |
| 370 - 379 | | | 2 | | 2 | | | | | | 6 | 7 | 1 | | **16** |
| 380 - 389 | | 3 | | 1 | 4 | | | | | | 10 | 6 | 1 | | **21** |
| 390 - 399 | 1 | 1 | 1 | | 3 | | | | | | 8 | 13 | 2 | | **26** |
| 400 - 409 | | 1 | 2 | | 3 | | | | | | 16 | 15 | 1 | | **35** |
| 410 - 419 | | 1 | 1 | | 2 | | | | | | 2 | 20 | 1 | | **25** |
| 420 - 429 | 1 | | | | 1 | | | | | | 7 | 39 | | | **47** |
| 430 - 439 | 2 | 1 | 1 | | 4 | | | | | | | 22 | 1 | | **27** |
| 440 - 449 | 2 | | | | 2 | | | | | | 4 | 7 | | | **13** |
| 450 - 459 | | | 1 | | 1 | | | | | | | 3 | | | **4** |
| 460 - 469 | 2 | | | 1 | 3 | | | | | | | 2 | | | **5** |
| 470 - 479 | 1 | | | | 1 | | | | | | | | | | **1** |
| 480 - 489 | | | | | | | | | | | | | | | **0** |
| 490 - 499 | | | | | | | | | | | | | | | **0** |
| 500 - 509 | | | | | | | | | | | 3 | | | | **3** |
| 510 - 519 | | | | | | | | | | | 2 | | | | **2** |
| **Total** | **73** | **19** | **12** | **10** | **114** | **2** | **2** | **14** | **18** | **2** | **83** | **227** | **11** | **42** | **497** |

Appendix 7.5-Fe. Length-frequency (count) of Cisco captured for the Project, 1997 to 2012

| Fork Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML | | | | | A | | | B | | | | | D | | | LML | | | | MR | PAR | |
| | ML-E | ML-S | ML-W | ML-PL | Subtotal | A1 | A6 | Subtotal | B0-1 | B2 | B6 | B7 | Subtotal | D0-1 | D1 | Subtotal | HSL | LML | W | Subtotal | MR-L | PAR | Total |
| 70 - 79 | 2 | 2 | | | 4 | | | | 1 | | | | 1 | | | | | | | | | | **5** |
| 80 - 89 | 20 | 19 | | | 39 | | | | | | | | | | | | | | | | | | **39** |
| 90 - 99 | 217 | 4 | | | 221 | | | | 1 | | | | 1 | | | | | | | | | | **222** |
| 100 - 109 | 394 | | | 1 | 395 | | | | | | | | | | 2 | 2 | | | | | | | **397** |
| 110 - 119 | 161 | 1 | | | 162 | | | | 1 | 1 | | | 2 | 1 | 10 | 11 | | | | | | | **175** |
| 120 - 129 | 44 | 6 | | | 50 | | | | | 3 | | | 3 | | 4 | 4 | | | | | | | **57** |
| 130 - 139 | 121 | 11 | | | 132 | | | | 1 | | | | 1 | | 3 | 3 | | | | | | | **136** |
| 140 - 149 | 214 | 38 | | | 252 | | | | | | | | | | | | | | | | | | **252** |
| 150 - 159 | 103 | 24 | | | 127 | | | | | | | 1 | 1 | | 1 | 1 | | | | | | | **129** |
| 160 - 169 | 19 | 8 | | | 27 | | | | | | | | | | 10 | 10 | | | | | | | **37** |
| 170 - 179 | 5 | 1 | | | 6 | | | | | 1 | 3 | | 4 | | 14 | 14 | | | | | | | **24** |
| 180 - 189 | 4 | | | 4 | 8 | | | | | | | | | | 14 | 14 | | | | | | | **22** |
| 190 - 199 | 7 | | | 1 | 8 | | | | | | | | | | 21 | 21 | | | | | | | **29** |
| 200 - 209 | 3 | | | | 3 | | | | | | | | | | 11 | 11 | | | | | | | **14** |
| 210 - 219 | 4 | 2 | | | 6 | | | | | | | | | | 6 | 6 | | | | | | | **12** |
| 220 - 229 | | 3 | | | 3 | | | | | | | | | | 6 | 6 | | | | | | | **9** |
| 230 - 239 | 1 | | | | 1 | | | | | | | | | | 10 | 10 | | | | | | | **11** |
| 240 - 249 | 1 | | | | 1 | 1 | | 1 | | | | | | 1 | 6 | 7 | 1 | | | 1 | | | **10** |
| 250 - 259 | | | | | | | | | | 1 | | | 1 | | 5 | 5 | | | | | | | **6** |
| 260 - 269 | 1 | | | | 1 | | | | | | | | | | 8 | 8 | | | | | | | **9** |
| 270 - 279 | | 1 | | | 1 | | | | | | | 3 | 3 | | 5 | 5 | | | | | | | **9** |
| 280 - 289 | 1 | | | | 1 | | | | | 1 | | 10 | 11 | | 1 | 1 | | | | | 2 | | **15** |
| 290 - 299 | | | | | | | | | | 2 | | 9 | 11 | | 2 | 2 | | | | | | | **13** |
| 300 - 309 | 5 | 10 | | | 15 | | | | | | | 3 | 3 | | 1 | 1 | | | | | | | **19** |
| 310 - 319 | 10 | 13 | | | 23 | | | | | 2 | | 1 | 3 | | 3 | 3 | 1 | 1 | | 2 | 2 | | **33** |
| 320 - 329 | 21 | 8 | 1 | | 30 | | | | | 4 | | 2 | 6 | | 2 | 2 | | 1 | | 1 | | | **39** |
| 330 - 339 | 8 | 8 | | 1 | 17 | | 1 | 1 | | 5 | | 2 | 7 | | 3 | 3 | 1 | | | 1 | | | **29** |
| 340 - 349 | 3 | 3 | 1 | | 7 | | | | | 2 | | 2 | 4 | | 4 | 4 | | 1 | | 1 | | | **16** |
| 350 - 359 | | 1 | 2 | | 3 | | 1 | 1 | | 5 | | | 5 | | 2 | 2 | | 2 | 1 | 3 | 2 | | **16** |
| 360 - 369 | | | 2 | | 2 | | 1 | 1 | | 2 | | 1 | 3 | | 3 | 3 | | | | | | | **9** |
| 370 - 379 | | | | | | | | | | 4 | | | 4 | | 1 | 1 | 1 | 2 | | 3 | 2 | 1 | **11** |
| 380 - 389 | | 1 | | | 1 | | | | | | | | | | | | | 5 | 2 | 7 | 4 | 2 | **14** |
| 390 - 399 | | | | | | | | | | | | | | | | | | 3 | | 3 | 1 | 1 | **5** |
| 400 - 409 | | | | | | | | | | | | | | | 1 | 1 | | | | | | 2 | **3** |
| 410 - 419 | | | | | | | 1 | 1 | | | | | | | | | | | | | | | **1** |
| 420 - 429 | | | | | | | | | | | | | | | | | | 1 | | 1 | | | **1** |
| 430 - 439 | | | | 1 | 1 | | | | | | | | | | | | | 2 | | 2 | | | **3** |
| 440 - 449 | | | | | | | | | | | | | | | | | | 1 | | 1 | | | **1** |
| 450 - 459 | | | | | | | | | | | | | | | | | | 1 | | 1 | | | **1** |
| **Total** | **1369** | **164** | **6** | **8** | **1547** | **1** | **4** | **5** | **4** | **33** | **3** | **34** | **74** | **2** | **159** | **161** | **4** | **20** | **3** | **27** | **13** | **6** | **1833** |

Appendix 7.5-Ff. Length-frequency (count) of Burbot captured for the Project, 1997 to 2012

| Total Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML | | | | A | B | | | | | | | | | D | | | LML | MR | CHL | | |
| | ML-E | ML-S | ML-PL | Subtotal | A0-1 | B0-1 | B1-2 | B3-4 | B4-5 | B5 | B6-7 | B7 | B46-66 | Subtotal | D0-1 | D1 | Subtotal | HSL-W | LML-MR | CH6 | Control | Total |
| 70 - 79 | | | | 0 | 1 | 1 | | | | | | | 4 | 5 | | 1 | 1 | | | | | 7 |
| 80 - 89 | | | | 0 | 1 | | | 1 | | | 1 | | | 2 | 2 | 1 | 3 | 1 | | | | 7 |
| 90 - 99 | 1 | | | 1 | | | | 1 | 1 | | 1 | | | 3 | | | 0 | | | | | 4 |
| 100 - 109 | 1 | | | 1 | | | 1 | | | | | | | 1 | | | 0 | | | | | 2 |
| 110 - 119 | | | | 0 | | | | 1 | | | | | | 1 | | | 0 | | | | | 1 |
| 120 - 129 | | | | 0 | | | 1 | 1 | | | | | | 2 | | | 0 | | | | | 2 |
| 130 - 139 | | | | 0 | | | 1 | | | | | | | 1 | | 3 | 3 | | | | | 4 |
| 140 - 149 | | | | 0 | | | | 1 | | | | | | 1 | | 2 | 2 | | | | | 3 |
| 150 - 159 | | | | 0 | | | | | | | | | | 0 | | 2 | 2 | | | | | 2 |
| 160 - 169 | | | | 0 | | | | | | | | | | 0 | | 3 | 3 | | | | | 3 |
| 170 - 179 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 180 - 189 | | | | 0 | | | | | | | | | | 0 | | 1 | 1 | | | | | 1 |
| 190 - 199 | | | | 0 | | | | | | | | | | 0 | | 1 | 1 | | 1 | | | 2 |
| 200 - 209 | | | | 0 | | | | 1 | | | | | | 1 | 1 | 1 | 2 | | | | | 3 |
| 210 - 219 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 220 - 229 | | | | 0 | | 1 | | | | | | | | 1 | | | 0 | | | | | 1 |
| 230 - 239 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 240 - 249 | | | | 0 | | | | | | | | | | 0 | | 3 | 3 | | | | 1 | 4 |
| 250 - 259 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 260 - 269 | | | | 0 | | 2 | | 1 | | | | | | 3 | | | 0 | | | | | 3 |
| 270 - 279 | | | | 0 | | | | 1 | | | | 1 | | 2 | | | 0 | | | | | 2 |
| 280 - 289 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 290 - 299 | | 2 | 1 | 3 | | | | | | | | | | 0 | 1 | | 1 | | | | | 4 |
| 300 - 309 | | 1 | 1 | 2 | | | | | | 1 | | 1 | | 2 | | | 0 | | | | | 4 |
| 310 - 319 | | 1 | | 1 | | | | 1 | | | | | | 1 | | | 0 | | | | | 2 |
| 320 - 329 | | 1 | | 1 | | | | | | | | | | 0 | 1 | | 1 | | | | | 2 |
| 330 - 339 | | | 1 | 1 | | | | | | | | | | 0 | | | 0 | | | 1 | | 2 |
| 340 - 349 | | | 1 | 1 | | | | | | | | | | 0 | | | 0 | | | | | 1 |
| 350 - 359 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 360 - 369 | | 1 | | 1 | | | | | | | | | | 0 | | | 0 | | | | | 1 |
| 370 - 379 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 380 - 389 | | | | 0 | | | | | | | | | | 0 | | 1 | 1 | | | | | 1 |
| 390 - 399 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 400 - 409 | | | | 0 | | | | | | 1 | | | | 1 | | | 0 | | | | | 1 |
| 410 - 419 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 420 - 429 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 430 - 439 | | 1 | 3 | 4 | | | | | | | | | | 0 | | | 0 | | | | | 4 |
| 440 - 449 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 450 - 459 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 460 - 469 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 470 - 479 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 480 - 489 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 490 - 499 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 500 - 509 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 510 - 519 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 520 - 529 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 530 - 539 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 540 - 549 | | | 1 | 1 | | | | | | | | | | 0 | | | 0 | | | | | 1 |
| 550 - 559 | | | 1 | 1 | | | | | | | | | | 0 | | | 0 | | | | | 1 |
| 560 - 569 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 570 - 579 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 580 - 589 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 590 - 599 | | | | 0 | | | | | | | | | | 0 | | | 0 | | | | | 0 |
| 600 - 609 | | | | 0 | | | | | | | | 1 | | 1 | | | 0 | | | | | 1 |
| **Total** | **2** | **7** | **9** | **18** | **2** | **4** | **3** | **9** | **1** | **2** | **2** | **3** | **4** | **28** | **5** | **19** | **24** | **1** | **1** | **1** | **1** | **76** |

Appendix 7.5-Fg. Length-frequency (count) of Slimy Sculpin captured for the Project, 1997 to 2012

| Total Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML | | | A | | | | | | B | | | | | | | | | | | D | | | F | LML | | | MR | | | |
| | ML-E | ML-PL | Subtotal | A0-1 | A2-3 | A5-6 | A6-7 | A7-8 | Subtotal | B0-1 | B1-2 | B3-4 | B4-5 | B5-6 | B5-31 | B6-7 | B30-6 | B68-69 | B69 | Subtotal | D0-1 | D1-2 | Subtotal | F0-1 | HSL-W | W-LML | Subtotal | ML-MR | Control | Total |
| 30 - 39 | | | | | | | 1 | | 1 | | | | | | 1 | | | | | 1 | | | | | | | | | | **2** |
| 40 - 49 | | | | 1 | | 2 | 3 | | 6 | | 3 | | | | | 3 | | 1 | | 7 | 5 | 1 | 6 | | | | | 2 | | **21** |
| 50 - 59 | 1 | | 1 | 1 | | 7 | 7 | | 15 | 4 | 1 | 3 | | | | 2 | 3 | | 1 | 15 | 20 | 1 | 21 | | | | | 6 | | **58** |
| 60 - 69 | 2 | | 2 | | | 3 | 2 | 1 | 6 | 5 | 3 | 8 | 3 | | | 2 | | | | 21 | 13 | 3 | 16 | 1 | 2 | | 3 | 1 | | **49** |
| 70 - 79 | | | | 1 | 1 | 2 | 1 | 2 | 7 | 2 | 5 | 2 | 1 | 1 | | 3 | | | | 14 | 9 | 3 | 12 | | | | | 1 | | **34** |
| 80 - 89 | | | | 1 | | | 6 | | 7 | 1 | 4 | 4 | 1 | | | | | | | 10 | 3 | 1 | 4 | | 4 | 1 | 5 | | | **26** |
| 90 - 99 | | 1 | 1 | | | 1 | 2 | | 3 | | 1 | | 2 | | | 1 | | | | 4 | 1 | | 1 | | | | | | 1 | **10** |
| 100 - 109 | | | | | | | | | | 1 | | | 1 | | | | | | | 2 | 1 | 1 | 2 | | | | | | | **4** |
| 110 - 119 | | | | | | | | | | | | | 1 | | | | | | | 1 | | | | | | | | | | **1** |
| 120 - 129 | | | | 1 | | | | | 1 | | | | | | | | | | | | | | | | | | | | | **1** |
| **Total** | **3** | **1** | **4** | **5** | **1** | **15** | **22** | **3** | **46** | **13** | **17** | **17** | **9** | **2** | **1** | **11** | **3** | **1** | **1** | **75** | **52** | **10** | **62** | **1** | **6** | **1** | **8** | **10** | **1** | **206** |

Appendix 7.5-Fh. Length-frequency (count) of Ninespine Stickleback captured for the Project, 1997 to 2012

| Total Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | | | | | | B | | | | | | C | | | D | | | | | | | | | E | | | | F | G | H | J | | | | O | | | P | LML | MR | | |
| | A0-1 | A5-6 | A6 | A6-7 | A7 | 32 other sites | Subtotal | B4 | B4-5 | B6-7 | B7 | 38 other sites | Subtotal | C7 | C10 | Subtotal | D0-1 | D1 | D4 | D5 | D6 | D8 | D23 | 4 other sites | Subtotal | E3 | E4 | E4-5 | Subtotal | 2 sites | 4 sites | 11 sites | J0-1 | J1 | 4 other sites | Subtotal | O2 | O4 | Subtotal | P2 | HSL-W | 2 sites | Control | Total |
| 10 - 19 | | | | | | 5 | 5 | | | | | 3 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **8** |
| 20 - 29 | 2 | 1 | | 11 | | 17 | 31 | | 5 | 1 | | 16 | 22 | | | | 3 | | | 2 | | | | 7 | 12 | | | | | 2 | 8 | | 4 | | | 4 | | | | | 2 | | 2 | **83** |
| 30 - 39 | 39 | 8 | | 7 | | 23 | 77 | 2 | 10 | 2 | | 30 | 44 | | 2 | 2 | 12 | | 8 | 14 | 5 | 2 | 13 | 24 | 78 | | 2 | 1 | 3 | 10 | 45 | | 68 | | | 68 | 3 | 1 | 4 | 8 | 6 | | 3 | **348** |
| 40 - 49 | 16 | 26 | | 15 | 11 | 2 | 70 | 8 | 29 | 6 | 1 | 103 | 147 | | | | 15 | | 8 | 37 | 5 | 14 | 13 | 40 | 132 | 5 | 18 | 2 | 25 | 9 | 64 | | 21 | 2 | | 23 | 4 | 1 | 5 | 9 | 3 | 2 | 3 | **492** |
| 50 - 59 | 6 | 78 | 1 | 18 | 13 | 9 | 125 | 9 | 33 | 13 | | 207 | 262 | 2 | 9 | 11 | 7 | 1 | 9 | 16 | 3 | 9 | 9 | 50 | 104 | 5 | 19 | 3 | 27 | 7 | 36 | 9 | 5 | 7 | 3 | 15 | 5 | 7 | 12 | 1 | 5 | 4 | 5 | **623** |
| 60 - 69 | 2 | 40 | 3 | 11 | 6 | 78 | 140 | 1 | 9 | 7 | 1 | 113 | 131 | 12 | 1 | 13 | 4 | 9 | 1 | 5 | | | 2 | 18 | 39 | 1 | 3 | 1 | 5 | 8 | 11 | 7 | 4 | 6 | 1 | 11 | 2 | 6 | 8 | 3 | 2 | 1 | | **379** |
| 70 - 79 | | 7 | 1 | 1 | | 16 | 25 | | 3 | 2 | 2 | 19 | 26 | 1 | | 1 | | 2 | | 1 | | | | 2 | 5 | | | | | | 1 | 1 | | | | | | 1 | 1 | | | | **61** |
| 80 - 89 | | 1 | | | | 4 | 5 | 1 | | | | 4 | 5 | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | | 1 | | | | **12** |
| **Total** | **65** | **161** | **5** | **63** | **30** | **154** | **478** | **21** | **89** | **31** | **4** | **495** | **640** | **15** | **12** | **27** | **41** | **12** | **26** | **75** | **13** | **25** | **37** | **142** | **371** | **11** | **42** | **7** | **60** | **36** | **165** | **17** | **102** | **15** | **4** | **121** | **15** | **15** | **30** | **23** | **18** | **7** | **13** | **2006** |

Appendix 7.5-Fi. Length-frequency (count) of Threespine Stickleback captured for the Project, 1997 to 2012

| Total Length (mm) | Number of Fish Captured per Basin/Site | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ML | | | | A | | | | | | | | B | | | C | D | | | | F | G | MR | |
| | ML-E | ML-PL | ML-S | Subtotal | A0-1 | A1 | A1-2 | A2 | A2-3 | A5-6 | A6 | Subtotal | B0-1 | B1-2 | Subtotal | C7 | D0-1 | D1 | D1-2 | Subtotal | F0-1 | G0-1 | ML-MR | Total |
| 20 - 29 | 2 | | | 2 | 9 | 2 | | | | | | 11 | 2 | | 2 | | 1 | | | 1 | 2 | | 3 | **21** |
| 30 - 39 | 12 | | 4 | 16 | 5 | 5 | | 2 | | | | 12 | 3 | 1 | 4 | | 1 | | | 1 | 1 | | | **34** |
| 40 - 49 | 29 | | 65 | 94 | 7 | 1 | | 3 | 2 | | | 13 | 18 | | 18 | | 8 | | | 8 | 1 | 1 | 7 | **142** |
| 50 - 59 | 48 | 3 | 52 | 103 | 25 | 1 | 1 | 3 | 4 | 2 | | 36 | 9 | 1 | 10 | 1 | 6 | 1 | | 7 | 4 | | 3 | **164** |
| 60 - 69 | 43 | 3 | 10 | 56 | 15 | | 1 | 2 | 1 | 1 | 1 | 21 | 6 | 2 | 8 | 1 | 4 | 1 | 1 | 6 | 1 | 1 | 1 | **95** |
| 70 - 79 | 15 | | 3 | 18 | | | | | | | | | | | | | | | 1 | 1 | | | | **19** |
| **Total** | **149** | **6** | **134** | **289** | **61** | **9** | **2** | **10** | **7** | **3** | **1** | **93** | **38** | **4** | **42** | **2** | **20** | **2** | **2** | **24** | **9** | **2** | **14** | **475** |

# APPENDIX 7.5-G

## Length-weight Relationships of Fish Captured for the Project, 1997-2012

April 2014
Report No. Doc 314-1314280007 Ver 0

AGNICO EAGLE Golder Associates

# APPENDIX 7.5-G
## Length-Weight Table

Appendix 7.5-G. Length-weight relationships of fish captured for the Project, 1997-2012

| Species | Basin/Site | $\log_{10}$ (Weight) = a + b ($\log_{10}$ Fork Length) | | | | Relative Weight | | |
|---|---|---|---|---|---|---|---|---|
| | | *n* | a | b | $r^2$ | *n* [a] | Mean | SD |
| Arctic Char | ML-E | 381 | -5.0341 | 2.9808 | 0.984 | 381 | 76.26 | 7.36 |
| | ML-S | 52 | -5.2824 | 3.0888 | 0.971 | 52 | 75.45 | 10.98 |
| | ML-W | 15 | -3.7159 | 2.5600 | 0.895 | 15 | 95.84 | 6.86 |
| | ML Total | 448 | -5.3194 | 3.1079 | 0.989 | 448 | 76.82 | 8.60 |
| | A | 11 | -5.1482 | 3.0599 | 0.993 | 11 | 88.89 | 14.29 |
| | B | 29 | -5.5673 | 3.2484 | 0.956 | 29 | 83.23 | 16.99 |
| | D | 53 | -5.0735 | 3.0520 | 0.989 | 53 | 100.45 | 12.12 |
| | Peninsula Total | 93 | -5.4237 | 3.1871 | 0.993 | 93 | 93.71 | 16.02 |
| | Mine LSA | 541 | -5.4165 | 3.1561 | 0.988 | 541 | 79.73 | 12.07 |
| | MR | 516 | -5.1376 | 3.0806 | 0.986 | 516 | 102.75 | 8.71 |
| | LML | 24 | -4.8000 | 2.9411 | 0.994 | 24 | 93.72 | 8.83 |
| | Combined[a] | 1093 | -5.6490 | 3.2633 | 0.995 | 1093 | 91.03 | 15.46 |
| Lake Trout | ML-E | 227 | -5.3387 | 3.1414 | 0.997 | 227 | 94.47 | 12.37 |
| | ML-S | 77 | -5.2155 | 3.0909 | 0.994 | 77 | 94.54 | 11.70 |
| | ML-W | 52 | -5.0177 | 3.0230 | 0.987 | 52 | 96.36 | 9.43 |
| | ML Total | 356 | -53.1570 | 3.1311 | 0.997 | 356 | 94.76 | 11.83 |
| | Peninsula Total | 63 | -5.2035 | 3.1077 | 0.990 | 63 | 108.95 | 20.09 |
| | CH | 16 | -5.1727 | 3.0818 | 0.995 | 16 | 99.55 | 6.91 |
| | Mine LSA | 435 | -5.2552 | 3.1100 | 0.996 | 435 | 96.99 | 14.10 |
| | LML | 69 | -4.8338 | 2.9498 | 0.970 | 69 | 95.76 | 10.10 |
| | MR | 16 | -5.1799 | 3.0861 | 0.974 | 16 | 98.89 | 9.46 |
| | Combined[a] | 587 | -5.2491 | 3.1073 | 0.997 | 587 | 96.75 | 13.17 |
| | PAR | 29 | -5.0916 | 3.0492 | 0.989 | 29 | 97.71 | 12.64 |
| Arctic Grayling | ML-E | 93 | -5.1190 | 3.0707 | 0.996 | 93 | 87.95 | 8.57 |
| | ML-S | 82 | -5.0714 | 3.0402 | 0.986 | 82 | 82.14 | 8.79 |
| | ML Total | 181 | -5.0959 | 3.0561 | 0.992 | 178 | 85.16 | 9.07 |
| | A6 | 117 | -5.3043 | 3.1417 | 0.995 | 117 | 88.73 | 8.45 |
| | A | 253 | -5.2753 | 3.1231 | 0.994 | 253 | 86.57 | 11.18 |
| | B | 481 | -5.2350 | 3.1072 | 0.990 | 481 | 87.76 | 12.01 |
| | B7 | 305 | -5.2286 | 3.1031 | 0.988 | 305 | 87.25 | 10.41 |
| | D | 106 | -5.4017 | 3.1991 | 0.993 | 106 | 95.30 | 9.47 |
| | Peninsula Total | 849 | -5.2953 | 3.1359 | 0.991 | 849 | 88.40 | 11.81 |
| | Mine LSA | 1039 | -5.2833 | 3.1310 | 0.993 | 1039 | 87.79 | 11.40 |
| | AWAR LSA | 8 | -5.0673 | 2.9757 | 0.964 | 8 | 80.01 | 10.96 |
| | LSA Total | 1048 | -5.3010 | 3.1383 | 0.993 | 1048 | 87.73 | 11.40 |
| | LML | 24 | -4.9457 | 2.9865 | 0.986 | 24 | 83.73 | 13.79 |
| | MR | 60 | -5.6508 | 3.2925 | 0.993 | 60 | 89.54 | 9.08 |
| | Combined[a] | 1136 | -5.3094 | 3.1424 | 0.993 | 1136 | 87.74 | 11.36 |
| Round Whitefish | ML-E | 72 | -5.4245 | 3.1572 | 0.996 | 72 | 78.76 | 9.58 |
| | ML-S | 17 | -5.0845 | 3.0287 | 0.976 | 17 | 84.36 | 12.40 |
| | ML-W | 6 | -4.7101 | 2.9014 | 0.991 | 6 | 90.31 | 2.54 |
| | ML Total | 95 | -5.4656 | 3.1785 | 0.996 | 95 | 80.49 | 10.34 |
| | Peninsula Total | 12 | -5.0158 | 3.0100 | 0.929 | 12 | 94.59 | 15.12 |
| | Mine LSA | 107 | -5.4521 | 3.1759 | 0.994 | 107 | 82.08 | 11.77 |
| | Control Lake | 27 | -4.7112 | 2.8989 | 0.989 | 27 | 106.76 | 14.13 |
| | LML | 78 | -4.7549 | 2.9057 | 0.938 | 78 | 84.01 | 6.73 |
| | MR | 85 | -3.9933 | 2.6173 | 0.925 | 85 | 87.56 | 8.84 |
| | Combined[a] | 307 | -5.3312 | 3.1326 | 0.993 | 307 | 86.35 | 11.99 |
| | PAR | 11 | -5.3207 | 3.1359 | 0.969 | 11 | 89.66 | 7.59 |
| Cisco | ML-E | 313 | -5.4837 | 3.1965 | 0.995 | 313 | 83.52 | 10.33 |
| | ML-S | 86 | -5.5611 | 3.2211 | 0.989 | 86 | 73.50 | 10.64 |
| | ML Total | 401 | -5.4644 | 3.1859 | 0.995 | 401 | 81.35 | 11.14 |
| | B7 | 21 | -5.5175 | 3.2123 | 0.873 | 21 | 73.37 | 7.31 |
| | B | 57 | -5.5811 | 3.2578 | 0.978 | 57 | 84.24 | 16.06 |
| | D | 117 | -5.9751 | 3.4292 | 0.981 | 117 | 87.23 | 12.57 |
| | Peninsula Total | 179 | -5.7739 | 3.3406 | 0.982 | 179 | 86.06 | 13.70 |
| | Mine LSA | 580 | -5.6248 | 3.2654 | 0.992 | 580 | 82.81 | 12.18 |
| | MR | 7 | -5.0810 | 3.0338 | 0.739 | 7 | 68.11 | 8.03 |
| | LML | 25 | -3.9380 | 2.6032 | 0.879 | 25 | 74.07 | 12.33 |
| | Combined[a] | 618 | -5.6034 | 3.2553 | 0.993 | 618 | 82.24 | 12.31 |
| | PAR | 6 | -5.1757 | 3.0994 | 0.678 | 6 | 79.05 | 5.80 |
| Burbot | Combined[a] | *47* | -4.8445 | 2.8487 | 0.976 | - | - | - |

[a] Combined length-weight regression developed using data for all fish collected in the LSA and RSA (excludes Parallel Lake).

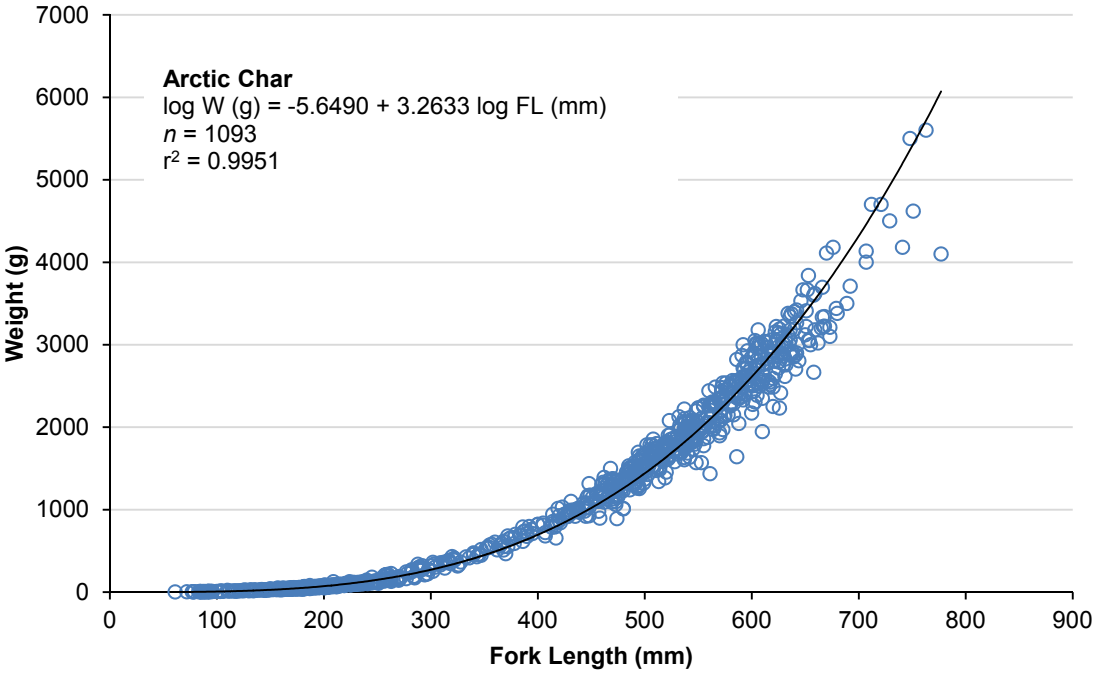
# APPENDIX 7.5-H

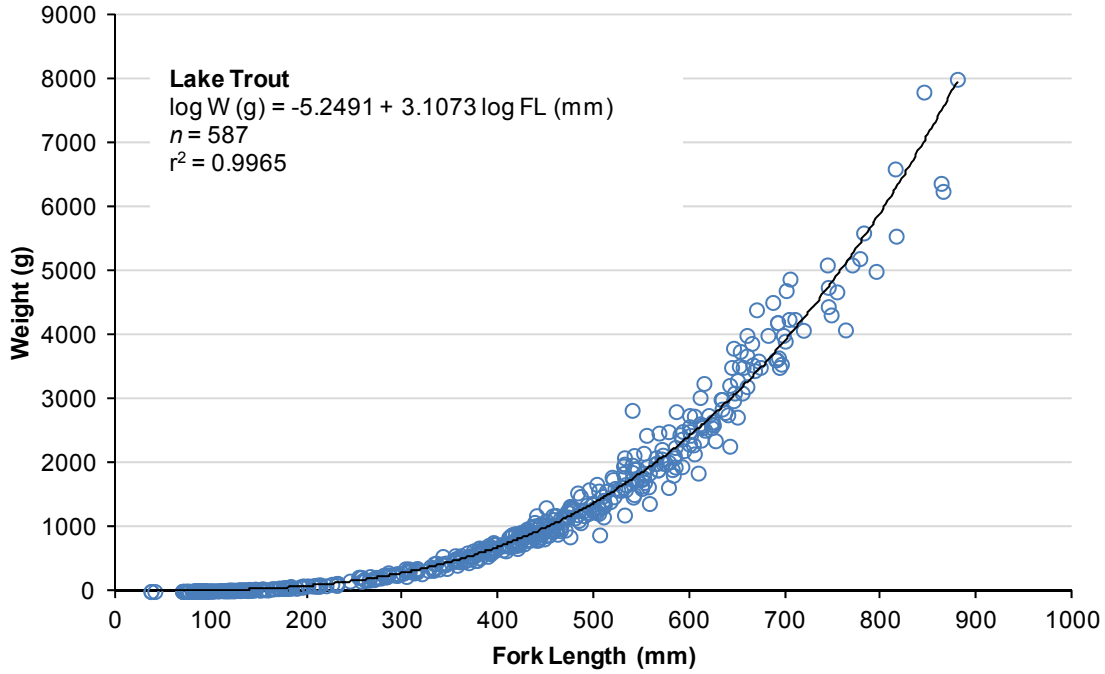
## Length-weight Regression for Fish Species Captured in the LSA and RSA, 1997 to 2012 (all areas combined)

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# APPENDIX 7.5-H

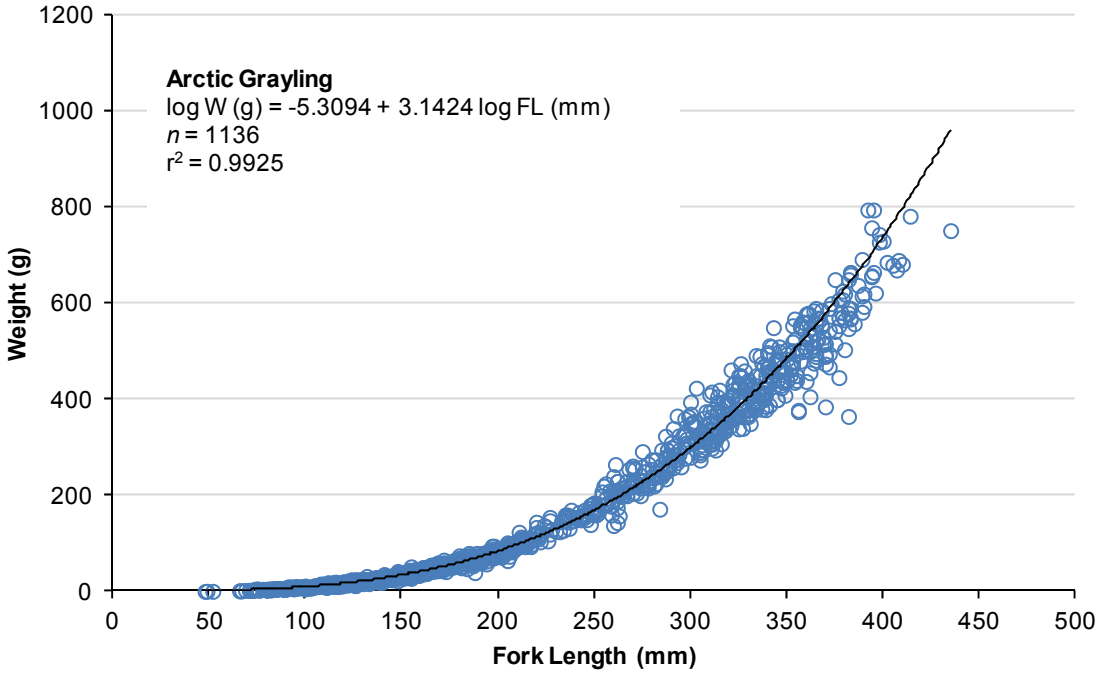
LENGTH-WEIGHT REGRESSION FOR FISH SPECIES CAPTURED IN THE LSA AND RSA, 1997 TO 2012 (ALL AREAS COMBINED)

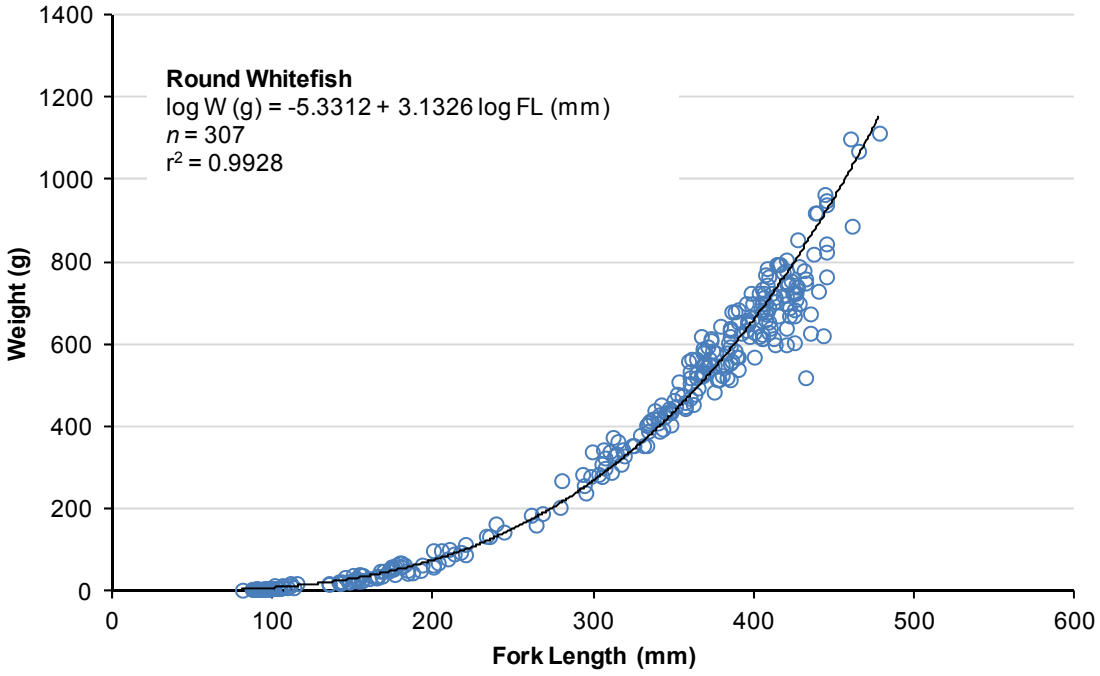


# APPENDIX 7.5-H

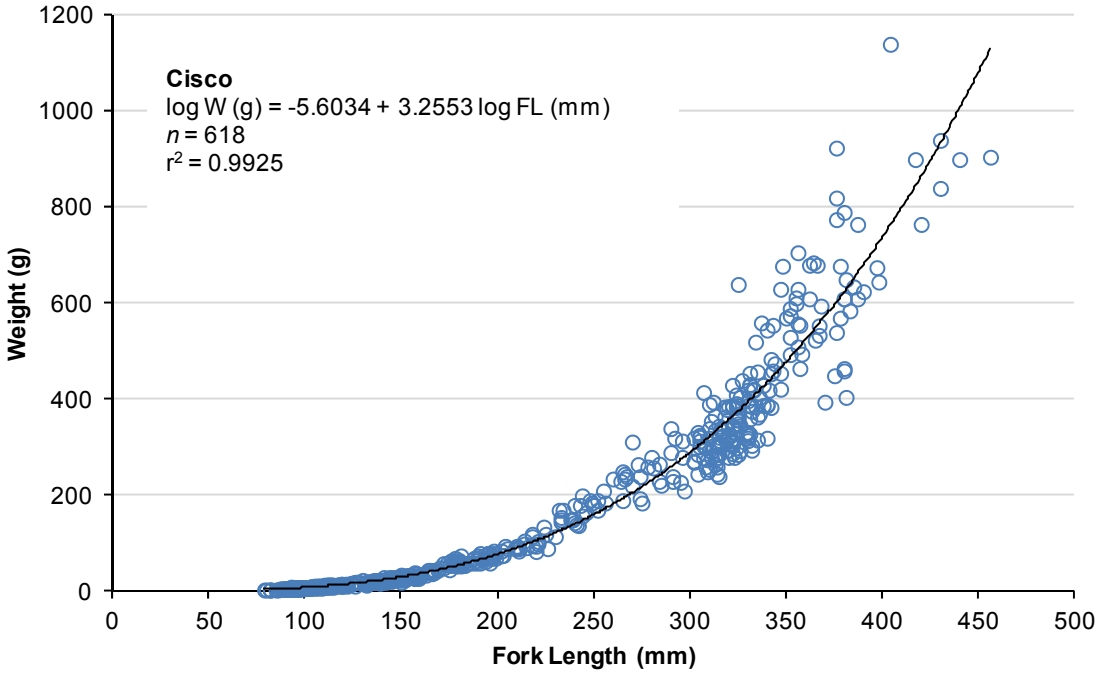
LENGTH-WEIGHT REGRESSION FOR FISH SPECIES CAPTURED IN THE LSA AND RSA, 1997 TO 2012 (ALL AREAS COMBINED)



# APPENDIX 7.5-H

LENGTH-WEIGHT REGRESSION FOR FISH SPECIES CAPTURED IN THE LSA AND RSA, 1997 TO 2012 (ALL AREAS COMBINED)



At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.


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