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FOR THE

North Warning System

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CHANGE HISTORY

This sheet is a record of each issue of this document. When the revised document is issued, the previous issue is automatically superseded.

Revision	Date	Author	Pages Changed	Reason for Change
1	16-Mar-2017	W. Wyman	All	Initial Document Release
2	29-Mar-2017	W. Wyman	All	Updated as per NWSO comments.

ᓇᐃᓪᓕᑎᒋᐊᖅᓯᒪᔪᖅ

ENGLISH EXECUTIVE SUMMARY FOLLOWS

ᑖᒃᑯᐊ 2016-ᒥ ᐊᕐᕋᒍᑕᒪᖅ ᐅᓂᒃᑲᓪᓚᐊᑦ ᓄᓇᕗᒻᒥ ᐃᒪᐃᑦ ᐊᑐᖅᑕᐅᔪᓐᓇᕐᓂᖏᓄᑦ ᑲᑎᒪᔨᓄᑦ ᓴᓇᔭᐅᓯᒪᕗᑦ ᑖᒃᑯᓂᖓ ᓅᑎᐊᔭᓐᑯᓐᓄᑦ ᑲᓇᑕᒥ ᐱᓕᕆᕝᕕᖓᓄᑦ -Raytheon Canada Limited (RCL-ᒥᒃ ᑕᐃᔭᐅᓂᐊᖅᑐᑦ ᑖᒃᑯᓇᓂ ᑎᑎᕋᖅᓯᒪᓂᖏᓂ) ᐱᔅ ᔪᔅ ᔨᓐᓄᑎᒃ ᒐᕙᒪᒃᑯᑦ ᐱᓕᕆᕝᕕᖕᓂᒃ ᑲᓇᑕᒥᒃ ᓴᐳᓐᓂᐊᖅᑎᐅᓂᕐᒥᒃ, ᒪᓕᒋᐊᖃᕐᓂᖏᓄᑦ ᒪᓕᒐᕐᓂᒃ ᓄᓇᕗᒻᒥ ᐃᒪᐃᑦ ᐊᑐᖅᑕᐅᔪᓐᓇᕐᓂᖏᓄᑦ ᑲᑎᒪᔨᓄᑦ ᓴᕿᑎᑕᐅᓚᐅᖅᑐᑦ 10 ᓯᑎᐱᕆ 2009 3BC-BAF0919 – ᖃᓄᐃᑦᑐᓕᓂᒃ “B”, ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓂ B. ᑕᒪᐃᓐᓂᒃ ᖃᓄᐃᓕᖓᓂᖏᓂᒃ, ᐃᖕᒥᒍᖓᓂᖏᓂᒃ ᑎᑎᕋᖅᓯᒪᓂᖏᓂ 1. ᑖᒃᑯᐊ ᐅᓂᒃᑲᓪᓚᐊᑦ ᑐᕋᖑᐃᑦ ᐅᖃᐅᓯᖃᕐᓂᕐᒥᒃ 01 ᔭᓄᐊᕆᒥᒃ 31 ᑎᓯᐱᕆ 2016-ᒧᑦ.

ᑕᐃᑯᐊ RCL-ᑯᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐋᕿᐅᒪᑎᑦᑎᓂᕐᒧᓪᓗ ᐊᖏᕈᑎᑎᒍᑦ ᐱᓕᕆᔨᐅᑎᑕᐅᕙᑦ ᑕᐃᒃᑯᓂᖓ ᐅᑭᐅᖅᑖᑐᓂᕐᒥ ᐅᓇᑕᖅᑐᒃᓴᓄᑦ ᓇᐅᑦᑎᖅᑐᐃᕝᕕᖕᓄᑦ, ᐃᓚᒋᔭᐅᓪᓗᓂ ᓄᓇᖕᓂᑦᑐᖅ ᑕᐃᔭᐅᔪᖅ BAF-3-ᒥ ᐃᓄᖅᖕᕆᓚᖅ ᑕᐃᑲᓂ ᐱᓕᕆᕝᕕᖕᓂ ᐃᖃᓗᐃᑦ ᖃᓂᒋᔭᖕᓂ, ᕿᑭᖅᑕᒥ, ᓄᓇᕗᒻᒥ. ᐃᓂᖓ ᑕᑯᓂᐊᖅᑕᐅᕙᒃᑐᖅ ᐱᖑᐃᑦ ᑕᕿᑦ ᐊᕐᕋᒍᒥ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᒃ ᑕᑯᓂᐊᖅᑕᐅᕙᒃᑐᖅ ᐱᓕᕆᔨᖏᓄᑦ ᐃᖃᓗᓐᓂ, ᐱᔭᓇᖅᑕᐅᖃᑦᑕᖅᓯᑎᒃ ᓯᕗᕆᒃᑯᑎᒃ ᓴᓄᓪᓗ ᐊᕿᐅᒪᑎᑕᐅᑦᑎᐊᕆᐊᖃᕐᓂᖏᓂ ᐊᓯᖏᓂᓪᓗ ᐱᓕᕆᐊᖑᔭᕆᐊᖅᑐᓂᒃ.

ᑲᑎᓪᓗᒋᑦ ᑕᒪᐃᓐᓂᒃ ᐊᖏᓂᓕᖕᒥᒃ 819.9 ᑭᑉᐸᓇᒃ ᑐᒥᒃ ᒥᑕᓂᒃ ᐃᒥᖅᑕᖅᐸᓚᐅᖅᑐᑦ ᓄᓇᒥᒃ ᑕᓯᕐᓂᒃ. ᑕᒪᒃᑯᐊ ᐊᑐᖅᑕᐅᕙᓐᓂᖏᑦ ᐊᑦᑎᖕᓂᖅᓴᐅᕗᑦ ᐊᑐᖅᑕᐅᔪᓐᓇᖅᑕᐅᔪᓂᒃ ᑕᒪᐃᓐᓂᒃ ᑳᑎᓪᓗᒋᑦ 1,750-ᒥᒃ ᑭᑉᐸᓇᒃ ᑐᓂᒃ ᒦᑕᖃᖅᑎᑕᐅᔪᓂᒃ ᐊᑐᕈᓐᓇᖅᑕᖏᓂᒃ ᐱᔪᓐᓇᐅᑎᑦᑎᒍᑦ ᓚᐃᓴᓐᓯᒥᒍᑦ.

ᐅᖅᓯᐊᓗᖃᐅᑎᖏᑦ ᐊᕙᓗᓕᐅᖅᑕᐅᓯᒪᓂᖏᓂ ᐲᔭᖅᑕᐅᓚᐅᖅᑐᑦ 2012-ᒥᓗ 2013-ᒥᓗ, ᐊᕙᓗᓕᐊᖑᓯᒪᓂᖏᓗ ᐃᓗᑐᓂᖏ ᓄᓇᒥ ᓯᕋᖅᑎᖅᑕᐅᓪᓗᑎᒃ 2012 ᐊᒻᒪᓗ 2015. ᐃᒪᕐᓗᑯᖃᕐᕕᐅᔪᓂᒃ ᐊᒧᓯᓯᒪᔪᖃᓚᐅᖅᑐᖅ 2016-ᒥ.

ᐅᓗᕆᐊᓇᖅᑐᖃᖅᑐᑦ ᐊᒃᑕᑯᐃᑦ ᓅᑕᐅᓚᐅᖅᑐᑦ ᑕᐅᕙᖑ BAF-3-ᒥᒃ ᐊᒃᑕᖅᑕᐅᑎᐊᕐᓂᐊᕐᒪᑕ ᓯᓚᑕᓂ ᓄᓇᕗᑦ. ᐊᒃᑕᑯᖏ ᑕᐃᒃᑯᐊ ᑐᔪᖅᑕᐅᓚᐅᖅᑐᑦ ᐅᕗᖑ ᑐᖅᓯᕈᑎᓕᖕᒧᑦ ᑯᐸᐃᒃᒥ, ᐱᓕᕆᕝᕕᖕᓂᓗ ᖃᓪᓗᓇᑎᑐᑦ ᑕᐃᔭᐅᔪᓂᒃ : Safety Kleen, 2730 Boulevard Industriel, Chambly, QC, J3L 4V2. ᐅᓗᕆᐊᓇᖅᑐᖃᕐᓂᖏᓂᒃ ᐊᒃᑕᑯᐃᑦ ᑕᐅᕙᖑ BAF-3-ᒥᒃ, 2016-ᒥ, ᐃᓚᖃᓚᐅᖅᐳᑦ 24-ᓂᒃ ᖃᑦᑕᐅᔭᕐᔪᐊᕐᕕᓂᕐᓂᒃ ᐱᖑᓂᒃ 3 ᕿᔪᖁᑏᖕᓂᒃ ᐊᒃᑕᑯᓂᒃ ᐹᑐᓖᕕᓂᕐᓂᒃ ᐊᒻᒪᓗ ᒪᕐᕉᖕᓂᒃ ᐊᒃᓴᓗᐊᓕᖕᓂᒃ ᐊᑐᕈᓂᖅᓯᒪᔪᓂᓪᓗ ᐃᑭᑦᑐᖃᓴᖅᐸᑦ ᖃᑦᑎᕈᑎᓂᒃ (ᐊᑐᓚᒃᓴᐃᑦ ᐅᓗᕆᐊᓇᕐᓂᖅ ᐱᖁᑎᖅ ᐃᓗᐊᓂᓚᐅᖅᑐᑦ ᐲᔭᖅᑕᐅᓯᒪᓪᓗᑎᒃ).

ᐅᓗᕆᐊᓇᑐᖃᕐᓂᖏᑦ ᐊᒃᑕᑯᐃᑦ ᓯᑎᔪᑦ ᐅᓯᔭᐅᕙᓚᐅᖅᑐᑦ ᐸᕐᓇᐅᑕᐅᓯᒪᕖᖕᓂ ᐃᑲᔪᖅᑕᐅᕖᖕᓂᒃ ᐃᓂᖏᓂᒃ ᐃᖃᓗᖕᓂ, ᐊᒻᒪᓗ ᐊᒃᑕᖅᑕᐅᕙᓚᐅᖅᓯᑎᒃ ᐃᖃᓗᐃᑦ ᐊᒃᑕᑯᖏᓄᑦ. RCL-ᑯᑦ ᓅᑎᔭᓐᑯᑦ ᑎᑎᖅᑲᖁᑎᖃᖅᑐᑦ ᐊᖏᕈᑕᐅᓯᒪᓂᖏᓂᒃ ᐊᒃᑕᖏᓂᒃ ᐊᒃᑕᕐᕕᖃᕈᓇᕐᓂᖏᓂᒃ ᑕᐅᕙᖑ ᐊᒃᑕᑯᖏᓂᒃ.

ᐱᖒᔪᖅᑐᓂᒃ 6-ᓂᒃ ᓯᓚᒥ ᑯᕕᓯᔪᖃᖅᓯᒪᓚᐅᖅᑐᖅ ᑕᐅᕙᓂ BAF-3-ᒥ 2016-ᖑᑎᓪᓗᒍ:

a. ᓄᓇᑦᓯᐊᕐᒥ-ᓄᓇᕗᒻᒥ ᑯᕕᔪᓯᔪᖃᓚᐅᕐᓂᕐᒧᑦ ᐅᓂᒃᑲᓪᓚᐊᑦ #16-023-ᒥᒃ ᓈᓴᐅᑎᓕᖕᒥᒃ. ᐅᓪᓗᖓ 22ᔭᓄᐊᕆ2016-ᒥ, ᐊᑕᔪᖅ ᐅᖅᓯᐊᓗᖃᐅᒧᑦ W22J-ᒥ ᑯᑐᖕᓂᕐᒪᑦ ᒥᑭᔪᒥᒃ ᐊᖅᓯᐊᓗᖕᒥᒃ ᐊᐳᒻᒧᑦ ᖃᑦᑕᐅᔭᖑᓂ. ᐊᑕᔾᔪᑎᖑ ᓯᑲᑎᖅᑕᐅᓚᐅᖅᑐᖅ, ᑯᑐᒃᕕᐅᔪᓂᖅᓯᓂ. ᐊᒃᑐᖅᑕᐅᓯᒪᓂᖓᐊᐳᑦ ᐱᔭᖅᑕᐅᓚᐅᖅᑐ.

b. ᓄᓇᑦᓯᐊᕐᒥ-ᓄᓇᕗᒻᒥ ᑯᕕᔪᓯᔪᖃᓚᐅᕐᓂᕐᒧᑦ # 16-058. 25 ᕕᕗᐊᕆ 2016-ᒥ, ᐱᓕᕆᔨ ᖃᐅᔨᓚᐅᖅᑐᖅ ᐅᖅᓯᐊᓗᐃᓇᐅᔪᒥᒃ ᐊᐳᒻᒥ ᒥᓪᓗᐊᕈᑎᖏᓕ ᐊᕙᓗᐊᓂ ᒪᕐᕉᖕᓂᒃ ᐅᖅᓯᐊᓗᖃᐅᑎᖕᓂ, ᐊᒻᒪᓗ ᐳᓚᓕᐅᕈᑎᖃᕐᕕᖕᓂ. ᖃᑦᑕᐅᔭᕐᔪᐊᑦ ᐲᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᑕᕕᖏᓂᒃ ᐃᒪᐃᔭᖅᑕᐅᓇᓱᖕᓂᐊᕐᒪᑕ. ᐊᒃᑐᖅᑕᐅᓯᒪᓂᖏ ᐊᐱᖁᑎᖏ ᐱᔭᖅᑕᐅᓚᐅᖅᑐᑦ ᑯᑐᒃᕕᐅᓯᒪᓂᖏᓪᓗ ᐱᔭᖅᑕᐅᑲᐃᓐᓇᓚᐅᖅᓯᑎᒃ.

c. ᓄᓇᑦᓯᐊᕐᒥ-ᓄᓇᕗᒻᒥ ᑯᕕᔪᓯᔪᖃᓚᐅᕐᓂᕐᒧᑦ #16-322. ᐅᓪᓗᖓ 26 ᐋᒐᓯ 2016-ᒥ, ᐱᓕᕆᔩᑦ ᐊᑐᕐᓂᖏᓂ ᐅᓯᓕᖅᑐᐃᔾᔪᑎᒥᒃ ᓄᓇᓯᐅᑎᒥᒃ ᐱᖁᑎᓂᒃ ᐱᔭᐃᓚᐅᖅᑐᑦ ᓄᓇᖕᓂ ᑕᐅᕙᓂ. ᐊᖁᑎᖑ ᖃᐅᔨᓚᐅᖅᐳᖅ ᑯᑐᖕᓂᖓᒃ, ᐃᒻᒥᓯᖅᑐᖅᓯᓂᐅᓪᓗ ᐊᓪᓚᕈᑎᒃ ᓴᔭᓄᑦ, ᐅᑎᕈᑎᓗᓂᕆᓪᓗ

ᓴ ᓇᖅ ᑭᑎᖏᑦ ᐃᒃ ᓗᖅ ᓯᐸᖅ ᒧᑦ , ᑕᐃᓵ ᓇ ᑯᑐᓄ ᓂᖏᓴ ᓴ ᓇᒃ ᐅᓯᓵ ᓇᖅ ᓂᐊᖅ ᒪ ᑕ, ᑯ ᑐᒍ ᓂᖅᑎᑕᐅᓗᓂᓗ. ᓴ ᓇᒃ ᐅᑎᐊᓕᐅᖅᑐᖅ ᑯ ᑐᑦ ᕆᐊᐅᖏᓐᓇ ᑯ ᓯᓯᒪ ᓴᓕᖅ ᐅᑎᖏᓂᒃ ᐅᖅᓯ ᖅᑎᑭᑎᓵ ᓇᐃᑦ ᓴᓗᒃ ᓴ ᖅᓴ ᖅᑕᐅᓵ ᓗᑎᒃ .

d. ᓄᓇᑦ ᓯ ᐊᖅ ᒥ -ᓄᓇᕐᒃ ᒥ ᑯ ᕆᔨᓯᓯᓯᖅ ᓂᖅ ᒧᑦ #16-319-ᒥᒃ ᓰᓴ ᐅᑎᓚᖓᒥᒃ . ᐅᓵ ᓗᖏᓂ 29ᐊᑦᓀ ᓯ 2016, ᓄᓇᓯ ᐅᑎᓚᓱᕐ ᐃᒪ ᐃᕐ ᐃᓕᐅᖅᓯ ᒪ ᑦ ᐅᖅᓯ ᐊᓗᐃᐃᑦ ᐊᖅᑯᖅᑎᑦᓯᓂᒃ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᑯᑐᒃ ᑐᓂᒃᑯᑦ ᐃᖏᖅ ᖃᐅᑎᒥᒃ ᐊᐸᓚᖅᓯ ᓯᓚᖅᑐᒃ ᐃᓕᓴᐅᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐊᑐᓄᖅᓯᓂᒃ ᓯᓚᖅᑐᒃ ᑯᑐᒃ ᓴᖅᑐᒃ . ᓄᓇᒥ ᐅᑎᓚᓱᕐ ᐃᓕᓯ ᓯᓚᖅᑐᒃ ᑯᑐᒃ ᓴᖅᑐᒃ ᐅᖅᓯ ᐊᓗᐃᐃᑦ ᓴᓕᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐃᓕᓴᐅᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐊᑐᓄᖅᓯᓂᒃ ᓯᓚᖅᑐᒃ ᑯᑐᒃ ᓴᖅᑐᒃ .

e. ᓄᓇᑦ ᓯ ᐊᖅ ᒥ -ᓄᓇᕐᒃ ᒥ ᑯ ᕆᔨᓯᓯᓯᖅ ᓂᖅ ᒧᑦ #16-329-ᒥᒃ ᓰᓴ ᐅᑎᓚᖓᒥᒃ . ᐅᓵ ᓗᖏᓂ 03ᓯ ᑎᐱᓗ2016, ᐱᓚᓱᕐ ᐅᔨᑦ ᓄᓇᖏᓂᑦ ᑐᑦ ᐊᑐᖅᓯ ᑎᓯ ᓚᖅᑐᐃᓵᒃ ᔨᓯᓗᒃ ᓄᓇᒃ ᑯᑐᒥᒃ ᖅᐅᔨᒃ ᓯᓚᖅᑐᒃ ᑯᑦ ᓴᖅᑎᒃ ᓂᖏᖅᑐᒃ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᑐᓂᒃᑯᑦ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᓴᖅᑐᒃ . ᐅᓯ ᓚᖅᑐᐃᓵᒃ ᔨᑦ ᑎᖏᓐᓄᑦ ᓄᖅᑲᖅᓯᒪᓕᐅᖅᑐᒃ ᓴ ᓇᒃ ᐅᓵ ᓗᖏᓂ, ᑯ ᐃᔨᓂᖅᑎᑕᐅᓗᓂ. ᓄᓇᒥ ᑐᐊᐸᐃᑦ ᐅᖅᓯ ᐊᓗᐃᐃᑦ ᓇᐅᔨᑦ ᐱᓴ ᖅᑕᐅᓚᐅᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐃᓕᓴᐅᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐊᑐᓄᖅᓯᓂᒃ ᓯᓚᖅᑐᒃ ᑯᑐᒃ ᓴᖅᑐᒃ .

f. ᓄᓇᑦ ᓯ ᐊᖅ ᒥ -ᓄᓇᕐᒃ ᒥ ᑯ ᕆᔨᓯᓯᓯᖅ ᓂᖅ ᒧᑦ #16-330-ᒥᒃ ᓰᓴ ᐅᑎᓚᖓᒥᒃ . On 06ᓯ ᑎᐱᓗ2016, ᐱᓚᓱᕐ ᐅᔨᑦ ᓄᓇᖏᓂᑦ ᑐᑦ ᐊᑐᖅᓯ ᑎᓯ ᓚᖅᑐᐃᓵᒃ ᔨᓯᓗᒃ ᓄᓇᒃ ᑯᑐᒥᒃ ᖅᐅᔨᒃ ᓯᓚᖅᑐᒃ ᑯᑦ ᓴᖅᑎᒃ ᓂᖏᖅᑐᒃ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᑐᓂᒃᑯᑦ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᓯᓚᖅᑐᒃ ᓴᖅᑐᒃ . ᐅᓯ ᓚᖅᑐᐃᓵᒃ ᔨᑦ ᑎᖏᓐᓄᑦ ᓄᖅᑲᖅᓯᒪᓕᐅᖅᑐᒃ ᓴ ᓇᒃ ᐅᓵ ᓗᖏᓂ, ᑯ ᐃᔨᓯᖅᑎᑕᐅᓗᓂ. ᓄᓇᒥ ᑐᐊᐸᐃᑦ ᐅᖅᓯ ᐊᓗᐃᐃᑦ ᓇᐅᔨᑦ ᐱᓴ ᖅᑕᐅᓚᐅᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐃᓕᓴᐅᖅᑐᒃ ᐃᓚᖅᑐᒃ ᐊᑐᓄᖅᓯᓂᒃ ᓯᓚᖅᑐᒃ ᑯᑐᒃ ᓴᖅᑐᒃ .

ᑯ ᐃᔨᓯ ᓴᖅᑭᖏᑦ ᑐᐊᐃᓵᑦ ᓇᖅᑐᓕᖅᓯᑦ ᒧᑦ ᐸᑦ ᓇᐅᑎᖏᓐᓄᑦ ᐊᑐᖅᑕᐅᑦ ᑎᐊᓕᐅᖅᑐᒃ ᐅᑦ .

ᓄᓇᒥ ᓇᐅᑦ ᑎᖅᑐᐃᓄᖅᑭᓗᒃ ᓂᒃ ᐱᓕᕆᓵ ᓴᑎᒃ (BAF-5)-ᒥ 2007-ᒥ ᓂᐅᐃᐊᖏᓂᑯ ᐃᑦ ᖃᖏᑕᓯᑦ ᓄᑦ ᐅᖅᓯ ᐊᓗᐃᐃᑦ Jet A1 ᑯ ᐃᔨᒃ ᓕᐅᖅᑐᑦ 2015-ᒥ , ᒪ ᓕᒃ ᑕᐅᑦ ᓴᑎᒃ ᐊᑐᓕᖓᓱᒃ ᐅᓯ ᒪ ᔨᑦ ᑕᐃᒃ ᑯ ᓄᖏᑐᑭᓯ ᓂᐊᖅᑎᑎᐅᑦ ᑲᒪ ᐸᓂᖏᓄᑦ Stantec Consulting Ltd.-ᑯ ᓄᑦ . ᓄᓇᖏᓂ ᓇᐅᑦ ᑎᖅᑐᑐᖅᑐᒃ ᓇᖅᑐᑦ 2015-ᒥ ᑯ ᐃᔨᓯ ᖃᓕᐅᖅᑎᑦ ᓴᓓᑦ ᐅᖅᓯ ᐊᓗᐃᐃᑦ Jet A1 2015-ᒥ , ᖃᐅᔨᒃ ᖅᑕᐅᔪᑦ ᓕᐊᖏᓂ ᓇᖅᓯ ᑎᑦ 2016-ᒧᑦ .

EXECUTIVE SUMMARY

This 2016 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada Limited (RCL) for the Department of National Defence in order to meet the requirements of the licence issued 10 September 2009 3BC-BAF0919 – Type "B", Part B "General Conditions", paragraph 1. This report covers the period from 01 January to 31 December 2016.

RCL is the Operation and Maintenance (O&M) Contractor for the North Warning System (NWS), including BAF-3, the unattended (unmanned) North Warning System radar site located on Brevoort Island, Nunavut. The site is visited quarterly by RCL staff based out of Iqaluit, Nunavut for preventive maintenance inspections and as required for other work.

A total of 819.9 cubic meters was drawn from the water supply lake. This is below the annual maximum of 1,750 cubic meters allowed by the current licence.

Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. No effluent (berm water) samples were taken in 2016.

Hazardous waste was removed from BAF-3 for disposal outside of Nunavut. The waste went to Safety Kleen, 2730 Boulevard Industriel, Chambly, QC, J3L 4V2. The hazardous waste shipped from BAF-3 in 2016 consisted of 24 drums, 3 crates of waste batteries, 2 cylinders, and 2 wheeled fire extinguishers (with all dangerous goods removed).

Non-hazardous domestic solid waste was flown out to the Logistics Support Site in Iqaluit and disposed of at Iqaluit's landfill. RCL has documented authorization from the community for receiving the waste.

There were six outdoor spills at BAF-3 in 2016:

a. NT-NU Spill Line Report # 16-023. On 22-Jan-2016, a threaded connection on tank W22J was found to be weeping a small amount of fuel onto snow that had accumulated on the tank. The connection was tightened, stopping the leak. The impacted snow was placed in a drum.
b. NT-NU Spill Line Report # 16-058. On 25-Feb-2016, staff noted fuel impacted snow around the pump head on two tanks and a Pressure Relief Valve (PRV). The tanks were isolated from the system until a cause of the weep could be determined. The impacted snow was placed in a drum and the weeping components were temporarily removed from service.
c. NT-NU Spill Line Report # 16-322. On 26-Aug-2016, staff were using a loader to move materials on-site. The Heavy Equipment Operator noticed the leak and wrapped it in absorbent to return the equipment to the building so that the leaking fitting could be repaired, stopping the leak. The leaking fitting was repaired and the spilled hydraulic fluid was cleaned up.
d. NT-NU Spill Line Report # 16-319. On 29-Aug-2016, a mechanic was bleeding the fuel line on a truck that had stalled. The mechanic had placed a drip tray under the line, but a gust of wind blew a small amount of fuel away from the tray. Impacted gravel was scraped up and placed into a drum.
e. NT-NU Spill Line Report # 16-329. On 03-Sep-2016, staff on-site were using the loader until they noticed a leak from a hydraulic hose. The loader was stopped and repaired, stopping the spill. Impacted gravel was scraped up and placed into a drum.
f. NT-NU Spill Line Report # 16-330. On 06-Sep-2016, staff on-site were using the loader until they noticed a leak from a hydraulic hose. The loader was stopped and repaired, stopping the spill. Sorbents were placed on ground and booms were placed across rain runoff drainage. Impacted gravel was scraped up and placed into a drum.

The Spill Contingency Plan was successfully implemented.

SOW Ref: 16.F.5.d

Groundwater monitoring activities (BAF-5) of the 2007 Jet A1 spill ended in 2015 as per the recommendation by Stantec Consulting Ltd. Groundwater monitoring of the 2015 Jet A1 spill continued in 2016.

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1.0 INTRODUCTION

This 2016 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada Limited (RCL) for the Department of National Defence in order to meet the requirements of the licence issued 10 September 2009 3BC-BAF0919 – Type "B", Part B "General Conditions", paragraph 1. This report covers the period from 01 January to 31 December 2016.

RCL is the Operations and Maintenance (O&M) Contractor for the North Warning System (NWS), including BAF-3, the unattended (unmanned) North Warning System radar site located on Brevoort Island, Nunavut. The site is visited quarterly by RCL staff based in Iqaluit for preventive maintenance inspections and as required for other work.

1.1 Report Details

Licensee:	Department of National Defence, Government of Canada
Licence:	3BC-BAF0919 – Type "B"
Location:	BAF-3 North Warning System Site, Brevoort Island, Qikiqtani Region, Nunavut
Report Prepared by:	Raytheon Canada Limited, 29-Mar-2017
Time period covered:	01 January to 31 December 2016

2.0 WATER USE

A total of 819.9 cubic meters was drawn from the water supply lake. This is below the annual maximum of 1,750 cubic meters allowed by the current licence. See Table 2-1 for the volume of raw water drawn at BAF-3 in 2016.

Table 2-1: Monthly Raw Water Usage at BAF-3 in 2016

Month	Raw water usage (m^3)
January	0
February	0
March	0
April	0
May	0
June	0
July	0
August	301
September	518.9
October	0
November	0
December	0
TOTAL	**819.9**

3.0 HAZARDOUS WASTE AND WASTE OIL DISPOSAL

Hazardous waste and waste oil were sent to an approved hazardous waste disposal site outside of Nunavut as required by the licence. The hazardous waste was shipped to Safety Kleen, 2730 Boulevard Industriel, Chambly, QC, J3L 4V2. See Table 3-1 for the list of items sent for disposal.

See Annex A for the shipping document including the completed movement documents for waste regulated under the Transportation of Dangerous Goods Regulations (TDGR) and NWS Manifests for

non-regulated waste. The hazardous waste shipped from BAF-3 in 2016 consisted of 24 drums, 3 crates of waste of waste batteries, 2 cylinders, and 2 wheeled fire extinguishers (with all dangerous goods removed).

Table 3-1: Hazardous Waste and Waste Oil Sent for Disposal from BAF-3 in 2016

Description, TDG shipping name	Quantity	Movement Document or Manifest #
Nitrogen cylinder Waste Nitrogen	2 cylinders	Movement Document 2539177-2
Waste batteries, wet, filled with acid	1 crate	Movement Document 2539177-2
Waste batteries, wet, non-spillable	1 crate	Movement Document 2539177-2
Waste fuel filters Waste Solids containing flammable liquids n.o.s. (fuel, aviation, turbine engine)	1 drum	Movement Document 2539177-2
Waste Jet A1 fuel contaminated soil Waste Solids containing flammable liquids n.o.s. (fuel, aviation, turbine engine)	2 drums	Movement Document 2539177-2
Waste oily rags Waste Solids containing flammable liquids n.o.s. (fuel, aviation, turbine engine)	1 drum	Movement Document 2539177-2
Waste Jet A1 fuel Mixture Waste Fuel, Aviation Turbine Engine Mixture	1 drum	Movement Document 2539178-0
Waste Jet A1 fuel Waste Fuel, Aviation Turbine Engine	1 drum	Movement Document 2539178-0
Waste oil (drum) Not TDG Regulated	12 drums	NWS Manifest 35751, 35752, 35757, 35759, 35760
Waste cooking oil Not TDG Regulated	1 drum	NWS Manifest 35752
Waste glycol Not TDG Regulated	3 drums	NWS Manifest 35752, 35757
Fire extinguisher (wheeled) Not TDG Regulated	2 Units	NWS Manifest 35753, 35754
Waste batteries, dry, non-regulated Not TDG Regulated	1 crate	NWS Manifest 35764
Waste oil filters Not TDG Regulated	1 drum	NWS Manifest 35765
Waste fire suppressant foam concentrate Not TDG Regulated	1 drum	NWS Manifest 35768

4.0 NON-HAZARDOUS SOLID WASTE DISPOSAL

Non-hazardous domestic solid waste was flown out to the Logistics Support Site in Iqaluit and disposed of at Iqaluit's landfill. RCL has documented authorization from the community for receiving the waste.

See **Table 4-1** for the quantity of waste generated.

Table 4-1: Non-hazardous Domestic Solid Waste Sent for Disposal from BAF-3 in 2016

Month	Waste Generated (kg)
January	635
February	136.1
March	226.8
April	167.8
May	499
June	462.7
July	595.1
August	1,417.5
September	1,818.9
October	349.3
November	294.8
December	374.2
TOTAL	**6,977.2**

5.0 MONITORING PROGRAM

In 2016, a monitoring program was implemented at BAF-3 as required by the water licence, Part J. The monitoring program included the following:

1. Volume of raw water drawn from the water Supply Lake (BAF-1). The information gathered from this requirement is shown in **Section 2.0 Water Use**. The volume of water drawn was within the limit stated in the water licence.
2. Quality of sewage discharged from the final discharge point of the sewage disposal facility (BAF-2). The location of the sewage effluent outfall is shown in **Annex C**, including coordinates. A sump for the sewage outfall was constructed in 2010. The sewage outfall sump was pumped out once in 2016. The results are shown in **Annex D: Analysis of Discharged Sewage Effluent**.

   A misinterpretation of sampling requirements led field staff to believe that samples were only required when the sump was pumped out, as opposed to sampling monthly during periods of flow (i.e. a sample every month the sewage holding tank is discharged). Corrective action will be taken to ensure this does not recur.
3. Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. As there are no intact berms, no effluent (berm water) samples (BAF-4) were taken in 2016, **Annex E: Analysis of Berm Water** has been left blank.
4. Groundwater monitoring activities (BAF-5) of the 2007 Jet A1 spill ended in 2015 as per the recommendation by Stantec Consulting Ltd. Groundwater monitoring of the 2015 Jet A1 spill continued in 2016. A summary of the work completed in 2016 is included in **Annex F: Monitoring Activities**.

6.0 SPILLS (UNAUTHORIZED DISCHARGES)

Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
22-Jan-2016, Spill # 16-023	Jet A1	1 L	A threaded connection on tank W22J was found to be weeping a small amount of fuel onto snow that had accumulated on the tank. The connection was tightened, stopping the leak. The impacted snow was placed in a drum. Staff on-site continue to monitor the fuel system for any leaks.	W22J (63°20'23.64"N, 64° 9'21.87"W)
25-Feb-2016, Spill # 16-058	Jet A1	Trace	On 25 Feb 2016, staff noted fuel impacted snow around the pump head on two tanks and a Pressure Relief Valve (PRV). Staff determined that the pump heads were weeping only when those pumps were pumping. The tanks were isolated from the system until a cause of the weep could be determined. Staff investigated the extent of the impacted snow. The impacted snow was on the pumps and one chunk had fallen off onto the ground. To ensure that no fuel had wept down the sides of the tanks, staff dug down in the snow around the tanks approximately 1 m and found no sign of impacted snow. The impacted snow was removed from the pumps and PRV and all four pumps were wrapped in sorbent pads to contain any weep. The impacted snow was placed in a drum and the weeping components were temporarily removed from service.	PGS Tanks W22G and W22J (63° 20' 24"N 64° 9' 23"W)
27-Aug-2016, Spill # 16-322	Hydraulic Fluid	1 L	On 26-Aug-2016, staff were using a loader to move materials on-site. The Heavy Equipment Operator noticed the leak and wrapped it in absorbent to return the equipment to the building so that the leaking fitting could be repaired, stopping the leak. The leaking fitting was repaired and the spilled hydraulic fluid was cleaned up.	North of water storage building (63° 20.387'N, 064° 09.347'W)
29-Aug-2016, Spill # 16-319	Jet A1	0.2 L	On 29-Aug-2016, a mechanic was bleeding the fuel line on a truck that had stalled. The mechanic had placed a drip tray under the line, but a gust of wind blew approximately 200 mL of fuel over a 0.21m² area. Impacted gravel was scraped up and placed into a drum.	20 m west of TSM (63 20'26"N, 64 9'31"W)

Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
03-Sep-2016, Spill # 16-329	Hydraulic Fluid	3 L	On 03-Sep-2016, staff on-site were using the loader until they noticed a leak from a hydraulic hose. The loader was stopped and repaired, stopping the spill. Impacted gravel was scraped up and placed into a drum.	Summit (63°20'24.39"N, 64° 9'31.67"W)
06-Sep-2016, Spill # 16-330	Hydraulic Fluid	2 L	On 06-Sep-2016, staff on-site were using the loader until they noticed a leak from a hydraulic hose. The loader was stopped and repaired, stopping the spill. Although it wasn't raining at the time of the spill, there was runoff flowing near the spill. Sorbents were placed on ground and booms were placed across rain runoff drainage. Impacted gravel was scraped up and placed into a drum.	Borrow pit (63°19'40.99"N, 64° 8'25.47"W)

The Spill Contingency Plan was successfully implemented.

7.0 REVISIONS TO THE SPILL CONTINGENCY PLAN

There were no revisions to the Spill Contingency Plan in 2016.

8.0 PROGRESSIVE RECLAMATION WORK UNDERTAKEN

2016 was the second year of clean-up following the 19-Mar-2015 fuel spill. Environmental staff mobilized to the site on 13-Jun-2016 during the freshet to ensure that water control measures were in place and functioning. The facility for treating impacted water was re-established and water treatment began on 03-Jul-2016. A summary of the work completed in 2016 is included in **Annex F: Monitoring Activities**.

9.0 ACRONYMS

Table 9-1: Acronyms

Acronym	Definition
CC&C	Care, Custody, and Control
DEG	Diesel Electric Generator
DND	Department of National Defence
NWB	Nunavut Water Board
NWS	North Warning System
NWSO	North Warning System Office
O&M	Operations and Maintenance
PCB	Polychlorinated Biphenyl
RCL	Raytheon Canada Limited
TDGR	Transportation of Dangerous Goods Regulations

ANNEX A: HAZARDOUS WASTE AND WASTE OIL DISPOSAL IN 2016

The 2016 Movement Documents for TDG Regulated waste and NWS Manifests for non-TDG Regulated waste described in Table 3-1 are below.

MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

Movement Document / Manifest Reference No. / N° de référence du document de mouvement/manifeste: **2539177-2**

A – Generator / consignor / Producteur / expéditeur
Registration No. / Provincial ID No.: NUG100033
Company name: Department of National Defence c/o RCL
Mailing address: 22 Wing Bldg 109 Hornell Heights, ON P0H 1P0
Tel. No.: 705-494-2011 2861
Shipping site address: NWS LRR BAF-3
City: Brevoort Island, NU
Intended Receiver / consignee: Safety-Kleen — Registration No. 27011824-1
Mailing address: Clean Harbors 6785 route 132 Ville-Ste-Catherine, QC J5C 1B6
Receiving site address: 1730 boulevard Industriel, Chambly QC J3L 4V2

B – Carrier / Transporteur
Company name: NEAS INC
Mailing address: 2600 Ave Pierre Dupuy suite 2060 Montreal QC
Tel. No.: 877-255-6327
Carrier Certification — Name of authorized person: Quentin Brenneur
Date: 16/09/12

C – Receiver / consignee / Réceptionnaire / destinataire

	Shipping name	Class	UN No.	Packing group	Quantity shipped	Units	No.	Codes	Phys. state
(i)	Nitrogen, Compressed	2.2	UN 1066		25	Kg	1	07	G
(ii)	Waste Batteries, wet filled with Acid	8	UN 2794		298	Kg	1	07	S
(iii)	Waste Batteries, wet, non spillable	8	UN 2800		200	Kg	1	07	S
(iv)	Waste Solids Containing Flammable liquid n.o.s. (Fuel Aviation, Turbine Engine)	4.1	UN 3175	II	150	Kg	1	01	S

(i) 2 – Cylinders in one crate
International use only
24 hour Number Canutec 613-996-6666 use in case of Dangerous Good Emergency

Generator / consignor certification — Name of authorized person: I. Shepherd
Tel. No.: Civ Ops Mgr Hoss. 705-494-2011 ext 2861

MOE 04-1917 (07/07)
Instructions for completion and distribution on reverse / Instructions pour compléter et distribuer au verso
Copy / Copie 1 (white / blanche)

Figure 1: Movement Document 2539177-2

MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

Movement Document / Manifest Reference No. / N° de référence du document de mouvement/manifeste: **2539178-0**

A — Generator / consignor / Producteur / expéditeur

- Registration No. / Provincial ID No.: NUG 100003
- Company name / Nom de l'entreprise: Department of National Defence c/o RCL
- Mailing address / Adresse postale: 22 Wing bldg 109 Hornell Hights ON P0H 1P0
- E-mail / Courrier électronique: — Tel. No. / N° de tél.: ( )
- Shipping site address / Adresse du lieu de l'expédition: NWS LRR BAF-3
- City / Ville: Brevoort Island — Province: NU
- Intended Receiver / consignee / Réceptionnaire / destinataire prévu: Safety-Kleen — Registration No.: 27011824-1
- Mailing address / Adresse postale: Clean Harbors, 6785 route 132 Villeste Catherine QC J5C 1B6
- Receiving site address / Adresse du lieu de réception: 2730 boulevard Industriel
- City / Ville: Chambly — Province: QC — Postal code: J3L 4V2

B — Carrier / Transporteur

- Company name / Nom de l'entreprise: NEAS INC
- Mailing address / Adresse postale: 2100 Ave Pierre-Dupuy Montreal QC H3C 3R5
- Port of entry / Point d'entrée: International use only — Port of exit / Point de sortie: International use only
- Carrier Certification: I certify that I have received waste or recyclable material from the generator / consignor for delivery to the receiver / consignee as set out in Part A and that the information contained in Part B is complete and correct. / Attestation du transporteur : J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur en vue de leur livraison au réceptionnaire / destinataire, tels qu'ils figurent à la partie A et que les renseignements inscrits à la partie B sont exacts et complets.
- Name of authorized person (print): QUENTIN BRENNEUR
- Year / Month / Day: 16 / 09 / 12 — Signature: [signature]

C — Receiver / consignee / Réceptionnaire / destinataire (blank)

Prov. code	Shipping name / Appellation réglementaire	Class / Sub. class(es)	UN No.	Packing / risk gr.	Quantity shipped	Units L or Kg	Packaging No.	Packaging Codes	Phys. state
(i)	Waste Fuel Aviation Turbine engine	3	UN 1863	491	180	L	1	01	L
(ii)	Waste Fuel Aviation Turbine engine mixture	3	UN 1863	115	80	L	1	01	L
(iii)									
(iv)									

(i) XF Flash point 38°C

(iii) 24 hour Number. Canutec 1-613-996-6666 Use Canutec Dangerous goods Emergency

Generator / consignor certification: I certify that the information contained in Part A is correct and complete. / Attestation du producteur / expéditeur : J'atteste que tous les renseignements à la partie A sont exacts et complets.

Name of authorized person (print): [signature] — Signature: [signature] — C ILVANY Mrs [illegible] Tel. No.: 705 494 2011 ext 2861 — Date shipped: 16

MOE 04-1917 (07/07)

Instructions for completion and distribution on reverse / Instructions pour compléter et distribuer au verso

Copy / Copie 1 (white / blanche)

Figure 2: Movement Document 2539178-0

SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By:	Date:	
TSHAW	**Aug 18, 2016 11:43 AM**	**TCN-35751**

Ship To:	From:	Priority
CLEAN HARBORS CANADA INC. 6785 ROUTE 132 SAINTE-CATHERINE, QC, J5C 1B6 CA 450-632-6640	BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818	**0**

Attention:		Attention:	PSHEPPARD

Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	40 x 48 x 40		1 Skid	**750 LB**

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
1			2002406	WASTE - OIL, 45 GAL			Asset# 338945
1			2002406	WASTE - OIL, 45 GAL			Asset# 338943
1			2002406	WASTE - OIL, 45 GAL			Asset# 330947*
1			2002406	WASTE - OIL, 45 GAL			Asset# 330740

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By:	Date

Received By:	Date

Figure 3: NWS Shipping Manifest TCN-35751

SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By:	Date:	
TSHAW	**Aug 18, 2016 11:55 AM**	**TCN-35752**

Ship To:	From:	Priority
CLEAN HARBORS CANADA INC. 6785 ROUTE 132 SAINTE-CATHERINE, QC, J5C 1B6 CA 450-632-6640	BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818	**0**

Attention:		Attention:	PSHEPPARD

Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	40 x 48 x 40		1 Skid	**785 LB**

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
1			2002344	WASTE - GLYCOL (DRUM)			ASSET# 334533
1			3006485	WASTE - COOKING OIL			ASSET# 334986
1			2002406	WASTE - OIL, 45 GAL			ASSET# 339890
1			2002406	WASTE - OIL, 45 GAL			ASSET# 335349

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By:	Date

Received By:	Date

Figure 4: NWS Shipping Manifest TCN-35752

SOW Ref: 16.F.5.d

SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8 — **NON NEGOTIABLE**

Filled By:	Date:	
TSHAW	**Aug 18, 2016 2:43 PM**	**TCN-35757**

Ship To:	From:	Priority
CLEAN HARBORS CANADA INC. 6785 ROUTE 132 SAINTE-CATHERINE, QC, J5C 1B6 CA 450-632-6640	BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818	**0**

Attention:		Attention:	PSHEPPARD

Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	40 x 48 x 40 - 4 DRUMS		1 Skid	**780 LB**

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
1			2002344	WASTE - GLYCOL (DRUM)			ASSET# 334533*,323454*
2			2002406	WASTE - OIL, 45 GAL			ASSET# 336008, 338944

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By:	Date
Received By:	**Date**

Figure 5: NWS Shipping Manifest TCN-35757

SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8 — **NON NEGOTIABLE**

Filled By:	Date:	
TSHAW	**Aug 18, 2016 2:50 PM**	**TCN-35759**

Ship To:	From:	Priority
CLEAN HARBORS CANADA INC. 6785 ROUTE 132 SAINTE-CATHERINE, QC, J5C 1B6 CA 450-632-6640	BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818	**0**

Attention:		Attention:	PSHEPPARD

Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	40 x 48 x 40 - 4 DRUMS		1 Skid	**790 LB**

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
2			2002406	WASTE - OIL, 45 GAL			ASSET# 339937, 339938

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By:	Date
Received By:	**Date**

Figure 6: NWS Shipping Manifest TCN-35759

SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By:	Date:	
TSHAW	**Aug 18, 2016 3:52 PM**	**TCN-35760**

Ship To:	From:	Priority
CLEAN HARBORS CANADA INC. 6785 ROUTE 132 SAINTE-CATHERINE, QC, J5C 1B6 CA 450-632-6640	BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818	**0**

Attention:		Attention:	PSHEPPARD

Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	40 x 48 x 40 - 4 DRUMS		1 Skid	**790 LB**

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
2			2002406	WASTE - OIL, 45 GAL			ASSET# 339937, 339938
2			2002357	WASTE - FUEL CONTAMINATED SOIL			ASSET# 323452, 323183*

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By:	Date
Received By:	**Date**

Figure 7: NWS Shipping Manifest TCN-25760

ANNEX B: LOCATION OF LANDFILL WITH COORDINATES

Coordinates of Landfill Location: 63° 20’ 30.00”N, 64° 10’ 02.00”W

ANNEX C: SEWAGE EFFLUENT OUTFALL (BAF-2) LOCATION WITH COORDINATES

Coordinates of Sewage Outfall Location (BAF-2): 63° 20’ 21.40”N, 64° 09’ 26.63”W

ANNEX D: ANALYSIS OF DISCHARGED SEWAGE EFFLUENT

The sewage outfall sump was pumped out and sampled on 10 September 2016. The sample was analysed for the parameters listed in the water licence Part J, Item 3.

Table D-1: Summary of Analysis of Discharged Sewage Effluent at BAF-3 in 2016

Sample Date	Parameter				
	pH	Oil and Grease (Present - P / Absent - A)	Biological Oxygen Demand (mg/L)	Total Suspended Solids (mg/L)	Faecal Coliforms
10Sep2016	7.03	A	181	74	2,310,000

EXOVA ENVIRONMENTAL ONTARIO **Certificate of Analysis**

Exova

Client: Raytheon Canada Limited Ottawa
400 Cooper St.
Ottawa, ON
K2P 2H8
Attention: Mr. Will Wyman
PO#: 15-00343-OT
Invoice to: Raytheon Canada Limited Ottawa

Report Number: 1616631
Date Submitted: 2016-09-19
Date Reported: 2016-09-26
Project: 140351
COC #: 127310

				Lab I.D.	1260918
				Sample Matrix	Sewage
				Sample Type	
				Sampling Date	2016-09-10
				Sample I.D.	Sewage Sample Baf 3
Group	Analyte	MRL	Units	Guideline	
General Chemistry	pH	1.00			7.03
	Total Suspended Solids	2	mg/L		74
Oil & Grease	Oil & Grease - Mineral	1	mg/L		6
	Oil & Grease - Non-mineral	1	mg/L		36
	Oil & Grease - Total	1	mg/L		42
Subcontract	BOD5	1	mg/L		181
Visable Sheen	Visible Sheen		P/A		A

Guideline = *** = Guideline Exceedence**
All analysis completed in Ottawa, Ontario (unless otherwise indicated by ** which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL ■ Method Reporting Limit, AO ■ Aesthetic Objective, OG ■ Operational Guideline, MAC ■ Maximum Acceptable Concentration, IMAC ■ Interim Maximum Acceptable Concentration, STD ■ Standard, PWQO ■ Provincial Water Quality Guideline, IPWQO ■ Interim Provincial Water Quality Objective, TDR ■ Typical Desired Range

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

Page 2 of 3

Figure 8: 10-Sep-2016 sewage effluent results, Page 1 of 2

EXOVA ENVIRONMENTAL ONTARIO **Certificate of Analysis**

Exova

Client: Raytheon Canada Limited Ottawa
400 Cooper St.
Ottawa, ON
K2P 2H8
Attention: Mr. Will Wyman
PO#: 15-00343-OT
Invoice to: Raytheon Canada Limited Ottawa

Report Number: 1616624
Date Submitted: 2016-09-19
Date Reported: 2016-09-20
Project: 140351
COC #: 127310

				Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.	1260906 / Sewage / 2016-09-10 / Sewage Sample Baf 3
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Others	Faecal Coliforms	0	ct/100mL	Water	2310000

Guideline = *** = Guideline Exceedence**
All analysis completed in Ottawa, Ontario (unless otherwise indicated by ** which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1
additional QA/QC information available on request.
146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

Page 2 of 2

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Figure 9: 10-Sep-2016 sewage effluent results, Page 2 of 2

ANNEX E: ANALYSIS OF BERM WATER[1]

Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. As there are no intact berms, no effluent (berm water) samples (BAF-4) were taken in 2016 and this section has been left blank.

[1] Effluent from bermed fuel storage facilities.

ANNEX F: MONITORING ACTIVITIES

Raytheon

Customer Success Is Our Mission

BAF-3
Jet Fuel Release
2016 Project Update

February 28, 2017

Proposed 2016 Site Efforts

Raytheon Canada Limited

- Monitor and control fuel migration
- Treat surficial contaminated media using hydrogen peroxide
- Focus will be on Jet A1 NAPL recovery efforts
  - reconstruct the water treatment system
  - system upgrades to address phenols
  - install water and product pumps in the recovery trench to create cone of depression
  - collect product that accumulates behind coffer dams
  - soil-vapor extraction
- Complete additional Site delineation of soil and water impacts
  - soil-vapor survey
- Perform pilot test of in-situ oxidation using ozone to treat subsurface soils

Proposed 2016 Actions Timeline

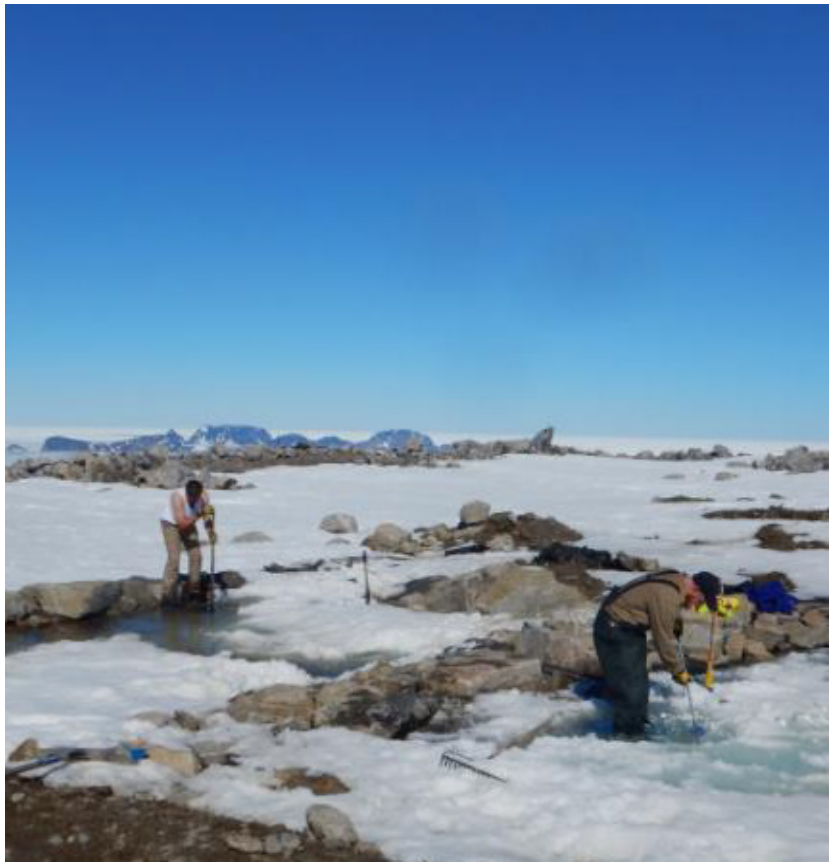
Raytheon Canada Limited

	2016 Season															
				June				July				August				
	March	April	May	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	eptembe
Discuss action plan with INAC and NWSO																
Identify equipment needs for the season																
Workplans for regulatory approval																
Equipment procurement and delivery																
Targeted snow removal																
Inspect water control structures and boom placement																
Reconstruct the water treatment system																
Operate water treatment																
Monitor accumulation of fuel in wells																
Recondition recovered fuel																
Peroxide application (poss ozone treatment for soils)																
Further delineation																
Season cleanup and winterization																
Support Manpower (Operator, Laborer, ...)						4	4	4	1-2	1-2	1-2	1-2	1-2	1-2	1-2	
Consulting Manpower	1	1	2	2	2	5	5	5	4	2	2	2	2	2	2	0.5

Monitor and Control Fuel Migration

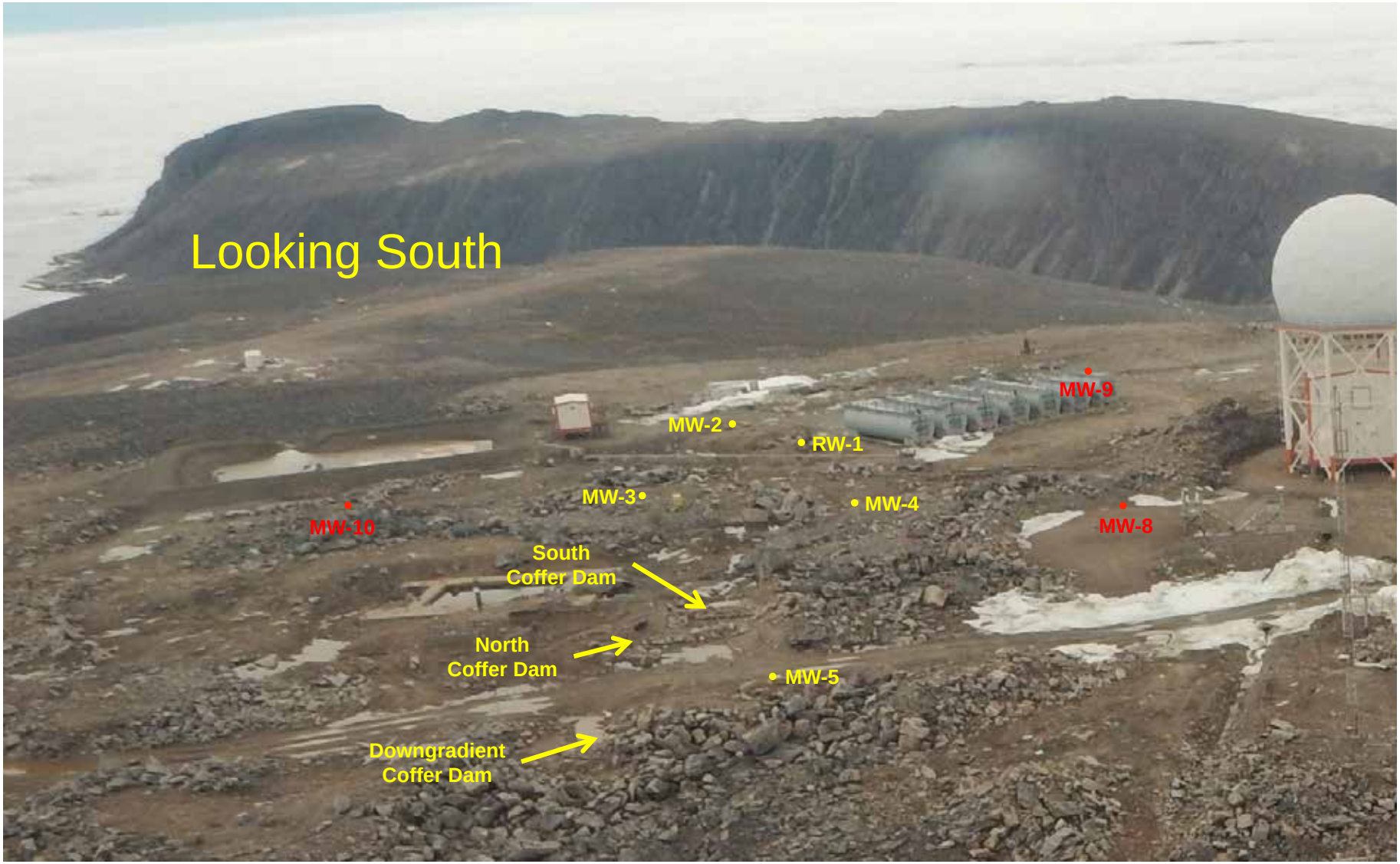
Raytheon Canada Limited

- Environmental staff arrived on site June 13, focuses on assessing site conditions and preparing to reconnect water treatment system
- Freshet was occurring, but there was no evidence of fuel migration
- Team cleared ice from coffer dams, laid out hose and electrical between recovery area and treatment, transferred water from recovery area to coffer dams
- Treatment re-started July 3



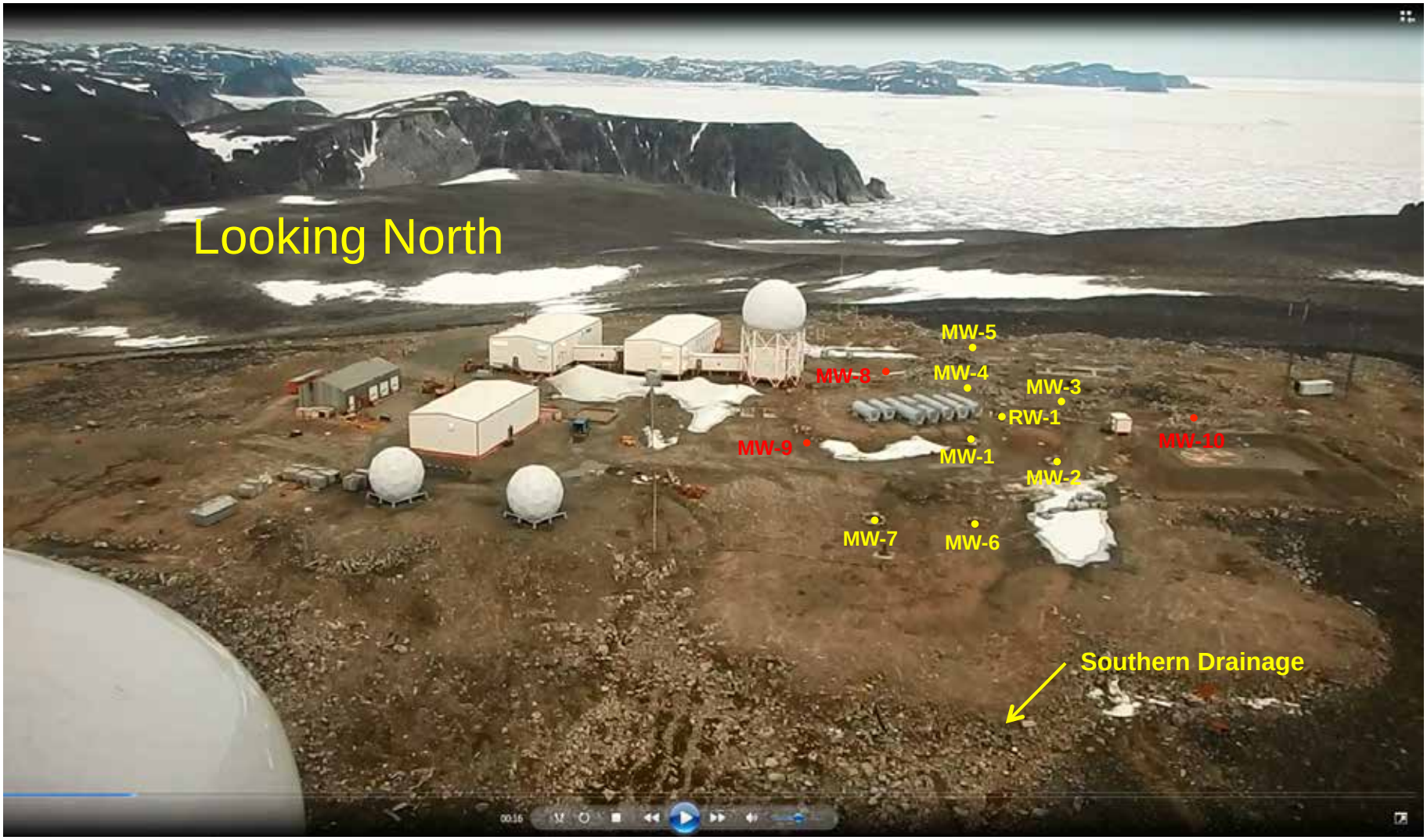
Monitor and Control Fuel Migration

Raytheon Canada Limited



Monitor and Control Fuel Migration

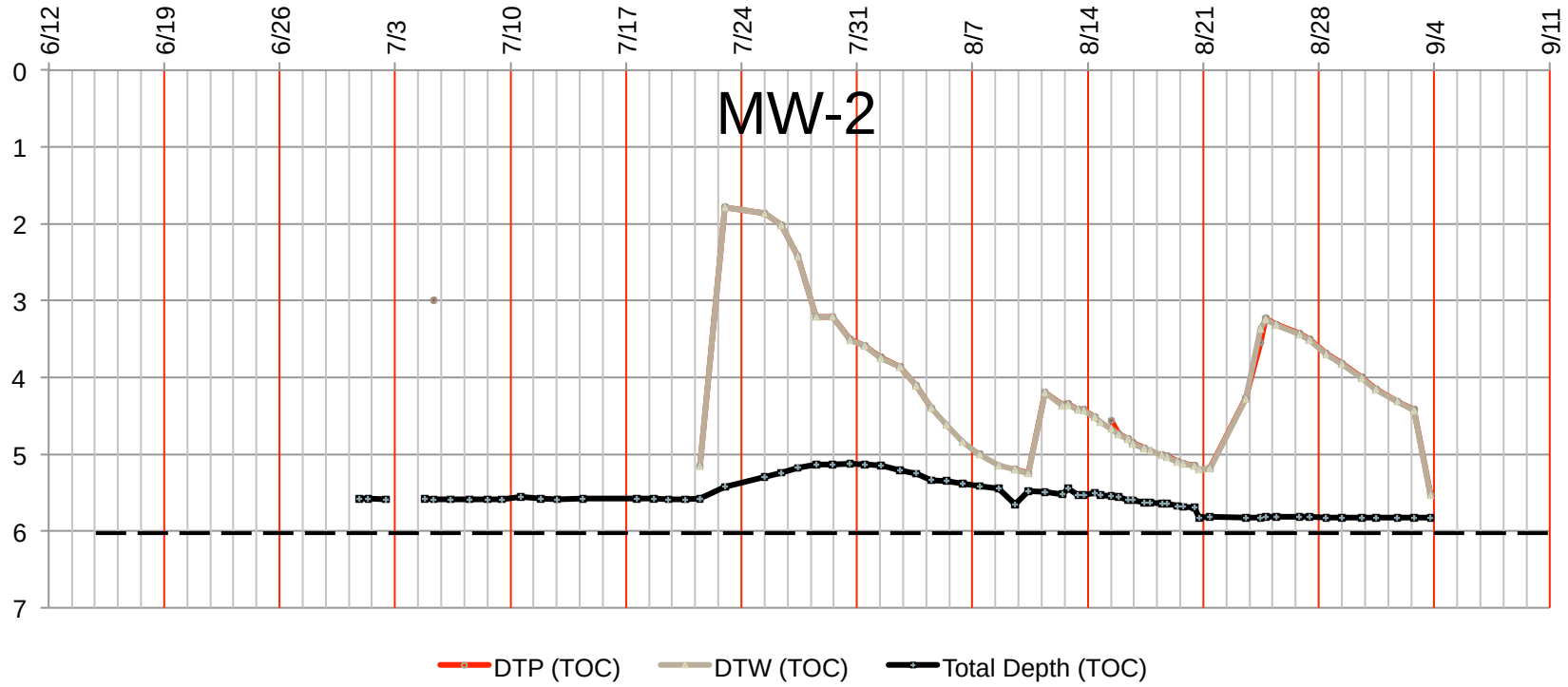
Raytheon Canada Limited



Monitor and Control Fuel Migration

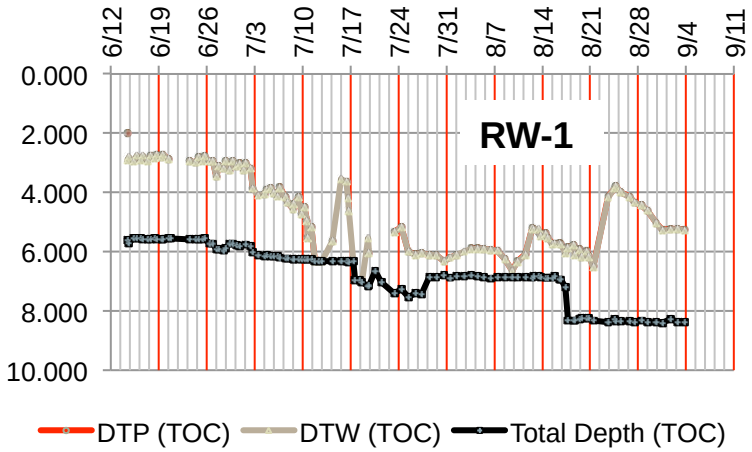
Raytheon Canada Limited

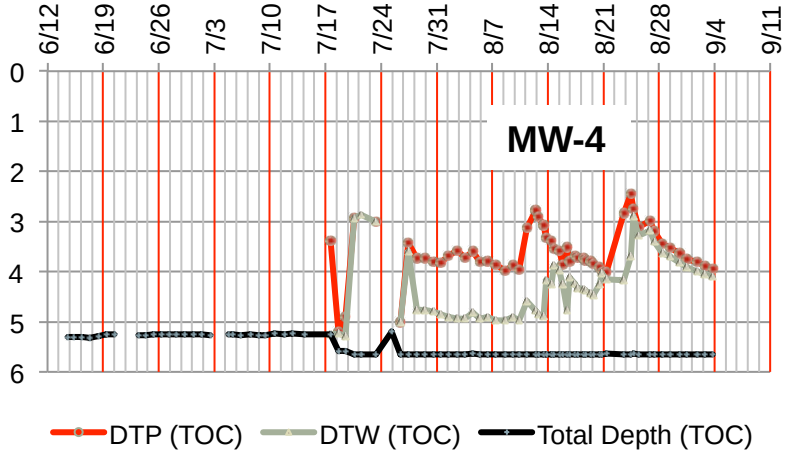
- Wells were cleared of snow to allow for monitoring of fuel levels, water levels, and total depths of each well
- Monitoring total depths provided significant insight to thawing of the permafrost and mobilization of subsurface fuel

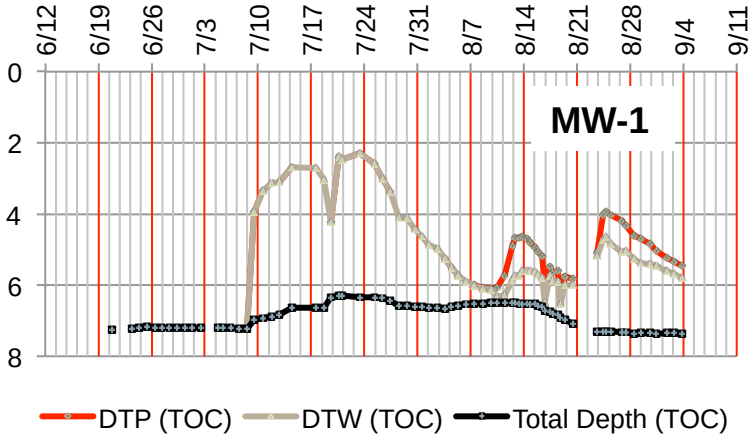


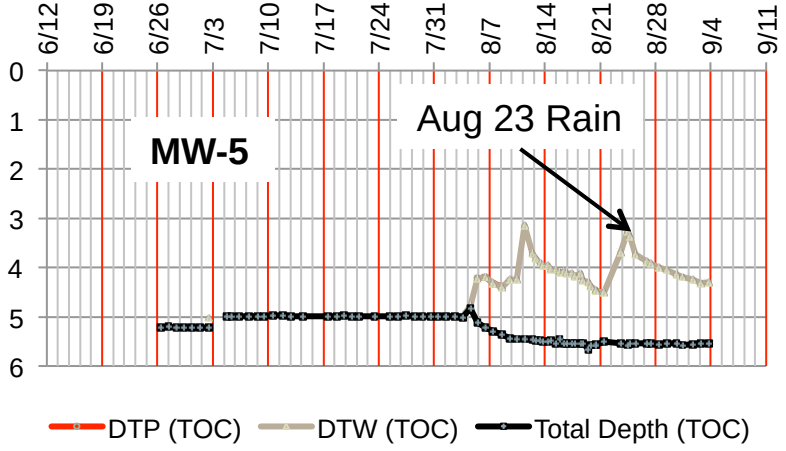
Monitor and Control Fuel Migration

Raytheon Canada Limited









Monitor and Control Fuel Migration

Raytheon Canada Limited

- Coffer dams in the north drainage exhibited little evidence of fuel migration throughout the summer
  - Minor sheens were detected on the surface of intermittent stream flow
- There was sheen observed in the south drainage warranting installation of an oil water trap
- No NAPL accumulation was observed to the South until a late season (Aug 23) major rain event changed conditions, warranting installation of an additional coffer dam and booms

South Drainage

Raytheon Canada Limited

Typical Flow Conditions

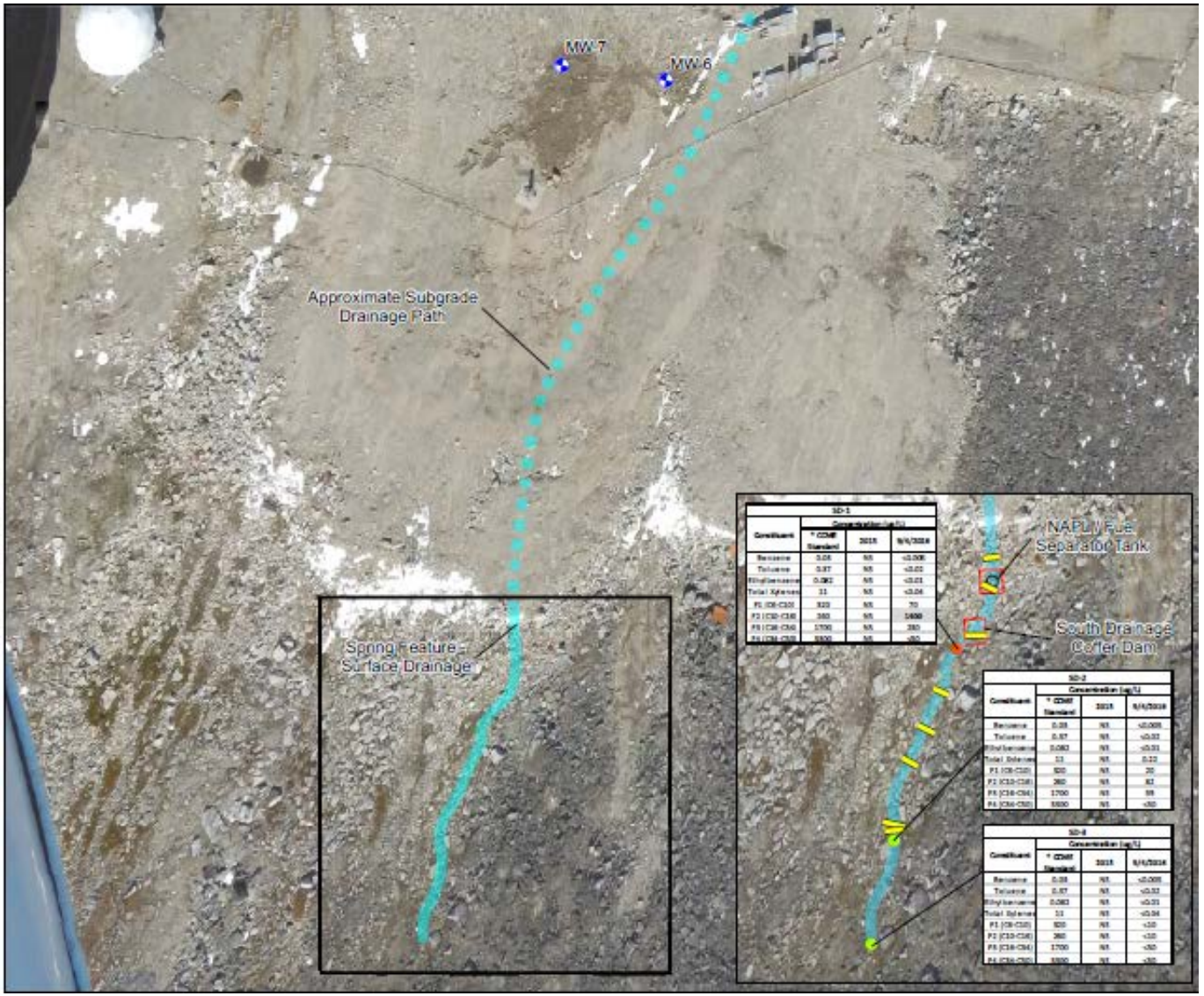
Fresh Storm Flushed NAPL

South Drainage Coffer

Raytheon Canada Limited

South Drainage Mitigation Controls

Raytheon Canada Limited



Pit Installation

- Three investigation pits have been installed in areas immediately downgradient of the release area
- Little to no recoverable NAPL existed even after induced drawdown of the water table

Fuel Recovery Efforts (GW)

Raytheon Canada Limited

- Pit 3 is located north of the POL line and east of the release
- The Pit was installed in a boulder area where NAPL recovery occurred during 2015
- Limited NAPL recovery from the newly installed Pit during 2016
  - Two distinctly different NAPLs were recovered
  - One an amber colored fresh NAPL
  - One black weathered and viscous NAPL

Pit Recovery Efforts

Raytheon
Canada Limited

Fuel Recovery Efforts (GW)

- Groundwater depression was reactivated in the recovery trench after the water treatment became operational July 3
- To address phenol exceedances observed in 2015, RCL increased temperature through the air stripper and added H_2O_2 chemical feed and UV activation



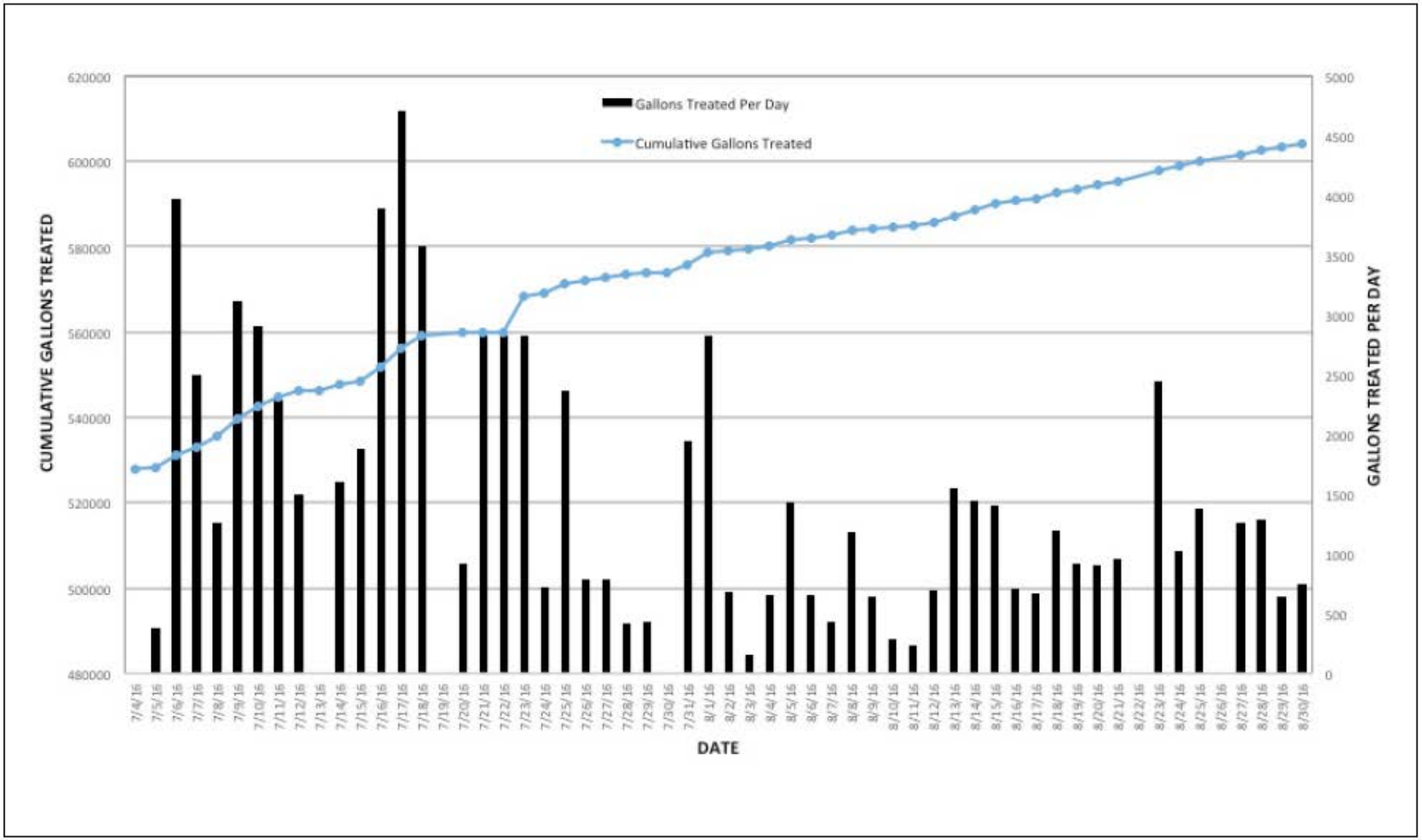
Compliance Sampling

Raytheon Canada Limited

- Original layout used a 1,000 gallon berm for the effluent outfall before discharge
- Modified discharge of outfall to a large berms allowed for more conservative monitoring of effluent prior to discharge

Water Treatment

Raytheon Canada Limited



2016 On-site Analytical

- Addition of on-site analytical capabilities to analyze for phenols and H_2O_2
  - field test kits for higher concentrations
  - wet chemical technique for lower concentrations
- 2016 efforts resulted in compliant results for phenols
- Phenols appear related to dissolution of treated wood preservatives

Fuel Recovery Efforts (GW)

Raytheon Canada Limited

Location	2015 Total Volume of NAPL (gal)	2015 Total Volume of NAPL (L)	2016 Total Volume of NAPL (gal)	2016 Total Volume of NAPL (L)
Initial Response	1479	5599	N/A	N/A
Water Treatment System	117	553	16	61
Depression Area	1121	4122	8	30
Cofferdams	100	379	20	76

Additional Site Investigation

Raytheon Canada Limited

- Sample collection and analyses were performed for all impacted media
  - Water treatment samples tracked influent conditions and treatment system compliance
  - Groundwater samples from all wells define the extent of migration
  - Soil samples used to define nature and extent of sorbed impacts, and the ability to treat soils in place
  - Air samples of the SVE discharge support mass removal calculations, and SVS air samples define the extent of subsurface HC vapors

Laboratory Analytical Samples	
Media	**Number of Samples**
Water Treatment System	67
Groundwater	13
Soil • Surface Soil • At Depth • Pile	 25 9 30
Air	86
Total	**230**

Additional Site Investigation

- 64 soil samples were collected from the investigation area
- Three new wells were installed to better define the horizontal extent of impact
  - All wells were sampled and analyzed in the laboratory
- Installed two additional Petroleum Investigation Trenches (PITs)
  - One just north of the recovery trench area, one north of MW-4
  - Limited product was visible at all three PITs
- Completed a soil vapor survey north and south of area of release

Additional Investigation

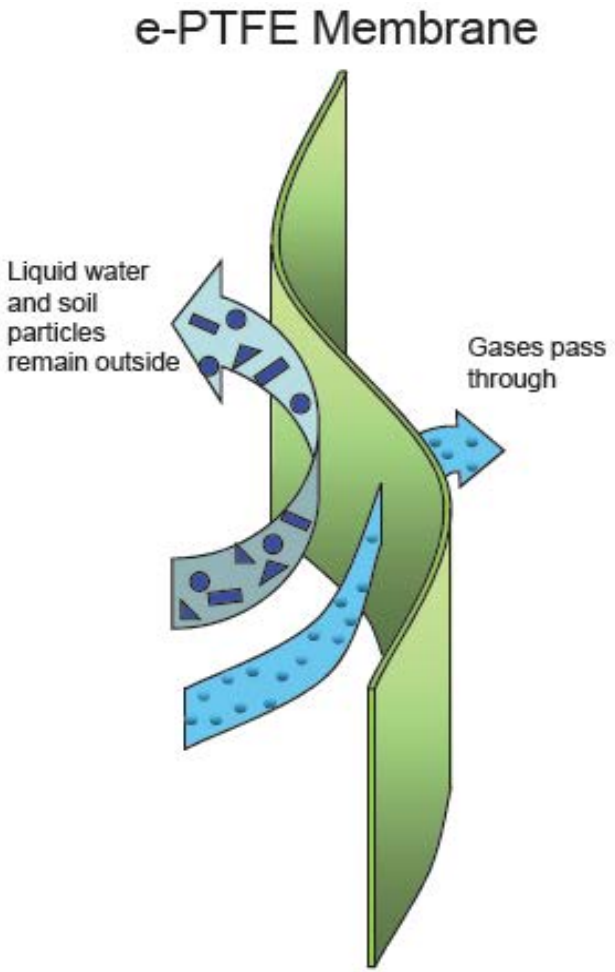
Raytheon Canada Limited

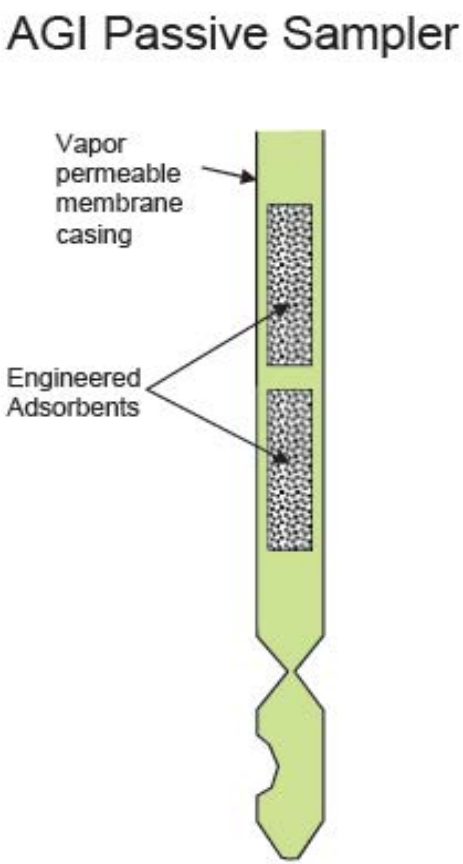
- Soil vapor survey
  - Used to further delineate nature and extent of soil and water impacts
  - Process
    - Sample
    - Analyze
    - Report
  - Works in: air, soil-gas, water, sediment
  - Sampling for VOCs/SVOCs, target petroleum hydrocarbons
  - Aid in identification of high petroleum hydrocarbon concentration areas

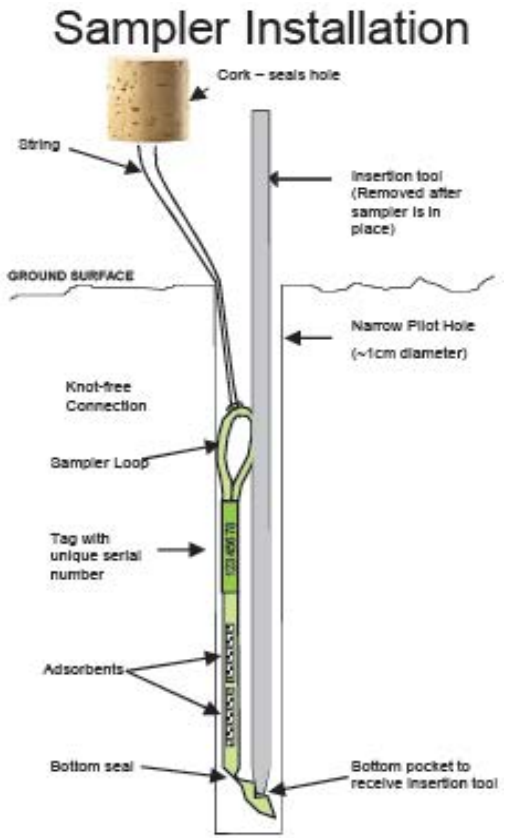
Additional Investigation

Raytheon Canada Limited

- Soil vapor survey sampling process







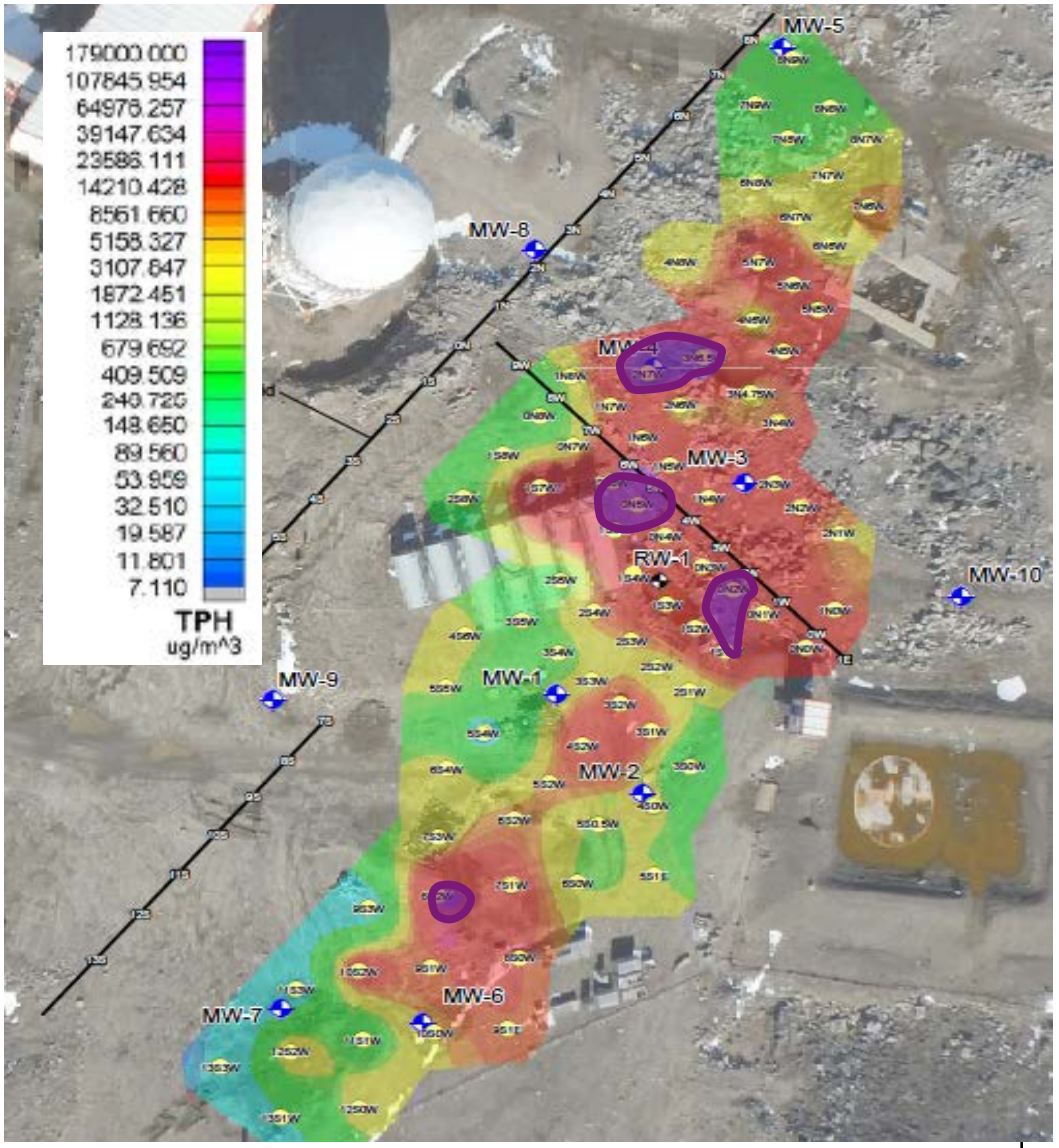
Additional Investigation

- Soil vapor survey sampling grid
  - 84 passive soil vapor sampler locations
  - Locations spaced on 6 m (20 ft) to 10 m (32 ft) centers
  - Samplers installed approximately 0.5 m (18 in) below ground surface

Additional Investigation

Raytheon Canada Limited

- Soil vapor survey results
  - Identification of petroleum hydrocarbon areas
  - Results indicate high concentrations reside in pocketed locations
    - Purple color represents higher total petroleum hydrocarbon concentrations
  - Identification of migration pathways
  - Petroleum hydrocarbon soil impacts primary reside in proximity of spill area



TPH Soil Vapors

Raytheon Canada Limited

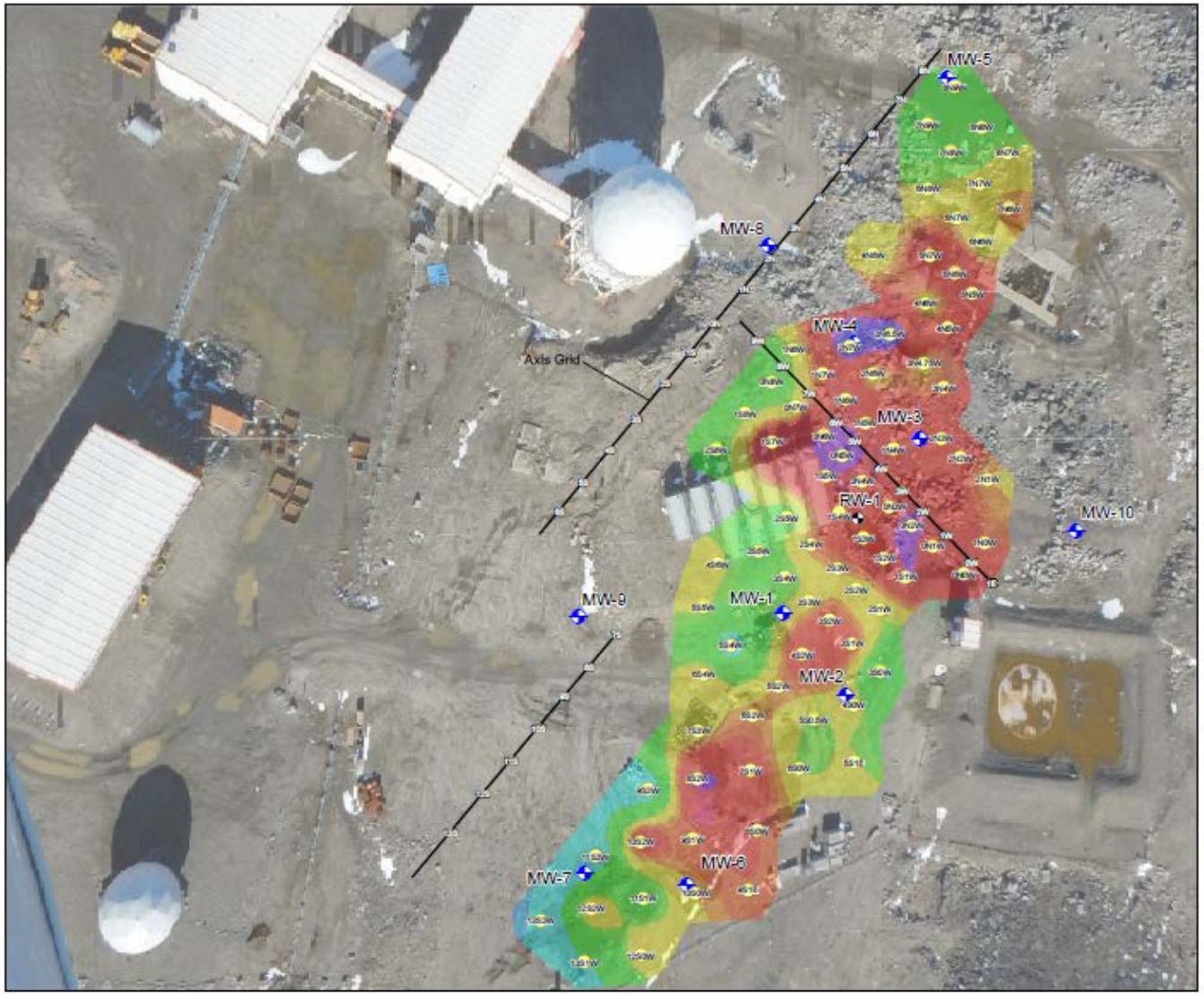


Figure 11

Soil Vapor Survey
Total Petroleum Hydrocarbon Concentration Map
BAF-3

Legend

- Monitoring Well
- Soil Vapor Sample Location
- Recovery Well
- Axis Grid
- 2S8W Soil Vapor Sample Identification

179000.000
107845.954
64976.257
39147.634
23586.111
14210.428
8561.000
5158.327
3107.847
1872.451
1128.136
679.602
409.509
246.725
148.650
89.560
53.959
32.510
19.587
11.801
7.110
TPH
ug/m^3

ESSENTIAL MANAGEMENT SOLUTIONS

BTEX Soil Vapors

Raytheon Canada Limited

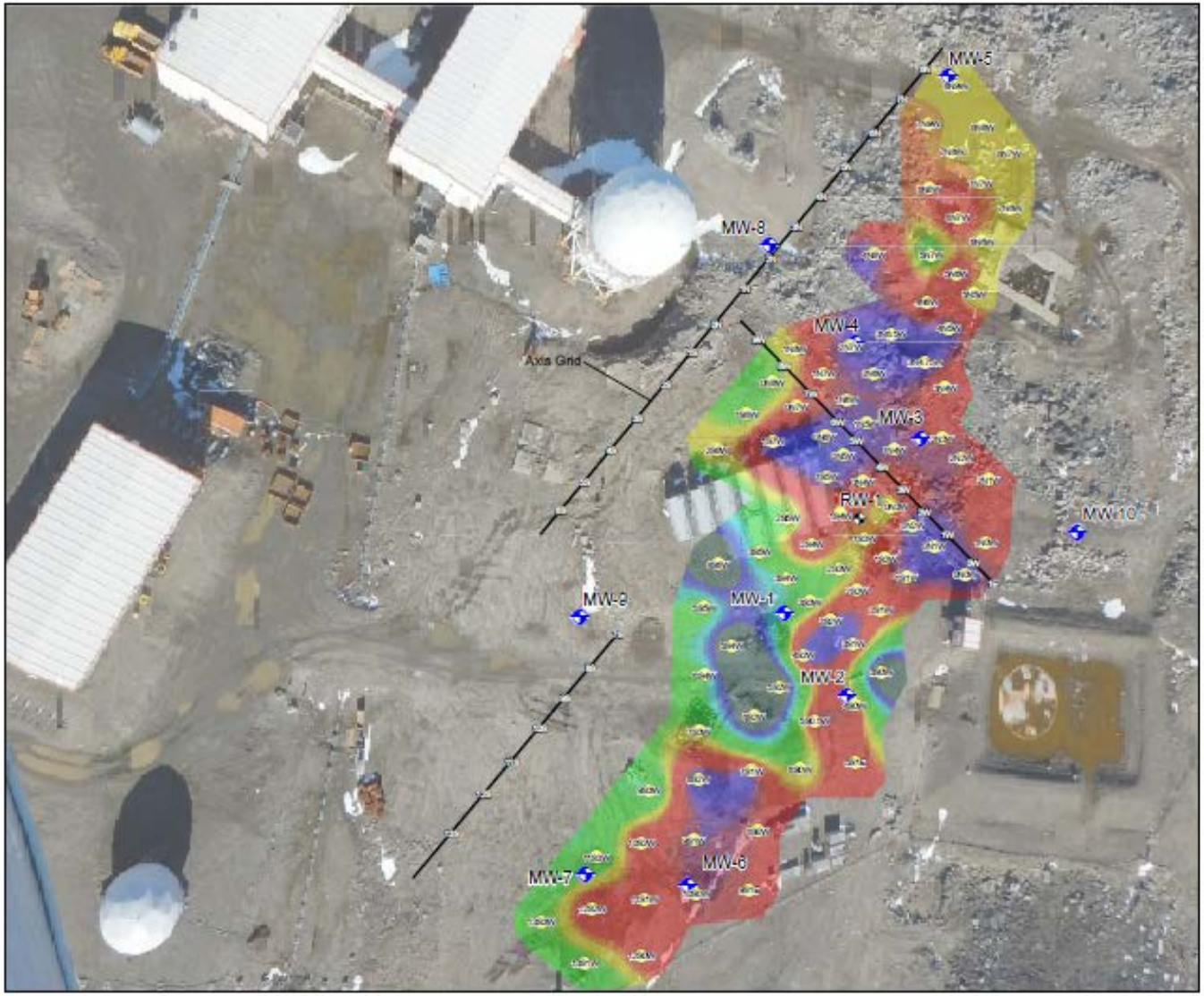


Figure 13

Soil Vapor Survey
Total BTEX (benzene / toluene / ethylbenzene / m,p-xylene / o-xylene) Concentration Map

BAF-3

Legend

- Monitoring Well
- Soil Vapor Sample Location
- Recovery Well
- Axis Grid
- 2S8W Soil Vapor Sample Identification

3340.500
2118.512
1343.540
852.060
540.368
342.696
217.334
137.831
87.411
55.435
35.157
22.296
14.140
8.967
5.687
3.607
2.287
1.451
0.920
0.583
0.370

BTEX ug/m^3

ESSENTIAL MANAGEMENT SOLUTIONS

Fuel Recovery Efforts (SVE)

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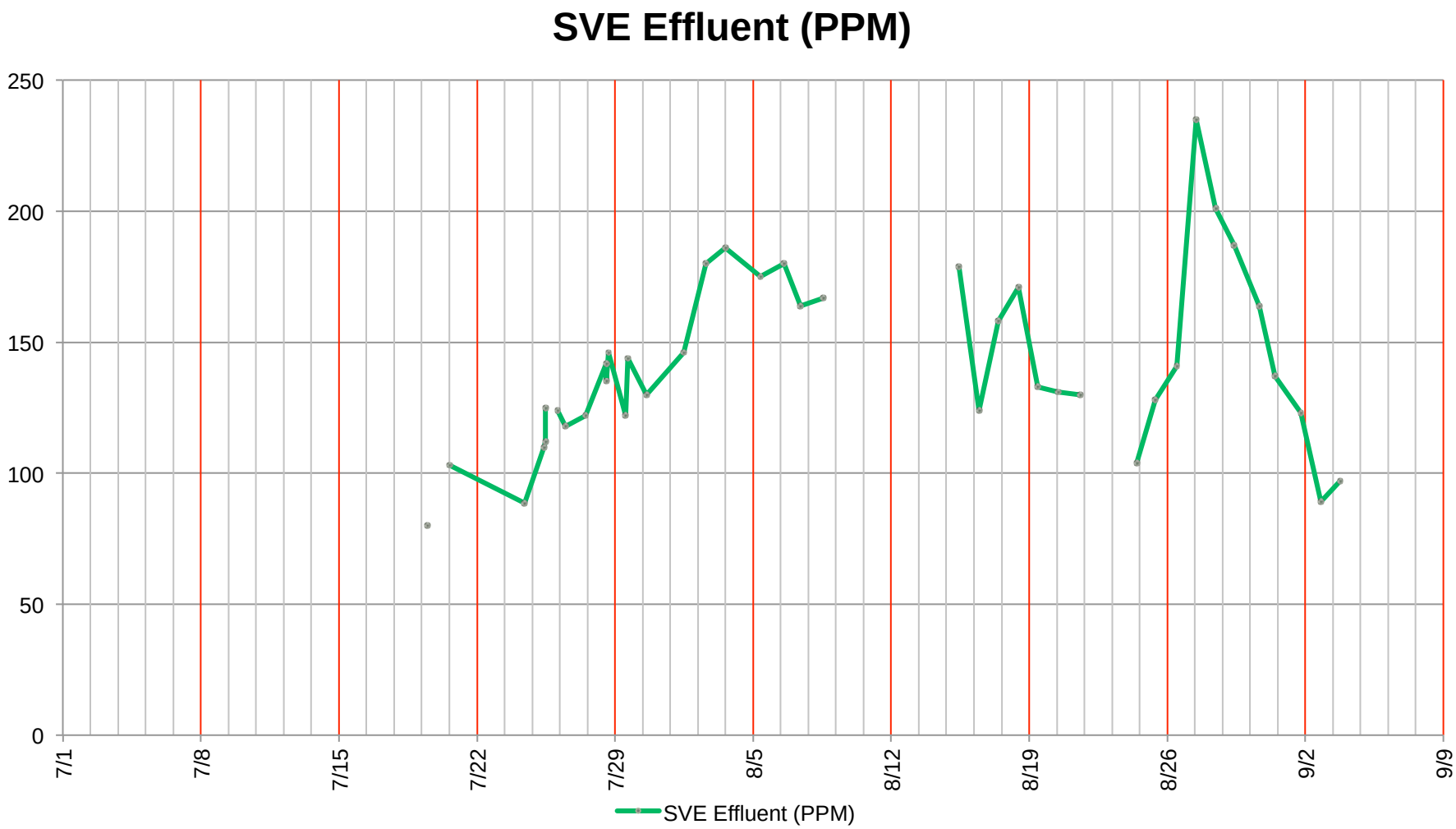
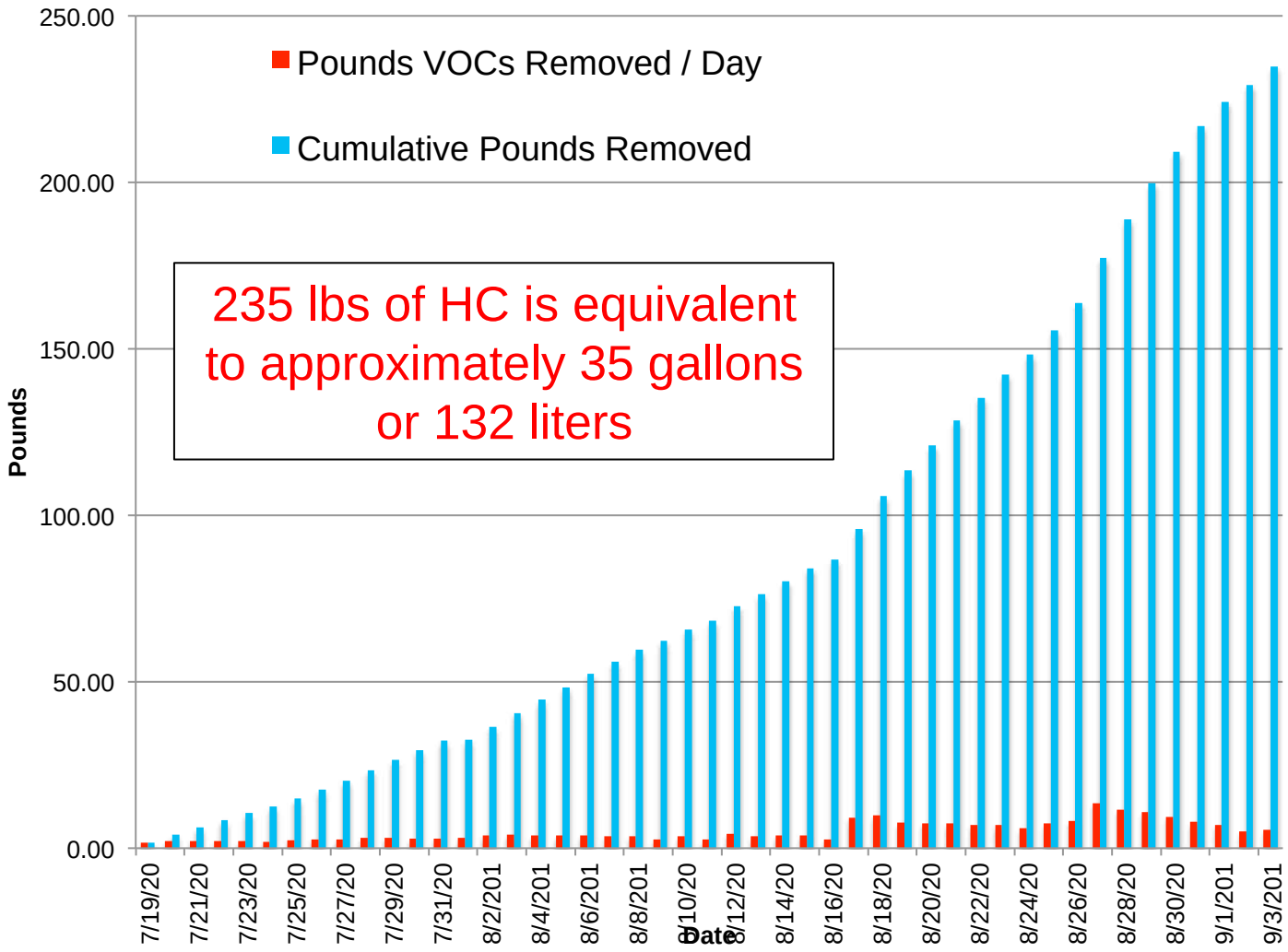
- Soil vapor extraction was initiated by installing a blower pump in the recovery trench area using the connector pipes installed during 2015
- SVE proved very effective removing volatile hydrocarbon compounds from the recovery trench area

Fuel Recovery Efforts (SVE)



Fuel Recovery Efforts (SVE)

Raytheon Canada Limited



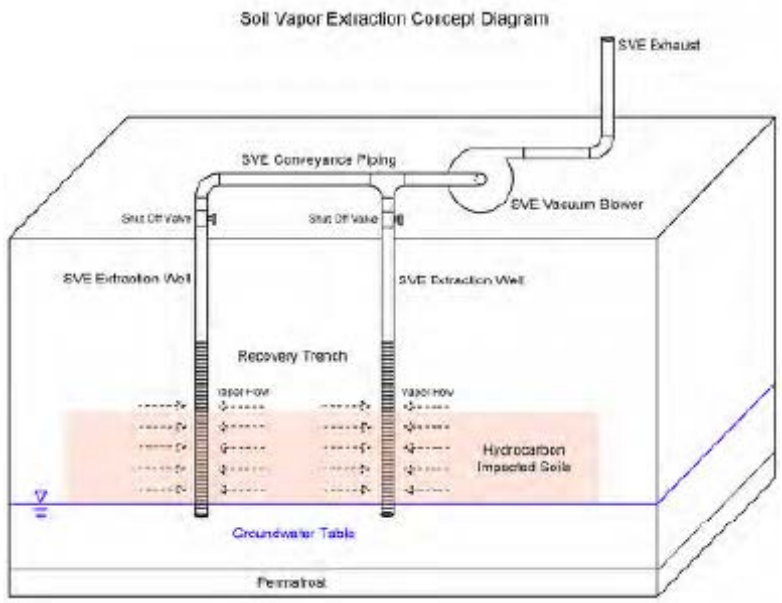
Fuel Recovery Efforts (SVE)

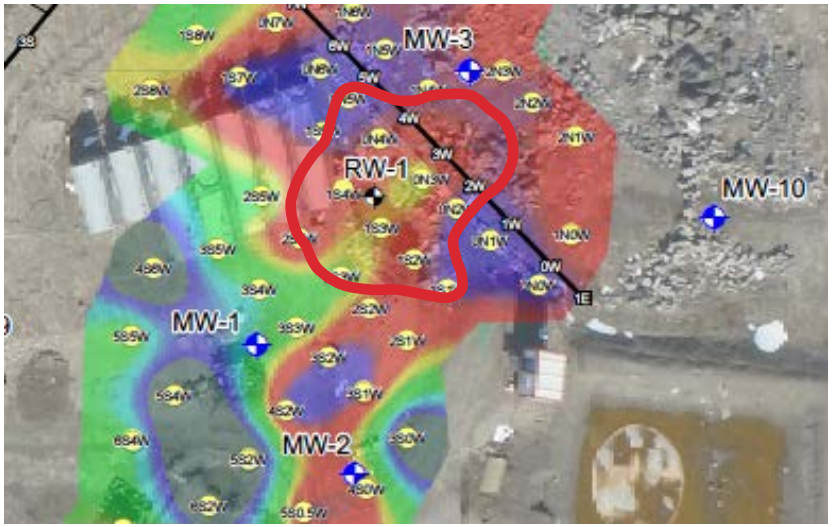
Raytheon Canada Limited

- Based on the successful SVE from the recovery area, RCL completed testing of SVE from several wells and subsurface access points in the area

Soil Vapor Extraction

- Soil vapor survey results compared to soil vapor extraction area indicates much lower petroleum hydrocarbon concentrations are observed in effective treatment area





Surficial Soil Treatment

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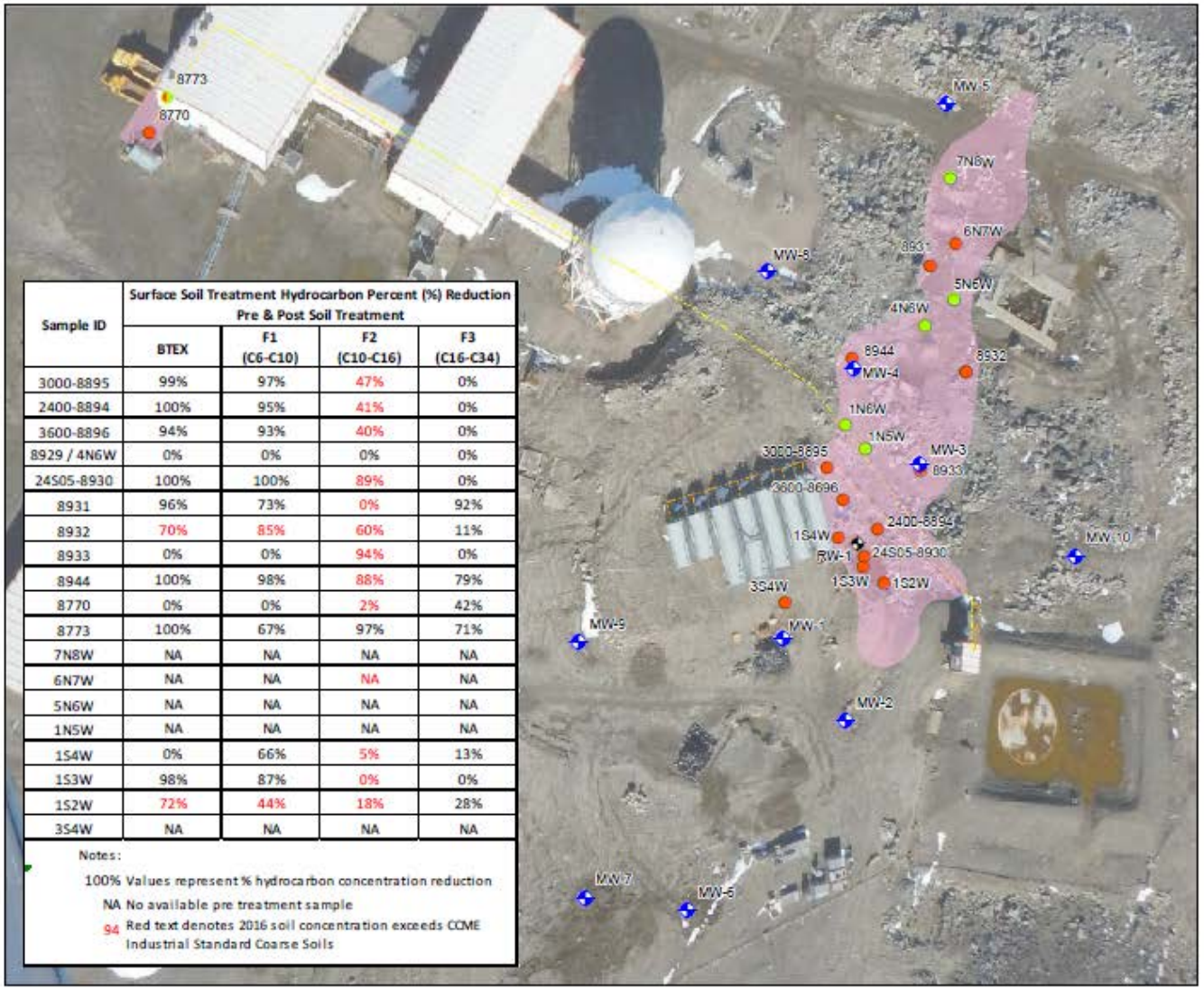
- 2½ totes of hydrogen peroxide were transferred from interior storage to the recovery trench area
- The H_2O_2 was diluted to 5 totes of 20% solution for application to the Jet A1 impacted areas
- Soil samples were collected before and after the application of the H_2O_2
- Sample results confirm effectiveness
- Initial penetration of the H_2O_2 appeared minimal; however, after application water from the recovery trench was recorded with detections of H_2O_2

Peroxide Treatment of Soils

Raytheon Canada Limited



Sample ID	Surface Soil Treatment Hydrocarbon Percent (%) Reduction Pre & Post Soil Treatment			
	BTEX	F1 (C6-C10)	F2 (C10-C16)	F3 (C16-C34)
3000-8895	99%	97%	47%	0%
2400-8894	100%	95%	41%	0%
3600-8896	94%	93%	40%	0%
8929 / 4N6W	0%	0%	0%	0%
24S05-8930	100%	100%	89%	0%
8931	96%	73%	0%	92%
8932	70%	85%	60%	11%
8933	0%	0%	94%	0%
8944	100%	98%	88%	79%
8770	0%	0%	2%	42%
8773	100%	67%	97%	71%
7N8W	NA	NA	NA	NA
6N7W	NA	NA	NA	NA
5N6W	NA	NA	NA	NA
1N5W	NA	NA	NA	NA
1S4W	0%	66%	5%	13%
1S3W	98%	87%	0%	0%
1S2W	72%	44%	18%	28%
3S4W	NA	NA	NA	NA

Notes:

100% Values represent % hydrocarbon concentration reduction

NA No available pre treatment sample

94 Red text denotes 2016 soil concentration exceeds CCME Industrial Standard Coarse Soils

Figure 8

Surface Soil Treatment Hydrocarbon Concentration Reduction and Sampling Map

BAF-3

Legend

- Monitoring Wells
- Recovery Well
- * Exceed 2015 / 2016
- * Not Exceed 2015 / 2016
- * Exceed 2015 / Not Exceed 2016
- POL Line
- Fuel Recirculation Line
- Surface Soil Treatment Area

ESSENTIAL MANAGEMENT SOLUTIONS

Fuel Reconditioning

- A 500-gallon arctic grade fuel bladder was purchased from SEI Ind. for collecting salvageable Jet A1 fuel collected as part of the remediation efforts
- The bladder is set up in a secondary containment berm near the vehicle refueling dispenser
- 405 gallons of recovered fuel was filtered using an aircraft grade fuel filtration system owned by the NWS program, and stored in the bladder
- A fuel sample was collected from the filtered fuel and sent to a certified laboratory to document the fuel is within specifications for reuse
- Once confirmed, the fuel will be added to the vehicle refueling tank and / or used to support the remediation project to avoid requiring offsite disposal

2016 Winterization Complete

Raytheon Canada Limited

Summary/Conclusions

- Treated total of 2,286,995 liters of PHC impacted water
- 2016 NAPL recovery was 167 liters, only about 1% of the 10,664 liters recovered during 2016
- Limited mobile NAPL remains, and potential additional migration is primarily limited to major precipitation events
- NAPL migration controls are in place
- Good understanding of the nature and extent of hydrocarbon impacts
- Differences in NAPL observed indicative of historic impacts mixing with 2015 release
- SVE effective in removal of PHC impacted soils
- Hydrogen peroxide treatment of soils have improved site conditions

The End - Questions

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