Agnico Eagle Mines Limited

# HOPE BAY PROJECT
# 2020 Nunavut Water Board Annual Report

AGNICO EAGLE

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**Prepared by**
Agnico Eagle Mines Limited

**Prepared for**
Nunavut Water Board

**March 2021**

# Executive Summary – English

Hope Bay is a gold mining and exploration Project located on a property approximately 20 km × 80 km along the south shore of Melville Sound in Nunavut, Canada, and continued to be operated by TMAC Resources Inc. (TMAC) in 2020. On February 2, 2021 TMAC was purchased by Agnico Eagle Mines (Agnico) but TMAC continues to exist as a legal entity and is now a wholly owned subsidiary of Agnico. All rights, obligations, liabilities of TMAC continue to reside with TMAC until or if an amalgamation with Agnico occurs later in 2021. This report to the Nunavut Water Board (NWB) has been prepared to summarize the Project activities and monitoring conducted under TMAC Type A Water Licences 2AM-DOH1335, 2AM-BOS1835, Type B Water Licences 2BB-MAE1727, 2BB-BOS1727, and the exploration Type B Water Licence 2BE-HOP1222 for 2020.

In 2020 logistical, operational and travel restrictions imposed by the COVID-19 pandemic influenced activity-based monitoring. However environmental protection and compliance at Hope Bay remained a top priority.

In response to the health risks associated with the COVID-19 pandemic, TMAC implemented an Infectious Disease Control Plan at Hope Bay on March 12, 2020. On March 17, 2020, TMAC communicated the decision to demobilize Nunavut-based workers to eliminate the ongoing risk of transmitting the virus to remote communities in Nunavut and initiated enhanced pre-boarding health screening of each southern passenger by a medical professional. Southern crew change flights were reduced from twice per week to once per month, and later crew changes occurred on a three-week rotation. All non-essential work and visits to Hope Bay were suspended in 2020.

In line with many other mining operators, TMAC made the difficult decision to scale down operations and reduce its workforce as the best course of action. Exploration activities at Hope Bay and all development activities at Madrid North were suspended. In 2020, TMAC reduced the number of employees and contractors on-site to approximately 120, relative to a camp capacity of approximately 345 people. The Cambridge Bay, Nunavut office was closed to the public for a period of time with employees working from home, and reopened later in 2020 in line with other businesses. Employees of the Toronto, Ontario office continued to work from home.

Commercial operations continued in 2020 at Doris with ongoing efforts to stabilize mill throughput and optimize gold recovery. In 2020 the mill processed 382,811 tonnes (t) of ore and poured 108,724 ounces of gold. Following the reduction in workforce, TMAC continued processing ore at a reduced rate and achieved steady state processing and improved gold recovery.

The Robert's Bay Discharge system was commissioned in January and discharge to Robert's Bay commenced in accordance with the Metal and Diamond Mining Effluent Regulations (MDMER) in February 2020. Discharge to Robert's Bay was suspended in August 2020 for the seasonal algae bloom  A water management sump (Sump 3) was installed at Doris to enhance the existing water management system.

Civil construction activities included expansion of the Tailings Impoundment Area (TIA) reclaim jetty, maintenance conducted on the airstrip and installation of three water management sumps around the perimeter of the Madrid waste rock pad.

Earthworks continued at the Madrid North site in early 2020 to support the Naartok East Crown Pillar and Madrid North underground decline. This included contouring and armouring of Naartok East Crown Pillar overburden pile and maintenance on Madrid North Contact Water Pond.

Underground mining operations continued at Doris Mine, while Madrid underground and surface operations, including mining of the Naartok East Crown Pillar trench, were suspended in March 2020. At Doris, TMAC focused on producing from developed stopes and bringing ore to surface. A grouting program at Doris greatly reduced inflows of water over the course of 2020.

In the fall, TMAC concluded another successful sealift operation including the purchase and delivery of diesel fuel as well as explosives and reagents to support mining and milling activities. Heavy equipment that had been used for the Naartok East Crown Pillar Recovery mining was removed from site on sealift.

Hazardous waste was successfully backhauled without incident. Waste disposal, fuel usage and chemical storage stayed consistent with previous years. Eight spills were reported to the Nunavut Spill Line, CIRNAC Inspector and KIA Major Projects office. The remaining spills that occurred during 2020 were minor in nature, occurring on camp pads and infrastructure, with quick response and clean up resulting in negligible impact to the receiving environment.

Water use in 2020 was conducted in accordance with the Type A Water Licence 2AM-DOH1335 for Doris-Madrid, the Type A Water Licence 2AM-BOS1835 and the Type B Water Licences 2BB-BOS1727 for Boston, the Type B Water Licences 2BB-MAE1727 for Advanced Exploration at Madrid, and the Type B Water Licence 2BE-HOP1222 for regional exploration. The referenced water licences include provisions for sampling programs that involve recording data related to the volume of water extracted for any purpose, testing of effluents (e.g., treated sewage effluents) discharged to the environment, and monitoring water quality within specific Project areas (e.g., surface discharge downstream of construction areas, storm water from an engineered containment structure, sewage, and oily water effluent, etc.). Water usage in 2020 was conducted within approved limits. There were no changes to surface water management practices at site. Due to limited access to the Boston site during the summer period, efficient use of helicopter time ensured that the site was accessed for monitoring and de-watering requirements of any water containing structures. On June 14, 2020, seepage was identified emanating from the downstream toe of the Madrid North Contact Water pond located at the Madrid North site. On June 15, 2020, the Nunavut Spill Line was notified via email of a release of an estimated 264$m^3$ of contact water. Despite this unplanned event, water met discharge criteria in the licence.

Community consultation in 2020 focused on engaging positively and effectively with communities and the Inuit Environmental Advisory Committee regarding TMAC operations, employment and contracting opportunities and consultation on TMAC's environmental monitoring and fisheries offsetting. The TMAC Cambridge Bay office was closed to the public early in the pandemic and therefore it was not possible for the public in Cambridge Bay to physically engage with TMAC staff, although electronic lines of communication remained open.

As demonstrated above, TMAC strives to continually achieve compliance with the various regulatory requirements and maintain community relationships. Environmental monitoring in accordance with the existing Water Licences, Framework Agreement, Project Certificate, authorizations, management plans and environmental effects monitoring plans will continue during 2021. TMAC is pleased to submit the details of this report to the Nunavut Water Board and looks forward to the integration phase with Agnico Eagle Mines in 2021 for their support in developing Hope Bay in a responsible manner that respects requirements set forth by the Nunavut Water Board.

# ᓇᐃᓪᓕᑎᐊᖅᓯᒪᔨᑦ ᐅᖃᐅᓯᑦ – Inuktitut (North Baffin)

Hᐅᐳᐸ ᐸᐃ ᐱᓕᓚᐊᖅ ᐱᑎᕆᐅᔪᖓᑦᑐᖅ 20 ᑭᓯᒥᑕᓪᓗᐊᓂᒃ x 80 ᑭᓯᑎᑕᓪᓗᐊᓇᑦ ᐅᖓᑲᓴᑎᑎᔪᖅ ᓂᒋᐊᓂᑦ ᓯᓴᒥᑦ ᒥᐅᓪᕆᐃᐅᓪ ᓴᓇᓇᓂᑦ, ᑲᓇᑕᒥᑦ, ᐊᓚᒪᓗ ᐊᐅᓯᖏᑎᑕᐅᖓᓕᓇᖅᑐᖅ TMAC Resources Inc.-ᑯᓘᓇᑦ (TMAC) 2020-ᒥᑦ. ᐊᐳᓘᓂᕐᐳᖅ (ᐃᐳᐊᕆ) 2, 2021-ᒥᑦ TMAC-ᑯᑦ ᓂᐅᐃᖅᑕᐅᓯᐅᖅᑐᑦ ᐊᓴᓂᑯᑯᓘᓇᑦ ᑭᓯᐊᓂ TMAC-ᑯᑦ ᑕᐃᒪᐅᔪᑦ ᓯᓚ ᒪᓕᓚᓕᓇᓂᑯᑦ ᐊᓚᒪᓗ ᓇᖕᒥᓂᓚᐅᓕᖅᑐᖅ ᐊᓴᓂᑯᑯᓘᓇᑦ. ᐱᔪᖏᓇᐅᑎᓗᓴᒋᖓᑦ, ᐱᔪᓴᐅᑎᖓᑦ, ᐊᑭᓕᑦᓴᓴᖓᑦ TMAC-ᑯᑦ ᑕᐃᒪᐅᖓᑦᓇᖅᑐᖅ ᓯᓚ ᒋᑦᑯᓇᓂ ᑭᓯᐊᓂ ᐅᐟᖏᓗᓂᓂᑦ ᑲᑎᑎᑕᐅᓯᒪᓕᖅᐸᑦ ᐊᓴᓂᑯᑯᓘᓇᑦ 2021-ᒥᑦ. ᐅᓂᐸᑲᖅ ᓇᓂᕐᒪᓂ ᐃᒪᓕᓚᓵᔪᑯᑯᓘᓇᑦ ᐱᓕᕆᓂᖅ ᐊᓕᓚᒃᓴᓯᓂᖅ ᐊᓚᒪᓕᖅᑎᑦ ᖃᓄᐃᓕᐅᕈᓯᐅᓕᖅᑐᖅ ᐊᓴᓂᑯᑯᓘᓇᑦ 2021-ᒥᑦ. ᐅᓂᐸᑲᖅ ᓇᓂᕐᒪᓂ ᐃᒪᓕᓚᓵᔪᑯᑯᓘᓇᑦ ᐱᓕᕆᓂᖅ ᐊᓚᒪᓕᖅᑎᑦ ᖃᓄᐃᓕᐅᕈᓯᐅᓕᖅᑐᖅ ᐊᓴᓂᑯᑯᓘᓇᑦ. ᐊᔪᖓᓇᐅᑎᓗᓴᒋᖓᑦ, ᐊᔪᓴᐅᑎᖓᑦ, ᐊᑭᓕᑦᓴᓴᖓᑦ TMAC-ᑯᑦ ᑕᐃᒪᐅᖓᑦᓇᖅᑐᖅ ᓯᓚ ᒋᑦᑯᓇᓂ ᑭᓯᐊᓂ ᐅᐸᒥᓴᖅᑐᖅ 2021-ᒥᑦ. ᐅᓂᐸᑲᖅ ᓇᓂᕐᒪᓂ ᐃᒪᓕᓚᓵᔪᑯᑯᓘᓇᑦ ᐱᓕᕆᓂᖅ ᐊᓚᒪᓕᖅᑎᑦ ᖃᓄᐃᓕᐅᕈᓯᐅᓕᖅᑐᖅ ᐊᓴᓂ

ᓄᓇᓕᖅᑯᓪ ᑲᔪᓯᐅᖅᑐᑦ Madrid ᐅᐊᖏᓇᒥᑦ ᐱᒋᐊᕐᕉᑎᓪᓗᒍ 2020 ᐃᑲᔪᖅᓯᒍ ᓇᖅᑐᖅ ᑲᓇᖏᓇᒥᑦ Crown Pillar ᐊᒻᒪᓗ Madrid ᐅᐊᖏᓇᒥᑦ ᓄᓇᐅᕐᓂ ᐃᓗᐊᓂᑦ ᐱᐊᓂᕐᓯᓕᓂᖅ. ᒪᓂᖅᑲᕐᐃᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᖃᓪᓕᖅᑐᐃᓪᓗᑎᒃ ᓇᖅᑐᖅ ᑲᓇᖏᓇᒥᑦ Crown Pillar-ᒥᑦ ᐅᖏᓪᓕᐅᕐᑎᕆᔨᑦ ᖃᓕᓴᓕᖅᑐᖅᓯᐅᕐᔨᑦ ᐊᒻᒪᓗ ᐱᓕᕆᓚᐅᖅᑐᑦ Madrid ᐅᐊᖏᓇᒥᑦ ᐃᒪᖅ ᐊᑐᖅᓯᐅᕐᔪᒪᑦ ᑕᓯᕋᕐᓂᒥᑦ.

ᓄᓇᐅᕐᔨ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᓚᐊᓕᑲᓇᑦ ᑲᔪᓯᐅᖅᑐᑦ ᑐᓴᐅ ᐅᓴᖅᑕᕆᓚᐊᖅᑎᒥᑦ, Madrid ᓄᓇᐅᕐᔨ ᐃᓗᐊᓂᑦ ᐊᒻᒪᓗ ᖃᐅᔨᖅᑎᑕᐅᓂᑦ ᐊᐅᓪᓚᐅᖅᑐᓂᑦ, ᓄᖅᑲᖅᑎᑕᐅᓚᐅᖅᑐᑦ ᓇᑕᑎᐊᑦ (ᒪᑕᓯ) 2020-ᒥᑦ. ᑐᓴᐅᓪᓗᒥᑦ, TMAC-ᓱᑦ ᑕᐅᑐᐃᓐᓇᖅᑐᑦ ᐱᓕᐅᓇᓭᓕᐊᓂᖅᑲᒃ ᐱᓕᓇᐊᖏᔪᓓᒥᑦ ᓴᓂᕆᔨᓂᑦ ᐊᒻᒪᓗ ᐅᓴᖅᑕᕐᑕᑕᐅᔨᑦ ᓄᓇᐅᕐᔨ ᖃᖅᓱᓕᐊᖅᑎᓂᔨᓂᖅ. ᔨᓪᑲᑐᐃᓂᖅ ᑐᓴᐅᓪᓗᒥᑦ ᐃᒪᖅᑎᑦ ᐃᓗᐊᓄᑦ ᓱᓕᓴᕐᓗᒥᑦ ᑲᑎᒪᔨᖅᑐᑦ 2020-ᒥᑦ.

ᐅᑭᐊᖅᓴᒥᑦ, TMAC-ᓱᑦ ᖃᐅᔨᓕᐅᖅᑐᑦ ᐊᔪᐊᓂᑲ ᐱᐊᓂᕆᐊᖅᑐᒥᒃ ᐅᒥᐊᕐᔪᐊᓂᑲ ᐊᐅᓪᓚᐅᖅᑐᓂᔪᓄᑦ ᐃᓕᓴᕐᓗᐃᑦ ᓂᐅᐅᓪᓗᒥᑦ ᐊᒻᒪᓗ ᐊᖏᔪᖅᑕᐅᓂᖓ ᐅᖅᑯᓕᓗᓄᑦ ᐊᒻᒪᓗ ᖃᓄᖅᑕᐅᔪᓐᓇᖅᑐᑦ ᐊᒻᒪᓗ ᐊᓱᓕᖅᑐᐃᓪᓗᑎᒃ ᐊᒻᒪᓗ ᓴᖅᑭᑦᑐᖅᑐᑦ ᐅᖅᑯᓕᓗᓄᑦ ᐊᒻᒪᓗ ᐊᓱᓕᖅᑐᐃᓪᓗᑎᒃ ᐊᒻᒪᓗ ᓴᖅᑭᑦᑐᖅᑐᑦ ᐅᖅᑯᓕᓗᓄᑦ ᐊᒻᒪᓗ ᔨᓴᖅᑕᐅᓪᓗᑎᒃ. ᓄᓇᖅᓯᐅᑎᕐᔪᐊᑦ ᐊᑐᖅᑕᐅᔨᒪᔪᑦ ᐃᓗᐊᖅ ᖃᖅᑐᖅ ᑲᓇᖏᓇᒥᑦ Crown Pillar-ᒥᑦ ᐅᑎᖅᑎᑕᓂᕐᓗᒥᑦ ᐋᖅᑕᐅᓕᐅᖅᑐᖅ ᐅᓴᖅᑕᕆᓚᐊᖏᑦ ᐅᒥᐊᕐᔪᐊᓘᓐᓃᑦᑐᐊᖅᑕᐅᓕᐅᖅᑐᑦ.

ᐅᓗᑕᐊᓇᖅᑐᖅᖅᑐᑦ ᐊᖅᑕᓯᐅᑦ ᐃᓂᐅᔪᓄᕐᕕᑕᐅᑎᐊᓕᐅᖅᑐᑦ ᖃᓄᐃᓕᓂᖅᑐᖅᓯᓐᓂᑎᒃ. ᐊᖅᑕᓯᓱᓐᓂᑦ, ᐅᖅᔨᐊᓗᓴᖅᑐᓂᑦ ᐊᒻᒪᓗ ᐊᓱᓂᓂᖅᑐᑎᒃ ᑐᖅᔨᖅᑕᔨᒪᔨᑦ ᐊᖅᑕᐅᓯᐅᑉᐸᑦ ᐃᓕᓴᕐᓗᐃᑦ ᐅᓪᓚᐅᖅᑐᓂᑦ ᐃᓕᓴᕐᓗᒥᑦ ᐊᒻᒪᓗ ᐊᓱᓂᓂᖅᑐᑎᒃ

TMAC-ძᑦ ᐊᑐᐃᓴᓇᖅᓂᐊᖃᖅᑐᑦ ᒪᓂᕈᐊᓂᖅᓂᒃ ᐊᐱᕆᙵᕈᑦᑐᓂᒃ ᒪᓂᑎᖅᒪᑦ ᐱᕆᐊᖃᖅᖃᑎᒌᐅᔪᓂᒃ ᐊᓚᒪᓗ ᓄᓇᓂᖅᒥᑦ ᐱᓂᕆᖃᑎᖅᐃᓴᓇᖅᓂᑎᒃ. ᐊᓯᑎᓂᕆᓂᖅᒥᒃ ᖃᐅᔨᓴᐃᓂᖅ ᒪᓂᒃᓴᓂᑦ ᑕᐃᒪᐅᔪᑦ ᐃᒪᖅᒪᑦ ᓯᓚᐅᔨᓂᑦ, ᐱᓂᕆᐊᖅᒪᑦ ᐊᑲᑭᐅᒪᓂᖅᓄᑦ, ᐱᓂᕆᐊᖅᒪᑦ ᓇᓗᓇᐃᒃᓂᑦ, ᐱᔪᖅᓇᖅᑎᑎᒃᓂᑦ, ᐊᐅᓪᓚᑎᓂᖅᒪᑦ ᐸᖅᓇᐅᑎᑦ ᐊᓚᒪᓗ ᐊᓯᑎᒥᒃ ᖃᓄᐃᖅᓯᓂᕆᑎᓂᖅᒪᑦ ᖃᐅᔨᓴᐃᓂᖅᒪᑦ ᐸᖅᓇᐅᑎᑦ ᑲᔪᓂᐅᓂᖅᒪᑦ 2021-ᒥᑦ. TMAC-ძᑦ ᖁᐃᐊᓂᖅᑐᑦ ᐊᓯᑎᓂᕆᓚᐅᔪᓂᒃᓴᓇᖅᑐᓂᒃ ᑐᓂᓪᓕᖅᑐᑦ ᓇᓗᓇᐃᖅᓯᓚᐅᔪᓂᒃ ᐅᓂᒡᓗᑎᑦᑐᓂᒃ ᐊᓚᒪᓗ ᓂᓚᐅᐳᑐᑦ ᐃᓕᓴᐅᑎᓯᒪᓂᖅ ᐊᓚᖅᓂᐊᓂᒃ 2021-ᒥᑦ ᐃᑲᔪᓂᖅᑭᓐᓄᑦ ᐱᓯᒡᓕᐊᓂᖅᓚᓄᑦ ᕼᐅᐳᒡ <ᐃ ᐱᕆᔨᓴᐅᑎᖃᖅᓂᓂᖅᑐᑦ ᐃᖅᐱᐊᓗᓂᖅᖃᖅᓂᖅᑐᓂᒃ ᐱᕆᐊᖃᖅᓂᐅᔪᓂᒃ ᐊᑭᑭᑕᐅᓗᒪᔪᓂᒃ ᐊᓯᑎᓂᓚᓕᖅᑐᓄᑦ.

# Atanguyup Titikgakgaikhimayunik Havakhautit – Inuinnaqtun

Kapihiliktuumi Havaaghaq nayugalik nanminiqmi aktigiyuq 20 km-nik x 80 km-nik hivuraani hinaani Melville Sound-mi Nunavunmi, Kanatami, aulapkaqtitauvaghunilu TMAC Resources Inc.-kunnit (TMAC) 2020-mi. February 2-mi, 2021-mi TMAC-kut niuviqtauhimayuq Agnico Eagles Uyaraghiuqvianit (AEM) kihimi TMAC-kut tajja maligaliqiyikkut nanminiuyuq tajjalu nanminiriliqtait Agnico-kut. Tamangnik pilaarutit, havaaghat, akiliqtaghait TMAC-kut munarivagait TMAC-kut kihimi katitkumik Agnico-kut hivunighami 2021-mi.

2020-mi parnaiyainiq, aulapkainiqmut aullaaqtaqtunullu nutqaqtittiyut Qalakyuarnaq-19-mit ayuqhautauyut havaktunik-munaqhiyunik. Kihimi avatiniq munaqhiqyut maliguaqtullu Kapihiliktuumi irinigiyaulluaqtut.

Kiutjutigiplugu aanniaqtailiniqmut amirnautinik Qalakyuarnaq-19-mut, TMAC-kut aullaqtittihimayut taapkuninnga Hangutaqtunik Aanniarutinik Munaqtit Parnaiyautainik Kapihiliktuumi March 12-mi, 2020-mi. March 17-mi, 2020-mi, TMAC-kut tuhaqtittihimayut ihumaliugainik taimaa havaguiqtittillagahuaqtait Nunavunmiut-havaktit amirnaiqpaallirahuaqhugu hangutaqtuq qalak inuilrumut nunallaarnut Nunavunmi aullaqtittiplutiklu havauhiqnik taimaa ihivriuqhiplutik tingminahuaqnik hivuraaniqmiunit aanniaqtuliqiyimit. Hivuraaniqmiunik havaktinik agyaqtaqtut ikighivaalliqhimayut malruiqtunit 1 week-mi taimaa atauhiiliqhutik tatqiqhiutimi, kinguanilu havaktit kaipiktaqpaktut pingahunik Santinik havaghutik. Tamangnik ihariagiyaunngittut havaaghat pulaaqtillu Kapihiliktuumut nutqaqtitauhimayut 2020-mi.

Maliguaqhutik amihuuyut uyaraghiuqtit, TMAC-kut ayuqnaqtumik ihumaliuqhimayut taimaa mighivaalliriamik ikighivaalliriamiklu havaktiit ihuaqnighakkut. Nalvaaqhiuqtit havaangit Kapihiliktuumi hanayullu havaangit Madrid North-mi nutqaqtitauhimayullu. Nunam iluani hanahimmaaqpaktut Doris-mi ikighivaalliqhimaplutik taapkua TMAC-kut ihumagilluaqhugit hauyauhimayunit uyaraghiuqtut kuluniklu qaanganunngaqtiniriniqmik. Marliliqhiyut Doris-mi ihuaqutauqpiaqtuq kuvihuiqpaalliutaugami imaqmik ukiumi 2020-mi. 2020-mi, TMAC-kut ikighivaalliqhimayait havaktiit kaantulaaktillu havakvingnit taimaa 120-nguyunik, havaqviqaqhutik inighalingmik 345-nik inungnik. Iqaluktuuttiaqmi, Nunavunmi havakviat umighimavaktuq inungnut havaktiillu havaghutik aimaviinit; angmatqighutik nungutinnagu 2020 malighugit ahiillu nanminiit. Havaktiit talvanngat Toronto, Ontario-mi havakvianit huli aimavingnit havakpaktut.

Manighiuqtit havaangit aulahimmaaqtut 2020-mi Doris-mi uyaraktaqtait qipliqhiiplugit kulutaqpaallirahuaqhutik. 2020-mi, qipliqhiviit hanahimayut 382,811 tonnes-nik (t) uyarangnik kuvihiplutik 108,724 ounces-nik kulunik, ihuaqtukkullu iniqhittiaqhutik 17,886 t-nik tuqunaqtunik cyanide-nik uyaraktarvingnik. Ikighivaalliqhugit havaktiit, TMAC-kut uyaraghiuqhimmaaqpaktut kayumiikpaalliqhutik kihimi aulattiaqhutik kulutaqpaktut.

Roberts Kangiqhuani Imaiyaqviat hanahimayuq aullaqtitaupluni January-mi anialattiplutik Roberts Kangiqhuanut maliqhugu MDMER February-mit talvunga August 2020-mut. Anialattiyut Roberts Kangiqhuanut nutqaqtitauhimayuq August 2020-mi nauvalliayunut kingungnut ukiuq tamaat. Imautighanik (Pakpaut 3) iliuraqtauhimayuq Doris-mi ihuaqhivaalliriamik imautainut ingilrutit.

Hanayunit iniqhihimayait taapkua ilaaqtuqhugu TIA-nit uhiiyaqvianit, manigighaqhugu milvik iliuraiplutiklu pingahunik imautinut pakpautinik kikliani Madrid-mi hiqquplugaqnit.

Nunaliqivaktut talvani Madrid North havakvianit 2020 atulihaaqtumi ikayuqhugu Naartok Kivalliqhianit Itiqtarvianit Madrid North-mi nunam iluanunngaqtumi. Hanaplugu manighiplugu amiqnaiyaqhugulu Naartok Kivalliqhianit Itiqtaqvianit qaanga hanaplugulu Madrid North-mi Imautait Tahiraq.

Nunam iluani uyaraghiuqtut havakpaktut Doris Uyaraghiuqvianit, talvanittauq Madrid-mi nunam iluani qaanganilu havaghutik, uyaraghiuqhutiklu Naartok Kivalliqhianit Itiqtarvianit, nutqaqtitauhimayt March 2020-mi.

Ukiaghami, TMAC-kut naammaktumik umiakkut agyaqtaqhimayut niuviqhutik agyaqtauplunilu uqhugaq qagaqtautillu ikighatillu ingilrutighait uyaraghiuqtut qipliqhaiyullu. Pualritit ingilrutit atuqtauhimayut talvani Naartok Kivalliqhianit Itiqtarvianit uyaraghiuqvianit ahivaqtauhimayuq havakvingnit umiakkut.

Qayangnaqtut kuvvikkuit ihuaqtukkut utiqtitauhimayut ayuqnaittumik. Kuvvikkuit, uqhughat atuqtaghat ikkighatillu tutquumaviat aajjikkutauyuq hivuanit ukiunit. 8-nguyut kuvihimayut naunaiqhitiyauhimayut talvunga Nunavunmi Kuviyuqarniqqat Hivayautaat, Imaqmik Laisiutinik Ihivriuqhiyimut talvungalu KIA-kut Angiyut Havaaghat havakvianut. Kuvihimayuttauq ahiit 2020-mi mikiyut, kuviplutik allarutinut havakvingnilu, kiuhinariqpaghutik halummaqhinariqpaghutiklu mihingnaittumik kuvivianut.

Imaq atuqtauyuq 2020-mi ihivriuqhimayuq malighugu taamna Type A Imaqmut Laisiutit 2AM-DOH1335 Doris-Madrid-mut, Type A Imaqmut Laisiutit 2AM-BOS1835 taamnalu Type B Imaqmut Laisiutit 2BB-BOS1727 Boston-mut, Type B Imaqmut Laisiutit 2BB-MAE1727 taapkununnga Nalvaaqhiuqpaalliqtunut Madrid-mi, taamnalu Type B Imaqmut Laisiutit 2BE-HOP1222 aviktuqhimayumi nalvaaqhiuqtunut. Ilittuqhitilgit imaqmut laisiutinit titiraqhimayulik qauyihaiyut ikayuutainut ilauplutik taapkua naunaitkutanik titiraqtut ilaupluni aktinianut imaiyaqhimayuq hunanutkiaq, qimilruughugit kuvviit (taapkuatut, avuliqhugit annakkuit) kuviyauhimayut avatinut, munaqhugulu immap qanuriningania nanikiaq Havakvingnit (taapkuatut, qaangani kuviralattiyut qurluqtumik hannavingnit, hilam imautainik hanahimayumit imautimit, kuvviqnit, uqhuqyualiklu kuvvikkuit, qanuqlu). Imaqmik atuqtut 2020-mi ihivriuqtauhimayuq angiqhimayunit havakvingnit. Aallannguqtuqanngittuq qaanganit imaqmik munaqhiyut havauhiinik havakvingnit Ayuqnautinut pulaaqtariamik Boston havakvianik auyami, ihuaqtukkut atuqhutik halikaaptakkut pulaaqpaghimayaat havakvik munariplugulu imaiyaqtughallu havaaghainik kitunikiaq immiqtaqtunik hanahimayunit. June 14-mi, 2020-mi, qaangani kuviralattiyumik qurluqtumik hannaviat putuguanit talvani Madrid North Imautait Tahiraa talvani Madrid North havakvianit. June 15-mi, 2020-mi, Nunavunmi Kuviyuqarniqqat Hivayaut naunaiqhitihimayut qaritauyakkut titirakkut taimaa anialattiyumik 254 $m^3$ halummaqhitimik imaqmik. Ahiagut taamna naahurinnaittuq, imaq anialattiyauyuq naammagiyauyuq laisiutainit kihimi taapkua naallugit hiamitittut naptuyut (TSS).

Nunallaaqnik katimaqatigihimayait 2020-mi ihumagilluaqpagait katitpallianiq naammaktukkut ihuaqtukkul nunallaarmiullu taapkualu Inuit Avatinik Unniqtuiyit Katimayiralaangit mighaagut TMAC-kut havaangit, havaaghait kaantulaaktaghaniklu katimatjutigilugilu TMAC-kut avatinik munaqhiyut mighaagut iqalliqiyillu havaaghainut. TMAC-kut Iqaluktuuttiaqmi havakvianit umighivaktuq qalakyualihaaqhutik talvuuna inuit Iqaluktuuttiaqmi katimattailivaktut TMAC-kut havaktiillu, kihimi alruyaqtuqtukut tuhaqtittigiikpaktut.

TMAC-kut maliguattiaqhimmaarahuaqpagait aallatqiik aulapkainiqmut maliktaghat ilagiittiarahuaqhugit nunallaarmiut. Avatinik munaqtiuyuq malighugit tajja atuqtauyuq Imaqmut Laisiutit, Havaaghanut Angirutit, Havaaghanut Ilitaritjutit, angirutit, atannguyait parnaiyautait avatinullu mihingnautinik munaqhiyut parnaiyautait aulavangniaqtut 2021-mi. TMAC-kut quviahuktut tunihiyaamik naunaitkutanik talvunga Nunavunmi Avatiliqiyit Katimayiinut naahurittiaqhutik katitpalliayaamik taapkualu Agnico Eagle Uyaraghiuqtit 2021-mi ikayuqtighat hanayunik Kapihiliktuumi munarittiaqhugit ihumagittiaqhugillu pitquyauhimayut taapkunannga Nunavunmi Avatiliqiyit Katimayiit.

# HOPE BAY PROJECT
# 2020 Nunavut Water Board Annual Report

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# Acronyms and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

| | |
|---|---|
| **ABA** | Acid-base accounting |
| **AEMP** | Aquatic Effects Monitoring Program |
| **Agnico** | Agnico Eagle Mines Limited |
| **ANFO** | Ammonium nitrate/fuel oil |
| **AP** | Acid Production Potential |
| **AWR** | All weather road |
| **BTD** | Below the Dyke |
| **CIRNAC** | Crown-Indigenous Relations and Northern Affairs Canada |
| **CPR** | Crown Pillar Recovery |
| **CPRT** | Crown Pillar Recovery Trench |
| **CSR** | Corporate Social Responsibility |
| **CWP** | Contact Water Pond |
| **CWS** | Canada-wide Standards |
| **DCN** | Doris Central |
| **DCO** | Doris Connector |
| **DNO** | Doris North |
| **DWV** | Doris West Valley |
| **DNSEMC** | Doris North Project Specific Committee |
| **EC** | Electrical conductivity |
| **ED&T** | Economic Development and Transportation |
| **FEIS** | Madrid-Boston Final Environmental Impact Statement |
| **GN** | Government of Nunavut |
| **HCT** | Humidity cell test |
| **HR/SR** | Human Resources/Social Responsibility |
| **IIBA** | Inuit Impact and Benefits Agreement |

| | |
|---|---|
| **ISET** | Indigenous Skills and Employment Training |
| **KIA** | Kitikmeot Inuit Association |
| **KSEMC** | Kitikmeot Socio-Economic Monitoring Committee |
| **LTA** | Landfarm Treatment Area |
| **m** | Metre |
| **MDMER** | Metal and Diamond Mining Effluent Regulations |
| **ML/ARD** | Metal leaching and/or acid rock drainage |
| **MMER** | Metal Mining Effluent Regulations |
| **NEF** | Nunavut Economic Forum |
| **NIRB** | Nunavut Impact Review Board |
| **NP** | Neutralization Potential |
| **NWB** | Nunavut Water Board |
| **NWS** | Naartok West |
| **OPEP** | Oil Pollution Emergency Plan |
| **OPPP** | Oil Pollution Prevention Plan |
| **ORP** | Oxidation-reduction potential |
| **PAG** | Potentially acid generating |
| **PCP** | Pollution Control Pond |
| **the Project** | the Hope Bay Project |
| **pXRF** | Portable X-ray fluorescence |
| **QA/QC** | Quality assurance and quality control |
| **QIA** | Qikiqtani Inuit Association |
| **RBDS** | Roberts Bay Discharge System |
| **SCP** | Sediment Control Pond |
| **SDS** | Safety data sheets |
| **SFE** | Shake flask extraction |
| **SNP** | Surveillance Network Program |
| **SOP** | Standard Operating Procedure |
| **t** | Tonnes |

| | |
|---|---|
| **TDGA** | *Transportation of Dangerous Goods Act* |
| **TDS** | Total dissolved solids |
| **TIA** | Tailings Impoundment Area |
| **TIC** | Total inorganic carbon |
| **TMAC** | TMAC Resources Inc. |
| **TSS** | Total suspended solids |
| **WAD** | Weak acid dissociable |
| **WRIA** | Waste rock influenced area |
| **WRSA** | Waste Rock Storage Area |
| **WWTF** | Wastewater treatment facility |

# 1. Introduction

Hope Bay is a gold mining and exploration Project located on a property approximately 20 km × 80 km along the south shore of Melville Sound in Nunavut, Canada, and continued to be operated by TMAC Resources Inc. (TMAC) in 2020. On February 2, 2021 TMAC was purchased by Agnico Eagle Mines Limited (Agnico) but TMAC continues to exist as a legal entity and is now a wholly owned subsidiary of Agnico. All rights, obligations, liabilities of TMAC continue to reside with TMAC until or if an amalgamation with Agnico occurs later in 2021.

This report to the Nunavut Water Board (NWB) has been prepared to summarize the Project activities and monitoring conducted under TMAC Type A Water Licence(s) 2AM-DOH1335, 2AM-BOS1835, Type B Water Licence(s) 2BB-MAE1727, 2BB-BOS1727 and the exploration Type B Water Licence 2BE-HOP1222 for 2020. Concordance tables referencing where in this report the requirements of the reporting outlined in each of the referenced water licences has been met are presented in Appendix A.

The referenced water licences include provisions for sampling programs that involve recording data related to the volume of water extracted for any purpose, testing of effluents (e.g., treated sewage effluents) discharges to the environment, and monitoring water quality within specific Project areas (e.g., surface discharge downstream of construction areas, storm water from an engineered containment structure, sewage and oily water effluent, etc.). These data are summarized and referenced on the completed NWB Annual Report Forms, included as Appendix B, and all monitoring data are provided in Appendix D of this report.

# 2. Regulatory Framework and Legal Matters

The key regulatory and legal documents that relates to this report are the Project Type A and B Water Licence(s), however this report is presented in context of other applicable regulatory authorizations and schedules. TMAC holds, or will soon hold, the permits and authorizations required to carry out the future work scope. A listing of the key regulatory instruments that allowed for work to be completed in 2020 is provided in Table 2-1.

**Table 2-1. Key TMAC Permits/Licences and Approvals**

| Name | Approval No. | Scope / Purpose | Term / Duration | Expiration Date |
|---|---|---|---|---|
| Nunavut Impact Review Board (NIRB) Project Certificate | 009 | Authorization for Madrid-Boston to proceed, provided certain conditions and requirements are incorporated in the various regulatory permits and authorizations issued by the regulatory agencies with permitting authority for the Hope Bay Project. The Project includes the construction of all required surface Infrastructure and operation of three new mines at Hope Bay: Madrid North, Madrid South and Boston. | Life of Doris Project | None |
| NIRB Project Certificate | 003 | Authorization for Doris to proceed provided certain conditions and requirements are incorporated in the various regulatory permits and authorizations issued by the regulatory agencies with permitting authority for the Hope Bay Project. | Life of Doris Project | None |
| NWB Type A Water Licence Amendment No.2 | 2AM-DOH1335 | Water Licence for Doris and Madrid project that authorizes the construction, operation and reclamation of the Doris, Madrid and the all- weather road of the Hope Bay Project. Licence scope includes Amendment No.1. | 22 years | March 2035 |
| NWB Type A Water Licence Amendment No.1 | 2AM-DOH1323 | Water Licence for Doris with a 10-year term that authorizes the construction, operation and reclamation of the Doris Project. Licence was renewed (with certain amendments) in November 2016. – Superseded by Amendment No. 2 2AM-DOH1835. | 10 years | August 2023 |
| NWB Type A Water Licence Amendment | 2AM-BOS1835 | Water Licence for the Phase 2 Boston Site that authorizes the construction, operation and reclamation of the Boston Project. | 17 years | March 2035 |
| Type B Water Licence for the HBVB including a camp at Windy Lake | 2BE-HOP1222 | Water Licence that allows for the use of water and disposal of waste associated with regional exploration program including drilling and camp operations. | 10 years | June 2022 |
| Type B Water Licence for bulk sample exploration at Boston | 2BB-BOS1727 | Water licence that allows for the use of water and the disposal of waste for the Boston Advanced Exploration Project. Licence was renewed in July 2017, was formerly 2BB-BOS1217. | 10 years | July 2027 |

*(continued)*

**Table 2-1. Key TMAC Permits/Licences and Approvals (continued)**

| Name | Approval No. | Scope / Purpose | Term / Duration | Expiration Date |
|---|---|---|---|---|
| Type B Water Licence for Madrid Advanced Exploration Amendment No.2 | 2BB-MAE1727 | Water licence that allows for the use of water and the disposal of waste for an undertaking classified as Mining and Milling as per Schedule II of the Regulations for the Madrid Advanced Exploration Project (Amended in 2018). | 10 years | May 2027 |
| Framework Agreement | | Framework Agreement provides comprehensive land tenure governing the issuance of surface exploration licences, advanced exploration leases, commercial leases, and compensation associated with tenure. Framework Agreement includes a belt-wide Land Use Licence, an Inuit Impact and Benefits Agreement (IIBA) and a Water and Wildlife Agreement. Framework Agreement was signed in March 2015 for belt-wide land tenure. | 20 years | March 2035 |
| Water and Wildlife Agreement | | Included as a Schedule to the Framework Agreement, this Agreement details compensation to be provided to the Kitikmeot Inuit Association (KIA) and Inuit beneficiaries for negative effects that may occur to wildlife harvesting and water as a result of mining related activities across the Belt. | 20 years | March 2035 |
| Amended and Restated Inuit Owned Lands Commercial Lease | KTCL 313D001 | Commercial Lease for use of designated lands associated with the Hope Bay Volcanic Belt (HBVB) area. Currently, lands have been designated that encompass Doris. Expansion to include other areas of the HBVB is administrative in nature. Original Commercial Lease was amended and restated in March 2015 as a means to obtain surety of belt-wide land tenure. | 20 years | March 2035 |
| Inuit Impact and Benefits Agreement | | Included as a Schedule to the Framework Agreement, this Agreement details the benefits to be provided to the KIA and Inuit beneficiaries from the Hope Bay Project, including compensation, employment and contracting opportunities. The IIBA originally signed in association with Doris was revised in March 2015 and expanded in scope to encompass belt-wide activities. | 20 years | March 2035 |
| KIA Advanced Exploration Agreements | KTAEL15C001 KTAEL15C002 | Two agreements as per the terms of the Framework Agreement enabling quarry operations at designated locations in the Hope Bay Belt and advanced exploration at Boston. | 5 year renewable annually thereafter for up to 20 years | March 2021 |
| KIA Land Use Licences | | Enables exploration activities across the Hope Bay Belt as per the terms of the Framework Agreement. | 1 year automatic renewable for 20 years | March 2021 |

*(continued)*

**Table 2-1. Key TMAC Permits/Licences and Approvals (completed)**

| Name | Approval No. | Scope / Purpose | Term / Duration | Expiration Date |
|---|---|---|---|---|
| DFO authorization | NU-02-0117.2 | Construction of the jetty in Roberts Bay. | | December 2009 |
| DFO authorization | NU-1000-0028 | Changes to the Doris jetty. | | July 2012 |
| DFO authorizations | NU-02-01117.3 | Construction of the Doris Tailings Impoundment Area (TIA) north dam. | Life of Mine | None |
| Navigable Waters Permit | 8200-02-6565 | Installation of the jetty in Roberts Bay. | N/A | N/A |
| Navigable Waters Permit | 2018-600028 | Approval for Jetty in Roberts Bay | N/A | N/A |
| Navigable Waters Permit | 2018-600006 | Approval for Marine Outfall Berm | N/A | N/A |
| Jetty Lease | 77A3-1-2 | Foreshore lease from the Crown for construction and operation of the Roberts Bay Jetty. | 30 years | June 2047 |
| Marine Outfall Berm | 77A/3-3-2 | Lease from Crown for construction and operation of Roberts Bay Marine Outfall Berm. | 30 years | July 2048 |
| Amendment to Schedule 2 of the Metal Mining Effluent Regulations (MMER) | Registration SOR/2008-216 | Designation of Tail Lake as a tailings impoundment. | Life of Mine | None |

# 3. Summary of Project Activities for 2020

## 3.1 CONSTRUCTION AND OPERATIONS

Doris

- Full operations continued until March 2020. Workforce reduction due to COVID-19 pandemic in March 2020.
- Underground mining operations continued at Doris Mine, Madrid underground and surface operations were suspended in March.
- Northern workforce sent home to eliminate risk of COVID-19 transmission to communities.
- Milling operations continued at reduced rate with one rotation processing ore and opposite rotation conducting maintenance.
- Expansion of TIA reclaim jetty conducted in July-August.
- Maintenance conducted on airstrip.
- Robert's Bay Discharge system commissioned in January including Water Treatment Plant for treating underground effluent for total suspended solids (TSS). Commenced effluent discharge to Robert's Bay in accordance with MDMER in February.
- Discharge to Robert's Bay was suspended in August.
- Water Management Sump 3 installed to manage potential contact water.
- New building to house ambient air quality monitoring samplers was placed east of Doris pad (awaiting installation and commissioning of air quality monitors delayed due to COVID-19 pandemic).
- Completed sealift operation with delivery of supplies, diesel fuel, explosives and reagents to support mining and milling activities.
- Hazardous waste was backhauled without incident.
- Heavy equipment that had been used for the Naartok East Crown Pillar Recovery (CPR) mining was removed from site on sealift.

Madrid

- Completed collaring underground portal and continued underground decline development until March 2020.
- Installation of three water management sumps around perimeter of waste rock pad prior to freshet.
- Completed contouring and armouring of Naartok East Crown Pillar overburden pile.
- Continued mining of Naartok East Crown Pillar trench until March.
- Performed maintenance on Madrid North Contact Water Pond.
- New building to house ambient air quality monitoring samplers was placed east of Doris pad (awaiting installation and commissioning of air quality monitors delayed due to COVID-19 pandemic).

In 2020 logistical, operational and travel restrictions imposed by the COVID-19 pandemic influenced activity-based monitoring. However environmental protection and compliance at Hope Bay remained a top priority.

In response to the health risks associated with the COVID-19 pandemic, TMAC implemented an Infectious Disease Control Plan at Hope Bay on March 12, 2020. On March 17, 2020, TMAC communicated the decision to demobilize Nunavut-based workers to eliminate the ongoing risk of transmitting the virus to remote communities in Nunavut and initiated enhanced pre-boarding health screening of each southern passenger by a medical professional. Southern crew change flights were reduced from twice per week to once per month, and later crew changes occurred on a three-week rotation. All non-essential work and visits to Hope Bay were suspended in 2020.

In line with many other mining operators, TMAC made the difficult decision to scale down operations and reduce its workforce as the best course of action. Exploration activities at Hope Bay and all development activities at Madrid North were suspended. In 2020, TMAC reduced the number of employees and contractors on-site to approximately 120, relative to a camp capacity of approximately 345 people. The Cambridge Bay, Nunavut office was closed to the public for a period of time with employees working from home; and then reopened later in 2020 in line with other businesses. Employees of the Toronto, Ontario office continued to work from home.

Commercial operations continued in 2020 at Doris with continued efforts to stabilize mill throughput and optimize gold recovery. In 2020 the mill processed 382,811 tonnes (t) of ore and poured 108,724 ounces of gold, and successfully treated 17,886 t of concentrate with cyanide solutions. Following the reduction in workforce, TMAC continued processing ore at a reduced rate and achieved steady state processing and improved gold recovery.

The Robert's Bay Discharge system was commissioned in January and discharge to Robert's Bay commenced in accordance with MDMER in February 2020. Discharge to Robert's Bay was suspended in August 2020 for the seasonal algae bloom. A water management sump (Sump 3) was installed at Doris to enhance the existing water management system.

Civil construction activities included expansion of the TIA reclaim jetty, maintenance conducted on airstrip and installation of three water management sumps around perimeter of the Madrid waste rock pad.

Earthworks continued at the Madrid North site in early 2020 to support the Naartok East Crown Pillar and Madrid North underground decline. This included contouring and armouring of Naartok East Crown Pillar overburden pile and maintenance on Madrid North Contact Water Pond.

Underground mining operations continued at Doris Mine, while Madrid underground and surface operations, including mining of the Naartok East Crown Pillar trench, were suspended in March 2020. At Doris, TMAC focused on producing from developed stopes and bringing ore to surface. A grouting program at Doris greatly reduced inflows of water over the course of 2020.

In the fall, TMAC concluded another successful sealift operation including the purchase and delivery of diesel fuel as well as explosives and reagents to support mining and milling activities. Heavy equipment that had been used for the Naartok East Crown Pillar Recovery mining was removed from site on sealift.

Site layouts and aerial photos for the Belt are provided in Appendix C of this report and provide details of the existing camps, infrastructure and equipment at site.

## 3.2 EXPLORATION

The 2020 Exploration and Geoscience program at Hope Bay consisted of both underground and surface diamond drilling. The 2020 exploration program at Doris included drilling high-grade targets in the Below the Dyke (BTD) extension for mineral resource expansion and drilling in the Doris Central (DCN), Doris West Valley (DWV), and Naartok West (NWS) for further resource and mine developments. A total of 39,072 meters in 330 diamond drill holes was completed in 2020.

### 3.2.1 Drilling

Underground diamond drilling at Doris operated throughout the year in 2020, with a brief hiatus from April-June due to the COVID-19 pandemic. The diamond drilling program focused on expansion drilling in the high-grade zones within the Doris BTD and infill drilling within the Doris Connector (DCO), Doris North (DNO) and Doris Central (DCN) to support detailed mine planning. A total of 293 underground diamond drill holes, totalling 35,926 meters was completed in 2020.

TMAC contracted Geotech Ekutak Drilling Services Ltd. to complete the diamond drilling on the Hope Bay Belt for both underground and surface operations in 2020. On surface, no drill setup or associated items were placed within 31 meters of any waterbody during the open water season and no spills were reported into water bodies. Water quality monitoring was performed on runoff from drill sites and water used for drilling to ensure the respective Water License Criteria were met. Drill cuttings and mud were contained within a recirculation system and were transported and stored in approved containment areas including the TIA at Doris.

Surface diamond drilling activities for the 2020 Exploration and Geoscience program occurred between February and November within the Hope Bay Belt. Diamond drilling focused on targets proximal to the Doris and Madrid deposits. All drill sites on surface were reclaimed following the decommissioning of drills. A total of 37 surface diamond drill holes totalling 3,146 meters was completed in 2020.

# 4. Summary of Project Plans for 2021

## 4.1 CONSTUCTION AND OPERATIONAL WORK PLANS FOR FUTURE YEAR (2021)

The following activities are planned for the Doris site and associated permitted infrastructure for 2021:

### 4.1.1 Doris

- Construction of Millwright/Electrical shop on current Doris footprint;
- Maintenance of Roberts Bay Discharge System;
- Expansion of the Doris accommodation complex;
- Expansion of dry facilities at Doris Camp;
- Upgrades to existing Water Treatment Plant;
- Construction of heated parking structure for storage of emergency response vehicles on existing Doris footprint; and
- Installation of heat-traced and insulated emergency underground dewatering line to the TIA.

### 4.1.2 Madrid

- Commence Naartok East CPR backfill; and
- Removal of the Madrid North Portal Pad infrastructure and laydown area reclamation.

### 4.1.3 Boston

- No development is planned for Boston.

## 4.2 EXPLORATION WORK PLANS FOR FUTURE YEAR (2021)

Exploration activities for 2021 will include surface and underground diamond drilling. Surface drilling will focus on completion of the infill and geotechnical drilling program at Madrid North Naartok West, which was initiated and subsequently suspended due to COVID-19 restrictions in 2020. Surface exploration north of the Doris Deposit will be completed in the summer season.

Surface diamond drilling planned for 2021 will consist of approximately 14,000 meters of delineation and geotechnical drilling on the Madrid North Naartok West zone, and 6,000 metres of exploration drilling in the Doris Valley area, north of the Doris deposit. Exploration drilling north of Doris will follow-up on positive results from 2019 drilling.

# 5. Water Use and Waste Disposal

During 2020, water management at Hope Bay Project Site was in line with the authorized Type A Water Licence for Doris and Madrid 2AM-DOH1335, the Type B Regional Exploration Licence 2BE-HOP1222, and the Type B Water Licence for Boston 2BB-BOS1727. No activities occurred under the Type A Water Licence 2AM-BOS1835 for Boston or the Type B Water Licence 2BB-MAE1727 for Madrid, therefore no water was used or waste produced from activities associated with these licences.

An overview of the sampling programs for each of the sites (Doris, Windy, Madrid and Boston) including site photographs showing the locations of monitoring sites as well as annual water sampling programs for the Hope Bay Project are provided in Appendix D of this report.

## 5.1 DORIS-MADRID

A summary of monitoring conducted for Doris and Madrid under the Type A Water Licence 2AM-DOH1335 is presented in Appendix D.1 of this report as outlined in Schedule I.

Water for domestic use at Doris is obtained from Windy Lake. Water is drawn from the lake at the freshwater intake and trucked to Doris Camp. The Doris Lake pumphouse was not supplying domestic water to Doris Camp in 2020.

Sewage and greywater produced onsite is processed in the sewage treatment plant at Doris in line with Part F Item 5 of the Type A Water Licence 2AM-DOH1335. Sludge produced by the treatment plant is disposed of within the TIA as outlined in the existing Hope Bay Project Domestic Waste Water Treatment Management Plan.

All containment berm water is sampled for water quality against the discharge criteria of the licence. Water that meets the standards for discharge is released in accordance with the licence following a notification to the Inspector; water that does not meet the licence criteria is treated onsite until it is remediated to acceptable levels for discharge to the tundra, is discharged to the TIA, and/or is managed as approved by the Inspector.

Runoff and contact seepage at site is managed in accordance with the approved Quarry Management and Monitoring Plan and Water Management Plan for the Doris Site.

During 2020, TMAC collected data from the following active or seasonally active monitoring stations: TL-1, TL-2, TL-5, TL-6, TL-7a, TL-7b, TL-9, TL-11, TL-12, ST-1, ST-2, ST-4, ST-5, ST-6a, ST-6b, ST-7, ST-7a/MMS-4b, ST-8, ST-9, ST-11, ST-12, MMS-1, and MMS-6.

Monitoring at stations ST-3 (Landfill Sump), ST-13 (Doris Contact Water Pond Pad U), MMS-4a (Freshwater intake at Windy Lake North), and MMS-8 (Madrid North Fuel Storage Facility) did not occur, as these facilities were not constructed as of 2020.

Monitoring at ST-10 (Doris Site runoff from sediment controls) and MMS-9 (Madrid Site runoff for sediment controls during construction) was not conducted as no new infrastructure was constructed at Doris or Madrid in 2020.

The Madrid North Concentrator was not constructed in 2020, therefore no effluent was discharged to the TIA from this facility and no monitoring occurred at station MMS-7. No monitoring at station MMS-10 (Madrid Mine Water Discharge) occurred as no mine water was pumped from Madrid underground workings in 2020.

No activities occurred at Madrid South in 2020. Therefore monitoring at stations MMS-2 (Madrid South Primary Contact Water Pond), MMS-3 (Madrid South Secondary Contact Water Pond) and MMS-5 (Madrid South Fuel Storage Facility) did not occur as these facilities were not constructed as of 2020.

Monitoring of the TIA was undertaken at monitoring station TL-1. Monitoring of the tailings deposited into the TIA continued at monitoring stations TL-5 and TL-6 in 2020. Monitoring of detoxified tailings backfilled underground was completed at monitoring stations TL-7a, TL-7b and TL-11. As described in the Hope Bay Water Management Plan, the sedimentation pond (ST-1) was used as a collection pond for the water that accumulated in the pollution control pond (ST-2) and the three underflow sumps (ST2-S1, ST2-S2 and ST2-S3). The water collected in ST-1 was then transferred to the TIA by pipeline. The sedimentation pond was also used to transfer water from the landfarm (ST-4) and fuel storage facility berms (ST-5 and ST-6b) to the TIA. Water from the Naartok East Crown Pillar Trench (NECPT) and Madrid North Contact Water Pond (MMS-1) was also transferred to the TIA through the sedimentation pond. Dewatering of the TIA to Roberts Bay through the Roberts Bay Discharge System began in February and continued until August 2020.

All monitoring was conducted in accordance with the Hope Bay Project Quality Assurance and Quality Control Plan (2020).

TMAC uses external certified laboratories to carry out all analyses reported in the monthly and annual reports. The QA/QC data produced by ALS Canada Ltd. and Bureau Veritas Laboratories Inc. are used to determine the accuracy and precision of results in these reports.

Analytical results for all monitoring stations can be found in Appendix D.1.

### 5.1.1 Water Balance and Water Quality Model

In 2020 commercial operations continued at Doris and monitoring continued at the associated SNP stations. Water quality source terms, climate data, mine water dewatering rates, processing rates and TIA storage curves were reviewed and/or updated in the water and load balance model, with 2017 to 2020 data, to compare against the predicted TIA water quality and water elevation. Results of the Water and Load Balance Assessment, including relevant supporting data, internal modelling results and adaptive management strategies, have been summarized in the Doris Mine Annual Water and Load Balance Assessment found in Appendix E.

### 5.1.2 Tailings Impoundment Area

The North Dam which ensures containment of reclaim water in the TIA was completed in 2012. The South Dam which ensures containment of tailings solids was completed in 2018. The total tonnage of tailings solids deposited in 2020 was 0.37 Mt. As of December 2020, 64% of the licensed 2.5 Mt TIA tailings capacity has been utilized (1.6 Mt). The water level at the end of December 2020 was 31.6 masl. The full supply level of the TIA is 33.5 masl. This equates to approximately 2.07 Mm3 of additional water storage capacity available in the reclaim pond. Approximately 17,886 tonnes of detoxified tailings were placed underground as backfill.

## 5.2 WINDY – 2BE-HOP1222

The Type B Water Licence No. 2BE-HOP1222 issued to TMAC by the NWB details the sampling and analysis requirements for the Surveillance Network Program (SNP). Windy Camp and the Patch Lake Laydown facility were not in use in 2020; therefore, sampling stations associated with camp operations and fuel storage facility are not being used or monitored. Tables in Appendix D.2 of this report summarize the results of sampling undertaken as part of the monitoring program detailed in Part J of 2BE-HOP1222.

Water is obtained from Windy Lake (ST-7a/MMS-4b) for use at Doris Camp under 2AM-DOH1335 and as allowed under 2BE-HOP1222. Water is taken up through a screened intake and sunken heat-traced line by a permanent pump house, which is used as needed to fill a water truck that transports the water to Doris Camp for use.

The camp water treatment and wastewater treatment facility (WWTF) permitted under this licence was not operational in 2020, therefore no sampling was conducted at monitoring stations HOP-1 (freshwater intake), HOP-2 (WWTF discharge), or HOP-3 (point of entry of WWTF discharge to Windy Lake). Water was utilized from Windy Lake for domestic consumption at Doris Camp and the monitoring station ST-7a/MMS-4b (HOP-1) was sampled for the monitoring criteria under the Doris Water Licence 2AM-DOH1335. For the ST-7a/MMS-4b results see the 2AM-DOH1335 Appendix D.1. The Landfarm at Windy Camp (HOP-4) has been dismantled, so no sampling was conducted at this monitoring station.

The bulk fuel storage tanks at Windy Camp were moved to Doris Camp in winter 2009 for use there, and the bulk fuel storage berm (HOP-5) was dismantled in 2012. The bulk fuel storage berm at Patch Lake laydown (HOP-6) was also dismantled in 2012. No sampling was conducted at either of these monitoring stations.

No sampling occurred at monitoring stations HOP-7A HOP-7B, or HOP-7D (located in Quarries A, B, and D, respectively) during 2020 as no discharge of water was required from these areas during the year.

No on-ice exploration drilling was conducted in the licence area in 2020, therefore no sampling was conducted as outlined in Part F Item 7 and Part J Item 7 of the licence. On-land exploration drilling was conducted in the licence area in February and March 2020. This surface exploration drilling was suspended in March due to the COVID-19 pandemic.

Water used for exploration drilling was taken from Windy Lake in accordance with Part C Item 1 of the 2BE-HOP1222 Licence. Water is supplied to a water tank at the drill, and recirculation to cool equipment occurs through this tank. A summary of monitoring activities conducted under this licence is provided in Appendix D.2.

No additional details on water use or waste disposal were requested by the Board in 2020 related to the Project. No artesian flow occurrences were encountered in 2020.

## 5.3 MADRID – 2BB-MAE1727

The Type B Water Licence No. 2BB-MAE1727 issued to TMAC by the NWB details the sampling and analysis requirements for the SNP. No activities were conducted under this licence in 2020. Activities conducted at Madrid North in 2020 were monitored under the Type A Water Licence 2AM-DOH1335. A summary of monitoring activities conducted under this licence is provided in Appendix D.3.

No additional details on water use or waste disposal were requested by the Board in 2020 related to the Project. No artesian flow occurrences were encountered in 2020.

## 5.4 BOSTON – 2BB-BOS1727

The Type B Water Licence No.2BB-BOS1727 details the sampling and analysis requirements for the SNP program. The Boston Camp was closed in December 2019 and remained inactive during 2020.

No water was used from Aimaokatalok (Spyder) Lake (BOS-1a) or from Stickleback Lake (BOS-1b) for domestic use at Boston Camp, to support surface exploration drilling activities or any other purpose in 2020. No samples were collected from monitoring stations BOS-1a or BOS-1b in 2020.

The Sewage Treatment Facility (BOS-3) was not active in 2020 as the camp was not operational and no samples were collected at monitoring station BOS-3 as outlined in Part D Item 14 and 15, and Part J Item 9 of the licence. Monitoring was not conducted for monitoring station BOS-4 (treated effluent prior to entering into Aimaokatalok (Spyder) Lake), as no effluent was discharged from the Sewage Treatment Plant in 2020. Water management occurred at the Containment Pond (BOS-2) and the Bulk Fuel Storage Facility (BOS-5) in 2020. Water accumulation in the Bulk Fuel Storage Facility (BOS-5) was transferred to the Containment Pond (BOS-2) to facilitate treatment prior to discharge. Water quality sampling was completed prior to discharge to the environment to confirm effluent quality. Notification of discharges from these facilities was provided to the Inspector in May 2020 and approval was granted prior to any dewatering activities.

Dewatering of the Portal (BOS-9) was not conducted in 2020.

Dewatering of the Landfarm Treatment Area (LTA; BOS-6) was not required in 2020. The LTA was decommissioned in 2019 and no water quality sampling was conducted for this facility.

Water quality sampling of seepage/runoff from the ore stockpiles and camp pad to the tundra (BOS-8) was conducted in 2020.

A summary of water quality monitoring for the Boston Site under this licence 2BB-BOS1727 is provided in Appendix D.4.

No additional details on water use or waste disposal were requested by the Board in 2020 related to the Project. No artesian flow occurrences were encountered in 2020.

## 5.5 BOSTON – 2AM-BOS1835

The Type A Water Licence No. 2AM-BOS1835 issued to TMAC by the NWB details the sampling and analysis requirements for the SNP program. No activities were conducted under this licence in 2020. Activities conducted at Boston Camp were monitored under the Type B Water Licence 2BB-BOS1727. A summary of monitoring activities conducted under this licence is provided in Appendix D.5.

# 6. Solid Waste Disposal

At present Waste Management for the Hope Bay Project is currently divided into the following management areas:

- Non-hazardous Waste Management;
- Landfarm Management; and
- Hazardous Waste Management.

## 6.1 NON-HAZARDOUS WASTE MANAGEMENT

TMAC has an existing Non-hazardous Waste Management Plan (Section 12) which covers information pertaining to management of non-hazardous waste generated at Doris, Madrid, Boston and the regional exploration leases in the Hope Bay Greenstone Belt. The Hope Bay Project Non-hazardous Waste Management Plan has been developed to ensure that proper documentation, tracking and handling strategies are in place to monitor compliance and take corrective actions as necessary. In general, non-hazardous waste is generated by the camp(s), the kitchen and various on-site facilities and contracting groups. Management of non-hazardous waste includes recycling, treatment, and disposal of waste streams based on their specific characteristics. Incineration is used as a volume reduction treatment on-site for most non-hazardous domestic waste streams.

In 2020, waste produced at site was collected and consolidated at the Doris Waste Management area by the waste management department (includes waste produced during activities at Madrid and Boston). TMAC is authorized to dispose of all non-hazardous solid waste in a landfill on site under the existing Type A Water Licence; however to date a landfill has not been built. Therefore in 2020, all non-hazardous solid waste that could not be incinerated on site was stored on site for later landfilling or back haul to an approved facility off site.

### 6.1.1 Camp Incinerators

TMAC's Type A Water Licence 2AM-DOH1335, Type B Water Licence 2BE-HOP1222 and Type B Water Licence 2BB-BOS1727 issued by the NWB allows for the incineration of approved waste streams.

In August 2019, a new CY-100-CA incinerator located in Quarry 2 was commissioned for use in the Doris development area. This incinerator has the capacity to burn three 150-185kg batches per day and was used for waste incineration throughout 2020.

There was no incinerator operated at the Windy Camp and no domestic waste produced at Windy Camp in 2020.

There was no incinerator operated at the Boston Camp and no domestic waste produced at Boston Camp in 2020.

Food waste and paper is incinerated as per the Incinerator Management Plan (2019) for the Hope Bay Project. This plan outlines TMAC's approach to domestic waste stream segregation and incinerator management as it pertains to all the Hope Bay Project developments. The objective of the plan is to enable

the operation of domestic waste incinerators to be undertaken in a safe, efficient and environmentally compliant manner. The Incinerator Management Plan strives to ensure that:

- Only appropriate burnable material enters the incinerator waste stream;
- Animal attractants are promptly incinerated;
- The incinerator is operated in a manner that reduces harmful emissions;
- Residual ash is handled and disposed of properly; and
- Compliance monitoring and reporting associated with incinerator operations are undertaken.

As recommended by the Nunavut Environmental Guideline for the Burning and Incinerations of Solid Waste, written records are kept of date and volume of burnt waste.

As per Schedule B, Item 12 of Type A Water Licence 2AM-DOH1335, TMAC is required to report the results of Incinerator Stack Testing when available compared to the Canada-wide Standards (CWS) for Dioxins and Furans and the CWS for Mercury. No stack testing was conducted in 2020.

In 2020, TMAC waste management operators have attempted to optimize incineration conditions to address past exceedances. A stack test to assess the techniques applied is planned for 2021. Based on the outcome of the investigation TMAC will evaluate if source control or 'end-of-pipe' pollution control technologies is the preferred approach to address exceedances. TMAC will continue to maintain good combustion practices in parallel with improved waste sorting practices to reduce the formation of hazardous compounds during incineration in the interim.

### 6.1.2 Open Burning

The disposal method for untreated wood, cardboard and paper products generated on-site is open burning. This method reduces the volume of inert waste disposed of in the landfill. The landfill has yet to be constructed at the Doris Site.

A total of 1,191 $m^3$ of clean wood and 735 $m^3$ of cardboard was open burned in 2020.

All other waste is sorted and stored in sea cans at the Waste Management facility and is either backhauled for disposal or stored until the Landfill is constructed.

## 6.2 LANDFARM MANAGEMENT

TMAC is permitted to operate a landfarm facility at the Doris and Boston sites to treat hydrocarbon contaminated materials. TMAC's Hydrocarbon Contaminated Material Management and Monitoring Plan (Section 12) describes the Doris and Boston facility design as it relates to storage and management of hydrocarbon contaminated materials, including soils and water generated at the site and associated facilities. This plan presents the management and monitoring obligations for each facility as modules A and B, respectively.

Hydrocarbon contaminated water and snow is either stored on-site for shipment off-site to an approved facility or treated with the use of an oil separation (absorbent) treatment system (if required) on site and then verified through laboratory analysis to meet discharge criteria prior to discharge to the environment. Hydrocarbon contaminated soils (including waste rock and ore) are treated in the Doris Landfarm or placed in the Doris underground mine for permanent storage.

The Doris Landfarm Facility is located on previously disturbed area approximately 0.6 km north of the existing Doris Camp Area, at approximately 432,573 Easting and 7,559,542 Northing (UTM NAD 83, Zone 13). The Facility is located in a restricted area of the site and is situated between the existing all-weather road and Quarry 2.

Hydrocarbon contaminated water, snow and soils (including crush rock) can be treated using on-site facilities at Doris or can be relocated off site to an appropriate remediation/disposal facility.

Only material containing the following hydrocarbons is farmed at the Doris Landfarm facility:

- Diesel fuel;
- Jet fuels (Jet A, Jet A-1); and
- Gasoline.

All other materials are deemed inappropriate for landfarming and will ultimately be placed in the Doris Mine for permanent storage in accordance with the approved Hope Bay Project Hazardous Waste Management Plan or packaged for offsite disposal at a licensed remediation/disposal facility.

The Boston Landfarm Treatment Area (LTA), is located at the Boston Camp Site, south west of the tank farm. In 2017, TMAC commenced reclamation of the LTA at Boston with the excavation and stockpiling of contaminated materials into mega-bags for future treatment or shipment offsite to an approved facility. In March 2019, TMAC backhauled contaminated soil from the LTA to Doris Camp via a winter track and disposed of this material underground in the Doris Mine as approved in the Hope Bay Project Hazardous Waste Management Plan. The Boston LTA was decommissioned in 2019 and no additional materials will be placed in this facility. Hydrocarbon contaminated materials generated from future activities conducted at Boston will be packaged for backhaul to Doris until a new LTA facility is constructed.

## 6.3 HAZARDOUS MATERIAL MANAGEMENT

TMAC has a Hazardous Waste Management Plan aimed at ensuring that hazardous waste collection, segregation, handling, storage, transport and disposal procedures are promptly and efficiently carried out, thus minimizing the risk to the site workforce and the environment, as well as reducing the financial cost to the Project (Section 12).

The Hazardous Waste Management Plan requires in general that all hazardous materials will be shipped offsite for disposal at an approved site. The Hazardous Waste Management Plan describes the purpose-designed hazardous waste management facility. Based on the principles of reduction, reuse and recycling, the plan addresses hazardous waste streams in terms of their risks, storage and labelling, transportation, and disposal, including:

- waste glycol (antifreeze);
- waste solvents;
- waste batteries;
- fluorescent tubes;
- penetrable wastes (sharps);
- waste lubricating oils;
- waste aerosols;

- medical wastes and sewage treatment plant sludge;
- applicable incinerator and wood ash;
- contaminated rags, absorbents and soil;
- residue last contained ammonium nitrate packaging; and
- explosives products and explosives residue containers.

### 6.3.1 Waste Back-haul

Waste materials back-hauled off site are regulated by the *Transportation of Dangerous Goods Act* (TDGA). In 2020, empty cargo aircraft were utilized for waste backhaul from the Doris Camp throughout the year. Waste oil backhauled on empty cargo aircraft was received by Buffalo Airways Ltd. in Yellowknife for recycling in waste oil heaters at that facility. All other waste backhauled on empty cargo aircraft was received by KBL Environmental Inc. in Yellowknife for final remediation and disposal. In August 2020, hazardous waste was backhauled by sealift to the Port of Cote Ste Catherine, Quebec and received by KBL Environmental Ltd. for final remediation and disposal. Table 6-1 summarizes the type and volume of hazardous wastes that were transported offsite for final remediation/disposal in 2020.

**Table 6-1. Hazardous Wastes Transported Offsite in 2020**

| Hazardous Waste Type | Volume ($m^3$) |
|---|---|
| Used Oil | 85 |
| Used Glycol | 18 |
| Used Oil/Glycol Mix | 5 |
| Used Oil and Polymer | 3 |
| Waste Leachate Mix | 21 |
| Water contaminated with hydrocarbons | 58 |
| Used Petroleum Grease | 3 |
| Sodium Hydroxide Solid (Residue) | 152 |
| Copper Sulphate Pentahydrate Solid (Residue) | 120 |
| Sodium Metabisulfite Solid (Residue) | 210 |
| Kitchen Grease | 19 |

## 6.4 LANDFILL

TMAC is authorized to dispose of all non-hazardous solid waste in a landfill on site as per Type A Water Licences 2AM-DOH1335 and 2AM-BOS1835. To date, a landfill has not been constructed. All waste that cannot be incinerated on site is backhauled to an approved facility for disposal or is stored on site for future landfilling. Because a landfill has not been constructed, no landfill management report has been prepared. TMAC will continue to manage solid waste produced in Hope Bay according to three waste management plans:

- Non-Hazardous Waste Management Plan;
- Hazardous Waste Management Plan; and
- Incinerator Management Plan.

These plans describe how various streams of waste are managed.

# 7. Aquatic Effects Monitoring Program

The Hope Bay Project (the Project) is a gold mining development in the West Kitikmeot region of mainland Nunavut. The Project property is approximately 153 km southwest of Cambridge Bay on the southern shore of Melville Sound and contains a greenstone belt that runs 80 km in a north-south direction varying in width between 7 km and 20 km. The Project continued to be operated by TMAC in 2020. On February 2, 2021 TMAC was purchased by Agnico Eagle Mines Limited. (Agnico) but TMAC continues to exist as a legal entity and is now a wholly owned subsidiary of Agnico. TMAC remains the operator of the Hope Bay Project.

The Project consists of three developments: Doris, Madrid, and Boston. Construction of the Doris Mine and associated infrastructure began in 2010, and commercial operations began in 2017. Construction of mining infrastructure at the Madrid North development began in April 2019, followed by a transition to operations in August 2019 with mining of the Naartok East Crown Pillar trench. As of December 2020, construction had not begun at the Madrid South or Boston developments.

This report presents the results of the 2020 Aquatic Effects Monitoring Program (AEMP), the second year of implementation of the approved Belt-wide *Hope Bay Project: Aquatic Effects Monitoring Plan* (TMAC 2018). The primary goals of the AEMP are to evaluate potential Project effects on the surrounding freshwater environment during the construction and operation of the Project, verify predictions from the Madrid-Boston *Final Environmental Impact Statement* (FEIS; TMAC 2017b), support current and future Fisheries Authorizations, and provide a mechanism to respond to potential Project effects in the freshwater environment through the Response Framework. This framework sets environmental thresholds that, if exceeded, would trigger further investigation and/or mitigation.

The 2020 AEMP includes lakes adjacent to proposed infrastructure that have the greatest potential to receive non-point-source inputs such as runoff or dust (i.e., Doris and Patch lakes) and lakes that could be affected by water loss due to permitted water withdrawal and groundwater seepage into the mines through underground workings (i.e., Windy, Glenn, Patch, Imniagut, P.O., Ogama, Doris, and Little Roberts lakes). Aquatic components evaluated in 2020 included the following: fish habitat (water level and ice thickness), under-ice dissolved oxygen concentration, water temperature, water quality, and phytoplankton biomass. Statistical and/or graphical analyses were undertaken to determine whether there were any apparent effects of Project activities on these aquatic components in the monitored lakes.

Table 7-1 presents a summary of the overall findings of the evaluation of effects for the 2020 AEMP, as well as the corresponding section in this report in which to find the discussion of the evaluation of effects for each monitoring component. No adverse Project-related effects to fish habitat (water level and ice thickness), under-ice dissolved oxygen concentrations, water temperature, or phytoplankton biomass were detected in the exposure lakes (i.e., lakes with the potential to be influenced by the Project). The evaluation of effects concluded that there was a potential Project effect on open-water season turbidity levels in Doris Lake, as 2020 turbidity was elevated compared to baseline turbidity; however, the regression analysis showed that this apparent change was not statistically significant, thus a low action level response under the Response Framework was not triggered for Doris Lake turbidity.

**Table 7-1. Summary of Evaluation of Effects for 2020 AEMP**

| Variable | Exposure Lakes Included in Evaluation of Effects | Conclusion of Effect | Low Action Level Triggered? | AEMP Report Section |
|---|---|---|---|---|
| Fish Habitat (Water Level and Ice Thickness) | Windy Lake, Glenn Lake, Patch Lake, Imniagut Lake, P.O. Lake, Ogama Lake, Doris Lake, Little Roberts Lake | No Effect | No | 3.1; Appendix B |
| Physical Limnology (Dissolved Oxygen and Temperature) | Windy Lake, Patch Lake, Doris Lake | No Effect | No | 3.2 |
| Water Quality | Windy Lake, Patch Lake, Doris Lake | Possible Effect on Open-water Turbidity in Doris Lake | No | 3.3 |
| Phytoplankton Biomass (as Chlorophyll *a*) | Patch Lake, Doris Lake | No Effect | No | 3.4 |

# 8. Geochemical Studies

## 8.1 DORIS AND MADRID MINES

This section summarizes the operational geochemical monitoring results for the Doris and Madrid North Mines, including waste rock, flotation tailings slurry and detoxified tailing solids from the Doris Mill, quarry rock used for infrastructure and road construction and seepage monitoring programs of waste rock, construction rock and underground mine backfill (detoxified tailings). Detailed discussion and interpretation of geochemical data for the Doris and Madrid North Mines is presented in Appendix F of this report.

### 8.1.1 Waste Rock

Waste rock monitoring for the Doris and Madrid North Mines (except for waste rock from the Naartok East CPR) is outlined in *Waste Rock, Ore and Mine Backfill Management Plan* (TMAC 2019), which is a part of Licence 2AM-DOH1335 Amendment No. 2. The program includes inspection and geochemical monitoring of the waste rock solids from the underground mine and Doris CPR and routine monitoring of the Pollution Control Pond (PCP). Geochemical monitoring of waste rock from Naartok East CPR is documented in *Classification of Waste Rock in Support of Segregating Construction Rock from Naartok East Crown Pillar Recovery, Madrid North* (SRK 2019). SRK (2019) includes a field geochemical classification method and associated criteria to identify waste rock that is non-potentially acid generating (PAG) and with low potential for neutral pH arsenic leaching and recommendations for operational implementation of the field-based geochemical characterization program that identifies waste rock that is suitable for use as construction rock.

In 2020, waste rock produced from underground mining at Doris was kept underground and used as backfill. In addition, waste rock was removed from the surface waste rock stockpile on Pad T and placed as backfill in stopes of the Doris mine. At Doris CPR Trench (CPRT), mining ceased and placement of backfill was completed in 2019.

TMAC initiated mining at Madrid North in 2019, initially with development of the Naartok East CPR in July 2019 followed by development of the decline for the underground mine in December 2019. Mining at Madrid North was halted at the end of March 2020 due to the COVID-19 global pandemic.

#### *8.1.1.1 Underground Doris Mine*

Mining at Doris in 2020 resulted in production of 106,890 t of waste rock; this material was kept underground and used as backfill. In addition, approximately 68,899 t of waste rock was removed from the surface waste rock stockpile on Pad T and placed as backfill in stopes of the Doris mine. In 2020, Doris underground workings were geologically described as 95% mafic volcanics with trace sulphide and 1-2% quartz-carbonate veining, 4% sericite altered mafic volcanics with contain trace sulphide and 2-5% quartz-carbonate veining and 1% diabase dyke with trace to 1% sulphide and trace quartz-carbonate veining.

Waste rock observed on Pad T was a mixture of approximately 90% chloritic green mafic metavolcanics (1a), 9% light tan colored sericite altered mafic metavolcanics (1as), and <1% white quartz veins (12q). SRK collected six samples (five of mafic metavolcanics (1a) and one of altered mafic metavolcanics (1as)) from the surface waste rock stockpile on Pad T. For mafic metavolcanics samples (1a), total sulphur ranged from 0.14 to 0.77% and median levels of 0.24%. Total inorganic carbon (TIC) and Modified neutralization potential (NP) content was high ranging from 187 to 259 kg $CaCO_3$ eq/tonne and 177 to 798 kg $CaCO_3$ eq/tonne, respectively. All samples were classified as non-PAG on the basis of TIC/acid production potential (AP) and NP/AP. The one sample of altered mafic metavolcanics samples (1as) had a total sulphur content

of 0.24%. TIC and Modified NP content was 295 and 172 kg $CaCO_3$ eq/tonne, respectively. The sample was classified as non-PAG on the basis of TIC/AP and NP/AP. Trace element content was below the screening criteria for all samples with the exception of arsenic in one and sulphur in three mafic metavolcanics (1a) samples. Total metal concentrations for all other samples were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment. Shake flask extraction (SFE) tests for the altered mafic metavolcanics (1as) waste rock had alkaline pH (8.5-9.0 s.u.). Nitrate concentrations (7.4 to 124 mg/L) and chloride values (180 to 490 mg/L) were lower than previous years, suggesting the continuous flushing of residual explosives and drilling brines from waste rock.

The Type A waste rock sample set represents the geochemical characteristics of the altered mafic metavolcanic (1as) waste rock sample collected in 2020. Sulphur and arsenic content of the mafic metavolcanic (1a) samples collected from Pad T in 2020 were more comparable to the CPR waste rock than the underground waste rock.

The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the waste rock and ore stockpile area and routine monitoring of the PCP.

#### *8.1.1.2 Underground Madrid North Mine*

Mining of the underground in 2020 resulted in the production of approximately 17,158 t of waste rock that was placed on the Madrid North Waste Rock Storage Area (WRSA). Mining of the NE CPR in 2020 resulted in the production of approximately 93,289 t of waste rock, of which approximately 83,968 t was placed on the Madrid North WRSA and the balance was used for construction.

Based on TMAC's geological inspections of the underground, the majority (99%) of waste rock was geologically logged as mafic metavolcanics (1a) and minor (1%) quartz-carbonate veining. TMAC collected two samples of waste from the underground mine for the purposes of geochemical classification. The samples were mafic metavolcanics (1a) characterized by low sulphur content (0.19 and 0.23%) and levels of Modified NP and TIC between 85 and 273 kg $CaCO_3$/t. Both samples were classified as non-PAG. Arsenic content (49 ppm) was enriched in one sample compared to the screening criterion. All other parameters were below the screening criteria suggesting no appreciable enrichment.

#### *8.1.1.3 Naartok East CPR*

TMAC executed the geochemical construction monitoring program of NE CPR waste rock by sampling drill cuttings from each blast round, analyzing the samples by portable X-ray fluorescence (pXRF) coupled with geological inspection and classifying samples according the criteria in SRK (2019). Based on the geochemical classifications of the drill cutting samples, TMAC classified waste rock from each blast round as either suitable for construction (i.e., low risk of metal leaching and/or acid rock drainage [ML/ARD]) or not suitable for construction (i.e., risk of ML/ARD) followed by segregation and management of waste rock according to the risk classifications.

TMAC collected 1,000 samples, representing 21 blast rounds, for pXRF analysis for the purposes of geochemical classification of construction rock according to SRK (2019). Based on the geological inspection of drill cutting samples, waste rock lithologies were predominantly (44%) mafic metavolcanics with sediments (1aj/10j, n=440), 20% mafic metavolcanics (1a, n=202), 19% sedimentary units (5, n=186), 16% altered mafic metavolcanics (1aj/1oj, n=158), 1% quartz veins (12q, n=10), and <1% overburden (15, n=4). Based on pXRF analysis of drill cuttings, TMAC classified 7% of samples as low risk of ML/ARD and 93% as having risk of ML/ARD. These results were interpolated by TMAC to a field scale, e.g. blast round basis, resulting in 10% of waste rock being classified as geochemically suitable for construction and 90% as not suitable for construction.

In 2020, a total of 93,289 t of waste rock was produced from Naartok East CPR, of which 83,968 t was placed on the Madrid North WRSA and 9,321 t used for construction of the following infrastructure and access roads at Madrid North: Naartok East CPR for in-pit armouring; Madrid Shop Laydown pad; Madrid North portal pad and internal roads and cladding within the Overburden stockpile.

The geochemical behaviour of the waste rock used as construction rock is monitored as part of the construction rock monitoring program, including the annual seep survey and geochemical monitoring of as-built infrastructure.

#### *8.1.1.4 Madrid North Waste Rock Storage Area (WRSA)*

In 2020, a total of 101,126 t of waste rock were placed on the Madrid North WRSA, with the majority (83%) sourced from Naartok East CPR and the balance from the decline of the Madrid North underground mine. No waste rock was removed from the waste rock stockpiles. In accordance with the *Waste Rock, Ore and Mine Backfill Management Plan (*TMAC 2019), SRK conducted an inspection and collected waste rock samples from the WRSA. Waste rock at the WRSA was placed in two stockpiles including a smaller stockpile located directly upstream of the Contact Water Pond (CWP) that contains ore hosted in mafic volcanics with sediments (1aj) from Naartok East CPR that could not be segregated from waste rock and ii) a larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from Naartok East CPR and the underground mine (the latter as indicated by rinse tests).

Waste rock was a mix of approximately 85% chloritic green mafic metavolcanics (1a), 10% light tan colored sericite altered mafic metavolcanics (1as), with the remainder composed of lesser proportions of strongly weathered and pervasively oxidized waste rock (oxide), chert and siltstones (5), quartz veins (12) and diabase (11c). Sedimentary units (5) were observed throughout the waste rock stockpile area. Oxide material was concentrated in the stockpile located directly upstream of the CWP and represents ore that could not be segregated from waste rock. Lesser amounts of oxide (not ore) were present in the stockpile adjacent to Sumps 1 to 3.

SRK collected 13 samples for geochemical characterization, of which five were from the stockpile upstream of the CWP and eight were from the stockpile adjacent to the sumps. Furthermore, three samples contained oxide and sedimentary units (5), six samples contained oxide only and four did not contain oxide and/or sediments. Geochemical data suggest that two of the samples without oxide and/or sediments (20-MAD-10 and 20-MAD-12) were sourced from the underground mine.

Total sulphur content for samples containing sediments and/or oxide ranged from 0.35 to 1.2% (n=9) whereas sulphur ranged from 0.28 to 0.36% for samples that did not contain sediments and/or oxide (n=4). For all samples, TIC and NP ranged from 158 to 411 kg $CaCO_3$/t in the 1as samples. All samples were classified as non-PAG. All samples were enriched in arsenic (134 to 683 ppm) compared to the screening criterion. Arsenic content was highest for samples containing oxide and exhibited a positive trend with sulphur. There was no relationship between gold and arsenic content. Rinse tests, SFE tests, and paste pH indicated all samples were non-acidic. SFE tests indicated higher soluble content associated with samples containing oxide, including antimony (0.0011 to 0.021 mg/L), arsenic (0.013 to 3.5 mg/L for all samples), cobalt (0.00013 to 0.0007 mg/L), nickel (0.00039 to 0.011 mg/L) and zinc (below detection limit of 0.0001 mg/L to 0.0012 mg/L). Soluble arsenic concentrations exhibited a positive trend with arsenic and sulphur content but did not have a relationship with gold.

The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the Madrid North WRSA and routine monitoring of the CWP, Sump 1, Sump 2 and Sump 3.

### 8.1.2 Tailings

#### *8.1.2.1 Effluent from Process Plant Tailings (TL-5)*

Samples of effluent from the Process Plant (TL-5) were collected from January to December 2020 as part of the SNP monitoring program outlined in Schedule I of the Water Licence. Results of this SNP monitoring are presented in Appendix D.1 of this report.

The geochemistry of the 2020 process plant tailings discharge (TL-5) is summarized as follows:

- pH was slightly alkaline ranging from 8.0 to 8.5 s.u for all months.
- Sulphate concentrations were within the range of historical data, but an operational maximum concentration was observed in August 2020 (10,000 mg/L).
- Sodium, used as a milling reagent, ranged between 1,700 and 8,000 mg/L in TL-5 and a gradually increasing trend was evident, although the maximum result was anomalously high in August 2020 and other results averaged 2,200 mg/L.
- Trends for major ions and trace elements were generally stable in 2020 and fluctuated within historical ranges. Exceptions included chloride, ammonia, arsenic, antimony, molybdenum, which displayed increasing trends for at least part of the year.
- Total cyanide concentrations were stable in TL-5 (0.5 to 6.5 mg/L). Weak acid dissociable (WAD) cyanide, free cyanide and thiocyanate concentrations were within the range of historical values except for a fivefold increase observed in thiocyanate in September 2020. Cyanate concentrations increased in TL-5 to August 2020 then decreased thereafter.

#### *8.1.2.2 Flotation Tailings (TL-6)*

Flotation tailings deposition in the Doris TIA commenced on January 20, 2017. In 2020, a total of 364,982 t (dry weight equivalent) of flotation tailings were deposited in the Doris TIA. Samples of flotation tailings solids from the Process Plant (TL-6) were collected from January to December 2020 as part of the SNP monitoring program outlined in Schedule I of the Water Licence. Results of this SNP monitoring are presented in Appendix D.1 of this report. For flotation tailings solids (TL-6), sulphur concentrations ranged between 0.07 and 0.63% with a median value of 0.22%. TIC content ranged between 170 and 290 kg $CaCO_3$/t. All flotation tailings samples were classified as non-PAG, which is consistent with 2017 and 2018 operational tailings monitoring and metallurgical tailings samples. Trace element content was elevated compared to screening criteria for arsenic in all samples except February and October. All other parameters were below the screening criteria indicating no appreciable enrichment.

#### *8.1.2.3 Detoxified Tailings Solids (TL-7a)*

In 2020 a total of 17,886 t (dry weight) of detoxified tailings were placed as backfill in Doris Mine underground stopes. Samples of detoxified tailings (TL-7a) were collected from January to December 2020 as part of the SNP monitoring program outlined in Schedule I of the Water Licence. Results of this SNP monitoring are presented in Appendix D.1 of this report.

Sulphur concentrations ranged between 15 and 34 % in 2020. TIC results for 2020 ranged between 96 and 184 kg $CaCO_3$/t. All of the detoxified tailings samples were classified as PAG, which is consistent with 2017 to 2019 operational tailings monitoring and metallurgical tailings samples.

All detoxified tailings samples were elevated in arsenic, bismuth, copper, gold, selenium, silver and sulphur compared to the screening criteria. More than half of the 2020 samples were also elevated for lead. Selected

samples were elevated in cadmium (n=3), antimony (n=4) and zinc (n=1) compared to the screening criteria. All other parameters were below the screening criteria indicating no appreciable enrichment.

#### *8.1.2.4 Detoxified Tailings Filtrate (TL-7b)*

Samples of detoxified tailings filtrate (TL-7b) were collected from January to December 2020 as part of the SNP monitoring program outlined in Schedule I of the Water Licence. Results of this SNP monitoring are presented in Appendix D.1 of this report.

For the detoxified tailings filtrate (TL-7b) pH conditions ranged from 8.3 to 8.8 s.u. Concentrations of sulphate (a by-product of milling of sulphide rich ore) were within the range of historical data, but an operational maximum concentration was observed in August 2020 (41,000 mg/L). Total cyanide concentrations ranged from 0.3 to 2.5 mg/L and were within the range of historical values. WAD cyanide and free cyanide concentrations were within the range of historical values except for an anomalously high result for free cyanide in TL-7B in August 2020, which was due to an elevated detection limit.

Thiocyanate concentrations were within the range of historical values. Cyanate concentrations were within the range of 2019 data with the exception of three samples with values greater than 800 mg/L. Ammonia concentrations reached operational maximums in May and September 2020, otherwise values were within range of historical data. These parameters are produced as by-products of the cyanide detoxification process.

Milling of the sulphide rich ore results in high concentrations of total metals, including arsenic, antimony, cadmium, cobalt, copper, iron, manganese, molybdenum, nickel, selenium, and silver. Trace element concentrations were generally within range of historical data in TL-7B. Arsenic concentrations were within a similar range to the 2019 results except for May and July when elevated concentrations were reported (0.046 to 0.92 mg/L throughout 2020). An increasing trend in antimony was apparent from June 2019. Concentrations of manganese were stable in TL-7B apart from slightly higher results in June 2020 (0.63 mg/L).

### 8.1.3 Quarry Rock

#### *8.1.3.1 Quarry Monitoring*

Infrastructure at Doris and Madrid North were constructed using rock from Quarry 2 and Quarry D, respectively. In 2020, active blasting was conducted twice in March at Quarry 2. All construction activities at Hope Bay during winter 2019/2020 were conducted at Madrid North and included construction of the Madrid North portal pad, Madrid WRSA pad, Madrid Surface Shop Laydown pad and cladding and interior roads placed on top of and within the Overburden Stockpile.

In 2020, TMAC conducted two quarry inspections after blasting at Quarry 2 in March. Both inspections identified that quarry rock was mafic volcanics (1a) with less than 1% quartz-carbonate. Strong chlorite and moderate epidote alteration plus trace amounts of disseminated sulphides were also observed in one of the inspections. Both inspections noted the absence of fibrous actinolite.

Geochemical monitoring of the Quarry 2 samples indicated that they were all non-PAG on the basis of TIC/AP and NP/AP. Total sulphur concentrations ranged between 0.14 and 0.21 wt% and sulphate sulphur content was between 0.02 and 0.07 wt%. Modified NP and TIC content ranged between 129 and 173 kg CaCO3/t and 103 and 153 kg CaCO3/t, respectively. All solid-phase elements were below the screening criteria suggesting no appreciable enrichment.

SFE test results for the Quarry 2 samples reported pH at 9.3 and 8.7. Electrical conductivity (EC) was notably lower for the first blast round (55 µS/cm) compared to the second blast round (370 µS/cm). Sulphate concentrations were low (<10 mg/L) indicative of the low sulphide content. In both blast rounds, the major

anion was alkalinity (20 to 26 mg/L as $CaCO_3$) and the major cation was calcium (7.6 to 38 mg/L). Metal mobilization was low and SFE concentrations were similar to the 2019 results apart from molybdenum in the second blast round which was around one order of magnitude higher (0.01 mg/L).

*8.1.3.2 Construction Monitoring Madrid*

In September 2020, SRK conducted a geological inspection and geological sampling program of the Madrid North WRSA pad, Madrid Surface Shop Laydown pad and construction rock placed at the Overburden Stockpile. A total of 12 samples were collected (four from the Madrid Surface Shop Laydown, six from the Madrid North WRSA pad, and two from the Overburden Stockpile). At each sampling location, 1 to 2 kg of a sieved -1 cm fraction and 50 g of a sieved -2 mm fraction were collected. The construction rock was geologically described, a fizz test was undertaken to provide an indication of carbonate content, and rinse tests were conducted for EC and pH using the -2 mm sieved fraction. All samples were analyzed at for acid-base accounting (ABA) and trace element content and a subset of eight samples were selected for SFE tests. Quarry 2 material used for surface dressing at the Madrid Surface Shop Laydown was mafic metavolcanics (1a) and classified as non-PAG with a total sulphur content of 0.3% and modified NP and TIC of 130 kg $CaCO_3$/t (n=1). Elemental analysis showed no appreciable enrichment compared to the screening criteria. SFE tests reported a pH of 8.9 and low soluble metals concentrations.

The construction monitoring program identified that sedimentary rock was used for construction rock in the pads of the Madrid Surface Shop Laydown and the Madrid North WRSA. The predominant rock type was mafic metavolcanics (1a). According to SRK, sedimentary units are not geochemically suitable for use as construction materials due to potential for neutral pH metal leaching. A geochemical investigation of waste rock on the Madrid North Portal Pad was conducted by SRK in 2020. Details of this investigation are included in Appendix F of this report (see Appendix E – 2020 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines).

All samples were classified as non-PAG on the basis of both TIC/AP and NP/AP. Five samples were enriched in arsenic relative to the screening criteria including four at Madrid North WRSA and one at Madrid Surface Shop Laydown. All other parameters were below the screening criteria suggesting no appreciable enrichment.

All samples of Naartok East CPR waste rock used for construction rock at the Madrid Surface Shop Laydown were geochemically suitable for use as construction rock. At the WRSA, all samples (n=6) were classified as non-PAG and arsenic content for four of the samples was below the criterion (< 70 ppm). Arsenic content was elevated in two WRSA samples (76 to 560 ppm). These samples are within the catchment boundary of the Madrid North CWP which collects runoff from the WRSA. Water management at the Madrid North WRSA includes collection of drainage from the WRSA in the CWP and three sumps located on the northern, eastern and western extents of the WRSA pad (MMS1-S1 to MMS1-S3). Water quality monitoring of water collected in the CWP and sumps is conducted on a routine basis.

Construction rock sampled in 2020 at the Overburden Stockpile included mafic metavolcanics (1) sourced from Quarry D in 2019 to construct the access roads (20-OVB-03) and mafic metavolcanics (1a) with gabbro (7a) from Naartok East CPR placed as cladding at the southern toe of the Overburden Stockpile (20-OVB-06). No sedimentary units were observed, however NE CPR waste rock placed in 2020 as internal access roads within the stockpile were buried and not accessible for inspection.

Both samples were classified as non-PAG. Total sulphur content ranged between 0.1 and 0.2 % and Modified NP and TIC ranged from 120 to 150 kg $CaCO_3$/t and from 100 to 140 kg $CaCO_3$/t, respectively. Solid-phase elemental content was below the screening criteria suggesting no appreciable enrichment.

SFE tests indicated that the samples were non-acidic. EC values were 4,200 and 5,400 µS/cm with major cation chemistry dominated by sodium (610 to 780 mg/L) and major anion by sulphate and chloride (530 to 550 mg/L and 960 to 1,200 mg/L respectively). Major ion concentrations were higher than other construction rock samples. SFE concentrations of nickel and cobalt were similar to the highest levels reported in the Madrid North WRSA samples (0.0018 to 0.0021 mg/L and 0.0002 to 0.0003 mg/L respectively). Of the construction rock sample set, SFE manganese concentrations were highest from the Overburden Stockpile construction rock samples (0.079 to 0.11 mg/L).

## 8.2 BOSTON CAMP

Currently there is no monitoring under the Type A Water Licence at Boston. This section summarizes monitoring in support of the Boston Camp closure plan under Type B. Detailed discussion and interpretation of geochemical data collected at Boston in 2020 is presented in Appendix G of this report.

### 8.2.1 Waste Rock and Ore

The Boston ore/waste rock management plan (SRK 2017) includes a commitment to monitor the oxidation of the ore by carrying out a survey of rinse pH and conductivity every ten years. This monitoring was conducted in 2018 and was not a requirement in 2020.

# 9. Geochemical Seepage Surveys

## 9.1 DORIS AND MADRID MINES

This section summarizes the seepage surveys conducted at Doris and Madrid Mines as part of the geochemical operational monitoring programs.

The scope of the 2020 Hope Bay seepage monitoring survey included infrastructure constructed between fall 2019 and spring 2020 at Madrid North from Naartok East CPR waste rock; infrastructure surveyed for seepage at Doris and Madrid in 2019 but where none was observed, three reference stations, areas downstream of the Doris waste rock stockpiles (referred to as the Waste Rock Influenced Area or WRIA) and contact water downstream of the Madrid North Waste Rock Storage Area (WRSA). In 2020, reference station at Windy (REF-01) was removed from the program due to its proximity to development and a new station established south of the Madrid North WRSA (REF-01A). Concentrations for reference area seeps were consistent and stable with the historical data record.

### 9.1.1 Doris Waste Rock Influenced Area

Seepage monitoring in the WRIA was at the same locations as previous years: in the embankment of the Pollution Control Pond (PCP) at the downstream toe of the stockpile on Pad I and the toe of the access road. In 2015, TMAC regraded the waste rock stockpile on Pad I and placed ore stockpiles on top.

The pH for all seepage samples was non-acidic (7.5 to 7.9). EC ranged from 1,300 and 1,800 µS/cm for the seepage samples at the toe of Pad I and 11,000 to 22,000 µS/cm for samples along the access road samples. Since 2016, decreasing concentrations of ammonia, nitrate, and chloride concentrations have continuously indicated the flushing of salts from drilling brines (chloride) and explosives residues (ammonia, nitrate, and nitrite) from the stockpile on Pad I. Prior to 2020, seepage collected at the toe of Pad I was interpreted to be waste rock contact water and seepage at the toe of the access road was more dilute. In 2020, seepage collected along the access road contained higher levels of residual drilling brines and blast reagents. The differences in concentrations of operational reagents suggests that access road seepage is from a different seepage source. Madrid ore was sourced from the Naartok East CPR where brines are not used for drilling and accordingly, Madrid ore is not the source of elevated chloride.

Seepage at the toe of the stockpile at Pad I is within the range of constituent concentrations from previous years. Parameters with higher concentrations in seepage along the access road compared to the toe of the stockpile at Pad I include sulphate (220 to 270 mg/L compared to ~75 mg/L, respectively), cobalt (4 to 11 times higher), nickel (4 to 15 times higher), manganese (22 to 58 times higher), cadmium (140 to 410 times higher) and zinc (10 to 24 times higher). Notably arsenic concentrations for all 2020 samples were within the same range. Furthermore, arsenic, cobalt and nickel concentrations were lower in 2020 compared to 2019.

All drainage from the Doris camp pad, including seepage captured in the collection sumps downstream of the toe of the access road, is pumped to the sediment control pond (SCP) prior to transfer to the TIA. In 2020, water from the SCP accounted for 2% of total inflow volumes entering the TIA and 0.6% of the total volume stored in the TIA.

### 9.1.2 Doris Infrastructure and Roads

Infrastructure surveyed at Doris included the Doris CPR cover (constructed of Doris CPR waste rock) and access road to the vent raise (constructed of Quarry 2 rock). Seepage was observed and samples collected representing construction rock from the Doris CPR cover but not at the access road to the Doris vent raise.

Of the two seepage samples collected, sample 20-DCPR-02 water quality was geochemically equivalent to the reference seeps and does not represent contact water from the Doris CPR cover. Drilling brines were not used to mine the CPR and explosives residue concentrations are lower as a result of differing blasting practices. The lower ammonia and chloride concentrations in seepage suggests that the waste rock used to construct the Naartok East CPR cover was sourced from Naartok East CPR. Dissolved trace metals concentrations were typically within an order of magnitude of concentrations for Doris waste rock seepage samples downstream of Pad I except for copper for 20-DCPR-01 (0.0013 mg/L and 30 times lower).

### 9.1.3 Madrid North Waste Rock Storage Area

Of the 101,126 t of rock placed at the WRSA, the majority of waste rock originated from Naartok East CPR (83,968 t). Approximately, 17,158 t of waste rock from the decline of the Madrid North underground mine was also placed at the WRSA. Waste rock at the WRSA was geochemically classified as non-PAG and placed in two stockpiles. The stockpiles at the WRSA include:

1. A smaller stockpile located directly upstream of the CWP that contains oxide rock. The oxide rock is ore hosted in mafic volcanics with sediments (1aj) from Naartok East CPR that could not operationally be segregated from waste rock.
2. A larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from Naartok East CPR and the underground mine (the latter as indicated by rinse tests).

Water management at the Madrid North WRSA includes three water collection sumps (Sump 1, Sump 2 and Sump 3) and the Madrid North CWP. Water from the sumps is pumped to the CWP, therefore water chemistry at the CWP is influenced by waste rock seepage draining to CWP and the collection sumps. Discharge of effluent onto tundra from the CWP is in accordance with the effluent quality limits provided in the Water Licence. Water that does not meet these criteria is transferred to the TIA via water truck.

Water quality samples collected downstream of the WRSA included one freshet seepage sample near Sump 1 and routine water quality samples in the contact water pond (CWP), Sump 1, Sump 2 and Sump 3. Samples collected from the CWP and sumps of the Madrid North WRSA were analyzed for total metals whereas the seepage sample was analyzed for dissolved metals. As a result of high TSS in selected sump samples, aluminum, iron, copper, zinc and possibly manganese data were interpreted to be biased high.

All waste rock drainage samples were non-acidic. The waste rock drainage chemistry collected in the CWP and Sump 1 are geochemically distinct from Sump 2 and Sump 3. Contact water collected in the CWP and Sump 1 had higher sulphate concentrations (13 to 260 mg/L compared to <40 mg/L at Sumps 2 and 3), higher chloride and/or ammonia concentrations (maximum of 990 and 2.2 mg/L, respectively), higher arsenic and nickel concentrations (maximum of 0.022 and 0.012 mg/L, respectively).

Cobalt concentrations in June ranged from 0.0012 to 0.0033 mg/L for all samples but in September were higher at Sump 1 (0.025 mg/L) compared to Sump 2, Sump 3 and CWP (0.0033 to 0.0075 mg/L). Manganese exhibited temporal rather than spatial trends and were an order of magnitude higher in samples from September (0.24 to 7.0 mg/L) compared to samples from June (0.026 to 0.17 mg/L). Maximum selenium concentrations were indicated at Sump 1 and Sump 3 and selected sample from the CWP

(ranging from 0.0011 to 0.0023 mg/L for all aforementioned areas). In comparison concentrations at Sump 2 and selected CWP samples were lower (0.00020 to 0.00075 mg/L).

Chloride and ammonia are operational byproducts that are introduced to underground waste rock from drilling brines and blast residues, respectively. In contrast, mining at the Naartok East CPR did not use drilling brine and has lower ammonia residues because of differing blasting practices at surface. A review of the drainage chemistry suggests the following with respect to weathering of Naartok East CPR and Madrid North underground waste rock at the WRSA:

- Chloride concentrations and trends suggest contact water from underground waste rock primarily reports to Sumps 1 and 3 with minor flows reporting directly to the CWP and Sump 2. The source of higher selenium concentrations in Sump 1 and Sump 3 are likely related to weathering of underground waste rock.
- A comparison of the seepage sample (ID 20-MWAR-01) compared to the overall June sample set suggests that 20-MWAR-01 represents a mixture of contact water of waste rock from the underground mine (as indicated by chloride and ammonia) and Naartok East CPR (as indicated by arsenic).
- In June, seepage was observed emanating from the newly constructed CWP to the tundra. TMAC collected paired samples of the seepage downstream of the CWP and water in the CWP. The seepage sample had higher chloride that was indicative of drainage chemistry from underground waste rock whereas CWP pond sample had higher As, Co and Ni indicative of Naartok East CPR waste rock.
- Multiple parameters suggest spatial variability in water chemistry within the CWP. This is likely due to point discharge of waste rock drainage pumped from the sumps to the CWP.

### 9.1.4 Madrid Infrastructure and Roads

Infrastructure surveyed at Madrid North included the access road to Naartok East CPR (constructed of Quarry D rock), overburden stockpile (constructed in two phases of Quarry D rock and Naartok East CPR waste rock), Madrid North Portal Pad (constructed of Naartok East CPR waste rock) and Madrid Shop Laydown (constructed of Naartok East CPR waste rock). Seepage samples were collected downstream of all areas except the Madrid Shop Laydown.

The overburden stockpile contains construction rock sourced from two areas: Quarry D for construction in early 2019 of access roads and NE CPR waste rock for construction in late 2019 interior access roads and placement as cladding. Seepage from the overburden stockpile had the following chemistry:

- pH and EC ranged from 6.8 to 7.7 and 31,000 to 81,000 µS/cm, respectively.
- The major cation chemistry was dominated by sodium (6,200 to 19,000 mg/L) and magnesium (960 to 2,900 mg/L) and anion chemistry was dominated by chloride (12,000 to 31,000 mg/L) and sulphate (1,600 mg/L to 4,000 mg/L). A comparison of major ions for overburden stockpile compared to portal pad seepage is summarized as follows and indicates different geochemical sources. Chloride was the same order of magnitude as the portal pad however calcium one was order of magnitude lower for the overburden stockpile. Concentrations for potassium, sodium, magnesium and sulphate were an order of magnitude higher for Overburden Seepage.
- Nutrient concentrations ranged from 8.8 to 24 mg/L as N ammonia, <0.5 to 24 mg/L as N nitrate, and <0.1 to 0.57 mg/L nitrite.
- Ranges in trace metal concentrations that were elevated in portal pad seepage are as follows: cobalt (0.0037 to 0.096 mg/L), manganese (1.4 to 11 mg/L), nickel (<0.01 to 0.086 mg/L) and zinc (below detection of <0.05 mg/L). Notably, arsenic concentrations were near analytical detection limits.

- Iron concentrations ranged from <0.2 to 15 mg/L. Samples with iron concentrations above detection exhibited more reducing conditions whereas iron was below detection for samples with higher values of oxidation-reduction potential (ORP). Iron concentrations did not have a positive trend with manganese, the latter which showed the highest concentrations with higher ORP values indicative of oxidizing conditions.

The Naartok East CPR access road was constructed of rock from Quarry D. Seepage was non-acidic (7.3 to 7.8) with low values of EC (120 to 510 µS/cm). Sulphate concentrations were low (2.3 to 31 mg/L). Ammonia and nitrate were within one to two orders of magnitude greater than reference samples. Dissolved metals concentrations were the same order of magnitude compared to the reference seeps except for manganese. Manganese concentrations ranged from 0.00099 mg/L to 0.71 mg/L.

### 9.1.5 Underground Backfilled Stopes (TL-11) Seepage Survey

TMAC completed underground seepage inspections of backfilled stopes in July and December 2020. Visual surveys were conducted of all backfilled stopes that could be accessed safely at the time of the survey, i.e., not all backfill could be inspected. Four locations were sampled in July and two locations were sampled in December. During the July sampling survey, TMAC collected two ponded water samples from Levels 4905 and 5002 and two seepage samples from Levels 120 and 134. In December, TMAC collected two samples during the underground survey from Levels 110 and 120.

Field measurements of pH, EC, ORP, temperature and flow rate were recorded at each station. TMAC submitted samples to ALS in Burnaby, BC for analysis of pH, EC, TSS, TDS, alkalinity, chloride, sulphate, total, free and WAD cyanide, and dissolved and total metals. The sample for dissolved metals was filtered and preserved at the time of sampling.

Of the six underground samples collected, four are interpreted to represented backfill seepage (Levels 134 and 120 from the July survey and Levels 110 and 120 from the December surveys) and two are as ponded water samples (Levels 5002 and 4905) with chemistry that did not represent contact waters of backfill.

Key results for the seepage samples inferred to represent contact waters are summarized as follows:

- The pH and EC ranged from 7.6 to 7.9 s.u and 21,000 to 26,000 µS/cm, respectively.
- Major anions were chloride (7,100 to 9,000 mg/L) and sulphate (920 to 1,200 mg/L) and major cations were sodium (4,200 to 4,800 mg/L) and magnesium (510 to 580 mg/L). Potential sources of the major ions include residues on waste rock from drilling brines (calcium and chloride), process reagents (sodium), and sulphide oxidation with resulting carbonate dissolution from waste rock and detoxified tailings (sulphate, calcium and magnesium).
- Levels of ammonia, nitrate and nitrite were lower than the 50th percentile concentrations from the historical sample set.
- Cadmium, copper, nickel, selenium and silver were noted as parameters of potential concern based on the humidity cell test (HCT) program for Doris detoxified tailings (SRK 2015b). All of these parameters reported concentrations in the July sampling program which were less than the $50^{th}$ percentile concentrations from the historical sample set: cadmium (0.00007 to 0.00083 mg/L), copper (0.02 to 0.06 mg/L), nickel (0.014 to 0.18 mg/L), selenium (0.001 to 0.012 mg/L) and silver (0.0001 to 0.0004 mg/L). Zinc and manganese were not noted as parameters of potential concern in the HCT program but have historically reported elevated concentrations. Zinc and manganese concentrations ranged from 0.02 and 0.12 mg/L and 1.2 and 2.2 mg/L, respectively and were within the range of historical underground seepage concentrations.

## 9.2 BOSTON CAMP

This section summarizes the geochemical monitoring results at Boston. The seepage and ephemeral streams monitoring programs are conducted annually in the context of the waste rock and ore management and Boston closure plans. The objective of the seepage monitoring is to provide an indication of water quality from the waste rock (camp pad) and ore stockpiles. The seepage samples are collected at the toe of the camp pad. The two objectives of the ephemeral streams program are to monitor drainage from the Boston ore stockpiles and camp pad before entering Aimaokatalok Lake and the natural attenuation of the tundra.

### 9.2.1 Seepage Monitoring

There are two opportunistic seepage monitoring programs, seepage monitoring at station BOS8 as indicated by Boston water licence 2BB-BOS1727 and a freshet seepage survey along the north and east sides of the camp pad, and the southern end of the airstrip as specified in the Boston Water and Ore/Waste Rock Management Plan (SRK 2017).

During the 2020 freshet seepage survey, no flowing seeps were observed.

TMAC collected one sample each from BOS-8A, BOS-8C, and BOS-8D on June 18, 2020. All seepage samples were pH neutral to slightly alkaline (7.5 to 7.8). Lab EC values at BOS-8C (930 µS/cm) were approximately three times higher than BOS-8A (220 µS/cm) and BOS-8D (320 µS/cm). Similarly, concentrations of major ions (calcium, chloride, magnesium, sodium, and sulphate) were higher at BOS-8C (e.g. 200 mg/L sulphate) compared to BOS-8A and BOS-8D (e.g. 64 mg/L and 70 mg/L sulphate, respectively). Values of EC and major ions at BOS-8C were lower than median values for the historical seepage data set.

Concentrations of arsenic, cadmium, cobalt, nickel, and selenium were equivalent for BOS-8A and BOS-8D (i.e., 0.021 and 0.019 mg/L cobalt, respectively) and higher at BOS-8C (e.g. 0.34 mg/L cobalt). Manganese concentrations at BOS-8C (0.091 mg/L) were approximately three times higher than BOS-8A (0.036 mg/L) and BOS-8D (0.024 mg/L). Aluminum concentrations at BOS-8D (0.019 mg/L) were higher than BOS-8A (0.0069 mg/L) and BOS-8C (0.0036 mg/L). Concentrations of copper and zinc were similar for all three samples with the highest concentrations at BOS-8A. Iron and lead concentrations were less than detection (0.01 and 0.00005 mg/L, respectively) for all samples. Concentrations of these parameters were generally within the range of the historical concentrations.

September 2018 repairs to a berm adjacent to station BOS-8C are believed to have disturbed ore material. This activity may be the source of higher sulphate, arsenic, cobalt, and nickel concentrations in the seepage at station BOS-8C relative to BOS-8A and BOS-8D.

### 9.2.2 Ephemeral Streams Monitoring

As outlined in the Water and Ore/Waste Rock Management Plan for the Boston Site, Hope Bay Project, Nunavut (2017), five ephemeral streams (A to E) within the catchments of the Boston camp pad are monitored during spring freshet. The objectives of the program are to monitor drainage from the Boston ore stockpiles and camp pad before entering Aimaokatalok Lake and the natural attenuation of the tundra. TMAC inspected ephemeral streams A to E for flow on June 24, 2020. Flow was observed and samples collected from C2 and D2.

Field measurements included pH, EC, ORP, temperature, and flow rate at station C2. The flow at D2 was too shallow and fragmented to measure. The water quality samples were submitted by TMAC for laboratory testing at ALS Environmental (ALS) in Burnaby, British Columbia for pH, EC, hardness, TSS, total dissolved

solids (TDS), acidity, total alkalinity, anions (bromide, chloride, fluoride, and sulphate), nutrients (nitrate, nitrite, ammonia, and phosphorus), and dissolved metals (filtered and preserved in the field). The quality assurance and quality control (QA/QC) sampling program included the collection of one field duplicate.

The pH and EC of ephemeral streams ranged from 6.3 to 7.2 and from 830 to 1,100 µS/cm, respectively, and were within the range of historical data. Sulphate concentrations have oscillated for C2 and D2. Chloride concentrations for ephemeral streams exhibit a decreasing trend. Nickel values have oscillated, and iron values have increased after remaining stable prior to 2020. Nitrate, copper, arsenic, and selenium have stable trends. The 2020 monitoring data were below maximum predicted values for chloride, nitrate, copper, iron, nickel, and selenium at streams C2, and D2. At C2 and D2, sulphate concentrations observed in 2020 exceeded the maximum modeled values; however, concentrations were lower than 2019 and within the same order of magnitude as the modeled values.

Sulphate and chloride are not attenuated by the tundra and the concentrations measured in 2020 validate the Boston 2009 water and load balance. In general, ephemeral streams monitoring indicates that overall, geochemical conditions remain stable with some annual variability.

# 10. Fuel Storage

Bulk fuel storage at the Hope Bay Project site is accomplished in compliance with relevant regulations and authorizations. Bulk fuel is stored in steel tanks or manufactured fuel bladders which are housed in a "tank farm" that is lined with an impermeable membrane and surrounded with a berm with sufficient capacity to meet containment criteria (i.e., 110% of the largest tank in the farm). This minimizes the potential of fuel entering the environment from a spill. Chemical storage at the Hope Bay Project site is accomplished in compliance with handling and storage instructions detailed in the respective manufactures Safety Data Sheets (SDS).

TMAC maintains a Hope Bay Project Spill Contingency Plan (most recently revised in 2021), available in Appendix H of this report, which is utilized to safeguard against accidental spills of harmful substances that may negatively affect the environment. Implementation of spill prevention systems are critical to avoid such accidents, followed by a response system that is timely and efficient if spills do occur, and contains and mitigates the negative environmental consequences. The Hope Bay Project Spill Contingency Plan was developed in accordance with the Spill Contingency Planning and Reporting Regulations developed under Section 34 the Government of Nunavut's *Environmental Protection Act* (RSNWT Nu1988), the Environmental Emergency Regulations (SOR/2019-51), the Metal and Diamond Mining Effluent Regulations (SOR/2002-222) and was developed specifically to address the requirements of the Framework Agreement; NWB Water Licences: 2AM-DOH1335, 2AM-BOS1835, 2BE-HOP1222, 2BB-MAE1727 and 2BB-BOS1727; and NIRB Project Certificates: Number 003 and Number 009; including all amendments. The Hope Bay Project Spill Contingency Plan provides a consistent spill response framework that is available to all site personnel so they can effectively and efficiently respond to a spill of petroleum products and/or hazardous materials regardless of where on the Hope Bay site they are encountered.

The Hope Bay Project Spill Contingency Plan contains detailed inventories and measurable quantities of all on-site hazardous materials and provides layouts indicating locations of all spill response equipment at site. A list of spill containment systems used are summarized below:

- Gravel/HDPE lined containment facilities (e.g., Roberts Bay and Doris Tank Farms);
- HDPE/wood containments (e.g., Jet-A storage at Heli-pad);
- Concrete berms (day-tanks at the Powerhouse);
- Double-walled steel tanks at location of use;
- Steel spill containment (e.g., beneath tanks at incinerator);
- Insta-berms; and
- Plastic spill pallets.

Spill response resources are also described in detail in the existing management plan together with their routine maintenance and inspection. The availability and organization of the human resources deemed required to respond to spill events is described in the Hope Bay Project Spill Contingency Plan, along with the responsibilities of specified personnel and response teams clearly defined. External notification and communication in the event of spill events are addressed and there is also a specified and comprehensive system of internal reporting. The Plan is subject to annual review and an update to this plan is being provided with this Annual Report in Appendix H.

# 11. Spill Reports

During 2020, eight spills were reported to the Nunavut Spill Line, Water Licence Inspector and KIA Major Projects. No spills were reported to Environment and Climate Change Canada. These eight spills met the reporting threshold as outlined in the Nunavut Spill Contingency Planning and Reporting Regulations. In addition to the required Spill Line report, a more detailed follow-up report was filed within thirty days of each reported spill that included a description of the event together with the immediate cause, corrective and preventative action. The eight reportable spill events are summarized in Table 11-1 below.

The remaining spills that occurred during 2020 were minor in nature, occurring on project roads/laydowns, with quick response and clean up resulting in negligible impact to the receiving environment. TMAC tracks all unauthorized discharges and spills on site, regardless if they are externally reportable or not, and identifies any observable trends. Based on those results, root cause analysis and corrective actions are recorded, tracked and implemented. Inspectors have the opportunity to review the information on demand or when at site conducting inspections.

## Table 11-1. Summary of Reportable Spills in 2020

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| 1-Feb-20 | 2020030 | 2-Feb-20 | Treated Mine Effluent<br>500 L | On February 1, 2020, final commissioning of the Roberts Bay discharge pipeline began to initiate pumping of treated underground mine water and excess water from the Tailings Impoundment Area (TIA) to Roberts Bay. Pumping of treated mine water through the system began from the main pump house with no issues identified along the pipeline. When the pump located at the TIA was started, a leak was identified emanating from a flange on an elbow section of the pipeline located approximately 75m south of the main pump house and 20m east of the heli-pad. Bolts on the flange were found to be loose and an estimated 500L of water was released at this location.<br><br>Monitoring of the pipeline was actively being conducted during the commissioning process. Crews in the area immediately identified the leak and tightened the bolts on the flange to minimize the release. Bolts on all other flanges of the pipeline were checked to verify bolts were torqued to specification.<br><br>Snow surrounding the area of the flange was removed and placed in the TIA for disposal.<br><br>An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• Contraction/temperature change occurred in between the time of initial installation of the pipeline (summer) and commissioning of the pipeline. This caused the bolts of the flange to become loose.<br>• No insulation kit had been installed on the elbow or flange during initial installation which likely increased the impact of this contraction/temperature change.<br>• Verification of torque on the flange bolts was not identified on the pre-commissioning checklist and was not performed prior to start of commissioning.<br><br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• A Standard Operating Procedure (SOP) for commissioning surface pipelines was developed to identify all items that must be confirmed prior to start up, including confirmation of bolt torque on all flanges.<br>• Insulation kit and protective housing was installed at flange location.<br>• A preventative maintenance program to routinely inspect flanges on the pipeline was initiated. | 27-Feb-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| 9-Feb-20 | 2020035 | 10-Feb-20 | Ammonium nitrate/fuel oil (ANFO) Explosives Pellets <1 kg | On February 9, 2020, while performing daily inspections near an outside storage magazine, the Environmental Projects Technician identified a spill of less than 1kg of ANFO explosives pellets on the snow covered gravel pad.<br>The incident occurred when the blasting contractor was removing a 500kg bag of ANFO explosives from the magazine in advance of a planned blast. While removing the bag, the bag contacted a protruding nail from a pallet and a small tear in the bag developed. ANFO pellets were released to the ground. Authorized personnel cleaned up the impacted area. The pellets were shoveled into pails and utilized in the next scheduled blast.<br>An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• Failure to identify the nail protruding from a pallet prior to removal of the bag.<br>• Inadequate procedures related to the removal of ANFO bags from containment, which would have identified the hazard.<br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• Improved task planning was completed by Supervisor to identify all potential risks associated with handling ANFO explosives pellets.<br>• Workers shall conduct Field Level Risk Assessment to identify all hazards prior to handling ANFO explosives pellets, and develop mitigation measures to minimize those hazards prior to beginning the task. | 27-Feb-20 |
| 21-Feb-20 | 2020058 | 21-Feb-20 | Partially Treated Mine Effluent 18,700 L | On February 21, 2020, an operator was completing an inspection of the water treatment facility which treats mine water for Total Suspended Solids prior to discharge to Roberts Bay. The operator observed partially treated effluent overflowing onto the ground from the containment underneath the lamella clarifier tank. The operator discovered that the feed box to the clarifier tank was unable to accept the water which caused excess effluent to overflow onto the concrete containment and then onto the adjacent crush pad.<br>Immediately, flow from the underground was stopped. Spilled effluent, contained in the concrete berm, was pumped back into the lamella clarifier tank for treatment. The feed box was cleaned to remove mud from the underflow of the baffle. The contaminated crush material was deposited into the Tailings Impoundment Facility. | 22-Mar-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| | | | | An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• Lack of an alarm to inform control room operator when flow exceeds system rated capacity;<br>• Lack of remote observation capability during times when facility is unattended;<br>• Inadequate volume capacity of the facility's secondary spill containment;<br>• Incorrect underground valve installed outside of system design; and<br>• Lack of an alarm to inform control room operator that pumping from the underground sump has commenced<br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• Install alarm system programmed to sound when flow into the wastewater treatment plant exceeds 80$m^3$/hour;<br>• Install camera inside the water treatment facility to provide real-time observation from the control room;<br>• Increase the capacity of the secondary containment area with expansion of concrete containment berm;<br>• Install control valve underground to ensure system design functionality;<br>• Install level switch control in the sumps to inform control room when it is pumping. | |
| 3-Mar-20 | 2020069 | 4-Mar-20 | ANFO Explosives Pellets 1 kg | On March 3, 2020, while performing daily inspections near the Doris Portal, a site worker identified a spill of approximately 1kg of ANFO explosives pellets on the gravel pad. The incident occurred when a tele-handler operator was removing a 300 kg mega bag of ANFO explosives from the dedicated ANFO sea-can. While removing the bag, the fork contacted the mega bag and a small tear in the bag developed. ANFO pellets were released to the ground. At the time of the incident, the tele-handler operator did not notice the released product.<br>An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• The right fork on the tele-handler was bent from a previous event, causing the fork to contact the mega bag and damage the pallet.<br>• Tele-handler fork carriage is too wide to access individual pallets inside seacan. Both rows of double-stacked pallets must be pulled towards the seacan door simultaneously, which causes pallets to bind together when retracting the tele-handler boom during removal. This increases the risk of the top mega-bags becoming unsecured. | 28-Mar-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| | | | | • Standard shipping pallets were not used by the vendor to load mega bags into sea can prior to shipment to site.<br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• Repair right fork of tele-handler.<br>• Contact vendor to investigate options for using standard wood pallets for shipping explosives products and packing pallets into sea can in correct orientation prior to 2020 sealift shipment.<br>• Investigate alternative equipment options for removing pallets from sea cans. | |
| 14-Mar-20 | 2020079 | 14-Mar-20 | ANFO Explosives Pellets<br>4 kg | On March 14, 2020, an employee was in the process of removing mega-bags of ANFO explosives product from the storage seacan near the Doris Portal to transfer to the underground explosives magazine. While pulling the double-stacked shipping pallets forward, the top mega-bag slipped from the pallet and a small tear occurred in the bag. When the bag was removed from the sea-can a spill of approximately 4kg of ANFO explosives pellets occurred to the gravel pad.<br>An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• Poor quality pallets used by the vendor to load mega bags into seacan prior to shipment to site. Pallets are prone to damage when accessed by equipment.<br>• Orientation of pallets inside sea can is not consistent and impedes access of the equipment forks. Prevents forks from properly securing pallet prior to lift and increases the risk of forks coming into contact with mega bags or pallets.<br>• Plywood used to separate top and bottom pallet caused pallet to slip when contacted with forks. Resulted in mega-bag to slip from pallet.<br>• Tele-handler fork carriage is too wide to access individual pallets inside seacan. Both rows of double-stacked pallets must be pulled towards the seacan door simultaneously, which causes pallets to bind together when retracting the tele-handler boom during removal. This increases the risk of the top mega-bags becoming unsecured.<br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• Prior to 2020 sealift delivery, contact vendor to investigate options for using standard wood pallets and stacking materials for shipping explosives products.<br>• Prior to 2020 sealift delivery, request vendor pack pallets into sea can in correct orientation to allow forked equipment to access properly. | 31-Mar-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| | | | | • Investigate alternative equipment options for removing pallets from sea cans. | |
| 31-Mar-20 | 2020090 | 31-Mar-20 | Untreated Mine Effluent<br>32,000 L | Underground workings at the Doris-Madrid Project are dewatered to allow for continued mining activities. In this process, mine inflow water is pumped from an underground sump using a 60hp pump to a large tank in the main Roberts Bay Discharge Pump house (720 Building) and then transferred to the water treatment facility (740 Building), where the water is treated for removal of Total Suspended Solids (TSS) before discharge to Roberts Bay.<br><br>As a risk mitigation for mining activities, a larger 200hp pump is also located at the underground sump which would allow increased pumping capacity from the underground workings to the Tailings Impoundment Facility in the event of a sudden inflow into the mine. In order to use this pump, a series of valves are closed/opened on this system to redirect flow from the 720 Building to a dedicated emergency dewatering pipeline that transfers this water to the Tailings Impoundment Area.<br><br>At 00:11 on March 31, the mill control room operator received an alarm that the 200hp pump had been activated while the 60hp pump was running. This resulted in a combined flow of 147m3/h to be pumped to the water treatment facility. The control room operator immediately contacted underground personnel to turn off the pump and sent a mill operator to the 720 Building to assess the situation.<br><br>The mill operator discovered that the increased pumping rate had overwhelmed the receiving tank (Tank-100) located in the 720 Building which began overflowing onto the floor. A sump system in the 720 Building had begun pumping this water to the overflow tank (Tank-140) which transfers to the mill tailings pump box and out to the TIA. During the process of shutting down the underground pumps, Tank-140 was also overwhelmed and began overflowing. Water was released from the roll-up doors on the north and south side of the 720 Building. The mill operator called for assistance and sand-bags were placed at both roll-up doors to minimize the volume of the release. The sump system continued to pump water accumulating on the floor to Tank-140 for transfer to the mill tailings box.<br><br>The investigation revealed that a lower volume of water was released outside the 720 Building than was initially reported. The initial volume did not take into account the volume of water that remained within Tank-100 and Tank-140, or the volume of water transferred from Tank-140 to the mill tailings box. Some water also drained through the overflow pipe extending from inside the 720 Building to the Sedimentation Pond. Based on this, the volume of the release is estimated to be 26,000 L. | 26-Apr-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| | | | | An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• Underground worker misunderstood instructions given over the radio by the Supervisor to start a pump in the 200 level of the mine and instead started the 200hp pump at the underground sump station;<br>• Valves and control panels of the underground pumping system not adequately labelled to identify each component. Control panel and valves of the 60hp and 200hp systems look identical;<br>• Underground supervisor failed to provide adequate instruction and training for the worker in this task; and<br>• Lack of written procedure for controlling underground pump system.<br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• Electricians labelled control panels on both the 200hp and 60hp pumps;<br>• Signage added to 60hp and 200hp valves to prevent misidentification of valve system;<br>• Supervisor must ensure workers are trained and competent to perform assigned tasks and must ensure instructions are understood by the worker when assigning tasks;<br>• Written procedure developed for controlling underground pump system. Laminated copy of this procedure to be located at the underground pump station. | |
| 22-May-20 | 2020150 | 22-May-20 | Untreated Sewage 30 L | While performing daily inspections, the Sewage Treatment Plant operator identified a distribution line between lift stations had ruptured at a fitting and was leaking. An estimated 30L of untreated sewage was released to the gravel surrounding the lift station enclosure.<br>An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• The distribution line was aged (original installation); and<br>• The lift station was not plumbed with the proper piping for this specific application.<br>The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>• Continue with daily lift station and distribution line inspections; and | 22-May-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| | | | | • Conduct lift station and distribution system audit to identify components that show signs of wear or are not adequate for the application and replace components as required. | |
| 14-Jun-20 | 2020180 | 15-Jun-20 | Contact Water 264 $m^3$ | On June 14, 2020, seepage was identified emanating from the downstream toe of the Madrid North Contact Water Pond (CWP) located at the Madrid North site. The pond collects contact water from the Madrid North Waste Rock pile located upstream of the pond and is identified in Nunavut Water Board Type 'A' Water Licence 2AM-DOH1335 as SNP monitoring station MMS-1 (the Licence).<br><br>The design of the CWP incorporates a rockfill berm with a geomembrane liner on the upstream face to contain contact water. The CWP liner is anchored to bedrock and concrete plinths at the upstream toe of the berm. The rest of the pond is unlined and relies upon naturally low permeability of the bedrock and permafrost within the pond basin to contain contact water. Water accumulating in the CWP may be discharged to tundra if the discharge criteria outlined in Part F 18(a) of the Licence is met. At the time of the release, a pre-discharge sample had been collected; however results of this sample had not yet been received from the independent 3rd Party Laboratory.<br><br>An estimated 264 $m^3$ of contact water was released to the tundra downstream of the CWP. This volume was calculated based on the surveyed high water mark observed in the CWP at freshet and the CWP stage-storage curve.<br><br>An incident investigation conducted soon after the incident occurred concluded with the following root causes:<br>• Two stand pipes installed at the south end of the CWP during construction were not capped after construction was completed. These pipes were installed to facilitate dewatering of groundwater inflow from the surrounding permafrost below the liner during construction of the pond in 2019. These pipes extend below the lined section of the CWP. The open ends of the pipes were below the full supply level identified in the as-built summary report of the CWP, and below the water level at the time of the release. It is believed that these pipes acted as a conduit for water within the CWP to be released below the liner.<br>• Potential cracks/fissures in the bedrock/concrete plinths were identified near the south-east corner of the CWP. Leak testing of these areas indicated water was being lost at this location either through a crack in the bedrock or gaps at the concrete plinth/bedrock interface. | 14-Jul-20 |

**Table 11-1. Summary of Reportable Spills in 2020**

| Date of Occurrence | Spill Number | Date of Notification to an Inspector | Spilled Material and Volume or Mass | Details of Spill Event and Follow up Activities | Date Follow-up Report Provided to an Inspector |
|---|---|---|---|---|---|
| | | | | The following corrective/preventative actions were implemented to reduce the likelihood of a reoccurrence:<br>Short Term:<br>• Caps were placed on the stand pipes within the pond to prevent further release from this area;<br>• A new Full Supply Level for the CWP was identified in consultation with the Engineer of Record (SRK Consulting) based on survey data of the sections of the pond which have proven to hold water; and<br>• The CWP will be managed below the newly established Full Supply Level until long term corrective actions can be completed. Water accumulation will be transferred to the Doris TIA or discharged to tundra if Licence criteria are met.<br>Long Term:<br>• Repairs were made to the cracks/fissures in the bedrock/concrete plinths. An excavator was used to remove overburden from this area and a thick layer of bentonite was placed covering the areas of cracks/fissure. This was covered with crush and will be allowed to freeze during winter 2021. Monitoring during freshet 2021 will evaluate the effectiveness of these repairs;<br>• Investigate installation of a shallow sump downstream of the seepage area to ensure any seepage exiting the CWP is captured and returned to the water management system via an automated float operated pump. To be further evaluated in 2021. | |

# 12. Management Plans

The Table 12-1 below provides and overview of all Management Plans for the Hope Bay Project.

**Table 12-1. Hope Bay Project Management Plans**

| Topic | Management Plans | Revision Date |
|---|---|---|
| Environmental Management System | Hope Bay Project Environmental Management System | Dec-17 |
| **Management Plans** | | |
| Emergency Response | Hope Bay Project Emergency Response Plan | Feb-21 |
| Spill Contingency | Hope Bay Project Spill Contingency Plan | Mar-21 |
| Hazardous Waste Management Plan | Hope Bay Project Hazardous Waste Management Plan | Mar-20 |
| Incinerator Management Plan | Hope Bay Project Incinerator Management Plan | Mar-19 |
| De-icing Management | Hope Bay Project Aircraft De-icing Management Plan | Mar-19 |
| QA/QC | Hope Bay Project Quality Assurance Quality Control Plan | Mar-21 |
| Water Management | Hope Bay Project Doris-Madrid Water Management Plan | Mar-21 |
| | Hope Bay Project Boston Water Management Plan | Dec-17 |
| | Hope Bay Project Water and Ore/Waste Rock Management Plan for Boston Site | Jan-17 |
| Waste Rock Management Plan | Hope Bay Project Waste Rock, Ore and Mine Backfill Management Plan | Mar-19 |
| | Hope Bay Project Water and Ore/Waste Rock Management Plan for Boston Site | Jan-17 |
| Landfarm Management | Hope Bay Project Hydrocarbon Contaminated Material Management Plan | Dec-17 |
| Air Quality | Air Quality Management Plan, Hope Bay Project | Apr-19 |
| Domestic Waste Water Management | Hope Bay Project Domestic Wastewater Treatment Management Plan | Dec-17 |
| | Boston Sewage Treatment Operations and Maintenance Management Plan | Sep-17 |
| WWMP | Doris North Project Wildlife Mitigation and Monitoring Plan | Dec-16 |
| | Wildlife Mitigation and Monitoring Plan | Dec-19 |
| AMEP | Hope Bay Project Aquatic Effects Monitoring Plan | Apr-18 |
| Ground Water Management Plan | Hope Bay Project Ground Water Management Plan | Apr-18 |
| Tailing Management Plan | Hope Bay Project, Phase2 Doris Tailings Impoundment Area – Operations, Maintenance, and Surveillance Manual | Aug-20 |
| | Hope Bay Project Boston Tailings Management Area - Operations, Maintenance, and Surveillance Manual | Dec-17 |

*(continued)*

**Table 12-1. Hope Bay Project Management Plans (completed)**

| Topic | Management Plans | Revision Date |
|---|---|---|
| Non-Hazardous Waste | Hope Bay Project Non-hazardous Waste Management Plan | Dec-17 |
| Quarry Management | Hope Bay Project Quarry Management and Monitoring Plan | Dec-17 |
| Closure | Hope Bay Project Doris-Madrid Closure and Reclamation Plan | Nov-17 |
| | Hope Bay Project Boston Conceptual Closure and Reclamation Plan | Nov-17 |
| | Hope Bay Project Windy Camp and Patch Lake Facility Updated Closure Plan (SRK) | May-14 |
| | Hope Bay Project: Madrid Advanced Exploration Program: Conceptual Closure and Reclamation Plan (SRK) | Oct-14 |
| Explosives | Hope Bay Project Explosives Management Plan | Nov-17 |
| OPPP & OPEP | Oil Pollution Prevention Plan (OPPP) and Oil Pollution Emergency Plan (OPEP) | May-20 |
| **Socio-economic Management Plans** | | |
| Health and Safety | Hope Bay Health and Safety Management Plan | Dec-17 |
| Human Resources | Hope Bay Project Human Resources Plan | Sep-16 |
| Community Involvement | Hope Bay Project Community Involvement Plan | Dec-16 |
| Cultural Heritage | Cultural Heritage and Natural Resources Management Plan | Dec-17 |

# 13. Closure and Reclamation

## 13.1 PROGRESSIVE RECLAMATION

### 13.1.1 Operation Areas

The Doris CPRT was reclaimed in 2019 following the completion of mining activities at this site. Backfill and final reclamation activities were completed in May 2019, and a 1-metre cap of geochemically stable rock was placed. Sedimentation controls including coco-matting and silt fence surrounding the CPRT remained in place into 2020 to ensure no siltation or sedimentation could occur during freshet of 2020. Monitoring of this area continued in 2020 to ensure backfilled area remained stable. Figure 13-1 shows an aerial photo of the Doris CPRT in 2020 post-reclamation activities. Due to reduced operations and personnel availability onsite as a result of the COVID-19 global pandemic, no additional operational areas were reclaimed in 2020.

**Figure 13-1. Doris Crown Pillar Recovery Trench Post-Reclamation Activities**

### 13.1.2 Exploration Areas

Following surface diamond drilling operations, a reclamation process is conducted. Once drill equipment is demobilized from site, all cuttings and drill casings are removed, and the land is leveled with bentonite and capped with peat moss. Following drilling operations on ice, equipment and soiled and/or oily snow and ice are removed from the surface of the ice and deposited in active sumps. Once drilling operations are complete at a drill site, a site closure inspection report is completed by TMAC, reviewed by the site Drilling Supervisor and approved by the TMAC Environment Superintendent. Generalized items inspected in closure review include: water management, drill collar sites and adjacent vegetation inspections and housekeeping. All site closures are photographed with records filed and maintained by TMAC.

On-land drilling was conducted at Naartok West from January to March of 2020 at which time surface exploration activities were halted due to the COVID-19 global pandemic. Drill sites were reclaimed prior to demobilizing drill teams from the site. Due to reduced operations and personnel on site, no historical drill site reclamation was completed in 2020.

## 13.2 COST ESTIMATE

The reclamation work for the Hope Bay Project will be done in accordance to approved Closure and Reclamation Plans for the Project. Reclamation progress is monitored through site inspections and annual reporting to the KIA, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and NWB, and is documented in updates of the Project Closure and Reclamation Plan and financial security costs estimates. As part of the Type A Water Licence approval process for Boston-Madrid (Phase 2) Project in 2018, financial security costs estimates were updated and approved by the NWB, KIA and CIRNAC and consider all existing infrastructure, proposed Phase 2 infrastructure, and any new information available since the last revision. The resulting financial security estimates and their associated Closure and Reclamation Plans, which are applicable to each site, are outlined in the subsections below.

### 13.2.1 Doris and Madrid

TMAC maintains the *Hope Bay Project Doris-Madrid Closure and Reclamation Plan* (November 2017) which describes the activities, requirements, and monitoring necessary for the closure and reclamation of the Doris site.

As part of the Type A Water Licence approval process for Boston-Madrid (Phase 2) Project in 2018, TMAC provided to the NWB an updated and final Closure and Reclamation cost estimate, which constituted an agreement between TMAC, KIA and CIRNAC on the financial security parties agreed was required for Doris and Madrid sites. Details of this process can be found on the NWB public registry and resulted in a requirement in Type A Water Licence 2AM-DOH1335 for $62,058,577 to be posted for the Doris-Madrid portion of the Project; $51,659,822 to KIA, $10,398,755 to the Crown. This security is to be posted across nine (9) installments or tranches based on distinct project components.

In addition to the financial security required to be posted for Doris and Madrid under Type A Water Licence 2AM-DOH1335 described above, TMAC also has rights to conduct the Madrid Advanced Exploration Program in accordance with Water Licence No. 2BB-MAE1727 Amendment No.2. In the event TMAC proceeds the Madrid Advanced Exploration Program, and does not commence activities under Type A Water Licence 2AM-DOH1335, TMAC's Conceptual *Madrid Closure and Reclamation Plan* (2017) will dictate the activities, requirements, and monitoring necessary for the closure and reclamation of the Madrid site(s). In this scenario, TMAC is required to maintain reclamation security in the amount of $7,131,000 for the work at Madrid. As per the amended licence, this amount is split between activities at Madrid North ($4,042,000), Madrid South ($3,072,000) and Madrid North to South All Weather Road (AWR) ($17,000).

### 13.2.2 Windy

TMAC has an approved *Hope Bay Project, Windy Camp and Patch Lake Facility Updated Closure Plan* (SRK 2014). This document presents the closure obligations and the plan for closing both facilities, and demonstrates how the closure obligations can be met. A copy of this plan can be found on the NWB public registry.

### 13.2.3 Boston

For current Boston infrastructure, TMAC has an approved *Boston Camp Interim Closure Plan* (2020), which was submitted to the NWB September 14, 2020. The plan includes a current closure cost estimate of $3,722,000. This amount includes cost escalation, management of mineralized rock, reclaiming drill sites and other areas of permafrost degradation, remediation of hydrocarbon contaminated soils, indirect costs, and a contingency. A copy of this plan can be found on the NWB public registry.

For planned Boston infrastructure under the Boston-Madrid (Phase 2) Project, TMAC provided to the NWB an updated and final Closure and Reclamation cost estimate as part of the Type A Water Licence approval process. The updated and final Closure and Reclamation cost estimate provided constituted an agreement between TMAC, KIA and CIRNAC on the financial security parties agreed was required for the Boston site. Details of this process can be found on the NWB public registry and resulted in a requirement in Type A Water Licence 2AM-BOS1835 for $37,458,491 total to be posted; $9,963,564 to KIA and $27,494,927 to the Crown. This security is to be posted across nine (6) installments or tranches based on distinct project components.

# 14. Community Consultation

TMAC is committed to engaging positively and effectively with local communities in a manner that emphasizes respect, integrity and demonstrates a willingness to learn from experience and embrace necessary change. TMAC recognizes that maintaining engagement and community involvement is necessary throughout the mining cycle, and critical to continuous improvement. TMAC bases its approach to community involvement on the following principles:

1. Identify all Stakeholders in our operations;
2. Effectively engage Stakeholders and establish a dialogue;
3. Provide Stakeholders with means to respond to us as well as generate responses; and
4. Report to Stakeholders and regulators on our Engagements.

TMAC operates within Nunavut, and on Inuit Owned Lands. The Kitikmeot Inuit Association (KIA), representing the Inuit of the Kitikmeot region, advised TMAC during the Inuit Impact and Benefits Agreement (IIBA) negotiation process that all Kitikmeot communities are considered affected by Hope Bay. As a result, TMAC considers every Kitikmeot Inuk, and their representative organizations including the KIA to be Stakeholders in the Belt. For the purposes of local community engagement, communities involved in the Belt include Kugaaruk, Taloyoak, Gjoa Haven, Cambridge Bay, Umingmaktok, Kingaok, and Kugluktuk, comprising the Kitikmeot region of Nunavut.

In order to effectively engage, establish and maintain a dialogue with TMAC's various local communities, TMAC has implemented a number of steps and activities designed to support two-way communication. These efforts and activities are described in the subsections below.

In 2020, and in particular the last three quarters of the year, TMAC Community Consultation activities were severely constrained by public health measures enacted by the Government of Nunavut Department of Health pursuant to the Nunavut public health emergency declared in response to the COVID-19 global pandemic.

## 14.1 CAMBRIDGE BAY OFFICE

TMAC maintains an office in Cambridge Bay, which is the closest, occupied, affected community to the Belt. The office is centrally located in the community, furnished with bilingual signage, and accessible by the public during regular business hours. The primary purpose of this office is to facilitate community engagement. The Cambridge Bay office supports TMAC's engagement of government, regulators, intervenors, interested members of the public, employees, those seeking employment at Hope Bay and other interested parties.

Staff of the Cambridge Bay office are available to communicate directly with local Stakeholders and participate in a number of regional and territorial events that regularly occur in Cambridge Bay, thereby informing communities of TMAC operations, and actively soliciting feedback. The Cambridge Bay office is staffed with a Vice President of Corporate Social Responsibility, a TMAC Liaison and a Human Resources/Social Responsibility (HR/SR) Coordinator. They engage regularly with the public using two-way communications for a variety of activities including:

- Employee and public relations;
- Annual community awareness meetings;

- Regular meetings with individual Inuit job seekers;
- Recruiting and onboarding Inuit personnel;
- Regular communications with Community Liaison Officers in the Kitikmeot;
- Annual meetings between KIA and TMAC Presidents;
- Annual updating of KIA Board by TMAC Executive;
- Attendance at the KIA Annual General Meeting;
- Quarterly participation in the IIBA Implementation Committee;
- Presentation of the IIBA Annual Evaluation Report to the KIA Board;
- At a minimum, semi-annual meetings of the Inuit Environmental Advisory Committee (IEAC) in order to review environmental management and monitoring plans, discuss project related environmental issues, and obtain advice from knowledgeable Inuit on these matters;
- Meetings between TMAC staff and Kitikmeot Qualified Businesses;
- Regular meetings with relevant KIA Lands, Employment and Training and Executive staff; and
- Annual visits of the KIA Board, IIBA Implementation Committee, IEAC, and individual harvesters at Hope Bay.

During 2020, public access to the Cambridge Bay office was restricted by public health measure from March onward. This eliminated the ability of TMAC to communicate directly with the Cambridge Bay public, and to host in person meetings with stakeholders.

## 14.2 ENGAGEMENT WITH INUIT THROUGH THE IIBA

In accordance with the IIBA, TMAC regularly engages Inuit on a range of matters directly as well as through the KIA. The IIBA includes the following schedules which contain specific provisions of adaptive socio-economic effect mitigation measures aimed at Kitikmeot Inuit:

- Schedule D – Training and Education Opportunities: whereby Inuit are provided support and training for opportunities at the Hope Bay Project;
- Schedule E – Employment: whereby measures and supports are provided to maximize Inuit participation in the Hope Bay Project;
- Schedule F – Business and Contracting Opportunities: whereby Inuit are provided business and contracting opportunities; and
- Schedule I – Inuit Environmental Advisory Committee: whereby Inuit have the opportunity to receive and consider information, provide advice and attempt to resolve community concerns relative to the environment and wildlife for the Hope Bay Project.

During 2020, meetings between TMAC and the KIA for the purposes of implementing the Hope Bay IIBA were curtailed due to office closures made as a result of the COVID-19 public health emergency.

## 14.3 COMMUNITY AWARENESS: KITIKMEOT COMMUNITY MEETINGS

TMAC is committed to undertaking annual regional consultation tours of the Kitikmeot region. The tours consist of visits to each Kitikmeot community by TMAC community relations staff and relevant subject matter experts. During community consultation tours, public meetings are scheduled in each community, and in-person meetings are arranged with local stakeholders.

The 2020 annual Kitikmeot Community meeting tour was cancelled due to the COVID-19 public health emergency.

## 14.4 COMMUNITY AWARENESS: KITIKMEOT CAREER AWARENESS SESSIONS

TMAC hosts community and information and career awareness sessions in all Kitikmeot communities annually in order to maximize Inuit employment opportunities at Hope Bay. The purpose of these sessions is to provide information on:

- expected labour needs of Hope Bay;
- the skills, behaviours and qualifications required for employment and advancement at Hope Bay;
- the training opportunities and educational support programs available to prepare for employment at Hope Bay; and
- career opportunities in related fields such as science, technology, mathematics or professional services.

In 2020, the Kitikmeot Career Awareness tour was cancelled due to the COVID-19 public health emergency.

## 14.5 SOCIAL MEDIA

TMAC maintains a company Facebook™ page to both share operational information with communities and increase awareness of mining. TMAC uses its Facebook™ page to augment information distributed through TMAC's website. TMAC also makes use of Kitikmeot community Facebook™ pages to advertise job postings, meeting notices, and any other news that may be of interest to Nunavut Stakeholders (http://www.facebook.com/tmacresources/).

Comments, questions or concerns received via social media are addressed promptly in a manner consistent with public meetings.

## 14.6 ELECTRONIC MAIL

TMAC maintains and periodically updates a listing of electronic mail addresses of Stakeholders, including select community members. This listing includes, but is not restricted to the following:

- Public elected officials;
- Inuit elected officials;
- Relevant federal and territorial regulator employees;
- Relevant Inuit Organization employees;
- Relevant municipal officials; and
- Relevant training and employment agency employees.

When necessary, TMAC distributes electronic mail messages to this listing to inform them of TMAC related events, news and happenings. This engagement activity is conducted to ensure that Stakeholders and communities are well informed and if willing, able to plan participation in any future TMAC engagement.

## 14.7 NUNAVUT EVENT PARTICIPATION

TMAC ensures it is well informed of key events that occur on an annual basis in Nunavut that represent opportunities for community involvement and dialogue. TMAC makes staff available to attend these events in order to foster communication. TMAC also provides financial support as appropriate to event planning groups in order to assist in paying for event costs. Sponsored events include the following:

- Kitikmeot Mayor's Meeting;
- Kitikmeot Trade Show; and
- Nunavut Mining Symposium.

In 2020, all Nunavut events normally attended and sponsored were cancelled due to the COVID-19 public health emergency.

## 14.8 STAKEHOLDER REPRESENTATIVE ORGANIZATIONS

TMAC recognizes that one of the most effective means of engagement and dialogue with Stakeholders and communities is joining with them in an organization of mutual benefit. Towards this aim, TMAC is a member of established organizations involving numerous community members. TMAC's participation in these groups provides members with information on TMAC's activities and, allows them to discuss matters of mutual concern, and undertake initiatives of mutual benefit. These organizations include the following:

- NWT/Nunavut Chamber of Mines;
- Nunavut Mine Training Roundtable; and
- Kitikmeot Indigenous Skills and Employment Training (ISET) Stakeholder Working Group.

In 2020, TMAC continued to participate in Stakeholder representative organizations. However, in-person meetings that normally take place within the listed groups above were cancelled due to the COVID-19 public health emergency.

## 14.9 COMMUNITY RELATIONS SUMMARY FOR 2020

TMAC's Corporate Social Responsibility (CSR) group is responsible for leading community relations on behalf of TMAC. TMAC conducts its activities in accordance with the *Community Involvement Plan*, and in compliance with the *Hope Bay Inuit Impact and Benefit Agreement*.

TMAC Corporate Social Responsibility supports the implementation of a number of TMAC Policies and Procedures including:

- Code of Ethical Business Conduct;
- Respectful Workplace;
- Whistleblower Policy;
- Corrective Action Policy;

- Community Complaints Procedure;
- Sustainable Development Policy; and
- Employee and Family Assistance Program.

During 2020, Julia Micks EVP of Human Resources for TMAC continued to head the community involvement team. Alex Buchan, VP of Corporate Social Responsibility, based in Cambridge Bay, is primarily responsible for delivering community involvement activities. The Community Relations team in Cambridge Bay includes Ikey Evalik, Inuit Impact and Benefit Agreement Coordinator, and Sandra Eyegetok, the HR/SR Coordinator.

Communications in 2020 focused on the TMAC Strategic Review process aimed at identifying potential buyers or partners for TMAC to continue development at Hope Bay, the Shandong Gold arrangement agreement to acquire TMAC, the regulatory process related to the sale of a Canadian company to foreign buyers, and the TMAC response to the COVID-19 global pandemic.

### 14.9.1 Cambridge Bay Logistics Hub

Cambridge Bay continues to be the logistics hub for TMAC in the Kitikmeot. In 2020, TMAC operated weekly Northern Crew Change Flights from Cambridge Bay into Doris Mine. In alternating weeks, this crew change flight also took in either Kugluktuk (West) and Gjoa Haven, Taloyoak and Kugaaruk (East) workers. TMAC, similar to previous years, utilizes a twin engine 14 seat aircraft for these crew change flights. In March 2020, crew change flights were discontinued in order to break contact between Nunavut workers and their home communities, and the Hope Bay southern workforce, thereby eliminating the possibility that Hope Bay could be the source of COVID-19 infection in the Kitikmeot. No other crew change flights occurred during the remainder of the year due to this reason.

### 14.9.2 Other Communications in 2020

TMAC continues the use of a project/company Facebook page to provide information on Hope Bay primarily to northern stakeholders. Content of this page includes permitting information, meeting notices, job advertisements, and pictures of site activities linked to Kitikmeot community news pages. Feedback from TMAC information from this social media source is growing and it may be surmised that many younger Kitikmeot residents make better use of this information source than Elders or others more typically reliant on information received during public meetings. The page can be viewed at the following link: https://www.facebook.com/tmacresources.

### 14.9.3 Corporate Social Responsibility Activities in 2020 by Month

<u>January</u>

- CSR Staff attended the KIA Employment and Training Stakeholders Working Group meeting this month to share information on Hope Bay employment and training initiatives. During this meeting the KIA described changes to its ISETS funding programs that now provide for more flexibility in supporting individuals and training programs.
- 2019 data collection and compilation began this month towards Socio-Economic Monitoring reporting.
- CSR Staff delivered an IIBA 101 Presentation to new Toronto hires this month as well as providing further advice and training on IIBA procurement procedures to new Finance staff.
- CSR staff met with and arranged for Camp Orientation and Cross Cultural Awareness introductions to the locally delivered Introduction to Mining course by the NWT Mine Training Society.

- Agreement was reached this month with the Nunavut Arctic College to host an Office Administration student for a work practicum next month.

February

- CSR Staff attended the Kitikmeot Trades Show in Cambridge Bay this month. Due to the strategic review process, participation was diminished from previous year. Several one-on-one meetings were held with Kitikmeot Qualified Businesses to provide project updates. TMAC sponsored the Trade Show cultural events evening for delegates and members of the public.
- CSR Staff attended the Northern Lights Trades Show in Ottawa this month. A presentation on mining benefits was delivered to delegates. SR staff also attended a northern mining introductory function at the US Embassy.
- Kitikmeot Camp Solutions and Nuna West were both recognised for their 2019 Inuit employment efforts by letter this month.
- CSR staff delivered Cross Cultural and Camp Life presentations to the Cambridge Bay Mining Essentials Class.
- Group email activity summary sent to northern stakeholders.

March

- CSR provided cross cultural awareness and life in camp presentations to Kitikmeot Camp Solutions training program in Cambridge Bay this month.
- Key early 2020 CSR engagements were cancelled due to the corona virus pandemic this month including an IIBA IC meeting and attendance at the 2020 Nunavut Mining Symposium.
- CSR liaised with Government of Nunavut (GN) Health officials on drafting of the Hope Bay Infectious Disease Control Plan and was in daily communication with GN Economic Development and Transportation (ED&T) officials on pandemic matters.
- Public notices and Hunters and Trappers Organization communications on site harvester visitation ban were distributed this month.
- A listing of key pandemic actions and messages was prepared for a KIA/TMAC President briefing meeting.
- CSR staff advocated with Kitikmeot Corporation to extend standby pay provisions to their workers that were affected by the termination of access to their Hope Bay workplaces due to the pandemic.
- CSR assisted HR staff in advocating with GN ED&T and Justice officials on varying the duration of temporary lay offs applied to Hope Bay workers under territorial legislation.
- CSR staff advocated with GN ED&T and Health officials in order to exempt Hope Bay from Nunavut travel ban instituted this month.
- CSR staff contributed to industry pandemic advocacy and coordination efforts through the NWT/Nunavut Chamber of Mines.

April

- CSR Staff continued to assist Nunavut temporarily laid off workers seek and obtain federal pandemic support programs this month.
- CSR Staff continued to participate and support Nunavut/NWT Chamber of Mines efforts to advocate for federal pandemic relief support for the northern mining industry including preparing

correspondence to federal ministers highlighting need and gaps in existing programs. Advocacy work also included preparing key messages to northern Premiers in advance of parliamentary debate on the pandemic relief bill. Progress was seen in obtaining exploration work relief from 2020 Crown lease and claim exploration work requirements. Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) in Iqaluit working to implement.

- CSR staff restated community directed communications on Hope Bay "no visitor" policy in response to a hunting group attending Doris Mine this month.
- KIA formally agreed to postpone the 5-year reviews of the Hope Bay Framework Agreement and Inuit Impact and Benefit Agreement due to the pandemic.
- SR staff prepared IIBA Implementation Committee meeting materials in advance of a meeting to be scheduled in the future based on the progression of the pandemic.
- Group email activity summary sent to northern stakeholders.

May

- The Cambridge Bay office remained closed to the public this month as a precaution against the spread of COVID-19 virus.
- CSR Staff continued to assist Nunavut temporarily laid off workers seek and obtain federal pandemic support programs including the submission of monthly reapplications for payments. Service Canada office in Cambridge Bay remains closed and all applications are being done via the phone or internet, with some workers experiencing difficulty in applying using these methods.
- CSR staff assisted in communication of the Shandong Gold acquisition to northern stakeholders this month included Nunavut Tunngavik Inc., Kitikmeot Corporation and Government of Nunavut. Support letters from northern stakeholders were also requested this month for the Shandong Gold acquisition.
- SCR staff prepared an introductory presentation to Shandong Gold management team in Canada, Hong Kong and China on Nunavut as a mining jurisdiction and operating environment. Presentation materials included explanation of Inuit, the Nunavut Agreement, co-management of resources and socio-economic conditions.
- An IIBA Implementation Committee meeting was held this month via teleconference. The purpose of this meeting was to review IIBA related activities for 2019. The next IIBA IC meeting will be scheduled to review the 2019 IIBA Evaluation Report.
- Both the 2019 IIBA Evaluation Report and 2019 Socio-Economic Monitoring Report drafts were completed this month.

June

- CSR Staff worked to support the Shandong Gold acquisition including preparing draft responses to KIA due diligence questions and engaging with other Northern stakeholders in order explain the acquisition and to garner written support for the transaction.
- CSR staff attended an online meeting with Investment Canada officials in order to provide CSR context and information in relation to the acquisition.
- SR staff delivered an introductory presentation to Shandong Gold management in Canada, Hong Kong and China on the Nunavut jurisdiction and operating environment.
- At the invitation of the Kitikmeot Chamber of Commerce, CSR staff attended a KCC board meeting this month to provide information on the acquisition and answer questions that the board members had in preparation for their consideration of a letter of support.

July

- CSR staff participated in a teleconference meeting with the Hope Bay Socio-Economic Working Group to review the 2019 Socio-Economic Monitoring Report this month. Several requests for additional details were received from Crown Indigenous and Northern Affairs Canada in relation to impacts on the regional labour force and business community. After these final edits, the report will be submitted to the NIRB.
- CSR Staff continued to support efforts to complete the Shandong Acquisition process by seeking support from northern stakeholders, including assisting in the preparation of communications and interactions by the acquisition team with the Kitikmeot Inuit Association, Government of Nunavut and Canada Investment Review Division. This included the preparation and review of correspondence.
- Upon the signing of an amended IIBA between Baffinland and Qikiqtani Inuit Association (QIA), SR staff prepared a cost and benefit comparison to the Hope Bay IIBA for strategic purposes.
- Nunavut Mining Symposium planning restarted this month looking at options to deliver a virtual conference in lieu of in person in Iqaluit due to the pandemic. Participants to be offered an online poll to garner support for this option.

August

- CSR staff prepared Inuit employment and training initiative options for Shandong Gold to propose to the KIA in anticipation of a completed acquisition this month. These initiatives were then shared with the KIA. The options package compared and contrasted various levels of support for pre-employment training for Inuit from all sources for other Nunavut mining projects.
- CSR Staff engaged with consultants engaged by the Government of Nunavut Department of Economic Development and Transportation charged with developing a draft Nunavut Mine Training Strategy. Hope Bay training needs and experiences were shared with the consultant group for inclusion into this strategy.
- CSR staff engaged with Government of Nunavut officials seeking direction on what steps to take to safely return Nunavut workers to employment at Hope Bay in advance of the expiry of the temporary lay off period in September. Thus far, no clear direction on this issue has been obtained from the Nunavut Chief Public Health Officer.
- CSR staff continued to support the TMAC acquisition process by communicating with key northern stakeholders this month, supporting the acquisition team with CSR perspective.

September

- CSR staff facilitated a number of northern engagements for Shandong Gold in coordination with LongView Communications this month. This included a call to acclaimed Kugluktuk MLA Calvin Pederson, an introductory teleconference with the KIA as well as two northern print media interviews in support and explanation of the TMAC acquisition.
- CSR Staff engaged with Nunavut public health officials and northern stakeholders to share updates and information regarding the Hope Bay COVID outbreak in September. Efforts included ensuring that the KIA was fully briefed on the evolving situation, northern media were provided accurate information including case counts, and underline that although a COVID cases were confirmed at Hope Bay, transmission to Nunavut communities would not occur. CSR staff communicated these efforts also to Northern stakeholders and media.

- CSR staff undertook steps this month to terminate Nunavut based staff upon the expiry of the temporary lay off period begun in March. Included in this work was informing affected staff, mailing correspondence, informing northern stakeholders of the action taken, and beginning coordination of government supports to unemployed persons.
- CSR staff participated in a Conference Board of Canada Fly-In Fly-Out Employment research study advisory committee that commenced its work this month.

October

- A Hope Bay COVID pandemic narrative was drafted and submitted to Mining North Magazine this month to be added to an article on northern mining experiences during the pandemic.
- CSR Staff continued to facilitate engagement with Nunavut public health officials, northern stakeholders and site staff to share updates and information on the Hope Bay COVID outbreak. Efforts included providing updates to northern media contacts, reviewing plans to demobilize affected crew shift, addressing questions and comments from the internal COVID email address, and addressing site staff home jurisdiction public health stipulations.
- CSR staff participated in an introductory call this month with representatives of Shandong Gold in order to better understand the acquisition process and how CSR at Hope Bay may change under new ownership.
- CSR staff audited the 2020 KIA Annual General Meeting and Dolphin and Union Caribou management meeting held in Cambridge Bay this month and shared relevant meeting materials from these events within the company.
- CSR staff consulted with Kitikmeot Hunters and Trappers groups in drafting a new public notice preventing site visitation and distributed the final product to the public in Cambridge Bay.

November

- CSR staff participated in a KIA Employment and Training Stakeholders group meeting this month to share information on this topic. Based on this meeting, a 2020/21 summary of Kitikmeot training and employment initiatives was written and shared with the Executive and Shandong Gold.
- This month CSR staff made Cambridge Bay office space available for use by an Adult Educator employed by Frontier College, under contract to the Government of Nunavut to deliver pre-trades examination study support for Cambridge Bay residents. The adult educator and students will be working from the TMAC office until February 2021.
- CSR Staff mailed out unemployment support packages to all Nunavut terminated workers as developed by the Government of Nunavut Department of Family Services.
- CSR staff arranged a catch-up call between Shandong Gold and KIA this month. No items of concern were discussed.
- CSR staff began site wildlife remote camera photo interpretation work this month in order to support this compliance monitoring program.
- CSR staff implemented additional public health restrictions at the Cambridge Bay office in compliance with Nunavut public health guidance following the outbreak of COVID-19 in the territory.

December

- CSR staff coordinated a number of seasonal initiatives this month including accepting, sorting and shipping donations of socks to Kitikmeot schools, coordinating Christmas food hamper donations from TMAC and Shandong Gold to Kitikmeot Hamlets, and distribution of Christmas gift cards to Nunavut terminated workers.
- CSR staff confirmed through the Government of Nunavut that the 2020 Kitikmeot Socio-Economic Monitoring Committee meeting (KSMEC) is postponed for the year due to the pandemic. A KSEMC meeting may be planned for Q1 2021 depending on the Nunavut vaccination roll-out.
- CSR staff provided IIBA Schedule F advice procurement staff engaged in the initial stages of 2021 tendering processes to ensure that Kitikmeot Qualified Businesses were included appropriately.
- CSR staff provided assistance in areas of short staffing this month including conducting pre-travel COVID assessment calls for southern workers, and interpretation of remote wildlife camera photos.
- CSR staff provided feedback to the KIA proposed Terms of Reference to review Schedule F of the Hope Bay IIBA this month. The actual process will be completed in 2021.
- CSR staff communicated the rejection by Canada of the Shandong arrangement agreement to northern stakeholders.

# 15. Annual Inspection Activities

Due to the COVID-19 pandemic, regulatory inspections were limited at Hope Bay due to travel restrictions within Nunavut. Inspections were not conducted by CIRNAC, NIRB or KIA in 2020. A virtual site tour was completed as requested by NIRB, with a series of site photos provided to NIRB by TMAC staff. WSCC conducted one site inspection in January 2020 and desktop reviews in August and December 2020. A summary of the reports and follow up from those visits are detailed in Table 15-1.

**Table 15-1. Summary of Annual Inspection Activities**

| Date | Agency | Summary | Follow up | Response |
|---|---|---|---|---|
| January 28-29, 2020 | Worker's Safety and Compensation Commission | Inspection to verify compliance with Mines Health & Safety Regulations. The inspection focused on Doris and Madrid underground mining, mill operations as well as surface infrastructure including the warehouse, powerhouse and shop facilities. The inspector issued 5 orders for action. | Orders issued. | Compliance report was submitted from TMAC within 30 days. |
| August 19-25, 2020 | Worker's Safety and Compensation Commission | Inspector conducted a desktop geotechnical review for Hope Bay Mine. This included an audit of previous WSCC geotechnical inspections along with responses to these inspections and a review of various documents. The inspector issued 1 order for action. | Order issued. | Compliance report was submitted from TMAC within 30 days. |
| September 11, 2020 | Nunavut Impact Review Board | TMAC provided a digital photograph directory to NIRB as a substitute to the in person annual site tour. | No follow up items identified. | |
| October 13-14, 2021 | Worker's Safety and Compensation Commission | Inspector conducted post Covid-19 incident desktop inspection. The desktop inspection included review of various requested documents and witness interviews, along with various teleconferences. The inspector issued 1 order for action. | Order issued. | Compliance report was submitted from TMAC within 30 days. |

# References


SRK Consulting (Canada) Inc. 2009. *Water and Ore/Waste Rock Management Plan for the Boston Site Hope Bay Project, Nunavut*. Report 1CH008.022 for Hope Bay Mining Ltd. July 2009.

SRK Consulting (Canada) Inc. 2017. *Water and Ore/Waste Rock Management Plan for the Boston Site Hope Bay Project, Nunavut*. Report 1CT022.009 for TMAC Resources Inc. January 2017.

SRK Consulting (Canada) Inc., 2019. Classification of Waste Rock in Support of Segregating Construction Rock from Naartok East Crown Pillar Recovery Trench, Madrid North, Hope Bay Project – DRAFT. Prepared for TMAC Resources Inc. SRK Project No. 1CT022.037. June 2020.ERM. 2016. *Doris North Project: 2015 Aquatic Effects Monitoring Program Report.* Prepared for TMAC Resources Inc. by ERM Consultants Canada Ltd.: Yellowknife, NT.

TMAC. 2017. Madrid-Boston Project Final Environmental Impact Statement. TMAC Resources Inc.: Toronto, ON.

TMAC. 2018. Hope Bay Project: Aquatic Effects Monitoring Plan. Prepared by TMAC Resources Inc.: Toronto, ON.

TMAC. 2019. Waste Rock, Ore and Mine Backfill Management Plan, Hope Bay Project, Nunavut. Prepared by TMAC Resources Inc. for the Nunavut Water Board: Toronto, ON.

# Appendix A
Concordance Table

AGNICO EAGLE

| Type A Water Licence 2AM-DOH1335 | |
|---|---|
| **Condition** | **Section** |
| Summary of monitoring reporting performed in accordance with Part I, Item 6. The Summary shall include conversion of daily amounts to monthly and annual amounts. | Section 5, Appendix D |
| A Geochemical Monitoring and Waste Rock Storage Assessment that includes following:<br><br>a. For the tailings solids:<br>i. All geochemical data appended;<br>ii. All tonnage data appended and locations of disposal;<br>iii. Discussion of geochemical data (static and kinetic, if applicable) with relevant figures and calculation of NNP and NPR; and<br>iv. Geochemical interpretation of data.<br><br>b. For waste rock:<br>i. Tonnage of mineralized and un-mineralized Waste Rock placed on Temporary Waste Rock Pad and in other locations as approved by the Boain writing;<br>ii. Tonnage of Waste rock placed underground; and<br>iii. Geochemical and inspection data . Note: Detox Tailings are characterized by TL-7 (dry detoxified tailings sent underground as backfill (solids)) and proposed TL-8 (filtrate from TL-7 (solution)). | Section 8, Appendix F |
| Include the report referenced in Part D, Item 18, that presents the data collected from the Quarry Rock Seepage Monitoring and Management Program. The report shall include a discussion of the interpretation of geochemical data and shall be presented to the Board for review. | Section 9, Appendix F |
| A summary of the results of the monthly TIA Water balance and Water quality model assessments referred to in Part E, Item 24 and any re-calibrations that have been carried out. The report shall include:<br>a. Relevant supporting data;<br>b. a comparison of measured Water balance and Water quality values to predicted values;<br>c. Monitoring and internal modelling results;<br>d. a discussion of any discrepancies in model inputs; and<br>e. Identification of any necessary adaptive management strategies. | Appenidx E |
| An update on the current capacity of the Tailings Management Area. | Section 5.1.2 |
| A record of measurements of the following:<br>a. The flows ($m^3$/day) at monitoring station TL-2; and<br>b. A record of measurements of Doris Lake Water Level. | Appendix D.1 |
| Annual review of and submission of any revisions to the Management Plans or Emergency Response or Contingency Plan in the form of either addenda or revised Plan. | Section 12 |
| A list and description of all reportable unauthorized discharges including volumes, spill report line identification number and summaries of follow-up action taken. | Section 11 |
| The results of the Aquatic Effects Monitoring Program and in accordance with Part I, Item 3. | Section 7<br>Also see 2020 AEMP Report Submission |

| Type A Water Licence 2AM-DOH1335 | |
|---|---|
| **Condition** | **Section** |
| A summary of any closure and reclamation work undertaken and an outline of any work anticipated for next year, including changes to implementation and scheduling. | Section 13 |
| Incineration stack testing results when stack testing is required. | Section 6.1.1 |
| Annual Landfill Management Report. | Section 6.4 |
| A summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and an outline of any work anticipated for the next year. | Section 3 and Section 4 |
| A summary report describing consultation and participation with local organizations and residents of nearby communities, including a schedule of upcoming events/information sessions. | Section 14 |
| GPS locations of monitoring stations as confirmed with the Inspector under Part I, Item 3. | Appendix B |
| A summary of the data requested under Part I Item 5 and 6. | Section 5, 8 and 9<br>Appendix D and G |
| A summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector any other details on water use and waste disposal requested by the board. | Section 15 |
| Any other details on Water use or Waste Disposal requested by the Board by November 1 of the year being reported. | N/A |

AGNICO EAGLE

| Type A Water Licence 2AM-BOS1835 | |
|---|---|
| **Condition** | **Section** |
| Summary of monitoring reporting performed in accordance with Part I, Item 11. The Summary shall include conversion of daily amounts to monthly and annual amounts. | Section 5, Appendix D |
| Information with respect to Geochemical Monitoring and Waste Rock Storage Assessment<br>a. For the tailings solids.<br><br>b. geochemical data appended:<br>i. All tonnage data appended and locations of disposal;<br>ii. Discussion of geochemical data (static and kinetic, if applicable) with relevant figures and calculation of NNP and NPR; and<br>iii. Geochemical interpretation of data.<br><br>c. For waste rock:<br>i. Tonnage of mineralized and un-mineralized Waste Rock placed on the Temporary Waste Rock Pad and in other locations as approved by the Board in writing; and<br>ii. Tonnage of Waste rock placed underground. | Section 8, Appendix F |
| Include the report referenced in Part D, Item 17, that presents the data collected from the Quarry Rock Seepage Monitoring and Management Program. The report shall include a discussion of the interpretation of geochemical data and shall be presented to the Board for review. | Section 9, Appendix F |
| An update on the current capacity of the Tailings Management Area. | Section 5.1.2 |
| Annual review of and submission of any revisions to the Management Plans or Emergency Response or Contingency Plan in the form of either addenda or revised Plan. | Section 12 |
| A list and description of all reportable unauthorized discharges including volumes, spill report line identification number and summaries of follow-up action taken. | Section 11 |
| The results of the Aquatic Effects Monitoring Program approved by the Board under Part B, Item 13. | Section 7<br>Also see 2020 AEMP Report Submission |
| Annual Adjustments to reclamation security estimates including any additional security that may be required or reductions in security requirements for progressive reclamation actions. | Section 13 |
| A summary of any closure and reclamation work undertaken and an outline of any work anticipated for next year, including changes to implementation and scheduling. | Section 13 |
| Incineration stack testing results when stack testing is required. | Section 6.1 and Appendix I |
| Annual Landfill Management Report. | Section 6.4 |
| A summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and an outline of any work anticipated for the next year. | Section 3 and Section 4 |
| A summary report describing consultation and participation with local organizations and residents of nearby communities, including a schedule of upcoming events/information sessions. | Section 14 |

| Type A Water Licence 2AM-BOS1835 | |
|---|---|
| **Condition** | **Section** |
| GPS locations of monitoring stations as confirmed with the Inspector under Part I, Item 3. | Appendix B |
| A summary of the data requested under Part I Item 5 and 6. | Section 5, 8 and 9<br>Appendix D and G |
| A summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector any other details on water use and waste disposal requested by the board. | Section 15 |
| Any other details on Water use or Waste Disposal requested by the Board by November 1st of the year being reported. | N/A |

| Type A Water Licence 2BE-HOP1222 | |
|---|---|
| **Condition** | **Section** |
| A summary report of water use and waste disposal activities. | Section 5.2, Section 6, Appendix D.2 |
| A summary of all information requested and results of the Monitoring Program. | Section 5.2, Appendix D.2 |
| A list of unauthorized discharges and a summary of follow-up actions taken. | Section 11 |
| A brief description of follow-up actions taken to address concerns detailed in inspection and compliance reports prepared by the Inspector. | Section 15 |
| An update to the Spill Contingency Plan, if required, including contact information in the form of an addendum. | Section 10, Section 12 |
| A description of all progressive and/or final reclamation work undertaken, including photographic records of site conditions before, during and after completion of operations. | Section 13 |
| A summary of modification and/or major maintenance work carried out on the water supply and waste disposal facilities, including all associated structures, and an outline of any work anticipated for the next year. | Section 3, Section 4 |
| A summary of any specific studies or reports requested by the board, and a brief description of future studies planned or proposed. | Section 4 |
| Any other details on water use or waste disposal requested by the board. | Section 5.2 |

| Type A Water Licence 2BB-MAE1727 | |
|---|---|
| **Condition** | **Section** |
| The monthly and annual quantities in cubic metres of all freshwater obtained at Monitoring Stations No. MAE-01, No. MAE-02 and MAE-03, including all sources of water identified for domestic and industrial use under Part D, Item 1. | Section 5.3, Appendix D.3 |
| The daily, monthly and annual quantities, in cubic metres, of mine water pumped from the underground mine. | Section 5.3, Appendix D.3 |
| The monthly and annual quantities in cubic metres of Effluent discharged from the Pollution Control Ponds onto the tundra and/or transported to Doris to be discharged into the TIA, including the analysis result. | Section 5.3, Appendix D.3 |
| The monthly and annual quantities in cubic metres of Sewage Effluent transported to the Doris North site. | Section 5.3, Appendix D.3 |
| Report all artesian flow occurrences as identified under Part F, Item 9. | Section 5.3 |
| An estimate of the volume of waste rock and ore currently stockpiled at site, to date. | No waste rock and ore to date. |
| Tabular summaries of all data generated under the Monitoring Program, Part J. | Section 5.3, Appendix D.3 |
| A summary of modifications and/or major maintenance work carried out on the Water Supply Facilities, Bulk Fuel Storage Facility, Pollution Control Ponds and any wastewater related facility including all associated structures, and an outline of any work anticipated for the next year. | Section 3, Section 4 |
| A list of unauthorized discharges and follow-up action taken. | Section 11 |
| Updates or revisions to the Water Management Plan, Abandonment and Restoration Plan, QA/QC, Waste Rock and Ore Storage Plan, and Spill Contingency Plan and/or any other management plan. | Section 12 |
| An updated estimate of the current Madrid Advanced Exploration Project restoration and liability, as required under Part C, Item 5, based upon the results of the restoration research, project development monitoring, and any modifications to the site plan. | Section 13 |
| A brief description of follow-up action taken to address concerns detailed in inspection and compliance reports prepared by the Inspector. | Section 15 |
| A summary of drilling activities and reclamation of drilling sites. | Section 3.2, Section 13 |
| A public consultation/participation report describing consultation with local organizations and residents of the nearby communities, conducted during the Report period. | Section 14 |
| A summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year. | Section 13 |
| A summary of any specific studies or reports requested by the Board, and a brief description of any future studies planned or proposed; and any other details on the use of Water or the deposit of Waste requested by the board Board by November 1 of year being reported. | Section 5.3 |

AGNICO EAGLE

| Type A Water Licence 2BB-BOS1727 | |
|---|---|
| **Condition** | **Section** |
| The monthly and annual quantities in cubic metres of all freshwater obtained from Aimaokatalok (Spyder) Lake, Monitoring Stations No. BOS-1a and from Stickleback Lake, Monitoring Station No. BOS-1b and additional sources of water identified for domestic and other uses under Part C, Item 1. | Section 5.4, Appendix D.4 |
| The monthly and annual quantities in cubic metres of Mine water pumped from the underground. | Section 5.4, Appendix D.4 |
| The monthly and annual quantities in cubic metres of Effluent discharged at Monitoring Station Number BOS-2, BOS-2, BOS-4 and BOS-5, BOS-6 and BOS-7. | Section 5.4, Appendix D.4 |
| The monthly and annual quantities in cubic metres of non-compliant effluent transported to Doris North's Tailings Impoundment Area. | Section 5.4, Appendix D.4 |
| The monthly and annual quantities in cubic metres of Sludge removed from the Sewage Treatment Facility. | Appendix D.4 |
| The annual quantities in cubic metres of all soil and types of contaminants from all locations that are placed within the Landfarm facility and/or transported to Doris North Project. | Section 6.2 |
| Report all artesian flow occurrences as identified under Part F, Item 3. | Section 5.4 |
| Boston Ephemeral Stream Monitoring Report. | Section 9.2, Appendix G |
| Tabular summaries of all data generated under the Monitoring Program. | Appendix D.4 |
| A summary of modification and/or major maintenance work carried out on the Water Supply and the Waste Disposal Facilities, including all associated structures, and an outline of any work anticipated for the next year. | Section 3, Section 4 |
| A list of unauthorized discharges and follow-up action taken. | Section 11 |
| Updates or revisions to the Closure Plan, QA/QC, Water and Ore/Waste Rock Management Plan, Spill Contingency Plan, and Landfarm Plan and/or any other plans. | Section 12 |
| A brief description of follow-up action taken to address concerns detailed in inspection and compliance reports prepared by the Inspector. | Section 15 |
| A summary of drilling activities and progressive reclamation of drill sites. | Section 13.1 |
| An estimate of the current volume of waste rock and ore stockpiled on site. | Section 8.2 |
| A public consultation/participation report describing consultation with local organizations and residents of the nearby communities, if any were conducted. | Section 14 |
| A summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year. | Section 13 |
| A summary of any specific studies or reports requested by the Board, and a brief description of any future studies planned or proposed. | Section 5.4 |
| Any other details on Water use or Waste disposal requested by the Board by November 1st of the year being reported. | Section 5.4 |

# Appendix B
NWB Forms

AGNICO EAGLE

**NWB Annual Report** **Year being reported:** 2020

**License No:** 2AM-DOH1335 **Issued Date:** August 16, 2013
**Expiry Date:** March 30, 2035

**Project Name:** Doris-Madrid Project

**Licensee:** TMAC Resources Inc.

**Mailing Address:**
145 King St E
Toronto, ON M5C 2Y7

**Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):**

Licence 2AM-DOH0713 was assigned from Hope Bay Mining Ltd. to TMAC Resources Inc. on June 18, 2013. This licence was renewed on Aug. 16, 2013 and renamed 2AM-DOH1323. This license was subsequently amended in November, 2016. The licence was amended a second time in December, 2018 and renamed 2AM-DOH1335.

**General Background Information on the Project (*optional):**

Licence 2AM-DOH1335 allows TMAC to carry out out activities in support of mining and milling operations at Doris and Madrid.

**Licence Requirements: the licensee must provide the following information in accordance with**

| Part B | Item 2 |
|---|---|

**A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.**

Water Source(s): Doris Lake/Windy Lake/lakes proximal to drilling targets/ice road

Water Quantity:

| | |
|---|---|
| 43000 cu.m/yr* | Quantity Allowable Domestic (cu.m) |
| 11528 cu. m/yr | Actual Quantity Used Domestic (cu.m) |
| 2033800 cu.m/yr | Quantity Allowable Domestic, Mining, Milling, Drilling, etc. (cu.m) |
| 14543 cu. m/yr | Total Quantity Used Domestic, Mining, Milling, Drilling, etc. (cu.m) |

**Part E, Item 1 total volume from "all sources and for all purposes"*

Waste Management and/or Disposal

- [x] Solid Waste Disposal
- [x] Sewage
- [x] Drill Waste
- [x] Greywater
- [x] Hazardous

- [x] Other: Containment Berm and Control Pond Effluent

Additional Details:

Water for domestic use at Doris Camp was obtained from Windy Lake. Water is drawn from the lake at the freshwater intake and trucked to Doris Camp. The Doris Lake pump house is not supplying domestic water to Doris Camp at this time.

Waste produced on site is treated according to Part F of the licence, and in accordance with the relevant Management Plans *(Incinerator Management Plan, Non-Hazardous Waste Management Plan, Hazardous Waste Management Plan, Waste Rock, Ore and Mine Backfill Management Plan, Hydrocarbon Contaminated Material Management Plan, Domestic Waste Water Treatment Management Plan, and Doris-Madrid Water Management Plan*).

Some specifics are as follows:

-Food waste is incinerated as per Part F Item 6.
-Paper products, paperboard packing, and untreated wood waste is open burned as per Part F Item 7.
-TMAC is authorized to dispose of all non-hazardous solid waste in a landfill on site as per Part F Item 9. To date, a landfill has not been built. All waste that cannot be incinerated on site is backhauled to an approved facility off site or will be held for deposit in a landfill once constructed.
-Sewage and greywater produced onsite is processed in the sewage treatment plant as per Part F Item 5. Sludge produced by the treatment plant is disposed in the TIA as outlined in the Domestic Waste Water Treatment Management Plan.
-Hazardous materials such as waste oil, glycol, and contaminated soil are shipped offsite for disposal at an approved site as per Part F Item 10.
-All containment berm water is sampled for water quality against the discharge criteria of the licence. Water that meets the standards for discharge is released in accordance with the licence following a notification to the Inspector; water that does not meet the licence criteria is treated onsite until it is remediated to acceptable levels for discharge to the tundra, and/or it is discharged to the TIA.
-Runoff and contact seepage at site is managed in accordance with the Quarry Management and Monitoring Plan and Doris-Madrid Water Management Plan.

**A list of unauthorized discharges and a summary of follow-up actions taken.**

Spill No.: (as reported to the Spill Hot-line)
Date of Spill:
Date of Notification to an Inspector:
Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc.)

Please see Section 11. of the attached Annual Report Supplement for a summary of all unauthorized discharges that occurred in 2020 under license 2AM-DOH1335.

**Revisions to the Spill Contingency Plan**

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

## Revisions to the Abandonment and Restoration Plan

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

## Progressive Reclamation Work Undertaken

Additional Details (i.e., work completed and future works proposed)

Please see Section 13. of the attached Annual Report Supplement for details.

## Results of the Monitoring Program including:

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;**

Additional Details:

N/A

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;**

Additional Details:

N/A

**Results of any additional sampling and/or analysis that was requested by an Inspector**

Additional Details: (date of request, analysis of results, data attached, etc.)

N/A

## Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.

Additional Details: (Attached or provided below)

N/A

**Any responses or follow-up actions on inspection/compliance reports**

Additional Details: (Dates of Report, Follow-up by the Licensee)

Due to the COVID-19 pandemic, no inspections were conducted by CIRNAC Inspectors in 2020.

**Any additional comments or information for the Board to consider**

Please see attached Annual Report Supplement for additional information requirements set out in Licence No. 2AM-DOH1335.

| | | |
|---|---|---|
| **Date Submitted:** | March 31 2021 | |
| **Submitted/Prepared by:** | Oliver Curran | |
| **Contact Information:** | **Tel:** | 416-577-5829 |
| | **Fax:** | |
| | **email:** | oliver.curran@agnicoeagle.com |

## GPS Coordinates for water sources utilized

| Source Description | UTM Easting | UTM Northing |
|---|---|---|
| ST-7 Doris Freshwater Intake | 433525 | 7558727 |
| ST-7a/MMS-4b Windy Freshwater Intake | 432626 | 7550477 |
| | | |

## GPS Locations of areas of waste disposal

| Location Description | UTM Easting | UTM Northing |
|---|---|---|
| TL-5 | 435539 | 7556285 |
| TL-6 | 435539 | 7556285 |
| TL-7a | 435539 | 7556285 |
| TL-7b | 435539 | 7556285 |
| TL-9 | 435539 | 7556285 |
| ST-4 | 432450 | 7559600 |
| ST-5 | 432960 | 7559270 |
| ST-6A | 432954 | 7563407 |
| ST-6B | 432878 | 7563130 |
| ST-8 STP Discharge | 432413 | 7559596 |
| ST-9 STP Tundra Discharge | 430898 | 7559328 |

## GPS Locations of Active Monitoring Stations not included above*

| Monitoring Station | UTM Easting | UTM Northing |
|---|---|---|
| TL-1 | 434712 | 7558948 |
| TL-2 | 434059 | 7559504 |
| TL-11 | various locations as required | |
| TL-12 | 435539 | 7556285 |
| ST-1 | 433093 | 7558914 |
| ST-2 | 433217 | 7558935 |
| ST-10 | various locations as required | |
| ST-11 | 434573 | 7559182 |
| ST-12 | various locations as required | |
| MMS-1 | 433175 | 7549837 |
| MMS-9 | various locations as required | |

** Thermal monitoring locations are documented in the Annual Geotechnical Report*

**NWB Annual Report** **Year being reported:** 2020

**License No:** 2BE-HOP1222 **Issued Date:** June 30, 2012
**Expiry Date:** June 30, 2022

**Project Name:** Hope Bay Regional Exploration Project

**Licensee:** TMAC Resources Inc.

**Mailing Address:**
145 King St E
Toronto, ON M5C 2Y7

**Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):**

Licence 2BE-HOP1222 was issued June 30, 2012 to Hope Bay Mining Ltd. Effective June 18, 2013, the NWB authorized the assignment of Licence 2BE-HOP1222 from Hope Bay Mining Ltd. to TMAC Resources Inc.

**General Background Information on the Project (*optional):**

Licence 2BE-HOP1222 allows TMAC to carry out activities in support of exploration drilling at the Hope Bay Regional Exploration Project and the Windy Camp, which supports exploration activities.

**Licence Requirements: the licensee must provide the following information in accordance with**

**Part B Item 2**

**A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.**

Water Source(s): Domestic and dust suppression water sourced from Windy Lake. Water to supply drilling activities taken from source proximal to drilling target.

| Water Quantity: | |
|---|---|
| 22995 cu.m | Quantity Allowable Domestic (cu.m) |
| 11528 cu.m | Actual Quantity Used Domestic (cu.m) |
| 29200 cu.m | Quantity Allowable Drilling (cu.m) |
| 683 cu. m. | Total Quantity Used Drilling (cu.m) |
| 30600 cu.m | Quantity Allowable Dust Suppression (cu.m) |
| 0 cu.m | Total Quantity Used Dust Suppression (cu.m) |

Waste Management and/or Disposal

- [x] Solid Waste Disposal
- [ ] Sewage
- [x] Drill Waste
- [ ] Greywater
- [ ] Hazardous
- [ ] Other:

Additional Details:

Occupancy of the Old Windy Camp ended October 23, 2008 and dismantling and reclamation of the area is on-going. Surface exploration drilling conducted in the licence area is supported from Doris Camp.

Water was used from Windy Lake to supply domestic water to Doris Camp in accordance with 2BE-HOP1222 Part C, Item 1. Water used for drilling is taken from the closest lake to each drill using a similar system to the domestic system, or for drill locations accessible by road or winter ice road, water is hauled by truck from Windy Lake, or compliant berm effluent from the Doris Project is recycled through the drills to lessen freshwater lake use. In the case of regional drilling, water is taken from the closest lake to the drill site in accordance with Part C Item 1. Drill cuttings produced under this licence are deposited in a sump constructed for this purpose, an appropriate natural depression located at least 31m from the high water mark of any adjacent water body, or disposed of in the Tailings Imoundmnet Area at the Doris Project. A regional exploration drill program occurred in the license area in 2020.

The Landfarm at Windy Camp and Bulk Fuel Storage Facilities at Windy Camp and Patch Lake have been dismantled and are in the process of reclamation. No effluent is produced at these locations.

Water accumulated in Quarries A, B and D is managed in accordance with the approved *Quarry A, B, D Management and Monitoring Plan* and the relevant sections of Part D of the licence. No discharges of water occurred form these sites in 2020.

**A list of unauthorized discharges and a summary of follow-up actions taken.**

Spill No.: (as reported to the Spill Hot-line)

Date of Spill:

Date of Notification to an Inspector:

Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc)

No unauthorized discharges occurred in 2020 under licence 2BE-HOP1222.

**Revisions to the Spill Contingency Plan**

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

**Revisions to the Abandonment and Restoration Plan**

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

**Progressive Reclamation Work Undertaken**

Additional Details (i.e., work completed and future works proposed)

Please see Section 13. of the attached Annual Report Supplement for details.

**Results of the Monitoring Program including:**

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;**

Additional Details:

Details attached.

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;**

Additional Details:

N/A

**Results of any additional sampling and/or analysis that was requested by an Inspector**

Additional Details: (date of request, analysis of results, data attached, etc)

No additional sampling requested.

**Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.**

Additional Details: (Attached or provided below)

No additional sampling requested.

**Any responses or follow-up actions on inspection/compliance reports**

Additional Details: (Dates of Report, Follow-up by the Licensee)

Due to the COVID-19 pandemic, no inspections were conducted by CIRNAC Inspectors in 2020.

**Any additional comments or information for the Board to consider**

Please see attached Annual Report Supplement for additional information requirements set out in Licence No. 2BE-HOP1222.

| | | |
|---|---|---|
| **Date Submitted:** | March 31 2021 | |
| **Submitted/Prepared by:** | Oliver Curran | |
| **Contact Information:** | **Tel:** | 416-577-5829 |
| | **Fax:** | |
| | **email:** | oliver.curran@agnicoeagle.com |

## GPS Coordinates for water sources utilized

| Source Description | Latitude | Longitude |
|---|---|---|
| HOP-1 - Raw water supply intake at Windy Lake | 432626 | 7550477 |

## GPS Locations of areas of waste disposal

| Source Description | Latitude | Longitude |
|---|---|---|

**NWB Annual Report** **Year being reported:** 2020

**License No:** 2BB-MAE1727 **Issued Date:** May 23, 2017
**Expiry Date:** May 22, 2027

**Project Name:** Madrid Advanced Exploration Program

**Licensee:** TMAC Resources Inc.

**Mailing Address:**
145 King St E
Toronto, ON M5C 2Y7

**Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):**

Licence 2BB-MAE1727 was assigned to TMAC Resources Inc. on May 23, 2017.

**General Background Information on the Project (*optional):**

No activities occurred under license 2BB-MAE1727 in 2020.

**Licence Requirements: the licensee must provide the following information in accordance with**

**A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.**

Water Source(s): Patch Lake/Windy Lake

| Water Quantity: | |
|---|---|
| 108000 cu.m/yr* | Quantity Allowable Domestic (cu.m) |
| 0 cu. m/yr | Actual Quantity Used Domestic (cu.m) |
| not specified | Quantity Allowable Drilling (cu.m) |
| 0 cu. m/yr | Total Quantity Used Drilling (cu.m) |

**Part E, Item 1 total volume from "all sources and for all purposes"*

Waste Management and/or Disposal

- ☐ Solid Waste Disposal
- ☐ Sewage
- ☐ Drill Waste
- ☐ Greywater
- ☐ Hazardous
- ☐ Other:

Additional Details:

No water was used or waste disposal under this licence in 2020.

**A list of unauthorized discharges and a summary of follow-up actions taken.**

Spill No.: N/A (as reported to the Spill Hot-line)
Date of Spill: N/A
Date of Notification to an Inspector: N/A
Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc.)

No spills occurred in this license area during 2020.

**Revisions to the Spill Contingency Plan**

Additional Details:

See Section 12. of attached Annual Report Supplement for details.

**Revisions to the Abandonment and Restoration Plan**

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

**Progressive Reclamation Work Undertaken**

Additional Details (i.e., work completed and future works proposed)

Please see Section 13. of the attached Annual Report Supplement for details.

**Results of the Monitoring Program including:**

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;**

Additional Details:

N/A

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;**

Additional Details:

N/A

**Results of any additional sampling and/or analysis that was requested by an Inspector**

Additional Details: (date of request, analysis of results, data attached, etc.)

N/A

**Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.**

Additional Details: (Attached or provided below)

N/A

**Any responses or follow-up actions on inspection/compliance reports**

Additional Details: (Dates of Report, Follow-up by the Licensee)

Due to the COVID-19 pandemic, no inspections were conducted by CIRNAC Inspectors in 2020.

**Any additional comments or information for the Board to consider**

Please see attached Annual Report Supplement for additional information requirements set out in Licence No. 2BB-MAE1727.

| | | |
|---|---|---|
| **Date Submitted:** | March 31 2021 | |
| **Submitted/Prepared by:** | Oliver Curran | |
| **Contact Information:** | **Tel:** | 416-577-5829 |
| | **Fax:** | |
| | **email:** | oliver.curran@agnicoeagle.com |

## GPS Coordinates for water sources utilized

| Source Description | UTM Easting | UTM Northing |
|---|---|---|
| MAE-01 Windy Freshwater Intake | 432626 | 7550477 |

## GPS Locations of areas of waste disposal

| Location Description | UTM Easting | UTM Northing |
|---|---|---|

## GPS Locations of Active Monitoring Stations not included above*

| Monitoring Station | UTM Easting | UTM Northing |
|---|---|---|
| MAE-14 | 7550317 | 432644 |
| MAE-15 | 7550458 | 433578 |
| MAE-16 | 7547060 | 434748 |

**NWB Annual Report** **Year being reported:** 2021

**License No:** 2BB-BOS1727 **Issued Date:** August 1, 2017
**Expiry Date:** July 31, 2027

**Project Name:** Boston Advanced Exploration Project

**Licensee:** TMAC Resources Inc.

**Mailing Address:**
145 King St E
Toronto, ON M5C 2Y7

**Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):**

Licence 2BB-BOS1217 was issued Aug 2, 2012 to Hope Bay Mining Ltd. Effective June 18, 2013, the NWB authorized the assignment of Licence 2BB-BOS1217 from Hope Bay Mining Ltd. to TMAC Resources Inc. The license was renewed on August 1, 2017 and renamed 2BB-BOS1727.

**General Background Information on the Project (*optional):**

The Boston site supports advanced mineral exploration in the south end of the Hope Bay Project. Boston Camp was was closed in December 2019 and remained closed throughout 2020. Routine sampling, inspections and dewatering of water management facilities occurred during the open water season in 2020.

**Licence Requirements: the licensee must provide the following information in accordance with**

| Part B | Item 9 |
|---|---|

**A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.**

Water Source(s): Aimaokatalok (Spyder) Lake for domestic use and drilling purposes. The total quantity of water allowable by the licence is 36,500 $m^3$/yr or 100 $m^3$/day. There is no differentiation between quantities to be used domestically or for drilling.

Water Quantity:

| | |
|---|---|
| not specified | Quantity Allowable Domestic (cu.m) |
| 0 cu.m | Actual Quantity Used Domestic (cu.m) |
| not specified | Quantity Allowable Drilling (cu.m) |
| 0 cu.m | Total Quantity Used Drilling (cu.m) |

Waste Management and/or Disposal

- [x] Solid Waste Disposal
- [x] Sewage
- [ ] Drill Waste
- [x] Greywater
- [ ] Hazardous
- [x] Other: Fuel Farm Berm, Containment Pond and Mine Portal discharges

Additional Details:

Boston Camp was was closed in December 2019 and remained closed throughout 2020.

Water for domestic use at Boston Camp is obtained from Aimaokatalok Lake via a 2 inch diameter submerged pipe with a DFO compliant fish screen. This intake pipe is linked to a pump house located approximately 30 metres from shore. In winter, the pump house is moved onto the ice to decrease the length of heat-traced line required to reach the location where the water is open under the ice. No water was used in 2020.
Sewage and greywater produced on site is processed in the sewage treatment plant as per Part D Item 11. Effluent from the Sewage Treatment Plant is sampled for effluent quality against the dischrage criteria of the licence. Effluent that meets the standards for discharge is released in accordance with the licence following a notification to the Inspector. Sludge is transported to Doris camp via winter track for disposal. No effluent was discharged from the Sewage Treatment Plant and no sludge was generated at Boston Camp in 2020.
Waste produced on site is treated according to Part D of the licence, and in accordance with the relevant Management Plans *(Incineration Management Plan, Non-Hazardous Waste Management Plan, and Hazardous Waste Management Plan*). Some specifics are as follows:
-Food waste, paper waste and untreated wood waste is burned in the incinerator as per Part D Item 3.
-Solid waste that cannot be burned is transferred to the Roberts Bay waste management facility for packaging and is taken offsite for disposal.
-Drill cuttings produced under this licence are disposed of in depressions as per Part F Item 2.
-Waste hazardous materials such as waste oil, glycol, and contaminated soil are shipped to Doris either to be reclaimed or shipped offsite for disposal in an approved facility as per Part D Item 6.
-Fuel berm effluent and Containment Berm effluent is sampled for water quality against the discharge criteria of the licence. Effluent that meets the standards for discharge is released in accordance with the licence following a notification to the Inspector. Effluent that does not meet the licence criteria is treated onsite with an oil-water separator system containing activated carbon and Metsorb media until it is remediated to acceptable levels for discharge.
-The landfarm facility was decommissioned in 2019. Hydrocarbon contaminated material generated by activities under this licence will be transported to Doris for treatment/disposal.
- Effluent from the mine portal/decline is sampled in accordance with the criteria specified for Monitoring Station BOS-9.

**A list of unauthorized discharges and a summary of follow-up actions taken.**

Spill No.: (as reported to the Spill Hot-line)
Date of Spill:
Date of Notification to an Inspector:
Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc)

No spills occurred in this license area during 2020.

## Revisions to the Spill Contingency Plan

Additional Details:

See section 12. of attached Annual Report Supplement for details.

## Revisions to the Abandonment and Restoration Plan

Additional Details:

Please see section 12. of the attached Annual Report Supplement for details.

## Progressive Reclamation Work Undertaken

Additional Details (i.e., work completed and future works proposed)

Please see section 13. of the attached Annual Report Supplement for details.

## Results of the Monitoring Program including:

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;**

Additional Details:

Details attached.

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;**

Additional Details:

Details attached.

**Results of any additional sampling and/or analysis that was requested by an Inspector**

Additional Details: (date of request, analysis of results, data attached, etc)

No additional sampling or analysis was requested.

**Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.**

Additional Details: (Attached or provided below)

No additional sampling or analysis was requested.

**Any responses or follow-up actions on inspection/compliance reports**

Additional Details: (Dates of Report, Follow-up by the Licensee)

Due to the COVID-19 pandemic, no inspections were conducted by CIRNAC Inspectors in 2020.

**Any additional comments or information for the Board to consider**

Please see attached Annual Report Supplement for additional information requirements set out in Licence No. 2BB-BOS1727.

| | | |
|---|---|---|
| **Date Submitted:** | March 31 2021 | |
| **Submitted/Prepared by:** | Oliver Curran | |
| **Contact Information:** | **Tel:** | 416-577-5829 |
| | **Fax:** | |
| | **email:** | oliver.curran@agnicoeagle.com |

## GPS Coordinates for water sources utilized

| Source Description | UTM Easting | UTM Northing |
|---|---|---|
| BOS-1a - Raw water supply intake at Spyder Lake | 440855 | 7505584 |

## GPS Locations of areas of waste disposal

| Location Description (type) | UTM Easting | UTM Northing |
|---|---|---|
| BOS-2 - Containment Pond Discharge | 441332 | 7505378 |
| BOS-3 - Sewage Disposal Facility Final Discharge | 441191 | 7505560 |
| BOS-4 - Treated sewage effluent point prior to entry into Aimaokatuk (Spyder) Lake | 441211 | 7505776 |
| BOS-5 - Effluent from the bulk fuel storage facility prior to release | 441321 | 7505322 |
| BOS-6 - Effluent from the landfarm treatment facility prior to release | 441274 | 7505317 |
| BOS-8 - Seepage/runoff from the ore stockpiles and camp pad, monitored on the tundra east of the ore stockpiles | 441272 | 7505473 |
| BOS-9 - Effluent from the portal decline | 441219 | 7505378 |

**NWB Annual Report** **Year being reported:** 2020

**License No:** 2AM-BOS1835 **Issued Date:** December 7, 2018
**Expiry Date:** March 30, 2035

**Project Name:** Boston Project

**Licensee:** TMAC Resources Inc.

**Mailing Address:** 145 King St E
Toronto, ON M5C 2Y7

**Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):**

Licence 2AM-BOS1835 was issued Dec 7, 2018 to TMAC Resources Inc.

**General Background Information on the Project (*optional):**

No construction, operations or other activities occurred under licence 2AM-BOS1835 in 2020.

**Licence Requirements: the licensee must provide the following information in accordance with**

| Part B | Item 2 |
|---|---|

**A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.**

Water Source(s): Aimoakatalok Lake/lakes proximal to drilling targets/ice road

Water Quantity:

| | |
|---|---|
| 33000 cu.m/yr* | Quantity Allowable Domestic (cu.m) |
| 0 cu. m/yr | Actual Quantity Used Domestic (cu.m) |
| 503000 cu.m/yr | Quantity Allowable Domestic, Mining, Milling, Drilling, etc. (cu.m) |
| 0 cu. m/yr | Total Quantity Used Domestic, Mining, Milling, Drilling, etc. (cu.m) |

**Part E, Item 1 total volume from "all sources and for all purposes"*

Waste Management and/or Disposal

- ☐ Solid Waste Disposal
- ☐ Sewage
- ☐ Drill Waste
- ☐ Greywater
- ☐ Hazardous

☐ Other:

Additional Details:

No water was used or waste disposal under this licence in 2020. Facilities listed under this licence have not yet been constructed.

**A list of unauthorized discharges and a summary of follow-up actions taken.**

Spill No.: (as reported to the Spill Hot-line)

Date of Spill:

Date of Notification to an Inspector:

Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc.)

No spills occurred in this license area during 2020.

## Revisions to the Spill Contingency Plan

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

## Revisions to the Abandonment and Restoration Plan

Additional Details:

Please see Section 12. of the attached Annual Report Supplement for details.

## Progressive Reclamation Work Undertaken

Additional Details (i.e., work completed and future works proposed)

Please see Section 13. of the attached Annual Report Supplement for details.

## Results of the Monitoring Program including:

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;**

Additional Details:

Facilities under this licence have not yet been constructed. No water used in 2020.

**The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;**

Additional Details:

Facilities under this licence have not yet been constructed. No waste disposal in 2020.

**Results of any additional sampling and/or analysis that was requested by an Inspector**

Additional Details: (date of request, analysis of results, data attached, etc.)

N/A

**Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.**

Additional Details: (Attached or provided below)

N/A

**Any responses or follow-up actions on inspection/compliance reports**

Additional Details: (Dates of Report, Follow-up by the Licensee)

Due to the COVID-19 pandemic, no inspections were conducted by CIRNAC Inspectors in 2020.

**Any additional comments or information for the Board to consider**

Please see attached Annual Report Supplement for additional information requirements set out in Licence No. 2AM-BOS1835.

| | | |
|---|---|---|
| **Date Submitted:** | March 31 2021 | |
| **Submitted/Prepared by:** | Oliver Curran | |
| **Contact Information:** | **Tel:** | 416-577-5829 |
| | **Fax:** | |
| | **email:** | oliver.curran@agnicoeagle.com |

## GPS Coordinates for water sources utilized

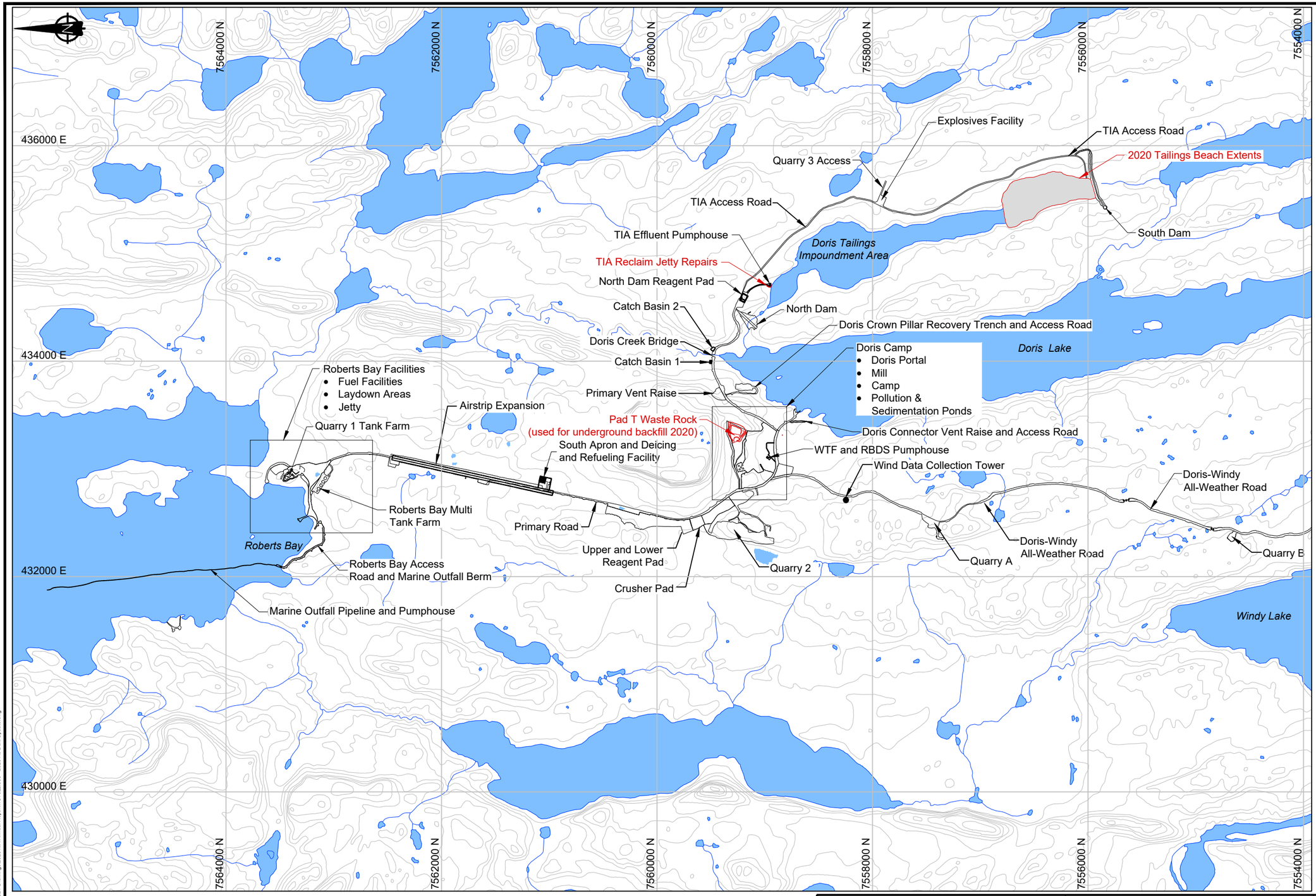
| Source Description | UTM Easting | UTM Northing |
|---|---|---|
| | | |

## GPS Locations of areas of waste disposal

| Location Description (type) | UTM Easting | UTM Northing |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# Appendix C
Site Layouts

AGNICO EAGLE




## LEGEND

- Existing As-Built Infrastructure
- 2020 As-Built Infrastructure

## NOTES

1. Coordinate system is UTM Zone 13, NAD83.
2. 2020 as-built information shown based on information provided by site / TMAC.

0m 350 700 1050 1400

srk consulting

TMAC RESOURCES

HOPE BAY PROJECT

| | |
|---|---|
| SRK JOB NO.: | 1CT022.055 |
| FILE NAME: | 1CT022.055 - 2020 As-Built Update.dwg |

2020 KIA Annual Report

# Doris Area 2020 As-Built Summary

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| January 27, 2021 | JBK / PL | 1 |

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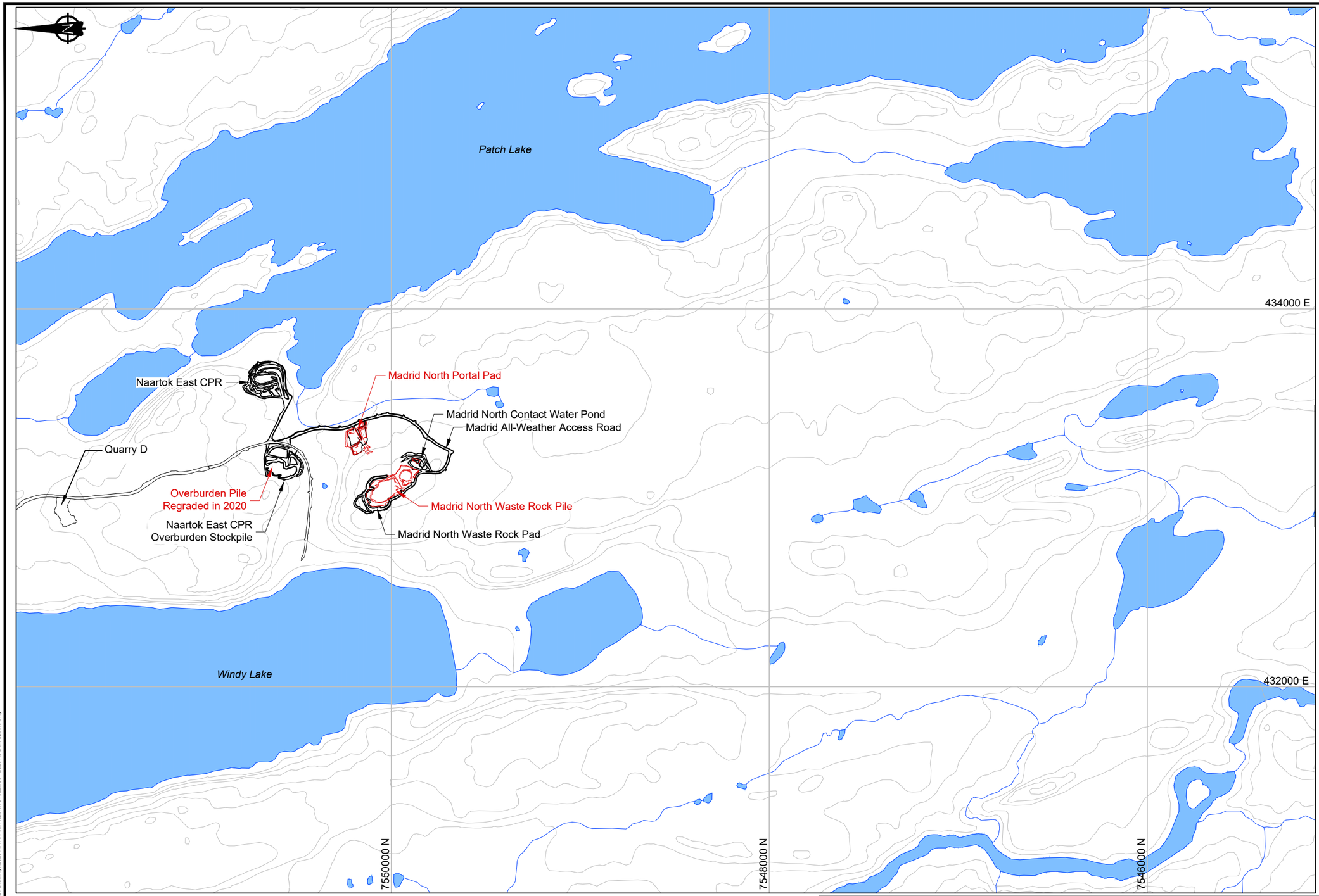


## LEGEND

- Existing As-Built Infrastructure
- 2020 As-Built Infrastructure

## NOTES

1. Coordinate system is UTM Zone 13, NAD83.

0m 200 400 600 800

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srk consulting

SRK JOB NO.: 1CT022.055

FILE NAME: 1CT022.055 - 2020 As-Built Update.dwg

TMAC RESOURCES

**HOPE BAY PROJECT**

2020 KIA Annual Report

# Madrid North Area 2020 As-Built Summary

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| January 27, 2021 | JBK / PL | 2 |

# Appendix D

Water Licence(s) Monitoring Data

AGNICO EAGLE

# Appendix D.1. 2AM-DOH1335

AGNICO EAGLE

# Appendix D.1. 2AM-DOH1335

The Type A Water Licence No. 2AM-DOH1335 details the sampling and analysis requirements for the Surveillance Network Program (SNP) program. Table D1-1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the SNP for water licence 2AM-DOH1335. The location of each sampling point is illustrated in Figure D1-1 through Figure D1-3 below.

**Table D1-1. 2AM-DOH1335 Sample Stations, Sample Frequency and Analytical Parameters**

| SNP Station | Description | Phase | Monitoring Parameters | Frequency during Operations and Anytime after Initial Deposit of Tailings to the TIA |
|---|---|---|---|---|
| ST-1 | Doris Sedimentation Pond | Construction, Operation, Care and Maintenance, Closure | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS | Annually |
| ST-2 | Doris Contact Water Pond | Construction, Operation, Care and Maintenance, Closure | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS | Annually |
| ST-3 | Discharge from Non-hazardous Landfill Contact Water control sump | Construction, Care and Maintenance, Operation, Closure | G, MT and Total Ammonia-N, Total Sulphate, Total and Free CN, Total Oil and Grease | Annually. Once prior to every discharge onto the tundra |
| | | | D | Daily during periods of discharge |
| ST-4 | Discharge from Landfarm sump | Construction, Operation, Care and Maintenance, Closure | G, HC, total Ammonium, total Lead | Annually. Once prior to every discharge onto the tundra |
| | | | D | Daily during periods of discharge |
| ST-5 | Discharge from Doris Plant Site Fuel Storage and Containment Area Sump | Construction, Operation, Care and Maintenance, Closure | G, HC, Total Pb | Annually. Once prior to every discharge onto the tundra |
| | | | D | Daily during periods of discharge |
| ST-6a and ST-6b | Discharge from the Roberts Bay Fuel Storage and Containment Area Sumps | Construction, Operation, Care and Maintenance, Closure | G, HC, Total Pb | Annually. Once prior to every discharge onto the tundra |
| | | | D | Daily during periods of discharge |
| ST-7 | Freshwater pumped from Doris Lake | Construction, Operation, Care and Maintenance, and Closure | G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl | Monthly during periods of pumping |
| | | | D | Monthly during periods of pumping |
| | | | Cl-a | Annually |

| SNP Station | Description | Phase | Monitoring Parameters | Frequency during Operations and Anytime after Initial Deposit of Tailings to the TIA |
|---|---|---|---|---|
| ST-7a | Freshwater pumped from the Windy Lake freshwater intake | Construction, Operation, Care and Maintenance, Closure | G, N1, N2, MT, Cl and, T-Ag, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, T-Ca, and Total Oil and Grease, Free CN, Total CN | Monthly during periods of pumping |
| | | | B | |
| | | | D | |
| ST-8 | Discharge from Doris Sewage Treatment Plant bio-membrane | Construction, Operation, Care and Maintenance, Closure | G, B, and Total Oil and Grease | Monthly when discharge to the Tundra, Annually when discharge to the TIA |
| | | | Location of discharge | Monthly during periods of discharge |
| | | | D | Daily during periods of discharge |
| ST-9 | Runoff from Doris Sewage Treatment Plant discharge - downstream of wastewater treatment plant discharge point and just prior to flow entering Doris Lake | Construction, Operation, Care and Maintenance, Closure | G, B, and Total Oil and Grease | Monthly when ST-8 is discharged to the tundra |
| ST-10 | Doris Site Runoff from Sediment Controls | Construction, Operations, Closure | TSS or Turbidity (following development and approval of a site-specific TSS-Turbidity) | Daily during periods of discharge |
| ST-11 | Reagent and Cyanide Doris Storage Facility Sumps | Construction, Operation, Care and Maintenance, Closure | G, HC , MT, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl Total Ammonia, Total and Free Cyanide, and D | Annually |
| ST-12 | Doris Lake | Operation, Closure | Water Level | Monthly |
| | | | Ice Thickness | Annually in April |
| ST-13 | Doris Contact Water Pond associated to Pad U | Construction, Operation, Care and Maintenance, Closure | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS | Annually |
| | | | D | Daily during periods of discharge |
| TL-1 | TIA at the Reclaim Pipeline | Operation, Care and Maintenance, Closure, Post-Closure | G, N1, N2, MT and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, HC, Fecal Coliforms | Monthly during Operations, Closure and Post-Closure<br>Annually during Care and Maintenance |
| | | | Dissolved Oxygen, Redox Potential, BOD | Annually |
| | | | Acute Lethality | Annually during Post-Closure |
| | | | D | Daily during periods of discharge |

| SNP Station | Description | Phase | Monitoring Parameters | Frequency during Operations and Anytime after Initial Deposit of Tailings to the TIA |
|---|---|---|---|---|
| TL-2 | Doris Outflow Creek - upstream (at the flow monitoring station adjacent to the bridge) | Closure, Post-Closure | G, N1, N2, MT and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, Oil and Grease | Annually during Care and Maintenance<br>Annually for 2 years prior to Post-Closure, and during Post-Closure, increase to three times per year (under ice, freshet, and pre-freeze up), two years prior to breach of the North Dam |
| | | Operation | D | Daily upon commencement of mining in or beneath the Doris Lake Talik |
| TL-3 | Doris Outflow Creek (~80m downstream of the base of the waterfall) | Care and Maintenance, prior to any deposit of tailings to the TIA | G, N1, N2, MT and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, Total Oil and Grease | Inactive |
| | | | D | |
| TL-4 | TIA Discharge End-of-Pipe | Care and Maintenance, prior to any deposit of tailings to the TIA | G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, T-Radium 226 | Inactive |
| | | | Acute Lethality | |
| | | | B | |
| | | | D | |
| TL-5 | Effluent from Doris Process Plant (tailings slurry/water) | Operations | G, N1, MT, and Free CN, Total CN, WAD CN, Sulphate, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, and Total Metals by ICP-MS | Monthly |
| | | | Cyanate and Thiocyanate | Quarterly |
| TL-6 | Tailings Discharged into TIA (Solid Component) taken from a valve in the mill at the discharge end of the mill tailings pumps | Operations | Tonnage of dry tailings solids | Monthly during periods of discharge |
| | | | MT and T-Cd, T-Cr, T-Hg, T-Mo, T-Se, Total Inorganic Carbon and Total Metals by ICP-MS (must include Sulphur) | Sampled on a weekly basis with analyses carried out monthly on a composite sample of the TL-6 weekly samples |
| TL-7a | Detoxified tailings solids sent underground as backfill | Operations | Dry tonnage of detoxified tailings sent underground; Moisture content of backfill trucked underground | Monthly |
| TL-7b | Filtrate from TL-7a (Detoxified tailings sent underground as backfill) | Operations | Cyanate and Thiocyanate, WAD CN, Total Inorganic Carbon, Total Metals by ICP-MS (including Sulphur) | Monthly |
| TL-8 | Reclaim water pumped from TIA to Mill Process water tank taken from a valve at the discharge end of the reclaim water pump | Operations | G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl | Inactive |
| | | | D | Daily during periods of pumping |

| SNP Station | Description | Phase | Monitoring Parameters | Frequency during Operations and Anytime after Initial Deposit of Tailings to the TIA |
|---|---|---|---|---|
| TL-9 | Detox tailings reactor tank (650-TK-565) | Monitoring and reporting is captured within the Water Management Plan | | Monitoring and reporting is captured within the Water Management Plan |
| TL-10 | Water Column in deepest portion of Tail Lake and at a location away from the TIA Reclaim water floating pump house, sampled at surface, mid- depth and near bottom | Inactive | | Inactive |
| TL-11 | Seepage from Doris underground backfilled stopes | Operations | Visual inspection for seepage. If seepage present parameters to be monitored include N1 and pH, EC, Trace metals by ICP-MS, Alkalinity, Acidity, Sulphate, Total, Free and WAD CN | Survey Twice annually |
| TL-12 | Doris Mine Water Discharge Point | Operations during continuous pumping | Chloride, TDS and nitrate<br>Total Ammonia, Nitrate, Nitrite, pH, EC, Total Metals by ICPMS, alkalinity, bromide, fluoride, sulphate, TSS, and Total and WAD Cyanide<br>D | Weekly<br>Monthly<br>Daily during periods of discharge |
| MMS-1 | Madrid North Contact Water Pond | Construction, Operations, Care and Maintenance | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS | Sampled twice annually, Weekly water levels |
| MMS-2 | Madrid South Primary Contact Water Pond | Construction, Operations, Care and Maintenance, Closure | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS | Sampled twice annually, Weekly water levels |
| MMS-3 | Madrid South Secondary Contact Water Pond | Construction, Operations, Care and Maintenance, Closure | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS | Sampled twice annually, Weekly water levels |
| MMS-4a | Freshwater Intake at Windy Lake North | Construction, Operations, Care and Maintenance, Closure | G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl, D | Sampled monthly during active pumping periods |
| MMS-4b | Freshwater Intake at Windy Lake South (Windy Camp) | Construction, Operations, Care and Maintenance, Closure | G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl, D | Sampled monthly during active pumping periods |
| MMS-5 | Discharge from Madrid South Fuel Storage facility | Construction, Operations, Care and Maintenance, Closure | G, HC, Total Pb | Annually. Once prior to every discharge to tundra |

| SNP Station | Description | Phase | Monitoring Parameters | Frequency during Operations and Anytime after Initial Deposit of Tailings to the TIA |
|---|---|---|---|---|
| MMS-6 | Brine Mixing Facility | Operations during continuous pumping | G, N1, Chloride, Fluoride, Bromide, Sulphate, TDS, EC, Total Metals ICP-MS, alkalinity, and Total and WAD Cyanide | Sampled monthly during active pumping periods |
| MMS-7 | Effluent from Madrid North Concentrator to TIA | Operations | G, N1, MT, and Free CN, Total CN, WAD CN, Sulphate, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, and Total Metals by ICP-MS | Sampled quarterly during active pumping periods |
| MMS-8 | Discharge from Madrid North Fuel Storage Facility | Construction, Operations, Care and Maintenance, Closure | G, HC, Total Pb | Annually. Once prior to every discharge to tundra |
| MMS-9 | Site runoff from sediment controls during construction | Construction | TSS or Turbidity | Sampled daily during periods of discharge |
| MMS-10 | Mine Water Discharge Point | Operations during continuous pumping | Chloride, TDS and nitrate<br>Total Ammonia, Nitrate, Nitrite, pH, EC, Total Metals ICP-MS, alkalinity, Fluoride, Bromide, Sulphate, TSS, and Total and WAD Cyanide | Weekly<br>Monthly |

**Figure D1-1. 2AM-DOH1335 Sample Stations Location**

**Figure D1-2. 2AM-DOH1335 Sample Stations Location**

**Figure D1-3. 2AM-DOH1335 Sample Stations Location**

## SUMMARY OF MONTHLY MONITORING REPORTING [SEE PART I ITEM 12]

Commercial operations continued in 2020 at Doris with continued efforts to stabilize mill throughput and optimize gold recovery. In 2020 the mill processed 382,811 tonnes (t) of ore and poured 108,724 ounces of gold, and successfully treated 17,886 t of cyanide solutions. Following the reduction in workforce due to the COVID-19 pandemic, TMAC continued processing ore at a reduced rate and achieved steady state processing and improved gold recovery.

The Robert's Bay Discharge system was commissioned in January and discharge to Robert's Bay commenced in accordance with MDMER in February 2020. Discharge to Robert's Bay was suspended in August 2020 for the seasonal algae bloom. A water management sump (Sump 3) was installed at Doris to enhance the existing water management system.

Civil construction activities included expansion of the TIA reclaim jetty, maintenance conducted on airstrip and installation of three water management sumps around perimeter of the Madrid waste rock pad.

Earthworks continued at the Madrid North site in early 2020 to support the Naartok East Crown Pillar and Madrid North underground decline. This included contouring and armouring of Naartok East Crown Pillar overburden pile and maintenance on Madrid North Contact Water Pond.

Underground mining operations continued at Doris Mine, while Madrid underground and surface operations, including mining of the Naartok East Crown Pillar trench, were suspended in March 2020. At Doris, TMAC focused on producing from developed stopes and bringing ore to surface. A grouting program at Doris greatly reduced inflows of mine water over the course of 2020.

During 2020, TMAC collected data from the following active or seasonally active monitoring stations: TL-1, TL-2, TL-5, TL-6, TL-7a, TL-7b, TL-9, TL-11, TL-12, ST-1, ST-2, ST-4, ST-5, ST-6a, ST-6b, ST-7, ST-7a/MMS-4b, ST-8, ST-9, - ST-11, ST-12, MMS-1, and MMS-6.

Monitoring at stations ST-3 (Landfill Sump), ST-13 (Doris Contact Water Pond Pad U), MMS-4a (Freshwater intake at Windy Lake North), and MMS-8 (Madrid North Fuel Storage Facility) did not occur, as these facilities were not constructed as of 2020.

Monitoring at ST-10 (Doris Site runoff from sediment controls) was not conducted as no new infrastructure was constructed at Doris. Monitoring at MMS-9 (Madrid Site runoff from sediment controls during construction) was not conducted as no construction was conducted at Madrid in 2020.

The Madrid North Concentrator was not constructed in 2020, therefore no effluent was discharged to the TIA from this facility and no monitoring occurred at station MMS-7. No monitoring at station MMS-10 (Madrid Mine Water Discharge) occurred as no mine water was pumped from Madrid underground workings in 2020.

No activities occurred at Madrid South in 2020. Therefore monitoring at stations MMS-2 (Madrid South Primary Contact Water Pond), MMS-3 (Madrid South Secondary Contact Water Pond) and MMS-5 (Madrid South Fuel Storage Facility) did not occur as these facilities were not constructed as of 2020.

Monitoring of the TIA was undertaken at monitoring station TL-1. Monitoring of the tailings deposited into the TIA continued at monitoring stations TL-5 and TL-6 in 2020. Monitoring of detoxified tailings backfilled underground was completed at monitoring stations TL-7a, TL-7b and TL-11. As described in the Hope Bay Water Management Plan, the Doris Sedimentation Pond (ST-1) was used as a collection pond for the water that accumulated in the Doris Contact Water Pond (ST-2) and the three underflow sumps (ST2-S1, ST2-S2 and ST2-S3). The water collected in ST-1 was then transferred to the TIA by pipeline. The sedimentation

pond was also used to transfer water from the landfarm (ST-4) and fuel storage facility berms (ST-5 and ST-6b) to the TIA. Water from the Naartok East Crown Pillar Trench (NECPT) and Madrid North Contact Water Pond (MMS-1) was also transferred to the TIA through the sedimentation pond. Dewatering of the TIA to Roberts Bay through the Roberts Bay Discharge System began in February and continued until August 2020.

All monitoring was conducted in accordance with the Hope Bay Project Quality Assurance and Quality Control Plan (2020).

TMAC uses an external certified laboratory to carry out all analyses reported in the monthly and annual reports. The QA/QC data produced by ALS Canada Ltd. and Bureau Veritas Laboratories Inc. are used to determine the accuracy and precision of results in these reports.

Thermal monitoring was undertaken in 2020 at active ground temperature monitoring stations. Results of this monitoring are included in the annual Geotechnical Inspection report.

Conditions of the Doris North Diversion Berm's effectiveness during spring freshet, major rain events, and periods of sustained (non-frozen) precipitation were monitored and documented.

Details of all monitoring follows.

## ST-1 Doris Sedimentation Pond

This facility was constructed and first used in 2011. In 2020, during open water season, all discharges from the facility were made directly to the TIA via pipeline as per Part F Item 17. All discharges from the facility were metered. Water quality samples were collected from an outlet on the discharge pump with the intake on the pump submerged approximately 0.25m below the water surface. If the pump was not running, samples were collected from the pond itself.

Water was transferred from ST-1 to the TIA beginning in June and continued into September. The final day of discharge from the Sedimentation Pond was September 15, 2020.

Volumes transferred to the TIA from ST-1 are summarized in Table D1-2. This includes water transferred from ST-2, ST2-S1, ST2-S2 and ST2-S3 to ST-1, as described above, and water transferred from the landfarm (ST-4) and fuel storage facility berms ST-5 and ST-6b. Volumes presented also include water transferred from the Madrid North Contact Water Pond (MMS-1) and Naartok East Crown Pillar Recovery Trench (NECPRT) to the Doris Sedimentation Pond for transfer to the TIA. Results of water quality samples, collected from ST-1, are summarized in Table D1-3.

**Table D1-2. Summary of Monthly Water Management Volumes for Monitoring Station ST-1, June to September 2020**

| Month | Monthly Volume ($m^3$) | Cumulative Volume ($m^3$)* |
|---|---|---|
| June | 26,457 | 26,457 |
| July | 7,634 | 34,091 |
| August | 3,908 | 37,999 |
| September | 1,552 | 39,551 |
| **Total Volume** | | **39,551** |

** Values rounded to nearest whole cubic metre.*
*Volumes presented includes water from transferred from ST-2, ST2-S1, ST2-S2, ST2-S3, ST-4, ST-5, ST-6b, MMS-1, and NECPRT.*

**Table D1-3. Water Quality Monitoring Program Results for ST-1, June, July, August, and September 2020**

| | Sample ID | ST1 | ST1 | ST1 ^ | ST1 | ST1 |
|---|---|---|---|---|---|---|
| | ALS ID | L2458627-1 | L2471340-1 | L2471340-6 | YL2000004-001 | L2498958-1 |
| | Date Sampled | 8-Jun-2020 11:00 | 6-Jul-2020 17:00 | 6-Jul-2020 17:00 | 2-Aug-2020 10:30 | 1-Sep-2020 15:50 |
| **Parameter** | **Units** | **Results** | | | | |
| pH | pH | 7.74 | 7.8 | 7.81 | 7.8 | 8.1 |
| Total Suspended Solids | mg/L | 13.6 | 8.0 | 8.8 | 35.1 | 4.9 |
| Chloride (Cl) | mg/L | 5390 | 2670 | 2740 | 2820 | 1950 |
| Cyanide, Total | mg/L | 0.179 | 5.86 | 6.39 | 5.27 | 14.5 |
| Ammonia, Total (as N) | mg/L | 13.9 | 46 | 46.1 | 43.9 | 24.4 |
| Nitrate (as N) | mg/L | 15.8 | 113 | 117 | 100 | 61.7 |
| Nitrite (as N) | mg/L | 0.74 | 0.792 | 0.765 | 0.666 | 0.445 |
| Sulfate ($SO_4$) | mg/L | 594 | 425 | 436 | 413 | 425 |
| Aluminum (Al)-Total | mg/L | 0.25 | 0.058 | 0.06 | 56.9 | 0.218 |
| Antimony (Sb)-Total | mg/L | <0.0010 | 0.00103 | 0.00102 | <0.00500 | 0.00094 |
| Arsenic (As)-Total | mg/L | 0.003 | 0.0035 | 0.00362 | 0.177 | 0.00269 |
| Barium (Ba)-Total | mg/L | 0.034 | 0.11 | 0.111 | 0.158 | 0.0654 |
| Beryllium (Be)-Total | mg/L | <0.0010 | <0.00050 | <0.00050 | <0.00100 | <0.00020 |
| Boron (B)-Total | mg/L | 1.35 | 0.466 | 0.488 | 2.92 | 0.474 |
| Cadmium (Cd)-Total | mg/L | 0.000122 | 0.000468 | 0.000478 | 0.0035 | 0.000083 |
| Calcium (Ca)-Total | mg/L | 454 | 750 | 761 | 1510 | 474 |
| Chromium (Cr)-Total | mg/L | <0.0010 | 0.00056 | 0.0007 | 0.0988 | 0.00122 |
| Cobalt (Co)-Total | mg/L | 0.0103 | 0.0415 | 0.0415 | 0.133 | 0.0681 |
| Copper (Cu)-Total | mg/L | 0.216 | 1.64 | 1.63 | 3.67 | 4.7 |
| Iron (Fe)-Total | mg/L | 1.02 | 4.7 | 4.6 | 248 | 6.58 |
| Lead (Pb)-Total | mg/L | 0.00079 | 0.00029 | 0.00027 | 0.0857 | 0.00026 |
| Lithium (Li)-Total | mg/L | 0.054 | 0.0202 | 0.0212 | 0.157 | 0.0209 |
| Magnesium (Mg)-Total | mg/L | 347 | 165 | 165 | 1050 | 121 |
| Manganese (Mn)-Total | mg/L | 0.579 | 1.05 | 1.04 | 6.11 | 0.42 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.000025 | <0.000025 | <0.0000500 | <0.000050 |
| Molybdenum (Mo)-Total | mg/L | 0.0079 | 0.0118 | 0.012 | 0.023 | 0.0114 |

| | Sample ID | ST1 | ST1 | ST1 ^ | ST1 | ST1 |
|---|---|---|---|---|---|---|
| | ALS ID | L2458627-1 | L2471340-1 | L2471340-6 | YL2000004-001 | L2498958-1 |
| | Date Sampled | 8-Jun-2020 11:00 | 6-Jul-2020 17:00 | 6-Jul-2020 17:00 | 2-Aug-2020 10:30 | 1-Sep-2020 15:50 |
| **Parameter** | **Units** | **Results** | | | | |
| Nickel (Ni)-Total | mg/L | 0.0527 | 0.0798 | 0.0793 | 0.178 | 0.12 |
| Potassium (K)-Total | mg/L | 86.9 | 62.7 | 63.7 | 194 | 46.9 |
| Selenium (Se)-Total | mg/L | 0.00111 | 0.00403 | 0.00467 | 0.00517 | 0.00571 |
| Silver (Ag)-Total | mg/L | 0.00119 | 0.00441 | 0.00438 | 0.0134 | 0.0223 |
| Sodium (Na)-Total | mg/L | 2740 | 1140 | 1170 | 6480 | 876 |
| Thallium (Tl)-Total | mg/L | <0.00010 | 0.000086 | 0.000076 | <0.000500 | <0.000020 |
| Tin (Sn)-Total | mg/L | <0.0010 | <0.00050 | <0.00050 | <0.00500 | <0.00020 |
| Titanium (Ti)-Total | mg/L | <0.010 | <0.0015 | 0.0017 | 1.15 | <0.0072 |
| Uranium (U)-Total | mg/L | 0.00035 | 0.00196 | 0.00197 | 0.00274 | 0.0021 |
| Vanadium (V)-Total | mg/L | <0.0050 | <0.0025 | <0.0025 | 0.224 | 0.0017 |
| Zinc (Zn)-Total | mg/L | <0.030 | 0.078 | 0.077 | 1.85 | 0.032 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 82.9 | 136 | 135 | 128 | 148 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | No | No | No | No | No |

^ *Indicates duplicate sample.*

## ST-2 Doris Contact Water Pond

This facility was constructed in 2011. In 2020, it was active between June and September. Samples from ST-2 were collected from a depth of 0.25 m below the water surface. All water from the Doris Contact Water Pond was directed to the Sedimentation Pond.

Water quality monitoring sampling at ST-2 occurred as per Schedule I of the water licence. Results of the sampling are presented in Table D1-4.

## ST-4 Landfarm

Water quality samples were collected on June 8 and June 30 from the Landfarm (ST-4) prior to discharge of water from this facility. These samples met the discharge criteria identified in Part F Item 18(b). No discharge to tundra occurred from this facility in 2020. A total of 263 $m^3$ was transferred from the Landfarm to the sedimentation pond, and 7 $m^3$ was transferred to the TIA. Results of Landfarm water sampling are presented in Table D1-5.

## ST-5 Doris Plant Site Fuel Storage and Containment

Water from the Doris tank farm (ST-5) was sampled on May 30, 2020, prior to dewatering events and results met the discharge criteria outlined in Part F Item 18(b). Results of this sampling are presented in Table D1-6.

No discharge to tundra occurred from this facility in 2020. A total of 144 $m^3$ of water was transferred to the Sedimentation Control Pond and 563 m3 was directed to the TIA.

## ST-6a Roberts Bay Bulk Fuel Storage Facility

Water from the Roberts Bay 5ML tank farm (ST-6a) was sampled on May 30, 2020, prior to discharge and met the discharge criteria outlined in Part F Item 18(b). Results of this sampling are presented in Table D1-7.

Notification of discharge from this facility was provided to the Inspector on May 11, 2020. Upon receipt of compliant results, a total of 53 $m^3$ of water was discharge to tundra (location 13W 432954 7563407) or used as dust suppression on site roads in 2020.

## ST-6b Roberts Bay Bulk Fuel Storage Facility

Water from the Roberts Bay 4x5 ML tank farm (ST-6b) was sampled on May 30, 2020, prior to discharge and results met the discharge criteria outlined in Part F Item 18(b) of the licence. A third sample collected on June 30, 2020, also met the discharge criteria. Results of this monitoring are presented in Table D1-8. A total of 70 $m^3$ was discharge to tundra (location 13W 432878 7563130) from this facility in 2020. An additional 126 $m^3$ of water from this facility was transferred to the Sedimentation Control Pond for transfer to the TIA in 2020.

## Table D1-4. Water Quality Monitoring Program Results for ST-2, June, July, August, and September 2020

| | Sample ID | ST2 | ST2 | ST2 ^ | ST2 | ST2 |
|---|---|---|---|---|---|---|
| | ALS ID | L2458627-2 | L2471340-2 | L2471340-7 | YL2000004-002 | L2498958-2 |
| | Date Sampled | 8-Jun-2020 11:15 | 6-Jul-2020 16:30 | 6-Jul-2020 16:30 | 2-Aug-2020 9:45 | 1-Sep-2020 15:35 |
| **Parameter** | **Units** | **Results** | | | | |
| pH | pH | 7.69 | 7.75 | 7.67 | 8.04 | 7.94 |
| Total Suspended Solids | mg/L | 3.2 | <3.0 | 9 | <3.0 | <3.0 |
| Chloride (Cl) | mg/L | 710 | 1920 | 2970 | 981 | 4560 |
| Cyanide, Total | mg/L | 0.969 | 25.5 | 23.1 | 15.1 | 12.4 |
| Ammonia, Total (as N) | mg/L | 6.92 | 28.5 | 28.4 | 13.6 | 40.3 |
| Nitrate (as N) | mg/L | 22 | 37.4 | 58.8 | 37.9 | 137 |
| Nitrite (as N) | mg/L | 0.29 | 0.459 | 0.477 | 0.502 | 0.518 |
| Sulfate ($SO_4$) | mg/L | 124 | 574 | 644 | 446 | 666 |
| Aluminum (Al)-Total | mg/L | 0.152 | 0.061 | 0.052 | 0.0542 | 0.039 |
| Antimony (Sb)-Total | mg/L | <0.00050 | 0.00128 | 0.00131 | 0.00128 | 0.00085 |
| Arsenic (As)-Total | mg/L | 0.0022 | 0.00437 | 0.00401 | 0.00409 | 0.00247 |
| Barium (Ba)-Total | mg/L | 0.028 | 0.109 | 0.104 | 0.0371 | 0.133 |
| Beryllium (Be)-Total | mg/L | <0.00010 | <0.00050 | <0.00050 | <0.000040 | <0.00050 |
| Boron (B)-Total | mg/L | 0.14 | 0.865 | 0.829 | 0.537 | 0.602 |
| Cadmium (Cd)-Total | mg/L | 0.0000315 | 0.000271 | 0.000221 | 0.0000274 | 0.000273 |
| Calcium (Ca)-Total | mg/L | 199 | 964 | 902 | 215 | 1140 |
| Chromium (Cr)-Total | mg/L | <0.0010 | 0.00097 | 0.00093 | 0.001 | 0.00055 |
| Cobalt (Co)-Total | mg/L | 0.0185 | 0.135 | 0.134 | 0.061 | 0.0899 |
| Copper (Cu)-Total | mg/L | 0.793 | 4.62 | 4.61 | 2.81 | 3.71 |
| Iron (Fe)-Total | mg/L | 0.717 | 8.38 | 8.47 | 6.53 | 5.3 |
| Lead (Pb)-Total | mg/L | <0.00050 | <0.00025 | <0.00025 | 0.000156 | <0.00025 |
| Lithium (Li)-Total | mg/L | 0.0112 | 0.0305 | 0.0284 | 0.016 | 0.0509 |
| Magnesium (Mg)-Total | mg/L | 39.3 | 278 | 280 | 66.6 | 236 |
| Manganese (Mn)-Total | mg/L | 0.309 | 0.584 | 0.579 | 0.148 | 1.61 |
| Mercury (Hg)-Total | mg/L | 0.0000061 | <0.000025 | <0.000025 | <0.0000500 | <0.000050 |

| | Sample ID | ST2 | ST2 | ST2 ^ | ST2 | ST2 |
|---|---|---|---|---|---|---|
| | ALS ID | L2458627-2 | L2471340-2 | L2471340-7 | YL2000004-002 | L2498958-2 |
| | Date Sampled | 8-Jun-2020 11:15 | 6-Jul-2020 16:30 | 6-Jul-2020 16:30 | 2-Aug-2020 9:45 | 1-Sep-2020 15:35 |
| **Parameter** | **Units** | **Results** | | | | |
| Molybdenum (Mo)-Total | mg/L | 0.0037 | 0.0158 | 0.0151 | 0.0127 | 0.0118 |
| Nickel (Ni)-Total | mg/L | 0.0267 | 0.219 | 0.218 | 0.111 | 0.11 |
| Potassium (K)-Total | mg/L | 15.9 | 81.1 | 80.9 | 35.5 | 70.6 |
| Selenium (Se)-Total | mg/L | 0.0012 | 0.00618 | 0.00587 | 0.00536 | 0.0061 |
| Silver (Ag)-Total | mg/L | 0.00468 | 0.0108 | 0.0107 | 0.00976 | 0.0195 |
| Sodium (Na)-Total | mg/L | 280 | 2100 | 2020 | 589 | 1490 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000050 | <0.000050 | <0.000020 | <0.000050 |
| Tin (Sn)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00020 | <0.00050 |
| Titanium (Ti)-Total | mg/L | <0.010 | 0.0015 | 0.0017 | 0.00166 | 0.0018 |
| Uranium (U)-Total | mg/L | 0.00057 | 0.00336 | 0.00342 | 0.00169 | 0.00333 |
| Vanadium (V)-Total | mg/L | 0.00088 | <0.0025 | <0.0025 | 0.002 | <0.0025 |
| Zinc (Zn)-Total | mg/L | <0.0050 | <0.015 | <0.015 | <0.0060 | <0.015 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 56.1 | 178 | 177 | 164 | 149 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | No | No | No | No | No |

*Note: Effluent quality limits listed under Part F Item 18(a) are not applicable as water accumulating in this facility is transferred to the Tailings Impoundment Area. ^ Indicates duplicate sample.*

## Table D1-5. Water Quality Monitoring Program Results for ST-4, June 2020

| | Sample ID | ST4 | ST4 ^ | ST4-B | Part F Item 18(b) | |
|---|---|---|---|---|---|---|
| | ALS ID | L2458912-1 | L2458912-2 | L2469129-1 | Maximum Authorized Monthly Mean Concentration (mg/L) | Maximum Authorized Concentration in a Grab Sample (mg/L) |
| | Date Sampled | 8-Jun-2020 16:00 | 8-Jun-2020 16:00 | 30-Jun-2020 12:40 | | |
| **Parameter** | **Units** | **Results** | | | | |
| pH | pH | 7.86 | 7.85 | 8.42 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | 7.2 | 6.4 | <3.0 | 50.0 | 100.0 |
| Benzene | mg/L | <0.00050 | <0.00050 | <0.00050 | 0.37 | 0.37 |
| Toluene | mg/L | <0.00045 | <0.00045 | <0.00045 | 0.002 | 0.002 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | <0.00050 | 0.09 | 0.09 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | No | No | No | No Visible | No Visible |
| Lead (Pb)-Total | mg/L | 0.000196 | 0.00019 | <0.000050 | 0.2 | 0.4 |
| Ammonia, Total (as N) | mg/L | 0.256 | 0.249 | 0.0114 | | |

*Bold/shading indicates exceedance of Part F Item 18(b) Maximum Authorized Concentration.*
*^ Indicates duplicate sample.*

## Table D1-6. Water Quality Monitoring Program Results for ST-5, May 2020

| | Sample ID | ST5 | ST5 ^ | Part F Item 18(b) | |
|---|---|---|---|---|---|
| | ALS ID | L2456709-1 | L2456709-2 | Maximum Authorized Monthly Mean Concentration (mg/L) | Maximum Authorized Concentration in a Grab Sample (mg/L) |
| | Date Sampled | 30-May-2020 15:45 | 30-May-2020 15:45 | | |
| **Parameter** | **Units** | **Results** | | | |
| pH | pH | 7.93 | 7.94 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | 5.1 | 8.7 | 50.0 | 100.0 |
| Benzene | mg/L | <0.00050 | <0.00050 | 0.37 | 0.37 |
| Toluene | mg/L | <0.00045 | <0.00045 | 0.002 | 0.002 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | 0.09 | 0.09 |
| Oil and Grease | mg/L | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | No | No | No Visible Sheen | No Visible Sheen |
| Lead (Pb)-Total | mg/L | 0.000544 | 0.000548 | 0.2 | 0.4 |

*Bold/shading indicates exceedance of Part F Item 18(b) Maximum Authorized Concentration.*
*^ Indicates duplicate sample.*

## Table D1-7. Water Quality Monitoring Program Results for ST-6a, May 2020

| | Sample ID | ST6A | ST6A ^ | Part F Item 18(b) | |
|---|---|---|---|---|---|
| | ALS ID | L2456709-3 | L2456709-4 | Maximum Authorized Monthly Mean Concentration (mg/L) | Maximum Authorized Concentration in a Grab Sample (mg/L) |
| | Date Sampled | 30-May-2020 16:40 | 30-May-2020 16:40 | | |
| **Parameter** | **Units** | **Results** | | | |
| pH | pH | 8.3 | 8.31 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | <3.0 | 3.5 | 50.0 | 100.0 |
| Benzene | mg/L | <0.00050 | <0.00050 | 0.37 | 0.37 |
| Toluene | mg/L | <0.00045 | <0.00045 | 0.002 | 0.002 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | 0.09 | 0.09 |
| Oil and Grease | mg/L | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | No | No | No Visible Sheen | No Visible Sheen |
| Lead (Pb)-Total | mg/L | <0.000050 | 0.000056 | 0.2 | 0.4 |

*Bold/shading indicates exceedance of Part F Item 18(b) Maximum Authorized Concentration.*
*^ Indicates duplicate sample.*

## Table D1-8. Water Quality Monitoring Program Results for ST-6b, May and June 2020

| | Sample ID | ST6B | ST6B ^ | ST6B | Part F Item 18 (b) | |
|---|---|---|---|---|---|---|
| | ALS ID | L2456709-5 | L2456709-6 | L2469124-1 | Maximum Authorized Monthly Mean Concentration (mg/L) | Maximum Authorized Concentration in a Grab Sample (mg/L) |
| | Date Sampled | 30-May-2020 17:15 | 30-May-2020 17:15 | 30-Jun-2020 12:00 | | |
| **Parameter** | **Units** | **Results** | | | | |
| pH | pH | 8.04 | 8.06 | 8.21 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | 15.1 | 66.7 | 12.5 | 50.0 | 100.0 |
| Benzene | mg/L | <0.00050 | <0.00050 | <0.00050 | 0.37 | 0.37 |
| Toluene | mg/L | <0.00045 | <0.00045 | 0.00068 | 0.002 | 0.002 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | <0.00050 | 0.09 | 0.09 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | No | No | No | No Visible Sheen | No Visible Sheen |
| Lead (Pb)-Total | mg/L | 0.000205 | 0.000199 | 0.000312 | 0.2 | 0.4 |

*Bold/shading indicates exceedance of Part F Item 18(b) Maximum Authorized Concentration.*
*^ Indicates duplicate sample.*

## ST-7 and ST-7a/MMS-4b Freshwater Usage from Doris and Windy Lakes

Table D1-9 provides the volumes of water usage at the Doris and Madrid project areas as required under Part E Item 1 of water licence 2AM-DOH1335. The water extraction pump for Doris operations is located off the northwest shoreline of Doris Lake and the sampling station ST-7 is located within the Doris Lake pump house. In 2020, water from Doris Lake was not used for domestic consumption; all water for domestic consumption was obtained from Windy Lake at ST-7a (also referred to as MMS-4b in this licence and equivalent to location HOP-1 of the Regional Exploration Licence 2BE-HOP1222). Water for dust suppression in 2020 was obtained from Doris Lake, as well as from compliant containment berm effluent as approved by the Inspector. Underground development and construction occurred in support of the Doris mine and Madrid North mine; water was sourced from Doris Lake, for these purposes. Additionally, water was used from Doris Lake for seasonal winter ice track construction in January, February, March, April, and December. Water from Doris Lake was used in the mill for reagent mixing in 2020. Table D19 provides only water volumes used from lake sources and does not include water recycled from berms that would otherwise have been discharged to tundra as effluent.

Results of sampling at ST-7 at Doris Lake are provided in Table D1-10 and Table D1-11. Table D1-12 and Table D1-13 provide the results of water quality sampling for monitoring station ST-7a/MMS-4b (HOP-1) at Windy Lake in compliance with the requirements set out in Schedule I of water licence 2AM-DOH1335.

## ST-8 Discharge from Sewage Treatment Plant Bio-membrane

The Sewage Treatment Plant (STP) at Doris Camp is made up of two sewage treatment plant modules. Each plant has the capacity to treat wastewater for up to 180 personnel. Both units were utilized throughout 2020 to treat all domestic wastewater generated by the site.

Treated effluent samples were collected from the combined effluent holding tank of these two modules (ST-8) in 2020 to test the quality of the effluent to be discharged to the tundra, in accordance with Part F, Item 5(b) of the Licence. In-plant sampling facilitates year-round compliance evaluation of plant performance.

All effluent quality samples collected in 2020 were in compliance with the discharge criteria. All effluent quality monitoring results for ST-8 are provided in Table D1-14 and Table D1-15.

Treated effluent volumes released from ST-8 are metered daily and summary volumes reported in the monthly monitoring reports. In 2020 all treated effluent from ST-8 was discharged to the tundra west of the facility laydown areas (13W 432933 7559057) as approved by the Inspector. The monthly volumes of effluent discharged are presented in Table D1-16.

The sludge produced at the sewage treatment plant is sent to the TIA for disposal. The volume of sludge produced in 2020 is presented in Table D1-17.

## ST-9 Runoff from Sewage Treatment Plant Discharge

In consultation with the Inspector during the 2009 inspection tour, the ST-9 sampling location was established (13W 430807 7559282). This point is east of Glenn Lake and down slope from the ST-8 tundra discharge location. Monthly monitoring was conducted at ST-9 in June and August in 2020 in accordance with Schedule I of 2AM-DOH1335; due to COVID-19 restrictions and limited helicopter support, samples could not be collected in July or September 2020. The station is frozen during the remainder of the year. There is no water quality criteria specified in the licence for this monitoring station. Table D1-18 provides results of the 2020 seasonal monitoring.

**Table D1-9. Doris North Water Usage in 2020**

| Month | Windy Lake (ST-7A) | Doris Lake (ST-7) | | | | | Total Usage |
|---|---|---|---|---|---|---|---|
| | Domestic Water* | Domestic Water* | Surface Exploration | Industrial Usage** | Dust Suppression | Winter Track | |
| January | 1,492 | 0 | 0 | 289 | 0 | 93 | 1,874 |
| February | 1,448 | 0 | 76 | 138 | 0 | 445 | 2,107 |
| March | 1,529 | 0 | 0 | 20 | 0 | 208 | 1,757 |
| April | 759 | 0 | 0 | 13 | 0 | 32 | 804 |
| May | 733 | 0 | 0 | 0 | 0 | 0 | 733 |
| June | 729 | 0 | 0 | 7 | 112 | 0 | 848 |
| July | 1,004 | 0 | 0 | 205 | 240 | 0 | 1,449 |
| August | 809 | 0 | 0 | 209 | 0 | 0 | 1,018 |
| September | 685 | 0 | 0 | 145 | 0 | 0 | 830 |
| October | 695 | 0 | 0 | 185 | 0 | 0 | 880 |
| November | 784 | 0 | 0 | 287 | 0 | 0 | 1,071 |
| December | 861 | 0 | 0 | 251 | 0 | 60 | 1,172 |
| **Annual Total** | 11,528 | 0 | 76 | 1,749 | 352 | 838 | 14,543 |
| **Annual Allowance** | **43,800** | | | **1,930,000** | | **60,000** | **2,033,800** |

*Note: All values rounded to nearest whole cubic metre.*

** As permitted by water licences 2BE-HOP1222 and 2AM-DOH1335 Part E Item 1 and Part I Item 5(a)(b).*

*** Includes industrial uses such as underground drilling, core processing, milling , concrete batching, etc.*

## Table D1-10. Water Sampling Monitoring Program Results for January to May 2020 Taken from ST-7

| Sample ID | | ST-7 | ST-7 ^ | ST-7 | ST-7 | ST-7 | ST7 |
|---|---|---|---|---|---|---|---|
| ALS ID | | L2403845-1 | L2403845-2 | L2413118-1 | L2423312-1 | L2437418-1 | L2447183-1 |
| Date Sampled | | 8-Jan-2020 10:15 | 8-Jan-2020 10:15 | 3-Feb-2020 17:30 | 2-Mar-2020 10:25 | 14-Apr-2020 10:05 | 12-May-2020 11:00 |
| **Parameter** | **Units** | **Results** | | | | | |
| pH | pH | 7.41 | 7.42 | 7.38 | 7.47 | 7.38 | 7.67 |
| Total Suspended Solids | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | 3.3 |
| Chloride (Cl) | mg/L | 55.5 | 55.6 | 58.3 | | 59.3 | 61.5 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) | mg/L | 0.03 | 0.0324 | 0.0368 | 0.0275 | 0.0075 | 0.0231 |
| Nitrate (as N) | mg/L | <0.0050 | <0.0050 | <0.0050 | 0.0131 | 0.0705 | <0.0050 |
| Nitrite (as N) | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Orthophosphate-Dissolved (as P) | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Phosphorus (P)-Total | mg/L | 0.0205 | 0.0173 | 0.0198 | 0.0205 | 0.0137 | 0.0199 |
| Aluminum (Al)-Total | mg/L | 0.0217 | 0.0215 | 0.021 | 0.0173 | 0.0104 | 0.014 |
| Arsenic (As)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Cadmium (Cd)-Total | mg/L | <0.0000050 | 0.0000234 | 0.000019 | 0.0000092 | <0.0000050 | <0.0000050 |
| Calcium (Ca)-Total | mg/L | 8.03 | 8.15 | 8.59 | 8.61 | 8.52 | 8.63 |
| Chromium (Cr)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Copper (Cu)-Total | mg/L | 0.0019 | 0.0026 | 0.0021 | 0.0018 | 0.0019 | 0.0017 |
| Iron (Fe)-Total | mg/L | 0.124 | 0.12 | 0.161 | 0.128 | 1.23 | 0.175 |
| Lead (Pb)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Mercury (Hg)-Total | mg/L | 0.0000155 | <0.0000050 | <0.0000050 | 0.0000082 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Nickel (Ni)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Selenium (Se)-Total | mg/L | 0.000052 | 0.000063 | 0.000062 | <0.000050 | <0.000050 | <0.000050 |
| Silver (Ag)-Total | mg/L | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Zinc (Zn)-Total | mg/L | <0.0050 | 0.0057 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |

| Sample ID | ST-7 | ST-7 ^ | ST-7 | ST-7 | ST-7 | ST7 |
|---|---|---|---|---|---|---|
| ALS ID | L2403845-1 | L2403845-2 | L2413118-1 | L2423312-1 | L2437418-1 | L2447183-1 |
| Date Sampled | 8-Jan-2020 10:15 | 8-Jan-2020 10:15 | 3-Feb-2020 17:30 | 2-Mar-2020 10:25 | 14-Apr-2020 10:05 | 12-May-2020 11:00 |
| **Parameter** **Units** | **Results** | | | | | |
| Oil and Grease mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | NO | NO | NO | NO | NO | NO |
| Chlorophyll-a µg | | | | | | |

^ *Indicates duplicate sample.*

**Table D1-11. Water Sampling Monitoring Program Results for June to December 2020 Taken from ST-7**

| Sample ID | ST7 | ST7 | ST7 | ST7 | ST7 | ST7 | ST7 |
|---|---|---|---|---|---|---|---|
| ALS ID | L2458637-1 | L2472320-1 | YL2000007-001 | L2498968-1 | YL2000124-001 | YL2000189-001 | YL2000256-001 |
| Date Sampled | 8-Jun-2020 9:30 | 6-Jul-2020 15:25 | 3-Aug-2020 9:45 | 1-Sep-2020 14:25 | 15-Oct-2020 15:40 | 3-Nov-2020 17:30 | 2-Dec-2020 17:30 |
| **Parameter** **Units** | **Results** | | | | | | |
| pH pH | 7.59 | 7.7 | 7.62 | 7.63 | 7.66 | 7.24 | 7.57 |
| Total Suspended Solids mg/L | 4.8 | 3.2 | 15.1 | 4.1 | 7.6 | <3.0 | 4 |
| Chloride (Cl) mg/L | 61.1 | 45.4 | 47.7 | 85.6 | 48.4 | 49 | 57.1 |
| Cyanide, Free mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) mg/L | 0.0278 | 0.0166 | <0.0050 | 0.389 | <0.0050 | 0.0171 | <0.0050 |
| Nitrate (as N) mg/L | 0.0628 | <0.0050 | <0.0050 | 1.62 | <0.0050 | 0.513 | <0.0050 |
| Nitrite (as N) mg/L | 0.0013 | <0.0010 | <0.0010 | 0.0057 | <0.0010 | <0.0010 | <0.0010 |
| Orthophosphate-Dissolved (as P) mg/L | <0.0010 | <0.0010 | 0.0014 | <0.0010 | <0.0010 | 0.0031 | <0.0010 |
| Phosphorus (P)-Total mg/L | 0.0227 | <0.050 | 0.0262 | 0.0285 | <0.050 | <0.050 | <0.050 |
| Aluminum (Al)-Total mg/L | 0.0256 | 0.125 | 0.543 | 0.0325 | 0.034 | 0.0113 | 0.0108 |
| Arsenic (As)-Total mg/L | <0.00050 | 0.00026 | 0.00032 | 0.00028 | 0.00026 | 0.00024 | 0.00027 |
| Cadmium (Cd)-Total mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Calcium (Ca)-Total mg/L | 10.6 | 6.37 | 7.26 | 20.2 | 7.55 | 7.34 | 8.48 |
| Chromium (Cr)-Total mg/L | <0.0010 | 0.00036 | 0.00112 | 0.00013 | 0.00011 | 0.00016 | 0.00011 |

| Sample ID | | ST7 | ST7 | ST7 | ST7 | ST7 | ST7 | ST7 |
|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2458637-1 | L2472320-1 | YL2000007-001 | L2498968-1 | YL2000124-001 | YL2000189-001 | YL2000256-001 |
| Date Sampled | | 8-Jun-2020 9:30 | 6-Jul-2020 15:25 | 3-Aug-2020 9:45 | 1-Sep-2020 14:25 | 15-Oct-2020 15:40 | 3-Nov-2020 17:30 | 2-Dec-2020 17:30 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Copper (Cu)-Total | mg/L | 0.0045 | 0.00162 | 0.00261 | 0.00147 | 0.00136 | 0.00176 | 0.00154 |
| Iron (Fe)-Total | mg/L | 0.236 | 0.246 | 0.765 | 0.105 | 0.065 | 0.354 | 0.019 |
| Lead (Pb)-Total | mg/L | 0.0012 | 0.000403 | 0.000743 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | <0.0010 | 0.000128 | 0.000186 | 0.000214 | 0.000186 | 0.000102 | 0.000224 |
| Nickel (Ni)-Total | mg/L | <0.0010 | 0.00068 | 0.00121 | 0.00067 | 0.00051 | 0.00072 | 0.00063 |
| Selenium (Se)-Total | mg/L | <0.000050 | 0.000051 | <0.000050 | 0.000062 | <0.000050 | <0.000050 | <0.000050 |
| Silver (Ag)-Total | mg/L | <0.000020 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Zinc (Zn)-Total | mg/L | <0.0050 | <0.0030 | 0.004 | <0.0030 | <0.0030 | 0.0055 | 0.0057 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | NO | Absent | Absent | Absent |
| Chlorophyll-a* | µg | | | 2.41 | | | | |

** Chlorophyll-a sample collected August 12, 2020 during AEMP sampling program. ALS Lab Work Order VA20B2888.*

**Table D1-12. Water Sampling Monitoring Program Results for January to June 2020 Taken from ST-7a/MMS-4b (HOP-1)**

| Sample ID | | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B ^ | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B |
|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2402894-1 | L2413153-1 | L2413153-3 | L2426271-1 | L2437409-1 | L2447140-1 | L2458639-1 |
| Date Sampled | | 6-Jan-2020 17:05 | 3-Feb-2020 16:30 | 3-Feb-2020 16:30 | 9-Mar-2020 17:00 | 14-Apr-2020 16:30 | 12-May-2020 17:00 | 8-Jun-2020 14:30 |
| **Parameter** | **Units** | **Results** | | | | | | |
| pH | pH | 7.87 | 7.8 | 7.76 | 7.88 | 8.05 | 7.99 | 7.86 |
| Total Suspended Solids | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Chloride (Cl) | mg/L | 110 | 114 | 114 | 117 | 116 | 115 | 139 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) | mg/L | 0.0106 | 0.0106 | 0.0103 | 0.0072 | 0.0273 | 0.0074 | 0.115 |
| Nitrate (as N) | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.178 |
| Nitrite (as N) | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Orthophosphate-Dissolved (as P) | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Phosphorus (P)-Total | mg/L | 0.005 | 0.0038 | 0.0033 | 0.0037 | 0.0033 | 0.0049 | 0.0066 |
| Aluminum (Al)-Total | mg/L | 0.0072 | 0.0084 | 0.0068 | 0.0063 | 0.0052 | 0.0114 | 0.0224 |
| Arsenic (As)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Cadmium (Cd)-Total | mg/L | <0.0000050 | 0.0000075 | <0.0000050 | <0.0000050 | 0.000008 | <0.0000050 | 0.0000181 |
| Calcium (Ca)-Total | mg/L | 15.3 | 15.4 | 15.9 | 15.3 | 15.4 | 14.8 | 15.2 |
| Chromium (Cr)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Copper (Cu)-Total | mg/L | 0.0015 | 0.0027 | 0.0017 | 0.0012 | 0.0021 | 0.0013 | 0.0018 |
| Iron (Fe)-Total | mg/L | <0.030 | <0.030 | <0.030 | <0.030 | <0.030 | <0.030 | 0.127 |
| Lead (Pb)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Mercury (Hg)-Total | mg/L | 0.0000249 | 0.0000088 | 0.0000082 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Nickel (Ni)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Selenium (Se)-Total | mg/L | <0.000050 | <0.000050 | <0.000050 | 0.000053 | <0.000050 | <0.000050 | <0.000050 |
| Silver (Ag)-Total | mg/L | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |

| Sample ID | | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B ^ | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B |
|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2402894-1 | L2413153-1 | L2413153-3 | L2426271-1 | L2437409-1 | L2447140-1 | L2458639-1 |
| Date Sampled | | 6-Jan-2020 17:05 | 3-Feb-2020 16:30 | 3-Feb-2020 16:30 | 9-Mar-2020 17:00 | 14-Apr-2020 16:30 | 12-May-2020 17:00 | 8-Jun-2020 14:30 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Zinc (Zn)-Total | mg/L | 0.0062 | 0.0064 | <0.0050 | <0.0050 | <0.0050 | 0.0067 | 0.0079 |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 3 | 2 | 2 | <2.0 | 2 | 3 | <2.0 |
| Fecal Coliforms | MPN/ 100mL | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | NO | NO | NO | NO |

^ *Indicates duplicate sample.*

**Table D1-13. Water Sampling Monitoring Program Results for July to December 2020 Taken from ST-7a/MMS-4b (HOP-1)**

| Sample ID | | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B |
|---|---|---|---|---|---|---|---|
| ALS ID | | L2471608-1 | L2483423-1 | L2498914-1 | YL2000127-001 | YL2000188-001 | YL2000254-001 |
| Date Sampled | | 7-Jul-2020 15:00 | 3-Aug-2020 17:00 | 2-Sep-2020 15:00 | 15-Oct-2020 14:30 | 3-Nov-2020 16:30 | 4-Dec-2020 11:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| pH | pH | 7.78 | 7.78 | 8.08 | 7.85 | 7.85 | 7.82 |
| Total Suspended Solids | mg/L | <3.0 | 3.5 | <3.0 | <3.0 | <3.0 | <3.0 |
| Chloride (Cl) | mg/L | 65.9 | 95.6 | 94.3 | 95.4 | 100 | 107 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) | mg/L | <0.0050 | <0.0050 | 0.0096 | <0.0050 | 0.0122 | 0.0054 |
| Nitrate (as N) | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Nitrite (as N) | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Orthophosphate-Dissolved (as P) | mg/L | 0.0013 | 0.0011 | <0.0010 | 0.001 | <0.0010 | <0.0010 |
| Phosphorus (P)-Total | mg/L | 0.0037 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Aluminum (Al)-Total | mg/L | 0.0363 | 0.0526 | 0.185 | 0.182 | 0.0428 | 0.0182 |
| Arsenic (As)-Total | mg/L | 0.00023 | 0.00024 | 0.0003 | 0.0003 | 0.00024 | 0.00022 |
| Cadmium (Cd)-Total | mg/L | <0.0000050 | <0.0000050 | 0.0000092 | <0.0000050 | 0.0000056 | <0.0000050 |

| | Sample ID | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B | ST-7A/MMS-4B |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2471608-1 | L2483423-1 | L2498914-1 | YL2000127-001 | YL2000188-001 | YL2000254-001 |
| | Date Sampled | 7-Jul-2020 15:00 | 3-Aug-2020 17:00 | 2-Sep-2020 15:00 | 15-Oct-2020 14:30 | 3-Nov-2020 16:30 | 4-Dec-2020 11:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| Calcium (Ca)-Total | mg/L | 9.26 | 12.9 | 12.9 | 12.9 | 13 | 13.7 |
| Chromium (Cr)-Total | mg/L | 0.00035 | 0.00019 | 0.00044 | 0.00048 | 0.00017 | 0.00016 |
| Copper (Cu)-Total | mg/L | 0.00076 | 0.00098 | 0.00148 | 0.00101 | 0.00113 | 0.00104 |
| Iron (Fe)-Total | mg/L | 0.037 | 0.055 | 0.161 | 0.159 | 0.04 | 0.015 |
| Lead (Pb)-Total | mg/L | <0.000050 | <0.000050 | 0.000075 | 0.00006 | 0.000086 | 0.000064 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.000398 | 0.000639 | 0.000674 | 0.000642 | 0.000685 | 0.000706 |
| Nickel (Ni)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Selenium (Se)-Total | mg/L | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Silver (Ag)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Zinc (Zn)-Total | mg/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0105 | 0.0064 |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 2 | <2.0 | <2.0 | 4 | 3 | 2 |
| Fecal Coliforms | MPN/ 100mL | <1 | <1 | <1 | <1 | <1.0 | <1.0 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | Absent | Absent | Absent |

## Table D1-14. Water Quality Monitoring Program Results for ST-8 (Sewage Treatment Plant), January to June 2020

| | Sample ID | ST8 | ST8 | ST8 | ST8 | ST8 | ST8 | Part F Item 5(b) | |
|---|---|---|---|---|---|---|---|---|---|
| | ALS ID | L2405187-1 | L2415844-1 | L2426269-1 | L2437404-1 | L2447137-1 | L2462438-1 | | |
| | Date Sampled | 14-Jan-2020 6:15 | 11-Feb-2020 7:00 | 10-Mar-2020 7:00 | 15-Apr-2020 6:30 | 13-May-2020 9:00 | 17-Jun-2020 7:45 | Maximum Average Concentration (mg/L) | Maximum Concentration of Any Grab Sample (mg/L) |
| **Parameter** | **Units** | **Results** | | | | | | | |
| pH | pH units | 7.22 | 7.59 | 7.35 | 7.49 | 7.96 | 7.52 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | 100 | 100 |
| Biochemical Oxygen Demand (BOD5) | mg/L | 4 | 4 | 3 | 2 | 3 | 3 | 80 | 160 |
| Fecal Coliforms | CFU/ 100mL | <1 | <1 | <1 | <1 | <1 | <1 | 10,000 | 10,000 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | NO | NO | NO | No Visible Sheen | No Visible Sheen |

*Bold/shading indicates exceedance of Part F Item 5(b) Maximum Concentration.*

## Table D1-15. Water Quality Monitoring Program Results for ST-8, July to December 2020

| | Sample ID | ST8 | ST8 ^ | ST8 | ST8 | ST8 | ST8 | ST8 | Part F Item 5(b) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ALS ID | L2476238-1 | L2476238-2 | L2490397-1 | L2499965-1 | YL2000151-001 | YL2000191-001 | YL2000257-001 | | |
| | Date Sampled | 17-Jul-2020 8:30 | 17-Jul-2020 8:30 | 18-Aug-2020 6:00 | 8-Sep-2020 6:30 | 22-Oct-2020 8:00 | 4-Nov-2020 6:00 | 4-Dec-2020 10:30 | Maximum Average Concentration (mg/L) | Maximum Concentration of Any Grab Sample (mg/L) |
| **Parameter** | **Units** | **Results** | | | | | | | | |
| pH | pH units | 7.21 | 7.19 | 7.3 | 7.57 | 7.35 | 7.27 | 7.55 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | 100 | 100 |
| Biochemical Oxygen Demand (BOD5) | mg/L | 2 | 4 | 5 | <2.0 | <2.0 | <2.0 | 2 | 80 | 160 |
| Fecal Coliforms | CFU/100mL | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 10,000 | 10,000 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | NO | Absent | Absent | Absent | No Visible Sheen | No Visible Sheen |

*Bold/shading indicates exceedance of Part F Item 5(b) Maximum Concentration.*
*^ Indicates duplicate sample.*

**Table D1-16. Treated Effluent Released from the Doris Sewage Treatment Plant (ST-8), 2020**

| Month | Monthly Volume ($m^3$)* | Cumulative Volume ($m^3$)* |
|---|---|---|
| January | 1,434 | 1,434 |
| February | 1,371 | 2,805 |
| March | 1,361 | 4,166 |
| April | 721 | 4,887 |
| May | 585 | 5,472 |
| June | 693 | 6,165 |
| July | 638 | 6,803 |
| August | 655 | 7,458 |
| September | 608 | 8,066 |
| October | 706 | 8,772 |
| November | 714 | 9,486 |
| December | 748 | 10,234 |
| **Total Volume of Treated Effluent Released 2020 ($m^3$)** | | **10,234** |

** Values rounded to nearest whole cubic metre.*

**Table D1-17. Volume of Sludge Removed from the Doris Sewage Treatment Plant, 2020**

| Month | Monthly Volume ($m^3$) | Cumulative Volume ($m^3$) |
|---|---|---|
| January | 32.8 | 32.8 |
| February | 35.0 | 67.8 |
| March | 28.2 | 96.0 |
| April | 23.0 | 119.0 |
| May | 23.9 | 142.9 |
| June | 22.7 | 165.6 |
| July | 28.0 | 193.6 |
| August | 25.3 | 218.9 |
| September | 30.7 | 249.6 |
| October | 31.5 | 281.1 |
| November | 31.3 | 312.4 |
| December | 33.2 | 345.6 |
| **Total Volume of Sludge Produced in 2020 ($m^3$)** | | **345.6** |

** All sewage sludge reported to the TIA for disposal.*

**Table D1-18. Water Quality Monitoring Program Results for ST-9, June and August 2020**

| | Sample ID | ST9 | ST9 ^ | ST9 |
|---|---|---|---|---|
| | ALS ID | L2462438-2 | L2462438-3 | L2490397-2 |
| | Date Sampled | 16-Jun-2020 16:55 | 16-Jun-2020 16:55 | 17-Aug-2020 16:55 |
| **Parameter** | **Units** | **Results** | | |
| pH | pH | 7.55 | 7.59 | 7.79 |
| Total Suspended Solids | mg/L | <3.0 | 9.1 | <3.0 |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 3 | 2 | <2.0 |
| Fecal Coliforms | MPN/100mL | <1.0 | <1.0 | 1 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO |

^ *Indicates duplicate sample.*

## ST-10 Site Runoff from Sediment Controls

Monitoring at Doris Site runoff from sediment controls (ST-10) was not conducted in 2020 as no new infrastructure was constructed at Doris.

No earthworks were conducted in the Doris area in 2020 and no samples were collected.

## ST-11 Reagent and Cyanide Storage Containment Area Sump

This facility was constructed and first used in 2017. The storage area is a lined berm area divided into two cells to allow separation of different chemical products. Each cell has a water collection sump to facilitate water management (ST-11a and ST-11b). Water accumulating in this facility will be discharged directly into the Tailings Impoundment Area (TIA). No water was transferred to the TIA from this facility in 2020 as not enough water accumulated to require dewatering.

Water quality samples were collected from each sump as per Schedule I of the water licence. Results of the sampling are presented in Table D1-19.

**Table D1-19. Water Quality Monitoring Program Results for ST-11, June 2020**

| | Sample ID | ST11-A | ST11-A ^ | ST11-B |
|---|---|---|---|---|
| | ALS ID | L2462239-1 | L2462239-2 | L2458899-1 |
| | Date Sampled | 15-Jun-2020 15:30 | 15-Jun-2020 15:30 | 8-Jun-2020 15:00 |
| **Parameter** | **Units** | **Results** | | |
| pH | pH | 7.94 | 7.96 | 8.11 |
| Total Suspended Solids | mg/L | 3.1 | 3.5 | 4 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | <0.0050 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) | mg/L | 0.0167 | 0.0167 | 0.0207 |
| Aluminum (Al)-Total | mg/L | 0.126 | 0.174 | 0.099 |
| Arsenic (As)-Total | mg/L | 0.00116 | 0.00123 | 0.00189 |
| Cadmium (Cd)-Total | mg/L | 0.0000084 | 0.0000074 | 0.0000081 |
| Calcium (Ca)-Total | mg/L | 23 | 23 | 44.1 |

| | Sample ID | ST11-A | ST11-A ^ | ST11-B |
|---|---|---|---|---|
| | ALS ID | L2462239-1 | L2462239-2 | L2458899-1 |
| | Date Sampled | 15-Jun-2020 15:30 | 15-Jun-2020 15:30 | 8-Jun-2020 15:00 |
| **Parameter** | **Units** | **Results** | | |
| Chromium (Cr)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 |
| Copper (Cu)-Total | mg/L | 0.0019 | 0.0025 | 0.0033 |
| Iron (Fe)-Total | mg/L | 0.191 | 0.309 | 0.159 |
| Lead (Pb)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.0028 | 0.0029 | 0.0066 |
| Nickel (Ni)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 |
| Selenium (Se)-Total | mg/L | 0.000273 | 0.000221 | 0.000639 |
| Silver (Ag)-Total | mg/L | <0.000020 | <0.000020 | <0.000020 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 |
| Zinc (Zn)-Total | mg/L | 0.0059 | 0.0068 | <0.0050 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO |
| Benzene | mg/L | <0.00050 | <0.00050 | <0.00050 |
| Toluene | mg/L | <0.00045 | <0.00045 | <0.00045 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | <0.00050 |

^ *Indicates duplicate sample.*

## Hydrology Monitoring – Doris Lake Water Level and Ice Thickness (ST-12) and Doris Creek Flow (TL-2)

Lake level monitoring in Doris Lake (ST-12) and stream flow monitoring in Doris Creek (TL-2) was conducted in 2020 as outlined in Schedule I of the licence. Stations were visited throughout the open water season to perform water level surveys and manual discharge measurements. Water level surveys are performed using an engineer's level and stadia rod using a minimum of three local bench marks at each station. All bench marks are tied to geodetic elevation. Manual discharge measurements were performed using the velocity area method with an OTT MF Pro electromagnetic current meter. Details regarding the standard methods used for installation of hydrometric stations, development of stage-discharge rating equations, and daily flow hydrographs can be found in the Doris North Project 2013 Hydrology Compliance Monitoring Report (ERM 2014).

### Doris Lake Station (ST-12)

Doris Lake-2 monitoring station collected data from January 1 through to December 31, 2020 and continues to collect data. In September of 2017, the Doris Lake monitoring location was moved to the north to facilitate the installation of two, year-round pressure transducers and to avoid potential interactions with mine construction. The new location was named Doris Lake-2 (13W 433547 7558601) and consists of two Solinst Leveloggers installed at depths of approximately 7 metres to monitor lake level year round. The Leveloggers are coupled with a Solinst Barologger, located at Doris Camp, to compensate for changes in atmospheric pressure. The Leveloggers and Barologger record a pressure reading every 15 minutes. TMAC personnel performed under ice water level surveys on April 9 and May 4. Four water level surveys were performed between June 19 and October 1, 2020 to confirm the proper functioning of the pressure transducer. Table D1-20 provides the results of this monitoring.

## Table D1-20. Summary of Doris Lake Mean Daily Water Levels, in Metres above Sea Level (masl), 2020

| Date | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 21.735 | 21.723 | 21.715 | 21.682 | 21.657 | 21.647 | 22.120 | 21.832 | 21.729 | 21.745 | 21.749 | 21.788 |
| 2 | 21.728 | 21.720 | 21.707 | 21.690 | 21.655 | 21.647 | 22.109 | 21.826 | 21.727 | 21.741 | 21.749 | 21.776 |
| 3 | 21.744 | 21.725 | 21.701 | 21.681 | 21.651 | 21.650 | 22.097 | 21.822 | 21.733 | 21.748 | 21.750 | 21.799 |
| 4 | 21.748 | 21.726 | 21.704 | 21.675 | 21.646 | 21.649 | 22.083 | 21.814 | 21.734 | 21.741 | 21.740 | 21.774 |
| 5 | 21.744 | 21.729 | 21.701 | 21.676 | 21.649 | 21.650 | 22.072 | 21.806 | 21.735 | 21.737 | 21.740 | 21.791 |
| 6 | 21.734 | 21.717 | 21.704 | 21.676 | 21.654 | 21.658 | 22.060 | 21.799 | 21.734 | 21.731 | 21.750 | 21.785 |
| 7 | 21.731 | 21.722 | 21.707 | 21.668 | 21.642 | 21.666 | 22.044 | 21.794 | 21.742 | 21.733 | 21.746 | 21.796 |
| 8 | 21.729 | 21.719 | 21.709 | 21.662 | 21.646 | 21.672 | 22.033 | 21.788 | 21.738 | 21.733 | 21.746 | 21.787 |
| 9 | 21.733 | 21.717 | 21.694 | 21.671 | 21.654 | 21.694 | 22.022 | 21.778 | 21.724 | 21.734 | 21.742 | 21.790 |
| 10 | 21.734 | 21.715 | 21.694 | 21.669 | 21.659 | 21.722 | 22.007 | 21.775 | 21.732 | 21.734 | 21.750 | 21.801 |
| 11 | 21.732 | 21.717 | 21.693 | 21.665 | 21.655 | 21.754 | 22.003 | 21.769 | 21.733 | 21.725 | 21.749 | 21.809 |
| 12 | 21.725 | 21.716 | 21.696 | 21.671 | 21.651 | 21.801 | 21.995 | 21.766 | 21.728 | 21.728 | 21.755 | 21.799 |
| 13 | 21.726 | 21.718 | 21.704 | 21.668 | 21.652 | 21.881 | 21.981 | 21.761 | 21.729 | 21.738 | 21.747 | 21.800 |
| 14 | 21.725 | 21.716 | 21.695 | 21.658 | 21.649 | 21.973 | 21.975 | 21.756 | 21.732 | 21.741 | 21.755 | 21.804 |
| 15 | 21.721 | 21.713 | 21.681 | 21.664 | 21.656 | 22.049 | 21.966 | 21.753 | 21.724 | 21.748 | 21.750 | 21.804 |
| 16 | 21.719 | 21.705 | 21.683 | 21.670 | 21.653 | 22.102 | 21.955 | 21.754 | 21.727 | 21.748 | 21.750 | 21.813 |
| 17 | 21.724 | 21.698 | 21.688 | 21.666 | 21.654 | 22.145 | 21.944 | 21.756 | 21.730 | 21.747 | 21.762 | 21.814 |
| 18 | 21.725 | 21.708 | 21.690 | 21.668 | 21.656 | 22.174 | 21.941 | 21.759 | 21.732 | 21.752 | 21.759 | 21.806 |
| 19 | 21.722 | 21.712 | 21.694 | 21.661 | 21.657 | 22.193 | 21.931 | 21.756 | 21.735 | 21.753 | 21.763 | 21.812 |
| 20 | 21.722 | 21.706 | 21.691 | 21.658 | 21.650 | 22.213 | 21.919 | 21.746 | 21.728 | 21.749 | 21.765 | 21.817 |
| 21 | 21.726 | 21.707 | 21.675 | 21.661 | 21.653 | 22.215 | 21.915 | 21.745 | 21.732 | 21.747 | 21.765 | 21.809 |
| 22 | 21.728 | 21.708 | 21.675 | 21.661 | 21.654 | 22.222 | 21.908 | 21.745 | 21.736 | 21.750 | 21.769 | 21.808 |
| 23 | 21.722 | 21.707 | 21.684 | 21.657 | 21.654 | 22.219 | 21.898 | 21.741 | 21.736 | 21.757 | 21.776 | 21.819 |
| 24 | 21.714 | 21.707 | 21.686 | 21.659 | 21.653 | 22.210 | 21.894 | 21.743 | 21.743 | 21.748 | 21.782 | 21.809 |
| 25 | 21.718 | 21.707 | 21.689 | 21.663 | 21.653 | 22.204 | 21.885 | 21.739 | 21.740 | 21.760 | 21.779 | 21.806 |
| 26 | 21.712 | 21.704 | 21.675 | 21.663 | 21.649 | 22.194 | 21.874 | 21.733 | 21.737 | 21.746 | 21.784 | 21.805 |
| 27 | 21.721 | 21.706 | 21.685 | 21.665 | 21.647 | 22.174 | 21.873 | 21.727 | 21.744 | 21.747 | 21.786 | 21.815 |
| 28 | 21.713 | 21.702 | 21.684 | 21.654 | 21.649 | 22.163 | 21.861 | 21.731 | 21.743 | 21.751 | 21.789 | 21.802 |
| 29 | 21.720 | 21.710 | 21.680 | 21.644 | 21.651 | 22.150 | 21.850 | 21.735 | 21.732 | 21.743 | 21.788 | 21.802 |

| Date | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 21.720 | | 21.680 | 21.652 | 21.648 | 22.130 | 21.843 | 21.730 | 21.741 | 21.744 | 21.779 | 21.801 |
| 31 | 21.718 | | 21.677 | | 21.648 | | 21.839 | 21.737 | | 21.750 | | 21.805 |
| Minimum | 21.726 | 21.713 | 21.692 | 21.666 | 21.652 | 21.961 | 21.965 | 21.765 | 21.734 | 21.744 | 21.760 | 21.802 |
| Maximum | 21.748 | 21.729 | 21.715 | 21.690 | 21.659 | 22.222 | 22.120 | 21.832 | 21.744 | 21.760 | 21.789 | 21.819 |
| Mean | 21.712 | 21.698 | 21.675 | 21.644 | 21.642 | 21.647 | 21.839 | 21.727 | 21.724 | 21.725 | 21.740 | 21.774 |

Ice thickness measurements were collected in April 2020 at monitoring station ST-12 as per Schedule I, Table 2. Ice thickness of Doris Lake was 182 cm.

### Doris Creek Flow (TL-2)

The Doris Creek stream flow monitoring station TL-2 (13W 434059 7559504) was reactivated on June 29 after being deactivated during the winter. The station uses an INW PT2X vented pressure transducer, recording water level readings every 15 minutes. The station operated during the open water season until October 9, when the station was deactivated for winter. During the 2020 open water season, TMAC personnel made a combined 5 visits to the station. Water level (stage) measured by the pressure transducer every 15 minutes was converted to discharge using a stage-discharge curve, also known as a rating curve. The rating curve at TL-2 is well established, with small changes from year to year due to aggradation and scour of the channel. No adjustment to the rating curve was necessary in 2020. Flow during periods that were not observed during the 2020 open water season was estimated using a linear regression between Doris Lake water level and monitored flow at TL-2, and exponential growth/decay curves from June 10 to 28 and October 9 to November 9. It is estimated that there is no flow in Doris Creek prior to June 10 or after November 9. Discharge at the TL-2 hydrometric monitoring station is reported as mean daily discharge in cubic meters per second ($m^3/s$). Table D1-21 provides the results of this monitoring.

## TL-1 TIA Monitoring

This section presents the results of monitoring of the Tailings Impoundment Area (TIA) as per the applicable sections of Part F (Conditions Applying to Waste Deposit and Waste Management), Part I (Conditions Applying to General and Aquatic Effects Monitoring) and Schedule I of the water licence.

Dewatering of the TIA to Roberts Bay through the Roberts Bay Discharge System (RBDS) occurred between February 1 and August 12, 2020. Table D1-22 provides the volume of water discharged from the TIA to Roberts Bay in 2020. Water quality sampling and Acute Lethality testing was conducted as outlined in the Metal and Diamond Mining Effluent Regulations; no exceedance of the discharge criteria occurred.

Tailings deposition into the TIA continued throughout the year. Reclaim water was utilized to support the milling process. Table D1-23 provides the volume of reclaim water obtained from the TIA for process water in 2020.

Water quality samples were collected at the TIA Reclaim Pipeline monitoring station TL-1 from January to December from a sample port on the reclaim pump. Sampling results are provided in Table D1-24 and Table D1-25.

## TL-5, TL6 and TL7a/b Tailings Monitoring

This section presents the results of monitoring of the Tailings as per the applicable sections of Part I (Conditions Applying to General and Aquatic Effects Monitoring) and Schedule I of the water licence.

Samples of effluent from the Process Plant (TL-5) were collected from January to December 2020. These samples were collected monthly from the tailings thickener tank inside the Process Plant prior to discharge to the Tailings Impoundment Area. A clean container was used to collect a representative sample of tailings material from the tailings thickener tank and the solid material allowed to settle. The remaining supernatant (the liquid effluent of the discharged tailings) was collected and submitted for laboratory analysis. Results of monitoring conducted at TL-5 are presented in Table D1-26 and Table D1-27.

**Table D1-21. Summary of Doris Creek (TL-2) Daily Flow Rate, in Cubic Metres per Second ($m^3/s$), 2020**

| Date | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *0* | *0* | *0* | *0* | *0* | - | 1.641 | 0.479 | 0.237 | 0.312 | 0.001 | *0* |
| 2 | *0* | *0* | *0* | *0* | *0* | - | 1.569 | 0.462 | 0.233 | 0.313 | 0.001 | *0* |
| 3 | *0* | *0* | *0* | *0* | *0* | - | 1.509 | 0.445 | 0.211 | 0.313 | 0.001 | *0* |
| 4 | *0* | *0* | *0* | *0* | *0* | - | 1.457 | 0.433 | 0.242 | 0.309 | 0.001 | *0* |
| 5 | *0* | *0* | *0* | *0* | *0* | - | 1.403 | 0.427 | 0.256 | 0.308 | 0.000 | *0* |
| 6 | *0* | *0* | *0* | *0* | *0* | - | 1.343 | 0.410 | 0.260 | 0.303 | 0.000 | *0* |
| 7 | *0* | *0* | *0* | *0* | *0* | - | 1.299 | 0.388 | 0.261 | 0.302 | 0.000 | *0* |
| 8 | *0* | *0* | *0* | *0* | *0* | - | 1.233 | 0.378 | 0.260 | 0.293 | 0.000 | *0* |
| 9 | *0* | *0* | *0* | *0* | *0* | - | 1.185 | 0.365 | 0.269 | 0.290 | 0.000 | *0* |
| 10 | *0* | *0* | *0* | *0* | *0* | 0.000 | 1.143 | 0.344 | 0.268 | 0.228 | 0.000^ | *0* |
| 11 | *0* | *0* | *0* | *0* | *0* | 0.000 | 1.106 | 0.338 | 0.258 | 0.179 | - | *0* |
| 12 | *0* | *0* | *0* | *0* | *0* | 0.001* | 1.064 | 0.331 | 0.263 | 0.140 | - | *0* |
| 13 | *0* | *0* | *0* | *0* | *0* | 0.004 | 1.020 | 0.314 | 0.262 | 0.110 | - | *0* |
| 14 | *0* | *0* | *0* | *0* | *0* | 0.012 | 0.981 | 0.303 | 0.259 | 0.087 | - | *0* |
| 15 | *0* | *0* | *0* | *0* | *0* | 0.040 | 0.943 | 0.281 | 0.250 | 0.068 | - | *0* |
| 16 | *0* | *0* | *0* | *0* | *0* | 0.134 | 0.910 | 0.256 | 0.262 | 0.053 | - | *0* |
| 17 | *0* | *0* | *0* | *0* | *0* | 1.475 | 0.879 | 0.275 | 0.235 | 0.042 | - | *0* |
| 18 | *0* | *0* | *0* | *0* | *0* | 1.673 | 0.843 | 0.283 | 0.253 | 0.033 | - | *0* |
| 19 | *0* | *0* | *0* | *0* | *0* | 1.811 | 0.817 | 0.296 | 0.265 | 0.026 | - | *0* |
| 20 | *0* | *0* | *0* | *0* | *0* | 1.907 | 0.794 | 0.294 | 0.268 | 0.020 | - | *0* |
| 21 | *0* | *0* | *0* | *0* | *0* | 2.008 | 0.755 | 0.282 | 0.272 | 0.016 | - | *0* |
| 22 | *0* | *0* | *0* | *0* | *0* | 2.018 | 0.721 | 0.268 | 0.278 | 0.013 | - | *0* |
| 23 | *0* | *0* | *0* | *0* | *0* | 2.052 | 0.699 | 0.264 | 0.285 | 0.010 | - | *0* |
| 24 | *0* | *0* | *0* | *0* | *0* | 2.035 | 0.676 | 0.258 | 0.292 | 0.008 | - | *0* |
| 25 | *0* | *0* | *0* | *0* | *0* | 1.993 | 0.637 | 0.252 | 0.295 | 0.006 | - | *0* |
| 26 | *0* | *0* | *0* | *0* | *0* | 1.959 | 0.623 | 0.253 | 0.305 | 0.005 | - | *0* |
| 27 | *0* | *0* | *0* | *0* | *0* | 1.912 | 0.599 | 0.241 | 0.306 | 0.004 | - | *0* |
| 28 | *0* | *0* | *0* | *0* | *0* | 1.811 | 0.566 | 0.235 | 0.313 | 0.003 | - | *0* |
| 29 | *0* | | *0* | *0* | *0* | 1.763 | 0.548 | 0.220 | 0.319 | 0.002 | - | *0* |

| Date | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | *0* | | *0* | *0* | *0* | 1.713 | 0.521 | 0.224 | 0.318 | 0.002 | - | *0* |
| 31 | *0* | | *0* | | *0* | | 0.499 | 0.236 | | 0.001 | | *0* |
| Minimum | 0 | 0 | 0 | 0 | 0 | 1.253 | 0.967 | 0.317 | 0.269 | 0.123 | 0.000 | 0 |
| Maximum | 0 | 0 | 0 | 0 | 0 | 2.052 | 1.641 | 0.479 | 0.319 | 0.313 | 0.001 | 0 |
| Mean | 0 | 0 | 0 | 0 | 0 | 0.000 | 0.499 | 0.220 | 0.211 | 0.001 | 0.000 | 0 |

*Note: Estimated and modelled values are italicized. Estimated data were determined using linear regression with Doris Lake elevations.*
*Monitored data were observed using stage data collected by the TL-2 pressure transducer, converted to discharge using a rating curve that was developed using stage and discharge measurements from 2017-2020.*
**Assumed start of flow.*
*^Assumed end of flow.*

### Table D1-22. Volume of Water Pumped from TIA to WWTF, 2020

| Month | Number of Days of Discharge | Discharge Volume ($m^3$) | Exceedances of Discharge Criteria* |
|---|---|---|---|
| January | 0 | 0 | 0 |
| February | 29 | 154,211 | 0 |
| March | 31 | 172,675 | 0 |
| April | 30 | 165,578 | 0 |
| May | 31 | 167,282 | 0 |
| June | 30 | 147,624 | 0 |
| July | 31 | 170,302 | 0 |
| August | 12 | 67,952 | 0 |
| September | 0 | 0 | 0 |
| October | 0 | 0 | 0 |
| November | 0 | 0 | 0 |
| December | 0 | 0 | 0 |
| **Annual Cumulative** | **194** | **1,045,624** | **0** |

** Discharge criteria as outlined in Metal and Diamond Mining Effluent Regulations.*
*Acute Lethality testing conducted as per Part F Item 22 and Part I Item 14.*

**Table D1-23. Volume of Reclaim Water Used to Support Mill Processing, 2020**

| Month | Monthly Volume ($m^3$)* | Cumulative Volume ($m^3$)* |
|---|---|---|
| January | 76,601 | 76,601 |
| February | 64,317 | 140,918 |
| March | 67,732 | 208,650 |
| April | 68,825 | 277,475 |
| May | 67,457 | 344,932 |
| June | 62,787 | 407,719 |
| July | 65,822 | 473,541 |
| August | 60,015 | 533,556 |
| September | 45,973 | 579,529 |
| October | 71,946 | 651,475 |
| November | 80,145 | 731,620 |
| December | 86,495 | 818,115 |
| **Volume of Reclaim Water Used in Mill Processing, 2020 ($m^3$)** | | **818,115** |

** Values rounded to nearest whole cubic metre.*

**Table D1-24. Water Quality in the Tailings Impoundment Area (TL-1), January to June 2020**

| | Sample ID | TL1 | TL1 | TL1 | TL1 | TL1 | TL1 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2402830-1 | L2413197-1 | L2423271-1 | L2435046-1 | L2444630-1 | L2456734-1 |
| | Date Sampled | 6-Jan-2020 17:50 | 3-Feb-2020 18:00 | 2-Mar-2020 15:20 | 6-Apr-2020 12:40 | 5-May-2020 16:55 | 2-Jun-2020 11:00 |
| **Parameter** | **Units** | **Results** | | | | | |
| pH | pH | 8.12 | 7.56 | 7.83 | 8.13 | 8.03 | 7.94 |
| Total Suspended Solids | mg/L | 7 | 6.5 | 7.4 | 5.8 | 10.2 | 11.1 |
| Total Dissolved Solids | mg/L | 4990 | 5570 | 5490 | 5730 | 5410 | 5180 |
| Chloride (Cl) | mg/L | 2250 | 2470 | 2590 | 2490 | 2620 | 2350 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.21 |
| Cyanide, Total | mg/L | 0.444 | 0.202 | 0.179 | 0.159 | 0.178 | 0.506 |
| Ammonia, Total (as N) | mg/L | 10.5 | 9.02 | 9.52 | 9.04 | 9.25 | 10.3 |
| Nitrate (as N) | mg/L | 6.35 | 4.96 | 4.73 | 4.63 | 4.7 | 5.58 |

| | Sample ID | TL1 | TL1 | TL1 | TL1 | TL1 | TL1 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2402830-1 | L2413197-1 | L2423271-1 | L2435046-1 | L2444630-1 | L2456734-1 |
| | Date Sampled | 6-Jan-2020 17:50 | 3-Feb-2020 18:00 | 2-Mar-2020 15:20 | 6-Apr-2020 12:40 | 5-May-2020 16:55 | 2-Jun-2020 11:00 |
| **Parameter** | **Units** | **Results** | | | | | |
| Nitrite (as N) | mg/L | 0.34 | 0.293 | 0.204 | 0.236 | 0.21 | 0.216 |
| Orthophosphate-Dissolved (as P) | mg/L | 0.001 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.0015 |
| Phosphorus (P)-Total | mg/L | 0.0693 | <0.30 | 0.0406 | <0.30 | 0.0484 | <0.30 |
| Aluminum (Al)-Total | mg/L | 0.119 | 0.102 | 0.121 | 0.075 | 0.066 | 0.139 |
| Arsenic (As)-Total | mg/L | 0.00174 | 0.00131 | 0.00174 | 0.00133 | 0.00217 | 0.00242 |
| Cadmium (Cd)-Total | mg/L | <0.000025 | 0.000027 | 0.000037 | <0.000025 | <0.000025 | <0.000025 |
| Calcium (Ca)-Total | mg/L | 195 | 242 | 216 | 229 | 220 | 212 |
| Chromium (Cr)-Total | mg/L | <0.0010 | <0.0010 | 0.0013 | <0.0010 | <0.0010 | 0.001 |
| Copper (Cu)-Total | mg/L | 0.0624 | 0.0637 | 0.0689 | 0.0569 | 0.0543 | 0.295 |
| Iron (Fe)-Total | mg/L | 0.602 | 0.789 | 1.52 | 1.18 | 1.41 | 1.58 |
| Lead (Pb)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Magnesium (Mg)-Total | mg/L | 145 | 155 | 150 | 148 | 149 | 147 |
| Mercury (Hg)-Total | mg/L | 0.000019 | 0.0000112 | 0.0000065 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.0155 | 0.0102 | 0.0092 | 0.01 | 0.0094 | 0.0117 |
| Nickel (Ni)-Total | mg/L | 0.0137 | 0.0099 | 0.0102 | 0.0098 | 0.0092 | 0.0282 |
| Potassium (K)-Total | mg/L | 58.7 | 54.6 | 50.3 | 53.1 | 54.7 | 58.5 |
| Selenium (Se)-Total | mg/L | 0.00047 | 0.00036 | 0.00054 | 0.0004 | 0.00028 | 0.00056 |
| Silver (Ag)-Total | mg/L | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | 0.00025 |
| Sodium (Na)-Total | mg/L | 1460 | 1480 | 1410 | 1390 | 1380 | 1430 |
| Thallium (Tl)-Total | mg/L | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Zinc (Zn)-Total | mg/L | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Fecal Coliforms | MPN/100mL | <1 | <1 | <1 | <1 | <1 | <1 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | NO | NO | NO |
| Benzene | mg/L | <0.00050 | 0.00072 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Toluene | mg/L | <0.00045 | 0.00128 | <0.00045 | <0.00045 | <0.00045 | <0.00045 |

| | Sample ID | TL1 | TL1 | TL1 | TL1 | TL1 | TL1 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2402830-1 | L2413197-1 | L2423271-1 | L2435046-1 | L2444630-1 | L2456734-1 |
| | Date Sampled | 6-Jan-2020 17:50 | 3-Feb-2020 18:00 | 2-Mar-2020 15:20 | 6-Apr-2020 12:40 | 5-May-2020 16:55 | 2-Jun-2020 11:00 |
| **Parameter** | **Units** | **Results** | | | | | |
| Ethylbenzene | mg/L | <0.00050 | 0.00087 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Dissolved Oxygen | mg/L | | | | | | |
| Redox Potential | mV | | | | | | |
| Biochemical Oxygen Demand (BOD5) | mg/L | | | | | | |

**Table D1-25. Water Quality in the Tailings Impoundment Area (TL-1), July to December 2020**

| | Sample ID | TL1 | TL1 | TL1 | TL1 | TL1 | TL1 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2471611-1 | L2485657-1 | L2498918-1 | YL2000126-001 | YL2000185-001 | YL2000258-001 |
| | Date Sampled | 7-Jul-2020 16:20 | 6-Aug-2020 12:00 | 2-Sep-2020 16:35 | 15-Oct-2020 16:00 | 3-Nov-2020 14:30 | 4-Dec-2020 10:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| pH | pH | 7.64 | 7.82 | 7.9 | 8.08 | 8.07 | 7.97 |
| Total Suspended Solids | mg/L | 8 | 6.7 | 16.8 | 11.5 | 12 | 23.4 |
| Total Dissolved Solids | mg/L | 5770 | 5300 | 5170 | 3550 | 3900 | 3980 |
| Chloride (Cl) | mg/L | 2500 | 2220 | 2390 | 1620 | 1740 | 2110 |
| Cyanide, Free | mg/L | 0.0706 | 0.0064 | 0.0108 | <0.0050 | <0.0050 | <0.0100 |
| Cyanide, Total | mg/L | 0.319 | 0.189 | 0.0817 | 0.022 | 0.0234 | 0.0619 |
| Ammonia, Total (as N) | mg/L | 10.4 | 10.3 | 9.46 | 4.82 | 4.66 | 5.56 |
| Nitrate (as N) | mg/L | 5.31 | 4.67 | 4.43 | 3.5 | 3.79 | 4.6 |
| Nitrite (as N) | mg/L | 0.156 | 0.136 | 0.191 | 0.114 | 0.0895 | 0.145 |
| Orthophosphate-Dissolved (as P) | mg/L | 0.0019 | 0.0013 | 0.0023 | <0.0010 | 0.0011 | 0.001 |
| Phosphorus (P)-Total | mg/L | 0.0654 | <0.25 | <0.25 | <0.250 | <0.250 | <0.250 |
| Aluminum (Al)-Total | mg/L | 0.123 | 0.086 | 0.068 | 0.0438 | 0.109 | 0.203 |
| Arsenic (As)-Total | mg/L | 0.00264 | 0.00269 | 0.00249 | 0.00186 | 0.00484 | 0.00246 |
| Cadmium (Cd)-Total | mg/L | 0.000026 | <0.000025 | <0.000025 | <0.0000250 | <0.0000250 | <0.0000250 |
| Calcium (Ca)-Total | mg/L | 257 | 244 | 238 | 135 | 172 | 166 |

| | Sample ID | TL1 | TL1 | TL1 | TL1 | TL1 | TL1 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2471611-1 | L2485657-1 | L2498918-1 | YL2000126-001 | YL2000185-001 | YL2000258-001 |
| | Date Sampled | 7-Jul-2020 16:20 | 6-Aug-2020 12:00 | 2-Sep-2020 16:35 | 15-Oct-2020 16:00 | 3-Nov-2020 14:30 | 4-Dec-2020 10:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| Chromium (Cr)-Total | mg/L | 0.00072 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | 0.00064 |
| Copper (Cu)-Total | mg/L | 0.21 | 0.116 | 0.0828 | 0.0748 | 0.0799 | 0.0723 |
| Iron (Fe)-Total | mg/L | 1.76 | 1.05 | 0.725 | 0.522 | 0.654 | 0.759 |
| Lead (Pb)-Total | mg/L | <0.00025 | <0.00025 | <0.00025 | <0.000250 | <0.000250 | <0.000250 |
| Magnesium (Mg)-Total | mg/L | 169 | 152 | 156 | 92.7 | 123 | 123 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.000010 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000250 |
| Molybdenum (Mo)-Total | mg/L | 0.0111 | 0.0123 | 0.0127 | 0.00905 | 0.0099 | 0.0103 |
| Nickel (Ni)-Total | mg/L | 0.0248 | 0.0233 | 0.0226 | 0.0115 | 0.0158 | 0.0155 |
| Potassium (K)-Total | mg/L | 62.3 | 63.2 | 60.8 | 36.1 | 47.5 | 47.1 |
| Selenium (Se)-Total | mg/L | 0.00042 | 0.00045 | 0.00055 | 0.000468 | 0.000439 | 0.000341 |
| Silver (Ag)-Total | mg/L | 0.000201 | 0.00006 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Sodium (Na)-Total | mg/L | 1610 | 1500 | 1470 | 854 | 1240 | 1200 |
| Thallium (Tl)-Total | mg/L | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Zinc (Zn)-Total | mg/L | <0.015 | <0.015 | <0.015 | <0.0150 | <0.0150 | <0.0150 |
| Fecal Coliforms | MPN/100mL | <1 | <1 | <1 | <1 | <1.0 | <1.0 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | Absent | Absent | Absent |
| Benzene | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Toluene | mg/L | <0.00045 | <0.00045 | <0.00045 | <0.00050 | <0.00050 | <0.00050 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Dissolved Oxygen | mg/L | | 10.27 | | | | |
| Redox Potential | mV | | 191 | | | | |
| Biochemical Oxygen Demand (BOD5) | mg/L | | 5 | | | | |

**Table D1-26. Effluent from Process Plant Tailings Slurry Water (TL-5), January to June 2020**

| | Sample ID | TL5 | TL5 | TL5 | TL5 | TL5 | TL5 ^ | TL5 |
|---|---|---|---|---|---|---|---|---|
| | ALS ID | L2402982-1 | L2413105-1 | L2425667-1 | L2435040-1 | L2444686-1 | L2444686-2 | L2458861-1 |
| | Date Sampled | 5-Jan-2020 16:45 | 2-Feb-2020 17:05 | 4-Mar-2020 16:15 | 6-Apr-2020 9:50 | 4-May-2020 10:50 | 4-May-2020 10:50 | 7-Jun-2020 16:00 |
| **Parameter** | **Units** | **Results** | | | | | | |
| pH | pH Units | 8.23 | 8.18 | 8.16 | 8.19 | 8.51 | 8.37 | 8.24 |
| Total Suspended Solids | mg/L | 104 | 15.5 | 39 | 34.6 | 5.6 | 8.2 | 69 |
| Cyanide, Free | mg/L | 0.139 | 0.122 | 0.178 | 0.043 | 1.36 | 1.05 | 0.075 |
| Cyanide, Total | mg/L | 5.52 | 2.79 | 3.08 | 2.8 | 6.49 | 5.26 | 1.56 |
| Cyanide, WAD | mg/L | 0.162 | 0.159 | 0.429 | 0.152 | 2.13 | 1.73 | 0.176 |
| Ammonia, Total (as N) | mg/L | 47.2 | 39.8 | 30.4 | 37 | 48.3 | 46.9 | 31.5 |
| Nitrate (as N) | mg/L | 24.4 | 22.5 | 13.8 | 21.3 | 19.7 | 19.6 | 10.2 |
| Nitrite (as N) | mg/L | 1.25 | 1.18 | 0.79 | 1.14 | 1.15 | 1.15 | 0.393 |
| Sulfate (SO4) | mg/L | 2290 | 1850 | 1360 | 1750 | 2420 | 2410 | 1520 |
| Aluminum (Al)-Total | mg/L | 0.329 | 0.283 | 0.239 | 0.428 | 0.119 | 0.139 | 0.225 |
| Antimony (Sb)-Total | mg/L | 0.003 | 0.0034 | 0.0048 | 0.0047 | 0.0052 | 0.0053 | 0.004 |
| Arsenic (As)-Total | mg/L | 0.0131 | 0.008 | 0.0262 | 0.0377 | 0.0301 | 0.0251 | 0.0393 |
| Barium (Ba)-Total | mg/L | 0.0368 | 0.0441 | 0.0493 | 0.0471 | 0.0495 | 0.0504 | 0.0377 |
| Beryllium (Be)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Bismuth (Bi)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Boron (B)-Total | mg/L | 0.96 | 1.04 | 1.09 | 0.95 | 0.93 | 0.94 | 0.86 |
| Cadmium (Cd)-Total | mg/L | <0.000080 | <0.000050 | <0.000060 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Calcium (Ca)-Total | mg/L | 176 | 203 | 245 | 147 | 147 | 149 | 210 |
| Cesium (Cs)-Total | mg/L | <0.00010 | 0.00018 | 0.00034 | 0.00019 | 0.00059 | 0.00056 | 0.00014 |
| Chromium (Cr)-Total | mg/L | 0.0026 | 0.001 | 0.0018 | 0.0031 | <0.0010 | <0.0010 | 0.0033 |
| Cobalt (Co)-Total | mg/L | 0.0129 | 0.0088 | 0.0173 | 0.0151 | 0.0435 | 0.0429 | 0.0124 |
| Copper (Cu)-Total | mg/L | 0.334 | 0.135 | 0.365 | 0.221 | 1.8 | 1.77 | 0.106 |
| Iron (Fe)-Total | mg/L | 6.06 | 2.96 | 3.65 | 4 | 2.42 | 2.31 | 2.88 |
| Lead (Pb)-Total | mg/L | 0.00079 | 0.00074 | 0.00058 | 0.00108 | <0.00050 | <0.00050 | <0.00050 |
| Lithium (Li)-Total | mg/L | 0.045 | 0.049 | 0.054 | 0.061 | 0.064 | 0.064 | 0.054 |

| | Sample ID | TL5 | TL5 | TL5 | TL5 | TL5 | TL5 ^ | TL5 |
|---|---|---|---|---|---|---|---|---|
| | ALS ID | L2402982-1 | L2413105-1 | L2425667-1 | L2435040-1 | L2444686-1 | L2444686-2 | L2458861-1 |
| | Date Sampled | 5-Jan-2020 16:45 | 2-Feb-2020 17:05 | 4-Mar-2020 16:15 | 6-Apr-2020 9:50 | 4-May-2020 10:50 | 4-May-2020 10:50 | 7-Jun-2020 16:00 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Magnesium (Mg)-Total | mg/L | 150 | 151 | 241 | 153 | 164 | 164 | 177 |
| Manganese (Mn)-Total | mg/L | 0.237 | 0.228 | 0.237 | 0.172 | 0.119 | 0.116 | 0.243 |
| Mercury (Hg)-Total | mg/L | <0.000025 | <0.000025 | 0.0000063 | <0.0000050 | 0.0000071 | 0.0000066 | <0.000025 |
| Molybdenum (Mo)-Total | mg/L | 0.105 | 0.063 | 0.0468 | 0.0541 | 0.0902 | 0.0914 | 0.0721 |
| Nickel (Ni)-Total | mg/L | 0.0163 | 0.0111 | 0.172 | 0.101 | 0.531 | 0.523 | 0.108 |
| Phosphorus (P)-Total | mg/L | <0.50 | <0.50 | <0.50 | <0.50 | 0.53 | <0.50 | <0.50 |
| Potassium (K)-Total | mg/L | 115 | 115 | 131 | 120 | 143 | 143 | 112 |
| Rubidium (Rb)-Total | mg/L | 0.0201 | 0.0383 | 0.048 | 0.0289 | 0.0505 | 0.0505 | 0.0429 |
| Selenium (Se)-Total | mg/L | 0.00151 | 0.00194 | 0.00218 | 0.00206 | 0.00468 | 0.00413 | 0.00278 |
| Silicon (Si)-Total | mg/L | 2.2 | 1.9 | 1.5 | 2.2 | 1.6 | 1.6 | 1.9 |
| Silver (Ag)-Total | mg/L | 0.00056 | 0.00027 | 0.00029 | 0.00106 | 0.00063 | 0.00067 | 0.00015 |
| Sodium (Na)-Total | mg/L | 2470 | 2420 | 2450 | 2130 | 2400 | 2410 | 2080 |
| Strontium (Sr)-Total | mg/L | 1.56 | 1.91 | 2.6 | 1.73 | 1.68 | 1.75 | 1.95 |
| Tellurium (Te)-Total | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Thallium (Tl)-Total | mg/L | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Thorium (Th)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Tin (Sn)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Titanium (Ti)-Total | mg/L | 0.004 | <0.0030 | <0.0030 | 0.0138 | <0.0030 | <0.0030 | <0.0030 |
| Tungsten (W)-Total | mg/L | 0.0037 | 0.0033 | 0.0065 | 0.0044 | 0.0069 | 0.0071 | 0.0044 |
| Uranium (U)-Total | mg/L | 0.00017 | 0.00033 | 0.00067 | 0.00078 | 0.00103 | 0.00102 | 0.00041 |
| Vanadium (V)-Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Zinc (Zn)-Total | mg/L | <0.030 | <0.030 | <0.030 | <0.030 | <0.030 | <0.030 | <0.030 |
| Zirconium (Zr)-Total | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Cyanate | mg/L | 88.2 | 76.2 | 64.5 | 79.2 | 129 | 130 | 59 |
| Thiocyanate | mg/L | 20.3 | 21.4 | 12.9 | 14.9 | 52 | 51.9 | 8.82 |

^ *Indicates duplicate sample.*

**Table D1-27. Effluent from Process Plant Tailings Slurry Water (TL-5), July to December 2020**

| | Sample ID | TL5 | TL5 | TL5 | TL5 | TL5 | TL5 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2472321-1 | YL2000006-001 | L2500031-1 | YL2000153-001 | YL2000198-001 | YL2000261-001 |
| | Date Sampled | 5-Jul-2020 16:45 | 2-Aug-2020 11:25 | 6-Sep-2020 15:00 | 20-Oct-2020 13:45 | 9-Nov-2020 9:25 | 4-Dec-2020 7:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| pH | pH Units | 8 | 8.2 | 8.21 | 8.21 | 8.23 | 8.38 |
| Total Suspended Solids | mg/L | 72.8 | 42.6 | 22.3 | 17.5 | 7.8 | 29.4 |
| Cyanide, Free | mg/L | 1.04 | <0.0100 | <0.10 | <0.200 | <0.200 | 0.0589 |
| Cyanide, Total | mg/L | 4.09 | 0.512 | 2.49 | 3.23 | 2.46 | 3.02 |
| Cyanide, WAD | mg/L | 2.1 | 0.047 | 0.13 | <0.200 | <0.200 | 0.176 |
| Ammonia, Total (as N) | mg/L | 33.5 | 56.3 | 42.6 | 28.3 | 28.2 | 38.4 |
| Nitrate (as N) | mg/L | 15.8 | 5.82 | 13.7 | 18 | 12.9 | 18.6 |
| Nitrite (as N) | mg/L | 0.721 | 0.735 | 0.582 | 1.23 | 0.707 | 0.942 |
| Sulfate (SO4) | mg/L | 1780 | 10300 | 2030 | 1520 | 1810 | 2080 |
| Aluminum (Al)-Total | mg/L | 1.02 | 0.119 | 0.337 | 0.471 | 0.188 | 0.605 |
| Antimony (Sb)-Total | mg/L | 0.0041 | 0.0061 | 0.0033 | 0.00587 | 0.00423 | 0.0058 |
| Arsenic (As)-Total | mg/L | 0.202 | 0.0158 | 0.0098 | 0.00608 | 0.00443 | 0.0496 |
| Barium (Ba)-Total | mg/L | 0.043 | 0.0595 | 0.0428 | 0.0272 | 0.0373 | 0.0339 |
| Beryllium (Be)-Total | mg/L | <0.0010 | <0.00200 | <0.0010 | <0.00100 | <0.000500 | <0.00100 |
| Bismuth (Bi)-Total | mg/L | <0.00050 | <0.00100 | <0.00050 | <0.000500 | <0.000250 | <0.000500 |
| Boron (B)-Total | mg/L | 0.95 | 0.808 | 1.04 | 0.787 | 0.897 | 0.889 |
| Cadmium (Cd)-Total | mg/L | 0.000055 | <0.000100 | <0.000050 | <0.0000500 | <0.0000300 | 0.000153 |
| Calcium (Ca)-Total | mg/L | 191 | 202 | 173 | 120 | 141 | 149 |
| Cesium (Cs)-Total | mg/L | 0.00034 | <0.000200 | 0.00018 | 0.000506 | 0.000298 | 0.000165 |
| Chromium (Cr)-Total | mg/L | 0.0132 | 0.00805 | 0.0021 | <0.00100 | 0.00068 | 0.00353 |
| Cobalt (Co)-Total | mg/L | 0.0634 | 0.0372 | 0.012 | 0.0111 | 0.00711 | 0.0205 |
| Copper (Cu)-Total | mg/L | 1.61 | 2.35 | 0.0858 | 0.139 | 0.0945 | 0.262 |
| Iron (Fe)-Total | mg/L | 11.9 | 2.38 | 3.56 | 2.58 | 1.49 | 9.91 |
| Lead (Pb)-Total | mg/L | 0.00198 | 0.00339 | <0.00050 | <0.000500 | <0.000250 | 0.001 |
| Lithium (Li)-Total | mg/L | 0.05 | 0.0513 | 0.044 | 0.0206 | 0.0295 | 0.0373 |

| | Sample ID | TL5 | TL5 | TL5 | TL5 | TL5 | TL5 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2472321-1 | YL2000006-001 | L2500031-1 | YL2000153-001 | YL2000198-001 | YL2000261-001 |
| | Date Sampled | 5-Jul-2020 16:45 | 2-Aug-2020 11:25 | 6-Sep-2020 15:00 | 20-Oct-2020 13:45 | 9-Nov-2020 9:25 | 4-Dec-2020 7:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| Magnesium (Mg)-Total | mg/L | 183 | 121 | 161 | 122 | 117 | 128 |
| Manganese (Mn)-Total | mg/L | 0.275 | 0.525 | 0.208 | 0.105 | 0.111 | 0.166 |
| Mercury (Hg)-Total | mg/L | <0.000025 | 0.000041 | <0.00010 | <0.000100 | <0.0000500 | <0.0000250 |
| Molybdenum (Mo)-Total | mg/L | 0.0701 | 0.0307 | 0.0719 | 0.0445 | 0.0319 | 0.0392 |
| Nickel (Ni)-Total | mg/L | 0.639 | 0.144 | 0.0421 | 0.0448 | 0.0564 | 0.092 |
| Phosphorus (P)-Total | mg/L | 0.62 | <1.00 | 0.89 | <0.500 | 0.387 | 0.523 |
| Potassium (K)-Total | mg/L | 148 | 62 | 120 | 119 | 94 | 93.9 |
| Rubidium (Rb)-Total | mg/L | 0.0389 | 0.0192 | 0.0388 | 0.0372 | 0.0397 | 0.0347 |
| Selenium (Se)-Total | mg/L | 0.00586 | 0.00323 | 0.00431 | 0.00325 | 0.00282 | 0.0049 |
| Silicon (Si)-Total | mg/L | 2.9 | 2.94 | 2.2 | 2.7 | 1.31 | 2.17 |
| Silver (Ag)-Total | mg/L | 0.00062 | 0.00678 | 0.00024 | 0.000767 | 0.000176 | 0.00101 |
| Sodium (Na)-Total | mg/L | 2350 | 6090 | 2260 | 1700 | 1810 | 2040 |
| Strontium (Sr)-Total | mg/L | 1.73 | 1.87 | 1.6 | 1.07 | 1.2 | 1.24 |
| Tellurium (Te)-Total | mg/L | <0.0020 | <0.00400 | <0.0020 | <0.00200 | <0.00100 | <0.00200 |
| Thallium (Tl)-Total | mg/L | <0.00010 | <0.000200 | <0.00010 | <0.000100 | <0.000050 | <0.000100 |
| Thorium (Th)-Total | mg/L | <0.0010 | <0.00200 | <0.0010 | <0.00100 | <0.00050 | <0.00100 |
| Tin (Sn)-Total | mg/L | <0.0010 | <0.00200 | <0.0010 | <0.00100 | <0.00050 | <0.00100 |
| Titanium (Ti)-Total | mg/L | 0.0122 | <0.00600 | <0.0030 | <0.0171 | <0.00150 | 0.00574 |
| Tungsten (W)-Total | mg/L | 0.0051 | 0.00762 | 0.003 | 0.00625 | 0.00539 | 0.00976 |
| Uranium (U)-Total | mg/L | 0.00087 | <0.000200 | 0.00025 | 0.000176 | 0.000399 | 0.000353 |
| Vanadium (V)-Total | mg/L | 0.0057 | <0.0100 | <0.0050 | <0.00500 | <0.00250 | <0.00500 |
| Zinc (Zn)-Total | mg/L | <0.030 | <0.0600 | <0.030 | <0.0300 | <0.0150 | 0.0561 |
| Zirconium (Zr)-Total | mg/L | <0.0020 | <0.00400 | <0.0020 | <0.00200 | <0.00100 | <0.00200 |
| Cyanate | mg/L | 55.2 | 157 | 95.7 | 61.2 | 46.6 | 67 |
| Thiocyanate | mg/L | 32.5 | 15.6 | 231 | 31.8 | 14.5 | 14.7 |

Samples of the tailings solids (TL-6) were collected weekly from the tailings thickener tank inside the Process Plant from January to December 2020. A clean container was used to collect a representative sample of tailings material from the tailings thickener tank and the solid material allowed to settle in the container. The supernatant was then discarded and the solid materials transferred into a clean Ziploc bag and refrigerated until four weekly samples had been collected. These weekly samples were then combined to create a composite sample which was submitted for laboratory analysis. Table D1-28 and Table D1-29 provide results for monitoring conducted at TL-6.

Detoxified tailings solids (TL-7a) were collected monthly from January to December 2020 from the discharge compartment of the detox filter press inside the Process Plant (Table D1-30 and Table D1-31). Filtrate from the detoxified solids (TL-7b) was collected monthly from January to December 2020 from the receiving filtrate tank for the detox filter press inside the Process Plant (Table D1-32 and Table D1-33).

## TL-11 Underground Seepage Monitoring

Visual inspections were conducted of all safely accessible backfilled underground stopes in July and December 2020 to identify seepage (TL-11) from the stopes. In July, seepage was observed and sampled at two locations during the inspection; two additional samples were collected at locations with pooling water to provide additional characterization of water underground near backfilled materials. In December, two flowing seeps were identified and samples were collected at each location. Results of this sampling is provided in Table D1-34 and Table D1-35.

## TL-12 Monitoring of Underground Dewatering

Dewatering of the Doris underground workings continued in 2020. Groundwater inflow accumulating underground from mine development occurring in the Doris Connector and Doris Central zones was discharged to Roberts Bay through the Roberts Bay Discharge System (RBDS) from February to August 2020. Dewatering of the Doris underground workings to the Tailings Impoundment Area continued in 2020.

Table D-36 provides the dewatering volumes for the Doris mine in 2020. Water quality samples were collected weekly and submitted for laboratory analysis as outlined in Schedule I of the water licence. Results of this sampling is provided in Table D1-37 through Table D1-40.

## Table D1-28. Effluent from Process Plant Tailings Slurry Solids (TL-6), January to May 2020

| | Sample ID | TL6 | TL6 | TL6 | TL6 | TL6 | TL6^ |
|---|---|---|---|---|---|---|---|
| | ALS ID | C002161 | XJ1119 | XN5637 | C025600 | XT4005 | XT4006 |
| | Date Sampled | 5-Jan-2020 | 2-Feb-2020 | 4-Mar-2020 | 5-Apr-2020 | 11-May-2020 | 11-May-2020 |
| Parameter | Units | Results | | | | | |
| Aluminum (Al) | % | 0.89 | 0.79 | 0.8 | 1 | 0.99 | 0.97 |
| Antimony (Sb) | mg/kg | <0.1 | <0.1 | <0.1 | 0.2 | 0.2 | 0.2 |
| Arsenic (As) | mg/kg | 52.4 | 17.1 | 30.4 | 109 | 107 | 106 |
| Barium (Ba) | mg/kg | 10 | 8 | 11 | 9 | 14 | 9 |
| Bismuth (Bi) | mg/kg | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Boron (B) | mg/kg | <20 | 38 | <20 | <20 | 25 | 30 |
| Cadmium (Cd) | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Calcium (Ca) | % | 4.05 | 4.87 | 4.87 | 3.97 | 4.89 | 4.76 |
| Chromium (Cr) | mg/kg | 64 | 68 | 56 | 97 | 88 | 84 |
| Cobalt (Co) | mg/kg | 18 | 15 | 12.6 | 17.4 | 21 | 20.6 |
| Copper (Cu) | mg/kg | 128 | 81.6 | 45.5 | 43.6 | 47.7 | 41.1 |
| Iron (Fe) | % | 4.84 | 5.21 | 5 | 4.46 | 5.22 | 5.23 |
| Lead (Pb) | mg/kg | 4.9 | 4.6 | 2.6 | 2.6 | 2.3 | 3.7 |
| Magnesium (Mg) | % | 1.8 | 1.57 | 1.76 | 2.31 | 2.25 | 2.25 |
| Manganese (Mn) | mg/kg | 1170 | 1330 | 1280 | 1100 | 1290 | 1290 |
| Mercury (Hg) | mg/kg | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 |
| Molybdenum (Mo) | mg/kg | 0.8 | 0.6 | 0.4 | 0.5 | 0.6 | 0.6 |
| Nickel (Ni) | mg/kg | 46.5 | 26.9 | 39 | 93.5 | 114 | 112 |
| Phosphorus (P) | mg/kg | 0.037 | 0.042 | 0.046 | 0.038 | 0.039 | 0.038 |
| Potassium (K) | % | 0.06 | 0.06 | 0.06 | 0.05 | 0.07 | 0.06 |
| Selenium (Se) | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Silver (Ag) | mg/kg | 0.6 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| Sodium (Na) | % | 0.128 | 0.131 | 0.129 | 0.109 | 0.117 | 0.121 |
| Strontium (Sr) | mg/kg | 34 | 28 | 35 | 54 | 59 | 58 |
| Tellurium (Te) | mg/kg | 0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Thallium (Tl) | mg/kg | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | <0.1 |

| Sample ID | TL6 | TL6 | TL6 | TL6 | TL6 | TL6^ |
|---|---|---|---|---|---|---|
| ALS ID | C002161 | XJ1119 | XN5637 | C025600 | XT4005 | XT4006 |
| Date Sampled | 5-Jan-2020 | 2-Feb-2020 | 4-Mar-2020 | 5-Apr-2020 | 11-May-2020 | 11-May-2020 |
| **Parameter** | **Units** | **Results** | | | | |
| Thorium (Th) | mg/kg | 0.2 | 0.2 | 0.5 | 0.2 | 0.2 | 0.2 |
| Titanium (Ti) | % | 0.017 | 0.007 | 0.011 | 0.024 | 0.018 | 0.018 |
| Tungsten (W) | mg/kg | 1.3 | 0.8 | 1 | 0.8 | 1.4 | 1.2 |
| Uranium (U) | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium (V) | mg/kg | 31 | 23 | 27 | 34 | 40 | 40 |
| Zinc (Zn) | mg/kg | 70 | 54 | 46 | 37 | 44 | 45 |
| CaCO3 Equiv. (Kg $CaCO_3$/T) | kg/T | 174.3 | 226.6 | 211.8 | 209.3 | 221.4 | 234.1 |
| $CO_2$ | wt% | 7.67 | 9.97 | 9.32 | 9.21 | 9.74 | 10.3 |
| Sulphur (S) | % | 0.62 | 0.3 | 0.17 | 0.24 | 0.28 | 0.26 |

^ *Indicates duplicate sample.*

### Table D1-29. Effluent from Process Plant Tailings Slurry Solids (TL-6), June to December 2020

| Sample ID | TL6 | TL6 | TL6 | TL6 | TL6 | TL6 | TL6 |
|---|---|---|---|---|---|---|---|
| ALS ID | XY8803 | YD1771 | YF8181 | YL0019 | YL0019 | YU1728 | ZA9357 |
| Date Sampled | 22-Jun-2020 | 6-Jul-2020 | 11-Aug-2020 | 8-Sep-2020 | 21-Oct-2020 | 9-Nov-2020 | 9-Dec-2020 |
| **Parameter** | **Units** | **Results** | | | | | |
| Aluminum (Al) | % | 0.67 | 0.77 | 0.62 | 1.01 | 0.96 | 0.96 | 0.89 |
| Antimony (Sb) | mg/kg | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 |
| Arsenic (As) | mg/kg | 91 | 64.4 | 58.5 | 25.5 | 12.1 | 12.1 | 21.4 |
| Barium (Ba) | mg/kg | 7 | 7 | 7 | 9 | 7 | 7 | 8 |
| Bismuth (Bi) | mg/kg | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Boron (B) | mg/kg | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Cadmium (Cd) | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 |
| Calcium (Ca) | % | 4.5 | 4.76 | 4.17 | 5.26 | 5.81 | 5.81 | 5.1 |
| Chromium (Cr) | mg/kg | 65 | 58 | 72 | 66 | 43 | 43 | 40 |
| Cobalt (Co) | mg/kg | 16.8 | 16.3 | 12.3 | 15.5 | 14 | 14 | 13.5 |
| Copper (Cu) | mg/kg | 62 | 38.7 | 46.3 | 53.8 | 18.6 | 18.6 | 41.2 |

| | Sample ID | TL6 | TL6 | TL6 | TL6 | TL6 | TL6 | TL6 |
|---|---|---|---|---|---|---|---|---|
| | ALS ID | XY8803 | YD1771 | YF8181 | YL0019 | YL0019 | YU1728 | ZA9357 |
| | Date Sampled | 22-Jun-2020 | 6-Jul-2020 | 11-Aug-2020 | 8-Sep-2020 | 21-Oct-2020 | 9-Nov-2020 | 9-Dec-2020 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Iron (Fe) | % | 4.66 | 4.68 | 4.12 | 6.16 | 6.02 | 6.02 | 5.77 |
| Lead (Pb) | mg/kg | 3.4 | 3.5 | 5.9 | 3 | 0.9 | 0.9 | 1.9 |
| Magnesium (Mg) | % | 1.93 | 1.85 | 1.71 | 1.85 | 1.92 | 1.92 | 1.78 |
| Manganese (Mn) | mg/kg | 1260 | 1210 | 1140 | 1510 | 1510 | 1510 | 1550 |
| Mercury (Hg) | mg/kg | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum (Mo) | mg/kg | 0.7 | 0.6 | 0.9 | 0.8 | 0.4 | 0.4 | 0.4 |
| Nickel (Ni) | mg/kg | 81.3 | 66.8 | 61.8 | 40.6 | 28.3 | 28.3 | 29.3 |
| Phosphorus (P) | mg/kg | 0.046 | 0.036 | 0.041 | 0.054 | 0.041 | 0.041 | 0.051 |
| Potassium (K) | % | 0.05 | 0.05 | 0.06 | 0.07 | 0.04 | 0.04 | 0.04 |
| Selenium (Se) | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Silver (Ag) | mg/kg | 0.3 | 0.2 | 0.2 | 0.2 | <0.1 | <0.1 | 0.2 |
| Sodium (Na) | % | 0.102 | 0.087 | 0.105 | 0.143 | 0.089 | 0.089 | 0.087 |
| Strontium (Sr) | mg/kg | 47 | 45 | 49 | 35 | 33 | 33 | 35 |
| Tellurium (Te) | mg/kg | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Thallium (Tl) | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Thorium (Th) | mg/kg | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 |
| Titanium (Ti) | % | 0.006 | 0.01 | 0.011 | 0.012 | 0.003 | 0.003 | 0.006 |
| Tungsten (W) | mg/kg | 1.7 | 1 | 0.9 | 1 | 0.6 | 0.6 | 1.1 |
| Uranium (U) | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium (V) | mg/kg | 32 | 30 | 25 | 33 | 30 | 30 | 27 |
| Zinc (Zn) | mg/kg | 46 | 43 | 37 | 54 | 51 | 51 | 55 |
| $CaCO_3$ Equiv. (Kg $CaCO_3$/T) | kg/T | 224.8 | 226.6 | 208.2 | 221.1 | 288.6 | 288.6 | 255.5 |
| $CO_2$ | wt% | 9.89 | 9.97 | 9.16 | 9.73 | 12.7 | 12.7 | 11.24 |
| Sulphur (S) | % | 0.36 | 0.26 | 0.17 | 0.22 | 0.07 | 0.08 | 0.2 |

**Table D1-30. Detoxified Tailings Solids (TL-7a), January to June 2020**

| | Sample ID | TL7A | TL7A | TL7A | TL7A | TL7A | TL7A^ | TL7A |
|---|---|---|---|---|---|---|---|---|
| | ALS ID | C002167 | XJ1126 | XN5658 | C025605 | XT4018 | XT4019 | XY8818 |
| | Date Sampled | 5-Jan-2020 | 2-Feb-2020 | 1-Mar-2020 | 5-Apr-2020 | 11-May-2020 | 11-May-2020 | 22-Jun-2020 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Aluminum (Al) | % | 0.75 | 0.51 | 0.54 | 0.59 | 0.7 | 0.68 | 0.37 |
| Antimony (Sb) | mg/kg | 0.7 | 0.6 | 1.4 | 2.2 | 1.7 | 1.8 | 2.4 |
| Arsenic (As) | mg/kg | 421 | 671 | 1310 | 1440 | 2130 | 2110 | 2640 |
| Barium (Ba) | mg/kg | 10 | 6 | 8 | 7 | 8 | 9 | 7 |
| Bismuth (Bi) | mg/kg | 3.9 | 4.4 | 2.4 | 3.8 | 1.8 | 1.8 | 4.3 |
| Boron (B) | mg/kg | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Cadmium (Cd) | mg/kg | 2.1 | 2.1 | 0.9 | 1.4 | 1 | 1.1 | 1.3 |
| Calcium (Ca) | % | 3.49 | 2.42 | 3.4 | 2.82 | 4.12 | 3.95 | 2.94 |
| Chromium (Cr) | mg/kg | 306 | 254 | 193 | 266 | 304 | 294 | 239 |
| Cobalt (Co) | mg/kg | 169 | 263 | 259 | 234 | 225 | 228 | 332 |
| Copper (Cu) | mg/kg | 2720 | 3850 | 2460 | 2250 | 3330 | 3300 | 4700 |
| Iron (Fe) | % | 16.1 | 22.2 | 20.7 | 18.7 | 18.3 | 18.5 | 25.9 |
| Lead (Pb) | mg/kg | 86.3 | 125 | 61.9 | 204 | 44.4 | 49.2 | 39.9 |
| Magnesium (Mg) | % | 1.28 | 0.97 | 1.4 | 1.48 | 1.86 | 1.82 | 1.17 |
| Manganese (Mn) | mg/kg | 1080 | 812 | 963 | 805 | 1100 | 1070 | 848 |
| Mercury (Hg) | mg/kg | 0.05 | 0.05 | 0.03 | 0.05 | 0.02 | 0.03 | 0.04 |
| Molybdenum (Mo) | mg/kg | 3 | 3.2 | 2.7 | 2.7 | 2.8 | 2.7 | 4.2 |
| Nickel (Ni) | mg/kg | 117 | 197 | 469 | 566 | 790 | 770 | 879 |
| Phosphorus (P) | % | 0.034 | 0.025 | 0.033 | 0.024 | 0.032 | 0.03 | 0.022 |
| Potassium (K) | % | 0.06 | 0.04 | 0.05 | 0.04 | 0.06 | 0.06 | 0.06 |
| Selenium (Se) | mg/kg | 9.8 | 14.7 | 12.9 | 11.3 | 8.7 | 8.5 | 17 |
| Silver (Ag) | mg/kg | 15.8 | 16.9 | 11.3 | 12.5 | 13.7 | 12.8 | 23.2 |
| Sodium (Na) | % | 0.306 | 0.226 | 0.178 | 0.183 | 0.221 | 0.23 | 0.128 |
| Strontium (Sr) | mg/kg | 27 | 22 | 47 | 48 | 68 | 67 | 45 |
| Tellurium (Te) | mg/kg | 4.1 | 4.4 | 3.7 | 3.3 | 2.5 | 2.3 | 8 |
| Thallium (Tl) | mg/kg | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

| Sample ID | TL7A | TL7A | TL7A | TL7A | TL7A | TL7A^ | TL7A |
|---|---|---|---|---|---|---|---|
| ALS ID | C002167 | XJ1126 | XN5658 | C025605 | XT4018 | XT4019 | XY8818 |
| Date Sampled | 5-Jan-2020 | 2-Feb-2020 | 1-Mar-2020 | 5-Apr-2020 | 11-May-2020 | 11-May-2020 | 22-Jun-2020 |
| **Parameter** | **Units** | **Results** | | | | | |
| Thorium (Th) | mg/kg | 0.1 | 0.1 | 0.7 | 0.1 | 0.2 | 0.2 | 0.1 |
| Titanium (Ti) | % | 0.008 | 0.006 | 0.003 | 0.01 | 0.007 | 0.006 | 0.002 |
| Tungsten (W) | mg/kg | 3.9 | 4.7 | 2.6 | 2 | 1.8 | 1.7 | 3.3 |
| Uranium (U) | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium (V) | mg/kg | 24 | 17 | 22 | 21 | 30 | 30 | 39 |
| Zinc (Zn) | mg/kg | 622 | 659 | 265 | 506 | 361 | 361 | 366 |
| Moisture | % | 22 | 21 | 18 | 21 | 19 | 19 | 16 |
| $CaCO_3$ Equiv. (Kg $CaCO_3$/T) | kg/T | 149.1 | 130.7 | 182.3 | 165.7 | 184.1 | 190.9 | 139.1 |
| $CO_2$ | wt% | 6.56 | 5.75 | 8.02 | 7.29 | 8.1 | 8.4 | 6.12 |
| Sulphur (S) | wt% | 14.5 | 25.33 | 20.05 | 20 | 16.55 | 16.94 | 27.93 |

^ *Indicates duplicate sample.*

## Table D1-31. Detoxified Tailings Solids (TL-7a), July to December 2020

| Sample ID | TL7A | TL7A | TL7A | TL7A | TL7A | TL7A^ |
|---|---|---|---|---|---|---|
| ALS ID | C002167 | XJ1126 | XN5658 | C025605 | XT4018 | XT4019 |
| Date Sampled | 5-Jul-2020 | 11-Aug-2020 | 6-Sep-2020 | 21-Oct-2020 | 9-Nov-2020 | 1-Dec-2020 |
| **Parameter** | **Units** | **Results** | | | | |
| Aluminum (Al) | % | 0.46 | 0.65 | 0.28 | 0.63 | 0.63 | 0.59 |
| Antimony (Sb) | mg/kg | 2.7 | 2.4 | 1.3 | 0.8 | 0.8 | 0.9 |
| Arsenic (As) | mg/kg | 2400 | 1010 | 1330 | 652 | 652 | 1050 |
| Barium (Ba) | mg/kg | 5 | 9 | 4 | 6 | 6 | 8 |
| Bismuth (Bi) | mg/kg | 5.3 | 3.1 | 5.3 | 4.4 | 4.4 | 3 |
| Boron (B) | mg/kg | <20 | <20 | <20 | <20 | <20 | <20 |
| Cadmium (Cd) | mg/kg | 1 | 2.4 | 1.8 | 1.2 | 1.2 | 3.4 |
| Calcium (Ca) | % | 3.45 | 2.87 | 2.11 | 3.43 | 3.43 | 3.28 |
| Chromium (Cr) | mg/kg | 216 | 600 | 237 | 144 | 144 | 182 |

| | Sample ID | TL7A | TL7A | TL7A | TL7A | TL7A | TL7A^ |
|---|---|---|---|---|---|---|---|
| | ALS ID | C002167 | XJ1126 | XN5658 | C025605 | XT4018 | XT4019 |
| | Date Sampled | 5-Jul-2020 | 11-Aug-2020 | 6-Sep-2020 | 21-Oct-2020 | 9-Nov-2020 | 1-Dec-2020 |
| **Parameter** | **Units** | **Results** | | | | | |
| Cobalt (Co) | mg/kg | 340 | 203 | 425 | 215 | 215 | 261 |
| Copper (Cu) | mg/kg | 3990 | >10000 | 3130 | 1690 | 1690 | 2410 |
| Iron (Fe) | % | 19.3 | 16.5 | 33.1 | 19.6 | 19.6 | 20.9 |
| Lead (Pb) | mg/kg | 93.5 | 261 | 73.3 | 30.1 | 30.1 | 31.1 |
| Magnesium (Mg) | % | 1.49 | 1.28 | 0.75 | 1.22 | 1.22 | 1.13 |
| Manganese (Mn) | mg/kg | 891 | 926 | 758 | 1060 | 1060 | 1100 |
| Mercury (Hg) | mg/kg | 0.05 | 0.05 | 0.04 | 0.03 | 0.03 | 0.05 |
| Molybdenum (Mo) | mg/kg | 3.7 | 3.8 | 4.4 | 2.5 | 2.5 | 3.9 |
| Nickel (Ni) | mg/kg | 876 | 411 | 441 | 153 | 153 | 318 |
| Phosphorus (P) | % | 0.022 | 0.028 | 0.024 | 0.037 | 0.037 | 0.033 |
| Potassium (K) | % | 0.04 | 0.05 | 0.03 | 0.04 | 0.04 | 0.05 |
| Selenium (Se) | mg/kg | 12.4 | 10.6 | 21.4 | 14.7 | 14.7 | 14.8 |
| Silver (Ag) | mg/kg | 21 | 27.9 | 19.5 | 16.2 | 16.2 | 17.7 |
| Sodium (Na) | % | 0.258 | 0.603 | 0.197 | 0.172 | 0.172 | 0.217 |
| Strontium (Sr) | mg/kg | 54 | 35 | 20 | 26 | 26 | 37 |
| Tellurium (Te) | mg/kg | 8.2 | 3.5 | 6.4 | 5.1 | 5.1 | 4.1 |
| Thallium (Tl) | mg/kg | 0.2 | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 |
| Thorium (Th) | mg/kg | 0.3 | 0.2 | <0.1 | 0.2 | 0.2 | 0.8 |
| Titanium (Ti) | % | 0.004 | 0.021 | 0.003 | 0.002 | 0.002 | 0.003 |
| Tungsten (W) | mg/kg | 2.1 | 3.4 | 4.4 | 3.1 | 3.1 | 2.6 |
| Uranium (U) | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium (V) | mg/kg | 21 | 27 | 12 | 20 | 20 | 18 |
| Zinc (Zn) | mg/kg | 386 | 993 | 572 | 341 | 341 | 861 |
| Moisture | % | 20 | 38 | 13 | 19 | 19 | 17 |
| $CaCO_3$ Equiv. (Kg $CaCO_3$/T) | kg/T | 170.5 | 128.6 | 96.14 | 179.8 | 179.8 | 161.8 |
| $CO_2$ | wt% | 7.5 | 5.66 | 4.23 | 7.91 | 7.91 | 7.12 |
| Sulphur (S) | wt% | 19.99 | 16.53 | 33.5 | 21.03 | 21.03 | 21.86 |

## Table D1-32. Detoxified Tailings Filtrate (TL-7b), January to June 2020

| Sample ID | | TL-7B | TL-7B | TL-7B | TL-7B^ | TL-7B | TL-7B | TL-7B |
|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2402981-1 | L2413143-1 | L2423399-1 | L2423399-2 | L2435057-1 | L2444703-1 | L2458880-1 |
| Date Sampled | | 5-Jan-2020 16:55 | 2-Feb-2020 16:50 | 2-Mar-2020 8:20 | 2-Mar-2020 8:20 | 5-Apr-2020 9:15 | 5-May-2020 17:00 | 7-Jun-2020 15:15 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Cyanate | mg/L | 732 | 517 | 378 | 401 | 704 | 896 | 395 |
| Thiocyanate | mg/L | 220 | 199 | 142 | 101 | 281 | 233 | 76.9 |
| Cyanide, WAD | mg/L | 0.212 | 0.178 | 0.077 | 0.082 | 0.267 | 0.117 | 0.0118 |
| Aluminum (Al)-Total | mg/L | 0.33 | 0.81 | <0.15 | <0.15 | 0.39 | 0.35 | 0.31 |
| Antimony (Sb)-Total | mg/L | 0.0342 | 0.026 | 0.0347 | 0.035 | 0.0459 | 0.0785 | 0.0289 |
| Arsenic (As)-Total | mg/L | 0.0585 | 0.0527 | 0.199 | 0.192 | 0.258 | 0.915 | 0.192 |
| Barium (Ba)-Total | mg/L | 0.067 | 0.0492 | 0.0895 | 0.0871 | 0.0662 | 0.103 | 0.035 |
| Beryllium (Be)-Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0020 |
| Boron (B)-Total | mg/L | 1.37 | 1.27 | 0.87 | 0.86 | 1.36 | 1.08 | 0.7 |
| Cadmium (Cd)-Total | mg/L | <0.00025 | <0.00025 | <0.00025 | <0.00025 | <0.00025 | <0.00025 | 0.00027 |
| Calcium (Ca)-Total | mg/L | 44.6 | 51.7 | 84.7 | 85.1 | 68.6 | 54.8 | 146 |
| Chromium (Cr)-Total | mg/L | 0.0139 | 0.0119 | 0.0096 | 0.0077 | 0.0114 | 0.0141 | 0.015 |
| Cobalt (Co)-Total | mg/L | 0.0253 | 0.0239 | 0.0335 | 0.0318 | 0.0711 | 0.0642 | 0.0358 |
| Copper (Cu)-Total | mg/L | 11.6 | 11.9 | 5.79 | 5.75 | 2.87 | 21.6 | 7.62 |
| Iron (Fe)-Total | mg/L | 2.3 | 4.19 | 1.37 | 0.63 | 2.4 | 2.23 | 7.01 |
| Lead (Pb)-Total | mg/L | 0.0027 | 0.0049 | <0.0025 | <0.0025 | 0.0127 | <0.0025 | 0.0049 |
| Lithium (Li)-Total | mg/L | 0.069 | 0.079 | <0.050 | <0.050 | <0.050 | 0.079 | 0.045 |
| Magnesium (Mg)-Total | mg/L | 48.3 | 78.4 | 89.6 | 90.9 | 74.3 | 63.1 | 120 |
| Manganese (Mn)-Total | mg/L | 0.245 | 0.261 | 0.218 | 0.225 | 0.199 | 0.204 | 0.625 |
| Molybdenum (Mo)-Total | mg/L | 0.14 | 0.102 | 0.0498 | 0.051 | 0.0762 | 0.158 | 0.0584 |
| Nickel (Ni)-Total | mg/L | <0.025 | <0.025 | 0.058 | 0.055 | 0.028 | 0.12 | 0.177 |
| Potassium (K)-Total | mg/L | 81.8 | 77.4 | 71 | 72.4 | 70.2 | 110 | 49.3 |
| Selenium (Se)-Total | mg/L | 0.0186 | 0.0123 | 0.0114 | 0.0101 | 0.0104 | 0.029 | 0.0152 |
| Silver (Ag)-Total | mg/L | 0.00553 | 0.00411 | 0.00145 | 0.00151 | 0.00406 | 0.00775 | 0.0019 |
| Sodium (Na)-Total | mg/L | 9560 | 10100 | 7960 | 7990 | 7430 | 11300 | 4320 |

| Sample ID | | TL-7B | TL-7B | TL-7B | TL-7B^ | TL-7B | TL-7B | TL-7B |
|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2402981-1 | L2413143-1 | L2423399-1 | L2423399-2 | L2435057-1 | L2444703-1 | L2458880-1 |
| Date Sampled | | 5-Jan-2020 16:55 | 2-Feb-2020 16:50 | 2-Mar-2020 8:20 | 2-Mar-2020 8:20 | 5-Apr-2020 9:15 | 5-May-2020 17:00 | 7-Jun-2020 15:15 |
| **Parameter** | **Units** | **Results** | | | | | | |
| Sulfur (S) - Total | mg/L | 5720 | 5950 | 4490 | 4580 | 4110 | 7350 | 2350 |
| Thallium (Tl)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00020 |
| Tin (Sn)-Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0020 |
| Titanium (Ti)-Total | mg/L | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.0060 |
| Uranium (U)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | 0.00095 | <0.00020 |
| Vanadium (V)-Total | mg/L | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.010 |
| Zinc (Zn)-Total | mg/L | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | 0.065 |

^ *Indicates duplicate sample.*

### Table D1-33. Detoxified Tailings Filtrate (TL-7b), July to December 2020

| Sample ID | | TL-7B | TL-7B | TL-7B | TL-7B | TL-7B | TL-7B |
|---|---|---|---|---|---|---|---|
| ALS ID | | L2472316-1 | YL2000008-001 | YL2000019-001 | YL2000152-001 | YL2000199-001 | YL2000259-001 |
| Date Sampled | | 5-Jul-2020 16:35 | 2-Aug-2020 11:15 | 6-Sep-2020 15:47 | 21-Oct-2020 13:30 | 9-Nov-2020 9:55 | 1-Dec-2020 8:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| Cyanate | mg/L | 629 | 548 | 1030 | 829 | 380 | 622 |
| Thiocyanate | mg/L | 213 | 23 | 444 | 220 | 21.8 | 205 |
| Cyanide, WAD | mg/L | 0.154 | <0.200 | 0.317 | 0.154 | 0.0649 | 0.222 |
| Aluminum (Al)-Total | mg/L | 0.42 | 0.21 | 0.215 | 1.08 | 0.665 | 0.884 |
| Antimony (Sb)-Total | mg/L | 0.0808 | 0.0165 | 0.0562 | 0.0532 | 0.0327 | 0.0726 |
| Arsenic (As)-Total | mg/L | 0.843 | 0.0504 | 0.0913 | 0.0728 | 0.0455 | 0.194 |
| Barium (Ba)-Total | mg/L | 0.088 | 0.114 | 0.0422 | 0.0462 | 0.0532 | 0.0775 |
| Beryllium (Be)-Total | mg/L | <0.0050 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 |
| Boron (B)-Total | mg/L | 1.36 | 0.892 | 1.09 | 1.09 | 1.09 | 1.18 |
| Cadmium (Cd)-Total | mg/L | <0.00025 | <0.000250 | <0.000250 | <0.000250 | <0.000250 | <0.000250 |
| Calcium (Ca)-Total | mg/L | 66.5 | 98 | 55 | 45.2 | 87.9 | 53.9 |
| Chromium (Cr)-Total | mg/L | 0.0163 | 0.0263 | <0.0250 | <0.0250 | <0.0250 | <0.0250 |

| | Sample ID | TL-7B | TL-7B | TL-7B | TL-7B | TL-7B | TL-7B |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2472316-1 | YL2000008-001 | YL2000019-001 | YL2000152-001 | YL2000199-001 | YL2000259-001 |
| | Date Sampled | 5-Jul-2020 16:35 | 2-Aug-2020 11:15 | 6-Sep-2020 15:47 | 21-Oct-2020 13:30 | 9-Nov-2020 9:55 | 1-Dec-2020 8:30 |
| **Parameter** | **Units** | **Results** | | | | | |
| Cobalt (Co)-Total | mg/L | 0.0726 | 0.104 | 0.0424 | 0.0987 | 0.0223 | 0.0839 |
| Copper (Cu)-Total | mg/L | 10.3 | 7.7 | 7.02 | 2.79 | 4.97 | 8.01 |
| Iron (Fe)-Total | mg/L | 2.61 | 1.03 | 3.36 | 5.66 | 4.21 | 8.78 |
| Lead (Pb)-Total | mg/L | 0.0059 | 0.0052 | 0.00267 | <0.00250 | 0.00678 | <0.00250 |
| Lithium (Li)-Total | mg/L | 0.068 | 0.114 | <0.0500 | <0.0500 | <0.0500 | <0.0500 |
| Magnesium (Mg)-Total | mg/L | 63.5 | 42.2 | 57.1 | 50.2 | 77.2 | 51.1 |
| Manganese (Mn)-Total | mg/L | 0.292 | 0.159 | 0.299 | 0.213 | 0.438 | 0.297 |
| Molybdenum (Mo)-Total | mg/L | 0.168 | 0.0815 | 0.117 | 0.0861 | 0.0574 | 0.0732 |
| Nickel (Ni)-Total | mg/L | 0.269 | 0.249 | <0.0250 | <0.0250 | 0.0337 | 0.037 |
| Potassium (K)-Total | mg/L | 98 | 82.3 | 61.1 | 67.2 | 55.5 | 57 |
| Selenium (Se)-Total | mg/L | 0.0151 | 0.0122 | 0.0231 | 0.0103 | 0.0175 | 0.0221 |
| Silver (Ag)-Total | mg/L | <0.00050 | 0.00157 | 0.00772 | 0.00491 | 0.00368 | 0.0112 |
| Sodium (Na)-Total | mg/L | 13200 | 18200 | 8400 | 7850 | 7950 | 9510 |
| Sulfur (S) - Total | mg/L | 7470 | 13800 | 5150 | 5020 | 5130 | 6050 |
| Thallium (Tl)-Total | mg/L | <0.00050 | <0.000500 | <0.000500 | <0.000500 | <0.000500 | <0.000500 |
| Tin (Sn)-Total | mg/L | <0.0050 | <0.00500 | <0.00500 | <0.00500 | <0.00500 | <0.00500 |
| Titanium (Ti)-Total | mg/L | <0.015 | <0.0150 | <0.0150 | <0.0150 | <0.0150 | 0.0465 |
| Uranium (U)-Total | mg/L | 0.00063 | <0.000500 | <0.000500 | <0.000500 | <0.000500 | <0.000500 |
| Vanadium (V)-Total | mg/L | <0.025 | <0.0250 | <0.0250 | <0.0250 | <0.0250 | <0.0250 |
| Zinc (Zn)-Total | mg/L | <0.15 | <0.150 | <0.150 | <0.150 | <0.150 | <0.150 |

**Table D1-34. Seepage from Underground Backfilled Stopes (TL-11), July 2020**

| | Sample ID | TL11-A | TL11-B | TL11-C | TL11-C^ | TL11-D |
|---|---|---|---|---|---|---|
| | ALS ID | L2477557-1 | L2477557-2 | L2477557-3 | L2477557-5 | L2477557-4 |
| | Date Sampled | 19-Jul-2020 9:16 | 19-Jul-2020 9:44 | 19-Jul-2020 10:40 | 19-Jul-2020 8:20 | 19-Jul-2020 11:08 |
| **Parameter** | **Units** | **Results** | | | | |
| pH | pH | 7.94 | 7.72 | 7.57 | 7.82 | 7.81 |
| Conductivity | µS/cm | 5050 | 7090 | 22500 | 22100 | 25600 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | 0.0535 | 0.0097 | 0.0162 | 0.0126 | 0.0127 |
| Cyanide, WAD | mg/L | <0.0050 | <0.0050 | 0.0054 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) | mg/L | 25 | 23.7 | 26.5 | 27.9 | 4.44 |
| Nitrate (as N) | mg/L | 26.9 | 35.2 | 34.2 | 33.5 | 8.75 |
| Nitrite (as N) | mg/L | 1.45 | 0.403 | 0.53 | 0.65 | 0.28 |
| Sulfate ($SO_4$) | mg/L | 495 | 578 | 1240 | 1270 | 1060 |
| Aluminum (Al)-Dissolved | mg/L | 0.0133 | 0.0077 | <0.010 | <0.010 | <0.020 |
| Antimony (Sb)-Dissolved | mg/L | 0.0011 | 0.00062 | 0.0022 | 0.0023 | <0.0020 |
| Arsenic (As)-Dissolved | mg/L | 0.00295 | 0.00101 | 0.0019 | 0.002 | 0.0059 |
| Barium (Ba)-Dissolved | mg/L | 0.0217 | 0.0271 | 0.0355 | 0.0315 | 0.0324 |
| Beryllium (Be)-Dissolved | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0010 | <0.0020 |
| Bismuth (Bi)-Dissolved | mg/L | <0.00010 | <0.00025 | <0.00050 | <0.00050 | <0.0010 |
| Boron (B)-Dissolved | mg/L | 0.393 | 0.47 | 2.29 | 2.29 | 2.4 |
| Cadmium (Cd)-Dissolved | mg/L | 0.000065 | 0.000375 | 0.00083 | 0.000843 | 0.00021 |
| Calcium (Ca)-Dissolved | mg/L | 191 | 382 | 485 | 450 | 395 |
| Chromium (Cr)-Dissolved | mg/L | 0.00353 | <0.00050 | <0.0010 | <0.0010 | <0.0020 |
| Cobalt (Co)-Dissolved | mg/L | 0.0119 | 0.0486 | 0.0937 | 0.0883 | 0.0259 |
| Copper (Cu)-Dissolved | mg/L | 0.0429 | 0.0632 | 0.0553 | 0.054 | 0.0162 |
| Iron (Fe)-Dissolved | mg/L | <0.020 | <0.050 | <0.10 | <0.10 | <0.20 |
| Lead (Pb)-Dissolved | mg/L | <0.00010 | <0.00025 | <0.00050 | <0.00050 | <0.0010 |
| Lithium (Li)-Dissolved | mg/L | 0.0308 | 0.0288 | 0.086 | 0.075 | 0.09 |
| Magnesium (Mg)-Dissolved | mg/L | 88 | 127 | 522 | 496 | 575 |
| Manganese (Mn)-Dissolved | mg/L | 0.431 | 2.17 | 2.15 | 2.02 | 1.2 |

| | Sample ID | TL11-A | TL11-B | TL11-C | TL11-C^ | TL11-D |
|---|---|---|---|---|---|---|
| | ALS ID | L2477557-1 | L2477557-2 | L2477557-3 | L2477557-5 | L2477557-4 |
| | Date Sampled | 19-Jul-2020 9:16 | 19-Jul-2020 9:44 | 19-Jul-2020 10:40 | 19-Jul-2020 8:20 | 19-Jul-2020 11:08 |
| **Parameter** | **Units** | **Results** | | | | |
| Mercury (Hg)-Dissolved | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.00734 | 0.00295 | 0.00613 | 0.00558 | 0.004 |
| Nickel (Ni)-Dissolved | mg/L | 0.0136 | 0.052 | 0.181 | 0.175 | 0.053 |
| Phosphorus (P)-Dissolved | mg/L | <0.10 | <0.25 | <0.50 | <0.50 | <1.0 |
| Potassium (K)-Dissolved | mg/L | 38.5 | 40.6 | 131 | 124 | 145 |
| Selenium (Se)-Dissolved | mg/L | 0.0119 | 0.00302 | 0.00269 | 0.00316 | <0.0010 |
| Silicon (Si)-Dissolved | mg/L | 2.18 | 2.3 | 3.17 | 3.15 | 3.8 |
| Silver (Ag)-Dissolved | mg/L | 0.000386 | <0.000050 | 0.00013 | 0.00015 | <0.00020 |
| Sodium (Na)-Dissolved | mg/L | 672 | 906 | 4150 | 3840 | 4800 |
| Strontium (Sr) - Dissolved | mg/L | 0.839 | 1.27 | 5.42 | 4.92 | 5.42 |
| Sulphur (S)-Dissolved | mg/L | 213 | 236 | 516 | 462 | 423 |
| Thallium (Tl)-Dissolved | mg/L | <0.000020 | <0.000050 | <0.00010 | <0.00010 | <0.00020 |
| Tin (Sn)-Dissolved | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0010 | <0.0020 |
| Titanium (Ti)-Dissolved | mg/L | <0.00060 | <0.0015 | <0.0030 | <0.0030 | <0.0060 |
| Uranium (U)-Dissolved | mg/L | 0.000621 | 0.000154 | 0.00046 | 0.00047 | 0.00027 |
| Vanadium (V)-Dissolved | mg/L | <0.0010 | <0.0025 | <0.0050 | <0.0050 | <0.010 |
| Zinc (Zn)-Dissolved | mg/L | 0.112 | 0.0781 | 0.122 | 0.128 | <0.020 |
| Zirconium (Zr)-Dissolved | mg/L | <0.00040 | <0.0010 | <0.0020 | <0.0020 | <0.0040 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 154 | 146 | 255 | 254 | 220 |
| Acidity as $CaCO_3$ | mg/L | 9.1 | 13.9 | 29.6 | 21.9 | 17.8 |

^ *Indicates duplicate sample.*

**Table D1-35. Seepage from Underground Backfilled Stopes (TL-11), December 2020**

| | Sample ID | TL11-A | TL11-A^ | TL11-B |
|---|---|---|---|---|
| | ALS ID | YL2100015-001 | YL2100015-003 | YL2100015-002 |
| | Date Sampled | 28-Dec-2020 13:50 | 28-Dec-2020 14:05 | 28-Dec-2020 14:40 |
| **Parameter** | **Units** | **Results** | | |
| pH | pH | 7.76 | 7.75 | 7.77 |
| Conductivity | µS/cm | 21500 | 21600 | 20800 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | 0.0159 | 0.0154 | <0.0050 |
| Cyanide, WAD | mg/L | <0.0050 | <0.0050 | <0.0050 |
| Ammonia, Total (as N) | mg/L | 32 | 32.2 | 4.69 |
| Nitrate (as N) | mg/L | 41.8 | 41.5 | 7.19 |
| Nitrite (as N) | mg/L | 2.45 | 2.69 | 0.531 |
| Sulfate ($SO_4$) | mg/L | 1120 | 1140 | 918 |
| Aluminum (Al)-Dissolved | mg/L | <0.0200 | <0.0200 | <0.0200 |
| Antimony (Sb)-Dissolved | mg/L | 0.00303 | 0.00316 | <0.00200 |
| Arsenic (As)-Dissolved | mg/L | 0.00466 | 0.00518 | 0.0044 |
| Barium (Ba)-Dissolved | mg/L | 0.0446 | 0.047 | 0.0284 |
| Beryllium (Be)-Dissolved | mg/L | <0.00200 | <0.00200 | <0.00200 |
| Bismuth (Bi)-Dissolved | mg/L | <0.00100 | <0.00100 | <0.00100 |
| Boron (B)-Dissolved | mg/L | 2.25 | 2.26 | 2.19 |
| Cadmium (Cd)-Dissolved | mg/L | 0.000223 | 0.000256 | 0.000208 |
| Calcium (Ca)-Dissolved | mg/L | 554 | 539 | 365 |
| Chromium (Cr)-Dissolved | mg/L | <0.00200 | <0.00200 | <0.00200 |
| Cobalt (Co)-Dissolved | mg/L | 0.0548 | 0.0531 | 0.0219 |
| Copper (Cu)-Dissolved | mg/L | 0.0238 | 0.0231 | 0.0135 |
| Iron (Fe)-Dissolved | mg/L | <0.200 | <0.200 | <0.200 |
| Lead (Pb)-Dissolved | mg/L | <0.00100 | <0.00100 | <0.00100 |
| Lithium (Li)-Dissolved | mg/L | 0.0746 | 0.0746 | 0.0689 |
| Magnesium (Mg)-Dissolved | mg/L | 510 | 511 | 546 |
| Manganese (Mn)-Dissolved | mg/L | 1.04 | 1.03 | 1.14 |
| Mercury (Hg)-Dissolved | mg/L | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.0149 | 0.0158 | 0.00452 |
| Nickel (Ni)-Dissolved | mg/L | 0.158 | 0.158 | 0.0399 |
| Phosphorus (P)-Dissolved | mg/L | <1.00 | <1.00 | <1.00 |
| Potassium (K)-Dissolved | mg/L | 137 | 145 | 130 |
| Selenium (Se)-Dissolved | mg/L | 0.00246 | 0.00224 | <0.00100 |
| Silicon (Si)-Dissolved | mg/L | 2.92 | 3.3 | 3.38 |
| Silver (Ag)-Dissolved | mg/L | <0.000200 | <0.000200 | <0.000200 |
| Sodium (Na)-Dissolved | mg/L | 4110 | 4180 | 4260 |
| Strontium (Sr) - Dissolved | mg/L | 5.61 | 5.76 | 4.99 |
| Sulphur (S)-Dissolved | mg/L | 434 | 438 | 362 |
| Thallium (Tl)-Dissolved | mg/L | <0.000200 | <0.000200 | <0.000200 |

| | Sample ID | TL11-A | TL11-A^ | TL11-B |
|---|---|---|---|---|
| | ALS ID | YL2100015-001 | YL2100015-003 | YL2100015-002 |
| | Date Sampled | 28-Dec-2020 13:50 | 28-Dec-2020 14:05 | 28-Dec-2020 14:40 |
| **Parameter** | **Units** | **Results** | | |
| Tin (Sn)-Dissolved | mg/L | <0.00200 | <0.00200 | <0.00200 |
| Titanium (Ti)-Dissolved | mg/L | <0.00600 | <0.00600 | <0.00600 |
| Uranium (U)-Dissolved | mg/L | 0.000393 | 0.000388 | 0.000233 |
| Vanadium (V)-Dissolved | mg/L | <0.0100 | <0.0100 | <0.0100 |
| Zinc (Zn)-Dissolved | mg/L | 0.033 | 0.0297 | 0.0252 |
| Zirconium (Zr)-Dissolved | mg/L | <0.00400 | <0.00400 | <0.00400 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 220 | 221 | 212 |
| Acidity as $CaCO_3$ | mg/L | 9.5 | 9.4 | 5.5 |

^ *Indicates duplicate sample.*

## Table D1-36. Doris Underground Mine Dewatering, 2020

| Month | Monthly Volume ($m^3$)* | Cumulative Volume ($m^3$)* |
|---|---|---|
| January | 85,742 | 85,742 |
| February | 62,959 | 148,701 |
| March | 73,560 | 222,261 |
| April | 59,378 | 281,639 |
| May | 44,238 | 325,877 |
| June | 36,039 | 361,916 |
| July | 21,393 | 383,309 |
| August | 54,835 | 438,144 |
| September | 45,401 | 483,545 |
| October | 49,807 | 533,352 |
| November | 56,995 | 590,347 |
| December | 41,792 | 632,139 |
| **Volume of Mine Water Dewatering for Doris Mine, 2020 ($m^3$)** | | **632,139** |

** Values rounded to nearest whole cubic metre.*

**Table D1-37. Water Sampling Monitoring Program Results for January to March 2020 Taken from TL-12**

| Sample ID | | TL-12A | TL12 | TL-12A | TL12 | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2402984-1 | L2405209-1 | L2407843-1 | L2411632-1 | L2413161-1 | L2416914-1 | L2417809-1 | L2423323-1 | L2426413-1 | L2428744-1 | L2431086-1 | L2432843-1 |
| Date Sampled | | 6-Jan-2020 16:00 | 13-Jan-2020 12:30 | 20-Jan-2020 17:55 | 28-Jan-2020 16:00 | 3-Feb-2020 15:30 | 10-Feb-2020 11:50 | 17-Feb-2020 13:15 | 2-Mar-2020 13:00 | 9-Mar-2020 13:20 | 16-Mar-2020 13:15 | 23-Mar-2020 14:15 | 30-Mar-2020 13:10 |
| **Parameter** | **Units** | **Results** | | | | | | | | | | | |
| pH | pH | 7.87 | 7.8 | 7.92 | 7.88 | 7.88 | 8.01 | 7.91 | 7.96 | 7.94 | 7.85 | 7.91 | 7.79 |
| Conductivity | µS/cm | 27700 | | | | 21600 | | | 24300 | 25300 | 25200 | | |
| Total Suspended Solids | mg/L | 284 | 289 | 282 | 4230 | 768 | 270 | 382 | 658 | 266 | 390 | 221 | 139 |
| Total Dissolved Solids | mg/L | 18500 | 19600 | 17700 | 14400 | 14000 | 19000 | 19400 | 16100 | 16400 | 17400 | 20800 | 16700 |
| Chloride (Cl) | mg/L | 9800 | 9310 | 9480 | 7290 | 7840 | 9430 | 9390 | 8540 | 8790 | 9240 | 9070 | 9060 |
| Bromide (Br) | mg/L | 36.9 | | | | 28 | | | 30.2 | 31.4 | 32.5 | | |
| Fluoride (F) | mg/L | <2.0 | | | | <2.0 | | | <2.0 | <2.0 | <2.0 | | |
| Cyanide, Total | mg/L | 0.0474 | 0.0423 | 0.0899 | | 0.311 | 0.0546 | 0.17 | 0.536 | 0.106 | 0.136 | 0.0168 | 0.0522 |
| Cyanide, WAD | mg/L | 0.0063 | | | | <0.010 | | | <0.0050 | <0.0050 | <0.0050 | | |
| Ammonia, Total (as N) | mg/L | 12.8 | 8.27 | 10.8 | 23.1 | 13.9 | 6.9 | 8.08 | 7.56 | 6.39 | 6.36 | 6.04 | 7.55 |
| Nitrate (as N) | mg/L | 12.8 | 7.25 | 10.3 | 26.1 | 15.5 | 5.58 | 7.95 | 7.28 | 6 | 6.19 | 3.85 | 5.53 |
| Nitrite (as N) | mg/L | 1.12 | | | | 0.96 | | | 0.84 | 0.54 | 0.75 | | |
| Sulfate ($SO_4$) | mg/L | 1010 | | | | 812 | | | 877 | 887 | 952 | | |
| Aluminum (Al)-Total | mg/L | 8.92 | 8.96 | 9.32 | 50.8 | 7.93 | 6.48 | 1.26 | 13.2 | 10.9 | 9.63 | 5.18 | 2.71 |
| Antimony (Sb)-Total | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.00020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Arsenic (As)-Total | mg/L | 0.0103 | 0.0133 | 0.0116 | 0.138 | 0.0342 | 0.0084 | 0.00162 | 0.0695 | 0.0217 | 0.0254 | 0.0093 | 0.0149 |
| Barium (Ba)-Total | mg/L | 0.0582 | 0.0534 | 0.057 | 0.0818 | 0.0584 | 0.0437 | 0.00548 | 0.0501 | 0.0525 | 0.048 | 0.047 | 0.049 |
| Beryllium (Be)-Total | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.00020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Bismuth (Bi)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | 0.0013 | <0.0010 | <0.0010 | <0.00010 | <0.0010 | <0.0010 | <0.0010 | | |
| Boron (B)-Total | mg/L | 2.81 | 2.75 | 2.76 | 2.37 | 2.33 | 2.59 | 0.254 | 2.47 | 2.43 | 2.65 | 2.32 | 2.74 |
| Cadmium (Cd)-Total | mg/L | 0.00017 | 0.00012 | 0.00011 | 0.00086 | 0.0002 | <0.00010 | 0.000014 | 0.00025 | 0.00012 | 0.00015 | 0.00014 | <0.00010 |
| Calcium (Ca)-Total | mg/L | 740 | 683 | 687 | 634 | 604 | 644 | 65.2 | 569 | 578 | 700 | 698 | 731 |
| Cesium (Cs)-Total | mg/L | 0.00058 | 0.00068 | 0.00051 | 0.00114 | 0.00026 | 0.00063 | 0.000036 | 0.00053 | 0.00088 | 0.00054 | | |
| Chromium (Cr)-Total | mg/L | 0.0101 | 0.0096 | 0.0107 | 0.07 | 0.0169 | 0.0151 | 0.00162 | 0.0324 | 0.0145 | 0.0163 | 0.0073 | 0.0051 |
| Cobalt (Co)-Total | mg/L | 0.0136 | 0.0129 | 0.0137 | 0.0986 | 0.0233 | 0.0112 | 0.002 | 0.0353 | 0.0174 | 0.0191 | 0.0091 | 0.0108 |
| Copper (Cu)-Total | mg/L | 0.133 | 0.118 | 0.16 | 0.973 | 0.432 | 0.122 | 0.0353 | 0.83 | 0.163 | 0.194 | 0.079 | 0.131 |
| Iron (Fe)-Total | mg/L | 28 | 26.6 | 27.3 | 253 | 45.8 | 20.1 | 4.29 | 60.3 | 37.3 | 34.4 | 19.4 | 11.3 |
| Lead (Pb)-Total | mg/L | 0.0054 | 0.0049 | 0.005 | 0.0492 | 0.0137 | 0.0035 | 0.00077 | 0.0132 | 0.008 | 0.0056 | 0.0031 | 0.002 |
| Lithium (Li)-Total | mg/L | 0.111 | 0.104 | 0.107 | 0.124 | 0.092 | 0.103 | 0.0096 | 0.091 | 0.094 | 0.098 | 0.105 | 0.111 |
| Magnesium (Mg)-Total | mg/L | 678 | 635 | 613 | 512 | 505 | 580 | 58.1 | 522 | 562 | 553 | 624 | 595 |
| Manganese (Mn)-Total | mg/L | 1.61 | 1.63 | 1.56 | 6.04 | 1.77 | 1.49 | 0.189 | 1.93 | 1.58 | 1.61 | 1.6 | 1.35 |
| Mercury (Hg)-Total | mg/L | <0.000025 | | <0.000025 | <0.000050 | 0.0000267 | <0.0000050 | <0.000025 | 0.0000114 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.0068 | 0.0063 | 0.0062 | 0.0094 | 0.0074 | 0.0059 | 0.00062 | 0.006 | 0.0058 | 0.0073 | 0.0057 | 0.0058 |
| Nickel (Ni)-Total | mg/L | 0.02 | 0.018 | 0.019 | 0.095 | 0.03 | 0.021 | 0.0021 | 0.041 | 0.021 | 0.029 | 0.011 | 0.02 |
| Phosphorus (P)-Total | mg/L | <1.0 | <1.0 | <1.0 | 3.7 | <1.0 | <1.0 | <0.10 | <1.0 | <1.0 | <1.0 | | |
| Potassium (K)-Total | mg/L | 152 | 163 | 150 | 127 | 138 | 144 | 14.8 | 131 | 139 | 140 | 150 | 150 |
| Rubidium (Rb)-Total | mg/L | 0.0796 | 0.0784 | 0.0745 | 0.066 | 0.0509 | 0.0679 | 0.00628 | 0.0584 | 0.0721 | 0.0656 | | |

| Sample ID | TL-12A | TL12 | TL-12A | TL12 | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | L2402984-1 | L2405209-1 | L2407843-1 | L2411632-1 | L2413161-1 | L2416914-1 | L2417809-1 | L2423323-1 | L2426413-1 | L2428744-1 | L2431086-1 | L2432843-1 |
| Date Sampled | 6-Jan-2020 16:00 | 13-Jan-2020 12:30 | 20-Jan-2020 17:55 | 28-Jan-2020 16:00 | 3-Feb-2020 15:30 | 10-Feb-2020 11:50 | 17-Feb-2020 13:15 | 2-Mar-2020 13:00 | 9-Mar-2020 13:20 | 16-Mar-2020 13:15 | 23-Mar-2020 14:15 | 30-Mar-2020 13:10 |
| **Parameter** | **Units** | **Results** | | | | | | | | | | |
| Selenium (Se)-Total | mg/L | <0.0010 | <0.0010 | <0.0010 | 0.0029 | <0.0010 | <0.0010 | <0.0010 | 0.0012 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Silicon (Si)-Total | mg/L | 15 | 14 | 15 | 57.9 | 13.1 | 11.5 | 1.99 | 19.4 | 18.3 | 15.7 | | |
| Silver (Ag)-Total | mg/L | 0.00044 | 0.00077 | 0.00053 | 0.00366 | 0.00194 | 0.0005 | 0.000104 | 0.00225 | 0.00059 | 0.00056 | 0.00047 | 0.00045 |
| Sodium (Na)-Total | mg/L | 5250 | 5080 | 5170 | 3870 | 4270 | 4730 | 468 | 4170 | 4410 | 4580 | 5020 | 4990 |
| Strontium (Sr)-Total | mg/L | 9.35 | 8.93 | 8.04 | 6.57 | 7.74 | 8.29 | 0.826 | 7.19 | 7.03 | 8.39 | | |
| Tellurium (Te)-Total | mg/L | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.00040 | <0.0040 | <0.0040 | <0.0040 | | |
| Thallium (Tl)-Total | mg/L | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.000020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 |
| Thorium (Th)-Total | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.00020 | <0.0020 | <0.0020 | <0.0020 | | |
| Tin (Sn)-Total | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.00020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Titanium (Ti)-Total | mg/L | 0.145 | 0.207 | 0.175 | 0.737 | 0.099 | 0.0863 | 0.0212 | 0.218 | 0.195 | 0.227 | 0.092 | 0.042 |
| Tungsten (W)-Total | mg/L | 0.0043 | 0.0045 | 0.0035 | 0.0082 | 0.0038 | 0.0046 | 0.00032 | 0.0029 | 0.0043 | 0.0082 | | |
| Uranium (U)-Total | mg/L | 0.00038 | 0.00037 | 0.00039 | 0.00061 | 0.00046 | 0.00035 | 0.000049 | 0.00037 | 0.00044 | 0.00035 | 0.00027 | 0.00029 |
| Vanadium (V)-Total | mg/L | 0.033 | 0.029 | 0.034 | 0.179 | 0.027 | 0.02 | 0.0047 | 0.048 | 0.037 | 0.038 | 0.02 | 0.01 |
| Zinc (Zn)-Total | mg/L | 0.185 | 0.148 | 0.258 | 0.629 | 0.216 | 0.232 | 0.0252 | 0.343 | 0.269 | 0.171 | 0.25 | 0.17 |
| Zirconium (Zr)-Total | mg/L | <0.0040 | <0.0040 | <0.0040 | 0.0058 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | | |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 195 | | | | 231 | | | 203 | 202 | 202 | | |

**Table D1-38. Water Sampling Monitoring Program Results for April to June 2020 Taken from TL-12**

| Sample ID | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | L2435033-1 | L2437424-1 | L2439895-1 | L2441157-1 | L2444655-1 | L2451011-1 | L2453232-1 | L2456747-1 | L2462415-1 | L2464834-1 | L2469121-1 |
| Date Sampled | 6-Apr-2020 11:00 | 14-Apr-2020 11:15 | 21-Apr-2020 14:20 | 27-Apr-2020 11:25 | 5-May-2020 9:30 | 21-May-2020 16:45 | 26-May-2020 16:20 | 2-Jun-2020 12:30 | 16-Jun-2020 11:38 | 22-Jun-2020 8:10 | 30-Jun-2020 18:15 |
| **Parameter** | **Units** | **Results** | | | | | | | | | |
| pH | pH | 7.92 | 7.98 | 8.05 | 8 | 7.94 | 7.89 | 7.86 | 7.94 | 7.92 | 7.89 | 7.96 |
| Conductivity | µS/cm | | | | | 24000 | | | 25300 | | | |
| Total Suspended Solids | mg/L | 132 | 197 | 128 | 102 | 215 | 74.8 | 40.9 | 76.9 | 127 | 4 | 71.9 |
| Total Dissolved Solids | mg/L | 16000 | 15400 | 17600 | 19200 | 18000 | 19900 | 21800 | 19700 | 18900 | 20900 | 17000 |
| Chloride (Cl) | mg/L | 9700 | 9470 | 9380 | 8830 | 9010 | 11300 | 10300 | 9330 | 9990 | 9390 | 7980 |
| Bromide (Br) | mg/L | | | | | 33.7 | | | 33.5 | | | |
| Fluoride (F) | mg/L | | | | | <2.0 | | | <2.0 | | | |
| Cyanide, Total | mg/L | 0.0825 | 0.0143 | 0.0518 | 0.0222 | 0.0215 | 0.0293 | 0.0343 | 0.0388 | 0.0362 | 0.0481 | 0.0295 |
| Cyanide, WAD | mg/L | | | | | <0.0050 | | | <0.0050 | | | |
| Ammonia, Total (as N) | mg/L | 5.77 | 6.2 | 5.56 | 4.28 | 5.94 | 8.45 | 3.68 | 8.41 | 5.46 | 3.66 | 11.7 |
| Nitrate (as N) | mg/L | 4.81 | 5.77 | 4.98 | 3.16 | 4.66 | 13.7 | 2.07 | 10 | 4.68 | 2.3 | 12.7 |
| Nitrite (as N) | mg/L | 0.27 | | | | 0.21 | | | 0.44 | | | |
| Sulfate ($SO_4$) | mg/L | | | | | 945 | | | 1010 | | | |
| Aluminum (Al)-Total | mg/L | 5.46 | | 2.85 | 3.07 | 3.79 | 1.13 | 0.404 | 1.28 | 1.74 | 1.64 | 1.68 |
| Antimony (Sb)-Total | mg/L | <0.0020 | 0.00076 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 | <0.0020 |

| Sample ID | | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2435033-1 | L2437424-1 | L2439895-1 | L2441157-1 | L2444655-1 | L2451011-1 | L2453232-1 | L2456747-1 | L2462415-1 | L2464834-1 | L2469121-1 |
| Date Sampled | | 6-Apr-2020 11:00 | 14-Apr-2020 11:15 | 21-Apr-2020 14:20 | 27-Apr-2020 11:25 | 5-May-2020 9:30 | 21-May-2020 16:45 | 26-May-2020 16:20 | 2-Jun-2020 12:30 | 16-Jun-2020 11:38 | 22-Jun-2020 8:10 | 30-Jun-2020 18:15 |
| **Parameter** | **Units** | **Results** | | | | | | | | | | |
| Arsenic (As)-Total | mg/L | 0.0176 | 0.00763 | 0.0138 | 0.0115 | 0.0103 | 0.0037 | <0.0020 | 0.0033 | 0.0075 | 0.0036 | 0.0087 |
| Barium (Ba)-Total | mg/L | 0.05 | 0.047 | 0.042 | 0.04 | 0.0521 | 0.045 | 0.045 | 0.0456 | 0.045 | 0.0484 | 0.0462 |
| Beryllium (Be)-Total | mg/L | <0.0020 | <0.00050 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 | <0.0020 |
| Bismuth (Bi)-Total | mg/L | | | | | <0.0010 | | | <0.00050 | | <0.0010 | <0.0010 |
| Boron (B)-Total | mg/L | 2.37 | 2.36 | 2.57 | 2.33 | 2.41 | 2.51 | 2.46 | 2.38 | 2.33 | 2.56 | 2.46 |
| Cadmium (Cd)-Total | mg/L | 0.0001 | 0.000099 | 0.00016 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | 0.000084 | <0.00010 | <0.00010 | 0.00017 |
| Calcium (Ca)-Total | mg/L | 643 | 600 | 673 | 615 | 607 | 670 | 725 | 645 | 617 | 648 | 624 |
| Cesium (Cs)-Total | mg/L | | | | | 0.00042 | | | 0.00061 | | 0.00069 | 0.00041 |
| Chromium (Cr)-Total | mg/L | 0.0075 | 0.0047 | 0.0063 | 0.0059 | 0.0063 | <0.0020 | <0.0020 | 0.0017 | 0.0031 | 0.0027 | 0.0031 |
| Cobalt (Co)-Total | mg/L | 0.0114 | 0.0115 | 0.0141 | 0.0088 | 0.0106 | 0.0103 | 0.0027 | 0.0094 | 0.0082 | 0.004 | 0.0145 |
| Copper (Cu)-Total | mg/L | 0.119 | 0.0553 | 0.096 | 0.118 | 0.064 | 0.036 | 0.022 | 0.0282 | 0.045 | 0.031 | 0.08 |
| Iron (Fe)-Total | mg/L | 14.8 | 14.4 | 10.9 | 8.59 | 15.7 | 4.62 | 2.19 | 4.52 | 7.97 | 5.17 | 5.18 |
| Lead (Pb)-Total | mg/L | 0.0042 | 0.00345 | 0.0031 | 0.0025 | 0.0031 | 0.0011 | <0.0010 | 0.00128 | 0.0019 | 0.0011 | 0.0016 |
| Lithium (Li)-Total | mg/L | 0.095 | 0.096 | 0.092 | 0.089 | 0.091 | 0.108 | 0.098 | 0.093 | 0.088 | 0.096 | 0.092 |
| Magnesium (Mg)-Total | mg/L | 572 | 591 | 538 | 529 | 577 | 647 | 631 | 598 | 596 | 618 | 530 |
| Manganese (Mn)-Total | mg/L | 1.44 | 1.48 | 1.43 | 1.32 | 1.5 | 1.63 | 1.5 | 1.46 | 1.44 | 1.41 | 1.52 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.0067 | 0.0053 | 0.0057 | 0.0058 | 0.0068 | 0.0049 | 0.0047 | 0.00464 | 0.0048 | 0.0042 | 0.0071 |
| Nickel (Ni)-Total | mg/L | 0.02 | 0.0188 | 0.028 | 0.018 | 0.022 | 0.021 | <0.010 | 0.0208 | 0.012 | <0.010 | 0.031 |
| Phosphorus (P)-Total | mg/L | 0.136 | | | | <1.0 | | | <0.50 | | <1.0 | <1.0 |
| Potassium (K)-Total | mg/L | 143 | 142 | 146 | 142 | 148 | 151 | 158 | 148 | 143 | 151 | 133 |
| Rubidium (Rb)-Total | mg/L | | | | | 0.0669 | | | 0.0775 | | 0.0794 | 0.0662 |
| Selenium (Se)-Total | mg/L | <0.0010 | 0.00033 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.00050 | <0.0010 | <0.0010 | 0.0014 |
| Silicon (Si)-Total | mg/L | | | | | 9 | | | 5.8 | | 6.1 | 5.8 |
| Silver (Ag)-Total | mg/L | 0.00044 | 0.000297 | 0.00036 | 0.00035 | 0.00028 | <0.00020 | <0.00020 | 0.00011 | 0.00023 | <0.00020 | 0.00035 |
| Sodium (Na)-Total | mg/L | 4640 | 4860 | 5110 | 4510 | 4940 | 5190 | 5230 | 5000 | 4540 | 4910 | 4450 |
| Strontium (Sr)-Total | mg/L | | | | | 8.39 | | | 8.07 | | 8.68 | 7.41 |
| Tellurium (Te)-Total | mg/L | | | | | <0.0040 | | | <0.0020 | | <0.0040 | <0.0040 |
| Thallium (Tl)-Total | mg/L | <0.00020 | <0.000050 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00010 | <0.00020 | <0.00020 | <0.00020 |
| Thorium (Th)-Total | mg/L | | | | | <0.0020 | | | <0.0010 | | <0.0020 | <0.0020 |
| Tin (Sn)-Total | mg/L | <0.0020 | <0.00050 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 | <0.0020 |
| Titanium (Ti)-Total | mg/L | 0.188 | 0.052 | 0.057 | 0.069 | 0.0665 | 0.016 | <0.010 | 0.0193 | 0.028 | 0.0292 | 0.0333 |
| Tungsten (W)-Total | mg/L | | | | | 0.0031 | | | 0.0016 | | <0.0020 | 0.0043 |
| Uranium (U)-Total | mg/L | 0.00033 | 0.00034 | 0.0004 | 0.0004 | 0.0004 | 0.0003 | 0.00028 | 0.00032 | 0.00028 | 0.00027 | 0.0003 |
| Vanadium (V)-Total | mg/L | 0.023 | 0.0119 | 0.012 | 0.011 | 0.015 | <0.010 | <0.010 | 0.0055 | <0.010 | <0.010 | <0.010 |
| Zinc (Zn)-Total | mg/L | 0.127 | 0.105 | 0.108 | 0.145 | 0.093 | 0.127 | 0.105 | 0.111 | 0.107 | 0.074 | 0.574 |
| Zirconium (Zr)-Total | mg/L | | | | | <0.0040 | | | <0.0020 | | <0.0040 | <0.0040 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | | | | | 195 | | | 180 | | | |

^ *Indicates duplicate sample.*

**Table D1-39. Water Sampling Monitoring Program Results for July to September 2020 Taken from TL-12**

| Sample ID | | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | | YL2000000-001 | L2476559-1 | L2479636-1 | L2482663-1 | L2486022-1 | L2490451-1 | L2492314-1 | L2495686-1 | L2498930-1 | L2500037-1 |
| Date Sampled | | 7-Jul-2020 16:50 | 16-Jul-2020 14:05 | 23-Jul-2020 18:00 | 30-Jul-2020 14:20 | 6-Aug-2020 14:15 | 15-Aug-2020 9:45 | 19-Aug-2020 15:45 | 26-Aug-2020 10:30 | 2-Sep-2020 15:45 | 7-Sep-2020 17:45 |
| **Parameter** | **Units** | **Results** | | | | | | | | | |
| pH | pH | 7.85 | 7.87 | 7.87 | 7.9 | 7.96 | 7.95 | 7.95 | 7.95 | 8.15 | 7.94 |
| Conductivity | µS/cm | 24600 | | | | 25900 | | | | 21200 | |
| Total Suspended Solids | mg/L | 33 | 45.6 | 52.6 | 71.2 | 55.3 | 57.2 | 44.6 | 127 | 9.5 | 69.9 |
| Total Dissolved Solids | mg/L | 19800 | 19800 | 24200 | 19600 | 19800 | 18900 | 18500 | 18900 | 17400 | 16100 |
| Chloride (Cl) | mg/L | 9270 | 9170 | 10000 | 9210 | 8620 | 7780 | 9750 | 8770 | 7880 | 8520 |
| Bromide (Br) | mg/L | 34 | | | | 31.9 | | | | 29.6 | |
| Fluoride (F) | mg/L | <2.00 | | | | <2.0 | | | | <1.0 | |
| Cyanide, Total | mg/L | 0.066 | 0.02 | 0.0433 | 0.0138 | 0.0154 | 0.0198 | 0.0273 | 0.106 | 0.101 | 0.325 |
| Cyanide, WAD | mg/L | <0.0050 | | | | <0.0050 | | | | <0.0050 | |
| Ammonia, Total (as N) | mg/L | 5.95 | 4.32 | 3.76 | 4.14 | 4.78 | 4.02 | 2.84 | 4.36 | 6.82 | 4.45 |
| Nitrate (as N) | mg/L | 6.07 | 2.81 | 2.25 | 2.04 | 3.28 | 2.46 | 1.27 | 2.93 | 6.85 | 2.72 |
| Nitrite (as N) | mg/L | 0.227 | | | | 0.17 | | | | 0.28 | |
| Sulfate ($SO_4$) | mg/L | 973 | | | | 884 | | | | 908 | |
| Aluminum (Al)-Total | mg/L | 1.89 | 0.445 | 0.434 | 2.39 | 0.805 | 0.573 | 0.494 | 3.21 | 0.34 | 1.72 |
| Antimony (Sb)-Total | mg/L | <0.00200 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 |
| Arsenic (As)-Total | mg/L | 0.0155 | 0.0048 | 0.0042 | 0.0097 | 0.0052 | 0.005 | 0.0037 | 0.0571 | 0.0123 | 0.0678 |
| Barium (Ba)-Total | mg/L | 0.0448 | 0.0436 | 0.0416 | 0.0398 | 0.0393 | 0.0432 | 0.0427 | 0.0427 | 0.0589 | 0.0433 |
| Beryllium (Be)-Total | mg/L | <0.000400 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 |
| Bismuth (Bi)-Total | mg/L | <0.00100 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.00050 | <0.0010 | <0.0010 |
| Boron (B)-Total | mg/L | 2.77 | 2.84 | 2.51 | 2.56 | 2.32 | 2.45 | 2.63 | 2.4 | 2.13 | 2.35 |
| Cadmium (Cd)-Total | mg/L | <0.000100 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | 0.00006 | <0.00010 | 0.00021 |
| Calcium (Ca)-Total | mg/L | 671 | 714 | 692 | 617 | 663 | 571 | 674 | 608 | 429 | 561 |
| Cesium (Cs)-Total | mg/L | 0.000335 | 0.00056 | 0.00048 | 0.00046 | 0.00045 | 0.00037 | 0.00069 | 0.00042 | <0.00020 | <0.00020 |
| Chromium (Cr)-Total | mg/L | | <0.0020 | <0.0020 | 0.0064 | <0.0020 | <0.0020 | <0.0020 | 0.0097 | 0.008 | 0.0259 |
| Cobalt (Co)-Total | mg/L | 0.00959 | 0.006 | 0.0049 | 0.0066 | 0.0059 | 0.0046 | 0.0026 | 0.0155 | 0.0075 | 0.0216 |
| Copper (Cu)-Total | mg/L | 0.158 | 0.036 | 0.029 | 0.11 | 0.065 | 0.036 | 0.029 | 0.316 | 0.063 | 0.675 |
| Iron (Fe)-Total | mg/L | 3.9 | 2.24 | 2.69 | 7.48 | 3.58 | 2.88 | 3.15 | 12.5 | 1.23 | 13.6 |
| Lead (Pb)-Total | mg/L | 0.0014 | <0.0010 | 0.0011 | 0.0015 | 0.0012 | 0.0014 | 0.0012 | 0.00396 | <0.0010 | 0.0052 |
| Lithium (Li)-Total | mg/L | 0.104 | 0.109 | 0.107 | 0.102 | 0.089 | 0.084 | 0.097 | 0.101 | 0.069 | 0.083 |
| Magnesium (Mg)-Total | mg/L | 583 | 596 | 587 | 575 | 558 | 492 | 592 | 584 | 468 | 501 |
| Manganese (Mn)-Total | mg/L | 1.22 | 1.3 | 1.48 | 1.3 | 1.18 | 1.06 | 1.38 | 1.37 | 0.488 | 1.08 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.000010 | <0.0000050 | <0.0000050 | <0.000025 | <0.0000050 | <0.000050 |
| Molybdenum (Mo)-Total | mg/L | 0.00865 | 0.0066 | 0.0052 | 0.0063 | 0.0059 | 0.0056 | 0.0033 | 0.00493 | 0.0113 | 0.0057 |
| Nickel (Ni)-Total | mg/L | 0.0244 | 0.013 | 0.012 | 0.022 | 0.017 | 0.014 | <0.010 | 0.0422 | 0.115 | 0.039 |
| Phosphorus (P)-Total | mg/L | <1.00 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 |
| Potassium (K)-Total | mg/L | 135 | 148 | 148 | 136 | 138 | 123 | 140 | 144 | 132 | 127 |
| Rubidium (Rb)-Total | mg/L | 0.0607 | 0.0753 | 0.0761 | 0.077 | 0.0698 | 0.0713 | 0.0755 | 0.0704 | 0.0557 | 0.0442 |
| Selenium (Se)-Total | mg/L | <0.00100 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.00050 | <0.0010 | 0.0012 |

| Sample ID | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | YL2000000-001 | L2476559-1 | L2479636-1 | L2482663-1 | L2486022-1 | L2490451-1 | L2492314-1 | L2495686-1 | L2498930-1 | L2500037-1 |
| Date Sampled | 7-Jul-2020 16:50 | 16-Jul-2020 14:05 | 23-Jul-2020 18:00 | 30-Jul-2020 14:20 | 6-Aug-2020 14:15 | 15-Aug-2020 9:45 | 19-Aug-2020 15:45 | 26-Aug-2020 10:30 | 2-Sep-2020 15:45 | 7-Sep-2020 17:45 |
| **Parameter** **Units** | **Results** | | | | | | | | | |
| Silicon (Si)-Total mg/L | 7.62 | 4.5 | 4.7 | 7 | 4.8 | 4.6 | 5.3 | 7.9 | 7.7 | 6.7 |
| Silver (Ag)-Total mg/L | 0.000826 | 0.00027 | 0.00021 | 0.00075 | 0.00029 | 0.00023 | <0.00020 | 0.00103 | 0.00023 | 0.00262 |
| Sodium (Na)-Total mg/L | 4660 | 4850 | 5230 | 4910 | 4540 | 4120 | 4670 | 4770 | 4050 | 4260 |
| Strontium (Sr)-Total mg/L | 8.32 | 9.13 | 9.73 | 8.43 | 7.89 | 7.12 | 8.82 | 7.87 | 5.85 | 7.18 |
| Tellurium (Te)-Total mg/L | <0.00400 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0020 | <0.0040 | <0.0040 |
| Thallium (Tl)-Total mg/L | <0.000200 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00020 | <0.00010 | <0.00020 | <0.00020 |
| Thorium (Th)-Total mg/L | <0.00200 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 |
| Tin (Sn)-Total mg/L | <0.00200 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0020 | <0.0010 | <0.0020 | <0.0020 |
| Titanium (Ti)-Total mg/L | <0.0573 | <0.0060 | <0.0060 | 0.0505 | 0.011 | <0.0060 | <0.0060 | 0.057 | <0.0060 | <0.040 |
| Tungsten (W)-Total mg/L | 0.00336 | 0.0043 | 0.0036 | 0.019 | 0.0058 | 0.0057 | 0.0025 | 0.0078 | 0.0289 | 0.0104 |
| Uranium (U)-Total mg/L | 0.000308 | 0.00027 | 0.00023 | 0.00031 | 0.00033 | 0.00038 | 0.00026 | 0.00029 | 0.00033 | 0.00028 |
| Vanadium (V)-Total mg/L | <0.0100 | <0.010 | <0.010 | 0.011 | <0.010 | <0.010 | <0.010 | 0.0125 | <0.010 | <0.010 |
| Zinc (Zn)-Total mg/L | 0.48 | 0.061 | 0.097 | 0.075 | 0.071 | 0.095 | 0.061 | 0.073 | <0.060 | 0.063 |
| Zirconium (Zr)-Total mg/L | <0.00400 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0040 | <0.0020 | <0.0040 | <0.0040 |
| Alkalinity, Total (as $CaCO_3$) mg/L | 218 | | | | 180 | | | | 141 | |

*Note: A travel embargo was placed on the Doris site by the Government of Nunavut in September-October 2020 due to positively confirmed cases of COVID-19 at the Hope Bay site, prohibiting the transportation of personnel and materials from the site. As a result monitoring at station TL-12 was not sampled and tested as per the frequency outlined in Schedule I, Table 3 of the licence as a result of the embargo.*

**Table D1-40. Water Sampling Monitoring Program Results for October to December 2020 Taken from TL-12**

| Sample ID | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | YL2000129-001 | YL2000150-001 | YL2000172-001 | YL2000186-001 | YL2000204-001 | YL2000218-001 | YL2000245-001 | YL2000260-001 | YL2000281-001 | YL2000295-001 | YL2000303-001 | YL2100017-001 |
| Date Sampled | 15-Oct-2020 16:20 | 21-Oct-2020 10:40 | 28-Oct-2020 15:50 | 3-Nov-2020 13:30 | 10-Nov-2020 14:10 | 18-Nov-2020 14:20 | 24-Nov-2020 12:15 | 2-Dec-2020 13:30 | 9-Dec-2020 15:30 | 15-Dec-2020 15:40 | 20-Dec-2020 14:30 | 30-Dec-2020 14:20 |
| **Parameter** **Units** | **Results** | | | | | | | | | | | |
| pH pH | 8.06 | 8 | 7.99 | 8.02 | 8.02 | 7.87 | 7.92 | 8.02 | 8.13 | 7.92 | 7.87 | 7.91 |
| Conductivity µS/cm | 22800 | | | 21300 | | | | 20900 | | | | |
| Total Suspended Solids mg/L | 86.6 | 85.7 | 56.3 | 102 | 92.6 | 47.2 | 28.4 | 37 | 66.4 | 68.8 | 13.8 | 5.2 |
| Total Dissolved Solids mg/L | 14800 | 12600 | 15900 | 16000 | 13400 | 13000 | 15000 | 13200 | 17400 | 13700 | 14400 | 11400 |
| Chloride (Cl) mg/L | 8080 | 7980 | 8100 | 8640 | 7730 | 7950 | 7910 | 8180 | 8210 | 7050 | 7920 | 7580 |
| Bromide (Br) mg/L | 28 | | | 30.8 | | | | 24.1 | | | | |
| Fluoride (F) mg/L | <2.00 | | | <2.00 | | | | <2.00 | | | | |
| Cyanide, Total mg/L | 0.053 | 0.162 | 0.0363 | 0.199 | 0.0488 | 0.0276 | 0.0223 | 0.063 | 0.0608 | 0.0824 | 0.0147 | 0.0432 |
| Cyanide, WAD mg/L | <0.0100 | | | <0.0100 | | | | <0.0100 | | | | |
| Ammonia, Total (as N) mg/L | 3.38 | 3.13 | 3.78 | 4.53 | 4.62 | 5.68 | 3.39 | 5.17 | 4.18 | 4.73 | 5.31 | 6.75 |
| Nitrate (as N) mg/L | 1.97 | 2.17 | 3.22 | 3.63 | 3.71 | 5.24 | 2.43 | 4.89 | 3.17 | 4.55 | 3.98 | 6.27 |
| Nitrite (as N) mg/L | 0.124 | | | 0.29 | | | | 0.743 | | | | |
| Sulfate ($SO_4$) mg/L | 844 | | | 916 | | | | 854 | | | | |
| Aluminum (Al)-Total mg/L | 1.97 | 2.04 | 1.46 | 2.54 | 2.06 | 1.25 | 0.852 | 2.32 | 0.688 | 1.74 | 0.268 | 0.194 |
| Antimony (Sb)-Total mg/L | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00100 | <0.00200 | <0.00100 |

| Sample ID | | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A | TL-12A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALS ID | | YL2000129-001 | YL2000150-001 | YL2000172-001 | YL2000186-001 | YL2000204-001 | YL2000218-001 | YL2000245-001 | YL2000260-001 | YL2000281-001 | YL2000295-001 | YL2000303-001 | YL2100017-001 |
| Date Sampled | | 15-Oct-2020 16:20 | 21-Oct-2020 10:40 | 28-Oct-2020 15:50 | 3-Nov-2020 13:30 | 10-Nov-2020 14:10 | 18-Nov-2020 14:20 | 24-Nov-2020 12:15 | 2-Dec-2020 13:30 | 9-Dec-2020 15:30 | 15-Dec-2020 15:40 | 20-Dec-2020 14:30 | 30-Dec-2020 14:20 |
| **Parameter** | **Units** | **Results** | | | | | | | | | | | |
| Arsenic (As)-Total | mg/L | 0.0198 | 0.0272 | 0.0155 | 0.0313 | 0.00762 | 0.0062 | 0.00511 | 0.013 | 0.00711 | 0.0122 | 0.00307 | 0.00323 |
| Barium (Ba)-Total | mg/L | 0.0444 | 0.0502 | 0.0495 | 0.0684 | 0.0528 | 0.0512 | 0.056 | 0.0546 | 0.0576 | 0.0503 | 0.0467 | 0.0532 |
| Beryllium (Be)-Total | mg/L | <0.000400 | <0.00200 | <0.00200 | <0.000400 | <0.00200 | <0.00200 | <0.00200 | <0.000400 | <0.00200 | <0.00100 | <0.00200 | <0.00100 |
| Bismuth (Bi)-Total | mg/L | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.000500 | <0.00100 | <0.000500 |
| Boron (B)-Total | mg/L | 1.93 | 2.14 | 2.22 | 2.04 | 2.72 | 2.35 | 2.25 | 2.31 | 2.44 | 2.4 | 2.46 | 2.08 |
| Cadmium (Cd)-Total | mg/L | <0.000100 | <0.000100 | 0.000106 | <0.000100 | <0.000100 | <0.000100 | <0.000100 | <0.000100 | <0.000100 | 0.000101 | <0.000100 | 0.0000686 |
| Calcium (Ca)-Total | mg/L | 442 | 497 | 543 | 489 | 530 | 505 | 566 | 513 | 592 | 461 | 510 | 465 |
| Cesium (Cs)-Total | mg/L | 0.000355 | 0.000273 | 0.000334 | <0.000200 | 0.000338 | 0.000391 | 0.000412 | 0.000245 | 0.000239 | 0.000171 | 0.000282 | 0.000199 |
| Chromium (Cr)-Total | mg/L | 0.0112 | 0.0134 | 0.00618 | 0.0132 | 0.00413 | 0.00341 | <0.00200 | <0.0100 | 0.00291 | 0.0036 | <0.00200 | <0.00100 |
| Cobalt (Co)-Total | mg/L | 0.0117 | 0.013 | 0.0119 | 0.00928 | 0.00884 | 0.0083 | 0.0085 | 0.00992 | 0.00645 | 0.0113 | 0.0064 | 0.00753 |
| Copper (Cu)-Total | mg/L | 0.233 | 0.398 | 0.152 | 0.234 | 0.0712 | 0.0598 | 0.0534 | 0.128 | 0.0788 | 0.114 | 0.0339 | 0.0298 |
| Iron (Fe)-Total | mg/L | 8.08 | 10.9 | 6.36 | 10.6 | 6.56 | 4.16 | 3.37 | 7.37 | 3.05 | 6.22 | 1.14 | 0.98 |
| Lead (Pb)-Total | mg/L | 0.00286 | 0.00297 | 0.00203 | 0.0034 | 0.00146 | 0.00113 | <0.00100 | 0.00179 | 0.00101 | 0.00167 | <0.00100 | <0.000500 |
| Lithium (Li)-Total | mg/L | 0.0741 | 0.079 | 0.0824 | 0.082 | 0.0958 | 0.0848 | 0.0913 | 0.0841 | 0.0902 | 0.0772 | 0.0841 | 0.077 |
| Magnesium (Mg)-Total | mg/L | 453 | 478 | 458 | 492 | 508 | 485 | 564 | 491 | 530 | 483 | 524 | 483 |
| Manganese (Mn)-Total | mg/L | 1.02 | 1.01 | 1.01 | 0.832 | 1.06 | 1.12 | 1.2 | 1.17 | 1.02 | 0.998 | 0.948 | 0.938 |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.000100 | <0.0000500 | <0.000100 | <0.0000500 | <0.0000250 | <0.0000050 | <0.0000250 | <0.0000050 | <0.0000250 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.00576 | 0.00608 | 0.0075 | 0.00954 | 0.00912 | 0.00652 | 0.00784 | 0.00748 | 0.00776 | 0.00611 | 0.00517 | 0.00555 |
| Nickel (Ni)-Total | mg/L | 0.0239 | 0.0217 | 0.0212 | 0.02 | 0.0203 | 0.0162 | 0.0181 | 0.0242 | 0.0136 | 0.0223 | 0.0132 | 0.0201 |
| Phosphorus (P)-Total | mg/L | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <0.500 | <1.00 | <0.500 |
| Potassium (K)-Total | mg/L | 124 | 125 | 128 | 144 | 142 | 136 | 139 | 128 | 142 | 125 | 137 | 137 |
| Rubidium (Rb)-Total | mg/L | 0.0546 | 0.0461 | 0.0608 | 0.053 | 0.0681 | 0.0651 | 0.0714 | 0.0541 | 0.061 | 0.0494 | 0.0562 | 0.0522 |
| Selenium (Se)-Total | mg/L | <0.00100 | 0.00103 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 | 0.00105 | <0.00100 | 0.000567 |
| Silicon (Si)-Total | mg/L | 6.38 | 7.34 | 7.4 | 10.2 | 7.22 | 5.75 | 5.24 | 6.61 | 6.41 | 6.34 | 4.44 | 4.62 |
| Silver (Ag)-Total | mg/L | 0.000767 | 0.00166 | 0.000608 | 0.000818 | 0.000328 | 0.000263 | 0.000442 | 0.000469 | 0.000566 | 0.000817 | 0.000213 | 0.000127 |
| Sodium (Na)-Total | mg/L | 4090 | 3930 | 3940 | 4340 | 4300 | 4210 | 4590 | 4180 | 4670 | 3810 | 4040 | 4170 |
| Strontium (Sr)-Total | mg/L | 6.45 | 6.5 | 7.28 | 6.78 | 6.68 | 6.58 | 7.32 | 6.67 | 7.42 | 5.88 | 6.49 | 6.54 |
| Tellurium (Te)-Total | mg/L | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00200 | <0.00400 | <0.00200 |
| Thallium (Tl)-Total | mg/L | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000100 | <0.000200 | <0.000100 |
| Thorium (Th)-Total | mg/L | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00100 | <0.00200 | <0.00100 |
| Tin (Sn)-Total | mg/L | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00100 | <0.00200 | <0.00100 |
| Titanium (Ti)-Total | mg/L | 0.0422 | 0.0572 | 0.0303 | <0.0549 | 0.0354 | 0.026 | 0.013 | 0.0574 | 0.00906 | 0.0338 | <0.00600 | <0.00300 |
| Tungsten (W)-Total | mg/L | 0.00797 | 0.00676 | 0.00714 | 0.0061 | 0.00566 | 0.00876 | 0.0066 | 0.00444 | 0.00864 | 0.009 | 0.00598 | 0.00402 |
| Uranium (U)-Total | mg/L | 0.000286 | 0.000338 | 0.00052 | 0.000425 | 0.000379 | 0.000321 | 0.000339 | 0.000307 | 0.000372 | 0.000409 | 0.000402 | 0.000294 |
| Vanadium (V)-Total | mg/L | <0.0100 | <0.0100 | <0.0100 | 0.0105 | <0.0100 | <0.0100 | <0.0100 | <0.0100 | <0.0100 | 0.00605 | <0.0100 | <0.00500 |
| Zinc (Zn)-Total | mg/L | 0.358 | <0.0600 | <0.0600 | <0.0600 | <0.0600 | <0.0600 | <0.0600 | <0.0600 | <0.0600 | 0.0471 | <0.0600 | <0.0300 |
| Zirconium (Zr)-Total | mg/L | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00400 | <0.00200 | <0.00400 | <0.00200 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 208 | | | 150 | | | | 194 | | | | |

## MMS-1 Madrid North Contact Water Pond

The Madrid North Contact Water Pond (MMS-1) was constructed in 2019 to support the commencement of mining activities at the Madid North site. The pond incorporates a rockfill berm with a geomembrane liner anchored to bedrock to capture contact water runoff from the Madrid North Waste Rock storage pad. Contact water is then either discharged to tundra from the Contact Water Pond if water quality meets the criteria outlined in Part F Item 18(a) of the licence or is transferred to the TIA via water truck.

Water quality samples were collected from this facility from June through September 2020 and results met the criteria outlined in Part F Item 18(a) of the licence. Results of this sampling is provided in Table D1-41. In 2020, a total of 58 $m^3$ of water was discharged to tundra (location 13W 433203 7549806) from this facility. An additional 86 $m^3$ of water was transferred to the TIA via water truck from this facility in 2020.

## MMS-6 Brine Mixing Facility

Brine mixing was conducted from January to March 2020 to support underground mining at Madrid North. Brine was mixed in a tank on surface located adjacent to the portal entrance for use underground.

One sample was collected in 2020 from the brine mixing tank (MMS-6) located at the Madrid North Portal entrance. Results of this sampling is provided in Table D1-42.

## MMS-9 Site Runoff from Sediment Controls

Monitoring at Madrid Site runoff from sediment controls (MMS-9) was not conducted in 2020 as no new infrastructure was constructed in the Madrid area.

No earthworks were conducted in the Madrid area in 2020 and no samples were collected.

## Table D1-41. Water Quality Monitoring Program Results for MMS-1, June to September 2020

| Sample ID | | MMS-1 | MMS-1 | MMS-1N * | MMS-1S * | MMS-1N * | MMS-1S * | Part F Item 18(a) | |
|---|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2458921-1 | L2471347-1 | YL2000005-001 | YL2000005-002 | L2498955-1 | L2498955-4 | Maximum Monthly Mean Concentration (mg/L) | Maximum Concentration of Any Grab Sample (mg/L) |
| Date Sampled | | 8-Jun-2020 12:15 | 6-Jul-2020 11:30 | 2-Aug-2020 13:30 | 2-Aug-2020 14:00 | 2-Sep-2020 14:35 | 2-Sep-2020 14:20 | | |
| **Parameter** | **Units** | **Results** | | | | | | | |
| pH | pH Units | 7.94 | 8.09 | 8.14 | 8 | 8.07 | 7.55 | 6.0-9.5 | 6.0-9.5 |
| Total Suspended Solids | mg/L | 15.4 | <3.0 | 14.1 | 4.3 | 11.2 | 8.4 | 50 | 100 |
| Chloride (Cl) | mg/L | 20.2 | 183 | 2660 | 512 | 988 | 276 | | |
| Cyanide, Total | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | |
| Ammonia, Total (as N) | mg/L | 0.148 | 0.0156 | 1.94 | 0.102 | 0.682 | 0.138 | | |
| Nitrate (as N) | mg/L | 0.708 | 2.7 | 0.606 | 2.44 | 0.37 | 0.684 | | |
| Nitrite (as N) | mg/L | 0.0107 | 0.0398 | 0.161 | 0.0438 | <0.020 | 0.007 | | |
| Sulfate ($SO_4$) | mg/L | 13.4 | 110 | 792 | 271 | 264 | 115 | | |
| Aluminum (Al)-Total | mg/L | 1.31 | 0.106 | 0.153 | 0.113 | 0.401 | 0.899 | | |
| Antimony (Sb)-Total | mg/L | <0.00050 | 0.00052 | 0.0013 | 0.00038 | 0.00027 | 0.00015 | | |
| Arsenic (As)-Total | mg/L | 0.011 | 0.0215 | 0.024 | 0.0158 | 0.0103 | 0.0158 | 0.5 | 1 |
| Barium (Ba)-Total | mg/L | <0.020 | 0.0178 | 0.202 | 0.0433 | 0.0751 | 0.0231 | | |
| Beryllium (Be)-Total | mg/L | <0.00010 | <0.00010 | <0.000500 | <0.000100 | <0.00020 | <0.00010 | | |
| Boron (B)-Total | mg/L | <0.10 | 0.101 | 0.193 | 0.104 | 0.08 | 0.034 | | |
| Cadmium (Cd)-Total | mg/L | 0.0000114 | 0.0000091 | 0.000095 | 0.000035 | 0.000034 | 0.0000657 | | |
| Calcium (Ca)-Total | mg/L | 16 | 86.8 | 373 | 145 | 184 | 67.4 | | |
| Chromium (Cr)-Total | mg/L | 0.0053 | 0.0013 | 0.0011 | 0.00084 | 0.00195 | 0.0027 | | |
| Cobalt (Co)-Total | mg/L | 0.00156 | 0.0007 | 0.00834 | 0.00213 | 0.00746 | 0.00344 | | |
| Copper (Cu)-Total | mg/L | 0.0052 | 0.00603 | 0.0103 | 0.00667 | 0.0088 | 0.00669 | | |
| Iron (Fe)-Total | mg/L | 2.13 | 0.114 | 0.61 | 0.161 | 0.675 | 1.36 | | |
| Lead (Pb)-Total | mg/L | <0.00050 | 0.000059 | <0.000250 | 0.00006 | 0.00023 | 0.00025 | | |
| Lithium (Li)-Total | mg/L | 0.0018 | 0.0045 | 0.0168 | 0.0056 | 0.0102 | 0.0032 | | |
| Magnesium (Mg)-Total | mg/L | 3.91 | 19.2 | 238 | 39.4 | 101 | 20.5 | | |
| Manganese (Mn)-Total | mg/L | 0.062 | 0.0185 | 2.14 | 0.0635 | 2.18 | 0.236 | | |

| Sample ID | | MMS-1 | MMS-1 | MMS-1N * | MMS-1S * | MMS-1N * | MMS-1S * | Part F Item 18(a) | |
|---|---|---|---|---|---|---|---|---|---|
| ALS ID | | L2458921-1 | L2471347-1 | YL2000005-001 | YL2000005-002 | L2498955-1 | L2498955-4 | Maximum Monthly Mean Concentration (mg/L) | Maximum Concentration of Any Grab Sample (mg/L) |
| Date Sampled | | 8-Jun-2020 12:15 | 6-Jul-2020 11:30 | 2-Aug-2020 13:30 | 2-Aug-2020 14:00 | 2-Sep-2020 14:35 | 2-Sep-2020 14:20 | | |
| **Parameter** | **Units** | **Results** | | | | | | | |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | 0.0000055 | <0.0000050 | <0.0000050 | <0.0000050 | | |
| Molybdenum (Mo)-Total | mg/L | <0.0010 | 0.00206 | 0.00272 | 0.00142 | 0.00241 | 0.000874 | | |
| Nickel (Ni)-Total | mg/L | 0.0074 | 0.00451 | 0.0189 | 0.00582 | 0.0136 | 0.00683 | 0.5 | 1 |
| Potassium (K)-Total | mg/L | 2.1 | 9.17 | 62.6 | 10.2 | 23 | 4.38 | | |
| Selenium (Se)-Total | mg/L | 0.000287 | 0.0011 | 0.00226 | 0.00252 | 0.0005 | 0.000691 | | |
| Silver (Ag)-Total | mg/L | <0.000020 | <0.000010 | <0.000050 | <0.000010 | 0.000028 | 0.000022 | | |
| Sodium (Na)-Total | mg/L | 19.8 | 111 | 1500 | 282 | 559 | 119 | | |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000050 | 0.000021 | <0.000020 | 0.000014 | | |
| Tin (Sn)-Total | mg/L | <0.00050 | <0.00010 | <0.00050 | 0.00015 | <0.00020 | <0.00010 | | |
| Titanium (Ti)-Total | mg/L | 0.03 | 0.00275 | 0.00566 | <0.00270 | 0.0112 | <0.030 | | |
| Uranium (U)-Total | mg/L | <0.00020 | 0.00167 | 0.00475 | 0.0018 | 0.00362 | 0.000607 | | |
| Vanadium (V)-Total | mg/L | 0.00586 | 0.00238 | 0.00282 | 0.0017 | 0.0024 | 0.00427 | | |
| Zinc (Zn)-Total | mg/L | 0.0071 | 0.0033 | <0.0150 | 0.0054 | <0.0060 | 0.0094 | | |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 50.2 | 126 | 251 | 114 | 183 | 215 | | |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | NO | NO | NO | NO | NO | NO | No Visible Sheen | No Visible Sheen |

*No exceedance of Part F Item 18(a) Maximum Concentration occurred in 2020.*
** Note: N denotes north section of pond. S denotes south section of pond.*

## Table D1-42. Water Sampling Monitoring Program Results for MMS-6, 2020

| | Sample ID | MMS-6 |
|---|---|---|
| | ALS ID | L2426290-1 |
| | Date Sampled | 8-Mar-2020 11:30 |
| **Parameter** | **Units** | **Results** |
| pH | pH Units | 9.51 |
| Conductivity | µS/cm | 139000 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 316 |
| Total Suspended Solids | mg/L | 449 |
| Total Dissolved Solids | mg/L | 116000 |
| Chloride (Cl) | mg/L | 77400 |
| Fluoride (F) | mg/L | <2.0 |
| Bromide (Br) | mg/L | 71.1 |
| Cyanide, Total | mg/L | <0.0050 |
| Cyanide, WAD | mg/L | <0.0050 |
| Ammonia, Total (as N) | mg/L | 2.71 |
| Nitrate (as N) | mg/L | 0.59 |
| Nitrite (as N) | mg/L | <0.10 |
| Sulfate ($SO_4$) | mg/L | 36 |
| Aluminum (Al)-Total | mg/L | <0.30 |
| Antimony (Sb)-Total | mg/L | <0.010 |
| Arsenic (As)-Total | mg/L | <0.010 |
| Barium (Ba)-Total | mg/L | 2.5 |
| Beryllium (Be)-Total | mg/L | <0.010 |
| Boron (B)-Total | mg/L | 7.3 |
| Cadmium (Cd)-Total | mg/L | 0.00201 |
| Calcium (Ca)-Total | mg/L | 38500 |
| Chromium (Cr)-Total | mg/L | 0.016 |
| Cobalt (Co)-Total | mg/L | <0.010 |
| Copper (Cu)-Total | mg/L | 0.055 |
| Iron (Fe)-Total | mg/L | 32.5 |
| Lead (Pb)-Total | mg/L | 0.033 |
| Lithium (Li)-Total | mg/L | 5.38 |
| Magnesium (Mg)-Total | mg/L | 152 |
| Manganese (Mn)-Total | mg/L | 0.533 |
| Mercury (Hg)-Total | mg/L | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.0323 |
| Nickel (Ni)-Total | mg/L | <0.050 |
| Potassium (K)-Total | mg/L | 657 |
| Selenium (Se)-Total | mg/L | 0.0086 |
| Silver (Ag)-Total | mg/L | <0.0010 |
| Sodium (Na)-Total | mg/L | 765 |
| Thallium (Tl)-Total | mg/L | 0.0091 |
| Tin (Sn)-Total | mg/L | 0.027 |
| Titanium (Ti)-Total | mg/L | <0.030 |
| Uranium (U)-Total | mg/L | 0.003 |
| Vanadium (V)-Total | mg/L | <0.050 |
| Zinc (Zn)-Total | mg/L | <0.30 |

# Appendix D.2. 2BE-HOP1222

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# Appendix D.2. 2BE-HOP1222

Table D2-1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the SNP for water licence 2BE-HOP1222. The location of each sampling point is illustrated in Figure D2-1 below.

**Table D2-1. 2BE-HOP1222 Sample Stations, Sample Frequency and Analytical Parameters**

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| HOP-1 | Raw water supply intake at Windy Lake | B, G, Oil and Grease | Monthly (when in use for Doris) |
| | | D | Daily during periods of pumping |
| HOP-2* | WWTF effluent discharge at the surge tank prior to being pumped over the ridge east of the Windy Camp Facilities | G, B, MT, Oil and Grease | Monthly |
| | | D | Daily during periods of discharge |
| HOP-3* | WWTF effluent at a point of entry into Windy lake | G, B, Oil and Grease | Monthly |
| | | Acute Lethality | Annually |
| | | D | Daily during periods of discharge |
| HOP-4* | Effluent from the Landfarm Treatment Facility pumped to the WWTF surge tank | B, G, Oil and Grease | Once before any discharge, daily when discharging onto the tundra |
| | | D | Daily during periods of discharge |
| HOP-5* | Effluent from the Bulk Fuel Storage Facility located at the Windy Camp, prior to release | G, MT, HC, TPH, PAH, Nitrate, Nitrite, Total Phenols, Total Hardness, Total Alkalinity, Calcium, Potassium, Sulphate, Sodium, Magnesium | Once before any discharge, monthly when discharging onto the tundra |
| | | D | Daily during periods of discharge |
| HOP-6* | Effluent from the Bulk Fuel Storage Facility located at the Patch Lake location, prior to release to a location approved by an Inspector | G, MT, HC, Oil and Grease Total Hardness, Total Alkalinity, Calcium, Potassium, Sulphate, Sodium, Magnesium | Once before any discharge, monthly when discharging onto the tundra |
| | | D | Daily during periods of discharge |
| HOP-7A, B, and D | Discharge from Quarries A, B, and D respectively | G, N1, MT, Total Sulphate, Alkalinity, Oil and Grease, Electrical Conductivity and Reduction potential (Eh) | Once before any discharge, monthly when discharging onto the tundra |
| | | D | Daily during periods of discharge |
| HOP-8* | Effluent from the Bulk Fuel Storage Facility located at the new Windy Camp location, prior to release to a location approved by an Inspector | G, MT, HC, Total Hardness, Total Alkalinity, Calcium, Potassium, Sulphate, Sodium, Magnesium | Once before any discharge, monthly when discharging onto the tundra |
| | | D | Daily during periods of discharge |
| Drill Sites | Under-ice sampling before and after drilling | G, MT, Electrical Conductivity, Oil and Grease | Before and after on-ice drilling |
| | Water intake from all sources | D | Daily during periods of discharge |

** Station not in use at this time.*

**Figure D2-1. 2BE-HOP1222 Sample Stations Locations**

## SUMMARY OF MONITORING INFORMATION

The following tables summarize the results of sampling undertaken as part of the monitoring program detailed in Part J of 2BE-HOP1222.

The camp water treatment and wastewater treatment facility (WWTF) permitted under this licence were not operational in 2020, therefore no sampling was conducted at monitoring stations HOP-1 (freshwater intake), HOP-2 (WWTF discharge), or HOP-3 (point of entry of WWTF discharge to Windy Lake). Water was utilized from Windy Lake for domestic consumption at Doris Camp and the monitoring station ST-7a/MMS-4b (HOP-1) was sampled for the monitoring criteria under the Doris North Water Licence 2AM-DOH1335. For the ST-7a/MMS-4b results see Table D1-12 and Table D1-13 in Appendix D.1 of this report. The Landfarm at Windy Camp (HOP-4) was dismantled in 2008, so no sampling was conducted at this monitoring station.

The bulk fuel storage tanks at Windy Camp were moved to Doris Camp in winter 2009 for use there, and the bulk fuel storage berm (HOP-5) was dismantled in 2012. The bulk fuel storage berm at Patch Lake laydown (HOP-6) was also dismantled in 2012. No sampling was conducted at either of these monitoring stations.

No sampling occurred at monitoring stations HOP-7A HOP-7B, or HOP-7D (located in Quarries A, B, and D, respectively) during 2020 because no discharge occurred from these locations.

On-ice surface exploration was not conducted in the licence area in 2020, therefore under-ice water quality sampling outlined in Part F Item 7 and Part J Item 7 of the licence was not required. On-land exploration drilling was conducted in the licence area from January until March 2020. In March, on-land exploration drilling was shut down in response to the COVID-19 pandemic and did not resume in 2020.

### Quantities of Water Utilized for Camp, Drilling and Other Purposes

Water used from Windy Lake for domestic purposes at Doris Camp is reported under monitoring station ST-7a/MMS-4b of water licence 2AM-DOH1335. For the ST-7a/MMS-4b water use see Table D1-9 in Appendix D.1 of this report.

No water was used in 2020 from Windy Lake for dust suppression on the Doris-Windy All-Weather Road. Water used for dust suppression in the Doris area was taken from Doris Lake and is reported under the 2AM-DOH1335 licence.

A total of 681 $m^3$ of water was used from Windy Lake (location 13W 432626 7550477) to support surface exploration in 2020. Water volumes used under licence 2BE-HOP1222 are presented in Table D2-2 below.

**Table D2-2. Volume of Water Utilized for Drilling and Dust Suppression Purposes, 2020**

| Date | Dust Suppression ($m^3$) | Regional Drill Water Usage Total ($m^3$) | Total Usage ($m^3$) |
|---|---|---|---|
| January | 0 | 0 | 0 |
| February | 0 | 349 | 349 |
| March | 0 | 332 | 332 |
| April | 0 | 0 | 0 |
| May | 0 | 0 | 0 |
| June | 0 | 0 | 0 |
| July | 0 | 0 | 0 |
| August | 0 | 0 | 0 |

| Date | Dust Suppression ($m^3$) | Regional Drill Water Usage Total ($m^3$) | Total Usage ($m^3$) |
|---|---|---|---|
| September | 0 | 0 | 0 |
| October | 0 | 0 | 0 |
| November | 0 | 0 | 0 |
| December | 0 | 0 | 0 |
| **Total** | **0** | **681** | **681** |

*Note: Values rounded to nearest whole cubic metre.*

## Quantity of Effluent Discharged

Windy Camp was closed throughout 2020 therefore no discharges occurred related to the waste water treatment facility (WWTF) at monitoring station HOP-2.

No discharges occurred at the Windy Camp bulk fuel storage facility (HOP-5) in 2020 as this facility was decommissioned in 2012 and the containment berm removed.

No discharges occurred at the Patch Lake bulk fuel storage facility (HOP-6) in 2020 as this facility was decommissioned and the berm removed in 2012.

## Volume of Sludge Removed from Sewage Disposal Facility

No sludge was removed from the Windy Camp WWTF in 2020 because this facility was not operational and the camp was closed.

## Results of Toxicity Testing

TMAC did not perform toxicity testing to demonstrate the non-acute toxicity of the effluent discharged from the WWTF at HOP-3 (at a point of entry to Windy Lake), as the camp is closed and no effluent was discharged (this facility has been removed).

## Hydrology Monitoring – Windy Lake Water Level

Windy Lake water level monitoring was conducted in 2020 as outlined in Part J Item 9 of the licence. In 2019, the station was relocated to the north end of Windy Lake (13W 431404 7554948) to facilitate discharge measurements of the Windy Lake outflow and water level monitoring as outlined in the Hope Bay Aquatic Effects Monitoring Plan. The water level station was reactivated on June 27 after being deactivated during the winter. The station uses an INW PT2X vented pressure transducer with water level readings recorded every 15 minutes. The station operated throughout the open water season until August 27, when the station was deactivated for winter. TMAC personnel performed under ice water level surveys on April 13 and May 3, and three water level surveys between June 19 and August 27. Observed data, and data that were estimated for the periods that were not observed, are reported as mean daily water level in meters above sea level and are shown in Table D2-3.

**Table D2-3. Summary of Windy Lake Mean Daily Water Levels, in Metres above Sea Level (masl), 2020**

| Date | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.404 | 18.365 | *18.287* | *18.304* | *18.293* | *18.293* |
| 2 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.402 | 18.362 | *18.284* | *18.300* | *18.293* | *18.293* |
| 3 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.401 | 18.361 | *18.292* | *18.307* | *18.293* | *18.293* |
| 4 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.398 | 18.360 | *18.293* | *18.300* | *18.293* | *18.293* |
| 5 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.397 | 18.359 | *18.294* | *18.296* | *18.293* | *18.293* |
| 6 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.394 | 18.351 | *18.292* | *18.289* | *18.293* | *18.293* |
| 7 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.392 | 18.347 | *18.302* | *18.291* | *18.293* | *18.293* |
| 8 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.389 | 18.340 | *18.297* | *18.292* | *18.293* | *18.293* |
| 9 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.387 | 18.340 | *18.281* | *18.293* | *18.293* | *18.293* |
| 10 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | 18.385 | 18.337 | *18.291* | *18.293* | *18.293* | *18.293* |
| 11 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.330* | 18.382 | 18.334 | *18.291* | *18.293* | *18.293* | *18.293* |
| 12 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.342* | 18.383 | 18.331 | *18.286* | *18.293* | *18.293* | *18.293* |
| 13 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.354* | 18.382 | 18.327 | *18.287* | *18.293* | *18.293* | *18.293* |
| 14 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.365* | 18.382 | 18.323 | *18.291* | *18.293* | *18.293* | *18.293* |
| 15 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.377* | 18.383 | 18.318 | *18.281* | *18.293* | *18.293* | *18.293* |
| 16 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.401* | 18.380 | 18.318 | *18.284* | *18.293* | *18.293* | *18.293* |
| 17 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.406* | 18.377 | 18.318 | *18.288* | *18.293* | *18.293* | *18.293* |
| 18 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.410* | 18.376 | 18.317 | *18.291* | *18.293* | *18.293* | *18.293* |
| 19 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.413* | 18.374 | 18.314 | *18.294* | *18.293* | *18.293* | *18.293* |
| 20 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.415* | 18.373 | 18.309 | *18.285* | *18.293* | *18.293* | *18.293* |
| 21 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.415* | 18.370 | 18.303 | *18.291* | *18.293* | *18.293* | *18.293* |
| 22 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.416* | 18.368 | 18.300 | *18.295* | *18.293* | *18.293* | *18.293* |
| 23 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.416* | 18.364 | 18.296 | *18.295* | *18.293* | *18.293* | *18.293* |
| 24 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.415* | 18.366 | 18.293 | *18.302* | *18.293* | *18.293* | *18.293* |
| 25 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.414* | 18.375 | 18.288 | *18.300* | *18.293* | *18.293* | *18.293* |
| 26 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.413* | 18.378 | 18.287 | *18.297* | *18.293* | *18.293* | *18.293* |
| 27 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.410* | 18.375 | 18.282 | *18.303* | *18.293* | *18.293* | *18.293* |
| 28 | *18.318* | *18.318* | *18.318* | *18.318* | *18.318* | *18.409* | 18.374 | 18.289 | *18.303* | *18.293* | *18.293* | *18.293* |

| Date | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | *18.318* | 18.318 | *18.318* | *18.318* | *18.318* | 18.407 | 18.369 | *18.294* | *18.291* | *18.293* | *18.293* | *18.293* |
| 30 | *18.318* | | *18.318* | *18.318* | *18.318* | 18.405 | 18.370 | *18.288* | *18.301* | *18.293* | *18.293* | *18.293* |
| 31 | *18.318* | | *18.318* | | *18.318* | | 18.367 | *18.296* | | *18.293* | | *18.293* |
| Minimum | 18.318 | 18.318 | 18.318 | 18.318 | 18.318 | 18.370 | 18.381 | 18.321 | 18.292 | 18.294 | 18.293 | 18.293 |
| Maximum | 18.318 | 18.318 | 18.318 | 18.318 | 18.318 | 18.416 | 18.404 | 18.365 | 18.303 | 18.307 | 18.293 | 18.293 |
| Mean | 18.318 | 18.318 | 18.318 | 18.318 | 18.318 | 18.318 | 18.364 | 18.282 | 18.281 | 18.289 | 18.293 | 18.293 |

*Note: Estimated and modelled values are italicized.*

# Appendix D.3. 2BB-MAE1727

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# Appendix D.3. 2BB-MAE1727

Table D3-1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the SNP for water licence 2BB-MAE1727. Sample station locations have not yet been established at this time as work has not commenced under this licence. Sample points and discharge locations for SNP stations under this licence will be established in consultation with the Inspector. The proposed sample point locations for SNP Stations MAE-14, MAE-15 and MAE-16 are illustrated in Figure D3-1 below.

**Table D3-1. 2BB-MAE1727 Sample Stations, Sample Frequency and Analytical Parameters**

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| MAE-01* | Madrid North, Freshwater intake at Windy Lake | B, G, Oil and Grease | Monthly |
| | | D | Daily during periods of pumping |
| MAE-02* | Madrid South, Freshwater intake at Patch Lake | B, G, Oil and Grease | Monthly |
| | | D | Daily during periods of pumping |
| MAE-03* | Freshwater intake at other Lakes | B, G, Oil and Grease | Monthly |
| | | D | Daily during periods of pumping |
| MAE-04* | Madrid North Pollution Control Pond (PCP) Water at the point of discharge | pH, TSS, Electrical Conductivity, Oil and Grease, Total Ammonia, Nitrate-Nitrite, Total Phenols, Total Alkalinity, Total Hardness, Chloride, Sulphate, Magnesium, Sodium, Calcium, Potassium, Total As, Cd, Cu, Cr, Fe, Pb, Hg, and Ni | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-05* | Madrid South Pollution Control Pond No.1 Water at the point of discharge | pH, TSS, Electrical Conductivity, Oil and Grease, Total Ammonia, Nitrate-Nitrite, Total Phenols, Total Alkalinity, Total Hardness, Chloride, Sulphate, Magnesium, Sodium, Calcium, Potassium, Total As, Cd, Cu, Cr, Fe, Pb, Hg, and Ni | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-06* | Madrid South Pollution Control Pond No.2 Water at the point of discharge | pH, TSS, Electrical Conductivity, Oil and Grease, Total Ammonia, Nitrate-Nitrite, Total Phenols, Total Alkalinity, Total Hardness, Chloride, Sulphate, Magnesium, Sodium, Calcium, Potassium, Total As, Cd, Cu, Cr, Fe, Pb, Hg, and Ni | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| MAE-07* | Madrid North Fuel Storage Area Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-08* | Madrid North Fuel Transfer Station Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-09* | Madrid South Fuel Storage Area Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-10* | Madrid South Fuel Transfer Station Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-11* | Quarry G Contact Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-12* | Quarry H Contact Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| MAE-13* | Quarry I Contact Water Sump | pH, TSS, Sulphate, Chloride, Electrical Conductivity, Oil and Grease, Total Ammonia, BTEX, Total Arsenic, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Once, prior to every discharge onto the tundra |
| | | D | Daily during periods of discharge |
| MAE-14* | Windy Lake immediately downgradient of the Pollution Control Pond Discharge | Chloride, Electrical Conductivity, Total Dissolved Solids (TDS) | Once prior to each discharge; and a maximum of two weeks post discharge |
| MAE-15* | Patch Lake immediately downgradient of the Pollution Control Pond Discharge | Chloride, Electrical Conductivity, Total Dissolved Solids (TDS) | Once prior to each discharge; and a maximum of two weeks post discharge |
| MAE-16* | Wolverine Lake immediately downgradient of the Pollution Control Pond Discharge | Chloride, Electrical Conductivity, Total Dissolved Solids (TDS) | Once prior to each discharge; and a maximum of two weeks post discharge |
| Drill Sites | Under-ice sampling before and after drilling | pH, TSS, Electrical Conductivity, Total Trace Metals for a minimum of the following elements: As, Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Hg, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Before and after on-ice drilling |
| | Water intake from all sources | D | Daily during periods of pumping |
| Mine Sumps* | Water from Madrid South Underground Mine Water Sumps during periods of Water inflow | Total Dissolved Solids, pH, Electrical Conductivity, Chloride, Total Ammonia and Nitrate, Alkalinity, Sulfate, Trace Metals for a minimum of the following elements: As, Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn | Three times per year |

* *Station not in use at this time.*

**Figure D3-1. 2BB-MAE1727 Sample Stations Locations**

## SUMMARY OF MONITORING INFORMATION

The following summarizes the results of sampling undertaken as part of the monitoring program detailed in Part J of 2BB-MAE1727.

No activity occurred at the Madrid North or Madrid South sites under this licence in 2020. Monitoring was not undertaken at monitoring stations MAE-01 (Madrid North Windy Lake Freshwater intake), MAE-02 (Madrid South Patch Lake Freshwater intake) or MAE-03 (Freshwater intake at other lakes) as no water was obtained from these locations for use under this licence. No water was used for domestic, drilling or all other purposes and no waste was deposited under this licence in 2020. Location coordinates of all water sources and locations of waste deposit will be reported as required.

Monitoring of the Madrid North Contact Water Pond was conducted under water licence 2AM-DOH1335 (MMS-1). Results of this monitoring are presented in Appendix D.1 of this report. No discharge occurred and no monitoring was conducted at MAE-05 (Madrid South Pollution Control Pond No.1) or MAE-06 (Madrid South Pollution Control Pond No.2) as these facilities have not yet been constructed.

The Fuel Storage Areas and Transfer Stations at Madrid North (MAE-07 and MAE-08) and Madrid South (MAE-09 and MAE-10) have not yet been constructed. No water quality monitoring was conducted and no discharge occurred at these sampling locations.

Quarrying activities have not yet been undertaken at Quarry G (MAE-11), Quarry H (MAE-12) or Quarry I (MAE-13). No sampling or discharge was required for these monitoring locations in 2020.

No sampling was conducted at lakes located immediately downgradient of Madrid North and Madrid South Pollution Control Pond discharge locations (MAE-14, Windy Lake; MAE-15, Patch Lake; MAE-16, Wolverine Lake). The Madrid North Contact Water Pond is monitored under water licence 2AM-DOH1335 and the Madrid South Pollution Control Ponds have not yet been constructed.

Underground mining began at Madrid North in Q4 of 2019 and continued in Q1 of 2020 (until March 2020) under water licence 2AM-DOH1335. Underground mining has not yet commenced at Madrid South. No water was discharged from underground sumps at Madrid North in 2020 and no water quality monitoring was conducted.

On-ice surface exploration was not conducted in the licence area in 2020, therefore under-ice water quality sampling as outlined in Part F Item 12 of the licence was not required.

# Appendix D.4. 2BB-BOS1727

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# Appendix D.4. 2BB-BOS1727

Table D4-1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the SNP for water licence 2BB-BOS1727. The location of each sampling point is illustrated in Figure D4-1 below.

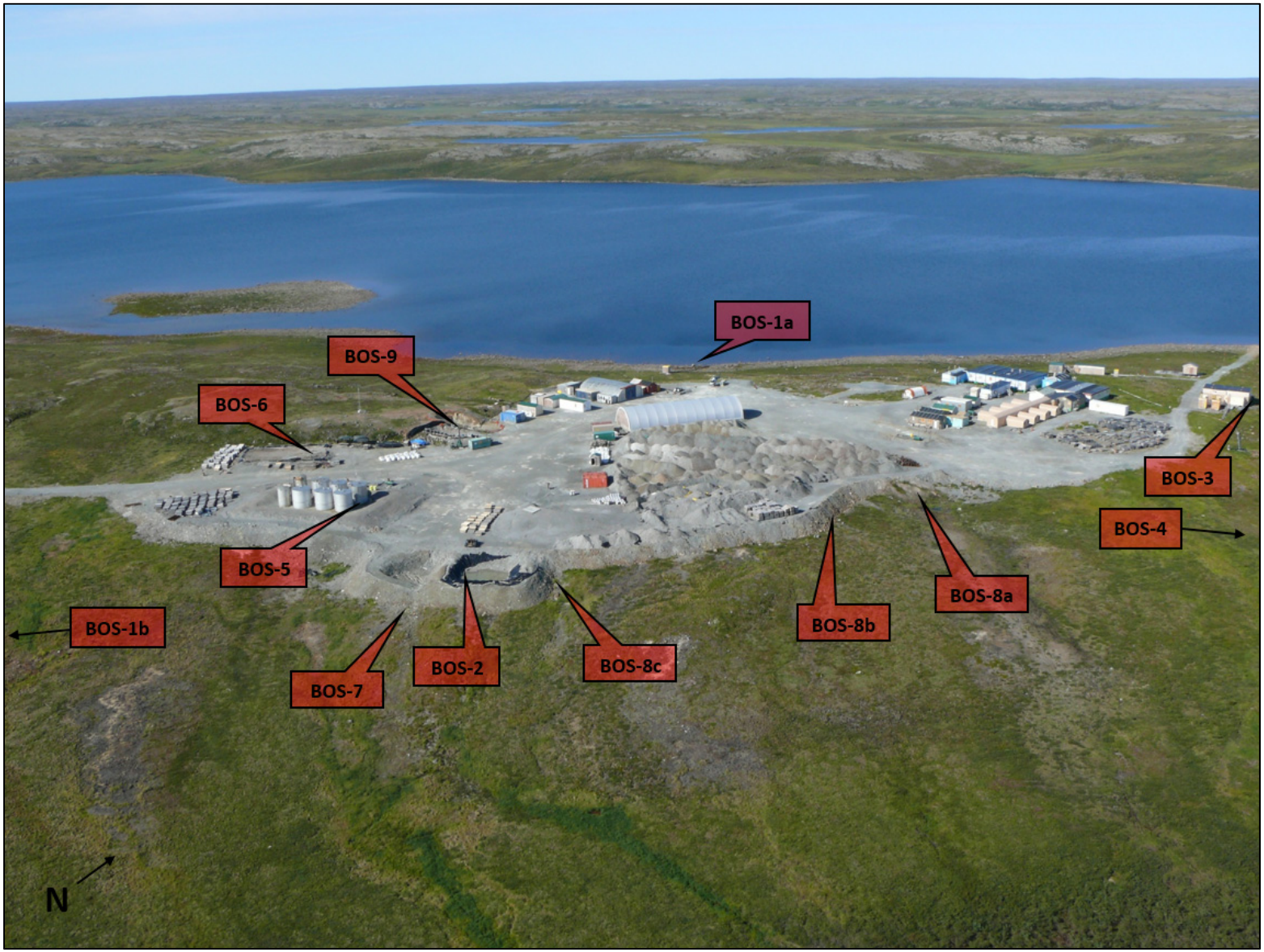
**Table D4-1. 2BB-BOS1727 Sample Stations, Sample Frequency and Analytical Parameters**

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| BOS-1a* | Raw water supply intake at Aimaokatalok (Spyder) Lake | B, G, Oil and Grease | Monthly |
| | | D | Daily during periods of pumping |
| BOS-1b* | Raw water supply intake at Stickleback Lake | B, G, Oil and Grease | Monthly |
| | | D | Daily during periods of pumping |
| BOS-2 | Containment Pond discharge | TPH, PAH, BTEX, pH, Electrical Conductivity, Nitrate-Nitrite, Oil and Grease, Total Phenols, Total Alkalinity, Total Hardness, Calcium, Magnesium, Potassium, Sodium, Sulphate & Chloride, Total As, Cd, Cu, Cr, Fe, Pb, Hg, Ni and Se. | Prior to discharge, weekly during periods of discharge |
| | | D | Daily during periods of discharge |
| BOS-3* | Sewage Disposal Facility final discharge | $BOD_5$, TSS, Oil and Grease, Fecal Coliforms, pH | Monthly |
| | | D | Daily during periods of discharge |
| BOS-4* | Treated sewage effluent point prior to entry into Aimaokatalok (Spyder) Lake | BOD5, TSS, Oil and Grease, Fecal Coliforms, pH | Once before any discharge, daily when discharging onto the tundra |
| | | Acute Lethality | Annually |
| BOS-5 | Effluent from the Bulk Fuel Storage Facility prior to release to a location approved by an Inspector | TPH, PAH, BTEX, pH, Electrical Conductivity, Nitrate-Nitrite, Oil and Grease, Total Phenols, Total Alkalinity, Total Hardness, Calcium, Magnesium, Potassium, Sodium, Sulphate & Chloride, Total As, Cd, Cu, Cr, Fe, Pb, Hg, Ni and Se. TTPH | Once before any discharge, monthly when discharging onto the tundra |
| | | D | Daily during periods of discharge |
| BOS-6* | Effluent from the Landfarm Treatment Facility prior to release | TPH, PAH, BTEX, pH, Electrical Conductivity, Nitrate-Nitrite, Oil and Grease, Total Phenols, Total Alkalinity, Total Hardness, Calcium, Magnesium, Potassium, Sodium, Sulphate & Chloride, Total As, Cd, Cu, Cr, Fe, Pb, Hg, Ni and Se. | Once before any discharge, monthly when discharging onto the tundra |
| | | D | Daily during periods of discharge |

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| BOS-7* | Runoff from the temporary storage of hydrocarbon contaminated soils prior to discharge onto the tundra | TPH, PAH, BTEX, pH, Electrical Conductivity, Nitrate-Nitrite, Oil and Grease, Total Phenols, Total Alkalinity, Total Hardness, Calcium, Magnesium, Potassium, Sodium, Sulphate & Chloride, Total As, Cd, Cu, Cr, Fe, Pb, Hg, Ni and Se. | During periods of observed flow |
| | | D | Daily during periods of discharge |
| BOS-8 | Waste Rock and Ore Storage Pad | pH, Sulphate & Chloride, Electrical Conductivity, TSS, Total Ammonia, Total As, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sr, Tl, Ti, U, V, Zn | Initially during spring thaw and monthly during periods of observed flow |
| BOS-9 | Portal decline, surface water runoff discharged to onto the tundra | pH, Sulphate & Chloride, Electrical Conductivity, TSS, Total Ammonia, Total As, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sr, Tl, Ti, U, V, Zn | Once before any discharge |
| | | D | Daily during periods of discharge |
| BOS-10* | Underground Mine Water Sumps pumped from Underground | pH, Sulphate & Chloride, Electrical Conductivity, TSS, Total Ammonia, Total As, Total Trace Metals for a minimum of the following elements: Al, Sb, Ba, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sr, Tl, Ti, U, V, Zn | Three times a year, during periods of water inflow |
| | | D | Daily during periods of discharge |
| Drill Sites | Under-ice sampling before and after drilling | pH, TSS, Electrical Conductivity, Total Trace Metals for a minimum of the following elements: As, Al, Sb, Ba, Cd, Cr, Co, Cu, Fe, Hg, Pb, Li, Mn, Mo, Ni, Se, Sr, Tl, Ti, U, V, Zn | Before and after on-ice drilling |
| | Water intake from all sources | D | Daily during periods of discharge |

** Station not in use at this time.*

**Figure D4-1. 2BB-BOS1727 Sample Stations Locations**



## TABULAR SUMMARY OF MONITORING INFORMATION

The following tables summarize the results of sampling undertaken in 2020 as part of the monitoring program detailed in Part J of licence 2BB-BOS1727.

Boston Camp was not operational in 2020. No water was used from Aimaokatalok (Spyder) Lake (BOS-1a) or Stickleback Lake (BOS-1b) for domestic camp, surface drilling or any other purpose. No water quality samples were collected from these locations in 2020.

The Sewage Treatment Facility (BOS-3) was not active as the camp was not operational, therefore no effluent was discharged and no sewage sludge was produced from this facility in 2020. No effluent quality sampling was conducted at BOS-3 or at the point prior to treated effluent entering into Aimaokatalok (Spyder) Lake (BOS-4).

The Containment Pond (BOS-2) has been used to consolidate water from the smaller fuel containment berms and from the Bulk Fuel Storage Facility (BOS-5), to facilitate testing and treatment while allowing the fuel berms to be promptly vacated of water. As in previous years, water from the Containment Pond (BOS-2) is sampled for and screened against both BOS-2 and BOS-5 criteria.

Water quality sampling was conducted at the Bulk Fuel Storage Facility (BOS-5) on June 16 prior to water management activities. Due to limited helicopter availability as a result of the COVID-19 pandemic, this water was immediately transferred to the Containment Pond (BOS-2) prior to receiving results of the June 16 sample. This was completed to facilitate water quality treatment using an oil-water separator system (OWS) containing activated carbon and Metsorb media to promptly vacate water from the Bulk Fuel Storage Facility.

Water quality treatment was conducted on the water within the Contact Water Pond (BOS-2) using the OWS containing activated carbon and Metsorb media and water quality samples were collected on June 18 post-water quality treatment.

Results of the June 18 Contact Water Pond (BOS-2) water quality sample met the discharge criteria outlined in Part D Item 6 of the licence. Results of this sampling are presented in Table D4-2 below. A total of 48 $m^3$ of water was discharged to tundra (13W 441332 7505378) from the Contact Water Pond in 2020 after receiving compliant water quality results. No additional water management was required at this facility in 2020.

Results of the June 16 Bulk Fuel Storage Facility (BOS-5) water quality sample exceeded the *Maximum Concentration in Any Grab Sample* allowable criteria for total arsenic outlined in Part D Item 19 of the water licence. Results of sampling conducted at the Bulk Fuel Storage Facility (BOS-5) are presented in Table D4-3 below. This water had been transferred to the Containment Pond to facilitate water quality treatment; no water was discharged to tundra from this facility in 2020. No additional water management was required at this facility in 2020.

Dewatering of the Landfarm Treatment Area (LTA; BOS-6) was not required in 2020. In 2017, TMAC commenced reclamation of the LTA at Boston with the excavation and stockpiling of contaminated soils from the LTA into mega-bags for future disposal. In March 2019, the contaminated soil from the LTA was transported to Doris Camp via a winter track and disposed of underground in the Doris Mine as approved in the Hope Bay Project Hazardous Waste Management Plan. The Boston LTA was decommissioned in 2019 and no additional materials will be placed in this facility. Hydrocarbon contaminated materials generated from future activities conducted at Boston will be packaged for backhaul to Doris until a new LTA facility is constructed.

No landfill exists at Boston and the status of monitoring station BOS-7 is inactive.

## Table D4-2. Results of 2020 Containment Pond (BOS-2) Effluent Samples

| | | BOS2 | Part D Item 6 | |
|---|---|---|---|---|
| | ALS ID | L2463545-1 | Maximum Average Concentration (mg/L) | Maximum Concentration in Any Grab Sample (mg/L) |
| | Date Sampled | 18-Jun-2020 15:15 | | |
| **Parameter** | **Units** | **Results** | | |
| Conductivity | µS/cm | <2.0 | | |
| Hardness (as $CaCO_3$) | mg/L | 266 | | |
| pH | pH Units | 7.7 | 6.5-9.0 | |
| Total Suspended Solids | mg/L | 5.5 | 15 | 30 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 105 | | |
| Chloride (Cl) | mg/L | 8.01 | | |
| Nitrate (as N) | mg/L | <0.0050 | 130 | 260 |
| Nitrite (as N) | mg/L | 0.0026 | | |
| Sulfate ($SO_4$) | mg/L | 163 | | |
| Aluminum (Al)-Total | mg/L | 0.0354 | | |
| Antimony (Sb)-Total | mg/L | <0.00050 | | |
| Arsenic (As)-Total | mg/L | 0.0355 | 0.050 | 0.10 |
| Barium (Ba)-Total | mg/L | <0.020 | | |
| Beryllium (Be)-Total | mg/L | <0.00010 | | |
| Boron (B)-Total | mg/L | 0.12 | | |
| Cadmium (Cd)-Total | mg/L | 0.0000092 | | |
| Calcium (Ca)-Total | mg/L | 62.1 | | |
| Chromium (Cr)-Total | mg/L | <0.0010 | | |
| Cobalt (Co)-Total | mg/L | 0.00176 | | |
| Copper (Cu)-Total | mg/L | 0.0037 | 0.02 | 0.04 |
| Iron (Fe)-Total | mg/L | 0.263 | | |
| Lead (Pb)-Total | mg/L | 0.00173 | 0.01 | 0.02 |
| Lithium (Li)-Total | mg/L | 0.0055 | | |
| Magnesium (Mg)-Total | mg/L | 26.9 | | |
| Manganese (Mn)-Total | mg/L | 0.00416 | | |
| Mercury (Hg)-Total | mg/L | <0.0000050 | | |
| Molybdenum (Mo)-Total | mg/L | <0.0010 | | |
| Nickel (Ni)-Total | mg/L | 0.0134 | 0.25 | 0.5 |
| Potassium (K)-Total | mg/L | 4.8 | | |
| Selenium (Se)-Total | mg/L | 0.000153 | | |
| Silver (Ag)-Total | mg/L | <0.000020 | | |
| Sodium (Na)-Total | mg/L | 6.9 | | |
| Strontium (Sr)-Total | mg/L | 0.172 | | |
| Thallium (Tl)-Total | mg/L | <0.000010 | | |
| Tin (Sn)-Total | mg/L | <0.00050 | | |
| Titanium (Ti)-Total | mg/L | <0.010 | | |
| Uranium (U)-Total | mg/L | <0.00020 | | |
| Vanadium (V)-Total | mg/L | <0.00050 | | |
| Zinc (Zn)-Total | mg/L | 0.0344 | 0.3 | 0.6 |

| | | BOS2 | Part D Item 6 | |
|---|---|---|---|---|
| | ALS ID | L2463545-1 | Maximum Average Concentration (mg/L) | Maximum Concentration in Any Grab Sample (mg/L) |
| | Date Sampled | 18-Jun-2020 15:15 | | |
| Parameter | Units | Results | | |
| Oil and Grease | mg/L | <5.0 | 5 | 10 |
| Oil And Grease (Visible Sheen) | | NO | No visible sheen | No visible sheen |
| Phenols (4AAP) | mg/L | <0.0010 | | |
| Benzene | mg/L | <0.00050 | | |
| Ethylbenzene | mg/L | <0.00050 | | |
| Methyl t-butyl ether (MTBE) | mg/L | <0.00050 | | |
| Styrene | mg/L | <0.00050 | | |
| Toluene | mg/L | <0.00045 | | |
| ortho-Xylene | mg/L | <0.00050 | | |
| meta- & para-Xylene | mg/L | <0.00050 | | |
| Xylenes, Total | mg/L | <0.00075 | | |
| TPH10-32 | mg/L | <1.0 | | |
| Acenaphthene | mg/L | <0.000010 | | |
| Acenaphthylene | mg/L | <0.000010 | | |
| Acridine | mg/L | <0.000010 | | |
| Anthracene | mg/L | <0.000010 | | |
| Benz(a)anthracene | mg/L | <0.000010 | | |
| Benzo(a)pyrene | mg/L | <0.0000050 | | |
| Benzo(b&j)fluoranthene | mg/L | <0.000010 | | |
| Benzo(b+j+k)fluoranthene | mg/L | <0.000015 | | |
| Benzo(g,h,i)perylene | mg/L | <0.000010 | | |
| Benzo(k)fluoranthene | mg/L | <0.000010 | | |
| Chrysene | mg/L | <0.000010 | | |
| Dibenz(a,h)anthracene | mg/L | <0.0000050 | | |
| Fluoranthene | mg/L | <0.000010 | | |
| Fluorene | mg/L | <0.000010 | | |
| Indeno(1,2,3-c,d)pyrene | mg/L | <0.000010 | | |
| 1-Methylnaphthalene | mg/L | <0.000050 | | |
| 2-Methylnaphthalene | mg/L | <0.000050 | | |
| Naphthalene | mg/L | <0.000050 | | |
| Phenanthrene | mg/L | <0.000020 | | |
| Pyrene | mg/L | <0.000010 | | |
| Quinoline | mg/L | <0.000050 | | |

## Table D4-3. Results of 2020 Bulk Fuel Storage Facility (BOS-5) Effluent Samples

| | Sample ID | BOS5 | BOS5 ^ | Part D Item 19 |
|---|---|---|---|---|
| | ALS ID | L2462424-1 | L2462424-2 | Maximum Concentration in Any Grab Sample |
| | Date Sampled | 16-Jun-2020 13:20 | 16-Jun-2020 13:20 | |
| **Parameter** | **Units** | **Results** | | |
| Conductivity | µS/cm | 757 | 756 | |
| Hardness (as $CaCO_3$) | mg/L | 382 | 366 | |
| pH | pH Units | 7.94 | 7.95 | 6.5-9.0 |
| Total Suspended Solids | mg/L | <3.0 | <3.0 | 15 |
| Alkalinity, Total (as $CaCO_3$) | mg/L | 58.4 | 58 | |
| Nitrate (as N) | mg/L | <0.025 | <0.025 | |
| Nitrite (as N) | mg/L | <0.0050 | <0.0050 | |
| Chloride (Cl) | mg/L | 9.1 | | |
| Sulfate ($SO_4$) | mg/L | 324 | 331 | |
| Aluminum (Al)-Total | mg/L | 0.0176 | 0.0142 | |
| Antimony (Sb)-Total | mg/L | 0.00425 | 0.00422 | |
| Arsenic (As)-Total | mg/L | **0.247** | **0.246** | 0.05 |
| Barium (Ba)-Total | mg/L | <0.020 | <0.020 | |
| Beryllium (Be)-Total | mg/L | <0.00010 | <0.00010 | |
| Boron (B)-Total | mg/L | 0.11 | 0.11 | |
| Cadmium (Cd)-Total | mg/L | 0.0000536 | 0.0000546 | |
| Calcium (Ca)-Total | mg/L | 91.1 | 87.7 | |
| Chromium (Cr)-Total | mg/L | <0.0010 | <0.0010 | |
| Cobalt (Co)-Total | mg/L | 0.0115 | 0.0113 | |
| Copper (Cu)-Total | mg/L | 0.0068 | 0.0066 | 0.04 |
| Iron (Fe)-Total | mg/L | 0.698 | 0.677 | |
| Lead (Pb)-Total | mg/L | 0.00924 | 0.00898 | 0.01 |
| Lithium (Li)-Total | mg/L | 0.0064 | 0.0062 | |
| Magnesium (Mg)-Total | mg/L | 37.4 | 35.7 | |
| Manganese (Mn)-Total | mg/L | 0.01 | 0.00946 | |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | |
| Molybdenum (Mo)-Total | mg/L | 0.002 | 0.002 | |
| Nickel (Ni)-Total | mg/L | 0.129 | 0.125 | 0.5 |
| Potassium (K)-Total | mg/L | 5.2 | 5 | |
| Selenium (Se)-Total | mg/L | 0.000329 | 0.000322 | |
| Silver (Ag)-Total | mg/L | <0.000020 | <0.000020 | |
| Sodium (Na)-Total | mg/L | 5.6 | 5.4 | |
| Strontium (Sr)-Total | mg/L | 0.209 | | |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | |
| Tin (Sn)-Total | mg/L | <0.00050 | <0.00050 | |
| Titanium (Ti)-Total | mg/L | <0.010 | <0.010 | |
| Uranium (U)-Total | mg/L | <0.00020 | <0.00020 | |
| Vanadium (V)-Total | mg/L | <0.00050 | <0.00050 | |
| Zinc (Zn)-Total | mg/L | 0.0058 | 0.006 | 0.6 |

| | Sample ID | BOS5 | BOS5 ^ | Part D Item 19 |
|---|---|---|---|---|
| | ALS ID | L2462424-1 | L2462424-2 | Maximum Concentration in Any Grab Sample |
| | Date Sampled | 16-Jun-2020 13:20 | 16-Jun-2020 13:20 | |
| **Parameter** | **Units** | **Results** | | |
| Oil and Grease | mg/L | <5.0 | <5.0 | 15 |
| Oil And Grease (Visible Sheen) | | NO | NO | No visible sheen |
| Phenols (4AAP) | mg/L | 0.001 | 0.001 | |
| Benzene | mg/L | <0.00050 | <0.00050 | 0.37 |
| Ethylbenzene | mg/L | <0.00050 | <0.00050 | 0.91 |
| Methyl t-butyl ether (MTBE) | mg/L | <0.00050 | <0.00050 | |
| Styrene | mg/L | <0.00050 | <0.00050 | |
| Toluene | mg/L | <0.00045 | <0.00045 | 0.002 |
| ortho-Xylene | mg/L | <0.00050 | <0.00050 | |
| meta- & para-Xylene | mg/L | <0.00050 | <0.00050 | |
| Xylenes, Total | mg/L | <0.00075 | <0.00075 | |
| TPH10-32 | mg/L | <1.0 | <1.0 | |
| Acenaphthene | mg/L | <0.000020 | <0.000020 | |
| Acenaphthylene | mg/L | <0.000030 | <0.000030 | |
| Acridine | mg/L | <0.000010 | <0.000010 | |
| Anthracene | mg/L | <0.000010 | <0.000010 | |
| Benz(a)anthracene | mg/L | <0.000010 | <0.000010 | |
| Benzo(a)pyrene | mg/L | <0.0000050 | <0.0000050 | |
| Benzo(b&j)fluoranthene | mg/L | <0.000010 | <0.000010 | |
| Benzo(b+j+k)fluoranthene | mg/L | <0.000015 | <0.000015 | |
| Benzo(g,h,i)perylene | mg/L | <0.000010 | <0.000010 | |
| Benzo(k)fluoranthene | mg/L | <0.000010 | <0.000010 | |
| Chrysene | mg/L | <0.000010 | <0.000010 | |
| Dibenz(a,h)anthracene | mg/L | <0.0000050 | <0.0000050 | |
| Fluoranthene | mg/L | <0.000010 | <0.000010 | |
| Fluorene | mg/L | <0.000020 | <0.000020 | |
| Indeno(1,2,3-c,d)pyrene | mg/L | <0.000010 | <0.000010 | |
| 1-Methylnaphthalene | mg/L | <0.00010 | <0.00020 | |
| 2-Methylnaphthalene | mg/L | <0.000050 | <0.000050 | |
| Naphthalene | mg/L | <0.000050 | <0.000050 | |
| Phenanthrene | mg/L | <0.000020 | <0.000020 | |
| Pyrene | mg/L | <0.000010 | <0.000010 | |
| Quinoline | mg/L | <0.00070 | <0.00060 | |

***Bold*** *indicates exceedance of Part D Item 19 Maximum Concentration.*
*^ Indicates duplicate sample.*
*Note: Chloride and Total Strontium analysis inadvertently omitted on duplicate sample.*

During 2020, TMAC opportunistically sampled at locations where seepage was observed during periods of runoff near the waste rock and ore storage pad (BOS-8). Sampling in June was conducted concurrently with the annual seepage sampling program (June 18, 2020). No seepage was identified at BOS-8 locations after June. Table D4-4 shows the results of this sampling. These monitoring results were compared with previously reported kinetic testing results from the ARD Characterization Data base for the Boston Deposit. Further discussion regarding the waste rock and ore monitoring program at Boston Camp is presented in Appendix G.

**Table D4-4. Opportunistic Seepage Sampling at Waste Rock and Ore Storage Pad (BOS-8) 2020**

| Sample ID | | BOS8A | BOS8A^ | BOS8C | BOS8D |
|---|---|---|---|---|---|
| ALS ID | | L2463552-1 | L2463552-2 | L2463552-3 | L2463552-4 |
| Date Sampled | | 18-Jun-2020 11:40 | 18-Jun-2020 11:40 | 18-Jun-2020 12:30 | 18-Jun-2020 14:05 |
| **Parameter** | **Units** | **Results** | | | |
| Conductivity | µS/cm | 225 | 224 | 925 | 317 |
| Hardness (as $CaCO_3$) | mg/L | 92.9 | 96 | 401 | 129 |
| pH | pH | 7.47 | 7.48 | 7.77 | 7.59 |
| Total Suspended Solids | mg/L | 34.8 | 38 | 16.2 | 60 |
| Chloride (Cl) | mg/L | 0.0999 | 0.0932 | 0.209 | 0.0205 |
| Ammonia, Total (as N) | mg/L | 5.85 | 5.85 | 124 | 27.5 |
| Sulfate ($SO_4$) | mg/L | 63.8 | 64.2 | 200 | 69.6 |
| Aluminum (Al)-Total | mg/L | 0.365 | 0.418 | 0.588 | 0.944 |
| Antimony (Sb)-Total | mg/L | 0.00257 | 0.00264 | 0.0321 | 0.00506 |
| Arsenic (As)-Total | mg/L | 0.058 | 0.0608 | 0.663 | 0.121 |
| Barium (Ba)-Total | mg/L | <0.020 | <0.020 | <0.020 | <0.020 |
| Beryllium (Be)-Total | mg/L | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Boron (B)-Total | mg/L | <0.10 | <0.10 | 0.13 | <0.10 |
| Cadmium (Cd)-Total | mg/L | 0.0000173 | 0.0000179 | 0.0000157 | 0.0000279 |
| Calcium (Ca)-Total | mg/L | 23.1 | 25.5 | 114 | 38.8 |
| Chromium (Cr)-Total | mg/L | 0.0049 | 0.0055 | 0.0153 | 0.0118 |
| Cobalt (Co)-Total | mg/L | 0.0264 | 0.028 | 0.356 | 0.0302 |
| Copper (Cu)-Total | mg/L | 0.0066 | 0.0071 | 0.0041 | 0.0101 |
| Iron (Fe)-Total | mg/L | 0.947 | 1.02 | 1.39 | 1.79 |
| Lead (Pb)-Total | mg/L | 0.00102 | 0.00114 | 0.00074 | 0.00228 |
| Lithium (Li)-Total | mg/L | 0.0019 | 0.002 | 0.0243 | 0.008 |
| Magnesium (Mg)-Total | mg/L | 8.91 | 9.23 | 29.6 | 9.81 |
| Manganese (Mn)-Total | mg/L | 0.049 | 0.0505 | 0.112 | 0.0483 |
| Molybdenum (Mo)-Total | mg/L | <0.0010 | <0.0010 | 0.0025 | 0.0019 |
| Nickel (Ni)-Total | mg/L | 0.0674 | 0.072 | 0.46 | 0.0553 |
| Potassium (K)-Total | mg/L | <2.0 | <2.0 | 8 | 2.5 |
| Selenium (Se)-Total | mg/L | 0.000213 | 0.000188 | 0.00124 | 0.000379 |
| Silver (Ag)-Total | mg/L | 0.00003 | 0.000036 | 0.000032 | 0.000081 |
| Sodium (Na)-Total | mg/L | 3.7 | 3.9 | 12.4 | 5.5 |
| Strontium (Sr)-Total | mg/L | 0.053 | 0.0572 | 0.694 | 0.185 |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | <0.000010 |

| Sample ID | | BOS8A | BOS8A^ | BOS8C | BOS8D |
|---|---|---|---|---|---|
| ALS ID | | L2463552-1 | L2463552-2 | L2463552-3 | L2463552-4 |
| Date Sampled | | 18-Jun-2020 11:40 | 18-Jun-2020 11:40 | 18-Jun-2020 12:30 | 18-Jun-2020 14:05 |
| **Parameter** | **Units** | **Results** | | | |
| Tin (Sn)-Total | mg/L | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Titanium (Ti)-Total | mg/L | <0.010 | <0.010 | <0.010 | <0.010 |
| Uranium (U)-Total | mg/L | <0.00020 | <0.00020 | <0.00020 | <0.00020 |
| Vanadium (V)-Total | mg/L | 0.00157 | 0.00169 | 0.00347 | 0.00375 |
| Zinc (Zn)-Total | mg/L | 0.0073 | 0.0075 | <0.0050 | 0.0142 |

^ *Indicates duplicate sample.*
*Sampling Locations: BOS8A - 13W 0441232 7505521; BOS8C - 13W 0441341 7505412; BOS8D - 13W 0441353 7505382.*

The Portal Decline (BOS-9) was sampled on June 24 and results of this sample were compliant with the discharge criteria outlined in Part D Item 6 of the licence. Due to limitations in helicopter availability resulting from the COVID-19 pandemic, no water was discharged from the facility after receiving these results. An additional sample and duplicate sample were collected on August 17. Results of these samples exceeded the discharge criteria for total arsenic outlined in Part D Item 6 of the licence. No dewatering of this facility occurred in 2020. Results of sampling conducted at the Portal Decline Facility (BOS-9) are presented in Table D4-5 below.

Underground mining activities were not conducted in 2020. Mine water was not pumped from underground and no water quality monitoring was conducted of the underground mine water sumps (BOS-10).

On-ice exploration drilling did not occur in the licence area in 2020, therefore no samples were taken through lake ice (required by Part F Item 6 and Part J Item 15) to establish water quality prior to, and upon completion of, an on-ice drilling program.

## Table D4-5. Results of 2020 Portal Decline (BOS-9) Effluent Quality Sampling

| | Sample ID | BOS9 | BOS9 | BOS9^ | Part D Item 6 | |
|---|---|---|---|---|---|---|
| | ALS ID | L2466875-1 | L2490477-1 | L2490477-2 | Maximum Average Concentration (mg/L) | Maximum Concentration in Any Grab Sample (mg/L) |
| | Date Sampled | 6/24/2020 12:00 | 8/17/2020 15:25 | 8/17/2020 15:25 | | |
| **Parameter** | **Units** | **Results** | | | | |
| Conductivity | µS/cm | 59.7 | 527 | 527 | | |
| Hardness (as $CaCO_3$) | mg/L | | 180 | 180 | | |
| pH | pH Units | 6.92 | 7.78 | 7.8 | 6.5-9.0 | |
| Total Suspended Solids | mg/L | 14.2 | <3.0 | <3.0 | 15 | 30 |
| Ammonia, Total (as N) | mg/L | <0.0050 | 0.0071 | 0.0065 | | |
| Chloride (Cl) | mg/L | 6.96 | 73 | 73 | | |
| Nitrate (as N) | mg/L | 0.0545 | 0.636 | 0.639 | 130 | 260 |
| Sulfate ($SO_4$) | mg/L | 6.47 | 92 | 92 | | |
| Aluminum (Al)-Total | mg/L | 1.06 | 0.0521 | 0.0441 | | |
| Antimony (Sb)-Total | mg/L | 0.00057 | 0.00179 | 0.00175 | | |
| Arsenic (As)-Total | mg/L | 0.0356 | **0.0995** | **0.1** | 0.050 | 0.10 |
| Barium (Ba)-Total | mg/L | 0.00529 | 0.00508 | 0.00514 | | |
| Beryllium (Be)-Total | mg/L | <0.00010 | <0.00010 | <0.00010 | | |
| Boron (B)-Total | mg/L | 0.015 | 0.063 | 0.063 | | |
| Cadmium (Cd)-Total | mg/L | 0.0000119 | 0.0000146 | 0.0000136 | | |
| Calcium (Ca)-Total | mg/L | 4.53 | 45.9 | 46 | | |
| Chromium (Cr)-Total | mg/L | 0.00938 | 0.00049 | 0.00057 | | |
| Cobalt (Co)-Total | mg/L | 0.00616 | 0.0203 | 0.0205 | | |
| Copper (Cu)-Total | mg/L | 0.00433 | 0.00676 | 0.00475 | 0.02 | 0.04 |
| Iron (Fe)-Total | mg/L | 0.618 | 0.204 | 0.21 | | |
| Lead (Pb)-Total | mg/L | 0.0011 | 0.000167 | 0.000158 | 0.01 | 0.02 |
| Lithium (Li)-Total | mg/L | 0.0012 | 0.0074 | 0.0074 | | |
| Magnesium (Mg)-Total | mg/L | 1.63 | 15.9 | 15.9 | | |
| Manganese (Mn)-Total | mg/L | 0.0233 | 0.0341 | 0.0347 | | |
| Mercury (Hg)-Total | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | | |
| Molybdenum (Mo)-Total | mg/L | 0.000693 | 0.000913 | 0.000922 | | |

| | Sample ID | BOS9 | BOS9 | BOS9^ | Part D Item 6 | |
|---|---|---|---|---|---|---|
| | ALS ID | L2466875-1 | L2490477-1 | L2490477-2 | | |
| | Date Sampled | 6/24/2020 12:00 | 8/17/2020 15:25 | 8/17/2020 15:25 | Maximum Average Concentration (mg/L) | Maximum Concentration in Any Grab Sample (mg/L) |
| **Parameter** | **Units** | **Results** | | | | |
| Nickel (Ni)-Total | mg/L | 0.0162 | 0.0827 | 0.0827 | 0.25 | 0.5 |
| Potassium (K)-Total | mg/L | 1.03 | 3.77 | 3.86 | | |
| Selenium (Se)-Total | mg/L | <0.000050 | 0.00045 | 0.000457 | | |
| Silver (Ag)-Total | mg/L | 0.000031 | <0.000010 | <0.000010 | | |
| Sodium (Na)-Total | mg/L | 3.21 | 23.4 | 23.7 | | |
| Strontium (Sr)-Total | mg/L | 0.0156 | 0.253 | 0.26 | | |
| Thallium (Tl)-Total | mg/L | <0.000010 | <0.000010 | <0.000010 | | |
| Tin (Sn)-Total | mg/L | 0.00011 | <0.00010 | <0.00010 | | |
| Titanium (Ti)-Total | mg/L | 0.0071 | 0.00038 | 0.00039 | | |
| Uranium (U)-Total | mg/L | 0.000017 | 0.000901 | 0.000897 | | |
| Vanadium (V)-Total | mg/L | 0.00398 | <0.00050 | <0.00050 | | |
| Zinc (Zn)-Total | mg/L | 0.0085 | 0.004 | 0.0035 | 0.3 | 0.6 |
| Oil and Grease | mg/L | <5.0 | <5.0 | <5.0 | 5 | 10 |

***Bold*** *indicates exceedance of Part D Item 6 Maximum Concentration.*
^ *Indicates duplicate sample.*

# Appendix D.5. 2AM-BOS1835

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# Appendix D.5. 2AM-BOS1835

Table D5-1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the SNP for water licence 2AM-BOS1835. Sample station locations have not yet been established at this time as work has not commenced under this licence. Sample points and discharge locations for SNP stations under this licence will be established in consultation with the Inspector.

**Table D5-1. 2AM-BOS1835 Sample Stations, Sample Frequency and Analytical Parameters**

| SNP Station | Description | Monitoring Parameters | Frequency |
|---|---|---|---|
| BMS-1* | Contact Water Pond #1 and #2 | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total metals by ICP-MS, D | Sampled twice annually; Weekly water levels |
| BMS-2* | Surge pond at intake to Contact Water Treatment Plant | G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, T-Radium 226, HC, D | Sampled monthly during discharge periods; Weekly water levels |
| BMS-3* | Discharge from Contact Water Treatment Plant | G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, T-Radium 226, D, AT | Sampled weekly during discharge periods and prior to discharge |
| BMS-4* | Reclaim line from TMA Contact Water Pond | G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, HC, D, Fecal coliform | Sampled monthly during reclaim periods; Weekly water levels |
| BMS-5* | Non-contact water pond | G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total metals by ICP-MS, D | Sampled annually; Water levels after large inflow events |
| BMS-6* | Fresh Water intake at Aimaokatalok Lake | G, N1, N2, MT, and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl, D | Sampled monthly during active pumping periods |
| BMS-7* | Landfill sump | G, MT and Total Ammonia-N, Total Sulphate, Total and Free CN, Total Oil and Grease, D | Annually. Once prior to every discharge onto the tundra |
| BMS-8* | Discharge of treated Sewage | G, B, and Total Oil and Grease, D | Sampled monthly during active pumping periods |
| BMS-9* | Landfarm sump | G, HC, Total Ammonium, Total Lead, D | Annually. Once prior to every discharge onto the tundra |
| BMS-10* | Site runoff from sediment controls during construction | TSS or Turbidity | Daily during periods of discharge |
| BMS-11* | Discharge from the Boston fuel storage and containment sumps | G, HC, Total Pb D | Annually. Once prior to every discharge onto the tundra. Daily during periods of discharge |

** Station not in use at this time.*

## SUMMARY OF MONITORING INFORMATION

The following summarizes sampling undertaken as part of the monitoring program detailed in Part I of 2AM-BOS1835.

No activity occurred at the Boston site under this licence in 2020. Activities at Boston Camp conducted in 2020 to maintain environmental compliance are reported under water licence 2BB-BOS1727. Results of this monitoring are presented in Appendix D.4 of this report.

Monitoring was not undertaken at monitoring stations BMS-1 (Contact Water Pond #1 and #2) as these facilities have not yet been constructed. The Contact Water Treatment Plant and surge pond have not yet been constructed and no monitoring was conducted at BMS-2 or BMS-3. The Tailings Management Area (TMA) has not yet been constructed, therefore monitoring of the reclaim line from the TMA contact water pond (BMS-4) was not conducted in 2020. The Non-contact water pond (BMS-5) has not yet been constructed and no monitoring of this facility occurred in 2020.

No samples were collected under monitoring station BMS-6 as no fresh water was used from Aimaokatalok Lake in 2020.

No landfill exists at Boston at this time and no samples were collected from the landfill sump (BMS-7).

No samples were collected under monitoring station BMS-8 (Discharge of treated sewage) in 2020 as the Sewage Treatment Plant at Boston Camp was not operational under licence 2AM-BOS1835. Monitoring of the Sewage Treatment Plant at Boston Camp to support surface exploration drilling programs is completed under licence 2BB-BOS1727. The Boston Camp was not operational in 2020.

The Landfarm at Boston has not yet been constructed (BMS-9). No construction was conducted at Boston in 2020 and no monitoring was conducted under monitoring station BMS-10.

Monitoring of the Bulk Fuel Storage Facility at Boston was conducted under water licence 2BB-BOS1727. Results of this monitoring are presented in Table D4-3 in Appendix D.4 of this report. The Boston Fuel Storage Area and Containment sumps (BMS-11) listed under licence 2AM-BOS1835 has not been constructed at this time.

# Appendix E

Doris Mine Annual Water and Load Balance Assessment – 2020 Calendar Year

AGNICO EAGLE

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**FINAL**

# Technical Memo

March 30, 2021

| | |
|---|---|
| **To** | Ashley Mathai and Sarah Warnock, Hope Bay Project |
| **From** | Andrea Bowie, SRK; Nina Feng, SRK |
| **Cc** | Oliver Curran, Hope Bay Project<br>John Kurylo, SRK; Lisa Barazzol, SRK |
| **Subject** | Doris Mine – Annual Water and Load Balance Assessment – 2020 Calendar Year |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.066 |

## 1 Introduction

Monthly monitoring of the Doris Tailings Impoundment Area (TIA) is a requirement during operations under the Hope Bay Water Licence No: 2AM-DOH1335 – Amendment No. 2 (NWB 2018). The Doris TIA receives tailings slurry from the mine's process plant (mill); mine water from the Doris and Madrid underground mines; runoff from the Naartok East crown pillar recovery pit; runoff from the camp, ore and waste rock pads (and associated ponds);as well as natural runoff and direct precipitation.

Under Water Licence No: 2AM-DOH1335, Schedule B Item 4, a summary of the results for the monthly Doris TIA water balance and water quality model assessments, including any re-calibrations, is required to be reported. Model assessments are conducted each year. A summary of the past assessments is presented in Table 1.

**Table 1: Previous Model Calibrations (2017, 2018, and 2019)**

| Model Reference | Monitoring Year | Calibration Changes | Key Conclusions and Model Changes |
|---|---|---|---|
| SRK 2017 | Final Environmental Impact Statement | Baseline Model | Baseline Model |
| SRK 2018 | 2017 | None | *Water Balance:* predictions trending with measured elevations<br>*Load Balance:* Doris Process Plant not at steady state, no changes made for underpredicted parameters |

| Model Reference | Monitoring Year | Calibration Changes | Key Conclusions and Model Changes |
|---|---|---|---|
| SRK 2019 | 2018 | Hydrology, processing rate, mine water flows, stage storage curves | *Water Balance:* after updates, predictions trending with measured elevations<br>*Load Balance:* most parameters at detection limits, overpredicted, or trending well with measured data. Update for underpredicted parameters as follows:<br>*Doris process water:* ammonia, total cyanide, free cyanide, sulphate, and the following total metals: aluminum, copper, iron, manganese, nickel, phosphorous and sodium<br>*Doris Mine water:* ammonia |
| SRK 2020 | 2019 | Hydrology, processing rate, mine water flows, stage storage curves, sedimentation control ponds, degradation rates, process water source term, mine water source term | *Water Balance:* after updates, predictions trending with measured elevations<br>*Load Balance:* most parameters at detection limits, overpredicted, or trending well with measured data. Update for underpredicted parameters as follows:<br>*Degradation rates:* increased ammonia degradation rate, changed total cyanide degradation rate and degradation products to free and Weak Acid Dissociable (WAD) cyanide.<br>*Doris process water:* cyanate, total and dissolved manganese<br>*Doris Mine water:* total and dissolved manganese |

Sources: SRK 2018, 2019, 2020

The previous annual assessments (i.e., 2017 through 2020) concluded that the overall mechanisms behind the water balance adequately represented the system (SRK 2018, 2019, 2020). Therefore, a similar approach was taken for the 2020 calibration (as presented in this memorandum). Measured 2020 elevations and water quality data were compared to the predictions from the calibrated SRK (2020) model adjusted for 2020 measured values (e.g. flows, precipitation, processing rate).

After the water balance (quantity or volume) adjustment, the model was assessed from a water quality perspective. Parameters were grouped based on the comparison of predicted and observed results for the Doris TIA. The following parameter groups were previously identified:

- Conservative predictions (measured values below the model predictions),
- Predictions trending well with measured data,
- Underpredicted, and,
- Detection limit greater than prediction (i.e. below testing detection)

The model was considered adequate for the parameters where predictions were conservative (overestimated in the model), trending well with measured data, and where detection limits were greater than prediction. Underpredicted values were assessed individually and adjusted based on measured observations in the process water, mine water and the Doris TIA.

# 2 Model Inputs and Measured Data Comparison

The model set-up and mechanisms represented are detailed in the Final Environmental Impact Statement (FEIS) Water and Load Balance report (SRK 2017). Changes to source terms, based on review of data from:

- 2018 are documented in the memo Doris Mine Annual Water and Load Balance Assessment – 2018 Calendar Year (SRK 2019), and,
- 2019 are documented in the memo Doris Mine Annual Water and Load Balance Assessment – 2019 Calendar Year (SRK 2020).

This section will discuss the key differences between the SRK (2020) model assumptions and the measured inputs, or implemented infrastructure decisions, from 2020.

## 2.1 Review of Water Balance Inputs

The model calibration relies on a comparison of similar input assumptions. For example, if the model assumed an average hydrological year but the site measured a 1 in 50 wet year, it would be likely that the model would underpredict elevations in the Doris TIA. Therefore, only inputs that were measured onsite were updated in the model. Any input not discussed in this section remained as per the original model assumptions, as documented in the FEIS model (SRK 2017).

### 2.1.1 Hydrology Update

The measured Doris meteorological data in the model was updated to include values from the 2020 calendar year for mean daily temperature, daily rainfall, and daily total precipitation. There was a gap in the 2020 Doris measured data for rainfall and precipitation between January 10 to 31. Data gaps are common in weather records and the gaps in 2020 represent 6% percent of the total yearly collection for rainfall and precipitation. The available record from the Doris meteorological station was used in the model for 2020 and the Cambridge Bay data was only used to fill in the gaps in the Doris record (Jan 10 to 31, 2020) for rainfall and precipitation.

Therefore, for completeness of records, measured data from four Cambridge Bay Stations (Environment and Climate Change Canada IDs: 2400600, 2400601, 2400602 and, 2400603) were compiled and updated in the model until the end of 2020. Data from the Cambridge Bay Stations included mean daily temperature, daily rainfall, daily precipitation and monthly under catch values for snow and rain. It is expected that data would be missing from the annual dataset from time to time. Patching in Cambridge Bay data was previously found to be an acceptable method for filling in the gaps, as discussed above, and continues to be implemented if / as needed (SRK 2017).

### 2.1.2 Processing Rate

The FEIS processing rate for 2020 was higher than the actual production rates and the distribution between the Doris and Madrid ore was different than what actually resulted on site The measured processing rates for 2020 are presented in Table 2 and Figure 1. Approximately 89% of the total

processed ore was from Doris Mine, and 11% from Madrid North Mine. Overall, 2020 measured processing was at an average of approximately 59% (430,000 tonnes) of the FEIS modelled amount (730,000 tonnes). The FEIS model also included a processing rate of 1,000 tpd of Madrid North ore to the Madrid North Concentrator in 2020. This infrastructure does not exist at site and this processing rate has there been set to zero throughout 2020.

Monthly processing rates were updated in the model to reflect the measured values for 2020. For 2021 to 2032, the forecasted processing rates in the model were left as the FEIS values, as presented in Attachment 1.

**Table 2: Summary of FEIS Forecasted and Measured Processing Rates for 2020**

| Month | Ore Processing Rate in the Doris Process Plant (tpd) | | | | | |
|---|---|---|---|---|---|---|
| | Doris Mine | | Madrid Mine | | Total Processed | |
| | FEIS | Measured | FEIS | Measured | FEIS/Modelled | Measured |
| January | 1,900 | 960 | 140 | - | 2,000 | 960 |
| February | 1,900 | 1,000 | 140 | - | 2,000 | 1,000 |
| March | 1,900 | 1,300 | 140 | 35 | 2,000 | 1,400 |
| April | 1,900 | 1,300 | 140 | 550 | 2,000 | 1,800 |
| May | 1,900 | 1,100 | 140 | 120 | 2,000 | 1,200 |
| June | 1,900 | 1,600 | 140 | 140 | 2,000 | 1,800 |
| July | 1,900 | 990 | 140 | 210 | 2,000 | 1,200 |
| August | 1,900 | 770 | 140 | 160 | 2,000 | 930 |
| September | 1,900 | 400 | 140 | 32 | 2,000 | 440 |
| October | 1,900 | 1,100 | 140 | 140 | 2,000 | 1,200 |
| November | 1,900 | 920 | 140 | - | 2,000 | 920 |
| December | 1,900 | 1,100 | 140 | 220 | 2,000 | 1,300 |
| Total (tonnes) | 680,000 | 380,000 | 50,000 | 49,000 | 730,000 | 430,000 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

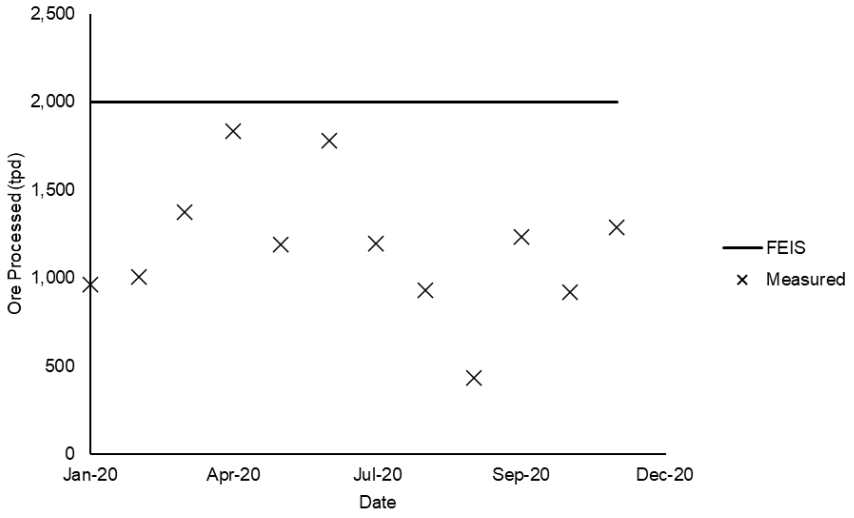



**Figure 1: FEIS Forecasted and Measured Processing Rates**

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

### 2.1.3 Site Contact Water

Contact water at the Doris site from the ore, waste rock, and camp pads is collected in two ponds: the Doris pollution control and the sediment control ponds. Contact water is also collected in Sumps 1 to 3 and pumped back up to the pollution control pond. Contact water is transferred from the pollution control pond to the sediment control pond, which is pumped to the Doris TIA during the open water season.

Transfer rates from the sediment control pond to the Doris TIA were updated to include rates from 2017 to 2020, presented in Table 3.

**Table 3: Monthly Measured Flows from the Sediment Control Pond to the Doris TIA**

| Month | Sediment Control Pond to Doris TIA ($m^3$/month) | | | |
|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020 |
| January | - | - | - | - |
| February | - | - | - | - |
| March | - | - | - | - |
| April | - | - | - | - |
| May | - | - | - | - |
| June | - | 12,000 | 9,800 | 15,000 |
| July | 3,800 | 6,900 | 43,000 | 7,600 |
| August | 3,000 | 22,000 | 39,000 | 3,900 |

| Month | Sediment Control Pond to Doris TIA ($m^3$/month) | | | |
|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020 |
| September | - | 12,000 | 33,000 | 1,600 |
| October | - | - | - | - |
| November | - | - | - | - |
| December | - | - | - | - |
| Total | 6,800 | 53,000 | 120,000 | 28,000 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

Note that there is typically none or minimal pumping form the ponds to the TIA during the winter / ice covered months (approx. October to May)

### 2.1.4 Mine Water and Roberts Bay Marine Discharge Line

In 2020, mine water was directed either to the Doris TIA for storage or discharged to Roberts Bay, through the marine outfall / discharge line, after TSS treatment. Measured mine water encountered to date totaled 1,100,000 $m^3$, representing about 25% of the total volume of water held in the Doris TIA at the end of 2020. This assumes an elevation of 31.64 masl as observed on January 1, 2021 and a total of 1,600,000 tonnes of dry tailings deposited in the Doris TIA. The Doris Mine measured mine water was 88% of the FEIS predicted flow for 2020, and the Madrid North mine water was 35%. The use of the Roberts Bay marine discharge line is a key component of the overall Doris TIA system, that is used to help keep water levels within appropriate operational elevation ranges. Most of the Madrid North mine water was collected as contact water in the Naartok East crown pillar recovery pit. A comparison of modelled and measured mine water flows are presented in Table 4, Figure 2, and Figure 3.

Flow rates for both Doris and Madrid Underground mine water were updated in the model to reflect measured values for 2020. In the model, all mine water was directed to Roberts Bay for discharge, this was updated to reflect the split to Roberts Bay and the Doris TIA. For 2021 to 2032, the forecasted mine water flows for Doris, Madrid North and Madrid South were left as the FEIS values (Attachment 1), where all are directed to Roberts Bay through the marine discharge line.

**Table 4: Summary of FEIS Forecasted and Measured Mine Water Flows for 2020**

| Month | Mine Water ($m^3$/month) | | | | | |
|---|---|---|---|---|---|---|
| | Doris Mine | | | | Madrid Mine | |
| | FEIS | Measured to Rob Bay | Measured – To Doris TIA | Measured - Total | FEIS | Measured |
| January | 82,000 | - | 86,000 | 86,000 | - | - |
| February | 67,000 | 38,000 | 25,000 | 63,000 | - | - |
| March | 75,000 | 49,000 | 22,000 | 70,000 | - | - |
| April | 72,000 | 50,000 | 9,900 | 59,000 | 60 | - |
| May | 74,000 | 32,000 | 12,000 | 44,000 | 370 | - |

| Month | Mine Water ($m^3$/month) | | | | | |
|---|---|---|---|---|---|---|
| | Doris Mine | | | | Madrid Mine | |
| | FEIS | Measured to Rob Bay | Measured – To Doris TIA | Measured - Total | FEIS | Measured |
| June | 57,000 | 29,000 | 7,100 | 36,000 | 780 | - |
| July | 65,000 | 19,000 | 30,000 | 49,000 | 1,100 | - |
| August | 43,000 | 32,000 | 20,000 | 52,000 | 1,400 | - |
| September | 51,000 | - | 45,000 | 45,000 | 1,500 | - |
| October | 53,000 | - | 50,000 | 50,000 | 1,900 | 1,400 |
| November | 51,000 | - | 57,000 | 57,000 | 2,400 | 2,500 |
| December | 53,000 | - | 42,000 | 42,000 | 3,700 | 660 |
| Total | 740,000 | - | 410,000 | 650,000 | 13,000 | 4,600 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

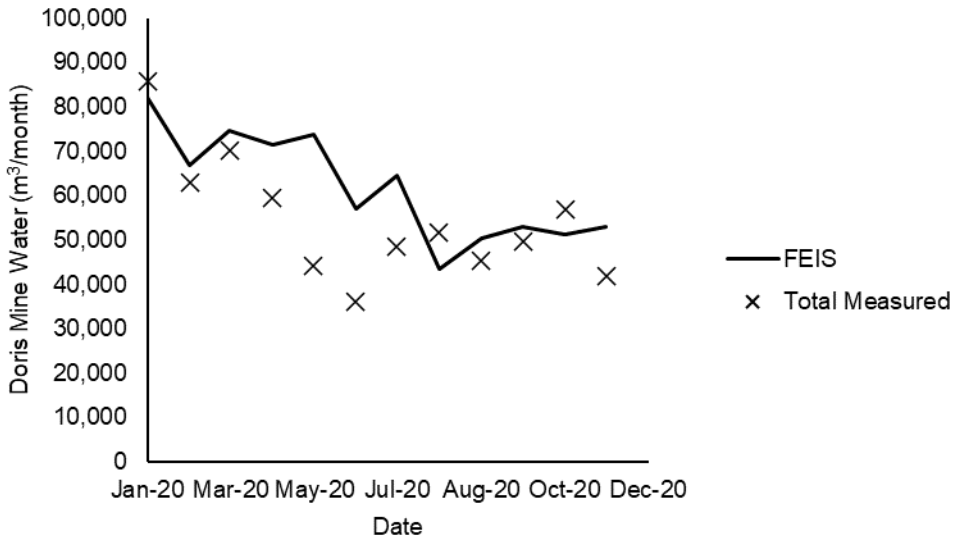



**Figure 2: FEIS Forecasted and Measured Doris Mine Water Flows for 2020**

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

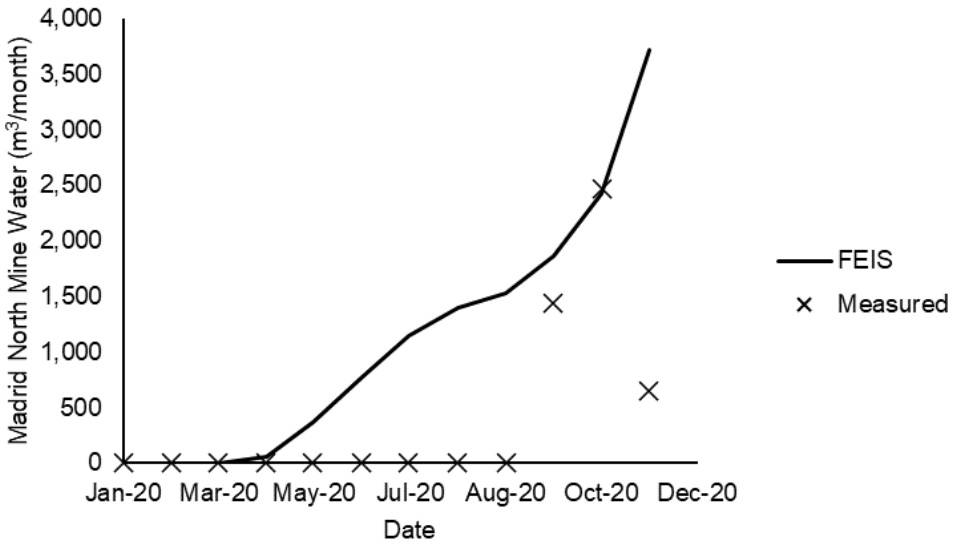



**Figure 3: FEIS Forecasted and Measured Madrid North Mine Water Flows for 2020**

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

The discharge line to Roberts Bay was operational on February 1, 2020. The measured water discharged from the Doris TIA to Robert's Bay was very similar to projected discharge rates from the FEIS. In 2020, the total discharged volume was 94% of the planned discharge volume, but the timing of discharge differed. In the FEIS the pumping rate was assumed to be 6,750 $m^3$/day and occur between June and September; in 2020 measured pumping rates were approximately 5,400 $m^3$/day and occurred from February until mid August. A comparison of modelled and measured discharge is presented in Table 5 and Figure 4.

Flow rates for Roberts Bay discharge were updated in the model to reflect measured values for 2020. For 2021 to 2032, the forecasted Roberts Bay discharge rates were left as the FEIS pumping rate.

**Table 5: Summary of Monthly Forecasted and Measured Flows from the Doris TIA to Robert's Bay for 2020**

| Month | Doris TIA to Robert's Bay ($m^3$/month) | |
|---|---|---|
| | FEIS | Measured |
| January | - | - |
| February | - | 150,000 |
| March | - | 170,000 |
| April | - | 170,000 |
| May | - | 170,000 |
| June | 210,000 | 150,000 |

| Month | Doris TIA to Robert's Bay ($m^3$/month) | |
|---|---|---|
| | FEIS | Measured |
| July | 210,000 | 160,000 |
| August | 210,000 | 68,000 |
| September | 210,000 | - |
| October | - | - |
| November | - | - |
| December | - | - |
| Total | 820,000 | 1,000,000 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

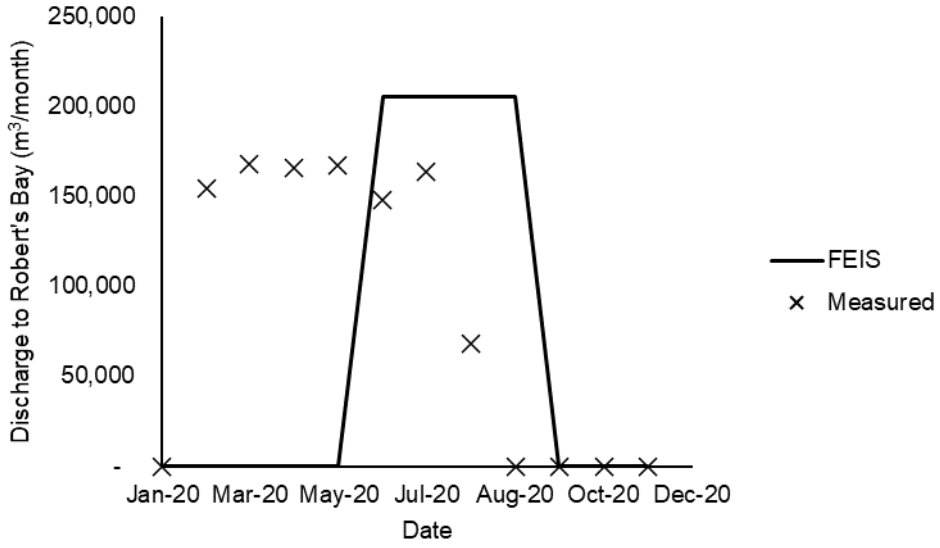



**Figure 4: FEIS Forecasted and Measured Doris TIA to Robert's Bay Flows for 2020**

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

## 2.2 Review of Water Quality Inputs

The SRK (2020) model was updated with the 2020 measured water balance inputs (referred to Predicted Concentration – WB in Attachment 2). TMAC provided 2020 water quality data collected in the Doris TIA at the reclaim pump station (TL-1). This data was compared to the SRK (2020) model predictions (referred to as Predicted Concentration – 2019 in Attachment 2). Parameters were grouped into three categories identified through the previous reviews (as discussed in Section 1), and as presented in Table 6. For parameters that were conservative or trending well according to model predictions no further action was taken; however, parameters that were underpredicted are addressed

in the sections below. TSS was not evaluated based on the 2019 review (which was again applied in 2020) as the model is a conservation of mass balance that does not include a mechanism for TSS settlement (SRK 2020).

**Table 6: Initial Screening Assessment of Water Load Balance Parameters**

| Classification Type | Parameters Included | Comparison to Model Prediction |
|---|---|---|
| Conservative | F, nitrate ($NO_3$), nitrite ($NO_2$)<br><br>Dissolved Metals: Al, Sb, As, Ba, Cd, Ca, Cr, Fe, Pb, Li, Mn, Hg, Mo, Ni, Se, Ag, Tl, Zn, V, P<br>Total Metals: Al, Sb, As, Ba, Cd, Ca, Cr, Fe, Pb, Li, Mn, Hg, Mo, Se, Ag, Tl, Zn, V, P | Measured values are below the model prediction. The modeled values are reflective of conservative assumptions (typically higher predictions than measured parameter values).<br><br>*Note: some values may be at or close to the method detection limit and slightly above the model prediction; these parameters were still considered to be in the conservative classification type.* |
| Trending Well | Total dissolved solids (TDS), Cl, ammonia ($NH_4$)<br><br>Dissolved Metals: Be, Co, Mg, Na, U<br>Total Metals: Be, Co, Mg, Ni, Na, U, | Measured values are tracking well with the model predictions. |
| Underpredicted | Total suspended solids (TSS), total cyanide (CN-T), Free cyanide (CN-F), WAD cyanide (CN-WAD), cyanate (CNO), thiocyanate (SCN)<br><br>Dissolved Metals: B, Cu<br>Total Metals: B, Cu | Model predictions are lower than measured values. Corrective actions discussed in subsequent sections. |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R02_ajb_nf.xlsx

To re-calibrate the model, TIA source terms were evaluated to determine how each would affect the results. The remainder of this section describes the model refinement while Section 3 presents the step-wise methodology for calibration. Section 4 discusses why the calibration was carried out and the results of the calibration.

### 2.2.1 Total and Dissolved Boron

Measured total and dissolved boron concentrations were compared to the model source terms for process water (TL-5), mine water (TL-12) and the sediment control pond (ST-1). Both mine water and sediment control pond source terms were found to be in the range of measured 2020 values, however process water source terms were underpredicted for boron. The process water source terms were updated for Boron as presented in Table 7.

**Table 7: Summary of Boron Source Term Changes**

| Source Term | Parameter | Units | Process Water Source Terms | | | |
|---|---|---|---|---|---|---|
| | | | Doris | Madrid North | Madrid South | Boston |
| FEIS | Dissolved Boron | mg/L | 0.23 | 0.18 | 0.18 | 0.18 |
| | Total Boron | mg/L | 0.23 | 0.18 | 0.18 | 0.18 |
| Revised based on 2020 measured average at TL-5 | Dissolved Boron | mg/L | 0.93 | 0.93 | 0.93 | 0.93 |
| | Total Boron | mg/L | 0.93 | 0.93 | 0.93 | 0.93 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R02_ajb_nf.xlsx

### 2.2.2 Total and Dissolved Copper

Copper concentrations increased in Doris TIA outside of those observed between 2017 and 2019:

- For dissolved copper, Doris TIA concentrations in 2020 increased from 0.022 mg/L on May 5 to 0.15 mg/L on May 12, peaking at 0.22 mg/L on June 2 and dropping back down to 0.017 mg/L on July 30. All other measurements throughout the year fell within the historical range.
  - All process water samples were near the model source term value of 0.17 mg/L, except for three samples on May 4, July 5, and August 2 ranging from 0.87 to 2.2 mg/L.
  - Dissolved copper is not monitored in the mine water directed to the Doris TIA.
- For total copper, Doris TIA concentrations increased from 0.054 mg/L on May 5 to 0.23 mg/L on May 12, peaking at 0.33 mg/L on May 20 and dropping back down to 0.091 mg/L on August 13. All other measurements throughout the year fell within the historical range.
  - All process water samples were near the model source term value of 0.17 mg/L, except for three samples on May 4, July 5, and August 2 ranging from 1.6 to 2.4 mg/L.
  - Mine water concentrations were all within the historical range with one exception on May 8 of 3.7 mg/L.

Variability exists in the 2020 copper datasets and within the process water and mine water flowing into the Doris TIA. Models are built to predict average conditions in the base case results and include variability in the sensitivity runs. The aim of this work is to evaluate if the model base case is reflective of the measured data. Overall the base case model was seen to be reflective of the measured data. As a result, no changes to the model source terms for copper were applied, see discussion in Section 4.2.2.

### 2.2.3 Cyanide Derivatives in the Doris TIA

Parameters identified as underpredicted by the model and not trending well with measured values in 2020:

1. Total cyanide (CN-T): peaks on January 6 (0.44 mg/L) then decreases until February 17 (0.11 mg/L), then increases again between May 5 and 12, 2020 (0.18 to 0.44 mg/L), reaches a peak on June 2 (0.51 mg/L), starts decreasing until September 9 (0.082 mg/L) and increases again throughout the remainder of 2020. The model predicts total cyanide concentrations increase until the open water season when photolysis decreases concentrations. After ice cover, concentrations steadily increase through the remainder of the year.
2. Free cyanide (CN-F): spikes in June 2 sample (0.21 mg/L) while ice cover is still persistent over much of the Doris TIA. The model predicts free cyanide concentrations remain low throughout the year and briefly peak for a short period during photolysis of total cyanide.
3. WAD cyanide (CN-WAD): spikes in May 21 sample (0.25 mg/L) ahead of free cyanide while ice cover is still persistent over much of the Doris TIA. The model predicts WAD cyanide concentrations remain low throughout the year and briefly peak for a short period during photolysis of total cyanide.
4. Cyanate (CNO): peaks on December 9, 2019 (18 mg/L) then decreases to a variable range roughly between 2 and 6 mg/L, increases on May 12 (6.9 mg/L), then decreasing during the open water season and increasing again towards the end of 2020. The model predicts cyanate concentrations increase until the open water season when degradation decreases concentrations. After ice cover, concentrations steadily increase through the remainder of the year.
5. Thiocyanate (SCN): peaks on January 6 (2.8 mg/L) then decreased until February 17 (0.68 mg/L), then is effected by samples below detection limits until a sudden increase on May 12 (1.4 mg/L), peaking again on June 2 (1.8 mg/L), then decreasing throughout the open water season and increasing again towards the end of 2020 with lots of samples below detection limits. The model predicts cyanate concentrations increase until the open water season when degradation decreases concentrations. After ice cover, concentrations steadily increase through the remainder of the year.

Several checks were completed in attempt to isolate the source terms or model mechanism discrepancy:

- Measured data in 2020 were compared to the model source terms for process water (TL-5), mine water (TL-12) and the sediment control pond (ST-1):
  - Measured sediment control pond values were in the range of the model source terms.
  - Measured mine water samples were in the range of the model source terms, with the exception of high total cyanide samples on March 8, 2020 (1.7 mg/L) and six samples towards the end of 2019 from September 9 to November 25 ranging between 0.32 and 1.7 mg/L of total cyanide. All other mine water samples directed to the TIA were typically below 0.2 mg/L with some between 0.2 and 0.3 mg/L.
  - Measured process water chemistry was highly variable and did not exhibit a specific trend. Of note was:
    - Total cyanide concentrations were within the historical range with most samples at or close to the model source term (3 mg/L), except for three samples on January 5, May 4, and, July 5 ranging from 4.1 to 6.5 mg/L.

  - Free and WAD cyanide samples fell within the historical range, except for two samples on May 4 (1.1 and 1.7 mg/L) and July 5 (1.0 and 2.1 mg/L). All other samples for free and WAD cyanide fell below 0.18 and 0.42 mg/L, respectively, but above the model source terms of 0.0025 mg/L and 0.0025 mg/L, respectively.
  - Slight increase in cyanate values compared to 2019 and higher than the source term (40 mg/L), with higher concentrations on May 4 (129 mg/L) and August 2 (157 mg/L).
  - Thiocyanate concentrations were in the range of historical values and the model source term (30 mg/L), except for two samples on May 4 (51.9 mg/L) and September 6 (231 mg/L).
- Process plant reagent consumption rates for 2020 were compared to the 2017 to 2019 usage rates:
  - Reagents used in the cyanide leach and detoxification circuits that would impact cyanide and cyanide derivative concentrations in the TIA were reviewed. Monthly sodium cyanide, sodium metabisulphite and cupric sulphate all fell within the range of historical data and were not found to be higher during months with higher percentages of Madrid North ore processing.
  - Review of sodium and sulphate concentration trends in the Doris TIA, both act as a conservative parameter check within the Doris TIA. Both sodium and sulphate follow similar trends to the historical dataset and model forecasted concentrations.

After these checks, no clear mechanism for the decrease in the overwinter trending nor for the dramatic increase in concentrations at the end of 2019 into the start of 2020 and during May 2020 were identified. As a result, no model mechanism or source terms were changed, the rationale is further discussed in Section 4.2.3.

# 3 Calibration Methodology

Changes to the model were applied one step at a time to assess the impact on the model results. A summary of the steps taken during the calibration were:

1. Water balance inputs updated:
   a. Includes: hydrology update, Doris mine water flows, and Doris Process Plant processing rate updated to include the measured data for 2020.
   b. Predicted concentrations were compared to measured Doris TIA data at station TL-1. Water quality screening assessment results are presented in Table 5.
2. Boron evaluation:
   a. Total and dissolved boron concentrations updated in the process water source terms based on TL-5 data (Table 7).
   b. Predicted concentrations were compared back to measured Doris TIA data at station TL-1.
3. Final results generation:
   a. All adopted values were reviewed and accepted.

# 4 Calibration Evaluation

## 4.1 Doris TIA Elevation

TMAC provided measured water elevations for the Doris TIA for 2020. These were compared to the SRK (2020) model predictions (Predicted Elevation – 2019) as well as the updated predictions (Predicted Elevation – WB). The results of the measured elevations and the two predicted elevation cases are shown in Table 8 and Figure 5.

Although some months show an elevation difference, the general trend of the measured elevation data matches the updated predictions. Based on a visual inspection of goodness of fit, the mechanisms affecting model calibration are trending well with measured data and no further recalibration of the model is required at this time regarding water inventory.

**Table 8: Doris TIA Elevation Comparison to Model Predictions**

| Month | Doris TIA Elevation (masl) | | |
|---|---|---|---|
| | Average Measured Monthly Elevation | Predicted Elevation – 2020 | Predicted Elevation – WB |
| January | 32.0 | 32.1 | 31.9 |
| February | 31.9 | 32.0 | 31.8 |
| March | 31.6 | 31.9 | 31.7 |
| April | 31.4 | 31.7 | 31.5 |
| May | 31.1 | 31.5 | 31.3 |
| June | 31.3 | 31.5 | 31.3 |
| July | 31.4 | 31.3 | 31.3 |
| August | 31.3 | 31.1 | 31.3 |
| September | 31.4 | 30.9 | 31.5 |
| October | 31.5 | 30.9 | 31.6 |
| November | 31.5 | 30.9 | 31.6 |
| December | 31.6 | 31.0 | 31.6 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

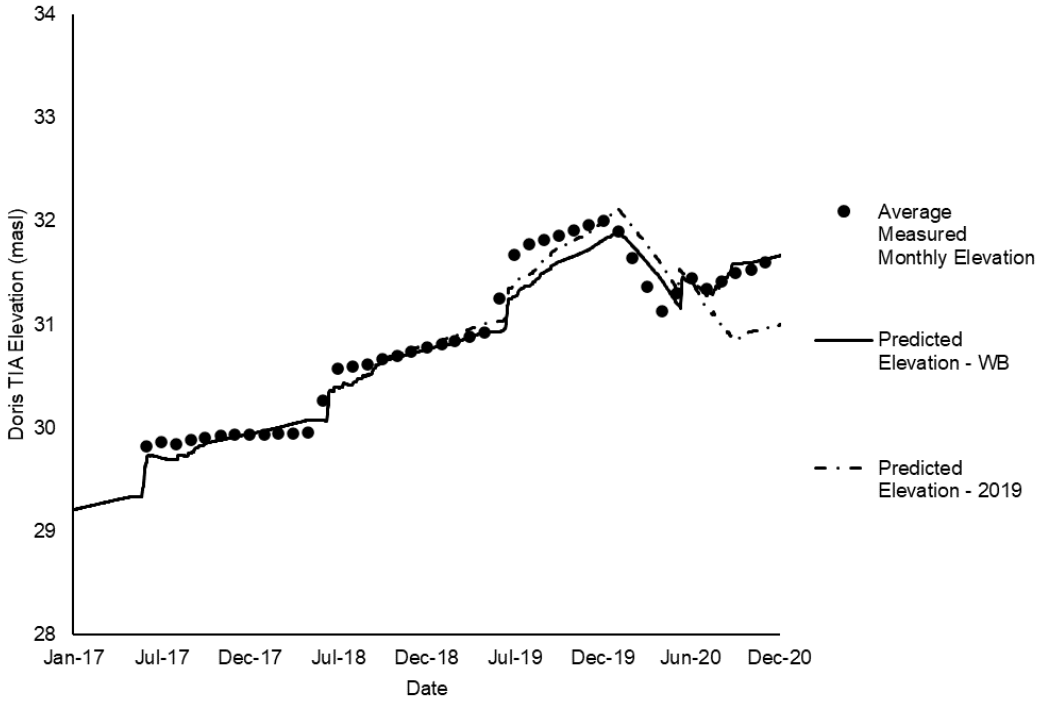



**Figure 5: Modeled and Predicted Elevations in the Doris TIA**

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

## 4.2 Predicted TIA Water Quality (Post Model Calibration)

Attachment 2 presents a comparison between the measured data at TL-1 and the water quality predictions generated by the calibrated SRK (2020) model. The graphs show several model predictions, representing the model calibration evolution described in Section 3. A summary of the graphed results is presented in Table 9.

The graphs include predictions up until the Doris TIA is drained and maintained empty after the North Dam is breached during reclamation, immediate before final closure. For parameters regulated under the Metal and Diamond Mining Effluent Regulations (MDMER), the maximum authorized monthly mean concentrations were included on the plots (MDMER 2019).

**Table 9: Description of the Predictive Cases Graphed in Attachment 2**

| Graphed Prediction | Description |
|---|---|
| Predicted – 2019 | Model results based on calibration with 2019 data (SRK 2020) |
| Predicted – WB | Model results after water balance updates with 2020 measured data (hydrology update, mine water, process rate, sedimentation flows) |
| Predicted – LB1 | Model results after boron evaluation based on 2020 data. |
| Predicted – 2020 | Model results after the full 2020 assessment presented herein. |

After the screening assessment, parameters could be reclassified into three groups presented in Table 10.

**Table 10: Screening Summary of Water Load Balance Parameters after Calibration**

| Classification Type | Parameters Included | Comparison to 2019 Model Prediction |
|---|---|---|
| Conservative | F, nitrate ($NO_3$), nitrite ($NO_2$)<br><br>Dissolved Metals: Al, Sb, As, Ba, Cd, Ca, Cr, Fe, Pb, Li, Mn, Hg, Mo, Ni, Se, Ag, Tl, Zn, V, P<br>Total Metals: Al, Sb, As, Ba, Cd, Ca, Cr, Fe, Pb, Li, Mn, Hg, Mo, Se, Ag, Tl, Zn, V, P | Measured values are below the model prediction. The modeled values are reflective of conservative assumptions (parameter predictions typical greater than measured)<br><br>*Note: some values may be at or close to the method detection limit and slightly above the model prediction; these parameters were still considered to be conservative.* |
| Trending Well | Total dissolved solids (TDS), Cl, ammonia ($NH_4$)<br><br>Dissolved Metals: B, Be, Co, Mg, Na, U<br>Total Metals: B, Be, Co, Mg, Ni, Na, U, | Measured values are tracking well with the model predictions. |
| Underpredicted – TSS driven | Total suspended solids (TSS) | Model predictions are lower than measured values, no model changes as per the 2019 evaluation (SRK 2020). |
| Underpredicted – Copper Concentrations | Dissolved Metals: Cu<br>Total Metals: Cu | Model predictions are similar to measured concentrations except for a peak in May 2020. Mechanism likely an isolated event due to special circumstances related to the COVID-19 pandemic in 2020. |
| Underpredicted – Cyanide derivatives | total cyanide (CN-T), Free cyanide (CN-F), WAD cyanide (CN-WAD), cyanate (CNO), thiocyanate (SCN) | Model predictions are similar to measured concentrations except for a decrease in January 2020 for total cyanide, cyanate and thiocyanate and a peak in May 2020 for all cyanide derivatives listed. Decrease mechanism unknown and peak mechanism likely an isolated event due to special circumstances related to the COVID-19 pandemic in 2020. |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\Inputs\HopeBay_2020Inputs_1CT022-066_R01_ajb_nf.xlsx

### 4.2.1 Total and Dissolved Boron

Variability in ores from different mining zones is expected and as a result variability in some process water parameters is also expected. It is likely that ore with higher soluble boron was processed in 2020 (a similar trend was observed in 2019 to a lesser extent), and therefore the source term was updated.

Water from the Doris TIA is discharged to Roberts Bay. Guidelines from the Canadian Environmental Quality Guidelines (CCME 2009) provide no recommended guidelines for boron concentrations with respect to marine life toxicity.

### 4.2.2 Total and Dissolved Copper

Total and dissolved copper concentrations increase between the May 5 and 12 samples in 2020. No total copper MDMER exceedances were observed during discharge of Doris TIA water to Roberts Bay (Section 5). It is theorized that, during this timeframe, an unfrozen area developed in the Doris TIA pond ice where the pond meets the tailings beach, which could have led to one or both of the following:

1. A flushing of the tailings beach material and water ponded on the beach into the Doris TIA, and/ or,
2. A short-circuiting of flow from deposited tailings slurry to the reclaim pump station.

The first bullet above would cause an increase in Doris TIA concentrations as increased loading would enter the Doris TIA. The second could cause reclaim pump samples (TL-1) to be more reflective of the process water and mine water chemistry, both being added to the Doris TIA via the tailings pumpbox. This trend was observed in other parameters (e.g. nickel, cobalt), although these parameters remained close to or under model predictions. Process water copper samples were high at the start of May, and it is unknown how long these high concentrations persisted before decreasing in June.

No spikes in spring chemistry were observed throughout 2017 to 2019. It may be that operational changes linked to the start of the COVID-19 pandemic during March and April 2020 resulted in a short period where no tailings deposition occurred. This could have led to the Doris TIA pond freezing near the end of tailings beach, where there is also a natural narrowing of the lake, creating an ice barrier between the Doris TIA pond and deposited tailings slurry for the remainder of the ice on period (i.e., until approximately May).

The practice of rotating the process plant operations between three week periods of processing and three weeks of maintenance was developed later in the year, during the COVID-19 pandemic. During maintenance weeks, it was common practice to run reclaim water through the tailings pipeline to prevent pipeline freezing.

Therefore, the increase in copper concentrations was hypothesized to be related to the short-circuiting of flow and / or flushing of tailings beach material between May 4 and May 17 as a result of a pond freezing event linked to an interruption in normal operations during the start of the COVID-19 pandemic. Due to the practice of continuously pumping reclaim water through the tailings line between processing campaigns, done in part to ensure the line does not freeze and in part so a heat source is keep on active deposition locations to help limit ice entrainment, it is not anticipated that this will

happen again in the future and does not require a change to mechanisms affecting copper in the SRK (2020) model.

### 4.2.3 Cyanide Derivatives in the Doris TIA

Two different trends were noted in the cyanide derivatives datasets:

1. Decrease in total cyanide, cyanate, and, thiocyanate concentrations in January 2020, and
2. Spike in concentrations for all cyanide derivates in May 2020.

For the second trend, the mechanism affecting copper in 2020 likely also affected free, WAD and total cyanide, cyanate, and thiocyanate, and can help explain the increase in concentration during May 2020. For a complete discussion on the mechanisms affecting copper see the discussion above (Section 4.2.2).

For the first trend, total cyanide, cyanate, and, thiocyanate concentrations all decreased in January and then remained stable from February to April, with the most dramatic decrease seen in total cyanide. Discharge to Roberts Bay did not occur during January. All three parameters saw an increase between the end of October and December 2019 that was more rapid than historical rates. Processing rates and reagent usage were consistent with historical ranges during this period; however, Madrid ore was processed for the first time in October at 10% of the total ore processed increasing to 90% in December.

The rapid increase in total cyanide, cyanate, and, thiocyanate concentrations at the end of 2019 could be linked to variable process chemistry, while Madrid ore was being processed for the first time, that was not captured within the monthly process water samples. Both thiocyanate and cyanate concentrations were higher in the detoxified tailings filtrate (TL-7b) than in the process water (TL-5), while total cyanide concentrations were higher in the process water than in the detoxified tailings filtrate. At TL-5, concentrations of total cyanide are much higher than free and WAD cyanide suggesting that most of the cyanide is strongly complexed.

Total suspended solids decreased from September 2, 2019 (24 mg/L) to April 4, 2020 (4.6 mg/L). It is possible that total cyanide could have interacted with some of the biomass as it settled out of the water column throughout winter, causing a decrease in total cyanide concentrations. Although this explanation would be less likely for cyanate and thiocyanate.

It is possible that the rise in concentrations at the end of 2019 was an anomaly, potentially linked to the processing of Madrid ore for the first time. It is unclear what has caused the dramatic decrease in total cyanide and smaller decreases in thiocyanate and cyanate during January 2020. It could be a shift in process chemistry as no Madrid ore was processed in January and February 2020 or it could be related to biomass settling out of the water column during this time.

No change was made to the calibrated SRK (2020) model; however, these parameters will be monitored in the future along with the rate of Madrid ore being processed to determine if a correlation exists between the Madrid ore processing rate and cyanide chemistry in the TIA.

# 5 Comparison to MDMER

## 5.1 Measured Values

Updated water quality projections for the Doris TIA were compared to the MDMER limits (MDMER 2019) in Attachment 2, as Doris TIA water was and will continue to be discharged to Roberts Bay. All measured data were compared to the MDMER maximum authorized monthly mean concentrations and maximum authorized concentrations in a grab sample, presented in Table 11 and Table 12, respectively. During discharge of Doris TIA water to Roberts Bay in 2020, there were no MDMER exceedances.

Average monthly total copper increased from a background concentration below 0.1 mg/L to a maximum of 0.27 mg/L but remained below the MDMER maximum authorized monthly mean limit of 0.5 mg/L. Based on the hypothesized mechanism discussed in Section 4.2.2, it is anticipated that this increase should not occur in the future.

Unionized ammonia peaked on August 26 at 0.071 mg/L, well below the MDMER limit.

Total suspended solids would have exceeded MDMER limits in September and December 2020 after development of an algal bloom in late summer; however, Doris TIA discharge to Roberts Bay was proactively shut off, a practice that will be continued in the future (i.e. no discharge is planned to Roberts Bay for the periods that the algal bloom occurs at the TIA).

**Table 11: Comparison of Maximum Monthly Mean Measured Concentrations in the Doris TIA to the Proposed MDMER**

| Parameter | Units | MDMER Maximum Authorized Monthly Mean Concentration | Maximum of 2020 Doris TIA Average Monthly Concentrations (TL-1) | Month of Maximum Concentration | Percent of MDMER Limit |
|---|---|---|---|---|---|
| TSS | mg/L | 15 | 19 | December * | 124% |
| Total Arsenic | mg/L | 0.5 | 0.0028 | December * | 0.6% |
| Total Copper | mg/L | 0.3 | 0.27 | June | 89% |
| Cyanide – Total | mg/L | 1 | 0.41 | June | 41% |
| Total Lead | mg/L | 0.2 | 0.00050 | April | 0.3% |
| Total Nickel | mg/L | 0.5 | 0.027 | June | 5% |
| Total Zinc | mg/L | 0.5 | 0.023 | December * | 5% |
| Unionized Ammonia (as N) | mg/L | - | 0.06 | January * | - |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\HopeBay_AnnualWLBReview_1CT022-066_R00_ajb_Rev06_nf.xlsm

Note: * no discharge to Roberts Bay from the Doris TIA occurred in January and September to December 2020.

**Table 12: Comparison of Maximum Grab Sample Concentration Measured in the Doris TIA Compared to the Proposed MDMER**

| Parameter | Units | MDMER Maximum Authorized Concentration in a Grab Sample | Maximum Concentration Measured in the Doris TIA in 2020 (TL-1) | Date of Maximum Concentration | Percent of MDMER Limit |
|---|---|---|---|---|---|
| TSS | mg/L | 30 | 40 | 12/4/2020 * | 132% |
| Total Arsenic | mg/L | 1 | 0.0048 | 9/7/2020 * | 0.5% |
| Total Copper | mg/L | 0.6 | 0.33 | 5/21/2020 | 54% |
| Cyanide – Total | mg/L | 2 | 0.51 | 6/2/2020 | 25% |
| Total Lead | mg/L | 0.4 | 0.001 | 1/13/2020 * | 0.3% |
| Total Nickel | mg/L | 1 | 0.029 | 3/9/2020 | 2.9% |
| Total Zinc | mg/L | 1 | 0.06 | 3/23/2020 | 6.0% |
| Unionized Ammonia (as N) | mg/L | - | 0.10 | 1/6/2020 * | - |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\8_2020_AnnualWLB\HopeBay_AnnualWLBReview_1CT022-066_R00_ajb_Rev06_nf.xlsm

Note: * no discharge to Roberts Bay from the Doris TIA occurred in January and September to December 2020.

## 5.2 Modeled Values

The updated water quality predictions were also screened against the MDMER limits. A summary of the findings is presented in Table 13 with a discussion included for each parameter. MDMER limits were also presented along side predictions in Attachment 2.

Arsenic was identified during the FEIS as a parameter requiring treatment once the Madrid ore was processed and this remains unchanged for the updated predictions. Processing of Madrid ore began in October 2019, and the average monthly concentration in the Doris TIA increased by a factor of 2.5 in December 2020 compared to January 2019. The arsenic concentrations observed in 2020 remain below the predictions for arsenic and less than 1% of the MDMER limits for both maximum authorized monthly mean concentrations and maximum authorized concentrations in a grab sample.

The same four parameters identified as parameters to watch in the 2018 and 2019 reviews will still be monitored closely: TSS, total copper, total cyanide, and unionized ammonia.

**Table 13: Comparison of Updated Predictions to MDMER Limits**

| Parameter | Discussion of Results |
|---|---|
| TSS | The model is not able to accurately predict TSS. A treatment plant to target TSS removal for mine water sent directly to the environment was operational in 2020. TSS will continue to be monitored and the discharge to Roberts Bay managed to prevent discharge of high TSS water linked to a yearly algal bloom. |

| Parameter | Discussion of Results |
|---|---|
| Arsenic | Concentrations in the Doris TIA increased by a factor of 2.5 after commencing Madrid ore processing, however, remain under the model predictions. The need for arsenic treatment will be monitored as greater quantities of Madrid ore are processed. |
| Copper | Updated predictions remain below the proposed MDMER limit. However, the average monthly total copper concentrations in June 2020 approached the limit. This is hypothesized to be related to a short-circuiting of flow and / or flushing of tailings beach material between May 4 and May 17 as a result of a pond freezing event linked to an interruption in normal operations during the start of the COVID-19 pandemic. It is not anticipated that this will continue to occur. Copper concentrations will continue to be monitored, and if arsenic treatment is required, copper treatment may also be considered. |
| Total Cyanide | Updated predictions increase above the MDMER limit in Feb 2022. Total cyanide concentrations in the Doris TIA originate from iron cyanide complexes which readily degrade by photolysis. Modelled peaks for total cyanide occur in the spring before longer sunlight days commence photolysis. Measured cyanide concentrations have demonstrated that cyanide readily undergoes degradation in the Doris TIA during the open water season. TMAC will not discharge water that is above total cyanide limits. |
| Lead | Updated predictions remain below the MDMER limits and are not of concern. |
| Nickel | Updated predictions remain below the MDMER limits and are not of concern. |
| Zinc | Updated predictions remain below the MDMER limits and are not of concern. |
| Unionized Ammonia | Unionized ammonia is both pH and temperature dependent and not included in the model. Agnico Eagle is aware that algal blooms may occur each year and result in an increase in pH in the Doris TIA during the period when pond water temperatures are the warmest. Agnico Eagle are actively taking steps towards managing this issue. |

# 6 Final Remarks

Overall, the mechanisms behind the FEIS water and load balance appear to be well calibrated to the measured data for most parameters. In addition to updating measured model inputs, the following modifications were made to the model based on review of 2020 monitoring data:

- Update to boron source term.

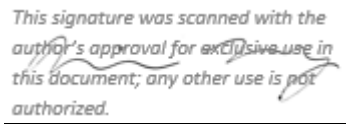
Although the model did not replicate trends in total and dissolved copper, total cyanide, free cyanide, WAD cyanide, cyanate, and, thiocyanate the conclusion of data review was that the mechanisms influencing these parameters were anomalous (i.e., unusually early ice off at TIA beach, and modified operations schedule due to COVID), and are not expected to repeat or continue. Therefore, no changes were made to the model to address the calibration of these parameters at this time. Doris TIA concentrations will continue to be monitored throughout 2021 especially for: total and dissolved copper, total cyanide, free cyanide, WAD cyanide, cyanate, and thiocyanate.

Four parameters (TSS, total copper, total cyanide, and unionized ammonia) have been identified as parameters of concern regarding MDMER limits applied to mine discharges and will continue to be monitored throughout 2021. Arsenic was identified in the FEIS as a parameter that could require treatment; however, current concentrations remain well below the MDMER limit. Arsenic concentrations will also be monitored throughout 2021 as greater proportions of Madrid ore will be processed.

**Table 14: Summary of the SRK (2020) Model Calibration to the Measured 2020 Data**

| Evaluated Model Input | Changes Made to Model Input | Conclusions of Calibration |
|---|---|---|
| Hydrology Data | Updated with 2020 measured data | Predicted elevation considered good fit with measure elevations. |
| Doris Process Plant process rate | Updated with 2020 measured data | |
| Doris Mine water flows | Updated with 2020 measured data | |
| Sedimentation control pond flows | Updated with 2020 measured data | |
| Total and dissolved boron | Source term for total and dissolved boron updated for 2020 measured data at TL-5 | Predicted boron concentrations trending well with measured data. |
| Total and Dissolved copper | No changes made | Calibration evaluation was underpredicted by the model. Increase in measured data during May hypothesized to be related to a hole in the Doris TIA pond opening-up around this same time. This is not expected to occur in the future as is it was suspected to occur after upset to operations during the COVID-19 pandemic. |
| Cyanate derivatives in the Doris TIA | No changes made | Calibration evaluation was underpredicted by the model. Decrease in measured data during January is hypothesized to be related to variable process chemistry after processing higher rates of Madrid ore at the end of 2020 and/or potential interaction with the settling biomass during this time.<br>Increase in measured data during May hypothesized to be related to a hole in the Doris TIA pond opening-up around this same time. This is not expected to occur in the future as is it was suspected to occur after upset to operations during the start of the COVID-19 pandemic. |

Regards,
SRK Consulting (Canada) Inc.

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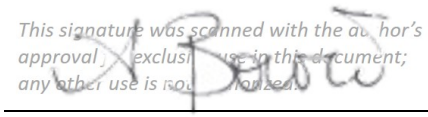
And,

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## Attachments:

Attachment 1 Annual WLB Assessment – 2020 – TABLES
Attachment 2 Annual WLB Assessment – 2020 – PLOTS

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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# Attachment 1 Annual WLB Assessment – 2020 – TABLES

**Project:** **Hope Bay**
**Number:** **1CT022.066**
**Task:** **Summary of the FEIS Model Inputs**
*Source:* *HopeBay_FEISWLBalance_TypeA_Rev31_AJB_NF.gsm*

***Table A1.1: Processing Rates for the Doris, Madrid and Boston Processing Plants***

| Model Date | Processing Rates (tonnes/day) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total Doris Process Plant | Doris Ore to Doris Process Plant | Madrid North Ore to Doris Process Plant | Madrid North Ore to Madrid Process Plant | Madrid South to Doris Process Plant | Boston Ore to Doris Process Plant | Boston Ore to Boston Process Plant |
| 1/1/1900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2016 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2/1/2017 | 212 | 212 | 0 | 0 | 0 | 0 | 0 |
| 3/1/2017 | 351 | 351 | 0 | 0 | 0 | 0 | 0 |
| 4/1/2017 | 635 | 635 | 0 | 0 | 0 | 0 | 0 |
| 5/1/2017 | 659 | 659 | 0 | 0 | 0 | 0 | 0 |
| 6/1/2017 | 662 | 662 | 0 | 0 | 0 | 0 | 0 |
| 7/1/2017 | 569 | 569 | 0 | 0 | 0 | 0 | 0 |
| 8/1/2017 | 741 | 741 | 0 | 0 | 0 | 0 | 0 |
| 9/1/2017 | 555 | 555 | 0 | 0 | 0 | 0 | 0 |
| 10/1/2017 | 733 | 733 | 0 | 0 | 0 | 0 | 0 |
| 11/1/2017 | 634 | 634 | 0 | 0 | 0 | 0 | 0 |
| 12/1/2017 | 841 | 841 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2018 | 814 | 814 | 0 | 0 | 0 | 0 | 0 |
| 2/1/2018 | 966 | 966 | 0 | 0 | 0 | 0 | 0 |
| 3/1/2018 | 1,012 | 1,012 | 0 | 0 | 0 | 0 | 0 |
| 4/1/2018 | 1,073 | 1,073 | 0 | 0 | 0 | 0 | 0 |
| 5/1/2018 | 893 | 893 | 0 | 0 | 0 | 0 | 0 |
| 6/1/2018 | 818 | 818 | 0 | 0 | 0 | 0 | 0 |
| 7/1/2018 | 1,027 | 1,027 | 0 | 0 | 0 | 0 | 0 |
| 8/1/2018 | 1,386 | 1,386 | 0 | 0 | 0 | 0 | 0 |
| 9/1/2018 | 1,614 | 1,614 | 0 | 0 | 0 | 0 | 0 |
| 10/1/2018 | 1,851 | 1,851 | 0 | 0 | 0 | 0 | 0 |
| 11/1/2018 | 1,842 | 1,842 | 0 | 0 | 0 | 0 | 0 |
| 12/1/2018 | 1,555 | 1,555 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2019 | 1,464 | 1,464 | 0 | 0 | 0 | 0 | 0 |
| 2/1/2019 | 1,696 | 1,696 | 0 | 0 | 0 | 0 | 0 |
| 3/1/2019 | 1,680 | 1,680 | 0 | 0 | 0 | 0 | 0 |
| 4/1/2019 | 1,335 | 1,335 | 0 | 0 | 0 | 0 | 0 |
| 5/1/2019 | 1,999 | 1,999 | 0 | 0 | 0 | 0 | 0 |
| 6/1/2019 | 1,877 | 1,877 | 0 | 0 | 0 | 0 | 0 |
| 7/1/2019 | 1,416 | 1,416 | 0 | 0 | 0 | 0 | 0 |
| 8/1/2019 | 1,835 | 1,835 | 0 | 0 | 0 | 0 | 0 |
| 9/1/2019 | 1,893 | 1,893 | 0 | 0 | 0 | 0 | 0 |
| 10/1/2019 | 1,966 | 1,792 | 174 | 0 | 0 | 0 | 0 |
| 11/1/2019 | 1,794 | 1,369 | 425 | 0 | 0 | 0 | 0 |
| 12/1/2019 | 1,888 | 1,143 | 745 | 0 | 0 | 0 | 0 |
| 1/1/2020 | 963 | 963 | 0 | 0 | 0 | 0 | 0 |
| 1/2/2020 | 1,007 | 1,007 | 0 | 0 | 0 | 0 | 0 |
| 1/3/2020 | 1,374 | 1,339 | 35 | 0 | 0 | 0 | 0 |
| 1/4/2020 | 1,835 | 1,286 | 549 | 0 | 0 | 0 | 0 |
| 1/5/2020 | 1,192 | 1,072 | 121 | 0 | 0 | 0 | 0 |
| 1/6/2020 | 1,781 | 1,643 | 138 | 0 | 0 | 0 | 0 |
| 1/7/2020 | 1,196 | 990 | 205 | 0 | 0 | 0 | 0 |
| 1/8/2020 | 930 | 770 | 161 | 0 | 0 | 0 | 0 |
| 1/9/2020 | 435 | 404 | 32 | 0 | 0 | 0 | 0 |
| 1/10/2020 | 1,233 | 1,092 | 141 | 0 | 0 | 0 | 0 |
| 1/11/2020 | 917 | 917 | 0 | 0 | 0 | 0 | 0 |
| 1/12/2020 | 1,289 | 1,069 | 220 | 0 | 0 | 0 | 0 |
| 1/1/2021 | 2,000 | 286 | 1,714 | 1,000 | 0 | 0 | 0 |
| 1/1/2022 | 2,000 | 0 | 1,800 | 1,200 | 0 | 200 | 200 |
| 1/1/2023 | 2,400 | 0 | 2,000 | 1,200 | 0 | 400 | 800 |
| 1/1/2024 | 2,400 | 0 | 2,000 | 1,200 | 0 | 400 | 2,200 |
| 1/1/2025 | 2,400 | 0 | 2,000 | 1,200 | 0 | 400 | 2,400 |
| 1/1/2026 | 2,400 | 0 | 2,000 | 1,200 | 0 | 400 | 2,400 |
| 1/1/2027 | 2,400 | 0 | 2,000 | 1,200 | 0 | 400 | 2,400 |
| 1/1/2028 | 2,400 | 0 | 2,000 | 1,200 | 0 | 400 | 2,400 |
| 1/1/2029 | 2,400 | 0 | 1,932 | 1,200 | 68 | 400 | 1,184 |
| 1/1/2030 | 2,400 | 0 | 1,452 | 1,200 | 548 | 400 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1/1/2031 | 2,400 | 0 | 1,147 | 1,200 | 685 | 569 | 0 |
| 1/1/2032 | 2,400 | 0 | 0 | 0 | 1,414 | 184 | 0 |
| 1/1/2033 | 2,400 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2300 | 2,400 | 0 | 0 | 0 | 0 | 0 | 0 |

Note; Model interprets the values as constant over the next time period

**Project:** **Hope Bay**
**Number:** **1CT022.066**
**Task:** **Summary of the FEIS Model Inputs**
*Source:* *HopeBay_FEISWLBalance_TypeA_Rev31_AJB_NF.gsm*

***Table A1.2: Mine Water Flows By Source***

| Model Date | Mine Water Flows ($m^3$/day) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Doris Mine | | Madrid North Mine | | | | Madrid South Mine | | |
| | Flows from Bedrock | Flows from Doris Lake | Flows from Patch Lake | Flows from Imniagut Lake | Flows from Windy Lake | Flows from Bedrock | Flows from Wolverine Lake | Flows from Patch Lake | Flows from Bedrock |
| 1/1/1900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10/1/2017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/1/2017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/1/2017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2/1/2018 | 13 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3/1/2018 | 95 | 204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4/1/2018 | 101 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5/1/2018 | 119 | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6/1/2018 | 188 | 137 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/1/2018 | 191 | 170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/1/2018 | 188 | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9/1/2018 | 142 | 83 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10/1/2018 | 396 | 215 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/1/2018 | 467 | 268 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/1/2018 | 419 | 234 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2019 | 402 | 247 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2/1/2019 | 385 | 293 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3/1/2019 | 645 | 446 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4/1/2019 | 485 | 296 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5/1/2019 | 522 | 306 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6/1/2019 | 523 | 389 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7/1/2019 | 569 | 345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/1/2019 | 604 | 344 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9/1/2019 | 653 | 361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10/1/2019 | 643 | 373 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/1/2019 | 831 | 507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/1/2019 | 1,477 | 875 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2020 | 1,752 | 1,014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2/1/2020 | 628 | 249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3/1/2020 | 462 | 239 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4/1/2020 | 215 | 114 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 5/1/2020 | 256 | 138 | 0 | 3 | 0 | 9 | 0 | 0 | 0 |
| 6/1/2020 | 188 | 49 | 0 | 9 | 0 | 17 | 0 | 0 | 0 |
| 7/1/2020 | 659 | 303 | 0 | 17 | 0 | 20 | 0 | 0 | 0 |
| 8/1/2020 | 605 | 33 | 1 | 24 | 0 | 20 | 0 | 0 | 0 |
| 9/1/2020 | 1,064 | 449 | 2 | 28 | 0 | 21 | 0 | 0 | 0 |
| 10/1/2020 | 1,093 | 560 | 3 | 31 | 0 | 26 | 0 | 0 | 0 |
| 11/1/2020 | 1,292 | 690 | 3 | 34 | 0 | 44 | 0 | 0 | 0 |
| 12/1/2020 | 892 | 478 | 5 | 37 | 0 | 78 | 0 | 0 | 0 |
| 1/1/2021 | 1,112 | 595 | 7 | 39 | 0 | 80 | 0 | 0 | 0 |
| 2/1/2021 | 1,111 | 592 | 9 | 40 | 0 | 71 | 0 | 0 | 0 |
| 3/1/2021 | 1,111 | 589 | 11 | 42 | 0 | 66 | 0 | 0 | 0 |
| 4/1/2021 | 1,111 | 589 | 12 | 43 | 1 | 59 | 0 | 0 | 0 |
| 5/1/2021 | 1,111 | 587 | 70 | 43 | 1 | 146 | 0 | 0 | 0 |
| 6/1/2021 | 1,111 | 588 | 244 | 45 | 2 | 146 | 0 | 0 | 0 |
| 7/1/2021 | 1,104 | 585 | 329 | 46 | 2 | 114 | 0 | 0 | 0 |
| 8/1/2021 | 0 | 0 | 386 | 47 | 3 | 102 | 0 | 0 | 0 |
| 9/1/2021 | 0 | 0 | 428 | 48 | 3 | 90 | 0 | 0 | 0 |
| 10/1/2021 | 0 | 0 | 460 | 49 | 3 | 85 | 0 | 0 | 0 |
| 11/1/2021 | 0 | 0 | 488 | 50 | 4 | 84 | 0 | 0 | 0 |
| 12/1/2021 | 0 | 0 | 512 | 51 | 4 | 80 | 0 | 0 | 0 |
| 1/1/2022 | 0 | 0 | 531 | 52 | 5 | 77 | 0 | 0 | 0 |
| 2/1/2022 | 0 | 0 | 547 | 52 | 5 | 71 | 0 | 0 | 0 |
| 3/1/2022 | 0 | 0 | 559 | 53 | 5 | 70 | 0 | 0 | 0 |
| 4/1/2022 | 0 | 0 | 569 | 53 | 6 | 63 | 0 | 0 | 0 |
| 5/1/2022 | 0 | 0 | 576 | 54 | 6 | 59 | 0 | 0 | 0 |
| 6/1/2022 | 0 | 0 | 601 | 54 | 6 | 196 | 0 | 0 | 0 |
| 7/1/2022 | 0 | 0 | 701 | 54 | 7 | 163 | 0 | 0 | 0 |
| 8/1/2022 | 0 | 0 | 773 | 55 | 7 | 139 | 0 | 0 | 0 |
| 9/1/2022 | 0 | 0 | 826 | 55 | 7 | 129 | 0 | 0 | 0 |
| 10/1/2022 | 0 | 0 | 868 | 55 | 7 | 125 | 0 | 0 | 0 |
| 11/1/2022 | 0 | 0 | 905 | 55 | 7 | 118 | 0 | 0 | 0 |
| 12/1/2022 | 0 | 0 | 935 | 55 | 8 | 109 | 0 | 0 | 0 |
| 1/1/2023 | 0 | 0 | 959 | 55 | 8 | 104 | 0 | 0 | 0 |
| 2/1/2023 | 0 | 0 | 977 | 56 | 8 | 97 | 0 | 0 | 0 |
| 3/1/2023 | 0 | 0 | 990 | 56 | 8 | 92 | 0 | 0 | 0 |
| 4/1/2023 | 0 | 0 | 1,001 | 56 | 8 | 91 | 0 | 0 | 0 |
| 5/1/2023 | 0 | 0 | 1,010 | 56 | 9 | 87 | 0 | 0 | 0 |
| 6/1/2023 | 0 | 0 | 1,017 | 56 | 9 | 84 | 0 | 0 | 0 |
| 7/1/2023 | 0 | 0 | 1,023 | 56 | 9 | 80 | 0 | 0 | 0 |
| 8/1/2023 | 0 | 0 | 1,028 | 56 | 9 | 80 | 0 | 0 | 0 |
| 9/1/2023 | 0 | 0 | 1,032 | 56 | 9 | 77 | 0 | 0 | 0 |
| 10/1/2023 | 0 | 0 | 1,035 | 56 | 9 | 76 | 0 | 0 | 0 |
| 11/1/2023 | 0 | 0 | 1,038 | 56 | 9 | 74 | 0 | 0 | 0 |
| 12/1/2023 | 0 | 0 | 1,041 | 56 | 9 | 73 | 0 | 0 | 0 |
| 1/1/2024 | 0 | 0 | 1,042 | 56 | 10 | 69 | 0 | 0 | 0 |
| 2/1/2024 | 0 | 0 | 1,044 | 56 | 10 | 69 | 0 | 0 | 0 |
| 3/1/2024 | 0 | 0 | 1,045 | 56 | 10 | 67 | 0 | 0 | 0 |
| 4/1/2024 | 0 | 0 | 1,046 | 56 | 10 | 66 | 0 | 0 | 0 |
| 5/1/2024 | 0 | 0 | 1,047 | 56 | 10 | 65 | 0 | 0 | 0 |

**Project:** **Hope Bay**
**Number:** **1CT022.066**
**Task:** **Summary of the FEIS Model Inputs**
*Source:* *HopeBay_FEISWLBalance_TypeA_Rev31_AJB_NF.gsm*

***Table A1.2: Mine Water Flows By Source***

| Model Date | Mine Water Flows ($m^3$/day) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Doris Mine | | Madrid North Mine | | | | Madrid South Mine | | |
| | Flows from Bedrock | Flows from Doris Lake | Flows from Patch Lake | Flows from Imniagut Lake | Flows from Windy Lake | Flows from Bedrock | Flows from Wolverine Lake | Flows from Patch Lake | Flows from Bedrock |
| 6/1/2024 | 0 | 0 | 1,048 | 56 | 10 | 64 | 0 | 0 | 0 |
| 7/1/2024 | 0 | 0 | 1,049 | 56 | 10 | 63 | 0 | 0 | 0 |
| 8/1/2024 | 0 | 0 | 1,049 | 57 | 10 | 63 | 0 | 0 | 0 |
| 9/1/2024 | 0 | 0 | 1,050 | 57 | 10 | 62 | 0 | 0 | 0 |
| 10/1/2024 | 0 | 0 | 1,051 | 57 | 10 | 60 | 0 | 0 | 0 |
| 11/1/2024 | 0 | 0 | 1,051 | 57 | 10 | 59 | 0 | 0 | 0 |
| 12/1/2024 | 0 | 0 | 1,051 | 57 | 11 | 56 | 0 | 0 | 0 |
| 1/1/2025 | 0 | 0 | 1,052 | 57 | 11 | 55 | 0 | 0 | 0 |
| 2/1/2025 | 0 | 0 | 1,052 | 57 | 11 | 54 | 0 | 0 | 0 |
| 3/1/2025 | 0 | 0 | 1,052 | 57 | 11 | 53 | 0 | 0 | 0 |
| 4/1/2025 | 0 | 0 | 1,053 | 57 | 11 | 52 | 0 | 0 | 0 |
| 5/1/2025 | 0 | 0 | 1,053 | 57 | 11 | 51 | 0 | 0 | 0 |
| 6/1/2025 | 0 | 0 | 1,053 | 57 | 11 | 51 | 0 | 0 | 0 |
| 7/1/2025 | 0 | 0 | 1,053 | 57 | 11 | 51 | 0 | 0 | 0 |
| 8/1/2025 | 0 | 0 | 1,053 | 57 | 11 | 51 | 0 | 0 | 0 |
| 9/1/2025 | 0 | 0 | 1,053 | 57 | 11 | 48 | 0 | 0 | 0 |
| 10/1/2025 | 0 | 0 | 1,054 | 57 | 11 | 49 | 0 | 0 | 0 |
| 11/1/2025 | 0 | 0 | 1,054 | 57 | 11 | 49 | 0 | 0 | 0 |
| 12/1/2025 | 0 | 0 | 1,054 | 57 | 11 | 49 | 0 | 0 | 0 |
| 1/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 2/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 3/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 4/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 5/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 6/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 7/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 8/1/2026 | 0 | 0 | 1,054 | 57 | 11 | 48 | 0 | 0 | 0 |
| 9/1/2026 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 10/1/2026 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 11/1/2026 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 12/1/2026 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 1/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 2/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 3/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 4/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 5/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 6/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 7/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 8/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 9/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 10/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 11/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 12/1/2027 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 1/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 2/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 3/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 4/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 5/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 6/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 7/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 8/1/2028 | 0 | 0 | 1,055 | 57 | 12 | 45 | 0 | 0 | 0 |
| 9/1/2028 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 0 | 0 |
| 10/1/2028 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 0 | 0 |
| 11/1/2028 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 0 | 0 |
| 12/1/2028 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 0 | 0 |
| 1/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 2 | 2 |
| 2/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 2 | 2 |
| 3/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 2 | 2 |
| 4/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 2 | 2 |
| 5/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 2 | 2 |
| 6/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 0 | 2 | 31 |
| 7/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 18 | 111 | 151 |
| 8/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 35 | 166 | 115 |
| 9/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 49 | 198 | 97 |
| 10/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 62 | 219 | 90 |
| 11/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 72 | 234 | 86 |
| 12/1/2029 | 0 | 0 | 1,056 | 57 | 12 | 41 | 82 | 246 | 85 |
| 1/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 91 | 257 | 85 |
| 2/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 99 | 265 | 90 |
| 3/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 109 | 272 | 106 |
| 4/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 122 | 277 | 109 |
| 5/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 135 | 283 | 105 |
| 6/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 146 | 287 | 98 |
| 7/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 153 | 291 | 93 |
| 8/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 160 | 294 | 87 |
| 9/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 164 | 297 | 84 |
| 10/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 168 | 299 | 78 |
| 11/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 171 | 300 | 75 |
| 12/1/2030 | 0 | 0 | 1,056 | 57 | 12 | 41 | 173 | 302 | 73 |
| 1/1/2031 | 0 | 0 | 1,056 | 57 | 12 | 41 | 175 | 303 | 70 |
| 2/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 177 | 304 | 69 |

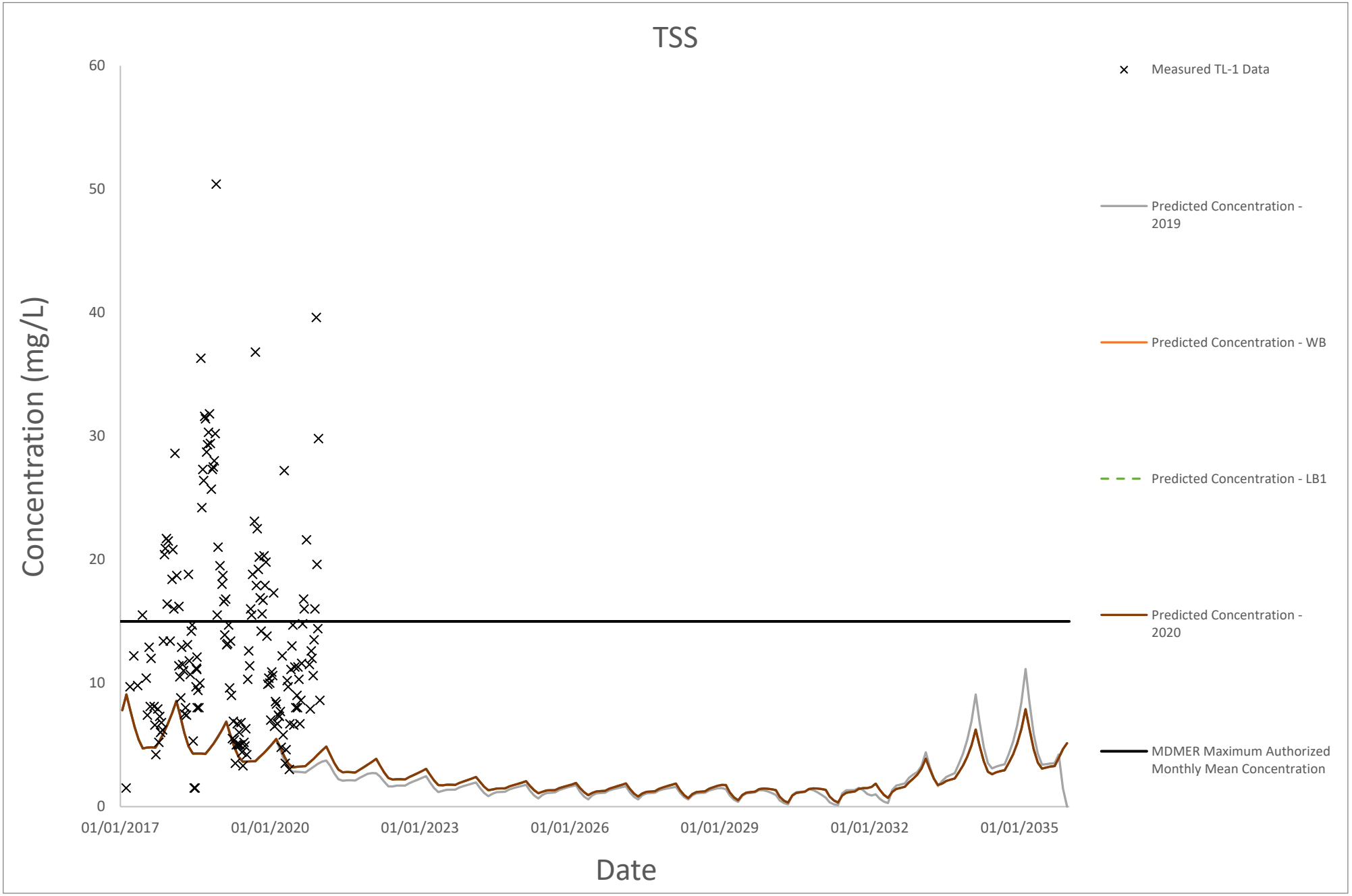
**Project:** **Hope Bay**
**Number:** **1CT022.066**
**Task:** **Summary of the FEIS Model Inputs**
*Source:* *HopeBay_FEISWLBalance_TypeA_Rev31_AJB_NF.gsm*

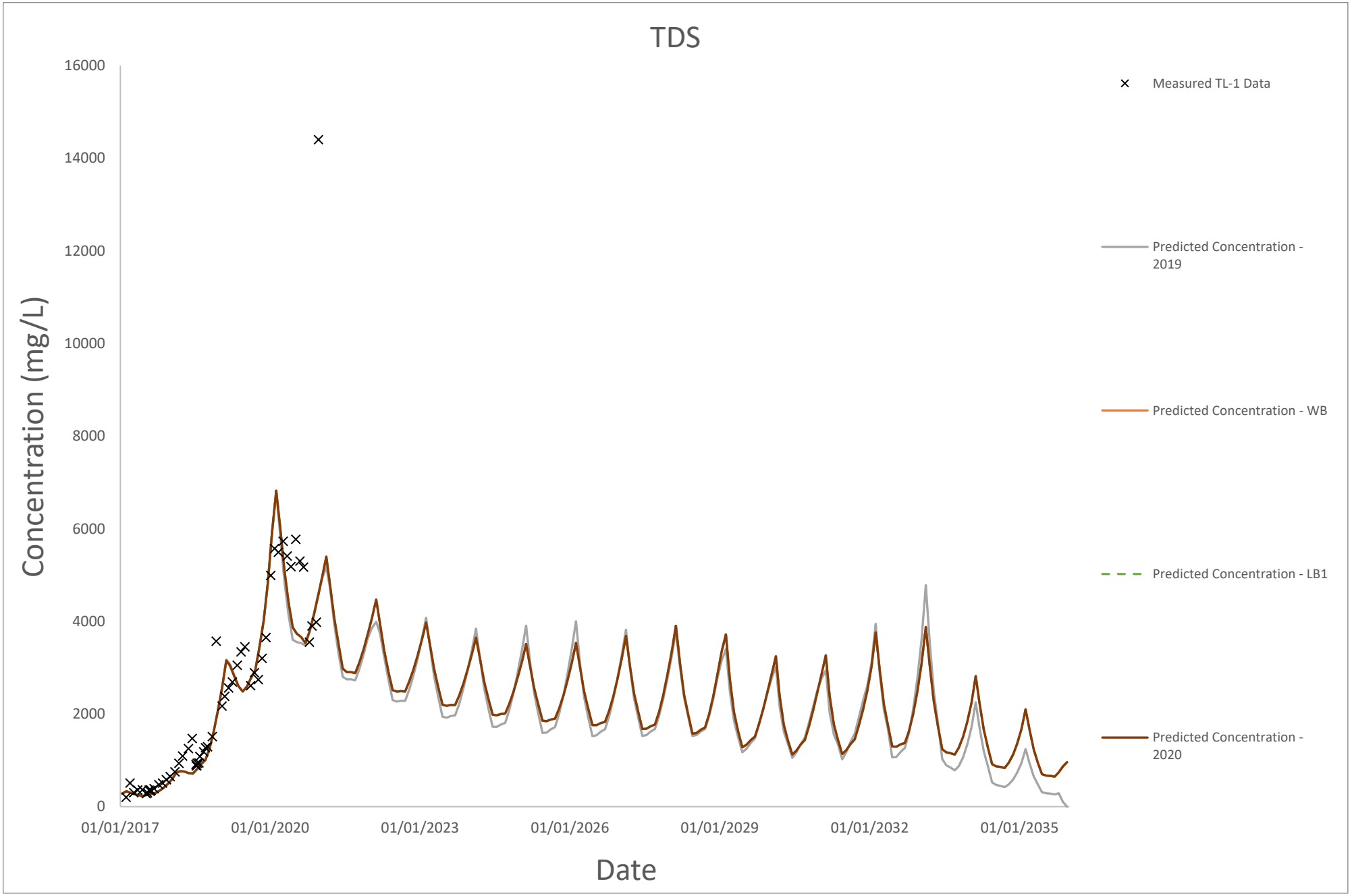
***Table A1.2: Mine Water Flows By Source***

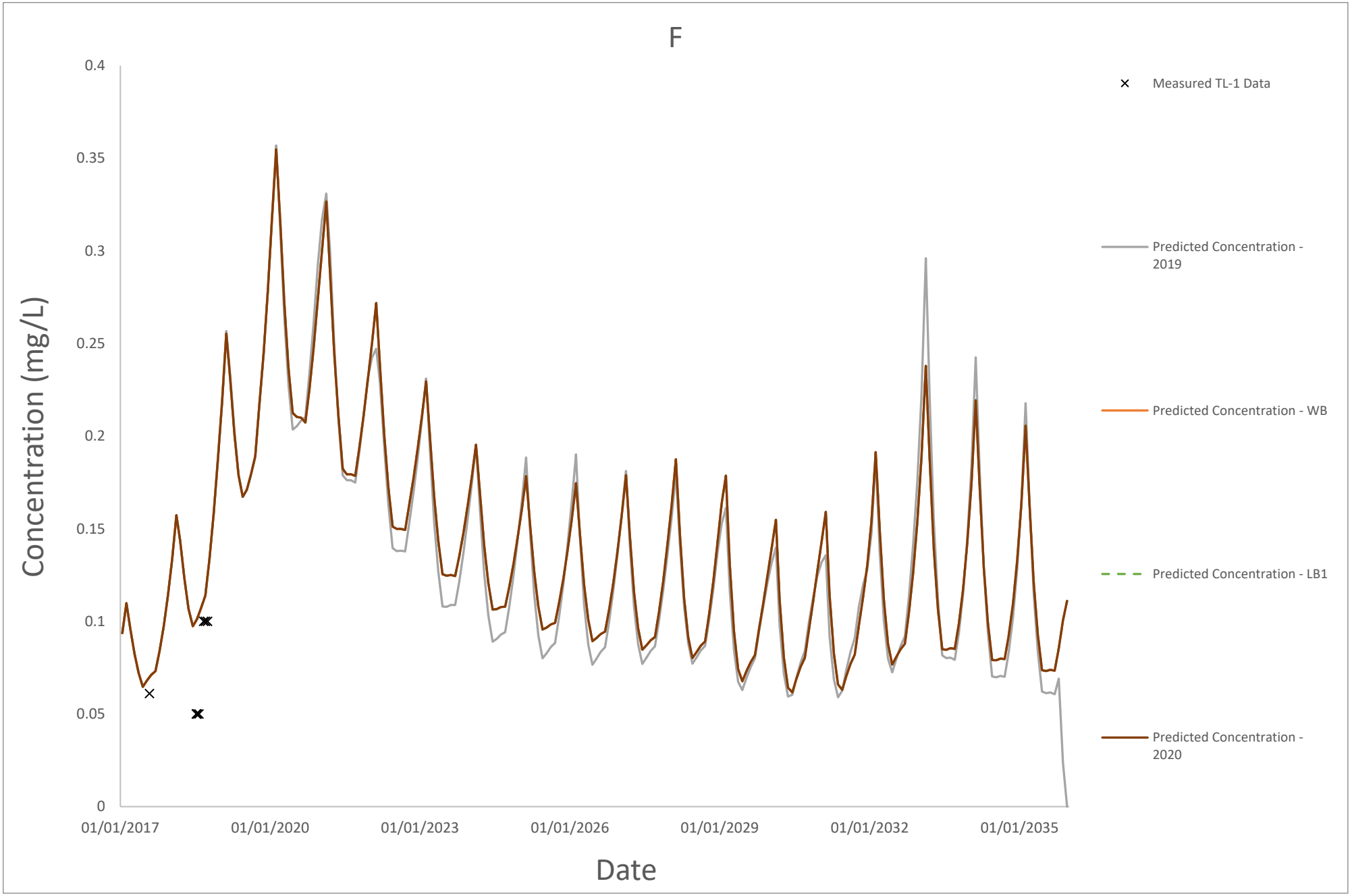
| Model Date | Mine Water Flows ($m^3$/day) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Doris Mine | | Madrid North Mine | | | | Madrid South Mine | | |
| | Flows from Bedrock | Flows from Doris Lake | Flows from Patch Lake | Flows from Imniagut Lake | Flows from Windy Lake | Flows from Bedrock | Flows from Wolverine Lake | Flows from Patch Lake | Flows from Bedrock |
| 3/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 178 | 305 | 65 |
| 4/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 179 | 305 | 64 |
| 5/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 179 | 306 | 60 |
| 6/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 180 | 306 | 59 |
| 7/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 180 | 307 | 58 |
| 8/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 181 | 307 | 58 |
| 9/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 181 | 308 | 57 |
| 10/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 181 | 308 | 55 |
| 11/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 182 | 308 | 55 |
| 12/1/2031 | 0 | 0 | 1,056 | 57 | 13 | 38 | 182 | 308 | 53 |
| 1/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 182 | 308 | 53 |
| 2/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 182 | 309 | 54 |
| 3/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 182 | 309 | 52 |
| 4/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 182 | 309 | 51 |
| 5/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 182 | 309 | 50 |
| 6/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 309 | 49 |
| 7/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 309 | 48 |
| 8/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 309 | 47 |
| 9/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 309 | 47 |
| 10/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 309 | 47 |
| 11/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 309 | 47 |
| 12/1/2032 | 0 | 0 | 0 | 0 | 0 | 0 | 183 | 310 | 46 |
| 1/1/2033 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/1/2100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

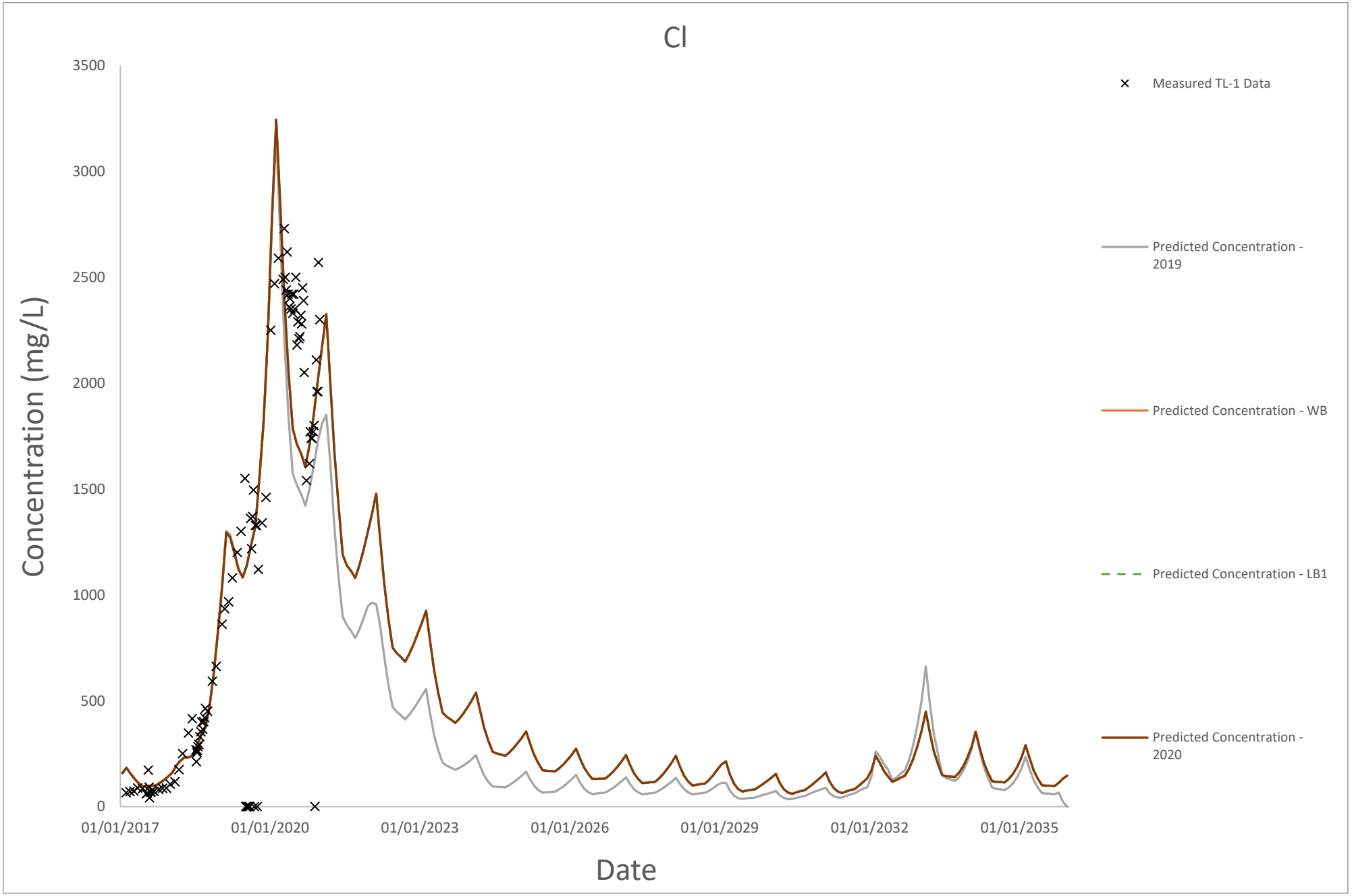
Note; Model interprets the values as constant over the next time period

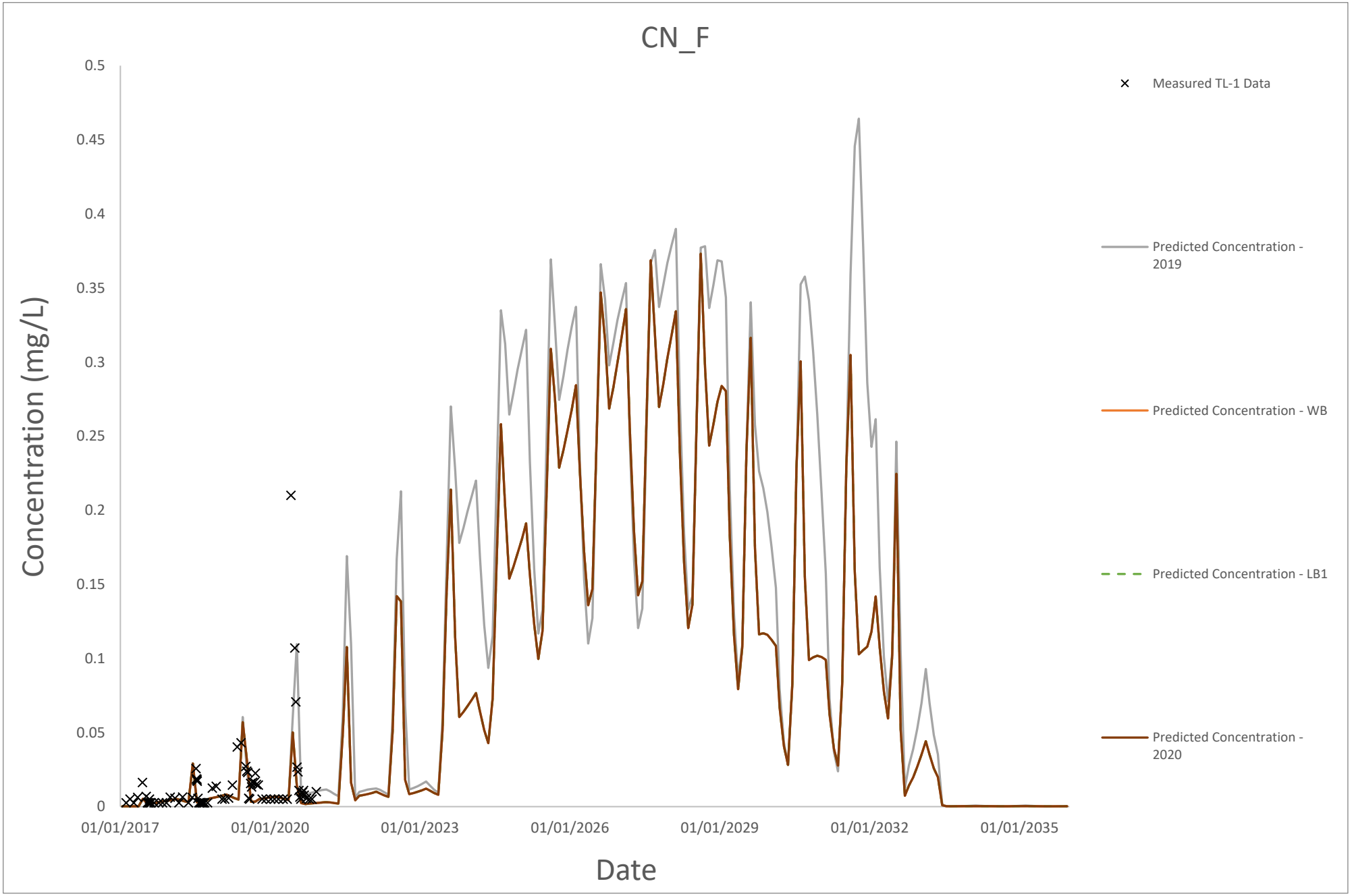
# Attachment 2 Annual WLB Assessment – 2020 – PLOTS

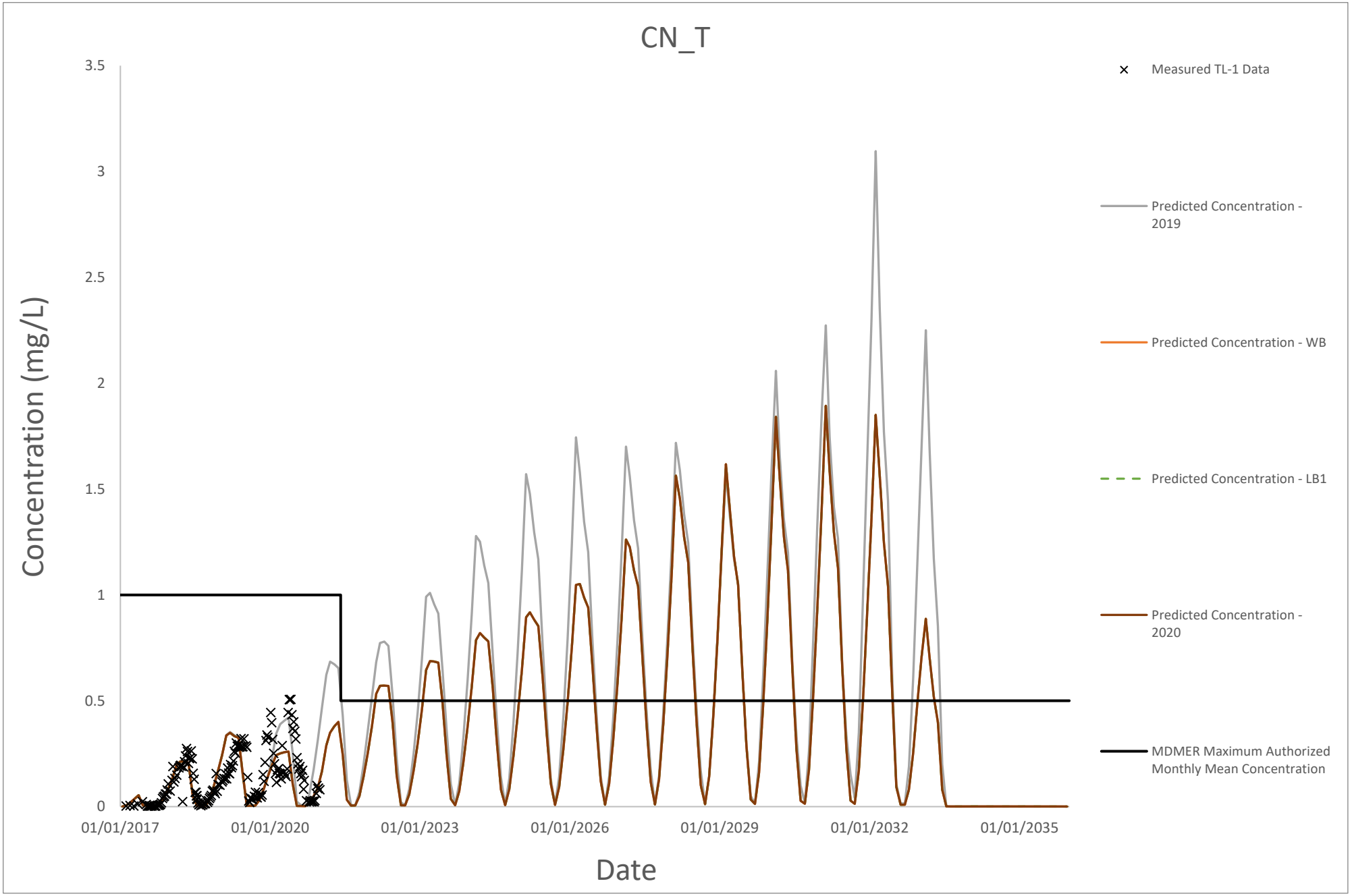

TSS
Concentration (mg/L)
60
50
40
30
20
10
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020
MDMER Maximum Authorized Monthly Mean Concentration

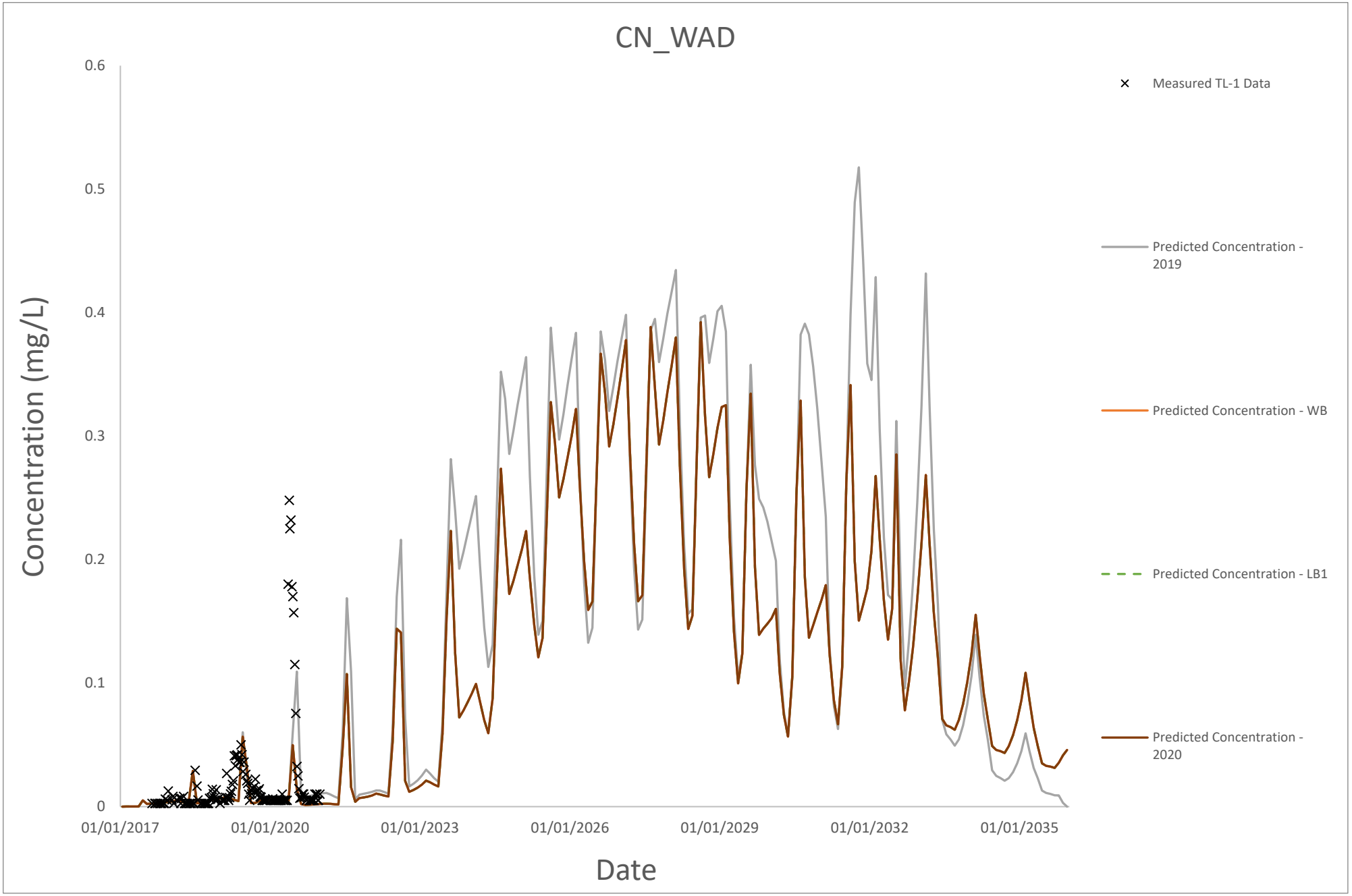

TDS
Concentration (mg/L)
16000
14000
12000
10000
8000
6000
4000
2000
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

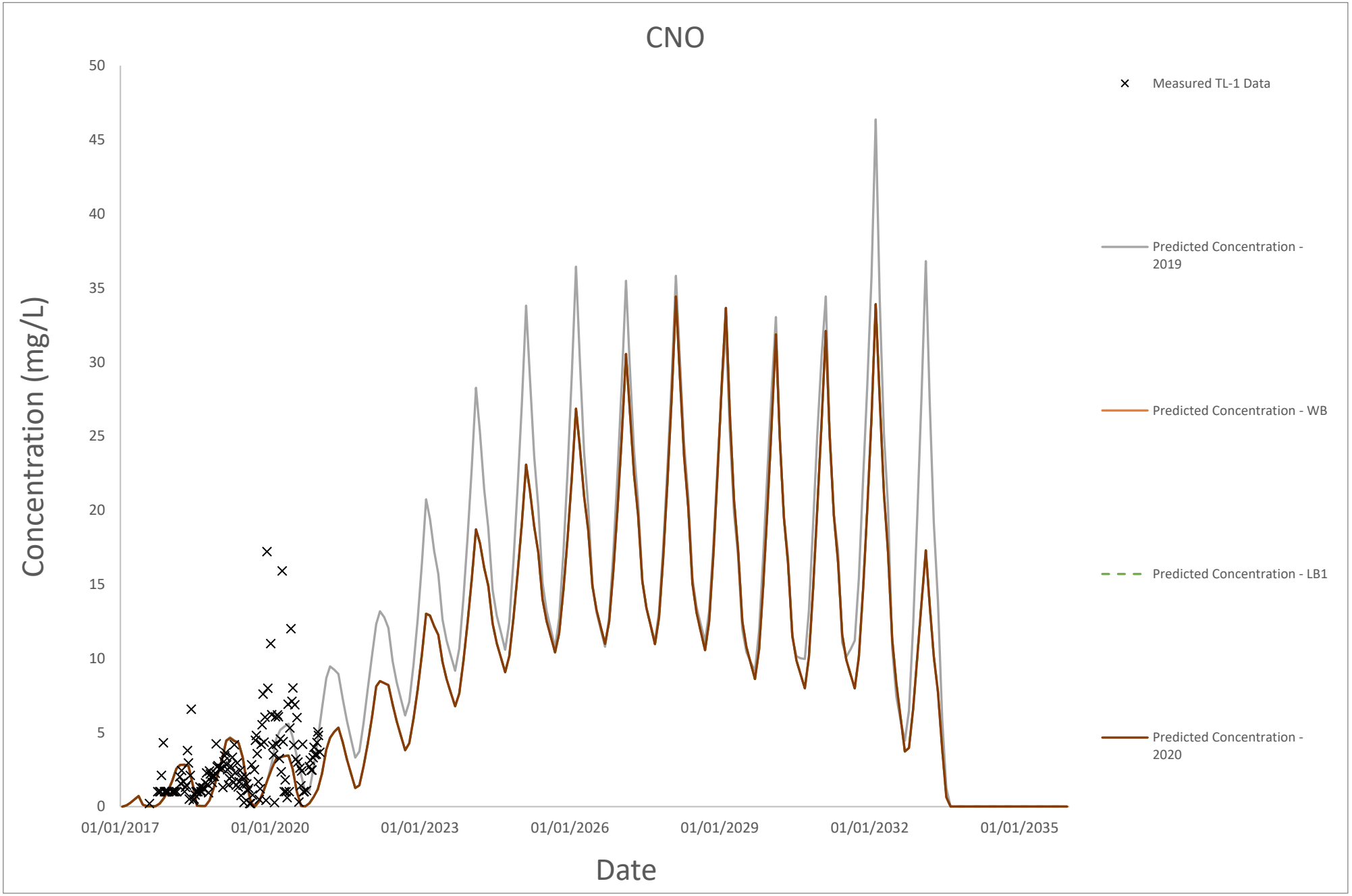

F
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

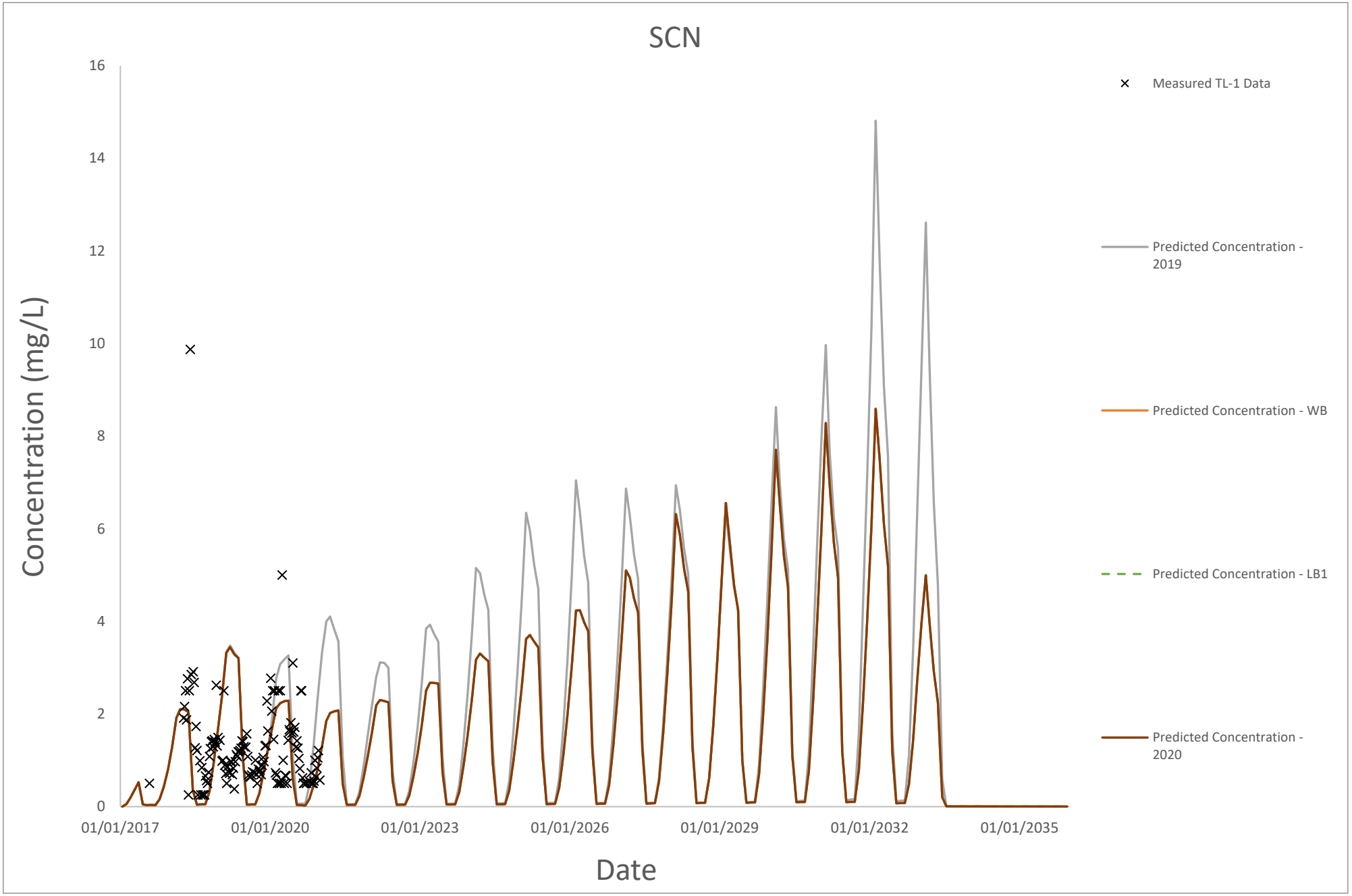

Cl
Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

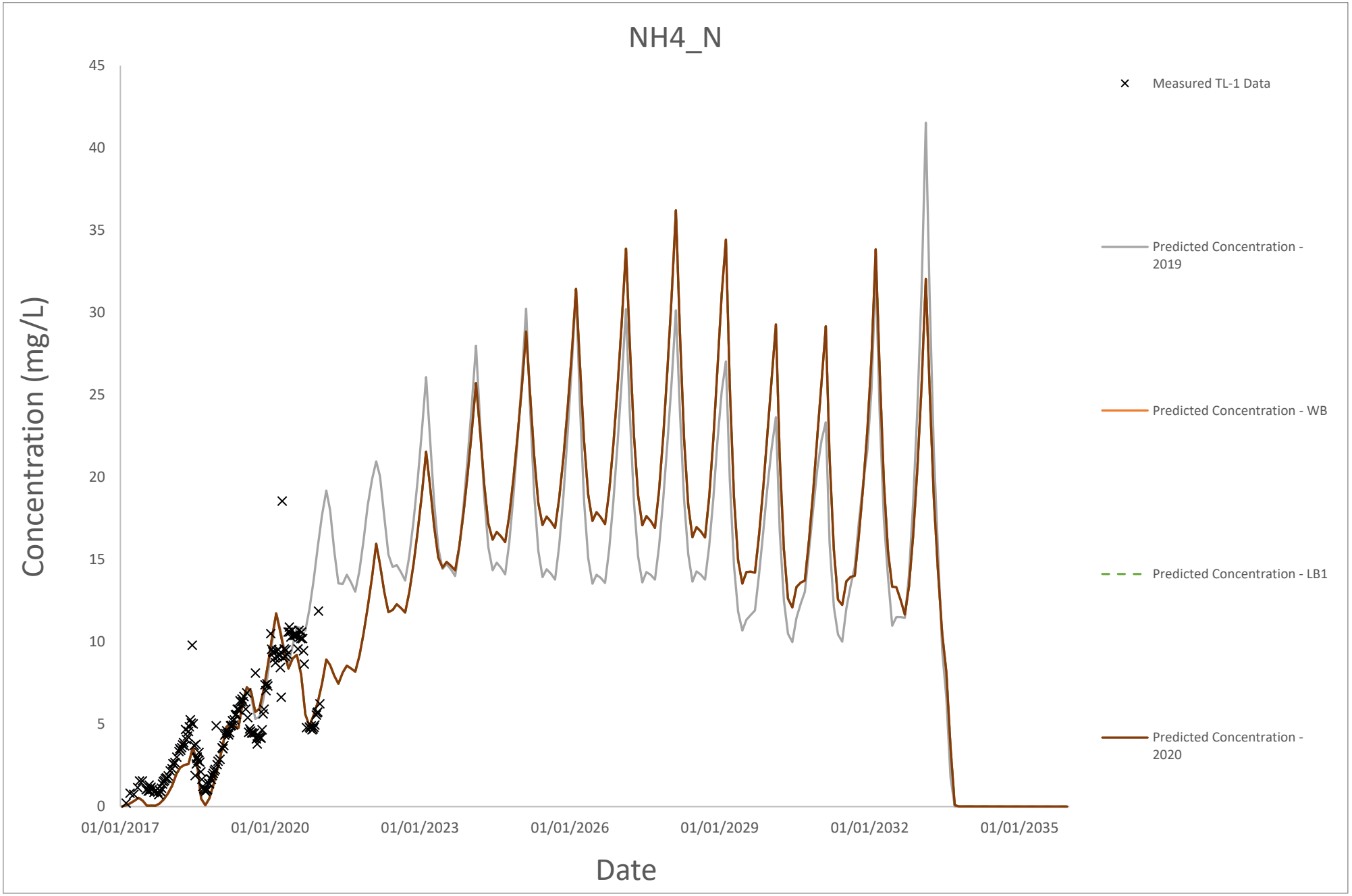

CN_F
Concentration (mg/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

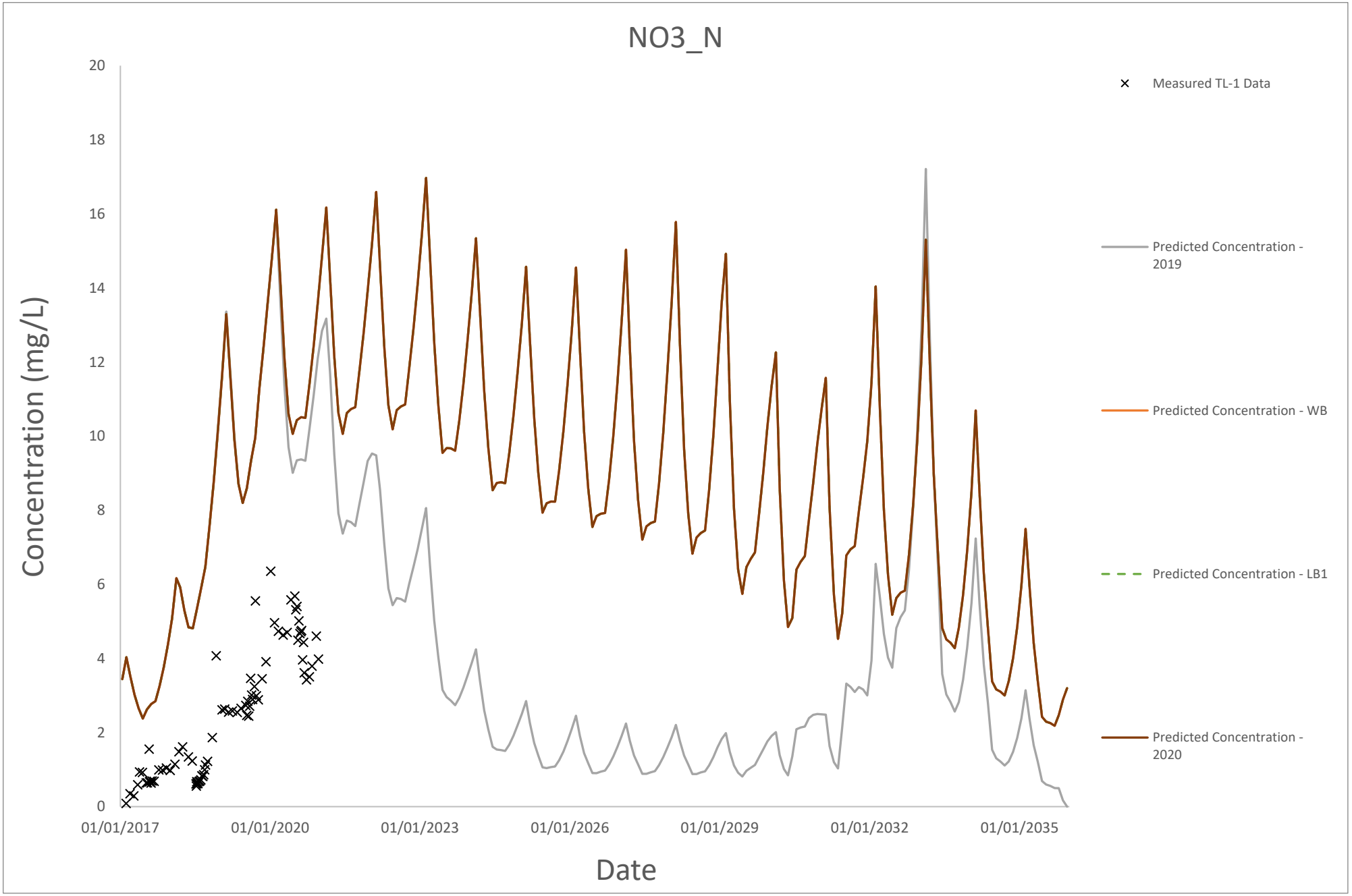

CN_T
Concentration (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020
MDMER Maximum Authorized Monthly Mean Concentration

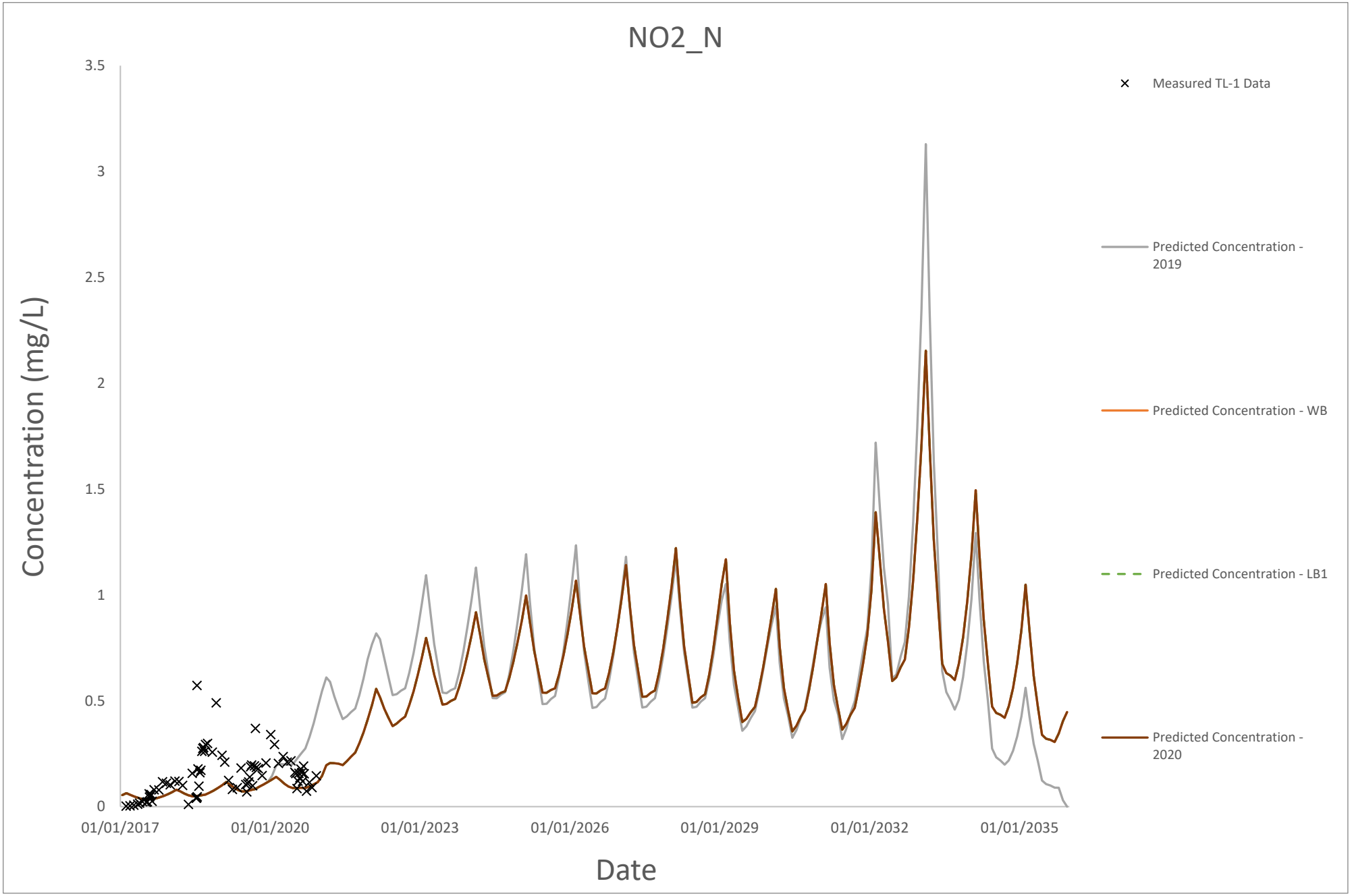

CN_WAD
Concentration (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

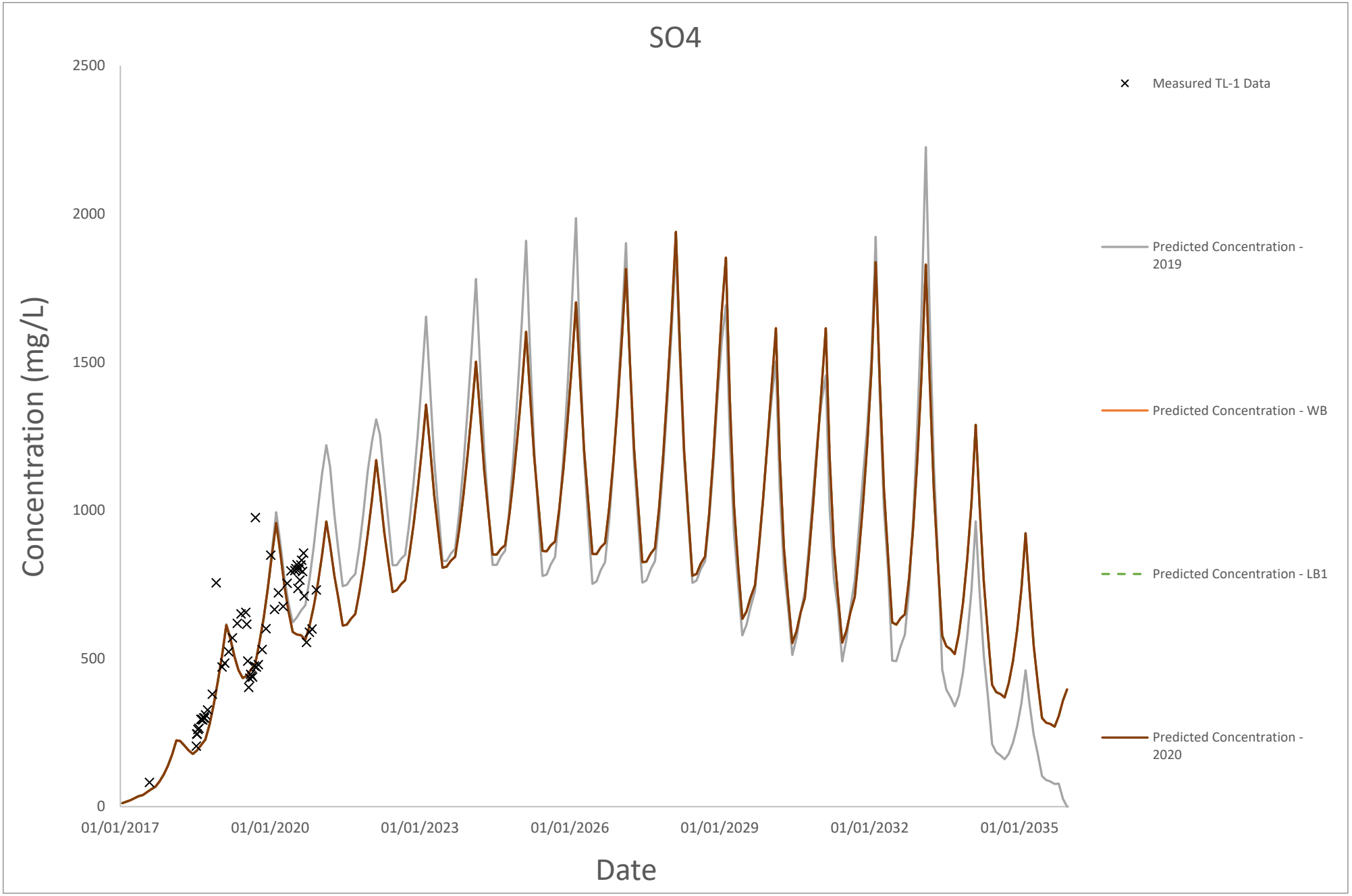

CNO
Concentration (mg/L)
50
45
40
35
30
25
20
15
10
5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

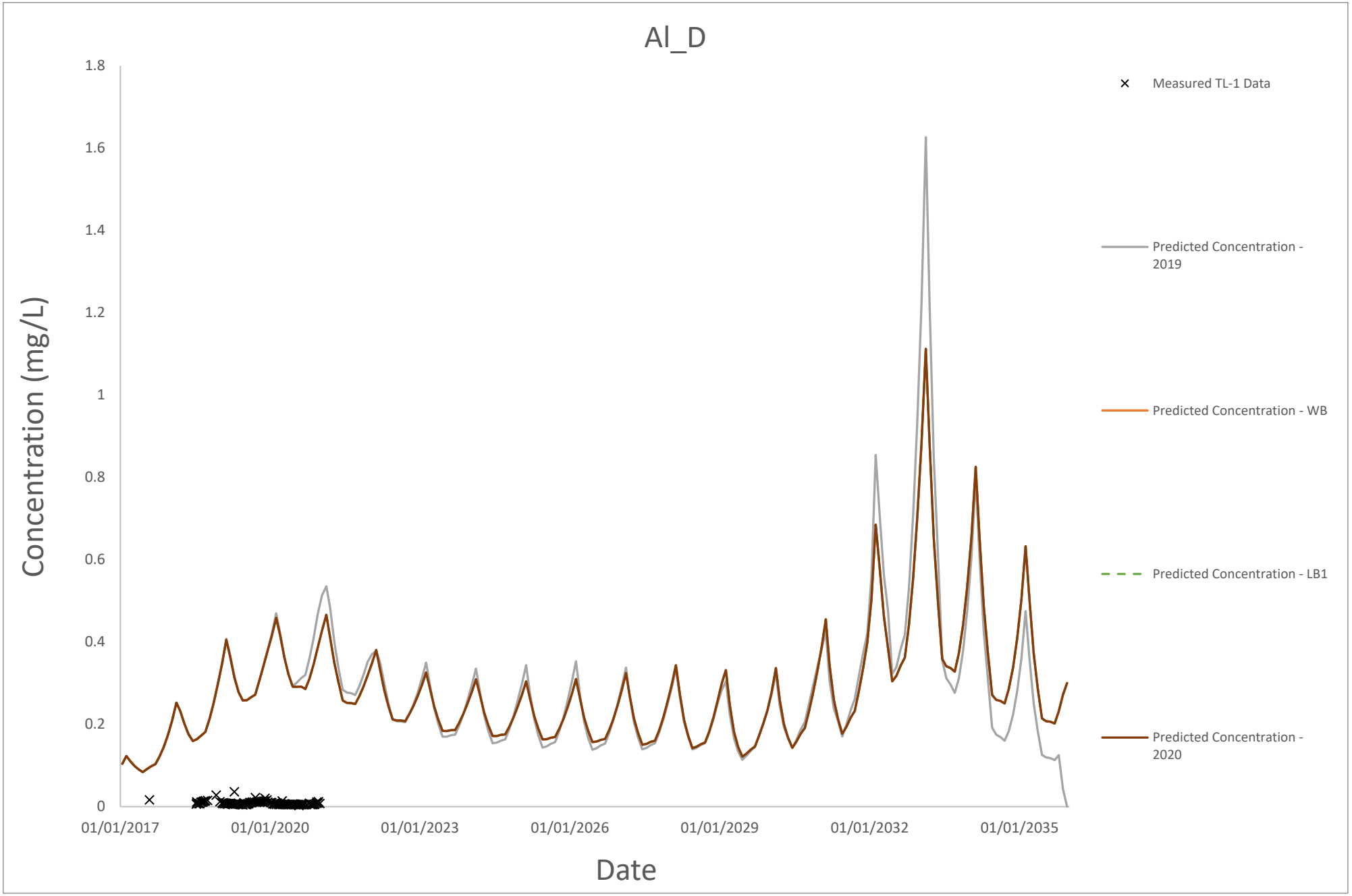

SCN
Concentration (mg/L)
16
14
12
10
8
6
4
2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

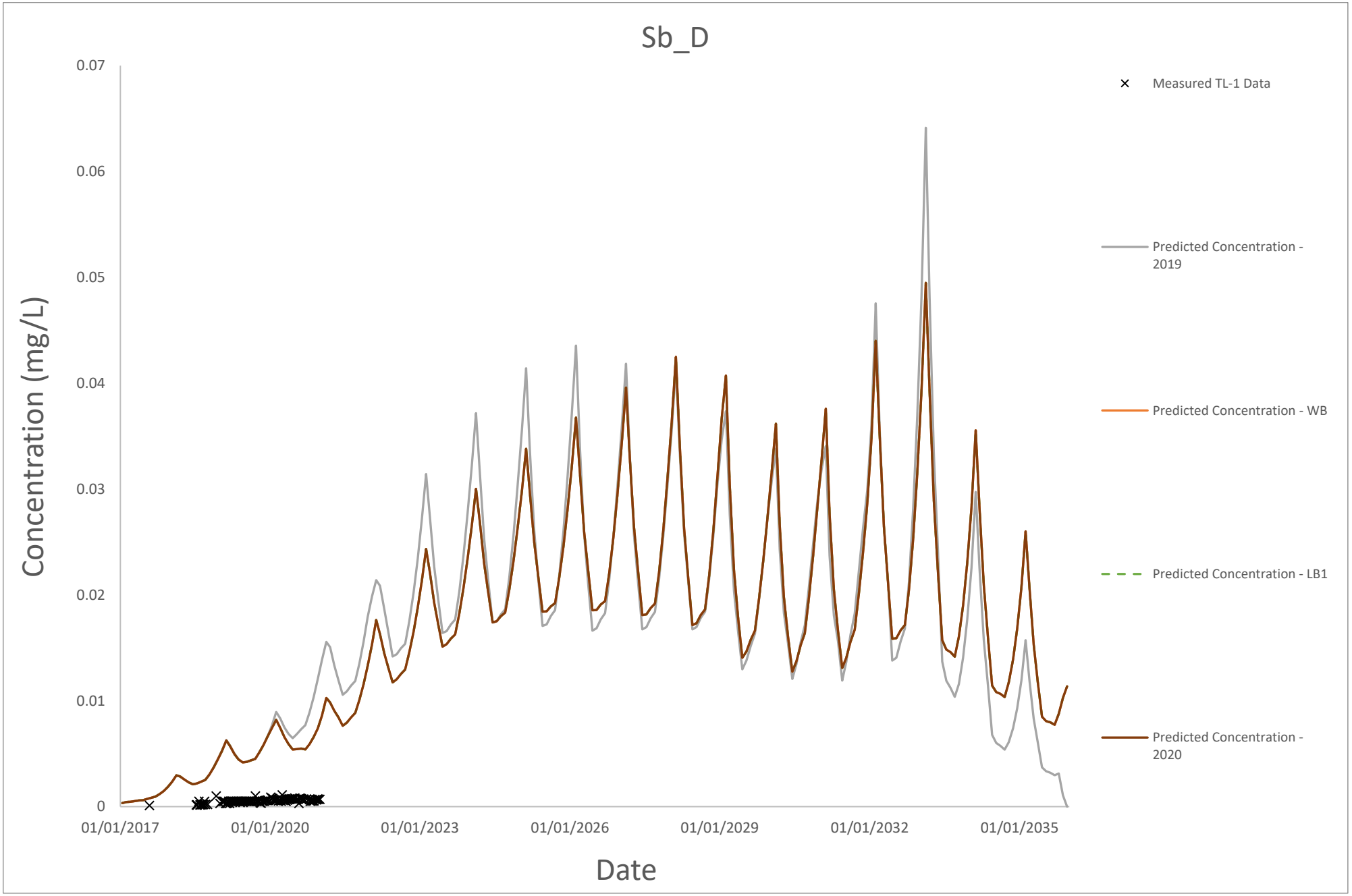

NH4_N
Concentration (mg/L)
45
40
35
30
25
20
15
10
5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

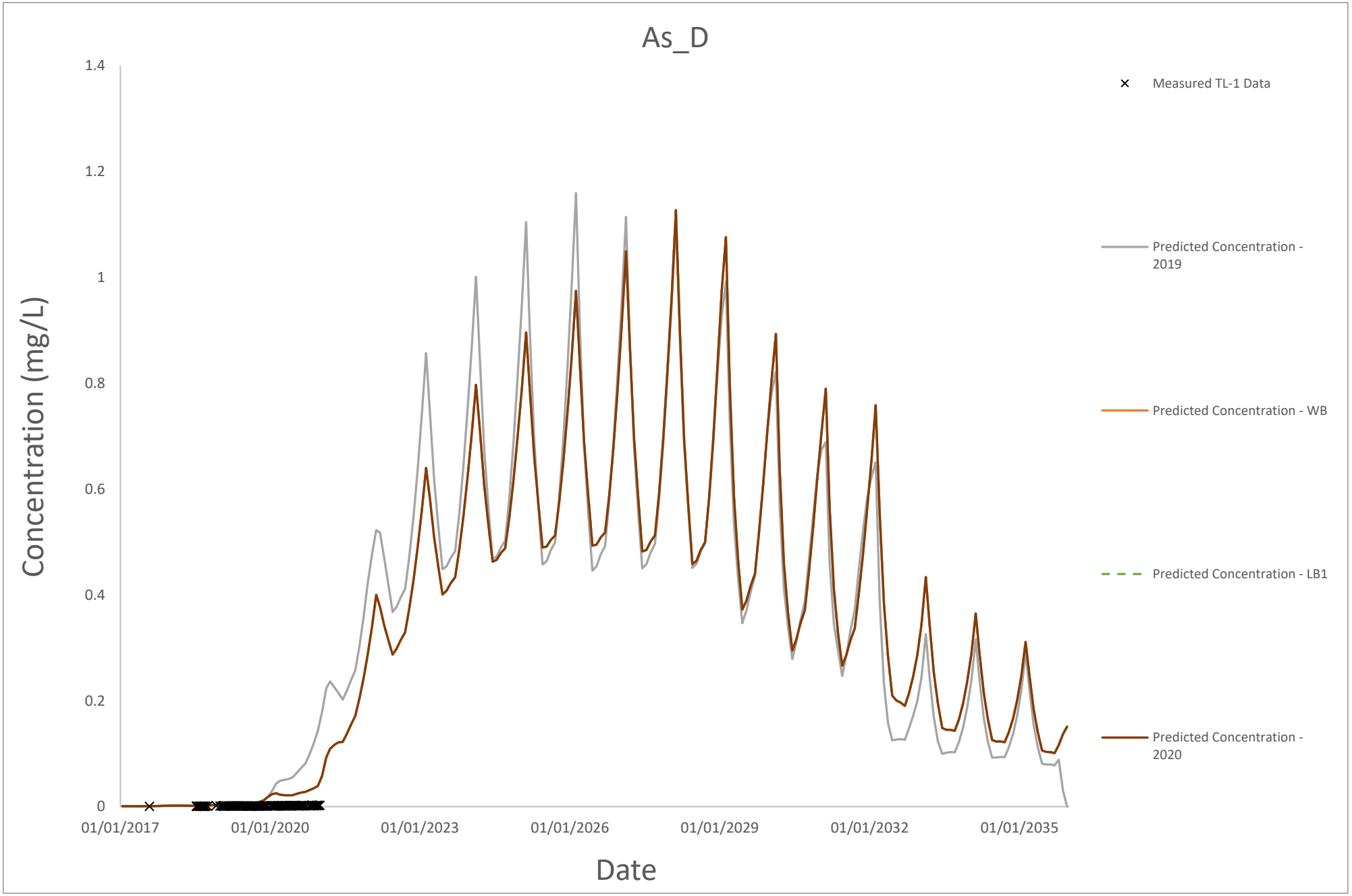

NO3_N
Concentration (mg/L)
20
18
16
14
12
10
8
6
4
2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

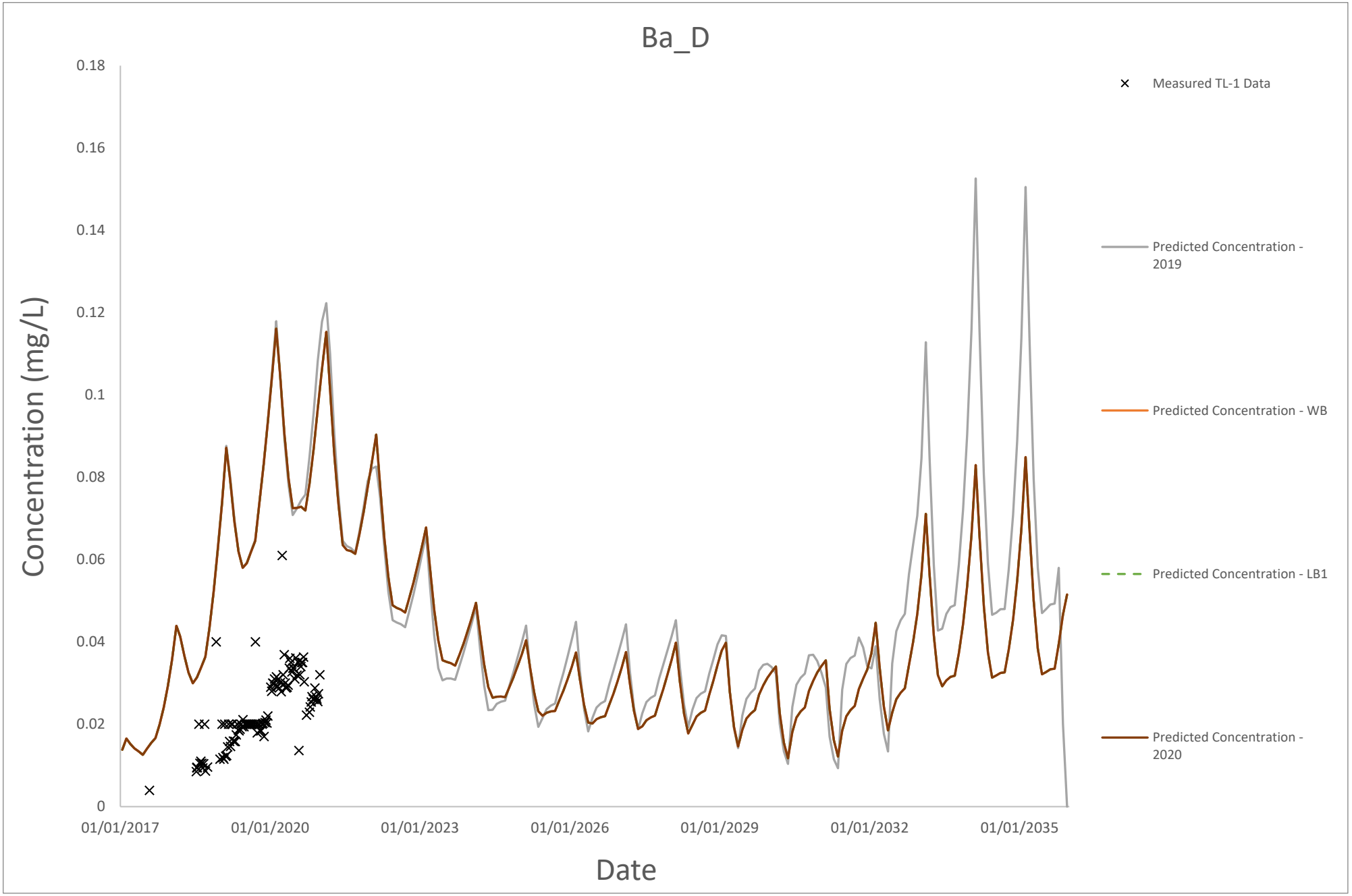

NO2_N
Concentration (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

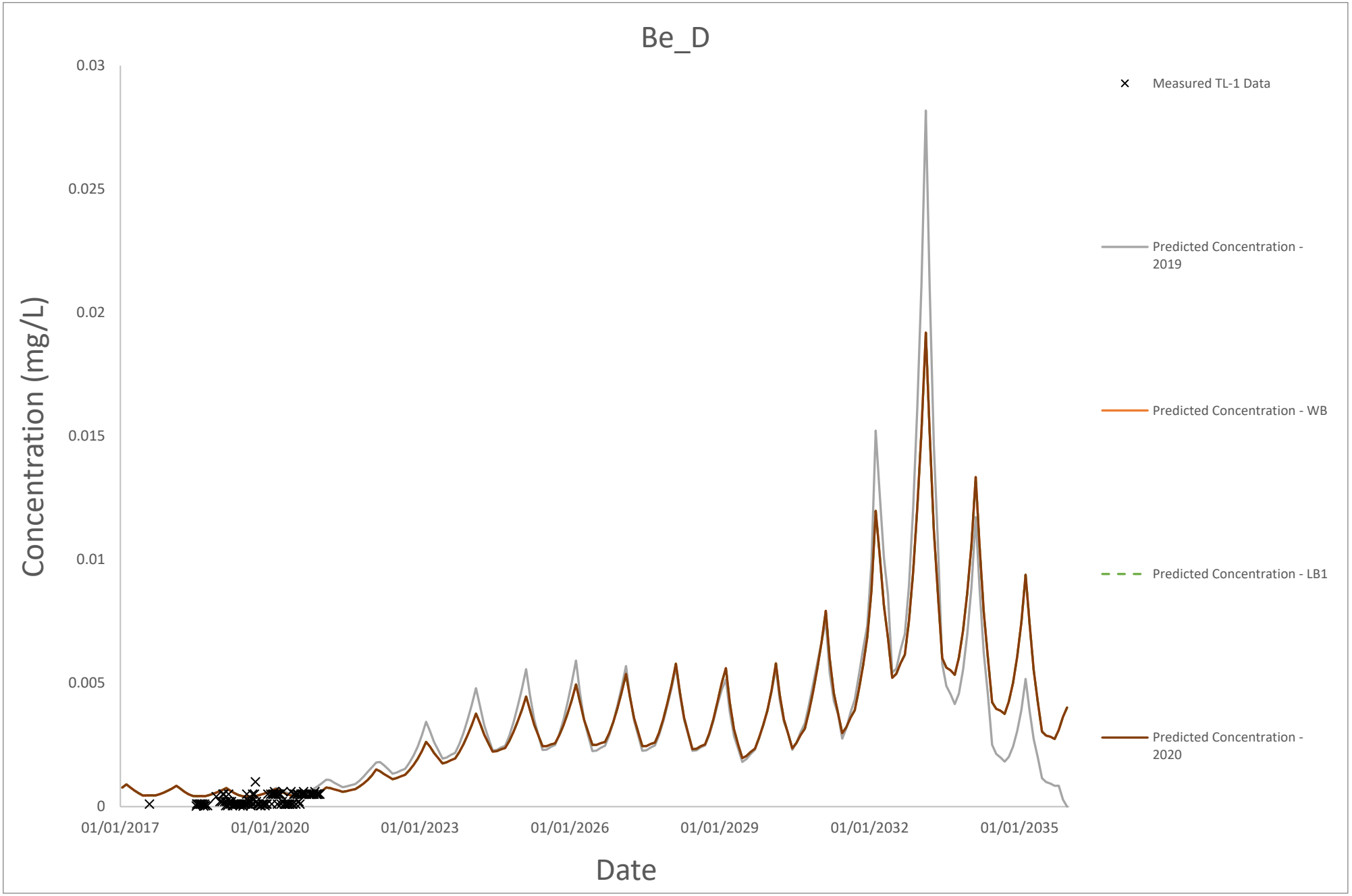

SO4
Concentration (mg/L)
2500
2000
1500
1000
500
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

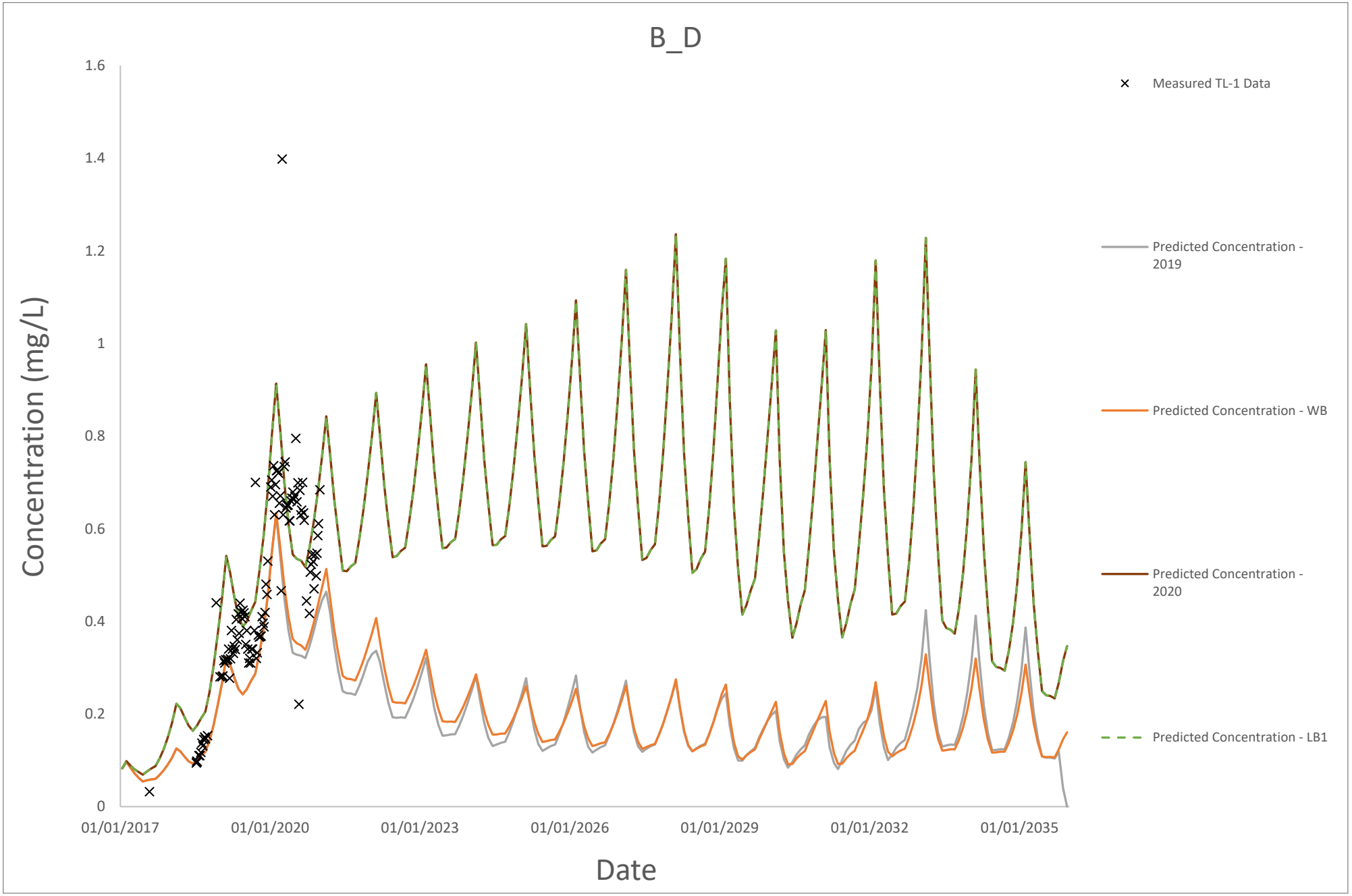

Al_D
Concentration (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

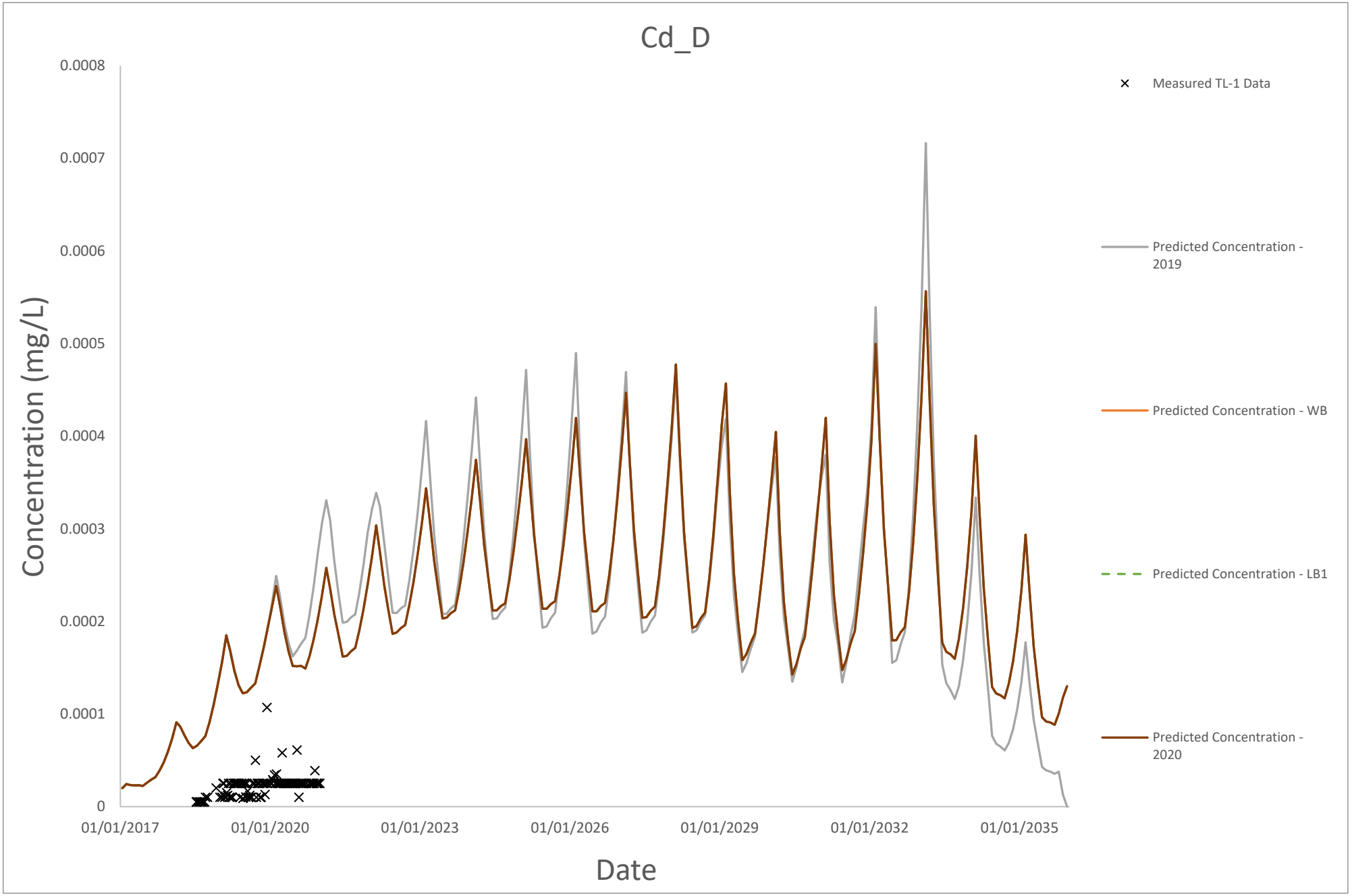

Sb_D
Concentration (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

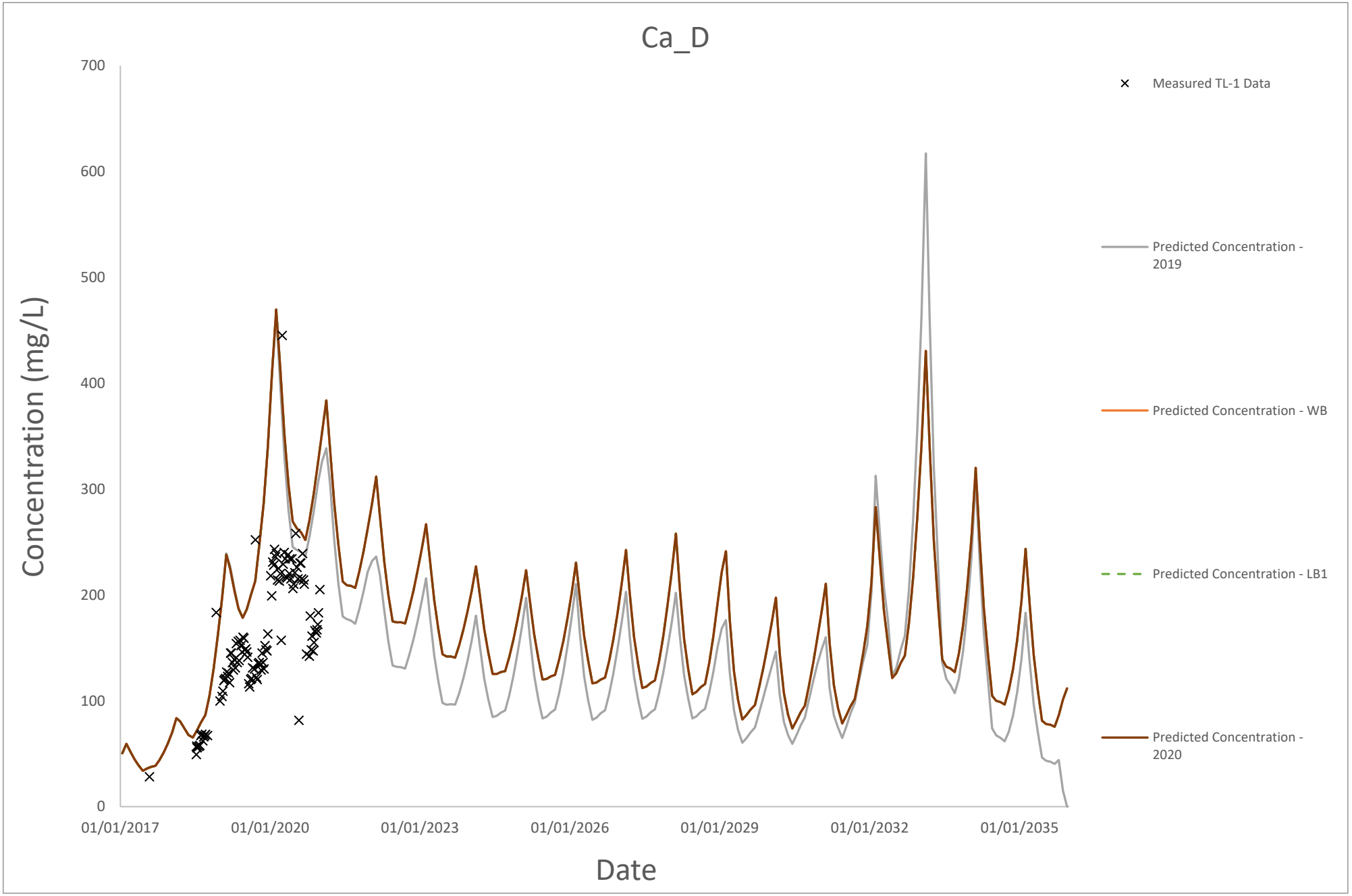

As_D
Concentration (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

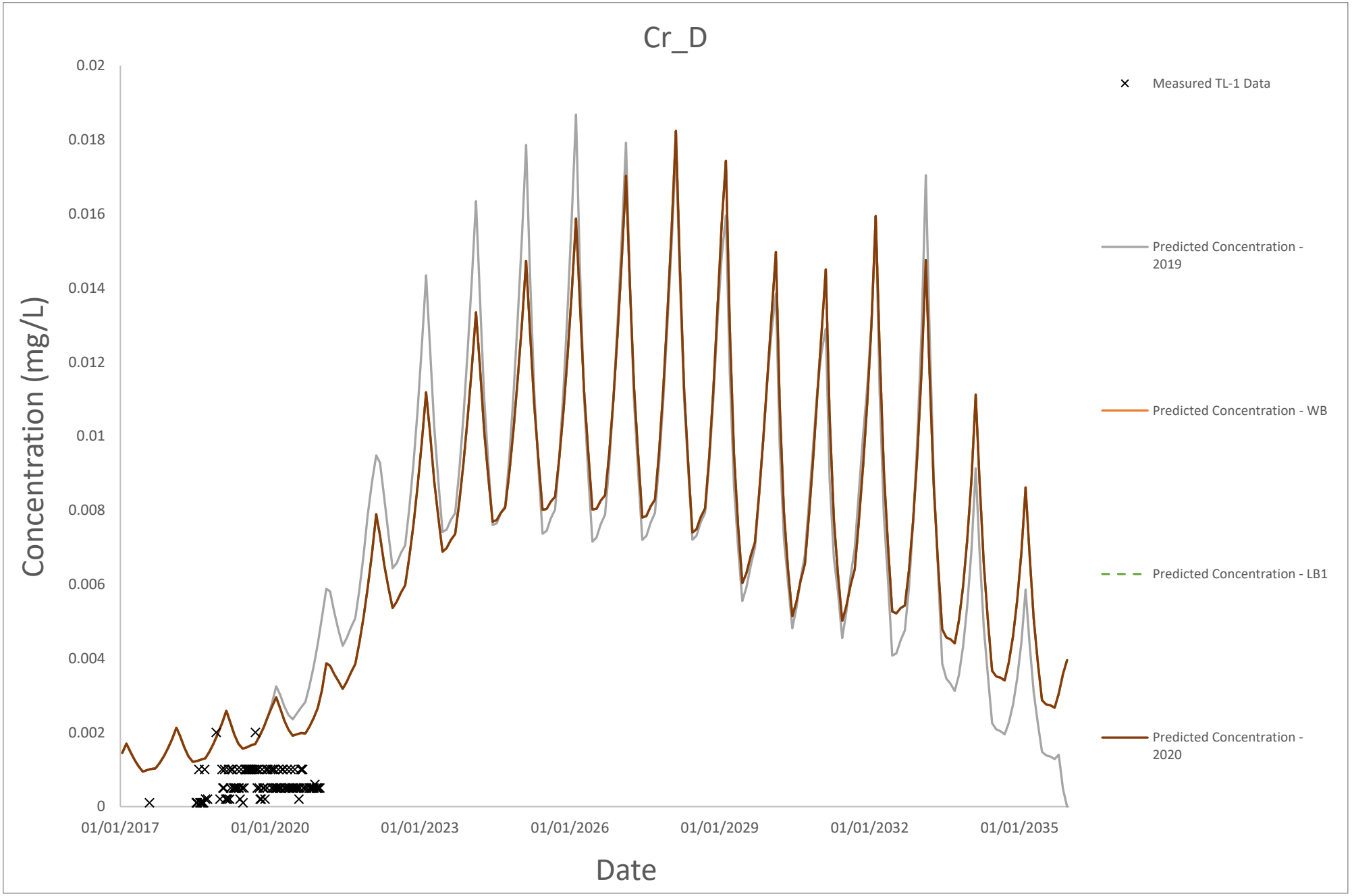

Ba_D
Concentration (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

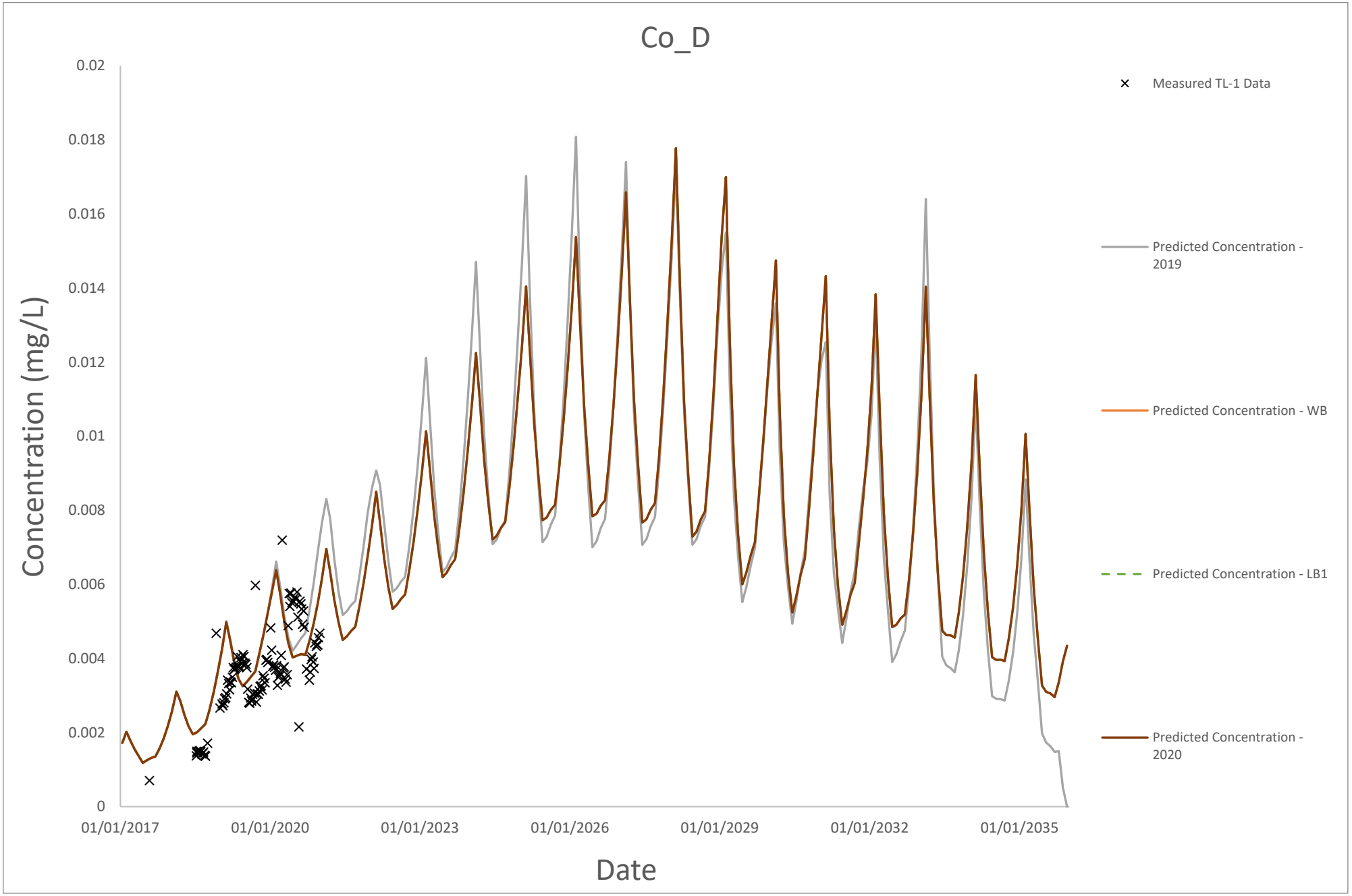

Be_D
Concentration (mg/L)
0.03
0.025
0.02
0.015
0.01
0.005
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

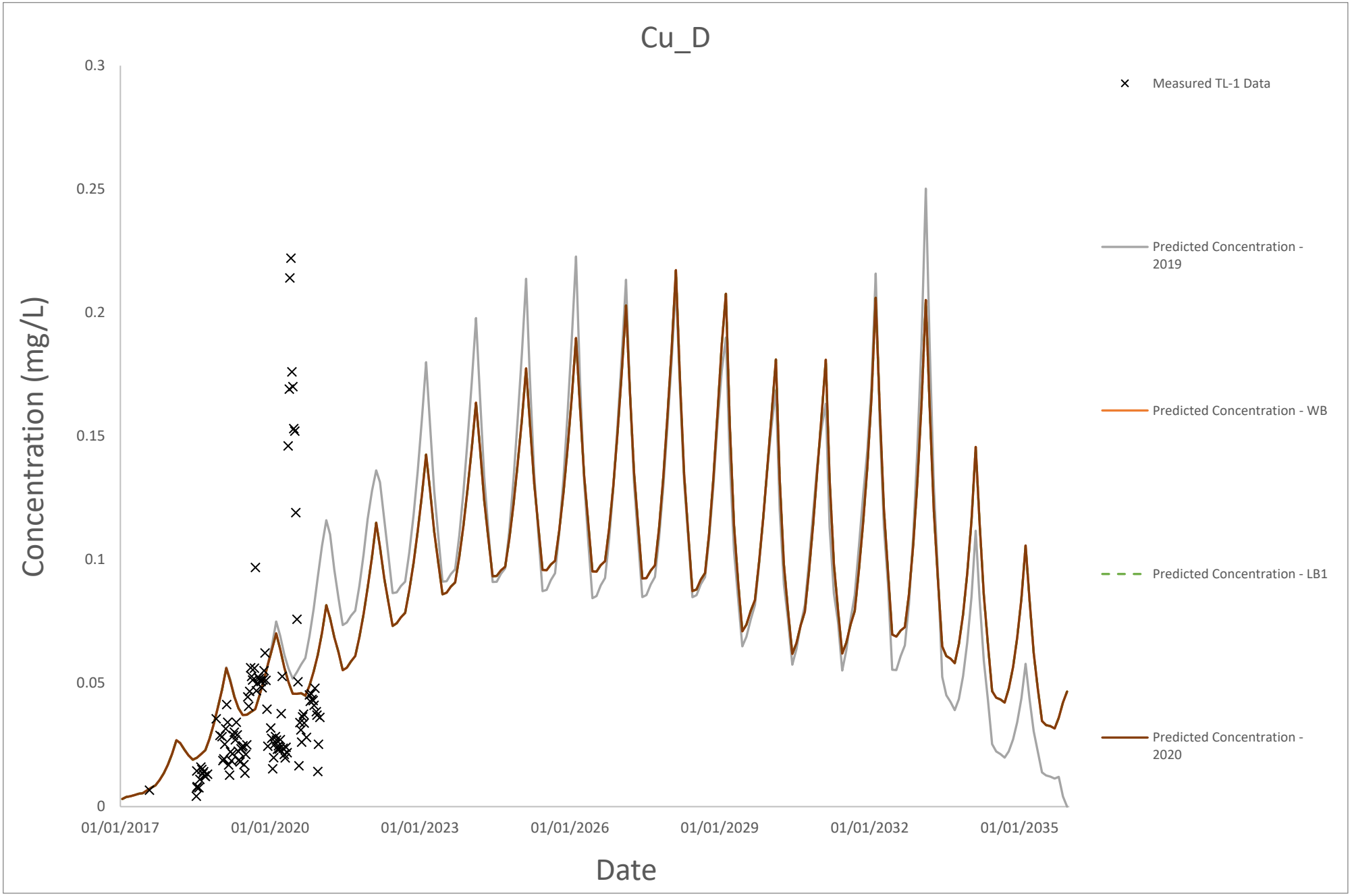

B_D
Concentration (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - 2020
Predicted Concentration - LB1

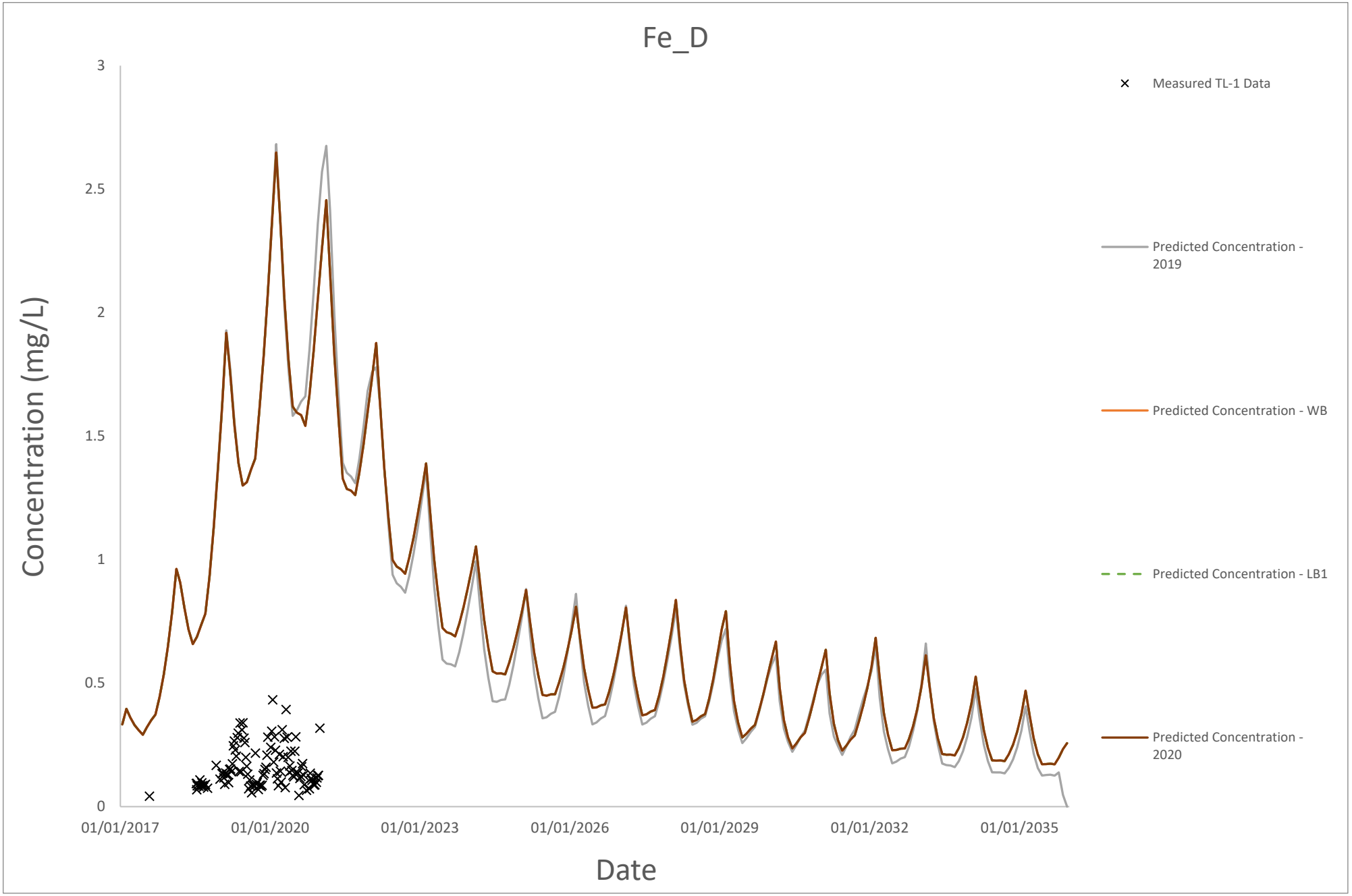

Cd_D
Concentration (mg/L)
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

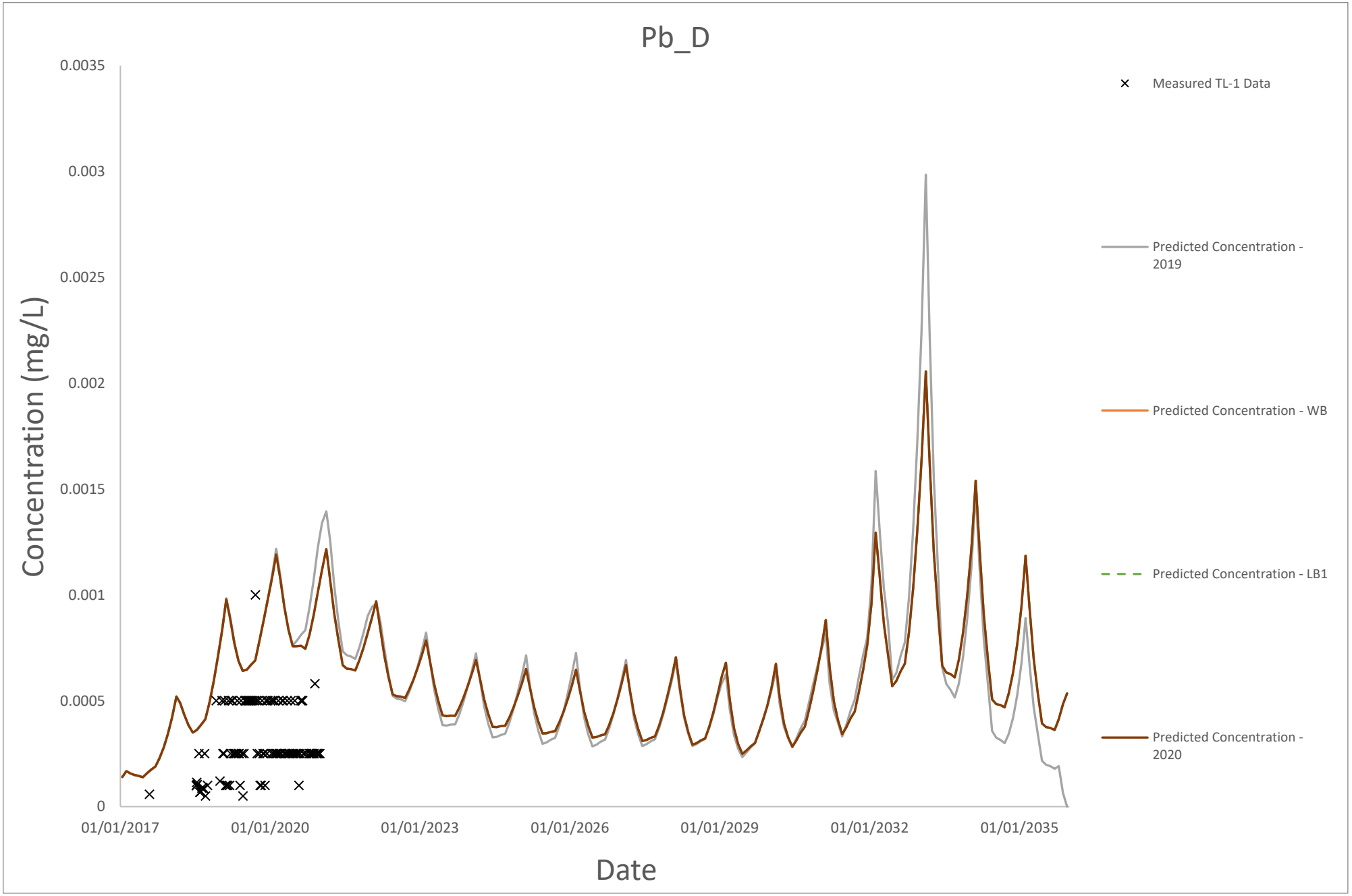

Ca_D
Concentration (mg/L)
700
600
500
400
300
200
100
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

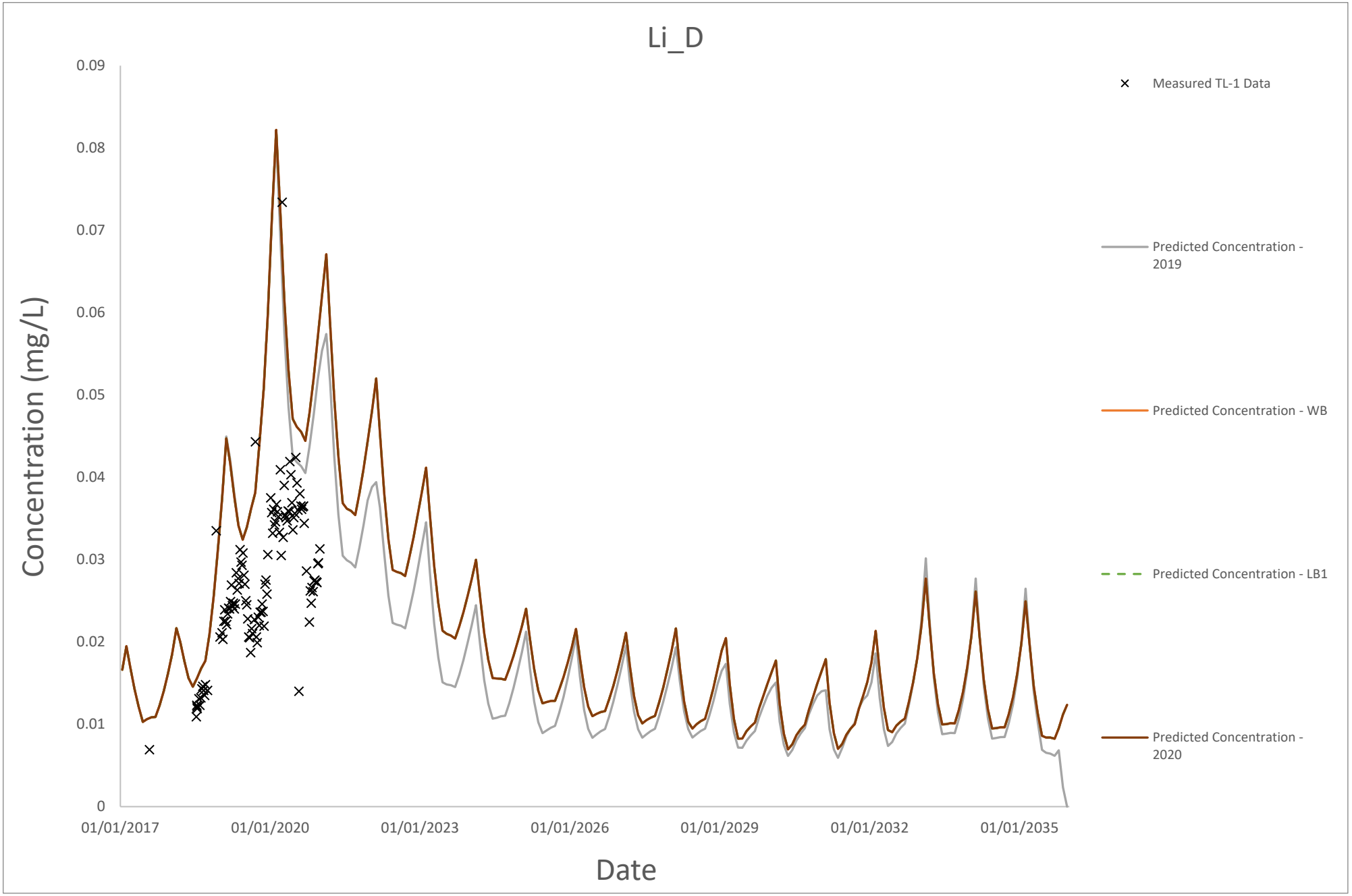

Cr_D
Concentration (mg/L)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

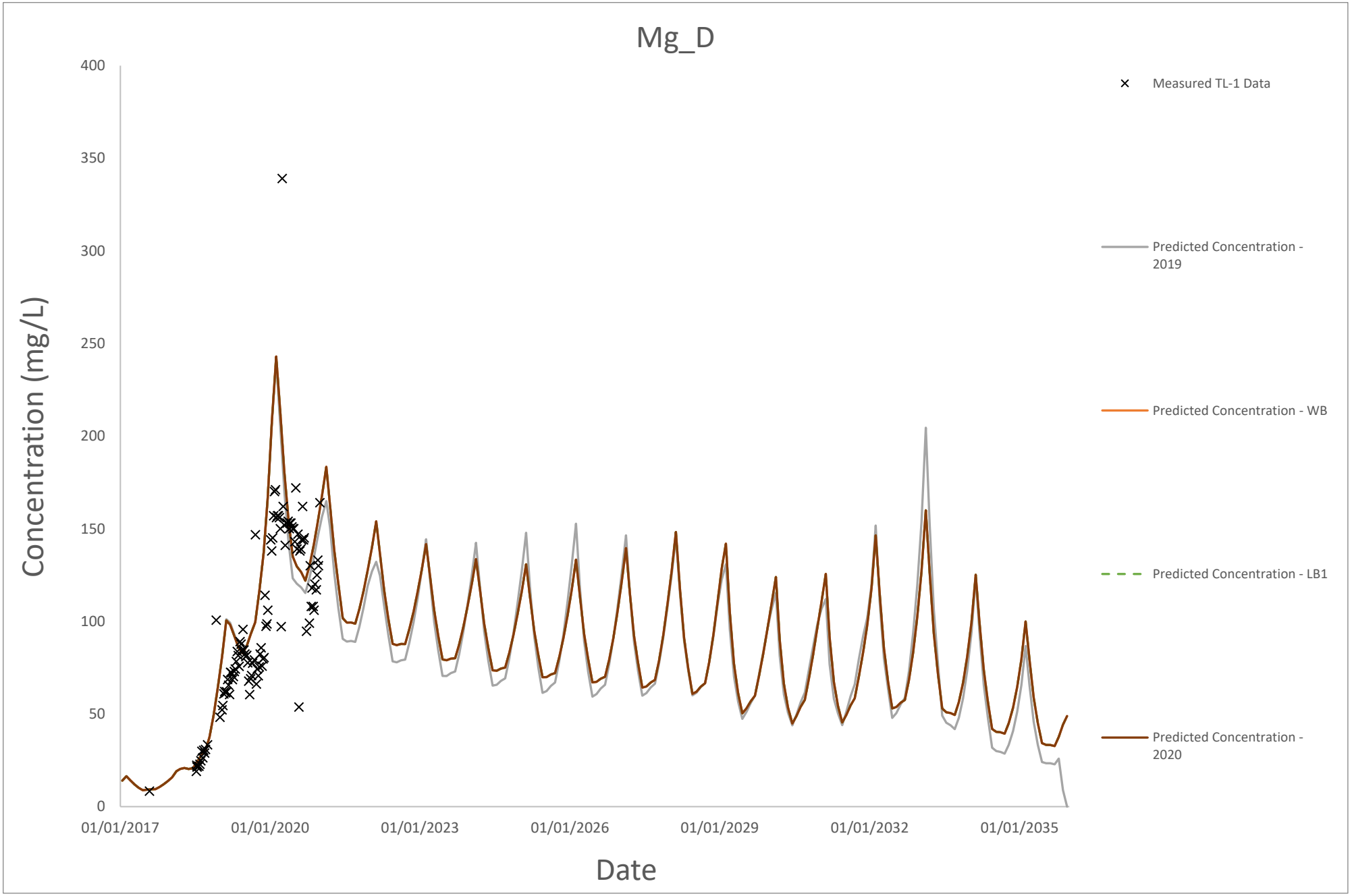

Co_D
Concentration (mg/L)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

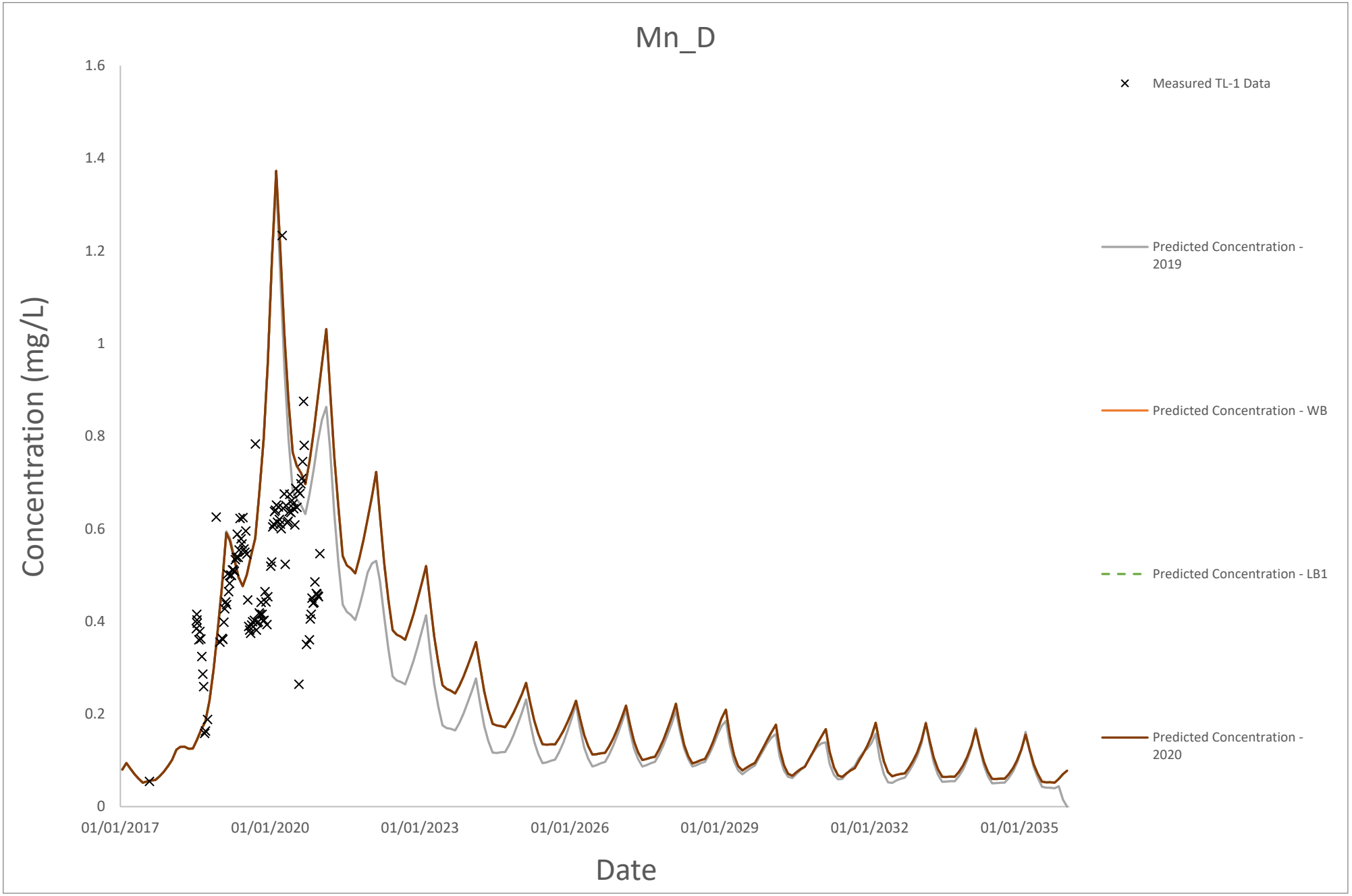

Cu_D
Concentration (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

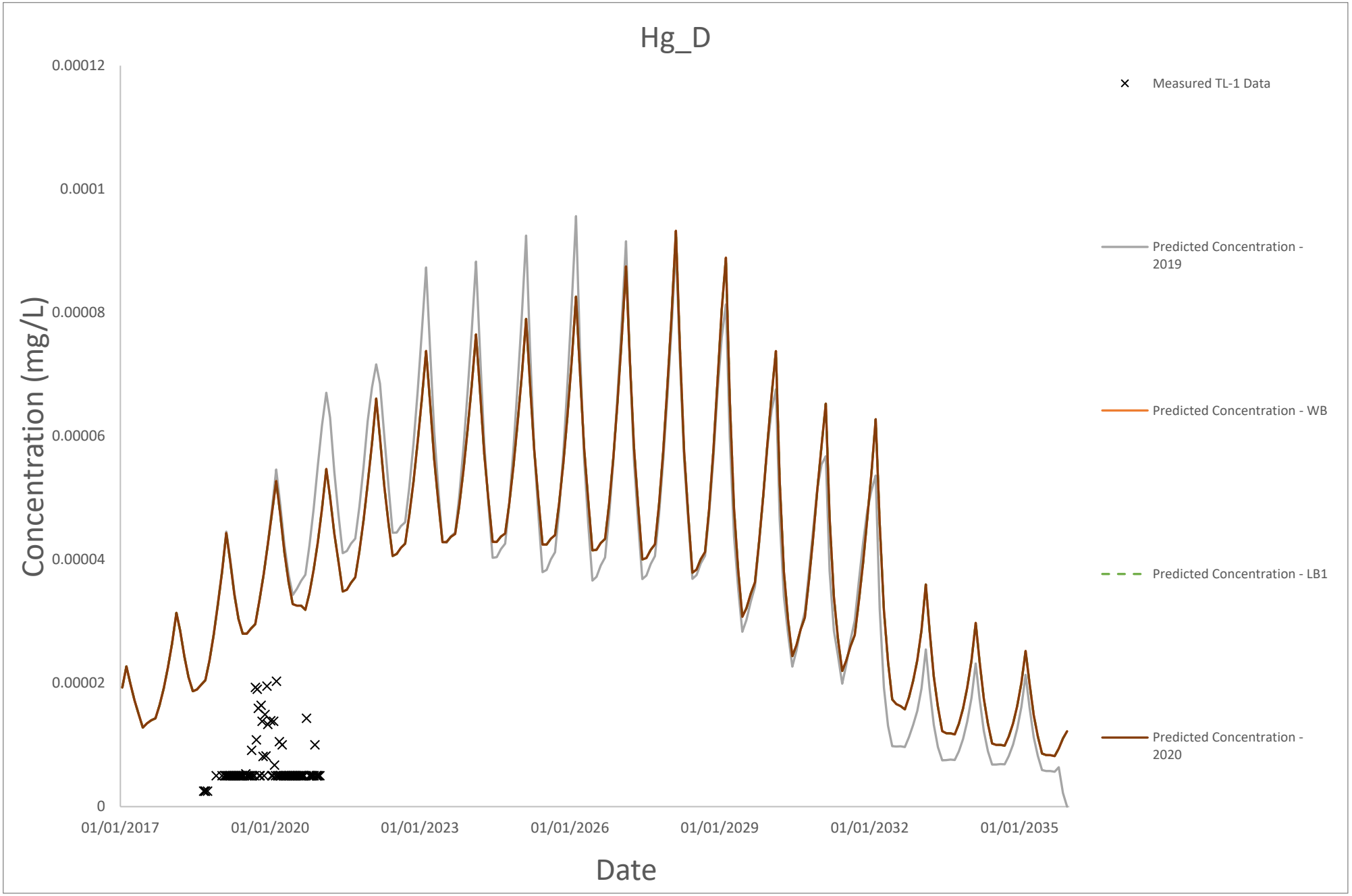

Fe_D
Concentration (mg/L)
3
2.5
2
1.5
1
0.5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

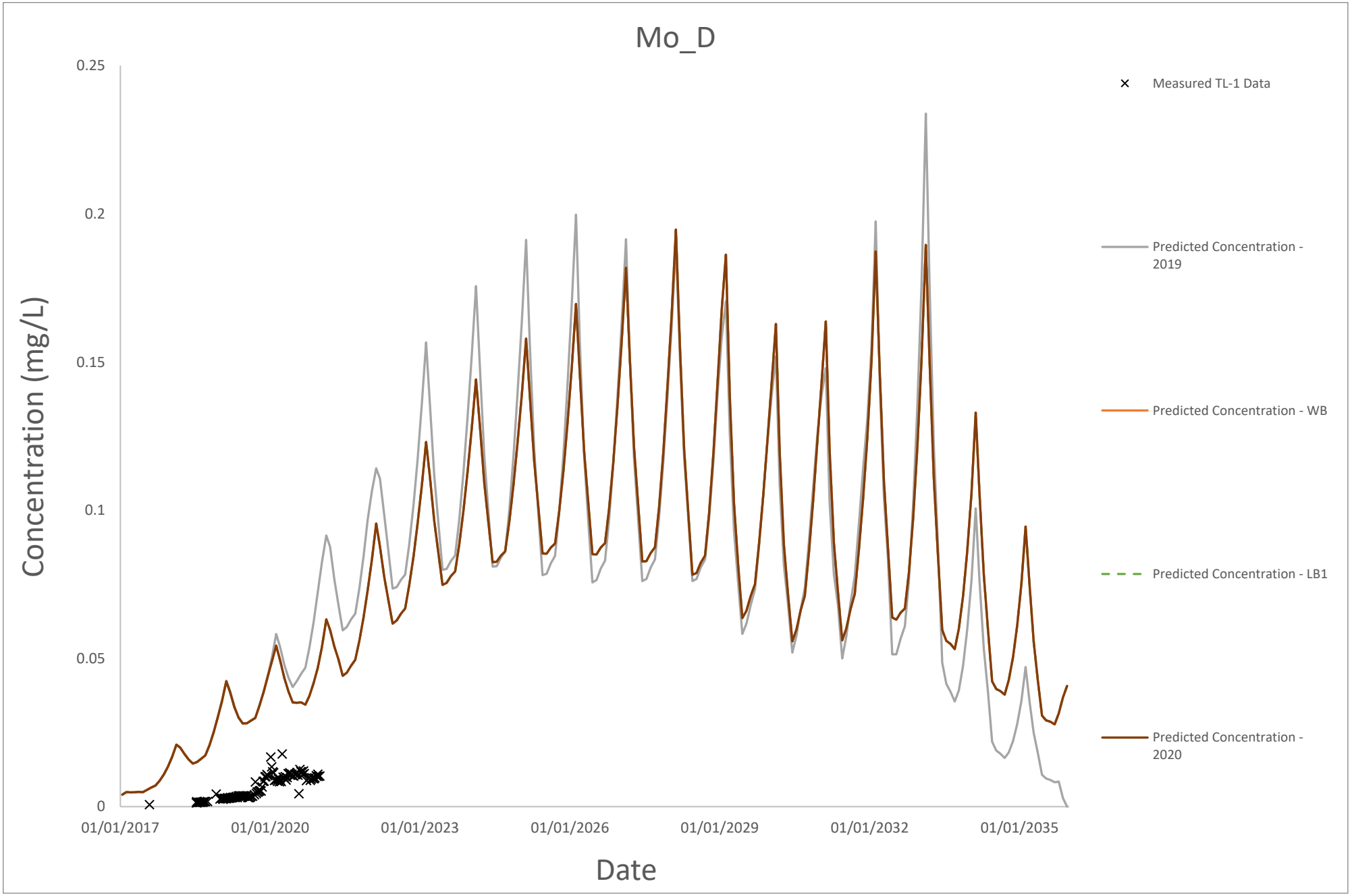

Pb_D
Concentration (mg/L)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

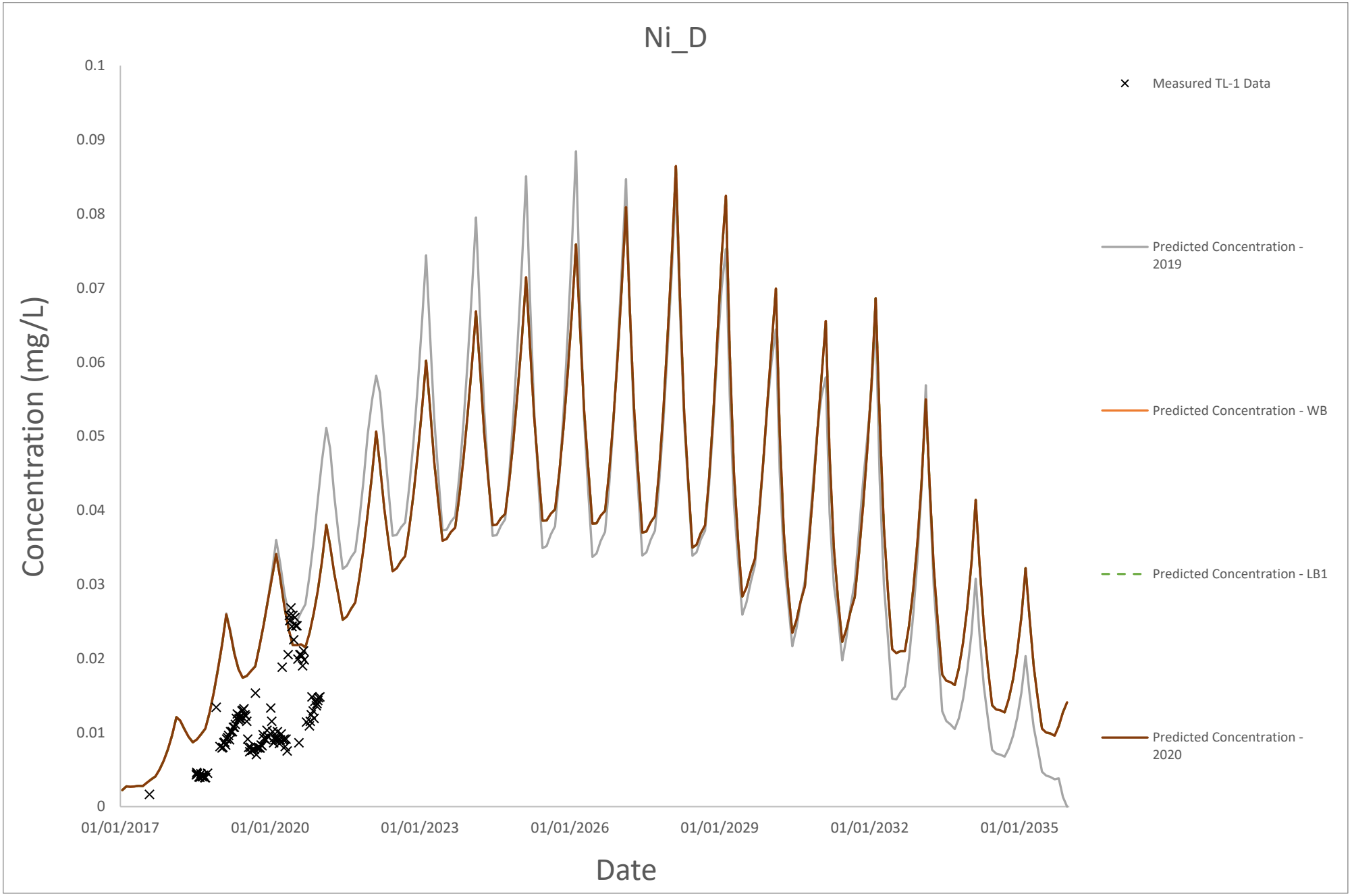

Li_D
Concentration (mg/L)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

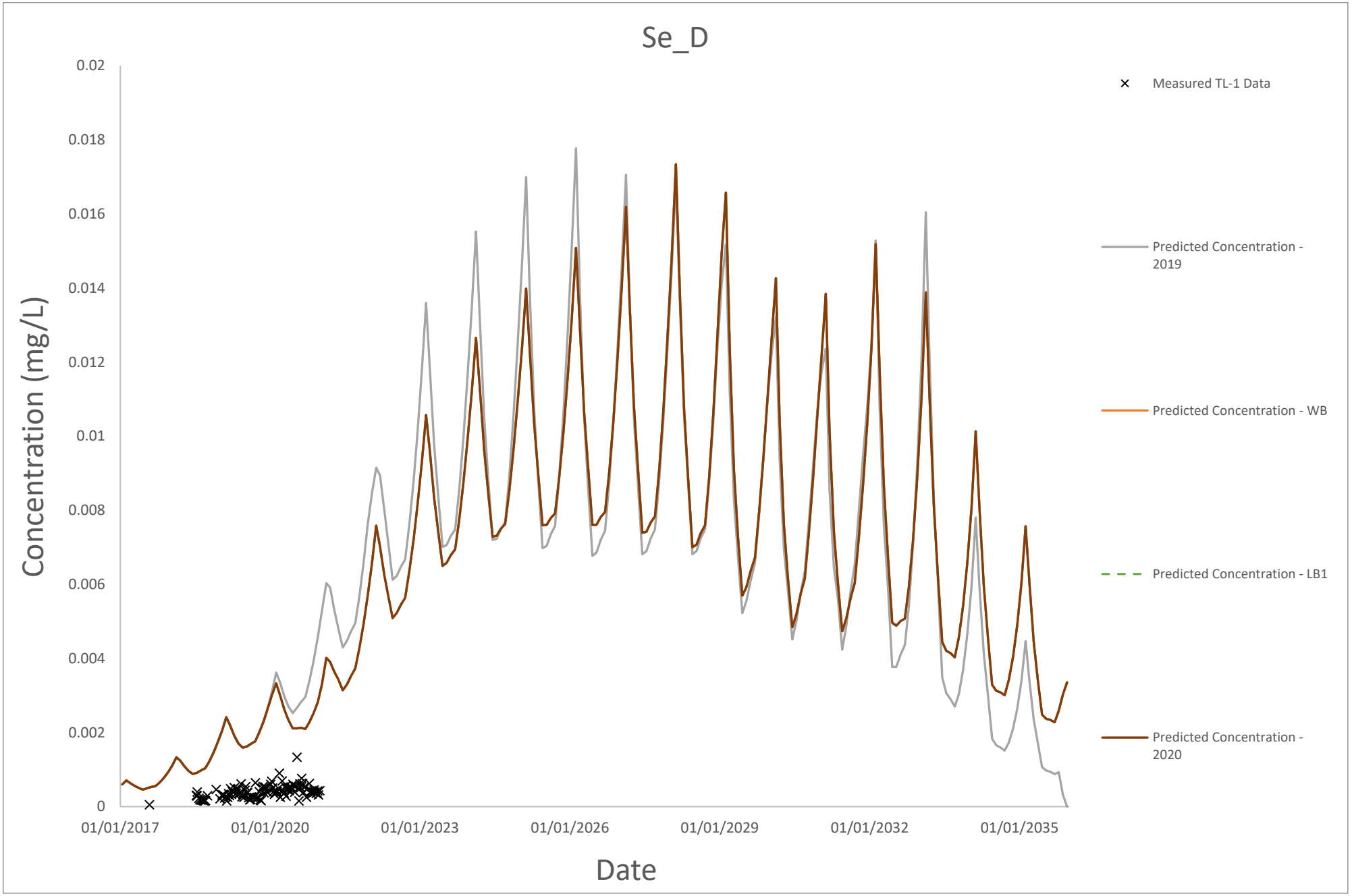

Mg_D
Concentration (mg/L)
400
350
300
250
200
150
100
50
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

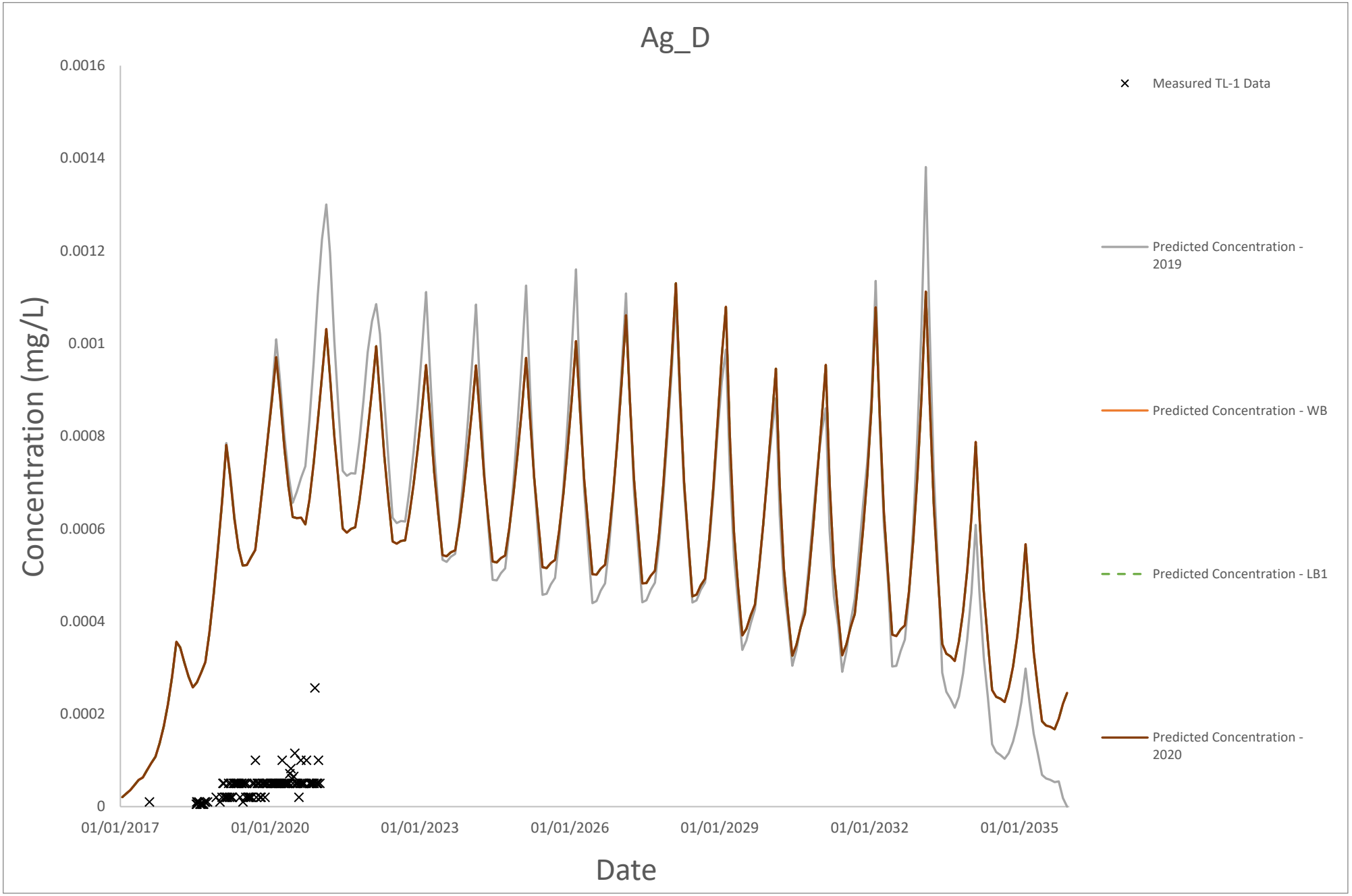

Mn_D
Concentration (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

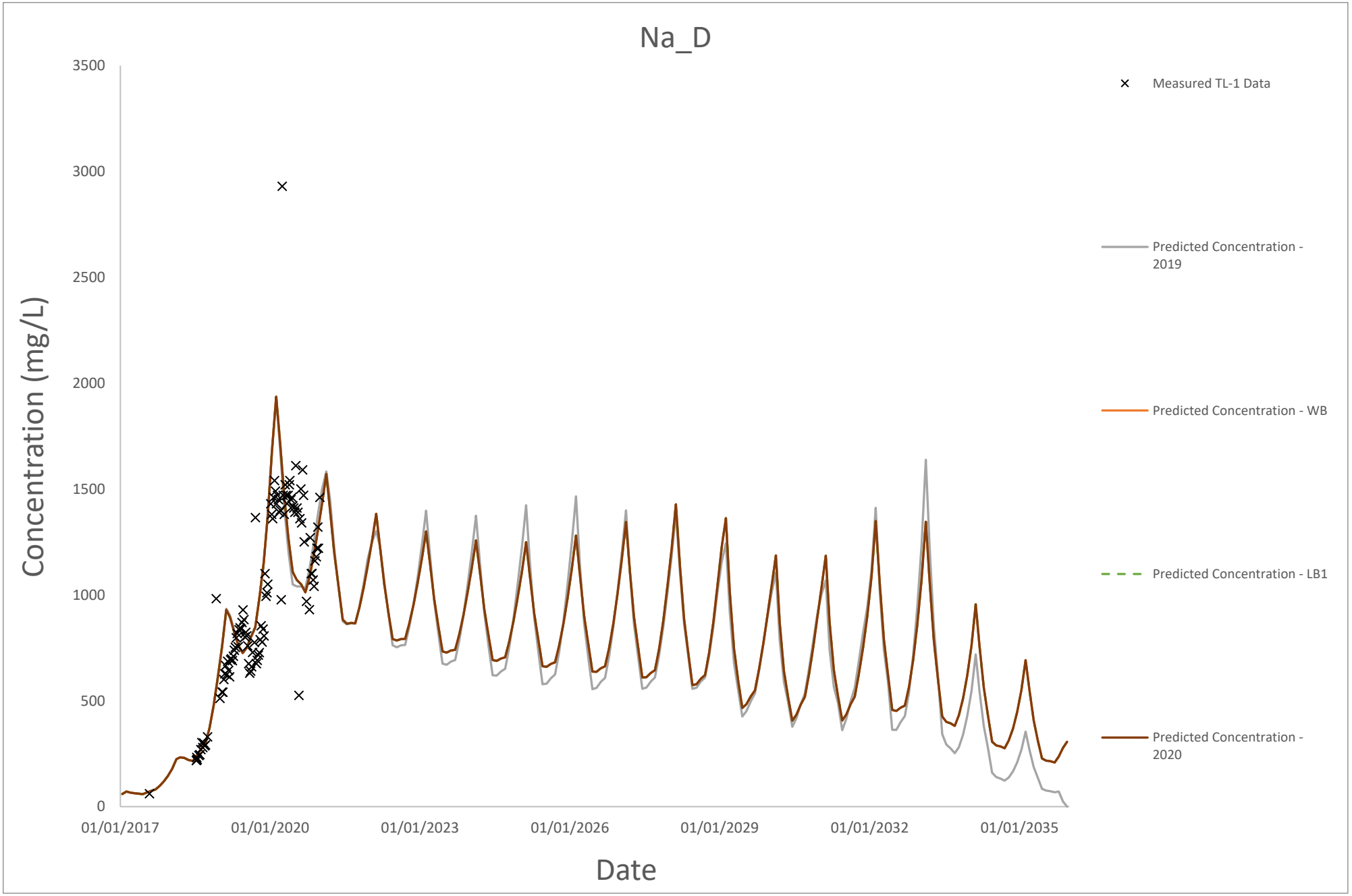

Hg_D
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
Concentration (mg/L)
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

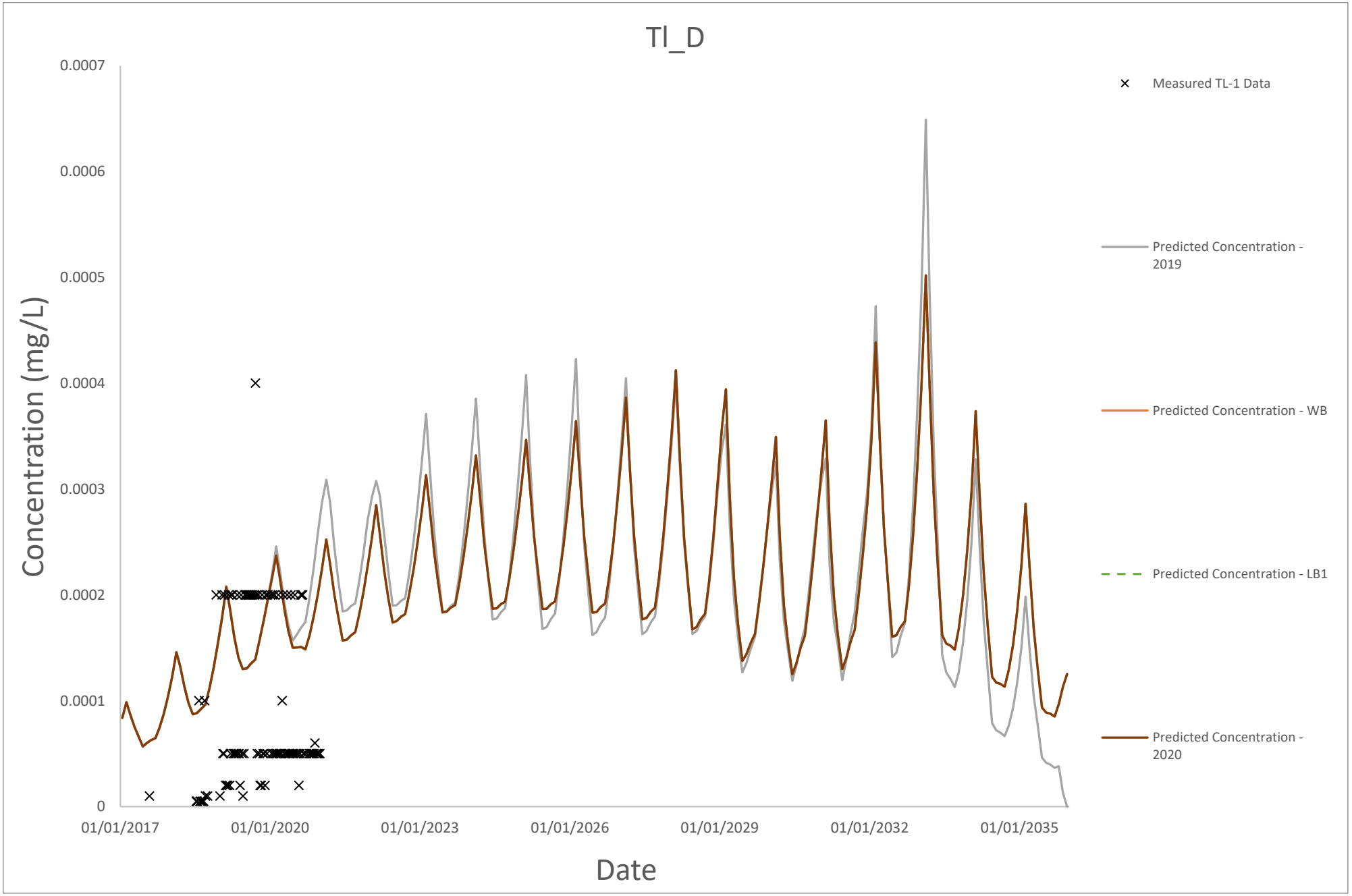

Mo_D
Concentration (mg/L)
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

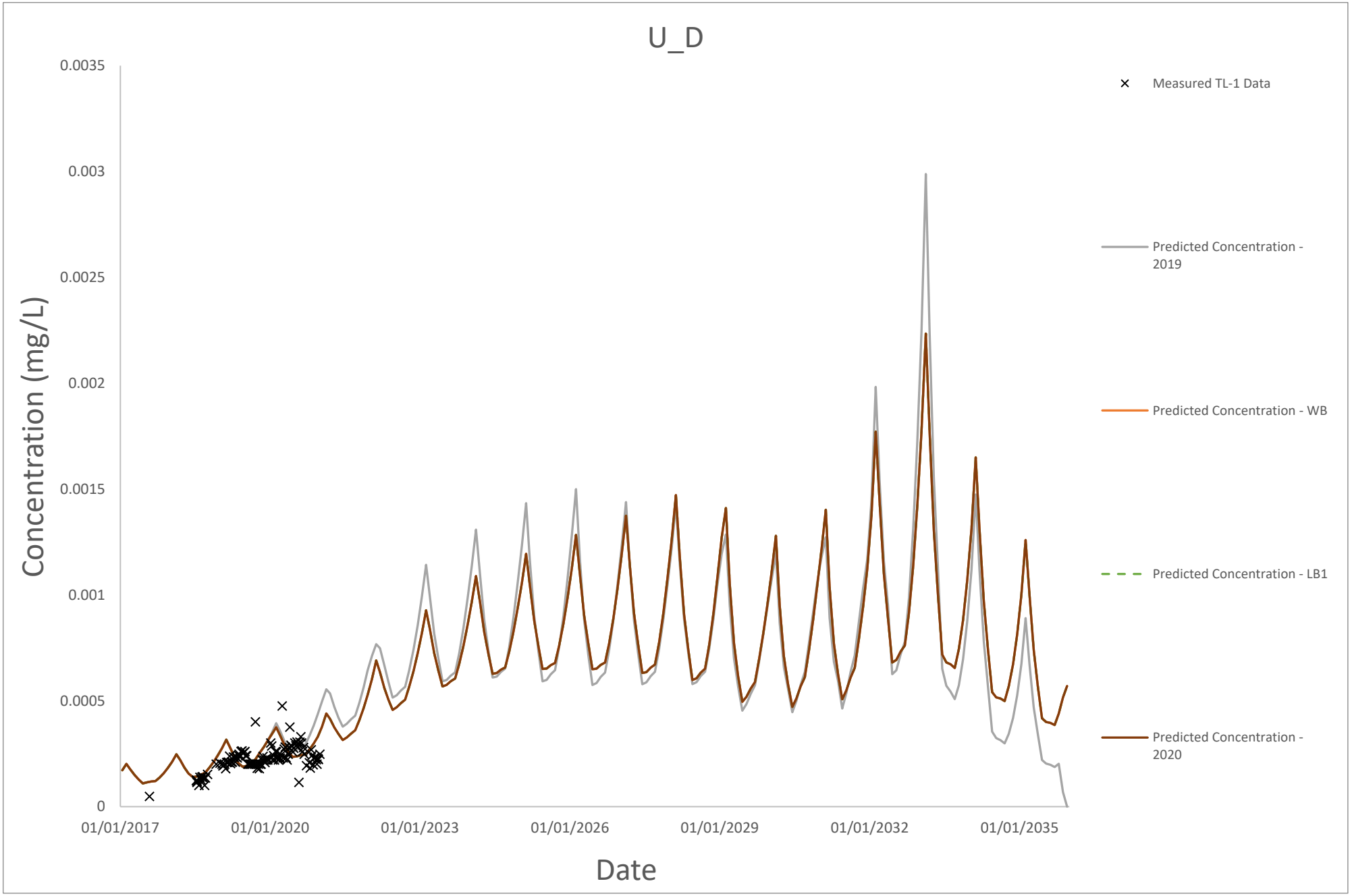

Ni_D
Concentration (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

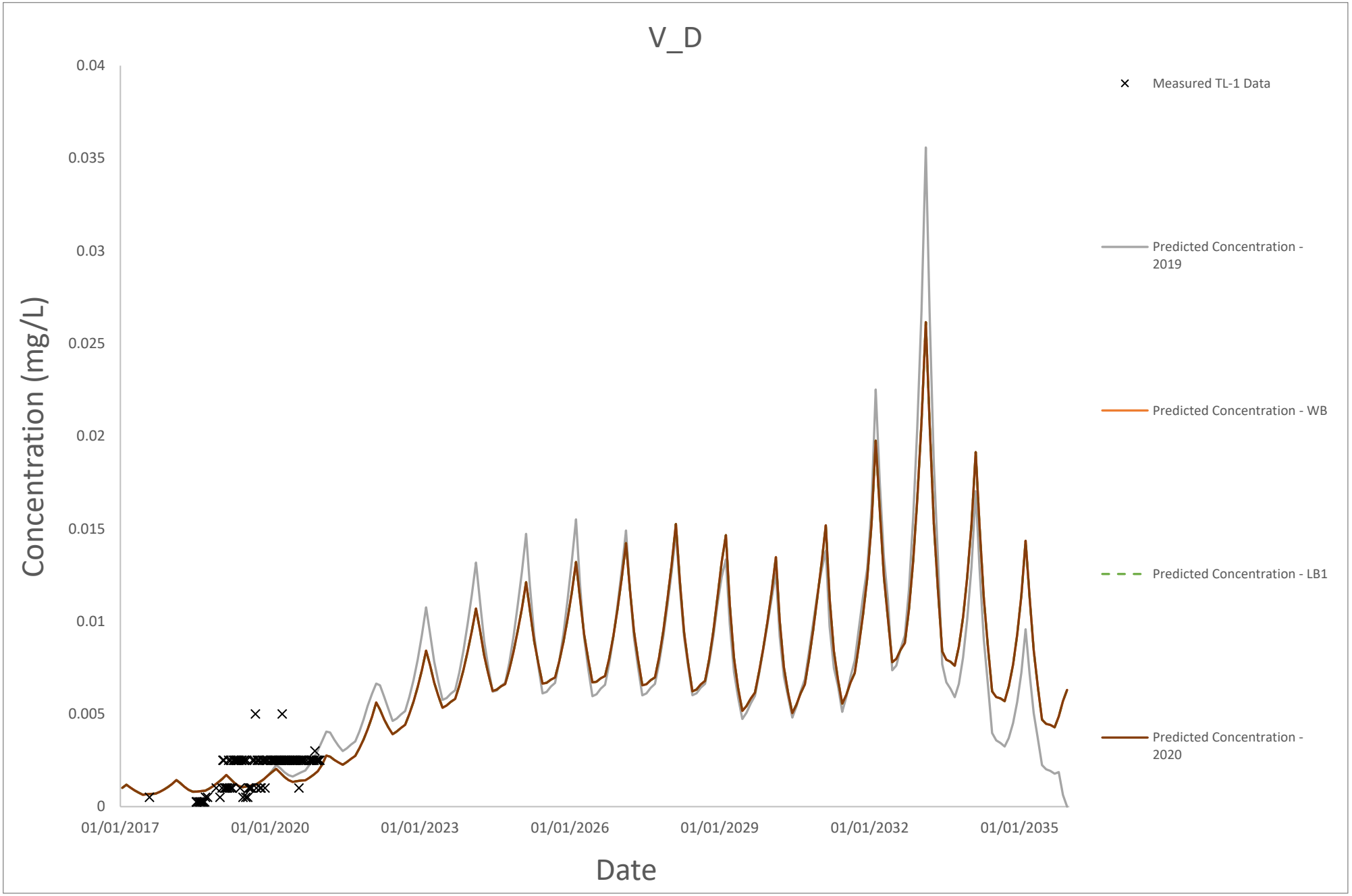

Se_D
Concentration (mg/L)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

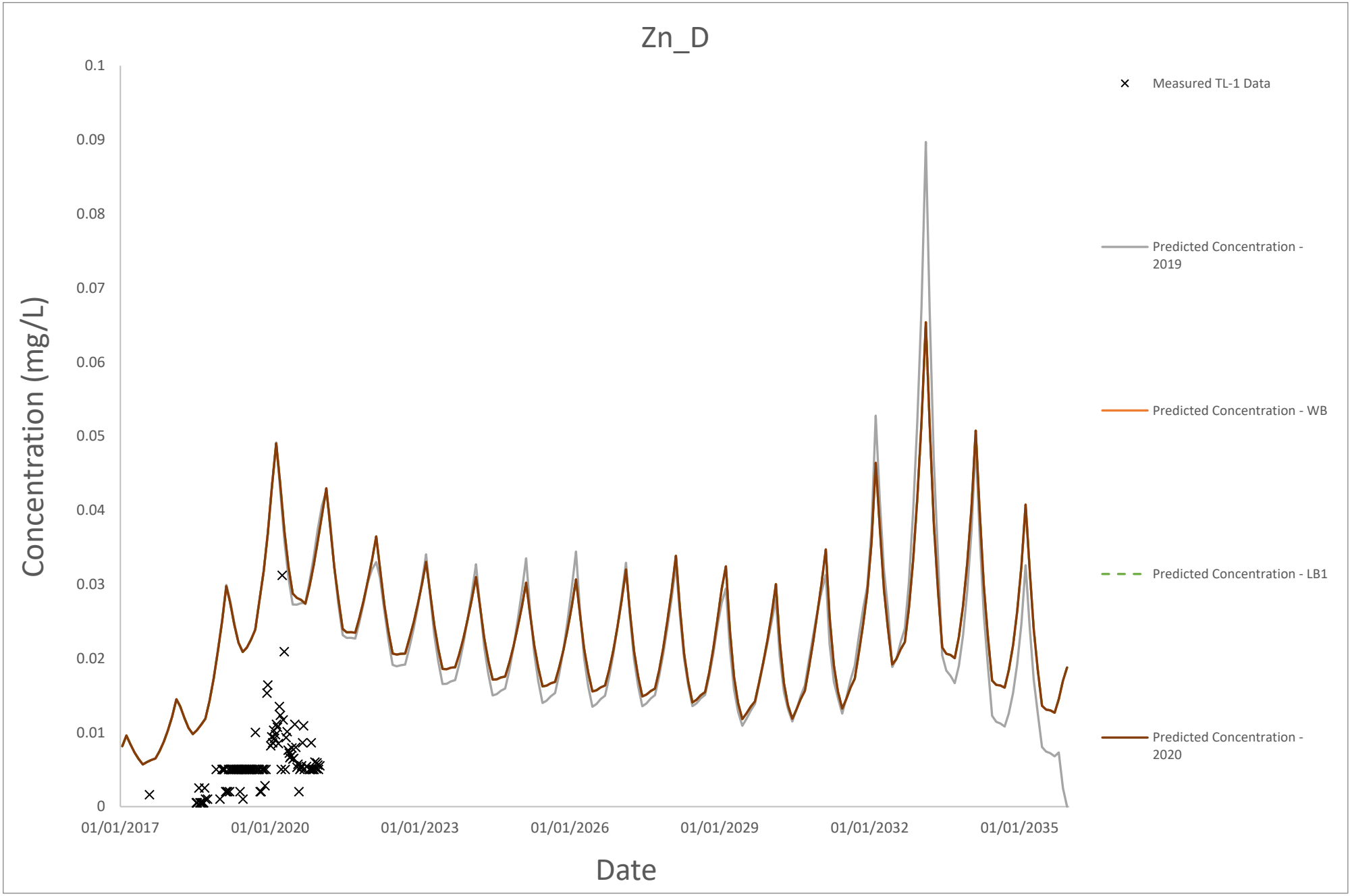

Ag_D
Concentration (mg/L)
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

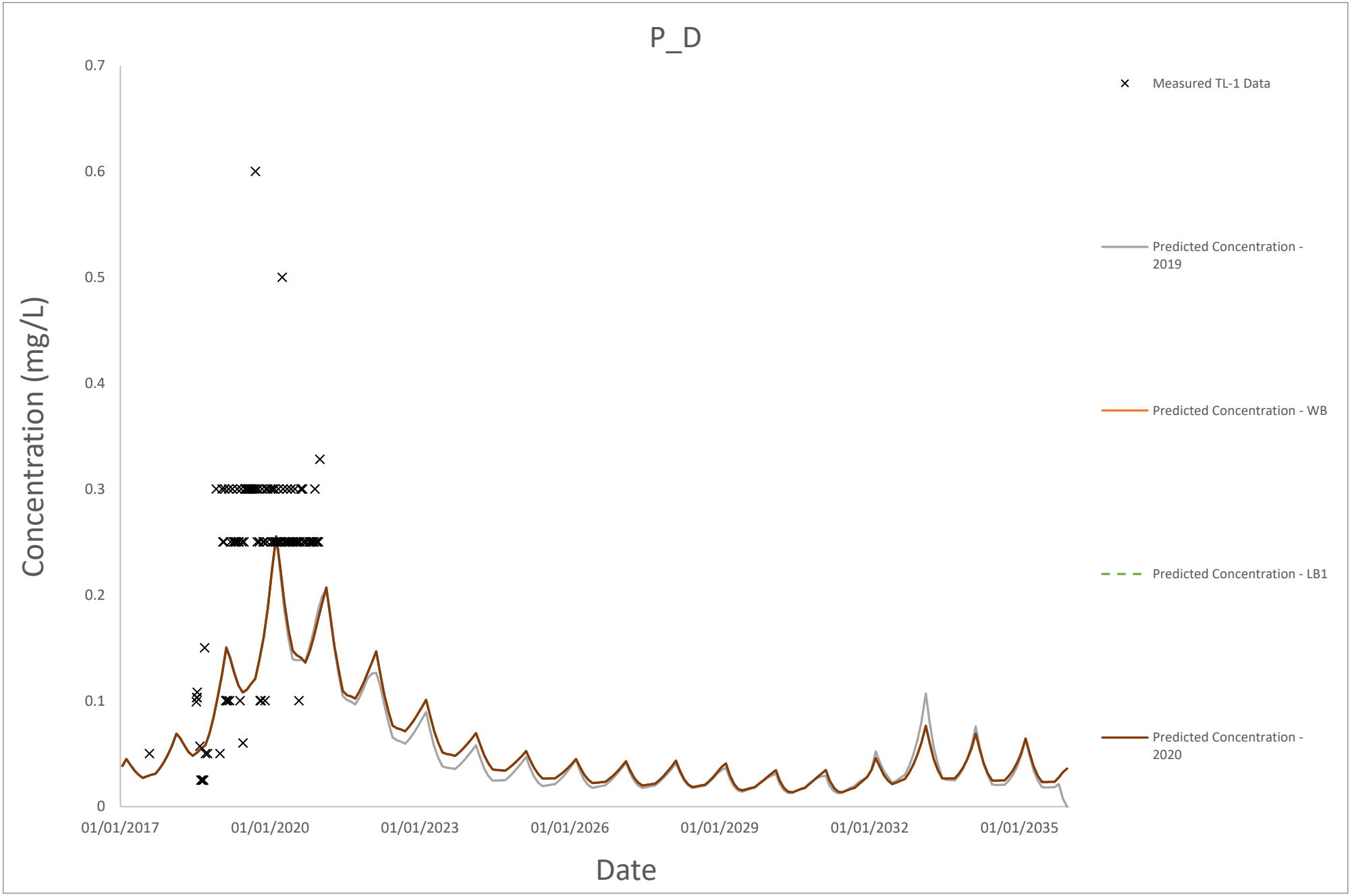

Na_D
Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

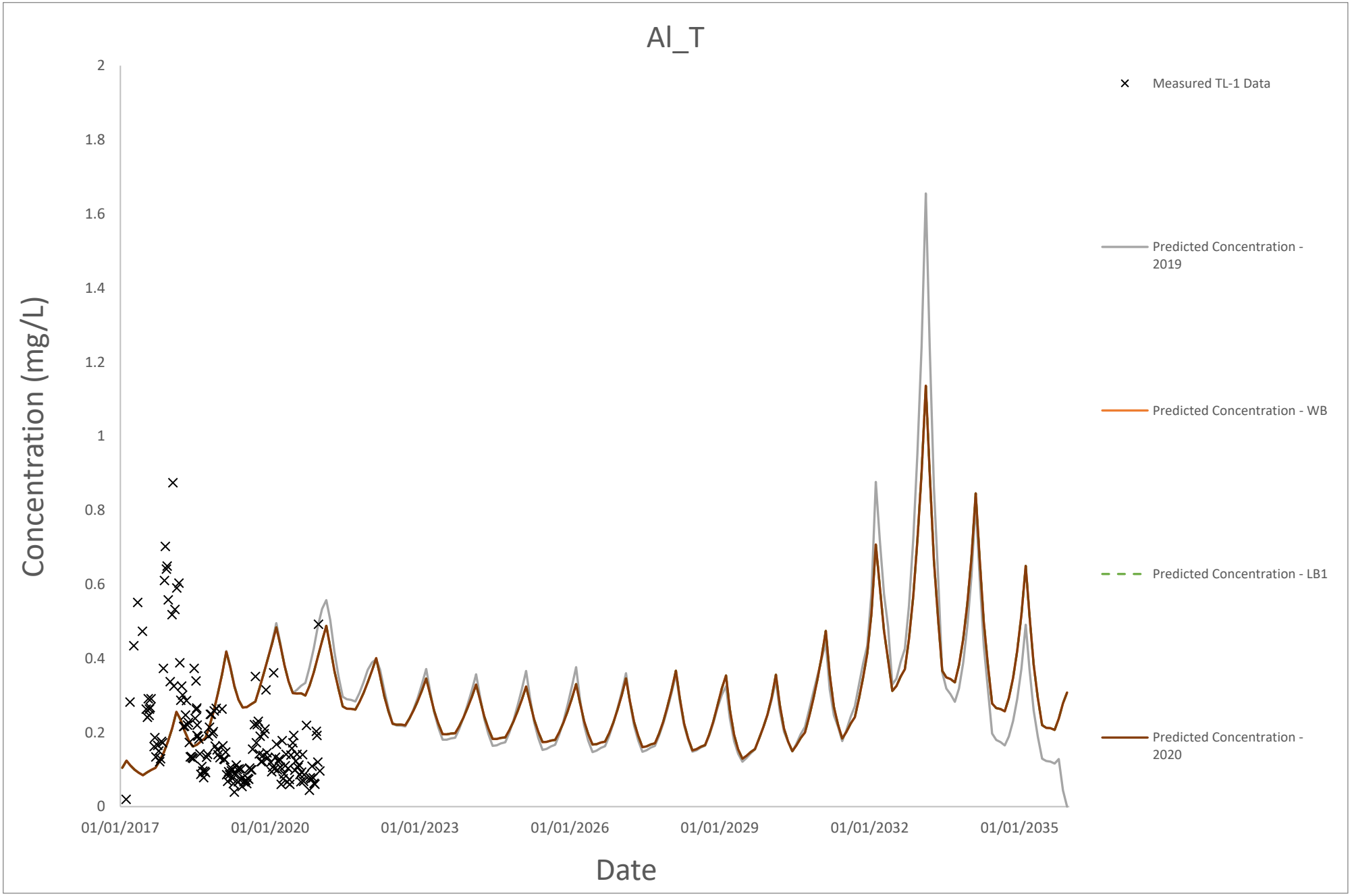

Tl_D
Concentration (mg/L)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

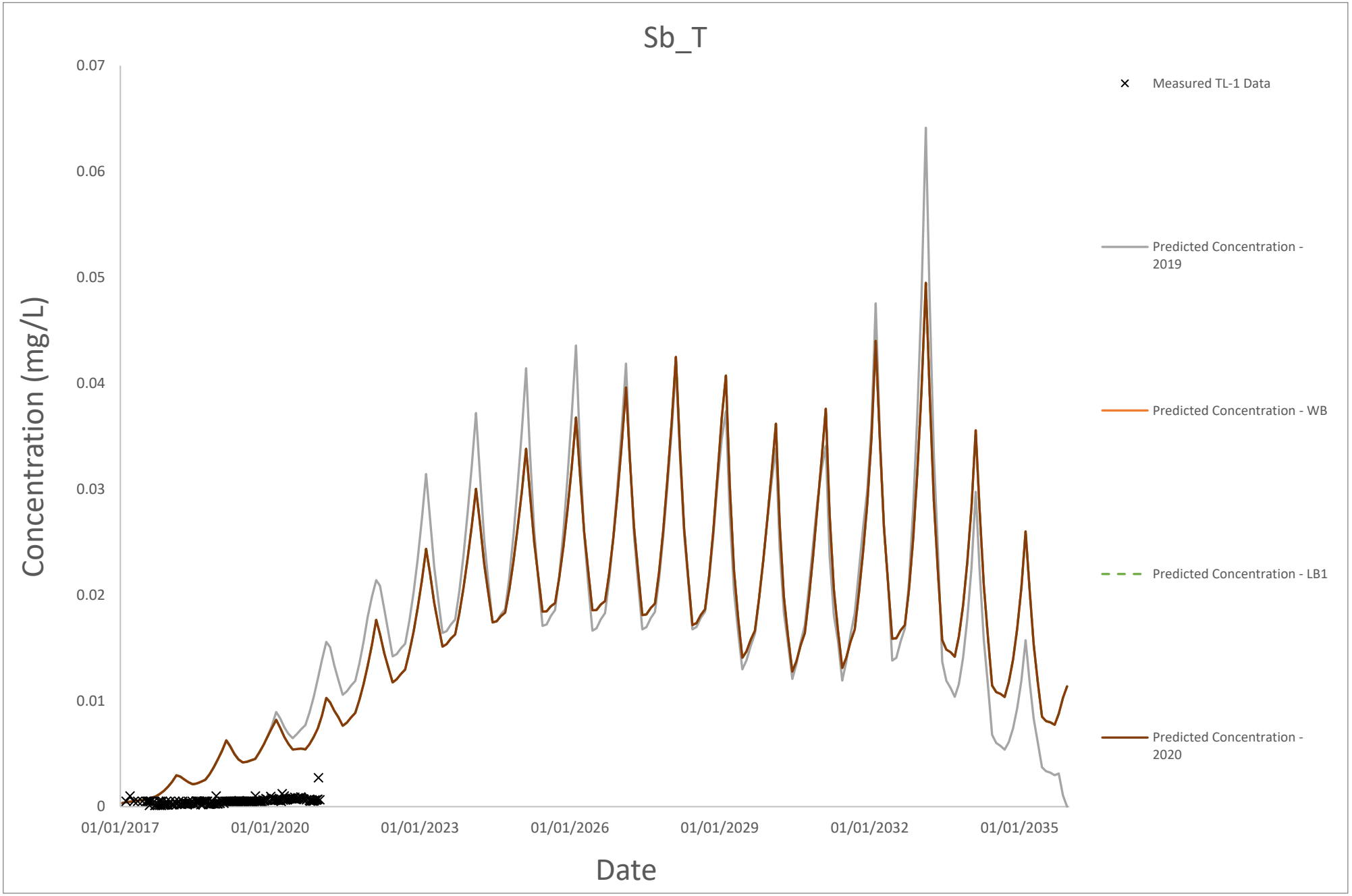

U_D
Concentration (mg/L)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

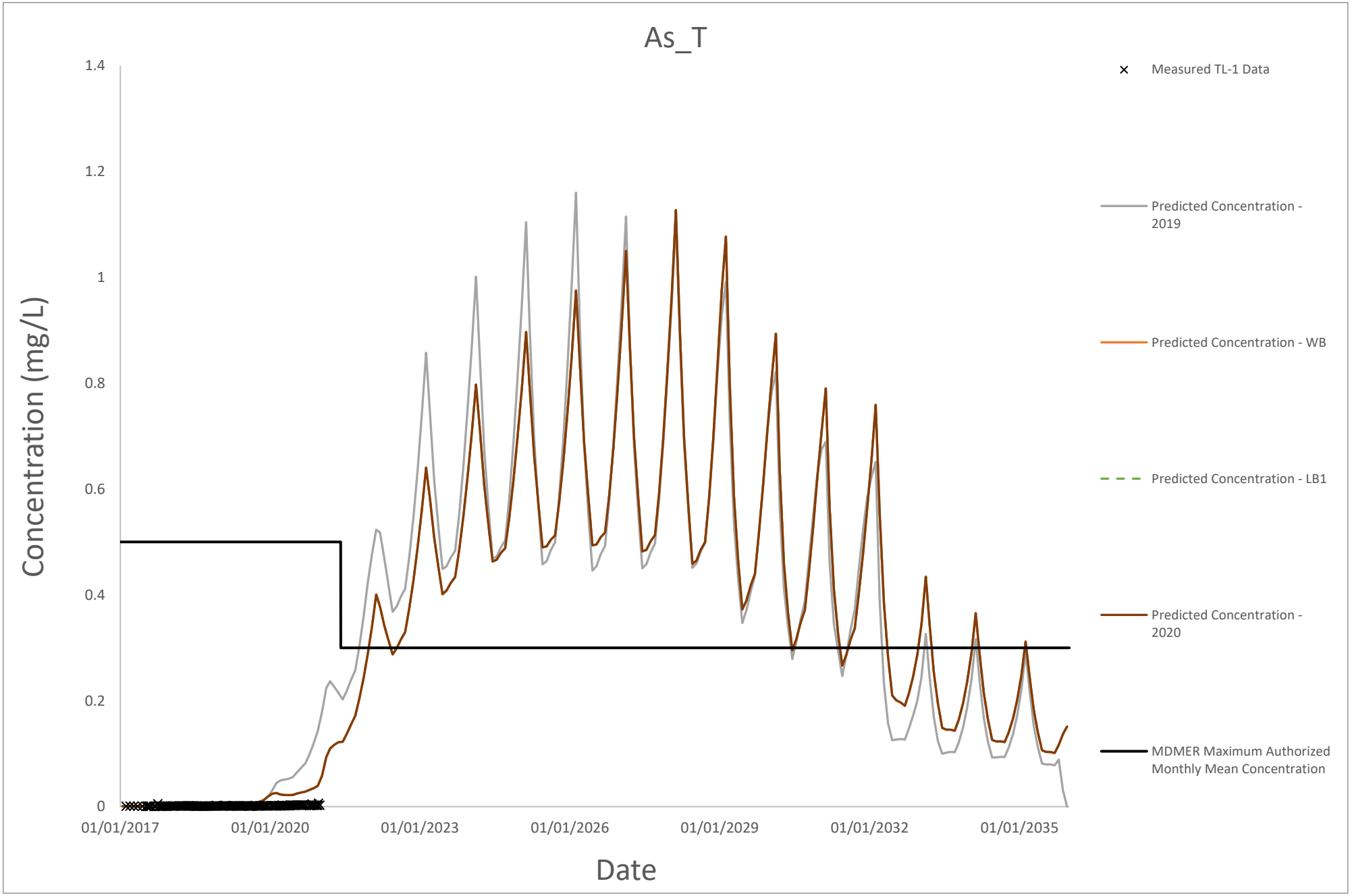

V_D
Concentration (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

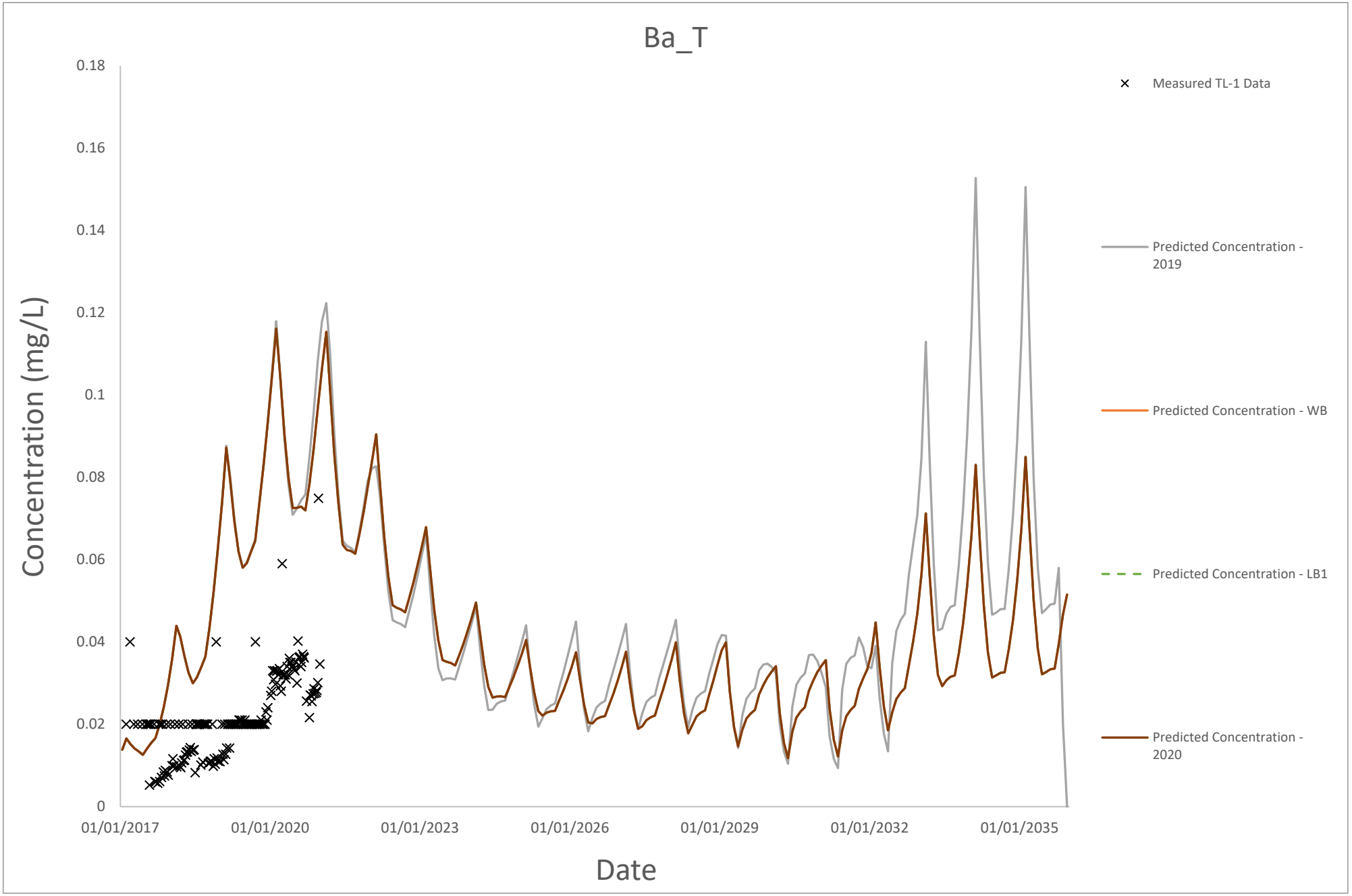

Zn_D
Concentration (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

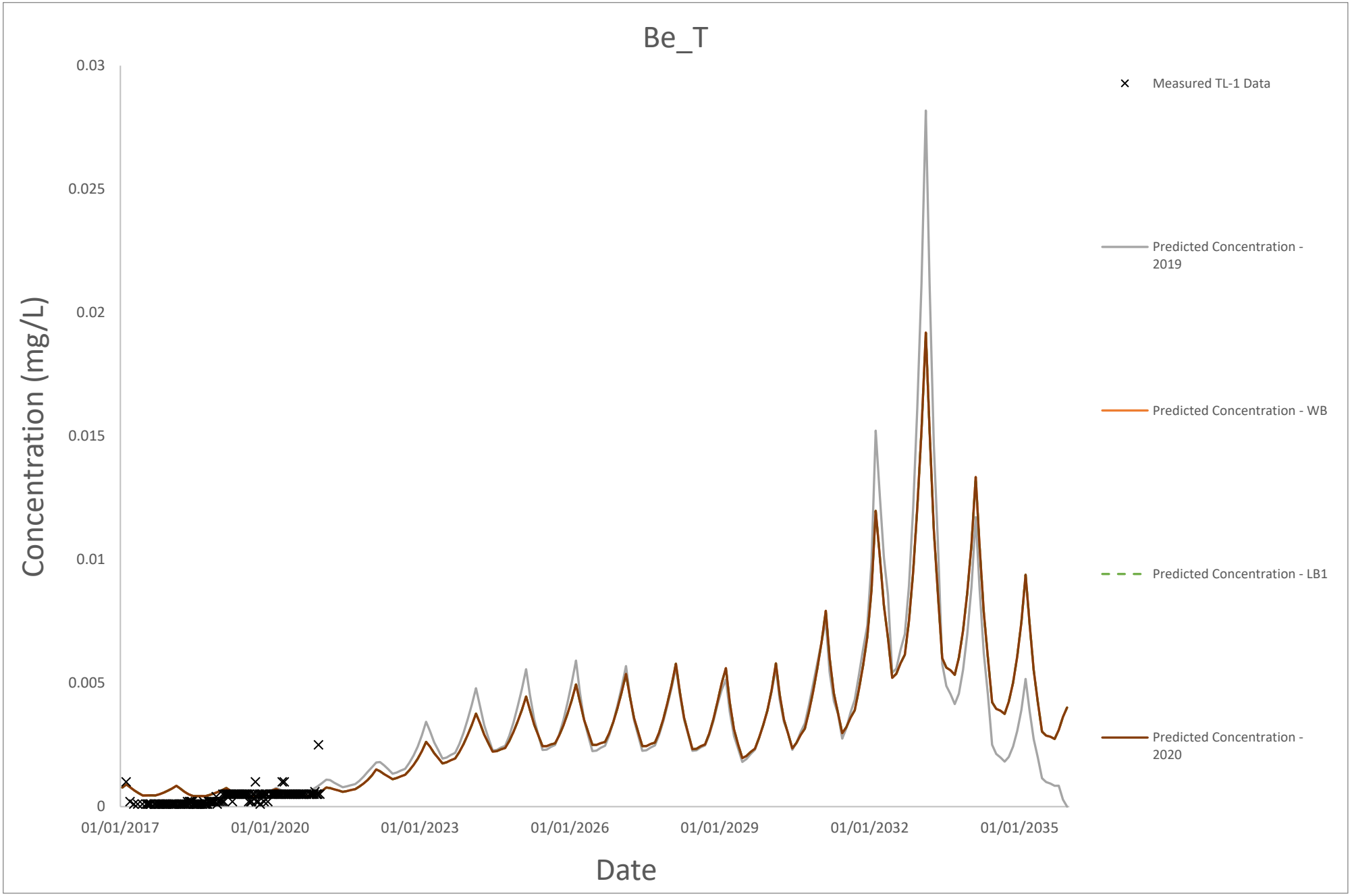

P_D
Concentration (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Al_T
Concentration (mg/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Sb_T
Concentration (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


As_T
Concentration (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020
MDMER Maximum Authorized Monthly Mean Concentration


Ba_T
Concentration (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Be_T
Concentration (mg/L)
0.03
0.025
0.02
0.015
0.01
0.005
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
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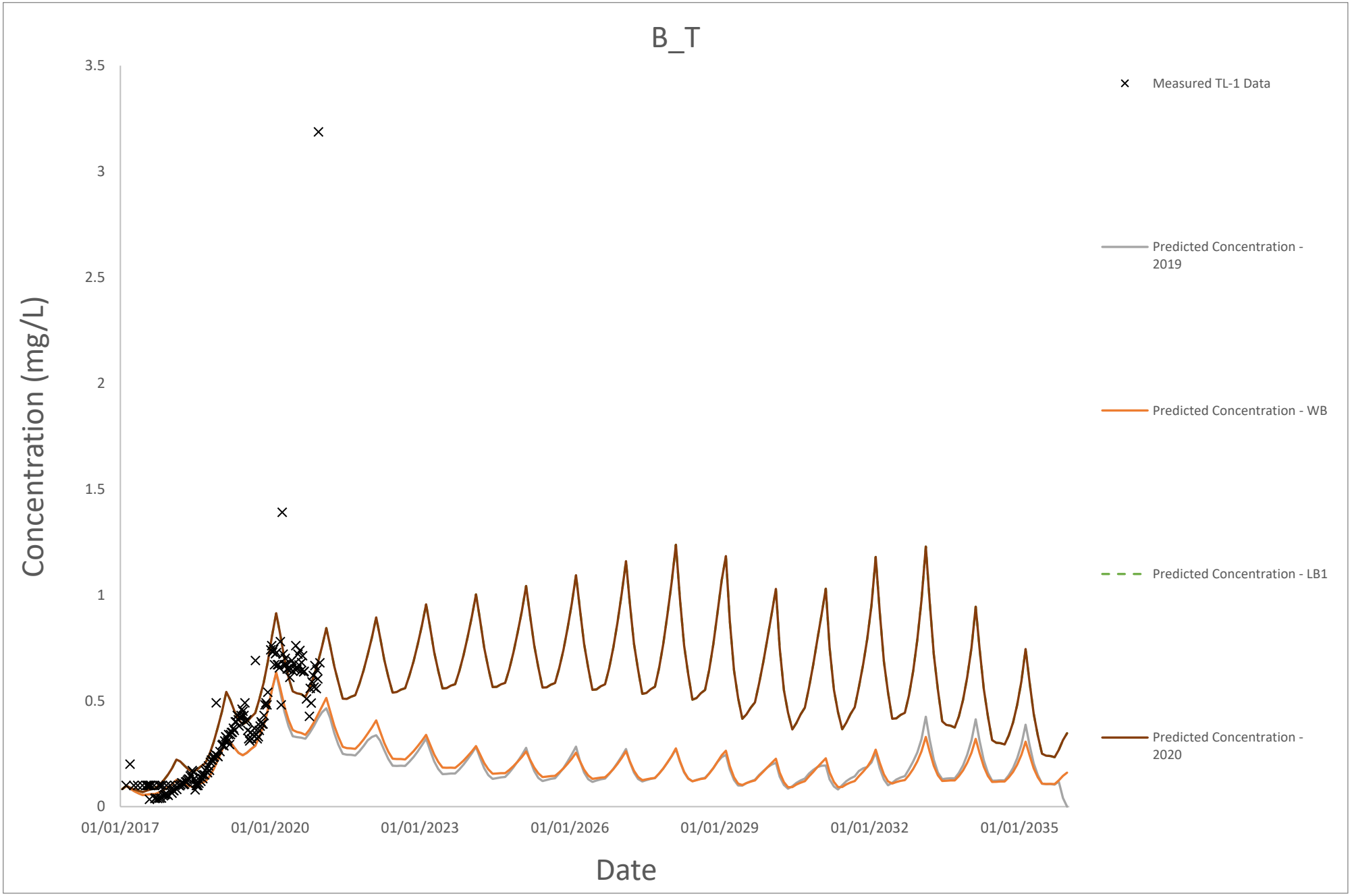
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


B_T
Concentration (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
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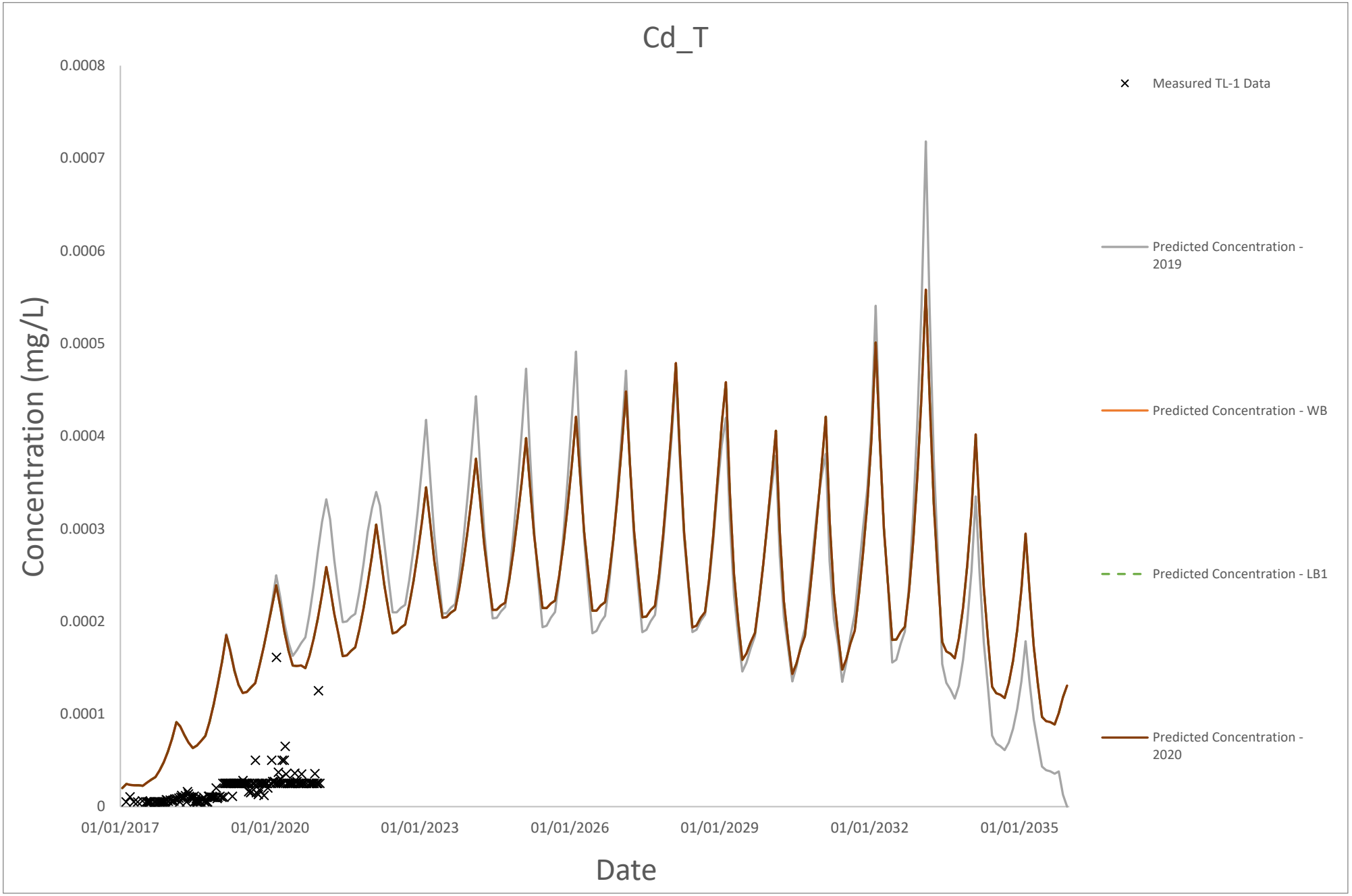
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Cd_T
Concentration (mg/L)
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0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
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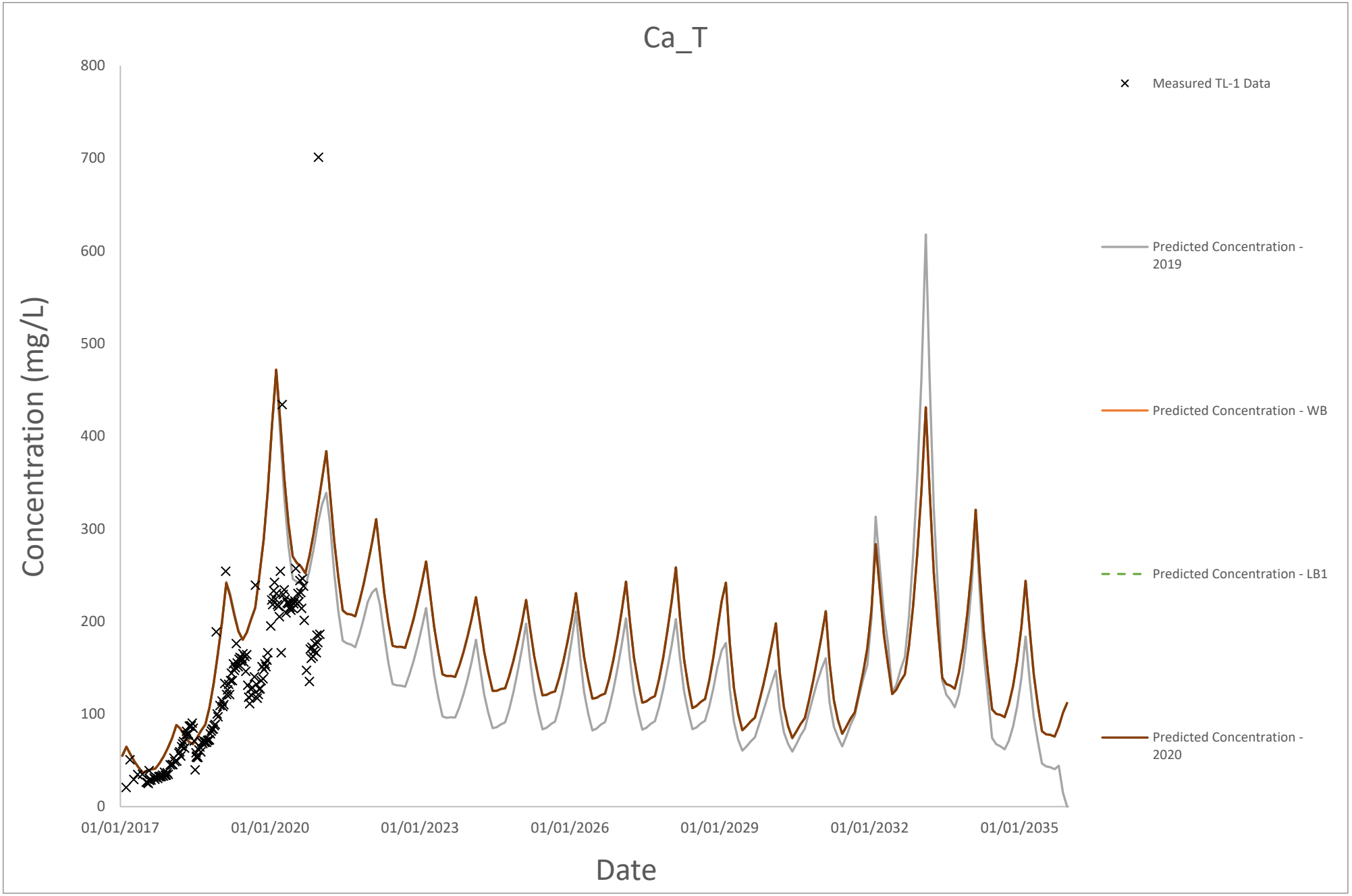
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Ca_T
Concentration (mg/L)
800
700
600
500
400
300
200
100
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
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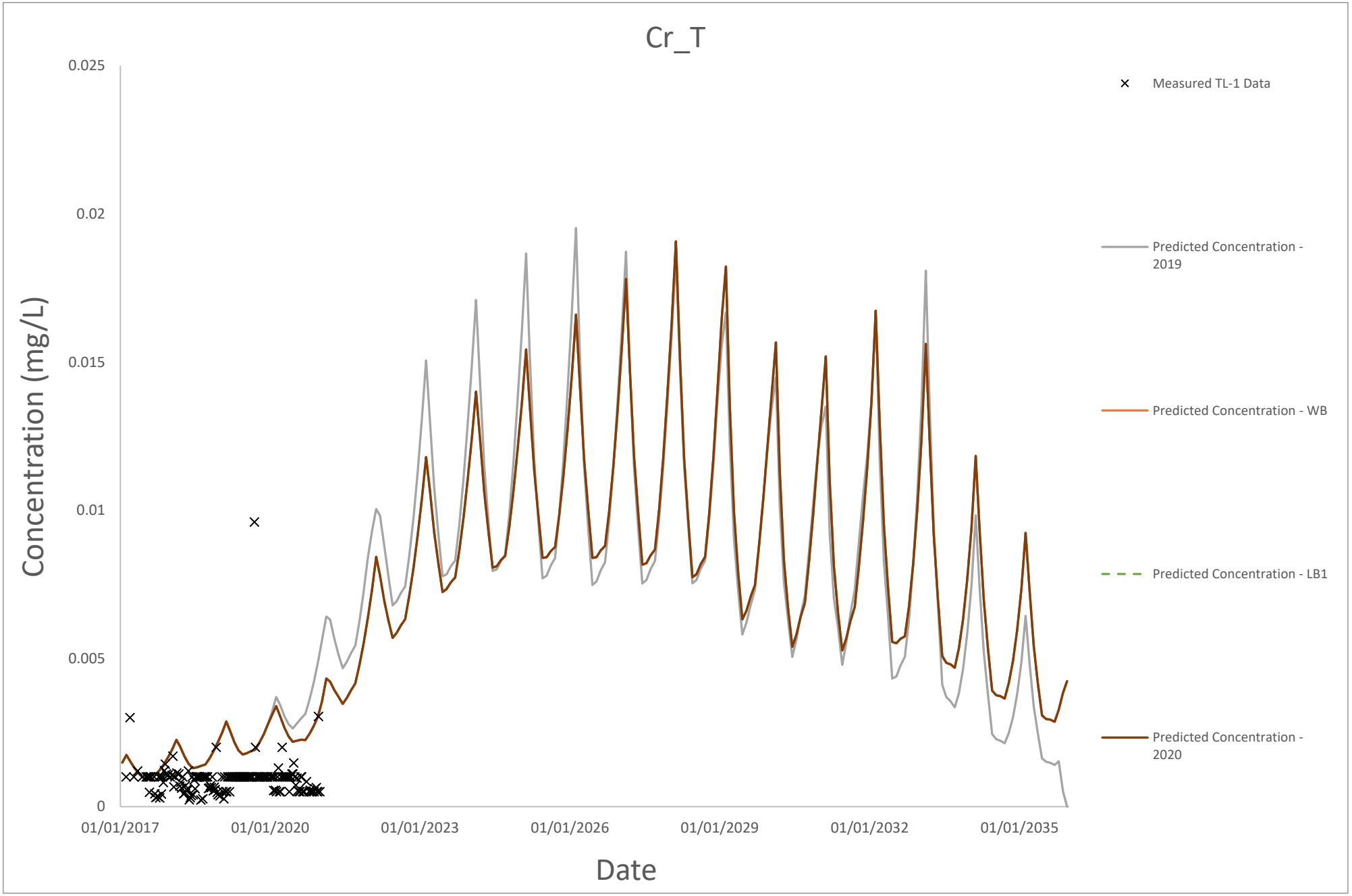
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Cr_T
0.025
0.02
0.015
0.01
0.005
0
Concentration (mg/L)
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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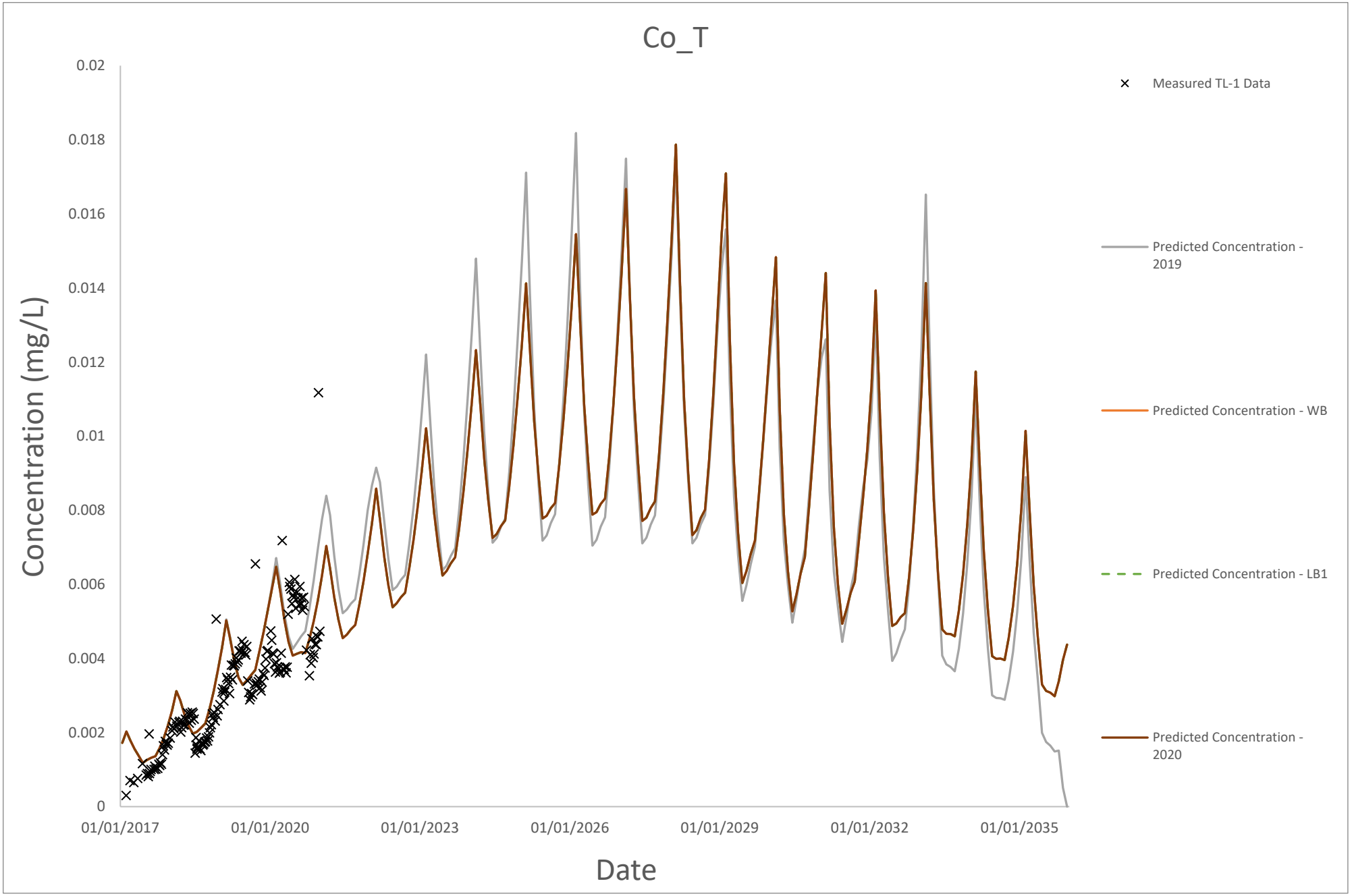
Predicted Concentration - LB1
Predicted Concentration - 2020


Co_T
Concentration (mg/L)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
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Date
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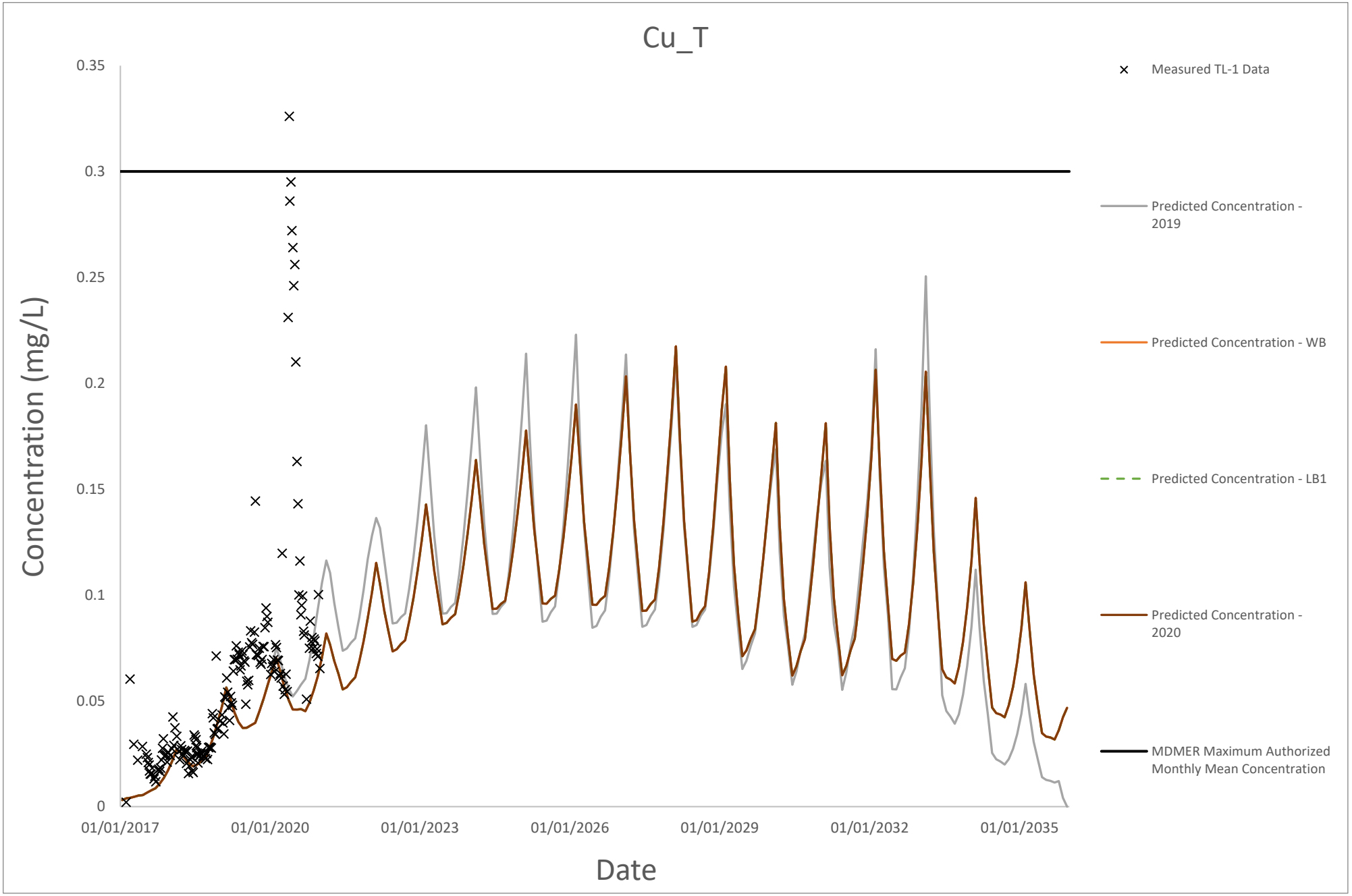
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Cu_T
Concentration (mg/L)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
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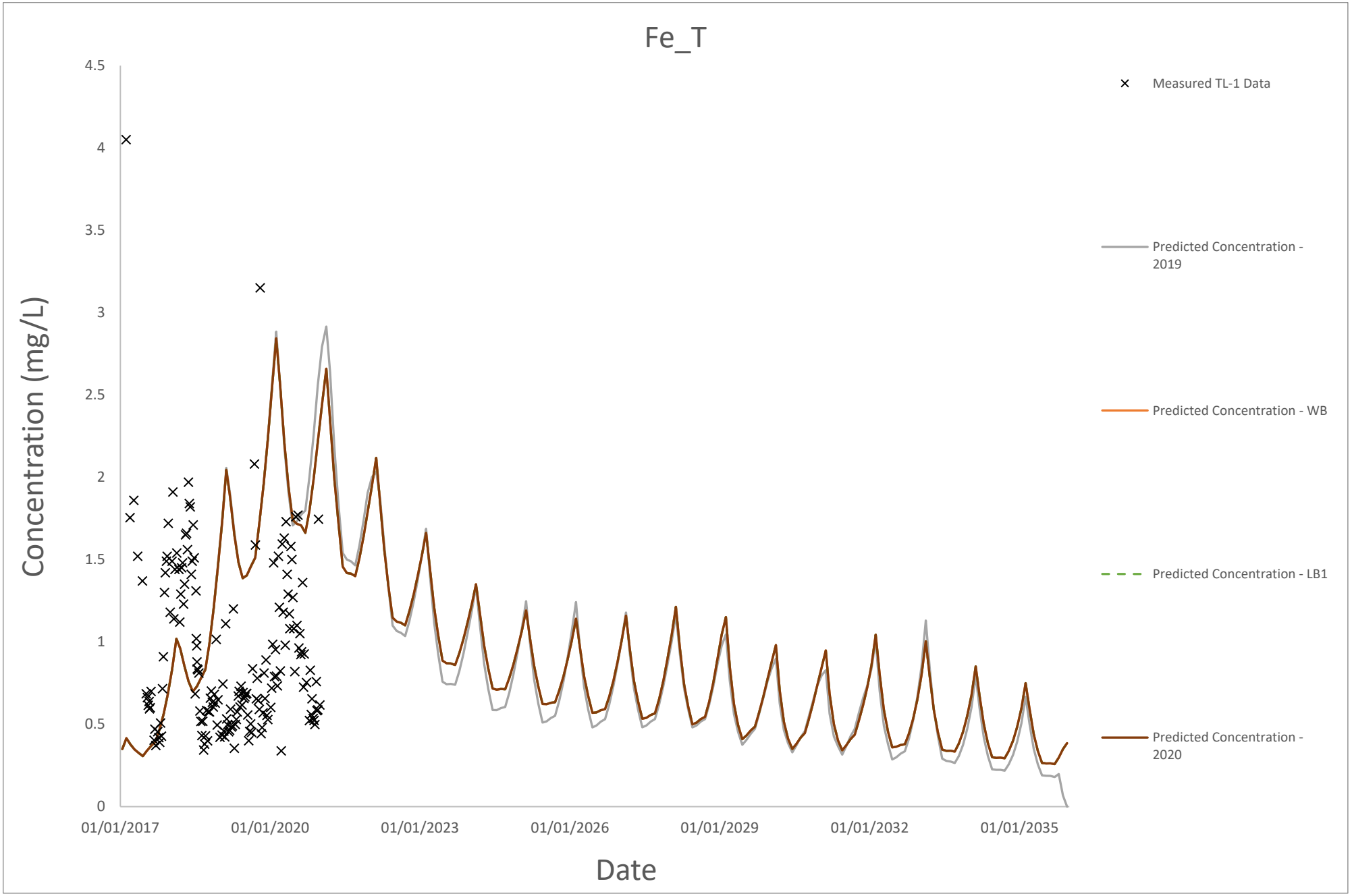
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020
MDMER Maximum Authorized Monthly Mean Concentration


Fe_T
Concentration (mg/L)
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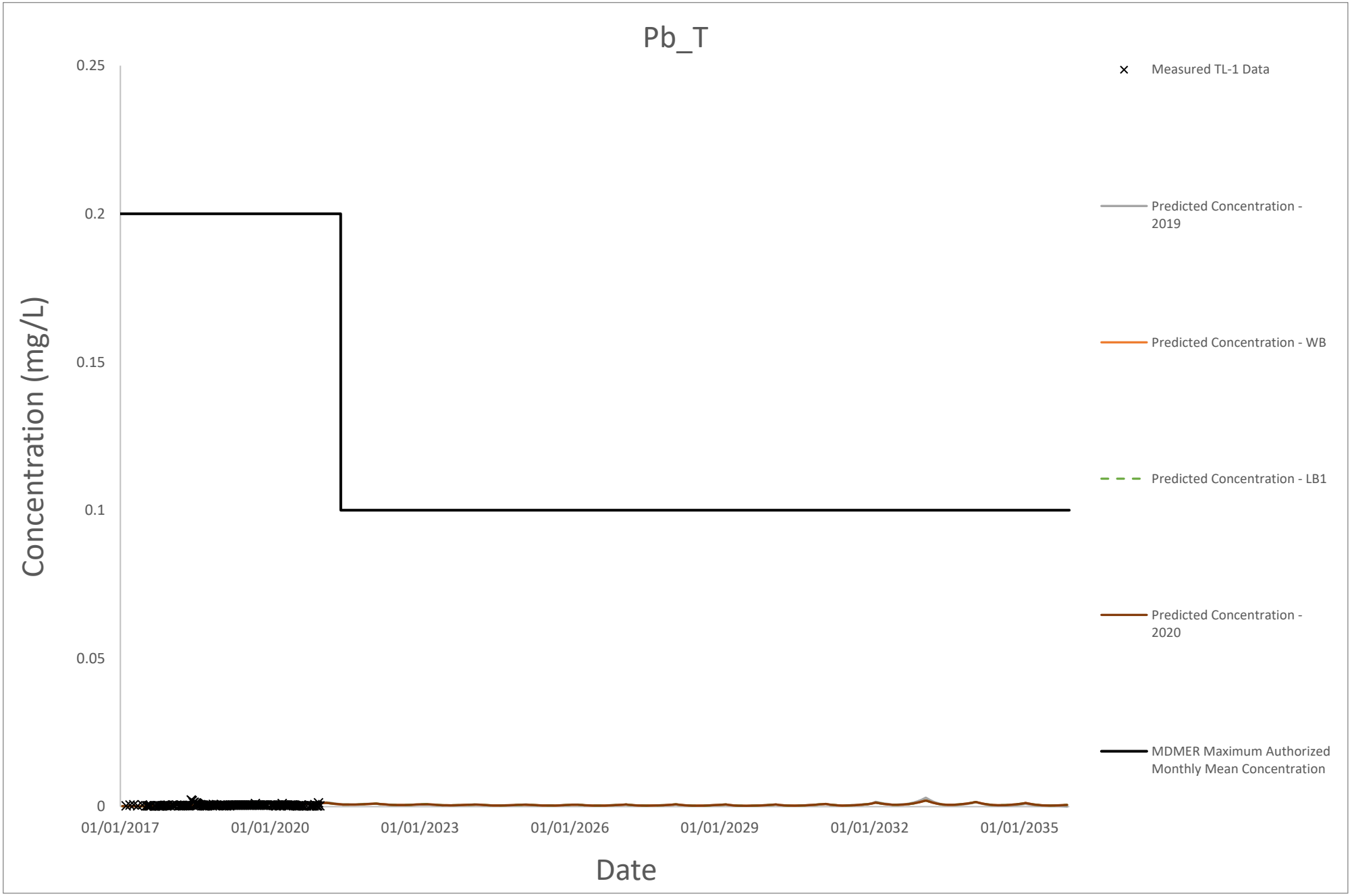
4
3.5
3
2.5
2
1.5
1
0.5
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Pb_T
Concentration (mg/L)
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0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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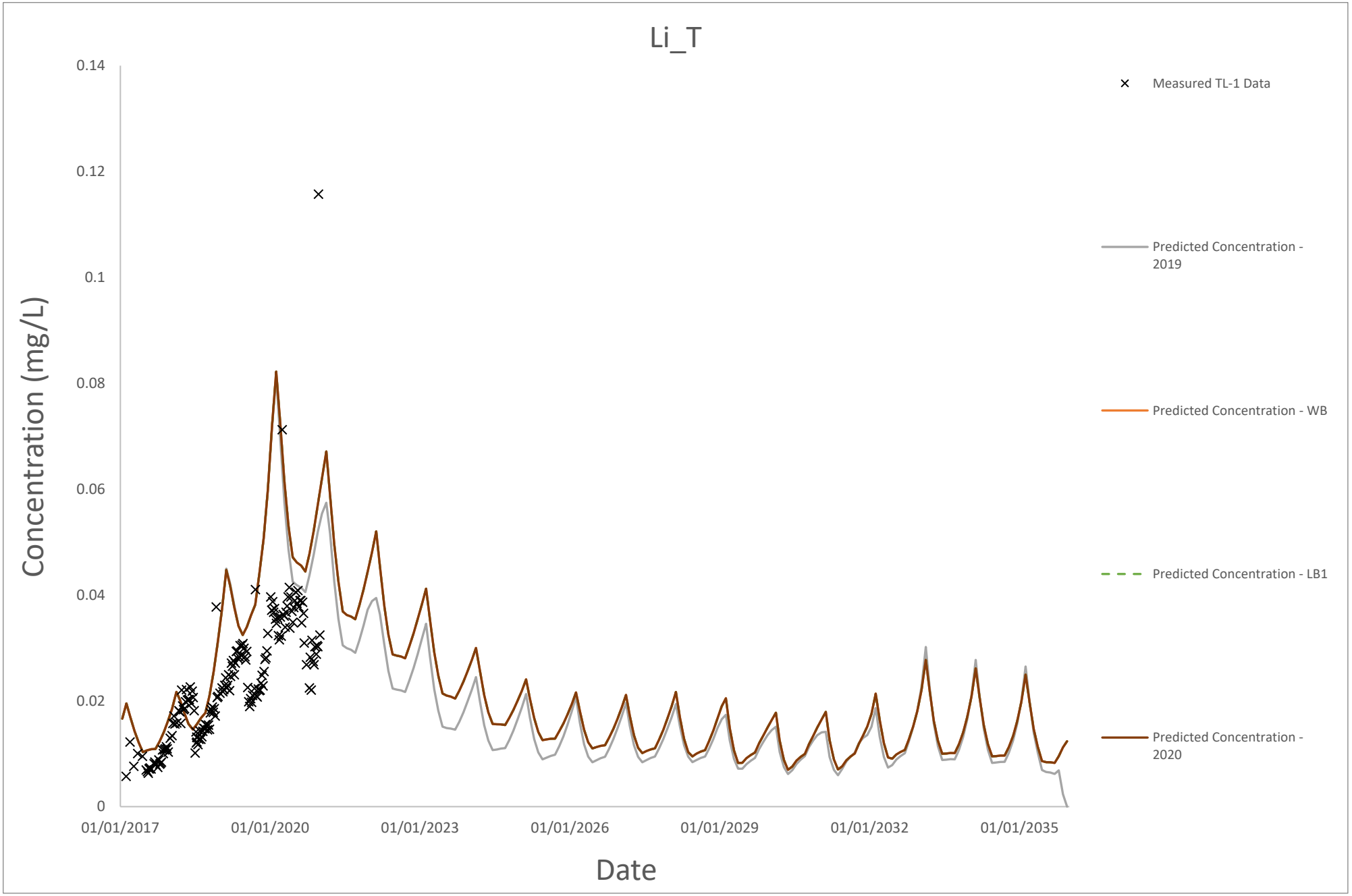
MDMER Maximum Authorized Monthly Mean Concentration


Li_T
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Concentration (mg/L)
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
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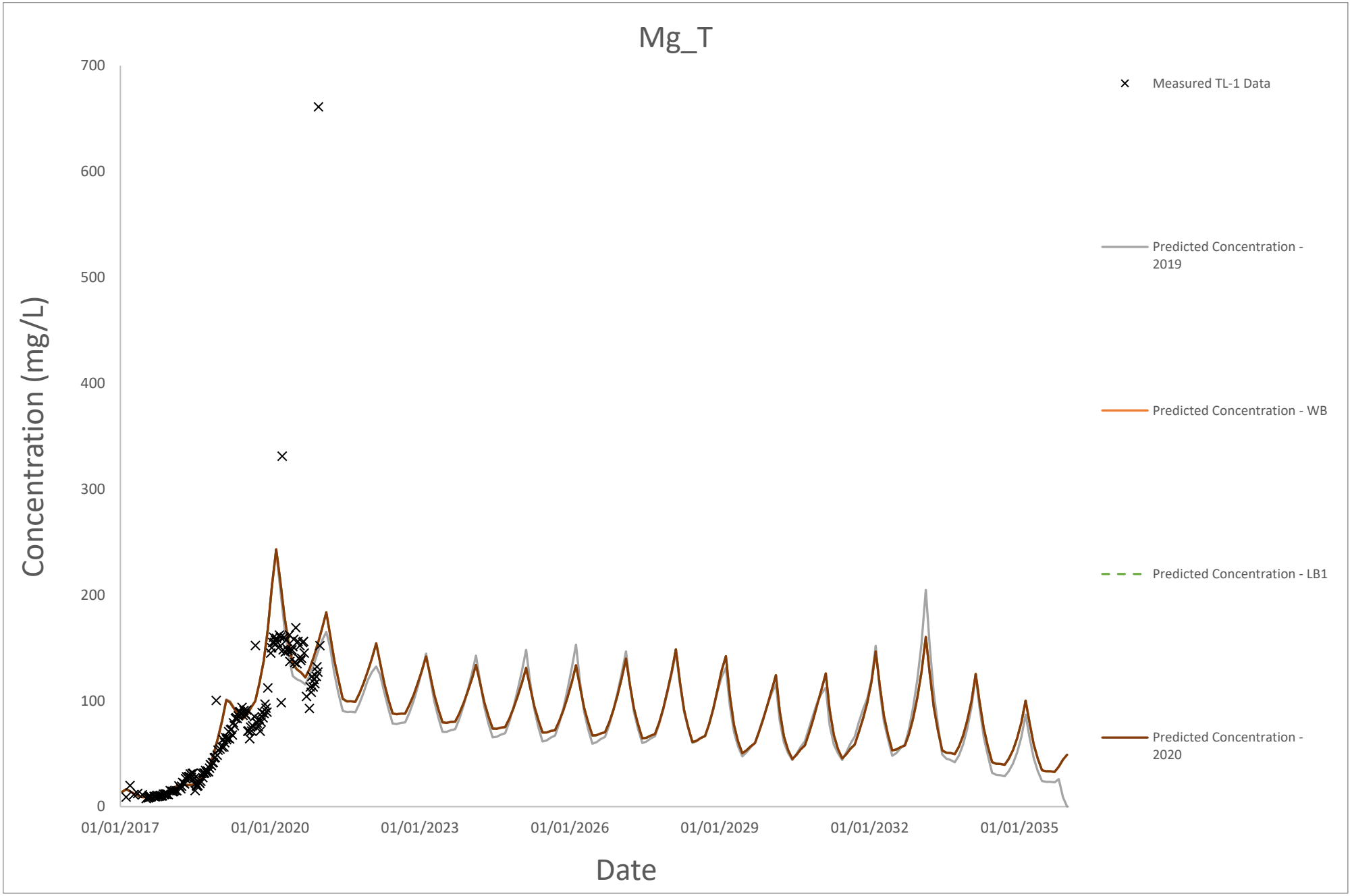
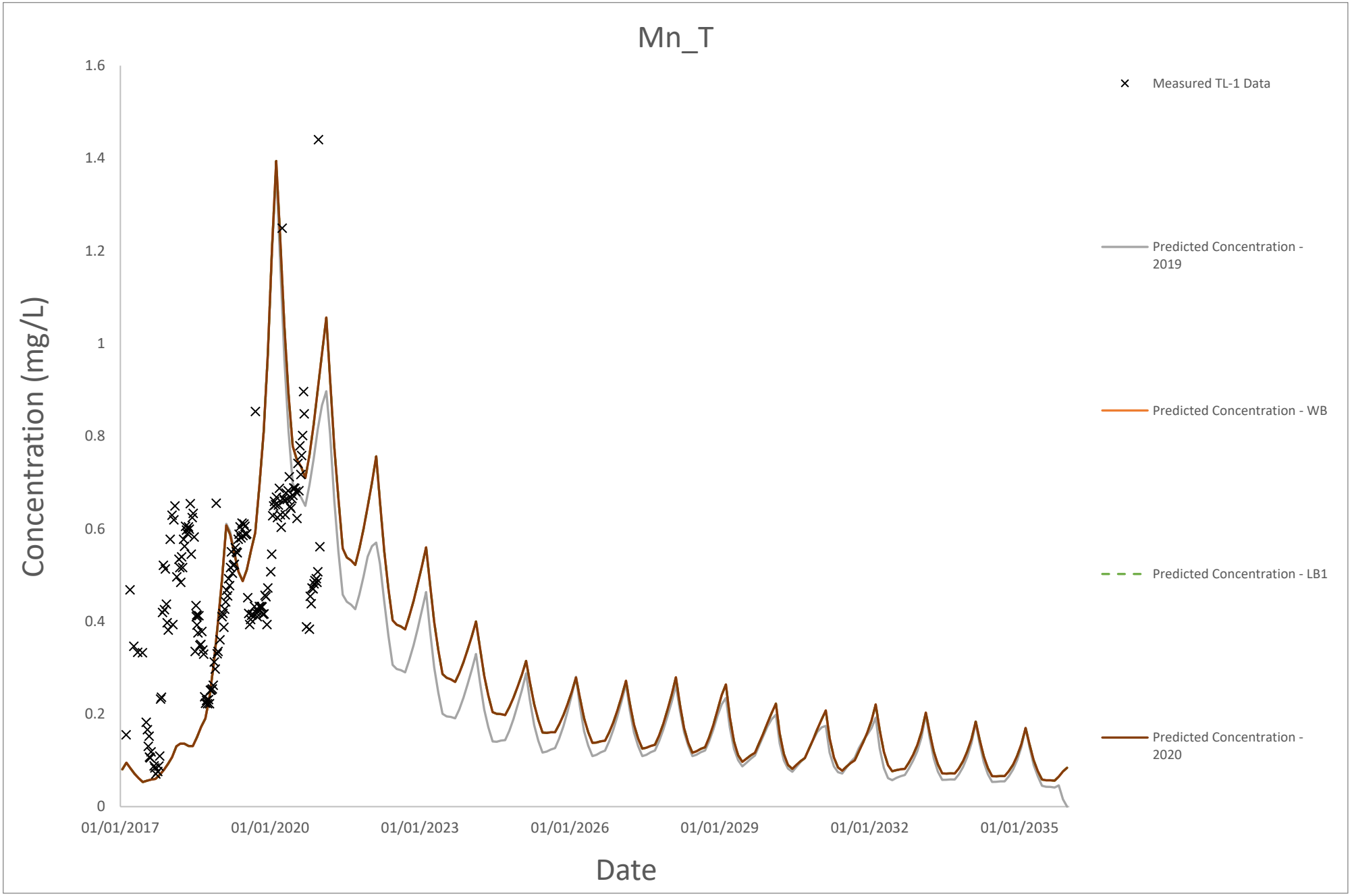
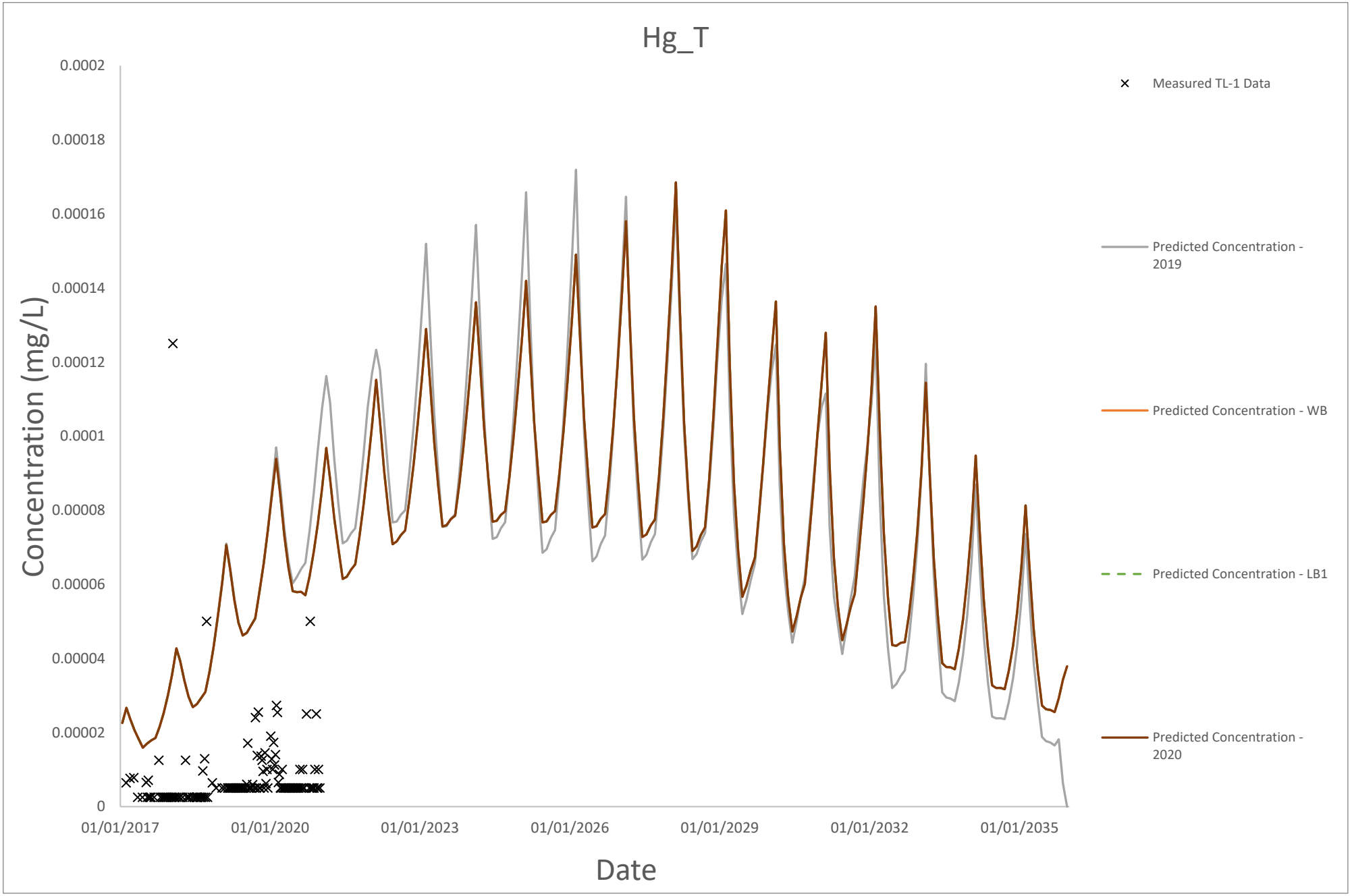
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Mg_T
Concentration (mg/L)
700
600
500
400
300
200
100
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Mn_T
Concentration (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Hg_T
Concentration (mg/L)
0.0002
0.00018
0.00016
0.00014
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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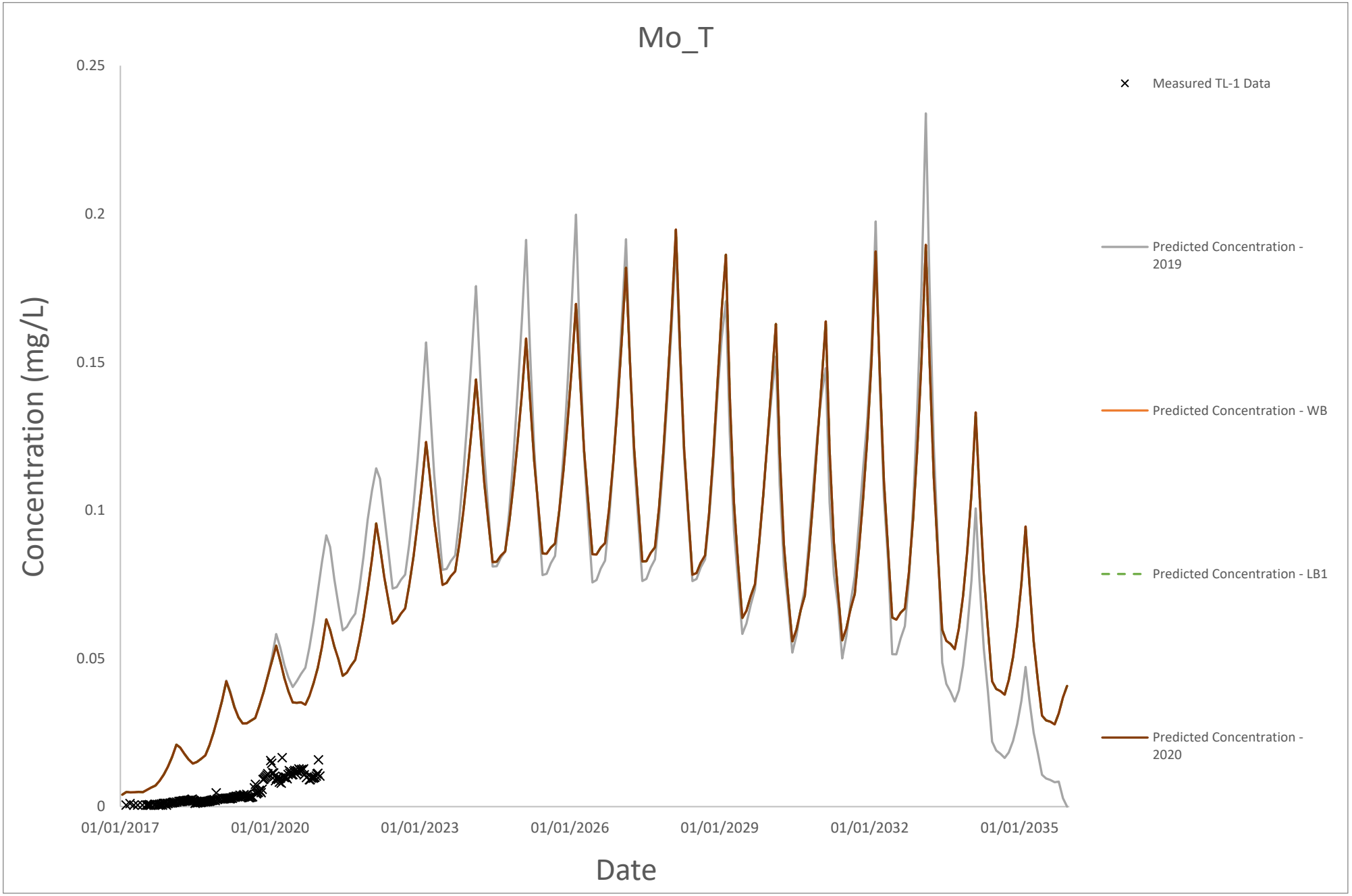
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Mo_T
Concentration (mg/L)
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
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Predicted Concentration - WB
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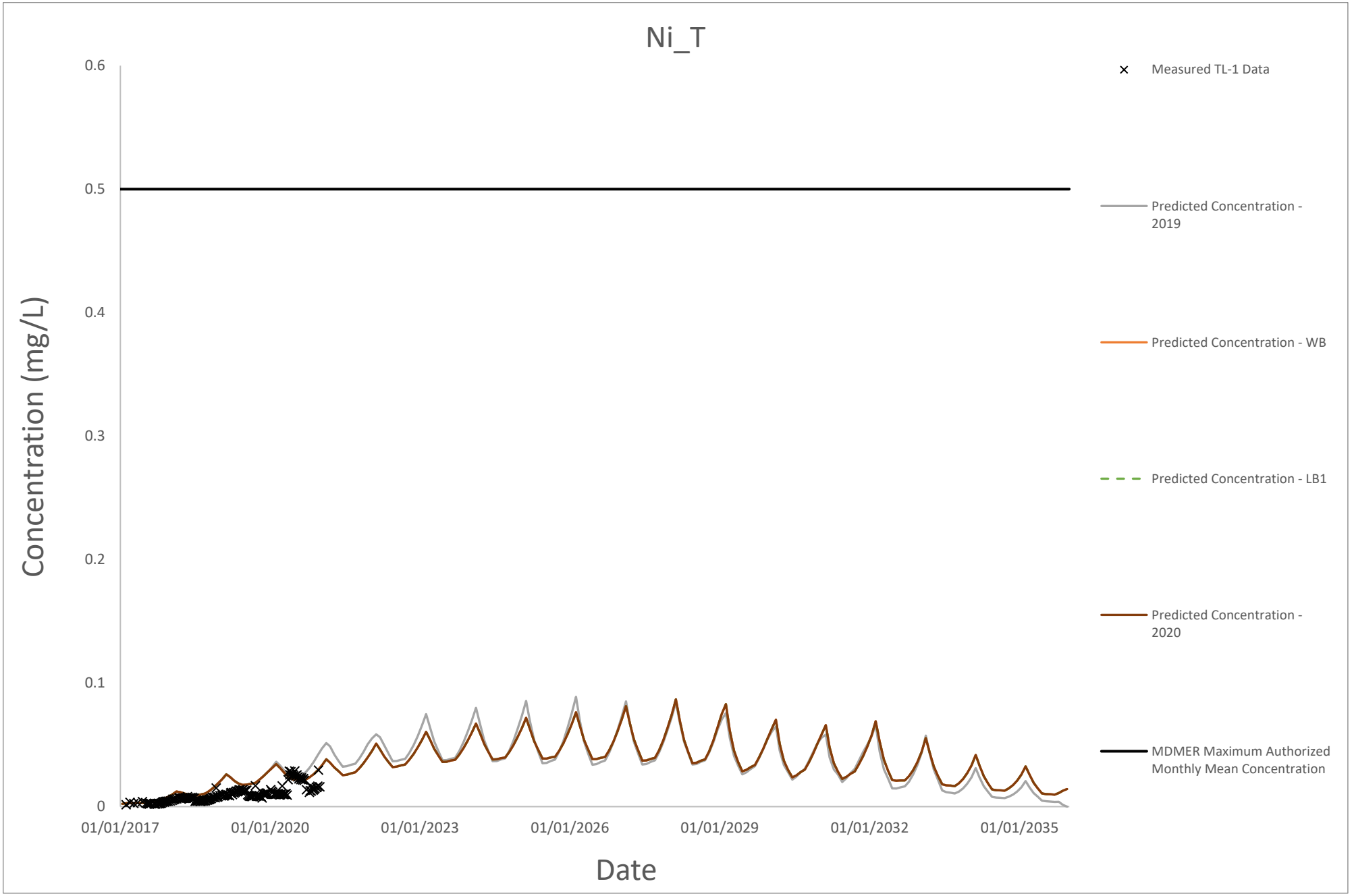
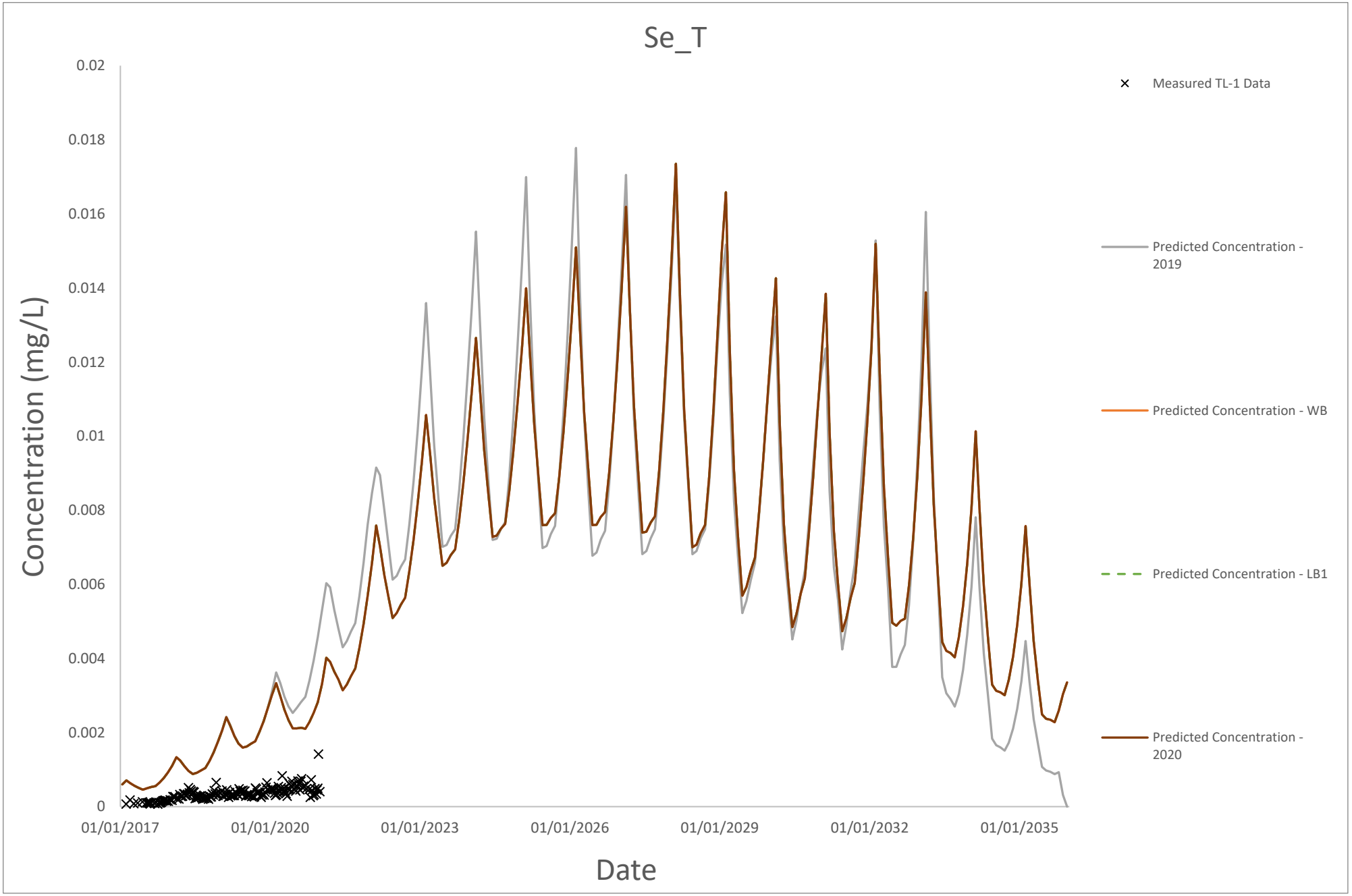

Ni_T
Concentration (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020
MDMER Maximum Authorized Monthly Mean Concentration


Se_T
Concentration (mg/L)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
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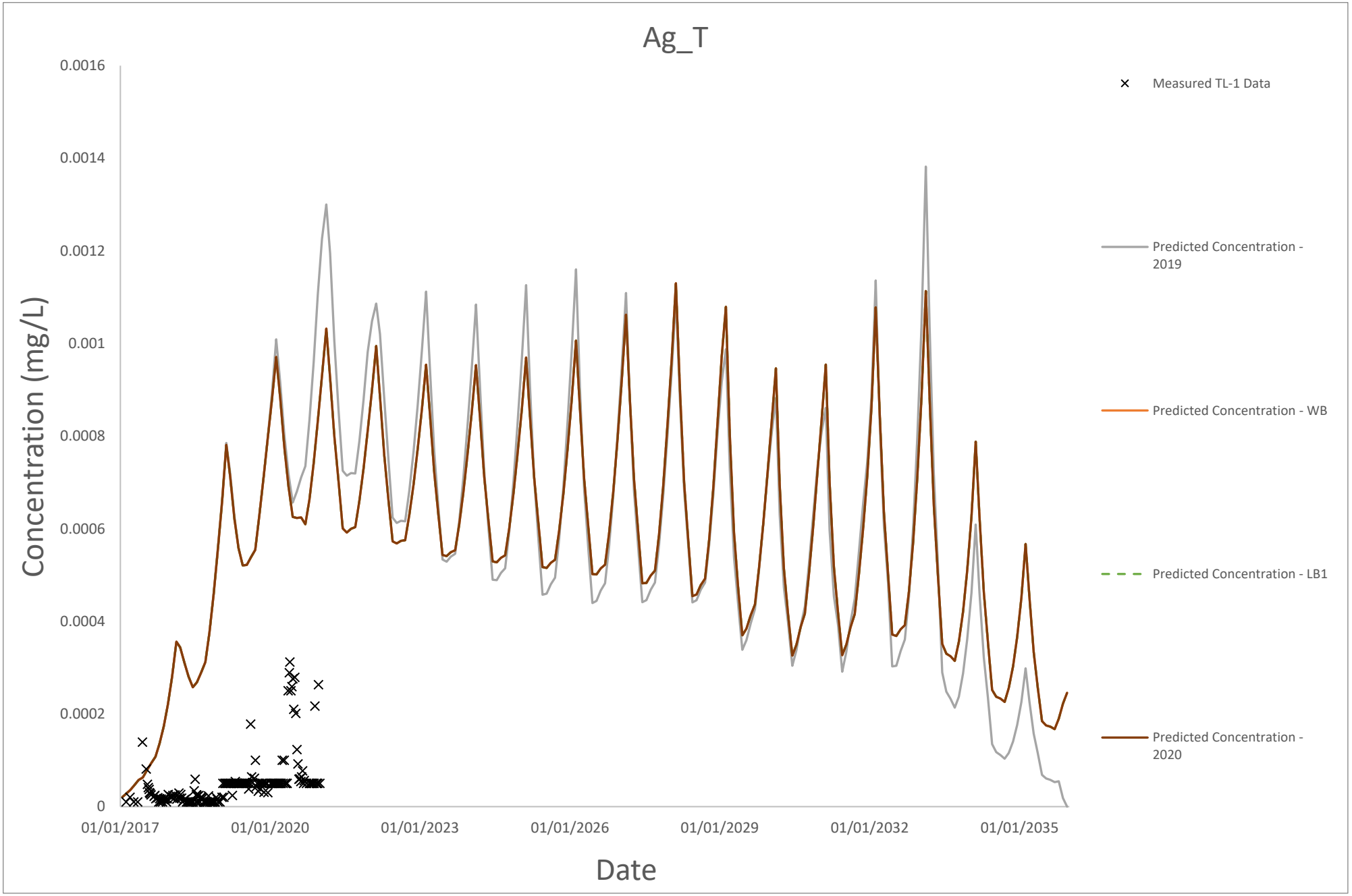
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Ag_T
Concentration (mg/L)
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
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01/01/2035
Date
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Predicted Concentration - WB
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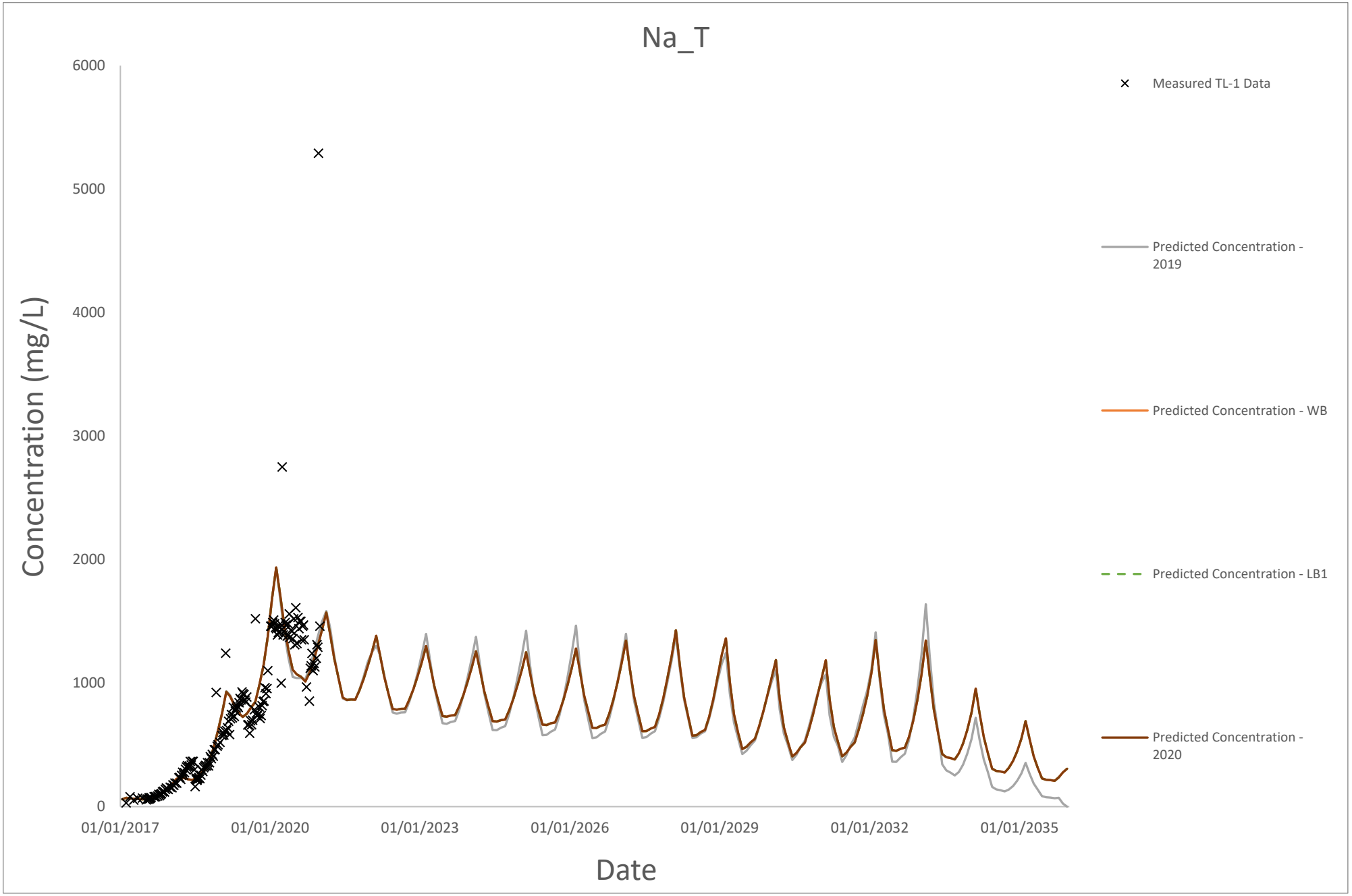
Predicted Concentration - 2020


Na_T
Concentration (mg/L)
6000
5000
4000
3000
2000
1000
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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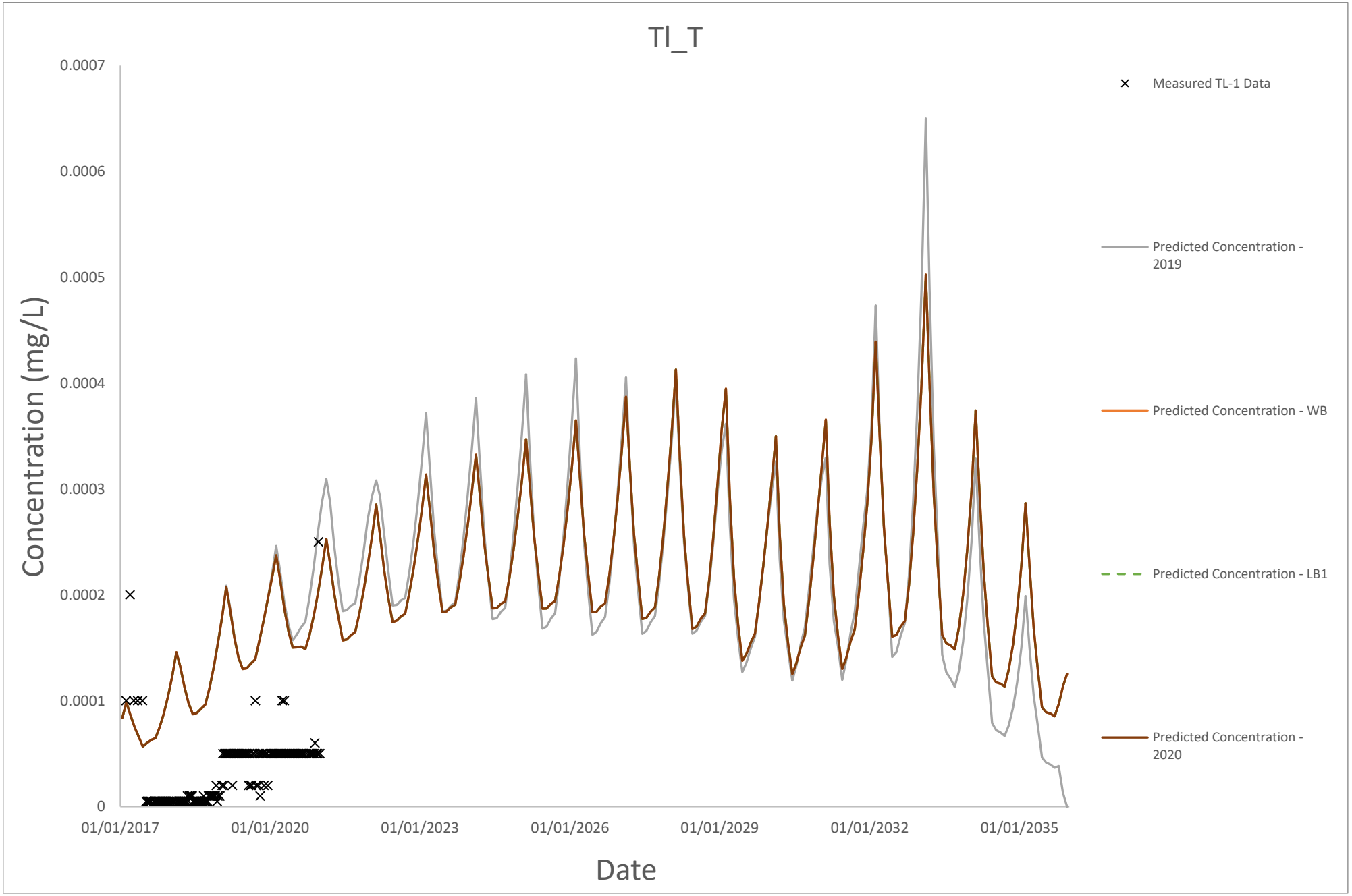
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Tl_T
Concentration (mg/L)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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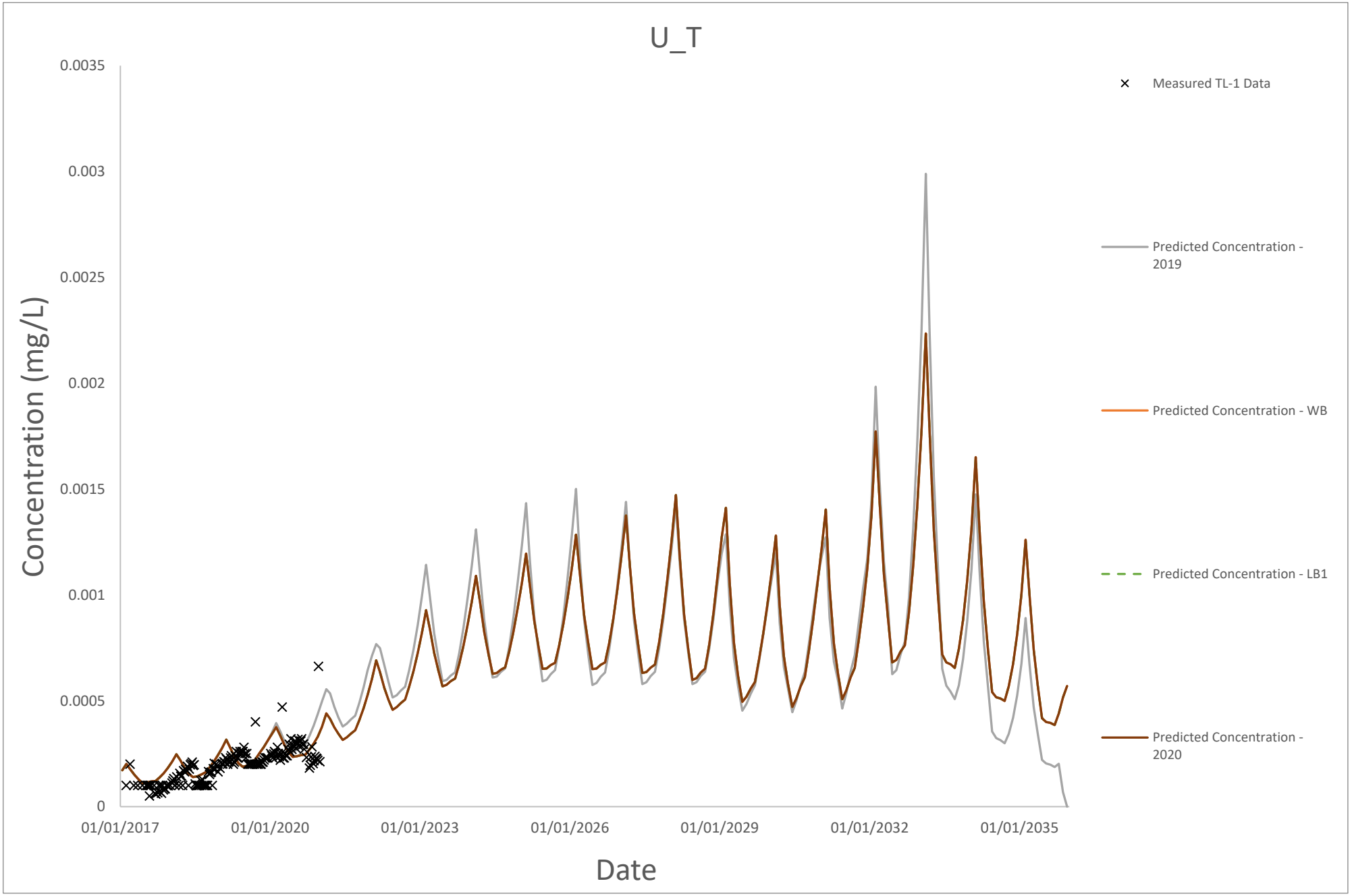
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


U_T
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Concentration (mg/L)
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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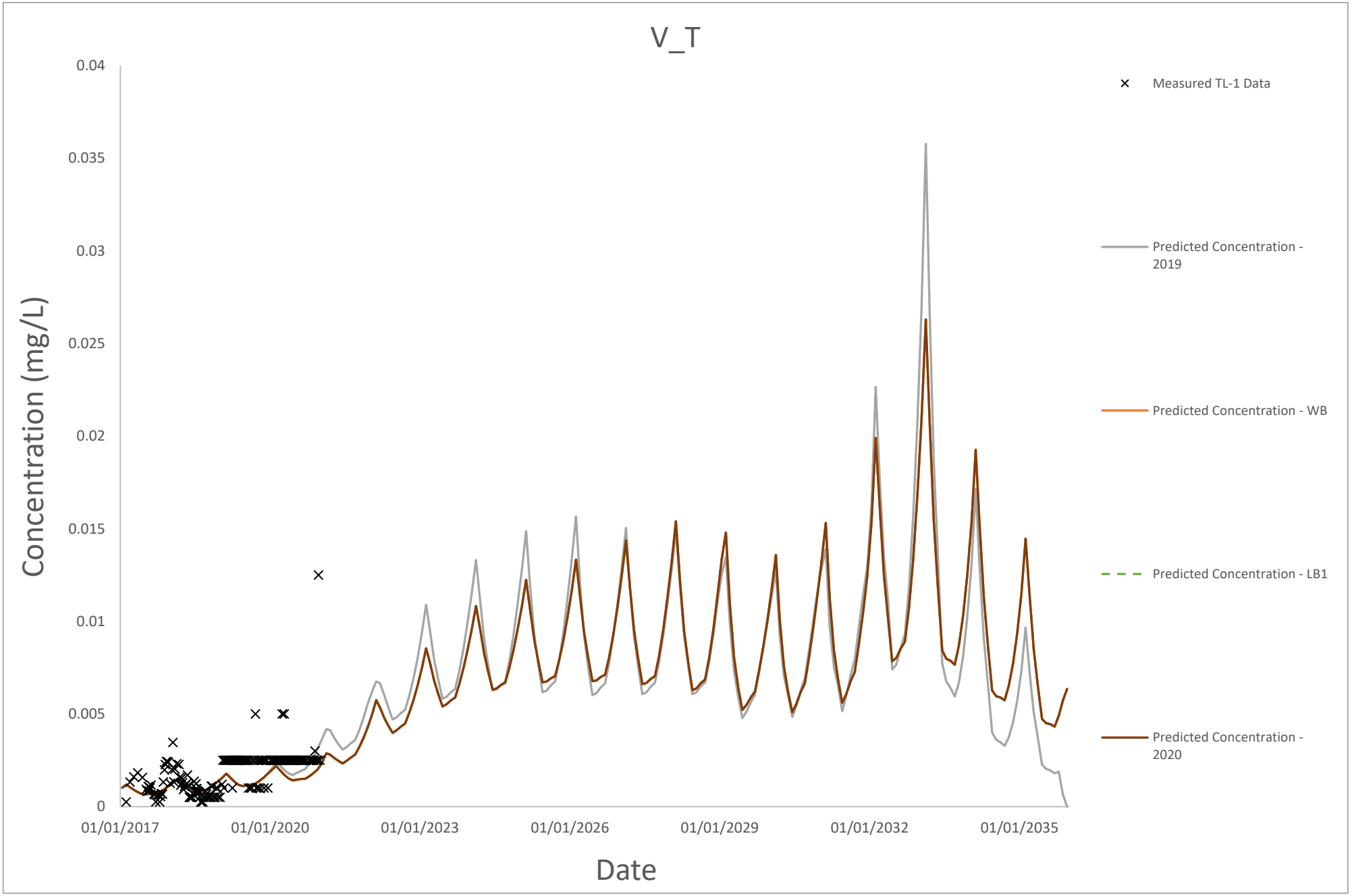
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


V_T
Concentration (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
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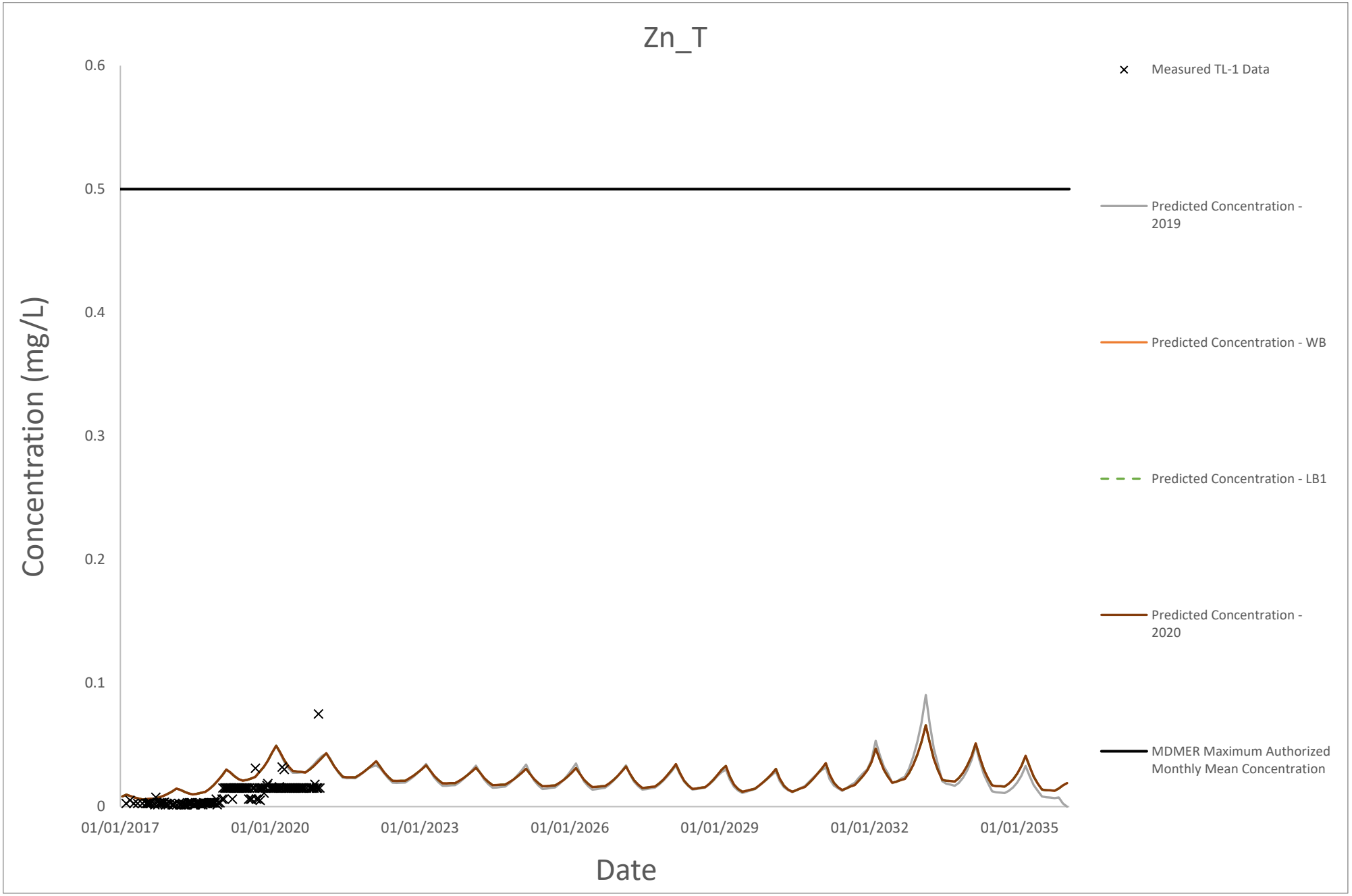
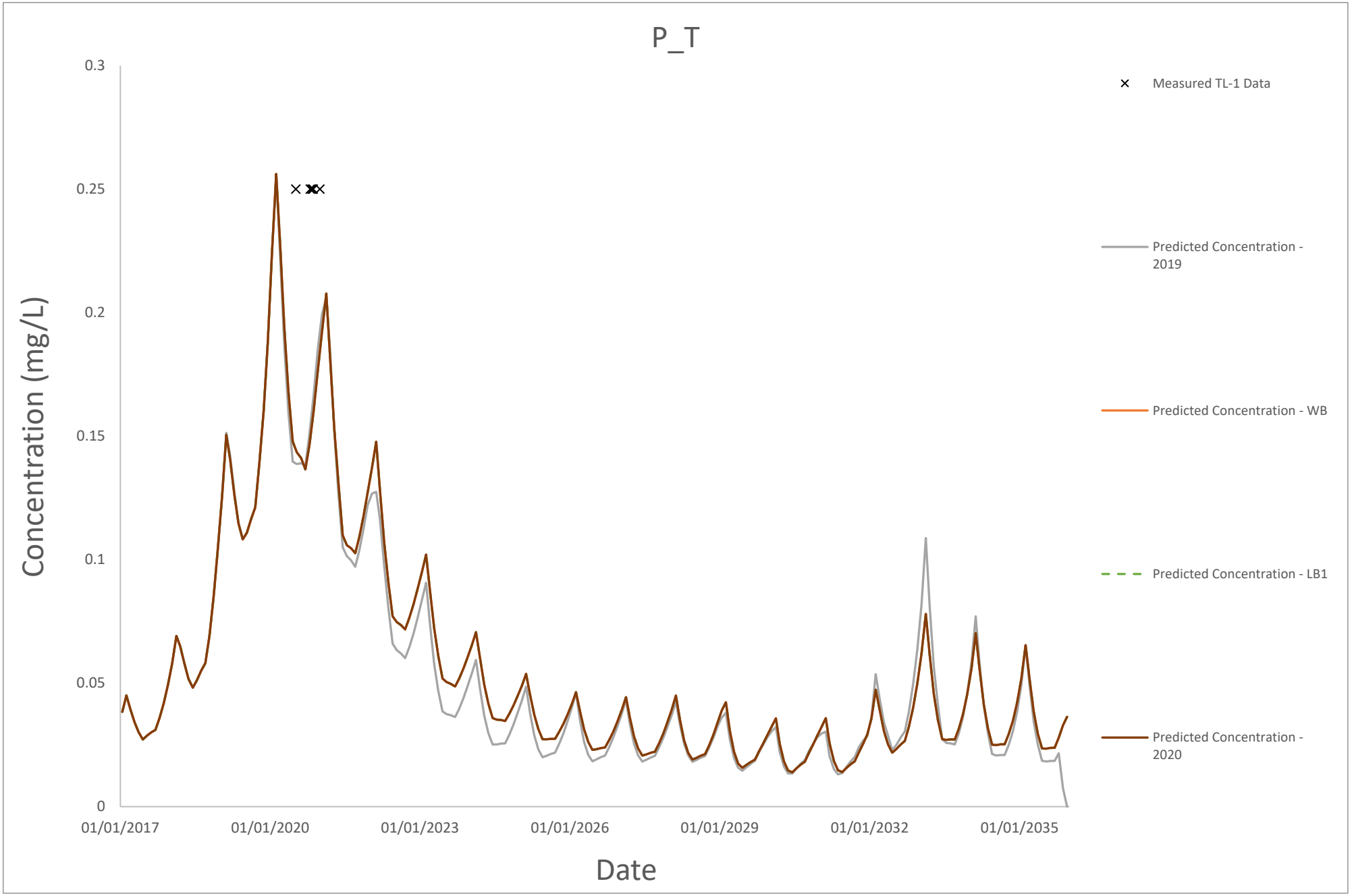
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020


Zn_T
Concentration (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020
MDMER Maximum Authorized Monthly Mean Concentration


P_T
Concentration (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
01/01/2017
01/01/2020
01/01/2023
01/01/2026
01/01/2029
01/01/2032
01/01/2035
Date
Measured TL-1 Data
Predicted Concentration - 2019
Predicted Concentration - WB
Predicted Concentration - LB1
Predicted Concentration - 2020

# Appendix F

2020 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid Mines, Hope Bay Project

AGNICO EAGLE

FINAL

# 2020 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines

Hope Bay Project, Nunavut Canada

Agnico Eagle Mines Ltd.

SRK Consulting (Canada) Inc. ▪ 1CT022.056 ▪ March 2021

srk consulting

**FINAL**

# 2020 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines

Hope Bay Project, Nunavut Canada

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**Reviewer:** Lisa Barazzuol, PGeo (NT/NU) **Initials:** LNB

**File Name:**
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# Useful Definitions

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

| | |
|---|---|
| ABA | Acid based accounting |
| ARD | Acid rock drainage |
| BV | Bureau Veritas Laboratories |
| CPR | Crown Pillar Recovery |
| CPRT | Crown Pillar Recovery Trench |
| CRM | Certified reference materials |
| EC | Electrical conductivity |
| HCT | Humidity cell test |
| LOD | Limit of detection |
| ML | Metal leaching |
| NP | Neutralization potential |
| ORP | Oxidation reduction potential |
| PCP | Pollution control pong |
| QA/QC | Quality assurance/quality control |
| SFE | Shake flask extraction |
| TDS | Total dissolved solids |
| TSS | Total suspended solids |
| WRP | Waste rock pile |

# 1 Introduction

Development of the Doris and Madrid North mine has resulted in the development of quarries, use of quarry rock and waste rock for construction of roads, pads and other infrastructure, production of waste rock from the underground mine and processing of ore resulting in flotation tailings slurry and detoxified tailings. Monitoring plans are in place to confirm metal leaching and acid rock drainage (ML/ARD) potential for quarry rock, waste rock and tailings (flotation and detoxified) are consistent with geochemical characterization studies conducted at the environmental assessment and/or water licence applications for Doris and Madrid, and to monitor the chemistry of seepage and runoff associated with these materials.

This report presents results from the 2020 waste rock, quarry, construction rock and tailings geochemical monitoring programs for Doris and Madrid North. The report is organized as follows:

- Section 2: Summary of the monitoring requirements.
- Section 3: A summary of the geological inspections and monitoring of Doris underground waste rock.
- Section 4: A summary of the geological inspections and monitoring of Madrid North waste rock.
- Section 5: A summary of the geochemical inspections and monitoring of quarry and construction rock, except for the Madrid North Portal Pad.
- Section 6: A summary of the seepage surveys around infrastructure areas and downgradient of the waste rock surface stockpiles.
- Section 7: A summary of the geochemical investigation of the Madrid North Portal Pad. This study fulfilled the annual monitoring requirements with an expanded scope to investigate the source of neutral pH metal leaching and high saline drainage as indicated by the 2020 seepage monitoring program.
- Section 8: A summary of geochemical monitoring of flotation tailings slurry and detoxified tailings solids. .
- Appendix A to F: Detailed technical memorandum for each monitoring program and the Portal Pad investigation.

# 2 Monitoring Requirements and Conformity Assessment

## 2.1 Waste Rock

### 2.1.1 Doris Mine

Monitoring plans for Doris waste rock are provided in the "*Waste Rock, Ore and Mine Backfill Management Plan, Hope Bay Project, Nunavut [WROMP]"* (TMAC 2019), which is a part of Licence 2AM-DOH1335 Amendment No. 2 (NWB 2018). The program includes inspection and geochemical monitoring of the waste rock solids from the underground mine and Doris crown pillar recovery (CPR) and routine monitoring of the pollution control pond (PCP).

A summary of the requirements of TMAC (2019) is summarized in Table 2.1.

**Table 2.1: Doris Waste Rock Monitoring Requirements and 2020 Monitoring Summary**

| Monitoring Reference | Monitoring Item | Report Section | 2020 Monitoring Summary |
|---|---|---|---|
| TMAC (2019) | Conduct waste rock geological inspections: i) underground at the blast face by TMAC geologists, with internal record keeping and ii) surface waste rock stockpile (Pad T); | Section 3.1 - Mine Backfill Monitoring; Table 3-1 – Overview of Mine Backfill Monitoring Programs and Objectives for Doris, Madrid North, Madrid South and Boston | Completed. Refer to Section 3 and Appendix A. |
| TMAC (2019) | Geochemical sampling program for CPR waste rock to confirm that it is suitable for use as construction rock: sampling frequency of one sample for every 20,000 tonnes; | Section 3.2 - Use of Waste Rock for Construction | Not applicable in 2020. |
| TMAC (2019), NWB (2018) | Monitoring and recording the volumes of waste rock mined, waste rock management designations (mineralized and non-mineralized) and placement locations, including any waste rock that is approved and used for construction (pending confirmatory test work and approval from NWB); to be reported monthly; | Section 3.1 - Mine Backfill Monitoring; Table 3-1 – Overview of Mine Backfill Monitoring Programs and Objectives for Doris, Madrid North, Madrid South and Boston | Completed. Refer to Section 3 and Appendix A. All waste rock managed as mineralized. |
| NWB (2018) | Annual water quality monitoring will be carried out at a surveillance monitoring station ST-2 located in the pollution control pond; parameters include pH, TSS, total ammonia, nitrate, nitrite, total sulphate, total cyanide, total oil and grease, alkalinity, chloride, and total metals by ICP-MS; | Schedule I - Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Appendix D of the Hope Bay Belt Project 2020 Nunavut Water Board Annual Report. |

| Monitoring Reference | Monitoring Item | Report Section | 2020 Monitoring Summary |
|---|---|---|---|
| TMAC (2019) | Annual inspections by a qualified geochemist of the designated non-mineralized areas of the waste rock pile to confirm that there are no areas with elevated amounts of sulphide mineralization, and inspections of the designated mineralized areas of the pile to look for signs of weathering and oxidation of the sulphides; representative sample set of waste rock to be collected; | Section 3.1.3 - Annual Inspections and Geochemical Characterization of Waste Rock; Table 3-1 – Overview of Mine Backfill Monitoring Programs and Objectives for Doris, Madrid North, Madrid South and Boston | Completed. Ten samples geochemically characterized from Pad T. Refer to Section 3 and Appendix A. |
| TMAC (2019) | Seep surveys along the down-gradient toe of the waste rock pile and below the pollution control ponds and access road throughout operations. The seep survey will be completed at the same time and will follow the same procedures as used for the seep survey around other infrastructure areas. However, given the increased importance of obtaining samples from this area, all distinct seeps in the immediate vicinity of the waste rock pile (i.e. any seeps spaced more than 50 metres apart) will be tested for a full suite of laboratory parameters; and | Section 3.1.4 - Seep Survey | Completed. Refer to Section 6 and Appendix D. |
| TMAC (2019), NWB (2018) | An annual waste rock monitoring report, including the results and an interpretation of the geochemical data and a summary of all mitigation activities undertaken as a result of monitoring will be prepared and submitted to the NWB by March 31 of the year following sample collection (i.e. within 6 months of collecting the final quarry samples). | TMAC (2019): Section 3.3 - Documentation and Reporting<br><br>NWB (2018): Part F - Conditions Applying to Waste Deposit and Management | Completed. Refer to Section 3 and Appendix A. |

### 2.1.2 Madrid North Mine

Waste rock monitoring at Madrid North is outlined in in *Waste Rock, Ore and Mine Backfill Management Plan* (TMAC 2019), which is a part of Licence 2AM-DOH1335 Amendment No. 2 (NWB 2018) except for waste rock from the Naartok East CPR. Geochemical monitoring of waste rock from NE CPR is documented in *Classification of Waste Rock in Support of Segregating Construction Rock from Naartok East Crown Pillar Recovery, Madrid North, Hope Bay* (SRK 2019). SRK (2019) includes a field geochemical classification method and associated criteria to identify waste rock that is non-PAG and with low potential for neutral pH arsenic leaching and recommendations for operational implementation of the field-based geochemical characterization program that identifies waste rock that is suitable for use as construction rock.

A summary of the requirements for Madrid North waste rock monitoring as outlined in SRK (2019) and TMAC (2019) is summarized in Table 2.2. Of note is that the program of geochemical sampling for Madrid North waste rock from the underground mine has been modified, with rationale outlined in Table 2.2.

**Table 2.2: Madrid North Waste Rock Monitoring Requirements and 2020 Monitoring Summary**

| Monitoring Reference | Monitoring Item | Report Section | 2020 Monitoring Summary |
|---|---|---|---|
| TMAC (2019) | Conduct waste rock geological inspection at underground blast face by TMAC geologists, with internal record keeping. | Section 3.1 - Mine Backfill Monitoring; Table 3-1 – Overview of Mine Backfill Monitoring Programs and Objectives for Doris, Madrid North, Madrid South and Boston | Completed. Refer to Section 4 and Appendix B. |
| SRK (2019) | Geological inspection and pXRF analysis of Naartok East Crown Pillar Recovery (NE CPR) drill cuttings for geochemical classification of waste rock to determine suitability of waste rock as construction rock. | Section 5 – Field Classification of Construction Rock | Completed. Refer to Section 4 and Appendix B. |
| TMAC program documented in SRK (2020) | Operational application of field based geochemical classification program of NE CPR waste rock (SRK 2019) to identify and segregate run-of-mine waste rock geochemically suitable as construction rock. | Section 3.1.1 – Field-Based Classification of Waste Rock as Construction Rock | Completed. Refer to Section 4 and Appendix B. |
| TMAC (2019), NWB (2018) | Monitoring and recording the volumes of waste rock mined and placement locations, including waste rock that is approved for use in construction (pending confirmatory test work and approval from NWB); to be reported monthly. | Section 3.1 - Mine Backfill Monitoring; Table 3-1 – Overview of Mine Backfill Monitoring Programs and Objectives for Doris, Madrid North, Madrid South and Boston | Completed. Refer to Section 4 and Appendix B. |

| Monitoring Reference | Monitoring Item | Report Section | 2020 Monitoring Summary |
|---|---|---|---|
| TMAC (2019) | Annual inspections by a qualified geochemist of Madrid North WRSA to confirm that there are no areas with elevated amounts of sulphide mineralization, and inspections of the designated mineralized areas of the pile to look for signs of weathering and oxidation of the sulphides; representative sample set of waste rock to be collected. | Section 3.1.3 - Annual Inspections and Geochemical Characterization of Waste Rock; Table 3-1 – Overview of Mine Backfill Monitoring Programs and Objectives for Doris, Madrid North, Madrid South and Boston | Completed. Refer to Section 4 and Appendix B. |
| Refer to footnotes[1] | Geochemical verification sampling program of underground waste rock with samples collected from underground mine. Sample frequency of one sample for every 20,000 t as per underground sampling program for underground mines. | -- | Completed. Refer to Section 4 and Appendix B. Sample collection frequency was 1 sample per 8,500 t. |
| TMAC (2019) | Seep surveys along the down-gradient toe of the Madrid North WRSA and below the CWP and access road throughout operations and for at least 2 years following mining and backfilling activities. The seep survey will be completed at the same time and will follow the same procedures as used for the seep survey around other infrastructure areas. However, given the increased importance of obtaining samples from this area, all distinct seeps in the immediate vicinity of the waste rock pile (i.e. any seeps spaced more than 50 metres apart) will be tested for a full suite of laboratory parameters. | Section 3.1.4 - Seep Survey | Completed. Refer to Section 6 and Appendix D. |
| NWB (2018) | Routine water quality monitoring (sampled twice annually, weekly water levels) will be carried out at a surveillance monitoring station MMS-1, located at the Madrid North CWP. | Schedule I - Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Appendix D of the Hope Bay Belt Project 2020 Nunavut Water Board Annual Report. |
| TMAC (2019), NWB (2018) | An annual waste rock monitoring report, including the results and an interpretation of the geochemical data will be prepared and submitted to the NWB by March 31 of the year following sample collection (i.e. within 6 months of collecting the final quarry samples). | TMAC (2019): Section 3.3 – Documentation and Reporting<br><br>NWB (2018): Part F – Conditions Applying to Waste Deposit and Management | Completed. Refer to Section 4 and Appendix B. |

Notes:

[1] Not in TMAC (2019). TMAC executed monitoring based on advice of SRK.

## 2.2 Quarry and Construction Rock

Details on the monitoring program for quarries and as-built construction rock for Doris and Madrid infrastructure are provided in "*Quarry Management and Monitoring Plan*" (TMAC 2017). A summary of the requirements is provided in Table 2.3.

**Table 2.3: Quarry and Construction Rock Monitoring Requirements and 2020 Monitoring Summary**

| Monitoring Item[1] | Report Section | 2020 Monitoring Summary |
|---|---|---|
| Visual inspections and sampling at the quarry face by site geologist or geochemist at least once per week when the quarries are in active use. | Section 3.1.1- Quarry Visual Inspection | Completed. Refer to Section 5 and Appendix C. |
| Collection and testing of two samples per year from each active quarry for total sulphur analysis, and, if the sulphur content exceeds 0.1%, the samples would be subjected to full ABA tests. A subset of samples will be subjected to shake flask extraction tests. The ABA tests would be done on the whole sample and on the -2mm size fraction to determine whether there is any concentration of sulphides in the fine component of the rock. | Section 3.1.3 – Quarry Rock Sampling | Completed. Refer to Section 5 and Appendix C. |
| Quarry sumps will be monitored as described under the routine site water quality monitoring program. | Section 3.1.4 – Quarry Sump Monitoring | Quarry sump monitoring was not required in 2020 because it was not necessary to discharge water from Quarry 2. |
| Visual inspection of each mined-out quarry will be completed at least once per year in order to ensure that the site remains safe and no environmental or public health and safety concerns have developed. If potentially acid generating (PAG) waste rock has been placed in the quarries, the area will be inspected to ensure that the 2 m cover remains intact and no seeps are evident. | Section 3.3.1 | Completed. PAG rock has not been placed in the quarries. |
| After construction of roads and other infrastructure components that were constructed using the quarry or waste rock since the previous inspection will be inspected by a qualified geologist or geochemist to verify that the rock used in construction was suitable for that purpose. During the inspection, samples (<1" and -2 mm fractions, when available) will be collected for total sulphur analysis. If the sulphur content exceeds 0.1%, the samples will be subjected to full ABA tests. A subset of samples will be subjected to shake flask extraction tests. | Section 3.3.2 | Completed. Refer to Section 5 and Appendix C. Section 7 and Appendix E. |
| A seep survey will be conducted around all infrastructure components that have been constructed or modified within the previous year. Field pH, electrical conductivity (EC), Eh, and temperature readings will be collected. A water sample will be collected from a minimum of 10% of the identified ephemeral seeps and will be submitted for laboratory analyses, as detailed in Quarry Management and Monitoring Plan (TMAC 2017). Established reference stations will also be | Section 3.3.2 | Completed. Refer to Section 6 and Appendix D. |

| Monitoring Item[1] | Report Section | 2020 Monitoring Summary |
|---|---|---|
| monitored to provide basis for comparing this to waters that are not influenced by the development activities. | | |
| An annual quarry monitoring report, including the results and an interpretation of the geochemical data will be prepared and submitted to the NWB by March 31 of the year following sample collection (i.e. within 6 months of collecting the final quarry samples). | Section 4 – Documentation and Reporting | Completed. Refer to Section 5 and Appendix C. Section 7 and Appendix E. |

Notes:

[1] Monitoring program outlined in TMAC (2017).

## 2.3 Tailings

The geochemical monitoring program for flotation tailings slurry and detoxified tailings are specified in Schedule I, Tables 1 to 3 of NWB Type A Water Licence 2AM-DOH1335 Amendment No. 2 (the "Water Licence", Nunavut Water Board 2018) and includes the following monitoring stations: process plant tailings water discharge (TL-5), flotation tailings solids (TL-6), detoxified tailings solids[1] (TL-7A), detoxified tailings supernatant (TL-7B) and seepage from underground backfilled stopes (TL-11). Station TL-7B was added to the Water Licence (NWB 2018) and monitoring commenced in 2019. A summary of the monitoring requirements is summarized in Table 2.4.

**Table 2.4: Tailings Monitoring Requirements and 2020 Monitoring Summary**

| Monitoring Item | Report Section | 2020 Monitoring Summary |
|---|---|---|
| Sampling of the supernatant from flotation tailings slurry discharge (TL-5) once per month for the analysis of pH, TSS, ammonia, nitrate, nitrite, sulphate, cyanide (WAD, free and total), and total metals by ICP-MS. Cyanate and thiocyanate should be analyzed quarterly. | Schedule I – Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Section 8 and Appendix F. |
| Maintain monthly records of tonnages and locations of disposal for flotation tailings (TL-6) discharged into the TIA and detoxified tailings (TL-7A) placed in the underground mine in stopes as backfill. | Schedule I – Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Section 8 and Appendix F. |
| Analysis of a homogenized monthly composite sample of flotation tailings solids (TL-6), from equal amounts of weekly samples, for total sulphur, sulphate sulphur, TIC and trace element content. | Schedule I – Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Section 8 and Appendix F. |
| Monthly sampling and analysis of detoxified tailings solids (TL-7A) for moisture content[1]. | Schedule I – Conditions Applying to General and Aquatic Effects | Completed[1]. Refer to Section 8 and Appendix F. |

[1] Detoxified tailings are referred to as cyanide leach residue in the Water License and prior to 2019 was monitored as station TL-7.

| Monitoring Item | Report Section | 2020 Monitoring Summary |
|---|---|---|
| | Monitoring; Table 3 – Monitoring Program | |
| Monthly sampling and analysis of detoxified tailings filtrate (TL-7B) for total metals by ICP-MS (including sulphur), TIC[2], WAD cyanide, cyanate and thiocyanate. | Schedule I – Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Section 8 and Appendix F. |
| Bi-annual seepage surveys of underground backfilled stopes with opportunistic sampling of seepage (TL-11) for the analysis of pH, electrical conductivity (EC), trace metals by ICP-MS, alkalinity, acidity, sulphate, cyanide (WAD, free, and total), total ammonia, nitrate and nitrite. | Schedule I – Conditions Applying to General and Aquatic Effects Monitoring; Table 3 – Monitoring Program | Completed. Refer to Section 8 and Appendix F. |
| Preparation of an annual tailings monitoring report to be submitted to the NWB by March 31 of the year following sample collection and including the results and interpretation of the geochemical data for tailings solids (TL-6, TL-7A, TL-7B), and results and interpretation of seepage data from the bi-annual underground seepage survey of backfilled stopes (TL-11). | Schedule B – General Conditions | Completed. Refer to Section 8 and Appendix F. |

Notes:

[1] A full geochemical characterization of TL-7A is required to validate geochemical characterization of tailings and the project closure planning, therefore, TMAC conducts monthly sampling and full analysis of the detoxified tailings solids (TL 7A) including moisture content, total sulphur, sulphate sulphur, TIC and trace element content.

[2] Total Inorganic Carbon (TIC) is specified as a requirement for the filtrate analysis of TL-7B in the Water Licence however this is not an analytical parameter for aqueous samples but is analyzed for detoxified tailings solids (TL-7A).

# 3 Monitoring of Doris Waste Rock Geochemistry

Full details of the 2020 Doris waste rock monitoring program are presented in Appendix A. Data are presented in Tables 3-1 to 3-4 of Appendix A.

## 3.1 Overview of Waste Rock Production and Placement

In April 2015, TMAC re-initiated underground mining at Doris, with placement of waste rock on surface commencing in October 2015. In 2020 a total of 106,890 t of waste rock was produced from mining activities in the Doris mine; this material was kept underground and used as backfill. In addition, approximately 68,699 t of waste rock was removed from the surface waste rock stockpile on Pad T and placed as backfill in stopes of the Doris mine (Table 3-1). At Doris Crown Pillar Recovery Trench (CPRT) mining ceased and placement of backfill was completed in 2019.

**Table 3-1: Summary of 2020 Waste Rock Placement Locations and Volume, Doris Mine**

| Doris Mine | Source Location | Placement Location | Volume (t) | Total (t) |
|---|---|---|---|---|
| Underground | Underground | Backfill in Stopes | 106,890 | 175,789 |
| | | Pad T | 0 | |
| | Pad T | Backfill in Stopes | 68,899 | |

## 3.2 Doris Underground Mine

### 3.2.1 Geological Inspections

Waste Rock, Ore and Mine Backfill Management Plan (TMAC 2019) outlines two types of waste rock inspections: routine underground geological inspections at the blast face by site geologists and annual inspection of the surface waste rock stockpile on Pad T.

#### Underground Mine

Underground geological inspections were conducted by at the working face by TMAC geologists. The data were recorded in geological inspection logs and maps. aste rock intersected by the Doris underground workings in 2020 was geologically described as 95% mafic volcanics with trace sulphide and 1-2% quartz-carbonate veining; 4% sericite altered mafic volcanics with trace sulphide and 2-5% quartz-carbonate veining; and 1% diabase dyke with trace to 1% sulphide and trace quartz-carbonate veining.

#### Waste Rock Stockpile (Pad T)

SRK completed an inspection of the underground waste rock placed in the stockpile on Pad T in September 2020. SRK inspected accessible waste rock on the surface over the entirety of Pad T, examining rock types and the presence of sulphide and carbonate content. At the time of the inspection, TMAC geologists indicated that the stockpile had been reworked prior to the inspection which resulted in waste rock placed in 2020 being mixed with waste rock placed in previous years. The waste rock observed on Pad T was a mixture of approximately 90% chloritic green mafic metavolcanics (1a), 9% light tan colored sericite altered mafic metavolcanics (1as), and <1% white quartz veins (12q).

### 3.2.2 Sampling and Testing Programs

#### Waste Rock Stockpile (Pad T)

SRK collected six samples with sample distribution according to the rock types visually identified by SRK during the stockpile inspection and also the proportion of rock types that were intersected by mining, as provided by TMAC geologists.

Each sample consisted of a sieved coarse fraction (screened to -1 cm) and a finer fraction (screened to -2 mm) for rinse tests. SRK visually described the samples for rock type, sulphide content (quantity, type and occurrence) and carbonates (fizz test with 10% HCl, type, and occurrence). SRK shipped samples to Bureau Veritas (BV) in Burnaby, BC for analysis of acid base accounting and elemental analysis on the coarse fraction. Three samples were selected by SRK for shake flask extraction (SFE) testing based upon the low, medium and high values of rinse EC.

### 3.2.3 Results

#### Waste Rock Stockpile (Pad T)

As part of the TMAC (2019) waste rock monitoring program, SRK collected six samples (five of mafic metavolcanics (1a) and one of altered mafic metavolcanics (1as)) from the surface waste rock stockpile on Pad T. The results are summarized as follows:

- For mafic metavolcanics samples (1a), total sulphur ranged from 0.14 to 0.77% and median levels of 0.24%. TIC and Modified NP content was high ranging from 187 to 259 kg $CaCO_3$ eq/tonne and 177 to 798 kg $CaCO_3$ eq/tonne, respectively. All samples were classified as non-PAG on the basis of TIC/AP and NP/AP.
- The one sample of altered mafic metavolcanics (1as) had a total sulphur content of 0.24%. TIC and Modified NP content was 295 and 172 kg $CaCO_3$ eq/tonne, respectively. The sample was classified as non-PAG on the basis of TIC/AP and NP/AP.
- Trace element content was below the screening criteria for all samples with the exception of arsenic in one and sulphur in three mafic metavolcanics (1a) samples. Total metal concentrations

for all other samples were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment.

- SFE tests for the altered mafic metavolcanics (1as) waste rock had alkaline pH (8.5-9.0 s.u.). Nitrate concentrations and chloride values were lower than previous years, ranging from 0.8 to 18 mg/L and 7.4 to 124 mg/L respectively. In comparison in 2019 nitrate ranged from 140 to 170 mg/L and chloride ranged from 180 to 490 mg/L. The decreasing concentrations suggest the continuous flushing of residual explosives and drilling brines from waste rock.

The Type A waste rock sample set (SRK 2015a) represents the geochemical characteristics of the altered mafic metavolcanic (1as) waste rock sample collected in 2020. Sulphur and arsenic content of the mafic metavolcanic (1a) samples collected from Pad T in 2020 were more comparable to the CPR waste rock than the underground waste rock.

The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the waste rock and ore stockpile area and routine monitoring of the Pollution Control Pond (PCP). The results of the seepage survey are reported in Section 6 and Appendix D, while results of the routine monitoring program are included in monthly water quality reports prepared by TMAC and submitted to the Nunavut Water Board.

# 4 Monitoring of Madrid North Waste Rock Geochemistry

Details of the 2020 geochemical mentoring program for Madrid North waste rock are presented in Appendix B as an addendum to this report. Sample locations are presented in Figure 4-1 of Appendix B and data is presented in Table 2-3, Table 3-4 to 3-5, Table 4-1, and Tables 4-3, to 4-6 of Appendix B.

## 4.1 Overview of Waste Rock Production and Placement

TMAC initiated mining at Madrid North in 2019, initially with development of the Naartok East Crown Pillar Recovery (NE CPR) in July 2019 followed by development of the decline for the underground mine in December 2019. Mining at Madrid North was halted at the end of March 2020 due to the Covid-19 global pandemic. Mining of the underground in 2020 resulted in the production of approximately 17,158 t of waste rock that was placed on the Madrid North waste rock storage area (WRSA, Table 4-1). Mining of the NE CPR in 2020 resulted in the production of approximately 93,289 t of waste rock, of which approximately 83,968 t was placed on the Madrid North WRSA and the balance was used for construction (Table 4-1).

**Table 4-1: Summary of 2020 Madrid North Waste Rock Volumes and Placement Locations**

| Source | Placement Location | 2020 Volume (t) |
|---|---|---|
| **Material to Madrid North WRSA** | | |
| NE CPR | Madrid North WRSA | 83,968 |
| Underground Mine | Madrid North WRSA | 17,158 |
| **Waste Rock Used in Construction** | | |
| NE CPR | NE CPR | 749 |
| | Madrid Shop Laydown | 1,172 |
| | Overburden Dump | 7,400 |
| **Total** | | **110,447** |

## 4.2 Madrid North Underground Mine

### 4.2.1 Methods

#### Geological Inspections

Protocols for geological inspections are documented in TMAC (2019). TMAC site geologists inspect and document the fronts and back of the blast face and maintain internal records of these inspections. Waste rock from the underground placed on the Madrid North WRSA may be inaccessible due to and/or indistinguishable from NE CPR waste rock. Accordingly, geochemical sample collection of underground waste rock is conducted prior to placement on the WRSA. The geochemical sampling

and testing frequency of the underground waste rock is a minimum of one sample per 10,000 tonnes of rock; in 2020 TMAC submitted two samples two samples of mafic metavolcanics (1a) material to Bureau Veritas (BV) in Burnaby, BC for ABA and elemental analysis, which meets the sampling density requirements.

### 4.2.2 Results

In 2020, 17,100 t of waste rock was produced from the decline and placed on the Madrid North waste rock storage area (WRSA). Based on TMAC's geological inspections of the underground, the majority (99%) of waste rock was geologically logged as mafic metavolcanics (1a) and minor (1%) quartz-carbonate veining. TMAC collected two samples of waste from the underground mine for the purposes of geochemical classification. Samples were collected directly from the underground to generate a data set specific to this mine because waste rock from the underground and NE CPR are both managed at the WRSA where the rock types can be indistinguishable.

The samples of underground waste rock were mafic metavolanics (1a) characterized by low sulphur content (0.19 and 0.23%) and levels of Modified NP and TIC between 85 and 273 kg CaCO3/t. Both samples were classified as non-PAG. Arsenic content (49 ppm) was enriched in one sample compared to the screening criterion. All other parameters were below the screening criteria suggesting no appreciable enrichment.

## 4.3 Naartok East CPR

### 4.3.1 Methods

#### Field-Based Classification of Waste Rock as Construction Rock

TMAC collected samples for pXRF analysis for the purposes of geochemical classification of construction rock. For each blast round, the blast hole sample density was determined by TMAC. In 2020, 25% of blast holes were sampled for each blast round and increased to 50% when close to the ore contact. For each blast hole sample, TMAC collected one sample representing the length of each blast hole. The pXRF program was managed and executed by TMAC according to SRK (2019). In total, the pXRF program for NE CPR waste rock included geological descriptions and analysis of the -2 mm fraction of 1,000 samples of drill cuttings from 1,000 holes representing 21 blast rounds.

#### Waste Rock Segregation Program

Based on the geochemical classifications of samples collected from the surveyed blast holes, TMAC geologists defined a dig line boundary to delineate geochemical management units, e.g. waste rock that was geochemical suitable for use as construction rock (denoted as green dots in Figure 4-1) from waste rock that was determined to have a risk of ML/ARD (denoted as red dots in Figure 4-1). TMAC geologists defined the dig line boundary conservatively such that material not suitable for construction was not mixed with material designated for use in construction. For example, as shown in Figure 4-1A, for blast rounds containing "red" material that could be operationally segregated from "green" waste

rock, the dig line boundary included a 2 to 2.5 m buffer of suitable material was incorporated into the block of the unsuitable “red” material. Alternatively, if unsuitable waste rock could not be operationally segregated from suitable waste rock or the blast itself resulted in too much intermixing, the entire blast was considered not suitable for construction.

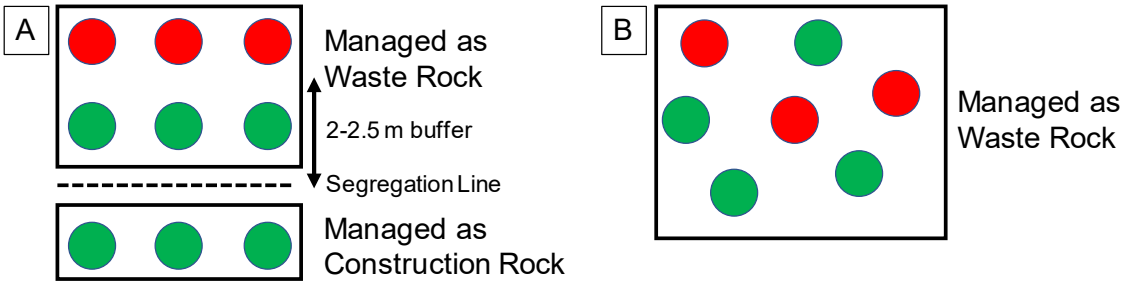



**Figure 4-1: Examples of dig limit boundaries for a blast round containing waste rock that is suitable (green dots) and not suitable (red dots) for construction when (A) green and red dots are operationally segregated and (B) are intermixed.**

### 4.3.2 Results

Using the document *Classification of Waste Rock in Support of Segregating Construction Rock from Naartok East Crown Pillar Recovery, Madrid North, Hope Bay* (SRK 2019), TMAC developed and executed a program of waste rock geochemical monitoring, classification and segregation to identify NE CPR waste rock that was geochemically suitable for construction. SRK (2019) outlines criteria and field-based methodology using portable XRF (pXRF) to classify waste rock samples as having a low risk of metal leaching and/or acid rock drainage (ML/ARD).

In summary, TMAC executed the geochemical construction monitoring program of waste rock by sampling drill cuttings from each blast round, analyzing the samples by pXRF coupled with geological inspection and classifying samples according the criteria in SRK (2019). Based on the geological logging and geochemical classifications of the drill cutting samples, TMAC classified waste rock from each blast round as either suitable for construction (e.g. low risk of ML/ARD) or not suitable for construction (e.g. risk of ML/ARD) followed by segregation and management of waste rock according to the risk classifications.

TMAC’s execution of SRK (2019) included geological logging and pXRF analysis of 1,000 samples of drill cuttings representing 22 blast rounds. Based on the geological inspection of drill cutting samples, waste rock lithologies were predominantly (44%) mafic metavolcanics with sediments (1aj/10j, n=440), 20% mafic metavolcanics (1a, n=202), 19% sedimentary units (5, n=186), 16% altered mafic metavolcanics (1aj/1oj, n=158), 1% quartz veins (12q, n=10), and <1% overburden (15, n=4). Based on pXRF analysis of drill cuttings, TMAC classified 7% of samples as low risk of ML/ARD and 93% as having risk of ML/ARD. These results were interpolated by TMAC to a field scale, e.g. blast round basis, resulting in 10% of waste rock being classified as geochemically suitable for construction and 90% as not suitable for construction.

In 2020, a total of 93,289 t of waste rock was produced from NE CPR, of which 83,968 t was placed on the Madrid North WRSA and 9,321 t used for construction of the following infrastructure and access roads at Madrid North: NE CPR for in-pit armouring; Madrid Shop Laydown; and internal roads and cladding within the Overburden stockpile.

Geochemical monitoring data of NE CPR waste rock indicate that the FEIS waste rock humidity sample set represents that geochemical characteristics of waste rock excavated from NE CPR (SRK 2017).

The geochemical behaviour of the waste rock used as construction rock is monitored as part of the construction rock monitoring program, including the annual seep survey and geochemical monitoring of as-built infrastructure. Waste rock placed on the Madrid North WRP will also be subject to annual geochemical monitoring including geological inspection, geochemical sampling, seepage monitoring at the downstream toe of the stockpile and routine collection of the water in the Madrid North contact water pond (CWP).

## 4.4 Madrid North WRSA

### 4.4.1 Methods

In September 2020, SRK geochemist Jonathon Doherty, GIT (BC) completed a geological inspection of waste rock placed on the Madrid North WRSA. The inspection and sample collection methods are as outlined in Section 5.3 of this report. It was noted that the primary sulphide within the waste rock was pyrite with rare occurrences of trace chalcopyrite. SRK collected 13 samples of waste rock at the Madrid North WRSA.

### 4.4.2 Results

In 2020, a total of 101,126 t of waste rock were placed on the Madrid North WRSA, with the majority (83%) sourced from NE CPR and the balance from the decline of the Madrid North underground mine. No waste rock was removed from the waste rock stockpiles. In accordance with the *Waste Rock, Ore and Mine Backfill Management Plan (*TMAC 2019), SRK conducted an inspection and collected waste rock samples from the WRSA. Waste rock at the WRSA was placed in two stockpiles including a smaller stockpile located directly upstream of the CWP that contains ore hosted in mafic volcanics with sediments (1aj) from NE CPR that could not be segregated from waste rock and ii) a larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from NE CPR and the underground mine (the latter as indicated by rinse tests).

Waste rock was a mix of approximately 85% chloritic green mafic metavolcanics (1a), 10% light tan colored sericite altered mafic metavolcanics (1as), with the remainder composed of lesser proportions of strongly weathered and pervasively oxidized waste rock (oxide), chert and siltstones (5), quartz veins (12) and diabase (11c). Sedimentary units (5) were observed throughout the waste rock stockpile area. Oxide material was concentrated in the stockpile located directly upstream of the CWP and

represents ore that could not be segregated from waste rock. Lesser amounts of oxidej (not ore) were present in the stockpile adjacent to Sumps 1 to 3.

SRK collected 13 samples for geochemical characterization, of which five were from the stockpile upstream of the CWP and eight were from the stockpile adjacent to the sumps. Furthermore, three samples contained oxide and sedimentary units (5), six samples contained oxide only and four did not contain oxide and/or sediments. Geochemical data suggest that two of the samples without oxide and/or sediments (20-MAD-10 and 20-MAD-12) were sourced from the underground mine.

Total sulphur content for samples containing sediments and/or oxide ranged from 0.35 to 1.2% (n=9) whereas sulphur ranged from 0.28 to 0.36% for samples that did not contain sediments and/or oxide (n=4). For all samples, TIC and NP ranged from 158 to 411 kg $CaCO_3$/t in the 1as samples. All samples were classified as non-PAG. All samples were enriched in arsenic (134 to 683 ppm) compared to the screening criterion. Arsenic content was highest for samples containing oxide and exhibited a positive trend with sulphur. There was no relationship between gold and arsenic content. Rinse tests, SFE tests, and paste pH indicated all samples were non-acidic. SFE tests indicated higher soluble content associated with samples containing oxide, including antimony (0.0011 to 0.021 mg/L), arsenic (0.013 to 3.5 mg/L for all samples), cobalt (0.00013 to 0.0007 mg/L), nickel (0.00039 to 0.011 mg/L) and zinc (below detection limit of 0.0001 mg/L to 0.0012 mg/L). Soluble arsenic concentrations exhibited a positive trend with arsenic and sulphur content but did not have a relationship with gold.

The FEIS the waste rock and ore humidity sample set represent the geochemical of the waste rock stockpiles at the WRSA (SRK 2017). The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the Madrid North WRSA and routine monitoring of CWP, Sump 1, Sump 2 and Sump 3. The results of the seepage survey and water quality monitoring are reported in Section 6 and Appendix D, while results of the routine monitoring program are included in monthly water quality reports prepared by TMAC and submitted to the Nunavut Water Board.

# 5 Monitoring of Quarry and Construction Rock Geochemistry

Details of the 2020 construction rock monitoring program are presented in Appendix C. Sample locations and data are presented in Attachment A and Tables 4-1 to 4-7 of Appendix C, respectively.

## 5.1 Overview of Quarry and Construction Activity

In 2020, active blasting was conducted twice in March at Quarry 2. All construction activities at Hope Bay during winter 2019/20 were conducted at Madrid North and included construction of the Madrid North portal pad, Madrid North Waste Rock Storage Area (WRSA) pad, Madrid Surface Shop Laydown pad and cladding and interior roads placed on top of and within the Overburden Stockpile. The results of the Portal Pad monitoring program are presented in Section 7 and Appendix E.

NE CPR waste rock the sole source of construction rock in 2020 except for the crushed top dressing on pads, which was sourced from Quarry 2. NE CPR waste rock was also used as cladding within the NE CPR but this material was not included in the scope of the geochemical monitoring program because SRK understands that the contact water drains into the NE CPR.

## 5.2 Quarry Monitoring

### 5.2.1 Methods

TMAC conducted geological inspections of the blast face and documented the lithology, sulphide content and veining plus the presence or absence of fibrous actinolite. For the March 4, 2020 blast, it was not safe to inspect the quarry face so TMAC inspected the blasted muck and took photos of the quarry face.

TMAC collected samples of ROQ rock as two size fractions: a sieved coarse fraction (screened to -1 cm) and a finer fraction (screened to -2 mm) on March 4 and 21, 2020. The samples were shipped to Bureau Veritas (BV) in Burnaby, BC for analysis of total sulphur by Leco. Samples containing total sulphur concentrations >0.1% were subsequently tested for acid-base accounting (ABA) and trace element content. The -2 mm samples also underwent a shake flask extraction (SFE) test on the as-received fraction using the MEND (2009) method.

### 5.2.2 Results

In 2020, TMAC conducted two quarry inspections after blasting at Quarry 2 in March. Both inspections identified mafic volcanics (1a) within the quarry face. Both inspections noted the absence of fibrous actinolite.

Geochemical monitoring of the Quarry 2 samples indicated that they were all non-PAG on the basis of TIC/AP and NP/AP. Total sulphur concentrations ranged between 0.14 and 0.21 wt% and sulphate sulphur content was between 0.02 and 0.07 wt%. Modified NP and TIC content ranged between 129

and 173 kg $CaCO_3$/t and 103 and 153 kg $CaCO_3$/t, respectively. All solid-phase elements were below the screening criteria suggesting no appreciable enrichment.

SFE test results for the Quarry 2 samples reported pH at 9.3 and 8.7. EC was notably lower for the first blast round (55 µS/cm) compared to the second blast round (370 µS/cm). Sulphate concentrations were low (<10 mg/L) indicative of the low sulphide content. In both blast rounds, the major anion was alkalinity (20 to 26 mg/L as $CaCO_3$) and the major cation was calcium (7.6 to 38 mg/L) Metal mobilization was low and SFE concentrations were similar to the 2019 results apart from molybdenum in the second blast round which was around one order of magnitude higher (0.01 mg/L).

## 5.3 Construction Monitoring

### 5.3.1 Methods

In September 2020, SRK geochemist Jonathon Doherty, GIT (BC) conducted the as-built geological inspection and geochemical sampling program of the Madrid North WRSA pad, Madrid Surface Shop Laydown pad and construction rock placed at the Overburden Stockpile.

Twelve samples of construction rock were collected for the annual geochemical monitoring program (four from the Madrid Surface Shop Laydown, six from the Madrid N WRP and two from the Overburden Stockpile). The two samples collected form Overburden Stockpile included one of waste rock cladding, placed in 2020 and one of the access roads constructed in 2019 from Quarry D rock. The latter sample was collected to support a separate scope of work related to the geochemical investigation of seepage from the Overburden Stockpile and is presented herein for completeness. At each sample location 1-2 kg of a sieved -1 cm fraction and 50 g of a sieved -2 mm fraction were collected. The construction rock was geologically described, a fizz test was undertaken using 10% HCl to provide an indication of carbonate content and SRK conducted rinse tests for electrical conductivity (EC) and pH using the -2 mm sieved fraction and a 1:1 solid to liquid ratio. All samples were analyzed at BV, Burnaby for ABA and trace element content and a subset of eight samples were selected for shake flask extraction (SFEs) tests including two samples from the Overburden Stockpile, two samples from the Madrid Surface Shop Laydown and four samples from the Madrid North WRSA. The SFE samples were selected to cover a range of rinse EC results and spatial locations.

### 5.3.2 Results

#### Quarry 2 Surface Crush

Quarry 2 material used for surface dressing at the Madrid Surface Shop Laydown was mafic metavolcanics (1a) and classified as non-PAG with a total sulphur content of 0.3% and modified NP and TIC of 130 kg $CaCO_3$/t (n=1). Elemental analysis showed no appreciable enrichment compared to the screening criteria. SFE tests reported a pH of 8.9 and low soluble metals concentrations.

### Madrid Surface Shop Laydown and WRSA Pads

SRK's inspection identified that sedimentary rock was used for construction rock in the pads of the Madrid Surface Shop Laydown and the Waste Rock Storage Area. According to SRK (2019), sedimentary units are not geochemically suitable for use as construction materials due to potential for neutral pH metal leaching. Typical construction rock observed at Madrid North WRSA was weakly foliated greenstone (1a) with some tan brown colored strongly foliated, sericite altered metavolcanics (1as). Silicified siltstone (5) was present in three samples in quantities ranging between 2 and 30%. Construction rock at the Madrid Surface Shop Laydown was a mixture of weakly weathered 1a/1as mafic metavolcanics (ranging between 30-90 %), gabbro (7a, up to 45%) and silicified sedimentary siltstone (5) in quantities up to 25 % in two of the three samples.

All of the Madrid Surface Shop Laydown and Madrid N WRSA samples were classified as non-PAG. Total sulphur content ranged between 0.1 and 0.9%, with maximum sulphur in Madrid N WRSA sample 20-WRP-02. Modified NP and TIC ranged from 110 to 310 kg $CaCO_3$/t and from 100 to 360 kg $CaCO_3$/t, respectively.

Five samples were enriched in arsenic relative to the screening criteria including four at Madrid North WRSA and one at Madrid Surface Shop Laydown. Three of the Madrid North WRSA samples contained sediments. A maximum arsenic content of 560 ppm was reported in Madrid North WRSA sample (20-WPR-02) but concentrations ranged between 36 and 76 ppm in the other enriched samples. All other parameters were below the screening criteria suggesting no appreciable enrichment.

SFE pH indicated that all samples were non-acidic. SFE arsenic concentrations were highest for the samples that had the highest solid-phase arsenic content, specifically 20-NUN-01 (0.15 mg/L), 20-WRP-02 (2.6 mg/L) and 20-WRP-07 (0.21 mg/L). In contrast, the maximum soluble arsenic content was 0.082 mg/L for all other Madrid Surface Shop Laydown and WRSA samples. SFE nickel and cobalt content were highest in WRSA construction rock samples, 20-WRP-02 (0.0095 mg/L and 0.00077 mg/L respectively) and 20-WRP-03 (0.0021 mg/L and 0.00034 mg/L respectively).

### Construction Rock at the Overburden Stockpile

Construction rock at the Overburden Stockpile included mafic metavolcanics (1) sourced from Quarry D in 2019 to construct the access roads (20-OVB-03) and mafic metavolcanics (1a) with gabbro (7a) from NE CPR placed as cladding at the southern toe of the Overburden Stockpile (20-OVB-06). No sedimentary units were observed, however NE CPR waste rock placed in 2020 as internal access roads within the stockpile were buried and not visible during the inspection.

Both construction rock samples from the overburden area were classified as non-PAG. Total sulphur content ranged between 0.1 and 0.2 % and Modified NP and TIC ranged from 120 to 150 kg $CaCO_3$/t and from 100 to 140 kg $CaCO_3$/t, respectively. Solid-phase elemental content was below the screening criteria suggesting no appreciable enrichment.

SFE tests indicated that the samples were non-acidic (7.5 to 7.9 s.u.). EC values were 4,200 and 5,400 µS/cm with major cation chemistry dominated by sodium (610 to 780 mg/L) and major anion by

sulphate and chloride (530 to 550 mg/L and 960 to 1,200 mg/L respectively). Notably, major ion concentrations were higher than other construction rock samples. Concentrations SFE soluble nickel and cobalt were similar to maximum concentrations for the Madrid North WRSA SFE data set (0.0018 to 0.0021 mg/L and 0.0002 to 0.0003 mg/L respectively). SFE manganese was also highest in the Overburden Stockpile construction rock samples (0.079 to 0.11 mg/L).

### Verification Monitoring of NE CPR Waste Rock used as Construction Rock

SRK (2019) specifies that construction rock should have a low ARD risk and low potential for neutral pH metal leaching (specifically pXRF As < 70 ppm). All samples of NE CPR waste rock used for construction rock from the Madrid Surface Shop Laydown and Overburden Stockpile were classified as non-PAG with arsenic content below 70 ppm. At the WRSA, all samples (n=6) were classified as non-PAG with arsenic content below the criterion (As < 70 ppm) for four of the samples. Arsenic content for samples 20-WRP-02 and 20-WRP-07 was 560 and 76 ppm, respectively.

Construction rock monitoring includes a freshet seepage survey of as-built construction rock. The results of the construction seepage survey and water quality monitoring are reported in Section 6 and Appendix D.

# 6 Seepage Survey

Details of the 2020 seep survey are provided in Appendix D, with sample locations presented in Attachment 1 of Appendix D and data presented in Tables 2 to 6 of Appendix D.

## 6.1 Overview of Seepage Survey

The scope of the 2020 Hope Bay seepage monitoring survey included infrastructure constructed between fall 2019 and spring 2020 at Madrid North from NE CPR waste rock; infrastructure surveyed for seepage at Doris and Madrid in 2019 but where none was observed, three reference stations, areas downstream of the Doris waste rock stockpiles (referred to as the Waste Rock Influenced Area or WRIA) and contact water downstream of the Madrid North WRSA. In 2020, reference station at Windy (REF-01) was removed from the program due to its proximity to development and a new station established south of the Madrid North WRSA (REF-01A). Concentrations for reference area seeps were consistent and stable with the historical data record.

## 6.2 Sampling and Testing Program

TMAC conducted the 2020 seepage survey in multiple phases as follows: i) freshet seepage survey from June 8 to 21; ii) supplemental sample collection downstream of the portal pad and overburden stockpile on July 2 and 3, July 27, and August 15 and iii) Madrid North WRSA on July 6 and September 2. Survey locations were established where seepage was observed or suspected by examining the toes of the waste rock stockpile, infrastructure, roadways, and berms. Samples were collected and field measurements were taken at locations where water was observed flowing into and out of construction rock material; this included seepage where precipitation runoff and snowmelt came into contact with rock along the roadways, building pads, and berms. Electrical conductivity (EC), pH, temperature, oxidation-reduction potential (ORP), and flow rates (where possible) were measured at each of these locations at the time of monitoring.

TMAC collected a total of thirty-six (36) seepage samples, including samples from three (3) reference survey sites. At each station the chemical and physical properties of seepage water were measured, and samples were taken for laboratory analysis. The three reference sites, located in the undisturbed tundra and not subject to mine influences, were sampled on June 21, 2020. These samples, used as baseline reference points, were collected at approximately the same locations as the 2010 to 2019 seepage surveys (in the vicinity of the Doris Windy Road) except for REF-01A which was collected to the south of the Madrid North WRSA. It was noted in the 2019 seepage survey that the original REF-01 location may have been impacted by nearby infrastructure.

All samples were analyzed at ALS Environmental Laboratory, Vancouver BC for pH, EC, sulphate, acidity, alkalinity, chloride, fluoride, nitrate, nitrite, phosphorus, ammonia, TDS, TSS and dissolved metals except for samples collected from the CWP and sumps of the Madrid North WRSA. These samples were analyzed for total metals. One Overburden Stockpile sample was analyzed for both total and dissolved metals.

## 6.3 Results

### 6.3.1 Doris

#### Waste Rock Impacted Area

Seepage monitoring in the waste rock impacted area was at the same locations as previous years: in the embankment of the pollution control pond (PCP) at the downstream toe of the stockpile on Pad I and the toe of the access road. In 2015, TMAC regraded the waste rock stockpile on Pad I and placed ore stockpiles on top.

The pH for all seepage samples was non-acidic (7.5 to 7.9). EC ranged from 1,300 and 1,800 µS/cm for the seepage samples at the toe of Pad I and 11,000 to 22,000 µS/cm for samples along the access road. Since 2016, concentrations of ammonia, nitrate, and chloride concentrations have continuously indicated the flushing of salts from drilling brines (chloride) and explosives residues (ammonia, nitrate, and nitrite) from the stockpile on Pad I. Prior to 2020, seepage collected at the toe of Pad I was interpreted to be waste rock contact water and seepage at the toe of the access road was less concentrated. In 2020, seepage collected along the access road contained higher levels of residual drilling brines and blast reagents. The differences in concentrations of operational reagents suggests that access road seepage is from a different seepage source. Madrid ore was sourced from the NE CPR where brines are not used for drilling and accordingly, Madrid ore is not the source of elevated chloride.

Seepage at the toe of the stockpile at Pad I is within the range of constituent concentrations from previous years. Parameters with higher concentrations in seepage along the access road compared to the toe of the stockpile at Pad I include sulphate (220 to 270 mg/L compared to ~75 mg/L, respectively), cobalt (4 to 11 times higher), nickel (4 to 15 times higher), manganese (22 to 58 times higher), cadmium (140 to 410 times) and zinc (10 to 24 times higher). Notably arsenic concentrations for all 2020 samples were within the same range. Furthermore, arsenic, cobalt and nickel concentrations were lower in 2020 compared to 2019.

All drainage from the Doris camp pad, including seepage captured in the collection sumps downstream of the toe of the access road, is pumped to the sediment control pond (SCP) prior to transfer to the TIA. In 2020, water from the SCP accounted for 2% of total inflow volumes entering the TIA and 0.6% of the total volume stored in the TIA.

#### Infrastructure and Roads

Infrastructure surveyed at Doris included the Doris CPR cover (constructed of Doris CPR waste rock) and access road to the vent raise (constructed of Quarry 2 rock). Seepage was observed and samples collected representing construction rock from the Doris CPR cover but not at the access road to the Doris vent raise.

Of the two seepage samples collected, sample 20-DCPR-02 water quality was geochemically equivalent to the reference seeps and is interpreted to not represent contact water from the Doris CPR

cover. For sample 20-DCPR-01, concentrations of ammonia and chloride were 10 and 30 times lower, respectively than Doris waste rock seepage downstream of the Pad I. Drilling brines were not used to mine the CPR and explosives residue concentrations are lower as a result of differing blasting practices. The lower ammonia and chloride concentrations in seepage suggests that the waste rock used to construct the NE CPR cover was sourced from NE CPR. Dissolved trace metals concentrations were typically within an order of magnitude of concentrations for Doris waste rock seepage samples downstream of Pad I except for copper for 20-DCPR-01 (0.0013 mg/L and 30 times lower).

### 6.3.2 Madrid North

#### Waste Rock Storage Area

Of the 101,126 t of rock placed at WRSA, the majority of waste rock originated from NE CPR (83,968 t). Approximately, 17,158 t of waste rock from the decline of the Madrid North underground mine was also placed at WRSA. Waste rock at the WRSA was geochemically classified as non-PAG and placed in two stockpiles (Section 4 and Appendix B). The stockpiles at the WRSA include:

1. a smaller stockpile located directly upstream of the contact water pond (CWP) that contains oxide rock. The oxide rock is ore hosted in mafic volcanics with sediments (1aj) from NE CPR that could not operationally be segregated from waste rock.
2. A larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from NE CPR and the underground mine (the latter as indicated by rinse tests).

SFE arsenic concentrations for Madrid North waste rock at WRSA exhibited a positive trend with solid-phase arsenic and sulphur content. SFE arsenic did not have a relationship with gold in WRSA rock suggesting arsenic leaching is not higher for the oxide stockpile containing ore (Section 4 and Appendix B)

Water management at the Madrid North WRSA includes three water collection sumps (Sump 1, Sump 2 and Sump 3) and the Madrid North CWP. Water from the sumps are pumped to the contact water pond, therefore water chemistry at the CWP is influenced by waste rock seepage draining to CWP and the collection sumps. Discharge of effluent onto tundra from the CWP is in accordance with the effluent quality limits provided in the Water Licence. Water that does not meet these criteria is transferred to the TIA via water truck.

Water quality samples collected downstream of the WRSA included one freshet seepage sample near Sump 1 and routine water quality samples in the contact water pond (CWP), Sump 1, Sump 2 and Sump 3. Samples collected from the CWP and sumps of the Madrid North WRSA were analyzed for total metals whereas the seepage sample was analyzed for dissolved metals. As a result of high TSS in selected sump samples, total aluminum, iron, copper, zinc and possibly manganese data were interpreted to be biased high.

All waste rock drainage samples were non-acidic. The waste rock drainage chemistry collected in the CWP and Sump 1 are geochemically distinct from Sump 2 and Sump 3. Contact water collected in the

CWP and Sump 1 had higher sulphate concentrations (13 to 260 mg/L compared to <40 mg/L at Sumps 2 and 3), higher chloride and/or ammonia concentrations (maximum of 990 and 2.2 mg/L, respectively), higher arsenic and nickel concentrations (maximum of 0.022 and 0.012 mg/L, respectively).

Cobalt concentrations in June ranged from 0.0012 to 0.0033 mg/L for all samples but in September were higher at Sump 1 (0.025 mg/L) compared to Sump 2, Sump 3 and CWP (0.0033 to 0.0075 mg/L). Manganese exhibited temporal rather than spatial trends and were an order of magnitude higher in samples from September (0.24 to 7.0 mg/L) compared to samples from June (0.026 to 0.17 mg/L). Maximum selenium concentrations were indicated at Sump 1 and Sump 3 and selected sample from the CWP (ranging from 0.0011 to 0.0023 mg/L for all aforementioned areas). In comparison concentrations at Sump 2 and selected CWP samples were lower (0.00020 to 0.00075 mg/L).

Chloride and ammonia are operational by-products that are introduced to underground waste rock from drilling brines and blast residues, respectively. In contrast, mining at the NE CPR did not use drilling brine and has lower ammonia residues because of differing blasting practices at surface. A review of the drainage chemistry suggests the following with respect to weathering of NE CPR and Madrid North underground waste rock at WRSA:

- Chloride concentrations and trends suggest contact water from underground waste rock primarily reports to Sumps 1 and 3 with minor flows reporting directly to the CWP and Sump 2. The source of higher selenium concentrations in Sump 1 and Sump 3 are likely related to weathering of underground waste rock.
- A comparison of the seepage sample (ID 20-MWAR-01) compared to the overall June sample set suggests that 20-MWAR-01 represents a mixture of contact water of waste rock from the underground mine (as indicated by chloride and ammonia) and NE CPR (as indicated by arsenic).
- In June, seepage was observed emanating from the newly constructed CWP to the tundra (NT-NU Report submitted by TMAC on June 15, 2020). TMAC collected paired samples of the seepage downstream of the CWP and water in the CWP. The seepage sample had higher chloride that was indicative of drainage chemistry from underground waste rock whereas CWP pond sample had higher As, Co and Ni indicative of NE CPR waste rock.
- Multiple parameters suggest spatial variability in water chemistry within the CWP. This variability is likely due to point discharge of waste rock drainage pumped from the sumps to the CWP.

### Infrastructure and Roads

Infrastructure surveyed at Madrid North included the access road to Naartok East CPR (constructed of Quarry D rock), overburden stockpile (constructed in two phases of Quarry D rock and NE CPR waste rock), Madrid North Portal Pad (constructed of NE CPR waste rock) and Madrid Shop Laydown (constructed of NE CPR waste rock). Seepage samples were collected downstream of all areas except the Madrid Shop Laydown.

### Madrid North Portal Pad

Construction rock from the portal pad was sourced from NE CPR waste rock. A comprehensive summary of sources of the portal pad seepage chemistry is documented in Appendix E. A summary is provided herein as follows:

- Portal Pad: pH and EC ranged from 4.9 to 6.6 and 35,000 to 40,000 µS/cm, respectively.
- The major cation chemistry was dominated by calcium (6,700 to 17,000 mg/L) and sodium (510 to 1,700 mg/L), while major anion chemistry was dominated by chloride (9,700 and 31,000 mg/L) and sulphate (68 to 120 mg/L). Sulphate concentrations suggest low rates of sulphide oxidation, which is consistent with the sulphide content of the Portal Pad construction rock construction rock (median and 95$^{th}$ percentile values of 0.18 and 0.52%, respectively).
- Ammonia concentrations ranged from 63 to 150 mg/L as N and nitrate concentrations ranged from 61 to 1,100 mg/L as N. The portal pad was constructed from waste rock from NE CPR; however, the concentrations of nitrogen nutrients are indicative of blast residues from underground waste rock.
- Dissolved metals concentrations were notable for cadmium (0.0025 to 0.0032 mg/L), cobalt (0.14 to 0.53 mg/L), manganese (22 to 36 mg/L), nickel (0.058 to 0.12 mg/L), and zinc (0.25 to 0.33 mg/L). Notably, arsenic concentrations were below analytical detection and are interpreted to be adsorbed to iron (oxy)hydroxides visible in the seepage flow path.
- The source of elevated major ions and cobalt, manganese, nickel and zinc in the seepage is not from portal pad construction rock sourced from NE CPR but is from a stockpile of briny waste rock placed on the lined temporary transfer area of the Madrid North Portal Pad. The liner was compromised thereby allowing the hypersaline solution to flow across the tundra.
- Geochemical characterization of the briny waste rock indicated the presence of a high ionic strength solution that is more concentrated than residual drilling brine on typical Hope Bay underground waste rock. The hypersaline solution on the waste rock resulted in increased metal leaching rates and mobility as a response to ion exchange and/or formation of chloride complexes.
- Portal pad construction rock and briny waste rock were classified as non-PAG with non-acidic paste pH and accordingly are not the source of slightly acidic pH indicated in the seepage (5.3 to 5.6). Rather development of mildly acidic pH is likely related to organic acids in the active layer and/or release of acidity from ion exchange between the hypersaline seepage and the tundra.

### Madrid Overburden Stockpile

The overburden stockpile contains construction rock sourced from two areas: Quarry D for construction in early 2019 of access roads and NE CPR waste rock for construction in late 2019 interior access roads and placement as cladding.

- pH and EC ranged from 6.8 to 7.7 and 31,000 to 81,000 uS/cm, respectively.
- The major cation chemistry was dominated by sodium (6,200 to 19,000 mg/L) and magnesium (960 to 2,900 mg/L) and anion chemistry was dominated by chloride (12,000 to 31,000 mg/L)

and sulphate (1,600 mg/L to 4,000 mg/L). A comparison of major ions for overburden stockpile compared to portal pad seepage is summarized as follows and indicates different geochemical sources. Chloride was the same order of magnitude as the portal pad however calcium one was order of magnitude lower for the overburden stockpile. Concentrations for potassium, sodium, magnesium and sulphate were an order of magnitude higher for Overburden Seepage.

- Nutrient concentrations ranged from 8.8 to 24 mg/L as N (ammonia), <0.5 to 24 mg/L as N (nitrate) and <0.1 to 0.57 mg/L (nitrite).
- Ranges in trace metal concentrations that were elevated in portal pad seepage are as follows: cobalt (0.0037 to 0.096 mg/L), manganese (1.4 to 11 mg/L), nickel (<0.01 to 0.086 mg/L) and zinc (below detection of <0.05 mg/L). Notably, arsenic concentrations were near analytical detection limits.
- Iron concentrations ranged from <0.2 to 15 mg/L. Samples with iron concentrations above detection exhibited more reducing conditions whereas iron was below detection for samples with higher values of ORP. Iron concentrations did not have a positive trend with manganese, the latter which showed the highest concentrations with higher ORP values indicative of oxidizing conditions.
- A geochemical investigation of the source of overburden stockpile seepage is currently in progress (SRK in progress).

### NE CPR Access Road

The NE CPR access road was constructed of rock from Quarry D. Seepage was non-acidic (7.3 to 7.8) with low values of EC (120 to 510 µS/cm). Sulphate concentrations were low (2.3 to 31 mg/L). Ammonia and nitrate were within one to two orders of magnitude greater than reference samples. Dissolved metals concentrations were the same order of magnitude compared to the reference seeps except for manganese. Manganese concentrations ranged from 0.00099 mg/L to 0.71 mg/L.

# 7 Geochemical Investigation of Madrid North Portal Pad

Full details of the 2020 geochemical investigation of Madrid North Portal Pad are documented in Appendix D with sample locations presented in Figures 2-1 and 4-1 and data in Tables 4-2 to 4-7 of Appendix D.

## 7.1 Background

The Madrid North Portal Pad was constructed using waste rock from NE CPR that included sedimentary units. The Portal Pad included a designated and lined storage area for temporary placement of leachable blast residues and drilling brines. This lined area was intended to be a transfer area where waste rock from underground mining equipment could be placed before being hauled to the Madrid North Waste Rock Storage Area (WRSA) using more efficient haul trucks.. In September 2020, TMAC excavated and removed the lined area of the pad after concluding that the liner had been compromised.

As outlined in Section 6, seepage monitoring at the portal pad indicated higher levels of chloride, nitrate, nitrite, ammonia, iron, cobalt, manganese, nickel, and zinc and lower pH compared to typical construction rock at Doris and Madrid. Furthermore, there was a zone of impacted vegetation along a seepage pathway noted immediately downstream of the Portal Pad infrastructure. SRK was retained by TMAC to conduct a geochemical investigation to investigate the source of neutral pH metal leaching and high saline drainage at the Madrid North Portal Pad. The investigation satisfies and exceeds the construction monitoring and seepage geochemical monitoring requirements presented in Sections 5 and 6 of this report.

## 7.2 Inspection, Sampling and Testing Program

### 7.2.1 Construction Monitoring

SRK inspected NE CPR construction rock and collected samples along the periphery of the pad because of the surface of the pad was covered in crushed rock from Quarry 2. The inspection and sample collection methods are as outlined in Section 5.3 of this report. SRK collected a total of 12 samples, including a sample of brine affected waste rock at the portal pad.

### 7.2.2 Tundra pH Survey

Measurements of field pH, EC and temperature was undertaken at seven background sites at Madrid North and along the Doris-Windy road and one site within the ephemeral seepage plume. The objective of the program was to determine the pH of tundra porewater within the path of the portal pad seepage flow and other tundra areas, including areas outside the area of mine influence along the Doris-Windy road. The survey included shallow (<40 cm), hand-dug test pits within easily accessible low-lying wetland areas, allowing water to seep back into each test pit.

### 7.2.3 Construction Rock Mapping Program

Following SRK's observation of sedimentary waste rock types from NE CPR along the periphery of the Portal Pad, SRK designed a construction rock mapping program to quantify the distribution of the sedimentary rock. The program included mapping of all visible waste rock and excavation of three north-south trending trenches to expose NE CPR waste rock beneath the layer of crushed rock from Quarry 2. The trenches were oriented perpendicular to the road to intersect the advancing face of the pad construction.

TMAC geologists geologically mapped the long wall of each excavated trench, the material excavated from each trench, and all visible waste rock used for construction of the Portal Pad, including perimeter embankments, water diversion structures and waste rock placed above the portal for the purposes of access during initial development. Waste rock was mapped for rock type, sulphide content, and percent composed of sedimentary rock. Following mapping, one composite sample was collected for every 5 m length along each trench for geochemical characterization. Samples were geochemically characterized using the same test methods outlined in Section 5.3, including SFE tests on a subset of samples.

## 7.3 Results

### 7.3.1 As-Built Construction Seepage Survey

One seepage station at the Portal Pad area was identified during the 2020 freshet survey and monitored a total of three times in 2020. The seepage flowed from the Portal Pad area underneath the base of the roadway leading onto the Portal Pad and daylighted with a northward flow direction. Field pH was initially pH 6 and mildly acidic conditions developed over time (pH 5.3 to 5.6), EC values were above detection (>20,000 µS/cm). Laboratory pH values ranged from mildly acidic to circum-neutral (pH 4.9 to 6.6), with EC ranging from 35,000 to 68,000 µS/cm. Major cation chemistry was dominated by calcium (6,700 to 17,000 mg/L) and sodium (510 to 1,700 mg/L), while major anion chemistry was dominated by chloride (9,700 and 31,000 mg/L) and sulphate (68 to 120 mg/L). Sulphate concentrations suggest low rates of sulphide oxidation, which is consistent with the sulphide content of the Portal Pad construction rock. Ammonia concentrations ranged from 63 to 150 mg/L as N and nitrate concentrations ranged from 61 to 1,100 mg/L as N, indicative of blast residues although the Portal Pad was constructed from NE CPR waste rock. Dissolved metals concentrations were notable for cadmium (0.0025 to 0.0032 mg/L), cobalt (0.14 to 0.53 mg/L), manganese (22 to 36 mg/L), nickel (0.058 to 0.12 mg/L), and zinc (0.25 to 0.33 mg/L). Notably, arsenic concentrations were below analytical detection and are interpreted to be adsorbed to iron (oxy)hydroxides visible in the seepage flow path.

### 7.3.2 Field pH Survey of Tundra

For baseline tundra sites, the pH of porewater in the active layer (uppermost horizon of the tundra that annually freezes and thaws) ranged from mildly acidic (5.6) to a maximum of 8.1 and the EC ranged

from 130 to 520 µS/cm. In contrast, the station within the Portal Pad plume of impacted vegetation had the lowest pH (4.4) and highest EC (5,200 µS/cm).

### 7.3.3 Geochemical Characterization of Portal Pad

#### Geological Inspections

Geological inspections by SRK and TMAC indicated that waste rock from NE CPR used for construction contained sedimentary rock except for localized areas of the berm. The majority of construction rock was mafic metavolcanics intermixed with 1 to 10% sedimentary units except for localized areas containing more than 50% sedimentary rock. The crushed material from Quarry 2 placed on the pad surface described the surface dressing was dark chloritic green mafic metavolcanics (1a).

Notably, the lined area of the pad contained a small pool of ponded brine (field EC >20,000 µS/cm) and dark stained waste rock (sampled as PP-12). The lined area was being excavated at the time of SRK's inspection and had a noticeable brine odor.

Rinse pH for all samples ranged from 7.2 to 9.2 indicating that construction rock and waste rock on the lined pad were non-acidic. Rinse EC for construction rock samples ranged from 82 to 380 µS/cm and was significantly lower than the brine stained waste rock (18,000 µS/cm). The rinse EC for the brine stained waste rock was more than ten times higher than equivalent values for run-of-mine (ROM) waste rock samples collected from stockpiles by SRK in 2020 at Doris (87 to 1,616 µS/cm) and Madrid North (140 to 1,845 µS/cm), suggesting that the lined pad contained a more concentrated source of brine compared to concentrations of residual brine on waste rock that are typical of blasting underground mine development.

#### Geochemical Verification Monitoring of NE CPR Waste Rock Segregation Program

All samples were classified as non-PAG on the basis of NP/AP and TIC/AP. The 5$^{th}$ to 95$^{th}$ percentile levels of total sulphur content for construction rock ranged from 0.13 to 0.52%, with median values of 0.18% (n=32). Sulphur content of the briny waste rock was 0.57%. Modified NP levels for all samples were greater than 90 kg$CaCO_3$/t and were typically higher than levels of TIC (greater than 60 kg$CaCO_3$/t). Arsenic content was below the geochemical construction criterion of 70 ppm arsenic except for one sample (at 208 ppm) that also had the highest sulphur content (0.71%). The results of the construction geochemical characterization program confirmed the execution of the field based pXRF classification and segregation program by TMAC, however sedimentary waste rock is a rock type not approved for construction (Section 4.3.1).

#### Metal Leaching Potential

Neutral pH metal leaching of arsenic, cobalt and nickel at Madrid North is related to the occurrence of gersdorffite and/or sedimentary rock units. Results of a SFE test program of Portal Pad construction rock and briny rock samples were assessed to investigate sources of high metal loads to seepage.

SFE results for the construction rock samples indicated major ion chemistry dominated by alkalinity and sodium, whereas for the briny waste rock sample was dominated by chloride and calcium. Sulphate concentrations were less than 80 mg/L for all samples and exhibited an increasing and positive trend with total sulphur suggesting sulphate is the result of sulphide oxidation (except for one construction rock sample with low sulphur (<0.2%) and high sulphate (>70 mg/L). This sample was described as having strong hematite alteration. SFE data indicated that all samples were non-acidic, with pH values ranging from 7.7 to 9.3 and confirmed rinse pH data.

SFE chloride and calcium concentrations for briny waste rock (1,800 and 970 mg/L, respectively) were more than 50 times higher than concentrations for Portal Pad construction rock samples and also underground waste rock from Doris (maximum of 140 and 490 mg/L, respectively; SRK 2020a). Brines are not used for quarry development or mining at NE CPR. Conductivity showed a strong positive statistically significant correlation with chloride concentrations. SFE ammonia and nitrate concentrations for briny waste rock (80 and 110 mg/L, respectively) were comparable to Doris ROM waste rock (SFE nitrate of 170 mg/L, SRK 2020a), which are more than an order of magnitude higher than the Portal Pad construction rock (95$^{th}$ percentile values of 0.21 and 3.7 mg/L, respectively) and quarry rock (maximum of 6 and 15 mg/L, respectively, SRK 2020a). The difference in concentrations is attributable to differences in blasting practices for underground waste rock compared to quarry or NE CPR waste rock.

SFE arsenic concentrations for portal pad construction rock samples were less than 0.07 mg/L and showed a strong correlation with solid phase arsenic content. This relationship is consistent with geochemical characterization studies of Madrid North waste rock that suggested the risk of neutral pH arsenic, cobalt and nickel leaching in relation to solid-phase arsenic and the trace minerals gersdorffite (NiAsS) and cobaltite (CoAsS). In contrast, the briny waste rock sample had relatively high arsenic content (24 ppm) but a low SFE arsenic concentration (0.00096 mg/L). Cobalt, nickel, cadmium, zinc and manganese had notably higher SFE concentrations for the briny waste rock sample suggesting increased mobility under saline conditions. For cadmium and zinc, there was no relationship between pH and metal mobility.

The solid-phase content of the briny waste rock was compared to Portal Pad construction rock. Arsenic, cadmium, cobalt, iron, nickel and zinc for the briny waste rock was within the range of concentrations of Portal Pad construction rock. Manganese content in briny waste rock was lower than the 5th percentile value for construction samples.

### 7.3.4 Conceptual Model

A conceptual model was generated for the seepage chemistry at the Portal Pad, summarized as follows:

- Madrid North Portal Pad construction rock contains varying proportions of sedimentary rock that overall is classified as non-PAG with arsenic content below the arsenic criterion required for classifying waste rock as suitable as construction rock.
- A flow of high ionic strength solution flowed through the compromised liner on the temporary transfer area of the Madrid North Portal Pad and across the tundra, resulting in a downstream area

of impacted vegetation within the seepage pathway. The chemistry of the ponded water on the lined transfer area and leachable products of the briny waste rock indicate the presence of a high ionic strength solution that is more concentrated than residual drilling brine on typical Hope Bay underground waste rock.

- The source of elevated major ions and cobalt, manganese, nickel and zinc in the seepage is the briny waste rock on Madrid North Portal Pad and not construction rock sourced from NE CPR. The hypersaline solution on the waste rock resulted in increased metal leaching rates and mobility.
- All samples from the portal pad, including briny waste rock and construction rock (NE CPR waste rock and Quarry 2 rock) are non-acidic and non-PAG. Portal pad construction rock and briny waste rock are not the source of slightly acidic pH indicated in the seepage (5.3 to 5.6). Rather development of mildly acidic pH is related to organic acids in the active layer and/or release of acidity from ion exchange between the hypersaline seepage and the tundra.

# 8 Monitoring of Tailings

Details of the 2020 tailings monitoring programs are provided in Appendix F with data presented in Tables 4-3 to 4-9 of Appendix F.

## 8.1 Overview of Tailings Production and Placement

The geochemical monitoring program for flotation tailings slurry and detoxified tailings includes the following monitoring stations: process plant tailings water discharge (TL-5), flotation tailings solids (TL-6), detoxified tailings solids[2] (TL-7A), detoxified tailings filtrate (TL-7B)[3] and seepage from underground backfilled stopes (TL-11). In 2020, a total of 364,982 t (dry weight equivalent) of flotation tailings were deposited in the Doris TIA and 17,886 t of detoxified tailings were placed as backfill in the stopes of the Doris Mine.Sampling and Testing Program

## 8.2 Sampling and Testing Program

### 8.2.1 Process Plant Flotation Tailings Slurry Discharge: Solids (TL-6) and Supernatant (TL-5)

Samples of the flotation tailings solids (TL-6) and the supernatant solution (TL-5) are collected from the flotation tailings thickener tank. The filtrate from the detox filter press (where detoxified tailings are dewatered) is pumped to the flotation tailings thickener tank prior to discharge to the TIA. The 2020 monitoring program included geochemical characterization of 12 monthly samples (January to December) of tailings process supernatant (TL-5) and monthly composites of flotation tailings (TL-6).

### 8.2.2 Detoxified Tailings Solids (TL-7A) and Filtrate (TL-7B)

The 2020 monitoring program included geochemical characterization of twelve samples of detoxified tailings solids (TL-7A), including 11 monthly samples and a duplicate collected in November. A sample was not available October 2020. Twelve samples of detoxified tailings filtrate (TL-7B) were collected from January to December.

### 8.2.3 Seepage Survey of Underground Backfilled Stopes (TL-11)

TMAC completed underground seepage inspections of backfilled stopes in July and December 2020. Visual surveys were conducted of all backfilled stopes that could be accessed safely at the time of the survey, i.e. not all backfill could be inspected. Four locations were sampled in July and two locations were sampled in December. During the July sampling survey, TMAC collected two ponded water

[2] Detoxified tailings are referred to as cyanide leach residue in the Water Licence and prior to 2019 was monitored as station TL-7.

[3] Station TL7-B was added to the Water Licence as part of Amendment No. 2 and monitoring commenced in 2019.

samples from Levels 4905 and 5002 and two seepage samples from Levels 120 and 134. In December, TMAC collected two samples during the underground survey from Levels 110 and 120.

Field measurements of pH, EC, ORP, temperature and flow rate were recorded at each station. TMAC submitted samples to ALS in Burnaby, BC for analysis of pH, EC, TSS, TDS, alkalinity, chloride, sulphate, total, free and WAD cyanide, and dissolved and total metals. The sample for dissolved metals was filtered and preserved at the time of sampling.

## 8.3 Results

### 8.3.1 Tailings Slurry to TIA

The filtrate from the detox filter press (monitored as TL-7A) is pumped to the flotation tailings thickener tank where the filtrate is combined with flotation tailings slurry in the flotation tailings thickener tank prior to discharge to the TIA. The flotation tailings slurry is composed of tailings solids (monitored as TL-6) and process water (monitored asTL-5).

#### Flotation Tailings Solids (TL-6)

All flotation tailings samples were classified as non-PAG, which in consistent with 2017 to 2019 operational tailings monitoring (SRK 2020b) and metallurgical tailings samples (SRK 2015b). Sulphur concentrations ranged between 0.07 and 0.63% with a median value of 0.22%. TIC content ranged between 170 and 290 kg CaCO3/t.

All parameters were below the screening criteria indicating no appreciable enrichment except arsenic was enriched for all flotation tailings samples except for February and October and exhibited the highest operational concentrations in flotation tailings between March and September. In contrast, prior to November 2019, the majority of flotation tailings samples had arsenic content less than the screening criteria. The increase is attributed to the processing of Madrid North ore. Nickel was below the screening criteria but exhibited a similar trend to arsenic.

#### Tailings Detoxified Filtrate (TL-7B) and Process Plant Tailings Discharge (TL-5)

Monthly monitoring of TL-5 and TL-7B is summarized as follows:

- pH was stable in both TL-5 (8.0 to 8.5 s.u.) and TL-7B (8.3 to 8.8 s.u.).
- Sulphate concentrations were within the range of historical data, but an operational maximum concentration was observed in August 2020 (10,000 mg/L in TL-5 and 41,000 mg/L in TL-7B).
- Sodium, used as a milling reagent, reported concentrations between 1,700 and 8,000 mg/L in TL-5 and between 4,300 and 18,000 mg/L in TL-7B. TL-5 reported a gradually increasing trend although the maximum result was anomalously high in August 2020 and other results averaged 2,200 mg/L. In TL-7B concentrations fluctuated but the overall trend was within the range of 2019 data.

- Concentrations of ammonia increased between July 2019 and January 2020 in TL-5 then decreased thereafter. In TL-7B operational maximums were observed in May and September 2020 otherwise values were within range of historical data.
- Total cyanide concentrations were stable in TL-5 (0.5 to 6.5 mg/L) and were lower in 2020 compared to 2019 at TL-7B (0.3 to 2.5 mg/L).
- WAD cyanide, free cyanide and thiocyanate concentrations were within the range of historical values in TL-5 and TL-7B except for a fivefold increase observed in thiocyanate in TL-5 in September 2020 and an anomalously high result for free CN in TL-7B in August 2020 which was due to an elevated detection limit. Cyanate concentrations increased in TL-5 to August 2020 then decreased thereafter. In TL-7B cyanate concentrations were within the range of 2019 data with the exception of three samples with values greater than 800 mg/L.
- Chloride concentrations reported an increasing trend between December 2019 and April 2020 to a maximum of 3,700 mg/L then decreased thereafter. Chloride was not analyzed in TL-7B.
- Arsenic reported an increasing trend in TL-5 between July 2019 and April 2020 then a decreasing trend thereafter (0.0016 to 0.014 mg/L throughout 2020). In TL-7B, arsenic concentrations were within a similar range to the 2019 results except for May and July when elevated concentrations were reported (0.046 to 0.92 mg/L throughout 2020).
- Cobalt and nickel concentrations were within range of historical data. Cobalt concentrations have fluctuated between 0.005 and 0.09 mg/L in TL-5 and between 0.02 and 0.23 mg/L in TL-7B over the operational period of the mill. Nickel concentrations have fluctuated between 0.007 and 3.5 mg/L in TL-5 and between 0.03 and 0.27 mg/L in TL-7B.
- Prior to March 2019, concentrations of antimony and molybdenum in TL-5 were relatively stable after which both parameters exhibited increasing trends and higher concentrations. An increasing antimony trend was also apparent in TL-7B from June 2019, whereas molybdenum concentrations in TL-7B fluctuated with no obvious trend.
- Cadmium and zinc concentrations have been relatively stable since August 2018 in TL-5 with the majority of results reported at detection limit and in TL-7B all results for these parameters are reported at detection limit.
- Copper concentrations were stable in TL-5 and reached a new maximum in TL-7B in May 2020 (22 mg/L) but otherwise fluctuated within historical levels.
- Concentrations of manganese were stable in TL-5 and TL-7B apart from slightly higher results in August 2020 (TL-5, 0.60 mg/L) and June 2020 (TL-7B, 0.63 mg/L).
- Molybdenum concentrations in TL-5 were typically stable to March 2019 then fluctuated at higher levels thereafter (0.03 to 0.1 mg/L in 2020). No trend was apparent in TL-7B (0.05 to 0.17 mg/L in 2020).
- Selenium concentrations fluctuated within historical range (0.001 to 0.007 mg/L in TL-5 and 0.010 to 0.030 mg/L in TL-7B).

### 8.3.2 Detoxified Tailings to Doris Mine

#### Detoxified Tailings Solids (TL-7A)

The results of the 2020 geochemical monitoring program of detoxified tailings solids (TL-7A) is summarized as follows:

All detoxified tailings samples were classified as PAG, which is consistent with 2017 to 2019 operational tailings monitoring and metallurgical tailings samples (SRK 2015b). Sulphur concentrations ranged between 15 and 34 % in 2020. TIC results for 2020 ranged between 96 and 184 kg $CaCO_3$/t.

All detoxified tailings samples were elevated in arsenic, bismuth, copper, gold, selenium, silver and sulphur compared to the screening criteria. More than half of the 2020 samples were also elevated for lead. Selected samples were elevated in cadmium (n=3), antimony (n=4) and zinc (n=1) compared to the screening criteria. All other parameters, including cobalt and nickel were below the screening criteria indicating no appreciable enrichment.

#### Underground Seepage Survey (TL-11)

Of the six underground samples collected, four are interpreted to represented backfill seepage (Levels 134 and 120 form the July survey and Levels 110 and 120 from the December surveys) and two are as ponded water samples (Levels 5002 and 4905) with chemistry that did not represent contact waters of backfill.

- Key results for the seepage samples inferred to represent contact waters are summarized as follows:
  - The pH and EC ranged from 7.6 to 7.9 s.u and 21,000 to 26,000 µS/cm, respectively.
  - Major anions were chloride (7,100 to 9,000 mg/L) and sulphate (920 to 1,200 mg/L) and major cations were sodium (4,200 to 4,800 mg/L) and magnesium (510 to 580 mg/L). Potential sources of the major ions include residues on waste rock from drilling brines (calcium and chloride), process reagents (sodium), and sulphide oxidation with resulting carbonate dissolution from waste rock and detoxified tailings (sulphate, calcium and magnesium).
  - Levels of ammonia, nitrate and nitrite were lower than the 50th percentile concentrations from the historical sample set.
  - Cadmium, copper, nickel, selenium and silver were noted as parameters of potential concern based on the humidity cell test (HCT) program for Doris detoxified tailings (SRK 2015b). All of these parameters reported concentrations in the July sampling program which were less than the 50th percentile concentrations from the historical sample set: cadmium (0.00007 to 0.00083 mg/L), copper (0.02 to 0.06 mg/L), nickel (0.014 to 0.18 mg/L), selenium (0.001 to 0.012 mg/L) and silver (0.0001 to 0.0004 mg/L). Zinc and manganese were not noted as a parameters of potential concern in the HCT program but have historically reported elevated concentrations. Zinc and manganese concentrations ranged from 0.02 and 0.12 mg/L and 1.2 and 2.2 mg/L, respectively and were within the range of historical underground seepage concentrations.

# 9 Conclusions

## 9.1 Doris Waste Rock

Mining at Doris in 2020 resulted in production of 106,890 t of waste rock; this material was kept underground and used as backfill. In addition, approximately 68,899 t of waste rock was removed from the surface waste rock stockpile on Pad T and placed as backfill in stopes of the Doris mine. In 2020, Doris underground workings were geologically described as 95% mafic volcanics with trace sulphide and 1-2% quartz-carbonate veining, 4% sericite altered mafic volcanics with contain trace sulphide and 2-5% quartz-carbonate veining and 1% diabase dyke with trace to 1% sulphide and trace quartz-carbonate veining.

Waste rock observed on Pad T was a mixture of approximately 90% chloritic green mafic metavolcanics (1a), 9% light tan colored sericite altered mafic metavolcanics (1as), and <1% white quartz veins (12q). SRK collected six samples (five of mafic metavolcanics (1a) and one of altered mafic metavolcanics (1as)) from the surface waste rock stockpile on Pad T.

For mafic metavolcanics samples (1a), total sulphur ranged from 0.14 to 0.77% and median levels of 0.24%. TIC and Modified NP content was high ranging from 187 to 259 kg $CaCO_3$ eq/tonne and 177 to 798 kg $CaCO_3$ eq/tonne, respectively. All samples were classified as non-PAG on the basis of TIC/AP and NP/AP. The one sample of altered mafic metavolcanics samples (1as) had a total sulphur content of 0.24%. TIC and Modified NP content was 295 and 172 kg $CaCO_3$ eq/tonne, respectively. The sample was classified as non-PAG on the basis of TIC/AP and NP/AP. Trace element content was below the screening criteria for all samples with the exception of arsenic in one and sulphur in three mafic metavolcanics (1a) samples. Total metal concentrations for all other samples were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment. SFE tests for the altered mafic metavolcanics (1as) waste rock had alkaline pH (8.5-9.0 s.u.). Nitrate concentrations (7.4 to 124 mg/L) and chloride values (180 to 490 mg/L) were lower than previous years, suggesting the continuous flushing of residual explosives and drilling brines from waste rock.

The Type A waste rock sample set (SRK 2015a) represents the geochemical characteristics of the altered mafic metavolcanic (1as) waste rock sample collected in 2020. Sulphur and arsenic content of the mafic metavolcanic (1a) samples collected from Pad T in 2020 were more comparable to the CPR waste rock than the underground waste rock.

The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the waste rock and ore stockpile area and routine monitoring of the Pollution Control Pond (PCP). The results of the seepage survey are reported in Section 6 and Appendix D, while results of the routine monitoring program are included in monthly water quality reports prepared by TMAC and submitted to the Nunavut Water Board.

## 9.2 Madrid North Waste Rock

Mining of the underground in 2020 resulted in the production of approximately 17,158 t of waste rock that was placed on the Madrid North WRSA. Mining of the NE CPR in 2020 resulted in the production of approximately 93,289 t of waste rock, of which approximately 83,968 t was placed on the Madrid North WRSA and the balance was used for construction.

### 9.2.1 Madrid North Underground Waste Rock

Based on TMAC's geological inspections of the underground, the majority (99%) of waste rock was geologically logged as mafic metavolcanics (1a) and minor (1%) quartz-carbonate veining. TMAC collected two samples of waste from the underground mine for the purposes of geochemical classification. The samples were mafic metavolanics (1a) characterized by low sulphur content (0.19 and 0.23%) and levels of Modified NP and TIC between 85 and 273 kg $CaCO_3$/t. Both samples were classified as non-PAG. Arsenic content (49 ppm) was enriched in one sample compared to the screening criterion. All other parameters were below the screening criteria suggesting no appreciable enrichment.

### 9.2.2 Naartok East CPR Waste Rock

TMAC executed the geochemical construction monitoring program of NE CPR waste rock by sampling drill cuttings from each blast round, analyzing the samples by pXRF coupled with geological inspection and classifying samples according the criteria in SRK (2019). Based on the geochemical classifications of the drill cutting samples, TMAC classified waste rock from each blast round as either suitable for construction (e.g. low risk of ML/ARD) or not suitable for construction (e.g. risk of ML/ARD) followed by segregation and management of waste rock according to the risk classifications.

TMAC collected 1,000 samples, representing 21 blast rounds, for pXRF analysis for the purposes of geochemical classification of construction rock according to SRK (2019). Based on the geological inspection of drill cutting samples, waste rock lithologies were predominantly (44%) mafic metavolcanics with sediments (1aj/10j, n=440), 20% mafic metavolcanics (1a, n=202), 19% sedimentary units (5, n=186), 16% altered mafic metavolcanics (1aj/1oj, n=158), 1% quartz veins (12q, n=10), and <1% overburden (15, n=4). Based on pXRF analysis of drill cuttings, TMAC classified 7% of samples as low risk of ML/ARD and 93% as having risk of ML/ARD. These results were interpolated by TMAC to a field scale, e.g. blast round basis, resulting in 10% of waste rock being classified as geochemically suitable for construction and 90% as not suitable for construction.

In 2020, a total of 93,289 t of waste rock was produced from NE CPR, of which 83,968 t was placed on the Madrid North WRSA and 9,321 t used for construction of the following infrastructure and access roads at Madrid North: NE CPR for in-pit armouring; Madrid Shop Laydown pad; Madrid North portal pad and internal roads and cladding within the Overburden stockpile.

### 9.2.3 Madrid North Waste Rock Stockpile Area (WRSA)

In 2020, a total of 101,126 t of waste rock were placed on the Madrid North WRSA, with the majority (83%) sourced from NE CPR and the balance from the decline of the Madrid North underground mine. No waste rock was removed from the waste rock stockpiles. In accordance with the *Waste Rock, Ore and Mine Backfill Management Plan (*TMAC 2019), SRK conducted an inspection and collected waste rock samples from the WRSA. Waste rock at the WRSA was placed in two stockpiles including a smaller stockpile located directly upstream of the CWP that contains ore hosted in mafic volcanics with sediments (1aj) from NE CPR that could not be segregated from waste rock and ii) a larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from NE CPR and the underground mine (the latter as indicated by rinse tests).

Waste rock was a mix of approximately 85% chloritic green mafic metavolcanics (1a), 10% light tan colored sericite altered mafic metavolcanics (1as), with the remainder composed of lesser proportions of strongly weathered and pervasively oxidized waste rock (oxide), chert and siltstones (5), quartz veins (12) and diabase (11c). Sedimentary units (5) were observed throughout the waste rock stockpile area. Oxide material was concentrated in the stockpile located directly upstream of the CWP and represents ore that could not be segregated from waste rock. Lesser amounts of oxidej (not ore) were present in the stockpile adjacent to Sumps 1 to 3.

SRK collected 13 samples for geochemical characterization, of which five were from the stockpile upstream of the CWP and eight were from the stockpile adjacent to the sumps. Furthermore, three samples contained oxide and sedimentary units (5), six samples contained oxide only and four did not contain oxide and/or sediments. Geochemical data suggest that two of the samples without oxide and/or sediments (20-MAD-10 and 20-MAD-12) were sourced from the underground mine.

Total sulphur content for samples containing sediments and/or oxide ranged from 0.35 to 1.2% (n=9) whereas sulphur ranged from 0.28 to 0.36% for samples that did not contain sediments and/or oxide (n=4). For all samples, TIC and NP ranged from 158 to 411 kg $CaCO_3$/t in the 1as samples. All samples were classified as non-PAG. All samples were enriched in arsenic (134 to 683 ppm) compared to the screening criterion. Arsenic content was highest for samples containing oxide and exhibited a positive trend with sulphur. There was no relationship between gold and arsenic content. Rinse tests, SFE tests, and paste pH indicated all samples were non-acidic. SFE tests indicated higher soluble content associated with samples containing oxide, including antimony (0.0011 to 0.021 mg/L), arsenic (0.013 to 3.5 mg/L for all samples), cobalt (0.00013 to 0.0007 mg/L), nickel (0.00039 to 0.011 mg/L) and zinc (below detection limit of 0.0001 mg/L to 0.0012 mg/L). Soluble arsenic concentrations exhibited a positive trend with arsenic and sulphur content but did not have a relationship with gold.

The FEIS the waste rock and ore humidity sample set represent the geochemical of the waste rock stockpiles at the WRSA (SRK 2017). The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the Madrid North WRSA and routine monitoring of CWP, Sump 1, Sump 2 and Sump 3. The results of the seepage survey and water quality monitoring are reported in Section 6 and Appendix D, while results of the routine monitoring program

are included in monthly water quality reports prepared by TMAC and submitted to the Nunavut Water Board.

## 9.3 Quarry and Construction Rock

### 9.3.1 Quarry 2

Two geological inspections of active Quarry 2 faces indicated that quarry rock was mafic volcanics (1a) with less than 1% quartz-carbonate. Strong chlorite and moderate epidote alteration plus trace amounts of disseminated sulphides were also observed in one of the inspections. Geochemical monitoring of the Quarry 2 samples indicated that they were all non-PAG on the basis of TIC/AP and NP/AP.

### 9.3.2 As-Built Construction Monitoring

Geological inspection of as-built construction areas included the Madrid North WRSA pad, the Madrid Surface Shop Laydown pad and construction rock placed in association with the Overburden Stockpile. All construction material was sourced from NE CPR except the surface dressing placed at the Madrid Surface Shop Laydown (sourced from Quarry 2) and the Overburden access road at the Overburden Stockpile (constructed in 2019 of Quarry D rock).

#### Madrid Surface Shop Laydown and Madrid North WRSA

The construction monitoring program identified that sedimentary rock was used for construction rock in the pads of the Madrid Surface Shop Laydown and the Madrid North WRSA. According to SRK (2019), sedimentary units are not geochemically suitable for use as construction materials due to potential for neutral pH metal leaching. The predominant rock type was mafic metavolcanics (1a).

All samples were classified as non-PAG on the basis of both TIC/AP and NP/AP. Five samples were enriched in arsenic relative to the screening criteria including four at Madrid North WRSA and one at Madrid Surface Shop Laydown. All other parameters were below the screening criteria suggesting no appreciable enrichment.

All samples of NE CPR waste rock used for construction rock at the Madrid Surface Shop Laydown were geochemical suitable for use as construction rock. At the WRSA, all samples (n=6) were classified as non-PAG and arsenic content for four of the samples was below the criterion (As < 70 ppm). Arsenic content was elevated in two WRSA samples (76 to 560 ppm). These samples are within the catchment boundary of the Madrid North CWP which collects runoff from the WRSA (SRK 2020a). Water management at the Madrid North WRSA includes collection of drainage from the WRSA in the CWP and three sumps located on the northern, eastern and western extents of the WRSA pad (MMS1-S1 to MMS1-S3). Agnico conducts routine water quality monitoring of water collected in the CWP and sumps.

#### Construction Rock at the Overburden Stockpile

Construction rock sampled in 2020 at the Overburden Stockpile included mafic metavolcanics (1) sourced from Quarry D in 2019 to construct the access roads (20-OVB-03) and mafic metavolcanics (1a) with gabbro (7a) from NE CPR placed as cladding at the southern toe of the Overburden Stockpile (20-OVB-06). No sedimentary units were observed, however NE CPR waste rock placed in 2020 as internal access roads within the stockpile were buried and not accessible for inspection.

Both samples were classified as non-PAG. Total sulphur content ranged between 0.1 and 0.2 % and Modified NP and TIC ranged from 120 to 150 kg $CaCO_3$/t and from 100 to 140 kg $CaCO_3$/t, respectively. Solid-phase elemental content was below the screening criteria suggesting no appreciable enrichment.

SFE tests indicated that the samples were non-acidic. EC values were 4,200 and 5,400 µS/cm with major cation chemistry dominated by sodium (610 to 780 mg/L) and major anion by sulphate and chloride (530 to 550 mg/L and 960 to 1,200 mg/L respectively). Notable, major ion concentrations were higher than other construction rock samples. SFE concentrations of nickel and cobalt were similar to the highest levels reported in the Madrid North WRSA samples (0.0018 to 0.0021 mg/L and 0.0002 to 0.0003 mg/L respectively). Of the construction rock sample set, SFE manganese concentrations were highest from the Overburden Stockpile construction rock samples (0.079 to 0.11 mg/L).

## 9.4 Seepage Monitoring

The scope of the 2020 Hope Bay seepage monitoring survey included infrastructure constructed between fall 2019 and spring 2020 at Madrid North from NE CPR waste rock; infrastructure surveyed for seepage at Doris and Madrid in 2019 but where none was observed, three reference stations, areas downstream of the Doris waste rock stockpiles (referred to as the Waste Rock Influenced Area or WRIA) and contact water downstream of the Madrid North WRSA. In 2020, reference station at Windy (REF-01) was removed from the program due to its proximity to development and a new station established south of the Madrid North WRSA (REF-01A). Concentrations for reference area seeps were consistent and stable with the historical data record.

### 9.4.1 Doris

#### Waste Rock Impacted Area

Seepage monitoring in the waste rock impacted area was at the same locations as previous years: in the embankment of the pollution control pond (PCP) at the downstream toe of the stockpile on Pad I and the toe of the access road. In 2015, TMAC regraded the waste rock stockpile on Pad I and placed ore stockpiles on top.

The pH for all seepage samples was non-acidic (7.5 to 7.9). EC ranged from 1,300 and 1,800 µS/cm for the seepage samples at the toe of Pad I and 11,000 to 22,000 µS/cm for samples along the access road samples. Since 2016, decreasing concentrations of ammonia, nitrate, and chloride

concentrations have continuously indicated the flushing of salts from drilling brines (chloride) and explosives residues (ammonia, nitrate, and nitrite) from the stockpile on Pad I. Prior to 2020, seepage collected at the toe of Pad I was interpreted to be waste rock contact water and seepage at the toe of the access road was more dilute. In 2020, seepage collected along the access road contained higher levels of residual drilling brines and blast reagents. The differences in concentrations of operational reagents suggests that access road seepage is from a different seepage source. Madrid ore was sourced from the NE CPR where brines are not used for drilling and accordingly, Madrid ore is not the source of elevated chloride.

Seepage at the toe of the stockpile at Pad I is within the range of constituent concentrations from previous years. Parameters with higher concentrations in seepage along the access road compared to the toe of the stockpile at Pad I include sulphate (220 to 270 mg/L compared to ~75 mg/L, respectively), cobalt (4 to 11 times higher), nickel (4 to 15 times higher), manganese (22 to 58 times higher), cadmium (140 to 410 times) and zinc (10 to 24 times higher). Notably arsenic concentrations for all 2020 samples were within the same range. Furthermore, arsenic, cobalt and nickel concentrations were lower in 2020 compared to 2019.

All drainage from the Doris camp pad, including seepage captured in the collection sumps downstream of the toe of the access road, is pumped to the sediment control pond (SCP) prior to transfer to the TIA. In 2020, water from the SCP accounted for 2% of total inflow volumes entering the TIA and 0.6% of the total volume stored in the TIA.

#### Infrastructure and Roads

Infrastructure surveyed at Doris included the Doris CPR cover (constructed of Doris CPR waste rock) and access road to the vent raise (constructed of Quarry 2 rock). Seepage was observed and samples collected representing construction rock from the Doris CPR cover but not at the access road to the Doris vent raise.

Of the two seepage samples collected, sample 20-DCPR-02 water quality was geochemically equivalent to the reference seeps and is interpreted to not represent contact water from the Doris CPR cover. Drilling brines were not used to mine the CPR and explosives residue concentrations are lower as a result of differing blasting practices. The lower ammonia and chloride concentrations in seepage suggests that the waste rock used to construct the NE CPR cover was sourced from NE CPR. Dissolved trace metals concentrations were typically within an order of magnitude of concentrations for Doris waste rock seepage samples downstream of Pad I except for copper for 20-DCPR-01 (0.0013 mg/L and 30 times lower).

### 9.4.2 Madrid North

#### Waste Rock Storage Area

Of the 101,126 t of rock placed at WRSA, the majority of waste rock originated from NE CPR (83,968 t). Approximately, 17,158 t of waste rock from the decline of the Madrid North underground

mine was also placed at WRSA. Waste rock at the WRSA was geochemically classified as non-PAG and placed in two stockpiles (Section 4 and Appendix B). The stockpiles at the WRSA include:

1. a smaller stockpile located directly upstream of the contact water pond (CWP) that contains oxide rock. The oxide rock is ore hosted in mafic volcanics with sediments (1aj) from NE CPR that could not operationally be segregated from waste rock.
2. A larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from NE CPR and the underground mine (the latter as indicated by rinse tests).

Water management at the Madrid North WRSA includes three water collection sumps (Sump 1, Sump 2 and Sump 3) and the Madrid North CWP. Water from the sumps are pumped to the contact water pond, therefore water chemistry at the CWP is influenced by waste rock seepage draining to CWP and the collection sumps. Discharge of effluent onto tundra from the CWP is in accordance with the effluent quality limits provided in the Water Licence. Water that does not meet these criteria is transferred to the TIA via water truck.

Water quality samples collected downstream of the WRSA included one freshet seepage sample near Sump 1 and routine water quality samples in the contact water pond (CWP), Sump 1, Sump 2 and Sump 3. Samples collected from the CWP and sumps of the Madrid North WRSA were analyzed for total metals whereas the seepage sample was analyzed for dissolved metals. As a result of high TSS in selected sump samples, aluminum, iron, copper, zinc and possibly manganese data were interpreted to be biased high.

All waste rock drainage samples were non-acidic. The waste rock drainage chemistry collected in the CWP and Sump 1 are geochemically distinct from Sump 2 and Sump 3. Contact water collected in the CWP and Sump 1 had higher sulphate concentrations (13 to 260 mg/L compared to <40 mg/L at Sumps 2 and 3), higher chloride and/or ammonia concentrations (maximum of 990 and 2.2 mg/L, respectively), higher arsenic and nickel concentrations (maximum of 0.022 and 0.012 mg/L, respectively).

Cobalt concentrations in June ranged from 0.0012 to 0.0033 mg/L for all samples but in September were higher at Sump 1 (0.025 mg/L) compared to Sump 2, Sump 3 and CWP (0.0033 to 0.0075 mg/L). Manganese exhibited temporal rather than spatial trends and were an order of magnitude higher in samples from September (0.24 to 7.0 mg/L) compared to samples from June (0.026 to 0.17 mg/L). Maximum selenium concentrations were indicated at Sump 1 and Sump 3 and selected sample from the CWP (ranging from 0.0011 to 0.0023 mg/L for all aforementioned areas). In comparison concentrations at Sump 2 and selected CWP samples were lower (0.00020 to 0.00075 mg/L).

Chloride and ammonia are operational reagents that are introduced to underground waste rock from drilling brines and blast residues, respectively. In contrast, mining at the NE CPR did not use drilling brine and has lower ammonia residues because of differing blasting practices at surface. A review of the drainage chemistry suggests the following with respect to weathering of NE CPR and Madrid North underground waste rock at WRSA:

- Chloride concentrations and trends suggest contact water from underground waste rock primarily reports to Sumps 1 and 3 with minor flows reporting directly to the CWP and Sump 2. The source

of higher selenium concentrations in Sump 1 and Sump 3 are likely related to weathering of underground waste rock.

- A comparison of the seepage sample (ID 20-MWAR-01) compared to the overall June sample set suggests that 20-MWAR-01 represents a mixture of contact water of waste rock from the underground mine (as indicated by chloride and ammonia) and NE CPR (as indicated by arsenic).
- In June, seepage was observed emanating from the newly constructed CWP to the tundra (NT-NU Report submitted by TMAC on June 15, 2020). TMAC collected paired samples of the seepage downstream of the CWP and water in the CWP. The seepage sample was had higher chloride that was indicative of drainage chemistry from underground waste rock whereas CWP pond sample had higher As, Co and Ni indicative of NE CPR waste rock.
- Multiple parameters suggest spatial variability in water chemistry within the CWP. This is likely due to point discharge of waste rock drainage pumped from the sumps to the CWP.

### Infrastructure and Roads

Infrastructure surveyed at Madrid North included the access road to Naartok East CPR (constructed of Quarry D rock), overburden stockpile (constructed in two phases of Quarry D rock and NE CPR waste rock), Madrid North Portal Pad (constructed of NE CPR waste rock) and Madrid Shop Laydown (constructed of NE CPR waste rock). Seepage samples were collected downstream of all areas except the Madrid Shop Laydown. A summary of Madrid North Portal Pad seepage is presented in Section 9.5.

#### Madrid Overburden Stockpile

The overburden stockpile contains construction rock sourced from two areas: Quarry D for construction in early 2019 of access roads and NE CPR waste rock for construction in late 2019 interior access roads and placement as cladding.

- pH and EC ranged from 6.8 to 7.7 and 31,000 to 81,000 uS/cm, respectively.
- The major cation chemistry was dominated by sodium (6,200 to 19,000 mg/L) and magnesium (960 to 2,900 mg/L) and anion chemistry was dominated by chloride (12,00 to 31,000 mg/L) and sulphate (1,600 mg/L to 4,000 mg/L). A comparison of major ions for overburden stockpile compared to portal pad seepage is summarized as follows and indicates different geochemical sources. Chloride was the same order of magnitude as the portal pad however calcium one was order of magnitude lower for the overburden stockpile. Concentrations for potassium, sodium, magnesium and sulphate were an order of magnitude higher for Overburden Seepage.
- Nutrient concentrations ranged from 8.8 to 24 mg/L as N (ammonia), <0.5 to 24 mg/L as N (nitrate) and <0.1 to 0.57 mg/L (nitrite).
- Ranges in trace metal concentrations that were elevated in portal pad seepage are as follows: cobalt (0.0037 to 0.096 mg/L), manganese (1.4 to 11 mg/L), nickel (<0.01 to 0.086 mg/L) and zinc (below detection of <0.05 mg/L). Notably, arsenic concentrations were near analytical detection limits.

- Iron concentrations ranged from <0.2 to 15 mg/L. Samples with iron concentrations above detection exhibited more reducing conditions whereas iron was below detection for samples with higher values of ORP. Iron concentrations did not have a positive trend with manganese, the latter which showed the highest concentrations with higher ORP values indicative of oxidizing conditions.
- A geochemical investigation of the source of overburden stockpile seepage is currently in progress (SRK in progress).

NE CPR Access Road

The NE CPR access road was constructed of rock from Quarry D. Seepage was non-acidic (7.3 to 7.8) with low values of EC (120 to 510 µS/cm). Sulphate concentrations were low (2.3 to 31 mg/L). Ammonia and nitrate were within one to two orders of magnitude greater than reference samples. Dissolved metals concentrations were the same order of magnitude compared to the reference seeps except for manganese. Manganese concentrations ranged from 0.00099 mg/L to 0.71 mg/L.

## 9.5 Madrid North Portal Pad Investigation

A geochemical investigation of the Madrid North Portal Pad was undertaken in addition to the regular annual monitoring to investigate the source of neutral pH metal leaching and high saline drainage at the Madrid North Portal Pad as indicated by the 2020 seepage monitoring program (Section 7 and Appendix E).

One seepage location was identified and monitored flowing from the Portal Pad area underneath the base of the roadway leading onto the Portal Pad and daylighting with a northward flow direction. Field and laboratory pH ranged from 5.3 to 6.6 and 4.9 to 6.6 respectively. Laboratory EC ranged from 35,000 to 68,000 µS/cm. The major cation chemistry was dominated by calcium (6,700 to 17,000 mg/L) and sodium (510 to 1,700 mg/L), while major anion chemistry was dominated by chloride (9,700 and 31,000 mg/L) and sulphate (68 to 120 mg/L). Sulphate concentrations suggest low rates of sulphide oxidation, which is consistent with the sulphide content of the Portal Pad construction rock construction rock (median and 95th percentile values of 0.18 and 0.52%, respectively). Ammonia concentrations ranged from 63 to 150 mg/L as N and nitrate concentrations ranged from 61 to 1,100 mg/L as N. The portal pad was constructed from waste rock from NE CPR; however, the concentrations of nitrogen nutrients are indicative of blast residues from underground waste rock. Dissolved metals concentrations were notable for cadmium (0.0025 to 0.0032 mg/L), cobalt (0.14 to 0.53 mg/L), manganese (22 to 36 mg/L), nickel (0.058 to 0.12 mg/L), and zinc (0.25 to 0.33 mg/L). Notably, arsenic concentrations were below analytical detection and are interpreted to be adsorbed to iron (oxy)hydroxides visible in the seepage flow path.

Field pH and EC were measured in natural tundra waters from hand-dug test pits at seven background sites at Madrid North and along the Doris-Windy road and one site within the ephemeral seepage plume downstream of the Madrid North Portal Pad. pH and EC ranged from 5.6 to 8.1 and 130 to 520 µS/cm, respectively. In contrast, the station within the Portal Pad plume of impacted vegetation had the lowest pH (4.4) and highest EC (5,200 µS/cm).

TMAC geologist geologically inspected all visible waste rock at the Portal Pad and excavated three north-south trending trenches to expose NE CPR waste rock beneath the surface layer of crushed rock from Quarry 2. The trenches were oriented perpendicular to the road to intersect the advancing face of the original pad construction. The mapping confirmed that construction rock sourced from NE CPR contained sedimentary rock in all areas except for localized areas of the berm. The majority of construction rock was mafic metavolcanics intermixed with 1 to 10% sedimentary units except for localized areas containing more than 50% sedimentary rock. The crushed material from Quarry 2 placed on the pad surface described the surface dressing was dark chloritic green mafic metavolcanics (1a). The geochemical characterization program included 32 construction rock samples collected from berms and trenches and one samples from a stockpile of briny waste rock located on and within an excavated area of the lined pad where material was being relocated to Madrid North WRSA.

Rinse pH for the 33 waste rock samples ranged from 7.2 to 9.2 and EC ranged from 82 to 380 µS/cm for construction rock samples, with values significantly lower than the brine stained waste rock (18,000 µS/cm). The rinse EC for the brine stained waste rock was more than ten times higher than equivalent values for run-of-mine (ROM) waste rock samples collected from stockpiles by SRK in 2020 at Doris and Madrid North, suggesting that the lined pad contained a more concentrated source of brine compared to concentrations of residual brine on waste rock that are typical of blasting underground mine development.

All 33 samples were classified as non-PAG on the basis of NP/AP and TIC/AP, median sulphur was 0.18% compared to sulphur content of the waste rock stockpile at 0.57%. Modified NP was greater than 90 kg$CaCO_3$/t and typically higher than TIC (greater than 60 kg$CaCO_3$/t). The solid-phase content of the briny waste rock was compared to Portal Pad construction rock for parameters of concern. Arsenic, cadmium, cobalt, iron, nickel and zinc concentrations in the briny waste rock was within the range of concentrations of Portal Pad construction rock. All construction rock samples except one sample met the geochemical criteria for arsenic (pXRF As < 70 ppm).

SFE results showed that all 33 samples were non-acidic, with pH values ranging from 7.7 to 9.3. Major ion chemistry for construction rock samples was dominated by alkalinity and sodium, whereas for the briny waste rock samples, the major ion chemistry was dominated by chloride and calcium. Sulphate concentrations were less than 80 mg/L for all samples and exhibited an increasing and positive trend with total sulphur.

The briny waste rock SFE chloride and calcium concentrations were more than 50 times higher than concentrations for Portal Pad construction rock samples and also underground waste rock from Doris. Brines are not used for quarry development or mining at NE CPR. SFE ammonia and nitrate concentrations for briny waste rock were comparable to Doris ROM waste rock, which are more than an order of magnitude higher than the Portal Pad construction rock and quarry rock. The difference in blast residue concentrations is attributable to differences in blasting practices for underground waste rock compared to quarry or NE CPR waste rock. SFE arsenic concentrations were less than 0.07 mg/L and showed a strong correlation with solid phase arsenic content for construction rock samples. In contrast, the briny waste rock sample had relatively high arsenic content (24 ppm) but a low SFE arsenic concentration (0.00096 mg/L) suggesting an arsenic attenuation mechanism. Nickel and cobalt concentrations were notably higher for the briny waste rock sample suggesting increased mobility

under saline conditions. For cadmium and zinc, the absence of a relationship with pH coupled with the briny waste rock sample exhibiting notably higher concentrations similarly suggests increased metal mobility under saline conditions.

The conceptual model for Madrid North portal pad seepage is that a flow of high ionic strength solution flowed through the compromised liner on the temporary transfer area of the Madrid North Portal Pad and across the tundra, resulting in a downstream area of impacted vegetation within the seepage pathway. The chemistry of the ponded water on the lined transfer area and leachable products of the briny waste rock indicate the presence of a high ionic strength solution that is more concentrated than residual drilling brine on typical Hope Bay underground waste rock. The source of elevated major ions and cobalt, manganese, nickel and zinc in the seepage is the briny waste rock on Madrid North Portal Pad and not construction rock sourced from NE CPR. The hypersaline solution on the waste rock resulted in increased metal leaching rates and mobility as a response to ion exchange and/or formation of chloride complexes. Portal pad construction rock and briny waste rock are not the source of slightly acidic pH indicated in the seepage; rather, development of mildly acidic pH is related to organic acids in the active layer and/or release of acidity from ion exchange between the hypersaline seepage and the tundra.

## 9.6 Tailings

In 2020, a total of 364,982 t (dry weight equivalent) of flotation tailings were deposited in the Doris TIA and 17,886 t of detoxified tailings were placed as backfill in the stopes of the Doris Mine.

### 9.6.1 Flotation Tailings Slurry

For flotation tailings solids (TL-6), sulphur concentrations ranged between 0.07 and 0.63% with a median value of 0.22%. TIC content ranged between 170 and 290 kg $CaCO_3$/t. All flotation tailings samples were classified as non-PAG, which is consistent with 2017 and 2018 operational tailings monitoring (SRK 2020b) and metallurgical tailings samples (SRK 2015b). Trace element content was elevated compared to screening criteria for arsenic in all samples except February and October. All other parameters were below the screening criteria indicating no appreciable enrichment.

pH was stable in both the tailings detoxified filtrate (TL-7B) (8.3 to 8.8 s.u.) and the process plant tailings discharge (TL-5) (8.0 to 8.5 s.u.). Sulphate concentrations were within the range of historical data, but an operational maximum concentration was observed in August 2020 (10,000 mg/L in TL-5 and 41,000 mg/L in TL-7B). Total cyanide concentrations were stable in TL-5 (0.5 to 6.5 mg/L) and lower than 2019 in TL-7B (0.3 to 2.5 mg/L). WAD cyanide, free cyanide and thiocyanate concentrations were within the range of historical values in TL-5 and TL-7B except for a fivefold increase observed in thiocyanate in TL-5 in September 2020 and an anomalously high result for free CN in TL-7B in August 2020 which was due to an elevated detection limit. Cyanate concentrations increased in TL-5 to August 2020 then decreased thereafter. In TL-7B cyanate concentrations were within the range of 2019 data with the exception of three samples with values greater than 800 mg/L. Trace element concentrations were generally within range of historical data; arsenic reported an increasing trend in TL-5 between July 2019 and April 2020 then a decreasing trend thereafter. Concentrations of antimony and

molybdenum increased from March 2019 in TL-5; an increasing antimony trend was also apparent in TL-7B from June 2019.

### 9.6.2 Detoxified Tailings

For detoxified tailings solids (TL-7A), total sulphur concentrations ranged between 15 and 34% in 2020. TIC results for 2020 ranged between 96 and 184 kg $CaCO_3$/t. All of the detoxified tailings samples were classified as PAG, which is consistent with 2017 to 2019 operational tailings monitoring and metallurgical tailings samples (SRK 2015b). All detoxified tailings samples were elevated in arsenic, bismuth, copper, gold, selenium, silver and sulphur compared to the screening criteria. More than half of the 2020 samples were also elevated for lead. Selected samples were elevated in cadmium (n=3), antimony (n=4) and zinc (n=1) compared to the screening criteria. All other parameters were below the screening criteria indicating no appreciable enrichment.

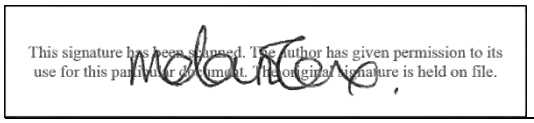
Opportunistic seepage monitoring of the backfilled stopes reported similar major ion chemistry for two samples from the July (Levels 134 and 120) and December surveys (Levels 110 and 120) which differed from the two ponded water samples (Levels 5002 and 4905) collected in July suggesting that the ponded water samples did not represent contact waters.

For the samples inferred to be contact waters, pH and EC ranged from 7.6 to 7.9 s.u and 21,000 to 26,000 µS/cm, respectively. Major anions were chloride and sulphate and major cations were sodium and magnesium. Levels of ammonia, nitrate and nitrite were lower than the 50th percentile concentrations from the historical sample set. Concentrations of cadmium, copper, nickel, selenium and silver, noted as parameters of potential concern based on the humidity cell test (HCT) program (SRK 2015b), reported concentrations less than the 50th percentile concentrations from the historical sample set. Zinc was not noted as a parameter of potential concern in the HCT program but has historically reported elevated concentrations; all samples were below the 50$^{th}$ percentile from the historical sample set.

For the ponded water samples, pH and EC ranged from 7.7 to 7.9 s.u. and 3,100 to 5,000 µS/cm, respectively. Dominant anions were chloride and sulphate, major cations were dominated by sodium and to a lesser extent calcium. Levels of ammonia, nitrate and nitrite plus key trace elements (cadmium, copper, nickel, selenium, silver and zinc) were lower than the 50th percentile concentrations from the historical sample set.

# Closure

This report, 2020 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines, was prepared by

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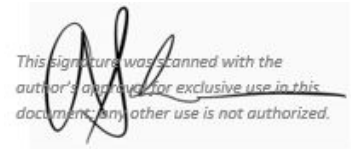


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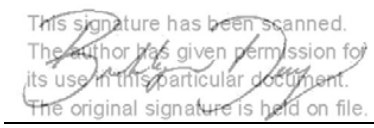


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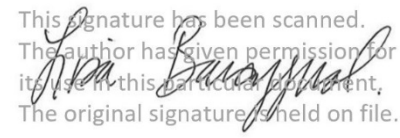


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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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TMAC Resources Inc. 2019. Waste Rock, Ore and Mine Backfill Management Plan, Hope Bay Project, Nunavut. Report prepared for the Nunavut Water Board by TMAC Resources, March 2019.

# Appendix A 2020 Geochemical Monitoring of Waste Rock, Doris Mine

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# Technical Memo

March 12, 2021

| | |
|---|---|
| **To** | Ashley Mathai and Sarah Warnock, Hope Bay Project |
| **From** | Jessica Evans, SRK; Lisa Barazzuol, SRK |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | 2020 Geochemical Monitoring of Waste Rock, Doris Mine |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

In April 2015, TMAC re-initiated underground mining at Doris, with placement of waste rock on surface commencing in October 2015. Requirements for management and monitoring of waste rock and ore are specified in the Waste Rock and Ore Management Plan (WROMP, TMAC 2019) which is part of Water Licence 2AM DOH1335 Amendment No. 2 (Nunavut Water Board 2018).

In 2020 a total of 106,890 t of waste rock was produced from mining activities in the Doris mine; this material was kept underground and used as backfill. In addition, approximately 68,699 t of waste rock was removed from the surface waste rock stockpile on Pad T and placed as backfill in stopes of the Doris mine (Table 1-1, Figure 1-1). At Doris Crown Pillar Recovery Trench (CPRT) mining ceased and placement of backfill was completed in 2019.

**Table 1-1: Summary of 2020 Waste Rock Placement Locations and Volume**

| Doris Mine | Source Location | Placement Location | Volume (t) | Total Moved (t) |
|---|---|---|---|---|
| Underground | Underground | Backfill in Stopes | 106,890 | 175,789 |
| | | Pad T | 0 | |
| | Pad T | Backfill in Stopes | 68,899 | |

This memo documents the geochemical monitoring of underground waste rock on the Pad T surface waste rock stockpile executed by SRK according to the requirements of the waste rock management plan outlined in TMAC (2019). Other 2020 monitoring activities in the Doris mine area related to waste rock included an annual seep survey along the downgradient toe of the waste rock and ore stockpile area, routine monitoring of the Pollution Collection Pond (PCP) and seepage monitoring of Doris waste rock used as construction rock in 2019 for the cover of the Doris CPR. The results of the seepage surveys and monitoring of construction rock are reported in the accompanying memos (SRK 2021a and SRK 2021b), while results of the routine monitoring program are included in monthly water quality reports prepared by TMAC and submitted to the NWB.

**Figure 1-1: Waste Rock Stockpile on Pad T, Doris (looking down, July, 2020)**

# 2 Methods

## 2.1 Geological Inspections

Waste Rock, Ore and Mine Backfill Management Plan (TMAC 2019) outlines two types of waste rock inspections: routine underground geological inspections at the blast face by site geologists and annual inspection of the surface waste rock stockpile on Pad T.

In September 2020, SRK geochemist Jonathon Doherty, GIT (BC) completed a geological inspection of waste rock placed on Pad T. The objective of the inspection was to determine the geological composition of waste rock, to examine for signs of sulphide oxidation and weathering and to collect samples for geochemical characterization of waste rock for comparison with baseline geochemical

characterization (Section 3.1.3, Table 3.1; TMAC 2019). At the time of the inspection, TMAC geologists indicated that the stockpile had been reworked prior to the inspection which resulted in waste rock placed in 2020 being mixed with waste rock placed in previous years. SRK's inspection therefore covered the entire stockpile.

The inspection was carried out by walking over the stockpiles and along the perimeter of the upper bench, examining rock types and the presence of sulphide and carbonate content (Attachment A).

## 2.2 Sample Collection and Geochemical Test Work Program

As per the Waste Rock, Ore and Mine Backfill Management Plan (TMAC 2019), SRK collected samples of waste rock from Pad T. SRK collected six samples (Table 2-1) with sample distribution according to the rock types visually identified by SRK during the stockpile inspection (Section 2.1) and also the proportion of rock types that were intersected by mining, as indicated by TMAC geologists. One field duplicate was also collected from the stockpile for quality assurance and quality control QA/QC purposes (see Section 2.4 for more detail).

Each sample consisted of a sieved coarse fraction (screened to -1 cm) and a finer fraction (screened to -2 mm) for rinse tests. SRK visually described the samples for rock type, sulphide content (quantity, type and occurrence) and carbonates (fizz test with 10% HCl, type, and occurrence). Rinse tests involved mixing a 1 to 1 ratio of distilled water and solids and measuring the resulting pH and electrical conductivity (EC).

SRK shipped samples to Bureau Veritas (BV) in Burnaby, BC for analysis of ABA (Section 2.3) and elemental analysis on the coarse -1 cm fraction. Three samples were selected by SRK for shake flask extraction (SFE) testing based upon the low, medium and high values of rinse EC. SFE samples were sieved to -2 mm at BV from the -1 cm size fraction.

**Table 2-1: Pad T Waste Rock Monitoring Samples Collected and Associated Test Program**

| Rock Type[1] | ABA & Elemental Analysis | SFE | Rinse Test (pH and EC) |
|---|---|---|---|
| 1a | 5 | 3 | 5 |
| 1as | 1 | 0 | 1 |
| Total Number of Tests | 6 | 3 | 6 |

Source: Z:\01_SITES\Hope.Bay\1CT022.037_2019 Geochem Compliance\Task 110 Doris WR Monitoring\3. Working File\HopeBay_WRMonitoring_1CT022.037_DM_rev03.xlsx

Notes:

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics

## 2.3 Analytical Methods

The geochemical analytical methods for waste rock samples are summarized as follows:

- Total sulphur by Leco;
- Sulphate by HCl leach;
- TIC by Leco furnace to directly measure $CO_2$ gas evolved from HCl treatment of the sample;
- Modified Sobek NP (MEND 1991);
- Elemental analysis by aqua regia digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) determination of 9 major elements (e.g., aluminium, calcium, magnesium, sodium, potassium, iron, sulphur) and 26 trace elements (e.g., arsenic, zinc, copper, cadmium, lead); and
- SFE tests on the -2 mm size fraction, using a 3:1 solution to solid ratio and a 24-hour shaking period (MEND 2009). SFE leachates were analyzed for pH, EC, total dissolved solids (TDS), $SO_4$, alkalinity, acidity, chloride, ammonia, $NO_3$, $NO_2$ and element analysis by ICP-MS (including Hg).

## 2.4 Quality Assurance and Quality Control

All results, including BV's internal quality assurance and quality control (QA/QC) program, were reviewed by SRK for quality assurance. In addition to BV's QA/QC program, SRK followed internal QA/QC procedures as outlined in the SRK Expectations for Laboratory Geochemical Data Quality (2019) which have been agreed upon with the laboratories that SRK uses. Table 2-4 presents a summary of the QA/QC checks for the waste rock samples collected from Pad T by SRK, including the assessment of duplicate and blank samples and standard reference materials. SRK determined all data to be acceptable.

**Table 2-2: Summary of QA/QC Results**

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Paste pH** | | |
| Crush Duplicate (n=1) | For any samples, +/- 0.5 difference pH unit | All passed. |
| Pulp Duplicate (n=5) | For any samples, +/- 0.5 difference pH unit | All passed. |
| Field Duplicate (n=1) | For any samples, +/- 0.5 difference pH unit | All passed. |
| Standard Reference Material (n=3) | Within specified tolerance ranges. | All passed. |
| **Total C and TIC** | | |
| Method Blank (n=1) for TIC | <2X detection limit (DL) | All passed. |
| Crush Duplicate (n=1) for TIC | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Pulp Duplicate (n=3) for TIC | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed. |
| Field Duplicate (n=1) | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Standard Reference Material (n=2) for TIC | Within specified tolerance ranges. | All passed. |
| **Total S & Total Sulphate** | | |
| Method Blank (n=1) | <2X detection limit (DL) | All passed. |
| Sulphur balance (Total S > sulphate S) (n=6) | For samples > 10X the detection limit (DL), Total Sulphur should be greater than Total Sulphate, if not the % difference should be within +/-20% | All passed. |
| Crush Duplicate (n=1) | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Pulp Duplicate (n=2) for Total S and (n=5) for $SO_4$ | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed. |
| Field Duplicate (n=1) | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Standard Reference Material (n=2) | Within specified tolerance ranges. | All passed. |
| **Modified NP** | | |
| Method Blank (n=3) | within -2.50 to 2.50 NP Kg CaCO3/t | All passed. |
| NP consistent with paste pH (n=6) | Negative NP has paste pH <= 5 | All passed. |
| Crush Duplicate (n=1) | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Pulp Duplicate (n=5) | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Field Duplicate (n=1) | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Fizz test rating with NP (n=6) | Max NP does not exceed fizz test rating | All passed. |
| Standard Reference Material (n=3) | Within specified tolerance ranges. | Passed |
| **Modified NP and TIC** | | |
| Comparison between Modified NP and TIC (n=6) | Check for trends/co-relation | TIC > NP |
| Total S-Leco and S-ICP | | |
| Comparison between Total S-Leco and S-ICP (n=6) | For samples >10X detection limit (DL), % RPD within +/-20% | All passed. |
| **Trace Elements (Aqua Regia Digestion with ICP Finish)** | | |
| Method Blank (n=1) | <2X detection Limit (DL) | All passed. |
| Crush Duplicate (n=1) | For samples >10X detection limit (DL), % RPD within +/- 30%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| Pulp Duplicate (n=2) | For samples >10X detection limit (DL), % RPD within +/- 20%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| Field Duplicate (n=1) | For samples >10X detection limit (DL), % RPD within +/- 30%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | |
| Standard Reference Material (n=2) | Within specified tolerance ranges. | All passed. |
| **Shake Flask Extraction** | | |
| Method Blank (n=1) | <5X Detection Limit | All passed. |
| Ion Balance (n=2) | EC>100uS/cm, % difference should be within +/-10% | All passed. |
| Leachate Replicate (n=2) for pH & EC, (n=1) for $SO_4$, Total Alk & carbonate species, Cl | For samples >10X detection limit (DL), % RPD within +/- 20%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. For pH, difference unit is +/-0.2 | All passed. |
| $SO_4$-S vs S-ICP (n=6) | For samples > 10X the detection limit (DL), the % difference should be within +/-20% | All passed. |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\!020_Project_Data\Lab\SRK Solids Monitoring\Lab\QAQC files\Solids_ABA_Master_SummaryQAQC_mlt.xlsx

## 2.5 Data Interpretation Methods

The ratio of TIC to acid generating potential (AP) provides a measure of the acid rock drainage (ARD) potential of the sample. On the basis of sulphide (calculated as the difference between total sulphur and sulphate) and total sulphur content being at near parity, total sulphur was used to calculate AP. Samples are classified as non-potentially ARD generating (non-PAG) when TIC/AP ratios are greater than 3, as PAG when TIC/AP ratios are less than 1 and as having an uncertain potential for ARD when TIC/AP ratios are between 1 and 3. For samples with Modified NP, interpretations of ratios of NP to AP were the same as TIC to AP.

# 3 Results and Discussion

## 3.1 Geological Inspection

Based on underground geological mapping by TMAC, waste rock intersected by the Doris underground workings in 2020 was geologically described as 95% mafic volcanics with trace sulphide and 1-2% quartz-carbonate veining; 4% sericite altered mafic volcanics with trace sulphide and 2-5% quartz-carbonate veining; and 1% diabase dyke with trace to 1% sulphide and trace quartz-carbonate veining.

SRK inspected accessible waste rock on the surface over the entirety of Pad T (Figure 1-1). The waste rock observed on Pad T was a mixture of approximately 90% chloritic green mafic metavolcanics (1a), 9% light tan colored sericite altered mafic metavolcanics (1as), and <1% white quartz veins (12q).

The mafic metavolcanics (1a; Figure 3-1) consisted of fresh unoxidized dark chloritic green and weakly foliated mafic metavolcanics that had trace to 0.5% fine to medium grained disseminated pyrite, no fizz on the groundmass, and weak fizz on occasional <0.5cm quartz-carbonate veins. The sericite altered mafic metavolcanics (1as; Figure 3-2) consisted of light tan brown and moderately foliated altered mafic metavolcanics that had moderate to strong pervasive sericite alteration. The quartz veins (12q) consisted of milky white colored massive quartz with trace to 1% disseminated pyrite and chlorite and no fizz. Diabase was observed and represented <1% of waste rock.

**Figure 3-1: 20-DOR-01; showing mix of mafic metavolcanics (dark green), sericite altered mafic metavolcanics (tan) and quartz vein**

**Figure 3-2: 20-DOR-04; showing mix of mafic metavolcanics (dark green) and sericite altered mafic metavolcanics (tan)**

## 3.2 Rinse Tests

Rinse tests on the sieved -2 mm fraction indicated pH and EC values ranging from 8.2 to 8.7 and 87 to 1,615 µS/cm, respectively (Table 3-1).

**Table 3-1: Rinse Test Results, Pad T Waste Rock**

| Rock Type[1] | Sample ID | Rinse pH | Rinse EC |
|---|---|---|---|
| | | s.u. | µS/cm |
| 1a | 20-DOR-01 | 8.51 | 317 |
| | 20-DOR-02 | 8.62 | 195 |
| | 20-DOR-03 | 8.37 | 518 |
| | 20-DOR-04 | 8.23 | 1615 |
| | 20-DOR-06 | 8.44 | 132 |
| 1as | 20-DOR-05 | 8.70 | 87 |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\210 - Doris & Madrid Annual Report\Doris WR\HB_2020_SolidsGeochem_DorisWR_1CT022.056_rtc_jce_Rev00.xlsx

Note:

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics, 12q = quartz vein

## 3.3 ABA

A summary of ABA data are presented in Table 3-4 and Figure 3-7 to Figure 3-10. Complete results are presented in Attachment B.

Values of paste pH for all rock types ranged from 8.4 to 9.4.

Overall, total sulphur content for all samples was less than 1%, with concentrations ranging from 0.14% to 0.77% for mafic metavolcanics (1a). By comparison, total sulphur content for altered mafic metavolcanics (1as) was 0.24%. Sulphate content was below or near the level of analytical detection (0.01%). Sulphide sulphur, calculated as the difference between total sulphur and sulphate, was at near parity with total sulphur (Figure 3-7).

For mafic metavolcanics, values of Modified NP ranged from 177 to 198 kg $CaCO_3$/t compared to 172 kg $CaCO_3$/t for the altered mafic metavolcanics. TIC ranged from 186 to 259 kg $CaCO_3$/t in the 1a samples compared to 295 kg $CaCO_3$/t in the 1as sample. TIC content was uniformly greater than NP suggesting that TIC values overestimate the amount of carbonate available for buffering due to the presence of NP-neutral iron carbonate (Figure 3-8). All samples were classified as non-PAG on the basis of NP/AP and TIC/AP (Figure 3-9 and Figure 3-10).

**Table 3-2: Summary of ABA Analyses for Pad T Waste Rock Samples**

| Rock Type[1] | Sample ID | Paste pH | Total S | $SO_4$ | AP | TIC | Modified NP | TIC/AP | NP/AP |
|---|---|---|---|---|---|---|---|---|---|
| | | s.u. | % | % | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | - | - |
| 1a | 20-DOR-01 | 8.6 | 0.43 | 0.04 | 13 | 232 | 198 | 17 | 15 |
| | 20-DOR-02 | 9.0 | 0.36 | 0.03 | 11 | 244 | 194 | 22 | 17 |
| | 20-DOR-03 | 8.6 | 0.77 | 0.02 | 24 | 259 | 197 | 11 | 8.2 |
| | 20-DOR-04 | 8.4 | 0.41 | 0.02 | 13 | 240 | 191 | 19 | 15 |
| | 20-DOR-06 | 8.7 | 0.14 | <0.01 | 4.4 | 186 | 177 | 43 | 41 |
| 1as | 20-DOR-05 | 9.4 | 0.24 | <0.01 | 7.5 | 295 | 172 | 39 | 23 |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\210 - Doris & Madrid Annual Report\Doris WR\HB_2020_SolidsGeochem_DorisWR_1CT022.056_rtc_jce_Rev00.xlsx

**Notes**

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics

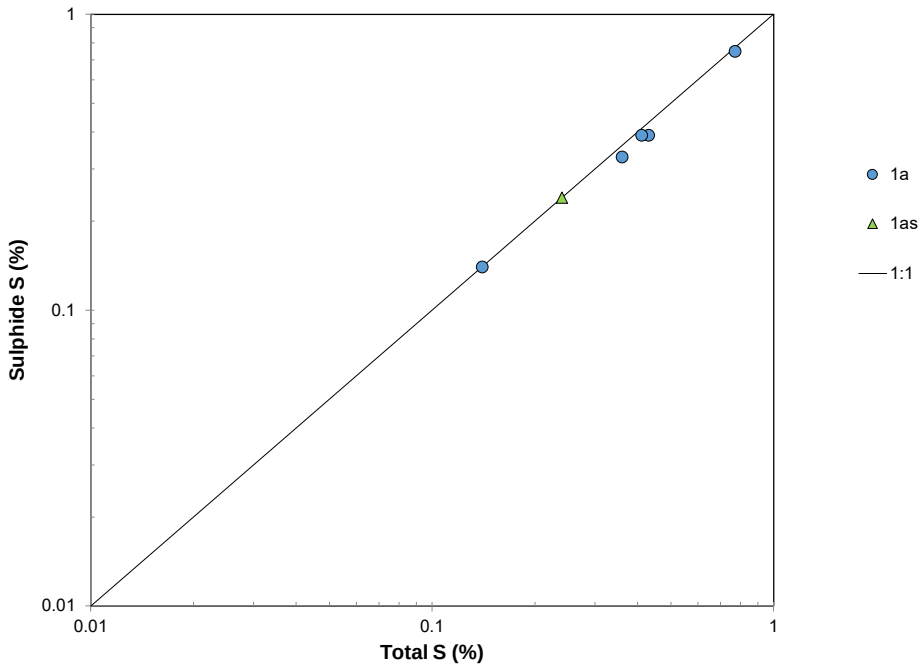


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**Figure 3-3: Comparison of Total Sulphur versus Sulphide, Pad T Waste Rock**

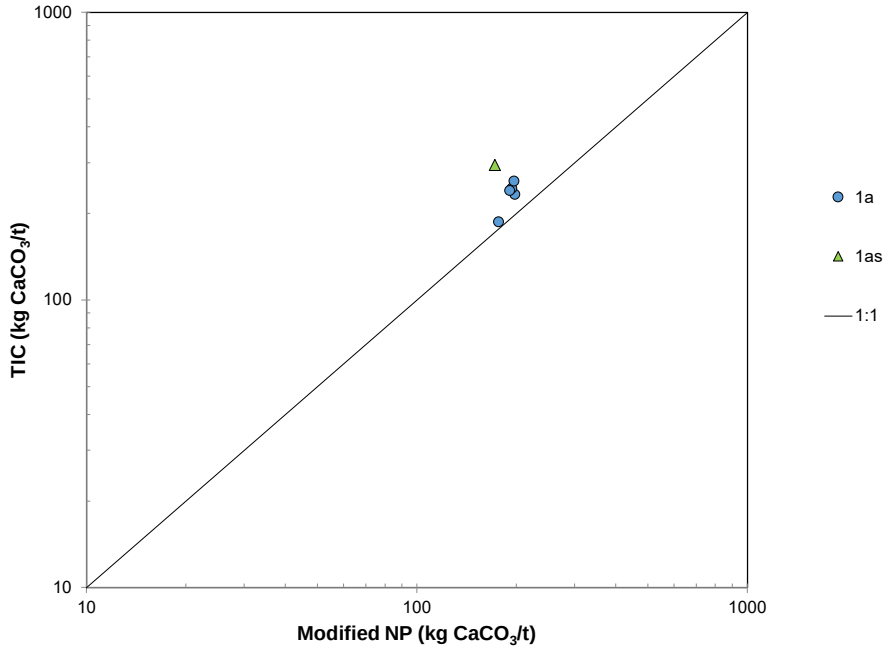


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**Figure 3-4: Comparison of Modified NP versus TIC, Pad T Waste Rock**

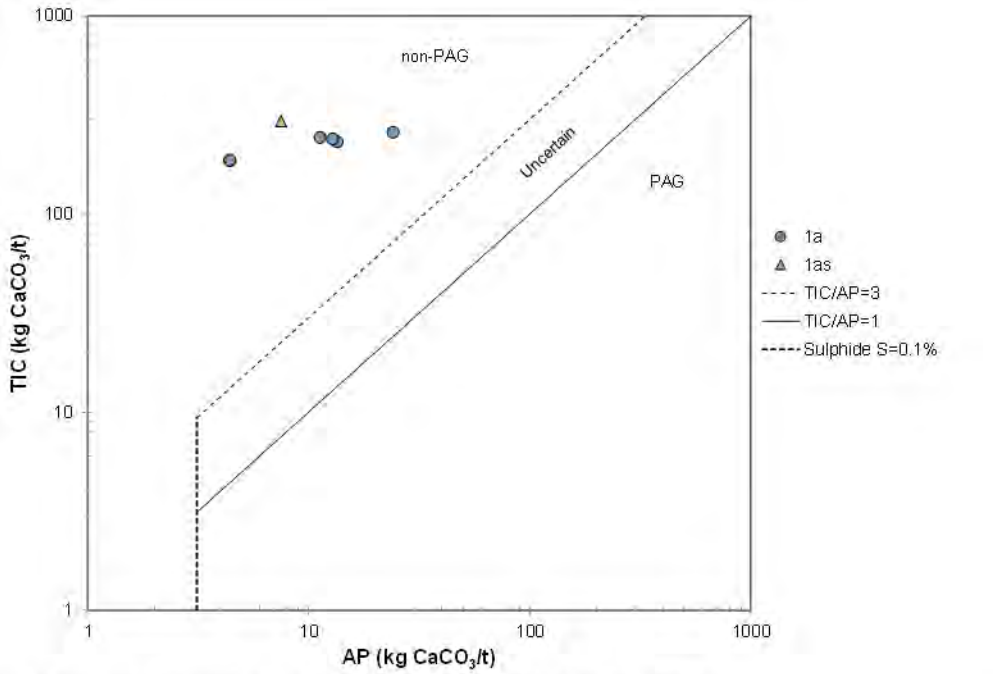


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**Figure 3-5: ARD Classifications by TIC/AP, Pad T Waste Rock**

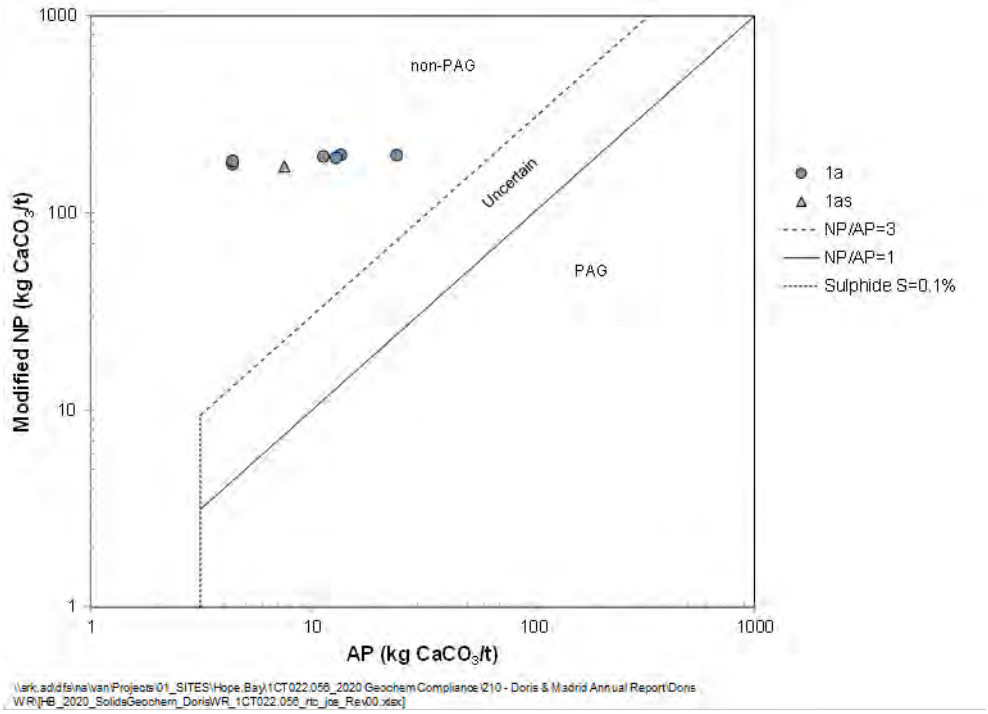



**Figure 3-6: ARD Classifications by NP/AP, Pad T Waste Rock**

## 3.4 Trace Elemental Analyses

The trace element content for the sample set is presented in Table 3-5 by rock type with complete laboratory results presented in Attachment C. Results were compared to ten times average crustal abundance (CA) for basalt (Price 1997) as an indicator of enrichment. Selenium could not be assessed because concentrations were below the detection limit or within the range of analytical error.

Arsenic and sulphur were enriched for selected samples of mafic metavolcanics (1a) compared to the average CA of basalt. Three samples of mafic metavolcanics (1a) were enriched in sulphur and the one sample with maximum sulphur content was also enriched in arsenic. All other parameters were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment.

**Table 3-3: Summary of Elemental Analyses for Pad T Waste Rock**

| Parameter | Unit | Detection Limit | 1a | | | | | 1as | 10x Average Crustal Abundance* |
|---|---|---|---|---|---|---|---|---|---|
| | | | 20-DOR-01 | 20-DOR-02 | 20-DOR-03 | 20-DOR-04 | 20-DOR-06 | 20-DOR-05 | |
| Ag | ppm | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 | <0.1 | <0.1 | 1.1 |
| As | ppm | 0.1 | 19 | 19 | **22** | 17 | 1.4 | 4.7 | 20 |
| Ba | ppm | 0.5 | 13 | 16 | 13 | 18 | 23 | 17 | 3300 |
| Ca | % | 0.01 | 5.4 | 5.6 | 5.5 | 5.6 | 6.1 | 4.7 | 76 |
| Cd | ppm | 0.1 | 0.2 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 2.2 |
| Co | ppm | 0.1 | 33 | 36 | 33 | 34 | 33 | 30 | 480 |
| Cr | ppm | 0.5 | 33 | 29 | 28 | 37 | 15 | 27 | 1700 |
| Cu | ppm | 0.1 | 108 | 68 | 74 | 79 | 33 | 37 | 870 |
| Fe | % | 0.01 | 8.6 | 8.9 | 8.9 | 9.4 | 10.2 | 9.3 | 87 |
| Hg | ppm | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.09 |
| Mg | % | 0.01 | 1.7 | 1.7 | 1.7 | 1.9 | 1.6 | 1.5 | 46 |
| Mn | ppm | 1 | 1890 | 2010 | 2010 | 2000 | 2000 | 2100 | 15000 |
| Mo | ppm | 0.01 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.4 | 15 |
| Ni | ppm | 0.1 | 24 | 14 | 18 | 19 | 2.4 | 3 | 1300 |
| P | % | 0.001 | 0.081 | 0.082 | 0.083 | 0.089 | 0.095 | 0.093 | 1 |
| Pb | ppm | 0.01 | 5.7 | 4.3 | 4.3 | 5.2 | 3.6 | 3.8 | 60 |
| S | % | 0.05 | **0.36** | 0.30 | **0.66** | **0.37** | 0.12 | 0.21 | 0.3 |
| Sb | ppm | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 2 |
| Sr | ppm | 1 | 47 | 45 | 40 | 42 | 77 | 45 | 4650 |
| U | ppm | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 10 |
| V | ppm | 2 | 46 | 44 | 38 | 41 | 67 | 17 | 2500 |
| W | ppm | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | <0.1 | <0.1 | 7 |
| Zn | ppm | 0.1 | 118 | 115 | 114 | 115 | 134 | 99 | 1050 |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris WR\HB_2020_SolidsGeochem_DorisWR_1CT022.056_rtc_jce_Rev01.xlsx

Notes:

* Numbers bolded and underlined exceed 10 times the average crustal abundance for basaltic rocks from Price (1997)

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics

## 3.5 SFE Tests

A summary of results for key SFE parameters is presented in Table 3-4 and complete results are included in Attachment D.

All SFE tests had alkaline pH ranging from 8.5 to 9.0 s.u. Values of EC ranged from 125 to 726 µS/cm. Major cation chemistry was dominated by sodium (7.0 to 80 mg/L) and calcium (12 to 42 mg/L), while major anion chemistry was dominated by alkalinity (31 to 34 mg/L as $CaCO_3$), sulphate (13 to 133 mg/L) and to a lesser degree chloride (7.4 to 104 mg/L). The source of chloride is drilling brines. Concentrations of ammonia and nitrate ranged from 0.22 to 1.3 mg/L and 0.8 to 18 mg/L, respectively. The source of nitrate and ammonia are explosives residues. Trace element concentrations overall were low.

**Table 3-4: Shake Flask Extraction Results, 2020 Pad T Waste Rock Samples**

| Sample ID | Unit | Detection Limit | 1a | | |
|---|---|---|---|---|---|
| | | | 20-DOR-01 | 20-DOR-04 | 20-DOR-07 |
| pH | pH Units | 0.1 | 8.5 | 8.7 | 9.0 |
| EC | uS/cm | 1 | 496 | 726 | 125 |
| Total Alkalinity | mg/L | 0.5 | 34 | 32 | 31 |
| $SO_4$ | mg/L | 0.5 | 133 | 59 | 13 |
| Cl | mg/L | 0.5 | 40 | 124 | 7.4 |
| Ca | mg/L | 0.05 | 42 | 37 | 12 |
| Mg | mg/L | 0.05 | 8.23 | 9 | 1.8 |
| K | mg/L | 0.05 | 5.5 | 9.1 | 2.0 |
| Na | mg/L | 0.05 | 34 | 80 | 7.0 |
| $NO_3$ | mg/L as N | 0.2 | 4.7 | 18 | 0.8 |
| $NO_2$ | mg/L as N | 0.05 | <0.05 | <0.05 | <0.05 |
| $NH_3$ | mg/L as N | 0.05 | 1.1 | 1.3 | 0.22 |
| Al | mg/L | 0.0005 | 0.082 | 0.11 | 0.32 |
| Sb | mg/L | 0.00002 | 0.00034 | 0.00034 | 0.00062 |
| As | mg/L | 0.00002 | 0.00067 | 0.00090 | 0.00026 |
| Ba | mg/L | 0.000063 | 0.0028 | 0.0048 | 0.0075 |
| B | mg/L | 0.05 | 0.11 | 0.10 | <0.05 |
| Cs | mg/L | 0.00005 | <0.00005 | 0.00019 | <0.00005 |
| Cd | mg/L | 0.000005 | <0.000005 | <0.000005 | <0.000005 |
| Cr | mg/L | 0.0001 | <0.0001 | 0.00012 | <0.0001 |
| Co | mg/L | 0.000005 | 0.00048 | 0.00047 | 0.000037 |
| Cu | mg/L | 0.00005 | 0.0037 | 0.0026 | 0.00048 |
| Fe | mg/L | 0.001 | 0.026 | 0.029 | 0.0014 |
| La | mg/L | 0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Pb | mg/L | 0.00005 | <0.000005 | <0.000005 | <0.000005 |
| Li | mg/L | 0.0005 | 0.0063 | 0.0056 | 0.0022 |

| Sample ID | Unit | Detection Limit | 1a | | |
|---|---|---|---|---|---|
| | | | 20-DOR-01 | 20-DOR-04 | 20-DOR-07 |
| Mn | mg/L | 0.00005 | 0.028 | 0.026 | 0.0065 |
| Hg | mg/L | 0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Mo | mg/L | 0.00005 | 0.0025 | 0.0022 | 0.0012 |
| Ni | mg/L | 0.00002 | 0.00032 | 0.00027 | 0.000085 |
| Se | mg/L | 0.00004 | 0.0011 | 0.00055 | 0.00051 |
| Sr | mg/L | 0.00004 | 0.11 | 0.11 | 0.047 |
| S | mg/L | 10 | 40 | 19 | <10 |
| Tl | mg/L | 0.000002 | 0.0000027 | 0.0000048 | 0.0000029 |
| U | mg/L | 0.000002 | 0.0000033 | 0.000003 | <0.000002 |
| V | mg/L | 0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Zn | mg/L | 0.0001 | <0.0001 | <0.0001 | <0.0001 |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris WR\HB_2020_SolidsGeochem_DorisWR_1CT022.056_rtc_jce_Rev01.xlsx

Notes:

All element concentrations are given as dissolved; SFE tests do not represent natural waters.

Values in italics represent values below the detection limit.

## 3.6 Comparison to Previous Waste Rock Geochemical Characterization Results

This section compares data from the 2020 waste rock monitoring samples to previous sample sets. Specifically, waste rock samples are presented according to rock type and the following samples sets:

1. Waste rock characterized as part of the Type A water licence amendment application (SRK 2015);
2. Underground mine operational waste rock monitoring samples collected prior to 2020;
3. Doris CPR operational waste rock monitoring samples (2018 to 2019); and
4. Underground mine operational waste rock monitoring samples collected in 2020.

Table 3-11 summarizes the differences in geological logging codes and sample types for the sample sets. The mafic metavolcanic waste rock samples that were geochemically characterized as part of the Type A Doris water licence amendment application (SRK 2015) were geologically logged as part of the exploration drilling program, at which time the lithology code 1as (altered mafic metavolcanics) was not used. Based on the geochemistry and spatial coverage of the ABA sample set, SRK assumes that altered mafic metavolcanics (1as) is represented in SRK (2015).

Figure 3-16 to Figure 3-18 compares by rock type the geochemical results from the 2020 waste rock monitoring program to the other sample sets presented in Table 3-11. The results are discussed in subsequent sections.

**Table 3-5: Overview of Waste Rock Geochemical Sample Sets**

| Rock Type | Sample Set and Source[1] | | Geology Code[2] | Geology Codes for Samples[3] | Comment |
|---|---|---|---|---|---|
| Mafic Metavolcanics | 2020 Operational Monitoring | Pad T | 1a,1as | 1a, 1as | |
| | Pre-2020 Operational Monitoring | ROM from Underground | 1a, 1as | 1a, 1as | |
| | | ROM from CPR | 1a | 1a | |
| | Type A | Drill core | 1 | 1, 1a, 1ay, 1p and 1u | Logging code 1as (altered basalt) is not documented in SRK (2015) because this code was not used during the exploration logging program. Based on the geochemistry and spatial coverage of the ABA sample set, SRK assumes that rock type 1as is represented in the sample set. |
| Quartz Vein | 2019 Operational Monitoring | Pad T | 12q | 12q | |
| | Pre-2019 Operational Monitoring | ROM from Underground | 12q | 12q | |
| | Type A | Drill core | 12q | 12q, 12 (mixed) | |

Notes:

[1]All operational monitoring samples are run-of-mine (ROM) waste rock samples; in 2019 waste rock from 2019 was sampled from the blasted pile underground and the Pad T stockpile

[2]For data interpretation and figures. For the Type A sample set, the sample set is as presented in SRK (2015).

[3] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics; 12q = quartz vein

### 3.6.1 Mafic Metavolcanics (1a)

For mafic metavolcanics (1a), the 25$^{th}$ to 75$^{th}$ percentile sulphur content for 2020 waste rock samples (0.36 to 0.43%, n=5) were higher than all other samples sets, including the Type A sample set (0.11 to 0.31%, n=401), underground waste rock samples collected prior to 2020 (0.09 to 0.19%, n=176) and CPR samples (0.16 to 0.32%, n=20).

The range of levels of NP (177 to 198 kg $CaCO_3$ eq/tonne) and (TIC 186 to 259 kg $CaCO_3$ eq/tonne) for the 2020 sample set was equivalent to the range of 25$^{th}$ to 75$^{th}$ percentile levels in all previous samples sets (26 to 223 kg $CaCO_3$ eq/tonne and 18 to 335 kg $CaCO_3$ eq/tonne, respectively).

All samples of mafic metavolcanic (1a) collected from Pad T in 2020 were classified as non-PAG on the basis of TIC/AP and NP/AP. This was consistent with the majority of the Type A and operational monitoring mafic metavolcanic (1a) samples (Figure 3-17 and Figure 3-18).

Solid-phase arsenic content can be elevated in waste rock (e.g. Section 3.4) and can be mobile at neutral pH, though seepage monitoring of Doris waste rock does not indicate neutral pH arsenic leaching. The maximum level of arsenic (22 ppm, n=5) for the 2020 mafic metavolcanic (1a) operational samples collected from Pad T was within the 25$^{th}$ to 75$^{th}$ percentile range of the Type A sample set (1.9 to 30 ppm, n=337). The 25$^{th}$ to 75$^{th}$ percentile sulphur content was consistent with the 2018-2019 CPR sample set (20 to 28, n=20). Based on sulphur and arsenic content the mafic metavolcanic (1a) samples collected from Pad T in 2020 were more comparable to the CPR waste rock than the underground waste rock. The geochemical characteristics of the CPR samples are likely representative of the alteration envelope related to ore genesis.

### 3.6.2 Altered Mafic Metavolcanics (1as)

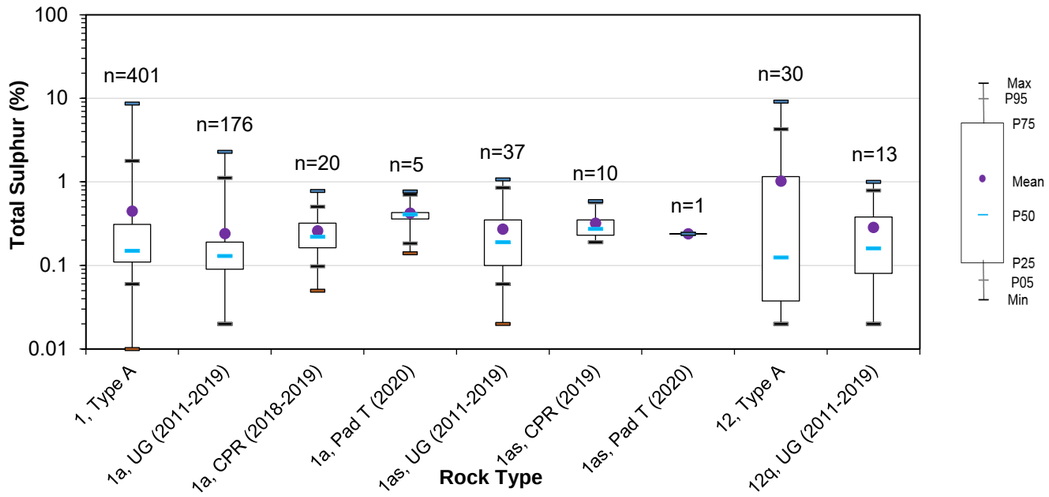
Total sulphur content for the 2020 altered mafic metavolcanic (1as) sample (0.24%) was roughly equivalent to median values of the operational waste rock samples (0.19%) and CPR samples (0.28%) and was within the 25$^{th}$ to 75$^{th}$ percentile sulphur content of the Type A sample set (0.11 to 0.31%).

TIC and NP content for the 2020 altered mafic metavolcanic sample (295 and 172 kg $CaCO_3$ eq/tonne, respectively) were equivalent to the range in 75$^{th}$ percentile values for the previous sample sets (283 to 335 kg $CaCO_3$ eq/tonne and 179 to 223 kg $CaCO_3$ eq/tonne, respectively.

The non-PAG classification of the altered mafic metavolcanic (1as) sample was consistent with the majority of the Type A and operational monitoring of altered mafic metavolcanic (1as) samples.

The one 2020 altered mafic metavolcanic (1as) sample reported an arsenic concentration (5 ppm) that was lower than previous samples of altered mafic metavolcanic (1as) operational monitoring samples (25th and 75th percentile levels of 7.7 and 32 ppm, respectively) and within the Type A range (25$^{th}$ and 75$^{th}$ percentile levels of 1.9 and 30 ppm, respectively).

The ABA characteristics and arsenic content for the 2020 altered mafic metavolcanic (1as) were represented by the Type A waste rock sample set.

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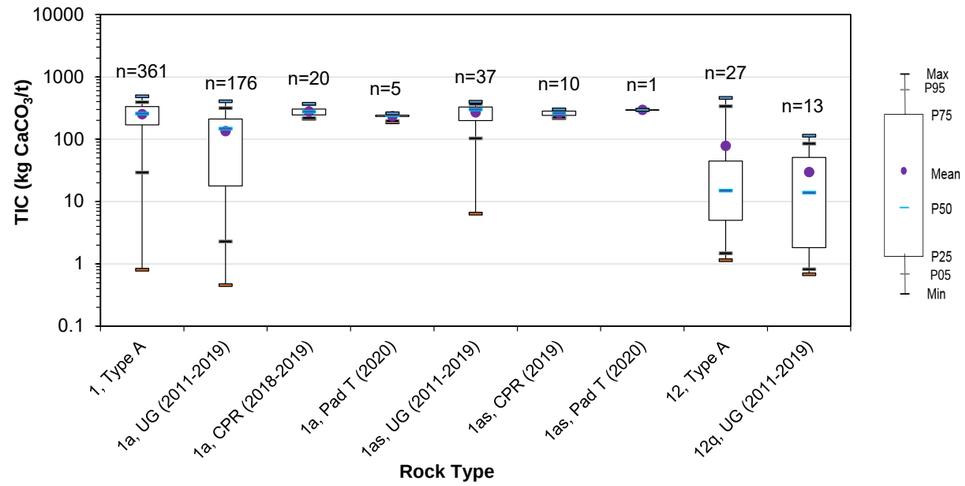


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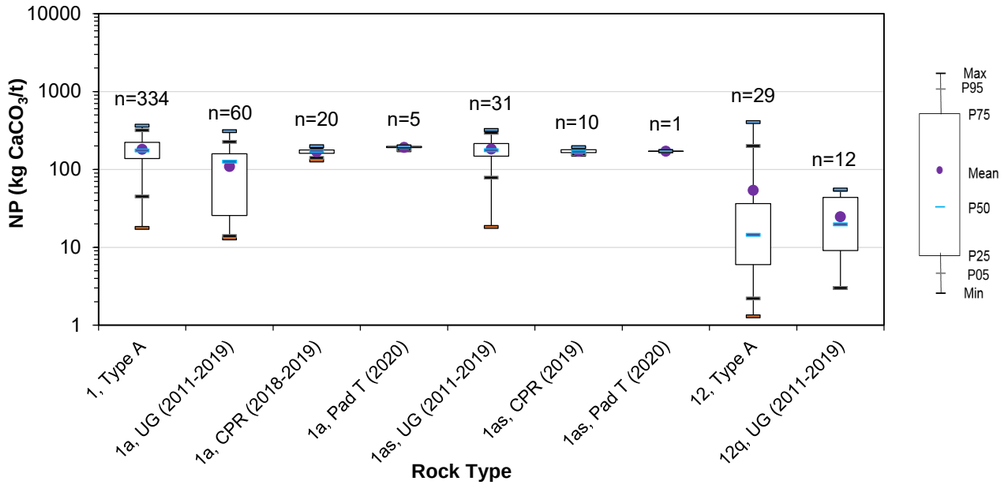


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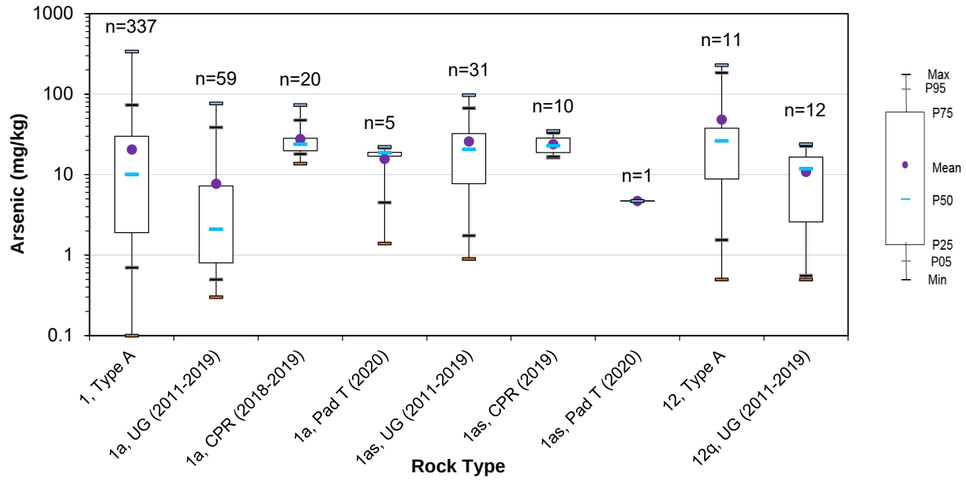


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**Figure 3-7: Box and Whisker Plots of S, TIC, NP and Arsenic – Comparison of 2020 Doris Waste Rock Monitoring Samples to Other Waste Rock Sample Sets**

(These plots are conventional box and whisker graphs, with the upper and lower extremes showing the minimum and maximum values, tick marks outside of the box showing the 5th and 95th percentiles, outer margins of the box showing the 25th and 75th percentiles and central division in the box showing the median value)

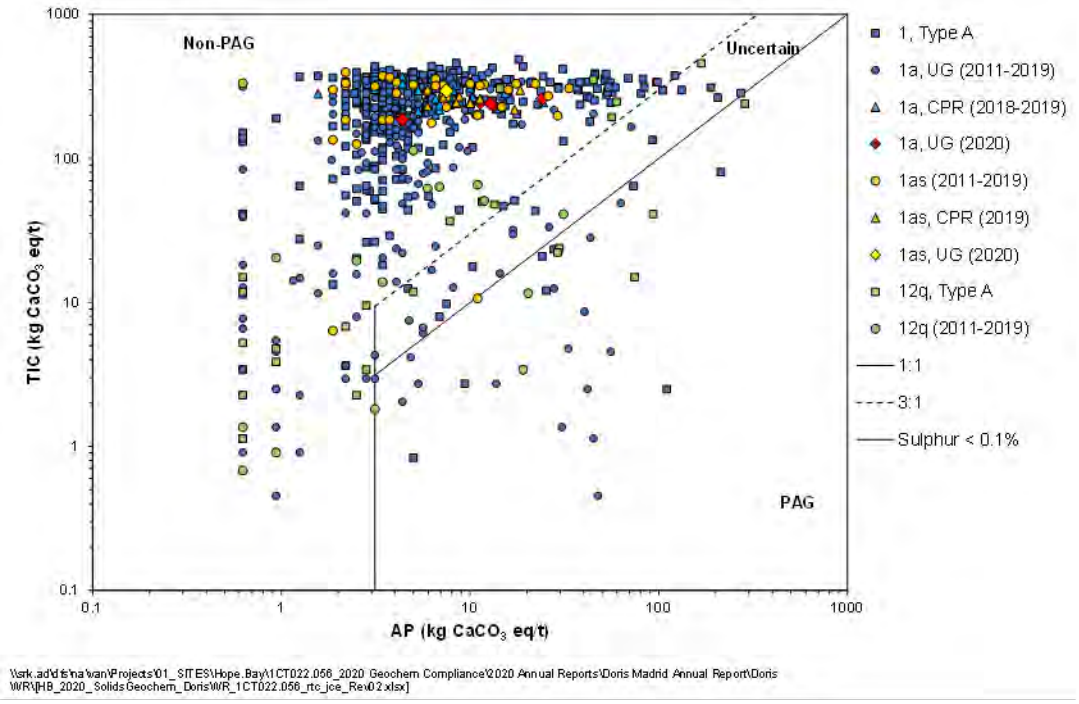


**Figure 3-8: ARD Classifications by TIC/AP, Doris Waste Rock Samples**

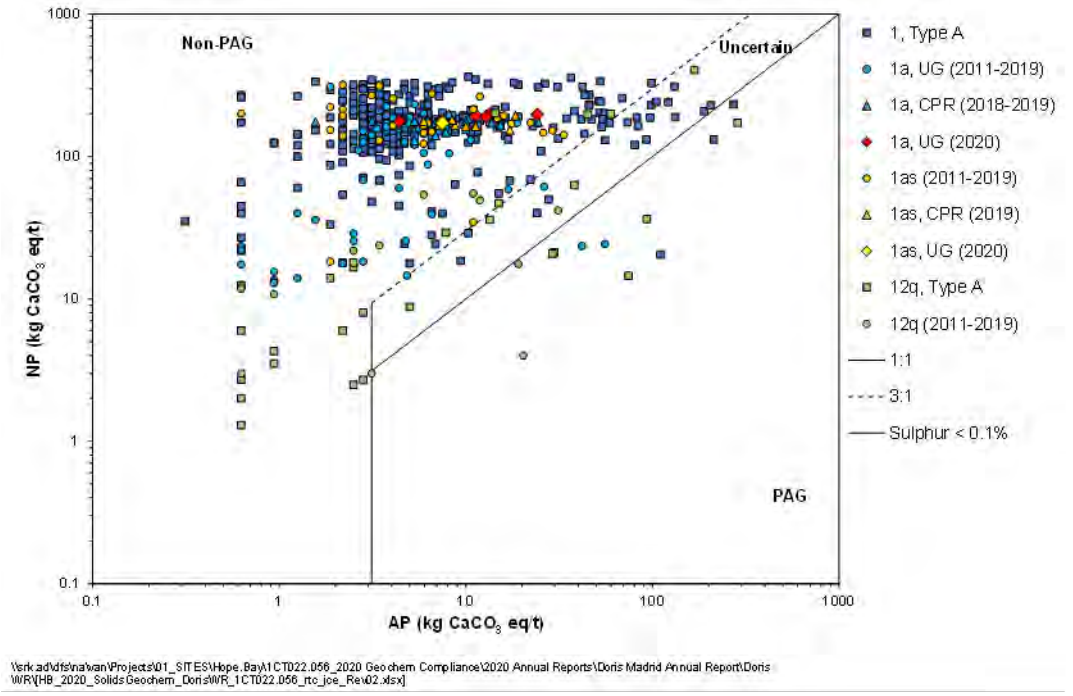


**Figure 3-9: ARD Classifications by NP/AP, Doris Waste Rock Samples**

# 4 Summary and Conclusions

In 2020 a total of 106,890 t of waste rock was produced from mining activities in the Doris mine; this material was kept underground and used as backfill. In addition, approximately 68,899 t of waste rock was removed from the surface waste rock stockpile on Pad T and placed as backfill in stopes of the Doris mine. Doris underground workings in 2020 were geologically described as 95% mafic volcanics with trace sulphide and 1-2% quartz-carbonate veining, 4% sericite altered mafic volcanics with contain trace sulphide and 2-5% quartz-carbonate veining and 1% diabase dyke with trace to 1% sulphide and trace quartz-carbonate veining.

In accordance with the *Waste Rock, Ore and Mine Backfill Management Plan (*TMAC 2019), SRK collected six samples (five of mafic metavolcanics (1a) and one of altered mafic metavolcanics (1as)) from the surface waste rock stockpile on Pad T. The results are summarized as follows:

- For mafic metavolcanics samples (1a), total sulphur ranged from 0.14 to 0.77% and median levels of 0.24%. TIC and Modified NP content was high ranging from 187 to 259 kg $CaCO_3$ eq/tonne and 177 to 798 kg $CaCO_3$ eq/tonne, respectively. All samples were classified as non-PAG on the basis of TIC/AP and NP/AP.
- The one sample of altered mafic metavolcanics samples (1as) had a total sulphur content of 0.24%. TIC and Modified NP content was 295 and 172 kg $CaCO_3$ eq/tonne, respectively. The sample was classified as non-PAG on the basis of TIC/AP and NP/AP.
- Trace element content was below the screening criteria for all samples with the exception of arsenic in one and sulphur in three mafic metavolcanics (1a) samples. Total metal concentrations for all other samples were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment.
- SFE tests for the altered mafic metavolcanics (1as) waste rock had alkaline pH (8.5-9.0 s.u.). Nitrate concentrations and chloride values were lower than previous years, ranging from 0.8 to 18 mg/L and 7.4 to 124 mg/L respectively. In comparison in 2019 nitrate ranged from 140 to 170 mg/L and chloride ranged from 180 to 490 mg/L. The decreasing concentrations suggest the continuous flushing of residual explosives and drilling brines from waste rock.

The Type A waste rock sample set represents the geochemical characteristics of the altered mafic metavolcanic (1as) waste rock sample collected in 2020. Sulphur and arsenic content of the mafic metavolcanic (1a) samples collected from Pad T in 2020 were more comparable to the CPR waste rock than the underground waste rock.

The geological and geochemical inventory of waste rock on Pad T precludes a long-term assessment of the anticipated geochemical behaviour of the waste rock on Pad T with respect to metal leaching and acid rock drainage (ML/ARD). The geochemical behaviour of the waste rock is monitored through the annual seep survey along the downgradient toe of the waste rock and ore stockpile area and routine monitoring of the Pollution Control Pond (PCP). The results of the seepage survey are reported in the accompanying memo (SRK 2020a), while results of the routine monitoring program are included in monthly water quality reports prepared by TMAC and submitted to the Nunavut Water Board.

Regards,
SRK Consulting (Canada) Inc.

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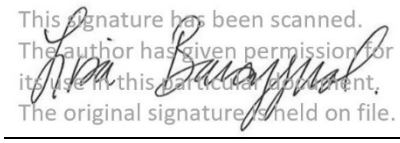
Senior Consultant (Geochemistry)

Reviewed by

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Principal Consultant (Geochemistry)

## Attachments:

| | |
|---|---|
| Attachment A | Pad T Geological Descriptions |
| Attachment B | Pad T Laboratory Results – Full ABA |
| Attachment C | Pad T Laboratory Results – Multi-Element Analysis |
| Attachment D | Pad T Laboratory Results – SFE |

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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# Attachment A Pad T Geological Descriptions

| Sample ID | Sample Location | Rock Type | Easting | Northing | Sulphide 1 | Sulph 1 % | Fizz Test (Groundmass) | Fizz Test on Carbonate / Quartz Veins | Weathering Intensity | Color of -2mm Fraction | Rock Types | Geological Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-DOR-01 | Pad T | 1a | 433402 | 7559305 | Pyrite | trace | None | | None | Dark greenish grey | 1a>1as>gabbro>12 | Chlorite green to tan colored mix of unoxidized 1a (80%) which contains no fizz or observable pyrite with lesser 1as (18%) which contains pervasive sericite alteration, no fizz, and no observable pyrite, and quartz vein (2%) which contains disseminated fine grained chlorite and pyrite |
| 20-DOR-02 | Pad T | 1a | 433366 | 7559308 | Pyrite | 0.005 | None | | None | Dark greenish grey | 1a>1as | Chlorite green to tan colored mix of unoxidized 1a (80%) which contains no fizz and fine to mediumly disseminated pyrite with lesser 1as (20%) which contains pervasive sericite alteration, no fizz, and no observable pyrite |
| 20-DOR-03 | Pad T | 1a | 433316 | 7559311 | Pyrite | 0.5% | None | | None | Dark greenish grey | 1a>1as | Chlorite green to tan colored mix of unoxidized 1a (70%) which contains no fizz and fine to mediumly disseminated pyrite with lesser 1as (30%) which contains pervasive sericite alteration, no fizz, and no observable pyrite |
| 20-DOR-04 | Pad T | 1a | 433302 | 7559235 | Pyrite | trace | None | | None | Dark greenish grey | 1a>1as>12 | Chlorite green to tan colored mix of unoxidized 1a (80%) which contains no fizz or observable pyrite with lesser 1as (19.5%) which contains pervasive sericite alteration, no fizz, and no observable pyrite, and quartz vein (0.5%) which contains disseminated fine grained chlorite and pyrite |
| 20-DOR-05 | Pad T | 1as | 433338 | 7559241 | | | None | | None | tan colored | 1as>1a>12 | Tan colored to chlorite green mix of unoxidized 1as (90%) which contains no fizz or observable pyrite and no quartz stockwork veining, 1a (9.5%) which contains no fizz or observable pyrite, and 12 (0.5%) which contains trace vein hosted pyrite. |
| 20-DOR-06 | Pad T | 1a | 433376 | 7559238 | | | None | Strong | None | Dark greenish grey | 1a | Dark chloritic green weakly foliated greenstone (1a) that is crosscut by abundant quartz-carbonate veinlets with moderate to locally strong fizz. No observable pyrite |
| 20-DOR-07 | Pad T | 1a | | | | | | | | | | Duplicate of 20-DOR-06 |

# Attachment B Pad T Laboratory Results – Full ABA

| Sample ID | Rock Type | Paste pH | Fizz Rating | S(T) | $S(SO_4)$ | S(S-2) | AP from S(T) | AP - from S(S-2) | $CO_2$ | TIC | Mod NP | TIC/AP_S(T) | NP/AP_S(T) | TIC/AP_S(S-2) | NP/AP_S(S-2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | pH Units | - | wt% | wt% | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | - | - | - | - |
| | | #N/A | #N/A | 0.02 | 0.01 | Calc. | 0.6 | | 0.06 | 1.8 | 0.1 | #N/A | #N/A | #N/A | #N/A |
| 20-DOR-01 | 1a | 8.6 | STRONG | 0.43 | 0.04 | 0.39 | 13 | 12 | 10 | 232 | 198 | 17 | 15 | 19 | 16 |
| 20-DOR-04 | 1a | 8.4 | STRONG | 0.41 | 0.02 | 0.39 | 13 | 12 | 11 | 240 | 191 | 19 | 15 | 20 | 16 |
| 20-DOR-07 | 1a | 8.7 | STRONG | 0.14 | <0.01 | 0.14 | 4.4 | 4.4 | 8 | 187 | 184 | 43 | 42 | 43 | 42 |
| 20-DOR-05 | 1as | 9.4 | STRONG | 0.24 | <0.01 | 0.24 | 7.5 | 7.5 | 13 | 295 | 172 | 39 | 23 | 39 | 23 |
| 20-DOR-06 | 1a | 8.7 | STRONG | 0.14 | <0.01 | 0.14 | 4.4 | 4.4 | 8.2 | 186 | 177 | 43 | 40 | 42 | 40 |
| 20-DOR-02 | 1a | 9.0 | STRONG | 0.36 | 0.03 | 0.33 | 11 | 10 | 11 | 244 | 194 | 22 | 17 | 24 | 19 |
| 20-DOR-03 | 1a | 8.6 | STRONG | 0.77 | 0.02 | 0.75 | 24 | 23 | 11 | 259 | 197 | 11 | 8.2 | 11 | 8 |

# Attachment C Pad T Laboratory Results – Multi-Element Analysis

| Sample ID | Rock Type | Ag | Al | As | Au | B | Ba | Bi | Bi | Ca | Cd | Co | Cr | Cu | Fe | Ga | Hg | K | La | Mg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ppb | % | ppm | ppb | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm | % | ppm | ppm | % | ppm | % |
| | | 0.1 | 0.01 | 0.1 | 0.5 | 20 | 0.5 | 0.1 | 0.1 | 0.01 | 0.1 | 0.1 | 0.5 | 0.01 | 0.01 | 0.1 | 0.01 | 0.01 | 0.5 | 0.01 |
| 20-DOR-01 | 1a | 0.2 | 2.2 | 19 | 1690 | <20 | 13 | <0.1 | <0.1 | 5.4 | 0.2 | 33 | 33 | 108 | 8.6 | 9 | <0.01 | 0.06 | 2 | 1.7 |
| 20-DOR-02 | 1a | 0.1 | 2.2 | 19 | 119 | <20 | 16 | <0.1 | <0.1 | 5.6 | <0.1 | 36 | 29 | 68 | 8.9 | 9 | <0.01 | 0.06 | 3 | 1.7 |
| 20-DOR-03 | 1a | 0.2 | 1.8 | 22 | 213 | <20 | 13 | 0.1 | 0.1 | 5.5 | 0.1 | 33 | 28 | 74 | 8.9 | 7 | <0.01 | 0.07 | 2 | 1.7 |
| 20-DOR-04 | 1a | 0.2 | 2.1 | 17 | 645 | <20 | 18 | <0.1 | <0.1 | 5.6 | 0.1 | 34 | 37 | 79 | 9.4 | 8 | <0.01 | 0.08 | 2 | 1.9 |
| 20-DOR-05 | 1as | <0.1 | 0.81 | 5 | 6.2 | <20 | 17 | <0.1 | <0.1 | 4.7 | 0.1 | 30 | 27 | 37 | 9.3 | 3 | <0.01 | 0.09 | 3 | 1.5 |
| 20-DOR-06 | 1a | <0.1 | 3.7 | 1 | <0.5 | <20 | 23 | <0.1 | <0.1 | 6.1 | <0.1 | 33 | 15 | 33 | 10.2 | 16 | <0.01 | 0.06 | 4 | 1.6 |
| 20-DOR-07 | 1a | <0.1 | 3.7 | 1 | 0.7 | <20 | 24 | <0.1 | <0.1 | 6.2 | <0.1 | 34 | 13 | 35 | 10.2 | 16 | <0.01 | 0.06 | 3 | 1.5 |

| Sample ID | Rock Type | Mn | Mo | Na | Ni | P | Pb | S | Sb | Sc | Se | Sr | Te | Th | Ti | Tl | U | V | W | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ppm | ppm | % | ppm | % | ppm | % | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm | ppm |
| | | 1 | 0.01 | 0.001 | 0.1 | 0.001 | 0.01 | | 0.1 | 0.02 | 0.5 | 0.5 | 0.2 | 0.1 | 0.001 | 0.1 | 0.1 | 2 | 0.1 | 0.1 |
| 20-DOR-01 | 1a | 1890 | 0.5 | 0.038 | 24 | 0.081 | 5.7 | 0.36 | <0.1 | 14 | <0.5 | 47 | <0.2 | 0.5 | 0.013 | <0.1 | <0.1 | 46 | 0.2 | 118 |
| 20-DOR-02 | 1a | 2010 | 0.5 | 0.037 | 14 | 0.082 | 4.3 | 0.3 | <0.1 | 14 | 0.7 | 45 | <0.2 | 0.5 | 0.016 | <0.1 | <0.1 | 44 | 0.2 | 115 |
| 20-DOR-03 | 1a | 2010 | 0.4 | 0.043 | 18 | 0.083 | 4.3 | 0.66 | <0.1 | 13 | <0.5 | 40 | <0.2 | 0.4 | 0.021 | <0.1 | <0.1 | 38 | 0.2 | 114 |
| 20-DOR-04 | 1a | 2000 | 0.4 | 0.067 | 19 | 0.089 | 5.2 | 0.37 | <0.1 | 14 | <0.5 | 42 | <0.2 | 0.5 | 0.022 | <0.1 | <0.1 | 41 | 0.1 | 115 |
| 20-DOR-05 | 1as | 2100 | 0.4 | 0.079 | 3.0 | 0.093 | 3.8 | 0.21 | <0.1 | 13 | <0.5 | 45 | <0.2 | 1.6 | 0.002 | <0.1 | <0.1 | 17 | <0.1 | 99 |
| 20-DOR-06 | 1a | 2000 | 0.5 | 0.016 | 2.4 | 0.095 | 3.6 | 0.12 | <0.1 | 19 | <0.5 | 77 | <0.2 | 0.5 | 0.007 | <0.1 | <0.1 | 67 | <0.1 | 134 |
| 20-DOR-07 | 1a | 1980 | 0.4 | 0.016 | 2.3 | 0.095 | 3.2 | 0.13 | <0.1 | 19 | <0.5 | 82 | <0.2 | 0.5 | 0.007 | <0.1 | <0.1 | 67 | <0.1 | 133 |

# Attachment D Pad T Laboratory Results – SFE

| Parameter | Units | LOD | 20-DOR-01 | 20-DOR-04 | 20-DOR-07 |
|---|---|---|---|---|---|
| | | | 1a | 1a | 1a |
| pH | pH Units | N/A | 8.5 | 8.7 | 9.0 |
| EC | uS/cm | 0.5 | 496 | 726 | 125 |
| SO4 | mg/L | 0.5 | 133 | 59 | 13 |
| Acidity to pH4.5 | mg/L | 0.5 | <0.5 | <0.5 | <0.5 |
| Acidity to pH8.3 | mg/L | 0.5 | <0.5 | <0.5 | <0.5 |
| Total Alkalinity | mg/L | 0.5 | 34 | 32 | 31 |
| Bicarbonate | mg/L | 0.5 | 41 | 39 | 38 |
| Carbonate | mg/L | 0.5 | <0.5 | <0.5 | <0.5 |
| Hydroxide | mg/L | 0.5 | <0.5 | <0.5 | <0.5 |
| Dissolved Chloride | mg/L | 0.5 | 40.2 | 124 | 7.4 |
| Total Ammonia (N) | mg/L | 0.005 | 1.1 | 1.3 | 0.22 |
| Nitrate-N | mg/L | 0.02 | 4.7 | 18 | 0.8 |
| Nitrite-N | mg/L | 0.05 | <0.05 | <0.05 | <0.05 |
| Hardness CaCO3 | mg/L | 0.5 | 139 | 128 | 36 |
| Dissolved Aluminum (Al) | mg/L | 0.0005 | 0.082 | 0.11 | 0.32 |
| Dissolved Antimony (Sb) | mg/L | 0.00002 | 0.00034 | 0.00034 | 0.00062 |
| Dissolved Arsenic (As) | mg/L | 0.00002 | 0.00067 | 0.00090 | 0.00026 |
| Dissolved Barium (Ba) | mg/L | 0.00002 | 0.0028 | 0.0048 | 0.0075 |
| Dissolved Beryllium (Be) | mg/L | 0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Dissolved Bismuth (Bi) | mg/L | 0.000005 | <0.000005 | <0.000005 | <0.000005 |
| Dissolved Boron (B) | mg/L | 0.05 | 0.11 | 0.10 | <0.05 |
| Dissolved Cesium (Cs) | mg/L | 0.00005 | <0.00005 | 0.000192 | <0.00005 |
| Dissolved Cadmium (Cd) | mg/L | 0.000005 | <0.000005 | <0.000005 | <0.000005 |
| Dissolved Calcium (Ca) | mg/L | 0.05 | 42 | 37 | 12 |
| Dissolved Chromium (Cr) | mg/L | 0.0001 | <0.0001 | 0.00012 | <0.0001 |
| Dissolved Cobalt (Co) | mg/L | 0.000005 | 0.00048 | 0.00047 | 0.000037 |
| Dissolved Copper (Cu) | mg/L | 0.00005 | 0.0037 | 0.0026 | 0.00048 |
| Dissolved Lanthanum (La) | mg/L | 0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Dissolved Iron (Fe) | mg/L | 0.001 | 0.026 | 0.029 | 0.0014 |
| Dissolved Lead (Pb) | mg/L | 0.000005 | <0.000005 | <0.000005 | <0.000005 |
| Dissolved Lithium (Li) | mg/L | 0.0005 | 0.0063 | 0.0056 | 0.0022 |
| Dissolved Magnesium (Mg) | mg/L | 0.05 | 8.2 | 9 | 1.8 |
| Dissolved Manganese (Mn) | mg/L | 0.00005 | 0.028 | 0.026 | 0.0065 |
| Dissolved Phosphorus (P) | mg/L | 0.002 | 0.0072 | 0.006 | 0.0097 |
| Dissolved Molybdenum (Mo) | mg/L | 0.00005 | 0.0025 | 0.0022 | 0.0012 |
| Dissolved Nickel (Ni) | mg/L | 0.000005 | 0.00032 | 0.00027 | 0.000085 |
| Dissolved Potassium (K) | mg/L | 0.05 | 5.5 | 9.1 | 2.0 |
| Dissolved Rubidium (Rb) | mg/L | 0.00005 | 0.0015 | 0.0073 | 0.0025 |
| Dissolved Selenium (Se) | mg/L | 0.00004 | 0.0011 | 0.00055 | 0.00051 |
| Dissolved Silicon (Si) | mg/L | 0.1 | 0.47 | 0.43 | 0.39 |
| Dissolved Silver (Ag) | mg/L | 0.000005 | 0.00016 | 0.000031 | <0.000005 |
| Dissolved Sodium (Na) | mg/L | 0.05 | 34 | 80 | 7.0 |
| Dissolved Strontium (Sr) | mg/L | 0.00005 | 0.11 | 0.11 | 0.047 |
| Dissolved Sulphur (S) | mg/L | 10 | 40 | 19 | <10 |
| Dissolved Tellurium (Te) | mg/L | 0.00002 | <0.00002 | <0.00002 | <0.00002 |
| Dissolved Thallium (Tl) | mg/L | 0.000002 | 0.0000027 | 0.0000048 | 0.0000029 |
| Dissolved Thorium (Th) | mg/L | 0.000005 | <0.000005 | <0.000005 | <0.000005 |
| Dissolved Tin (Sn) | mg/L | 0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Dissolved Titanium (Ti) | mg/L | 0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Dissolved Tungsten (W) | mg/L | 0.00001 | 0.00040 | 0.00036 | 0.00054 |
| Dissolved Uranium (U) | mg/L | 0.000002 | 0.0000033 | 0.000003 | <0.000002 |
| Dissolved Vanadium (V) | mg/L | 0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Dissolved Zinc (Zn) | mg/L | 0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Dissolved Zirconium (Zr) | mg/L | 0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Dissolved Mercury (Hg) | mg/L | 0.00005 | <0.00005 | <0.00005 | <0.00005 |

# Appendix B 2020 Geochemical Monitoring of Waste Rock, Madrid North Mine

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# Technical Memo

March 18, 2021

| | |
|---|---|
| **To** | Ashley Mathai and Sarah Warnock, Hope Bay Project |
| **From** | Jessica Evans, Lisa Barazzuol, SRK |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | 2020 Monitoring of Waste Rock, Madrid North Mine |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

TMAC initiated mining at Madrid North in 2019, initially with development of the Naartok East Crown Pillar Recovery (NE CPR) in July 2019 followed by development of the decline for the underground mine in December 2019. Mining at Madrid North was halted at the end of March 2020 due to the Covid-19 global pandemic. Mining of the underground in 2020 resulted in the production of approximately 17,158 t of waste rock that was placed on the Madrid North waste rock storage area (WRSA, Table 1-1). Mining of the NE CPR in 2020 resulted in the production of approximately 93,289 t of waste rock, of which approximately 83,968 t was placed on the Madrid North WRSA and the balance was used for construction (Table 1-1).

**Table 1-1: Summary of 2020 Madrid North Waste Rock Volumes and Placement Locations**

| Source | Placement Location | 2020 Volume (t) |
|---|---|---|
| **Material to Madrid North WRSA** | | |
| NE CPR | Madrid North WRSA | 83,968 |
| Underground Mine | Madrid North WRSA | 17,158 |
| **Waste Rock Used in Construction** | | |
| NE CPR | NE CPR | 749 |
| | Madrid Shop Laydown | 1,172 |
| | Overburden Dump | 7,400 |
| **Total** | | **110,447** |

Waste rock monitoring at Madrid North is outlined in Licence 2AM-DOH1335 Amendment No. 2 (NWB 2018), *Waste Rock, Ore and Mine Backfill Management Plan* (TMAC 2019) and *Classification of Waste*

*Rock in Support of Segregating Construction Rock from Naartok East Crown Pillar Recovery, Madrid North, Hope Bay* (SRK 2019). SRK (2019) includes a field classification method and geochemical criteria to classify NE CPR waste rock samples that have a low risk of ML/ARD (non-PAG and with low potential for neutral pH arsenic leaching) and are therefore suitable for construction, and also recommendations for operational implementation of the geochemical characterization program. The implementation of SRK (2019), including the sampling program and classification and segregation of run-of-mine waste rock was designed by TMAC as documented in SRK (2020).

This memo documents the geochemical monitoring of Madrid North waste rock in 2020, which included the following programs:

- Geochemical monitoring of underground waste rock from the Madrid North decline.
- Geochemical monitoring and classification of run-of-mine waste rock from NE CPR for the purposes of identifying and segregating waste rock that is geochemically suitable as construction rock.
- Geochemical monitoring of waste rock in stockpiles at the Madrid North WRSA. Waste rock at the WRSA was sourced from the NE CPR and underground mines.

Other geochemical monitoring activities in 2020 associated with Madrid North waste rock include an annual seep survey along the downgradient toe of the waste rock pad, routine monitoring of the Madrid North contact water pond (CWP) and as-built geochemical monitoring of waste rock used as construction rock. Results of the routine monitoring program of the CWP are included in monthly water quality reports prepared by TMAC and submitted to the NWB.

# 2 Madrid North Underground

## 2.1 Methods

### 2.1.1 Geological Inspection

TMAC site geologists inspect and document the fronts and back of the blast face and maintain internal records of these inspections. Protocols for geological inspections are documented in TMAC (2019).
Sample Collection and Geochemical Test Work Program

Waste rock from the underground placed on the Madrid North WRSA may be inaccessible and/or indistinguishable from NE CPR waste rock. Accordingly, geochemical sample collection of underground waste rock is conducted prior to placement on the WRSA. The geochemical sampling and testing frequency of the underground waste rock is a minimum of one sample per 10,000 tonnes of rock. Sampling was initiated by TMAC in January 2020. TMAC shipped two samples of mafic metavolcanics (1a) material to Bureau Veritas (BV) in Burnaby, BC for ABA and elemental analysis (Section 2.1.2). The test work program was managed by TMAC.

### 2.1.2 Analytical Methods

The geochemical analytical methods for waste rock samples from the underground are summarized as follows:

- Total sulphur by Leco;
- Sulphate by HCl leach;
- TIC by Leco furnace to directly measure $CO_2$ gas evolved from HCl treatment of the sample;
- Modified Sobek NP (MEND 1991); and
- Elemental analysis by aqua regia digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) determination of 9 major elements (e.g., aluminum, calcium, magnesium, sodium, potassium, iron, sulphur) and 26 trace elements (e.g., arsenic, zinc, copper, cadmium, lead).

### 2.1.3 Data Interpretation

The ratio of TIC to acid generating potential (AP) provides a measure of the acid rock drainage (ARD) potential of the sample. On the basis of sulphide (calculated as the difference between total sulphur and sulphate) and total sulphur content being at near parity, total sulphur was used to calculate AP. Samples are classified as non-potentially ARD generating (non-PAG) when TIC/AP ratios are greater than 3, as PAG when TIC/AP ratios are less than 1 and as having an uncertain potential for ARD when TIC/AP ratios are between 1 and 3. For samples with Modified NP, interpretations of ratios of NP to AP were the same as TIC to AP.

## 2.2 Quality Assurance and Quality Control

All results, including BV's internal quality assurance and quality control (QA/QC) program, were reviewed by SRK for quality assurance. Table 2-1 presents a summary of the QA/QC checks for the waste rock samples collected from the Madrid North underground by TMAC, including the assessment of duplicate and blank samples and standard reference materials. SRK determined all data to be acceptable.

**Table 2-1: Summary of QA/QC Results**

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **paste pH** | | |
| Pulp Duplicate | For any samples, +/- 0.5 difference pH unit | All passed. (n=2) |
| Standard Reference Material | Within specified tolerance ranges. | All passed. (n=2) |
| **TIC** | | |
| Method Blank | <5x Detection Limit | Passed. Total Inorganic Carbon (n=2) |
| Pulp Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-20% | All Passed. Total Inorganic Carbon (n=2) |
| Standard Reference Material | Within +/-20% difference | All Passed. Total Inorganic Carbon (n=2) |
| **Total S & Total Sulphate** | | |
| Method Blank | <5x Detection Limit | All passed. Total Sulphur and Sulphate (n=2) |
| Sulphur balance (total S > sulphate S) | For samples > 10X the detection limit (DL), Total Sulphur should be greater than Total Sulphate, if not the % difference should be within +/-20% | All passed. (n=2) |
| Pulp Dupli**cate** | For samples > 10X the detection limit (DL), % RPD within +/-20% | All Passed. Total Sulphate (n=2) |
| Standard Reference Material | Within specified tolerance ranges. | All Passed. Total Sulphate (n=3) and Total Sulphur (n=2) |
| **Modified NP** | | |
| Method Blank | <5x Detection Limit | All passed. (n=1) for Neutralization Potential |
| NP consistent with paste pH | Negative NP has paste pH <= 5 | All passed. (n=2) |
| Pulp Duplicate | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. Neutralization Potential and Fizz Test Rating (n=2) |
| Fizz test rating with NP | Max NP does not exceed fizz test rating | All passed. (n=1) |
| Standard Reference Material | Within specified tolerance ranges. | All passed. (n=2) for Neutralization Potential |
| **Modified NP and TIC** | | |
| Comparison between Modified NP and TIC | Check for trends/co-relation | TIC higher than NP (n=2) |
| **Total S-Leco and S-ICP** | | |
| Comparison between Total S-Leco and S-ICP | For samples >10X detection limit (DL), % RPD within +/-30% | All passed. (n=2) |
| **Aqua Regia Metals** | | |
| Method Blank | <5x Detection Limit | All passed. (n=2) |
| Pulp Duplicate | For samples >10X detection limit (DL), % RPD within +/- 20%, ok 10% of metal scan failing. | All passed. (n=1) |
| Standard Reference Material | Within specified tolerance ranges. | All passed. (n=4) |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\!020_Project_Data\Lab\Waste Rock\Madrid North_East Naartok\[Madrid North_WR_ABA_Master_SummaryQAQC_mlt.xlsx]Summa

## 2.3 Results and Discussion

### 2.3.1 Geological Inspection

The majority (99%) of waste rock was mafic metavolcanics (1) with the balance (1%) logged as quartz-carbonate veining.

### 2.3.2 Geochemical Results

A summary of ABA and trace element content for the two Madrid North UG samples are presented in Table 2-2. Complete results are presented in Attachment 1.

Values of paste pH for the two Madrid North UG samples were 6.8 and 8.0. Total sulphur content was 0.19% and 0.23% and sulphate content was below or near the level of analytical detection (0.01%). Sulphide sulphur, calculated as the difference between total sulphur and sulphate, was at near parity with total sulphur.

Modified NP was 109 and 178 kg $CaCO_3$/t compared to TIC content of 85 and 273 kg $CaCO_3$/t. TIC content was greater than NP in one sample (M011301) suggesting that TIC values overestimate the amount of carbonate available for buffering due to the presence of NP-neutral iron carbonate. Whereas in the other sample NP was greater than TIC suggesting buffering from silicates as quantified by the NP method. Both samples were classified as non-PAG on the basis of NP/AP and TIC/AP.

Trace element results were compared to ten times average crustal abundance for basalt (Price 1997) as an indicator of enrichment. Selenium could not be assessed because the detection limit is equal to the screening criterion and concentrations were below the detection limit or within the range of analytical error.

Arsenic was enriched in one of the samples at a concentration of 49 ppm relative to the screening criteria of 20 ppm. All other parameters were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment.

**Table 2-2: Summary of ABA and Trace Element Analyses, Madrid North UG Samples**

| Parameter | Unit | M020502 | M011301 | 10x Average Crustal Abundance* for Basalt |
|---|---|---|---|---|
| | | 1a | 1a | |
| Paste pH | s.u. | 6.8 | 8.0 | n/a |
| TIC | kg $CaCO_3$/t | 85 | 237 | |
| Modified NP | kg $CaCO_3$/t | 109 | 178 | |
| Total S | % | 0.19 | 0.23 | |
| $SO_4$ | % | <0.01 | 0.02 | |
| AP | kg $CaCO_3$/t | 5.9 | 7.2 | |
| TIC/AP | - | 14 | 33 | |
| NP/AP | - | 18 | 25 | |
| Ag | ppm | <0.1 | 0.1 | 1.1 |
| As | ppm | 1 | **49** | 20 |
| Ba | ppm | 18 | 11 | 3300 |
| Ca | % | 5 | 8 | 76 |
| Cd | ppm | <0.1 | 0.1 | 2.2 |
| Co | ppm | 25 | 43 | 480 |
| Cr | ppm | 100 | 110 | 1700 |
| Cu | ppm | 76 | 112 | 870 |
| Fe | % | 4 | 6 | 87 |
| Hg | ppm | <0.1 | <0.1 | 0.09 |
| Mg | % | 2 | 3 | 46 |
| Mn | ppm | 789 | 1370 | 15000 |
| Mo | ppm | 0.40 | 0.20 | 15 |
| Ni | ppm | 33 | 114 | 1300 |
| P | % | 0.063 | 0.025 | 1 |
| Pb | ppm | 6 | 1 | 60 |
| S | % | 0.17 | 0.16 | 0.3 |
| Sb | ppm | <0.1 | 0.2 | 2 |
| Sr | ppm | 23 | 62 | 4650 |
| U | ppm | <0.1 | <0.1 | 10 |
| V | ppm | 82 | 104 | 2500 |
| W | ppm | 0.10 | <0.1 | 7 |
| Zn | ppm | 66 | 69 | 1050 |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Madrid WR\HB_2020_SolidsGeochem_MadridWR_1CT022.056_rtc_jce_Rev00.xlsx

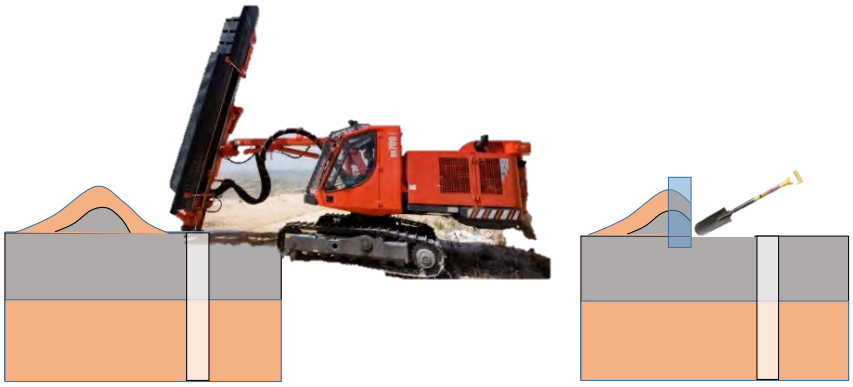
# 3 Naartok East Crown Pillar Recovery

## 3.1 Methods

### 3.1.1 Field-Based Classification of Waste Rock as Construction Rock

#### Sample Collection

TMAC collected samples for pXRF analysis for the purposes of geochemical classification. For each blast round, the blast hole sample density was determined by TMAC. In 2020, 25% of blast holes were sampled for each blast round and as increased to 50% when close to the ore contact. For each blast hole, TMAC collected one sample representing the length of each blast hole. As illustrated in Figure 3-1, a sample was collected by first removing the outside periphery (or front section) of the drill cuttings pile and then collecting the complete height of the interior section of the pile (as denoted by the blue box). Each sample from the drill cuttings cone was approximately ~1 kg.



a) b)

**Figure 3-1: Schematic of a) drill cuttings cone and b) sampling method of cuttings cone. The blue box denotes the material collected for the geochemical sample.**

#### pXRF Analysis

The pXRF program was managed and executed by TMAC according to SRK (2019). Samples were geologically described and sieved using a -2 mm sieve. In total, the pXRF program for NE CPR waste rock included the analysis of the -2 mm fraction of 1,000 samples of drillhole cuttings from 1,000 holes representing 21 blast rounds.

The -2 mm size fraction of each sample was analyzed using a Thermo Scientific Niton ZL3t GOLDD+ pXRF in soil mode with a total beam time of 150 seconds (low range and main range beam ran for 60 seconds each and the high range beam ran for 30 seconds). Each sample was analyzed once, with the exception of samples with calibrated pXRF arsenic values greater than 50 ppm, which were

analyzed in triplicate[1] with the maximum value used for data interpretation. For verification of pXRF results, approximately 0.5% of pXRF samples (n=5) were submitted to the TMAC assay lab for total sulphur using the Eltra Elementrac CS-d analyzer. Total carbon analysis was coupled with the total sulphur assay.

The QA/QC analytical program included analysis of the blanks and certified reference materials (CRM). TMAC conducted post-processing of data, which included defining values that were less than the limit of detection (LOD) as equal to the pXRF error value for that parameter. Calibrated values of arsenic and sulphur were calculated using the calibration equations documented in SRK (2019).

## Geochemical Classification Criterion for Construction Rock

The field-based geochemical classification program to identify NE CPR waste rock as construction rock are outlined in Figure 5-1 of SRK (2019). The segregation program is based on identification and classification of waste rock according to ML/ARD potential based on geological inspection and calibrated pXRF values of arsenic and sulphur, with the latter indicated by samples of sieved -2 mm drill cone cuttings that are representative of the blast round.

The criteria applied by TMAC to define NE CPR waste rock as geochemically suitable for use as construction rock (e.g. low risk of ML/ARD) is summarized as follows:

- Geologically defined as mafic metavolcanics (1) or gabbro (7a);
- Low risk of neutral pH metal leaching (calibrated pXRF As < 70 ppm); and
- Low risk of ARD (S < 0.5%, where sulphur content is indicated by calibrated pXRF value or the Hope Bay assay lab).

As part of the field classification program, waste rock samples are defined as not suitable for use as construction rock (e.g. risk of ML/ARD) using the following criteria:

- Geologically defined as mafic metavolcanics with sediments (1aj) or sedimentary units (5);
- Moderate to high risk of neutral pH metal leaching (calibrated pXRF As > 70 ppm); or
- Potential risk of ARD based (S > 1% when using the calibrated pXRF value or S > 0.5% when using the assay lab).

## Waste Rock Segregation

Based on the geochemical classifications of samples collected from the surveyed blast holes, TMAC geologists defined a dig line boundary to delineate geochemical management units, e.g. waste rock that was geochemical suitable for use as construction rock (denoted as green dots in Figure 3-2) from waste rock that was determined to have a risk of ML/ARD (denoted as red dots in Figure 3-2). TMAC geologists defined the dig line boundary conservatively such that material not suitable for construction

[1] Three pXRF (triplicate) sample replicate readings for a sample, where a replicate is defined as the analysis of the sample in unique area

was not mixed with material designated for use in construction. For example, as shown in Figure 3-2A, for blast rounds containing “red” material that could be operationally segregated from “green” waste rock, the dig line boundary included a 2 to 2.5 m buffer of suitable material was incorporated into the block of the unsuitable “red” material. Alternatively, if unsuitable waste rock could not be operationally segregated from suitable waste rock or the blast itself resulted in too much intermixing, the entire blast was considered not suitable for construction.

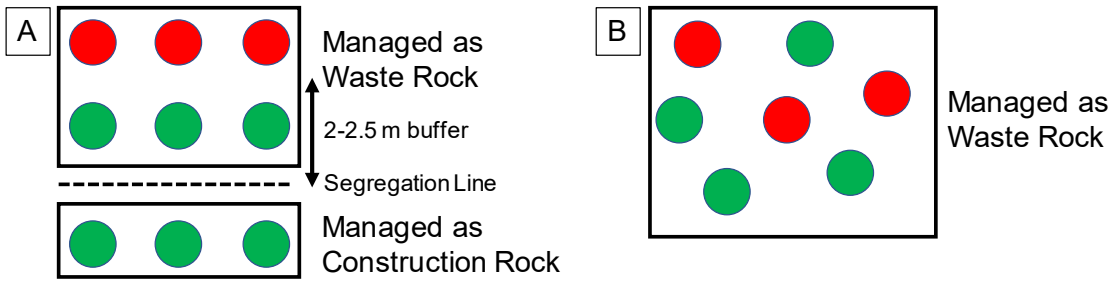



**Figure 3-2: Examples of dig limit boundaries for a blast round containing waste rock that is suitable (green dots) and not suitable (red dots) for construction when (A) green and red dots are operationally segregated and (B) are intermixed.**

### 3.1.2 Construction Geochemical Verification Program

TMAC did not collect verification samples in 2020.

### 3.1.3 Quality Assurance and Quality Control

#### pXRF Data

TMAC conducted the QA/QC program for pXRF that included the following: i) pXRF triplicate analysis for two samples; ii) pXRF duplicate analysis for six samples; iii) analysis of a method blank every 30 pXRF runs; and iv) analysis of certified reference material (CRM) every 30 pXRF runs. Table 3-1 presents the arsenic and sulphur content for CRMs selected by TMAC. CRMs were selected based on vendor availability and to represent the range of concentrations of arsenic and sulphur in typical Hope Bay rocks.

**Table 3-1: Arsenic and Sulphur Content for CRMs Analyzed for pXRF Program**

| CRM ID | Arsenic (ppm) | Sulphur (ppm) |
|---|---|---|
| VS 8549-04 | 40 | 6,200 |
| CAN Till-3 | 87 | 500 |
| NIST-2780a | 66 | 88,500 |
| NIST-2709a | 11 | n/a |

SRK conducted a QA/QC assessment of all pXRF arsenic and sulphur data, including duplicate and triplicate analyses, blanks and CRMs, and as summarized in Table 3-2 and Table 3-3, respectively. A summary of samples that did not pass the QA/QC screening tests for arsenic are summarized as follows:

- CRMs:
  - VS 8549-04: Of the 36 CRM runs, one CRM run had arsenic content of 191 ppm compared to the COA value of 40 ppm (RPD 65%). One sample failed.
  - NIST-2780a: pXRF arsenic content ranged between 160 and 200 ppm compared to the COA value of 66 ppm (RPD of 33 to 54%). All 36 samples failed. TMAC pXRF analysts confirmed the CRM identification.
  - Arsenic content for the other CRMs passes the QC criteria as the values were all below the %RPD criteria and below ten times the detection limit, including all analyses of CAN Till-3 (87 ppm).

For pXRF sulphur data, results of the QC are summarized as follows:

- All triplicate (n=2) and duplicate (n=6) pXRF readings with values within the specified tolerance ranges.
- Of the 36 silica blanks, all samples passed and were within the specified tolerance range.
- CRMs:
  - NIST-2780a: Sulphur content of pXRF ranged from 32,000 to 41,000 ppm (RPD 47 to 46%) with all values lower than the COA (88,500 ppm). All 36 samples failed.
  - Sulphur content for the other CRMs passes the QC criteria as the values were all below the %RPD criteria and below ten times the detection limit.

In 2020, analysis of NIST-2780a by pXRF consistently did not generate values as per certified values. SRK accepted all pXRF for arsenic and sulphur data as received for the purpose of reporting.

**Table 3-2: Summary of QAQC Assessment for pXRF Arsenic Data**

| QC Test | Sample Type | SRK QC Criteria | Arsenic |
|---|---|---|---|
| Blank | Pure Silica Sand (n=36) | Within specified tolerance ranges, <5X the detection limit (DL). | All passed. |
| Triplicate pXRF As readings | pXRF Sample (n=2) | For As, RPD% comparison between i) minimum and median and ii) maximum and median values. For samples >10X detection limit (DL), % RPD within +/- 30%. | All passed. |
| Duplicate pXRF As readings | pXRF Sample (n=6) | For As, RPD% comparison between the two values. For samples >10X detection limit (DL), % RPD within +/- 30%. | All passed. |
| Split Duplicate pXRF As readings | pXRF Sample (n=4) | For As, RPD% comparison between the two values. For samples >10X detection limit (DL), % RPD within +/- 30%. | All passed. |
| Certified Reference Materials | VS 8549-04 (n=36) As = 40 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All samples passed except for one with % RPD of 65% and a value of 191 ppm. |
| | NIST-2780a (n=36) As = 66 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All samples failed with %RPD ranging from 33 to 54%. Majority of values are between 160 and 200 ppm. |
| | NIST-2709a (n=33) As = 11 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All passed. |
| | CAN Till-3 (n=35) As = 87 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All passed. |
| | CAN Till-4 (n=1) As = 111 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | Passed. |

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**Table 3-3: Summary of QA/QC Assessment for pXRF Sulphur Data**

| QC Test | Sample Type | SRK QC Criteria | Arsenic |
|---|---|---|---|
| Blank | Pure Silica Sand (n=36) | Within specified tolerance ranges, <5X the detection limit (DL). | All passed. |
| Triplicate pXRF S readings | pXRF Sample (n=2) | For As, RPD% comparison between i) minimum and median and ii) maximum and median values. For samples >10X detection limit (DL), % RPD within +/- 30%. | All passed. |
| Duplicate pXRF S readings | pXRF Sample (n=6) | For As, RPD% comparison between the two values. For samples >10X detection limit (DL), % RPD within +/- 30%. | All passed. |
| Split Duplicate pXRF S readings | pXRF Sample (n=4) | For As, RPD% comparison between the two values. For samples >10X detection limit (DL), % RPD within +/- 30%. | All passed. |
| Certified Reference Materials | VS 8549-04 (n=36) S = 6,200 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All passed. |
| | NIST-2780a (n=36) S = 88,500 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All samples failed with %RPD ranging from 37 to 46%. Failed values are between 32,000 and 41,000 ppm. All samples also failed for Arsenic. |
| | NIST-2709a (n=33) S = N/A | Sulphur content not reported in the COA. | N/A |
| | CAN Till-3 (n=35) S = 500 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | All passed. |
| | CAN Till-4 (n=1) S = 800 ppm | Within specified tolerance ranges (% RPD within +/- 20%), compared to CRM certificate of analysis values. | Passed. |

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### 3.1.4 Data Interpretation Methods

#### ARD Classifications

The ratio of TIC to acid generating potential (AP) provides a measure of the acid rock drainage (ARD) potential of the sample, where total sulphur was used to calculate AP. TIC was calculated based on total carbon content determined by the TMAC assay lab. This method assumes that all carbon is

present as inorganic carbon (IC), however this may overestimate the buffering capacity for sedimentary rock types, including mafic metavolcanics with sediments (1aj/1ojf) and sedimentary units (5), which are known to contain organic carbon.

Samples are classified as non-potentially ARD generating (non-PAG) when TIC/AP ratios are greater than 3, as PAG when TIC/AP ratios are less than 1 and as having an uncertain potential for ARD when TIC/AP ratios are between 1 and 3. If total sulphur is less than 0.1%, it is considered non-PAG regardless of the TIC/AP ratio (Day and Kennedy 2015).

#### Waste Rock as Construction Rock

Geochemical criteria and the method of classifying and segregating run-of-mine waste rock as construction rock are outlined in Section 3.1.1.

## 3.2 Results and Discussion

### 3.2.1 Geochemical Results for Drillhole Samples

#### Field Monitoring and Geochemical Classification Program

Based on the geological inspection of drill cutting samples, waste rock lithologies[2] were predominantly (44%) mafic metavolcanics with sediments (1aj/1oj, n=440), 20% mafic metavolcanics (1a, n=202), 19% sedimentary units (5, n=186), 16% altered mafic metavolcanics (1aj/1oj, n=158), 1% quartz veins (12q, n=10), and <1% overburden (15, n=4).

Table 3-4 and Figure 3-3 present the geochemical monitoring data by rock type for the blasthole sample set, including a comparison to the arsenic and sulphur criteria outlined in Section 3.1.1. Complete monitoring results are presented in Attachment 2. The majority of blasthole samples (93%, n=1,000) were classified as PAG with results summarized by rock type as follows:

- Mafic metavolcanics (1a): arsenic and sulphur content below the criteria for construction rock for approximately 20% of samples (n=202). Median values of calibrated pXRF arsenic and sulphur were 370 ppm and 1.2%, respectively, and are higher than median arsenic and sulphur content for the 2019 sample set (74 ppm and 0.63%, respectively).
- Altered mafic metavolcanics (1as): arsenic and sulphur content below the criteria for construction rock for approximately 20% of samples (n=158). Median values of calibrated pXRF arsenic and sulphur were 520 ppm and 1%, respectively.
- Mafic metavolcanics with sediment (1aj/1oj): arsenic and sulphur content below the criteria for construction rock for 3% of samples (n=440), however all samples were classified as not suitable for construction based on rock type. Median values of calibrated pXRF arsenic and sulphur were 430 ppm and 1.4%, respectively.

[2] Geological codes according to TMAC lithology logging assignments and groupings according to SRK (2017)

- Sedimentary units (5): arsenic and sulphur content below the criteria for construction rock for 2% of samples (n=186), however all samples were classified as not suitable for construction based on rock type. Median values of calibrated pXRF arsenic and sulphur were 370 ppm and 1.9%, respectively.
- Quartz veins (12q): calibrated pXRF sulphur and arsenic were above the criteria for all samples. Accordingly, all samples were classified as not suitable for construction.
- Overburden (15c): arsenic and sulphur content below the criteria for construction rock for approximately 20% of samples (n=4).

The range of sulphur and arsenic content as indicated by the pXRF monitoring data indicate that the FEIS waste rock humidity cell sample set represents the geochemical characteristics of waste rock excavated from NE CPR (SRK 2017).

**Table 3-4: Geochemical Monitoring Data by Rock Type, Blasthole Sample Set**

| Rock Type | Statistic | As (ppm) | Sulphur (%) | | TIC[2] | TIC/AP[2] | Geochemical Classification (%)[3] | |
|---|---|---|---|---|---|---|---|---|
| | | pXRF[1] | pXRF[1] | Assay | (kgCaCO3/t) | | S <0 .5% and As < 70 ppm[4] | S < 0 .5% and/or As > 70 ppm[4] |
| Mafic Metavolcanics (1a) | P5 | 27 | 0.45 | 0.15 | 150 | 14 | 18% | 82% |
| | P50 | 370 | 1.2 | 0.24 | 170 | 22 | | |
| | P95 | 810 | 6.5 | 0.39 | 200 | 45 | | |
| | count | 202 | 202 | 4 | 4 | 4 | | |
| Altered Mafic Metavolcanics (1as) | P5 | 21 | 0.43 | -- | -- | -- | 9% | 91% |
| | P50 | 520 | 1 | -- | -- | -- | | |
| | P95 | 860 | 3.4 | -- | -- | -- | | |
| | count | 158 | 158 | 0 | 0 | 0 | | |
| Mafic Metavolcanics with Sediments (1aj/1oj) | P5 | 89 | 0.52 | 0.28 | 250 | 29 | 3% | 97% |
| | P50 | 430 | 1.4 | 0.28 | 250 | 29 | | |
| | P95 | 850 | 5.1 | 0.28 | 250 | 29 | | |
| | count | 440 | 440 | 1 | 1 | 1 | | |
| Sedimentary Units (5) | P5 | 110 | 0.58 | -- | -- | -- | 2% | 98% |
| | P50 | 370 | 1.9 | -- | -- | -- | | |
| | P95 | 890 | 6.6 | -- | -- | -- | | |
| | count | 186 | 186 | 0 | 0 | 0 | | |
| Quartz veins (12q) | P5 | 130 | 0.81 | -- | -- | -- | 0% | 100% |
| | P50 | 240 | 1.9 | -- | -- | -- | | |
| | P95 | 560 | 2.7 | -- | -- | -- | | |
| | count | 10 | 10 | 0 | 0 | 0 | | |
| Overburden (15c) | P5 | 12 | 0.3 | 0.12 | 42 | 11 | 100% | 0% |
| | P50 | 13 | 0.34 | 0.12 | 42 | 11 | | |
| | P95 | 14 | 0.36 | 0.12 | 42 | 11 | | |
| | count | 4 | 4 | 1 | 1 | 1 | | |
| All (n=1,000) | | | | | | | 7% | 93% |

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**Notes:**
[1] Calibrated value
[2] Not used for construction classification. Presented as supporting data.
[3] Construction classification also includes geological criterion. Rock types 1aj/1oj and 5 not to be used as construction rock.

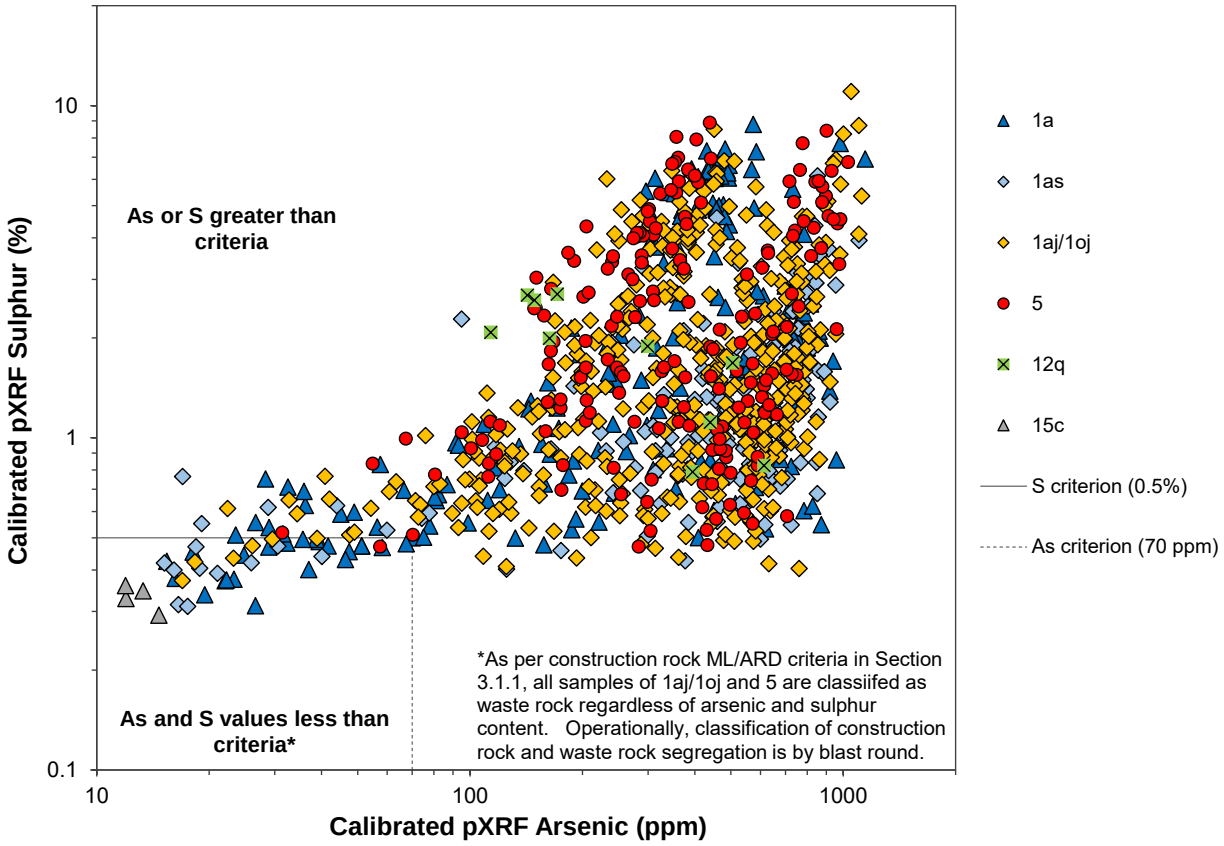


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**Figure 3-3: Comparison of Calibrated pXRF Data and Construction Rock Criteria**

## Verification of pXRF Analyses

Table 3-5 presents the pXRF verification geochemical data with complete results presented in Attachment 2. A comparison of calibrated pXRF and assay sulphur content indicated that sulphur indicated by the calibrated pXRF and assay methods resulted in consistent ARD classifications (Section 3.1.1) except one sample each of mafic metavolcanics (1a). The difference in sulphur content could be a result of sample heterogeneity. TIC to AP ratios for the verification samples indicated that all samples were classified as non-PAG, TIC content calculated based on total carbon content may be overestimated for rock types that may contain organics, e.g. 1aj/1of and 5.

**Table 3-5: pXRF Verification Monitoring Data, Blast Hole Sample Set**

| Rock Type | Hole ID | Sulphur (%) | | TIC[1] | TIC/AP |
|---|---|---|---|---|---|
| | | pXRF | Assay | kgCaCO3/t | |
| 1a | NE-1016-02-H9 | 0.45 | 0.18 | 170 | 29 |
| | NE-1016-02-Z12 | 0.34 | 0.14 | 210 | 48 |
| | NE-1010-06-H20 | 0.51 | 0.3 | 140 | 15 |
| | NE-1010-06-H21 | 0.71 | 0.41 | 170 | 14 |
| 1aj/1oj | NE-1016-11-P32 | 0.74 | 0.28 | 250 | 29 |
| 15 | NE-1034-25-K10 | 0.29 | 0.12 | 42 | 11 |

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**Notes:**

[1] Calculated from total carbon.

### 3.2.2 Waste Rock Segregation and Management

For each blast round TMAC interpreted geochemical classifications of blasthole samples to define dig line boundaries to delineate construction rock that could be operationally segregated from waste rock during excavation (Section 3.1.1).

In 2020, mining at NE CPR occurred between January and March, after which operations were terminated due to the Covid-19 pandemic. During this period, TMAC excavated 93,000 t of waste rock from NE CPR of which 90% was operationally classified and segregated as not suitable for construction and placed at the Madrid North WRSA. NE CPR waste rock that was classified and segregated as suitable for construction was used to construct the facilities listed in Table 1-1.

# 4 Madrid North Waste Rock Storage Area

## 4.1 Methods

### 4.1.1 Geological Inspections

In September 2020, SRK geochemist Jonathon Doherty, GIT (BC) completed a geological inspection of waste rock placed on the Madrid North WRP. The objective of the inspection was to document the geological composition of waste rock, to examine for signs of sulphide oxidation and weathering and to collect samples for geochemical characterization of waste rock for comparison with baseline geochemical characterization (TMAC 2019). The inspection was carried out by walking over and around the extent of the stockpile and logging the rock types and geochemical characteristics (i.e. sulphide and carbonate content) of the waste rock. It was noted that the primary sulphide within the waste rock was pyrite with rare occurrences of trace chalcopyrite.

### 4.1.2 Sample Collection and Geochemical Test Work Program

As per the Waste Rock, Ore and Mine Backfill Management Plan (TMAC 2019), SRK collected 13 samples of waste rock at the Madrid North WRSA. The sample set was selected to cover the range of rock types that were intersected by mining, as indicated by TMAC geologists as well as covering the full spatial distribution of the storage area.

Each sample consisted of a sieved coarse fraction (screened to -1 cm) and a finer fraction (screened to -2 mm) for rinse tests. SRK visually described the samples for rock type, sulphide content (quantity, type and occurrence) and carbonates (fizz test with 10% HCl, type, and occurrence). Rinse tests involved mixing a 1 to 1 ratio of distilled water and solids and measuring the resulting pH and electrical conductivity (EC).

Table 4-1 summarizes the sample set according to the rock type, as assigned by SRK and also the associated geochemical test work program. SRK shipped samples to Bureau Veritas (BV) in Burnaby, BC for ABA and elemental analysis (Section 2.1.2) on the coarse -1 cm fraction. SRK selected a subset of samples for SFE tests to cover the range of rinse EC values. SFE samples were sieved to -2 mm at BV from the -1 cm size fraction. The test work program was managed by SRK.

**Table 4-1: Madrid North WRSA Samples Collected and Associated Test Program**

| Dominant Rock Type[1] | Secondary Rock Types[1] | ABA & Elemental Analysis | SFE | Rinse Test (pH and EC) |
|---|---|---|---|---|
| 1a | 1as, 5, oxide, 12, 11c | 9 | 5 | 9 |
| 1as | 1a, oxide, 5, 12 | 4 | 3 | 4 |
| Total Number of Tests | | 13 | 8 | 13 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Madrid WR\HB_2020_SolidsGeochem_MadridWR_1CT022.056_rtc_jce_Rev00.xlsx

Notes: [1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics; [2] 5 = sedimentary units including chert and siltstone, 11c = diabase, 12 = quartz veins, oxide = strongly oxidized waste rock. The rock types 1aj/oj (mafic metavolcanics with sediment) cannot be differentiated from a mix of 1a (mafic metavolcanics) and 5 (sediments) in run-of-mine rock.

## LEGEND

- Waste Rock Sample
- Seepage Sample Location
- Contact Water Pond
- Sump

## NOTES

1. Drone imagery georeferenced by SRK. Imagery taken at oblique angle, therefore sample locations may appear offset.

## REFERENCES

NAD 1983 Zone UTM 13N.
Drone imagery captured by TMAC August 7th, 2020.

0 25 50 75 100
Meters

srk consulting

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Filename: 1CT022_056_Madrid_N_Portal_Pad

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**Hope Bay Project**

Madrid North WRSA

Geochemical Monitoring of Waste Rock at Madrid North WRSA

| Date: | Approved: | Figure: |
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| Mar 2021 | LNB | **4-1** |

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### 4.1.3 Analytical Methods

The waste rock samples collected from the Madrid North WRSA were submitted to BV for ABA and multi-element using the methods outlined in Section 2.1.2.

SFE tests were completed on the -2 mm size fraction, using a 3:1 solution to solid ratio and a 24-hour shaking period (MEND 2009). SFE leachates were analyzed for pH, EC, total dissolved solids (TDS), $SO_4$, alkalinity, acidity, chloride, ammonia, $NO_3$, $NO_2$ and element analysis by ICP-MS (including Hg).

## 4.2 Quality Assurance and Quality Control

All results, including BV's internal quality assurance and quality control (QA/QC) program, were reviewed by SRK for quality assurance. In addition to BV's QA/QC program, SRK followed internal QA/QC procedures as outlined in the SRK Expectations for Laboratory Geochemical Data Quality (2019) which have been agreed upon with the laboratories that SRK uses. Table 4-2 presents a summary of the QA/QC checks for the waste rock samples collected from the Madrid North waste rock storage area by SRK, including the assessment of duplicate and blank samples and standard reference materials. SRK determined all data to be acceptable.

**Table 4-2: Summary of QA/QC Results**

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **paste pH** | | |
| Split Duplicate (n=1) | For any samples, +/- 0.5 difference pH unit | Passed |
| Pulp Duplicate (n=2) | For any samples, +/- 0.5 difference pH unit | All passed. |
| Standard Reference Material (n=3) | Within specified tolerance ranges. | All passed. |
| **Total C and TIC** | | |
| Method Blank (n=1) for TIC | <2X detection limit (DL) | All passed. |
| Split Duplicate (n=1) for TIC | For samples > 10X the detection limit (DL), % RPD within +/-30% | Passed |
| Pulp Duplicate (n=1) for TIC | For samples > 10X the detection limit (DL), % RPD within +/-20% | Passed |
| Standard Reference Material (n=2) for TIC | Within specified tolerance ranges. | All passed. |
| **Total S & Total Sulphate** | | |
| Method Blank (n=1) for Total S and SO4 | <2X detection limit (DL) | All passed. |
| Sulphur balance (total S > sulphate S) (n=13) | For samples > 10X the detection limit (DL), Total Sulphur should be greater than Total Sulphate, if not the % difference should be within +/-20% | All passed. |
| Split Duplicate (n=1) for Total S and SO4 | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Pulp Duplicate (n=2) for SO4 | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed. |
| Standard Reference Material (n=2) for Total S and SO4 | Within specified tolerance ranges. | All passed. |

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Modified NP** | | |
| Method Blank (n=3) | within -2.50 to 2.50 NP Kg CaCO3/t | All passed. |
| NP consistent with paste pH (n=13) | Negative NP has paste pH <= 5 | All passed. |
| Split Duplicate (n=1) for NP and Fizz Rating | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Pulp Duplicate (n=2) for NP and Fizz test | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Fizz test rating with NP (n=13) | Max NP does not exceed fizz test rating | All passed. |
| Standard Reference Material (n=3) for NP | Within specified tolerance ranges. | All passed. |
| **Modified NP and TIC** | | |
| Comparison between Modified NP and TIC (n=13) | Check for trends/co-relation | Trend is variable |
| **Total S-Leco and S-ICP** | | |
| Comparison between Total S-Leco and S-ICP (n=13) | For samples >10X detection limit (DL), % RPD within +/-20% | All passed. |
| **Trace Elements (Aqua Regia Digestion with ICP Finish)** | | |
| Method Blank (n=1) | <2X detection Limit (DL) | All passed. |
| Split Duplicate (n=1) | For samples >10X detection limit (DL), % RPD within +/- 30%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| Standard Reference Material (n=2) | Within specified tolerance ranges. | All passed. |
| **Shake Flask Extraction** | | |
| Method Blank (n=1) | <5X Detection Limit | All passed. |
| Ion Balance (n=8) | EC>100uS/cm, % difference should be within +/-10% | All passed. |
| Leachate Duplicate (n=1) | For samples >10X detection limit (DL), % RPD within +/- 30%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. For pH, difference unit is within +/-0.2 | All passed. |
| SO4-S vs S-ICP (n=8) | For samples > 10X the detection limit (DL), the % difference should be within +/-20% | All passed. |

## 4.3 Results and Discussion

### 4.3.1 Geological Inspection

SRK inspected accessible waste rock on the surface and perimeter of the WRSA. Waste rock was a mix of approximately 85% chloritic green mafic metavolcanics (1a), 10% light tan colored sericite altered mafic metavolcanics (1as), with the remainder composed of lesser proportions of strongly weathered and pervasively oxidized waste rock (oxide), chert and siltstones (5), quartz veins (12) and diabase (11c). Sedimentary units were observed throughout the waste rock stockpile area. Oxide

material was concentrated within the pile located within the southeastern area of the WRSA and directly upstream and adjacent to the contact water pond (MMS-1), however oxide waste rock was present throughout the WRSA but in lesser amounts. According to TMAC geology, oxide rock is from the NE CPR and is described as follows:

- Ore lithologies that could not be segregated from waste rock. TMAC logged the ore lithologies as:
  - Primarily in association with rock type 1aj (mafic volcanics with sediments; Section 3.2.1) and were predominantly present as silicified clast-red cherty fragments (resembling a fragments of Banded Iron Formation)
  - As sparse fragments in association with rock type 12 (quartz veins).
- Present along localized fractures of mafic metavolcanics (1 and/or 1as) high in Fe-Mg.
- Present locally (<1% of a blast round) along localized fractures, faults and shear zones.

Overall, the waste rock located near the seepage collection pond had the highest sulphide content. The lithologies present were well mixed and most samples reflect a mix of the lithologies present. The rock types logged as mafic metavolcanics with sediments (1aj/oj) within drill core and in underground mapping were mapped as mafic metavolcanics (1a) and sediments (5) the sedimentary interbeds within rock type 1aj/1oj were not distinguishable from rock type 5 in run-of-mine rock.

Waste rock types observed at the WRSA are summarized as follows:

- Mafic metavolcanics (1a; Figure 4-2) were fresh (unoxidized), dark green, weakly foliated with trace to 2% fine to medium-grained disseminated pyrite, no fizz on the groundmass, and weak fizz on rare <0.5cm quartz-carbonate veins.
- Altered mafic metavolcanics (1as; Figure 4-2) were light tan brown, weakly to moderately foliated with moderate to strong pervasive sericite alteration, none to weak fizz, and frequent stockwork quartz veining with fine to medium-grained vein hosted pyrite.
- Sedimentary units (5;Figure 4-3) consisted either of dark grey chert or black weakly to moderately silicified siltstone which had no fizz and trace finely disseminated pyrite.
- Oxide (Figure 4-4) was characterized by rock with moderate to strongly pervasive oxidation noted by reddish coloration of the entire groundmass and all fractures in the rock. Oxide had none to weak fizz and none to 2% finely disseminated pyrite. Where the intensity of oxidation did not completely overprint primary rock textures, material classified as oxide included the rock types 1a and 1as.
- Quartz veins (12) consisted of milky white colored massive quartz with trace to 1% disseminated pyrite and chlorite and no fizz.
- Diabase (11c) was identified as an olive green and massive textured subvolcanic rock with medium grained plagioclase phenocrysts in a fine-grained olive colored groundmass. Diabase had weak to no fizz and no visibly identifiable pyrite.

Of the 13 samples collected, five were from the stockpile upstream of the CWP and eight were from the stockpile adjacent to the sumps. Furthermore, three samples contained oxide and sedimentary units (5) and six samples contained oxide only.

**Figure 4-2: 20-MAD-05; showing mix of dark green mafic metavolcanics (1a), tan-coloured sericite altered mafic metavolcanics (1as) with stockwork quartz veining, and strongly oxidized waste rock (oxide) present as smaller cobble and gravel sized and fines.**

**Figure 4-3: 20-MAD-06 showing a mix of dark green mafic metavolcanics (1a) and black silicified siltstone (5).**

**Figure 4-4: 20-MAD-01 showing a mix of dark green mafic metavolcanics (1a), tan-coloured sericite altered mafic metavolcanics (1as) and oxide (red)**

### 4.3.2 Rinse Tests

Rinse tests on the sieved -2 mm fraction indicated values of pH and EC ranged from 7.7 to 8.9 and 5 to 593 µS/cm, respectively (Table 4-3). Two exceptions were samples 20-MAD-10 and 20-MAD-12, which had EC values of 1,018 and 1,845 µS/cm, respectively. These values are within the range of rinse EC values of Doris underground waste rock (e.g. 87 to 1,615 uS/cm). These samples were both samples of mafic metavolcanics (1a, 1as) with diabase and/or quartz veins and were collected from the top bench of the stockpile in the northwestern area of the WRSA and upstream of MMS1-S1 and MMS1-S3. The geological composition and EC values suggests these samples may be from the underground mine.

**Table 4-3: Rinse Test Results, Madrid North WRSA Samples**

| Dominant Rock Type[1] | Secondary Rock Type | % Sediments | % Oxide | Sample ID | Rinse pH | Rinse EC |
|---|---|---|---|---|---|---|
| | | | | | s.u. | µS/cm |
| 1a | 1as > 5 > oxide | 15 | 5 | 20-MAD-01 | 8.7 | 275 |
| | 1a>1as>oxide | - | 10 | 20-MAD-02 | 8.8 | 363 |
| | 1a>1as>oxide | - | 2 | 20-MAD-05 | 8.9 | 245 |
| | 1a>1as>oxide | - | 1 | 20-MAD-06 | 8.4 | 593 |
| | 1a>1as | - | - | 20-MAD-08 | 7.8 | 5.0 |
| | -- | - | - | 20-MAD-10 | 8.2 | 1,018 |

| Dominant Rock Type[1] | Secondary Rock Type | % Sediments | % Oxide | Sample ID | Rinse pH | Rinse EC |
|---|---|---|---|---|---|---|
| | | | | | s.u. | µS/cm |
| 1as | 1as>11c | - | - | 20-MAD-12 | 8.0 | 1,845 |
| | 1as>11c>12 | - | - | 20-MAD-13 | 8.9 | 137 |
| | 1as>5 (1%) >12>oxide>11c | 1 | 1 | 20-MAD-14 | 8.8 | 309 |
| | 1a> 5 (2%) >oxide | 2 | 3 | 20-MAD-03 | 7.7 | 586 |
| | 1a > oxide | - | 2 | 20-MAD-04 | 8.7 | 540 |
| | 1a > oxide | - | 2 | 20-MAD-07 | 8.8 | 234 |
| | 1a > oxide > 12 | - | 2 | 20-MAD-09 | 8.7 | 421 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Madrid WR\HB_2020_SolidsGeochem_MadridWR_1CT022.056_rtc_jce_Rev00.xlsx

Note:

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics

### 4.3.3 ABA

A summary of ABA data are presented in Table 4-4 and Figure 4-5 to Figure 4-8. Complete results are presented in Attachment 3.

Values of paste pH for all rock types ranged from 7.7 to 8.9.

Total sulphur content ranged from 0.28% to 1.2% with a median value of 0.69%. Sulphur content for samples containing sediments and/or oxide ranged from 0.35 to 1.2% (n=9) whereas sulphur ranged from 0.28 to 0.36% for samples that did not contain sediments and/or oxide (n=4). Sulphate content was below or near the level of analytical detection (0.01%). Sulphide sulphur, calculated as the difference between total sulphur and sulphate, was at near parity with total sulphur (Figure 4-5).

For mafic metavolcanics (1a), values of Modified NP ranged from 178 to 331 kg $CaCO_3$/t compared to 272 to 328 kg $CaCO_3$/t for the altered mafic metavolcanics (1as). TIC ranged from 158 to 357 kg $CaCO_3$/t in the 1a samples compared to 299 to 411 kg $CaCO_3$/t in the 1as samples. For NP values greater than 200 kg $CaCO_3$/t , TIC content was generally higher than NP suggesting that TIC values overestimate the amount of carbonate available for buffering due to the presence of NP-neutral iron carbonate (Figure 4-6). At values of NP below 200 kg $CaCO_3$/t, NP and TIC content are at near parity. All samples were classified as non-PAG on the basis of NP/AP and TIC/AP (Section 2.1.3) as shown in Figure 4-7 and Figure 4-8.

**Table 4-4: Summary of ABA Analyses, Madrid North WRSA Samples**

| Dominant Rock Type[1] | Secondary Rock Type | Sample ID | Paste pH | Total S | SO4 | AP | TIC | Modified NP | TIC/AP | NP/AP |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | s.u. | % | % | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | - | - |
| 1a | 1as > 5 (15%) > oxide | 20-MAD-01 | 8.6 | 1.0 | 0.01 | 31 | 340 | 331 | 11 | 11 |
| | 1a>1as>oxide | 20-MAD-02 | 8.8 | 1.2 | <0.01 | 38 | 356 | 325 | 9.3 | 8.5 |
| | 1a>1as>oxide | 20-MAD-05 | 8.9 | 0.97 | <0.01 | 30 | 357 | 291 | 12 | 10 |
| | 1a>1as>oxide | 20-MAD-06 | 8.7 | 0.90 | 0.01 | 28 | 349 | 275 | 12 | 10 |
| | 1a>1as | 20-MAD-08 | 7.7 | 0.36 | 0.02 | 11 | 204 | 210 | 18 | 19 |
| | -- | 20-MAD-10 | 8.6 | 0.28 | 0.08 | 8.8 | 219 | 244 | 25 | 28 |
| | 1as>11c | 20-MAD-12 | 8.6 | 0.29 | 0.03 | 9.1 | 221 | 234 | 24 | 26 |
| | 1as>11c>12 | 20-MAD-13 | 8.5 | 0.33 | 0.02 | 10 | 158 | 178 | 15 | 17 |
| | 1as>5 (1%) >12>oxide>11c | 20-MAD-14 | 8.7 | 0.58 | 0.01 | 18 | 258 | 243 | 14 | 13 |
| 1as | 1a> 5 (2%) >oxide | 20-MAD-03 | 8.9 | 0.93 | <0.01 | 29 | 411 | 328 | 14 | 11 |
| | 1a > oxide | 20-MAD-04 | 8.9 | 0.73 | 0.02 | 23 | 299 | 283 | 13 | 12 |
| | 1a > oxide | 20-MAD-07 | 8.9 | 0.35 | 0.01 | 11 | 300 | 270 | 27 | 25 |
| | 1a > oxide > 12 | 20-MAD-09 | 8.7 | 0.69 | 0.01 | 22 | 303 | 272 | 14 | 13 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Madrid WR\HB_2020_SolidsGeochem_MadridWR_1CT022.056_rtc_jce_Rev00.xlsx

**Notes**

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics

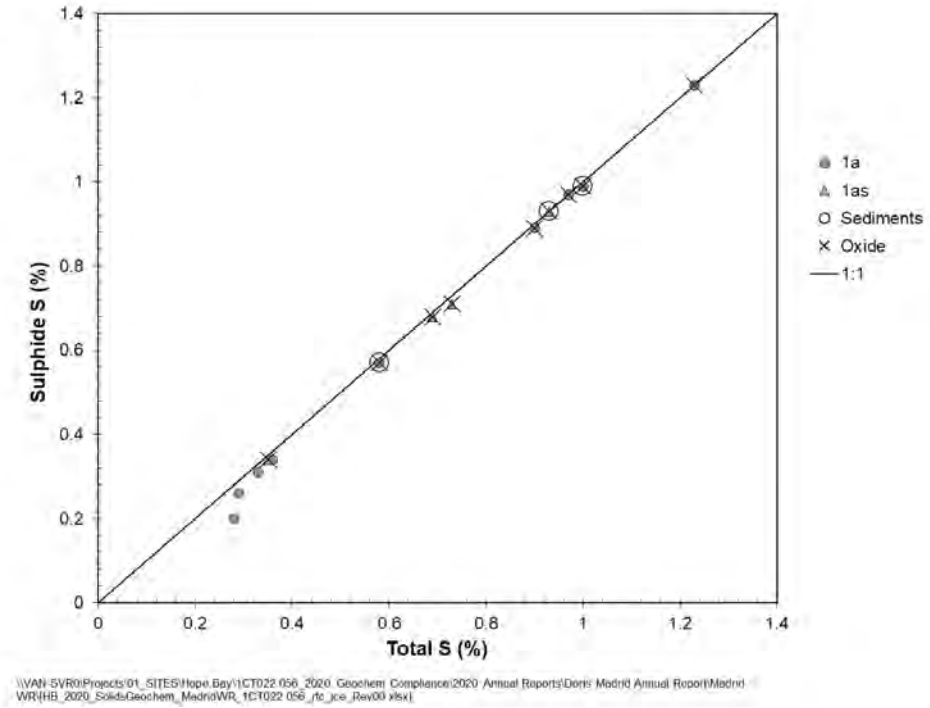


**Figure 4-5: Comparison of Total Sulphur versus Sulphide by dominant rock type, Madrid North WRSA**

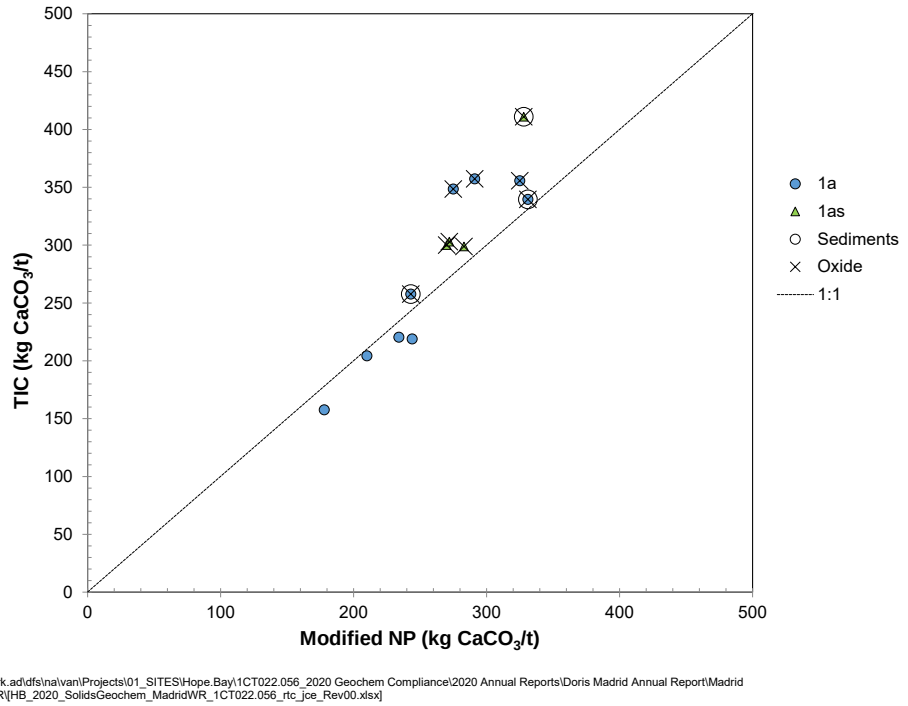


**Figure 4-6: Comparison of Modified NP versus TIC by dominant rock type, Madrid North WRSA**

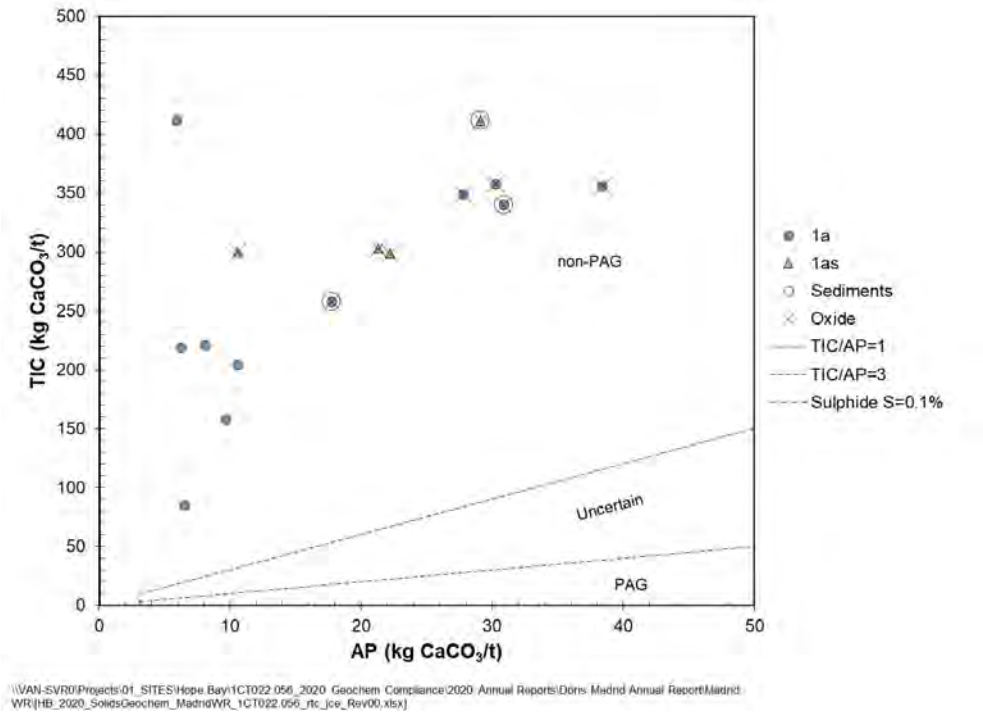


**Figure 4-7: ARD Classifications by TIC/AP by dominant rock type, Madrid North WRSA**

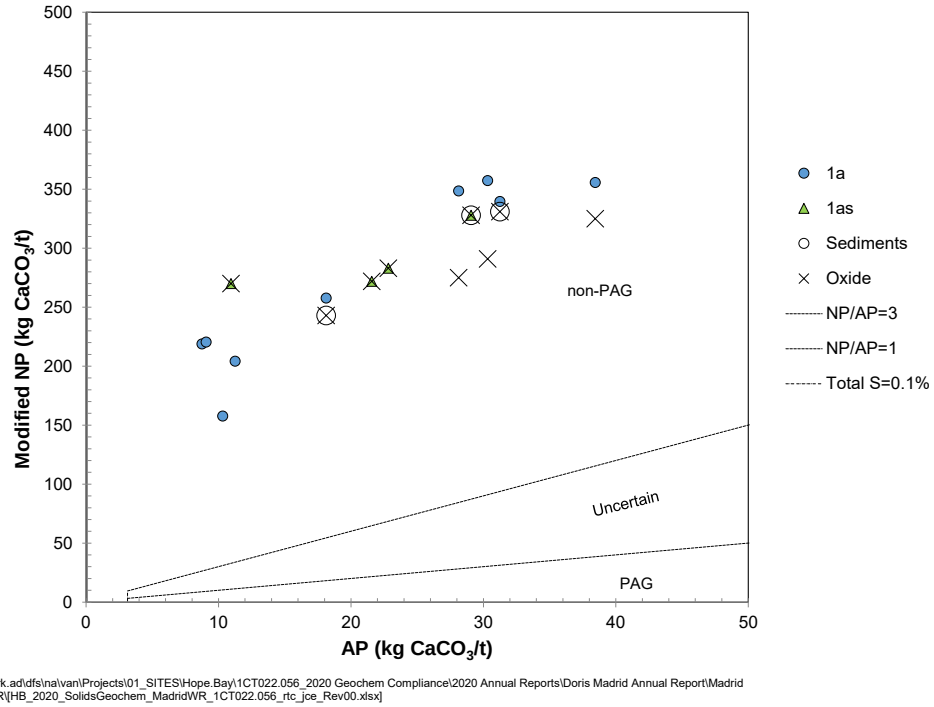


**Figure 4-8: ARD Classifications by NP/AP by dominant rock type, Madrid North WRSA**

### 4.3.4 Trace Element Analyses

The trace element content for the sample set is presented in Table 4-5 by rock type with complete laboratory results presented in Attachment 3. Results were compared to ten times average crustal abundance for basalt (Price 1997) as an indicator of enrichment. Selenium could not be assessed because the detection limit is equal to the screening criterion and concentrations were below the detection limit or within the range of analytical error.

Arsenic was enriched in all samples and sulphur was enriched for selected samples of mafic metavolcanics (1a) and altered mafic metavolcanics (1as) compared to the screening criteria. Samples with the highest arsenic content contained the highest sulphur content and also oxide and/or sediments (Figure 4-9). Sulphur was above the screening criterion for nine samples all of which contained oxide and/or sediments. All other parameters were less than ten times the average crustal abundance for basalt indicating no appreciable enrichment.

Gold content in the samples indicates that samples collected from the red-coloured oxide stockpile directly upstream of the CWP (Figure 4-1) contains ore grade lithologies that could not be separated from waste rock, as discussed in Section 4.3.1. Solid-phase arsenic did not exhibit a positive trend with gold content (Figure 4-9).

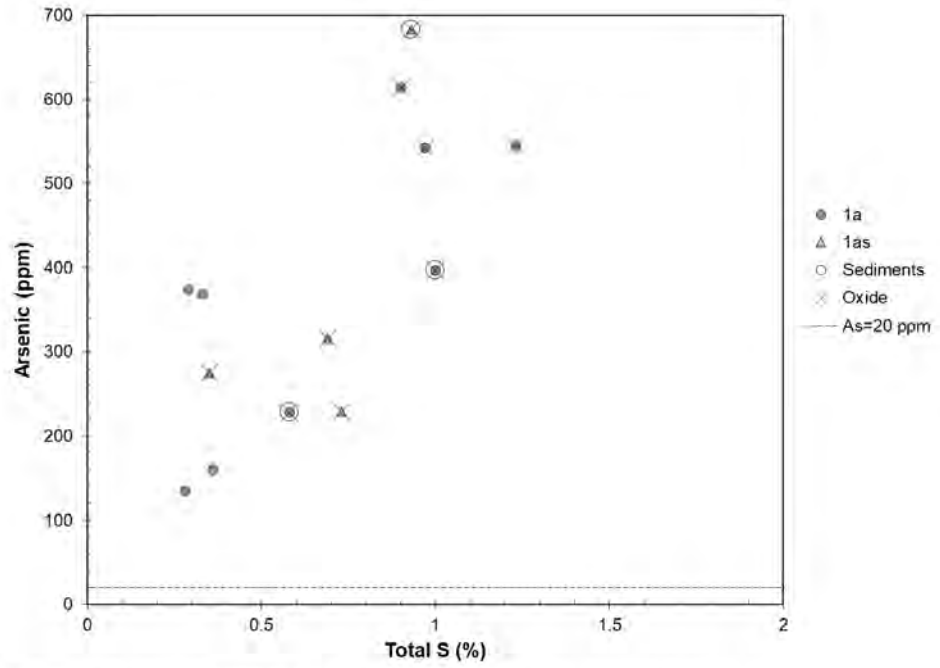


**Figure 4-9: Total Sulphur versus Arsenic by dominant rock type, Madrid North WRSA**

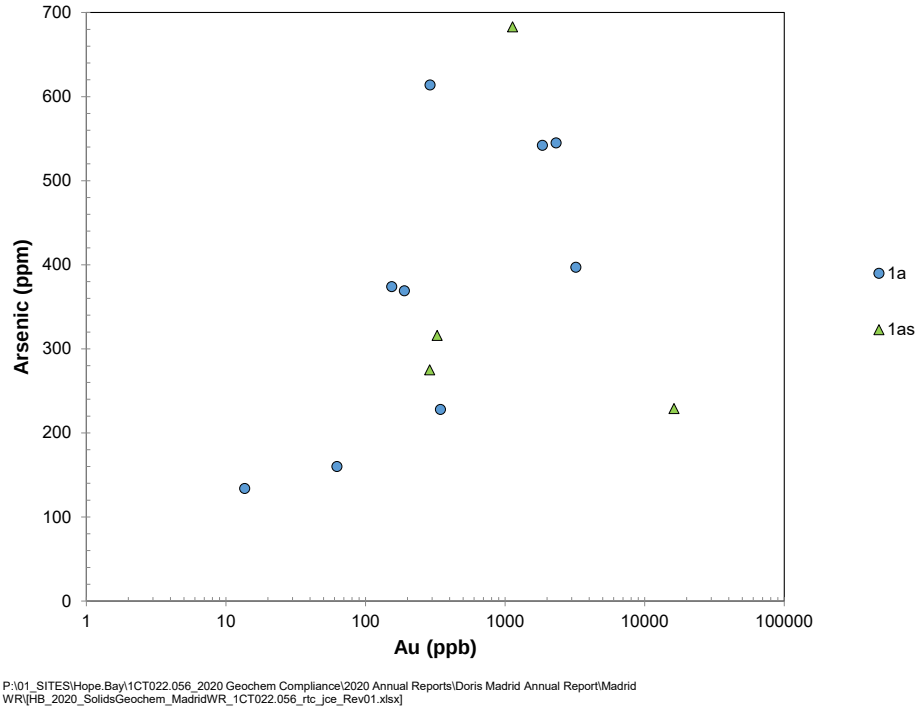


**Figure 4-10: Gold versus Arsenic by dominant rock type, Madrid North WRSA**

**Table 4-5: Summary of Elemental Analyses, Madrid North WRSA**

| Parameter | Unit | Detection Limit | 1a Dominant Rock Type | | | | | | | | | 1as Dominant Rock Type | | | | 10x Average Crustal Abundance* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20-MAD-01* | 20-MAD-02* | 20-MAD-05* | 20-MAD-06* | 20-MAD-08 | 20-MAD-10 | 20-MAD-12 | 20-MAD-13 | 20-MAD-14* | 20-MAD-03* | 20-MAD-04* | 20-MAD-07* | 20-MAD-09* | |
| Ag | ppm | 0.1 | 0.4 | 0.3 | 0.3 | 0.1 | 0.1 | <0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 2 | <0.1 | <0.1 | 1.1 |
| Au | ppb | 0.5 | 3200 | 2300 | 1900 | 290 | 62 | 14 | 150 | 190 | 340 | 1100 | 16000 | 290 | 330 | 0.04 |
| As | ppm | 0.1 | **397** | **545** | **542** | **614** | **160** | **134** | **374** | **369** | **228** | **683** | **229** | **275** | **316** | 20 |
| Ba | ppm | 0.5 | 14 | 9.0 | 23 | 23 | 15 | 12 | 14 | 10 | 19 | 12 | 12 | 19 | 20 | 3300 |
| Ca | % | 0.01 | 7.43 | 7.11 | 6.7 | 6.18 | 6.85 | 8.3 | 8.1 | 6.5 | 6.0 | 7.3 | 6.7 | 5.9 | 6.7 | 76 |
| Cd | ppm | 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 | 2.2 |
| Co | ppm | 0.1 | 66.1 | 58.9 | 58.1 | 56.6 | 46.1 | 46 | 48 | 41 | 54 | 64 | 55 | 60 | 64 | 480 |
| Cr | ppm | 0.5 | 271 | 180 | 174 | 127 | 113 | 106 | 158 | 129 | 251 | 133 | 182 | 336 | 252 | 1700 |
| Cu | ppm | 0.1 | 154 | 135 | 115 | 115 | 104 | 94.8 | 132 | 153 | 110 | 141 | 118 | 116 | 152 | 870 |
| Fe | % | 0.01 | 7.5 | 6.4 | 6.3 | 6.1 | 6.3 | 6.2 | 6.8 | 5.7 | 6.3 | 6.9 | 7.5 | 6.2 | 7.8 | 87 |
| Hg | ppm | 0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.09 |
| Mg | % | 0.01 | 4.35 | 4.13 | 3.91 | 4.11 | 3.49 | 3.19 | 3.3 | 2.6 | 4.1 | 4.4 | 4.1 | 4.2 | 4.4 | 46 |
| Mn | ppm | 1 | 1900 | 1570 | 1530 | 1320 | 1270 | 1470 | 1580 | 1340 | 1580 | 1590 | 1790 | 1490 | 1720 | 15000 |
| Mo | ppm | 0.01 | 0.7 | 0.6 | 0.9 | 0.7 | 0.4 | 0.3 | 0.3 | 0.3 | 0.7 | 0.7 | 0.3 | 0.4 | 0.5 | 15 |
| Ni | ppm | 0.1 | 463 | 427 | 432 | 436 | 144 | 103 | 164 | 94 | 324 | 521 | 261 | 443 | 392 | 1300 |
| P | % | 0.001 | 0.044 | 0.029 | 0.037 | 0.033 | 0.032 | 0.027 | 0.025 | 0.023 | 0.039 | 0.029 | 0.048 | 0.042 | 0.046 | 1.0 |
| Pb | ppm | 0.01 | 3.0 | 2.1 | 3.3 | 2.5 | 4.8 | 2.3 | 4.7 | 2.5 | 3.5 | 2.4 | 1.6 | 2.0 | 2.1 | 60 |
| S | % | 0.05 | **0.9** | **1.1** | **0.85** | **0.79** | **0.35** | 0.25 | 0.24 | 0.27 | **0.49** | **0.84** | **0.67** | 0.3 | **0.61** | 0.3 |
| Sb | ppm | 0.1 | 0.6 | 0.7 | 0.7 | 1.1 | 0.3 | 0.2 | 0.2 | 0.2 | 0.4 | 1.3 | 0.4 | 0.4 | 0.5 | 2.0 |
| Sr | ppm | 1 | 102 | 139 | 147 | 159 | 57 | 50 | 52 | 40 | 75 | 163 | 79 | 109 | 103 | 4650 |
| U | ppm | 0.1 | 0.1 | <0.1 | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | 0.1 | 0.1 | 0.2 | <0.1 | 10 |
| V | ppm | 2 | 111 | 63 | 62 | 58 | 127 | 134 | 164 | 121 | 110 | 63 | 114 | 101 | 146 | 2500 |
| W | ppm | 0.1 | 0.8 | 0.8 | 1.2 | 0.9 | 0.1 | <0.1 | 0.1 | 0.2 | 0.2 | 1.6 | 0.3 | 0.3 | 0.5 | 7.0 |
| Zn | ppm | 0.1 | 32 | 23 | 27 | 33 | 62 | 59 | 70 | 70 | 51 | 24 | 61 | 38 | 51 | 1050 |

Source:\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Madrid WR\HB_2020_SolidsGeochem_MadridWR_1CT022.056_rtc_jce_Rev00.xlsx

**Notes:**

* Numbers bolded and underlined exceed 10 times the average crustal abundance for basaltic rocks from Price (1997)

[1] 1a = mafic metavolcanic, 1as = altered mafic metavolcanics

*Sample contained at least a portion of strongly oxidized material

### 4.3.5 SFE Tests

A summary of results for key SFE parameters is presented in Table 4-6 and in Figure 4-9 to Figure 4-12 below. Complete results are included in Attachment 3. The pH ranged from 8.6 to 9.2. Values of EC ranged from 114 to 227 µS/cm, including samples 20-MAD-10 and 20-MAD-12 that had rinse EC values 2 to 3 times higher than other samples.

Major cation chemistry of all samples was dominated by calcium (8 to 24 mg/L) and sodium (1.2 to 24 mg/L). Major anion chemistry of all samples except 20-MAD-10 was dominated by alkalinity (24 to 36 mg/L) and sulphate (17 to 63 mg/L). For 20-MAD-10 major anion chemistry was dominated by alkalinity (29 mg/L) and chloride (22 mg/L) and to a lesser degree sulphate (15 mg/L). Chloride concentration from 20-MAD-10 (22 mg/l) was at least twice as high as concentrations from all other samples (2.0 to 11 mg/L) and are within the range of Doris underground waste rock (7.4 to 124 mg/L). Nitrate concentrations from 20-MAD-10 (2.7 mg/L) were an order of magnitude higher than all other samples, which ranged from at or near the detection limit (0.2 mg/L as N) to 0.3 mg/L as N. Similarly, ammonia concentrations from 20-MAD-10 (1.3 mg/L) were one to two orders of magnitude higher than all other samples (0.047 to 0.92 mg/L).

Rinse EC, chloride, ammonia, and nitrate concentrations suggest sample 20-MAD-10 represents underground waste rock sample with chloride sourced from drilling brines and nitrogen nutrients originating from additional explosives. Samples with lower chloride and nitrogen nutrient concentrations likely represent NE CPR waste rock, where blasting does not use drilling brines and less explosives than underground mining.

For arsenic, four oxidized samples (20-MAD-01, 20-MAD-03, 20-MAD-05 and 20-MAD-06) reported concentrations greater than 1 mg/L, ranging from 1.1 to 3.5 mg/L; two other oxidized samples (20 MAD-04 and 20-MAD-09) reported arsenic concentration between 0.1 and 1 mg/L and the two non-oxidized samples (20-MAD-10 and 20-MAD-12) reported concentrations <0.1 mg/L. This suggests higher arsenic leaching in association with oxide content or could be in relation to the mine source and/or proximity to ore body (20-MAD-10 and 20-MAD-12 are interpreted to be from the decline of the underground mine, Section 4.3.2).

For arsenic there was positive trend between leachable concentrations and solid-phase content of arsenic and total sulphur (Figure 4-10). Gold content did not exhibit a relationship with soluble arsenic suggesting that arsenic mobility under neutral pH conditions is not associated with ore grade. This is consistent with the finding of SRK (2019) that characterizes waste rock according to arsenic content in association with risk of pH neutral metal leaching of arsenic.

Cobalt concentrations were the same order of magnitude for all samples, ranging from 0.00013 to 0.0007 mg/L (Figure 4-11). Samples with high leachable arsenic concentrations tended to have higher leachable nickel concentrations (Figure 4-12). Four samples (20-MAD-03, 20-MAD-04, 20-MAD-05 and 20-MAD-06) reported zinc concentrations greater than the analytical limit of detection at concentration ranging from 0.00046 to 0.0012 mg/L (Figure 4-13). Three of the samples were oxide material from the stockpile located upstream of the CWP and one on was from the upper bench of the stockpile to the north. Samples 20-MAD-03 (containing sediments and oxide) and 20-MAD-06 (containing oxide) had antimony concentrations (0.21 and 0.015 mg/L) one order of magnitude higher than other samples.

In general, samples containing oxides exhibited higher soluble concentrations of parameters than those not containing oxides.

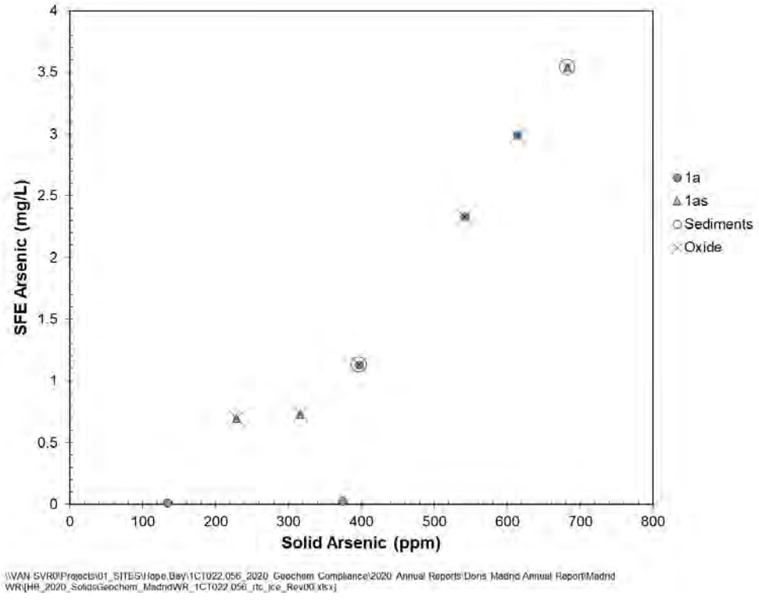


**Figure 4-11: Solid Arsenic versus SFE Arsenic by dominant rock type, Madrid North WRSA**

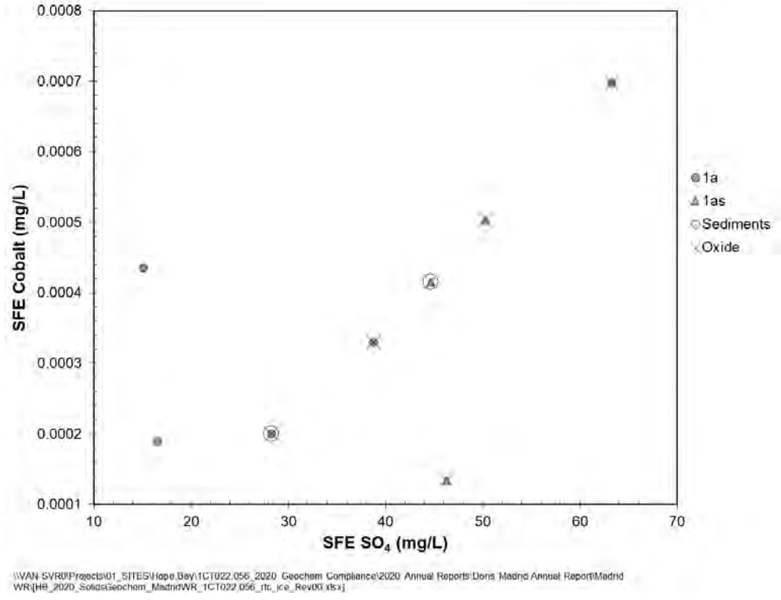


**Figure 4-12: SFE Sulphate versus SFE Cobalt by dominant rock type, Madrid North WRSA**

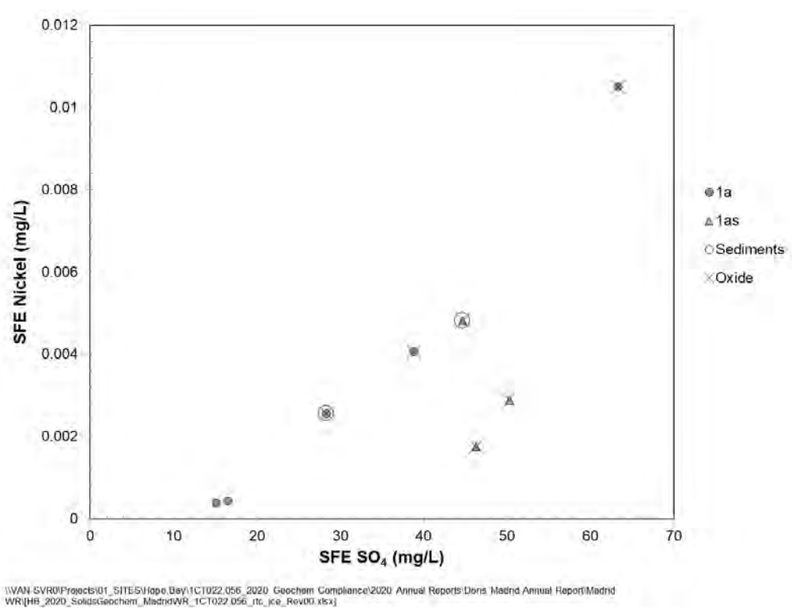


**Figure 4-13: SFE Sulphate versus SFE Nickel by dominant rock type, Madrid North WRSA**

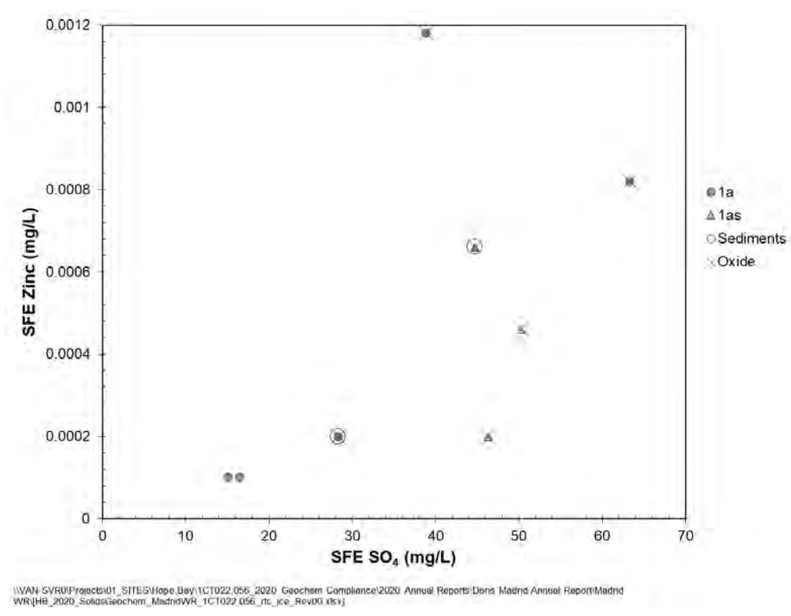


**Figure 4-14: SFE Sulphate versus SFE Zinc by dominant rock type, Madrid North WRSA**

**Table 4-6: Shake Flask Extraction Results, Madrid North WRSA**

| Sample ID | Unit | Detection Limit | 1a Dominant Rock type[1] | | | | | 1as Dominant Rock Type[1] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20-MAD-01* | 20-MAD-05* | 20-MAD-06* | 20-MAD-10 | 20-MAD-12 | 20-MAD-03* | 20-MAD-04* | 20-MAD-09* |
| pH | pH Units | 0.1 | 8.9 | 9.0 | 8.8 | 8.6 | 8.9 | 8.9 | 9.2 | 9.1 |
| EC | uS/cm | 1 | 147 | 186 | 198 | 192 | 114 | 227 | 226 | 178 |
| Total Alkalinity | mg/L | 0.5 | 32 | 31 | 24 | 29 | 28 | 34 | 36 | 27 |
| $SO_4$ | mg/L | 0.5 | 28 | 39 | 63 | 15 | 17 | 45 | 50 | 46 |
| Cl | mg/L | 0.5 | 2.0 | 10 | 2.7 | 22 | 4.2 | 11 | 11 | 5.3 |
| Ca | mg/L | 0.05 | 12 | 11 | 22 | 24 | 15 | 11 | 8 | 14 |
| Mg | mg/L | 0.05 | 4.7 | 3.6 | 3.3 | 2.1 | 1.5 | 5.2 | 3.1 | 3.0 |
| K | mg/L | 0.05 | 4.8 | 8.8 | 6.8 | 2.1 | 1.5 | 9.7 | 8.7 | 5.2 |
| Na | mg/L | 0.05 | 4.0 | 12 | 4.1 | 2.3 | 1.2 | 16 | 24 | 11 |
| $NO_3$ | mg/L as N | 0.2 | <0.2 | <0.2 | <0.2 | 2.7 | 0.3 | 0.2 | <0.2 | <0.2 |
| $NO_2$ | mg/L as N | 0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| $NH_3$ | mg/L as N | 0.05 | 0.047 | 0.078 | 0.25 | 1.3 | 0.92 | 0.059 | 0.063 | 0.17 |
| Al | mg/L | 0.0005 | 0.11 | 0.10 | 0.050 | 0.24 | 0.20 | 0.086 | 0.23 | 0.10 |
| Sb | mg/L | 0.00002 | 0.0071 | 0.0064 | 0.021 | 0.0013 | 0.0010 | 0.015 | 0.0034 | 0.0044 |
| As | mg/L | 0.00002 | 1.1 | 2.3 | 3.0 | 0.013 | 0.026 | 3.5 | 0.70 | 0.73 |
| Ba | mg/L | 0.000063 | 0.0075 | 0.0052 | 0.0061 | 0.0015 | 0.0047 | 0.0059 | 0.0023 | 0.0063 |
| B | mg/L | 0.05 | <0.1 | <0.25 | <0.25 | 0.105 | 0.053 | <0.25 | 0.12 | 0.097 |
| Cs | mg/L | 0.00005 | <0.0001 | <0.00025 | <0.00025 | 0.00027 | 0.000179 | <0.00025 | <0.0001 | 0.000051 |
| Cd | mg/L | 0.000005 | <0.00001 | <0.000025 | <0.000025 | <0.000005 | <0.000005 | <0.000025 | <0.00001 | <0.000005 |
| Cr | mg/L | 0.0001 | <0.0002 | <0.0005 | <0.0005 | <0.0001 | <0.0001 | <0.0005 | 0.00041 | 0.00015 |
| Co | mg/L | 0.000005 | 0.00020 | 0.00033 | 0.00070 | 0.00044 | 0.00019 | 0.00042 | 0.00050 | 0.00013 |
| Cu | mg/L | 0.00005 | 0.00072 | 0.00127 | 0.00044 | 0.00058 | 0.00042 | 0.00087 | 0.0022 | 0.0024 |
| Fe | mg/L | 0.001 | 0.0106 | 0.0251 | 0.0055 | 0.0214 | 0.0027 | 0.0246 | 0.0928 | 0.0212 |
| La | mg/L | 0.00005 | <0.0001 | <0.00025 | <0.00025 | <0.00005 | <0.00005 | <0.00025 | <0.0001 | <0.00005 |
| Pb | mg/L | 0.00005 | <0.00001 | <0.000025 | <0.000025 | 0.0000142 | <0.000005 | <0.000025 | 0.000042 | 0.0000062 |
| Li | mg/L | 0.0005 | 0.0041 | 0.0048 | 0.0056 | 0.0293 | 0.00355 | 0.0056 | 0.0038 | 0.00329 |
| Mn | mg/L | 0.00005 | 0.0033 | 0.0026 | 0.0030 | 0.0087 | 0.0035 | 0.0026 | 0.0032 | 0.0022 |
| Hg | mg/L | 0.00005 | <0.0001 | <0.00025 | <0.00025 | <0.00005 | <0.00005 | <0.00025 | <0.0001 | <0.00005 |
| Mo | mg/L | 0.00005 | 0.0042 | 0.0036 | 0.0035 | 0.0013 | 0.0016 | 0.0052 | 0.0037 | 0.0036 |
| Ni | mg/L | 0.00002 | 0.0026 | 0.0041 | 0.011 | 0.00039 | 0.00043 | 0.0048 | 0.0029 | 0.0018 |
| Se | mg/L | 0.00004 | 0.0024 | 0.0036 | 0.0038 | 0.0010 | 0.0008 | 0.0052 | 0.0035 | 0.0019 |
| Sr | mg/L | 0.00004 | 0.039 | 0.042 | 0.055 | 0.055 | 0.017 | 0.037 | 0.025 | 0.040 |
| S | mg/L | 10 | <20 | <50 | <50 | <10 | <10 | <50 | <20 | 14 |
| Tl | mg/L | 0.000002 | <0.000004 | <0.00001 | <0.00001 | 0.0000137 | 0.0000035 | <0.00001 | 0.000006 | 0.0000053 |
| U | mg/L | 0.000002 | 0.00023 | 0.00033 | 0.00014 | <0.000002 | <0.000002 | 0.00033 | 0.00011 | 0.000074 |
| V | mg/L | 0.0002 | 0.0041 | 0.0061 | 0.0047 | 0.00039 | 0.00062 | 0.0068 | 0.0044 | 0.0035 |
| Zn | mg/L | 0.0001 | <0.0002 | 0.0012 | 0.00082 | <0.0001 | <0.0001 | 0.00066 | 0.00046 | 0.00020 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Madrid WR\HB_2020_SolidsGeochem_MadridWR_1CT022.056_rtc_jce_Rev00.xlsx

Notes

All element concentrations are given as dissolved; SFE tests do not represent natural waters.

Values in italics represent values below the detection limit.

*Sample contained at least a portion of strongly oxidized material

[1]Samples 20-MAD-01, 20-MAD-03, 20-MAD-04 and 20-MAD-05 located in stockpile upstream of CWP that contains ore that could not be segregated from waste rock.

# 5 Summary and Conclusions

In 2020, mining at the Madrid North underground mine and NE CPR occurred for 3 months and was halted in March 2020 due to the Covid-19 global pandemic.

## 5.1 Underground Madrid North Mine

In 2020, 17,100 t of waste rock was produced from the decline and placed on the Madrid North waste rock storage area (WRSA). Based on TMAC's geological inspections of the underground, the majority (99%) of waste rock was geologically logged as mafic metavolcanics (1a) and minor (1%) quartz-carbonate veining. TMAC collected two samples of waste from the underground mine for the purposes of geochemical classification. Samples were collected directly from the underground to generate a data set specific to this mine because waste rock from the underground and NE CPR are both managed at the WRSA where the rock types can be indistinguishable.

The samples of underground waste rock were mafic metavolanics (1a) characterized by low sulphur content (0.19 and 0.23%) and levels of Modified NP and TIC between 85 and 273 kg CaCO3/t. Both samples were classified as non-PAG. Arsenic content (49 ppm) was enriched in one sample compared to the screening criterion. All other parameters were below the screening criteria suggesting no appreciable enrichment.

## 5.2 Naartok East CPR

Using the document *Classification of Waste Rock in Support of Segregating Construction Rock from Naartok East Crown Pillar Recovery, Madrid North, Hope Bay* (SRK 2019), TMAC developed and executed a program of waste rock geochemical monitoring, classification and segregation to identify NE CPR waste rock that was geochemically suitable for construction. SRK (2019) outlines criteria and field-based methodology using portable XRF (pXRF) to classify waste rock samples as having a low risk of metal leaching and/or acid rock drainage (ML/ARD).

In summary, TMAC executed the geochemical construction monitoring program of waste rock by sampling drill cuttings from each blast round, analyzing the samples by pXRF coupled with geological inspection and classifying samples according the criteria in SRK (2019). Based on the geological logging and geochemical classifications of the drill cutting samples, TMAC classified waste rock from each blast round as either suitable for construction (e.g. low risk of ML/ARD) or not suitable for construction (e.g. risk of ML/ARD) followed by segregation and management of waste rock according to the risk classifications.

TMAC's execution of SRK (2019) included geological logging and pXRF analysis of 1,000 samples of drill cuttings representing 21 blast rounds. Based on the geological inspection of drill cutting samples, waste rock lithologies were predominantly (44%) mafic metavolcanics with sediments (1aj/10j, n=440), 20% mafic metavolcanics (1a, n=202), 19% sedimentary units (5, n=186), 16% altered mafic metavolcanics (1aj/1oj, n=158), 1% quartz veins (12q, n=10), and <1% overburden (15, n=4). Based on pXRF analysis of drill cuttings, TMAC classified 7% of samples as low risk of ML/ARD and 93% as

having risk of ML/ARD. These results were interpolated by TMAC to a field scale, e.g. blast round basis, resulting in 10% of waste rock being classified as geochemically suitable for construction and 90% as not suitable for construction.

In 2020, a total of 93,289 t of waste rock was produced from NE CPR, of which 83,968 t was placed on the Madrid North WRSA and 9,321 t used for construction of the following infrastructure and access roads at Madrid North: NE CPR for in-pit armouring; Madrid Shop Laydown; and internal roads and cladding within the Overburden stockpile.

Geochemical monitoring data of NE CPR waste rock indicate that the FEIS waste rock humidity sample set represents that geochemical characteristics of waste rock excavated from NE CPR (SRK 2017).

The geochemical behaviour of the waste rock used as construction rock is monitored as part of the construction rock monitoring program, including the annual seep survey and geochemical monitoring of as-built infrastructure. Waste rock placed on the Madrid North WRP will also be subject to annual geochemical monitoring including geological inspection, geochemical sampling, seepage monitoring at the downstream toe of the stockpile and routine collection of the water in the Madrid North contact water pond (CWP).

## 5.3 Madrid North WRSA

In 2020, a total of 101,126 t of waste rock were placed on the Madrid North WRSA, with the majority (83%) sourced from NE CPR and the balance from the decline of the Madrid North underground mine. No waste rock was removed from the waste rock stockpiles. In accordance with the *Waste Rock, Ore and Mine Backfill Management Plan (*TMAC 2019), SRK conducted an inspection and collected waste rock samples from the WRSA. Waste rock at the WRSA was placed in two stockpiles including a smaller stockpile located directly upstream of the CWP that contains ore hosted in mafic volcanics with sediments (1aj) from NE CPR that could not be segregated from waste rock and ii) a larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from NE CPR and the underground mine (the latter as indicated by rinse tests).

Waste rock was a mix of approximately 85% chloritic green mafic metavolcanics (1a), 10% light tan colored sericite altered mafic metavolcanics (1as), with the remainder composed of lesser proportions of strongly weathered and pervasively oxidized waste rock (oxide), chert and siltstones (5), quartz veins (12) and diabase (11c). Sedimentary units (5) were observed throughout the waste rock stockpile area. Oxide material was concentrated in the stockpile located directly upstream of the CWP and represents ore that could not be segregated from waste rock. Lesser amounts of oxide (not ore) were present in the stockpile adjacent to Sumps 1 to 3.

SRK collected 13 samples for geochemical characterization, of which five were from the stockpile upstream of the CWP and eight were from the stockpile adjacent to the sumps. Furthermore, three samples contained oxide and sedimentary units (5), six samples contained oxide only and four did not contain oxide and/or sediments. Geochemical data suggest that two of the samples without oxide and/or sediments (20-MAD-10 and 20-MAD-12) were sourced from the underground mine.

Total sulphur content for samples containing sediments and/or oxide ranged from 0.35 to 1.2% (n=9) whereas sulphur ranged from 0.28 to 0.36% for samples that did not contain sediments and/or oxide (n=4). For all samples, TIC and NP ranged from 158 to 411 kg $CaCO_3$/t in the 1as samples. All samples were classified as non-PAG. All samples were enriched in arsenic (134 to 683 ppm) compared to the screening criterion. Arsenic content was highest for samples containing oxide and exhibited a positive trend with sulphur. There was no relationship between gold and arsenic content. Rinse tests, SFE tests, and paste pH indicated all samples were non-acidic. SFE tests indicated higher soluble content associated with samples containing oxide, including antimony (0.0011 to 0.021 mg/L), arsenic (0.013 to 3.5 mg/L for all samples), cobalt (0.00013 to 0.0007 mg/L), nickel (0.00039 to 0.011 mg/L) and zinc (below detection limit of 0.0001 mg/L to 0.0012 mg/L). Soluble arsenic concentrations exhibited a positive trend with arsenic and sulphur content but did not have a relationship with gold.

The FEIS the waste rock and ore humidity sample set represent the geochemical of the waste rock stockpiles at the WRSA (SRK 2017).

Regards,
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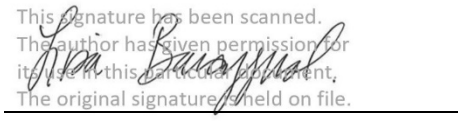
Reviewed by

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## Attachments:

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|---|---|
| Attachment 1 | Geochemical Data, Waste Rock from Madrid North Underground Mine |
| Attachment 2 | pXRF Data, Naartok East CPR Waste Rock |
| Attachment 3 | Geochemical Data, Waste Rock Samples from Madrid North WRSA |

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# Attachment 1 Geochemical Data, Waste Rock from Madrid North Underground Mine

| Sample ID | Material Source Area | Sample Type | Dominant Rock Type | Sampling Rationale | Sulph 1 % | Carbonate Occurrence | Paste pH | Total S | $SO_4$ | Sulphide Sulphur (by diff.) | AP - Tot S | AP - S2 | Fizz Rating | $CO_2$ | TIC | Mod NP | TIC/AP TotS | NP/AP TotS | TIC/AP S2 | NP/AP S2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | pH Units | wt% | wt% | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | Tot S | Tot S | S2 | S2 |
| M020502 | Madrid N UG | WR | 1a | TMAC UG WR monitoring program | trace | veinlet | 6.8 | 0.19 | -0.01 | 0.19 | 5.9 | 5.9 | MODERATE | 1.0 | 85 | 109 | 14 | 18 | 14 | 18 |
| M011301 | Madrid N UG | WR | 1a | TMAC UG WR monitoring program | trace | veinlet | 8.0 | 0.23 | 0.02 | 0.21 | 7.2 | 6.6 | STRONG | 2.8 | 237 | 178 | 33 | 25 | 36 | 27 |

| Sample ID | As | Co | Ni | Zn | Mo | Cu | Pb | Ag | Mn | Fe | U | Au | Th | Sr | Cd | Sb | Bi | V | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm | ppb | ppm | ppm | ppm | ppm | ppm | ppm | % |
| M020502 | 1.3 | 25 | 33 | 66 | 0.4 | 76 | 6.2 | -0.1 | 789 | 4.19 | -0.1 | 1 | 0.8 | 23 | -0.1 | -0.1 | -0.1 | 82 | 4.7 |
| M011301 | 49 | 43 | 114 | 69 | 0.2 | 112 | 1.2 | 0.1 | 1370 | 6.2 | -0.1 | 4.4 | 0.4 | 62 | 0.1 | 0.2 | -0.1 | 104 | 7.6 |

| Sample ID | P | La | Cr | Mg | Ba | Ti | B | Al | Na | K | W | Hg | Sc | Tl | S | Ga | Se | Te | Bi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | ppm | ppm | % | ppm | % | ppm | % | % | % | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm |
| M020502 | 0.063 | 5 | 100 | 1.9 | 18 | 0.098 | -20 | 2.3 | 0.029 | 0.03 | 0.1 | -0.1 | 3.7 | -0.1 | 0.17 | 7 | -0.5 | -0.2 | -0.1 |
| M011301 | 0.025 | 2 | 110 | 2.6 | 11 | 0.042 | -20 | 3.2 | 0.017 | 0.04 | -0.1 | -0.1 | 15 | -0.1 | 0.16 | 7 | -0.5 | -0.2 | -0.1 |

# Attachment 2 pXRF Data, Naartok East CPR Waste Rock

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1016-02 | NE-1016-02-P1 | 5.5 | 1/1/2020 | 1aj | 374 | 3.07 | | | PAG |
| 1016-02 | NE-1016-02-P2 | 5.4 | 1/1/2020 | 1aj | 404 | 3.62 | | | PAG |
| 1016-02 | NE-1016-02-P3 | 4.1 | 1/1/2020 | 1aj | 384 | 3.88 | | | PAG |
| 1016-02 | NE-1016-02-O4 | 5.9 | 1/1/2020 | 1ax | 538 | 1.56 | | | PAG |
| 1016-02 | NE-1016-02-P4 | 4.3 | 1/1/2020 | 1aj | 753 | 3.34 | | | PAG |
| 1016-02 | NE-1016-02-O5 | 5.9 | 1/1/2020 | 1aj | 210 | 2.26 | | | PAG |
| 1016-02 | NE-1016-02-P5 | 3.9 | 1/1/2020 | 5h | 150 | 2.46 | | | PAG |
| 1016-02 | NE-1016-02-O6 | 5.8 | 1/1/2020 | 5h | 112 | 0.84 | | | PAG |
| 1016-02 | NE-1016-02-P6 | 4.4 | 1/1/2020 | 5h | 167 | 1.95 | | | PAG |
| 1016-02 | NE-1016-02-I8 | 6.3 | 1/1/2020 | 1a | 51 | 0.47 | | | NAG |
| 1016-02 | NE-1016-02-H7 | 6.3 | 1/2/2020 | 1a | 23 | 0.38 | | | NAG |
| 1016-02 | NE-1016-02-H8 | 6.2 | 1/2/2020 | 1a | 22 | 0.37 | | | NAG |
| 1016-02 | NE-1016-02-H9 | 6.4 | 1/2/2020 | 1a | 18 | 0.45 | 2.0 | 0.2 | NAG |
| 1016-02 | NE-1016-02-H10 | 6.9 | 1/2/2020 | 1a | 36 | 0.63 | | | NAG |
| 1016-02 | NE-1016-02-I7 | 6.2 | 1/2/2020 | 1a | 39 | 0.49 | | | NAG |
| 1016-02 | NE-1016-02-I8 | 6.3 | 1/2/2020 | 1a | 51 | 0.47 | | | NAG |
| 1016-02 | NE-1016-02-I9 | 6.3 | 1/2/2020 | 1a | 28 | 0.75 | | | NAG |
| 1016-02 | NE-1016-02-I10 | 7.0 | 1/2/2020 | 1a | 27 | 0.31 | | | NAG |
| 1016-02 | NE-1016-02-J7 | 6.2 | 1/2/2020 | 1a | 32 | 0.48 | | | NAG |
| 1016-02 | NE-1016-02-J8 | 6.3 | 1/2/2020 | 5hj | 31 | 0.52 | | | NAG |
| 1016-02 | NE-1016-02-K7 | 6.3 | 1/2/2020 | 5hj | 70 | 0.51 | | | PAG |
| 1016-02 | NE-1016-02-K8 | 6.4 | 1/2/2020 | 5hj | 81 | 0.78 | | | PAG |
| 1016-02 | NE-1016-02-L7 | 6.3 | 1/2/2020 | 5hj | 57 | 0.47 | | | NAG |
| 1016-02 | NE-1016-02-L8 | 6.3 | 1/2/2020 | 1aj | 574 | 0.77 | | | PAG |
| 1016-02 | NE-1016-02-M7 | 6.2 | 1/2/2020 | 1aj | 80 | 0.71 | | | PAG |
| 1016-02 | NE-1016-02-M8 | 6.2 | 1/2/2020 | 5hj | 112 | 0.76 | | | PAG |
| 1016-02 | NE-1016-02-N7 | 5.8 | 1/2/2020 | 1aj | 631 | 0.42 | | | PAG |
| 1016-02 | NE-1016-02-N8 | 5.8 | 1/2/2020 | 1aj | 761 | 0.40 | | | PAG |
| 1016-02 | NE-1016-02-O7 | 5.7 | 1/2/2020 | 12qd | 299 | 1.89 | | | PAG |
| 1016-02 | NE-1016-02-O8 | 5.6 | 1/2/2020 | 12qd | 440 | 1.11 | | | PAG |
| 1016-02 | NE-1016-02-P7 | 4.2 | 1/2/2020 | 12qd | 142 | 2.69 | | | PAG |
| 1016-02 | NE-1016-02-P8 | 4.1 | 1/2/2020 | 12qd | 171 | 2.71 | | | PAG |
| 1016-02 | NE-1016-02-J9 | 6.4 | 1/3/2020 | 1a | 24 | 0.51 | | | NAG |
| 1016-02 | NE-1016-02-J10 | 6.6 | 1/3/2020 | 1a | 67 | 0.70 | | | NAG |
| 1016-02 | NE-1016-02-K9 | 6.5 | 1/3/2020 | 5hj | 161 | 1.28 | | | PAG |
| 1016-02 | NE-1016-02-K10 | 7.0 | 1/3/2020 | 5hj | 101 | 0.93 | | | PAG |
| 1016-02 | NE-1016-02-L9 | 6.3 | 1/3/2020 | 1aj | 786 | 0.93 | | | PAG |
| 1016-02 | NE-1016-02-L10 | 6.5 | 1/3/2020 | 1aj | 583 | 0.98 | | | PAG |
| 1016-02 | NE-1016-02-L11 | 5.7 | 1/3/2020 | 1aj | 429 | 1.89 | | | PAG |
| 1016-02 | NE-1016-02-M9 | 6.0 | 1/3/2020 | 1aj | 700 | 1.06 | | | PAG |
| 1016-02 | NE-1016-02-M10 | 5.9 | 1/3/2020 | 1aj | 864 | 0.86 | | | PAG |
| 1016-02 | NE-1016-02-M11 | 5.6 | 1/3/2020 | 1aj | 617 | 0.97 | | | PAG |
| 1016-02 | NE-1016-02-N9 | 5.4 | 1/3/2020 | 1aj | 658 | 2.20 | | | PAG |
| 1016-02 | NE-1016-02-N10 | 5.4 | 1/3/2020 | 5h | 552 | 3.11 | | | PAG |
| 1016-02 | NE-1016-02-N11 | 5.5 | 1/3/2020 | 5h | 239 | 2.17 | | | PAG |
| 1016-02 | NE-1016-02-O9 | 5.5 | 1/3/2020 | 5hj | 201 | 2.66 | | | PAG |
| 1016-02 | NE-1016-02-O10 | 5.4 | 1/3/2020 | 5h | 266 | 3.11 | | | PAG |
| 1016-02 | NE-1016-02-O11 | 5.2 | 1/3/2020 | 5h | 404 | 7.91 | | | PAG |
| 1016-02 | NE-1016-02-P9 | 4.5 | 1/3/2020 | 5h | 205 | 4.33 | | | PAG |
| 1016-02 | NE-1016-02-P10 | 5.1 | 1/3/2020 | 5h | 310 | 4.09 | | | PAG |
| 1016-02 | NE-1016-02-P11 | 5.6 | 1/3/2020 | 5h | 361 | 6.97 | | | PAG |
| 1016-02 | NE-1016-02-H11 | 6.5 | 1/4/2020 | 1a | 29 | 0.47 | | | NAG |
| 1016-02 | NE-1016-02-I11 | 7.0 | 1/4/2020 | 1a | 45 | 0.59 | | | NAG |
| 1016-02 | NE-1016-02-J11 | 6.2 | 1/4/2020 | 1as | 128 | 0.85 | | | PAG |
| 1016-02 | NE-1016-02-K11 | 6.3 | 1/4/2020 | 1as | 224 | 1.04 | | | PAG |
| 1016-02 | NE-1016-02-Z5 | 6.3 | 1/5/2020 | 1a | 22 | 0.37 | | | NAG |
| 1016-02 | NE-1016-02-Z9 | 6.4 | 1/5/2020 | 1a | 47 | 0.45 | | | NAG |
| 1016-02 | NE-1016-02-Z12 | 6.7 | 1/5/2020 | 1a | 19 | 0.34 | 2.5 | 0.1 | NAG |
| 1016-03 | NE-1016-03-F7 | 5.5 | 1/5/2020 | 1aj | 364 | 1.15 | | | PAG |
| 1016-03 | NE-1016-03-F8 | 5.8 | 1/5/2020 | 1aj | 458 | 1.65 | | | PAG |
| 1016-03 | NE-1016-03-F9 | 5.9 | 1/5/2020 | 1aj | 678 | 1.57 | | | PAG |
| 1016-03 | NE-1016-03-F10 | 5.9 | 1/5/2020 | 5hj | 531 | 1.93 | | | PAG |
| 1016-03 | NE-1016-03-F11 | 5.8 | 1/5/2020 | 1aj | 589 | 1.44 | | | PAG |
| 1016-03 | NE-1016-03-F12 | 5.6 | 1/5/2020 | 5hj | 251 | 1.37 | | | PAG |
| 1016-03 | NE-1016-03-F13 | 5.8 | 1/5/2020 | 5h | 113 | 1.12 | | | PAG |
| 1016-03 | NE-1016-03-F14 | 5.7 | 1/5/2020 | 5hj | 108 | 0.99 | | | PAG |
| 1016-03 | NE-1016-03-E7 | 5.7 | 1/5/2020 | 1aj | 773 | 1.33 | | | PAG |
| 1016-03 | NE-1016-03-E8 | 5.9 | 1/5/2020 | 1aj | 139 | 0.78 | | | PAG |
| 1016-03 | NE-1016-03-E9 | 5.9 | 1/5/2020 | 1aj | 583 | 1.20 | | | PAG |
| 1016-03 | NE-1016-03-E10 | 5.9 | 1/5/2020 | 1aj | 455 | 1.10 | | | PAG |
| 1016-03 | NE-1016-03-E11 | 5.8 | 1/5/2020 | 1aj | 605 | 1.11 | | | PAG |
| 1016-03 | NE-1016-03-E12 | 5.5 | 1/5/2020 | 1aj | 631 | 0.70 | | | PAG |
| 1016-03 | NE-1016-03-E13 | 5.6 | 1/5/2020 | 1as | 394 | 0.91 | | | PAG |
| 1016-03 | NE-1016-03-E14 | 5.4 | 1/5/2020 | 1aj | 202 | 1.14 | | | PAG |
| PRESHEAR | NE-1016PS167 | 6.8 | 1/5/2020 | 1as | 242 | 0.68 | | | PAG |
| PRESHEAR | NE-1016PS169 | 6.7 | 1/5/2020 | 1aj | 157 | 0.77 | | | PAG |
| PRESHEAR | NE-1016PS173 | 6.7 | 1/5/2020 | 1as | 421 | 1.61 | | | PAG |
| PRESHEAR | NE-1016PS175 | 6.4 | 1/5/2020 | 1as | 258 | 0.97 | | | PAG |
| | NE-1016-05-B7 | 6.5 | 1/6/2020 | 1aj | 707 | 1.39 | | | PAG |
| 1016-07 | NE-1016-07-B8 | 5.8 | 1/6/2020 | 1aj | 562 | 0.97 | | | PAG |
| 1016-05 | NE-1016-05-C7 | 6.0 | 1/6/2020 | 1aj | 565 | 0.79 | | | PAG |
| 1016-03 | NE-1016-03-C8 | 5.9 | 1/6/2020 | 1aj | 455 | 0.72 | | | PAG |
| | NE-1016-03-C9 | 6.3 | 1/6/2020 | 1aj | 231 | 0.60 | | | PAG |
| 1016-05 | NE-1016-05-D7 | 5.7 | 1/6/2020 | 1aj | 674 | 0.88 | | | PAG |
| 1016-03 | NE-1016-03-D8 | 5.8 | 1/6/2020 | 1aj | 230 | 0.87 | | | PAG |
| 1016-03 | NE-1016-03-D9 | 6.1 | 1/6/2020 | 5hj | 159 | 1.05 | | | PAG |
| 1016-07 | NE-1016-07-B9 | 5.8 | 1/7/2020 | 1aj | 550 | 0.69 | | | PAG |
| 1016-07 | NE-1016-07-B10 | 5.7 | 1/7/2020 | 1aj | 108 | 0.44 | | | PAG |
| 1016-07 | NE-1016-07-B11 | 5.7 | 1/7/2020 | 1aj | 447 | 0.58 | | | PAG |
| 1016-07 | NE-1016-07-B12 | 5.8 | 1/7/2020 | 1aj | 287 | 0.48 | | | PAG |
| 1016-07 | NE-1016-07-B13 | 5.8 | 1/7/2020 | 5hj | 307 | 0.75 | | | PAG |
| 1016-07 | NE-1016-07-B14 | 5.7 | 1/7/2020 | 5hj | 298 | 0.64 | | | PAG |
| 1016-07 | NE-1016-07-B15 | 5.8 | 1/7/2020 | 1aj | 332 | 1.04 | | | PAG |
| 1016-07 | NE-1016-07-B18 | 5.6 | 1/7/2020 | 1aj | 639 | 0.60 | | | PAG |
| | NE-1016-03-C10 | 6.2 | 1/7/2020 | 1aj | 125 | 0.41 | | | PAG |
| 1016-03 | NE-1016-03-C11 | 4.3 | 1/7/2020 | 1aj | 445 | 0.55 | | | PAG |
| 1016-03 | NE-1016-03-C12 | 4.6 | 1/7/2020 | 1aj | 314 | 0.46 | | | PAG |
| 1016-03 | NE-1016-03-C13 | 4.4 | 1/7/2020 | 1aj | 364 | 0.64 | | | PAG |
| 1016-03 | NE-1016-03-C14 | 4.5 | 1/7/2020 | 1aj | 574 | 0.65 | | | PAG |
| 1016-03 | NE-1016-03-C15 | 4.5 | 1/7/2020 | 5hj | 254 | 0.68 | | | PAG |
| 1016-03 | NE-1016-03-D10 | 5.9 | 1/7/2020 | 5hj | 283 | 0.47 | | | PAG |
| 1016-03 | NE-1016-03-D11 | 5.8 | 1/7/2020 | 5hj | 419 | 0.62 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1016-03 | NE-1016-03-D12 | 6.1 | 1/7/2020 | 1aj | 361 | 0.77 | | | PAG |
| 1016-03 | NE-1016-03-D13 | 5.5 | 1/7/2020 | 1aj | 365 | 0.82 | | | PAG |
| 1016-03 | NE-1016-03-D14 | 5.6 | 1/7/2020 | 1aj | 329 | 1.79 | | | PAG |
| 1016-03 | NE-1016-03-D15 | 5.6 | 1/7/2020 | 5hj | 276 | 1.12 | | | PAG |
| 1016-03 | NE-1016-03-D16 | 5.5 | 1/7/2020 | 5hj | 362 | 1.12 | | | PAG |
| 1016-03 | NE-1016-03-E15 | 5.1 | 1/7/2020 | 5hj | 205 | 1.30 | | | PAG |
| 1016-03 | NE-1016-03-E16 | 5.4 | 1/7/2020 | 5h | 326 | 1.59 | | | PAG |
| 1016-03 | NE-1016-03-F15 | 5.6 | 1/7/2020 | 5hl | 158 | 2.33 | | | PAG |
| 1016-03 | NE-1016-03-F16 | 5.7 | 1/7/2020 | 5h | 151 | 3.03 | | | PAG |
| 1016-07 | NE-1016-07-B16 | 5.6 | 1/7/2020 | 1aj | 362 | 0.44 | | | PAG |
| 1016-07 | NE-1016-07-B17 | 5.6 | 1/7/2020 | 1aj | 449 | 0.58 | | | PAG |
| 1016-07 | NE-1016-07-B19 | 5.5 | 1/7/2020 | 1aj | 391 | 0.76 | | | PAG |
| | NE-1016-03-C16 | 6.0 | 1/7/2020 | 1aj | 574 | 0.49 | | | PAG |
| 1016-03 | NE-1016-03-C17 | 5.4 | 1/7/2020 | 5hj | 456 | 0.57 | | | PAG |
| 1016-03 | NE-1016-03-C18 | 5.5 | 1/7/2020 | 5hj | 542 | 0.59 | | | PAG |
| 1016-03 | NE-1016-03-C19 | 5.5 | 1/7/2020 | 5hj | 465 | 0.81 | | | PAG |
| 1016-03 | NE-1016-03-D17 | 5.2 | 1/7/2020 | 5hj | 474 | 1.08 | | | PAG |
| 1016-03 | NE-1016-03-D18 | 5.4 | 1/7/2020 | 1aj | 352 | 1.23 | | | PAG |
| 1016-03 | NE-1016-03-D19 | 4.4 | 1/7/2020 | 5hj | 486 | 0.87 | | | PAG |
| 1016-03 | NE-1016-03-E19 | 5.7 | 1/7/2020 | 5hq | 327 | 1.29 | | | PAG |
| 1016-03 | NE-1016-03-E17 | 5.5 | 1/9/2020 | 5hj | 518 | 1.59 | | | PAG |
| 1016-03 | NE-1016-03-E18 | 5.6 | 1/9/2020 | 5hq | 385 | 2.57 | | | PAG |
| 1016-03 | NE-1016-03-E19 | 5.7 | 1/9/2020 | 5h | 327 | 1.29 | | | PAG |
| 1016-03 | NE-1016-03-F17 | 5.6 | 1/9/2020 | 5hl | 204 | 1.12 | | | PAG |
| 1016-03 | NE-1016-03-F18 | 5.4 | 1/9/2020 | 5h | 277 | 2.31 | | | PAG |
| 1016-03 | NE-1016-03-F19 | 5.3 | 1/9/2020 | 5hq | 309 | 2.76 | | | PAG |
| | NE-1016-03-F19_dup | 5.8 | 1/9/2020 | 5hq | 240 | 3.38 | | | PAG |
| 1016-03 | NE-1016-03-G14 | 5.9 | 1/9/2020 | 5h | 165 | 2.81 | | | PAG |
| 1016-03 | NE-1016-03-G15 | 5.8 | 1/9/2020 | 5h | 149 | 2.45 | | | PAG |
| 1016-03 | NE-1016-03-G16 | 5.8 | 1/9/2020 | 5hl | 323 | 5.44 | | | PAG |
| 1016-03 | NE-1016-03-G17 | 5.8 | 1/9/2020 | 5hl | 280 | 4.04 | | | PAG |
| 1016-03 | NE-1016-03-G18 | 5.7 | 1/9/2020 | 5hl | 291 | 4.06 | | | PAG |
| 1016-03 | NE-1016-03-G19 | 5.1 | 1/9/2020 | 5hj | 311 | 2.59 | | | PAG |
| 1016-04 | NE-1016-04-J23 | 5.5 | 1/9/2020 | 5hj | 302 | 4.88 | | | PAG |
| 1016-04 | NE-1016-04-J24 | 5.5 | 1/9/2020 | 5hj | 366 | 3.40 | | | PAG |
| 1016-04 | NE-1016-04-K22 | 5.5 | 1/9/2020 | 5h | 778 | 7.71 | | | PAG |
| 1016-04 | NE-1016-04-K23 | 5.5 | 1/9/2020 | 5hi | 742 | 4.20 | | | PAG |
| 1016-04 | NE-1016-04-L23 | 5.6 | 1/9/2020 | 5hi | 737 | 5.13 | | | PAG |
| | NE-1016-06-G20 | 5.1 | 1/10/2020 | 5h | 285 | 2.58 | | | PAG |
| | NE-1016-06-G21 | 5.2 | 1/10/2020 | 5h | 354 | 6.77 | | | PAG |
| | NE-1016-04-H19 | 6.2 | 1/10/2020 | 5h | 303 | 4.48 | | | PAG |
| 1016-04 | NE-1016-04-H20 | 4.0 | 1/10/2020 | 5hq | 357 | 5.48 | | | PAG |
| 1016-04 | NE-1016-04-H21 | 5.2 | 1/10/2020 | 5hj | 348 | 3.71 | | | PAG |
| 1016-04 | NE-1016-04-H22 | 5.0 | 1/10/2020 | 5hj | 362 | 5.92 | | | PAG |
| 1016-04 | NE-1016-04-H23 | 5.0 | 1/10/2020 | 5hj | 348 | 6.68 | | | PAG |
| 1016-04 | NE-1016-04-H24 | 4.7 | 1/10/2020 | 5hj | 442 | 6.93 | | | PAG |
| 1016-04 | NE-1016-04-H25 | 4.9 | 1/10/2020 | 5hi | 365 | 3.43 | | | PAG |
| 1016-04 | NE-1016-04-I19 | 3.9 | 1/10/2020 | 5hi | 408 | 5.88 | | | PAG |
| 1016-04 | NE-1016-04-I20 | 5.5 | 1/10/2020 | 5hq | 346 | 5.57 | | | PAG |
| 1016-04 | NE-1016-04-I21 | 5.4 | 1/10/2020 | 5hq | 299 | 4.81 | | | PAG |
| 1016-04 | NE-1016-04-I22 | 5.1 | 1/10/2020 | 5hj | 384 | 6.43 | | | PAG |
| 1016-04 | NE-1016-04-I23 | 5.1 | 1/10/2020 | 5hj | 400 | 6.16 | | | PAG |
| 1016-04 | NE-1016-04-I24 | 5.1 | 1/10/2020 | 1aj | 375 | 3.17 | | | PAG |
| 1016-04 | NE-1016-04-I25 | 5.0 | 1/10/2020 | 1aj | 256 | 2.59 | | | PAG |
| 1016-04 | NE-1016-04-J25 | 5.0 | 1/10/2020 | 5hj | 273 | 3.00 | | | PAG |
| | NE-1016-04-J25 Dup | 5.2 | 1/10/2020 | 5hj | 248 | 2.32 | | | PAG |
| 1016-04 | NE-1016-04-K24 | 5.3 | 1/10/2020 | 5hj | 965 | 4.42 | | | PAG |
| 1016-04 | NE-1016-04-K25 | 4.9 | 1/10/2020 | 5hj | 628 | 3.66 | | | PAG |
| 1016-04 | NE-1016-04-L24 | 5.3 | 1/10/2020 | 1aj | 898 | 3.87 | | | PAG |
| 1016-04 | NE-1016-04-L25 | 5.1 | 1/10/2020 | 1aj | 676 | 2.96 | | | PAG |
| 1016-04 | NE-1016-04-M24 | 5.5 | 1/10/2020 | 5hq | 898 | 5.34 | | | PAG |
| 1016-04 | NE-1016-04-M25 | 5.4 | 1/10/2020 | 5hq | 629 | 3.60 | | | PAG |
| 1016-04 | NE-1016-04-J19 | 5.6 | 1/11/2020 | 5hq | 288 | 3.54 | | | PAG |
| | NE-1016-04-J19 Dup | 6.1 | 1/11/2020 | 5hq | 284 | 4.14 | | | PAG |
| 1016-04 | NE-1016-04-J20 | 5.6 | 1/11/2020 | 5hq | 241 | 3.52 | | | PAG |
| 1016-04 | NE-1016-04-J21 | 5.5 | 1/11/2020 | 5hj | 208 | 2.74 | | | PAG |
| 1016-04 | NE-1016-04-J22 | 5.4 | 1/11/2020 | 5hj | 288 | 3.37 | | | PAG |
| | NE-1016-04-J22 DUP | 6.1 | 1/11/2020 | 5hj | 280 | 4.13 | | | PAG |
| 1016-04 | NE-1016-04-K20 | 5.5 | 1/11/2020 | 5hq | 315 | 4.27 | | | PAG |
| 1016-04 | NE-1016-04-K21 | 5.5 | 1/11/2020 | 5hq | 416 | 5.11 | | | PAG |
| 1016-04 | NE-1016-04-L18 | 4.1 | 1/11/2020 | 5hj | 750 | 1.55 | | | PAG |
| 1016-04 | NE-1016-04-L19 | 5.5 | 1/11/2020 | 5hj | 733 | 4.06 | | | PAG |
| 1016-04 | NE-1016-04-L20 | 5.6 | 1/11/2020 | 5hq | 765 | 6.40 | | | PAG |
| 1016-04 | NE-1016-04-L21 | 5.5 | 1/11/2020 | 5hq | 902 | 8.40 | | | PAG |
| 1016-04 | NE-1016-04-L22 | 5.6 | 1/11/2020 | 5hq | 718 | 5.92 | | | PAG |
| 1016-04 | NE-1016-04-M18 | 4.5 | 1/11/2020 | 1aj | 421 | 1.06 | | | PAG |
| 1016-04 | NE-1016-04-M19 | 4.4 | 1/11/2020 | 1aj | 618 | 1.21 | | | PAG |
| 1016-04 | NE-1016-04-M21 | 5.5 | 1/11/2020 | 5hj | 930 | 6.37 | | | PAG |
| 1016-04 | NE-1016-04-M22 | 5.4 | 1/11/2020 | 5hq | 878 | 5.71 | | | PAG |
| 1016-04 | NE-1016-04-M23 | 5.4 | 1/11/2020 | 5hq | 842 | 5.90 | | | PAG |
| 1016-04 | NE-1016-04-N18 | 5.1 | 1/11/2020 | 1aj | 357 | 1.22 | | | PAG |
| 1016-04 | NE-1016-04-N19 | 4.4 | 1/11/2020 | 1aj | 566 | 0.56 | | | PAG |
| 1016-04 | NE-1016-04-P20 | 4.8 | 1/11/2020 | 1aj | 788 | 1.59 | | | PAG |
| 1016-04 | NE-1016-04-N21 | 5.4 | 1/11/2020 | 5hq | 858 | 5.94 | | | PAG |
| 1016-04 | NE-1016-04-N22 | 5.4 | 1/11/2020 | 5hj | 833 | 4.29 | | | PAG |
| | NE-1016-04-N24_3m | 6.2 | 1/11/2020 | 5hj | 912 | 4.66 | | | PAG |
| | NE-1016-04-N24_6m | 6.2 | 1/11/2020 | 5hj | 728 | 2.72 | | | PAG |
| | NE-1016-04-N25_3m | 6.2 | 1/11/2020 | 1aj | 751 | 2.70 | | | PAG |
| | NE-1016-04-N25_6m | 6.2 | 1/11/2020 | 1aj | 566 | 2.02 | | | PAG |
| 1016-04 | NE-1016-04-P21 | 5.3 | 1/11/2020 | 5hj | 982 | 4.55 | | | PAG |
| 1016-04 | NE-1016-04-P22 | 5.5 | 1/11/2020 | 5hj | 1030 | 6.77 | | | PAG |
| | NE-1016-04-P23_3m | 6.2 | 1/11/2020 | 5hj | 942 | 4.55 | | | PAG |
| | NE-1016-04-P23_6m | 6.2 | 1/11/2020 | 5hj | 878 | 5.13 | | | PAG |
| | NE-1016-04-P24_3m | 6.3 | 1/11/2020 | 5hj | 820 | 3.53 | | | PAG |
| | NE-1016-04-P24_6m | 6.3 | 1/11/2020 | 1aj | 1119 | 5.35 | | | PAG |
| | NE-1016-04-P25_3m | 6.3 | 1/11/2020 | 1aj | 776 | 2.94 | | | PAG |
| | NE-1016-04-P25_6m | 6.3 | 1/11/2020 | 1aj | 641 | 3.02 | | | PAG |
| 1016-04 | NE-1016-04-Q21 | 5.5 | 1/11/2020 | 1aj | 468 | 1.50 | | | PAG |
| 1016-04 | NE-1016-04-Q22 | 5.5 | 1/11/2020 | 5hj | 760 | 2.49 | | | PAG |
| 1016-04 | NE-1016-04-Q23 | 6.0 | 1/11/2020 | 5hj | 960 | 2.12 | | | PAG |
| | NE-1016-04-Q24_3m | 6.8 | 1/11/2020 | 5hj | 976 | 3.33 | | | PAG |
| | NE-1016-04-Q24_6m | 6.8 | 1/11/2020 | 1aj | 688 | 2.24 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1016-04 | NE-1016-04-K19 | 5.4 | 1/13/2020 | 5hq | 234 | 3.23 | | | PAG |
| 1016-04 | NE-1016-04-M20 | 5.6 | 1/13/2020 | 5hj | 565 | 1.47 | | | PAG |
| 1016-04 | NE-1016-04-N20 | 4.7 | 1/13/2020 | 1aj | 608 | 2.03 | | | PAG |
| 1016-04 | NE-1016-04-P19 | 5.3 | 1/13/2020 | 1aj | 369 | 0.89 | | | PAG |
| 1016-04 | NE-1016-04-N23 | 5.6 | 1/14/2020 | 5hj | 873 | 3.72 | | | PAG |
| 1016-09 | NE-1016-05-A3 | 4.8 | 1/14/2020 | 1aj | 549 | 0.97 | | | PAG |
| 1016-09 | NE-1016-05-A4 | 4.4 | 1/14/2020 | 1aj | 361 | 0.78 | | | PAG |
| 1016-09 | NE-1016-05-A5 | 4.5 | 1/14/2020 | 1aj | 568 | 1.52 | | | PAG |
| 1016-09 | NE-1016-05-A6 | 5.4 | 1/14/2020 | 1aj | 627 | 1.59 | | | PAG |
| 1016-09 | NE-1016-05-A7 | 6.2 | 1/14/2020 | 1aj | 554 | 1.08 | | | PAG |
| 1016-09 | NE-1016-05-B3 | 4.7 | 1/14/2020 | 1aj | 619 | 1.06 | | | PAG |
| 1016-09 | NE-1016-05-B4 | 4.5 | 1/14/2020 | 1aj | 638 | 1.21 | | | PAG |
| 1016-09 | NE-1016-05-B5 | 4.7 | 1/14/2020 | 1aj | 471 | 0.73 | | | PAG |
| 1016-09 | NE-1016-05-B6 | 5.7 | 1/14/2020 | 1aj | 669 | 1.60 | | | PAG |
| | NE-1016-05-B7 | 6.5 | 1/14/2020 | 1aj | 707 | 1.39 | | | PAG |
| 1016-09 | NE-1016-05-C2 | 4.9 | 1/14/2020 | 1aj | 707 | 1.75 | | | PAG |
| 1016-09 | NE-1016-05-C3 | 4.6 | 1/14/2020 | 1aj | 541 | 1.44 | | | PAG |
| | NE-1016-05-C4 | 5.1 | 1/14/2020 | 1aj | 773 | 1.44 | | | PAG |
| 1016-09 | NE-1016-05-C5 | 5.2 | 1/14/2020 | 1aj | 773 | 1.45 | | | PAG |
| 1016-09 | NE-1016-05-Z1 | 6.2 | 1/14/2020 | 1as | 462 | 1.36 | | | PAG |
| 1016-09 | NE-1016-05-Z2 | 6.1 | 1/14/2020 | 1a | 320 | 1.21 | | | PAG |
| 1016-09 | NE-1016-05-Z3 | 5.3 | 1/14/2020 | 1a | 523 | 1.15 | | | PAG |
| 1016-09 | NE-1016-05-Z4 | 5.5 | 1/14/2020 | 1as | 493 | 1.24 | | | PAG |
| 1016-09 | NE-1016-05-Z5 | 5.9 | 1/14/2020 | 1as | 542 | 1.11 | | | PAG |
| | NE-1016-05-Z6 | 4.1 | 1/14/2020 | 1as | 314 | 0.79 | | | PAG |
| | NE-1016-05-D5 | 6.0 | 15-Jan-20 | 1as | 744 | 1.87 | | | PAG |
| 1016-05 | NE-1016-05-D7 | 5.7 | 15-Jan-20 | 1aj | 674 | 0.88 | | | PAG |
| 1016-05 | NE-1016-05-E2 | 4.7 | 15-Jan-20 | 1aj | 582 | 1.05 | | | PAG |
| 1016-05 | NE-1016-05-E4 | 5.2 | 15-Jan-20 | 1aj | 922 | 1.47 | | | PAG |
| 1016-05 | NE-1016-05-E6 | 5.4 | 15-Jan-20 | 1aj | 776 | 1.21 | | | PAG |
| 1016-05 | NE-1016-05-F3 | 4.7 | 15-Jan-20 | 1aj | 386 | 0.94 | | | PAG |
| 1016-05 | NE-1016-05-F5 | 5.0 | 15-Jan-20 | 1aj | 705 | 1.11 | | | PAG |
| 1016-05 | NE-1016-05-G4 | 4.9 | 15-Jan-20 | 1aj | 606 | 1.82 | | | PAG |
| | NE-1016-05-G6 | 6.4 | 15-Jan-20 | 1aj | 502 | 3.48 | | | PAG |
| 1016-05 | NE-1016-05-H1 | 5.2 | 15-Jan-20 | 1aj | 589 | 0.82 | | | PAG |
| 1016-05 | NE-1016-05-H3 | 4.9 | 15-Jan-20 | 1a | 187 | 2.14 | | | PAG |
| 1016-05 | NE-1016-05-H5 | 4.9 | 15-Jan-20 | 1a | 577 | 4.92 | | | PAG |
| 1016-05 | NE-1016-05-I5 | 4.9 | 15-Jan-20 | 1as | 95 | 2.28 | | | PAG |
| 1016-06b | NE-1016-06-A23 | 5.8 | 15-Jan-20 | 1as | 562 | 0.80 | | | PAG |
| | NE-1016-06-B20 | 5.9 | 15-Jan-20 | 1as | 645 | 0.89 | | | PAG |
| 1016-06b | NE-1016-06-B22 | 5.7 | 15-Jan-20 | 1as | 654 | 0.76 | | | PAG |
| 1016-06b | NE-1016-06-B24 | 5.8 | 15-Jan-20 | 1ax | 784 | 0.60 | | | PAG |
| 1016-06b | NE-1016-06-Z22 | 5.3 | 15-Jan-20 | 1ax | 619 | 0.53 | | | PAG |
| 1016-06b | NE-1016-06-Z27 | 5.7 | 15-Jan-20 | 1ax | 409 | 0.50 | | | PAG |
| | NE-1016-06-C21 | 6.0 | 16-Jan-19 | 1ax | 630 | 0.79 | | | PAG |
| | NE-1016-06-C22 | 6.0 | 16-Jan-19 | 1as | 553 | 0.80 | | | PAG |
| | NE-1016-06-C23 | 6.2 | 16-Jan-19 | 1as | 545 | 0.95 | | | PAG |
| 1016-06b | NE-1016-06-C24 | 5.7 | 16-Jan-19 | 1as | 725 | 0.55 | | | PAG |
| 1016-06b | NE-1016-06-C25 | 5.6 | 16-Jan-19 | 1as | 780 | 1.49 | | | PAG |
| | NE-1016-06-D20 | 6.6 | 16-Jan-19 | 1ax | 511 | 1.14 | | | PAG |
| 1016-06a | NE-1016-06-D21 | 5.7 | 16-Jan-19 | 1as | 568 | 0.73 | | | PAG |
| 1016-06a | NE-1016-06-D22 | 5.6 | 16-Jan-19 | 1as | 676 | 0.92 | | | PAG |
| 1016-06a | NE-1016-06-D23 | 5.7 | 16-Jan-19 | 1as | 707 | 0.75 | | | PAG |
| 1016-06a | NE-1016-06-D24 | 5.3 | 16-Jan-19 | 1as | 616 | 0.55 | | | PAG |
| 1016-06b | NE-1016-06-D25 | 5.5 | 16-Jan-19 | 1as | 529 | 0.75 | | | PAG |
| 1016-06a | NE-1016-06-E21 | 5.1 | 16-Jan-19 | 12qd | 505 | 1.68 | | | PAG |
| 1016-06a | NE-1016-06-E22 | 5.6 | 16-Jan-19 | 1as | 487 | 0.99 | | | PAG |
| 1016-06a | NE-1016-06-E23 | 5.5 | 16-Jan-19 | 1as | 519 | 1.18 | | | PAG |
| 1016-06a | NE-1016-06-E24 | 5.4 | 16-Jan-19 | 1as | 336 | 0.92 | | | PAG |
| 1016-06a | NE-1016-06-E25 | 5.0 | 16-Jan-19 | 1as | 310 | 1.09 | | | PAG |
| | NE-1016-06-F21 | 5.4 | 16-Jan-19 | 1aj | 250 | 3.92 | | | PAG |
| 1016-06a | NE-1016-06-F22 | 4.4 | 16-Jan-19 | 1aj | 191 | 2.16 | | | PAG |
| 1016-06a | NE-1016-06-F23 | 4.4 | 16-Jan-19 | 1aj | 303 | 4.37 | | | PAG |
| 1016-06a | NE-1016-06-F24 | 5.3 | 16-Jan-19 | 1aj | 254 | 4.86 | | | PAG |
| 1016-06a | NE-1016-06-F25 | 5.2 | 16-Jan-19 | 1aj | 286 | 5.19 | | | PAG |
| 1016-06a | NE-1016-06-G22 | 3.2 | 16-Jan-19 | 1aj | 272 | 4.48 | | | PAG |
| 1016-06a | NE-1016-06-G23 | 3.0 | 16-Jan-19 | 1aj | 451 | 8.48 | | | PAG |
| 1016-06a | NE-1016-06-G24 | 4.1 | 16-Jan-19 | 1aj | 387 | 5.64 | | | PAG |
| 1016-06a | NE-1016-06-G25 | 4.2 | 16-Jan-19 | 1aj | 304 | 3.71 | | | PAG |
| | NE-1016-05-C6 | 6.5 | 17-Jan-19 | 1as | 800 | 1.32 | | | PAG |
| | NE-1016-05-D2 | 5.3 | 17-Jan-19 | 1as | 486 | 1.29 | | | PAG |
| | NE-1016-05-D3 | 6.3 | 17-Jan-19 | 1as | 707 | 1.01 | | | PAG |
| | NE-1016-05-D4 | 5.5 | 17-Jan-19 | 1as | 879 | 1.57 | | | PAG |
| 1016-05 | NE-1016-05-D6 | 5.6 | 17-Jan-19 | 1as | 858 | 1.15 | | | PAG |
| | NE-1016-06-A20 | 5.7 | 17-Jan-19 | 1as | 286 | 0.69 | | | PAG |
| 1016-06b | NE-1016-06-A22 | 5.7 | 17-Jan-19 | 1as | 543 | 1.40 | | | PAG |
| 1016-06b | NE-1016-06-Z23 | 5.7 | 17-Jan-19 | 1as | 573 | 0.76 | | | PAG |
| 1016-06b | NE-1016-06-Z25 | 6.0 | 17-Jan-19 | 1as | 541 | 0.93 | | | PAG |
| 1016-07 | NE-1016-07-A8 | 6.1 | 17-Jan-19 | 1as | 435 | 1.13 | | | PAG |
| 1016-07 | NE-1016-07-A11 | 5.7 | 17-Jan-19 | 1a | 111 | 0.65 | | | PAG |
| 1016-07 | NE-1016-07-A12 | 5.6 | 17-Jan-19 | 1as | 294 | 1.04 | | | PAG |
| 1016-07 | NE-1016-07-A13 | 5.8 | 17-Jan-19 | 1a | 187 | 0.53 | | | PAG |
| 1016-07 | NE-1016-07-A14 | 5.7 | 17-Jan-19 | 1a | 120 | 0.70 | | | PAG |
| 1016-07 | NE-1016-07-A15 | 6.1 | 17-Jan-19 | 1as | 175 | 0.46 | | | PAG |
| 1016-07 | NE-1016-07-A16 | 6.2 | 17-Jan-19 | 1as | 125 | 0.40 | | | PAG |
| 1016-07 | NE-1016-07-A17 | 5.5 | 17-Jan-19 | 1as | 385 | 0.56 | | | PAG |
| 1016-07 | NE-1016-07-A18 | 5.5 | 17-Jan-19 | 1as | 468 | 0.62 | | | PAG |
| 1016-07 | NE-1016-07-A19 | 5.4 | 17-Jan-19 | 1as | 565 | 0.56 | | | PAG |
| 1016-07 | NE-1016-07-Z7 | 6.2 | 17-Jan-19 | 1a | 184 | 0.77 | | | PAG |
| 1016-07 | NE-1016-07-Z13 | 5.7 | 17-Jan-19 | 1a | 200 | 0.69 | | | PAG |
| 1016-07 | NE-1016-07-Z14 | 5.8 | 17-Jan-19 | 1a | 81 | 0.65 | | | PAG |
| 1016-07 | NE-1016-07-Z15 | 5.9 | 17-Jan-19 | 1a | 132 | 0.50 | | | PAG |
| 1016-07 | NE-1016-07-Z16 | 6.2 | 17-Jan-19 | 1as | 324 | 0.63 | | | PAG |
| 1016-07 | NE-1016-07-Z17 | 5.8 | 17-Jan-19 | 1as | 139 | 0.80 | | | PAG |
| 1016-07 | NE-1016-07-Z18 | 5.8 | 17-Jan-19 | 1as | 345 | 1.00 | | | PAG |
| 1016-07 | NE-1016-07-Z19 | 5.7 | 17-Jan-19 | 1as | 437 | 1.00 | | | PAG |
| 1016-05 | NE-1016-05-F2 | 4.9 | 18-Jan-19 | 1as | 275 | 1.90 | | | PAG |
| 1016-05 | NE-1016-05-G2 | 5.0 | 18-Jan-19 | 1as | 511 | 1.72 | | | PAG |
| 1016-05 | NE-1016-05-G3 | 4.9 | 18-Jan-19 | 1as | 604 | 1.87 | | | PAG |
| 1016-05 | NE-1016-05-G5 | 5.0 | 18-Jan-19 | 1a | 495 | 4.37 | | | PAG |
| 1016-05 | NE-1016-05-H4 | 4.8 | 18-Jan-19 | 1aj | 254 | 1.72 | | | PAG |
| | NE-1016-05-H6 | 6.3 | 18-Jan-19 | 1aj | 543 | 2.24 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1016-14 | NE-1016-08-M26 | 5.5 | 19-Jan-19 | 1a | 267 | 1.02 | | | PAG |
| 1016-14 | NE-1016-08-M27 | 5.7 | 19-Jan-19 | 1as | 331 | 1.35 | | | PAG |
| 1016-14 | NE-1016-08-M28 | 5.5 | 19-Jan-19 | 1as | 165 | 0.93 | | | PAG |
| 1016-14 | NE-1016-08-N26 | 5.8 | 19-Jan-19 | 1as | 409 | 1.02 | | | PAG |
| 1016-14 | NE-1016-08-N27 | 5.6 | 19-Jan-19 | 1as | 375 | 1.22 | | | PAG |
| | NE-1016-08-F26 | 5.8 | 20-Jan-19 | 1aj | 347 | 6.36 | | | PAG |
| | NE-1016-08-G26 | 5.8 | 20-Jan-19 | 1aj | 480 | 6.83 | | | PAG |
| | NE-1016-08-H26 | 5.4 | 20-Jan-19 | 1aj | 359 | 4.19 | | | PAG |
| 1016-08 | NE-1016-08-H27 | 5.0 | 20-Jan-19 | 1aj | 328 | 3.78 | | | PAG |
| 1016-08 | NE-1016-08-H28 | 5.2 | 20-Jan-19 | 1aj | 456 | 4.22 | | | PAG |
| 1016-08 | NE-1016-08-H29 | 5.0 | 20-Jan-19 | 1aj | 400 | 4.24 | | | PAG |
| 1016-08 | NE-1016-08-H30 | 5.1 | 20-Jan-19 | 1aj | 350 | 3.26 | | | PAG |
| 1016-08 | NE-1016-08-I27 | 5.1 | 20-Jan-19 | 1aj | 194 | 1.79 | | | PAG |
| 1016-08 | NE-1016-08-I28 | 5.1 | 20-Jan-19 | 1a | 135 | 0.94 | | | PAG |
| 1016-08 | NE-1016-08-I29 | 5.1 | 20-Jan-19 | 1aj | 392 | 4.03 | | | PAG |
| 1016-08 | NE-1016-08-I30 | 5.1 | 20-Jan-19 | 1aj | 216 | 1.93 | | | PAG |
| | NE-1016-08-J27 | 5.8 | 20-Jan-19 | 1aj | 1049 | 11.03 | | | PAG |
| 1016-08 | NE-1016-08-J28 | 5.0 | 20-Jan-19 | 1a | 246 | 1.49 | | | PAG |
| 1016-08 | NE-1016-08-J29 | 5.0 | 20-Jan-19 | 1a | 330 | 3.35 | | | PAG |
| 1016-08 | NE-1016-08-J30 | 5.0 | 20-Jan-19 | 1a | 253 | 2.03 | | | PAG |
| 1016-08 | NE-1016-08-J31 | 5.4 | 20-Jan-19 | 1a | 233 | 1.89 | | | PAG |
| | NE-1016-08-K27 | 6.0 | 20-Jan-19 | 1a | 611 | 2.68 | | | PAG |
| | NE-1016-08-K28 | 6.1 | 20-Jan-19 | 1a | 173 | 1.07 | | | PAG |
| | NE-1016-08-K29 | 6.2 | 20-Jan-19 | 1as | 419 | 1.51 | | | PAG |
| 1016-14 | NE-1016-08-L27 | 5.7 | 20-Jan-19 | 1aj | 893 | 3.33 | | | PAG |
| 1016-14 | NE-1016-08-L28 | 5.7 | 20-Jan-19 | 1a | 171 | 1.23 | | | PAG |
| 1016-14 | NE-1016-11-N28 | 5.4 | 20-Jan-19 | 1ax | 99 | 0.55 | | | PAG |
| 1016-14 | NE-1016-10-P26 | 5.7 | 20-Jan-19 | 1as | 523 | 3.35 | | | PAG |
| 1016-14 | NE-1016-10-P27 | 5.6 | 20-Jan-19 | 1as | 316 | 1.06 | | | PAG |
| 1016-08B | NE-1016-08-B26 | 5.9 | 21-Jan-19 | 1as | 371 | 0.78 | | | PAG |
| | NE-1016-08-C26 | 5.8 | 21-Jan-19 | 1as | 459 | 0.56 | | | PAG |
| 1016-08B | NE-1016-08-C27 | 5.6 | 21-Jan-19 | 1as | 298 | 0.51 | | | PAG |
| 1016-08B | NE-1016-08-C28 | 5.3 | 21-Jan-19 | 1as | 556 | 0.64 | | | PAG |
| | NE-1016-08-D26 | 5.8 | 21-Jan-19 | 1as | 638 | 0.75 | | | PAG |
| 1016-08B | NE-1016-08-D27 | 5.3 | 21-Jan-19 | 1as | 630 | 0.80 | | | PAG |
| | NE-1016-08-D28 | 5.6 | 21-Jan-19 | 1as | 476 | 0.94 | | | PAG |
| | NE-1016-08-D29 | 5.6 | 21-Jan-19 | 1as | 566 | 1.21 | | | PAG |
| | NE-1016-08-E26 | 5.3 | 21-Jan-19 | 1aj | 454 | 6.28 | | | PAG |
| | NE-1016-08-E27 | 5.5 | 21-Jan-19 | 1aj | 358 | 2.73 | | | PAG |
| | NE-1016-08-E28 | 5.7 | 21-Jan-19 | 1as | 374 | 2.10 | | | PAG |
| | NE-1016-08-E29 | 5.4 | 21-Jan-19 | 12qd | 149 | 2.60 | | | PAG |
| | NE-1016-08-E30 | 5.5 | 21-Jan-19 | 1aj | 365 | 2.10 | | | PAG |
| 1016-08 | NE-1016-08-F27 | 5.2 | 21-Jan-19 | 1aj | 326 | 4.48 | | | PAG |
| 1016-08 | NE-1016-08-F28 | 5.3 | 21-Jan-19 | 1aj | 423 | 5.53 | | | PAG |
| 1016-08 | NE-1016-08-F29 | 5.1 | 21-Jan-19 | 1aj | 398 | 4.44 | | | PAG |
| 1016-08 | NE-1016-08-F30 | 5.1 | 21-Jan-19 | 1aj | 354 | 3.95 | | | PAG |
| 1016-08 | NE-1016-08-F31 | 5.3 | 21-Jan-19 | 1aj | 303 | 3.12 | | | PAG |
| 1016-08 | NE-1016-08-G27 | 5.1 | 21-Jan-19 | 1aj | 459 | 6.24 | | | PAG |
| 1016-08 | NE-1016-08-G28 | 5.1 | 21-Jan-19 | 1aj | 457 | 5.92 | | | PAG |
| 1016-08 | NE-1016-08-G30 | 5.1 | 21-Jan-19 | 1aj | 256 | 2.12 | | | PAG |
| 1016-08B | NE-1016-08-Z29 | 3.3 | 21-Jan-19 | 1aj | 233 | 6.02 | | | PAG |
| 1016-08B | NE-1016-08-Z30 | 3.3 | 21-Jan-19 | 1as | 566 | 0.65 | | | PAG |
| 1016-08B | NE-1016-08-Z32 | 3.1 | 21-Jan-19 | 1as | 492 | 0.96 | | | PAG |
| | NE-1016-08-Z34 | 3.8 | 21-Jan-19 | 1aj | 270 | 2.40 | | | PAG |
| 1016-08 | NE-1016-08-Z36 | 5.6 | 21-Jan-19 | 1as | 529 | 0.63 | | | PAG |
| 1016-14 | NE-1016-10-Q25 | 5.8 | 21-Jan-19 | 1aj | 621 | 1.72 | | | PAG |
| 1016-14 | NE-1016-10-Q26 | 5.8 | 21-Jan-19 | 1as | 455 | 1.30 | | | PAG |
| 1016-14 | NE-1016-10-Q27 | 5.6 | 21-Jan-19 | 1as | 651 | 2.40 | | | PAG |
| 1016-14 | NE-1016-11-Q28 | 5.4 | 21-Jan-19 | 1aj | 698 | 2.78 | | | PAG |
| 1016-08 | NE-1016-08-G31 | 5.1 | 22-Jan-20 | 1a | 197 | 1.78 | | | PAG |
| 1016-08 | NE-1016-08-G32 | 5.4 | 22-Jan-20 | 1a | 117 | 0.81 | | | PAG |
| 1016-08 | NE-1016-08-H32 | 5.5 | 22-Jan-20 | 1a | 162 | 1.46 | | | PAG |
| 1016-08 | NE-1016-08-H33 | 5.3 | 22-Jan-20 | 1as | 74 | 0.57 | | | PAG |
| 1016-08 | NE-1016-08-Z38 | 5.6 | 22-Jan-20 | 1a | 92 | 0.97 | | | PAG |
| 1016-09 | NE-1016-09-B51 | 5.6 | 22-Jan-20 | 1as | 955 | 2.88 | | | PAG |
| 1016-09 | NE-1016-09-B52 | 5.4 | 22-Jan-20 | 1as | 791 | 1.81 | | | PAG |
| 1016-09 | NE-1016-09-B53 | 5.5 | 22-Jan-20 | 1as | 749 | 2.74 | | | PAG |
| 1016-09 | NE-1016-09-B54 | 5.6 | 22-Jan-20 | 1as | 733 | 2.41 | | | PAG |
| 1016-09 | NE-1016-09-B55 | 5.5 | 22-Jan-20 | 1as | 844 | 2.92 | | | PAG |
| 1016-09 | NE-1016-09-C51 | 5.1 | 22-Jan-20 | 1as | 581 | 1.51 | | | PAG |
| 1016-09 | NE-1016-09-C52 | 5.2 | 22-Jan-20 | 1as | 794 | 2.74 | | | PAG |
| 1016-09 | NE-1016-09-C53 | 5.3 | 22-Jan-20 | 1as | 797 | 3.02 | | | PAG |
| 1016-09 | NE-1016-09-C54 | 5.4 | 22-Jan-20 | 1as | 422 | 2.21 | | | PAG |
| 1016-09 | NE-1016-09-C55 | 5.3 | 22-Jan-20 | 1aj | 660 | 2.26 | | | PAG |
| 1016-09 | NE-1016-09-D51 | 5.1 | 22-Jan-20 | 1as | 773 | 2.12 | | | PAG |
| | NE-1016-09-D52 | 5.5 | 22-Jan-20 | 1as | 779 | 1.31 | | | PAG |
| 1016-09 | NE-1016-09-D53 | 5.3 | 22-Jan-20 | 1as | 857 | 1.60 | | | PAG |
| 1016-09 | NE-1016-09-D54 | 5.4 | 22-Jan-20 | 1as | 728 | 2.72 | | | PAG |
| 1016-09 | NE-1016-09-D55 | 5.5 | 22-Jan-20 | 1as | 548 | 2.31 | | | PAG |
| 1016-05 | NE-1016-09-E51 | 4.9 | 22-Jan-20 | 1as | 796 | 1.40 | | | PAG |
| 1016-05 | NE-1016-09-E52 | 5.0 | 22-Jan-20 | 1as | 673 | 1.19 | | | PAG |
| | NE-1016-09-E53 | 5.8 | 22-Jan-20 | 1as | 889 | 1.58 | | | PAG |
| | NE-1016-09-E54 | 5.8 | 22-Jan-20 | 1as | 697 | 1.98 | | | PAG |
| 1016-09 | NE-1016-09-E55 | 5.5 | 22-Jan-20 | 1ax | 812 | 2.09 | | | PAG |
| 1016-05 | NE-1016-09-F51 | 5.0 | 22-Jan-20 | 1as | 655 | 1.28 | | | PAG |
| 1016-05 | NE-1016-09-F52 | 5.2 | 22-Jan-20 | 1aj | 671 | 1.48 | | | PAG |
| 1016-05 | NE-1016-09-F53 | 5.4 | 22-Jan-20 | 1aj | 685 | 2.08 | | | PAG |
| 1016-05 | NE-1016-09-F54 | 5.3 | 22-Jan-20 | 1as | 468 | 1.31 | | | PAG |
| | NE-1016-09-F55 | 5.9 | 22-Jan-20 | 1as | 604 | 1.54 | | | PAG |
| 1016-05 | NE-1016-09-G52 | 5.3 | 22-Jan-20 | 1as | 430 | 1.33 | | | PAG |
| 1016-05 | NE-1016-09-G53 | 5.4 | 22-Jan-20 | 1as | 383 | 0.81 | | | PAG |
| 1016-05 | NE-1016-09-G54 | 5.4 | 22-Jan-20 | 1aj | 476 | 1.07 | | | PAG |
| 1016-05 | NE-1016-09-H52 | 5.2 | 22-Jan-20 | 1as | 377 | 0.43 | | | PAG |
| 1016-09 | NE-1016-09-Y80 | 5.5 | 22-Jan-20 | 1as | 757 | 2.14 | | | PAG |
| 1016-09 | NE-1016-09-Y82 | 5.7 | 22-Jan-20 | 1as | 651 | 1.90 | | | PAG |
| 1016-09 | NE-1016-09-Z81 | 5.5 | 22-Jan-20 | 1as | 60 | 0.53 | | | NAG |
| 1016-09 | NE-1016-09-Z83 | 5.8 | 22-Jan-20 | 1as | 277 | 0.81 | | | PAG |
| | NE-1016-10-R25 | 6.8 | 22-Jan-20 | 1as | 853 | 3.48 | | | PAG |
| | NE-1016-10-R26 | 5.8 | 22-Jan-20 | 1as | 591 | 2.35 | | | PAG |
| 1016-10 | NE-1016-10-S25 | 5.8 | 22-Jan-20 | 1as | 518 | 1.87 | | | PAG |
| 1016-10 | NE-1016-10-S26 | 5.2 | 22-Jan-20 | 1as | 314 | 0.92 | | | PAG |
| 1016-09 | NE-1016-09-B50 | 5.0 | 23-Jan-20 | 1as | 821 | 1.85 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1016-09 | NE-1016-09-C56 | 5.1 | 23-Jan-20 | 1aj | 861 | 3.81 | | | PAG |
| 1016-09 | NE-1016-09-D56 | 5.2 | 23-Jan-20 | 1aj | 507 | 1.90 | | | PAG |
| 1016-09 | NE-1016-09-E56 | 5.4 | 23-Jan-20 | 1as | 643 | 1.84 | | | PAG |
| 1016-09 | NE-1016-09-Y76 | 5.2 | 23-Jan-20 | 1as | 482 | 1.21 | | | PAG |
| 1016-09 | NE-1016-09-Y78 | 5.5 | 23-Jan-20 | 1as | 719 | 1.82 | | | PAG |
| 1016-09 | NE-1016-09-Z77 | 5.0 | 23-Jan-20 | 1as | 488 | 1.21 | | | PAG |
| 1016-09 | NE-1016-09-Z79 | 5.2 | 23-Jan-20 | 1as | 232 | 0.91 | | | PAG |
| | NE-1016-10-R23 | 6.8 | 23-Jan-20 | 1as | 792 | 1.75 | | | PAG |
| | NE-1016-10-R24 | 7.3 | 23-Jan-20 | 1as | 840 | 4.35 | | | PAG |
| | NE-1016-10-S21 | 6.4 | 23-Jan-20 | 1aj | 235 | 1.94 | | | PAG |
| 1016-10 | NE-1016-10-S22 | 5.7 | 23-Jan-20 | 5hj | 234 | 1.72 | | | PAG |
| 1016-10 | NE-1016-10-S23 | 6.2 | 23-Jan-20 | 1a | 786 | 4.10 | | | PAG |
| 1016-10 | NE-1016-10-S24 | 5.9 | 23-Jan-20 | 1a | 699 | 2.86 | | | PAG |
| 1016-10 | NE-1016-10-X66 | 6.0 | 23-Jan-20 | 1aj | 584 | 1.62 | | | PAG |
| 1016-10 | NE-1016-10-X68 | 6.1 | 23-Jan-20 | 5hj | 440 | 1.88 | | | PAG |
| 1016-10 | NE-1016-10-X70 | 5.7 | 23-Jan-20 | 5hj | 175 | 1.23 | | | PAG |
| 1016-14 | NE-1016-11-N29 | 5.2 | 23-Jan-20 | 1a | 37 | 0.40 | | | NAG |
| 1016-14 | NE-1016-11-N31 | 5.2 | 23-Jan-20 | 1a | 27 | 0.56 | | | NAG |
| 1016-14 | NE-1016-11-Q30 | 5.0 | 23-Jan-20 | 1a | 82 | 0.67 | | | PAG |
| 1016-11 | NE-1016-11-S28 | 5.4 | 23-Jan-20 | 1as | 858 | 3.46 | | | PAG |
| 1016-11 | NE-1016-11-T30 | 5.8 | 23-Jan-20 | 1as | 383 | 0.97 | | | PAG |
| 1016-09 | NE-1016-13-B56 | 5.4 | 23-Jan-20 | 1as | 913 | 3.70 | | | PAG |
| 1016-09 | NE-1016-13-B57 | 5.7 | 23-Jan-20 | 1as | 803 | 2.49 | | | PAG |
| 1016-09 | NE-1016-13-B58 | 5.9 | 23-Jan-20 | 1as | 844 | 2.93 | | | PAG |
| 1016-09 | NE-1016-13-B60 | 6.0 | 23-Jan-20 | 1as | 1102 | 3.93 | | | PAG |
| 1016-09 | NE-1016-13-C57 | 5.1 | 23-Jan-20 | 1as | 752 | 3.14 | | | PAG |
| 1016-09 | NE-1016-13-C58 | 5.7 | 23-Jan-20 | 1as | 863 | 3.56 | | | PAG |
| 1016-09 | NE-1016-13-C60 | 6.1 | 23-Jan-20 | 1aj | 919 | 3.19 | | | PAG |
| 1016-09 | NE-1016-13-D57 | 4.8 | 23-Jan-20 | 1aj | 536 | 3.00 | | | PAG |
| 1016-09 | NE-1016-13-D58 | 5.5 | 23-Jan-20 | 1aj | 716 | 2.63 | | | PAG |
| 1016-09 | NE-1016-13-D59 | 6.0 | 23-Jan-20 | 1aj | 831 | 2.49 | | | PAG |
| 1016-09 | NE-1016-13-E58 | 5.3 | 23-Jan-20 | 1aj | 344 | 2.84 | | | PAG |
| 1016-09 | NE-1016-13-Y84 | 5.7 | 23-Jan-20 | 1aj | 849 | 2.66 | | | PAG |
| 1016-09 | NE-1016-13-Y86 | 6.0 | 23-Jan-20 | 1aj | 868 | 2.12 | | | PAG |
| 1016-09 | NE-1016-13-Y88 | 6.0 | 23-Jan-20 | 1aj | 979 | 3.57 | | | PAG |
| 1016-08 | NE-1016-08-I31 | 5.4 | 24-Jan-20 | 1aj | 211 | 1.59 | | | PAG |
| 1016-08 | NE-1016-08-I32 | 5.5 | 24-Jan-20 | 1aj | 166 | 1.23 | | | PAG |
| 1016-08 | NE-1016-08-H31 | 5.4 | 24-Jan-20 | 1aj | 222 | 2.03 | | | PAG |
| 1016-10 | NE-1016-10-R18 | 5.9 | 24-Jan-20 | 1aj | 113 | 0.85 | | | PAG |
| 1016-10 | NE-1016-10-R19 | 6.0 | 24-Jan-20 | 1ax | 158 | 0.73 | | | PAG |
| 1016-10 | NE-1016-10-R20 | 6.0 | 24-Jan-20 | 1aj | 233 | 0.82 | | | PAG |
| 1016-10 | NE-1016-10-X72 | 5.9 | 24-Jan-20 | 1aj | 167 | 1.52 | | | PAG |
| 1016-10 | NE-1016-10-X74 | 5.9 | 24-Jan-20 | 1aj | 54 | 0.61 | | | NAG |
| 1016-10 | NE-1016-10-Z73 | 6.0 | 24-Jan-20 | 1aj | 124 | 0.84 | | | PAG |
| 1016-10 | NE-1016-10-Z75 | 6.1 | 24-Jan-20 | 1aj | 106 | 0.87 | | | PAG |
| 1016-09 | NE-1016-13-X77 | 6.0 | 24-Jan-20 | 1ax | 711 | 2.42 | | | PAG |
| 1016-09 | NE-1016-13-Y90 | 6.1 | 24-Jan-20 | 1ax | 774 | 2.32 | | | PAG |
| 1016-09 | NE-1016-13-Z85 | 5.7 | 24-Jan-20 | 1ax | 720 | 2.75 | | | PAG |
| 1016-09 | NE-1016-13-Z87 | 6.1 | 24-Jan-20 | 1ax | 724 | 2.42 | | | PAG |
| 1016-09 | NE-1016-13-Z89 | 6.1 | 24-Jan-20 | 1ax | 722 | 1.98 | | | PAG |
| | NE-1016-12-X41 | 6.0 | 25-Jan-20 | 1aj | 107 | 0.75 | | | PAG |
| 1016-12 | NE-1016-12-X42 | 5.7 | 25-Jan-20 | 1aj | 121 | 0.92 | | | PAG |
| 1016-12 | NE-1016-12-X43 | 5.8 | 25-Jan-20 | 1aj | 120 | 0.61 | | | PAG |
| 1016-12 | NE-1016-12-X48 | 6.2 | 25-Jan-20 | 1aj | 147 | 1.16 | | | PAG |
| | NE-1016-11-X51 | 6.4 | 25-Jan-20 | 1aj | 34 | 0.59 | | | NAG |
| | NE-1016-11-X53 | 5.9 | 25-Jan-20 | 1aj | 30 | 0.50 | | | NAG |
| 1016-11 | NE-1016-11-X55 | 5.7 | 25-Jan-20 | 1aj | 48 | 0.51 | | | NAG |
| 1016-11 | NE-1016-11-X57 | 5.8 | 25-Jan-20 | 1aj | 71 | 0.65 | | | PAG |
| 1016-11 | NE-1016-11-X59 | 5.7 | 25-Jan-20 | 1ax | 244 | 0.68 | | | PAG |
| | NE-1016-12-J32 | 6.0 | 25-Jan-20 | 1aj | 111 | 1.36 | | | PAG |
| 1016-12 | NE-1016-12-J33 | 5.6 | 25-Jan-20 | 1aj | 199 | 1.43 | | | PAG |
| | NE-1016-12-K30 | 6.0 | 25-Jan-20 | 1ax | 248 | 2.36 | | | PAG |
| | NE-1016-12-K31 | 6.0 | 25-Jan-20 | 1aj | 205 | 1.70 | | | PAG |
| 1016-12 | NE-1016-12-K32 | 5.7 | 25-Jan-20 | 1aj | 106 | 0.72 | | | PAG |
| 1016-12 | NE-1016-12-K33 | 5.5 | 25-Jan-20 | 1aj | 104 | 0.65 | | | PAG |
| 1016-12 | NE-1016-12-K34 | 5.6 | 25-Jan-20 | 1aj | 179 | 2.08 | | | PAG |
| 1016-14 | NE-1016-12-L31 | 5.5 | 25-Jan-20 | 1ax | 520 | 1.60 | | | PAG |
| | NE-1016-12-M32 | 5.9 | 25-Jan-20 | 1aj | 100 | 0.75 | | | PAG |
| 1016-12 | NE-1016-12-M33 | 5.5 | 25-Jan-20 | 1ax | 83 | 0.73 | | | PAG |
| 1016-12 | NE-1016-12-M34 | 5.6 | 25-Jan-20 | 1ax | 109 | 1.10 | | | PAG |
| | NE-1016-11-N32 | 5.8 | 25-Jan-20 | 1ax | 36 | 0.69 | | | NAG |
| 1016-12 | NE-1016-12-N33 | 5.6 | 25-Jan-20 | 1aj | 221 | 1.12 | | | PAG |
| 1016-12 | NE-1016-12-N34 | 5.7 | 25-Jan-20 | 1ax | 57 | 0.83 | | | NAG |
| 1016-14 | NE-1016-12-L30 | 5.5 | 25-Jan-20 | 1ax | 93 | 0.95 | | | PAG |
| | NE-1016-12-L32 | 6.0 | 25-Jan-20 | 1ax | 189 | 0.85 | | | PAG |
| 1016-12 | NE-1016-12-L33 | 5.5 | 25-Jan-20 | 1ax | 288 | 1.49 | | | PAG |
| | NE-1016-11-P32 | 5.2 | 25-Jan-20 | 1aj | 63 | 0.74 | 3.0 | 0.3 | NAG |
| | NE-1016-11-P34 | 6.2 | 25-Jan-20 | 1aj | 74 | 0.63 | | | PAG |
| 1016-14 | NE-1016-11-Q31 | 5.1 | 25-Jan-20 | 1aj | 33 | 0.65 | | | NAG |
| | NE-1016-11-Q33 | 6.0 | 25-Jan-20 | 1aj | 95 | 0.64 | | | PAG |
| 1016-11 | NE-1016-11-R32 | 5.6 | 25-Jan-20 | 1aj | 42 | 0.65 | | | NAG |
| 1016-11 | NE-1016-11-Z60 | 5.7 | 25-Jan-20 | 1aj | 330 | 0.83 | | | PAG |
| 1016-12 | NE-1016-12-Z50 | 6.1 | 26-Jan-20 | 1aj | 112 | 0.52 | | | PAG |
| | NE-1016-11-Z52 | 2.6 | 26-Jan-20 | 1a | 39 | 0.49 | | | NAG |
| 1016-11 | NE-1016-11-Z55 | 5.8 | 26-Jan-20 | 1a | 56 | 0.54 | | | NAG |
| 1016-11 | NE-1016-11-Z57 | 5.6 | 26-Jan-20 | 1a | 49 | 0.60 | | | NAG |
| 1016-11 | NE-1016-11-Z59 | 5.7 | 26-Jan-20 | 1ax | 80 | 0.66 | | | PAG |
| 1016-09 | NE-1016-13-X78 | 5.4 | 26-Jan-20 | 1aj | 459 | 0.98 | | | PAG |
| 1016-09 | NE-1016-13-X79 | 5.1 | 26-Jan-20 | 1aj | 268 | 0.78 | | | PAG |
| 1016-09 | NE-1016-13-X80 | 4.7 | 26-Jan-20 | 1ax | 462 | 2.65 | | | PAG |
| 1016-09 | NE-1016-13-X81 | 4.3 | 26-Jan-20 | 1ax | 636 | 1.28 | | | PAG |
| 1016-09 | NE-1016-13-X83 | 3.6 | 26-Jan-20 | 1ax | 734 | 1.49 | | | PAG |
| 1016-05 | NE-1016-09-X84 | 3.3 | 26-Jan-20 | 1aj | 359 | 1.24 | | | PAG |
| 1016-05 | NE-1016-09-X85 | 2.9 | 26-Jan-20 | 1aj | 216 | 0.70 | | | PAG |
| 1016-05 | NE-1016-09-G51 | 5.2 | 26-Jan-20 | 1aj | 626 | 1.15 | | | PAG |
| 1016-10 | NE-1016-10-T25 | 5.5 | 27-Jan-20 | 1aj | 529 | 1.13 | | | PAG |
| 1016-10 | NE-1016-10-T26 | 5.3 | 27-Jan-20 | 1aj | 256 | 0.68 | | | PAG |
| 1016-11 | NE-1016-11-T27 | 5.5 | 27-Jan-20 | 1ax | 262 | 0.91 | | | PAG |
| 1016-11 | NE-1016-11-T28 | 5.5 | 27-Jan-20 | 1aj | 360 | 1.13 | | | PAG |
| 1016-11 | NE-1016-11-T29 | 5.4 | 27-Jan-20 | 1aj | 196 | 0.89 | | | PAG |
| 1016-11 | NE-1016-11-X60 | 5.7 | 27-Jan-20 | 1a | 158 | 0.48 | | | PAG |
| 1016-11 | NE-1016-11-X61 | 5.6 | 27-Jan-20 | 1a | 222 | 0.56 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1016-11 | NE-1016-11-X62 | 5.6 | 27-Jan-20 | 1aj | 378 | 0.50 | | | PAG |
| 1016-11 | NE-1016-11-X63 | 5.5 | 27-Jan-20 | 1aj | 462 | 0.67 | | | PAG |
| 1016-10 | NE-1016-10-X64 | 5.3 | 27-Jan-20 | 1aj | 555 | 0.80 | | | PAG |
| 1016-10 | NE-1016-10-X65 | 5.5 | 27-Jan-20 | 1aj | 580 | 0.83 | | | PAG |
| 1016-11 | NE-1016-11-Z61 | 5.8 | 27-Jan-20 | 1ax | 440 | 0.86 | | | PAG |
| 1016-11 | NE-1016-11-Z62 | 5.7 | 27-Jan-20 | 1ax | 582 | 0.71 | | | PAG |
| 1016-11 | NE-1016-11-Z63 | 5.5 | 27-Jan-20 | 1ax | 450 | 0.60 | | | PAG |
| 1016-11 | NE-1016-11-Z64 | 5.5 | 27-Jan-20 | 1ax | 309 | 0.80 | | | PAG |
| 1016-11 | NE-1016-11-Z65 | 5.4 | 27-Jan-20 | 1ax | 598 | 1.15 | | | PAG |
| 1016-10 | NE-1016-10-Z66 | 5.0 | 27-Jan-20 | 1ax | 872 | 0.55 | | | PAG |
| 1010-02 | NE-1010-02-M30 | 5.9 | 4-Feb-20 | 1aj | 352 | 1.11 | | | PAG |
| 1010-02 | NE-1010-02-M31 | 5.9 | 4-Feb-20 | 1aj | 390 | 1.19 | | | PAG |
| 1010-02 | NE-1010-02-M32 | 5.9 | 4-Feb-20 | 1aj | 440 | 1.13 | | | PAG |
| 1010-02 | NE-1010-02-M33 | 6.1 | 4-Feb-20 | 1aj | 784 | 1.27 | | | PAG |
| 1010-02 | NE-1010-02-M34 | 6.0 | 4-Feb-20 | 1aj | 654 | 1.60 | | | PAG |
| 1010-02 | NE-1010-02-M35 | 5.8 | 4-Feb-20 | 1aj | 694 | 3.51 | | | PAG |
| 1010-02 | NE-1010-02-N30 | 5.6 | 4-Feb-20 | 1aj | 112 | 1.15 | | | PAG |
| 1010-02 | NE-1010-02-N31 | 5.5 | 4-Feb-20 | 1aj | 214 | 1.38 | | | PAG |
| 1010-02 | NE-1010-02-N32 | 5.6 | 4-Feb-20 | 1aj | 457 | 1.86 | | | PAG |
| 1010-02 | NE-1010-02-N33 | 5.9 | 4-Feb-20 | 1aj | 584 | 1.94 | | | PAG |
| 1010-02 | NE-1010-02-N34 | 5.8 | 4-Feb-20 | 1aj | 773 | 3.13 | | | PAG |
| 1010-02 | NE-1010-02-N35 | 5.7 | 4-Feb-20 | 1aj | 1101 | 4.11 | | | PAG |
| 1010-02 | NE-1010-02-Y75 | 5.5 | 4-Feb-20 | 5hj | 783 | 4.49 | | | PAG |
| 1010-02 | NE-1010-02-Y77 | 5.6 | 4-Feb-20 | 5hj | 198 | 1.52 | | | PAG |
| 1010-02 | NE-1010-02-Y79 | 5.6 | 4-Feb-20 | 5hj | 165 | 1.83 | | | PAG |
| 1010-02 | NE-1010-02-Y81 | 5.4 | 4-Feb-20 | 5hj | 162 | 1.67 | | | PAG |
| 1010-02 | NE-1010-02-Z75 | 1.0 | 4-Feb-20 | 5hj | 331 | 1.63 | | | PAG |
| 1010-02 | NE-1010-02-Z77 | 1.3 | 4-Feb-20 | 5hj | 247 | 1.63 | | | PAG |
| 1010-02 | NE-1010-02-Z78 | 1.1 | 4-Feb-20 | 5hj | 204 | 1.63 | | | PAG |
| 1010-02 | NE-1010-02-J27 | 5.9 | 5-Feb-20 | 1as | 767 | 0.84 | | | PAG |
| 1010-02 | NE-1010-02-J28 | 6.0 | 5-Feb-20 | 1as | 746 | 1.35 | | | PAG |
| 1010-02 | NE-1010-02-J29 | 5.9 | 5-Feb-20 | 1aj | 552 | 2.59 | | | PAG |
| 1010-02 | NE-1010-02-J30 | 5.9 | 5-Feb-20 | 1aj | 626 | 4.35 | | | PAG |
| 1010-02 | NE-1010-02-J31 | 5.9 | 5-Feb-20 | 1aj | 956 | 6.89 | | | PAG |
| 1010-02 | NE-1010-02-J32 | 5.9 | 5-Feb-20 | 1aj | 909 | 5.16 | | | PAG |
| 1010-02 | NE-1010-02-J33 | 5.7 | 5-Feb-20 | 1aj | 403 | 1.90 | | | PAG |
| 1010-02 | NE-1010-02-J34 | 5.8 | 5-Feb-20 | 1aj | 535 | 2.83 | | | PAG |
| 1010-02 | NE-1010-02-J35 | 5.6 | 5-Feb-20 | 1aj | 603 | 3.29 | | | PAG |
| 1010-02 | NE-1010-02-K27 | 5.9 | 5-Feb-20 | 1aj | 316 | 1.62 | | | PAG |
| 1010-02 | NE-1010-02-K28 | 5.9 | 5-Feb-20 | 1aj | 592 | 0.86 | | | PAG |
| 1010-02 | NE-1010-02-K29 | 6.0 | 5-Feb-20 | 1aj | 528 | 1.06 | | | PAG |
| 1010-02 | NE-1010-02-K30 | 6.0 | 5-Feb-20 | 1aj | 651 | 4.15 | | | PAG |
| 1010-02 | NE-1010-02-K31 | 5.9 | 5-Feb-20 | 1aj | 777 | 4.65 | | | PAG |
| 1010-02 | NE-1010-02-K32 | 5.9 | 5-Feb-20 | 1aj | 798 | 4.64 | | | PAG |
| 1010-02 | NE-1010-02-K33 | 5.8 | 5-Feb-20 | 1aj | 511 | 1.45 | | | PAG |
| 1010-02 | NE-1010-02-K34 | 5.9 | 5-Feb-20 | 1as | 853 | 6.15 | | | PAG |
| 1010-02 | NE-1010-02-K35 | 5.6 | 5-Feb-20 | 1aj | 740 | 3.76 | | | PAG |
| 1010-02 | NE-1010-02-L27 | 5.8 | 5-Feb-20 | 1aj | 171 | 1.27 | | | PAG |
| 1010-02 | NE-1010-02-L28 | 5.8 | 5-Feb-20 | 1aj | 542 | 1.15 | | | PAG |
| 1010-02 | NE-1010-02-L29 | 5.9 | 5-Feb-20 | 5hj | 555 | 1.29 | | | PAG |
| 1010-02 | NE-1010-02-M27 | 5.8 | 5-Feb-20 | 1aj | 101 | 1.12 | | | PAG |
| 1010-02 | NE-1010-02-M28 | 5.7 | 5-Feb-20 | 1aj | 344 | 1.25 | | | PAG |
| 1010-02 | NE-1010-02-M29 | 5.8 | 5-Feb-20 | 1aj | 231 | 1.42 | | | PAG |
| 1010-02 | NE-1010-02-N27 | 5.9 | 5-Feb-20 | 5a | 55 | 0.84 | | | NAG |
| 1010-02 | NE-1010-02-N28 | 5.6 | 5-Feb-20 | 5a | 95 | 1.04 | | | PAG |
| 1010-02 | NE-1010-02-N29 | 5.5 | 5-Feb-20 | 1aj | 101 | 0.99 | | | PAG |
| | NE-1010-02-O27 | 4.4 | 5-Feb-20 | 5a | 67 | 0.99 | | | NAG |
| 1010-02 | NE-1010-02-O28 | 5.4 | 5-Feb-20 | 1aj | 173 | 1.04 | | | PAG |
| 1010-02 | NE-1010-02-O29 | 5.5 | 5-Feb-20 | 1aj | 154 | 1.03 | | | PAG |
| 1010-02 | NE-1010-02-O30 | 5.5 | 5-Feb-20 | 1aj | 152 | 1.25 | | | PAG |
| 1010-02 | NE-1010-02-O31 | 5.6 | 5-Feb-20 | 1as | 250 | 1.71 | | | PAG |
| 1010-02 | NE-1010-02-O32 | 5.8 | 5-Feb-20 | 1a | 146 | 1.29 | | | PAG |
| 1010-02 | NE-1010-02-O33 | 5.7 | 5-Feb-20 | 1aj | 361 | 1.60 | | | PAG |
| 1010-02 | NE-1010-02-O34 | 5.6 | 5-Feb-20 | 5hj | 607 | 3.25 | | | PAG |
| 1010-02 | NE-1010-02-Y82 | 5.3 | 5-Feb-20 | 1aj | 124 | 0.82 | | | PAG |
| 1010-02 | NE-1010-02-Y83 | 5.2 | 5-Feb-20 | 1aj | 117 | 1.02 | | | PAG |
| 1010-02 | NE-1010-02-Y84 | 5.2 | 5-Feb-20 | 1aj | 96 | 0.86 | | | PAG |
| 1010-02 | NE-1010-02-Y85 | 5.5 | 5-Feb-20 | 1aj | 61 | 0.69 | | | NAG |
| 1010-02 | NE-1010-02-Y86 | 5.7 | 5-Feb-20 | 1aj | 144 | 0.54 | | | PAG |
| 1010-03 | NE-1010-03-J38 | 5.7 | 5/Feb/20 | 1aj | 175 | 0.87 | | | PAG |
| 1010-03 | NE-1010-03-J39 | 5.7 | 5/Feb/20 | 1aj | 195 | 1.07 | | | PAG |
| 1010-03 | NE-1010-03-J40 | 5.7 | 5/Feb/20 | 1aj | 129 | 0.59 | | | PAG |
| 1010-03 | NE-1010-03-J41 | 5.8 | 5/Feb/20 | 1aj | 153 | 0.71 | | | PAG |
| 1010-03 | NE-1010-03-J42 | 5.8 | 5/Feb/20 | 1aj | 26 | 0.47 | | | NAG |
| 1010-03 | NE-1010-03-K38 | 5.6 | 5/Feb/20 | 1aj | 153 | 0.67 | | | PAG |
| 1010-03 | NE-1010-03-K39 | 5.7 | 5/Feb/20 | 1aj | 206 | 0.85 | | | PAG |
| 1010-03 | NE-1010-03-K40 | 5.8 | 5/Feb/20 | 1aj | 49 | 0.52 | | | NAG |
| 1010-03 | NE-1010-03-K41 | 6.0 | 5/Feb/20 | 1aj | 127 | 0.64 | | | PAG |
| 1010-03 | NE-1010-03-K42 | 5.7 | 5/Feb/20 | 1a | 42 | 0.47 | | | NAG |
| 1010-03 | NE-1010-03-L38 | 5.8 | 5/Feb/20 | 5hj | 321 | 1.07 | | | PAG |
| 1010-03 | NE-1010-03-L39 | 6.0 | 5/Feb/20 | 1aj | 137 | 0.89 | | | PAG |
| 1010-03 | NE-1010-03-L40 | 6.0 | 5/Feb/20 | 1aj | 97 | 0.75 | | | PAG |
| 1010-03 | NE-1010-03-L41 | 5.9 | 5/Feb/20 | 1aj | 105 | 0.62 | | | PAG |
| 1010-03 | NE-1010-03-L42 | 5.7 | 5/Feb/20 | 1aj | 73 | 0.58 | | | PAG |
| 1010-03 | NE-1010-03-M38 | 5.8 | 5/Feb/20 | 1as | 400 | 1.31 | | | PAG |
| 1010-03 | NE-1010-03-M39 | 5.9 | 5/Feb/20 | 1ay | 164 | 0.89 | | | PAG |
| 1010-03 | NE-1010-03-M40 | 5.8 | 5/Feb/20 | 1a | 70 | 0.50 | | | NAG |
| 1010-03 | NE-1010-03-N38 | 5.4 | 5/Feb/20 | 1aj | 854 | 1.91 | | | PAG |
| 1010-03 | NE-1010-03-N39 | 5.5 | 5/Feb/20 | 1aj | 754 | 1.75 | | | PAG |
| 1010-03 | NE-1010-03-N40 | 5.8 | 5/Feb/20 | 1aj | 399 | 1.26 | | | PAG |
| 1010-03 | NE-1010-03-O37 | 5.5 | 5/Feb/20 | 1aj | 618 | 2.44 | | | PAG |
| 1010-03 | NE-1010-03-Y62 | 5.9 | 5/Feb/20 | 1aj | 90 | 0.59 | | | PAG |
| 1010-03 | NE-1010-03-Y63 | 5.8 | 5/Feb/20 | 1a | 29 | 0.54 | | | NAG |
| 1010-03 | NE-1010-03-Y64 | 5.8 | 5/Feb/20 | 1a | 32 | 0.48 | | | NAG |
| 1010-03 | NE-1010-03-Y65 | 6.0 | 5/Feb/20 | 1aj | 39 | 0.50 | | | NAG |
| 1010-03 | NE-1010-03-Y66 | 5.9 | 5/Feb/20 | 1aj | 308 | 0.91 | | | PAG |
| 1010-03 | NE-1010-03-Y67 | 5.8 | 5/Feb/20 | 1aj | 253 | 0.64 | | | PAG |
| 1010-03 | NE-1010-03-Y68 | 5.8 | 5/Feb/20 | 1ax | 636 | 1.06 | | | PAG |
| 1010-03 | NE-1010-03-Y69 | 5.7 | 5/Feb/20 | 1ax | 725 | 0.82 | | | PAG |
| 1010-03 | NE-1010-03-Y70 | 5.6 | 5/Feb/20 | 1aj | 641 | 0.87 | | | PAG |
| 1010-03 | NE-1010-03-Y71 | 5.6 | 5/Feb/20 | 1ax | 867 | 2.00 | | | PAG |
| 1010-03 | NE-1010-03-Y72 | 5.5 | 5/Feb/20 | 1ax | 757 | 1.96 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1010-03 | NE-1010-03-Z61 | 2.8 | 5/Feb/20 | 1a | 67 | 0.48 | | | NAG |
| 1010-03 | NE-1010-03-Z63 | 1.7 | 5/Feb/20 | 1a | 78 | 0.54 | | | PAG |
| 1010-03 | NE-1010-03-Z65 | 2.6 | 5/Feb/20 | 1a | 75 | 0.50 | | | PAG |
| 1010-03 | NE-1010-03-Z67 | 3.2 | 5/Feb/20 | 1aj | 251 | 0.75 | | | PAG |
| 1010-03 | NE-1010-03-Z69 | 2.0 | 5/Feb/20 | 1aj | 294 | 0.61 | | | PAG |
| 1010-03 | NE-1010-03-Z71 | 2.0 | 5/Feb/20 | 1aj | 744 | 1.63 | | | PAG |
| 1010-03 | NE-1010-03-Z73 | 1.7 | 5/Feb/20 | 1a | 800 | 1.87 | | | PAG |
| 1010-04 | NE-1010-04-C37 | 5.9 | 6/Feb/20 | 1aj | 439 | 2.70 | | | PAG |
| 1010-04 | NE-1010-04-C38 | 5.7 | 6/Feb/20 | 1aj | 249 | 1.84 | | | PAG |
| 1010-04 | NE-1010-04-D37 | 5.8 | 6/Feb/20 | 1aj | 456 | 3.83 | | | PAG |
| 1010-04 | NE-1010-04-D38 | 5.7 | 6/Feb/20 | 1as | 291 | 3.25 | | | PAG |
| 1010-04 | NE-1010-04-D39 | 5.8 | 6/Feb/20 | 1aj | 495 | 4.97 | | | PAG |
| 1010-04 | NE-1010-04-D40 | 5.7 | 6/Feb/20 | 1as | 458 | 4.60 | | | PAG |
| 1010-04 | NE-1010-04-E36 | 5.7 | 6/Feb/20 | 1aj | 318 | 3.14 | | | PAG |
| 1010-04 | NE-1010-04-E37 | 5.7 | 6/Feb/20 | 1aj | 404 | 4.16 | | | PAG |
| 1010-04 | NE-1010-04-E38 | 5.7 | 6/Feb/20 | 1aj | 279 | 2.89 | | | PAG |
| 1010-04 | NE-1010-04-E39 | 5.7 | 6/Feb/20 | 1aj | 362 | 3.55 | | | PAG |
| 1010-04 | NE-1010-04-E40 | 5.8 | 6/Feb/20 | 1as | 240 | 1.93 | | | PAG |
| 1010-04 | NE-1010-04-F36 | 5.8 | 6/Feb/20 | 1aj | 384 | 3.97 | | | PAG |
| 1010-04 | NE-1010-04-F37 | 5.8 | 6/Feb/20 | 1aj | 520 | 3.74 | | | PAG |
| 1010-04 | NE-1010-04-F38 | 5.7 | 6/Feb/20 | 1aj | 241 | 2.15 | | | PAG |
| 1010-04 | NE-1010-04-F39 | 5.8 | 6/Feb/20 | 1aj | 233 | 1.79 | | | PAG |
| 1010-04 | NE-1010-04-F40 | 5.8 | 6/Feb/20 | 1aj | 267 | 2.30 | | | PAG |
| 1010-04 | NE-1010-04-F41 | 5.8 | 6/Feb/20 | 1as | 190 | 1.43 | | | PAG |
| 1010-04 | NE-1010-04-G37 | 5.7 | 6/Feb/20 | 1aj | 539 | 2.73 | | | PAG |
| 1010-04 | NE-1010-04-G38 | 5.8 | 6/Feb/20 | 1aj | 622 | 4.86 | | | PAG |
| 1010-04 | NE-1010-04-G39 | 5.8 | 6/Feb/20 | 1aj | 249 | 2.18 | | | PAG |
| 1010-04 | NE-1010-04-G40 | 5.8 | 6/Feb/20 | 1as | 117 | 0.94 | | | PAG |
| 1010-04 | NE-1010-04-G41 | 5.8 | 6/Feb/20 | 1a | 156 | 0.96 | | | PAG |
| 1010-04 | NE-1010-04-Y47 | 6.2 | 6/Feb/20 | 1ax | 404 | 4.91 | | | PAG |
| 1010-04 | NE-1010-04-Y49 | 5.8 | 6/Feb/20 | 1aj | 410 | 4.74 | | | PAG |
| 1010-04 | NE-1010-04-Y51 | 5.7 | 6/Feb/20 | 1aj | 180 | 1.68 | | | PAG |
| 1010-04 | NE-1010-04-Y53 | 5.8 | 6/Feb/20 | 1aj | 249 | 2.53 | | | PAG |
| 1010-04 | NE-1010-04-Y55 | 5.8 | 6/Feb/20 | 1ax | 144 | 1.22 | | | PAG |
| 1010-04 | NE-1010-04-Y57 | 5.8 | 6/Feb/20 | 1aj | 298 | 2.19 | | | PAG |
| 1010-04 | NE-1010-04-Y59 | 5.9 | 6/Feb/20 | 1aj | 162 | 0.92 | | | PAG |
| 1010-04 | NE-1010-04-Z46 | 2.8 | 6/Feb/20 | 1aj | 330 | 4.21 | | | PAG |
| 1010-04 | NE-1010-04-Z48 | 2.2 | 6/Feb/20 | 1a | 235 | 1.45 | | | PAG |
| 1010-04 | NE-1010-04-Z50 | 2.1 | 6/Feb/20 | 1aj | 153 | 1.20 | | | PAG |
| 1010-04 | NE-1010-04-Z52 | 2.0 | 6/Feb/20 | 1a | 284 | 2.34 | | | PAG |
| 1010-04 | NE-1010-04-Z54 | 2.5 | 6/Feb/20 | 1aj | 309 | 1.52 | | | PAG |
| 1010-04 | NE-1010-04-Z56 | 1.4 | 6/Feb/20 | 1aj | 179 | 1.06 | | | PAG |
| 1010-04 | NE-1010-04-Z58 | 3.5 | 6/Feb/20 | 1aj | 292 | 1.24 | | | PAG |
| 1010-04 | NE-1010-04-Z60 | 1.8 | 6/Feb/20 | 1a | 58 | 0.47 | | | NAG |
| 1010-05 | NE-1010-05-B29 | 5.8 | 6/Feb/20 | 1aj | 606 | 0.88 | | | PAG |
| 1010-05 | NE-1010-05-B30 | 5.8 | 6/Feb/20 | 1aj | 191 | 1.90 | | | PAG |
| 1010-05 | NE-1010-05-B31 | 5.8 | 6/Feb/20 | 1aj | 200 | 1.58 | | | PAG |
| 1010-05 | NE-1010-05-B32 | 5.9 | 6/Feb/20 | 1aj | 330 | 2.82 | | | PAG |
| 1010-05 | NE-1010-05-B33 | 5.9 | 6/Feb/20 | 1aj | 244 | 4.11 | | | PAG |
| 1010-05 | NE-1010-05-B34 | 5.9 | 6/Feb/20 | 1ax | 340 | 5.47 | | | PAG |
| 1010-05 | NE-1010-05-B35 | 5.9 | 6/Feb/20 | 1aj | 510 | 6.81 | | | PAG |
| 1010-05 | NE-1010-05-B36 | 6.1 | 6/Feb/20 | 1ax | 477 | 5.03 | | | PAG |
| 1010-05 | NE-1010-05-C29 | 5.9 | 6/Feb/20 | 1aj | 548 | 1.22 | | | PAG |
| 1010-05 | NE-1010-05-C30 | 5.9 | 6/Feb/20 | 1aj | 291 | 4.66 | | | PAG |
| 1010-05 | NE-1010-05-C31 | 5.8 | 6/Feb/20 | 1aj | 389 | 6.27 | | | PAG |
| 1010-05 | NE-1010-05-C32 | 5.8 | 6/Feb/20 | 1aj1 | 449 | 5.80 | | | PAG |
| 1010-05 | NE-1010-05-C33 | 5.8 | 6/Feb/20 | 1ax | 436 | 6.55 | | | PAG |
| 1010-05 | NE-1010-05-C34 | 5.8 | 6/Feb/20 | 1ax | 479 | 6.77 | | | PAG |
| 1010-05 | NE-1010-05-C35 | 5.8 | 6/Feb/20 | 1ax | 488 | 6.40 | | | PAG |
| 1010-05 | NE-1010-05-C36 | 6.0 | 6/Feb/20 | 1ax | 417 | 4.96 | | | PAG |
| 1010-05 | NE-1010-05-D29 | 5.8 | 6/Feb/20 | 1ax | 409 | 4.85 | | | PAG |
| 1010-05 | NE-1010-05-D30 | 5.9 | 6/Feb/20 | 1ax | 464 | 5.00 | | | PAG |
| 1010-05 | NE-1010-05-D31 | 5.9 | 6/Feb/20 | 1ax | 369 | 4.85 | | | PAG |
| 1010-05 | NE-1010-05-D32 | 5.8 | 6/Feb/20 | 1ax | 456 | 4.89 | | | PAG |
| 1010-05 | NE-1010-05-D33 | 5.9 | 6/Feb/20 | 1ax | 494 | 6.61 | | | PAG |
| 1010-05 | NE-1010-05-D34 | 5.7 | 6/Feb/20 | 1ax | 443 | 6.10 | | | PAG |
| 1010-05 | NE-1010-05-D35 | 5.9 | 6/Feb/20 | 1ax | 493 | 6.06 | | | PAG |
| 1010-05 | NE-1010-05-D36 | 5.7 | 6/Feb/20 | 1ax | 481 | 4.64 | | | PAG |
| 1010-05 | NE-1010-05-E27 | 5.8 | 6/Feb/20 | 1ax | 385 | 4.68 | | | PAG |
| 1010-05 | NE-1010-05-E28 | 5.8 | 6/Feb/20 | 1ax | 490 | 6.27 | | | PAG |
| 1010-05 | NE-1010-05-E29 | 5.8 | 6/Feb/20 | 1ax | 437 | 6.31 | | | PAG |
| 1010-05 | NE-1010-05-E30 | 5.8 | 6/Feb/20 | 1ax | 584 | 7.26 | | | PAG |
| 1010-05 | NE-1010-05-E31 | 5.8 | 6/Feb/20 | 1ax | 483 | 7.28 | | | PAG |
| 1010-05 | NE-1010-05-E32 | 5.7 | 6/Feb/20 | 1ax | 454 | 6.04 | | | PAG |
| 1010-05 | NE-1010-05-E33 | 5.9 | 6/Feb/20 | 5hj | 439 | 8.89 | | | PAG |
| 1010-05 | NE-1010-05-E34 | 5.8 | 6/Feb/20 | 1ax | 469 | 6.97 | | | PAG |
| 1010-05 | NE-1010-05-E35 | 5.8 | 6/Feb/20 | 1ax | 387 | 4.67 | | | PAG |
| 1010-05 | NE-1010-05-F27 | 5.9 | 6/Feb/20 | 1ax | 409 | 6.11 | | | PAG |
| 1010-05 | NE-1010-05-F28 | 5.9 | 6/Feb/20 | 1ax | 447 | 5.08 | | | PAG |
| 1010-05 | NE-1010-05-F29 | 5.9 | 6/Feb/20 | 1ax | 469 | 6.14 | | | PAG |
| 1010-05 | NE-1010-05-F30 | 5.9 | 6/Feb/20 | 1ax | 435 | 6.36 | | | PAG |
| 1010-05 | NE-1010-05-F31 | 5.8 | 6/Feb/20 | 1ax | 392 | 6.46 | | | PAG |
| 1010-05 | NE-1010-05-F32 | 5.8 | 6/Feb/20 | 1ax | 573 | 8.79 | | | PAG |
| 1010-05 | NE-1010-05-F33 | 5.8 | 6/Feb/20 | 1ax | 483 | 7.41 | | | PAG |
| 1010-05 | NE-1010-05-F34 | 5.8 | 6/Feb/20 | 1ax | 430 | 7.31 | | | PAG |
| 1010-05 | NE-1010-05-F35 | 5.9 | 6/Feb/20 | 1ax | 367 | 4.64 | | | PAG |
| 1010-05 | NE-1010-05-G27 | 5.8 | 6/Feb/20 | 1ax | 419 | 5.86 | | | PAG |
| 1010-05 | NE-1010-05-G28 | 5.9 | 6/Feb/20 | 1ax | 486 | 4.18 | | | PAG |
| 1010-05 | NE-1010-05-G29 | 5.9 | 6/Feb/20 | 1ax | 296 | 5.53 | | | PAG |
| 1010-05 | NE-1010-05-G30 | 5.9 | 6/Feb/20 | 1ax | 313 | 6.05 | | | PAG |
| 1010-05 | NE-1010-05-G31 | 5.9 | 6/Feb/20 | 1ax | 353 | 5.43 | | | PAG |
| 1010-05 | NE-1010-05-G32 | 5.9 | 6/Feb/20 | 1ax | 304 | 3.87 | | | PAG |
| 1010-05 | NE-1010-05-G33 | 5.8 | 6/Feb/20 | 1ax | 568 | 6.43 | | | PAG |
| 1010-05 | NE-1010-05-G34 | 5.9 | 6/Feb/20 | 1ax | 732 | 5.60 | | | PAG |
| 1010-05 | NE-1010-05-G35 | 5.9 | 6/Feb/20 | 1ax | 305 | 4.69 | | | PAG |
| 1010-05 | NE-1010-05-A29 | 5.8 | 7-Feb-20 | 1aj | 725 | 0.97 | | | PAG |
| 1010-05 | NE-1010-05-A30 | 5.9 | 7-Feb-20 | 12qd | 613 | 0.82 | | | PAG |
| 1010-05 | NE-1010-05-A31 | 5.9 | 7-Feb-20 | 1aj | 475 | 1.01 | | | PAG |
| 1010-05 | NE-1010-05-A32 | 6.0 | 7-Feb-20 | 1aj | 413 | 1.14 | | | PAG |
| 1010-05 | NE-1010-05-A33 | 6.0 | 7-Feb-20 | 1ax | 316 | 1.86 | | | PAG |
| 1010-05 | NE-1010-05-A34 | 6.0 | 7-Feb-20 | 1ax | 315 | 3.75 | | | PAG |
| 1010-05 | NE-1010-05-Y37 | 5.7 | 7-Feb-20 | 1aj | 614 | 0.61 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1010-05 | NE-1010-05-Y38 | 5.9 | 7-Feb-20 | 1aj | 645 | 1.20 | | | PAG |
| 1010-05 | NE-1010-05-Y39 | 5.9 | 7-Feb-20 | 1aj | 593 | 0.77 | | | PAG |
| 1010-05 | NE-1010-05-Y40 | 6.0 | 7-Feb-20 | 1ax | 459 | 0.94 | | | PAG |
| 1010-05 | NE-1010-05-Y41 | 6.0 | 7-Feb-20 | 1ax | 531 | 1.13 | | | PAG |
| 1010-05 | NE-1010-05-Y42 | 6.0 | 7-Feb-20 | 1aj | 483 | 1.27 | | | PAG |
| 1010-05 | NE-1010-05-Y43 | 5.9 | 7-Feb-20 | 1ax | 483 | 1.43 | | | PAG |
| 1010-05 | NE-1010-05-Y44 | 6.0 | 7-Feb-20 | 1aj | 415 | 1.74 | | | PAG |
| 1010-05 | NE-1010-05-Y45 | 6.1 | 7-Feb-20 | 1ax | 351 | 2.00 | | | PAG |
| 1010-05 | NE-1010-05-Y46 | 6.3 | 7-Feb-20 | 1ax | 362 | 3.70 | | | PAG |
| 1010-05 | NE-1010-05-Z37 | 2.3 | 7-Feb-20 | 1ax | 336 | 0.93 | | | PAG |
| 1010-05 | NE-1010-05-Z39 | 2.5 | 7-Feb-20 | 1ax | 513 | 1.21 | | | PAG |
| | NE-1010-05-Z41 | 1.9 | 7-Feb-20 | 1ax | 558 | 1.64 | | | PAG |
| 1010-05 | NE-1010-05-Z43 | 3.6 | 7-Feb-20 | 1ax | 469 | 1.16 | | | PAG |
| 1010-05 | NE-1010-05-H34 | 5.7 | 8-Feb-20 | 1aj | 1100 | 8.72 | | | PAG |
| 1010-05 | NE-1010-05-H35 | 5.8 | 8-Feb-20 | 1aj | 718 | 3.92 | | | PAG |
| 1010-05 | NE-1010-05-I28 | 6.0 | 8-Feb-20 | 1aj | 565 | 2.95 | | | PAG |
| 1010-05 | NE-1010-05-I29 | 6.0 | 8-Feb-20 | 1aj | 583 | 5.70 | | | PAG |
| 1010-05 | NE-1010-05-I30 | 5.9 | 8-Feb-20 | 1ax | 980 | 7.69 | | | PAG |
| 1010-05 | NE-1010-05-I31 | 5.9 | 8-Feb-20 | 1ax | 1145 | 6.91 | | | PAG |
| 1010-05 | NE-1010-05-I32 | 5.9 | 8-Feb-20 | 1aj | 984 | 5.80 | | | PAG |
| 1010-05 | NE-1010-05-I33 | 5.7 | 8-Feb-20 | 1aj | 706 | 2.09 | | | PAG |
| 1010-05 | NE-1010-05-I35 | 5.7 | 8-Feb-20 | 1aj | 461 | 1.78 | | | PAG |
| 1010-04 | NE-1010-04-H36 | 5.7 | 8-Feb-20 | 1aj | 195 | 1.52 | | | PAG |
| 1010-04 | NE-1010-04-H37 | 5.8 | 8-Feb-20 | 1as | 567 | 1.79 | | | PAG |
| 1010-04 | NE-1010-04-H38 | 5.8 | 8-Feb-20 | 1aj | 727 | 3.69 | | | PAG |
| 1010-04 | NE-1010-04-H39 | 5.7 | 8-Feb-20 | 1aj | 890 | 5.00 | | | PAG |
| 1010-04 | NE-1010-04-H40 | 5.7 | 8-Feb-20 | 1ax | 365 | 1.41 | | | PAG |
| 1010-04 | NE-1010-04-H41 | 5.7 | 8-Feb-20 | 1ax | 221 | 0.92 | | | PAG |
| 1010-04 | NE-1010-04-H42 | 5.8 | 8-Feb-20 | 1ax | 298 | 1.09 | | | PAG |
| 1010-04 | NE-1010-04-H43 | 5.9 | 8-Feb-20 | 1ax | 483 | 2.47 | | | PAG |
| 1010-04 | NE-1010-04-I36 | 5.6 | 8-Feb-20 | 1aj | 388 | 1.94 | | | PAG |
| 1010-04 | NE-1010-04-I37 | 5.7 | 8-Feb-20 | 1aj | 126 | 1.06 | | | PAG |
| 1010-04 | NE-1010-04-I38 | 5.7 | 8-Feb-20 | 1aj | 134 | 1.23 | | | PAG |
| 1010-04 | NE-1010-04-I39 | 5.7 | 8-Feb-20 | 1ax | 735 | 2.77 | | | PAG |
| 1010-04 | NE-1010-04-I40 | 5.7 | 8-Feb-20 | 1as | 124 | 0.75 | | | PAG |
| 1010-04 | NE-1010-04-I41 | 5.8 | 8-Feb-20 | 1aj | 41 | 0.77 | | | NAG |
| 1010-04 | NE-1010-04-I42 | 5.8 | 8-Feb-20 | 1aj | 103 | 0.91 | | | PAG |
| 1010-04 | NE-1010-04-I43 | 6.1 | 8-Feb-20 | 1aj | 76 | 1.02 | | | PAG |
| 1010-02 | NE-1010-03-J36 | 5.6 | 8-Feb-20 | 1aj | 165 | 1.30 | | | PAG |
| 1010-03 | NE-1010-03-J37 | 5.6 | 8-Feb-20 | 1ax | 242 | 1.10 | | | PAG |
| 1010-03 | NE-1010-03-K36 | 5.6 | 8-Feb-20 | 1aj | 435 | 1.53 | | | PAG |
| 1010-03 | NE-1010-03-K37 | 5.6 | 8-Feb-20 | 1aj | 479 | 1.75 | | | PAG |
| 1010-04 | NE-1010-05-H27 | 5.9 | 9-Feb-20 | 1aj | 546 | 2.86 | | | PAG |
| 1010-05 | NE-1010-05-H28 | 5.9 | 9-Feb-20 | 5hj | 377 | 4.63 | | | PAG |
| 1010-05 | NE-1010-05-H29 | 5.9 | 9-Feb-20 | 1aj | 345 | 3.67 | | | PAG |
| 1010-05 | NE-1010-05-H30 | 5.9 | 9-Feb-20 | 5hj | 274 | 3.99 | | | PAG |
| 1010-05 | NE-1010-05-H31 | 5.9 | 9-Feb-20 | 1aj | 940 | 6.70 | | | PAG |
| 1010-05 | NE-1010-05-H32 | 5.9 | 9-Feb-20 | 1aj | 1001 | 8.22 | | | PAG |
| 1010-05 | NE-1010-05-I27 | 5.9 | 9-Feb-20 | 1ax | 920 | 1.38 | | | PAG |
| 1010-07 | NE-1010-07-A2 | 5.9 | 10-Feb-20 | 5hj | 581 | 2.37 | | | PAG |
| 1010-07 | NE-1010-07-A3 | 5.6 | 10-Feb-20 | 1aj | 628 | 2.21 | | | PAG |
| 1010-07 | NE-1010-07-A4 | 5.7 | 10-Feb-20 | 1aj | 716 | 2.14 | | | PAG |
| 1010-07 | NE-1010-07-A5 | 5.8 | 10-Feb-20 | 1aj | 453 | 1.47 | | | PAG |
| 1010-07 | NE-1010-07-A6 | 5.8 | 10-Feb-20 | 1aj | 647 | 1.82 | | | PAG |
| 1010-07 | NE-1010-07-A7 | 5.9 | 10-Feb-20 | 5hj | 705 | 2.16 | | | PAG |
| 1010-07 | NE-1010-07-B4 | 5.7 | 10-Feb-20 | 5hj | 464 | 1.41 | | | PAG |
| 1010-07 | NE-1010-07-B5 | 5.6 | 10-Feb-20 | 1aj | 756 | 1.18 | | | PAG |
| 1010-07 | NE-1010-07-B6 | 5.7 | 10-Feb-20 | 1aj | 408 | 0.91 | | | PAG |
| 1010-07 | NE-1010-07-B7 | 5.9 | 10-Feb-20 | 5hj | 543 | 1.11 | | | PAG |
| 1010-07 | NE-1010-07-C7 | 5.8 | 10-Feb-20 | 5hj | 497 | 0.63 | | | PAG |
| 1010-07 | NE-1010-07-C8 | 6.0 | 10-Feb-20 | 5hj | 728 | 1.56 | | | PAG |
| 1010-07 | NE-1010-07-C9 | 5.8 | 10-Feb-20 | 1aj | 740 | 1.44 | | | PAG |
| 1010-07 | NE-1010-07-C10 | 5.8 | 10-Feb-20 | 1aj | 657 | 1.05 | | | PAG |
| 1010-07 | NE-1010-07-D6 | 5.7 | 10-Feb-20 | 1aj | 495 | 1.17 | | | PAG |
| 1010-07 | NE-1010-07-D7 | 5.7 | 10-Feb-20 | 5hj | 448 | 1.85 | | | PAG |
| 1010-07 | NE-1010-07-D8 | 5.9 | 10-Feb-20 | 1aj | 497 | 1.40 | | | PAG |
| 1010-07 | NE-1010-07-D9 | 5.9 | 10-Feb-20 | 5hj | 571 | 1.67 | | | PAG |
| 1010-07 | NE-1010-07-D10 | 5.9 | 10-Feb-20 | 1aj | 367 | 3.28 | | | PAG |
| 1010-07 | NE-1010-07-Y1 | 6.0 | 10-Feb-20 | 5hj | 525 | 1.23 | | | PAG |
| 1010-07 | NE-1010-07-Y2 | 5.8 | 10-Feb-20 | 1aj | 706 | 2.18 | | | PAG |
| 1010-07 | NE-1010-07-Y3 | 5.8 | 10-Feb-20 | 1aj | 710 | 3.31 | | | PAG |
| 1010-07 | NE-1010-07-Y4 | 5.8 | 10-Feb-20 | 1aj | 750 | 2.95 | | | PAG |
| 1010-07 | NE-1010-07-Y5 | 5.7 | 10-Feb-20 | 1aj | 654 | 2.49 | | | PAG |
| 1010-07 | NE-1010-07-Y7 | 5.8 | 10-Feb-20 | 1a | 817 | 2.53 | | | PAG |
| 1010-07 | NE-1010-07-Y8 | 5.8 | 10-Feb-20 | 1aj | 803 | 2.09 | | | PAG |
| 1010-07 | NE-1010-07-Y9 | 5.9 | 10-Feb-20 | 1aj | 666 | 1.32 | | | PAG |
| 1010-07 | NE-1010-07-Y10 | 5.9 | 10-Feb-20 | 1aj | 727 | 1.31 | | | PAG |
| 1010-07 | NE-1010-07-Y11 | 6.0 | 10-Feb-20 | 1a | 727 | 1.22 | | | PAG |
| 1010-07 | NE-1010-07-Y12 | 6.0 | 10-Feb-20 | 1a | 785 | 2.38 | | | PAG |
| 1010-07 | NE-1010-07-Z1 | 2.2 | 10-Feb-20 | 1a | 734 | 2.00 | | | PAG |
| 1010-07 | NE-1010-07-Z2 | 2.5 | 10-Feb-20 | 1aj | 705 | 2.63 | | | PAG |
| 1010-07 | NE-1010-07-Z3 | 2.5 | 10-Feb-20 | 1a | 862 | 2.10 | | | PAG |
| 1010-07 | NE-1010-07-Z4 | 2.1 | 10-Feb-20 | 5hj | 644 | 1.56 | | | PAG |
| 1010-07 | NE-1010-07-Z6 | 2.6 | 10-Feb-20 | 1aj | 696 | 1.99 | | | PAG |
| | NE-1010-07-Z7 | 2.6 | 10-Feb-20 | 5hj | 644 | 2.05 | | | PAG |
| 1010-07 | NE-1010-07-Z8 | 2.7 | 10-Feb-20 | 1aj | 814 | 1.68 | | | PAG |
| 1010-07 | NE-1010-07-Z9 | 2.8 | 10-Feb-20 | 1aj | 845 | 3.17 | | | PAG |
| 1010-07 | NE-1010-07-Z11 | 3.0 | 10-Feb-20 | 1aj | 954 | 2.05 | | | PAG |
| 1010-07 | NE-1010-07-Z12 | 3.0 | 10-Feb-20 | 1aj | 739 | 1.79 | | | PAG |
| 1010-07 | NE-1010-07-Y13 | 6.0 | 10-Feb-20 | 1aj | 765 | 2.41 | | | PAG |
| 1010-07 | NE-1010-07-Z13 | 2.6 | 10-Feb-20 | 1aj | 576 | 1.10 | | | PAG |
| 1010-07 | NE-1010-07-A9 | 5.8 | 11-Feb-20 | 1a | 592 | 1.54 | | | PAG |
| 1010-07 | NE-1010-07-A10 | 5.9 | 11-Feb-20 | 1aj | 798 | 1.87 | | | PAG |
| 1010-07 | NE-1010-07-A11 | 5.8 | 11-Feb-20 | 1aj | 721 | 1.17 | | | PAG |
| 1010-07 | NE-1010-07-A12 | 5.7 | 11-Feb-20 | 1aj | 733 | 1.54 | | | PAG |
| 1010-07 | NE-1010-07-B9 | 5.9 | 11-Feb-20 | 1ax | 734 | 1.25 | | | PAG |
| 1010-07 | NE-1010-07-B10 | 6.0 | 11-Feb-20 | 5hj | 705 | 1.61 | | | PAG |
| 1010-07 | NE-1010-07-B11 | 5.8 | 11-Feb-20 | 1aj | 846 | 1.12 | | | PAG |
| 1010-07 | NE-1010-07-B12 | 5.8 | 11-Feb-20 | 5hj | 613 | 1.44 | | | PAG |
| 1010-07 | NE-1010-07-C11 | 5.8 | 11-Feb-20 | 5hj | 621 | 1.49 | | | PAG |
| 1010-07 | NE-1010-07-C12 | 5.7 | 11-Feb-20 | 5hj | 589 | 0.83 | | | PAG |
| 1010-07 | NE-1010-07-D11 | 5.8 | 11-Feb-20 | 5hj | 649 | 2.09 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1010-07 | NE-1010-07-D12 | 5.7 | 11-Feb-20 | 1aj | 467 | 4.00 | | | PAG |
| | NE-1010-07-E8 | 6.7 | 11-Feb-20 | 5hj | 177 | 0.83 | | | PAG |
| 1010-07 | NE-1010-07-E10 | 6.1 | 11-Feb-20 | 5hj | 431 | 0.53 | | | PAG |
| 1010-07 | NE-1010-07-E11 | 6.0 | 11-Feb-20 | 5hj | 442 | 1.53 | | | PAG |
| 1010-07 | NE-1010-07-F10 | 6.2 | 11-Feb-20 | 5hj | 707 | 0.58 | | | PAG |
| 1010-07 | NE-1010-07-Y14 | 5.9 | 11-Feb-20 | 1aj | 813 | 1.69 | | | PAG |
| 1010-07 | NE-1010-07-Y15 | 5.7 | 11-Feb-20 | 5aj | 664 | 1.18 | | | PAG |
| 1010-07 | NE-1010-07-Z14 | 2.7 | 11-Feb-20 | 5aj | 460 | 1.06 | | | PAG |
| 1010-08 | NE-1010-08-A13 | 5.7 | 11-Feb-20 | 1ax | 595 | 1.15 | | | PAG |
| 1010-08 | NE-1010-08-B13 | 5.8 | 11-Feb-20 | 1ay | 709 | 0.99 | | | PAG |
| 1010-08 | NE-1010-08-C13 | 5.8 | 11-Feb-20 | 1aj | 622 | 1.31 | | | PAG |
| 1010-08 | NE-1010-08-C14 | 5.8 | 11-Feb-20 | 5hj | 575 | 1.04 | | | PAG |
| 1010-08 | NE-1010-08-D13 | 5.8 | 11-Feb-20 | 1a | 587 | 2.76 | | | PAG |
| 1010-08 | NE-1010-08-D14 | 6.0 | 11-Feb-20 | 1aj | 550 | 4.69 | | | PAG |
| 1010-08 | NE-1010-08-Y16 | 5.7 | 11-Feb-20 | 1a | 939 | 1.70 | | | PAG |
| 1010-08 | NE-1010-08-Y17 | 5.7 | 11-Feb-20 | 5hj | 589 | 0.88 | | | PAG |
| 1010-08 | NE-1010-08-Y18 | 5.5 | 11-Feb-20 | 1ax | 543 | 1.74 | | | PAG |
| 1010-08 | NE-1010-08-Z15 | 2.5 | 11-Feb-20 | 5hj | 484 | 0.92 | | | PAG |
| | NE-1010-08-Z16 | 3.1 | 11-Feb-20 | 5hj | 243 | 0.81 | | | PAG |
| 1010-08 | NE-1010-08-Z17 | 3.2 | 11-Feb-20 | 5hj | 387 | 1.09 | | | PAG |
| 1010-08 | NE-1010-08-Z18 | 2.6 | 11-Feb-20 | 1ax | 609 | 1.15 | | | PAG |
| 1010-07 | NE-1010-07-A8 | 6.0 | 12-Feb-20 | 1aj | 744 | 1.36 | | | PAG |
| 1010-07 | NE-1010-07-B8 | 5.9 | 12-Feb-20 | 1aj | 695 | 1.69 | | | PAG |
| 1010-07 | NE-1010-07-E12 | 6.0 | 12-Feb-20 | 1aj | 345 | 2.69 | | | PAG |
| 1010-07 | NE-1010-07-F11 | 6.4 | 12-Feb-20 | 5hj | 571 | 0.55 | | | PAG |
| 1010-07 | NE-1010-07-F12 | 6.4 | 12-Feb-20 | 1aj | 208 | 0.71 | | | PAG |
| 1010-08 | NE-1010-08-A14 | 5.7 | 12-Feb-20 | 5hj | 445 | 0.92 | | | PAG |
| 1010-08 | NE-1010-08-A15 | 5.6 | 12-Feb-20 | 5hj | 423 | 0.73 | | | PAG |
| 1010-08 | NE-1010-08-A16 | 5.5 | 12-Feb-20 | 1aj | 252 | 0.58 | | | PAG |
| 1010-08 | NE-1010-08-A17 | 5.5 | 12-Feb-20 | 1aj | 338 | 0.66 | | | PAG |
| 1010-08 | NE-1010-08-A18 | 5.6 | 12-Feb-20 | 5hj | 432 | 0.48 | | | PAG |
| 1010-08 | NE-1010-08-B14 | 5.8 | 12-Feb-20 | 5hj | 566 | 0.74 | | | PAG |
| 1010-08 | NE-1010-08-B15 | 5.7 | 12-Feb-20 | 5hj | 468 | 0.93 | | | PAG |
| 1010-08 | NE-1010-08-B16 | 5.7 | 12-Feb-20 | 5hj | 176 | 0.70 | | | PAG |
| 1010-08 | NE-1010-08-B17 | 5.7 | 12-Feb-20 | 1aj | 327 | 0.59 | | | PAG |
| 1010-08 | NE-1010-08-B18 | 5.8 | 12-Feb-20 | 1a | 415 | 0.85 | | | PAG |
| 1010-08 | NE-1010-08-B19 | 5.9 | 12-Feb-20 | 1a | 550 | 1.07 | | | PAG |
| 1010-08 | NE-1010-08-C15 | 5.8 | 12-Feb-20 | 5hj | 466 | 0.99 | | | PAG |
| 1010-08 | NE-1010-08-C16 | 5.8 | 12-Feb-20 | 1aj | 301 | 1.29 | | | PAG |
| 1010-08 | NE-1010-08-C17 | 5.8 | 12-Feb-20 | 1a | 560 | 0.94 | | | PAG |
| 1010-08 | NE-1010-08-C18 | 5.8 | 12-Feb-20 | 1a | 359 | 2.55 | | | PAG |
| 1010-08 | NE-1010-08-D16 | 6.0 | 12-Feb-20 | 1aj | 413 | 4.37 | | | PAG |
| 1010-08 | NE-1010-08-D17 | 6.0 | 12-Feb-20 | 1aj | 366 | 2.71 | | | PAG |
| 1010-08 | NE-1010-08-E13 | 6.1 | 12-Feb-20 | 1aj | 451 | 1.55 | | | PAG |
| 1010-08 | NE-1010-08-E14 | 6.2 | 12-Feb-20 | 1aj | 345 | 0.66 | | | PAG |
| 1010-08 | NE-1010-08-E15 | 6.1 | 12-Feb-20 | 1ax | 958 | 0.86 | | | PAG |
| 1010-08 | NE-1010-08-E16 | 6.2 | 12-Feb-20 | 1ax | 828 | 0.62 | | | PAG |
| 1010-08 | NE-1010-08-E17 | 6.2 | 12-Feb-20 | 1aj | 648 | 0.62 | | | PAG |
| 1010-08 | NE-1010-08-F13 | 6.4 | 12-Feb-20 | 1aj | 169 | 2.25 | | | PAG |
| 1010-08 | NE-1010-08-F14 | 6.3 | 12-Feb-20 | 1aj | 167 | 2.94 | | | PAG |
| 1010-08 | NE-1010-08-F15 | 6.2 | 12-Feb-20 | 1a | 235 | 1.57 | | | PAG |
| 1010-08 | NE-1010-08-Y19 | 5.5 | 12-Feb-20 | 1a | 192 | 0.57 | | | PAG |
| 1010-08 | NE-1010-08-Y20 | 5.4 | 12-Feb-20 | 1aj | 423 | 0.80 | | | PAG |
| 1010-08 | NE-1010-08-Y21 | 5.5 | 12-Feb-20 | 5hj | 499 | 0.78 | | | PAG |
| 1010-08 | NE-1010-08-Y22 | 5.6 | 12-Feb-20 | 1aj | 193 | 0.43 | | | PAG |
| 1010-08 | NE-1010-08-Y23 | 5.8 | 12-Feb-20 | 1aj | 204 | 0.62 | | | PAG |
| 1010-08 | NE-1010-08-Z19 | 2.4 | 12-Feb-20 | 1aj | 519 | 1.10 | | | PAG |
| 1010-08 | NE-1010-08-Z20 | 2.5 | 12-Feb-20 | 1aj | 292 | 0.58 | | | PAG |
| 1010-08 | NE-1010-08-Z22 | 2.4 | 12-Feb-20 | 1aj | 211 | 0.50 | | | PAG |
| 1010-08 | NE-1010-08-Z23 | 2.7 | 12-Feb-20 | 1aj | 412 | 0.66 | | | PAG |
| 1010-06 | NE-1010-06-B20 | 5.9 | 12-Feb-20 | 1a | 534 | 1.09 | | | PAG |
| 1010-08 | NE-1010-08-D15 | 6.0 | 13-Feb-20 | 1a | 457 | 4.86 | | | PAG |
| 1010-08 | NE-1010-08-D18 | 6.1 | 13-Feb-20 | 1aj | 349 | 4.01 | | | PAG |
| 1010-08 | NE-1010-08-D19 | 6.0 | 13-Feb-20 | 1a | 451 | 3.51 | | | PAG |
| 1010-08 | NE-1010-08-E18 | 6.3 | 13-Feb-20 | 1aj | 582 | 0.52 | | | PAG |
| 1010-08 | NE-1010-08-E19 | 6.2 | 13-Feb-20 | 1aj | 482 | 2.09 | | | PAG |
| 1010-08 | NE-1010-08-F16 | 6.2 | 13-Feb-20 | 1ax | 679 | 0.86 | | | PAG |
| 1010-08 | NE-1010-08-F17 | 6.3 | 13-Feb-20 | 1aj | 619 | 0.95 | | | PAG |
| 1010-08 | NE-1010-08-A19 | 5.9 | 13-Feb-20 | 1aj | 498 | 0.61 | | | PAG |
| 1010-08 | NE-1010-08-Y24 | 5.9 | 13-Feb-20 | 1a | 514 | 0.63 | | | PAG |
| 1010-06 | NE-1010-06-Y25 | 5.9 | 13-Feb-20 | 1aj | 300 | 0.57 | | | PAG |
| 1010-06 | NE-1010-06-Y26 | 5.9 | 13-Feb-20 | 1aj | 443 | 0.69 | | | PAG |
| 1010-06 | NE-1010-06-Y27 | 5.9 | 13-Feb-20 | 1aj | 606 | 0.72 | | | PAG |
| 1010-06 | NE-1010-06-Z24 | 2.7 | 13-Feb-20 | 5hj | 304 | 0.52 | | | PAG |
| 1010-06 | NE-1010-06-Z25 | 2.5 | 13-Feb-20 | 1aj | 478 | 0.49 | | | PAG |
| 1010-06 | NE-1010-06-Z27 | 2.4 | 13-Feb-20 | 1aj | 484 | 0.51 | | | PAG |
| 1010-06 | NE-1010-06-Z28 | 2.4 | 13-Feb-20 | 1aj | 546 | 0.58 | | | PAG |
| 1010-06 | NE-1010-06-Z29 | 2.4 | 13-Feb-20 | 1aj | 513 | 0.58 | | | PAG |
| | NE-1010-06-A20 | 6.4 | 13-Feb-20 | 1a | 356 | 0.70 | | | PAG |
| 1010-06 | NE-1010-06-A21 | 5.9 | 13-Feb-20 | 1aj | 511 | 0.49 | | | PAG |
| 1010-06 | NE-1010-06-A22 | 6.0 | 13-Feb-20 | 1aj | 563 | 0.90 | | | PAG |
| 1010-06 | NE-1010-06-A23 | 5.9 | 14-Feb-20 | 1aj | 710 | 1.21 | | | PAG |
| 1010-06 | NE-1010-06-A24 | 5.9 | 14-Feb-20 | 5hj | 616 | 1.19 | | | PAG |
| 1010-06 | NE-1010-06-A25 | 5.9 | 14-Feb-20 | 1aj | 422 | 1.05 | | | PAG |
| 1010-06 | NE-1010-06-A26 | 5.9 | 14-Feb-20 | 1aj | 448 | 0.77 | | | PAG |
| 1010-06 | NE-1010-06-A27 | 6.0 | 14-Feb-20 | 1aj | 684 | 0.76 | | | PAG |
| 1010-06 | NE-1010-06-B21 | 5.9 | 14-Feb-20 | 5hj | 606 | 1.33 | | | PAG |
| 1010-06 | NE-1010-06-B22 | 6.0 | 14-Feb-20 | 1aj | 453 | 1.59 | | | PAG |
| 1010-06 | NE-1010-06-B23 | 6.0 | 14-Feb-20 | 1aj | 486 | 1.75 | | | PAG |
| 1010-06 | NE-1010-06-B24 | 5.9 | 14-Feb-20 | 5hj | 466 | 2.12 | | | PAG |
| 1010-06 | NE-1010-06-B25 | 6.0 | 14-Feb-20 | 1aj | 373 | 1.98 | | | PAG |
| 1010-06 | NE-1010-06-B26 | 6.0 | 14-Feb-20 | 1aj | 436 | 1.57 | | | PAG |
| 1010-08 | NE-1010-08-C19 | 5.9 | 14-Feb-20 | 1aj | 528 | 3.41 | | | PAG |
| 1010-06 | NE-1010-06-C20 | 5.9 | 14-Feb-20 | 1aj | 376 | 4.79 | | | PAG |
| 1010-06 | NE-1010-06-C21 | 5.9 | 14-Feb-20 | 5hj | 254 | 1.57 | | | PAG |
| 1010-06 | NE-1010-06-C22 | 5.9 | 14-Feb-20 | 1aj | 447 | 1.56 | | | PAG |
| 1010-06 | NE-1010-06-C23 | 6.0 | 14-Feb-20 | 5hj | 377 | 1.52 | | | PAG |
| 1010-06 | NE-1010-06-D20 | 6.0 | 14-Feb-20 | 1aj | 382 | 4.22 | | | PAG |
| 1010-06 | NE-1010-06-D21 | 6.0 | 14-Feb-20 | 1aj | 333 | 2.65 | | | PAG |
| 1010-06 | NE-1010-06-D22 | 6.0 | 14-Feb-20 | 12qd | 163 | 1.99 | | | PAG |
| 1010-06 | NE-1010-06-D23 | 5.9 | 14-Feb-20 | 12qd | 114 | 2.08 | | | PAG |
| 1010-06 | NE-1010-06-E20 | 6.2 | 14-Feb-20 | 1aj | 808 | 2.02 | | | PAG |

| Blast Name | Hole ID (New name) | Depth | Date Sampled | Rock Type | Arsenic (Calibrated) ppm | Sulphur (Calibrated) % | Carbon (Assay) % | Sulphur (Assay) % | TMAC Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1010-06 | NE-1010-06-E21 | 6.1 | 14-Feb-20 | 1aj | 577 | 1.93 | | | PAG |
| 1010-06 | NE-1010-06-E22 | 6.0 | 14-Feb-20 | 5hj | 190 | 3.41 | | | PAG |
| 1010-08 | NE-1010-08-F18 | 6.4 | 14-Feb-20 | 1as | 600 | 0.50 | | | PAG |
| 1010-08 | NE-1010-08-F19 | 6.3 | 14-Feb-20 | 5a | 353 | 1.70 | | | PAG |
| 1010-06 | NE-1010-06-F20 | 6.2 | 14-Feb-20 | 5hj | 175 | 1.31 | | | PAG |
| 1010-06 | NE-1010-06-F21 | 6.2 | 14-Feb-20 | 5hj | 209 | 1.19 | | | PAG |
| 1010-06 | NE-1010-06-F22 | 6.1 | 14-Feb-20 | 1aj | 257 | 1.22 | | | PAG |
| 1010-08 | NE-1010-08-G15 | 6.2 | 14-Feb-20 | 1a | 87 | 0.72 | | | PAG |
| 1010-08 | NE-1010-08-G16 | 6.3 | 14-Feb-20 | 5hj | 120 | 1.09 | | | PAG |
| 1010-08 | NE-1010-08-G17 | 6.3 | 14-Feb-20 | 5hj | 374 | 1.24 | | | PAG |
| 1010-08 | NE-1010-08-G18 | 6.3 | 14-Feb-20 | 5hj | 258 | 1.53 | | | PAG |
| 1010-08 | NE-1010-08-G19 | 6.2 | 14-Feb-20 | 1aj | 130 | 0.91 | | | PAG |
| 1010-06 | NE-1010-06-Y28 | 5.9 | 14-Feb-20 | 1as | 493 | 0.76 | | | PAG |
| 1010-06 | NE-1010-06-Y29 | 5.9 | 14-Feb-20 | 1as | 466 | 0.82 | | | PAG |
| 1010-06 | NE-1010-06-Y30 | 5.9 | 14-Feb-20 | 1as | 669 | 1.05 | | | PAG |
| 1010-06 | NE-1010-06-Y31 | 5.9 | 14-Feb-20 | 1as | 675 | 1.03 | | | PAG |
| 1010-06 | NE-1010-06-Y32 | 5.8 | 14-Feb-20 | 1aj | 614 | 0.99 | | | PAG |
| 1010-06 | NE-1010-06-Y33 | 5.8 | 14-Feb-20 | 1aj | 613 | 1.13 | | | PAG |
| 1010-06 | NE-1010-06-Y34 | 5.8 | 14-Feb-20 | 1aj | 584 | 0.81 | | | PAG |
| 1010-06 | NE-1010-06-Z31 | 2.4 | 14-Feb-20 | 1as | 560 | 0.83 | | | PAG |
| 1010-06 | NE-1010-06-Z32 | 2.2 | 14-Feb-20 | 12qd | 395 | 0.79 | | | PAG |
| 1010-06 | NE-1010-06-Z33 | 6.0 | 14-Feb-20 | 5hj | 445 | 0.73 | | | PAG |
| 1010-07 | NE-1010-07-C5 | 5.7 | 15-Feb-20 | 1aj | 390 | 0.81 | | | PAG |
| 1010-07 | NE-1010-07-C6 | 5.7 | 15-Feb-20 | 1aj | 217 | 0.62 | | | PAG |
| 1010-06 | NE-1010-06-C24 | 6.0 | 15-Feb-20 | 1aj | 352 | 1.45 | | | PAG |
| 1010-06 | NE-1010-06-C25 | 6.0 | 15-Feb-20 | 5aj | 374 | 3.23 | | | PAG |
| 1010-06 | NE-1010-06-C26 | 6.0 | 15-Feb-20 | 1aj | 308 | 2.00 | | | PAG |
| 1010-06 | NE-1010-06-D24 | 6.0 | 15-Feb-20 | 5aj | 183 | 3.61 | | | PAG |
| 1010-06 | NE-1010-06-D25 | 6.0 | 15-Feb-20 | 5aj | 357 | 8.06 | | | PAG |
| 1010-06 | NE-1010-06-D26 | 6.0 | 15-Feb-20 | 1aj | 219 | 3.68 | | | PAG |
| 1010-06 | NE-1010-06-E23 | 5.9 | 15-Feb-20 | 5hj | 204 | 1.96 | | | PAG |
| 1010-06 | NE-1010-06-E24 | 5.9 | 15-Feb-20 | 1aj | 364 | 5.13 | | | PAG |
| 1010-06 | NE-1010-06-E25 | 5.9 | 15-Feb-20 | 5hj | 380 | 4.40 | | | PAG |
| 1010-06 | NE-1010-06-F23 | 6.0 | 15-Feb-20 | 1aj | 265 | 2.67 | | | PAG |
| 1010-06 | NE-1010-06-F24 | 6.0 | 15-Feb-20 | 1aj | 408 | 2.27 | | | PAG |
| 1010-06 | NE-1010-06-F25 | 5.9 | 15-Feb-20 | 1aj | 426 | 4.93 | | | PAG |
| 1010-06 | NE-1010-06-G20 | 6.3 | 15-Feb-20 | 1aj | 83 | 0.73 | | | PAG |
| 1010-06 | NE-1010-06-G21 | 6.2 | 15-Feb-20 | 1aj | 93 | 0.54 | | | PAG |
| 1010-06 | NE-1010-06-G22 | 6.2 | 15-Feb-20 | 1aj | 168 | 0.52 | | | PAG |
| 1010-06 | NE-1010-06-G23 | 6.0 | 15-Feb-20 | 1aj | 661 | 0.93 | | | PAG |
| 1010-06 | NE-1010-06-G24 | 5.9 | 15-Feb-20 | 1aj | 803 | 1.01 | | | PAG |
| 1010-06 | NE-1010-06-G25 | 5.8 | 15-Feb-20 | 5hj | 535 | 2.32 | | | PAG |
| 1010-06 | NE-1010-06-G26 | 5.7 | 15-Feb-20 | 5aj | 632 | 1.26 | | | PAG |
| 1010-06 | NE-1010-06-H20 | 6.3 | 15-Feb-20 | 1a | 32 | 0.51 | 1.7 | 0.3 | NAG |
| 1010-06 | NE-1010-06-H21 | 6.2 | 15-Feb-20 | 1a | 33 | 0.71 | 2.1 | 0.4 | NAG |
| 1010-06 | NE-1010-06-H22 | 6.1 | 15-Feb-20 | 1aj | 115 | 0.59 | | | PAG |
| 1010-06 | NE-1010-06-H23 | 6.0 | 15-Feb-20 | 1as | 677 | 0.72 | | | PAG |
| 1010-06 | NE-1010-06-H24 | 5.9 | 15-Feb-20 | 1as | 852 | 0.68 | | | PAG |
| 1010-06 | NE-1010-06-H25 | 5.8 | 15-Feb-20 | 1as | 847 | 0.84 | | | PAG |
| 1010-06 | NE-1010-06-H26 | 5.8 | 15-Feb-20 | 1as | 922 | 1.28 | | | PAG |
| 1010-06 | NE-1010-06-I23 | 6.0 | 15-Feb-20 | 5aj | 118 | 0.89 | | | PAG |
| 1010-06 | NE-1010-06-I24 | 5.9 | 15-Feb-20 | 1aj | 485 | 1.15 | | | PAG |
| 1010-06 | NE-1010-06-I25 | 5.8 | 15-Feb-20 | 1aj | 710 | 1.00 | | | PAG |
| 1010-06 | NE-1010-06-I26 | 5.8 | 15-Feb-20 | 1aj | 612 | 1.10 | | | PAG |
| | NE-1034-25-D5 | | 13-Mar-20 | 1as | 21 | 0.39 | | | NAG |
| | NE-1034-25-D7 | | 13-Mar-20 | 1aj | 17 | 0.37 | | | PAG |
| | NE-1034-25-F6 | | 13-Mar-20 | 1aj | 23 | 0.43 | | | PAG |
| | NE-1034-25-F8 | | 13-Mar-20 | 1aj | 18 | 0.42 | | | PAG |
| | NE-1034-25-F10 | | 13-Mar-20 | 1as | 29 | 0.62 | | | NAG |
| | NE-1034-25-H7 | | 13-Mar-20 | 1aj | 22 | 0.61 | | | PAG |
| | NE-1034-25-H9 | | 13-Mar-20 | 1as | 19 | 0.40 | | | NAG |
| | NE-1034-25-D2 | | 14-Mar-20 | 1as | 19 | 0.55 | | | NAG |
| | NE-1034-25-E4 | | 14-Mar-20 | 1as | 17 | 0.31 | | | NAG |
| | NE-1034-25-F2 | | 14-Mar-20 | 1as | 18 | 0.31 | | | NAG |
| | NE-1034-25-G4 | | 14-Mar-20 | 1as | 31 | 0.47 | | | NAG |
| | NE-1034-25-G11 | | 14-Mar-20 | 1as | 40 | 0.44 | | | NAG |
| | NE-1034-25-G13 | | 14-Mar-20 | 1a | 16 | 0.38 | | | NAG |
| | NE-1034-25-H11 | | 14-Mar-20 | 1as | 78 | 0.59 | | | PAG |
| | NE-1034-25-H12 | | 14-Mar-20 | 1as | 18 | 0.47 | | | NAG |
| | NE-1034-25-H15 | | 14-Mar-20 | 1as | 15 | 0.42 | | | NAG |
| | NE-1034-25-C3 | | 15-Mar-20 | 1as | 44 | 0.62 | | | NAG |
| | NE-1034-25-C10 | | 15-Mar-20 | 1as | 26 | 0.42 | | | NAG |
| | NE-1034-25-D10 | | 15-Mar-20 | 1a | 46 | 0.43 | | | NAG |
| | NE-1034-25-D12 | | 15-Mar-20 | 1a | 25 | 0.44 | | | NAG |
| | NE-1034-25-E12 | | 15-Mar-20 | 1a | 36 | 0.49 | | | NAG |
| | NE-1034-25-I6 | | 15-Mar-20 | 1as | 17 | 0.77 | | | NAG |
| | NE-1034-25-I10 | | 15-Mar-20 | 1as | 16 | 0.40 | | | NAG |
| | NE-1034-25-I14 | | 15-Mar-20 | 1a | 15 | 0.43 | | | NAG |
| | NE-1034-25-K10 | | 15-Mar-20 | 15c | 15 | 0.29 | 0.5 | 0.1 | NAG |
| | NE-1034-25-M10 | | 15-Mar-20 | 15c | 12 | 0.33 | | | NAG |
| | NE-1034-25-M12 | | 15-Mar-20 | 15c | 13 | 0.35 | | | NAG |
| | NE-1034-25-N9 | | 15-Mar-20 | 15c | 12 | 0.36 | | | NAG |

# Attachment 3 Geochemical Data, Waste Rock Samples from Madrid North WRSA

| Sample ID | Sample Location | Material Source Area | Sample Type | Dominant Rock Type | Easting | Northing | Sampling Rationale | Sulphid | Sulph % | Fizz Test (Groundmass) | Fizz Test on Carbonate +- Quartz Veins | Carbonate Color | Carbonate Occurrence | Weathering Intensity | Secondary Min | Color of -2mm Fraction | Rock Types | Geological Description | Rinse pH | Rinse EC (uS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-MAD-01 | WR Stockpile | CPR or UG | WR | 1a | 433146 | 7549918 | Characterize oxidized PAG waste rock | Pyrite | 0.005 | None | Weak | salmon | vein | weak - strong | FeOx | reddish grey | 1a>1as>chert (5h)>oxide | Greyish green to red mix of weakly foliated greenstone (45%) (mafic metavolcanics; 1a) which contains abundant <1cm quartz carbonate veins with 0.5% vein hosted pyrite, 35% moderately to strongly pervasively sericite altered mafic metavolcanics (1as) which contains <0.5cm stockwork quartz veins with 0.5% vein hosted pyrite, 15% sediments (chert;) which contain trace pyrite, 5% strongly pervasively oxidized 1a which contains ~1% disseminated pyrite. | 8.7 | 275 |
| 20-MAD-02 | WR Stockpile | CPR or UG | WR | 1a | 433133 | 7549945 | Characterize oxidized PAG waste rock | Pyrite | 0.015 | None | | | | weak - strong | FeOx | reddish | 1a>1as>oxide | Greyish tan to red mix of 50% 1a which contains up to 2% fine to medium grained disseminated pyrite, 40% 1as which contains 10% <1cm stockwork quartz veins with vein hosted fine to medium grained pyrite, and 10% pervasively oxidized and crumbly oxide | 8.8 | 363 |
| 20-MAD-05 | WR Stockpile | CPR or UG | WR | 1a | 433104 | 7549945 | Characterize oxidized PAG waste rock | Pyrite | 0.02 | None | | | | weak - strong | FeOx | grey green to dark red | 1a>1as>oxide | Chlorite green to tan colored mix of 1a (75%) which contains up to 2% disseminated pyrite, 13% 1as with 10-15% stockwork quartz veins and up to 2% disseminated pyrite, and 2% oxide which was originally either 1a or 1as. | 8.9 | 245 |
| 20-MAD-06 | WR Stockpile | CPR or UG | WR | 1a | 433028 | 7549986 | Characterize madrid N NAG waste rock | Pyrite | 0.01 | None | Strong | white | vein | weak - strong | FeOx | slight reddish grey | 1a>1as>oxide | Chlorite green to tan colored mix of 1a (90%) which contains up to 2% disseminated pyrite and frequent qtz-calcite veinlets, 9% 1as with 10-15% stockwork quartz veins with chlorite selvages and up to 1% vein hosted pyrite, and 1% oxide with strong pervasive oxidation which has overprinted original lithologies. | 8.4 | 593 |
| 20-MAD-08 | WR Stockpile | CPR or UG | WR | 1a | 433097 | 7550021 | Characterize madrid N NAG waste rock | Pyrite | 0.005 | None | Moderate | white | vein | weak - moderate | FeOx | grey | 1a>1as | Dark grey to tan colored mix of 1a (90%) which contains <2% qtz-calcite veins with vein hosted pyrite and trace chalcopyrite and has weak fracture coating oxidation and 1as (10%) which contains infrequent quartz veins with trace vein hosted pyrite and weak to moderate fracture coating iron oxidation. | 7.8 | 5.0 |
| 20-MAD-10 | WR Stockpile | CPR or UG | WR | 1a | 433048 | 7550064 | Characterize madrid N NAG waste rock | Pyrite | trace | None | Strong | white | vein | none - weak | FeOx | grey | 1a | Dark grey to chlorite green colored weakly foliated greenstone (1a) which is bisected by frequent quartz-calcite veinlets which have mod-strong fizz. Trace finely disseminated pyrite. No oxidation of groundmass, weak fracture coating oxidation. | 8.2 | 1018 |
| 20-MAD-12 | WR Stockpile | CPR or UG | WR | 1a | 433001 | 7550023 | Characterize madrid N NAG waste rock | Pyrite | 0.005 | None | Moderate | white | vein | weak | FeOx | grey | 1a>1as>gabbro | Dark green to tan colored mix of 1a (90%) which contains trace finely disseminated pyrite and frequent quartz-carbonate veinlets, 1as (9%) which contains <5% stockwork quartz veining, no fizz, and trace to 1% local disseminated and vein hosted pyrite, and gabbro (1%) which consists of a medium grained, massive textured, plagioclase and actinolyte phyric intrusive in a light grey very fine grained groundmass - no fizz or sulphides. | 8.0 | 1845 |
| 20-MAD-13 | WR Stockpile | CPR or UG | WR | 1a | 432978 | 7550076 | Characterize madrid N NAG waste rock | Pyrite | 0.005 | None | Moderate | white | vein | weak | FeOx | grey | 1a>1as>gabbro>12 | Dark green to tan colored mix of 1a (89%) which contains trace finely disseminated pyrite and frequent quartz-carbonate veinlets, 1as (9%) which contains <5% stockwork quartz veining, no fizz, and trace to 1% local disseminated and vein hosted pyrite, gabbro (1%) which consists of a medium grained, massive textured, plagioclase and actinolyte phyric intrusive in a light grey very fine grained groundmass - no fizz or sulphides, and quartz vein (12) which consists of milky quartz with finely disseminated pyrite and chlorite inclusions. | 8.9 | 137 |
| 20-MAD-14 | WR Stockpile | CPR or UG | WR | 1a | 432998 | 7550119 | Characterize madrid N NAG waste rock | Pyrite | 0.005 | Weak | Weak | white | vein | weak - strong | FeOx | grey | 1a>1as>siltstone>12>oxide>gabbro | Dark green to tan to red colored homogenous mix of all rock types identified on the waste rock pile. 50% 1a with weak-moderate fizz and finely disseminated trace to 1% pyrite, 40% 1as with stockwork quartz veins, no fizz, and <1% vein hosted pyrite, trace gabbro, black massive textured silicified siltsone with finely disseminated pyrite and no fizz, trace quartz vein fragments, and 1% oxide material. | 8.8 | 309 |
| 20-MAD-03 | WR Stockpile | CPR or UG | WR | 1as | 433118 | 7549930 | Characterize oxidized PAG waste rock | Pyrite | 0.03 | None | | | | weak -strong | FeOx | reddish to dark red | 1as>1a>chert (5h)>oxide | Tan to rusty red colored mix of 1as (70%) with 10-15% stockwork quartz veins and up to 4% disseminated pyrite and trace chalcopyrite, 35% 1a with up to 3% finely disseminated pyrite, 2% chert (5h) with 1% disseminated pyrite, and 3% oxide | 7.7 | 586 |
| 20-MAD-04 | WR Stockpile | CPR or UG | WR | 1as | 433098 | 7549904 | Characterize oxidized PAG waste rock | Pyrite | 0.02 | None | | | | weak -strong | FeOx | grey to slight red | 1as>1a>oxide | Tan to rusty red colored mix of 1as (85%) with 10-15% stockwork quartz veins and up to 2% disseminated pyrite, 13% 1a with up to 2% finely disseminated pyrite, and 2% oxide with weathering intensity so intense that original lithology is unidentifyable | 8.7 | 540 |
| 20-MAD-07 | WR Stockpile | CPR or UG | WR | 1as | 433101 | 7549997 | Characterize madrid N NAG waste rock | Pyrite | 0.02 | None | Weak | white | vein | weak - strong | FeOx | reddish grey | 1as>1a>oxide | Tan to rusty red colored mix of 1as (80%) with 15% 0.5 to 10cm stockwork quartz veins which contain trace to locally 2% pyrite and weak to strong fracture coating oxidation, 1a (18%) that is chloritic green with no surficial oxidation and contains <0.5 finely disseminated pyrite and has weak fizz on occasional quartz-calcite veinlets, and oxide (2%) that is red to dark red and pervasively oxidized and crumbly. | 8.8 | 234 |
| 20-MAD-09 | WR Stockpile | CPR or UG | WR | 1as | 433077 | 7550094 | Characterize madrid N NAG waste rock | Pyrite | 0.01 | None | Weak | white | vein | weak - strong | FeOx | grey/brown | 1as>1a>oxide>12 | Dark grey-green to tan to oxidized red colored mix of 1as (58%) with stockwork quartz veins and vein hosted pyrite (no fizz), 1a (40%) with 1% finely disseminated pyrite and moderate fizz on calcite veinlets, pervasively oxidized oxide (2%), and trace quartz vein (12) with fine-mediumly disseminated pyrite. | 8.7 | 421 |

| Sample ID | Paste pH | Total S | Total S_seds | $SO_4$ | Sulphide Sulphur (by diff.) | AP - Tot S | AP - S2 | Fizz Rating | $CO_2$ | TIC | Mod NP | TIC/AP TotS | NP/AP TotS | TIC/AP S2 | NP/AP S2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Units | wt% | | wt% | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | Tot S | Tot S | S2 | S2 |
| 20-MAD-01 | 8.6 | 1.0 | 1.0 | 0.01 | 1.0 | 31 | 31 | STRONG | 15 | 340 | 331 | 11 | 11 | 11 | 11 |
| 20-MAD-02 | 8.8 | 1.2 | #N/A | -0.01 | 1.2 | 38 | 38 | STRONG | 16 | 356 | 325 | 9.3 | 8.5 | 9.3 | 8.5 |
| 20-MAD-05 | 8.9 | 1.0 | #N/A | -0.01 | 1.0 | 30 | 30 | STRONG | 16 | 357 | 291 | 12 | 10 | 12 | 10 |
| 20-MAD-06 | 8.7 | 0.90 | #N/A | 0.01 | 0.89 | 28 | 28 | STRONG | 15 | 349 | 275 | 12 | 10 | 13 | 10 |
| 20-MAD-08 | 7.7 | 0.36 | #N/A | 0.02 | 0.34 | 11 | 11 | STRONG | 9.0 | 204 | 210 | 18 | 19 | 19 | 20 |
| 20-MAD-10 | 8.6 | 0.28 | #N/A | 0.08 | 0.20 | 8.8 | 6.3 | STRONG | 10 | 219 | 244 | 25 | 28 | 35 | 39 |
| 20-MAD-12 | 8.6 | 0.29 | #N/A | 0.03 | 0.26 | 9.1 | 8.1 | STRONG | 10 | 221 | 234 | 24 | 26 | 27 | 29 |
| 20-MAD-13 | 8.5 | 0.33 | #N/A | 0.02 | 0.31 | 10 | 10 | STRONG | 6.9 | 158 | 178 | 15 | 17 | 16 | 18 |
| 20-MAD-14 | 8.7 | 0.58 | #N/A | 0.01 | 0.57 | 18 | 18 | STRONG | 11 | 258 | 243 | 14 | 13 | 14 | 14 |
| 20-MAD-03 | 8.9 | 0.93 | 0.9 | -0.01 | 0.93 | 29 | 29 | STRONG | 18 | 411 | 328 | 14 | 11 | 14 | 11 |
| 20-MAD-04 | 8.9 | 0.73 | #N/A | 0.02 | 0.71 | 23 | 22 | STRONG | 13 | 299 | 283 | 13 | 12 | 13 | 13 |
| 20-MAD-07 | 8.9 | 0.35 | #N/A | 0.01 | 0.34 | 11 | 11 | STRONG | 13 | 300 | 270 | 27 | 25 | 28 | 25 |
| 20-MAD-09 | 8.7 | 0.69 | #N/A | 0.01 | 0.68 | 22 | 21 | STRONG | 13 | 303 | 272 | 14 | 13 | 14 | 13 |

| Sample ID | As | Co | Ni | Zn | Mo | Cu | Pb | Ag | Mn | Fe | U | Au | Th | Sr | Cd | Sb | Bi | V | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm | ppb | ppm | ppm | ppm | ppm | ppm | ppm | % |
| 20-MAD-01 | 397 | 66 | 463 | 32 | 0.7 | 154 | 3 | 0.4 | 1900 | 7.5 | 0.1 | 3210 | 2 | 102 | <0.1 | 0.6 | <0.1 | 111 | 7.4 |
| 20-MAD-02 | 545 | 59 | 427 | 23 | 0.6 | 135 | 2.1 | 0.3 | 1570 | 6.4 | <0.1 | 2320 | 0.7 | 139 | <0.1 | 0.7 | <0.1 | 63 | 7.1 |
| 20-MAD-05 | 542 | 58 | 432 | 27 | 0.9 | 115 | 3.3 | 0.3 | 1530 | # | 0.2 | 1850 | 1.2 | 147 | <0.1 | 0.7 | <0.1 | 62 | 6.7 |
| 20-MAD-06 | 614 | 57 | 436 | 33 | 0.7 | 115 | 2.5 | 0.1 | 1320 | 6.1 | 0.1 | 290 | 1 | 159 | <0.1 | 1.1 | <0.1 | 58 | 6.2 |
| 20-MAD-08 | 160 | 46 | 144 | 62 | 0.4 | 104 | 4.8 | 0.1 | 1270 | 6.3 | <0.1 | 62 | 0.7 | 57 | <0.1 | 0.3 | <0.1 | 127 | 6.9 |
| 20-MAD-10 | 134 | 46 | 103 | 59 | 0.3 | 95 | 2.3 | <0.1 | 1470 | 6.2 | <0.1 | 14 | 0.5 | 50 | <0.1 | 0.2 | <0.1 | 134 | 8.3 |
| 20-MAD-12 | 374 | 48 | 164 | 70 | 0.3 | 132 | 4.7 | 0.2 | 1580 | 6.8 | <0.1 | 154 | 0.5 | 52 | 0.1 | 0.2 | <0.1 | 164 | 8.1 |
| 20-MAD-13 | 369 | 41 | 93.9 | 70 | 0.3 | 153 | 2.5 | 0.1 | 1340 | 5.7 | <0.1 | 190 | 0.3 | 40 | 0.1 | 0.2 | <0.1 | 121 | 6.5 |
| 20-MAD-14 | 228 | 54 | 324 | 51 | 0.7 | 110 | 3.5 | 0.1 | 1580 | 6.3 | 0.2 | 344 | 1.7 | 75 | <0.1 | 0.4 | <0.1 | 110 | 6.0 |
| 20-MAD-03 | 683 | 64 | 521 | 24 | 0.7 | 141 | 2.4 | 0.2 | 1590 | 6.9 | 0.1 | 1130 | 0.7 | 163 | <0.1 | 1.3 | <0.1 | 63 | 7.3 |
| 20-MAD-04 | 229 | 55 | 261 | 61 | 0.3 | 118 | 1.6 | 2 | 1790 | 7.5 | 0.1 | 16200 | 0.9 | 79 | <0.1 | 0.4 | <0.1 | 114 | 6.7 |
| 20-MAD-07 | 275 | 60 | 443 | 38 | 0.4 | 116 | 2 | <0.1 | 1490 | 6.2 | 0.2 | 288 | 1.5 | 109 | <0.1 | 0.4 | <0.1 | 101 | 5.9 |
| 20-MAD-09 | 316 | 64 | 392 | 51 | 0.5 | 152 | 2.1 | <0.1 | 1720 | 7.8 | <0.1 | 326 | 0.7 | 103 | <0.1 | 0.5 | <0.1 | 146 | 6.7 |

| Sample ID | P | La | Cr | Mg | Ba | Ti | B | Al | Na | K | W | Hg | Sc | Tl | S | Ga | Se | Te | Bi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | ppm | ppm | % | ppm | % | ppm | % | % | % | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm |
| 20-MAD-01 | 0.044 | 3 | 271 | 4.35 | 14 | 0.009 | <20 | 1.9 | 0.011 | 0.09 | 0.8 | 0.02 | 18.3 | <0.1 | 0.90 | 6 | <0.5 | <0.2 | <0.1 |
| 20-MAD-02 | 0.029 | 2 | 180 | 4.13 | 9 | 0.004 | <20 | 1.4 | 0.014 | 0.08 | 0.8 | <0.01 | 15.7 | <0.1 | 1.1 | 4 | 0.5 | <0.2 | <0.1 |
| 20-MAD-05 | 0.037 | 5 | 174 | 3.91 | 23 | 0.011 | <20 | 1.1 | 0.019 | 0.12 | 1.2 | <0.01 | 14.4 | <0.1 | 0.85 | 4 | 0.5 | <0.2 | <0.1 |
| 20-MAD-06 | 0.033 | 4 | 127 | 4.11 | 23 | 0.005 | <20 | 1.1 | 0.009 | 0.11 | 0.9 | <0.01 | 11.6 | <0.1 | 0.79 | 4 | <0.5 | 0.3 | <0.1 |
| 20-MAD-08 | 0.032 | 3 | 113 | 3.49 | 15 | 0.037 | <20 | 3.6 | 0.011 | 0.05 | 0.1 | <0.01 | 14.4 | <0.1 | 0.35 | 8 | <0.5 | <0.2 | <0.1 |
| 20-MAD-10 | 0.027 | 2 | 106 | 3.19 | 12 | 0.021 | <20 | 3.9 | 0.01 | 0.05 | <0.1 | <0.01 | 16.3 | <0.1 | 0.25 | 9 | 0.6 | <0.2 | <0.1 |
| 20-MAD-12 | 0.025 | 2 | 158 | 3.28 | 14 | 0.092 | <20 | 3.5 | 0.01 | 0.04 | 0.1 | <0.01 | 17.4 | <0.1 | 0.24 | 9 | 0.5 | <0.2 | <0.1 |
| 20-MAD-13 | 0.023 | 2 | 129 | 2.62 | 10 | 0.119 | <20 | 3.2 | 0.01 | 0.03 | 0.2 | <0.01 | 11.8 | <0.1 | 0.27 | 7 | <0.5 | <0.2 | <0.1 |
| 20-MAD-14 | 0.039 | 7 | 251 | 4.06 | 19 | 0.027 | <20 | 2.5 | 0.023 | 0.11 | 0.2 | <0.01 | 14.7 | <0.1 | 0.49 | 7 | <0.5 | <0.2 | <0.1 |
| 20-MAD-03 | 0.029 | 3 | 133 | 4.44 | 12 | 0.005 | <20 | 1.0 | 0.012 | 0.09 | 1.6 | <0.01 | 15.4 | <0.1 | 0.84 | 3 | <0.5 | 0.3 | <0.1 |
| 20-MAD-04 | 0.048 | 4 | 182 | 4.14 | 12 | 0.02 | <20 | 2.6 | 0.019 | 0.12 | 0.3 | <0.01 | 16.8 | <0.1 | 0.67 | 7 | <0.5 | <0.2 | <0.1 |
| 20-MAD-07 | 0.042 | 7 | 336 | 4.16 | 19 | 0.022 | <20 | 1.8 | 0.018 | 0.11 | 0.3 | <0.01 | 14.3 | <0.1 | 0.30 | 6 | <0.5 | <0.2 | <0.1 |
| 20-MAD-09 | 0.046 | 4 | 252 | 4.35 | 20 | 0.028 | <20 | 2.5 | 0.015 | 0.09 | 0.5 | <0.01 | 19.1 | <0.1 | 0.61 | 8 | 0.5 | <0.2 | <0.1 |

| Sample ID | Sample Weight | Volume Used | pH | EC | SO4 | Acidity to pH4.5 | Acidity to pH8.3 | Total Alkalinity | Bicarbonate | Carbonate | Hydroxide | Dissolved Chloride | Total Ammonia (N) | Nitrate<N | Nitrite<N | Hardness CaCO3 | Dissolved Aluminum (Al) | Dissolved Antimony (Sb) | Dissolved Arsenic (As) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | g | ml | pH Units | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | 250 | 750 | 8.9 | 147 | 28 | <0.5 | <0.5 | 32 | 39 | <0.5 | <0.5 | 2 | 0.047 | <0.2 | <0.05 | 49 | 0.11 | 0.0071 | 1.1 |
| 20-MAD-05 | 250 | 750 | 9.0 | 186 | 39 | <0.5 | <0.5 | 31 | 38 | <0.5 | <0.5 | 9.7 | 0.078 | <0.2 | <0.05 | 43 | 0.098 | 0.0064 | 2.3 |
| 20-MAD-06 | 250 | 750 | 8.8 | 198 | 63 | <0.5 | <0.5 | 24 | 29 | <0.5 | <0.5 | 2.7 | 0.25 | <0.2 | <0.05 | 69 | 0.050 | 0.021 | 3.0 |
| 20-MAD-10 | 150 | 450 | 8.6 | 192 | 15 | <0.5 | <0.5 | 29 | 35 | <0.5 | <0.5 | 22 | 1.3 | 2.7 | <0.05 | 69 | 0.24 | 0.0013 | 0.013 |
| 20-MAD-12 | 250 | 750 | 8.9 | 114 | 17 | <0.5 | <0.5 | 28 | 34 | <0.5 | <0.5 | 4.2 | 0.92 | 0.3 | <0.05 | 43 | 0.2 | 0.0010 | 0.026 |
| 20-MAD-03 | 250 | 750 | 8.9 | 227 | 45 | <0.5 | <0.5 | 34 | 41 | <0.5 | <0.5 | 11 | 0.059 | 0.2 | <0.05 | 50 | 0.086 | 0.015 | 3.5 |
| 20-MAD-04 | 250 | 750 | 9.2 | 226 | 50 | <0.5 | <0.5 | 36 | 44 | <0.5 | <0.5 | 11 | 0.063 | <0.2 | <0.05 | 33 | 0.23 | 0.0034 | 0.70 |
| 20-MAD-09 | 250 | 750 | 9.1 | 178 | 46 | <0.5 | <0.5 | 27 | 32 | <0.5 | <0.5 | 5.3 | 0.17 | <0.2 | <0.05 | 47 | 0.10 | 0.0044 | 0.73 |

| Sample ID | Dissolved Barium (Ba) | Dissolved Beryllium (Be) | Dissolved Bismuth (Bi) | Dissolved Boron (B) | Dissolved Cesium (Cs) | Dissolved Cadmium (Cd) | Dissolved Calcium (Ca) | Dissolved Chromium (Cr) | Dissolved Cobalt (Co) | Dissolved Copper (Cu) | Dissolved Lanthanum (La) | Dissolved Iron (Fe) | Dissolved Lead (Pb) | Dissolved Lithium (Li) | Dissolved Magnesium (Mg) | Dissolved Manganese (Mn) | Dissolved Phosphorus (P) | Dissolved Molybdenum (Mo) | Dissolved Nickel (Ni) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | 0.0075 | <0.00002 | <0.00001 | <0.1 | <0.0001 | <0.00001 | 12 | <0.0002 | 0.0002 | 0.00072 | <0.0001 | 0.011 | <0.00001 | 0.0041 | 4.7 | 0.0033 | 0.014 | 0.0042 | 0.0026 |
| 20-MAD-05 | 0.0052 | <0.00005 | <0.000025 | <0.25 | <0.00025 | <0.000025 | 11 | <0.0005 | 0.00033 | 0.0013 | <0.00025 | 0.025 | <0.000025 | 0.0048 | 3.6 | 0.0026 | 0.022 | 0.0036 | 0.0041 |
| 20-MAD-06 | 0.0061 | <0.00005 | <0.000025 | <0.25 | <0.00025 | <0.000025 | 22 | <0.0005 | 0.00070 | 0.00044 | <0.00025 | 0.0055 | <0.000025 | 0.0056 | 3.3 | 0.0030 | 0.015 | 0.0035 | 0.011 |
| 20-MAD-10 | 0.0015 | <0.00001 | <0.000005 | 0.105 | 0.00027 | <0.000005 | 24 | <0.0001 | 0.00044 | 0.00058 | <0.00005 | 0.021 | 0.000014 | 0.029 | 2.1 | 0.0087 | 0.0085 | 0.0013 | 0.00039 |
| 20-MAD-12 | 0.0047 | <0.00001 | <0.000005 | 0.053 | 0.000179 | <0.000005 | 15 | <0.0001 | 0.00019 | 0.00042 | <0.00005 | 0.0027 | <0.000005 | 0.0036 | 1.5 | 0.0035 | 0.0084 | 0.0016 | 0.00043 |
| 20-MAD-03 | 0.0059 | <0.00005 | <0.000025 | <0.25 | <0.00025 | <0.000025 | 11 | <0.0005 | 0.00042 | 0.00087 | <0.00025 | 0.025 | <0.000025 | 0.0056 | 5.2 | 0.0026 | 0.02 | 0.0052 | 0.0048 |
| 20-MAD-04 | 0.0023 | <0.00002 | <0.00001 | 0.12 | <0.0001 | <0.00001 | 8.2 | 0.00041 | 0.00050 | 0.0022 | <0.0001 | 0.093 | 0.000042 | 0.0038 | 3.1 | 0.0032 | 0.020 | 0.0037 | 0.0029 |
| 20-MAD-09 | 0.0063 | <0.00001 | <0.000005 | 0.097 | 0.000051 | <0.000005 | 14 | 0.00015 | 0.00013 | 0.0024 | <0.00005 | 0.021 | 0.0000062 | 0.0033 | 3.0 | 0.0022 | 0.011 | 0.0036 | 0.0018 |

| Sample ID | Dissolved Potassium (K) | Dissolved Rubidium (Rb) | Dissolved Selenium (Se) | Dissolved Silicon (Si) | Dissolved Silver (Ag) | Dissolved Sodium (Na) | Dissolved Strontium (Sr) | Dissolved Sulphur (S) | Dissolved Tellurium (Te) | Dissolved Thallium (Tl) | Dissolved Thorium (Th) | Dissolved Tin (Sn) | Dissolved Titanium (Ti) | Dissolved Tungsten (W) | Dissolved Uranium (U) | Dissolved Vanadium (V) | Dissolved Zinc (Zn) | Dissolved Zirconium (Zr) | Dissolved Mercury (Hg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | 4.8 | 0.0033 | 0.0024 | 0.94 | <0.00001 | 4.0 | 0.039 | <20 | <0.00004 | <0.000004 | <0.00001 | <0.0004 | <0.001 | 0.0013 | 0.00023 | 0.0041 | 0.0002 | <0.0002 | <0.0001 |
| 20-MAD-05 | 8.8 | 0.0039 | 0.0036 | 1.1 | <0.000025 | 12 | 0.042 | <50 | <0.0001 | <0.00001 | <0.000025 | <0.001 | <0.0025 | 0.0015 | 0.00033 | 0.0061 | 0.0012 | <0.0005 | <0.00025 |
| 20-MAD-06 | 6.8 | 0.0050 | 0.0038 | 0.97 | <0.000025 | 4.1 | 0.055 | <50 | <0.0001 | <0.00001 | <0.000025 | <0.001 | <0.0025 | 0.0017 | 0.00014 | 0.0047 | 0.00082 | <0.0005 | <0.00025 |
| 20-MAD-10 | 2.1 | 0.0034 | 0.00095 | 0.58 | <0.000005 | 2.3 | 0.055 | <10 | <0.00002 | 0.000014 | <0.000005 | <0.0002 | <0.0005 | 0.00079 | <0.000002 | 0.00039 | 0.0001 | <0.0001 | <0.00005 |
| 20-MAD-12 | 1.5 | 0.0019 | 0.00076 | 0.51 | <0.000005 | 1.2 | 0.017 | <10 | <0.00002 | 0.0000035 | <0.000005 | <0.0002 | <0.0005 | 0.00074 | <0.000002 | 0.00062 | 0.0001 | <0.0001 | <0.00005 |
| 20-MAD-03 | 9.7 | 0.0049 | 0.0052 | 1.1 | <0.000025 | 16 | 0.037 | <50 | <0.0001 | <0.00001 | <0.000025 | <0.001 | <0.0025 | 0.0021 | 0.00033 | 0.0068 | 0.00066 | <0.0005 | <0.00025 |
| 20-MAD-04 | 8.7 | 0.0028 | 0.0035 | 1.2 | <0.00001 | 24 | 0.025 | <20 | <0.00004 | 0.000006 | <0.00001 | <0.0004 | 0.0025 | 0.00082 | 0.00011 | 0.0044 | 0.00046 | <0.0002 | <0.0001 |
| 20-MAD-09 | 5.2 | 0.0032 | 0.0019 | 0.75 | <0.000005 | 11 | 0.04 | 14 | <0.00002 | 0.0000053 | <0.000005 | <0.0002 | <0.0005 | 0.00070 | 0.000074 | 0.0035 | 0.0002 | <0.0001 | <0.00005 |

# Appendix C 2020 Hope Bay Quarry and Construction Rock Monitoring

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# Technical Memo

March 19, 2021

| | |
|---|---|
| **To** | Ashley Mathai and Sarah Warnock, Hope Bay Project |
| **From** | Melanie Cox, Lisa Barazzuol, SRK |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | 2020 Hope Bay Quarry Rock and Construction Rock Geochemical Monitoring |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

All construction activities at Hope Bay during winter 2019/20 were conducted at Madrid North as outlined in Table 1-1 and presented in Attachment A. Monitoring requirements for quarries and quarry rock associated with the Doris Mine, Doris-Windy Road and Madrid North Mine are specified in Nunavut Water Board Water Licence 2AM-DOH1335 Amendment No. 2 (NWB 2018), Water Licence 2BE-HOP1222 (Nunavut Water Board 2012), and the Framework Agreement signed between TMAC and the Kitikmeot Inuit Association (KIA) for belt wide land tenure. Details of the geochemical monitoring program for quarries and quarry rock are documented in the Quarry Management and Monitoring Plan (TMAC 2017).

This memo documents the results of the 2020 geochemical monitoring program of run-of quarry (ROQ) rock from Quarry 2 and as-built construction rock for the infrastructure outlined in Table 1-1. Construction rock sources in 2020 included NE CPR waste rock with Quarry 2 rock used as crushed top dressing on pads. The NE CPR waste rock monitoring program for the characterization of waste rock as construction rock is documented in SRK (2020b). The 2020 geochemical construction monitoring program included the Madrid North Portal Pad and Laydown, however the scope of the construction rock monitoring at the Portal Pad was expanded to investigate the source of neutral pH metal leaching and high saline drainage as indicated by the 2020 seepage monitoring program (SRK 2021). The sampling program for the Madrid North Portal Pad investigation is presented in Figure A-1; however, results are reported separately in SRK (2021).

**Table 1-1: Summary of 2020 As-Built Construction Monitoring Program**

| Area | Infrastructure |
|---|---|
| Madrid North Portal Pad and Laydown | Pad |
| Madrid North Waste Rock Storage Area (WRSA) | Pad |
| Madrid Surface Shop Laydown | Pad |
| Overburden Stockpile | Cladding and roads |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

Notes:

Construction material source was waste rock from NE CPR except for materials used as crushed top dressing on pads which was sourced from Quarry 2.

NE CPR waste rock was used as cladding within NE CPR with contact water reporting to the pit. This material was not included within the scope of the geochemical monitoring program because SRK understands that the contact water reports to the pit.

# 2 Background

Waste rock from the NE CPR can be used as construction rock as outlined in the Nunavut Water Board Water Licence 2AM-DOH1335 Amendment No. 2 (NWB 2018), TMAC Resources (2019) and geochemical classification methods documented in SRK (2019a). The suitability of NE CPR waste rock for construction was approved by TMAC geologists according to the classification methods described in Section 3.5.2. The criteria were developed to classify and identify waste rock with a risk of ARD and/or neutral pH leaching of arsenic and to a lesser degree cobalt and nickel.

The rock from Quarry 2 was also geochemically characterized and classified as not potentially acid generating with low potential for metal leaching prior to development (SRK 2008; SRK 2010). Operational quarry rock characterization and construction monitoring has assessed the ARD potential of the run-of-quarry (ROQ) rock and confirmed these conclusions (e.g. SRK 2020a). There is no requirement to geochemically characterize materials prior to use as construction materials.

# 3 Methods

## 3.1 Quarry Monitoring Sampling

To comply with the Quarry Management and Monitoring Plan (TMAC 2017), monitoring includes geological inspections of active quarry blast faces and collection of ROQ rock for geochemical characterization. A summary of monitoring activities is presented in Table 3-1. Quarry activities in 2020 included two blasts at Quarry 2 in March.

**Table 3-1: Summary of Quarry Inspections and Samples Collected**

| Inspection Date | Quarry 2 | |
|---|---|---|
| | Inspections | Samples Collected |
| 04 March 2020 | 1 | 2 |
| 21 March 2020 | 1 | 2 |

TMAC conducted geological inspections of the blast face and documented the lithology, sulphide content and veining and the presence or absence of fibrous actinolite. For the March 4, 2020 blast, it was not safe to inspect the quarry face so TMAC inspected the blasted muck and took photos of the quarry face. TMAC collected samples of ROQ rock as two size fractions: a sieved coarse fraction (screened to -1 cm) and a finer fraction (screened to -2 mm). TMAC visually described the samples, including lithology, visible sulphide content, carbonate content, evidence of oxidation and presence of veining. Attachment B includes the quarry inspection records, sample descriptions and photos.

TMAC shipped the samples to Bureau Veritas (BV) in Burnaby, BC for analysis of total sulphur by Leco. Samples containing total sulphur concentrations >0.1% were subsequently tested for acid-base accounting (ABA) and trace element content (Section 3.3). The -2 mm samples also underwent a shake flask extraction (SFE) test on the as-received fraction. Geochemical analysis was coordinated by TMAC.

## 3.2 Construction Monitoring Sampling

In September 2020, SRK geochemist Jonathon Doherty, GIT (BC) conducted the as-built geological inspection and geochemical sampling program at Madrid North WRSA, Madrid Surface Shop Laydown and the Overburden Stockpile. The inspection entailed walking around the periphery of the infrastructure with the objective of confirming the geology. At the Overburden Stockpile, the waste rock used to construct the roads within the overburden pile could not be inspected because the Overburden Stockpile had been recontoured and the waste rock materials used were subsequently buried (Attachment A-1). SRK inspected and sampled accessible construction materials at the Overburden Stockpile as denoted in Attachment A-1.

Twelve samples of construction rock were collected for the annual geochemical monitoring program (4 from the Madrid Surface Shop Laydown, 6 from the Madrid N WRP and 2 from the Overburden Stockpile)[1]. The two samples collected form Overburden Stockpile included one of waste rock cladding, placed in 2020 and one of the access roads constructed in 2019 from Quarry D rock. The latter sample was collected to support a separate scope of work related to the geochemical investigation of seepage from the Overburden Stockpile and is presented herein for completeness. At each sample location, the following samples were collected: 1-2 kg of a sieved -1 cm fraction and a

[1] The construction monitoring program included sampling at Madrid North Portal Pad. Results are presented separately in SRK (2020a) to account for the expanded scope to investigate the source of the neutral pH metal leaching and high saline drainage.

50 g sample of a sieved -2 mm fraction. The sample trowel and sieves were rinsed with de-ionized water and wiped clean with new paper towels between each sample. At each sample location, the construction rock was geologically described for rock type, texture, fizz test using 10% HCl as an indication of carbonate content, sulphide content, mineral form and occurrence, and the presence and intensity of secondary minerals. SRK conducted rinse tests for electrical conductivity (EC) and pH using the -2 mm sieved fraction and a 1:1 solid to liquid ratio.

SRK submitted samples to BV in Burnaby, BC and managed the test work program. All samples were analyzed for ABA and trace element content (Section 3.3). SRK selected eight samples for shake flask extractions (SFEs) tests including two samples from the Overburden Stockpile, two samples from the Madrid Surface Shop Laydown and four samples from the Madrid North WRSA. Samples were selected to cover a range of rinse EC and spatial locations.

## 3.3 Analytical Program

The ABA testwork conducted on the quarry rock and construction rock materials included:

- Paste pH (Sobek *et al.* 1978).
- Total sulphur by Leco combustion furnace.
- Sulphate sulphur by hydrochloric acid leach.
- Total inorganic carbon or carbonate by Leco furnace using the HCl direct method where the sample is reacted with HCl in a cell and the evolved $CO_2$ is measured by Leco.
- Fizz test and modified neutralization potential (MEND 1991).

The trace element analysis included ICP-MS analysis following an aqua regia digestion.

SFE tests were on the as-received -2 mm sieved fraction using deionized water at a 3:1 liquid to solid ratio and a 24-hour shaking period (MEND 2009). The SFE leachates were analyzed for pH, EC, $SO_4$, acidity, alkalinity, chloride, ammonia, total dissolved solids (TDS), and low-level dissolved metals including mercury and selenium

## 3.4 Quality Assurance and Control

The QA/QC program executed by the analytical laboratories and SRK is outlined in the SRK Expectations for Laboratory Geochemical Data Quality (SRK 2019b). Table 3-2 presents the QAQC for the ABA, trace element and SFE tests including split duplicate 20-WRP-02 created at BV. SRK has reviewed all of the data including the laboratories internal QA/QC results according to SRK (2019b) and considers all of the results acceptable.

Field rinse tests were carried out during the construction monitoring using deionized water and a handheld pH / EC meter that was calibrated prior to taking measurements.

**Table 3-2: QAQC Summary**

| QC Test | SRK QC Criteria | Quarry Monitoring | Construction Monitoring |
|---|---|---|---|
| **Paste pH** | | | |
| Split Duplicates | For any samples, +/- 0.5 difference pH unit | 0 | Passed: (n=1) |
| Lab Duplicate | For any samples, +/- 0.5 difference pH unit | All passed: (n=2) | All passed: (n=2) |
| Standard Reference Material | Within specified tolerance ranges. | All passed: (n=2) | All passed: (n=3) |
| **Total Inorganic Carbon (TIC)** | | | |
| Method Blank | <2x Detection Limit | All passed: (n=2) | Passed (n=1) |
| Split Duplicates | For samples >10X detection limit (DL), % RPD within +/- 30%, ok 10% of metal scan failing. | 0 | Passed (n=1) |
| Lab Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed: (n=2) | Passed (n=2) |
| Standard Reference Material | Within +/-20% difference | All passed: (n=2) | Passed (n=2) |
| **Total Sulphur & Total Sulphate** | | | |
| Method Blank | <5x Detection Limit | All passed: Total Sulphur (n=3); Sulphate (n=2) | All passed: Total Sulphur (n=1); Sulphate (n=1) |
| Sulphur balance (total S > sulphate S) | For samples > 10X the detection limit (DL), Total Sulphur should be greater than Total Sulphate, if not the % difference should be within +/-20% | All passed: (n=6) | All passed: (n=12) |
| Split Duplicates | For samples >10X detection limit (DL), % RPD within +/- 30%, ok 10% of metal scan failing. | 0 | All passed: Total Sulphur (n=1); Sulphate (n=1) |
| Lab Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed: Sulphate (n=2) | All passed: Total Sulphur (n=1); Sulphate (n=2) [4] |
| Standard Reference Material | Within specified tolerance ranges. | All passed: Total Sulphur (n=6); Sulphate (n=2) | All passed: Total Sulphur (n=2); Sulphate (n=2) |
| **Modified Neutralization Potential (NP)** | | | |
| Method Blank | <5x Detection Limit | All passed: (n=2) | All passed: (n=3) |
| NP consistent with paste pH | Negative NP has paste pH <= 5 | All passed: (n=6) | All passed: (n=12) |
| Split Duplicates | For samples >10X detection limit (DL), % RPD within +/- 30%, ok 10% of metal scan failing. | 0 | All passed: NP (n=1); Fizz Rating (n=1) |
| Lab Duplicate | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed: (n=2); Fizz Rating (n=2) | All passed: NP and Fizz Rating (n=2) |
| Fizz test rating with NP | Max NP does not exceed fizz test rating | All passed: (n=6) | All passed: (n=12) |
| Standard Reference Material | Within specified tolerance ranges. | All passed: NP (n=2) | All passed: NP (n=3) |
| **Modified Neutralization Potential and Total Inorganic Carbon** | | | |
| Comparison between Modified NP and TIC | Check for trends/co-relation | All passed: (n=6) | All passed: (n=12) |
| **Total Sulphur-Leco and Sulphur-ICP** | | | |
| Comparison between Total S-Leco and S-ICP | For samples >10X detection limit (DL), % RPD within +/-30% | All passed: (n=6) | All passed: (n=12) |
| **Aqua Regia Metals** | | | |
| Method Blank | <5x Detection Limit | All passed: (n=2) | All Passed: (n=1) |
| Split Duplicates | For samples >10X detection limit (DL), % RPD within +/- 30%, ok 10% of metal scan failing. | 0 | All Passed: (n=1) |
| Lab Duplicate | For samples >10X detection limit (DL), % RPD within +/- 20%, ok 10% of metal scan failing. | 0 | All passed: (n=2) |
| Standard Reference Material | Within specified tolerance ranges. | All passed: (n=4) | All passed: (n=2) |
| **MEND Shake Flask Extraction** | | | |
| Method Blank | <5x Detection Limit | All passed: (n=2) | All passed: (n=2) |
| Leachate Duplicate | For samples >10X detection limit (DL), % RPD within +/- 30%, ok 10% of metal scan failing. | | All parameters passed except nitrate. Lab reran and confirmed data. Data accepted as is. (n=1) |
| Leachate Replicate | For samples >10X detection limit (DL), % RPD within +/- 20%, ok 10% of metal scan failing. | All passed: Conductivity and pH (n=2); Total Alkalinity (n=1) | All passed: Conductivity and pH (n=2) |
| Ion Balance | EC>100 uS/cm, % difference should be within +/- 10% | All passed: (n=2) | All passed: (n=8) |
| $SO_4$-S vs S-ICP | For samples > 10X the detection limit (DL), the % difference should be within +/-20% | All passed: (n=2) | All passed: (n=8) |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[1CT022.056_HopeBay_Quarry&Construction_Rock_2020_Summary QAQC_mlt.xlsx]Compiled_Summa

## 3.5 Data Interpretation

### 3.5.1 ARD Classifications According to ABA Data

The ratio of TIC to acid generating potential (AP) provides a measure of the acid rock drainage (ARD) potential of the sample, where total sulphur is used to calculate AP. Samples are classified as non-potentially ARD generating (non-PAG) when TIC/AP ratios are greater than 3, as PAG when TIC/AP ratios are less than 1 and as having an uncertain potential for ARD when TIC/AP ratios are between 1 and 3. For samples with Modified NP, interpretations of ratios of NP to AP were the same as TIC to AP.

### 3.5.2 Field Based Classification of NE CPR Waste Rock as Construction Rock

TMAC (2019) specifies that waste rock used for construction must be geochemically characterized to identify and segregate waste rock with a low risk for metal leaching and/or acid rock drainage (ML/ARD) for use as construction rock. Given the geochemical and geological variability of waste rock at Hope Bay, each potential construction rock source is assessed on a case-by-case basis.

SRK developed a geochemical characterization and classification program to classify NE CPR waste rock as geochemically suitable for use as construction rock (SRK 2019a). The geochemical classification program is based on geological inspection and calibrated portable x-ray Fluorescence (pXRF) values of arsenic and sulphur, as determined on samples of sieved -2 mm drill cuttings that are representative of the blast round. The criteria to classify NE CPR waste rock as geochemically suitable for use as construction rock (e.g. low risk of ML/ARD) is summarized as follows:

- Geologically defined as mafic metavolcanics (1) or gabbro (7a);
- Low risk of neutral pH metal leaching (calibrated pXRF As < 70 ppm); and
- Low risk of ARD (S < 0.5%).

Conversely, waste rock samples are classified as not suitable for use as construction rock (e.g. risk of ML/ARD) using the following criteria:

- Geologically defined as mafic metavolcanics with sediments (1aj) or sedimentary units (5);
- Moderate to high risk of neutral pH metal leaching (calibrated pXRF As > 70 ppm); OR
- Potential risk of ARD (S > 0.5%).

The operational sampling, classification and segregation program of run-of-mine waste rock was designed and executed by TMAC geologists (SRK 2020b).

# 4 Results

## 4.1 Quarry Monitoring

### 4.1.1 Quarry Face Inspections

In 2020, TMAC conducted two quarry inspections after blasting at Quarry 2 in March. Inspection forms are included in Attachment B. Both inspections identified mafic volcanics (1a) within the quarry face, described as fine to medium grained green / grey material with minor hematite staining on fractures and joints. Less than 1% quartz-carbonate was observed in both inspections and these were typically less than 1 cm wide. The first inspection also identified strong chlorite and moderate epidote alteration plus trace amounts of disseminated sulphides. Both inspections noted the absence of fibrous actinolite.

### 4.1.2 Acid Base Accounting

The ABA results are presented in Table 4-1, Figure 4-1 to Figure 4-4 and included in Attachment E.

The samples reported paste pH values between 7.9 and 8.5. Total sulphur concentrations ranged between 0.14 and 0.21 wt% and sulphate sulphur content was between 0.02 and 0.07 wt%. Quarry samples from the second blast had lower total sulphur and higher sulphate content compared to the first blast.

Modified NP and TIC content ranged between 129 and 173 kg $CaCO_3$/t and 103 and 153 kg $CaCO_3$/t, respectively. Figure 4-2 shows that modified NP was consistently greater than TIC content. All samples were classified as non-PAG on the basis of TIC/AP and NP/AP (Figure 4-3 and Figure 4-4).

**Table 4-1: Acid Base Accounting Results for the 2020 Quarry 2 Rock Samples**

| Sampling Date | Grain Size | Sample ID | Paste pH | Total S | Sulphate Sulphur | Sulphide Sulphur | AP | Modified NP | TIC | NP/AP | TIC/AP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | pH Units | wt% | | | kg $CaCO_3$/t | | | | |
| 04-Mar-20 | -1 cm | M011302 | 8.5 | 0.21 | 0.04 | 0.17 | 6.6 | 130 | 100 | 20 | 16 |
| | -2 mm | M011303 | 8.1 | 0.20 | 0.02 | 0.18 | 6.3 | 170 | 150 | 27 | 25 |
| 21-Mar-20 | -1 cm | M020505 | 8.0 | 0.14 | 0.04 | 0.10 | 4.4 | 130 | 120 | 30 | 27 |
| | -2 mm | M020504 | 7.9 | 0.15 | 0.07 | 0.08 | 4.7 | 170 | 150 | 37 | 31 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

Notes:

AP calculated from total sulphur content

Results are rounded to 2 significant figures

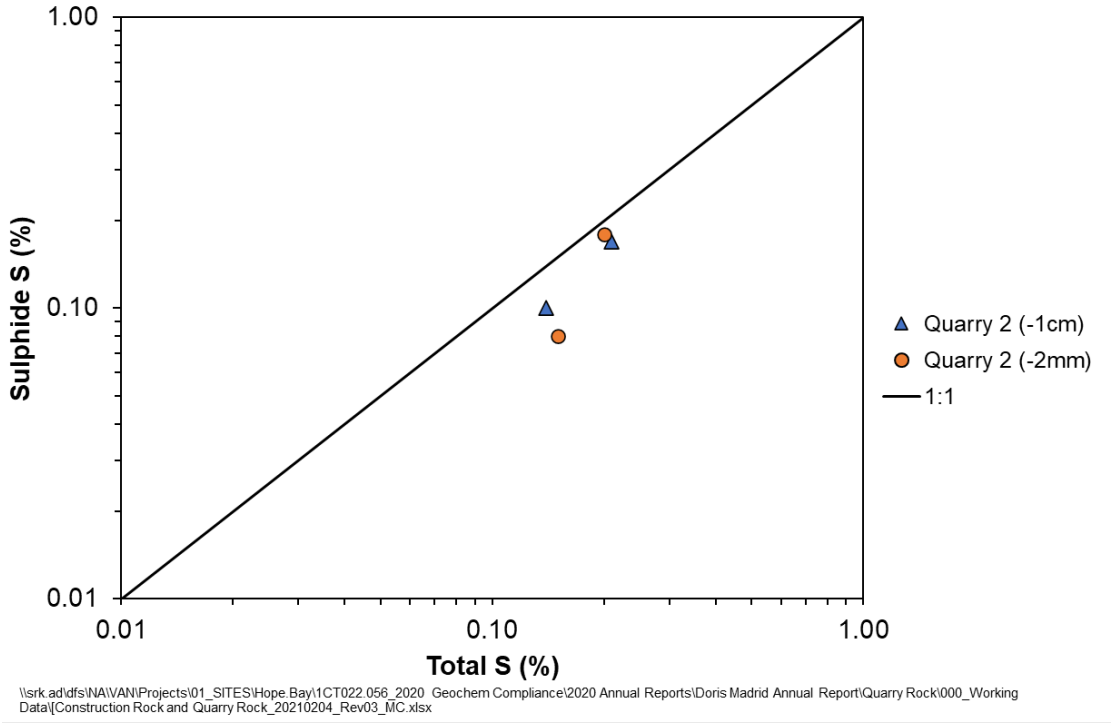


**Figure 4-1: Comparison of Total Sulphur versus Sulphide, Quarry 2 Samples**

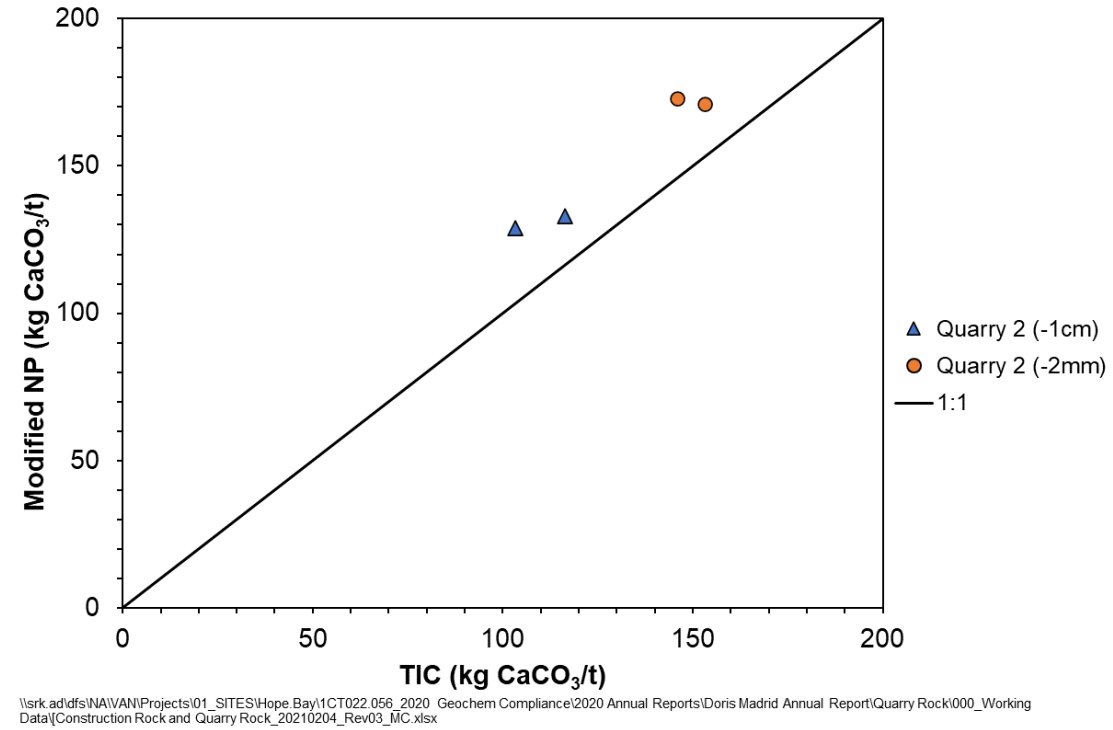


**Figure 4-2: Comparison of Modified NP versus TIC, Quarry 2 Samples**

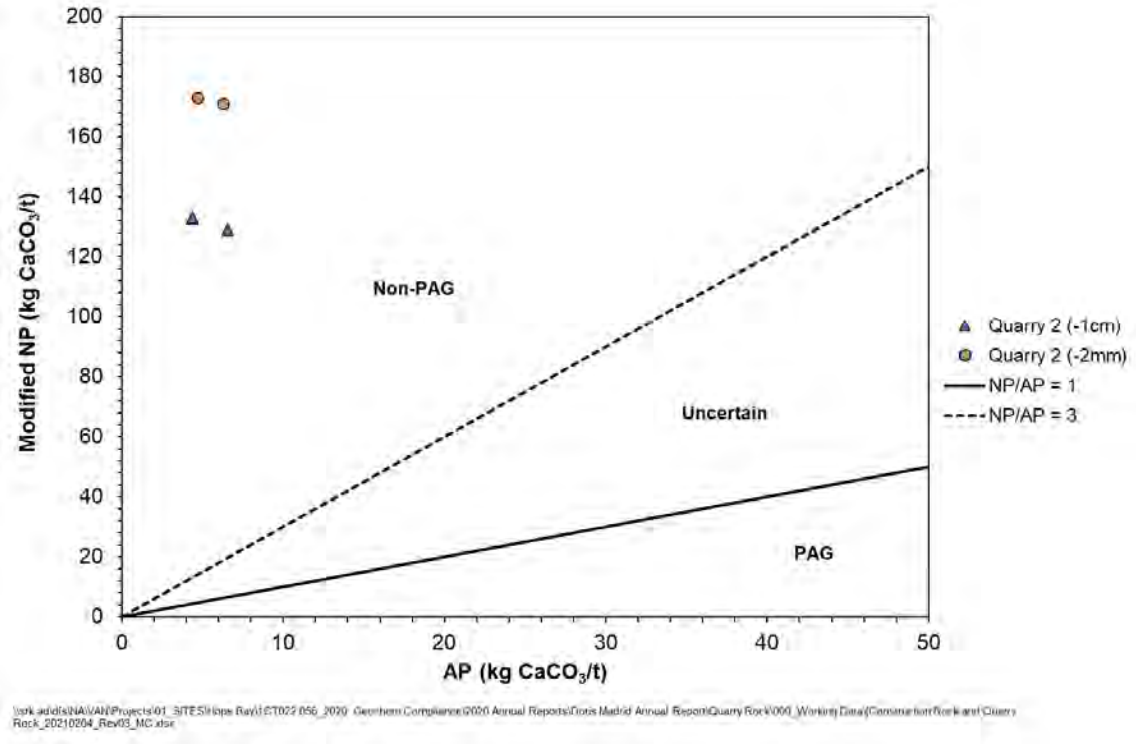


**Figure 4-3: ARD Classifications by NP/AP, Quarry 2 Samples**

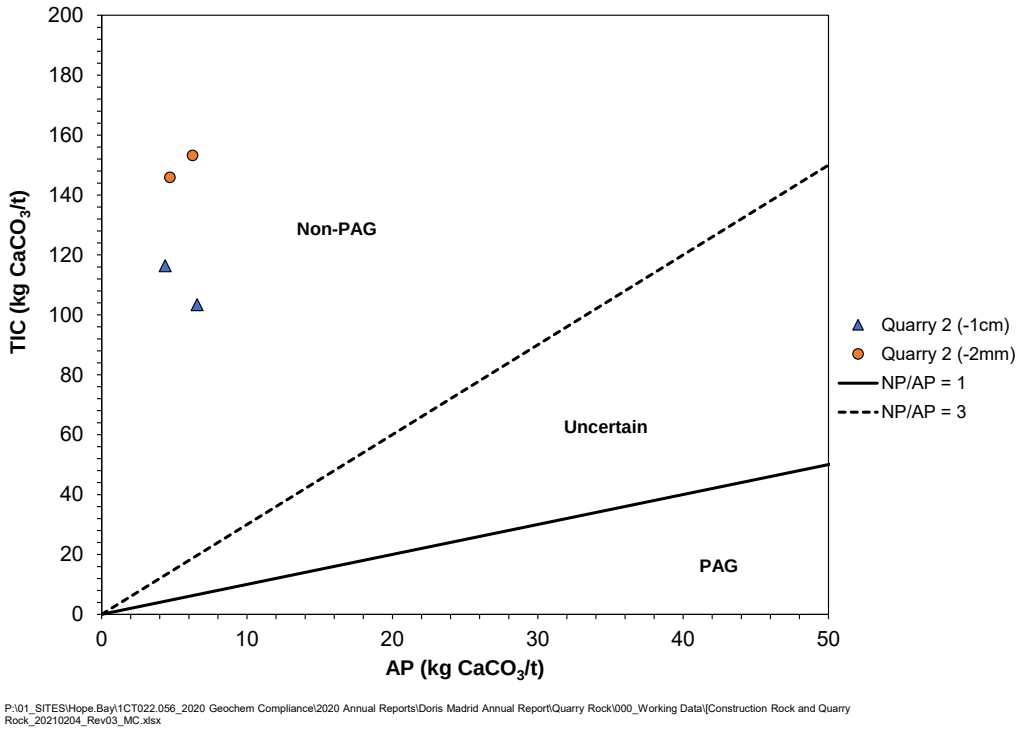


**Figure 4-4: ARD Classifications by TIC/AP, Quarry 2 Samples**

### 4.1.3 Elemental Analyses

Selected key parameter results are presented in Table 4-2 and full laboratory results are included in Attachment E. The data were compared to ten times the average crustal abundance for basaltic rocks (Price 1997) to screen for enrichment. Selenium could not be assessed because the detection limit was equal to the screening criterion and selenium content was either below or within the range of analytical error. All samples were below the screening criteria suggesting no appreciable enrichment.

**Table 4-2: Metals Analysis of Key Parameters for Quarry 2 Rock Samples**

| Parameter | Units | Screening Criteria* | 04-Mar-20 | | 21-Mar-20 | |
|---|---|---|---|---|---|---|
| | | | -1 cm | -2 mm | -1 cm | -2 mm |
| | | | M011302 | M011303 | M020505 | M020504 |
| Al | ppm | *780000* | 33000 | 35000 | 34000 | 34000 |
| As | ppm | *20* | 1.8 | 5.3 | 0.8 | 1.4 |
| Cd | ppm | *2.2* | 0.1 | 0.2 | 0.1 | 0.2 |
| Cu | ppm | *870* | 150 | 170 | 140 | 140 |
| Fe | ppm | *865000* | 62000 | 65000 | 64000 | 61000 |
| Hg | ppm | *0.9* | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Mo | ppm | *15* | 0.6 | 0.9 | 0.4 | 0.9 |
| Ni | ppm | *1300* | 76 | 70 | 69 | 68 |
| Pb | ppm | *60* | 2.4 | 4.0 | 2.6 | 3.9 |
| Se | ppm | *0.5* | < 0.50 | 0.8 | < 0.50 | < 0.50 |
| Tl | ppm | *2.1* | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Zn | ppm | *1050* | 81 | 92 | 87 | 84 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

Notes:

*Screening criteria is ten times average crustal abundance for basaltic rocks from Price (1997).

Bold and underlined values indicate value is above the screening criteria.

Results rounded to 2 significant figures.

### 4.1.4 SFE Tests

A summary of selected parameters from SFE tests are presented in Table 4-3, with complete results presented in Attachment E.

Samples collected during the first and second inspections reported pH at 9.3 and 8.7, respectively. EC was notably lower for the first blast round (55 µS/cm) compared to the second blast round (370 µS/cm). Quarry material from the second blast reported higher nitrate (35 mg/L as N) and ammonia (8.2 mg/L) compared to the first blast (<0.2 and 0.035 mg/L as N, respectively). The maximum nitrate and

ammonia concentrations reported for Quarry 2 in 2019 were 0.9 mg/L as N and 1.3 mg/L respectively however the higher levels reported during the second blast are more comparable to the 2019 Quarry D results (maximum nitrate 18.9 mg/L as N and maximum ammonia concentration 6 mg/L),

Sulphate concentrations were low (<10 mg/L) indicative of the low sulphide content. In both blast rounds, the major anion was alkalinity (20 to 26 mg/L as $CaCO_3$) and the major cation was calcium (7.6 to 38 mg/L).

**Table 4-3: Shake Flask Extraction Results for Quarry 2 Monitoring Samples (-2 mm fraction)**

| Parameter | Units | Detection Limit | 04-Mar-20 | 21-Mar-20 |
|---|---|---|---|---|
| | | | -2 mm | -2 mm |
| | | | M011303 | M020504 |
| pH* | pH Units | N/A | 9.3 | 8.7 |
| EC* | uS/cm | 1 | 55 | 370 |
| Total Alkalinity | mg/L | 0.5 | 20 | 26 |
| Total Dissolved Solids | mg/L | 10 | 28 | 270 |
| Hardness $CaCO_3$ | mg/L | 0.50 | 22 | 110 |
| $SO_4$ | mg/L | 0.5 | 6.0 | 6.8 |
| Dissolved Chloride | mg/L | 0.5 | 1.1 | 5.0 |
| Nitrate-N | mg/L | 0.02 | < 0.2 | 35 |
| Nitrite-N | mg/L | 0.005 | < 0.05 | < 0.05 |
| Total Ammonia* | mg/L | 0.005 | 0.04 | 8.2 |
| Dissolved Calcium (Ca) | mg/L | 0.05 | 7.6 | 38 |
| Dissolved Potassium (K) | mg/L | 0.05 | 0.3 | 2.3 |
| Dissolved Sodium (Na) | mg/L | 0.05 | 1.1 | 8.8 |
| Dissolved Magnesium (Mg) | mg/L | 0.05 | 0.8 | 4.3 |
| Dissolved Aluminum (Al)* | mg/L | 0.0005 | 0.32 | 0.19 |
| Dissolved Antimony (Sb) | mg/L | 0.00002 | 0.00006 | 0.0001 |
| Dissolved Arsenic (As)* | mg/L | 0.00002 | 0.0009 | 0.0003 |
| Dissolved Cadmium (Cd) | mg/L | 0.00001 | < 0.00001 | < 0.00001 |
| Dissolved Copper (Cu)* | mg/L | 0.0001 | 0.001 | 0.003 |
| Dissolved Iron (Fe)* | mg/L | 0.001 | 0.04 | 0.001 |
| Dissolved Lead (Pb)* | mg/L | 0.00001 | 0.00003 | 0.000005 |
| Dissolved Mercury (Hg) | mg/L | 0.0001 | < 0.00005 | < 0.00005 |
| Dissolved Molybdenum (Mo) | mg/L | 0.0001 | 0.001 | 0.01 |
| Dissolved Nickel (Ni)* | mg/L | 0.00002 | 0.0001 | 0.0002 |
| Dissolved Selenium (Se) | mg/L | 0.00004 | 0.0001 | 0.0004 |
| Dissolved Thallium (Tl) | mg/L | 0.000002 | 0.000005 | 0.00005 |
| Dissolved Zinc (Zn)* | mg/L | 0.0001 | 0.0001 | < 0.0001 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

Notes: °All element concentrations are given as dissolved (rounded to 2 significant figures).

## 4.2 As-Built Construction Monitoring

### 4.2.1 Geological Inspections

SRK's as-built geological inspection included the Madrid North WRSA, the Madrid Surface Shop Laydown and the Overburden Stockpile. The Overburden Stockpile inspection was limited to access roads material and cladding because the roads constructed within the stockpile footprint had been covered in overburden and were therefore not visible. All construction material was sourced from NE CPR except the surface dressing from Quarry 2 placed at the Madrid Surface Shop Laydown and the Overburden access road at the Overburden Stockpile (20-OVB-03), which were constructed in 2019 of Quarry D rock (Attachment A). The predominant rock type was mafic metavolcanics (1a).

The Quarry 2 rock was exclusively mafic metavolcanics (1a) with frequent quartz-calcite veinlets that produced a moderate fizz (Figure 4-5). The Quarry 2 materials had fractures with iron oxide coatings and no visible pyrite. The Overburden Stockpile access road at 20-OVB-03 was similarly mafic metavolcanics (1a).

Overall, NE CPR waste rock used as construction rock was mafic metavolcanics and sericite altered mafic metavolcanics (1a/1as), gabbro (7a), siltstone (5), and/or quartz veins (12). According to SRK (2019a), sedimentary units are not geochemically suitable for use as construction materials due to potential for neutral pH metal leaching. The sericite altered mafic metavolcanics (1as) consisted of light tan brown and moderately foliated altered mafic metavolcanics that had moderate to strong pervasive sericite alteration. The quartz veins (12q) consisted of milky white colored massive quartz with trace to 1% disseminated pyrite and chlorite and reported no fizz.

Typical construction rock observed at Madrid North WRSA was weakly foliated greenstone (1a) with some tan brown colored strongly foliated, sericite altered metavolcanics (1as). Silicified siltstone in quantities ranging between 2 and 30% was present in samples WRP-01 to WRP-03 (Figure 4-6). Finely disseminated pyrite was visible in some of the mafic metavolcanics (1a) (trace to around 0.5%) and the some of the siltstones (5) (trace amounts). The materials were weakly to moderately weathered and some fracture coating oxidation was observed. The metavolcanics contained variable amounts of quartz-calcite veinlets (rare to abundant) which typically produced a moderate fizz. Sample 20-WRP-02 contained around 60% sericite altered mafic metavolcanics (1as) which itself contained around 5% stockwork quartz veinlets. The sample also contained around 3% strongly oxidized, crumbly mafic metavolcanics (1a).

Construction rock at the Madrid Surface Shop Laydown was a mixture of weakly weathered 1a/1as mafic metavolcanics (ranging between 30-90 %), gabbro (7a, up to 45%) and silicified sedimentary siltstone (5, up to 25 %). Some of the mafic metavolcanics (1a) contained trace amounts of finely disseminated pyrite and occasional to frequent quartz-calcite veins which produced a weak fizz. Finely disseminated pyrite (trace amounts) was also observed in some of the silicified siltstones along with quartz veins (in trace amounts) which contained trace vein hosted pyrite.

Construction rock at the Overburden Stockpile ranged between 90 and 100 % weekly foliated greenstone (1a) and up to 10 % gabbro (7a). Medium grained disseminated pyrite (up to trace

amounts) and occasional quartz-calcite veinlets which produced a weak fizz were observed. The materials contained weak fracture coating oxidation. Sample 20-OVB-03 represents 2019 construction material from Quarry D and sample 20-OVB-06 is NE CPR. No sedimentary units (5) were observed, however the internal roads constructed from NE CPR waste rock were not accessible for inspection.

**Figure 4-5: Quarry 2 Surface Dressing Sample (20-NUN-05), 100% Mafic Metavolcanics (1a) with Frequent Quartz-calcite Veinlets, No Visible Pyrite, and Weak Fracture Coating Iron Oxides**

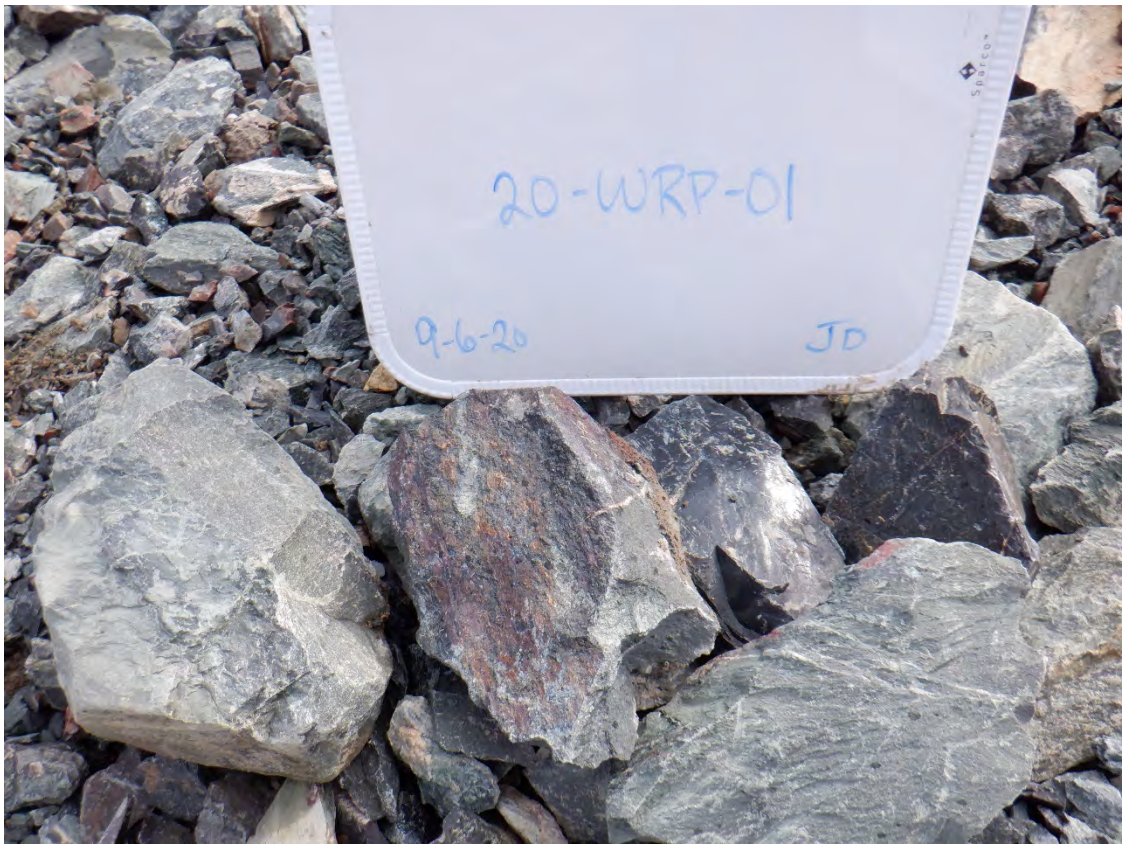


**Figure 4-6: Example of Weakly Foliated Mafic Metavolcanics with Moderate Fracture Coating Oxidation, Quartz-calcite Veinlets and Absent to Moderate Sericite Alteration (1a and 1as) Mixed with Moderately Silicified Siltstone (5).**

### 4.2.2 Contact Tests

Contact rinse tests for the construction rock samples are presented in Table 4-4. Rinse pH values for all samples ranged between 7.7 and 9.5 s.u. and rinse EC values were between 90 and 370 µS/cm.

**Table 4-4: Rinse Test Results for 2020 Construction Rock Samples (-2 mm Fraction)**

| Sample Location | Sample ID | Rock Type* | Rinse pH | Rinse EC |
|---|---|---|---|---|
| | | | s.u. | µS/cm |
| Madrid Surface Shop Laydown | 20-NUN-05 | 1a | 9.0 | 90 |
| | 20-NUN-01 | 1a>1as | 9.5 | 300 |
| | 20-NUN-02 | 1a>7a>5(3%)>12 | 9.0 | 110 |
| | 20-NUN-03 | 7a>1a>5(25%) | 8.9 | 150 |
| Madrid N WRSA | 20-WRP-01 | 1a>5(30%) | 9.1 | 210 |
| | 20-WRP-02 | 1as>1a>strongly oxidized 1a(3%)>5 (2%) | 7.7 | 370 |
| | 20-WRP-03 | 1a>5 (15%)>7a | 9.1 | 120 |
| | 20-WRP-04 | 1a | 9.5 | 250 |
| | 20-WRP-05 | 1a | 8.4 | 180 |
| | 20-WRP-07 | 1a | 9.2 | 230 |
| Overburden Stockpile Infrastructure | 20-OVB-03 | 1a | 9.1 | 110 |
| | 20-OVB-06 | 1a>7a | 9.3 | 310 |

Source\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

Notes:

All samples are NE CPR materials except for 20-NUN-05 which is Quarry 2 material and 20-OVB-03 which is Quarry D material

* Rock types defined as follows: 1a = mafic metavolcanics; 1as = sericite altered mafic metavolcanics; 5 = siltstone (parentheses denotes approximate proportion of siltstone); 7a = gabbro and 12 = quartz veins

### 4.2.3 Acid Base Accounting

ABA results are presented in Table 4-5, Figure 4-7 to Figure 4-10, and Attachment F.

Paste pH ranged from 8.4 to 9.5. Total sulphur concentrations ranged between 0.1 and 0.4% in all construction rock samples except for sample 20-WRP-02, which had a maximum sulphur content of 0.9%. Notably four of the five samples containing siltstone (5) had sulphur content between 0.3 and 0.4%. Sample 20-WRP-02 from the Madrid North WRSA contained the highest sulphur content (0.9%). 20-WRP-02 was described as primarily (65%) altered metavolcanics (1as), 35% mafic metavolcanics (1a), 3% strongly oxidized and crumbly mafic metal volcanics (1a) (3%) and 2% silicified siltstone.

Sulphate sulphur was below or near the level of detection (<0.01%) for all construction rock samples. Sulphide sulphur is calculated as the difference between total sulphur and sulphate sulphur. Figure 4-7 shows that there is near parity between total sulphur and sulphide sulphur indicating that sulphide sulphur is the predominant sulphur species.

Modified NP ranged between 110 and 310 kg $CaCO_3$/t and TIC ranged between 100 and 360 kg$CaCO_3$/t in all samples. Figure 4-8 shows that values of TIC and Modified NP were at near parity. All samples were classified as non-PAG on the basis of both NP/AP (Figure 4-9) and TIC/AP (Figure 4-10).

**Table 4-5: Acid Base Accounting Results for the 2020 Construction Rock Samples (-1 cm Fraction)**

| Sample Location | Sample ID | Rock Type* | Paste pH | Total S | Sulphate Sulphur | Sulphide Sulphur | AP | TIC | Modified NP | TIC/AP | NP/AP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | pH Units | wt% | wt% | wt% | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | N/A | N/A |
| Madrid Surface Shop Laydown | 20-NUN-05 | 1a | 8.7 | 0.3 | 0.07 | 0.2 | 7.8 | 130 | 130 | 17 | 16 |
| | 20-NUN-01 | 1a>1as | 8.9 | 0.3 | <0.01 | 0.3 | 11 | 190 | 190 | 18 | 18 |
| | 20-NUN-02 | 1a>7a>5(3%)>12 | 8.6 | 0.3 | 0.05 | 0.3 | 10 | 140 | 160 | 14 | 16 |
| | 20-NUN-03 | 7a>1a>5(25%) | 8.7 | 0.4 | 0.01 | 0.4 | 13 | 120 | 130 | 9.0 | 9.5 |
| Madrid N WRP | 20-WRP-01 | 1a>5(30%) | 8.7 | 0.3 | 0.01 | 0.3 | 9.1 | 160 | 140 | 17 | 16 |
| | 20-WRP-02 | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 8.7 | 0.9 | 0.01 | 0.9 | 29 | 360 | 310 | 12 | 11 |
| | 20-WRP-03 | 1a>5 (15%)>7a | 8.7 | 0.3 | 0.01 | 0.3 | 11 | 100 | 110 | 10 | 10 |
| | 20-WRP-04 | 1a | 9.3 | 0.2 | <0.01 | 0.2 | 5.6 | 150 | 160 | 26 | 28 |
| | 20-WRP-05 | 1a | 8.4 | 0.1 | <0.01 | 0.1 | 3.1 | 190 | 200 | 61 | 65 |
| | 20-WRP-07 | 1a | 9.5 | 0.3 | <0.01 | 0.3 | 7.8 | 230 | 230 | 29 | 30 |
| Overburden Stockpile Infrastructure | 20-OVB-03 | 1a | 8.5 | 0.2 | 0.03 | 0.2 | 5.6 | 140 | 150 | 24 | 26 |
| | 20-OVB-06 | 1a>7a | 8.5 | 0.1 | 0.02 | 0.1 | 4.4 | 100 | 120 | 24 | 28 |

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Notes:

All samples are NE CPR materials except for 20-NUN-05 which is Quarry 2 material and 20-OVB-03 which is Quarry D material

AP is acid generation potential, calculated from total sulphur

NP is neutralization potential

Sulphide Sulphur calculated from the difference of Total Sulphur and Sulphate Sulphur

* Rock types defined as follows:

1a = mafic metavolcanics

1as = sericite altered mafic metavolcanics

5 = siltstone (parentheses denotes approximate proportion of siltstone)

7a = gabbro

12 = quartz veins

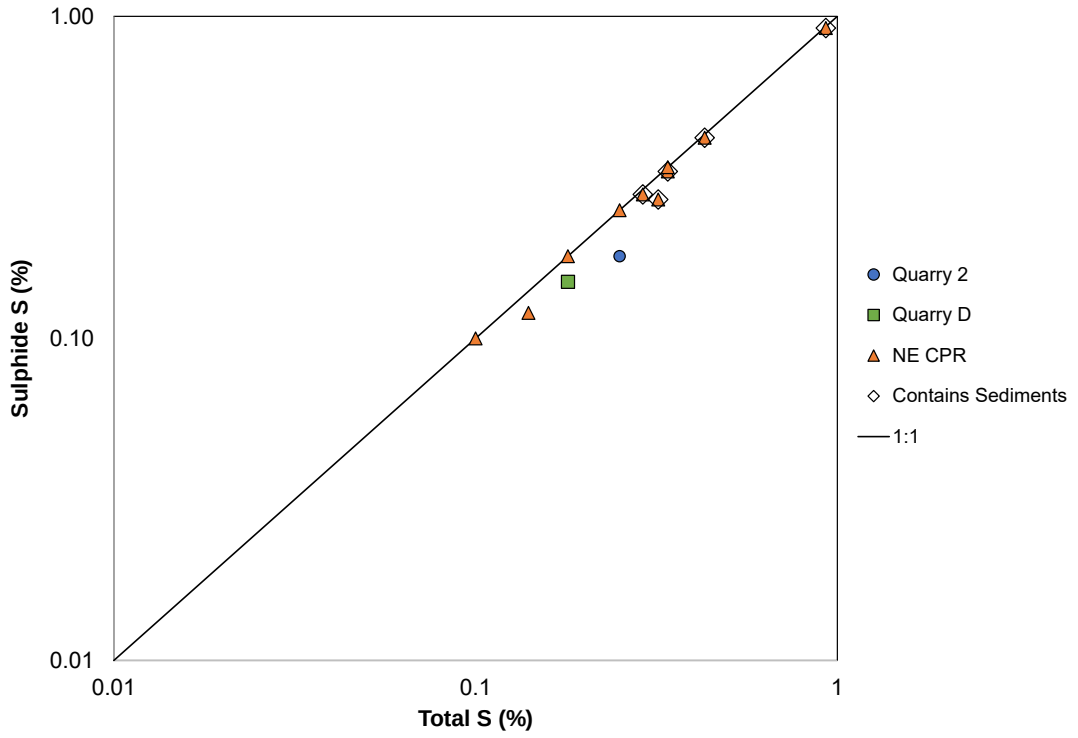


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**Figure 4-7: Comparison of Total Sulphur versus Sulphide, Construction Rock Samples**

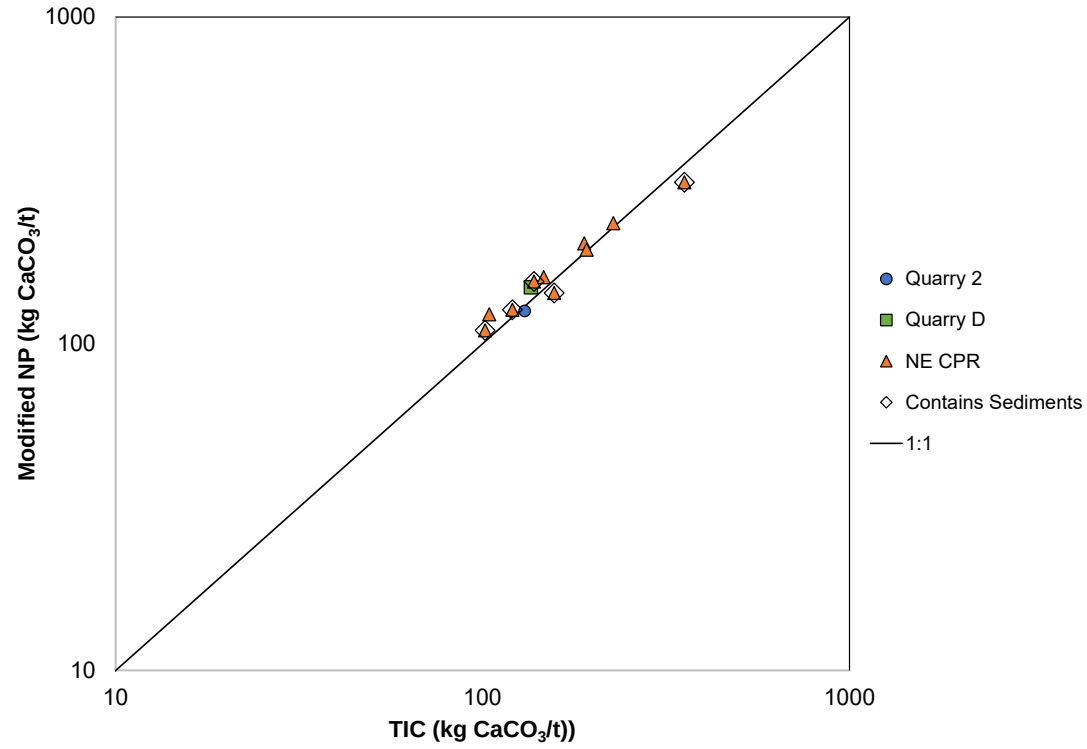


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**Figure 4-8: Comparison of Modified NP versus TIC, Construction Rock Samples**

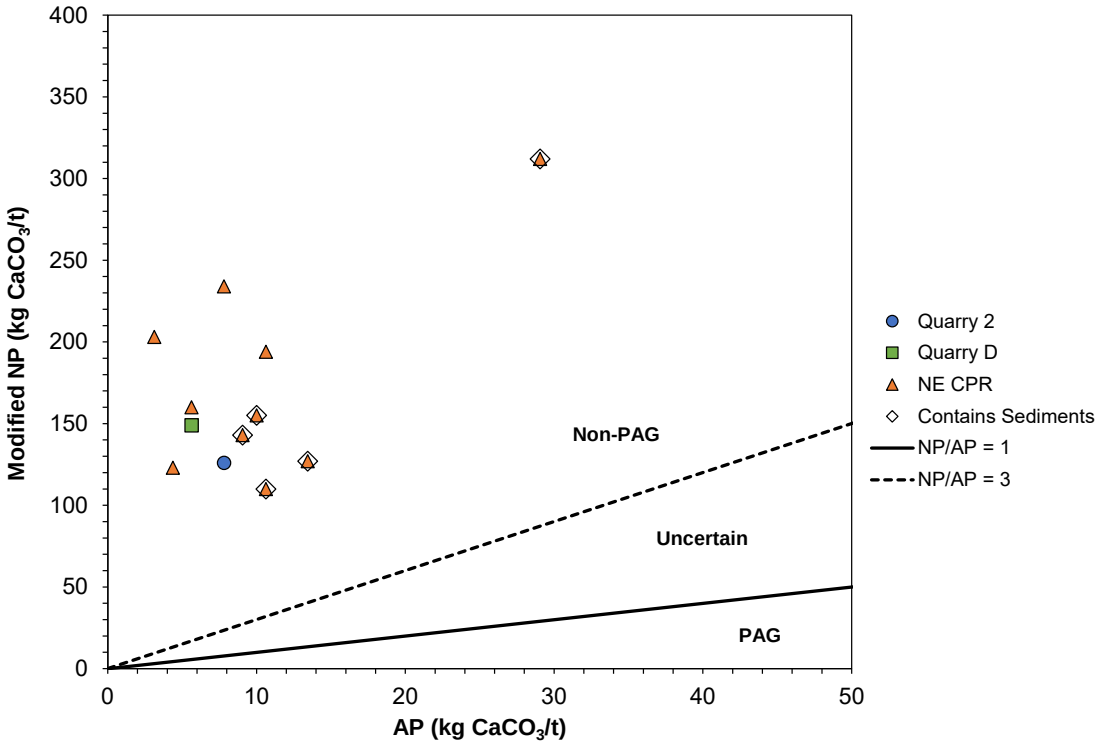


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**Figure 4-9: ARD Classifications by NP/AP, Construction Rock Samples**

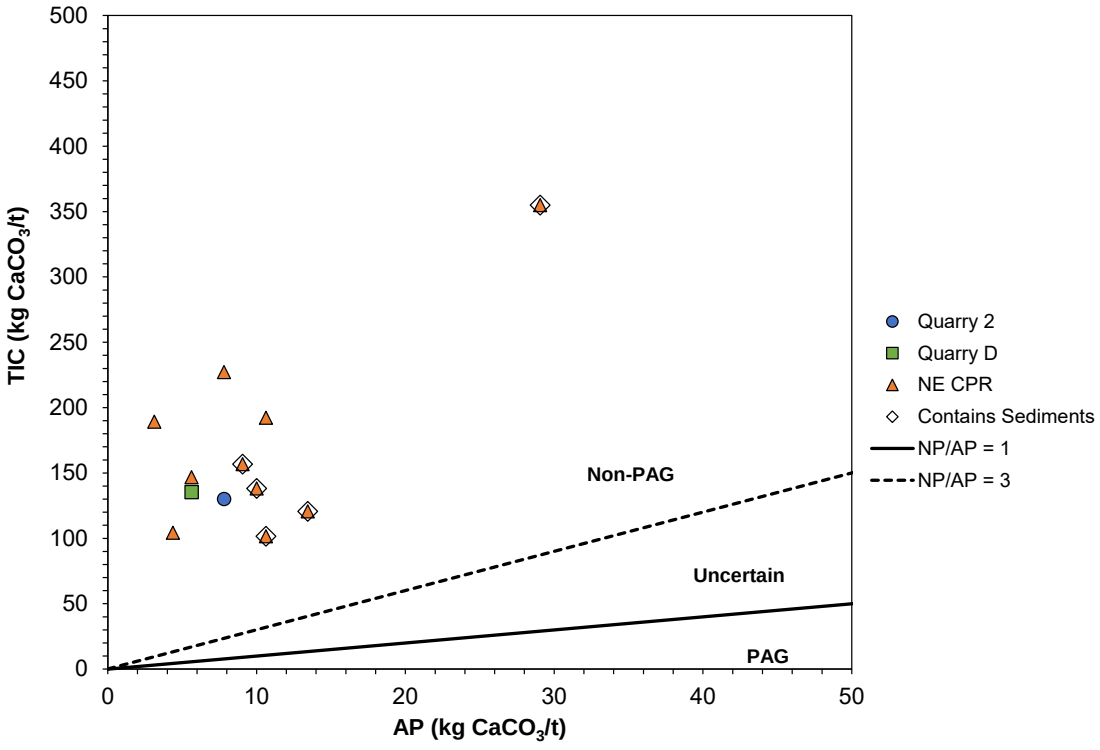


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**Figure 4-10: ARD Classifications by TIC/AP, Construction Rock Samples**

### 4.2.4 Elemental Analyses

Table 4-6 presents a summary of elemental content with full laboratory results presented in Attachment F. Elemental content was compared to ten times the average crustal abundance for basaltic rocks (Price 1997) to screen for enrichment.

Five samples were enriched in arsenic relative to the screening criteria in the following two areas:

- Madrid North WRSA: four samples were enriched (20-WRP-01, 20-WRP-02, 20-WRP-03 and 20-WRP-07). All of these samples contained sediments except for 20-WRP-07. 20-WRP-02 contained the maximum arsenic content for the sample set (560 ppm) whereas arsenic content ranged from 36 to 76 ppm for the other three samples.
- Madrid Surface Shop Laydown: sample 20-NUN-01 had elevated arsenic (52 ppm). This sample did not contain any sediments.

All other parameters and samples (20-NUN-02 and 20-NUN-03) were below the screening criteria suggesting no appreciable enrichment. Samples 20-NUN-02 and 20-NUN-03 are from the Madrid Surface Shop Laydown and contain sediments.

**Table 4-6: Summary of Element Analysis for the 2020 Construction Rock Samples (-1 cm Size Fraction)**

| Parameter | Units | *Screening Criteria | Madrid Surface Shop Laydown | | | | Madrid N WRP | | | | | | Overburden Stockpile Infrastructure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1a | 1a>1as | 1a>7a>5(3%)>12 | 7a>1a>5(25%) | 1a>5(30%) | 1as> 1a>strongly oxidized 1a(3%)> 5(2%) | 1a>5 (15%)>7a | 1a | 1a | 1a | 1a | 1a>7a |
| | | | 20-NUN-05 | 20-NUN-01 | 20-NUN-02 | 20-NUN-03 | 20-WRP-01 | 20-WRP-02 | 20-WRP-03 | 20-WRP-04 | 20-WRP-05 | 20-WRP-07 | 20-OVB-03 | 20-OVB-06 |
| As | ppm | 20 | 7.5 | **52** | 8.1 | 14 | **36** | **560** | **36** | 14 | 14 | **76** | 5 | 7.5 |
| Au | ppb | 40 | 6.1 | **120** | 1.5 | 10 | **66** | **720** | **110** | 13 | 4.1 | 38 | 1.9 | 9.1 |
| Cd | ppm | 2.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 0.3 | 0.2 | 0.2 | < 0.1 |
| Co | ppm | 480 | 41 | 49 | 45 | 41 | 51 | 58 | 39 | 55 | 39 | 66 | 44 | 41 |
| Cr | ppm | 1700 | 62 | 180 | 92 | 160 | 280 | 160 | 230 | 290 | 340 | 480 | 270 | 260 |
| Cu | ppm | 870 | 100 | 150 | 120 | 110 | 98 | 150 | 71 | 88 | 85 | 160 | 100 | 87 |
| Hg | ppm | 0.9 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Mo | ppm | 15 | 1.9 | 0.7 | 1.5 | 0.6 | 0.3 | 0.5 | 0.4 | 0.3 | 0.2 | 0.5 | 0.8 | 0.5 |
| Ni | ppm | 1300 | 41 | 150 | 52 | 100 | 220 | 440 | 170 | 210 | 120 | 430 | 110 | 120 |
| Pb | ppm | 60 | 2 | 1.5 | 1.5 | 2.9 | 1.9 | 2.5 | 2.6 | 2.6 | 4.1 | 1.5 | 2.9 | 3.2 |
| S | % | 3000 | 0.21 | 0.32 | 0.25 | 0.37 | 0.23 | 0.79 | 0.27 | 0.12 | 0.07 | 0.21 | 0.15 | 0.11 |
| Se | ppm | 0.5 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | 0.5 | < 0.50 | < 0.50 | < 0.50 |
| Sr | ppm | 4650 | 21 | 37 | 22 | 28 | 15 | 130 | 18 | 20 | 19 | 130 | 26 | 21 |
| Zn | ppm | 1050 | 110 | 71 | 100 | 78 | 82 | 21 | 62 | 85 | 110 | 52 | 100 | 79 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

Notes:

All samples are NE CPR materials except for 20-NUN-05 which is Quarry 2 material and 20-OVB-03 which is Quarry D material

* Screening criteria corresponds to 10 times the average crustal abundance for basaltic rocks as per Price (1997)

All values have been rounded to two significant figures

**BOLD** values indicate result exceeds screening criteria

Rock types defined as follows:

- 1a = mafic metavolcanics
- 1as = sericite altered mafic metavolcanics
- 5 = siltstone (parentheses denotes approximate proportion of siltstone)
- 7a = gabbro
- 12 = quartz veins

### 4.2.5 Construction Classification of NE CPR Waste Rock

Section 3.5.2 describes the classification criteria used to determine the geochemical suitability of NE CPR waste rock for use as construction material. SRK (2019a) specifies that construction rock should have a low ARD risk and low potential for neutral pH metal leaching (specifically pXRF As < 70 ppm).

Figure 4-11 assesses the ML/ARD potential of NE CPR construction rock samples according to the lab data, specifically ARD classifications according to NP/AP and arsenic content compared to the criterion from SRK (2019a). All of the construction rock samples were classified as non-PAG and below the arsenic criterion except for two samples from the Madrid WRSA pad that are summarized as follows:

- Sample 20-WRP-02 had an arsenic content of 560 ppm. The sample was collected from the south-eastern edge of the Madrid North WRSA, upstream of the WRSA collection pond and described as approximately 95% mafic metavolcanics (1a/1as), 3% strongly oxidized mafic metavolcanics (1a) and 2% sediments (5). Seepage from this material would drain into the Madrid North Contact Water Pond (CWP).
- Sample 20-WRP-07 had an arsenic content slightly above the criterion of 76 ppm. The sample was described as mafic metavolcanics (1a) and collected from the western edge of Madrid North WRSA. Seepage from this material would drain into the CWP.

Nickel was two and ten times higher in samples 20-WRP-02 and 20-WRP-07 (440 and 430 ppm, respectively) compared to the other construction sample samples.

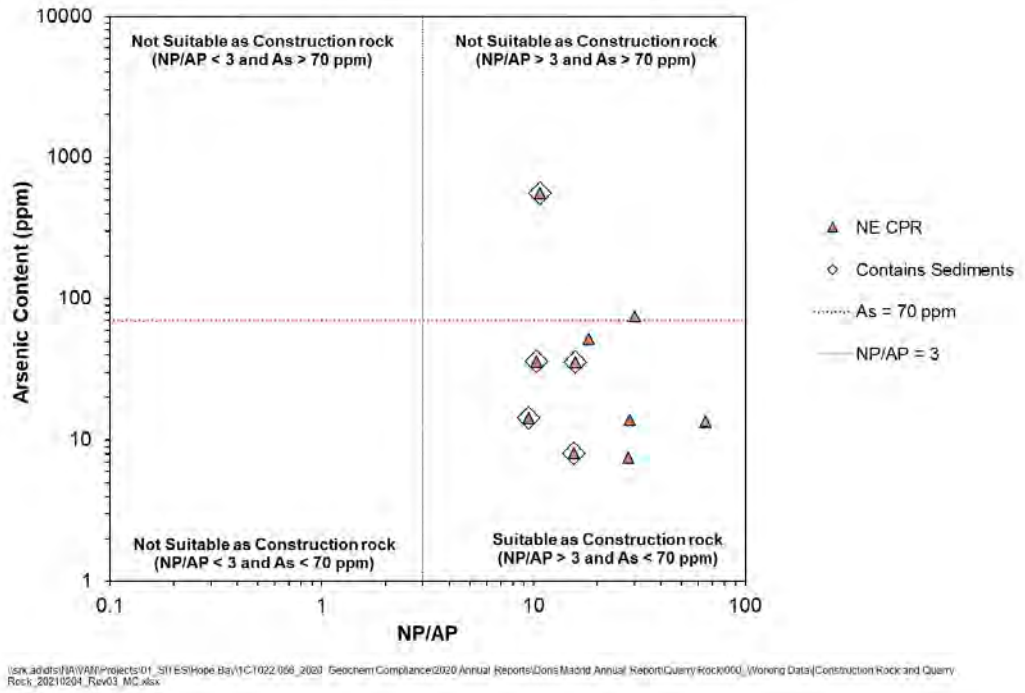



**Figure 4-11: Construction Classification of NE CPR Waste Rock**

### 4.2.6 SFE Tests

A summary of selected parameters for the eight samples analyzed for SFE tests are presented in Table 4-7 with full results are included in Attachment F.

The pH ranged between 7.5 and 9.5 s.u. EC values ranged between 91 and 270 µS/cm in the Madrid Surface Shop Laydown and Madrid N WRP samples and were much higher for the two Overburden Stockpile samples (5,400 and 4,200 µS/cm in 20-OVB-03 and 20-OVB-06, respectively). These EC values were two orders of magnitude higher than those reported in the field contact tests.

For the Madrid Surface Shop Laydown and Madrid N WRP samples, major cation chemistry was dominated by calcium (4.5 to 27 mg/L) and sodium (23 to 87 mg/L) and major anion chemistry by sulphate (7.4 to 90 mg/L) and chloride (0.9 to 10 mg/L). For the Overburden Stockpile samples, concentrations of major ions were higher with major cation chemistry dominated by sodium (610 to 780 mg/L) and major anion by sulphate and chloride (530 to 550 mg/L and 960 to 1,200 mg/L respectively).

Soluble arsenic content was highest for the samples that had the highest solid-phase arsenic content, specifically sample 20-NUN-01 from the Madrid Surface Shop Laydown (0.15 mg/L) and samples 20-WRP-02 (2.6 mg/L) and 20-WRP-07 (0.21 mg/L) from the WRSA pad. In contrast, the maximum soluble arsenic content was 0.082 mg/L for all other samples.

Soluble nickel and cobalt content was highest in two samples from the WRSA: 20-WRP-02 (0.0095 mg/L and 0.00077 mg/L respectively) and 20-WRP-03 (0.0021 mg/L and 0.00034 mg/L) and the two Overburden Stockpile samples: 20-OVB-03 (0.0021 mg/L and 0.00032 mg/L) and 20-OVB-06 0.0018 mg/L and 0.00020 mg/L). In contrast, the maximum soluble nickel content in all other samples was 0.00063 mg/L and the maximum soluble cobalt content was 0.000091 mg/L. Although sample 20-WRP-02 reported an enrichment in arsenic (560 ppm) and nickel (440 ppm) the higher soluble nickel and cobalt content does not correspond to high solid-phase content in the other samples. Soluble manganese content was also notably higher for the Overburden Stockpile samples (0.079 to 0.11 mg/L) compared to samples from other areas (0.00052 to 0.0072 mg/L). The two WRSA samples (20-WRP-02 and 20-WRP-03) contained sediments reported at 2% and 15% respectively but the samples from the Overburden Stockpile did not.

**Table 4-7: Shake Flask Extraction Results for 2020 Construction Rock Samples (-2 mm Fraction)**

| Parameter | Units | Madrid Surface Shop Laydown | | Madrid North WRSA | | | | Overburden Stockpile Infrastructure | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1a | 1a>1as | 1a>5(30%) | 1as> 1a>strongly oxidized 1a(3%)> 5(2%) | 1a>5 (15%)>7a | 1a | 1a | 1a>7a |
| | | 20-NUN-05 | 20-NUN-01 | 20-WRP-01 | 20-WRP-02 | 20-WRP-03 | 20-WRP-07 | 20-OVB-03 | 20-OVB-06 |
| pH | pH Units | 8.9 | 9.5 | 9.0 | 8.6 | 8.8 | 9.4 | 7.5 | 7.9 |
| EC | uS/cm | 91 | 130 | 220 | 270 | 130 | 120 | 5400 | 4200 |
| Total Alkalinity | mg/L | 36 | 38 | 29 | 30 | 45 | 43 | 39 | 30 |
| $SO_4$ | mg/L | 7.4 | 11 | 54 | 90 | 14 | 10 | 530 | 550 |
| Chloride | mg/L | 0.9 | 9.2 | 10 | 3.8 | 2 | 3.6 | 1200 | 960 |
| Nitrate-N | mg/L | < 0.2 | < 0.2 | < 0.2 | < 0.2 | 0.9 | 0.2 | 4.5 | 2.1 |
| Nitrite-N | mg/L | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.17 | < 0.05 | 0.05 | 0.09 |
| Total Ammonia | mg/L | 0.016 | 0.089 | 0.059 | 0.07 | 0.15 | 0.11 | 0.056 | 0.067 |
| Calcium (Ca) | mg/L | 8.6 | 4.5 | 8.3 | 27 | 6.3 | 4.7 | 47 | 54 |
| Magnesium (Mg) | mg/L | 1.9 | 1.1 | 2.5 | 5.7 | 2.1 | 0.91 | 50 | 42 |
| Potassium (K) | mg/L | 3.2 | 4.1 | 11 | 9.9 | 4.2 | 1.7 | 38 | 34 |
| Sodium (Na) | mg/L | 4.1 | 18 | 23 | 7.6 | 15 | 19 | 780 | 610 |
| Aluminum (Al) | mg/L | 0.24 | 0.29 | 0.13 | 0.052 | 0.27 | 0.31 | 0.019 | 0.023 |
| Antimony (Sb) | mg/L | 0.00053 | 0.0014 | 0.00048 | 0.011 | 0.00071 | 0.0019 | 0.00027 | 0.00013 |
| Arsenic (As) | mg/L | 0.0052 | 0.15 | 0.036 | 2.6 | 0.082 | 0.21 | 0.0016 | 0.0017 |
| Cadmium (Cd) | mg/L | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000025 | < 0.000005 | < 0.000005 | < 0.00001 | < 0.00001 |
| Chromium (Cr) | mg/L | < 0.0001 | 0.00021 | 0.0001 | < 0.0005 | 0.00053 | 0.00021 | < 0.0002 | < 0.0002 |
| Cobalt (Co) | mg/L | 0.000055 | 0.000051 | 0.000091 | 0.00077 | 0.00034 | 0.000076 | 0.00032 | 0.00020 |
| Copper (Cu) | mg/L | 0.002 | 0.00075 | 0.00074 | 0.0027 | 0.0076 | 0.0012 | 0.011 | 0.0087 |
| Iron (Fe) | mg/L | 0.0085 | 0.071 | 0.024 | 0.011 | 0.2 | 0.03 | 0.0076 | 0.0028 |
| Lead (Pb) | mg/L | < 0.000005 | 0.0000081 | 0.0000056 | < 0.000025 | 0.00018 | 0.0000099 | 0.000025 | < 0.00001 |
| Manganese (Mn) | mg/L | 0.003 | 0.00052 | 0.0014 | 0.0072 | 0.0049 | 0.001 | 0.11 | 0.079 |
| Mercury (Hg) | mg/L | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00025 | < 0.00005 | < 0.00005 | < 0.0001 | < 0.0001 |
| Molybdenum (Mo) | mg/L | 0.0029 | 0.002 | 0.0022 | 0.0035 | 0.0019 | 0.0012 | 0.018 | 0.0078 |
| Nickel (Ni) | mg/L | 0.00019 | 0.00045 | 0.00027 | 0.0095 | 0.0021 | 0.00063 | 0.0021 | 0.0018 |
| Selenium (Se) | mg/L | 0.00044 | 0.0021 | 0.0014 | 0.0028 | 0.0011 | 0.0011 | 0.0023 | 0.0011 |
| Sulphur (S) | mg/L | < 10 | < 10 | 16 | < 50 | < 10 | < 10 | 210 | 200 |
| Zinc (Zn) | mg/L | < 0.0001 | 0.00021 | < 0.0001 | 0.00092 | 0.00057 | 0.00016 | 0.0014 | 0.00046 |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Quarry Rock\000_Working Data\[Construction Rock and Quarry Rock_20210204_Rev03_MC.xlsx

**Notes:**

All samples are NE CPR materials except for 20-NUN-05 which is Quarry 2 material and 20-OVB-03 which is Quarry D material

All element concentrations are given as dissolved;

Rock types defined as follows: 1a = mafic metavolcanics; 1as = sericite altered mafic metavolcanics; 5 = siltstone (parentheses denotes approximate proportion of siltstone); 7a = gabbro; 12 = quartz veins

# 5 Summary and Conclusions

## 5.1 Quarry 2 Monitoring

There were two blasts at Quarry 2 in 2020 both in March. TMAC conducted geological inspections of the active quarry faces. The inspections identified mafic volcanics (1a) with trace amounts of disseminated sulphides and noted the absence of fibrous actinolite.

Geochemical monitoring indicated that all samples were non-PAG according to values of NP/AP and TIC/AP. Total sulphur concentrations ranged between 0.14 and 0.21 wt% and Modified NP and TIC content ranged between 129 and 173 kg $CaCO_3$/t and 103 and 153 kg $CaCO_3$/t, respectively.

Elemental concentrations were below the screening criteria suggesting no appreciable enrichment.

Samples collected during the first and second inspections reported pH at 9.3 and 8.7, respectively. EC was notably lower for the first blast round (55 µS/cm) compared to the second blast round (370 µS/cm). Quarry material from the second blast reported higher nitrate (35 mg/L as N) and ammonia (8.2 mg/L) compared to the first blast (<0.2 and 0.035 mg/L as N, respectively). Sulphate concentrations were low (<10 mg/L) indicative of the low sulphide content. In both blast rounds, the major anion was alkalinity (20 to 26 mg/L as $CaCO_3$) and the major cation was calcium (7.6 to 38 mg/L).

## 5.2 Madrid North Construction Monitoring

SRK conducted a geological inspection and geochemical sampling program of the Madrid North WRSA, Madrid Surface Shop Laydown and the Overburden Stockpile. The Madrid North Portal Pad was also inspected and sampled but the scope of the program was expanded to investigate the source of the neutral pH metal leaching and high saline drainage as indicated by the 2020 seepage monitoring program (SRK 2021). The sampling program for the Madrid North Portal Pad investigation is presented in Figure A-1 for completeness but results reported separately in SRK (2021).

### 5.2.1 Quarry 2 Surface Crush

Quarry 2 material was used for surface dressing at the Madrid Surface Shop Laydown was mafic metavolcanics (1a) and classified as non-PAG with a total sulphur content of 0.3% and modified NP and TIC of 130 kg $CaCO_3$/t (n=1). Elemental analysis showed no appreciable enrichment compared to the screening criteria. SFE tests reported a pH of 8.9 and low soluble metals concentrations.

### 5.2.2 Madrid Surface Shop Laydown and Waste Rock Storage Area Pad

Of the areas constructed of NE CPR waste rock discussed in this memo, sedimentary rock was used for construction rock in the pads of the Madrid Surface Shop Laydown and the Waste Rock Storage Area. Construction rock at the Madrid Surface Shop Laydown (n=1) and Waste Rock Storage Area (n=6) was composed of unaltered and altered mafic metavolcanics (1a/1as) with selected areas containing sedimentary units (5) and at the WRSA, gabbro (7a).

Total sulphur content ranged between 0.1 and 0.9%, with maximum sulphur in sample 20-WRP-02. Modified NP and TIC ranged from 110 to 310 kg $CaCO_3$/t and from 100 to 360 kg $CaCO_3$/t, respectively. All of the Madrid Surface Shop Laydown and Madrid N WRSA samples were classified as non-PAG.

The one Madrid Surface Shop Laydown sample (20-NUN-01) and four of the WRSA samples (20-WRP-01, 20-WRP-02, 20-WRP-03 and 20-WRP-07) were enriched in arsenic. All of the enriched samples contained sediments except 20-WRP-07 and 20-NUN-01. 20-WRP-02 contained the maximum arsenic (560 ppm), whereas arsenic in the other four samples ranged from 36 to 76 ppm. All other parameters and samples (20-NUN-02 and 20-NUN-03) were below the screening criteria suggesting no appreciable enrichment. Samples 20-NUN-02 and 20-NUN-03 are from the Madrid Surface Shop Laydown and contain sediments.

SFE pH indicated that all samples were non-acidic. Soluble arsenic content was highest for the samples that had the highest solid-phase arsenic content, specifically 20-NUN-01 (0.15 mg/L), 20-WRP-02 (2.6 mg/L) and 20-WRP-07 (0.21 mg/L). In contrast, the maximum soluble arsenic content was 0.082 mg/L for all other Madrid Surface Shop Laydown and WRSA samples. Soluble nickel and cobalt content was highest in WRSA samples, 20-WRP-02 (0.0095 mg/L and 0.00077 mg/L respectively) and 20-WRP-03 (0.0021 mg/L and 0.00034 mg/L respectively).

### 5.2.3 Overburden Stockpile

Construction rock sampled in 2020 at the Overburden Stockpile included mafic metavolcanics (1) sourced from Quarry D in 2019 to construct the access roads (20-OVB-03) and mafic metavolcanics (1a) with gabbro (7a) from NE CPR placed as cladding at the southern toe of the Overburden Stockpile (20-OVB-06). No sedimentary units were observed, however NE CPR waste rock placed in 2020 as internal access roads within the stockpile were buried and not accessible for inspection.

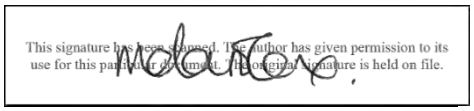
Total sulphur content ranged between 0.1 and 0.2 % and Modified NP and TIC ranged from 120 to 150 kg $CaCO_3$/t and from 100 to 140 kg $CaCO_3$/t, respectively. Both samples were classified as non-PAG. Solid-phase elemental content was below the screening criteria suggesting no appreciable enrichment.

SFE tests indicated that the samples were non-acidic. EC values were 4,200 and 5,400 µS/cm with major cation chemistry dominated by sodium (610 to 780 mg/L) and major anion by sulphate and chloride (530 to 550 mg/L and 960 to 1,200 mg/L respectively). Notable, major ion concentrations were higher than other construction rock samples. SFE concentrations of nickel and cobalt were similar to the highest levels reported in the Madrid North WRSA samples (0.0018 to 0.0021 mg/L and 0.0002 to 0.0003 mg/L respectively). Of the construction rock sample set, SFE manganese concentrations were highest from the Overburden Stockpile construction rock samples (0.079 to 0.11 mg/L).

### 5.2.4 Verification Monitoring of NE CPR Waste Rock used as Construction Rock

All samples of NE CPR waste rock used for construction rock from the Madrid Surface Shop Laydown and Overburden Stockpile were classified as non-PAG with arsenic content below criterion of 70 ppm. At the WRSA, all samples (n=6) were classified as non-PAG with arsenic content for four of the samples below the criterion (As < 70 ppm). Arsenic content for samples 20-WRP-02 and 20-WRP-07 was 560 and 76 ppm, respectively. These samples are within the catchment boundary of the Madrid North CWP which collects runoff from the WRSA (SRK 2020b). Water management at the Madrid North WRSA includes collection of drainage from the WRSA in the CWP and three sumps located on the northern, eastern and western extents of the WRSA pad (MMS1-S1 to MMS1-S3, as denoted in Attachment A). Agnico conducts routine water quality monitoring of water collected in the CWP and sumps.

Regards,
SRK Consulting (Canada) Inc.




Melanie Cox
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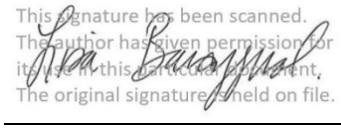
SRK Consulting (Canada) Inc.




Lisa Barazzuol, PGeo (NT/NU)
Principal Consultant (Geochemistry)

## Attachments:

| | |
|---|---|
| Attachment A | Map of Construction Monitoring Sample Locations |
| Attachment B | Geological Inspections, Quarry Monitoring Program |
| Attachment C | Sample Descriptions, Construction Monitoring Program |
| Attachment D | Photos of Sample Locations, Construction Monitoring Program |
| Attachment E | Sample Descriptions and Geochemical Data, Quarry Monitoring Program |
| Attachment F | Geochemical Data, Construction Monitoring Program |

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# Attachment A Map of Construction Monitoring Sample Locations

7550750
7550500
7550250
7550000
7549750
N
433250
433000
Portal Pad
Doris Windy Road
Overburden Stockpile
Waste Rock Storage Area
Madrid Surface Shop Laydown
20-MAD-01
20-MAD-02
PP-11
PP-08
PP-02
PP-03
PP-12
PH-10
20-MADPP-TR-03
PP-09
20-MADPP-TR-02
PP-05
PP-01
PP-04
PP-06
PP-07
20-MADPP-TR-01
20-OVB-03
20-OVB-06
20-OVB-02
20-OVB-01
20-NUN-01
20-NUN-01
20-NUN-02
20-NUN-05
20-NUN-03
MMS1-OUTSIDE
MMS1-N
MMS1-S
MMS1
20-WRP-01
20-WRP-02
MMS1-S3
20-WRP-04
20-WRP-03
20-WRP-07
MMS1-S2
20-WRP-05
20-MWAR-01
MMS1-S1
0
50
100
150
Meters

**LEGEND**

- Construction Samples
- Seepage Locations
- Contact Water Pond
- Sump
- Trench Samples
- As-built Linework

**NOTES**

1. Drone imagery georeferenced by SRK. Imagery taken at oblique angle, therefore sample locations may appear offset.
2. Results for Madrid North Portal Pad samples are reported in SRK (2020) but presented here for completeness.
3. Construction rock within the Overburden Stockpile are buried except where sampled.

**REFERENCES**

NAD 1983 Zone UTM 13N.
Drone imagery collected by TMAC August 6th, 2020.

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Madrid_N_Portal_Pad

AGNICO EAGLE

**Hope Bay Project**

Geochemical Monitoring of Quarry Rock and Construction Rock

# 2020 Construction Rock Monitoring Locations, Madrid North

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| Feb 2021 | LNB | **A-1** |

C:\Users\sconard\OneDrive - SRK Consulting\Projects\Hope_Bay\20200924_Madrid_N_Portal_Pad\1CT022_056_Madrid_N_Portal_Pad\1CT022_056_Madrid_N_Portal_Pad.aprx

# Attachment B Geological Inspections, Quarry Monitoring Program

# Quarry Inspection

Inspection Date: 04-Mar-20 Blast Date: 02-Mar-20

Geologist: Annette P & James F

Quarry Location: Quarry 2

**General Visual Inspection**

| | | |
|---|---|---|
| **Rock Type** | Mafic Volcanic | Description: Fine-medium grained green/grey rock with strong chlorite and moderate epidote alteration. Fe-oxidation on fractures/joints. Minor hematite staining. |
| **Vein** | Y | If yes, describe (min, %, size): Less than 1cm wide quartz/carbonate veinlets <1% |
| **Sulphides** | Y | If yes: Disseminated<br><br>Percentage: Trace |
| **Fibrous Actinolite** | N | If yes, describe (min, %, size): |
| **If anomalous rock types/significant sulphides:** | TAGGED:<br><br>Y/N | |
| **UTM** (only needed if anomalous)**:** | | |

**Inspection at 100m intervals**

| **Rock Characteristics** | |
|---|---|
| **Interval:** | **Description** |
| | |
| | |
| | |
| | |
| | |

**Quarry Rock Sampling (**to be done at two different stages of quarry development per year**)**

| **Whole Rock Sample** |
|---|
| Sample ID: M011302 |
| Description: N= 680811.0 W= 106 deg. 37min 44.8sec Elevation:49 Fine-medium grained green/grey rock with strong chlorite and moderate epidote alteration. Fe-oxidation on fractures/joints. Minor hematite staining. |
| **2 mm screen sample (same material as Whole Rock Sample)** |
| Sample ID: M011303 |
| Description: N= 680811.0 W= 106 deg. 37min 44.8sec Elevation:49 Fine-medium grained green/grey rock with strong chlorite and moderate epidote alteration. Fe-oxidation on fractures/joints. Minor hematite staining. |

**Contingency - Identification of Inappropriate Quarry Rock**

| |
|---|
| In the unlikely event that the visual inspection identifies PAG rock, the geologist will 'tag' the material for avoidance or removal. If the material is excavated, it will be transported to a waste rock storage area for disposal underground. If this is not possible at the time, the PAG rock will be buried in an active or previously mined out quarry. If the PAG material is buried, it will be covered with a min of 2m of rock material that is approved for construction and will be clearly marked as inappropriate for use as construction material. |
| In the unlikely event that the visual inspection identifies fibrous actinolite, the geologist will 'tag' the material for avoidance or removal. If the materical is excavated, it will be transported to a waste storage area for disposal underground. If this is not possible at the time, the material will be buried in one of the previously mined-out quarries and covered with a 1m layer of benign rock and a record of the location maintained.<br>*Pg 16: Quarry Management and Monitoring Plan - Revision 02 SRK Consulting* |

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TMAC RESOURCES

# Quarry Inspection

Inspection Date: Mar 21 2020 Blast Date: Mar 20 2020

Geologist: Jared Liimu

Quarry Location: Quarry 2

**General Visual Inspection**

| | | |
|---|---|---|
| **Rock Type** | 1a | Description: dark green-grey basalt, hem ox on joints, <1% carb |
| **Vein** | (Y)/N | If yes, describe (min, %, size): <1% carb <1cm wide |
| **Sulphides** | Y/(N) | If yes: Disseminated/Vein/Stringer/Other<br>Percentage: |
| **Fibrous Actinolite** | Y/(N) | If yes, describe (min, %, size): |
| **If anomalous rock types/significant sulphides:** | TAGGED:<br>Y/(N) | |
| **UTM** (only needed if anomalous)**:** | | |

**Inspection at 100m intervals**

| Rock Characteristics | |
|---|---|
| **Interval:** | **Description** |
| 1a | dark green grey basalt, hem ox on joints |
| 1a | |
| | |
| | |
| | |

**Quarry Rock Sampling** (to be done at two different stages of quarry development per year)

| **Whole Rock Sample** |
|---|
| Sample ID: M020505 |
| Description: ~~Fine~~ Fine grained basalt with moderate hematite staining on joint surface, 1/2-1cm wide carbonate veinlets |
| **2 mm screen sample (same material as Whole Rock Sample)** |
| Sample ID: M020504 |
| Description: Fg bas. w/ mod jthem, ~~1/2-1cm~~ tr. 1cm carb vnlt. |

**Contingency - Identification of Inappropriate Quarry Rock**

| |
|---|
| In the unlikely event that the visual inspection identifies PAG rock, the geologist will 'tag' the material for avoidance or removal. If the material is excavated, it will be transported to a waste rock storage area for disposal underground. If this is not possible at the time, the PAG rock will be buried in an active or previously mined out quarry. If the PAG material is buried, it will be covered with a min of 2m of rock material that is approved for construction and will be clearly marked as inappropriate for use as construction material. |
| In the unlikely event that the visual inspection identifies fibrous actinolite, the geologist will 'tag' the material for avoidance or removal. If the materical is excavated, it will be transported to a waste storage area for disposal underground. If this is not possible at the time, the material will be buried in one of the previously mined-out quarries and covered with a 1m layer of benign rock and a record of the location maintained.<br>*Pg 16: Quarry Management and Monitoring Plan - Revision 02 SRK Consulting* |

# Attachment C Sample Descriptions, Construction Monitoring Program

| Material Source Area | Sample ID | Mine Facility | Coordinates (NAD83) | | Rock Types | Geological Description | Sedimentary Unit | % Sediments | Sulphide | % Sulphide | Fizz (Groundmass) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Easting | Northing | | | | | | | |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 432956 | 7550463.8 | 1a | Surface dressing sample (Crushed Quarry 2 rock). 100% 1a which has frequent quartz-calcite veinlets which have moderate fizz, no visible pyrite, and weak fracture coating iron oxides. | | 0 | | | None |
| NE CPR | 20-NUN-01 | | 432991 | 7550454.9 | 1a>1as | Sample of NE construction rock. Mix of 1a (90%) which contains no visible pyrite and no fizz except for rare quartz-calcite veinlets, 1as (10%) which has no fizz and contains ~5% stockwork quartz veins which contain 0.5% vein hosted pyrite. Weak iron oxidation of fractures of both units. | | 0 | | | None |
| | 20-NUN-02 | | 432957 | 7550503.7 | 1a>gabbro>siltstone>12 | Sample of NE construction rock. Mix of 1a (85%) which contains no visible pyrite and occasional quartz-calcite veinlets, gabbro (10%) which contains no visible pyrite or fizz, silicified siltstone (3%) which contains trace finely disseminated pyrite, and quartz veins (trace) which contain trace vein hosted pyrite. | Y | 3 | Pyrite | trace | None |
| | 20-NUN-03 | | 432906 | 7550468.2 | gabbro>1a>siltstone | Sample of NE construction rock. Mix of gabbro (45%) with no visible pyrite or fizz, 1a (30%) which contains trace finely disseminated pyrite and frequent quartz-calcite veinlets which have weak fizz, and silicified siltstone (25%) which have no visible fizz or sulphide content. | Y | 25 | Pyrite | trace | None |
| | 20-WRP-01 | Madrid N WRP | 433142 | 7549886.7 | 1a>siltstone | Mix of weakly foliated greenstone (1a) which contains 0.5% finely disseminated pyrite, no fizz on groundmass, weak fizz on quartz-calcite veinlets, and weak fracture coating oxidation and moderately silicified siltstone (30%) which has no fizz, trace finely disseminated pyrite, and no oxidation. | Y | 30 | Pyrite | 0.5% | None |
| | 20-WRP-02 | | 433129 | 7549962 | 1as>1a>oxide>siltstone | Mix of tan brown colored strongly foliated 1as (60%) which contains 5% stockwork quartz veinlets, trace vein hosted pyrite, and no oxidation, 1a (35%) which has moderate fracture coating oxidation, trace disseminated pyrite, and weak fizz on quartz-calcite veinlets, oxide (3%) which is pervasively strongly oxidized and crumbly 1a, and moderately silicified siltstone (2%) which has no visible fizz or sulphide content. | Y | 2 | Pyrite | 0.5% | None |
| | 20-WRP-03 | | 433065 | 7549923.5 | 1a>siltstone>gabbro | Mix of 1a (75%) which has trace disseminated pyrite and rare quartz-carbonate veinlets with weak fizz, weakly silicified siltstone (15%) with no fizz and trace finely disseminated pyrite, and gabbro (10%) which has no visible fizz or gabbro. | Y | 15 | Pyrite | 0.5% | None |
| | 20-WRP-04 | | 433112 | 7550077.7 | 1a | Weakly foliated greenstone (1A) which has no fizz except occasional quartz-calcite veinlets, trace finely disseminated pyrite, and moderate fracture coating oxidation. | | 0 | Pyrite | 0.5% | None |
| | 20-WRP-05 | | 432946 | 7550083.4 | 1a | Weakly foliated greenstone (1A) which has abundant calcite veinlets and trace finely disseminated pyrite. | | 0 | Pyrite | trace | None |
| | 20-WRP-07 | | 433026 | 7549948.6 | 1a | Weakly foliated greenstone (1A) which has abundant calcite veinlets and trace finely disseminated pyrite. | | 0 | Pyrite | trace | None |
| | 20-OVB-03 | Overburden pad material | 433157 | 7550668.6 | 1a | Construction rock sample of overburden pad material. 100% weekly foliated greenstone (1a) with trace medium grained disseminated pyrite, occasional quartz-calcite veinlets, and weak fracture coating oxidation. | | 0 | | | None |
| | 20-OVB-06 | Overburden stockpile cladding | 433174 | 7550487 | 1a>gabbro | Construction rock sample of waste rock cladding material. Weakly foliated greenstone (1a) (90%) with no visible sulphides, weak fizz on quartz-calcite veinlets, and weak fracture coating oxidation. 10% gabbro with no visible fizz or sulphide content. | | 0 | | | None |

| Material Source Area | Sample ID | Mine Facility | Fizz (Carbonate+Quartz Veins) | Carbonate Color | Carbonate Occurrence | Weathering Intensity | Secondary Minerals | Color of -2mm Fraction | Contact Test | | Analyses Conducted | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Rinse pH | Rinse EC (uS/cm) | Total Sulphur (<1 cm) | ABA (<1 cm) | Aqua Regia Metals (<1 cm) | SFE (<2 mm) |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | Moderate | White | Vein | Weak | FeOx | reddish tan | 8.98 | 90 | x | x | x | x |
| NE CPR | 20-NUN-01 | | Weak | White | Vein | Weak | FeOx | Dark greenish grey | 9.48 | 297 | x | x | x | x |
| | 20-NUN-02 | | Weak | White | Vein | Weak | FeOx | Dark greenish grey | 9.01 | 111 | x | x | x | |
| | 20-NUN-03 | | Weak | White | Vein | Weak | FeOx | grey | 8.91 | 151 | x | x | x | |
| | 20-WRP-01 | Madrid N WRP | Moderate | White | Vein | weak-moderate | FeOx | reddish grey | 9.12 | 208 | x | x | x | x |
| | 20-WRP-02 | | Moderate | White | Vein | weak-moderate | FeOx | grey | 7.73 | 367 | x | x | x | x |
| | 20-WRP-03 | | Weak | White | Vein | weak-moderate | FeOx | grey | 9.13 | 120 | x | x | x | x |
| | 20-WRP-04 | | Moderate | White | Vein | weak-moderate | FeOx | brownish grey | 9.54 | 253 | x | x | x | |
| | 20-WRP-05 | | Moderate | White | Vein | weak-moderate | FeOx | greenish grey | 8.44 | 181 | x | x | x | |
| | 20-WRP-07 | | Moderate | White | Vein | weak-moderate | FeOx | greenish grey | 9.18 | 227 | x | x | x | x |
| | 20-OVB-03 | Overburden pad material | Weak | White | Vein | Weak | FeOx | Greenish grey | 9.12 | 109 | x | x | x | x |
| | 20-OVB-06 | Overburden stockpile cladding | Weak | White | Vein | Weak | FeOx | Brown | 9.31 | 305 | x | x | x | x |

# Attachment D Photos of Sample Locations, Construction Monitoring Program

**Photo:** Sampling Location 20-WRP-01.

**Photo**: Mix of weakly foliated greenstone (1a) with quartz-calcite veinlets and moderately silicified siltstone.

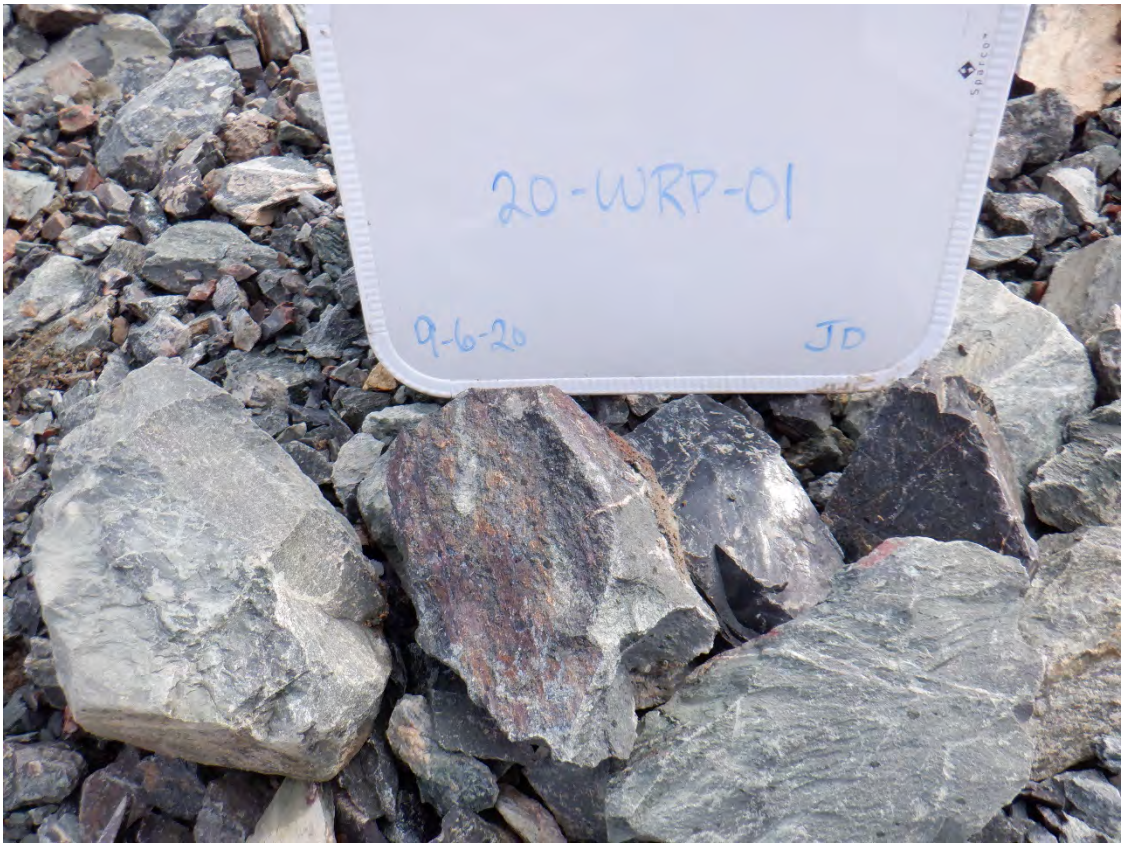


**Photo**: Mix of weakly foliated greenstone with moderate fracture coating oxidation, quartz-calcite veinlets and weak to moderate sericite alteration and moderately silicified siltstone.

**Photo**: Sampling Location 20-WRP-02.

**Photo**: Tan brown colored strongly foliated sericite altered mafic metavolcanics (1as), greenstone metavolcanics (1a), moderately silicified siltstone, and oxide.

**Photo:** Sampling location 20-WRP-03.

**Photo:** Mafic metavolcanics with trace disseminated pyrite, silicified siltstone and gabbro.

**Photo:** Sampling location 20-WRP-04.

**Photo:** Weekly foliated greenstone with <1cm quartz-carbonate veins and moderate fracture coating oxidation.

**Photo:** Sampling location 20-WRP-05.

**Photo:** Weekly foliated greenstone (1A) with abundant quartz-calcite veinlets.

**Photo:** Sampling location 20-WRP-07, weekly foliated greenstone with abundant calcite veinlets and weak to moderate fracture iron oxides.

**Photo:** Sample location 20-OVB-03, overburden pad material, foliated greenstone (1a) with trace medium grained disseminated pyrite, occasional quartz-calcite veinlets, and weak fracture coating oxidation.

**Photo:** Sample location 20-OVB-06, cladding material. Weakly foliated greenstone (1a) and gabbro with no visible sulphides.

**Photo:** Sample location 20-NUN-01

**Photo:** 20-NUN-01, mix of 1a with no visible pyrite, 1as and stockwork quartz veins which contain vein hosted pyrite. Weak iron oxidation of fractures of both units.

**Photo:** 20-NUN-02, mix of 1a with no visible pyrite and occasional quartz-calcite veinlets, gabbro with no visible pyrite and silicified siltstone which contains trace finely disseminated pyrite, and quartz veins which contain trace vein hosted pyrite.

**Photo:** Sample location 20-NUN-03.

**Photo:** 20-NUN-03, mix of gabbro, with no visible pyrite, mafic metavolcanics (1a) which contains trace finely disseminated pyrite and frequent quartz-calcite veinlets and silicified siltstone which have no visible sulphide content.

**Photo:** 20-NUN-05, Surface dressing sample (Crushed Quarry 2 rock). 100% mafic metavolcanics (1a) which has frequent quartz-calcite veinlets, no visible pyrite, and weak fracture coating iron oxides.

# Attachment E Sample Descriptions and Geochemical Data, Quarry Monitoring Program

| Sample No (LAB) | Client Sample ID | Size Fraction | Quarry Monitoring - ABA | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Paste pH | CO2 | CaCO3 Equiv. | Total S | HCl Extractable Sulphur | Sulphide Sulphur (by diff.) | AP Calculated from Total S | Mod. ABA Neutralization Potential | Fizz Rating | Net Neutralization Potential | Neutralization Potential Ratio | TIC/AP (calculated from Total S) | NP/AP (calculated from Total S) |
| | | | pH Units | wt% | Kg CaCO3/T | wt% | wt% | wt% | Calc | Kg CaCO3/T | N/A | Kg CaCO3/T | N/A | N/A | N/A |
| YY4033 | M020504 | -2mm | 7.9 | 6.4 | 150 | 0.15 | 0.07 | 0.1 | 4.7 | 170 | STRONG | 170 | 69 | 31 | 37 |
| YY4036 | M011303 | -2mm | 8.1 | 6.7 | 150 | 0.20 | 0.02 | 0.2 | 6.3 | 170 | STRONG | 170 | 31 | 25 | 27 |
| YY4035 | M011302 | -1cm | 8.5 | 4.6 | 100 | 0.21 | 0.04 | 0.2 | 6.6 | 130 | STRONG | 120 | 24 | 16 | 20 |
| YY4034 | M020505 | -1cm | 8.0 | 5.1 | 120 | 0.14 | 0.04 | 0.1 | 4.4 | 130 | STRONG | 130 | 43 | 27 | 30 |
| | *Detection Limits>>* | | *N/A* | *0.08* | *0.50* | *0.02* | *0.01* | *0.02* | | *N/A* | *N/A* | *N/A* | *N/A* | | |
| | *BV Labs SOP # >>* | | *BBY0SOP-00016* | *LECO* | *BBY WI-00033* | *LECO* | *BBY ARD-00009* | *BBY WI-00033* | | *BBY0SOP-00020* | *BBY0SOP-00020 / BBY0SOP-00023* | *BBY WI-00033* | *BBY WI-00033* | | |

| Sample No (LAB) | Client Sample ID | Size Fraction | Aqua Regia Metals | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mo | Cu | Pb | Zn | Ag | Ni | Co | Mn | Fe | As | U | Au | Th | Sr | Cd | Sb | Bi | V | Ca |
| | | | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm | ppb | ppm | ppm | ppm | ppm | ppm | ppm | % |
| YY4033 | M020504 | -2mm | 0.9 | 140 | 3.9 | 84 | <0.1 | 68 | 41 | 1400 | 6.1 | 1.4 | <0.1 | 2.5 | 0.4 | 20 | 0.2 | <0.1 | <0.1 | 150 | 6.4 |
| YY4036 | M011303 | -2mm | 0.9 | 170 | 4.0 | 92 | <0.1 | 70 | 45 | 1600 | 6.5 | 5.3 | <0.1 | 1.5 | 0.3 | 22 | 0.2 | <0.1 | <0.1 | 150 | 7.1 |
| YY4035 | M011302 | -1cm | 0.6 | 150 | 2.4 | 81 | <0.1 | 76 | 39 | 1400 | 6.2 | 1.8 | <0.1 | 6.9 | 0.3 | 22 | 0.1 | <0.1 | <0.1 | 150 | 5.1 |
| YY4034 | M020505 | -1cm | 0.4 | 140 | 2.6 | 87 | <0.1 | 69 | 41 | 1400 | 6.4 | 0.8 | <0.1 | 0.7 | 0.2 | 18 | 0.1 | <0.1 | <0.1 | 150 | 5.6 |
| | *Detection Limits>>* | | 0.1 | 0.1 | 0.1 | 1 | 0.1 | 0.1 | 0.1 | 1 | 0.01 | 0.5 | 0.1 | 0.5 | 0.1 | 1 | 0.1 | 0.1 | 0.1 | 2 | 0.01 |
| | *BV Labs SOP # >>* | | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 |

| Sample No (LAB) | Client Sample ID | Size Fraction | Aqua Regia Metals | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | P | La | Cr | Mg | Ba | Ti | B | Al | Na | K | W | Hg | Sc | Tl | S | Ga | Se | Te |
| | | | % | ppm | ppm | % | ppm | % | ppm | % | % | % | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm |
| YY4033 | M020504 | -2mm | 0.027 | 1.0 | 220 | 2.5 | 6.0 | 0.4 | <20 | 3.4 | 0.02 | 0.02 | 0.2 | <0.01 | 7.7 | <0.1 | 0.1 | 7.0 | <0.5 | <0.2 |
| YY4036 | M011303 | -2mm | 0.026 | 2.0 | 200 | 2.6 | 6.0 | 0.4 | 39 | 3.5 | 0.02 | 0.03 | 0.4 | <0.01 | 7.9 | <0.1 | 0.2 | 7.0 | 0.8 | <0.2 |
| YY4035 | M011302 | -1cm | 0.027 | 2.0 | 210 | 2.5 | 6.0 | 0.4 | 31 | 3.3 | 0.03 | 0.03 | <0.1 | <0.01 | 8.1 | <0.1 | 0.1 | 7.0 | <0.5 | <0.2 |
| YY4034 | M020505 | -1cm | 0.031 | 1.0 | 170 | 2.7 | 3.0 | 0.3 | <20 | 3.4 | 0.01 | 0.02 | <0.1 | <0.01 | 7.5 | <0.1 | 0.1 | 7.0 | <0.5 | <0.2 |
| | *Detection Limits>>* | | 0.001 | 1 | 1 | 0.01 | 1 | 0.001 | 20 | 0.01 | 0.001 | 0.01 | 0.1 | 0.01 | 0.1 | 0.1 | 0.05 | 1 | 0.5 | 0.2 |
| | *BV Labs SOP # >>* | | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 | AQ-200 |

| Sample No (LAB) | Client Sample ID | Size Fraction | MEND SFE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Weight | Volume Used | pH | EC | SO4 | Acidity to pH4.5 | Acidity to pH8.3 | Total Alkalinity | Bicarbonate | Carbonate | Hydroxide | Dissolved Chloride | Nitrate-N | Nitrite-N | Total Ammonia |
| | | | g | ml | pH Units | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| YY4033 | M020504 | -2mm | 250 | 750 | 8.7 | 370 | 6.8 | <0.5 | <0.5 | 26.0 | 38.0 | <0.5 | <0.5 | 5.0 | 35.0 | <0.05 | 8.2 |
| YY4036 | M011303 | -2mm | 250 | 750 | 9.3 | 55 | 6.0 | <0.5 | <0.5 | 20.0 | 25.0 | <0.5 | <0.5 | 1.1 | <0.2 | <0.05 | 0.035 |
| | *Detection Limits>>* | | | | N/A | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.02 | 0.005 | 0.005 |
| | *BV Labs SOP # >>* | | BBY0SOP-00008 | BBY0SOP-00008 | BBY0SOP-00003 | BBY0SOP-00006 | BBY6SOP-00017 | BBY6SOP-00037 | BBY6SOP-00037 | BBY6SOP-00026 | BBY6SOP-00026 | BBY6SOP-00026 | BBY6SOP-00026 | BBY6SOP-00011 | BBY WI-00033 | BBY6SOP-00010 | |

| Sample No (LAB) | Client Sample ID | Size Fraction | MEND SFE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total Dissolved Solids | Hardness CaCO3 | Dissolved Aluminum (Al) | Dissolved Antimony (Sb) | Dissolved Arsenic (As) | Dissolved Barium (Ba) | Dissolved Beryllium (Be) | Dissolved Bismuth (Bi) | Dissolved Boron (B) | Dissolved Cesium (Cs) | Dissolved Cadmium (Cd) | Dissolved Calcium (Ca) | Dissolved Chromium (Cr) | Dissolved Cobalt (Co) | Dissolved Copper (Cu) |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| YY4033 | M020504 | -2mm | 270 | 110 | 0.2 | 0.0001 | 0.0003 | 0.0029 | <0.00001 | <0.000005 | 0.1 | 0.0003 | <0.000005 | 38 | <0.0001 | 0.0001 | 0.003 |
| YY4036 | M011303 | -2mm | 28 | 22 | 0.3 | 0.0001 | 0.0009 | 0.0004 | <0.00001 | <0.000005 | <0.1 | <0.0001 | <0.000005 | 7.6 | <0.0001 | 0.0001 | 0.001 |
| | *Detection Limits>>* | | 10 | 0.50 | 0.00050 | 0.000020 | 0.000020 | 0.000020 | 0.000010 | 0.0000050 | 0.050 | 0.000050 | 0.0000050 | 0.050 | 0.00010 | 0.0000050 | 0.000050 |
| | *BV Labs SOP # >>* | | BBY6SOP-00033 | BBY WI-00033 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 |

| Sample No (LAB) | Client Sample ID | Size Fraction | MEND SFE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dissolved Lanthanum (La) | Dissolved Iron (Fe) | Dissolved Lead (Pb) | Dissolved Lithium (Li) | Dissolved Magnesium (Mg) | Dissolved Manganese (Mn) | Dissolved Phosphorus (P) | Dissolved Molybdenum (Mo) | Dissolved Nickel (Ni) | Dissolved Potassium (K) | Dissolved Rubidium (Rb) | Dissolved Selenium (Se) | Dissolved Silicon (Si) | Dissolved Silver (Ag) | Dissolved Sodium (Na) |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| YY4033 | M020504 | -2mm | <0.00005 | 0.001 | 0.00001 | 0.005 | 4.3 | 0.014 | 0.027 | 0.011 | 0.0002 | 2.3 | 0.0045 | 0.0004 | 0.7 | <0.000005 | 8.8 |
| YY4036 | M011303 | -2mm | <0.00006 | 0.036 | 0.00003 | <0.001 | 0.8 | 0.002 | 0.005 | 0.001 | 0.0001 | 0.3 | 0.0003 | 0.0001 | 0.7 | <0.000005 | 1.1 |
| | *Detection Limits>>* | | 0.000050 | 0.0010 | 0.0000050 | 0.00050 | 0.050 | 0.000050 | 0.0020 | 0.000050 | 0.000020 | 0.050 | 0.000050 | 0.000040 | 0.10 | 0.0000050 | 0.050 |
| | *BV Labs SOP # >>* | | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 |

| Sample No (LAB) | Client Sample ID | Size Fraction | MEND SFE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dissolved Strontium (Sr) | Dissolved Sulphur (S) | Dissolved Tellurium (Te) | Dissolved Thallium (Tl) | Dissolved Thorium (Th) | Dissolved Tin (Sn) | Dissolved Titanium (Ti) | Dissolved Tungsten (W) | Dissolved Uranium (U) | Dissolved Vanadium (V) | Dissolved Zinc (Zn) | Dissolved Zirconium (Zr) | Dissolved Mercury (Hg) | Carbonate | Hydroxide |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| YY4033 | M020504 | -2mm | 0.038 | <10 | <0.00002 | 0.000050 | <0.000005 | <0.0002 | <0.0005 | 0.0002 | 0.000004 | 0.001 | <0.0001 | <0.0001 | <0.00005 | <0.5 | <0.5 |
| YY4036 | M011303 | -2mm | 0.004 | <10 | <0.00002 | 0.000005 | <0.000005 | <0.0002 | <0.0005 | 0.0006 | 0.000011 | 0.002 | <0.0001 | <0.0001 | <0.00005 | -- | -- |
| | *Detection Limits>>* | | 0.000050 | 10 | 0.000020 | 0.0000020 | 0.0000050 | 0.00020 | 0.00050 | 0.000010 | 0.0000020 | 0.00020 | 0.00010 | 0.00010 | 0.000050 | 0.5 | 0.5 |
| | *BV Labs SOP # >>* | | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY7SOP-00002 | BBY6SOP-00026 | BBY6SOP-00026 |

# Attachment F Geochemical Data, Construction Monitoring Program

| Material Source Area | Sample ID | Mine Facility | Rock Types | ABA | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Paste pH | Total S | SO4 (HCl Extractable Sulphur) | Sulphide Sulphur (by difference) | AP (calculated from Total S) | Fizz Rating | $CO_2$ | TIC | Modified NP | TIC/AP (calculated from Total S) | NP/AP (calculated from Total S) |
| | | | | pH Units | wt% | wt% | wt% | Kg CaCO3/T | | wt% | Kg CaCO3/T | Kg CaCO3/T | Tot S | Tot S |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 1a | 8.7 | 0.25 | 0.07 | 0.18 | 7.8 | MODERATE | 5.7 | 130 | 130 | 17 | 16 |
| NE CPR | 20-NUN-01 | Nuna Pad Laydown | 1a>1as | 8.9 | 0.34 | <0.01 | 0.34 | 11 | STRONG | 8.5 | 190 | 190 | 18 | 18 |
| NE CPR | 20-NUN-02 | Nuna Pad Laydown | 1a>7a>5(3%)>12 | 8.6 | 0.32 | 0.05 | 0.27 | 10 | MODERATE | 6.1 | 140 | 160 | 14 | 16 |
| NE CPR | 20-NUN-03 | Nuna Pad Laydown | 7a>1a>5(25%) | 8.7 | 0.43 | 0.01 | 0.42 | 13 | MODERATE | 5.3 | 120 | 130 | 9.0 | 10 |
| NE CPR | 20-WRP-01 | Madrid N WRP | 1a>5(30%) | 8.7 | 0.29 | 0.01 | 0.28 | 9.1 | MODERATE | 6.9 | 160 | 140 | 17 | 16 |
| NE CPR | 20-WRP-02 | Madrid N WRP | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 8.7 | 0.93 | 0.01 | 0.92 | 29 | STRONG | 16 | 360 | 310 | 12 | 11 |
| NE CPR | 20-WRP-03 | Madrid N WRP | 1a>5 (15%)>7a | 8.7 | 0.34 | 0.01 | 0.33 | 11 | MODERATE | 4.5 | 100 | 110 | 10 | 10 |
| NE CPR | 20-WRP-04 | Madrid N WRP | 1a | 9.3 | 0.18 | <0.01 | 0.18 | 5.6 | STRONG | 6.5 | 150 | 160 | 26 | 28 |
| NE CPR | 20-WRP-05 | Madrid N WRP | 1a | 8.4 | 0.10 | <0.01 | 0.10 | 3.1 | STRONG | 8.3 | 190 | 200 | 61 | 65 |
| NE CPR | 20-WRP-07 | Madrid N WRP | 1a | 10 | 0.25 | <0.01 | 0.25 | 7.8 | STRONG | 10 | 230 | 230 | 29 | 30 |
| NE CPR | 20-OVB-03 | Overburden pad material | 1a | 8.5 | 0.18 | 0.03 | 0.15 | 5.6 | MODERATE | 6.0 | 140 | 150 | 24 | 26 |
| NE CPR | 20-OVB-06 | Overburden stockpile cladding | 1a>7a | 8.5 | 0.14 | 0.02 | 0.12 | 4.4 | MODERATE | 4.6 | 100 | 120 | 24 | 28 |

* Rock types defined as follows:

1a = mafic metavolcanics

1as = sericite altered mafic metavolcanics

5 = siltstone (parentheses denotes approximate proportion of siltstone)

7a = gabbro

12 = quartz veins

| Material Source Area | Sample ID | Mine Facility | Rock Types | Aqua Regia | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | As | Co | Ni | Zn | Mo | Cu | Pb | Ag | Mn | Fe | U | Au | Th | Sr | Cd | Sb | Bi | V | Ca |
| | | | | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm | ppb | ppm | ppm | ppm | ppm | ppm | ppm | % |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 1a | 7.5 | 41 | 41 | 110 | 1.9 | 100 | 2.0 | <0.10 | 1600 | 8.5 | 0.10 | 6.1 | 0.8 | 21 | <0.10 | <0.10 | <0.10 | 220 | 3.8 |
| NE CPR | 20-NUN-01 | Nuna Pad Laydown | 1a>1as | 52 | 49 | 150 | 71 | 0.7 | 150 | 1.5 | <0.10 | 1300 | 8.9 | 0.10 | 120 | 1.1 | 37 | <0.10 | 0.1 | <0.10 | 250 | 4.6 |
| NE CPR | 20-NUN-02 | Nuna Pad Laydown | 1a>7a>5(3%)>12 | 8.1 | 45 | 52 | 100 | 1.5 | 120 | 1.5 | <0.10 | 1700 | 8.4 | <0.10 | 1.5 | 1.7 | 22 | <0.10 | <0.10 | <0.10 | 230 | 4.4 |
| NE CPR | 20-NUN-03 | Nuna Pad Laydown | 7a>1a>5(25%) | 14 | 41 | 100 | 78 | 0.6 | 110 | 2.9 | <0.10 | 1400 | 7.0 | 0.20 | 10 | 2.0 | 28 | <0.10 | 0.1 | <0.10 | 140 | 3.6 |
| NE CPR | 20-WRP-01 | Madrid N WRP | 1a>5(30%) | 36 | 51 | 220 | 82 | 0.3 | 98 | 1.9 | 0.20 | 1800 | 8.4 | 0.10 | 66 | 0.8 | 15 | <0.10 | 0.1 | <0.10 | 170 | 3.4 |
| NE CPR | 20-WRP-02 | Madrid N WRP | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 560 | 58 | 440 | 21 | 0.5 | 150 | 2.5 | 0.20 | 1500 | 5.8 | 0.10 | 720 | 1.3 | 130 | <0.10 | 0.8 | <0.10 | 50 | 7.2 |
| NE CPR | 20-WRP-03 | Madrid N WRP | 1a>5 (15%)>7a | 36 | 39 | 170 | 62 | 0.4 | 71 | 2.6 | <0.10 | 1400 | 7.3 | 0.20 | 110 | 1.5 | 18 | <0.10 | 0.1 | <0.10 | 130 | 2.4 |
| NE CPR | 20-WRP-04 | Madrid N WRP | 1a | 14 | 55 | 210 | 85 | 0.3 | 88 | 2.6 | <0.10 | 1900 | 8.9 | <0.10 | 13 | 0.4 | 20 | <0.10 | <0.10 | <0.10 | 170 | 4.2 |
| NE CPR | 20-WRP-05 | Madrid N WRP | 1a | 14 | 39 | 120 | 110 | 0.2 | 85 | 4.1 | <0.10 | 1400 | 5.6 | 0.10 | 4.1 | 1.5 | 19 | 0.3 | <0.10 | <0.10 | 140 | 7.6 |
| NE CPR | 20-WRP-07 | Madrid N WRP | 1a | 76 | 66 | 430 | 52 | 0.5 | 160 | 1.5 | <0.10 | 1700 | 7.5 | <0.10 | 38 | 0.3 | 130 | 0.2 | <0.10 | <0.10 | 200 | 7.9 |
| NE CPR | 20-OVB-03 | Overburden pad material | 1a | 5.0 | 44 | 110 | 100 | 0.8 | 100 | 2.9 | <0.10 | 1600 | 7.1 | 0.20 | 1.9 | 3.1 | 26 | 0.2 | <0.10 | <0.10 | 170 | 5.3 |
| NE CPR | 20-OVB-06 | Overburden stockpile cladding | 1a>7a | 7.5 | 41 | 120 | 79 | 0.5 | 87 | 3.2 | <0.10 | 1400 | 6.5 | 0.40 | 9.1 | 4.6 | 21 | <0.10 | <0.10 | <0.10 | 120 | 3.9 |

| Material Source Area | Sample ID | Mine Facility | Rock Types | Aqua Regia | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | P | La | Cr | Mg | Ba | Ti | B | Al | Na | K | W | Hg | Sc | Tl | S | Ga | Se | Te | Bi |
| | | | | % | ppm | ppm | % | ppm | % | ppm | % | % | % | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 1a | 0.05 | 5.0 | 62 | 3.0 | 10 | 0.2 | <20 | 3.5 | 0.01 | 0.1 | <0.10 | <0.01 | 20 | <0.10 | 0.2 | 13 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-NUN-01 | Nuna Pad Laydown | 1a>1as | 0.06 | 10 | 180 | 5.1 | 27 | 0.1 | 30 | 3.3 | 0.03 | 0.1 | <0.10 | <0.01 | 20 | <0.10 | 0.3 | 14 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-NUN-02 | Nuna Pad Laydown | 1a>7a>5(3%)>12 | 0.05 | 4.0 | 92 | 3.4 | 9.0 | 0.1 | <20 | 3.9 | 0.01 | 0.1 | 0.2 | <0.01 | 21 | <0.10 | 0.3 | 13 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-NUN-03 | Nuna Pad Laydown | 7a>1a>5(25%) | 0.04 | 9.0 | 160 | 3.4 | 21 | 0.1 | <20 | 3.1 | 0.02 | 0.1 | <0.10 | <0.01 | 13 | <0.10 | 0.4 | 10 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-WRP-01 | Madrid N WRP | 1a>5(30%) | 0.04 | 8.0 | 280 | 5.5 | 11 | 0.0 | <20 | 4.3 | 0.02 | 0.1 | 0.5 | <0.01 | 20 | <0.10 | 0.2 | 11 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-WRP-02 | Madrid N WRP | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 0.02 | 4.0 | 160 | 3.9 | 12 | 0.0 | <20 | 1.2 | 0.01 | 0.1 | 1.0 | 0.01 | 15 | <0.10 | 0.8 | 3.0 | <0.50 | 0.20 | <0.10 |
| NE CPR | 20-WRP-03 | Madrid N WRP | 1a>5 (15%)>7a | 0.04 | 8.0 | 230 | 4.6 | 11 | 0.0 | <20 | 3.6 | 0.02 | 0.1 | 0.3 | 0.01 | 13 | <0.10 | 0.3 | 10 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-WRP-04 | Madrid N WRP | 1a | 0.03 | 6.0 | 290 | 6.0 | 5 | 0.1 | <20 | 4.8 | 0.03 | 0.1 | <0.10 | <0.01 | 16 | <0.10 | 0.1 | 11 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-WRP-05 | Madrid N WRP | 1a | 0.02 | 5.0 | 340 | 3.4 | 10 | 0.1 | <20 | 3.7 | 0.01 | 0.1 | <0.10 | <0.01 | 14 | <0.10 | 0.1 | 8 | 0.50 | <0.20 | <0.10 |
| NE CPR | 20-WRP-07 | Madrid N WRP | 1a | 0.04 | 4.0 | 480 | 3.8 | 53 | 0.1 | <20 | 3.2 | 0.04 | 0.1 | <0.10 | <0.01 | 19 | <0.10 | 0.2 | 10 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-OVB-03 | Overburden pad material | 1a | 0.04 | 6.0 | 270 | 3.4 | 18 | 0.2 | 30 | 3.8 | 0.04 | 0.1 | 0.2 | <0.01 | 15 | <0.10 | 0.2 | 10 | <0.50 | <0.20 | <0.10 |
| NE CPR | 20-OVB-06 | Overburden stockpile cladding | 1a>7a | 0.04 | 10 | 260 | 3.8 | 29 | 0.2 | <20 | 3.7 | 0.07 | 0.2 | <0.10 | <0.01 | 10 | <0.10 | 0.1 | 9.0 | <0.50 | <0.20 | <0.10 |

* Rock types defined as follows:

1a = mafic metavolcanics

1as = sericite altered mafic metavolcanics

5 = siltstone (parentheses denotes approximate proportion of siltstone)

7a = gabbro

12 = quartz veins

| Material Source Area | Sample ID | Mine Facility | Rock Types | MEND SFE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample Weight | Volume Used | pH | EC | SO4 | Acidity to pH4.5 | Acidity to pH8.3 | Total Alkalinity | Bicarbonate | Carbonate | Hydroxide | Dissolved Chloride | Dissolved Bromide | Total Ammonia | Nitrate-N | Nitrite-N | Hardness CaCO3 | Dissolved Aluminum (Al) |
| | | | | g | ml | pH Units | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 1a | 250 | 750 | 8.9 | 91 | 7.4 | <0.5 | <0.5 | 36 | 44 | <0.5 | <0.5 | 0.9 | | 0.02 | <0.2 | <0.05 | 29 | 0.24 |
| NE CPR | 20-NUN-01 | Nuna Pad Laydown | 1a>1as | 250 | 750 | 10 | 130 | 11 | <0.5 | <0.5 | 38 | 46 | <0.5 | <0.5 | 9.2 | | 0.09 | <0.2 | <0.05 | 16 | 0.29 |
| NE CPR | 20-WRP-01 | Madrid N WRP | 1a>5(30%) | 250 | 750 | 9.0 | 220 | 54 | <0.5 | <0.5 | 29 | 35 | <0.5 | <0.5 | 10 | | 0.06 | <0.2 | <0.05 | 31 | 0.13 |
| NE CPR | 20-WRP-02 | Madrid N WRP | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 200 | 600 | 8.6 | 270 | 90 | <0.5 | <0.5 | 30 | 36 | <0.5 | <0.5 | 3.8 | | 0.07 | <0.2 | <0.05 | 92 | 0.05 |
| NE CPR | 20-WRP-03 | Madrid N WRP | 1a>5 (15%)>7a | 150 | 450 | 8.8 | 130 | 14 | <0.5 | <0.5 | 45 | 54 | <0.5 | <0.5 | 2.0 | | 0.15 | 0.9 | 0.17 | 24 | 0.27 |
| NE CPR | 20-WRP-07 | Madrid N WRP | 1a | 200 | 600 | 9.4 | 120 | 10 | <0.5 | <0.5 | 43 | 53 | <0.5 | <0.5 | 3.6 | | 0.11 | 0.2 | <0.05 | 15 | 0.31 |
| NE CPR | 20-OVB-03 | Overburden stockpile cladding | 1a | 250 | 750 | 7.5 | 5400 | 530 | <0.5 | 2.1 | 39 | 47 | <0.5 | <0.5 | 1200 | 3.6 | 0.06 | 4.5 | 0.05 | 320 | 0.02 |
| NE CPR | 20-OVB-06 | Overburden stockpile cladding | 1a>7a | 250 | 750 | 7.9 | 4200 | 550 | <0.5 | 0.9 | 30 | 37 | <0.5 | <0.5 | 960 | 2.7 | 0.07 | 2.1 | 0.09 | 310 | 0.02 |

| Material Source Area | Sample ID | Mine Facility | Rock Types | MEND SFE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dissolved Antimony (Sb) | Dissolved Arsenic (As) | Dissolved Barium (Ba) | Dissolved Bismuth (Bi) | Dissolved Cesium (Cs) | Dissolved Cadmium (Cd) | Dissolved Calcium (Ca) | Dissolved Chromium (Cr) | Dissolved Cobalt (Co) | Dissolved Copper (Cu) | Dissolved Lanthanum (La) | Dissolved Iron (Fe) | Dissolved Lead (Pb) | Dissolved Lithium (Li) | Dissolved Magnesium (Mg) | Dissolved Manganese (Mn) | Dissolved Phosphorus (P) | Dissolved Molybdenum (Mo) |
| | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 1a | 0.0005 | 0.01 | 0.002 | <0.000005 | <0.00005 | <0.000005 | 8.6 | <0.0001 | 0.0001 | 0.002 | <0.00005 | 0.009 | <0.000005 | 0.0018 | 1.9 | 0.003 | 0.014 | 0.003 |
| NE CPR | 20-NUN-01 | Nuna Pad Laydown | 1a>1as | 0.0014 | 0.15 | 0.007 | <0.000005 | <0.00005 | <0.000005 | 4.5 | 0.0002 | 0.0001 | 0.001 | <0.00005 | 0.071 | 0.000008 | 0.0011 | 1.1 | 0.001 | 0.011 | 0.002 |
| NE CPR | 20-WRP-01 | Madrid N WRP | 1a>5(30%) | 0.0005 | 0.04 | 0.008 | <0.000005 | <0.00005 | <0.000005 | 8.3 | 0.0001 | 0.0001 | 0.001 | <0.00005 | 0.024 | 0.000006 | 0.0042 | 2.5 | 0.001 | 0.008 | 0.002 |
| NE CPR | 20-WRP-02 | Madrid N WRP | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 0.011 | 2.60 | 0.008 | <0.000025 | <0.00025 | <0.000025 | 27 | <0.0005 | 0.0008 | 0.003 | <0.00025 | 0.011 | <0.000025 | 0.0076 | 5.7 | 0.007 | 0.029 | 0.004 |
| NE CPR | 20-WRP-03 | Madrid N WRP | 1a>5 (15%)>7a | 0.0007 | 0.08 | 0.003 | <0.000005 | <0.00005 | <0.000005 | 6.3 | 0.0005 | 0.0003 | 0.008 | 0.00022 | 0.20 | 0.00018 | 0.0033 | 2.1 | 0.005 | 0.031 | 0.002 |
| NE CPR | 20-WRP-07 | Madrid N WRP | 1a | 0.0019 | 0.21 | 0.010 | <0.000005 | <0.00005 | <0.000005 | 4.7 | 0.0002 | 0.0001 | 0.001 | <0.00005 | 0.030 | 0.000010 | <0.0005 | 0.9 | 0.001 | 0.016 | 0.001 |
| NE CPR | 20-OVB-03 | Overburden stockpile cladding | 1a | 0.0003 | 0.002 | 0.022 | <0.00001 | <0.0001 | <0.00001 | 47 | <0.0002 | 0.0003 | 0.011 | <0.0001 | 0.008 | 0.000025 | 0.0330 | 50 | 0.11 | 0.045 | 0.018 |
| NE CPR | 20-OVB-06 | Overburden stockpile cladding | 1a>7a | 0.0001 | 0.002 | 0.021 | <0.00001 | <0.0001 | <0.00001 | 54 | <0.0002 | 0.0002 | 0.009 | <0.0001 | 0.003 | <0.00001 | 0.0250 | 42 | 0.079 | 0.034 | 0.008 |

| Material Source Area | Sample ID | Mine Facility | Rock Types | MEND SFE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dissolved Nickel (Ni) | Dissolved Potassium (K) | Dissolved Rubidium (Rb) | Dissolved Silicon (Si) | Dissolved Sodium (Na) | Dissolved Strontium (Sr) | Dissolved Sulphur (S) | Dissolved Tellurium (Te) | Dissolved Thallium (Tl) | Dissolved Thorium (Th) | Dissolved Tin (Sn) | Dissolved Titanium (Ti) | Dissolved Tungsten (W) | Dissolved Uranium (U) | Dissolved Vanadium (V) | Dissolved Zinc (Zn) | Dissolved Zirconium (Zr) | Dissolved Mercury (Hg) |
| | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Quarry 2 | 20-NUN-05 | Nuna Pad Laydown | 1a | 0.0002 | 3.2 | 0.0011 | 0.73 | 4.1 | 0.017 | <10 | <0.00002 | 0.000003 | <0.000005 | <0.0002 | <0.0005 | 0.0003 | 0.00005 | 0.0015 | <0.0001 | <0.0001 | <0.00005 |
| NE CPR | 20-NUN-01 | Nuna Pad Laydown | 1a>1as | 0.0005 | 4.1 | 0.0028 | 0.94 | 18 | 0.019 | <10 | <0.00002 | <0.000002 | <0.000005 | <0.0002 | 0.0012 | 0.0003 | 0.00002 | 0.0077 | 0.0002 | <0.0001 | <0.00005 |
| NE CPR | 20-WRP-01 | Madrid N WRP | 1a>5(30%) | 0.0003 | 11.0 | 0.0042 | 0.76 | 23 | 0.037 | 16 | <0.00002 | 0.000004 | <0.000005 | <0.0002 | <0.0005 | 0.0012 | 0.00002 | 0.0022 | <0.0001 | <0.0001 | <0.00005 |
| NE CPR | 20-WRP-02 | Madrid N WRP | 1as>1a>strongly oxidized 1a(3%) >5 (2%) | 0.0095 | 9.9 | 0.0041 | 1.5 | 7.6 | 0.092 | <50 | <0.0001 | <0.00001 | <0.000025 | <0.001 | <0.0025 | 0.0012 | 0.00018 | 0.0041 | 0.0009 | <0.0005 | <0.00025 |
| NE CPR | 20-WRP-03 | Madrid N WRP | 1a>5 (15%)>7a | 0.0021 | 4.2 | 0.0010 | 1.8 | 15 | 0.019 | <10 | <0.00002 | 0.000002 | 0.000042 | <0.0002 | 0.0057 | 0.0030 | 0.00048 | 0.0049 | 0.0006 | 0.0002 | <0.00005 |
| NE CPR | 20-WRP-07 | Madrid N WRP | 1a | 0.0006 | 1.7 | 0.0012 | 1.1 | 19 | 0.017 | <10 | <0.00002 | <0.000002 | <0.000005 | <0.0002 | 0.0007 | 0.0002 | 0.00001 | 0.0073 | 0.0002 | <0.0001 | <0.00005 |
| NE CPR | 20-OVB-03 | Overburden pad material | 1a | 0.0021 | 38 | 0.0050 | 2.5 | 780 | 0.45 | 210 | <0.00004 | 0.000020 | <0.00001 | <0.0004 | <0.001 | 0.0005 | 0.00026 | 0.0023 | 0.0014 | <0.0002 | <0.0001 |
| NE CPR | 20-OVB-06 | Overburden stockpile cladding | 1a>7a | 0.0018 | 34 | 0.0062 | 2.0 | 610 | 0.46 | 200 | <0.00004 | 0.000020 | <0.00001 | <0.0004 | <0.001 | 0.0006 | 0.00059 | 0.0018 | 0.0005 | <0.0002 | <0.0001 |

* Rock types defined as follows:

1a = mafic metavolcanics

1as = sericite altered mafic metavolcanics

5 = siltstone (parentheses denotes approximate proportion of siltstone)

7a = gabbro

12 = quartz veins

# Appendix D 2020 Hope Bay Waste Rock, Ore and Infrastructure Seep Monitoring

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# Technical Memo

March 25, 2021

| | |
|---|---|
| **To** | Sarah Warnock, Hope Bay Project<br>Ashley Mathai, Hope Bay Project |
| **From** | Brooklyn Derry<br>Lisa Barazzuol |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | 2020 Seep Monitoring of Doris and Madrid Waste Rock, Ore, and Infrastructure |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

As part of the verification, monitoring and management plans for the Hope Bay Project (the Project), located in Nunavut, TMAC Resources Inc. (TMAC) monitors seepage at the downstream toe of mine infrastructure, pads, roads and waste rock. Water Licence 2AM-DOH1335 Amendment No. 2 (Nunavut Water Board 2018) is the permit that governs mining activities at the Doris and Madrid areas of the Project. The 2020 seepage monitoring program was completed by TMAC in accordance with conditions outlined in Part D Item 18 of Water Licence 2AM-DOH1335 Amendment No. 2, Quarry Management and Monitoring Plan (TMAC 2017) and Waste Rock, Ore and Backfill Management Plan, Hope Bay Project, Nunavut (TMAC 2019).

In 2020, TMAC conducted a seepage survey of the waste rock at Doris and Madrid. At Doris, this included a survey of the waste rock influenced area (WRIA) defined as (Attachment 1): toe of the waste rock stockpile on Pad T; pollution control pond (PCP) located immediately downstream of the waste rock and ore stockpile on Pad I; and toe of the access road located down-gradient of the Doris waste rock stockpiles. At Madrid North, waste rock seepage was collected along the toe of the Waste Rock Storage Area (WRSA), three surrounding water collection sumps and the Contact Water Pond (CWP).

The scope of the 2020 construction rock seepage survey included infrastructure constructed between Fall 2019 and Spring 2020 and infrastructure surveyed for seepage in 2019 but where none was observed (SRK 2020). At Madrid North, the construction survey included the access road to Naartok

East Crown Pillar Recovery (NE CPR), overburden stockpile, portal pad and Madrid Shop laydown with construction rock was sourced from waste rock from NE CPR except for the NE CPR access road. At Doris, the construction seepage survey included the cover of Doris CPR and the access road to the vent raise. This memo documents the seepage monitoring results for all areas. Companion documents SRK (2021a and 2021 in progress) document associated geochemical investigations related to 2020 seepage chemistry from the portal pad and overburden stockpile at Madrid North. Geochemical monitoring and characterization of construction rock is documented in SRK (2021b) and includes monitoring of quarry rock, the field-based geochemical characterization program of NE CPR waste rock to classify and segregate waste rock as geochemically suitable as construction rock and as-built geochemical characterization of infrastructure and pads (SRK 2021b).

# 2 Methods

## 2.1 Seepage Survey and Sample Collection

TMAC conducted the 2020 seepage survey in multiple phases as follows: i) freshet seepage survey from June 8 to 21; ii) supplemental sample collection downstream of the Madrid North portal pad and overburden stockpile on July 2 and 3, July 27, and August 15 and iii) Madrid North WRSA on July 6 and September 2.

Seepage survey locations, outlined in Table 1 and presented in Attachment 1, were established where seepage was observed or suspected by examining the toes of the waste rock stockpile, infrastructure, roadways, and berms. Samples were collected and field measurements were taken at locations where water was observed flowing into and out of construction rock material; this included seepage where precipitation runoff and snowmelt came into contact with rock along the roadways, building pads, and berms. Electrical conductivity (EC), pH, temperature, oxidation-reduction potential (ORP), and flow rates (where possible) were measured at each of these locations at the time of monitoring.

TMAC collected a total of thirty-six (36) seepage samples, including samples from three (3) reference survey sites. At each station the chemical and physical properties of seepage water were measured, and samples were taken for laboratory analysis. The three reference sites, located in the undisturbed tundra and not subject to mine influences, were sampled on June 21, 2020. These samples, used as baseline reference points, were collected at approximately the same locations as the 2010 to 2019 seepage surveys (in the vicinity of the Doris Windy Road, Attachment 1) except for REF-01A which was collected to the south of the Madrid North WRSA. It was noted in the 2019 seepage survey that the original REF-01 location may have been impacted by nearby infrastructure. As a result, REF-01A was established in 2020.

**Table 1: Summary of 2020 seepage survey**

| Mine Area | Material Source | Surveyed Area | Surveyed Seeps |
|---|---|---|---|
| Reference | Background[1] | Reference (Doris-Windy Road) | 3 |
| Doris | Waste Rock Stockpiles (at Pad T)[2] | Toe of the waste rock stockpiles on Pad T and Pad I | 0 |
| | | Berm of the pollution control ponds (PCP) located immediately downstream of the waste rock and ore stockpile on Pad I | 3 |
| | | Toe of the access roads located down-gradient of the Doris waste rock stockpiles | 3 |
| | Quarry 2 | Access Road to Vent Raise | 0 |
| | Doris Waste Rock | Cover of Doris CPR | 2 |
| Madrid North | Quarry D | Access Road to Naartok East CPR | 4 |
| | | Overburden Stockpile[3] | 6 |
| | NE CPR Waste Rock | Portal Pad | 3 |
| | | Madrid Shop Laydown | 0 |
| | Waste Rock Stockpiles (at WRSA) | WRSA Seepage | 1 |
| | | Sump 1, 2 and 3 | 5 |
| | | Contact Water Pond[4] | 6 |

Notes: See Attachment 1 for surveyed areas in 2019

[1] 20-REF-01A was collected in a different location than in previous seepage surveys.

[2] Referred to as Waste Rock Influenced Area (WRIA) in text.

[3] Quarry D construction in 2019 and Naartok East CPR waste rock as construction rock in 2020.

[4] Three samples were collected from station MMS1 within the contact water pond, two samples were collected from other locations within the CWP, and one sample was collected as seepage downstream of the CWP (Figure 1-8 in Attachment 1).

One duplicate sample and one field blank were collected and submitted for laboratory analysis as part of SRK's recommended quality assurance/quality control (QA/QC) program.

TMAC submitted a total of 38 samples (including a duplicate and field blank) to ALS Environmental Labs in Vancouver, BC. All samples were analyzed for pH, EC, sulphate, acidity, alkalinity, chloride, fluoride, nitrate, nitrite, phosphorus, ammonia, total dissolved solids (TDS), total suspended solids (TSS) and dissolved metals (including mercury and selenium) except for samples collected from the CWP and sumps of the Madrid North WRSA. CWP samples were analyzed for total metals only as per the Water Licence with the same parameters monitored for the WRSA sumps. One Overburden

Stockpile sample was analyzed for both total and dissolved metals. All samples were filtered and preserved in the field, as required.

## 2.2 Quality Assurance / Quality Control

SRK conducted a QA/QC review of all data QA/QC with results detailed in Table 2. Data for all QA/QC tests passed except the following:

- For a comparison of laboratory and field values of EC, eleven samples were over-range for field conductivity (>20,000 µS/cm), which precluded a relative percent difference (RPD) calculation, however lab values confirmed the over-range EC levels.
- Ion balances were calculated for all samples. Calculations were based on total metals for samples without dissolved metals results (all Madrid North WRSA samples except the WRSA seepage sample). One sample calculated based on dissolved metals and two samples calculated based on total metals had an ion balance greater than ±10%.

SRK deemed the data to be acceptable.

**Table 2: QA/QC Summary**

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| | **Physical Test**[1] | |
| Field Blank | Minimum criteria is <2X DL, will accept <5X DL | Passed. (n=1). L2460314-6 - FB collected at 20-NEAR-03. |
| Method Blank | <2X DL | All passed. Total Suspended Solids (n=14); Total Dissolved Solids (n=9); and Conductivity (n=17) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | Passed. (n=1). L2460314-5 - DUP1 collected at 20-NEAR-02. |
| Leachate Duplicate | For samples >10X DL should be within +/-20% RPD | All passed. Total Suspended Solids (n=4); Conductivity and pH (n=5); Total Dissolved Solids (n=5) |
| Field pH vs. Lab pH | Difference should not be greater than 1 pH unit | All passed. (n=38) |
| Field EC vs Lab EC | For samples > 10X the detection limit (DL), % RPD should be within +/-30% | Failed (n=3) - MMS1-N (L2498955-1), MMS1-S1 (L2498955-2) and MMS1-S (L2498955-4). After converting the field EC to SPC, MMS1-N, MMS1-S1 and MMS1-S are still >30% RPD, >10x DL<br><br>(n=11) Field Conductivity are over range - 20-MAD-01 (L2469515-3), 20-NUN-01 (L2469515-1), 20-OVB-01 (L2469515-2), 20-MAD-02 (L2480744-1), 20-OVB-03 (L2480744-2), MAD-02 (L2490476-3), OVB-03 (L2490476-5), 20-MAD-02 (L2480744-1), 20-OVB-03-2 (L2480744-2), 20-OVB-02 (L2472310-1) and 20-OVB-03 (L2472310-2)<br><br>All others passed. (n=24) |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All passed. Conductivity (n=17); Total Suspended Solids (n=14); Total Dissolved Solids (n=9); pH (n=12); Turbidity (n=1) |

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Anions and Nutrients**[2] | | |
| Field Blank | Minimum criteria is <2X DL, will accept <5X DL | Failed. (n=1). L2460314-6 - FB collected at 20-NEAR-03. Failed for Nitrate - lab re-ran and confirmed the result. |
| Method Blank | <2X DL | All passed. Total Alkalinity (n=14), Chloride, Nitrite, Sulphate, Bromide and Fluoride (n=13); Acidity (n=10); Total Ammonia (n=15); Total Phosphorus (n=8); Nitrate (n=14) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | Passed. (n=1). L2460314-5 - DUP1 collected at 20-NEAR-02. |
| Leachate Duplicate | For samples >10X DL should be within +/-20% RPD | All Passed. Acidity (n=4); Total Ammonia (n=4); Total Phosphorus (n=4); Total Alkalinity (n=6); Acidity (n=3); Total Ammonia, Chloride, Nitrate, Nitrite, Sulphate, Bromide, Fluoride (n=1) |
| Ion Balance | EC>100 µS/cm, % difference should be within +/-10% | Ion balance calculated on Dissolved Metals:<br><br>Failed: L2490476-3 - MAD-02 has an ion imbalance at 16% due to low Total Alkalinity<br><br>All others passed. (n=28) |
| | | Ion balance calculated on Total Metals:<br><br>Failed. (n=2) Ion balance calculated on Total Metals. MMS1-S2 (L2498955-3) and MMS1-S (L2498955-4) failed - >10% difference<br><br>All others passed. (n=9) |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All passed. Total Alkalinity (n=14), Chloride, Nitrite, Sulphate, Bromide and Fluoride (n=13); Acidity (n=10); Total Ammonia (n=15); Total Phosphorus (n=8); Nitrate (n=14) |
| **Cyanides**[3] | | |
| Method Blank | <2X DL | All passed. Total Cyanide (n=5) |
| Standard Reference Materials | Within specified tolerance ranges. | All passed. Total Cyanide (n=5) |
| **Trace Metals by ICP-MS** | | |
| Field Blank | Minimum criteria is <2X DL, will accept <5X DL | All passed. Dissolved (n=1) |
| Method Blank | <2X DL | Failed. (n=1)<br>L2471347-1 - Calcium (Ca)-Total exceeds lab data quality objective. The “B” qualifier for Calcium indicates that samples with a result more than 5x the blank level are considered reliable, in spite of a slight detection in the method blank. In this case, the Method Blank detection of 0.052 mg/L T-Ca is insignificant compared to the sample data (86.8 mg/L). Had the T-Ca data for the sample been above DL and within 5X the MB value, it would trigger re-analysis<br><br>All others passed. Dissolved (n=13); Total (n=5) |

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | All Passed. Dissolved (n=1) |
| Leachate Duplicate | For samples >10X DL should be within +/-20% RPD | All passed. Dissolved (n=1) |
| Total vs Dissolved Metals | Total Metals>Dissolved metals. Total Metals should be greater than Dissolved Metals, if not the % difference should be within +/-20%. ALS would use 10X DL, Maxxam would use 5X DL | All passed. 20-MAD-02 (L2490476-3), 20-OVB-03 (L2490476-5) (n=2)<br><br>All other samples were only analyzed for either total or dissolved metals. |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | Failed. (n=1) L2471347-1 - Phosphorus (P)-Total and Sodium (Na)-Total marginally exceeded data quality objective. The MES qualifier for Phosphorus and Sodium indicates that data is considered acceptable if less than 10% of the analytes in a multi-element scan exceed the DQOs by a small margin.<br><br>All others passed. Dissolved (n=11); Total (n=5) |
| **Hg-CVAAS** | | |
| Field Blank | Minimum criteria is <2X DL, will accept <5X DL | All Passed. Dissolved (n=1) |
| Method Blank | <2X DL | All Passed. Dissolved (n=11) and Total (n=6) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | All Passed. Dissolved (n=1) |
| Leachate Duplicate | For samples >10X DL should be within +/-20% RPD | All Passed. Dissolved (n=6) |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All Passed. Dissolved (n=11) and Total (n=6) |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\[1CT022.056_HopeBay_WR_Memo_2020_Compiled_Summary QAQC_mlt_Rev01.xlsx]Compiled_Summa

Notes:

[1] Conductivity, pH, Hardness (as CaCO3), Total Suspended Solids

[2] Total Alkalinity, Total Ammonia, Unionized Ammonia, Cl, NO3, NO2, Total N, SO4

[3] WAD CN, Total CN, Cyanate, SCN, Free CN

# 3 Results

Attachment 1 presents location maps of the seepage samples, surveyed areas, and of the as-built alignment of the Doris and Madrid mine areas. A complete set of field observations and measurements is provided in Attachment 2. Attachment 3 contains the laboratory water chemistry results.

## 3.1 Reference Stations

Table 3 presents field and lab data for the reference stations.

**Table 3: Summary of Select Laboratory Results of 2020 Reference Seepage Samples**

| Area | Station ID | Date | Field pH s.u. | Lab pH s.u. | Field EC µS/cm | Lab EC µS/cm | ORP mV | TDS mg/L | Total Alkalinity mg CaCO3/L | Total Ammonia mg N/L | Cl mg/L | NO3 mg /L | NO2 mg/L | SO4 mg/L | Ca mg/L | Mg mg/L | K mg/L | Na mg/L | Al mg/L | As mg/L | Cd mg/L | Co mg/L | Cu mg/L | Fe mg/L | Mn mg/L | Mo mg/L | Ni mg/L | Se mg/L | Zn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference (Windy Road) | 20-REF-01A | 21-Jun-20 | 7.0 | 7.1 | 49 | 44 | 150 | 60 | 15 | 0.0088 | 3.2 | <0.005 | <0.001 | <0.3 | 3.4 | 2.5 | 0.72 | 2.6 | 0.080 | 0.00018 | <0.000005 | <0.0001 | 0.0020 | 0.12 | 0.00023 | 0.00013 | 0.0029 | <0.00005 | 0.0029 |
| | 20-REF-02 | 21-Jun-20 | 7.3 | 7.8 | 160 | 150 | 190 | 120 | 52 | 0.013 | 15 | <0.005 | <0.001 | 0.80 | 15 | 5 | 1.0 | 8.3 | 0.021 | 0.00026 | <0.000005 | <0.0001 | 0.0017 | 0.060 | 0.00031 | 0.00012 | 0.0024 | <0.00005 | 0.0020 |
| | 20-REF-03 | 21-Jun-20 | 7.3 | 7.4 | 91 | 84 | 170 | 61 | 32 | <0.005 | 7.1 | <0.005 | <0.001 | 2.0 | 8.2 | 2 | 0.46 | 5.7 | 0.014 | <0.0001 | <0.000005 | <0.0001 | 0.0012 | 0.037 | 0.0018 | <0.00005 | <0.0005 | <0.00005 | <0.001 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Seepage\[1CT022.056_2020_Master_Compilation_Seepage_Rev00_mlt_bdd.xlsx]

Notes: Trace elements refer to dissolved metal concentrations

### 3.1.1 Field Data

For all samples, pH ranged from 7.0 to 7.3 and the EC ranged from 49 to 160 µS/cm

### 3.1.2 Laboratory Data

Consistent with previous years, three reference samples were taken in the Windy Road area and submitted for laboratory analysis (Table 3). The laboratory pH values ranged from 7.1 to 7.8 and laboratory EC measured between 44 and 150 µS/cm, both within the historical range (see Section 4.1).

Major cation chemistry was dominated by sodium (2.6 to 8.3 mg/L) and calcium (3.4 to 15 mg/L), while major anion chemistry was dominated by alkalinity (15 to 52 mg/L as $CaCO_3$), chloride (3.2 to 15 mg/L), and sulphate (<0.3 to 2.0 mg/L).

Nitrite and nitrate values were below the limit of detection (0.001 mg/L and 0.005 mg/L, respectively).

## 3.2 Doris

Table 4 presents field and lab data for the Doris seepage samples.

**Table 4: Summary of Select Laboratory Results of 2020 Doris Seepage Samples**

| Area | Station ID | Date | Field pH s.u. | Lab pH s.u. | Field EC[1] µS/cm | Lab EC µS/cm | ORP mV | TDS mg/L | Total Alkalinity mg CaCO3/L | Total Ammonia mg N/L | Cl mg/L | NO3 mg /L | NO2 mg/L | SO4 mg/L | Ca mg/L | Mg mg/L | K mg/L | Na mg/L | Al mg/L | As mg/L | Cd mg/L | Co mg/L | Cu mg/L | Fe mg/L | Mn mg/L | Mo mg/L | Ni mg/L | Se mg/L | Zn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waste Rock Influenced Area (WRIA) | 20-DC-01 | 10-Jun-20 | 7.2 | 7.9 | 1700 | 1800 | 200 | 1100 | 68 | 0.96 | 420 | 3.9 | 0.18 | 150 | 78 | 32 | 11 | 220 | 0.016 | 0.0025 | 0.000021 | 0.0015 | 0.033 | 0.12 | 0.095 | 0.0039 | 0.0015 | 0.00099 | 0.0011 |
| | 20-DC-02 | 10-Jun-20 | 7.3 | 7.9 | 1500 | 1500 | 170 | 890 | 75 | 1.1 | 320 | 4.2 | 0.27 | 160 | 76 | 28 | 10 | 170 | 0.0096 | 0.0026 | 0.000018 | 0.0018 | 0.044 | 0.14 | 0.084 | 0.0042 | 0.0019 | 0.0010 | <0.001 |
| | 20-DC-03 | 10-Jun-20 | 7.4 | 7.8 | 1400 | 1300 | 190 | 820 | 81 | 1.3 | 260 | 4.6 | 0.28 | 170 | 76 | 26 | 11 | 150 | 0.010 | 0.0029 | 0.000018 | 0.0021 | 0.056 | 0.16 | 0.085 | 0.0047 | 0.0025 | 0.0014 | <0.001 |
| | 20-DC-04 | 10-Jun-20 | 7.1 | 7.6 | 13000 | 11000 | 240 | 11000 | 87 | 58 | 3400 | 200 | 0.81 | 220 | 1200 | 180 | 60 | 860 | 0.010 | 0.0024 | 0.0030 | 0.0077 | 0.014 | <0.05 | 2.1 | 0.0071 | 0.010 | 0.0043 | 0.011 |
| | 20-DC-05 | 10-Jun-20 | 7.0 | 7.6 | 18000 | 14000 | 230 | 10000 | 85 | 80 | 4400 | 260 | 0.97 | 230 | 1600 | 240 | 79 | 1200 | 0.013 | 0.0025 | 0.0042 | 0.011 | 0.019 | <0.05 | 3.0 | 0.0071 | 0.014 | 0.0055 | 0.014 |
| | 20-DC-06 | 10-Jun-20 | 7.1 | 7.5 | OR | 22000 | 230 | 16000 | 84 | 130 | 7400 | 430 | 1.4 | 270 | 2600 | 380 | 120 | 1900 | 0.016 | 0.0023 | 0.0074 | 0.017 | 0.029 | <0.1 | 4.9 | 0.0074 | 0.023 | 0.0083 | 0.024 |
| Doris Crown Pillar | 20-DCPR-01 | 11-Jun-20 | 7.9 | 7.6 | 320 | 310 | 180 | 220 | 56 | 0.11 | 11 | 1.6 | 0.0047 | 76 | 30 | 12 | 2.2 | 13 | 0.030 | 0.00063 | <0.000005 | 0.00013 | 0.0013 | <0.01 | 0.028 | 0.00062 | <0.0005 | 0.00039 | <0.001 |
| | 20-DCPR-02 | 11-Jun-20 | 7.6 | 7.1 | 59 | 59 | 150 | 43 | 23 | <0.005 | 4.6 | 0.022 | 0.0013 | 1.7 | 5.1 | 1.6 | 0.92 | 3.5 | 0.019 | 0.00052 | 0.0000064 | <0.0001 | 0.0020 | 0.022 | 0.00060 | 0.000097 | <0.0005 | <0.00005 | <0.001 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Seepage\[1CT022.056_2020_Master_Compilation_Seepage_Rev00_mlt_bdd.xlsx]

Notes: Trace elements refer to dissolved metal concentrations

[1] OR denotes over range, which indicates value was higher than the range of the instrument (>20,000 µS/cm)

### 3.2.1 Waste Rock Influenced Area

Six samples from the Doris WRIA were submitted for laboratory analysis (Table 4). 20-DC-01, 20-DC-02, and 20-DC-03 were sampled along the northwest edge of the pollution containment pond (PCP). These three seeps are immediately downstream of the toe of the stockpile on Pad I. Prior to 2015, the stockpile was composed of waste rock and after this period TMAC placed ore on top of the waste rock stockpile. Accordingly, seepage from DC-01 to DC-03 were considered contact water from the stockpile on Pad I. Seepage stations 20-DC-04, 20-DC-05, and 20-DC-06 were along the downstream toe of the access road located down-gradient of the Doris waste rock stockpiles.

#### Field Data

Field pH ranged from 7.0 to 7.4 for all samples. Field EC values for samples collected along the access road were 10 times higher than those collected at the PCP (average of 17,000, including one over range measurement, and 1,500 µS/cm, respectively).

#### Laboratory Data

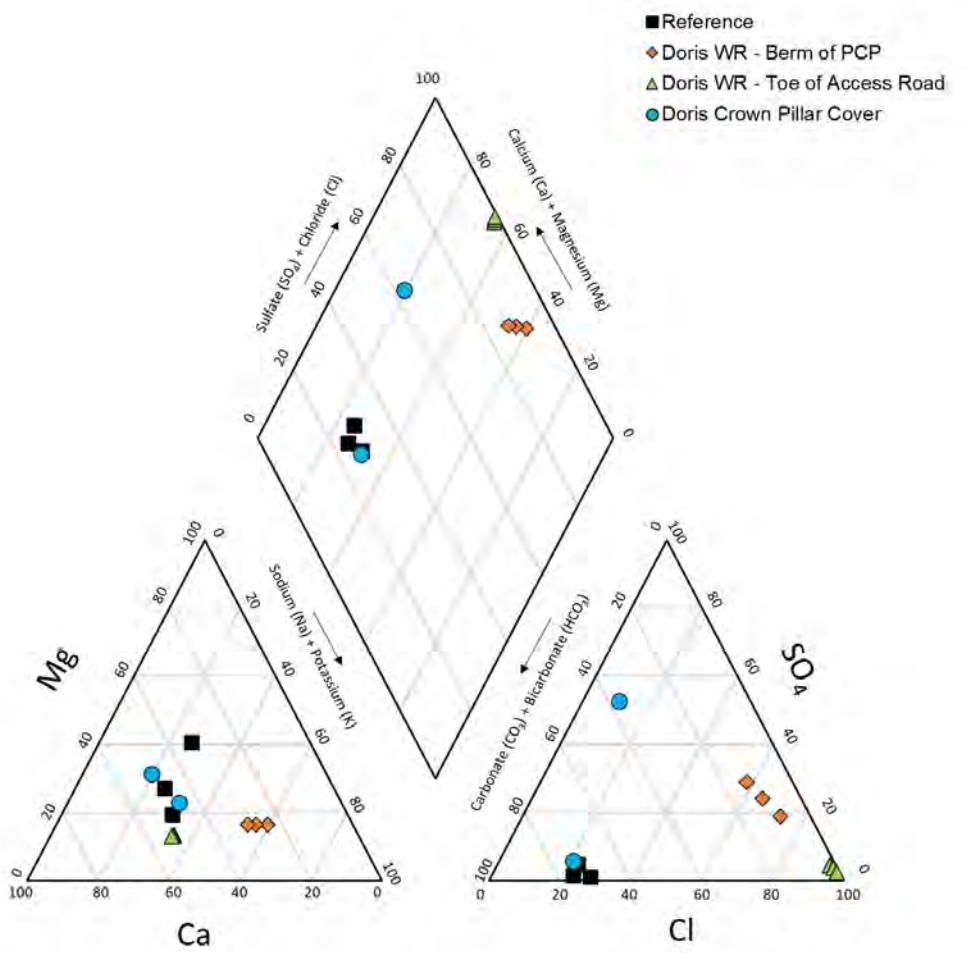
The laboratory pH values ranged from 7.5 to 7.9 and laboratory EC ranged between 1,300 and 1,800 µS/cm for the seepage samples at the toe of Pad I and 11,000 to 22,000 µS/cm for samples along the access road samples.

Sulphate concentrations for seepage along the access road (220 to 270 mg/L) was higher than seepage from the toe of stockpile on Pad I (150 to 170 mg/L). The major ion chemistry for WRIA samples located immediately downstream of the waste rock pile on Pad I (20-DC-01 to 20-DC-03) varied from the samples located at the toe of the road (20-DC-04 to 20-DC-06). The differences in major ion chemistry for the WRIA sample groups are illustrated in Figure 1. For the PCP samples, major cation chemistry was dominated by sodium (150 to 220 mg/L) with lesser calcium (76 to 78 mg/L), while major anion chemistry was dominated by chloride (260 to 420 mg/L), sulphate (150 to 170 mg/L) and alkalinity (68 to 81 mg/L as CaCO3) with notable levels of nitrate (3.9 to 4.6 mg/L as N). For the access road samples the cation chemistry was dominated by calcium (1,200 to 2,600 mg/L) and sodium (860 to 1,900 mg/L), while major anion chemistry was dominated by chloride (3,400 to 7,400 mg/L), nitrate (200 to 430 mg/L as N) and sulphate (220 to 270 mg/L) .

The high calcium and chloride concentrations in the access road samples are attributable to the use of the underground drilling brines ($CaCl_2$) whereas the high nitrate concentrations represent blast residues on waste rock. Access road concentrations of other nitrogen nutrients generated from blast residues, specifically ammonia (58 to 130 mg/L) and nitrite (0.81 to 1.4 mg/L), were similarly higher than PCP samples (0.96 to 1.3 mg/L and 0.18 to 0.28 mg/L, respectively). The differences in concentrations of operational reagents suggests that access road seepage is from a loading source recently influenced by drilling brines.

Access road samples had higher metals levels than samples downstream of Pad I for the following parameters: cadmium (ranging from 0.0030 to 0.0074 mg/L and 140 to 410 times higher), cobalt (0.0077 to 0.017 mg/L and 4 to 11 times higher), manganese (2.1 to 5.0 mg/L and 22 to 58 times

higher), molybdenum (0.0071 to 0.0074 mg/L and 3 times higher), nickel (0.014 to 0.01 mg/L and 4 to 15 times higher), selenium (0.0043 to 0.0083 mg/L and 3 to 8 times higher) and zinc (0.011 to 0.024 mg/L and 10 to 24 times higher). Copper concentrations were higher in seepage downstream of Pad I compared to along the access road (ranging from 0.033 to 0.056 mg/L and 1 to 4 times higher). All seepage from waste rock and at toe of the road is intercepted by water management collection systems and pumped to the Tailings Impoundment Area.




Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Seepage\[1CT022.056_2020_Master_Compilation_Seepage_Rev00_mlt_bdd.xlsx]

**Figure 1: Piper Plot for Reference and Doris Seepage Samples**

### 3.2.2 Infrastructure and Roads

Two seepage samples were collected from downstream of the Doris CPR cover, which was constructed primarily of Doris waste rock.

### Field Data

For the two Doris CPR samples, the pH was 7.6 and 7.9, and the EC was 59 and 320 µS/cm.

### Laboratory Data

Laboratory pH was 7.1 and 7.6. Laboratory EC was 59 and 310 µS/cm.

The major cation chemistry for both 20-DCPR-01 and 20-DCPR-02 was dominated by calcium (30 and 5.1 mg/L, respectively) and sodium (13 and 3.5 mg/L, respectively) with differing major anion chemistry. For 20-DCPR-01 major anions were characterized by sulphate (76 mg/L), alkalinity (56 mg/L as CaCO3),and chloride (11 mg/L) whereas 20-DCPR-02 was characterized by alkalinity (23 mg/L as CaCO3) and chloride (4.6 mg/L).

Compared to the Doris waste rock seepage sample downstream of Pad I, ammonia and nitrate concentrations at 20-DCPR-01 (0.11 and 1.6 mg/L as N, respectively) were 10 and 2 times lower, respectively, while chloride (11 mg/L) was 30 times lower. Doris waste rock was used to construct the Doris CPR cover and the lower concentrations of nitrogen nutrients and chloride indicate that the waste rock was sourced from the Doris CPR. Drilling brines were not used to mine the CPR and explosives residue concentrations are lower as a result of differing blasting practices.

Dissolved trace metals concentrations were typically within an order of magnitude of concentrations in the Doris waste rock seepage samples downstream of Pad I except for copper for 20-DCPR-01 (0.0013 mg/L and 30 times lower).

Major ion chemistry, nutrients and trace element concentrations for 20-DCPR-02 was geochemically equivalent to the reference seep samples (Figure 1). 20-DCPR-02 is interpreted to not represent contact water from the Doris CPR cover.

## 3.3 Madrid North

### 3.3.1 Waste Rock Storage Area

Table 5 presents a summary of water quality data for Madrid North waste rock seepage samples at the Madrid North WRSA as sampled at one seepage station, three water management collection sumps and the CWP (Attachment 1, Figure 1-8). The multi-element data in Table 5 are dissolved metals for the seepage sample and total metals for the CWP and sumps. Total metals are a requirement of the Water Licence. A pair of CWP samples were collected from inside and downstream of the CWP, on June 14, 2020 (referred to as CWP Inside and CWP Outside in the text, respectively). Samples CWP Inside and Outside were sampled in response to a seepage observed emanating from the newly constructed CWP to the tundra (NT-NU Report submitted by TMAC on June 15, 2020).

**Table 5: Summary of Select Laboratory Results of 2020 Seepage Samples, Madrid North Waste Rock at Madrid North WRSA**

| Area | Station ID | Date | Field pH s.u. | Lab pH s.u. | Field EC[2] µS/cm | Lab EC µS/cm | ORP mV | TDS mg/L | Total Alkalinity mg CaCO3/L | Total Ammonia mg N/L | Cl mg/L | NO3 mg /L | NO2 mg/L | SO4 mg/L | Ca mg/L | Mg mg/L | K mg/L | Na mg/L | Al mg/L | As mg/L | Cd mg/L | Co mg/L | Cu mg/L | Fe mg/L | Mn mg/L | Mo mg/L | Ni mg/L | Se mg/L | Zn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seepage | 20-MWAR-01 | 14-Jun-20 | 8 | 7.9 | 1900 | 1800 | 200 | 1100 | 110 | 2.2 | 410 | 15 | 0.13 | 98 | 69 | 29 | 13 | 250 | 0.033 | 0.014 | 0.00002 | 0.0013 | 0.0017 | 0.02 | 0.026 | 0.0043 | 0.012 | 0.0023 | 0.001 |
| Sump 1 | MMS1-S1 | 11-Jun-20 | 7.9 | 7.9 | 780 | 760 | 200 | -- | 93 | 0.64 | 140 | 5.9 | 0.049 | 47 | *23* | *10* | *6.5* | *110* | *2.1* | *0.0089* | *0.000017* | *0.0027* | *0.0083* | *3.8* | *0.066* | *0.0033* | *0.0049* | *0.0014* | *0.22* |
| | MMS1-S1 | 2-Sep-20 | 6.7 | 7.2 | 5200 | 3000 | 140 | -- | 180 | 0.7 | 800 | 12 | 0.7 | 100 | *320* | *78* | *10* | *290* | *0.66* | *0.0018* | *0.00044* | *0.025* | *0.022* | *1.8* | *7* | *0.00091* | *0.013* | *0.0015* | *8.8* |
| Sump 2 | MMS1-S2 | 11-Jun-20 | 7.6 | 7.6 | 190 | 190 | 190 | -- | 73 | 0.04 | 16 | 0.021 | 0.0021 | 3.5 | *13* | *12* | *2.2* | *11* | *1.5* | *0.0026* | *0.000022* | *0.0019* | *0.022* | *2.8* | *0.069* | *0.001* | *0.0078* | *0.00020* | *0.92* |
| | MMS1-S2[3] | 2-Sep-20[3] | 7.3 | 7.9 | 750 | 1300 | 67 | -- | 74 | 0.38 | 67 | 0.083 | 0.0052 | 14 | *40* | *38* | *5.4* | *29* | *3.3* | *0.0061* | *0.000018* | *0.0099* | *0.063* | *3.5* | *0.41* | *0.0016* | *0.013* | *0.00075* | *4.2* |
| Sump 3 | MMS1-S3 | 11-Jun-20 | 8.3 | 7.8 | 700 | 590 | 190 | -- | 86 | 0.67 | 100 | 1.5 | 0.04 | 39 | *14* | *11* | *10* | *90* | *2.4* | *0.0084* | *0.000026* | *0.0033* | *0.014* | *4.7* | *0.094* | *0.0035* | *0.0086* | *0.0018* | *1.7* |
| Contact Water Pond[1] | MMS1 | 8-Jun-20 | 8.3 | 7.9 | 200 | 200 | 130 | -- | 50 | 0.15 | 20 | 0.71 | 0.011 | 13 | *16* | *3.9* | *2.1* | *20* | *1.3* | *0.011* | *0.000011* | *0.0016* | *0.0052* | *2.1* | *0.062* | *0.001* | *0.0074* | *0.00029* | *0.0071* |
| | MMS1-INSIDE[4] | 14-Jun-20 | 7.8 | 7.8 | 950 | 960 | 190 | -- | 79 | 0.45 | 180 | 2.5 | 0.07 | 80 | *51* | *18* | *6.8* | *120* | *1.4* | *0.018* | *0.000017* | *0.0025* | *0.0057* | *2.3* | *0.17* | *0.0012* | *0.011* | *0.0011* | *0.0058* |
| | MMS1 | 6-Jul-20 | 8.1 | 8.1 | 1100 | 1100 | 130 | -- | 130 | 0.016 | 180 | 2.7 | 0.04 | 110 | *87* | *19* | *9.2* | *110* | *0.11* | *0.022* | *0.0000091* | *0.0007* | *0.006* | *0.11* | *0.019* | *0.0021* | *0.0045* | *0.0011* | *0.0033* |
| | MMS1-N | 2-Sep-20 | 7.9 | 8.1 | 6100 | 3800 | 140 | -- | 180 | 0.68 | 990 | 0.37 | 0.02 | 260 | *180* | *100* | *23* | *560* | *0.4* | *0.01* | *0.000034* | *0.0075* | *0.0088* | *0.68* | *2.2* | *0.0024* | *0.014* | *0.0005* | *0.006* |
| | MMS1-S[3] | 2-Sep-20[3] | 8 | 7.6 | 1500 | 650 | 130 | -- | 220 | 0.14 | 280 | 0.68 | 0.007 | 120 | *67* | *21* | *4.4* | *120* | *0.9* | *0.016* | *0.000066* | *0.0034* | *0.0067* | *1.4* | *0.24* | *0.00087* | *0.0068* | *0.00069* | *0.0094* |
| | MMS1-OUTSIDE | 14-Jun-20 | 7.5 | 7.6 | 1700 | 1600 | 210 | -- | 110 | 0.84 | 360 | 4.7 | 0.19 | 160 | *87* | *29* | *11* | *210* | *0.17* | *0.0085* | *0.000016* | *0.0012* | *0.0027* | *0.22* | *0.077* | *0.0012* | *0.0031* | *0.0019* | *0.003* |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Seepage\[1CT022.056_2020_Master_Compilation_Seepage_Rev00_mlt_bdd.xlsx]

Notes: Trace elements refer to dissolved metal concentrations for sample 20-MWAR-01. All other trace elements are total.

[1] Italicized and underlined values denote total metal concentrations.

[2] OR denotes over range, which indicates value was higher than the range of the instrument (>20,000 µS/cm)

[3] Failed ion balance with total metals

[4] MMS1-INSIDE (referred to as CWP Inside in text) was collected from the MMS1 station.

### Water Management

Water management at the Madrid North WRSA includes three water collection sumps and the Madrid North contact water pond. The water collection sumps were installed to ensure that any runoff/seepage that does not report directly to the CWP is collected. Runoff/seepage water from WRSA which reports to the sumps is transferred to the contact water pond, therefore water chemistry at the CWP is influenced by waste rock seepage draining to CWP and the collection sumps. Discharge of effluent onto tundra from the contact water pond is in accordance with the effluent quality limits provided in the Water License. Water that does not meet these criteria is transferred to the TIA via water truck.

### Field Data

Field pH for all Madrid waste rock samples ranged from 7.3 to 8.3 except for one sample collected from Sump 1 (west of the WR pile) in September 2020 (6.7 pH units). Field EC increased from June to September in all locations where multiple samples were collected and varied spatially by water management collection point. CWP and Sump 1 had higher EC values than Sumps 2 and 3 with results summarized as follows:

- CWP: Values ranged from 200 µS/cm in June and from 1,500 to 6,100 µS/cm in September. The two samples collected in September were from different areas of the CWP and exhibited spatial variability. In June, sample CWP Outside (1,700 µS/cm) had a higher conductivity than CWP Inside (950 µS/cm).
- Seepage sample near Sump 1: value of 1,900 µS/cm in June that was two times greater than the nearby sump (Sump 1) sample collected three days prior.
- Sump 1: ranged from 780 µS/cm in June to 5,200 µS/cm in September.
- Sump 2: ranged from 190 µS/cm in June to 750 µS/cm in September.
- Sump 3: value of 700 µS/cm in June.

### Laboratory Data

Laboratory pH for all Madrid waste rock samples ranged from 7.2 to 8.1. Lab EC confirmed temporal increases at all stations.

The major ion chemistry for the Madrid North WRSA sample groups are illustrated in Figure 2. As with EC, concentrations of all major ions increased with time (e.g. sulphate, chloride and calcium as shown in Figure 3). The major cation chemistry for all Madrid waste rock samples was typically dominated by sodium and calcium, however concentrations for Sumps 2 and 3 (11 to 90 mg/L and 13 to 40 mg/L, respectively) were lower than CWP, Sump 1 and seepage near Sump 1 samples (20 to 560 mg/L and 16 to 320 mg/L for sodium and calcium, respectively). Major anions for Sumps 2 and 3 were dominated by chloride (16 to 100 mg/L) and alkalinity (73 to 86 mg/L) whereas samples from the CWP, Sump 1 and seepage near Sump 1 were dominated by chloride (20 to 990 mg/L), alkalinity (50 to 220 mg/L), and sulphate (13 to 260 mg/L). Noteworthy trends in chloride and sulphate are summarized as follows:

- Sulphate is an indicator of sulphide oxidation.
  - CWP: Sulphate concentrations for two CWP samples collected on the same date in September exhibited variability, with concentrations for sample MMS1-N (260 mg/L) two times higher than MMS1-S. Sulphate is a geochemically conservative parameter. Accordingly, the difference suggests chemical variability within the CWP, which could be a result the localized discharge of waste rock seepage from Sumps 1, 2 and 3.
  - Sulphate concentrations in Sump 2 were 11 and 16 times lower in June and September, respectively, compared to other Madrid waste rock samples.
- Chloride is a tracer of drilling brines used for mining at the Madrid North underground mine but not the NE CPR. Chloride is geochemically conservative and therefore can be used as an indicator of waste rock drainage flow at the WRSA.
  - Concentrations were <400 mg/L for all stations in June except the seepage sample near Sump 1 (410 mg/L).
  - Seepage sample had chloride (410 mg/L) and sulphate (98 mg/L) concentrations that were three and two times greater, respectively, than the nearby sump sample from three days prior. The higher concentration suggests that the seepage is a more representative of waste rock contact water than the Sump 1.
  - There was a temporal increase in chloride concentrations at Sump 1 (maximum 800 mg/L), CWP (maximum 990 mg/L) and Sump 2 (67 mg/L) between June and September. Increases are likely due to continued flushing of residual drilling brines from waste rock. There was only one sample for Sump 3 which precluded a temporal trend assessment, however concentrations at Sump 3 in June (100 mg/L) were the same order of magnitude as Sump 1 suggesting contact water from underground waste rock reports to Sump 3. This is consistent with geochemical monitoring of waste rock in stockpiles at the WRSA suggested that underground mine waste rock was placed upgradient of Sump 1 and Sump 3 (SRK 2021c). The temporal increase in chloride concentrations at Sump 2 (from 16 mg/L in June to 67 mg/L in September) and the low concentration of CWP sample in June (20 mg/L) suggests that a minor loading source from underground waste rock reports directly to these water management collection points.
- In June, concentrations of chloride and sulphate were two times higher in CWP Outside (360 and 160 mg/L, respectively) than in its paired sample from CWP Inside (180 and 80 mg/L, respectively).

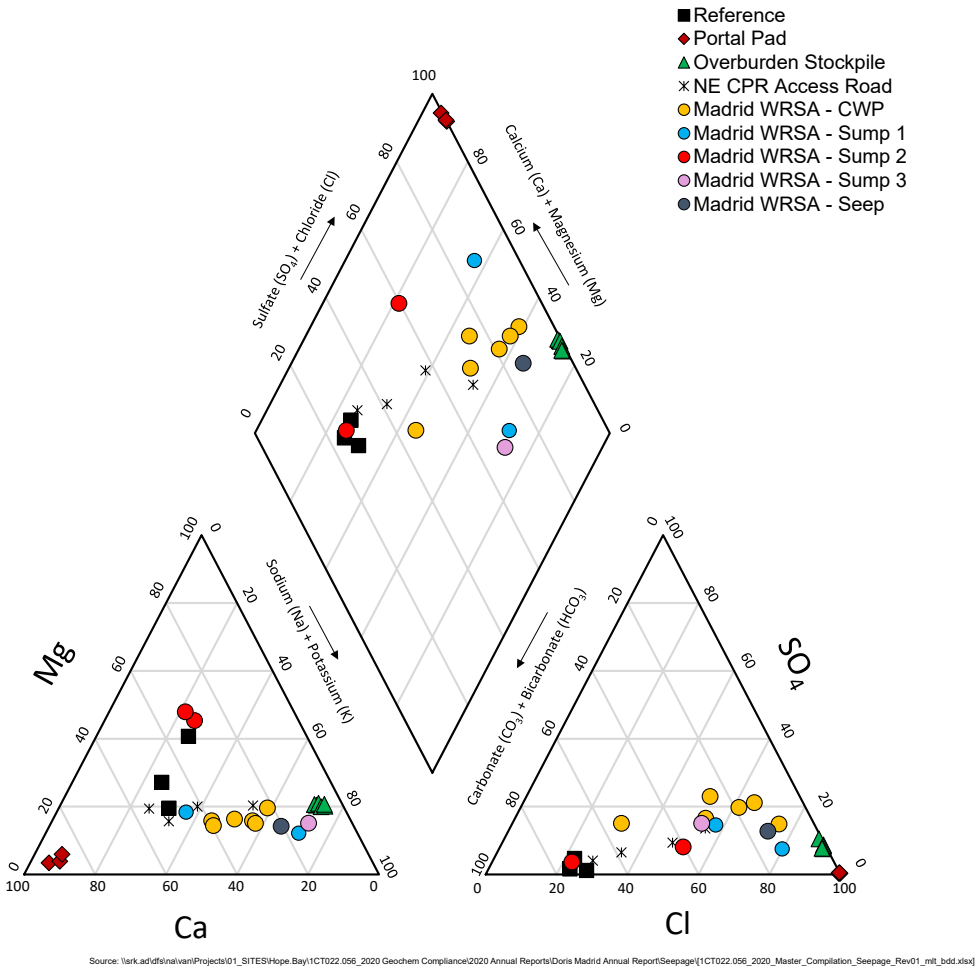



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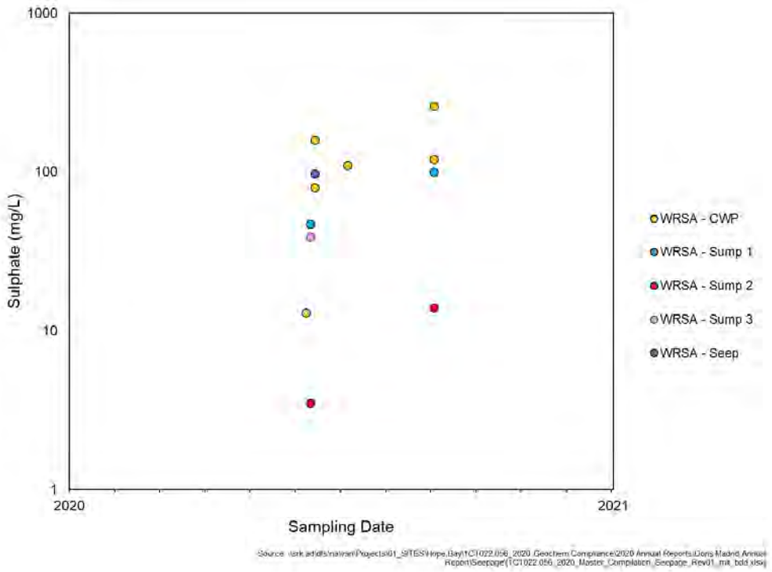
**Figure 2: Piper Plot for Reference and Madrid Seepage Samples**

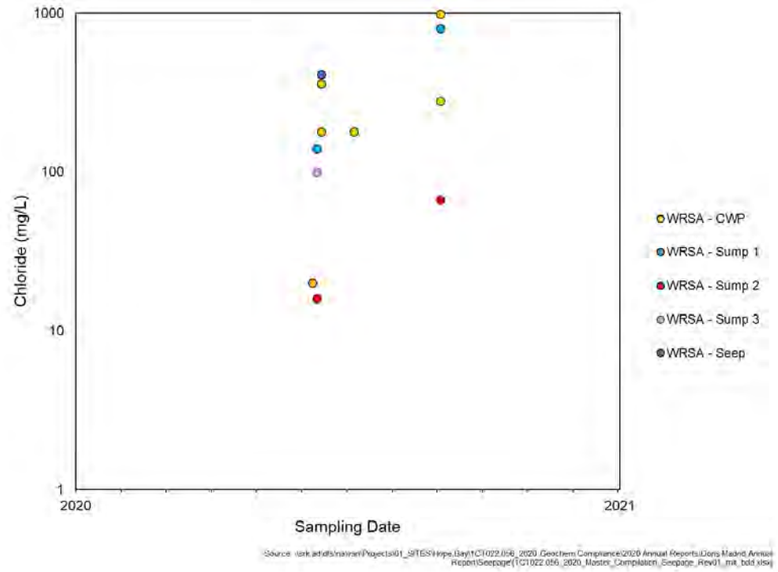
Nitrogen nutrients, e.g. ammonia, are indicative of blast residues. Blasting at the NE CPR uses less explosives than the underground mine resulting in lower concentrations of blast residues for NE CPR samples than underground mine samples (SRK 2021c). A maximum ammonia concentration of 2.2 mg/L was indicated at the seepage station near Sump 1 suggesting drainage from underground mine waste rock flows to this location. Notably ammonia concentrations at Sump 1 during that period were lower (0.64 mg/L). Ammonia concentrations for all other samples ranged from 0.0016 to 0.84 mg/L and concentrations were relatively stable concentrations with time (Figure 3). Concentration of nitrate and nitrite did not exhibit clear trends with respect to waste rock and blast residues (Figure 3).

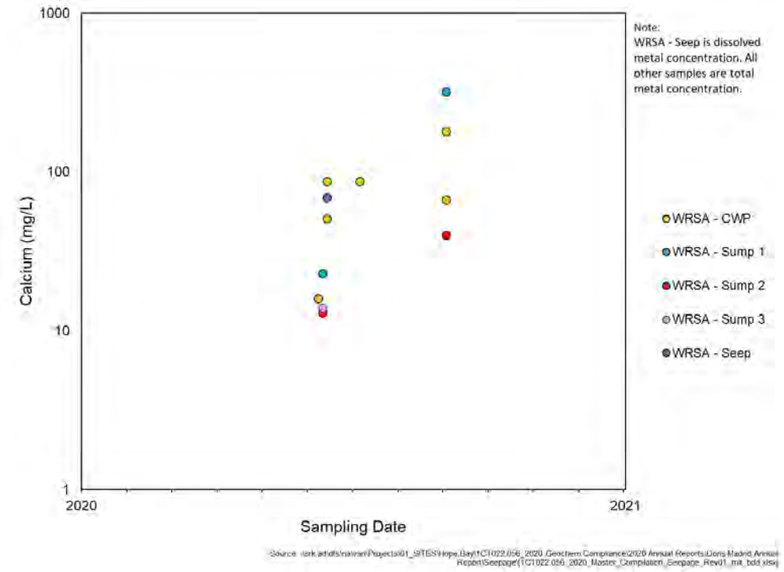
The following parameters had high total metals concentrations for sump samples with TSS greater than 10 mg/L: aluminum (maximum of 3.3 mg/L), iron (maximum of 3.3 mg/L), copper (maximum of 3.3 mg/L), and zinc (maximum of 3.3 mg/L) (e.g. Figure 4). Accordingly, the concentrations for these parameters are interpreted to be biased high as a result of solids contamination in the sample and

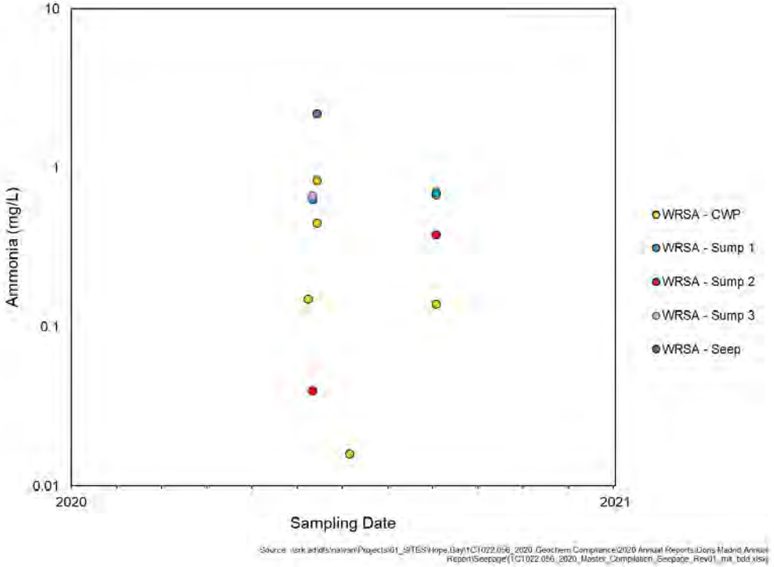
have been excluded from data interpretation. In contrast, dissolved concentrations for these parameters at the seepage station are lower and are considered to be representative of waste rock drainage chemistry: aluminum (0.033 mg/L), iron (0.020 mg/L), copper (0.0017 mg/L), manganese (0.026 mg/L), and zinc (<0.001 mg/L). Trace metals data are illustrated in Figure 5 and summarized as follows (totals metals for all samples except the seepage sample):

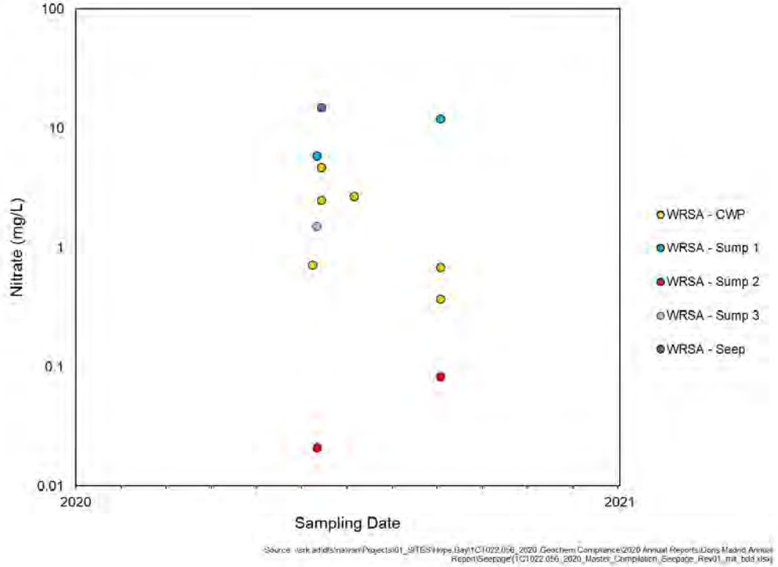
- Geochemical monitoring of waste rock in stockpiles at the WRSA confirmed the relationship between neutral pH arsenic leaching and solid phase arsenic content and the trace mineral gersdorffite (SRK 2017a and 2021c). Neutral pH metal leaching parameters from the oxidation of the trace sulphide mineral gersdorffite are arsenic, cobalt and nickel and are summarized as follows:
  - Concentrations of arsenic, cobalt, and nickel were two times higher for CWP Inside than CWP Outside. In contrast, the opposite was observed for chloride and sulphate (higher concentrations for CWP Outside. This suggests that the seepage chemistry of CWP Outside was characteristic of drainage from underground waste rock (chloride) and CWP Inside of NE CPR waste rock (arsenic, cobalt, and nickel).
  - Arsenic concentrations were higher at the CWP and seepage station near Sump 1 (0.011 to 0.022 mg/L) compared to the sumps (0.0018 to 0.0089 mg/L) suggesting that the seepage sample is influenced by drainage from NE CPR waste rock.
  - Cobalt concentrations for all Madrid waste rock samples ranged from 0.0012 to 0.0033 mg/L in June. In September, cobalt concentrations at Sump 1 (0.025 mg/L) were higher compared to Sump 2, Sump 3 and CWP (0.0033 to 0.0075 mg/L)
  - Nickel concentrations in June, maximum concentrations were indicated in seepage near Sump 1 and the CWP (0.012 and 0.011 mg/L, respectively), however nickel in the CWP was lower for other samples in June (0.0045 and 0.0074 mg/L) and roughly equivalent to the other sample locations. In September, concentrations for all samples were 0.013 to 0.14 mg/L (Sump 1, Sump 2 and CWP), however one CWP sample had a lower nickel concentration of 0.0068 mg/L suggesting spatial variability within the CWP.
- Selenium concentrations were highest in the Sump 1, Sump 3, and the seep sample near Sump 1 (ranging from 0.0014 to 0.0023 mg/L for all aforementioned areas) and lowest in the Sump 2 samples (0.00020 and 0.00075 mg/L). Selenium concentrations in the CWP samples ranged from 0.00029 to 0.0018 mg/L. Based on the drainage of contact water from underground waste rock, as indicated by chloride, the source of selenium is hypothesized to be from underground mine rock.
- Manganese concentrations exhibited temporal rather than spatial trends and were an order of magnitude higher in samples from September (0.24 to 7.0 mg/L) compared to samples from June (0.026 to 0.17 mg/L). Manganese may be biased in some samples due to high TSS concentrations.



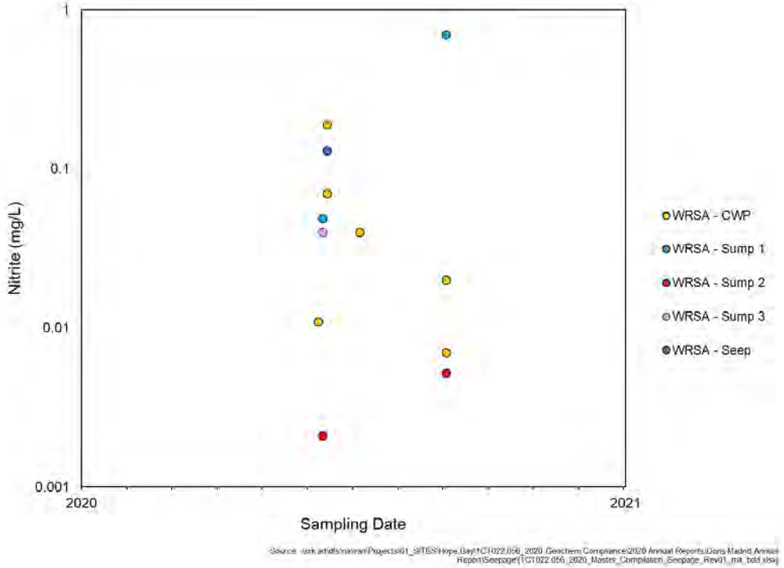




**Figure 3: Time Series Plots Sulphate, Chloride, Calcium, Ammonia, Nitrate, and Nitrite, Madrid North Waste Rock Storage Area**

Notes: CWP and sump samples are total metals whereas the seep is dissolved metals.

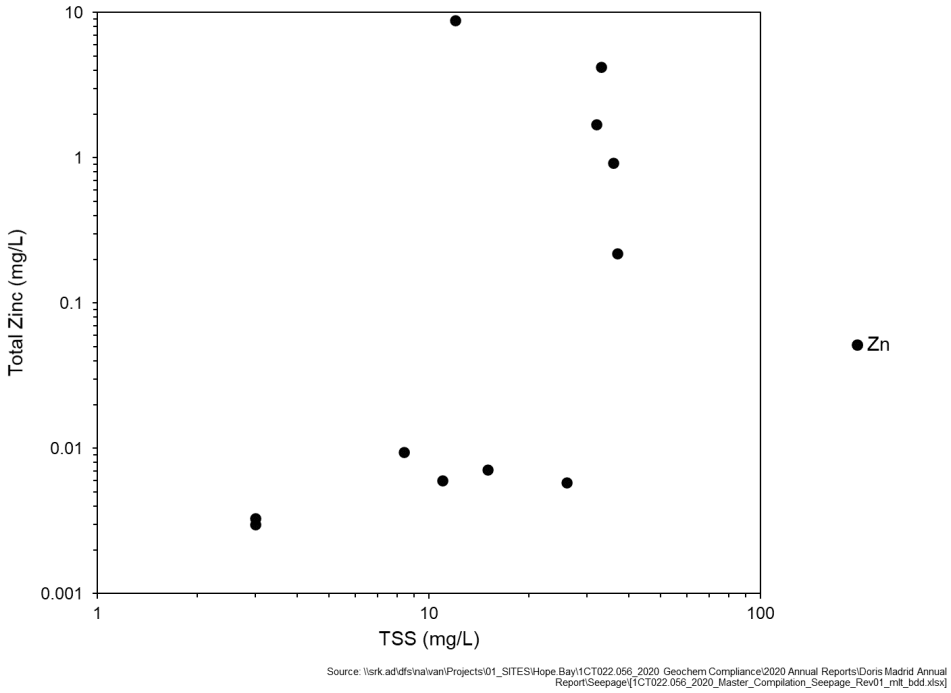
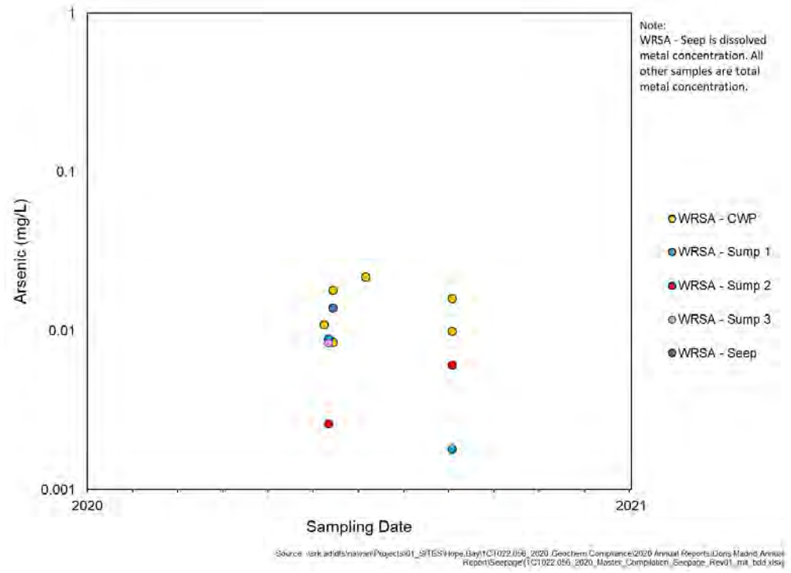
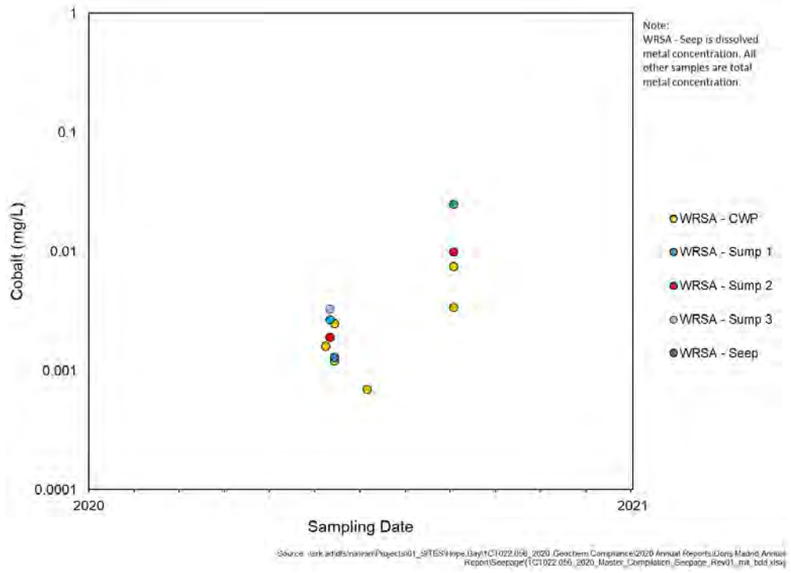
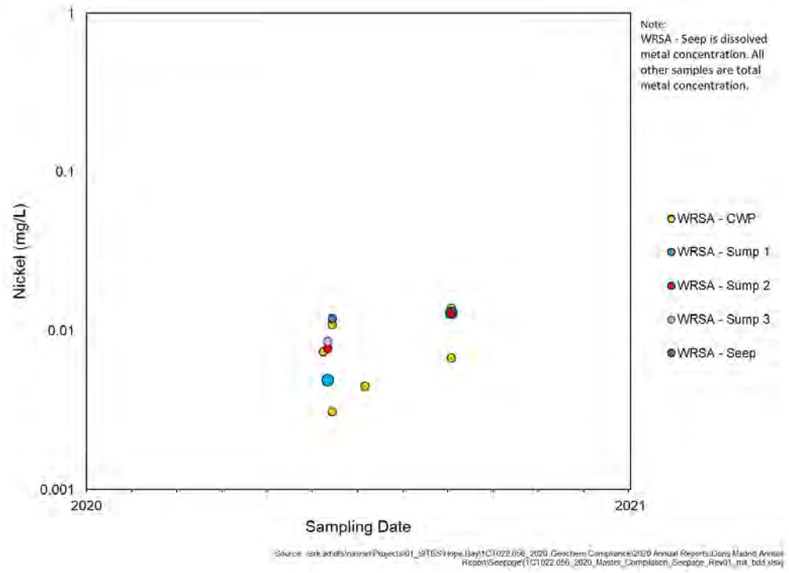
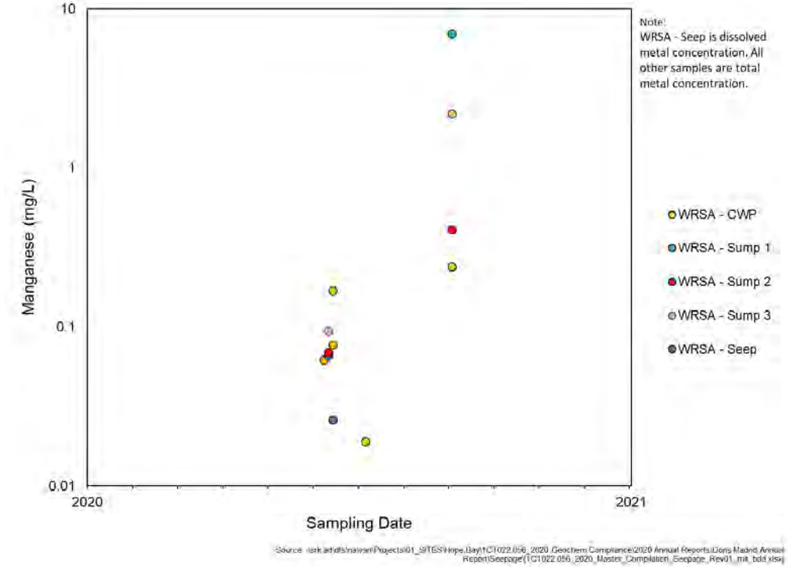



**Figure 4: Concentration of Total Zinc with Respect to TSS**



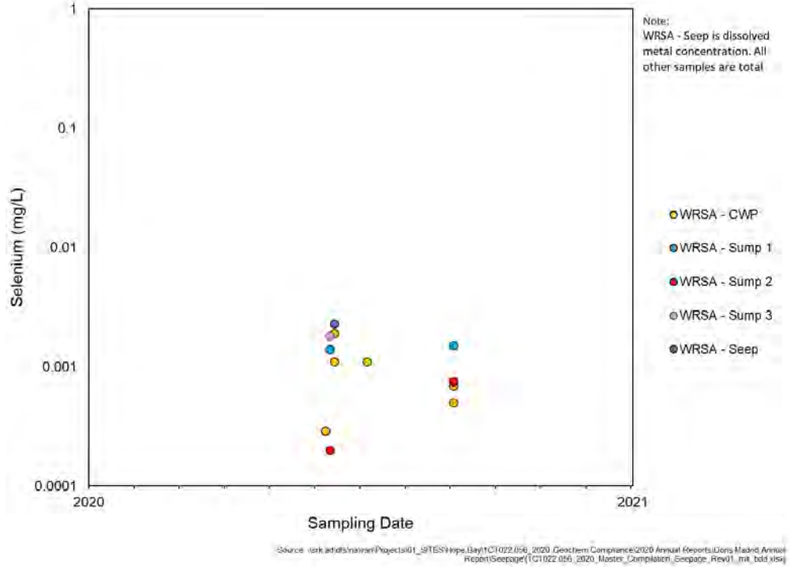




**Figure 5: Time Series Plots of Arsenic, Cobalt, Nickel, Manganese, and Selenium, Madrid North Waste Rock Storage Area**

Notes: CWP and sump samples are total metals whereas the seep is dissolved metals.

### 3.3.2 Infrastructure and Roads

Four seepage samples were collected from along the access road to the NE CPR, six samples from the overburden stockpile, and three samples from the portal pad. The results of the geochemical investigation of the Portal Pad seepage is documented in SRK (2021a). SRK conducted a geochemical investigation of the overburden stockpile seepage with the results of the investigation pending (SRK in progress). All seepage results are discussed herein for completeness.

#### Field Data

Field parameters are summarized as follows:

- Portal Pad: field pH ranged from 5.3 to 6.0 and EC values were over range (>20,000 µS/cm).
- Overburden Stockpile: pH ranged from 6.8 to 7.1 and field EC values were over range (>20,000 µS/cm). Field ORP at 20-OVB-03 and 20-OVB-03A indicated slightly reducing conditions (69 to 86 mV) whereas ORP at the other three seepage stations indicated oxidizing conditions (190 to 230 mV).
- NE CPR access road: pH ranged 7.1 to 7.8 and EC ranged from 120 to 580 µS/cm.

**Table 6: Summary of Select Laboratory Results of 2020 Seepage Samples, Madrid North Infrastructure and Roads**

| Area | Station ID | Date | Field pH s.u. | Lab pH s.u. | Field EC[1] µS/cm | Lab EC µS/cm | ORP mV | TDS mg/L | Total Alkalinity mg CaCO3/L | Ammonia mg N/L | Cl mg/L | NO3 mg /L | NO2 mg/L | SO4 mg/L | Ca mg/L | Mg mg/L | K mg/L | Na mg/L | Al mg/L | As mg/L | Cd mg/L | Co mg/L | Cu mg/L | Fe mg/L | Mn mg/L | Mo mg/L | Ni mg/L | Se mg/L | Zn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NE CPR Access Road | 20-NEAR-01 | 11-Jun-20 | 7.8 | 7.6 | 530 | 510 | 190 | 330 | 75 | 0.35 | 93 | 0.54 | 0.019 | 31 | 24 | 11 | 4.5 | 55 | 0.045 | 0.0026 | 0.000011 | 0.00050 | 0.0040 | 0.047 | 0.18 | 0.00094 | 0.0027 | 0.00021 | 0.0016 |
| | 20-NEAR-02 | 11-Jun-20 | 7.5 | 7.6 | 250 | 260 | 180 | 170 | 75 | 0.12 | 32 | 0.23 | 0.014 | 7.9 | 26 | 4.8 | 3.5 | 17 | 0.043 | 0.0014 | 0.000016 | 0.0012 | 0.0039 | 0.082 | 0.71 | 0.00059 | 0.0036 | 0.000051 | <0.001 |
| | 20-NEAR-03 | 11-Jun-20 | 7.4 | 7.8 | 580 | 550 | 190 | 360 | 110 | 0.19 | 91 | 0.34 | 0.014 | 24 | 43 | 13 | 4.6 | 44 | 0.031 | 0.0011 | 0.0000084 | 0.00090 | 0.0029 | 0.10 | 0.34 | 0.00078 | 0.0024 | 0.00013 | 0.0015 |
| | 20-NEAR-04 | 11-Jun-20 | 7.1 | 7.3 | 120 | 120 | 180 | 100 | 41 | 0.0079 | 12 | <0.005 | <0.001 | 2.3 | 13 | 2.8 | 1.9 | 6.0 | 0.027 | 0.00060 | 0.000015 | <0.0001 | 0.0031 | 0.034 | 0.00099 | 0.00027 | 0.0019 | <0.00005 | 0.0021 |
| Overburden Stockpile | 20-OVB-01 | 2-Jul-20 | 6.8 | 7.3 | OR | 31000 | 220 | 25000 | 160 | 8.8 | 12000 | 1.7 | 0.41 | 1900 | 610 | 960 | 200 | 6200 | <0.02 | 0.0022 | 0.0011 | 0.0037 | 0.0067 | <0.2 | 1.4 | 0.0044 | <0.01 | 0.0010 | <0.02 |
| | 20-OVB-02 | 3-Jul-20 | 7.0 | 7.2 | OR | 81000 | 230 | 67000 | 220 | 23 | 31000 | 24 | 0.20 | 4000 | 1500 | 2900 | 590 | 19000 | <0.05 | <0.005 | 0.0034 | 0.085 | 0.012 | <0.5 | 6.1 | 0.0064 | 0.057 | 0.0037 | <0.05 |
| | 20-OVB-03 | 27-Jul-20 | 6.9 | 6.8 | OR | 63000 | 86 | 58000 | 270 | 24 | 24000 | 12 | 0.57 | 2900 | 1000 | 2000 | 450 | 14000 | <0.05 | <0.005 | 0.0020 | 0.033 | <0.01 | 15 | 4.8 | 0.028 | 0.086 | 0.0027 | <0.05 |
| | 20-OVB-03 | 15-Aug-20 | 6.8 | 7.7 | OR | 55000 | 69 | 35000 | 320 | 18 | 18000 | <0.5 | <0.1 | 2000 | 660 | 1600 | 330 | 11000 | <0.05 | <0.005 | 0.00027 | 0.022 | <0.01 | 8.4 | 4.8 | 0.018 | <0.025 | <0.0025 | <0.05 |
| | 20-OVB-03A | 3-Jul-20 | 7.1 | 7.2 | OR | 37000 | 82 | 27000 | 290 | 12 | 14000 | 1.7 | 0.10 | 1600 | 450 | 1100 | 260 | 7300 | <0.02 | <0.002 | 0.00029 | 0.017 | <0.004 | 0.26 | 5.4 | 0.011 | 0.019 | <0.001 | <0.02 |
| | 20-NUN-01 | 2-Jul-20 | 7.1 | 7.3 | OR | 44000 | 190 | 38000 | 180 | 15 | 18000 | 5.3 | <0.1 | 2300 | 840 | 1400 | 280 | 9100 | <0.05 | <0.005 | 0.00091 | 0.096 | 0.019 | <0.5 | 11 | 0.0056 | 0.046 | <0.0025 | <0.05 |
| Portal Pad | 20-MAD-01 | 2-Jul-20 | 6.0 | 6.6 | OR | 40000 | 140 | 35000 | 85 | 98 | 18000 | 110 | 2.5 | 68 | 9100 | 210 | 170 | 510 | 0.058 | <0.005 | 0.0032 | 0.14 | <0.01 | <0.5 | 22 | <0.0025 | 0.058 | 0.0040 | 0.33 |
| | 20-MAD-02 | 27-Jul-20 | 5.3 | 4.9 | OR | 68000 | 110 | 68000 | 2.5 | 150 | 31000 | 200 | <0.1 | 120 | 17000 | 460 | 320 | 1700 | 0.26 | <0.005 | 0.003 | 0.53 | 0.013 | 490 | 36 | <0.0025 | 0.24 | 0.0059 | 0.26 |
| | 20-MAD-02 | 15-Aug-20 | 5.6 | 5.6 | OR | 35000 | 140 | 22000 | 5.1 | 63 | 9700 | 62 | <0.1 | 69 | 6700 | 280 | 130 | 610 | 0.099 | <0.002 | 0.0025 | 0.27 | 0.004 | 160 | 24 | <0.001 | 0.12 | 0.0031 | 0.25 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Seepage\[1CT022.056_2020_Master_Compilation_Seepage_Rev00_mlt_bdd.xlsx]

Notes:

[1] OR denotes over range, which indicates value was higher than the range of the instrument (>20,000 µS/cm)

## Laboratory Data

The geochemistry of the portal pad, overburden stockpile and NE CPR access road were significantly different and are summarized separately below. The major ion chemistry is presented in a Piper Plot (Figure 2) in Section 3.3.1.

### Portal Pad

A comprehensive summary of sources of the portal pad seepage chemistry is documented in SRK (2021a). A summary is provided herein as follows:

- pH and EC ranged from 4.9 to 6.6 and 35,000 to 40,000 µS/cm, respectively.
- The major cation chemistry was dominated by calcium (6,700 to 17,000 mg/L) and sodium (510 to 1,700 mg/L), while major anion chemistry was dominated by chloride (9,700 to 31,000 mg/L) and sulphate (68 to 120 mg/L). Sulphate concentrations suggest low rates of sulphide oxidation, which is consistent with the sulphide content of the Portal Pad construction rock (median and 95$^{th}$ percentile values of 0.18 and 0.52%S, respectively).
- Ammonia concentrations ranged from 63 to 150 mg/L as N and nitrate concentrations ranged from 61 to 1,100 mg/L as N (Figure 7). The portal pad was constructed from waste rock from NE CPR; however, the concentrations of nitrogen nutrients are indicative of blast residues from underground waste rock.
- Dissolved metals concentrations were notable for cadmium (0.0025 to 0.0032 mg/L), cobalt (0.14 to 0.53 mg/L), manganese (22 to 36 mg/L), nickel (0.058 to 0.12 mg/L), and zinc (0.25 to 0.33 mg/L) (Figure 8). Notably, arsenic concentrations were below analytical detection and are interpreted to be adsorbed to iron (oxy)hydroxides visible in the seepage flow path.
- The source of elevated major ions and cobalt, manganese, nickel and zinc in the seepage is not from portal pad construction rock sourced from NE CPR but is from a stockpile of briny waste rock placed on the lined temporary transfer area of the Madrid North Portal Pad. The liner was compromised thereby allowing the hypersaline solution to flow across the tundra.
- Geochemical characterization of the briny waste rock indicated the presence of a high ionic strength solution that is more concentrated than residual drilling brine on typical Hope Bay underground waste rock. The hypersaline solution on the waste rock resulted in increased metal leaching rates and mobility as a response to ion exchange and/or formation of chloride complexes.
- Portal pad construction rock and briny waste rock were classified as non-PAG with non-acidic paste pH and accordingly are not the source of slightly acidic pH indicated in the seepage (5.3 to 5.6). Rather development of mildly acidic pH is related to organic acids in the active layer and/or release of acidity from ion exchange between the hypersaline seepage and the tundra.

### Overburden Stockpile

- pH and EC ranged from 6.8 to 7.7 and 31,000 to 81,000 µS/cm, respectively.
- The major cation chemistry was dominated by sodium (6,200 to 19,000 mg/L) and magnesium (960 to 2,900 mg/L) and anion chemistry was dominated by chloride (12,00 to 31,000 mg/L) and sulphate (1,600 mg/L to 4,000 mg/L) (Figure 7). A comparison of major ions for overburden stockpile compared to portal pad seepage is summarized as follows and suggests different geochemical sources:
  - Chloride was the same order of magnitude however calcium was one order of magnitude lower for the overburden stockpile.
  - Concentrations for potassium, sodium, magnesium, and sulphate were an order of magnitude higher for Overburden Seepage
- Nutrient concentrations ranged from 8.8 to 24 mg/L as N (ammonia), <0.5 to 24 mg/L as N (nitrate) and <0.1 to 0.57 mg/L (nitrite) (Figure 7).
- Ranges in trace metal concentrations that were elevated in portal pad seepage are as follows: cobalt (0.0037 to 0.096 mg/L), manganese (1.4 to 11 mg/L), nickel (<0.01 to 0.086 mg/L) and zinc (below detection of <0.05 mg/L) (Figure 8). Notably, arsenic concentrations were near analytical detection limits.
- Iron concentrations ranged from <0.2 to 15 mg/L. Samples with iron concentrations above detection exhibited more reducing conditions whereas iron was below detection for samples with higher values of ORP (Figure 6). Iron concentrations did not have a positive trend with manganese, the latter which showed the highest concentrations with higher ORP values indicative of oxidizing conditions.
- A geochemical investigation of the source of overburden stockpile seepage is currently in progress (SRK in progress).

### NE CPR Access Road

- Lab pH and EC ranged from 7.3 to 7.8 and 120 to 510 µS/cm, respectively.
- The major cation chemistry was dominated by sodium (17 to 55 mg/L) and calcium (13 to 43 mg/L) and anions were dominated by chloride (12 to 93 mg/L) and alkalinity (41 to 114 mg/L) (Figure 7). Sulphate concentrations were low (2.3 to 31 mg/L).
- Ammonia and nitrate were within one to two orders of magnitude greater than reference samples, ranging from below detection limit (<0.005) to 0.54 mg/L for nitrate, and 0.0079 to 0.35 mg/L for ammonia (Figure 7). Concentrations were highest for sample NEAR-01, which was closest to the NE CPR.
- Dissolved metals concentrations were the same order of magnitude compared to the reference seeps except for manganese (Figure 8). Manganese concentrations ranged from 0.00099 mg/L to 0.71 mg/L.

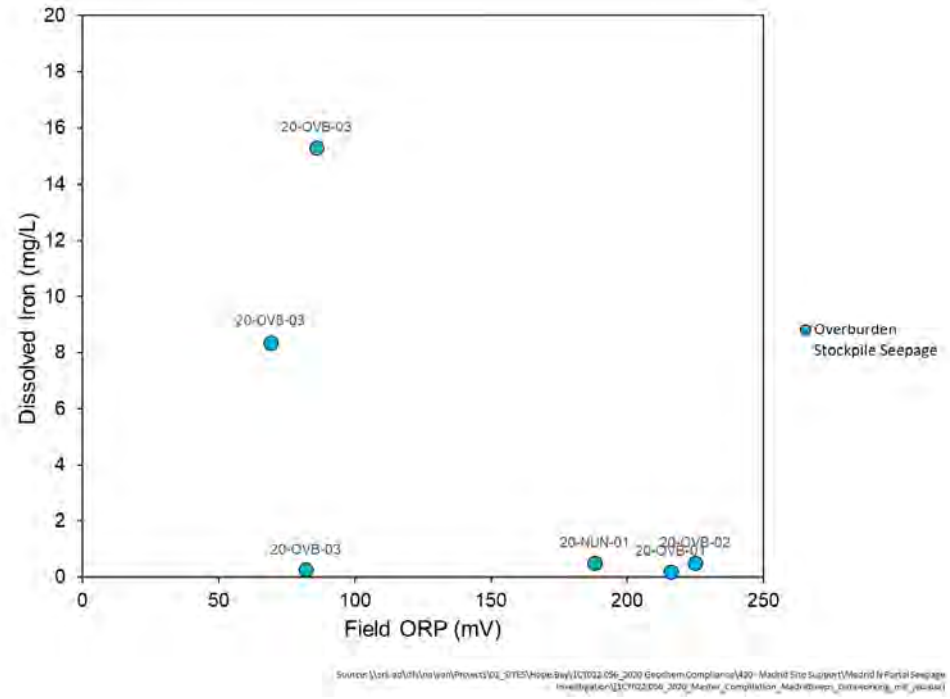



**Figure 6: Dissolved Iron vs Field ORP in Overburden Stockpile Seepage**

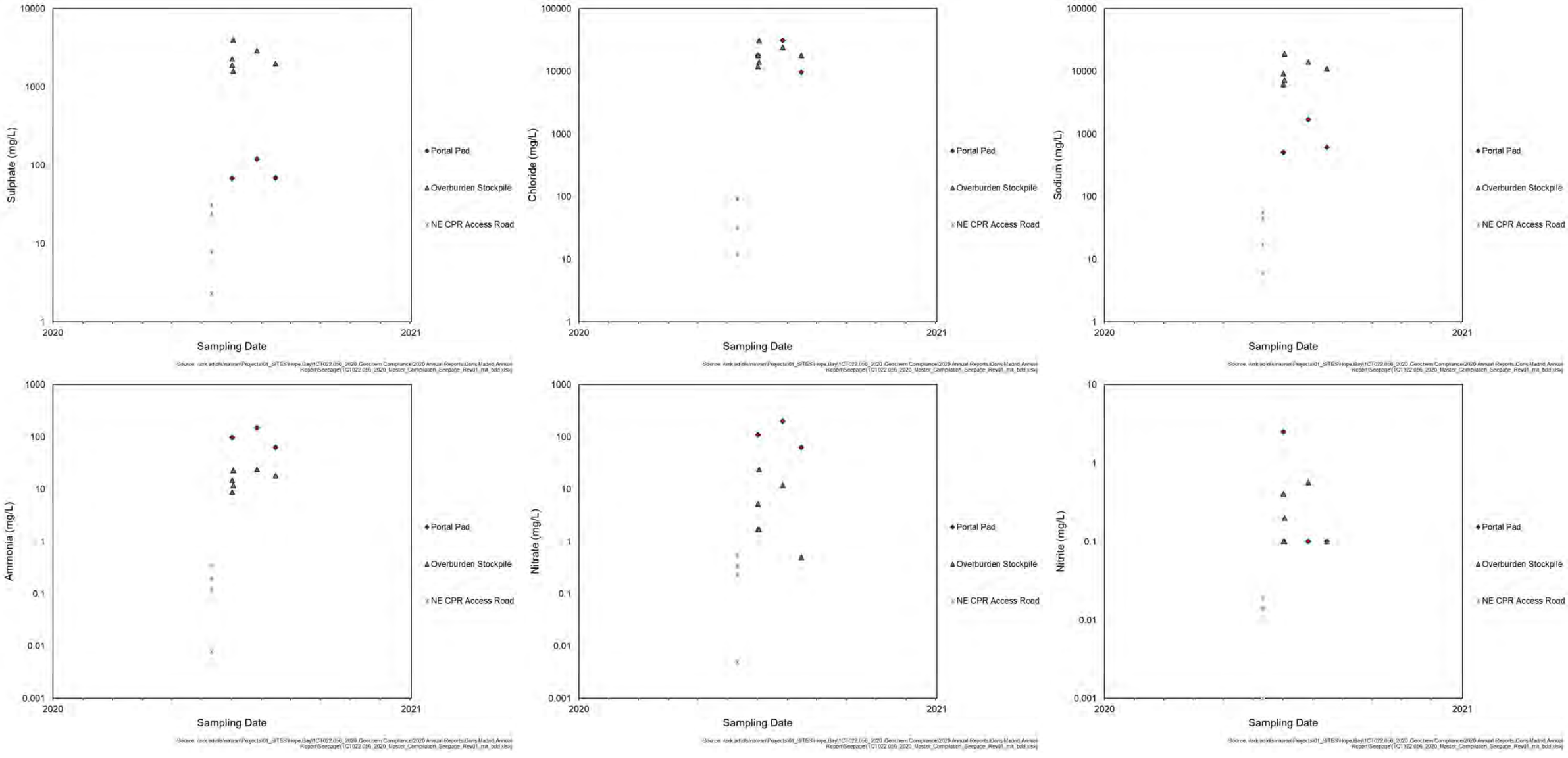
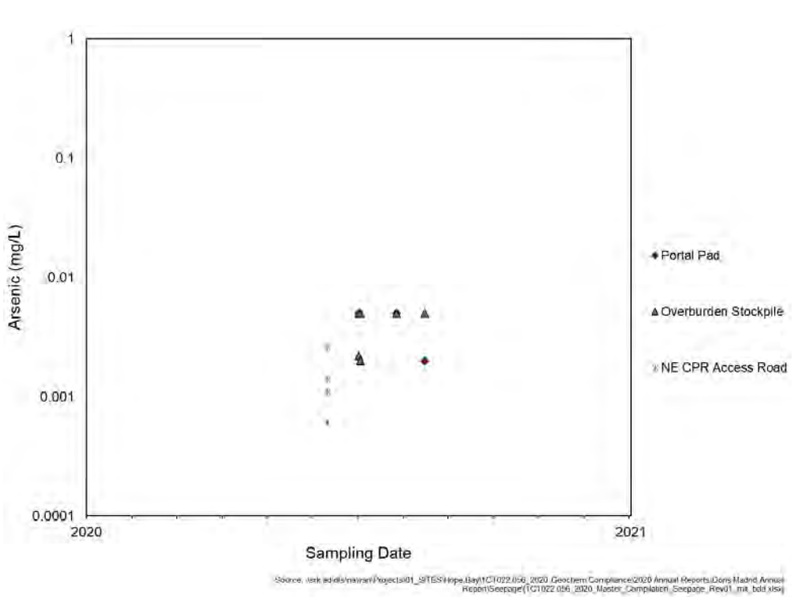
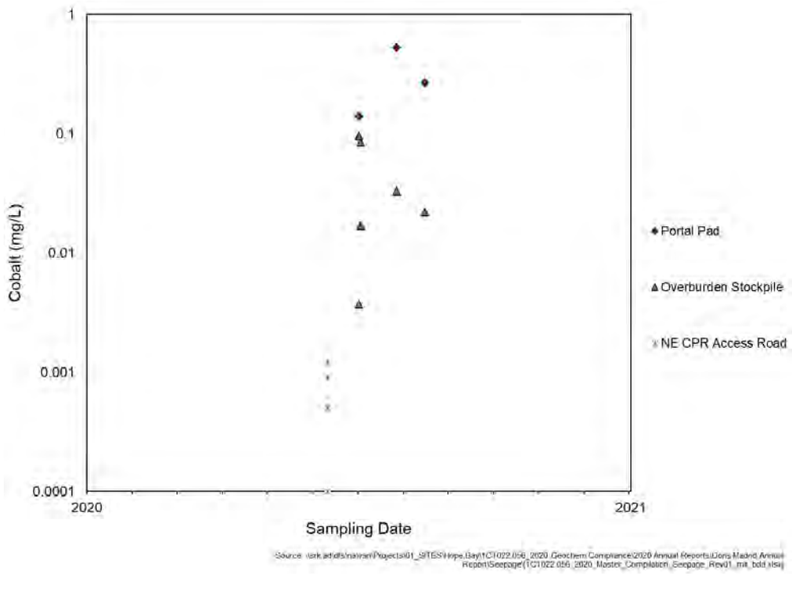
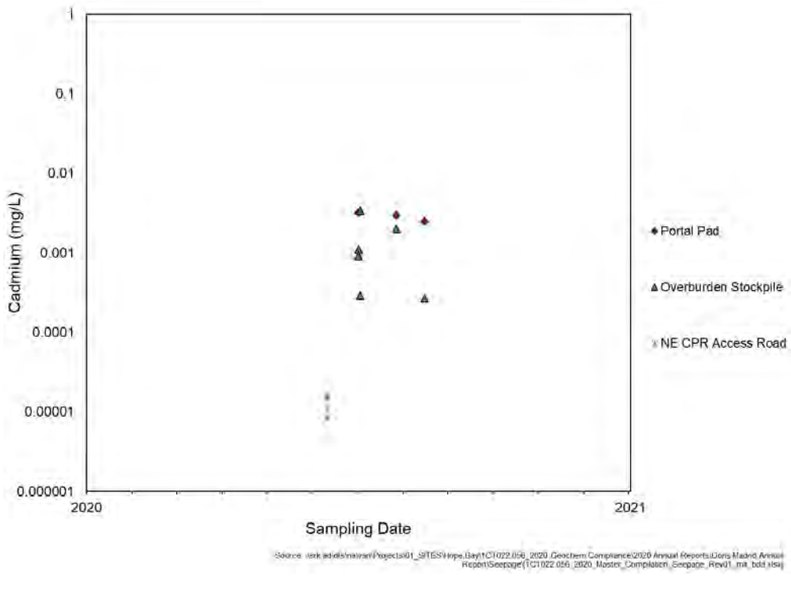
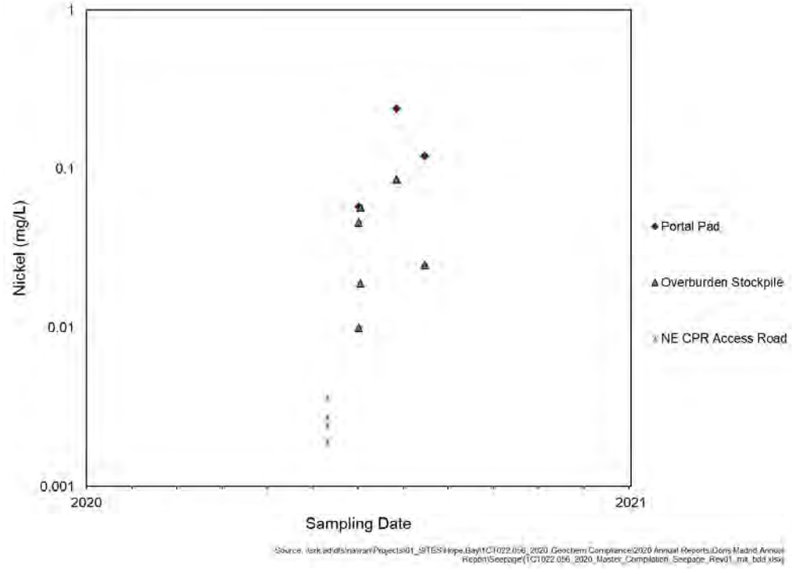


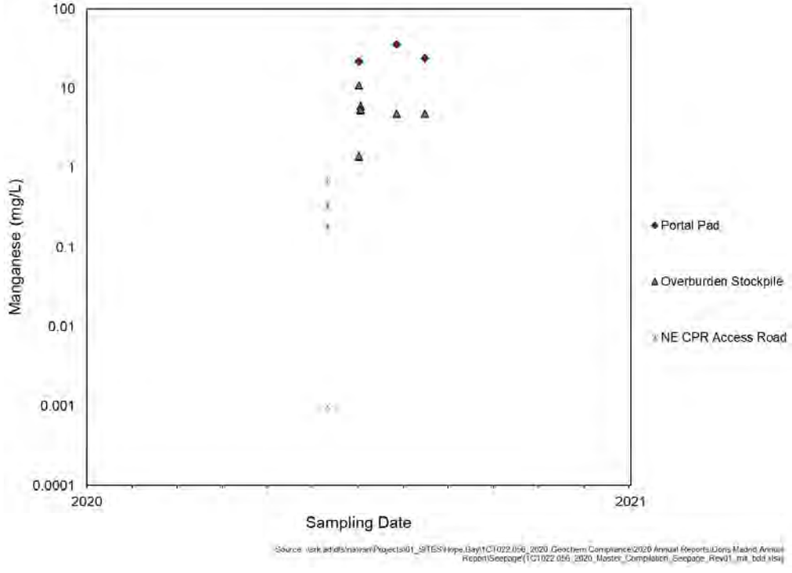

**Figure 7: Time Series Plots Sulphate, Chloride, Sodium, Ammonia, Nitrate, and Nitrite, Madrid North Infrastructure and Roads**



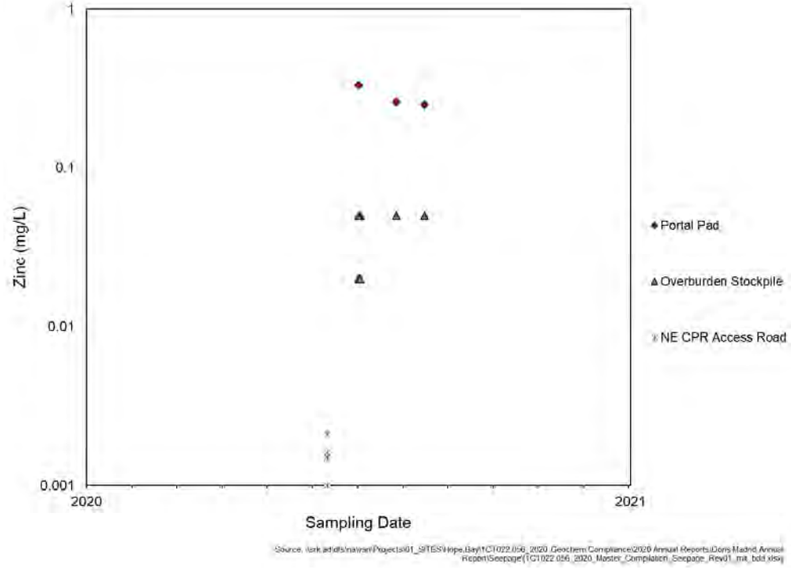




**Figure 8: Time Series Plots Arsenic, Cobalt, Cadmium, Nickel, Manganese, and Zinc, Madrid North Infrastructure and Roads.**

# 4 Comparison to Previous Surveys

Table 7 compares the results of samples collected in 2020 from the waste rock influenced area at Doris and reference stations (Windy Road area) with a statistical summary of historical seepage samples collected from those same areas between 2011 and 2019. Table 7 presents the historical data as 5th, 50th, and 95th percentile statistics, with concentrations below the detection limit assumed to be equal to the detection limit.

There are no historical seepage samples for the Doris CPR cover, Portal Pad, Naartok East access road, Overburden Stockpile, or Madrid North waste rock seepage at the WRSA.

**Table 7: Comparison of analytical results between 2020 survey data and 5th, 50th, and 90th percentile of 2011 to 2019 survey data**

| Area | Sample ID | Field pH s.u. | Lab pH s.u. | Field EC µS/cm | Lab EC µS/cm | Total Hardness mg $CaCO_3$/L | TDS mg/L | Ammonia mg N/L | Cl mg/L | $NO_3$ mg N/L | $SO_4$ mg/L | Al mg/L | As mg/L | Cd mg/L | Cu mg/L | Fe mg/L | Pb mg/L | Ni mg/L | Se mg/L | Zn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waste Rock Influenced Area | 20-DC-01 | 7.2 | 7.9 | 1700 | 1800 | 330 | 1100 | 0.96 | 420 | 3.9 | 150 | 0.016 | 0.0025 | 0.000021 | 0.033 | 0.12 | 0.00005 | 0.0015 | 0.00099 | 0.0011 |
| | 20-DC-02 | 7.3 | 7.9 | 1500 | 1500 | 300 | 890 | 1.1 | 320 | 4.2 | 160 | 0.0096 | 0.0026 | 0.000018 | 0.044 | 0.14 | 0.00005 | 0.0019 | 0.001 | 0.001 |
| | 20-DC-03 | 7.4 | 7.8 | 1400 | 1300 | 300 | 820 | 1.3 | 260 | 4.6 | 170 | 0.01 | 0.0029 | 0.000018 | 0.056 | 0.16 | 0.00005 | 0.0025 | 0.0014 | 0.001 |
| | 20-DC-04 | 7.1 | 7.6 | 13000 | 11000 | 3700 | 11000 | 58 | 3400 | 200 | 220 | 0.01 | 0.0024 | 0.003 | 0.014 | 0.05 | 0.00025 | 0.01 | 0.0043 | 0.011 |
| | 20-DC-05 | 7 | 7.6 | 18000 | 14000 | 4900 | 10000 | 80 | 4400 | 260 | 230 | 0.013 | 0.0025 | 0.0042 | 0.019 | 0.05 | 0.00025 | 0.014 | 0.0055 | 0.014 |
| | 20-DC-06 | 7.1 | 7.5 | OR | 22000 | 8100 | 16000 | 130 | 7400 | 430 | 270 | 0.016 | 0.0023 | 0.0074 | 0.029 | 0.1 | 0.0005 | 0.023 | 0.0083 | 0.024 |
| | 2011-2019, P5 | 7.6 | 7.6 | 530 | 420 | 120 | 240 | 0.6 | 64 | 2.1 | 14 | 0.006 | 0.00059 | 8.3E-06 | 0.0033 | 0.01 | 0.00005 | 0.00061 | 0.00021 | 0.001 |
| | 2011-2019, P50 | 8 | 7.9 | 2200 | 2500 | 540 | 1600 | 9.4 | 480 | 25 | 88 | 0.0092 | 0.0016 | 0.000063 | 0.0092 | 0.026 | 0.000084 | 0.0033 | 0.0014 | 0.0018 |
| | 2011-2019, P95 | 8.3 | 8.1 | 3800 | 8200 | 2400 | 6400 | 65 | 2400 | 140 | 330 | 0.027 | 0.0073 | 0.00031 | 3.7 | 7.2 | 0.00025 | 0.081 | 0.0047 | 0.005 |
| | 2011-2019, n[1] | 24 | 29 | 24 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| Reference (Windy Road) | 20-REF-01A | 7 | 7.1 | 49 | 44 | 19 | 60 | 0.0088 | 3.2 | 0.005 | 0.3 | 0.08 | 0.00018 | 0.000005 | 0.002 | 0.12 | 0.00005 | 0.0029 | 0.00005 | 0.0029 |
| | 20-REF-02 | 7.3 | 7.8 | 160 | 150 | 57 | 120 | 0.013 | 15 | 0.005 | 0.8 | 0.021 | 0.00026 | 0.000005 | 0.0017 | 0.06 | 0.00005 | 0.0024 | 0.00005 | 0.002 |
| | 20-REF-03 | 7.3 | 7.4 | 91 | 84 | 29 | 61 | 0.005 | 7.1 | 0.005 | 2 | 0.014 | 0.0001 | 0.000005 | 0.0012 | 0.037 | 0.00005 | 0.0005 | 0.00005 | 0.001 |
| | 2011-2019, P05 | 6.6 | 6.9 | 36 | 50 | 17 | 34 | 0.005 | 3.5 | 0.005 | 0.3 | 0.006 | 0.0001 | 0.000005 | 0.00086 | 0.03 | 0.00005 | 0.0005 | 0.00005 | 0.001 |
| | 2011-2019, P50 | 7.3 | 7.5 | 79 | 70 | 23 | 58 | 0.0063 | 6.3 | 0.005 | 0.74 | 0.02 | 0.00015 | 0.00001 | 0.0012 | 0.064 | 0.00005 | 0.0019 | 0.0001 | 0.0033 |
| | 2011-2019, P95 | 7.8 | 8 | 290 | 190 | 71 | 120 | 0.021 | 26 | 0.005 | 5 | 0.058 | 0.00024 | 0.00005 | 0.0025 | 0.18 | 0.00005 | 0.0026 | 0.001 | 0.005 |
| | 2011-2019, n | 15 | 25 | 15 | 21 | 25 | 25 | 22 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Seepage\[1CT022.037_2019_Doris-MadridSeep_rev03.xlsx]

Notes:

[1] n = number of samples

## 4.1 Windy Road Area (Reference Stations)

Parameters concentrations for reference samples collected in 2020 were generally stable and consistent with the historical dataset (Table 7).

## 4.2 Doris Waste Rock Influenced Area

As previously noted, the stockpile on Pad I is composed of Doris ore mined by TMAC that has been placed on top of the waste rock stockpile in 2015. Waste rock mined by TMAC has been placed on Pad T since 2015.

### Ammonia, Nitrate, and Chloride

Trends in ammonia, nitrate, and chloride concentrations increased after the placement of ore on the stockpile due to the re-initiation of mining by TMAC in 2015 and have continuously decreased since 2016 indicating the flushing of salts from drilling brines (chloride) and explosives residues (ammonia, nitrate, and nitrite) from the stockpile on Pad I (Figure 9 to Figure 11).

Prior to 2020, seepage collected at the toe of Pad I was interpreted to be waste rock contact water and seepage at the toe of the access road was less concentrated. In 2020, seepage collected along the access road contained higher levels of residual drilling brines and blast reagents suggesting that access road seepage is from a different a different seepage source. Madrid ore was sourced from the NE CPR where brines are not used for drilling and accordingly, Madrid ore is not the source of elevated chloride.

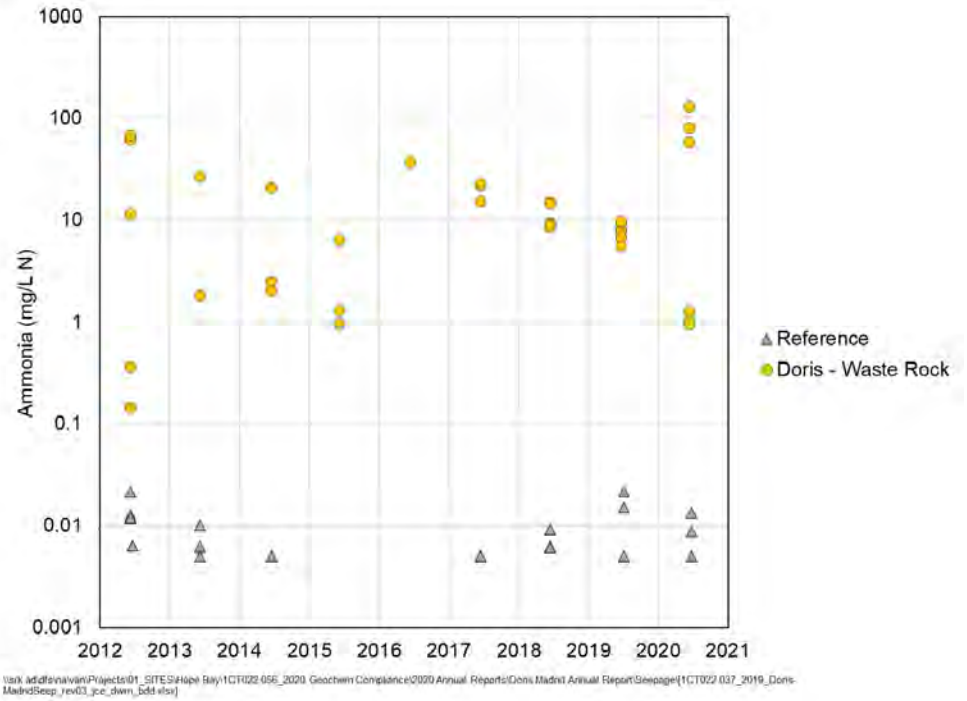



**Figure 9: Ammonia Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

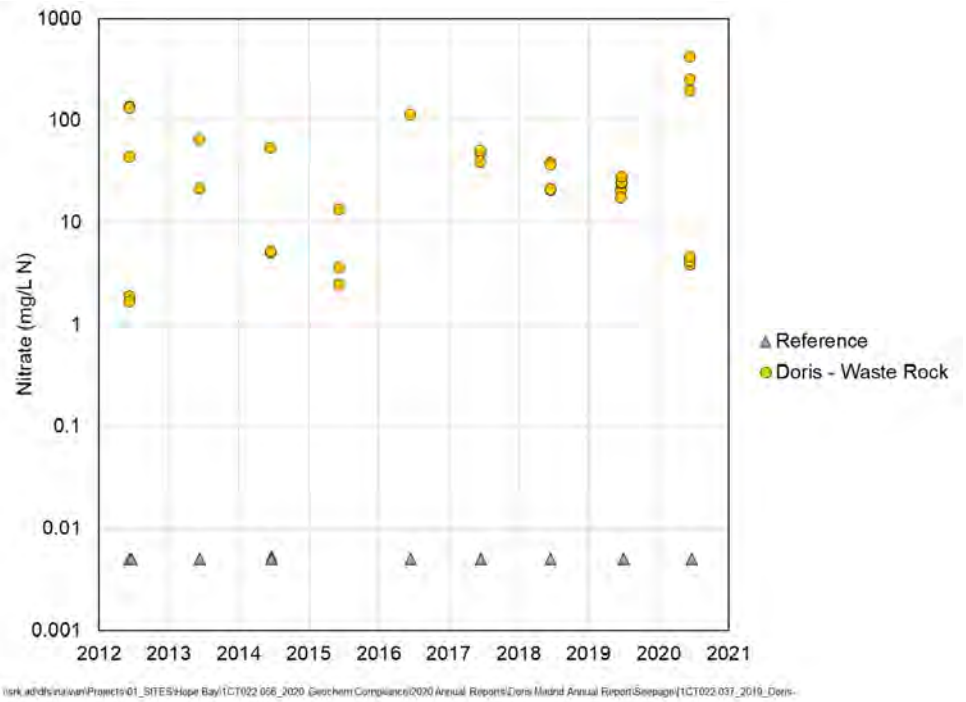



**Figure 10: Nitrate Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

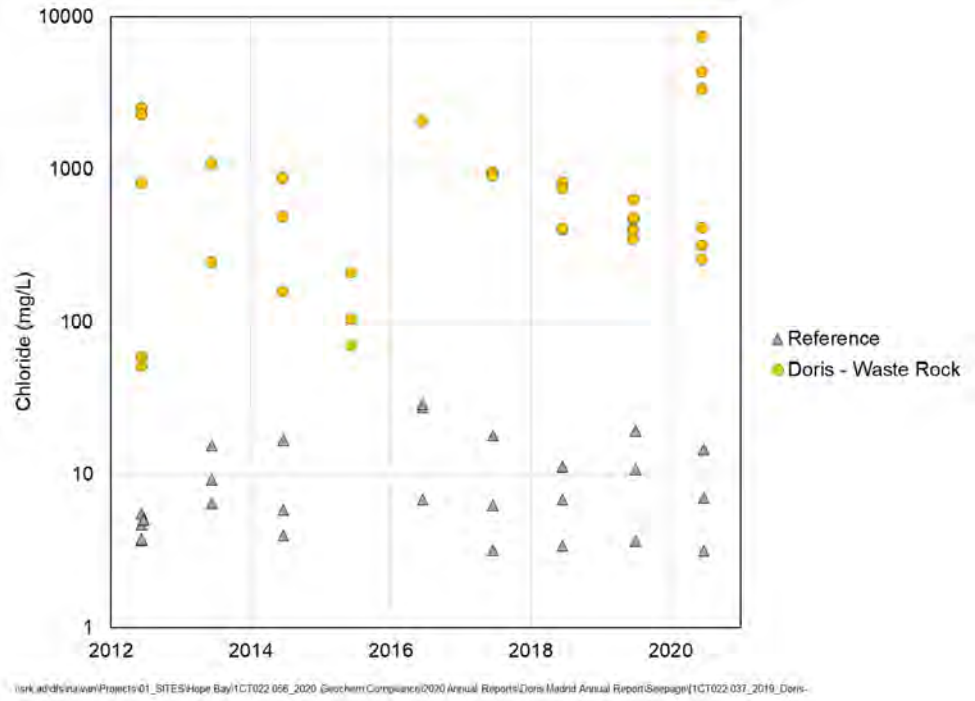



**Figure 11: Chloride Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

## Sulphate and Trace Elements

Figure 12 to Figure 20 present temporal trends of sulphate, manganese, arsenic, cobalt, nickel, cadmium, zinc, copper, and iron. Sulphate is presented in the context of sulphide oxidation in relation to metal leaching. Arsenic, cobalt and nickel are presented in the context of important neutral pH metal leaching parameters for Madrid North rock. Manganese, cadmium, and zinc are discussed because concentrations in the seepage at the toe of the access road was an order of magnitude higher than the seepage at the toe of the stockpile of Pad I. Copper, cobalt and iron are discussed in the context of decreasing concentrations compared to previous years.

Historically, sulphate concentrations in seepage at the toe of the access road were lower than at the toe of the stockpile on Pad I, however in 2020 sulphate concentrations were higher at the toe of the access road. Compared to 2019, sulphate concentrations in seepage have decreased from the stockpile at Pad I. As discussed in SRK (2020), prior to 2015, Pad I was used for the waste rock stockpile and increasing trends in sulphate are attributed to the placement of Doris ore on Pad I that is enriched in sulphide and with higher release rates compared to Doris waste rock (SRK 2015a). The increase in sulphate in seepage at the toe of the access road may be related to the placement of Madrid ore at Doris camp starting in Fall 2019. Madrid ore is stockpiled on the west side of Pad T and then moved to Pad I to be processed through the mill with Doris ore. Madrid and Doris ore have an average sulphur concentration of 1.5% and 1%, respectively (SRK 2017a and 2015b). SRK's humidity cell test program demonstrated that sulphate leaching rates were higher for samples of ore (average

stable rate of 13 mg/kg/week, n=3; SRK 2015a) compared to Doris ore (average stable rate of 3.2 mg/kg/week, n=4; SRK 2015b)

In 2020, seepage at the toe of the access road had higher concentrations than the toe of Pad I for cobalt (4 to 11 times higher) and nickel (4 to 15 times higher). For arsenic, concentrations were roughly equivalent at the two seepage sampling locations. Concentrations of arsenic, cobalt and nickel in 2020 were lower than 2019 (Figure 14 to Figure 16).

Manganese concentrations in seepage at the toe of the stockpile on Pad I are within the range of historic data but are higher in seepage at the toe of access road. Manganese concentrations at the toe of the access road are 22 to 58 times higher than the toe of Pad I suggesting a different seepage source (Figure 12). Sources of manganese leaching at Doris pad could include ore and/or detoxified tailings. A review of humidity cell test (HCT) data indicated that selected samples of ore from Doris Central (HC-36, HC-45, HC-52 and HC-54) and Madrid (Naartok East) (HC-26) had maximum manganese loading rates (0.014 to 0.038 mg/kg/week) that were higher than other Doris and Madrid waste rock and ore HCTs but that overall stable rates were roughly equivalent for all HCT samples (SRK 2017a and 2015b). Detoxified tailings are temporarily stored at the Doris pad. HCT data indicated that stable manganese loading rates for Doris and Madrid detoxified tailings were 0.091 and 0.26 mg/kg/week, respectively. Similarly, manganese concentrations from seepage samples collected from underground stopes containing detoxified tailings range from 0.43 to 10 mg/L (SRK 2021d).

Like manganese, cadmium and zinc concentrations in seepage at the toe of the stockpile on Pad I are within the range of historic data but are higher in seepage at the toe of access road. Cadmium and zinc concentrations at the toe of the access road are 140 to 410 times and 10 to 24 times higher, respectively, than the toe of Pad I suggesting a different seepage source (Figure 17 and Figure 18). HCT data for cadmium and zinc were below or within levels of analytical detection for all samples (SRK 2017a and 2015b). Barrel tests, which are primarily samples of waste rock with selected samples of mixed ore and waste rock, indicated a higher initial flush with higher concentrations ranging from 0.0001 to 0.0002 mg/L for waste rock types intersected at NE CPR followed by a decreasing trend with concentrations currently <0.0001 mg/L. Barrel zinc concentrations have oscillated between approximately 0.001 and 0.01 mg/L over the 11-year period operation, with no evident trends.

Notably, copper and iron previously exhibited increasing trends since 2015 when ore was placed on the waste rock stockpile, however 2020 data indicated that concentrations have decreased (Figure 19 and Figure 20). Copper concentrations for all 2020 seepage samples were within the same order of magnitude whereas cobalt concentrations were higher for seepage along the access road. Iron concentrations in 2020 were within the range of reference stations. Previous elevated concentrations of iron were interpreted to be represent colloids or TSS within the sample. This interpretation is supported by the 2020 seepage data.

All drainage from the Doris camp pad, including seepage captured in the collection sumps downstream of the toe of the access road, is pumped to the sediment control pond (SCP) prior to transfer to the TIA. In 2020, water from the SCP accounted for 2% of total inflow volumes entering the TIA and 0.6% of the total volume stored in the TIA.

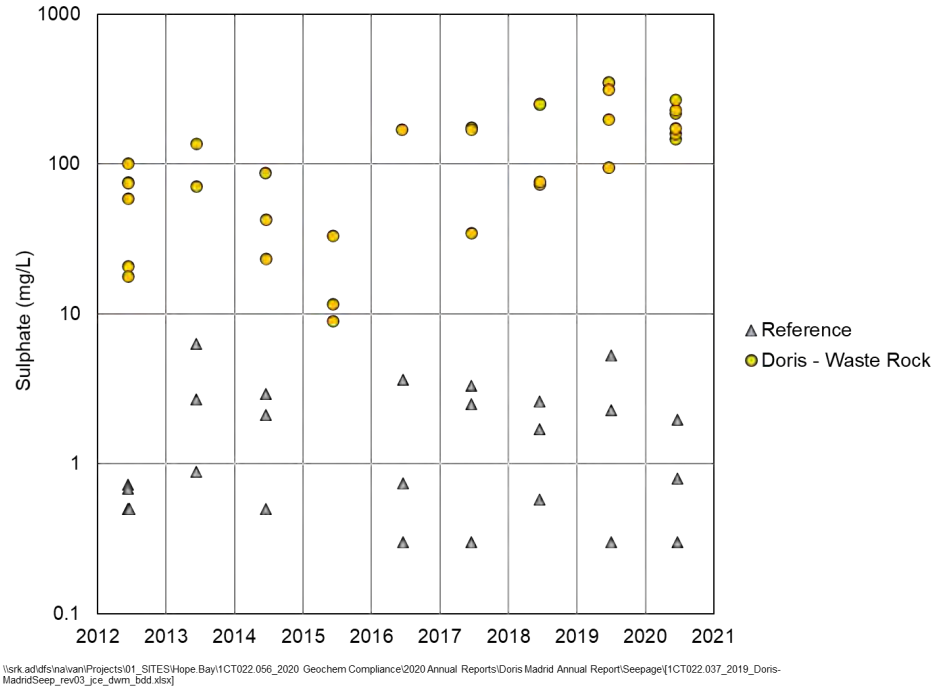



**Figure 12: Sulphate Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

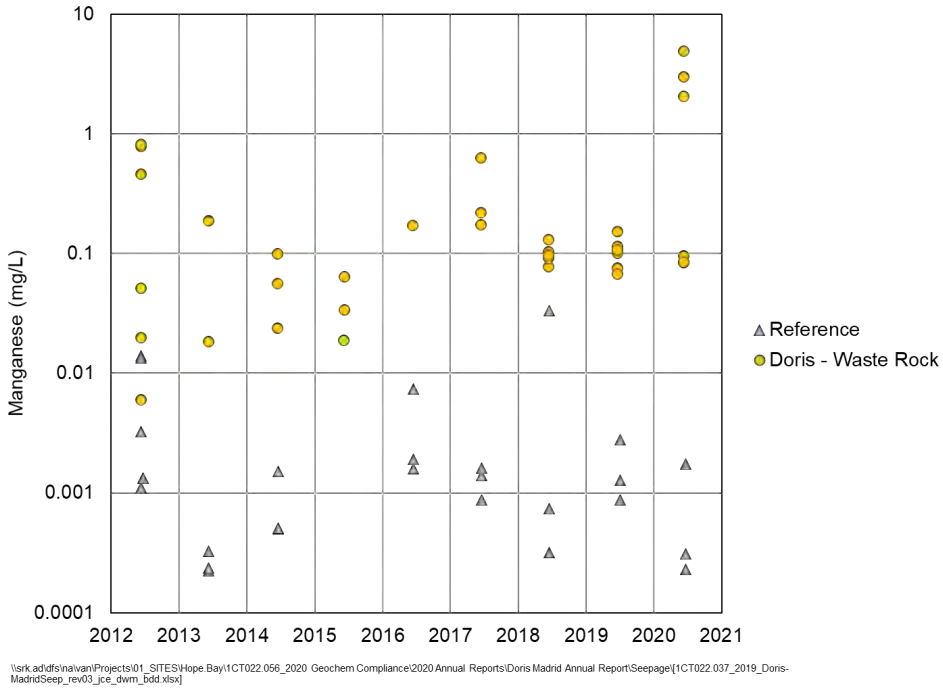



**Figure 13: Manganese Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

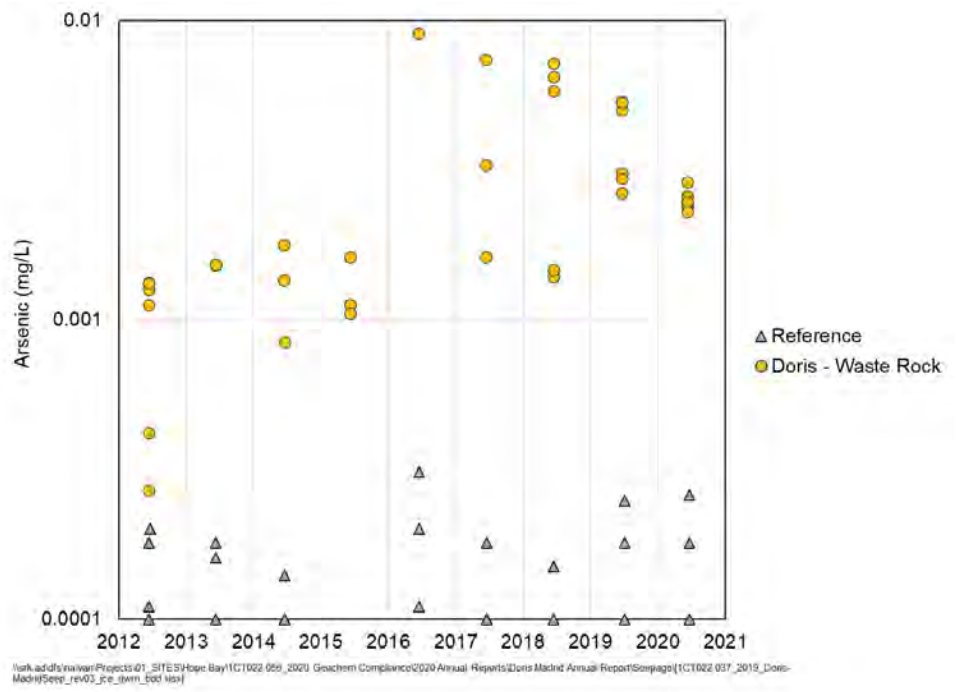



**Figure 14: Arsenic Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

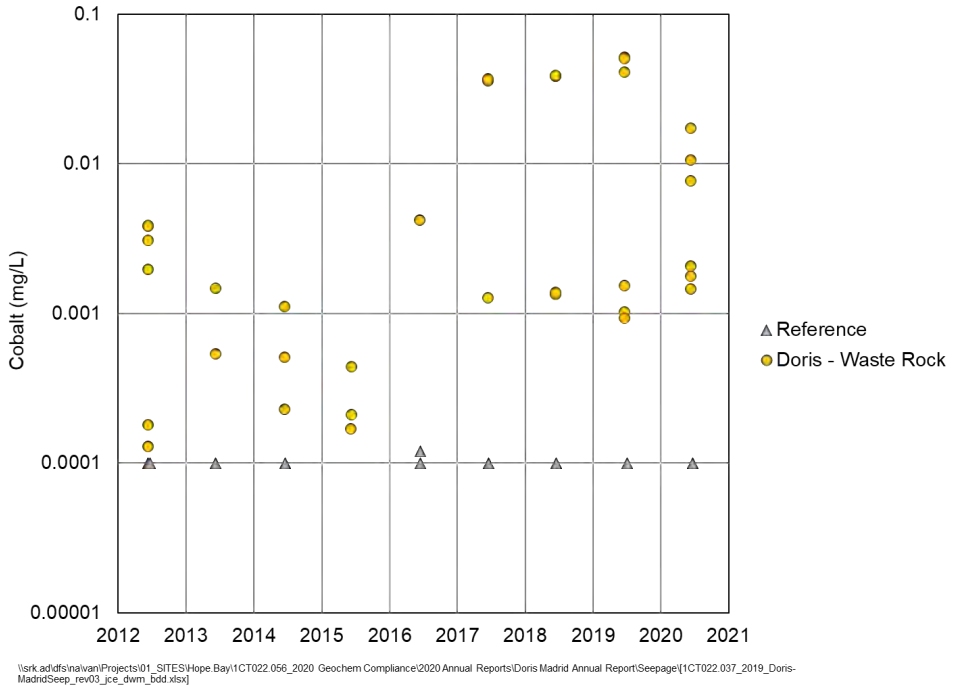



**Figure 15: Cobalt Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

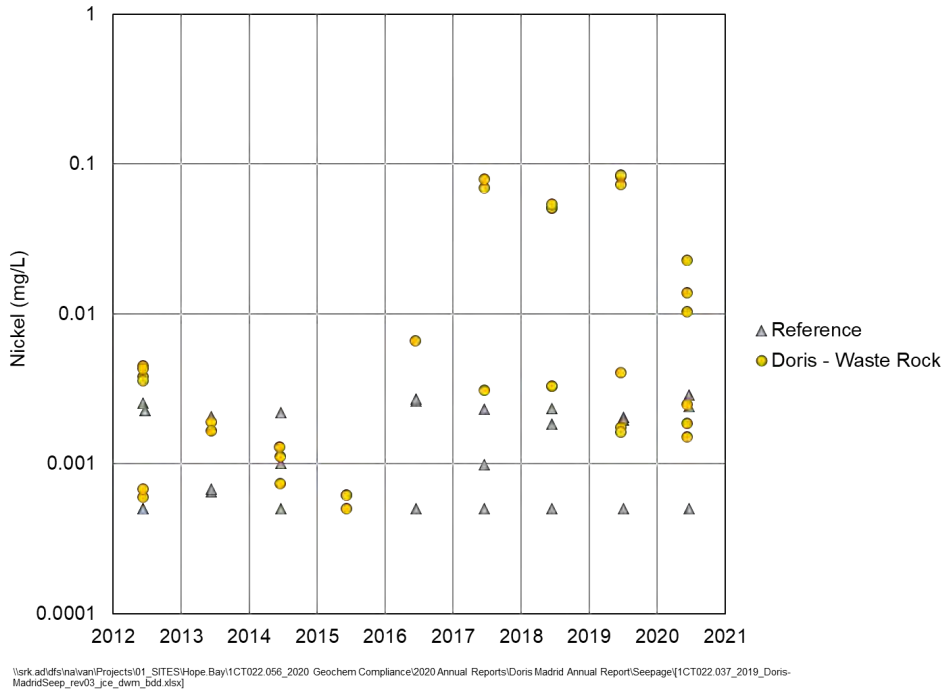



**Figure 16: Nickel Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

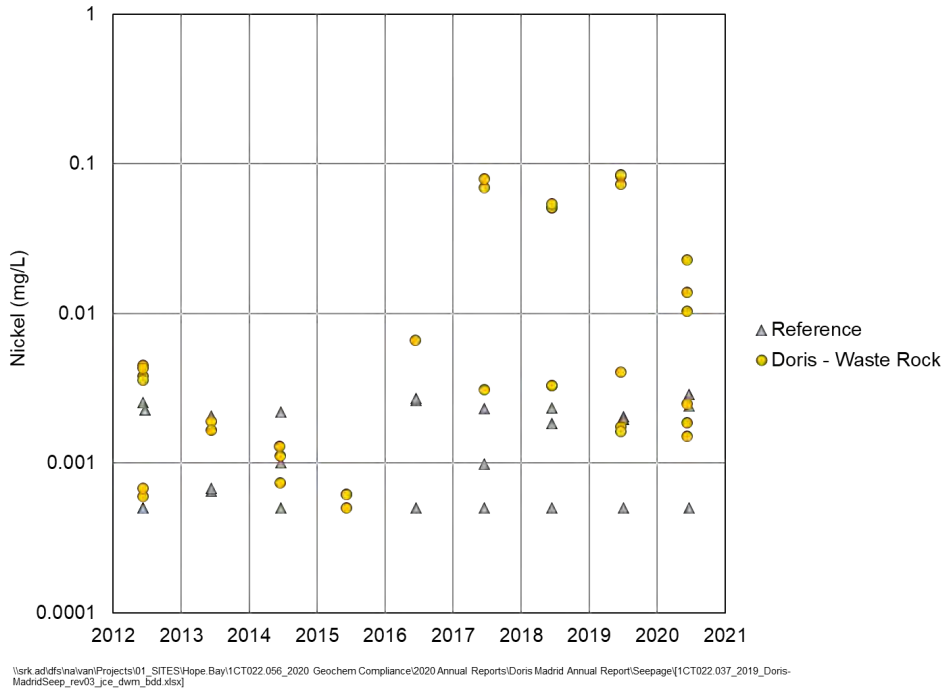



**Figure 17: Cadmium Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

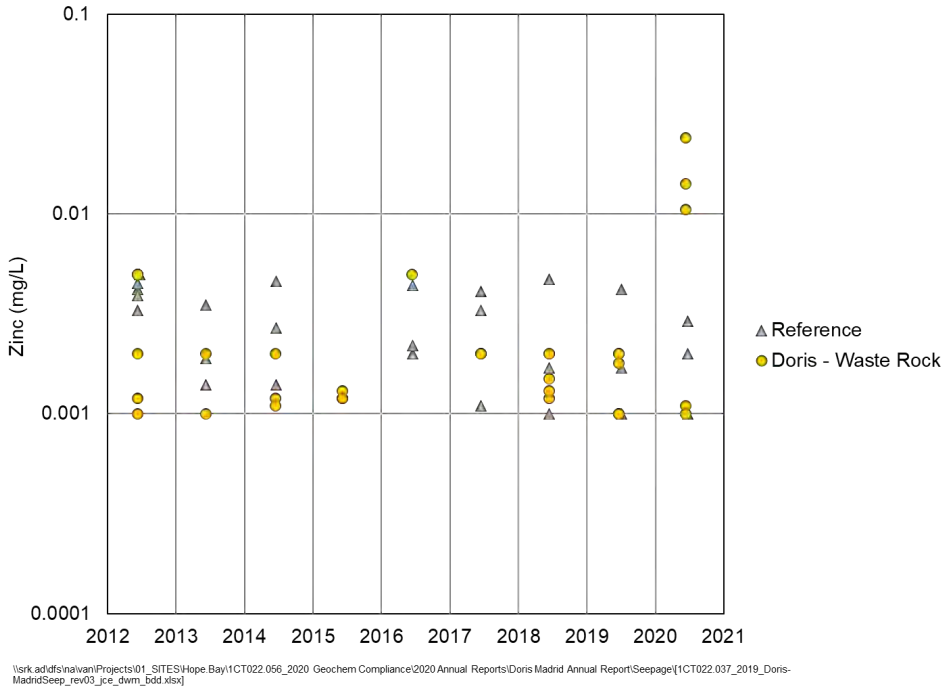



**Figure 18: Zinc Seepage Monitoring Data, Waste Rock Influenced Area and Reference Areas**

# 5 Conclusions and Recommendations

The scope of the 2020 Hope Bay seepage monitoring survey included infrastructure constructed between fall 2019 and spring 2020 at Madrid North from NE CPR waste rock; infrastructure surveyed for seepage at Doris and Madrid in 2019 but where none was observed, three reference stations, areas downstream of the Doris waste rock stockpiles (referred to as the Waste Rock Influenced Area or WRIA) and contact water downstream of the Madrid North WRSA. In 2020, reference station at Windy (REF-01) was removed from the program due to its proximity to development and a new station established south of the Madrid North WRSA (REF-01A). Concentrations for reference area seeps were consistent and stable with the historical data record.

## 5.1 Doris

### 5.1.1 Waste Rock Impacted Area

Seepage monitoring in the waste rock impacted area was at the same locations as previous years: in the embankment of the pollution control pond (PCP) at the downstream toe of the stockpile on Pad I and the toe of the access road. In 2015, TMAC regraded the waste rock stockpile on Pad I and placed ore stockpiles on top.

The pH for all seepage samples was non-acidic (7.5 to 7.9). EC ranged from 1,300 and 1,800 µS/cm for the seepage samples at the toe of Pad I and 11,000 to 22,000 µS/cm for samples along the access road samples. Since 2016, concentrations of ammonia, nitrate, and chloride concentrations have continuously indicated the flushing of salts from drilling brines (chloride) and explosives residues (ammonia, nitrate, and nitrite) from the stockpile on Pad I. Prior to 2020, seepage collected at the toe of Pad I was interpreted to be waste rock contact water and seepage at the toe of the access road was less concentrated. In 2020, seepage collected along the access road contained higher levels of residual drilling brines and blast reagents. The differences in concentrations of operational reagents suggests that access road seepage is from a different seepage source. Madrid ore was sourced from the NE CPR where brines are not used for drilling and accordingly, Madrid ore is not the source of elevated chloride.

Seepage at the toe of the stockpile at Pad I is within the range of constituent concentrations from previous years. Parameters with higher concentrations in seepage along the access road compared to the toe of the stockpile at Pad I include sulphate (220 to 270 mg/L compared to ~75 mg/L, respectively), cobalt (4 to 11 times higher), nickel (4 to 15 times higher), manganese (22 to 58 times higher), cadmium (140 to 410 times) and zinc (10 to 24 times higher). Notably arsenic concentrations for all 2020 samples were within the same range. Furthermore, arsenic, cobalt and nickel concentrations were lower in 2020 compared to 2019. A review of the kinetic test database indicated that potential sources of sulphate and manganese are Doris and Madrid ore and/or detoxified tailings, which are temporarily stored at the Doris mill until disposed of underground as backfill.

All drainage from the Doris camp pad, including seepage captured in the collection sumps downstream of the toe of the access road, is pumped to the sediment control pond (SCP) prior to transfer to the TIA. In 2020, water from the SCP accounted for 2% of total inflow volumes entering the TIA and 0.6% of the total volume stored in the TIA.

### 5.1.2 Infrastructure and Roads

Infrastructure surveyed at Doris included the Doris CPR cover (constructed of Doris CPR waste rock) and access road to the vent raise (constructed of Quarry 2 rock). Seepage was observed and samples collected representing construction rock from the Doris CPR cover but not at the access road to the Doris vent raise.

Of the two seepage samples collected, sample 20-DCPR-02 water quality was geochemically equivalent to the reference seeps and is interpreted to not represent contact water from the Doris CPR cover. For sample 20-DCPR-01, concentrations of ammonia and chloride were 10 and 30 times lower, respectively than Doris waste rock seepage downstream of the Pad I. Drilling brines were not used to mine the CPR and explosives residue concentrations are lower as a result of differing blasting practices. The lower ammonia and chloride concentrations in seepage suggests that the waste rock used to construct the NE CPR cover was sourced from NE CPR. Dissolved trace metals concentrations were typically within an order of magnitude of concentrations for Doris waste rock seepage samples downstream of Pad I except for copper for 20-DCPR-01 (0.0013 mg/L and 30 times lower).

## 5.2 Madrid North

### 5.2.1 Waste Rock

Of the 101,126 t of rock placed at WRSA, the majority of waste rock originated from NE CPR (83,968 t). Approximately, 17,158 t of waste rock from the decline of the Madrid North underground mine was also placed at WRSA. Waste rock at the WRSA was geochemically classified as non-PAG and placed in two stockpiles (SRK 2021c). The stockpiles at the WRSA include:

1. a smaller stockpile located directly upstream of the contact water pond (CWP) that contains oxide rock. The oxide rock is ore hosted in mafic volcanics with sediments (1aj) from NE CPR that could not operationally be segregated from waste rock.
2. A larger stockpile located adjacent to Sumps 1 to 3 that contains a mixture of waste rock from NE CPR and the underground mine (the latter as indicated by rinse tests).

SFE arsenic concentrations for Madrid North waste rock at WRSA exhibited a positive trend with solid-phase arsenic and sulphur content. SFE arsenic did not have a relationship with gold in WRSA rock suggesting arsenic leaching is not higher for the oxide stockpile containing ore (SRK 2021c).

Water management at the Madrid North WRSA includes three water collection sumps (Sump 1, Sump 2 and Sump 3) and the Madrid North CWP. Water from the sumps are pumped to the contact water pond, therefore water chemistry at the CWP is influenced by waste rock seepage draining to CWP and the collection sumps. Discharge of effluent onto tundra from the CWP is in accordance with the effluent quality limits provided in the Water License. Water that does not meet these criteria is transferred to the TIA via water truck.

Water quality samples collected downstream of the WRSA included one freshet seepage sample near Sump 1 and routine water quality samples in the contact water pond (CWP), Sump 1, Sump 2 and Sump 3. Samples collected from the CWP and sumps of the Madrid North WRSA were analyzed for total metals whereas the seepage sample was analyzed for dissolved metals. As a result of high TSS in selected sump samples, total aluminum, iron, copper, zinc and possibly manganese data were interpreted to be biased high.

All waste rock drainage samples were non-acidic. The waste rock drainage chemistry collected in the CWP and Sump 1 are geochemically distinct from Sump 2 and Sump 3. Contact water collected in the CWP and Sump 1 had higher sulphate concentrations (13 to 260 mg/L compared to <40 mg/L at Sumps 2 and 3), higher chloride and/or ammonia concentrations (maximum of 990 and 2.2 mg/L, respectively), higher arsenic and nickel concentrations (maximum of 0.022 and 0.012 mg/L, respectively).

Cobalt concentrations in June ranged from 0.0012 to 0.0033 mg/L for all samples but in September were higher at Sump 1 (0.025 mg/L) compared to Sump 2, Sump 3 and CWP (0.0033 to 0.0075 mg/L). Manganese exhibited temporal rather than spatial trends and were an order of magnitude higher in samples from September (0.24 to 7.0 mg/L) compared to samples from June (0.026 to 0.17 mg/L). Maximum selenium concentrations were indicated at Sump 1 and Sump 3 and selected sample from

the CWP (ranging from 0.0011 to 0.0023 mg/L for all aforementioned areas). In comparison concentrations at Sump 2 and selected CWP samples were lower (0.00020 to 0.00075 mg/L).

Chloride and ammonia are operational by-products that are introduced to underground waste rock from drilling brines and blast residues, respectively. In contrast, mining at the NE CPR did not use drilling brine and has lower ammonia residues because of differing blasting practices at surface. A review of the drainage chemistry suggests the following with respect to weathering of NE CPR and Madrid North underground waste rock at WRSA:

- Chloride concentrations and trends suggest contact water from underground waste rock primarily reports to Sumps 1 and 3 with minor flows reporting directly to the CWP and Sump 2. The source of higher selenium concentrations in Sump 1 and Sump 3 are likely related to weathering of underground waste rock.
- A comparison of the seepage sample (ID 20-MWAR-01) compared to the overall June sample set suggests that 20-MWAR-01 represents a mixture of contact water of waste rock from the underground mine (as indicated by chloride and ammonia) and NE CPR (as indicated by arsenic).
- In June, seepage was observed emanating from the newly constructed CWP to the tundra (NT-NU Report submitted by TMAC on June 15, 2020). TMAC collected paired samples of the seepage downstream of the CWP and water in the CWP. The seepage sample had higher chloride that was indicative of drainage chemistry from underground waste rock whereas CWP pond sample had higher As, Co and Ni indicative of NE CPR waste rock.
- Multiple parameters suggest spatial variability in water chemistry within the CWP. This is likely due to point discharge of waste rock drainage pumped from the sumps to the CWP.

### 5.2.2 Infrastructure and Roads

Infrastructure surveyed at Madrid North included the access road to Naartok East CPR (constructed of Quarry D rock), overburden stockpile (constructed in two phases of Quarry D rock and NE CPR waste rock), Madrid North Portal Pad (constructed of NE CPR waste rock) and Madrid Shop Laydown (constructed of NE CPR waste rock). Seepage samples were collected downstream of all areas except the Madrid Shop Laydown.

#### Portal Pad

Construction rock from the portal pad was sourced from NE CPR waste rock. A comprehensive summary of sources of the portal pad seepage chemistry is documented in SRK (2021a). A summary is provided herein as follows:

- Portal Pad: pH and EC ranged from 4.9 to 6.6 and 35,000 to 40,000 µS/cm, respectively.
- The major cation chemistry was dominated by calcium (6,700 to 17,000 mg/L) and sodium (510 to 1,700 mg/L), while major anion chemistry was dominated by chloride (9,700 and 31,000 mg/L) and sulphate (68 to 120 mg/L). Sulphate concentrations suggest low rates of sulphide oxidation, which is consistent with the sulphide content of the Portal Pad construction rock (median and 95$^{th}$ percentile values of 0.18 and 0.52%, respectively).

- Ammonia concentrations ranged from 63 to 150 mg/L as N and nitrate concentrations ranged from 61 to 1,100 mg/L as N (Figure 7). The portal pad was constructed from waste rock from NE CPR; however, the concentrations of nitrogen nutrients are indicative of blast residues from underground waste rock.
- Dissolved metals concentrations were notable for cadmium (0.0025 to 0.0032 mg/L), cobalt (0.14 to 0.53 mg/L), manganese (22 to 36 mg/L), nickel (0.058 to 0.12 mg/L), and zinc (0.25 to 0.33 mg/L) (Figure 8). Notably, arsenic concentrations were below analytical detection and are interpreted to be adsorbed to iron (oxy)hydroxides visible in the seepage flow path.
- The source of elevated major ions and cobalt, manganese, nickel and zinc in the seepage is not from portal pad construction rock sourced from NE CPR but is from a stockpile of briny waste rock placed on the lined temporary transfer area of the Madrid North Portal Pad. The liner was compromised thereby allowing the hypersaline solution to flow across the tundra.
- Geochemical characterization of the briny waste rock indicated the presence of a high ionic strength solution that is more concentrated than residual drilling brine on typical Hope Bay underground waste rock. The hypersaline solution on the waste rock resulted in increased metal leaching rates and mobility as a response to ion exchange and/or formation of chloride complexes.
- Portal pad construction rock and briny waste rock were classified as non-PAG with non-acidic paste pH and accordingly are not the source of slightly acidic pH indicated in the seepage (5.3 to 5.6). Rather development of mildly acidic pH is likely related to organic acids in the active layer and/or release of acidity from ion exchange between the hypersaline seepage and the tundra.

### Overburden Stockpile

The overburden stockpile contains construction rock sourced from two areas: Quarry D for construction in early 2019 of access roads and NE CPR waste rock for construction in late 2019 interior access roads and placement as cladding.

- pH and EC ranged from 6.8 to 7.7 and 31,000 to 81,000 µS/cm, respectively.
- The major cation chemistry was dominated by sodium (6,200 to 19,000 mg/L) and magnesium (960 to 2,900 mg/L) and anion chemistry was dominated by chloride (12,00 to 31,000 mg/L) and sulphate (1,600 mg/L to 4,000 mg/L) (Figure 7). A comparison of major ions for overburden stockpile compared to portal pad seepage is summarized as follows and indicates different geochemical sources. Chloride was the same order of magnitude as the portal pad however calcium was one order of magnitude lower for the overburden stockpile. Concentrations for potassium, sodium, magnesium and sulphate were an order of magnitude higher for Overburden Seepage.
- Nutrient concentrations ranged from 8.8 to 24 mg/L as N (ammonia), <0.5 to 24 mg/L as N (nitrate) and <0.1 to 0.57 mg/L (nitrite) (Figure 7).
- Ranges in trace metal concentrations that were elevated in portal pad seepage are as follows: cobalt (0.0037 to 0.096 mg/L), manganese (1.4 to 11 mg/L), nickel (<0.01 to 0.086 mg/L) and zinc

(below detection of <0.05 mg/L) (Figure 8). Notably, arsenic concentrations were near analytical detection limits.

- Iron concentrations ranged from <0.2 to 15 mg/L. Samples with iron concentrations above detection exhibited more reducing conditions whereas iron was below detection for samples with higher values of ORP (Figure 6). Iron concentrations did not have a positive trend with manganese, the latter which showed the highest concentrations with higher ORP values indicative of oxidizing conditions.
- A geochemical investigation of the source of overburden stockpile seepage is currently in progress (SRK in progress).

### NE CPR Access Road

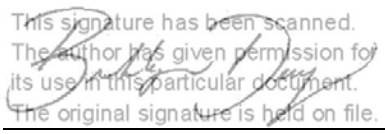
The NE CPR access road was constructed of rock from Quarry D. Seepage was non-acidic (7.3 to 7.8) with low values of EC (120 to 510 µS/cm). Sulphate concentrations were low (2.3 to 31 mg/L). Ammonia and nitrate were within one to two orders of magnitude greater than reference samples. Dissolved metals concentrations were the same order of magnitude compared to the reference seeps except for manganese. Manganese concentrations ranged from 0.00099 mg/L to 0.71 mg/L.

## 5.3 Recommendations

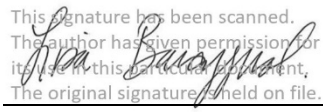
SRK recommends the following for the 2021 seepage survey:

- Monitoring of waste rock stockpiles at Madrid WRSA and Doris pad.
- Continued seepage monitoring at the Madrid Portal Pad and Overburden Stockpile.
- Include infrastructure areas monitored in 2020 where seepage was not observed at Doris (access road to vent raise) and Madrid North (Madrid Shop Laydown).
- Dissolved metals analysis for all samples collected downstream of the WRSA, including the CWP and Sumps to quantify metal leaching from waste rock at WRSA.
- Routine monitoring of infrastructure, pads and roads as per the Water Licence and applicable management plans (TMAC 2017b and 2019)

Regards,
SRK Consulting (Canada) Inc.




Brooklyn Derry, EIT (SK)
Staff Consultant (Surface Water)




Lisa Barazzuol, PGeo (NT/NU)
Principal Consultant (Geochemistry)

## Attachments:

| | |
|---|---|
| Attachment 1 | Maps of 2020 Seepage Survey Locations |
| Attachment 2 | 2020 Field Observations and Measurements |
| Attachment 3 | 2020 Laboratory Water Quality Data |

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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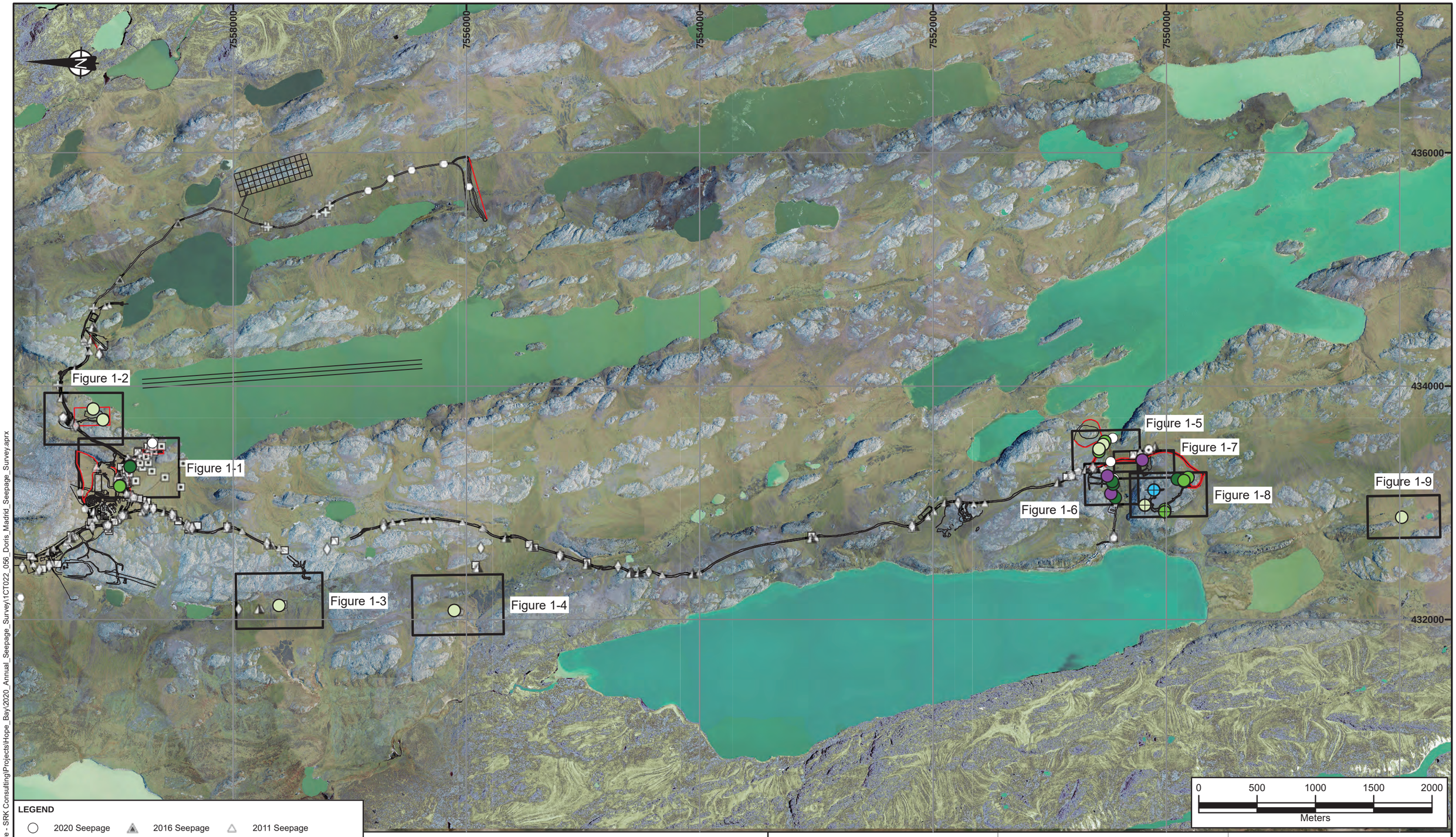
# Attachment 1 Maps of 2020 Seepage Survey Locations




**LEGEND**

- 2020 Seepage
- 2020 Sump
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

AGNICO EAGLE

**Hope Bay Gold Project**

2020 Seepage Monitoring

# Seep Survey Locations

| DATE: | APPROVED: | FIGURE: |
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7559250
7559100
7558950
7558800
7558650
433500
433350
433200

Vent Raise

Pad T

Pad I

PCP

SCP

20-DC-04
20-DC-05
20-DC-06
20-DC-01
20-DC-03
20-DC-02

0 25 50 75 100
Meters

**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

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SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

AGNICO EAGLE

**Hope Bay Gold Project**

2020 Seepage Monitoring

Seep Survey Locations

DATE: March 2021 | APPROVED: | FIGURE: **1-1**

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7559550

7559400

20-DCPR-02

Doris CPR

20-DCPR-01

0 25 50 75 100

Meters

**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

AGNICO EAGLE

**Hope Bay Gold Project**

2020 Seepage Monitoring

# Seep Survey Locations

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20-REF-03
0 50 100 150 200
Meters

**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

AGNICO EAGLE

**Hope Bay Gold Project**

2020 Seepage Monitoring

Seep Survey Locations

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7556000
7555750
7555500
7555250
432750
432500
432250
432000
20-REF-02
0 50 100 150 200
Meters

**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

AGNICO EAGLE

**Hope Bay Gold Project**

2020 Seepage Monitoring

Seep Survey Locations

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| March 2021 | | 1-4 |

C:\Users\sconard\OneDrive - SRK Consulting\Projects\Hope_Bay\2020_Annual_Seepage_Survey\1CT022_056_Doris_Madrid_Seepage_Survey.aprx

Naartok East CPR

20-NEAR-01

20-NEAR-02

20-NEAR-04

20-NEAR-03

7550700

7550550

7550250

433500

433350

0 25 50 75 100

Meters

**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

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SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

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**Hope Bay Gold Project**

2020 Seepage Monitoring

Seep Survey Locations

DATE: March 2021

APPROVED:

FIGURE: **1-5**

C:\Users\sconard\OneDrive - SRK Consulting\Projects\Hope_Bay\2020_Annual_Seepage_Survey\1CT022_056_Doris_Madrid_Seepage_Survey.aprx

7550200
7550550
7550900
7551250
433200
433050
N
20-OVB-03
Overburden Pad
20-OVB-03A
20-OVB-02
20-OVB-01
20-NUN-01
Madrid Surface Shop
Laydown
MMS1-S2
0 25 50 75 100
Meters

**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

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SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

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**Hope Bay Gold Project**

2020 Seepage Monitoring

# Seep Survey Locations

DATE: March 2021

APPROVED:

FIGURE: **1-6**

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**LEGEND**

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

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SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

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**Hope Bay Gold Project**

2020 Seepage Monitoring

# Seep Survey Locations

DATE: March 2021

APPROVED:

FIGURE: **1-7**

**LEGEND**

- 2020 Seepage
- 2020 Sump
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage
- 2016 Seepage
- 2015 Seepage
- 2014 Seepage
- 2013 Seepage
- 2012 Seepage
- 2011 Seepage
- 2010 Seepage
- 2019 Surveyed Areas
- Camp Layout Infrastructure

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

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SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

AGNICO EAGLE

**Hope Bay Gold Project**

2020 Seepage Monitoring

Seep Survey Locations

DATE: March 2021 | APPROVED: | FIGURE: **1-8**

C:\Users\sconard\OneDrive - SRK Consulting\Projects\Hope_Bay\2020_Annual_Seepage_Survey\1CT022_056_Doris_Madrid_Seepage_Survey.aprx

**LEGEND**

| | | | |
|---|---|---|---|
| 2020 Seepage | 2016 Seepage | 2012 Seepage | |
| 2019 Seepage | 2015 Seepage | 2011 Seepage | |
| 2018 Seepage | 2014 Seepage | 2010 Seepage | |
| 2017 Seepage | 2013 Seepage | 2019 Surveyed Areas | |
| | | Camp Layout Infrastructure | |

| | pH < 7 | 7 < pH < 8 | pH > 8 |
|---|---|---|---|
| EC ≤ 500 uS/cm | | | |
| 500 uS/cm < EC < 2000 uS/cm | | | |
| EC > 2000 uS/cm | | | |

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

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**Hope Bay Gold Project**

2020 Seepage Monitoring

Seep Survey Locations

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| March 2021 | | **1-9** |

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# Attachment 2 2020 Field Observations and Measurements

| Region | Area | Sample ID | Date | Description of Location | Field Measurements | | | | | | | | | | | | Lab sample collected | Duplicate | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | Conductivity | ORP | Water Temperature | Water Colour | Turbidity | t1[1] | t2 | t3 | Amount | Capture | Flow | | | |
| | | | | | pH units | µS/cm | mV | ºC | | | sec | sec | sec | mL | % | L/s | | | |
| Doris | Reference (Windy Road) | 20-REF-01A | 6/21/2020 | Grassy tundra ~30m downstream of bedrock outcrop with snowbank clear, fast steady flow. Channel splits into two, collected samples from east channel grassy bottom. | 7.01 | 49.4 | 153 | 9.9 | Light tea | None | 2.80 | 2.69 | 2.87 | 125 | 20 | -- | Y | N | N |
| | | 20-REF-02 | 6/21/2020 | Grassy tundra, shallow, even flow, organic sediments. | 7.34 | 160.3 | 191 | 7.00 | Light tea | None | 4.85 | 4.55 | 3.74 | 125 | 75 | -- | Y | N | N |
| | | 20-REF-03 | 6/21/2020 | Grassy tundra. Some small snow banks against outcrop ~30m east of sample location. Clear steady flow. Some grasses within flow. Fine, sandy sediment with some small pebbles. Orange on top of bottle lid, appears to be paint. See photos for Diss. metals/Diss. Mercury. | 7.28 | 91.3 | 171 | 10.6 | Clear | None | 3.14 | 2.73 | 2.67 | 125 | 20 | -- | Y | N | N |
| | Doris WR Influenced Area | 20-DC-01 | 6/10/2020 | No vegetation, rocky ground cover. Small pool with light sediment on bottom. Steady flow, multiple small seeps in area. Very fine sediment on bottom. Filling syringe (suction) caused some minor disturbance. | 7.20 | 1734 | 200 | 8.2 | Clear | None | 125 mL poly - multiple small shallow seeps unable to characterize | | | | | | Y | N | N |
| | | 20-DC-02 | 6/10/2020 | Small seep at base of rock berm, some sediment visible in path of flow (larger gravel present), longer pool downstream of seep. Some geotextile fabric that seep runs over. | 7.29 | 1486 | 170 | 6.9 | Clear | None | 2.99 (75%) | 2.33 (75%) | 2.59 (60%) | 125 | 0.75 | -- | Y | N | N |
| | | 20-DC-03 | 6/10/2020 | Small, very shallow seep emanating from berm. Flow through large boulders/rocks at base of berm, some geotextile cloth near source of seep, sampled from shallow pool between large rock, multiple flow paths around rocks, light brown sediment. | 7.43 | 1375 | 185 | 6.2 | Clear | None | shallow seep cannot characterize flow | | | | | | Y | N | N |
| | | 20-DC-04 | 6/10/2020 | Slow flowing seep from ROQ at base of road. Flow barely discernable, agitated sediment to determine was not pooling water and allowed to clear prior to collecting sample. Light brown sediment on ground at location, minor amount of dead grasses at sample location approx. 25m west of Sump #1 (STSS2). | 7.12 | 13250 | 242 | 6.5 | Clear | None | flow too slow to measure | | | | | | Y | N | N |
| | | 20-DC-05 | 6/10/2020 | No snow cover around seep. Snow pile from snow road construction location ~20m west of seep location. No visible flow from snow pile towards seep. Flow emanating from wide area of ROQ at toe of road, likely multiple small seeps forming pool at toe of road, visible flow. Flow measured at narrow point, downstream of pool. Light brown sediment at seep location (substrate). | 7.00 | 18420 | 231 | 4.1 | Clear | None | 1.67 | 1.46 | 1.39 | 125 | 1 | -- | Y | N | N |
| | | 20-DC-06 | 6/10/2020 | No snow at seep location. Snow pile from snow road location ~10-15m away from seep. No visible flow from snow pile towards seep location. Wide seep forming pool at ROQ base of road. Electrical cables in area of seep. Sampled downstream of these to avoid contact. Light brown sediment, some algae present near base of road. Flow split into two channels. | 7.11 | OR | 231 | 3.7 | Clear | None | 5.67 | 5.75 | 6.14 | 125 | 50% (one channel) | -- | Y | N | N |
| | Doris Crown Pillar | 20-DCPR-01 | 6/11/2020 | Surface seep on top of backfilled area, downstream of access road. Some snow banks on outcrop ~25m upstream of seep, no visible flow from snow. Crush rock, some fines, grey colour, light brown fines easily disturbed in area. Steady flow from two small seeps sample and flow measurements collected where 2 small seeps combine into one crush quarry rock on surface. No flow observed downstream from seep (see photo with culvert showing toe outside backfill). Pooling water but from snow bank at tow, no flow from pool. | 7.90 | 323 | 176 | 6.8 | Clear | None | 8.00 (100%) | 7.00 (90%) | 7.00 (90%) | 125 | 1 | -- | Y | N | N |
| | | 20-DCPR-02 | 6/11/2020 | No snow cover at seep location but large snow bank upstream of sample location. Vegetation present, grasses, dead leaves, no rocks (tundra). Snow bank ~5 m upstream. Some dust on surface of tundra surrounding area. Downstream of backfilled crown pillar. Flow emanating from snow bank. Flow measurements collected at small channel. | 7.58 | 58.7 | 148 | 6.5 | Clear | None | 2.60 | 2.60 | 2.07 | 125 | 1 | -- | Y | N | N |

| Region | Area | Sample ID | Date | Description of Location | Field Measurements | | | | | | | | | | | | Lab sample collected | Duplicate | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | Conductivity | ORP | Water Temperature | Water Colour | Turbidity | t1[1] | t2 | t3 | Amount | Capture | Flow | | | |
| | | | | | pH units | µS/cm | mV | ºC | | | sec | sec | sec | mL | % | L/s | | | |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | 6/11/2020 | Steady flow from ROW toe road, dust prevalent in area and at seep location. Fine sediments on ground easily disturbed. Evidence of dried overburden on surface/edge of road; light brown sediment; blast mat located on road above sample location; fine sediments on bottom and in flow. Very difficult to filter dissolved metals. Silt fence located downstream of flow. | 7.75 | 529 | 187 | 4.1 | Cloudy | Yes | 2.73 | 3.33 | 3.27 | 125 | 100 | -- | Y | N | N |
| | | 20-NEAR-02 | 6/11/2020 | Seep emanating from toe of ROQ road, 2m west of culvert clear steady flow; some vegetation (grasses) in seep; some dust cover in the area; light brown sediment. | 7.47 | 252 | 177 | 5.8 | Clear | Slight | 2.95 | 2.54 | 3.06 | 125 | 75 | -- | Y | Y | N |
| | | 20-NEAR-03 | 6/11/2020 | Wide seep at toe of ROQ road; dust deposition on surrounding grasses, some grasses at seep location submerged in flow; some light brown sediment on ground; wide seep, multiple flow paths, unable to measure flow, observed by grass. | 7.42 | 580 | 191 | 6.2 | Yellow | Slight | Unable to measure flow - too shallow | | | | | | Y | N | Y |
| | | 20-NEAR-04 | 6/11/2020 | Upstream flow of NEAR-01 and NEAR-02 on north side of access road, flow from tundra, vegetation present (grasses); some small rocks (crush) at base of seep; goose feces in water in vicinity of sample. | 7.14 | 119.8 | 184 | 13.4 | Clear | None | 2.07 | 2.27 | 2.33 | 125 | 75 | -- | Y | N | N |
| | Overburden Stockpile | 20-OVB-01 | 7/2/2020 | Flowing along SW edge of the Madrid Naartok OVB Pile, flowing through OVB sediment within sample. Sediment colour was brown; dissolved Hg filtered; dissolved metals unfiltered. | 6.82 | OR | 216 | 3.3 | Brown | Yes | 5.75 | 5.75 | 5.59 | 125 | 70 | -- | Y | N | N |
| | | 20-OVB-02 | 7/3/2020 | Flow from base of the OVB road, between OVB road and Windy Rd. Flow is through medium to large clast rocks. Flows into pool against Windy Rd. Reddish bacteria staining on tundra downstream of sample. Evidence of seeps to west, but none active at time of survey. | 7.03 | OR | 225 | 3.8 | Slight brown/clear | Slightly turbid | Unable to measure flow | | | | | | Y | N | N |
| | | 20-OVB-03 | 7/27/2020 | Seep emanating from toe of coffer dam at base of OVB pile around large boulders; steady flow roughly 1/2m wide area of toe; flow around large boulders. | 6.90 | OR | 86 | 7.8 | Rusty | -- | Steady flow roughly ~1/2m wide area of toe | | | | | | Y | N | N |
| | | 20-OVB-03 | 8/15/2020 | Previously identified seep; actively flowing from toe of OB berm; forms large pool at base of OB berm; flows towards Windy Rd to south; Red staining/precipitate at north toe of Windy Rd in several areas; iron bacteria present; dead vegetation in surrounding area (grasses/willows). | 6.82 | OR | 69 | 1.7 | Yellowish | -- | -- | -- | -- | -- | -- | -- | Y | N | N |
| | | 20-OVB-03A | 7/3/2020 | Approx 20m east of 20-OVB-02 along toe of the OVB roadway. Light flow through small-large clast material. Some fines present in sample. Bacterial staining and matting present in area. | 7.07 | OR | 82 | 4.8 | Clear/light brown | Some turbidity | 13.99 | 11.16 | 15.90 | 250 | 45 | -- | Y | N | N |
| | | 20-NUN-01 | 7/2/2020 | Draining from road into large pond south of oOVB pile. Pond has red staining along banks. Flow through large boulders at base of Windy road. | 7.08 | OR | 188 | 0.4 | Clear | None | Unable to measure flow | | | | | | Y | N | N |
| | Portal pad | 20-MAD-01 | 7/2/2020 | Sample collected from base of raodway leading to main Madrid portal pad. Flows though large boulders and road crush. Approx. 2 m from culvert. | 5.95 | OR | 136 | 5.4 | Clear/light brown | None | Unable to determine flow | | | | | | Y | N | N |
| | | 20-MAD-02 | 7/27/2020 | Emanating from base of access road to portal laydown; dead vegetation downstream of seep; small pools of water on tundra downstream of location. Very low flow volume; Flow hard to discern - potentially standing water at this point. | 5.31 | OR | 114 | 10.3 | Clear | None | Very low flow volume - flow hard to discern - potentially standing water at this point | | | | | | Y | N | N |
| | | 20-MAD-02 | 8/15/2020 | Seep previously identified from toe of road leading to portal laydown. Flow present. | 5.55 | OR | 141 | 7.8 | -- | -- | -- | -- | -- | -- | -- | -- | Y | N | N |

| Region | Area | Sample ID | Date | Description of Location | Field Measurements | | | | | | | | | | | | Lab sample collected | Duplicate | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | Conductivity | ORP | Water Temperature | Water Colour | Turbidity | t1[1] | t2 | t3 | Amount | Capture | Flow | | | |
| | | | | | pH units | µS/cm | mV | ºC | | | sec | sec | sec | mL | % | L/s | | | |
| | Seepage, WRSA | 20-MWAR-01 | 6/14/2020 | Very small seep from toe of access ramp to Sump 1 on east side of ramp. ROQ and large boulders, some dust in the vicinity. Flow too low to measure. Some foam on surface of water. Gravel substrate and vegetation in seep location. Very shallow, difficult not to stir up sediments with suction of syringe some fine particles/debris in poly/amber glass bottles. | 7.95 | 1867 | 200 | 5.1 | Clear | None | Too shallow to measure | | | | | | Y | N | N |
| | Sump 1, WRSA | MMS1-S1 | 6/11/2020 | -- | 7.90 | 782 | 204 | 5.2 | -- | -- | -- | -- | -- | -- | -- | -- | Y | N | N |
| | | MMS1-S1 | 9/2/2020 | -- | 6.74 | 5170 | 140 | 4.7 | -- | -- | 4.70 | -- | -- | -- | -- | -- | Y | N | N |
| | Sump 2, WRSA | MMS1-S2 | 6/11/2020 | -- | 7.61 | 194.7 | 185 | 4.1 | Tea colour with trace organics | -- | -- | -- | -- | -- | -- | -- | Y | N | N |
| | | MMS1-S2 | 9/2/2020 | -- | 7.25 | 749 | 67 | 3.5 | -- | -- | 3.50 | -- | -- | -- | -- | -- | Y | N | N |
| | Sump 3, WRSA | MMS1-S3 | 6/11/2020 | -- | 8.27 | 699 | 194 | 5.8 | -- | -- | -- | -- | -- | -- | -- | -- | Y | N | N |
| | Madrid Waste Rock Contact Water Pond | MMS1 | 6/8/2020 | -- | 8.33 | 202 | 130 | 7.3 | -- | -- | -- | -- | -- | -- | -- | -- | Y | N | N |
| | | MMS1-INSIDE | 6/14/2020 | -- | 7.84 | 951 | 186 | 10.3 | -- | -- | 4.19 | 4.27 | 5.47 | -- | -- | -- | Y | N | N |
| | | MMS1 | 7/6/2020 | -- | 8.12 | 1060 | 129 | 12.8 | -- | -- | -- | -- | -- | -- | -- | -- | Y | N | N |
| | | MMS1-N | 9/2/2020 | -- | 7.92 | 6080 | 142 | 5.5 | -- | -- | 5.50 | -- | -- | -- | -- | -- | Y | N | N |
| | | MMS1-S | 9/2/2020 | -- | 7.97 | 1531 | 128 | 5.5 | -- | -- | 5.50 | -- | -- | -- | -- | -- | Y | N | N |
| | | MMS1-OUTSIDE | 6/14/2020 | EPH Seep at Boat Ramp. DS seep check GPS for location. | 7.50 | 1683 | 207 | 4.9 | -- | -- | 2.94 (100%) | 2.72 (95%) | 2.87 (90%) | 125 | -- | -- | Y | N | N |

Notes: 1) Percentage indicates approximate fill level of collection bottle when not completely filled.

# Attachment 3 2020 Laboratory Water Quality Data

| Region | Area | Sample ID | Lab pH | Lab EC | ORP | Total Hardness | TSS | TDS | Acidity | Total Alkalinity | Ammonia | Cl | F | NO3 | NO2 | Total P | SO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | s.u. | µS/cm | mV | mg CaCO3/L | mg/L | mg/L | mg CaCO3/L | mg CaCO3/L | mg N/L | mg/L | mg/L | mg /L | mg/L | mg/L | mg/L |
| Doris | Reference (Windy Road) | 20-REF-01A | 7.11 | 44.4 | 153 | 18.6 | *3* | 60 | 3.5 | 14.7 | 0.0088 | 3.18 | 0.061 | *0.005* | *0.001* | 0.008 | *0.3* |
| | | 20-REF-02 | 7.77 | 151 | 191 | 57.1 | *3* | 117 | 2.8 | 52.3 | 0.0133 | 14.6 | 0.06 | *0.005* | *0.001* | 0.004 | 0.8 |
| | | 20-REF-03 | 7.42 | 83.9 | 171 | 28.7 | *3* | 61 | 2.2 | 31.9 | *0.005* | 7.1 | *0.02* | *0.005* | *0.001* | 0.0036 | 1.97 |
| | Doris WR Influenced Area | 20-DC-01 | 7.92 | 1750 | 200 | 329 | 6.2 | 1070 | 3 | 68.2 | 0.958 | 417 | *0.2* | 3.87 | 0.178 | 0.0454 | 147 |
| | | 20-DC-02 | 7.92 | 1520 | 170 | 302 | 6.2 | 890 | 3 | 75.3 | 1.06 | 319 | *0.1* | 4.2 | 0.268 | 0.0593 | 160 |
| | | 20-DC-03 | 7.76 | 1340 | 185 | 296 | 7.8 | 820 | 3 | 81.3 | 1.26 | 259 | *0.1* | 4.62 | 0.281 | 0.0637 | 174 |
| | | 20-DC-04 | 7.63 | 11400 | 242 | 3670 | 9.8 | 10600 | 24.5 | 86.6 | 58.4 | 3360 | *1* | 198 | 0.814 | 0.0105 | 218 |
| | | 20-DC-05 | 7.6 | 14200 | 231 | 4930 | *3* | 9950 | 29.4 | 84.8 | 79.8 | 4370 | *1* | 255 | 0.969 | 0.01 | 231 |
| | | 20-DC-06 | 7.48 | 22400 | 231 | 8060 | 9.4 | 16000 | 48 | 84 | 131 | 7380 | *2* | 426 | 1.35 | 0.0138 | 269 |
| | Doris Crown Pillar | 20-DCPR-01 | 7.64 | 308 | 176 | 124 | 42.8 | 218 | 2.1 | 55.9 | 0.109 | 10.9 | 0.033 | 1.61 | 0.0047 | 0.0488 | 76.4 |
| | | 20-DCPR-02 | 7.08 | 58.6 | 148 | 19.1 | *3* | 43 | *2* | 22.9 | *0.005* | 4.62 | *0.02* | 0.0215 | 0.0013 | 0.0163 | 1.74 |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | 7.59 | 507 | 187 | 105 | 103 | 331 | 3.2 | 74.7 | 0.345 | 93.2 | 0.081 | 0.54 | 0.0187 | 0.142 | 31 |
| | | 20-NEAR-02 | 7.59 | 259 | 177 | 84.7 | 5.8 | 171 | 2.5 | 74.6 | 0.116 | 31.7 | 0.043 | 0.226 | 0.0143 | 0.0496 | 7.94 |
| | | 20-NEAR-03 | 7.81 | 545 | 191 | 161 | 10.8 | 358 | 2.8 | 114 | 0.186 | 91 | 0.082 | 0.343 | 0.014 | 0.0643 | 24 |
| | | 20-NEAR-04 | 7.27 | 120 | 184 | 44.9 | *3* | 100 | 2.3 | 40.6 | 0.0079 | 12 | 0.054 | *0.005* | *0.001* | 0.0165 | 2.34 |
| | Overburden Stockpile | 20-OVB-01 | 7.34 | 31300 | 216 | 5440 | 384 | 25400 | 19.6 | 158 | 8.76 | 12000 | *2* | 1.65 | 0.41 | 0.465 | 1920 |
| | | 20-OVB-02 | 7.18 | 81000 | 225 | 15700 | 37.8 | 66800 | 65.5 | 224 | 22.8 | 30900 | *2* | 24.1 | 0.2 | 0.156 | 4000 |
| | | 20-OVB-03 | 6.81 | 62800 | 86 | 10800 | 63.8 | 58000 | 63 | 268 | 23.9 | 23700 | *2* | 12.4 | 0.57 | 0.107 | 2910 |
| | | 20-OVB-03 | 7.69 | 55100 | 69 | 8010 | 38 | 35300 | 41 | 322 | 18.2 | 18200 | -- | *0.5* | *0.1* | -- | 2040 |
| | | 20-OVB-03A | 7.2 | 37000 | 82 | 5660 | 63.4 | 27000 | 41.6 | 287 | 12.4 | 13900 | *2* | 1.68 | 0.1 | 0.102 | 1590 |
| | | 20-NUN-01 | 7.32 | 44400 | 188 | 7760 | 9.9 | 38100 | 35.2 | 180 | 15.2 | 18400 | *2* | 5.32 | *0.1* | 0.104 | 2300 |
| | Portal pad | 20-MAD-01 | 6.58 | 40100 | 136 | 23600 | 23.5 | 35200 | 79.9 | 85.1 | 97.8 | 17500 | *2* | 110 | 2.52 | 0.124 | 68 |
| | | 20-MAD-02 | 4.87 | 68200 | 114 | 45100 | 30.8 | 68200 | 1040 | 2.5 | 152 | 30800 | *2* | 202 | *0.1* | 0.077 | 120 |
| | | 20-MAD-02 | 5.55 | 34600 | 141 | 17800 | 18 | 22100 | 296 | 5.1 | 63.2 | 9680 | -- | 61.7 | *0.1* | -- | 69 |
| | Seepage, WRSA | 20-MWAR-01 | 7.91 | 1790 | 200 | 292 | 67.4 | 1130 | 2.7 | 112 | 2.2 | 413 | *0.2* | 15 | 0.131 | 0.204 | 97.5 |
| | Sump 1, WRSA | MMS1-S1 | 7.87 | 755 | 204 | 100 | 36.6 | -- | -- | 92.9 | 0.64 | 136 | 0.11 | 5.92 | 0.049 | -- | 46.5 |
| | | MMS1-S1 | 7.21 | 3040 | 140 | 1110 | 12 | -- | -- | 179 | 0.704 | 800 | *0.4* | 12 | 0.696 | -- | 102 |
| | Sump 2, WRSA | MMS1-S2 | 7.56 | 190 | 185 | 79.9 | 36.2 | -- | -- | 72.7 | 0.0403 | 15.7 | 0.22 | 0.0213 | 0.0021 | -- | 3.48 |
| | | MMS1-S2 | 7.89 | 1270 | 67 | 255 | 32.8 | -- | -- | 74 | 0.379 | 67.3 | 0.195 | 0.0827 | 0.0052 | -- | 14.3 |
| | Sump 3, WRSA | MMS1-S3 | 7.84 | 587 | 194 | 79 | 32.2 | -- | -- | 86 | 0.665 | 103 | 0.187 | 1.53 | 0.04 | -- | 39.3 |
| | Madrid Waste Rock Contact Water Pond | MMS1 | 7.94 | 204 | 130 | 56.1 | 15.4 | -- | -- | 50.2 | 0.148 | 20.2 | 0.023 | 0.708 | 0.0107 | -- | 13.4 |
| | | MMS1-INSIDE | 7.81 | 961 | 186 | 200 | 26.1 | -- | -- | 79 | 0.453 | 184 | *0.1* | 2.51 | 0.0703 | -- | 79.9 |
| | | MMS1 | 8.09 | 1060 | 129 | 296 | *3* | -- | -- | 126 | 0.0156 | 183 | *0.1* | 2.7 | 0.0398 | -- | 110 |
| | | MMS1-N | 8.07 | 3830 | 142 | 877 | 11.2 | -- | -- | 183 | 0.682 | 988 | *0.4* | 0.37 | *0.02* | -- | 264 |
| | | MMS1-S | 7.55 | 646 | 128 | 253 | 8.4 | -- | -- | 215 | 0.138 | 276 | *0.1* | 0.684 | 0.007 | -- | 115 |
| | | MMS1-OUTSIDE | 7.59 | 1620 | 207 | 338 | *3* | -- | -- | 106 | 0.837 | 357 | *0.1* | 4.71 | 0.185 | -- | 157 |

| Region | Area | Sample ID | Al | Sb | As | Ba | Be | Bi | B | Cd | Ca | Cs | Cr | Co | Cu | Fe | Pb | Li |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Doris | Reference (Windy Road) | 20-REF-01A | 0.0803 | *0.0001* | 0.00018 | 0.00223 | *0.00002* | *0.00005* | *0.01* | *0.000005* | 3.35 | -- | 0.00073 | *0.0001* | 0.00204 | 0.117 | *0.00005* | 0.0032 |
| | | 20-REF-02 | 0.0210 | *0.0001* | 0.00026 | 0.00295 | *0.00002* | *0.00005* | *0.01* | *0.000005* | 14.6 | -- | 0.00043 | *0.0001* | 0.00169 | 0.060 | *0.00005* | 0.0022 |
| | | 20-REF-03 | 0.0141 | *0.0001* | *0.0001* | 0.00229 | *0.00002* | *0.00005* | *0.01* | *0.000005* | 8.24 | -- | 0.00018 | *0.0001* | 0.00119 | 0.037 | *0.00005* | *0.001* |
| | Doris WR Influenced Area | 20-DC-01 | 0.0162 | 0.00047 | 0.00246 | 0.0171 | *0.00002* | *0.00005* | 0.152 | 0.0000211 | 78.4 | -- | 0.00050 | 0.00146 | 0.0333 | 0.115 | *0.00005* | 0.0060 |
| | | 20-DC-02 | 0.0096 | 0.00052 | 0.00258 | 0.0140 | *0.00002* | *0.00005* | 0.159 | 0.0000182 | 75.6 | -- | 0.00052 | 0.00177 | 0.0437 | 0.140 | *0.00005* | 0.0064 |
| | | 20-DC-03 | 0.0103 | 0.00055 | 0.00288 | 0.0132 | *0.00002* | *0.00005* | 0.179 | 0.0000177 | 76.3 | -- | 0.00062 | 0.00207 | 0.0560 | 0.158 | *0.00005* | 0.0062 |
| | | 20-DC-04 | 0.0104 | 0.00051 | 0.00239 | 0.191 | *0.0001* | *0.00025* | 0.217 | 0.00295 | 1170 | -- | 0.00080 | 0.00768 | 0.0141 | *0.05* | *0.00025* | 0.0143 |
| | | 20-DC-05 | 0.0126 | 0.00052 | 0.00248 | 0.246 | *0.0001* | *0.00025* | 0.221 | 0.00423 | 1580 | -- | 0.00096 | 0.0106 | 0.0190 | *0.05* | *0.00025* | 0.0161 |
| | | 20-DC-06 | 0.016 | *0.001* | 0.0023 | 0.381 | *0.0002* | *0.0005* | 0.24 | 0.00741 | 2590 | -- | 0.0013 | 0.0173 | 0.0290 | *0.1* | *0.0005* | 0.022 |
| | Doris Crown Pillar | 20-DCPR-01 | 0.0297 | 0.00013 | 0.00063 | 0.00257 | *0.00002* | *0.00005* | 0.029 | *0.000005* | 30.4 | -- | 0.00019 | 0.00013 | 0.00126 | *0.01* | *0.00005* | 0.0012 |
| | | 20-DCPR-02 | 0.0191 | *0.0001* | 0.00052 | 0.00076 | *0.00002* | *0.00005* | *0.01* | 0.0000064 | 5.12 | -- | *0.0001* | *0.0001* | 0.00196 | 0.022 | *0.00005* | *0.001* |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | 0.0449 | 0.00011 | 0.00255 | 0.00756 | *0.00002* | *0.00005* | 0.044 | 0.0000108 | 23.5 | -- | 0.00030 | 0.00050 | 0.00404 | 0.047 | 0.000061 | 0.0035 |
| | | 20-NEAR-02 | 0.0434 | *0.0001* | 0.00137 | 0.0111 | *0.00002* | *0.00005* | 0.025 | 0.0000161 | 26.0 | -- | 0.00040 | 0.00118 | 0.00385 | 0.082 | 0.000051 | 0.0042 |
| | | 20-NEAR-03 | 0.0313 | *0.0001* | 0.00106 | 0.0155 | *0.00002* | *0.00005* | 0.044 | 0.0000084 | 43.4 | -- | 0.00046 | 0.00090 | 0.00286 | 0.102 | *0.00005* | 0.0086 |
| | | 20-NEAR-04 | 0.0271 | *0.0001* | 0.00060 | 0.00668 | *0.00002* | *0.00005* | 0.022 | 0.0000150 | 13.3 | -- | 0.00035 | *0.0001* | 0.00313 | 0.034 | *0.00005* | 0.0041 |
| | Overburden Stockpile | 20-OVB-01 | *0.02* | *0.002* | 0.0022 | 0.203 | *0.0004* | *0.001* | 0.86 | 0.00112 | 605 | -- | *0.002* | 0.0037 | 0.0067 | *0.2* | *0.001* | 0.039 |
| | | 20-OVB-02 | *0.05* | *0.005* | *0.005* | 0.193 | *0.001* | *0.0025* | 1.17 | 0.00343 | 1500 | -- | *0.005* | 0.0850 | 0.012 | *0.5* | *0.0025* | 0.061 |
| | | 20-OVB-03 | *0.05* | *0.005* | *0.005* | 0.197 | *0.001* | *0.0025* | 2.06 | 0.00203 | 1040 | -- | *0.005* | 0.0333 | *0.01* | 15.3 | *0.0025* | *0.05* |
| | | 20-OVB-03 | *0.05* | *0.005* | *0.005* | 0.15 | *0.005* | *0.0025* | 1.82 | 0.00027 | 661 | -- | *0.005* | 0.0215 | *0.01* | 8.36 | *0.0025* | 0.051 |
| | | 20-OVB-03A | *0.02* | *0.002* | *0.002* | 0.153 | *0.0004* | *0.001* | 1.45 | 0.00029 | 447 | -- | *0.002* | 0.0165 | *0.004* | 0.26 | *0.001* | 0.058 |
| | | 20-NUN-01 | *0.05* | *0.005* | *0.005* | 0.314 | *0.001* | *0.0025* | 0.78 | 0.00091 | 836 | -- | *0.005* | 0.0962 | 0.019 | *0.5* | *0.0025* | *0.05* |
| | Portal pad | 20-MAD-01 | 0.058 | *0.005* | *0.005* | 3.37 | *0.001* | *0.0025* | *0.5* | 0.00324 | 9120 | -- | *0.005* | 0.137 | *0.01* | *0.5* | *0.0025* | 0.141 |
| | | 20-MAD-02 | 0.258 | *0.005* | *0.005* | 5.67 | *0.001* | *0.0025* | 0.50 | 0.00301 | 17300 | -- | *0.005* | 0.526 | 0.013 | 487 | *0.0025* | 0.202 |
| | | 20-MAD-02 | 0.099 | *0.002* | *0.002* | 2.78 | *0.002* | *0.001* | 0.46 | 0.00246 | 6680 | -- | *0.002* | 0.265 | 0.004 | 161 | *0.001* | 0.107 |
| | Seepage, WRSA | 20-MWAR-01 | 0.0327 | 0.00081 | 0.0136 | 0.0127 | 0.00002 | 0.00005 | 0.186 | 0.00002 | 69.1 | -- | 0.00016 | 0.00133 | 0.00173 | 0.02 | 0.00005 | 0.0025 |
| | Sump 1, WRSA | MMS1-S1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-S1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 2, WRSA | MMS1-S2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-S2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 3, WRSA | MMS1-S3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Madrid Waste Rock Contact Water Pond | MMS1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-INSIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-N | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-S | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-OUTSIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| Region | Area | Sample ID | Dissolved Metals | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mg | Mn | Hg | Mo | Ni | P | K | Rb | Se | Si | Ag | Na | Sr | S | Te | Tl |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Doris | Reference (Windy Road) | 20-REF-01A | 2.48 | 0.00023 | *0.000005* | 0.000133 | 0.00288 | *0.05* | 0.72 | -- | *0.00005* | 1.79 | *0.00001* | 2.58 | 0.00945 | *0.5* | -- | *0.00001* |
| | | 20-REF-02 | 5.03 | 0.00031 | *0.000005* | 0.000119 | 0.00241 | *0.05* | 1.00 | -- | *0.00005* | 3.16 | *0.00001* | 8.28 | 0.0621 | 0.54 | -- | *0.00001* |
| | | 20-REF-03 | 1.97 | 0.00175 | *0.000005* | *0.00005* | *0.0005* | *0.05* | 0.46 | -- | *0.00005* | 0.950 | *0.00001* | 5.68 | 0.0165 | 0.82 | -- | *0.00001* |
| | Doris WR Influenced Area | 20-DC-01 | 32.4 | 0.0953 | *0.000005* | 0.00391 | 0.00152 | *0.05* | 10.6 | -- | 0.000992 | 1.45 | 0.000379 | 216 | 0.293 | 50.4 | -- | *0.00001* |
| | | 20-DC-02 | 27.5 | 0.0836 | *0.000005* | 0.00416 | 0.00187 | 0.050 | 10.2 | -- | 0.00104 | 1.63 | 0.000570 | 173 | 0.268 | 53.7 | -- | *0.00001* |
| | | 20-DC-03 | 25.5 | 0.0850 | *0.000005* | 0.00473 | 0.00250 | *0.05* | 11.0 | -- | 0.00144 | 1.81 | 0.000691 | 153 | 0.279 | 64.7 | -- | *0.00001* |
| | | 20-DC-04 | 181 | 2.06 | *0.000005* | 0.00713 | 0.0103 | *0.25* | 60.0 | -- | 0.00430 | 2.45 | 0.000218 | 864 | 3.44 | 83.8 | -- | 0.000193 |
| | | 20-DC-05 | 241 | 3.01 | *0.000005* | 0.00707 | 0.0139 | *0.25* | 78.5 | -- | 0.00546 | 2.43 | 0.000383 | 1150 | 4.65 | 89.5 | -- | 0.000252 |
| | | 20-DC-06 | 383 | 4.93 | *0.000005* | 0.00740 | 0.0227 | *0.5* | 123 | -- | 0.00829 | 2.63 | 0.00075 | 1850 | 7.63 | 106 | -- | 0.00042 |
| | Doris Crown Pillar | 20-DCPR-01 | 11.7 | 0.0279 | *0.000005* | 0.000617 | *0.0005* | *0.05* | 2.23 | -- | 0.000393 | 0.437 | *0.00001* | 12.5 | 0.0500 | 25.5 | -- | *0.00001* |
| | | 20-DCPR-02 | 1.55 | 0.00060 | *0.000005* | 0.000097 | *0.0005* | *0.05* | 0.92 | -- | *0.00005* | 0.238 | *0.00001* | 3.49 | 0.0210 | *0.5* | -- | *0.00001* |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | 11.4 | 0.178 | *0.000005* | 0.000939 | 0.00270 | *0.05* | 4.54 | -- | 0.000210 | 1.86 | *0.00001* | 55.2 | 0.103 | 10.2 | -- | *0.00001* |
| | | 20-NEAR-02 | 4.81 | 0.709 | *0.000005* | 0.000585 | 0.00364 | *0.05* | 3.47 | -- | 0.000051 | 1.74 | 0.000014 | 17.1 | 0.0940 | 2.81 | -- | *0.00001* |
| | | 20-NEAR-03 | 12.8 | 0.341 | *0.000005* | 0.000778 | 0.00244 | *0.05* | 4.61 | -- | 0.000133 | 3.11 | *0.00001* | 44.3 | 0.213 | 7.84 | -- | *0.00001* |
| | | 20-NEAR-04 | 2.84 | 0.00099 | *0.000005* | 0.000266 | 0.00189 | *0.05* | 1.91 | -- | *0.00005* | 1.80 | 0.000017 | 5.95 | 0.0649 | 0.81 | -- | *0.00001* |
| | Overburden Stockpile | 20-OVB-01 | 955 | 1.42 | *0.000005* | 0.0044 | *0.01* | *1* | 199 | -- | 0.0010 | 2.8 | *0.0002* | 6160 | 5.20 | 700 | -- | *0.0002* |
| | | 20-OVB-02 | 2910 | 6.08 | *0.000005* | 0.0064 | 0.057 | *2.5* | 592 | -- | 0.0037 | 3.3 | *0.0005* | 18700 | 11.7 | 1870 | -- | *0.0005* |
| | | 20-OVB-03 | 1980 | 4.82 | *0.000005* | 0.0282 | 0.086 | *2.5* | 448 | -- | 0.0027 | 3.1 | *0.0005* | 13600 | 11.4 | 1280 | -- | *0.0005* |
| | | 20-OVB-03 | 1550 | 4.84 | *0.000005* | 0.0181 | *0.025* | *2.5* | 333 | 0.065 | *0.0025* | 3.8 | *0.0005* | 10700 | 7.6 | 803 | *0.01* | *0.0005* |
| | | 20-OVB-03A | 1100 | 5.44 | *0.000005* | 0.0110 | 0.019 | *1* | 257 | -- | *0.001* | 3.8 | *0.0002* | 7340 | 5.14 | 604 | -- | *0.0002* |
| | | 20-NUN-01 | 1380 | 11.3 | *0.000005* | 0.0056 | 0.046 | *2.5* | 278 | -- | *0.0025* | 3.0 | *0.0005* | 9070 | 6.92 | 764 | -- | *0.0005* |
| | Portal pad | 20-MAD-01 | 206 | 21.7 | 0.0000124 | *0.0025* | 0.058 | *2.5* | 169 | -- | 0.0040 | 4.5 | *0.0005* | 513 | 9.79 | 29 | -- | *0.0005* |
| | | 20-MAD-02 | 460 | 36.4 | 0.0000137 | *0.0025* | 0.243 | *2.5* | 315 | -- | 0.0059 | 4.3 | *0.0005* | 1650 | 19.0 | 55 | -- | *0.0005* |
| | | 20-MAD-02 | 279 | 24.1 | 0.0000096 | *0.001* | 0.116 | *1* | 126 | 0.0652 | 0.0031 | 5 | *0.0002* | 612 | 8.01 | 39 | *0.004* | *0.0002* |
| | Seepage, WRSA | 20-MWAR-01 | 29 | 0.0259 | 0.000005 | 0.00432 | 0.0118 | 0.05 | 13.1 | -- | 0.00226 | 0.874 | 0.00001 | 245 | 0.238 | 37.8 | -- | 0.000012 |
| | Sump 1, WRSA | MMS1-S1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-S1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 2, WRSA | MMS1-S2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-S2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 3, WRSA | MMS1-S3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Madrid Waste Rock Contact Water Pond | MMS1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-INSIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-N | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-S | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | MMS1-OUTSIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| Region | Area | Sample ID | Th | Sn | Ti | W | U | V | Zn | Zr | Al | Sb | As | Ba | Be | Bi | B | Cd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Doris | Reference (Windy Road) | 20-REF-01A | -- | 0.00022 | 0.00070 | -- | 0.000016 | *0.0005* | 0.0029 | 0.00052 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-REF-02 | -- | *0.0001* | 0.00047 | -- | 0.000014 | *0.0005* | 0.0020 | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-REF-03 | -- | 0.00011 | *0.0003* | -- | *0.00001* | *0.0005* | *0.001* | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | Doris WR Influenced Area | 20-DC-01 | -- | 0.00013 | 0.00037 | -- | 0.000672 | 0.00131 | 0.0011 | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-02 | -- | 0.00015 | *0.0003* | -- | 0.000694 | 0.00141 | *0.001* | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-03 | -- | 0.00017 | *0.0003* | -- | 0.000741 | 0.00149 | *0.001* | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-04 | -- | *0.0005* | *0.0015* | -- | 0.00274 | *0.0025* | 0.0105 | *0.001* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-05 | -- | *0.0005* | *0.0015* | -- | 0.00305 | *0.0025* | 0.0142 | *0.001* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-06 | -- | *0.001* | *0.003* | -- | 0.00469 | *0.005* | 0.024 | *0.002* | -- | -- | -- | -- | -- | -- | -- | -- |
| | Doris Crown Pillar | 20-DCPR-01 | -- | *0.0001* | *0.0003* | -- | 0.000115 | *0.0005* | *0.001* | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DCPR-02 | -- | *0.0001* | 0.00036 | -- | *0.00001* | *0.0005* | *0.001* | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | -- | *0.0001* | 0.00134 | -- | 0.000260 | 0.00054 | 0.0016 | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-02 | -- | *0.0001* | 0.00114 | -- | 0.000059 | *0.0005* | *0.001* | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-03 | -- | *0.0001* | 0.00109 | -- | 0.000077 | *0.0005* | 0.0015 | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-04 | -- | 0.00018 | 0.00052 | -- | 0.000014 | *0.0005* | 0.0021 | *0.0003* | -- | -- | -- | -- | -- | -- | -- | -- |
| | Overburden Stockpile | 20-OVB-01 | -- | *0.002* | *0.006* | -- | 0.0161 | *0.01* | *0.02* | *0.004* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-02 | -- | *0.005* | *0.015* | -- | 0.0292 | *0.025* | *0.05* | *0.01* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-03 | -- | *0.005* | *0.015* | -- | 0.0467 | *0.025* | *0.05* | *0.01* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-03 | *0.005* | *0.005* | *0.015* | *0.005* | 0.0333 | *0.025* | *0.05* | *0.01* | *0.15* | *0.005* | *0.005* | 0.144 | *0.005* | *0.0025* | 1.62 | 0.00030 |
| | | 20-OVB-03A | -- | *0.002* | *0.006* | -- | 0.0206 | *0.01* | *0.02* | *0.004* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NUN-01 | -- | *0.005* | *0.015* | -- | 0.00931 | *0.025* | *0.05* | *0.01* | -- | -- | -- | -- | -- | -- | -- | -- |
| | Portal pad | 20-MAD-01 | -- | *0.005* | *0.015* | -- | *0.0005* | *0.025* | 0.334 | *0.01* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-MAD-02 | -- | *0.005* | *0.015* | -- | *0.0005* | *0.025* | 0.261 | *0.01* | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-MAD-02 | *0.002* | *0.002* | *0.006* | *0.002* | *0.0002* | *0.01* | 0.25 | *0.004* | 0.136 | *0.002* | *0.002* | 2.56 | *0.002* | *0.001* | 0.44 | 0.00221 |
| | Seepage, WRSA | 20-MWAR-01 | -- | 0.0001 | 0.0003 | -- | 0.000625 | 0.0005 | 0.001 | 0.0003 | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 1, WRSA | MMS1-S1 | -- | -- | -- | -- | -- | -- | -- | -- | 2.11 | 0.00082 | 0.0089 | *0.02* | *0.0001* | -- | 0.14 | 0.0000169 |
| | | MMS1-S1 | -- | -- | -- | -- | -- | -- | -- | -- | 0.657 | 0.00024 | 0.00177 | 0.0655 | *0.0002* | *0.0001* | 0.059 | 0.00044 |
| | Sump 2, WRSA | MMS1-S2 | -- | -- | -- | -- | -- | -- | -- | -- | 1.5 | *0.0005* | 0.00262 | *0.02* | *0.0001* | -- | *0.1* | 0.000022 |
| | | MMS1-S2 | -- | -- | -- | -- | -- | -- | -- | -- | 3.26 | 0.00034 | 0.00612 | 0.0377 | 0.0001 | *0.00005* | 0.061 | 0.0000177 |
| | Sump 3, WRSA | MMS1-S3 | -- | -- | -- | -- | -- | -- | -- | -- | 2.35 | 0.00092 | 0.00843 | *0.02* | *0.0001* | -- | 0.15 | 0.0000262 |
| | Madrid Waste Rock Contact Water Pond | MMS1 | -- | -- | -- | -- | -- | -- | -- | -- | 1.31 | *0.0005* | 0.011 | *0.02* | *0.0001* | -- | *0.1* | 0.0000114 |
| | | MMS1-INSIDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.35 | 0.00034 | 0.0175 | 0.0278 | *0.0001* | *0.00005* | 0.066 | 0.0000172 |
| | | MMS1 | -- | -- | -- | -- | -- | -- | -- | -- | 0.106 | 0.00052 | 0.0215 | 0.0178 | *0.0001* | *0.00005* | 0.101 | 0.0000091 |
| | | MMS1-N | -- | -- | -- | -- | -- | -- | -- | -- | 0.401 | 0.00027 | 0.0103 | 0.0751 | *0.0002* | *0.0001* | 0.08 | 0.000034 |
| | | MMS1-S | -- | -- | -- | -- | -- | -- | -- | -- | 0.899 | 0.00015 | 0.0158 | 0.0231 | *0.0001* | *0.00005* | 0.034 | 0.0000657 |
| | | MMS1-OUTSIDE | -- | -- | -- | -- | -- | -- | -- | -- | 0.171 | 0.0004 | 0.00848 | 0.0305 | *0.0001* | *0.00005* | 0.068 | 0.000016 |

| Region | Area | Sample ID | Total Metals | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ca | Cs | Cr | Co | Cu | Fe | Pb | Li | Mg | Mn | Hg | Mo | Ni | K | Rb | Se |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Doris | Reference (Windy Road) | 20-REF-01A | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-REF-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-REF-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Doris WR Influenced Area | 20-DC-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Doris Crown Pillar | 20-DCPR-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DCPR-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Overburden Stockpile | 20-OVB-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-03 | 592 | *0.0005* | *0.005* | 0.0213 | *0.025* | 8.83 | *0.0025* | *0.05* | 1410 | 4.74 | *0.000005* | 0.0183 | 0.027 | 313 | 0.060 | *0.0025* |
| | | 20-OVB-03A | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NUN-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Portal pad | 20-MAD-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-MAD-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-MAD-02 | 6120 | *0.0002* | *0.002* | 0.266 | *0.01* | 154 | *0.001* | 0.091 | 252 | 22.5 | 0.0000103 | *0.001* | 0.114 | 118 | 0.0617 | 0.0035 |
| | Seepage, WRSA | 20-MWAR-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 1, WRSA | MMS1-S1 | 23.2 | -- | 0.0051 | 0.00269 | 0.0083 | 3.81 | 0.00066 | 0.0034 | 10.3 | 0.0659 | *0.000005* | 0.0033 | 0.0049 | 6.5 | -- | 0.00136 |
| | | MMS1-S1 | 317 | 0.000053 | 0.00139 | 0.0248 | 0.0216 | 1.83 | 0.00024 | 0.0214 | 77.9 | 7.02 | *0.000005* | 0.00091 | 0.0134 | 9.97 | 0.00245 | 0.00146 |
| | Sump 2, WRSA | MMS1-S2 | 12.6 | -- | 0.0038 | 0.00191 | 0.0218 | 2.78 | *0.0005* | 0.008 | 11.8 | 0.0689 | 0.0000071 | *0.001* | 0.0078 | 2.2 | -- | 0.000199 |
| | | MMS1-S2 | 39.8 | 0.000114 | 0.0059 | 0.00986 | 0.0626 | 3.51 | 0.000923 | 0.0155 | 37.8 | 0.414 | *0.00005* | 0.00156 | 0.0128 | 5.37 | 0.00461 | 0.000751 |
| | Sump 3, WRSA | MMS1-S3 | 14.2 | -- | 0.008 | 0.00326 | 0.0138 | 4.66 | 0.00088 | 0.004 | 10.6 | 0.0938 | 0.0000052 | 0.0035 | 0.0086 | 10.1 | -- | 0.00178 |
| | Madrid Waste Rock Contact Water Pond | MMS1 | 16 | -- | 0.0053 | 0.00156 | 0.0052 | 2.13 | *0.0005* | 0.0018 | 3.91 | 0.062 | *0.000005* | *0.001* | 0.0074 | 2.1 | -- | 0.000287 |
| | | MMS1-INSIDE | 50.9 | 0.000076 | 0.00538 | 0.00249 | 0.00569 | 2.28 | 0.000522 | 0.0028 | 17.6 | 0.17 | *0.00005* | 0.0012 | 0.0106 | 6.77 | 0.00377 | 0.00114 |
| | | MMS1 | 86.8 | 0.000038 | 0.0013 | 0.0007 | 0.00603 | 0.114 | 0.000059 | 0.0045 | 19.2 | 0.0185 | *0.000005* | 0.00206 | 0.00451 | 9.17 | 0.00645 | 0.0011 |
| | | MMS1-N | 184 | 0.000035 | 0.00195 | 0.00746 | 0.0088 | 0.675 | 0.00023 | 0.0102 | 101 | 2.18 | *0.000005* | 0.00241 | 0.0136 | 23 | 0.00473 | 0.0005 |
| | | MMS1-S | 67.4 | 0.000049 | 0.0027 | 0.00344 | 0.00669 | 1.36 | 0.00025 | 0.0032 | 20.5 | 0.236 | *0.000005* | 0.000874 | 0.00683 | 4.38 | 0.003 | 0.000691 |
| | | MMS1-OUTSIDE | 87.2 | 0.000037 | 0.00126 | 0.00118 | 0.00265 | 0.222 | 0.000126 | 0.0028 | 29.1 | 0.0768 | *0.000005* | 0.0012 | 0.00309 | 10.5 | 0.00574 | 0.00189 |

| Region | Area | Sample ID | Si | Ag | Na | Sr | S | Te | Tl | Th | Sn | Ti | W | U | V | Zn | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Doris | Reference (Windy Road) | 20-REF-01A | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-REF-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-REF-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Doris WR Influenced Area | 20-DC-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DC-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Doris Crown Pillar | 20-DCPR-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-DCPR-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Madrid | Naartok E Access Road (Madrid Construction Rock) | 20-NEAR-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NEAR-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Overburden Stockpile | 20-OVB-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-OVB-03 | *5* | *0.0005* | 9820 | 7.89 | 832 | *0.01* | *0.0005* | *0.005* | *0.005* | *0.015* | *0.005* | 0.0356 | *0.025* | *0.15* | *0.01* |
| | | 20-OVB-03A | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-NUN-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Portal pad | 20-MAD-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-MAD-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-MAD-02 | 4.8 | *0.0002* | 567 | 7.43 | 33 | *0.004* | *0.0002* | *0.002* | *0.002* | *0.006* | *0.002* | *0.0002* | *0.01* | 0.266 | *0.004* |
| | Seepage, WRSA | 20-MWAR-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Sump 1, WRSA | MMS1-S1 | -- | *0.00002* | 111 | -- | -- | -- | *0.00001* | -- | 0.00053 | 0.048 | -- | 0.0002 | 0.0104 | 0.221 | -- |
| | | MMS1-S1 | 6.45 | 0.000066 | 288 | 0.926 | 43.9 | *0.0004* | *0.00002* | *0.0002* | *0.0002* | 0.0141 | *0.0002* | 0.0023 | 0.0037 | 8.84 | 0.00045 |
| | Sump 2, WRSA | MMS1-S2 | -- | 0.000032 | 11.2 | -- | -- | -- | *0.00001* | -- | *0.0005* | 0.019 | -- | 0.00023 | 0.00765 | 0.918 | -- |
| | | MMS1-S2 | 13 | 0.00004 | 28.9 | 0.132 | 4.72 | *0.0002* | 0.000022 | 0.00076 | 0.00011 | 0.0357 | *0.0001* | 0.00112 | 0.01 | 4.21 | 0.00277 |
| | Sump 3, WRSA | MMS1-S3 | -- | 0.000021 | 90.3 | -- | -- | -- | 0.000013 | -- | *0.0005* | 0.059 | -- | *0.0002* | 0.011 | 1.7 | -- |
| | Madrid Waste Rock Contact Water Pond | MMS1 | -- | *0.00002* | 19.8 | -- | -- | -- | *0.00001* | -- | *0.0005* | 0.03 | -- | *0.0002* | 0.00586 | 0.0071 | -- |
| | | MMS1-INSIDE | 2.97 | *0.00001* | 115 | 0.0802 | 28.8 | *0.0002* | 0.000011 | 0.00014 | *0.0001* | 0.0264 | 0.0001 | 0.000656 | 0.00631 | 0.0058 | *0.0006* |
| | | MMS1 | 3.01 | *0.00001* | 111 | 0.18 | 39.3 | *0.0002* | *0.00001* | *0.0001* | *0.0001* | 0.00275 | 0.00013 | 0.00167 | 0.00238 | 0.0033 | 0.00031 |
| | | MMS1-N | 4.5 | 0.000028 | 559 | 0.511 | 103 | *0.0004* | *0.00002* | 0.00024 | *0.0002* | 0.0112 | *0.0002* | 0.00362 | 0.0024 | *0.006* | 0.00079 |
| | | MMS1-S | 2.54 | 0.000022 | 119 | 0.116 | 33.5 | *0.0002* | 0.000014 | 0.00019 | *0.0001* | *0.03* | *0.0001* | 0.000607 | 0.00427 | 0.0094 | 0.00055 |
| | | MMS1-OUTSIDE | 2.04 | *0.00001* | 205 | 0.121 | 56.1 | *0.0002* | *0.00001* | *0.0001* | *0.0001* | 0.00519 | *0.0001* | 0.000472 | 0.00084 | *0.003* | 0.00024 |

# Appendix E 2020 Hope Bay Geochemical Investigation of Madrid North Portal Pad

# Geochemical Investigation of the Madrid North Portal Pad

Hope Bay, Nunavut, Canada

Agnico Eagle Mines Ltd.

SRK Consulting (Canada) Inc. ▪ 1CT022.056 ▪ March 2021

srk consulting

# Geochemical Investigation of the Madrid North Portal Pad

Hope Bay, Nunavut, Canada

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Appendix E ABA, Solids Content Following an Aqua Regia Digestion, and Shake-Flask Extraction Data

# 1 Introduction and Scope

In winter 2019, TMAC Resources Inc. (TMAC) began constructing and developing the Madrid North underground mine at its Hope Bay Project in Nunavut. Infrastructure related to the Madrid North underground mine included construction of the Madrid North Portal Pad and Madrid North Portal Laydown, collectively referred as the Portal Pad using waste rock from the Naartok East Crown Pillar Recovery (NE CPR). Waste rock from the NE CPR can be used as construction rock as outlined in the Nunavut Water Board Water Licence 2AM-DOH1335 Amendment No. 2 (NWB 2019), TMAC Resources (2019) and geochemical classification methods documented in SRK (2019b).

In 2020 TMAC collected seepage samples from the Madrid North Portal Pad, done as part of routine geochemical monitoring of construction rock outlined in NWB (2019) and TMAC (2019). Seepage geochemical data indicated higher levels of cadmium, chloride, nitrate, nitrite, ammonia, iron, cobalt, nickel, and zinc and lower pH compared to typical construction rock at Doris and Madrid (SRK 2020). Furthermore, there was a zone of impacted vegetation along a seepage pathway noted immediately downstream of the Portal Pad infrastructure.

SRK was retained by TMAC to investigate the geochemical sources of the Madrid North Portal Pad seepage. This report documents SRK's geochemical investigation of the Madrid North Portal Pad and operational recommendations to Agnico Eagle.

# 2 Background

## 2.1 Mine Plan and Madrid North Portal Pad

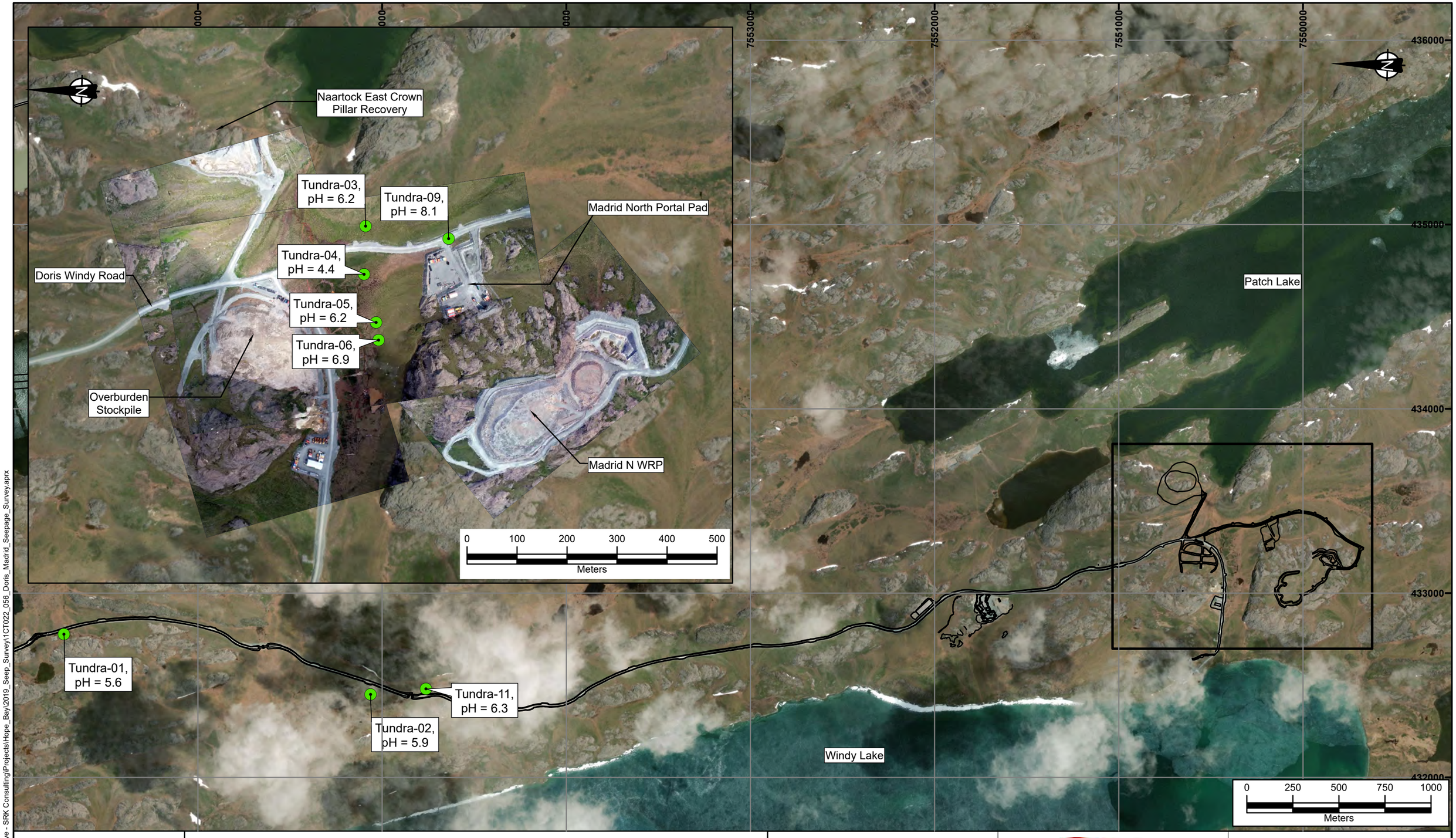
Mining at Madrid North started with the development of the NE CPR in July 2019, followed by development of the Madrid North portal decline in December 2019. During 2019 the main development activities were related to generating access and overburden stripping, then the main (Phase 1) mining activities at the NE CPR commenced in November of 2019 and ended in March of 2020. Mining in both areas was stopped in spring 2020, in part due to the COVID-19 pandemic. Agnico Eagle is scheduled to re-initiate development of the Madrid North decline in the first quarter of 2021.

Initial access to the Madrid North portal face, pre development and exploration, was by a pilot road constructed in winter 2018/19 using rock from Quarry D. The Madrid North Portal Pad and Madrid North Portal Laydown are collectively referred to as the Portal Pad in this report. The bulk of the main rockfill used for the construction of the Portal Pad was subsequently constructed in 2019 and early 2020. This construction was done using NE CPR waste rock approved by TMAC geologists for use as construction rock (Section 2.3). The pad was constructed laterally and perpendicular to the pilot road using end dumping methods. Construction lifts have been verbally indicated to SRK from TMAC site personnel to have been typically 1.65 m or less in thickness. Waste rock from NE CPR was also placed above the portal crest (on the top of the rock slope) for the initial blast of the portal.

The pad design included a designated and lined storage area for temporary placement of waste rock and containment of leachable blast residues and drilling brines. This lined area was intended to be a transfer area where waste rock from underground mining equipment could be placed before being hauled to the Madrid North Waste Rock Storage Area (WRSA) using more efficient haul trucks. This allowed a location for the material re-handling (specifically in the winter) so surface mining equipment, opposed to the underground fleet, could be used if / as required to help bring the waste rock to the Madrid WRSA. The surface of the pad was then covered in a layer of crushed rock from Quarry 2.

During active mining, the Portal Pad was also used as a temporary mechanical shop and to store diesel fuel, calcium chloride ($CaCl_2$), underground mine equipment and heavy machinery; that was actively being used for the adjacent portal decline advancement.

Following freshet in 2020, TMAC observed impacted surficial vegetation within the seepage pathway downstream of the Portal Pad (refer to inset of Figure 2-1). It was subsequently hypothesized that the liner in the temporary waste rock placement area had been compromised and that the source of the saline seepage was drilling fluids associated with waste rock material stored on the lined pad (Figure 2-2). Upon later field inspections (post freshet 2020), John Kurylo, P.Eng. of SRK noted that crush material of a larger gradation than specified as well as reduced crush thicknesses was in areas of the lined pad. Further there was indication of damage to the HDPE liner below (punctures).




## Legend

- Tundra Mat Porewater pH Sites
- Camp Layout Infrastructure

**NOTES**

NAD 1983 UTM Zone 13N.
Aerial imagery collected by TMAC Resources on August 22, 2020 and georeferenced by SRK.

srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Doris_Madrid_Seepage_Survey

TMAC RESOURCES

2020 Madrid North Geochemistry

Madrid North Portal Pad Geochemistry

# Site Layout and Tundra pH Survey Locations

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| Nov 2020 | LNB | 2-1 |

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**Figure 2-2: Photo from corner of lined pad looking NNE, Photo taken Aug. 21, 2020**

## 2.2 Geochemistry of Madrid North Waste Rock

Waste rock from the overall Madrid North deposit (SRK 2017a), of which the NE CPR is a localized area, is characterized by low acid potential (AP) (90% of samples collected by SRK (2017a) had less than (<)13 kg $CaCO_3$/t) with most rock types having moderate levels of neutralization potential (NP), median calcium and magnesium corrected NP greater than (>) 80 kg $CaCO_3$/t for all rock types except volumetrically minor late mafic intrusives (10b) and diabase (11c). Accordingly, the majority of the waste rock at Madrid North is classified as non-potentially acid generating (non-PAG), with NP from the overall stockpiles expected to provide sufficient buffering capacity for the volumetrically minor proportion of potentially acid generating (PAG) waste rock.

In terms of metal leaching, the kinetic test program (humidity cells and barrel tests) indicated that arsenic, cobalt, and nickel leaching from waste rock are potential issues at neutral to alkaline pH values, referred to as neutral pH metal leaching. Higher leaching rates for these elements are expected from mafic metavolcanic waste and ore (1 waste and 1 ore), sedimentary units (5 and 5 mixed), gabbro (7a), and the deformation zone rocks (13a). The humidity cell data showed that arsenic, cobalt and nickel leaching is possibly linked to the occurrence of the trace sulphide mineral gersdorffite (NiAsS), which forms a solids solution with cobaltite (CoAsS).

Based on geochemical source terms of Madrid North waste rock for the Phase 2 project (SRK 2017c), SRK identified arsenic as a parameter of concern (base case waste rock stockpile seepage arsenic estimate of 2.2 mg/L) and to a lesser degree, nickel and cobalt (0.27 and 0.1 mg/L, respectively). Accordingly, these are the neutral pH metal leaching parameters of concern for Madrid North waste rock.

### 2.2.1 Naartok East Crown Pillar Recovery

In 2019 and prior to development, 50 samples representing NE CPR waste rock were geochemically characterized (SRK 2019b). Seven samples collected from surface bedrock and 43 samples from seven drillholes. Samples were geologically logged as mafic metavolcanics (1a), mafic metavolcanics interlayered with sediments (1aj/1oj), sedimentary units (5) and early gabbro (7a). All samples were classified as non-PAG except three samples of sedimentary rock with sulphur content >1%. Arsenic content varied by rock type and spatial distribution with low arsenic content (<10 ppm) exhibited by early gabbro (7a), typically high arsenic content (>100 ppm) exhibited by mafic metavolcanics with sediments (1aj/1oj) and sedimentary units typically and variable arsenic content (2.7 to 826 ppm) for mafic metavolcanics (1a). For mafic metavolcanics (1a), high arsenic content tended to be for samples in contact with sedimentary units or proximal to the ore body.

Geology of waste rock excavated from the NE CPR included mafic metavolcanics (lithological code 1a), mafic metavolcanics interlayered with sediments (code 1aj/1oj), sedimentary units (code 5, which includes cherts and argillites), early gabbro (7a) and quartz veins (code 12, SRK 2020). Other rock types within the Madrid North deposit that were not intersected by the NE CPR include diabase (code 11c) and deformation zone effected lithologies (code 13).

SRK conducted geochemical verification monitoring of waste rock placed on the Madrid North WRSA and used for construction at Madrid North (SRK 2020b).

### 2.2.2 Madrid North Decline

The Madrid North portal location is outside of the immediate deposit area with geochemical characteristics of quarry rock (SRK 2017c). The majority (99%) of waste rock was mafic metavolcanics (1) with minimal sericitic alteration with the balance (1%) logged as quartz-carbonate veining.

Operational waste rock monitoring was conducted by TMAC with subsequent sampling of waste rock on the Madrid North WRSA by SRK (Section 2.4). Waste rock monitoring data for the Madrid underground mine is outside the scope of this memo and will be reported as part of the 2020 annual reports (SRK in progress).

## 2.3 Classification of NE CPR Waste Rock as Construction Rock

TMAC (2019) specifies that waste rock used for construction must be characterized and segregated to ensure it has a low risk for metal leaching or acid rock drainage (ML/ARD). Given the variability of waste rock at the site, each potential construction rock source is assessed on a case-by-case basis.

SRK developed a geochemical characterization and classification program to classify NE CPR waste rock as geochemically suitable to use as construction rock (SRK 2019b). The geochemical classification program is based on geological inspection and calibrated portable x-ray Fluorescence (pXRF) values of arsenic and sulphur, as determined on samples of sieved -2 mm drill cuttings that are representative of the blast round. The criteria to classify NE CPR waste rock as geochemically suitable for use as construction rock (e.g. low risk of ML/ARD) is summarized as follows:

- Geologically defined as mafic metavolcanics (1) or gabbro (7a);
- Low risk of neutral pH metal leaching (calibrated pXRF As < 70 ppm); and
- Low risk of ARD (S < 0.5%).

Conversely, waste rock samples are classified as not suitable for use as construction rock (e.g. risk of ML/ARD) using the following criteria:

- Geologically defined as mafic metavolcanics with sediments (1aj) or sedimentary units (5);
- Moderate to high risk of neutral pH metal leaching (calibrated pXRF As > 70 ppm); OR
- Potential risk of ARD (S > 0.5%).

The operational sampling, classification and segregation program of run-of-mine waste rock was designed and executed by TMAC geology (SRK 2020).

## 2.4 As-Built Geochemical Monitoring Programs

As outlined in TMAC (2019) and SRK (2019b), TMAC conducts as-built construction rock solids and seepage geochemical monitoring programs the year following construction. The solids monitoring includes construction rock inspections and a verification sampling program to confirm that construction rock has a low ML/ARD potential. The seepage monitoring programs include a visual survey and opportunistic seepage sampling. Seepage survey locations are established where seepage was observed or suspected by examining the toes of infrastructure, roadways, and berms; with samples collected at locations where water was observed flowing into and out of construction rock material or where precipitation runoff and snowmelt come into contact with rock. The as-built geochemical monitoring programs are documented in Section 3.1.

# 3 Methods

## 3.1 Field Investigations

### 3.1.1 As-Built Construction Seepage Survey

TMAC conducted the as-built construction geochemical seepage monitoring program in July 2020 (Section 2.4). At the Portal Pad, one seepage location, located at the northeast corner of the pad, was observed and sampled on July 2, 2020 (20-MAD-01) (Figure 3-1). Based on observations of visually impacted vegetation downstream of the Portal Pad, TMAC subsequently sampled the same seepage station on July 27 and August 15, 2020 (sample IDs were MAD-02). Sample collection involved observation of the presence or absence of seepage precipitates or turbidity and the measurement of field parameters which included electrical conductivity (EC), pH, temperature, and oxidation reduction potential (ORP). TMAC submitted samples to ALS Environmental in Burnaby, BC. The test work program was managed by TMAC.

**Figure 3-1: Photo of Portal Pad Seepage Station for Samples MAD-01 and MAD-02**

### 3.1.2 Investigation of Seepage Source Loads

SRK geochemist Jonathon Doherty, GIT (BC) conducted a geochemical field investigation of the Portal Pad on September 6 to 7, 2020 with the objective of identifying the geochemical load sources from the Portal Pad. The objectives and methods of the investigation are summarized in Table 3-1.

**Table 3-1: Summary of Seepage Investigation Objectives and Methods**

| Objective | Method |
|---|---|
| Determine Geochemical Load Sources of Seepage | ■ Collection of construction rock samples to assess metal loadings and source lithologies.<br>■ Collection of samples to assess source loading of calcium chloride. |
| Determine Source of Depressed Seepage pH | ■ Collection of construction rock samples to assess ARD potential and pH.<br>■ Field pH survey of tundra to assess baseline pH of tundra porewater. |

#### Portal Pad Inspection and Solids Sampling

SRK geochemist Jonathon Doherty, GIT (BC) conducted the construction rock inspection and sampling program at the Portal Pad. The scope of the inspection and sampling program for the Portal Pad was expanded from the annual geochemical construction monitoring program outlined in Section 2.4 for the purposes of the geochemical investigation of source loads for the observed seepage.

The inspection consisted of visually inspecting the entire pad for geochemical features indicative of ML/ARD potential (e.g. presence of sedimentary units, sulphide content) and potential source loads to Portal Pad seepage. The inspection of NE CPR waste rock used as construction rock was limited to the periphery of the pad because of the presence of surface crush on the pad surface. Based on the results of the inspection and operational information provided by TMAC, SRK selected twelve sample locations. At the time of the inspection TMAC was excavating the material overlying the compromised lined area of the pad, and the excavated material from this area was being relocated to the Madrid North WRSA. One of the sample locations therefore targeted brine affected material on and within the excavated area of the lined pad.

Sample collection consisted of 1-2 kg of a sieved -1 cm sample and a 50 g sample of a sieved -2 mm fraction. Sample trowels and sieves were rinsed with de-ionized water and wiped clean with new paper towels. At each sample location, the construction rock was geologically described for rock type, texture, fizz test using 10% HCl as an indication of carbonate content, sulphide content, mineral form and occurrence, and the presence and intensity of secondary minerals. SRK conducted rinse tests for EC and pH using the -2 mm sieved fraction and a 1:1 solid to liquid ratio.

SRK submitted samples to Bureau Veritas in Burnaby, BC for geochemical characterization. The test work program was managed by SRK.

### Tundra pH Survey

Figure 3-2 presents the tundra pH survey stations, including seven background sites at Madrid North and along the Doris-Windy road and one site within the ephemeral seepage plume. The objective of the program was to determine the pH of tundra porewater within the path of the portal pad seepage pad and other tundra areas, including areas outside the area of mine influence along the Doris-Windy road. The survey included shallow (<40 cm), hand-dug test pits within easily accessible low-lying wetland areas, allowing water to seep back into each test pit and measurement of field pH, EC, and temperature using handheld meters. Daily pre-survey calibration records are provided in Appendix A.

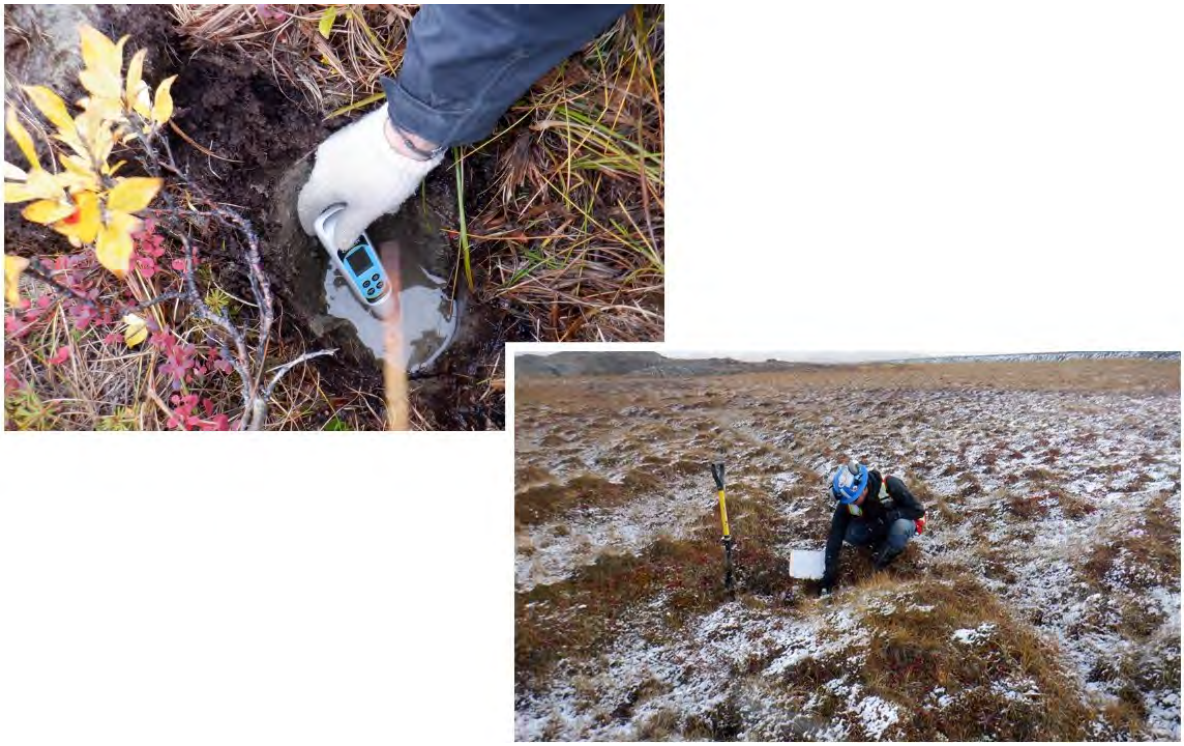

**Figure 3-2: Example of Typical Tundra Porewater pH Site**

## 3.1.3 Construction Rock Mapping Program

After SRK observed the presence of sedimentary waste rock types from NE CPR in the periphery of the Portal Pad (sedimentary units as defined in Section 2.3), SRK designed a construction waste rock mapping program to quantify the distribution of the sedimentary rock. The program included mapping of all visible waste rock and excavation of three north-south trending trenches to expose NE CPR waste rock beneath the layer of crushed rock from Quarry 2. The trenches were oriented perpendicular to the road to intersect the advancing face of the original pad construction. During trench excavation, material was placed laterally and sequentially beside the trench. Coordinates of the beginning and end of each trench are provided in Appendix B.

TMAC geologists geologically mapped the long wall of each excavated trench, the material excavated from each trench, and all visible waste rock used for construction of the Portal Pad, including perimeter embankments, water diversion structures and waste rock placed above the portal for the purposes of access during initial development. Waste rock was mapped for rock type, sulphide content, and percent composed of sedimentary rock. Following mapping, one composite sample was collected for every 5 m length along each trench for geochemical characterization. TMAC shipped samples to Global ARD in Burnaby, BC for geochemical characterization. Global ARD was selected rather than BV based on faster turn around time for data reporting.

## 3.2 Analytical Methods

### 3.2.1 Static Testing Methods

All construction rock samples were analyzed for acid-base accounting (ABA) including:

- Paste pH
- Total sulphur by Leco combustion furnace
- Sulphate sulphur by HCl extraction
- Total inorganic carbon or carbonate by Leco furnace using the HCl direct method where the sample is reacted with HCl in a cell and the evolved $CO_2$ is measured by Leco (BV procedure) or by coulometer (Global ARD procedure).
- Fizz test and modified neutralization potential using the MEND (1991) method.
- Multi-element analysis following an aqua regia digestion

A subset of samples were analyzed for shake-flask extractions (SFEs, Section 3.2.2), using deionized water and 3:1 liquid to solid ratio with 24-hour extraction (MEND 2009) on the -2 mm size fraction.

### 3.2.2 Water Quality Analysis

Seep survey water quality and SFE lixiviant samples were analyzed for pH, conductivity, total suspended solids, total dissolved solids, acidity, alkalinity, sulphate, bromide, chloride, nitrate, nitrate, ammonia, and dissolved metal (35 elements).

## 3.3 Data Quality Assurance (QA) and Quality Control (QC)

The QA/QC program executed by the analytical laboratories and SRK is outlined in the SRK Expectations for Laboratory Geochemical Data Quality (SRK 2019c). Results of SRK's QA assessment are shown in Appendix C. SRK concluded that all data were acceptable except sulphur results for sample Y247-823. The sulphur results for sample Y247-823 were flagged because relative percent difference (RPD%) for total suphur by Leco and sulphur by aqua regia digestion was higher than 20%. Sulphur data for Y247-823 are being re-analyzed to confirm initial results. The results of the recheck will not have a material change in data interpretation or conclusions and therefore the results were considered acceptable.

# 4 Results

## 4.1 As-Built Seepage Survey

Figure 4-1 presents the seepage monitoring station at the Portal Pad area with data summarized in Table 4-1 (Field Parameters) and Table 4-2 (Laboratory data). The complete data set is presented in Appendix D.

### Field Data

Results of the 2020 freshet seepage survey and follow-up sampling identified one seep from the Portal Pad area referred to as MAD-01 and MAD-02 in Figure 4-1 and Table 4-1. The seepage flowed from the Portal Pad area underneath the base of the roadway leading onto the Portal Pad and daylighted with a northward flow direction. The seepage observed was clear to light brown, non-turbid, non-odorous and developed red precipitates and staining on cobbles and boulders over the summer season.

The pH of seepage was initially six (6) and developed mildly acidic conditions over time (5.3 to 5.6). ORP ranged from 110 to 140 mV (equivalent to 330 to 360 mV Eh) and EC values were above detection (>20,000 uS/cm).

**Table 4-1: Summary of Portal Pad Seepage Field Parameters**

| Sample ID* | Sample Date | Description of Location | pH | EC (uS/cm) | ORP (mV) | T (°C) | Colour | Precipitates/ Stains |
|---|---|---|---|---|---|---|---|---|
| 20-MAD-01 | Jul 2 | Base of roadway leading to main Portal Pad. Flows Though large boulders and road crush. Approx. 2 m from culvert. | 6 | >20,000 | 140 | 5.4 | clear/ light brown | none |
| 20-MAD-02 | Jul 27 | Emanating from base of access road to portal laydown; dead vegetation d/s of seep; small pools of water on tundra d/s of location. Very low flow volume. | 5.3 | >20,000 | 110 | 10 | clear | none |
| | Aug 15 | Seep previously identified from toe of road leading to portal laydown. Flow present | 5.6 | >20,000 | 140 | 7.8 | clear | Red staining of boulders/cobbles |

Sources: Source: Z:\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\420 - Madrid Site Support\Madrid N Portal Seepage Investigation\[1CT022.056_2020_Master_Compilation_MadridSeeps_Dataworking_mlt_jed.xlsx]

Notes: *All samples collected at the same seepage station.

## LEGEND

Geochemical Samples

- SRK Samples
- Trench Samples
- 2020 Seepage Locations

Geological Mapping (% Sediments)

- <1%
- 1-2%
- 3-5%
- 5-10%
- >10%
- As-built Liner Extents

## NOTES

1. Coordinate system is NAD 1983 Zone UTM 13N.
2. PP-01 and PP-06 are construction rock from Quarry 2. All other samples are waste rock.
3. Sediments lithologically defined as mafic metavolcanics with sediments (logging code 1aj/1oj) or sedimentary units (5).

## REFERENCES

1. Drone imagery captured by TMAC on August 7, 2020.

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Meters

srk consulting

Job No: 1CT022.056
Filename: 1CT022_056_Madrid_N_Portal_Pad

TMAC RESOURCES

**Hope Bay Project**

Madrid North Portal Pad Geochemistry

# Geochemical Mapping Program and Sampling Locations

| Date: | Approved: | Figure: |
|---|---|---|
| Dec 2020 | LNB | **4-1** |

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## Laboratory Data

Laboratory pH values ranged from mildly acidic to circum-neutral (pH 4.9 to 6.6), with EC ranging from 35,000 to 68,000 uS/cm.

Cations within the portal pad seep were dominated by calcium (6,700 to 17,300 mg/L), sodium (510 to 1600 mg/L), iron (0.5 to 490 mg/L), and potassium (130 to 310 mg/L), while anions were dominated by chloride (9,700 to 31,000 mg/L), with lesser sulphate (70 to 120 mg/L) and alkalinity (2.5 to 85 mg/L). Ammonia, nitrate, and nitrite occurred in concentrations of 63 to 150 mg/L as N, 61 to 1,100 mg/L as N and <0.1 to 2.5 mg/L, respectively. Overall, all major ions and nutrients were consistently enriched relative to 2019 Madrid North seepage results except alkalinity and nitrite. In contrast to portal pad seepage, the 2019 Madrid North seepage samples surveyed construction rock that was sourced from Quarry D.

Trace metal content for portal pad seepage was enriched relative to the 2019 Madrid North seepage data for cadmium (0.0025 to 0.0032 mg/L), cobalt (0.14 to 0.53 mg/L), manganese (22 to 36 mg/L), nickel (0.058 to 0.12 mg/L), and zinc (0.25 to 0.33 mg/L). Notably, arsenic concentrations were below analytical detection.

**Table 4-2: Summary of Portal Pad Seepage Laboratory Data**

| Seepage Program | Sample ID or Statistic | Date | pH | EC | TSS | Acidity | Alkalinity | Chloride | Sulphate | Ammonia | Nitrate | Nitrite | As | Cd | Ca | Co | Cu | Fe | Mg | Mn | Ni | K | Na | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | uS/cm | mg/L | mg $CaCO_3$/t | mg $CaCO_3$/t | mg/L | mg/L | mg/L as N | mg/L as N | mg/L as N | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Portal Pad (2020) | 20-MAD-01 | 7/2/2020 | 6.6 | 40000 | 24 | 80 | 85 | 18000 | 68 | 98 | 110 | 2.5 | <0.005 | 0.0032 | 9100 | 0.14 | <0.01 | <0.5 | 210 | 22 | 0.058 | 170 | 510 | 0.33 |
| | 20-MAD-02 | 7/27/2020 | 4.9 | 68000 | 31 | 1000 | 2.5 | 31000 | 120 | 150 | 200 | 0.1 | <0.005 | 0.003 | 17000 | 0.53 | 0.013 | 490 | 460 | 36 | 0.24 | 320 | 1700 | 0.26 |
| | 20-MAD-02 | 8/15/2020 | 5.6 | 35000 | 18 | 300 | 5.1 | 9700 | 69 | 63 | 62 | <0.10 | <0.0020 | 0.0025 | 6700 | 0.27 | 0.004 | 160 | 280 | 24 | 0.12 | 130 | 610 | 0.25 |
| Madrid North Infrastructure (2019)[2] | Minimum | 2019 | 7.4 | 54 | 3 | 1.4 | 21 | 3.3 | 0.4 | 0.0074 | 0.0084 | 0.001 | 0.00013 | 0.000005 | 4.8 | 0.0001 | 0.0011 | 0.017 | 1.9 | 0.0017 | 0.00072 | 0.76 | 2.7 | 0.0018 |
| | Average | 2019 | 7.7 | 110 | 3.4 | 1.8 | 40 | 7.5 | 1.5 | 0.022 | 0.1 | 0.0058 | 0.00024 | 0.0000053 | 13 | 0.00012 | 0.0019 | 0.075 | 3.1 | 0.011 | 0.002 | 1.2 | 4.2 | 0.0052 |
| | Maximum | 2019 | 8.1 | 220 | 5.8 | 3.1 | 69 | 22 | 4.9 | 0.094 | 0.42 | 0.032 | 0.00046 | 0.0000087 | 29 | 0.00029 | 0.0025 | 0.12 | 5.5 | 0.065 | 0.0027 | 1.8 | 7.1 | 0.022 |

Sources: Source: Z:\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\420 - Madrid Site Support\Madrid N Portal Seepage Investigation\[Copy of 1CT022.056_2020_Master_Compilation_MadridSeeps_Dataworking_mlt_jed.xlsx]

Notes:

[1] Dissolved concentrations reported

[2] Construction rock from Quarry D.

## 4.2 Field pH Survey of Tundra

Table 4-3 and Figure 2-1 present the results of the tundra field pH and conductivity survey.

For baseline tundra sites, the pH and EC of porewater in the active layer (uppermost horizon of the tundra that annually freezes and thaws) ranged from mildly acidic (5.6) to neutral (maximum of 8.1) and 130 to 520 uS/cm, respectively. In contrast, the station within the Portal Pad plume of impacted vegetation had the lowest pH (4.4) and highest EC (5,200 uS/cm).

**Table 4-3: Field pH and EC of Background Tundra Porewater Sites**

| Area | Station | pH | EC | T |
|---|---|---|---|---|
| | | | uS/cm | °C |
| Background | Tundra-01 | 5.6 | 160 | 1.0 |
| | Tundra-02 | 5.9 | 130 | 1.1 |
| | Tundra-03 | 6.2 | 170 | 1.1 |
| | Tundra-05 | 6.2 | 340 | 1.1 |
| | Tundra-06 | 6.9 | 130 | 1.1 |
| | Tundra-09 | 8.1 | 200 | 1.5 |
| | Tundra-11 | 6.3 | 520 | 3.0 |
| Within Plume of Impacted Vegetation | Tundra-04 | 4.4 | 5200 | 0.9 |

Sources: Z:\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\!020_Project_Data\010_SRK\Field Data\[HopeBay_SampleDescriptions_1CT022.056_JED_LNB_20200922_Rev00.xlsx]

Notes: Results provided to two significant figures

## 4.3 Geochemical Characterization of Portal Pad

### 4.3.1 Geological Inspections

Figure 4-1 presents the results of the geological inspects of the Portal Pad construction rock according to proportion of sedimentary rock (1aj and 5) because these rock types have higher risk of neutral pH arsenic leaching (Section 2.2). Full geological and geochemical results of SRK's Portal Pad inspection are provided in Appendix A. Results of the TMAC construction rock trenching and mapping program are provided in Appendix B.

The inspections indicated that waste rock from NE CPR used for construction contained sedimentary rock except for localized areas of the berm as denoted in blue in Figure 4-1. The majority of construction rock was mafic metavolcanics intermixed with 1 to 10% sedimentary units except for

localized areas containing more than 50% sedimentary rock, including two trenches (TR-01 and TR-02) and waste rock placed above the portal. A localized area of southeast corner of the pad (e.g. sample PP-11) was pistachio green gabbro (7a). Pyrite was described as occurring within the construction rock in abundances ranging from trace to 1%, while the presence of alteration was limited to localized observations of hematite or sericite alteration.

SRK's inspection of the crushed material from Quarry 2 placed on the pad surface described the surface dressing as dark chloritic green mafic metavolcanics (1a) with no fizz, trace finely disseminated pyrite, and rare quartz-calcite veinlets with moderate fizz. Dark stains were present on the surface of the northwest portion of the pad (in the vicinity of TR-02 and TR-03) suggesting concentrated brine coating the waste rock. The dark stains had no odor or sheen and the material was sampled (sample 20-PP-01). Notably, the lined area of the pad contained a small pool of ponded brine (field EC >20,000 uS/cm, Table 4-4) and dark stained waste rock (sampled as PP-12 in Figure 4-1). The lined area was being excavated at the time of SRK's inspection and had a noticeable brine odor.

Table 4-4 summarizes the results of the rinse tests for samples of the construction rock and one sample of waste rock on the liner (PP-12). Values of rinse pH for all samples ranged from 7.2 to 9.2 indicating that construction rock and waste rock on the lined pad were non-acidic. Rinse EC for construction rock samples ranged from 82 to 380 uS/cm and was significantly lower than the brine stained waste rock (18,000 uS/cm). The rinse EC for the brine stained waste rock was more than ten times higher than equivalent values for run-of-mine (ROM) waste rock samples collected from stockpiles by SRK in 2020 at Doris (87 to 1,616 uS/cm) and Madrid North (140 to 1,845 uS/cm), suggesting that the lined pad contained a more concentrated source of brine compared to concentrations of residual brine on waste rock that are typical of blasting underground mine development.

**Table 4-4: pH and EC Data, Portal Pad Samples and Brine Pond**

| Portal Pad Area | Rock Types* | Statistic | Rinse pH | Rinse EC (uS/cm) |
|---|---|---|---|---|
| Construction Rock | 1a, 7a (1aj, 5) | P5 | 8.5 | 90 |
| | | P50 | 9.1 | 110 |
| | | P95 | 9.2 | 320 |
| | | Count | 10 | 10 |
| Waste Rock on Lined Area | 7a (1a) | -- | 7.2 | 18000 |
| | | Count | 1 | 1 |
| Brine Pond | -- | -- | 7.2 | >20,0000 |

Notes:

*Rock types in parentheses are secondary rock types.

Rock types: 1a = mafic metavolcanics, 1aj = mafic metavolcanics with sediments, 5 = sediments, 7a = gabbro

**Quarry 2 rock is 1a only.

### 4.3.2 Acid-Base Accounting

A statistical summary of ABA is presented in Table 4-5 with the complete data set presented in Appendix E. Table 4-5 presents data according to construction rock and the briny waste rock pile on the lined area of the pad.

Paste pH data indicated that all samples were non-acidic. The 5$^{th}$ to 95$^{th}$ percentile levels of total sulphur content for construction rock ranged from 0.13 to 0.52%, with median values of 0.18%. Sulphur content of the waste rock stockpile was 0.57%. Sulphate content for all samples was below detection (0.01%) or within the range of analytical error. Sulphide content (calculated as the difference between total sulphur and sulphate) was slightly lower than total sulphur (Figure 4-2 ). Based on sulphate levels being within analytical error, acid potential (AP) was calculated based on total sulphur.

Modified NP levels for all samples were greater than 90 kg$CaCO_3$/t and were typically higher than levels of TIC (greater than 60 kg$CaCO_3$/t, Figure 4-3). This indicates that values of TIC/AP are more conservative for ARD classifications. On the basis of NP/AP and TIC/AP all samples were classified as non-PAG (Figure 4-4).

**Table 4-5: Statistical Summary of ABA for Construction Rock and Briny Waste Rock Pile on Lined Area**

| Portal Pad Area | Rock Types* | Statistic | Paste pH | Total S %S | SO4 %S | TIC $kgCaCO_3/t$ | Modified NP $kgCaCO_3/t$ | NP/AP | TIC/AP |
|---|---|---|---|---|---|---|---|---|---|
| Construction Rock** | 1a, 7a (1aj, 5) | P5 | 8.2 | 0.13 | 0.01 | 89 | 96 | 10 | 10 |
| | | P50 | 8.9 | 0.18 | 0.06 | 140 | 140 | 21 | 21 |
| | | P95 | 9.1 | 0.52 | 0.065 | 190 | 200 | 31 | 35 |
| | | Count | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Briny Waste Rock on Liner | 1a (7a) | P5 | 7.4 | 0.57 | 0.01 | 61 | 94 | 3.4 | 5.3 |
| | | P50 | 7.4 | 0.57 | 0.01 | 61 | 94 | 3.4 | 5.3 |
| | | P95 | 7.4 | 0.57 | 0.01 | 61 | 94 | 3.4 | 5.3 |
| | | Count | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Sources: P:\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\110 - SRK Field Monitoring\[HB_2020_SolidsGeochem_1CT022.056_RTC_Rev00.xlsx]

Notes:

*Rock types in parentheses are secondary rock types. Figures presented according to primary rock type in samples (with presence of sediments indicated). Surface coating on briny waste rock pile obscured rock type.

Rock types: 1a = mafic metavolcanics, 7a = gabbro, 1aj = mafic metavolcanics with sediments, 5 = sediments

**From NE CPR except surface crush is from Quarry 2. Quarry 2 rock is 1a only.

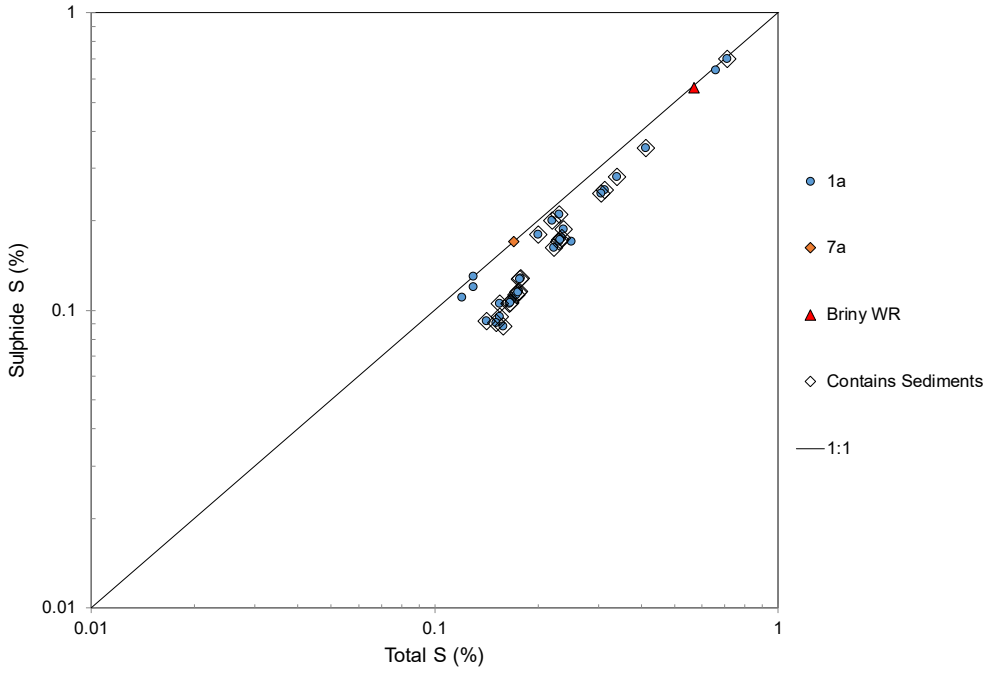


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**Figure 4-2: Comparison of Total Sulphur and Calculated Sulphide by Rock Type**

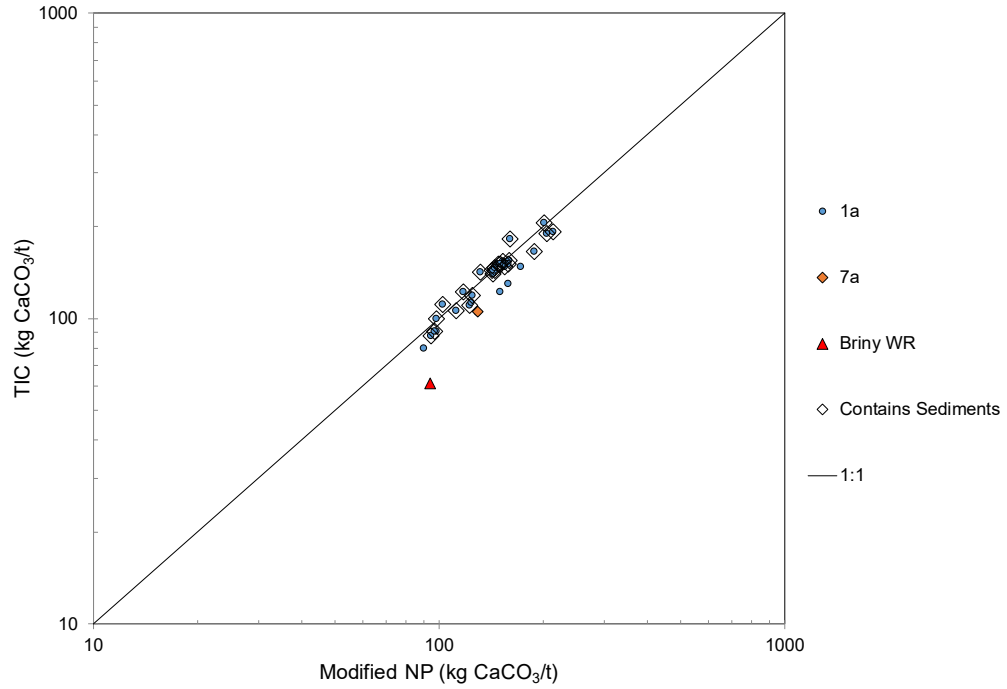


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**Figure 4-3: Comparison of Modified NP and TIC by Rock Type**

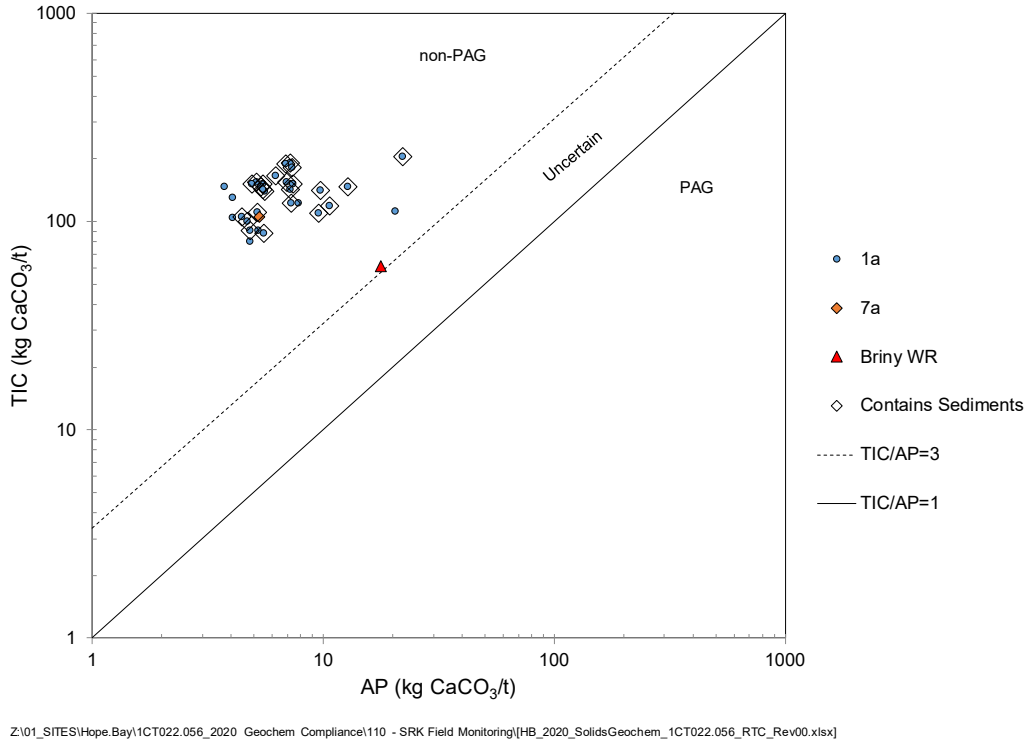


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**Figure 4-4: ARD Classification According to TIC/AP by Rock Type**

### 4.3.3 Trace Element Content

Neutral pH metal leaching of arsenic, cobalt and nickel is related to the occurrence of gersdorffite and/or sedimentary rock units (Section 2.1). Furthermore, seepage data has indicated that iron, manganese and zinc are parameters of concern at the Portal Pad. A statistical summary of selected parameters is presented in Table 4-6 with the full suite of elemental content presented in Appendix E. The solid-phase content of the briny waste rock compared to Portal Pad construction rock is summarized as follows:

- Arsenic, cadmium, cobalt, iron, nickel and zinc for the briny waste rock was within the range of concentrations of Portal Pad construction rock.
- Arsenic content was below 70 ppm except for one sample (Figure 4-5). The one sample with higher arsenic content contained levels of 208 ppm and sedimentary rock containing the highest total sulphur content (0.71%). SRK understands that for sedimentary units, TMAC classified waste rock as construction rock according to the pXRF monitoring program and criteria (Section 2.3). Figure 4-5 indicates that all samples of construction rock meet the geochemical criteria for arsenic and are non-PAG except one sample.
- Manganese content in briny waste rock was lower than the 5$^{th}$ percentile value for construction samples.
- Copper content for the briny waste rock sample was higher than the 95$^{th}$ percentile value for construction samples.

**Table 4-6: Statistical Summary of Selected Elements, Construction Rock and Briny Waste Rock Pile Compared to NE CPR Waste Rock**

| Area | Rock Types* | Statistic | As ppm | Ca % | Cd ppm | Co ppm | Cu ppm | Fe % | Mg % | Mn ppm | Ni ppm | Na % | K % | Zn ppm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Portal Pad Construction Rock | 1a, 7a (1aj, 5) | P5 | 3.9 | 2.8 | 0.04 | 39 | 90 | 5.2 | 2.7 | 1100 | 88 | 0.011 | 0.03 | 67 |
| | | P50 | 6.6 | 4.5 | 0.1 | 48 | 110 | 7.8 | 3.5 | 1400 | 120 | 0.021 | 0.05 | 86 |
| | | P95 | 35 | 7.1 | 0.29 | 58 | 130 | 9 | 5 | 1900 | 250 | 0.05 | 0.11 | 110 |
| | | Count | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Briny Waste Rock on Liner | 7a (1a) | P5 | 24 | 3.5 | 0.1 | 30 | 230 | 5.5 | 1.5 | 750 | 52 | 0.21 | 0.12 | 63 |
| | | Count | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Sources: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\110 - SRK Field Monitoring\[HB_2020_SolidsGeochem_1CT022.056_RTC_Rev00.xlsx]

Notes:

*Rock types in parentheses are secondary rock types. Figures presented according to primary rock type in samples (with presence of sediments indicated)

Rock types: 1a = mafic metavolcanics, 7a = gabbro, 1aj/1oj = mafic metavolcanics with sediments, 5 = sediments

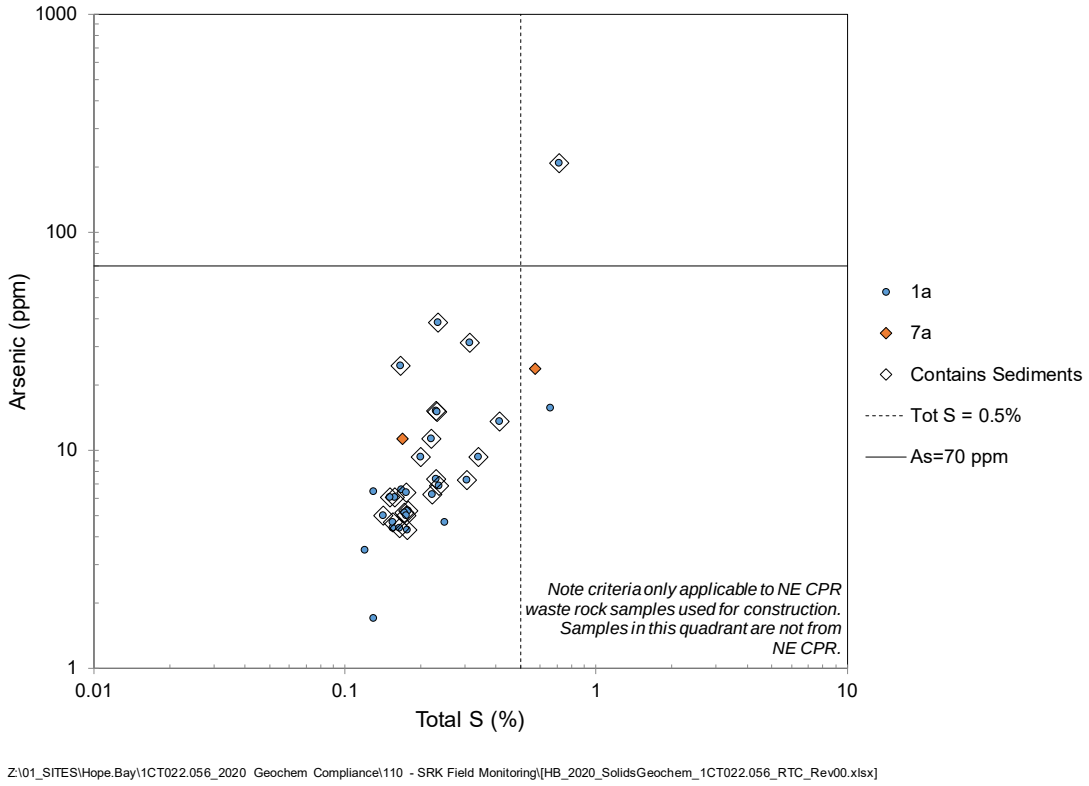



**Figure 4-5: Presentation of Samples by NE CPR Waste Rock as Construction Rock Criteria**

### 4.3.4 Leach Tests

Table 4-7 presents selected SFE test data for construction rock and the briny waste rock located on the lined area of the Portal Pad. Parameters presented in Table 4-7 are parameters of concern as indicated by the seepage monitoring data (Section 4.1). The complete SFE data set is presented in Appendix E.

For construction rock samples, the major anion and cation were alkalinity (median 32 mg$CaCO_3$/L) and sodium (median 20 mg/L), respectively whereas for the waste rock stockpile, the major anion and cation were chloride (1,802 mg/L) and calcium (968 mg/L), respectively. SFE sulphate concentrations were less than 80 mg/L for all samples and exhibited an increasing and positive trend with total sulphur (Figure 4-7). The data suggest sulphate is due to sulphide oxidation except for one construction rock sample with low sulphur (<0.2%) and high sulphate (>70 mg/L). This sample was described as having strong hematite alteration suggesting that soluble sulphur was present as secondary sulphate minerals. SFE data indicated that all samples were non-acidic, with pH values ranging from 7.7 to 9.3.

SFE chloride and calcium concentrations for briny waste rock (1,800 and 970 mg/L, respectively) were more than 50 times higher than concentrations for Portal Pad construction rock samples (Figure 4-6) and also underground waste rock from Doris (maximum of 140 and 490 mg/L, respectively; SRK 2020). Brines are not used for quarry development or mining at NE CPR. Conductivity showed a

strong positive statistically significant correlation (r=0.99) with chloride concentrations using a 99% confidence interval, demonstrating that construction rock samples with low rinse EC contained low chloride content (Table 4-4).

SFE ammonia and nitrate concentrations for briny waste rock (80 and 110 mg/L, respectively) were comparable to Doris ROM waste rock (SFE nitrate of 170 mg/L, SRK 2020), which are more than an order of magnitude higher than the Portal Pad construction rock (95$^{th}$ percentile values of 0.21 and 3.7 mg/L, respectively) and quarry rock (maximum of 6 and 15 mg/L, respectively, SRK 2020). The difference in concentrations is attributable to differences in blasting practices for underground waste rock compared to quarry or NE CPR waste rock.

SFE arsenic concentrations were less than 0.07 mg/L and showed a strong (r = 0.92) statistically significant correlation with solid phase arsenic content for construction rock samples (Figure 4-8). This relationship is consistent with geochemical characterization studies of Madrid North waste rock that suggested the risk of neutral pH arsenic, cobalt and nickel leaching in relation to solid-phase arsenic and the trace minerals gersdorffite (NiAsS) and cobaltite (CoAsS, Section 2.2). In contrast, the briny waste rock sample had relatively high arsenic content (24 mg/kg) but a low SFE arsenic concentration (0.00096 mg/L) suggesting an arsenic attenuation mechanism.

The 5$^{th}$ to 95$^{th}$ concentrations of SFE nickel and cobalt for construction rock ranged from 0.00020 to 0.0013 mg/L and 0.000052 to 0.00033 mg/L, respectively. Soluble nickel and cobalt concentrations varied with arsenic content owing to its presence as a trace element in solid solution in gersdorffite and cobaltite (Figure 4-9). Nickel and cobalt concentrations were notably higher for the briny waste rock sample suggesting increased mobility under saline conditions.

For cadmium and zinc, the absence of a relationship with pH coupled with the briny waste rock sample exhibiting notably higher concentrations similarly suggests increased metal mobility under saline conditions (Figure 4-10 and Figure 4-11). Manganese concentrations were similarly highest for the briny waste rock sample whereas notably iron was not.

**Table 4-7: Selected SFE Test and Rinse EC Data for Construction Rock and Briny Waste Rock Stockpile on Lined Area**

| Portal Pad Component | Rock Types* | Statistic | pH | EC | SO4 | Total Alkalinity | Cl | NH3 | NO3 | As | Ca | Cd | Co | Cu | Fe | Mn | Mg | Ni | K | Se | Na | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | uS/cm | mg/L | mgCaCO3/L | mg/L | mgN/L | mgN/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Construction Rock | 1a, 7a (1aj, 5) | P5 | 7.8 | 86 | 5.2 | 24 | 2.6 | 0.067 | 0.2 | 0.0015 | 1.9 | 0.000005 | 0.000052 | 0.0011 | 0.011 | 0.0015 | 0.78 | 0.00021 | 1.4 | 0.00046 | 5.6 | 0.00016 |
| | | P50 | 9 | 210 | 24 | 32 | 11 | 0.11 | 1.9 | 0.0086 | 7.1 | 0.00001 | 0.00017 | 0.0022 | 0.035 | 0.0026 | 1.8 | 0.0005 | 3.3 | 0.00071 | 20 | 0.001 |
| | | P95 | 9.2 | 310 | 72 | 55 | 29 | 0.21 | 3.7 | 0.057 | 17 | 0.00001 | 0.00033 | 0.0046 | 0.37 | 0.0062 | 3.4 | 0.0013 | 5.8 | 0.0021 | 48 | 0.0012 |
| | | Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Briny Waste Rock on Lined Pad | 7a (1a) | -- | 7.8 | 6400 | 41 | 43 | 1800 | 80 | 110 | 0.00096 | 970 | 0.00019 | 0.0012 | 0.002 | 0.005 | 0.4 | 28 | 0.0037 | 25 | 0.00041 | 180 | 0.0029 |
| | | Count | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Sources: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\110 - SRK Field Monitoring\[HB_2020_SolidsGeochem_1CT022.056_RTC_Rev00.xlsx]

Notes:

*Rock types in parentheses are secondary rock types. Figures presented according to primary rock type in samples (with presence of sediments indicated)

Rock types: 1a = mafic metavolcanics, 7a = gabbro, 1aj/1oj = mafic metavolcanics with sediments, 5 = sediments

**Quarry 2 rock is 1a only.

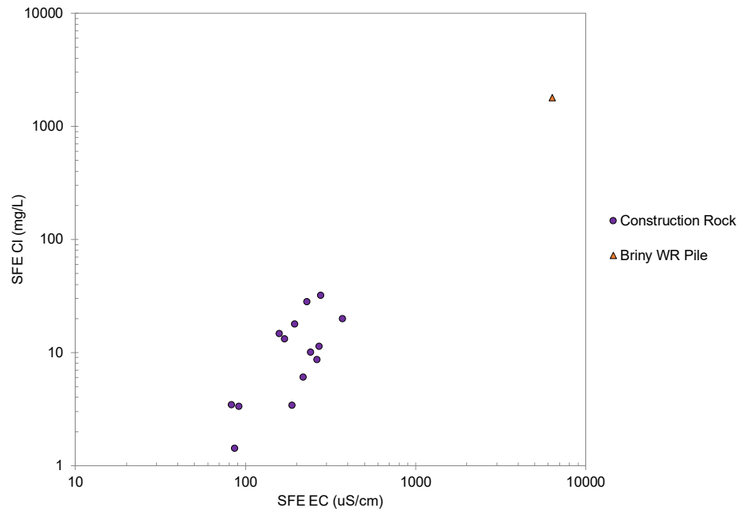



**Figure 4-6: Comparison of SFE EC and Chloride, Construction Rock and Briny Waste Rock Samples**

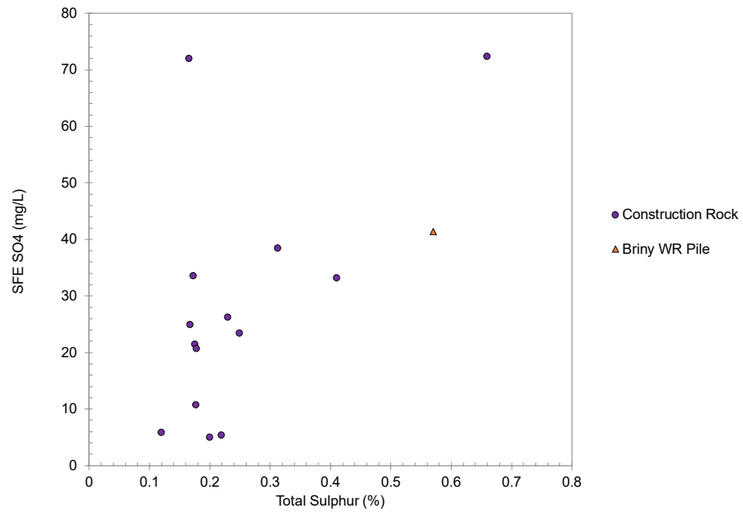



**Figure 4-7: Comparison of Total Sulphur and SFE Sulphate, Construction Rock and Briny Waste Rock Samples**

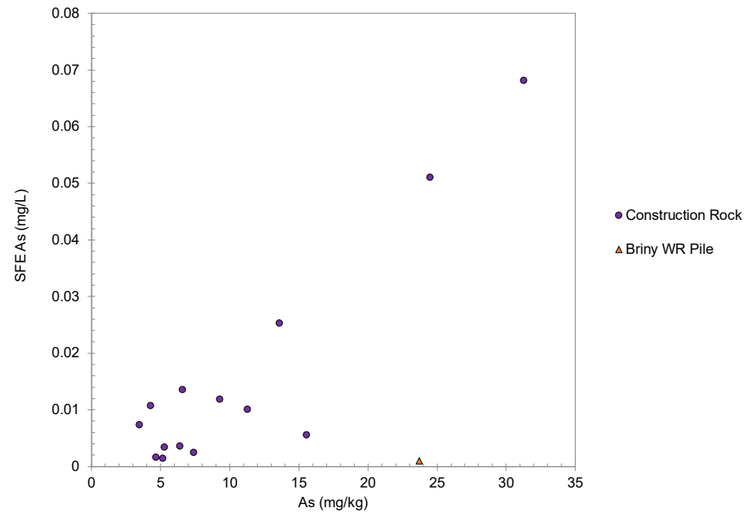



**Figure 4-8: Comparison of Solid-Phase and SFE Arsenic, Construction Rock and Briny Waste Rock Samples**

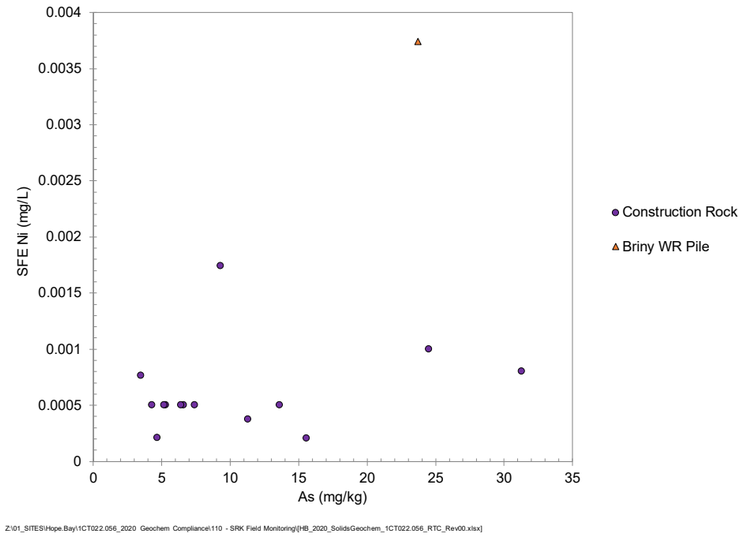



**Figure 4-9: Comparison of Solid-Phase Arsenic and SFE Nickel, Construction Rock and Briny Waste Rock Samples**

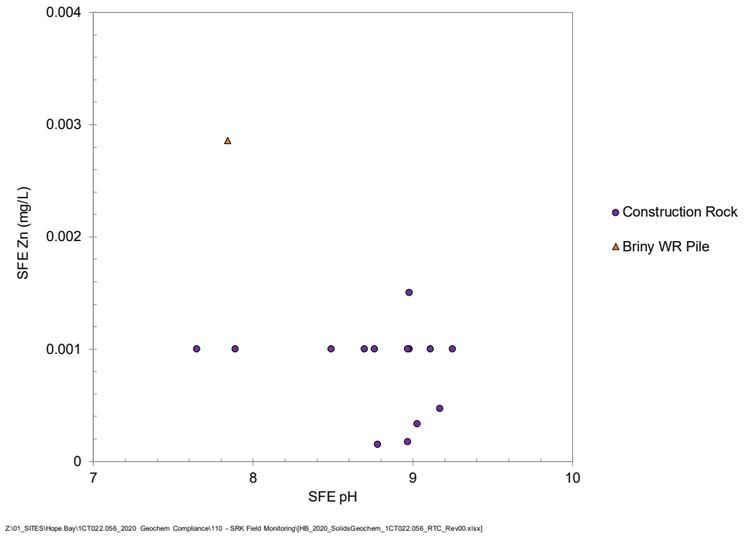



**Figure 4-10: Comparison of pH and SFE Zinc, Construction Rock and Briny Waste Rock Samples**

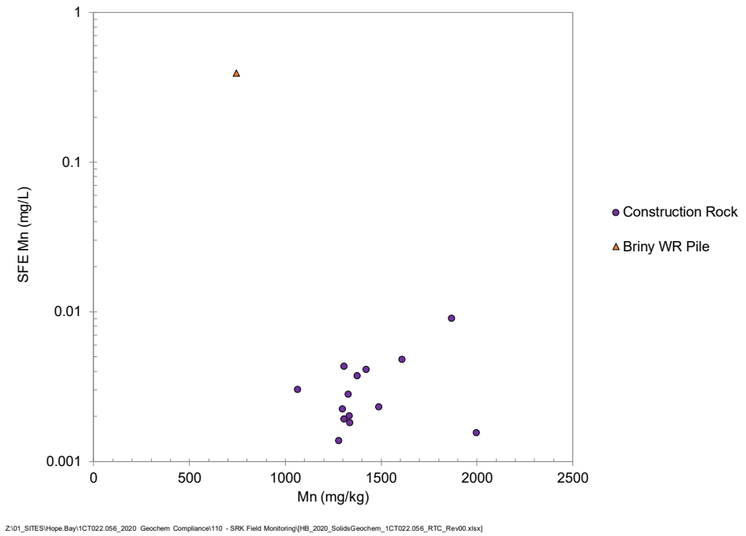



**Figure 4-11: Comparison of Solid-Phase and SFE Manganese, Construction Rock and Briny Waste Rock Samples**

# 5 Geochemical Conceptual Model

This section presents the basis of the geochemical conceptual model for seepage chemistry at the Portal Pad.

Soluble nitrogen nutrients concentrations for the briny waste rock are indicative of underground mine operational blasting practices at Hope Bay whereas data for construction rock are indicative of operational practices for NE CPR and quarry rock.

Figure 5-1 presents the major ion chemistry for portal pad seepage, construction rock and briny waste rock on the lined pad. Calcium and chloride were dominant and equivalent for both the seepage and briny waste samples whereas the major ion chemistry for construction samples was variable and dominated by sodium and alkalinity-sulphate. Concentrations of calcium and chloride on briny waste rock were higher than ROM underground waste rock suggesting a different and more concentrated source of $CaCl_2$ brine. This is supported by field EC of the brine ponded in the formerly lined transfer area (>20,000 uS/cm) and rinse EC of the briny waste rock (17,500 uS/cm).

High ionic strength solutions have been documented to increase metal mobility for cadmium and zinc in response to cation exchange and/or formation of chloride complexes (Backstrom et al 2004). Cadmium, cobalt, manganese, nickel and zinc mobility were anomalously high for briny waste rock compared to construction rock or waste rock from Doris (SRK 2020). Notably, dissolved arsenic concentrations were below detection for briny waste rock but exhibited a positive trend with solid-phase arsenic for construction rock samples. This suggests the source arsenic is sulphide (gersdorffite) oxidation and an arsenic attenuation mechanism under hypersaline conditions. A significant flow of metal-enriched brine flowed from the lined transfer area of the Portal Pad and across the tundra, as indicated by the downstream extents of impacted vegetation.

Seepage monitoring at the Portal Pad indicated an initial field pH of 6 at freshet and the subsequent onset of mildly acidic in late July and August (5.3 to 5.6). In contrast, ABA data indicated that construction rock and briny waste rock were non-acidic and classified as non-PAG. The pH survey of the tundra indicated slightly acidic pH (5.9) is naturally present in the tundra. The data suggest that the depressed pH in the portal pad seepage is related to organic acids and/or anion exchange between calcium and hydrogen ions sorbed onto mineral surfaces in the active layer resulting of release of acidity (Backstrom et al 2004). Seepage iron concentrations fluctuated with pH and observations in August of iron staining on rocks within the seepage pathway, as well as the downstream impacted vegetation, suggest that the source of iron is the active layer in the tundra with iron mobilization related to changes in pH.

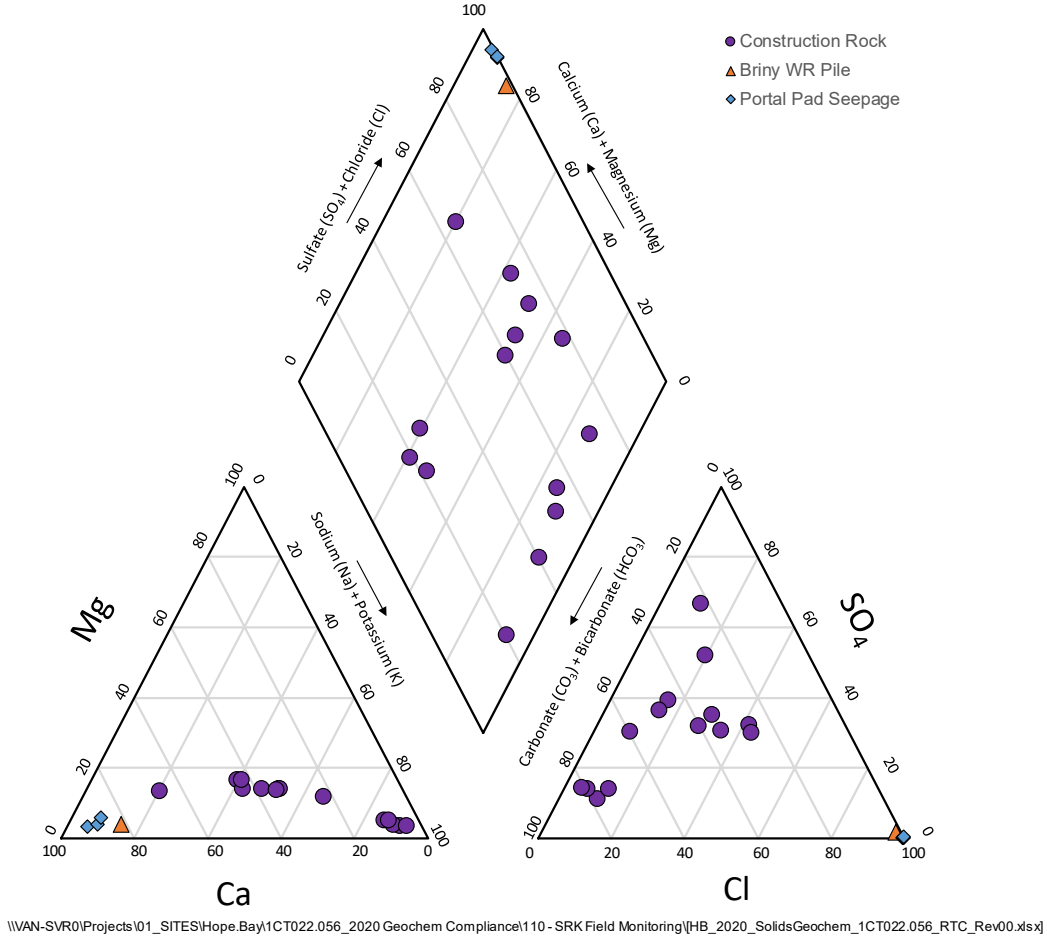



**Figure 5-1: Piper Plot for Construction Rock, Briny Waste Rock and Portal Pad Seepage**

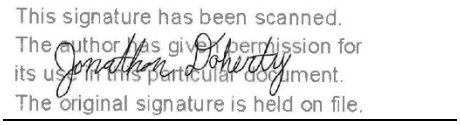
# 6 Conclusion

The geochemical conceptual model for portal pad seepage chemistry is summarized as follows:

- Madrid North Portal Pad construction rock contains varying proportions of sedimentary rock that overall is classified as non-PAG with arsenic content below the arsenic criterion required for classifying waste rock as suitable as construction rock.
- A flow of high ionic strength solution flowed through the compromised liner on the temporary transfer area of the Madrid North Portal Pad and across the tundra, resulting in a downstream area of impacted vegetation within the seepage pathway. The chemistry of the ponded water on the lined transfer area and leachable products of the briny waste rock indicate the presence of a high ionic strength solution that is more concentrated than residual drilling brine on typical Hope Bay underground waste rock.
- The source of elevated major ions and cobalt, manganese, nickel and zinc in the seepage is the briny waste rock on Madrid North Portal Pad and not construction rock sourced from NE CPR. The hypersaline solution on the waste rock resulted in increased metal leaching rates and mobility as a response to ion exchange and/or formation of chloride complexes.
- The briny waste rock and Madrid North Portal Pad construction rock (NE CPR waste rock and Quarry 2 rock) are non-acidic and non-PAG. Portal pad construction rock and briny waste rock are not the source of slightly acidic pH indicated in the seepage (5.3 to 5.6). Rather development of mildly acidic pH is related to organic acids in the active layer and/or release of acidity from ion exchange between the hypersaline seepage and the tundra.

# Closure

This report, Geochemical Investigation of the Madrid North Portal Pad, was prepared by

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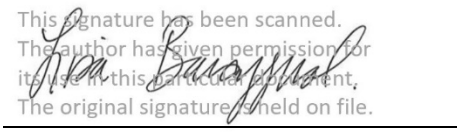
and reviewed by




Lisa Barazzuol, MSc, PGeo (NT/NU)
Principal Consultant (Geochemistry)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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# Appendix A SRK Field Data

# Appendix A1: SRK Portal Pad Field Data



| Sample ID | Easting | Northing | Location | Sampling Rationale | Rinse pH | Rinse EC (uS/cm) | Sulphide 1 | Sulph 1 % |
|---|---|---|---|---|---|---|---|---|
| 20-PP-01 | 433298 | 7550199.836 | Portal Pad | Characterize quarry 2 surface dressing that had been affected by a spill | 8.78 | 377 | Pyrite | trace |
| 20-PP-02 | 433366 | 7550207.563 | Portal Pad | Characterize NE CPR construction rock, directly above where brine plume exits pad | 8.95 | 113 | Pyrite | 0.5% |
| 20-PP-03 | 433342 | 7550243.319 | Portal Pad | Characterize NE CPR construction rock | 9.03 | 98 | Pyrite | 0.5% |
| 20-PP-04 | 433272 | 7550241.448 | Portal Pad | Characterize NE CPR construction rock | 9.13 | 100 | Pyrite | 0.5% |
| 20-PP-05 | 433289 | 7550184.128 | Portal Pad | Characterize NE CPR construction rock | 9.10 | 114 | Pyrite | 0.5% |
| 20-PP-06 | 433262 | 7550194.198 | Portal Pad | Characterize quarry 2 surface dressing on Madrid Shop Laydown Pad | 8.47 | 133 | Pyrite | trace |
| 20-PP-07 | 433251 | 7550211.19 | Portal Pad | Characterize NE CPR construction rock | 9.19 | 103 | Pyrite | 0.5% |
| 20-PP-08 | 433379 | 7550132.598 | Portal Pad | Characterize NE CPR construction rock | 9.13 | 82 | Pyrite | trace |
| 20-PP-09 | 433317 | 7550140.448 | Portal Pad | Characterize NE CPR construction rock | 9.15 | 252 | Pyrite | trace |
| 20-PP-10 | Duplicate of 20-PP-09 | | Portal Pad | Characterize NE CPR construction rock | 9.04 | 307 | | |
| 20-PP-11 | 433369 | 7550166.222 | Portal Pad | Characterize NE CPR construction rock | 8.61 | 184 | Pyrite | trace |
| 20-PP-12 | 433346 | 7550168.149 | Portal Pad | Characterize brine stained "underground rock" | 7.15 | 17500 | Pyrite | trace |

**Notes**
Coordinates Provided in NAD 83 UTM Zone 13N

## Appendix A1: SRK Portal Pad Field Data

| Sample ID | Sulph 2 | Sulph 2 % | Fizz Test (Groundmass) | Fizz Test on Carbonate +- Quartz Veins | Carbonate Color | Carbonate Occurrence | Weathering Intensity | Secondary Min | Color of -2mm Fraction |
|---|---|---|---|---|---|---|---|---|---|
| 20-PP-01 | | | None | weak | white | vein | weak | FeOx | grey |
| 20-PP-02 | | | weak | moderate | white | vein | weak | FeOx | dark greenish grey |
| 20-PP-03 | | | weak | moderate | white | vein | moderate | FeOx | dark greenish grey |
| 20-PP-04 | | | None | moderate | white | vein | weak | FeOx | dark greenish grey |
| 20-PP-05 | | | None | moderate | white | vein | weak | FeOx | brownish grey |
| 20-PP-06 | | | None | moderate | white | vein | weak | FeOx | grey |
| 20-PP-07 | | | None | moderate | white | vein | weak | FeOx | dark greenish grey |
| 20-PP-08 | | | None | moderate | white | vein | moderate | FeOx | dark greenish grey |
| 20-PP-09 | | | None | moderate | white | vein | weak | FeOx | grey |
| 20-PP-10 | | | | | | | | | |
| 20-PP-11 | | | None | weak | white | vein | weak | FeOx | grey |
| 20-PP-12 | | | None | weak | white | vein | weak | FeOx | dark grey |

# Appendix A1: SRK Portal Pad Field Data

| Sample ID | Rock Types | Geological Description |
|---|---|---|
| 20-PP-01 | 1a | Sample targeting quarry 2 crushed dressing material that was contaminated with drill brine spills. Visibly dark crushed 1a, no detectable odor or visible precipitate. Trace disseminated pyrite and weak fizz on occasional quartz-calcite veinlets. |
| 20-PP-02 | 1a>siltstone | NE CPR construction rock sample, directly above where brine plume exits the portal pad. Mix of 1a (95%) which has moderate fizz on quartz-calcite veinlets, weak fizz on groundmass, and trace finely disseminated pyrite and moderately silicified siltstone (5%) which has fine to mediumly disseminated pyrite. Weak fracture coating oxidation. |
| 20-PP-03 | 1a>siltstone | NE CPR construction rock sample, near where brine plume exits the portal pad. Mix of 1a (95%) which has moderate fizz on quartz-calcite veinlets, weak fizz on groundmass, and trace finely disseminated pyrite and moderately silicified siltstone (5%) which has fine to mediumly disseminated pyrite. Weak fracture coating oxidation. |
| 20-PP-04 | 1a>siltstone | NE CPR construction rock sample. Mix of 1a (90%) which has moderate fizz on quartz-calcite veinlets, weak fizz on groundmass, and trace finely disseminated pyrite and moderately silicified siltstone (10%) which has fine to mediumly disseminated pyrite. Weak fracture coating oxidation. |
| 20-PP-05 | 1a | NE CPR construction rock sample. Dark green to pistacio green colored weakly foliated 1a with 0.5% finely disseminated pyrite, weak epidote alteration, and moderate fizz on frequent calcite veinlets. |
| 20-PP-06 | 1a | Quarry 2 crushed surface dressing sample of Madrid shop laydown. Homogenous 1a with trace finely disseminated pyrite, abundant quartz-calcite veinlets, and very weak fracture coating oxidation. |
| 20-PP-07 | 1a | NE CPR construction rock sample. Dark green to pistacio green colored weakly foliated 1a with 0.5% finely disseminated pyrite, weak epidote alteration, and moderate fizz on frequent calcite veinlets. |
| 20-PP-08 | 1a | NE CPR construction rock sample. Homogenous 1a with trace finely disseminated pyrite, abundant quartz-calcite veinlets, and moderate fracture coating oxidation. |
| 20-PP-09 | 1a>siltstone | NE CPR construction rock sample. Mix of 1a (90%) which has moderate fizz on quartz-calcite veinlets, weak fizz on groundmass, and trace finely disseminated pyrite and moderately silicified siltstone (10%) which has fine to mediumly disseminated pyrite. Weak fracture coating oxidation. |
| 20-PP-10 | | Duplicate of 20-PP-09 |
| 20-PP-11 | gabbro>1a | NE CPR construction rock sample. Dark green to pistacio green colored weakly foliated 1a with 0.5% finely disseminated pyrite, weak epidote alteration, and moderate fizz on frequent calcite veinlets. |
| 20-PP-12 | 1a + gabbro | Dark brine-stained underground rock within lined area of portal pad. Noticeable "underground" odor. 1a and gabbro coated with black greasy coating. Adjacent to ponded brine water which had >20,000 uS/cm and neutral pH (7.02). |

## Appendix A2: SRK Field Meter Calibration Records

**Meter Used** Oakton PCTS 50

**Date** 9/6/2020
**Time** 7:30
**Comment** Calibrated before 20-pH-01 to 20-pH-10

| Buffer | Before Calibration | After Calibration |
|---|---|---|
| pH = 4.00 | 4.23 | 4.01 |
| pH = 7.00 | 7.23 | 7.01 |
| pH = 10.00 | 10.23 | 10.01 |
| cond = 1413 uS/cm | 1361 | 1413 |

**Date** 9/6/2020
**Time** 19:30
**Comment** Calibrated before 20-DOR-01 to 20-DOR-07 rinse tests, also acts as drift check after day of field work

| Buffer | Before Calibration | After Calibration |
|---|---|---|
| pH = 4.00 | 4.00 | 4.00 |
| pH = 7.00 | 7.01 | 7.00 |
| pH = 10.00 | 10.09 | 10.00 |
| cond = 1413 uS/cm | 1342 | 1413 |

**Date** 9/7/2020
**Time** 7:00
**Comment** Calibrated before 20-pH-11 to 20 pH-13 and seep-01 to seep-06

| Buffer | Before Calibration | After Calibration |
|---|---|---|
| pH = 4.00 | 4.21 | 4.00 |
| pH = 7.00 | 7.22 | 7.04 |
| pH = 10.00 | 10.18 | 10.00 |
| cond = 1413 uS/cm | 1419 | 1412 |

**Date** 9/7/2020
**Time** 19:00
**Comment** Calibrated before overburden, Nuna pad, Madrid WRP, and Portal pad rinse tests, also acts as drift check after day of field work

| Buffer | Before Calibration | After Calibration |
|---|---|---|
| pH = 4.00 | 4.05 | 4.00 |
| pH = 7.00 | 6.94 | 7.03 |
| pH = 10.00 | 10.24 | 10.09 |
| cond = 1413 uS/cm | 1403 | 1412 |

**Date** 9/7/2020
**Time** 19:30
**Comment** Drift check, performed after overburden and nuna pad rinse tests, before Madrid WRP and portal pad rinse tests

| Buffer | Before Calibration | After Calibration | |
|---|---|---|---|
| pH = 7.00 | 7.1 | 7.10 | Not recalibrated, within acceptable range |
| cond = 1413 uS/cm | 1330 | 1413 | Recalibrated |

# Appendix B TMAC Field Data

# Trench #1

# 20-MADPP-TR-01

# Sept 19, 2020

**GPS COORDINATES**

North End:

13W0433255; 7550195; 52m

Width: 2m

Depth: 2m

South End:

13W0433270; 7550152; 54m

Width: 2m

Depth: 2m

**Geological Mapping Description of Trench #1**

Mapping Direction North – South

**0-5m: 1a**

Weak rust alteration (1%). Week Epidote alteration (1%) Sericitzed Chert alteration (~3%)

40cm of crush overlay 1.5m of boulders and cobble.

5% 1aj

GPS Coordinates: 13W0433274; 7550196

**5-10m: 1a**

Up to 2% 1aj. 5% 5a, Trace PY associated with 5a

GPS Coordinates: 13W0433260; 7550184

## Appendix B1: TMAC Trench Logs and Sample Descriptions

**10-15m: 1a**

5% 1aj. 2% 5a with local 1% PY.

GPS Coordinates: 13W0433262; 7550173

**15-20m: 1a**

10% Metasediments. 7% 1aj. Trace 5a

GPS Coordinates: 13W0433262; 7550173

**20-25m: 1a**

Contains Metasediment zone. 1aj 5-10%. 1-2% 5a

GPS Coordinates: 13W0433262; 7550169

**25-30m: 1a**

1-2% 1aj. Trace hematite alteration

GPS Coordinates: 13W0433265; 7550164

**30-35m: 1a**

1-2% 1aj. <1% intercalated sediments.

GPS Coordinates: 13W0433268; 7552153

35-40m: 1a

2-3% 1aj. Sheared (13a) mafic material with intense sericite alteration and quartz flooding. (Potential MDZ 13am). Hematite stained. 5a (Chroritic seds) 5-10% Seds.

GPS Coordinates: 13W0433268; 7552153

# Appendix B1: TMAC Trench Logs and Sample Descriptions

## Geological Sample Descriptions of Trench #1

Sample Direction North –South

*** only large pebble to cobble sized rocks are described below. Fines are not described.

Sample#Y247807

0-5m: 1a, 1aj, some 5aj w/ garnet phenocrysts, 2% qtz along joints and faults (slickenlines). 1% hematite altered rock, 1% ser altered rock

Sample#Y247808

5-10m: dominantly 1a, with varying degrees of sericite alteration. 2% argillite (unit 5), tr. Py (disseminated and blebby along joints and slip planes)

Sample#Y247809

10-15m: dominantly 1a, varying degrees of sericite alteration (locally strong along joint surfaces, slip planes. 3% 1aj.

Sample#Y247810

15-20m:80% 1a (weak sericite alteration), 15% 1aj (intercalation of seds less than 5%), 2% argillite. 1% qtz veins.

Sample#Y247811

20-25m: 95% 1a, 4% 5a cobbles, 1% granite (hem/potassic alteration).

Sample#Y247812

25-30m: 95% 1a, 2% 5a, weak sericite alteration on mafics.

Sample#Y247813

30-35m: 90% 1a, 5% 1aj, 2% 5aj, 1% quartz, basalt is sericite altered.

## Appendix B1: TMAC Trench Logs and Sample Descriptions

Sample#Y247814

35-40m: 98% 1a, 2% 1aj, 1% Py along chlorite altered joint and slip surface

Sample#Y247815

40-45m: 95% 1a, 2% qtz veinlets, 4% 5a, 1% granite

# Trench #2

# 20-MADPP-TR-02

# Sept 19, 2020

**GPS COORDINATES**

North End:

13W0433299; 7550216; 46m

Width: 3.5m

Depth: 2m

South End:

13W0433309; 7550192; 46m

Width: 3.5m

Depth: 2m

**Geological Mapping Description of Trench #2**

Mapping Direction North – South

**0-5m: 1a**

50% 5aj, 25-30% Hematite alteration. Size ranges 5% Boulder, 25% Cobble, and 70% Fines

GPS coordinates: 13W0433297; 7550214; 45m

**5-10m: 1a**

75% 1a, 25% 5aj/1aj.

GPS Coordinates 13W0433301; 7550213; 45m

## Appendix B1: TMAC Trench Logs and Sample Descriptions

**10-15m: 1a**

60% mafic Volcanic with 25% silicate argillite stringers

10% Boulder 1a/1aj, 60% Cobble 1a, 30% Fines 1aj

GPS Coordinates: 13W0433308; 7550208; 53m

**15-20m: 5aj/1aj Metasediments**

25% Argillaceous fines, 10% Mafic Boulders and 65% mafic volcanic fines

GPS Coordinates: 13W0433306; 7550206; 55m

**20-25m: Mafic Volcanics**

75% Mafic Volcanic Cobble size, 10% mafic boulders with hematite alteration and 5% mafic fines

GPS Coordinates: 13W0433309; 7550203; 54m

**25-30m: Mafic Volcanics**

25% mafic boulders with hematite alteration, 50% mafic cobbles and 25% mafic fines

GPS Coordinates: 13W0433310; 7550200; 51m

**Geological Sample Descriptions of Trench #2**

Sample Direction North –South

Sample#247816

0-5m: 83% 1a, 10% hematite altered material, 5% argillite. 2% qtz veinlets

Sample#247817

5-10m: 40% 5aj, 60% 1a/1aj, small qtz veinlets. Weak sericite alteration throughout. <1% rock mass with strong hematite alteration

Sample#247818

10-15m:  3% 5a, 90% 1a, 3% qtz, 2% 1aj. 5% of material is intensely sericite altered.

Sample#247819

15-20m: 95% 1a/1aj, 3% 5a, 1% qtz veinlet

Sample#247820

20-25m: 92% 1a/1aj, 5% 5a, 1% granite. 2% quartz, weak hematite alteration on ~10% of material

Sample#247821

25-30m: 95% 1a, 3% 5a, 2% 1aj, trace disseminated Py in 1a host rock. Trace quartz veinlets

Sample#247822

30-32m: 99% 1a, <1% argillite

# Trench #3

# 20-MADPP-TR-03

# Sept 19, 2020

**GPS COORDINATES**

North End:

13W0433332; 7550224; 49m

Width: 3m

Depth: 2m

South End:

13W0433331; 7550198; 56m

Width: 3m

Depth: 2m

**Geological Mapping Description of Trench #3**

Mapping Direction North – South

0-5m: 1a

Predominately 80% Mafic volcanic, 5% 5aj-med grey silicified siltstone. 15% 1a fines-rust brown weathered material.

GPS Coordinates: 13W433331; 7550218; 45m

**5-10m: Mafic Volcanics**

80% Mafic. 5% mafic boulders, 60% Mafic cobles, 15% Mafic fines. 5% 5aj-Med grey silicified chert cobbles, 15% undistinguishable Mud

GPS Coordinates: 13W433331;7550213; 45m

## Appendix B1: TMAC Trench Logs and Sample Descriptions

### 10-15m: Mafic Volcanics

80% mafic Volcanics. 75% mafic boulders with hematite staining. 20% mafic cobble and 5% rusty brown mud.

GPS Coordinates 13W43334; 7550208; 45m

### 15-20m: Mafic Volcanics

10% mafic boulders with hematite staining, 75% cobble, 5% rusty brown mud. 5% 5a-Pink Brown 5a cherty boulders pocket at 16m.

GPS Coordinates: 13W43336; 7550202; 45m

### 20-25m: Mafic Volcanics

90% Mafic Volcanics. 10% Boulders, 70% cobble sized, 10$ fines with rust brouwn mud.

GPS Coordinates: 13W43338; 7550195; 45m

### 25-30m: Mafic Volcanics

85% Mafics, 5% 5aj boulders-dark grey silicified fine grained, 10% Cobble tp fine rusty brown hematite discoloration.

GPS Coordinates: 13W43334; 7550189; 45m

### Geological Sample Descriptions of Trench #3

Sample Direction North –South

Sample#Y247823

0-5m: 99% 1a, 1% 5a, qtz veinlets, strong hematite altered material

Sample#Y247824

5-10m: 95% 1a, 3% 5a, 2% 1aj. Some quartz mineralization along joint surface.

## Appendix B1: TMAC Trench Logs and Sample Descriptions

Sample#Y247825

10-15m: 1a. 2% material has strong hematite alteration. Tr quartz mineralization

Sample#Y247826

15-20m: 95% 1a, 1% chert/argillite , 3% 5a, 1% 1aj. 3% material has qtz veinlets

Sample#Y247827

20-25m: 95% 1a, 3% 1aj, 2% 5a, 2% material has quartz mineralization

Sample#Y24828

25-30m: 95% 1a (10% str sericite altered), 2% quartz veined material, 3% 5a. 1% disseminated Py mineralization within host rock

## Appendix B2: TMAC Trench and Sample Descriptions



| Trench ID | Sample ID | From | To | Northing | Easting | Pyrite | TMAC complete description |
|---|---|---|---|---|---|---|---|
| | | m | m | | | % | |
| 20-MADPP-TR-01 | Y247807 | 0 | 5 | 7550196 | 433274 | trace | Weak rust alteration (1%). Week Epidote alteration (1%) Sericitzed Chert alteration (~3%); 40cm of crush overlay 1.5m of boulders and cobble; 5% 1aj |
| 20-MADPP-TR-01 | Y247808 | 5 | 10 | 7550184 | 433260 | trace | Up to 2% 1aj. 5% 5a, Trace PY associated with 5a |
| 20-MADPP-TR-01 | Y247809 | 10 | 15 | 7550173 | 433262 | trace (1%) | 5% 1aj. 2% 5a with local 1% PY. |
| 20-MADPP-TR-01 | Y247810 | 15 | 20 | 7550173 | 433262 | | 10% Metasediments. 7% 1aj. Trace 5a |
| 20-MADPP-TR-01 | Y247811 | 20 | 25 | 7550169 | 433262 | | Contains Metasediment zone. 1aj 5-10%. 1-2% 5a |
| 20-MADPP-TR-01 | Y247812 | 25 | 30 | 7550164 | 433265 | | 1-2% 1aj. Trace hematite alteration |
| 20-MADPP-TR-01 | Y247813 | 30 | 35 | 7552153 | 433268 | | 1-2% 1aj. <1% intercalated sediments. |
| 20-MADPP-TR-01 | Y247814 | 35 | 40 | 7552153 | 433268 | trace | 2-3% 1aj. Sheared (13a) mafic material with intense sericite alteration and quartz flooding. (Potential MDZ 13am). Hematite stained. 5a (Chroritic seds) 5-10% Seds. |
| 20-MADPP-TR-01 | Y247815 | 40 | 45 | | | | |
| 20-MADPP-TR-02 | Y247816 | 0 | 5 | 7550214 | 433297 | | 50% 5aj, 25-30% Hematite alteration. Size ranges 5% Boulder, 25% Cobble, and 70% Fines |
| 20-MADPP-TR-02 | Y247817 | 5 | 10 | 7550213 | 433301 | | 75% 1a, 25% 5aj/1aj. |
| 20-MADPP-TR-02 | Y247818 | 10 | 15 | 7550208 | 433308 | | 60% mafic Volcanic with 25% silicate argillite stringers, 10% Boulder 1a/1aj, 60% Cobble 1a, 30% Fines 1aj |
| 20-MADPP-TR-02 | Y247819 | 15 | 20 | 7550206 | 433306 | | 25% Argillaceous fines, 10% Mafic Boulders and 65% mafic volcanic fines |
| 20-MADPP-TR-02 | Y247820 | 20 | 25 | 7550203 | 433309 | | 75% Mafic Volcanic Cobble size, 10% mafic boulders with hematite alteration and 5% mafic fines |
| 20-MADPP-TR-02 | Y247821 | 25 | 30 | 7550200 | 433310 | | 25% mafic boulders with hematite alteration, 50% mafic cobbles and 25% mafic fines |
| 20-MADPP-TR-02 | Y247822 | 30 | 32 | | | | |
| 20-MADPP-TR-03 | Y247823 | 0 | 5 | 7550218 | 433331 | | Predominately 80% Mafic volcanic, 5% 5aj-med grey silicified siltstone. 15% 1a fines-rust brown weathered material. |
| 20-MADPP-TR-03 | Y247824 | 5 | 10 | 7550213 | 433331 | | 80% Mafic. 5% mafic boulders, 60% Mafic cobles, 15% Mafic fines. 5% 5aj-Med grey silicified chert cobbles, 15% undistinguishable Mud |
| 20-MADPP-TR-03 | Y247825 | 10 | 15 | 7550208 | 433334 | | 80% mafic Volcanics. 75% mafic boulders with hematite staining. 20% mafic cobble and 5% rusty brown mud. |
| 20-MADPP-TR-03 | Y247826 | 15 | 20 | 7550202 | 433336 | | 10% mafic boulders with hematite staining, 75% cobble, 5% rusty brown mud. 5% 5a-Pink Brown 5a cherty boulders pocket at 16m. |
| 20-MADPP-TR-03 | Y247827 | 20 | 25 | 7550195 | 433338 | | 90% Mafic Volcanics. 10% Boulders, 70% cobble sized, 10$ fines with rust brouwn mud. |
| 20-MADPP-TR-03 | Y247828 | 25 | 30 | 7550189 | 433334 | 1% | 85% Mafics, 5% 5aj boulders-dark grey silicified fine grained, 10% Cobble tp fine rusty brown hematite discoloration. |

## Appendix B2: TMAC Trench and Sample Descriptions

| Trench ID | Sample ID | % Sediments | Sample description |
|---|---|---|---|
| | | | |
| 20-MADPP-TR-01 | Y247807 | >1? | 1a, 1aj, some 5aj w/ garnet phenocrysts, 2% qtz along joints and faults (slickenlines). 1% hematite altered rock, 1% ser altered rock |
| 20-MADPP-TR-01 | Y247808 | 2 | dominantly 1a, with varying degrees of sericite alteration. 2% argillite (unit 5), tr. Py (disseminated and blebby along joints and slip planes) |
| 20-MADPP-TR-01 | Y247809 | 3 | dominantly 1a, varying degrees of sericite alteration (locally strong along joint surfaces, slip planes. 3% 1aj. |
| 20-MADPP-TR-01 | Y247810 | 17 | 80% 1a (weak sericite alteration), 15% 1aj (intercalation of seds less than 5%), 2% argillite. 1% qtz veins. |
| 20-MADPP-TR-01 | Y247811 | 4 | 95% 1a, 4% 5a cobbles, 1% granite (hem/potassic alteration). |
| 20-MADPP-TR-01 | Y247812 | 1 | 95% 1a, 2% 5a, weak sericite alteration on mafics. |
| 20-MADPP-TR-01 | Y247813 | 7 | 90% 1a, 5% 1aj, 2% 5aj, 1% quartz, basalt is sericite altered. |
| 20-MADPP-TR-01 | Y247814 | 2 | 98% 1a, 2% 1aj, 1% Py along chlorite altered joint and slip surface |
| 20-MADPP-TR-01 | Y247815 | 4 | 95% 1a, 2% qtz veinlets, 4% 5a, 1% granite |
| 20-MADPP-TR-02 | Y247816 | 5 | 83% 1a, 10% hematite altered material, 5% argillite. 2% qtz veinlets |
| 20-MADPP-TR-02 | Y247817 | >40 | 40% 5aj, 60% 1a/1aj, small qtz veinlets. Weak sericite alteration throughout. <1% rock mass with strong hematite alteration |
| 20-MADPP-TR-02 | Y247818 | 5 | 3% 5a, 90% 1a, 3% qtz, 2% 1aj. 5% of material is intensely sericite altered. |
| 20-MADPP-TR-02 | Y247819 | >3 | 95% 1a/1aj, 3% 5a, 1% qtz veinlet |
| 20-MADPP-TR-02 | Y247820 | >5 | 92% 1a/1aj, 5% 5a, 1% granite. 2% quartz, weak hematite alteration on ~10% of material |
| 20-MADPP-TR-02 | Y247821 | 5 | 95% 1a, 3% 5a, 2% 1aj, trace disseminated Py in 1a host rock. Trace quartz veinlets |
| 20-MADPP-TR-02 | Y247822 | <1 | 99% 1a, <1% argillite |
| 20-MADPP-TR-03 | Y247823 | 1 | 99% 1a, 1% 5a, qtz veinlets, strong hematite altered material |
| 20-MADPP-TR-03 | Y247824 | 5 | 95% 1a, 3% 5a, 2% 1aj. Some quartz mineralization along joint surface. |
| 20-MADPP-TR-03 | Y247825 | 0 | 2% material has strong hematite alteration. Tr quartz mineralization |
| 20-MADPP-TR-03 | Y247826 | 5 | 95% 1a, 1% chert/argillite , 3% 5a, 1% 1aj. 3% material has qtz veinlets |
| 20-MADPP-TR-03 | Y247827 | 5 | 95% 1a, 3% 1aj, 2% 5a, 2% material has quartz mineralization |
| 20-MADPP-TR-03 | Y247828 | 3 | 95% 1a (10% str sericite altered), 2% quartz veined material, 3% 5a. 1% disseminated Py mineralization within host rock |

# Appendix C QA/QC Results

# Seepage Water Quality QA/QC Results

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Physical Test** | | |
| Method Blank (n=3) for TSS, (n=3) for TDS and (n=5) for Conductivity | <2X DL | All passed. |
| Pulp Duplicate (n=1) for Conductivity, (n=1) for pH and (n=1) for TDS | For samples >10X DL should be within +/-20% RPD | All passed. |
| Field pH vs. Lab pH (n=3) | Difference should not be greater than 1 pH unit | All passed. |
| Field EC vs Lab EC (n=3) | For samples > 10X the detection limit (DL), % RPD should be within +/-30% | Field Conductivity are OR |
| Standard Reference Materials (n=5) for Conductivity, (n=3) for TSS, (n=3) for TDS and (n=5) for pH | Within specified tolerance ranges. | All passed. |
| **Anions and Nutrients** | | |
| Method Blank (n=3) for Alkalinity, Total, (n=4) for Acidity (as CaCO3), (n=3) for Ammonia, Total, (n=1) for Cl, (n=3) for Nitrate (as N), (n=3) for Nitrite (as N), (n=3) for Sulfate (SO4), (n=2) for Br, (n=2) for F, and (n=3) for Phosphorus (P)-Total | <2X DL | All passed. |
| Pulp Duplicate (n=1) for Alkalinity, Total, (n=1) for Acidity (as CaCO3), (n=1) for Ammonia, Total, (n=1) for Cl, (n=1) for Nitrate (as N), (n=1) for Nitrite (as N), (n=1) for Sulfate (SO4), (n=1) for Br, (n=1) for F, and (n=2) for Phosphorus (P)-Total | For samples >10X DL should be within +/-20% RPD | All passed. |
| Ion Balance (n=3) | EC>100 uS/cm, % difference should be within +/-10% | All passed except for L2490476-3 - ion imbalance due to low Total Alkalinity |
| Standard Reference Materials (n=3) for Alkalinity, Total, (n=4) for Acidity (as CaCO3), (n=3) for Ammonia, Total, (n=3) for Cl, (n=3) for Nitrate (as N), (n=3) for Nitrite (as N), (n=3) for Sulfate (SO4), (n=2) for Br, (n=2) for F, and (n=3) for Phosphorus (P)-Total | Within specified tolerance ranges. | All passed. |
| **Trace Metals by ICP-MS** | | |
| Method Blank (n=4) for Dissolved Metals and (n=1) for Total Metals | <2X DL | All passed. |
| Pulp Duplicate (n=1) for Dissolved Metals | For samples >10X DL should be within +/-20% RPD | All passed. |
| Standard Reference Materials (n=4) for Dissolved Metals and (n=1) for Total Metals | Within specified tolerance ranges. | All passed. |
| **Hg-CVAAS** | | |
| Method Blank (n=3) for Dissolved Mercury and (n=1) for Total Mercury | <2X DL | All passed. |
| Pulp Duplicate (n=1) for Dissolved Mercury | For samples >10X DL should be within +/-20% RPD | Passed. |
| Standard Reference Materials (n=3) for Dissolved Mercury and (n=1) for Total Mercury | Within specified tolerance ranges. | All passed. |

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\!020_Project_Data\Lab\Madrid Seep Program\[Water Quality_Master_Summary_QAQC_mlt.xlsx]WQ_Master_

# ABA, Solids Content Following an Aqua Regia, and SFE QA/QC Results

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **paste pH** | | |
| Crush Duplicate (n=3) | For any samples, +/- 0.5 difference pH unit | All passed. |
| Pulp Duplicate (n=2) | For any samples, +/- 0.5 difference pH unit | All passed. |
| Standard Reference Material (n=2) | Within specified tolerance ranges. | All passed. |
| **Total C and TIC** | | |
| Method Blank (n=4) for TIC | <2X detection limit (DL) | All passed. |
| Crush Duplicate (n=3) for TIC | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Pulp Duplicate (n=4) for TIC | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed. |
| Standard Reference Material (n=4) for TIC | Within specified tolerance ranges. | All passed. |
| **Total S & Total Sulphate** | | |
| Method Blank (n=4) for Total S, (n=2) for SO4 | <2X detection limit (DL) | All passed. |
| Sulphur balance (total S > sulphate S) (n=34) | For samples > 10X the detection limit (DL), Total Sulphur should be greater than Total Sulphate, if not the % difference should be within +/-20% | All passed. |
| Crush Duplicate (n=3) for Total S and (n=3) for SO4 | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed. |
| Pulp Duplicate (n=4) for Total S and (n=3) for SO4 | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed. |
| Standard Reference Material (n=5) for Total S and (n=2) for SO4 | Within specified tolerance ranges. | All passed. |
| **Modified NP** | | |
| NP consistent with paste pH (n=34) | Negative NP has paste pH <= 5 | All passed. |
| Crush Duplicate (n=3) for NP and (n=3) for Fizz Rating | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Pulp Duplicate (n=1) for NP, (n=1) for Fizz test | % RPD better than +/-15% for NP>20 kg/t, % RPD better than +/-20% for NP>10 kg/t, Difference within +/-5kg/t for NP<10 kg/t. Fizz test rating is the same. | All passed. |
| Fizz test rating with NP (n=34) | Max NP does not exceed fizz test rating | All passed. |
| Standard Reference Material (n=2) for KZK-1 (Slight) | Within specified tolerance ranges. | All passed. |

| | | |
|---|---|---|
| **Modified NP and TIC** | | |
| Comparison between Modified NP and TIC (n=34) | Check for trends/co-relation | NP is generally higher than TIC, if not they are within +/-20% RPD |
| **Total S-Leco and S-ICP** | | |
| Comparison between Total S-Leco and S-ICP (n=34) | For samples >10X detection limit (DL), % RPD within +/-20% | All passed except Y247-823 which failed and is pending recheck data |
| **Trace Elements (Aqua Regia Digestion with ICP Finish)** | | |
| Method Blank (n=2) | <2X Detection Limit | All passed. |
| Crush Duplicate (n=3) | For samples >10X detection limit (DL), % RPD within +/-30%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| Pulp Duplicate (n=2) | For samples >10X detection limit (DL), % RPD within +/-20%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| Standard Reference Material (n=3) | Within +/-15 % Difference or within the tolerance ranges | All passed. |
| **Shake Flask Extraction** | | |
| Method Blank (n=2) | <5X Detection Limit | All passed. |
| Ion Balance (n=16) | EC>100uS/cm, % difference should be within +/-10% | All passed. |
| Leachate Duplicate (n=2) | For samples >10X detection limit (DL), % RPD within +/-20%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| Leachate Replicate (n=1) for SO4, (n=1) for Cl, (n=1) for Nitrate (as N) and (n=1) for Nitrite (as N), (n=1) for pH and (n=1) for EC | For samples >10X detection limit (DL), % RPD within +/-20%, For ICP metal scan, it is acceptable for 10% of parameters to be outside of this criterion. | All passed. |
| SO4-S vs S-ICP (n=16) | For samples > 10X the detection limit (DL), the % difference should be within +/-20% | All passed. |
| Standard Reference Material (n=1) | Within specified tolerance ranges. | All passed. |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\!020_Project_Data\Lab\SRK Solids Monitoring\Lab\QAQC files\[Solids_ABA_Master_SummaryQAQC_mlt.xlsx]Solids_Master

# Appendix D Seepage Water Quality Data

**Appendix D: Seepage Water Quality Data**

| Sampling Point | Area | Sub Area | WR Source (LNB) | WR Source Rationale | Sample Date | Start Time | Finish Time | Sample Matrix | Sampled By | Lab Reference | Field Observations | | | | | Field Measurements | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Weather | GPS Location | Coordinates (UTM Zone 13W) | | Description of Location | Field pH | Field Conductivity | ORP | Water Temperature | Water Colour | Turbidity |
| | | | | | | | | | | | | | | | | pH units | uS/cm | RmV | °C | - | - |
| 20-MAD-01 | Madrid | Portal pad | NE CPR | Geological inspection, TMAC records | 2-Jul-20 | 17:15 | 17:35 | Water | PJ | L2469515-3 | Sunny, calm 20 degrees Celsius | UTM zone 13 433367 7550210 | 433367 | 7550210 | Sample collected from base of raodway leading to main madrid portal pad. Flows Though large boulders and road crush. Approx. 2 m from culvert. | 5.95 | OR | 136 | 5.4 | clear/ light brown | none |
| 20-MAD-02 | Madrid | Portal pad | NE CPR | Geological inspection, TMAC records | 27-Jul-20 | 12:05 | - | Water | SW | L2480744-1 | - | UTM zone 13 433367 7550207 | 433367 | 7550207 | Emenating from base of access road to portal laydown; dead vegetation d/s of seep;small pools of water on tundra d/s of location. Very low flow volume; Flow hard to discern - potentially standing water at this point | 5.31 | OR | 114 | 10.3 | clear | none |
| 20-MAD-02 | Madrid Drainage Sampling | Portal pad | NE CPR | Geological inspection, TMAC records | 15-Aug-20 | 15:15 | - | Water | SW | L2490476-3 | Overcast, wind from NW. Heavy rain on Aug 14 throughout day. | - | - | - | Seep previously identified from toe of road leading to portal laydown. Flow present. | 5.55 | OR | 141 | 7.8 | - | - |

| Sampling Point | Field Measurements | | | | | | | | | | | | Sample Collections | | | | | | Physical Tests (Water) | | | | | Anions and Nutrients (Water) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Salt | Precipitates/ Stains | Odours | Photos Taken | Flow Measurement Calculations | t1 | t2 | t3 | t4 | Amount captured | Capture | Flow | Lab sample collected | Filtrate colour | Sediment colour | Number of filters used | Duplicate | Field Blank | Conductivity | Hardness | pH | Total Suspended Solids | Total Dissolved Solids | Acidity (as CaCO3) | Alkalinity, Total (as CaCO3) | Ammonia (as N) | Bromide (Br) | Chloride (Cl) | Fluoride (F) | Nitrate (as N) | Nitrite (as N) |
| | ppt | - | - | - | - | s | s | s | s | mL | % | L/s | - | - | - | - | - | - | uS/cm | as CaCO3 | pH unit | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | - | none | none | Yes | - | Unable to determine flow | - | - | - | - | - | - | Yes | Clear | Brown | 2 | No | No | 40100 | 23600 | 6.58 | 23.5 | 35200 | 79.9 | 85.1 | 97.8 | 14.7 | 17500 | <2 | 110 | 2.52 |
| 20-MAD-02 | - | none | none | - | - | Very low flow volume - flow hard to discern potentially standing water at this point. | - | - | - | - | - | - | Yes | Clear | Clear | - | No | No | 68200 | 45100 | 4.87 | 30.8 | 68200 | 1040 | 2.5 | 152 | 27.8 | 30800 | <2 | 202 | <0.1 |
| 20-MAD-02 | OR | Some red staining on rocks within water; red precipitate in small pool adjacent to seep; Small shallow seep. | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 34600 | 17800 | 5.55 | 18 | 22100 | 296 | 5.1 | 63.2 | - | 9680 | - | 61.7 | <0.10 |

| Sampling Point | Anions and Nutrients (Water) | | | Dissolved Metals (Water) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phosphorus (P)-Total | Sulfate (SO4) | Cyanide, Total | Dissolved Metals Filtration Location | Aluminum (Al)-Dissolved | Antimony (Sb)-Dissolved | Arsenic (As)-Dissolved | Barium (Ba)-Dissolved | Beryllium (Be)-Dissolved | Bismuth (Bi)-Dissolved | Boron (B)-Dissolved | Cadmium (Cd)-Dissolved | Calcium (Ca)-Dissolved | Cesium (Cs)-Dissolved | Chromium (Cr)-Dissolved | Cobalt (Co)-Dissolved | Copper (Cu)-Dissolved | Iron (Fe)-Dissolved | Lead (Pb)-Dissolved | Lithium (Li)-Dissolved | Magnesium (Mg)-Dissolved | Manganese (Mn)-Dissolved | Mercury (Hg)-Dissolved | Molybdenum (Mo)-Dissolved | Nickel (Ni)-Dissolved | Phosphorus (P)-Dissolved | Potassium (K)-Dissolved | Rubidium (Rb)-Dissolved | Selenium (Se)-Dissolved | Silicon (Si)-Dissolved | Silver (Ag)-Dissolved | Sodium (Na)-Dissolved |
| | mg/L | mg/L | mg/L | - | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | 0.124 | 68 | - | FIELD | 0.058 | <0.0050 | <0.0050 | 3 | <0.0010 | <0.0025 | <0.50 | 0.003 | 9120 | - | <0.0050 | 0.137 | <0.010 | <0.50 | <0.0025 | 0.141 | 206 | 22 | 0.0000124 | <0.0025 | 0.058 | <2.5 | 169 | - | 0.004 | 5 | <0.00050 | 513 |
| 20-MAD-02 | 0.0770 | 120 | - | FIELD | <0.050 | <0.0050 | <0.0050 | 0.197 | <0.0010 | <0.0025 | 2 | 0.002 | 1040 | - | <0.0050 | 0.033 | <0.010 | 15 | <0.0025 | <0.050 | 1980 | 5 | <0.0000050 | 0.028 | 0.086 | <2.5 | 448 | - | 0.003 | 3 | <0.00050 | 13600 |
| 20-MAD-02 | - | 69 | - | FIELD | 0.099 | <0.0020 | <0.0020 | 3 | <0.0020 | <0.0010 | 0.46 | 0.002 | 6680 | <0.00020 | <0.0020 | 0.265 | 0.004 | 161 | <0.0010 | 0.107 | 279 | 24 | 0.0000096 | <0.0010 | 0.116 | <1.0 | 126 | 0.065 | 0.003 | 5 | <0.00020 | 612 |

| Sampling Point | Dissolved Metals (Water) | | | | | | | | | | | | Total Metals (Water) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Strontium (Sr)-Dissolved | Sulfur (S)-Dissolved | Tellurium (Te)-Dissolved | Thallium (Tl)-Dissolved | Thorium (Th)-Dissolved | Tin (Sn)-Dissolved | Titanium (Ti)-Dissolved | Tungsten (W)-Dissolved | Uranium (U)-Dissolved | Vanadium (V)-Dissolved | Zinc (Zn)-Dissolved | Zirconium (Zr)-Dissolved | Aluminum (Al)-Total | Antimony (Sb)-Total | Arsenic (As)-Total | Barium (Ba)-Total | Beryllium (Be)-Total | Bismuth (Bi)-Total | Boron (B)-Total | Cadmium (Cd)-Total | Calcium (Ca)-Total | Cesium (Cs)-Total | Chromium (Cr)-Total | Cobalt (Co)-Total | Copper (Cu)-Total | Iron (Fe)-Total | Lead (Pb)-Total | Lithium (Li)-Total | Magnesium (Mg)-Total | Manganese (Mn)-Total | Mercury (Hg)-Total |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | 10 | 29 | - | <0.00050 | - | <0.0050 | <0.015 | - | <0.00050 | <0.025 | 0.334 | <0.010 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20-MAD-02 | 11 | 1280 | - | <0.00050 | - | <0.0050 | <0.015 | - | 0.0467 | <0.025 | <0.050 | <0.010 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20-MAD-02 | 8 | 39 | <0.0040 | <0.00020 | <0.0020 | <0.0020 | <0.0060 | <0.0020 | <0.00020 | <0.010 | 0.25 | <0.0040 | 0.136 | <0.0020 | <0.0020 | 3 | <0.0020 | <0.0010 | 0.440 | 0.002 | 6120 | <0.00020 | <0.0020 | 0.266 | <0.010 | 154 | <0.0010 | 0.091 | 252 | 23 | 0.00001 |

| Sampling Point | Total Metals (Water) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Molybdenum (Mo)-Total | Nickel (Ni)-Total | Phosphorus (P)-Total | Potassium (K)-Total | Rubidium (Rb)-Total | Selenium (Se)-Total | Silicon (Si)-Total | Silver (Ag)-Total | Sodium (Na)-Total | Strontium (Sr)-Total | Sulfur (S)-Total | Tellurium (Te)-Total | Thallium (Tl)-Total | Thorium (Th)-Total | Tin (Sn)-Total | Titanium (Ti)-Total | Tungsten (W)-Total | Uranium (U)-Total | Vanadium (V)-Total | Zinc (Zn)-Total | Zirconium (Zr)-Total |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| 20-MAD-01 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20-MAD-02 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20-MAD-02 | <0.0010 | 0.114 | <1.0 | 118 | 0.062 | 0.004 | 5 | <0.00020 | 567 | 7 | 33 | <0.0040 | <0.00020 | <0.0020 | <0.0020 | <0.0060 | <0.0020 | <0.00020 | <0.010 | 0.266 | <0.0040 |

# Appendix E ABA, Solids Content Following an Aqua Regia Digestion, and Shake-Flask Extraction Data

## Appendix E: ABA, Solids Content Following an Aqua Regia Digestion, and Shake-Flask Extraction Data

| Sample ID | ABA | | | | | | | | | | | | | | | Aqua Regia | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Paste pH | Total S | Total S_seds | SO4 | Sulphide Sulphur (by diff.) | AP - Tot S | AP - S2 | Fizz Rating | CO2 | TIC | Mod NP | TIC/AP_TotS | NP/AP_TotS | TIC/AP_S2 | NP/AP_S2 | As | Co | Ni | Zn | Mo | Cu | Pb | Ag | Mn | Fe | U | Au |
| | | | | | | Kg CaCO3/T | | | | | | Tot S | Tot S | S2 | S2 | | | | | | | | | | | | |
| | pH Units | wt% | | wt% | wt% | Calc. | Kg CaCO3/T | | wt% | Kg CaCO3/T | Kg CaCO3/T | Calc. | Calc. | Calc. | Calc. | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm | ppb |
| Y247822 | 9.18 | 0.16 | #REF! | 0.05 | 0.11 | 4.84 | 3.28 | STRONG | 0.96 | 80 | 90 | 16.52 | 18.58 | 24.38 | 27.43 | 4 | 55.4 | 145.6 | 75 | 0.35 | 99.8 | 1.7 | 0.04 | 1398 | 8.81 | 0.06 | 0.0019 |
| Y247825 | 9.03 | 0.17 | #N/A | 0.06 | 0.11 | 5.25 | 3.38 | STRONG | 1.09 | 90.83333333 | 97.9 | 17.30 | 18.65 | 26.91 | 29.01 | 7 | 50.8 | 110.6 | 89 | 0.41 | 98.9 | 2 | 0.04 | 1329 | 8.54 | 0.1 | 0.0077 |
| 20-PP-02 | 8.9 | 0.20 | 0.20 | 0.02 | 0.18 | 6.25 | 5.60 | STRONG | 7.3 | 165.9 | 188 | 26.54 | 30.08 | 29.63 | 33.57 | 9 | 55.5 | 223 | 88 | 0.3 | 95 | 1 | <0.1 | 1870 | 8.1 | <0.1 | 2.5 |
| 20-PP-03 | 8.99 | 0.23 | 0.23 | 0.02 | 0.21 | 7.19 | 6.60 | STRONG | 8.43 | 191.6 | 214 | 26.66 | 29.77 | 29.03 | 32.42 | 15 | 60 | 272 | 81 | 0.3 | 110 | 1.2 | <0.1 | 1920 | 8.04 | <0.1 | 9.7 |
| 20-PP-04 | 8.98 | 0.22 | 0.22 | 0.02 | 0.20 | 6.88 | 6.30 | STRONG | 8.32 | 189.1 | 205 | 27.51 | 29.82 | 30.02 | 32.54 | 11 | 64.9 | 328 | 84 | 0.3 | 128 | 1 | <0.1 | 2000 | 8.53 | <0.1 | 16.1 |
| 20-PP-09 | 9.08 | 0.71 | 0.71 | 0.01 | 0.70 | 22.19 | 21.90 | STRONG | 9.06 | 205.9 | 201 | 9.28 | 9.06 | 9.40 | 9.18 | 208 | 51.2 | 211 | 68 | 0.7 | 134 | 2.3 | <0.1 | 1290 | 7.89 | 0.2 | 222 |
| Y247807 | 8.27 | 0.17 | 0.165 | 0.06 | 0.11 | 5.16 | 3.28 | STRONG | 1.86 | 155 | 159.3 | 30.06 | 30.89 | 47.24 | 48.55 | 4 | 46.2 | 130.8 | 86 | 0.41 | 125.1 | 3 | 0.07 | 1250 | 6.58 | <0.05 | 0.0017 |
| Y247808 | 8.45 | 0.18 | 0.176 | 0.06 | 0.12 | 5.50 | 3.63 | STRONG | 1.81 | 150.8333333 | 158.7 | 27.42 | 28.85 | 41.61 | 43.78 | 6 | 45.8 | 113.3 | 85 | 0.35 | 119.7 | 2.7 | 0.08 | 1308 | 6.91 | 0.07 | 0.005 |
| Y247809 | 8.46 | 0.18 | 0.178 | 0.05 | 0.13 | 5.56 | 4.00 | STRONG | 1.68 | 140 | 143.4 | 25.17 | 25.78 | 35.00 | 35.85 | 5 | 46.3 | 114.9 | 86 | 0.37 | 116.3 | 2.6 | 0.08 | 1336 | 7.26 | 0.07 | 0.002 |
| Y247810 | 8.38 | 0.24 | 0.237 | 0.05 | 0.19 | 7.41 | 5.84 | STRONG | 1.81 | 150.8333333 | 148.4 | 20.37 | 20.04 | 25.81 | 25.39 | 7 | 44.5 | 87.5 | 100 | 0.52 | 114.5 | 2.6 | 0.07 | 1394 | 7.7 | 0.08 | 0.0024 |
| Y247811 | 8.42 | 0.22 | 0.222 | 0.06 | 0.16 | 6.94 | 5.06 | STRONG | 1.85 | 154.1666667 | 152.3 | 22.22 | 21.95 | 30.45 | 30.08 | 6 | 45.3 | 87.6 | 95 | 0.47 | 123.3 | 2.3 | 0.06 | 1386 | 7.64 | 0.07 | 0.006 |
| Y247812 | 8.36 | 0.17 | 0.173 | 0.06 | 0.11 | 5.41 | 3.53 | STRONG | 1.77 | 147.5 | 154.7 | 27.28 | 28.62 | 41.77 | 43.81 | 5 | 44.7 | 112.6 | 88 | 0.45 | 119.1 | 3.4 | 0.08 | 1307 | 7.01 | 0.07 | 0.0037 |
| Y247813 | 8.37 | 0.23 | 0.23 | 0.06 | 0.17 | 7.19 | 5.31 | STRONG | 1.72 | 143.3333333 | 144.8 | 19.94 | 20.15 | 26.98 | 27.26 | 7 | 45.7 | 97.6 | 95 | 0.38 | 113.9 | 2.2 | 0.06 | 1378 | 7.74 | 0.05 | 0.0043 |
| Y247814 | 8.21 | 0.18 | 0.175 | 0.06 | 0.12 | 5.47 | 3.59 | STRONG | 1.72 | 143.3333333 | 142.2 | 26.21 | 26.00 | 39.88 | 39.57 | 5 | 41.5 | 106.1 | 81 | 0.43 | 109.2 | 2.9 | 0.07 | 1238 | 6.42 | 0.08 | 0.0035 |
| Y247815 | 8.04 | 0.16 | 0.158 | 0.07 | 0.09 | 4.94 | 2.75 | STRONG | 1.81 | 150.8333333 | 149.9 | 30.55 | 30.36 | 54.85 | 54.51 | 6 | 38.2 | 89.6 | 100 | 0.55 | 95.1 | 8.4 | 0.11 | 1375 | 6.26 | 0.25 | 0.0018 |
| Y247816 | 8.6 | 0.24 | 0.235 | 0.06 | 0.18 | 7.34 | 5.47 | STRONG | 2.18 | 181.6666667 | 160 | 24.74 | 21.79 | 33.22 | 29.26 | 39 | 51.1 | 174.2 | 78 | 1.4 | 117 | 2.8 | 0.05 | 1388 | 8.37 | 0.15 | 0.0267 |
| Y247817 | 8.77 | 0.31 | 0.313 | 0.06 | 0.25 | 9.78 | 7.91 | STRONG | 1.7 | 141.6666667 | 131.9 | 14.48 | 13.48 | 17.92 | 16.68 | 31 | 53.2 | 189.3 | 75 | 0.34 | 115.5 | 2.5 | 0.08 | 1339 | 8.21 | 0.11 | 0.0642 |
| Y247818 | 8.89 | 0.41 | 0.411 | 0.06 | 0.35 | 12.84 | 10.97 | STRONG | 1.76 | 146.6666667 | 144.8 | 11.42 | 11.27 | 13.37 | 13.20 | 14 | 51.7 | 103 | 88 | 0.37 | 129.9 | 2.5 | 0.05 | 1490 | 8.98 | 0.1 | 0.0096 |
| Y247819 | 9.03 | 0.34 | 0.34 | 0.06 | 0.28 | 10.63 | 8.75 | STRONG | 1.43 | 119.1666667 | 124.5 | 11.22 | 11.72 | 13.62 | 14.23 | 9 | 53.6 | 114.4 | 88 | 0.42 | 105.9 | 2.4 | 0.05 | 1450 | 9.1 | 0.09 | 0.0039 |
| Y247820 | 9.16 | 0.31 | 0.306 | 0.06 | 0.25 | 9.56 | 7.69 | STRONG | 1.32 | 110 | 122.2 | 11.50 | 12.78 | 14.31 | 15.90 | 7 | 55.9 | 138.9 | 94 | 0.38 | 124.2 | 2.4 | 0.05 | 1434 | 8.78 | 0.07 | 0.0049 |
| Y247821 | 9.02 | 0.18 | 0.177 | 0.05 | 0.13 | 5.53 | 3.97 | STRONG | 1.05 | 87.5 | 94.8 | 15.82 | 17.14 | 22.05 | 23.89 | 4 | 55.3 | 135.5 | 84 | 0.39 | 92.4 | 1.5 | 0.04 | 1423 | 9.03 | 0.06 | 0.0013 |
| Y247823 | 8.83 | 0.17 | 0.166 | 0.06 | 0.11 | 5.19 | 3.31 | STRONG | 1.33 | 110.8333333 | 102.1 | 21.37 | 19.68 | 33.46 | 30.82 | 25 | 41.7 | 125.1 | 66 | 0.39 | 83.3 | 2.6 | 0.06 | 1066 | 6.52 | 0.26 | 0.183 |
| Y247824 | 8.97 | 0.23 | 0.232 | 0.06 | 0.17 | 7.25 | 5.38 | STRONG | 1.47 | 122.5 | 117.6 | 16.90 | 16.22 | 22.79 | 21.88 | 15 | 48.8 | 152.3 | 73 | 0.39 | 101.2 | 2.9 | 0.12 | 1326 | 7.73 | 0.88 | 0.5452 |
| Y247826 | 9.11 | 0.16 | 0.155 | 0.06 | 0.10 | 4.84 | 2.97 | STRONG | 1.09 | 90.83333333 | 97 | 18.75 | 20.03 | 30.60 | 32.67 | 5 | 51.8 | 113.7 | 115 | 0.36 | 102.7 | 18.6 | 0.05 | 1381 | 8.86 | 0.08 | 0.0018 |
| Y247827 | 9.12 | 0.14 | 0.142 | 0.05 | 0.09 | 4.44 | 2.88 | STRONG | 1.27 | 105.8333333 | 111.6 | 23.85 | 25.15 | 36.81 | 38.82 | 5 | 49 | 105.8 | 92 | 0.4 | 95.4 | 1.5 | 0.04 | 1426 | 8.47 | 0.07 | 0.0022 |
| Y247828 | 9.12 | 0.15 | 0.151 | 0.06 | 0.09 | 4.72 | 2.84 | STRONG | 1.2 | 100 | 97.9 | 21.19 | 20.75 | 35.16 | 34.43 | 6 | 52.9 | 145.8 | 72 | 0.31 | 103.7 | 1.8 | 0.04 | 1357 | 8.56 | 0.06 | 0.0024 |
| 20-PP-01 | 8.83 | 0.66 | #N/A | 0.02 | 0.64 | 20.63 | 20.00 | MODERATE | 4.94 | 112.3 | 124 | 5.44 | 6.01 | 5.62 | 6.20 | 16 | 44.3 | 104 | 74 | 0.8 | 124 | 3.3 | <0.1 | 1280 | 6.72 | 0.1 | 5.3 |
| 20-PP-05 | 9.09 | 0.12 | #N/A | 0.01 | 0.11 | 3.75 | 3.40 | STRONG | 6.48 | 147.3 | 172 | 39.28 | 45.87 | 43.32 | 50.59 | 4 | 43.3 | 172 | 70 | 0.5 | 111 | 2.7 | 0.1 | 1300 | 5.2 | <0.1 | 5.5 |
| 20-PP-06 | 8.68 | 0.25 | #N/A | 0.08 | 0.17 | 7.81 | 5.30 | STRONG | 5.39 | 122.5 | 150 | 15.68 | 19.20 | 23.11 | 28.30 | 5 | 42.7 | 47.6 | 114 | 0.6 | 104 | 1.4 | <0.1 | 1610 | 8.3 | <0.1 | 2 |
| 20-PP-07 | 9.07 | 0.13 | #N/A | 0.01 | 0.12 | 4.06 | 3.80 | MODERATE | 4.59 | 104.3 | 129 | 25.67 | 31.75 | 27.45 | 33.95 | 2 | 39.1 | 145 | 66 | 0.3 | 112 | 1.3 | <0.1 | 1190 | 5.21 | <0.1 | 2.2 |
| 20-PP-08 | 9.13 | 0.13 | #N/A | <0.01 | 0.13 | 4.06 | 4.10 | STRONG | 5.72 | 130 | 158 | 32.00 | 38.89 | 31.71 | 38.54 | 7 | 47.5 | 194 | 74 | 0.7 | 106 | 2.1 | <0.1 | 1450 | 5.92 | <0.1 | 3.4 |
| 20-PP-11 | 8.53 | 0.17 | #N/A | <0.01 | 0.17 | 5.31 | 5.30 | MODERATE | 4.64 | 105.5 | 129 | 19.86 | 24.28 | 19.91 | 24.34 | 11 | 31.1 | 99.3 | 112 | 0.4 | 86.8 | 3.3 | <0.1 | 1060 | 4.49 | 0.4 | 9.2 |
| 20-PP-12 | 7.4 | 0.57 | #N/A | 0.01 | 0.56 | 17.81 | 17.50 | MODERATE | 2.69 | 61.14 | 94.1 | 3.43 | 5.28 | 3.49 | 5.38 | 24 | 29.8 | 51.7 | 63 | 0.5 | 227 | 10.1 | 0.1 | 745 | 5.51 | <0.1 | 8.2 |

| Sample ID | Aqua Regia | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Th | Sr | Cd | Sb | Bi | V | Ca | P | La | Cr | Mg | Ba | Ti | B | Al | Na | K | W | Hg | Sc | Tl | S | Ga | Se | Te | Be | Bi | Ce | Cs | Ge | Hf | In |
| | ppm | ppm | ppm | ppm | ppm | ppm | % | % | ppm | ppm | % | ppm | % | ppm | % | % | % | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| Y247822 | 0.4 | 17.2 | 0.04 | 0.12 | 0.02 | 132 | 2.53 | 0.0333 | 4.3 | 163 | 5.3 | <10 | 0.143 | 26 | 4.42 | 0.05 | 0.04 | 0.06 | <0.005 | 11.2 | 0.02 | 0.16 | 9.67 | 0.4 | 0.01 | 0.13 | 0.02 | 11.35 | 0.16 | 0.14 | 0.18 | 0.037 |
| Y247825 | 0.6 | 22.2 | 0.06 | 0.07 | 0.04 | 160 | 2.96 | 0.0381 | 4.5 | 133 | 3.96 | 14 | 0.194 | 24 | 3.94 | 0.04 | 0.06 | <0.05 | <0.005 | 14.6 | 0.03 | 0.19 | 10.12 | 0.3 | 0.06 | 0.17 | 0.04 | 11.84 | 0.21 | 0.14 | 0.18 | 0.044 |
| 20-PP-02 | 0.4 | 41 | 0.1 | <0.1 | <0.1 | 174 | 6.07 | 0.032 | 5 | 299 | 4.22 | 6 | 0.113 | <20 | 4.32 | 0.012 | 0.03 | <0.1 | <0.01 | 17.6 | <0.1 | 0.16 | 12 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-03 | 0.4 | 57 | <0.1 | <0.1 | <0.1 | 187 | 7.68 | 0.035 | 6 | 385 | 3.59 | 10 | 0.138 | <20 | 4.04 | 0.015 | 0.04 | <0.1 | <0.01 | 19.4 | <0.1 | 0.2 | 12 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-04 | 0.3 | 57 | 0.1 | <0.1 | <0.1 | 205 | 7.68 | 0.037 | 6 | 478 | 3.73 | 10 | 0.166 | <20 | 4.24 | 0.013 | 0.03 | <0.1 | <0.01 | 20.7 | <0.1 | 0.19 | 13 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-09 | 1.2 | 97 | <0.1 | 0.3 | <0.1 | 206 | 4.99 | 0.055 | 10 | 142 | 4.01 | 33 | 0.11 | <20 | 2.72 | 0.022 | 0.15 | 0.1 | <0.01 | 17.7 | <0.1 | 0.67 | 12 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247807 | 0.2 | 23.5 | 0.2 | 0.06 | 0.03 | 128 | 5.66 | 0.0248 | 1.7 | 304 | 2.78 | <10 | 0.199 | 43 | 3.32 | 0.02 | 0.04 | 0.2 | <0.005 | 12 | 0.05 | 0.19 | 7.3 | 0.5 | 0.02 | 0.12 | 0.03 | 4.76 | 0.14 | 0.11 | 0.16 | 0.028 |
| Y247808 | 0.5 | 24.7 | 0.18 | 0.06 | 0.03 | 144 | 5.2 | 0.028 | 2.7 | 257 | 2.84 | <10 | 0.183 | 43 | 3.33 | 0.02 | 0.05 | 0.13 | <0.005 | 14.7 | 0.04 | 0.2 | 7.87 | 0.5 | 0.04 | 0.15 | 0.03 | 7.31 | 0.14 | 0.11 | 0.16 | 0.038 |
| Y247809 | 0.5 | 23.7 | 0.14 | 0.06 | 0.03 | 151 | 4.75 | 0.0291 | 2.8 | 257 | 3.04 | <10 | 0.192 | 55 | 3.52 | 0.02 | 0.05 | 0.15 | <0.005 | 15.1 | 0.04 | 0.17 | 8.35 | 0.4 | 0.03 | 0.17 | 0.03 | 7.45 | 0.18 | 0.11 | 0.17 | 0.036 |
| Y247810 | 0.5 | 23.9 | 0.16 | 0.06 | 0.04 | 172 | 4.78 | 0.035 | 3.4 | 179 | 2.94 | <10 | 0.154 | 40 | 3.46 | 0.02 | 0.05 | 0.1 | <0.005 | 18.2 | 0.04 | 0.24 | 9.5 | 0.5 | <0.01 | 0.18 | 0.04 | 9.22 | 0.17 | 0.1 | 0.14 | 0.051 |
| Y247811 | 0.4 | 24 | 0.13 | 0.06 | 0.05 | 175 | 4.84 | 0.0327 | 2.9 | 180 | 2.89 | <10 | 0.145 | 36 | 3.48 | 0.02 | 0.05 | 0.12 | <0.005 | 18.4 | 0.04 | 0.24 | 9.31 | 0.5 | 0.04 | 0.18 | 0.05 | 8.08 | 0.19 | 0.1 | 0.13 | 0.047 |
| Y247812 | 0.5 | 22.6 | 0.18 | 0.05 | 0.04 | 144 | 5.1 | 0.0273 | 3 | 256 | 2.91 | <10 | 0.188 | 53 | 3.46 | 0.02 | 0.05 | 0.13 | <0.005 | 14.8 | 0.04 | 0.18 | 7.94 | 0.4 | 0.04 | 0.16 | 0.04 | 7.86 | 0.17 | 0.09 | 0.16 | 0.035 |
| Y247813 | 0.3 | 22.1 | 0.11 | <0.05 | 0.04 | 172 | 4.66 | 0.0308 | 2.5 | 202 | 3 | <10 | 0.152 | 42 | 3.63 | 0.02 | 0.05 | 0.08 | <0.005 | 18.5 | 0.04 | 0.23 | 9.04 | 0.5 | 0.02 | 0.17 | 0.04 | 7.18 | 0.18 | 0.09 | 0.13 | 0.046 |
| Y247814 | 0.6 | 22.2 | 0.14 | 0.05 | 0.04 | 130 | 4.67 | 0.0282 | 3.2 | 225 | 2.65 | <10 | 0.145 | 45 | 3.1 | 0.02 | 0.05 | 0.08 | <0.005 | 13.1 | 0.04 | 0.19 | 7.16 | 0.4 | 0.05 | 0.15 | 0.04 | 8.27 | 0.17 | 0.09 | 0.13 | 0.036 |
| Y247815 | 2.2 | 29.6 | 0.32 | <0.05 | 0.04 | 124 | 4.41 | 0.0331 | 7.9 | 159 | 2.69 | 17 | 0.11 | 23 | 2.95 | 0.03 | 0.09 | 0.07 | <0.005 | 14.7 | 0.05 | 0.16 | 7.92 | 0.3 | 0.02 | 0.18 | 0.04 | 19.65 | 0.23 | 0.1 | 0.15 | 0.039 |
| Y247816 | 1.2 | 36.7 | 0.06 | 0.16 | 0.05 | 171 | 4.24 | 0.0437 | 6 | 172 | 3.47 | 13 | 0.079 | 22 | 3.31 | 0.03 | 0.09 | 0.14 | <0.005 | 20.7 | 0.03 | 0.26 | 9.8 | 0.4 | 0.02 | 0.28 | 0.05 | 15.39 | 0.28 | 0.09 | 0.12 | 0.057 |
| Y247817 | 0.8 | 31.7 | 0.06 | 0.11 | 0.07 | 150 | 3.59 | 0.0402 | 5.2 | 190 | 4.01 | 12 | 0.117 | 22 | 3.49 | 0.04 | 0.08 | 0.08 | <0.005 | 16 | 0.03 | 0.3 | 9.36 | 0.5 | 0.07 | 0.22 | 0.07 | 13.61 | 0.39 | 0.1 | 0.15 | 0.048 |
| Y247818 | 0.7 | 23.6 | 0.05 | 0.09 | 0.11 | 177 | 3.67 | 0.0389 | 4.7 | 101 | 3.89 | 10 | 0.098 | 25 | 3.86 | 0.03 | 0.07 | <0.05 | <0.005 | 19.8 | 0.03 | 0.41 | 10.93 | 0.7 | 0.03 | 0.22 | 0.11 | 12.77 | 0.34 | 0.11 | 0.13 | 0.066 |
| Y247819 | 0.5 | 18.7 | 0.04 | 0.1 | 0.11 | 169 | 3.28 | 0.038 | 4.6 | 126 | 4.32 | <10 | 0.113 | 31 | 4.15 | 0.05 | 0.07 | <0.05 | 0.005 | 16.9 | 0.03 | 0.35 | 10.85 | 0.6 | 0.08 | 0.18 | 0.11 | 12.25 | 0.29 | 0.12 | 0.15 | 0.057 |
| Y247820 | 0.3 | 19 | 0.17 | 0.09 | 0.08 | 152 | 3.65 | 0.0329 | 3.6 | 204 | 4.31 | 13 | 0.172 | 28 | 4.19 | 0.05 | 0.06 | <0.05 | <0.005 | 13.9 | 0.03 | 0.32 | 9.81 | 0.5 | 0.02 | 0.16 | 0.08 | 9.69 | 0.23 | 0.12 | 0.18 | 0.044 |
| Y247821 | 0.4 | 17.3 | 0.07 | 0.09 | 0.02 | 136 | 2.68 | 0.0342 | 4.2 | 150 | 5.15 | <10 | 0.152 | 24 | 4.42 | 0.05 | 0.04 | <0.05 | <0.005 | 11.6 | 0.03 | 0.16 | 10 | 0.3 | 0.02 | 0.13 | 0.02 | 11.26 | 0.15 | 0.14 | 0.17 | 0.038 |
| Y247823 | 2.1 | 31.2 | 0.09 | 0.07 | 0.04 | 105 | 3.04 | 0.038 | 7.8 | 145 | 3.32 | 18 | 0.13 | 19 | 2.94 | 0.05 | 0.11 | 0.09 | <0.005 | 10.7 | 0.05 | 0.21 | 7.65 | 0.3 | 0.02 | 0.17 | 0.04 | 19.07 | 0.36 | 0.09 | 0.19 | 0.033 |
| Y247824 | 1.2 | 30.6 | 0.05 | 0.1 | 0.05 | 142 | 3.55 | 0.0366 | 6.2 | 188 | 3.8 | 12 | 0.141 | 21 | 3.48 | 0.04 | 0.08 | 0.07 | <0.005 | 14.3 | 0.04 | 0.25 | 9.08 | 0.4 | <0.01 | 0.2 | 0.05 | 15.7 | 0.28 | 0.12 | 0.18 | 0.044 |
| Y247826 | 0.4 | 22.1 | 0.26 | 0.08 | 0.03 | 157 | 2.99 | 0.0375 | 4.2 | 132 | 4.3 | <10 | 0.196 | 23 | 4.12 | 0.05 | 0.05 | <0.05 | <0.005 | 14 | 0.02 | 0.17 | 10.08 | 0.4 | 0.02 | 0.17 | 0.03 | 11.26 | 0.19 | 0.14 | 0.2 | 0.042 |
| Y247827 | 0.5 | 19.5 | 0.24 | 0.07 | 0.02 | 149 | 3.1 | 0.0352 | 4.4 | 121 | 4.46 | <10 | 0.166 | 22 | 4.01 | 0.05 | 0.05 | <0.05 | <0.005 | 14.3 | 0.02 | 0.14 | 9.81 | 0.3 | 0.01 | 0.15 | 0.02 | 11.69 | 0.17 | 0.15 | 0.18 | 0.045 |
| Y247828 | 0.3 | 19.4 | 0.03 | 0.09 | 0.02 | 142 | 2.86 | 0.0344 | 4.2 | 174 | 4.86 | <10 | 0.131 | 24 | 4.06 | 0.05 | 0.04 | <0.05 | <0.005 | 13.4 | 0.04 | 0.18 | 9.55 | 0.4 | 0.03 | 0.15 | 0.02 | 11.36 | 0.16 | 0.14 | 0.15 | 0.042 |
| 20-PP-01 | 1 | 20 | <0.1 | 0.2 | 0.2 | 132 | 3.13 | 0.038 | 7 | 135 | 3.5 | 12 | 0.062 | <20 | 3.41 | 0.023 | 0.11 | <0.1 | <0.01 | 12.4 | <0.1 | 0.57 | 10 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-05 | 0.3 | 22 | 0.2 | <0.1 | <0.1 | 110 | 6.67 | 0.019 | 2 | 393 | 2.92 | 7 | 0.225 | 54 | 3.32 | 0.011 | 0.03 | 0.6 | <0.01 | 7.2 | <0.1 | 0.11 | 6 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-06 | 0.5 | 25 | <0.1 | <0.1 | <0.1 | 243 | 4.11 | 0.043 | 4 | 71 | 2.99 | 8 | 0.117 | <20 | 3.84 | 0.009 | 0.06 | <0.1 | <0.01 | 21.9 | <0.1 | 0.23 | 13 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-07 | 0.1 | 17 | 0.1 | <0.1 | <0.1 | 94 | 4.82 | 0.02 | <1 | 348 | 2.73 | 5 | 0.205 | <20 | 3.3 | 0.011 | 0.03 | <0.1 | <0.01 | 6 | <0.1 | 0.11 | 6 | 0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-08 | 0.2 | 24 | <0.1 | <0.1 | <0.1 | 146 | 5.98 | 0.02 | 2 | 499 | 3.74 | 7 | 0.241 | <20 | 3.9 | 0.011 | 0.02 | <0.1 | <0.01 | 11.8 | <0.1 | 0.1 | 9 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-11 | 2.7 | 23 | 0.4 | <0.1 | <0.1 | 103 | 4.72 | 0.028 | 9 | 276 | 2.58 | 23 | 0.169 | 108 | 2.85 | 0.02 | 0.1 | 0.4 | <0.01 | 8.3 | <0.1 | 0.14 | 6 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-12 | 0.6 | 52 | <0.1 | 0.6 | <0.1 | 216 | 3.48 | 0.046 | 4 | 71 | 1.53 | 17 | 0.371 | <20 | 2.35 | 0.213 | 0.12 | 0.2 | <0.01 | 7.6 | 0.2 | 0.52 | 8 | <0.5 | <0.2 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |

| Sample ID | Aqua Regia | | | | | | | MEND SFE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nb | Rb | Re | Sn | Ta | Y | Zr | Sample Weight | Volume Used | pH | pH_Seds | EC | EC_seds | SO4 | Acidity to pH4.5 | Acidity to pH8.3 | Total Alkalinity | Bicarbonate | Carbonate | Hydroxide | Dissolved Chloride | Dissolved Bromide | Total Ammonia | Nitrate-N | Nitrite-N | Hardness CaCO3 |
| | ppm | ppm | ppm | ppm | ppm | ppm | ppm | g | ml | pH Units | | uS/cm | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Y247822 | <0.05 | 1.6 | 0.002 | 0.2 | <0.01 | 15.22 | 4.6 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247825 | <0.05 | 2.6 | 0.002 | 0.3 | <0.01 | 11.7 | 5.2 | 250 | 750 | 9.11 | #N/A | 219 | #N/A | 24.9 | #N/A | #N/A | 51 | #N/A | #N/A | #N/A | 5.99 | #N/A | 0.09 | 2.14 | 0.035 | 8.8 |
| 20-PP-02 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 250 | 750 | 8.98 | 9.98 | 92 | 93 | 4.9 | <0.5 | <0.5 | 35 | 43 | <0.5 | <0.5 | 3.3 | 0.016 | 0.15 | 0.2 | <0.05 | 23.7 |
| 20-PP-03 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-04 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 250 | 750 | 8.97 | 9.97 | 83 | 84 | 5.3 | <0.5 | <0.5 | 29 | 35 | <0.5 | <0.5 | 3.4 | 0.016 | 0.081 | <0.2 | <0.05 | 23.5 |
| 20-PP-09 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247807 | 0.05 | 1.8 | 0.003 | 0.3 | <0.01 | 6.44 | 3.9 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247808 | 0.06 | 2.5 | 0.002 | 0.3 | <0.01 | 7.38 | 4 | 250 | 750 | 8.49 | 8.49 | 196 | 196 | 21.4 | #N/A | #N/A | 25 | #N/A | #N/A | #N/A | 17.7 | #N/A | 0.07 | 2.06 | 0.02 | 35.2 |
| Y247809 | 0.07 | 2.6 | 0.002 | 0.2 | <0.01 | 7.46 | 4.2 | 250 | 750 | 8.7 | 8.7 | 171 | 171 | 20.6 | #N/A | #N/A | 27 | #N/A | #N/A | #N/A | 13.1 | #N/A | 0.07 | 1.58 | 0.024 | 32.9 |
| Y247810 | <0.05 | 2.5 | 0.002 | 0.3 | <0.01 | 8.4 | 3.7 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247811 | <0.05 | 2.5 | 0.002 | 0.2 | <0.01 | 7.78 | 3.1 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247812 | 0.05 | 2.7 | 0.002 | 0.2 | <0.01 | 7.18 | 3.6 | 250 | 750 | 7.65 | 7.65 | 279 | 279 | 33.5 | #N/A | #N/A | 28.5 | #N/A | #N/A | #N/A | 31.7 | #N/A | 0.07 | 2.13 | 0.024 | 53.2 |
| Y247813 | <0.05 | 2.3 | 0.002 | 0.2 | <0.01 | 7.38 | 3 | 250 | 750 | 7.89 | 7.89 | 231 | 231 | 26.2 | #N/A | #N/A | 24.5 | #N/A | #N/A | #N/A | 27.8 | #N/A | 0.06 | 1.31 | 0.017 | 51.9 |
| Y247814 | 0.06 | 2.6 | 0.002 | 0.2 | <0.01 | 6.07 | 3.4 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247815 | 0.19 | 6 | 0.002 | 0.3 | <0.01 | 7.03 | 4.5 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247816 | <0.05 | 3.8 | 0.002 | 0.3 | <0.01 | 8.48 | 3.7 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247817 | <0.05 | 3.6 | 0.002 | 0.3 | <0.01 | 9.88 | 4.9 | 250 | 750 | 8.98 | 8.98 | 272 | 272 | 38.4 | #N/A | #N/A | 45.5 | #N/A | #N/A | #N/A | 11.2 | #N/A | 0.14 | 3.96 | 0.046 | 17.1 |
| Y247818 | <0.05 | 2.8 | 0.002 | 0.2 | <0.01 | 11.75 | 4.3 | 250 | 750 | 8.97 | 8.97 | 242 | 242 | 33.1 | #N/A | #N/A | 46 | #N/A | #N/A | #N/A | 9.97 | #N/A | 0.13 | 2.42 | 0.048 | 11.7 |
| Y247819 | <0.05 | 2.6 | 0.002 | 0.3 | <0.01 | 12.14 | 4.7 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247820 | <0.05 | 2.2 | 0.002 | 0.2 | <0.01 | 11.61 | 5 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247821 | <0.05 | 1.5 | 0.002 | 0.2 | <0.01 | 14.75 | 4.9 | 250 | 750 | 9.25 | 9.25 | 189 | 189 | 10.7 | #N/A | #N/A | 62 | #N/A | #N/A | #N/A | 3.38 | #N/A | 0.14 | 1.66 | 0.064 | 6.4 |
| Y247823 | 0.09 | 6.7 | 0.001 | 0.3 | <0.01 | 9.09 | 5.6 | 250 | 750 | 8.76 | 8.76 | 373 | 373 | 71.9 | #N/A | #N/A | 41 | #N/A | #N/A | #N/A | 19.8 | #N/A | 0.14 | 3.59 | 0.02 | 20.5 |
| Y247824 | 0.06 | 4.1 | 0.002 | 0.3 | <0.01 | 10.79 | 5.4 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247826 | <0.05 | 2 | 0.002 | 0.3 | <0.01 | 13.05 | 5.8 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247827 | <0.05 | 1.8 | 0.002 | 0.3 | <0.01 | 14.06 | 5 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247828 | <0.05 | 1.6 | 0.002 | 0.2 | <0.01 | 13.42 | 4.9 | - | - | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-01 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 250 | 750 | 9.03 | #N/A | 265 | #N/A | 72.3 | <0.5 | <0.5 | 25 | 31 | <0.5 | <0.5 | 8.6 | 0.043 | 0.077 | 2.1 | <0.05 | 39 |
| 20-PP-05 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 250 | 750 | 9.17 | #N/A | 87 | #N/A | 5.8 | <0.5 | <0.5 | 34 | 42 | <0.5 | <0.5 | 1.4 | <0.01 | 0.13 | 0.6 | 0.06 | 25.1 |
| 20-PP-06 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 250 | 750 | 8.78 | #N/A | 159 | #N/A | 23.4 | <0.5 | <0.5 | 24 | 29 | <0.5 | <0.5 | 14.6 | 0.024 | 0.33 | 1.5 | 0.1 | 54.6 |
| 20-PP-07 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-08 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-11 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-12 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 251 | 750 | 7.84 | #N/A | 6370 | #N/A | 41.4 | <0.5 | <0.5 | 43 | 53 | <0.5 | <0.5 | 1802 | 1.6 | 80 | 114 | <0.05 | 2530 |

| Sample ID | MEND SFE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dissolved Aluminum (Al) | Dissolved Antimony (Sb) | Dissolved Arsenic (As) | Dissolved Barium (Ba) | Dissolved Beryllium (Be) | Dissolved Bismuth (Bi) | Dissolved Boron (B) | Dissolved Cesium (Cs) | Dissolved Cadmium (Cd) | Dissolved Calcium (Ca) | Dissolved Chromium (Cr) | Dissolved Cobalt (Co) | Dissolved Copper (Cu) | Dissolved Lanthanum (La) | Dissolved Iron (Fe) | Dissolved Lead (Pb) |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Y247822 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247825 | 0.442 | 0.0003 | 0.014 | 0.0045 | <0.0001 | <0.0001 | 0.11 | #N/A | <0.00001 | 2.19 | <0.0005 | 0.00020 | 0.0033 | #N/A | 0.24 | <0.0005 |
| 20-PP-02 | 0.587 | 0.000508 | 0.0118 | 0.00256 | <0.00001 | <0.000005 | 0.051 | <0.00005 | <0.000005 | 6.9 | 0.00137 | 0.00039 | 0.0046 | 0.000078 | 0.387 | 0.000177 |
| 20-PP-03 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-04 | 0.355 | 0.000497 | 0.00997 | 0.00326 | <0.00001 | <0.000005 | <0.05 | <0.00005 | <0.000005 | 6.82 | 0.00013 | 0.00006 | 0.0011 | <0.00005 | 0.0161 | 0.0000481 |
| 20-PP-09 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247807 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247808 | 0.167 | 0.0002 | 0.0035 | 0.0009 | <0.0001 | <0.0001 | 0.18 | #N/A | <0.00001 | 9.87 | <0.0005 | 0.00010 | 0.0023 | #N/A | <0.02 | <0.0005 |
| Y247809 | 0.165 | 0.0002 | 0.0033 | 0.0009 | <0.0001 | <0.0001 | 0.16 | #N/A | <0.00001 | 9.26 | <0.0005 | 0.00010 | 0.0019 | #N/A | <0.02 | <0.0005 |
| Y247810 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247811 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247812 | 0.123 | 0.0003 | 0.0014 | 0.0015 | <0.0001 | <0.0001 | 0.34 | #N/A | <0.00001 | 15.2 | <0.0005 | 0.00020 | 0.0019 | #N/A | <0.02 | <0.0005 |
| Y247813 | 0.137 | 0.0003 | 0.0024 | 0.0012 | <0.0001 | <0.0001 | 0.24 | #N/A | <0.00001 | 15.7 | <0.0005 | 0.00010 | 0.0017 | #N/A | <0.02 | <0.0005 |
| Y247814 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247815 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247816 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247817 | 0.273 | 0.0008 | 0.0681 | 0.0017 | <0.0001 | <0.0001 | 0.19 | #N/A | <0.00001 | 4.33 | <0.0005 | 0.00020 | 0.0034 | #N/A | 0.11 | <0.0005 |
| Y247818 | 0.356 | 0.0005 | 0.0252 | 0.0014 | <0.0001 | <0.0001 | 0.16 | #N/A | <0.00001 | 3.07 | <0.0005 | 0.00020 | 0.0022 | #N/A | 0.15 | <0.0005 |
| Y247819 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247820 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247821 | 0.427 | 0.0003 | 0.0107 | 0.0008 | <0.0001 | <0.0001 | 0.12 | #N/A | <0.00001 | 1.34 | <0.0005 | 0.00030 | 0.0029 | #N/A | 0.36 | <0.0005 |
| Y247823 | 0.293 | 0.0005 | 0.051 | 0.0021 | <0.0001 | <0.0001 | 0.21 | #N/A | <0.00001 | 4.97 | <0.0005 | 0.00030 | 0.0048 | #N/A | 0.19 | <0.0005 |
| Y247824 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247826 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247827 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247828 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-01 | 0.257 | 0.000402 | 0.00548 | 0.0031 | <0.00001 | <0.000005 | 0.135 | <0.00005 | <0.000005 | 10.2 | <0.0001 | 0.00007 | 0.0014 | <0.00005 | 0.0155 | 0.0000167 |
| 20-PP-05 | 0.331 | 0.000497 | 0.00725 | 0.00128 | <0.00001 | <0.000005 | 0.156 | <0.00005 | <0.000005 | 7.21 | 0.00041 | 0.00015 | 0.0023 | <0.00005 | 0.0498 | 0.0000535 |
| 20-PP-06 | 0.232 | 0.000443 | 0.00154 | 0.00173 | <0.00001 | <0.000005 | 0.105 | <0.00005 | <0.000005 | 18.1 | <0.0001 | 0.00004 | 0.0011 | <0.00005 | 0.0024 | 0.0000081 |
| 20-PP-07 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-08 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-11 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-12 | 0.0362 | 0.00094 | 0.00096 | 0.067 | <0.00005 | <0.000025 | 0.88 | 0.0134 | 0.000186 | 968 | <0.0005 | 0.00121 | 0.0020 | <0.00025 | <0.005 | 0.000027 |

| Sample ID | MEND SFE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dissolved Lithium (Li) | Dissolved Magnesium (Mg) | Dissolved Manganese (Mn) | Dissolved Phosphorus (P) | Dissolved Molybdenum (Mo) | Dissolved Nickel (Ni) | Dissolved Potassium (K) | Dissolved Rubidium (Rb) | Dissolved Selenium (Se) | Dissolved Silicon (Si) | Dissolved Silver (Ag) | Dissolved Sodium (Na) | Dissolved Strontium (Sr) | Dissolved Sulphur (S) | Dissolved Tellurium (Te) |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Y247822 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247825 | 0.0009 | 0.8 | 0.0028 | <0.05 | 0.0024 | <0.0005 | 3.22 | #N/A | 0.0006 | 1.05 | <0.00008 | 35.8 | 0.0098 | 7.8 | <0.0002 |
| 20-PP-02 | 0.00089 | 1.56 | 0.0090 | 0.0141 | 0.0014 | 0.0017 | 1.62 | 0.00104 | 0.000513 | 1.29 | <0.000005 | 8.86 | 0.0162 | <10 | <0.00002 |
| 20-PP-03 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-04 | 0.00061 | 1.57 | 0.0016 | 0.0069 | 0.0016 | 0.0004 | 1.11 | 0.000786 | 0.00061 | 0.84 | <0.000005 | 6.42 | 0.0159 | <10 | <0.00002 |
| 20-PP-09 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247807 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247808 | 0.0012 | 2.56 | 0.0019 | <0.05 | 0.0021 | <0.0005 | 2.65 | #N/A | 0.0018 | 0.16 | <0.00008 | 16.1 | 0.0194 | 6.5 | <0.0002 |
| Y247809 | 0.0009 | 2.37 | 0.0020 | <0.05 | 0.0021 | <0.0005 | 2.15 | #N/A | 0.0009 | 0.22 | <0.00008 | 15.3 | 0.0188 | 6.4 | <0.0002 |
| Y247810 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247811 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247812 | 0.0018 | 3.71 | 0.0043 | <0.05 | 0.0032 | <0.0005 | 3.44 | #N/A | 0.0011 | 0.27 | <0.00008 | 24.1 | 0.0307 | 10.5 | <0.0002 |
| Y247813 | 0.0023 | 3.08 | 0.0037 | <0.05 | 0.0023 | <0.0005 | 3.54 | #N/A | 0.0005 | 0.06 | <0.00008 | 15.4 | 0.0286 | 8.1 | <0.0002 |
| Y247814 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247815 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247816 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247817 | 0.0014 | 1.52 | 0.0018 | <0.05 | 0.0028 | 0.0008 | 4.98 | #N/A | 0.0014 | 0.89 | <0.00008 | 42.7 | 0.0245 | 12.4 | <0.0002 |
| Y247818 | 0.001 | 0.98 | 0.0023 | <0.05 | 0.0026 | <0.0005 | 4.42 | #N/A | 0.0023 | 0.8 | <0.00008 | 37.9 | 0.0142 | 10.3 | <0.0002 |
| Y247819 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247820 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247821 | 0.001 | 0.73 | 0.0041 | <0.05 | 0.0032 | 0.0005 | 2.78 | #N/A | <0.0005 | 1.51 | <0.00008 | 33.8 | 0.0075 | 3.4 | <0.0002 |
| Y247823 | 0.0023 | 1.97 | 0.0030 | <0.05 | 0.0037 | 0.0010 | 5.24 | #N/A | 0.0008 | 1.21 | <0.00008 | 57.3 | 0.0278 | 22.7 | <0.0002 |
| Y247824 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247826 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247827 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247828 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-01 | 0.00209 | 3.27 | 0.0014 | 0.0071 | 0.0028 | 0.0002 | 6.96 | 0.00287 | 0.00204 | 0.79 | <0.000005 | 30.1 | 0.0328 | 22 | <0.00002 |
| 20-PP-05 | 0.00075 | 1.72 | 0.0022 | 0.0075 | 0.0027 | 0.0008 | 1.9 | 0.000822 | 0.000416 | 1.71 | <0.000005 | 6.8 | 0.0142 | <10 | <0.00002 |
| 20-PP-06 | 0.00466 | 2.24 | 0.0048 | 0.0063 | 0.0041 | 0.0002 | 3.78 | 0.00253 | 0.000476 | 0.61 | <0.000005 | 4.01 | 0.0302 | <10 | <0.00002 |
| 20-PP-07 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-08 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-11 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-12 | 0.47 | 27.7 | 0.3950 | 0.04 | 0.0067 | 0.0037 | 25.4 | 0.0654 | 0.00041 | 1.1 | <0.000025 | 179 | 7.58 | <50 | <0.0001 |

| Sample ID | MEND SFE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dissolved Thallium (Tl) | Dissolved Thorium (Th) | Dissolved Tin (Sn) | Dissolved Titanium (Ti) | Dissolved Tungsten (W) | Dissolved Uranium (U) | Dissolved Vanadium (V) | Dissolved Zinc (Zn) | Dissolved Zirconium (Zr) | Dissolved Mercury (Hg) |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Y247822 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247825 | <0.00005 | <0.0001 | <0.0005 | 0.0055 | 0.0002 | <0.00005 | 0.011 | 0.0010 | 0.0004 | <0.0005 |
| 20-PP-02 | 0.0000032 | 0.0000168 | <0.0002 | 0.00641 | 0.000226 | 0.0000819 | 0.0048 | 0.0015 | 0.0002 | <0.00005 |
| 20-PP-03 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-04 | <0.000002 | <0.000005 | <0.0002 | 0.00055 | 0.000154 | 0.0000067 | 0.00355 | 0.0002 | <0.0001 | <0.00005 |
| 20-PP-09 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247807 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247808 | <0.00005 | <0.0001 | <0.0005 | <0.0005 | 0.0016 | <0.00005 | 0.001 | <0.001 | <0.0001 | <0.0005 |
| Y247809 | <0.00005 | <0.0001 | <0.0005 | <0.0005 | 0.0023 | <0.00005 | 0.002 | <0.001 | <0.0001 | <0.0005 |
| Y247810 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247811 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247812 | <0.00005 | <0.0001 | <0.0005 | <0.0005 | 0.0018 | <0.00005 | 0.001 | <0.001 | <0.0001 | <0.0005 |
| Y247813 | <0.00005 | <0.0001 | <0.0005 | <0.0005 | 0.0008 | <0.00005 | <0.001 | <0.001 | <0.0001 | <0.0005 |
| Y247814 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247815 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247816 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247817 | <0.00005 | <0.0001 | <0.0005 | 0.0045 | 0.0004 | 0.00007 | 0.006 | <0.001 | <0.0001 | <0.0005 |
| Y247818 | <0.00005 | <0.0001 | <0.0005 | 0.0032 | 0.0002 | <0.00005 | 0.007 | <0.001 | 0.0003 | <0.0005 |
| Y247819 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247820 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247821 | <0.00005 | <0.0001 | <0.0005 | 0.0041 | 0.0002 | <0.00005 | 0.022 | <0.001 | <0.0001 | <0.0005 |
| Y247823 | <0.00005 | <0.0001 | <0.0005 | 0.0072 | 0.0005 | 0.00048 | 0.007 | <0.001 | 0.0002 | <0.0005 |
| Y247824 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247826 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247827 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Y247828 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-01 | 0.0000143 | <0.000005 | <0.0002 | 0.00067 | 0.000163 | 0.0000319 | 0.0019 | 0.0003 | <0.0001 | <0.00005 |
| 20-PP-05 | 0.0000095 | <0.000005 | <0.0002 | 0.00254 | 0.011 | 0.000136 | 0.00718 | 0.0005 | 0.00021 | <0.00005 |
| 20-PP-06 | 0.0000057 | <0.000005 | <0.0002 | <0.0005 | 0.000226 | 0.0000156 | 0.00082 | 0.0002 | <0.0001 | <0.00005 |
| 20-PP-07 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-08 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-11 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| 20-PP-12 | 0.000254 | <0.000025 | <0.001 | <0.0025 | 0.000683 | 0.000013 | <0.001 | 0.0029 | <0.0005 | <0.00025 |

# Appendix F 2020 Geochemical Monitoring of Flotation and Detoxified Tailings, Doris Mill

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# Technical Memo

March 19, 2021

| | |
|---|---|
| **To** | Sarah Warnock and Ashley Mathai, Hope Bay Project |
| **From** | Melanie Cox; Lisa Barazzuol, SRK |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | 2020 Geochemical Monitoring of Flotation and Detoxified Tailings, Doris Mill |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

TMAC initiated ore processing at the Doris mill and commenced deposition of flotation tailings in the Doris tailings impoundment area (TIA) in January 2017 and placement of detoxified tailings as backfill in stopes of the Doris Mine in February 2017. The geochemical monitoring of tailings commenced in February 2017. In October 2019, TMAC started processing ore from Madrid North (Naartok East Crown Pillar Recovery, NE CPR) at the Doris mill. Ore from the NE CPR is blended with Doris ore for processing at a target ratio of a maximum 25% Naartok East ore to 75% Doris ore. In 2020, a total of 364,982 t (dry weight equivalent) of flotation tailings were deposited in the Doris TIA and 17,886 t of detoxified tailings were placed as backfill in Doris Mine.

The geochemical monitoring program for flotation tailings slurry and detoxified tailings are specified in Schedule I, Tables 1 to 3 of NWB Type “A” Water Licence 2AM-DOH1335 Amendment No. 2 (the “Water Licence”, Nunavut Water Board 2018) and includes the following monitoring stations: process plant tailings water discharge (TL-5), flotation tailings solids (TL-6), detoxified tailings solids[1] (TL-7A), detoxified tailings filtrate (TL7-B) and seepage from underground backfilled stopes (TL-11)[2]. This memo documents the results of the 2020 geochemical monitoring of flotation and detoxified tailings at TL-5, TL-6, TL-7A, TL-7B and TL-11 and fulfills the reporting requirements outlined in Schedule B, Items 2a i, ii, iii and iv of the Water Licence.

[1] Detoxified tailings are referred to as cyanide leach residue in the Water Licence and prior to 2019 was monitored as station TL-7.

[2] Station TL7-B was added to the Water Licence as part of Amendment No. 2 and monitoring commenced in 2019.

# 2 Background

In the processing plant, there are two sections: the concentrate lines (CL1 and CL2) and the Concentrate Treatment Plant (CTP). Cyanide is a reagent used exclusively in the CTP to dissolve gold from the solid concentrate to be captured by resin. The concentrate lines (CL) react poorly to the presence of cyanide and so this side must be kept free of cyanide in order for the process to perform well. The final stage of the CTP is cyanide destruction. Cyanide is destroyed using the INCO $SO_2$ process. The detoxified slurry is filtered and the solids (TL-7A) are combined with waste rock and placed underground as permanent backfill. Seepage surveys are conducted bi-annually of the backfilled detoxified tailings (TL-11). The detoxified tailings filtrate (TL-7B) is pumped to the tailings thickener where it is combined with the flotation tailings slurry. Samples of TL-5 and TL-6 represent the tailings slurry supernatant and solids, respectively, that are discharged to the TIA. The detoxification circuit is run to produce a total cyanide level of less than one part per million (1 ppm). The solution from the detoxification circuit and final detoxified tailings are routinely analyzed for weak acid dissociable (WAD) and total cyanide species by mill personnel to monitor the performance of the cyanide detoxification circuit. Concentrations of free, WAD and total cyanide in the process plant tailings water discharge (TL-5) are reported monthly to the Nunavut Water Board and cyanate and thiocyanate are reported quarterly. Concentrations of cyanate, thiocyanate and WAD cyanide in the detoxified tailings filtrate (TL-7B) are analyzed monthly.

# 3 Methods

## 3.1 Sample Collection and Analysis

### 3.1.1 Tailings and Process Water

#### Process Plant Flotation Tailings Slurry Discharge: Solids (TL-6) and Supernatant (TL-5)

Schedule I (Table 3) of the Water Licence specifies weekly sampling of flotation tailings (TL-6) and monthly sampling of the process plant tailings supernatant (TL-5). Samples of the flotation tailings solids (TL-6) and the supernatant solution (TL-5) are collected from the flotation tailings thickener tank. The filtrate from the detox filter press (where detoxified tailings are dewatered) is pumped to the flotation tailings thickener tank prior to discharge to the TIA.

TMAC collects flotation tailings slurry from the tailings thickener tank in a clean 5-gallon bucket. The sample is left in the bucket to allow gravitational settling and separation of the tailings solids from the liquid. After settling, samples of supernatant solution (TL-5) and flotation tailings solids (TL-6) are collected at the frequency outlined above.

The tailings supernatant solution (TL-5) is sampled using a sterile 60 mL syringe and submitted to ALS Laboratory in Burnaby, BC[3] once per month for the analysis of pH, TSS, ammonia, nitrate, nitrite,

[3] Results for August, October, November and December 2020 are reported by ALS, Whitehorse, YT.

sulphate, cyanide (WAD, free and total), cyanate, thiocyanate, dissolved and total metals. The 2020 monitoring program for TL-5 included geochemical characterization of 12 monthly samples of tailings process supernatant collected from January to December with a duplicate sample collected in May 2020.

After sampling is completed for the tailings supernatant solution (TL-5), the remaining supernatant is discarded and a clean stainless-steel spoon is used to transfer the solid tailings into a clean plastic Ziploc bag supplied by the laboratory. The bag is then sealed and placed in a fridge until the last weekly sample for the month has been collected. At the end of each month, TMAC combines and homogenizes equal amounts of tailings from each weekly sample to create an approximately 500 g monthly composite sample of flotation tailings solids (TL-6).

The 2020 monitoring program for TL-6 included geochemical characterization of 12 monthly composites of flotation tailings collected from January to December with a duplicate sample collected in May 2020. Monthly flotation tailings solids (TL-6) composite samples were submitted in glass jars to Bureau Veritas Laboratory in Burnaby, BC for analysis of:

- Total sulphur – by Leco combustion;
- Sulphate sulphur – by hydrochloric acid leach;
- TIC – carbonate carbon by $CO_2$ hydrochloric acid leach; and
- Trace element content – by aqua regia digest (nitric and hydrochloric acid) with ICP-MS finish.

### Detoxified Tailings Solids (TL-7A) and Filtrate (TL-7B)

As a requirement of Water License 2AM-DOH1335 samples of the detoxified tailings produced in the process plant must be submitted for laboratory analysis. Schedule I of the Water Licence identifies the detoxified tailings solids component (TL-7A) and the filtrate liquid component (TL-7B) as compliance monitoring stations.

The 2020 monitoring program included geochemical characterization of twelve samples of detoxified tailings solids (TL-7A). The samples were collected each month between January and December with the exception of October 2020, two sampling rounds took place in November instead (3rd and 23rd November 2020). One duplicate sample was collected in May 2020. Twelve samples of filtrate (TL-7B) from the detoxified tailings were collected from January to December. One duplicate sample was collected in March 2020.

At the end of a detoxification cycle, TMAC collects one discrete sample of detoxified tailings solids (TL-7A) from the discharge compartment of the detoxification circuit filter press. A clean stainless-steel spoon is used to transfer the detoxified tailings solids into 125 mL glass sample jars supplied by the laboratory. Samples of the filtrate liquid component are collected from the receiving tank of the detoxification filter press using a 10 foot sampling pole with an open top 1 L poly bottle and then poured into four 500 mL settling bottles to allow gravitational settling and separation of residual tailings solids from the liquid. After settling, the filtrate (TL-7B) is transferred into laboratory supplied sample bottles either using a clean syringe or decanting the supernatant into the sample bottles.

Schedule I (Table 3) of the Water Licence specifies monitoring moisture content of the detoxified backfill tailings. However, a full geochemical characterization of TL-7A is required to inform the project closure planning, therefore, TMAC conducts monthly sampling and full analysis of the detoxified tailings solids (TL-7A) including moisture content, total sulphur, sulphate sulphur, TIC and trace element content at BV, Burnaby, BC using the same methods as TL-6. Laboratory data are provided in Attachment B. The filtrate from the detoxified tailings (TL-7B) is analyzed monthly according to the Water Licence monitoring requirements. Filtrate samples are submitted to ALS Laboratory for analysis of pH, ammonia, cyanide (WAD, free and total), cyanate, thiocyanate, and total metals (including sulphur)[4]. Full laboratory results are provided in Attachment C.

### 3.1.2 Seepage Survey of Underground Backfilled Stopes (TL-11)

Schedule I (Table 3) of the Water Licence specifies bi-annual seepage surveys of underground backfilled stopes with opportunistic sampling of seepage for the analysis of pH, electrical conductivity (EC), trace metals by ICP-MS, alkalinity, acidity, sulphate, total and WAD cyanide, total ammonia, nitrate and nitrite.

TMAC completed underground seepage inspections of backfilled stopes in July and December 2020. Visual surveys were conducted of all backfilled stopes that could be accessed safely at the time of the survey, i.e. not all backfill could be inspected. Four locations were sampled in July and two locations were sampled in December. During the July sampling survey, TMAC collected the following samples:

- Level 5002: There was no apparent seepage but a sample was collected from a pool at the bottom of the stope (TL-11A). This location is at the base of the vent raise so it is possible that surface water contributes to the pooled water.
- Level 4905: collected in the area where all Doris Crown Pillar Recover Trench (CPRT) stope drainage reports to. There was no apparent seep, but a sample was collected from pooled water that collected drainage from a few detoxified tailings backfilled stopes (TL-11B).
- Level 134: a sample was collected from an apparent seep observed flowing from the left side of the backfilled stope (TL-11C).
- Level 120: a sample was collected from an apparent seep at the toe of the backfilled stope (TL-11D). TMAC indicated there is a historic drillhole in the area of this stope which had not yet been grouted which may be a contributing a source of water inflow at this location.

In December, TMAC collected two samples during the underground survey from the following locations:

- Level 110, location E433757, N7558156 (TL-11A): TMAC observed a muck berm which was holding back an accumulated inflow pool from the backfilled stope and a clear, shallow seep from the base of the muck berm.

[4] Total Inorganic Carbon (TIC) is specified as a requirement for the filtrate analysis of TL-7B in the Water Licence however this is not an analytical parameter for aqueous samples but has been analyzed for detoxified tailings solids.

- Level 120, location E433718, N7558636 (TL-11B): TMAC observed clear, fast running channels from the toe of a backfilled stope. Sample TL-11B was collected where three small channels converged into one larger channel, estimated to represent approximately 75% of seepage from the toe. A historic drillhole in the area of this stope which had not yet been grouted may be a contributing source of water inflow at this location.

Field measurements of pH, EC, ORP, temperature and flow rate were recorded at each station. TMAC submitted samples to ALS in Burnaby, BC for analysis of pH, EC, TSS, TDS, alkalinity, chloride, sulphate, total, free and WAD cyanide, and dissolved and total metals. The sample for dissolved metals was filtered and preserved at the time of sampling. Laboratory data are provided in Attachment E.

## 3.2 Data Interpretation

The ratio of TIC to acid potential (AP) provides a measure of the acid rock drainage (ARD) potential of the sample. Samples are classified as non-potentially ARD generating (non-PAG) when TIC/AP ratios are greater than 3, as PAG when ratios are less than 1 and as having an uncertain potential for ARD when ratios are between 1 and 3 (MEND 2009).

# 4 Results and Discussion

## 4.1 Data QA/QC

### 4.1.1 Tailings Solids Samples (TL-6 and TL-7A)

The QA/QC program executed by the analytical laboratories and SRK is outlined in the SRK Expectations for Laboratory Geochemical Data Quality (SRK 2019). All solids data for the flotation (TL-6) and detoxified (TL-7A) tailings were reviewed by SRK for QA/QC. Table 4-1 presents the results of the QA/QC checks including comparison of duplicate sample pairs for the flotation (TL-6) and detoxified (TL-7A). The November 2020 TIC result for TL-6 was originally reported as anomalously low value but a recheck with the laboratory confirmed that this was an input error which was subsequently rectified. SRK considers the data acceptable.

### 4.1.2 Detoxified Tailings Filtrate (TL-7B)

All filtrate water quality data from the detoxified tailings (TL-7B) were reviewed by SRK for QA/QC. Table 4-2 presents the results of the QA/QC checks including a comparison of the duplicate sample collected in March 2020. All results were considered acceptable except for the March 2020 thiocyanate data which exceeded the acceptable RPD threshold when compared with the sample duplicate collected that month. The laboratory investigated the results and confirmed that there was a negative matrix interference in TL-7B for thiocyanate testing resulting in suspect data. The laboratory recommended that the sample should have been diluted 20x prior to analysis for proper quantification. The under-dilution therefore. The samples were disposed before a re-run could be requested but an

alternative handling procedure was flagged as a requirement for analyzing thiocyanate in future TL-7B samples.

### 4.1.3 Process Plant Tailings Supernatant (TL-5)

All supernatant water quality data from the flotation tailings (TL-5) were reviewed by SRK for QA/QC. Table 4-2 presents the results of the QA/QC checks including a comparison of the duplicate sample collected in May 2020. All data passed the QC criteria with the following exceptions:

- Field and laboratory EC values for two samples (October and November 2020) exceeded +/-30% RPD. The samples were re-analyzed and the data confirmed.
- Ion balance for the August 2020 sample was 14% and exceeded the acceptability criteria of +/-10%. The sample was disposed before a re-run could be undertaken.
- Alkalinity: the May duplicate sample exceeded +/-30% RPD for alkalinity and is assumed to be due to sample heterogeneity.
- Selenium: for the November sample, the dissolved concentration was greater than total selenium by more than an RPD% of +/-20%. This was observed in 2019 at TL-5 and was attributed to the introduction to contamination during field filtration (SRK 2020). However, ALS has suggested that there may be a positive bias for dissolved selenium data due to potential signal enhancement from volatile selenium species.

All data were accepted as reported.

### 4.1.4 Seepage Survey Samples (TL-11)

All seepage water quality data from the underground stopes (TL-11) were reviewed by SRK for QA/QC. Table 4-2 presents the results of the QA/QC checks including a comparison of the duplicate samples and analysis of the field blank samples collected in July and December 2020 (TL11-C-DUP, TL11-A-DUP-28Dec20 and TL11_FB). All data passed QC criteria except EC for two July samples. For these samples, the RPD% of field and lab EC data exceeded the +/-30% value. The laboratory verified the EC data through re-analysis. All data were accepted as reported.

**Table 4-1: QA/QC Summary for Solid Analysis of Flotation (TL-6) and Detoxified (TL-7A) Tailings**

| QC Test | SRK QC Criteria | TL-6 Results | TL-7A Results |
|---|---|---|---|
| **Total C and TIC** | | | |
| Lab Method Blank | <5X detection limit (DL) | All passed: Total Inorganic Carbon (n=12) | All passed: Total Inorganic Carbon (n=12) |
| Lab Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-20% | Passed: Total Inorganic Carbon (n=1) | All passed: Total Inorganic Carbon (n=2) |
| Field Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-30% | Passed: Total Inorganic Carbon (n=1) | Passed: Total Inorganic Carbon (n=1) |
| Standard reference materials | Within +/-20% Difference | All passed: Total Carbon (n=1) and Total Inorganic Carbon (n=13) | All passed: Total Inorganic Carbon (n=12) |
| **Total S & Sulphate** | | | |
| Lab Method Blank | <5X detection limit (DL) | All passed: Total Sulphur and Sulphate (n=12) | All passed: Total Sulphur and Sulphate (n=12) |
| Sulphur balance (Total Sulphate > Sulphate S) | For samples > 10X the detection limit (DL), Total Sulphur should be greater than Total Sulphate, if not then (sulphate-total S)/Total S> 20% | All passed: (n=12) | All passed: (n=13) |
| Lab Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-20% | All passed: Total Sulphur (n=1) and Sulphate (n=11) | All passed: Sulphate (n=12) |
| Field Duplicate | For samples > 10X the detection limit (DL), % RPD within +/-30% | All passed: Total Sulphur and Sulphate (n=1) | All passed: Total Sulphur and Sulphate (n=1) |
| Standard reference materials | Within +/-20% Difference | All passed: Total Sulphur (n=22) and Sulphate (n=14) | All passed: Total Sulphur (n=24) and Sulphate (n=16) |
| **Total S-Leco and S-ICP** | | | |
| Comparison between Total S-Leco and S-ICP | For samples >10X detection limit (DL), % RPD within +/-20% | All passed: (n= 12) | (n=13) Not assessed because S-ICP is over range. Data considered acceptable. |
| **Trace Element Content** | | | |
| Lab Method Blank | <5X Detection Limit | All passed: (n= 12) | All passed: (n= 12) |
| Lab Duplicate | For samples >10X detection limit (DL), % RPD within +/- 20%, ok 10% of metal scan failing. | (n=0) | All passed: (n= 2) |
| Field Duplicate | For samples >10X detection limit (DL), % RPD within +/- 30%, ok 10% of metal scan failing. | Passed: (n=1) | Passed: (n= 1) |
| Standard reference materials | Within specified tolerance ranges. | All passed: (n= 22) | All passed: (n= 24) |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\[1CT022.056_HopeBay_TailingsMonitoringData_2020_TL-6 & TL-7A_Summary QAQC_nv_mlt_Rev02.xlsx]Summary QA

**Table 4-2: QA/QC Summary for Process Plant Tailings Supernatant from Flotation Tailings (TL-5) and Backfilled Stope Seepage Samples (TL-11)**

| QC Test | SRK QC Criteria | TL-5 Results | TL-7B Results | TL-11 Results |
|---|---|---|---|---|
| **Physical Test[1]** | | | | |
| Field Blank | Minimum criteria <2X DL, will accept <5X DL | (n=0) | (n=0) | All passed: Total Suspended Solids, Total Dissolved Solids, Acidity, Total Alkalinity, pH and Conductivity (n=1) |
| Method Blank | <2X DL | All passed: Total Suspended Solids and Conductivity (n=12) | (n=0) | All passed: Total Suspended Solids, Acidity, Total Alkalinity (n=3); Total Dissolved Solids (n=1); Conductivity and Turbidity (n=2) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | All passed: Total Suspended Solids, pH and Conductivity (n=1) | All passed: pH (n=1) | All passed: Total Suspended Solids, Total Dissolved Solids, Acidity, Total Alkalinity, pH and Conductivity (n=2) |
| Lab Duplicate | For samples >10X DL should be within +/-20% RPD | All passed: Total Suspended Solids, pH and Conductivity (n=5) | All passed: pH (n=5) | All passed: Total Suspended Solids, Total Alkalinity, pH, Conductivity, Total Dissolved Solids (n=1); Acidity (n=2) |
| Field pH vs. Lab pH | Difference should not be greater than 1 pH unit | All passed: (n=11) | No field measurements except for November Passed: (n=1) | All passed: (n=6) |
| Field EC vs Lab EC | For samples > 10X the detection limit (DL), % RPD should be within +/-30% | No field measurements in June 2020. (n=11)<br><br>Failed: August & September 2020's field conductivity were over-range. January 2020 resulted in 44% RPD and >10X DL. Both lab and field conductivity have been confirmed. November 2020 resulted in 45% RPD and >10X DL. Both lab and field conductivity have been confirmed. | No field measurements | Field Conductivity over-range value for TL11-A, TL11-B, TL11-C, TL11-D (n=6). Data accepted.<br><br>TL11-A (L2477557-1) and TL11-B (L2477557-2) have >30% RPD and >10X DL. Lab rechecked and verified the value. Data accepted as is. |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All passed: Total Suspended Solids, pH and Conductivity (n=12) | All passed: pH (n=11) | All passed: Total Suspended Solids, Total Dissolved Solids, Acidity, Total Alkalinity, pH, Conductivity (n=3) |
| **Anions and Nutrients[2]** | | | | |
| Field Blank | Minimum criteria <2X DL, will accept <5X DL | (n=0) | (n=0) | All passed: Total Ammonia, Nitrate, Nitrite, Sulphate and Chloride (n=1) |
| Method Blank | <2X DL | All Passed: Total Alkalinity, Total Ammonia, Chloride, Nitrite, Sulphate and Nitrate (n=12); Phenolphthalein Alkalinity (n=6), Hydroxide Alkalinity, Carbonate Alkalinity (n=1); Bicarbonate Alkalinity (n=2) | All passed: Total Ammonia (n=10) | All passed: Total Ammonia, Nitrate, Nitrite, Sulphate and Chloride (n=3) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | All Passed: Total Alkalinity, Total Ammonia, Chloride, Nitrite, Sulphate, Nitrate, Phenolphthalein Alkalinity, Hydroxide Alkalinity, Carbonate Alkalinity (n=1); Bicarbonate Alkalinity (n=2).<br>Failed: L2444686 -38% RPD and >10x DL for Carbonate Alkalinity - difference assumed due to sample heterogeneity. | All passed: Total Ammonia (n=1) | All passed: Total Ammonia, Nitrate, Nitrite, Sulphate and Chloride (n=2) |
| Lab Duplicate | For samples >10X DL should be within +/-20% RPD | All passed: Total Ammonia, Chloride, Nitrate, Nitrite, Sulphate, Total Alkalinity (n=4) | All passed: Total Ammonia (n=5) | All passed: Total Ammonia, Nitrate, Nitrite, Sulphate and Chloride (n=1) |
| Ion Balance | EC>100 uS/cm, % difference should be within +/-10% | All Passed: (n=11)<br>Failed: August 2020 - Ion imbalance at 14% (anions lower than cations) values have been confirmed by data review, and there are no apparent errors. Samples have been disposed, so re-analysis was not possible. | No Dissolved Metals reported | All passed: (n=6) |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All passed: Total Ammonia, Nitrate, Nitrite, Sulphate, Chloride, Total Alkalinity, Phenolphthalein Alkalinity (n=6) | All passed: Total Ammonia (n=10) | All passed: Total Ammonia, Nitrate, Nitrite, Sulphate and Chloride (n=3) |
| **Cyanides[3]** | | | | |
| Field Blank | Minimum criteria <2X DL, will accept <5X DL | (n=0) | (n=0) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=1) |
| Method Blank | <2X DL | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=12); Cyanate (n=13); Thiocyanate (n=11) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide, Cyanate, Thiocyanate (n=11) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=3) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=1); Cyanate (n=3), Thiocyanate (n=1) | All passed: WAD Cyanide, Cyanate, Thiocyanate, Free Cyanide, Total Cyanide (n=1)<br>Failed: July 2020 - Thiocyanate has 34% RPD and >10x DL. Lab confirmed a matrix interference was noted in sample TL7B for thiocyanate and recommended a 20x dilution in future. Re-run not possible due to sample disposal. | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=2) |
| Lab Duplicate | For samples >10X DL should be within +/-20% RPD | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=5); Cyanate, Thiocyanate (n=6) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=5); Cyanate (n=11); Thiocyanate (n=7) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=1) |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=12); Cyanate (n=13); Thiocyanate (n=11) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide, Cyanate, Thiocyanate (n=11) | All passed: Weak Acid Diss., Cyanide, Total Cyanide, Free Cyanide (n=3) |
| **Trace Metals by ICP-MS and Hg-CVAAS** | | | | |
| Field Blank | Minimum criteria <2X DL, will accept <5X DL | (n=0) | (n=0) | All passed: Total and Dissolved (n=1) |
| Method Blank | <2X DL | All passed: Total and Dissolved (n=11) | All passed: Total (n=11) | All passed: Total and Dissolved (n=3) |
| Field Duplicate | For samples >10X DL should be within +/-30% RPD | All passed: Total and Dissolved (n=1) | All passed: Total (n=1) | All passed: Total and Dissolved TL11-A and TL11-B (n=2); Total and Dissolved TL11-C and TL11-D (n=1) |
| Lab Duplicate | For samples >10X DL should be within +/-20% RPD | All passed: Total (n=3) and Dissolved (n=4) | All passed: Total (n=5) | All passed: Total (n=1) and Dissolved (n=2) |
| Total vs Dissolved Metals | Total Metals>Dissolved metals. Total Metals should be greater than Dissolved Metals, if not the % difference should be within +/-20%. ALS would use 10X DL, Maxxam would use 5X DL | All passed: (n=11)<br>Failed: September 2020 - Dissolved Se >10x DL but Total Se <10x DL. Lab also noted the issue, positive bias on D-Se suspected due to signal enhancement from volatile selenium species. | No Dissolved Metals reported | All passed: Total and Dissolved (n=6) |
| Laboratory Control Sample and Certified Reference Material | Within specified tolerance ranges. | All passed: Total (n=12) and Dissolved (n=11) | All passed: Total (n=11) | All passed: Total and Dissolved (n=3) |

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## 4.2 Tailings Solids (TL-6 and TL-7A)

### 4.2.1 Acid Base Accounting

A summary of ABA results for the flotation tailings (TL-6) and detoxified tailings (TL-7A) solids are presented in Table 4-3 and Table 4-4, respectively. Full results are presented in Attachment A and Attachment B. In 2017 and 2018, tailings samples were analyzed at a different lab (ALS) using different analytical test work methods that resulted in results that were in some cases lower, e.g. TIC. Accordingly, parameters in Table 4-3 and Table 4-4 are presented by laboratory to account for analytical differences when data sets are not equivalent methods (SRK 2020). The methods used by BV are equivalent to the geochemical test work conducted on metallurgical tailings (SRK 2015).

**Table 4-3: Summary of ABA Results for Flotation Tailings (TL-6)**

| Year | Sampling Date | Moisture | Rinse pH | Total Sulphur | Sulphate | | TIC | | AP | TIC/AP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ALS(*) | BV | ALS | BV | | ALS | BV |
| | | % | pH | % | % S | % S | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | Ratio | Ratio |
| 2020 | Jan | -- | -- | 0.63 | -- | 0.02 | -- | 170 | 20 | -- | 8.9 |
| | Feb | -- | -- | 0.36 | -- | 0.02 | -- | 230 | 11 | -- | 20 |
| | Mar | -- | -- | 0.17 | -- | 0.02 | -- | 210 | 5.3 | -- | 40 |
| | Apr | -- | -- | 0.24 | -- | 0.02 | -- | 210 | 7.5 | -- | 28 |
| | May | -- | -- | 0.29 | -- | 0.01 | -- | 220 | 9.1 | -- | 24 |
| | Jun | -- | -- | 0.36 | -- | 0.02 | -- | 220 | 11 | -- | 20 |
| | Jul | -- | -- | 0.26 | -- | 0.02 | -- | 230 | 8.1 | -- | 28 |
| | Aug | -- | -- | 0.18 | -- | 0.03 | -- | 210 | 5.6 | -- | 37 |
| | Sep | -- | -- | 0.20 | -- | 0.02 | -- | 220 | 6.3 | -- | 35 |
| | Oct | -- | -- | 0.07 | -- | 0.02 | -- | 290 | 2.2 | -- | 130 |
| | Nov | -- | -- | 0.17 | -- | 0.03 | -- | 250 | 5.3 | -- | 48 |
| | Dec | -- | -- | 0.20 | -- | 0.02 | -- | 260 | 6.3 | -- | 41 |
| **Statistical Summary** | | | | | | | | | | | |
| 2020 | P005 | -- | -- | 0.13 | -- | 0.02 | -- | 190 | 3.9 | -- | 15.0 |
| | P050 | -- | -- | 0.22 | -- | 0.02 | -- | 220 | 6.9 | -- | 32 |
| | P095 | -- | -- | 0.48 | -- | 0.03 | -- | 270 | 15 | -- | 86 |
| | P100 | -- | -- | 0.63 | -- | 0.03 | -- | 290 | 20 | -- | 130 |
| | n | -- | -- | 12 | -- | 12 | -- | 12 | 12 | -- | 12 |
| 2019 | P005 | -- | -- | 0.13 | -- | 0.01 | -- | 100 | 3.4 | -- | 11 |
| | P050 | -- | -- | 0.24 | -- | 0.02 | -- | 140 | 7.7 | -- | 17 |
| | P095 | -- | -- | 0.45 | -- | 0.04 | -- | 210 | 14 | -- | 48 |
| | P100 | -- | -- | 0.53 | -- | 0.04 | -- | 220 | 17 | -- | 72 |
| | n | -- | -- | 12 | -- | 12 | -- | 12 | 12 | -- | 12 |
| 2018 | P005 | 15 | 9.0 | 0.05 | 0.01 | 0.01 | 57 | 77 | 1.6 | 36 | 8.1 |
| | P050 | 19 | 9.1 | 0.10 | 0.01 | 0.02 | 58 | 97 | 3.1 | 37 | 28 |
| | P095 | 27 | 9.2 | 0.71 | 0.02 | 0.05 | 66 | 140 | 22 | 37 | 41 |
| | P100 | 27 | 9.2 | 1.40 | 0.02 | 0.06 | 67 | 140 | 43 | 37 | 42 |
| | n | 5 | 3 | 12 | 3 | 9 | 3 | 9 | 12 | 3 | 9.0 |
| 2017 | P005 | 21 | 8.8 | 0.05 | 0.01 | -- | 43 | -- | 1.6 | 1.7 | -- |
| | P050 | 24 | 9.0 | 0.07 | 0.02 | -- | 63 | -- | 2.2 | 25 | -- |
| | P095 | 26 | 9.3 | 0.86 | 0.02 | -- | 92 | -- | 27 | 48 | -- |
| | P100 | 27 | 9.3 | 1.0 | 0.02 | -- | 110 | -- | 33 | 48 | -- |
| | n | 11 | 11 | 11 | 11 | -- | 11 | -- | 11 | 11 | -- |

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Notes:

AP calculation is based upon total sulphur

(*) ALS sulphate values updated to units of %S.

Results from ALS and Bureau Veritas presented separately when methods were not comparable.

"-" denotes sample not analyzed.

**Table 4-4: Summary of ABA Results for Detoxified Tailings (TL-7A)**

| Year | Sampling Date | Moisture | Rinse pH | Total Sulphur | Sulphate | | TIC | | AP | TIC/AP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ALS | ALS(*) | BV | ALS | BV | | ALS | BV |
| | | % | pH | % | % S | % S | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | Ratio | Ratio |
| 2020 | Jan | 22 | -- | 15 | -- | 0.15 | -- | 150 | 450 | -- | 0.33 |
| | Feb | 21 | -- | 25 | -- | 0.20 | -- | 130 | 790 | -- | 0.17 |
| | Mar | 18 | -- | 20 | -- | 0.13 | -- | 180 | 630 | -- | 0.29 |
| | Apr | 21 | -- | 20 | -- | 0.14 | -- | 170 | 630 | -- | 0.27 |
| | May | 19 | -- | 17 | -- | 0.13 | -- | 180 | 520 | -- | 0.36 |
| | Jun | 16 | -- | 28 | -- | 0.08 | -- | 140 | 870 | -- | 0.16 |
| | Jul | 20 | -- | 20 | -- | 0.20 | -- | 170 | 620 | -- | 0.27 |
| | Aug | 38 | -- | 17 | -- | 0.46 | -- | 130 | 520 | -- | 0.25 |
| | Sep | 13 | -- | 34 | -- | 0.13 | -- | 96 | 1000 | -- | 0.09 |
| | Oct | 19 | -- | 21 | -- | 0.06 | -- | 180 | 660 | -- | 0.27 |
| | Nov | 20 | -- | 26 | -- | 0.20 | -- | 130 | 810 | -- | 0.16 |
| | Dec | 17 | -- | 22 | -- | 0.14 | -- | 160 | 680 | -- | 0.24 |
| **Statistical Summary** | | | | | | | | | | | |
| 2020 | P005 | 15 | -- | 16 | -- | 0.07 | -- | 110 | 490 | -- | 0.13 |
| | P050 | 20 | -- | 21 | -- | 0.14 | -- | 160 | 640 | -- | 0.26 |
| | P095 | 29 | -- | 30 | -- | 0.32 | -- | 180 | 950 | -- | 0.34 |
| | P100 | 38 | -- | 34 | -- | 0.46 | -- | 180 | 1000 | -- | 0.36 |
| | n | 12 | -- | 12 | -- | 12 | -- | 12 | 12 | -- | 12 |
| 2019 | P005 | 19 | -- | 11 | -- | 0.12 | -- | 83 | 330 | -- | 0.12 |
| | P050 | 24 | -- | 17 | -- | 0.21 | -- | 130 | 540 | -- | 0.27 |
| | P095 | 38 | -- | 23 | -- | 0.28 | -- | 160 | 730 | -- | 0.50 |
| | P100 | 54 | -- | 25 | -- | 0.29 | -- | 170 | 770 | -- | 0.57 |
| | n | 12 | -- | 12 | -- | 12 | -- | 12 | 12 | -- | 12 |
| 2018 | P005 | 19 | 8.4 | 4.6 | 0.04 | 0.09 | 60 | 76 | 140 | 0.22 | 0.12 |
| | P050 | 21 | 8.9 | 13 | 0.07 | 0.20 | 67 | 110 | 420 | 0.37 | 0.24 |
| | P095 | 26 | 9.0 | 23 | 0.10 | 0.26 | 82 | 140 | 700 | 0.60 | 0.34 |
| | P100 | 26 | 9.0 | 23 | 0.10 | 0.27 | 84 | 140 | 720 | 0.64 | 0.37 |
| | n | 13 | 4 | 13 | 4 | 9 | 4 | 9 | 13 | 4 | 9 |
| 2017 | P005 | 20 | 8.1 | 2.9 | 0.05 | -- | 51 | -- | 92 | 0.10 | -- |
| | P050 | 24 | 8.4 | 7.9 | 0.09 | -- | 75 | -- | 250 | 0.32 | -- |
| | P095 | 26 | 9.2 | 17 | 0.13 | -- | 81 | -- | 530 | 0.81 | -- |
| | P100 | 27 | 9.4 | 19 | 0.14 | -- | 82 | -- | 610 | 1.0 | -- |
| | n | 11 | 11 | 11 | 11 | -- | 11 | -- | 11 | 11 | -- |

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Notes:

AP calculation is based upon total sulphur

(*) ALS sulphate values updated to reflect a change in units from % $SO_4$ to % $SO_4$ as S.

Results from ALS and Bureau Veritas presented separately when methods were not comparable.

"-" denotes sample not analyzed.

### Flotation Tailings (TL-6)

Total sulphur in the flotation tailings (TL-6) ranged between a minimum of 0.07% in October and a maximum of 0.63% in January with a median value of 0.22% (Figure 4-1). Sulphate sulphur content was near analytical detection (0.01%) resulting in total sulphur content at near parity with sulphide sulphur content (which is calculated as the difference between total sulphur and sulphate sulphur). This indicates that the majority of sulphur is present as sulphide sulphur (Figure 4-2) and on this basis, total sulphur is used to calculate AP.

In 2020, TIC content ranged between 170 and 290 kg $CaCO_3$/t and was generally equivalent to 2019 except for higher observed values in October to December 2020 (Figure 4-3). TIC content in the flotation tailings (TL-6) was greater than the detoxified tailings (TL-7A) with the exception of January 2020 when results were near equivalent. Figure 4-4 shows that all flotation tailings samples were classified as non-PAG. The non-PAG classifications are consistent with the ARD classifications of the metallurgical flotation tailings characterized as part of the Type A Water Licence Amendment (SRK 2015).

### Detoxified Tailings (TL-7A)

Total sulphur content in the detoxified tailings (TL-7A) was consistent with the 2019 monitoring data (Figure 4-1), ranging between a minimum of 15% (January 2020) and a maximum of 34 % (September 2020) (Table 4-4).

Sulphate sulphur ranged between 0.06 and 0.46% and possibly represents sulphate that is a by-product of the cyanide detoxification process and is present in the residual moisture in tailings. This low sulphate content relative to the total sulphur content means that total sulphur and sulphide sulphur are at near parity for the detoxified tailings (Figure 4-2). Accordingly, total sulphur was used to calculate AP.

TIC content ranged between 96 and 184 kg $CaCO_3$/t and oscillated throughout 2020 but there were no apparent trend (Figure 4-3). TIC content in 2020 was within the range of the 2019 samples. Consistent with the ARD classifications of the metallurgical tailings characterized as part of the Type A Water Licence Amendment (SRK 2015), all detoxified tailings were classified as PAG (Figure 4-4).

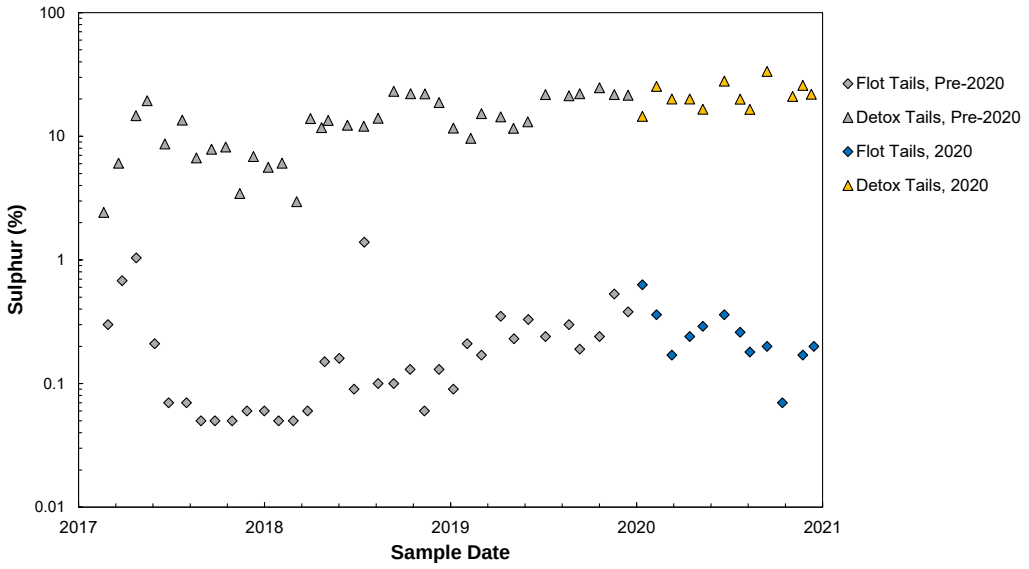


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**Figure 4-1: Sulphur Concentrations for Tailings Samples Over Time**

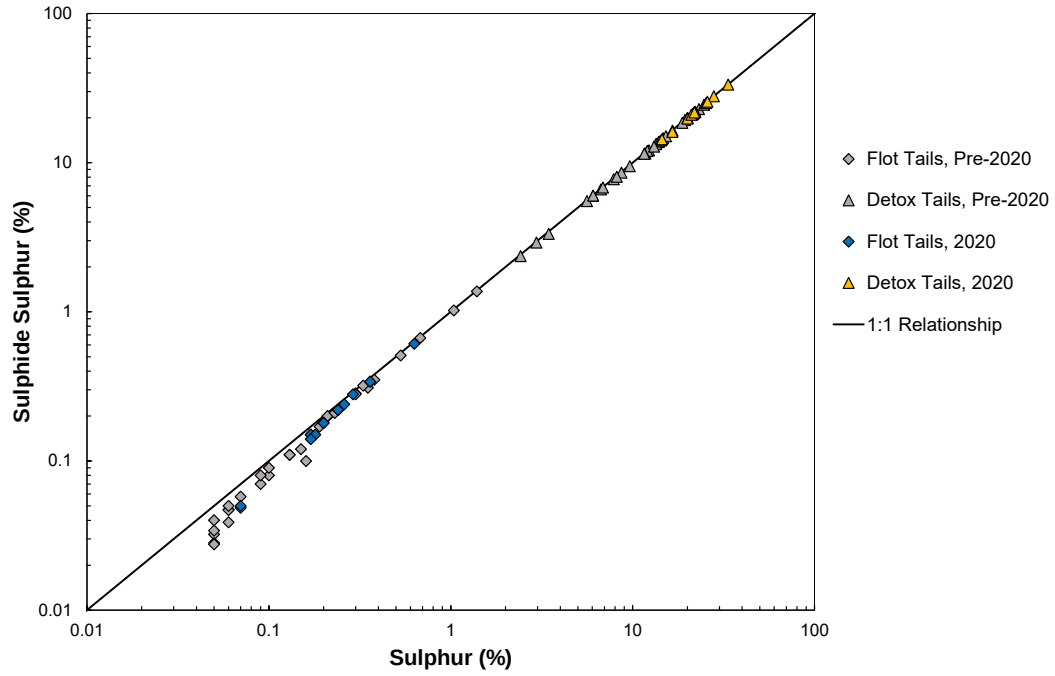


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**Figure 4-2: Total Sulphur versus Calculated Sulphide Sulphur**

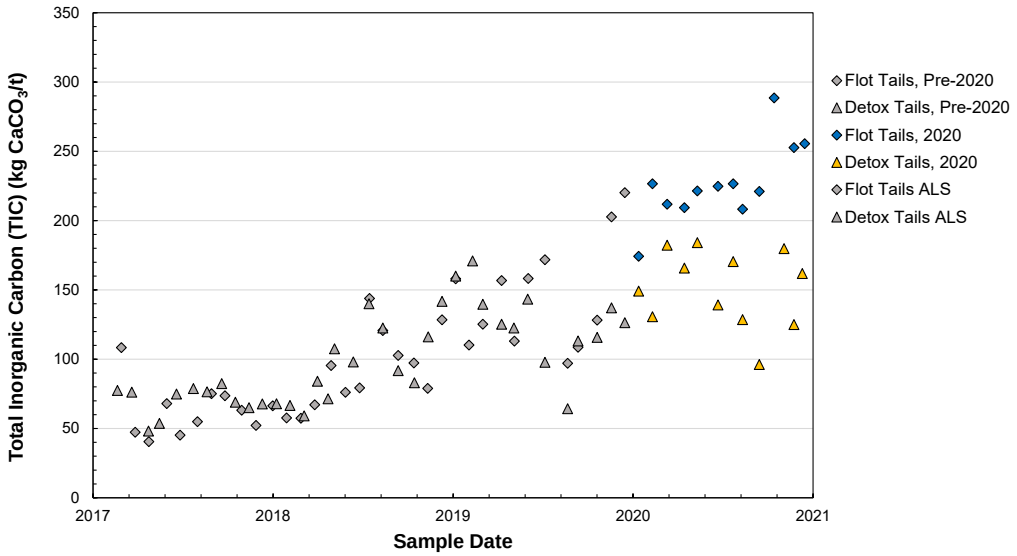


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**Figure 4-3: Total Inorganic Carbon (TIC) Concentrations for Tailings Samples Over Time**

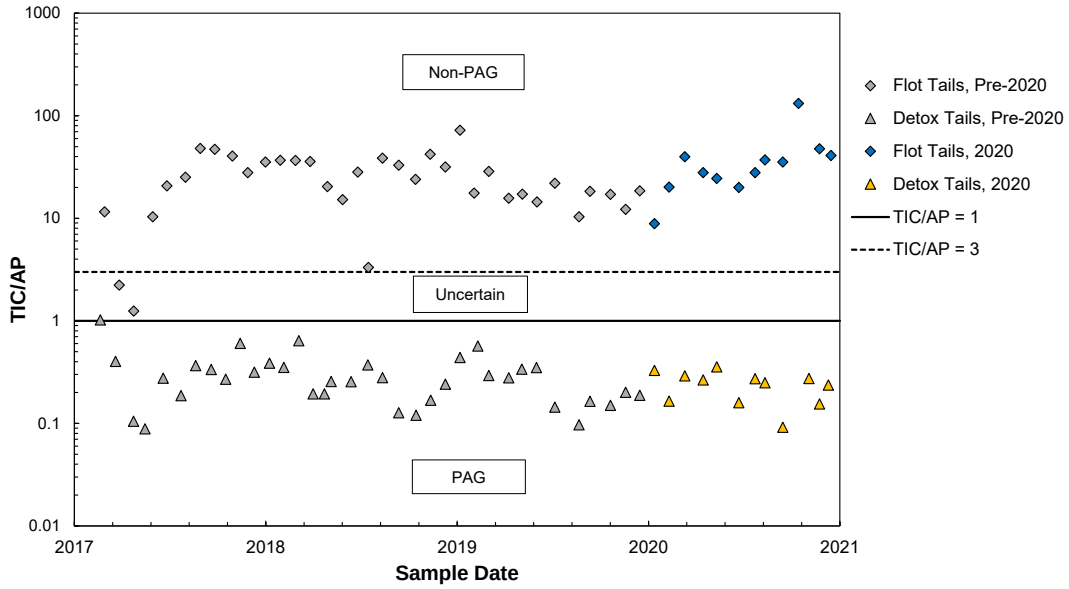


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**Figure 4-4: ARD Classifications for Tailings Samples Over Time**

### 4.2.2 Elemental Analysis

Trace element content for flotation (TL-6) and detoxified (TL-7A) tailings are summarized in Table 4-5 and Table 4-6, respectively with operational trends for selected parameters presented in Figure 4-5 to Figure 4-14. Complete results for flotation (TL-6) and detoxified (TL-7A) tailings are presented in Attachment A and Attachment B, respectively.

Data were compared to ten times the average crustal abundance data for basalt (Price 1997) as an indicator of enrichment. The detection limits for selenium and bismuth were equivalent to or higher than the screening criteria of 0.5 mg/kg and 0.07 mg/kg, respectively. Therefore, data were not assessed for selenium and bismuth when concentrations were within ten times the detection limit

#### Flotation Tailings (TL-6)

In 2020, trace element content for flotation tailings samples (TL-6) was below the screening criteria except for arsenic, gold and sulphur, which are summarized as follows:

- Arsenic was enriched for all flotation tailings samples except for February and October and exhibited the highest operational concentrations in flotation tailings between March and September. In contrast, prior to November 2019, the majority of flotation tailings samples had arsenic content less than the screening criteria. The increase in arsenic content in flotation tailings is attributed to the processing of Madrid North ore. Nickel also exhibits the same trend as arsenic and cobalt is relatively stable.

#### Detoxified Tailings (TL-7A)

Several parameters were elevated relative to the screening criteria in the 2020 detoxified tailings samples (TL-7A) and are summarized as follows:

- Arsenic: all samples were elevated compared to the screening criteria in arsenic (between 21 and 132 times the screening criterion). Similar to flotation tailings, arsenic and nickel content in detoxified tailings peaked between March and September 2020 with the overall increase attributed to the processing of Madrid North ore. Notably cobalt content was relatively stable. Both cobalt and nickel content were below the screening criteria.
- Antimony was enriched in April, June, July and August 2020 samples with enrichment coinciding with the peak in arsenic and nickel content. Antimony content in the flotation tailings did not exhibit a concomitant increase.
- All samples were enriched in bismuth (between 26 and 76 times), selenium (between 17 and 44 times) and silver (between 10 and 25 times). All aforementioned parameters exhibited stable trends since 2017.
- Copper, lead, cadmium and zinc content in detoxified tailings has decreased since the introduction of Madrid North ore. In 2020, copper was enriched in all samples (between 2 and 11 times) whereas lead was enriched in more than half of samples (up to 4 times the screening criteria), cadmium in three (August, November and December) and zinc in one (November). Prior to January 2020, the majority of detoxified tailings samples were enriched in lead, cadmium and zinc.

All other parameters, including cobalt and nickel were below the screening criteria indicating no appreciable enrichment.

**Table 4-5: Summary of Elemental Concentrations for Flotation (TL-6) Tailings**

| Year | Sampling Date | Ag mg/kg | As mg/kg | B mg/kg | Bi mg/kg | Cd mg/kg | Co mg/kg | Cu mg/kg | Ni mg/kg | Pb mg/kg | Sb mg/kg | Se mg/kg | Zn mg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | Jan | 0.6 | ***52*** | <20 | ***0.2*** | <0.1 | 18 | 130 | 47 | 4.9 | 0.1 | <0.5 | 70 |
| | Feb | 0.3 | 17 | 38 | ***0.1*** | 0.1 | 15 | 82 | 27 | 4.6 | 0.1 | <0.5 | 54 |
| | Mar | 0.2 | ***30*** | <20 | <0.1 | <0.1 | 13 | 46 | 39 | 2.6 | 0.1 | <0.5 | 46 |
| | Apr | 0.2 | ***110*** | <20 | <0.1 | 0.1 | 17 | 44 | 94 | 2.6 | 0.2 | <0.5 | 37 |
| | May | 0.2 | ***110*** | <25 | <0.1 | 0.1 | 21 | 48 | 110 | 2.3 | 0.2 | <0.5 | 44 |
| | Jun | 0.3 | ***91*** | <20 | <0.1 | 0.1 | 17 | 62 | 81 | 3.4 | 0.1 | <0.5 | 46 |
| | Jul | 0.2 | ***64*** | <20 | 0.1 | 0.1 | 16 | 39 | 67 | 3.5 | 0.1 | <0.5 | 43 |
| | Aug | 0.2 | ***59*** | <20 | ***0.1*** | 0.1 | 12 | 46 | 62 | 5.9 | 0.1 | <0.5 | 37 |
| | Sep | 0.2 | ***26*** | <20 | <0.1 | 0.1 | 16 | 54 | 41 | 3.0 | 0.1 | <0.5 | 54 |
| | Oct | 0.1 | 12 | <20 | <0.1 | 0.1 | 14 | 19 | 28 | 0.9 | 0.1 | <0.5 | 51 |
| | Nov | 0.1 | ***40*** | 20 | <0.1 | 0.1 | 18 | 37 | 56 | 2.5 | 0.2 | <0.5 | 66 |
| | Dec | 0.2 | ***21*** | 20 | ***0.1*** | 0.1 | 14 | 41 | 29 | 1.9 | 0.1 | 0.5 | 55 |
| **Summary Statistics** | | | | | | | | | | | | | |
| 2020 | P005 | 0.1 | 15 | 20 | ***0.1*** | 0.1 | 12 | 29 | 28 | 1.5 | 0.1 | 0.5 | 37 |
| | P050 | 0.2 | ***46*** | 20 | ***0.1*** | 0.1 | 16 | 46 | 51 | 2.8 | 0.1 | 0.5 | 49 |
| | P095 | 0.4 | ***110*** | 31 | ***0.2*** | 0.1 | 20 | 100 | 100 | 5.4 | 0.2 | 0.5 | 68 |
| | P100 | 0.6 | ***110*** | 38 | ***0.2*** | 0.1 | 21 | 130 | 110 | 5.9 | 0.2 | 0.5 | 70 |
| | n | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 2019 | P005 | 0.2 | 7.8 | 20 | ***0.1*** | 0.1 | 10 | 32 | 18 | 2.8 | 0.1 | 0.5 | 37 |
| | P050 | 0.3 | 15 | 20 | ***0.1*** | 0.1 | 13 | 90 | 22 | 10 | 0.1 | 0.5 | 63 |
| | P095 | 1.0 | ***110*** | 32 | ***4.4*** | 0.5 | 19 | 360 | 55 | 43 | ***2.5*** | ***0.6*** | 100 |
| | P100 | 1.0 | ***170*** | 47 | ***9.4*** | 0.7 | 21 | 640 | 58 | 44 | ***5.0*** | ***0.6*** | 140 |
| | n | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 2018 | P005 | 0.1 | 6.2 | 20 | ***0.1*** | 0.1 | 8.7 | 25 | 16 | 4.8 | 0.1 | 0.2 | 30 |
| | P050 | 0.2 | 9.2 | 20 | ***0.1*** | 0.1 | 11 | 39 | 21 | 11 | 0.1 | 0.5 | 45 |
| | P095 | ***1.6*** | ***39*** | 49 | ***0.2*** | 0.4 | 30 | 180 | 36 | 47 | 0.1 | 0.5 | 110 |
| | P100 | ***2.9*** | ***67*** | ***68*** | ***0.2*** | 0.4 | 44 | 300 | 50 | ***70*** | 0.1 | 0.5 | 150 |
| | n | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 2017 | P005 | 0.2 | 6.6 | 7.3 | ***0.2*** | 0.1 | 10 | 22 | 18 | 4.2 | 0.1 | 0.2 | 47 |
| | P050 | 0.3 | 8.3 | 14 | ***0.2*** | 0.1 | 13 | 27 | 22 | 6.3 | 0.1 | 0.2 | 61 |
| | P095 | ***1.4*** | ***47*** | 34 | ***0.2*** | 0.2 | 32 | 140 | 42 | 15 | 0.2 | ***0.5*** | 130 |
| | P100 | ***2.1*** | ***83*** | 41 | ***0.2*** | 0.3 | 48 | 200 | 55 | 22 | 0.2 | ***0.8*** | 130 |
| | n | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| ***10 X Basalt Average*** | | ***1.1*** | ***20*** | ***50*** | ***0.07*** | ***2.2*** | ***480*** | ***870*** | ***1300*** | ***60*** | ***2.0*** | ***0.5*** | ***1050*** |

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Notes

Numbers highlighted in bold exceed 10 times the average crustal abundance for basaltic rocks from Price (1997).

Where bismuth is reported below detection limit the data could not be assessed because the detection limit was greater than the screening criteria.

**Table 4-6: Summary of Elemental Concentrations for Detoxified Tailings (TL-7A)**

| Year | Sampling Date | Ag mg/kg | As mg/kg | B mg/kg | Bi mg/kg | Cd mg/kg | Co mg/kg | Cu mg/kg | Ni mg/kg | Pb mg/kg | Sb mg/kg | Se mg/kg | Zn mg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | Jan | ***16*** | ***420*** | <20 | ***3.9*** | 2.1 | 170 | ***2700*** | 120 | ***86*** | 0.7 | ***9.8*** | 620 |
| | Feb | ***17*** | ***670*** | <20 | ***4.4*** | 2.1 | 260 | ***3900*** | 200 | ***130*** | 0.6 | ***15*** | 660 |
| | Mar | ***11*** | ***1300*** | <20 | ***2.4*** | 0.9 | 260 | ***2500*** | 470 | ***62*** | 1.4 | ***13*** | 270 |
| | Apr | ***13*** | ***1400*** | <20 | ***3.8*** | 1.4 | 230 | ***2300*** | 570 | ***200*** | ***2.2*** | ***11*** | 510 |
| | May | ***14*** | ***2100*** | <20 | ***1.8*** | 1.0 | 230 | ***3300*** | 790 | 44 | 1.7 | ***8.7*** | 360 |
| | Jun | ***23*** | ***2600*** | <20 | ***4.3*** | 1.3 | 330 | ***4700*** | 880 | 40 | ***2.4*** | ***17*** | 370 |
| | Jul | ***21*** | ***2400*** | <20 | ***5.3*** | 1.0 | 340 | ***4000*** | 880 | ***94*** | ***2.7*** | ***12*** | 390 |
| | Aug | ***28*** | ***1000*** | <20 | ***3.1*** | ***2.4*** | 200 | ***10000*** | 410 | ***260*** | ***2.4*** | ***11*** | 990 |
| | Sep | ***20*** | ***1300*** | <20 | ***5.3*** | 1.8 | 430 | ***3100*** | 440 | ***73*** | 1.3 | ***21*** | 570 |
| | Oct | ***16*** | ***650*** | <20 | ***4.4*** | 1.2 | 220 | ***1700*** | 150 | 30 | 0.8 | ***15*** | 340 |
| | Nov | ***21*** | ***960*** | <20 | ***4.9*** | ***4.5*** | 370 | ***3600*** | 260 | ***210*** | 1.5 | ***22*** | ***1200*** |
| | Dec | ***18*** | ***1100*** | <20 | ***3.0*** | ***3.4*** | 260 | ***2400*** | 320 | 31 | 0.9 | ***15*** | 860 |
| **Summary Statistics** | | | | | | | | | | | | | |
| 2020 | P005 | ***12*** | ***550*** | <20 | ***2.1*** | 1.0 | 190 | ***2000*** | 140 | 31 | 0.7 | ***9.3*** | 310 |
| | P050 | ***17*** | ***1200*** | <20 | ***4.1*** | 1.6 | 260 | ***3200*** | 430 | ***80*** | 1.5 | ***14*** | 540 |
| | P095 | ***25*** | ***2500*** | <20 | ***5.3*** | ***3.9*** | 390 | ***7100*** | 880 | ***230*** | ***2.5*** | ***22*** | ***1100*** |
| | P100 | ***28*** | ***2600*** | <20 | ***5.3*** | ***4.5*** | 430 | ***10000*** | 880 | ***260*** | ***2.7*** | ***22*** | ***1200*** |
| | n | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 2019 | P005 | ***14*** | ***450*** | <20 | ***1.3*** | 0.8 | 200 | ***3500*** | 170 | ***96*** | 0.5 | ***6.7*** | 400 |
| | P050 | ***17*** | ***590*** | <20 | ***3.6*** | ***3.5*** | 280 | ***5300*** | 210 | ***370*** | 1.2 | ***12*** | ***1700*** |
| | P095 | ***37*** | ***1000*** | 22 | ***5.7*** | ***6.6*** | 330 | ***9300*** | 330 | ***810*** | ***2.9*** | ***17*** | ***3400*** |
| | P100 | ***51*** | ***1000*** | 24 | ***6.2*** | ***7.1*** | 350 | ***9400*** | 350 | ***850*** | ***4.6*** | ***19*** | ***3900*** |
| | n | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 2018 | P005 | ***8.9*** | ***240*** | <20 | ***1.8*** | 1.8 | 140 | ***4000*** | 120 | ***180*** | 0.8 | ***5.8*** | 800 |
| | P050 | ***17*** | ***490*** | <20 | ***3.2*** | ***3.2*** | 260 | ***5700*** | 230 | ***410*** | 1.3 | ***10*** | ***1400*** |
| | P095 | ***42*** | ***840*** | 47 | ***6.9*** | ***6.9*** | 410 | ***10000*** | 370 | ***610*** | 1.9 | ***18*** | ***3100*** |
| | P100 | ***65*** | ***860*** | 47 | ***7.5*** | ***7.5*** | 430 | ***10000*** | 420 | ***610*** | 1.9 | ***18*** | ***3400*** |
| | n | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| 2017 | P005 | ***6.5*** | ***260*** | 8.3 | ***1.9*** | 1.9 | 150 | ***2900*** | 130 | ***180*** | 0.9 | ***4.7*** | 850 |
| | P050 | ***21*** | ***410*** | 13 | ***5.7*** | ***5.7*** | 280 | ***5400*** | 220 | ***380*** | 1.4 | ***8.2*** | ***2800*** |
| | P095 | ***50*** | ***710*** | 24 | ***12*** | ***12*** | 460 | ***16000*** | 320 | ***1100*** | ***2.3*** | ***17*** | ***5100*** |
| | P100 | ***51*** | ***730*** | 24 | ***13*** | ***13*** | ***510*** | ***20000*** | 350 | ***1500*** | ***2.6*** | ***18*** | ***6100*** |
| | n | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| ***10 X Basalt Average*** | | ***1.1*** | ***20*** | ***50*** | ***0.07*** | ***2.2*** | ***480*** | ***870*** | ***1300*** | ***60*** | ***2.0*** | ***0.5*** | ***1050*** |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\[1CT022.056_HopeBay_TailingsMonitoringData_TL-6 & TL-7_2020_rev17.xlsx]

Notes:

Numbers highlighted in bold exceed 10 times the average crustal abundance for basaltic rocks from Price (1997).

Summary statistics assume values which are reported as below minimum or above maximum detection limits are equal to that limit.

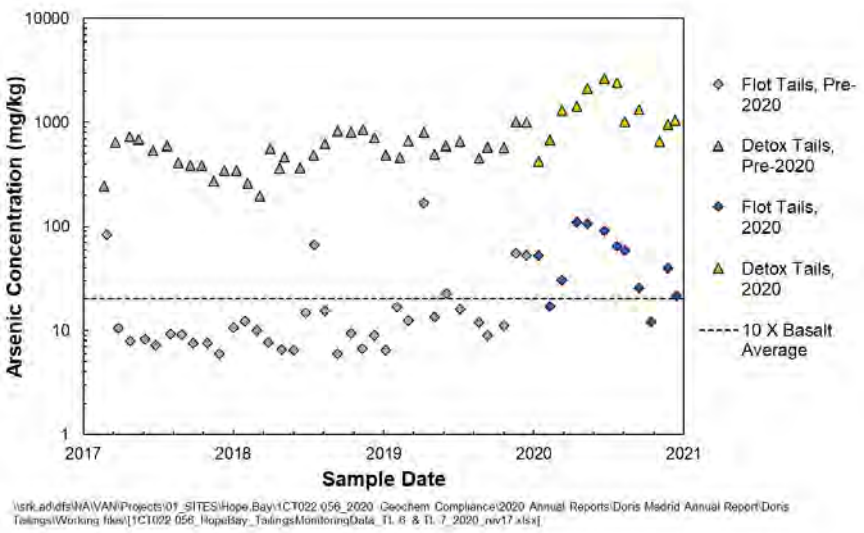



**Figure 4-5: Arsenic Concentrations in Tailings Samples**

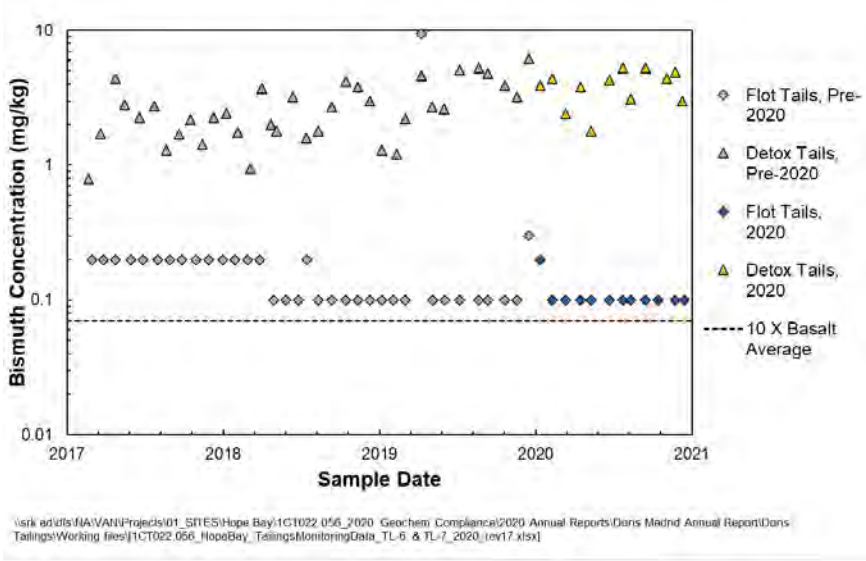



**Figure 4-6: Bismuth Concentrations in Tailings Samples**

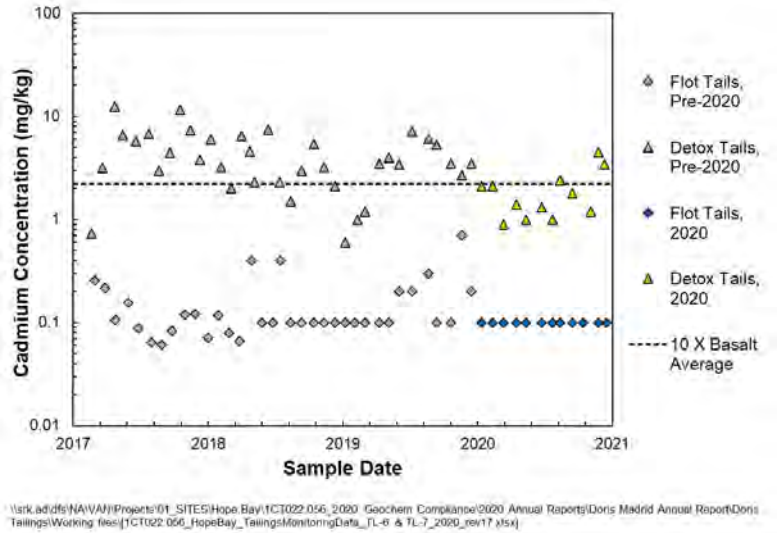



**Figure 4-7: Cadmium Concentrations in Tailings Samples**

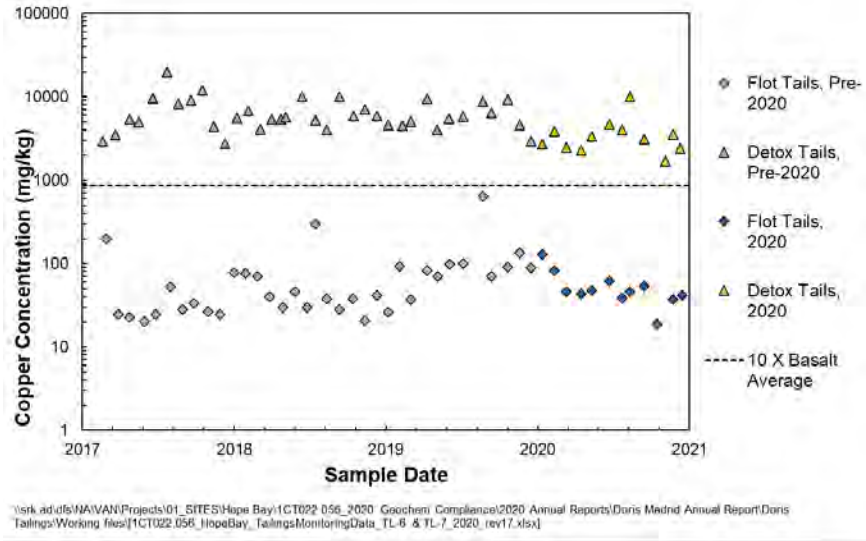



**Figure 4-8: Copper Concentrations in Tailings Samples**

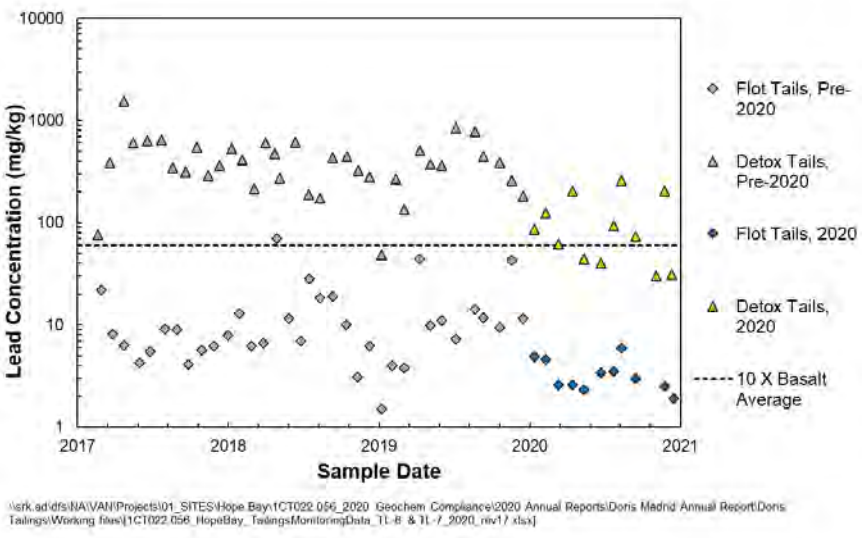



**Figure 4-9: Lead Concentrations in Tailings Samples**

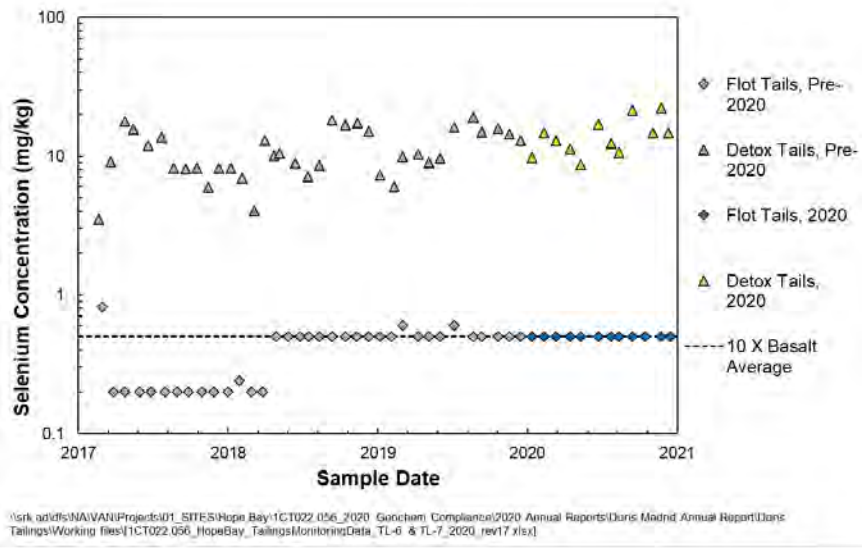



**Figure 4-10: Selenium Concentrations in Tailings Samples**

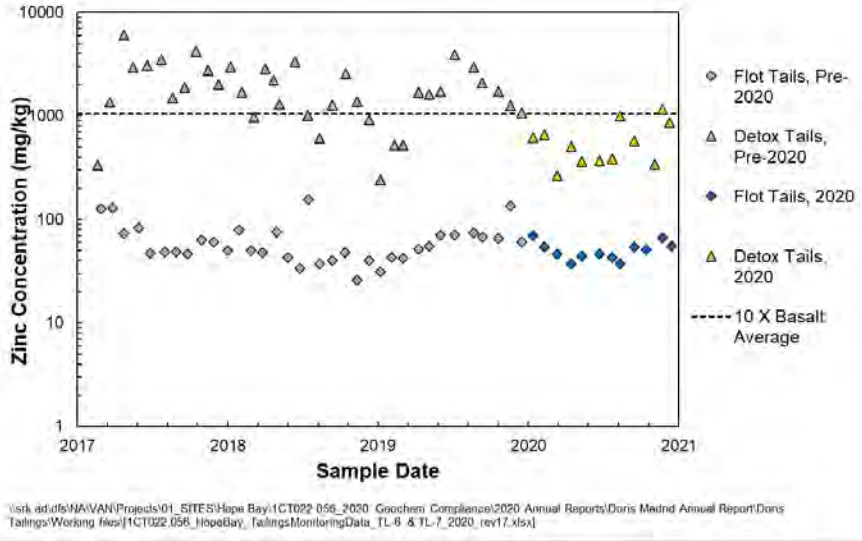



**Figure 4-11: Zinc Concentrations in Tailings Samples**

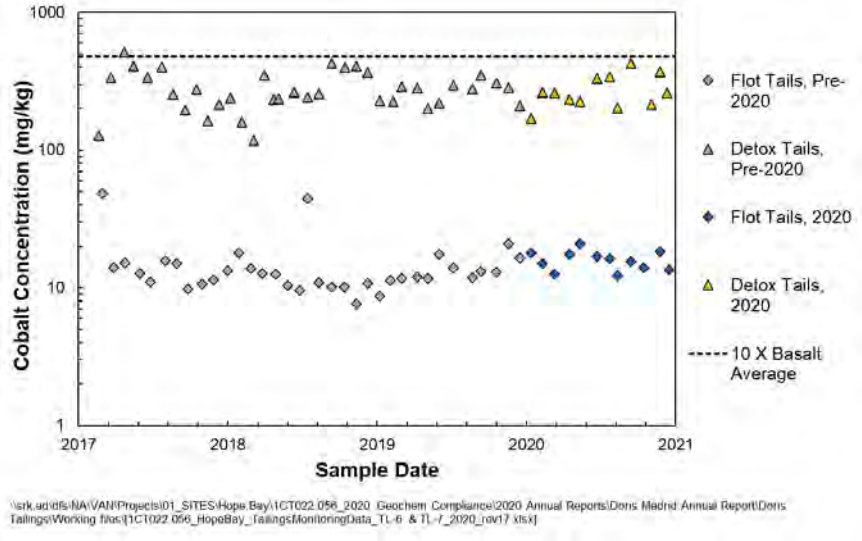



**Figure 4-12: Cobalt Concentrations in Tailings Samples**

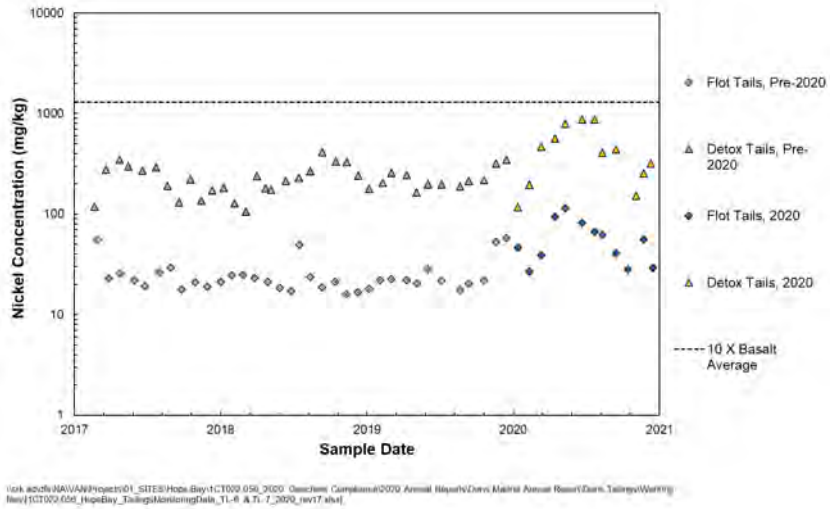



**Figure 4-13: Nickel Concentrations in Tailings Samples**

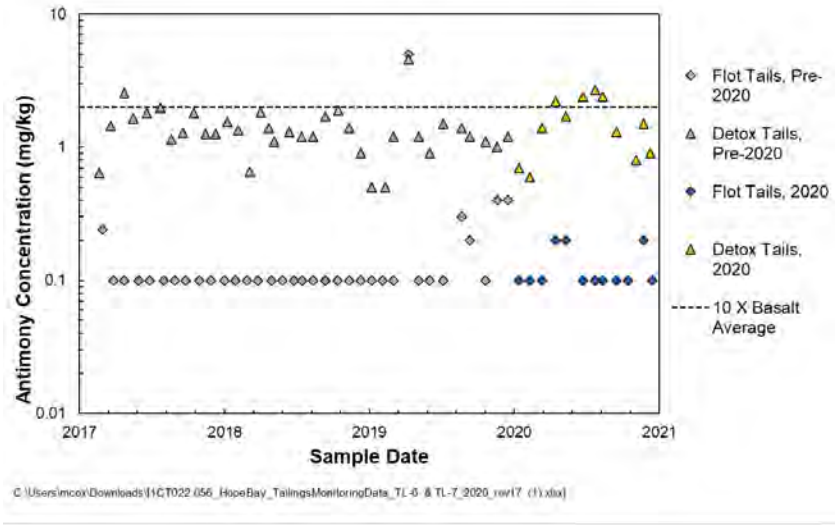



**Figure 4-14: Antimony Concentrations in Tailings Samples**

## 4.3 Detoxified Tailings Filtrate (TL-7B)

A summary of the detoxified tailings filtrate (TL-7B) analysis is presented in Table 4-7. Full results are presented in Attachment C. Cyanide detoxified tailings slurry is squeezed in a filter press to separate the detoxified tailings filtrate from solids (TL-7A). The detoxified tailings filtrate is combined with the flotation tailings slurry in the thickener tank (TL-5). The detoxified tailings filtrate is approximately 7% of the volume of TL-5 and is managed within the TIA. TL-7B represents the chemistry of the residual moisture within the detoxified tailings, which ranges from 18 to 24%.

The 2020 detoxified tailings filtrate (TL-7B) monitoring data are summarized as follows (all metals are total as per the Water Licence):

- pH conditions remained stable, ranging between 8.3 and 8.8.
- Sulphur as sulphate ranged between 7,050 and 41,400 mg/L with concentrations within the range of 2019 data (Figure 4-15).
- Sodium is used as a milling reagent and ranged between 4,320 and 18,200 mg/L. Concentrations fluctuated but the overall trend was within the range of 2019 data.
- Total cyanide concentrations ranged from 0.31 to 2.45 mg/L. Total cyanide concentrations reported a gradual decrease in 2019 with 2020 concentrations lower than in 2019.
- Concentrations of free and WAD cyanide ranged from 0.009 to 0.021 mg/L and 0.01 to 0.32 mg/L, respectively. Free cyanide results remained stable with the 2019 results except for an anomalously high result in August 2020 where the sample is reported at an elevated detection limit. WAD cyanide concentrations fluctuated within historical levels but with no obvious trend.
- Thiocyanate, cyanate and ammonia are produced as by-products of the cyanide detoxification process. Thiocyanate and cyanate concentrations ranged from 22 mg/L to 444 mg/L and 378 mg/L to 1,030 mg/L, respectively. Thiocyanate fluctuated within historical levels with no apparent trends. Cyanate concentrations were within the range of 2019 data with the exception of three samples with values greater than 800 mg/L (Figure 4-20).
- Ammonia concentrations ranged from 160 to 356 mg/L. Ammonia concentrations in May and September 2020 were operational maximums otherwise values were within the range of historical data (Figure 4-19).
- Arsenic concentrations ranged between 0.046 to 0.92 mg/L and were within the range to the 2019 results except for May and July 2020 when elevated concentrations were reported (Figure 4-16).
- Antimony concentrations exhibited an increasing trend (Figure 4-17) starting in June 2019 (0.017 to 0.081 mg/L).
- Cobalt and nickel concentrations were within the range of the 2019 results (0.022 to 0.10 mg/L and <0.025 to 0.27 mg/L respectively).
- Copper concentrations reached a new maximum in May 2020 (22 mg/L) but otherwise fluctuated within historical levels (averaging 8.5 mg/L) (Figure 4-21).

- Concentrations of manganese were stable apart from a slightly higher result in June 2020 (0.16 to 0.63 mg/L) (Figure 4-22).
- Molybdenum and selenium concentrations ranged from 0.05 to 0.17 mg/L and from 0.010 to 0.030 mg/L respectively with no apparent trends.
- Nickel concentrations increased between March and August 2020 to a maximum of 0.27 mg/L was after which concentrations decreased to historical ranges (Figure 4-18). Cadmium and zinc were below the level of analytical detection.

**Table 4-7: Summary of 2020 Detoxified Tailings Filtrate (TL-7B) Analyses**

| Parameters | Units | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moisture Content | % | 22 | 21 | 18 | 21 | 19 | 16 | 20 | 38 | 13 | 19 | 20 | 17 |
| pH | s.u. | 8.5 | 8.6 | 8.3 | 8.5 | 8.6 | 8.4 | 8.4 | 8.6 | 8.8 | 8.6 | 8.6 | 8.6 |
| Ca | mg/L | 45 | 52 | 85 | 69 | 55 | 150 | 67 | 98 | 55 | 45 | 88 | 54 |
| Mg | mg/L | 48 | 78 | 90 | 74 | 63 | 120 | 64 | 42 | 57 | 50 | 77 | 51 |
| K | mg/L | 82 | 77 | 71 | 70 | 110 | 49 | 98 | 82 | 61 | 67 | 56 | 57 |
| Na | mg/L | 9600 | 10000 | 8000 | 7400 | 11000 | 4300 | 13000 | 18000 | 8400 | 7900 | 8000 | 9500 |
| Al | mg/L | 0.33 | 0.81 | < 0.15 | 0.39 | 0.35 | 0.31 | 0.42 | 0.21 | 0.22 | 1.10 | 0.67 | 0.88 |
| Ag | mg/L | 0.006 | 0.004 | 0.002 | 0.004 | 0.008 | 0.002 | < 0.00 | 0.002 | 0.008 | 0.005 | 0.004 | 0.011 |
| As | mg/L | 0.06 | 0.05 | 0.20 | 0.26 | 0.92 | 0.19 | 0.84 | 0.05 | 0.09 | 0.07 | 0.05 | 0.19 |
| B | mg/L | 1.40 | 1.30 | 0.87 | 1.40 | 1.10 | 0.70 | 1.40 | 0.89 | 1.10 | 1.10 | 1.10 | 1.20 |
| Cd | mg/L | < 0.00025 | < 0.00025 | < 0.00025 | < 0.00025 | < 0.00025 | 0.00027 | < 0.00025 | < 0.00025 | < 0.00025 | < 0.00025 | < 0.00025 | < 0.00025 |
| Cr | mg/L | 0.014 | 0.012 | 0.010 | 0.011 | 0.014 | 0.015 | 0.016 | 0.026 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Co | mg/L | 0.03 | 0.02 | 0.03 | 0.07 | 0.06 | 0.04 | 0.07 | 0.10 | 0.04 | 0.10 | 0.02 | 0.08 |
| Cu | mg/L | 12 | 12 | 5.8 | 2.9 | 22 | 7.6 | 10 | 7.7 | 7.0 | 2.8 | 5.0 | 8.0 |
| Fe | mg/L | 2.30 | 4.20 | 1.40 | 2.40 | 2.20 | 7.00 | 2.60 | 1.00 | 3.40 | 5.70 | 4.20 | 8.80 |
| Pb | mg/L | 0.0027 | 0.0049 | < 0.00 | 0.0130 | < 0.0025 | 0.0049 | 0.0059 | 0.0052 | 0.0027 | < 0.0025 | 0.0068 | < 0.0025 |
| Mn | mg/L | 0.25 | 0.26 | 0.22 | 0.20 | 0.20 | 0.63 | 0.29 | 0.16 | 0.30 | 0.21 | 0.44 | 0.30 |
| Mo | mg/L | 0.14 | 0.10 | 0.05 | 0.08 | 0.16 | 0.06 | 0.17 | 0.08 | 0.12 | 0.09 | 0.06 | 0.07 |
| Ni | mg/L | < 0.03 | < 0.03 | 0.06 | 0.03 | 0.12 | 0.18 | 0.27 | 0.25 | < 0.03 | < 0.03 | 0.03 | 0.04 |
| Se | mg/L | 0.019 | 0.012 | 0.011 | 0.010 | 0.029 | 0.015 | 0.015 | 0.012 | 0.023 | 0.010 | 0.018 | 0.022 |
| Sb | mg/L | 0.03 | 0.03 | 0.04 | 0.05 | 0.08 | 0.03 | 0.08 | 0.02 | 0.06 | 0.05 | 0.03 | 0.07 |
| S | mg/L as $SO_4$ | 17,200 | 17,900 | 13,500 | 12,300 | 22,000 | 7,000 | 22,400 | 41,400 | 15,500 | 15,000 | 15,400 | 18,200 |
| Zn | mg/L | < 0.15 | < 0.15 | < 0.15 | < 0.15 | < 0.15 | 0.07 | < 0.15 | < 0.15 | < 0.15 | < 0.15 | < 0.15 | < 0.15 |
| Cyanate | mg/L | 730 | 520 | 380 | 700 | 900 | 400 | 630 | 550 | 1000 | 830 | 380 | 620 |
| Thiocyanate | mg/L | 220 | 200 | 140 | 280 | 230 | 77.0 | 210 | 23.0 | 440 | 220 | 22.0 | 210 |
| $NH_3$ | mg/L as N | 260 | 230 | 180 | 230 | 360 | 230 | 280 | 160 | 320 | 250 | 180 | 260 |
| Total CN | mg/L | 1.00 | 0.90 | 0.31 | 0.61 | 0.54 | 0.55 | 0.96 | 2.50 | 0.54 | 0.54 | 0.94 | 0.38 |
| WAD CN | mg/L | 0.21 | 0.18 | 0.08 | 0.27 | 0.12 | 0.01 | 0.15 | < 0.20 | 0.32 | 0.15 | 0.07 | 0.22 |
| Free CN | mg/L | 0.011 | < 0.01 | 0.016 | 0.014 | < 0.01 | < 0.01 | < 0.01 | < 0.20 | 0.009 | 0.021 | < 0.02 | < 0.02 |

Source: "\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\1CT022.056_HopeBay_TailingsMonitoringData_TL-7B_2020_rev02_mlt_jce_mc.xlsx"

Notes:

< denotes value less than analytical detection limit.

Metal(loid) concentrations are reported as 'Totals'

* Moisture content of TL-7A

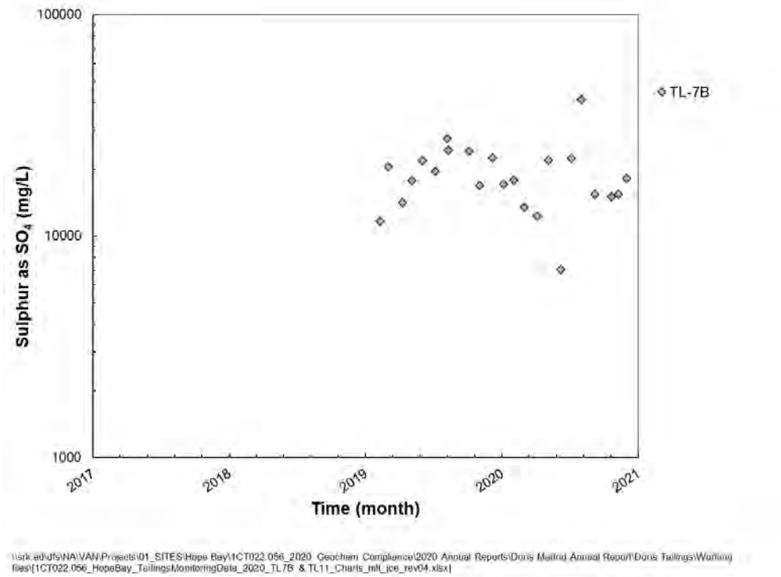



**Figure 4-15: Sulphur as $SO_4$ Concentrations Over Time (TL-7B)**

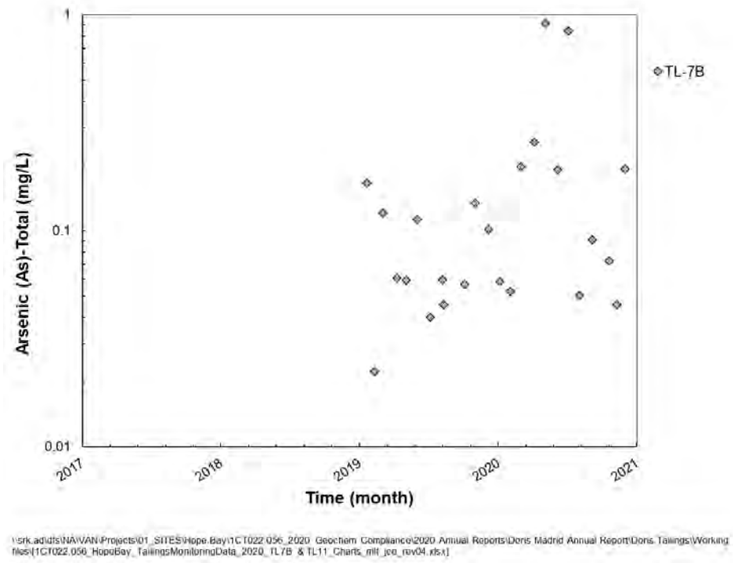



**Figure 4-16: Arsenic Concentrations Over Time (TL-7B)**

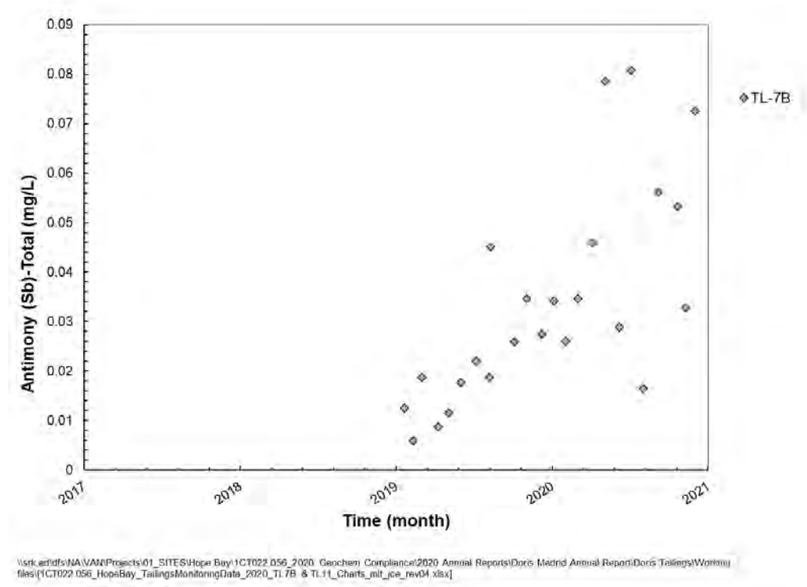



**Figure 4-17: Antimony Concentrations Over Time (TL-7B)**

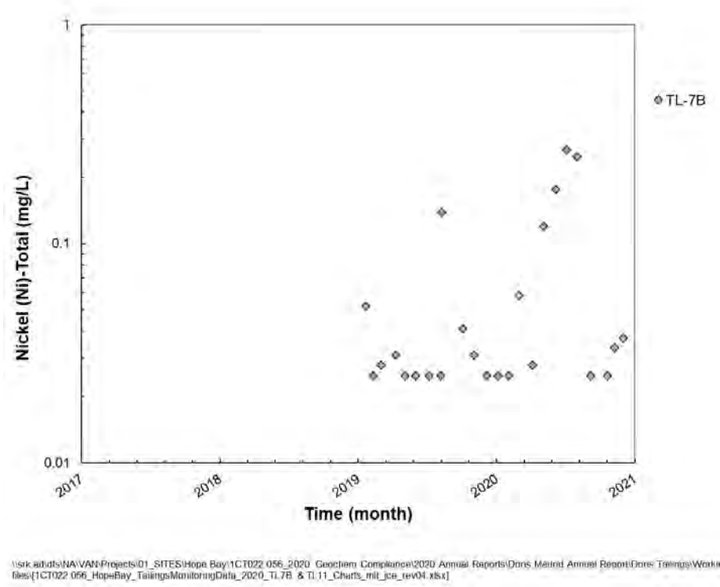



**Figure 4-18: Nickel Concentrations Over Time (TL-7B)**

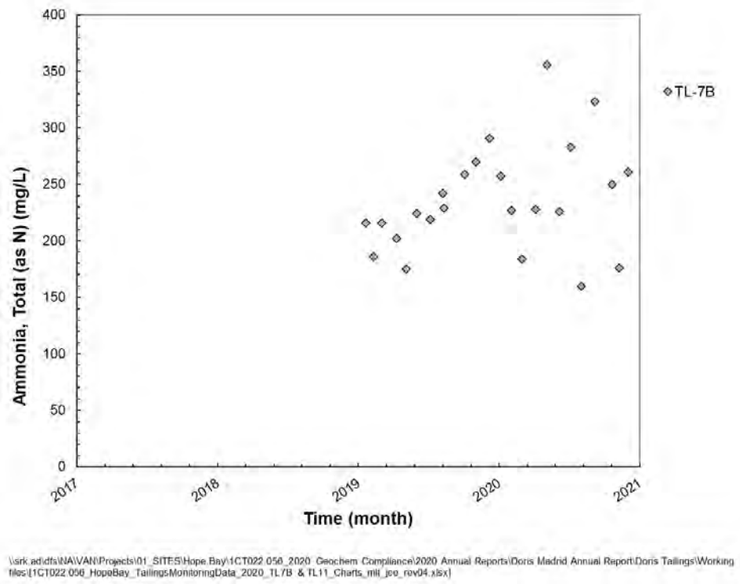



**Figure 4-19: Ammonia Concentrations Over Time (TL-7B)**

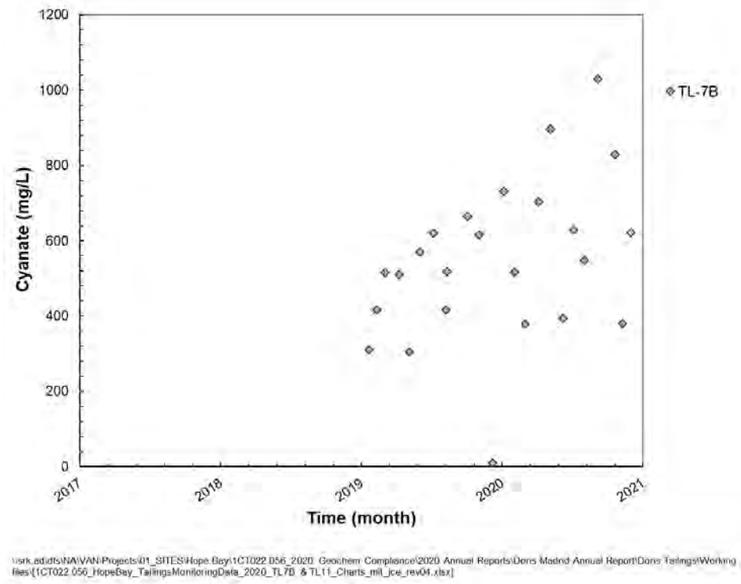



**Figure 4-20: Cyanate Concentrations Over Time (TL-7B)**

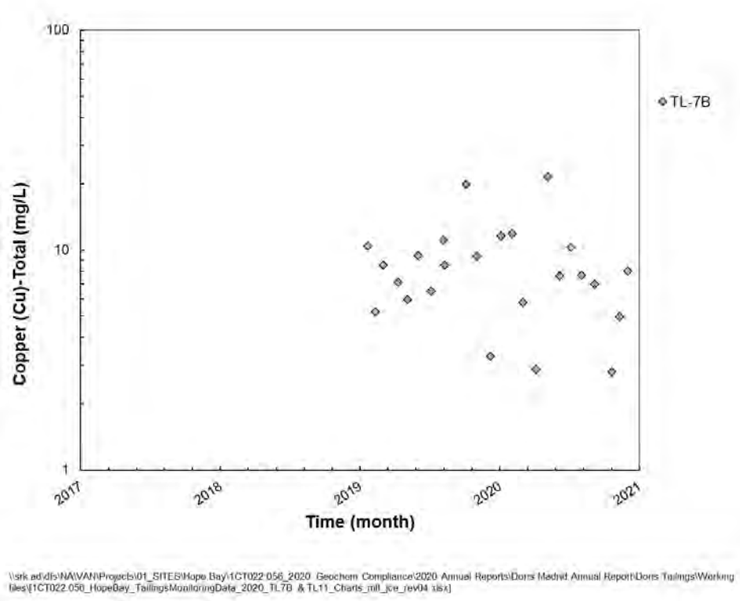



**Figure 4-21: Copper Concentrations Over Time (TL-7B)**

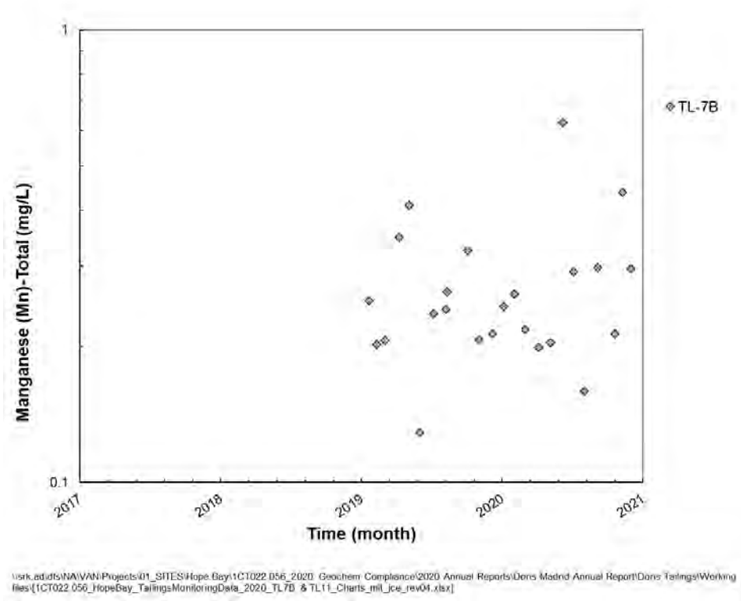



**Figure 4-22: Manganese Concentrations Over Time (TL-7B)**

## 4.4 Process Plant Tailings Water Discharge (TL-5)

Between January and December 2020, 12 samples of process plant tailings water discharge (TL-5) were collected. Results for key parameters are summarized in Table 4-8 and presented in Figure 4-23 to Figure 4-31. Key results are included in Attachment D. Prior to April 2019, total metals were determined at TL-5 as per the Water Licence whereas from April 2019 onwards both total and dissolved metals were analyzed. The subsequent figures for key parameters present total metals data to April 2019 and dissolved metals data thereafter.

The geochemistry of the 2020 process plant tailings discharge (TL-5) is summarized as follows:

- The pH of TL-5 remained stable, ranging from 8.0 to 8.5 s.u throughout 2020 (Figure 4-23).
- Sulphate concentrations fluctuated in 2020 and were within the range of historical data. An operational maximum sulphate concentration of 10,000 mg/L was observed in August 2020 (Figure 4-24).
- Ammonia concentrations increased between July 2019 to a maximum of 56 mg/L in August 2020 with a decreasing trend thereafter (Figure 4-25). Trends in nitrite and cyanate concentrations followed the same trend to ammonia and nitrate fluctuated within historical levels (figures not presented).
- Total cyanide, WAD cyanide and thiocyanate concentrations were stable in 2020 and within the range of historical values except for a fivefold increase relative to historical data observed in thiocyanate in September 2020.
- Chloride data is available from April 2019 onwards. Concentrations reported an increasing trend between October 2019 and March 2020 to a maximum of 3,700 mg/L then decreased thereafter (Figure 4-26).
- Arsenic concentrations showed an increasing trend starting July 2019 and after April 2020 a decreasing trend (Figure 4-27). Cobalt and nickel trends have typically fluctuated between 0.005 and 0.09 mg/L and 0.007 and 3.5 mg/L, respectively over the operational period of the mill.
- Prior to February 2019, concentrations of antimony and molybdenum were relatively stable after which both parameters exhibited increasing trends and higher concentrations.
- Cadmium and zinc concentrations have been relatively stable since August 2018 (Figure 4-28).

**Table 4-8: Summary of 2020 Process Plant Tailings Water Discharge (TL-5) Analyses**

| Parameter | Units | Detection Limit | Jan-2020 | Feb-2020 | Mar-2020 | Apr-2020 | May-2020 | Jun-2020 | Jul-2020 | Aug-2020 | Sep-2020 | Oct-2020 | Nov-2020 | Dec-2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | pH | 0.1 | 8.2 | 8.2 | 8.2 | 8.2 | 8.5 | 8.2 | 8 | 8.2 | 8.2 | 8.2 | 8.2 | 8.4 |
| TSS | mg/L | 3 | 100 | 16 | 39 | 35 | 5.6 | 69 | 73 | 43 | 22 | 18 | 7.8 | 29 |
| $NO_3$ as N | mg/L | 0.1 | 24 | 23 | 14 | 21 | 20 | 10 | 16 | 5.8 | 14 | 18 | 13 | 19 |
| $NO_2$ as N | mg/L | 0.02 | 1.3 | 1.2 | 0.8 | 1.1 | 1.2 | 0.4 | 0.7 | 0.7 | 0.6 | 1.2 | 0.7 | 0.9 |
| $NH_4$ as N | mg/L | 0.25 | 47 | 40 | 30 | 37 | 48 | 32 | 34 | 56 | 43 | 28 | 28 | 38 |
| Cl | mg/L | 25 | 2500 | 2700 | 3700 | 2700 | 2900 | 2500 | 2500 | 2300 | 2500 | 1900 | 1800 | 2000 |
| $SO_4$ | mg/L | 6 | 2300 | 1900 | 1400 | 1800 | 2400 | 1500 | 1800 | 10000 | 2000 | 1500 | 1800 | 2100 |
| Ca | mg/L | 0.1 | 180 | 210 | 250 | 160 | 150 | 200 | 180 | 210 | 170 | 120 | 130 | 150 |
| Mg | mg/L | 0.01 | 140 | 180 | 210 | 150 | 170 | 160 | 190 | 140 | 140 | 110 | 110 | 130 |
| K | mg/L | 0.1 | 100 | 120 | 130 | 110 | 140 | 100 | 160 | 74 | 110 | 110 | 89 | 96 |
| Na | mg/L | 0.1 | 2300 | 2400 | 2400 | 2200 | 2500 | 2000 | 2400 | 8000 | 2100 | 1700 | 1700 | 2100 |
| Total CN | mg/L | 0.005 | 5.5 | 2.8 | 3.1 | 2.8 | 6.5 | 1.6 | 4.1 | 0.51 | 2.5 | 3.2 | 2.5 | 3.0 |
| WAD CN | mg/L | 0.005 | 0.16 | 0.16 | 0.43 | 0.15 | 2.1 | 0.18 | 2.1 | 0.05 | 0.13 | *0.2* | *0.2* | 0.18 |
| Free CN | mg/L | 0.005 | 0.14 | 0.12 | 0.18 | 0.043 | 1.4 | 0.08 | 1.0 | *0.01* | *0.1* | *0.2* | *0.2* | 0.1 |
| Cyanate | mg/L | 2 | 88 | 76 | 65 | 79 | 130 | 59 | 55 | 160 | 96 | 61 | 47 | 67 |
| Thiocyanate (SCN) | mg/L | 0.5 | 20 | 21 | 13 | 15 | 52 | 8.8 | 33 | 16 | 230 | 32 | 15 | 15 |
| Ag | mg/L | 0.00002 | *0.0001* | *0.0001* | *0.0001* | 0.0008 | *0.0001* | *0.0001* | *0.0001* | *0.0005* | *0.0001* | 0.0002 | *0.0001* | *0.0001* |
| Al | mg/L | 0.006 | 0.03 | 0.04 | 0.05 | 0.04 | 0.06 | 0.04 | 0.07 | 0.09 | 0.05 | 0.13 | 0.11 | 0.08 |
| As | mg/L | 0.0002 | 0.002 | 0.002 | 0.004 | 0.008 | 0.012 | 0.006 | 0.01 | 0.014 | 0.003 | 0.003 | 0.003 | 0.004 |
| B | mg/L | 0.02 | 1.0 | 0.9 | 1.2 | 1.0 | 0.9 | 0.9 | 1.1 | 0.8 | 1.0 | 0.9 | 0.9 | 0.8 |
| Cd | mg/L | 0.00001 | 0.00006 | *0.00005* | *0.00005* | *0.00005* | *0.00005* | *0.00005* | *0.00005* | *0.00025* | *0.00005* | *0.00005* | *0.00005* | *0.00005* |
| Co | mg/L | 0.0002 | 0.008 | 0.006 | 0.01 | 0.01 | 0.04 | 0.009 | 0.04 | 0.05 | 0.009 | 0.009 | 0.006 | 0.010 |
| Cr | mg/L | 0.0002 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | -- | *0.001* | *0.001* | *0.001* | *0.001* |
| Cu | mg/L | 0.001 | 0.19 | 0.055 | 0.36 | 0.18 | 1.7 | 0.1 | 0.87 | 2.2 | 0.013 | 0.14 | 0.034 | 0.13 |
| Fe | mg/L | 0.02 | 1.9 | 1.0 | 1.2 | 1.0 | 1.6 | 0.4 | 0.3 | *0.5* | 0.9 | 1.1 | 0.8 | 1.1 |
| Mn | mg/L | 0.0002 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.6 | 0.2 | 0.1 | 0.1 | 0.1 |
| Mo | mg/L | 0.0001 | 0.1 | 0.06 | 0.05 | 0.05 | 0.09 | 0.07 | 0.07 | 0.03 | 0.07 | 0.04 | 0.03 | 0.04 |
| Ni | mg/L | 0.001 | 0.01 | 0.01 | 0.15 | 0.08 | 0.5 | 0.1 | 0.57 | 0.16 | 0.03 | 0.04 | 0.05 | 0.08 |
| Pb | mg/L | 0.0001 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0025* | *0.0005* | *0.0005* | *0.0005* | *0.0005* |
| S | mg/L | 1 | -- | 720 | 530 | 710 | 840 | 620 | 800 | 4400 | 760 | 610 | 690 | 780 |
| Sb | mg/L | 0.0002 | 0.002 | 0.003 | 0.005 | 0.005 | 0.005 | 0.003 | 0.004 | 0.005 | 0.003 | 0.006 | 0.003 | 0.006 |
| Se | mg/L | 0.0001 | 0.001 | 0.002 | 0.001 | 0.002 | 0.005 | 0.001 | 0.003 | 0.007 | 0.007 | 0.004 | 0.002 | 0.003 |
| Zn | mg/L | 0.006 | *0.01* | *0.01* | *0.01* | *0.01* | *0.01* | *0.01* | *0.01* | *0.05* | *0.01* | *0.01* | *0.01* | *0.01* |

Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\[1CT022.056_HopeBay_TailingsMonitoringData_TL-5_2020_Figs_Rev08_lnb_rtc_mlt_jce_mc.xlsm]

Notes:

*Blue italics* = Value less than laboratory detection limit. Detection limit shown.

Metal(loid) concentrations are reported as 'Dissolved

-- denotes no result reported

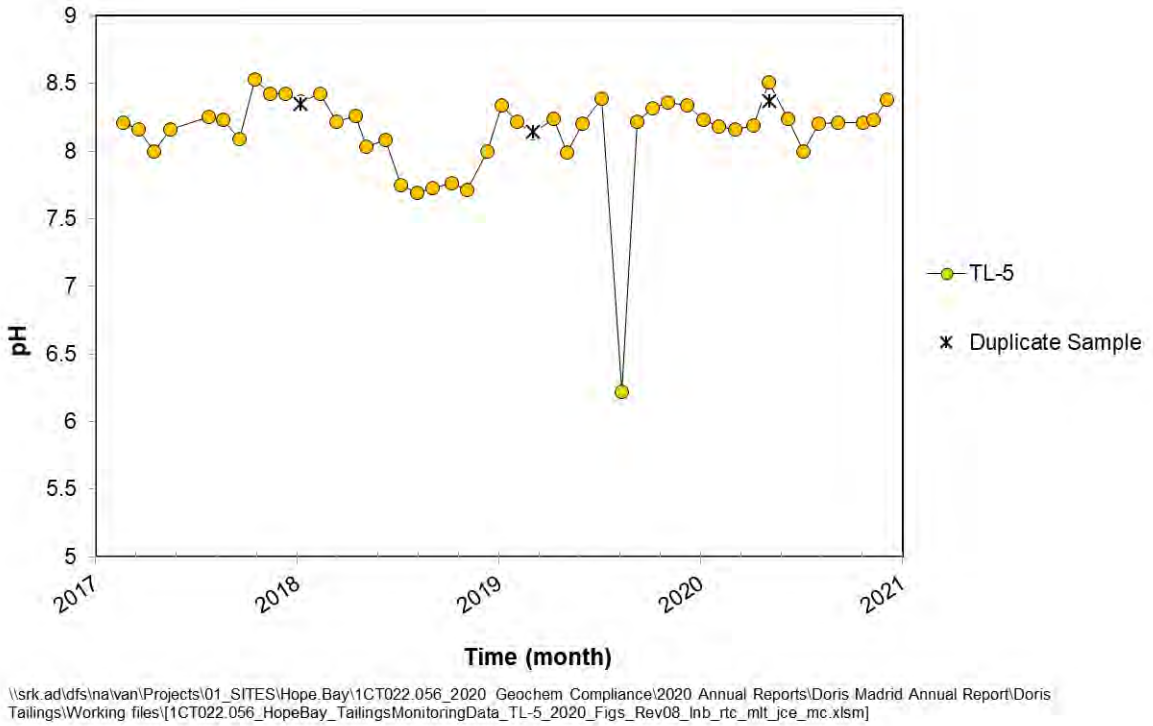



**Figure 4-23: Trends in pH for Process Plant Supernatant Discharge (TL-5)**

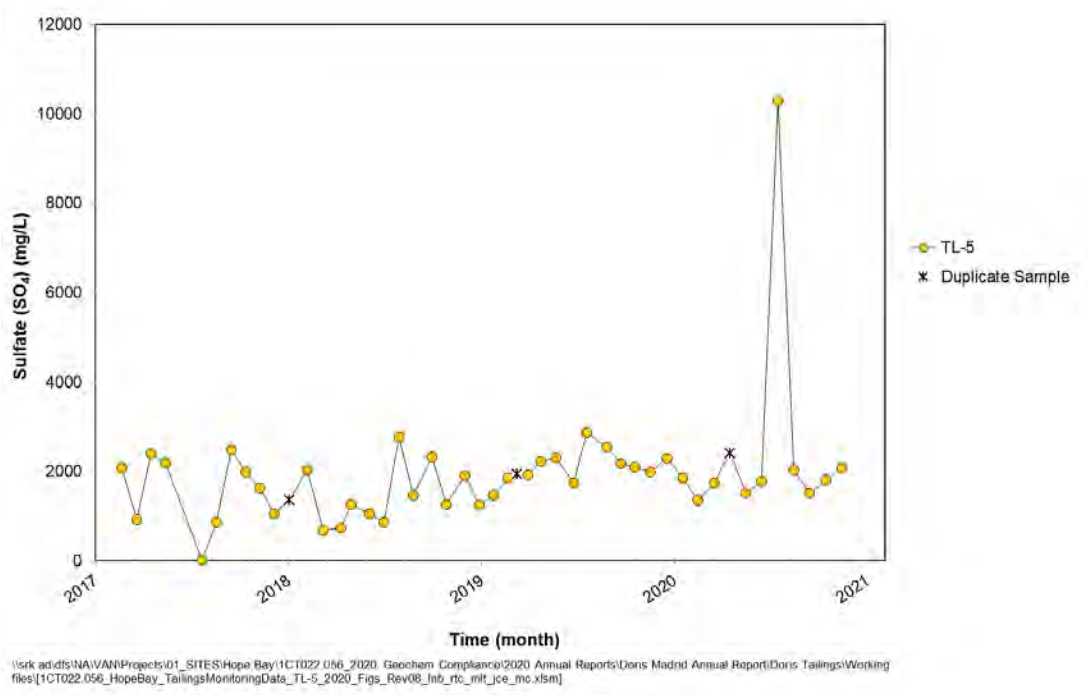



**Figure 4-24: Trends in Sulphate for Process Plant Supernatant Discharge (TL-5)**

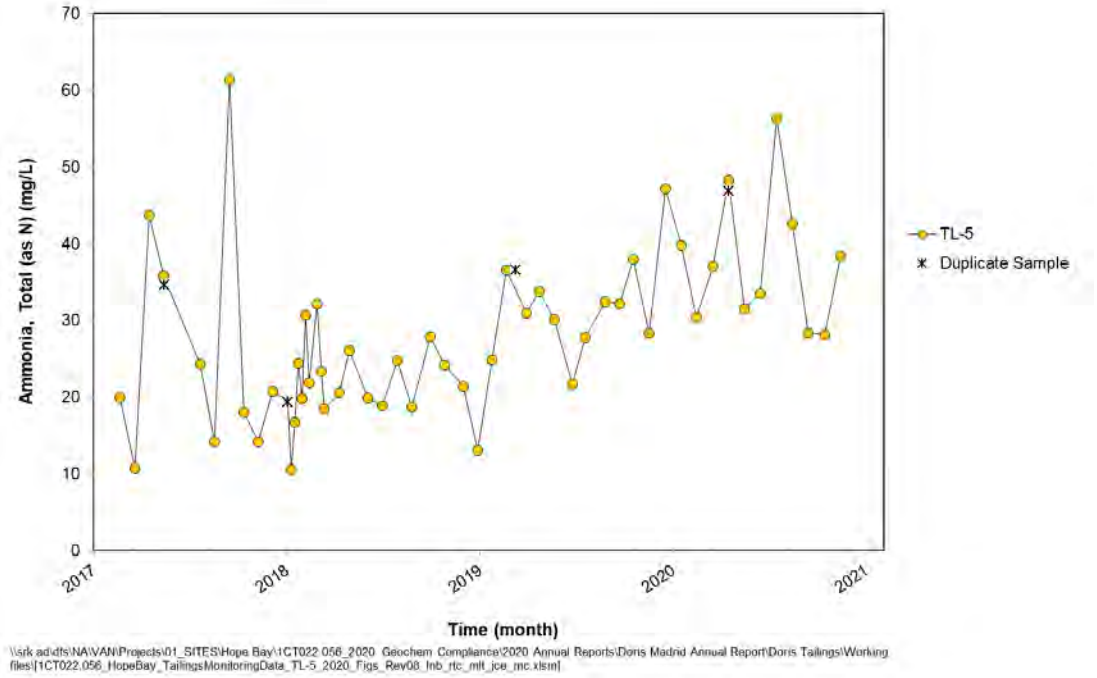



**Figure 4-25: Trends in Ammonia for Process Plant Supernatant Discharge (TL-5)**

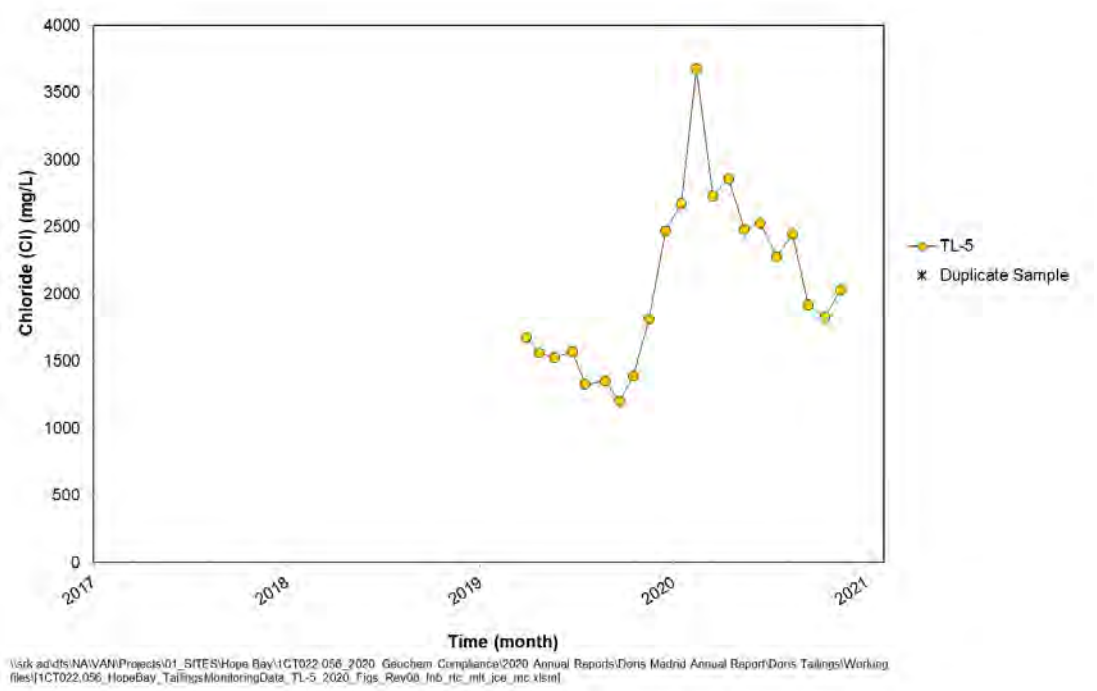



**Figure 4-26: Trends in Chloride for Process Plant Supernatant Discharge (TL-5)**

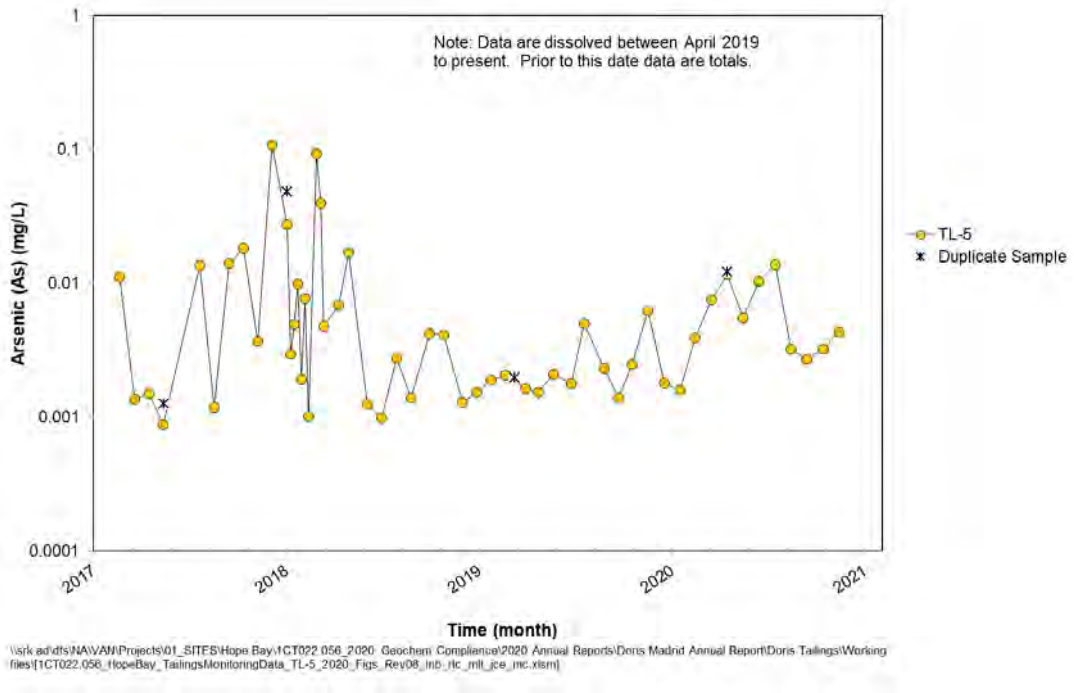



**Figure 4-27: Trends in Arsenic for Process Plant Supernatant Discharge (TL-5)**

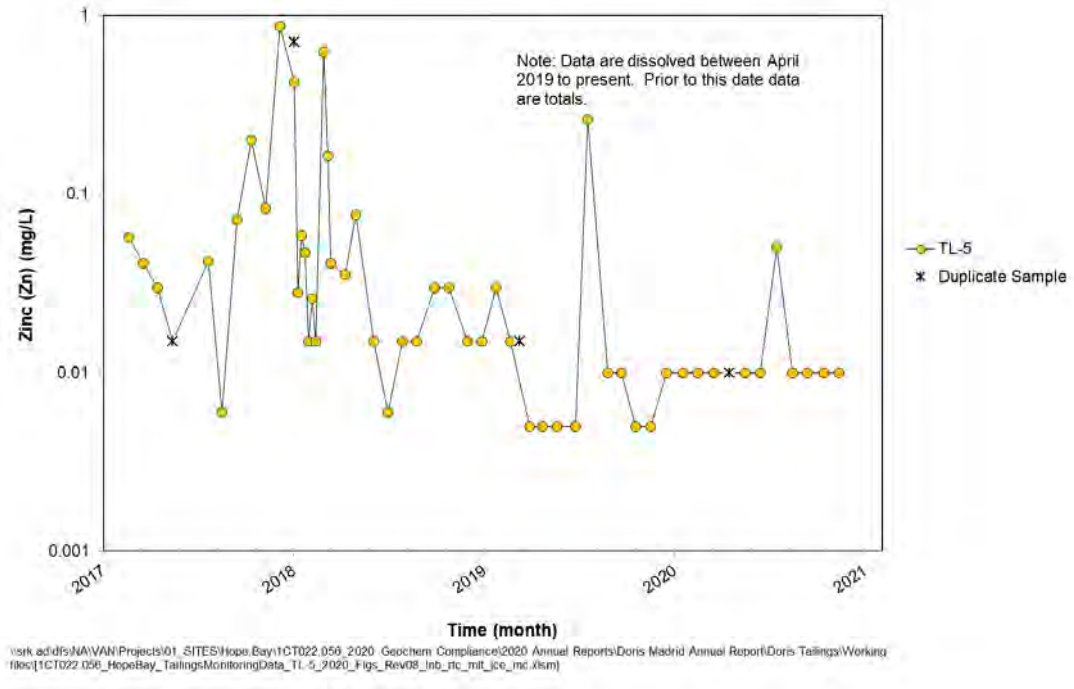



**Figure 4-28: Trends in Zinc for Process Plant Supernatant Discharge (TL-5)**

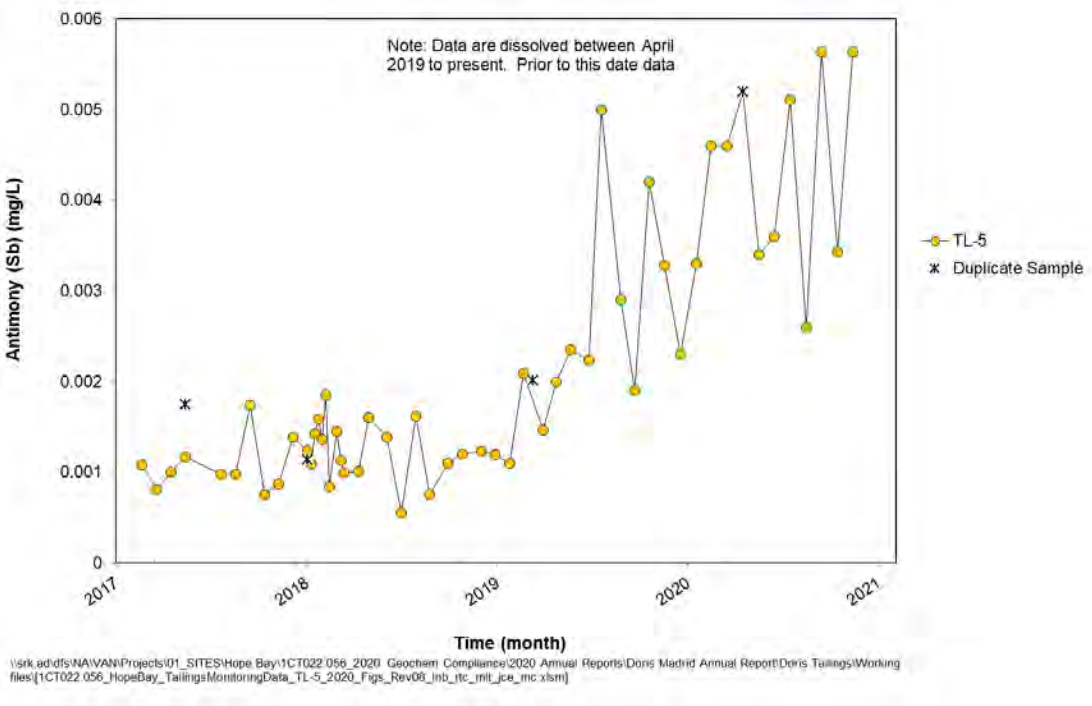



**Figure 4-29: Trends in Antimony for Process Plant Supernatant Discharge (TL-5)**

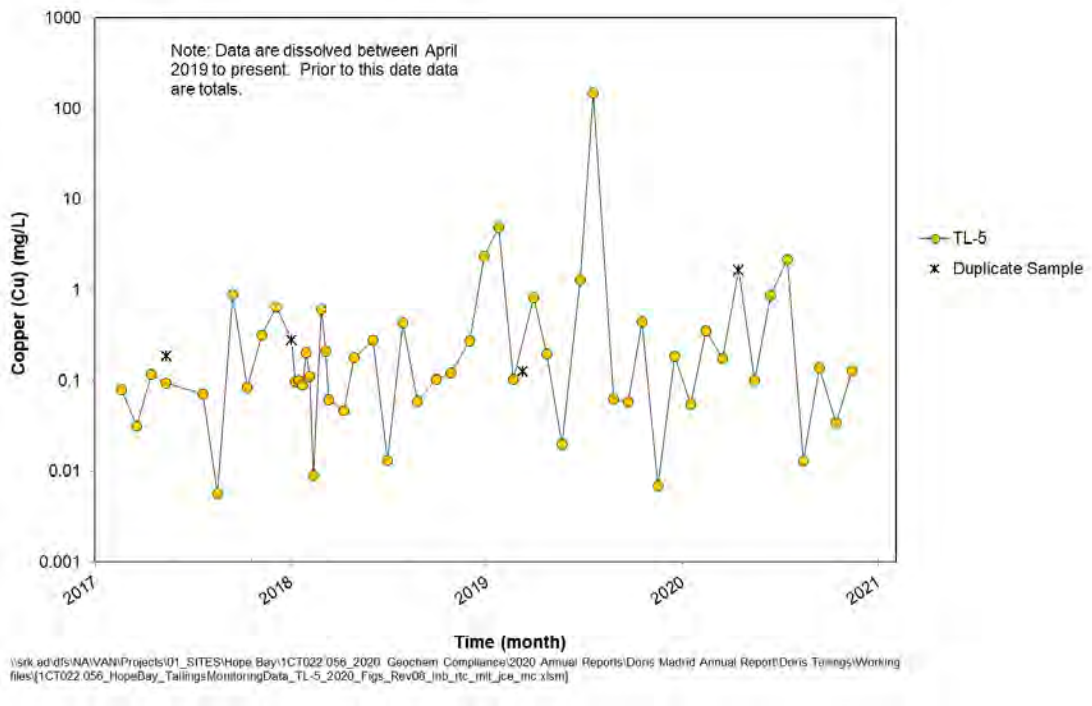



**Figure 4-30: Trends in Copper for Process Plant Supernatant Discharge (TL-5)**

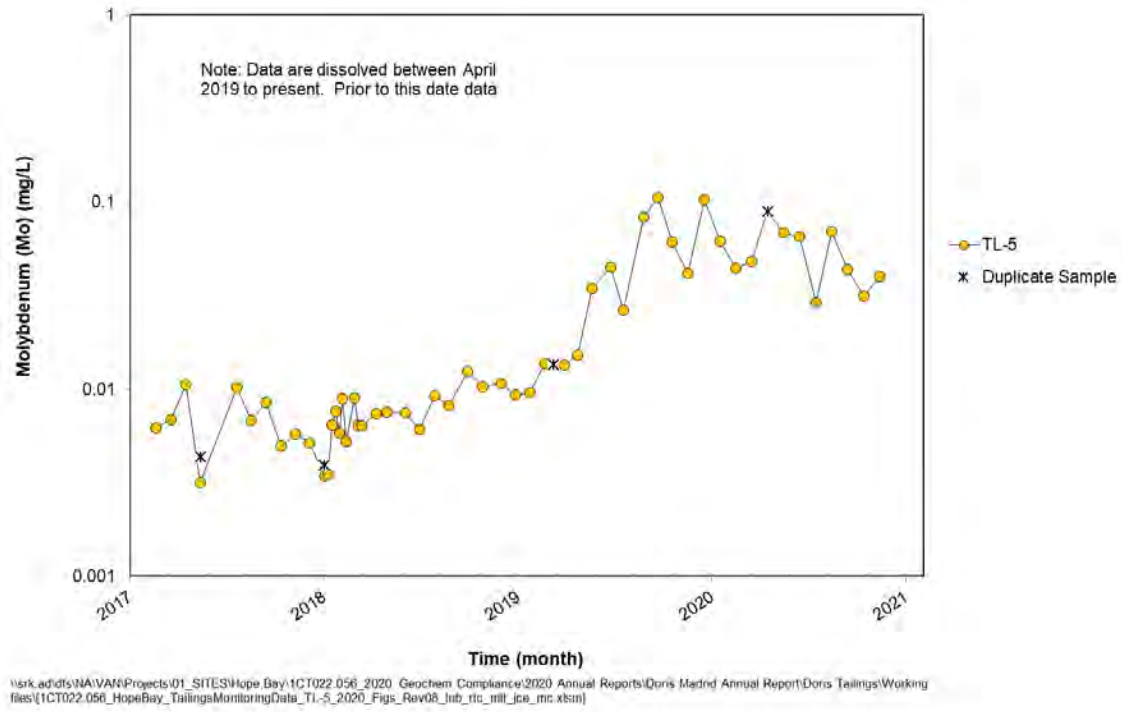



**Figure 4-31: Trends in Molybdenum for Process Plant Supernatant Discharge (TL-5)**

## 4.5 Seepage Monitoring of Backfilled Stopes (TL-11)

Selected water quality analyses of the seepage monitoring samples collected from the base of underground stopes are provided in Table 4-9 and full results are included in Attachment E. The results are compared to median and 5$^{th}$ and 95$^{th}$ percentile concentrations reported in the previous TL-11 monitoring surveys (2017 to 2019).

In July 2020 two samples were collected from flowing seepage (Level 134 and Level 120) and two samples from ponded water that collected drainage from stopes (Level 4905 and Level 5002). The results of the July seepage survey are summarized as follows:

- The pH ranged from 7.6 to 7.9 s.u. in all of the samples.
- Concentrations for the following parameters were elevated in the seepage samples relative to the ponded water samples: EC, TDS, chloride and sulphate. As such, it is possible that the ponded water samples do not represent direct contact waters although they were collected from the toe of detoxified tailings backfilled stopes.
- EC ranged from 23,000 to 26,000 µS/cm in the seepage samples and from 3,100 to 5,000 µS/cm in the ponded water samples.
- Levels of ammonia (4.4 to 27 mg/L), nitrate (8.8 to 35 mg/L) and nitrite (0.3 to 1.5 mg/L) were lower than the 50$^{th}$ percentile concentrations from the historical sample set. Concentrations of these

parameters were lowest in one of the seepage samples (Level 120) but there were otherwise no differences between the seepage and ponded water samples.

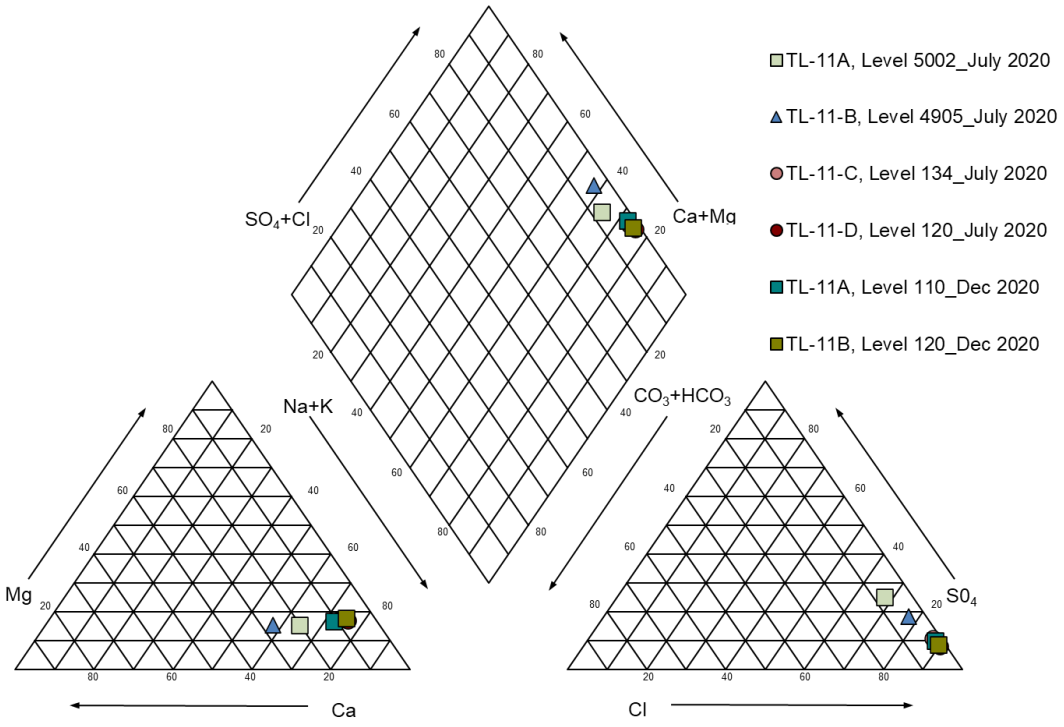
- Arsenic concentrations ranged from 0.002 to 0.006 mg/L in the seepage samples and from 0.001 to 0.003 mg/L in the ponded water samples. The maximum arsenic concentration of 0.006 mg/L (Level 120) exceeded the 50$^{th}$ percentile of concentrations from the historical data.
- Total cyanide averaged 0.02 mg/L in the July samples, below the 50$^{th}$ percentile of concentrations from the historical data.
- Cadmium, copper, nickel, selenium and silver were noted as parameters of potential concern based upon the humidity cell test (HCT) program for Doris detoxified tailings (SRK 2015). All of these parameters reported concentrations in the July sampling program which were less than the 50$^{th}$ percentile concentrations from the historical sample set: cadmium (0.00007 to 0.00083 mg/L), copper (0.02 to 0.06 mg/L), nickel (0.014 to 0.18 mg/L), selenium (0.001 to 0.012 mg/L) and silver (0.0001 to 0.0004 mg/L). Zinc was not noted as a parameter of potential concern in the HCT program and has historically reported elevated concentrations. In July 2020 all samples were below the 50$^{th}$ percentile from the historical sample set ranging between 0.02 and 0.12 mg/L.
- The following dissolved parameters were consistently reported at concentrations less than analytical detection limits in all seepage samples from the July survey: beryllium, bismuth, iron, lead, mercury, phosphorous, tellurium, thallium, thorium, tin, titanium, vanadium and zirconium.

Two samples were collected from the base of backfilled stopes during the December 2020 inspections. Key results are summarized as follows:

- pH conditions ranged from 7.7 to 7.8.
- EC ranged from 20,800 to 21,500 µS/cm.
- Concentrations of ammonia, nitrate and nitrite were all below the 50$^{th}$ percentile concentrations from the historical sample set, averaging 18 mg/L, 25 mg/L and 1.5 mg/L respectively.
- Arsenic concentrations were similar to the 50$^{th}$ percentile concentrations from historical data (0.004 to 0.005 mg/L).
- Total cyanide was similar to the 5$^{th}$ percentile concentrations from historical data, averaging 0.01 mg/L.
- Cadmium concentrations averaged 0.0002 mg/L, copper averaged 0.02 mg/L, nickel averaged 0.01 mg/L, selenium averaged 0.002 mg/L and zinc averaged 0.03 mg/L. Concentrations of these parameters were consistently below the 50$^{th}$ percentile from the historical sample set.
- Concentrations of aluminium, chromium, iron, lead, thallium, tin and silver were reported below the analytical limit of detection in both December seepage samples.

The major ion chemistry suggest that all seepage samples from July and December have the same major ion composition and that the ponded water samples were mixed with other waters and likely are not representative of contact water (Figure 4-24). TMAC has indicated that ponded water at Level 4905 and Level 5002 are likely influenced by surface water inflows. For the July and December seepage samples, the major anions were chloride (7,100 to 9,000 mg/L) and sulphate (920 to

1,200 mg/L). These anions were predominant in the ponded water samples, but concentrations were significantly lower: 1,000 to 1,800 mg/L and 500 to 580 mg/L respectively. Sodium (4,200 to 4,800 mg/L) and magnesium (510 to 580 mg/L) were the major cations in the seepage samples; whereas the ponded water samples were dominated by sodium (670 to 910 mg/L) and to a lesser extent calcium (190 to 380 mg/L). Potential sources of the major ions include residues on waste rock from drilling brines (calcium and chloride), process reagents (sodium), and sulphide oxidation with resulting carbonate dissolution from waste rock and detoxified tailings (sulphate, calcium and magnesium).




Source: \\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\[1CT022.056_Hope Bay_TailingsMonitoringData_PiperPlot_TL-11_2020_mc_rev01.xlsx]

**Figure 4-32: Major Ion Chemistry for TL-11 Seepage Water Quality Analysis**

**Table 4-9: Summary of Underground Stope Seepage and Ponded Water Samples (TL-11)**

| Parameter | Units | Detection Limit | July 2020 | | | | December 2020 | | Historical Statistics (2017-2019) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Level 120 | Level 134 | Level 4905 | Level 5002 | Level 110 | Level 120 | | | |
| | | | seepage | seepage | ponded | ponded | Pooled seep at muck berm | Toe of muck pile | P05 | P50 | P95 |
| | | | TL11-D | TL11-C | TL11-B | TL11-A | TL11-A | TL11-B | n=14 | n=14 | n=14 |
| Flow Rate | L/s | | 0.061 | 0.066 | -- | -- | 0.13 | 0.042 | - | - | - |
| pH | pH | 0.1 | 7.8 | 7.6 | 7.7 | 7.9 | 7.8 | 7.8 | 6.4 | 7 | 8 |
| EC | uS/cm | 2 | 26000 | 23000 | 7100 | 5100 | 22000 | 21000 | 17000 | 80000 | 100000 |
| TSS | mg/L | 3 | 180 | 3 | *3.3* | 9.5 | 7.4 | *3* | 9.9 | 130 | 15000 |
| TDS | mg/L | 10 | 19000 | 18000 | 5000 | 3100 | 13000 | 14000 | 12000 | 57000 | 95000 |
| $SO_4$ | mg/L | 0.3 | 1100 | 1200 | 580 | 500 | 1100 | 920 | 560 | 1100 | 1300 |
| Total Alkalinity | mg/L as $CaCO_3$ | 1 | 220 | 260 | 150 | 150 | 220 | 210 | 25 | 73 | 240 |
| Cl | mg/L | 0.5 | 9000 | 7200 | 1800 | 1000 | 7200 | 7100 | 6200 | 34000 | 48000 |
| Ca | mg/L | 0.05 | 400 | 490 | 380 | 190 | 550 | 370 | 350 | 9500 | 17000 |
| Mg | mg/L | 0.1 | 580 | 520 | 130 | 88 | 510 | 550 | 400 | 1200 | 1800 |
| K | mg/L | 0.05 | 150 | 130 | 41 | 39 | 510 | 550 | 100 | 490 | 590 |
| Na | mg/L | 0.05 | 4800 | 4200 | 910 | 670 | 4100 | 4300 | 3100 | 8000 | 12000 |
| Total CN | mg/L | 0.005 | 0.013 | 0.016 | 0.0097 | 0.054 | 0.016 | *0.005* | 0.015 | 0.073 | 0.54 |
| WAD CN | mg/L | 0.005 | *0.005* | *0.0054* | 0.005 | *0.005* | *0.005* | *0.005* | 0.005 | 0.011 | 0.027 |
| Free CN | mg/L | 0.005 | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.005 | 0.0092 | 0.024 |
| $NH_3$ | mg/L | 0.005 | 4.4 | 27 | 24 | 25 | 32 | 4.7 | 15 | 250 | 380 |
| $NO_3$ | as N mg/L | 0.005 | 8.8 | 34 | 35 | 27 | 42 | 7.2 | 15 | 430 | 590 |
| $NO_2$ | as N mg/L | 0.001 | 0.28 | 0.53 | 0.4 | 1.5 | 2.5 | 0.53 | 0.67 | 6.8 | 19 |
| Al | mg/L | 0.001 | 0.02 | 0.01 | *0.0077* | *0.013* | *0.02* | *0.02* | 0.017 | 0.05 | 0.11 |
| Ag | mg/L | 0.00001 | 0.0002 | *0.00013* | 0.00005 | *0.00039* | *0.0002* | *0.0002* | 0.00016 | 0.013 | 0.055 |
| As | mg/L | 0.0001 | 0.0059 | 0.0019 | 0.001 | 0.003 | 0.0047 | 0.0044 | 0.0018 | 0.005 | 0.01 |
| Ba | mg/L | 0.0001 | 0.032 | 0.036 | 0.027 | 0.022 | 0.045 | 0.028 | 0.027 | 0.25 | 0.61 |
| B | mg/L | 0.01 | 2.4 | 2.3 | 0.47 | 0.39 | 2.3 | 2.2 | 1.3 | 2.8 | 3.7 |
| Cd | mg/L | 0.000005 | 0.00021 | 0.00083 | 0.00038 | 0.000065 | 0.00022 | 0.00021 | 0.00021 | 0.016 | 0.038 |
| Cr | mg/L | 0.0001 | 0.002 | *0.001* | *0.0005* | *0.0035* | *0.002* | *0.002* | 0.002 | 0.005 | 0.012 |
| Co | mg/L | 0.0001 | 0.026 | 0.094 | 0.049 | 0.012 | 0.055 | 0.022 | 0.018 | 0.1 | 0.26 |
| Cu | mg/L | 0.0002 | 0.016 | 0.055 | 0.063 | 0.043 | 0.024 | 0.014 | 0.031 | 0.25 | 0.71 |
| Fe | mg/L | 0.01 | *0.2* | *0.1* | *0.05* | *0.02* | *0.2* | *0.2* | 0.14 | 0.5 | 1 |
| Pb | mg/L | 0.00005 | *0.001* | *0.0005* | *0.00025* | *0.0001* | *0.001* | *0.001* | 0.00069 | 0.0036 | 0.16 |
| Mn | mg/L | 0.0001 | 1.2 | 2.2 | 2.2 | 0.43 | 1 | 1.1 | 0.96 | 7.5 | 10 |
| Mo | mg/L | 0.00005 | 0.004 | 0.0061 | 0.003 | 0.0073 | 0.015 | 0.0045 | 0.0055 | 0.022 | 0.056 |
| Ni | mg/L | 0.0005 | 0.053 | 0.18 | 0.052 | 0.014 | 0.16 | 0.04 | 0.054 | 0.25 | 0.46 |
| Sb | mg/L | 0.0001 | 0.002 | 0.0022 | 0.00062 | *0.0011* | 0.003 | *0.002* | 0.0014 | 0.005 | 0.01 |
| Se | mg/L | 0.00005 | 0.001 | 0.0027 | 0.003 | *0.012* | 0.0025 | *0.001* | 0.0011 | 0.009 | 0.03 |
| S | mg/L | 0.5 | 420 | 520 | 240 | 210 | 430 | 360 | 270 | 500 | 600 |
| Zn | mg/L | 0.001 | 0.02 | 0.12 | 0.078 | *0.11* | 0.033 | 0.025 | 0.02 | 0.49 | 2.5 |

Source: "\\srk.ad\dfs\NA\VAN\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\2020 Annual Reports\Doris Madrid Annual Report\Doris Tailings\Working files\1CT022.056_HopeBay_TailingsMonitoringData_TL-11_2020_jce_mc_rev08.xlsx"

Notes:

*Blue italics* = Value less than laboratory detection limit. Detection limit shown.

Metal(loid) concentrations are reported as 'Dissolved

# 5 Summary and Conclusions

In 2020, the Doris mill processed ore from Doris and Madrid North mines.

## 5.1 Tailings Slurry to TIA

In 2020, a total of 364,982 t (dry weight equivalent) of flotation tailings were deposited in the Doris TIA.

### 5.1.1 Flotation Tailings Solids (TL-6)

Monthly monitoring of flotation tailings solids (TL-6) is summarized as follows:

- Sulphur concentrations ranged between 0.07 and 0.63% with a median value of 0.22%.
- TIC content ranged between 170 and 290 kg $CaCO_3$/t. All flotation tailings samples were classified as non-PAG, which in consistent with 2017 to 2019 operational tailings monitoring (SRK 2020) and metallurgical tailings samples (SRK 2015).
- Trace element content was compared to ten times the average crustal abundance data for basalt (Price 1997) as an indicator of enrichment. All parameters were below the screening criteria indicating no appreciable enrichment except for the following:
  - Arsenic was enriched for all flotation tailings samples except for February and October and exhibited the highest operational concentrations in flotation tailings between March and September. In contrast, prior to November 2019, the majority of flotation tailings samples had arsenic content less than the screening criteria. The increase is attributed to the processing of Madrid North ore.
  - Nickel was below the screening criteria but exhibited a similar trend to arsenic.

### 5.1.2 Tailings Detoxified Filtrate (TL-7B) and Process Plant Tailings Discharge (TL-5)

The detoxified tailings filtrate (TL-7B) is combined with the flotation tailings slurry in the thickener tank (TL-5). The detoxified tailings filtrate is approximately 7% of the volume of TL-5 and is managed within the TIA. TL-7B represents the chemistry of the residual moisture within the detoxified tailings, which ranges from 18 to 24%. Monthly monitoring of TL-5 and TL-7B is summarized as follows:

- pH was stable in both TL-5 (8.0 to 8.5 s.u.) and TL-7B (8.3 to 8.8 s.u.).
- Sulphate concentrations were within the range of historical data, but an operational maximum concentration was observed in August 2020 (10,000 mg/L in TL-5 and 41,000 mg/L in TL-7B).
- Sodium, used as a milling reagent, reported concentrations between 1,700 and 8,000 mg/L in TL-5 and between 4,300 and 18,000 mg/L in TL-7B. TL-5 reported a gradually increasing trend although the maximum result was anomalously high in August 2020 and other results averaged 2,200 mg/L. In TL-7B concentrations fluctuated but the overall trend was within the range of 2019 data.

- Concentrations of ammonia increased between July 2019 and January 2020 in TL-5 then decreased thereafter. In TL-7B operational maximums were observed in May and September 2020 otherwise values were within range of historical data.
- Total cyanide concentrations were stable in TL-5 (0.5 to 6.5 mg/L) and lower than 2019 in TL-7B (0.3 to 2.5 mg/L).
- WAD cyanide, free cyanide and thiocyanate concentrations were within the range of historical values in TL-5 and TL-7B except for a fivefold increase observed in thiocyanate in TL-5 in September 2020 and an anomalously high result for free CN in TL-7B in August 2020 which was due to an elevated detection limit. Cyanate concentrations increased in TL-5 to August 2020 then decreased thereafter. In TL-7B cyanate concentrations were within the range of 2019 data with the exception of three samples with values greater than 800 mg/L.
- Chloride data is available for TL-5 from April 2019 onward. Concentrations reported an increasing trend between December 2019 and April 2020 to a maximum of 3,700 mg/L then decreased thereafter. Chloride was not analyzed in TL-7B.
- Arsenic reported an increasing trend in TL-5 between July 2019 and April 2020 then a decreasing trend thereafter (0.0016 to 0.014 mg/L throughout 2020). In TL-7B arsenic concentrations were within a similar range to the 2019 results except for May and July when elevated concentrations were reported (0.046 to 0.92 mg/L throughout 2020).
- Cobalt and nickel concentrations were within range of historical data. Cobalt concentrations have fluctuated between 0.005 and 0.09 mg/L in TL-5 and between 0.02 and 0.23 mg/L in TL-7B over the operational period of the mill. Nickel concentrations have fluctuated between 0.007 and 3.5 mg/L in TL-5 and between 0.03 and 0.27 mg/L in TL-7B.
- Prior to March 2019, concentrations of antimony and molybdenum in TL-5 were relatively stable after which both parameters exhibited increasing trends and higher concentrations. An increasing antimony trend was also apparent in TL-7B from June 2019, whereas molybdenum concentrations in TL-7B fluctuated with no obvious trend.
- Cadmium and zinc concentrations have been relatively stable since August 2018 in TL-5 with the majority of results reported at detection limit and in TL-7B all results for these parameters are reported at detection limit.
- Copper concentrations were stable in TL-5 and reached a new maximum in TL-7B in May 2020 (22 mg/L) but otherwise fluctuated within historical levels.
- Concentrations of manganese were stable in TL-5 and TL-7B apart from slightly higher results in August 2020 (TL-5) and June 2020 (TL-7B).
- Molybdenum concentrations in TL-5 were typically stable to March 2019 then fluctuated at higher levels thereafter (0.03 to 0.1 mg/L in 2020). No trend was apparent in TL-7B (0.05 to 0.17 mg/L in 2020).
- Selenium concentrations fluctuated within historical range (0.001 to 0.007 mg/L in TL-5 and 0.010 to 0.030 mg/L in TL-7B).

## 5.2 Detoxified Tailings to Doris Mine

### 5.2.1 Detoxified Tailings Solids (TL-7A)

In 2020 17,886 t of detoxified tailings were placed as backfill in the stopes of the Doris Mine. The results of the 2020 geochemical monitoring program of detoxified tailings solids (TL-7A) is summarized as follows:

- Sulphur concentrations ranged between 15 and 34 % in 2020.
- TIC results for 2020 ranged between 96 and 184 kg $CaCO_3$/t. All detoxified tailings samples were classified as PAG, which is consistent with 2017 to 2019 operational tailings monitoring and metallurgical tailings samples (SRK 2015).
- All detoxified tailings samples were elevated in arsenic, bismuth, copper, gold, selenium, silver and sulphur compared to the screening criteria. More than half of the 2020 samples were also elevated for lead. Selected samples were elevated in cadmium (n=3), antimony (n=4) and zinc (n=1) compared to the screening criteria.
- All other parameters, including cobalt and nickel were below the screening criteria indicating no appreciable enrichment. Cobalt was stable and nickel oscillated, increasing during the first half of 2020 then subsequently decreasing.

### 5.2.2 Underground Seepage Survey (TL-11)

The results of the opportunistic seepage sampling from underground backfilled stopes (TL-11) is summarized as follows:

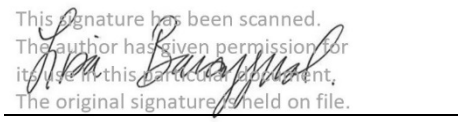
- Major ion chemistry was equivalent for two samples from the July (Levels 134 and 120) and December surveys (Levels 110 and 120) and differed from the two ponded water samples (Levels 5002 and 4905) collected in July suggesting that the ponded water samples did not represent contact waters.
- Key results for the seepage samples inferred to represent contact waters are summarized as follows:
  - The pH and EC ranged from 7.6 to 7.9 s.u and 21,000 to 26,000 µS/cm, respectively.
  - Major anions were chloride (7,100 to 9,000 mg/L) and sulphate (920 to 1,200 mg/L) and major cations were sodium (4,200 to 4,800 mg/L) and magnesium (510 to 580 mg/L). Potential sources of the major ions include residues on waste rock from drilling brines (calcium and chloride), process reagents (sodium), and sulphide oxidation with resulting carbonate dissolution from waste rock and detoxified tailings (sulphate, calcium and magnesium).
  - Levels of ammonia, nitrate and nitrite were lower than the $50^{th}$ percentile concentrations from the historical sample set.
  - Cadmium, copper, nickel, selenium and silver were noted as parameters of potential concern based on the humidity cell test (HCT) program for Doris detoxified tailings (SRK 2015). All of

these parameters reported concentrations in the July sampling program which were less than the 50th percentile concentrations from the historical sample set: cadmium (0.00007 to 0.00083 mg/L), copper (0.02 to 0.06 mg/L), nickel (0.014 to 0.18 mg/L), selenium (0.001 to 0.012 mg/L) and silver (0.0001 to 0.0004 mg/L). Zinc was not noted as a parameter of potential concern in the HCT program but has historically reported elevated concentrations; in July 2020 all samples were below the 50th percentile from the historical sample set ranging between 0.02 and 0.12 mg/L.

- The geochemistry of the two ponded waters (Levels 5002 and 4905) are summarized as follows:
  - The pH and EC ranged from 7.7 to 7.9 s.u. and 3,100 to 5,000 µS/cm, respectively.
  - Similar to the seepage samples inferred to be contact waters, dominant anions were chloride and sulphate but at lower concentrations (1,000 to 1,800 mg/L and 500 to 580 mg/L respectively). Major cations for the ponded water samples were dominated by sodium (670 to 910 mg/L) and to a lesser extent calcium (190 to 380 mg/L). Levels of ammonia, nitrate and nitrite were lower than the 50th percentile concentrations from the historical sample set.

Regards,
SRK Consulting (Canada) Inc.

Melanie Cox, BSc, FGS
Consultant




Lisa Barazzuol, PGeo
Principal Consultant

## Attachments:

| | |
|---|---|
| Attachment A | TL-6 Geochemical Data |
| Attachment B | TL-7A Geochemical Data |
| Attachment C | TL-7B Geochemical Data |
| Attachment D | TL-5 Geochemical Data |
| Attachment E | TL-11 Geochemical Data |

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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# Attachment A TL-6 Geochemical Data

| MAC RESOURCES | Flotation Tailings (TL-6) | | | ABA | | | | | | | | Metals | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Station ID | Lab ID | Date Sampled | Moisture | Total Sulfur | Sulfate (S) | Sulfide Sulfur (by diff.) | $CO_2$ | Inorganic Carbon | $CaCO_3$ Equiv. | AP | $NP_{TIC}/AP$ | Al | Sb | As | Ba | Bi | B | Cd | Ca | Cr | Co | Cu | Fe | La | Pb | Ga | Au |
| | | | Units> | % | % | % | % | % | % | kg $CaCO_3$/t | kg $CaCO_3$/t | Ratio | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppb |
| TL6-13JAN20 | TL-6 | C002161 | 13/01/2020 | - | 0.63 | 0.02 | 0.61 | 7.7 | 2.1 | 174 | 19.7 | 9 | 8900 | <0.1 | 52.4 | 10 | 0.2 | <20 | 0.1 | 40500 | 64 | 18 | 128 | 48400 | 2 | 4.9 | 3 | 1090 |
| TL6-10FEB20 | TL-6 | C009100 | 10/02/2020 | - | 0.36 | 0.02 | 0.34 | 10.0 | 2.7 | 227 | 11.3 | 20 | 7900 | <0.1 | 17.1 | 8 | 0.1 | 38 | <0.1 | 48700 | 68 | 15 | 81.6 | 52100 | 1 | 4.6 | 3 | 702 |
| TL6-11MAR20 | TL-6 | C018299 | 11/03/2020 | - | 0.17 | 0.02 | 0.15 | 9.3 | 2.5 | 212 | 5.3 | 40 | 8000 | <0.1 | 30.4 | 11 | <0.1 | <20 | <0.1 | 48700 | 56 | 12.6 | 45.5 | 50000 | 2 | 2.6 | 3 | 964 |
| TL6-15APR20 | TL-6 | C025600 | 15/04/2020 | - | 0.24 | 0.02 | 0.22 | 9.2 | 2.5 | 209 | 8 | 28 | 1000 | 0.2 | 109 | 9 | <0.1 | <20 | <0.1 | 39700 | 97 | 17.4 | 43.6 | 44600 | 2 | 2.6 | 4 | 1050 |
| TL6-11MAY20 | TL-6 | C031719 | 11/05/2020 | - | 0.29 | 0.01 | 0.28 | 9.7 | 2.7 | 221 | 9.1 | 24 | 9900 | 0.2 | 107 | 14 | <0.1 | <25 | <0.1 | 48900 | 88 | 21 | 47.7 | 52200 | 3 | 2.3 | 4 | 668 |
| TL6-22JUN20 | TL-6 | C042819 | 22/06/2020 | - | 0.36 | 0.02 | 0.34 | 9.9 | 2.7 | 225 | 11 | 20 | 6700 | 0.1 | 91 | 7 | <0.1 | <20 | 0.1 | 45000 | 65 | 16.8 | 62 | 46600 | 2 | 3.4 | 2 | 706 |
| TL6-23JUL20 | TL-6 | C051450 | 23/07/2020 | - | 0.26 | 0.02 | 0.24 | 10.0 | 2.7 | 227 | 8.1 | 28 | 7700 | 0.1 | 64.4 | 7 | 0.1 | <20 | <0.1 | 47600 | 58 | 16.3 | 38.7 | 46800 | 2 | 3.5 | 3 | 671 |
| TL6-11AUG20 | TL-6 | C056227 | 11/08/2020 | - | 0.18 | 0.03 | 0.15 | 9.2 | 2.5 | 208 | 5.6 | 37 | 6200 | 0.1 | 58.5 | 7 | 0.1 | <20 | <0.1 | 41700 | 72 | 12.3 | 46.3 | 41200 | 2 | 5.9 | 2 | 736 |
| TL6-14SEP20 | TL-6 | C065995 | 14/09/2020 | - | 0.2 | 0.02 | 0.18 | 9.7 | 2.7 | 221 | 6.3 | 35 | 10100 | 0.1 | 25.5 | 9 | <0.1 | <20 | <0.1 | 52600 | 66 | 15.5 | 53.8 | 61600 | 2 | 3 | 4 | 543 |
| TL6-14OCT20 | TL-6 | C081059 | 14/10/2020 | - | 0.07 | 0.02 | 0.05 | 12.7 | 3.5 | 289 | 2.2 | 132 | 9600 | <0.1 | 12.1 | 7 | <0.1 | <20 | <0.1 | 58100 | 43 | 14 | 18.6 | 60200 | 1 | 0.9 | 3 | 337 |
| TL6-23NOV20 | TL-6 | C086374 | 23/11/2020 | - | 0.17 | 0.03 | 0.14 | 11.1 | 3.0 | 253 | 5.3 | 0.3 | 12000 | 0.2 | 39.9 | 11 | <0.1 | <20 | <0.1 | 56000 | 62 | 18.4 | 37 | 64500 | 3 | 2.5 | 4 | 274 |

| TMAC RESOURCES | Flotation Tailings (TL-6) | | | Metals | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Station ID | Lab ID | Date Sampled | Mg | Mn | Hg | Mo | Ni | P | K | Sc | Se | Ag | Na | Sr | S | Te | Tl | Th | Ti | W | U | V | Zn |
| | | | Units> | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| TL6-13JAN20 | TL-6 | C002161 | 13/01/2020 | 18000 | 1170 | <0.01 | 0.8 | 46.5 | 370 | 600 | 8.2 | <0.5 | 0.6 | 1280 | 34 | 6200 | 0.2 | <0.1 | 0.2 | 170 | 1.3 | <0.1 | 31 | 70 |
| TL6-10FEB20 | TL-6 | C009100 | 10/02/2020 | 15700 | 1330 | <0.01 | 0.6 | 26.9 | 420 | 600 | 8.1 | <0.5 | 0.3 | 1310 | 28 | 3000 | <0.2 | <0.1 | 0.2 | 70 | 0.8 | <0.1 | 23 | 54 |
| TL6-11MAR20 | TL-6 | C018299 | 11/03/2020 | 17600 | 1280 | <0.01 | 0.4 | 39 | 460 | 600 | 8.7 | <0.5 | 0.2 | 1290 | 35 | 1700 | <0.2 | 0.2 | 0.5 | 110 | 1 | <0.1 | 27 | 46 |
| TL6-15APR20 | TL-6 | C025600 | 15/04/2020 | 23100 | 1100 | <0.01 | 0.5 | 93.5 | 380 | 500 | 9.9 | <0.5 | 0.2 | 1090 | 54 | 2300 | <0.2 | <0.1 | 0.2 | 240 | 0.8 | <0.1 | 34 | 37 |
| TL6-11MAY20 | TL-6 | C031719 | 11/05/2020 | 22500 | 1290 | 0.01 | 0.6 | 114 | 390 | 700 | 11.3 | <0.5 | 0.2 | 1170 | 59 | 2800 | <0.2 | <0.1 | 0.2 | 180 | 1.4 | <0.1 | 40 | 44 |
| TL6-22JUN20 | TL-6 | C042819 | 22/06/2020 | 19300 | 1260 | <0.01 | 0.7 | 81.3 | 460 | 500 | 8.9 | <0.5 | 0.3 | 1020 | 47 | 3600 | <0.2 | <0.1 | 0.1 | 60 | 1.7 | <0.1 | 32 | 46 |
| TL6-23JUL20 | TL-6 | C051450 | 23/07/2020 | 18500 | 1210 | <0.01 | 0.6 | 66.8 | 360 | 500 | 9.2 | <0.5 | 0.2 | 870 | 45 | 2500 | <0.2 | <0.1 | 0.2 | 100 | 1 | <0.1 | 30 | 43 |
| TL6-11AUG20 | TL-6 | C056227 | 11/08/2020 | 17100 | 1140 | <0.01 | 0.9 | 61.8 | 410 | 600 | 8.7 | <0.5 | 0.2 | 1050 | 49 | 1700 | <0.2 | <0.1 | 0.2 | 110 | 0.9 | <0.1 | 25 | 37 |
| TL6-14SEP20 | TL-6 | C065995 | 14/09/2020 | 18500 | 1510 | <0.01 | 0.8 | 40.6 | 540 | 700 | 10.6 | <0.5 | 0.2 | 1430 | 35 | 2200 | <0.2 | <0.1 | 0.2 | 120 | 1 | <0.1 | 33 | 54 |
| TL6-14OCT20 | TL-6 | C081059 | 14/10/2020 | 19200 | 1510 | <0.01 | 0.4 | 28.3 | 410 | 400 | 11.1 | <0.5 | <0.1 | 890 | 33 | 800 | <0.2 | <0.1 | 0.2 | 30 | 0.6 | <0.1 | 30 | 51 |
| TL6-23NOV20 | TL-6 | C086374 | 23/11/2020 | 22300 | 1550 | <0.01 | 0.5 | 56.2 | 540 | 600 | 12.8 | <0.5 | 0.1 | 1060 | 51 | 1500 | <0.2 | <0.1 | 0.3 | 90 | 0.5 | <0.1 | 41 | 66 |

# Attachment B TL-7A Geochemical Data

| TMAC RESOURCES | Detoxified Tailings (TL-7A) | | | ABA | | | | | | | | Metals | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Station ID | Lab ID | Date Sampled | Moisture | Total Sulfur | Sulfate (S) | Sulfide Sulfur (by diff.) | $CO_2$ | Inorganic Carbon | $CaCO_3$ Equiv. | AP | $NP_{TIC}/AP$ | Al | Sb | As | Ba | Bi | B | Cd | Ca | Cr | Co | Cu | Fe | La | Pb | Ga | Au |
| | | | Units> | % | % | % | % | % | % | kg $CaCO_3$/t | kg $CaCO_3$/t | Ratio | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppb |
| TL7-13JAN20 | TL-7A | C002167 | 13/01/2020 | 22 | 15 | 0.15 | 14 | 6.6 | 1.8 | 149 | 453 | 0.33 | 7500 | 0.7 | 421 | 10 | 3.9 | <20 | 2.1 | 34900 | 306 | 169 | 2720 | 161000 | <1 | 86 | 3 | 8460 |
| TL7-10FEB20 | TL-7A | C009104 | 10/02/2020 | 21 | 25 | 0.20 | 25 | 5.8 | 1.6 | 131 | 792 | 0.17 | 5100 | 0.6 | 671 | 6 | 4.4 | <20 | 2 | 24200 | 254 | 263 | 3850 | 222000 | <1 | 125 | 2 | 15500 |
| TL7-11MAR20 | TL-7A | C018302 | 11/03/2020 | 18 | 20 | 0.13 | 20 | 8.0 | 2.2 | 182 | 627 | 0.29 | 5400 | 1.4 | 1310 | 8 | 2.4 | <20 | 0.9 | 34000 | 193 | 259 | 2460 | 207000 | <1 | 61.9 | 2 | 8830 |
| TL7-15APR20 | TL-7A | C025605 | 15/04/2020 | 21 | 20 | 0.14 | 20 | 7.3 | 2.0 | 166 | 625 | 0.27 | 5900 | 2.2 | 1440 | 7 | 3.8 | <20 | 1.4 | 28200 | 266 | 234 | 2250 | 187000 | <1 | 204 | 2 | 14600 |
| TL7-11MAY20 | TL-7A | C031721 | 11/05/2020 | 19 | 17 | 0.13 | 16 | 8.1 | 2.2 | 184 | 517 | 0.36 | 7000 | 1.7 | 2130 | 8 | 1.8 | <20 | 1 | 41200 | 304 | 225 | 3330 | 183000 | 1 | 44.4 | 3 | 4740 |
| TL7-22JUN20 | TL-7A | C042825 | 22/06/2020 | 16 | 28 | 0.08 | 28 | 6.1 | 1.7 | 139 | 873 | 0.16 | 3700 | 2.4 | 2640 | 7 | 4.3 | <20 | 1.3 | 29400 | 239 | 332 | 4700 | 259000 | <1 | 39.9 | 1 | 14900 |
| TL7-23JUL20 | TL-7A | C051451 | 23/07/2020 | 20 | 20 | 0.20 | 20 | 7.5 | 2.0 | 171 | 625 | 0.27 | 4600 | 2.7 | 2400 | 5 | 5.3 | <20 | 1.0 | 34500 | 216 | 340 | 3990 | 193000 | <1 | 93.5 | 2 | 19000 |
| TL7-11AUG20 | TL-7A | C056231 | 11/08/2020 | 38 | 17 | 0.46 | 16 | 5.7 | 1.54 | 129 | 517 | 0.25 | 6500 | 2.4 | 1010 | 9 | 3.1 | <20 | 2.4 | 28700 | 600 | 203 | >10000 | 165000 | 1 | 261 | 3 | 6290 |
| TL7-14SEP20 | TL-7A | C065996 | 14/09/2020 | 13 | 34 | 0.13 | 33 | 4.2 | 1.2 | 96 | 1047 | 0.09 | 2800 | 1.3 | 1330 | 4 | 5.3 | <20 | 1.8 | 21100 | 237 | 425 | 3130 | 331000 | <1 | 73.3 | 1 | 15400 |
| TL7-3NOV20 | TL-7A | C081067 | 03/11/2020 | 19 | 21 | 0.06 | 21 | 7.9 | 2.2 | 180 | 657 | 0.27 | 6300 | 0.8 | 652 | 6 | 4.4 | <20 | 1.2 | 34300 | 144 | 215 | 1690 | 196000 | <1 | 30.1 | 2 | 4510 |
| TL7-23NOV20 | TL-7A | C086373 | 23/11/2020 | 20 | 26 | 0.20 | 26 | 5.5 | 1.5 | 125 | 806 | 0.16 | 5400 | 1.5 | 961 | 8 | 4.9 | <20 | 4.5 | 27000 | 246 | 370 | 3580 | 254000 | <1 | 205 | 2 | 6090 |

| TMAC RESOURCES | Detoxified Tailings (TL-7A) | | | Metals | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Station ID | Lab ID | Date Sampled | Mg | Mn | Hg | Mo | Ni | P | K | Sc | Se | Ag | Na | Sr | S | Te | Tl | Th | Ti | W | U | V | Zn |
| | | | Units> | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| TL7-13JAN20 | TL-7A | C002167 | 13/01/2020 | 12800 | 1080 | 0.05 | 3 | 117 | 340 | 600 | 6.5 | 9.8 | 16 | 3060 | 27 | >100000 | 4.1 | 0.1 | 0.1 | 80 | 3.9 | <0.1 | 24 | 622 |
| TL7-10FEB20 | TL-7A | C009104 | 10/02/2020 | 9700 | 812 | 0.05 | 3.2 | 197 | 250 | 400 | 5 | 14.7 | 17 | 2260 | 22 | >100000 | 4.4 | 0.1 | 0.1 | 60 | 4.7 | <0.1 | 17 | 659 |
| TL7-11MAR20 | TL-7A | C018302 | 11/03/2020 | 14000 | 963 | 0.03 | 2.7 | 469 | 330 | 500 | 6.9 | 13 | 11 | 1780 | 47 | >100000 | 3.7 | 0.1 | 0.7 | 30 | 2.6 | <0.1 | 22 | 265 |
| TL7-15APR20 | TL-7A | C025605 | 15/04/2020 | 14800 | 805 | 0.05 | 2.7 | 566 | 240 | 400 | 7 | 11 | 13 | 1830 | 48 | >100000 | 3.3 | 0.1 | 0.1 | 100 | 2 | <0.1 | 21 | 506 |
| TL7-11MAY20 | TL-7A | C031721 | 11/05/2020 | 18600 | 1100 | 0.02 | 2.8 | 790 | 320 | 600 | 10.4 | 8.7 | 14 | 2210 | 68 | >100000 | 2.5 | 0.1 | 0.2 | 70 | 1.8 | <0.1 | 30 | 361 |
| TL7-22JUN20 | TL-7A | C042825 | 22/06/2020 | 11700 | 848 | 0.04 | 4.2 | 879 | 220 | 600 | 6.1 | 17 | 23 | 1280 | 45 | >100000 | 8 | 0.1 | 0.1 | 20 | 3.3 | <0.1 | 39 | 366 |
| TL7-23JUL20 | TL-7A | C051451 | 23/07/2020 | 14900 | 891 | 0.05 | 3.7 | 876 | 220 | 400 | 7.5 | 12 | 21 | 2580 | 54 | >100000 | 8.2 | 0.2 | 0.3 | 41 | 2.1 | <0.1 | 21 | 386 |
| TL7-11AUG20 | TL-7A | C056231 | 11/08/2020 | 12800 | 926 | 0.05 | 3.8 | 411 | 280 | 500 | 7.1 | 11 | 28 | 6030 | 35 | >100000 | 3.5 | 0.2 | 0.2 | 210 | 3.4 | <0.1 | 27 | 993 |
| TL7-14SEP20 | TL-7A | C065996 | 14/09/2020 | 7500 | 758 | 0.04 | 4.4 | 441 | 240 | 300 | 4.7 | 21 | 20 | 1970 | 20 | >100000 | 6.4 | 0.1 | 0.1 | 30 | 4.4 | <0.1 | 12 | 572 |
| TL7-3NOV20 | TL-7A | C081067 | 03/11/2020 | 12200 | 1060 | 0.03 | 2.5 | 153 | 370 | 400 | 7.3 | 15 | 16 | 1720 | 26 | >100000 | 5.1 | 0.1 | 0.2 | 20 | 3.1 | <0.1 | 20 | 341 |
| TL7-23NOV20 | TL-7A | C086373 | 23/11/2020 | 8800 | 898 | 0.07 | 5.2 | 256 | 260 | 400 | 5.4 | 22 | 21 | 2360 | 25 | >100000 | 5.5 | 0.4 | 0.2 | 60 | 3.5 | <0.1 | 37 | 1170 |

# Attachment C TL-7B Geochemical Data

| MAC RESOURCES | | | Aluminum (Al)-Total | Ammonia, Total (as N) | Antimony (Sb)-Total | Arsenic (As)-Total | Barium (Ba)-Total | Beryllium (Be)-Total | Bismuth (Bi)-Total | Boron (B)-Total | Cadmium (Cd)-Total | Calcium (Ca)-Total | Cesium (Cs)-Total | Chromium (Cr)-Total | Cobalt (Co)-Total | Copper (Cu)-Total | Cyanate | Cyanide, Total | Cyanide, Weak Acid Diss | Iron (Fe)-Total | Lead (Pb)-Total | Lithium (Li)-Total | Magnesium (Mg)-Total | Manganese (Mn)-Total | Molybdenum (Mo)-Total | Nickel (Ni)-Total | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Lab ID | Sample Date | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | pH |
| TL7B | L2402981-1 | 05/01/2020 16:55 | 0.33 | 257 | 0.03 | 0.06 | 0.07 | <0.005 | <0.0025 | 1.37 | <0.00025 | 44.6 | <0.0005 | 0.014 | 0.03 | 11.6 | 732 | 1.01 | 0.21 | 2.30 | 0.0027 | 0.07 | 48.3 | 0.25 | 0.14 | <0.025 | 8.5 |
| TL7B | L2413143-1 | 02/02/2020 16:50 | 0.81 | 227 | 0.03 | 0.05 | 0.05 | <0.005 | <0.0025 | 1.27 | <0.00025 | 51.7 | <0.0005 | 0.012 | 0.02 | 11.9 | 517 | 0.90 | 0.18 | 4.19 | 0.0049 | 0.08 | 78.4 | 0.26 | 0.10 | <0.025 | 8.6 |
| TL7B | L2435057-1 | 02/03/2020 00:00 | <0.15 | 184 | 0.03 | 0.20 | 0.09 | <0.005 | <0.0025 | 0.87 | <0.00025 | 84.7 | <0.0005 | 0.010 | 0.03 | 5.79 | 378 | 0.31 | 0.08 | 1.37 | <0.0025 | <0.05 | 89.6 | 0.22 | 0.05 | 0.06 | 8.3 |
| TL7B | L2444703-1 | 05/04/2020 09:15 | 0.39 | 228 | 0.05 | 0.26 | 0.07 | <0.005 | <0.0025 | 1.36 | <0.00025 | 68.6 | <0.0005 | 0.011 | 0.07 | 2.87 | 704 | 0.61 | 0.27 | 2.40 | 0.0127 | <0.05 | 74.3 | 0.20 | 0.08 | 0.03 | 8.5 |
| TL7B | L2458880-1 | 05/05/2020 17:00 | 0.35 | 356 | 0.08 | 0.92 | 0.10 | <0.005 | <0.0025 | 1.08 | <0.00025 | 54.8 | <0.0005 | 0.014 | 0.06 | 21.6 | 896 | 0.54 | 0.12 | 2.23 | <0.0025 | 0.08 | 63.1 | 0.20 | 0.16 | 0.12 | 8.6 |
| TL7B | L2423399-1 | 07/06/2020 00:00 | 0.31 | 226 | 0.03 | 0.19 | 0.04 | <0.002 | <0.0010 | 0.70 | 0.00027 | 146 | <0.0002 | 0.015 | 0.04 | 7.62 | 395 | 0.55 | 0.01 | 7.01 | 0.0049 | 0.05 | 120 | 0.63 | 0.06 | 0.18 | 8.4 |
| TL7B | L2472316-1 | 05/07/2020 00:00 | 0.42 | 283 | 0.08 | 0.84 | 0.09 | <0.005 | <0.0025 | 1.36 | <0.00025 | 66.5 | <0.0005 | 0.016 | 0.07 | 10.3 | 629 | 0.96 | 0.15 | 2.61 | 0.0059 | 0.07 | 63.5 | 0.29 | 0.17 | 0.27 | 8.4 |
| TL7B | YL2000008-001 | 02/08/2020 00:00 | 0.21 | 160 | 0.02 | 0.05 | 0.11 | <0.001 | <0.0025 | 0.89 | <0.00025 | 98.0 | <0.0005 | 0.026 | 0.10 | 7.70 | 548 | 2.45 | <0.20 | 1.03 | 0.0052 | 0.11 | 42.2 | 0.16 | 0.08 | 0.25 | 8.6 |
| TL7B | YL2000019-001 | 06/09/2020 00:00 | 0.22 | 323 | 0.06 | 0.09 | 0.04 | <0.001 | <0.0025 | 1.09 | <0.00025 | 55.0 | <0.0005 | <0.025 | 0.04 | 7.02 | 1030 | 0.54 | 0.32 | 3.36 | 0.0027 | <0.050 | 57.1 | 0.30 | 0.12 | <0.0250 | 8.8 |
| TL7B | YL2000152-001 | 21/10/2020 00:00 | 1.08 | 250 | 0.05 | 0.07 | 0.05 | <0.001 | <0.0025 | 1.09 | <0.00025 | 45.2 | <0.0005 | <0.025 | 0.10 | 2.79 | 829 | 0.54 | 0.15 | 5.66 | <0.00250 | <0.050 | 50.2 | 0.21 | 0.09 | <0.0250 | 8.6 |
| TL7B | YL2000199-001 | 09/11/2020 00:00 | 0.67 | 176 | 0.03 | 0.05 | 0.05 | <0.001 | <0.0025 | 1.09 | <0.00025 | 87.9 | <0.0005 | <0.025 | 0.02 | 4.97 | 380 | 0.94 | 0.06 | 4.21 | 0.0068 | <0.050 | 77.2 | 0.44 | 0.06 | 0.03 | 8.6 |
| TL7B | YL2000259-001 | 01/12/2020 00:00 | 0.88 | 261 | 0.07 | 0.19 | 0.08 | <0.001 | <0.0025 | 1.18 | <0.00025 | 53.9 | <0.0005 | <0.025 | 0.08 | 8.01 | 622 | 0.38 | 0.22 | 8.78 | <0.00250 | <0.050 | 51.1 | 0.30 | 0.07 | 0.04 | 8.6 |

| TMAC RESOURCES | | | Phosphorus (P)-Total | Potassium (K)-Total | Rubidium (Rb)-Total | Selenium (Se)-Total | Silicon (Si)-Total | Silver (Ag)-Total | Sodium (Na)-Total | Strontium (Sr)-Total | Sulfur (S)-Total | Tellurium (Te)-Total | Thallium (Tl)-Total | Thiocyanate (SCN) | Thorium (Th)-Total | Tin (Sn)-Total | Titanium (Ti)-Total | Tungsten (W)-Total | Uranium (U)-Total | Vanadium (V)-Total | Zinc (Zn)-Total | Zirconium (Zr)-Total | Cyanide, Free |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Lab ID | Sample Date | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| TL7B | L2402981-1 | 05/01/2020 16:55 | <2.5 | 81.8 | <0.010 | 0.019 | <5.00 | 0.006 | 9560 | 0.67 | 5720 | <0.010 | <0.00050 | 220 | <0.0050 | <0.0050 | <0.015 | 0.18 | <0.0005 | <0.025 | <0.15 | <0.010 | 0.011 |
| TL7B | L2413143-1 | 02/02/2020 16:50 | <2.5 | 77.4 | <0.010 | 0.012 | <5.00 | 0.004 | 10100 | 0.75 | 5950 | <0.010 | <0.00050 | 199 | <0.0050 | <0.0050 | <0.015 | 0.11 | <0.0005 | <0.025 | <0.15 | <0.010 | <0.010 |
| TL7B | L2435057-1 | 02/03/2020 00:00 | <2.5 | 71.0 | <0.010 | 0.011 | <5.00 | 0.001 | 7960 | 1.27 | 4490 | <0.010 | <0.00050 | 142 | <0.0050 | <0.0050 | <0.015 | 0.04 | <0.0005 | <0.025 | <0.15 | <0.010 | 0.016 |
| TL7B | L2444703-1 | 05/04/2020 09:15 | <2.5 | 70.2 | <0.010 | 0.010 | <5.00 | 0.004 | 7430 | 1.01 | 4110 | <0.010 | <0.00050 | 281 | <0.0050 | <0.0050 | <0.015 | 0.05 | <0.0005 | <0.025 | <0.15 | <0.010 | 0.014 |
| TL7B | L2458880-1 | 05/05/2020 17:00 | <2.5 | 110 | <0.010 | 0.029 | 5.90 | 0.008 | 11300 | 0.93 | 7350 | <0.010 | <0.00050 | 233 | <0.0050 | <0.0050 | <0.015 | 0.09 | 0.0010 | <0.025 | <0.15 | <0.010 | <0.0050 |
| TL7B | L2423399-1 | 07/06/2020 00:00 | <1.0 | 49.3 | <0.0040 | 0.015 | 3.60 | 0.002 | 4320 | 1.49 | 2350 | <0.004 | <0.00020 | 76.9 | <0.0020 | <0.0020 | <0.0060 | 0.02 | <0.0002 | <0.010 | 0.07 | <0.0040 | <0.0050 |
| TL7B | L2472316-1 | 05/07/2020 00:00 | <2.5 | 98.0 | <0.010 | 0.015 | 5.60 | <0.0005 | 13200 | 0.98 | 7470 | <0.010 | <0.00050 | 213 | <0.0050 | <0.0050 | <0.015 | 0.07 | 0.0006 | <0.025 | <0.15 | <0.010 | <0.010 |
| TL7B | YL2000008-001 | 02/08/2020 00:00 | <2.5 | 82.3 | 0.026 | 0.012 | <5.00 | 0.002 | 18200 | 1.17 | 13800 | <0.010 | <0.00050 | 23.0 | <0.0050 | <0.0050 | <0.015 | 0.03 | <0.0005 | <0.025 | <0.15 | <0.010 | <0.200 |
| TL7B | YL2000019-001 | 06/09/2020 00:00 | <2.5 | 61.1 | <0.010 | 0.023 | <5.00 | 0.008 | 8400 | 0.78 | 5150 | <0.010 | <0.00050 | 444 | <0.0050 | <0.0050 | <0.015 | 0.06 | <0.0005 | <0.025 | <0.15 | <0.010 | 0.009 |
| TL7B | YL2000152-001 | 21/10/2020 00:00 | <2.5 | 67.2 | <0.010 | 0.010 | 5.02 | 0.005 | 7850 | 0.55 | 5020 | <0.010 | <0.00050 | 220 | <0.0050 | <0.0050 | <0.015 | 0.08 | <0.0005 | <0.025 | <0.15 | <0.010 | 0.021 |
| TL7B | YL2000199-001 | 09/11/2020 00:00 | <2.5 | 55.5 | <0.010 | 0.018 | <5.00 | 0.004 | 7950 | 0.95 | 5130 | <0.010 | <0.00050 | 21.8 | <0.0050 | <0.0050 | <0.015 | 0.03 | <0.0005 | <0.025 | <0.15 | <0.010 | <0.020 |
| TL7B | YL2000259-001 | 01/12/2020 00:00 | <2.5 | 57.0 | <0.010 | 0.022 | 5.42 | 0.011 | 9510 | 0.76 | 6050 | <0.010 | <0.00050 | 205 | <0.0050 | <0.0050 | 0.047 | 0.07 | <0.0005 | <0.025 | <0.15 | <0.010 | <0.020 |

# Attachment D TL-5 Geochemical Data

| | | Sample ID | TL5-5JAN-20 | TL5-2FEB-20 | TL5-4MAR-20 | TL5-6APR-20 | TL5-4MAY-20 | TL5-7JUN-20 | TL5-5JUL-20 | TL5-2AUG-20 | TL5-6SEP-20 | TL5-21OCT-20 | TL5-9NOV-20 | TL5-4DEC-20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Jan-2020 | Feb-2020 | Mar-2020 | Apr-2020 | May-2020 | Jun-2020 | Jul-2020 | Aug-2020 | Sep-2020 | Oct-2020 | Nov-2020 | Dec-2020 |
| Parameter | Units | Detection Limit | Water | Water | Water | Water | Water | Water | Water | Water | Water | Water | Water | Water |
| Hardness (as CaCO3) | mg/L | 0.5 | 1010 | 1240 | 1500 | 1010 | 1050 | 1170 | 1230 | 1000 | 997 | 805 | 836 | 900 |
| pH | pH | 0.1 | 8.23 | 8.18 | 8.16 | 8.19 | 8.51 | 8.24 | 8 | 8.2 | 8.21 | 8.21 | 8.23 | 8.38 |
| Total Suspended Solids | mg/L | 3 | 104 | 15.5 | 39 | 34.6 | 5.6 | 69 | 72.8 | 42.6 | 22.3 | 17.5 | 7.8 | 29.4 |
| Ammonia, Total (as N) | mg/L | 0.25 | 47.2 | 39.8 | 30.4 | 37 | 48.3 | 31.5 | 33.5 | 56.3 | 42.6 | 28.3 | 28.2 | 38.4 |
| Chloride (Cl) | mg/L | 25 | 2470 | 2680 | 3680 | 2730 | 2860 | 2480 | 2530 | 2280 | 2450 | 1920 | 1830 | 2030 |
| Nitrate (as N) | mg/L | 0.1 | 24.4 | 22.5 | 13.8 | 21.3 | 19.7 | 10.2 | 15.8 | 5.82 | 13.7 | 18 | 12.9 | 18.6 |
| Nitrite (as N) | mg/L | 0.02 | 1.25 | 1.18 | 0.79 | 1.14 | 1.15 | 0.393 | 0.721 | 0.735 | 0.582 | 1.23 | 0.707 | 0.942 |
| Sulfate (SO4) | mg/L | 6 | 2290 | 1850 | 1360 | 1750 | 2420 | 1520 | 1780 | 10300 | 2030 | 1520 | 1810 | 2080 |
| Cyanide, Weak Acid Diss | mg/L | 0.005 | 0.162 | 0.159 | 0.429 | 0.152 | 2.13 | 0.176 | 2.1 | 0.047 | 0.13 | *0.2* | *0.2* | 0.176 |
| Cyanide, Total | mg/L | 0.005 | 5.52 | 2.79 | 3.08 | 2.8 | 6.49 | 1.56 | 4.09 | 0.512 | 2.49 | 3.23 | 2.46 | 3.02 |
| Cyanate | mg/L | 2 | 88.2 | 76.2 | 64.5 | 79.2 | 129 | 59 | 55.2 | 157 | 95.7 | 61.2 | 46.6 | 67 |
| Thiocyanate (SCN) | mg/L | 0.5 | 20.3 | 21.4 | 12.9 | 14.9 | 52 | 8.82 | 32.5 | 15.6 | 231 | 31.8 | 14.5 | 14.7 |
| Cyanide, Free | mg/L | 0.005 | 0.139 | 0.122 | 0.178 | 0.043 | 1.36 | 0.075 | 1.04 | *0.01* | *0.1* | *0.2* | *0.2* | 0.0589 |
| Aluminum (Al)-Dissolved | mg/L | 0.006 | 0.032 | 0.038 | 0.045 | 0.037 | 0.059 | 0.042 | 0.066 | 0.0868 | 0.049 | 0.126 | 0.109 | 0.0787 |
| Antimony (Sb)-Dissolved | mg/L | 0.0002 | 0.0023 | 0.0033 | 0.0046 | 0.0046 | 0.0052 | 0.0034 | 0.0036 | 0.00511 | 0.0026 | 0.00564 | 0.00343 | 0.00564 |
| Arsenic (As)-Dissolved | mg/L | 0.0002 | 0.0018 | 0.0016 | 0.0039 | 0.0075 | 0.0116 | 0.0055 | 0.0103 | 0.0137 | 0.0032 | 0.00269 | 0.00321 | 0.00433 |
| Barium (Ba)-Dissolved | mg/L | 0.0001 | 0.034 | 0.045 | 0.0461 | 0.0455 | 0.0461 | 0.0342 | 0.044 | 0.067 | 0.0433 | 0.0275 | 0.0362 | 0.0336 |
| Beryllium (Be)-Dissolved | mg/L | 0.0002 | *0.001* | *0.0002* | *0.001* | *0.0002* | *0.0002* | *0.001* | *0.001* | *0.001* | *0.0002* | *0.001* | *0.001* | *0.001* |
| Bismuth (Bi)-Dissolved | mg/L | 0.0001 | *0.2* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0025* | *0.0005* | *0.0005* | *0.0005* | *0.0005* |
| Boron (B)-Dissolved | mg/L | 0.02 | 1.03 | 0.91 | 1.15 | 0.97 | 0.94 | 0.85 | 1.06 | 0.793 | 0.98 | 0.877 | 0.849 | 0.793 |
| Cadmium (Cd)-Dissolved | mg/L | 0.00001 | 0.000061 | *0.00005* | *0.00005* | *0.00005* | *0.00005* | *0.00005* | *0.00005* | *0.00025* | *0.00005* | *0.00005* | *0.00005* | *0.00005* |
| Calcium (Ca)-Dissolved | mg/L | 0.1 | 180 | 206 | 252 | 155 | 146 | 200 | 176 | 205 | 171 | 123 | 130 | 147 |
| Cesium (Cs)-Dissolved | mg/L | 0.00002 | #N/A | #N/A | 0.00036 | #N/A | #N/A | 0.00014 | 0.00026 | *0.0005* | *0.0001* | 0.00053 | 0.000233 | 0.000125 |
| Chromium (Cr)-Dissolved | mg/L | 0.0002 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | #N/A | *0.001* | *0.001* | *0.001* | *0.001* |
| Cobalt (Co)-Dissolved | mg/L | 0.0002 | 0.0075 | 0.0062 | 0.0139 | 0.0103 | 0.0402 | 0.0085 | 0.0404 | 0.0471 | 0.0093 | 0.00923 | 0.00615 | 0.00972 |
| Copper (Cu)-Dissolved | mg/L | 0.001 | 0.185 | 0.055 | 0.355 | 0.177 | 1.68 | 0.101 | 0.872 | 2.17 | 0.0131 | 0.138 | 0.0338 | 0.128 |
| Iron (Fe)-Dissolved | mg/L | 0.02 | 1.87 | 1.03 | 1.15 | 1.04 | 1.59 | 0.38 | 0.33 | *0.5* | 0.91 | 1.14 | 0.77 | 1.06 |
| Lead (Pb)-Dissolved | mg/L | 0.0001 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0025* | *0.0005* | *0.0005* | *0.0005* | *0.0005* |
| Lithium (Li)-Dissolved | mg/L | 0.002 | 0.044 | 0.048 | 0.062 | 0.061 | 0.06 | 0.045 | 0.046 | 0.057 | 0.043 | 0.0211 | 0.0289 | 0.0356 |
| Magnesium (Mg)-Dissolved | mg/L | 0.01 | 136 | 177 | 213 | 152 | 166 | 163 | 191 | 136 | 138 | 114 | 106 | 129 |
| Manganese (Mn)-Dissolved | mg/L | 0.0002 | 0.185 | 0.201 | 0.183 | 0.136 | 0.103 | 0.208 | 0.135 | 0.622 | 0.165 | 0.0857 | 0.1 | 0.128 |
| Mercury (Hg)-Dissolved | mg/L | 0.000005 | *0.000005* | *0.000025* | *0.00001* | *0.00005* | 0.0000059 | *0.00001* | *0.000025* | 0.0000636 | *0.000025* | *0.000005* | *0.000005* | *0.000005* |
| Molybdenum (Mo)-Dissolved | mg/L | 0.0001 | 0.103 | 0.0622 | 0.0445 | 0.0482 | 0.0889 | 0.0683 | 0.0657 | 0.0291 | 0.0699 | 0.0436 | 0.0315 | 0.04 |
| Nickel (Ni)-Dissolved | mg/L | 0.001 | 0.0105 | 0.0088 | 0.151 | 0.0814 | 0.503 | 0.1 | 0.569 | 0.164 | 0.0344 | 0.0426 | 0.0542 | 0.077 |
| Phosphorus (P)-Dissolved | mg/L | 0.1 | *0.5* | *0.5* | *0.5* | *0.5* | 0.77 | *0.5* | 0.62 | *2.5* | 0.7 | *0.5* | *0.5* | 0.522 |
| Potassium (K)-Dissolved | mg/L | 0.1 | 103 | 116 | 129 | 113 | 138 | 104 | 160 | 74.3 | 112 | 114 | 89 | 96.4 |
| Rubidium (Rb)-Dissolved | mg/L | 0.0004 | #N/A | #N/A | 0.048 | #N/A | #N/A | 0.0412 | 0.0436 | 0.022 | 0.0346 | 0.0391 | 0.0388 | 0.0342 |
| Selenium (Se)-Dissolved | mg/L | 0.0001 | 0.00133 | 0.00214 | 0.00137 | 0.0022 | 0.00497 | 0.00128 | 0.00316 | 0.00686 | 0.00646 | 0.00356 | 0.00174 | 0.00251 |
| Silicon (Si)-Dissolved | mg/L | 0.2 | 1.54 | 1.48 | 1.25 | 1.53 | 1.55 | 1.56 | 1.87 | 3.3 | 1.74 | 1.04 | 1.1 | 1.22 |
| Silver (Ag)-Dissolved | mg/L | 0.00002 | *0.0001* | *0.0001* | *0.0001* | 0.00082 | *0.0001* | *0.0001* | *0.0001* | *0.0005* | *0.0001* | 0.000234 | *0.0001* | *0.0001* |
| Sodium (Na)-Dissolved | mg/L | 0.1 | 2280 | 2420 | 2390 | 2220 | 2470 | 2000 | 2380 | 8040 | 2060 | 1660 | 1720 | 2060 |
| Strontium (Sr)-Dissolved | mg/L | 0.0004 | 1.62 | 2.02 | 2.44 | 1.74 | 1.83 | 1.7 | 1.55 | 2.1 | 1.51 | 1.07 | 1.18 | 1.3 |
| Sulfur (S)-Dissolved | mg/L | 1 | #N/A | 715 | 527 | 708 | 844 | 620 | 796 | 4400 | 760 | 610 | 690 | 775 |
| Tellurium (Te)-Dissolved | mg/L | 0.0004 | #N/A | #N/A | *0.002* | #N/A | #N/A | *0.002* | *0.002* | *0.01* | *0.002* | *0.002* | *0.002* | *0.002* |
| Thallium (Tl)-Dissolved | mg/L | 0.00002 | *0.0002* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0005* | *0.0001* | *0.0001* | *0.0001* | *0.0001* |
| Thorium (Th)-Dissolved | mg/L | 0.0002 | #N/A | #N/A | *0.001* | #N/A | #N/A | *0.001* | *0.001* | *0.005* | *0.001* | *0.001* | *0.001* | *0.001* |
| Tin (Sn)-Dissolved | mg/L | 0.0002 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.005* | *0.001* | *0.001* | *0.001* | *0.001* |
| Titanium (Ti)-Dissolved | mg/L | 0.0006 | *0.01* | *0.003* | *0.003* | *0.003* | *0.003* | *0.003* | *0.003* | *0.015* | *0.003* | *0.003* | *0.003* | *0.003* |
| Tungsten (W)-Dissolved | mg/L | 0.0002 | #N/A | #N/A | 0.0064 | #N/A | #N/A | 0.0043 | 0.005 | 0.00819 | 0.0031 | 0.00567 | 0.00582 | 0.0103 |
| Uranium (U)-Dissolved | mg/L | 0.00002 | *0.0002* | 0.00027 | 0.00073 | 0.00084 | 0.00111 | 0.00044 | 0.00081 | *0.0005* | 0.00029 | 0.00016 | 0.000368 | 0.000372 |
| Vanadium (V)-Dissolved | mg/L | 0.001 | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.025* | *0.005* | *0.005* | *0.005* | *0.005* |
| Zinc (Zn)-Dissolved | mg/L | 0.006 | *0.01* | *0.01* | *0.01* | *0.01* | *0.01* | *0.01* | *0.01* | *0.05* | *0.01* | *0.01* | *0.01* | *0.01* |
| Zirconium (Zr)-Dissolved | mg/L | 0.00012 | #N/A | *0.002* | *0.002* | *0.002* | *0.002* | *0.002* | *0.002* | *0.015* | *0.002* | *0.002* | *0.002* | *0.002* |

*Blue italics* denotes sample below detection limit

**MONTHLY LOADINGS FOR TL-5 TO TIA**

| | | Sample ID | TL5-5JAN-20 | TL5-2FEB-20 | TL5-4MAR-20 | TL5-6APR-20 | TL5-4MAY-20 | TL5-7JUN-20 | TL5-5JUL-20 | TL5-2AUG-20 | TL5-6SEP-20 | TL5-21OCT-20 | TL5-9NOV-20 | TL5-4DEC-20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Jan-2020 | Feb-2020 | Mar-2020 | Apr-2020 | May-2020 | Jun-2020 | Jul-2020 | Aug-2020 | Sep-2020 | Oct-2020 | Nov-2020 | Dec-2020 |
| Parameter | Units | Detection Limit | Water | Water | Water | Water | Water | Water | Water | Water | Water | Water | Water | Water |
| Hardness (as CaCO3) | kg/year | 0.5 | 1,078,241 | 1,291,684 | 750,645 | 1,106,953 | 424,495 | 1,139,480 | 394,794 | 268,824 | 557,884 | 678,618 | 762,812 | 408,916 |
| pH | | 0.1 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Total Suspended Solids | kg/year | 3 | 111,027 | 16,146 | 19,517 | 37,921 | 2,264 | 67,200 | 23,367 | 11,452 | 12,478 | 14,753 | 7,117 | 13,358 |
| Ammonia, Total (as N) | kg/year | 0.25 | 50,389 | 41,459 | 15,213 | 40,552 | 19,527 | 30,678 | 10,753 | 15,135 | 23,837 | 23,857 | 25,731 | 17,447 |
| Chloride (Cl) | kg/year | 25 | 2,636,885 | 2,791,703 | 1,841,584 | 2,992,062 | 1,156,244 | 2,415,308 | 812,055 | 612,919 | 1,370,929 | 1,618,567 | 1,669,792 | 922,333 |
| Nitrate (as N) | kg/year | 0.1 | 26,049 | 23,438 | 6,906 | 23,345 | 7,964 | 9,934 | 5,071 | 1,565 | 7,666 | 15,174 | 11,771 | 8,451 |
| Nitrite (as N) | kg/year | 0.02 | 1,334 | 1,229 | 395 | 1,249 | 465 | 383 | 231 | 198 | 326 | 1,037 | 645 | 428 |
| Sulfate (SO4) | kg/year | 6 | 2,444,724 | 1,927,109 | 680,585 | 1,917,989 | 978,361 | 1,480,350 | 571,327 | 2,768,887 | 1,135,913 | 1,281,365 | 1,651,543 | 945,051 |
| Cyanide, Weak Acid Diss | kg/year | 0.005 | 173 | 166 | 215 | 167 | 861 | 171 | 674 | 13 | 73 | 169 | 182 | 80 |
| Cyanide, Total | kg/year | 0.005 | 5,893 | 2,906 | 1,541 | 3,069 | 2,624 | 1,519 | 1,313 | 138 | 1,393 | 2,723 | 2,245 | 1,372 |
| Cyanate | kg/year | 2 | 94,159 | 79,376 | 32,278 | 86,803 | 52,152 | 57,461 | 17,718 | 42,205 | 53,550 | 51,592 | 42,520 | 30,442 |
| Thiocyanate (SCN) | kg/year | 0.5 | 21,672 | 22,292 | 6,456 | 16,330 | 21,023 | 8,590 | 10,432 | 4,194 | 129,259 | 26,808 | 13,231 | 6,679 |
| Cyanide, Free | kg/year | 0.005 | 148 | 127 | 89 | 47 | 550 | 73 | 334 | 3 | 56 | 169 | 182 | 27 |
| Aluminum (Al)-Dissolved | kg/year | 0.006 | 34 | 40 | 23 | 41 | 24 | 41 | 21 | 23 | 27 | 106 | 99 | 36 |
| Antimony (Sb)-Dissolved | kg/year | 0.0002 | 2.46 | 3.44 | 2.30 | 5.04 | 2.10 | 3.31 | 1.16 | 1.37 | 1.45 | 4.75 | 3.13 | 2.56 |
| Arsenic (As)-Dissolved | kg/year | 0.0002 | 1.92 | 1.67 | 1.95 | 8.22 | 4.69 | 5.36 | 3.31 | 3.68 | 1.79 | 2.27 | 2.93 | 1.97 |
| Barium (Ba)-Dissolved | kg/year | 0.0001 | 36 | 47 | 23 | 50 | 19 | 33 | 14 | 18 | 24 | 23 | 33 | 15 |
| Beryllium (Be)-Dissolved | kg/year | 0.0002 | 1.07 | 0.21 | 0.50 | 0.22 | 0.08 | 0.97 | 0.32 | 0.27 | 0.11 | 0.84 | 0.91 | 0.45 |
| Bismuth (Bi)-Dissolved | kg/year | 0.0001 | 214 | 0.52 | 0.25 | 0.55 | 0.20 | 0.49 | 0.16 | 0.67 | 0.28 | 0.42 | 0.46 | 0.23 |
| Boron (B)-Dissolved | kg/year | 0.02 | 1,100 | 948 | 575 | 1,063 | 380 | 828 | 340 | 213 | 548 | 739 | 775 | 360 |
| Cadmium (Cd)-Dissolved | kg/year | 0.00001 | 0.07 | 0.05 | 0.03 | 0.05 | 0.02 | 0.05 | 0.02 | 0.07 | 0.03 | 0.04 | 0.05 | 0.02 |
| Calcium (Ca)-Dissolved | kg/year | 0.1 | 192,162 | 214,586 | 126,108 | 169,879 | 59,025 | 194,783 | 56,491 | 55,109 | 95,685 | 103,689 | 118,619 | 66,790 |
| Cesium (Cs)-Dissolved | kg/year | 0.00002 | #N/A | #N/A | 0.18 | #N/A | #N/A | 0.14 | 0.08 | 0.13 | 0.06 | 0.45 | 0.21 | 0.06 |
| Chromium (Cr)-Dissolved | kg/year | 0.0002 | 1.07 | 1.04 | 0.50 | 1.10 | 0.40 | 0.97 | 0.32 | #N/A | 0.56 | 0.84 | 0.91 | 0.45 |
| Cobalt (Co)-Dissolved | kg/year | 0.0002 | 8.01 | 6.46 | 6.96 | 11 | 16 | 8.28 | 13 | 13 | 5.20 | 7.78 | 5.61 | 4.42 |
| Copper (Cu)-Dissolved | kg/year | 0.001 | 197 | 57 | 178 | 194 | 679 | 98 | 280 | 583 | 7 | 116 | 31 | 58 |
| Iron (Fe)-Dissolved | kg/year | 0.02 | 1,996 | 1,073 | 575 | 1,140 | 643 | 370 | 106 | 134 | 509 | 961 | 703 | 482 |
| Lead (Pb)-Dissolved | kg/year | 0.0001 | 0.53 | 0.52 | 0.25 | 0.55 | 0.20 | 0.49 | 0.16 | 0.67 | 0.28 | 0.42 | 0.46 | 0.23 |
| Lithium (Li)-Dissolved | kg/year | 0.002 | 47 | 50 | 31 | 67 | 24 | 44 | 15 | 15 | 24 | 18 | 26 | 16 |
| Magnesium (Mg)-Dissolved | kg/year | 0.01 | 145,189 | 184,377 | 106,592 | 166,591 | 67,111 | 158,748 | 61,305 | 36,560 | 77,220 | 96,102 | 96,720 | 58,611 |
| Manganese (Mn)-Dissolved | kg/year | 0.0002 | 197 | 209 | 92 | 149 | 42 | 203 | 43 | 167 | 92 | 72 | 91 | 58 |
| Mercury (Hg)-Dissolved | kg/year | 0.000005 | 0.01 | 0.03 | 0.01 | 0.05 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 |
| Molybdenum (Mo)-Dissolved | kg/year | 0.0001 | 110 | 65 | 22 | 53 | 36 | 67 | 21 | 8 | 39 | 37 | 29 | 18 |
| Nickel (Ni)-Dissolved | kg/year | 0.001 | 11 | 9 | 76 | 89 | 203 | 97 | 183 | 44 | 19 | 36 | 49 | 35 |
| Phosphorus (P)-Dissolved | kg/year | 0.1 | 534 | 521 | 250 | 548 | 311 | 487 | 199 | 672 | 392 | 422 | 456 | 237 |
| Potassium (K)-Dissolved | kg/year | 0.1 | 109,959 | 120,835 | 64,556 | 123,847 | 55,791 | 101,287 | 51,355 | 19,974 | 62,671 | 96,102 | 81,208 | 43,799 |
| Rubidium (Rb)-Dissolved | kg/year | 0.0004 | #N/A | #N/A | 24 | #N/A | #N/A | 40 | 14 | 6 | 19 | 33 | 35 | 16 |
| Selenium (Se)-Dissolved | kg/year | 0.0001 | 1.42 | 2.23 | 0.69 | 2.41 | 2.01 | 1.25 | 1.01 | 1.84 | 3.61 | 3.00 | 1.59 | 1.14 |
| Silicon (Si)-Dissolved | kg/year | 0.2 | 1,644 | 1,542 | 626 | 1,677 | 627 | 1,519 | 600 | 887 | 974 | 877 | 1,004 | 554 |
| Silver (Ag)-Dissolved | kg/year | 0.00002 | 0.11 | 0.10 | 0.05 | 0.90 | 0.04 | 0.10 | 0.03 | 0.13 | 0.06 | 0.20 | 0.09 | 0.05 |
| Sodium (Na)-Dissolved | kg/year | 0.1 | 2,434,048 | 2,520,867 | 1,196,028 | 2,433,106 | 998,575 | 1,947,829 | 763,910 | 2,161,345 | 1,152,700 | 1,399,386 | 1,569,422 | 935,964 |
| Strontium (Sr)-Dissolved | kg/year | 0.0004 | 1,729 | 2,104 | 1,221 | 1,907 | 740 | 1,656 | 498 | 565 | 845 | 902 | 1,077 | 591 |
| Sulfur (S)-Dissolved | kg/year | 1 | #N/A | 744,801 | 263,727 | 775,963 | 341,213 | 603,827 | 255,492 | 1,182,826 | 425,268 | 514,232 | 629,594 | 352,122 |
| Tellurium (Te)-Dissolved | kg/year | 0.0004 | #N/A | #N/A | 1.00 | #N/A | #N/A | 1.95 | 0.64 | 2.69 | 1.12 | 1.69 | 1.82 | 0.91 |
| Thallium (Tl)-Dissolved | kg/year | 0.00002 | 0.21 | 0.10 | 0.05 | 0.11 | 0.04 | 0.10 | 0.03 | 0.13 | 0.06 | 0.08 | 0.09 | 0.05 |
| Thorium (Th)-Dissolved | kg/year | 0.0002 | #N/A | #N/A | 0.50 | #N/A | #N/A | 0.97 | 0.32 | 1.34 | 0.56 | 0.84 | 0.91 | 0.45 |
| Tin (Sn)-Dissolved | kg/year | 0.0002 | 1.07 | 1.04 | 0.50 | 1.10 | 0.40 | 0.97 | 0.32 | 1.34 | 0.56 | 0.84 | 0.91 | 0.45 |
| Titanium (Ti)-Dissolved | kg/year | 0.0006 | 10.68 | 3.13 | 1.50 | 3.29 | 1.21 | 2.92 | 0.96 | 4.03 | 1.68 | 2.53 | 2.74 | 1.36 |
| Tungsten (W)-Dissolved | kg/year | 0.0002 | #N/A | #N/A | 3.20 | #N/A | #N/A | 4.19 | 1.60 | 2.20 | 1.73 | 4.78 | 5.31 | 4.68 |
| Uranium (U)-Dissolved | kg/year | 0.00002 | 0.21 | 0.28 | 0.37 | 0.92 | 0.45 | 0.43 | 0.26 | 0.13 | 0.16 | 0.13 | 0.34 | 0.17 |
| Vanadium (V)-Dissolved | kg/year | 0.001 | 5.34 | 5.21 | 2.50 | 5.48 | 2.02 | 4.87 | 1.60 | 6.72 | 2.80 | 4.22 | 4.56 | 2.27 |
| Zinc (Zn)-Dissolved | kg/year | 0.006 | 11 | 10 | 5.00 | 11 | 4.04 | 9.74 | 3.21 | 13.44 | 5.60 | 8.43 | 9.12 | 4.54 |
| Zirconium (Zr)-Dissolved | kg/year | 0.00012 | #N/A | 2.08 | 1.00 | 2.19 | 0.81 | 1.95 | 0.64 | 4.03 | 1.12 | 1.69 | 1.82 | 0.91 |

# Attachment E TL-11 Geochemical Data

| TMAC RESOURCES | Sample ID | TL11-A-19JUL20 | TL11-B-19JUL20 | TL11-C-19JUL20 | TL11-D-19JUL20 | TL11-A-28DEC20 | TL11-B-28DEC20 |
|---|---|---|---|---|---|---|---|
| | ALS ID | L2477557-1 | L2477557-2 | L2477557-3 | L2477557-4 | YL2100015-001 | YL2100015-002 |
| | Date Sampled | 19/07/2020 09:16 | 19/07/2020 09:44 | 19/07/2020 10:40 | 19/07/2020 11:08 | 28/12/2020 13:50 | 28/12/2020 14:40 |
| **Parameter** | **Units** | **Water** | **Water** | **Water** | **Water** | **Water** | **Water** |
| Conductivity | uS/cm | 5050 | 7090 | 22500 | 25600 | 21500 | 20800 |
| Hardness (as CaCO3) | mg/L | 840 | 1480 | 3360 | 3350 | 3480 | 3160 |
| pH | pH | 7.94 | 7.72 | 7.57 | 7.81 | 7.76 | 7.77 |
| Total Suspended Solids | mg/L | 9.5 | 3.3 | <3.0 | 184 | 7.4 | <3.0 |
| Total Dissolved Solids | mg/L | 3070 | 4980 | 17600 | 19100 | 12600 | 13600 |
| Acidity (as CaCO3) | mg/L | 9.1 | 13.9 | 29.6 | 17.8 | 9.5 | 5.5 |
| Alkalinity, Total (as CaCO3) | mg/L | 154 | 146 | 255 | 220 | 220 | 212 |
| Ammonia, Total (as N) | mg/L | 25.0 | 23.7 | 26.5 | 4.44 | 32 | 4.69 |
| Chloride (Cl) | mg/L | 1040 | 1810 | 7230 | 8970 | 7230 | 7100 |
| Nitrate (as N) | mg/L | 26.9 | 35.2 | 34.2 | 8.75 | 41.8 | 7.19 |
| Nitrite (as N) | mg/L | 1.45 | 0.403 | 0.53 | 0.28 | 2.45 | 0.531 |
| Sulfate (SO4) | mg/L | 495 | 578 | 1240 | 1060 | 1120 | 918 |
| Cyanide, Weak Acid Diss | mg/L | <0.0050 | <0.0050 | 0.0054 | <0.0050 | <0.0050 | <0.0050 |
| Cyanide, Total | mg/L | 0.0535 | 0.0097 | 0.0162 | 0.0127 | 0.0159 | <0.0050 |
| Cyanide, Free | mg/L | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| Aluminum (Al)-Total | mg/L | 0.222 | 0.024 | <0.030 | 10.7 | 0.0785 | <0.0600 |
| Antimony (Sb)-Total | mg/L | 0.00111 | 0.00066 | 0.0023 | <0.0020 | 0.00289 | <0.00200 |
| Arsenic (As)-Total | mg/L | 0.00673 | 0.00123 | 0.0021 | 0.0454 | 0.00649 | 0.00419 |
| Barium (Ba)-Total | mg/L | 0.0226 | 0.0270 | 0.0357 | 0.0406 | 0.0505 | 0.0281 |
| Beryllium (Be)-Total | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0020 | <0.000400 | <0.000400 |
| Bismuth (Bi)-Total | mg/L | <0.00010 | <0.00025 | <0.00050 | <0.0010 | <0.00100 | <0.00100 |
| Boron (B)-Total | mg/L | 0.401 | 0.479 | 2.26 | 2.41 | 2.14 | 2.07 |
| Cadmium (Cd)-Total | mg/L | 0.000110 | 0.000409 | 0.000812 | 0.00034 | 0.000263 | 0.000182 |
| Calcium (Ca)-Total | mg/L | 199 | 399 | 498 | 432 | 484 | 340 |
| Cesium (Cs)-Total | mg/L | 0.000046 | 0.000174 | 0.00029 | 0.00098 | <0.000200 | 0.000653 |
| Chromium (Cr)-Total | mg/L | 0.00410 | <0.00050 | <0.0010 | 0.0121 | | |
| Cobalt (Co)-Total | mg/L | 0.0232 | 0.0483 | 0.0945 | 0.0504 | 0.0588 | 0.0204 |
| Copper (Cu)-Total | mg/L | 0.130 | 0.0787 | 0.0581 | 0.317 | 0.0252 | 0.0139 |
| Iron (Fe)-Total | mg/L | 0.862 | 0.223 | <0.10 | 50.6 | 2.48 | <0.200 |
| Lead (Pb)-Total | mg/L | 0.00309 | 0.00033 | <0.00050 | 0.0167 | <0.00100 | <0.00100 |
| Lithium (Li)-Total | mg/L | 0.0325 | 0.0298 | 0.088 | 0.098 | 0.078 | 0.0763 |
| Magnesium (Mg)-Total | mg/L | 97.6 | 126 | 524 | 569 | 499 | 492 |
| Manganese (Mn)-Total | mg/L | 0.620 | 2.14 | 2.19 | 2.26 | 1.15 | 1.08 |
| Mercury (Hg)-Total | mg/L | 0.0000080 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.00719 | 0.00294 | 0.00659 | 0.0043 | 0.0149 | 0.00404 |
| Nickel (Ni)-Total | mg/L | 0.0302 | 0.0525 | 0.187 | 0.071 | 0.169 | 0.039 |
| Phosphorus (P)-Total | mg/L | <0.10 | <0.25 | <0.50 | <1.0 | <1.00 | <1.00 |
| Potassium (K)-Total | mg/L | 39.0 | 38.9 | 132 | 139 | 154 | 131 |
| Rubidium (Rb)-Total | mg/L | 0.0266 | 0.0194 | 0.0557 | 0.0846 | 0.0644 | 0.0665 |
| Selenium (Se)-Total | mg/L | 0.0127 | 0.00297 | 0.00286 | 0.0016 | 0.0021 | 0.001 |
| Silicon (Si)-Total | mg/L | 2.57 | 2.40 | 3.3 | 18.9 | 2.93 | 3.47 |
| Silver (Ag)-Total | mg/L | 0.00135 | 0.000104 | 0.00028 | 0.00100 | 0.000319 | <0.000200 |
| Sodium (Na)-Total | mg/L | 719 | 907 | 4180 | 4730 | 4260 | 4080 |
| Strontium (Sr)-Total | mg/L | 0.862 | 1.25 | 5.44 | 5.42 | 5.54 | 4.73 |
| Sulfur (S)-Total | mg/L | 269 | 243 | 528 | 419 | 454 | 358 |
| Tellurium (Te)-Total | mg/L | <0.00040 | <0.0010 | <0.0020 | <0.0040 | <0.00400 | <0.00400 |
| Thallium (Tl)-Total | mg/L | <0.000020 | <0.000050 | <0.00010 | <0.00020 | <0.000200 | <0.000200 |
| Thorium (Th)-Total | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Tin (Sn)-Total | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Titanium (Ti)-Total | mg/L | 0.00496 | <0.0015 | <0.0030 | 0.358 | <0.00600 | <0.00600 |
| Tungsten (W)-Total | mg/L | 0.00059 | <0.00050 | <0.0010 | <0.0020 | 0.00216 | <0.00200 |
| Uranium (U)-Total | mg/L | 0.000663 | 0.000146 | 0.00044 | 0.00031 | 0.000286 | <0.000200 |
| Vanadium (V)-Total | mg/L | 0.0015 | <0.0025 | <0.0050 | 0.036 | <0.0100 | <0.0100 |
| Zinc (Zn)-Total | mg/L | 0.133 | 0.076 | 0.120 | 0.141 | <0.0600 | <0.0600 |
| Zirconium (Zr)-Total | mg/L | <0.00040 | <0.0010 | <0.0020 | 0.0102 | <0.00400 | <0.00400 |
| Aluminum (Al)-Dissolved | mg/L | 0.0133 | 0.0077 | <0.010 | <0.020 | <0.0200 | <0.0200 |
| Antimony (Sb)-Dissolved | mg/L | 0.00110 | 0.00062 | 0.0022 | <0.0020 | 0.00303 | <0.00200 |
| Arsenic (As)-Dissolved | mg/L | 0.00295 | 0.00101 | 0.0019 | 0.0059 | 0.00466 | 0.0044 |
| Barium (Ba)-Dissolved | mg/L | 0.0217 | 0.0271 | 0.0355 | 0.0324 | 0.0446 | 0.0284 |
| Beryllium (Be)-Dissolved | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Bismuth (Bi)-Dissolved | mg/L | <0.00010 | <0.00025 | <0.00050 | <0.0010 | <0.00100 | <0.00100 |
| Boron (B)-Dissolved | mg/L | 0.393 | 0.470 | 2.29 | 2.40 | 2.25 | 2.19 |
| Cadmium (Cd)-Dissolved | mg/L | 0.000065 | 0.000375 | 0.000830 | 0.00021 | 0.000223 | 0.000208 |
| Calcium (Ca)-Dissolved | mg/L | 191 | 382 | 485 | 395 | 554 | 365 |
| Cesium (Cs)-Dissolved | mg/L | 0.000025 | 0.000176 | 0.00029 | 0.00073 | <0.000200 | 0.000736 |
| Chromium (Cr)-Dissolved | mg/L | 0.00353 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Cobalt (Co)-Dissolved | mg/L | 0.0119 | 0.0486 | 0.0937 | 0.0259 | 0.0548 | 0.0219 |
| Copper (Cu)-Dissolved | mg/L | 0.0429 | 0.0632 | 0.0553 | 0.0162 | 0.0238 | 0.0135 |
| Iron (Fe)-Dissolved | mg/L | <0.020 | <0.050 | <0.10 | <0.20 | <0.200 | <0.200 |
| Lead (Pb)-Dissolved | mg/L | <0.00010 | <0.00025 | <0.00050 | <0.0010 | <0.00100 | <0.00100 |
| Lithium (Li)-Dissolved | mg/L | 0.0308 | 0.0288 | 0.086 | 0.090 | 0.0746 | 0.0689 |
| Magnesium (Mg)-Dissolved | mg/L | 88.0 | 127 | 522 | 575 | 510 | 546 |
| Manganese (Mn)-Dissolved | mg/L | 0.431 | 2.17 | 2.15 | 1.20 | 1.04 | 1.14 |
| Mercury (Hg)-Dissolved | mg/L | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.00734 | 0.00295 | 0.00613 | 0.0040 | 0.0149 | 0.00452 |
| Nickel (Ni)-Dissolved | mg/L | 0.0136 | 0.0520 | 0.181 | 0.053 | 0.158 | 0.0399 |
| Phosphorus (P)-Dissolved | mg/L | <0.10 | <0.25 | <0.50 | <1.0 | <1.00 | <1.00 |
| Potassium (K)-Dissolved | mg/L | 38.5 | 40.6 | 131 | 145 | 137 | 130 |
| Rubidium (Rb)-Dissolved | mg/L | 0.0261 | 0.0184 | 0.0522 | 0.0769 | 0.061 | 0.0706 |
| Selenium (Se)-Dissolved | mg/L | 0.0119 | 0.00302 | 0.00269 | <0.0010 | 0.00246 | <0.00100 |
| Silicon (Si)-Dissolved | mg/L | 2.18 | 2.30 | 3.17 | 3.8 | 2.92 | 3.38 |
| Silver (Ag)-Dissolved | mg/L | 0.000386 | <0.000050 | 0.00013 | <0.00020 | <0.000200 | <0.000200 |
| Sodium (Na)-Dissolved | mg/L | 672 | 906 | 4150 | 4800 | 4110 | 4260 |
| Strontium (Sr)-Dissolved | mg/L | 0.839 | 1.27 | 5.42 | 5.42 | 5.61 | 4.99 |
| Sulfur (S)-Dissolved | mg/L | 213 | 236 | 516 | 423 | 434 | 362 |
| Tellurium (Te)-Dissolved | mg/L | <0.00040 | <0.0010 | <0.0020 | <0.0040 | <0.00400 | <0.00400 |
| Thallium (Tl)-Dissolved | mg/L | <0.000020 | <0.000050 | <0.00010 | <0.00020 | <0.000200 | <0.000200 |
| Thorium (Th)-Dissolved | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Tin (Sn)-Dissolved | mg/L | <0.00020 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Titanium (Ti)-Dissolved | mg/L | <0.00060 | <0.0015 | <0.0030 | <0.0060 | <0.00600 | <0.00600 |
| Tungsten (W)-Dissolved | mg/L | 0.00057 | <0.00050 | <0.0010 | <0.0020 | <0.00200 | <0.00200 |
| Uranium (U)-Dissolved | mg/L | 0.000621 | 0.000154 | 0.00046 | 0.00027 | 0.000393 | 0.000233 |
| Vanadium (V)-Dissolved | mg/L | <0.0010 | <0.0025 | <0.0050 | <0.010 | <0.0100 | <0.0100 |
| Zinc (Zn)-Dissolved | mg/L | 0.112 | 0.0781 | 0.122 | <0.020 | 0.033 | 0.0252 |
| Zirconium (Zr)-Dissolved | mg/L | <0.00040 | <0.0010 | <0.0020 | <0.0040 | <0.00400 | <0.00400 |

# Appendix G

2020 Waste Rock and Ore Monitoring Report,
Boston Camp, Hope Bay Project

AGNICO EAGLE

# 2020 Waste Rock and Ore Monitoring Report, Boston Camp

Hope Bay Project, Nunavut, Canada

Agnico Eagle Mines Ltd.

SRK Consulting (Canada) Inc. ▪ 1CT022.056 ▪ March 2021

srk consulting

# 2020 Waste Rock and Ore Monitoring Report, Boston Camp

Hope Bay Project, Nunavut, Canada

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## Appendices

Appendix A 2020 Boston Seepage Monitoring Memo
Appendix B 2020 Boston Ephemeral Streams Monitoring Memo

# 1 Introduction

At the Boston site, ore and waste rock were generated as part of a 1996-1997 BHP Billiton underground exploration program. The ore was placed in several stockpiles on the camp pad and the waste rock was used to construct a camp pad, roads, and an airstrip at Boston. Since then, the site has been primarily in care and maintenance, with periodic use of the camp and airstrip in support of exploration activities.

The seepage and ephemeral streams sampling programs are conducted annually to validate the Boston waste rock and ore management and closure plans. A survey of rinse pH and conductivity of the ore is carried out every ten years as part of these plans and was last completed in 2018 (SRK 2019). This report presents results from the 2020 seepage and ephemeral streams monitoring at the Boston site, as outlined in the *Water and Ore/Waste Rock Management Plan for the Boston Site* (SRK 2017) and Water License 2BB-BOS1727 (Nunavut Water Board 2017).

The report is organized as follows:

- Section 2 contains a summary of the monitoring requirements.
- Section 3 summarizes the results of the seepage monitoring at the Boston site.
- Section 4 summarizes the results of the ephemeral streams monitoring.
- Detailed technical memoranda for each of these monitoring programs are provided in Appendices A and B.

# 2 Monitoring Requirements

As a condition of Water Licence 2BB-BOS1727 (Part E, Item 2), Agnico Eagle Mines is required to implement a water and ore/waste rock management plan that addresses the acid rock drainage (ARD) and metal leaching (ML) potential of the materials at the site (NWB 2017). TMAC Resources had acquired the Hope Bay project, including the Boston site, in 2013 and had maintained the Boston site in care and maintenance until Agnico Eagle Mines acquired the project in 2021.

## 2.1 Waste Rock and Ore

Geochemical characterization of waste rock and ore materials has indicated that all waste rock and most of the ore is non-acid generating with some of the ore classified as having an uncertain potential for ARD (SRK 2009). Based on the uncertain classifications, the ore/waste rock management plan (SRK 2017) includes a commitment to monitor the oxidation of the ore by carrying out a survey of rinse pH and conductivity every ten years. This monitoring has been conducted in 2008 and 2018 and was not a requirement in 2020.

## 2.2 Seepage Monitoring

The objective of the seepage monitoring is to provide an indication of contact water quality from the waste rock (camp pad) and ore stockpiles. There are two seepage monitoring programs: seepage monitoring at station BOS-8 and a freshet seepage survey along the north and east sides of the camp pad, and the southern end of the airstrip. The differences in the monitoring programs are because each program was designed using different frameworks.

As stipulated in Water Licence 2BB-BOS1727 (NWB 2017) and referenced in SRK (2017), TMAC monitors the seepage station BOS-8A, BOS-8B, BOS-8C, and BOS-8D. In summary, NWB (2017) stipulates the sampling of water quality station BOS-8 and any opportunistic seeps, are required initially during spring thaw and at a minimum frequency of monthly whenever flow is observed. Samples collected at BOS-8 are analyzed for pH, electrical conductivity (EC), total suspended solids (TSS), major anions (sulphate, chloride, ammonia), and total and dissolved trace metals through an ICP scan.

A freshet seepage survey along the north and east sides of the camp pad and the full extent of the airstrip is to be completed in accordance with Section 5.2.1 of the Boston Water and Ore/Waste Rock Management Plan (SRK 2017). In summary, these areas of the pad are to be surveyed for seepage and samples collected opportunistically during freshet.

## 2.3 Ephemeral Streams

As outlined in the Hope Bay Project Water and Ore/Waste Rock Management Plan for the Boston Site (SRK 2017), five ephemeral streams (A to E) within the catchments of the Boston camp pad are monitored during spring freshet. The objectives of the program are to monitor drainage from the Boston ore stockpiles and camp pad before entering Aimaokatalok Lake.

# 3 Monitoring of Boston Seepage

Full details of the 2020 seepage monitoring programs are presented in Appendix A with sample locations presented in Figure 1 and data in Tables 2 to 4.

## 3.1 Sampling and Testing Program

### 3.1.1 Seepage Monitoring at BOS-8

In 2020, TMAC surveyed the BOS-8 area in June and August and collected one sample each from BOS-8A, BOS-8C, and BOS-8D on June 18, 2020. No seepage flow was observed in August. A survey was not conducted in July due to lack of site staff related to the Covid-19 pandemic. Field measurements of electrical conductivity (EC), pH, oxidation-reduction potential (ORP), temperature, and flow rate (where possible) were measured.

As outlined in SRK (2017) opportunistic samples are to be collected from any flowing seeps identified in surveys of the north and east side of the camp pad, and the southern end of the airstrip. TMAC conducted a seepage survey in 2020 but did not observe any flowing seeps.

Three water quality samples were submitted by TMAC to ALS Environmental (ALS) in Burnaby, British Columbia for pH, EC, hardness, total suspended solids (TSS), ammonia, chloride, sulphate, and dissolved and total metals. Nitrate and total alkalinity were not analyzed. The field QA/QC program included one duplicate sample.

## 3.2 Results

Laboratory pH values ranged from 7.5 to 7.8. Lab EC values were equivalent to field EC values, with values at BOS-8C (930 µS/cm) approximately three times higher than BOS-8A (220 µS/cm) and BOS-8D (320 µS/cm). Similarly, concentrations of major ions (calcium, chloride, magnesium, sodium, and sulphate) are higher at BOS-8C (e.g. 200 mg/L sulphate) compared to BOS-8A and BOS-8D (e.g. 64 mg/L and 70 mg/L sulphate, respectively). Values of EC and major ions at BOS-8C were lower than median values for the historic seepage data set.

Concentrations of arsenic, cobalt, nickel, and selenium are equivalent for BOS-8A and BOS-8D (e.g. 0.021 and 0.019 mg/L cobalt, respectively) and are one order of magnitude higher at BOS-8C (e.g. 0.34 mg/L cobalt). Manganese concentrations at BOS-8C (0.091 mg/L) are approximately three times higher than BOS-8A (0.036 mg/L) and BOS-8D (0.024 mg/L). Concentrations of copper concentrations are equivalent for all three samples with the highest concentrations at BOS-8A (0.0024 mg/L).

All concentrations for the aforementioned parameters are within the range of the historical concentrations. According to TMAC, in September 2018, repairs to a berm adjacent to station BOS-8C disturbed ore material. This activity may be the source of higher sulphate, arsenic, cobalt, and nickel concentrations in the seepage at station BOS-8C relative to BOS-8A and BOS-8D.

Continued monitoring will allow for further trends in the seepage to be established.

# 4 Monitoring of Ephemeral Streams

Full details of the 2020 Boston ephemeral streams monitoring program are documented in Appendix B with sample locations presented in Figure 1 and data in Tables 2 and 3.

## 4.1 Sampling and Testing Program

TMAC inspected ephemeral streams A to E for flow on June 24, 2020. Flow was observed and samples collected from C2 and D2. Field measurements included pH, EC, ORP, temperature, and flow rate at station C2. The flow at D2 was too shallow and fragmented to measure. The water quality samples were submitted by TMAC for laboratory testing at ALS Environmental (ALS) in Burnaby, British Columbia for pH, EC, hardness, TSS, total dissolved solids (TDS), acidity, total alkalinity, anions (bromide, chloride, fluoride, and sulphate), nutrients (nitrate, nitrite, ammonia, and phosphorus), and dissolved metals (filtered and preserved in the field). The quality assurance and quality control (QA/QC) sampling program included the collection of one field duplicate.

## 4.2 Results

Contaminants of concern as identified by the 2009 water and load balance (Supporting Document B of SRK 2009) include nitrate, sulphate, arsenic, copper, iron, nickel, and selenium.

Field pH values ranged from 6.3 to 7.2 and were within the range of historical data. EC values ranged from 830 to 1,100 µS/cm and were within the range of historical data. The flowrate at C2 was an order of magnitude lower than historical flow rates and the flow rate at D2 was too low to quantify.

Sulphate concentrations have oscillated for C2 and D2. Chloride concentrations for ephemeral streams exhibit a decreasing trend. Nickel values have oscillated, and iron values have increased after remaining stable prior to 2020. Nitrate, copper, arsenic, and selenium have stable trends.

Compared to SRK (2009) model predictions, the 2020 monitoring data were below maximum predicted values for chloride, nitrate, copper, iron, nickel, and selenium at streams C2, and D2. At C2 and D2, sulphate concentrations observed in 2020 exceeded the maximum modeled values; however, concentrations were lower than 2019 and within the same order of magnitude as the modeled values.

Sulphate and chloride are not attenuated by the tundra and the concentrations measured in 2020 validate the 2009 water and load balance. In general, ephemeral streams monitoring indicates that overall, geochemical conditions remain stable with some annual variability, SRK recommends continued monitoring of the ephemeral stream sampling sites as outlined in SRK (2017).

# 5 Conclusions

The seepage program monitors contact water from the camp pad and ore stockpiles while the ephemeral stream program monitors drainage from the Boston ore stockpiles and camp pad before entering Aimaokatalok Lake and changes in drainage from the camp flow as it flows across the tundra.

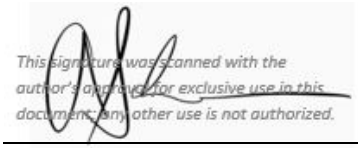
In 2020, TMAC completed the required geochemical monitoring programs including i) monthly seepage surveys near BOS-8 located at the eastern edge of the camp pad and a freshet seepage survey along the northern and eastern edges of the camp pad and the full extent of the airstrip for opportunistic seepage samples and ii) opportunistic sampling of five ephemerals streams (A to E) within the catchment of the Boston camp pad. In total, TMAC collected three seepage samples along the eastern side of the camp pad and two ephemeral streams samples from streams C2 and D2.

All seepage and ephemeral stream samples had pH values ranging from 7.5 to 7.9, indicating that the waste rock on the camp pad is not acidic. Monitoring of the seepage from the camp pad and the ore stockpiles indicates that water quality for the contaminants of concern are within the range of the historical data. The analysis of water quality data for ephemeral streams C2 and D2 indicate that concentrations of nitrate, copper, arsenic, and selenium are stable, sulphate and nickel are oscillating, chloride are decreasing, and iron concentrations are increasing. Sulphate concentrations at both streams exceeded the maximum modeled values; however, concentrations were lower than 2019 and within the same order of magnitude as the modeled values.

SRK recommends continued annual monitoring according to the Water and Ore/Waste Rock Management Plan for the Boston Site (SRK 2017).

# Closure

This report, 2020 Waste Rock and Ore Monitoring Report, Boston Camp, was prepared by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Amanda Schevers, GIT (BC)
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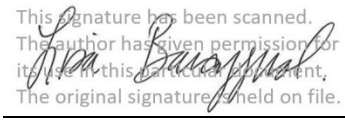
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Lisa Barazzuol, PGeo (NT/NU)
Principal Consultant (Geochemistry)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

# References

[NWB] Nunavut Water Board, 2017. Water Licence No: 2BB-BOS1727. July 2017.

SRK Consulting (Canada) Inc., 2009. Water and Ore/Waste Rock Management Plan for the Boston Site Hope Bay Project, Nunavut. Report 1CH008.022 for Hope Bay Mining Ltd. July 2009.

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SRK Consulting (Canada) Inc., 2019. 2018 Water Rock and Ore Monitoring Report, Boston Camp, Hope Bay Project, Nunavut. Report 1CT022.027 for TMAC Resources Inc. March 2019.

# Appendix A 2020 Boston Seepage Monitoring Memo

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**DRAFT**

# Technical Memo

February 18, 2021

| | |
|---|---|
| **To** | Ashley Mathai and Sarah Warnock, Hope Bay Project |
| **From** | Amanda Schevers; Lisa Barazzuol, SRK |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | Results from the Boston Seepage Monitoring Program 2020 |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

At the Boston site, ore and waste rock were generated as part of a 1996-1997 BHP Billiton underground exploration program. The ore was placed in several stockpiles on the camp pad and the waste rock was used to construct a camp pad, roads, and an airstrip at Boston. Since then, the site has been primarily in care and maintenance, with periodic use of the camp and airstrip in support of exploration activities.

The requirements for seepage monitoring at Boston camp are outlined in the in the *Water and Ore/Waste Rock Management Plan for the Boston Site* (SRK 2017). 2020 seepage monitoring activities include:

- Seepage monitoring at station BOS8.
- Opportunistic seepage monitoring.

This memo presents the results of all Boston seepage samples collected in 2020 and complies with SRK (2017).

# 2 Methods

## 2.1 Sample Collection

### 2.1.1 Seepage Monitoring at BOS-8

The location of water quality monitoring station BOS-8 is defined in Water License 2BB-BOS1727 (Nunavut Water Board, 2017). As outlined in the *Water and Ore/Waste Rock Management Plan for the Boston Site* (SRK 2017), TMAC monitors these seepage stations at freshet, and monthly thereafter and collects a sample if flowing seepage is observed. In 2020, TMAC surveyed the area in June and August and collected one sample each from BOS-8A, BOS-8C, and BOS-8D (Figure 1) on June 18, 2020. No seepage flow was observed in August. A survey was not conducted in July due to lack of site staff related to the Covid-19 pandemic. Field measurements of electrical conductivity (EC), pH, oxidation-reduction potential (ORP), temperature, and flow rate (where possible) were measured.

Samples were collected by TMAC from all three stations for laboratory analysis. The water quality samples were submitted by TMAC to ALS Environmental (ALS) in Burnaby, British Columbia for pH, EC, hardness, total suspended solids (TSS), ammonia, chloride, sulphate, and dissolved and total metals. Nitrate and total alkalinity were not analyzed. The field QA/QC program included one duplicate sample. The test work program was managed by TMAC.

### 2.1.2 Opportunistic Seepage Sampling

As outlined in SRK (2017) opportunistic samples are to be collected from any flowing seeps identified in surveys of the north and east side of the camp pad, and the southern end of the airstrip. TMAC conducted a seepage survey in 2020 but did not observe any flowing seeps.

7506000 7505800 7505600 7505400 7505200 7505000 7504800 7504600

441600 441400 441200 441000 440800

BOS8A BOS8C BOS8D

0 50 100 150 200
Meters

Legend

- 2020 Seepage
- 2019 Seepage
- 2018 Seepage
- 2017 Seepage

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srk consulting

SRK JOB NO.: 1CT022.056

FILE NAME: 1CT022_056_Annual_Boston_Seepage_2019

AGNICO EAGLE

2020 Seepage Monitoring

Hope Bay Gold Project

# Seep Survey Locations Boston Area

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| Feb 2020 | | 1 |

## 2.2 Data Quality Assurance and Quality Control

### 2.2.1 2020 Data

Standard quality control checks were conducted on the ALS laboratory data as per SRK (2019) which describes SRK's expectations for laboratory geochemical data quality. One field duplicate (DUP1) was analyzed to ensure reproducibility of sampling and low heterogeneity in the seepage water. The ion balance for all three samples could not be assessed because total alkalinity and nitrate data were unavailable. Quality control checks and results are shown in Table 1. To summarize, the data passed the QAQC checks and were accepted as reported.

**Table 1: Summary of Quality Control Checks on Laboratory Data**

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Physical Test** | | |
| Field Blank (n=0) | Minimum criteria <2X DL, will accept <5X DL | #N/A |
| Method Blank (n=1) for TSS and EC | <2X DL | All passed. |
| Field Duplicate (n=1) | For samples >10X DL should be within +/-30% RPD | All passed. |
| Leachate Duplicate (n=1) for EC and pH | For samples >10X DL should be within +/-20% RPD | All passed. |
| Field pH vs. Lab pH (n=4) | Difference should not be greater than 1 pH unit | All passed. |
| Field EC vs Lab EC (n=4) | For samples > 10X the detection limit (DL), % RPD should be within +/-30% | All passed. |
| Certified Reference Material (n=1) for pH Laboratory Control Sample (n=1) for EC and TSS | Within specified tolerance ranges. | All passed. |
| **Anions and Nutrients** | | |
| Field Blank (n=0) | Minimum criteria is <2X DL, will accept <5X DL | #N/A |
| Method Blank (n=1) for Total Ammonia, Sulfate (SO4) and Cl | <2X DL | All passed. |
| Field Duplicate (n=1) | For samples >10X DL should be within +/-30% RPD | All passed. |
| Leachate Duplicate (n=1) for Cl and Sulfate (SO4) | For samples >10X DL should be within +/-20% RPD | All passed. |
| Ion Balance (n=4) | EC>100 uS/cm, % difference should be within +/-10% | Could not be assessed due to missing major anions (total alkalinity and nitrate) |
| Laboratory Control Sample (n=1) for Total Ammonia, Sulfate (SO4) and Cl | Within specified tolerance ranges. | All passed. |

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Trace Metals by ICP-MS and Hg-CVAAS** | | |
| Field Blank (n=0) for Dissolved | Minimum criteria is <2X DL, will accept <5X DL | #N/A |
| Method Blank (n=1) for Dissolved and Total | <2X DL | All passed. |
| Field Duplicate (n=1) for Dissolved and Total | For samples >10X DL should be within +/-30% RPD | All passed. |
| Leachate Duplicate (n=1) for Dissolved Hg | For samples >10X DL should be within +/-20% RPD | Passed |
| Total vs Dissolved Metals (n=4) | Total Metals>Dissolved metals. Total Metals should be greater than Dissolved Metals, if not the % difference should be within +/-20%. | BOS8C - both Total and Dissolved Se >10x DL |
| Laboratory Control Sample (n=1) for Dissolved and Total | Within specified tolerance ranges. | All passed. |

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### 2.2.2 Historic Data

The historic seepage data set is comprised of 59 samples collected between 2008 and 2019, with the majority of samples analyzed for total metals rather than dissolved metals (Attachment 2). SRK collected three seepage samples in 2008 and based on QA/QC screening concluded that the data were acceptable (SRK 2009). All other historic samples were collected by Hope Bay Mining Ltd (HBML) or TMAC as part of the water licence monitoring program or the seepage monitoring program. SRK did not conduct QA/QC of the historic seepage data collected by HBML or TMAC prior to 2017 because the limited analytical suite precluded the calculation of ion balances and other QA/QC checks. SRK accepted all water licence monitoring data as-is.

# 3 Results

## 3.1 Field Observations

Field parameters for the three seeps sampled in 2020 are presented in Table 2. Field pH ranged from 7.4 to 7.7. Field EC values at BOS-8C (906 µS/cm) were approximately three times higher than BOS-8A (229 µS/cm) and BOS-8D (336 µS/cm).

**Table 2: 2020 Field Observations**

| Sample ID | Field pH | Field EC | ORP | Temperature | Flow | Comments |
|---|---|---|---|---|---|---|
| | s.u | µS/cm | mV* | °C | L/s | |
| BOS8A | 7.4 | 229 | 167 | 13 | - | Seep flowing from toe of pad. Two main seeps emanating from around large boulder. Runoff from snow infiltrating camp pad rock. Snowbank upstream of camp pad. |
| BOS8C | 7.7 | 906 | 202 | 5.6 | - | Small seep emanating from toe of old containment pond. Algae present in seep flow and may have been disturbed with syringe. |
| BOS8D | 7.7 | 336 | 204 | 9.3 | - | Seep at toe of old Burn Pit (BOS7). Runoff from camp pad surface into Burn Pit likely contributing to flow. 3-4 small seeps within 5 m of each other - sheet flow unable to measure flow. |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\230 - Boston Annual Report\Seepage_Memo\1.Working_File\[1CT022.056-230_2020_BostonSeep_REV00_ajs.xlsx]

Notes:

*Field calibrated ORP values

## 3.2 Laboratory Results

Table 3 and Table 4 present selected parameters from the 2020 Boston seepage data set and a comparison to a statistical summary of historical Boston seepage samples (2008 to 2019). The complete data set is documented in Attachment 1. Figure 2 to Figure 10 present sulphate, chloride, nitrate, ammonia, arsenic, copper, iron, nickel, and selenium concentrations observed since 2008.

Laboratory pH values ranged from 7.5 to 7.8. Lab EC values were equivalent to field EC values, with values at BOS-8C (930 µS/cm) approximately three times higher than BOS-8A (220 µS/cm) and BOS-8D (320 µS/cm). Similarly, concentrations of major ions (calcium, chloride, magnesium, sodium, and sulphate) are higher at BOS-8C (e.g. 200 mg/L sulphate) compared to BOS-8A and BOS-8D (e.g. 64 mg/L and 70 mg/L sulphate, respectively). Values of EC and major ions at BOS-8C were lower than median values for the historic seepage data set.

Concentrations of arsenic, cadmium, cobalt, nickel, and selenium are equivalent for BOS-8A and BOS-8D (e.g. 0.021 and 0.019 mg/L cobalt, respectively) and are one order of magnitude higher at BOS-8C (e.g. 0.34 mg/L cobalt). Manganese concentrations at BOS-8C (0.091 mg/L) are approximately three times higher than BOS-8A (0.036 mg/L) and BOS-8D (0.024 mg/L).

Aluminum concentrations at BOS-8D (0.019 mg/L) are one order of magnitude higher than BOS-8A (0.0069 mg/L) and BOS-8C (0.0036 mg/L). Concentrations of copper and zinc are equivalent for all three samples with the highest concentrations at BOS-8A (Table 4). Iron and lead concentrations were less than detection (0.01 and 0.00005 mg/L, respectively) for all samples.

All concentrations for the aforementioned parameters are within the range of the historical concentrations.

According to TMAC, in September 2018, repairs to a berm adjacent to station BOS-8C disturbed ore material. This activity may be the source of higher sulphate, arsenic, cobalt, and nickel concentrations in the seepage at station BOS-8C relative to BOS-8A and BOS-8D (Table 3 and Table 4).

**Table 3: Summary of General Parameters, Major Dissolved Ions and Nutrients, 2020 and Historical Seepage Samples**

| Sample ID | Sample Date | Physical Tests | | | Major Ions and Nutrients[1,2] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | pH | Conductivity | Total Suspended Solids | Sulphate | Calcium | Magnesium | Potassium | Sodium | Ammonia | Chloride |
| | | s.u. | µS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L as N | mg/L |
| BOS8A | 6/18/2020 | 7.5 | 220 | 38 | 64 | 26 | 9.2 | <2.0 | 3.9 | 0.093 | 5.9 |
| BOS8C | 6/18/2020 | 7.8 | 930 | 16 | 200 | 110 | 30 | 8.0 | 12 | 0.21 | 120 |
| BOS8D | 6/18/2020 | 7.6 | 320 | 60 | 70 | 39 | 9.8 | 2.5 | 5.5 | 0.021 | 28 |
| **Historic Seepage Data** | | | | | | | | | | | |
| P5 | | 7.0 | 360 | 3.0 | 69 | 33 | 9.1 | 1.6 | 4.1 | 0.0079 | 13 |
| P50 | | 7.8 | 1300 | 6.7 | 330 | 150 | 62 | 9.1 | 28 | 0.05 | 130 |
| P95 | | 8.1 | 2600 | 40 | 670 | 430 | 100 | 26 | 110 | 7.2 | 860 |
| Number of samples | | 59 | 59 | 45 | 59 | 16 | 16 | 16 | 16 | 56 | 34 |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\230 - Boston Annual Report\Seepage_Memo\1.Working_File\[1CT022.056-230_2020_BostonSeep_REV00_ajs.xlsx]

Notes:

[1]Dissolved concentrations presented for historic calcium, magnesium, potassium, and sodium statistics.

[2]Nitrate and total alkalinity not analyzed in 2020.

**Table 4: Comparison of Selected Trace Elements from 2020 and Historical Seepage Samples**

| Sample ID | Aluminum | Arsenic | Cadmium | Cobalt | Copper | Iron | Lead | Manganese | Nickel | Selenium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dissolved Metals | | | | | | | | | | |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| BOS8A | 0.0069 | 0.027 | 0.0000071 | 0.021 | 0.0024 | <0.01 | <0.00005 | 0.036 | 0.054 | 0.00018 | 0.0021 |
| BOS8C | 0.0036 | 0.64 | 0.000014 | 0.34 | 0.0015 | <0.01 | <0.00005 | 0.091 | 0.42 | 0.0016 | <0.001 |
| BOS8D | 0.019 | 0.076 | 9.1E-06 | 0.019 | 0.0019 | <0.01 | <0.00005 | 0.024 | 0.029 | 0.00048 | 0.0015 |
| **Historic Seepage Data** | | | | | | | | | | | |
| **Dissolved Metals** | | | | | | | | | | | |
| P5 | 0.0024 | 0.022 | 0.0000064 | 0.0093 | 0.0018 | 0.01 | 0.00005 | 0.021 | 0.026 | 0.00021 | 0.0014 |
| P50 | 0.0049 | 0.09 | 0.000029 | 0.2 | 0.004 | 0.01 | 0.00005 | 0.13 | 0.37 | 0.002 | 0.0027 |
| P95 | 0.026 | 0.92 | 0.00031 | 1.1 | 0.0078 | 0.15 | 0.00039 | 0.64 | 1.7 | 0.021 | 0.033 |
| Maximum | 0.034 | 0.99 | 0.000037 | 1.2 | 0.0085 | 0.25 | - | 1.4 | 1.8 | 0.04 | 0.041 |
| Number of Samples | 16 | 16 | 16 | 16 | 16 | 16 | 10 | 16 | 16 | 16 | 15 |
| **Total Metals** | | | | | | | | | | | |
| P5 | 0.015 | 0.0037 | 0.000015 | 0.0021 | 0.0014 | 0.036 | 0.0001 | 0.017 | 0.011 | 0.00038 | 0.0039 |
| P50 | 0.099 | 0.12 | 0.00005 | 0.035 | 0.0049 | 0.31 | 0.0005 | 0.17 | 0.12 | 0.0017 | 0.0057 |
| P95 | 0.94 | 0.72 | 0.001 | 0.74 | 0.011 | 4 | 0.005 | 0.7 | 1.4 | 0.0078 | 0.091 |
| Maximum | 6.9 | 5.6 | 0.002 | 1.4 | 0.045 | 16 | 0.022 | 2 | 4 | 0.017 | 0.1 |
| Number of Samples | 47 | 45 | 49 | 47 | 49 | 49 | 49 | 47 | 49 | 45 | 47 |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\230 - Boston Annual Report\Seepage_Memo\1.Working_File\[1CT022.056-230_2020_BostonSeep_REV00_ajs.xlsx]

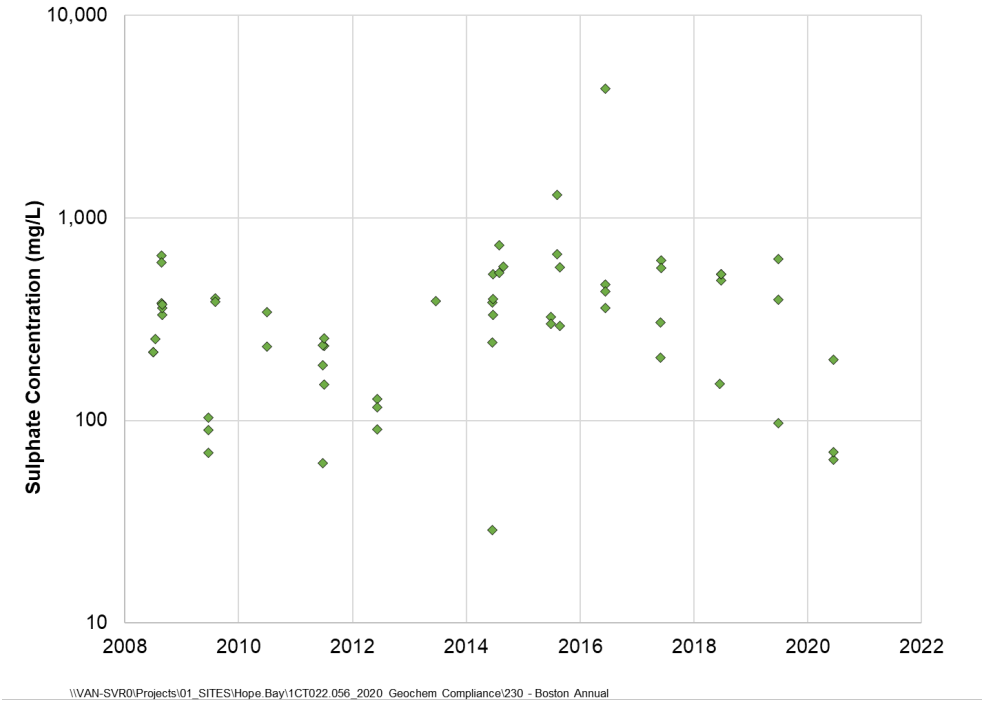



**Figure 2: Sulphate concentrations in seeps at the Boston Camp since 2008**

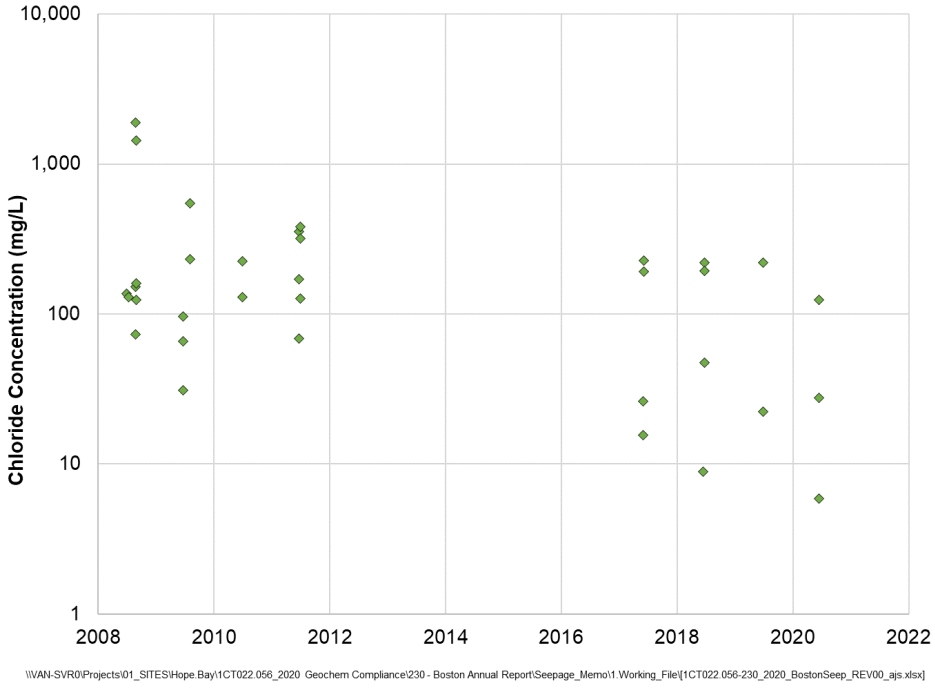



**Figure 3: Chloride concentrations in seeps at the Boston Camp since 2008**

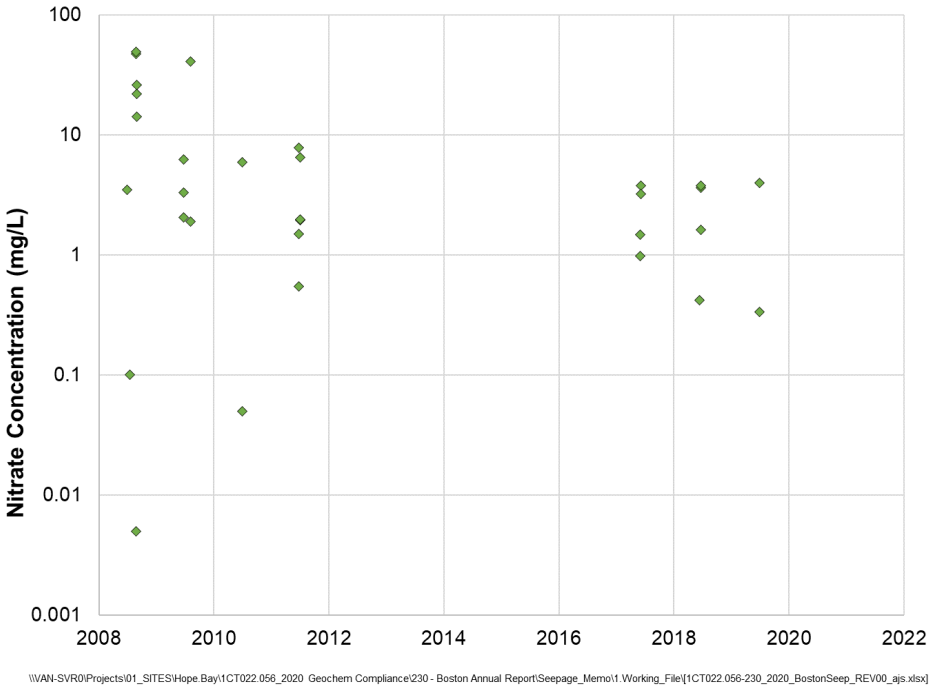



**Figure 4: Nitrate concentrations in seeps at the Boston Camp since 2008**

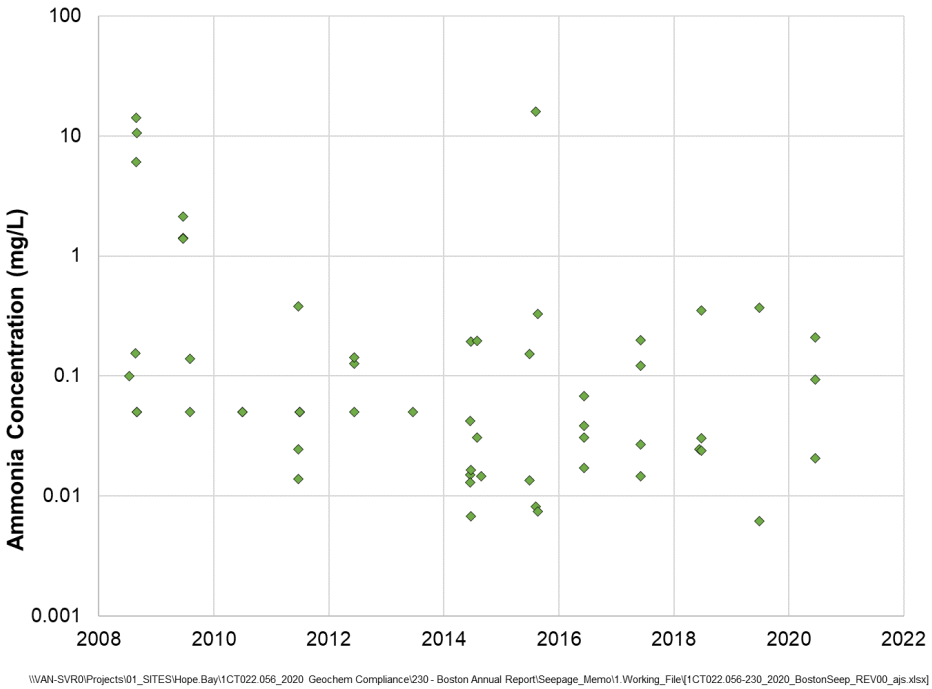



**Figure 5: Ammonia concentrations in seeps at the Boston Camp since 2008**

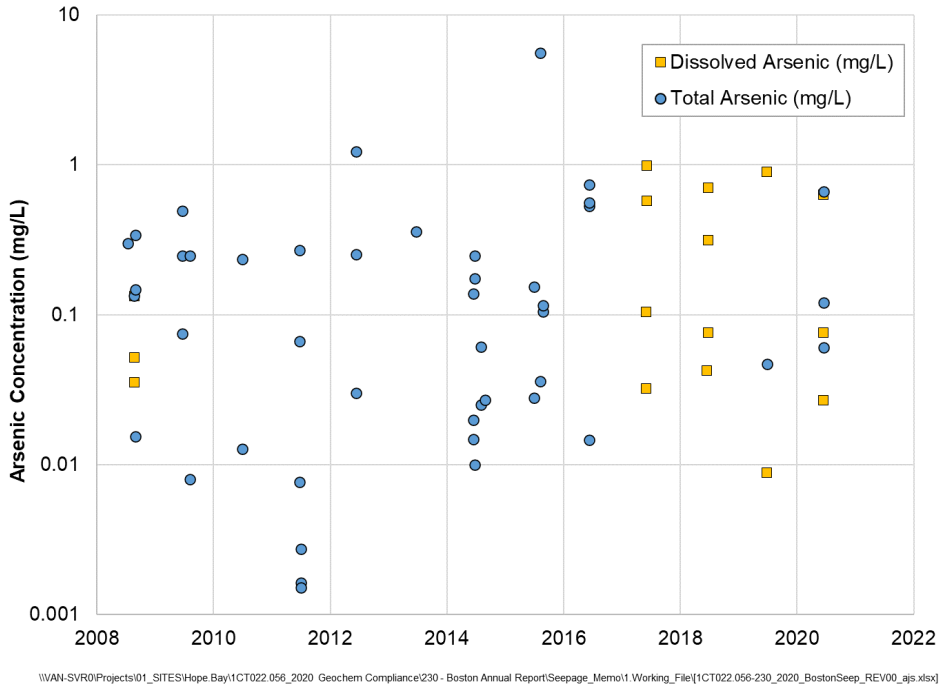



**Figure 6: Arsenic concentrations in seeps at the Boston Camp since 2008**

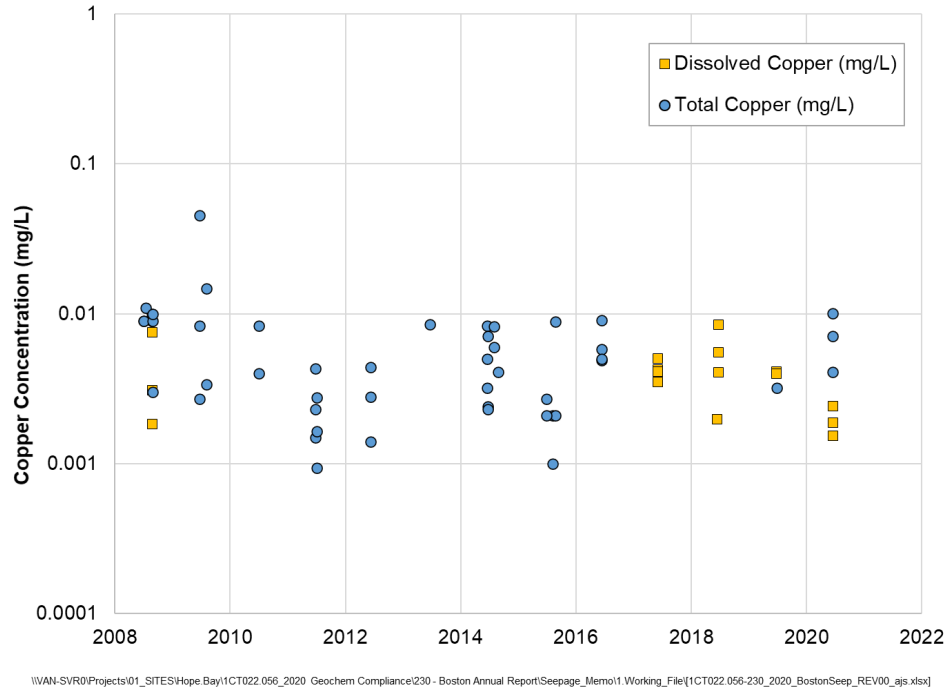



**Figure 7: Copper concentrations in seeps at the Boston Camp since 2008**

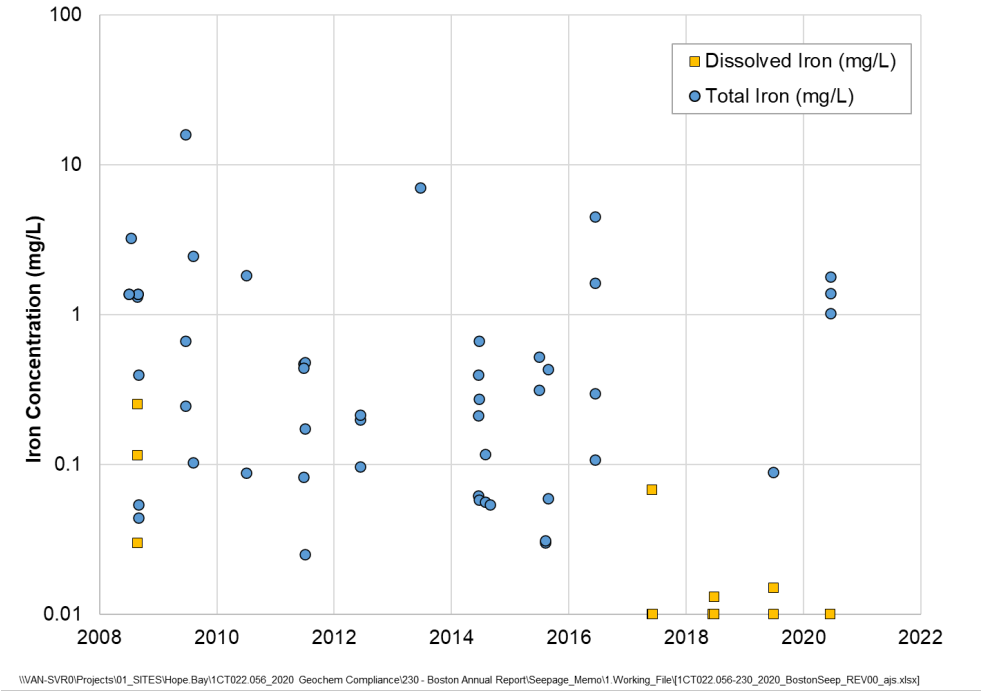



**Figure 8: Iron concentrations in seeps at the Boston Camp since 2008**

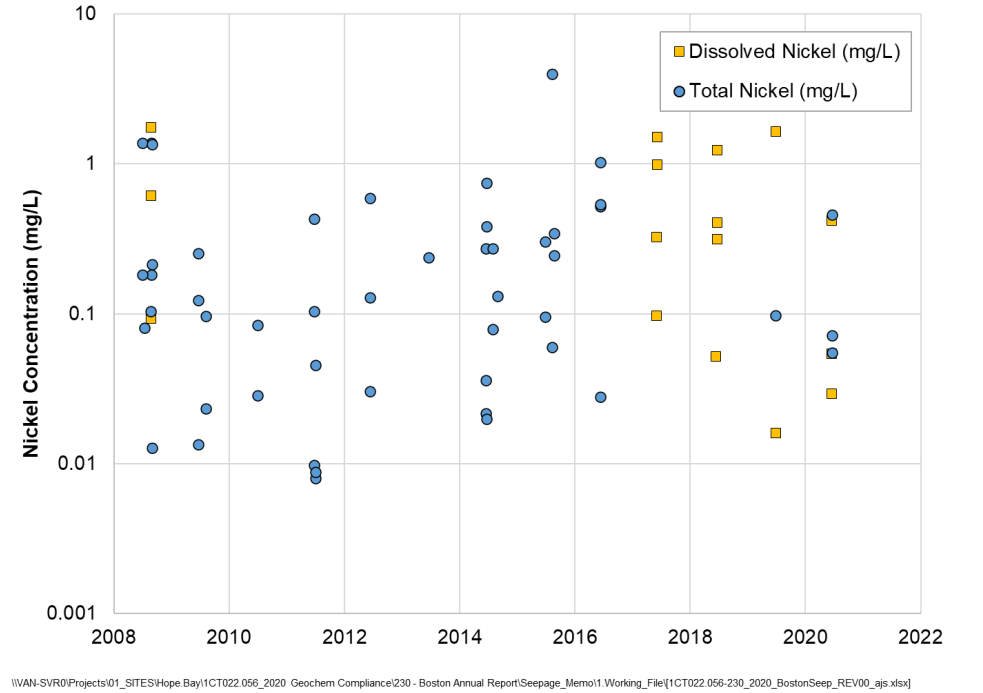



**Figure 9: Nickel concentrations in seeps at the Boston Camp since 2008**

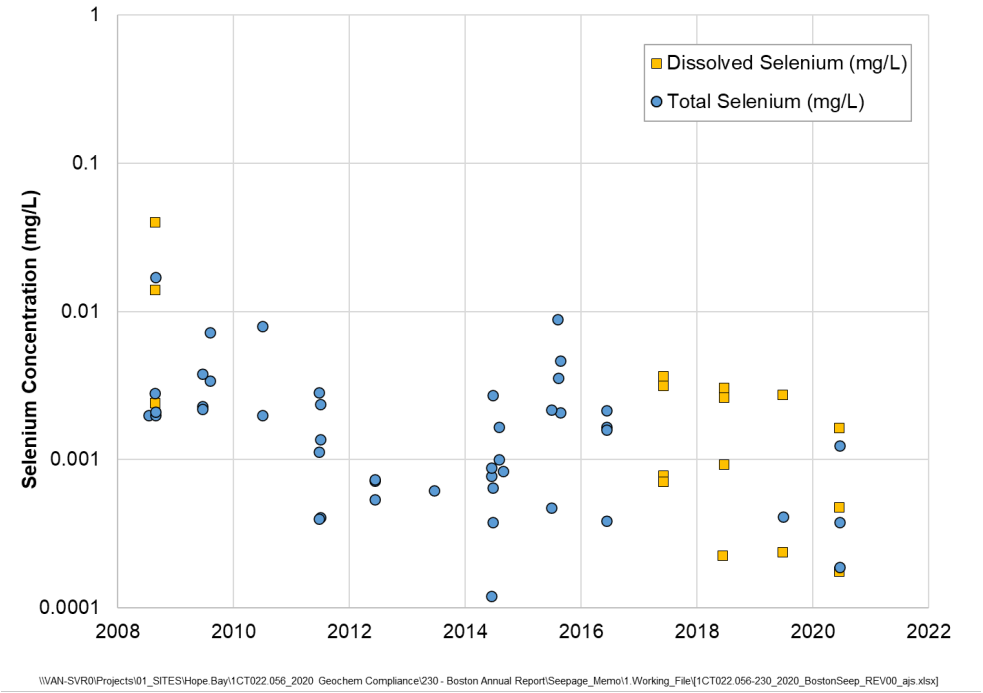



**Figure 10: Selenium concentration in seeps at the Boston Camp since 2008**

# 4 Conclusions and Recommendations

In 2020, TMAC conducted the following seepage surveys as outlined in the *Water and Ore/Waste Rock Management Plan for the Boston Site* (SRK 2017):

- Two surveys of station BOS-8 were complete in June and August. A total of three samples were collected from BOS-8A, BOS-8C and BOS-8D in June and no seepage was observed in August.
- Freshet seepage survey of the north and east side of the camp pad, and the southern end of the airstrip. TMAC did not observe flowing seepage and therefore did not collected any water quality samples.

All seepage samples were pH neutral (7.5 to 7.8). The seepage chemistry is summarized as follows:

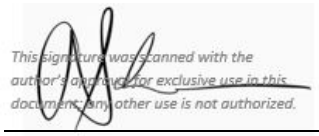
- EC values at BOS-8C (930 µS/cm) were approximately three times higher than at BOS-8A (220 S/cm) and BOS-8D (320 µS/cm). Concentrations of major ions (calcium, chloride, magnesium, sodium, and sulphate) are equivalent in magnitude for BOS-8A and BOS-8D (e.g. 64 mg/L and 70 mg/L sulphate, respectively) and an order of magnitude higher for BOS-8C (e.g. 200 mg/L sulphate).
- Concentrations of arsenic, cadmium, cobalt, nickel, and selenium are equivalent in magnitude for BOS-8A and BOS-8D (e.g. 0.021 and 0.019 mg/L cobalt, respectively) and are one order of magnitude higher at BOS-8C (e.g. 0.34 mg/L cobalt). Manganese concentrations at BOS-8C

(0.091 mg/L) are approximately three times higher than BOS-8A (0.036 mg/L) and BOS-8D (0.024 mg/L).

- Aluminum concentrations at BOS-8D (0.019 mg/L) are one order of magnitude higher than BOS-8A (0.0069 mg/L) and BOS-8C (0.0036 mg/L). Concentrations of copper and zinc are equivalent for all three sample with the highest concentrations at BOS-8A. Iron and lead concentrations were less than detection (0.01 and 0.00005 mg/L, respectively) for all samples.
- All concentrations for the aforementioned parameters are within the range of the historical concentrations.

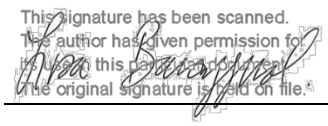
Continued monitoring will allow for further trends in the seepage to be established.

Regards,
SRK Consulting (Canada) Inc.




Amanda Schevers, GIT (BC)
Staff Consultant (Geochemistry)

Reviewed by




Lisa Barazzuol, PGeo (NT/NU)
Principal Consultant (Geochemistry)

## Attachments:

Attachment 1 2020 Field Observations and Water Quality Results
Attachment 2 Boston Seepage Data 2008-2020

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

# References

[NWB] Nunavut Water Board, 2017. Water License No: 2BB-BOS1727. July 2017.

SRK Consulting (Canada) Inc., 2009. Geochemical Characterization of Historic Waste Rock and Ore Stockpiles at the Boston Deposit, Hope Bay Project, Nunavut. Report 1CH008.005 for Hope Bay Mining Ltd. April 2009.

SRK Consulting (Canada) Inc., 2017. Water and Ore/Waste Rock Management Plan for the Boston Site, Hope Bay Project, Nunavut. Report 1CT022.009 for Hope Bay Mining Ltd. January 2017.

SRK Consulting (Canada) Inc., 2019. Expectations for Laboratory Geochemical Data Quality. Internal Memo.

# Attachment 1 2020 Field Observations and Water Quality Results

| Sample ID | Unit | Detection Limit | DUP1 | BOS8A | BOS8C | BOS8D |
|---|---|---|---|---|---|---|
| Date | | | 18-Jun-2020 | 18-Jun-2020 | 18-Jun-2020 | 18-Jun-2020 |
| Time | | | 11:40 | 11:40 | 12:30 | 14:05 |
| Easting | | | 441232 | 441232 | 441341 | 441353 |
| Northing | | | 7505521 | 7505521 | 7505412 | 7505382 |
| ALS Sample ID | | | L2463552-1 | L2463552-2 | L2463552-3 | L2463552-4 |
| **Field Parameters** | | | | | | |
| pH | s.u. | | | 7.4 | 7.7 | 7.7 |
| Electrical Conductivity | µS/cm | | | 229 | 906 | 336 |
| Temperature | °C | | | 13 | 5.6 | 9.3 |
| ORP | RmV | | | 167 | 202 | 204 |
| Photos | | | | Y | Y | Y |
| Flow | L/s | | | - | - | - |
| Duplicate | | | | Y | N | N |
| Blank | | | | N | N | N |
| **Physical Tests (Water)** | | | | | | |
| Conductivity | µS/cm | 2.0 | 225 | 224 | 925 | 317 |
| Hardness (as CaCO3) | mg/L | 0.50 | 92.9 | 96 | 401 | 129 |
| pH | pH | 0.10 | 7.47 | 7.48 | 7.77 | 7.59 |
| Total Suspended Solids | mg/L | 3.0 | 34.8 | 38.0 | 16.2 | 60.0 |
| **Anions and Nutrients (Water)** | | | | | | |
| Ammonia, Total (as N) | mg/L | 0.0050 | 0.0999 | 0.0932 | 0.209 | 0.0205 |
| Chloride (Cl) | mg/L | 0.50 | 5.85 | 5.85 | 124 | 27.5 |
| Sulfate (SO4) | mg/L | 0.30 | 63.8 | 64.2 | 200 | 69.6 |
| **Total Metals (Water)** | | | | | | |
| Aluminum (Al)-Total | mg/L | 0.0050 | 0.365 | 0.418 | 0.588 | 0.944 |
| Antimony (Sb)-Total | mg/L | 0.00050 | 0.00257 | 0.00264 | 0.0321 | 0.00506 |
| Arsenic (As)-Total | mg/L | 0.00050 | 0.0580 | 0.0608 | 0.663 | 0.121 |
| Barium (Ba)-Total | mg/L | 0.020 | 0.02 | 0.02 | 0.02 | 0.02 |
| Beryllium (Be)-Total | mg/L | 0.00010 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Boron (B)-Total | mg/L | 0.10 | 0.1 | 0.1 | 0.13 | 0.1 |
| Cadmium (Cd)-Total | mg/L | 0.0000050 | 0.0000173 | 0.0000179 | 0.0000157 | 0.0000279 |
| Calcium (Ca)-Total | mg/L | 0.10 | 23.1 | 25.5 | 114 | 38.8 |
| Chromium (Cr)-Total | mg/L | 0.0010 | 0.0049 | 0.0055 | 0.0153 | 0.0118 |
| Cobalt (Co)-Total | mg/L | 0.00030 | 0.0264 | 0.0280 | 0.356 | 0.0302 |
| Copper (Cu)-Total | mg/L | 0.0010 | 0.0066 | 0.0071 | 0.0041 | 0.0101 |
| Iron (Fe)-Total | mg/L | 0.030 | 0.947 | 1.02 | 1.39 | 1.79 |
| Lead (Pb)-Total | mg/L | 0.00050 | 0.00102 | 0.00114 | 0.00074 | 0.00228 |
| Lithium (Li)-Total | mg/L | 0.0010 | 0.0019 | 0.0020 | 0.0243 | 0.0080 |
| Magnesium (Mg)-Total | mg/L | 0.10 | 8.91 | 9.23 | 29.6 | 9.81 |
| Manganese (Mn)-Total | mg/L | 0.00030 | 0.0490 | 0.0505 | 0.112 | 0.0483 |
| Molybdenum (Mo)-Total | mg/L | 0.0010 | 0.001 | 0.001 | 0.0025 | 0.0019 |
| Nickel (Ni)-Total | mg/L | 0.0010 | 0.0674 | 0.0720 | 0.460 | 0.0553 |
| Potassium (K)-Total | mg/L | 2.0 | -2 | -2 | 8.0 | 2.5 |
| Selenium (Se)-Total | mg/L | 0.000050 | 0.000213 | 0.000188 | 0.00124 | 0.000379 |

| Sample ID | Unit | Detection Limit | DUP1 | BOS8A | BOS8C | BOS8D |
|---|---|---|---|---|---|---|
| Date | | | 18-Jun-2020 | 18-Jun-2020 | 18-Jun-2020 | 18-Jun-2020 |
| Time | | | 11:40 | 11:40 | 12:30 | 14:05 |
| Easting | | | 441232 | 441232 | 441341 | 441353 |
| Northing | | | 7505521 | 7505521 | 7505412 | 7505382 |
| ALS Sample ID | | | L2463552-1 | L2463552-2 | L2463552-3 | L2463552-4 |
| Silver (Ag)-Total | mg/L | 0.000020 | 0.000030 | 0.000036 | 0.000032 | 0.000081 |
| Sodium (Na)-Total | mg/L | 2.0 | 3.7 | 3.9 | 12.4 | 5.5 |
| Strontium (Sr)-Total | mg/L | 0.00020 | 0.0530 | 0.0572 | 0.694 | 0.185 |
| Thallium (Tl)-Total | mg/L | 0.000010 | 0.00001 | 0.00001 | 0.00001 | 0.00001 |
| Tin (Sn)-Total | mg/L | 0.00050 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Titanium (Ti)-Total | mg/L | 0.010 | 0.01 | 0.01 | 0.01 | 0.01 |
| Uranium (U)-Total | mg/L | 0.00020 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| Vanadium (V)-Total | mg/L | 0.00050 | 0.00157 | 0.00169 | 0.00347 | 0.00375 |
| Zinc (Zn)-Total | mg/L | 0.0050 | 0.0073 | 0.0075 | -0.005 | 0.0142 |
| | | | | | | |
| **Dissolved Metals (Water)** | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | 0.0010 | 0.0072 | 0.0069 | 0.0036 | 0.0186 |
| Antimony (Sb)-Dissolved | mg/L | 0.00010 | 0.00198 | 0.00196 | 0.0297 | 0.00432 |
| Arsenic (As)-Dissolved | mg/L | 0.00010 | 0.0273 | 0.0269 | 0.635 | 0.0758 |
| Barium (Ba)-Dissolved | mg/L | 0.00010 | 0.00222 | 0.00221 | 0.0105 | 0.00617 |
| Beryllium (Be)-Dissolved | mg/L | 0.00010 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Bismuth (Bi)-Dissolved | mg/L | 0.000050 | 0.00005 | 0.00005 | 0.00005 | 0.00005 |
| Boron (B)-Dissolved | mg/L | 0.010 | 0.022 | 0.023 | 0.147 | 0.052 |
| Cadmium (Cd)-Dissolved | mg/L | 0.0000050 | 0.0000081 | 0.0000071 | 0.0000135 | 0.0000091 |
| Calcium (Ca)-Dissolved | mg/L | 0.050 | 23.4 | 23.6 | 114 | 36.6 |
| Cesium (Cs)-Dissolved | mg/L | 0.000010 | 0.000041 | 0.000038 | 0.000470 | 0.000056 |
| Chromium (Cr)-Dissolved | mg/L | 0.00010 | 0.0001 | 0.00020 | 0.00035 | 0.00031 |
| Cobalt (Co)-Dissolved | mg/L | 0.00010 | 0.0201 | 0.0208 | 0.339 | 0.0185 |
| Copper (Cu)-Dissolved | mg/L | 0.00020 | 0.00253 | 0.00241 | 0.00154 | 0.00187 |
| Iron (Fe)-Dissolved | mg/L | 0.010 | 0.01 | 0.01 | 0.01 | 0.01 |
| Lead (Pb)-Dissolved | mg/L | 0.000050 | 0.00005 | 0.00005 | 0.00005 | 0.00005 |
| Lithium (Li)-Dissolved | mg/L | 0.0010 | 0.0018 | 0.0018 | 0.0280 | 0.0079 |
| Magnesium (Mg)-Dissolved | mg/L | 0.0050 | 8.40 | 8.99 | 28.4 | 9.18 |
| Manganese (Mn)-Dissolved | mg/L | 0.00010 | 0.0349 | 0.0356 | 0.0905 | 0.0244 |
| Mercury (Hg)-Dissolved | mg/L | 0.0000050 | 0.000005 | 0.000005 | 0.000005 | 0.000005 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.000050 | 0.000298 | 0.000292 | 0.00232 | 0.00158 |
| Nickel (Ni)-Dissolved | mg/L | 0.00050 | 0.0524 | 0.0544 | 0.420 | 0.0292 |
| Phosphorus (P)-Dissolved | mg/L | 0.050 | 0.05 | 0.05 | 0.05 | 0.05 |
| Potassium (K)-Dissolved | mg/L | 0.050 | 1.32 | 1.34 | 7.35 | 2.26 |
| Rubidium (Rb)-Dissolved | mg/L | 0.00020 | 0.00081 | 0.00080 | 0.00507 | 0.00160 |
| Selenium (Se)-Dissolved | mg/L | 0.000050 | 0.000220 | 0.000176 | 0.00163 | 0.000476 |
| Silicon (Si)-Dissolved | mg/L | 0.050 | 0.285 | 0.303 | 1.70 | 0.796 |
| Silver (Ag)-Dissolved | mg/L | 0.000010 | 0.00001 | 0.00001 | 0.00001 | 0.00001 |
| Sodium (Na)-Dissolved | mg/L | 0.050 | 3.66 | 3.89 | 12.5 | 5.27 |
| Strontium (Sr)-Dissolved | mg/L | 0.00020 | 0.0582 | 0.0587 | 0.727 | 0.193 |
| Sulfur (S)-Dissolved | mg/L | 0.50 | 22.7 | 23.2 | 73.6 | 23.9 |

| Sample ID | Unit | Detection Limit | DUP1 | BOS8A | BOS8C | BOS8D |
|---|---|---|---|---|---|---|
| Date | | | 18-Jun-2020 | 18-Jun-2020 | 18-Jun-2020 | 18-Jun-2020 |
| Time | | | 11:40 | 11:40 | 12:30 | 14:05 |
| Easting | | | 441232 | 441232 | 441341 | 441353 |
| Northing | | | 7505521 | 7505521 | 7505412 | 7505382 |
| ALS Sample ID | | | L2463552-1 | L2463552-2 | L2463552-3 | L2463552-4 |
| Tellurium (Te)-Dissolved | mg/L | 0.00020 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| Thallium (Tl)-Dissolved | mg/L | 0.000010 | 0.00001 | 0.00001 | 0.00001 | 0.00001 |
| Thorium (Th)-Dissolved | mg/L | 0.00010 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Tin (Sn)-Dissolved | mg/L | 0.00010 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Titanium (Ti)-Dissolved | mg/L | 0.00030 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Tungsten (W)-Dissolved | mg/L | 0.00010 | 0.00011 | 0.00010 | 0.00145 | 0.00148 |
| Uranium (U)-Dissolved | mg/L | 0.000010 | 0.000023 | 0.000024 | 0.000116 | 0.000063 |
| Vanadium (V)-Dissolved | mg/L | 0.00050 | 0.0005 | 0.0005 | 0.00072 | 0.0005 |
| Zinc (Zn)-Dissolved | mg/L | 0.0010 | 0.0024 | 0.0021 | 0.001 | 0.0015 |
| Zirconium (Zr)-Dissolved | mg/L | 0.00020 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |

Note: Blue text indicates values below the limit of detection

# Attachment 2 Boston Seepage Data 2008-2020

| Year | Sample Code | Station Code | Date | Conductivity | Hardness (as CaCO3) | pH | Total Suspended Solids | Total Dissolved Solids | Acidity (as CaCO3) | Alkalinity, Total (as CaCO3) | Ammonia, Total (as N) | Bromide (Br) | Chloride (Cl) | Fluoride (F) | Nitrate (as N) | Nitrite (as N) | Phosphorus (P)-Total | Ortho Phosphate as P | Sulfate (SO4) | Dissolved Mercury Filtration Location | Dissolved Metals Filtration Location | Aluminum (Al)-Dissolved | Antimony (Sb)-Dissolved | Arsenic (As)-Dissolved | Barium (Ba)-Dissolved | Beryllium (Be)-Dissolved | Bismuth (Bi)-Dissolved | Boron (B)-Dissolved |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Units | uS/cm | mg/L | s.u. | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | LOR | 2 | 0.5 | 0.1 | 3 | 10 | 1 | 1 | 0.005 | 0.05 | 0.5 | 0.02 | 0.005 | 0.001 | 0.002 | 0.001 | 0.3 | n/a | n/a | 0.001 | 0.0001 | 0.0001 | 0.00005 | 0.00002 | 0.00005 | 0.01 |
| 2008 | 2008-BOS<001 | 2008-BOS<001 | 8/23/2008 | 1470 | 596 | 7.9 | 18.7 | 1110 | 12.2 | 162 | 0.155 | <0.05 | 152 | 0.065 | <0.005 | 0.0019 | - | - | 380 | - | - | 0.0146 | 0.00437 | 0.0521 | 0.0314 | <0.001 | <0.001 | 0.147 |
| 2008 | 2008-BOS<003 | 2008-BOS<003 | 8/25/2008 | 1890 | 901 | 7.71 | <5 | 1490 | 6.4 | 76.7 | 6.04 | <0.05 | 73 | 0.106 | 47.6 | 0.542 | - | - | 650 | - | - | <0.005 | 0.0142 | 0.0353 | 0.011 | <0.0025 | <0.0025 | 0.295 |
| 2008 | BOS-8 | BOS-8A | 8/25/2008 | 6720 | 2740 | 6.9 | 19 | 8200 | 19.1 | 42.8 | 14.2 | 3.4 | 1890 | 1.3 | 49.7 | 0.261 | - | - | 603 | - | - | 0.023 | 0.0206 | 0.134 | 0.126 | <0.005 | <0.005 | 0.43 |
| 2008 | BOS-8A | BOS-8A | 6/30/2008 | 1190 | 464 | 8 | 11 | - | - | 149 | - | - | 136 | - | 3.5 | 0.05 | - | - | 217 | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | 6/30/2008 | 1190 | 464 | 8 | 11 | - | - | 149 | - | - | - | - | - | - | - | - | 217 | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | 7/14/2008 | 1280 | 490 | 8.1 | 40 | - | - | 172 | 0.1 | - | 129 | 0.09 | 0.1 | 0.05 | 0.27 | - | 253 | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | 8/29/2008 | 1330 | 548 | 8 | - | - | - | 130 | 0.05 | - | 124 | - | 22.1 | 0.05 | 0.08 | - | 333 | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8A | BOS-8A | 6/21/2009 | 483 | 161 | 8.04 | 19 | 260 | - | 111 | 1.41 | - | 30.9 | 0.073 | 2.07 | 0.05 | 0.186 | 0.186 | 69 | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8A | BOS-8A | 8/4/2009 | 1820 | 660 | 8.2 | 34 | 1110 | - | 188 | 0.138 | - | 231 | 0.061 | 1.91 | 0.05 | 0.161 | 0.161 | 402 | - | - | - | - | - | - | - | - | - |
| 2010 | BOS-8A | BOS-8A | 7/1/2010 | 1210 | 481 | 7.85 | - | - | - | 198 | 0.05 | - | 130 | 0.083 | 0.05 | 0.05 | - | 0.216 | 232 | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8A | BOS-8A | 6/23/2011 | 763 | 274 | 7.71 | - | - | - | 68.4 | 0.381 | - | 68.6 | - | 1.5 | 0.05 | - | 0.0593 | 188 | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8A | BOS-8A | 7/3/2011 | 1050 | 362 | 7.99 | - | - | - | 72 | 0.05 | - | 127 | - | 1.96 | 0.05 | - | 0.02 | 233 | - | - | - | - | - | - | - | - | - |
| 2012 | BOS-8A | BOS-8A | 6/10/2012 | 394 | 149 | 7.78 | 3 | - | - | - | 0.127 | - | - | - | - | - | - | - | 90.1 | - | - | - | - | - | - | - | - | - |
| 2013 | BOS-8A | BOS-8A | 6/21/2013 | 1320 | 687 | 8.28 | 15 | - | - | - | 0.05 | - | - | - | - | - | - | - | 387 | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8B | BOS-8B | 8/29/2008 | 1560 | 571 | 7.9 | - | - | - | 128 | 0.05 | - | 160 | - | 14.3 | 0.05 | 0.02 | - | 358 | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8B | BOS-8B | 6/21/2009 | 724 | 209 | 7.71 | 4 | 387 | - | 63.8 | 2.12 | - | 96.8 | 0.054 | 6.26 | 0.071 | 0.102 | 0.102 | 103 | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8B | BOS-8B | 8/4/2009 | 2800 | 956 | 7.73 | 3 | 1640 | - | 38.6 | 0.05 | - | 548 | 0.05 | 41 | 0.05 | 0.02 | 0.02 | 384 | - | - | - | - | - | - | - | - | - |
| 2010 | BOS-8B | BOS-8B | 7/1/2010 | 1520 | 583 | 7.48 | - | - | - | 58.2 | 0.05 | - | 224 | 0.05 | 5.95 | 0.05 | - | 0.103 | 343 | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8B | BOS-8B | 6/23/2011 | 1690 | 635 | 6.87 | - | - | - | 10.1 | 0.0246 | - | 355 | - | 7.87 | 0.05 | - | 0.0393 | 236 | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8B | BOS-8B | 7/3/2011 | 1850 | 708 | 7.6 | - | - | - | 38.4 | 0.05 | - | 383 | - | 6.52 | 0.05 | - | 0.02 | 254 | - | - | - | - | - | - | - | - | - |
| 2012 | BOS-8B | BOS-8B | 6/10/2012 | 462 | 168 | 7.73 | 3 | - | - | - | 0.142 | - | - | - | - | - | - | - | 128 | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8C | BOS-8C | 8/29/2008 | 4860 | 1890 | 7.4 | - | - | - | 47 | 10.6 | - | 1440 | - | 26.3 | 0.16 | 0.17 | - | 374 | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8C | BOS-8C | 6/21/2009 | 520 | 176 | 7.55 | 656 | 275 | - | 37.2 | 1.4 | - | 65.5 | 0.05 | 3.33 | 0.055 | 0.282 | 0.282 | 89.5 | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8C | BOS-8C | 6/23/2011 | 786 | 281 | 7.58 | - | - | - | 33.8 | 0.0139 | - | 171 | - | 0.549 | 0.05 | - | 0.0156 | 61.6 | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8C | BOS-8C | 7/3/2011 | 1450 | 502 | 7.51 | - | - | - | 29.8 | 0.05 | - | 320 | - | 1.98 | 0.05 | - | 0.02 | 150 | - | - | - | - | - | - | - | - | - |
| 2012 | BOS-8C | BOS-8C | 6/10/2012 | 358 | 124 | 6.4 | 3 | - | - | - | 0.05 | - | - | - | - | - | - | - | 116 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-16JUN14a | BOS8 | 6/16/2014 | 683 | 346 | 7.93 | <3 | - | - | - | 0.0149 | - | - | - | - | - | - | - | 242 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-16JUN14b | BOS8 | 6/16/2014 | 1040 | 461 | 7.86 | 3.2 | - | - | - | 0.013 | - | - | - | - | - | - | - | 383 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-16JUN14c | BOS8 | 6/16/2014 | 347 | 106 | 7.95 | 8.8 | - | - | - | 0.0421 | - | - | - | - | - | - | - | 28.7 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-23JUN14a | BOS8 | 6/23/2014 | 974 | 537 | 8.03 | <3 | - | - | - | 0.0164 | - | - | - | - | - | - | - | 333 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-23JUN14b | BOS8 | 6/23/2014 | 1110 | 506 | 7.96 | <3 | - | - | - | 0.0068 | - | - | - | - | - | - | - | 398 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-23JUN14c | BOS8 | 6/23/2014 | 2160 | 1040 | 7.75 | 9.5 | - | - | - | 0.194 | - | - | - | - | - | - | - | 526 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-31JUL14 | BOS8 | 7/31/2014 | 1610 | 885 | 7.72 | 4.3 | - | - | - | 0.195 | - | - | - | - | - | - | - | 733 | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8A<09AUG15 | BOS8 | 8/9/2015 | 1460 | 742 | 7.02 | <3 | - | - | - | 0.0081 | - | - | - | - | - | - | - | 662 | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8A-12JUN16 | BOS8 | 6/12/2016 | 951 | 416 | 7.72 | <3 | - | - | - | 0.0308 | - | - | - | - | - | - | - | 359 | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8A-24AUG15 | BOS8 | 8/24/2015 | 1490 | 721 | 7.16 | 12.1 | - | - | - | 0.0074 | - | - | - | - | - | - | - | 569 | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8A-29JUN15 | BOS8 | 6/29/2015 | 944 | 426 | 8.03 | <3 | - | - | - | 0.0134 | - | - | - | - | - | - | - | 325 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8A-31JUL14 | BOS8 | 7/31/2014 | 1320 | 669 | 7.18 | <3 | - | - | - | 0.0305 | - | - | - | - | - | - | - | 535 | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8C<09AUG15 | BOS8 | 8/9/2015 | 2620 | 1370 | 7.6 | <3 | - | - | - | 16 | - | - | - | - | - | - | - | 1300 | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8C-12JUN16 | BOS8 | 6/12/2016 | 1610 | 739 | 7.9 | 28 | - | - | - | 0.0678 | - | - | - | - | - | - | - | 468 | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8C-24AUG15 | BOS8 | 8/24/2015 | 1370 | 601 | 7.14 | <3 | - | - | - | 0.33 | - | - | - | - | - | - | - | 292 | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8C-28AUG14 | BOS8 | 8/28/2014 | 1500 | 762 | 7.6 | <3 | - | - | - | 0.0146 | - | - | - | - | - | - | - | 575 | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8C-29JUN15 | BOS8 | 6/29/2015 | 1220 | 529 | 7.49 | <3 | - | - | - | 0.153 | - | - | - | - | - | - | - | 301 | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8D-12JUN16a | BOS8 | 6/12/2016 | 1470 | 668 | 7.91 | 9.8 | - | - | - | 0.0383 | - | - | - | - | - | - | - | 4350 | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8D-12JUN16b | BOS8 | 6/12/2016 | 1470 | 669 | 7.94 | 10.1 | - | - | - | 0.017 | - | - | - | - | - | - | - | 434 | - | - | - | - | - | - | - | - | - |
| 2017 | BOS8A<04JUN | BOS-8A | 6/4/2017 | 811 | 0 | 7.61 | <3.0 | 611 | 5.5 | 91.2 | 0.0145 | <0.25 | 26.1 | <0.10 | 1.48 | <0.0050 | 0.0275 | - | 305 | FIELD | - | 0.0047 | 0.00691 | 0.105 | 0.0127 | <0.00010 | <0.000050 | 0.065 |
| 2017 | 2017-BOS<001 | 2017-BOS<001 | 6/4/2017 | 577 | 0 | 7.09 | 32.8 | 428 | 8.1 | 61 | 0.0267 | <0.050 | 15.6 | 0.032 | 0.983 | 0.0028 | 0.0356 | - | 205 | FIELD | - | 0.0335 | 0.00407 | 0.0323 | 0.0106 | <0.00010 | <0.000050 | 0.087 |
| 2017 | 17-BOS<02 | BOS-8B | 6/6/2017 | 1830 | 968 | 8.03 | 6.7 | 1440 | 4.8 | 109 | 0.198 | 0 | 228 | <0.20 | 3.81 | <0.010 | 0.0314 | - | 619 | FIELD | - | 0.0025 | 0.0363 | 0.989 | 0.0188 | <0.000020 | <0.000050 | 0.203 |
| 2017 | 17-BOS<03 | 17-BOS<03 | 6/6/2017 | 1690 | 903 | 8.04 | 11.7 | 1250 | 4.6 | 108 | 0.122 | 0 | 192 | <0.20 | 3.23 | 0.026 | 0.03 | - | 566 | FIELD | - | 0.0042 | 0.027 | 0.578 | 0.0256 | <0.000020 | <0.000050 | 0.205 |
| 2018 | 18-BOS<01 | BOS8 | 6/16/2018 | 401 | - | 7.31 | 12.7 | 288 | 4.3 | 22 | 0.0246 | - | 8.88 | 0.024 | 0.42 | 0.0071 | 0.0155 | - | 152 | - | - | 0.0044 | 0.0025 | 0.0427 | 0.00445 | <0.0001 | <0.00005 | 0.025 |
| 2018 | 18-BOS<01 | BOS8 | 6/25/2018 | 1200 | 666 | 7.81 | 4.1 | 967 | 4.5 | 129 | 0.0239 | - | 47.2 | <0.1 | 1.62 | <0.005 | 0.0384 | - | 493 | - | - | 0.0054 | 0.00648 | 0.0758 | 0.0191 | <0.00002 | <0.00005 | 0.078 |
| 2018 | 18-BOS<02 | 18-BOS<02 | 6/25/2018 | 1840 | 916 | 8.04 | 3.7 | 1500 | 2.8 | 90.1 | 0.349 | - | 220 | <0.2 | 3.62 | 0.012 | 0.0507 | - | 527 | - | - | 0.002 | 0.038 | 0.707 | 0.0156 | <0.00002 | <0.00005 | 0.176 |
| 2018 | 18-BOS<03 | 18-BOS<03 | 6/25/2018 | 1640 | 826 | 8.05 | 3.3 | 1370 | 4 | 88.8 | 0.0302 | - | 194 | <0.1 | 3.79 | 0.0172 | 0.0213 | - | 527 | - | - | 0.0043 | 0.0244 | 0.315 | 0.0254 | <0.00002 | <0.00005 | 0.178 |
| 2019 | BOS8A | BOS-8A | 6/29/2019 | 1030 | 544 | 7.8 | <3 | - | - | - | 0.0062 | - | - | - | - | - | - | - | 395 | - | - | - | - | - | - | - | - | - |
| 2019 | 19-BOS<01 | 19-BOS<01 | 6/29/2019 | 1810 | 1010 | 8.04 | <3 | 1680 | 3.4 | 100 | 0.372 | <0.5 | 219 | <0.2 | 3.99 | 0.017 | 0.0302 | - | 629 | FIELD | FIELD | 0.0025 | 0.0338 | 0.903 | 0.0176 | <0.00002 | <0.00005 | 0.189 |
| 2019 | 19-BOS<02 | 18-BOS<02 | 6/29/2019 | 394 | 185 | 7.98 | 11.9 | 299 | 1.7 | 70.5 | <0.005 | <0.05 | 22.3 | 0.049 | 0.335 | <0.001 | 0.0078 | - | 97 | FIELD | FIELD | 0.0087 | 0.00278 | 0.00888 | 0.00950 | <0.00002 | <0.00005 | 0.045 |
| 2020 | BOS8A | BOS8A | 6/18/2020 | 224 | 96 | 7.48 | 38 | - | - | - | 0.0932 | - | 5.85 | - | - | - | - | - | 64.2 | FIELD | FIELD | 0.0069 | 0.00196 | 0.0269 | 0.00221 | <0.0001 | <0.00005 | 0.023 |
| 2020 | BOS8C | BOS8C | 6/18/2020 | 925 | 401 | 7.77 | 16.2 | - | - | - | 0.209 | - | 124 | - | - | - | - | - | 200 | FIELD | FIELD | 0.0036 | 0.0297 | 0.635 | 0.0105 | <0.0001 | <0.00005 | 0.147 |
| 2020 | BOS8D | BOS8D | 6/18/2020 | 317 | 129 | 7.59 | 60 | - | - | - | 0.0205 | - | 27.5 | - | - | - | - | - | 69.6 | FIELD | FIELD | 0.0186 | 0.00432 | 0.07580 | 0.00617 | <0.0001 | <0.00005 | 0.052 |

| Year | Sample Code | Station Code | Cadmium (Cd)-Dissolved | Calcium (Ca)-Dissolved | Cesium (Ce)-Dissolved | Chromium (Cr)-Dissolved | Cobalt (Co)-Dissolved | Copper (Cu)-Dissolved | Iron (Fe)-Dissolved | Lead (Pb)-Dissolved | Lithium (Li)-Dissolved | Magnesium (Mg)-Dissolved | Manganese (Mn)-Dissolved | Mercury (Hg)-Dissolved | Molybdenum (Mo)-Dissolved | Nickel (Ni)-Dissolved | Phosphorus (P)-Dissolved | Potassium (K)-Dissolved | Rubidium (Rb)-Dissolved | Selenium (Se)-Dissolved | Silicon (Si)-Dissolved | Silver (Ag)-Dissolved | Sodium (Na)-Dissolved | Strontium (Sr)-Dissolved | Sulfur (S)-Dissolved | Tellurium (Te)-Dissolved | Thallium (Tl)-Dissolved | Thorium (Th)-Dissolved |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | 0.000005 | 0.05 | 0.00001 | 0.0001 | 0.0001 | 0.0002 | 0.01 | 0.00005 | 0.001 | 0.1 | 0.0001 | 0.000005 | 0.00005 | 0.0005 | 0.05 | 0.1 | 0.0002 | 0.00005 | 0.05 | 0.00001 | 0.05 | 0.0002 | 0.5 | 0.0002 | 0.00001 | 0.0001 |
| 2008 | 2008-BOS<001 | 2008-BOS<001 | <0.0001 | 137 | - | 0.0011 | 0.0113 | 0.00756 | 0.253 | <0.0001 | 0.014 | 62.1 | 0.135 | <0.00005 | 0.00278 | 0.0928 | <0.3 | 14.8 | - | 0.0024 | 0.588 | <0.00002 | 85.9 | 0.767 | - | - | <0.0002 | - |
| 2008 | 2008-BOS<003 | 2008-BOS<003 | <0.00025 | 202 | - | <0.0025 | 0.253 | 0.00183 | <0.03 | <0.00025 | <0.025 | 96.6 | 0.374 | <0.00005 | 0.00656 | 0.613 | <0.3 | 17.9 | - | 0.014 | 1.21 | <0.00005 | 50.5 | 0.553 | - | - | <0.0005 | - |
| 2008 | BOS-8 | BOS-8A | <0.0005 | 888 | - | <0.005 | 1.02 | 0.0031 | 0.115 | <0.0005 | 0.195 | 128 | 1.44 | <0.00005 | 0.00385 | 1.75 | <0.3 | 51 | - | <0.04 | 3.88 | <0.0001 | 182 | 7.26 | - | - | <0.001 | - |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2010 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2012 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2013 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2010 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2012 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2009 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2011 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2012 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-16JUN14a | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-16JUN14b | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-16JUN14c | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-23JUN14a | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-23JUN14b | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-23JUN14c | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8-31JUL14 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8A<09AUG15 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8A-12JUN16 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8A-24AUG15 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8A-29JUN15 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8A-31JUL14 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8C<09AUG15 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8C-12JUN16 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8C-24AUG15 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2014 | BOS8C-28AUG14 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2015 | BOS8C-29JUN15 | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8D-12JUN16a | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 | BOS8D-12JUN16b | BOS8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | BOS8A<04JUN | BOS-8A | 0.0000138 | 94.2 | - | 0.00014 | 0.141 | 0.00505 | <0.010 | <0.000050 | 0.005 | 40.3 | 0.112 | <0.0000050 | 0.000868 | 0.326 | <0.050 | 4.5 | - | 0.000781 | 1.36 | <0.000010 | 14 | 0.25 | 111 | - | <0.000010 | - |
| 2017 | 2017-BOS<001 | 2017-BOS<001 | 0.0000367 | 62.2 | - | 0.00015 | 0.0716 | 0.00424 | 0.068 | <0.000050 | 0.0012 | 28.4 | 0.285 | <0.0000050 | 0.00074 | 0.0971 | <0.050 | 5.53 | - | 0.000713 | 1.56 | <0.000010 | 11.3 | 0.215 | 75.4 | - | <0.000010 | - |
| 2017 | 17-BOS<02 | BOS-8B | 0.0000353 | 264 | - | <0.00010 | 1.1 | 0.0035 | <0.010 | <0.000050 | 0.0524 | 75.2 | 0.3 | <0.0000050 | 0.0024 | 1.51 | <0.050 | 14.1 | - | 0.00367 | 2.33 | 0.000014 | 38.9 | 1.56 | 215 | - | <0.000010 | - |
| 2017 | 17-BOS<03 | 17-BOS<03 | 0.0000299 | 239 | - | <0.00010 | 0.754 | 0.00411 | <0.010 | <0.000050 | 0.0483 | 74.5 | 0.208 | <0.0000050 | 0.00288 | 0.99 | <0.050 | 13.7 | - | 0.00314 | 2.35 | 0.000019 | 37.1 | 1.43 | 207 | - | <0.000010 | - |
| 2018 | 18-BOS<01 | BOS8 | <0.000005 | 50.8 | - | <0.0001 | 0.0246 | 0.00198 | <0.01 | <0.00005 | 0.0022 | 13 | 0.0241 | <0.000005 | 0.00036 | 0.0519 | <0.05 | 1.68 | - | 0.000226 | 0.246 | <0.00001 | 4.11 | 0.108 | 50.5 | - | <0.00001 | - |
| 2018 | 18-BOS<01 | BOS8 | 0.0000247 | 166 | - | <0.0001 | 0.109 | 0.00848 | 0.013 | <0.00005 | 0.0069 | 61.4 | 0.111 | <0.000005 | 0.0011 | 0.315 | <0.05 | 6.27 | - | 0.000927 | 2.11 | 0.000012 | 24.8 | 0.42 | 160 | - | <0.00001 | - |
| 2018 | 18-BOS<02 | 18-BOS<02 | 0.0000287 | 256 | - | <0.0001 | 0.956 | 0.00555 | <0.01 | <0.00005 | 0.0456 | 67.6 | 0.25 | <0.000005 | 0.00313 | 1.23 | <0.05 | 13.3 | - | 0.00305 | 1.93 | 0.000011 | 36.3 | 1.63 | 181 | - | <0.00001 | - |
| 2018 | 18-BOS<03 | 18-BOS<03 | 0.0000313 | 226 | - | <0.0001 | 0.345 | 0.00406 | <0.01 | <0.00005 | 0.0399 | 63.5 | 0.133 | <0.000005 | 0.00401 | 0.406 | <0.05 | 10.9 | - | 0.00261 | 1.88 | 0.000014 | 31.3 | 1.44 | 168 | - | <0.00001 | - |
| 2019 | BOS8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2019 | 19-BOS<01 | 19-BOS<01 | 0.0000319 | 278 | - | <0.0001 | 1.21 | 0.00413 | <0.01 | <0.00005 | 0.0398 | 75.6 | 0.268 | <0.000005 | 0.00284 | 1.64 | <0.05 | 13.5 | - | 0.00273 | 1.98 | <0.00001 | 36.8 | 1.61 | 211 | - | <0.00001 | - |
| 2019 | 19-BOS<02 | 18-BOS<02 | 0.0000069 | 47.0 | - | 0.00010 | 0.00320 | 0.00400 | 0.015 | <0.00005 | 0.0046 | 16.5 | 0.0102 | 0.0000055 | 0.000931 | 0.0161 | <0.05 | 2.31 | - | 0.000238 | 0.825 | <0.00001 | 8.74 | 0.170 | 32.1 | - | <0.00001 | - |
| 2020 | BOS8A | BOS8A | 0.0000071 | 23.6 | 0.000038 | 0.0002 | 0.0208 | 0.00241 | <0.01 | <0.00005 | 0.0018 | 8.99 | 0.0356 | <0.000005 | 0.000292 | 0.0544 | <0.05 | 1.34 | 0.0008 | 0.000176 | 0.303 | <0.00001 | 3.89 | 0.0587 | 23.2 | <0.0002 | <0.00001 | <0.0001 |
| 2020 | BOS8C | BOS8C | 0.0000135 | 114 | 0 | 0.00035 | 0.34 | 0.00154 | <0.01 | <0.00005 | 0.0280 | 28.4 | 0.091 | <0.000005 | 0.00232 | 0.42 | <0.05 | 7.4 | 0.0 | 0.00163 | 1.70 | <0.00001 | 12.5 | 0.73 | 74 | <0.0002 | <0.00001 | <0.0001 |
| 2020 | BOS8D | BOS8D | 0.0000091 | 36.6 | 0.0 | 0.00031 | 0.01850 | 0.00187 | <0.01 | <0.00005 | 0.0079 | 9.2 | 0.0244 | <0.000005 | 0.001580 | 0.0292 | <0.05 | 2.26 | 0.00 | 0.000476 | 0.796 | <0.00001 | 5.27 | 0.193 | 23.9 | <0.0002 | <0.00001 | <0.0001 |

| Year | Sample Code | Station Code | Tin (Sn)-Dissolved | Titanium (Ti)-Dissolved | Tungsten (W)-Dissolved | Uranium (U)-Dissolved | Vanadium (V)-Dissolved | Zinc (Zn)-Dissolved | Zirconium (Zr)-Dissolved | Aluminum (Al)-Total | Antimony (Sb)-Total | Arsenic (As)-Total | Barium (Ba)-Total | Beryllium (Be)-Total | Bismuth (Bi)-Total | Boron (B)-Total | Cadmium (Cd)-Total | Calcium (Ca)-Total | Chromium (Cr)-Total | Cobalt (Co)-Total | Copper (Cu)-Total | Iron (Fe)-Total | Lead (Pb)-Total | Lithium (Li)-Total | Magnesium (Mg)-Total | Manganese (Mn)-Total | Mercury (Hg)-Total | Molybdenum (Mo)-Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | 0.0001 | 0.0003 | 0.0001 | 0.00001 | 0.0005 | 0.001 | 0.0003 | 0.001 | 0.0001 | 0.0001 | 0.00005 | 0.00002 | 0.00005 | 0.01 | 0.000005 | 0.05 | 0.0001 | 0.0001 | 0.0002 | 0.01 | 0.00005 | 0.001 | 0.1 | 0.0001 | 0.000005 | 0.00005 |
| 2008 | 2008-BOS<001 | 2008-BOS<001 | <0.0002 | 0.012 | - | 0.000186 | <0.002 | <0.002 | - | 0.377 | 0.00448 | 0.134 | 0.0342 | <0.001 | <0.001 | 0.158 | <0.0001 | 136 | 0.0052 | 0.0147 | 0.01 | 1.32 | 0.00062 | 0.014 | 62 | 0.153 | <0.00005 | 0.00226 |
| 2008 | 2008-BOS<003 | 2008-BOS<003 | <0.0005 | 0.012 | - | 0.000419 | <0.005 | 0.0068 | - | 0.11 | - | - | 0.032 | 0.002 | - | 0.17 | 0.001 | 112 | 0.005 | 0.052 | 0.009 | 1.38 | 0.005 | - | 40.5 | 0.224 | - | 0.005 |
| 2008 | BOS-8 | BOS-8A | <0.001 | <0.01 | - | 0.00019 | <0.01 | 0.022 | - | - | - | - | - | - | - | - | 0.001 | - | 0.005 | - | 0.009 | 1.38 | 0.005 | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.11 | - | - | 0.032 | 0.002 | - | 0.17 | 0.001 | 112 | 0.005 | 0.052 | 0.009 | 1.38 | 0.005 | - | 40.5 | 0.224 | - | 0.005 |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.001 | - | 0.005 | - | 0.009 | 1.38 | 0.005 | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.94 | 0.003 | 0.301 | 0.0304 | 0.001 | 0.0001 | 0.12 | 0.0002 | 81.9 | 0.0192 | 0.0248 | 0.011 | 3.23 | 0.002 | - | 42.6 | 0.277 | - | 0.004 |
| 2008 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.15 | 0.0114 | 0.148 | 0.0281 | 0.001 | 0.0001 | 0.16 | 0.0002 | 132 | 0.0029 | 0.0503 | 0.009 | 0.398 | 0.0005 | - | 48.1 | 0.072 | - | 0.0059 |
| 2009 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.268 | 0.00874 | 0.247 | 0.0127 | 0.001 | - | 0.096 | 0.0002 | 42.8 | 0.005 | 0.0603 | 0.0083 | 0.665 | 0.00085 | 0.01 | 16.3 | 0.146 | 0.0001 | 0.005 |
| 2009 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.426 | 0.00532 | 0.248 | 0.0598 | 0.001 | - | 0.214 | 0.00005 | 133 | 0.0062 | 0.0312 | 0.0147 | 2.46 | 0.00294 | 0.013 | 60.8 | 0.311 | 0.0001 | 0.005 |
| 2010 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.08 | 0.00496 | 0.235 | 0.0341 | 0.001 | - | - | 0.00005 | 109 | 0.005 | 0.0223 | 0.0083 | 1.82 | 0.00038 | 0.011 | 50.5 | 0.219 | - | 0.005 |
| 2011 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.167 | 0.0033 | 0.0664 | 0.0239 | 0.001 | - | 0.113 | 0.00005 | 60 | 0.005 | 0.0967 | 0.0043 | 0.469 | 0.00032 | 0.01 | 36.3 | 1.97 | 0.0001 | 0.005 |
| 2011 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.0461 | 0.00124 | 0.00274 | 0.0386 | 0.0005 | - | 0.0497 | 0.000015 | 79.1 | 0.00045 | 0.00064 | 0.00278 | 0.173 | 0.000114 | 0.005 | 38.1 | 0.0136 | - | 0.000604 |
| 2012 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.132 | 0.00884 | 0.253 | 0.0075 | 0.001 | - | 0.067 | 0.000015 | 42.3 | 0.0014 | 0.0618 | 0.0044 | 0.199 | 0.00032 | 0.01 | 12.8 | 0.0573 | 0.00002 | 0.005 |
| 2013 | BOS-8A | BOS-8A | - | - | - | - | - | - | - | 0.292 | 0.00322 | 0.359 | 0.0355 | 0.001 | - | 0.118 | 0.000052 | 157 | 0.0041 | 0.114 | 0.0085 | 7.04 | 0.00137 | 0.01 | 57.6 | 0.695 | 0.00002 | 0.005 |
| 2008 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.04 | 0.0116 | 0.0155 | 0.0428 | 0.001 | 0.0001 | 0.15 | 0.0002 | 120 | 0.0019 | 0.0025 | 0.003 | 0.044 | 0.0001 | - | 58.6 | 0.002 | - | 0.0042 |
| 2009 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.155 | 0.00833 | 0.0749 | 0.0289 | 0.001 | - | 0.078 | 0.0002 | 43.5 | 0.005 | 0.0093 | 0.0027 | 0.246 | 0.00036 | 0.01 | 22 | 0.198 | 0.0001 | 0.005 |
| 2009 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.042 | 0.00318 | 0.00801 | 0.113 | 0.001 | - | 0.201 | 0.00008 | 210 | 0.005 | 0.0057 | 0.0034 | 0.103 | 0.00014 | 0.011 | 110 | 0.04 | 0.0001 | 0.005 |
| 2010 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.051 | 0.0045 | 0.0128 | 0.0442 | 0.004 | - | - | 0.0002 | 107 | 0.005 | 0.0044 | 0.004 | 0.088 | 0.0004 | 0.024 | 63.3 | 0.0359 | - | 0.005 |
| 2011 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.099 | 0.0218 | 0.271 | 0.107 | 0.001 | - | 0.193 | 0.00005 | 171 | 0.005 | 0.245 | 0.0015 | 0.082 | 0.0001 | 0.051 | 35.8 | 0.188 | 0.0001 | 0.0081 |
| 2011 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.0145 | 0.00614 | 0.00164 | 0.0803 | 0.0005 | - | 0.128 | 0.000039 | 226 | 0.00018 | 0.00893 | 0.00165 | 0.478 | 0.00005 | 0.0387 | 48.7 | 0.0432 | - | 0.000609 |
| 2012 | BOS-8B | BOS-8B | - | - | - | - | - | - | - | 0.122 | 0.00287 | 0.03 | 0.0119 | 0.001 | - | 0.079 | 0.000026 | 43.9 | 0.001 | 0.0138 | 0.0028 | 0.214 | 0.00027 | 0.01 | 19.3 | 0.146 | 0.00002 | 0.005 |
| 2008 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | 0.2 | 0.029 | 0.341 | 0.088 | 0.01 | 0.001 | 0.5 | 0.002 | 661 | 0.019 | 0.813 | 0.01 | 0.054 | 0.001 | - | 87 | 0.912 | - | 0.079 |
| 2009 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | 6.91 | 0.00672 | 0.495 | 0.0496 | 0.001 | - | 0.095 | 0.0002 | 57.5 | 0.141 | 0.129 | 0.0452 | 16 | 0.0223 | 0.016 | 16.4 | 0.398 | 0.0001 | 0.005 |
| 2011 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | 0.136 | 0.00073 | 0.00767 | 0.0382 | 0.001 | - | 0.078 | 0.00005 | 89.6 | 0.005 | 0.0028 | 0.0023 | 0.439 | 0.00045 | 0.011 | 19.6 | 0.0259 | 0.0001 | 0.005 |
| 2011 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | 0.0087 | 0.00214 | 0.00151 | 0.0612 | 0.0005 | - | 0.108 | 0.000014 | 161 | 0.00013 | 0.0013 | 0.00094 | 0.025 | 0.00005 | 0.0227 | 32.5 | 0.0109 | - | 0.000818 |
| 2012 | BOS-8C | BOS-8C | - | - | - | - | - | - | - | 0.181 | 0.00179 | 1.23 | 0.0077 | 0.001 | - | 0.128 | 0.000054 | 34 | 0.001 | 0.123 | 0.0014 | 0.097 | 0.0001 | 0.01 | 8.26 | 0.063 | 0.00002 | 0.005 |
| 2014 | BOS8-16JUN14a | BOS8 | - | - | - | - | - | - | - | 0.0311 | 0.00947 | 0.138 | <0.02 | <0.001 | - | <0.1 | 0.00002 | 89.3 | <0.001 | 0.132 | 0.005 | 0.062 | <0.0005 | 0.0068 | 30 | 0.127 | - | 0.0012 |
| 2014 | BOS8-16JUN14b | BOS8 | - | - | - | - | - | - | - | 0.036 | 0.00252 | 0.0148 | 0.027 | <0.001 | - | 0.11 | 0.00003 | 100 | <0.001 | 0.0143 | 0.0032 | 0.212 | <0.0005 | <0.005 | 51.4 | 0.171 | - | <0.001 |
| 2014 | BOS8-16JUN14c | BOS8 | - | - | - | - | - | - | - | 0.0988 | 0.00105 | 0.02 | 0.034 | <0.001 | - | <0.1 | 0.000025 | 26.9 | <0.001 | 0.00618 | 0.0083 | 0.398 | <0.0005 | <0.005 | 9.48 | 0.0413 | - | <0.001 |
| 2014 | BOS8-23JUN14a | BOS8 | - | - | - | - | - | - | - | 0.0233 | 0.00918 | 0.175 | 0.025 | <0.001 | - | 0.12 | 0.000037 | 136 | <0.001 | 0.154 | 0.0071 | 0.667 | <0.0005 | 0.0076 | 47.7 | 0.267 | - | 0.0017 |
| 2014 | BOS8-23JUN14b | BOS8 | - | - | - | - | - | - | - | 0.0231 | 0.00201 | 0.01 | 0.032 | <0.001 | - | 0.14 | 0.000017 | 111 | <0.001 | 0.0019 | 0.0024 | 0.058 | <0.0005 | <0.005 | 55.7 | 0.0253 | - | <0.001 |
| 2014 | BOS8-23JUN14c | BOS8 | - | - | - | - | - | - | - | 0.105 | 0.0294 | 0.247 | 0.041 | <0.001 | - | 0.25 | 0.000086 | 299 | 0.0026 | 0.576 | 0.0023 | 0.274 | <0.0005 | 0.0492 | 71.2 | 0.277 | - | 0.003 |
| 2014 | BOS8-31JUL14 | BOS8 | - | - | - | - | - | - | - | 0.0579 | 0.0121 | 0.0615 | 0.032 | <0.001 | - | 0.2 | 0.000039 | 227 | 0.0011 | 0.0588 | 0.0082 | 0.117 | <0.0005 | 0.0134 | 77 | 0.0547 | - | 0.0019 |
| 2015 | BOS8A<09AUG15 | BOS8 | - | - | - | - | - | - | - | 0.0246 | 0.00498 | 0.0362 | 0.039 | <0.001 | - | 0.27 | 0.000129 | 192 | <0.001 | 0.0599 | <0.001 | <0.03 | <0.0005 | 0.0348 | 64 | 0.0974 | - | <0.001 |
| 2016 | BOS8A-12JUN16 | BOS8 | - | - | - | - | - | - | - | 0.0401 | 0.00139 | 0.0146 | <0.02 | <0.001 | - | <0.1 | 0.0000295 | 91.5 | <0.001 | 0.00817 | 0.0049 | 0.107 | <0.0005 | 0.002 | 45.6 | 0.325 | - | <0.001 |
| 2015 | BOS8A-24AUG15 | BOS8 | - | - | - | - | - | - | - | 0.074 | 0.00548 | 0.105 | 0.025 | <0.001 | - | 0.17 | 0.0000322 | 168 | <0.001 | 0.0349 | 0.0089 | 0.431 | <0.0005 | 0.0056 | 73.3 | 0.677 | - | <0.001 |
| 2015 | BOS8A-29JUN15 | BOS8 | - | - | - | - | - | - | - | 0.0148 | 0.00208 | 0.0281 | <0.02 | <0.001 | - | 0.11 | 0.0000133 | 89.2 | <0.001 | 0.0198 | 0.0027 | 0.313 | <0.0005 | 0.0025 | 49.2 | 0.624 | - | <0.001 |
| 2014 | BOS8A-31JUL14 | BOS8 | - | - | - | - | - | - | - | 0.0663 | 0.0032 | 0.0251 | 0.021 | <0.001 | - | 0.16 | 0.000073 | 142 | <0.001 | 0.0171 | 0.006 | 0.056 | <0.0005 | <0.005 | 75.9 | 0.701 | - | <0.001 |
| 2015 | BOS8C<09AUG15 | BOS8 | - | - | - | - | - | - | - | 0.0167 | 0.118 | 5.62 | <0.02 | <0.001 | - | 0.6 | 0.000061 | 346 | <0.001 | 1.35 | 0.0021 | 0.031 | <0.0005 | 0.0758 | 122 | 0.465 | - | 0.0056 |
| 2016 | BOS8C-12JUN16 | BOS8 | - | - | - | - | - | - | - | 0.541 | 0.0353 | 0.739 | <0.02 | <0.001 | - | 0.17 | 0.0000366 | 210 | 0.0136 | 0.82 | 0.0058 | 1.62 | 0.00061 | 0.0425 | 51.9 | 0.312 | - | 0.0025 |
| 2015 | BOS8C-24AUG15 | BOS8 | - | - | - | - | - | - | - | 0.021 | 0.0102 | 0.116 | 0.033 | <0.001 | - | 0.22 | 0.0000753 | 185 | <0.001 | 0.167 | 0.0021 | 0.059 | <0.0005 | 0.0299 | 34 | 0.24 | - | 0.0016 |
| 2014 | BOS8C-28AUG14 | BOS8 | - | - | - | - | - | - | - | 0.0216 | 0.00317 | 0.0272 | 0.021 | <0.001 | - | 0.14 | 0.000018 | 155 | <0.001 | 0.0105 | 0.0041 | 0.054 | <0.0005 | <0.005 | 91 | 0.299 | - | <0.001 |
| 2015 | BOS8C-29JUN15 | BOS8 | - | - | - | - | - | - | - | 0.0285 | 0.0113 | 0.154 | 0.027 | <0.001 | - | 0.26 | 0.0000601 | 157 | <0.001 | 0.178 | 0.0021 | 0.521 | <0.0005 | 0.0248 | 33.4 | 0.256 | - | 0.0032 |
| 2016 | BOS8D-12JUN16a | BOS8 | - | - | - | - | - | - | - | 0.116 | 0.03 | 0.534 | <0.02 | <0.001 | - | 0.18 | 0.0000159 | 188 | 0.0026 | 0.431 | 0.005 | 0.298 | <0.0005 | 0.0417 | 48.3 | 0.131 | - | 0.003 |
| 2016 | BOS8D-12JUN16b | BOS8 | - | - | - | - | - | - | - | 1.24 | 0.0291 | 0.56 | 0.021 | <0.001 | - | 0.18 | 0.0000261 | 186 | 0.0284 | 0.436 | 0.0091 | 4.49 | 0.00174 | 0.042 | 49.3 | 0.257 | - | 0.003 |
| 2017 | BOS8A<04JUN | BOS-8A | <0.00010 | <0.00030 | - | 0.000145 | <0.00050 | 0.0044 | <0.000060 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | 2017-BOS<001 | 2017-BOS<001 | <0.00010 | 0.00079 | - | 0.000033 | <0.00050 | 0.0056 | 0.00016 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | 17-BOS<02 | BOS-8B | <0.00010 | <0.00030 | - | 0.000284 | 0.00142 | 0.0028 | <0.00030 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | 17-BOS<03 | 17-BOS<03 | <0.00010 | <0.00030 | - | 0.000295 | 0.00076 | 0.0407 | <0.00030 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<01 | BOS8 | <0.0001 | <0.0003 | - | 0.000035 | <0.0005 | 0.0017 | <0.00006 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<01 | BOS8 | <0.0001 | <0.0006 | - | 0.000284 | <0.0005 | 0.0027 | <0.0003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<02 | 18-BOS<02 | <0.0001 | <0.0003 | - | 0.000247 | 0.0009 | 0.002 | <0.0003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<03 | 18-BOS<03 | <0.0001 | <0.0003 | - | 0.000268 | <0.0005 | 0.0292 | <0.0003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2019 | BOS8A | BOS-8A | - | - | - | - | - | - | - | 0.0090 | 0.00401 | 0.0471 | 0.025 | <0.0001 | | 0.10 | 0.0000222 | 136 | <0.001 | 0.0244 | 0.0032 | 0.089 | <0.0005 | 0.0068 | 49.5 | 0.0286 | | 0.0012 |
| 2019 | 19-BOS<01 | 19-BOS<01 | <0.0001 | <0.0003 | - | 0.000257 | 0.00128 | 0.0024 | <0.0003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2019 | 19-BOS<02 | 18-BOS<02 | <0.0001 | <0.0003 | - | 0.000042 | <0.0005 | <0.001 | <0.0003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2020 | BOS8A | BOS8A | <0.0001 | <0.0003 | 0.0001 | 0.000024 | <0.0005 | 0.0021 | <0.0002 | 0.4180 | 0.00264 | 0.0608 | <0.02 | <0.0001 | - | <0.1 | 0.0000179 | 26 | 0.0055 | 0.0280 | 0.0071 | 1.020 | 0.00114 | 0.0020 | 9.2 | 0.0505 | - | <0.001 |
| 2020 | BOS8C | BOS8C | <0.0001 | <0.0003 | 0.00145 | 0.000116 | 0.00072 | <0.001 | <0.0002 | 0.588 | 0.0321 | 0.663 | <0.02 | <0.0001 | - | 0.13 | 0.0000157 | 114 | 0.0153 | 0.356 | 0.0041 | 1.39 | 0.00074 | 0.0243 | 29.6 | 0.112 | - | 0.0025 |
| 2020 | BOS8D | BOS8D | <0.0001 | <0.0003 | 0.00148 | 0.000063 | <0.0005 | 0.0015 | <0.0002 | 0.944 | 0.00506 | 0.121 | <0.02 | <0.0001 | - | <0.1 | 0.0000279 | 38.8 | 0.0118 | 0.0302 | 0.0101 | 1.79 | 0.00228 | 0.008 | 9.81 | 0.0483 | - | 0.0019 |

| Year | Sample Code | Station Code | Nickel (Ni)-Total | Phosphorus (P)-Total | Potassium (K)-Total | Selenium (Se)-Total | Silicon (Si)-Total | Silver (Ag)-Total | Sodium (Na)-Total | Strontium (Sr)-Total | Thallium (Tl)-Total | Tin (Sn)-Total | Titanium (Ti)-Total | Uranium (U)-Total | Vanadium (V)-Total | Zinc (Zn)-Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | 0.0005 | 0.05 | 0.1 | 0.00005 | 0.05 | 0.00001 | 0.05 | 0.0002 | 0.00001 | 0.0001 | 0.0003 | 0.00001 | 0.0005 | 0.001 |
| 2008 | 2008-BOS<001 | 2008-BOS<001 | 0.104 | <0.3 | 15.3 | 0.0028 | 1.42 | 0.000042 | 86.5 | 0.782 | <0.0002 | <0.0002 | 0.024 | 0.000173 | 0.0032 | 0.0037 |
| 2008 | 2008-BOS<003 | 2008-BOS<003 | 0.183 | - | 12 | - | - | 0.005 | 59 | 0.619 | 0.05 | 0.05 | 0.002 | - | 0.002 | 0.103 |
| 2008 | BOS-8 | BOS-8A | 1.38 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | 0.183 | - | 12 | - | - | 0.005 | 59 | 0.619 | 0.05 | 0.05 | 0.002 | - | 0.002 | 0.103 |
| 2008 | BOS-8A | BOS-8A | 1.38 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | BOS-8A | BOS-8A | 0.0805 | - | 13.7 | 0.002 | - | 0.0004 | 69 | 0.694 | 0.0001 | 0.0004 | 0.013 | 0.0002 | 0.0075 | 0.099 |
| 2008 | BOS-8A | BOS-8A | 0.215 | - | 12.3 | 0.002 | - | 0.0004 | 65 | 0.64 | 0.0001 | 0.0004 | 0.005 | 0.0003 | 0.002 | 0.008 |
| 2009 | BOS-8A | BOS-8A | 0.123 | - | 6.64 | 0.0023 | - | 0.0001 | 18.5 | - | 0.0001 | 0.05 | 0.0018 | 0.00028 | 0.0017 | 0.0071 |
| 2009 | BOS-8A | BOS-8A | 0.097 | - | 17.3 | 0.0034 | - | 0.0001 | 102 | - | 0.0001 | 0.05 | 0.0052 | 0.00015 | 0.0045 | 0.0318 |
| 2010 | BOS-8A | BOS-8A | 0.0843 | - | 12.6 | 0.002 | - | 0.0001 | - | - | 0.0001 | 0.05 | 0.0029 | 0.00018 | 0.0017 | 0.0049 |
| 2011 | BOS-8A | BOS-8A | 0.104 | - | 8.93 | 0.00113 | - | 0.0001 | 37 | - | 0.0001 | 0.05 | 0.001 | 0.00011 | 0.001 | 0.0068 |
| 2011 | BOS-8A | BOS-8A | 0.00804 | - | 7.3 | 0.00041 | - | 0.000093 | 51.4 | - | 0.00005 | 0.0001 | 0.00066 | 0.000047 | 0.00021 | 0.0038 |
| 2012 | BOS-8A | BOS-8A | 0.129 | - | 3.73 | 0.00072 | - | 0.00002 | 11.9 | - | 0.0001 | 0.05 | 0.0029 | 0.00011 | 0.001 | 0.0042 |
| 2013 | BOS-8A | BOS-8A | 0.239 | - | 10.4 | 0.00062 | - | 0.000066 | 40.5 | - | 0.0001 | 0.05 | 0.0036 | 0.00058 | 0.0021 | 0.0079 |
| 2008 | BOS-8B | BOS-8B | 0.0127 | - | 18.7 | 0.0021 | - | 0.0004 | 96 | 0.53 | 0.0001 | 0.0004 | 0.005 | 0.0002 | 0.0015 | 0.009 |
| 2009 | BOS-8B | BOS-8B | 0.0135 | - | 9.53 | 0.0038 | - | 0.0001 | 36.5 | - | 0.0001 | 0.05 | 0.001 | 0.0001 | 0.001 | 0.0063 |
| 2009 | BOS-8B | BOS-8B | 0.0233 | - | 23.2 | 0.0072 | - | 0.0001 | 180 | - | 0.0001 | 0.05 | 0.001 | 0.0001 | 0.0011 | 0.0091 |
| 2010 | BOS-8B | BOS-8B | 0.0287 | - | 14.6 | 0.008 | - | 0.0004 | - | - | 0.0004 | 0.05 | 0.0024 | 0.0004 | 0.002 | 0.016 |
| 2011 | BOS-8B | BOS-8B | 0.43 | - | 12 | 0.00285 | - | 0.0001 | 40 | - | 0.0001 | 0.05 | 0.0032 | 0.0001 | 0.001 | 0.0055 |
| 2011 | BOS-8B | BOS-8B | 0.0454 | - | 13.2 | 0.00238 | - | 0.000032 | 54.7 | - | 0.00005 | 0.0001 | 0.00044 | 0.00002 | 0.00016 | 0.0055 |
| 2012 | BOS-8B | BOS-8B | 0.0305 | - | 5.38 | 0.00054 | - | 0.000038 | 16 | - | 0.0001 | 0.05 | 0.001 | 0.0001 | 0.001 | 0.0057 |
| 2008 | BOS-8C | BOS-8C | 1.35 | - | 42.8 | 0.017 | - | 0.004 | 174 | 5.83 | 0.001 | 0.004 | 0.05 | 0.001 | 0.006 | 0.04 |
| 2009 | BOS-8C | BOS-8C | 0.254 | - | 4.94 | 0.0022 | - | 0.0001 | 11.1 | - | 0.0001 | 0.05 | 0.108 | 0.00011 | 0.0373 | 0.0717 |
| 2011 | BOS-8C | BOS-8C | 0.0098 | - | 5.46 | 0.0004 | - | 0.0001 | 22.9 | - | 0.0001 | 0.05 | 0.0012 | 0.0001 | 0.001 | 0.004 |
| 2011 | BOS-8C | BOS-8C | 0.00885 | - | 9.15 | 0.00137 | - | 0.00001 | 48.9 | - | 0.00005 | 0.0001 | 0.0003 | 0.00001 | 0.00011 | 0.003 |
| 2012 | BOS-8C | BOS-8C | 0.592 | - | 5.95 | 0.00074 | - | 0.00002 | 9.1 | - | 0.0001 | 0.05 | 0.0011 | 0.0001 | 0.001 | 0.0099 |
| 2014 | BOS8-16JUN14a | BOS8 | 0.272 | - | 4.7 | 0.00078 | - | 0.000021 | 14.2 | - | <0.0002 | <0.0005 | 0.011 | <0.0002 | <0.001 | <0.005 |
| 2014 | BOS8-16JUN14b | BOS8 | 0.0361 | - | 10.5 | 0.00088 | - | 0.00005 | 42 | - | <0.0002 | <0.0005 | 0.011 | <0.0002 | <0.001 | <0.005 |
| 2014 | BOS8-16JUN14c | BOS8 | 0.0216 | - | 3.1 | 0.00012 | - | 0.000842 | 4.6 | - | <0.0002 | <0.0005 | <0.01 | <0.0002 | <0.001 | <0.005 |
| 2014 | BOS8-23JUN14a | BOS8 | 0.384 | - | 7.7 | 0.00065 | - | 0.00003 | 26.5 | - | <0.0002 | <0.0005 | 0.014 | 0.00035 | <0.001 | 0.0064 |
| 2014 | BOS8-23JUN14b | BOS8 | 0.0199 | - | 10.6 | 0.00038 | - | <0.00002 | 48.3 | - | <0.0002 | <0.0005 | 0.013 | <0.0002 | <0.001 | <0.005 |
| 2014 | BOS8-23JUN14c | BOS8 | 0.744 | - | 16.9 | 0.00271 | - | 0.000114 | 50.9 | - | <0.0002 | <0.0005 | 0.018 | <0.0002 | <0.001 | 0.0071 |
| 2014 | BOS8-31JUL14 | BOS8 | 0.272 | - | 5.3 | 0.001 | - | <0.00002 | 44.4 | - | <0.0002 | <0.0005 | 0.019 | 0.00042 | <0.001 | 0.0053 |
| 2015 | BOS8A<09AUG15 | BOS8 | 0.0601 | - | 13.5 | 0.00357 | - | <0.00002 | 23.5 | - | <0.0002 | <0.0005 | <0.01 | <0.0002 | <0.0005 | 0.0077 |
| 2016 | BOS8A-12JUN16 | BOS8 | 0.0279 | - | 7.4 | 0.000389 | - | 0.000025 | 30 | - | <0.0002 | <0.0005 | <0.01 | 0.00034 | <0.0005 | <0.005 |
| 2015 | BOS8A-24AUG15 | BOS8 | 0.245 | - | 12.9 | 0.00209 | - | 0.000032 | 53.7 | - | <0.0002 | <0.0005 | <0.01 | 0.00062 | 0.00052 | <0.005 |
| 2015 | BOS8A-29JUN15 | BOS8 | 0.0952 | - | 8.9 | 0.000472 | - | <0.00002 | 32.6 | - | <0.0002 | <0.0005 | <0.01 | 0.00024 | <0.0005 | <0.005 |
| 2014 | BOS8A-31JUL14 | BOS8 | 0.0793 | - | 13.2 | 0.00166 | - | 0.000026 | 55.9 | - | <0.0002 | <0.0005 | 0.016 | 0.00067 | <0.001 | 0.0053 |
| 2015 | BOS8C<09AUG15 | BOS8 | 3.98 | - | 31.8 | 0.00884 | - | 0.000031 | 46.6 | - | <0.0002 | <0.0005 | <0.01 | 0.0003 | 0.0037 | <0.005 |
| 2016 | BOS8C-12JUN16 | BOS8 | 1.03 | - | 11.8 | 0.00216 | - | 0.000163 | 28.2 | - | <0.0002 | <0.0005 | 0.011 | 0.00025 | 0.00394 | <0.005 |
| 2015 | BOS8C-24AUG15 | BOS8 | 0.344 | - | 15.1 | 0.00464 | - | 0.000028 | 43.3 | - | <0.0002 | <0.0005 | <0.01 | <0.0002 | <0.0005 | 0.0068 |
| 2014 | BOS8C-28AUG14 | BOS8 | 0.132 | - | 12.7 | 0.00084 | - | <0.00002 | 67.9 | - | <0.0002 | <0.0005 | 0.017 | 0.00042 | <0.001 | <0.005 |
| 2015 | BOS8C-29JUN15 | BOS8 | 0.302 | - | 12.8 | 0.00218 | - | 0.000065 | 28.7 | - | <0.0002 | <0.0005 | <0.01 | <0.0002 | <0.0005 | 0.0051 |
| 2016 | BOS8D-12JUN16a | BOS8 | 0.523 | - | 11 | 0.00167 | - | 0.000073 | 26.1 | - | <0.0002 | <0.0005 | <0.01 | 0.00027 | 0.00138 | 0.0213 |
| 2016 | BOS8D-12JUN16b | BOS8 | 0.536 | - | 10.9 | 0.00159 | - | 0.000221 | 25.8 | - | <0.0002 | <0.0005 | 0.02 | 0.00027 | 0.00691 | 0.0322 |
| 2017 | BOS8A<04JUN | BOS-8A | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | 2017-BOS<001 | 2017-BOS<001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | 17-BOS<02 | BOS-8B | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 | 17-BOS<03 | 17-BOS<03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<01 | BOS8 | - | 0.0155 | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<01 | BOS8 | - | 0.0384 | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<02 | 18-BOS<02 | - | 0.0507 | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018 | 18-BOS<03 | 18-BOS<03 | - | 0.0213 | - | - | - | - | - | - | - | - | - | - | - | - |
| 2019 | BOS8A | BOS-8A | 0.0979 | | 6.4 | 0.000411 | | <0.00002 | 21.1 | | <0.00001 | <0.0005 | <0.01 | <0.0002 | 0.00054 | <0.005 |
| 2019 | 19-BOS<01 | 19-BOS<01 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2019 | 19-BOS<02 | 18-BOS<02 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2020 | BOS8A | BOS8A | 0.0720 | - | -2.0 | 0.000188 | - | 0.000036 | 3.9 | 0.0572 | <0.00001 | <0.0005 | <0.01 | <0.0002 | 0.00169 | 0.0075 |
| 2020 | BOS8C | BOS8C | 0.46 | - | 8 | 0.00124 | - | 0.000032 | 12.4 | 0.694 | <0.00001 | <0.0005 | <0.01 | <0.0002 | 0.00347 | <0.005 |
| 2020 | BOS8D | BOS8D | 0.0553 | - | 2.5 | 0.000379 | - | 0.000081 | 5.5 | 0.185 | <0.00001 | <0.0005 | <0.01 | <0.0002 | 0.00375 | 0.0142 |

# Appendix B 2020 Boston Ephemeral Streams Monitoring Memo

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# Technical Memo

March 11, 2021

| | |
|---|---|
| **To** | Ashley Mathai and Sarah Warnock, Hope Bay Project |
| **From** | Amanda Schevers; Lisa Barazzuol, SRK |
| **Cc** | Oliver Curran, Hope Bay Project |
| **Subject** | Results from the Boston Ephemeral Streams Monitoring Program 2020 |
| **Client** | Agnico Eagle Mines Ltd. |
| **Project** | 1CT022.056 |

## 1 Introduction

At the Boston site, ore and waste rock were generated as part of a 1996-1997 BHP Billiton underground exploration program. The ore was placed in several stockpiles on the camp pad and the waste rock was used to construct a camp pad, roads, and an airstrip at Boston. The ore/waste rock and associated runoff were defined in Water License 2BB-BOS1727 (Nunavut Water Board (NWB) 2017) and are referenced in the Hope Bay Project *Water and Ore/Waste Rock Management Plan for the Boston Site* (SRK 2017).

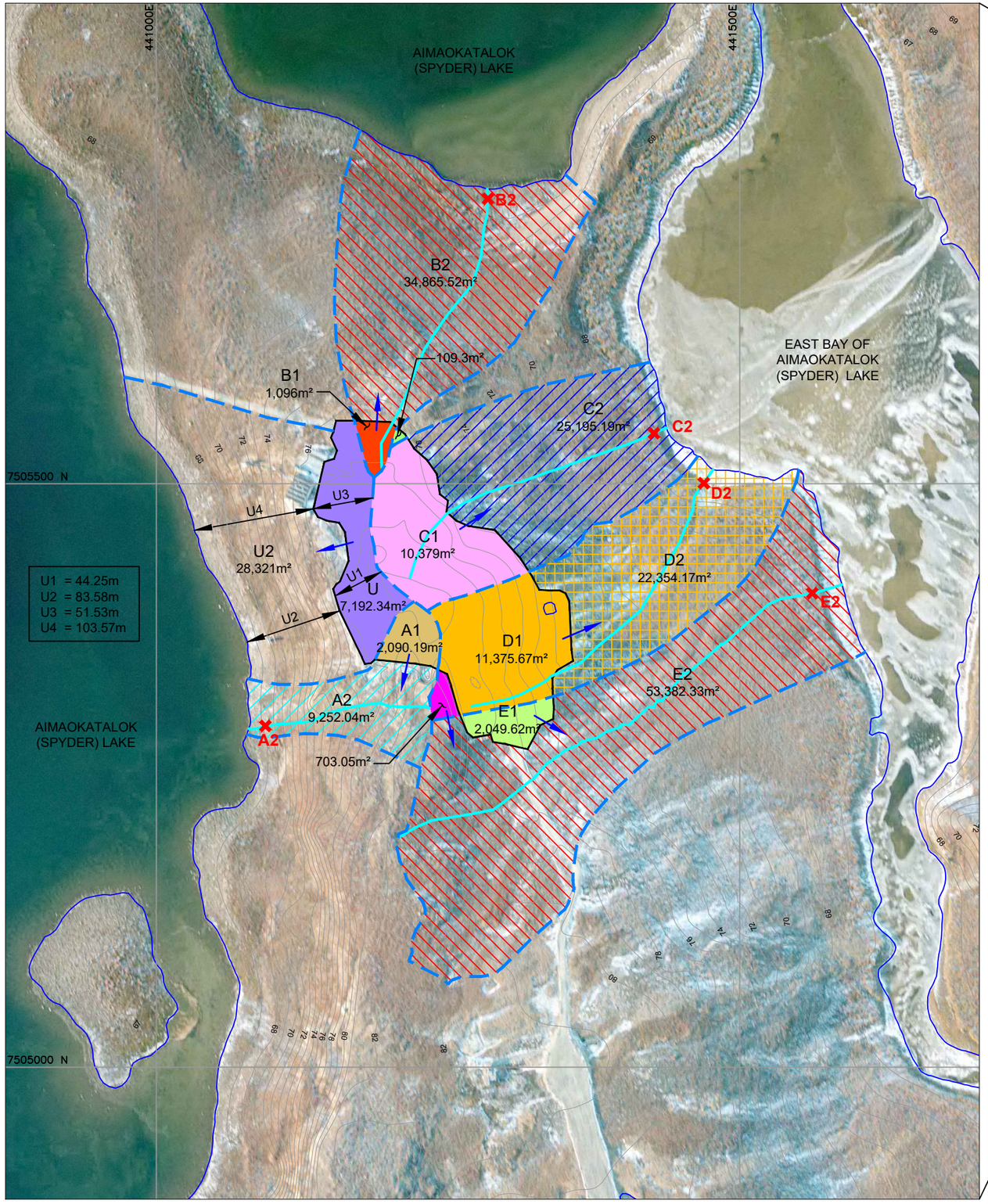
As recommended in the Hope Bay Project *Water and Ore/Waste Rock Management Plan for the Boston Site* (SRK 2017), ephemeral streams downgradient of the waste rock pile have been monitored during spring freshet since 2009 to monitor seepage downgradient of the Boston camp pad and to provide an indication of whether contaminants of potential concern from ore and waste rock piles are reaching the shoreline of Aimaokatalok Lake. This memo presents the results of the 2020 ephemeral streams monitoring program.

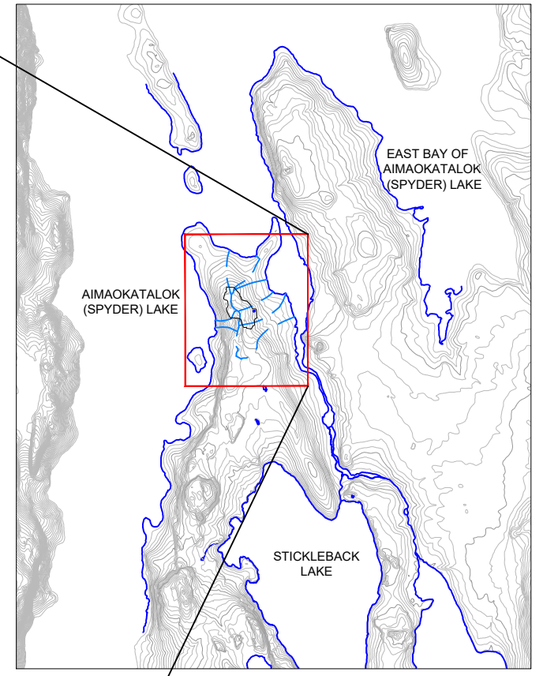
## 2 Methods

### 2.1 Sample Collection

Five ephemeral stream sites have been identified in previous surveys of the area, as shown in Figure 1. TMAC surveyed each of these sites for flow on June 24, 2020. Flow was observed at stations C2 and D2 only.

Field measurements included pH, electrical conductivity (EC), oxidation-reduction potential (ORP), temperature, and flow rate at station C2. The flow at the other stations was too shallow and fragmented to measure. TMAC collected and submitted water quality samples from stations C2 and D2 for laboratory testing at ALS Environmental (ALS) in Burnaby, British Columbia for pH, EC, hardness, total suspended solids, total dissolved solids, acidity, total alkalinity, anions (bromide, chloride, fluoride, and sulphate), nutrients (nitrate, nitrite, ammonia, and phosphorus), and dissolved metals (filtered and preserved in the field). The quality assurance and quality control (QA/QC) sampling program included the collection of one field duplicate.




Legend

| | | | |
|---|---|---|---|
| | Contours (1m) | | Catchment Boundary |
| | Ephemeral streams | | Flow direction |
| | Camp pad perimeter | 25,195.19m² | Catchment Areas |
| A2, B2, C2, D2, E2, U2 | Dilution Zone (Hatch) | × | Ephemeral Stream Sampling Station |

1:4000

0 50 100 150 200 Metres

srk consulting

SRK JOB NO.: 1CT022.0056

FILE NAME: 1CT022.056 – Boston_Catchments.dwg

AGNICO EAGLE

Hope Bay Gold Project

2020 Ephemeral Streams Monitoring

Ephemeral Stream Monitoring Locations
Boston Area

| DATE: | APPROVED: | FIGURE: |
|---|---|---|
| March 2021 | AJS | 1 |

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## 2.2 Quality Assurance and Quality Control

ALS executed a QC program as per SRK's expectations for laboratory geochemical data quality (SRK 2019). The field QA/QC program included one field duplicate (DUP1). The duplicate sample was not part of the ephemeral streams sample set but was included and reported herein as part of the QA/QC program. Quality control checks and results are shown in Table 1. To summarize, the data passed the QAQC checks and were accepted as reported.

**Table 1: Summary of Quality Control Checks on Laboratory Data**

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Physical Test** | | |
| Method Blank (n=1) for Total Suspended Solids, Total Dissolved Solids and Conductivity | <2X DL | All passed. |
| Field Duplicate (n=1) | For samples >10X DL should be within +/-30% RPD | All passed. |
| Leachate Duplicate (n=1) for Total Dissolved Solids | For samples >10X DL should be within +/-20% RPD | Passed |
| Field pH vs. Lab pH (n=4) | Difference should not be greater than 1 pH unit | EPH-C2 - diff. slightly exceeded 1 pH unit (@ 1.09) |
| Field EC vs Lab EC (n=4) | For samples > 10X the detection limit (DL), % RPD should be within +/-30% | All passed. |
| Certified Reference Material (n=1) for pH Laboratory Control Sample (n=1) for Conductivity, Total Suspended Solids and Total Dissolved Solids | Within specified tolerance ranges. | All passed. |
| **Anions and Nutrients** | | |
| Field Blank (n=0) | Minimum criteria is <2X DL, will accept <5X DL | #N/A |
| Method Blank (n=2) for Total Phosphorus; (n=1) for Total Alkalinity, Bromide, Fluoride, Nitrate (as N), Nitrite (as N), Sulfate (SO4), Acidity and Chloride | <2X DL | All passed. |
| Field Duplicate (n=1) | For samples >10X DL should be within +/-30% RPD | DUP1 for Phosphorus (P)-Total - 39% RPD, >10x DL |
| Leachate Duplicate (n=1) for Total Alkalinity | For samples >10X DL should be within +/-20% RPD | Passed |
| Ion Balance (n=4) | EC>100 uS/cm, % difference should be within +/-10% | Duplicate samples failed. DUP1 has an ion balance of 13% |
| Laboratory Control Sample (n=2) for Total Phosphorus; (n=1) for Total Alkalinity, Bromide, Fluoride, Nitrate (as N), Nitrite (as N), Sulfate (SO4), Acidity and Chloride | Within specified tolerance ranges. | All passed. |

| QC Test | SRK QC Criteria | Results |
|---|---|---|
| **Trace Metals by ICP-MS and Hg-CVAAS** | | |
| Field Blank (n=0) for Dissolved | Minimum criteria is <2X DL, will accept <5X DL | #N/A |
| Method Blank (n=1) for Dissolved | <2X DL | All passed. |
| Field Duplicate (n=1) for Dissolved | For samples >10X DL should be within +/-30% RPD | All passed. |
| Leachate Duplicate (n=0) | For samples >10X DL should be within +/-20% RPD | #N/A |
| Total vs Dissolved Metals (n=0) | Total Metals>Dissolved metals. Total Metals should be greater than Dissolved Metals, if not the % difference should be within +/-20%. | No Total Metals |
| Laboratory Control Sample (n=1) for Dissolved | Within specified tolerance ranges. | All passed. |

\\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\!020_Project_Data\Lab\Boston Seep\[L2466863_QAQC_mlt_sent_done.xls]

# 3 Results

## 3.1 Field Observations

Table 2 presents a comparison of field parameters for the 2020 samples from C2 and D2 to the historic data set. Field pH values ranged from 6.3 to 7.0. Field EC at D2 (1,300 µS/cm) was higher than C2 (860 µS/cm). The flow rate at C2 was an order of magnitude lower than historical flow rates. All other field parameters area within historical ranges.

**Table 2: Comparison of 2020 Field Observations to Historic Monitoring Data (2009-2019)**

| Ephemeral Stream | | | Field pH | Field EC | ORP | Temperature | Flow |
|---|---|---|---|---|---|---|---|
| | | | *s.u.* | *µS/cm* | *mV* | *°C* | *L/s* |
| EPH-C2 | Sample Year | 2020 | 6.3 | 860 | 120 | 15 | 0.069 |
| | Statistic | P5 | 6.5 | 160 | 22 | 2.9 | 0.41 |
| | | P50 | 7.2 | 1,100 | 160 | 7.6 | 0.69 |
| | | P95 | 7.5 | 2,000 | 370 | 17 | 0.97 |
| | | n | 8 | 8 | 8 | 8 | 4 |
| EPH-D2 | Sample Year | 2020 | 7.0 | 1,300 | 140 | 20 | - |
| | Statistic | P5 | 6.5 | 160 | 22 | 2.9 | 0.41 |
| | | P50 | 7.2 | 1,100 | 160 | 7.6 | 0.69 |
| | | P95 | 7.5 | 2,000 | 370 | 17 | 0.97 |
| | | n | 8 | 8 | 8 | 8 | 4 |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\230 - Boston Annual Report\Ephemeral_Streams_Memo\1.Working_File\[1CT022.056-230_2020EphemeralStreams_Working_Rev03_AJS.xlsx]

Notes:

Flowrate was too low and/or spread over too large of an area at D2; n = sample count

## 3.2 Laboratory Results

A summary of water quality results for 2020 is provided in Table 3 and complete results are presented in Attachment 1. Parameters identified by SRK (2009) as potential parameters of concern are presented in Figure 2 to Figure 9. Values below the detection limit are graphed as equal to the detection limit. Lines are included in the figure for ease of trend identification; however, ephemeral stream flow paths and therefore sample locations can vary from year to year.

A summary of the 2020 water quality data at C2 and D2 is as follows:

- Sulphate concentrations ranged from 310 to 320 mg/L at D2 and C2, respectively and were within the range of historical concentrations observed in previous years (Figure 2). Since 2009, sulphate concentrations have oscillated at C2 and D2.
- Alkalinity levels at C2 and D2 ranged from 49 to 78 mg/L with maximum historical concentrations at C2 observed in 2020.
- Chloride concentrations were one order of magnitude higher at D2 (140 mg/L) than at C2 (35 mg/L) and all values were within the historical range of concentrations. Chloride concentrations for ephemeral streams exhibit a decreasing trend (Figure 3).
- Copper concentrations (ranging from 0.0011 to 0.0018 mg/L) were within the range of historical data (Figure 4). Overall, copper concentrations have been relatively stable.
- Nitrate concentrations were below detection limit (0.025 mg/L) for C2 and D2. Nitrate concentrations have remained stable since 2009 (Figure 5).

- Arsenic concentrations were within the range of historical concentrations at C2 (0.0030 mg/L) and D2 (0.0015 mg/L). Overall, arsenic concentrations at C2 and D2 have remained stable since 2009 (Figure 6).
- Iron concentrations at C2 were within the range of historical data, however, the concentration at D2 (0.55 mg/L) was greater than the historical maximum concentration observed in 2013 (0.021 mg/L) (Figure 7). At station D2, red/brown staining associated with a bacterial sheen was observed on the grasses which would increase the dissolved iron concentration.
- Nickel concentrations (0.010 to 0.018 mg/L) (Figure 8) were stable and within the range of historical data. Nickel concentrations have oscillated since the start of monitoring.
- Selenium concentrations (Figure 9) ranged between 0.00013 and 0.00018 mg/L and were within the range of historical data. Values have remained stable since 2012.
- Concentrations of the remaining dissolved metals presented in Table 3 were within the range of historical data.

**Table 3: Comparison of Selected Water Quality Results from 2020 and Historical Ephemeral Streams Samples**

| Sample ID | | General Parameters | | | Anions and Nutrients | | | | | Dissolved Metals | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | pH | EC | TSS | Alkalinity, Total | Ammonia | Nitrate | Sulphate | Chloride | Aluminum | Arsenic | Cadmium | Copper | Iron | Lead | Nickel | Selenium | Zinc |
| | | s.u. | µS/cm | mg/L | mg/L as $CaCO_3$ | mg/L as N | mg/L as N | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| C2 | | 7.9 | 830 | <3 | 78 | 0.017 | <0.025 | 320 | 35 | 0.015 | 0.003 | 0.000011 | 0.0018 | 0.11 | <0.00005 | 0.01 | 0.00013 | 0.0015 |
| D2 | | 7.7 | 1,100 | 5.2 | 49 | 0.012 | <0.025 | 310 | 140 | 0.014 | 0.0015 | 0.00004 | 0.0011 | 0.55 | <0.00005 | 0.018 | 0.00018 | <0.001 |
| **Historic Ephemeral Streams Data** | | | | | | | | | | | | | | | | | | |
| C2 | P5 | 7.3 | 180 | 3 | 32 | 0.013 | 0.015 | 30 | 17 | 0.012 | 0.00051 | 0.00005 | 0.0011 | 0.03 | 0.00005 | 0.0022 | 0.001 | 0.002 |
| | P50 | 7.8 | 820 | 3 | 44 | 0.0097 | 0.42 | 220 | 66 | 0.014 | 0.0023 | 0.0000056 | 0.0018 | 0.019 | 0.00005 | 0.0079 | 0.00015 | 0.0021 |
| | P95 | 8 | 1,100 | 110 | 66 | 0.067 | 2.3 | 370 | 190 | 0.021 | 0.031 | 0.000017 | 0.0025 | 0.096 | 0.000075 | 0.0099 | 0.0011 | 0.005 |
| | Maximum | 8 | 1,100 | 150 | 66 | 0.083 | 3 | 400 | 200 | 0.021 | 0.055 | 0.00002 | 0.0025 | 0.12 | 0.0002 | 0.01 | 0.0018 | 0.0071 |
| | Sample Count | 10 | 8 | 6 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| D2 | P5 | 6.9 | 700 | 2.4 | 26 | 0.0056 | 0.039 | 71 | 110 | 0.004 | 0.0027 | 0.00019 | 0.00082 | 0.03 | 0.00025 | 0.0041 | 0.0057 | 0.005 |
| | P50 | 7.6 | 1,400 | 2.6 | 33 | 0.013 | 0.66 | 200 | 310 | 0.0067 | 0.0011 | 0.00002 | 0.0011 | 0.01 | 0.00005 | 0.0065 | 0.00059 | 0.0007 |
| | P95 | 7.8 | 1,600 | 7.5 | 54 | 0.089 | 3.5 | 400 | 520 | 0.015 | 0.0051 | 0.000026 | 0.0015 | 0.021 | 0.00005 | 0.022 | 0.0015 | 0.004 |
| | Maximum | 7.9 | 1,600 | 8.1 | 57 | 0.12 | 4 | 480 | 550 | 0.017 | 0.0065 | 0.000026 | 0.0016 | 0.021 | 0.00005 | 0.03 | 0.0015 | 0.0043 |
| | Sample Count | 7 | 5 | 2 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\230 - Boston Annual Report\Ephemeral_Streams_Memo\1.Working_File\[1CT022.056-230_2020EphemeralStreams_Working_Rev03_AJS.xlsx

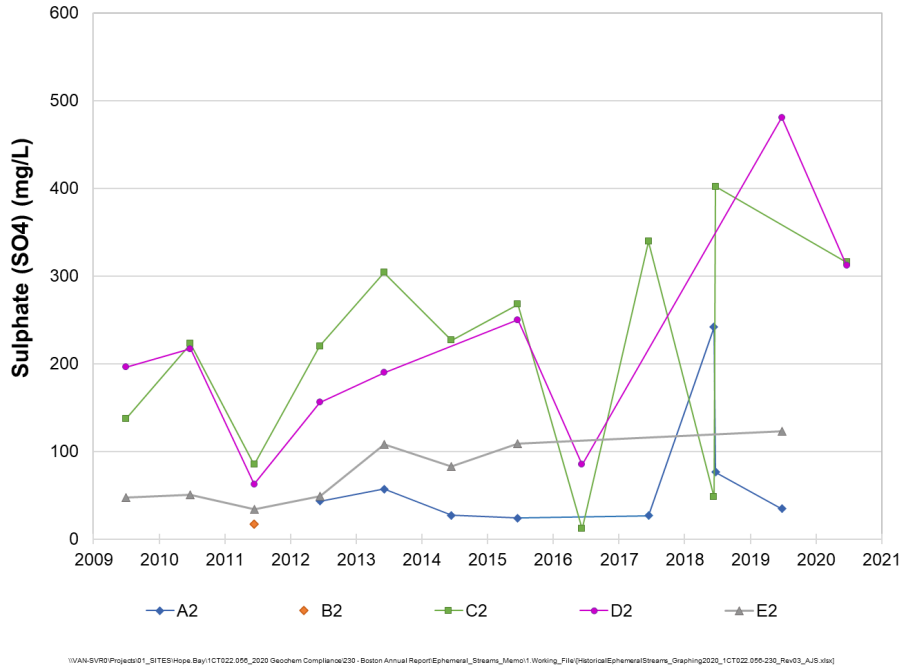



**Figure 2: Ephemeral streams sulphate concentrations**

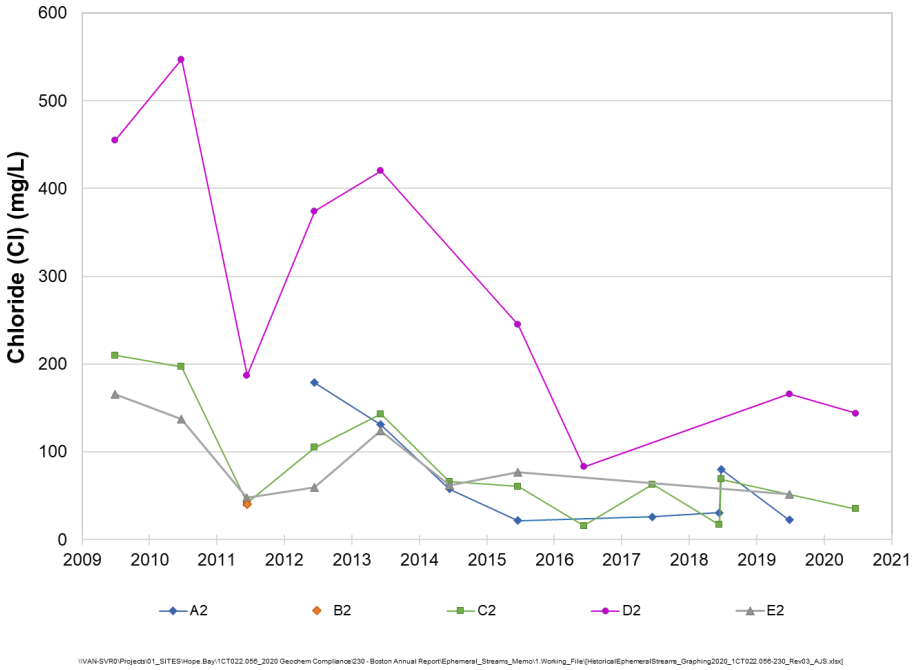



**Figure 3: Ephemeral streams chloride concentrations**

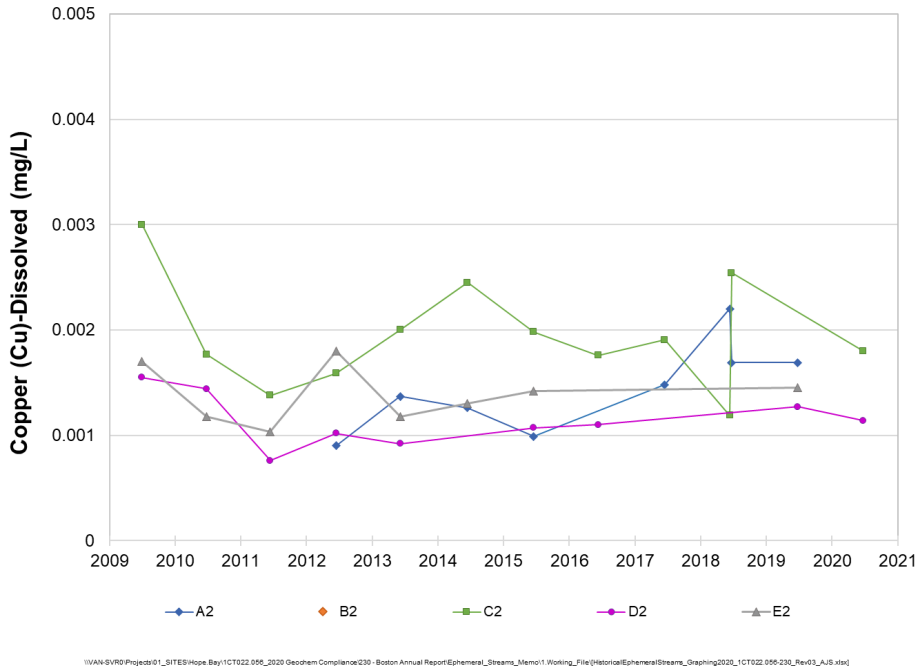



**Figure 4: Ephemeral streams copper concentrations**

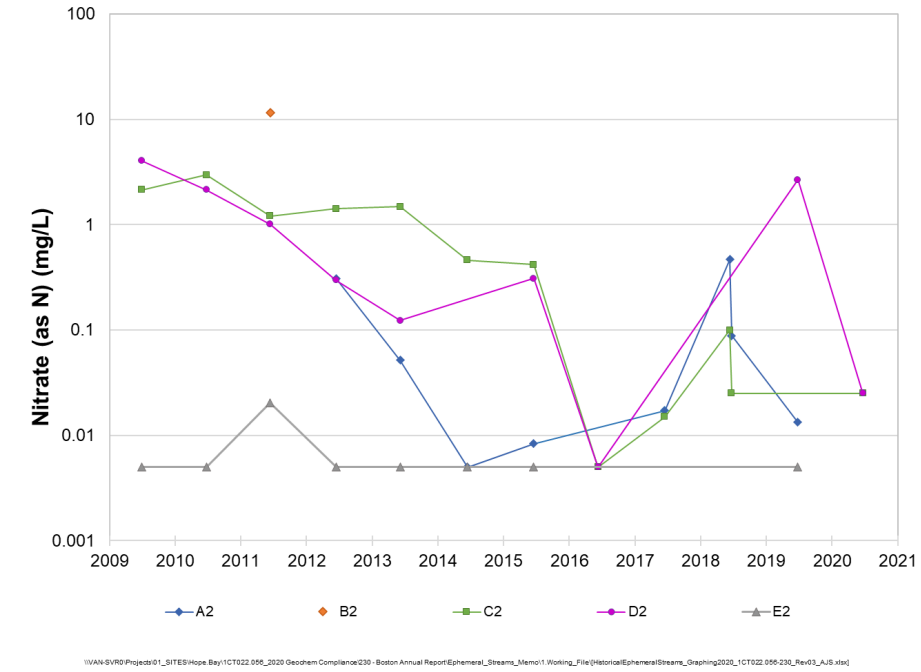



**Figure 5: Ephemeral streams nitrate concentrations**

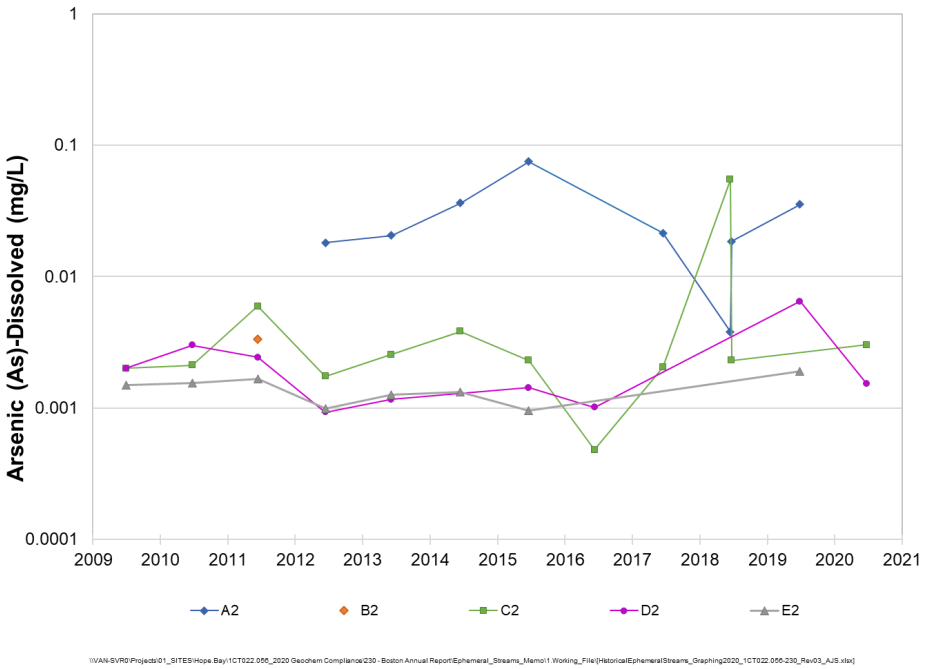



**Figure 6: Ephemeral streams arsenic concentrations**

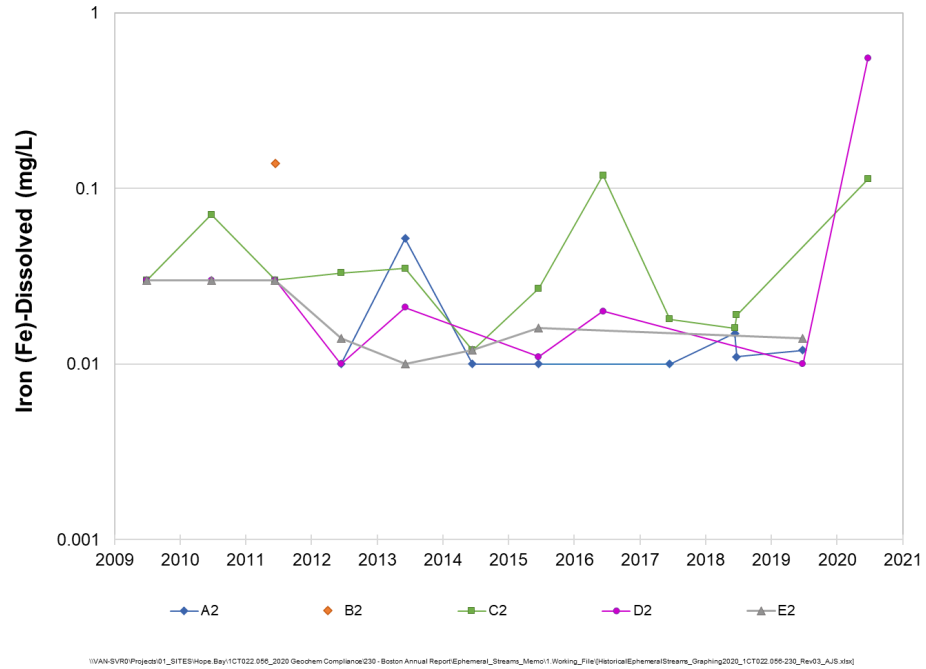



**Figure 7: Ephemeral streams iron concentrations**

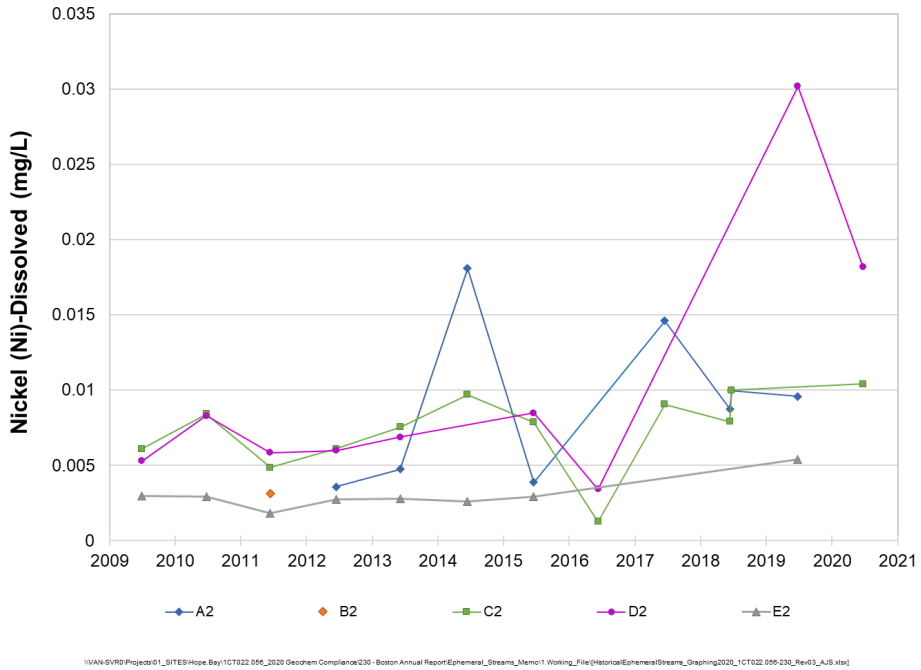



**Figure 8: Ephemeral streams nickel concentrations**

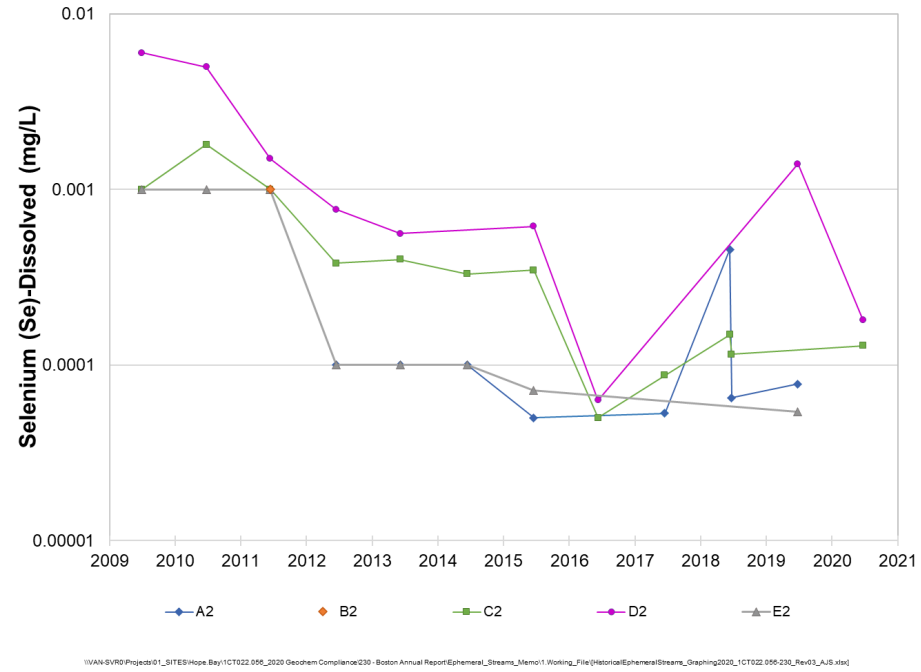



**Figure 9: Ephemeral streams selenium concentrations**

# 4 Discussion

Seepage chemistry predictions were made as part of the former Boston Water and Ore/Waste Rock Management Plan (Supporting Document B of SRK 2009). The report calculated average and maximum predicted concentrations of sulphate, chloride, nitrate, arsenic, copper, iron, nickel, and selenium that may be expected to discharge from the ore stockpile. Table 4 presents these model predictions for the ephemeral streams compared to the 2020 concentrations of these parameters.

At C2 and D2, sulphate concentrations observed in 2020 exceeded the maximum modeled values; however, concentrations are lower than 2019 and within the same order of magnitude as the modeled values. According to TMAC, in September 2018, repairs to a berm disturbed ore material which may have contributed an increase in sulphate within ephemeral streams catchment D2 (Figure 1).

All other 2020 monitoring data were below maximum predicted values at streams C2 and D2.

**Table 4: Comparison of 2020 Water Quality Results to Model Predictions (SRK 2009)**

| Parameters | Units | Predicted Value | | Max Predicted Value | | 2020 Measured Values | |
|---|---|---|---|---|---|---|---|
| | | C2 | D2 | C2 | D2 | C2 | D2 |
| Chloride | mg/L | 144 | 144 | 559 | 559 | 35 | 140 |
| Nitrate (as N) | mg/L | 5.4 | 6.3 | 15 | 17 | <0.025 | <0.025 |
| Sulphate | mg/L | 110 | 130 | 190 | 220 | **320** | **310** |
| Arsenic | mg/L | 0.048 | 0.056 | 0.1 | 0.1 | 0.003 | 0.0015 |
| Copper | mg/L | 0.0026 | 0.0028 | 0.004 | 0.005 | 0.0018 | 0.0011 |
| Iron | mg/L | 0.43 | 0.44 | 1.2 | 1.3 | 0.11 | 0.55 |
| Nickel | mg/L | 0.15 | 0.17 | 0.51 | 0.59 | 0.01 | 0.018 |
| Selenium | mg/L | 0.0021 | 0.0024 | 0.0053 | 0.0061 | 0.00013 | 0.00018 |

Source: \\VAN-SVR0\Projects\01_SITES\Hope.Bay\1CT022.056_2020 Geochem Compliance\230 - Boston Annual Report\Ephemeral_Streams_Memo\1.Working_File\[1CT022.056-230_2020EphemeralStreams_Working_Rev03_AJS.xlsx]

Notes:
Underlined values indicate measured values greater than the predicted value, and bolded values indicate measured values greater than the maximum predicted value

# 5 Conclusions and Recommendations

Nitrate, sulphate, arsenic, copper, iron, nickel, and selenium were identified by the water and load balance as potential contaminants of concern (SRK 2009) related to weathering of ore stockpiles at Boston. Monitoring of ephemeral streams A2, B2, C2, D2, and E2 (Attachment 1) was initiated in 2009 to validate the ore and waste rock management plan for the Boston Site (SRK 2017). In 2020 flow was observed, and samples collected on June 24 from ephemeral streams C2 and D2.

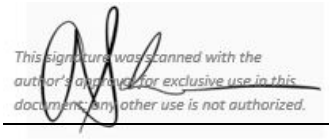
Field pH values ranged from 6.3 to 7.2 and were within the range of historical data. The flowrate at C2 was an order of magnitude lower than historical flow rates and the flow rate at D2 was too low to quantify.

Sulphate concentrations have oscillated for C2 and D2. Chloride concentrations for ephemeral streams exhibit a decreasing trend. Nickel values have oscillated, and iron values have increased after remaining stable prior to 2020. Nitrate, copper, arsenic, and selenium have stable trends.

Compared to SRK (2009) model predictions, the 2020 monitoring data were below maximum predicted values for chloride, nitrate, copper, iron, nickel, and selenium at streams C2, and D2. At C2 and D2, sulphate concentrations observed in 2020 exceeded the maximum modeled values; however, concentrations were lower than 2019 and within the same order of magnitude as the modeled values.

Sulphate and chloride are not attenuated by the tundra and the concentrations measured in 2020 validate the 2009 water and load balance. In general, ephemeral streams monitoring indicates that overall, geochemical conditions remain stable with some annual variability, SRK recommends continued monitoring of the ephemeral stream sampling sites as outlined in SRK (2017).

Regards,
SRK Consulting (Canada) Inc.

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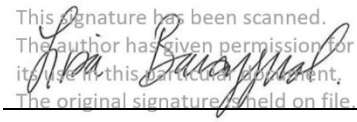
Staff Consultant (Geochemistry)

Reviewed by




Lisa Barazzuol, PGeo (NT/NU)
Principal Consultant (Geochemistry)

## Attachments:

Attachment 1 2020 Water Quality Results

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

# References

Nunavut Water Board, 2017. Water Licence No: 2BB-BOS1727. July 2017.

SRK Consulting (Canada) Inc., 2009. Water and Ore/Waste Rock Management Plan for the Boston Site Hope Bay Project, Nunavut. Report 1CH008.022 for Hope Bay Mining Ltd. July 2009.

SRK Consulting (Canada) Inc., 2017. Water and Ore/Waste Rock Management Plan for the Boston Site, Hope Bay Project, Nunavut. Report 1CT022.009 for TMAC Resources Inc. January 2017.

SRK Consulting (Canada) Inc., 2019. Expectations for Laboratory Geochemical Data Quality. Internal Memo.

# Attachment 1 2020 Water Quality Results

| Sample | | | EPH-C2 | EPH-D2 | DUP1 |
|---|---|---|---|---|---|
| Date | | | 6/24/2020 | 6/24/2020 | 6/24/2020 |
| Start time | | | 13:02 | 13:30 | 12:20 |
| Coordinates (E) | | | 441365 | 441409 | 441184 |
| Coordinates (N) | | | 7505523 | 7505451 | 7505334 |
| Description of location | | | Slightly upstream of original EPH-C2 location. | Bacterial sheen in area causing red/brown staining on grasses. | |
| **Field Measurements** | | | | | |
| | Unit | Detection Limit | | | |
| pH | s.u. | | 6.3 | 7.0 | |
| Conductivity | µS/cm | | 860 | 1295 | |
| ORP | mV | | 123 | 140 | |
| Temperature | ºC | | 14.7 | 19.7 | |
| **Laboratory Measurements** | | | | | |
| ALS Sample ID | | | L2466863-2 | L2466863-3 | L2466863-4 |
| Conductivity | µS/cm | 2 | 827 | 1080 | 310 |
| Hardness (as CaCO3) | mg/L | 0.5 | 375 | 493 | 132 |
| pH | s.u. | 0.1 | 7.91 | 7.66 | 7.83 |
| Total Suspended Solids | mg/L | 3 | -3 | 5.2 | 5.0 |
| Total Dissolved Solids | mg/L | 1 | 607 | 771 | 198 |
| Acidity (as CaCO3) | mg/L | 1 | 3.7 | 4.1 | 3.6 |
| Alkalinity, Total (as CaCO3) | mg/L | 1 | 77.9 | 49.0 | 88.7 |
| Ammonia, Total (as N) | mg/L | 0.005 | 0.0171 | 0.0115 | 0.0106 |
| Bromide (Br) | mg/L | 0.05 | -0.25 | -0.25 | -0.05 |
| Chloride (Cl) | mg/L | 0.5 | 34.8 | 144 | 17.1 |
| Fluoride (F) | mg/L | 0.02 | -0.1 | -0.1 | 0.028 |
| Nitrate (as N) | mg/L | 0.005 | -0.025 | -0.025 | 0.0683 |
| Nitrite (as N) | mg/L | 0.001 | -0.005 | -0.005 | 0.0029 |
| Phosphorus (P)-Total | mg/L | 0.002 | 0.0096 | 0.0102 | 0.0359 |
| Sulfate (SO4) | mg/L | 0.3 | 316 | 312 | 43.8 |
| Aluminum (Al)-Dissolved | mg/L | 0.001 | 0.0154 | 0.0139 | 0.0044 |
| Antimony (Sb)-Dissolved | mg/L | 0.0001 | 0.00050 | 0.00231 | 0.00301 |
| Arsenic (As)-Dissolved | mg/L | 0.0001 | 0.00303 | 0.00154 | 0.0950 |
| Barium (Ba)-Dissolved | mg/L | 0.00005 | 0.0287 | 0.0365 | 0.00567 |
| Beryllium (Be)-Dissolved | mg/L | 0.00002 | -0.00002 | -0.00002 | -0.00002 |
| Bismuth (Bi)-Dissolved | mg/L | 0.00005 | -0.00005 | -0.00005 | -0.00005 |
| Boron (B)-Dissolved | mg/L | 0.01 | 0.065 | 0.148 | 0.045 |
| Cadmium (Cd)-Dissolved | mg/L | 0.000005 | 0.0000107 | 0.0000403 | 0.0000093 |
| Calcium (Ca)-Dissolved | mg/L | 0.05 | 82.8 | 132 | 34.8 |
| Chromium (Cr)-Dissolved | mg/L | 0.0001 | 0.00018 | 0.00021 | 0.00010 |
| Cobalt (Co)-Dissolved | mg/L | 0.0001 | 0.00056 | 0.00583 | 0.0269 |
| Copper (Cu)-Dissolved | mg/L | 0.0002 | 0.00180 | 0.00114 | 0.00190 |
| Iron (Fe)-Dissolved | mg/L | 0.01 | 0.113 | 0.551 | 0.132 |
| Lead (Pb)-Dissolved | mg/L | 0.00005 | -0.00005 | -0.00005 | -0.00005 |
| Lithium (Li)-Dissolved | mg/L | 0.001 | 0.0015 | 0.0127 | 0.0059 |
| Magnesium (Mg)-Dissolved | mg/L | 0.1 | 40.7 | 39.8 | 10.9 |
| Manganese (Mn)-Dissolved | mg/L | 0.0001 | 0.0329 | 0.0400 | 0.151 |
| Mercury (Hg)-Dissolved | mg/L | 0.000005 | -0.000005 | 0.0000056 | -0.000005 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.00005 | 0.000315 | 0.000592 | 0.000733 |
| Nickel (Ni)-Dissolved | mg/L | 0.0005 | 0.0104 | 0.0182 | 0.0425 |
| Phosphorus (P)-Dissolved | mg/L | 0.05 | -0.05 | -0.05 | -0.05 |
| Potassium (K)-Dissolved | mg/L | 0.1 | 6.19 | 8.37 | 2.03 |
| Selenium (Se)-Dissolved | mg/L | 0.00005 | 0.000129 | 0.000181 | 0.000190 |
| Silicon (Si)-Dissolved | mg/L | 0.05 | 1.11 | 1.90 | 0.610 |
| Silver (Ag)-Dissolved | mg/L | 0.00001 | -0.00001 | 0.000013 | -0.00001 |
| Sodium (Na)-Dissolved | mg/L | 0.05 | 29.0 | 24.7 | 6.53 |
| Strontium (Sr)-Dissolved | mg/L | 0.0002 | 0.310 | 0.896 | 0.195 |
| Sulfur (S)-Dissolved | mg/L | 0.5 | 107 | 104 | 15.3 |
| Thallium (Tl)-Dissolved | mg/L | 0.00001 | 0.000011 | -0.00001 | -0.00001 |
| Tin (Sn)-Dissolved | mg/L | 0.0001 | -0.0001 | 0.00015 | -0.0001 |
| Titanium (Ti)-Dissolved | mg/L | 0.0003 | -0.0003 | 0.00062 | -0.0003 |
| Uranium (U)-Dissolved | mg/L | 0.00001 | 0.000038 | -0.00001 | 0.000052 |
| Vanadium (V)-Dissolved | mg/L | 0.0005 | -0.0005 | -0.0005 | -0.0005 |
| Zinc (Zn)-Dissolved | mg/L | 0.001 | 0.0015 | -0.001 | 0.0024 |
| Zirconium (Zr)-Dissolved | mg/L | 0.0003 | -0.0003 | -0.0003 | -0.0003 |

# Appendix H

Hope Bay Project Spill Contingency Plan

AGNICO EAGLE

# HOPE BAY SPILL CONTINGENCY PLAN

AGNICO EAGLE
HOPE BAY

**HOPE BAY, NUNAVUT**

**MARCH 2021**

# Hope Bay Spill Contingency Plan

Plain Language Overview:

This Plan describes the spill response procedures to be used at the Hope Bay mine site. This Plan ensures that 1) human life is protected and the potential for injury during spill response activities is minimized to the extent possible, 2) all potentially harmful environmental impacts are kept to a minimum, 3) resources are used effectively and efficiently, and 4) all required internal and regulatory reporting is completed on time and as required.

Hope Bay, Nunavut

Publication Date: March 2021

Agnico Eagle - Hope Bay
145 King St. East, Suite 400
Toronto, Ontario, M5C 2Y7
Phone: 1-416-947-1212

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# Hope Bay Emergency Phone Numbers

| Onsite Contacts | Day (7 am to 7 pm) | Night (7 pm to 7 am) |
|---|---|---|
| 24 hour Emergency Line<br>Mill Control Room Operator | 1-867-988-6882 ext. 150 | 1-867-988-6882 ext. 150 |
| Mine General Manager<br>Eric Steinmetzer | 1-867-988-6882 ext. 104 | Offsite Cell: 1-514-234-3261 |
| Maintenance Superintendent<br>Chris McMahon<br>Scott Pye | 1-867-988-6882 ext. 131 | |
| Mill (Process) Superintendent<br>Paul Simms<br>Mill Chief Metallurgist<br>Paul Grady | 1-867-988-6882 ext. 145 | |
| Manager of Mining<br>Vince Kapinus<br>Mine Superintendent<br>Greg Scammel | 1-867-988-6882 ext. 125 | |
| Health and Safety Manager<br>Doug Brown<br>Health and Safety Superintendent<br>Ken Cook | 1-867-988-6882 ext.138 | |
| Environmental Superintendent<br>Sarah Warnock | 1-867-988-6882 ext. 102 | |
| Medics<br>Kwame Sarpong<br>Genady Isal | 1-867-988-6882 ext. 105 | 1-867-988-6882 ext. 115 |
| Security Officer<br>Bob Fogarty<br>Mitch Bernier | 1-867-988-6882 ext. 165 | |
| **Offsite Contacts** | **Day (7 am to 7 pm)** | **Night (7 pm to 7 am)** |
| V.P. Environment and Critical Infrastructure<br>Michel Julien | 1-416-947-1212 ext. 4013738 | |
| Senior V.P., Operations – Canada and Europe<br>Dominique Girard<br>V.P. Nunavut<br>Martin Plante | 1-416-947-1212 ext. 4013747<br><br>1-819-759-3555 | |
| V.P. Health, Safety, Social and Public Affairs<br>Patrice Gilbert | 1-416-644-2058 | |

# Site Radio Channels

| | | | |
|---|---|---|---|
| Channel 1 | Emergency | Channel 6 | Medic |
| Channel 2 | Security | Channel 7 | Environment |
| Channel 3 | Aviation | Channel 8 | General |
| Channel 4 | Roads | Channel 9 | Electrical |
| Channel 5 | Site Services | Channel 10 | Mill |

# Key Government Contacts

| Organization | Contact | Location | Telephone | Fax |
|---|---|---|---|---|
| NT-NU Spill Centre | 24 hour Spill Report Line | Yellowknife | 867-920-8130 | 867-873-6924 |
| Canadian Coast Guard – Central and Arctic Region (Any discharge to the marine environment) | 24 hour Spill Report Line | Yellowknife | 800-265-0237 | |
| GN Department of Environment | Director Environmental Protection Division | Iqaluit | 867-975-7748 | |
| Nunavut Water Board | Executive Director | Gjoa Haven | 867-360-6338 | 867-360-6369 |
| Kitikmeot Inuit Association (KIA) | Sr. Lands Officer | Kugluktuk | 867-982-3310 | 867-982-3311 |
| CIRNAC (Crown-Indigenous Relations and Northern Affairs Canada) | Field Operations Manager | Iqaluit | 867-975-4553 | 867-979-6445 |
| CIRNAC (Crown-Indigenous Relations and Northern Affairs Canada) | Inspector | Iqaluit | 867-975-4655 | 867-979-6445 |
| ECCC (Environment and Climate Change Canada) | Manager of Enforcement | Yellowknife | 867-669-4730 | 867-669-6831 |
| ECCC (Environment and Climate Change Canada) | Environmental Enforcement Officer | Yellowknife | 867-669-4785 | |
| DFO (Fisheries & Oceans Canada) | Habitat Team Leader | Ottawa | 705-522-9909 | |
| Transport Canada, Marine | Regional Preparedness & Response Officer | Jasper | 780-442-1945 | 780-495-8607 |

# Offsite Resource Contacts

| Organization | Contact | Location | Telephone |
|---|---|---|---|
| Riverspill | Ian Lambton | Burnaby | 604-434-0994 |
| Points West Archaeology | Gabriella Prager | Langley | 780-980-2079 |
| Focus Wildlife | Chris Bataglia | North Vancouver | 1-800-578-3048 |

# Immediately Reportable Spills

Per GNWT-ENR Report a Spill Website (https://www.enr.gov.nt.ca/en/services/report-spill)

| Description of Contaminant | Amount Spilled | TDG Class |
|---|---|---|
| Explosives | Any amount | 1.0 |
| Compressed gas (toxic/corrosive) | | 2.3 / 2.4 |
| Infectious substances | | 6.2 |
| Sewage and Wastewater (Unless otherwise authorized) | | 6.2 |
| Radioactive materials | | 7.0 |
| Unknown substance | | None |
| Compressed gas (Flammable)<br>Compressed gas (Non-corrosive, non-flammable) | Any amount of gas from containers with a capacity greater than 100 L | 2.1<br>2.2 |
| Flammable Liquid | ≥ 100L | 3.1 / 3.2 / 3.3 |
| Flammable Solid<br>Substances liable to spontaneous combustion<br>Water reactant substances | ≥ 25kg | 4.1<br>4.2<br>4.3 |
| Oxidizing substances | ≥ 50 L or 50 kg | 5.1 |
| Organic peroxides<br>Environmentally hazardous substances intended for disposal | ≥ 1 L or 1 kg | 5.2<br>9.2 |
| Toxic substances | ≥ 5 L or 5 kg | 6.1 |
| Corrosive substances<br>Miscellaneous products, substances or organisms | ≥ 5 L or 5 kg | 8.0 |
| PCB mixtures of 5 or more ppm | ≥ 0.5 L or 0.5 kg | 9.1 |
| Other contaminants – for example, crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, wastewater | ≥ 100 L or 100 kg | None |
| Sour natural gas (i.e., contains $H_2S$)<br>Sweet natural gas | Uncontrolled release or sustained flow of 10 minutes or more | None |
| Flammable liquid<br>Vehicle fluid | ≥ 20 L when released on a frozen water body that is being used as a working surface | 3.1 / 3.2 / 3.3<br>None |
| Reported releases or potential releases of any substance that:<br>Are near or in an open water body (freshwater or marine);<br>Are near or in a designated sensitive environment or habitat;<br>Pose an imminent threat to human health or safety; or<br>Pose an imminent threat to a listed species at risk or its critical habitat | Any amount | None |

In the event that a particular material spill meets or exceeds the amount specified or conditions outlined in the above table the Environmental Superintendent will immediately report the spill by telephone to the NT-NU 24 Hour Spill Report Line, Yellowknife, Tel: 867-920-8130 (Email: spills@gov.nt.ca; Fax: 867-873-6924) using the NT-NU Spill Report.

Any spill or discharge that occurs to the marine environment must immediately be reported to the Canadian Coast Guard – Central and Arctic Region station at Tel: 1-800-265-0237.

# First Responder

When someone on site sees an unanticipated discharge or spill, he or she is immediately designated as the First Responder and, as such, shall complete the following actions

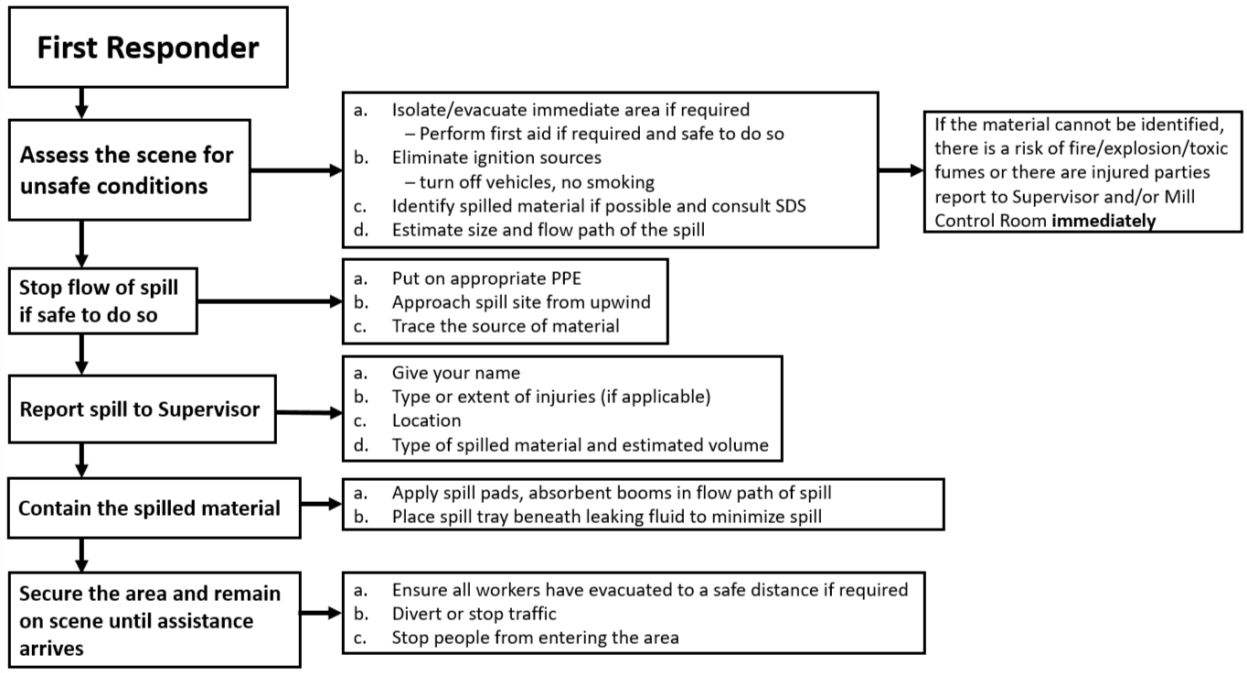


Figure I. First Responder Spill Response Actions

# Spill Response Organization Structure

When a Supervisor receives a report of an unanticipated discharge or spill, he or she shall immediately complete the following actions:

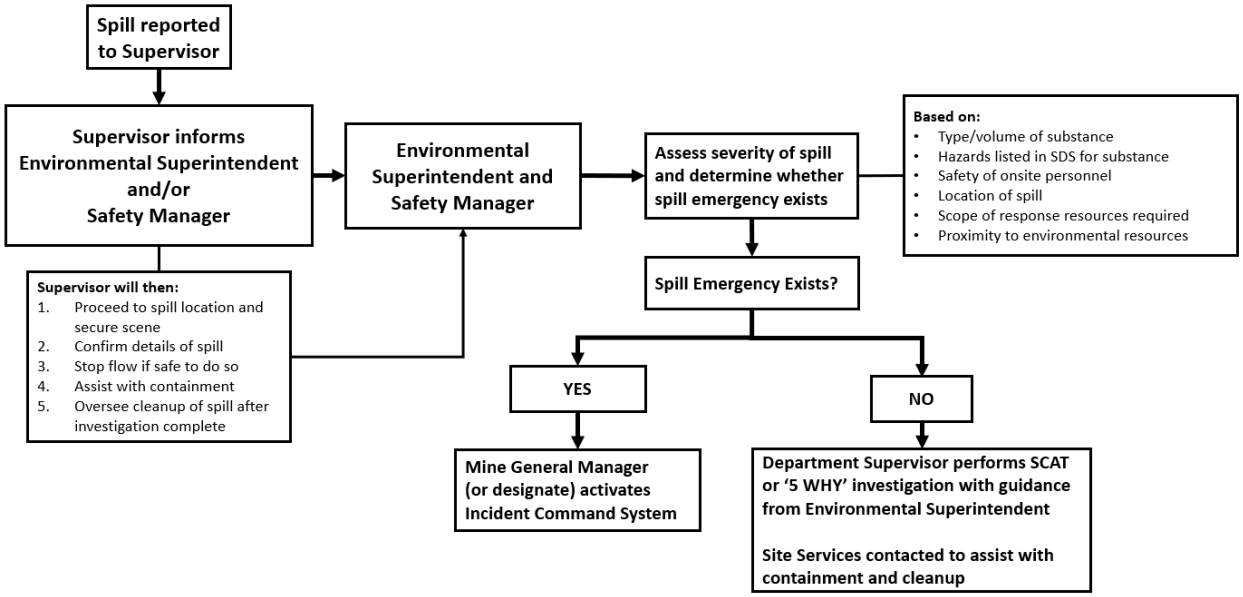


Figure II. Spill Response Organizational Structure

# Spill Emergency Incident Command System

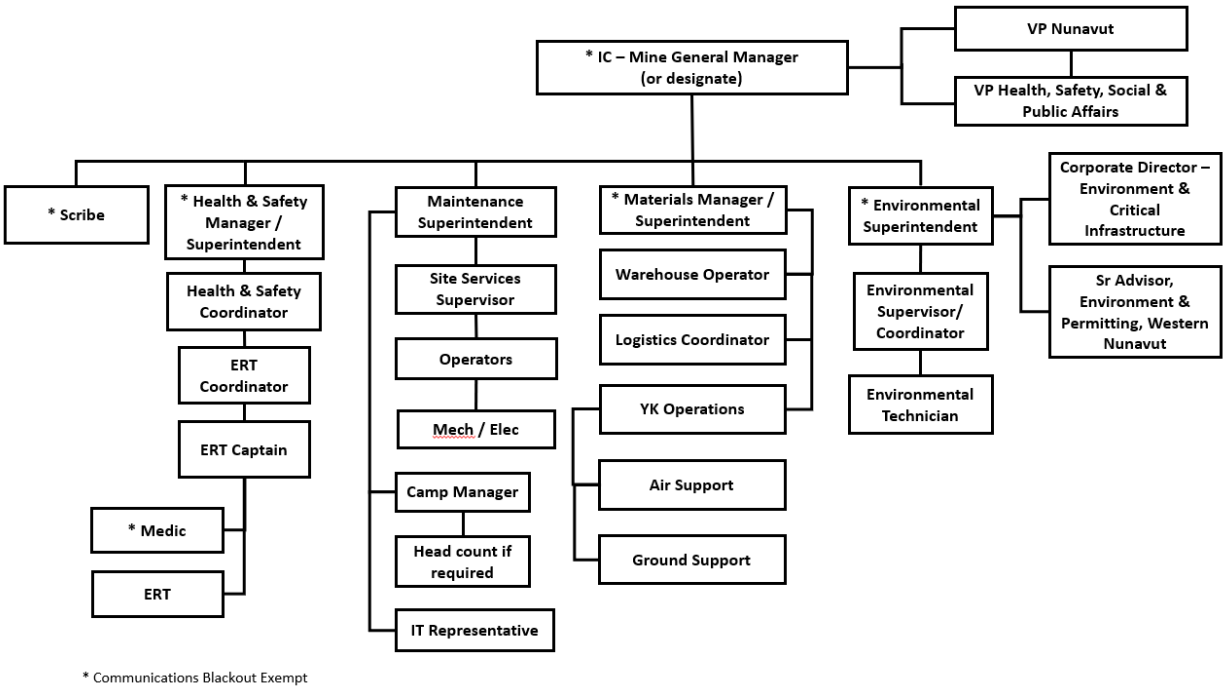


Figure III. Incident Command System organizational structure in the event of a spill emergency

# Revisions

| Revision # | Date | Section | Changes Summary |
|---|---|---|---|
| 1 | 2009 | | Hope Bay Project Spill Contingency Plan, August 2009 |
| 2 | Feb 2010 | | Update phone numbers |
| 3 | Jul 2010 | | Update phone numbers |
| 4 | 2011 | Throughout | Update channels, figures, included OPPP info, updated phone numbers, revised fuel storage locations |
| 5 | 2012 | Throughout | Overall revision for change to Care and Maintenance. Updated roles and responsibilities, phone numbers, fuel storage, added non-hydrocarbon chemicals, updated spill response procedures |
| 6 | 2014 | Throughout | Overall revision to include Care and Maintenance under ownership of TMAC Resources Inc. Updated roles and responsibilities, contact information, fuel storage, updated spill response procedures |
| 7 | Apr 2016 | Throughout | Updated to reflect comments on 2014 Plan and other stakeholder inputs. Changes to document structure and addition of licence specific modules and Incident Command System response structure. Revisions to reflect Construction and Operations phases for Doris and anticipated chemical storage quantities. Inclusion of Product-specific response plans, updated contacts. |
| 8 | Jan 2017 | Throughout | Revisions in consideration of comments on 2016 Plan, and in consideration of planned resumption of exploration activity at Boston |
| 9 | Nov 2017 | Throughout | Revisions to emergency contact information, spill response organizational and ICS structure. Updates to fuel/chemical storage quantities/locations and spill kit location maps in all modules. Addition of Module C: Madrid as per licence 2BB-MAE1727. Revisions to Module D: Boston as per licence 2BB-BOS1727. Addition of Aviation fuel Product Specific Spill Response Plan to Module A. |
| 10 | Mar 2019 | Throughout | Revisions to emergency contact information, spill response organizational and ICS structure. Updates to fuel/chemical storage quantities/locations and spill kit location maps in all modules. |
| 11 | Sep 2019 | Throughout, Module A | Revisions to emergency contact information, addition of spill prevention measures along the Roberts Bay Discharge Pipeline in Module A |
| 12 | Mar 2020 | Throughout, Appendix | Overall revisions to the plan |
| 13 | Mar 2021 | Throughout Section 3.4 | Updated to Agnico Eagle Mines Ltd ownership and format. Updated Emergency Phone Numbers, Site Radio Channels and Offsite Resource Contacts. Clarified scenarios where monitoring of spills is required. |

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# Glossary

| Term | Definition |
|---|---|
| Agnico Eagle | Agnico Eagle Mines Ltd. – Hope Bay |
| CWS | Canadian Wildlife Services |
| CIRNAC | Crown-Indigenous Relations and Northern Affairs Canada (formerly INAC) |
| DoE | Department of Environment |
| ECCC | Environment and Climate Change Canada |
| ERT | Emergency Response Team |
| ERP | Emergency Response Plan |
| GN | Government of Nunavut |
| IC | Incident Commander |
| ICS | Incident Command System |
| KIA | Kitikmeot Inuit Association |
| MGM | Mine General Manager |
| NWB | Nunavut Water Board |
| PSER | Product Specific Emergency Response Plan |
| PPE | Personal Protection Equipment |
| SDS | Safety Data Sheet |

# 1 Introduction

This Hope Bay Spill Contingency Plan (the Plan) has been prepared by Agnico Eagle Mines Limited (Agnico Eagle) in accordance with various water licences held by Agnico Eagle associated with developments throughout the Hope Bay region. This Plan has been developed to also meet the requirements of the Environmental Emergency (E2) Regulations as well as the Metal and Diamond Mining Effluent Regulations enacted under the Canadian Environmental Protection Act (CEPA, 1999).

The Plan is intended primarily for use by Agnico Eagle Hope Bay and its contractors to ensure that best practices for response are implemented in the event of a spill or unintentional release, and that the conditions of water licences, project permits and relevant legislations are met.

This Plan is structured in a manner such that one document pertaining to spill response is approved and implemented across all Hope Bay sites, while still addressing site- and licence-specific needs: the main document outlines Agnico Eagle's approach to spill response planning and management as it pertains to all Agnico Eagle Hope Bay developments; subsequent modules provide details for each site and the associated water licence. In the event of a new water licence, or an existing licence amendment, only the specific modules pertaining to that licence and site may need to be revised. This is intended for consistency and efficiency across operations and for compliance management.

This Plan has been developed to be applicable for all phases of development at various Hope Bay mine sites. This Plan is reviewed annually and updated as necessary.

## 1.1 Objectives

Agnico Eagle's vision and values strive for zero harm and protection of people and the environment. Safe work procedures and training provided to all employees promote best practices and sound environmental management; however, the potential exists for unanticipated discharges or spills to occur during the course of operations. Agnico Eagle recognizes that prompt, effective and organized responses to an unanticipated discharge or spill will enhance the health and safety of all employees, minimize the potential adverse environmental impacts resulting from such an event, and ensure effective communication with the appropriate regulatory agencies and the public. Consistent with Agnico Eagle's intent to be a responsible operator, these objectives are described as follows:

- Provide procedures for every employee should he/she identify an unanticipated discharge or spill;
- Define roles, responsibilities and procedures for spill response actions, documentation, reporting, incident investigation and review following an event;
- Outline a process to be followed when conducting spill clean-up activities to promote safe and effective recovery of spilled materials and minimize impacts to the environment;
- Provide information on available resources and potential operational hazards/risks that may be encountered during spill response activities;
- Define methods to provide spill response training for all employees; and
- Implement a process to evaluate and continuously improve site spill response procedures.

## 1.2 Relevant Legislation and Guidance

Table 1.1 provides a summary of federal and territorial regulations relevant to this Plan and associated guidelines.

Table 1.1. List of Federal and Territorial Regulations Relevant the Hope Bay Spill Contingency Plan

| Acts | Regulations | Guidelines |
|---|---|---|
| **Federal** | | |
| *Arctic Waters Pollution Prevention Act (R.S.C., 1985, c.A-12)* | Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353) | |
| *Canadian Environmental Protection Act (R.S.C.1999 c.33)* | Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197) | Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (Canadian Council of the Ministers of Environment (CCME) 2003) |
| | Environmental Emergency Regulations (SOR/2019-51) | |
| | Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301) | Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CCME2008) |
| | Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149) | |
| *Fisheries Act (1985, c.F-14)* | Metal and Diamond Mining Effluent Regulations (SOR/2002-222) | |
| *Explosives Act (1985, c.E-17)* | Explosives Regulations (C.R.C., c.1516) | |
| *Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002)* | Nunavut Water Regulations (2013) | |
| *National Fire Code of Canada (2010)* | | |
| *Transportation of Dangerous Goods Act (1992, C.34)* | Transportation of Dangerous Goods Regulations (SOR/2001-286) | 2016 Emergency Response Guidebook (Transport Canada and U.S. Department of Transportation, 2016) |
| *Territorial Lands Act (R. S. 1985, c.T-7)* | Northwest Territories and Nunavut Mining Regulations (C.R.C., c.1516) | |
| | Territorial Land Use Regulations (C.R.C., c.1524) | |
| | Territorial Lands Regulations (C.R.C., c.1525) | |
| *Hazardous Products Act* | *Controlled Products Regulations* | *Workplace Hazardous Materials Information System (WHMIS)* |
| *Nunavut Act (1993 c.28)* | | |

| Acts | Regulations | Guidelines |
|---|---|---|
| **Territorial – Nunavut** | | |
| *Environmental Protection Act* | Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93)<br>Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)<br>[The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment (DOE) as a waste generator as well as carrier (if applicable) prior to transport] | Government of Nunavut (GN) Environmental Guidelines for the Management of:<br>• General Management of Hazardous Waste in Nunavut (GN, 2010)<br>• Waste Paint (GN, 2010)<br>• Mercury-Containing Products and Waste Mercury (GN, 2010)<br>• Industrial Waste Discharges into Municipal Solid Waste and Sewage Disposal Facilities (GN, 2011)<br>• Waste Batteries (GN, 2011)<br>• Waste Solvent (GN, 2011)<br>• Waste Antifreeze (GN, 2011)<br>• Used Oil and Waste Fuel (GN, 2012)<br>• Biomedical and Pharmaceutical Waste (GN, 2014)<br>• Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil (CCME 2008) |
| *Mine Health and Safety Act (SNWT (Nu) 1994, c.25)* | Mine Health and Safety Regulations (NWT Reg (Nu) 125-95) | |
| *Workers' Compensation Act (RSNWT, 1998, c.W-6)* | Workers' Compensation General Regulations (Nu Reg 017-2010) | |
| *Explosives Use Act (RSNWT (Nu) 1988, c.E-10)* | Explosives Regulations (RRNWT (Nu) 1990, c.E-27) | |
| *Fire Prevention Act (RSNWT (Nu) 1988, c.F-6)* | Fire Prevention Regulations (RRNWT (Nu) 1990, c.F-12) | |
| *Motor Vehicles Act (RSNWT (Nu) 1988, c.M-16)* | Large Vehicle Control Regulations (RRNWT (Nu) 1990, c.M-30) | |
| *Public Health Act (RSNWT (Nu) 1988, c.P12)* | Camp Sanitation Regulations (RRNWT (Nu) 1990, c.P-12) | |
| *Safety Act (RSNWT 1988, c.S-1)* | General Safety Regulations (RRNWT (Nu) 1990, c.P-16) | |
| | Work Site Hazardous Materials Information System Regulations (RSNWT 1988, c.81 (Supp)) | |
| *Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c.81 (Supp))* | Transportation of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91) | |

## 1.3 Related Agnico Eagle Documents

The documents listed in Table 1.2 are expected to be referenced and utilized in conjunction with the Spill Contingency Plan.

Table 1.2. List of Agnico Eagle documents related to the Hope Bay Spill Contingency Plan

| Document Title | Year | Relevance |
|---|---|---|
| Hazardous Waste Management Plan | 2020 | Describes proper handling, storage and disposal procedures for hazardous wastes. |
| Non-Hazardous Waste Management Plan | 2017 | Describes proper handling, storage and disposal procedures for non- hazardous wastes. |
| Hope Bay Project Hydrocarbon Contaminated Material Management Plan | 2017 | Describes process for remediating hydrocarbon contaminated soil, water and gravel and criteria for determining level of remediation. |
| Emergency Response Plan | 2020 | Describes Incident Command System and actions relating to all surface emergencies. |
| Doris-Madrid Tailings Impoundment Area Operations, Management and Surveillance (OMS) Plan | 2020 | Describes the tailings management procedures and the aspects of the pipelines designed to reduce spills of tailings and effluent. |
| Oil Pollution Prevention and Oil Emergency Preparedness Plan | 2020 | Describes spill response actions associated with fuel transfer activities during annual sea-lift fuel offload. |

## 1.4 Plan Management

The Mine General Manager (MGM) has the overall responsibility for implementing this plan at the Hope Bay site and providing on-site support and resources for spill response management. The MGM will act as Incident Commander (IC) in the event that a spill occurs that requires activation of the Emergency Response Plan (ERP). As Incident Commander, the MGM will coordinate the spill response efforts that protect the health and safety of all responders and minimizes impacts to the environment.

The Environmental Superintendent is responsible for reviewing and revising this plan. In the event that a spill requires activation of the Emergency Response Plan, the Environmental Superintendent will provide guidance to the MGM regarding implementing response actions according to this plan and evaluating priorities for protection of sensitive habitats/species and archeological features at risk. The Environmental Superintendent will also ensure that regular inspections of spill response resources are conducted and documented.

The Environmental Supervisor/Coordinators will assist departmental supervisors with investigation of spill incidents, development of corrective actions for those incidents as necessary, maintain records of all spill events, and complete appropriate reporting as required by Agnico Eagle policies and relevant regulations as identified in this plan. Plan Implementation

In accordance with the requirements of the General Conditions (Part B) of the applicable water licences, the Environmental Emergency Regulations (SOR/2019-51) and the Metal and Diamond Mining Effluent Regulations (SOR/2002-222), this plan will be immediately

implemented following its submission, subject to any modifications proposed by the NWB or applicable regulatory agencies as a result of the review and approval process.

This plan will be reviewed annually and updated as necessary to capture changes to site operational structure/contacts, response technologies or applicable legislation and regulations.

## 1.5 Project Description

Hope Bay is a gold mine located in the West Kitikmeot region of Nunavut approximately 125 km southwest from Cambridge Bay and 75 km northeast from Umingmaktok. The various elements of the Hope Bay mine are centered at approximately N 68° 09’ and W 106° 40’ and extend from the head of Roberts Bay (an extension of Melville Sound) at the north end of the property to south of the Boston site located approximately 60 km to the south. Two jetties extend into Roberts Bay and are located on foreshore Crown Land. The Hope Bay mineral exploration rights property comprises an area of 1078 $km^2$ and forms a contiguous block that is approximately 80 km long by up to 20 km wide. Descriptions of infrastructure pertinent to each licence area are provided in the appended modules.

The Hope Bay area has a low arctic eco-climate and consists of coastal lowland habitats with numerous fresh water lakes and ponds. The drainage basins are generally long and narrow and predominately oriented along the north-south axis and are separated by bedrock ridges. Continuous permafrost covers the project area with a surficial active layer of approximately 1 m. Groundwater movement only occurs in the shallow active layer during the seasonal thaw period and within the talik zones (unfrozen ground underlying larger water bodies). Permafrost underlying the area is generally impervious to groundwater movements.

# 2 Spill Response and Management

## 2.1 Spill Incident Alerts

Any person on the Hope Bay mine site who comes across or sees an unanticipated discharge or spill is designated as the First Responder and will complete the following actions (Figure I):

1. Assess the Site:
   (a) Isolate/evacuate immediate area if required;
   (b) Perform first aid if required and safe to do so;
   (c) Eliminate ignition sources – turn off vehicles, no smoking;
   (d) Identify spilled material if possible and consult product SDS; and
   (e) Estimate size and flow path of the spill.

   **NOTE:** If the material cannot be identified, there is a risk of fire/explosion/toxic fumes produced or there are injured parties report to Supervisor **immediately** or call **Mill Control** if applicable (Step 3)**.**

2. Stop flow of spill if safe to do so:
   (a) Put on appropriate PPE;
   (b) Approach spill site from upwind; and
   (c) Trace the source of material.

3. Report spill to Supervisor:
   (a) Give your name;
   (b) Type or extent of injuries (if applicable);
   (c) Location; and
   (d) Type of spilled material and estimated volume.

   **NOTE**: Mill Control can be contacted on Radio **Channel 1**, Phone Extension **911** or **150**.

4. Contain the spilled material:
   (a) Apply spill pads, absorbent booms in flow path of spill; and
   (b) Place spill tray beneath leaking fluid to minimize spill.

5. Secure the area and remain on scene until assistance arrives:
   (a) Ensure all workers have evacuated to a safe distance if required;
   (b) Divert or stop traffic; and
   (c) Stop people from entering the area.

All personnel receive appropriate training during their initial site orientation of what to do when he/she sees an unanticipated discharge or spill anywhere at the Hope Bay mine site. A flow-chart summarizing the First Responder spill actions is provided in Figure I as a quick reference at the beginning of this plan and is available in all spill kits on site.

## 2.2 Spill Response Organizational Structure

Once a spill has been identified by the First Responder the following spill response organizational structure will be implemented. The responsibilities of the individuals involved in spill response actions are summarized in the sections below. A flow-chart summarizing this structure is provided in Figure II as a quick reference at the beginning of this plan.

### 2.2.1 Supervisors

In the event that a Supervisor is informed of a spill by an employee, he/she will immediately inform the Environmental Superintendent and/or Safety Manager that a spill has occurred and provide details of the spill as outlined in Section 2.1 above. The Supervisor will proceed to the spill location, secure the scene, confirm the type of material/size of the spill and assist with containment actions. Depending on the severity of the spill incident, either the Mine General Manager (MGM) or Environmental Superintendent will provide direction to the Supervisor regarding the removal, storage and disposal of the spilled material. The incident scene is not to be disturbed until an incident investigation can be completed.

Removal and disposal of spill materials is only to be conducted after this investigation is complete and the scene is released by the MGM and/or Environmental Superintendent.

### 2.2.2 Mine General Manager

Once notified of the spill, the MGM will consult with the Environmental Superintendent and Health & Safety Manager/Superintendent to assess the severity of the spill incident and determine whether a spill emergency exists that requires activation of the Incident Command System (ICS) emergency procedures. This assessment will take into account the type and volume of the substance that has spilled, the location of the spill, safety of site personnel, scope of resources required to respond and the proximity of the spill to environmental resources at risk, including water bodies, sensitive habitat, archeological sites or sensitive species in the area.

The ICS is a command structure used in the Emergency Response Plan (ERP) at the Hope Bay mine site. This structure is designed to have a documented sequence of decisions that has been reviewed in advance of an emergency situation and establishes a chain of command to minimize confusion, so that employees will have no doubt who has the authority for making decisions.

If the ICS is activated in response to a spill emergency, the MGM (or designate) becomes the Incident Commander and implements the ICS command system outlined in Figure III at the beginning of this plan. The Incident Commander will communicate with onsite managers and direct all efforts in the spill response including evacuating personnel, identifying resources

required to respond to the incident and activating the Emergency Response Team (ERT). The Incident Commander will direct the Maintenance Superintendent to coordinate containment and clean-up actions based on safety of the responders and environmental protection priorities as identified by the Health & Safety Manager/Superintendent and the Environmental Superintendent. In the event of a large spill, the Incident Commander may direct the Materials Manager/Superintendent to secure off-site resources and facilitate shipment to the Hope Bay site. The Incident Commander will establish communications with the VP Nunavut and VP Health, Safety, Social & Public Affairs and regularly brief these individuals on the status of the spill emergency. A scribe will be assigned to the Incident Commander to document all communications and response actions of the spill incident.

After the spill emergency has been contained, the Incident Commander will conduct an incident investigation with the assistance of the Environmental Superintendent, Health & Safety Manager/Superintendent and other site managers as required.

If the spill is not deemed an emergency by the MGM, the ICS will not be activated and the Environmental Superintendent will provide direction to Site Services for containment and clean-up of the spill after an incident investigation has been completed.

### 2.2.3 Environmental Superintendent

The Environmental Superintendent will assist the MGM in evaluating the severity of a spill situation to determine whether a spill emergency exists. The Environmental Superintendent will identify environmental resources at risk, including water bodies, sensitive habitat and species, or archeological sites in proximity to the spill based on the size/location of the spill, anticipated path of flow and weather conditions at the time. If a spill emergency exists that triggers the ICS, the Environmental Superintendent will advise the Incident Commander on the prioritization of containment and clean-up efforts. If the ICS is not triggered, the Environmental Superintendent will provide direction to Site Services for containment and clean-up of the spill after an incident investigation has been completed.

The Environmental Superintendent is also responsible for ensuring that incident reporting as outlined in Section 3 of this plan is completed and that follow-up monitoring actions deemed necessary to evaluate the extent of the spill and effectiveness of clean-up/remediation efforts are implemented. The Environmental Superintendent will communicate with the Corporate Director – Environment & Critical Infrastructure and the Sr Advisor – Environment & Permitting, Western Nunavut at any time as required to determine effective clean-up measures, discuss reporting submissions and implement environmental monitoring as necessary.

### 2.2.4 Environmental Supervisor/Coordinators

The Environmental Supervisors/Coordinators will assist departmental Supervisors to document and investigate the cause of all spills, and work with onsite managers to develop corrective actions as required to prevent a repeat occurrence of the incident.

The Environmental Supervisors/Coordinators will oversee any follow-up monitoring actions deemed necessary to evaluate the extent of the spill and effectiveness of clean-up/remediation efforts at the direction of the Environmental Superintendent.

## 2.2.5 Health & Safety Manager/Superintendent

The Health & Safety Manager/Superintendent will assist the MGM in evaluating the severity of a spill situation in instances where hazardous conditions may exist for site personnel as a result of a spill. This includes events involving injured personnel or damage to property resulting from the event, and/or situations where risk of fire, explosion or toxic fumes may be created as a result of the spill. The Health & Safety Manager/Superintendent will identify risks to site personnel and emergency responders and advise the Incident Commander on the response in conjunction with the Emergency Response Plan (ERP).

## 2.2.6 Emergency Response Team Coordinator

The Emergency Response Team (ERT) Coordinator is responsible for the implementation and training of the Emergency Response/Mine Rescue Team. During a spill emergency event, the ERT Coordinator will organize the response action of the ERT as directed by the Mine General Manager.

## 2.2.7 Emergency Response Team/Mine Rescue Team

The Emergency Response Team/Mine Rescue Team (ERT/MRT) may be the primary responders to a spill emergency event depending on the severity of spill incident and the containment and clean-up efforts.

## 2.2.8 Communications Delegate

In the event of a spill emergency, a Communications Delegate will be identified by Agnico Eagle who will communicate regularly with the Incident Commander to monitor the spill response and maintain a log of internal and external communications. The Communications Delegate will inform all appropriate agencies, which may include the Kitikmeot Inuit Association, the Nunavut Water Board, the Nunavut Impact Review Board, Environment and Climate Change Canada, Crown-Indigenous Relations and Northern Affairs Canada, the Department of Fisheries and Oceans Canada and will advise the public in the immediate vicinity of the spill if warranted. The Communications Delegate may designate alternative personnel to perform these communications. This individual will also update the Agnico Eagle Executive as required.

### 2.2.8.1 Spill Response Communications

During a spill emergency, on-site staff WILL NOT communicate directly with regulatory agencies, the press or other parties off of the mine site. All external communication is to be through the Communications Delegate. Communication systems will be shut down at the direction of the Incident Commander and only emergency radio and phone lines identified in the Incident Command organizational structure will remain operational.

All on-site communication with the Communications Designate will occur through or at the direction of the Incident Commander. On-site communications will use portable radios on

designated radio channels. Independent satellite phones are available for crews for emergency communications in the unlikely event that the radio and phone systems fail.

### 2.2.9 Spill Response Actions

Most chemicals stored onsite are kept in small quantities and not expected to result in a major spill incident. Any chemical product which is listed under the E2 Regulations and which will be stored in quantities on site equal to or greater than that listed in Schedule 1 of these regulations will have an additional Product Specific Emergency Response (PSER) Plan detailed for that product. These PSER plans can be found in Appendix 1 of this document.

Chemical containers are appropriately labelled to identify their contents in the event of a spill. The product label will be used to identify the substance and hazards, the Safety Data Sheet (SDS) will be consulted to determine the proper PPE requirements and appropriate spill response procedures. The following sections outline general spill response actions to be taken in the event of a spill in each associated environment. The basic spill response steps to be taken in the event of the spill are illustrated in Figure 2.1 below.

Note that some substances can be highly reactive in contact with water, air, or other substances and should not be addressed unless safe to do so.

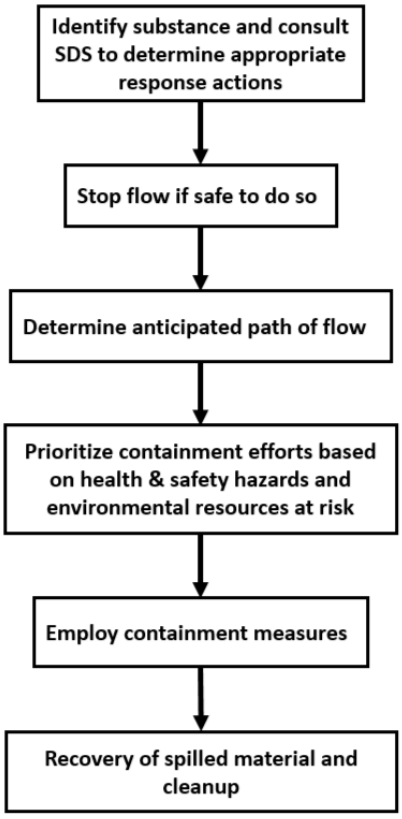


Figure 2.1. General Spill Response Actions

## 2.2.10 Spills on Land and Water

In the event of a liquid spill on gravel, rock, soil or vegetation, it is very important to prevent the liquid from entering any body of water where it will spread and likely have greater environmental impact. Liquid spills on land will be contained and cleaned up by:

- Covering the spill with appropriate absorbent pads and placing absorbent booms in the path of flow of the spill;
- Constructing temporary berms from soil or snow at the leading edge of the spill to minimize flow:
  - Plastic tarps can be placed over and at the foot of the berm to capture pooling liquid and facilitate recovery; and
  - Temporary berms are an interim measure and will be removed as soon as possible after the spill is contained and remedial actions complete.
- Pumping spilled material to empty drums or tanks;
- Using a vacuum truck to recover spilled material;
- Excavators and other heavy equipment may be used to excavate contaminated materials; and
- If safe to do so, blow torches (Tiger Torches) may be used to clean small hydrocarbon spills that occur on unlined areas of the camp pad to reduce waste generation and handling.

In the event of a spill on water, the spread of the spilled material will be limited to the extent possible. The following steps will be taken to contain and clean-up a spill on water:

- Identify the direction and speed of the flow path of the product based on weather conditions and drainage patterns:
  - Monitor the spread of the material using a drone or from a helicopter if possible to identify the area of spread.
- Use appropriate absorbent pads, socks and similar materials to recover spilled product:
  - Granular sorbent materials are NOT to be used for spill response on water.
- Hydrophobic absorbent booms will be deployed to contain large spills and to facilitate recovery:
  - Absorbent booms will be drawn slowly in to encircle the spilled product and absorb it.
  - High winds, waves and other factors may limit the effectiveness of these materials.
- Skimmers will be deployed in open-water areas to remove product from the water surface and boards or plywood may be used in streams or culverts to reduce the flow of spilled product on the surface and limit the area of the spill on the water;
- Use of sub-surface barriers to contain spilled product that may sink;
- Pump contaminated water into tanks or storage bladders if possible:
  - A vacuum truck may be used to recover spilled product.

- Contaminated substrate and vegetation will be removed either manually or with the use of heavy equipment if feasible; and
- Chemical dispersants should not be used as a spill response technique at the Hope Bay project, seek direction from the Corporate Director – Environment & Critical Infrastructure and the Sr Advisor – Environment & Permitting, Western Nunavut.

Also see Section 2.3.18 of this document for guidance related to additional spill protection, clean-up, and reporting measures for environmentally sensitive species and archaeological sites.

## 2.2.11 Spills in a Marine Environment

The most effective way to minimize environmental damage is to focus on source control and to prevent product from spreading. The following steps will be taken in the event of a spill in the marine environment:

- Identify the direction, speed and flow path of the product based on weather conditions and drainage patterns:
  - Monitor the spread of the material using a drone or from a helicopter if possible to identify the area of spread.
- Use of appropriate absorbent pads, socks and similar materials to recover small volumes of spilled product:
  - Floating spill response booms will be used to encircle a barge prior to off-loading chemicals and fuel from the barge as a precautionary measure.
  - Granular sorbent materials are NOT to be used for spill response on water.
- Hydrophobic absorbent booms will be deployed to contain large spills and to facilitate recovery:
  - Absorbent booms will be drawn slowly in to encircle the spilled fuel and absorb it.
  - High winds, waves and other factors may limit the effectiveness of these materials.
  - Granular sorbent materials are NOT to be used for spill response on water.
- Skimmers will be deployed in open-water areas to remove product from the water surface;
- Use of sub-surface barriers to contain spilled product that may sink;
- Pump contaminated water into tanks or storage bladders if possible; and
- Chemical dispersants should not be used as a spill response technique at the Hope Bay project, seek direction from the Corporate Director – Environment & Critical Infrastructure and the Sr Advisor – Environment & Permitting, Western Nunavut .

Also see Section 2.3.18 of this document for guidance related to additional spill protection, clean-up, and reporting measures for environmentally sensitive species and archaeological sites.

Spill response measures specific to bulk fuel offloads completed at Roberts Bay are detailed in the Hope Bay Ocean Pollution Prevention Plan/Oil Pollution Emergency Plan (OPPP/OPEP). The OPPP/OPEP is the main document of reference for spill control actions during a fuel offload at the Hope Bay project and is revised annually.

### 2.2.12 Spills on Snow

Spills on snow will be contained and recovered by:

- Use of appropriate absorbent pads, socks and similar materials to recover spilled product;
- Compacting the snow into snow-berms and placing a liner of plastic sheeting at the toe and over the berm to collect spilled material and facilitate recovery;
- Using the snow as a natural absorbent to collect spilled product; and
- An excavator, grader or other heavy equipment may be used to scrape up contaminated snow to be stored in a lined containment area or placed in steel drums.

### 2.2.13 Spills on Ice

Spills on ice will be contained and cleaned up by:

- Use of appropriate absorbent pads, socks and similar materials to recover spilled product;
- Creating snow-berms by compacting snow around the edge of the spill and placing a liner of plastic sheeting at the toe and over the berm to collect spilled material and facilitate recovery;
- Scraping contaminated snow/ice from the ice surface and placing in lined containment:
  - Snow may act as a natural absorbent to collect spilled product.
- In broken-ice conditions a skimmer may be used to collect product on the surface of open-water areas:
  - Caution must be used when conducting spill response efforts in broken-ice situations. An appropriate Task Hazard Analysis safety plan and PPE must be determined before initiating these actions.
- An excavator, grader or other heavy equipment may be used to scrape up contaminated ice to be stored in a lined containment area or placed in steel drums:
  - A vacuum truck may be employed to recover large volumes of spilled material.

### 2.2.14 Spills under Ice of Substances that Float

Hydrocarbon spills under ice will be addressed by:

- An appropriate Task Hazard Analysis safety plan and PPE must be determined before initiating these actions;
- Testing of the ice to ensure thickness is safe for personnel to work on the surface;

- Once ice has been deemed safe, slots will be cut in the ice surface in the area surrounding the spill and downstream of the anticipated direction of flow/spread:
  - Contaminant will rise to the surface within the slots.
  - Determine the direction of any currents (if expected; this would not be the case in an ice-covered lake) to identify the direction of flow and conduct ice profiling beyond the extent of the spill to identify any spread of the contaminant.
- Contaminant will be skimmed/scooped out from within the slots and placed into empty pails/drums as it is recovered;
- Pockets within the ice where contaminants can pool will be identified (this applies to ice which may have buckled areas where spills may pool; largely an ocean occurrence);
- Appropriate absorbent pads and booms will be used to contain spill if there is water moving past the ice edge (if any) where the spill took place:
  - Set booms ahead of the spill based on the direction of anticipated flow.
- A vacuum truck may be employed to recover larger volumes of spilled material or utilizing an Auger and pump system to pump spilled material into containers (e.g., drums).

## 2.2.15 Spills under Ice of Substances that Sink

- Response to spills below ice of substances which sink will be evaluated on a quantity, substance-specific, and risk basis. In many circumstances, particularly for small releases of non-toxic substances, the appropriate response may solely be to limit discharge as soon as possible and safe to do so. Agnico Eagle will assess each individual situation and may consult a remediation specialist for advice in addition to discussions with the KIA, CIRNAC, DFO, and ECCC, where appropriate;
- Allowing substance to settle with minimal disturbance to limit spread (for waterbodies without current);
- A vacuum truck may be employed to recover larger volumes of spilled material or utilizing an Auger and pump system to pump spilled material into containers (e.g., drums);
- Use of sub-surface barriers to contain spilled product if there is water moving past the ice edge (if any) where the spill took place; and
- Appropriate subsurface containment will be used to contain spilled material if there is water moving past the ice edge (if any) where the spill took place.

## 2.2.16 Spills under Ice of Substances that Dissolve

- Response to spills below ice of substances which dissolve will be evaluated on a quantity, substance-specific, and risk basis. In many circumstances, particularly for small releases of non-toxic substances, the appropriate response may solely be to limit discharge as soon as possible and safe to do so. Agnico Eagle will assess each individual situation and may consult a remediation specialist for advice in addition to discussions with the KIA, CIRNAC, DFO, and ECCC, where appropriate;

- A vacuum truck or an Auger and pump system may be used to pump contaminated water into containers (e.g., drums) if rate of dissolution is slow enough/contaminated water volume is small enough to make this feasible; and
- For Sodium Cyanide spills see substance-specific emergency response plan in Appendix 1.

## 2.2.17 Spills of Compressed Gas

If an accidental release of compressed gas occurs:

- Stop the source if safe to do so;
- Ventilate the area well to dilute the gas;
- Cordon off the area to prevent accidental ignition, explosion or inhalation by personnel; and
- Only employees with proper training and PPE will attempt to mitigate the release.

## 2.2.18 Burning Spills

Small spills of hydrocarbons (< 100 L) may be removed from unlined camp pad areas by using a propane torch (Tiger torch). This response method would reduce the waste production and handling/storage of contaminated materials associated with the spill and would reduce the risk of spreading or contaminating other areas during transport of these materials. No water would be used and no waste would be deposited to water as a result of this response method.

Extra safety precautions must be taken prior to the use of a propane torch in the event of a spill. A Task Hazard Analysis will be completed prior to undertaking this activity. The SDS for the product will be reviewed to check for the reaction of the substance to heat. PPE such as Fire Resistant clothing and the proper gloves and respirator will also be worn and a spotter with a fire extinguisher rated for the type of spill and fire must be present during the clean-up.

Burning of larger spills may be considered on a case by case basis and only once Agnico Eagle has consulted with and received approval from ECCC, the KIA, the CIRNAC Inspector and any other associated regulatory agencies. This method of response is only useful if quick action is possible, and prior to natural spill dispersal and loss of the more ignitable hydrocarbon fraction.

## 2.2.19 Spills Affecting Environmentally Sensitive Species or Archeological Sites

The Hope Bay mine site contains a number of habitats, species and sites of archeological and historical importance. The possibility exists for a spill to impact these environmental and cultural resources.

Agnico Eagle and previous companies operating on the Hope Bay site have conducted numerous ecological surveys to identify these areas at risk, with the focus of identifying those areas immediately surrounding mine infrastructure which are at greatest risk of impact from a spill.

In the event that a spill enters the natural environment, the Environmental Superintendent may use maps identifying these sensitive areas to prioritize the protection of these resources. Prioritization of environmental sensitivities will not be at the expense of safety or of reaching or maintaining control of the release. Sensitivity maps are provided in Appendix 3.

Should decisions be required which protect some sensitive areas at the expense of others, the hierarchy of protection will attempt to favour (except as directed otherwise by regulatory agencies):

1. waterbodies;
2. sensitive habitat types;
3. archaeological sites;
4. rare plants; and
5. active raptor nest or wildlife den.

For spills in water, prioritization will attempt to avoid vegetated and finer substrate shoreline areas (sand, gravel and cobble) from which recovery is most difficult and which may be of high value to fish.

All of the communications outlined in this section would occur in addition to any appropriate spill reporting outlined in Section 3.

### 2.2.19.1 Mitigation of Impacts to Wildlife

All reasonable measures will be taken to deter wildlife from coming into contact with any spilled material. In the event that wildlife does come in contact with a spilled material, Agnico Eagle will contact the KIA and either ECCC (in the case of migratory birds (does not include raptors)) or GN Wildlife Officers (in the case of other animals) to inform them of the impact and determine an appropriate course of action. In cases where wildlife can be rescued, wildlife spill response experts will be contacted for assistance and guidance.

### 2.2.19.2 Mitigation of Impacts to Birds

In the event that a contaminant is released to a body of water, initial wildlife response measures will be exercised in alignment with the Birds and Oil-CWS Response Plan Guidance document if migratory birds are or may be impacted. Environment and Climate Change Canada's Canadian Wildlife Service (ECCC-CWS) will be consulted to determine response strategies including the most appropriate humane treatment of oiled wildlife. Agnico Eagle may also engage contract response agencies specialized in wildlife response actions during a spill event. Initial wildlife response measures should include:

- Hazing to deter wildlife from using spill area:
  - Watercraft;
  - Sound makers such as whistles or horns; and
  - Helicopter* (if available and safe to do so).

- Wildlife monitoring:
  - Assessment surveys for oiled and unoiled wildlife; and
  - Wildlife observers will be on vessels and aircraft if possible.
- Bird Collection*:
  - To collect dead and live birds within the spill area and adjacent. All response vessels should be equipped with dip nets, large plastic collecting bags to hold dead birds, and cloth bags or cardboard boxes to hold live oiled birds.

** The use of aircraft to deter migratory birds and the collection of live and dead birds require an authorization from ECCC-CWS.*

#### 2.2.19.3 Mitigation of Impacts to Archeological Features and Sensitive Habitats

If a spill is determined to have impacted any archeological or historic resources, prior to removing soil or vegetation, Agnico Eagle will immediately contact the Project Archaeologist. The Project Archaeologist will provide advice on next steps, and may travel to site to mitigate the archeological site. The Archeologist will also coordinate permits and communications with the Government of Nunavut Territorial Archaeologist.

In the event that shoreline substrates or aquatic vegetation have been impacted, Agnico Eagle will contact Environment and Climate Change Canada and the Department of Fisheries and Ocean for advice prior to initiating removal.

## 2.3 Disposal of Contaminated Materials

All contaminated materials generated during a spill event will be contained and disposed of as per the product specific SDS and as outlined in the Hazardous Waste Management Plan and Non-Hazardous Waste Management Plan. Empty drums, barrels, mega-bags and storage tanks are available to store contaminated materials for disposal.

Hydrocarbon contaminated soil, snow and water may be remediated in Landfarm facilities if these materials meet the requirements for remediation as per the Hydrocarbon Contaminated Material Management Plan or may be placed within the underground mine.

## 2.4 Spill Response Resources

### 2.4.1 On-Site Resources

Spill Response Kits will be available near (within 200 m) any areas where chemicals are stored and used on site, including near all bulk fuel berms and smaller fuel tanks. Spill response kits will be easily accessible for personnel responding to a spill. As project activities evolve and new locations of chemical storage and use are identified new spill kits will be added as needed, and all active construction areas where equipment is operating will also have a spill kit located within 200 m.

Additional spill response equipment is maintained for response in an aquatic environment. This equipment is stored in ten moveable containers that can be relocated for rapid response to a spill in a stream, lake or marine environment.

Agnico Eagle maintains an on-site supply of appropriate Personal Protective Equipment compatible with the chemical products used on site, including chemical resistant suits, gloves and boots, face shields/goggles and respirators. In the event of a spill, this equipment is used by spill responders as outlined in the product SDS. Specialty equipment, such as Self-Contained Breathing Apparatus, air quality monitors and fire retardant clothing are available and used as needed to ensure a safe response to a spill incident.

All fuel transfer vehicles are also equipped with a spill kit designed to address smaller spills of hazardous fluids (< 40 L). Personnel are trained in proper fueling procedures and spill trays are used during all fueling activities to minimize the potential of an unintentional release.

A list of supplies contained in each spill kit type, supplies in the aquatic spill response containers, and PPE/specialized equipment for spill response is provided in Appendix 2.

Agnico Eagle also maintains an on-site supply of roll, pad and mat absorbents, plug and dyke kits, mini booms, absorbent socks, peat moss, crushed corn cobs, coconut mats, hand tools, empty storage tanks and various pieces of heavy equipment including a vacuum truck, grader, dozers, loaders, excavators and haul trucks that would be used in the event of a large spill.

Spill kits are replenished as needed after use and inspected at least once per quarter. The purpose of the inspection is to evaluate the location of spill kit proximity to associated work activities, inspect the condition of the spill kit, and check that all required contents are available and in good condition.

The aquatic response supplies and equipment are inspected annually prior to fuel offloading events and after use in the event of a spill to the aquatic environment.

### 2.4.2 Off-Site Resources

The Hope Bay Project is a remote location that is only accessible by plane for the majority of the year, with a short open-water ship access season. The Hope Bay Project Spill Contingency Plan does not rely on off-site resources to successfully respond to anticipated upset conditions. The Plan has been developed such that the resources required to respond to spills have been positioned on site. It is anticipated that the Hope Bay Project will have sufficient resources and trained personnel to respond to all types/sizes of spills that could potentially occur on site.

Additional off-site resources would be procured and flown to site as needed in the event that onsite resources were exhausted.

# 3 Spill Investigation, Documentation and Reporting

## 3.1 Spill Investigation

A spill investigation will be completed for all spill events that occur at the Hope Bay site. This investigation will be aimed at determining the root cause of a spill and identifying corrective actions that may reduce the risk of a repeated incident.

For spills that exceed the volume thresholds outlined in the Immediately Reportable Spills table at the beginning of this plan, a ‘Systematic Cause Analysis Technique’ (SCAT) Investigation will be completed. SCAT is an in-depth root cause analysis used to investigate significant incidents and identify corrective actions. The SCAT investigation form will be completed by the departmental Supervisor with support from the departmental Manager/Superintendent and the Environmental Superintendent within 7 days of the spill occurrence. The Safety Manager/ Safety Superintendent and MGM may participate in the investigation and assist in developing corrective actions.

For spills that do not exceed the volume thresholds outlined in the Immediately Reportable Spills table, a ‘5 Why’ Investigation will be completed. The ‘5 Why’ method is a simple question-asking technique used to determine the cause/effect relationships underlying a spill. The objective is to identify the root cause by repeatedly asking ‘Why?’ the event occurred. The ‘5 Why’ investigation form will be completed by the departmental Supervisor within 48 hours of the event and forwarded to the Environmental Supervisor/Coordinator.

Records of all spill events and investigations will be maintained by the Environmental department and documented in the Environmental Incident Register. Any corrective actions that are identified will be entered into the Environmental Incident Register and implemented immediately by the departmental Supervisor and/or Manager/Superintendent.

## 3.2 Agnico Eagle Internal Reporting

An Incident Event notification will be sent by the departmental Supervisor to the Environmental Superintendent prior to the end of the shift in which the spill event occurred. This notification will provide a brief description of the spill, consequences of the spill, root cause of the event if identified and a brief description of the response including containment and cleanup actions.

Results of the SCAT Investigation and the ‘5 Whys’ Investigation will be communicated to all site Supervisors, Superintendents and Managers, as well as offsite Environmental personnel. Corrective actions generated by these investigations will be discussed with all personnel at the Hope Bay site through email communications and/or discussions at departmental safety meetings.

All details of the spill investigation and implementation of corrective/preventative actions will be documented in the Environmental Incident Register by the Environmental department.

## 3.3 External Reporting Requirements

In the event that a particular material spill meets or exceeds the amount specified in the Immediately Reportable Spills Table (located at https://www.enr.gov.nt.ca/en/services/report-spill, and at the beginning of this plan), the Environmental Superintendent or delegate will complete the NT-NU Spill Report form (available through the preceding link) and report the spill to the NT-NU 24 Hour Spill Report Line by phone (867-920-8130) and/or e-mail (spills@gov.nt.ca) as soon as possible within 24 hours of the event. The CIRNAC Inspector and the KIA will be copied on these submissions. The submission of the report will not be delayed even if not all information is available at the time of submission.

In the event that a spill or an unauthorized deposit of a deleterious substance has occurred to the marine environment, the MGM and/or Environmental Superintendent will also notify the ECCC Enforcement Officer, the KIA and the Canadian Coast Guard station immediately and provide details on the time and location of the discharge, type and quantity of pollutant, description of assistance and salvage measures employed and any other relevant information. A written report will also be submitted within 24 hours. A copy of this report will be submitted to a Transport Canada Marine Safety Inspector if required.

The Environmental Superintendent will communicate with the Corporate Director – Environment and Critical Infrastructures and the Sr Advisor – Environment & Permitting, Western Nunavut during the incident to determine additional notifications to be submitted to regulatory agencies during the event.

In the unlikely event that an environmental emergency occurs which may adversely affect members of the public (closest community is located >120km away) the Mine General Manager will work with the Communications Delegate to provide notification to the public during and after the event.

Within 30 days of the event, the Environmental Superintendent or delegate will submit a detailed written spill report to the appropriate regulatory agencies. This report will include a description of the spill location, type and quantity of spilled material, associated causes that led to the incident, details of actions taken to remediate affected areas and potential effects of the spill, measures undertaken to reduce the potential for a reoccurrence of a similar incident, results of monitoring activities undertaken and details of any further actions required. Other applicable details such as the names of agencies on the scene, persons or agencies advised concerning the spill, a chronological sequence of events including internal/external notifications, and lessons learned from events leading up to the spill and the response actions taken may be included in this report. Additional follow-up engagement may occur as deemed appropriate by the Corporate Director – Environment and Critical Infrastructures based on the specific spill and stakeholder input.

A list of spills reported to the NT-NU Spill Report Line will also be provided in the annual report for each of the licence areas.

## 3.4 Monitoring and Restoration

Specific monitoring requirements for spills will be determined on a case by base basis dependent on the nature of the spill. Monitoring will be conducted in the event that i) spilled material cannot be removed, ii) spill occurs to water of substances that dissolve, sink, or where substance recovery is unlikely and iii) externally reportable spills to land for which recovery is unlikely or incomplete. Details of follow-up monitoring conducted in response to a spill will be detailed in the 30 day follow-up spill report submitted to the NT-NU Spills Hotline, the CIRNAC Inspector and the KIA.

Monitoring activities will be conducted to assess the impacts of the spill and the effectiveness of associated cleanup/remediation efforts in the event spilled material cannot be removed. This may include a number of monitoring techniques and collection of samples for laboratory analysis. The monitoring program will be developed by the Environmental Superintendent in consultation with the Environmental Affairs Department and associated regulatory agencies.

Monitoring will be triggered in the event of spills to water of substances that dissolve or sink or where substance recovery is unlikely. Samples will be collected to characterize 1) the material discharged (if not of known characteristics), 2) the water at the location of entry into the waterbody as soon after the discharge as possible, and 3) water at a ‘reference’ location, preferably within the same waterbody but outside of the area of potential impact and collected at approximately the same time as the sample collected at the point of entry.

Monitoring will also be triggered in the event of externally reportable spills to land for which recovery of spilled material is unlikely or may be incomplete. Samples will be collected from locations of suspected highest remaining contamination, or as a composite sample from the remediated area. Samples will be compared to soil remediation criteria and background soil concentration data to verify appropriate clean-up has occurred.

The Environmental Supervisor/Coordinators will be responsible for overseeing the implementation of these monitoring activities at the direction of the Environmental Superintendent. No person will be permitted to sample spilled materials unless that person has received adequate training in the identification of the hazards associated with the spilled material, the selection and use of appropriate personal protective equipment, and safe sampling procedures.

The final required clean-up, restoration (or mitigation) and on-going monitoring will be conducted as needed, and where appropriate in consultation with, and satisfaction of, the CIRNAC Inspector and the KIA. Site specific studies may be required to determine the appropriate final clean-up criteria.

If required, continuing and progressive sample collection/analysis will be conducted and reported upon until the completion of all prescribed remedial activities.

## 3.5 Incident Review and Root Cause Analysis

A review of incidents and root cause analysis will be conducted by the Environmental Superintendent quarterly. The purpose of this review will be to identify trends in root cause. Lessons learned from this exercise will be used to develop additional corrective actions including awareness campaigns for site personnel, improvements to operational equipment and spill response resources.

# 4 Spill Management and Mitigation

Site supervisors and managers are responsible for ensuring work area inspections and risk assessments are conducted of their respective work areas. Risk assessments include evaluation of hazardous materials available and in use in the work area, and likelihood and potential consequences of various spills. Where appropriate based on likelihood and potential severity, mitigation, management and/or substance-specific spill response plans will be developed.

The following section outlines currently identified potential spill risks with potential for high severity and/or probability of occurrence (worst case scenarios) and the management and mitigation measures employed to reduce the likelihood of these occurrences and/or the potential severity. Additional scenarios, as well as appropriate management and mitigation actions, will be added to this section through time as they are identified.

## 4.1 Issue: Spill from a Chemical Storage Tank or Other Containment

A fuel storage tank, containment area, sump, emergency dump catch basin or other product container may release their contents for a number of reasons, such as damage due to puncture, openings developed over time due to degradation (such as rusting), or overfilling.

Equipment malfunction or facility failure may cause a spill event to occur, particularly during extreme winter temperature conditions experienced at the Hope Bay mine site.

### 4.1.1 Management Response

This risk is minimized through the use of secondary containment and spill containment. All bulk fuel facilities are located in secondary containment (i.e., containment designed to contain volumes equivalent or greater than 110% of the aggregate or total volume of the largest container in the containment – whichever is greater). Smaller chemical storage tanks are either double walled (have built-in secondary containment), and are located in spill trays such that any leakage from hoses or lines are further contained or are located in secondary containment berms. Spill trays are used under fuel drums and other smaller chemical containers.

Inspections of all containment structures will be conducted weekly to ensure concerns are noted and are addressed promptly.

In the event that a spill exceeded the capacity of a containment berm (for example, if more than one container in a berm was breached) or a containment berm became compromised, the spill response actions outlined in Section 2 would be implemented. Containment measures would be deployed to prevent the spread of the chemical into the natural environment. This would include deploying absorbent materials or booms and constructing diversion trenches or sumps to intercept the spilled product. The vacuum truck and all available pumps would be deployed to transfer spilled product into empty storage tanks or alternative containment berms if necessary.

## 4.2 Issue: Spill during Transport

Spills may occur during the transport of chemicals from one site location to another.

### 4.2.1 Management Response

As new chemicals, fuels and hazardous materials are brought to site, standard operating procedures are developed that outline the process for safely transporting or transferring these products between locations at site. Experienced operators transport these materials and are familiar with site road conditions. Traffic right-of-way procedures are established that reduce the risk of an accident between two vehicles and all vehicles are equipped with radio communication to ensure operators can remain in contact at all times. A spotter is used to direct operators loading and off-loading these materials from transport vehicles to reduce the risk of damage to chemical storage containers during transport and loading. Spill trays are used when chemicals are transferred to equipment or secondary containers for use.

## 4.3 Issue: Spill during Transfer

Spills have an increased likelihood of occurring during transfer of chemicals. This may be the case during equipment refuelling, transfer of chemicals between containers, or transfer of wastewater or tailings in pipelines. Such spills may result from human error (overfilling, inaccurate filling) or equipment malfunction (such as a break in the transfer line/pipe due to wear or freeze/thaw cycles).

### 4.3.1 Management Response

As new chemicals, fuels and hazardous materials are brought to site, standard operating procedures are developed that outline the process for safely using these chemicals during operations. Workers who use chemicals or fuels during daily operational activities receive training in the proper handling, storage and disposal of these materials prior to commencement of work. Any applicable SDS sheets are reviewed by all workers using these chemicals to identify potential hazards. Workers are encouraged to plan work activities before beginning a task to reduce the potential for inadvertent errors.

Fueling of mobile equipment generally takes place at designated fueling stations, which are located inside of secondary containment berms, minimizing risk to the environment. Remote fueling, such as occurs for stationary equipment and helicopters, requires a spill kit be easily accessible and spill trays are used.

Fuel tanks are not filled to full capacity, to reduce the possibility of overflow during fueling or due to expansion.

Workers are provided with on-site training in spill response techniques and are familiar with the response resources available in the event of a spill.

Wastewater transfer pipelines, for sewage as well as other wastewaters, are constructed to reduce breakage due to freeze/thaw cycles and are routinely inspected to ensure they are

functioning. Delineators are used to mark pipelines to ensure vehicle and equipment operators are aware of pipeline locations when travelling on site roads.

Additional design features of the tailings lines which reduce the risk of spills are outlined in the Hope Bay Project Phase 2 Doris Tailings Impoundment Area Operations, Maintenance and Surveillance (OMS) Manual.

Should any of the above measures fail, spill response would be undertaken as outlined in this document.

## 4.4 Issue: Spills from Equipment

Spills may occur from mobile and stationary equipment during routine maintenance or due to equipment malfunction or wear combined with extreme weather conditions.

### 4.4.1 Management Response

All equipment at site undergoes routine preventative maintenance, and mobile equipment is subject to daily pre-operational inspections to identify specific issues for mechanical resolution. Where possible, all equipment maintenance is performed in designated maintenance areas. During equipment maintenance, spill trays are used as needed. Spill trays are also used for stationary equipment, or those parked for extended periods of time.

## 4.5 Issue: Health and Safety of Spill Responders

Some products and chemicals used at the Hope Bay site may pose a risk to the health and safety of personnel responding to a spill. Spilled materials may create toxic, explosive or flammable hazards that must be considered during response efforts.

### 4.5.1 Management Response

Personnel working at the Hope Bay site are provided on-site training in the proper handling, storage and disposal of chemicals related to their tasks. The product SDS is reviewed by personnel prior to using these chemicals to identify potential hazards related to handling these materials.

The SDS for each chemical outlines the specific personal protective equipment (PPE) required when handling each product and provides information on methods for clean-up in the event of an accidental release to the environment. SDS sheets are maintained at site for all chemicals stored and used at the Hope Bay Project.

In the event that a spill poses toxic, explosive, flammable or other hazards that endanger personnel or the environment, the Emergency Response Team (ERT) will be activated through the Incident Command System. Members of the ERT are equipped with additional PPE that allows them to safely respond to hazardous situations and receive additional training in response techniques for these scenarios.

Site chemicals are reviewed annually and compared to the Environmental Emergency Regulations. If any chemicals are anticipated to be stored in quantities exceeding the volume thresholds outlined in these regulations a Product Specific Emergency Response Plan will be developed and submitted as an addendum to this Plan. Product Specific Emergency Response Plans identified as necessary for products stored at the Hope Bay site are located in Appendix 1 of this Plan.

## 4.6 Issue: Spills to Water

Spills to water are of particular concern due to the sensitivity of water environments and potential of rapid spread of spills into water.

### 4.6.1 Management Response

No chemicals are stored within 31 m of water. All chemicals are kept in containment, and spill kits are located nearby which contain small booms and absorbent pads. In the event of a large spill to water, additional itemized and audited Aquatic Spill Response Equipment is located at Roberts Bay in movable seacans. Response actions protective of wildlife are outlined in Section 2.2.18 Environmentally Sensitive, above.

## 4.7 Issue: Operational Considerations for Spill Response

Hope Bay is a remote project site that experiences extreme weather conditions and seasonal daylight variations which may impact the effectiveness of spill response actions. The Hope Bay Project is only accessible by plane for the majority of the year, with a short open-water ship access season.

### 4.7.1 Management Response

This Plan has been developed such that the resources required to respond to spills have been positioned on site. It is anticipated that the Hope Bay Project will have sufficient resources and trained personnel to respond to all types/sizes of spills that could potentially occur on site.

The majority of activities conducted at the site occur on the project infrastructure roads and camp pads. In the event that a spill occurs off the site infrastructure, helicopters and off-road tundra (low impact) vehicles, such as the Rim-pull, will be used to mobilize spill response resources. The impact from these vehicles will be monitored and damage to the surrounding tundra minimized to the extent possible.

Extreme weather conditions, such as sub-zero temperatures, that may impact the response capabilities of personnel will be mitigated by rotating personnel from response activities to break areas as needed. This may include using heated vehicles, portable shelters or heated buildings.

Portable light plants are available on-site and will be used in seasonal darkness to aid in spill response containment, clean-up and remedial actions.

# 5 Training

All personnel working at the Hope Bay site receive onsite training during the initial site orientation. At that time, every employee is informed that he/she is potentially a First Responder to any spill or unanticipated discharge event and is provided a brief explanation of the actions expected of every First Responder and where to find the First Responder SOP (flow chart) which is included in the site spill kits. Spill response plans are also located in accessible public locations on site.

Supervisors provide task-specific training to workers using chemicals onsite which includes appropriate handling, storage, disposal, and where to find guidance on spill response for these chemicals. Workers are provided with information on spill response requirements and the locations of spill kits in their immediate work area. Spill response techniques are reviewed in departmental safety meetings by representatives of the Environmental department on a regular basis and lessons learned from spill investigations are communicated to all workers as corrective actions are developed.

Additionally, more detailed training is provided to workers involved in fuel offloading activities, through consultants such as Riverspill Response Canada Ltd. The instructional sessions include site safety, materials properties and strategies as well as tactics for containment and recovery in-facility, on land (brief) and on water spills. This training also includes the performance of mock spill response practical exercises in years of fuel offload, including deployment of spill response equipment under typical operating conditions.

Members of the Emergency Response Team receive frequent training regarding a variety of incident scenarios and response techniques applicable at the Hope Bay site. This training includes response to fire, explosive or toxic incidents, including spill of materials that could result in these conditions.

These training programs ensure that personnel understand the procedures in the Hope Bay Spill Contingency Plan, the hazards of the materials stored on-site, who is responsible for what activities, how to initiate a response, where to find and use response equipment, and how to obtain off-site resources.

## 5.1 Spill Response Simulation Exercises

A spill response simulation exercise will be conducted annually in coordination with Agnico Eagle Management and the Emergency Response Team. The exercise will simulate one of the environmental emergencies identified in Appendix 1 for an E2 Schedule 1 listed hazardous chemical or product stored on site. The exercise will simulate the release of one of these products to the environment and will test the response actions of the Incident Command System and Emergency Response Teams.

Every 5 years, a full-scale simulation exercise will be conducted which will test the response actions of the Incident Command System and Emergency Response Teams, and will include deployment of personnel, resources and equipment during the simulation.

Each annual exercise will simulate the release of a different E2 Schedule 1 listed product stored on site until all environmental emergencies identified in the Product Specific Emergency Response Plans have been tested, at which point the cycle will begin again. Emergency Response Plans for E2 Schedule 1 listed products stored on site are provided in Appendix 1 of this Plan.

Details of spill response simulation exercises will be documented and improvements identified will be incorporated into updates to the Spill Contingency and Emergency Response Plans. A record of these exercises, results and modifications to these plans will be maintained on file for 5 years and available for inspection upon request.

Once completed, a notice regarding the simulation exercise will be submitted to the Minister as outlined in Schedule 5 of the Environmental Emergency Regulations.

# 6 References

2010. *Consolidation of Environmental Protection Act* (R.S.N.W.T 1988, c.E-7). Current to August 29, 2010, Government of Nunavut.

2011. *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (S.C.2002, c.10) Current to May 5, 2011, Aboriginal Affairs and Northern Development Canada.

*Consolidation of Environmental Emergency Regulations* (S.O.R. 2019-51). Current to November 19, 2019, Environment and Climate Change Canada.

*Consolidation of Regulation R-068-93 Spill Contingency Planning and Reporting Regulations* as provided by the Government of Nunavut website.

*Contingency Planning and Spill Reporting in Nunavut, A Guide to the New Regulations*. Environmental Protection Service, Department of Sustainable Development, Government of Nunavut.

*Implementation Guidelines for Environmental Emergency Regulations.* 2011. Environment and Climate Change Canada.

Canadian Wildlife Services. 2012. *Birds and oil-CWS Response Plan*.

INAC. 2007. *Guidelines for Spill Contingency Planning*. Water resource Division, Indian and Northern Affairs Canada, April 2007.

International Council on Metals and the Environment. 1999. *The Management of Cyanide in Gold Extraction.*

Mudder, T.I. *Cyanide Spills Prevention and Response.*

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HOPE BAY SPILL CONTINGENCY PLAN

HOPE BAY, NUNAVUT

# Module A: Doris

# Conformity Table

| Licence | Part | Item | Topic | Report Section |
|---|---|---|---|---|
| 2AM-DOH1335 | H | 1. | The Licensee shall implement the following plans as approved by the Board: *Surface Emergency Response Plan*, *Underground Emergency Responses Plan*, and *Hope Bay Project Spill Contingency Plan*. The Licensee shall comply with the Plan(s) and any changes deemed significant shall require the submission and subsequent approval of the Board in writing. | This Plan |
| | | 2. | All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary High Water Mark of any adjacent Water body and inspected on a regular basis. | Section 2<br>Section 4.6 |
| | | 3. | The Licensee shall prevent any chemicals, petroleum products or wastes associated with the project from entering Water. | Section 2<br>Section 4.6 |
| | | 4. | The Licensee shall provide secondary containment for fuel and chemical storage as required by applicable standards and acceptable industry practice. | Section 4.1 |
| | | 5. | The Licensee shall perform weekly inspections of petroleum products storage and containment facilities, fuel tanks and connectors, for leaks and settlement and shall keep a written log of inspections to be made available to an Inspector upon request. More frequent inspections may be requested by an Inspector. | Section 4.1 |
| | | 8. | The Licensee shall conduct emergency maintenance and servicing on equipment, in designated areas, and shall implement measures to collect motor fluids and other Waste to prevent and contain spills. | Section 4.4 |
| | | 9. | The Licensee shall, subject to Section 16 of the Regulations, report any unauthorized deposits or foreseeable unauthorized deposits of waste and/or discharges of Effluent, and: | See below |
| | | 9a. | • employ the Spill Contingency Plan; | Section 2 |
| | | 9b. | • report the incident immediately via the 24-Hour Spill Reporting Line *[see pg. iii Key Government Contact List]*, to the Inspector at [see pg. iii Key Government Contact List] and to the Kitikmeot Inuit Association at *[see pg. iii Key Government Contact List]*; and | Section 3.3 |
| | | 9c. | • for each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site. | Section 3.3 |
| | | 10. | The Licensee shall, in addition to Part H, Item 9, regardless of the quantity of releases of harmful substances, report to the NWT/NU Spill Line if the release is near or into a Water body. | Section 3.3 |
| | I | 11. | The Licensee shall submit to the Board for review, at least sixty (60) days prior to operation of the Roberts Bay Discharge System, an addendum to the Spill Contingency Plan detailing spill prevention measures along the pipeline. | A3 |
| | Schedule B | | The Annual Report referred to in Part B, Item 2 shall include the following: | See below |
| | | 8. | A list and description of all reportable unauthorized discharges including volumes, spill report line identification number and summaries of follow-up action taken | Section 3.3 |

# A1 Introduction

The Type A Water Licence No. 2AM-DOH1335 issued by the Nunavut Water Board (NWB) requires the development of a Spill Contingency Plan in accordance with Part I. The Spill Contingency Plan has been prepared and is being submitted by Agnico Eagle to address this requirement, and also includes the plan for spill response throughout the Hope Bay belt.

The 2AM-DOH1335 Licence area includes the Doris Camp and the necessary infrastructure to support surface exploration, underground mining and development activities, and ore processing. Refer to Module C of this plan for details and description of chemical storage related to Madrid infrastructure under this licence.

# A2 Chemical Storage at Doris

A list of fuel and chemical storage facilities, containment capacity, products stored and maximum expected quantity to be stored within each facility for the Doris area is provided in Table A.1 below. Chemical storage locations are also depicted on the photographs provided below, in addition to the default spill kit locations.

Table A.1. Doris Fuel and Chemical Storage Locations

| Storage Location | Facility Description/ Storage Capacity | Tank Description | Containment Capacity | Products Stored | Maximum Expected Quantity Stored |
|---|---|---|---|---|---|
| Roberts Bay Bulk Fuel Storage Facility (Quarry 1 / ST-6a) | 1 @ 5,000,000 L Tank | Field-erected | Gravel/HDPE, 6,270,000 L | Diesel Fuel | 5,000,000 L |
| Roberts Bay Bulk Fuel Storage Facility (ST-6b) | 4 @ 5,000,000 L<br>1@ 400,000 L Tanks | Field-erected | Gravel/HDPE, 9,190,000 L | Diesel Fuel<br>Jet-A | 20,000,000 L<br>400,000 L |
| Batch Plant/ equipment storage | 2 @ 1240 L | Pre-fabricated, double-walled, portable | Spill containment | Diesel Fuel | 2 @1116 L |
| Doris Camp Site Fuel Storage Facility (ST-5) | 5 @ 1,500,000 L Tanks<br>Dispensing Module (Active) | Field-erected | Gravel/HDPE, 2,976,000 L | Diesel Fuel | 7,500,000 L |
| Doris Helipad (office, washcar) | 1 @ 1240 L | Pre-fabricated, double-walled, portable | Insta-berm, spill containment | Diesel Fuel | 1116 L |
| Doris Helipad (Jet-A Storage) | Drums in Seacan (maximum 64 drums)<br>2 @ 3000 L Tanks | Drums<br>Pre-fabricated, double-walled, portable | HDPE spill containment<br>Spill containment | Jet A Fuel<br>Jet-A Fuel | 13,120 L<br>5400 L |
| Doris Helipad (landing pads) | Drum fuel (8) placed at each active helicopter landing pad | Drums | Plastic spill pallets, 220 L | Jet A Fuel | 1640 L |

| Storage Location | Facility Description/ Storage Capacity | Tank Description | Containment Capacity | Products Stored | Maximum Expected Quantity Stored |
|---|---|---|---|---|---|
| Doris Muster Station | 1 @ 1240 L | Pre-fabricated, double-walled, portable | HDPE/Wood spill containment | Diesel Fuel | 1116 L |
| Doris Powerhouse (old) | 1 @ 15,000 L | Pre-fabricated, double-walled, portable | HDPE/Wood spill containment | Diesel Fuel | 15,000 L |
| Doris Powerhouse (new) | 4 @ 5000 L | Pre-fabricated, double-walled, portable | 4 @ 5500 L each, Concrete | Diesel Fuel | 20,000 L |
| Roberts Bay Waste Management Facility Generator | Internal tank @ 2250 L | Pre-fabricated, double-walled, | Internal steel spill containment | Diesel Fuel | 2025 L |
| Roberts Bay Incinerator | 1 @ 1500 L (Inactive)<br>2 @ 1000 L (Inactive) | Pre-fabricated, double-walled<br>Pre-fabricated, double-walled | Steel Spill containment | Diesel Fuel<br>Diesel Fuel | 1350 L<br>2 @ 1000 L |
| Quarry 2 Incinerator | 1 @ 4500 L | Pre-fabricated, double-walled | Steel Spill containment | Diesel Fuel | 4500 L |
| Waste Management Facility Waste Oil Burner | 2 @ 850 L | Plastic Cube | Spill containment | Waste Oil | 1700 L |
| Rob Bay Muster Station | 1 @ 1240 L | Pre-fabricated, double-walled, portable | Steel Spill containment | Diesel Fuel | 1116 L |
| Doris Vent Raise | 1 @ 70,000 L | Pre-fabricated, double-walled, portable | Gravel/HDPE, 77,000 L | Diesel Fuel | 70,000 L |
| Doris Airport Tower Generator | 1 @ 1240 L | Pre-fabricated, double-walled, portable | Steel spill containment; in seacan | Diesel Fuel | 1116 L |
| Doris Pump House | 1 @ 1240 L | Pre-fabricated, double-walled, portable | HDPE/Wood spill containment | Diesel Fuel | 1116 L |
| Geotech Shop | 1 @ 1240 L | Pre-fabricated, double-walled, portable | Steel spill containment | Diesel Fuel | 1116 L |
| Main Shop | 2 @ 1240 L | Pre-fabricated, double-walled, portable | Steel spill containment | Diesel Fuel | 2 @ 1116 L |
| Explosive Berm (TIA Access Road) | Seacan | NA | NA | Amex (Ammonium nitrate) | 900,000 kg |
| Mill Building | 1 @ 1240 L | Pre-fabricated, double-walled, portable | Steel spill containment | Diesel Fuel | 1116 L |
| Upper Laydown | Locked Seacan | NA | Seacans | Collector | 90,000 kg |

| Storage Location | Facility Description/ Storage Capacity | Tank Description | Containment Capacity | Products Stored | Maximum Expected Quantity Stored |
|---|---|---|---|---|---|
| TIA Reagent Berm | Locked Seacan | NA | Seacans | Promoter | 30, 100kg |
| | Locked Seacan | NA | Seacans | Frother | 16,000 kg |
| | Locked Seacan | NA | Seacans | Flocculant Low pH | 16, 000 kg |
| | Locked Seacan | NA | Seacans | Sodium Cyanide | 240,000 kg |
| | Locked Seacan | NA | Seacan | Caustic Soda | 450,000 kg |
| | Locked Seacan | NA | Seacans | Flocculant High pH | 2,000 kg |
| | Locked Seacan | NA | Seacan | Sodium Metabisulphate | 240,000 kg |
| | Locked Seacan | NA | Seacans | Copper Sulphate | 125,000 kg |
| | Locked Seacan | NA | Seacans | Hydrochloric Acid | 4000 kg |
| | Locked Seacan | NA | Seacans | Sodium Benzoate | 20,000 kg |
| | Locked Seacan | NA | Seacans | Silica Sand | 5000 kg |
| | Locked Seacan | NA | Seacans | Borax | 12,500 kg |
| | Locked Seacan | NA | Seacans | Soda Ash | 8750 kg |
| | Locked Seacan | NA | Seacans | Potassium Nitrate | 5000 kg |
| Lower Laydown | Seacans with 1000 kg mega bags | NA | NA | Calcium Chloride | 11,030 tonnes |
| | Seacan | NA | NA | Acetylene | 10 - WTL bottles (~3600 cu. ft. of product) |
| | Seacan | NA | NA | Propane | 30 – 100 lb bottles (3000 lbs) |
| | Seacan<br>ERT building ERT building | NA | NA | Oxygen | 10 - K bottles (6900 L ea)<br>3 - M bottles (3000 L ea)<br>4 - D bottles (350 L ea)<br>(~79,400 L. of product) |

*Plate A.1. Roberts Bay Laydown (Note: Red circles are fuel or chemical storage locations, smaller containment locations may vary. Yellow stars [or a yellow circle in the case of the aquatic mobile response spill response equipment] indicate default spill kit locations.)*

*Plate A.2. Doris Camp (Note: Red circles are fuel or chemical storage locations, smaller containment locations may vary. Yellow stars indicate default spill kit locations.)*

*Plate A.3. Quarry 2, Laydowns, Airstrip (Note: Red circles are fuel or chemical storage locations, smaller containment locations may vary. Yellow stars indicate default spill kit locations.)*

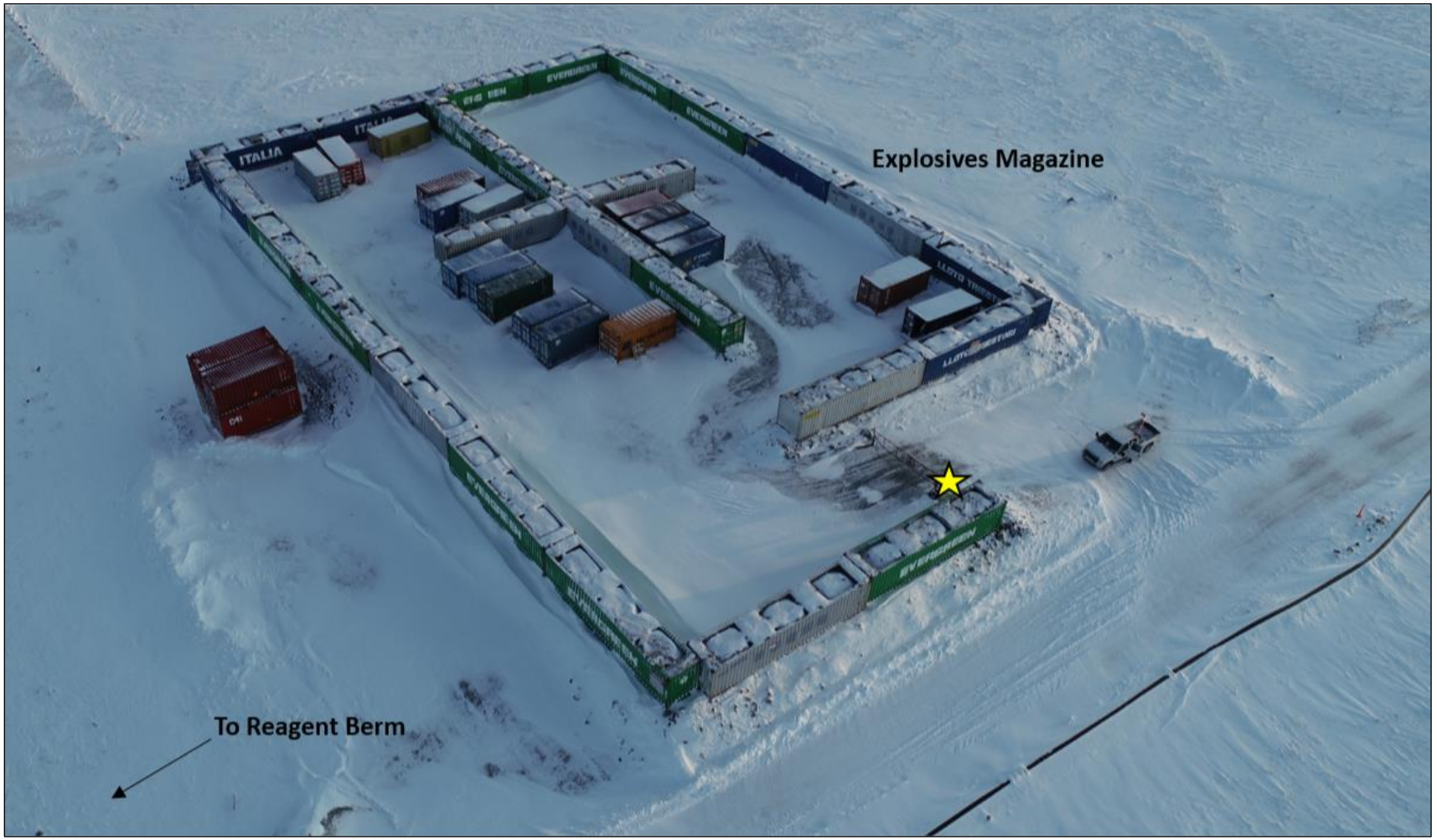


*Plate A.4. Explosive Magazine (Note: Yellow star indicate default spill kit locations.)*

# A3 Water Treatment Process

Underground mine water is pumped from a settling sump system to a Water Treatment Plant (WTP) on surface designed to provide Total Suspended Solids (TSS) removal from the effluent stream prior to being pumped to the RBDS Water Management Facility and to final discharge to Roberts Bay. The multi-stage process consists of coarse suspended solids removal via a lamella clarifier and the addition of a polymer flocculent and coagulant followed by fine suspended solids removal utilizing multimedia filters. This treatment process is capable of meeting the authorized limits for TSS outlined in Schedule 4 of the MDMER.

# A4 Roberts Bay Discharge System

The Roberts Bay Discharge System (RBDS) is designed to transport compliant effluent from the Doris underground mine and excess water from the Tailings Impoundment Area (TIA) to a subsea diffuser extending 2.1km into Roberts Bay. The Roberts Bay Discharge System consists of an insulated pipeline, the Roberts Bay Discharge Pipeline, which runs from the RBDS Water Management Facility, along to the Primary Road and the airstrip to the Roberts Bay Laydown Areas. At Roberts Bay the pipeline runs in front of the 20 ML fuel tank farm, along the south side of the Roberts Bay Jetty Access Road and laydown pads, to the Roberts Bay shoreline along the south side of the Roberts Bay Discharge Access Road. The discharge pipeline enters the Roberts Bay marine environment through a Marine Outfall Berm, which extends from the shoreline to approximately the 40 m bathymetric contour and terminates at the Roberts Bay Diffuser.

# A5 Spill Prevention

All pipelines in the system are constructed from HDPE material resistant to wear. Each pipe connection has been fuse welded to remove the risk introduced by Victaulic clamp installations which are susceptible to expansion during freeze/thaw conditions and wear resulting in leaks. The number of elbow joints on the pipelines has been minimized to the extent possible; elbow joints are more susceptible to wear over time due to increased force/pressure of effluent travelling through the joint. The system will operate at relatively low pressures, therefore leakage from normal operating modes is highly unlikely.

Flow meters have been installed between the TIA Intake Pump station and the RBDS Water Management Facility, and between the RBDS Water Management Facility and the Marine Outfall Berm Pump station to monitor flow within the pipeline. These flow meters are connected by fibre optic communication lines linked to a PLC system which communicates real-time flow measurements to the Process Plant Control Room. The Process Plant Control Room is manned 24hrs a day allowing for continuous monitoring of the discharge pipeline. An unanticipated drop in flow registered on these flow meters will trigger an immediate inspection of the pipeline to investigate cause. If a leak is detected during this inspection, discharge from the pipeline will be immediately shut down minimizing the volume of the release.

Inline instrumentation has been installed to measure TSS in each effluent stream prior to being combined. TSS is also measured after the effluent streams have been combined to determine

compliance with the authorized limits for TSS outlined in Schedule 4 of the MDMER prior to discharge from the Final Discharge Point (FDP) to the environment. Low and high level alarms have been established to provide early notification of an increase in TSS to the Process Plant Control Room. If the low level alarm is triggered, the Water Treatment Operator is notified and is able to respond to any potential treatment upsets. If the high level alarms are triggered for either effluent stream, the system is automatically placed into recirculation back to the TIA until effluent streams are determined to be in compliance with the authorized discharge limits, and discharge to the environment may then be resumed. This real time monitoring significantly reduces the likelihood of non-compliant effluent being discharged to the environment.

The pipeline connecting the Underground sump system to the RBDS Water Management Facility is located upstream of the Doris Sedimentation and Pollution Control Ponds. Any leak from this system would report to these water management ponds and be transferred to the TIA.

Delineators are used to mark pipelines to ensure vehicle and equipment operators are aware of pipeline locations when travelling on site roads. Pipelines in this system have been aligned adjacent to roadways to the extent possible to allow for thorough inspections and to reduce the risk of vehicle and equipment interaction with the pipelines.

Pipeline inspections are conducted during each 12hr shift. This inspection includes driving the entire length of the pipeline and visually assessing the line for signs of leaks or spills.

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HOPE BAY SPILL CONTINGENCY PLAN

HOPE BAY, NUNAVUT

# Module B: Windy

# Conformity Table

| Licence | Part | Item | Topic | Report Section |
|---|---|---|---|---|
| 2BE-HOP1222 | B | 2. | The Licensee shall file an Annual Report on the appurtenant undertaking with the Board no later than March 31st of the year following the calendar year being reported which shall contain the following information: | See below |
| | | 2.e | • an update to the Spill Contingency Plan, if required, including contact information in the form of an addendum. | This report |
| | H | 1. | The Licensee has submitted, September 23, 2011, a Spill Contingency Plan entitled Hope Bay Project Spill Contingency Plan, for the Hope Bay Project, which encompasses the Hope Bay Belt projects including Roberts Bay, the Doris, Boston and Windy camps. This Plan covers the Windy Camp with respect to care and maintenance of the site. The Licensee shall submit to the Board for approval in writing, within ninety (90) days of issuance of this Licence, a revised Plan that takes into consideration the status of the entire Hope Bay Belt project as it influences the activities, environmental and safety issues of the Windy Camp and the Hope Bay Regional Exploration Project. | This report |
| | | 2. | Licensee shall submit to the Board for approval in writing, sixty (60) days prior to the resumption of exploration activity at the Hope Bay Regional Exploration Project, a revised Spill Contingency Plan that is specific to the scope of this Licence and prepared in accordance with the *Spill Contingency Planning and Reporting Regulations* developed under Section 34 of the *Environmental Protection Act*. | Plan filed in March 2014, updated here. Sections 2 and B2 |
| | | 3. | The Licensee shall, if not approved by the Board, revise the Plan referred to in Part H, Item 1, and resubmit to the Board for approval within thirty (30) days of receiving notification of the Board's decision. | Section 1.5 |
| | | 4. | The Licensee shall implement the Plan specified in Part H, Item 1 as and when approved by the Board. | Section 1.5 |
| | | 5. | The Licensee shall review the Plan referred to in this Part as required by changes in operation and/or technology and modify the Plan accordingly. Revisions to the Plan are to be submitted in the form of an Addendum, to be included with the Annual Report unless directed otherwise by an Inspector. | Section 1.4 |
| | | 6. | The Licensee shall ensure that any chemicals, petroleum products or wastes associated with the project do not enter water. All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary high water mark of any adjacent water body and inspected on a regular basis. | Section 2<br>Section 4.6 |
| | | 7. | The Licensee shall ensure that any equipment maintenance and servicing be conducted only in designated areas and shall implement special procedures (such as the use of drip pans) to manage motor fluids and other waste and contain potential spills. | Section 4.4 |
| | | 8. | If during the term of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall: | See below |
| | | 8a. | • employ the Spill Contingency Plan; | Section 2 |
| | | 8b. | • report the spill immediately to the 24-Hour Spill Line and to the Inspector at *[see pg. iii Key Government Contact List]*; and | Section 3.3 |
| | | 8c. | • for each spill occurrence, submit to the Inspector, no later than thirty (30) days after initially reporting the event, a detailed report that will include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site. | Section 3.3 |

# B1 Introduction

The Type B Water Licence No. 2BE-HOP1222 issued by the Nunavut Water Board (NWB) requires the development of a Spill Contingency Plan in accordance with Part H. The Spill Contingency Plan has been prepared and is being submitted by Agnico Eagle to address this requirement, and also includes the plan for spill response throughout the Hope Bay belt.

# B2 Chemical Storage at Windy

Windy Camp is located 10km south of Doris Camp at N 68° 03.715' W 106° 37.109' and is in the process of being decommissioned. Fuel storage at Windy Camp is limited to one tank (double-walled Tidy Tank) containing a maximum of 1240L of diesel fuel. This tank is located more than 31 m from any waterbody and fuels a generator used to heat a pump house structure located at the potable freshwater intake south of Windy Camp. Water is used to supply Doris Camp with potable water, and regular inspection of this facility occurs as per the requirements of the Doris Water Licence. In case of a potential spill involving the Tidy Tank, there is a spill kit located at the pump house (at the shoreline).

No other hydrocarbons or chemicals are stored at Windy Camp. Any hydrocarbons or chemicals needed for decommissioning the camp structures will be brought to Windy Camp and consumed on an as-needed basis. Spill kits will be available within 200 m of working equipment during these activities. Chemical storage and spill kit locations at Windy Camp are shown in the photo below.

The Bulk Fuel Storage Facility at Patch Lake was fully dismantled in 2012 and the area is in the process of being reclaimed. There are no hydrocarbons or chemicals stored at the Patch Lake Facility. Fuel or lubes required to complete reclamation work will be brought in for immediate equipment use, and a spill kit will be available on site to support operating machinery.

In case of exploration drilling on land and on ice, chemicals will be brought in to assist with the drilling process and stored within secondary containment. Each drill will have its own fully stocked spill kit and chemicals stored will be kept to an amount needed for each shift. Excess chemicals will not be stored within Windy Camp.

One permitted facility for explosives materials is located at Quarry A on the west side of the Doris-Windy all-weather road. This facility can store a maximum of 40,800 kg of explosive materials containing ammonium nitrate. In the event of a spill of this material, the spill response actions would be completed as outlined in the Product Specific Emergency Response plan in Appendix 1 of this document.

# B3 Windy Fuel and Chemical Storage Locations

*Plate B.1. Windy Camp (Note: Red circle is fuel storage location. Yellow star indicates spill kit location.)*

*Plate B.2. Quarry A Explosives Magazine (Note: Yellow star indicates spill kit location.)*

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HOPE BAY SPILL CONTINGENCY PLAN

HOPE BAY, NUNAVUT

# Module C: Madrid (Exploration and Operations)

# Conformity Table

| Licence | Part | Item | Topic | Report Section |
|---|---|---|---|---|
| 2AM-DOH1335 | H | 1. | The Licensee shall implement the following plans as approved by the Board: Surface Emergency Response Plan, Underground Emergency Responses Plan, and Hope Bay Project Spill Contingency Plan. The Licensee shall comply with the Plan(s) and any changes deemed significant shall require the submission and subsequent approval of the Board in writing. | This Plan |
| | | 2. | All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary High Water Mark of any adjacent Water body and inspected on a regular basis. | Section 2<br>Section 4.6 |
| | | 3. | The Licensee shall prevent any chemicals, petroleum products or wastes associated with the project from entering Water. | Section 2<br>Section 4.6 |
| | | 4. | The Licensee shall provide secondary containment for fuel and chemical storage as required by applicable standards and acceptable industry practice. | Section 4.1 |
| | | 5. | The Licensee shall perform weekly inspections of petroleum products storage and containment facilities, fuel tanks and connectors, for leaks and settlement and shall keep a written log of inspections to be made available to an Inspector upon request. More frequent inspections may be requested by an Inspector. | Section 4.1 |
| | | 8. | The Licensee shall conduct emergency maintenance and servicing on equipment, in designated areas, and shall implement measures to collect motor fluids and other Waste to prevent and contain spills. | Section 4.4 |
| | | 9. | The Licensee shall, subject to Section 16 of the Regulations, report any unauthorized deposits or foreseeable unauthorized deposits of waste and/or discharges of Effluent, and: | See below |
| | | 9a. | • employ the Spill Contingency Plan; | Section 2 |
| | | 9b. | • report the incident immediately via the 24-Hour Spill Reporting Line [see pg. iii Key Government Contact List], to the Inspector at [see pg. iii Key Government Contact List] and to the Kitikmeot Inuit Association at *[see pg. iii Key Government Contact List]*; and | Section 3.3 |
| | | 9c. | • for each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site. | Section 3.3 |
| | | 10. | The Licensee shall, in addition to Part H, Item 9, regardless of the quantity of releases of harmful substances, report to the NWT/NU Spill Line if the release is near or into a Water body. | Section 3.3 |
| | I | 11. | The Licensee shall submit to the Board for review, at least sixty (60) days prior to operation of the Roberts Bay Discharge System, an addendum to the Spill Contingency Plan detailing spill prevention measures along the pipeline. | A3 |
| | Schedule B | | The Annual Report referred to in Part B, Item 2 shall include the following: | See below |
| | | 8. | A list and description of all reportable unauthorized discharges including volumes, spill report line identification number and summaries of follow-up action taken | Section 3.3 |
| 2BB-MAE1727 | B | 2. | The Licensee shall file an Annual Report on the Appurtenant Undertaking with the Board no later than 31st of March, of the year following the calendar year being reported, containing the following information: | See below |

| Licence | Part | Item | Topic | Report Section |
|---|---|---|---|---|
| | | 2j. | • Updates or revisions to the Water Management Plan, Abandonment and Restoration Plan, QA/QC, Waste Rock and Ore Storage Plan, and Spill Contingency Plan and/or any other management plan. | This Plan |
| | H | 1. | The Licensee shall submit for Board approval in writing, within ninety (90) days following issuance of the Licence, a spill contingency Plan that is specific to the scope of this Licence, addresses comments received by the parties, and is prepared in the format set out by the Consolidation of Spill Contingency Planning and Reporting Regulations, R-068-93. | This Plan |
| | | 2. | The Licensee shall prevent any chemicals, petroleum products or wastes associated with the project from entering water. All Sumps and fuel caches shall be located at a distance of at least thirty-one (31) metres from the ordinary High Water Mark of any adjacent water body and inspected on a regular basis. | Section 2<br>Section 4.1 |
| | | 3. | The Licensee shall conduct any equipment maintenance and servicing in designated areas and shall implement special procedures (such as the use of drip pans) to manage motor fluids and other waste and contain potential spills. | Section 4.4 |
| | | 4. | If during the term of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall: | See below |
| | | 4a. | • employ the Spill Contingency Plan; | This plan |
| | | 4b. | • report the spill immediately to the 24-Hour Spill Line at *[see pg. iii Key Government Contact List]* and to the Inspector at *[see pg. iii Key Government Contact List]*; and | Section 3.3 |
| | | 4c. | • for each spill occurrence, submit to the Inspector, no later than thirty (30) days after initially reporting the event, a detailed report that will include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site. | Section 3.3 |
| | | 5. | The Licensee shall, in addition to Part H, Item 4, regardless of the quantity of releases of harmful substances, report to the NWT/NU Spill Line if the release is near or into a Water body. | Section 3.3 |

# C1 Introduction

The Type A Water Licence No. 2AM-DOH1335 and the Type B Water Licence No. 2BB-MAE1727 issued by the Nunavut Water Board (NWB) requires the development of a Spill Contingency Plan in accordance with Part H. The Spill Contingency Plan has been prepared and is being submitted by Agnico Eagle to address this requirement, and also includes the plan for spill response throughout the Hope Bay belt.

The 2AM-DOH1335 Licence Area includes the Madrid North and Madrid South sites. Work at the Madrid North site began in 2019 and includes the necessary infrastructure to support surface mining at the Naartok East Crown Pillar trench and underground mining at the Madrid North portal. This infrastructure includes the Madrid North Contact Water Pond, Madrid North Waste Rock storage pad, as well as laydown pads and shop facilities.

Work at the Madrid North site was suspended in March 2020 due to the Covid-19 global pandemic and mining remains inactive at this site. Routine monitoring of fuel and chemical storage locations is conducted to ensure not spill of stored product occurs.

No work has yet been conducted at the Madrid South site.

# C2 Chemical Storage at Madrid North and Madrid South

A list of fuel and chemical storage facilities, containment capacity, products stored and maximum expected quantity to be stored within each facility for the Madrid North site is provided in Table C.1 below. Chemical storage locations are also depicted on the photographs provided below, in addition to the default spill kit locations. All storage facilities are located at a distance greater than 31 m from any water body.

Table C.1. Madrid North Fuel and Chemical Storage Locations

| Location* | Facility Description/ Storage Capacity | Tank Description | Containment Capacity | Products Stored | Expected Quantity Stored |
|---|---|---|---|---|---|
| Madrid North Fuel Storage Area ** (MMS-8) | 3 @ 1,500,000 Tanks | Field erected | Gravel/HDPE | Diesel Fuel | 4,500,000 L |
| Madrid North Portal Laydown | 1 @ 10,000 L | Pre-fabricated double wall tank | Steel spill containment | Diesel Fuel | 10,000 L |
| | Seacans with 1000 kg mega bags | NA | NA | Calcium Chloride | 11,030 tonnes |

**Additional portable storage facilities may be used depending on Project activity.*
*** Facility not yet constructed.*

Photos of chemical storage locations at the Madrid South site will be provided in the annual update of this plan once these facilities are constructed. A list of anticipated fuel and chemical storage facilities, containment capacity, products stored and maximum expected quantity to be stored at the Madrid South site is provided in Table C.2 below.

Table C.2. Madrid South Fuel and Chemical Storage Locations

| Location* | Facility Description/ Storage Capacity | Tank Description | Containment Capacity | Products Stored | Expected Quantity Stored |
|---|---|---|---|---|---|
| Madrid South Fuel Storage Area ** (MAE-07) | 1 @ 750,000 Tank | Field erected | Gravel/HDPE | Diesel Fuel | 4,500,000 L |

**Additional portable storage facilities may be used depending on Project activity.*
*** Facility not yet constructed.*

# C3 Madrid Fuel and Chemical Storage Locations

*Plate C.1. Surface Equipment Shop and former Office/Lunchroom. (Note: Red circles are fuel or chemical storage locations, smaller containment locations may vary. Yellow stars indicate default spill kit locations.)*

*Plate C.2. Naartok East Crown Pillar Recovery Trench (Note: Yellow stars indicate default spill kit locations.)*

*Plate C.1. Madrid North Portal (Note: Red circles are fuel or chemical storage locations, smaller containment locations may vary. Yellow stars indicate default spill kit locations.)*

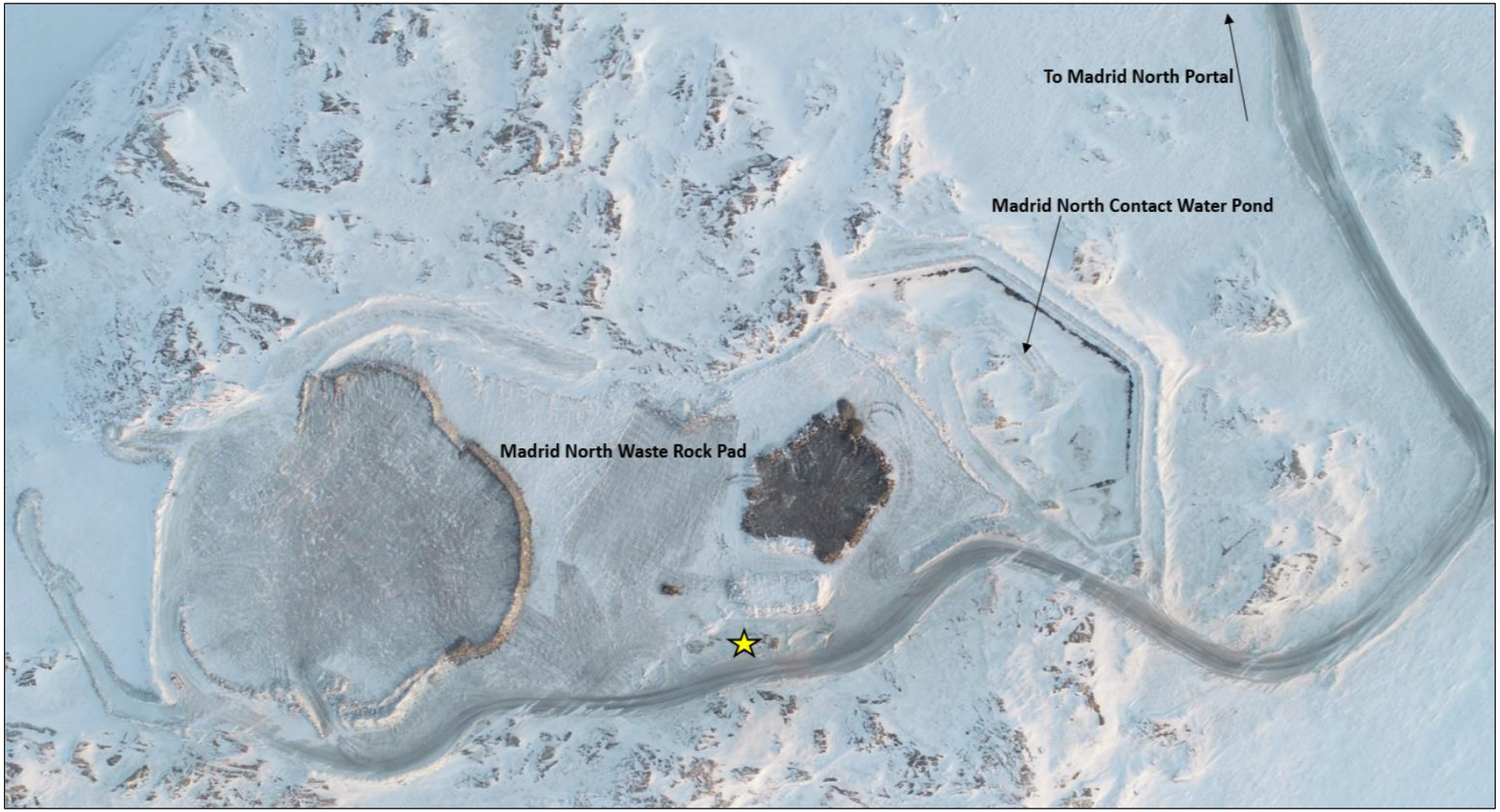


*Plate C.2. Madrid North Contact Water Pond and Waste Rock Pad (Note: Yellow stars indicate default spill kit locations.)*

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## HOPE BAY SPILL CONTINGENCY PLAN

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# Module D: Boston (Exploration and Operations)

# Conformity Table

| Licence | Part | Item | Topic | Report Section |
|---|---|---|---|---|
| 2BB-BOS1727 | B | 9. | The Licensee shall file an Annual Report on the appurtenant undertaking with the Board no later than March 31st of the year following the calendar year being reported which shall contain the following information: | See below |
| | | 9l. | • updates or revisions to the Abandonment and Restoration Plan, QA/QC, Waste Rock and Ore Storage Plan, Spill Contingency Plan, and Landfarm Plan. | This Plan |
| | H | 2. | The Licensee shall prevent any chemicals, petroleum products or wastes associated with the project from entering Water. All Sumps and fuel caches shall be located at a distance of at least thirty-one (31) metres from the ordinary High Water Mark of any adjacent Water body and inspected on a regular basis. | Section 2<br>Section 4.1 |
| | | 3. | The Licensee shall conduct any equipment maintenance and servicing in designated areas and shall implement special procedures (such as the use of drip pans) to manage motor fluids and other waste and contain potential spills. | Section 4.4 |
| | | 4. | If during the term of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall: | See below |
| | | 4a. | • employ the Spill Contingency Plan; | This plan |
| | | 4b. | • report the spill immediately to the 24-Hour Spill Line at *[see pg. iii Key Government Contact List]* and to the Inspector at *[see pg. iii Key Government Contact List]*; and | Section 3.3 |
| | | 4c. | • for each spill occurrence, submit to the Inspector, no later than thirty (30) days after initially reporting the event, a detailed report that will include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site. | Section 3.3 |
| | | 5. | The Licensee shall, in addition to Part H, Item 4, regardless of the quantity of releases of harmful substances, report to the NWT/NU Spill Line if the release is near or into a Water body. | Section 3.3 |
| 2AM-BOS1835 | H | 1. | The Licensee shall implement the following plans as approved by the Board: *Surface Emergency Response Plan*, *Underground Emergency Responses Plan*, and *Hope Bay Project Spill Contingency Plan*. The Licensee shall comply with the Plan(s) and any changes deemed significant shall require the submission and subsequent approval of the Board in writing. | This Plan |
| | | 2. | All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary High Water Mark of any adjacent Water body and inspected on a regular basis. | Section 2<br>Section 4.6 |
| | | 3. | The Licensee shall prevent any chemicals, petroleum products or unauthorized Wastes associated with the project from entering Water. | Section 2<br>Section 4.6 |
| | | 4. | The Licensee shall provide secondary containment for fuel and chemical storage as required by applicable standards and acceptable industry practice. | Section 4.1 |
| | | 5. | The Licensee shall perform regular inspections of Fuel Storage and Containment Facilities, Sumps, Emergency Dump Catch Basins, other fuel tanks and connectors for leaks and movement and shall keep a written log of inspections to be made available to an Inspector upon request. More frequent inspections may be required at the request of an Inspector | Section 4.1 |

| Licence | Part | Item | Topic | Report Section |
|---|---|---|---|---|
| | | 8. | The Licensee shall conduct emergency maintenance and servicing on equipment, in designated areas, and shall implement measures to collect motor fluids and other Waste to prevent and contain spills. | Section 4.4 |
| | | 9. | The Licensee shall, subject to Section 16 of the Regulations, report any unauthorized deposits or foreseeable unauthorized deposits of waste and/or discharges of Effluent, and: | See below |
| | | 9a. | • employ the Spill Contingency Plan; | Section 2 |
| | | 9b. | • report the incident immediately via the NT-NU 24-Hour Spill Reporting Line *[see pg. iii Key Government Contact List]* and to the Inspector at *[see pg. iii Key Government Contact List]*; and | Section 3.3 |
| | | 9c. | • for each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site. | Section 3.3<br>Section D3.2 |
| | | 10. | The Licensee shall, in addition to Part H, Item 9, regardless of the quantity of release of harmful substance, report to the NT-NU 24-Hour Spill Report Line if the release is near or into a Water body. | Section 3.3 |
| | | 11. | The Licensee shall submit to the Board for review, at least sixty (60) days prior to operation of the Aimaokatalok Lake Discharge System, an addendum to the Spill Contingency Plan detailing spill prevention measures along the pipeline. | To be provided 60 days prior to operation of Aimaokatalok Lake Discharge System |
| | Schedule B | | The Annual Report referred to in Part B, Item 2 shall include the following: | See below |
| | | 8. | A list and description of all reportable unauthorized discharges including volumes, spill report line identification number and summaries of follow-up action taken. | Section 3.3 |

# D1 Introduction

The Type A Water Licence No. 2AM-BOS1835 and Type B Water Licence No. 2BB-BOS1727 issued by the Nunavut Water Board (NWB) require the development of a Spill Contingency Plan in accordance with Part H. The Spill Contingency Plan has been prepared and is being submitted by Agnico Eagle to address this requirement, and also includes the plan for spill response throughout the Hope Bay belt.

The 2BB-BOS1727 Licence Area includes the current Boston Camp site, which is opened seasonally to support exploration activities.

Facilities outlined in the 2AM-BOS1835 Licence have not yet been constructed and there is no activity occurring at Boston Camp under this licence at this time.

# D2 Chemical Storage at Boston

Photos of current chemical storage locations and a list of current fuel and chemical storage facilities, containment capacity, products stored and maximum expected quantity to be stored within the facility for the Boston Licence area is provided below. All storage facilities are located at a distance greater than 31m from any water body.

Photos of anticipated fuel and chemical storage locations associated with facilities identified in the licence 2AM-BOS1835 for the Boston Project will be provided when these facilities are constructed.

The current and anticipated fuel and chemical storage facilities, containment capacity, products stored and maximum expected quantity to be stored within each facility associated with development of Boston are provided in Table D.1 below.

# D3 Additional Spill Contingency Management at Boston

## D3.1 Issue: Bulk Fuel Tank Farm

Eight fuel tanks are currently located in a lined fuel berm covered with crush material at the Boston Site. The berm was constructed on permafrost and the crush pad is thin in some areas which may lead to permafrost degradation beneath the berm over time. Foundation settlement of the tanks due to permafrost degradation could potentially occur over time and could cause the fuel tank to destabilize creating risk of one or more of the fuel tanks to destabilize and tip.

## D3.2 Management Response

Fuel tanks are visually monitored for differential settlement during seasonal visits when the Boston site is accessible and during annual geotechnical inspections. Measurements of tank movement may also be collected if visual monitoring indicates a potential issue with one or

more of the tanks. This may involve measuring the vertical angle of the fuel tank sidewall. A comparison of these values over time will indicate if differential settlement is occurring.

If settlement of the fuel tanks at the Boston site are detected beyond an acceptable limit, Agnico Eagle will discontinue the use of the tank(s) that are effected by settlement and engage the Engineer of Record (SRK Consulting) for guidance and recommendations for correcting the settlement issue.

Table D.1. Boston Fuel and Chemical Storage Locations

| Location* | Facility Description/ Storage Capacity | Tank Description | Containment Capacity | Products Stored | Expected Quantity Stored |
|---|---|---|---|---|---|
| Boston Camp Bulk Fuel Storage Facility (BOS-5) | 6 @ 77,000L Tanks<br>2 @ 33,500L Tanks | Pre-fabricated | Gravel/HDPE, 84,700 L | Diesel Fuel | 377,127 L |
| Boston Fuelling Stations (tidy tank beside bulk storage) | 1 @ 1374 L | Pre-fabricated, double-walled, portable | Gravel/HDPE spill containment | Diesel Fuel | 1236 L |
| Boston Fuelling Stations (fly tank beside bulk storage) | 1 @ 785 L | Pre-fabricated, double-walled, portable | Gravel/HDPE spill containment | Gasoline | 628 L |
| Boston Helipad | Drum storage (8 drums) | Drums | Plastic spill pallets, 220 L each | Jet A Fuel | 1640 L (empty when Project closed) |
| Boston Jet A fuel storage | Drum storage (Portable Insta-Berm) | Drums | 2 x 25,500 L | Jet A | 51,250 L |
| Boston Generator Daytanks | 2 @ 1240 L | Pre-fabricated, double-walled, portable | Gravel/HDPE spill containment (2) | Diesel Fuel | 2232 L |
| Boston Tent Heaters Daytank | 1 @ 1374 L | Pre-fabricated, double-walled, portable | Gravel/HDPE spill containment | Diesel Fuel | 1236 L |
| Boston Daytank (inside) | 1 @ 350 L | Pre-fabricated, Single walled | Steel floor and kickplate | Diesel Fuel | 315 L |
| Boston Camp Daytank (NE side of camp between main camp and tents | 1 @ 1374 L | Pre-fabricated, double-walled, portable | Gravel/HDPE spill containment | Diesel Fuel | 1236 L |
| Boston Incinerator | 1 @ 400 L | Pre-fabricated, double-walled | Steel spill containment | Diesel Fuel | 360 L |
| Boston Bulk Fuel Storage Facility** | 5 @ 1,500,000 | Field erected | Gravel/HDPE spill containment | Diesel Fuel | 7,500,000 |

** Additional portable storage facilities may be used depending on Project activity.*

*** Anticipated fuel storage as part of proposed Phase 2 Boston development outlined in Type A Water Licence 2AM-BOS1835. Facility not constructed at this time.*

# D4 Boston Fuel and Chemical Storage Locations

*Plate D.1. North end Boston Camp (Note: Red circles are fuel or chemical storage locations, smaller storage locations may vary. Yellow star indicates spill kit locations.)*

*Plate D.2. South end Boston Camp (Note: Red circles are fuel or chemical storage locations, smaller storage locations may vary. Yellow star indicates spill kit locations.)*

*Plate D.3. Boston Airstrip (Note: Red circles are fuel or chemical storage locations, smaller storage locations may vary. Yellow star indicates spill kit locations.)*

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HOPE BAY SPILL CONTINGENCY PLAN

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# Appendix 1: Hazardous Materials and Product Specific Emergency Response Plans

# Poisonous and Toxic Substances

## Sodium Cyanide Specific Spill Response Plan

Note: Sodium cyanide is not currently listed in Schedule 1 of the E2 regulations. However, a Product Specific Emergency Response Plan has been developed for this product based on the environmental and health and safety impacts of a potential spill. Hydrogen cyanide is produced when sodium cyanide reacts with water, acids or oxidizing agents. Hydrogen cyanide is listed in Schedule 1 of the E2 regulations.

CAS No: 143-33-9 (Sodium cyanide)

Hazards Identification:

Physical State: Solid (granular), White
Odor: Almond-like

Emergency Overview: DANGER. MAY BE FATAL IF INHALED, ABSORBED THORUGH SKIN OR SWALLOWED

Potential Acute Health Effects: Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, and of inhalation. Corrosive to eyes and skin. Cyanide is classified as extremely toxic.

Environmental Effects: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Usage: Sodium cyanide is used in gold recovery process within the process plant.

Storage: Sodium cyanide briquettes will be packaged in 1,000 kg bags. These bags must be kept dry, away from heat and sources of ignition. Keep away from oxidizing agents, acids and moisture. Bags will be stored on pallets in lined seacans or located in a lined containment berm or inside the Mill building as used. Do not store above 24°C. Avoid exposure to acid, water or weak alkalines which can react to form a toxic hydrogen cyanide (HCN) gas.

Personal Protective Equipment for Spill Response

- Self-contained breathing apparatus (SCBA) while conducting air quality monitoring to confirm HCN levels prior to initiating response and clean-up;
- SCBA required for response activities if HCN levels >2.5ppm;
- Full face respirator with vapor or dust cartridges, half face respirator with vapor or dust cartridges and splash goggles or safety glasses with face shield may be worn if HCN levels <2.5ppm;
- Full body chemical resistant suit (rubber);
- Rubber boots (chemical resistant); and

- Rubber gloves (chemical resistant).

Emergency response for a Sodium Cyanide Spill

- Isolate and evacuate the spill area if HCN has potentially been released.
  - Evacuation of other site locations may be required (large spills in water may require protection of personnel up to 5 km downwind).
- Report spill to Supervisor immediately. Provide location, estimated quantity, physical nature of the spilled material (e.g., solid or solution) and other substances/conditions that may create hazardous conditions during response (e.g., exposure of substance to water, acids, oxidizing agents).
- Supervisor will report the spill immediately to the Environmental Superintendent or Safety Coordinator.
- Mine General Manager will activate Incident Command System and Emergency Response Team if required for response:
  - Based on size, location of spill and potential hazardous conditions/environmental impacts; and
  - SDS will be consulted to confirm appropriate response measures and associated hazards.
- Ventilate the area of the spill or leak and eliminate all ignition sources.
  - Air quality monitoring will be conducted in enclosed spaces to determine concentration of hazardous vapours prior to initiating spill response efforts.
- Stop the flow of spill.
- Contain the spill by placing spill booms or constructing interception dikes ahead of the flow (prioritizing prevention of release to waterways or onto ice).
- Protect the spill area from water runoff by constructing dike/berm. If raining, use tarps to cover the area to minimize water contact and spread of contamination.
- For spill to land:
  - Recover spilled solid material by shoveling into drums or containers free from impurities, seal container with lid and clearly label per WHMIS guidelines.
  - Minimize dust generated to the extent possible. Use water spray to reduce vapours; avoid contact of water spray with spilled material. Use tarps to cover spill area if water spray is used to reduce vapours.
  - Recovered solids, if free from impurities, may be suitable for its intended use. In this case, material is to be placed into containers with lid, and clearly labeled as per WHMIS guidelines.
  - Recovered material which cannot be used will be packaged into drums for offsite disposal at an approved waste management facility.

  - Neutralize residual spill material with appropriate agent as recommended by the SDS (sodium or calcium hypochlorite solution) or continue to excavate area until no visible spilled solid remains. Use suitable spill absorbent or soil to absorb the neutralized residue.

- For spill to water:
  - NaCN dissolves in water producing highly toxic hydrogen cyanide gas – use extreme caution.
  - Pump contaminated water to drums, tanks or lined containment berms if possible. Isolate/confine the spill by damming or diversion if feasible.
  - Water treatment is only effective if it can be accomplished in conjunction with the spill.
  - Treatment chemicals (sodium or calcium hypochlorite) must not be added to surface waters (e.g., streams, lakes) as these are not generally effective and could result in additional environmental impacts.
  - Hydrogen peroxide for treatment of solution spills or a sulfur dioxide/air process for treatment of slurry spills may be considered. This measure may only be used as a last resort if containment is not achievable and the spill can be treated directly at the point of release.
- For indoor spills:
  - Recover spilled solid material by shoveling into drums or containers free from impurities, seal container with lid and clearly label per WHMIS guidelines.
  - Minimize dust generated to the extent possible. Use water spray to reduce vapours; avoid contact of water spray with spilled material. Use tarps to cover spill area if water spray is used to reduce vapours.
  - Recovered solids, if free from impurities, may be suitable for its intended use. In this case, material is to be placed into containers with lid, and clearly labeled as per WHMIS guidelines.
  - Recovered material which cannot be used will be packaged into drums for offsite disposal at an approved waste management facility.
  - Neutralize residual spill material with appropriate agent as recommended by the SDS (sodium or calcium hypochlorite solution) or continue to excavate area until no visible spilled solid remains. Use suitable spill absorbent or soil to absorb the neutralized residue and package into drums for offsite disposal at an approved waste management facility.
  - Mop the affected area using detergent and water.
  - Place this water in labeled waste drums for offsite disposal at an approved waste management facility
- Remove, bag and label personal protective equipment for offsite disposal.
- Thoroughly wash skin with soap.

# Ammonium Nitrate Specific Spill Response Plan

Notes: Ammonium Nitrate is a substance listed on Schedule 1 of the E2 Regulations, with a threshold of 20 tonnes. Ammonium nitrate is part of the Amex explosives (UN No 0082) mixture used at site.

CAS No: 6484-52-2 (Ammonium Nitrate)

UN No: 0082 (Amex)

Hazards Identification:

Physical State: Solid, pale oil-covered prills
Odour: Fuel oil

Emergency Overview: DANGER. STRONG OXIDIZER. CONTACT WITH OTHER MATERIALS MAY CAUSE FIRE OR EXPLOSION

Environmental Effects: Cause release of nitrogen compounds (nitrate, nitrite, ammonia) into aquatic environments. Potential effects include algal blooms, reduced oxygen and eutrophication of surface water bodies.

Usage: Amex is used for surface and subsurface blasting associated with quarrying and subsurface blasting related to mine development and mining.

Storage: Ammonium Nitrate is found in mixture form on site, in the form of Amex. Amex is stored in locked seacans located within the explosives berms or storage magazines, as well as temporary use locations during blasting preparation both underground and surface sites. The magazines and explosives berm locations are established and permitted through NRCan or the Ministry of Mines as appropriate.

The explosives storage areas are constructed and located so as to minimize risk to personnel and as permitted by the Ministry of Mines. The expected quantity to be stored on site is 1350 tonnes of Amex. The maximum allowed capacity of the largest container in which the substance is stored is 40,800 kgs.

Spill Response

Personal Protective Equipment for Spill Response:

- Chemically resistant gloves;
- Protective glasses or chemical safety goggles;
- Chemically resistant coveralls or tyvek coveralls; and
- Dust mask if spill is in confined space.

Emergency response for an Ammonium Nitrate Spill

- Isolate and evacuate the spill area if potential for explosion.
- Report spill to Supervisor immediately. Provide location and estimate of spill quantity.
- Supervisor will report the spill immediately to the Environmental Superintendent or Safety Coordinator.
- Mine General Manager will activate Incident Command System and Emergency Response Team if required for response.
  - Based on size, location of spill and potential hazardous conditions/environmental impacts.
- Remove all sources of heat and ignition (there is to be no smoking or use of any flames within the area). Remove all uncontaminated combustible materials or organic compounds from spill area.
- Stop flow if safe to do so.
  - Ventilate space prior to entering, if indoors.
- For spills to land, snow or ice:
  - Protect spill area from storm water runoff and prevent entry into surface waters by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barriers.
  - Vacuum or sweep the spilled residue using non-metal, non-sparking tools.
  - Avoid shock, friction and contact with grit. Wet spillage with water to prevent dust generation.
  - Place the residue in a plastic container, label as per WHMIS Guidelines and transport to waste management for offsite disposal.
  - Recovered solids, if free from impurities, may be suitable for its intended use. In this case, material is to be placed into suitable containers with lid, and clearly labelled as per WHMIS Guidelines.
- For spills to water:
  - Ammonium nitrate sinks and mixes with water.
  - Isolate/confine the spill from spreading by damming or diversion if feasible.
  - Pump contaminated water to drums, tanks or lined containment berms if possible.
  - Label drums for offsite disposal at an approved waste management facility.
- Remove, bag and label personal protective equipment for offsite disposal.
- Thoroughly wash skin with soap.

# Explosive Materials

## Aviation Fuel (Jet-A) Specific Spill Response Plan

Notes: Aviation fuel is a substance listed in Schedule 1 of the E2 regulations. The quantities of Aviation fuel currently stored at the Hope Bay Project do not exceed the Schedule 1 thresholds; however, a Product Specific Emergency Response Plan has been developed for this product based on the environmental and health and safety impacts of a potential spill. If spilled, aviation fuel could be immediately harmful to humans and/or the environment and has the potential to cause pool fires and vapour cloud explosion (dependent on manufacturer specific additives).

CAS No: 8008-20-06 (Kerosene)

UN No: 1223 (Kerosene)

Hazards Identification:

Physical State: Liquid, pale yellow
Odor: Petroleum/solvent
Flash Point: > 38˚C

Emergency Overview: HIGHLY COMBULSTIBLE. FLASH FIRE/EXPLOSION POTENTIAL. MATERIAL IS STATIC ACCUMULATOR.

Potential Acute Health Effects: Highly Explosive when vapour meets the air. Causes combustion and explosion. Hazardous if ingested or inhaled. May cause irritation to the eyes and respiratory tract. Reacts with oxidizing agents. Hazardous decomposition product: Carbon monoxide.

Environmental Effects: Toxic to aquatic organisms, may cause long-term adverse effects in aquatic environments.

Usage: Jet-A is used to fuel aircraft operating at the Hope Bay site (helicopters, airplanes).

Storage: Jet-A is stored in steel fuel tanks or manufactured fuel bladders within the secondary containment berm. Smaller quantities are stored in steel drums within ventilated seacans or within lined containment facilities at the location of use.

The expected quantity to be stored on site is 775 tonnes of Jet-A fuel. The maximum allowed capacity of the largest container in which the substance is stored is 400,000 L.

Spill Response

Personal Protective Equipment for Spill Response:

- Chemical-resistant gloves (e.g., nitrile);
- Protective glasses or chemical safety goggles;
- Chemically resistant coveralls or Tyvek coveralls;

- Half face respirator with organic vapour cartridges or self-contained breathing apparatus; and
- Anti-static clothing.

Emergency response for a Jet-A Spill

- Isolate and evacuate the spill area if potential for explosion or combustion.
- Report spill to Supervisor immediately. Provide location and estimate of spill quantity.
- Supervisor will report the spill immediately to the Environmental Superintendent or Safety Coordinator.
- Mine General Manager will activate Incident Command System and Emergency Response Team if required for response.
  - Based on size, location of spill and potential hazardous conditions/environmental impacts.
- Remove all sources of heat and ignition (there is to be no smoking or use of any flames within the area).
- Stop flow if safe to do so.
  - Low-lying areas can trap explosive vapours.
  - Air quality monitoring will be conducted in enclosed spaces to determine concentration of hazardous vapours prior to initiating spill response efforts.
  - Ventilate space prior to entering, if indoors.
  - Restrict access to area and approach upwind of spill.
- For spills to land, snow or ice:
  - Protect spill area from storm water runoff and prevent entry into surface waters by constructing a ditch or berm using suitable non-combustible absorbent materials (e.g., sand, diatomaceous earth).
  - Do not contain spill if there is any chance of igniting vapours.
  - Cover small spills with non-combustible absorbent materials.
  - Use non-metal, non-sparking tools to collect absorption materials.
  - Place the residue in a steel container, clearly labeled as per WHMIS guidelines. Close tightly.
  - Ground tools and containers when collecting absorption material.
  - Transport to waste management for offsite disposal. Store in ventilated areas away from incompatible materials.
- For spills to water:
  - Jet-A fuel floats on surface of water.

  - Light hydrocarbon with narrow boiling range and low viscosity. Will evaporate or naturally disperse within a day or less in open water (NOAA Office of Response & Restoration, 2019).
  - Do not attempt to contain or remove spills (high explosion potential due to quick evaporation).
  - If Flash Point exceeds the Ambient Temperature by 10˚C or more, use containment booms and remove from the surface by skimming.
  - If Flash Point does not exceed the Ambient Temperature by 10˚C or is less than the Ambient Temperature, use booms as a barrier to protect shorelines and allow the material to evaporate.
  - Use booms to prevent spread of spill. Protect spread to shoreline where fuel can penetrate quickly into porous sediments.
- Remove, bag and label personal protective equipment for offsite disposal.
- Thoroughly wash skin with soap.

# Diesel Fuel Specific Spill Response Plan

Notes: Diesel Fuel is a substance listed in Schedule 1 of the E2 regulations, with a threshold of 2500 tonnes. Diesel fuel is used on site to for power and to fuel various pieces of light/heavy equipment.

CAS No: 68334-30-5

UN No: UN1202

Hazards Identification:

Physical State: Liquid, clear to yellow
Odor: Petroleum/solvent
Flash Point: >= 40.0˚C

Emergency Overview:

Potential Acute Health Effects: Flammable liquid and vapour. Harmful if swallowed. May be fatal if swallowed and enters airways. Causes skin and serious eye irritation. Harmful if inhaled.

Environmental Effects: Toxic to aquatic life with long lasting effects.

Usage: Diesel is used for power generation and to fuel various pieces of light/heavy equipment operating at site.

Storage: Diesel is stored in steel fuel tanks within secondary containment berm or double walled fuel tanks.

The expected quantity to be stored on site is 24,000 tonnes of diesel fuel. The maximum allowed capacity of the largest container in which the substance is stored is 5,000,000 L.

Spill Response

Personal Protective Equipment for Spill Response:

- Chemical-resistant gloves (e.g., nitrile);
- Protective glasses or chemical safety goggles;
- Chemically resistant coveralls or Tyvek coveralls;
- Full face respirator with organic vapour cartridges or self-contained breathing apparatus

Emergency response for a Diesel Spill

- Isolate and evacuate the spill area if potential for explosion or combustion. Stay upwind of spill/leak.
- Eliminate ignition sources.

- Report spill to Supervisor immediately. Provide location and estimate of spill quantity.
- Supervisor will report the spill immediately to the Environmental Superintendent or Safety Coordinator.
- Mine General Manager will activate Incident Command System and Emergency Response Team if required for response.
  - Based on size, location of spill and potential hazardous conditions/environmental impacts.
- Remove all sources of heat and ignition (there is to be no smoking or use of any flames within the area).
- Stop flow if safe to do so.
  - Air quality monitoring will be conducted in enclosed spaces to determine concentration of hazardous vapours prior to initiating spill response efforts.
  - Ventilate space prior to entering, if indoors.
  - Restrict access to area and approach upwind of spill.
- For spills to land, snow or ice:
  - Protect spill area from storm water runoff and prevent entry into surface waters by constructing a ditch or berm using suitable non-combustible absorbent materials (e.g., sand, diatomaceous earth).
  - Cover small spills with non-combustible absorbent materials, appropriate absorbent pads and placing absorbent booms in the path of flow of the spill.
  - Constructing temporary berms from soil or snow at the leading edge of the spill to minimize flow
  - Plastic tarps can be placed over and at the foot of the berm to capture pooling liquid and facilitate recovery
  - Pumping spilled material to empty drums or tanks
  - Excavators and other heavy equipment may be used to excavate contaminated materials
  - Use non-metal, non-sparking tools to collect absorption materials.
  - Place the residue in a steel container, clearly labeled as per WHMIS guidelines. Close tightly.
  - Ground tools/equipment and containers when collecting absorption material.
  - Transport to waste management for offsite disposal. Store in ventilated areas away from incompatible materials.
- For spills to water:
  - Diesel fuel floats on surface of water.

  - Identify the direction and speed of the flow path of the product based on weather conditions and drainage patterns
  - Monitor the spread of the material using a drone or from a helicopter if possible to identify the area of spread
  - Use appropriate absorbent pads, socks and similar materials to recover spilled product
  - Granular sorbent materials are NOT to be used for spill response on water
  - Hydrophobic absorbent booms will be deployed to contain large spills and to facilitate recovery
  - Absorbent booms will be drawn slowly in to encircle the spilled product and absorb it
  - Skimmers will be deployed in open-water areas to remove product from the water surface and boards or plywood may be used in streams or culverts to reduce the flow of spilled product on the surface and limit the area of the spill on the water
  - Pump contaminated water into tanks or storage bladders if possible
- Remove, bag and label personal protective equipment for offsite disposal.
- Thoroughly wash skin with soap.

# Acetylene Specific Spill Response Plan

Notes: Acetylene is a substance listed in Schedule 1 of the E2 regulations, with a threshold of 4.5 tonnes. Acetylene is used on site for welding on site.

CAS No: 74-86-2

UN No: UN1001

Hazards Identification:

Physical State: Dissolved gas, colourless
Odor: Garlic-like
Flash Point: -18˚C
Lower Flammable Limit: 2.4%

Emergency Overview: EXTREMELY FLAMMABLE GAS. CHEMICALLY UNSTABLE. STORED UNDER PRESSURE. CAN CAUSE RAPID SUFFOCATION. IMMEDIATE FIRE AND EXPLOSION HAZARD EXISTS WHEN CONCENTRATIONS EXCEED LOWER FLAMMABILITY LEVEL.

Potential Acute Health Effects: Extremely flammable gas. May react explosively even in absence of air at elevated pressure and/or temperature. Contains gas under pressure. May explode if heated. May form explosive mixtures in air.

Environmental Effects: No known eco-toxicological effects.

Usage: Acetylene is used for welding on site.

Storage: Acetylene is stored in steel compressed gas cylinder secured in cages or racks in seacans.

The expected quantity to be stored on site is 175 tonnes of Acetylene gas. The maximum allowed capacity of the largest container in which the substance is stored is 242 cubic ft.

Spill Response

Personal Protective Equipment for Spill Response:

- Self-contained breathing apparatus when entering confined spaces

Emergency response for an Acetylene Spill:

- Isolate and evacuate the spill area. Suffocation potential.
- Report spill to Supervisor immediately. Provide location and estimate of spill quantity.
- Supervisor will report the spill immediately to the Environmental Superintendent or Safety Coordinator.

- Mine General Manager will activate Incident Command System and Emergency Response Team if required for response.
  - Based on size, location of spill and potential hazardous conditions/environmental impacts.
- Remove all sources of heat and ignition (there is to be no smoking or use of any flames within the area).
- Never enter confined space or other area where flammable gas concentration is > 10% of its lower flammable limit.
- Ventilate area and monitor concentrations.
- Stop flow if safe to do so.

# Hydrochloric Acid Specific Spill Response Plan

Notes: Hydrochloric Acid is a substance listed in Schedule 1 of the E2 regulations, with a threshold of 6.8 tonnes. Hydrochloric acid is used within the process plant.

CAS No: 7647-01-0

UN No: UN1789

Hazard Identification:

Physical State: Liquid, clear to pale yellow
Odor: Pungent

Emergency Overview: MAT BE FATAL IF INHALED. CAUSES RESPIRATORY TRACT, DIGESTIVE TRACT, EYE AND SKIN BURNS

Potential Acute Health Effects: Very toxic by inhalation. Corrosive to eyes, skin, respiratory system and digestive tract. Causes burns. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing.

Environmental Effects: Toxic to aquatic organisms, may cause long term adverse effects in the aquatic environment.

Usage: Hydrochloric acid is used within the process plant.

Storage: Hydrochloric acid is stored plastic totes inside seacans.

The expected quantity to be stored on site is 140 tonnes of hydrochloric acid. The maximum allowed capacity of the largest container in which the substance is stored is 240 kg.

Spill Response

Personal Protective Equipment for Spill Response:

- Chemical-resistant gloves (e.g., nitrile);
- Protective glasses or chemical safety goggles;
- Chemically resistant coveralls or Tyvek coveralls;
- Self-contained breathing apparatus.

Emergency response for a Hydrochloric Acid Spill

- Isolate and evacuate the spill area.
- Report spill to Supervisor immediately. Provide location and estimate of spill quantity.

- Supervisor will report the spill immediately to the Environmental Superintendent or Safety Coordinator.
- Mine General Manager will activate Incident Command System and Emergency Response Team if required for response.
  - Based on size, location of spill and potential hazardous conditions/environmental impacts.
- Do not touch or walk through spilled material.
- Do not breathe vapor or mist. Provide adequate ventilation.
- Stop flow if safe to do so.
- For spills to land, snow or ice:
  - Protect spill area from storm water runoff and prevent entry into surface waters by constructing a ditch or berm using suitable non-combustible absorbent materials (e.g., sand, diatomaceous earth).
  - Neutralize with soda ash or lime. Use caution neutralization reaction can cause splashes, fumes and yield large amounts of heat resulting in boiling.
  - Dilute with water and mop up or absorb with inert dry material
  - Place in appropriate waste disposal container and seal tightly
  - Keep away from alkalis
  - Transport to waste management for offsite disposal. Store in ventilated areas away from incompatible materials.
- For spills to water:
  - Hydrochloric acid is soluble in water.
  - Do not attempt to contain or remove spills (high explosion potential).
  - Use booms to prevent spread of spill.
- Remove, bag and label personal protective equipment for offsite disposal.
- Thoroughly wash skin with soap.

# Additional E2 Regulations Schedule 2 Materials to be Stored Onsite

The hazardous materials to be stored onsite and listed in the E2 Regulations may include the following substances throughout the duration of the project:

- Formalin;
- Unleaded Gasoline;
- Ethyl Mercaptan
- Propane; and
- Nitric acid.

The quantities of these products are not anticipated to meet the thresholds under the E2 Regulations for the development of a product specific spill response plan. However, if at any time the quantities of these materials stored onsite reach the threshold volume identified in these regulations a product specific spill plan will be developed and submitted as an addendum to this Plan.

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# Appendix 2: Spill Response Resources

# Mobile Equipment

Any mobile equipment present on site may be used as a resource for spill response or spill clean-up. This includes pick-ups, skid steers, excavators, loaders, dozers, vacuum trucks, haul trucks, and flatbed trucks.

# Spill Kit Contents

Each Spill Kit contains:

- 1 roll absorbent or bundle of spill pads;
- 2 plug and dyke kits;
- 1 – 3 m x 4 m tarpaulin;
- 2 pairs of disposable coveralls;
- 4 mini booms;
- 1 bag of corncob and/or peat moss absorbent;
- 1 bag of gravel type fire retardant granular for aviation stations (helipad and airstrip);
- 2 pair of neoprene gloves (i.e., POL [petroleum/oil/lubricants] resistant);
- 2 sets of splash proof POL resistant goggles;
- 1 shovel;
- 10 disposable waste bags and ties; and
- A copy of the First Responder diagram (Figure I at the beginning of this plan).

# Aquatic Environment Response Equipment

Response equipment available in the event of a spill to the aquatic environment is stored in ten moveable seacans, with the exception of the boats. This equipment includes:

- 450 feet of 24" solid floatation boom;
- 70 lb, 43 lb, 25 lb, and 17 lb Danforth anchors;
- 8 lb Grapnel Anchors;
- 36" sea anchors;
- Anchor pins;
- Anchor Buoys;
- Anchor lines;
- 150 feet Towline;
- Boom towing bridles;

- 1250 feet of skirted booms (preassembled with tow lines, bridles and floats);
- 200 feet of inflatable Shore Saver booms (with inflation kit);
- 1TDS-118 Drum Skimmer;
- 1 P10E Power Pack;
- 2 Pump;
- 175 L Drum Response Kits c/w lids;
- Disposable coveralls (i.e., Tyvek suits);
- POL (petroleum/oil/lubricants) resistant gloves;
- POL resistant goggles;
- Toolbox c/w assorted tools;
- 45 Gallon containers c/w lids;
- Pails and Rubbermaid tubs;
- 300 foot Nylon rope (3/8);
- Bags of Oclansorb™ Peat Moss or crushed corn cobs;
- Bundles of oil sorbent pads;
- Bundles of universal sorbent pads;
- Oil Sorbent booms;
- Oil snares;
- Universal sorbent booms;
- Bag of Sorbent scraps (spaghetti);
- Containment tanks and berms;
- Plug and dyke kits;
- HAZMAT Disposal Bags and Garbage bags;
- Portable fuel bladders;
- Ice scrapers;
- A net for capturing seabirds/oiled wildlife;
- An 18-foot landing craft boat (with boat safety kit); and
- An 18-foot Zodiac (with boat safety kit and repair kit).

The above aquatic response equipment is considered more than necessary for the potential spills covered under this Plan. Spills to the aquatic environment are limited in potential scale as all fuel storage tanks are located in secondary containment and most are located away from water. The

Roberts Bay multiple tank fuel farm berm also has significant excess capacity to contain failure of more than one tank.

As a consequence, spills that may reach water are expected to be limited in size, manageable and recoverable using the aquatic response equipment available on site. If for any reason additional resources are needed, the Materials Manager/Superintendent would immediately begin procuring additional supplies to be flown to site.

Large spills to the marine environment resulting from bulk fuel offloads are addressed through the OPPP/OPEP. As outlined therein, shipping contractors provide all necessary equipment needed to appropriately respond to a fuel-offload spill, with Agnico Eagle supplies serving as additional resources available.

# Specialized Response Equipment

A stock of specialized spill response equipment is maintained on site and available for use in the event that a product spill as outlined in a Product Specific Spill Response plan occurs. This equipment includes:

- Full body chemical resistant suits (Tyvek);
- Rubber chemical resistant jackets, pants;
- Chemical resistant boots and gloves;
- Splash goggles and full face shields;
- Full and half face respirators with appropriate filters (e.g. organic vapour cartridges);
- Drager Self-contained breathing apparatus;
- Fire retardant coveralls and firefighting bunker gear;
- Drager BG-4 breathing apparatus (not to be used if product has explosive potential);
- Air quality monitors equipped with HCN, CO and O2 sensors;
- Non sparking tools, such as plastic shovels; and
- Sodium hypochlorite solution.

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# Appendix 3:
# Environmental Resource Maps

# Environmental Resource Maps

Shown in the following resource maps are areas of particular vegetation meaningful to the local wildlife and ecosystems which surround the project as well as raptor nests, rare plants and fish habitat. Additional detailed information may be found in baseline and monitoring reports available from the Environmental Superintendent and publically available on the Nunavut Impact Review Board and Nunavut Water Board websites. Information regarding archeological sites that have been identified on the Hope Bay belt is available to the Environmental Superintendent in the event of a spill. At the requirement of the Territorial Archaeologist, the locations of these sites are strictly confidential and information on these locations is only shared on an as needed basis. Spill containment will attempt to minimize impacts to sensitive habitats and archaeological sites.

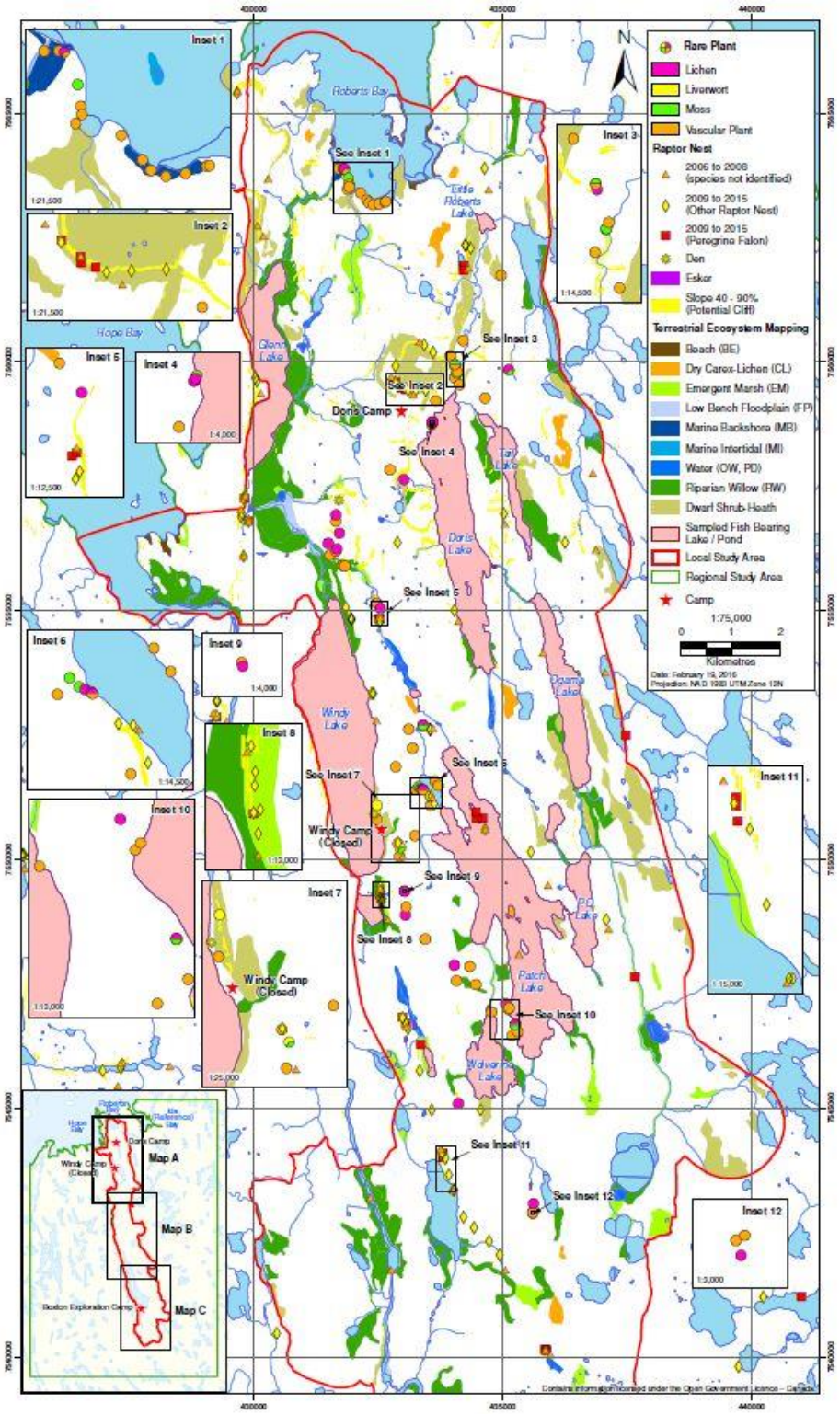


Figure 3.1. Environmental Sensitivity Mapping-Map A

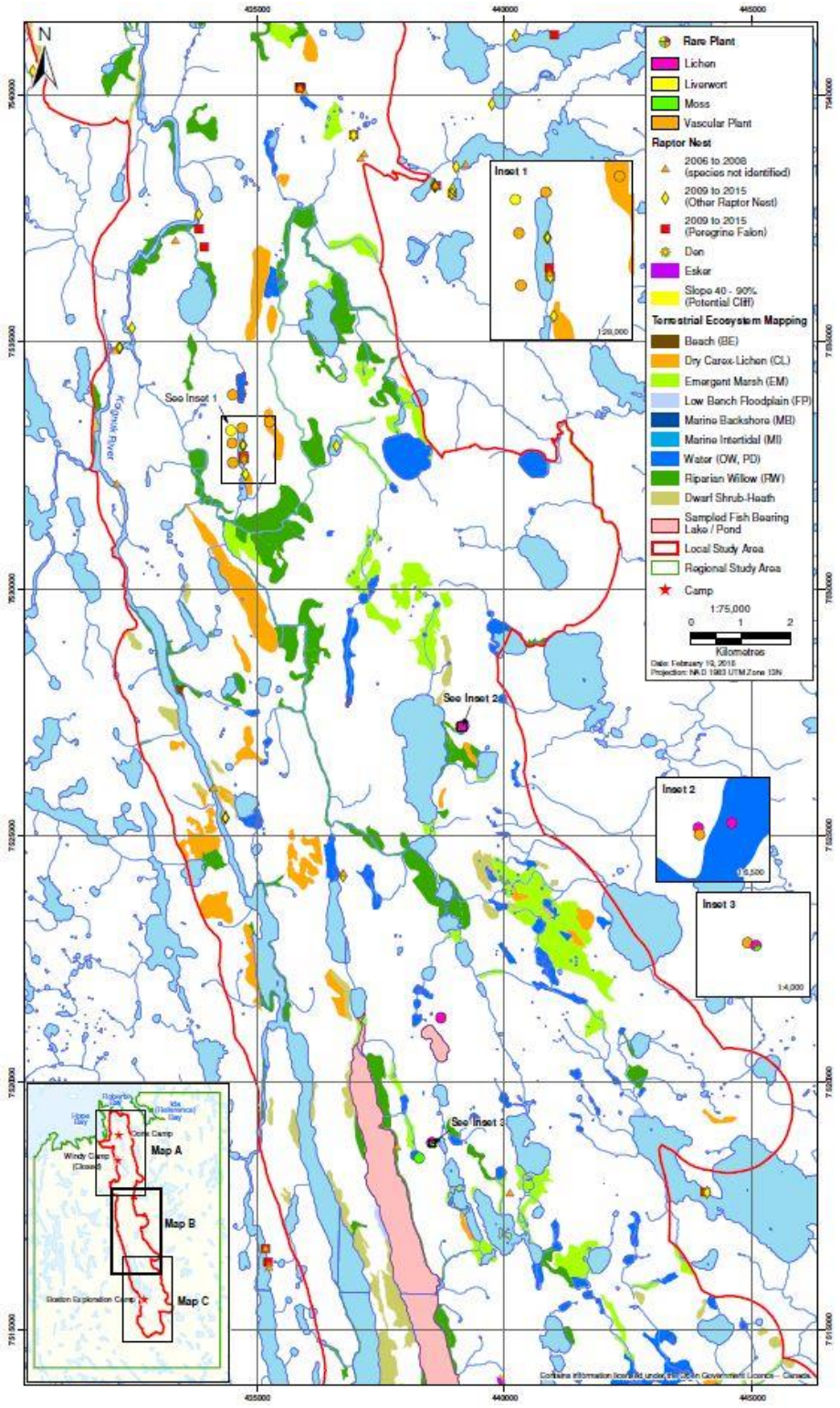


Figure 3.2. Environmental Sensitivity Mapping-Map B

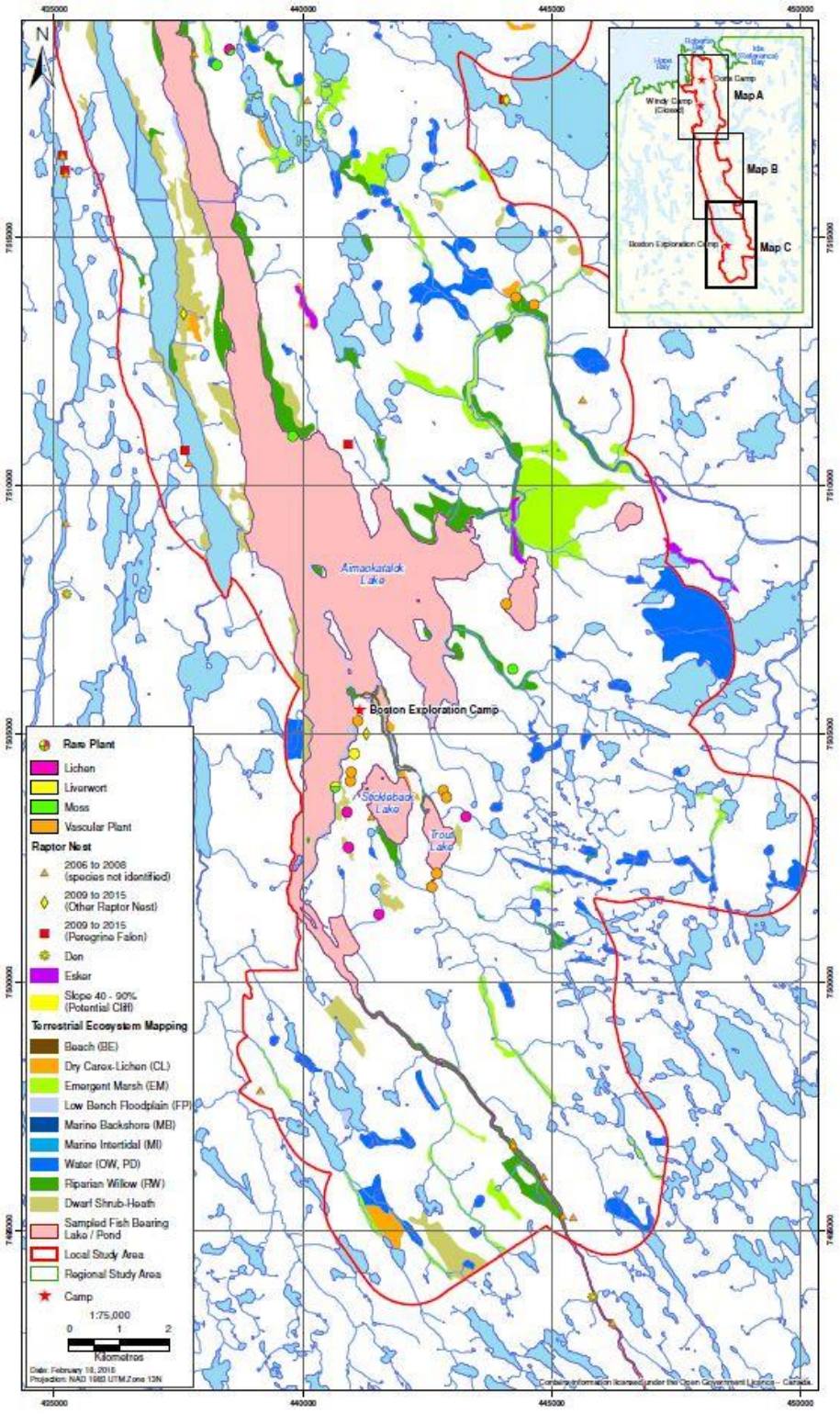


Figure 3.3. Environmental Sensitivity Mapping-Map C

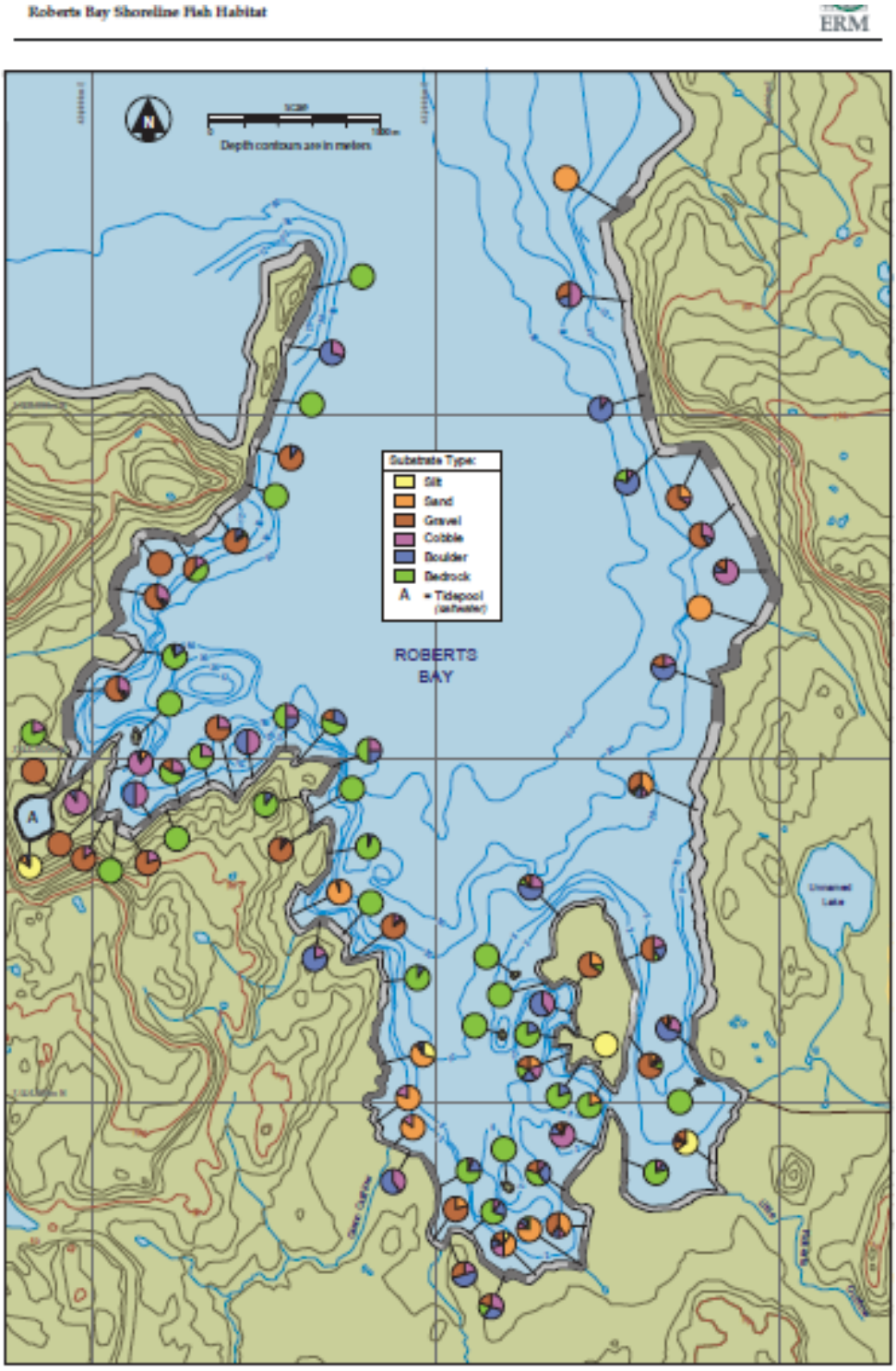


Figure 3.4. Environmental Sensitivity Mapping-Map D

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# Appendix 4: Responses to Comments on Previous Plan Versions

# Comment Responses and Revision References

This Plan replaces the September 2020 Spill Contingency Plan for the Hope Bay Project. Table 4.1 below outlines the comments received on previous versions of this Plan and Agnico Eagle's responses.

Table 4.1. Comments Received on Previous Versions of this Plan and TMAC's responses

| Version | Reviewer | Comment # | Comment | Recommendation | Response |
|---|---|---|---|---|---|
| 2016 | INAC | 1 | Module A of the Spill Contingency Plan provides details on spill kit contents and aquatic environment response equipment, but the information on mobile equipment (machinery) to be used for spill response is not available. | INAC recommends that the licensee include the list of mobile equipment to be used for spill management, as well as the spill containment equipment on each piece of equipment. | Any mobile equipment present on site may be used as a resource for spill response or spill clean-up. This includes pick-ups, skid steers, excavators, loaders, vacuum trucks, haul trucks, and flatbed trucks. This has been made clear in revised text in Module A. |
| 2016 | INAC | 2 | Section 2.5.1 of the spill contingency plan states that spill response kits will be available within 200 m of any areas where chemicals are stored and used. Aquatic spill response kits are available in moveable containers. The spill response kit locations are described as being easily accessible, but it is not clear if there will be adequate signage to identify them. As well, the modules at the end of the plan include pictures on which chemical storage locations are circled, but there is no indication where to find the spill kits beside them. The Guidelines for Spill Contingency Planning recommend including a plan with many features including storage locations of hazardous materials and locations of spill response kits. | INAC recommends that spill kit locations be identified on the ground and, on a site map or indicated in the pictures included in the plan. Default storage locations for the mobile aquatic response spill kits should be included so that a person consulting the plan would quickly know where to look for them. | Default spill kit locations, including the mobile aquatic response spill kits, have been now indicated on the site photographs provided in the site-specific modules. |
| 2016 | INAC | 3 | The section on spill response actions (2.3) outlines actions to be taken in event of different spill scenarios. Two of the scenarios for spills in water outline actions to be taken in event of a hydrocarbon spill, but do not speak to what should be done if other materials are spilled. These are sub-sections 2.3.5, spills under ice, and mitigation of impacts to birds. Some of the materials listed as on site including sodium cyanide would not disperse in the same way as petroleum products and would require different action responses. | INAC recommends that the licensee include action responses for materials that might sink or dissolve in water for spills under ice and mitigation of impacts to birds. | Information addressing spill sunder ice of substances that sink and dissolve is now presented in Sections 2.3.6 and 2.3.7, respectively. Mitigation of impacts to birds is addressed under 2.3.10.1. |

| Version | Reviewer | Comment # | Comment | Recommendation | Response |
|---|---|---|---|---|---|
| 2016 | INAC | 4 | Table 1 of Section 1.2 includes regulations and guidelines governing the spill contingency plan. Other regulations are referenced in the text and included in Section 7 of the plan. | INAC suggests that other material to be considered might include:<br>- Federal Transportation of Dangerous Goods Act and regulations; and<br>- NWT Used Oil and Waste Fuel Management Regulations | Waste material generated during spill response is managed as per the Hazardous Waste Management, Non-Hazardous Waste Management Plan, and/or the Landfarm Management Plan as indicated in Section 2.4 of the Plan. TMAC's Hazardous Waste Management Plan includes consideration of/reference to the Federal Transportation of Dangerous Goods Act and regulations and NWT Used Oil and Waste Fuel Management Regulations, as well as many other materials which may apply to management and disposal of spill response wastes, such as GN's Environmental Guideline for Used Oil and Waste Fuel. |
| 2016 | ECCC | 1 | Reference: Page 18 of the revised Spill Contingency Plan, EC #2<br><br>Comment: As noted in the table ECCC requested that TMAC undertake and incorporate hazardous substance identification and risk assessment into the Spill Contingency Plan in order to provide the required basis for accident scenario characterization and response planning. | It is expected that the risk assessment process will incorporate consideration of the likelihood of various spills and their potential consequences, which will determine appropriate mitigation/response strategies according to the resulting matrix rankings. | TMAC has provided further clarification of the risk assessment process to be undertaken for all work areas in the revised Plan, in Section 4. |
| 2016 | ECCC | 2 | Reference: Pages 18-19 of the revised Spill Contingency Plan, EC #4<br><br>Comment: ECCC reiterates recommendation EC #4 which requests that TMAC document and provide information on worst case accident scenarios for each hazardous product stored and handled onsite. | While the TMAC has indicated that the appropriate sections of the SCP “will continue to be refined in future revisions to capture additional scenarios as operational activities evolve and corrective actions/lessons learned are developed through incident investigations” ECCC is of the opinion that by identifying worst case accident scenarios now, TMAC will be better placed to determine actual required response capacities and develop adequate preparedness and response plans. | During the 2016 revision of the Plan, and based on ECCC's recommendation # 4 cited in the 2016 Plan, TMAC identified worse case scenarios and appropriate responses and included this information in the 2016 SCP as Section 4 "Spill Response Management Issues and Contingencies". TMAC's text indicating that worst case scenarios and responses 'will continue to be refined in future' was an acknowledgement of the continual improvement process loop employed at the Hope Bay Project including the risk assessment process, and recognition that additional scenarios may be identified and added to this Plan in future as a result. |

| Version | Reviewer | Comment # | Comment | Recommendation | Response |
|---|---|---|---|---|---|
| 2017 | KIA | 1 (KIA-6) | The Spill Contingency Plan provides a solid outline of reporting and mitigation measures in the event of a spill. Although specific mitigation of impacts to wildlife, including birds, and sensitive habitats is outlined, there is no specific detail associated with a spill into fish habitat.<br><br>It is noted that no chemicals are stored with 31 m of water, but there are no specific response actions protective of fish, as is outlined for other wildlife in the 'environmentally Sensitive Species' section. Environmental Resource Maps are provided in Module C, but the focus is on vegetation and terrestrial features. | TMAC should include additional maps and detail be provided for freshwater and marine fish habitat, so that sensitive features can be avoided, and if a spill were to occur near or in water, that the sensitivity of the habitat would be easily found and appropriate mitigation measures taken. | Fish are addressed and protected under the Plan by the management actions addressing spills to water. Fish habitat (sites which have been sampled for fish and within which fish have been found) are also indicated on the Environmental Resource Maps presented in Module C. TMAC has also included a fish habitat map of Roberts Bay in the revised Plan to allow identification of sensitive intertidal and shallow subtidal habitat for avoidance where possible. |
| 2017 | KIA | 2 (KIA-7) | The Spill Contingency Plan states in section 1.4, "In the event that a spill requires activation of the Emergency Response Plan, the Environmental Coordinator will provide guidance to the Surface Manager regarding implementing response actions according to this plan and evaluating priorities for protection of sensitive habitats/species and archeological features at risk."<br><br>A decision tree for use by the Surface Manager/Incident Commander or Environmental Coordinator has not been provided for the reviewer to evaluate how sensitive habitats/species and archeological features are prioritized in the event of potential impact to multiple priority areas. | TMAC should include a decision tree outlining how various sensitive or high value locations are prioritized. This will ensure of these locations are prioritized in the event of a spill or unplanned discharge in a manner satisfactory to KIA. | A prioritization hierarchy has been proposed for the environmental sensitivities and is now included in Section 2.3.10. |
| 2017 | KIA | 3 (KIA-8) | In Section 2.3.8, the Plan states, "TMAC and previous companies operating on the Hope Bay site have conducted numerous ecological surveys to identify [environmentally sensitive habitats or archeological sites] at risk, with the focus of identifying those areas immediately surrounding Project infrastructure which are at greatest risk of impact from a spill. In the event that a spill enters the natural environment, the Environmental Coordinator will use maps identifying these sensitive areas to prioritize the protection of these resources."<br><br>In the event of an unplanned spill or discharge, these sites will only become a mitigation priority after the Environmental Coordinator has had a chance to review the pertinent maps and provide guidance to the response team. | TMAC should ensure that the Environmental Coordinator has a-priori knowledge of high priority environmentally sensitive habitats and archeological sites and how to respond in these areas and provide all first responders with instruction on the locations of high priority environmentally sensitive habitats and archeological sites so that First Responders are immediately aware of them in the event of a spill or unplanned discharge. This would allow these locations to be prioritized and/or avoided when applying mitigation measures. | TMAC wishes to clarify that environmentally sensitive habitat maps are included in the Plan, which is available to all staff including the Environmental Coordinator. These maps identify locations of sensitive habitat, raptor nests, den sites, and fish habitat. Only archaeological site locations are kept confidential, at the requirement of the GN's Territorial Archaeologist. However, the Environmental Coordinator has ready access to archaeological site maps. of all locations which may be designated high priority. |

| Version | Reviewer | Comment # | Comment | Recommendation | Response |
|---|---|---|---|---|---|
| | | | A delay in First Responders becoming aware of these priority locations may limit the effectiveness of mitigation measures, permit more significant adverse impacts than necessary, or even damage those locations through the application of mitigation measures. We understand that, Environmental Resource Maps outlining archeological sites are kept confidential by TMAC. However, the need to keep the locations of these sites confidential must be weighed against the risk of potential spills and unplanned discharges. | | |
| 2017 | KIA | 4 (KIA-9) | In Section 3.4 the Plan states, "Monitoring activities may be conducted to assess the impacts of the spill and the effectiveness of associated cleanup/remediation efforts in the event a spill cannot be completely removed."<br><br>The KIA notes that spills reaching watercourses or waterbodies will eventually disperse as a result of natural hydrology such that they are "completely removed" from the environment even if impacts have occurred. The language included in the Plan does not require monitoring in the event of a spill or unplanned discharge to water nor other habitat types.<br><br>The KIA's right to compensation for damages to their lands and waters makes prompt and effective monitoring important to both TMAC and the KIA in the event of a spill or unplanned discharge. | TMAC should include triggers which require monitoring activities, and provide details of the type of monitoring that will be undertaken as part of adaptive management to spills and unplanned discharges in the Plan. This discussion should be specific to the type of spill, volume, mobility of the spilled material and proximity to various habitat features. Triggered monitoring should be implemented as quickly as possible such that it would characterize the impact of a spill to the receiving environment as well as the effectiveness of mitigation. | TMAC has provided more detail on spill related monitoring in Section 3.4. |

| Version | Reviewer | Comment # | Comment | Recommendation | Response |
|---|---|---|---|---|---|
| 2017 | KIA | 5 (KIA-10) | TMAC specifies in Module B that the Windy Camp is "no longer occupied". TMAC further specifies that "Fuel storage at Windy Camp is limited to one tank (double-walled Tidy Tank) containing a maximum of 1240L of diesel fuel." This tank is located more than 31 m from any waterbody and has been placed in "a secondary portable berm capable of containing the full volume of this tank in the event that the double-walled system failed".<br><br>However, no schedule for regular inspections of the tank or secondary containment has been included. A breach in the double-walled Tidy Tank may persist within the secondary containment for an unknown period of time placing the receiving environment and wildlife at potential risk. | TMAC should include the frequency fuel storage structures will be inspected at the Windy Camp, and increase the capacity of the secondary portable berm to 110% the total volume of the 1240L Tidy Tank. | TMAC has clarified in the revised Plan that the tank at Windy is a double-walled enviro tank (i.e. it possesses 110% secondary containment in its design and construction), and is also located inside of tertiary containment, with a capacity > 110 % of the volume of the tank. Although this tank is located at Windy camp, it is there to support Doris activities (it is the fuel supply tank for the potable water pump used to collect all potable water for Doris Camp), as such it is inspected on a regular basis as required under the Doris Water Licence (Part I Items 2 and 4). |
| 2017 | CIRNAC | 8 | | Section 2.4.1 of the Hope Bay Spill Contingency Plan indicates that spill response kits will be available near (within 200 m) areas where chemicals are stored and used on site, on fuel transfer vehicles, in moveable containers, and that additional kits will be added as project activities evolve and new locations of chemical storage and use are identified. Reference is made to Module B for a list of supplies in each spill kit and aquatic spill response container. This reference is incorrect – contents of spill kits and the aquatic spill response container are provided in Appendix 2: Spill Response Resources. CIRNAC recommends this error be corrected to eliminate confusion. | Corrected in this version of the Plan. |
| 2017 | CIRNAC | 9 | | Sections 2.3.12 and 2.2.13 of the Hope Bay Spill Contingency Plan make reference to substances that will sink or dissolve if spilled under ice, indicating that response to these substances will be decided on a case-by-case basis, with consultation with regulatory agencies and remediation specialists as necessary. CIRNAC recommends that the plan should include an indication of whether these categories of materials are present on site, what they are, as well as where and how they are stored and/or utilized. | TMAC keeps on file Safety Data Sheets (SDS) for all chemicals and materials on-site. The information provided in the SDS and by the manufacturer define what they are, as well as where and how they are stored and/or utilized. SDS are made available to all employees on site and help define spill response activities for any material, including any substances that will sink or dissolve if spilled under ice. |
| 2017 | CIRNAC | 10 | | Appendix 2 of the Hope Bay Project Spill Contingency Plan provides information on spill response resources including mobile equipment, spill kit contents, and aquatic environment response equipment, however no mention is made of specialized equipment and material to | Appendix 2 in this version of the Plan has been revised to include specialized equipment required for spill response. |

| Version | Reviewer | Comment # | Comment | Recommendation | Response |
|---|---|---|---|---|---|
| | | | | cleanup/handle spills, for example, the respirators/self-contained breathing apparatus, fire retardant clothing, sodium or calcium hypochlorite solution, etc. identified in Appendix 1 as required to clean up/neutralize spilled sodium cyanide. CIRNAC recommends Appendix 2 should be enhanced to include all equipment and material referenced in the plan for spill response and the Proponent ensures the equipment is available on site. | |
| 2017 | CIRNAC | 15 | Multiple references (e.g. in Section 2.2.6, 2.2.24 and 4.5.1) incorrectly state that Product Specific Spill Response Plans are provided in Module A | Ensure the proper reference (Appendix 1: Hazardous Materials and Product Specific Spill Response Plans) is used to eliminate confusion | References to appendices corrected in this version of the Plan. |
| 2018 | CIRNAC | CIRNAC-3 | In reviewing the 2017 Annual Report, CIRNAC commented that a table of key government contacts was presented in the Hope Bay Project Spill Contingency Plan which required an update. This contact information has not been updated to the recommended phone number in the 2019 revision. | CIRNAC recommends that the contact numbers for the inspector be updated. Candice Peterson is now responsible for this file. She is based out of Cambridge Bay, her phone number is 867-983-5115, and her fax number is 867-982-4307. | During the upcoming annual review and update of the Spill Contingency Plan, TMAC will update the Inspector contact information, as well as any other key government contacts, as required to ensure they are current. |
| 2018 | CIRNAC | CIRNAC-6 | Continuous monitoring and timely reporting of spills incidents is required by regulations and project Term and Condition. The Term and Condition 20 states that: “The Proponent shall ensure spill kits are at hand at the Roberts Bay oil handling facility at all times, and that appropriate containment measures are used in the event of a spill”. The Term and Condition 32 requires that: “Prior to the commencement of operation the Proponent shall have a complete Environment, Health and Safety Management System in place which includes: Emergency Response and Spill Contingency Plan; Occupational Health and Safety Plan; Monitoring and Follow-up Plan; and Auditing and Continuous Improvement Plan”.<br>General comments in Section 6.2 regarding the 2017 Annual Report state: “An information summary should be included in the annual report on these minor spills such as numbers, quantities, impacted media, reasons/causes, and corrective measures implemented (both short term and long term). As one of the objectives stated in the Hope Bay Project Spill Contingency Plan is to “Implement a process to evaluate and continuously improve site spill response procedures”, discussion should be provided regarding lessons learned related to spill response and improvement measures implemented.” The objectives for monitoring spills and | CIRNAC recommends that TMAC Resources Inc.:<br>• Consider including details of all spills (minor and major/reportable) in the Annual Report. Minimum details should include numbers, quantities, material spilled, impacted media, reasons/causes, and corrective measures implemented (both short term and long term).<br>• Identify corrective measures to address the timing for reporting of reportable spills. All reportable spills have to be reported within 24 hours as required by the Spill Contingency and Reporting regulation R-068-93 (Government of Nunavut, clauses 9(2) and 11(2)).<br>• Consider adding the following testing and review elements to the Spill Contingency Plan to promote continuous improvement, as best management practice:<br>• Document all spill incidents (major/reportable and minor/non-reportable) and undertake periodic review of trends and lessons learned. Analyze previous year’s data of reportable and non-reportable spills to identify trends.<br>• Plan, undertake and document an annual spill drill / simulation exercise. The incorporation of this element into the existing management plan(s) will provide a mechanism to learn and improve from accidents and malfunctions. | TMAC tracks all unauthorized discharges and spills on site, regardless if they are externally reportable or not and identifies any observable trends. Based on those results, root cause analysis and corrective actions are recorded, tracked and implemented. CIRNAC is welcome to review information with TMAC staff during any of their multiple annual site inspections. See Section 3 of this plan.<br><br>TMAC would like to clarify that only two of the 15 spills were reported outside of the 24 hour reporting window. TMAC strives to provide adequate reporting within the 24 hour reporting period and will aim to ensure all spills are reported as per the Spill Contingency and Reporting regulation R-068-93 (Government of Nunavut, clauses 9(2) and 11(2)).<br><br>An annual tabletop exercise is conducted prior to the sealift fuel transfer simulating a spill to land or water. The exercise tests TMAC’s Incident Command System and the implementation of the Spill Contingency Plan, Oil Pollution Prevention Plan and the Oil Pollution Emergency Plan in response to a spill scenario at the Roberts Bay oil handling facility as required by Transport Canada. See Section 5.1 of this plan. |

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| | | | discharges are designed to prevent negative impacts to the environment (e.g., water, soil, vegetation, wildlife, air, etc.) associated with project activities, prevent injuries and health impacts to workers and other people associated with project activities; ensure adequate spill response capacity and emergency response planning is in place and ensure adequate oversight of project activities is occurring.<br>In the 2018 Annual Report, 15 spills were reported to have met the reporting threshold of the Nunavut Spill Contingency Planning and Reporting Regulations and were reported to regulatory agencies. An unquantified number of spills termed minor in nature are noted. It is notable that:<br>• The overall number of reportable spills increased from 2017 (11) to 2018 (15).<br>• The overall number of total spills including minor spills is not reported and there is no provision of quantities, details of the 'minor' spills.<br>• Eight of 15 reportable spills were reported one day after the spill occurred.<br>• The total quantity of hazardous materials spilled to the environment is more than 25,000 L and is a greater volume than that of the previous year.<br>• The March 2019 Spill Contingency Plan does not include continuous improvement management processes addressing prevention. | • Revise Spill Contingency Plan to include requirements for evaluation and continuous improvement. | |
| 2018 | CIRNAC | CIRNAC-7 | Sections 2.3.12 and 2.2.13 of the Hope Bay Project Spill Contingency Plan (December 2017) make reference to substances that will sink or dissolve if spilled under ice, indicating that response to these substances will be decided on a case-by-case basis, with consultation with regulatory agencies and remediation specialists as necessary. CIRNAC recommended that at a minimum, the plan should include an indication of whether these categories of materials are present on site currently, if so identify them and indicate where they are stored and how they are utilized. TMAC Resources Inc. provided a response and referred to these substances in Table 4.2 (Pg. 27) of the updated Spill Contingency Plan (March, 2019). Therefore this issue has been resolved. Appendix 2 of the Hope Bay Project Spill Contingency Plan provides information on spill response resources including mobile equipment, spill kit contents, and aquatic environment response | CIRNAC recommends that TMAC Resources Inc.:<br>• Correct the Format and Reference errors indicated in the table above.<br>• Review and add new relevant documents pertaining to spills including:<br>• "A Guide to Spill Contingency Planning and Reporting" dated 2018 June, Nunavut Department of Environment; and<br>• Environmental Emergency Regulations, 2019 published in the Canada Gazette March 6, 2019, coming into force August 24, 2019, Environment and Climate Change Canada | TMAC agrees to update and correct the formatting and reference errors in the next annual update of the Spill Contingency Plan. |

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| | | | equipment, however no mention is made of specialized equipment and material to cleanup/handle spills, for example, the respirators/self-contained breathing apparatus, fire retardant clothing, sodium or calcium hypochlorite solution, etc. identified in Appendix 1 as required to clean up/neutralize spilled sodium cyanide. CIRNAC recommended that Appendix 2 should be enhanced to include all equipment and material referenced in the plan for spill response. TMAC Resources Inc. listed the specialized response equipment in the Spill Contingency Plan, March, 2019 (Pg. 13). This issue is resolved.<br><br>Format and reference errors were identified for the updated Spill Contingency Plan (March, 2019): Hope Bay Project Spill Contingency Plan (March 2019) Section 1.2 Title of Table 1.1 references the Incinerator Management Plan Correct Title of Table 1.1 Table 1.1 Regulation / Guideline Include updated regulation: | | |
| 2018 | KIA | KIA-NIRB-21<br>KIA-NWB-3 | There is a discrepancy in the spill amount-reporting threshold for “miscellaneous products, substances, or organisms” that needs to be resolved. The table of Immediately Reportable Spills (p. iv) refers to the “NU Spill Contingency Planning and Reporting Regulations”, a document on the GN DOE website that was created by the GNWT for the GNWT’s use in 1998. These regulations specify a 50 L or 50 kg reporting threshold. However, Section 3.3 of the Plan also implies that the Immediately Reportable Spills Table follows the current GNWT ENR “Report a spill” website, which states that this limit is ≥ 5L or 5kg. Unless there is a typo on the GNWT website, the more conservative values should be used in TMAC’s Spill Contingency Plan. In the Mar 2019 Hope Bay Spill Contingency Plan, there is a table showing Immediately Reportable Spills following “Schedule B of the NU Spill Contingency Planning and Reporting Regulations”. This document is available on the GN DOE website – it is a 1998 consolidation of the 1993 regulations created by the GNWT. In Schedule B of this document, the immediately reportable amount of “miscellaneous products or substances, excluding PCB mixtures” is 50 L or 50 kg, which are the values listed in the Plan. | The KIA recommends that TMAC confirm spill-reporting thresholds with the GN and GNWT, and to update the information presented in the Immediately Reportable Spills, if needed. | TMAC will investigate to determine the correct reportable quantity and include in the next update of the Spill Contingency Plan if required. Use of the GNWT ENR “Report a Spill” website confirmed with the Inspector. This plan has been updated to reflect these thresholds (Section 3.3). |

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| | | | However, the Plan also references the GNWT ENR "Report a spill" website within Section 3.3 when discussing the Immediately Reportable Spills Table. On this website, the reportable quantities for spills of "miscellaneous products, substances or organisms" are ≥ 5 L or 5 kg. These values are 10x lower than those listed in the Regulations, suggesting that the Hope Bay Spill Contingency Plan, or the website itself, contains a typo. It seems more likely that the values on the website are correct, and that those in the Plan are incorrect, based on precedents seen in other projects. Note also that the cited website link in Section 3.3 is broken. The current URL is: https://www.enr.gov.nt.ca/en/services/report-spill The correct spill amount threshold for miscellaneous substances needs to be resolved with regulators. The Immediately Reportable Spills table in the Hope Bay Spill Contingency Plan should then be updated, if necessary. | | |
| 2018 | KIA | KIA-NIRB-22<br>KIA-NWB-4 | The Plan states that a marine spill report will be submitted to a Transport Canada (TC) Marine Safety Inspector if required. There is no further information regarding these reporting requirements; and the table showing Key Government Contacts does not include the TC Inspector's contact information. In addition, the CIRNAC Inspector's phone number in the Key Government Contacts table is different from the number listed in the Type A/B Water License conditions within the Conformity Tables. | The KIA requests additional information about spill reporting requirements for Transport Canada, and that contact information be included in the Plan for TC's Marine Safety Inspector.<br>The KIA also recommends that TMAC confirm the correct contact information for the CIRNAC Inspector and update the table of Key Government Contacts, if needed. | TMAC will ensure the correct contact information for the CIRNAC inspector is up to date with key Government Contacts in the next annual update of the Spill Contingency Plan. |
| | | | Section 3.3 of the Hope Bay Spill Contingency Plan states that in the event that a spill has occurred to the marine environment, a written report will be submitted within 24 hours to the Canadian Coast Guard, and a copy of this report will be submitted to a Transport Canada Marine Safety Inspector "if required". There are no further details regarding the situation(s) in which a TC Marine Safety Inspector will need to be notified. There is also no contact information for the TC Marine Safety Inspector within the table of Key Government Contacts on p. iii of the Plan.<br><br>The Conformity Tables within Modules A, B, C, and D include conditions of the Type A and B Water Licenses that the Spill Contingency Plan is intended to address. Among | TMAC's response is partially satisfactory. They will confirm and include the correct contact information for the CIRNAC inspector in the next update of the Spill Contingency Plan. However, TMAC did not address the KIA's comment regarding marine spills and reporting requirements to a Transport Canada Marine Safety Inspector.<br><br>Request to TMAC: Please include contact information for the Marine Safety Inspector in the list of Key Government Contacts and indicate the situation(s) in which the Marine Safety Inspector needs to be notified in the next update of the Spill Contingency Plan. | Contact information for the Marine Safety Inspector and the situation(s) in which the Inspector would be contacted are detailed in the Hope Bay Ocean Pollution Prevention Plan/Oil Pollution Emergency Plan (OPPP/OPEP). The OPPP/OPEP is the main document of reference for spill control actions in a marine environment and is directly referenced in section 2.2.8 – Spill in a Marine Environment of the Spill Contingency Plan. |

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| | | | these conditions is the reporting of any unauthorized deposits or foreseeable unauthorized depots of waste and/or discharges of effluent to “the Inspector at (867) 975-4295” (in addition to the 24-Hour NT-NU Spill Reporting Line and the KIA). However, the phone number listed in Key Government Contacts (p. iii of the Plan) for the CIRNAC Inspector is (867) 983-5115. Please confirm which phone number is correct and update the list of key contacts, if needed. | | |
| 2018 | KIA | KIA-NIRB-23<br>KIA-NWB-5 | It is difficult to judge from the plates in Modules A and D whether TMAC is complying with their own policy of making spill kits available within 200 m of fuel and chemical storage locations. TMAC should ensure that spill kits are available as described. Section 2.4.1 of the Hope Bay Spill Contingency Plan states that spill response kits will be available near (within 200 m) any areas where chemicals are stored and used on site, including near all bulk fuel berms and smaller fuel tanks. In addition, all active construction areas where equipment is operating will have a spill kit located within 200 m.<br><br>Modules A through D within the Plan describe the specific conditions of Doris, Windy, Madrid, and Boston operations relevant to spill response, including chemical storage volumes and locations, and photographs of the sites. Plate A.4 shows the Reagent Berm at Doris, and an Explosive Berm is indicated to the right, outside of the photo. It is unclear whether the spill kit located at the Reagent Berm is also intended to serve spill incidents at the Explosive Berm, and it is also unknown whether the Explosive Berm is located within 200 m of the Reagent Berm (and spill kit). Furthermore, the lack of scale, and possible forced perspective, of Plate D.1 (Boston Camp) makes it difficult for a reviewer to determine whether the spill kit in the middle-left is located within 200 m of the chemical storage locations to the farthest left of the photo.<br><br>It would be useful to have updated photos or site diagrams, for all Hope Bay project locations, that encompass all infrastructure and activities and have a scale to assess | The KIA recommends that updated photos or site diagrams, with appropriate scale indicators, be included in the next version of the Hope Bay Spill Contingency Plan. | TMAC will ensure updated site diagrams will be included in the next annual update of the Spill Contingency Plan. Please refer to Modules A through D of this Plan. |

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| | | | distances. These would allow for a more comprehensive review of TMAC's spill response plan. | | |
| 2018 | KIA | KIA-NIRB-24<br>KIA-NWB-6 | The Jet-A Specific Spill Response Plan needs more information and subsequent steps for emergency response to a spill to water. Currently, the plan is limited to advising responders not to attempt to contain or remove spills, and to use booms to prevent spread. Even if TMAC staff are not responsible for cleaning up a Jet-A spill, there should be further information about who to contact for proper treatment. TMAC has developed a Product Specific Spill Response Plan for Jet-A fuel because spills of this substance could be immediately harmful to humans and/or the environment and has the potential to cause pool fires and vapour cloud explosion. Within the Jet-A plan, the instructions for spills to water include three bullet points:<br>• Jet-A fuel floats on surface of water.<br>• Do not attempt to contain or remove spills (high explosion potential).<br>• Use booms to prevent spread of spill.<br>• The subsequent generic steps regarding Jet-A fuel spills are to properly dispose of PPE and to thoroughly wash skin with soap. This is the end of the Jet-A spill response plan.<br>Further details are needed regarding Jet-A spills to water. It is perhaps implied (though this should be clarified) that no Hope Bay Project staff within the Spill Emergency Incident Command System (Figure III, p. vii) is qualified to clean up Jet-A spills to water. If this is the case, information about who should be contacted, and who will be responsible for clean-up, should be included in the Plan. | The KIA requests that additional information regarding spills to water be included in the Jet-A Specific Spill Response Plan, such as the party(ies) responsible for cleanup/ treatment. | TMAC will provide additional information to the Aviation Fuel (Jet-A) Specific Spill Response Plan.<br><br>Additional information has been provided in the Jet-A Specific Spill Response Plan with rationale for response to a spill on water. Refer to Appendix 1 of this Plan. Note, multiple spill response resources direct that attempts to recover spills of Jet-A to water should not be attempted due to volatility and explosive potential of the material, and the fact that evaporation of the product occurs within hours to days makes recovery of this product by conventional skimming methods difficult to accomplish. |

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| 2018 | KIA | KIA-NIRB-25<br>KIA-NWB-7 | TMAC's revisions to the Spill Contingency Plan in response to the previous KIA comment #2 are incomplete. There are ambiguities between Section 2.2.16 and the Environmental Resource Maps provided in Appendix 3, which would prevent a clear understanding of priorities in the event of a spill.<br>In response to previous KIA review comment KIA-7, TMAC proposed a prioritization hierarchy for environmental sensitivities. (Note that there is a typo in TMAC's response on p. 24 – it should refer to Section 2.2.16 rather than 2.3.10.) The proposed hierarchy of protection will attempt to favour:<br>1. Waterbodies;<br>2. Sensitive habitat types;<br>3. Archaeological sites;<br>4. Rare plants; and<br>5. Active raptor nest or wildlife den.<br>In addition, for spills in water, prioritization will attempt to avoid vegetated and finer substrate shoreline areas (sand, gravel, cobble). TMAC's proposed hierarchy is not detailed enough in comparison to the Environmental Sensitivity Maps A-C, which include rare plants, raptor nests, and wildlife dens. Are the "sensitive habitat types", indicated as the second highest priority, the other features on these maps, i.e., eskers, slopes of 40-90% (possible cliffs), or certain TEM classes?<br>For example, would the TEM class of Dry Carex-Lichen be prioritized over others because this is important forage for caribou?<br>Furthermore, the Environmental Resource Maps in Appendix 3 may not be at a size, scale, or resolution that is useful for emergency spill response. For example, Figure 3.1 (Map A) is very difficult to read; the need for 12 insets may indicate that larger scale maps are needed to cover the study area in sufficient detail. Map A also shows that Hope Bay is within the study area; however, only Roberts Bay was mapped for shoreline fish habitat values (Figure 3.4, Map D). | The KIA requests that the proposed prioritization hierarchy in Section 2.2.16 of the Spill Contingency Plan be revised to a level of detail that is compatible with the Environmental Sensitivity Mapping for this project. The KIA also requests that Environmental Sensitivity Maps be provided to Project personnel in a larger format and at higher resolution, such that they are useful for emergency spill response. | TMAC would like to take the opportunity to re-visit the response hierarchy to reflect operational experience. TMAC's first priority in any spill incident is to stop the source of the spill (if not already accomplished at the time discovered), then to prevent the spread and contain the spill and then to assess the best method to remove as much of the spilled substance as possible taking into consideration numerous factors including but not limited to land, water, topography, substrate depth, location and season. Safety of personnel is the paramount consideration in all efforts and workplans. Based on the review of Appendix 3 and experience to date, TMAC will re-visit the Environmental Sensitivity Mapping to account for the abiotic and biotic factors that practically guide spill response at Hope Bay. KIA will be engaged on this matter and the potential timing of the next update in the plan. |

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| 2018 | KIA | KIA-NIRB-26<br>KIA-NWB-8 | TMAC has made some revisions to the Spill Contingency Plan regarding spill-related monitoring. However, the wording is weak and does not reflect a commitment by TMAC to conduct monitoring activities. In response to previous KIA review comment KIA-9, TMAC responded that more details on spill related monitoring have been included in Section 3.4 of the Spill Contingency Plan. However, the revisions to Section 3.4 do not fully address the KIA's concerns. While TMAC has deleted the phrase "completely removed" and has added more information about monitoring triggers and locations for spills to water, the wording in this section still needs to be stronger. The current wording throughout Section 3.4 is that "monitoring may be triggered". TMAC should commit to conducting monitoring activities for spills that potentially have negative environmental impacts, and that are unlikely to be (completely) recovered, whether or land or in water. While monitoring for all spills may not be feasible, especially for small spills with little expected impact, TMAC could develop spill thresholds for various substances or situations for which "monitoring will be triggered". | The KIA recommends that TMAC use stronger wording within Section 3.4 of the Spill Contingency Plan, i.e. "monitoring will be triggered" rather than "monitoring may be triggered" for various spill response scenarios. | TMAC is committed to the application of the appropriate spill prevention, response, monitoring and restoration activities outlined in the Spill Contingency Plan. TMAC believes that it is not practical to establish specific thresholds for various spill response scenarios as there are many, and monitoring and restoration activities would need to be determined on a case-by-case basis. Where deemed appropriate, monitoring and restoration programs deemed would be developed in consultation with the CIRNAC Inspector and the KIA. |
| | | | Without a strong commitment from TMAC to monitor the potential effects of spilled substances that cannot be recovered, there is no guarantee that monitoring will occur at all. The KIA's right to compensation for damages to their lands and waters makes prompt and effective monitoring important to both TMAC and the KIA in the event of a spill or unplanned discharge. | TMAC's response is partially satisfactory. Please see detailed KIA review comments for KIA-NWB-9 below. | Please see detailed response as part of KIA-NWB-9 below. |

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| 2018 | KIA | KIA-NIRB-27<br>KIA-NWB-9 | Conditions for triggering of monitoring of spills into water is unclear. TMAC states that “monitoring may be triggered in the event of spills to water of substances that dissolve or sink where substance recovery unlikely” and that “monitoring may also be triggered in the event of externally reportable spills to land for which recovery of spilled material is unlikely or may be incomplete”. In Appendix 4, under Comment #4 (KIA-9), the KIA requested that “TMAC should include triggers which require monitoring activities, and provide details of the type of monitoring that will be undertaken as part of adaptive management to spills and unplanned discharges…the discussion should be specific to the type of spill, volume, mobility of the spilled material and proximity to various habitat features. Triggered monitoring should be implemented as quickly as possible”. | Please remove the discretionary language in Section 3.4 to so that monitoring is required for (i) all spills to water of substances that dissolve or sink which are unlikely to be recovered and (ii) all externally reportable spills to land of substances unlikely to be fully recovered.<br>Please specify under what conditions monitoring will be triggered for spills (i) and (ii) (e.g., type of spill, volume, mobility, proximity to sensitive environmental features), what parameters will be collected, and how soon after a spill triggered monitoring will be implemented. | TMAC is committed to the application of the appropriate spill prevention, response, monitoring and restoration activities outlined in the Spill Contingency Plan. TMAC believes that it is not practical to establish specific thresholds for various spill response scenarios as there are many, and monitoring and restoration activities would need to be determined on a case-by-case basis. Where deemed appropriate, monitoring and restoration programs would be developed in consultation with the CIRNAC Inspector and the KIA. |
| | | | TMAC responds that it “has provided more detail on spill related monitoring in Section 3.4”. We do not believe TMAC has satisfactorily responded to our original concern regarding monitoring spills. We are concerned with the use of discretionary language in the guidelines for monitoring spills under Section 3.4 (“may be triggered”). Furthermore, it is not clear what conditions will actually trigger monitoring under the two scenarios presented in this section (e.g., type of spill? volume? mobility? proximity to sensitive environmental features?). TMAC also has not indicated how soon after a spill triggered monitoring would be implemented, or what parameters will be collected. | TMAC’s response is the same as for KIA-NWB-8, which is partially satisfactory. The proponent states that “where deemed appropriate, monitoring and restoration programs would be developed in consultation with the CIRNAC Inspector and the KIA.” As evidenced by comments KIA-NWB-8 and -9, the KIA believes that monitoring and restoration programs should be developed prior to spill events as part of spill response planning and preparedness and to show an understanding of the potential effects of spills on land and in water. These programs can then be adapted, in a timely manner, to each spill response scenario on a case-by-case basis. We appreciate that TMAC’s monitoring and restoration programs will be developed in consultation with the KIA; however, we recommend that consultation about spill response and triggered monitoring occur as soon as possible.<br>KIA acknowledges that spill response varies depending on numerous factors (including type of substance, location of spill, volume, proximity to sensitive environmental features etc.), all spills need to be monitored to help determine what response is appropriate. Furthermore, in the case of spills to water and land that are unlikely to be recovered, it is paramount that monitoring be conducted to track whether these spills cause any adverse environmental effects, so that effective mitigation measures can be implemented.<br>Consequently, the discretionary language in the guidelines for | TMAC appreciates KIA’s intent to understand spill preparedness however TMAC does not feel predetermining every possible scenario, response, follow up monitoring, including parameters to be measured, and reclamation actions, is practical or effective. If TMAC were to attempt to address these requests it would result in an extremely voluminous document with thousands of iterations and combinations that account for every possible factor at Hope Bay. TMAC has explored this approach in the past and determined it would be unreasonable to maintain but more importantly, unnecessary. Including these details up front in the management plan is not the intent of the Spill Contingency Plan.<br>The Spill Contingency Plan was developed for the efficient and effective management of activities at site by ensuring the people responsible have the information required to make informed decisions that consider key factors. TMAC has evaluated this approach as being more effective than predetermined responses to a copious amount of scenarios. That said, TMAC would welcome discussing this matter further with the KIA to understand if there are opportunities for improvement that TMAC can incorporate into its approach to spill response. |

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| | | | | monitoring spills under Section 3.4 should be removed and replaced with wording stating that monitoring is required for all spills described under (i) and (ii) in our prior recommendation. The KIA also requests clarification about situations in which TMAC would deem it appropriate to develop appropriate monitoring and restoration programs in consultation with the CIRNAC Inspector and the KIA (e.g., compared to when it would be inappropriate to do so). | |
| 2019 | KIA | KIA-NIRB-28<br>KIA-NWB-10 | Photograph does not indicate location of spill kit at Patch Laydown Facility. Plate B.2 shows a photograph of the Patch Laydown Facility. The caption indicates that the red circle is for the fuel storage location and the yellow star is for the spill kit location.<br>However, no red circles or yellow stars are shown on the photograph. | Please clarify whether any fuel storage and spill kit locations exist at the Patch Laydown Facility. | Fuel and chemical storage facilities have been removed from the Patch Laydown Facility. Plate B.2 been removed in this version of the Plan. |
| 2019 | KIA | KIA-NIRB-29<br>KIA-NWB-11 | No mitigation measures are stated for settlement of tanks. Eight fuel tanks at the Boston site are situated on a lined fuel berm on the permafrost.<br>TMAC indicates that there are concerns that the permafrost may degrade over time due to thin areas of the crush pad, which could cause settlement of the tanks, making them unstable and prone to tipping. TMAC states that regular monitoring of the fuel tanks for differential settlement occurs during seasonal visits, annual geotechnical inspections, and as needed. However, TMAC does not discuss what mitigation measures are in place should settlement of the tanks be detected. | Please explain what management action is taken if settlement of the fuel tanks at the Boston site is detected during routine monitoring. | If settlement of the fuel tanks at the Boston site are detected beyond an acceptable limit, TMAC will discontinue the use of the tank(s) that are effected by settlement and engage the Engineer of Record (SRK Consulting) for guidance and recommendations for correcting the settlement issue. TMAC will continue to monitor permafrost and physical stability of site infrastructure on an ongoing basis and will take a proactive approach to risks identified. |

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| 2020 | KIA | KIA-NWB-33 | The discretionary language KIA identified in the 2018 Annual Report relating to monitoring of spills remains in the 2019 Annual Report. Under section 3.4 of Appendix H, TMAC states that “monitoring activities may be conducted to assess the impacts of the spill and the effectiveness of associated cleanup/ remediation efforts in the event spill material cannot be removed” (p. 20) and “monitoring may be triggered in the event of spills to water of substances that dissolve or sink or where substance recovery is unlikely” (p. 21) and “monitoring may also be triggered in the event of externally reportable spills to land for which recovery of spilled material is unlikely or may be incomplete” (p. 21).<br><br>In Appendix 4, in response to our previous comments, TMAC indicates that it is not reasonable or necessary to predetermine “every possible scenario, response, follow up monitoring” because such an approach “would result in an extremely voluminous document with thousands of iterations and combinations that account for every possible factor at Hope Bay” (p. 43).<br><br>We are not suggesting that every possible step for monitoring should be detailed in the Spill Contingency Plan, but we are requesting that monitoring be required for (i) every spill that cannot be removed, (ii) spills to water of substances that dissolve or sink or where substance recovery is unlikely, and (iii) externally reportable spills to land for which recovery is unlikely or incomplete. Specific details on what the required monitoring would entail could then be determined on a case by case basis, depending on the nature of the spill. We do not think such an approach would be unduly time-consuming or cumbersome, but rather, would provide an effective and efficient framework for ensuring monitoring of spills that are not fully or partially recoverable is conducted, so that ultimately no adverse effects to the environment occur, and long-term liabilities on IOL are avoided. | Please remove the discretionary language in section 3.4 and replace with wording that monitoring is required for all spills detailed in (i) to (iii) above. | TMAC acknowledges that any required environmental monitoring would be evaluated on a case by case basis in situations of reportable spills that cannot be removed or fully recovered; or, involve a substance spilled to water that dissolves, sinks or where substance recovery is unlikely. As part of regulated spill reporting and follow up, specific details on the spill and any follow-up monitoring would be detailed in the 30 day spill report submitted to the Government of Nunavut with copy to the KIA. Spill response and monitoring is determined on a case by case basis, depending on the nature of the spill and the KIA has the opportunity to inspect spill locations with their routine site inspections. |