2019 Mary River Project Terrestrial Environment Annual Monitoring Report

Prepared For

Lou Kamermans
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, ON L6H 0C3

Prepared By

EDI Environmental Dynamics Inc.
2195 -2nd Avenue
Whitehorse, YT Y1A 3T8

EDI Contact

Mike Setterington, M.Sc., R.P.Bio
Senior Terrestrial Biologist

EDI Project

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EDI
ENVIRONMENTAL DYNAMICS INC.
Down to Earth Biology

SHORT SUMMARY — ᓇᐃᓈᖅᓯᒪᔪᖅ

Mining at Mary River started in September 2014. Temporary approval for mining up to 6 million tonnes per year and trucking by the Tote Road for shipping out of Milne Port. Terrestrial environment impact monitoring has been conducted for the Mary River Project (the Project) since 2012. This report summarizes the terrestrial environment monitoring activities conducted in 2019 for the Project. Key findings from 2019 monitoring are described below:

ᐅᓴᕋᖕᓂᐊᕐᓂᖅ ᑕᐃᑲᓂ ᒧᓘᔮᖕᓂᑦ ᐱᒋᐊᓚᐅᖅᓯᒪᔪᖅ ᓯᑎᐱᕆ 2014. ᐊᖏᖅᑕᐅᓚᐅᖃᒃᓯᒪᔪᑦ ᐅᓴᕋᖕᓂᐊᕈᓐᓇᖅᑐᑎᒃ ᑎᑭᓪᓗᒍ 6 ᒥᓕᐊᓐ ᑕᓐ ᐊᕐᕌᒍᑕᒫᑦ ᐊᒻᒪᓗ ᓄᓇᓯᐅᑎᒃᑯᑦ ᐊᓯᒃᖅᑕᕐᓗᑎᒃ ᐊᖅᑯᑎᑯᑖᒃᑯᑦ ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᐅᓯᔭᐅᓗᑎᒃ ᑕᐃᑰᓇ ᕿᓐᖑᐊᒍᑦ. ᓄᓇᒥᑦ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓃᑦ ᖃᐃᔨᓴᖅᑕᐅᓃᑦ ᐱᓕᕆᐊᖑᐃᓐᓇᖅᑐᑦ ᑖᔅᓱᒧᖕᒪ ᒧᓘᔮᖕᓂᑦ ᐱᓕᕆᐊᒧᑦ (ᐱᓕᕆᐊᖅ) ᑕᐃᑲᙵᓂᑦ 2012. ᑖᓐᓇ ᐅᓂᒃᑳᖅ ᓇᐃᓪᓕᑎᖅᓯᒪᔪᖅ ᓄᓇᒥᑦ ᐊᕙᑎᖓ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᑕᐃᑲᓂ 2019 ᑖᔅᓱᒧᖕᒪ ᐱᓕᕆᐊᒧᑦ. ᐱᓪᓗᐊᑕᐅᔪᑦ ᖃᐅᔨᓴᐅᓚᐅᖅᑐᑦ ᑕᐃᑲᙵᓂᑦ 2019 ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐅᓂᒃᑳᖅᑕᐅᔪᓂᑦ ᐅᑯᐊᖑᔪᑦ ᐊᑖᓂᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᑦ”

Dustfall and Traffic: ᐳᔪᕐᓗᒃ ᐊᒻᒪᓗ ᐊᖏᕐᕋᔭᖕᓃᑦ:

- Summer (June to August) and winter (September to May) temperatures were cooler at Milne Inlet in 2019 relative to 2018. Summer and winter temperatures at Mary River, were somewhat warmer in 2019 than 2018. Average wind speeds were similar among years. At Mary River, average wind speeds in 2019 and 2018 were similar for all months except January 2019, which had a higher average wind speed than 2018.

  ᐊᐅᔭᖅ (ᔫᓂᒥᑦ ᐋᒃᒋᓯᒧᑦ) ᐊᒻᒪᓗ ᐅᑭᐅᖅ (ᓯᑎᐱᕆᒥᑦ ᒪᐃᒧᑦ) ᐅᖅᑰᓇᕐᓂᖓ ᓂᓪᓚᓱᖕᓂᖅᓴᐅᕌᕐᔪᓚᐅᖅᑐᑦ ᑕᐅᑲᓂ ᕿᓐᖑᐊᓂᑦ 2019-ᖑᑎᓪᓗᒍ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖓ 2018-ᒥᓂᑦ.
- There was a slight increase in the mean daily number of ore haul and non-haul vehicle transits in 2019 than there was in 2018.

  ᐅᓄᖅᓯᕆᐊᖅᓯᒫᕐᔪᓚᐅᖅᑐᑦ ᖃᐅᑕᒫᑦ ᐅᓄᕐᓂᖏᑦ ᓴᕕᒃᓴᒥᒃ ᐅᓯᔪᑦ ᐊᒻᒪᓗ ᐅᓯᙱᒃᑐᑦ ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᕐᓂᖏᑦ ᑕᐃᑲᓂ 2019-ᒥᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖓ 2018-ᒥᓂᑦ.
- In 2019, dustfall at the Mine Site was highest near the Tote Road, downwind of the ore deposit, while dustfall near the airstrip and the crusher decreased in 2019 in comparison with 2018.

  2019-ᒥᑦ, ᐳᔪᕐᓗᒃ ᑕᐃᑲᓂ ᐅᓴᕋᖕᓂᐊᕐᕕᖕᒥᑦ ᖁᕝᕙᓯᓛᖑᓚᐅᖅᑐᖅ ᖃᓂᒋᔭᖕᒪᓂᑦ ᐊᖅᑯᑎᑖᒃ, ᑎᒃᑕᐅᕙᓪᓕᐊᔪᑦ ᓴᕕᒃᓴᒥᖕᓛᖅᑐᑦ ᐅᓴᖃᖕᓂᐊᖅᑕᒥᑦ, ᐳᔪᕐᓗᐃᑦ ᖃᓂᒋᔭᖕᒪᓂᑦ ᒥᑦᑕᕐᕕᐅᑉ ᐊᒻᒪᓗ ᓯᖃᓪᓕᑦᑎᕕᐅᑉ ᒥᒃᓵᒋᐊᖅᓯᒪᓪᓗᑎᒃ ᑕᐃᑲᓂ 2019-ᒥᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖓ 2018-ᒥᓂᑦ.
- Dustfall at Milne Port decreased at all sites in 2019 during the winter months but increased in summer months relative to 2018.

  ᐳᔪᕐᓗᒃ ᑕᐃᑲᓂ ᕿᓐᖑᐊᓂᑦ ᐃᓄᑯᓐᓃᖅᐹᓪᓕᖅᑐᖅ ᐊᑕᖏᖅᓱᒥᑦ ᐃᓂᓂᑦ 2019-ᖑᑎᓪᓗᒍ ᐅᑭᐅᑉ ᑕᖅᑭᖏᓐᓂᑦ ᑭᓯᐊᓂᓕ ᐅᓄᖅᓯᕆᐊᖅᓯᒪᓪᓗᑎᒃ ᐊᐅᔭᐃᑦ ᑕᖅᑭᖏᓐᓂᑦ ᑕᑯᒃᓴᑎᒌᒃᓗᒍ 2018.

- In comparison with 2018, dustfall decreased at the north end of Tote Road in 2019, but slightly increased at the south end of the road.
  ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᑦ ᑕᑯᓗᒋᑦ ᐊᑐᖃᓯᐅᑎᓪᓗᒍ 2018, ᐳᔪᖅᓗᐊᙱᓐᓂᖅᓴᐅᓚᐅᖅᑐᖅ ᐅᐊᖕᓇᖓᓂᑦ ᐊᖅᑯᑎᑯᑖᑉ ᑕᐃᑲᓂ 2019, ᑭᓯᐊᓂᓕ ᐳᔫᖅᓗᖕᓂᖅᓴᓪᓗᓂ ᓂᒋᐊᓂᑦ ᐊᖅᑯᑎᐅᑉ ᐃᓱᐊᓂᑦ.
- Summer dustfall increased modestly over the Potential Development Area (PDA) in 2019 compared to 2018. Winter dustfall remained consistent with 2018.
  ᐊᐅᔭᒃᑯᑦ ᐅᔫᖅᓗᖕᓂᖅᓴᐅᕚᖅᔪᖃᑦᑕᖅᑐᖅ ᑕᐃᑲᓂ ᐱᕙᓪᓕᐊᓂᐅᑐᐃᓐᓇᕆᐊᓕᖕᓂᒃ ᐃᓂᓂᑦ (PDA) ᑲᐃᑲᓂᑦ 2019 ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖓ 2018-ᒥᓂᑦ.
- Dustfall was low at 12 sites located one kilometre from the PDA, ranging from below laboratory detection to less than 1.0 mg/dm²·day.
  ᐳᔪᖅᓗᒃ ᐊᒃᐸᓯᓚᐅᖅᑐᑦ 12−ᓂᑦ ᐃᓂᓂᑦ ᐃᓂᖃᖅᑐᓂᑦ ᐊᑕᐅᓯᖅ ᑭᓛᒥᑕᑦ ᑕᐃᑲᙵᑦ ᐱᕙᓪᓕᐊᓂᐅᑐᐃᓐᓇᕆᐊᓕᖕᓂᒃ ᐃᓂᓂᑦ, ᐊᔾᔩᙱᓐᓂᖃᐅᖅᓱᓂ ᐊᒃᐸᓯᖕᓂᖅᓴᐅᔪᓂᑦ ᖃᐅᔨᓴᖅᑕᐅᔾᕖᑦ ᖃᐅᔨᓴᖕᒋᓐᓂᑦ ᐃᒪᐃᓘᓪᓗᑎᒃ ᐅᓄᙱᓐᓂᖅᓴᖅ 1.0 mg/dm²·ᐅᓪᓗᕐᒧᑦ.

Climate, dustfall and traffic monitoring will continue in 2020.

ᓯᓚ, ᐳᔪᖅᓗᒃ ᐊᒻᒪᓗ ᐅᑎᖅᑕᖅᑐᓂᒃ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᖅ ᑲᔪᓯᓂᐊᖅᑐᖅ ᑕᒫᓂ 2020-ᒥᑦ.

Vegetation: ᐱᕈᖅᑐᑦ:

- There is annual variation in vegetation abundance among sites Near and Far from the PDA. There is no evidence to date of a Project-related effect on vegetation outside of the PDA. ᐊᕐᕌᒍᑕᒫᑦ ᐊᔾᔩᙱᑦᑕᖅᑐᑦ ᐱᕈᖅᑐᖅᑕᖃᐅᕐᓂᖓᓂᒃ ᐃᓂᒐᓚᖕᓂᑦ ᖃᓂᒋᔮᓂᑦ ᐊᒻᒪᓗ ᐅᖓᓯᒋᔭᖕᒋᓐᓂᑦ ᐱᕙᓪᓕᐊᓂᐅᑐᐃᓐᓇᕆᐊᓕᖕᓂᒃ ᐃᓂᓂᑦ.
- All soil samples were below Canadian Council of Ministers of the Environment (CCME) soil quality guidelines except one sample near the Mine Site for copper where a field sampling error is suspected.
  ᐊᑕᖏᖅᓱᒋᑦ ᐃᔾᔭᐃᑦ ᖃᐅᔨᓴᓚᒃᓴᓕᐊᑦ ᐊᑦᑎᖕᓂᖅᓴᐅᓚᐅᖅᑐᑦ ᑲᓇᑕᒥᑦ ᑲᑎᒪᔩᑦ ᒥᓂᔅᑕᐃᑦ ᐊᕙᑎᒧᑦ (CCME) ᐃᔾᔫᑉ ᐱᐅᓂᖓᓄᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᒃᓕᑦ ᑭᓯᐊᓂ ᐊᑕᐅᓯᖅ ᖃᐅᔨᓴᓚᒃᓴᖅ ᖃᓂᒋᔮᓂᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᐅᑉ copper ᓄᓇᒥᑦ ᖃᐅᔨᓴᓚᒃᓴᓄᑦ ᑕᒻᒪᖅᑕᐅᓯᒪᓇᓱᒋᔭᐅᓚᐅᖅᑐᖅ.
- An increase was identified in trace amounts of some metal concentrations in lichen at Near sites and a few increases at Far sites along the Tote Road. Lichen samples were below peer reviewed literature-based indicator values for all metals except for lead, which was within the range of the indicator value.
  ᐅᓄᖅᓯᒋᐊᓯᒪᓂᖓᓂᒃ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦᑦ ᐱᑕᖃᖅᔪᖕᓂᖓᓂᑦ ᓴᕕᖃᔭᔅᓴᖅᑕᖃᖅᓂᖓᓂᑦ ᖁᐊᔭᐅᑎᓂᑦ ᖃᓂᒋᔭᖓᓂᑦ ᐃᓃᑦ ᐊᒻᒪᓗ ᐅᓄᖅᓯᒋᐊᕚᖅᔪᒃᓯᒪᓪᓗᑎᒃ ᐅᖓᓯᒃᑐᓂᑦ ᐃᓂᓂᑦ ᑕᐃᑰᓇ ᐊᖅᑯᑎᑖᒃᑯᑦ. ᖁᐊᔭᐅᑏᑦ ᖃᐅᔨᓴᓚᒃᓴᐃᑦ ᐊᑖᓃᓐᓂᖅᓴᐅᓚᐅᖅᑐᑦ ᐱᕈᖅᑑᖃᑎᖏᑦ ᕿᒥᕐᕈᔭᐅᑎᓪᓗᒋᑦ ᑎᑎᖃᖅᑎᒪᔪᑎᒍᑦ−ᑐᙵᕕᓖᑦ ᓇᓗᓇᐃᔭᐅᑏᑦ ᐱᐅᓂᖏᓐᓄᑦ ᐊᑦᑎᖕᒍᓯᑦ ᓴᕕᖃᔭᒃᓴᐃᑦ ᑭᓯᐊᓂ ᐃᓚᐅᓇᓂ ᐅᕕᓂᖕᒧᑦ ᐆᓇᖅᑐᑦ, ᐃᓗᐊᓃᓚᐅᕐᓂᖓᓄᑦ ᑎᑭᑕᐅᔪᓇᖅᑐᑦ ᓇᓗᓇᐃᔭᐅᑏᑦ ᐱᐅᓂᕐᓄᑦ.

- Lichen remains a sensitive indicator of metal concentrations; increased metals concentrations in dustfall deposition corresponded to increased metal concentrations in lichen.
  ᖁᐊᔭᐅᑏᑦ ᓯᓕ ᐃᑉᐱᖕᓂᖅᓴᕋᐃᑦᑑᑎᑕᐅᔪᑦ ᓇᓗᓇᐃᔭᐅᑎᑎᒍᑦ ᓴᕕᕋᔭᒃᓴᖅᑕᖃᓪᓚᕆᖕᓂᕐᓄᑦ; ᐅᓄᖅᓯᒋᐊᖅᓯᒪᔪᑦ ᓴᕕᕋᔭᒃᓴᖅᑕᖃᓪᓕᕆᒃᑐᑦ ᑕᐃᑲᓂ ᐳᔪᕐᓗᖕᓂᑦ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᓂᑦ ᒪᓕᒃᓗᑎᒃ ᐅᓄᖅᓯᒋᐊᕐᓯᒪᓂᖏᓐᓄᑦ ᓴᕕᕋᔭᒃᓴᖅᑕᖃᓪᓚᕆᖕᓃᑦ ᖁᐊᔭᐅᑎᓂᑦ.
- One garden tomato (*Solanum lycopersium*) was growing at the Mine Site below the sewage/effluent discharge pipe.
  ᐊᑕᐅᓯᖅ ᐱᕈᖅᑐᑦ ᑐᒪᐃᑐᑦ (*Solanum lycopersium*) ᐱᕈᖅᐸᓪᓕᐊᓯᒪᔪᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥᑦ ᐊᑖᓂᖕᕌᖅ ᑭᓈᓗᖃᕐᕕᐅᑉ/ᓴᓗᒻᒪᖅᓴᖅᓯᒪᔪᑦ ᐃᒦᑦ ᑯᕕᔭᐅᕝᕕᖕᒥᑦ ᓱᓪᓗᐊᓗᖕᒥᑦ.
- Some natural revegetation of previously disturbed areas was observed in the Project footprint.
  ᐃᓚᖏᑦ ᐱᕈᒃᑲᓐᓂᑐᐃᓐᓇᖅᑐᑦ ᐸᕝᕕᓴᒃᑕᐅᓂᑯᓂᑦ ᐃᓂᓂ ᑕᑯᔭᐅᓚᐅᖅᑐᑦ ᑕᐃᑲᓂ ᐱᓕᕆᐊᑉ ᐊᒃᑐᕐᓂᑯᖏᓐᓂᑦ.

Vegetation and soil base metals/metalloids monitoring, and focused exotic vegetation monitoring will continue in 2020. The Terrestrial Environment Working Group (TEWG) and Baffinland are still considering the frequency of monitoring for the vegetation abundance monitoring program.
ᐱᕈᑦᑐᑦ ᐊᒻᒪᓗ ᐃᔾᔪᕐᓃᑦᑐᑦ ᓴᕕᕋᔭᑦ/ᐊᕿᓐᓂᖅᓴᑦ ᓴᕕᕋᔭᒃᓴᐃᑦ ᖃᐅᔨᓴᖅᑕᐅᖏᓐᓇᕐᓂᖏᓐᓄᑦ, ᐊᒻᒪᓗ ᑐᕌᖅᑕᐅᓂᖅᓴᐅᔪᑦ ᑕᑯᒥᓇᖅᓴᐅᑏᑦ ᐱᕈᖅᑐᓂᒃ ᖃᐅᔨᓴᐃᓐᓇᕐᓃᑦ ᓯᓕ ᑲᔪᓯᓂᐊᖅᑐᑦ ᑕᒫᓂ 2020-ᒥᑦ. ᓄᓇᒥᐅᑕᕐᓄᑦ ᑲᑎᒪᔨᐊᓛᑦ (TEWG) ᐊᒻᒪᓗ ᐹᕙᓛᓐᑯᑦ ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑎᖃᖅᑐᑦ ᓯᓕ ᐊᑯᓚᐃᓕᕇᖕᓂᖏᓐᓂᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓃᑦ ᑕᒪᒃᑯᓄᖓ ᐱᕈᖅᑐᖃᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓃᑦ ᐱᓕᕆᐊᓄᑦ.

Mammals: ᐆᒪᔪᑦ:

- Ground-based surveys continue to be used to monitor potential wildlife interactions with the Project. These include Height of Land (HOL) surveys throughout the Project area, snow track surveys along the Tote Road, snowbank height surveys along the Tote Road, and incidental sighting reports from on-site personnel throughout the Project area.
  ᓄᓇᒦᓪᓗᑎᒃ ᖃᐅᔨᓴᕐᓃᑦ ᑲᔪᓯᔪᑦ ᓯᓕ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐆᒪᔪᓂᒃ ᑕᑰᑎᓂᖅᑕᖅᑐᐃᓐᓇᓇᕆᐊᖅᑲᕐᓂᖏᓐᓄᑦ ᐱᓕᕆᐊᒥᑦ. ᐃᓚᐅᓪᓗᑎᒃ ᖁᑦᑎᒃᑐᒦᓪᓗᑎᒃ ᓄᓇᒥ (HOL) ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᕝᕕᐅᔪᓗᒃᑖᑉ ᐃᓂᖏᓐᓂᑦ, ᐊᐳᒻᒥᑦ ᑐᓪᓕᓂᕐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐊᖅᑯᑎᑯᑖᑉ ᓴᓂᐊᒍᑦ, ᐊᐳᔾᔭᕆᒃᓯᓯᒪᔪᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐊᖅᑯᑎᑯᑖᑉ ᓴᓂᐊᒍᑦ ᐊᒻᒪᓗ ᖃᓄᐃᑦᑐᖃᖅᑎᓪᓗᒍ ᑕᑯᔭᐅᔪᕕᓃᑦ ᐅᓂᒃᑳᖏᓐᓂᑦ ᑕᐃᑲᙵᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒦᑦᑐᓂᑦ ᐃᖅᑲᓇᐃᔭᖅᑎᓂᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᐅᔪᓗᒃᑖᒥᑦ.

- Low numbers of incidental observations of caribou between the Mine Site and Milne Inlet in 2019 coincide with the lack of caribou observations during the HOL surveys. Lack of caribou observations on site follow the trends of low numbers recorded in regional observations and have been confirmed through collaboration with the Government of Nunavut (GN), who conducts caribou aerial surveys, and through local observations received at workshops held in November 2015 and April 2016.
  ᐅᓄᓗᐊᙱᑦᑐᑦ ᖃᓄᐃᑦᑐᖃᖅᑎᓪᓗᒍ ᑕᑯᔭᐅᔪᕕᓃᑦ ᑐᒃᑐᐃᑦ ᐊᑯᓐᓂᖓᓂᑦ ᐅᔭᕐᓂᐊᕐᕕᐅᑉ ᐊᒻᒪᓗ ᕿᙳᐊᓂᑦ ᐊᑐᖅᑎᓪᓗᒍ 2019 ᒪᓕᒃᑐᖅ ᐱᑕᖃᑦᑎᐊᙱᓐᓂᖏᓐᓄᑦ ᑐᒃᑐᓂᒃ ᐅᔾᔨᖅᓱᕿᑦ ᐊᑐᖅᑎᓪᓗᒋᑦ ᖁᑦᑎᒃᑐᒦᓪᓗᑎᒃ ᓄᓇᒥ (HOL) ᖃᐅᔨᓴᕐᓂᕐᓂᒃ. ᐱᑕᖃᑦᑎᐊᙱᓐᓂᖏᓐᓄᑦ ᑐᒃᑐᓂᒃ ᐅᔾᔨᖅᓱᕿᑎᒃᓴᐃᑦ ᐱᓕᕆᕝᕕᐅᔪᒥᑦ ᒪᓕᑐᐃᓐᓇᖅᑐᑦ ᖃᓄᐃᓕᖓᓂᖏᓐᓂᒃ ᐅᓄᓗᐊᙱᑦᑐᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ ᓄᓇᐃᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᖃᐅᔨᓴᕿᑎᖏᓐᓂᑦ ᐊᒻᒪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᓪᓗᑎᒃ ᐊᑐᖅᐳᑎᒃ ᐱᓕᕆᖃᑎᖃᕐᓂᕐᒥᒃ ᒐᕙᒪᖏᑕ ᓄᓇᕗᑉ (GN), ᑕᐃᒃᑯᐊ ᐱᓕᕆᑲᑦᑕᖅᓯᒪᖓᑕ ᑐᒃᑐᓂᑦ ᖃᖓᑕᓘᒃᑯᑦ ᖃᐅᔨᓴᐃᓪᓗᑎᒃ, ᐊᒻᒪᓗ ᐊᑐᖅᐳᑎᒃ ᓄᓇᓖᑦ ᐅᔾᔨᖅᓱᕐᓂᖏᓐᓂᒃ ᑐᓴᖅᑎᑕᐅᑲᑦᑕᖅᐳᑎᒃ ᐃᓕᓐᓂᐊᖅᓯᓈᖅᐳᑎᒃ ᑲᑎᒪᑎᓪᓗᒋᑦ ᓄᕕᐱᕆ 2015-ᒥᑦ ᐊᒻᒪᓗ ᐊᐃᕆᓕ 2016-ᒥᑦ.
- No caribou, wolf or other large mammal tracks were observed during 2019 snow tracking surveys; however, Arctic fox and Arctic hare tracks were found in similar numbers to previous surveys.
  ᑐᒃᑐᐃᑦ, ᐊᒪᕈᐃᑦ ᐊᒻᒪᓗ ᐊᓯᖏᑦ ᐊᖏᓂᖅᓴᑦ ᐱᓱᒃᐲᑦ ᑐᓪᓕᓂᖃᓚᐅᙱᑦᑐᑦ ᐅᔾᔨᕆᔭᐅᕙᓂᒃ ᑕᐃᑲᓂ ᐊᑐᖅᑎᓪᓗᑕ 2019 ᐊᐳᒻᒥᑦ ᑐᓪᓕᓂᕐᓂᒃ ᖃᐅᔨᓴᐃᑎᓪᓗᒋᑦ; ᑭᓯᐊᓂᓕ ᑎᕆᒐᓂᐊᑦ ᐊᒻᒪᓗ ᐅᑲᓕᐊᕐᔪᐃᑦ ᑕᑯᔭᐅᖃᑦᑕᓚᐅᖅᑐᑦ ᐅᓄᕐᓂᕐᒥᑦ ᐊᔾᔨᐸᓗᒋᓪᓗᓂᒋᑦ ᑭᖑᓂᑦᑎᓐᓂ ᖃᐅᔨᓴᕈᑎᓂᑦ.
- The 2019 snowbank height monitoring was conducted monthly between November to May (six surveys). Percent compliance for all surveys combined in 2019 was 97%, which was like previous years, except for 2017, where compliance was only 66%.
  2019–ᒥᑦ ᐊᐳᔾᔭᓇᖕᓂᕐᒧᑦ ᐳᖅᑐᓯᓯᒪᔪᑦ ᖃᐅᔨᓴᐃᓐᓇᕈᑏᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᐊᑯᓐᓂᖓᓂᑦ ᑕᖅᑮᑦ ᓄᕕᐱᕆᒥᑦ ᒪᐃᒧᑦ (ᐊᕐᕕᓂᓖᑦ ᖃᐅᔨᓴᕈᑏᑦ). ᐳᓴᙱᓄᑦ ᒪᓕᒃᑐᑦ ᐊᑕᖏᖅᓗᑎᒃ ᖃᐅᔨᓴᕈᑏᑦ ᑕᐃᑲᓂ 2019-ᒥᑦ ᐃᒪᓐᓇᐅᓪᓗᑎᒃ 97%, ᐊᔾᔨᑐᐃᓐᓇᓇᓪᓗᓂᐅᒃ ᐊᕐᕌᓂᐅᓚᐅᖅᑐᖓᓂᑦ, ᑭᓯᐊᓂ 2017, ᒪᓕᖕᓂᖓ ᐃᒪᓐᓇᐅᓚᐅᕐᒪᑦ 66%–ᑐᐃᓐᓇᐅᓚᐅᕐᒥᑦ.
- Baffinland monitors human use by maintaining a voluntary log of site visitors. In 2019, 936 visitors checked in at either the Mary River or Milne Port camps.
  ᐹᕙᓖᓐᑯᑦ ᖃᐅᔨᓴᐃᓐᓇᖅᑐᑦ ᐃᓄᐃᑦ ᐊᑐᖃᑦᑕᕐᓂᖏᓐᓂᒃ ᑲᒪᐃᓐᓇᕐᓗᑎᒃ ᐊᑎᓕᐅᕈᒪᔭᕌᖕᒐᑕ ᐅᔭᕐᓂᐊᕝᕕᖕᒧᑦ ᐳᓛᖅᑐᑦ. ᑕᐃᑲᓂ 2019-ᒥᑦ, 936 ᐳᓛᓚᐅᖅᑐᑦ ᓄᓘᔮᓄᑦ ᓘᓐᓃᑦ ᕿᙳᐊᓄᑦ ᓘᓐᓃᑦ ᑕᖕᒫᖅᓯᒪᕝᕕᐅᔪᓄᑦ.

Height of Land, snow tracking, snow bank height, incidental observations, and the hunter and visitor log will continue in 2020.
ᖁᑦᑎᒃᑐᒦᓪᓗᑎᒃ ᓄᓇᒥ (HOL), ᐊᐳᒻᒥᑦ ᑐᓪᓕᓂᓯᐅᕐᓃᑦ, ᐊᐳᔾᔭᓇᖕᓂᕐᒧᑦ ᐳᖅᑐᓃᑦ, ᖃᓄᐃᑦᑐᖃᕐᓂᕐᒧᑦ ᐅᔾᔨᖅᓱᕿᑦ, ᐊᒻᒪᓗ ᐊᙳᓇᓱᒃᑏᑦ ᐊᒻᒪ ᐳᓛᖅᑐᑦ ᐊᑎᓕᐅᕐᕕᖕᒥᑦ ᓱᓕ ᑲᔪᓯᓂᐊᖅᑐᑦ ᐊᕐᕌᒍ 2020–ᒥᑦ.

Birds: ᑎᖕᒥᐊᑦ:

- Baffinland, in collaboration with Canadian Wildlife Service (CWS), deployed passive sound recording devices to detect Red Knot vocalizations throughout the breeding season.
  ᐹᕗᓐᓛᓐᑯᑦ, ᐱᓕᕆᖃᑎᖃᕐᖢᑎᒃ ᑲᓇᑕᒥᑦ ᐆᒪᔪᓄᑦ ᐱᔨᑦᑎᕋᖅᑏᑦ (CWS), ᐱᒋᐊᖅᓯᒪᔪᑦ ᓂᐱᓕᐅᕆᓂᕐᓂᒃ ᓂᓪᓕᐊᔪᓂᒃ ᓂᐱᓕᐅᕈᑎᒃᑯᑦ ᖃᐅᔨᒪᓪᓗᑎᒃ ᑎᖕᒥᐊᑦ ᓂᓪᓕᐊᒃᑕᕐᓂᖏᓐᓂᒃ ᓄᓕᐅᑎᓪᓗᒋᑦ.
- In 2019, no nests were located during active migratory bird nest searches (AMBNS) conducted prior to any proposed land disturbance and/or clearing during the breeding bird window (May 31 to August 5).
  ᑕᐃᑲᓂ 2019−ᒥᑦ, ᐃᕙᕝᕕᒃᓯᐊᖅᑐᖃᓚᐅᙱᑦᑐᖅ ᑎᑭᑉᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕝᕕᖏᓐᓂᒃ ᕿᓂᖅᑎᓪᓗᒋᑦ (AMBNS) ᐱᒋᐊᓚᐅᖅᑳᖅᑎᓐᓇᒋᑦ ᑐᒃᓯᖅᑕᐅᓯᒪᔪᒥᒃ ᓄᓇᒥᒃ ᐸᒡᕕᓴᐃᓂᕐᓂᒃ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐲᔭᐃᑎᓪᓗᒋᑦ ᐱᓕᕆᓪᓗᑎᒃ ᑎᖕᒥᐊᑦ ᐃᕐᓂᐅᖅᑎᓪᓗᒋᑦ ᐱᕈᖅᓱᐃᑎᓪᓗᒋᑦ (ᒪᐃ 31−ᒥᑦ ᐋᒡᒋᓯ 5-ᒧᑦ).
- 165 unique nesting sites were monitored in the Raptor Monitoring Area (RMA) in 2019. Of these, 55 sites were occupied by raptors, 43 by Peregrine Falcon, 11 by Rough-legged Hawk, and one by Gyrfalcon.
  165 ᐊᔾᔨᒌᙱᑦᑐᑦ ᐃᕙᕝᕖᑦ ᖃᐅᔨᓴᐃᓐᓇᖅᑕᐅᓚᐅᖅᑐᑦ ᓂᕿᑐᖅᑎᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕈᑎᓂᒃ ᐃᓂᓂᑦ (RMA) ᑕᐃᑲᓂ 2019−ᒥᑦ. ᑖᒃᑯᓇᓂ, 55 ᐃᓃᑦ ᐃᓄᖃᓚᐅᖅᑐᑦ ᓂᕿᑐᖅᑎᓂᒃ ᑎᖕᒥᐊᓂᒃ, 43 ᑭᒡᒐᕕᐊᕐᔪᐃᑦ, 11 ᑳᔫᑦ ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᑭᒡᒐᕕᒃ.
- Based on survey data up to 2019, Peregrine Falcon and Rough-legged Hawk occupancy is stable.
  ᒪᓕᒃᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᕈᑏᑦ ᑎᑎᖅᑲᑦ ᑎᑭᓪᖢᒍ 2019, ᑭᒡᒐᕕᐊᕐᔪᐃᑦ ᐊᒻᒪᓗ ᑳᔫᑦ ᓄᓇᖃᐃᓐᓇᕐᓂᖏᑦ ᖃᓄᐃᑉᐹᖅᓕᖅᐊᓪᓕᐊᙱᑦᑐᑦ.
- Peregrine Falcon and Rough-legged Hawk reproductive success in 2019 was within the range of variability estimated across all survey years.
  ᑭᒡᒐᕕᐊᕐᔪᐃᑦ ᐊᒻᒪᓗ ᑳᔫᑦ ᒪᓐᓂᐅᕐᓂᖏᑦ ᑲᔪᓯᑦᑎᐊᓚᐅᖅᑐᑦ ᑕᐃᑲᓂ 2019 ᐃᓗᐊᓃᖢᑎᒃ ᐊᔾᔨᒌᙱᓕᕇᖃᑦᑕᖅᑐᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ ᐊᑕᖏᖅᓗᒋᑦ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐊᕐᕌᒍᖏᓐᓂᑦ.
- Among survey years, spatial patterns in nest survival (i.e., the probability that an occupied site produced at least one nestling) for Peregrine Falcons and Rough-legged Hawks was fixed, suggesting that nesting sites that are occupied and produce young each year are relatively constant.
  ᑖᒃᑯᓇᓂ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐊᕐᕌᒍᓂᑦ, ᓄᓇᖃᖃᑦᑕᕐᓂᖏᑦ ᐃᕙᕝᕕᖏᑦ ᖃᓄᐃᙱᑦᑎᐊᖁᓪᓗᒋᑦ (ᓲᕐᓗ ᐱᑕᖃᑐᐃᓐᓇᕆᐊᖃᕐᓂᖏᑦ ᐃᓄᓕᖕᒥᒃ ᐃᓂᒥᑦ ᓴᖅᑮᓯᒪᓲᑦ ᐊᑕᐅᓯᕐᒥᓘᓐᓃᑦ ᐃᕙᕝᕕᖕᒥᑦ) ᑖᒃᑯᓄᖓ ᑭᒡᒐᕕᐊᕐᔪᖕᓄᑦ ᐊᒻᒪᓗ ᑳᔫᓄᑦ ᐋᖅᑭᒃᓯᒪᔪᑦ, ᐃᒪᐃᑎᑦᑎᑐᐃᓐᓇᕆᐊᖃᕐᖢᓂ ᐃᕙᕝᕕᖃᕐᕕᖏᑦ ᐃᓄᖃᖅᑐᑦ ᐊᒻᒪᓗ ᐱᐊᕋᖅᑖᕐᕕᐅᓲᑦ ᐊᕐᕌᒍᑕᒫᑦ ᑕᐃᒪᐃᓕᖓᐃᓐᓇᕈᔪᒃᑐᑦ.

- Small mammal abundance monitoring was continued as part of the raptor monitoring program to confirm the cyclical occupancy of Rough-legged Hawks in conjunction with the small mammal cycle. One collared lemming was captured in 2019, indicating regional low small mammal abundance. ᒥᑭᑦᑐᓂᒃ ᐆᒪᔪᖅᑕᖃᐅᑦᑎᐊᕐᓂᖓᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᖅ ᑲᔪᓯᓚᐅᖅᑐᖅ ᐃᓚᒋᔭᐅᓪᓗᓂ ᑎᖕᒥᐊᑦ ᓂᕿᑐᖅᑎᓂᒃ ᖃᐅᔨᓴᐃᓐᓇᕈᑎᓄᑦ ᐃᓂᕆᐊᓂᒃ ᓇᓗᓇᐃᖅᓯᕐᑯᓪᓗᒋᑦ ᐅᑎᖅᑕᖃᑦᑕᖅᑐᓂᒃ ᓄᓇᖃᕐᕕᐅᔪᓄᑦ ᑳᔪᓂᑦ ᒪᓕᒃᓗᑎᒃ ᒥᑭᑦᑐᑦ ᐆᒪᔪᑦ ᐱᑕᖃᓕᐅᒥᖃᑦᑕᕐᓂᖏᓐᓄᑦ. ᐊᑕᐅᓯᖅ ᐃᔭᒥᒃᓯᒪᔪᑦ ᐊᕕᙵᖅ ᐱᔭᐅᓚᐅᖅᑐᖅ ᑕᐃᑲᓂ 2019-ᒥᑦ, ᓇᓗᓇᐃᖅᓯᓪᓗᓂ ᓄᓇᐃᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᒥᑭᒃᑐᓂᒃ ᐆᒪᔪᖃᑦᑎᐊᕐᓂᖓᓄᑦ.

Baffinland will continue to support regional monitoring of shorebirds, including species at risk, in conjunction with CWS. The AMBNS surveys will be conducted before any proposed land disturbance and/or clearing during the breeding bird window, and raptor monitoring will continue to focus on multiple nesting territory visits in 2020.
ᐹᕙᓐᓛᒃᑯᑦ ᑲᔪᓰᓐᓇᕐᓂᐊᖅᑐᑦ ᐃᑲᔪᖅᓱᐃᓗᑎᒃ ᓄᓇᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᒃ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒥᒃ ᐅᑯᓂᖓ ᓯᒡᔭᕐᒥᐅᑦ ᑎᖕᒥᐊᑦ, ᐃᓚᐅᓪᓗᑎᒃ ᕿᐊᖅᓵᓇᖅᑐᒦᑦᑐᑦ ᐆᒪᔪᑦ, ᒪᓕᒃᑕᐅᓪᓗᑎᒃ ᑲᓇᑕᒥᑦ ᐆᒪᔪᓄᑦ ᐱᕚᑦᑎᕋᖅᑎᓂᑦ (CWS). ᑎᑭᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕝᕕᖏᓐᓂᒃ ᕿᓂᖅᑎᓪᓗᒋᑦ (AMBNS) ᖃᐅᔨᓴᕈᑏᑦ ᐱᓕᕆᐊᖑᓂᐊᖅᑐᑦ ᐱᒋᐊᓚᐅᖅᑳᖅᑎᓐᓇᒋᑦ ᑐᒃᓯᕋᖅᑕᐅᔪᑐᐃᓐᓇᕐᓄᑦ ᓄᓇᒥᒃ ᐸᒡᕕᓴᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐋᔭᐃᓂᖏᓐᓄᑦ ᑎᖕᒥᐊᑦ ᒫᓂᐅᖅᐸᒡᕕᖏᓐᓂᒃ, ᐊᒻᒪᓗ ᑎᖕᒥᐊᓂᒃ ᓂᕿᑐᖅᑏᑦ ᖃᐅᔨᓴᐃᓐᓇᖅᑕᐅᓂᖏᑦ ᑲᔪᓯᓂᐊᖅᑐᑦ ᑐᕌᒪᓪᓗᑎᒃ ᐊᒥᓱᓪᓚᖕᓂᒃ ᐃᕙᕝᕕᓕᐅᕕᐅᕙᒃᑐᓂᒃ ᐅᐸᒃᑕᐅᕙᒃᑐᓂᒃ ᑕᐃᑲᓂ 2020-ᒥᑦ.

Helicopter Flight Height ᖁᓕᒥᒎᓕᒃᑯᑦ ᖃᖓᑕᔪᓄᑦ ᐊᑦᑎᓈᕐᓂᖏᑦ ᖁᑦᑎᓈᕐᓂᖏᑦ

- Four helicopters were used to support Project operations between May and September 2019. ᑎᓴᒪᑦ ᖁᓕᒥᒎᓖᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᒥᑦ ᐊᐅᓚᓂᕐᓄᑦ ᐊᑯᓐᓂᖓᓂᑦ ᒪᐃ ᐊᒻᒪᓗ ᓯᑎᐱᕆ 2019.
- In 2019, helicopter flight height compliance inside the goose area identified by the CWS during the moulting period was 93%, and compliance within and outside the goose area in all months was 91%. ᑕᐃᑲᓂ 2019–ᒥᑦ, ᖁᓕᒥᒎᓕᒃᑯᑦ ᖃᖓᑕᔪᓄᑦ ᐊᑦᑎᓈᕐᓂᖏᓐᓄᑦ ᖁᑦᑎᓈᕐᓂᖏᓐᓄᑦ ᒪᓕᖕᓂᖏᑦ ᐃᓗᐊᓂᑦ ᑲᖑᐃᑦ ᓄᓇᖃᕐᕕᖏᓐᓂᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂᒃ ᑖᒃᑯᓇᙵᑦ ᑲᓇᑕᒥᑦ ᐆᒪᔪᓄᑦ ᐱᕚᑦᑎᕋᖅᑎᓂᑦ (CWS) ᑎᒡᔭᐅᖅᐸᓪᓕᐊᑎᓪᓗᒋᑦ ᐃᒪᓐᓇᐅᓚᐅᖅᑐᖅ 93%, ᐊᒻᒪᓗ ᒪᓕᖕᓂᖓ ᐃᓗᐊᓂᑦ ᐊᒻᒪᓗ ᓯᓚᑖᓂᑦ ᑲᖑᖃᖅᑐᓂᑦ ᑕᖅᑭᓗᒃᑖᓄᑦ ᐃᒪᓐᓇᐅᓚᐅᖅᑐᖅ 91%.
- Most compliant transits that met the elevation requirements in 2019 tended to be long-distance flights, where pilots were airborne long enough to reach and maintain the required elevations. ᒪᓕᓛᖑᓚᐅᖅᑐᑦ ᐊᐅᓪᓚᑲᑕᖕᓂᕐᓂᑦ ᑎᑭᐅᒪᓪᓗᑎᒃ ᐳᖅᑐᓂᕐᓄᑦ ᐃᑕᖅᑲᓇᐊᓃᑦ ᑕᐃᑲᓂ 2019 ᓴᖅᑮᔭᓚᐅᖅᑐᑦ ᐊᑯᓂᐅᔪᒃᑯᑦ ᖃᖓᑕᓂᕐᓂᑦ, ᐊᕐᑯᑎᖏᑦ ᖃᖓᑕᔩᔭᓚᐅᖅᑐᑦ ᑎᑭᑦᑐᓐᓇᕐᑯᓪᓗᒋᑦ ᐊᒻᒪᓗ ᒫᓐᓇᕐᑯᓪᓗᒋᑦ ᐊᑐᓇᐊᖅᑲᖅᑐᓂᒃ ᐳᖅᑐᔭᓇᐊᖅᑲᕐᓂᕐᓄᑦ.

Helicopter flight height analysis, including revisions requested by the TEWG, will continue in 2020.
ᖁᓕᒥᒎᓕᒃᑯᑦ ᖃᖓᑕᓃᑦ ᐅᑦᑎᓈᕐᓂᖏᑦ ᖁᑦᑎᓈᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕈᑎᑦ, ᐃᓚᐅᓪᓗᑎᒃ ᐋᖅᑭᒋᐊᖅᓯᒪᔪᑦ ᑐᒃᓯᕋᖅᑕᐅᓯᒪᔪᑦ ᓄᓇᒥᐅᑕᕐᓄᑦ ᑲᑎᒪᔨᐊᕌᓂᑦ (TEWG), ᑲᔪᓯᓂᐊᖅᑐᑦ ᑕᒫᓂ 2020-ᒥᑦ.

Wildlife Interactions and Mortalities ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᑐᖁᑦᑎᓃᑦ

- In 2019, nine non-fatal wildlife interactions and 13 wildlife mortality incidents were reported, all of which were individual losses.

  ᑕᐃᑲᓂ 2019-ᒥᑦ, ᖁᓕᖅᑲᙱᑐᐃᓐᓇᖅᑐᑦ ᑐᖁᑕᐅᙱᖢᑎᒃ ᑕᑯᖃᑦᑕᐅᑎᓂᖅᑕᖅᑲᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ 13 ᓂᕐᔪᑏᑦ ᑐᖁᑕᐅᓚᐅᖅᑐᑦ ᖃᓄᐃᓕᐅᕐᓂᕐᓂᑦ ᐅᖃᐅᓯᐅᓚᐅᖅᑐᑦ, ᐊᑕᖏᖅᖢᑎᒃ ᐊᑐᓂ ᐊᑕᐅᓯᐅᓪᓗᑎᒃ ᐱᔭᕆᔭᐅᓚᐅᖅᑐᑦ.
- Eight (8) of the mortalities that occurred in 2019 involved birds, three of which were due to collisions with infrastructure or vehicles; the cause of the other bird mortalities remains unknown. Four mortalities included Arctic fox, one involved Arctic hare, and one involved a ringed seal.

  8 ᑐᖁᑕᐅᔪᑦ ᑕᐃᑲᓂ 2019-ᒥᑦ ᐃᓚᐅᓪᓗᑎᒃ ᑎᖕᒥᐊᑦ, ᐱᖓᓱᑦ ᑐᓗᖅᖢᑎᒃ ᐱᖁᑎᕐᔪᐊᒧᑦ ᐅᕝᕙᓘᓐᓃᑦ ᓄᓇᓯᐅᑎᒧᑦ; ᐱᔾᔪᑕᐅᓪᓗᓂ ᐊᓯᖏᑦ ᑎᖕᒥᐊᑦ ᑐᖁᔪᑦ ᓱᓕ ᖃᐅᔨᒪᔭᐅᙱᑦᑐᑦ. ᑎᓴᒪᑦ ᑐᖁᑦᑎᓃᑦ ᐃᓚᐅᓪᓗᑎᒃ ᑎᕆᒐᓂᐊᕐᓂᒃ, ᐊᑕᐅᓯᖅ ᐅᑲᓯᐊᕐᔪᒃ, ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓇᑦᑎᖅ.

Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices. Wildlife interaction and mortality monitoring will continue in 2020.

ᐹᕙᓐᓛᓐᑯᑦ ᑲᔪᓯᓂᐊᖅᑐᑦ ᐊᒃᑐᐃᓗᐊᖅᑕᐃᓕᑎᑦᑎᓗᑎᒃ ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᓗᐊᖅᑕᐃᓕᑎᑦᑎᓗᑎᒃ ᐱᓕᕆᕝᕕᐅᔪᒥᑦ ᐃᒪᐃᓕᐅᕐᓂᒃᑯᑦ ᐃᓕᓐᓂᐊᖅᑎᑦᑎᓗᑎᒃ, ᐊᑐᓕᖅᑎᑦᑎᓗᑎᒃ ᐊᒻᒪᓗ ᖃᐅᓴᐃᓐᓇᕐᓗᑎᒃ ᓴᓂᕐᓂᒃ ᐃᒋᑦᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᑲᒪᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᓂᒃ. ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᑐᖂᑦᑎᖃᑦᑕᕐᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕈᑏᑦ ᓱᓕ ᑲᔪᓯᓂᐊᖅᑐᑦ ᑕᒫᓂ 2020-ᒥᑦ.

LONG SUMMARY

The Mary River Project (the Project) is an iron ore mine located in the Qikiqtaaluk Region on North Baffin Island, Nunavut. The Project involves the construction, operation, closure, and reclamation of a 22.2 million tonne per annum (mtpa) open pit mine that will operate for 21 years. The high-grade iron ore is suitable for international shipment after crushing and screening with no chemical processing facilities. Construction on the Project and associated facilities started in 2013, and mining began in September 2014.

The Project is currently in the Early Revenue Phase (ERP) that consists of a mining rate of up to 4.2 mtpa at Deposit No. 1. A temporary approval (for 2018 and 2019 exclusively) for a production increase to haul via the Tote Road and ship 6.0 mtpa from Milne Port was approved in September 2018 (Minister of Intergovernmental and Northern Affairs and Internal Trade 2018). Also approved is a railway system that will transport 18.0 mtpa of the ore from the mine area to a proposed all-season deep-water port at Steensby Inlet where the ore will be loaded into ore carriers for overseas shipment through Foxe Basin (not yet constructed).

The Nunavut Impact Review Board (NIRB) Project Certificate No. 005 includes numerous conditions that require Baffinland Iron Mines Corporation (Baffinland) to conduct effects monitoring for the terrestrial environment. Work performed for the terrestrial environmental monitoring program is guided by the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland Iron Mines Corporation 2016) and is overseen by the Terrestrial Environment Working Group (TEWG) that includes members from Baffinland, the Qikiqtani Inuit Association (QIA), the Government of Nunavut (GN), Environment and Climate Change Canada (ECCC) and the Mittimatalik Hunters and Trappers Organization (MHTO). The terrestrial environment monitoring program began in 2012 and has continued through 2019 with adaptations to the programs over the years.

This report summarizes the data collection and monitoring activities conducted in 2019 for the Project, including the following survey programs (summaries provided in Table 0):

- dustfall monitoring program;
- vegetation abundance monitoring;
- vegetation and soil base metals/metalloids monitoring;
- exotic invasive vegetation monitoring and natural revegetation;
- rare plant observations (incidental findings);
- snow track surveys;
- snowbank height monitoring;
- Height of Land caribou surveys;
- hunter and visitor log summaries;
- pre-clearing nest surveys;
- cliff-nesting raptor occupancy and productivity surveys;
- helicopter flight height analysis; and

- wildlife interactions and mortalities.

Results of the 2019 monitoring programs are as follows:

Climate, Dustfall and Traffic

Climate data from weather stations at the Mine Site and at Milne Port were collected and analyzed in 2019. Dustfall data were collected at sampling points and traffic data were recorded and analyzed following the same methods as previous years.

- Air temperature data indicated cooler mean temperatures at Milne Inlet in 2019 relative to 2018 during the summer (June to August) and winter (September to May) months. At Mary River, average air temperatures were somewhat warmer in 2019 than 2018 during the summer and winter months. A comparison of the 2018/2019 precipitation data was not completed because of a malfunction of the rain gauge at both Milne Inlet and Mary River meteorological stations in 2018. Average wind speeds were lower (i.e., calmer) at Milne Inlet in the fall of 2019 relative to 2018; otherwise, wind speeds were similar among years. At Mary River, average wind speeds in 2019 and 2018 were similar for all months except January 2019, which had a higher average wind speed than 2018.
- A slight increase occurred in the mean daily number of ore haul and non-haul transits in 2019 compared with 2018.
- In 2019, dustfall at the Mine Site was highest near the ore haul road, downwind of the ore deposit, while dustfall near the airstrip and the crusher decreased in 2019 in comparison with 2018.
- Dustfall at Milne Port decreased at all sites in 2019 during the winter months but increased in summer months when compared to 2018.
- In comparison with 2018, dustfall decreased at monitors at the north end of Tote Road in 2019, but a slight increase was noted at monitors at the south end of the road. In all areas, the dustfall was highest in the summer and decreased substantially during the winter. Calm conditions observed during August/September 2019 resulted in similar dustfall at all monitors within the vicinity of the Tote Road. In previous years, prevailing winds resulted in the greatest dustfall at monitors south and west of the Tote Road.
- Summer dustfall increased modestly over the Potential Development Area (PDA) in 2019 compared to 2018. Winter dustfall remained consistent with 2018.
- Dustfall one kilometre from the PDA was measured at 12 sites in 2019. Dustfall was low at all locations, ranging from below laboratory detection to less than 1.0 $mg/dm^2 \cdot day$.

Climate, dustfall and traffic monitoring will continue in 2020.

Vegetation

Vegetation abundance, vegetation and soil base metal sampling and exotic plant surveys were conducted in 2019.

- Abundance monitoring in 2019 continues to show that there is annual variation in vegetation abundance among sites Near and Far from the PDA. There is no evidence to date of a Project-related effect on vegetation outside of the PDA.
- Monitoring for metal concentrations in soil found that all soil samples were below Canadian Council of Ministers of the Environment (CCME) soil quality guidelines except one sample near the Mine Site for copper where a field sampling error is suspected.
- An increase was identified in trace amounts of some metal concentrations in lichen at Near sites and a few increases at Far sites along the Tote Road. Lichen samples were below peer reviewed literature-based indicator values for all metals except for lead, which was within the range of the indicator value.
- Concentrations of dust-deposited metals on lichen compared to metals in lichen tissues were compared using washed and unwashed samples. There was no difference for any of the metals/metalloids of potential concern, except for copper near the Tote Road and Mine Site. This result suggests that some of the copper in lichen samples may be attributed to dust on lichen rather than uptake in lichen.
- The relationship between metal concentrations in dustfall deposition and metal concentrations in soil and lichen was explored. Soil pH plays a mediating role in the relationship of some metal concentrations in dustfall deposition and soil, while other metals were less understood and may be influenced by additional factors such as soil chemistry, sample size or soil sampling depth. Lichen remains a sensitive indicator of metal concentrations; increased metals concentrations in dustfall deposition corresponded to increased metal concentrations in lichen.
- One exotic species, garden tomato (*Solanum lycopersium*), was growing at the Mine Site below the sewage/effluent discharge pipe.
- Evidence of natural revegetation was observed in the Project footprint. Although low in abundance, the diversity of revegetating flora was relatively high at Milne Inlet, moderate at the Mine Site, and low along Tote Road.
- Some previously reported rare plants have been found in the study area, and more may be found as vegetation surveys continue in the Project area. Known populations will continue to be monitored in the Project area, and newly discovered populations will be documented as they are found on an opportunistic basis.

Vegetation and soil base metals/metalloids monitoring will continue in 2020. Targeted monitoring for exotic vegetation (e.g., tomato plants) at the Mary River Mine Site sewage/effluent discharge pipe will occur in 2020. The TEWG and Baffinland are still considering the frequency of monitoring for the vegetation abundance monitoring program.

Mammals

- Ground-based surveys continue to be used to monitor potential wildlife interactions with the Project. These include Height of Land (HOL) surveys throughout the Project area, snow track surveys along the Tote Road, snowbank height surveys along the Tote Road, and incidental sighting reports from on-site personnel throughout the Project area.
- Low numbers of incidental observations of caribou between the Mine Site and Milne Inlet in 2019 coincide with the lack of caribou observations during the HOL surveys. Lack of caribou observations on site follow the trends of low numbers recorded in regional observations and have been confirmed through collaboration with the GN, who conducts caribou aerial surveys, and through local observations received at workshops held in November 2015 and April 2016.
- No caribou, wolf or other large mammal tracks were observed during 2019 snow tracking surveys; however, Arctic fox and Arctic hare tracks were found in similar numbers to previous surveys.
- The 2019 snowbank height monitoring was conducted monthly between November to May (six surveys). Percent compliance for all surveys combined in 2019 was 97%, which was like previous years, except for 2017, where compliance was only 66%.
- Baffinland monitors human use by maintaining a voluntary log of site visitors. In 2019, 936 visitors checked in at either the Mary River or Milne Port camps.

Height of Land, snow tracking, snow bank height, incidental observations, and the hunter and visitor log will continue in 2020.

Birds

- Baffinland, in collaboration with Canadian Wildlife Service (CWS), deployed passive sound recording devices to detect Red Knot vocalizations throughout the breeding season. As recommended by CWS, sound recorders were deployed in 2019.
- In 2019, no nests were located during active migratory bird nest searches (AMBNS) conducted prior to any proposed land disturbance and/or clearing during the breeding bird window (May 31 to August 5).
- In 2019, site occupancy, brood size, and nest success were monitored for all known nest sites located within 10 km of the PDA (the Raptor Monitoring Area [RMA]). Areas with high nest-site suitability for cliff-nesting raptors located between and nearby known nest sites were also surveyed.
- A total of 165 unique nesting sites were monitored in the RMA in 2019. Of these, 55 sites were occupied by raptors, 43 by Peregrine Falcon, 11 by Rough-legged Hawk, and one by Gyrfalcon.
- Based on survey data up to 2019, Peregrine Falcon and Rough-legged Hawk occupancy are stable.
- Peregrine Falcon and Rough-legged Hawk reproductive success in 2019 was within the range of variability estimated across all survey years.

- Among survey years, spatial patterns in nest survival (i.e., the probability that an occupied site produced at least one nestling) for Peregrine Falcons and Rough-legged Hawks was fixed, suggesting that nesting sites that are occupied and produce young each year are relatively constant.
- Small mammal abundance monitoring was continued as part of the raptor monitoring program to confirm the cyclical occupancy of Rough-legged Hawks in conjunction with the small mammal cycle. One collared lemming was captured in 2019, indicating regional low small mammal abundance.

Baffinland will continue to support regional monitoring of shorebirds, including species at risk, in conjunction with CWS. The AMBNS surveys will continue in future years before any proposed land disturbance and/or clearing during the breeding bird window, and raptor monitoring will continue to focus on multiple nesting territory visits in 2020.

Helicopter Flight Height

- Additional helicopter flight height analysis was requested by the TEWG in the February 2020 meeting. This data verification and analysis are still in progress, and so results presented for 2019 are preliminary and may change based on the updated analysis.
- Four helicopters were used to support Project operations between May and September 2019.
- Helicopter flight heights continue to be used to monitor potential disturbance to birds and other wildlife inside and outside the Snow Goose area.
- In 2019, helicopter flight height compliance inside the goose area during the moulting period was 93%, and compliance within and outside the goose area in all months was 91%.
- Most compliant transits that met the elevation requirements in 2019 tended to be long-distance flights, where pilots were airborne long enough to reach and maintain the required elevations.

Helicopter flight height analysis, including rationale from pilot flight logs, will continue in 2020.

Wildlife Interactions and Mortalities

- In 2019, nine non-fatal wildlife interactions and 14 wildlife mortality incidents were reported, all of which were individual losses.
- Eight of the mortalities that occurred in 2019 involved avian species, three of which were due to collisions with infrastructure or vehicles and one of which was bycatch during gill netting; the cause of the other avian mortalities remains unknown. Four mortalities included Arctic fox, one involved Arctic hare, and one involved a ringed seal.

Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices and guidelines. Wildlife interaction and mortality monitoring will continue in 2020.

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
Dustfall monitoring program	Addresses Project Conditions 36, 50, 54d, 58c, and Project Commitment 60	39 dustfall collectors are distributed around the Project area, some of which are further away from the PDA as Reference sites monitoring background levels. Six years of monitoring from August 2013 to December 2019 are now complete. Dustfall monitoring indicates effects are restricted to within 1,000 m of the PDA; an investigation of dustfall at 12 monitors 1,000 m distant from the PDA indicates that dustfall was low throughout 2019. Future monitoring will continue to investigate dustfall at the 39 sites through the summer season and a subset of 22 year-round sites.	Annual Total Suspended Particulates (TSP) deposition levels were predicted to exceed 50 g/m²/year within the PDA, with TSP levels decreasing to background outside of the PDA. 2019 dustfall results are consistent with predictions that the highest dustfall would be limited to mainly within the PDA.
Vegetation abundance monitoring	Addresses Project Conditions 36, 38 & 50 and Project Commitments 67, 69 & 107	A trend analysis was conducted to assess potential changes in percent plant cover and plant group composition with the relationship of distance to Project infrastructure and treatment effect between open and closed plots. Inter-annual differences in total percent ground cover, total percent canopy cover, and plant group composition were small in magnitude and consistent across all distance classes and treatments with the exception of a few interactions between year and distance class that were weak and inconsistent; therefore, differences are attributed to natural variation in plant cover among years rather than a Project-related effect in the first five years of monitoring. Vegetation abundance monitoring is not required in 2020 based on these results. Monitoring frequency for vegetation abundance remains under consideration by the TEWG and Baffinland. A soils assessment was completed as part of the vegetation abundance monitoring to determine if there was a difference in soil moisture and drainage between Near sites	Direct loss of plant habitat remains limited to developed areas of the PDA. Outside of this, there were no distinguishable Project-related effects on vegetation ground cover, canopy cover, or plant group composition. Differences in vegetation abundance were attributed to inter-annual natural variation, not Project-related effects. Thus, vegetation abundance results are consistent with the prediction of no significant impact.

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[1] Project Conditions and Project Commitments as per: Project Certificate No. 005 (Nunavut Impact Review Board 2014)

[2] Mary River Project Final environmental impact statement: volume 6 — terrestrial environment (Baffinland Iron Mines Corporation 2012) and Mary River Project early revenue phase addendum to final environmental impact statement: volume 6 — terrestrial environment (Baffinland Iron Mines Corporation 2013)

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
		(i.e., 30 and 100 m) and Reference sites (≥20 km), which may influence vegetation cover and composition. No systematic relationship between soil moisture and distance class was observed. Soil moisture and drainage were generally average to just above average at vegetation abundance sites among distance classes.	
Vegetation and soil base metals monitoring	Addresses Project Conditions 34, 36, 38 & 50 and Project Commitments 67, 69 & 107	Vegetation and soil base metals monitoring was conducted in 2019 to assess the relationship of metal concentrations in soil and lichen with distance to PDA between the 'Before' period (i.e., baseline sampling) and the 'After' period (i.e., post-baseline sampling) for all Contaminants of Potential Concern (CoPC). All soil samples were below CCME soil quality guidelines except one sample near the Mine Site for copper where a field sampling error is suspected. An increase for some metal concentrations in lichen was observed at Near sites (0– 100 m) and a few increases at Far sites (100–1,000 m) along the Tote Road. Lichen samples were below peer-reviewed literature-based indicator values for all metals except for lead, which was within the range of the indicator value. Metal concentrations in lichen remain either below or within the range of the indicator value. Vegetation and soil base metals monitoring is recommended in 2020. Recommended mitigation includes dust suppression activities, particularly along the Tote Road, considering the pilot trial for Dust Stop® that was undertaken in 2019 (see 3.2.1.3 — Dustfall Suppression and Mitigation in 2019). An index for dust-deposited metals on lichen was assessed to determine the full extent of potential metals both on the surface and in lichen tissues, which may contribute to metal toxicity. Across all Project areas, there was no evidence of a difference in metals concentrations between unwashed and washed lichen samples for any of the CoPCs. There was one exception for copper, which suggested that some of the	Some soil metal levels were predicted to exceed criteria guidelines by the end of the project life, including arsenic, manganese, cobalt, chromium, copper, nickel, and selenium. The uptake of metals was predicted to affect sensitive vegetation classes potentially. The prediction was that changes to vegetation would be indistinguishable from natural variation, limited to within and near the PDA, and not significant at the scale of the RSA. Aside from one sample in which a sampling or laboratory error is suspected, soil metal/metalloid levels were below CCME guidelines and thus consistent with impact predictions. Foliar uptake of metals/metalloids appears to be limited; all lichen samples were below or, in the case of lead, within the range of indicator values for all metals. No evidence of metal toxicity was observed. Foliar uptake of metals in plants was consistent with impact predictions.

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
		copper in samples near the Tote Road and Mine Site may be attributed to dust on lichen rather than solely in lichen. An assessment of metal concentrations in dustfall deposition with soil revealed the mediating role of soil pH for some metals. In contrast, other metals were less understood and may be influenced by additional factors such as soil chemistry, sample size or soil sampling depth. Lichen proved sensitive to changes in metal concentrations; increased metals concentrations in dustfall deposition corresponded to increased metal concentrations in lichen.	
Exotic invasive vegetation monitoring and natural revegetation	Addresses Project Conditions 32, 37, 38 & 50 and Project Commitments 67, 68, 69 & 70	The Project footprint in all three focal areas, including the Mine Site, Milne Inlet, and Tote Road was monitored for exotic invasive vegetation either on foot or by vehicle where it was permitted. One exotic species was found in the Project footprint; 20 garden tomato (*Solanum lycopersium*) plants were growing at the Mine Site below the sewage/effluent discharge pipe. Recommended mitigation includes the removal of tomato plants and targeted monitoring at the sewage/effluent discharge pipe in 2020. During exotic invasive vegetation monitoring, natural revegetation of disturbed sites in the Project footprint was assessed by comparing the relative diversity and abundance of colonizing plant species among focal areas. Although low in abundance, natural revegetation was observed in the Project footprint and diversity was relatively high at Milne Inlet, moderate at the Mine Site, and low along Tote Road. Previously reported rare plants were found in the study area opportunistically. Aside from a loss of 150-200 Horned Dandelion plants due to road widening in 2017, there is no evidence to suggest that the Mary River Project is affecting populations of rare plants.	Exotic invasive species becoming established was unlikely due to mitigation measures (i.e., cleaning equipment before arrival on site) and the use of or establishment of natural revegetation in disturbed areas. As only one exotic species (garden tomato) that is not invasive was observed in a single location within the PDA during 2019 monitoring, results are as predicted.

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
Snow track surveys	Addresses Project Condition 54dii, 58f Addresses QIA concerns about snow bank heights and the effects on wildlife	Snow track surveys were completed along the Tote Road to investigate the movement of caribou in April, May, and November. Arctic fox, Arctic hare, ermine, and ptarmigan were the only species detected during surveys; no evidence of caribou was observed during surveys. As part of the survey, at all locations where tracks crossed the Tote Road, snow bank heights were recorded, and tracks were followed to see if the individual was deterred by road crossing conditions. Future monitoring will continue to look for caribou and other wildlife tracks and indications of their interaction with the Tote Road.	The assessment predicted that there may be a reduction in caribou movement across project infrastructure throughout the operation phase. Still, it will not be significant at the scale of the North Baffin caribou population. If the ground monitoring of caribou suggests barrier effects (trails approaching but not crossing the road) and anecdotal caribou abundance indices show increasing numbers, then aerial surveys can be used to investigate the potential impact further. Since there were no caribou tracks identified along the Tote Road in 2019, it cannot be determined if Project infrastructure is or is not impacting caribou movement.
Snow bank height monitoring	Addresses Project Conditions 53ai and 53c Addresses QIA concerns about snow bank heights and the effects on wildlife	Snow bank height monitoring was conducted monthly from November 2018 to April 2019 to ensure compliance with recommended snow bank heights no higher than 1 m. The management of snow bank height allows for wildlife, specifically caribou, to cross the transportation corridor without being blocked by steep snow banks, as well as allowing drivers greater visibility to help reduce wildlife–vehicle collisions. In 2019, percent compliance for all snow bank surveys combined was 97%. In some areas where snow bank heights exceeded the guideline, the snow was being piled according to landscape limitations. As per a recommendation from the TEWG made in October 2019, sampling locations for snow bank heights will be randomized for each monthly sampling period.	The assessment predicted that there will be a reduction in caribou movement across project infrastructure throughout the operation phase but will be not significant at the scale of the North Baffin caribou population. Due to mitigations on the road (e.g., snow bank management, low embankments), the Tote Road was not expected to be a barrier to caribou movement. A minor to no increase to caribou mortality was anticipated as a result of the Project, and impacts will be not significant at the scale of the north Baffin Island caribou population. High compliance with snow bank heights minimizes the potential for the Tote Road to act as a barrier to caribou movement. However, there is inadequate observational data to quantify the effectiveness of this mitigation on caribou movement due to low caribou numbers. As caribou numbers increase, as is predicted by traditional knowledge, increased monitoring of caribou movement across the roadway will be implemented.

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
Height of Land (HOL) caribou surveys	Addresses Project Condition 53a, 53b, 54b, 58b	All 24 HOL stations were visited at least twice in 2019. A total of 24.3 hours of surveys were conducted at these stations in early June (coinciding with caribou calving period) with an EDI biologist, Pond Inlet local assistant, and up to two Baffinland staff. No caribou were observed during any of these surveys. In 2016, viewshed mapping was completed to demonstrate the extent of area surveyors could observe while conducting HOL surveys. Monitoring is expected to be conducted annually. The 2019 observations will add to a larger database as monitoring efforts continue through the life of the Project.	The assessment predicted some indirect caribou habitat loss due to sensory disturbance and dust deposition, leading to reduced habitat effectiveness in a Zone of Influence (ZOI). However, habitat effectiveness was estimated to be reduced by 2% to 4.25%, some disturbances (i.e. traffic) are short-duration, and caribou may adapt to these disturbances, thus limiting potential impacts. Many alternate calving sites exist within and outside of the ZOI. Indirect habitat loss was predicted to be indistinguishable from natural variation and not significant at the scale of the north Baffin Island caribou population. To date, there have not been adequate caribou observations during HOL surveys to assess any Project-related effects on caribou behavior or habitat use.
Hunters and visitors log	Addresses Project Condition 54f	Though not compulsory unless using Baffinland facilities, visitors to site may check in with Baffinland security. In 2019, a total of 936 individuals checked in at either Mary River or Milne Port camps. The hunters and visitors log will continue through the life of the Project.	Although Project-related effects may interact with land-use activities such as harvesting, travel, and camping, the impacts were expected to be not significant. The amount of country food harvested was expected to not change meaningfully due to Project-related effects. Although there may be some negative effects on travel and camping near the PDA itself, Inuit ability to travel and camp throughout the broader area will be not adversely impacted. Hunter and visitor check-ins have steadily increased since record-keeping began in 2011, including numerous hunting and camping trips. Baffinland will continue to manage access to the Project in a manner consistent with Article 13.3.1 of the IIBA.

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
Pre–clearing nest surveys	Addresses Project Conditions 66, 70	In 2019, approximately 650,962 m² (65.1 ha) was disturbed for Project infrastructure. Of the approximate areas cleared, 77% of the work was done outside of the breeding bird window (May 31 to August 5). During the breeding bird window, approximately 148,438 m² (14.8 ha) of land was cleared. Twelve pre-clearing surveys were conducted, and a total of 12.9 person-hours and 269,361 m² (26.9 ha) of area were searched for active nests in the Mine Site, Tote Road and Milne Port development areas. No nests were found in 2019. Surveys will continue to be conducted whenever clearing vegetation within the migratory bird nesting season.	By minimizing the Project footprint, conducting pre-clearing nest surveys, and implementing a nest management plan, Project-related effects to nesting birds were expected to be low to nil. No migratory bird nests were found nor disturbed during pre-clearing nest surveys in 2019; thus, effects are consistent with impact predictions.
Cliff–nesting raptor occupancy and productivity surveys	Addresses Project Conditions 50, 73, 74, and Project Commitment 75	This program is a continuation of baseline and effects monitoring work conducted since 2011. Approximately 33% of the 165 known nesting sites within the raptor monitoring area surveyed in summer 2019 were occupied by cliff-nesting raptors. Of these, 43 were occupied by Peregrine Falcon, 11 by Rough-legged Hawk, and one by Gyrfalcon. Productivity for Peregrine Falcons and rough-legged hawks was 1.5±1.2 and 0.5±1.0 nestlings, respectively. 2019 surveys focused on confirming raptor occupancy and the productivity of known nesting sites. Small mammal abundance monitoring was also conducted in 2019 to address cyclical occupancy of Rough-legged Hawks according to small mammal cycles. One collared lemming was trapped in 2019, indicating low regional small mammal abundance.	Annual variability within Peregrine Falcon and Rough-legged Hawk occupancy and productivity has been relatively high. Still, thus far, there have been no Project-related effects detected at the RMA level nor as a factor of distance to disturbance. Effects on cliff-nesting raptor occupancy and productivity are within the impact predictions.
Helicopter flight height analysis	Addresses Project Conditions 59, 71 and 72	Before flying for Baffinland, all personnel are made aware of flight height requirements to reduce stress to the wildlife of Baffin Island, particularly during sensitive times (e.g. staging, calving, etc.). Ensuring that aircraft maintain, whenever possible (except for specified operational purposes such as drill moves, takeoffs and landings), and subject to pilot discretion regarding aircraft and human safety, a cruising altitude of at least 650 m during point to point travel when in areas likely to have migratory birds, and 1,100 m vertical and 1,500 m	It was expected that some Snow Geese would be displaced by Project-related activities, but would relocate to nearby, less disturbed areas. As only a small portion of the Snow Goose area is subject to helicopter flyovers and is mainly outside of the ZOI, effects will likely be limited. A total loss of 2.4% high-quality habitat and 2.1% of medium quality habitat, along with a concomitant increase in low and nil quality habitat, was expected. Overall, local disturbance relative to the extent of the PDA and LSA was expected to cause some sensory disturbance and be a not significant

Table 0 Terrestrial baseline, monitoring and research activities completed in 2019 for the Mary River Project, and results compared to impact predictions.

Survey	Reason for survey[1]	Work completed, effects observed, required mitigation and recommendations for future work	Comparison to Impact Predictions[2]
		horizontal distance from observed concentrations of migratory birds (e.g., Snow Goose area). Flight corridors are also used to avoid areas of significant wildlife importance. In 2019, compliance within the Snow Goose area during the moulting season (July – August) was 93%, and compliance within and outside the Snow Goose area in all months of analysis (May – September) was 91%. 2019 was the third year that flight height data were cross-referenced with pilot logs from daily timesheets to help justify non-compliant transits. For analytical purposes, non-compliant flight height data were converted to represent compliance with Project Conditions in cases where reasonable explanations were provided by pilots. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years. Examples given to explain low-level flights included: weather, slinging, staking, surveys, drop off/pick up demobilization and evacuations.	adverse effect. Direct mortality due to aircraft was deemed unlikely and thus expected to have a not significant adverse effect. Compliance with minimum helicopter flight heights was high in 2019 when considering the pilots' rationale for low-level flying. Flights over the Snow Goose area have been limited to its southeastern edge so that any sensory disturbance would be minimal relative to the entire Snow Goose area, consistent with FEIS predictions. However, it has not been possible to directly monitor the potential effects of low-level flying on Snow Geese or other migratory birds. No direct mortality due to aircraft has been documented, which is consistent with impact predictions.
Wildlife interaction and mortality reporting	Addresses Project Conditions 53a, 53b, and 57d	Any interactions or mortalities involving wildlife within the Baffinland Project area are reported and investigated year-round. If possible, mitigation measures are implemented to reduce future wildlife interactions and mortalities. In 2019, nine non-fatal wildlife interactions and 14 wildlife mortality incidents were reported, all of which were individual losses. Wildlife mortality incidents involved eight birds, four Arctic foxes, one Arctic hare, and one ringed seal. Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices and guidelines. Wildlife interaction and mortality monitoring will continue in 2020.	Direct wildlife mortality from Project-related activities was predicted to be low to nil for raptors, birds, caribou, and other wildlife. Any mortalities that do occur were predicted to represent a small fraction of overall populations. Wildlife mortalities in 2019 were all individual losses, and never exceeded four individuals of any one species. Thus, wildlife mortalities were low overall and represented a very small proportion of overall populations, consistent with impact predictions.

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AUTHORSHIP

EDI Environmental Dynamics Inc. prepared this report with support from Arctic Raptors Inc. Report authors include:

Lyndsay Doetzel, M.Sc., R.P. Bio. (EDI)	Author — Dustfall
Brett Pagacz, B.Sc., P. Biol. (EDI)	Author — Vegetation
Kristina Beckmann, B.Sc. (EDI)	Author/Editor — Mammals, Birds and Helicopter Flight Heights
Alain Fontaine, M.Sc. (EDI)	Author/Editor — Raptors
Alastair Franke (Arctic Raptors Inc.)	Author — Raptors
Erik Hedlin, M.Sc. (Arctic Raptors Inc)	Author — Raptors
Allison Patterson, M.Sc. (EDI)	Statistical Analysis
Matt Power, A.Sc.T. (EDI)	GIS Mapping and Analysis
Elaine Kennedy, B. Sc. (EDI)	Editor
Mike Setterington, M.Sc., R.P. Bio. (EDI)	Senior Review

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ACRONYMS AND ABBREVIATIONS

AIC.	Akaike Information Criterion
ALS.	ALS Environmental Laboratory
AMBNS	Active Migratory Bird Nest Searches
AMR	Terrestrial Environment Annual Monitoring Report
ANOVA	Analysis of Variance
ARInc.	Arctic Raptors Inc.
ARU	Autonomous Recording Unit
BACI	Before-After-Control-Impact
Baffinland	Baffinland Iron Mines Corporation
CAD	Computer Aided Drawing
CANTTEX	Canadian Tundra and Taiga Experiment
CCME	Canadian Council of Ministers of the Environment
CI	Confidence Interval
CoPC	Contaminant (i.e., Metals/Metalloids) of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CVAAS	Cold Vapour-Atomic Absorption
CWS	Canadian Wildlife Service
DD	Distance to Disturbance
DEM	Digital Elevation Model
DIC	Deviance Information Criterion
ECCC	Environment and Climate Change Canada
EDI	Environmental Dynamics Inc.
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
ERP	Early Revenue Program
FEIS	Final Environmental Impact Statement
GIS	Geographic Information System
GN	Government of Nunavut
GPS	Global Positioning System
HOL	Height of Land

ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ID	Identification Numbers
INLA	Integrated Nested Laplace Approximation
IQR	Interquartile Range
ITEX	International Tundra Experiment
LSA	Local Study Area
MAA	Minimum Acceptable Age
MDL	Minimum Detection Limit
MHTO	Mittimatalik Hunters and Trappers Organization
MSC	Mine Site Complex
NIRB	Nunavut Impact Review Board
NLC	Northern Land Cover
NND	Nearest Neighbour Distance
OHT	Ore Haul Truck
PDA	Potential Development Area
PEFA	Peregrine Falcon
PSC	Port Site Complex
PRISM	Program for Regional and International Shorebird Monitoring
Project	Mary River Project
QIA	Qikiqtani Inuit Association
RLHA	Rough-Legged Hawk
RMA	Raptor Monitoring Area
RSA	Regional Study Area
SARA	Species at Risk Act
SMR	Soil Moisture Regime
SNGO	Snow Goose
SVF	Site Visit Form
TEMMP	Terrestrial Environment Mitigation and Monitoring Plan
TEWG	Terrestrial Environment Working Group
TSP	Total Suspended Particulates
US EPA	United States Environmental Protection Agency
VEC	Valued Ecosystem Component

UNITS

cm	centimetre
Dm^2	decametre square
G	gram
Ha	hectare
Km	kilometre
Km/hr	kilometre per hour
M	metre
M/s	metre per second
M^2	metre square
Magl	metres above ground level
Masl	metres above sea level
Mg	milligram
Mg/kg	milligram
Mm	millimetre
Mtpa	million tonnes per year
%	percent
A	alpha
^{O}c	degree celsius

1 OVERVIEW OF TERRESTRIAL ENVIRONMENT MONITORING

The Mary River Project (the Project) is an iron ore mine located in the Qikiqtaaluk Region on North Baffin Island, Nunavut. As a condition of Project approval, the Nunavut Impact Review Board (NIRB) Project Certificate No. 005 includes numerous conditions that require Baffinland Iron Mines Corporation (Baffinland) to conduct effects monitoring for the terrestrial environment. Work conducted for the terrestrial environmental monitoring program is guided by Inuit Qaujimajatuqangit and by the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland Iron Mines Corporation 2016). This work is overseen by the Terrestrial Environment Working Group (TEWG), including members from Baffinland, the Qikiqtani Inuit Association (QIA), the Government of Nunavut (GN), Environment and Climate Change Canada (ECCC) and the Mittimatalik Hunters and Trappers Organization (MHTO). Several data collection and monitoring programs are conducted as part of the terrestrial environmental monitoring program, the frequency of which is outlined in the TEMMP (Baffinland Iron Mines Corporation 2016). To date, numerous programs have been conducted:

- dustfall monitoring (2013–2019);
- vegetation abundance monitoring (2014, 2016, 2017, 2018, 2019);
- vegetation and soil base metals monitoring (2012–2017, 2019);
- exotic invasive vegetation monitoring and natural revegetation (2014, 2019);
- Height of Land caribou surveys (2013–2019);
- snow track surveys and snow bank height monitoring (2014–2019);
- Red Knot surveys (2014, 2019);
- active migratory bird nest surveys (2013–2019);
- cliff-nesting raptor occupancy and productivity surveys (2011–2019);
- helicopter flight height analysis (2015–2019);
- caribou fecal pellet collection (2011, 2012, 2013, 2014);
- caribou water crossing surveys (2014);
- carnivore den survey (2014);
- communication tower surveys (2014, 2015);
- roadside waterfowl surveys (2012–2014);
- staging waterfowl surveys (2015);
- tundra breeding bird PRISM (Program for Regional and International Shorebird Monitoring) plots (2012, 2013, 2018);
- bird encounter transects (2013); and
- coastline nesting and foraging habitat surveys along Steensby Inlet (2012) and Milne Inlet (2013).

The results of the 2012 to 2018 surveys are described in the Terrestrial Environment Annual Monitoring Reports (EDI Environmental Dynamics Inc. 2013, 2014, 2015, 2017, 2018, 2019). The 2019 terrestrial environment monitoring programs summarized in this report includes:

- dustfall monitoring program;
- vegetation abundance monitoring;
- vegetation and soil base metals monitoring;
- exotic invasive vegetation monitoring and natural revegetation;
- snow track surveys;
- snow bank height monitoring;
- Height of Land surveys;
- hunters and visitors log summaries;
- pre-clearing nest surveys;
- raptor occupancy and productivity surveys;
- Red Knot passive Autonomous Recording Unit deployment;
- helicopter flight height analysis; and
- wildlife interactions, incidental observations, and mortalities.

2 INUIT PARTICIPATION IN TERRESTRIAL MONITORING PROGRAMS

Baffinland believes that consultation with Inuit and incorporation of Inuit in field monitoring programs is critically important. Ensuring Inuit participation has become standard practice in Baffinland's field monitoring programs, including:

- hiring and training Inuit to work on terrestrial monitoring programs;
- supporting participation of the MHTO in the TEWG;
- funding for two full-time on-site Environmental Monitors (cross-shifts at both Milne Port and Mine Site) to be appointed and solely employed by QIA following Article 15.8 of the Inuit Impact and Benefit Agreement (IIBA; Baffinland Iron Mines Corporation and Qikiqtani Inuit Association 2013); and
- the implementation of a community-based monitoring program through the Mary River IIBA (Baffinland Iron Mines Corporation and Qikiqtani Inuit Association 2013).

Baffinland also conducts multiple meetings throughout the year to discuss all topics related to the Project, either by invitation from the community or by request to meet on specific items. These mediums serve to guide information gathering and sharing, which influences Baffinland's monitoring programs, Project operations, and a greater understanding of the environment.

In 2019, Baffinland had participation from one Inuit research assistant in the caribou Height of Land surveys, four in the vegetation monitoring programs, and three in the cliff-nesting raptor monitoring program. These programs provided 168 hours of employment in the Height of Land monitoring program, 372 hours of employment in the vegetation monitoring program, and 140 hours of employment in the cliff-nesting raptor monitoring program.

Inuit participation in caribou Height of Land surveys involved assistance with logistics and observation. Inuit participation for vegetation monitoring included all programs conducted in 2019 and consisted of hands-on fieldwork for vegetation abundance, vegetation and soil base metals and exotic invasive vegetation and natural regeneration monitoring. The fieldwork for these programs provided training to build skills in field logistics, site selection, global positioning system (GPS) navigation, plant identification, principles of soil moisture and drainage, program collection methods and general data management. Site selection for vegetation monitoring programs was reviewed and rationalized considering protocols, environmental factors and observations from field crew members. Inuit participation for cliff-nesting raptor monitoring included avian distance sampling, aerial raptor survey observations, and lemming trapping. The fieldwork for these programs provided training to build skills in GPS navigation, data collection methods, bird identification, raptor nesting habits, and general data management. Inuit participation was well received and provided practical knowledge on landscape patterns, wildlife observations and general climate changes.

3 DUSTFALL MONITORING PROGRAM

Several of the Project Conditions (e.g., Project Conditions 36, 50, 54d and 58c) address dustfall concerns or are relate to reporting requirements for the dustfall monitoring program. To meet those requirements, the Mary River dustfall monitoring program was initiated in the summer of 2013. The main objectives of the dustfall monitoring program are to:

- quantify the volume and extent of dustfall generated by Project activities;
- determine seasonal variations in dustfall; and
- determine if annual dustfall volume and extent exceed ranges predicted with the dustfall dispersion models (Volume 6, Section 3; Baffinland Iron Mines Corporation 2013).

To address Project Condition #57g, which states "*an assessment and presentation of annual environmental conditions including timing of snowmelt, green-up and standard weather summaries*," refer to Section 3.2.1.1 — Overview of Weather Conditions.

3.1 METHODS

3.1.1 REVIEW OF SUPPORTING DATA

In addition to the collection of dustfall data, the monitoring program also comprises a review of supporting data that could influence the volume and extent of dustfall during 2019. These supporting data include an overview of weather conditions at Mary River and Milne Inlet meteorological stations and vehicle traffic on the Tote Road.

From 1963 to 1965, Environment Canada (now ECCC) operated a climate station at Mary River during the summer months (Baffinland Iron Mines Corporation 2012). Where relevant, these data have been included to compare to data collected from Baffinland's on-site meteorological stations. Baffinland established a meteorological station at Mary River Camp on June 13, 2005, and at Milne Inlet in June 2006, creating a baseline dataset from 2005 to 2010 (Baffinland Iron Mines Corporation 2012). Meteorological data for 2019 were collected from on-site meteorological stations at Mary River and Milne Inlet and compared to available baseline data. Where feasible, the 2019 and 2018 weather data were also compared to identify potential differences in annual dustfall. Data included in the 2019 overview of weather conditions were recorded from January 1, 2019 to December 31, 2019.

Weather conditions data include monthly air temperature, wind direction, wind speed and precipitation as rainfall. The air temperature sensor from the Mary River station may have malfunctioned on October 5, 2019, from an unknown cause whereby temperature data dropped from -7ºC to -45ºC in a period of one to three hours before rapidly rising to above 0ºC. Air temperatures appeared to be stable and seasonal after this time frame; however, October/November data should be interpreted with caution.

Traffic data include the number of trucks hauling ore on the Tote Road each day and non-haul truck traffic (e.g., truck transits related to the transfer of personnel, equipment and/or fuel). These data are compared with the projected ore haul and non-haul vehicle transits (Volume 3, Appendix 3B, Baffinland Iron Mines Corporation 2013). Not all vehicle travel on the Tote Road consists of a full round trip from the Mine Site to Port Site. Traffic is therefore tracked as 'vehicle transits,' which were counted as a one-way trip; return trips were comprised of two transits.

3.1.2 DUSTFALL SAMPLING

From January 1 to 27, 2019, the dustfall monitoring program included 33 dustfall samplers located throughout the Project area (Table 3-1; Map 1):

- 9 dustfall samplers located at the Mine Site (three within the Mine Site, four outside the mine footprint within low to moderate isopleth areas and two references sites; one to the northeast, and one to the south) located at least 14,000 metres (m) from any Project infrastructure, outside of the extent of expected dustfall;
- 6 dustfall samplers located at Milne Port (five active sites on the Port Site footprint) and 1 reference site situated on a ridge approximately 3,000 m northeast (upwind) of the Port Site outside of the predicted extent of dustfall;
- 16 dustfall samplers divided between two sites along the Tote Road (North sites and South sites). These two sites are organized into transects, each composed of 8 dustfall samplers distributed perpendicular to the Tote Road centreline at 30 m, 100 m, 1,000 m, and 5,000 m on either side of the road; and
- 2 reference dustfall samplers located 14,000 m southwest of the Tote Road (one at the north site, one at the south site).

On January 27, 2019, modifications made to the dustfall monitoring program in 2019 included the following:

- 6 additional dustfall samplers were added along the Tote Road. These six monitors comprise three pairs, located 1,000 m distant from the Tote Road on its east and west sides at km 25, 56 and 75. The QIA requested the installation of these, recommending that additional samplers would better define the magnitude of dustfall at 1,000 m distance from Project activities. The final location of the additional dustfall samplers was selected by the MHTO during an August 2018 site visit.
- To accommodate the expansion of the ore stockpile area at Milne Port site, DF-P-01 was relocated to the boundary of the PDA. The new site is called DF-P-08, and the move was completed in May 2019.

Dustfall sampling methods are conducted as described in standard test method for collection and measurement of dustfall (ASTM International 2010). Each dustfall sampler comprises one sampling apparatus including a hollow post, approximately 2 m high, and a bowl-shaped terminal holder for the dust collection vessel. The terminal bowl is topped with 'bird spikes' to prevent birds perching and contaminating samples with feces (see Photo 3-1). Dust collection canisters were placed in the holder; these containers were pre-charged with 250 mL of algaecide in summer and 250 mL of isopropyl alcohol in winter. Collection vessels were changed out once per month and shipped to ALS Environmental Laboratory (ALS) in Waterloo, Ontario, for analysis of total suspended particulates (TSP; units of mg/dm²·day) and metals. In addition to the analysis of TSP, the dustfall samples were analyzed for total metal concentrations to help inform potential trends of metals in soil and vegetation tissues, collected as part of vegetation health monitoring.

Dustfall sampling was conducted year-round at 16 of the 33 monitors; the reduced winter sampling is due to safety considerations associated with access to remote sites during the winter months when helicopter support on site (e.g. September to May) is unavailable, and to account for seasonal difference described below. Those sites exposed to the highest dustfall, i.e., those samplers located within 1,000 m of the PDA, were sampled year-round throughout 2019 (Table 3-2). Sites not visited over the winter months are generally those situated at 1,000 m or greater from the PDA, which are historically least exposed to Project-related dustfall (EDI Environmental Dynamics Inc. 2015, 2017, 2018, 2019).

For data analysis and reporting purposes, summer includes sampling data from June, July and August, and winter includes data collected from September through May. This seasonal delineation was determined after reviewing site weather data, indicating that in September through May, the mean daily temperature is below 0°C, and more than 50% of the monthly precipitation falls as snow. The 2019 dustfall monitoring program includes data collected for a full calendar year from early January 2019 through early January 2020.

Table 3-1 Dustfall monitoring site location and sampling period information for the Mary River Project 2019 dustfall monitoring program.

Site ID	Location	Sample Period	Distance to PDA (m)	Dust Isopleth	Latitude	Longitude
DF-M-01	Mine Site	year-round	Within PDA	High	71.3243	-79.3747
DF-M-02	Mine Site	year-round	Within PDA	High	71.3085	-79.2906
DF-M-03	Mine Site	year-round	Within PDA	High	71.3072	-79.2433
DF-M-04	Mine Site	summer¹	9,000	Nil	71.2197	-79.3277
DF-M-05	Mine Site	summer¹	9,000	Nil	71.3731	-78.9230
DF-M-06	Mine Site	summer¹	1,000	Moderate	71.3196	-79.1560
DF-M-07	Mine Site	summer¹	1,000	Moderate	71.3000	-79.1953
DF-M-08	Mine Site	summer¹	4,000	Moderate	71.2945	-79.1002
DF-M-09	Mine Site	summer¹	2,500	Low	71.2936	-79.4127
DF-RS-01	Tote Road – south, km 78	summer¹	5,000	Nil	71.3275	-79.8001
DF-RS-02	Tote Road – south, km 78	variable²	1,000	Low	71.3893	-79.8324
DF-RS-03	Tote Road – south, km 78	year round	100	Moderate	71.3967	-79.8228
DF-RS-04	Tote Road – south, km 78	year round	30	Moderate	71.3975	-79.8222
DF-RS-05	Tote Road – south, km 78	year round	30	Moderate	71.3980	-79.8228
DF-RS-06	Tote Road – south, km 78	year round	100	Moderate	71.3986	-79.8234
DF-RS-07	Tote Road – south, km 78	variable²	1,000	Nil	71.4077	-79.8182
DF-RS-08	Tote Road – south, km 78	summer¹	5,000	Nil	71.4489	-79.7106

Table 3-1 Dustfall monitoring site location and sampling period information for the Mary River Project 2019 dustfall monitoring program.

Site ID	Location	Sample Period	Distance to PDA (m)	Dust Isopleth	Latitude	Longitude
DF-RN-01	Tote Road – north, km 27	summer[1]	5,000	Nil	71.6883	-80.5363
DF-RN-02	Tote Road – north, km 27	variable[2]	1,000	Low	71.7145	-80.4704
DF-RN-03	Tote Road – north, km 27	year round	100	Moderate	71.7186	-80.4473
DF-RN-04	Tote Road – north, km 27	year round	30	Moderate	71.7189	-80.4456
DF-RN-05	Tote Road – north, km 27	year round	30	Moderate	71.7185	-80.4414
DF-RN-06	Tote Road – north, km 27	year round	100	Moderate	71.7189	-80.4397
DF-RN-07	Tote Road – north, km 27	variable[2]	1,000	Nil	71.7226	-80.4165
DF-RN-08	Tote Road – north, km 27	summer[1]	5,000	Nil	71.7435	-80.2898
DF-P-01	Milne Port	year round	Within PDA	Moderate	71.8802	-80.9072
DF-P-02	Milne Port	decommissioned	Within PDA	Moderate	71.8850	-80.8912
DF-P-03	Milne Port	summer[1]	3,000	Nil	71.8996	-80.7884
DF-P-04	Milne Port	year round	Within PDA	Low	71.8710	-80.8828
DF-P-05	Milne Port	year round	Within PDA	Moderate	71.8843	-80.8945
DF-P-06	Milne Port	year round	Within PDA	Low	71.8858	-80.8790
DF-P-07	Milne Port	year round	Within PDA	Moderate	71.8838	-80.9160
DF-P-08	Milne Port	year round, installed 2019	1,000	Moderate	71.8722	-80.9126
DF-RR-01	Reference – Road	summer[1]	14,000	Nil	71.2805	-80.2450
DF-RR-02	Reference – Road	summer[1]	14,000	Nil	71.5189	-80.6923
DF-TR-25E	Tote Road	variable[2], installed 2019	1,000	Nil	71.7425	-80.4394
DF-TR-25W	Tote Road	variable[2], installed 2019	1,000	Low	71.7395	-80.5068
DF-TR-56E	Tote Road	variable[2], installed 2019	1,000	Nil	71.5097	-80.2109
DF-TR-56W	Tote Road	variable[2], installed 2019	1,000	Low	71.4944	-80.2685
DF-TR-75E	Tote Road	variable[2], installed 2019	1,000	Nil	71.3902	-79.9917
DF-TR-75W	Tote Road	variable[2], installed 2019	1,000	Low	71.3709	-80.0007

[1] Summer sampling includes data collection from June, July and August.

[2] Year-round sampling will be attempted dependent on safe access during winter months.

Table 3-2 Record of sampling associated with the Mary River Project 2019 dustfall monitoring program.

Sampling Session	Start Date[1]	End Date[1]	No. of Days[1]	No. of Canisters Deployed	No. of Canisters Analyzed	Sampling Solution
1	07-Jan-2019	04-Feb-2019	29	16	16	Alcohol
1b[2]	27-Jan-2019	26-Feb-2019	29-30	10	10	Alcohol
2	5-Feb-2019	04-Mar-2019	28-29	16	16	Alcohol
3	5-Mar-2019	01-Apr-2019	28-35	26	26	Alcohol
4	02-Apr-2019	30-Apr-2019	28-30	25	25	Alcohol
5	01-May-2019	28-May-2019	25-29	27	27	Alcohol
6	29-May-2019	25-Jun-2019	27-29	39	39	Algaecide
7	26-Jun-2019	23-Jul-2019	27-29	39	39	Algaecide
8	24- Jul-2019	20-Aug-2019	27-29	39	38 [3]	Algaecide
9	21-Aug-2019	18-Sept-2019	26-30	39	39	Algaecide
10	19-Sep-2019	16-Oct-2019	26-28	16	16	Alcohol
11	17-Oct-2019	13-Nov-2019	28-30	16	16	Alcohol
12	14-Nov-2019	12-Dec-2019	28-29	16	16	Alcohol
13	13-Dec-2019	8-Jan-2020	27-28	16	15 [4]	Alcohol

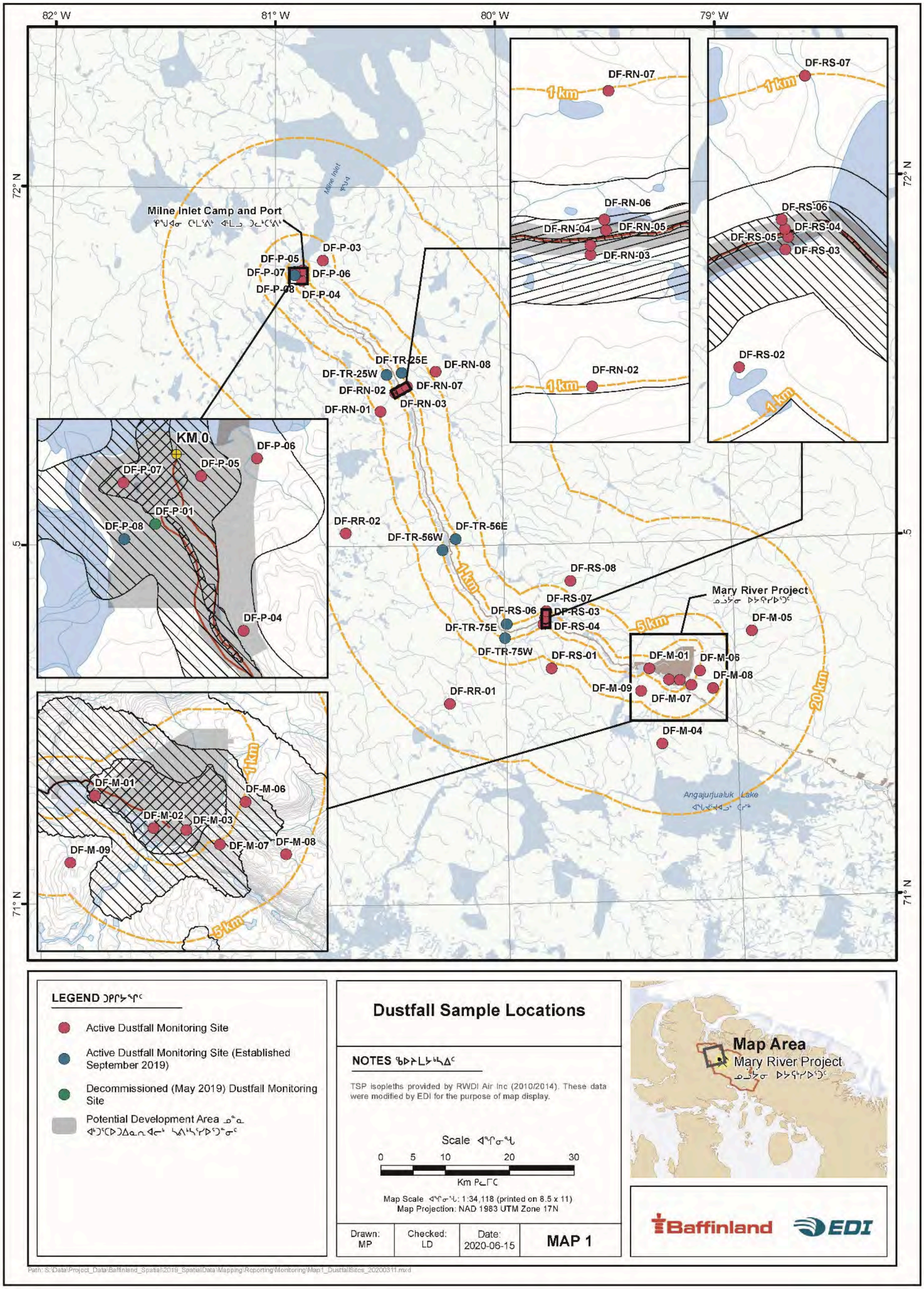
[1] Sample collection and jar changeout can take more than one day for all sites to be collected; the first date of monthly sampler changeout presented here.

[2] The six new dustfall monitoring located along the Tote Road plus the four existing road sites 1,000 m distant from the Tote Road (DF-RN-02 and -07 and DF-RS-02 and -07) were deployed for a test month from 27 January through 26 February and were added to the regular rotation on April 2, 2019

[3] The sample from DF-M-07 was discarded as a dead bird was found in the sample jar.

[4] The sample canister from DF-RN-06 was broken in shipping.

Photo 3-1 Dustfall monitoring station DF-P-01.



LEGEND ᑐᑭᖦᔭᖏᑦ

- ● Active Dustfall Monitoring Site
- ● Active Dustfall Monitoring Site (Established September 2019)
- ● Decommissioned (May 2019) Dustfall Monitoring Site
- ▨ Potential Development Area ᓄᓇ ᐊᒃᑐᕐᑕᐅᑐᐃᓇᕆᐊᓕᒃ ᓴᐱᒃᓴᕐᐳᑦ

Dustfall Sample Locations

NOTES ᖃᐅᔨᒪᔭᒃᓴᐃᑦ

TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.

Scale ᐊᖏᓂᖓ

0 5 10 20 30

Km ᑭᓚᒦᑕ

Map Scale ᐊᖏᓂᖓ: 1:34,118 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N

Drawn:	Checked:	Date:	
MP	LD	2020-06-15	MAP 1

Path: S:\Data\Project_Data\Baffinland_Spatial\2019_SpatialData\Mapping\Reporting\Monitoring\Map1_DustfallSites_20200311.mxd

3.1.3 ANALYTICAL METHODS

The regional study area (RSA) was divided into four areas for the purposes of reviewing dustfall data:

1. the Mine Site;
2. Milne Port;
3. the Tote Road North crossing (km 28); and
4. the Tote Road South crossing (km 78).

Extent and Magnitude of Dustfall at Various Sites — Dustfall deposition rates (as TSP) for each site were compiled for the 2019 season and reviewed to determine which sites in each sampling area are most affected by dustfall, and to draw comparisons to reference sites.

Daily dustfall from summer sampling periods (June, July, and August) was examined to assess the relationship between dustfall and distance from the road at both the north and south sides, dustfall from the mine and dustfall from the Port. Mixed effects models were used to test for a relationship between distance from Project infrastructure and daily dustfall. Distance from the mine was treated as a categorical variable with three classes: Near (within footprint), Far (1,000 m–5,000 m), and Reference (>5,000 m). Distance from the road was treated as a categorical variable with four classes — 30, 100, 1,000, and 5,000 m.

Data for daily dustfall as a function of distance from Project infrastructure did not meet the assumptions of normality or equality of variance in the residuals required for a linear model; this was due to the number of data points that were below laboratory detection. Differences in the distribution of dustfall by distance class were investigated using non-parametric Kruskal-Wallis tests, with data stratified by sampling month. If there was an effect of distance class on dustfall, pairwise tests were used to determine which distance classes were different. Medians and inter-quartile ranges were reported to summarize dustfall within distance classes. Statistical analysis was conducted using R version 3.5.2 (R Development Core Team 2019) Kruskal-Wallis tests were performed using the R package 'coin' (Hothorn et al. 2006).

Seasonal Variation in Dustfall – Generalized least squares regression was used to test for effects of season (summer and winter) and sample site on daily dustfall accumulation for each project area (Mine Site, Milne Port, north road and south road), for sites that were sampled throughout the year. Each model included main effects of season and sample site, with an interaction term between sample site and season. Dustfall data were log transformed prior to analysis and results were back-transformed to the original scale. Models included a first-order autocorrelation structure, based on sampling period within a site, to account for the possibility that dustfall in one sampling period was more like samples from the preceding period than other samples from the same site (Zuur et al. 2009). Fixed model weights based on the number of days in each sampling period were used to give more weight to dust samples collected over a longer time period (Zuur et al. 2009).

Residual plots were examined to confirm assumptions of normality and equality of variance in the residuals. The significance of model terms was tested using F-tests; terms were considered significant at $\alpha < 0.05$. If there was no evidence that daily dustfall was related to season or site, then median dustfall ± 95 % confidence intervals (CIs) were reported across all sites and seasons. If there was evidence of an effect of season on daily dustfall, least squared means were used to estimate the median effect of the season after accounting for the effect of sample site (Lenth 2014). Statistical analysis was conducted using R version 3.5.2 (R Development Core Team 2019).

Annual Dustfall —Within the Early Revenue Program (ERP) Final Environmental Impact Statement (FEIS), annual TSP rates predictions were developed with input from the results of the dust dispersion models, existing literature related to air quality guidelines and dust deposition, and similar dust monitoring programs in place at other northern mines:

Low: 1 to 4.5 $g/m^2/year$;

Moderate: 4.6 to 50 $g/m^2/year$; and

High: ≥ 50 $g/m^2/year$.

The results of the 2019 dustfall sampling program for monitoring site with year-round data collection were converted from units of $mg/dm^2 \cdot day$ to $g/m^2/year$ and were compared with the modelled dust deposition isopleths for the Project to determine if deposition rates exceed the predicted range. Data for each month were converted to $g/m^2/day$, and then summed to add up to one year. Milne Port site DF-P-01 was relocated to DF-P-08 to accommodate stockpile area expansion, therefore data from these two sites were compiled for the annual dustfall and inter-annual trend analysis.

Sites in the nil and low isopleth zones were not sampled during winter months, so annual accumulation was not calculated for those sites. Very low dustfall accumulation, often below laboratory detection, was observed at these sites during the summer months.

The laboratory detection limit for dustfall sampling is 0.10 $mg/dm^2 \cdot day$, which converts to an annual dustfall of 3.6 $g/m^2/year$, which is a significant proportion of the low dustfall threshold of 4.5 $g/m^2/year$. Therefore, total annual dustfall may be overestimated at some sites where data collected each month had dustfall below the laboratory detection limit.

Inter-annual Trends —Linear mixed effects models were used to test for effects of season (summer and winter) and year on daily dustfall accumulation for each Project area (Mine Site, Milne Port, north road and south road). Only sites that were sampled throughout the year were included in this analysis (three mine sites, five port sites, four north road sites, and four south road sites). Each model included main effects of season and year, with an interaction term between season and year. Both seasons (summer and winter) and year (2015, 2016, 2017, 2018 and 2019) were treated as categorical variables in this analysis. Sample site was included as a random effect, to account for a lack of independence in samples collected from the same location over time. Dustfall data were log transformed prior to analysis and results were back-transformed to the original scale. A constant variance structure for season was used to account for higher variation in summer dustfall relative to winter dustfall (Zuur et al. 2009).

Residual plots were examined to confirm assumptions of normality and equality of variance in the residuals. Significance of model terms was tested using F-tests; terms were considered significant at $\alpha < 0.05$. Tests with p values between 0.05 and 0.1 are reported as suggestive evidence of group differences. If there was evidence of an effect of season or year on daily dustfall, least squared means were used to estimate pairwise differences among groups (Lenth 2018). Statistical analysis was conducted using R version 3.5.2 (R Development Core Team 2019).

3.2 RESULTS AND DISCUSSION

3.2.1 SUPPORTING DATA

3.2.1.1 Overview of Weather Conditions

Weather conditions from January 1, 2019, to November 26, 2019, were reported from on-site meteorological stations at Mary River and Milne Inlet. Relevant weather data were compared between 2019 and baseline conditions; where feasible, 2019 and 2018 weather data were related to support observations from the dustfall monitoring program. Parameters measured include monthly air temperature, precipitation as rainfall, wind speed, and wind direction. Refer to Section 3.1.1 — Review of Supporting Data for detailed methods.

Air Temperature — In 2019, air temperatures at Milne Inlet rose consistently above 0ºC on June 26 (approximately 2.5 weeks later than 2018) and remained above freezing until August 20 (approximately 2 weeks earlier than 2018). By September, temperatures at Milne Inlet were consistently below 0ºC. At Mary River, air temperatures rose consistently above 0ºC on May 28 (approximately one week earlier than 2018) and remained above freezing until September 8 (like 2018) when temperatures dipped below 0ºC. Throughout September and October, temperatures fluctuated above/below freezing levels until November when temperatures dropped and remained consistently below 0ºC. In summary, a comparison of the 2018/2019 air temperature data found cooler average temperatures at Milne Inlet in 2019 relative to 2018 during the summer and winter months. At Mary River, average air temperatures were somewhat warmer in 2019 than 2018 during the summer and winter months.

A review of the air temperature data from 2019 relative to baseline conditions determined that the lowest air temperature recorded at Milne Inlet during baseline was -46.9°C in February 2008 compared to -50.2°C in January 2019. The highest air temperature recorded during baseline was 22.3°C in July 2009 compared to 10.7°C in July 2019. At the Mine Site, the lowest air temperature recorded during baseline was -70.0°C in April 2010 compared to -40.3°C in January/February 2019. The highest air temperature recorded during baseline was 22.8°C in July 2009 and 11.0°C in September 1964. In 2019, the highest temperature recorded was 21.3°C in July.

In summary, air temperatures were somewhat cooler at Milne Inlet in 2019 compared to baseline conditions for both summer and winter months. At Mary River, air temperatures were warmer than baseline conditions during the winter and similar to baseline conditions during the summer. Air temperatures recorded by Environment Canada at the Mary River meteorological station from 1963 to 1965 were cooler during the summer months compared to 2019 air temperatures.

Precipitation (Rainfall) — In general, July and August tend to be the wettest months for North Baffin Island. A comparison of the 2018/2019 precipitation data could not be completed due to a malfunction of the rain gauge at both Milne Inlet and Mary River meteorological stations in 2018; therefore, no comparisons were available among these years. Refer to Section 3.1.1 — Review of Supporting Data for details.

A review of the precipitation data from 2019 relative to baseline conditions determined that the total number of days when rainfall was recorded at Milne Inlet during baseline conditions was 40 days in 2006, 25 days in 2007, and 26 days in 2008. Baseline rainfall data were not available for Milne Inlet in August 2009 and after March 4, 2010, to provide an accurate estimate for these years. In 2019, there were 51 days when rainfall was recorded. The highest recorded daily rainfall at Milne Inlet during baseline conditions was 40.2 mm on September 2, 2006. This is higher than in 2019, which had a maximum daily rainfall of 16.7 mm on August 30, 2019. The total amount of rainfall recorded at the Milne Inlet weather station in 2019 was 156.6 mm. During baseline conditions, the highest amount of rainfall recorded in a single year at the Milne Inlet weather station was 221 mm in 2006.

At Mary River, the total number of days when rainfall was recorded during baseline conditions was 46 days in 2005, 53 days in 2006, 34 days in 2007, 27 days in 2008, and 51 days in 2009. Baseline rainfall data for Mary River were not available after July 7, 2010 to provide an accurate estimate for 2010. In 2019, 64 days of rainfall were recorded. The highest recorded daily rainfall at Mary River during baseline conditions was 32.8 mm on August 13, 2006. This is higher than 2019, which had a maximum daily rainfall of 10.6 mm on June 18, 2019. The total amount of rainfall recorded at the Mary River weather station in 2019 was 152.5 mm. From 1963 to 1965, the highest amount of rainfall recorded in a single year at the Mary River meteorological station was 94.4 mm in 1964.

In summary, more days of rainfall at Milne Inlet in 2019 occurred relative to baseline conditions, but there was less rainfall overall. At Mary River, more days of rainfall and more rainfall overall occurred in 2019 relative to baseline conditions, resulting in a higher total amount of rainfall in 2019.

Wind Speed and Direction — Wind direction recorded in 2019 at Milne Inlet and Mary River was mostly consistent with 2018 and baseline wind direction data. In 2018, 2019 and during baseline conditions, the range in minimum and maximum wind speeds was variable from calm to gusting winds on the upper end of the Beaufort scale. Wind data were not recorded at the Environment Canada Mary River meteorological station, 1963 to 1965.

A comparison of the 2018/2019 wind data at Milne Inlet and Mary River found that at each location the highest and lowest average wind speeds were similar among years. Average wind speeds recorded from June to August were also similar at each location; therefore, no difference was observed in the average wind speed during the summer months of 2018 or 2019; however, average wind speeds were lower (calmer) at Milne Inlet from September to November 2019 relative to 2018. No other comparisons can be made because there was an issue with the wind sensor at the Milne Inlet meteorological station in 2018. Refer to Section 3.1.1 — Review of Supporting Data for details. At Mary River, average wind speeds for the 2018/2019 data were similar for all months except January 2019, which had a relatively higher average windspeed than 2018.

A review of the wind data from 2019 relative to baseline conditions determined that wind direction data at Milne Inlet are similar between 2019 and baseline conditions where prevailing north/northwest winds occur most frequently. The range in minimum and maximum wind speeds was similar during baseline conditions and in 2019 with 0 to 23.8 m/s or 85 km/hr, which is considered "calm" to "severe gale" on the Beaufort scale. In both 2018 and 2019, a maximum wind speed of 100 m/s or 360 km/hr was recorded at Milne Inlet during eight or nine months of the year. A maximum wind speed of this nature is unlikely as it represents a value greater than "hurricane" on the Beaufort scale. An issue with the sensor was identified by onsite staff in 2018. Despite maintenance and repairs to the Milne Inlet station on August 28, 2018, an issue with the sensor remains likely.

At the Mine Site, baseline wind direction data are mostly consistent with previously reported wind direction data from the Mary River weather station, where prevailing south/southeast winds occur frequently, followed by strong north winds. The range in baseline minimum and maximum wind speed was similar during baseline conditions and 2019.

3.2.1.2 Vehicle Transits on the Tote Road

The mean number of ore haul transits per day in 2019 was 238.0 (Figure 3-1; Table 3-3); this represents a slight increase in the mean daily number of ore haul transits in 2019 compared with 2018 (219 ore haul transits per day). This is slightly above what was predicted in the FEIS Addendum for the Production Increase Proposal (ore haul transits: 236, non-haul transits: 40 (Stantec Consulting Ltd. 2018), but within a reasonable range of accuracy.

Other non-haul truck traffic had an annual mean of 43.0 vehicle transits per day. The mean daily total vehicle transits (haul and other) on the Tote Road in 2019 was 280.9 vehicle transits per day.

Table 3-3 Mean and total vehicle transits along the Tote Road, including ore haul, non-haul, and all vehicles combined.

Sample Year	Ore Haul Transits		Non-Haul Transits		Combined Vehicle Transits	
	Daily Mean	Total	Mean	Total	Mean	Total
2015	73.0	26,662	53.9	19,668	126.9	46,330
2016	151.2	55,354	27.7	10,150	179.0	65,504
2017	195.9	71,516	32.3	11,777	228.2	83,293
2018	219.5	80,118	37.3	13,616	256.8	93,734
2019	238.0	86,860	43.0	15,678	280.9	102,538

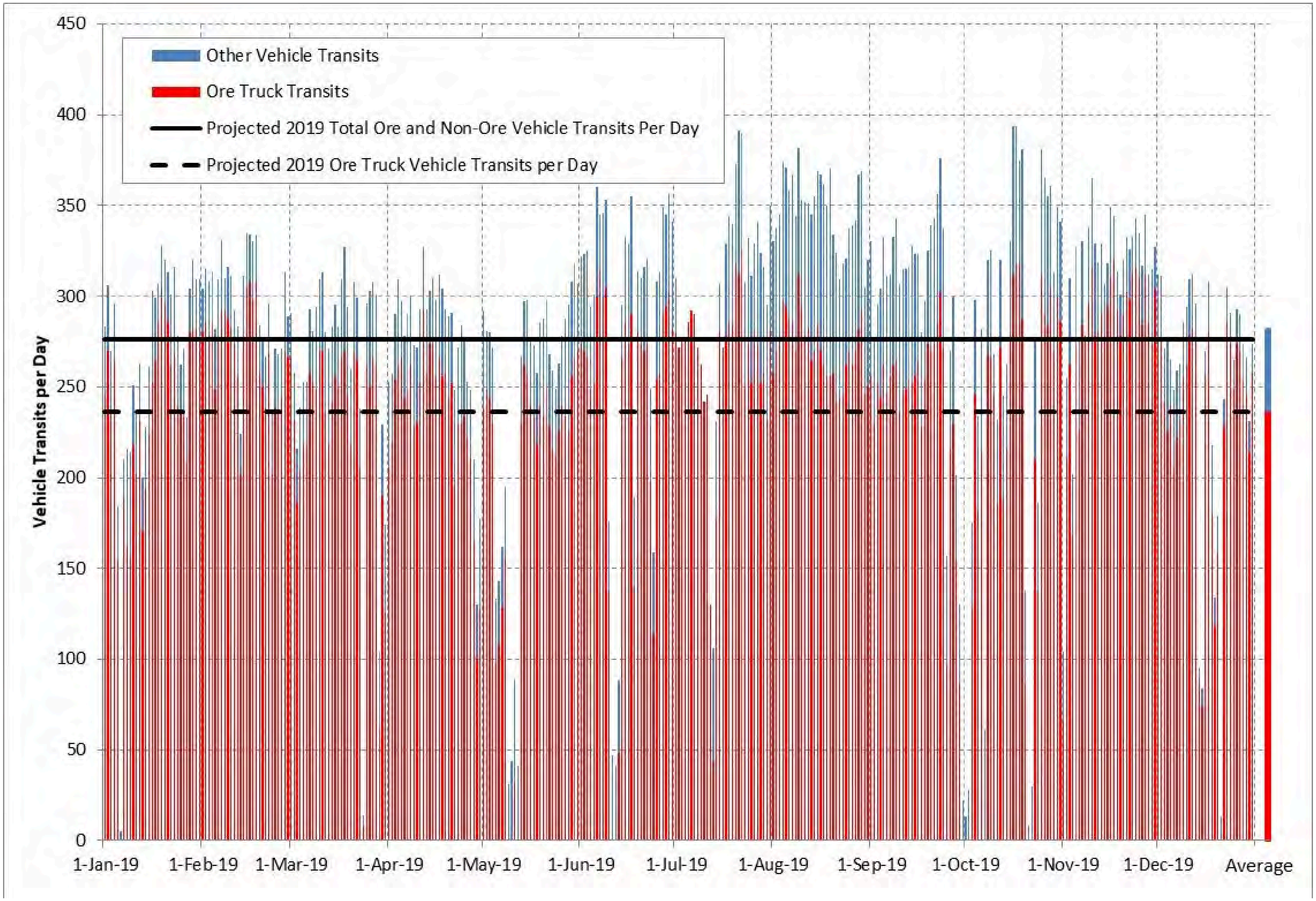


Figure 3-1 Vehicle transits per day on the Tote Road, including both full ore trucks (red), and all other traffic (blue) through 2019.

Also included is the projected maximum number of vehicle passes per day on the Tote Road, and the projected maximum number of Ore Haul Trucks per day on the Tote Road.

3.2.1.3 Dustfall Suppression and Mitigation in 2019

Baffinland is committed to controlling dust sources at the Project. Implementation and mitigation measures continued in 2019, including new crusher shrouding and enclosed chutes, road resurfacing, limiting speed and volume of vehicles on all roads, application of water and dust suppression substances, continued implementation of redesigned stockpile activities and layout at the Port, retrofitting existing dust suppressant equipment, and the removal of dust impacted snow at strategic locations at the Project. Additional shrouds were installed at the Mine Site crusher in 2019 and Baffinland is actively considering and/or implementing new methods through reengineering of equipment designs to minimize dust generation.

Calcium chloride and water were also been applied on road surfaces throughout operations to mitigate dust emissions. Based on feedback received from communities, the QIA and other regulators, in 2019 Baffinland also actioned a trial of Dust Stop® (Photo 2). Results of the micro-trial indicated that Dust Stop® is a successful and feasible alternative for dust management along Project roads. Baffinland has an available 720 totes (1,000 L) of Dust Stop® on site, which will be applied in spring of 2020 with fresh gravel. Results indicate that it will remain in place for most of the summer season, assuming routine maintenance after initial application. An additional order will be made for resupply on the 2020 sealift pending ongoing review of effectiveness.

Photo 3-2 Dust Stop® application to the Tote Road, 2019.

3.2.2 MAGNITUDE AND EXTENT OF 2019 DUSTFALL

Mine Site — The 2019 monitoring program included nine dustfall samplers associated with the Mine Site: three within the mine footprint (Near sites), four outside the mine footprint but within the 5,000 m buffer (Far sites), and two Reference sites located more than 5,000 m from the Mine Site (Table 3-1). Dustfall deposition rates at sample site DF-M-01, located near the airstrip (Map 1), ranged from 0.19 mg/dm²·day in June 2019 to a high of 3.33 mg/dm²·day in March 2019 (Table 3-4). At DF-M-02, located nearest the crusher, the dust deposition rates ranged from 0.21 mg/dm²·day (Oct/Nov 2019) to 9.92 mg/dm²·day in March 2019. At site DF-M-03, located just south of the mine haul road, the dustfall deposition rates ranged from 0.33 mg/dm²·day in December 2019 to a high of 7.37 mg/dm²·day, measured in March 2019.

Sites DF-M-06, -07, -08, and -09, located outside the PDA, but within a 5,000 m radius, were sampled only during the summer months (June, July, and August). Dustfall sampled at these stations was low, ranging from below detection (<0.10 mg/dm²·day) to a high of 0.23 mg/dm²·day, in August 2019 at DF-M-06 (Table 3-4). Dustfall deposition rates at both Mine Site reference locations (DF-M-04 and DF-M-05) were below detection (<0.10 mg/dm²·day) in all samples collected (also sampled only during summer months).

Dustfall was significantly higher in the Near monitoring sites when compared with Far and Reference monitors ($p < 0.001$; Figure 3-3 and Figure 3-4). Median daily dustfall was highest in the Near distance class at 0.9 mg/dm²·day (Interquartile Range [IQR] = 0.6 – 1.5 mg/dm²·day), which was significantly higher than the other two distances classes (all $p < 0.001$). Six samples (38%) in the Far distance class were above the detection limit (0.10 mg/dm²·day), and the maximum daily dustfall recorded at Far sites was 0.23 mg/dm²·day. No samples in the Reference distance class were above the detection limit (0.10 mg/dm²·day).

Milne Port — Six dustfall samplers were associated with Milne Port in 2019 (Table 3-1; Map 1); five active sites on the port footprint; DF-P-05 replaced DF-P-02 and one Reference site located northeast of the Port Site. In mid-2019 site DF-P-01 was replaced by DF-P-08; this site was relocated to accommodate the expansion of Project Infrastructure in this area. Site DF-P-08 will continue to be the dustfall monitor closest to the ore pad; however lower dustfall deposition was expected in 2019 while the ore pad expansion was being commissioned.

Dustfall deposition rates at Milne Port were highest at DF-P-05, located centrally in the camp area, near the sealift staging pad, where dustfall ranged from 0.51 mg/dm²·day (December 2019) to 6.78 mg/dm²·day in August 2019 (Figure 3-2). Dustfall deposition was similar at DF-P-01, nearest the ore pad, which ranged from 2.83 mg/dm²·day to 6.77 mg/dm²·day (Table 3-4). Dustfall monitoring location DF-P-01 was relocated in June 2019; dustfall at DF-P-08 ranged from 0.23 to 2.30 mg/dm²·day.

Dustfall at DF-P-07, near to the ore pad, had dustfall that ranged from below detection (<0.10 mg/dm²·day) to 2.26 mg/dm²·day. Dustfall deposition rates at DF-P-06, nearest to the sealift staging pad, but on the other side from DF-P-05, ranged from 0.10 mg/dm²·day to a high of 0.60 mg/dm²·day. Dustfall deposition rates at DF-P-04, mostly associated with the Tote Road and quarry operations, ranged from below detection to 1.14 mg/dm²·day. Dustfall deposition rates at the Milne Port Reference site, DF-03-P, which was sampled only in summer months were below detection in all samples.

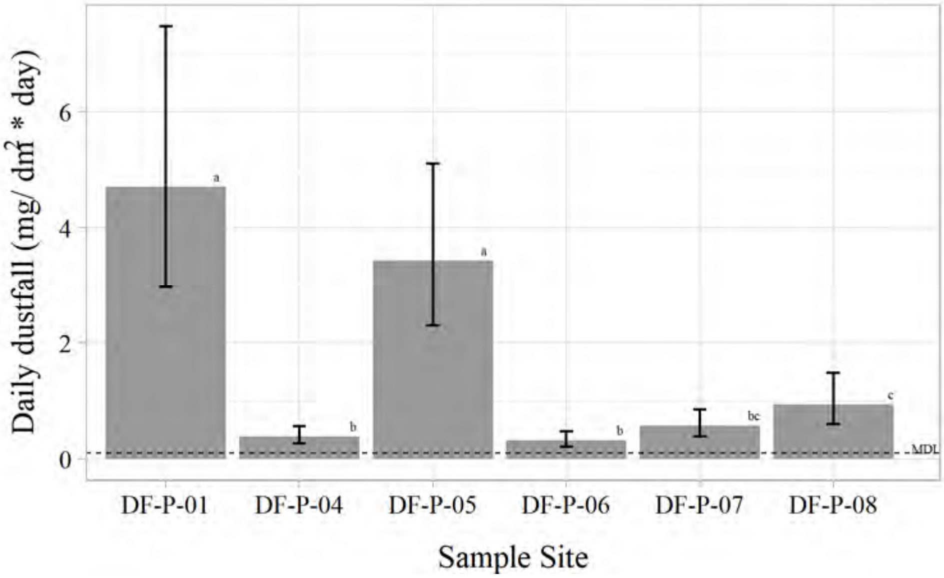


Figure 3-2 Median daily dustfall (mg/dm²·day) for Milne Port Sites.
Bar heights show median daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analysed on the log scale and back transformed to the natural scale. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project.

Tote Road Dustfall — Twenty-four dustfall monitors were associated with the Tote Road in 2019: eight at each of two transects perpendicular to the road (the North crossing site at km 27 of the Tote Road, and South crossing site at km 78 of the Tote Road), two Reference samplers located approximately 14,000 m from the road, and three pairs of two sites located at 1,000 m distance from the road on each side at kilometre marking 25, 56 and 75. These six paired sites were added in 2019 to increase monitoring of dustfall at 1,000 m distance from the PDA along the Tote Road.

North Crossing, Tote Road km 28 — Dustfall was highest at the sample stations nearest the centerline on both sides of the Tote Road (DF-RN-04 and -05) with dustfall that ranged from 0.56 to 10.00 mg/dm²·day at DF-RN-04 and from 0.45 to 10.30 mg/dm²·day at DF-RN-05. Dustfall decreased with distance from the centerline, and dustfall at DF-RN-03 and DF-RN-06 ranged from 0.17 to 3.50 mg/dm²·day, and from 0.30 to 4.87 mg/dm²·day, respectively. Dustfall in monitors at 1,000 m distance from the PDA (DF-RN-02 and -07) measured dustfall deposition that ranged from below detection to 0.25 mg/dm²·day, and below detection to 0.51 mg/dm²·day, respectively. Dustfall deposition data collected during the summer season at the farthest sites (DF-RN-01 and -08) were below laboratory detection, <0.10 mg/dm²·day (Table 3-4).

At the North Crossing, dustfall decreased with increasing distance from the road ($p < 0.001$; Figure 3-3). Data analysis also suggested an effect of distance from the north road on daily dustfall ($p < 0.001$; Figure 3-3). Median daily dustfall was highest in the 30 m distance class at 5.2 mg/dm²·day (IQR = 2.5 –

8.1 mg/dm^2·day), which was significantly higher than all other distances classes (all $p < 0.003$). Daily dustfall in the 100 m distance class was 2.10 mg/dm^2·day (IQR = 1.1 – 3.2 mg/dm^2·day), which was significantly higher than the two farther distance classes (all $p < 0.001$). A significant difference existed in dustfall between the 1,000 m and 5,000 m distance classes ($p = 0.009$). Median daily dustfall in the 1,000 m distance class was 0.20 mg/dm^2·day (IQR = 0.1 – 0.3 mg/dm^2·day); 62.5% of all samples were above the detection limit and maximum daily dustfall among these sites was 0.51 mg/dm^2·day. None of the samples at the 5,000 m distance class were above the detection limit of 0.10 mg/dm^2·day.

South Crossing, Tote Road km 78 — Dustfall was highest at the sample station nearest the centerline on the south side of the Tote Road (DF-RS-04) with dustfall that ranged from 0.55 to 53.30 mg/dm^2·day. On the north side of the road (DF-RS-05), the dustfall ranged from 0.45 to 62.50 mg/dm^2·day; elevated dustfall is not generally noted on the northwest side of the Tote Road and may have been associated with a number of days during the summer months when winds were observed to be unseasonably calm, minimizing dust from being blown and deposited on the southwest side. Dustfall decreased with distance from the centerline, and dustfall at DF-RS-03 and DF-RS-06 ranged from 0.13 to 7.22 mg/dm^2·day and from 0.17 to 9.21 mg/dm^2·day, respectively. Dustfall in monitors at 1,000 m distance from the PDA (DF-RS-02 and -07) measured dustfall deposition that ranged from below detection to 0.95 mg/dm^2·day, and below detection to 0.32 mg/dm^2·day, respectively. Dustfall deposition data collected during the summer season at the farthest sites (DF-RN-01 and -08) were all below laboratory detection, 0.10 mg/dm^2·day (Table 3-4). The south crossing monitoring stations are in a wide valley where high winds are common; they are also just north of a bridge crossing. As vehicles exit the bridge they accelerate, which results in increased dust production. Therefore, dustfall at the south crossing is generally higher than at other monitoring locations along the Tote Road.

As seen at the North crossing, dustfall at the South crossing decreased significantly with increasing distance from the Tote Road centerline ($p < 0.001$; Figure 3-4). There was strong evidence of an effect of distance from the south road on daily dustfall. Median daily dustfall was highest in the 30 m distance class at 23.70 mg/dm^2·day (IQR = 10.3 – 40.9 mg/dm^2·day); this was significantly higher than all other distances classes (all $p < 0.001$). Daily dustfall in the 100 m distance class was 2.70 mg/dm^2·day (IQR = 1.8 – 6.0 mg/dm^2·day), which was significantly higher than the two farther distance classes (all $p < 0.001$). There was also a significant difference in dustfall between the 1,000 m and 5,000 m distance classes ($p = 0.002$). Median daily dustfall in the 1,000 m distance class was 0.30 mg/dm^2·day (IQR = 0.1 – 0.4 mg/dm^2·day); 87.5% of all samples were above the detection limit and maximum daily dustfall among these sites was 0.95 mg/dm^2·day. None of the samples at the 5,000 m distance class were above the detection limit of 0.10 mg/dm^2·day.

Reference sites — Dustfall deposition rates at the two Tote Road reference sites (DF-RR-01 and DF-RR-02), which are sampled only in summer months were below lab detection in all samples (Table 3-4) and are not included in graphs such as Figure 3-3 and Figure 3-4.

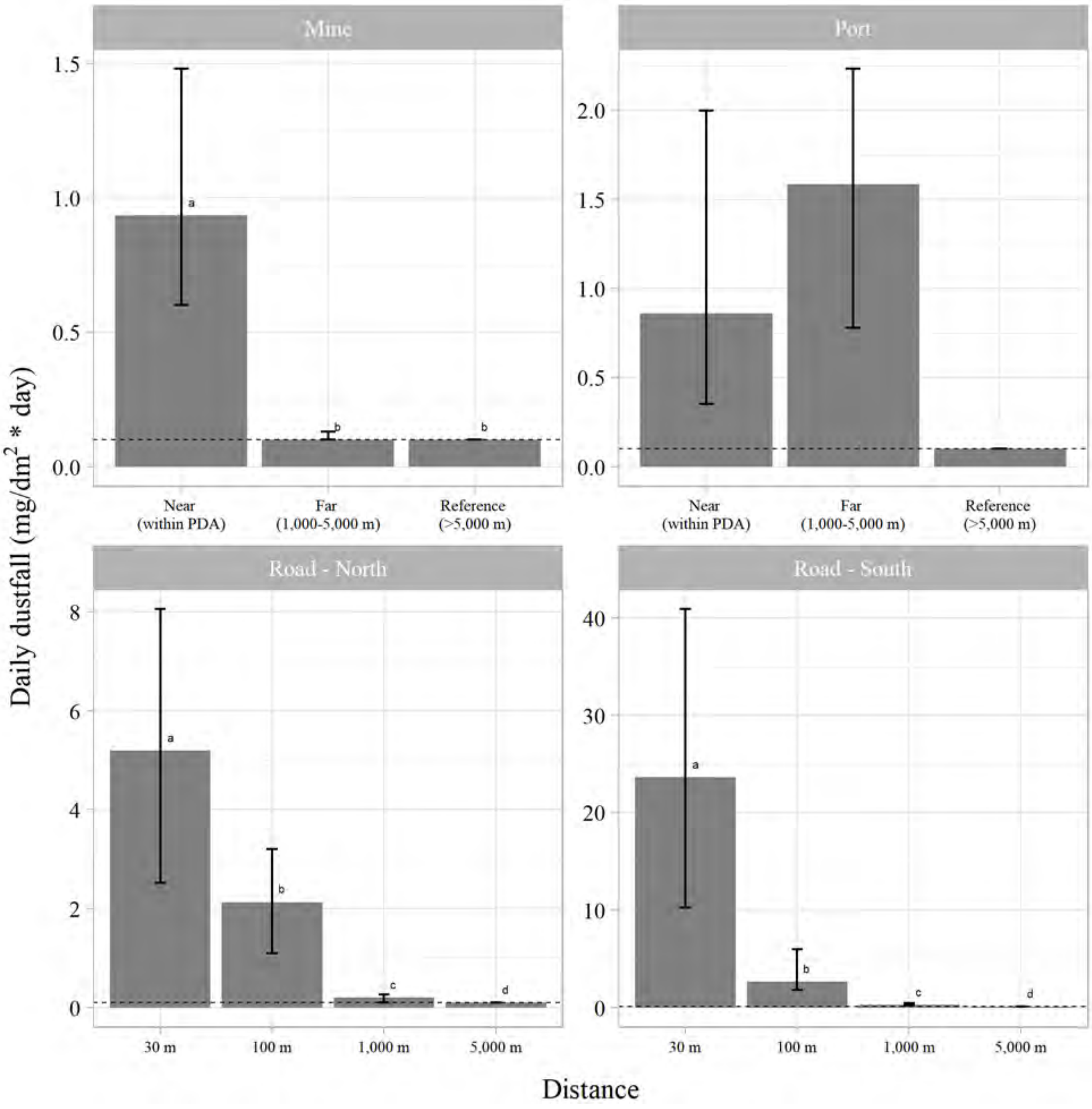


Figure 3-3 **Median daily dustfall (mg/dm²·day) for the Mine site, Milne Port, Tote Road north crossing (km 28), and Tote Road south crossing (km 78); Tote Road sites are measured as a function of distance from the Tote Road. Scales are different for each area to allow review of differences between the sites at each area.**

Bar heights show median daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analysed on the log scale and back transformed to the natural scale. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project.

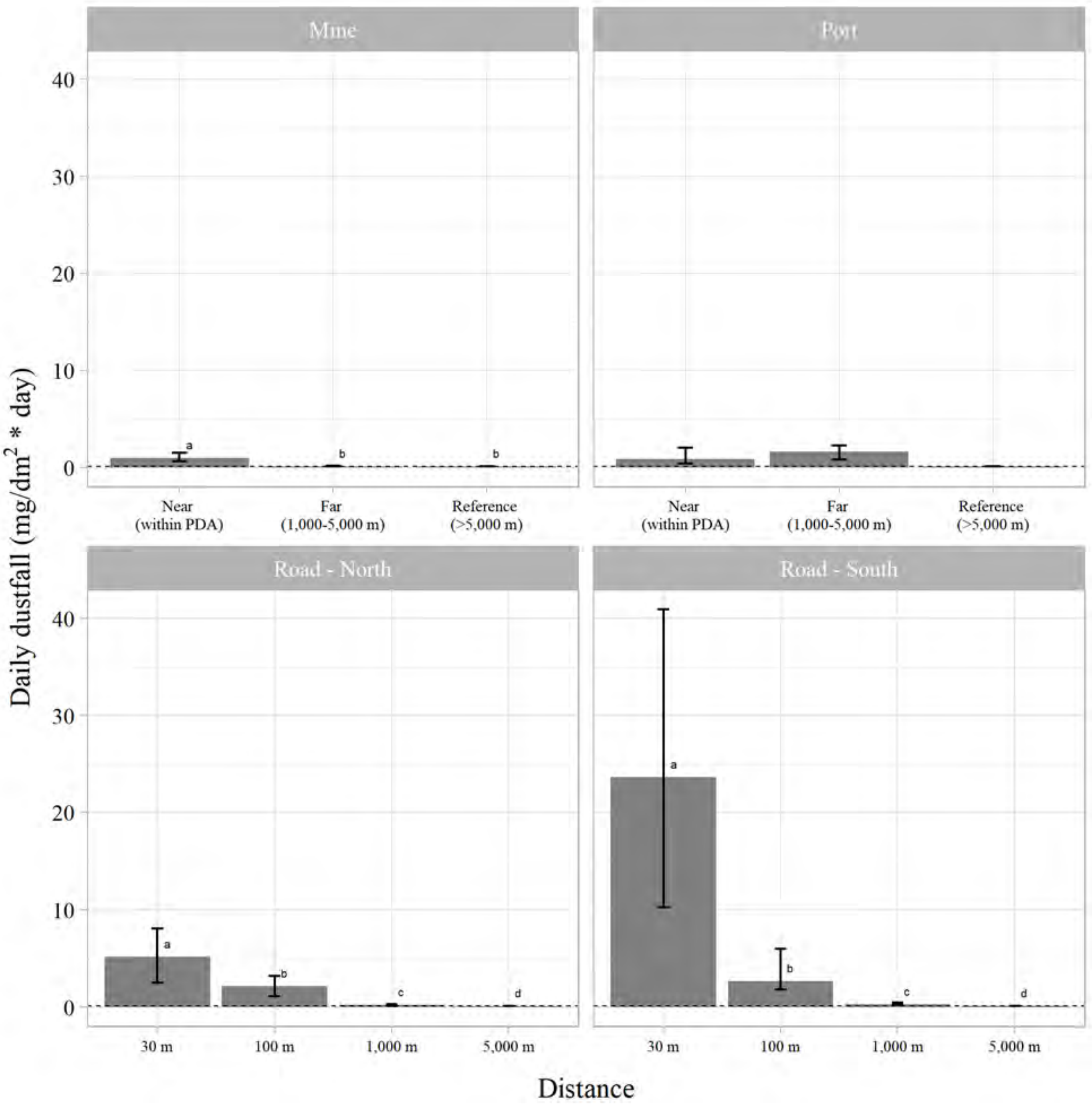


Figure 3-4 Median daily dustfall (mg/dm²·day) for the Mine site, Milne Port, Tote Road north crossing (km 28), and Tote Road south crossing (km 78); Tote Road sites are measured as a function of distance from the Tote Road. Scales are equal for each area to allow comparison of differences between each area.

Bar heights show median daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analysed on the log scale and back transformed to the natural scale. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project.

3.2.2.1 Dustfall at Sites 1,000 m Distant from Potential Development Area

Twelve dustfall monitoring sites were located at 1,000 m distance from the PDA; two of these were located at the Mine Site, and the other ten in various locations along the Tote Road. The two mine site collectors were sampled only during the summer period; however, the road sites were sampled throughout the year. Review of summer data for all sites indicated that little difference occurred in dustfall measured at sites located 1,000 m distant from the PDA in 2019; dustfall was consistently low in magnitude, ranging from less than laboratory detection (0.10 mg/dm²·day) to a high of 0.95 mg/dm²·day (measured in August/September at DF-RS-02; Table 3-4, Figure 3-5).

The highest dustfall among at the 1,000 m distance sites was at DF-RS-02, and the highest dustfall at this site occurred during the summer months. This site is in a wide valley, and often experiences high winds that can result in dustfall travelling long distances. Despite conditions conducive to dustfall transport, the median daily dustfall at this site was less than 0.50 mg/dm²·day during the summer months, and less than 0.3 mg/dm²·day when the full year of data was included; these dustfall amounts only slightly exceed the laboratory detection (0.10 mg/dm²·day). A review of year-round data indicates a decrease in both median dustfall and in dustfall variability (Figure 3-6).

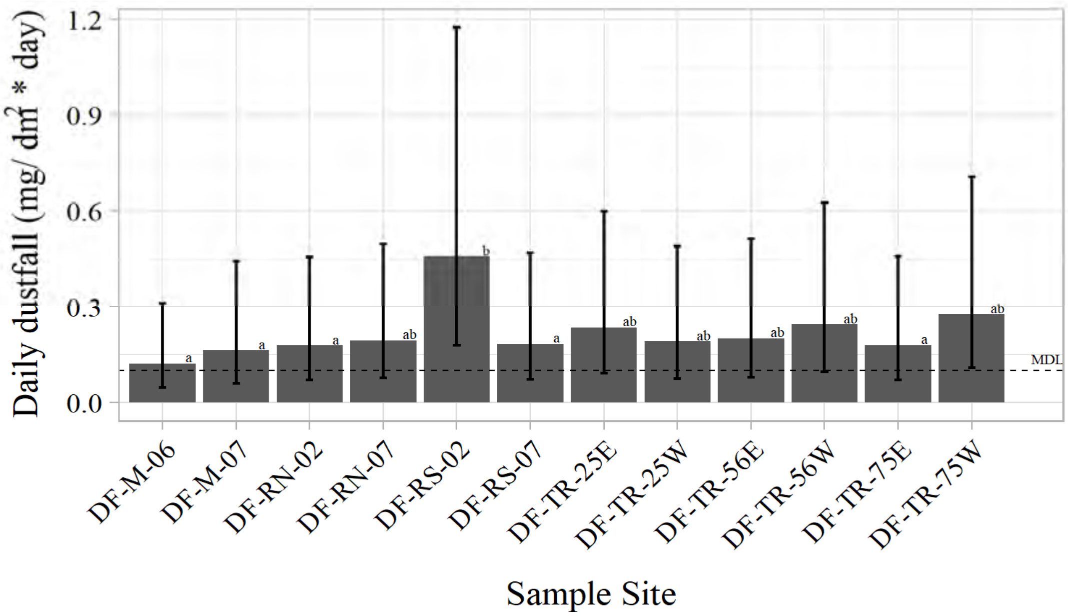


Figure 3-5 Median daily dustfall (mg/dm²·day) for all sites 1,000 m from project infrastructure during the summer season.

Bar heights show median daily dustfall with 95% confidence intervals. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project..

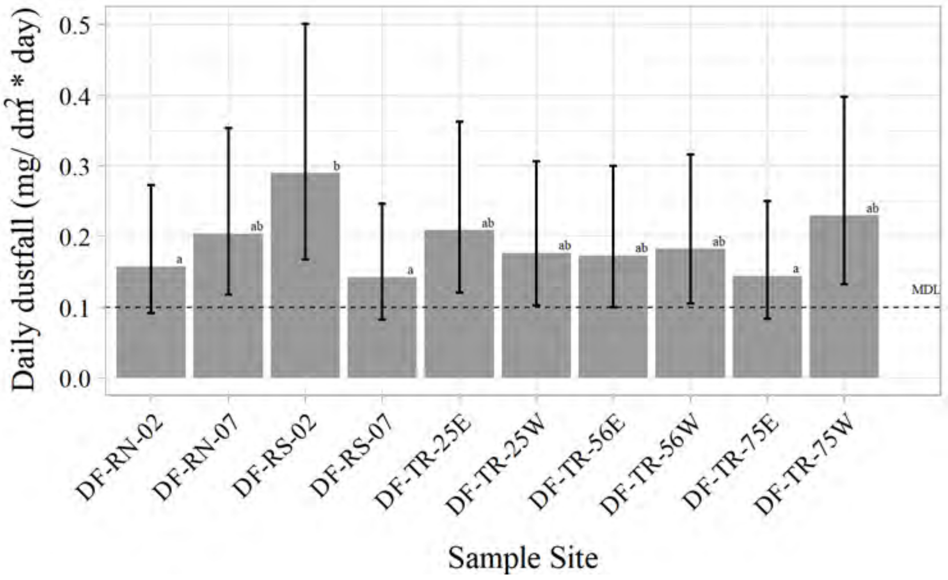


Figure 3-6 Median daily dustfall (mg/dm²·day) for all sites 1,000 m from the Tote Road using year-round data. *Bar heights show median daily dustfall with 95% confidence intervals. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project..*

Table 3-4 Dustfall, as total suspended particulates (TSP, mg/dm²·day), collected at all sample sites during the 2019 monitoring year.

Site Name	Sample Collection Timing													
	Jan 7 - Feb 4	Jan 27 - Feb 26	Feb 5 - Mar 4	Mar 5 - Apr 1	Apr 2 - Apr 30	May 1 - May 28	May 29 - Jun 25	Jun 26 - Jul 23	Jul 24 - Aug 20	Aug 21 - Sept 18	Sept 19 - Oct 16	Oct 17 - Nov 13	Nov 14 - Dec 12	Dec 12 - Jan 8	Jan 9 – Feb 8
DF-M-01	0.91	-	0.25	3.33	3.09	1.89	0.19	0.55	1.22	0.90	0.72	0.30	1.72	2.24	-
DF-M-02	2.48	-	2.12	9.92	-	1.70	0.23	1.10	0.97	0.62	0.52	0.21	1.95	0.73	-
DF-M-03	1.66	-	2.50	7.37	2.46	1.39	0.76	2.26	3.29	4.78	1.45	0.54	2.80	0.33	-
DF-M-04	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-M-05	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-M-06	-	-	-	-	-	-	<0.10	<0.10	0.23	<0.10	-	-	-	-	-
DF-M-07	-	-	-	-	-	-	<0.10	0.12	-	0.23	-	-	-	-	-
DF-M-08	-	-	-	-	-	-	<0.10	<0.10	0.11	<0.10	-	-	-	-	-
DF-M-09	-	-	-	-	-	-	<0.10	<0.10	0.14	0.18	-	-	-	-	-
DF-P-01/-08	2.83	-	3.36	5.67	6.77	4.50/0.56	0.23	2.21	2.30	0.96	0.47	0.29	0.51	-	-
DF-P-03	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-P-04	<0.10	-	0.13	0.29	0.57	0.41	0.55	1.14	1.00	0.66	0.26	0.98	0.13	0.10	-
DF-P-05	1.78	-	3.36	3.24	4.03	2.33	1.91	6.78	5.98	4.11	2.42	2.24	1.25	0.51	-
DF-P-06	0.25	-	0.56	0.49	0.60	0.16	0.33	0.36	0.28	0.19	0.22	0.50	0.28	0.10	-
DF-P-07	1.60	-	0.94	1.37	0.71	<0.10	0.14	0.72	1.32	2.26	0.55	0.21	0.15	0.14	-
DF-RN-01	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	0.20	-
DF-RN-02	-	<0.10	-	-	-	-	<0.10	0.25	0.24	0.17	<0.10 [1]	<0.10 [1]	<0.10 [1]	<0.10 [1]	<0.10 [1]
DF-RN-03	0.24	-	0.53	0.57	0.45	2.31	0.17	3.50	3.09	1.40	0.98	0.39	0.45	0.47	-
DF-RN-04	0.62	-	0.56	0.86	1.10	7.23	0.72	10.00	7.41	2.61	2.48	0.72	1.00	0.58	-
DF-RN-05	0.64	-	1.15	1.40	2.12	7.42	2.20	7.38	10.30	3.00	3.04	0.92	1.69	0.45	-
DF-RN-06	0.30	-	0.64	0.98	1.18	3.76	0.66	2.87	4.87	1.25	1.07	0.46	1.02	-	-
DF-RN-07	-	<0.10	-	0.44	<0.10	0.42	<0.10	0.31	0.51	<0.10	<0.10 [1]	<0.10 [1]	<0.10 [1]	<0.10 [1]	<0.10 [1]
DF-RN-08	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-RS-01	-	-	-	-	-	-	<0.10	<0.10	<0.10	0.10	-	-	-	-	-
DF-RS-02	-	<0.10	-	0.20	0.13	0.53	0.20	0.34	0.95	0.68	<0.10 [1]	<0.10 [1]	<0.10 [1]	<0.10 [1]	<0.10 [1]
DF-RS-03	0.20	-	0.43	0.73	0.91	4.20	1.65	2.47	7.22	2.88	0.91	0.13	0.40	0.16	-
DF–RS-04	0.97	-	2.13	2.64	3.80	13.10	8.77	28.20	53.30	19.10	4.21	0.64	2.23	0.55	-
DF-RS-05	0.72	-	1.54	1.69	2.69	45.30	5.92	36.80	62.50	10.80	2.74	0.47	0.48	0.45	-

Table 3-4 Dustfall, as total suspended particulates (TSP, $\mathrm{mg/dm^2 \cdot day}$), collected at all sample sites during the 2019 monitoring year.

Site Name	Sample Collection Timing														
	Jan 7 - Feb 4	Jan 27 - Feb 26	Feb 5 - Mar 4	Mar 5 - Apr 1	Apr 2 - Apr 30	May 1 - May 28	May 29 - Jun 25	Jun 26 - Jul 23	Jul 24 - Aug 20	Aug 21 - Sept 18	Sept 19 - Oct 16	Oct 17 - Nov 13	Nov 14 - Dec 12	Dec 12 - Jan 8	Jan 9 – Feb 8
DF-RS-06	0.23		0.27	0.53	0.69	3.94	1.32	5.54	9.21	1.80	0.83	0.17	1.83	0.32	-
DF-RS-07	-	<0.10	-	0.10	<0.10	0.18	<0.10	0.16	0.32	0.22	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]
DF-RS-08	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-RR-01	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-RR-02	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-
DF-TR-25E	-	<0.10	-	0.28	<0.10	0.35	<0.10	0.30	0.43	0.24	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]
DF-TR-25W	-	<0.10	-	0.16	<0.10	0.33	<0.10	0.31	0.26	0.17	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]
DF-TR-56E	-	<0.10	-	<0.10	<0.10	0.34	0.10	0.21	0.37	0.21	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]
DF-TR-56W	-	<0.10	-	<0.10	<0.10	0.23	<0.10	0.34	0.24	0.43	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]
DF-TR-75E	-	<0.10	-	<0.10	<0.10	0.22	<0.10	0.22	0.22	0.21	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]
DF-TR-75W	-	<0.10	-	0.15	0.25	0.47	<0.10	0.22	0.37	0.69	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]	<0.10[1]

[1] Data collected from DF-RS-02, -07, DF-RN-02, -07, DF-TR-25E, -25W, DF-TR-56E, -56W, DF-TR-75E, and-75W collected from September 19, 2019 through February 4, 2020 is based on one sample collection vessel that remained in place for 139 days due to safety considerations associated with visiting the sites during the shoulder season.

3.2.3 SEASONAL COMPARISONS OF 2019 DUSTFALL

Seasonal variations in dustfall in all Project areas were investigated as per the dustfall monitoring objectives.

Mine Site — Significant evidence existed of an interaction between season and sample site for the Mine Sites (p = 0.01), indicating that the effect of season on dustfall differed among sample sites in the Mine Site area (Figure 3-7 and Figure 3-8). At DF-M-01 and DF-M-03, no difference occurred in dustfall between summer and winter (DF-M-01: p = 0.19, DF-M-03: p = 0.41). In general, mine activities and air transport are year-round activities with few seasonal changes; camps are open year-round, and mining and crushing activities continue through both winter and summer seasons. At DF-M-02, which is located near the crusher, there was weak evidence that median dustfall was 2.6 times higher in winter than in summer (p = 0.10) (Confidence Interval [CI] = 0.9 – 7.8); this could be due to high winds during the winter season. Baffinland also installed additional shrouds at the crusher prior to the summer months, which may have reduced summer deposition rates.

Milne Port — Dustfall at all port sites did not respond equally to seasonal effects (p = 0.07). Summer dustfall at DF-P-04 was 2.6 times higher than winter dustfall (p = 0.05) (CI = 1.0 – 6.6). DF-P-04 is located close to the roadway and is likely affected by vehicle-caused dust during the dry summer months. Evidence suggested that summer dustfall at DF-P-05 was 2.3 times higher than winter dustfall (p = 0.08) (CI = 0.9 – 6.0), this summer increase is likely associated with warmer, drier summer conditions (Figure 3-7 and Figure 3-8).

In summer, dustfall at DF-P-05 was significantly higher than at all other Port sites: 7.9 times higher than DF-P-04 (p < 0.001) (CI = 3.7 – 17.1), 18.3 times higher than DF-P-06 (p < 0.001) (CI = 9.8 – 34.3), and 6.8 times higher than DF-P-07 (p < 0.001) (CI = 3.3 –14.2). Evidence suggested that DF-P-04 was 2.3 times higher than DF-P-06 (p = 0.06) (CI = 1.2 – 4.3) and DF-P-07 was 2.7 times higher than DF-P-06 (p = 0.08) (CI = 1.2 – 5.9).

In winter, dustfall continued to be highest at DF-P-05; this site is in the center of the Milne Port camp and is impacted by light traffic activities throughout the winter months. Further, dust suppression of roads in the camp area cannot occur during winter months because of icing and associated safety concerns. Winter dustfall at DF-P-05 was 8.8 times higher than DF-P-04 (p < 0.001) (CI = 5.4 – 14.5), 8.0 times higher than DF-P-06 (p < 0.001) (CI = 5.2 – 12.2), and 5.7 times higher than DF-P-07 (p = 0.001) (CI = 3.6 – 9.2). There was no evidence of differences in winter dustfall among DF-P-04, DF-P-06, and DF-P-07 (all p > 0.32). DF-P-04 likely receives less winter dust because road-sourced dust decreases during the winter months. DF-P-06 sees less winter dust because the sealift area is not active.

Seasonal effects at DF-P-01 and DF-P-08 were not evaluated because site DF-P-01 was relocated at the start of the summer season. Therefore, DF-P-01, which was closer to the existing ore pads and measured higher dustfall, would have represented the winter months, and DF-P-08, which is located farther away to allow for ore pad expansion, with lower dustfall, would have represented the summer period.

North Crossing, Tote Road km 28 — At each site along the north crossing transect, median dustfall was higher in summer than in winter; the median dustfall across all sites was 2.8 (CI = 1.1 – 7.4) times higher in summer than in winter, however, there was no statistical evidence of seasonal differences in dustfall for the north road sites (p = 0.18; Figure 3-7 and Figure 3-8). Dust suppression via water dispersion on the roadbed occurs during the summer, months, however, during time periods with little precipitation the roadbed does dry between suppression events, resulting in dust creation and deposition. During winter months the roadbed produces less dust.

South Crossing, Tote Road km 78 — There was evidence suggesting an interaction between sample site and season for the south road sampling area (p = 0.07; Figure 3-7 and Figure 3-8). This interaction occurred because the variation in dustfall among sites were larger in summer than in winter. As at the north crossing, dust suppression via water dispersion on the roadbed occurs during the summer months. However, there is still increased dust during dry summer conditions, resulting in higher dustfall near the road centerline. Dustfall measured at greater distances is less affected, resulting in the increased variation in dustfall during summer months.

In summer, dustfall at DF-RS-04 and DF-RS-05, which are closer to the Tote Road (30 m distant) was significantly higher than dustfall at DF-RS-03 and DF-RS-06, which are located at 100 m distant from the road. There was no difference between DF-RS-04 and DF-RS-05 (p = 0.99) or between DF-RS-03 and DF-RS-06 (p = 0.97) indicating that there was little effect of wind direction on dust dispersion in the area of the south crossing in 2019.

In winter, dustfall at DF-RS-04 and DF-RS-05 was significantly higher than dustfall at DF-RS-03 and DF-RS-06, again, due to distance from the centerline. There was weak evidence that DF-RS-04 was 1.6 (CI = 1.1 – 2.3) times higher than DF-RS-05 (p = 0.09). There was no difference between DF-RS-03 and DF-RS-06 (p = 0.99).

Many sites recorded higher dustfall in the summer when compared with winter months. At DF-RS-04, summer dustfall was 9.4 times higher than in winter (p = 0.03) (CI = 2.4 – 37.3). At DF-RS-05, summer dustfall was 13.1 times higher than in winter (p = 0.006) (CI = 3.3 – 52.2). At DF-RS-06, summer dustfall was 6.3 times higher than in winter (p = 0.002) (CI = 1.6 – 25.0). At DF-RS-03, summer dustfall was 5.4 times higher than in winter (p = 0.02) (CI = 1.4 – 21.2). Previous years' data indicates that summer dustfall is affected by climate conditions; cool, rainy summers result in lower dustfall along the Tote Road, while dry, warm summers result in increased dustfall. Winter dustfall is less affected by climate. Additionally, the south crossing dustfall monitoring locations are in a wide valley that often sees gusting winds. Furthermore, because road conditions are better, there is a slight increase in the amount of vehicle transits during the summer months, and less chance of a road closure due to weather conditions.

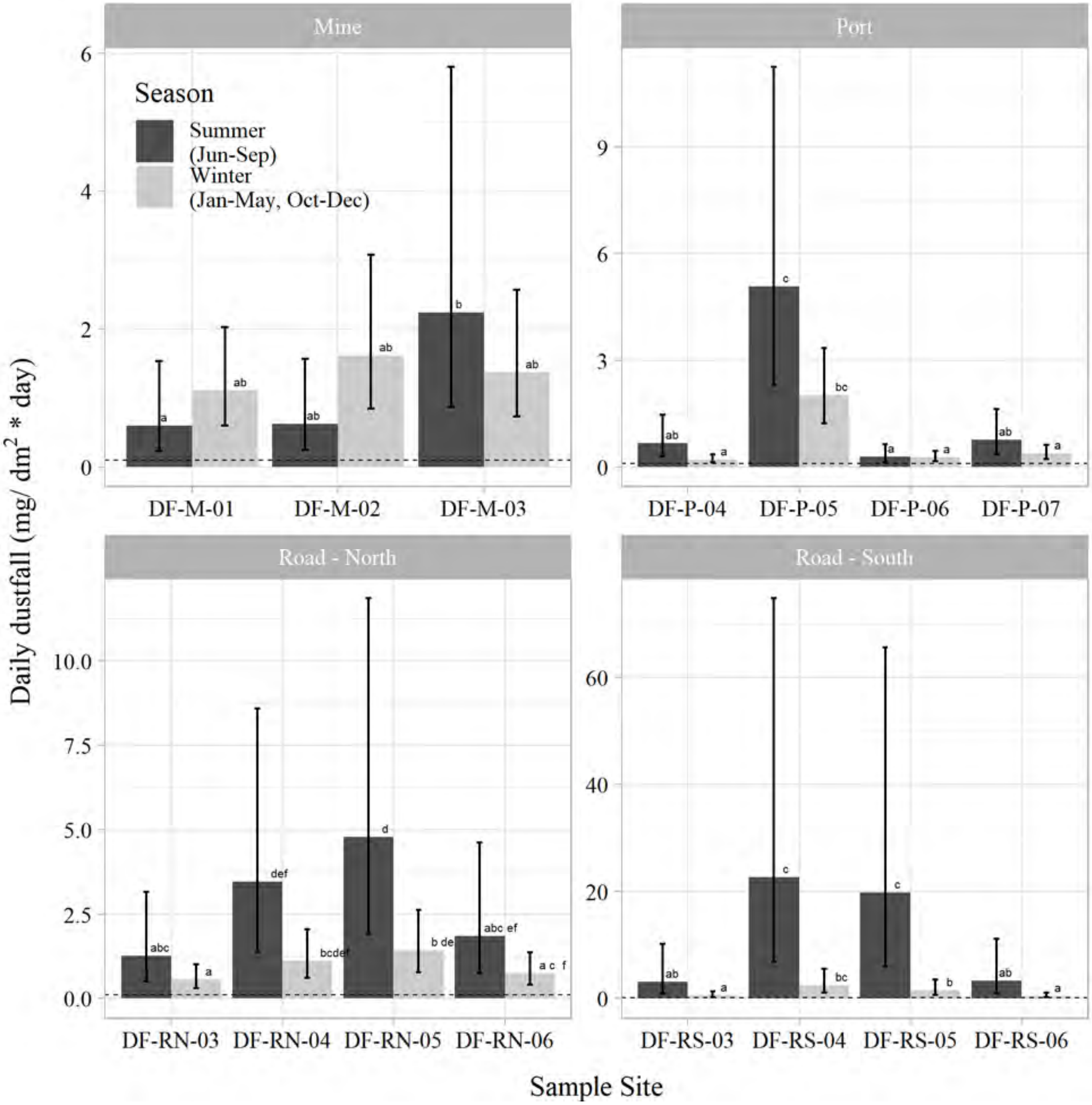


Figure 3-7 **Median daily dustfall (mg/dm²·day) by site and season for the Mine site, Milne Port, Tote Road north crossing (km 28), and Tote Road south crossing (km 78). Scales are different for each area to allow review of differences between the sites at each area.**

Bar heights show median daily dustfall with 95% confidence intervals. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project. Confidence intervals are asymmetrical because dust data were analysed on the log scale and back transformed to the natural scale.

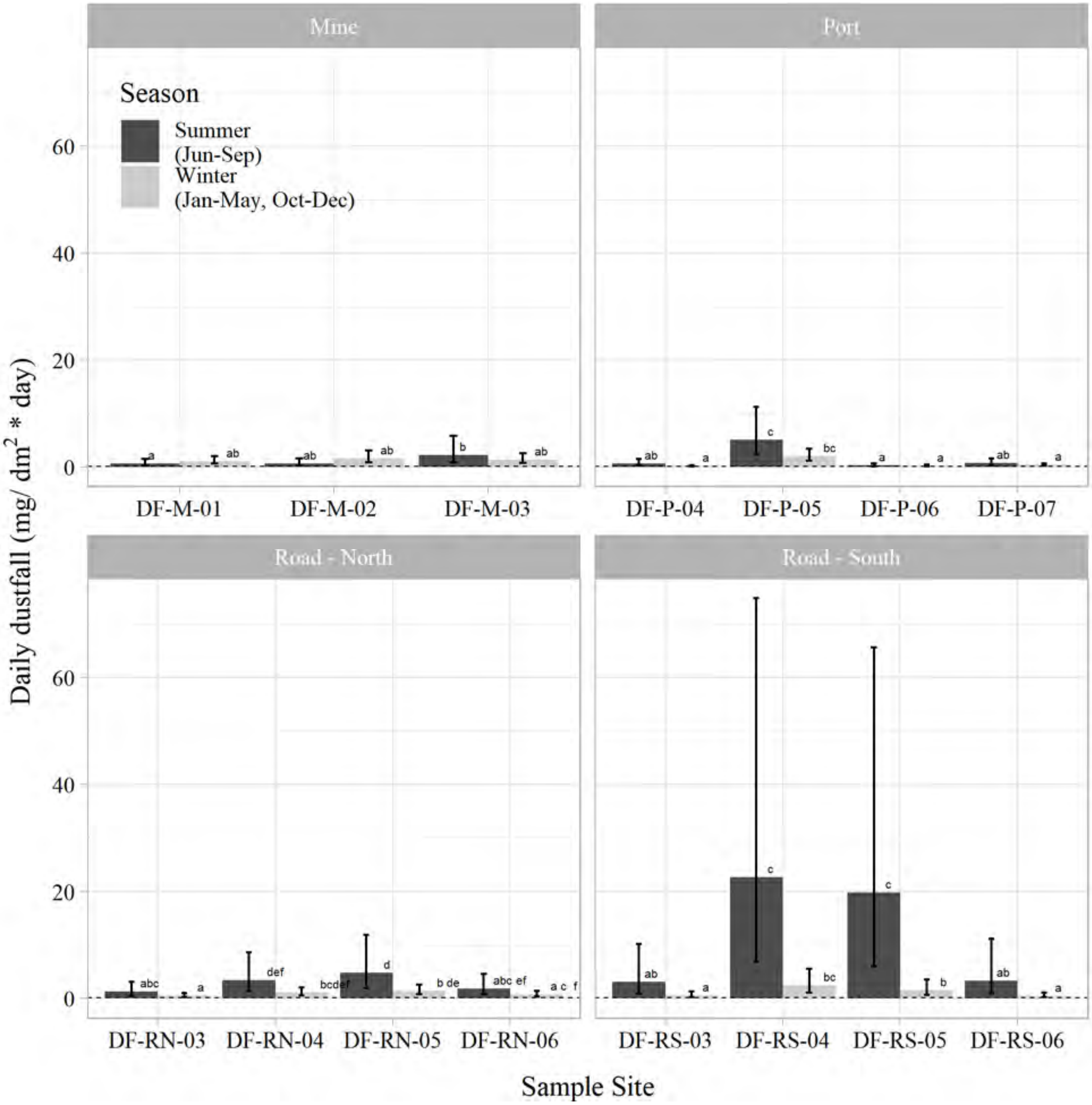


Figure 3-8 Median daily dustfall (mg/dm²·day) by site and season for the Mine site, Milne Port, Tote Road north crossing (km 28), and Tote Road south crossing (km 78). Scales are the same for each area to comparisons between all sites/areas.

Bar heights show median daily dustfall with 95% confidence intervals. The dashed horizontal line indicates the minimum detection limit (MDL) for dust samples, and the maximum dustfall rate at reference sites unaffected by the project. Confidence intervals are asymmetrical because dust data were analysed on the log scale and back transformed to the natural scale.

3.2.4 2019 ANNUAL DUSTFALL

Total annual dustfall was calculated for all sites that were sampled year-round for the 2019 calendar year. Sites in the nil and low isopleth zones were not sampled during winter months when helicopter access was unavailable; therefore, annual accumulation was not estimated for these sites. However, very low dustfall accumulation, generally below laboratory detection, was observed at these sites during the summer months and it can be reasonably assumed that this was likely the case in winter months as well.

Annual dustfall in samplers at the Mine Site were all predicted to be in the 'high' isopleth (≥50 g/m²/year). The highest dustfall was noted at site DF-M-03 (85.66 g/m²/year), followed by DF-M-02 (66.52 g/m²/year), and DF-M-01 (49.19 g/m²/year) (Table 3-5, Figure 3-9).

Year-round dustfall samplers at Milne Port Sites DF-P-01 and -05 had annual dustfall deposition rates that were greater than 50 g/m²/year, which differs from predictions that expected it would fall into the moderate isopleth. The total annual deposition rate at DF-P-01/08 and -05 were 78.09 g/m²/year and 113.44 g/m²/year, respectively (Table 3-5). Annual dustfall from Milne Port Sites DF-P-04, -06 and -07 all fell into the moderate isopleth with annual dustfall rates of 17.68, 12.10 and 29.20 g/m²/year, respectively; however, DF-P-04 and -06 were modelled to be in the low isopleth range (Figure 3-9).

Annual dustfall at the north and south Tote Road crossing locations within 30 m of the road centerline fell within the high isopleth, though they were modelled to fall into the moderate isopleth range (Table 3-5; Figure 3-9). However, while dustfall at the southern road crossing measured at 100 m from the centerline exceeded the moderate isopleth range, dustfall at the northern road crossing measured at 100 m from the centerline was within the predicted moderate isopleth.

Annual dustfall at all ten Tote Road monitors located 1,000 m from the road centerline fell just above the 'low' isopleth threshold of 4.5 g/m²/year. Annual dustfall at these sites ranged from 5.06 to 10.24 g/m²/year, with the highest annual dustfall of the 1,000 m sites recorded at DF-RS-02 (Figure 3-10 and Table 3-5).

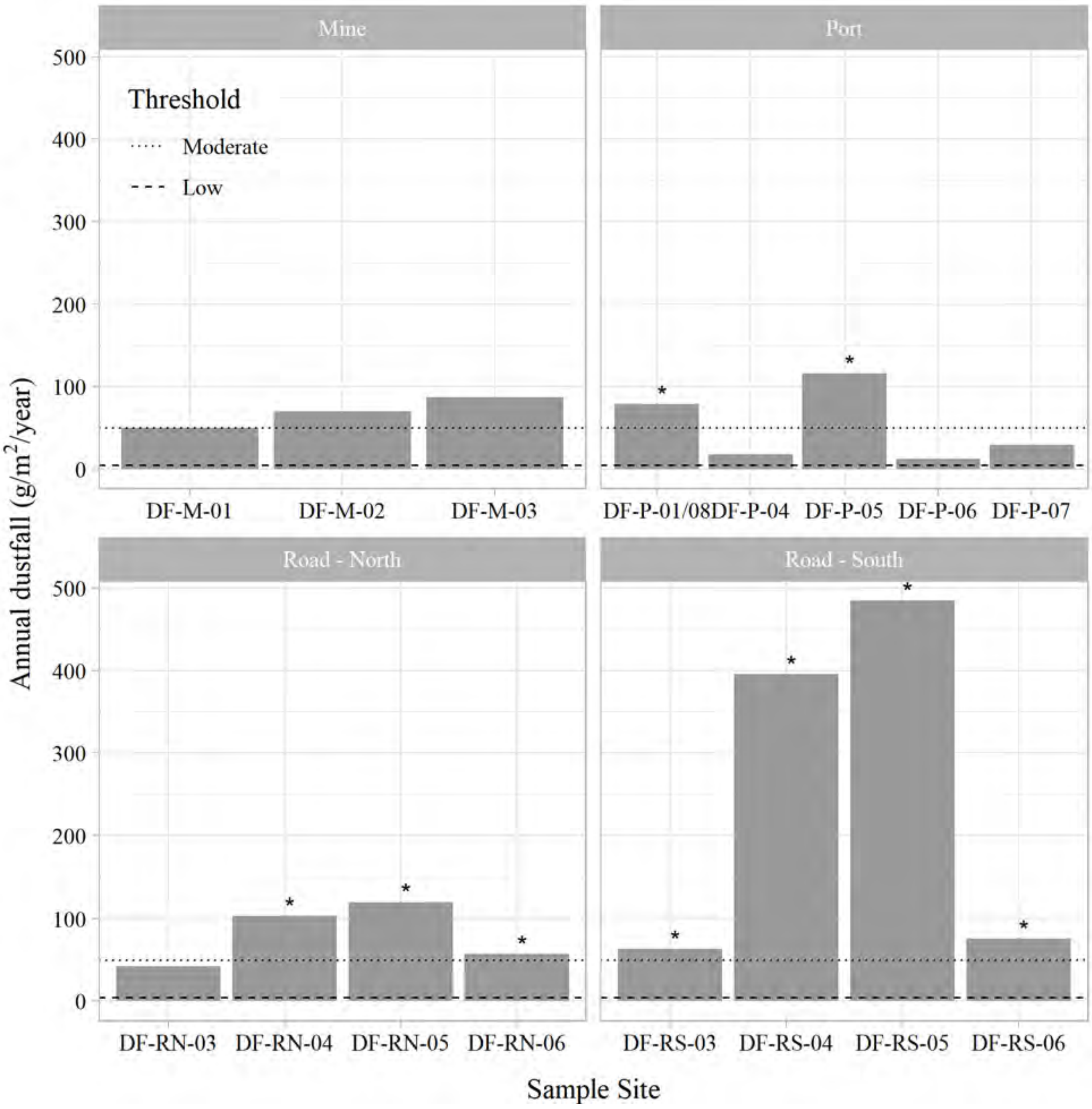


Figure 3-9 **Annual dustfall (g/m²/year) for stations sampled year-round at the Mine site, Milne Port, Tote Road north crossing (km 28), and Tote Road south crossing (km 78).**

Dashed horizontal lines show low, moderate, and high dust isopleth upper limits. The asterisk (*) denotes that the annual dustfall was greater than projected by the predicted isopleth.

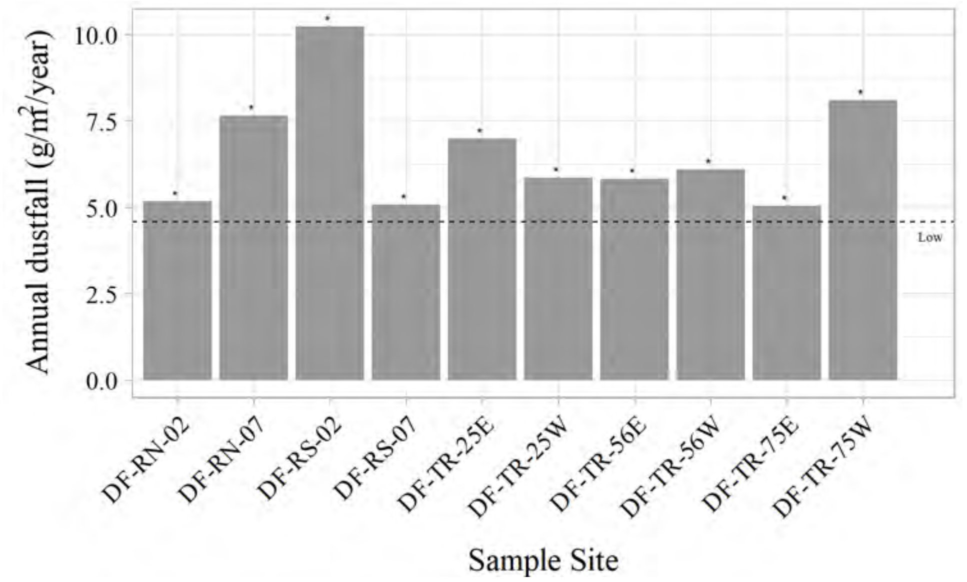


Figure 3-10 Total Annual dustfall (g/m^2/year) at Tote Road sites located 1,000 m distant from the centreline. *Dashed horizontal lines show low, moderate, and high dust isopleth upper limits. The asterisk (*) denotes that the annual dustfall was greater than projected by the predicted isopleth.*

Table 3-5 Annual dustfall accumulation for sites sampled throughout 2019. [1]

Site	Area	Distance from PDA	Predicted Range [2]	Isopleth Upper Limit	Annual Dustfall (g/m²/year)	EIS Prediction Comparison
DF-M-01	Mine Site	0	High	N/A [3]	49.19	Within prediction
DF-M-02	Mine Site	0	High	N/A	66.52	Within prediction
DF-M-03	Mine Site	0	High	N/A	85.66	Within prediction
DF-P-01/08	Milne Inlet Port	0	Moderate	50	78.09	Above prediction
DF-P-04	Milne Inlet Port	0	Low	4.5	17.68	Above prediction
DF-P-05	Milne Inlet Port	0	Moderate	50	113.44	Above prediction
DF-P-06	Milne Inlet Port	0	Low	4.5	12.10	Above prediction
DF-P-07	Milne Inlet Port	0	Moderate	50	29.20	Within prediction
DF-RN-02	Road North, km 28	1,000	Low	4.5	5.19	Above prediction
DF-RN-03	Road North, km 28	100	Moderate	50	62.24	Above prediction
DF-RN-04	Road North, km 28	30	Moderate	50	390.59	Above prediction
DF-RN-05	Road North, km 28	30	Moderate	50	480.41	Above prediction
DF-RN-06	Road North, km 28	100	Moderate	50	74.65	Above prediction
DF-RN-07	Road North, km 28	1,000	Low	4.5	7.66	Above prediction
DF-RS-02	Road South, km 78	1,000	Low	4.5	10.24	Above prediction
DF-RS-03	Road South, km 78	100	Moderate	50	41.14	Within prediction
DF-RS-04	Road South, km 78	30	Moderate	50	101.07	Above prediction
DF-RS-05	Road South, km 78	30	Moderate	50	117.52	Above prediction
DF-RS-06	Road South, km 78	100	Moderate	50	56.54	Above prediction
DF-RS-07	Road South, km 78	1,000	Low	4.5	5.09	Above prediction
DF-TR-25E	Tote Road, km 25	1,000	Low	4.5	7.00	Above prediction
DF-TR-25W	Tote Road, km 25	1,000	Low	4.5	5.87	Above prediction
DF-TR-56E	Tote Road, km 56	1,000	Low	4.5	5.83	Above prediction
DF-TR-56W	Tote Road, km 56	1,000	Low	4.5	6.11	Above prediction
DF-TR-75E	Tote Road, km 75	1,000	Low	4.5	5.06	Above prediction
DF-TR-75W	Tote Road, km 75	1,000	Low	4.5	8.11	Above prediction

[1] Annual accumulations are reported for the period 07 January 2019 to 8 January 2020, save for sites DF-RS-02, -07, DF-RN-02, -07, DF-TR-25E, -25W, DF-TR-56E, -56W, DF-TR-75E, and-75W, which were sampled from January 27, 2019 through February 4, 2020.

[2] Predictions based on pre-Project dust dispersion models.

[3] The 'high' range does not have an upper limit; sites modelled in the high category are predicted to have >50 g/m²/year of total suspended particulates (dustfall).

3.3 INTER-ANNUAL TRENDS

3.3.1 SEASONAL DUSTFALL

Mine Site — Median daily dustfall at the Mine Site was different between summer and winter, and the extent of these seasonal differences changed across years. There was a statistically significant interaction between season and year ($p < 0.001$, Figure 3-11).

Summer dustfall was highest in 2016 and lowest in 2018. Dustfall in 2018 was 0.22 (CI = 0.09 – 0.55) times lower than in 2015 ($p = 0.01$), 0.18 (CI = 0.07 – 0.49) times lower than in 2016 ($p = 0.009$), 0.31 (CI = 0.13 – 0.78) times lower than in 2017 ($p = 0.09$), and 0.33 (CI = 0.14 – 0.76) times lower than in 2019 ($p = 0.08$). There were no other significant interannual differences in summer dustfall (all $p > 0.73$).

Winter dustfall was lowest in 2015 and highest in 2019. There was suggestive evidence that dustfall in 2015 was lower than in 2018 ($p = 0.08$); 2015 dustfall was 0.50 (CI = 0.29 – 0.87) times lower than 2018. There were no other significant interannual differences in winter dustfall (all $p > 0.16$).

There was no seasonal difference in dustfall for 2015 ($p = 0.39$), 2016 ($p = 0.87$), or 2017 ($p = 0.12$). In 2018, winter dustfall was 6.5 (CI = 3.1 – 13.6) times higher than summer ($p < 0.001$). In 2019, winter dustfall was 2.2 (CI = 1.1 – 4.6) times higher than summer ($p =0.03$).

Milne Port — Median daily dustfall at the Port sites was different between summer and winter, the extent of these seasonal differences changed across years. There was a statistically significant interaction between season and year ($p < 0.001$, Figure 3-12).

Summer dustfall decreased from 2015 to 2018, then increased again in 2019. Summer dustfall in 2019 was 2.8 (CI = 1.7 – 4.6) times higher than in 2017 ($p < 0.001$) and 3.7 (CI = 2.2 – 6.0) times higher than in 2018 ($p < 0.001$). Summer dustfall in 2015 was 2.0 (CI = 1.2 –3.3) times higher than in 2017 ($p = 0.07$) and 2.6 (CI = 1.5 – 4.3) times higher than in 2018 ($p = 0.004$). Summer dustfall in 2016 was 2.1 (CI = 1.2 – 3.7) times higher than in 2018 ($p = 0.10$). There was no difference between summer dustfall in 2017 and 2018 ($p = 0.86$). There were no differences in dustfall among 2015, 2016, and 2019 (all $p > 0.28$).

Winter dustfall was lowest in 2015 and increased in all subsequent years. Winter dustfall in 2015 was 0.47 (CI = 0.34 – 0.66) times lower than in 2016 ($p < 0.001$), 0.46 (CI = 0.33 – 0.64) times lower than in 2017 ($p < 0.001$), 0.30 (CI = 0.21 – 0.42) times lower than in 2018 ($p < 0.001$), and 0.42 (CI = 0.30 – 0.59) times lower than in 2019 ($p < 0.001$). Winter dustfall in 2016 was 0.63 (CI = 0.45 – 0.88) times lower than in 2018 ($p = 0.05$). There was suggestive evidence that winter dustfall in 2017 was 0.65 (CI = 0.46 – 0.91) times lower than in 2018 ($p = 0.10$).

In 2015, summer dustfall was 2.7 (CI = 1.7 – 4.2) times higher than summer ($p < 0.001$). In 2017, winter dustfall was 1.3 (CI = 1.0 – 2.5) times higher than summer ($p =0.03$). In 2018, winter dustfall was 3.2 (CI = 2.1 – 5.0) times higher than summer ($p < 0.001$).

North Crossing — Median daily dustfall at the Road North sites was different between summer and winter, the extent of these seasonal differences changed across years. There was a statistically significant interaction between season and year ($p < 0.001$, Figure 3-13). Summer dustfall was highest in 2015 and lowest in 2018. There were no significant inter-annual differences in winter dustfall.

Summer dustfall decreased from 2015 to 2017 and has remained consistent from 2017 to 2019. Summer dustfall in 2015 was 3.3 (CI = 1.6 – 6.8) times higher than it was in 2017 ($p = 0.01$), 5.8 (CI = 2.8 – 12.0) times higher than it was in 2018 ($p < 0.001$), and 3.2 (CI = 1.6 – 6.4) times higher than it was in 2019 ($p = 0.008$). Summer dustfall in 2016 was 4.0 3 (CI = 1.7 – 9.0) times higher than in 2018 ($p = 0.01$). There was no evidence of differences in summer dustfall from 2017 to 2019 (all $p > 0.47$).

Winter dustfall was highest in 2018 and lowest in 2016; however, interannual differences in winter dustfall were not statistically significant. Winter dustfall in 2018 was 1.7 (CI = 1.1 – 2.7) times higher than in 2016, this difference was not significant after accounting for multiple comparisons ($p = 0.11$).

In 2015, summer dustfall was 7.6 (CI = 4.1 – 14.0) times higher than in winter ($p < 0.001$). In 2016, summer dustfall was 5.6 (CI = 2.8 – 11.2) times higher than in winter ($p < 0.001$). In 2017 and 2018, there was no significant difference between dustfall is summer and in winter (2017: $p = 0.23$; 2018: $p = 0.50$). In 2019, summer dustfall was 2.4 (CI = 1.4 – 4.2) times higher than in winter ($p = 0.002$).

South Crossing — Dustfall at the Road South sites was different between summer and winter, the extent of these seasonal differences changed across years. There was a statistically significant interaction between season and year ($p < 0.001$, Figure 3-14).

Summer dustfall was high in 2015 and 2016, declined in 2017 and 2018, and increased again in 2019. Summer dustfall in 2015 was 3.5 (CI = 1.8 – 6.9) times higher than in 2018 ($p = 0.003$). Summer dustfall in 2016 was 3.6 (CI = 1.7 – 7.6) times higher than in 2018 ($p = 0.01$). Summer dustfall in 2019 was 3.3 (CI = 1.7 – 6.2) times higher than in 2018 ($p = 0.003$). Dustfall in 2017 was intermediate between the high years (2015, 2016, and 2019) and the low year (2018), but not significantly different from any other year (all $p > 0.25$). There were no significant differences among 2015, 2016, and 2010 (all $p > 0.99$).

There were no interannual differences in winter dustfall (all $p > 0.20$).

Summer dustfall was significantly higher than winter dustfall in all years except 2018. In 2015, summer dustfall was 9.9 (CI = 5.1 – 19.4) times higher than winter dustfall ($p < 0.001$). In 2016, summer dustfall was 12.5 (CI = 6.0 – 26.1) times higher than winter dustfall ($p < 0.001$). In 2017, summer dustfall was 4.5 (CI = 2.3 – 8.8) times higher than winter dustfall ($p < 0.001$). In 2019, summer dustfall was 8.2 (CI = 4.4 – 15.4) times higher than winter dustfall ($p < 0.001$).

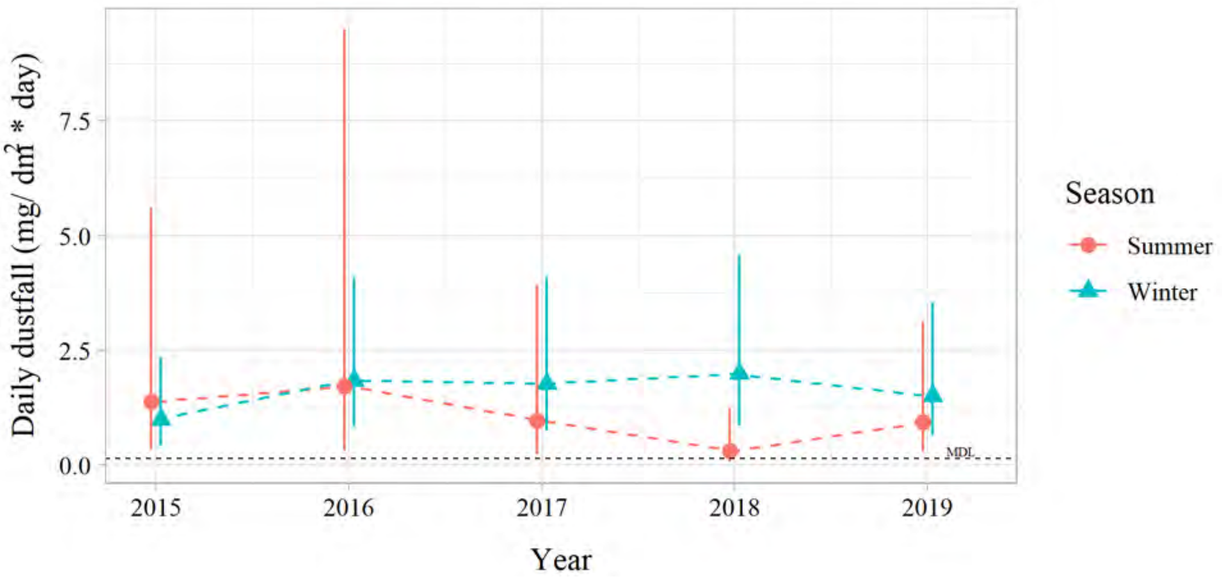


Figure 3-11 Inter-annual differences in dustfall at the Mine sites in summer and winter. *Points represent median dustfall, and vertical error bars are 95% confidence intervals. The dashed lines highlight changes in seasonal dustfall across years. Medians and confidence intervals were calculated on a log scale; therefore, the confidence intervals are asymmetrical on the linear scale shown in this graph.*

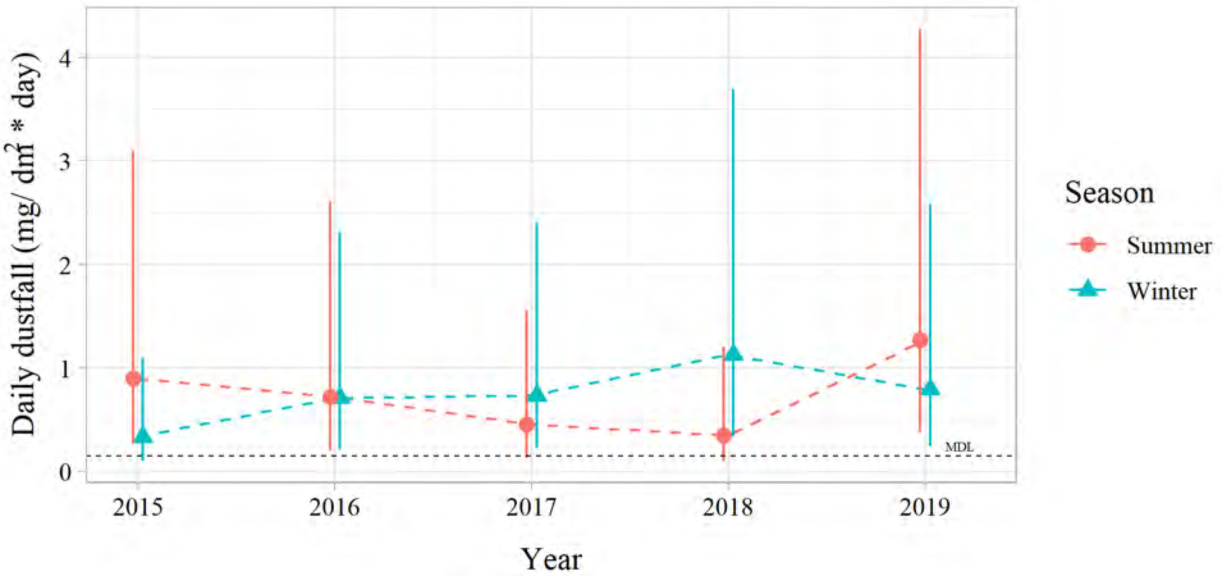


Figure 3-12 Inter-annual differences in dustfall at the Port sites in summer and winter. *Points represent median dustfall, and vertical error bars are 95% confidence intervals. The dashed lines highlight changes in seasonal dustfall across years. Medians and confidence intervals were calculated on a log scale; therefore, the confidence intervals are asymmetrical on the linear scale shown in this graph.*

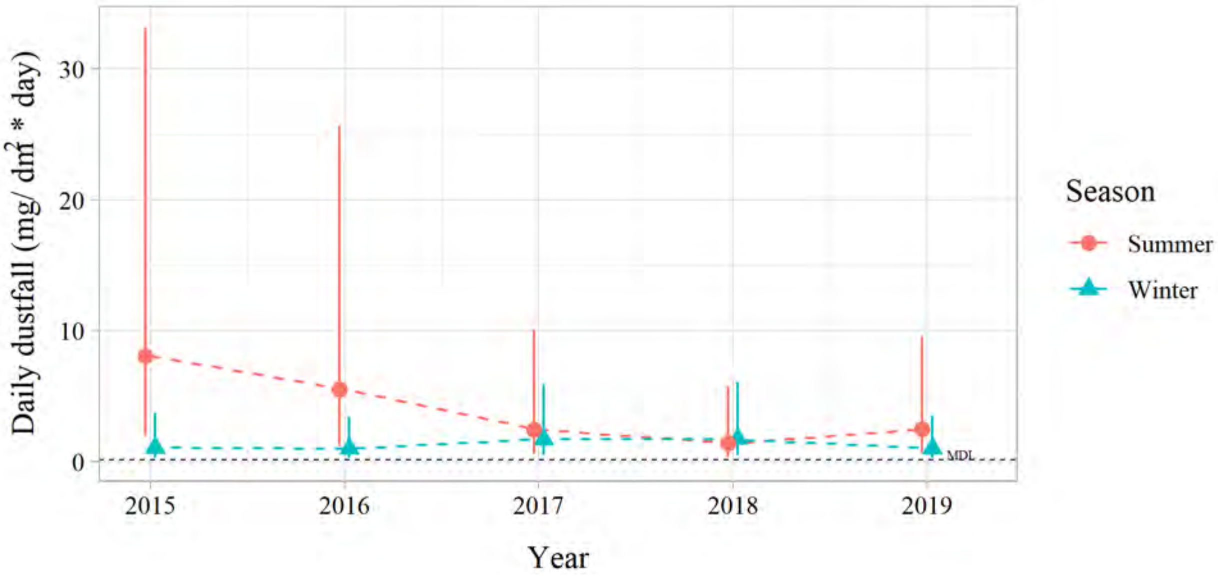


Figure 3-13 Inter-annual differences in dustfall at the North Road sites in summer and winter. *Points represent median dustfall, and vertical error bars are 95% confidence intervals. The dashed lines highlight changes in seasonal dustfall across years. Medians and confidence intervals were calculated on a log scale; therefore, the confidence intervals are asymmetrical on the linear scale shown in this graph.*

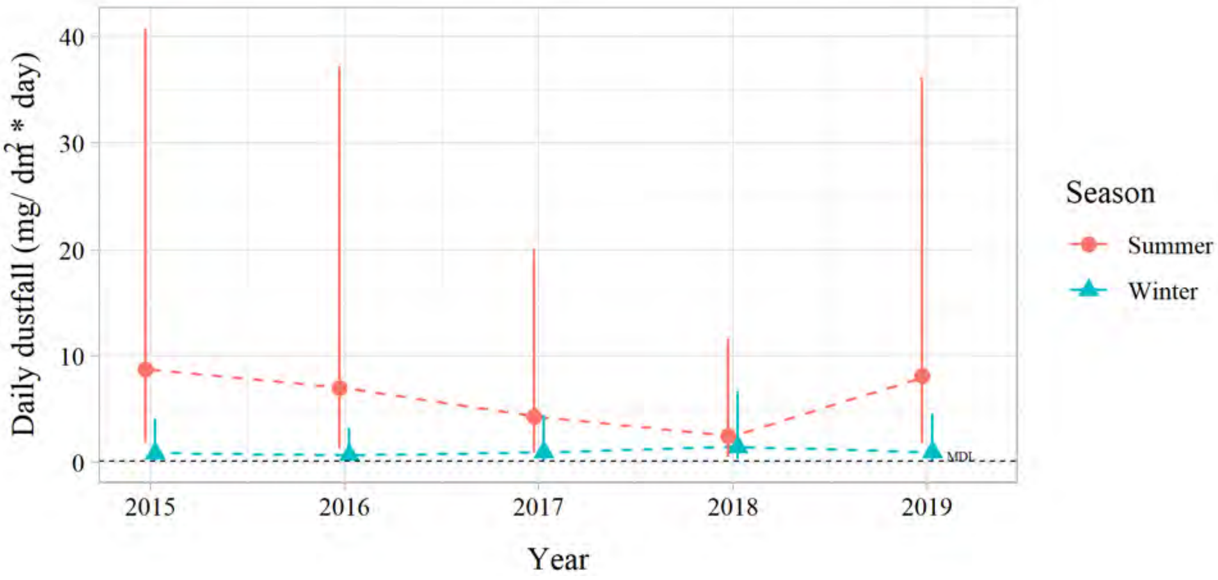


Figure 3-14 Inter-annual differences in dustfall at the South Road sites in summer and winter. *Points represent median dustfall, and vertical error bars are 95% confidence intervals. The dashed lines highlight changes in seasonal dustfall across years. Medians and confidence intervals were calculated on a log scale; therefore, the confidence intervals are asymmetrical on the linear scale shown in this graph.*

3.3.2 TOTAL ANNUAL DUSTFALL

In general, total annual dustfall across the Project area decreased in 2019 in comparison with earlier years. Exceptions to this observation include DF-M-03 and the south road crossing.

Mine area dustfall monitoring sites DF-M-01 and -02 saw a decrease in dustfall in 2019 compared with 2018, however there was a slight increase in dustfall at DF-M-03, which is nearest to the Ore Haul Road (Figure 3-15).

There was a modest decrease in dustfall at all Milne Port dustfall monitoring sites when compared with data from 2018 (Figure 3-15). This decrease could be associated with increase mitigations including shroud covers, optimal ore stockpiling with fines surrounded by large lump ore, and continuous monitoring of conveyor drop height.

Dust fall decreased or remained constant at the north road crossing, while ore production and hauling was increasing (Figure 3-15). Dustfall on the north side of the road, 30 m from the centerline decreased in comparison with 2018 dustfall. Dustfall at all other sites at the north road crossing has remained constant since 2016.

There was an increase in dustfall at the south road crossing; this increase was greater at the monitoring sites closest to the road (30 m distant), while the increase was very modest at monitoring sites 100 m distant from the Tote Road. These increases seen in 2019 are more noticeable because dustfall in 2018 was less than normal given a cool wet summer. Dustfall in this area in 2019 is comparable with what was seen in 2017.

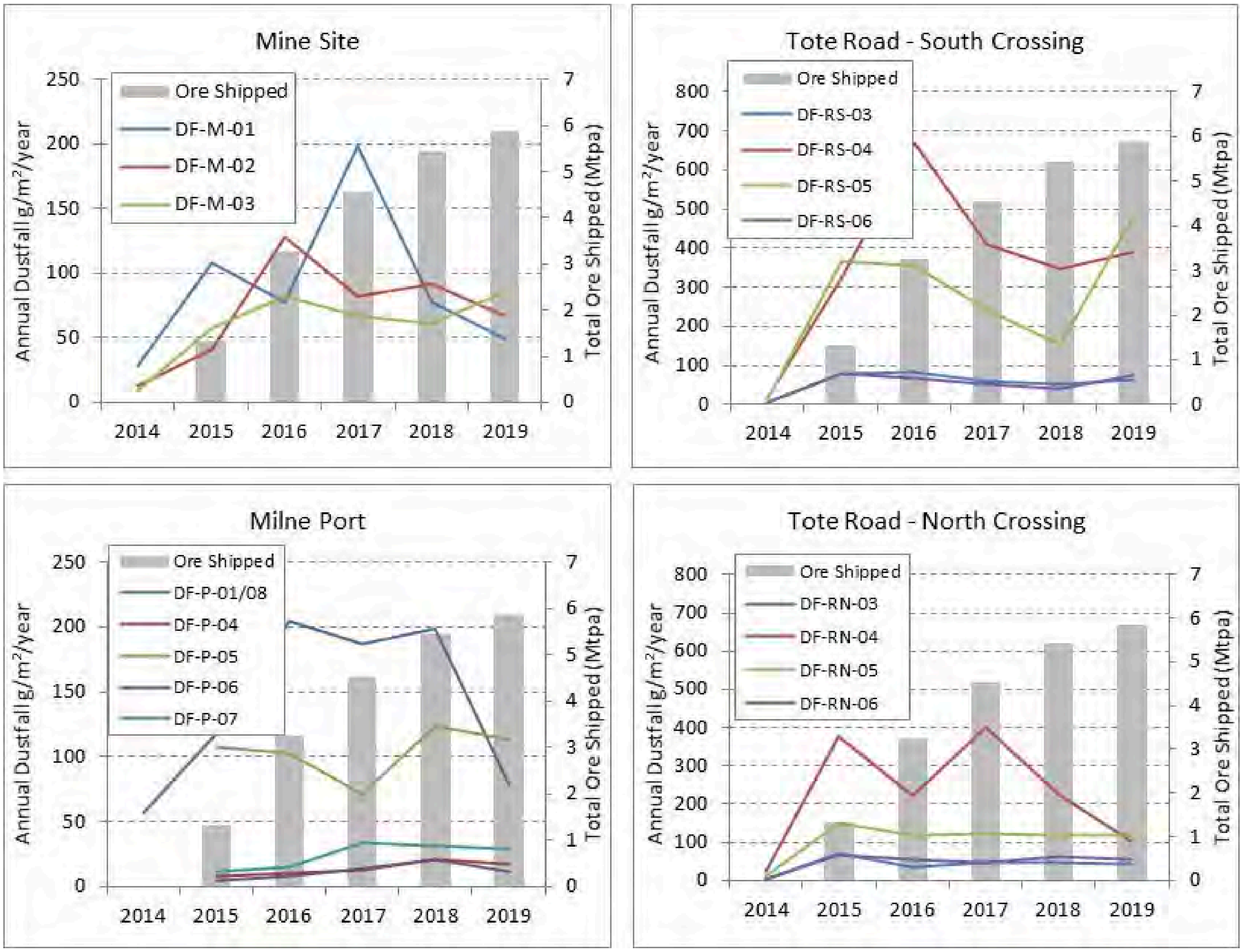


Figure 3-15 Annual dustfall trends throughout the Project area; note the y-axis scales are not consistent across the plots.

3.4 DUSTFALL SUMMARY

- Dustfall monitoring data are compared to predictions that were made in the Project's Final Environment Impact Statement (FEIS) and is important in the context of effects to other indicators including potential changes to vegetation and soil.
- Weather conditions from 2019 were reported from onsite meteorological stations at Mary River and Milne Port. Relevant weather data was compared between 2019 and baseline conditions; where feasible, 2019 and 2018 weather data were related to support observations from the dustfall monitoring program.
- Air temperature data indicated cooler average temperatures at Milne Inlet in 2019 relative to 2018 during the summer and winter months. At Mary River, mean air temperatures were somewhat warmer in 2019 than 2018 during the summer and winter months.

- A comparison of the 2018/2019 precipitation data could not be completed due to a malfunction of the rain gauge at both the Milne Inlet and Mary River meteorological stations in 2018; therefore, no meaningful comparisons were available among these years.
- Average wind speeds were lower (calmer) at Milne Inlet from August/September to November 2019 relative to 2018. At Mary River, average wind speeds for the 2018/2019 data were similar for all months except January 2019 which had a relatively higher average windspeed than 2018.
- There was a slight increase in the mean daily number of ore haul and non-haul transits in 2019 compared with 2018. The mean number of ore haul transits per day in 2019 was 238.0, and the number of non-haul transits per day was 43.0.
- The magnitude of annual dustfall at the Mine Site sample locations was comparable with 2018. However, in 2019 dustfall was highest near the ore haul road, downwind of the ore deposit, while dustfall near the airstrip and the crusher decreased in 2019 in comparison with 2018. In all previous years the highest dustfall in the Mine area was associated with the airstrip.
- Dustfall at Milne Port decreased at all sites in 2019 in comparison with 2018; however, this trend at DF-P-01 was likely due to its relocation to DF-P-08. Dustfall at Milne Port in 2019 was higher in summer than in winter; while winter dustfall in 2019 remained consistent with 2018, there was a modest increase in 2019 summer dustfall in comparison with 2018.
- Along the Tote Road in 2019 dustfall decreased at monitors at the north end of the road, but a slight increase was noted at monitors at the south end in comparison with 2018 dustfall. In all areas dustfall was highest in the summer months and decreased significantly during the winter months. Calm conditions observed during August/September 2019 resulted in similar dustfall on both sides of the Tote Road, which has not been seen in previous years when prevailing winds have resulted in greatest dustfall south and west of the Tote Road.
- Summer dustfall increased modestly over the PDA in 2019 in comparison with 2018 when cooler, wetter conditions resulted in a lower than expected dustfall. Winter dustfall remained generally consistent with 2018.
- Dustfall one kilometre distant from the PDA was measured at 12 sites in 2019. Dustfall was low at all sites, ranging from below laboratory detection to a high of less 1.0 mg/dm^2·day.
- Dustfall continues to remain relatively constant or decrease at most year-round sampling locations throughout the Project area.

4 VEGETATION

The FEIS for the Project identified potential Project-related effects on vegetation abundance, diversity and health (Baffinland Iron Mines Corporation 2012). Overall effects to vegetation abundance and diversity were predicted to be not significant with a high level of confidence Effects to vegetation health were predicted to be limited, with moderate confidence due to uncertainties on the effects of dust, metals and emissions on local vegetation. To address these limitations, data collection for long-term vegetation monitoring was completed in 2019 for the following programs:

- dustfall monitoring (Section 3 – Dustfall Monitoring Program);
- vegetation abundance monitoring;
- vegetation and soil base metal monitoring; and
- exotic invasive vegetation monitoring and natural revegetation.

4.1 VEGETATION ABUNDANCE MONITORING

To meet the terms and conditions required by NIRB Project Certificate No. 005, Baffinland committed to establishing a long-term monitoring program to study potential changes to vegetation abundance used as caribou forage within the RSA. This commitment directly relates to the following conditions:

- Project Condition #36 — *The Proponent shall establish an on-going monitoring program for vegetation species used as caribou forage (such as lichens) near Project development areas, prior to commencing operations.*
- Project Condition #38, 50 and Project Commitment #67, 69, and 107 also address these limitations or relate to the reporting requirements for the vegetation abundance monitoring program.

To meet these monitoring commitments, a long-term vegetation monitoring program was initiated in 2014. The objective of the vegetation abundance monitoring program is to measure percent plant cover and plant group composition of available caribou forage within the RSA to track potential changes at varying distances from the edge of the PDA through long-term monitoring.

Vegetation monitoring data were collected under the initial study design for four years. Vegetation data were collected for a total of 15 balanced transects and six Reference sites according to the following schedule:

- 2014 — Transects one to eight and Reference sites one to three
- 2015 — No vegetation monitoring occurred
- 2016 — Transects one to fifteen (transects four, five and eight were only sampled at the 1,200 m distance class) and Reference sites one to six (excluding Reference site five)
- 2017 — Transects one to fifteen and Reference sites one to six
- 2018 — Transects one to fifteen and Reference sites one to six
- 2019 — Transects one to fifteen and Reference sites one to fifteen

In 2019, a trends analysis was conducted and marked the third year that data were analyzed among years using a full sample size for 2017, 2018 and 2019 and partial sample size for 2014 and 2016. The trends analysis assessed potential changes in percent plant cover and plant group composition with the relationship of distance to the PDA and treatment effect between open and closed plots (to control for the effect of herbivory). As discussed in Section 4.1.2 – Results and Discussion, an annual variation in vegetation abundance occurred in the Project area, but there is no evidence of changes in vegetation abundance because of a Project-related effect. In response to comments at the TEWG meeting on February 26, 2020, Baffinland will consider alternative methods to analyzing vegetation abundance data in 2020 (Baffinland Iron Mines Corporation 2020).

A soils assessment was also completed in 2019 as part of the vegetation abundance monitoring program in response to ECCC technical review comment #3 on the 2018 Mary River Project Terrestrial Environment Annual Monitoring Report, which recommended the assessment of soil moisture at vegetation abundance monitoring sites (EDI Environmental Dynamics Inc. 2019). Specifically, the recommendation was to consider vegetation cover and composition with soil moisture measurements to determine if there is a difference between Near sites (i.e., 30 and 100 m) and Reference sites (≥20 km). To address this recommendation, soil pits were assessed, and measurements were taken at vegetation abundance monitoring sites to characterize soil moisture and drainage. The objective of the soils assessment was to characterize soil moisture and drainage at vegetation abundance monitoring sites to evaluate potential differences in percent plant cover and plant group composition.

As described in Section 4.1.2 – Results and Discussion, the results of the soils assessment determined there was no systematic relationship between soil moisture and distance class. This confirms that the study design for the vegetation abundance monitoring program is robust and defensible to monitor vegetation in the Project area.

4.1.1 METHODS

4.1.1.1 Vegetation Abundance Monitoring

The study design and sample site selection were based on a review of relevant literature, and input from the Government of Nunavut Department of Environment (GNDoE) staff in their role on the TEWG. Information considered when developing the vegetation monitoring program included dustfall modeling (Baffinland Iron Mines Corporation 2013), northern Canadian vegetation habitat types (Olthof et al. 2009), preferred caribou forage (summarized in Baffinland Iron Mines Corporation 2012) and other literature (Spatt and Miller 1981, Walker and Everett 1987, Walker 1996, Auerbach et al. 1997). Where feasible, recommendations from the TEWG meeting on April 23, 2014 (Baffinland Iron Mines Corporation 2014) and Parks Canada (Hudson and Ouimet 2011) were included in the study design.

A distance gradient approach was used based on the assumption that vegetation close to Project disturbance would likely be more affected than vegetation further from disturbance areas. To assess potential changes in vegetation associated with Project disturbance (e.g., dust and emissions), vegetation sampling occurred at specific distances (30, 100, 750 and 1,200 m) from the edge of the PDA. Reference sites were also established within the RSA, approximately 20 to 30 km from the PDA. These distance classes were chosen based on a review of relevant available literature and dust isopleth modelling (Baffinland Iron Mines Corporation 2013).

The monitoring program follows a Before-After-Control-Impact (BACI) design (Bernstein and Zalinski 1983, Stewart-Oaten et al. 1992) with a stratified random paired/block design. The BACI design is appropriate where the goal of the program is to determine if there is a statistically and biologically meaningful difference between baseline and disturbance conditions (e.g., changes to the abundance of a species). This design involves pairing control (or Reference) and impacted sites where samples are taken simultaneously at both sites before and after a disturbance occurs.

To reduce natural variability in vegetation cover associated with different habitat types and to allow for meaningful statistical comparisons, all sites were located within one habitat type. The habitat type chosen was based on the following factors:

- relative abundance of habitat type (as summarized in the Project's wildlife baseline report – Appendix 6F, Baffinland Iron Mines Corporation 2012);
- relative habitat use by caribou (a mixture of the Resource Selection Probability Function model results in the Project's wildlife baseline report and the energetics model presented in Russell (2014); and
- likelihood of habitat type containing high-quality caribou forage (Appendix 6F, Baffinland Iron Mines Corporation 2012).

The habitat type selected for vegetation abundance monitoring was the Moist to Dry Non-Tussock Graminoid/Dwarf Shrub type (Northern Land Cover, Olthof et al. 2009), one of the more common habitats in the RSA (Photo 4-1). The North Baffin Island Caribou herd does not appear to select one habitat type over another but do exclude areas where vegetation cover is relatively low (Russell 2014). The Moist to Dry Non-Tussock Graminoid/Dwarf Shrub vegetation habitat type is considered high-quality caribou forage, given that it contains lichen, grasses, sedges, forbs and deciduous shrubs. These plant groups are considered important food items for caribou in summer when plant nutritional value and digestibility is high, as well as in winter when food availability is mainly limited to lichen.

The vegetation abundance monitoring program involved the establishment of long-term vegetation plots. Four sites were situated along each transect with a total of 15 transects radiating out from the Mine Site (six transects), Tote Road (five transects) and Milne Port (four transects). In addition, 15 Reference sites were established within the RSA (Map 2), approximately 20 km from the PDA. Of these 15 Reference sites, nine were added in 2019 at the request of the TEWG during the December 11, 2018 meeting to reduce variability expressed by wider confidence intervals at Reference sites. In total, 75 sample sites were located within the RSA. Some pre-selected site locations had to be moved to locate the site within the selected habitat type. To prevent pseudo-replication and ensure independence between sites, all transects were spaced a minimum of 3 m apart with the majority of transects spaced 500 m apart. Each transect extended perpendicular from the Project disturbance footprint. Along each transect, four sample sites were located at 30, 100, 750 and 1,200 m from the edge of the PDA.

To exclude potentially confounding effects of grazing (e.g., from caribou and small mammals), both exclosure (i.e., closed plots consisting of a cage) and open plots were used to account for herbivory effects. In response to recommendations made by the TEWG during the April 23, 2014 meeting, all 1 x 1 m cages from 2014 were replaced with 2 m x 2 m cages in 2016 to reduce the influence of edge effects associated with the cages. Each sample site consisted of one closed plot and one open plot. To account for within-site variability in vegetation cover, some sites included a second open plot, for a total of three plots at one site. Of the 75 sample sites, 47 sites had one closed plot associated with an open plot and 28 sites had one closed plot associated with two open plots (all Reference sites had three plots each). In total, 179 plots were sampled. To reduce bias, individual plots at each site were located close to the center of the polygon. Plots within a site were spaced 3 m apart to provide replication and reduce within site variability. At sites where 1 x 1 m cages were replaced with 2 x 2 m cages, plots were spaced 2.5 m apart. Figure 4-1 provides a schematic illustration of sample site and plot locations along a transect. At the time of plot establishment none of the sites selected for this study showed signs of herbivory. A table of all plots, transects, distances, treatments and coordinates is provided in APPENDIX A — Vegetation Abundance Monitoring Site Locations.

Each monitoring plot was given a unique identifier code. The plot labelling scheme was based on the transect number, distance class, and type and number of plots at a given site. Closed plots were denoted with an “X”. The first open plot at a site was represented by an “A”; the second, if present, was labelled with a “B”. As an example of the plot labelling scheme, the plot label T1D30X represents Transect 1, distance class 30 m and a closed plot.

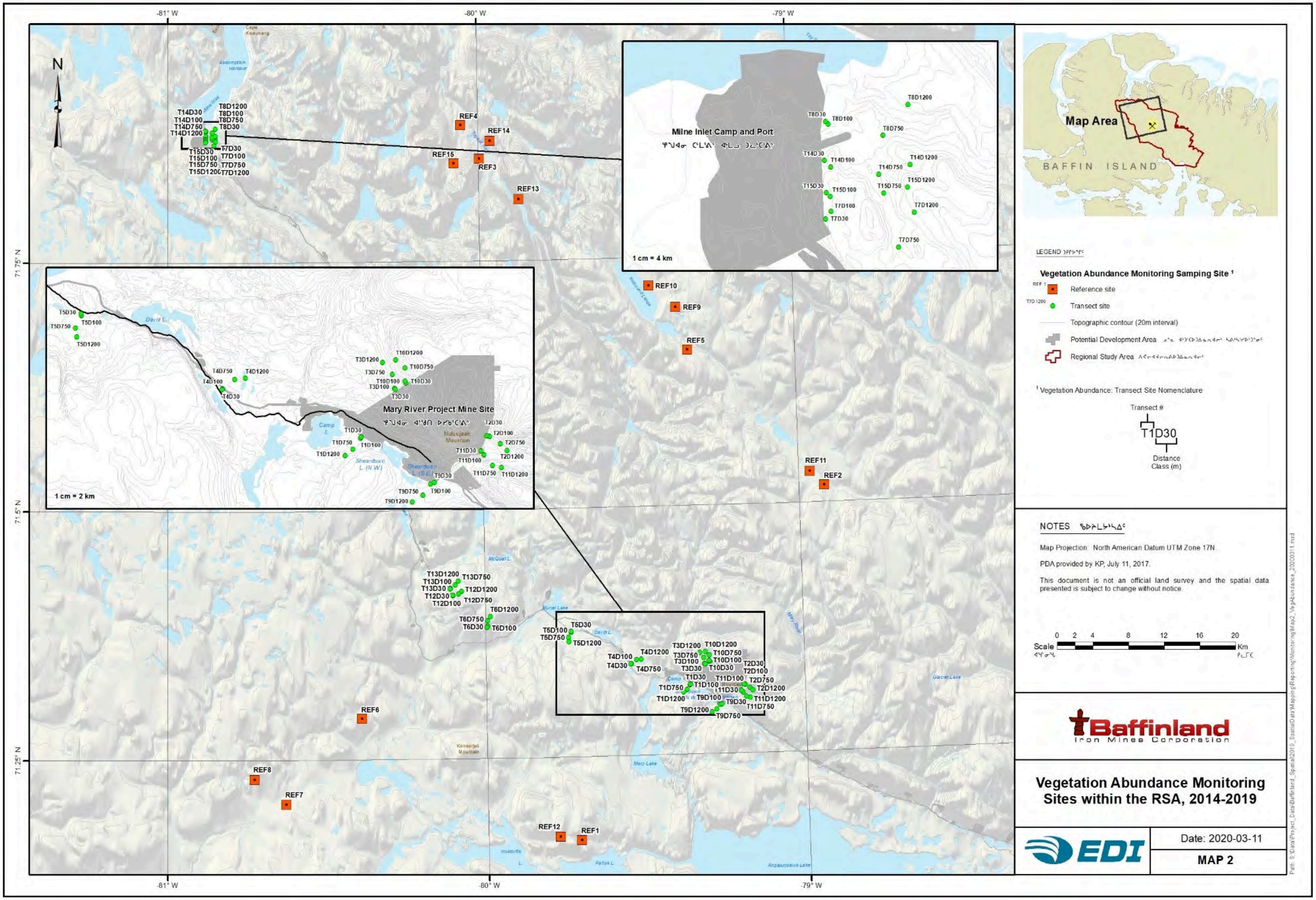
Baffinland vegetation abundance monitoring methods and design were based on standards used by the Canadian Tundra and Taiga Experiment (CANTTEX; Bean and Henry 2003, Bean et al. 2003) and International Tundra Experiment (ITEX; Walker 1996). The point quadrat method is considered one of the most objective and repeatable methods for monitoring vegetation (Levy and Madden 1933, Goodall 1952, Bonham 2013) and is the recommended method for assessing vegetation changes in tundra plant communities (Molau and Mølgaard 1996). It is a quantitative method that has been widely recommended for measuring vegetation abundance and is suitable for long-term monitoring (Stampfli 1991, Elzinga et al. 1998, Hudson and Henry 2009).

The point quadrat method involves a square 1 m x 1 m metal plot frame with 100 fixed measurement locations spaced 10 cm apart across the frame (Figure 4-2). In traditional studies, a long pin is dropped through the frame at each of the 100 locations; however, the quadrat frame in this study uses a laser instead of pins. The laser was moved and shot vertically downwards at each of the 100 marked locations along the frame. The first plant species that was touched or “hit” by the laser in the canopy layer and in the ground layer were tallied. Figure 4-3 provides a schematic illustration of the laser “hitting” the first plant in the canopy layer and then the first plant in the ground layer within a sampling plot. Percent plant cover was determined by summing the total number of “hits” for each species in each of the canopy and ground layers. Plant species were also categorized into respective plant groups to determine percent plant group cover.

The quadrat (i.e., plot) frame was set above the ground on four legs, two of which were permanent rebar posts marking the plot location (Photo 4-3). The rebar corner posts allow the frame to be set up in the same location year after year for repeatable measurements. All measurements began at the corner of the frame with the thicker of the two rebar pieces, moving from one side of the frame to the other and ended on the side of the plot with the skinny rebar post. The frame was levelled and positioned above the ground from 15 to 45 cm depending on the slope. The height of the frame had no effect on the diameter of the laser projecting onto the vegetation (approximately 2 mm; Photo 4-4).

Plant composition was assessed by tallying all species encountered and then grouped into broad vegetation groups (Molles and Cahill 2008). The plant groups selected for this study coincide with those used in the caribou energetics model (Russell 2014) and include deciduous shrubs, evergreen shrubs, forbs, graminoids, moss and lichen. Standing dead litter was also included as important winter forage that provides nutritional balance to caribou winter diet (Heggberget et al. 2002). Although ground litter is not considered caribou forage, it was included in the analysis because it is related to, and may help explain, potential changes in the standing dead litter group for the canopy layer. Un-vegetated substrates including bare ground, rock or gravel and cryptobiotic soil crusts were recorded but excluded from the percent cover values because these do not represent useable forage for caribou.

Photo 4-1 Example of the Moist to Dry Non —Tussock Graminoid/Dwarf shrub vegetation habitat type in the Mary River RSA selected for the vegetation abundance monitoring program.


-81° W
-80° W
-79° W
71.75° N
71.5° N
71.25° N
N
Milne Inlet Camp and Port
1 cm = 4 km
Mary River Project Mine Site
1 cm = 2 km
Map Area
BAFFIN ISLAND
REF1
REF2
REF3
REF4
REF5
REF6
REF7
REF8
REF9
REF10
REF11
REF12
REF13
REF14
REF15
T14D30
T14D100
T14D750
T14D1200
T8D1200
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T1D750
T1D1200
T11D100
T11D30
T11D750
T11D1200
T9D100
T9D30
T9D750
T9D1200
David L.
Camp L.
Sheardown L. (N.W.)
Sheardown L. (S.E.)
Nuluujaak Mountain
Mary Lake
Mary River
Muriel Lake
McQuat L.
Glacier Lake
Katiaarjuk Mountain
Assomption Harbour
Cape Kwaunang
LEGEND
Vegetation Abundance Monitoring Samping Site ¹
REF 1 🟥 Reference site
T7D 1200 ● Transect site
Topographic contour (20m interval)
Potential Development Area
Regional Study Area
¹ Vegetation Abundance: Transect Site Nomenclature
Transect #
T1D30
Distance Class (m)
NOTES
Map Projection: North American Datum UTM Zone 17N.
PDA provided by KP, July 11, 2017.
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0
2
4
8
12
16
20
Km
Baffinland
Iron Mines Corporation
Vegetation Abundance Monitoring Sites within the RSA, 2014-2019
EDI
Date: 2020-03-11
MAP 2
Path: S:\Data\Project_Data\Baffinland_Spatial\2019_SpatialData\Mapping\Reporting\Monitoring\Map2_VegAbundance_20200311.mxd

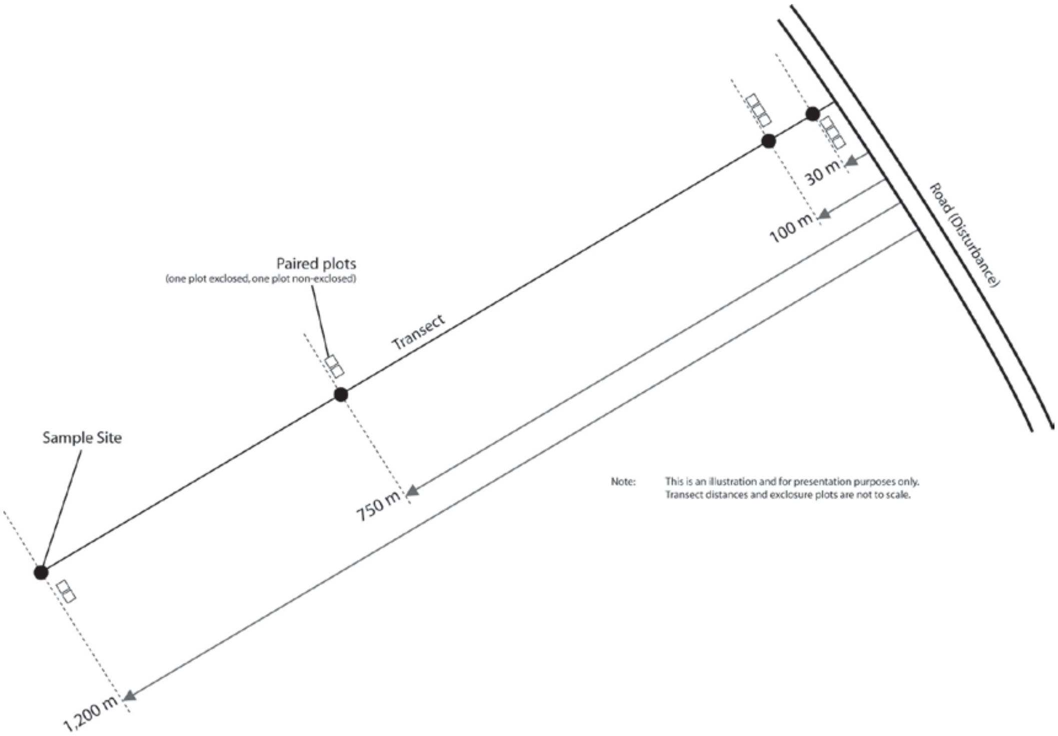


Figure 4-1 Schematic diagram showing the location of sample sites and plots along a transect.

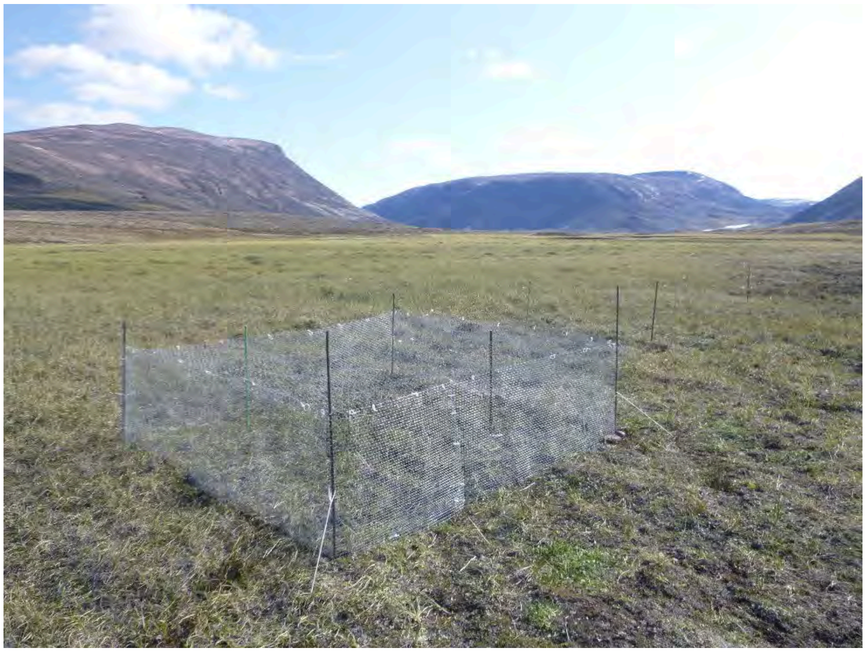


Photo 4-2 Representative site photo of general plot layout and site conditions.
This is site REF14 with one closed plot and two open plots located near Milne Port, 21 July 2019.

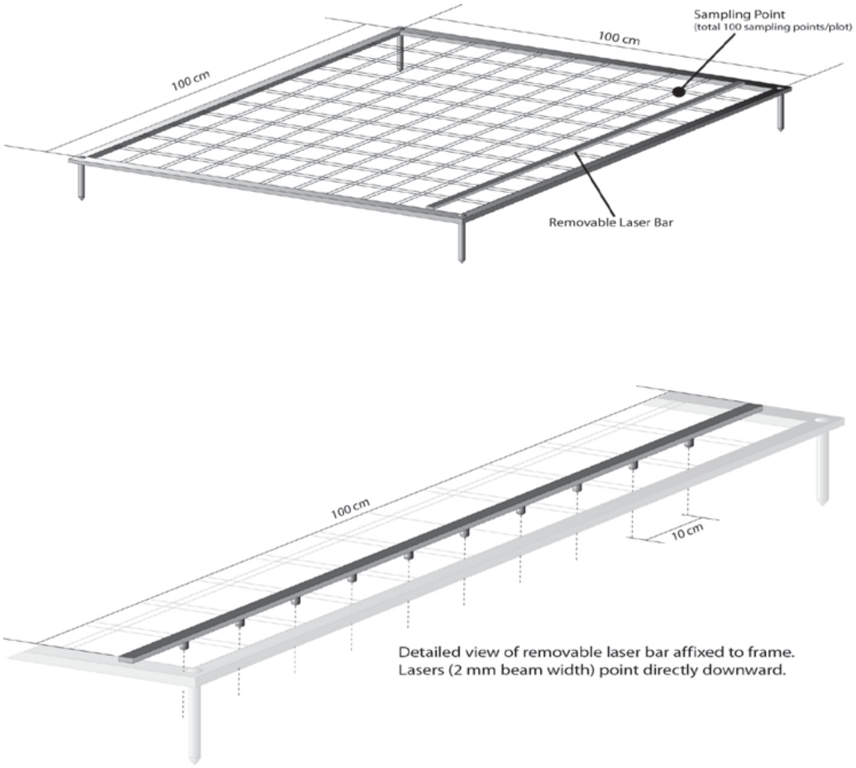


Figure 4-2 Illustration of the point quadrat frame used to measure percent plant cover.

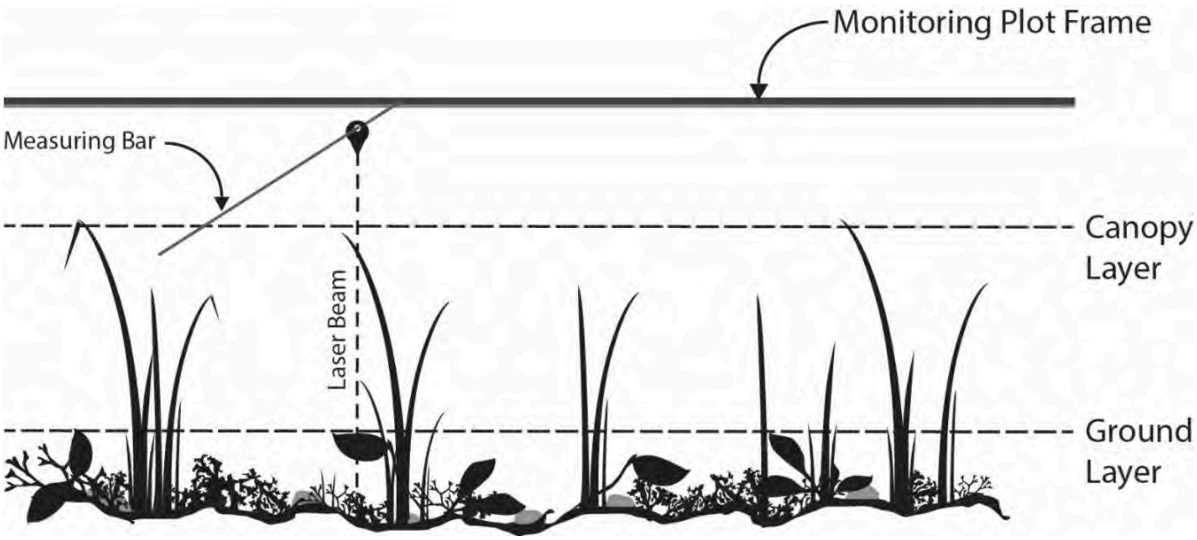


Figure 4-3 Schematic diagram of canopy and ground cover.

Showing the laser beam of the monitoring plot frame "hitting" the first plant in the canopy layer and then the first plant in the ground layer.

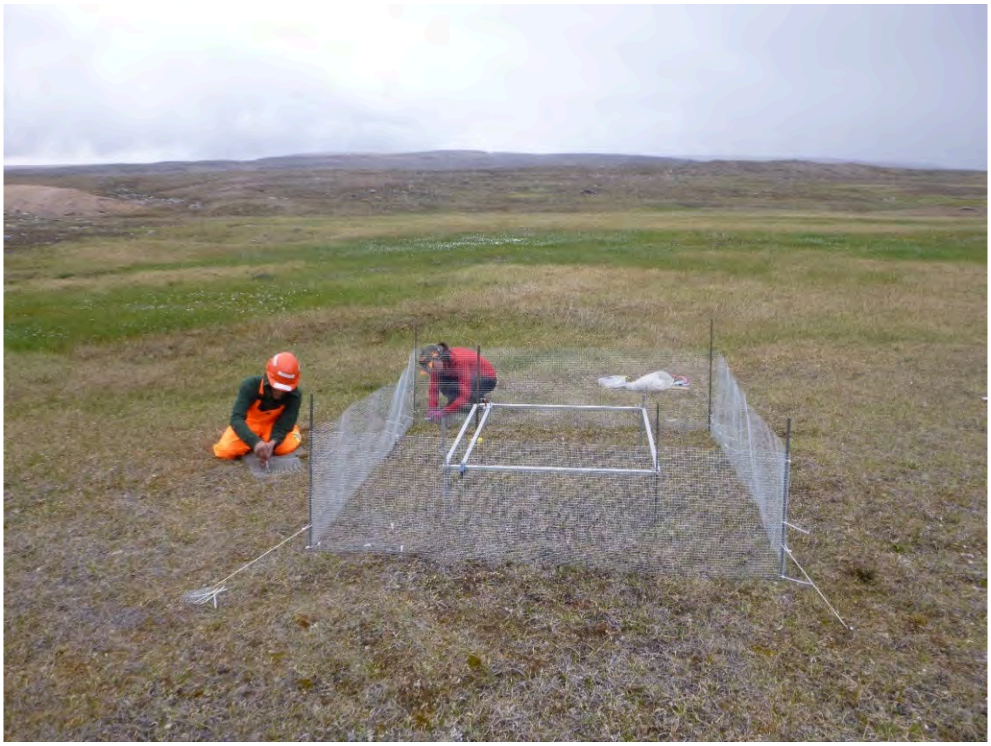


Photo 4-3 Measuring plot frame erected above the vegetation in cage at closed plot REF11, 19 July 2019.
Roof of cage not shown in photo; measuring plot erected in the cage was removed once monitoring was complete and roof was replaced.

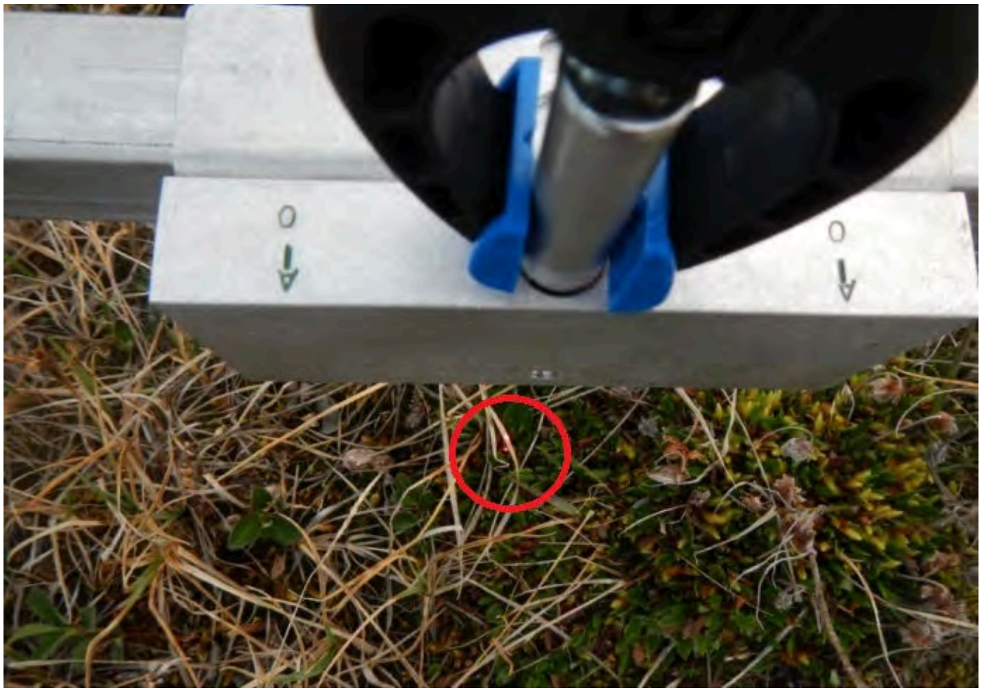


Photo 4-4 A view showing the diameter of the laser projecting onto the vegetation (2 mm), 27 July 2014.

Analytical Methods

Data were analyzed to investigate the relationship among years in vegetation cover and composition to distance class, while accounting for the potential effect of herbivory (closed versus open plots). An emphasis was placed on caribou forage, such as lichen. Data analyzed included 1) total ground cover, 2) total percent canopy cover, and 3) percent cover by plant group.

Since the variability in the individual species data was high, percent plant cover for ground and canopy layers was divided by general plant groups (i.e., deciduous shrubs, evergreen shrubs, forbs, graminoids, moss, and lichen). The percent cover of each plant group was first quantified by adding up all the "hits" from the laser for a plant group within a plot. This was done separately for the ground cover and canopy cover layers. The total number of "hits" within a plot represented overall percent plant cover.

Linear mixed effects models were used to test for differences in total ground cover, total canopy cover, and plant group cover. Models included three main effects for year, distance class, and plot treatment (i.e. closed vs. open plots), and all interactions between these effects. Plots nested within sample sites were included as random effects to account for repeated measurements of the sample plots over multiple years and the possibility that plots from the same sample site were more like one another than plots from different sampling sites. Percent cover values were logit transformed to create a continuous variable with an approximately normal distribution (Warton and Hui 2011). Not all plant groups were present in all plots; therefore, a value of 0.005 was added to plant group values prior to transformation (Warton and Hui 2011).

All estimates of plant cover were back-transformed to the original scales and are reported as mean plant cover with 95% confidence intervals. F-tests were used to determine the statistical significance of model parameters. Residual plots were visually examined to confirm that models met the assumptions of normality and equality of variance. All analyses were performed using R, version 3.3.1 (R Development Core Team 2019). Mixed effects models were run using the 'nlme' package (Pinheiro et al. 2016). Pairwise comparisons within groups and confidence intervals were calculated using the 'lsmeans' package (Lenth 2014).

4.1.1.2 Soil Moisture Regime

No guidelines specific to soils for the Canadian High Arctic currently exist. To address this limitation, applicable field guide information for the Yukon, Northwest Territories, British Columbia, and Ontario were reviewed and a similar set of ecosystem survey parameters were confirmed. These were used as a basis for developing a soils assessment protocol for the Project.

The Baffinland soils protocol considered factors expected to influence soil development in the RSA such as climate, short growing season, low nutrients, slow rate of decomposition, presence of permafrost, and active geomorphological processes such as cryoturbation. Cryoturbation is a process of soil movement and mixing of materials due to freeze-thaw cycles associated with permafrost (National Snow and Ice Data Center 2019). These conditions create soils known as Cryosols that are permafrost-affected and dominant in the northern third of Canada throughout Nunavut, Northwest Territories and Yukon (Soils of Canada 2019).

Soils were assessed within the active layer, which is the top layer of permafrost soils that thaw during the summer and are available for plant growth (Kelley et al. 2004). At each vegetation abundance monitoring site, the active layer was assessed by excavating a soil pit with a hand shovel. A total of 75 soils pits were dug creating minimal disturbance at a representative location for each monitoring site. At each soils pit, the surface disturbance was approximately 0.3x0.3 m and to a depth equivalent to the plant rooting zone or when permafrost was encountered. In some cases, where soils were exceptionally rocky or difficult to remove, the rooting depth was estimated, and the active layer was assessed for most of the rooting zone.

Soils data were collected using the Yukon Site Visit Form (SVF) and adapted to include additional information such as noted geomorphological processes. The Field Manual for Describing Yukon Ecosystems was used to support data collection and includes relevant keys and guides to describe soils and site features (Yukon Government Department of Environment 2017).

Soils were assessed in conjunction with vegetation abundance monitoring from July 11 to 31, 2019. The following attributes were recorded at each soils pit to characterize overall drainage and soil moisture regime (SMR): estimated rooting depth/soil depth; percent coarse fragments; humus/organic form; presence of permafrost/seepage/water table/mottling/gleying; depth to mineral soil; soil texture; surface shape; slope position; slope gradient; noted geomorphological processes (e.g., cryoturbation); and dominant plant species. Drainage is an ordinal variable used to support the SMR, which describes the speed and extent to which water is removed in relation to supply in a soil matrix (Yukon Government Department of Environment 2017). The SMR is also an ordinal variable used to indicate the amount of moisture available for plant growth over the entire growing season; SMR is directly correlated with the attributes that were recorded for each soils pit (Yukon Government Department of Environment 2017).

Drainage was characterized using a relative scale where "very rapidly drained" indicates water that is removed from the soil very rapidly in relation to supply and "very poorly drained" indicates water that is removed from the soil so slowly that the water table remains at or near the surface for most of the time the soil is not frozen. The SMR was characterized using a relative scale from 0 to 8 where "0" is very dry indicating that water is removed extremely rapidly in relation to supply and "8" is very wet indicating that water is removed so slowly that the water table is at or above the soil surface all year. A table of all sites, locations and attributes is provided in APPENDIX B — Soils Assessment at Vegetation Abundance Monitoring Sites, 2019.

Analytical Methods

The SMR was included as a fixed effect in all models for the vegetation abundance monitoring program to account for variation in plant cover that is due to the difference in moisture at the site level. The significance and effect size for SMR was reported for each analysis. Effect size for SMR is reported on the logit-scale; negative values indicate decreasing cover with increasing SMR and positive values indicate the opposite effect.

The SMR was treated as both a continuous and categorical variable where an analysis of variance analysis (ANOVA) was used to test for differences in SMR among distance classes and a Fisher's Exact Test was used to evaluate whether SMR classes were evenly distributed among the distance classes. A t-test was used to determine if the nine new References sites had a different SMR than the six existing Reference sites.

4.1.2 RESULTS AND DISCUSSION

Vegetation abundance monitoring was completed in 2019 and marked the third year that data were analyzed among years. A trends analysis was conducted using a full sample size for years 2017, 2018 and 2019 and partial sample size for 2014 and 2016. Refer to Section 4.1 — Vegetation Abundance Monitoring for details on the vegetation abundance monitoring program schedule.

Inter-annual changes in total ground cover have been consistent across all distance classes indicating that changes in ground cover were due to natural variation in plant cover and not a Project-related effect. Annual differences in total ground cover were less than 3%, which represents a modest change that is likely not biologically significant.

A detailed examination of changes in ground cover for the major plant groups identified annual differences in cover. However, differences for ground litter, evergreen shrubs, and lichen were consistent across distance classes indicating that changes in ground cover were due to natural variation in plant cover and not a Project-related effect. Ground litter was lower in 2019 than in 2016, 2017, and 2018; however, not as low as 2014. Evergreen shrub cover was higher in 2019 than in all previous years. Lichen cover was relatively high in 2014, lower from 2016 and 2018, then higher again in 2019; difference between the highest (2014: 2.8%) and lowest year (2016: 1.6%) was small. For moss, an interaction occurred between year and distance class; while the direction of inter-annual differences was the same at all distance classes, changes in moss cover among years at sites near to the PDA (30 and 100 m) were statistically different while the farther distance classes at 750 m, 1,200 m, and Reference sites were not. Overall trends of inter-annual variability in moss cover were similar across all distance classes, indicating that changes were not due to Project-related effects.

Inter-annual changes occurred for total canopy cover and a weak interaction existed between year and distance class. Despite these differences, trends did not indicate a Project-related effect and only some distance classes followed the overall trend. Total canopy cover was higher in 2016, 2017, and 2019 than in 2014 and 2018; the 30, 100, and 1,200 m distance classes followed this trend. The 750 m distance class had higher canopy cover in 2016 than 2018, with no other differences among years. The Reference distance class had increasing canopy cover from 2014 to 2017, with no differences in canopy cover between 2017 and 2019.

A detailed examination of changes in canopy cover for the major plant groups found annual differences in cover. However, differences for standing dead litter (including graminoids) were consistent across all distance classes indicating that changes were due to natural variation in plant cover and thus not Project-related effects. Standing dead litter was lowest in 2014, increased in 2016 and remained relatively consistent through 2019. Inter-annual changes occurred for deciduous shrub cover and a weak interaction existed between year and distance class; however, no distinct trends were obvious that would indicate a Project-related effect. Deciduous shrub cover was high in 2014 and lower in subsequent years with no distinct trends across distance class.

An evaluation of soil moisture and drainage at vegetation abundance monitoring sites determined no difference in SMR across distance classes. Most sites had a SMR of 4 or 5, indicating average or just above average soil moisture. Therefore, soil moisture and drainage did not bias percent plant cover or plant group composition among distance classes in the first five years of monitoring.

In summary, annual variation occurred in vegetation abundance within the Project area, but no evidence was found of a difference in vegetation abundance because of a Project-related effect. Furthermore, soil moisture and drainage were generally average to just above average at vegetation abundance sites among distance classes. No relationship was found between SMR and percent plant cover/plant group composition among distance classes.

4.1.2.1 Vegetation Abundance Monitoring

A detailed examination of 1) total ground cover, 2) total percent canopy cover, and 3) percent cover by major plant group is provided below.

4.1.2.1.1 Total Percent Ground Cover

Differences in total percent ground cover were consistent across all distance classes, indicating that changes were not attributable to Project-related effects. No main effect of distance class on total ground cover ($p = 0.49$) was identified. No interaction between distance class and year ($p = 0.78$), treatment and year ($p = 0.40$), or distance class and treatment ($p = 0.50$) occurred. There was also no three-way interaction among year, distance, and treatment ($p = 0.83$). Mean ground cover was positively related to SMR (Effect = 0.41, $p= 0.001$).

Although there was suggestive evidence of a difference in total ground cover among years ($p =0.06$; Figure 4-4), no distinct trends were obvious. Averaging across distance classes and treatment, total ground cover was 95.4% (CI = 93.9 – 96.6) in 2014, 92.4% (CI = 90.4 – 94.1) in 2016, 91.1% (CI = 88.9 – 93.0) in 2017, 93.1% (CI = 91.2 – 94.6) in 2018, and 93.8% (CI = 92.2 – 95.1) in 2019. Total ground cover in 2014 was higher than in the other years (all $p < 0.02$). No difference was found between 2016 and 2017 ($p = 0.18$) or between 2016 and 2018 ($p = 0.77$); however, ground cover was higher in 2019 than in 2016 ($p = 0.06$). Total ground cover in 2017 was statistically lower than in 2018 ($p = 0.004$) and 2019 ($p < 0.001$). No difference in total ground cover existed between 2018 and 2019 ($p = 0.50$).

No effect for herbivory on total ground cover was identified between open and closed plots. A statistical difference in treatment on total ground cover ($p = 0.05$; Figure 4-5) was determined. However, after accounting for year, mean ground cover in open plots was higher at 92.9% (CI = 91.3 – 94.2) than closed plots at 91.7% (CI = 89.7– 93.3), which does not imply a grazing effect.

Although there were statistical differences in total percent ground cover among years, these differences were small and consistent across all distance classes; therefore, data suggest that changes in cover among years appears to be more likely the result of natural variation rather than Project-related effects.

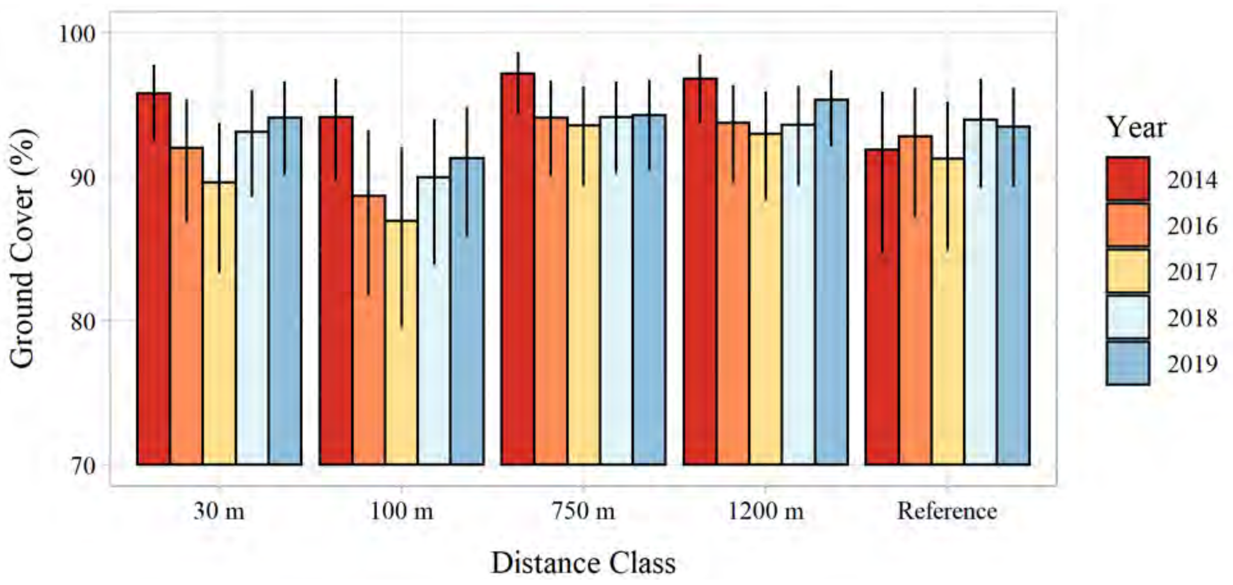


Figure 4-4 **Total ground cover by distance class and year.**
Bar heights show mean cover and error bars show 95% confidence intervals. Y-axis focuses on percent ground covers above 70% for greater legibility.

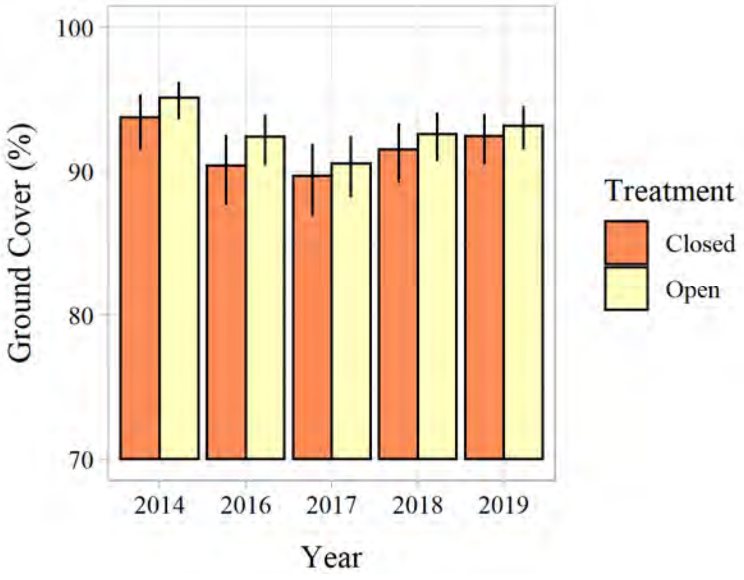


Figure 4-5 **Total ground cover by treatment and year.**
Bar heights show mean cover and error bars show 95% confidence intervals. Y-axis focuses on percent ground covers above 70% for greater legibility.

Ground Cover Plant Group

Differences in plant group cover were examined by year to look at overall changes in cover and to determine which plant groups in the ground layer warranted detailed examination. The average cover of plant groups changed among years ($p < 0.001$, Figure 4-6). Based on this analysis, the following plant groups were considered for detailed analysis including ground litter, moss, evergreen shrubs, and lichen. Deciduous shrubs, forbs, and graminoids each had less than 1% cover in all years; therefore, these plant groups were not investigated further.

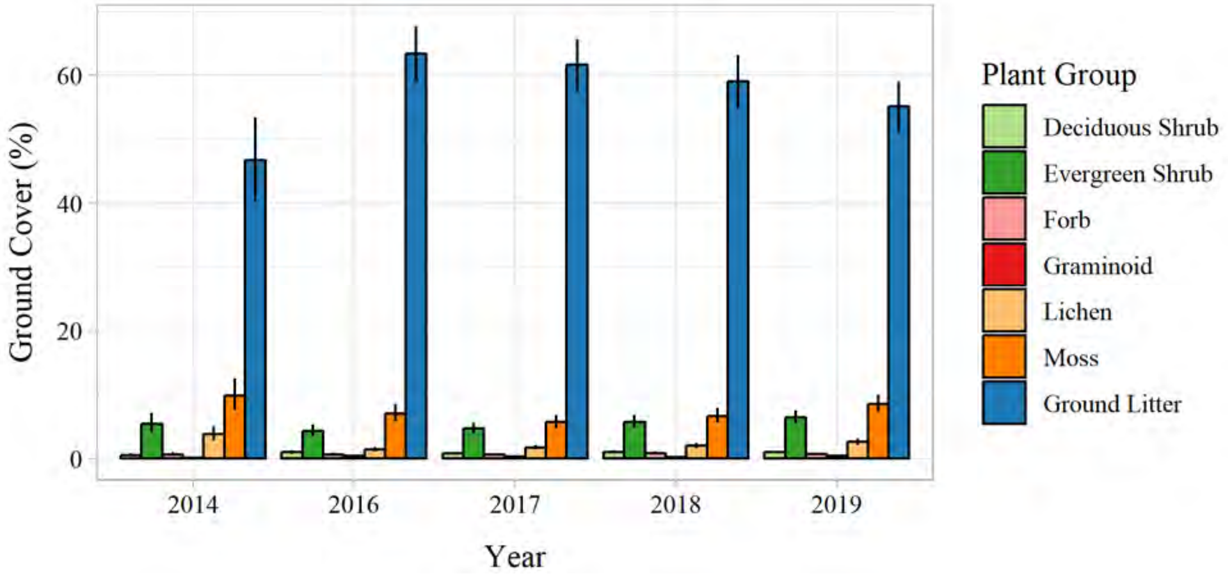


Figure 4-6 Ground cover by plant group and year.
Bar heights show average cover and error bars show 95% confidence intervals.

Ground Litter — Ground litter (dead, unattached material) made up most of the ground cover in all years. Although ground litter is not considered caribou forage, it was included in the analysis because it is related to, and may help explain, potential changes in the standing dead litter group for the canopy layer.

Differences in ground litter cover were consistent across all distance classes, indicating that changes were not due to Project-related effects. Differences occurred in cover among years ($p < 0.001$; Figure 4-7); however, there was no main effect of distance class ($p = 0.31$) or treatment ($p = 0.98$). No interaction was identified between distance class and year ($p = 0.11$), or distance class and treatment ($p = 0.22$). There was also no three-way interaction among year, treatment, and distance class ($p = 0.76$). No relationship occurred between ground litter and SMR ($p = 0.41$).

Although there were differences in ground litter cover among years ($p < 0.001$), no distinct trends were obvious. Average ground litter cover peaked in 2016 at 63.1% (CI = 60.5 — 65.5; $p < 0.001$), which was higher than 2014 ($p < 0.001$), 2018 ($p = 0.006$), and 2019 ($p < 0.001$), but comparable to 2017 at 62.1% (CI = 59.6 — 64.5). After peak ground litter cover in 2016, cover remained high in 2017 then decreased incrementally in 2018 to 59.9% (CI = 57.3 — 62.4) and 2019 to 55.6% (CI = 53.0 – 58.0%; all $p < 0.001$) relative to the high in 2016. Ground litter was lowest in 2014 at 50.8% (CI = 47.6 — 54.0), which was lower than in all other years (all $p < 0.002$).

Evidence suggested an interaction between year and treatment (p = 0.06). In 2014, average ground litter in open plots was higher at 53.0% (CI = 49.3 – 56.7) than in closed plots at 48.6% (CI = 44.3 – 52.9; p = 0.07). Ground litter did not differ among treatments in any other year (all p > 0.22).

Statistical differences in ground litter cover among years were consistent across all distance classes; therefore, changes in cover among years is likely the result of inter-annual variation rather than Project-related effects.

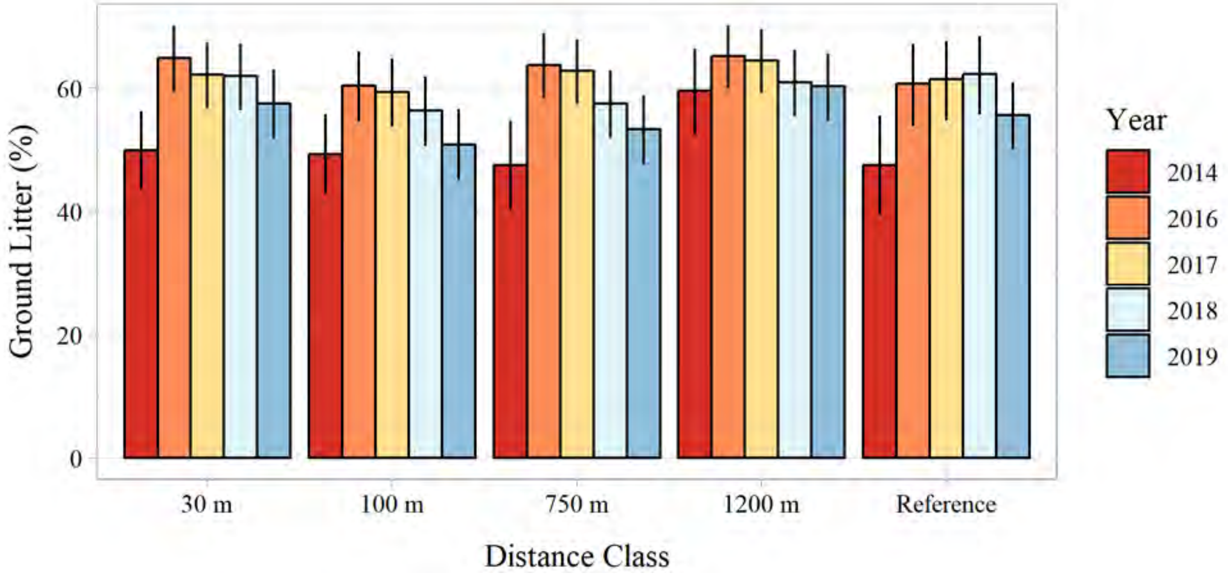


Figure 4-7 **Ground litter cover in the ground layer by distance class and year.**
Bar heights show mean cover and error bars show 95% confidence intervals.

Moss — Moss was the second highest cover in the ground layer for all years. Overall trends in inter-annual variability were similar across all distance classes, indicating that changes were not due to Project effects. While the differences were the same at all distance classes, the changes among years at the 30 and 100 m distance classes were statistically different while the farther distance classes at 750 m, 1,200 m, and Reference sites were not. This was likely due to greater variability in moss cover among sites at the farther sites.

No main effect of distance class (p = 0.17) was identified. No interaction between treatment and year (p = 0.31) or distance and treatment (p = 0.95) occurred. There was also no three-way interaction among year, treatment, and distance class (p = 0.60). Moss cover was higher at sites with higher soil moisture regime (SMR: 0.64, p < 0.001). A negative relationship was found between moss cover and ground litter cover (p < 0.001). Sites with high ground litter tended to have lower moss cover.

An interaction existed between distance class and year (p = 0.02; Figure 4-8). At the 30 and 100 m distance classes, moss cover was highest in 2014, lower in 2016 and 2017, and increased in 2018 and 2019. At 30 m, moss cover was higher in 2014 than 2016 (p = 0.003), 2017 (p < 0.001), and 2018 (p = 0.05); moss cover in 2018 was higher than in 2017 (p = 0.02); moss cover in 2019 was higher than in 2017 (p < 0.001). At 100 m, moss cover was higher in 2014 than 2016 (p < 0.001), 2017 (p < 0.001), and 2018 (p = 0.03); moss cover in 2019 was higher than in 2016 (p < 0.001) and 2017 (p < 0.001). At the 750 and 1,200 m distance classes, moss cover in 2014 was more than twice as high as in any other year (all p < 0.002). In the reference class, moss cover was highest in 2014, but no statistical differences occurred among years (all p > 0.52).

Although moss cover was similar across all distance classes, a year effect (p < 0.001; Figure 4-8) indicated that moss cover was higher in 2014 than in subsequent years. This does not indicate a Project-related effect. In 2014, moss cover was 13.1% (CI = 9.7 – 17.3); this was higher than in 2016 at 6.6% (CI = 4.9 – 8.9; p < 0.001), 2017 at 6.1% (CI = 4.5 – 8.2; p < 0.001), 2018 at 7.0% (CI = 5.2 – 9.4, p < 0.001), and 2019 at 8.5% (CI = 6.4 – 11.2, p < 0.001). No differences in moss cover occurred among 2016, 2017, and 2018 (all p > 0.14). Moss cover in 2019 was higher than in 2016 (p = 0.002), 2017 (p < 0.001), and 2018 (p = 0.03).

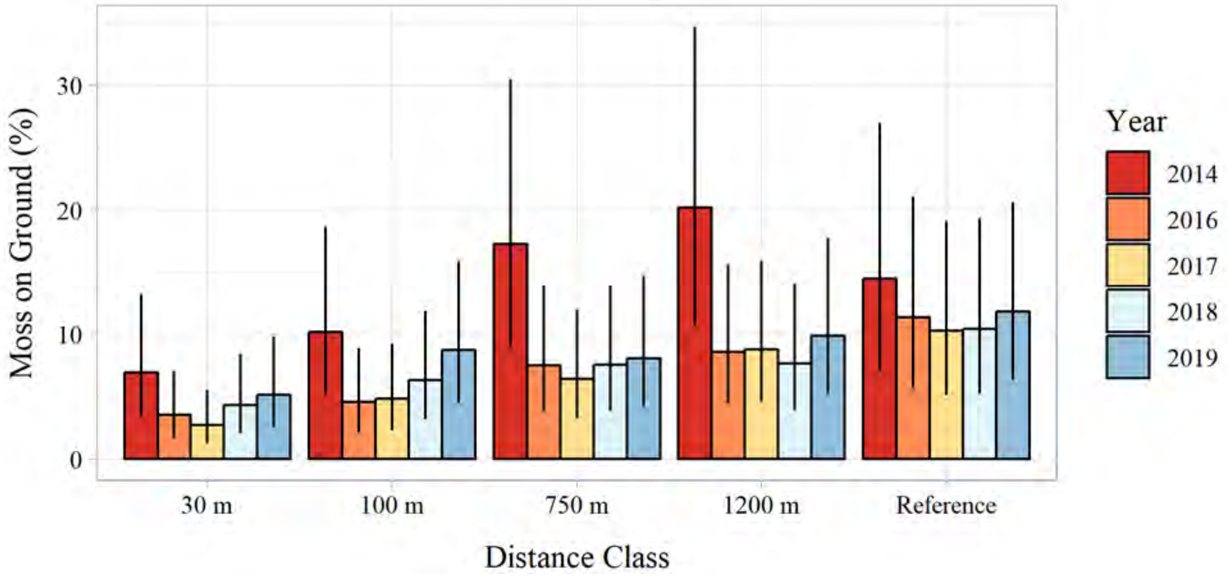


Figure 4-8 Moss cover in the ground layer by distance class and year.
Bar heights show mean cover and error bars show 95% confidence intervals.

Evergreen Shrubs — Differences in evergreen shrub cover were consistent across all distance classes, indicating that changes were not due to Project effects. No main effect of distance class (p = 0.36) or treatment (p = 0.61) was identified. No interaction between distance class and year (p = 0.23), treatment and year (p = 0.87), or treatment and distance class (p = 0.85) occurred. There was also no three-way interaction among year, treatment, and distance class (p = 0.73).

Although statistical differences existed in cover among years (p < 0.001; Figure 4-9), no distinct trends were obvious that would indicate a Project-related effect. Mean evergreen shrub cover was 4.5% (CI = 3.3 – 6.2) in 2014, 4.0% (CI = 3.0 – 5.4) in 2016, 4.0% (CI = 3.0 – 5.4) in 2017, 5.0% (CI = 3.7 – 6.6) in 2018, and 6.2% (CI = 4.7 – 8.1) in 2019. Evergreen shrub cover was higher on average in 2018 than in 2016 ($p = 0.02$) and in 2017 ($p = 0.02$), but not different from 2014 ($p = 0.83$). In 2019, evergreen shrub cover was higher than in all previous years (all $p < 0.01$). There were no differences in evergreen shrub cover among 2014, 2016, and 2017 (all $p > 0.73$).

Statistical differences in evergreen shrub cover among years were consistent across all distance classes; therefore, changes in cover among years is likely the result of inter-annual variation rather than Project-related effects.

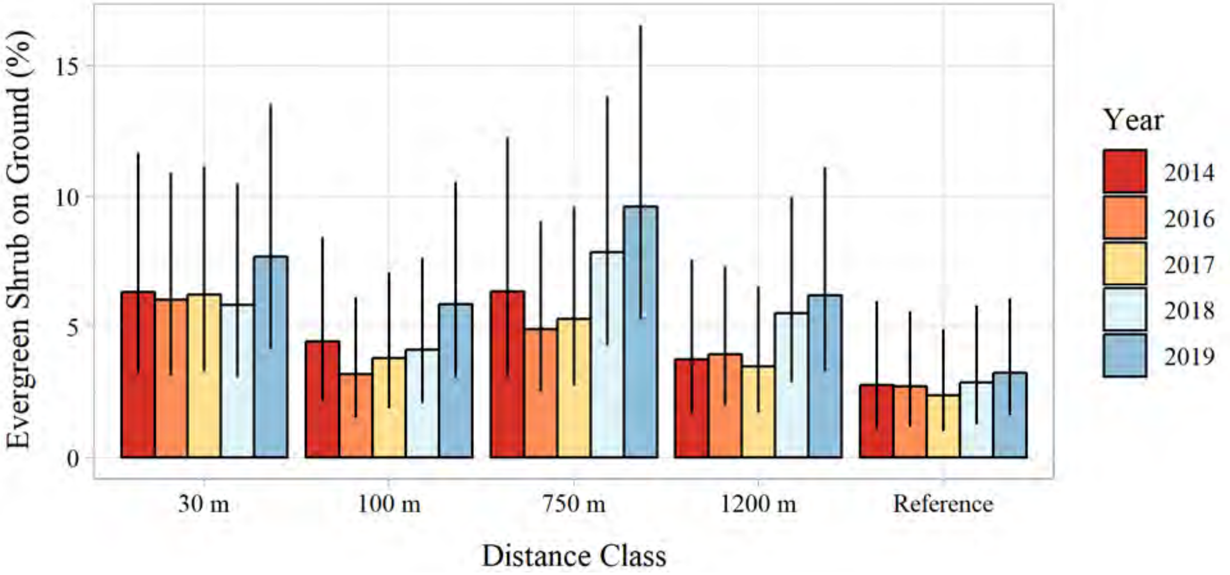


Figure 4-9 **Evergreen shrub cover in the ground layer by distance class and year.**
Bar heights show mean cover and error bars show 95% confidence intervals.

Lichen — Differences in lichen cover were consistent across all distance classes, indicating that changes were not due to Project-related effects. No interaction existed between distance class and year ($p = 0.48$), treatment and year ($p = 0.35$), or treatment and distance class ($p = 0.66$). No main effect of treatment ($p = 0.24$) occurred. There was also no three-way interaction among year, treatment, and distance class ($p = 0.91$). Lichen cover was lower at sites with higher soil moisture regime (SMR: -0.30, $p = 0.02$). A negative correlation existed between ground litter cover and lichen cover ($p < 0.001$), indicating that sites with higher ground litter tended to have lower lichen cover.

Although there were differences in lichen cover among years ($p < 0.001$) and distance classes ($p = 0.04$; Figure 4-10), no distinct trends were obvious. Lichen cover was 3.3% (CI = 2.4 – 4.5) in 2014, 2.0% (CI = 1.4 – 2.6) in 2016, 2.0% (CI = 1.4 – 2.7) in 2017, 2.3% (CI = 1.7 – 3.1) in 2018, and 2.4% (CI = 1.7 – 3.1) in 2019. Lichen cover was higher in 2014 than in 2016 ($p < 0.001$), 2017 ($p < 0.001$), 2018 (p = 0.002), and 2019 (p = 0.02). Lichen cover in 2019 was higher than in 2016 (p = 0.05) and in 2017 (p = 0.04), but no difference existed between 2018 and 2019 (p = 0.93).

After accounting for other effects, lichen cover was highest in the reference class at 4.7% (CI = 2.6 – 8.2), followed by the 30 m distance class at 3.0% (CI = 1.6 – 5.4). Average lichen cover in the other three distance classes was between 1.4% and 1.9%. The only statistical difference when assessing average lichen cover by distance class was higher lichen at Reference sites compared to 1,200 m sites (p = 0.06). In 2019, nine new Reference sites were added to the monitoring program. On average, these new sites had higher lichen cover than existing sites, which increased the overall estimate of average lichen cover in the reference distance class.

Statistical differences in lichen cover among years were consistent across all distance classes. Therefore, changes in cover among years is likely the result of inter-annual variation rather than Project-related effects.

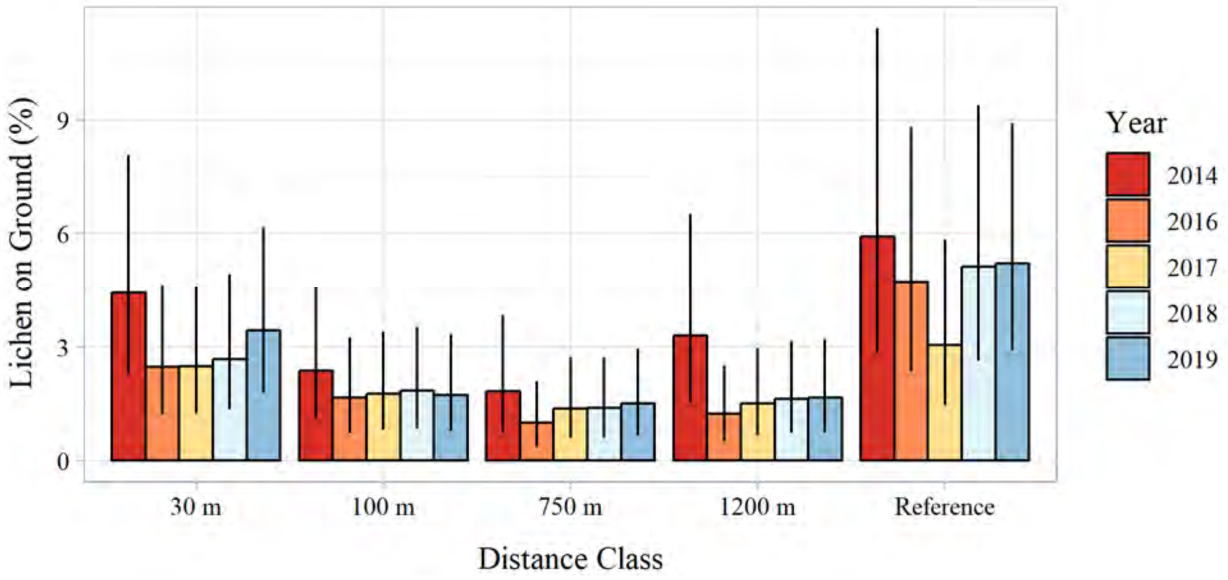


Figure 4-10 Lichen cover in the ground layer by distance class and year.
Bar heights show mean cover and error bars show 95% confidence intervals.

4.1.2.1.2 Total Percent Canopy Cover

Differences existed in total percent canopy cover among years (p = 0.004; Figure 4-11); however, no distinct trends were obvious that would indicate a Project-related effect. Average canopy cover was lower in 2014 and 2018 and higher in 2016, 2017, and 2019. Averaging across distance classes, treatments and soil moisture regime, total canopy cover was 43.9% (CI = 40.6 – 47.2) in 2014, 52.2% (CI = 49.3 – 55.0) in 2016, 51.0% (CI = 48.2 – 53.8) in 2017, 46.5% (CI = 43.8 – 49.3) in 2018, and 51.5% (CI = 48.8 – 54.1) in 2019. Total canopy cover in 2014 was lower than in 2016 (p < 0.001), 2017 (p < 0.001), and 2019 (p < 0.001). In 2018, total canopy cover was lower than in 2016 (p < 0.001), 2017 (p < 0.001), and 2019 (p < 0.001), but not different than canopy cover in 2014 (p = 0.31). No difference existed in canopy cover among the years 2016, 2017, and 2019 (all p > 0.81).

An interaction occurred between distance class and year (p = 0.009); however, not all distance classes followed the overall trend and trends do not indicate a Project-related effect. The 30, 100, and 1,200 m distance classes followed the inter-annual trend described above with higher canopy cover in 2016, 2017, and 2019. At 750 m, the only statistical interaction was between year and distance class, with lower canopy cover in 2018 than 2016 (p < 0.001) and 2019 (p = 0.02). At Reference sites, a trend of increasing canopy cover from 2014 to 2017 occurred; however, the difference was only statistical between 2014 and 2017 (p = 0.07), and between 2014 and 2019 (p = 0.02).

No effect of herbivory on total canopy cover was found between open and closed plots. Evidence suggested an interaction between year and treatment class for total canopy cover (p = 0.05; Figure 4-12); however, canopy cover was higher in 2014 at open plots (46.2%; CI = 42.4 – 50.1) than closed plots (41.7%; 37.4 – 46.1; p = 0.07), which does not imply a grazing effect. No differences were identified in total canopy cover among treatments in subsequent years (2016: p = 0.74; 2017: p = 0.89; 2018: p = 0.14; 2019: p = 0.49).

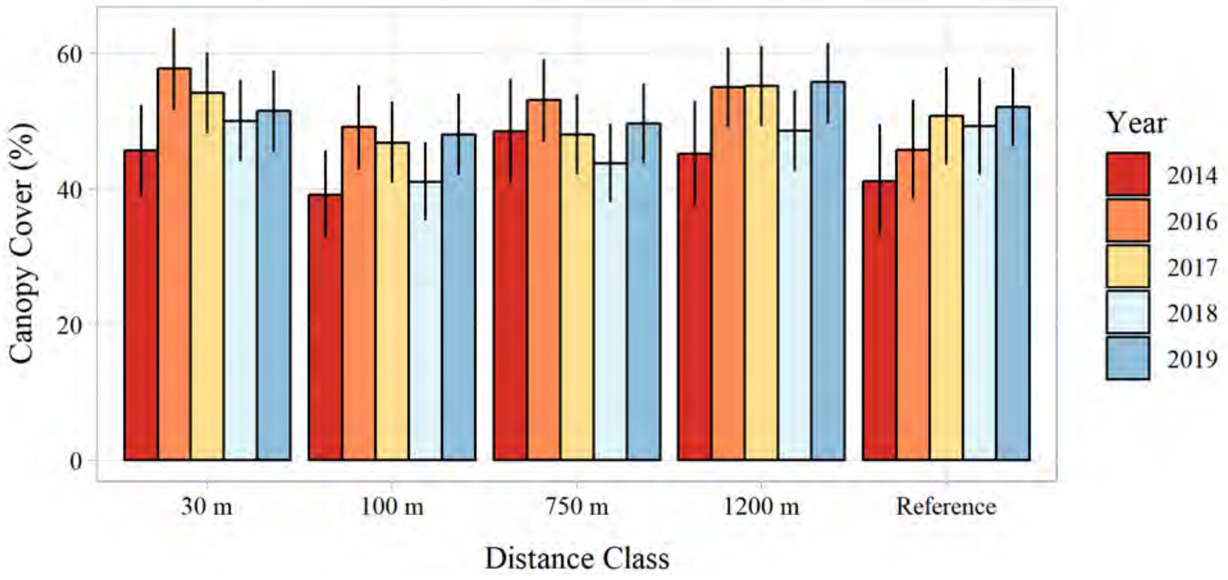


Figure 4-11 Total canopy cover by distance class and year.
Bar heights show average cover and error bars show 95% confidence intervals.

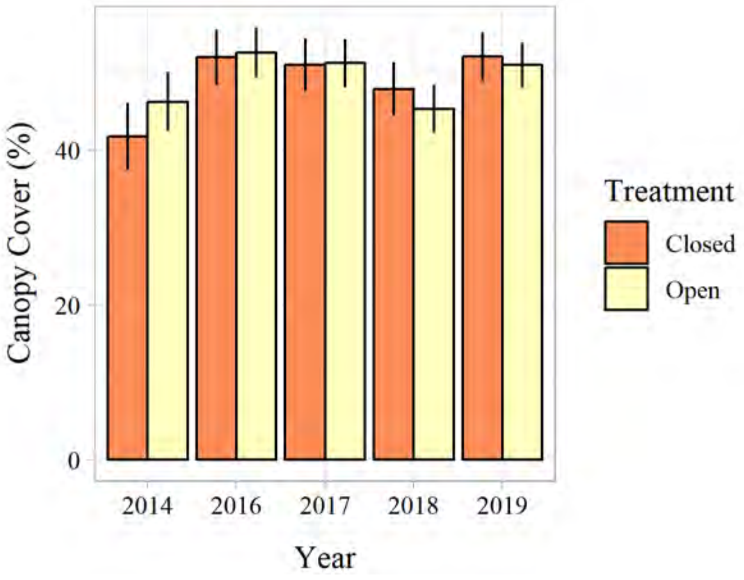


Figure 4-12 Total canopy cover by treatment and year.
Bar heights show average cover and error bars show 95% confidence intervals.

Canopy Cover Plant Groups — Differences in plant group cover were examined by year to look at overall changes in cover and to determine which plant groups in the canopy layer warranted detailed examination. The average cover of plant groups changed among years ($p < 0.001$; Figure 4-13). Based on this analysis, standing dead litter and deciduous shrub cover were considered for detailed analysis. Average cover of evergreen shrubs and forbs was less than 2% in all years; therefore, these plant groups were not investigated further.

In 2019, graminoids were combined with standing dead litter as a single plant group, based on results in the 2018 Terrestrial Environment Annual Monitoring Report, which indicated that graminoid cover in the canopy layer could not be measured reliably as a stand-alone plant group (EDI Environmental Dynamics Inc. 2019). Particularly in the Arctic, graminoids go through a rapid process of green up and senescence where the leaves of the plants can be half green and half standing dead litter. This leads to a discrepancy as to whether individual plants are categorized as living plant material (graminoid) or standing dead litter. Given the small surface area of graminoid leaves and the inherent difficulty in categorizing a single leaf as living or dead, 2019 monitoring results combined graminoid and standing dead litter data.

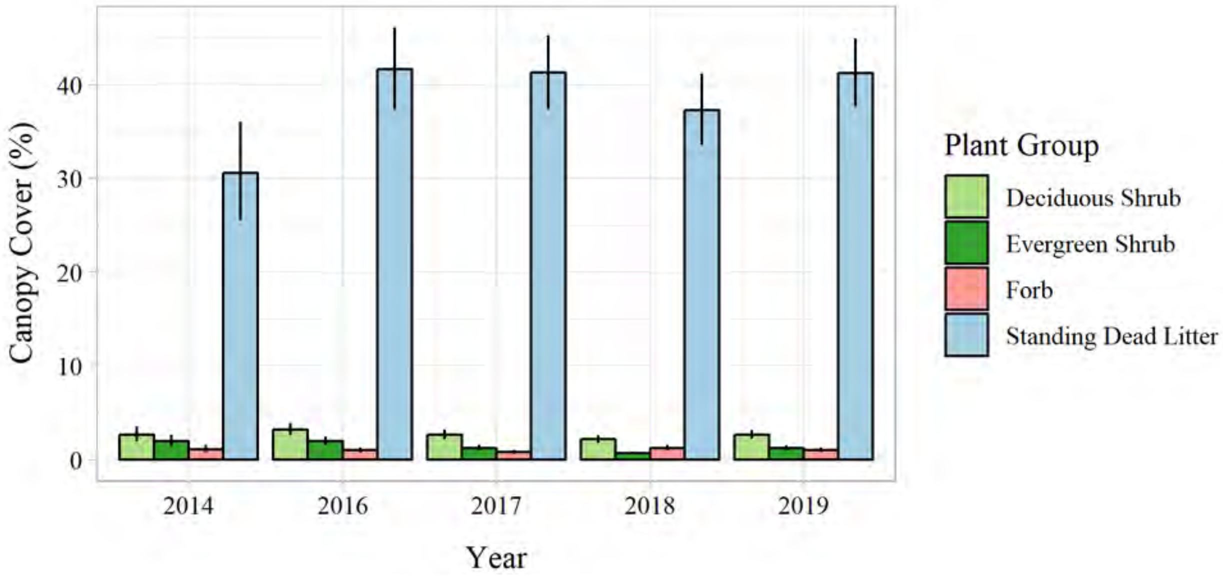


Figure 4-13 Canopy cover by plant group and year.
Bar heights show average cover and error bars show 95% confidence intervals.

Standing Dead Litter — Differences in standing dead litter cover were consistent across all distance classes, indicating that changes were not due to Project-related effects. No main effect of distance class (p = 0.47) or treatment (p = 0.95) was found. No interaction existed between year and treatment (p = 0.26). There was also no three-way interaction among year, treatment, and distance class (p = 0.88). Standing dead litter increased with soil moisture regime (SMR: 0.23, p <0.001).

Although there were statistical differences in cover among years (p < 0.001; Figure 4-14), no distinct trends were obvious that would indicate a Project effect. Standing dead litter cover was lowest in 2014, at 31.9% (CI = 28.8 – 35.2), and higher in all other monitoring years: 41.2% (CI = 38.1 – 44.3) in 2016, 41.8% (CI = 38.8 – 44.8) in 2017, 37.6% (CI = 34.7 – 40.6) in 2018, and 41.2% (CI = 38.3 – 44.1) in 2019. Standing dead litter in 2014 was lower than in all other years (all p < 0.001). Standing dead litter in 2018 was also lower than in 2016 (p = 0.003), 2017 (p < 0.001), and 2019 (p = 0.002).

Evidence existed of an interaction between distance class and year (p = 0.02). Inter-annual trends in all distance classes generally followed the same pattern described above but were less pronounced in the 750 m distance class and at reference sites. At 750 m distance class, 2014 and 2018 had the lowest cover for standing dead litter, but inter-annual differences were not statistical (all p > 0.1). At reference sites, standing dead litter in 2016 was comparable to 2014 (p = 0.40) and 2018 (p = 0.93), but lower than in 2017 (p = 0.008) and 2019 (p = 0.001).

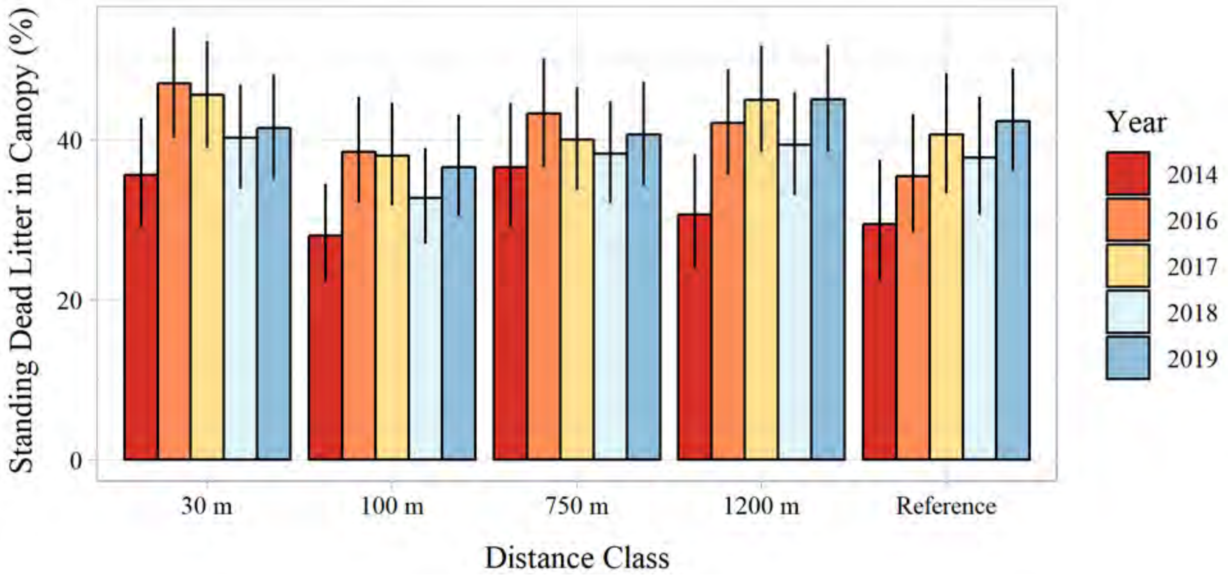


Figure 4-14 Standing dead litter in the canopy layer by distance class and year.
Bar heights show average cover and error bars show 95% confidence intervals.

Deciduous Shrub — Differences were identified for deciduous shrub cover among years ($p < 0.001$; Figure 4-15); however, no distinct trends were obvious that would indicate a Project-related effect. There was no main effect of treatment ($p = 0.47$) or distance class ($p = 0.28$). No interaction existed between year and treatment ($p = 0.69$) or distance class and treatment ($p = 0.44$). There was also no three-way interaction among year, treatment, and distance class ($p = 0.41$). No relationship occurred between deciduous shrub cover and soil moisture regime ($p = 0.13$).

Averaging across distance class and treatment, deciduous shrub cover was 3.2% (CI = 2.4 – 4.2) in 2014, 2.9% (CI = 2.3 – 3.7) in 2016, 2.6% (CI = 2.0 – 3.4) in 2017, 2.3% (CI = 1.7 – 2.9) in 2018, and 2.8% (CI = 2.2 – 3.5) in 2019. Deciduous shrub cover in 2018 was lower than in 2014 (p 0.005) and 2016 ($p = 0.01$).

A weak interaction existed between year and distance class ($p = 0.03$); however, trends in the data were inconsistent. No annual differences occurred for the 30 m and Reference distance classes (all $p > 0.64$). In the 100 m distance class, a trend existed for declining deciduous shrub cover from 2014 to 2018, then increasing again in 2019; deciduous shrub cover in 2014 was higher than 2017 ($p = 0.04$) and 2018 ($p < 0.001$) and cover in 2016 was higher than in 2018 ($p = 0.008$). In the 750 m distance class, deciduous shrub cover was lower in 2018 than 2017 ($p = 0.03$) and 2019 ($p = 0.02$), but there were no other inter-annual differences. In the 1,200 m distance class, deciduous shrub cover was higher in 2016 than in 2018 ($p = 0.003$).

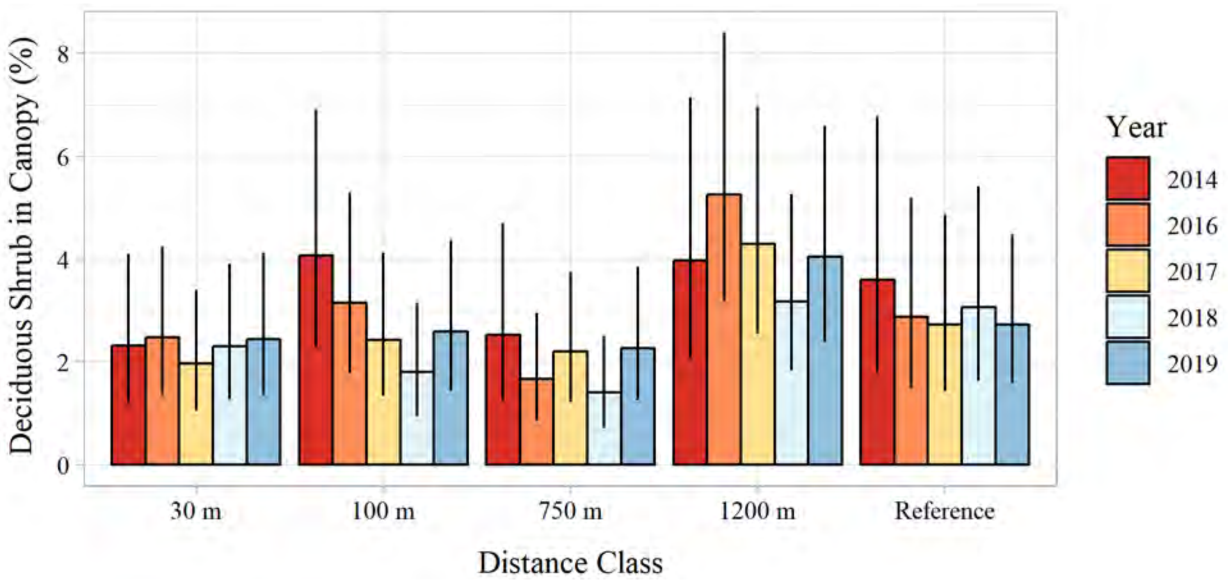


Figure 4-15 Deciduous shrub cover in the canopy layer by distance class and year.
Bar heights show mean cover and error bars show 95% confidence intervals.

4.1.2.2 Soil Moisture Regime

Generally, soils at vegetation abundance monitoring sites were Turbic or Static Cryosol soils composed of mineral soil with disrupted, mixed or broken soil horizons in the active layer caused by cryoturbation processes from the freezing and thawing of permafrost. At the soil surface, some sites appeared as patterned ground such as sorted and non-sorted circles or polygons indicating a Turbic Cryosol; the root of the word turbic or "turbi" indicates some level of ground disturbance. Comparatively, Static Cryosols lack surficial evidence of cryoturbation although they are permafrost-influenced. Both types of Cryosols can be found together and are often distributed based on topographical differences (Soils of Canada 2019).

The majority of sites had a SMR of 4 or 5 (52% and 32%, respectively; Table 4-1) indicating that sites were mesic (average moisture) or subhygric (above average moisture), respectively. Only a small proportion of sites were hygric (wet; SMR: 6, 7%) or subhydric (very wet; SMR 7, 9%). No evidence existed that SMR differed among the five distance classes (p = 0.65). Mean SMR across all distance classes was 4.7 (CI = 4.5 – 5.0; Figure 4-16). The Fisher's Exact Test showed that the distribution of SMR was independent of distance class (p = 0.86). The comparison of new and existing Reference sites showed that new Reference sites were not different in SMR from the existing Reference sites (p = 0.67).

Table 4-1 Distribution of Soil Moisture Regime (SMR) by Distance Class.

Number of Vegetation Abundance Monitoring Sites within Distance Class					SMR	SMR Description
30 m	100 m	750 m	1,200 m	Reference		
8	7	10	9	5	**4**	mesic/average moisture
4	4	4	4	8	**5**	subhygric/above average moisture
1	2	0	1	1	**6**	hygric/wet
2	2	1	1	1	**7**	subhydric/very wet

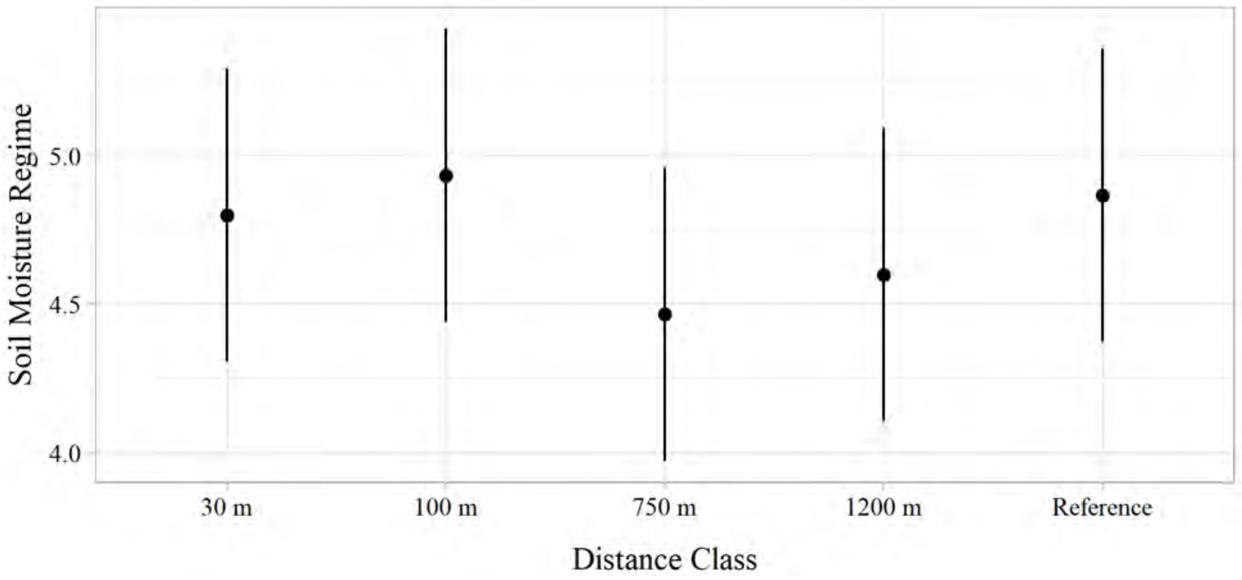


Figure 4-16 Soil moisture regime by distance class from the PDA.
Points show mean SMR and error bars show 95% confidence intervals.

4.2 VEGETATION AND SOIL BASE-METALS MONITORING

NIRB Project Certificate No. 005 conditions address the concern of potential increase in metal concentrations in vegetation and soil from Project activities:

- Project Condition #34 — *The Proponent shall conduct soil sampling to determine metal levels of soils in areas with berry-producing plants near any of the potential development areas, prior to commencing operations.*
- Project Condition #36 — *The Proponent shall establish an on-going monitoring program for vegetation species used as caribou forage (such as lichens) near Project development areas, prior to commencing operations.*
- Project Condition #38, 50 *and Project Commitment #67, 69 and 107 also addresses these limitations or relates to the reporting requirements for the vegetation and soil base metal monitoring program.*

Those conditions are addressed through a long-term vegetation and soil base-metals monitoring program established in the TEMMP (Baffinland Iron Mines Corporation 2016). The objectives of the vegetation and soil base-metals monitoring program are to:

- monitor metal concentrations in vegetation and soil, particularly caribou forage (i.e., lichen), near Project infrastructure; and
- determine if metal concentrations in vegetation and soil exceed either Canadian Council of Ministers of the Environment (CCME) soil quality guidelines and/or relevant indicator values for lichen provided in the literature.

Baseline data on vegetation and soil metal concentrations for the Project first collected as a baseline in August 2008 were not used because of discrepancies in the results. Those discrepancies were either due to laboratory methods or minimum detection limits at the time of analyses. Also, the collection methods from 2008 (Baffinland Iron Mines Corporation 2010a) were not available, and it is not possible to compare to the more recent data.

Additional baseline sampling occurred in the southern sections of the RSA in 2012 and the northern portions of the RSA in 2013. Vegetation included in the monitoring program consisted of three focal species/species groups: lichen (*Flavocetraria cucullata, Flavocetraria nivalis, Cladina arbuscula* and *Cladina rangiferina*), willow (*Salix* spp.), and blueberry (*Vaccinium uliginosum*). In 2013, exploratory the relationship of metal concentrations in vegetation and soils to distance from the PDA was explored for seven contaminants (metals/metalloids) of potential concern (CoPC): aluminum, arsenic, cadmium, copper, lead, selenium, and zinc (EDI Environmental Dynamics Inc. 2014). Results were compared to CCME soil quality guidelines and relevant indicator values for vegetation provided in the literature. Baseline metal concentrations in soil were well below guidelines, and metal concentrations in vegetation tissues (excluding blueberry due to insufficient sample size) were mostly below indicator values with few baseline CoPCs naturally exceeding the indicator. The detailed discussion of those findings is in the 2013 Terrestrial Environment Annual Monitoring Report (EDI Environmental Dynamics Inc. 2014).

In 2014, additional sample sites at distances of 5 to 15 km from the PDA increased the sample size for blueberry and improved overall sampling coverage. Based on the results of the 2014 vegetation and soil base-metals monitoring program (EDI Environmental Dynamics Inc. 2015), blueberry was removed from the monitoring program due to limited availability in the RSA from the Mine Site north to Milne Port. Willow was also removed due to issues regarding metal tolerance and lack of an indicator value. Aluminum was also removed as a CoPC due to its ubiquitous nature and lack of CCME and/or US Environment Protection Agency (US EPA) soil quality guidelines for the protection of environmental and human health. Lichen was selected as a focal species to assess metals uptake in vegetation and reporting on six metals/metalloids of potential concern: arsenic, cadmium, copper, lead, selenium, and zinc. Lichens have long been recognized as sensitive indicators of environmental conditions and accumulators of atmospheric pollutants (Naeth and Wilkinson 2008, Aslan et al. 2011); thus, it is appropriate to use lichen for Project monitoring of metals uptake in vegetation.

Regardless of the design modification noted above, the NIRB 2014–2015 Annual Monitoring Report for the Mary River Project (Nunavut Impact Review Board 2015) included recommendations from the NIRB and GN to modify the vegetation and soil base-metals monitoring program. Specifically, the recommended changes were to increase the sample size and extent of sampling to improve spatial coverage in the RSA to adequately detect changes in metal concentrations in soil and lichen over time. To address those recommendations, Baffinland conducted a statistical power analysis to determine the number of soil and lichen samples required to detect a change in metal concentrations. The analysis considered comparisons between the 'Before' period (i.e., baseline sampling) and the 'After' period (i.e., post-baseline sampling) for all CoPCs. The study design was modified to align with the dustfall monitoring program where feasible. It included new sample sites at varying distances from the PDA to compare metal concentrations in soil and vegetation between Near, Far, and Reference sites. Based on the results of the power analysis (included in the 2015 terrestrial environment annual report, EDI Environmental Dynamics Inc. 2016), the revised study design is statistically sound with adequate sample size and spatial coverage to address the NIRB and GN recommendations. The revised study design was implemented in 2016 to complete the baseline sampling program for vegetation and soil base metals. The results of the baseline analysis determined that metal concentrations in soil and lichen across all sites sampled in 2012 to2016 were below CCME soil quality guidelines and relevant indicator values for lichen provided in the literature (EDI Environmental Dynamics Inc. 2017, 2018).

The 2019 survey included Project effects monitoring for metal concentrations in soil and lichen. The program followed the revised study design implemented in 2016 as per the NIRB and GN recommendations (EDI Environmental Dynamics Inc. 2017). The analysis focused on six CoPCs in soil and lichen: arsenic, cadmium, copper, lead, selenium, and zinc. Soil and lichen CoPC concentrations were compared between the 'Before' and 'After' period and the distance from the PDA.

4.2.1 METHODS

In 2019, soil and lichen samples were collected at 57 sites (Table 4-2; Map 3 and Map 4). A replicate sample from the same site and time was collected from approximately 20% of the sites. The replicates were used to evaluate the precision of field and laboratory methods and/or estimate sample variability (Horowitz 1990, Glavich and Geiser 2008). A summary of all sites, coordinates, distances and parameters are in APPENDIX C — Vegetation and Soils Base Metals Monitoring Sites, 2012–2019.

The study design considered three Project areas (Milne Port, Tote Road, Mine Site) at varying distances from the PDA (Near: 0–100 m, Far: 101–1,000 m, and Reference: >1,000 m). Distance classes are based on results from the dustfall program, indicating that there are differences in dustfall within 100 m of the PDA and between 100–1,000 m from the PDA. Beyond 1,000 m, dustfall levels were generally below laboratory detection limits (EDI Environmental Dynamics Inc. 2015).

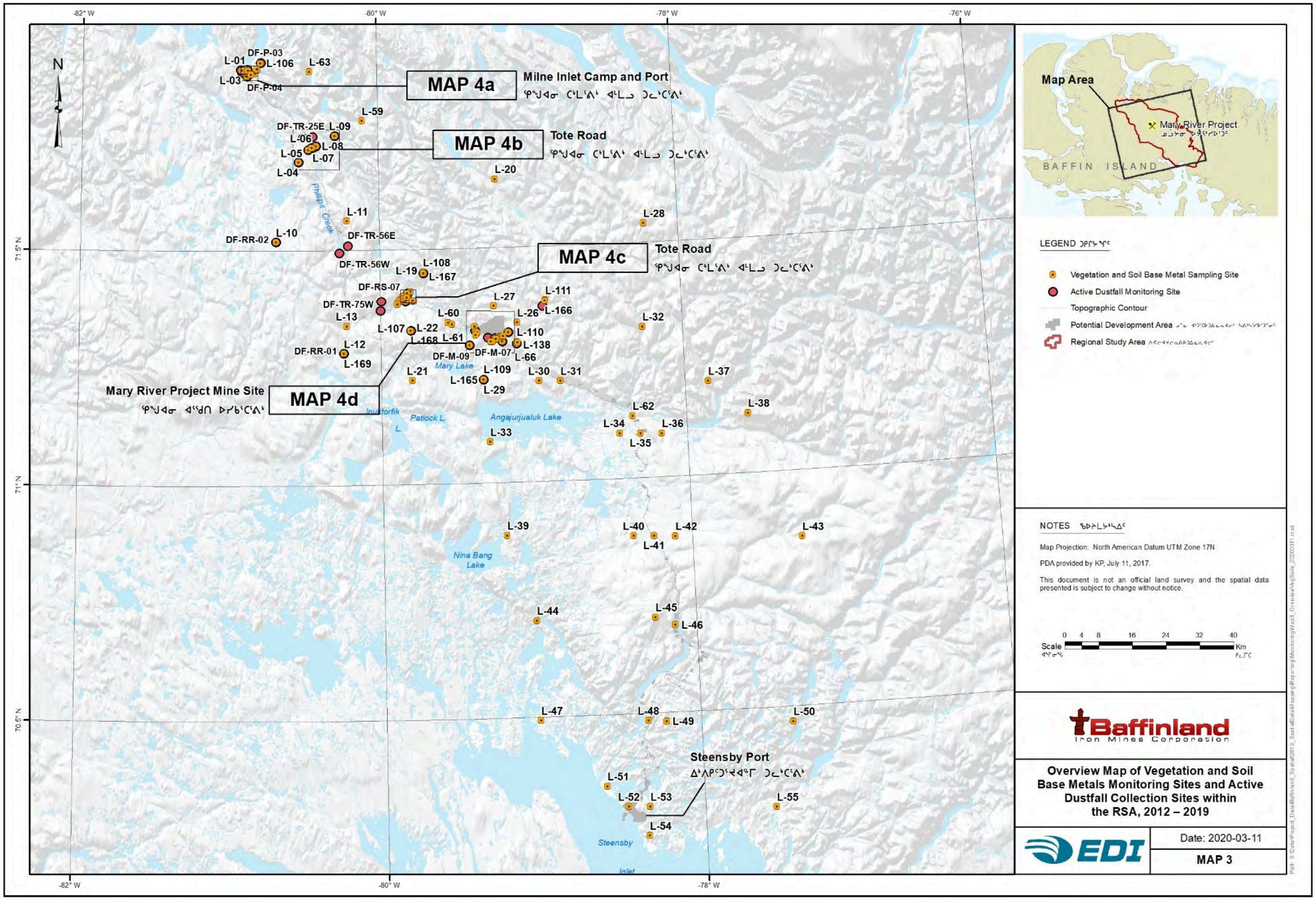
Soil and lichen sample collections occurred from mid- to late-July following the same procedures as previous vegetation and soil base-metals sampling:

- A new pair of nitrile gloves were worn at each sample site.

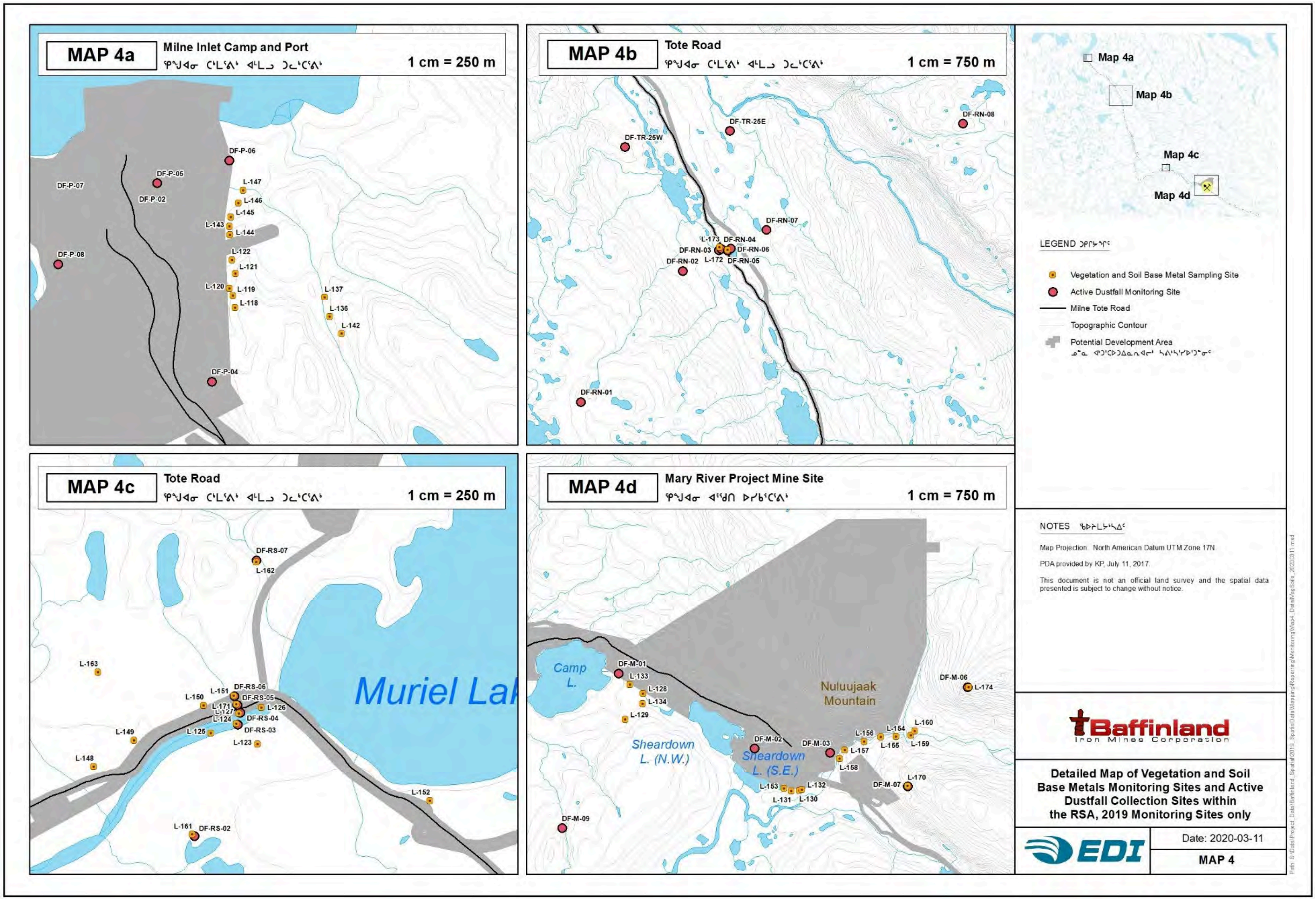
- Stainless steel tablespoons used for soil sampling were cleaned with alcohol wipes before and after each sample.
- A minimum of 10 grams of each vegetation sample was collected at each site.
- A minimum of 100 grams of soil from the top A horizon was collected at each site to a depth of ≤10 cm and above permafrost. This reflects the top layer of the rooting zone, where the potential for metal uptake in plants is expected to be the greatest.
- Samples were placed in new Ziploc® bags, frozen and sent to an accredited laboratory for metals analyses.

Table 4-2 2019 Vegetation and Soil Base Metals Monitoring Program.

Project Area	Distance Category	Distance from PDA (m)	Total Number of Sites		Total Number of Samples
			Soil	Lichen	
Milne Port	Near	0–100	10	10	20
Tote Road	Near	0–100	12	12	24
Mine Site	Near	0–100	11	11	22
Any Project area	Far	100–1,000	12	12	24
Any Project area	Reference	>1,000	12	12	24
Total	**--**	**--**	**57**	**57**	**114**



Overview Map of Vegetation and Soil Base Metals Monitoring Sites and Active Dustfall Collection Sites within the RSA, 2012 – 2019


MAP 4a
Milne Inlet Camp and Port
ᕿᖕᒍᐊᓂ ᑕᒃᒪᕐᕕᒃ ᐊᒻᒪ ᑐᓚᒃᑕᕐᕕᒃ
1 cm = 250 m
DF-P-06
DF-P-05
DF-P-07
DF-P-02
DF-P-08
DF-P-04
L-147
L-146
L-145
L-143
L-144
L-122
L-121
L-120
L-119
L-118
L-137
L-136
L-142
MAP 4b
Tote Road
ᕿᖕᒍᐊᓂ ᑕᒃᒪᕐᕕᒃ ᐊᒻᒪ ᑐᓚᒃᑕᕐᕕᒃ
1 cm = 750 m
DF-TR-25E
DF-TR-25W
DF-RN-08
DF-RN-07
L-173
DF-RN-04
DF-RN-03
DF-RN-06
DF-RN-02
L-172
DF-RN-05
DF-RN-01
Map 4a
Map 4b
Map 4c
Map 4d
MAP 4c
Tote Road
ᕿᖕᒍᐊᓂ ᑕᒃᒪᕐᕕᒃ ᐊᒻᒪ ᑐᓚᒃᑕᕐᕕᒃ
1 cm = 250 m
DF-RS-07
L-162
Muriel Lak
L-163
L-151
DF-RS-06
L-150
DF-RS-05
L-171
L-127
L-126
L-124
DF-RS-04
L-149
L-125
DF-RS-03
L-123
L-148
L-152
L-161
DF-RS-02
MAP 4d
Mary River Project Mine Site
ᕿᖕᒍᐊᓂ ᐊᕐᖁᑎ ᐅᓯᑲᕐᑕᕐᕕᒃ
1 cm = 750 m
Camp L.
DF-M-01
L-133
L-128
L-134
L-129
Nuluujaak Mountain
DF-M-06
L-174
Sheardown L. (N.W.)
DF-M-02
Sheardown L. (S.E.)
DF-M-03
L-156
L-154
L-160
L-157
L-155
L-159
L-158
L-170
L-153
L-132
DF-M-07
L-131
L-130
DF-M-09
LEGEND ᑐᑭᑎᔭᖏᑦ
Vegetation and Soil Base Metal Sampling Site
Active Dustfall Monitoring Site
Milne Tote Road
Topographic Contour
Potential Development Area
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Map Projection: North American Datum UTM Zone 17N
PDA provided by KP, July 11, 2017.
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland Iron Mines Corporation
Detailed Map of Vegetation and Soil Base Metals Monitoring Sites and Active Dustfall Collection Sites within the RSA, 2019 Monitoring Sites only
EDI
Date: 2020-03-11
MAP 4

4.2.1.1 Vegetation and Soil Base Metals Monitoring

Soil and vegetation samples were analyzed for 36 elements. Lichen was analyzed for the following total metals: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, cesium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury (includes elemental and organic/methyl mercury), molybdenum, nickel, phosphorus, potassium, rubidium, selenium, silver, sodium, strontium, tellurium, thallium, tin, titanium, uranium, vanadium, zinc, and zirconium. Excluding boron, the soil was analyzed for the same suite of metals, with the addition of soil pH. Percent moisture was also analyzed for soil and vegetation samples. Full data sets of soil and vegetation metal analyses from 2019 sampling are provided in APPENDIX D — Vegetation and Soils Base Metals Monitoring Laboratory Results, 2019.

CCME agricultural soil quality guidelines were chosen as indicators of potential toxicity in the soil for the following reasons:

- Land use types defined under the agricultural soil quality guidelines, which consider the potential for soil and food ingestion, were most representative of the land use associated with the Project (Canadian Council of Ministers of the Environment 2006).
- Baseline soil samples indicated that all samples had metals concentrations well below CCME agricultural guidelines.
- The CCME guidelines were consistent with the risk assessment and evaluation of exposure potential from ore dusting events in selected Valued Ecosystem Components (VEC; Intrinsik Environmental Sciences Inc 2011).

Six metal/metalloid CoPCs were selected for reporting: arsenic, cadmium, copper, lead, selenium, and zinc. The CoPCs presented in this, and previous annual reports focus on a subset of total metals analysis provided by the laboratory. The focal CoPCs were selected based on the following considerations:

- Baseline metal concentrations in soil and vegetation (EDI Environmental Dynamics Inc. 2014, 2016) indicated several metals were not detectable in soil and vegetation samples and therefore are not considered for analytical presentation. For example, 96% and 97% of baseline soil and lichen samples, respectively, were below the reportable detection limit (RDL) for mercury.
- Metal concentrations in the ore (Appendix 6G-1, FEIS; Baffinland Iron Mines Corporation 2010b) included iron (64%) and 21 other trace metals. Mercury was not present at measurable concentrations in the ore sampled. Conservative estimates of the metal content in ore-deposited dust excluded mercury as a target analyte.
- Various information sources relating to metals of concern for vegetation health, with the potential for uptake by wildlife and humans, were reviewed including:
    - peer-reviewed literature on native flora and lichen-specific toxicity (Nash 1975, Tomassini et al. 1976, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988, Kinalioglu et al. 2010);

- CCME soil quality guidelines for the protection of environmental and human health that provide the background, fate, behaviour and toxicity for a range of trace metals, as well as recommended soil quality guidelines for Canada; guidelines are derived for the protection of ecological receptors in the environment or the protection of human health associated with four land uses: agricultural, residential/parkland, commercial, and industrial (Canadian Council of Ministers of the Environment 2006);
- relevant studies on the presence and effects of metals in the Arctic and northern terrestrial biota (Canadian Arctic Contaminants Assessment Report 2003, Gamberg 2008); and
- the Evaluation of Exposure Potential from Ore Dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, 2011), which includes a screening-level assessment of caribou exposures to metals in ore dust.

For lichen, indicator values were selected from peer-reviewed literature because no thresholds specific to lichen toxicity in the Canadian High Arctic currently exist, even though the consensus is that they are excellent indicators of atmospheric pollutants and heavy metal contamination (Naeth and Wilkinson 2008). The determination of thresholds was further complicated by the fact that lichens are intimately tied to site conditions and exhibit species-specific tolerance to pollutants.

In the absence of standardized thresholds for metal toxicity in lichen applicable to the Project, indicator values were selected from peer-reviewed literature as a starting point from which to assess potential Project effects to vegetation health (Table 4-3). In this context, an indicator value is a metal concentration (mg/kg dry weight), selected from the best available scientific research for a similar or related lichen species and metal/metalloid, which may signal a change in vegetation health, such as reduced vigour or growth. However, species-specific tolerances and site-specific conditions based on differences in geographic regions will influence the actual concentration at which toxicity is reached. Thus, indicator values are predictive and indicate the potential for initial adverse effects to vegetation health, not a threshold past which acute toxicity occurs. As data continue to be collected through the vegetation and dustfall monitoring programs, indicator values may be revised in response to improvements in understanding of the dose-response relationship between metals and lichen.

Peer-reviewed literature offered indicator values for lichen toxicity for only four of the six CoPCs: cadmium, copper, lead, and zinc. Indicator values may or may not be specific to species found on Baffin Island. Where species-specific values were not found, considerations were made including a similar genus and known distribution in neighbouring Arctic areas (i.e., Greenland and Nunavut).

Table 4-3 CCME soil quality guidelines and lichen indicator values for the soil and vegetation base-metals monitoring program.

CoPCs	Soils[1] (mg/kg)	Lichens (mg/kg dry weight)	Lichen Indicator Value Source
pH	6–8	-	-
Arsenic	12	-	-
Cadmium	1.4	30	(Nash 1975, Nieboer et al. 1978)
Copper	63	15–20	(Tomassini et al. 1976, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988)
Lead	70	5–15	(Tomassini 1976, Nieboer et al. 1978, Kinalioglu et al. 2010)
Selenium	1	-	-
Zinc	200	178	(Nash 1975, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988)

[1] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health

Laboratory analyses followed the British Columbia Lab Manual for "Metals in Animal Tissue and Vegetation (Biota) – Prescriptive." Tissue samples are homogenized and sub-sampled prior to hot block digestion with nitric and hydrochloric acids, in combination with the addition of hydrogen peroxide (modified from Environment Protection Agency Method 6020A; (Environmental Protection Agency 1998). Soils were analyzed following the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Before 2019 monitoring, the micro-digestion analysis for total metal concentrations in soil and vegetation tissues was performed by high-resolution mass spectrometry using Inductively Coupled Plasma Mass Spectrometry (ICP- MS). As of 2019, accredited laboratories across Canada and the United States replaced high-resolution mass spectrometry with collision cell inductively coupled plasma-mass spectrometry (Hawthorne 2020). Despite this change, no significant differences in the results are expected (Jenson 2020). To account for the analyses of total mercury in soil and vegetation tissues, which considers both elemental and organic (e.g., methyl mercury), a strong acid digestion followed by analysis with cold vapor-atomic absorption (CVAAS) spectrometry was used.

Analytical Methods

For each CoPC, the proportion of samples below the RDL (%), median, geometric mean, interquartile range, minimum value, maximum value, and the proportion of samples above the CCME guideline for soil and available indicator value for lichen, were calculated. For statistical analysis, (as opposed to entering a 'zero' value), values below the RDL were replaced with half the RDL for that sample. Geometric means are reported in summary tables; metal concentrations have a log-normal distribution, and the geometric mean is a better estimate of central-tendency for log-normal data.

An ANOVA was used to test for differences among Project areas for samples collected before and after mine construction. The 'Before' sampling period refers to baseline sampling during pre-construction and includes all years of sampling up to and including 2016. The 'After' sampling period refers to post-baseline sampling after construction was initiated and includes all years of sampling following 2016. No sampling was conducted in 2015. The Project areas included:

- Near:
    - Mine — within 100 m of the Mine Site;
    - Road — within 100 m of the Tote Road;
    - Port — within 100 m of Milne Port;
- Far — between 100 m and 1,000 m of the PDA; and
- Reference — greater than 1,000 m from the PDA.

Metal concentrations were log-transformed before analysis. Pairwise comparisons were used to test if mean concentrations differed between sampling periods. Model estimates are reported as back-transformed means with 95% confidence intervals (CI). Statistical test results with p-values less than 0.05 were considered statistically different. Results with p-values between 0.05 and 0.01 were highlighted for future monitoring years based on suggestive evidence for a potential statistical difference. If there was statistical evidence that CoPC concentrations increased within a Project area, mean values were compared to the guideline/indicator value to assess the biological relevance of the change. Differences in the RDL among years were addressed by using the higher RDL; if there were data between the two RDLs, then these were converted to 0.5 of the higher RDL. No statistical test was performed if more than 50% of the samples for a CoPC were below the RDL.

Where there were differences in metal concentrations between the Before and After sampling period, linear regression was used to examine the relationship between metal concentrations with distance from the PDA. For this analysis, soil was not examined because of limited changes to metal concentrations between the sampling periods; therefore, results are presented for metals in lichen only. Regressions included distance and sampling period as the main effects and interaction between distance and sampling period. A significant interaction between distance and sampling period would indicate that the rate at which metals decline with distance from the PDA has changed following mine construction. If there was a significant interaction between sampling period and distance, the location of the intercept was varied to determine the distance from the PDA where the difference in metal concentrations between the Before and After period was no longer significantly different.

Metal concentrations and distances from the PDA were log-transformed before analysis. A value of 1 m was added to all distances to allow for log-transformation of sites sampled at 0 m from the PDA. Two samples collected in 2012 were more than 30 km from the PDA, but no other samples were collected more than approximately 20 km from the PDA; therefore, these two farthest samples were excluded from the analysis, because there are no comparable samples from the After period.

4.2.1.2 Dust-Deposited Metals on Lichen

To better understand metals contributed by dustfall, metal uptake in lichen tissue, as opposed to metals accumulation on the plants'surface, was evaluated. Before laboratory analysis, one half of the lichen sample was washed (for tissue analysis), while the other half of the sample was not washed (reflecting total metal concentrations both in and on lichen tissues). The difference between unwashed and washed samples is the concentration of metals that were dust-borne at the sample site.

An index for dust-deposited metals on lichen was calculated by subtracting metal concentrations between washed and unwashed samples of lichen. The difference between washed and unwashed samples was assumed to be the concentration of metals that were dust-borne (termed "dust-deposited metals") at the sample site (at that time), which may be absorbed by lichen. This assessment is relevant because it captures the full extent of potential metals both on the surface and in lichen tissues.

Positive index values indicate that there were metal concentrations on the surface of the lichen rather than in the lichen tissue. Because there is a natural variation of metal concentrations in lichen, even collected from the same site, the index can have values less than 0. However, large negative values are not expected because washed samples are likely to have lower metal concentrations than unwashed samples.

Differences in dust-deposited metals among Project areas were examined using an ANOVA. T-tests were used to determine if there was significant dust deposition of any CoPCs on lichen. If no areas had significant dust-deposited metals, then a t-test was used to determine if overall metal deposition was statistically different from zero.

4.2.1.3 Relationship Between Metals in Dustfall Deposition to Soil and Lichen

To integrate the results of the dustfall and metals/metalloids monitoring program, the relationship between metal concentrations in dustfall deposition and metal concentrations in soil and lichen was explored. The purpose of this analysis was to determine the association between metals in dustfall deposition ($mg/dm^2 \cdot day$; where the number of sampling days differed among sites) and accumulated concentrations of metals in soil and lichen (mg/kg dry weight) for CoPCs.

Where available, dustfall collectors and vegetation and soil base-metals sites were paired if they were within 150 m of each other. For consistency with the vegetation and soil base-metals analysis, concentrations in the dust at or below the RDL were converted to half of the RDL. Unless specified, each metal had 41 paired samples in lichen and 45 paired samples in soil. Refer to APPENDIX C — Vegetation and Soils Base Metals Monitoring Sites, 2012–2019 for details regarding paired dustfall and metal monitoring sites.

Analytical Methods

The concentrations of CoPCs in dustfall deposition and soil and lichen were log-transformed before analyses. Pearson's correlation coefficient, r (or Spearman's rho, ϱ, for non-parametric data) was used to identify a general association between metal concentrations in dustfall deposition and metal concentrations in soil or lichen. If the degree of association and corresponding statistical probability warranted further investigation (i.e., reject $r = 0$ if $p < 0.05$), a general linear model (GLM) was used to identify the functional relationship and whether dustfall deposition could predict the accumulation of trace metals in soil and lichen. First, a model was used to investigate the potential interaction between dustfall deposition (continuous variable) and distance to PDA (i.e., distance from either the Mine Site, Tote Road, or Milne Port; categorical variable), hereon referred to as the interaction model. Distance categories were consistent with those described in Section 4.2.1.1 — Vegetation and Soil Base Metals Monitoring: Near (0 to 100 m), Far (101 to 1,000 m), and Reference (>1,000 m). The main effects of distance were ignored because those effects on metal deposition in soil/lichen are addressed in Section 4.2.1.1 — Vegetation and Soil Base Metals Monitoring and Section 4.2.1.2 — Dust-Deposited Metals on Lichen. The analyses here focused on the interaction between metal in dustfall and each level of the distance categorical variable. Only two-way interactions were addressed in analyses due to limitations by sample sizes. Because of these limitations, interactions between dustfall deposition and either sampling period (Before/After) or year were not pursued because they would not account for the confounding effects of distance to the PDA (i.e., dustfall values categorized into their respective period or year would not differentiate between samples close to or far from the PDA).

Data were plotted to reflect the most relevant analyses; if a significant interaction was found, the associated figure was plotted to reflect the interaction; however, if no significant interaction was found, the related figure indicates the functional relationship using simple regression (i.e., a single independent variable, dustfall deposition). Figure axes use a logarithmic scale. A three-way interaction was not pursued among dustfall deposition, distance category, and sampling period due to limited data (e.g., only two samples in the Far distance category in the After period).

The Near distance category was used to determine if Far or Reference sites differed in their rate of change between metal concentrations in dustfall deposition to soil and lichen. All GLMs used weighted observations to account for differences in sample size between distance categories (Near: n = 14; Far: n = 8; Reference: n = 19). If no significant interactions were identified, a simple or interaction-based model was used to identify the percent change in metal concentrations of soil and lichen for each percent change in metal concentrations of dustfall deposition. Statistical test results with p-values less than 0.05 were considered statistically different. Results with p-values between 0.05 and 0.1 were highlighted for future monitoring years. All analyses were performed using R, version 3.6.2 (R Development Core Team 2019).

Soil pH was considered as a continuous variable to explore soil metal concentrations further. Due to the complexity of visualizing interactions between two continuous variables (i.e., dustfall deposition and soil pH), pH was divided into four categories: 4 to 5.5; 5.5 to 6.5; 6.5 to 7.5; and 7.5 to 9. To better visualize interactions, confidence intervals were excluded from these figures. Again, a three-way interaction was not pursued among dustfall deposition, distance category, and soil pH due to data limitations.

4.2.2 RESULTS AND DISCUSSION

Metal concentrations in soil remained either low, undetectable, or, where increases detected, were below CCME soil quality guidelines. The only exception was for copper at one site near the Mine Site, which may be due to a sampling or laboratory error. Some metal concentrations increased in lichen. The amounts of these increases were comparable between sites and among Project areas for the Mine Site, Tote Road, and Milne Port except lead in lichen near the Tote Road. Metals in lichen were below indicator values apart from lead (near the Tote Road), which are trace amounts within the range of the indicator values.

4.2.2.1 Metals in Soil

Arsenic — No samples exceeded the CCME soil quality guideline of 12 mg/kg (dry weight) for arsenic in soil. About half (50.6%) of the 'Before' samples were below the RDL (0.5 mg/kg). For 'After' samples, 1.8% were below the RDL (0.1 mg/kg), of which 47.4% of those samples were below the higher RDL (0.5 mg/kg). To avoid temporal bias and provide consistency across sampling periods, all samples below 0.5 mg/kg were assigned a value of half the RDL (0.25 mg/kg).

A summary of arsenic concentrations in soil by Project area and sampling period is provided in Table 4-4 and shown in Figure 4-17. In summary:

- Mean arsenic concentrations in soil near Milne Port increased from 0.77 mg/kg (CI = 0.53 – 1.11) 'Before' to 1.54 mg/kg (CI = 0.98 – 2.41) 'After' (p = 0.02).
- All samples collected near Milne Port during the 'After' period were below the CCME guideline (12 mg/kg), and substantially less than the CCME guideline for arsenic in soil.
- No difference occurred between the 'Before' and 'After' periods for any other Project area (Mine Site: p = 0.76, Tote Road: p = 0.89; Far: p = 0.12; Reference: p = 1.0).

Increased arsenic concentrations in soil near Milne Port occurred at sites nearest the PDA where there is existing infrastructure (Milne Port complex, water treatment plant, batch plant, incinerator, and environment lab) and a new laydown. These sites include L-145 (42.7 m from PDA) with a concentration of 4.38 mg/kg and the replicate sample L-145-R (42.7 m from PDA) at 4.28 mg/kg; L-146 (84.4 m from PDA) at 4.09 mg/kg,; and L-147 (105 m from PDA) at 3.5 mg/kg.

Table 4-4 Arsenic concentrations in soil (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	CCME Guideline[5]	Above Guideline[5] (%)
Mine	0-100	Before	11	0.00	0.66	0.49	0.80	0.31	3.35	12	0
Mine	0-100	After	15	73.33	0.32	0.25	0.00	0.22	1.25	12	0
Road	0-100	Before	12	0.00	0.24	0.20	0.08	0.11	1.08	12	0
Road	0-100	After	15	20.00	0.77	0.81	0.42	0.50	2.78	12	0
Port	0-100	Before	10	0.00	1.54	1.31	2.06	0.69	4.38	12	0
Port	0-100	After	17	70.59	0.35	0.25	0.31	0.50	1.26	12	0
Far	100-1,000	Before	11	9.09	0.41	0.40	1.02	0.10	2.46	12	0
Far	100-1,000	After	28	42.86	0.54	0.57	0.64	0.50	4.14	12	0
Reference	>1,000	Before	13	0.00	0.60	0.68	0.48	0.25	1.65	12	0
Reference	>1,000	After	11	0.00	0.66	0.49	0.80	0.31	3.35	12	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health (mg/kg dry weight).

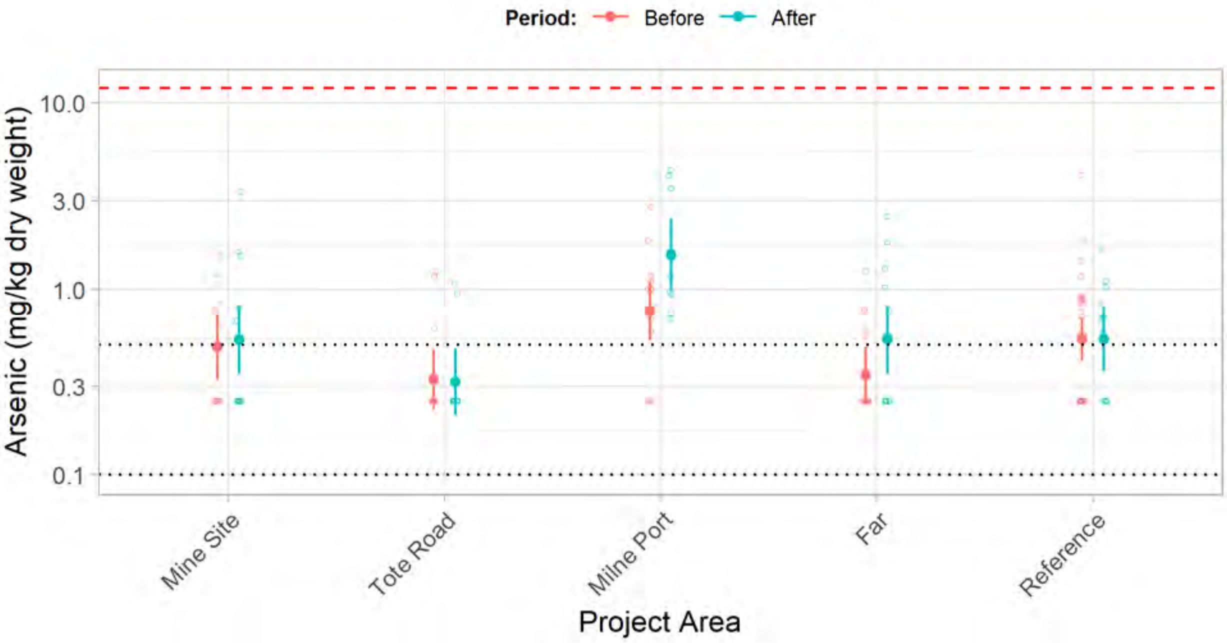


Figure 4-17 Arsenic concentrations in soil by Project area and sampling period.

Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. Concentrations below the RDL are displayed as half the RDL. The red dashed line shows the CCME guideline (12 mg/kg dry weight), and the black dotted lines show the RDLs, 0.5 mg/kg ('Before') and 0.1 mg/kg ('After') sampling.

Cadmium — No samples exceeded the CCME soil quality guideline of 1.4 mg/kg (dry weight) for cadmium in soil. About half (46.0%) of the 'Before' samples were below the RDL (0.05 mg/kg). More than half (57.9%) of the 'After' samples were below the RDL (0.02 mg/kg) and of those, 87.7% were below the higher RDL of 0.05 mg/kg.

No statistical comparison was conducted for cadmium in soil because most samples (57.9%) in the 'After' period were below the RDL. A summary of cadmium concentrations in soil by Project area and sampling period is provided in Table 4-5.

Table 4-5 Cadmium concentrations in soil (mg/kg dry weight) by Project area and sampling period Before and After mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean [4]	Median [4]	Inter-quartile Range[4]	Min [4]	Max [4]	CCME Guideline[5]	Above Guideline[5] (%)
Mine	0–100	Before	12	33.33	0.06	0.06	0.07	0.05	0.15	1.4	0
Mine	0–100	After	11	45.45	0.02	0.02	0.02	0.02	0.09	1.4	0
Road	0–100	Before	15	86.67	0.03	0.03	0.00	0.02	0.08	1.4	0
Road	0–100	After	12	83.33	0.01	0.01	0.00	0.02	0.21	1.4	0
Port	0–100	Before	15	26.67	0.06	0.08	0.05	0.05	0.15	1.4	0
Port	0–100	After	10	20.00	0.03	0.03	0.03	0.02	0.07	1.4	0
Far	100–1,000	Before	17	52.94	0.04	0.03	0.05	0.05	0.10	1.4	0
Far	100–1,000	After	11	72.73	0.01	0.01	0.01	0.02	0.05	1.4	0
Reference	>1,000	Before	28	35.71	0.06	0.07	0.10	0.05	0.28	1.4	0
Reference	>1,000	After	13	61.54	0.01	0.01	0.02	0.02	0.04	1.4	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.
[2] Number of sample sites.
[3] RDL provided by the laboratory at the time of analysis.
[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.
[5] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health (mg/kg dry weight).

Copper — All samples collected 'Before' were below the CCME soil quality guideline of 63 mg/kg (dry weight) for copper in soil except one site (L-157) near the Mine Site. A small percentage of 'Before' (2.3%) and 'After' (1.8%) of samples were below the RDL (0.5 mg/kg).

A summary of copper concentrations in soil by Project area and sampling period is provided in Table 4-6 and shown in Figure 4-18. In summary:

- In 2019, site L-157 (49 m from PDA) near the Mine Site exceeded the CCME guideline of 63 mg/kg for copper in soil by 9%, with a concentration of 81.2 mg/kg.
- Copper concentrations in soil near the Tote Road were not significantly different ($p = 0.09$) than baseline conditions. Mean copper concentrations near the Tote Road 'Before' were 1.1 mg/kg (CI = 0.72 – 1.72) and 1.97 mg/kg (CI = 1.21 – 3.20) 'After'. The concentrations near the Tote Road were approximately 32 times below the CCME soil quality guideline for copper in soils.

- No difference occurred between the Before and After sampling periods for any other Project area (Mine Site: p = 0.45, Milne Port: p = 0.31; Far: p = 0.92; Reference: p = 0.59).

The reason for the exceedance of copper in soil at site L-157 near the Mine Site is unknown; however, it is likely attributable to a field sampling error given that metal concentrations at nearby sample sites L-158 (4.64 mg/kg) and L-156 (8.06 mg/kg) were average in concentration and well below the CCME soil quality guideline. The replicate sample at L-156-R was 14.9 mg/kg, which could indicate the presence of natural variability of copper concentrations at the site.

Table 4-6 Copper concentrations in soil (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	CCME Guideline[5]	Above Guideline[5] (%)
Mine	0-100	Before	12	0.00	4.60	4.66	5.06	1.54	19.10	63	0.00
Mine	0-100	After	11	0.00	6.04	3.74	5.67	2.13	81.20	63	9.09
Road	0-100	Before	15	13.33	1.11	1.06	0.45	0.50	7.03	63	0.00
Road	0-100	After	12	0.00	1.97	1.50	0.60	0.89	49.80	63	0.00
Port	0-100	Before	15	0.00	5.00	5.25	1.88	1.56	27.20	63	0.00
Port	0-100	After	10	0.00	7.14	6.30	8.64	3.41	18.10	63	0.00
Far	100-1,000	Before	17	0.00	2.17	2.78	2.42	0.52	4.56	63	0.00
Far	100-1,000	After	11	9.09	2.10	1.86	3.87	0.50	12.00	63	0.00
Reference	>1,000	Before	28	0.00	4.36	4.52	2.69	0.67	16.90	63	0.00
Reference	>1,000	After	13	0.00	3.73	4.07	3.41	1.04	9.37	63	0.00

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health (mg/kg dry weight).

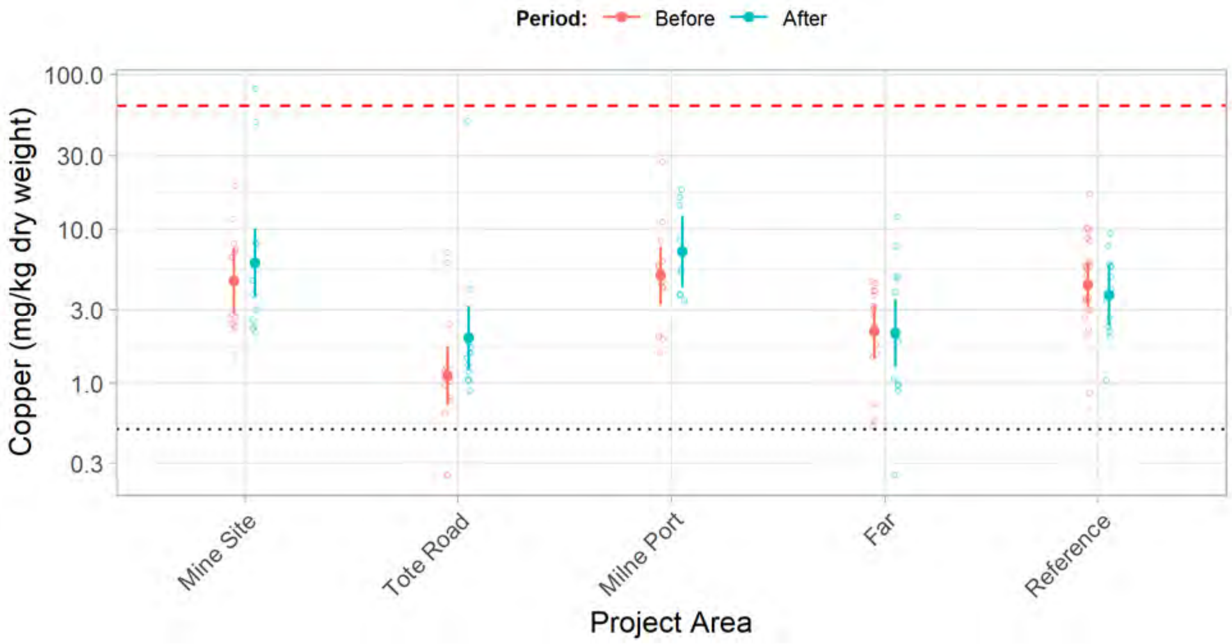


Figure 4-18 Copper concentrations in soil by Project area and sampling period.

Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. Concentrations below the RDL are displayed as half the RDL. The red dashed line shows the CCME guideline (63 mg/kg dry weight) and the black dotted line shows the RDL for all years, 0.5 mg/kg ('Before' and 'After') sampling.

Lead — No samples exceeded the CCME soil quality guideline of 70 mg/kg (dry weight) for lead in soil. No samples were below either the 'Before' RDL (0.1 mg/kg) or 'After' RDL (0.5 mg/kg).

A summary of lead concentrations in soil by Project area and sampling period is provided in Table 4-7 and shown in Figure 4-19. Lead concentrations in soil did not change between the Before and After sampling periods for any of the Project areas (Mine Site: p = 0.64, Tote Road: p = 0.44; Milne Port: p = 0.16; Far: p = 0.21; Reference: p = 0.72). During the After period, mean lead concentrations were highest near Milne Port at 7.4 mg/kg (CI = 4.9 – 11.2); this value is about 9.5 times lower than the CCME soil quality guideline for lead in soil. The highest concentration of lead in soil 'After' was near the Tote Road at 28.2 mg/kg, which is about 2.5 times lower than the CCME guideline for lead in soil.

Table 4-7 Lead concentrations in soil (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	CCME Guideline[5]	Above Guideline[5] (%)
Mine	0-100	Before	12	0.0	5.11	4.29	4.94	2.61	11.20	70	0
Mine	0-100	After	11	0.0	4.50	4.62	4.93	1.84	17.90	70	0
Road	0-100	Before	15	0.0	1.35	1.18	0.72	0.54	6.51	70	0
Road	0-100	After	12	0.0	1.65	1.27	0.40	0.80	28.20	70	0
Port	0-100	Before	15	0.0	5.08	4.73	2.68	1.64	22.50	70	0
Port	0-100	After	10	0.0	7.41	6.29	5.61	3.69	14.00	70	0
Far	100-1,000	Before	17	0.0	2.06	2.11	2.19	0.82	4.52	70	0
Far	100-1,000	After	12	0.0	2.84	2.85	4.01	0.96	19.00	70	0
Reference	>1,000	Before	28	0.0	3.59	3.95	2.11	1.18	7.85	70	0
Reference	>1,000	After	12	0.0	3.34	3.91	2.15	1.39	6.65	70	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health (mg/kg dry weight).

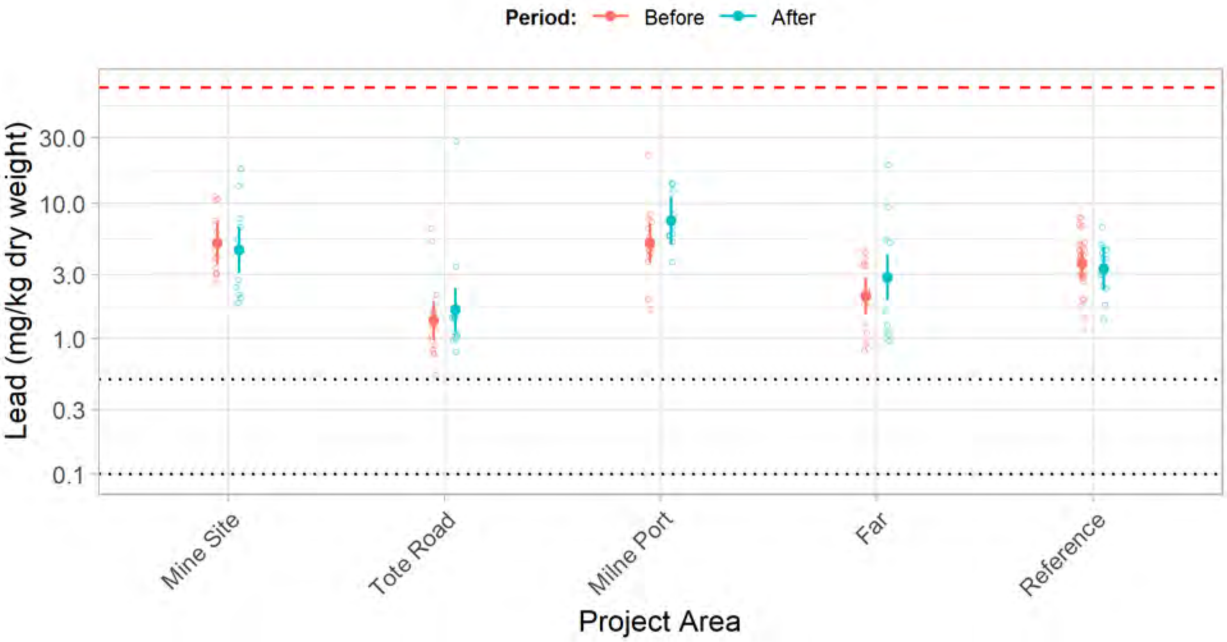


Figure 4-19 Lead concentrations in soil by Project area and sampling period.

Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. Concentrations below the RDL are displayed as half the RDL. The red dashed line shows the CCME guideline (70 mg/kg dry weight) and the black dotted line shows the RDLs, 0.1 mg/kg ('Before') and 0.5 mg/kg ('After') sampling.

Selenium — No samples exceeded the CCME soil quality guideline of 1 mg/kg (dry weight) for selenium in soil. Most (98.9%) of the 'Before' samples were below the RDL (0.5 mg/kg). Most (98.2%) of the 'After' samples were below the RDL (0.02 mg/kg), of which 100% of the samples were below the higher RDL (0.5 mg/kg).

No statistical comparison was conducted for selenium in soil because most samples (98.2%) in the After period were below the 0.5 mg/kg RDL. Samples collected 'After' near the Tote Road, Milne Port, Far sites, and Reference areas were all below the RDL. Near the Mine Site, 91% of samples were below the RDL. A summary of selenium concentrations in soil by Project area and sampling period is provided in Table 4-8.

Table 4-8 Selenium concentrations in soil (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	CCME Guideline[5]	Above Guideline[5] (%)
Mine	0-100	Before	12	100.00	0.25	0.25	0.00	0.50	0.50	1	0
Mine	0-100	After	11	90.91	0.11	0.10	0.00	0.20	0.36	1	0
Road	0-100	Before	15	100.00	0.24	0.25	0.00	0.20	0.50	1	0
Road	0-100	After	12	100.00	0.10	0.10	0.00	0.20	0.20	1	0
Port	0-100	Before	15	93.33	0.26	0.25	0.00	0.45	0.50	1	0
Port	0-100	After	10	100.00	0.10	0.10	0.00	0.20	0.20	1	0
Far	100-1,000	Before	17	100.00	0.25	0.25	0.00	0.50	0.50	1	0
Far	100-1,000	After	11	100.00	0.10	0.10	0.00	0.20	0.20	1	0
Reference	>1,000	Before	28	100.00	0.25	0.25	0.00	0.50	0.50	1	0
Reference	>1,000	After	13	100.00	0.10	0.10	0.00	0.20	0.20	1	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health (mg/kg dry weight).

Zinc — No samples exceeded the CCME soil quality guideline of 200 mg/kg (dry weight) for zinc in soil. A small proportion (1.1%) of the 'Before' samples were below the RDL (1 mg/kg). A small proportion (3.4%) of the 'After' samples were below the RDL (2.0 mg/kg). To avoid temporal bias and provide consistency across sampling periods, all samples below 2 mg/kg were assigned a value of half the RDL (1 mg/kg).

A summary of zinc concentrations in soil by Project area and sampling period is provided in Table 4-9 and shown in Figure 4-20. Zinc in soil did not change between the Before and After period sampling periods for any of the Project areas (Mine Site: p = 0.99, Tote Road: p = 0.25; Milne Port: p = 0.37; Far: p = 0.68; Reference: p = 0.61). During the After period, mean zinc concentrations were highest near Milne Port at 20.2 mg/kg (CI = 12.8 – 31.9), which is approximately 9.9 times lower than the CCME soil quality guideline for zinc in soil.

Table 4-9 Zinc concentrations in soil (mg/kg) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	CCME Guideline[5]	Above Guideline[5] (%)
Mine	0-100	Before	12	0.00	13.29	12.80	6.83	6.40	29.70	200	0
Mine	0-100	After	11	0.00	13.23	9.20	11.85	4.20	88.40	200	0
Road	0-100	Before	15	6.67	3.31	3.30	1.85	1.00	16.20	200	0
Road	0-100	After	12	0.00	4.76	3.65	0.90	2.40	86.20	200	0
Port	0-100	Before	15	0.00	15.39	15.80	10.35	4.10	35.30	200	0
Port	0-100	After	10	0.00	20.18	19.25	12.10	9.70	32.00	200	0
Far	100-1,000	Before	17	0.00	7.04	8.10	5.70	2.00	23.90	200	0
Far	100-1,000	After	11	9.09	6.02	3.50	11.25	2.00	31.00	200	0
Reference	>1,000	Before	28	0.00	12.35	13.80	7.83	2.40	39.60	200	0
Reference	>1,000	After	13	0.00	10.87	10.30	8.80	4.20	21.10	200	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] CCME Agricultural Soil Quality Guidelines for the Protection of Environmental and Human Health (mg/kg dry weight).

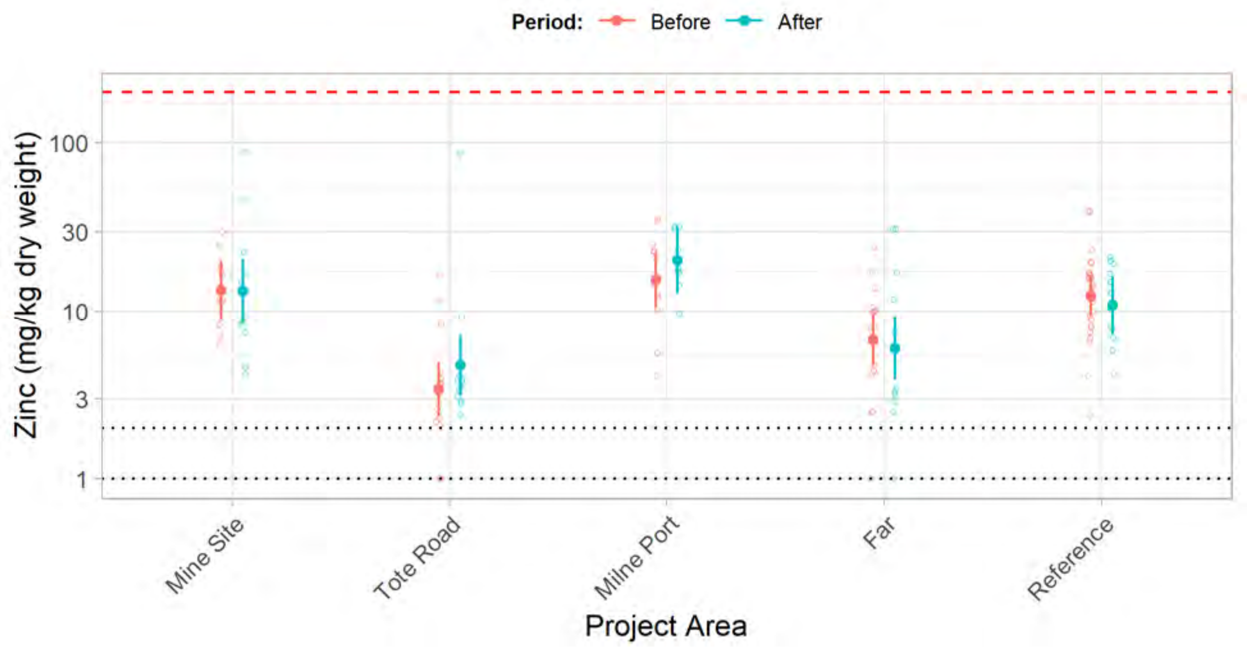


Figure 4-20 Zinc concentrations in soil by Project area and sampling period.

Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. Concentrations below the RDL are displayed as half the RDL. The red dashed line shows the CCME guideline (200 mg/kg dry weight) and the black dotted line shows the RDLS, 1 mg/kg ('Before') and 2 mg/kg ('After') sampling.

4.2.2.2 Metals in Lichen

Arsenic — About one quarter (24.4%) of the 'Before' samples were below the RDL (0.05 mg/kg). There were no 'After' samples below the RDL of 0.02 mg/kg, but about one sixth (15.7%) of the 'After' were below the higher RDL. For consistency across sampling periods, all samples below 0.05 mg/kg (20.9%) were assigned a value of half the higher detection limit (0.025 mg/kg).

A summary of arsenic concentrations in lichen by Project area and sampling period is provided in Table 4-10 and shown in Figure 4-21. In summary:

- Mean arsenic concentrations in lichen near the Mine Site increased from 0.09 mg/kg (CI = 0.07 – 0.14) during 'Before' to 0.17 mg/kg (CI = 0.11 – 0.24) 'After' (p = 0.03).
- Mean arsenic concentrations in lichen near Milne Port increased from 0.07 mg/kg (CI = 0.05 – 0.09) during baseline to 0.12 mg/kg (CI = 0.08 – 0.17) 'After' (p = 0.03).
- Mean arsenic concentrations in lichen at Far sites were 0.06 mg/kg (CI = 0.04 – 0.08) 'Before' and 0.10 mg/kg (CI = 0.07 – 0.13) 'After' (p = 0.03).
- No difference existed between the 'Before' and 'After' sampling periods for the Tote Road (p = 0.28) or Reference sites (p = 0.13).

Mean arsenic concentrations in lichen remained low between the Before and After periods despite increases from baseline conditions. Increased arsenic concentrations were comparable between Project areas where increases were detected near the Mine Site, Milne Port, and Far sites. At Far sites, increased arsenic was mainly associated with the Tote Road; however, the highest concentrations of arsenic near the Tote Road during the Before and After periods were similar at 0.11 mg/kg (several sites between 230 and 920 m from PDA) and 0.23 mg/kg (site L-123; 251 m from PDA) respectively. At the Mine Site, average arsenic concentrations were associated with the airstrip at sites L-134 (237 m from PDA) and L-129 (740 m from PDA) and the remaining sampling sites had lower than average arsenic. At Milne Port, site L-147 (105 m from PDA) was associated with average arsenic concentrations and the remaining sampling sites at the Port had lower than average arsenic. Increased arsenic concentrations were comparable to increases of other metals in lichen.

Due to the lack of available guidelines and studies there is no indicator value to evaluate arsenic toxicity in lichen for the Project. Future monitoring may consider values suggested for the updated risk assessment and evaluation of exposure potential in valued ecosystem components (VECs) (Intrinsik 2017).

Linear regression indicated an interaction between sampling period and distance from the PDA (p = 0.03). The difference in mean arsenic concentrations 'Before' and 'After' construction was significant out to 330 m from the PDA (Figure 4-22).

Table 4-10 Arsenic concentrations in lichen (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]
Mine	0-100	Before	12	0.00	0.09	0.10	0.03	0.06	0.24
Mine	0-100	After	11	0.00	0.17	0.15	0.04	0.11	0.33
Road	0-100	Before	15	0.00	0.18	0.19	0.06	0.10	0.35
Road	0-100	After	12	0.00	0.23	0.23	0.06	0.18	0.31
Port	0-100	Before	14	21.43	0.07	0.07	0.02	0.05	0.23
Port	0-100	After	10	0.00	0.12	0.13	0.04	0.08	0.16
Far	100-1,000	Before	17	29.41	0.06	0.07	0.05	0.05	0.11
Far	100-1,000	After	11	0.00	0.09	0.08	0.06	0.06	0.19
Reference	>1,000	Before	24	50.00	0.06	0.04	0.09	0.05	1.10
Reference	>1,000	After	13	0.00	0.06	0.04	0.03	0.03	0.36

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.
[2] Number of sample sites.
[3] RDL provided by the laboratory at the time of analysis.
[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

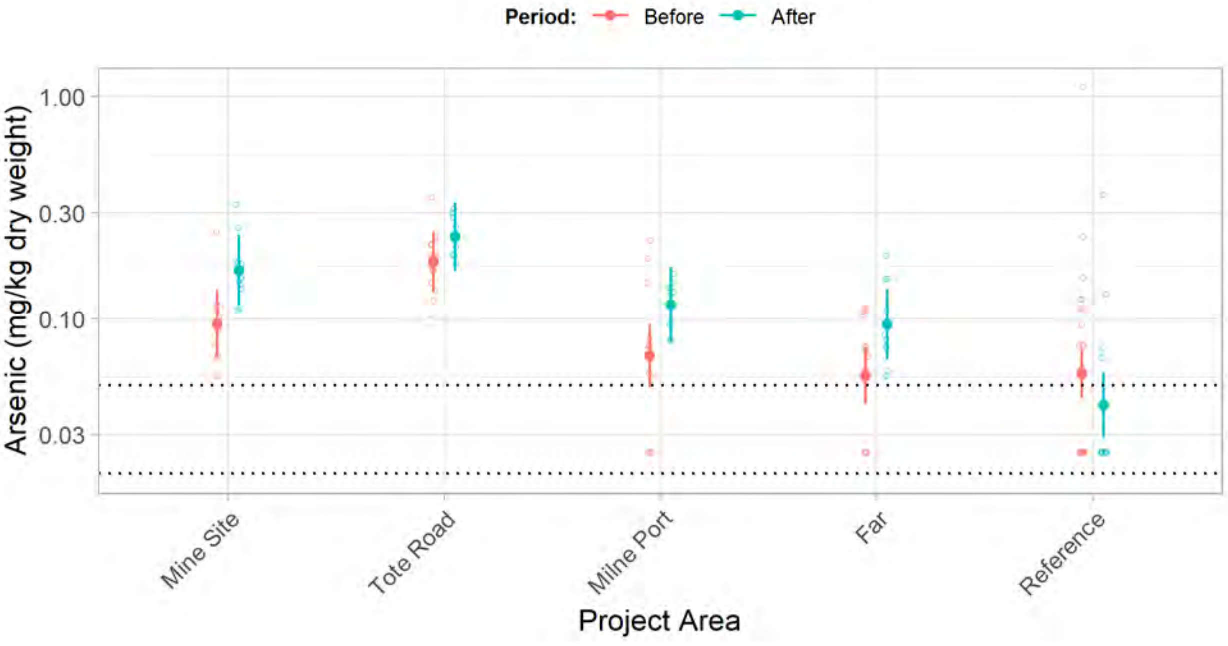


Figure 4-21 Arsenic concentrations in lichen by Project area and sampling period.
Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. Concentrations below the RDL are displayed as half the RDL. The black dotted lines show the RDLs, 0.05 mg/kg ('Before') and 0.02 mg/kg ('After') sampling.

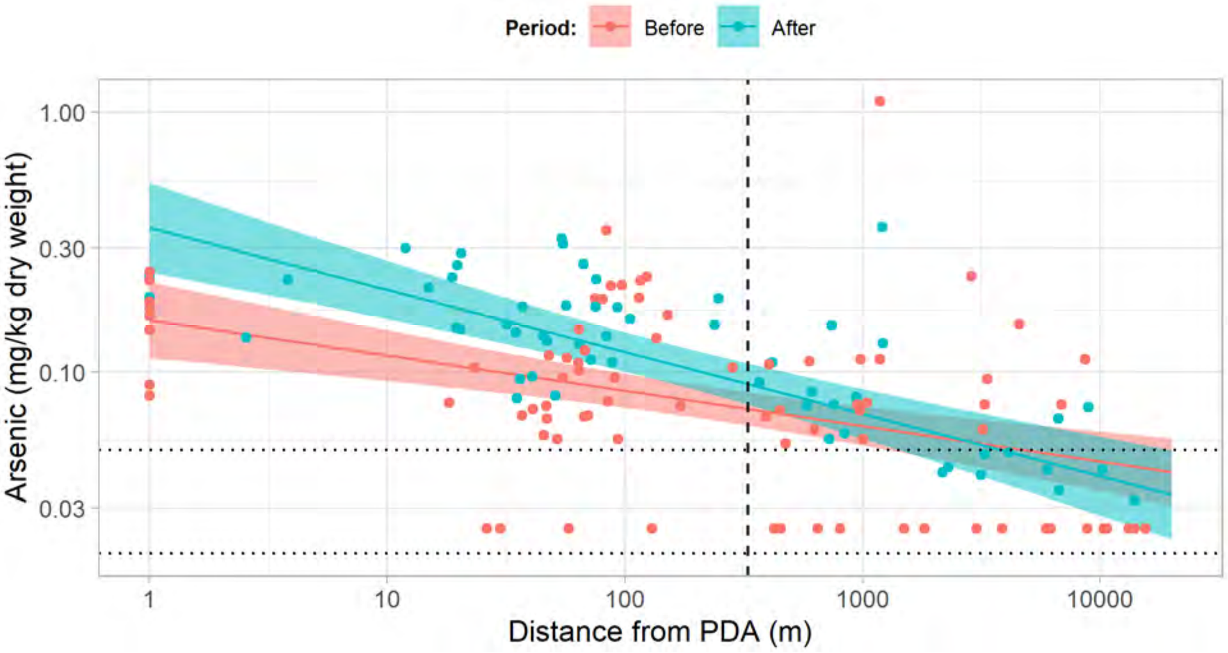


Figure 4-22 Arsenic concentrations by sampling period and distance from the PDA.
Solid lines with ribbons show estimated geometric mean (± 95% CI), circles show individuals sample values. Dashed vertical line shows the distance at which there is no difference between concentrations before and after mine construction. Concentrations below the RDL are displayed as half the RDL. The horizontal black dotted lines show the minimum RDLs, 0.05 mg/kg ('Before') and 0.02 mg/kg ('After') sampling.

Cadmium — No samples exceeded the indicator value of 30 mg/kg (dry weight) for cadmium in lichen. No samples were below either the 'Before' RDL (0.01 mg/kg) or 'After' RDL (0.005 mg/kg).

A summary of cadmium concentrations in lichen by Project area and sampling period is provided in Table 4-11 and shown in Figure 4-23. In summary:

- Mean cadmium concentrations in lichen near Tote Road increased from 0.04 mg/kg (CI = 0.03 – 0.06) during baseline to 0.09 mg/kg (CI = 0.07 – 0.12) post-baseline ($p < 0.001$).
- Cadmium concentrations in lichen near the Mine Site are no different than baseline conditions. Mean cadmium concentrations near the Mine Site were 0.06 mg/kg (CI = 0.04 – 0.08) 'Before' and 0.09 mg/kg (CI = 0.07 – 0.12) 'After', but the difference is not significant ($p = 0.09$).
- No difference existed between the Before and After sampling periods for Milne Port ($p = 0.69$), Far ($p = 0.11$), or Reference sites ($p = 0.13$).

Mean cadmium concentrations in lichen remained low between the Before and After periods despite increases from baseline conditions. Increased cadmium concentrations were comparable between sites that were near the Mine Site and at Far sites. At Far sites, increased cadmium was mainly associated with the Tote Road. Although low in concentration, relatively higher concentrations of cadmium were observed during the After period at site L-163 (586 m of the PDA) at 0.18 mg/kg followed by L-123 (251 m of the

PDA) at 0.09 mg/kg. Increased cadmium concentrations were comparable to increases of other metals in lichen.

All samples collected 'After' were well below the indicator value of 30 mg/kg for cadmium in lichen. Mean cadmium concentrations in lichen across all sites in the 'After' period were more than 300 times below the indicator value.

There is weak evidence of an interaction between the sampling period and distance from the PDA ($p = 0.09$). The difference in mean cadmium concentrations 'Before' and 'After' construction is noted out to 270 m from the PDA (Figure 4-24).

Table 4-11 Cadmium concentrations in lichen (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	Indicator Value[5]	Above Indicator Value[5] (%)
Mine	0-100	Before	12	0.0	0.06	0.05	0.03	0.03	0.17	30	0
Mine	0-100	After	11	0.0	0.08	0.06	0.05	0.04	0.74	30	0
Road	0-100	Before	15	0.0	0.04	0.04	0.02	0.03	0.10	30	0
Road	0-100	After	12	0.0	0.09	0.08	0.04	0.06	0.19	30	0
Port	0-100	Before	14	0.0	0.04	0.04	0.01	0.02	0.09	30	0
Port	0-100	After	10	0.0	0.04	0.04	0.00	0.03	0.05	30	0
Far	100-1,000	Before	17	0.0	0.04	0.04	0.02	0.02	0.08	30	0
Far	100-1,000	After	11	0.0	0.05	0.05	0.02	0.02	0.18	30	0
Reference	>1,000	Before	24	0.0	0.08	0.07	0.08	0.03	0.26	30	0
Reference	>1,000	After	13	0.0	0.06	0.06	0.07	0.02	0.19	30	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] The number of sample sites.

[3] RDL provided by the laboratory at the time of analysis

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] Source: Nash 1975, Nieboer et al. 1978.

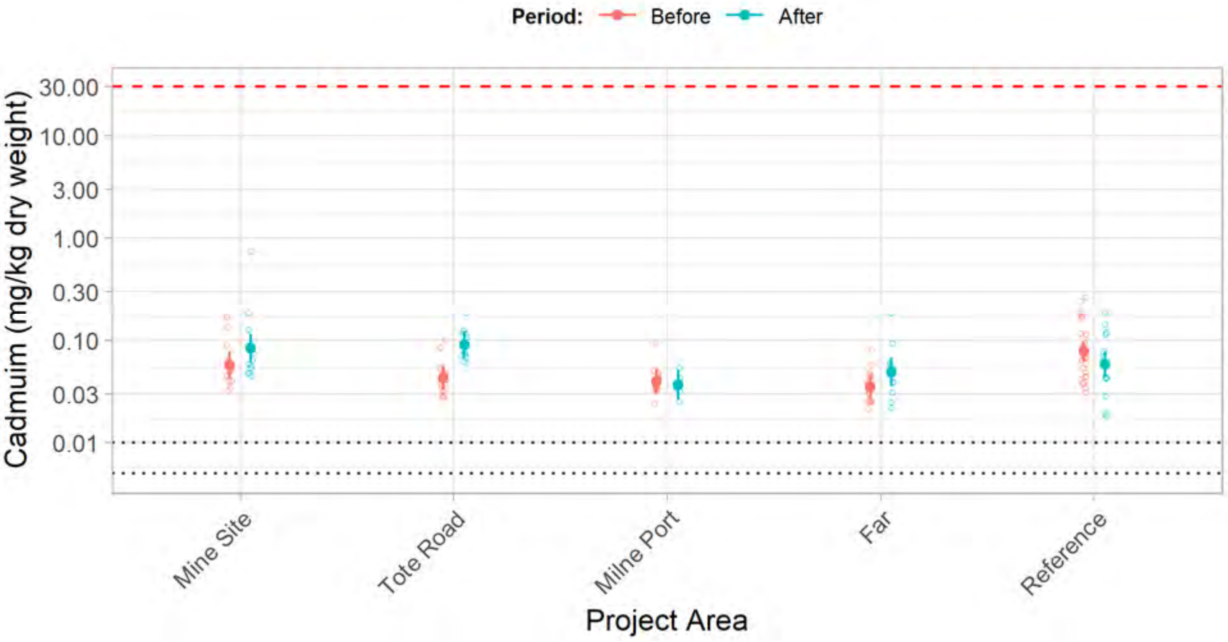


Figure 4-23 Cadmium concentrations in lichen by Project area and sampling period.

Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. The red dashed line shows the indicator value (30 mg/kg dry weight) and the black dotted lines show the RDLs, 0.01 mg/kg ('Before') and 0.005 mg/kg ('After') sampling.

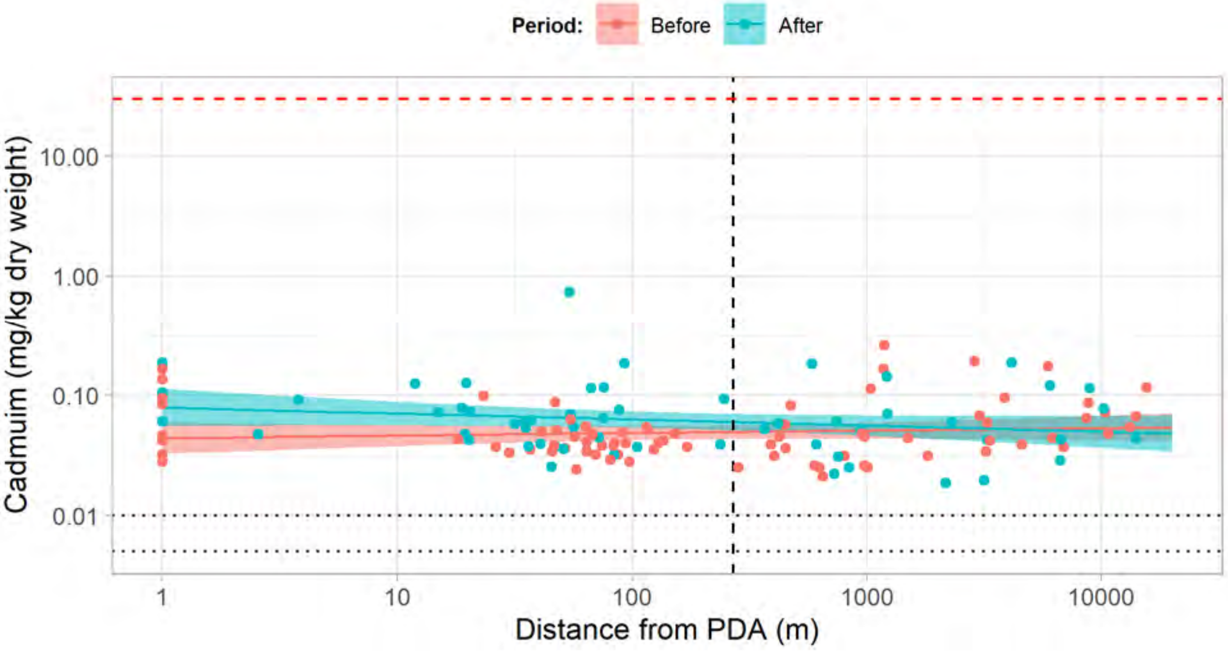


Figure 4-24 Cadmium concentrations by sampling period and distance from PDA.

Solid lines with ribbons show estimated geometric mean (± 95% CI), circles show individuals sample values. Dashed vertical line shows the distance at which there is no difference between concentrations before and after mine construction. Concentrations below the RDL are displayed as half the RDL. The horizontal black dotted lines show the RDLs, 0.01 mg/kg ('Before") and 0.005 mg/kg ('After') sampling.

Copper — No samples exceeded the indicator range of 15 to 20 mg/kg (dry weight) for copper in lichen. No samples were below the 'Before' (0.05 mg/kg) or 'After' (0.1 mg/kg) RDL.

A summary of copper concentrations in lichen by Project area and sampling period is provided in Table 4-12 and shown in Figure 4-25. In summary:

- Mean copper concentrations in lichen near the Mine Site increased from 2.10 mg/kg (CI = 1.67 – 2.66) 'Before' to 3.11 mg/kg (CI = 2.44 – 3.97) 'After' (p = 0.02).
- Mean copper concentrations in lichen near the Tote Road increased from 3.06 mg/kg (CI = 2.48 – 3.76) 'Before' to 4.87 mg/kg (CI = 3.86 – 6.15) 'After' (p = 0.004).
- No difference existed between the Before and After sampling periods for Milne Port (p = 0.60), Far sites (p = 0.24) or Reference sites (p = 0.20).

Mean copper concentrations in lichen remained low between the Before and After periods despite increases from baseline conditions. Increased copper concentrations were comparable between sites that were near the Mine Site and Tote Road. The highest concentrations of copper in lichen during the After period were near the Mine Site at L-157 (49 m from PDA) with a concentration of 12.7 mg/kg followed by L-152 (21 m from PDA) near Tote Road with a concentration of 8.9 mg/kg. Relatively high copper concentrations were also found near the Mine Site airstrip in the replicate sample for site L-133-R (16 m from PDA) with a concentration of 8.9 mg/kg; however, the non-replicate sample was 3.8 mg/kg, indicating the presence of natural variability in metal concentrations at the site. Increased copper concentrations were comparable to increases of other metals in lichen.

All samples collected during post-baseline sampling were well below the indicator range of 15 to 20 mg/kg for copper in lichen. Mean copper concentrations across all sites in the After period were more than 3 times below the indicator value for copper in lichen.

There is an interaction between the sampling period and distance from the PDA (p = 0.004). The difference in mean copper concentrations 'Before' and 'After' construction was significant out to 200 m from the PDA (Figure 4-26).

Table 4-12 Copper concentrations in lichen (mg/kg dry weight) by Project area and sampling period before and after mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	Indicator Value[5]	Above Indicator Value[5] (%)
Mine	0–100	Before	12	0.0	2.10	2.03	0.94	1.29	3.44	15–20	0
Mine	0–100	After	11	0.0	3.11	2.88	1.23	1.89	12.70	15–20	0
Road	0–100	Before	15	0.0	3.06	3.38	1.27	0.72	6.06	15–20	0
Road	0–100	After	12	0.0	4.87	4.34	1.76	3.32	8.94	15–20	0
Port	0–100	Before	14	0.0	0.99	0.86	0.38	0.68	2.12	15–20	0
Port	0–100	After	10	0.0	1.08	1.10	0.21	0.91	1.41	15–20	0
Far	100–1,000	Before	17	0.0	1.24	1.06	0.40	0.69	4.49	15–20	0
Far	100–1,000	After	11	0.0	1.46	1.45	0.89	0.68	2.88	15–20	0
Reference	>1,000	Before	24	0.0	1.04	0.92	0.36	0.66	3.18	15–20	0
Reference	>1,000	After	13	0.0	0.92	0.87	0.22	0.63	1.64	15–20	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] Source: Tomassini et al. 1976, Tomassini 1976, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988.

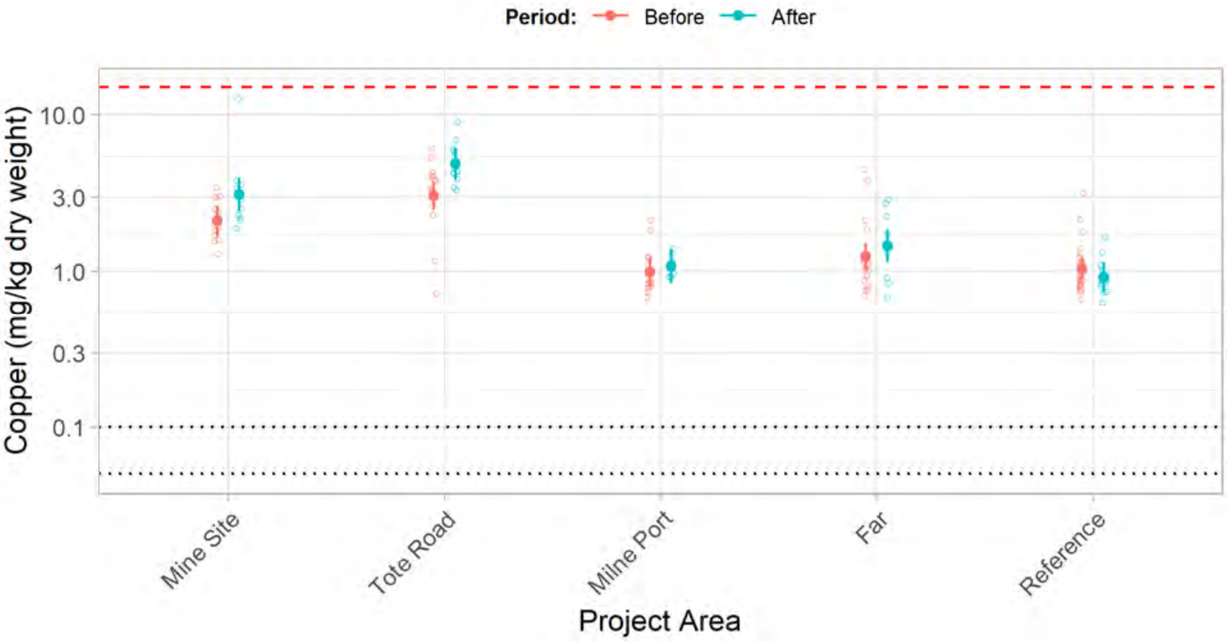


Figure 4-25 Copper concentrations in lichen by Project area and sampling period.
Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. The red dashed line shows the indicator value (15–20 mg/kg) and the black dotted lines show the RDLs, 0.05 mg/kg ('Before') and 0.1 mg/kg ('After') sampling.

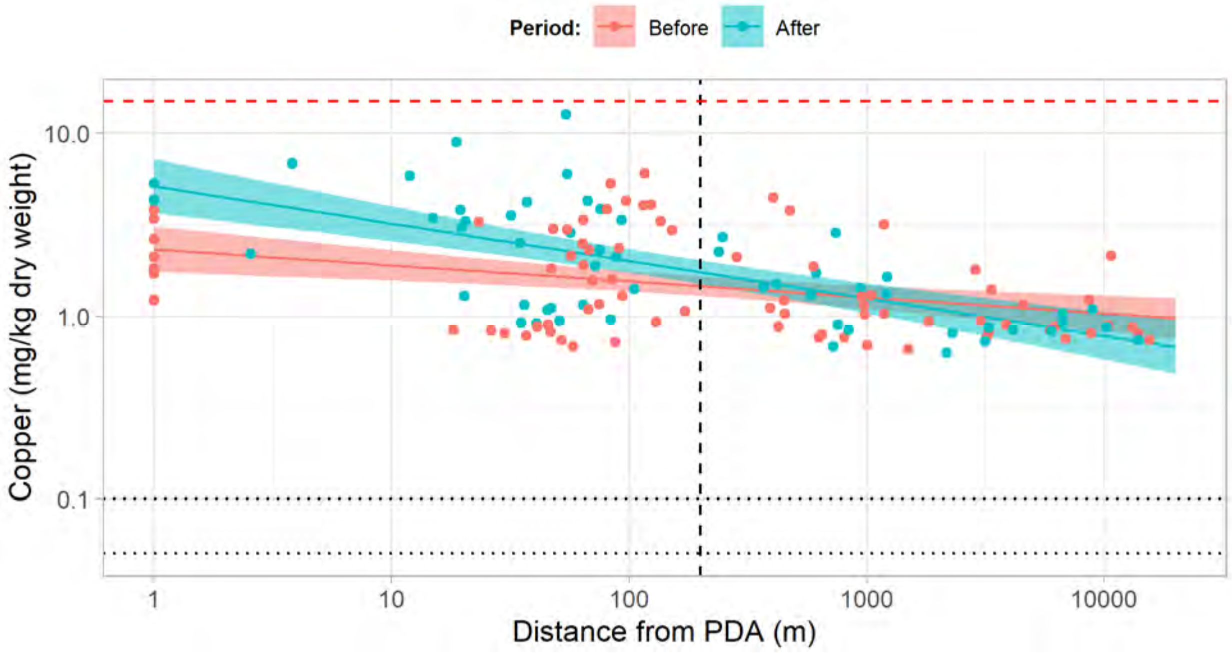


Figure 4-26 Copper concentrations in lichen by sampling period and distance from PDA.
Solid lines with ribbons show estimated geometric mean (± 95% CI), circles show individuals sample values. Dashed vertical line shows the distance at which there is no difference between concentrations before and after mine construction. Concentrations below the RDL are displayed as half the RDL. The horizontal black dotted lines show the RDLs, 0.05 mg/kg ('Before') and 0.1 mg/kg ('After') sampling.

Lead — Increased lead concentrations in lichen were found at the Mine Site, Tote Road, Milne Port and Far sites, while lead in lichen at Reference sites decreased during the same period. Lead in lichen exceeded the lower end of the indicator value near the Tote Road at 19.3% of sites; of these sites, 82% were within 1 to 2 mg/kg of the lower end of the indicator and only one of these samples was at the upper end of the indicator value. No samples were below the 'Before' (0.01 mg/kg) or 'After' (0.02 mg/kg) RDL.

A summary of lead concentrations in lichen by Project area and sampling period is provided in Table 4-13 and shown in Figure 4-27. In summary:

- Lead is the only metal detected that was greater than the lower range of indicator levels along the Tote Road.
- Mean lead concentrations in lichen near the Mine Site increased from 1.18 mg/kg (CI = 0.85 – 1.63) 'Before' to 2.35 mg/kg (CI = 1.67 – 3.31) 'After' (p = 0.005).
- Mean lead concentrations in lichen near the Tote Road increased from 1.74 mg/kg (CI = 1.30 – 2.34) 'Before' to 6.48 mg/kg (CI = 4.67 – 9.00) 'After' (p < 0.001).
- Mean lead concentrations in lichen near Milne Port may have increased from 1.07 mg/kg (CI = 0.79 – 1.44) 'Before' to 1.69 mg/kg (CI = 1.18 – 2.42) 'After' (p = 0.06).
- Mean lead concentrations in lichen increased at Far sites were 0.74 mg/kg (CI = 0.56 – 0.97) 'Before' and 1.26 mg/kg (CI = 0.90 – 1.78) 'After' (p < 0.02).

- Mean lead concentrations in lichen at Reference sites decreased from 0.90 mg/kg (CI = 0.71 – 1.13) 'Before' to 0.56 mg/kg (CI = 0.41 – 0.77) 'After' (p = 0.02) (4.2% of 'Before' samples collected from Reference sites previously exceeded the lower end of the indicator value).

Lead increases in lichen from 'Before' were mainly associated with the Tote Road followed by the Mine Site, Milne Port, and lastly Far sites. During the 'After' period, increased trace amounts of lead in lichen were observed near the Tote Road at sites L-127 (0 m from PDA) at 15.3 mg/kg, L-126 (11 m from PDA) at 10.1 mg/kg, and L-125-R (80 m from PDA) at 9.26 mg/kg. The non-replicate sample at L-125 was 7.51 mg/kg indicating natural variability in metal concentrations at the site. After construction, mean lead concentrations in lichen near the Tote Road was 6.48 mg/kg (CI = 4.67 – 9.00), which is within the range of the indicator value.

Lead increases in lichen near the Mine Site were mainly associated with the airstrip at sites L-128-R (35 m from PDA) at 4.5 mg/kg and L-133-R (15.8 m from PDA) at 5.65 mg/kg; however, lead concentrations for both non-replicate samples at sites L-128 (4.0 mg/kg) and L-133 (3.2 mg/kg) indicated natural variability in metal concentrations at the site. Increased lead in lichen at site L-157 (49 m from PDA) was comparable to L-128 and L-133, while the remaining sample locations near the Mine Site were around the average concentration of lead in lichen during the After period. All samples near the Mine Site were below the lower range of the indicator value for lead in lichen.

Increased concentrations near Milne Port and at Far sites were similar and comparable to increases of other metals in lichen. All samples near Milne Port were below the lower range of the indicator value for lead in lichen. Although still below the indicator value, increased lead at Far sites was detected and was mainly attributed to the Tote Road; the highest concentration was at site L-123 (251 m from PDA) at 4.53 mg/kg.

There is an interaction between sampling period and distance from the PDA ($p < 0.001$). The difference in mean lead concentrations 'Before' and 'After' construction was significant out to 660 m from the PDA (Figure 4-28).

Possible mechanisms for increased lead concentrations in lichen are vehicle-related non-emission sources and/or dust deposition. The lead unlikely a product of Project-related emissions. Project vehicles use diesel fuel. Diesel exhaust is a complex mixture of gases, vapors, aerosols, and particulate substances formed during the combustion (burning) of diesel fuel (Environment and Climate Change Canada 2019). The exact composition of the exhaust depends on several factors including the type of fuel and engine, how well serviced and maintained the engine is, speed and load on the vehicle, and emission control systems (Environment and Climate Change Canada 2019). The main emissions from diesel exhaust include carbon monoxide, hydrocarbons, particulate matter and nitrogen oxides (United Nations Economic Commission for Europe 2014, Reşitoğlu and Altinişik 2015, Hooftman et al. 2016, Environment and Climate Change Canada 2019). A review by ECCC (2019) assessed heavy and light-duty diesel vehicles for the various components of diesel exhaust and the proportion of emissions for each pollutant. This review concluded no emissions of heavy metals from diesel exhaust; therefore, diesel exhaust is not a likely pathway for increased lead concentration in lichen. This, however, does not account for vehicle-related sources of heavy metals from non-exhaust emissions that can contribute to road dust contamination such as tire and brake wear

(Hooftman et al. 2016, Adamiec et al. 2016). Although the contribution of heavy metals from vehicle related non-exhaust emissions for the Project has not been quantified, it is acknowledged that it is a potential pathway that could influence metal concentrations in road dust.

Consequently, the mechanism for increased metal concentrations in lichen is likely attributed to dustfall generated by road dust from vehicle traffic. Although dustfall continues to decrease at most year-round sites, lichens are well known bioaccumulators of atmospheric pollutants such as heavy metals (Chettri et al. 1998, Naeth and Wilkinson 2008, Aslan et al. 2011); therefore, metals accumulated in tissues may reflect previous exposure to heavy metals over time.

An integrated evaluation of other monitoring programs for the Project may assist in understanding the biological relevance and potential effects of dustfall and metals uptake to vegetation health. Results of the vegetation abundance monitoring program determined that annual differences in lichen cover were consistent across all distance classes; therefore, changes in cover among years is likely the result of inter-annual variation across all sites rather than Project-related effects.

Despite increased lead concentrations in lichen, metal concentrations for all samples were below or within the range of the indicator values, which were selected as a conservative estimate to assess the potential for potential initial adverse effects to vegetation health. As datasets are further developed through the ongoing implementation of vegetation and dustfall monitoring programs, the indicator values may be revised as understanding of the dose-response relationship between metals and lichen is deepened.

Decreased lead concentrations in lichen at Reference sites after construction is likely attributed to natural metabolism and removal of metals in lichen tissues over time. Samples collected before construction that previously exceeded the lower end of the indicator value suggest that there is natural variability in metal concentrations across the Project RSA. No pathway exists at Reference site locations that would cause a decrease in metal concentrations of lichen tissues except from natural processes.

Table 4-13 Lead concentrations in lichen (mg/kg dry weight) by Project area and sampling period Before and After mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	Indicator Value[5]	Above Indicator Value[5] (%)
Mine	0–100	Before	12	0.0	1.18	1.23	0.50	0.58	3.47	5–15	0
Mine	0–100	After	11	0.0	2.35	2.19	1.28	1.22	4.82	5–15	0
Road	0–100	Before	15	0.0	1.74	1.76	1.31	0.53	3.23	5–15	0
Road	0–100	After	12	0.0	6.48	6.18	1.62	4.05	15.30	5–15	83.3/8.33
Port	0–100	Before	14	0.0	1.07	0.97	0.36	0.53	2.60	5–15	0
Port	0–100	After	10	0.0	1.69	1.60	0.50	1.01	2.71	5–15	0
Far	100–1,000	Before	17	0.0	0.74	0.78	0.48	0.22	1.67	5–15	0
Far	100–1,000	After	11	0.0	1.26	1.17	1.11	0.41	4.53	5–15	0
Reference	>1,000	Before	24	0.0	0.90	0.80	1.05	0.28	6.71	5–15	4.17/0.00
Reference	>1,000	After	13	0.0	1.18	1.23	0.50	0.58	3.47	5–15	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] Source : Tomassini 1976, Nieboer et al. 1978, Kinalioglu et al. 2010.

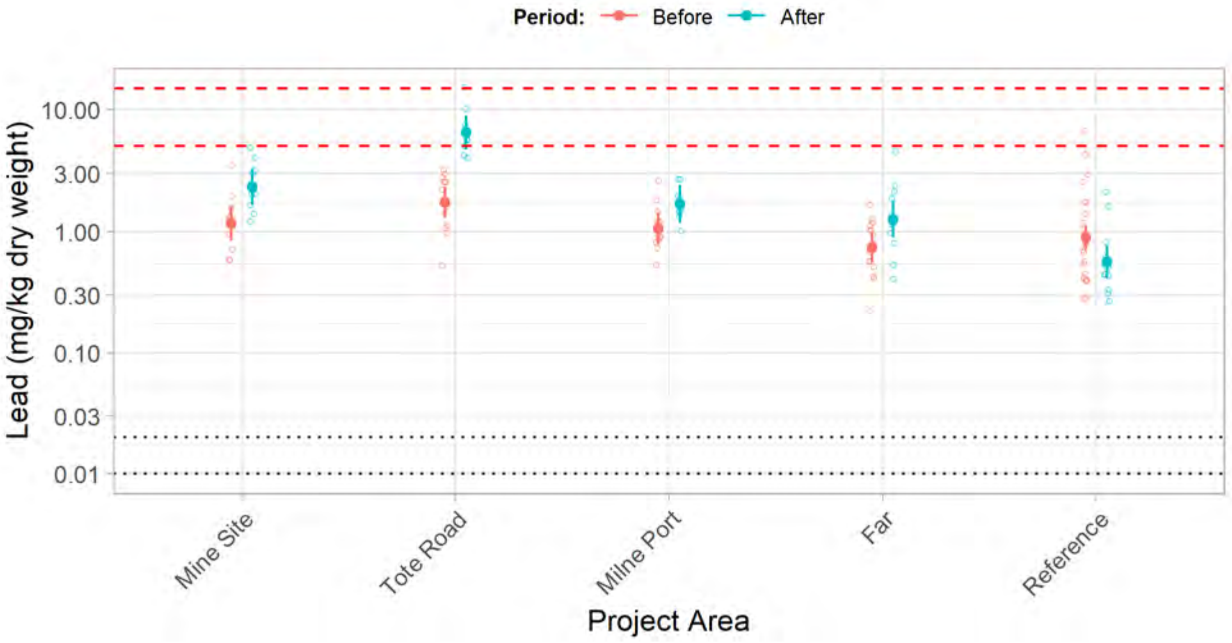


Figure 4-27 Lead concentrations in lichen by Project area and sampling period.

Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. The red dashed line shows the indicator value (5-15 mg/kg) and the black dotted lines show the RDLs, 0.01 mg/kg ('Before') and 0.02 mg/kg ('After') sampling.

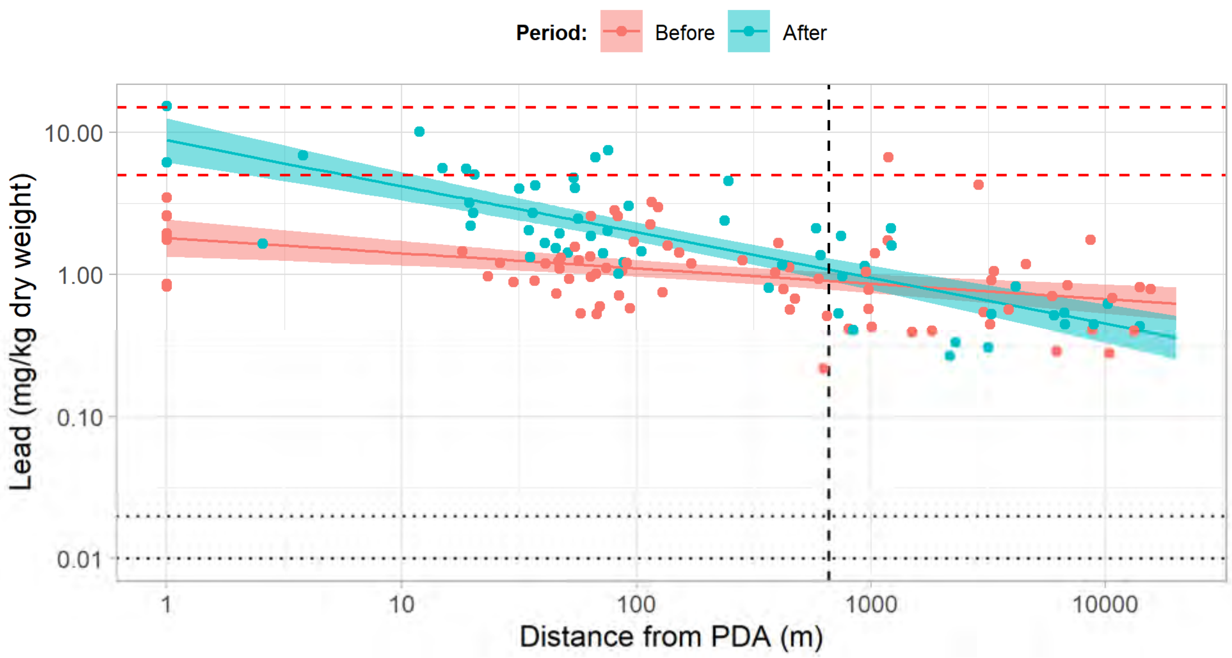


Figure 4-28 Lead concentrations in lichen by sampling period and distance from PDA.
Solid lines with ribbons show estimated geometric mean (± 95% CI), circles show individuals sample values. Dashed vertical line shows the distance at which there is no difference between concentrations before and after mine construction. Concentrations below the RDL are displayed as half the RDL. The horizontal black dotted lines show the RDLs, 0.01 mg/kg ('Before') and 0.02 mg/kg ('After') sampling.

Selenium — Selenium concentrations in lichen increased following construction near the Mine Site and at Far sites. About one-fifth (20.7%) of the 'Before' and 8.8% of the 'After' samples were below the RDL (0.05 mg/kg).

A summary of selenium concentrations in lichen by Project area and sampling period is provided in Table 4-14 and shown in Figure 4-29. In summary:

- There was a slight increase in mean selenium concentrations at Far sites from 0.04 mg/kg (CI = 0.03 – 0.05) 'Before' to 0.06 mg/kg (CI = 0.04 – 0.07) 'After' (p = 0.04).
- No difference existed between the Before and After sampling periods for any other Project area (Mine Site: p = 0.12, Tote Road: p = 0.48, Milne Port: p = 0.83, and Reference: p = 0.39).

Mean selenium concentrations in lichen between the Before and After periods remain low. The trace increases of selenium in lichen are not considered biologically relevant and could be attributed to natural variation in metal concentrations near the Mine Site and at Far Sites. Further, the highest selenium concentration before construction was 0.20 mg/kg and after construction was 0.12 mg/kg indicating natural variability in metal concentrations across the Project area.

Due to the lack of available guidelines and studies based on the literature, no indicator value to evaluate selenium toxicity in lichen was defined for the Project. Future monitoring may consider values suggested for the updated risk assessment and evaluation of exposure potential from ore dusting events in selected VECs (Intrinsik 2017).

There was no interaction between sampling period and distance from the PDA (p = 0.10; Figure 4-30).

Table 4-14 Selenium concentrations in lichen (mg/kg dry weight) by project area and sampling period Before and After mine construction

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]
Mine	0–100	Before	12	8.33	0.06	0.07	0.02	0.05	0.09
Mine	0–100	After	11	0.00	0.08	0.08	0.03	0.06	0.11
Road	0–100	Before	15	0.00	0.07	0.07	0.02	0.05	0.08
Road	0–100	After	12	8.33	0.06	0.07	0.01	0.05	0.08
Port	0–100	Before	14	7.14	0.07	0.07	0.02	0.05	0.14
Port	0–100	After	10	0.00	0.07	0.07	0.01	0.05	0.08
Far	100–1,000	Before	17	41.18	0.04	0.06	0.04	0.05	0.07
Far	100–1,000	After	11	18.18	0.06	0.06	0.01	0.05	0.08
Reference	>1,000	Before	24	29.17	0.05	0.06	0.05	0.05	0.20
Reference	>1,000	After	13	15.38	0.06	0.06	0.02	0.05	0.12

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

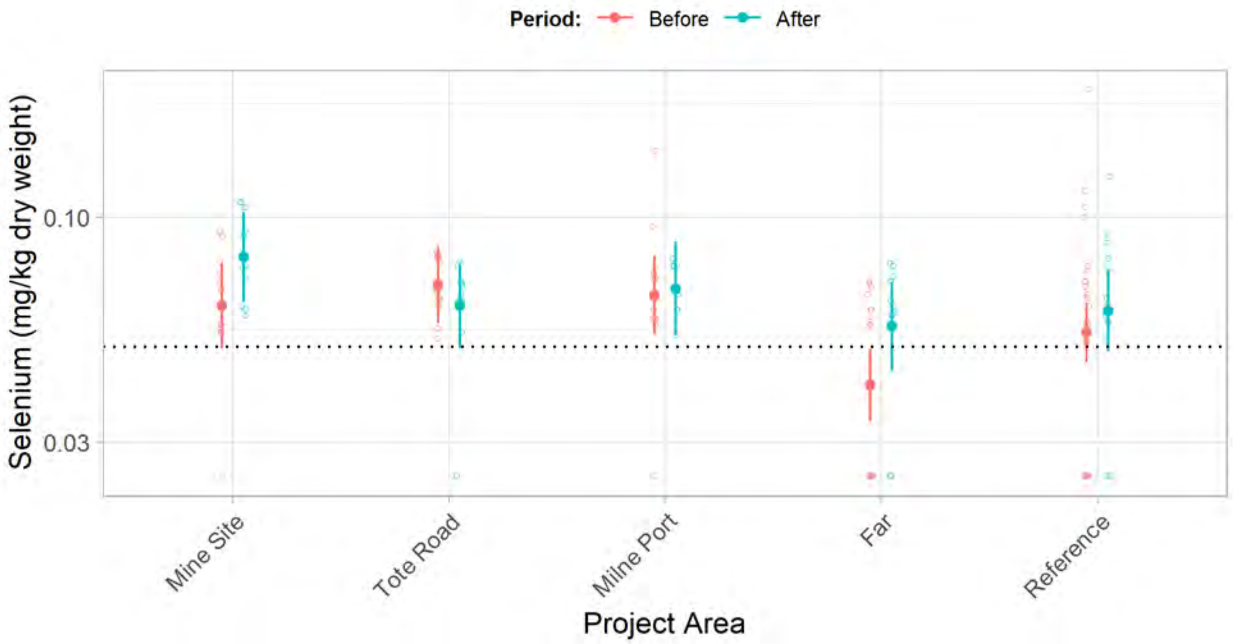


Figure 4-29 Selenium concentrations in lichen by Project area and sampling period.
Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. The black dotted lines show the RDL, 0.05 mg/kg ('Before' and 'After' sampling).

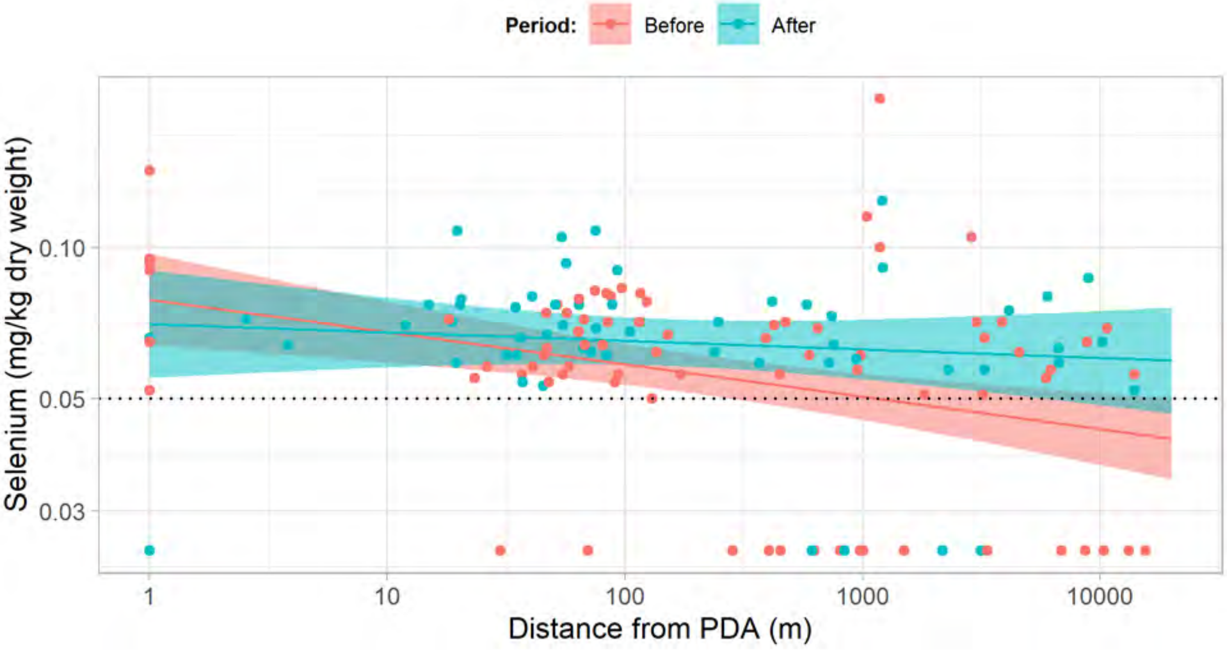


Figure 4-30 Selenium concentrations in lichen by sampling period and distance from PDA. *Solid lines with ribbons show estimated geometric mean (± 95% CI), circles show individuals sample values. Dashed vertical line shows the distance at which there is no difference between concentrations before and after mine construction. Concentrations below the RDL are displayed as half the RDL. The horizontal black dotted lines show the RDL, 0.05 mg/kg ('Before' and 'After' sampling).*

Zinc — No samples exceeded the indicator value of 178 mg/kg (dry weight) for zinc in lichen. No samples were below the 'Before' RDL (0.2 mg/kg) or 'After' RDL (0.5 mg/kg).

A summary of zinc concentrations in lichen by Project area and sampling period is provided in Table 4-15 and shown in Figure 4-31. In summary:

- There was no significant difference at the Mine Site 'Before' at 14.3 mg/kg (CI = 12.0 – 17.0) or 'After' at 17.7 mg/kg (CI = 14.8 – 21.2) (p = 0.09).
- No difference existed between the Before and After sampling periods for any other Project area (Tote Road: p = 0.18; Milne Port: p = 0.40; Reference: p = 0.42).

Mean zinc concentrations in lichen between the Before and After periods remain low. Suggestive increases of zinc in lichen are not considered biologically relevant and are likely attributed to natural variation in metal concentrations near the Mine Site. The highest zinc concentrations near the Mine Site after construction were nine times lower than the indicator value.

There was no interaction between sampling period and distance from the PDA (p = 0.19; Figure 4-32).

Table 4-15 Zinc concentrations in lichen (mg/kg dry weight) by Project area and sampling period Before and After mine construction.

Area	Distance from PDA (m)	Sampling Period[1]	n[2]	Below RDL[3] (%)	Mean[4]	Median[4]	Inter-quartile Range[4]	Min[4]	Max[4]	Indicator Value[5]	Above Indicator Value[5] (%)
Mine	0–100	Before	12	0.00	14.27	14.25	5.10	10.80	20.40	178	0
Mine	0–100	After	11	0.00	17.74	17.60	5.85	13.30	25.50	178	0
Road	0–100	Before	15	0.00	16.91	18.00	3.60	8.57	28.80	178	0
Road	0–100	After	12	0.00	19.78	20.70	4.73	14.40	24.30	178	0
Port	0–100	Before	14	0.00	10.55	10.55	2.94	7.16	16.20	178	0
Port	0–100	After	10	0.00	9.49	9.29	1.37	7.97	11.60	178	0
Far	100–1,000	Before	17	0.00	11.75	11.00	4.15	7.14	33.20	178	0
Far	100–1,000	After	11	0.00	12.82	12.60	6.81	6.32	20.50	178	0
Reference	>1,000	Before	24	0.00	14.35	14.65	6.43	6.47	23.80	178	0
Reference	>1,000	After	13	0.00	13.33	13.70	10.14	6.37	27.50	178	0

[1] Before = baseline sampling during pre-construction for all years up to and including 2016; After = post-baseline sampling after construction was initiated for all years of sampling following 2016.

[2] Number of sample sites.

[3] RDL provided by the laboratory at the time of analysis.

[4] Units are mg/kg dry weight; Min = minimum; Max = maximum.

[5] Source : Nash 1975, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988.

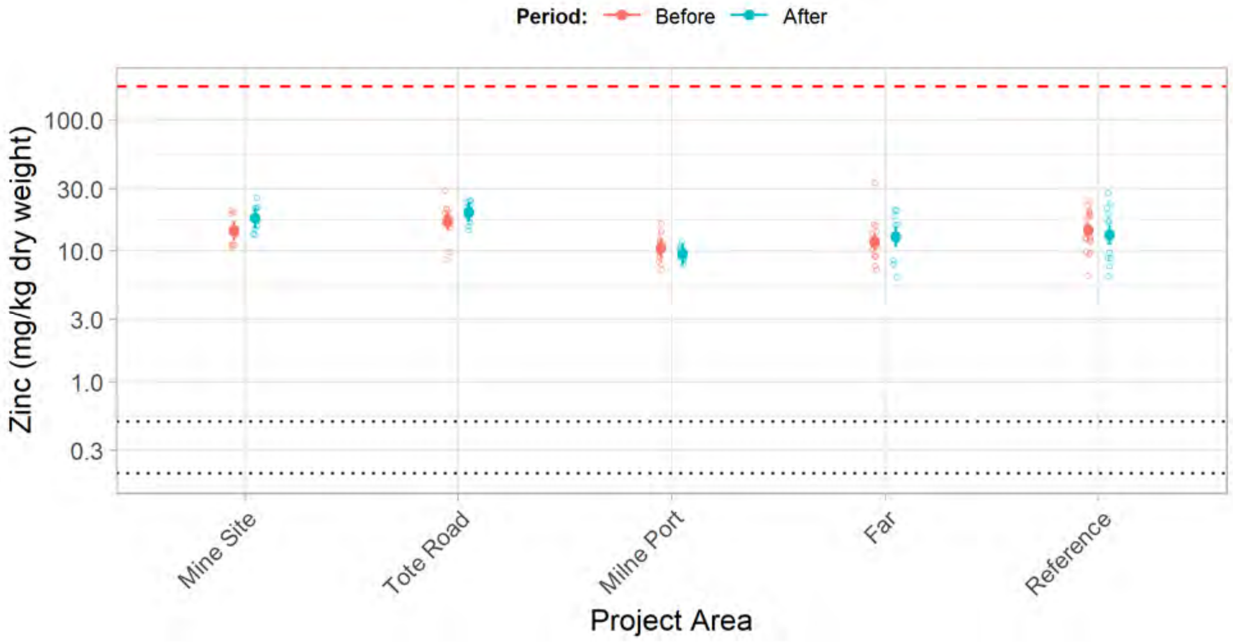


Figure 4-31 Zinc concentrations in lichen by Project area and sampling period.
Solid points with error bars show medians (± 95% CI), open circles show individuals sample values. The red dashed line shows the indicator value (178 mg/kg dry weight) and the black dotted lines show the RDL, 0.02 mg/kg ('Before' and 'After' sampling).

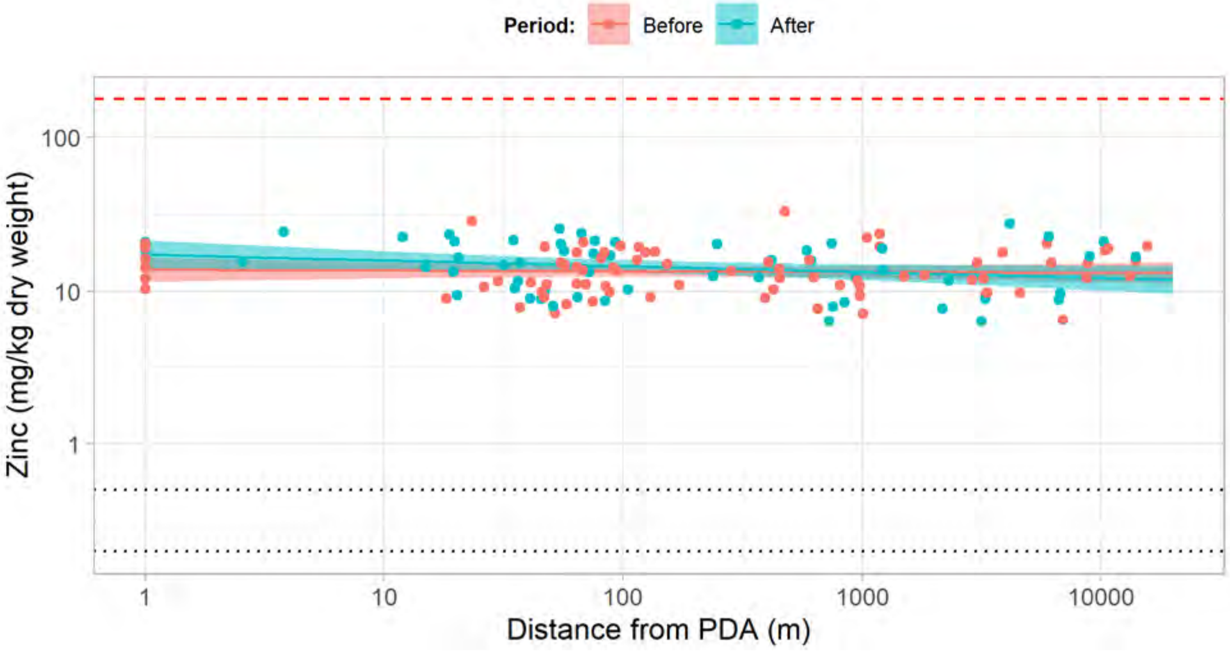


Figure 4-32 Zinc concentrations in lichen by sampling period and distance from PDA.
Solid lines with ribbons show estimated geometric mean (± 95% CI), circles show individuals sample values. Dashed vertical line shows the distance at which there is no difference between concentrations before and after mine construction. Concentrations below the RDL are displayed as half the RDL. The horizontal black dotted lines show the RDL, 0.2 mg/kg ('Before') and 0.5 mg/kg ('After') sampling.

4.2.2.3 Dust-Deposited Metals on Lichen

The results of the assessment to calculate an index for dust-deposited metals on lichen is outlined below. The analysis was conducted to determine the full extent of potential metals both on the surface and in lichen tissues that may contribute to metal toxicity. The difference between unwashed and washed samples was assumed to be the concentration of metals that were dust-borne (termed "dust-deposited metals") at the sample site (at that time), which may be absorbed by lichen.

Arsenic — Concentrations of dust-deposited arsenic on lichen did not differ among Project areas (p = 0.66). No statistical difference in dust-deposited arsenic on lichen occurred for any of the Project areas (Mine site: p = 0.16; Tote Road: p = 0.25; Milne Port: p = 0.79; Far: p = 0.96; Reference: p = 0.22). Across all areas combined, there was no evidence of a difference in arsenic concentrations between unwashed and washed lichen samples (p = 0.10). Mean dust-deposited arsenic for all samples was 0.007 mg/kg (CI = -0.002 – 0.16).

Cadmium — Concentrations of dust deposited cadmium on lichen did not differ among Project areas (p = 0.69). No statistical difference in dust-deposited cadmium on lichen occurred for any of the Project areas (Mine site: p = 0.42; Tote Road: p = 0.17; Milne Port: p = 0.98; Far: p = 0.72; Reference: p = 0.82). Across all areas combined, there was no evidence of a difference in cadmium concentrations between unwashed and washed lichen samples (p = 0.45). Mean dust-deposited cadmium for all samples was 0.002 mg/kg (CI = -0.007 – 0.003).

Copper —Mean dust deposited copper from sites near the Tote Road was 0.45 mg/kg (CI = 0.05 – 0.86), which was statistically different from 0 (p = 0.007). Mean dust-deposited copper from the Mine Site was 0.29 mg/kg (CI = -0.047 – 0.63), was not statistically different from 0 (p = 0.09). These findings suggest that some of the copper in the samples near the Tote Road and Mine Site may be attributed to dust on lichen rather than solely in lichen.

One paired sample of copper from a Reference site was removed from the analysis, because the unwashed sample had -3.3 mg/kg of copper compared to the washed sample, indicating that the two samples were not comparable.

Lead — Concentrations of dust-deposited lead on lichen did not differ among Project areas (p = 0.82). No statistical difference in dust-deposited lead on lichen occurred for any of the Project areas (Mine site: p = 0.26; Tote Road: p = 0.58; Milne Port: p = 0.79; Far: p = 0.71; Reference: p = 0.81). Across all areas combined, there was no evidence of a difference in lead concentrations between unwashed and washed lichen samples (p = 0.55). Mean dust-deposited lead for all samples was -0.03 mg/kg (CI = -0.14 – 0.07).

Selenium — Concentrations of dust-deposited selenium on lichen did not differ among Project areas (p = 0.67). No statistical difference in dust-deposited selenium on lichen occurred for any of the Project areas (Mine site: p = 0.98; Tote Road: p = 0.78; Milne Port: p = 0.88; Far: p = 0.27; Reference: p = 0.31). Across all areas combined, there was no evidence of a difference in selenium concentrations between unwashed and washed lichen samples (p = 0.85). Average dust deposited selenium for all samples was - 0.0002 mg/kg (CI = -0.003 – 0.002).

Zinc — Concentrations of dust-deposited zinc on lichen did not differ among Project areas ($p = 0.52$). No statistical difference in dust-deposited zinc on lichen occurred for any of the Project areas (Mine site: $p = 0.60$; Tote Road: $p = 0.81$; Milne Port: $p = 0.13$; Far: $p = 0.73$; Reference: $p = 0.15$). Across all areas combined, there was no evidence of a difference in zinc concentrations between unwashed and washed lichen samples ($p = 0.19$). Mean dust deposited zinc for all samples was -0.27 mg/kg (CI = -0.68 – 0.14).

Concentrations of dust-deposited metals on lichen did not differ among Project areas for any of the CoPCs except for copper near the Tote Road and Mine Site. This analysis found suggestive evidence of a difference in copper concentrations on the surface of lichen versus in lichen tissues, indicating that copper concentrations may be a product of dust-deposited metals on and absorbed by lichen. Across all areas combined, there was no evidence of a difference in metals concentrations between unwashed and washed lichen samples, which indicates that dust-borne metals with the potential to be absorbed by lichen were adequately captured in the analysis for metal concentrations in lichen tissues.

4.2.2.4 Relationship Between Metals in Dustfall Deposition to Soil and Lichen

The results of the analyses to assess metal concentrations in dustfall deposition and metal concentrations in soil and lichen are outlined below. The analyses were conducted to examine the association between metals in dustfall deposition ($mg/dm^2 \cdot days$; where the number of sampling days differed among sites) and accumulated concentrations of metals in soil and lichen (mg/kg dry weight) for CoPCs and soil pH in the Project RSA. Refer to Section 4.2.1.3 — Relationship Between Metals in Dustfall Deposition to Soil and Lichen for detailed methods. Resulting statistics are provided in APPENDIX F — Correlations For Metals in Dustfall Deposition with Soil and Lichen.

Arsenic — A significant negative correlation existed between arsenic concentrations in dustfall deposition and soil ($\varrho = - 0.34$, $p = 0.02$). Further investigations found a positive interaction between arsenic concentrations in dustfall deposition and soil pH (estimate = 0.14, $p = 0.0006$; Figure 4-33). In addition, there were significant main effects from dustfall deposition (estimate = - 1.00, $p = 0.0005$) and soil pH (estimate = 1.69, $p < 0.0001$). These results highlight the role of soil pH in mediating the relationship between arsenic concentrations in dustfall deposition with soil. As soil pH increases from acidic (low soil pH values) to basic (high soil pH values), so does the effect of dustfall deposition on arsenic concentrations in soil. Specifically, for every 1% increase of arsenic concentrations in dustfall deposition and unit of soil pH, there was a corresponding 0.14% increase of arsenic concentrations in soil. Due to slight departures from normality (of residuals) at the tails, p-values should be interpreted with caution.

Investigations between arsenic concentrations in dustfall deposition and lichen identified a highly influential data point (i.e., Cook's distance > 0.5) that contributed to deviations from normality (bold open circle in top left corner of Figure 4-34). Correlation was reassessed and found similar results for parametric and nonparametric methods ($r = 0.36$, $p = 0.02$). No significant interaction was identified; however, a significant main effect of dustfall deposition was determined using simple regression (estimate = 0.13, $p = 0.02$; Figure 4-34). For every 1% increase of arsenic concentrations in dustfall deposition, there was a corresponding 0.13% increase of arsenic concentrations in lichen.

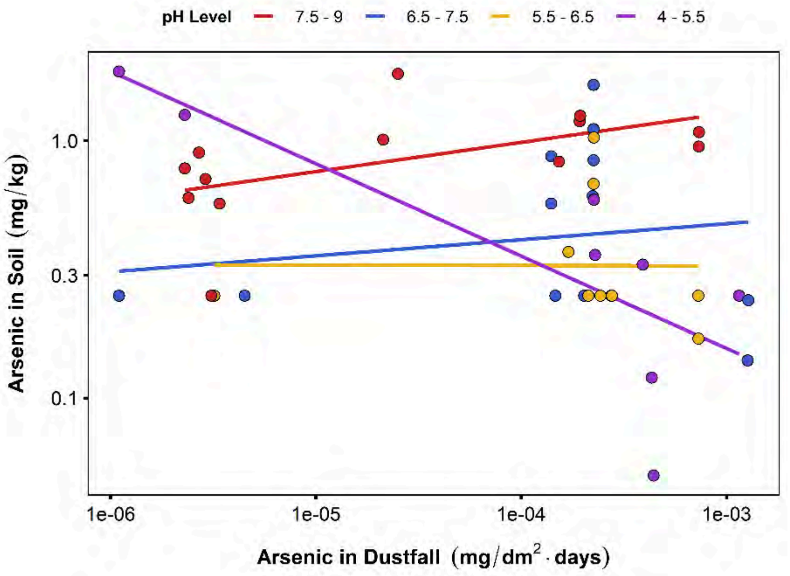


Figure 4-33 **Functional relationship (and interactions with soil pH) between arsenic concentrations in dustfall deposition with soil.**

Statistical analysis of interaction used soil pH as a continuous variable, but for graphical purposes, soil pH was divided into four categorical ranges from the highest values (basic pH) 7.5–9 to the lowest values (acidic pH) 4–5.5.

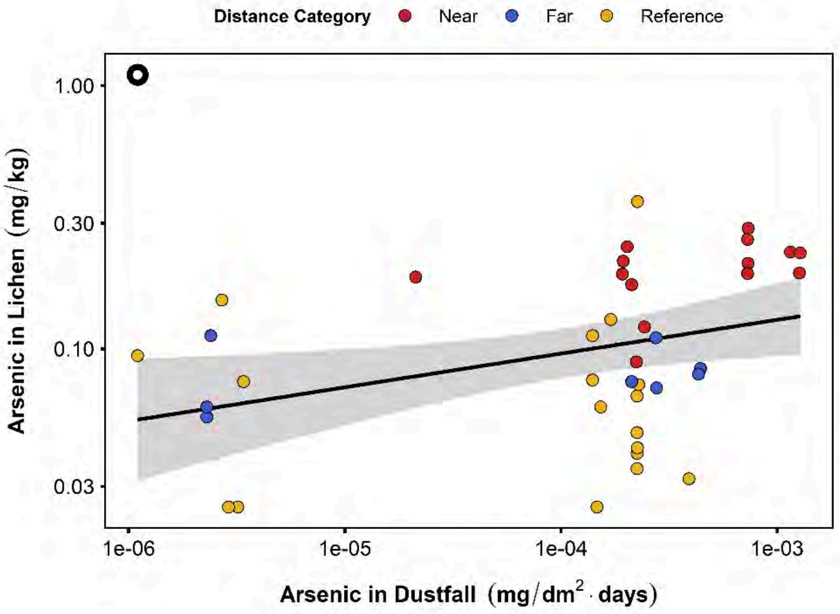


Figure 4-34 **Functional relationship (simple regression and 95% confidence intervals) between arsenic concentrations in dustfall deposition with lichen.**

Samples partitioned into three distance categories following the study design for the vegetation and soil base metals monitoring program. Bold open circle indicates the influential data point excluded from the analysis.

Cadmium — No statistical analyses were conducted for cadmium concentrations in dustfall deposition and soil, because 23 out of 45 (51%) samples (paired with dustfall data) of cadmium in soil fell below either 0.05 mg/kg (2016 and earlier) or 0.02 mg/kg (2017 and 2019) RDLs.

No correlation was found between cadmium concentrations in dustfall deposition and lichen (*r* = 0.008, p > 0.9). No functional relationship was identified through main effects or an interaction with distance category (all p > 0.3). Across all distance categories, no obvious patterns in that data were discernable (Figure 4-35).

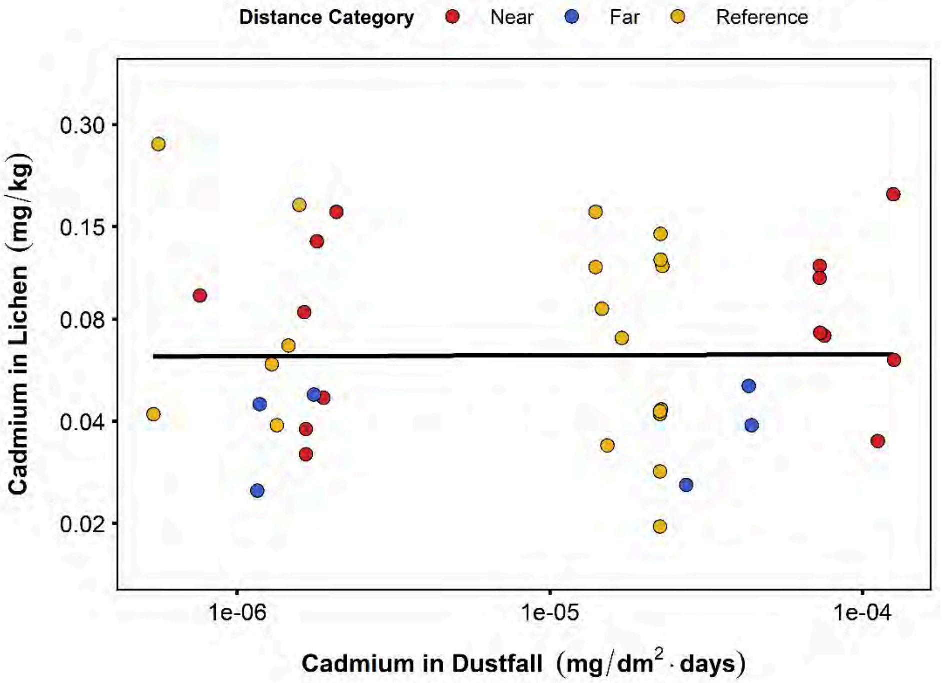


Figure 4-35 Functional relationship between cadmium concentrations in dustfall deposition with lichen.
Regression line provided to visualize the lack of association. Samples partitioned into three distance categories following the study design for the vegetation and soil base metals monitoring program.

Copper — No correlation occurred between copper concentrations in dustfall deposition and soil (*r* = - 0.17, p > 0.2); however, a significant positive interaction was identified between dustfall deposition and soil pH (estimate = 0.26, p = 0.007; Figure 4-36). Additionally, there were significant main effects from dustfall deposition (estimate = - 1.78, p = 0.007) and soil pH (estimate = 2.48, p = 0.001). These results highlight the role of soil pH in mediating the relationship between copper concentrations in dustfall deposition with soil. As soil pH increases from acidic (low soil pH values) to basic (high soil pH values), so does the effect of dustfall deposition on copper concentrations in soil. Specifically, for every 1% increase of copper concentrations in dustfall deposition and unit of soil pH, there was a corresponding 0.26% increase of copper concentrations in soil.

A significant positive correlation existed between copper concentrations in dustfall deposition and lichen ($r = 0.37$, $p = 0.02$). There was a clear difference in the slope of Near and Reference distance categories (estimate = -0.53, $p < 0.0001$). The rate of change in the Reference distance category follows a negative trend, while the rate of change at both Near and Far distances follows a positive trend (Figure 4-37). For every 1% increase of copper concentrations in dustfall deposition the following percent change of copper concentrations in lichen at each distance category was: Near: 0.39%, Far: 0.3%, and Reference: - 0.15%. Although a potential outlier was identified (i.e., Cook's distance = 0.4), removing this data point did not change the results.

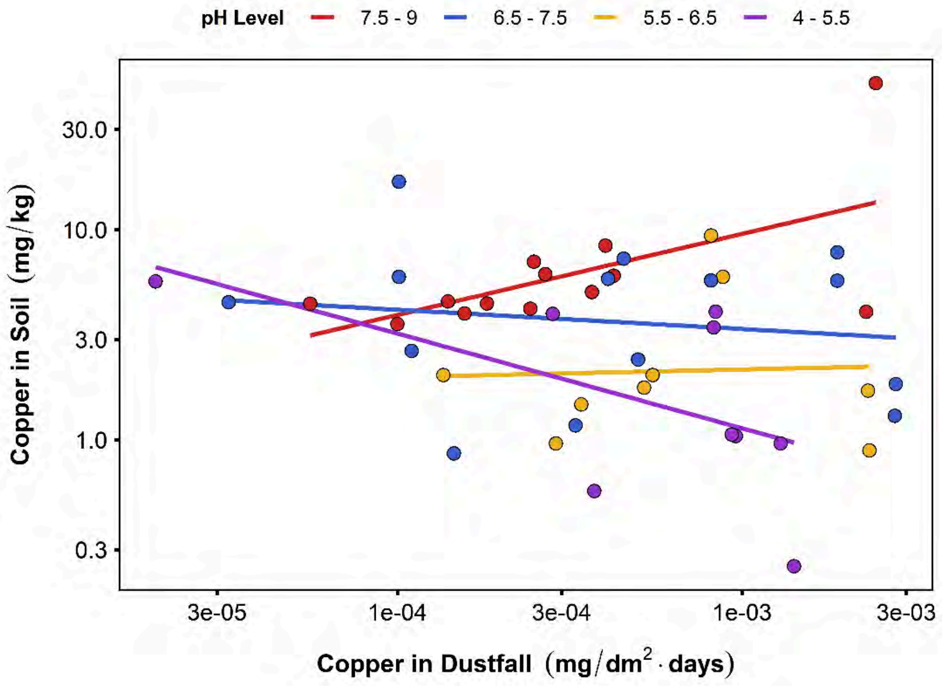


Figure 4-36 Functional relationship (and interactions with soil pH) between copper concentrations in dustfall deposition and soil.

Statistical analysis of interaction used soil pH as a continuous variable. For graphical purposes, soil pH was divided into four categorical ranges from the highest values (basic pH) 7.5–9 to the lowest values (acidic pH) 4–5.5.

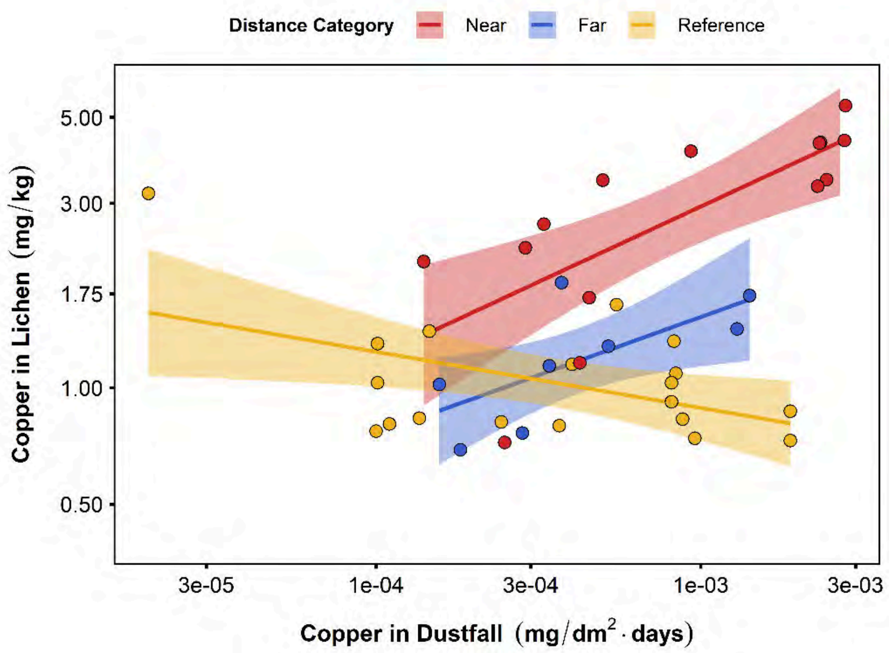


Figure 4-37 Functional relationship (interactions and 95% confidence intervals) between copper concentrations in dustfall deposition and lichen.

Distance categories following the study design for the vegetation and soil base metals monitoring program.

Lead — No correlation occurred between lead concentrations in dustfall deposition and soil (*r* = - 0.18, p > 0.2). However, these results were dependent on a single influential data point (i.e., Cook's distance = 0.4; bold open circle in top right corner of Figure 4-38). When the data point was removed, a significant negative correlation (*r* = - 0.37, p = 0.01) and functional relationship (estimate = -0.13, p = 0.01) were identified, but the interaction between dustfall deposition and distance was not significant (estimate = 0.25, p = 0.08). In this case, the functional relationship between lead concentrations in dustfall deposition and soil was not dependent on soil pH (for the interaction and all main effects, *P* > 0.2). For every 1% increase of lead concentrations in dustfall deposition, the following percent change of lead concentrations in soil at each distance category was: Near: - 0.15%, Far: - 0.31%, and Reference: 0.10%. A positive association at Near and Far sites and a negative association at Reference sites would be expected.

A positive correlation existed between lead concentrations in dustfall deposition and lichen (*r* = 0.59, p < 0.0001). Further investigations found an interaction between dustfall deposition and distance category, which demonstrated a significant difference between Near and Reference sites (estimate = -0.73, p = 0.0001). Both Near and Far distance categories had positive slopes, while the Reference distance had a strong negative slope (Figure 4-39). For every 1% increase of lead concentrations in dustfall deposition, the following percent change of lead concentrations in lichen at each distance category was: Near: 0.32%, Far: 0.24%, and Reference: -0.41%. A clustering of Near distance category points as shown in the top right of Figure 4-39 demonstrates the strongest positive association between dustfall deposition and lichen near the PDA.

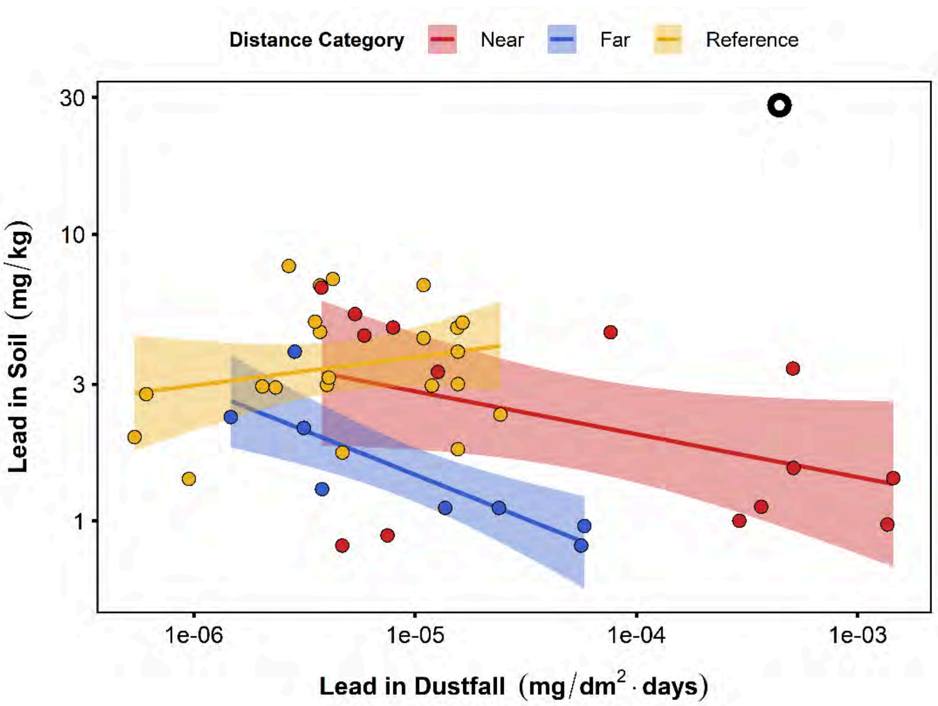


Figure 4-38 Functional relationship (interactions and 95% confidence intervals) between lead concentrations in dustfall deposition and soil.

Distance categories following the study design for the vegetation and soil base metals monitoring program. Bold open circle indicates influential data point not included in analysis.

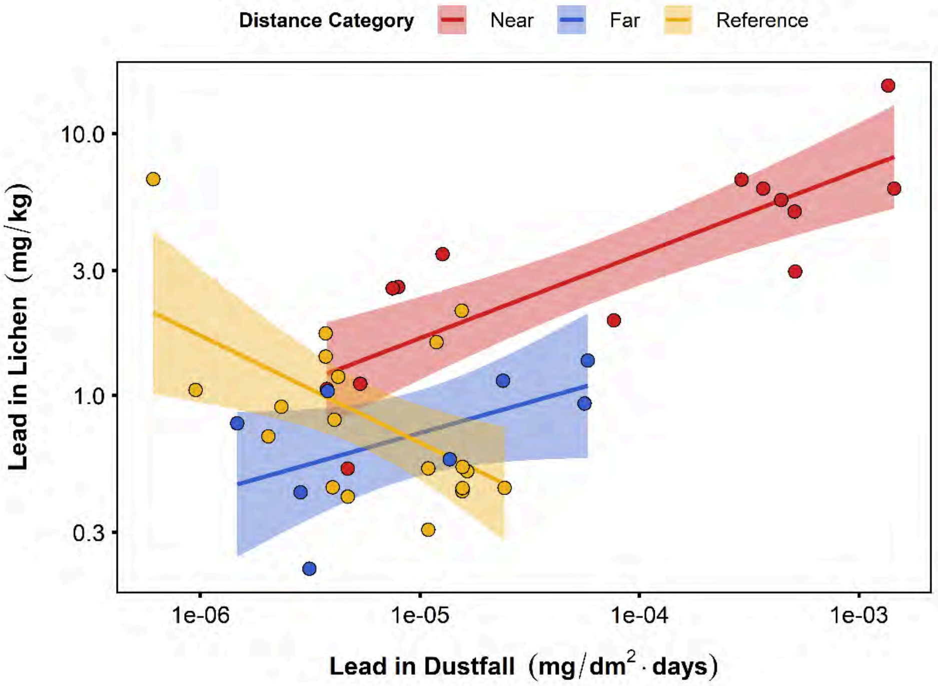


Figure 4-39 Functional relationship (interactions and 95% confidence intervals) between lead concentrations in dustfall deposition and lichen.

Distance categories following the study design for the vegetation and soil base metals monitoring program.

Selenium — No statistical analyses were conducted for selenium concentrations in dustfall deposition and soil, because all samples of selenium in soil (paired with dustfall data) were either below the 0.5 mg/kg (2016 and earlier) or 0.2 mg/kg (2017 and 2019) RDLs. Refer to Section 4.2.2.1 — Metals in Soil for further details included in the main analyses for the vegetation and soil base metals monitoring program.

No significant correlation existed between selenium concentrations in dustfall deposition and lichen ($\varrho = -0.07$, $p > 0.6$) and data deviated substantially from normality following log transformation. No significant main effects or interactions were found (all $p > 0.2$; Figure 4-40).

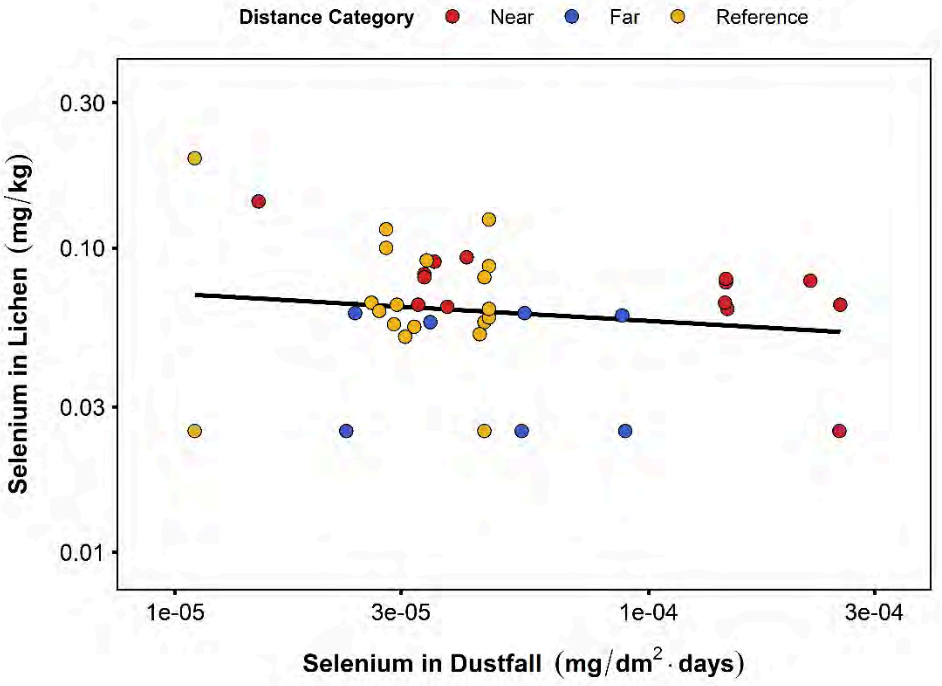


Figure 4-40 Functional relationship between selenium concentrations in dustfall deposition and lichen.
Regression line provided to visualize the lack of association. Samples partitioned into three distance categories following the study design for the vegetation and soil base metals monitoring program.

Zinc — No correlation existed between zinc concentrations in dustfall deposition and soil (r = -0.10, $p > 0.5$). These results were dependent on three data points that were identified through successive diagnostic checks and were either influential points (i.e., Cook's distance > 0.5) or had corresponding residuals that drastically deviated from normality (bold open circles in Figure 4-41). When these data points were removed, there was a significant interaction between dustfall deposition and distance category (estimate = -1.54, $p < 0.0001$). In contrast, when exploring an interaction model that included pH, no significant effects were found (all $p > 0.3$). This was true when including and excluding the three influential data points. For every 1% increase of zinc concentrations in dustfall deposition, the following percent change of zinc concentrations in soil at each distance category was: Near: -0.25%, Far: -1.79%, and Reference: 0.09%. This interaction was similar to the results for lead that were considered unrealistic; rather, a positive association at Near and Far sites and a negative association at Reference sites would be expected. Results may be influenced by a small sample size in the Far distance category (i.e., sample size reduced from 8 to 6 when influential data points were removed).

No significant correlation existed between zinc concentrations in dustfall deposition and lichen (r = 0.09, $p > 0.5$). Both Near and Far distance categories had positive slopes, while the Reference distance had a negative slope (Figure 4-42). For every 1% increase of zinc concentrations in dustfall deposition, the following percent change in zinc concentrations in lichen at each distance category was: Near: 0.06%, Far: 0.11%, and Reference: -0.18%.

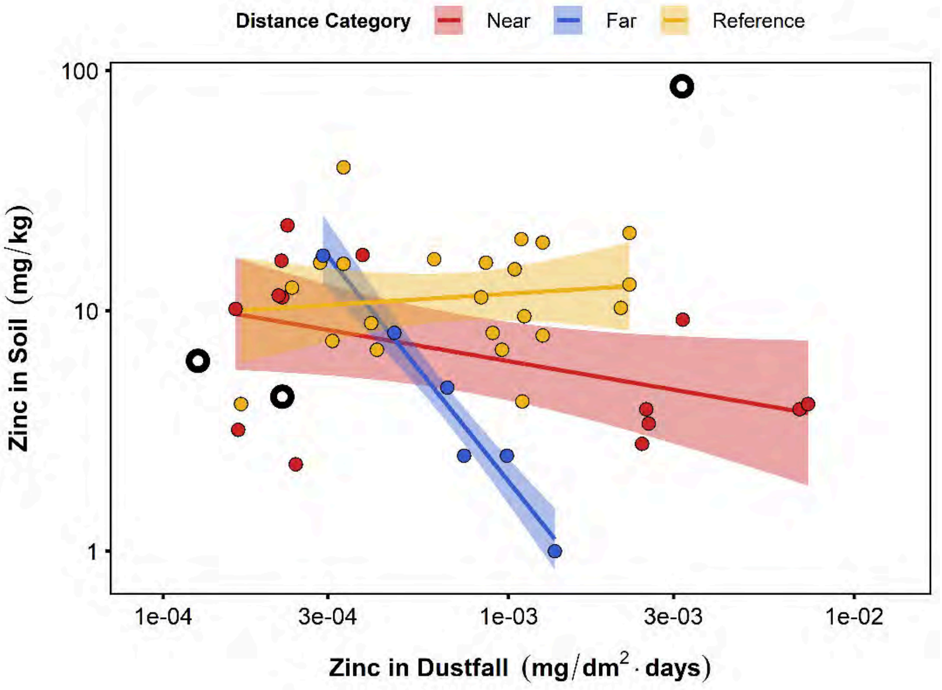


Figure 4-41 Functional relationship (interactions and 95% confidence intervals) between zinc concentrations in dustfall deposition and soil.

Distance categories following the study design for the vegetation and soil base metals monitoring program. Bold open circles indicate influential data points not included in analysis.

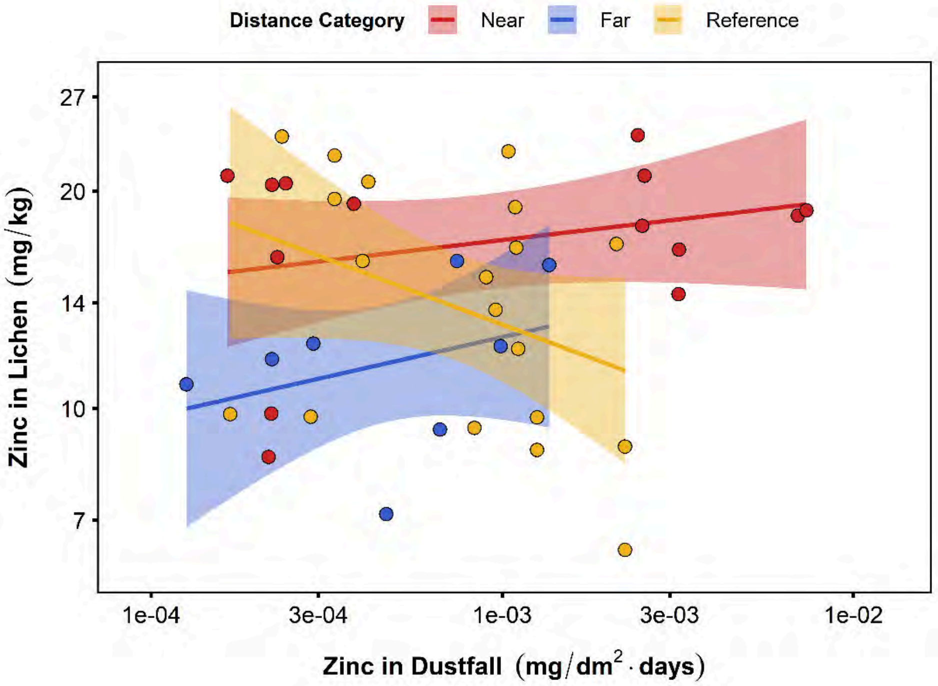


Figure 4-42 Functional relationship (interactions and 95% confidence intervals) between zinc concentrations in dustfall deposition and lichen.

Distance categories following the study design for the vegetation and soil base metals monitoring program.

In summary, the results of the analyses to assess metal concentrations in dustfall deposition and metal concentrations in soil and lichen determined that soil pH can play a mediating role in the relationship between metal concentrations in dustfall deposition and soil. This was true for arsenic and copper. As soil pH increased from acidic (low soil pH values) to basic (high soil pH values), the effect of dustfall deposition on metal concentrations in soils also increased. This was not the case for lead and zinc; an unexpected and unrealistic interaction was found between dustfall deposition and distance category. Results may be influenced by interactions with other soil chemistry variables, small sample size (e.g., sample size for zinc in soil was reduced from 8 to 6 when influential data points were removed), and/or soil sampling depth. Results indicate that lichen is a good indicator of changes in metal exposure; higher metals concentrations in dustfall deposition corresponded to higher metal concentrations in lichen for arsenic, copper, lead and zinc.

4.3 EXOTIC INVASIVE VEGETATION MONITORING AND NATURAL REVEGETATION

Conditions under the NIRB Project Certificate were developed to address concerns for the potential introduction and spread of exotic invasive vegetation from Project-related activities. Baffinland committed to establishing a long-term program to monitor for the potential introduction of invasive vegetation species. This commitment directly relates to the following:

- Project Condition #32 — *The Proponent shall ensure that equipment and supplies brought to the Project sites are clean and free of soils that could contain plant seeds not naturally occurring in the area. Vehicle tires and treads in particular must be inspected prior to initial use in Project areas.*
- Project Condition #37 — *The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g. surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.*
- Project Condition #38, 50 *and Project Commitment #67, 68, 69 & 70 also relate to monitoring for the potential introduction of invasive species or the reporting requirements for the exotic invasive monitoring program.*

To meet these requirements, a long-term monitoring program for exotic invasive vegetation was initiated in 2014 and will continue through the life of the mine and into post closure. The TEMMP outlines a monitoring plan for exotic invasive vegetation that includes targeted surveys in the Project footprint every five years or as triggered by observations from personnel on site (Baffinland Iron Mines Corporation 2016).

The objectives of the exotic invasive vegetation monitoring program are to:

- quantify the presence and occurrence of exotic invasive vegetation in and adjacent to the Project footprint through long-term monitoring; and
- assess disturbed areas to determine recolonization by plants, invasive or native.

Exotic vegetation refers to plant species that are found outside of their natural range and are either introduced by human activities or through environmental factors such as climate change. However, not all non-native species are considered invasive (Government of Nunavut 2020). Invasive species have certain biological traits that can pose negative impacts to the environment, economy, human health or other species. Based on available information through the Government of Nunavut (2020), no known invasive vegetation species occur in Nunavut.

Exotic invasive vegetation monitoring was conducted in 2019 and marked the second survey for exotic invasive vegetation for the Project. One exotic species was found in the Project footprint during surveys, which occurred from July 29 to 31, 2019 (Table 4-16). A garden tomato (*Solanum lycopersium*) was growing at the Mine Site below the sewage/effluent discharge pipe (Photo 4-5); however, these plants were not acting invasively and were not capable of producing flower or fruit. Although the source of the seed is unknown, it may indicate an issue with the Mary River Mine Site sewage/effluent system.

4.3.1 METHODS

Exotic invasive vegetation monitoring focused on surveying previously disturbed areas in and adjacent to the Project footprint. Presence/absence sampling was used to search for exotic invasive vegetation, as it is an efficient and targeted method for surveying exotic invasive vegetation (Oldham 2007, Alberta Native Plant Council 2012, Government of Alberta 2014). This method involved extensive surveys targeting disturbed habitats where exotic invasive vegetation could be found (i.e., disturbed areas along buildings, infrastructure, roads, laydowns and pullouts).

Areas were surveyed on foot, with some sections surveyed in a vehicle at slow speeds along the Tote Road. Each of the three focal areas (Mine Site, Milne Inlet and Tote Road) were surveyed to the extent that was permitted to safely walk or drive in the Project footprint. Surveys were conducted by two qualified botanists, one to two local assistants and, where available, one Baffinland Environmental staff.

4.3.2 RESULTS AND DISCUSSION

Field crews surveyed the PDA for exotic invasive vegetation in 2019 including the Mine Site Complex (MSC), Sailiivik camp, Weatherhaven at the Mine Site, perimeter of the airstrip, site services building, port and logistics warehouse, incinerator, emulsion plant, landfill, sewage/effluent discharge, pull outs, laydowns, Tote Road, Port Site Complex (PSC), Matrix camp, ship loader, water treatment plant, environment lab, batch plant and new camp at Milne Port for a total survey effort of 53 hours and 10 minutes (Table 4-16, Map 5). Site selection considered the degree of ground disturbance and areas of high human/equipment activity. Areas of active construction, heavy equipment use and blasting were not surveyed due to safety concerns. The Tote Road was driven from the Mine Site to Milne Port with one person on each side of the vehicle to observe roadside edges and ditches. All possible pullouts, laydowns, bridges, culverts, and the sea can laydown area near km 96.5 along the Tote Road where surveyed by crews on foot for exotic invasive vegetation.

One exotic species was found in the Project footprint during surveys conducted from July 29 to 31, 2019 (Table 4-16). Garden tomato was growing at the Mine Site below the sewage/effluent discharge pipe (Photo 4-5). A total of 20 plants were scattered throughout the rock armory and down slope of the discharge pipe. All plants were in a vegetative state; none were flowering/fruiting (Photo 4-6). Plants further from the discharge point were smaller in stature and discolored indicating lower health than the plants found directly adjacent to the outlet.

Daily records of effluent data show that on-site effluent is treated and discharged back into the environment (Baffinland Iron Mines Corporation 2019). Discharge released from the pipe migrates down slope through the rock armory and into an area covered by native vegetation prior to entering the Mary River (Photo 4-7). In the South, tomatoes are known to escape and regularly occur outside of cultivation, but do not persist (Klinkenberg 2019). It has been documented that in some situations, such as sewage lagoons, tomato plants appear abundantly (Klinkenberg 2019).

In conclusion, the tomato plants found during exotic invasive vegetation monitoring were not capable of producing flower or fruit and these plants were not acting invasively considering the description provided above which includes biological traits that cause species to act invasively.

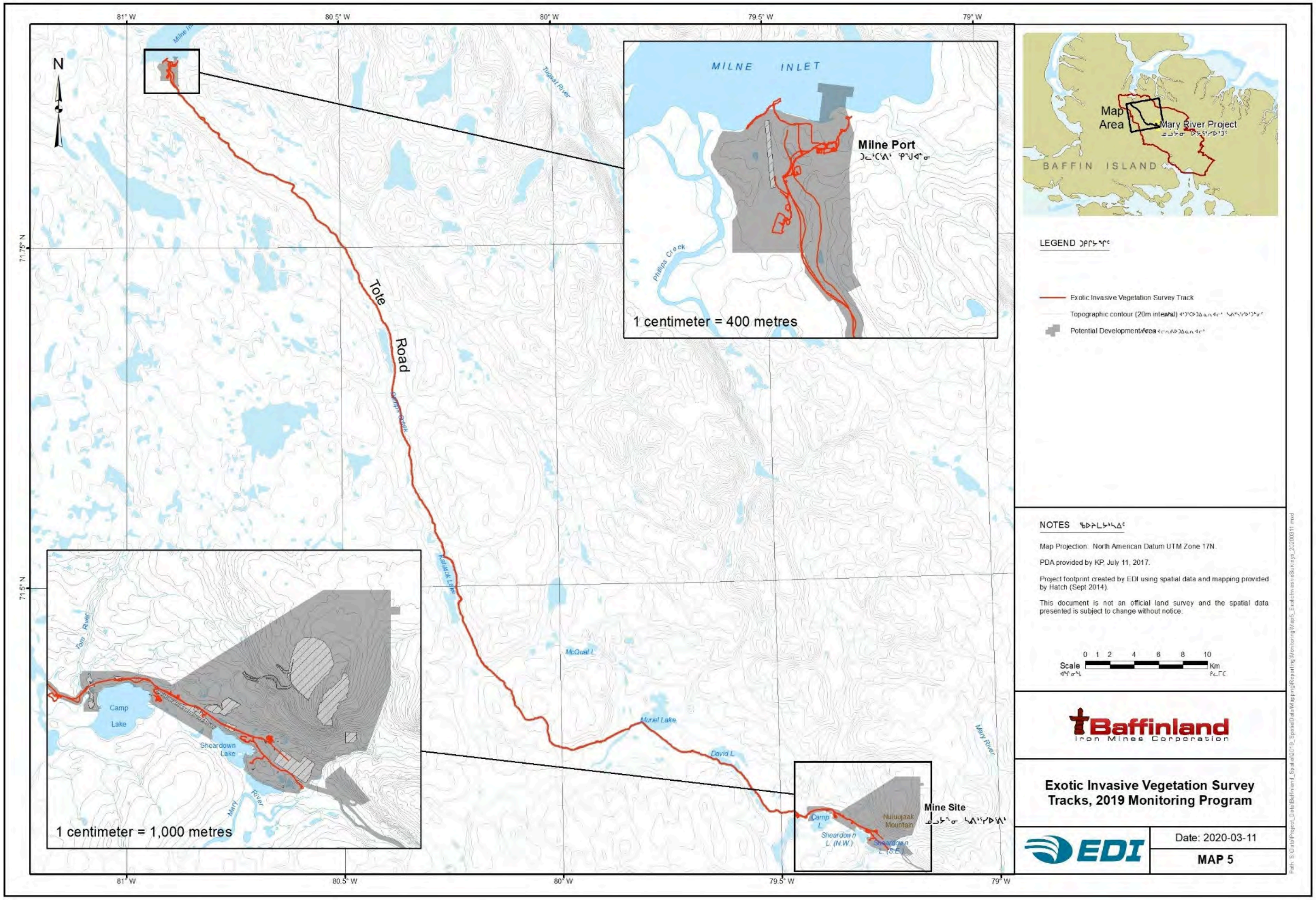
Table 4-16 Results of the exotic invasive vegetation monitoring program, 2019.

Site No.	Date	Start Time (hh:mm)	End Time (hh:mm)	Total Person Hrs (hh:mm)	No. Pers	Area	Observations	Location (Lat., Long.)
1	29 July 2019	10:00	12:00	8:00	4	Milne Port	-	-
2	29 July 2019	12:00	12:45	3:00	4	Milne Port	-	-
3	29 July 2019	12:45	13:45	4:00	4	Milne Port	-	-
4	29 July 2019	13:50	14:50	4:00	4	Milne Port	-	-
5	29 July 2019	15:00	15:36	2:24	4	Milne Port	-	-
6	30 July 2019	9:12	15:03	17:33	3	Tote Road	-	-
7	31 July 2019	7:42	12:25	14:09	2	Mine Site	Garden Tomato (*Solanum lycopersicum*)	N 71.3016, W -79.2582
		Total Survey Hours		**53:10**				

Photo 4-5 Garden tomato (*Solanum lycopersicum*) found growing down slope of the sewage/effluent discharge pipe in the rock armor during exotic invasive vegetation monitoring, 31 July 2019.

Photo 4-6 A close-up of a garden tomato (*Solanum lycopersicum*) found growing in the rock armory below the sewage/effluent discharge pipe during exotic invasive vegetation monitoring, 31 July 2019.

Photo 4-7 Overview of the sewage/effluent discharge area at the Mine Site looking upslope towards the outlet pipe and rock armor, 31 July 2019.


81° W
80.5° W
80° W
79.5° W
79° W
71.75° N
71.5° N
N
Tote Road
Milne Inlet
Tugaat River
Phillips Creek
Kalliktuk Lake
McQuil L.
Muriel Lake
David L.
Mary River
MILNE INLET
Milne Port
1 centimeter = 400 metres
Camp Lake
Sheardown Lake
Tom River
Mary River
1 centimeter = 1,000 metres
Mine Site
Nuluujaak Mountain
Camp L.
Sheardown L. (N.W.)
Sheardown L. (S.E.)
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Exotic Invasive Vegetation Survey Track
Topographic contour (20m interval)
Potential Development Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
PDA provided by KP, July 11, 2017.
Project footprint created by EDI using spatial data and mapping provided by Hatch (Sept 2014).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0 1 2 4 6 8 10
Scale
Km
Baffinland
Iron Mines Corporation
Exotic Invasive Vegetation Survey Tracks, 2019 Monitoring Program
EDI
Date: 2020-03-11
MAP 5

Natural Revegetation — At recently disturbed sites such as laydowns, pullouts, or the Sailiivik Camp, little to no vegetation was found growing. At previously disturbed areas, a diverse array of native plant species were found growing near buildings and infrastructure such as the Weatherhaven at the Mine Site or PSC at Milne Inlet (Table 4-17). Natural revegetation of disturbed sites in the Project footprint was assessed during exotic invasive vegetation monitoring by comparing the relative diversity and abundance of colonizing plant species among focal areas. A general summary of the relative diversity and abundance of natural revegetation observed in the Project footprint is as follows:

- Milne Inlet = high diversity and low abundance;
- Mine Site = moderate diversity and low abundance; and
- Tote Road = low diversity and low abundance.

Table 4-17 Native plant species found revegetating previous disturbances in the Project footprint, 2019.

Common name (species name)	Mine Site	Milne Inlet	Tote Road
Alpine fescue (*Festuca brachyphylla*)	√	-	-
Alpine bistort (*Bistorta vivipara*)	-	√	-
Arctic bladderpod (*Physaria arctica*)	-	√	√
Arctic mouse-ear chickweed (*Cerastium arcticum*)	√	√	-
Arctic poppy (*Papaver radicatum*)	√	√	√
Arctic thrift (*Armeria scabra)*	-	√	-
Arctic willow (*Salix arctica*)	√	√	√
Common horsetail (*Equisetum arvense*)	√	√	√
Draba species (*Draba* sp.)	√	√	√
Glaucous bluegrass (*Poa glauca*)	√	√	√
Long-stalked starwort (*Stellaria longipes*)	√	√	√
Maydell's oxytrope, Inuit carrot (*Oxytropis maydelliana*)	-	√	-
Mountain avens (*Dryas integrifolia*)	-	√	-
Mountain sorrel (*Oxyria digyna*)	√	√	-
Polar grass (*Arctagrostis latifolia*)	-	-	√
Prickly saxifrage (*Saxifraga tricuspidata*)	-	√	-
Purple saxifrage (*Saxifraga oppositifolia*)	√	√	-
Red bladder campion (*Silene uralensis* ssp. *uralensis*)	-	√	-
Reddish sandwort (*Minuartia rubella*)	-	√	-
River beauty (*Chamerion latifolium*)	√	√	-
Scurvy-grass (*Cochlearia groenlandica*)	-	√	-
Snow whitlow grass (*Draba nivalis*)	-	√	√
Spiked trisetum (*Trisetum spicatum*)	√	-	-
Villous cinquefoil (*Potentilla villosula*)	√	√	-
Yellow mountain saxifrage (*Saxifraga aizoides*)	-	√	-
Total Species	**13**	**22**	**9**

Evidence of natural revegetation was observed in the Project footprint in 2019. Although low in abundance, revegetation was relatively high in diversity at Milne Inlet, moderate at the Mine Site, and low along Tote Road.

Rare Plant Observations — Although surveys for rare plants are not required as part of the NIRB Project Certificate No. 005, incidental observations of a territorial "May Be At Risk" plant species for Nunavut were recorded from 2014 to 2019 during other vegetation surveys. This finding represents a large range extension for North Baffin Island and significant contribution to the overall knowledge of the species (Brouillet 2014). Horned dandelion (*Taraxacum ceratophorum*) is a dandelion species native to Baffin Island that was previously listed as "May Be At Risk" in Nunavut (Photo 9; Canadian Endangered Species Conservation Council 2011); however, due to a lack of survey information on the abundance and distribution of Horned dandelion on Baffin Island, the status for Horned dandelion changed in 2017 from "May Be At Risk" to "Unrankable" (Canadian Endangered Species Conservation Council 2016).

Horned dandelion was first found in the Project area in 2014 at two locations close to the Mine Site consisting of two populations and 31 individuals. In 2016, additional Horned dandelion populations were observed along the Tote Road from km 84.6 to 85.2. Five subpopulations were found growing along and up to 50 m from the road totalling approximately 750 to 800 plants. The habitat was open, dominated sandy, and sparsely to moderately covered by native vegetation. All Horned dandelion plants were in flower and appeared healthy. In 2017, road widening and clearing activities in the Project footprint along the Tote Road near kilometre 84.7 removed approximately 150 to200 Horned Dandelion plants. Since then, no further changes have been observed to the footprint where Horned dandelion was found and population numbers in 2019 are similar to 2017. Location details and population numbers for Horned dandelion in the Project area are summarized in Table 4-18.

Photo 4-8 Horned dandelion.
A previously reported "May Be At Risk" plant species in Nunavut was found during other vegetation surveys, 2014–2019.

Table 4-18 Locations and population update of Horned dandelion, a previously reported "May Be At Risk" species found incidentally during vegetation surveys in the Project area.

Year	Name	Location Description	Habitat	Latitude	Longitude	Abundance and Distribution	Present in 2019
2014	TARACER1_2014	Edge of PDA near KM 93.5, along Tote Road, sea can storage area	Sandy, exposed slope and small drainage leading down to delta	71.32708	-79.45897	25 scattered flowering plants in close vicinity	Yes
2014	TARACER2_2014	Near KM 98, along Tote Road	Sandy, exposed soil bank	71.33159	-82.59750	6 scattered flowering plants in close vicinity	Yes
2016	TARACER1_2016	South edge of PDA near KM 84.6, along Tote Road	Sandy, exposed soil near stream	71.37605	-79.70719	13 flowering plants in close vicinity	Yes
2016	TARACER2_2016	North edge of PDA near KM 84.6, along Tote Road	Sandy, exposed soil near stream	71.37662	-79.70661	65 flowering and vegetative plants scattered along slope of tributary	Yes
2016	TARACER3_2016	North edge of PDA and on plateau above slope near KM 84.7, along Tote Road	Sandy, exposed plateau	71.37643	-79.70499	96 flowering and vegetative plants scattered on sandy plateau	Yes
2016	TARACER4_2016	South edge of PDA near KM 84.7, along Tote Road	Sandy, exposed slope	71.3761	-79.70442	150 flowering and vegetative plants scattered along edge of Tote Road	No
2016	TARACER5_2016	South edge of PDA from approximately KM 85.1 to 85.2, along Tote Road	Sandy, exposed slope above lake	71.37571	-79.69231	420 flowering and vegetative plants scattered along edge of Tote Road	Yes

4.4 INTER-ANNUAL TRENDS

Inter-annual trends were assessed for the vegetation abundance monitoring program only. The vegetation and soil base metals monitoring and exotic invasive vegetation monitoring programs require one more year of data collection to assess initial trends among years.

Annual variation in vegetation abundance was observed in the Project area; however, there is no evidence of changes in percent plant cover and plant group composition because of a Project-related effect. The trends analysis for vegetation abundance monitoring is summarized below:

- Annual differences in total ground cover have been consistent across all distance classes indicating that changes in ground cover were due to natural variation in plant cover.
- A detailed examination of changes in ground cover for the major plant groups found annual differences in cover; however, differences for ground litter, evergreen shrubs, and lichen were consistent across distance classes indicating that changes in ground cover were due to natural variation in plant cover.
- Annual differences in total canopy cover and a weak interaction between year and distance class were observed; however, trends did not indicate a Project-related effect. Only some distance classes followed the overall trend demonstrating that differences were likely due to natural variation in plant cover.
- A detailed examination of changes in canopy cover for the major plant groups found annual differences in cover; however, differences for standing dead litter (including graminoids) were consistent across all distance classes indicating that changes were due to natural variation in plant cover.

In conclusion, annual variation in vegetation abundance occurred in RSA. Annual variation in percent plant cover and plant group composition was consistent across all distance classes; a weak inconsistent interaction between year and distance class was observed, which is likely due to natural variation in plant cover, and not a Project-related effect.

4.5 VEGETATION SUMMARY

- As part of the vegetation abundance monitoring program, a trends analysis was conducted in 2019 and marked the third year that data were analyzed among years using a full sample size for 2017, 2018 and 2019 and partial sample size for 2014 and 2016.
- To date, while annual variation in vegetation abundance in the RSA has been observed, there was no evidence of changes in vegetation abundance because of a Project-related effect.
- In response to comments at the TEWG meeting on February 26, 2019, Baffinland will consider alternative methods to analyze vegetation abundance data in 2020.
- A soils assessment was completed in 2019 as part of the vegetation abundance monitoring program in response to ECCC technical review comment #3 on the 2018 Mary River Project Terrestrial Environment Annual Monitoring Report. The recommendation was to consider plant

cover and composition with soil moisture measurements to determine if there is a difference between near sites (i.e., 30 and 100 m) and reference sites (≥20 km).

- The soils assessment determined no systematic relationship existed between soil moisture and distance class, which confirms that the study design for the vegetation abundance monitoring program is robust and defensible to monitor vegetation in the Project area.
- Vegetation and soil base metals monitoring was conducted in 2019 following the revised study design implemented in 2016. Results from 2019 marked the first year that metal concentrations in soil and lichen were analyzed with distance to the PDA between the 'Before' period (i.e., baseline sampling) and the 'After' period (i.e., post-baseline sampling).
- Post-baseline monitoring for metal concentrations in soil found that all soil samples were below CCME soil quality guidelines except one sample near the Mine Site for copper where a field sampling error is suspected.
- Post-baseline monitoring for metal concentrations in lichen found an increase of some metal concentrations in lichen at Near sites and a few increases at Far sites along the Tote Road. All lichen samples were below indicator values for all metals except for lead, which was within the range of the indicator value.
- Differences in dust-deposited metals on lichen (unwashed samples) relative to metals in lichen tissues (washed sampled) were assessed in 2019 to capture the full extent of metals that may contribute to lichen toxicity. Concentrations of dust-deposited metals on lichen compared to metals in lichen tissues did not differ among Project areas for any of the CoPCs. One exception was copper near the Tote Road and Mine Site, which suggests that some of the copper in lichen samples may be attributed to dust-deposited copper on lichen surfaces rather than solely in lichen tissues.
- The pathway for increased metal concentrations in lichen is likely attributed to dustfall generated by road dust from vehicle traffic on the Tote Road. Effects on vegetation health were not yet observed, and metal concentrations in lichen remain either below or within the range of the indicator value. Adaptive management strategies, such as dust suppression may control future increases of metal concentrations in lichen Refer to Section 3.2.1.3 for dust suppression mitigations in 2019 such as the application of Dust Stop®.
- The relationship between metal concentrations in dustfall deposition and metal concentrations in soil and lichen was explored in 2019 to better understand the results of the main analyses for the vegetation and soil base metals monitoring program and to initiate comparisons between the dustfall and metals monitoring programs. Results determined that soil pH plays a mediating role in the relationship of some metal concentrations in dustfall deposition and soil, while other metals were less understood and may be influenced by interactions with other soil chemistry variables, sample size, and/or soil sampling depth. Lichen remains a sensitive indicator of metal exposure where higher metals concentrations in dustfall deposition corresponded to higher metal concentrations in lichen.
- Exotic invasive vegetation monitoring was conducted in 2019 and marked the second survey of exotic invasive vegetation for the Project.

- One exotic species was found in the Project footprint during surveys: garden tomato (*Solanum lycopersium*) was found at the Mine Site growing below the sewage/effluent discharge pipe.
- Natural revegetation of disturbed sites in the Project footprint was assessed during exotic invasive vegetation monitoring by comparing the relative diversity and abundance of colonizing plant species among focal areas.
- Evidence of natural revegetation was observed in the Project footprint. Although low in abundance, the diversity of revegetating flora was relatively high at Milne Inlet, moderate at the Mine Site, and low along Tote Road.
- Some previously reported rare plants have been found in the study area and it is possible that more will be found as vegetation surveys continue in the Project area. Known populations will continue to be monitored in the Project area and newly discovered populations will be documented as they are found on an opportunistic basis. Changes to known populations of Horned dandelion in the Project area include a loss of approximately 150 to 200 plants due to road widening activities in 2017. No other evidence suggests that the Mary River Project is affecting the population of these plants.

5 MAMMALS

The 2019 monitoring for mammals included several surveys designed to enhance baseline data and monitor the effects of Project-related activities on caribou. Specific surveys included:

- snow track surveys;
- snow bank height monitoring;
- Height of Land caribou surveys; and
- incidental observations and wildlife log.

5.1 SNOW TRACK SURVEYS

During the review of both the original FEIS (Baffinland Iron Mines Corporation 2012) and the ERP FEIS Addendum (Baffinland Iron Mines Corporation 2013), the QIA and other reviewers expressed concerns that Project-related activities would have a negative effect on caribou movement patterns. Specific concerns included human infrastructure as well as human presence deterring, constraining, or altering the natural movement of wildlife with concern for caribou. Concerns that caribou would potentially avoid crossing linear features due to train or vehicle presence and the potential for constraining wildlife movement across roadways resulted in the establishment of the following terms and conditions for the Project:

- Project Condition #54dii) *"The Proponent shall provide an updated Terrestrial Environmental Management and Monitoring Plan which shall include…Snow track surveys during construction and the use of video–surveillance to improve the predictability of caribou exposure to the railway and Tote Road. Using the result of this information, an early warning system for caribou on the railway and Tote Road shall be developed for operation."*
- Project Condition #58f) *"Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes… Any updates to information regarding caribou migration trails. Maps of caribou migration trails, primarily obtained through any new collar and snow tracking data, shall be updated (at least annually) in consultation with the Qikiqtani Inuit Association and affected communities, and shall be circulated as new information becomes available."*

Snow track surveys were conducted in April, May, and November 2019 to study the movement of caribou and other wildlife in relation to the road and document behavioural reactions to human activities near the Project footprint.

5.1.1 METHODS

The snow track surveys took place on April 23, May 3, and November 6, 2019, and were conducted by two or three Baffinland employees. The purpose of the snow track surveys was to collect data on caribou response to Project-related activities based on patterns of movement observed by their tracks. The survey was conducted by light truck, with one Baffinland employee driving and one or two observers. The surveyors drove slowly (30 km/hr) along the Tote Road from Mary River to Milne Inlet, looking for tracks from the vehicle. When wildlife tracks were observed, surveyors would get out of the truck to confirm the species and then follow the tracks towards and away from the road to observe behaviour, habitat use and possible divergence of travel paths, where possible. When tracks were near or crossed the Tote Road, surveyors would record the following information:

- latitude and longitude at the point where the tracks crossed the road;
- species that produced the tracks;
- number of sets of tracks counted (i.e. group size);
- a designation describing travel in relation to the road (e.g., deflected, travelled along, or crossing the Tote Road);
- height of the snow bank measured at either the crossing point or likely point of deflection (i.e., the point where the animal redirected its path away from the road); and,
- photos and additional information, if relevant.

5.1.2 RESULTS AND DISCUSSION

Surveyors observed 22 distinct Arctic fox (*Vulpes lagopus*) crossings during the April survey, most of which were fresh, individual tracks. Tracks often followed either side of the road before crossing, and only one potential deflection was noted. Six sets of ptarmigan (*Lagopus* spp.) tracks were also recorded; however, no signs of caribou or other mammal tracks were observed. The April survey was completed 12 hours after a fresh snow fall with excellent visibility for the duration of the survey and consistent snow cover along the Tote Road. Wind speeds recorded at Mary River and Milne Inlet during April were considered typical for the area and ranged between 0 to 15.5 m/s and 0 to 10 m/s, respectively, which likely re-distributed the snow shortly after the snow fall event, resulting in a light dusting of fresh/windswept snow. No reliable system for measuring winter precipitation at Mary River currently exists, so information on snow conditions prior to the survey is based on observations from on-site staff.

During the May survey, 14 Arctic fox and two Arctic hare (*Lepus arcticus*) crossings were observed; however, only two sets of tracks were considered fresh. All tracks were either crossing or paralleling the Tote Road; no deflections were noted. Though visibility was good throughout the survey, tracking conditions were considered poor, as it had been approximately five days since the last snow fall and snow cover along the Tote Road was rapidly diminishing due to the onset of seasonal thaw. Wind speeds at Mary River and Milne Inlet in May were similar to April. No signs of caribou or other mammal tracks were observed.

Although snow track surveys are normally conducted in late winter due to adequate snowfall and availability of daylight, fresh snow in early November allowed for an additional opportunistic snow track survey. During the November survey, observers detected 22 sets of fox tracks, several Arctic hare tracks, three ermine (*Mustela erminea*) tracks, and two ptarmigan tracks. Thirteen of the fox tracks were considered fresh, along with two ermine tracks, one ptarmigan track, and one Arctic hare track. Only one Arctic fox and one Arctic hare track deflected from Tote Road; all other tracks either crossed, followed, or meandered near the road. The November survey was completed approximately 36 hours after the snow fall, and tracking conditions were good throughout the survey. Wind speeds recorded at Milne Inlet in the 36 hours leading up to the survey ranged from 0 to 5 m/s, thus limiting the potential for snow re-distribution. No caribou or other mammal tracks were observed.

Typical site conditions and examples of observed tracks during the April and May surveys are displayed in Photo 5-1, Photo 5-2, Photo 5-3 and Photo 5-4.

Snow track surveys will continue annually and will occur more often by on-site staff once caribou are observed near site on a consistent and regular basis (e.g., based on trends observed from the Height of Land monitoring data, incidental monitoring data, or on observations of local harvesters and as reported to Baffinland and the TEWG).

Photo 5-1 Fresh Arctic fox tracks observed crossing the Tote Road at km 76 with no deflection, April 23, 2019.

Photo 5-2 Fresh Arctic fox tracks observed travelling along the Tote Road near km 27, April 23, 2019.

Photo 5-3 Example of old Arctic fox tracks paralleling the Tote Road and deteriorating spring snow conditions near km 13, May 3, 2019.

Photo 5-4 Old Arctic fox tracks observed along the Tote Road near km 33, May 3, 2019.

5.2 SNOW BANK HEIGHT MONITORING

In conjunction with the snow track survey (Section 5.1), the following Project conditions were issued to address uncertainty in the FEIS (Baffinland Iron Mines Corporation 2012) and ERP FEIS (Baffinland Iron Mines Corporation 2013) with respect to caribou movement:

- Project Condition #53ai) *"Specific measures intended to address the reduced effectiveness of visual protocols for the Milne Inlet Tote Road and access roads/trails during times of darkness and low visibility must be included."*
- Project Condition #53c) *"The Proponent shall demonstrate consideration for…Evaluation of the effectiveness of proposed caribou crossing over the railway, Milne Inlet Tote Road and access roads as well as the appropriate number."*

To address these conditions, Baffinland committed to various mitigation measures allowing for effective caribou crossings of the Tote Road. Mitigation measures were developed to reduce the likelihood of a barrier effect on caribou movement, which involves snow bank management and maintaining the snow bank heights at no more than 100 centimetres (cm) along roadways as well as smoothing the snow banks on the edges of roadways to reduce the probability of drifting snow. These mitigations would make it possible for wildlife, specifically caribou, to cross the transportation corridor without being blocked by steep snow banks, as well as allowing greater visibility for drivers to help reduce wildlife-vehicle collisions.

5.2.1 METHODS

The 2019 snow bank height monitoring was conducted monthly from November 2018 to April 2019 (six surveys total), representing an increase from previous years. Prior to January 2018, only one snow bank height monitoring survey was conducted during the winter period. Monitoring was conducted by Baffinland staff who drove along the Tote Road and stopped at the same km markers established in previous survey years. At the established km markers, surveyors measured the height of the east and west snow banks in cm, captured photos of each snow bank, and recorded any relevant comments. Snow bank measurements were collected from the solid road surface to the top of the snow bank using survey rulers. East and west snow bank heights were measured at 45 separate km markers along the Tote Road, resulting in 90 measurements during each survey (Photo 5-5, Photo 5-6, Photo 5-7 and Photo 5-8). Snow bank heights were evaluated as compliant if they were at or below 100 cm, and non-compliant if they were above 100 cm.

5.2.2 RESULTS AND DISCUSSION

Snow bank height monitoring was conducted monthly from November 2018 to April 2019 by on-site staff. Each monthly survey was completed in one day. Measurements across all surveys ranged from 0 to over 200 cm. Monthly compliance to the 100 cm height limit ranged from 93% to 100%, with overall compliance of 97% for all surveys combined (Table 5-1). It was noted during several of the surveys that many of the snow banks were feathered out to reduce drifting (Photo 5-7). Mean snow bank height between all months for most km markers along the Tote Road was typically below 60 cm; however, some areas had higher mean snow bank heights. This was likely due to steep topography or winding sections of road constraining snow bank maintenance, especially after large snow events (Figure 5-1 and Figure 5-2). For example, the east side of km 66 had a mean snow bank height of 110 cm, likely due to steep topography on the east side of the road leaving very little room to push snow back on that side (Figure 5-1).

Table 5-1 Summary of snow bank height monitoring survey results for 2018/2019.

Survey Date	Number of Measurements Taken	Compliances	Exceedances	Percent Compliance
November 3, 2018	90	90	0	100%
December 25, 2018	90	86	4	95%
January 14, 2019	90	87	3	97%
February 4, 2019	90	89	1	99%
March 5, 2019	90	88	2	98%
April 22, 2019	90	84	6	93%
2018/2019 Total	**540**	**524**	**16**	**97%**

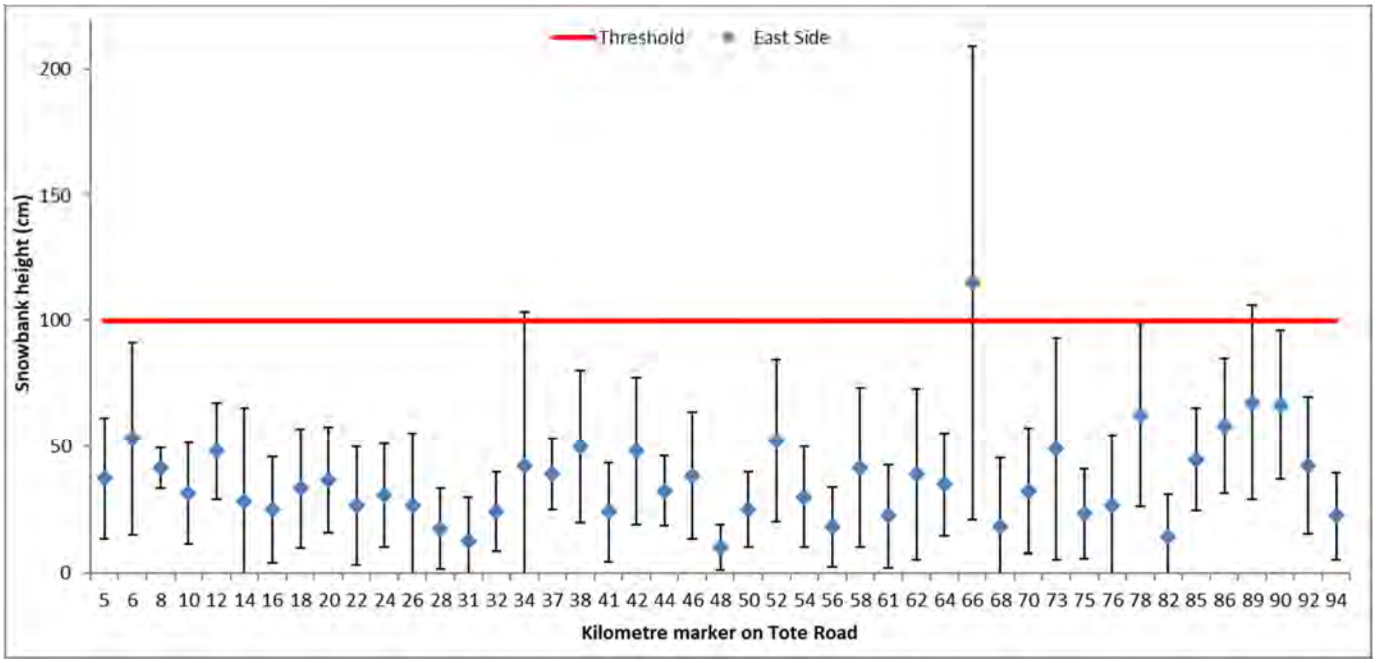


Figure 5-1 Mean snow bank height for select km markers on the east side of the Tote Road, measured monthly from November 2018 to April 2019. Error bars are ±1 standard deviation.

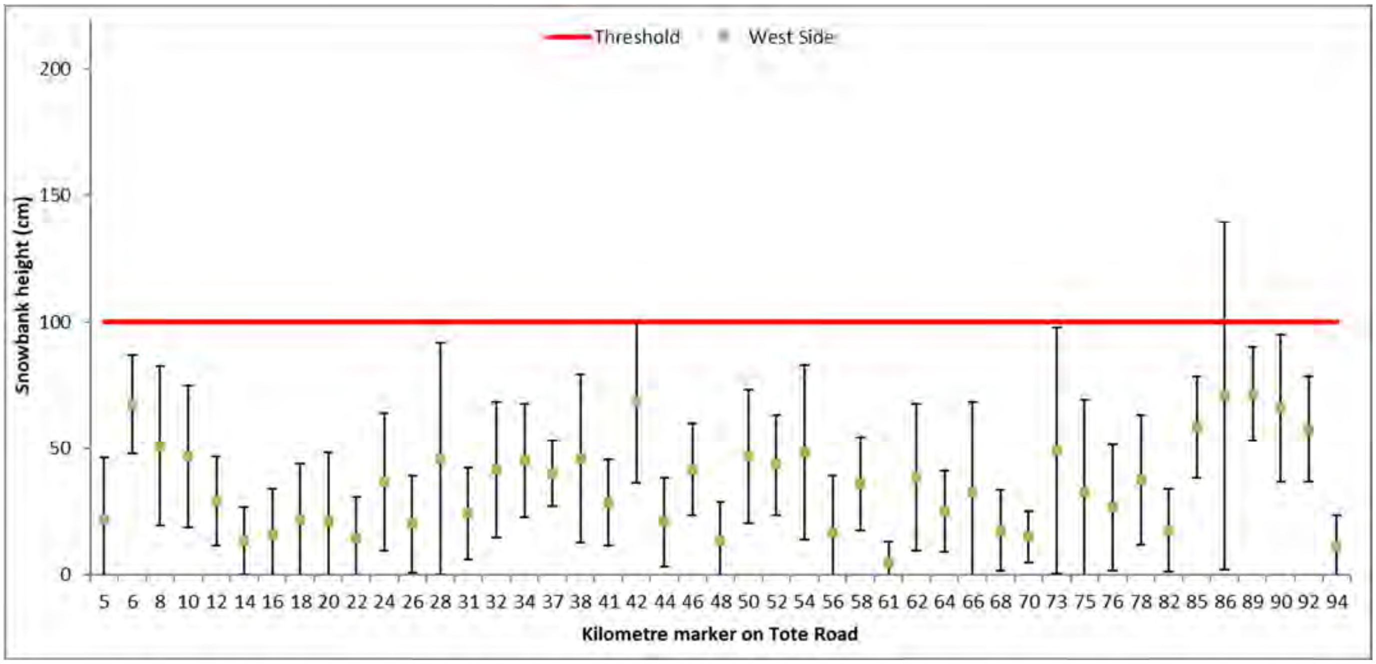


Figure 5-2 Mean snow bank height for select km markers on the west side of the Tote Road, measured monthly from November 2018 to April 2019. Error bars are ±1 standard deviation.

Photo 5-5 Snow bank heights measured from the road surface up to the top of the bank on both the east and west banks at set locations (km 06), November 3, 2018.

Photo 5-6 Snow bank heights measured from the road surface up to the top of the bank on both the east and west banks at set locations (km 89), November 3, 2018.

Photo 5-7 Example of snow bank management on side of Tote Road near km 15 to make sure they do not exceed the maximum snow bank height, December 25, 2018.

Photo 5-8 Example of typical snow bank conditions at km 82 on the Tote Road, December 25, 2018.

5.3 HEIGHT OF LAND SURVEYS

The NIRB and QIA expressed concern for Project-related infrastructure and activities disturbing caribou, particularly during sensitive periods (i.e., calving), with the potential to disrupt presence, movement, and behavior. This led to the development of the following terms and conditions for the Project:

- Project Condition #53b) "*Monitoring and mitigation measures at points where the railway, roads, trails, and flight paths pass through caribou calving areas, particularly during caribou calving times.*"
- Project Condition #54b) "*Monitoring for caribou presence and behavior during railway and Tote Road construction*"
- Project Condition #58b) "*A detailed analysis of wildlife responses to operations with emphasis on calving and post-calving caribou behaviour and displacements (if any), and caribou responses to and crossing of the railway, the Milne Inlet Tote Road and associated access roads/trails.*"

To address the Project conditions, Height of Land (HOL) surveys were initiated in 2013 to study caribou habitat use and behavioural reactions to human activities near the Project footprint, especially during the calving season (i.e., during May/June). The focus of the HOL surveys is to examine how or if caribou, especially cows with calves, respond to Project-related activities and infrastructure. The HOL surveys allow for long-term monitoring and observation of caribou behaviour throughout the life of the Project, providing information to verify predicted Project-related effects on caribou movement and habitat use. Behaviour sampling has been found to provide insight into responses to environmental stimuli (Martin and Bateson 1993).

5.3.1 METHODS

The HOL surveys use a basic survey technique that involves observing an area from a high point of land (to increase the amount of observable area) for a prescribed amount of time, and using binoculars and/or a spotting scope to detect and record caribou and their proximity to Project infrastructure. The 2019 HOL surveys were conducted in late May/early June 2019 to observe caribou during the calving period; opportunistic late winter surveys were not conducted in 2019. Surveys included two to four observers travelling within the Project footprint, stopping at predetermined HOL stations along the way and scanning the landscape for approximately 20 minutes. Surveyors included one EDI biologist, one Inuit field assistant from Pond Inlet, and one or two Baffinland staff.

In response to reviewer comments about increasing HOL survey effort, all twenty-four HOL stations were visited twice in 2019; some were visited three times. The HOL stations were established at the highest point possible, although a 360-degree view was rarely achievable. Project components (e.g., the Tote Road, accommodation complexes, Deposit No. 1) were visible from each station. Stations were chosen based on their location along the Tote Road, gain in height (e.g., improved view), and accessibility in spring conditions. Stations 1 to 16 are generally accessible by foot under good conditions, and Stations 17 to 24 would be inaccessible if not for helicopter support due to waterbodies and long travel time by foot. At each station, the following information was recorded:

- station number;
- location description (direction from road, aspect, terrain, other identifying features);
- general habitat description (vegetation and soil);
- photograph numbers (taken in multiple directions);
- observation start and end time; and
- snow cover on landscape.

Observations were made with one spotting scope and one to three sets of binoculars (Photo 5-9, Photo 5-10, Photo 5-11 and Photo 5-12). Generally, observations were made continuously for 20 to 41 minutes by scanning the viewable landscape. If caribou were observed, the crew would begin monitoring behaviour following protocols established and described in the 2013 AMR (EDI Environmental Dynamics Inc. 2014). Observations would be made as either a focal or scan sample (depending on the number of caribou; Martin and Bateson 1993), and were recorded on field data sheets. For scan sampling, activity categories (e.g., walking, foraging, running, lying) would be assigned and tallied every two minutes. For the focal sample, activity observations would be recorded every two minutes; however, certain events (e.g., a truck passing by) would also be recorded to document any unique response. The individual's or group's distance to Project infrastructure and directional movement would also be recorded when possible. Distance from the observers would either be estimated by sight or by using a GPS.

In 2016, viewshed mapping was completed to demonstrate how far and to what extent surveyors could actively observe while conducting HOL surveys (EDI Environmental Dynamics Inc. 2017). The viewshed was modelled to determine the amount of viewable area while conducting HOL surveys. A total of 227 km² were surveyed within the viewshed area, survey coverage ranging from 5 km² to 22 km² from each HOL station (Map 6). For more details on the viewshed mapping methodology, see Section 4.3.1 in the 2016 AMR (EDI Environmental Dynamics Inc. 2017).

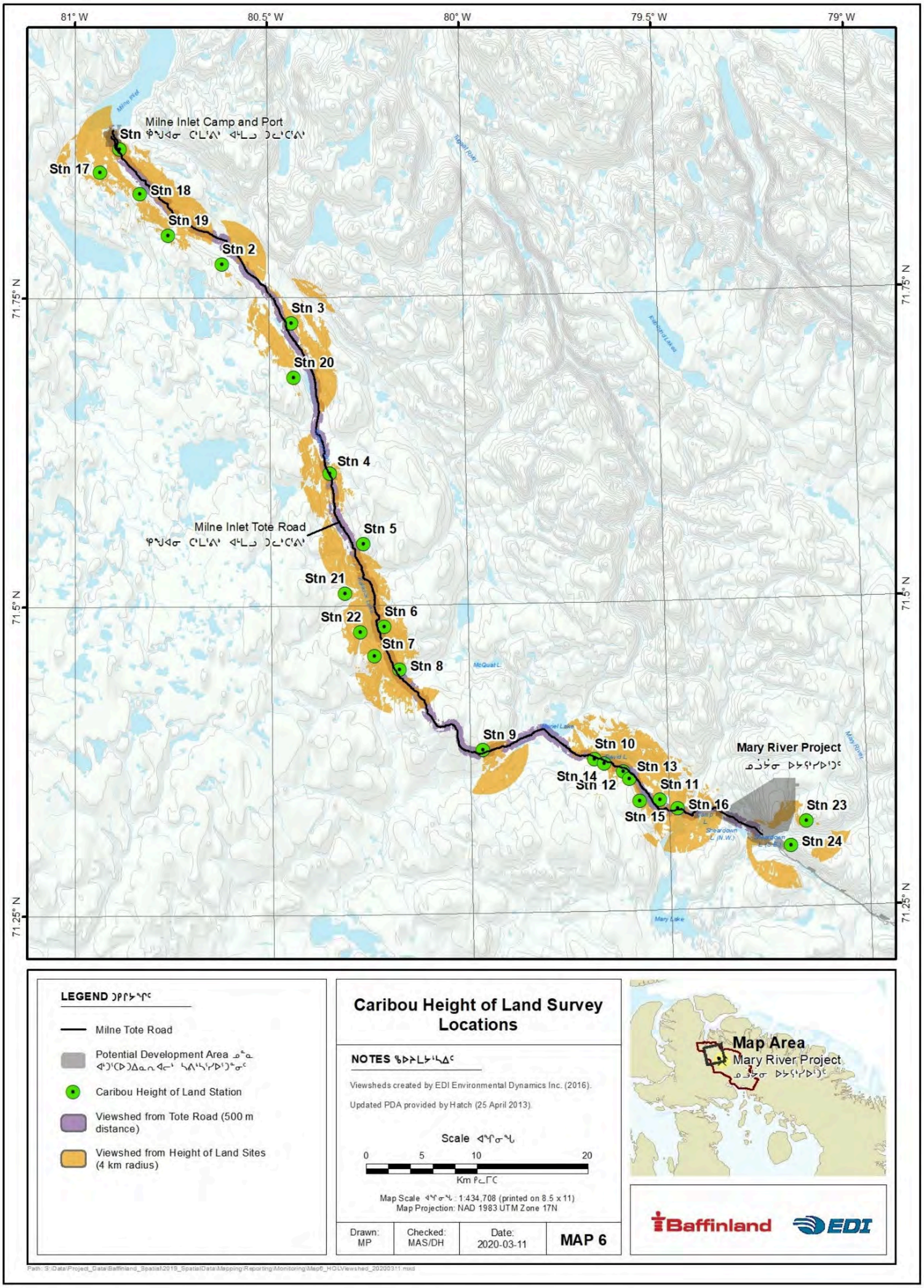
During the June 2019 TEWG meeting, MHTO suggested that observation station locations be re-evaluated to incorporate historic migration and calving patterns, and any new information relevant to HOL goals and methodologies. Consultation on HOL program design will be considered as part of future TEWG meetings and subsequently considered for implementation in 2021.

Photo 5-9 Height of Land surveys conducted in late May/early June, during peak calving season, were accessed by helicopter or hiking from the Tote Road; Station 18, May 30, 2019.

Photo 5-10 Height of Land surveys conducted in late May/early June, during peak calving season, were accessed by helicopter or hiking from the Tote Road; Station 07, June 8, 2019.

Photo 5-11 Height of Land surveys conducted in late May/early June, during peak calving season, were conducted using binoculars and a spotting scope; Station 23, June 8, 2019.

Photo 5-12 View of the Tote Road from Height of Land Station 18, which was accessed by helicopter, May 30, 2019.


81° W
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Milne Inlet Camp and Port ᕿᑭᖅᑕᓂ ᑕᒫᕐᕕᒃ ᐊᒻᒪᓗ ᑐᓚᑦᑕᕝᕕᒃ
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Mary River Project
Stn 1
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McQuat L.
Sheardown L. (N.W.)
Mary Lake
LEGEND ᑐᑭᓯᔾᔪᑏᑦ
Milne Tote Road
Potential Development Area
Caribou Height of Land Station
Viewshed from Tote Road (500 m distance)
Viewshed from Height of Land Sites (4 km radius)
Caribou Height of Land Survey Locations
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Viewsheds created by EDI Environmental Dynamics Inc. (2016).
Updated PDA provided by Hatch (25 April 2013).
Scale
0
5
10
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Km
Map Scale : 1:434,708 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N
Drawn: MP
Checked: MAS/DH
Date: 2020-03-11
MAP 6
Map Area
Mary River Project
Baffinland
EDI
Path: S:\Data\Project_Data\Baffinland_Spatial\2019_SpatialData\Mapping\Reporting\Monitoring\Map6_HOLViewshed_20200311.mxd

5.3.2 RESULTS AND DISCUSSION

No caribou were observed during HOL surveys in 2019. A total of 24 hours and 20 minutes of HOL surveys were conducted, with all surveys completed in late May/early June, during peak calving season (Table 5-2). All twenty-four HOL stations were visited at least twice and two stations were visited three times during the 2019 site visit. In 2019, stations 2, 7, 15, and 17 to 24 were accessed by helicopter, and the remainder of the stations were accessed by foot.

Weather conditions during the HOL surveys ranged from excellent, clear viewing conditions to poor, overcast or rainy conditions with wind. Temperatures during the surveys ranged from 2 to 8°C, snow was still present with 10 to 50% cover. Snow cover was enough to allow for observation of tracks in the snow for most areas, however, no caribou tracks or fresh signs of caribou were observed during surveys or on route to survey stations. Survey times at each station ranged from 20 to 41 minutes in duration, with observation times typically exceeding 20 minutes if observers were attempting to distinguish an unidentifiable object on the landscape (e.g., a suspected animal).

Table 5-2 Summary details of Height of Land surveys conducted for the Mary River Project in 2019.

Method of Transportation to HOL Station	Dates of Observation	Number of Observers per Survey	Survey Effort (hh:mm)
Helicopter; Truck and hiking from Tote Road	May 30; June 01, 02, 03, 05, 06, 07, 08, 09, 10	1–4	24:20
Total	**10 Days**		**24:20**

5.3.2.1 Inuit Qaujimajatuqangit

During the 2019 HOL surveys, the following subset of information (i.e., knowledge derived from the experience of the survey assistant), was used (with permission) to supplement training material for Baffinland staff members who assisted with the surveys:

Caribou behavior:

- When windy, male caribou sometimes go down into valleys to hide from wind, but pregnant females usually stay on top of hills because they do not want to walk up and down as much.
- In the morning, caribou are more active and can be seen walking around and feeding, whereas around noon they are often seen sitting and resting.

How to look for caribou on the North Baffin landscape:

- From a distance, caribou look white like Snow Geese at this time of year with a bit of brown on top. When seen against the snow, they look light brown, and when seen against the land they tend to look whiter.

- Calves are born brown and can be seen running around. In spring, caribou split apart into individuals or small groups; in fall/winter, they tend to gather in groups of 30 to 40.
- Look for caribou on gentler rolling slopes as opposed to steeper rockier slopes. Look on top of slopes, and on slopes with more vegetation and less rocks, as they contain more food resources.

5.4 INCIDENTAL OBSERVATIONS

Site personnel are asked to record wildlife sightings in the camps' wildlife logs — at both Sailiivik Camp and at Milne Port Camp. These logs provide an indication of the wildlife species that occur in proximity to Project infrastructure or areas where exploration or monitoring may be occurring.

Wildlife species recorded in the camp wildlife logs in 2019 are summarized in Table 5-3. A total of 52 caribou observations were reported in 2019, most of which were outside the PDA. Most of the caribou were observed in sampling and exploration areas south of Mary River; however, a group of four caribou was observed west of the Tote Road at km 13, approximately 1 km west of the road on the other side of Phillips Creek. These caribou were grazing and did not show signs of disturbance. The number of caribou observations recorded in 2019 are higher than previous years, which could be due to improvements in wildlife documentation on site, or could signify an increase in caribou in the area. However, regional population estimates conducted by the Government of Nunavut remain low (Ringrose 2018), so a perceived increase in caribou near the PDA may simply be attributable to yearly variation.

A wolf (*Canis lupus*) and two pups were observed on two consecutive days in July 2019 near km 42; however, these observations were not confirmed by the on-site Environment Department. A set of tracks, likely from a juvenile wolf, were also observed at the landfill in June by on-site staff (Photo 5-13). Two wolves were observed November 7 on a hill near the Mine Site. Incidental wolf observations have remained low throughout monitoring years; a maximum of four wolf observations were recorded in 2015; other years ranged from zero to three observations, typically of single wolves.

Several birds were also recorded on the wildlife logs including Tundra Swan (*Cygnus columbianus*), Common Eider (*Somateria mollissima*), Long-tailed Duck (*Clangula hyemalis*), Common Loon (*Gavia immer*), Yellow-Billed Loon (*Gavia adamsii*), Red-Throated Loon (*Gavia stellata*), Northern Shoveler (*Anas clypeata*), Common Raven (*Corvus corax*), Snow Bunting (*Plectrophenax nivalis*), American Pipit (*Anthus rubescens*), Lapland Longspur (*Calcarius lapponicus*), Semipalmated Plover (*Charadrius semipalmatus*), Sandhill Crane (*Grus canadensis*), Canada/Cackling geese (*Branta hutchinsii, B. canadensis*), Snow Geese (*Chen caerulescens*), gulls, ptarmigan, Rough-legged Hawk (*Buteo lagopus*), Snowy Owl (*Bubo scandiacus*) and Peregrine Falcon (*Falco peregrinus tundrius*).

Table 5-3 Wildlife species observations recorded in the 2019 Mary River and Milne Port camps wildlife logs.

Common Name	Scientific Name	Number of Observations			
		Mary River Camp	Tote Road	Milne Inlet	Outside PDA[1]
Arctic hare	*Lepus arcticus*	20	4	6	–
Arctic fox	*Vulpes lagopus*	120	17	118	1
Colllared lemming	*Dicrostonyx groenlandicus*	–	2	1	–
Ermine	*Mustela erminea*	–	1	–	–
Caribou	*Rangifer tarandus groenlandicus*	–	4[2]	–	48
Caribou (tracks)	*Rangifer tarandus groenlandicus*	–	–	–	–
Wolf	*Canis lupus*	2[3]	6[4]	–	–
Wolf (tracks)	*Canis lupus*	1[5]	–	–	–
Narwhal	*Monodon monoceros*	–	–	8	–
Ringed seal	*Pusa hispida*	–	–	20	–
Polar bear	*Ursus maritimus*	1	1[6]		5
Walrus	*Odobenus rosmarus*	–	–	–	23[7]
Beluga whale	*Delphinapterus leucas*	–	–	–	1[8]

[1] Wildlife sightings in areas outside the PDA.

[2] West of the Tote Road at km 13, on the other side of Phillips Creek. Technically outside PDA, but included within Tote Road observations.

[3] Two wolves observed on a hill near the Mine Site on November 7.

[4] Wolf with two pups spotted on both July 22 and 23 at km 42; observation not confirmed by Environment Department.

[5] Wolf tracks (likely a juvenile) seen at landfill in early June.

[6] Polar bear cub spotted walking away from Tote Road at km 36; tracks not confirmed by Environment Department.

[7] Walruses were observed on multiple occasions in July and August at Grant-Suttie Bay, Steensby Camp, and the mouth of Rowley River.

[8] One beluga whale was observed on August 31 at the mouth of Rowley River.

Photo 5-13 Juvenile wolf tracks seen at the landfill in early June.

5.5 HUNTERS AND VISITORS LOG

Baffinland monitors the presence of land users in the Project area by maintaining a log of visitors to site, with notation for those travelling through and hunting within the RSA. However, there is no certainty of a complete data set, as it is not compulsory for individuals to check in with Baffinland security unless they are stopping in and using the Baffinland facilities. A total of 936 individuals stopped and checked in at either Mary River or Milne Port camps in 2019, the majority of whom stopped at Milne Port (613 individuals in 188 groups), while 88 groups were recorded at Mary River. Group size ranged from one to 19 individuals. Visitors frequenting the area were often passing through, dog sled racing, hunting, visiting, or stopping in to pick up or service snowmobiles. Not all visitor activities were recorded. Baffinland provided food, beverages, transportation, lodging, tools, construction supplies, fuel and mechanical assistance to hunters and other visitors if requested.

5.6 INTER-ANNUAL TRENDS

In June 2013, a group of five caribou were observed in the PDA during HOL surveys; however, caribou have not been observed during surveys conducted between 2014 and 2019 (Figure 5-3). This is despite increases in survey effort over the years in response to TEWG input (i.e., increasing minimum survey time from 15 to 20 minutes, increasing number of survey stations from 16 to 24, increasing station visits from once to twice per season). Lack of caribou observations on site is consistent with low regional caribou numbers reported through Inuit Qaujimajatuqangit, received at workshops held in November 2015 and April 2016. Caribou abundance surveys conducted in 2014 by the Government of Nunavut also reported low abundance throughout Baffin Island (Pretzlaw 2016).

No caribou, wolf or other large mammal tracks were observed during snow tracking surveys conducted between 2014 and 2019; however, similar numbers of Arctic fox and Arctic hare tracks were observed throughout all survey years (Figure 5-4).

Most snow bank height measurements were in compliance with the 100 cm height limit between 2014 and 2019. Compliance of snow bank height was similar for 2014, 2015, 2016, 2018, and 2019, ranging between 80% to 97%; the 2017 survey had the lowest rate of compliance at 66% (Figure 5-5).

Substantially more visitors were recorded in 2019 than in previous years (Figure 5-6). During the first few years of monitoring (2010 to 2014), less than 100 visitors were recorded per year. The number of visitors increased moderately between 2015 and 2017, ranging from 150 to 300 visitors per year, before a substantial increase in 2018 to 539 visitors. These numbers often represent the same group(s) of visitors both leaving and returning from trips, and groups making multiple trips in year. As checking in is not mandatory, these numbers do not guarantee a complete record of all visitors.

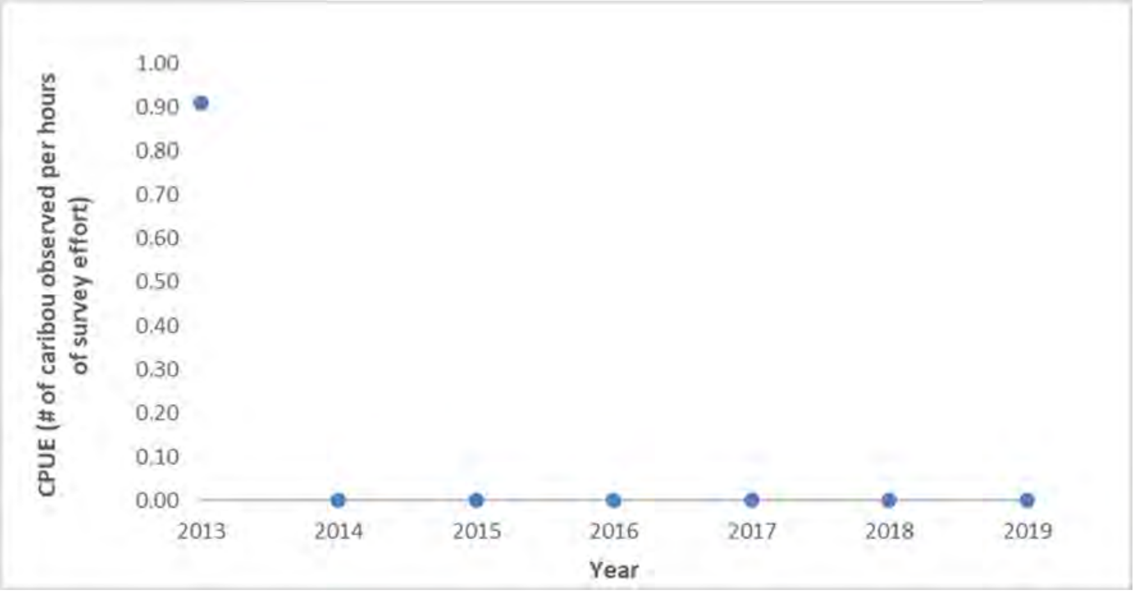


Figure 5-3 Caribou Height of Land survey trends 2013 – 2019.

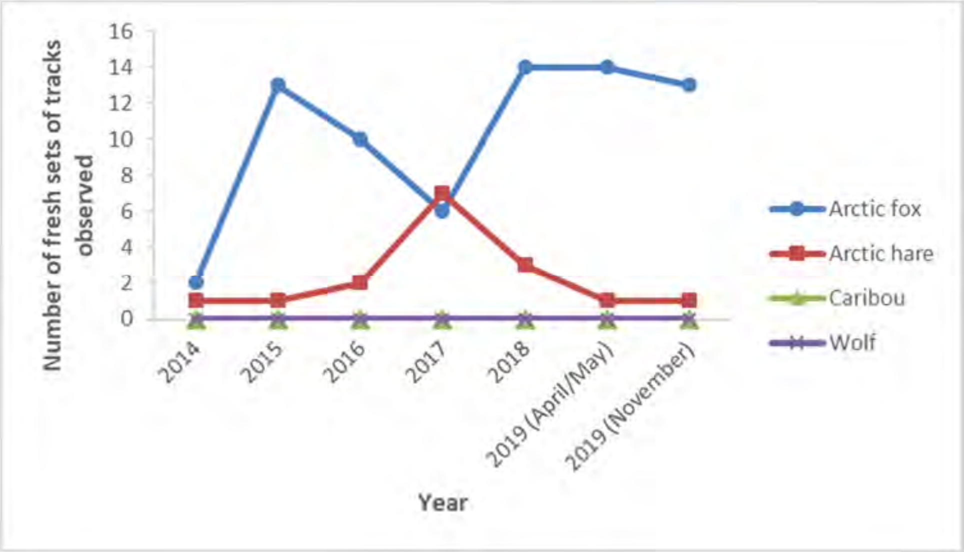


Figure 5-4 Snow track survey trends 2014 – 2019.

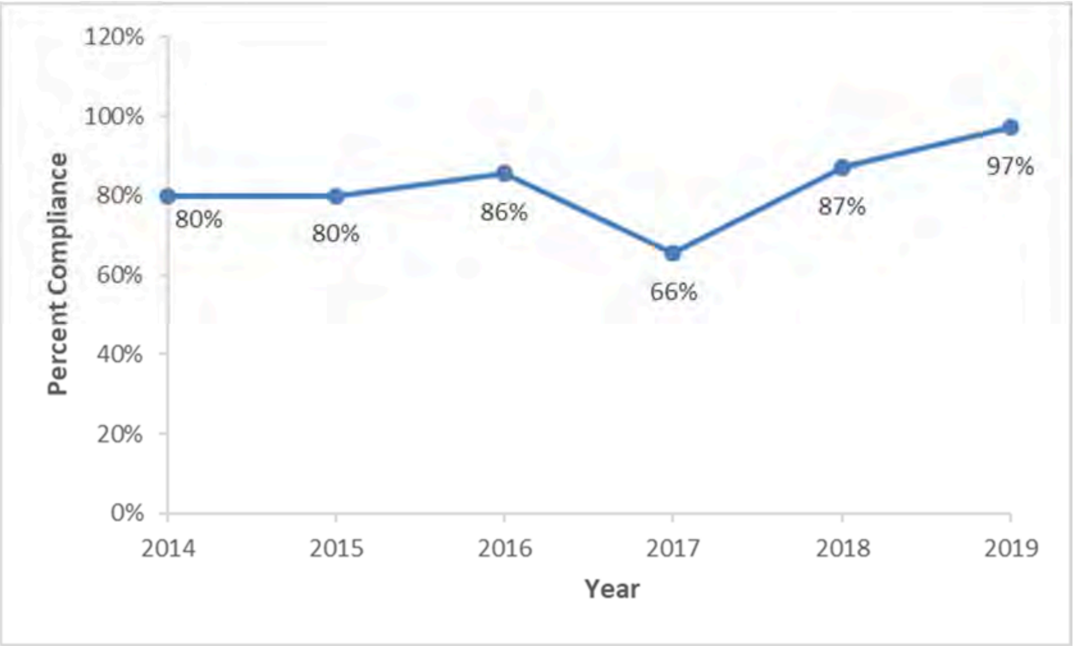


Figure 5-5 **Snow bank monitoring survey trends 2014 – 2019.**
Snow bank height monitoring was conducted once yearly from 2014 – 2017, and monthly in 2018 and 2019.

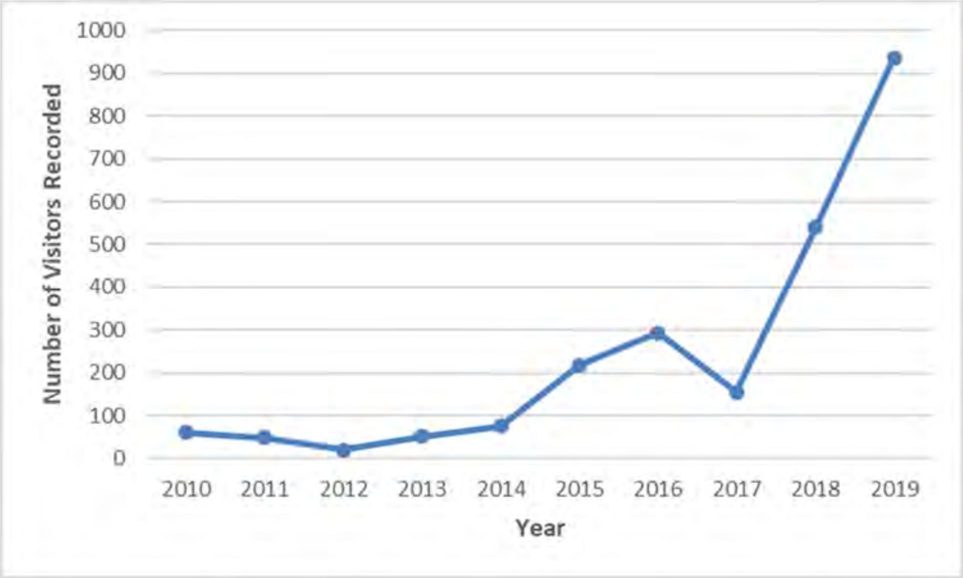


Figure 5-6 **Hunter and visitor trends 2010 – 2019.**

5.7 MAMMALS SUMMARY

- Ground-based surveys continue to be used to monitor potential wildlife interactions with the Project. These include Height of Land (HOL) surveys, snow track surveys, snow bank height surveys, and incidental sighting reports from on-site personnel.
- In June 2013, a group of five caribou were observed in the PDA during HOL surveys; however, caribou have not been observed during surveys conducted between 2014 and 2019. Lack of caribou observations on site follow the trends of low numbers recorded in regional observations and have been confirmed through collaboration with the GN, who conducts caribou aerial surveys, and through local observations received at workshops held in November 2015 and April 2016. Spring caribou surveys were conducted in the North Baffin Region by the GN in 2018.
- Low numbers of incidental observations of caribou between the Mine Site and Milne Inlet between 2013 and 2019 also coincided with the lack of caribou observations during the HOL surveys. However, higher numbers of caribou observations were recorded outside the PDA in 2019.
- No caribou, wolf or other large mammal tracks were observed during 2019 snow tracking surveys; however, Arctic fox and Arctic hare tracks were observed in similar numbers to previous surveys.
- The 2019 snow bank height monitoring was conducted monthly (six surveys) from November 2018 to April 2019. Percent compliance for these monthly surveys was 97%, which was similar to previous years, except for 2017, where compliance was only 66%.
- Height of Land, snow tracking, snow bank height surveys, and incidental observations through use of wildlife logs will continue in 2020.

6 BIRDS

The 2019 Project surveys for birds included pre-clearing nest surveys for birds when necessary, and continued monitoring and baseline data collection for cliff-nesting raptors. Specific surveys included:

- pre-clearing nest surveys for breeding birds; and,
- cliff-nesting raptor occupancy and productivity surveys.

Project Condition #74 requires that "*The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds…key indicators for follow up monitoring…will include: Peregrine Falcon, Gyrfalcon, Common and King Eider, Red Knot, seabird migration and wintering, and songbird and shorebird diversity.*" During previous years, bird surveys included several surveys for songbirds and shorebirds to meet that portion of Project Condition #74. However, analysis of the survey results from the 2012 and 2013 PRISM plots and the 2013 bird encounter transects indicated that monitoring of Project-related effects on songbirds and shorebirds was unlikely to detect an effect of disturbance due to the low number of birds present. Subsequent discussions with the TEWG and Canadian Wildlife Service (CWS) concluded that effects monitoring for tundra breeding birds could be discontinued but that Baffinland would:

- contribute to regional monitoring efforts by conducting 20 PRISM plots every five years (completed in 2018; next scheduled for 2023);
- complete coastline nesting surveys of the identified islet near the proposed Steensby Port Site prior to construction of the port;
- conduct pre-clearing nest surveys prior to any clearing of vegetation or surface disturbance during the nesting season; and
- continue with monitoring programs for cliff-nesting raptors (annual occupancy and productivity) and inland waterfowl survey when qualified biologists are available and on site (roadside waterfowl survey).

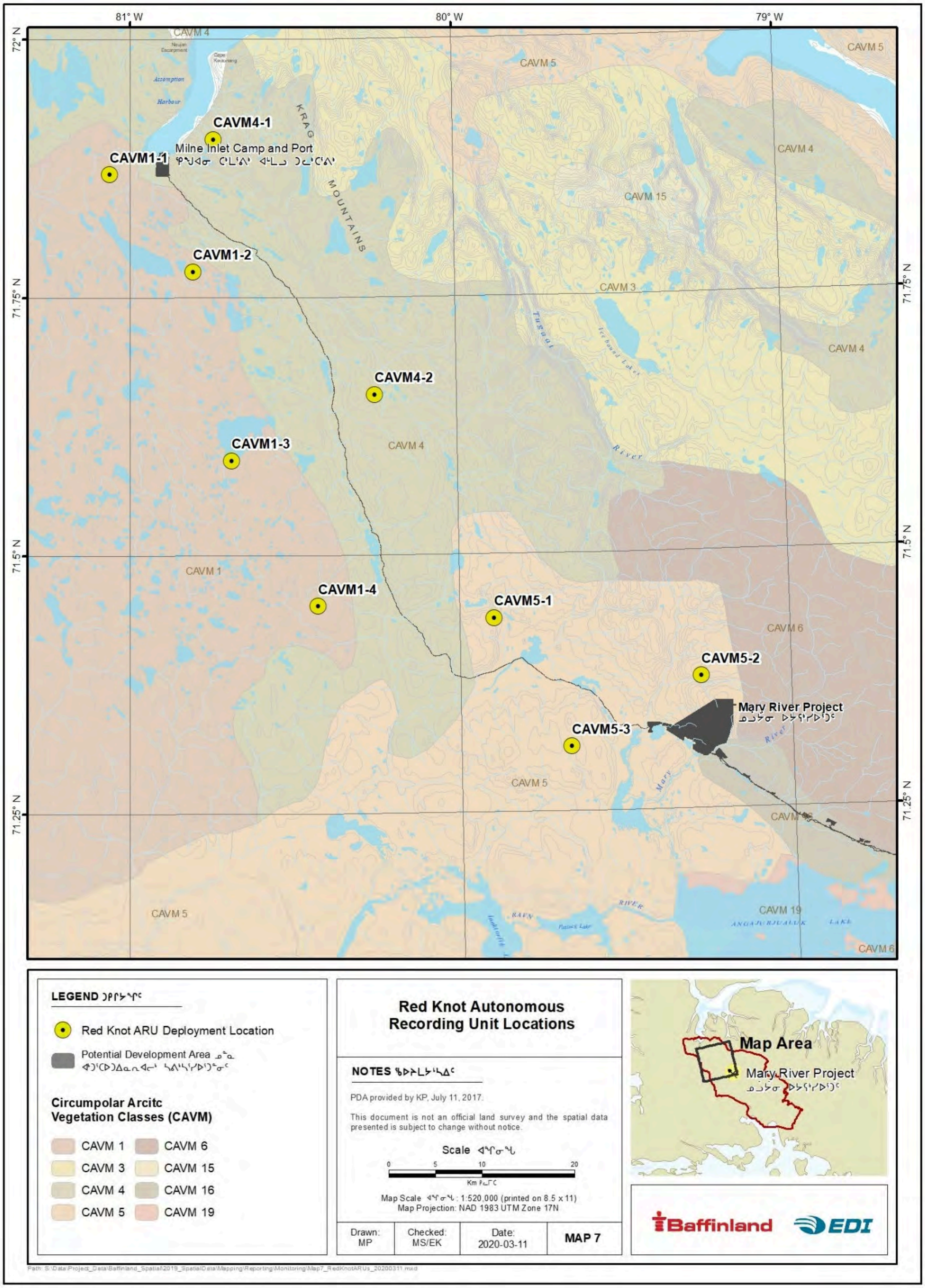
6.1 REGIONAL MONITORING IN 2019

In May 2019, Baffinland collaborated with CWS to deploy nine passive autonomous recording units (ARU) to detect Red Knot vocalizations. Baffinland Environmental staff monitored the ARUs throughout the summer to confirm functionality and change out memory cards every 16 days to allow for continuous monitoring (Photo 6-1). Site locations were determined based suitable habitat within Circumpolar Arctic Vegetation Map (CAVM) units, as recommended by CWS: four ARUs in CAVM 1, three in CAVM 5, and two in CAVM 4 (Map 7). The ARUs were deployed a minimum of 1 km from any roads, camps, and ports to minimize noise interference, and a minimum of 500 m from each other to provide independence.

Originally, CWS recommended that the sound recorders be deployed for at least two breeding seasons to achieve the best results. However, no Red Knot were detected during 2019. CWS has thus concluded that there are no Red Knot present in the Project area, and that ARU monitoring is not necessary for 2020.

Additionally, Baffinland Environmental staff were trained in conducting active migratory birds nest surveys (AMBNS), which included recognition of Red Knot as well as other listed species. A list of bird species observed within the Project area from 2006 to 2019 can be found in APPENDIX H — Bird Species Observed Within the Mary River Project Terrestrial RSA, 2006—2019.

Photo 6-1 **Baffinland Environmental staff swapping out memory cards for Red Knot passive sound recorders, June 2019.**



Red Knot Autonomous Recording Unit Locations

NOTES

PDA provided by KP, July 11, 2017.

This document is not an official land survey and the spatial data presented is subject to change without notice.

Map Scale : 1:520,000 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N

Drawn: MP | Checked: MS/EK | Date: 2020-03-11 | MAP 7

Path: S:\Data\Project_Data\Baffinland_Spatial\2019_SpatialData\Mapping\Reporting\Monitoring\Map7_RedKnotARUs_20200311.mxd

6.2 PRE-CLEARING NEST SURVEYS

Project Condition #66 states that "*If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance based on the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.*" Project Condition #70 states that "*The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan, until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest–specific guidelines and procedures to ensure bird's nests and their young are protected.*"

In accordance with those Project conditions, pre-clearing nest surveys were conducted prior to any disturbance to ensure no bird nests were in areas where clearing or disturbance was scheduled. In 2019, Baffinland attempted to clear potential development areas in advance of the breeding bird window as much as possible, therefore reducing the likeliness of interaction with nesting birds. Within any proposed disturbance, pre-clearing nest surveys are necessary between May 31 and August 5 while birds are actively nesting (TEMMP Section 3.2, Baffinland Iron Mines Corporation 2016).

6.2.1 METHODS

In 2019, pre-clearing nest surveys were conducted by Baffinland Environmental staff in areas that had to be disturbed for approved construction activities during the nesting season. In early June at the beginning of pre-clearing surveys, EDI biologists trained on-site staff on nest searching methods provided by CWS to Baffinland in 2015 (TEWG meeting no. 6; April 22, 2015). Training included nest searching methods using rope-drags and identification of common species known in the area. Rope drags were constructed following the template provided by CWS (Rausch 2015).

Pre-clearing surveys were conducted with a minimum of three observers. Observers conduct surveys by pulling the rope drag back and forth through the area in a systematic fashion, stopping regularly to note any bird observations. Areas were surveyed for active nests a maximum of five days prior to clearing. If nests were found, then development was delayed until the nest and/or nesting areas were no longer active. If no nests were found and the area was not developed within the five-day window, surveys were conducted again to ensure no birds had started nesting. While nest searching, observers looked for signs of nesting bird behaviour, including broken wing displays, alarm calls, or carrying food, indicating a nest was within the area. Surveyors recorded all bird observations during surveys, but identification was limited to the skills of the individual observers.

6.2.2 RESULTS AND DISCUSSION

Baffinland conducted pre-clearing AMBNS during the 2019 nesting season, prior to conducting any ground disturbance. Thirteen pre-clearing surveys were conducted between May 31 and August 5, 2019, consisting of 12.9 person-hours and 269,361 m² (26.9 ha) surveyed at the Mine Site, Tote Road and Milne Port development areas (Table 6-1). No nests were located during 2019 AMBNS. However, while conducting surveys, Baffinland Environmental staff did note that songbirds were in the area, but no indications of nesting behavior were observed (e.g., carrying food, carrying nesting material).

In 2019, approximately 650,962 m² (65.1 ha) was disturbed for Project infrastructure. Of the approximate areas cleared, 77% of the work was done outside of the breeding bird window. During the breeding bird window, approximately 148,438 m² (14.8 ha) of land was cleared while 269,362 m² (26.9 ha) was surveyed through AMBNS (Table 6-1). Some sites were surveyed multiple times if clearing had not been conducted within the allowable time.

Table 6-1 Summary of Active Migratory Bird Nest Surveys conducted in 2019 during the bird nesting season.

Location	Date (dd/mm/yy)	Site Description	Nest Located	Birds Observed	Surveys Effort (hours)	Area Surveyed (m²)
Mary River	02/06/19	Waste rock pile ring road	–	–	5 surveyors, 0.5 hours	11,600
Milne Port	05/06/19	LP3 (south) laydown	–	–	3 surveyors, 1.5 hours	47,344
Milne Port	14/06/19	R3 laydown	–	Snow Bunting, Snow Goose feathers	5 surveyors, 1.5 hours	26,358
Mary River	20/06/19	Waste rock pile ring road west ditch	–	Snow Bunting	3 surveyors, 1.2 hours	19,898
Mary River	21/06/19	Waste rock pile ring road west ditch	–	Snow Bunting	3 surveyors, 1.8 hours	39,202
Milne Port	23/06/19	North quarry expansion	–	–	3 surveyors, 0.5 hours	6,868
Mary River	27/06/19	Hillside cross cut road	–	Snow Bunting	3 surveyors, 1.0 hours	15,600
Milne Port	27/06/19	Bruce Head relay tower 1	–	–	3 surveyors, 0.2 hours	297
Mary River	28/06/19	Hillside cross cut road	–	Snow Bunting	3 surveyors, 1.1 hours	17,200
Milne Port	03/07/19	Bruce Head relay tower 2	–	–	3 surveyors, 0.2 hours	112
Mary River	06/07/19	GE generator pad	–	–	3 surveyors, 0.8 hours	8,303
Mary River	17/07/19	Hillside cross cut road	–	Snow Bunting, American Pipit	4 surveyors, 1.2 hours	15,431
Milne Port	18/08/19	L2 laydown	–	Gull, Common Raven	3 surveyors, 1.5 hours	61,149
Total Survey Effort (Person Hours) and Total Area Surveyed (m²)					**12.9**	**269,362**

6.3 RAPTOR EFFECTS MONITORING

The Baffinland FEIS states that a monitoring program for raptors will be used to assess the accuracy of predictions by comparing measurable parameters from within the footprint to those documented at appropriate reference sites (Baffinland Iron Mines Corporation 2012). NIRB Project Condition #74 identifies Peregrine Falcon and Gyrfalcon (*Falco rusticolus*) as key indicators for follow up monitoring of birds (Nunavut Impact Review Board 2014). Further, during the final hearing, Baffinland committed to monitoring relevant sections of the project area for Peregrine Falcon nesting activities (Commitment #75).

6.3.1 BACKGROUND 2011–2019

Arctic Raptors Inc. (ARInc.) personnel have conducted raptor monitoring as part of the Baffinland Iron Mine terrestrial baseline surveys and terrestrial effects monitoring efforts from 2011 through 2019. In general, surveys of known nesting sites have been conducted by truck along the Tote Road and helicopter from the Mine Site to Milne Inlet. Over this period, monitoring objectives have been modified periodically to align with priorities for each phase of the Project (e.g., pre-baseline, construction and operations of the Early Revenue Phase).

In 2011 surveys were conducted to confirm nesting site locations provided by Baffinland to substantiate and undertake quality control of monitoring data that had been collected from 2006 to 2008 in the RSA (extending from Milne Inlet in the north to Steensby Inlet in the south). A second goal was to gauge the potential for establishing a dedicated study area to be based at Steensby Inlet that could serve as a replicate for the long-term monitoring program located near Rankin Inlet, Nunavut. ARInc. initiated a banding program of breeding adults and nestlings, collected blood samples, searched for nesting locations that had not been previously identified, and conducted small mammal trapping following protocols already in place at Rankin Inlet. Surveys were conducted in 2012 of all known nesting sites with the same goals that had been identified in 2011. Surveys conducted in 2013 investigated nesting habitat selection of Peregrine Falcons (PEFA) and Rough-legged Hawks (RLHA). Fieldwork in 2014 involved ongoing extensive surveys (occupancy and productivity) of known nesting sites in the RSA and additional coverage of areas not previously surveyed to validate habitat selection models.

Prior to the 2015 breeding season, ARInc. was tasked with providing a monitoring program to estimate potential effects of the Project. This marked a departure from extensive monitoring of known nesting sites throughout the RSA to monitoring nests within a 10 km buffer of the PDA, hereafter referred to as the Raptor Monitoring Area (RMA). The density of nesting sites was distributed disproportionately, with higher densities located within 3 km of anthropogenic disturbance and much lower density beyond 3 km of disturbance. Thus, starting in 2015, survey effort shifted from extensive monitoring of known nesting sites throughout the RSA to monitoring of nesting sites only within the RMA as well as searching for previously unknown nesting sites. In 2015, efforts to locate previously unknown nest sites focused on those areas further from disturbance to address the limitation associated with small sample size further from disturbance. Survey effort in 2016 similarly focused on monitoring of known nesting sites within the RMA, as well as searching for previously unknown nesting sites, but also placed greater effort on multiple visits to address detection error. Fieldwork, analysis and reporting in 2019 followed the methodology adopted in

2016; additional effort was placed on addressing issues raised in previous reports regarding terminology, methodology to address the effect of alternative nesting sites on estimates of occupancy and reproductive success, and collection of additional data to address the influence of prey and weather on these same indicators.

6.3.2 TERMINOLOGY

The terminology used throughout this report follows Franke et al. (2017). The following terms are highlighted to clarify terminology used in this report, and/or to distinguish key terms used from similar terms that have distinct meaning:

nest — The structure made or the place used by birds for laying their eggs and sheltering their young (Steenhof and Newton 2007) regardless of whether eggs are laid in the nest in a given year or in any year (Millsap et al. 2015, Steenhof et al. 2017); see Scrape for Gyrfalcons.

nesting site — The substrate that supports the nest or the specific location of the nest on the landscape (Ritchie and Curatolo 1982, Millsap et al. 2015, Steenhof et al. 2017).

alternative nesting site — One of potentially several nests within a nesting territory that is not a used nest in the current year (Millsap et al. 2015).

fully surveyed site — A nesting site that receives two or more visits in a single season, where each visit is associated with a different phase in the breeding cycle (pre-laying, incubation, brood rearing), or within phases but visits are separated by sufficient time to be independent observations (e.g., early incubation and late incubation).

nesting territory — An area that contains, or historically contained, one or more nests within the home range of a mated pair; a confined locality where nests are found, usually in successive years, and where no more than one pair is known to have bred at one time (Newton and Marquiss 1984, Steenhoff and Newton 2007). Note that a nesting territory may or may not be defended (Postupalsky 1974), and probably does not include all of a pair's foraging habitat (Newton and Marquiss 1984, Steenhoff and Newton 2007).

occupancy — The quotient of the count of occupied nesting territories and the count of known nesting territories that were fully surveyed in each breeding season (Franke et al. 2017).

brood size — The actual number of young hatched from a single nesting attempt by a pair of birds. For studies in which mortality that occurs between hatching and the first observation of the brood is unknown, it is appropriate to report brood size (i.e., number hatched) only for broods equal to, or less than 10 days of age. For broods older than 10 days of age, see Brood Size ≥10 days. Report mean and standard error, or standard deviation.

brood size ≥ 10 days — The number of young hatched from a single nesting attempt by a pair of birds. For studies in which mortality that occurs between hatching and the first observation of the brood is unknown, and nestlings are equal to, or greater than 10 days of age, but less than Minimum Acceptable Age MAA) for assessing success. Report mean and standard error, or standard deviation.

minimum acceptable age (MAA) for assessing success — A standard nestling age at which a nest can be considered successful. An age when young are well grown but not old enough to fly and after which mortality is minimal until actual fledging. Typically 80% of the age that young of a species normally leave the nest of their own volition for many species, but lower (65–75%) for species in which age at fledging varies considerably or for species that are more likely to leave the nest prematurely when checked (Steenhoff and Newton 2007).

daily survival rate (DSR) — The probability that at least one young or egg in a nest will survive a single day (Dinsmore et al. 2002, Steenhoff and Newton 2007).

nest survival — The probability that a nesting attempt survives over the complete nesting period. When DSR (Dinsmore et al. 2002) is assumed to be constant over time and E is the nesting period (usually expressed in days), nest survival is DSR^E; otherwise nest survival is the product of each estimated DSR. For raptors, nest survival is the equivalent of nesting success for egg-laying pairs (Steenhof et al. 2017).

productivity — The number of young that reach the minimum acceptable age for assessing success; usually reported as the number of young produced per territorial pair or per occupied territory in a particular year (Steenhoff and Newton 2007, Steenhof et al. 2017).

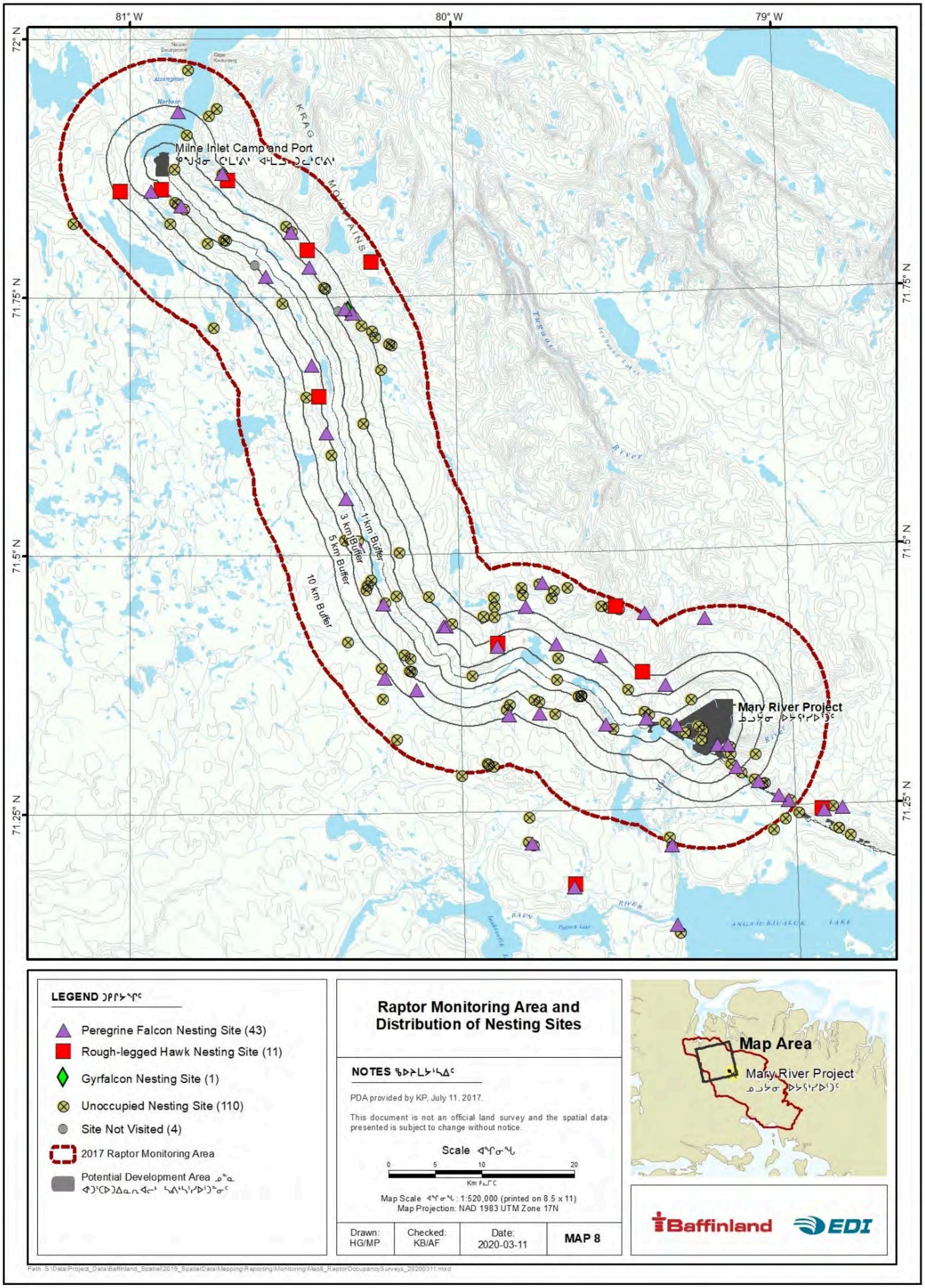
total production — The total number of young detected.

6.3.3 BREEDING PHENOLOGY

Breeding phenology is an important determinant of the timing of occupancy and productivity surveys. In Nunavut, the earliest documented arrival for Peregrine Falcons is May 10 at a known breeding site near Rankin Inlet. Although timing of arrival on territory varies with spring conditions, most sites are occupied during the third week of May. Median laying date in Rankin Inlet (June 9 ± 4.0 days) was earlier than Igloolik (June 15 ± 3.6 days; $Chi^2 = 31.56$, $p < 0.001$) and north Baffin Island (June 16 ± 3.5 days; $Chi^2 = 35.56$, $p < 0.001$) with no difference observed between Igloolik and north Baffin Island ($Chi^2 = 0.77$, $p = 0.38$) (Jaffré et al. 2015). The incubation period of the fourth laid egg (33 days) is similar to what has been reported elsewhere (Burnham 1983). Rough-legged Hawk breeding phenology is very similar to Peregrine Falcons but is typically advanced by a week to 10 days (Poole and Bromley 1988). Additionally, the presence of breeding pairs in locations where ground squirrels are absent (as is the case on Baffin Island) is typically cyclic in association with lemming abundance. The timing of surveys on Baffin Island was conducted to match the phenology of local breeding birds.

6.3.4 RAPTOR MONITORING DATA

The landscape is generally rugged, and elevation varies ranging from sea-level to 685 meters. The area includes a wide valley associated with Philip's Creek surrounded by high plateaus and mountains. The valley extends southward into poorly drained plains and rolling tundra. Vegetation is patchy, and dominated by mountain avens (*Dryas* spp.) and Arctic willow (*Salix arctica*), along with alpine foxtail (*Alopecurus* spp.), wood rush (*Luzula* spp.), and saxifrage (*Saxifraga* spp). Dry or high elevation sites are very sparsely vegetated, whereas wet areas have a continuous cover of sedge (*Carex* spp.), cottongrass (*Eriophorum* spp.), saxifrage, and moss. Peregrine Falcon and Rough-legged Hawk are the most common raptor species. Gyrfalcon, Snowy Owl, and Common Raven were also encountered. The spatial extent of the 2019 surveys was limited to nesting sites within the RMA (Map 8).


81° W
80° W
79° W
72° N
71.75° N
71.5° N
71.25° N
KRAG MOUNTAINS
Milne Inlet Camp and Port
Mary River Project
1 km Buffer
3 km Buffer
5 km Buffer
10 km Buffer
River
Map Area
LEGEND
Peregrine Falcon Nesting Site (43)
Rough-legged Hawk Nesting Site (11)
Gyrfalcon Nesting Site (1)
Unoccupied Nesting Site (110)
Site Not Visited (4)
2017 Raptor Monitoring Area
Potential Development Area
Raptor Monitoring Area and Distribution of Nesting Sites
NOTES
PDA provided by KP, July 11, 2017.
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0
5
10
20
Km
Map Scale : 1:520,000 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N
Drawn: HG/MP
Checked: KB/AF
Date: 2020-03-11
MAP 8
Baffinland
EDI
Path: S:\Data\Project_Data\Baffinland_Spatial\2019_SpatialData\Mapping\Reporting\Monitoring\Map8_RaptorOccupancySurveys_20200311.mxd

6.3.5 METHODS

Raptor surveys from 2011 to 2014 were conducted through the region extending from Milne Inlet to Steensby Inlet, and results of those surveys were reported in previous annual monitoring reports (EDI Environmental Dynamics Inc. 2013, 2014, 2015, 2016). Survey efforts from 2015 to 2019 focused on monitoring of occupancy and reproductive success only within the RMA, and opportunistically documented previously unknown nesting sites.

6.3.5.1 Helicopter Survey

Three helicopter-based raptor surveys were conducted in 2019: June 12 to 14 (18 hours), July 26 to 29 (19 hours), August 20 to 27 (19 hours). The focus of these surveys was to search known nesting sites for the presence of cliff-nesting birds. In addition to the structured surveys, favourable habitat was searched opportunistically when ferrying between known sites, camps or other mine infrastructure and when raptors or signs of site use (e.g., whitewash, orange-colored lichen, and unused nests) were observed. Sites were considered occupied if one or more adults displayed territorial or reproductive behavior (e.g., vocalization and/or flight behavior associated with defense of breeding territory or presence of nest building, nest, or eggs). Locations with partially built or unused nests without detection of breeding aged adults were noted as such (i.e., no birds detected).

6.3.5.2 Distance to Disturbance

Within the spatial extent of the study area, ESRI ArcGIS for Desktop v.10.3 (ESRI 2011) was used to calculate the distance from all raptor nest sites to the nearest mapped disturbance features (e.g., Project infrastructure). Shapefiles were derived from CAD drawings provided by HATCH, the on-site procurement and engineering contractors. From the CAD files, the Mine Site, Milne Port and Tote Road footprints were used to represent current and proposed disturbance as of September 2014. The ArcGIS Near Tool was used to calculate the Euclidean distance for each nest site (i.e., point location) to the nearest point of the Project footprint. Sites that were located within the spatial extent of the PDA received a distance value of 0 meters. Distance to disturbance (DD) values for only those sites within the RMA were retained for effects analysis on occupancy and reproductive success.

6.3.5.3 Distance to Nearest Neighbour

Nearest neighbour distances (NNDs) were calculated in R (R Development Core Team 2019) using the ‘sp", ‘rgeos”, and ‘geosphere’ packages. These packages were used to transform the geographic coordinates describing nesting site locations into spatial objects, calculate pairwise distances and identify the shortest distance between all known nest site locations, and the nearest occupied territory (DNON, i.e., distance to nearest neighbour).

6.3.5.4 Assigning Nesting Sites to Nesting Territories

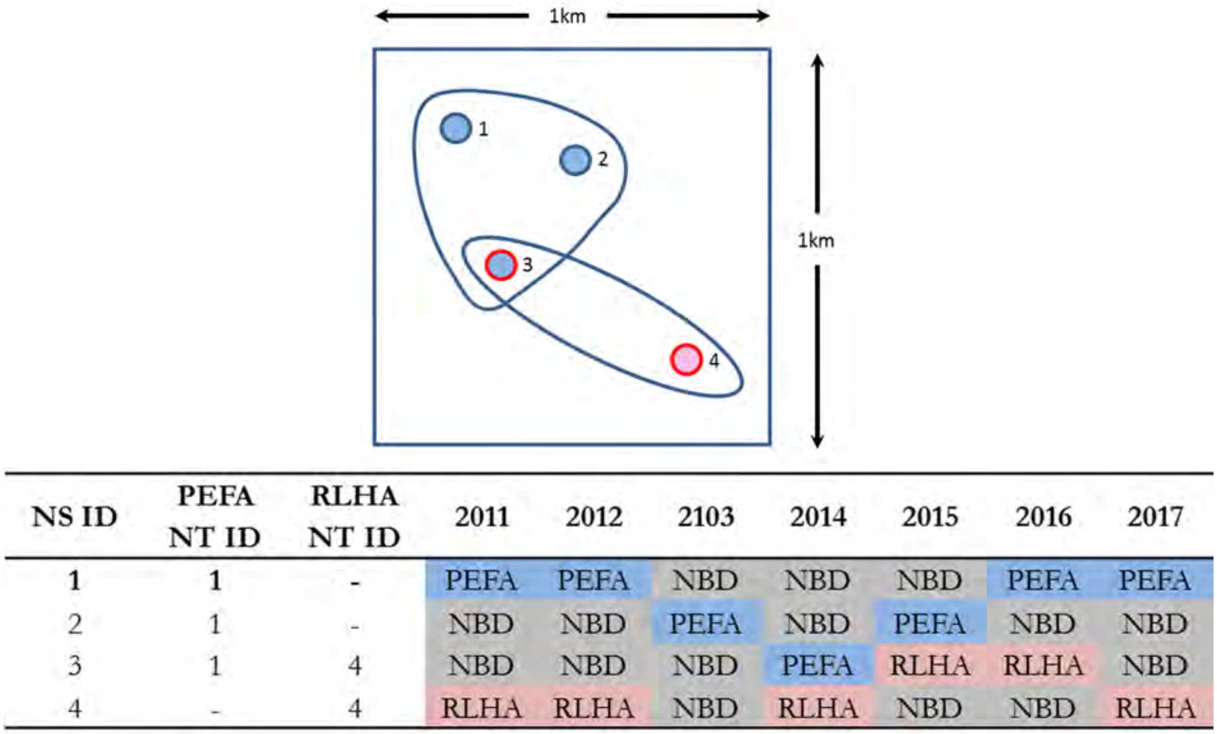
In the absence of marked individuals, it can be challenging to definitively identify alternative nesting sites. Failure to account for alternative nesting sites can lead to underestimating demographic parameters such as annual productivity. To address this problem, a rule-based approach was used to estimate the number of alternative nesting sites within the RMA. Mean NND within the RMA equalled 1.2 km, and this information was used with the following rule set to identify clusters of nesting sites that were potential alternative nesting sites (Figure 6-1):

- If two species-specific nesting sites were within 1 km of each other, they were considered alternative nesting sites in a single nesting territory.
- If two nesting sites within 1 km of each other were occupied by the same species in a given year, they were considered separate territories.
- If multiple species-specific nesting sites were within 1 km of one another, discrete geographic landforms or discontinuities in cliff structure were used to separate or combine sites into territories.

Temporal patterns of multi-species occupancy were used to assess the plausibility of decisions based on the application of the three rules listed above. For example, if two nesting sites were located within 1 km of each other and were occupied by two different species in alternating years, these nesting sites were identified as distinct alternative nesting sites for each species.

Assigning Identification Numbers (ID) to Nesting Territories was conducted according to the following rule set:

- Nesting Territory IDs were assigned within species only (e.g., Nesting Territory IDs for PEFA and RLHA were never shared).
- Nesting Territory IDs were assigned using the Identification Number of one of the Nesting Sites in the cluster according to the following rule set, in order of priority:
    i. length of tenure (i.e., nesting sites with the longest tenure); and
    ii. first tenure (i.e., nesting sites with the first tenure in the event length of tenure was equal).



NS ID	PEFA NT ID	RLHA NT ID	2011	2012	2103	2014	2015	2016	2017
1	**1**	**-**	PEFA	PEFA	NBD	NBD	NBD	PEFA	PEFA
2	1	-	NBD	NBD	PEFA	NBD	PEFA	NBD	NBD
3	1	4	NBD	NBD	NBD	PEFA	RLHA	RLHA	NBD
4	-	4	RLHA	RLHA	NBD	RLHA	NBD	NBD	RLHA

Figure 6-1 Rule-based approach used to assign nesting sites to nesting territories for occupancy modelling. *A cluster of four nesting sites within 1 km of one another that exhibit a site occupancy history among seven years for two species (PEFA and RLHA). Nesting Sites 1 and 2 (blue circles with blue borders) have been occupied solely by PEFA. Nesting Site 4 (red circle with red border) has been occupied solely by RLHA. Nesting Site 3 (blue circle with red border) has been occupied by both PEFA and RLHA. In this example, Nesting Sites 1, 2 and 3 are grouped into a single PEFA Nesting Territory and assigned Nesting Territory ID 1 based on PEFA–specific tenure length (Nesting Site 1 has the longest tenure) and first tenure. Nesting Sites 3 and 4 are grouped into a single RLHA Territory and assigned Nesting Territory ID 4 based on RLHA–specific tenure length (Nesting Site 4 has the longest tenure) and first tenure. Unique nesting locations are ultimately defined by a Nesting Territory ID and a Nesting Site ID (E.g., NT ID 1, NS ID 2). NBD = no birds detected.*

6.3.5.5 Occupancy Modelling

Although estimation of nesting site occupancy can serve as a metric of population status (MacKenzie et al. 2002, 2003), detection of nesting pairs is invariably imperfect, and estimating the proportion of occupied sites without accounting for detection error can lead to underestimation of true occupancy (Kéry and Schmidt 2008). Hierarchical occupancy modeling can estimate parameters that influence occupancy and simultaneously account for a detection probability less than 1 (Marsh and Trenham 2008).

Occupancy at nesting sites is limited to one of only two outcomes (occupied or not occupied) and is therefore a Bernoulli trial. The modelling process estimates colonization (i.e., an unoccupied site becomes occupied), extinction (i.e., an occupied site becomes unoccupied), and survival (i.e., an occupied site remains occupied), and covariates can be added to the model to test whether they influence the parameters by linking specific covariates to each of the three parameters using a logit link function.

Multi-year occupancy was calculated in R (R Development Core Team 2019) using the 'unmarked' package. Where appropriate, data were standardized (e.g., the covariate distance to nearest occupied neighbour was standardized by subtracting the mean from each distance value and dividing by the standard deviation) and then formatted specifically for 'unmarked' using the *unmarkedMultFrame* function. Occupancy dynamics among years were investigated separately for Peregrine Falcons and Rough-legged Hawks. To do so, the total number of nesting sites were filtered to include only sites that were occupied at least once between 2012 and 2019 for each species. A total number of 94 and 91 nesting sites were used to analyze Peregrine Falcon and Rough-legged Hawk occupancy dynamics, respectively. Model fitting of candidate models was performed using the *colext* function. Akaike Information Criterion (AIC) was used for model selection. Thirteen candidate models were selected *apriori* to address anthropogenic (i.e., distance to disturbance) and ecological factors (i.e., distance to nearest occupied neighbour), and interactions among factors with potential to influence model parameters (initial colonization, annual colonization, annual extinction, and detection probabilities). For example, the effect of distance to disturbance may vary with distance to nearest neighbour (i.e., the effect of distance to disturbance may depend on proximity of neighbouring nesting sites). The aim of this analysis was two-fold: 1) to estimate the proportion of occupied nesting sites annually, and identify factors that may influence whether sites are occupied or not, and; 2) to estimate the overall trend in occupancy from 2012to 2019 (2011 was dropped from the analysis as only four nesting sites were fully surveyed in 2011). Trend was estimated using annual occupancy probabilities to calculate average rate of change (λ) at the population level (MacKenzie et al. 2003) where a mean value less than1 indicates population decline and greater than 1 indicates an increase.

6.3.5.6 Reproductive Success

Given that nestling age during the survey period varied annually among years and sites, measures of annual productivity *per se* are expected to be biased high (i.e., counts of nestlings are often done when nestlings are less than the MAA). For this report, any nesting site that was surveyed at least twice was considered "fully surveyed", and estimates of reproductive success were reported as the number of young hatched from a single nesting attempt by a pair of birds (i.e., mean brood size ≥ 10 days ± standard deviation) for fully surveyed sites. All nesting sites were contained within a unique nesting territory (i.e., no nesting territories were occupied by more than one pair of birds, regardless of the existence of known alternative nesting sites within nesting territories).

To investigate patterns in nesting site survival (i.e., the probability that a nesting site produces young given that the nesting site was occupied) across space and time, a model was constructed that estimated spatiotemporal variation among sites, as follows: 1) spatial structure that remained static across all years; 2) spatial structure that varied annually, and; 3) an autoregressive spatial structure, where the spatial effect in a given year depended upon the previous year. All models were constructed and executed within the framework of Integrated Nested Laplace Approximation (INLA) using the R package 'R-INLA' (Rue et al. 2014), and compared using deviance information criterion. Covariates contained within the top model were individually assessed based on the proximity of their posterior distributions to zero.

6.3.5.7 Small Mammal Monitoring

Two small mammal trapping sessions were conducted from June 16 to 22 and August 7 to 14, 2019, following the procedure outlined by Cadieux et al. (2015). Two trapping sites were selected based on habitat thought to be suitable for both brown and collared lemmings (presence of old lemming nests, runways and burrows, seed-bearing plants, wet and dry tundra, and a total area that is equal to or larger than 700 m in length). In addition, areas accessible by a light vehicle along the Tote Road were selected.

Two permanent line transects were staked (GPS-located) at each trapping site. Line transects were 300 m long with 20 stations spaced 15 m apart. Each station consisted of a flagged stake and three museum special snap traps attached to the stake using string (1 m in length), for a total of 240 traps. Traps were evenly distributed around the stake at a distance no further than 1 m and baited with peanut butter.

Traps were checked once daily for six trap-nights, resulting in 1,440 trap-nights per trapping session. Recorded information included captures, misfires, or missing bait from each trap.

6.3.6 RESULTS

6.3.6.1 Nesting Site Detections

A total of 169 unique nesting sites have been detected in the RMA from 2012 to 2019. Among years, the greatest number of previously unknown nesting sites detected occurred in 2014 (N=19) and 2015 (N=32) due to efforts associated with the model validation aspect of the nesting habitat selection study (Galipeau et al. 2019) and efforts to increase sample sizes in regions further from a disturbance in 2014 and 2015, respectively. The number of known nesting sites has increased considerably in the RMA since 2012 (from N=107 to N=169); the percentage of known sites checked annually has remained high (range of 83% to 100%).

In 2019, 165 nesting sites were surveyed at least three times throughout the breeding season. For all years pooled, cliff-nesting raptors were detected at approximately half of known nesting sites that were checked. However, in years when detection of Rough-legged Hawks was low (i.e., 2013 and 2017–2019), cliff-nesting raptors were detected at approximately one third of known nesting sites. Of the 165 nesting sites visited in 2019, cliff-nesting raptors were detected at 55 sites; 43 held Peregrine Falcons, 11 held Rough-legged Hawks, and one held Gyrfalcons. Raptors were not detected at 110 known nesting sites (Table 6-2).

Table 6-2 Summary statistics for survey effort and detections at known Peregrine Falcon and Rough-legged Hawk nesting sites within the RMA from 2012 to 2019.

Variable	Year							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total nesting sites known annually	107	108	127	159	162	167	169	169
New sites found annually	—	1	19	32	3	5	2	0
Count of sites checked	107	90	125	147	142	166	166	165
Count of checked sites occupied	76	30	77	99	70	63	63	55
Count of fully surveyed sites	50	35	90	113	99	158	164	164
Count of sites no raptors detected	31	60	48	48	72	103	103	110
Proportion of sites no raptors detected	29%	67%	38%	33%	51%	62%	62%	67%
Count of sites PEFA detected	29	29	43	50	48	50	49	43
Proportion of sites PEFA detected	27%	32%	34%	34%	34%	30%	30%	26%
Count of sites RLHA detected	45	1	31	47	18	5	12	11
Proportion of sites RLHA detected	42%	1%	25%	32%	13%	3%	7%	7%

6.3.6.2 Assigning Nesting Sites to Nesting Territories

Only nesting sites occupied at least once by Peregrine Falcons or Rough-legged Hawks since 2012 were used to delineate nesting territories (n.b., the analysis conducted for the 2018 report incorporated known nesting sites prior to 2012, including those that had not been occupied from 2012 to 2018, and those that had been occupied by irruptive species such as the Snowy Owl). As indicated, the 2019 report only uses sites occupied by Peregrine Falcons and Rough-legged Hawks from 2012 to 2019. This resulted in 94 nesting sites for Peregrine Falcons, and 91 nesting sites for Rough-legged Hawks. Using the methods outlined in Section 6.3.5.4 – Assigning Nesting Sites to Nesting Territories, the 94 peregrine nesting sites were reduced to a total of 76 distinct nesting territories, and the 91 Rough-legged Hawk nesting sites were reduced to 71 distinct nesting territories (Figure 6-2).

6.3.6.3 Occupancy

From 2012 to 2019, the top model for the Peregrine Falcons indicated that colonization and extinction were best explained by yearly variation (see Table 6-3). Distance to disturbance, and distance to the nearest neighbour appeared in the third and fifth models with ΔAIC of 7.13 and 8.71 respectively; a drastic change from the top model and an indication that neither of the covariates explain colonization and extinction better than natural variation from year to year. The time-series (Figure 6-3) indicates relative stability among years as indicated by $\lambda = 1.01 \pm 0.17$. With highly varied occupancy across years, the best model for Rough-legged Hawks included a year effect for colonization and extinction (Table 6-4). Multi-year occupancy for Rough-legged Hawks (Figure 6-4) indicated $\lambda = 3.11 \pm 6.08$ from 2012 to 2019. Considerable annual variation exists with lows in 2013 and 2017. As is typical among specialists like Rough-legged Hawks, occupancy can vary widely across years when main prey species (i.e., microtine rodents) are not available. When yearly occupancy is summarized among years (Figure 6-4), two peaks are clearly evident in 2012 and 2015.

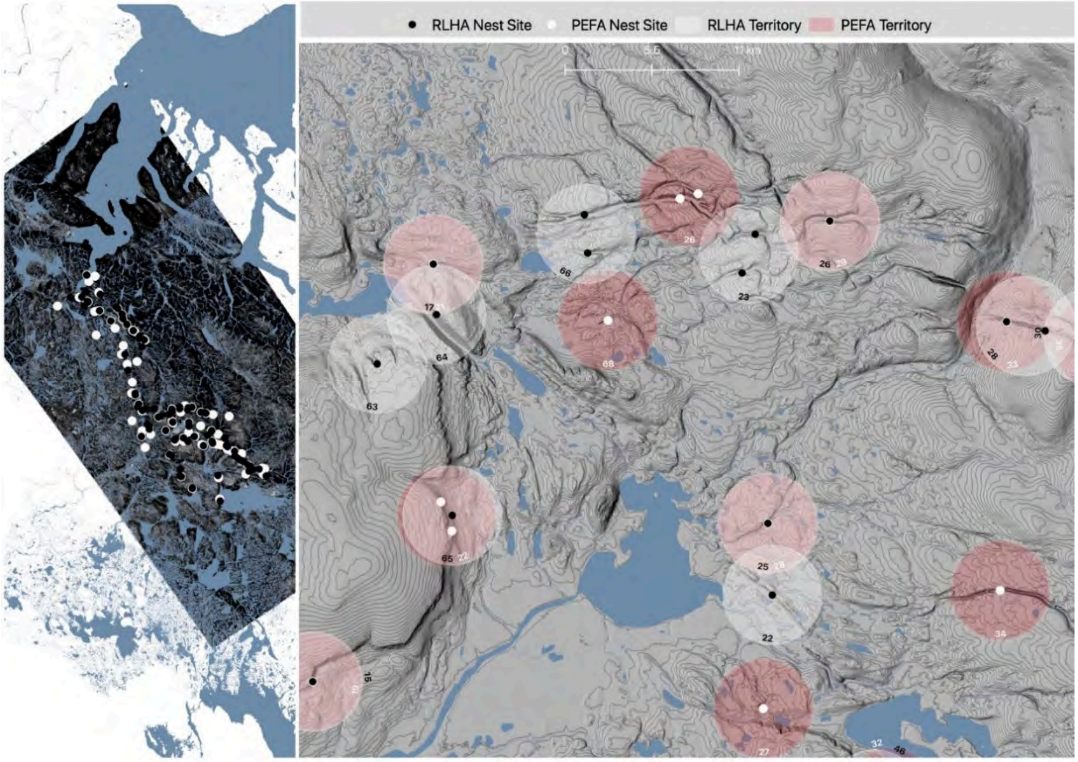


Figure 6-2 Territories were delineated using cluster analysis with Euclidean proximity and species as the inputs. Although Peregrine Falcon (PEFA) and Rough-legged Hawk (RLHA) territories often overlapped due to similar space use, territories were assigned unique identification numbers depending on the species.

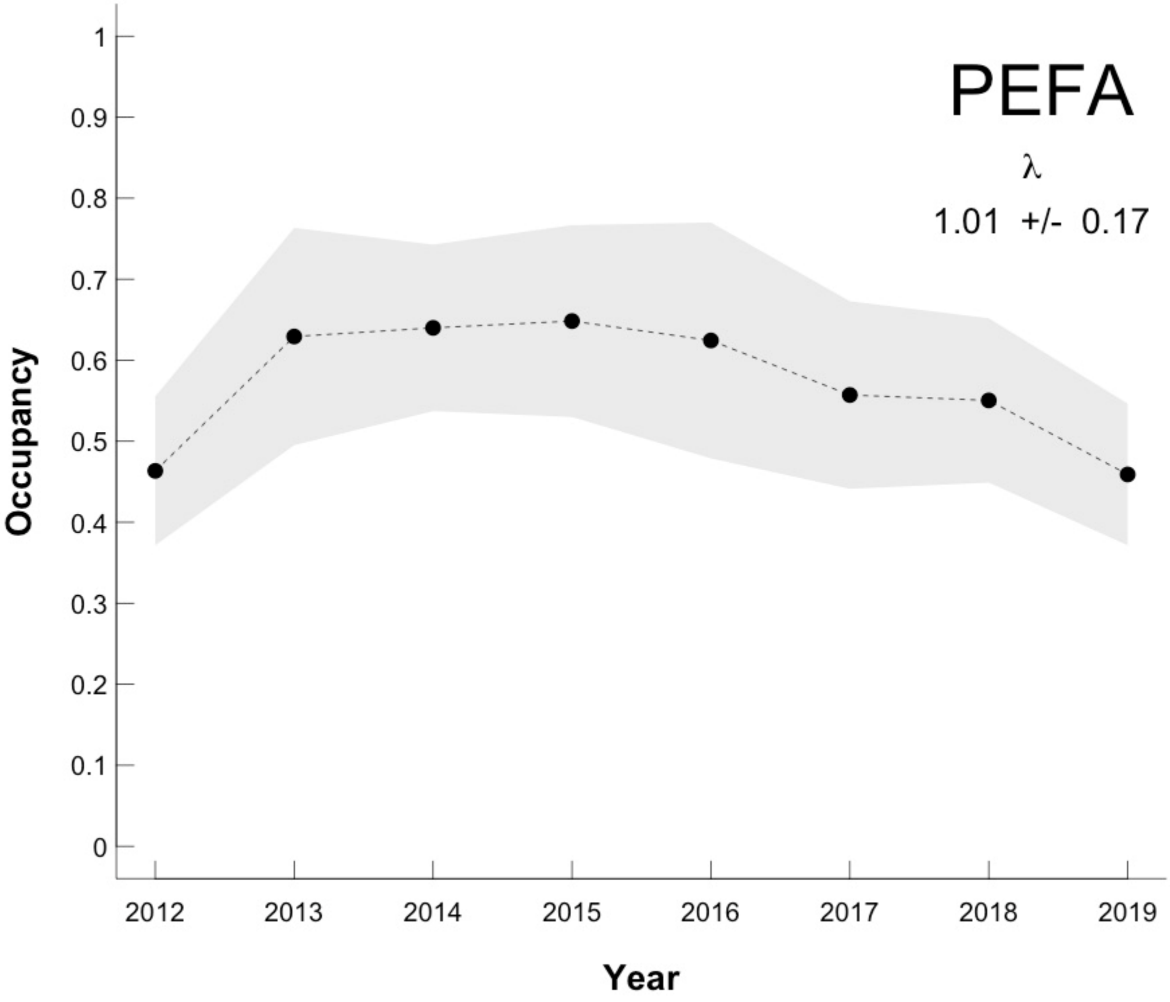


Figure 6-3 Annual estimates (± 95% confidence intervals) of nesting territory occupancy for Peregrine Falcons within the Raptor Monitoring Area from 2012 – 2019 has remained stable with λ = 1.01 ± 0.17.

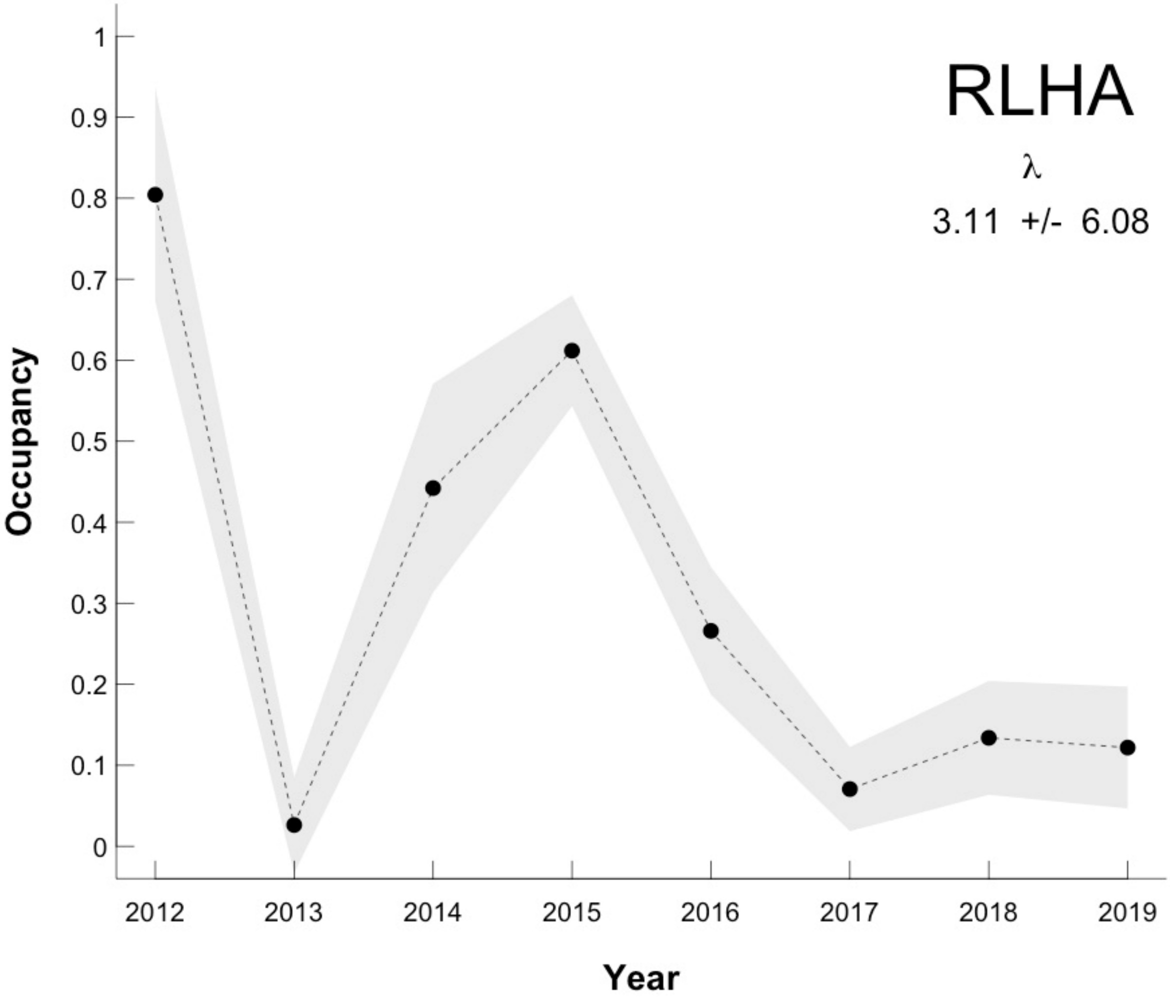


Figure 6-4 Annual estimates (± 95% confidence intervals) of nesting territory occupancy for Rough-legged Hawks within the Raptor Monitoring Area from 2012 –2019.

Although λ is positive, 95% confidence intervals overlap 1.0 indicating that the overall trend is stable.

Table 6-3 Site occupancy modeling for Peregrine Falcons incorporates the main parameters inherent to metapopulation dynamics (i.e., colonization (γ), and extinction (ε)).

Model	K	AICc	Delta_AICc	ModelLik	AICcWt	LL	Cum.Wt
psi + ε(year) + γ(year) + p(year)	23	1474.15	0.00	1.00	0.88	-706.19	0.88
psi + ε + γ + p(year)	4	1480.64	6.49	0.04	0.03	-736.09	0.92
psi + ε(dnon) + γ + p	5	1481.28	7.13	0.03	0.03	-735.30	0.94
psi + ε + γ(dnon) + p	5	1482.78	8.63	0.01	0.01	-736.05	0.96
psi + ε + γ(dist2dist) + p	5	1482.85	8.71	0.01	0.01	-736.09	0.97
psi + ε(dist2dist) + γ + p	5	1482.87	8.72	0.01	0.01	-736.09	0.98
psi + ε(dnon) + γ(dnon) + p	6	1483.56	9.41	0.01	0.01	-735.30	0.99
psi + ε(dist2dist) + γ(dist2dist) + p	6	1485.13	10.98	0.00	0.00	-736.08	0.99
psi(dist2dist) + ε(year) + γ(year) + p	17	1485.27	11.13	0.00	0.00	-721.61	0.99
psi + ε(dist2dist*dnon) + γ + p	7	1485.80	11.65	0.00	0.00	-735.25	1.00
psi + ε + γ(dist2dist*dnon) + p	7	1486.41	12.26	0.00	0.00	-735.55	1.00
psi(dist2dist) + ε(dist2dist) + γ(dist2dist) + p	7	1487.00	12.85	0.00	0.00	-735.85	1.00
psi + ε(dist2dist*dnon) + γ(dist2dist*dnon) + p	10	1492.06	17.91	0.00	0.00	-734.70	1.00

Model selection was conducted using Akaike Information Criterion (AIC). Model parameters reflect first-year occupancy, colonization, extinction and detection. Covariates used to model the above parameters were distance to nearest neighbour (dnon), distance to disturbance (dist2dist), and year.

Table 6-4 **Site occupancy modeling for Rough-legged Hawks incorporates the main parameters inherent to metapopulation dynamics (i.e., colonization (γ), and extinction (ε)).**

Model	K	AICc	Delta_AICc	ModelLik	AICcWt	LL	Cum.Wt
psi + ε(year) + γ(year) + p(year)	23	825.94	0.00	1.00	1.00	-381.73	1.00
psi(dist2dist) + ε(year) + γ(year) + p	17	854.16	28.22	0.00	0.00	-405.89	1.00
psi + ε + γ + p(year)	11	872.26	46.32	0.00	0.00	-423.46	1.00
psi + ε + γ(dist2dist) + p	5	936.30	110.36	0.00	0.00	-462.79	1.00
psi + ε(dnon) + γ + p	5	936.78	110.84	0.00	0.00	-463.03	1.00
psi + ε + γ(dist2dist*dnon) + p	7	937.59	111.65	0.00	0.00	-461.12	1.00
psi + ε(dnon) + γ(dnon) + p	6	937.64	111.70	0.00	0.00	-462.32	1.00
psi + ε + γ(dnon) + p	5	937.84	111.90	0.00	0.00	-463.57	1.00
psi + ε(dist2dist) + γ(dist2dist) + p	6	938.58	112.64	0.00	0.00	-462.79	1.00
psi(dist2dist) + ε(dist2dist) + γ(dist2dist) + p	7	940.10	114.16	0.00	0.00	-462.38	1.00
psi + ε(dist2dist) + γ + p	5	940.94	115.00	0.00	0.00	-465.12	1.00
psi + ε(dist2dist*dnon) + γ + p	7	941.21	115.27	0.00	0.00	-462.93	1.00
psi + ε(dist2dist*dnon) + γ(dist2dist*dnon) + p	10	941.93	115.99	0.00	0.00	-459.59	1.00

Model selection was conducted using Akaike Information Criterion (AIC). Model parameters reflect first-year occupancy, colonization, extinction and detection. Covariates used to model the above parameters were distance to nearest neighbour (dnon), distance to disturbance (dist2dist), and year.

5.2.6.4 Reproductive Success

Mean brood size for Peregrine Falcons and Rough-legged Hawks within the RMA in 2019 was 1.53±1.2 and 0.45±1.04 nestlings per fully-surveyed occupied site, respectively (Table 6-5). These values are within the range calculated for all survey years combined (0.76±1.19 to 2.38±1.60 for Peregrine Falcons, and 0.0 to 2.3±1.24 for Rough-legged Hawks). It should be noted that although productivity was within the range of values calculated annually from 2012 to 2019, the count of nestlings (Total Production) should be evaluated in conjunction with mean brood size. The count of nestlings for Peregrine Falcons and Rough-legged Hawks at fully surveyed nesting territories in 2019 was 66 and 5 nestlings, respectively.

Table 6-5 Mean brood size for Peregrine Falcons and Rough-legged Hawks within the Raptor Monitoring Area from 2011 – 2019 for fully surveyed sites.

	PEFA								RLHA							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Mean brood size ± SD	0.76± 1.19	1.43± 1.05	1.59± 1.44	1.98± 1.18	2.38± 1.60	1.22± 1.61	0.94± 1.20	1.53± 1.22	1.44± 1.14	0	2.22± 0.76	2.30± 1.24	1.78± 1.55	1.00± 1.15	0.58± 0.90	0.45± 1.04
Total production	13	33	65	95	114	61	46	66	26	0	60	106	32	5	7	5

Mean brood sized is used here as for studies in which mortality that occurs between hatching and the first observation of the brood is unknown, and nestlings are equal to, or greater than 10 days of age, but less than Minimum Acceptable Age for Assessing Success.

Variation in the probability of nest survival among Peregrine Falcons and Rough-legged Hawks was poorly explained by distance to nearest neighbor, distance to disturbance, and an interaction between them (Table 6-6, Figure 6-5, Figure 6-7). In general, model performance was improved by allowing intercepts to randomly vary according to nest sites and years, and further improved by adding a spatial correlation structure. For Rough-legged Hawks, the top model included random intercepts for year and brood. However, the model with a fixed spatial correlation structure had a delta AIC of 0.1; therefore a visualization of the spatial structure was included for reference in Figure 6-8. For Peregrine Falcons, nest survival was best explained by a spatial correlation structure that remained fixed among all years. Nest survival models for both species benefitted from the inclusion of random spatial correlation, indicating spatial patterns throughout the RMA (Figure 6-6 and Figure 6-8). Potential sources of spatial correlation include variation in food availability, environmental conditions, disturbance effects not captured by fixed variables, or various combinations of all three.

Table 6-6 Model selection results for nest survival of Peregrine Falcons and Rough-legged Hawks within the Raptor Monitoring Area.

RLHA			PEFA		
Model	WAIC	Delta	Model	WAIC	Delta
fixed + r(b) + r(y)	190.9	0.0	fixed + r(b) + r(y) + spat	414.4428	0
fixed + r(b) + r(y) + spat	191.0	0.0	fixed + r(b) + r(y)	430.0265	15.5837
fixed + r(b) + r(y) + spat/time(AR1)	191.9	0.9	fixed + r(b) + r(y) + spat/time(AR1)	430.52	16.0772
fixed + r(b) + r(y) + spat/time	192.4	1.5	fixed + r(b) + r(y) + spat/time	431.4	16.9572
fixed	229.8	38.9	fixed + r(b)	461.0648	46.622
fixed + r(b)	229.8	38.9	fixed	461.1276	46.6848

The fixed term in the model description refers to the variables distance to the nearest occupied territory, distance to disturbance, and the interaction between the two. The term r(variable) refers to a random grouping variable, and the "spat" terms refer to three different spatial correlation structures: 1) spat/temp(AR1) references an autoregressive term where spatial correlation is linked to the previous year, 2) spat/temp(year) refers to a correlation structure that changes each year, and 3) spat refers to a spatial correlation structure that remains fixed among all years. Top models are those with the lowest WAIC, and delta refers to the difference between the respective model and the top.

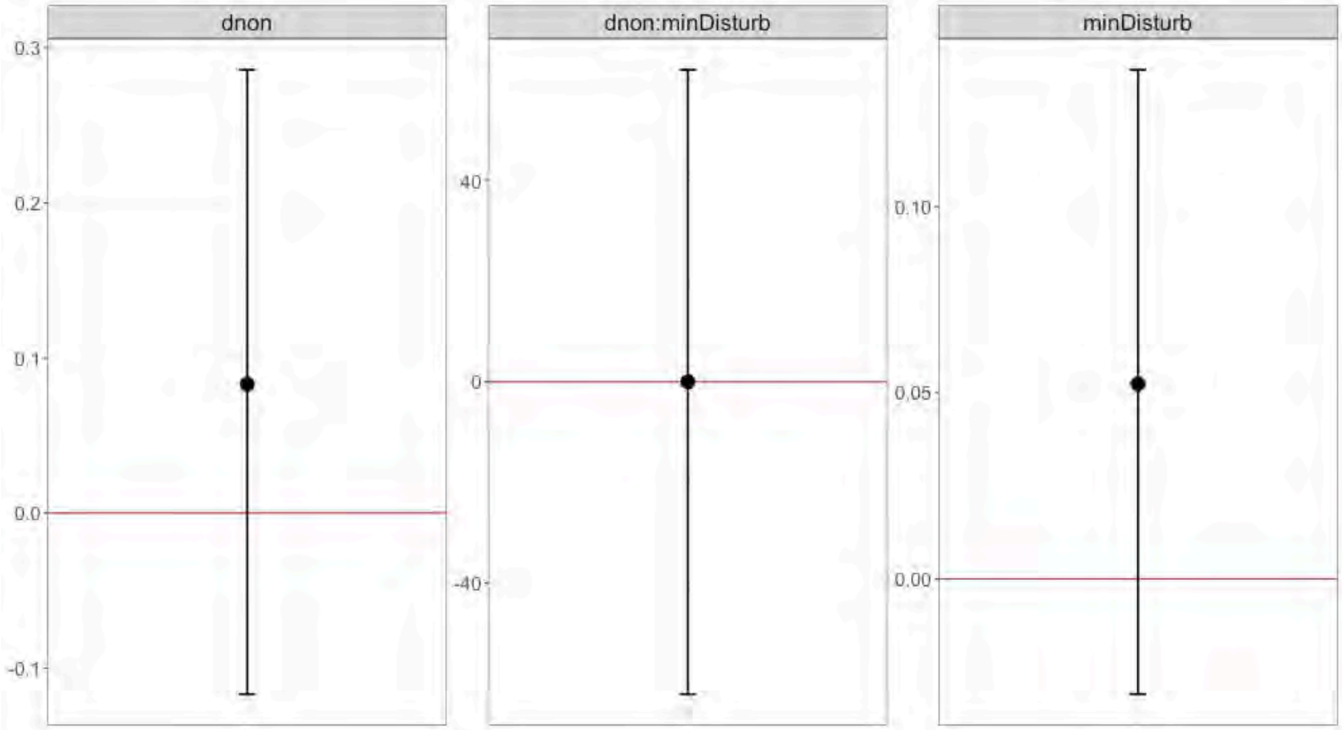


Figure 6-5 Posterior mean with 95% credible intervals from the top model for Peregrine Falcon nest survival. *As indicated by posterior distributions that overlap zero, distance to nearest occupied neighbour, distance to disturbance, and the interaction of these two covariates all have a weak effect on Peregrine Falcon breeding success. This model also included random variables for brood and year level effects, as well as a spatial correlation structure that remained static from 2012 to 2019.*

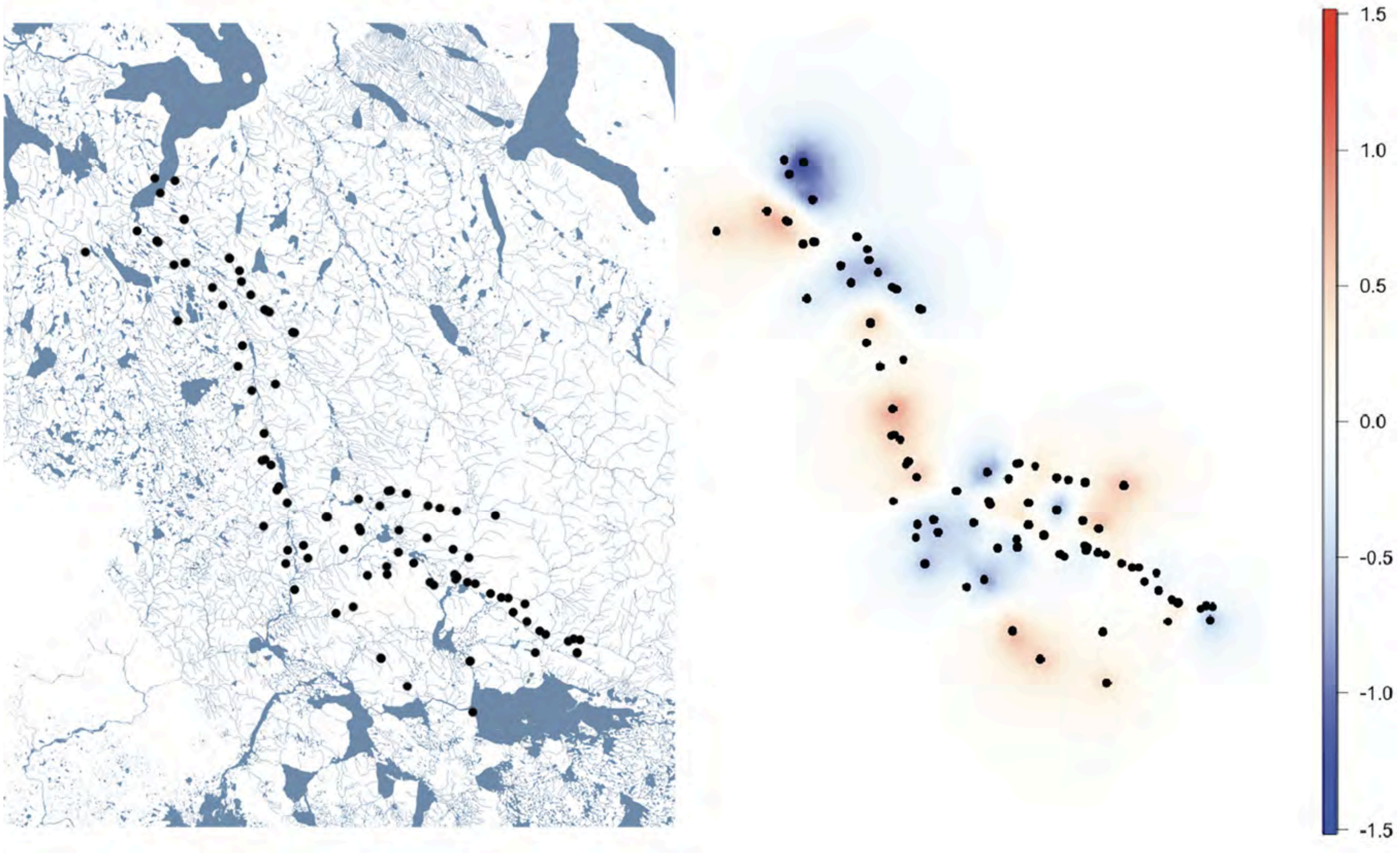


Figure 6-6 Spatial correlation in probability of nest survival among all nest sites occupied by Peregrine Falcons since 2012.
Multiple spatial structures were compared within the model for peregrine breeding success using WAIC, including spatial correlation that varied by year, autoregressive spatial correlation that depended on the previous year, and spatial correlation that remained static among all years. Static correlation performed the best, and as seen here, there are localized areas where nest survival appears to be consistently above or below the average.

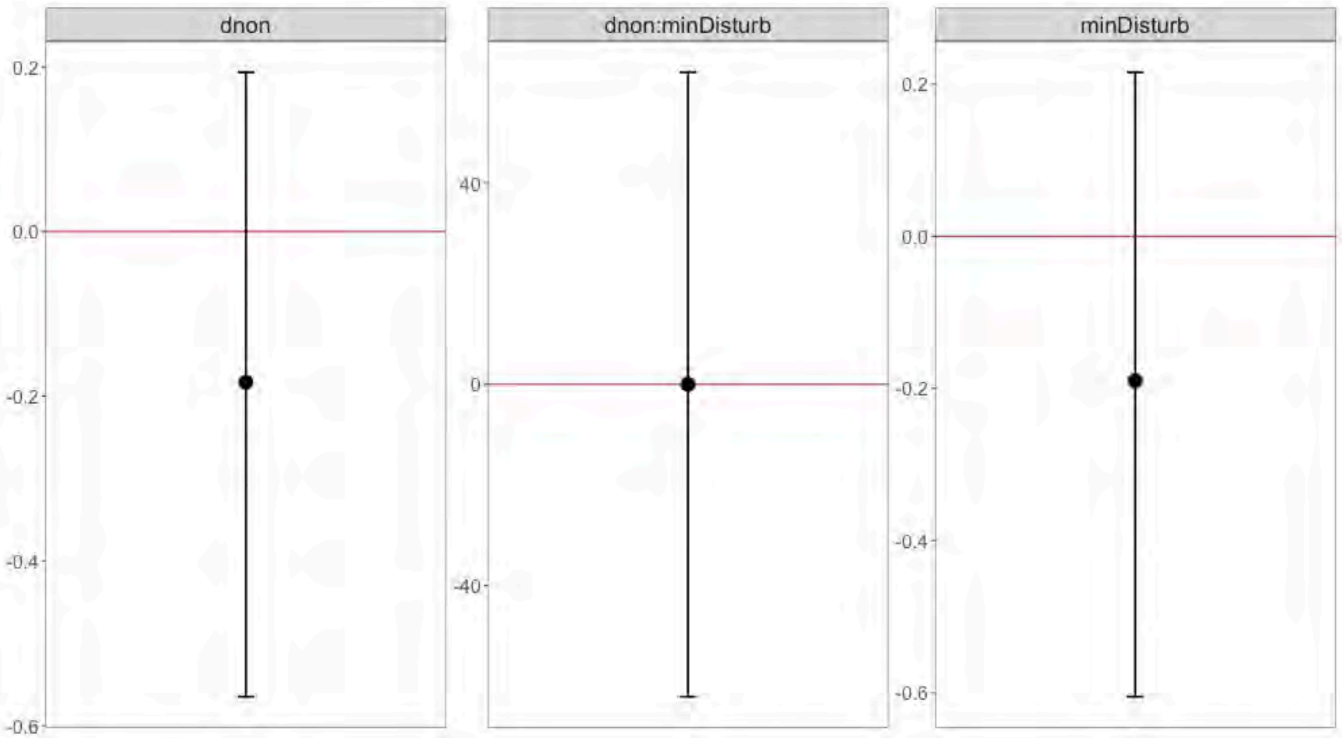


Figure 6-7 Posterior mean plus 95% credible intervals of fixed covariates contained within the top model for Rough-legged Hawk breeding success.

As indicated by posterior distributions that overlap zero, distance to nearest occupied neighbour, distance to disturbance, and the interaction of these two covariates all have a weak effect on Rough-legged Hawk breeding success. This model also included random variables for brood and year level effects, as well as an auto-regressive spatial/temporal correlation structure from 2012 to 2019.

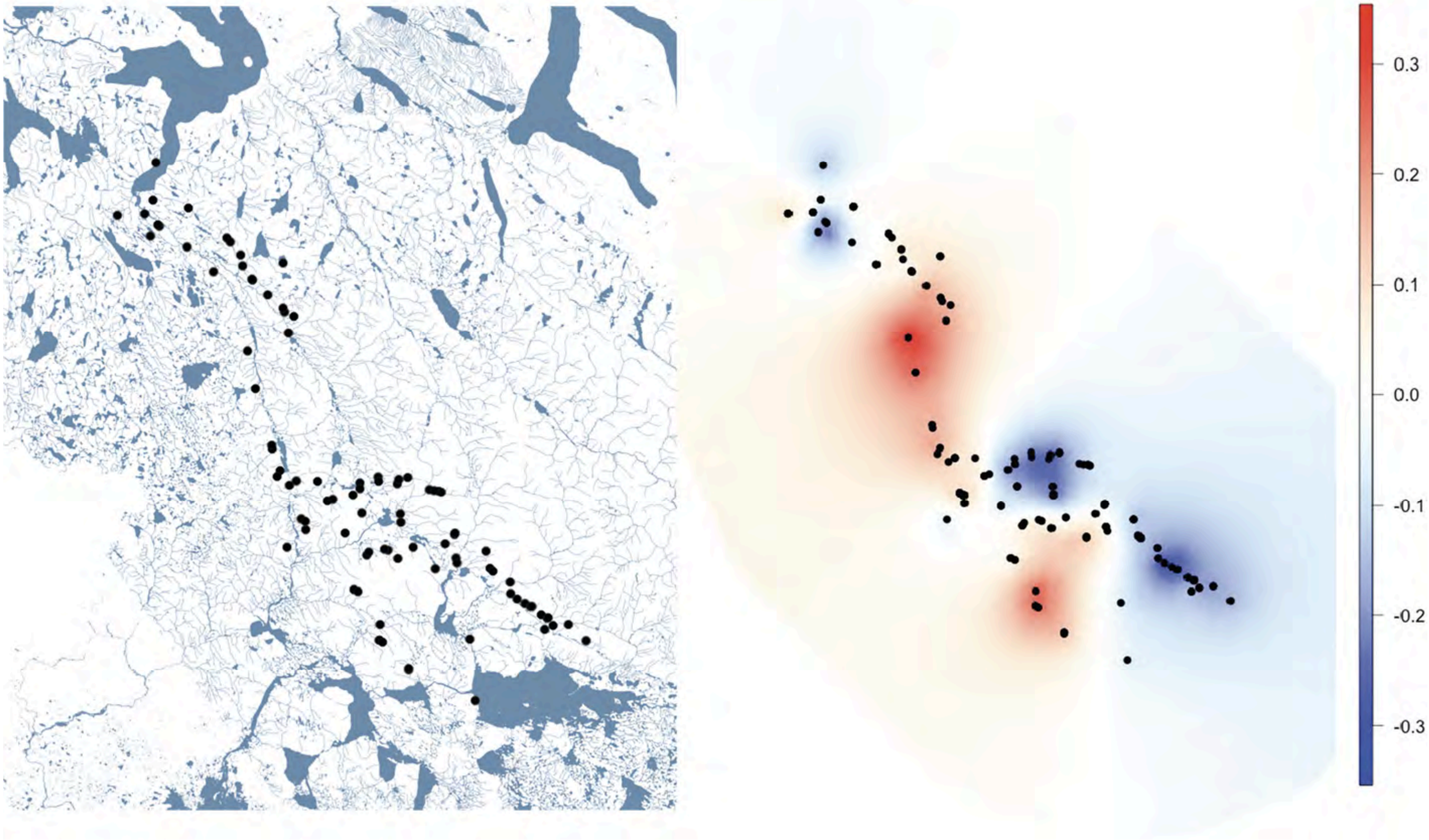


Figure 6-8 Spatial correlation in nest survival among nest sites occupied by Rough-legged Hawks since 2012.

Three spatial/temporal structures were compared using WAIC. The first structure including spatial correlation that varied by year, the second included autoregressive spatial correlation that depended on the previous year, and the third included spatial correlation that remained the static among all years. For Rough-legged Hawks, nest survival was best explained by a fixed spatial structure that remained static among all years.

6.3.6.4 Small Mammal Monitoring

Small mammal monitoring in 2019 tallied to a total of 2,880 trap-nights over two, 6-night trapping sessions. Over the trapping duration, one collared lemming was captured, 42 traps misfired, and three traps had missing bait. The low detection of small mammals despite high effort indicates a regional low abundance of small mammals in 2019.

6.3.7 DISCUSSION

The raptor section continues to address two main issues raised previously by reviewers: 1) clearly defining terminology; and 2) accounting for the effect of increased detection of alternative nesting sites on occupancy and reproductive success. Although annual variation in reproductive success for Peregrine Falcons and Rough-legged Hawks is apparent, it is most likely representative of natural variability associated with variation in prey availability and weather rather than due to the influence of anthropogenic disturbance. A potential ongoing decline in Peregrine Falcon occupancy and weak evidence that distance to disturbance may be associated with reduced reproductive success, flagged in 2018, does not appear warranted with the additional data collected in 2019. For Rough-legged Hawks, occupancy continues to appear to be cyclical (approximately 4-year oscillation), although the anticipated 2019 upswing in Rough-legged Hawk occupancy and reproductive success was not detected. Small mammal monitoring indicated that lemmings and voles remained at low abundance levels, which strongly suggests that occupancy (and therefore count of nestlings) is associated with the natural small mammal cycle (Gilg et al. 2003).

Monitoring of small mammal abundance was incorporated to address whether occupancy and reproductive success of Rough-legged Hawks cycles with small mammal abundance. In addition, weather-related environmental variables are anticipated to be included with distance to anthropogenic disturbance as part of on-going modelling efforts. Based on the analysis to account for distance to disturbance and distance to nearest neighbour individually, and as an interaction, it appears that there is no negative effect of these factors on occupancy (i.e., estimates ± standard errors of λ overlap with 1.0) or reproductive success.

Future monitoring will continue to focus on multiple nesting territory visits annually. Accounting for detection error is an important component of periodic within-season monitoring (to account for the assumption of closure), and surveys should thus be conducted a minimum of twice per season (early incubation and during brood rearing).

6.3.8 INTER-ANNUAL TRENDS

Annual variation in productivity for Peregrine Falcons and Rough-legged Hawks is apparent; however, it is most likely representative of natural variability associated with variation in prey availability and weather rather than due to any influence of anthropogenic disturbance. For Rough-legged Hawks, occupancy appears to be cyclical, and strongly suggests that occupancy is associated with presence of microtine rodents, which are known to cycle approximately every four years. Occupancy of potential nesting sites by Gyrfalcons in the RMA have been too low to monitor annual trends. At the population level, on-going monitoring suggests that distance to disturbance and distance to nearest neighbour (individually and as an interaction) have no negative effect on occupancy or reproductive success for Peregrine Falcons and Rough-legged Hawks.

6.4 BIRDS SUMMARY

- Baffinland, in collaboration with Canadian Wildlife Service (CWS), deployed passive sound recording devices to detect Red Knot vocalizations throughout the breeding season. No Red Knot were detected in 2019. As recommended by CWS, this confirms that Red Knot are not present in the Project area, and sound recording devices will not be deployed in 2020.
- Active migratory bird nest searches (AMBNS) have been conducted since 2013 prior to any proposed land disturbance and/or clearing during the breeding bird window (May 31 to August 15). In 2019, no nests were located during 13 AMBNS surveys, so no buffers were required. The only year nests were located during AMBNS was 2014; three nests were in 2014, one at the Mine Site and two at Milne Port.
- Raptor surveys were conducted in 2011 and 2012 as part of the Project's terrestrial baseline surveys, and annual surveys to account specifically for effects monitoring have been conducted since 2013.
- In 2019, site occupancy and reproductive success (brood size and nest survival) were estimated for all known nest sites located within 10 km of the PDA (the Raptor Monitoring Area [RMA]). When possible, areas with high nest-site suitability for cliff-nesting raptors located between known nest sites and nearby were also surveyed.
- A total of 165 unique nesting sites were monitored in the RMA in 2019. Of these, 55 sites were occupied by raptors; 43 by Peregrine Falcon, 11 by Rough-legged Hawk, and one by Gyrfalcon.
- Based on survey data up to 2019, occupancy by Peregrine Falcon and Rough-legged Hawk is stable.
- Peregrine Falcon and Rough-legged Hawk reproductive success in 2019 was within the range of variability estimated across all survey years.
- Among survey years, spatial patterns in nest survival (i.e., the probability that an occupied site produced at least one nestling) for Peregrine Falcons and Rough-legged Hawks was fixed, suggesting that nesting sites that are occupied and produce young each year are relatively constant.
- Small mammal abundance monitoring was continued as part of the raptor monitoring program to confirm the cyclical occupancy of Rough-legged Hawks in conjunction with the small mammal cycle. One collared lemming was captured in 2019, indicating regional low small mammal abundance.

7 HELICOPTER FLIGHT HEIGHT

Project Certificate No. 005 includes three Project Conditions to ensure that disturbance to birds and wildlife caused by aircraft is minimized whenever possible. The conditions are as follows:

- Project Condition #59) *"The Proponent shall ensure that aircraft maintain, whenever possible (except for specified operational purposes such as drill moves, take offs and landings), and subject to pilot discretion regarding aircraft and human safety, a cruising altitude of at least 610 metres during point to point travel when in areas likely to have migratory birds, and 1,000 metres vertical and 1,500 metres horizontal distance from observed concentrations of migratory birds (or as otherwise prescribed by the Terrestrial Environment Working Group) and use flight corridors to avoid areas of significant wildlife importance…"*
- Project Condition #71) *"Subject to safety requirements, the Proponent shall require all project related aircraft to maintain a cruising altitude of at least:*
    - *650 m during point to point travel when in areas likely to have migratory birds*
    - *1,100 m vertical and 1500 m horizontal distance from observed concentrations of migratory birds*
    - *1,100 m over the area identified as a key site for moulting Snow Geese during the moulting period (July–August), and if maintaining this altitude is not possible, maintain a lateral distance of at least 1,500 m from the boundary of this site."*
- Project Condition #72) *"The Proponent shall ensure that pilots are informed of minimum cruising altitude guidelines and that a daily log or record of flight paths and cruising altitudes of aircraft within all Project Areas is maintained and made available for regulatory authorities such as Transport Canada to monitor adherence and to follow up on complaints."*

Baffinland, in collaboration with the TEWG, committed to "specific measures to ensure that employees and subcontractors providing aircraft services to the Project are respectful of wildlife and Inuit harvesting that may occur in and around Project areas"(Qikiqtani Inuit Association and Baffinland Iron Mines Corporation 2014).

To monitor compliance with these Project Conditions, and Baffinland's commitment, data from helicopter flight logs were analyzed to determine if there was adherence with the Project Conditions.

7.1 METHODS

As per Project Condition #71, the analysis includes the following aircraft cruising altitudes in consideration of migratory birds during specific time periods:

- 1,100 metres above ground level (magl) and 1,500 m horizontal distance while travelling through the key moulting area for Snow Geese during July and August;
- 650 magl during point to point travel in areas outside of the goose area, and in all other months in all areas; and
- 1,100 magl vertical and 1,500 m horizontal distance from observed concentrations of migratory birds at all times.

Canadian Helicopters provided monthly flight tracklog data, as well as daily pilot timesheets (with flight details) to provide context and explain the need for transits that did not adhere to flight height guidelines. Point data were provided in feet above sea level and converted to metres above sea level (masl). A Digital Elevation Model (DEM) was used to estimate ground-level elevation value above sea level, which provides point elevation data that are used to calculate the helicopter tracklog's altitude above ground level. To find the elevation above ground level in metres (i.e., magl) at each tracklog point, the masl from the DEM was subtracted from the masl from the helicopter track log.

To assure the calculated values were correct, a Quality Assurance/Quality Control procedure was completed on the data by querying the status field of the flight tracklog data. It was assumed that when the helicopter status was "wheels off" or "wheels on", the elevation would be at or close to 0.0 magl. The average values from the query indicated that accuracy was approximately ±12 m.

Data were initially split into two categories: 1) data within the Snow Goose area in July and August in relation to 1,100 magl elevation requirement and 2) data within and outside the Snow Goose area in all months in relation to 650 magl. The data sets were then analyzed separately to assess specific flight height allowances using the different areas and elevation values. The flight height data were also cross-referenced with pilot logs from daily timesheets; any flight data with the rationale for flying at lower elevations than required was compliant. Based on this analysis, flight data were organized into the following six categories:

- data within the Snow Goose area in July and August, where the 1,100 magl elevation requirement was achieved (compliant);
- data within the Snow Goose area in July and August where the 1,100 magl elevation requirement was not achieved, but the rationale for lower elevation flying was given (compliant);
- data within the Snow Goose area in July and August where the 1,100 magl elevation requirement was not achieved and no rationale for low-level flying was given (non-compliant);
- data within and outside the Snow Goose area in all months where the 650 magl elevation requirement was achieved (compliant);

- data within and outside the Snow Goose area in all months where the 650 magl elevation requirement was not achieved, but the rationale for lower elevation flying was given (compliant); and
- data within and outside the Snow Goose area in all months where the 650 magl elevation requirement was not achieved and no rationale for low-level flying was given (non-compliant).

To comply with the horizontal guidelines, pilots are given the spatial boundaries of any identified concentrations of migratory birds, which are buffered by the required 1,500 m horizontal avoidance distance. Pilots are then asked to avoid flying in these areas. The only area identified for horizontal avoidance is the key moulting area for Snow Geese.

Additional details concerning helicopter flight purpose (e.g., environmental monitoring, exploration) and pilot rationale were requested during the February 2020 TEWG meeting. To address this request, the helicopter flight database must be re-analysed to maintain consistency and comparability between years. As this data verification and analysis are still in progress, results presented for 2019 are preliminary and may change based on the updated analysis. Transit data and flight rationale will likely be most affected by the updated analysis, while general trends and compliance data will likely remain the same.

7.2 RESULTS AND DISCUSSION

A discrepancy exists between Project Condition #59, suggesting that minimum flight height should be 610 magl in all areas, and Project Condition #71 prescribes a minimum flight height of 650 magl. Considering that most, if not all, areas where Baffinland operated in May through September 2019 were likely to have migratory birds, the default minimum altitude for the analysis was 650 magl (during point to point travel).

There were no “observed concentrations of migratory birds”, nor areas specifically prescribed by the TEWG to avoid for migratory birds were identified in 2019. With exception of the Snow Goose area, no analysis was necessary to determine compliance of 1,100 m vertical and 1,500 m horizontal distance of any other location. No known public complaints occurred about helicopter overflights for follow-up as per Project Condition #72. In 2019, Canadian Helicopters operated four helicopters during the summer season, whereas two or three helicopters have been used previously.

Preliminary results showed that a total of 3,426 transits were flown within the analysis time frame (May to September), of which 292 (9%) intersected the Snow Goose area and 3,134 (91%) were outside of the area (Table 7-1). In 2019, flight height compliance within the Snow Goose area during the moulting season was 93% (Table 7-2; Map 10 and Map 11), and compliance within and outside the Snow Goose area in all months was 91% (Table 7-3; Map 9 to Map 13).

Flight height data were cross-referenced with pilot logs from daily timesheets for the third year in 2019. For analytical purposes, flight height data points were designated “compliant” when elevation requirements were followed, or where pilot’s discretionary rationale for deviating from flight heights was provided. Data points were designated “non-compliant” if they did not meet elevation requirements, and no explanation was provided. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements. Some examples given in 2019 to explain low-level flights included the following:

- drop off/pick up;
- survey;
- slinging;
- weather;
- sampling;
- mobilization/demobilization;
- other (regulatory site tours, medevac, photography, ferrying environmental monitoring crews);
- staking; and
- evacuations.

A draft summary of low-level flight rationale for 2019 is provided in Table 7-4. Preliminary results showed that when considering rationale provided by pilots for low-level flying, most low-level data points were compliant. For example, of all the compliant points within the Snow Goose area during the moulting season, 31% were ≥1,100 magl, and the other 59% were <1,100 magl with reasons given by pilots. Similarly, when looking at all compliant points within and outside the Snow Goose area in all months, only 11% were ≥650 magl, and the other 89% were <650 magl with reasons given by pilots. The high percentage of low-level compliant flights is similar to what was observed in 2017 and 2018, and will likely continue in future years as the majority of helicopter work conducted at Mary River either requires low-level flying for safety/operational reasons (e.g. slinging, surveys), or requires multiple short distance flights whereby helicopters are unable to reach the required elevations between take-off and landing sites (e.g. staking, sampling, drop offs/pickups). In 2019, the most common reasons stated by pilots for flying below the elevation requirements were drop offs/pickups, surveys, and slinging. Most compliant transits that met the elevation requirements in 2019 tended to be long distance flights, where pilots were airborne long enough to reach and maintain the required elevations.

Overall, 2019 flight height compliance was high both inside and outside the Snow Goose area, despite there being nearly 10 times more transits outside the Snow Goose area than inside. The high level of compliance observed in 2019 is largely due to the additional analysis performed, which considered rationale provided by pilots for many of the transits flown below the elevation requirements, as well as improved documentation (i.e., enhanced communications) of the rationale for low-level flights by pilots and Baffinland staff over the past few years.

It is evident that pilots made efforts to avoid the Snow Goose area during the moulting season when possible in 2019, as only 8.5% of all transits were flown over the Snow Goose area. Most transits over the Snow Goose area also appeared to be direct flights between Mary River and Steensby, which only skirted the eastern edge of the boundary, and most flights near the boundary are within a well-defined track, away from habitat areas that have been identified as having higher concentrations of geese within the goose area. Non-compliant transits were those that did not achieve elevation requirements and where no rationale for low-level flights were provided. Baffinland will continue to work with Canadian Helicopters to document flight height compliance and communicate elevation requirements to pilots throughout the flying season. Although most transits were below the recommended elevations, the potential disturbance to birds or other wildlife cannot be quantified.

Table 7-1 **Number of transits flown per month with a breakdown of transits (№ and %) flown over and outside of the Snow Goose area, May 1– September 30, 2019.**

Month	Total Number of Transits	Number of Transits Over Snow Goose Area	% Transits Over Snow Goose Area	Number of Transits Outside Snow Goose Area	% Transits Outside Snow Goose Area
May	88	0	0	88	100
June	737	74	10	663	90
July	1,223	99	8	1,124	92
August	1,047	108	10	939	90
September	284	6	2	278	98
Total	**3,426**	**292**	**8.5**	**3,134**	**91**

Table 7-2 **Elevation points calculated to obtain flight height compliance over the Snow Goose area, May 1– September 30, 2019.**

Month	Area	Total Points	Total Compliant Points ≥1,100 magl	Total Compliant Points <1,100 magl with Rationale	% Compliance	Total Non–Compliant Points	% Non–Compliance
May	Not applicable (n/a)			n/a			
June	Not applicable (n/a)			n/a			
July	Within Snow Goose Area	344	72	240	91	32	9
August	Within Snow Goose Area	470	204	244	95	22	5
September	Not applicable (n/a)			n/a			
Total		**814**	**276**	**484**	**93**	**54**	**7**

magl = metres above ground level.

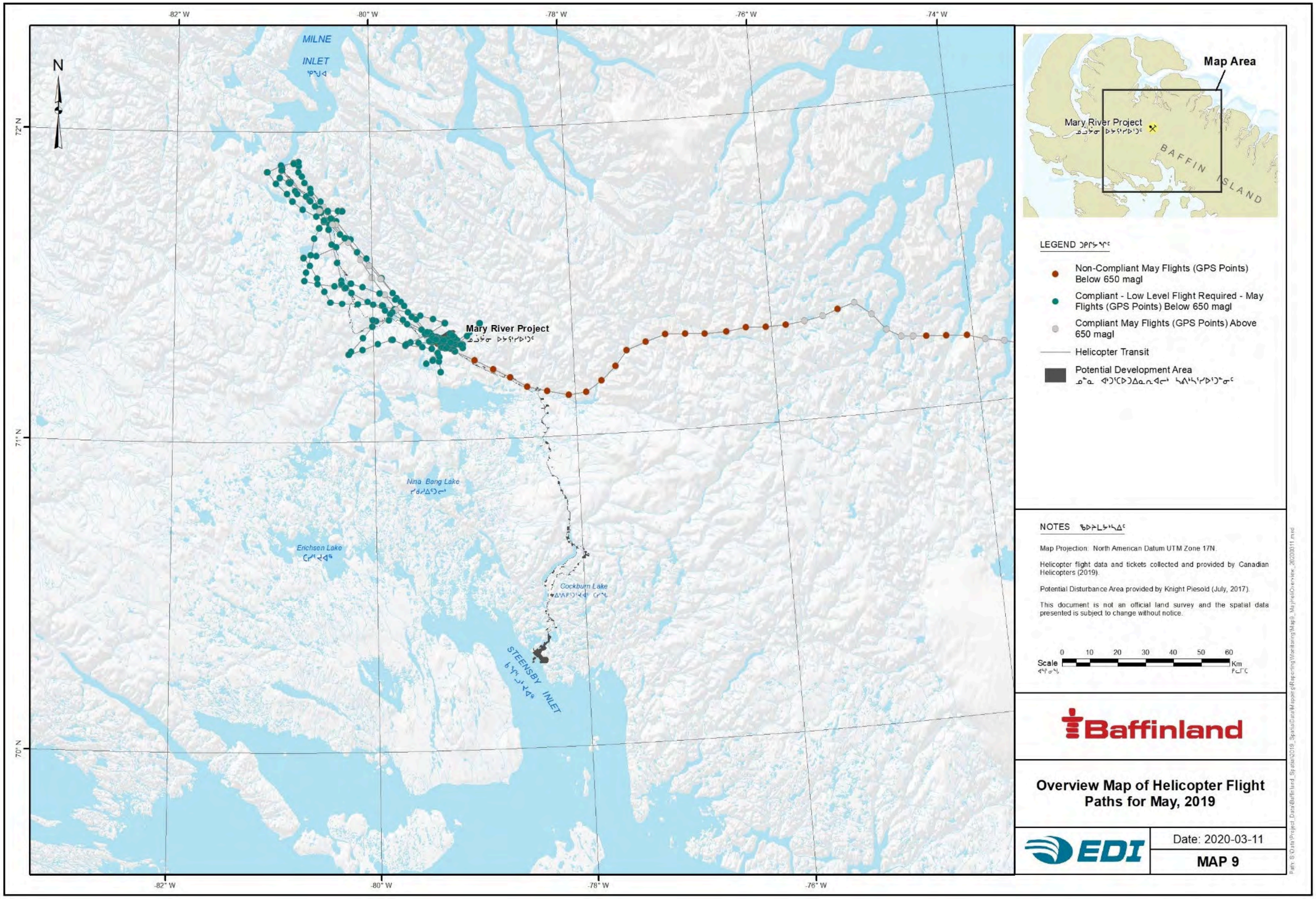
Table 7-3 Elevation points calculated to obtain flight height compliance outside the Snow Goose area, May 1–September 30, 2019.

Month	Area	Total Points	Total Compliant Points ≥650 magl	Total Compliant Points <650 magl with Rationale	% Compliance	Total Non–Compliant Points	% Non–Compliance
May	All Areas	381	25	327	92	29	8
June	All Areas	10,427	1,191	8,604	94	632	6
July	Outside Snow Goose Area	18,510	1,807	15,576	94	1,127	6
August	Outside Snow Goose Area	16,193	2,283	11,688	86	2,222	14
September	All Areas	3,314	212	2,863	93	239	7
Total		**48,825**	**5,518**	**39,058**	**91**	**4,249**	**9**

magl = metres above ground level.

Table 7-4 Draft summary of elevation points calculated to obtain low-level flight rationale in all areas, May 1 – September 30, 2019.

Rationale	Total Elevation Points	% of Total Elevation Points
Drop off/pick up	16,535	33.1
Survey	11,486	23.0
Slinging	10,634	21.3
Weather	1,575	3.2
Sampling	1,161	2.3
Mobilization/demobilization	1,142	2.3
Other	1,012	2.0
Staking	656	1.3
Evacuation	37	0.1
Total	**44,238**	**88.5**



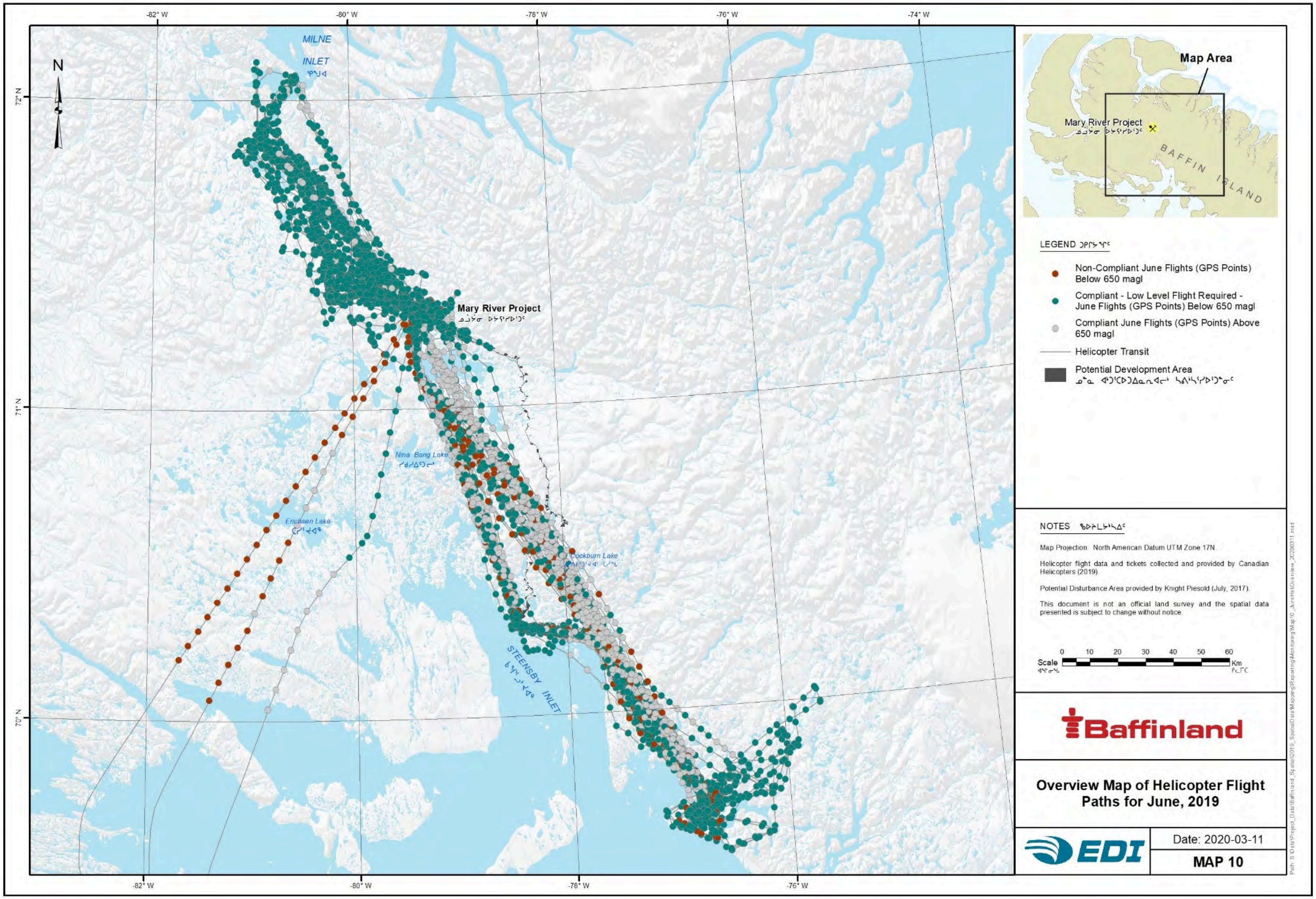
Overview Map of Helicopter Flight Paths for May, 2019

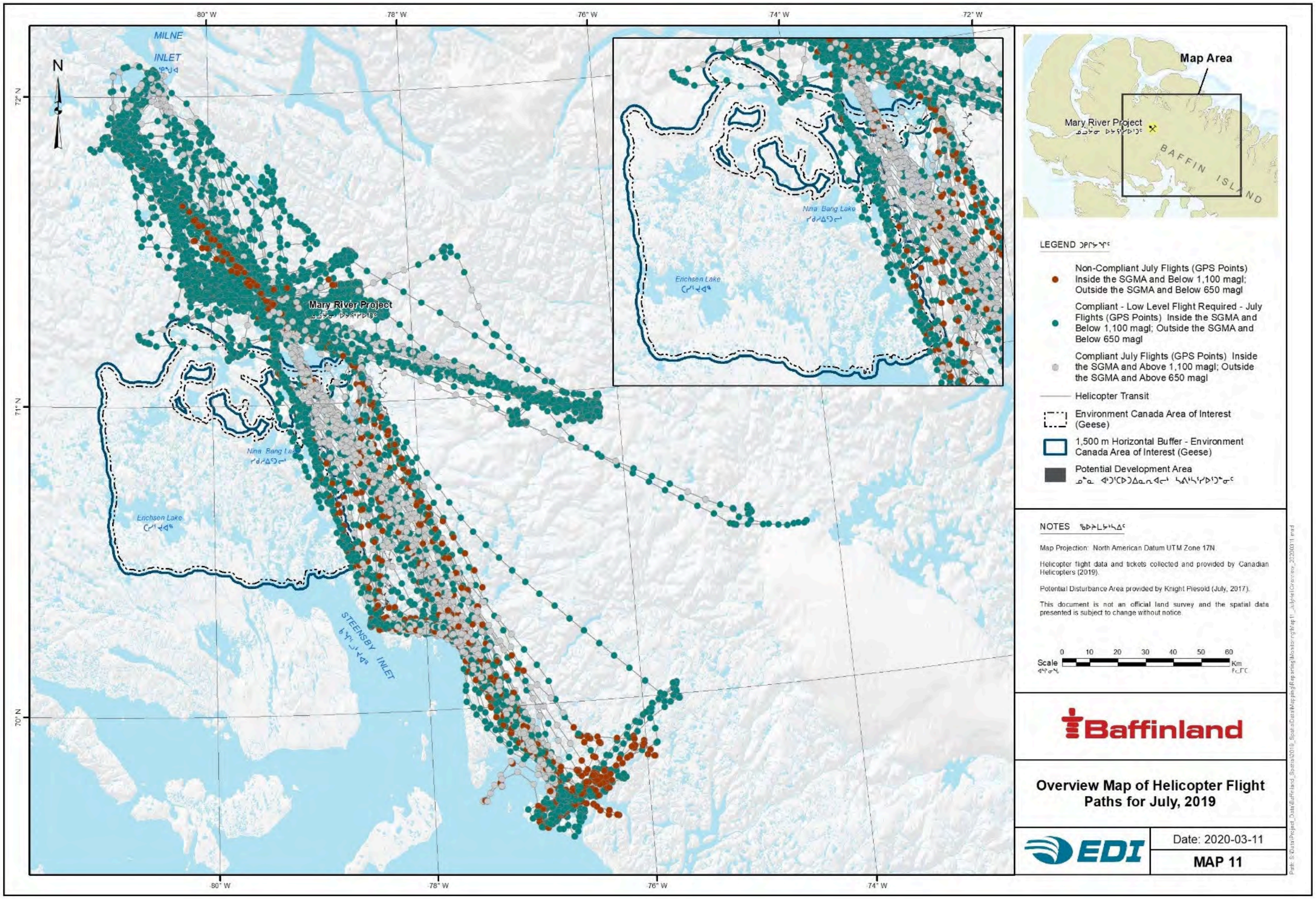
Map Projection: North American Datum UTM Zone 17N.

Helicopter flight data and tickets collected and provided by Canadian Helicopters (2019).

Potential Disturbance Area provided by Knight Piesold (July, 2017).

This document is not an official land survey and the spatial data presented is subject to change without notice.


-82° W
-80° W
-78° W
-76° W
-74° W
72° N
71° N
70° N
N
MILNE
INLET
Mary River Project
Nina Bang Lake
Erichsen Lake
Cockburn Lake
STEENSBY
INLET
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant June Flights (GPS Points) Below 650 magl
Compliant - Low Level Flight Required - June Flights (GPS Points) Below 650 magl
Compliant June Flights (GPS Points) Above 650 magl
Helicopter Transit
Potential Development Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2019).
Potential Disturbance Area provided by Knight Piesold (July, 2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0
10
20
30
40
50
60
Scale
Km
Baffinland
Overview Map of Helicopter Flight Paths for June, 2019
EDI
Date: 2020-03-11
MAP 10


80° W
78° W
76° W
74° W
72° W
72° N
71° N
70° N
N
MILNE INLET
Mary River Project
Nina Bang Lake
Erichsen Lake
STEENSBY INLET
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant July Flights (GPS Points) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant - Low Level Flight Required - July Flights (GPS Points) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant July Flights (GPS Points) Inside the SGMA and Above 1,100 magl; Outside the SGMA and Above 650 magl
Helicopter Transit
Environment Canada Area of Interest (Geese)
1,500 m Horizontal Buffer - Environment Canada Area of Interest (Geese)
Potential Development Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2019).
Potential Disturbance Area provided by Knight Piesold (July, 2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0
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30
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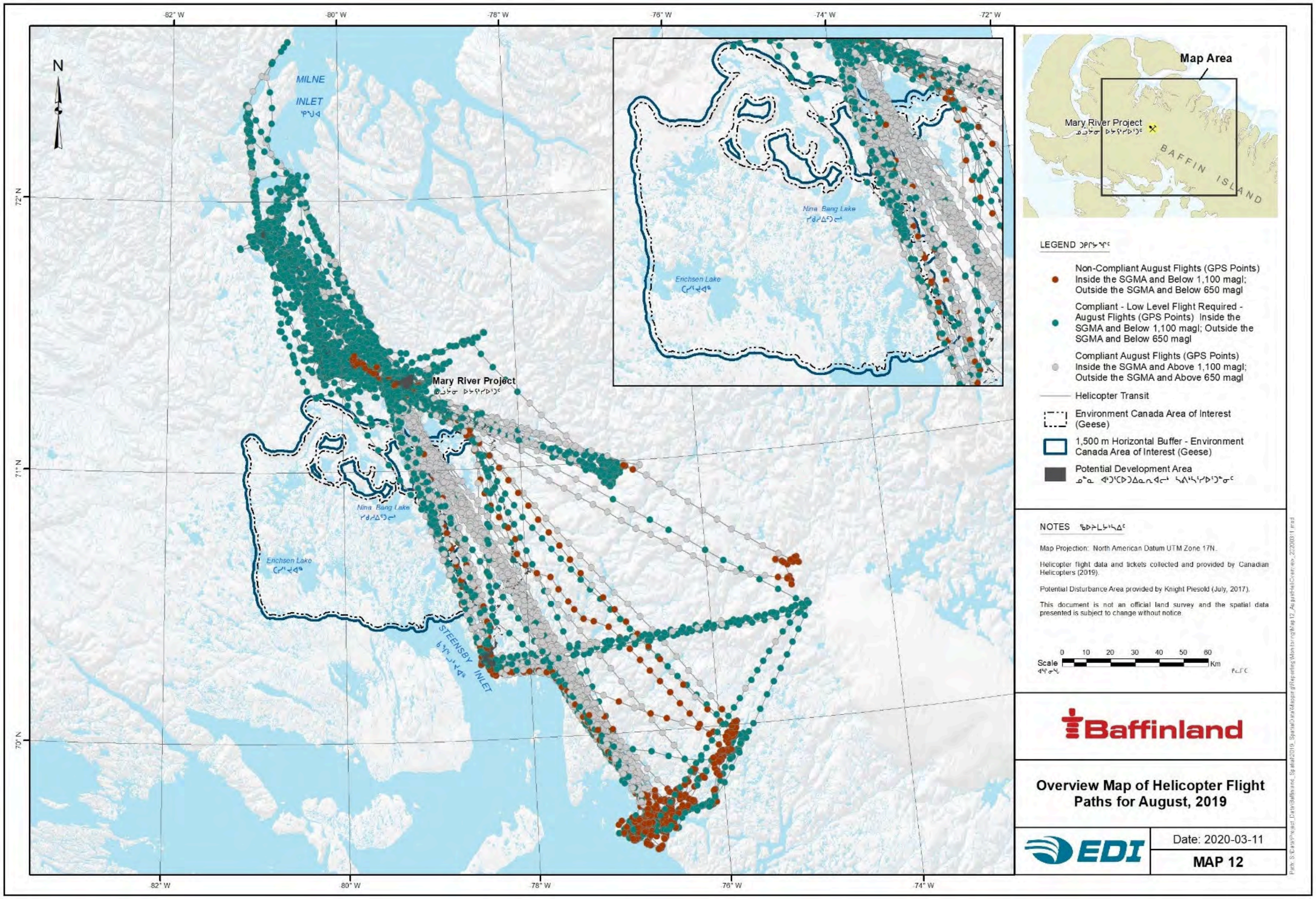
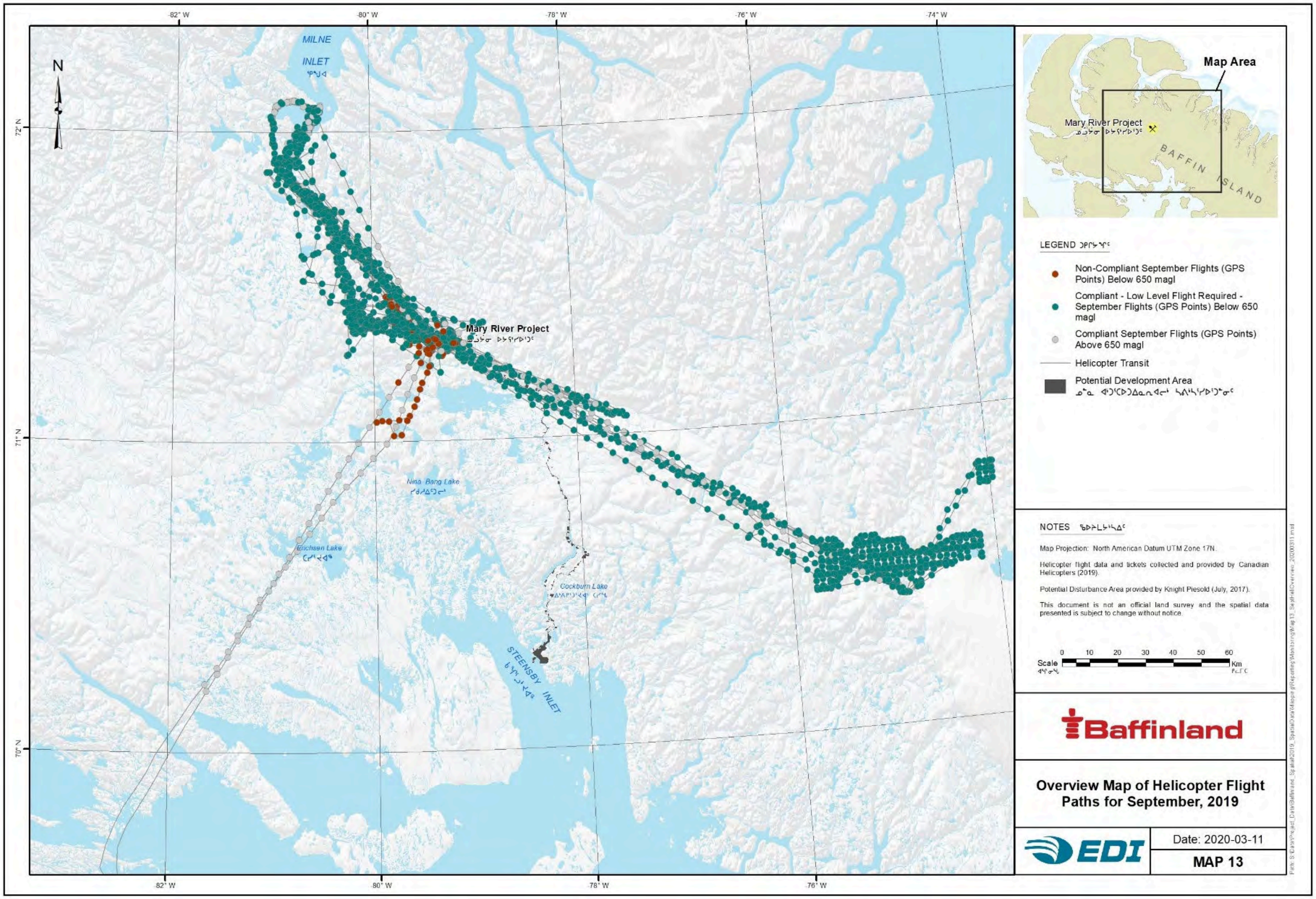
Km
Baffinland
Overview Map of Helicopter Flight Paths for July, 2019
EDI
Date: 2020-03-11
MAP 11


82° W
80° W
78° W
76° W
74° W
72° W
72° N
71° N
70° N
N
MILNE
INLET
Mary River Project
Nina Bang Lake
Erichsen Lake
STEENSBY INLET
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
● Non-Compliant August Flights (GPS Points) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
● Compliant - Low Level Flight Required - August Flights (GPS Points) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
● Compliant August Flights (GPS Points) Inside the SGMA and Above 1,100 magl; Outside the SGMA and Above 650 magl
Helicopter Transit
Environment Canada Area of Interest (Geese)
1,500 m Horizontal Buffer - Environment Canada Area of Interest (Geese)
Potential Development Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2019).
Potential Disturbance Area provided by Knight Piesold (July, 2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0 10 20 30 40 50 60
Scale
Km
Baffinland
Overview Map of Helicopter Flight Paths for August, 2019
EDI
Date: 2020-03-11
MAP 12



NOTES

Map Projection: North American Datum UTM Zone 17N.

Helicopter flight data and tickets collected and provided by Canadian Helicopters (2019).

Potential Disturbance Area provided by Knight Piesold (July, 2017).

This document is not an official land survey and the spatial data presented is subject to change without notice.

Overview Map of Helicopter Flight Paths for September, 2019

Date: 2020-03-11

MAP 13

7.3 INTER-ANNUAL TRENDS

Helicopter flight height compliance inside the Snow Goose area during moulting period was 93% in 2019, which was consistent with 2017 and 2018 (95%, 94%) and considerably higher than 2015 (55%) and 2016 (10%) (Figure 7-1). Helicopter flight height compliance within and outside the goose area in all months was similar in 2019 (91%) to 2018 (98%), and higher than all other previous years.

The 2019 flight season was the third year that additional analysis was performed, which considered rationale provided by pilots for many of the transits flown below the elevation requirements. The increase in compliance from 2017 to 2019 was likely due to this additional analysis as well as improved communication of requirements to pilots and Baffinland staff over the last few years (Figure 7-1). For example, Snow Goose area boundaries were input into the helicopter GPS systems in 2019. However, the 2019 dataset is currently being re-analysed as requested by the TEWG in the February 2020 meeting, and final results regarding total number of transits and a detailed summary of pilot rationale are not available yet.

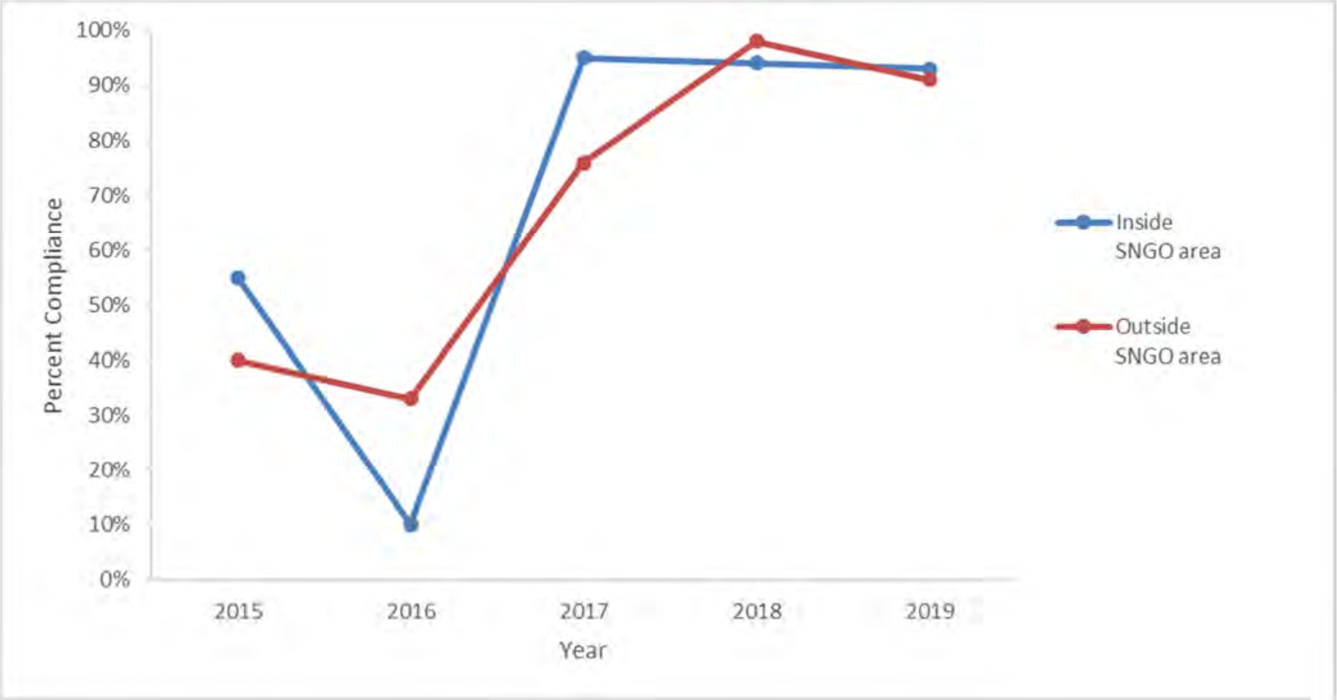


Figure 7-1 Percent compliance for flights inside the goose area during the moulting season and within and outside the goose area in all months from 2015–2019.

7.4 HELICOPTER FLIGHT HEIGHT SUMMARY

- Additional helicopter flight height analysis was requested by the TEWG in the February 2020 meeting. This data verification and analysis are still in progress, and so results presented for 2019 are preliminary and may change based on the updated analysis. Transit data and flight rationale data will be most affected, while general trends and compliance data will likely remain the same.
- Helicopter flight heights continue to be used to monitor potential disturbance to birds and other wildlife inside and outside the Snow Goose area.
- In 2019, helicopter flight height compliance inside the goose area during the moulting period was 93%, and compliance within and outside the goose area in all months was 91%.
- The 2019 flight season was the third year that additional analysis was performed, which considered rationale provided by pilots for many of the transits flown below the elevation requirements.
- This additional analysis showed that when considering rationale provided by pilots for low-level flying, most low-level data points were compliant. For example, of all the compliant points within the Snow Goose area during the moulting season, only 31% were ≥1,100 magl, and the other 59% were <1,100 magl with reasons given by pilots. Similarly, when looking at all compliant points within and outside the Snow Goose area in all months, only 11% were ≥650 magl, and the other 89% were < 650 magl with reasons given by pilots.
- The high percentage of low-level compliant flights in both areas is similar to what was observed in 2017 and 2018, and will likely continue in future years as the majority of helicopter work conducted at Mary River either requires low-level flying for safety/operational reasons (e.g. slinging, surveys), or requires multiple short distance flights whereby helicopters are unable to reach the required elevations between take-off and landing sites (e.g. staking, sampling, drop offs/pickups).
- Most compliant transits that met the elevation requirements in 2019 tended to be long-distance flights, where pilots were airborne long enough to reach and maintain the required elevations.
- Helicopter flight height analysis including rationale from pilot timesheets will continue in 2020.

8 WILDLIFE INTERACTIONS AND MORTALITIES

Although wildlife interactions and mortalities related to the human presence within the Project area are uncommon and measures are taken to avoid them, incidents did occur in 2019. When a wildlife interaction or mortality occurs, an incident report is written, and an investigation is undertaken to better understand the circumstances. Based on the outcomes of the investigation, mitigation methods, when possible, are implemented to address the areas of concern to help prevent further interactions and mortalities.

8.1 WILDLIFE INTERACTIONS AND MORTALITIES IN 2019

In 2019, nine non-fatal wildlife interactions and 14 wildlife mortality incidents were reported, all of which were individual losses. Most of the non-fatal wildlife interactions reported involved Arctic foxes in areas with attractants, such as dumpsters, incinerator or garbage bins at the Mine and Port Sites. Two Arctic foxes and an Arctic hare were observed to have injuries likely as a result of vehicle interactions.

Most of the mortalities that occurred in 2019 involved avian species (a total of eight individuals):

- American Pipit (3)
- Long-tailed Duck (1)
- Snow Bunting (1)
- Common Loon (1)
- Red-throated Loon (1)
- Rock Pigeon (*Columba livia*) (1)

Three of the avian species mortalities involved collisions with infrastructure (warehouse fan, shipping vessel) or vehicles (ore haul truck [OHT]). The Red-throated Loon was caught in a gill net during fish collection for research purposes (Scientific Licence No. S-19/20-1033-NU). The cause of the remainder of the mortalities are unknown.

Four Arctic fox fatalities occurred. One fox was euthanized because it was acting aggressive and not responding to non-lethal deterrents. The aggressive fox tested positive for rabies (Lacarte 2019). Two foxes were found beside Tote Road, deceased from suspected vehicle collisions, and one fox was discovered at the OHT laydown, the cause of death unknown.

Two additional wildlife fatalities occurred in 2019. One Arctic hare fatality occurred, likely resulting from a vehicle collision. One male sub-adult ringed seal was caught in a gill net during fish collection for research purposes (Scientific Licence No. S-19/20-1033-NU).

8.2 WILDLIFE INTERACTION AND MORTALITY PREVENTION MEASURES

Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices and guidelines. All management, supervisors and contract staff attend mandatory Environment Protection Plan (EPP) training, which is then passed on to all employees.

Included in the EPP are protection measures for wolf, polar bear, Arctic fox and caribou and waste management guidelines that are continually updated and implemented. Incineration and proper waste sorting are the most prominent deterrents used. Wildlife attractants such as food scraps and human waste are sorted and sealed in animal-proof containers and incinerated on site. Waste sorting guidelines that clearly define where food and other attractants should be placed are posted around each site. Additionally, wire skirting is used under the main camps at both sites to ensure no wildlife such as foxes or hares can den underneath. For equipment, honking the horn before starting the vehicle helps to scare off wildlife that might be hiding in the equipment. Wildlife has the right of way on all roadways, unless unsafe to do so. Snow banks along Tote Road are reduced where feasible by feathering back snow with equipment to ensure personnel along Tote Road can view wildlife crossing the road. Feeding of wildlife is strictly prohibited and non-compliance is dealt with accordingly.

8.3 INTER-ANNUAL TRENDS

Most mortalities that occurred on site from 2014 to 2019 have been attributed to collisions with infrastructure or vehicles. Other reported causes of mortality include fatal injuries incurred from heavy machinery or Project infrastructure, and euthanasia of animals by on-site staff due to aggressive behaviour towards employees, when rabies was suspected.

No inter-annual trends were identified in terms of wildlife mortality. In 2019, eight avian species mortalities were reported, which was higher than all previous years except 2016, where 10 avian species mortalities were reported. Four Arctic fox mortalities were reported, which is lower than all previous years except 2015, where three Arctic fox mortalities occurred. In addition to avian species and Arctic foxes, one Arctic hare mortality and one ringed seal mortality were reported in 2019. No caribou mortalities have occurred thus far because of the Project (Figure 8-1).

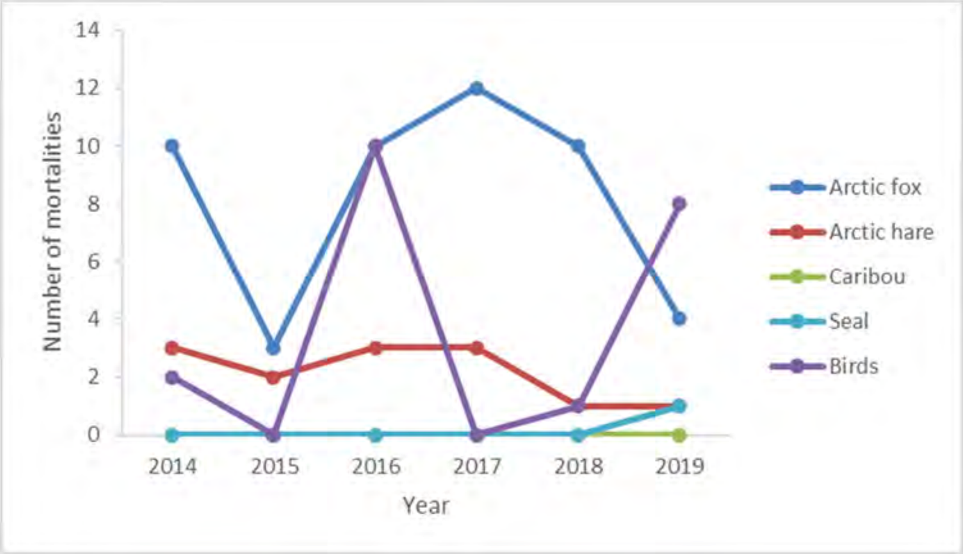


Figure 8-1 Wildlife mortality trends from 2014 to 2019.

8.4 WILDLIFE INTERACTION AND MORTALITY SUMMARY

- In 2019, nine non-fatal wildlife interactions and 14 wildlife mortality incidents were reported, all of which were individual losses.
- Eight of the mortalities that occurred in 2019 involved avian species, three of which were due to collisions with infrastructure or vehicles and one of which was bycatch during gill netting; the cause of the other avian mortalities remains unknown. Of the remaining mortalities, four were Arctic fox, one was an Arctic hare, and one was a ringed seal.
- Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices and guidelines, and integrating preventative measures into road maintenance, infrastructure design, and Environment Protection Plan.

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APPENDIX A. VEGETATION ABUNDANCE MONITORING SITES LOCATIONS

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual distance to PDA (m)	Treatment type	Latitude	Longitude
Mine Site	1	T1D30A	29	Open	71.32020	-79.35944
Mine Site	1	T1D30X	29	Closed	71.32016	-79.35923
Mine Site	1	T1D100A	102	Open	71.31966	-79.36069
Mine Site	1	T1D100X	102	Closed	71.31964	-79.36049
Mine Site	1	T1D750A	751	Open	71.31495	-79.37126
Mine Site	1	T1D750X	751	Closed	71.31495	-79.37126
Mine Site	1	T1D1200A	1,191	Open	71.31239	-79.38171
Mine Site	1	T1D1200X	1,186	Closed	71.31243	-79.38161
Mine Site	2	T2D30A	19	Open	71.31922	-79.19151
Mine Site	2	T2D30X	16	Closed	71.31921	-79.19163
Mine Site	2	T2D100A	175	Open	71.31862	-79.18756
Mine Site	2	T2D100X	174	Closed	71.31871	-79.18748
Mine Site	2	T2D750A	765	Open	71.31549	-79.17373
Mine Site	2	T2D750X	765	Closed	71.31549	-79.17373
Mine Site	2	T2D1200A	1,178	Open	71.31269	-79.16479
Mine Site	2	T2D1200B	1,177	Open	71.31271	-79.16478
Mine Site	2	T2D1200X	1,179	Closed	71.31264	-79.16482
Mine Site	3	T3D30A	30	Open	71.34010	-79.31164
Mine Site	3	T3D30X	34	Closed	71.34013	-79.31172
Mine Site	3	T3D100A	87	Open	71.34042	-79.31307
Mine Site	3	T3D100B	98	Open	71.34051	-79.31317
Mine Site	3	T3D100X	103	Closed	71.34054	-79.31329
Mine Site	3	T3D750A	734	Open	71.34668	-79.31554
Mine Site	3	T3D750X	730	Closed	71.34664	-79.31550
Mine Site	3	T3D71200A	1,445	Open	71.35172	-79.32806
Mine Site	3	T3D1200X	1,445	Closed	71.35172	-79.32806
Tote Road	4	T4D30A	35	Open	71.34193	-79.54399
Tote Road	4	T4D30X	36	Closed	71.34193	-79.54398

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual distance to PDA (m)	Treatment type	Latitude	Longitude
Tote Road	4	T4D100A	95	Open	71.31234	-79.54282
Tote Road	4	T4D100X	98	Closed	71.34231	-79.54267
Tote Road	4	T4D750A	830	Open	71.34631	-79.52631
Tote Road	4	T4D750B	831	Open	71.34626	-79.52620
Tote Road	4	T4D750X	832	Closed	71.34362	-79.52609
Tote Road	4	T4D1200A	1,268	Open	71.34653	-79.51250
Tote Road	4	T4D1200X	1,268	Closed	71.34653	-79.51250
Tote Road	5	T5D30A	21	Open	71.37588	-79.73111
Tote Road	5	T5D30X	22	Closed	71.37586	-79.73100
Tote Road	5	T5D100A*	86	Open	71.37511	-79.73049
Tote Road	5	T5D100X	89	Closed	71.37508	-79.73042
Tote Road	5	T5D750A	730	Open	71.36990	-79.73830
Tote Road	5	T5D750B	738	Open	71.36984	-79.73837
Tote Road	5	T5D750X	740	Closed	71.36983	-79.73842
Tote Road	5	T5D1200A*	1,106	Open	71.36624	-79.73808
Tote Road	5	T5D1200X	1,139	Closed	71.36585	-79.73741
Tote Road	6	T6D30A	42	Open	71.38194	-79.99419
Tote Road	6	T6D30B*	44	Open	71.38197	-79.99432
Tote Road	6	T6D30X	41	Closed	71.38196	-79.99448
Tote Road	6	T6D100A	91	Open	71.38248	-79.99201
Tote Road	6	T6D100X	91	Closed	71.38248	-79.99219
Tote Road	6	T6D750A*	694	Open	71.38803	-79.99321
Tote Road	6	T6D750X	694	Closed	71.38803	-79.99321
Tote Road	6	T6D1200A*	1,225	Open	71.39247	-79.98299
Tote Road	6	T6D1200X	1,226	Closed	71.39249	-79.98305
Milne Inlet	7	T7D30A*	26	Open	71.87114	-80.87792
Milne Inlet	7	T7D30X	26	Closed	71.87122	-80.87794

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual distance to PDA (m)	Treatment type	Latitude	Longitude
Milne Inlet	7	T7D100A	105	Open	71.87211	-80.87576
Milne Inlet	7	T7D100X	99	Closed	71.87212	-80.87593
Milne Inlet	7	T7D750A	884	Open	71.86808	-80.85032
Milne Inlet	7	T7D750B	874	Open	71.86797	-80.85041
Milne Inlet	7	T7D750X	871	Open	71.86788	-80.85025
Milne Inlet	7	T7D1200A	1,136	Open	71.87198	-80.84419
Milne Inlet	7	T7D1200B	1,135	Open	71.87201	-80.84426
Milne Inlet	7	T7D1200X	1,133	Closed	71.87203	-80.84431
Milne Inlet	8	T8D30A	51	Open	71.88273	-80.87804
Milne Inlet	8	T8D30X	54	Closed	71.88277	-80.87793
Milne Inlet	8	T8D100A*	90	Open	71.88243	-80.87705
Milne Inlet	8	T8D100X	94	Closed	71.88245	-80.87691
Milne Inlet	8	T8D750A	818	Open	71.88108	-80.85626
Milne Inlet	8	T8D750B	822	Open	71.88110	-80.85614
Milne Inlet	8	T8D750X	826	Closed	71.88111	-80.85604
Milne Inlet	8	T8D1200A	1,098	Open	71.88471	-80.84666
Milne Inlet	8	T8D1200X	1,104	Closed	71.88476	-80.84648
Mine Site	9	T9D30A*	32	Open	71.29982	-79.26338
Mine Site	9	T9D30X	32	Closed	71.29981	-79.26321
Mine Site	9	T9D100A	135	Open	71.29912	-79.26827
Mine Site	9	T9D100X	134	Closed	71.29915	-79.26846
Mine Site	9	T9D750A	713	Open	71.29443	-79.27907
Mine Site	9	T9D750B	708	Open	71.29448	-79.27903
Mine Site	9	T9D750X	701	Closed	71.29453	-79.27890
Mine Site	9	T9D1200A	1,186	Open	71.29173	-79.29365
Mine Site	9	T9D1200X	1,182	Closed	71.29176	-79.29358

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual distance to PDA (m)	Treatment type	Latitude	Longitude
Mine Site	10	T10D30A	28	Open	71.34274	-79.29750
Mine Site	10	T10D30X	34	Closed	71.34280	-79.29755
Mine Site	10	T10D100A	127	Open	71.34355	-79.29861
Mine Site	10	T10D100B	127	Open	71.34355	-79.29861
Mine Site	10	T10D100X	127	Closed	71.34355	-79.29861
Mine Site	10	T10D750A	650	Open	71.34911	-79.29802
Mine Site	10	T10D750X	650	Closed	71.34911	-79.29802
Mine Site	10	T10D1200A*	1,219	Open	71.35276	-79.31007
Mine Site	10	T10D1200X	1,219	Closed	71.35276	-79.31007
Mine Site	11	T11D30A	29	Open	71.31259	-79.19954
Mine Site	11	T11D30X	17	Closed	71.31273	-79.19974
Mine Site	11	T11D100A	233	Open	71.31095	-79.19546
Mine Site	11	T11D100X	233	Closed	71.31095	-79.19546
Mine Site	11	T11D750A*	804	Open	71.30648	-79.18466
Mine Site	11	T11D750B	805	Open	71.30640	-79.18483
Mine Site	11	T11D750X	802	Closed	71.30642	-79.18486
Mine Site	11	T11D1200A	1,219	Open	71.30536	-79.17309
Mine Site	11	T11D1200X	1,225	Closed	71.30538	-79.17287
Tote Road	12	T12D30A	55	Open	71.41457	-80.1019
Tote Road	12	T12D30X*	50	Closed	71.41467	-80.1021
Tote Road	12	T12D100A	113	Open	71.41430	-80.10019
Tote Road	12	T12D100X	113	Closed	71.4143	-80.10019
Tote Road	12	T12D750A	757	Open	71.41617	-80.08279
Tote Road	12	T12D750B	757	Open	71.41617	-80.08279
Tote Road	12	T12D750X	757	Closed	71.41617	-80.08279
Tote Road	12	T12D1200A*	1,141	Open	71.41851	-80.07372

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	**Transect/ Reference No.**	**Plot ID[1]**	**Actual distance to PDA (m)**	**Treatment type**	**Latitude**	**Longitude**
Tote Road	12	T12D1200X	1,140	Closed	71.41859	-80.07383
Tote Road	13	T13D30A	35	Open	71.42143	-80.10964
Tote Road	13	T13D30B	35	Open	71.42143	-80.10964
Tote Road	13	T13D30X	35	Closed	71.42143	-80.10964
Tote Road	13	T13D100A	87	Open	71.42149	-80.10794
Tote Road	13	T13D100X	87	Closed	71.42149	-80.10794
Tote Road	13	T13D750A	669	Open	71.42509	-80.09329
Tote Road	13	T13D750X	674	Closed	71.42512	-80.09317
Tote Road	13	T13D1200A	1,166	Open	71.42884	-80.08349
Tote Road	13	T13D1200X	1,165	Closed	71.42895	-80.08375
Milne Inlet	14	T14D30A	43	Open	71.87797	-80.87826
Milne Inlet	14	T14D30X	37	Closed	71.87815	-80.87845
Milne Inlet	14	T14D100A	129	Open	71.87736	-80.87571
Milne Inlet	14	T14D100X	118	Closed	71.87738	-80.87601
Milne Inlet	14	T14D750A	756	Open	71.87649	-80.85755
Milne Inlet	14	T14D750X	749	Closed	71.87649	-80.85775
Milne Inlet	14	T14D1200A	1,178	Open	71.87772	-80.84550
Milne Inlet	14	T14D1200B	1,173	Open	71.87770	-80.84564
Milne Inlet	14	T14D1200X	1,170	Closed	71.87766	-80.84573
Milne Inlet	15	T15D30A	48	Open	71.87430	-80.87769
Milne Inlet	15	T15D30X	50	Closed	71.87434	-80.87763
Milne Inlet	15	T15D100A	104	Open	71.87393	-80.87603
Milne Inlet	15	T15D100X	100	Closed	71.87391	-80.87615
Milne Inlet	15	T15D750A*	812	Open	71.87411	-80.85563
Milne Inlet	15	T15D750X	806	Closed	71.87427	-80.85583
Milne Inlet	15	T15D1200A	1,130	Open	71.87504	-80.84659

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual distance to PDA (m)	Treatment type	Latitude	Longitude
Milne Inlet	15	T15D1200X	1,126	Closed	71.87500	-80.84671
Total (60 sites)	**--**	**133 plots**	--	--	--	--
Reference	1	REF1A	19,450	Open	71.16658	-79.71055
Reference	1	REF1B*	19,448	Open	71.16658	-79.71037
Reference	1	REF1X	19,450	Closed	71.16655	-79.71028
Reference	2	REF2A	20,409	Open	71.51695	-78.91855
Reference	2	REF2B	20,410	Open	71.51694	-78.91845
Reference	2	REF2X	20,407	Closed	71.51690	-78.91839
Reference	3	REF3A*	20,595	Open	71.85313	-79.99586
Reference	3	REF3B*	20,593	Open	71.85307	-79.99581
Reference	3	REF3X	20,594	Closed	71.85302	-79.99567
Reference	4	REF4A*	21,178	Open	71.88674	-80.05467
Reference	4	REF4B	21,185	Open	71.88678	-80.05450
Reference	4	REF4X	21,190	Closed	71.88680	-80.05435
Reference	5	REF5A*	33,185	Open	71.65634	-79.34103
Reference	5	REF5B	33,184	Open	71.65635	-79.34108
Reference	5	REF5X	33,184	Closed	71.65638	-79.34125
Reference	6	REF6A	16,435	Open	71.29160	-80.39122
Reference	6	REF6B	16,429	Open	71.29161	-80.39097
Reference	6	REF6X	16,432	Closed	71.29155	-80.39089
Reference	7	REF7A	22537	Open	71.2059	-80.6292
Reference	7	REF7B	22537	Open	71.2059	-80.6292
Reference	7	REF7X	22537	Closed	71.2059	-80.6292
Reference	8	REF8A	23336	Open	71.2309	-80.7278
Reference	8	REF8B	23336	Open	71.2309	-80.7278
Reference	8	REF8X	23336	Closed	71.2309	-80.7278

Table A-1. Vegetation Abundance Monitoring Site Locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual distance to PDA (m)	Treatment type	Latitude	Longitude
Reference	9	REF9A	34634	Open	71.6994	-79.3761
Reference	9	REF9B	34634	Open	71.6994	-79.3761
Reference	9	REF9X	34634	Closed	71.6994	-79.3761
Reference	10	REF10A	32562	Open	71.7220	-79.4602
Reference	10	REF10B	32562	Open	71.7220	-79.4602
Reference	10	REF10X	32562	Closed	71.7220	-79.4602
Reference	11	REF11A	21221	Open	71.5311	-78.9635
Reference	11	REF11B	21221	Open	71.5311	-78.9635
Reference	11	REF11X	21221	Closed	71.5311	-78.9635
Reference	12	REF12A	20074	Open	71.1703	-79.7754
Reference	12	REF12B	20074	Open	71.1703	-79.7754
Reference	12	REF12X	20074	Closed	71.1703	-79.7754
Reference	13	REF13A	22085	Open	71.8114	-79.8702
Reference	13	REF13B	22085	Open	71.8114	-79.8702
Reference	13	REF13X	22085	Closed	71.8114	-79.8702
Reference	14	REF14A	22308	Open	71.8706	-79.9601
Reference	14	REF14B	22308	Open	71.8706	-79.9601
Reference	14	REF14X	22308	Closed	71.8706	-79.9601
Reference	15	REF15A	17530	Open	71.8484	-80.0778
Reference	15	REF15B	17530	Open	71.8484	-80.0778
Reference	15	REF15X	17530	Closed	71.8484	-80.0778
Total (15 Reference sites)	**--**	**45 plots**	--	--	--	--
Total (75 sites)	**--**	**178 plots**	--	--	--	--

APPENDIX B. SOILS ASSESSMENT AT VEGETATION ABUNDANCE MONITORING SITES, 2019

Table B-1. Soils Assessment at Vegetation Abundance Monitoring Sites, 2019.

Location	Site ID	Elev (m)	Asp[1]	Slope	Surface Shape	Slope Pos	SMR[2]	Drainage	Soil Text[3]	% Coarse Frag	Rest[4] (cm)	Rest Type[5]	Est Root Depth (cm)	Lat[6]	Long[6]
Mine Site	REF1	173	NE	Moderate = >10-30%	Straight	Mid	5	Imperfectly	FSL	3	-	Frost	55	71.1665	-79.7101
Mine Site	REF2	540	-	Level = <2%	Straight	Lower	7	Poorly	L	1	-	-	36	71.5169	-78.9187
Milne Port	REF3	137	-	Level = <2%	Straight	Level	4	Well	S	60	-	-	29	71.8530	-79.9957
Milne Port	REF4	98	-	Level = <2%	Straight	Toe	5	Moderately Well	SL/L	5	-	-	>31	71.8867	-80.0548
Tote Road	REF5	602	-	Level = <2%	Straight	Level	5	Moderately Well	SL	0	-	-	21	71.6563	-79.3409
Tote Road	REF6	229	NW	Moderate = >10-30%	Straight	Mid	4	Moderately Well	L	5	-	-	49	71.2915	-80.3910
Tote Road	REF7	146	NW	Moderate = >10-30%	Straight	Mid	4	Moderately Well	S	0	43	Frost	33	71.2059	-80.6292
Tote Road	REF8	162	SW	Gentle = >2-10%	Straight	Lower	4	Moderately Well	SL	0	42	Frost	39	71.2309	-80.7278
Tote Road	REF9	644	-	Level = <2%	Straight	Level	5	Moderately Well	S	5	37	Frost	9	71.6993	-79.3761
Tote Road	REF10	610	-	Level = <2%	Straight	Level	5	Imperfectly	S	0	-	-	13	71.7220	-79.4595
Mine Site	REF11	533	NE	Gentle = >2-10%	Straight	Mid	5	Imperfectly	S	0	-	-	15	71.5309	-78.9634
Mine Site	REF12	199	SW	Gentle = >2-10%	Straight	Mid	4	Moderately Well	L	0	24	Frost	24	71.1703	-79.7754
Milne Port	REF13	147	-	Level = <2%	Straight	Level	6	Imperfectly	L	60	-	-	20	71.8113	-79.8697
Milne Port	REF14	145	-	Level = <2%	Straight	Level	5	Moderately Well	L	15	-	-	33	71.8706	-79.9604
Milne Port	REF15	218	NE	Gentle = >2-10%	Straight	Mid	5	Moderately Well	L/S	0	31	Frost	30	71.8484	-80.0777
Mine Site	T1D30	175	-	Level = <2%	Straight	Level	4	Well	LS	60	-	-	>22	71.3201	-79.3594

Table B-1. Soils Assessment at Vegetation Abundance Monitoring Sites, 2019.

Location	Site ID	Elev (m)	Asp[1]	Slope	Surface Shape	Slope Pos	SMR[2]	Drainage	Soil Text[3]	% Coarse Frag	Rest[4] (cm)	Rest Type[5]	Est Root Depth (cm)	Lat[6]	Long[6]
Mine Site	T1D100	187	-	Level = <2%	Straight	Level	6	Imperfectly	FSL/ SL	40	-	-	20	71.3196	-79.3606
Mine Site	T1D750	182	-	Level = <2%	Straight	Level	4	Well	LS	0	24	Frost	24	71.3150	-79.3713
Mine Site	T1D1200	170	-	Level = <2%	Straight	Level	6	Imperfectly	SL	10	-	-	>30	71.3123	-79.3818
Mine Site	T2D30	337	SW	Gentle = >2-10%	Undulating	Level	5	Moderately Well	SL	10	-	-	30	71.3193	-79.1915
Mine Site	T2D100	339	-	Level = <2%	Straight	Mid	5	Moderately Well	SL	25	-	-	31	71.3187	-79.1877
Mine Site	T2D750	348	SW	Gentle = >2-10%	Undulating	Mid	5	Moderately Well	SL	5	-	-	50	71.3155	-79.1740
Mine Site	T2D1200	322	-	Level = <2%	Undulating	Mid	4	Well	LS/SL	35	37	Frost	37	71.3126	-79.1648
Mine Site	T3D30	320	-	Level = <2%	Straight	Level	4	Moderately Well	LS	5	30	Frost	29	71.3401	-79.3116
Mine Site	T3D100	306	-	Level = <2%	Straight	Dep	7	Poorly	LS	5	32	Frost	32	71.3406	-79.3134
Mine Site	T3D750	341	-	Level = <2%	Straight	Level	4	Well	LS	60	-	-	25	71.3466	-79.3153
Mine Site	T3D1200	330	SW	Gentle = >2-10%	Straight	Toe	4	Moderately Well	SiL	0	27	Frost	26	71.3517	-79.3279
Tote Road	T4D30	181	W	Gentle = >2-10%	Straight	Level	5	Imperfectly	L	15	-	-	25	71.3420	-79.1544
Tote Road	T4D100	182	W	Gentle = >2-10%	Convex	Toe	5	Imperfectly	L	0	-	-	24	71.3424	-79.5429
Tote Road	T4D750	183	-	Level = <2%	Straight	Mid	7	Poorly	SL	0	23	Frost	23	71.3463	-79.5264
Tote Road	T4D1200	172	-	Level = <2%	Straight	Mid	5	Moderately Well	SCL	0	37	Frost	37	71.3465	-79.5127
Tote Road	T5D30	176	E	Moderate = >10-30%	Straight	Mid	4	Well	LS	0	-	-	34	71.3758	-79.7311

Table B-1. Soils Assessment at Vegetation Abundance Monitoring Sites, 2019.

Location	Site ID	Elev (m)	Asp[1]	Slope	Surface Shape	Slope Pos	SMR[2]	Drainage	Soil Text[3]	% Coarse Frag	Rest[4] (cm)	Rest Type[5]	Est Root Depth (cm)	Lat[6]	Long[6]
Tote Road	T5D100	186	E	Gentle = >2-10%	Straight	Level	4	Moderately Well	LS	0	-	-	29	71.3750	-79.7302
Tote Road	T5D750	174	-	Level = <2%	Straight	Mid	4	Well	LS/SL	50	-	-	20	71.3700	-79.7382
Tote Road	T5D1200	170	-	Level = <2%	Straight	Level	4	Well	L	70	13	LIthic	13	71.3658	-79.7373
Tote Road	T6D30	244	W	Gentle = >2-10%	Straight	Lower	5	Moderately Well	S	0	26	Frost	26	71.3819	-79.9944
Tote Road	T6D100	257	W	Moderate = >10-30%	Straight	Lower	6	Imperfectly	SL	10	40	Frost	38	71.3825	-79.9921
Tote Road	T6D750	297	SW	Gentle = >2-10%	Straight	Mid	4	Well	SL	5	-	-	34	71.3880	-79.9932
Tote Road	T6D1200	327	-	Level = <2%	Straight	Level	4	Well	LS	75	-	-	36	71.3925	-79.9833
Milne Port	T7D30	116	NW	Moderate = >10-30%	Convex	Upper	4	Well	SL	70	-	-	24	71.8713	-80.8780
Milne Port	T7D100	114	-	Level = <2%	Concave	Level	4	Well	SiL	25	-	-	26	71.8722	-80.8763
Milne Port	T7D750	115	-	Level = <2%	Undulating	Level	4	Moderately Well	SL	70	-	-	40	71.8679	-80.8503
Milne Port	T7D1200	156	-	Level = <2%	Concave	Lower	4	Well	SL	60	-	-	34	71.8720	-80.8441
Milne Port	T8D30	34	-	Level = <2%	Undulating	Mid	4	Well	CL	30	25	Frost	11	71.8828	-80.8780
Milne Port	T8D100	37	-	Level = <2%	Undulating	Level	5	Moderately Well	SiL	60	-	-	11	71.8824	-80.8772
Milne Port	T8D750	70	-	Level = <2%	Straight	Level	4	Well	SL	25	-	-	>24	71.8812	-80.8562
Milne Port	T8D1200	31	W	Level = <2%	Straight	Level	4	Well	FSL	5	-	-	30	71.8847	-80.8467
Mine Site	T9D30	176	-	Level = <2%	Straight	Level	4	Moderately Well	SL	5	-	-	30	71.2998	-79.2631

Table B-1. Soils Assessment at Vegetation Abundance Monitoring Sites, 2019.

Location	Site ID	Elev (m)	Asp[1]	Slope	Surface Shape	Slope Pos	SMR[2]	Drainage	Soil Text[3]	% Coarse Frag	Rest[4] (cm)	Rest Type[5]	Est Root Depth (cm)	Lat[6]	Long[6]
Mine Site	T9D100	180	-	Level = <2%	Straight	Level	4	Moderately Well	L	60	-	-	18	71.2992	-79.2683
Mine Site	T9D750	181	-	Level = <2%	Straight	Level	5	Moderately Well	SL/L	0	-	-	25	71.2944	-79.2794
Mine Site	T9D1200	180	-	Level = <2%	Straight	Level	5	Moderately Well	SiL/L	0	18	Frost	18	71.2918	-79.2941
Mine Site	T10D30	407	-	Level = <2%	Straight	Dep	7	Poorly	LS	15	-	-	24	71.3428	-79.2976
Mine Site	T10D100	408	-	Level = <2%	Straight	Level	5	Moderately Well	SL	15	-	-	38	71.3436	-79.2985
Mine Site	T10D750	449	-	Level = <2%	Straight	Level	5	Imperfectly	S	60	-	-	28	71.3492	-79.2980
Mine Site	T10D1200	413	-	Level = <2%	Straight	Dep	7	Imperfectly	L	0	-	-	36	71.3528	-79.3101
Mine Site	T11D30	293	SE	Gentle = >2-10%	Straight	Mid	5	Moderately Well	L	20	-	-	53	71.3126	-79.1997
Mine Site	T11D100	265	N	Gentle = >2-10%	Undulating	Gully	4	Well	S	60	-	-	38	71.3110	-79.1954
Mine Site	T11D750	326	NE	Gentle = >2-10%	Straight	Mid	5	Imperfectly	SL	30	-	-	40	71.3065	-79.1847
Mine Site	T11D1200	332	NE	Gentle = >2-10%	Straight	Mid	5	Imperfectly	SL	5	-	-	28	71.3054	-79.1729
Tote Road	T12D30	269	W	Gentle = >2-10%	Straight	Crest	4	Well	L	70	-	-	35	71.4146	-80.1021
Tote Road	T12D100	270	N	Gentle = >2-10%	Straight	Dep	4	Well	SL	40	-	-	37	71.4143	-80.1004
Tote Road	T12D750	311	NW	Moderate = >10-30%	Straight	Mid	4	Well	L	75	-	-	35	71.4161	-80.0830
Tote Road	T12D1200	329	W	Gentle = >2-10%	Straight	Mid	4	Well	S	35	-	-	38	71.4186	-80.0737
Tote Road	T13D30	241	NW	Gentle = >2-10%	Straight	Lower	7	Imperfectly	L	20	-	-	42	71.4214	-80.1096

Table B-1. Soils Assessment at Vegetation Abundance Monitoring Sites, 2019.

Location	Site ID	Elev (m)	Asp[1]	Slope	Surface Shape	Slope Pos	SMR[2]	Drainage	Soil Text[3]	% Coarse Frag	Rest[4] (cm)	Rest Type[5]	Est Root Depth (cm)	Lat[6]	Long[6]
Tote Road	T13D100	238	NW	Gentle = >2-10%	Straight	Mid	7	Poorly	L	35	-	-	34	71.4214	-80.1080
Tote Road	T13D750	284	NW	Moderate = >10-30%	Straight	Mid	4	Well	SL	50	-	-	35	71.4252	-80.0931
Tote Road	T13D1200	290	N	Gentle = >2-10%	Straight	Mid	4	Well	LS	70	-	-	43	71.4289	-80.0836
Milne Port	T14D30	74	-	Level = <2%	Undulating	Level	4	Well	FSL/ SL	70	-	-	20	71.8781	-80.8785
Milne Port	T14D100	111	-	Level = <2%	Straight	Level	4	Well	L	60	-	-	33	71.8774	-80.8759
Milne Port	T14D750	82	-	Level = <2%	Undulating	Mid	4	Well	FSL/L	50	-	-	22	71.8764	-80.8577
Milne Port	T14D1200	117	-	Level = <2%	Straight	Lower	5	Moderately Well	SL/LS	15	-	-	>21	71.8777	-80.8454
Milne Port	T15D30	111	-	Level = <2%	Straight	Toe	6	Imperfectly	SiCL	55	-	-	40	71.8743	-80.8776
Milne Port	T15D100	118	W	Moderate = >10-30%	Straight	Mid	4	Well	L	40	-	-	33	71.8739	-80.8763
Milne Port	T15D750	91	W	Gentle = >2-10%	Undulating	Mid	4	Well	L	60	-	-	35	71.8743	-80.8558
Milne Port	T15D1200	162	W	Moderate = >10-30%	Straight	Upper	4	Well	L	50	-	-	35	71.8750	-80.8466

[1] Aspect: N = north; S =south; E = east; W = west; "-" = no aspect

[2] SMR = soil moisture regime

[3] Soil Texture: S = sand; LS = loamy sand; SL = Sandy Loam; FSL = fine sandy loam; SCL = sandy clay loam; SCL = sandy clay; Si = silt; SiL = silt loam; L = loam; SiCL = silty clay loam; CL = clay loam

[4] Depth of restriction present in soil pit (cm)

[5] Restriction type; "-" = no restriction encountered in soil pit

[6] Soil pit location at associated vegetation abundance monitoring site

APPENDIX C. VEGETATION AND SOILS BASE METALS MONITORING SITES, 2012–2019

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
2019 Sampling												
Milne Port	L-118	1	1			50	Near	0-100	n/a	n/a	71.8759	-80.8778
Milne Port	L-118-R*	1	1			50	Near	0-100	n/a	n/a	71.8759	-80.8778
Milne Port	L-119	1	1			40	Near	0-100	n/a	n/a	71.8768	-80.8782
Milne Port	L-120	1	1			19	Near	0-100	n/a	n/a	71.8777	-80.8789
Milne Port	L-121	1	1			63	Near	0-100	n/a	n/a	71.8783	-80.8777
Milne Port	L-121-R*	1	1			63	Near	0-100	n/a	n/a	71.8783	-80.8777
Milne Port	L-122	1	1			46	Near	0-100	n/a	n/a	71.8792	-80.8783
Milne Port	L-135	1	1			3264	Reference	>1000	DF-P-03	22	71.8994	-80.7882
Milne Port	L-136	1	1			755	Far	101-1000	n/a	n/a	71.8753	-80.8574
Milne Port	L-137	1	1			726	Far	101-1000	n/a	n/a	71.8766	-80.8584
Milne Port	L-137-R*	1	1			726	Far	101-1000	n/a	n/a	71.8766	-80.8584
Milne Port	L-139	1	1			3156	Reference	>1000	DF-P-03	124	71.8988	-80.7909
Milne Port	L-140	1	1			2302	Reference	>1000	n/a	n/a	71.8848	-80.8118
Milne Port	L-141	1	1			2167	Reference	>1000	n/a	n/a	71.8865	-80.8157
Milne Port	L-141-R*	1	1			2167	Reference	>1000	n/a	n/a	71.8865	-80.8157
Milne Port	L-142	1	1			841	Far	101-1000	n/a	n/a	71.8742	-80.8548
Milne Port	L-143	1	1			34	Near	0-100	n/a	n/a	71.8814	-80.8789
Milne Port	L-144	1	1			35	Near	0-100	n/a	n/a	71.8808	-80.8788
Milne Port	L-145	1	1			44	Near	0-100	n/a	n/a	71.8820	-80.8786
Milne Port	L-145-R*	1	1			44	Near	0-100	n/a	n/a	71.8820	-80.8786
Milne Port	L-146	1	1			83	Near	0-100	n/a	n/a	71.8830	-80.8770
Milne Port	L-147	1	1			104	Near	0-100	n/a	n/a	71.8838	-80.8760
Mine Site	L-128	1	1			31	Near	0-100	n/a	n/a	71.3202	-79.3595
Mine Site	L-128-R*	1	1			31	Near	0-100	n/a	n/a	71.3202	-79.3595
Mine Site	L-129	1	1			744	Far	101-1000	n/a	n/a	71.3150	-79.3712
Mine Site	L-130	1	1			34	Near	0-100	n/a	n/a	71.2998	-79.2634
Mine Site	L-130-R*	1	1			34	Near	0-100	n/a	n/a	71.2998	-79.2634

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Mine Site	L-131	1	1			71	Near	0-100	n/a	n/a	71.2997	-79.2683
Mine Site	L-132	1	1			2	Near	0-100	n/a	n/a	71.3000	-79.2615
Mine Site	L-133	1	1			18	Near	0-100	n/a	n/a	71.3220	-79.3677
Mine Site	L-133-R*	1	1			18	Near	0-100	n/a	n/a	71.3220	-79.3677
Mine Site	L-134	1	1			238	Far	101-1000	n/a	n/a	71.3181	-79.3600
Mine Site	L-138	1	1			4139	Reference	>1000	n/a	n/a	71.2968	-79.0955
Mine Site	L-153	1	1			19	Near	0-100	n/a	n/a	71.3004	-79.2729
Mine Site	L-154	1	1			87	Near	0-100	n/a	n/a	71.3101	-79.2015
Mine Site	L-155	1	1			74	Near	0-100	n/a	n/a	71.3101	-79.2112
Mine Site	L-156	1	1			56	Near	0-100	n/a	n/a	71.3093	-79.2218
Mine Site	L-156-R*	1	1			56	Near	0-100	n/a	n/a	71.3093	-79.2218
Mine Site	L-157	1	1			53	Near	0-100	n/a	n/a	71.3076	-79.2340
Mine Site	L-158	1	1			92	Near	0-100	n/a	n/a	71.3060	-79.2373
Mine Site	L-159	1	1			367	Far	101-1000	n/a	n/a	71.3103	-79.1922
Mine Site	L-160	1	1			417	Far	101-1000	n/a	n/a	71.3111	-79.1897
Mine Site	L-165	1	1			8922	Reference	>1000	DF-M-04	3	71.2197	-79.3276
Mine Site	L-165-R*	1	1			8922	Reference	>1000	DF-M-04	3	71.2197	-79.3276
Mine Site	L-166	1	1			10246	Reference	>1000	n/a	n/a	71.3843	-78.9051
Mine Site	L-170	1	1			1221	Reference	>1000	DF-M-07	9	71.3001	-79.1953
Mine Site	L-174	1	1			1214	Reference	>1000	DF-M-06	36	71.3196	-79.1550
Tote Road	L-123	1	1			246	Far	101-1000	n/a	n/a	71.3954	-79.8187
Tote Road	L-124	1	1			66	Near	0-100	DF-RS-03	8	71.3967	-79.8230
Tote Road	L-125	1	1			75	Near	0-100	n/a	n/a	71.3962	-79.8284
Tote Road	L-125-R*	1	1			75	Near	0-100	n/a	n/a	71.3962	-79.8284
Tote Road	L-126	1	1			11	Near	0-100	n/a	n/a	71.3978	-79.8177
Tote Road	L-127	1	1			0	Near	0-100	DF-RS-04	15	71.3974	-79.8225
Tote Road	L-148	1	1			54	Near	0-100	n/a	n/a	71.3941	-79.8532
Tote Road	L-149	1	1			36	Near	0-100	n/a	n/a	71.3958	-79.8447

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Tote Road	L-149-R*	1	1			36	Near	0-100	n/a	n/a	71.3958	-79.8447
Tote Road	L-150	1	1			3	Near	0-100	n/a	n/a	71.3980	-79.8299
Tote Road	L-151	1	1			0	Near	0-100	DF-RS-06	4	71.3986	-79.8235
Tote Road	L-152	1	1			18	Near	0-100	n/a	n/a	71.3913	-79.7827
Tote Road	L-161	1	1			611	Far	101-1000	DF-RS-02	19	71.3894	-79.8328
Tote Road	L-162	1	1			942	Far	101-1000	DF-RS-07	10	71.4076	-79.8182
Tote Road	L-163	1	1			584	Far	101-1000	n/a	n/a	71.4004	-79.8519
Tote Road	L-164	1	1			6736	Reference	>1000	DF-RS-08	50	71.4493	-79.7100
Tote Road	L-167	1	1			6668	Reference	>1000	DF-RS-08	22	71.4489	-79.7112
Tote Road	L-168	1	1			6028	Reference	>1000	DF-RS-01	22	71.3275	-79.8007
Tote Road	L-168-R*	1	1			6028	Reference	>1000	DF-RS-01	22	71.3275	-79.8007
Tote Road	L-169	1	1			13968	Reference	>1000	DF-RR-01	13	71.2806	-80.2451
Tote Road	L-171	1	1			0	Near	0-100	DF-RS-05	15	71.3981	-79.8230
Tote Road	L-172	1	1			19	Near	0-100	DF-RN-05	12	71.7186	-80.4414
Tote Road	L-173	1	1			14	Near	0-100	DF-RN-04	50	71.7192	-80.4466
2019 Total	57[3]	57[3]	57[3]	0	0							
2016 Sampling												
Milne Port	L-100	1	1			36	Near	0-100	n/a	n/a	71.8767	-80.8783
Milne Port	L-101	1	1			51	Near	0-100	n/a	n/a	71.8761	-80.8778
Milne Port	L-102	1	1			424	Far	101-1000	n/a	n/a	71.8757	-80.8670
Milne Port	L-103	1	1			649	Far	101-1000	n/a	n/a	71.8765	-80.8606
Milne Port	L-104	1	1			805	Far	101-1000	n/a	n/a	71.8748	-80.8559
Milne Port	L-105	1	1			1823	Reference	>1000	n/a	n/a	71.8770	-80.8268
Milne Port	L-106	1	1			3216	Reference	>1000	DF-P-03	72	71.8999	-80.7902
Milne Port	L-91	1	1			67	Near	0-100	n/a	n/a	71.8819	-80.8780
Milne Port	L-92	1	1			45	Near	0-100	n/a	n/a	71.8814	-80.8786
Milne Port	L-93	1	1			171	Far	101-1000	n/a	n/a	71.8818	-80.8750
Milne Port	L-94	1	1			25	Near	0-100	n/a	n/a	71.8809	-80.8791

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Milne Port	L-95	1	1			29	Near	0-100	n/a	n/a	71.8801	-80.8789
Milne Port	L-96	1	1			46	Near	0-100	n/a	n/a	71.8791	-80.8783
Milne Port	L-97	1	1			57	Near	0-100	n/a	n/a	71.8785	-80.8779
Milne Port	L-98	1	1			40	Near	0-100	n/a	n/a	71.8777	-80.8783
Milne Port	L-99	1	1			17	Near	0-100	n/a	n/a	71.8772	-80.8789
Mine Site	L-109	1	1			8802	Reference	>1000	DF-M-04	124	71.2208	-79.3274
Mine Site	L-110	1	1			3873	Reference	>1000	n/a	n/a	71.2981	-79.1020
Mine Site	L-111	1	1			10376	Reference	>1000	n/a	n/a	71.3860	-78.9034
Mine Site	L-112	1	1			1043	Reference	>1000	DF-M-06	142	71.3202	-79.1594
Mine Site	L-113	1	1			1181	Reference	>1000	DF-M-06	7	71.3196	-79.1560
Mine Site	L-114	1	1			391	Far	101-1000	n/a	n/a	71.3098	-79.1921
Mine Site	L-115	1	1			452	Far	101-1000	n/a	n/a	71.3105	-79.1894
Mine Site	L-117	1	1			46	Near	0-100	n/a	n/a	71.2998	-79.2657
Mine Site	L-81	1	1			56	Near	0-100	n/a	n/a	71.3001	-79.2737
Mine Site	L-82	1	1			69	Near	0-100	n/a	n/a	71.2997	-79.2679
Mine Site	L-83	1	1			93	Near	0-100	n/a	n/a	71.3101	-79.2012
Mine Site	L-84	1	1			84	Near	0-100	n/a	n/a	71.3101	-79.2043
Mine Site	L-85	1	1			63	Near	0-100	n/a	n/a	71.3102	-79.2114
Mine Site	L-86	1	1			47	Near	0-100	n/a	n/a	71.3094	-79.2215
Mine Site	L-87	1	1			63	Near	0-100	n/a	n/a	71.3089	-79.2263
Mine Site	L-88	1	1			54	Near	0-100	n/a	n/a	71.3075	-79.2346
Mine Site	L-89	1	1			90	Near	0-100	n/a	n/a	71.3047	-79.2379
Mine Site	L-90	1	1			403	Far	101-1000	n/a	n/a	71.3182	-79.3691
Tote Road	L-107	1	1			6192	Reference	>1000	n/a	n/a	71.3259	-79.8008
Tote Road	L-108	1	1			6890	Reference	>1000	n/a	n/a	71.4515	-79.7117
Tote Road	L-116	1	1			449	Far	101-1000	n/a	n/a	71.3833	-79.8862
Tote Road	L-68	1	1			114	Near	0-100	n/a	n/a	71.3884	-79.8766
Tote Road	L-69	1	1			83	Near	0-100	n/a	n/a	71.3904	-79.8657

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Tote Road	L-70	1	1			151	Near	0-100	n/a	n/a	71.3933	-79.8671
Tote Road	L-71	1	1			115	Near	0-100	n/a	n/a	71.3944	-79.8560
Tote Road	L-72	1	1			63	Near	0-100	n/a	n/a	71.3967	-79.8428
Tote Road	L-73	1	1			80	Near	0-100	n/a	n/a	71.3984	-79.8325
Tote Road	L-74	1	1			123	Near	0-100	DF-RS-03	55	71.3962	-79.8227
Tote Road	L-75	1	1			283	Far	101-1000	n/a	n/a	71.3948	-79.8217
Tote Road	L-76	1	1			599	Far	101-1000	DF-RS-02	36	71.3896	-79.8326
Tote Road	L-77	1	1			976	Far	101-1000	DF-RS-07	30	71.4079	-79.8187
Tote Road	L-78	1	1			96	Near	0-100	n/a	n/a	71.3922	-79.7995
Tote Road	L-79	1	1			0	Near	0-100	n/a	n/a	71.3891	-79.7862
Tote Road	L-80	1	1			135	Near	0-100	n/a	n/a	71.3904	-79.7759
2016 Total	50	50	50	0	0							
2014 Sampling												
Milne Port	L-56	1	1	1		0	Near	0-100	DF-P-04	13	71.8709	-80.8824
Milne Port	L-57	1	-	1		0	Near	0-100	DF-P-06	5	71.8858	-80.8790
Milne Port	L-58	1	1			0	Near	0-100	n/a	n/a	71.8838	-80.9159
Mine Site	L-64	1	1			1186	Reference	>1000	DF-M-06	5	71.3196	-79.1559
Mine Site	L-67	1	1	1	1	3344	Reference	>1000	DF-M-09	5	71.2936	-79.4128
South Rail	L-62	1	1	1	1	0	Near	0-100	n/a	n/a	71.1324	-78.3563
South Rail	L-65	1	1	1		333	Far	101-1000	DF-M-07	1	71.3000	-79.1953
South Rail	L-66	1	1	1		2142	Reference	>1000	DF-M-08	3	71.2945	-79.1001
Tote Road	L-59	1	1	1		13232	Reference	>1000	n/a	n/a	71.7752	-80.1047
Tote Road	L-60	1	1	1	1	22	Near	0-100	n/a	n/a	71.3423	-79.5512
Tote Road	L-61	1	1	1	1	474	Far	101-1000	n/a	n/a	71.3383	-79.5246
Tote Road	L-63	1	1	1		10684	Reference	>1000	n/a	n/a	71.8805	-80.4592
2014 Total	12	12	11	10	4							
2013 Sampling												
Milne Port	L-01	1	1			0	Near	0-100	DF-P-05	139	-80.8912	71.8850

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Milne Port	L-02	1	1	1		3267	Reference	>1000	DF-P-03	5	-80.7884	71.8996
Milne Port	L-03	1	1		1	0	Near	0-100	DF-P-04	103	-80.8844	71.8702
Mine Site	L-23	1	1		1	0	Near	0-100	DF-M-01	4	-79.3747	71.3243
Mine Site	L-25	1	1	1		0	Near	0-100	DF-M-03	1	-79.2433	71.3072
South Rail	L-29	1	1	1		8922	Reference	>1000	DF-M-04	1	-79.3277	71.2197
Tote Road	L-04	1	1	1		4566	Reference	>1000	DF-RN-01	7	-80.5363	71.6882
Tote Road	L-05	1	1	1		1006	Far	101-1000	DF-RN-02	2	-80.4704	71.7145
Tote Road	L-06	1	1	1		74	Near	0-100	DF-RN-03	3	-80.4473	71.7186
Tote Road	L-07	1	1			86	Near	0-100	DF-RN-06	2	-80.4397	71.7189
Tote Road	L-08	1	1	1		979	Far	101-1000	DF-RN-07	1	-80.4165	71.7226
Tote Road	L-09	1	1	1		5921	Reference	>1000	DF-RN-08	3	-80.2898	71.7435
Tote Road	L-10	1	-	1		14009	Reference	>1000	DF-RR-02	2	-80.6923	71.5189
Tote Road	L-12	1	1	1	1	13976	Reference	>1000	DF-RR-01	2	-80.2450	71.2805
Tote Road	L-14	1	1			627	Far	101-1000	DF-RS-02	3	-79.8324	71.3893
Tote Road	L-15	1	1		1	67	Near	0-100	DF-RS-03	2	-79.8228	71.3967
Tote Road	L-16	1	1	1		0	Near	0-100	DF-RS-06	1	-79.8234	71.3986
Tote Road	L-17	1	1	1		954	Far	101-1000	DF-RS-07	2	-79.8182	71.4077
Tote Road	L-19	1	-	1		6681	Reference	>1000	DF-RS-08	2	-79.7106	71.4489
Tote Road	L-22	1	-	1		6018	Reference	>1000	DF-RS-01	3	-79.8001	71.3275
2013 Total	20	20	17	14	4							
2012 Sampling												
Tote Road	L-11	1	1			3017	Reference	>1000	n/a	n/a	-80.2148	71.5628
Tote Road	L-13	1	1			8651	Reference	>1000	n/a	n/a	-80.2239	71.3387
Tote Road	L-18	1	1			1493	Reference	>1000	n/a	n/a	-79.7981	71.4113
Mine Site	L-20	1	1			32526	Reference	>1000	n/a	n/a	-79.2153	71.6457
Tote Road	L-21	1	1			15552	Reference	>1000	n/a	n/a	-79.7948	71.2216
Mine Site	L-24	1	1			129	Far	101-1000	n/a	n/a	-79.3766	71.3331
Mine Site	L-26	1	1			2879	Reference	>1000	n/a	n/a	-79.0935	71.3391

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Mine Site	L-27	1	-			2446	Reference	>1000	n/a	n/a	-79.2471	71.3758
Mine Site	L-28	1	1			39613	Reference	>1000	n/a	n/a	-78.2296	71.5403
South Rail	L-30	1	1			2014	Reference	>1000	n/a	n/a	-78.9602	71.2144
South Rail	L-31	1	1			0	Near	0-100	n/a	n/a	-78.8212	71.2128
South Rail	L-32	1	1			18164	Reference	>1000	n/a	n/a	-78.2655	71.3204
South Rail	L-33	1	1			20019	Reference	>1000	n/a	n/a	-79.2946	71.0875
South Rail	L-34	1	1			3708	Reference	>1000	n/a	n/a	-78.4455	71.0966
South Rail	L-35	1	1			0	Near	0-100	n/a	n/a	-78.3074	71.0947
South Rail	L-36	1	1			3406	Reference	>1000	n/a	n/a	-78.1693	71.0926
South Rail	L-37	1	1			18216	Reference	>1000	n/a	n/a	-77.8489	71.1990
South Rail	L-38	1	1			24240	Reference	>1000	n/a	n/a	-77.5989	71.1263
South Rail	L-39	1	1			31690	Reference	>1000	n/a	n/a	-79.2013	70.8878
South Rail	L-40	1	1			3738	Reference	>1000	n/a	n/a	-78.3816	70.8778
South Rail	L-41	1	1			0	Near	0-100	n/a	n/a	-78.2491	70.8763
South Rail	L-42	1	1			3508	Reference	>1000	n/a	n/a	-78.1139	70.8734
South Rail	L-43	1	1			31312	Reference	>1000	n/a	n/a	-77.2928	70.8591
South Rail	L-44	1	1			30424	Reference	>1000	n/a	n/a	-79.0278	70.7046
South Rail	L-45	1	1			4457	Reference	>1000	n/a	n/a	-78.2643	70.7024
South Rail	L-46	1	1			318	Far	101-1000	n/a	n/a	-78.1393	70.6845
South Rail	L-47	1	1			23707	Reference	>1000	n/a	n/a	-79.0190	70.4932
South Rail	L-48	1	1			198	Far	101-1000	n/a	n/a	-78.3384	70.4844
South Rail	L-49	1	1			3018	Reference	>1000	n/a	n/a	-78.2233	70.4813
South Rail	L-50	1	1			25143	Reference	>1000	n/a	n/a	-77.4203	70.4673
Steensby Port	L-51	1	1			4723	Reference	>1000	n/a	n/a	-78.6165	70.3491
Steensby Port	L-52	1	1			0	Near	0-100	n/a	n/a	-78.4834	70.3044
Steensby Port	L-53	1	1			1943	Reference	>1000	n/a	n/a	-78.3506	70.3025

Table C-1. Vegetation and Soil Base Metals Monitoring Sites, 2012–2019

Location	Site ID[1]	Soil	Lichen	Willow	Blueberry	Dist. to PDA (m)	Dist. Category	Dist. Class (m)	Associated Dustfall Site[2]	Dist. to Dustfall Site (m)	Latitude (dec. degree)	Longitude (dec. degree)
Steensby Port	L-54	1	1			3585	Reference	>1000	n/a	n/a	-78.3607	70.2413
South Rail	L-55	1	1			29275	Reference	>1000	n/a	n/a	-77.5545	70.2890
2012 Total	35	35	34	0	0							

[1] Replicate sites are labelled with an asterisk (*) where "-R" indicates replicate; approximately 20% of the monitoring sites included a replicate sample.

[2] Dustfall collectors and metals sampling sites were considered 'associated' if Near sites (0–100 m of the Mine Site, Tote Road, Milne Port PDA) were within 0 – 12 m of a dustfall collector, Far sites (100–1,000 m from the PDA) were associated if up to 13–60 m of a dustfall collector, and Reference sites (≥1,000 m from the PDA) were associated if up to 60–150 m of a dustfall collector.

[3] Number of samples sites was greater than 50; extra sites were sampled because of limited lichen availability encountered at some sites which could have affected the laboratory analysis and minimum collection requirements.

APPENDIX D. VEGETATION AND SOILS BASE METALS MONITORING LABORATORY RESULTS, 2019

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-118 to L-125.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-118	L-118-R[3]	L-119	L-120	L-121	L-121-R[3]	L-122	L-123	L-124	L-125	LDL[4]
pH	6-8	6-8	7.65	7.56	6.08	6.80	7.07	7.15	7.18	4.61	6.19	4.69	0.10
Aluminum	NA	NA	3210	4740	4460	5270	5230	4040	3750	1070	741	1040	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.69	1.04	0.94	1.17	1.44	1.02	0.96	0.14	0.17	0.15	0.10
Barium	750	2000	10.9	15.6	13.6	16.4	14.1	10.9	10.6	6.36	3.04	4.92	0.50
Beryllium	4	8	0.18	0.27	0.28	0.29	0.29	0.22	0.21	<0.10	<0.10	<0.10	0.10
Bismuth	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Boron	2	NA	6.7	10.2	<5.0	10.2	9.2	6.6	7.4	<5.0	<5.0	<5.0	5.0
Cadmium	1.4	22	<0.020	0.021	0.024	0.040	0.028	<0.020	0.025	<0.020	<0.020	<0.020	0.020
Calcium	NA	NA	29000	45600	1830	3240	7680	4490	3260	198	198	274	50
Chromium	64	87	6.34	9.57	7.68	16.0	12.9	9.67	11.3	6.10	3.67	4.35	0.50
Cobalt	40	300	1.83	2.72	2.61	3.37	3.43	3.03	2.51	0.63	0.63	1.28	0.10
Copper	63	91	3.73	5.04	3.41	5.47	7.13	5.17	5.27	1.07	0.89	1.03	0.50
Iron	NA	NA	5490	8320	7990	10000	10400	7910	7710	1770	2070	3180	50
Lead	70	600	3.69	5.39	5.77	5.92	6.65	4.99	5.20	1.26	1.00	1.05	0.50
Lithium	NA	NA	9.5	13.8	13.7	14.7	14.7	11.6	10.1	<2.0	<2.0	<2.0	2.0
Magnesium	NA	NA	11300	18600	3080	3440	6430	4110	3130	587	605	744	20
Manganese	NA	NA	93.8	137	157	152	182	135	118	11.7	18.8	39.0	1.0
Mercury	6.6	50	0.0073	0.0051	0.0099	0.0098	0.0119	0.0110	0.0113	0.0096	<0.0050	0.0061	0.0050
Molybdenum	5	40	0.13	0.15	0.18	0.26	0.25	0.17	0.20	<0.10	<0.10	<0.10	0.10
Nickel	45	89	3.65	5.38	4.22	8.87	7.16	5.14	6.17	2.57	2.25	3.07	0.50
Phosphorus	NA	NA	132	176	147	221	227	188	198	93	<50	89	50
Potassium	NA	NA	570	810	370	870	760	600	650	200	190	150	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Silver	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Sodium	NA	NA	53	84	<50	<50	<50	<50	<50	<50	<50	<50	50
Strontium	NA	NA	14.6	21.8	2.89	5.52	5.96	4.10	4.25	1.82	1.43	1.55	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	0.085	0.119	0.085	0.125	0.119	0.098	0.097	<0.050	<0.050	<0.050	0.050
Tin	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-118 to L-125.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-118	L-118-R[3]	L-119	L-120	L-121	L-121-R[3]	L-122	L-123	L-124	L-125	LDL[4]
Titanium	NA	NA	174	271	260	265	315	270	195	86.7	66.5	83.1	1.0
Tungsten	NA	NA	<0.50	<0.50	0.52	<0.50	0.53	<0.50	0.58	<0.50	<0.50	<0.50	0.50
Uranium	23	300	0.713	0.977	1.52	4.77	1.88	1.39	2.00	0.385	0.155	0.174	0.050
Vanadium	130	130	8.51	12.9	11.6	15.3	16.5	12.2	12.3	4.99	2.95	4.04	0.20
Zinc	250	410	9.7	14.0	17.3	18.0	20.5	16.4	14.3	3.5	2.8	3.1	2.0
Zirconium	NA	NA	1.8	3.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-125-R to L-132.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-125-R[3]	L-126	L-127	L-128	L-128-R[3]	L-129	L-130	L-130-R[3]	L-131	L-132	LDL[4]
pH	6-8	6-8	4.58	6.29	6.77	6.34	6.11	6.55	6.12	5.81	6.41	5.73	0.10
Aluminum	NA	NA	1520	757	968	1310	962	703	1360	1490	2780	1800	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.23	0.11	0.14	0.33	0.23	0.76	0.31	0.31	0.67	0.35	0.10
Barium	750	2000	6.99	3.59	4.57	5.15	3.91	1.63	5.10	6.32	12.5	7.74	0.50
Beryllium	4	8	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.10
Bismuth	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Boron	2	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.0
Cadmium	1.4	22	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	<0.020	0.020
Calcium	NA	NA	334	270	310	2420	1810	1050	1910	2500	1940	2400	50
Chromium	64	87	6.23	3.50	4.50	9.23	8.82	2.24	9.26	8.76	19.1	13.2	0.50
Cobalt	40	300	2.20	0.61	0.80	1.51	1.05	1.32	1.40	1.24	2.92	1.56	0.10
Copper	63	91	1.62	1.58	1.30	2.25	1.67	3.86	3.74	2.30	2.57	2.13	0.50
Iron	NA	NA	5380	2180	2390	3750	2990	1910	6320	6010	17300	7460	50
Lead	70	600	1.33	0.80	0.97	1.84	1.41	2.75	2.11	1.89	5.43	2.40	0.50
Lithium	NA	NA	2.8	<2.0	<2.0	<2.0	<2.0	<2.0	2.8	2.8	5.6	3.1	2.0
Magnesium	NA	NA	1060	646	758	1390	978	712	1250	1290	2320	1450	20
Manganese	NA	NA	72.0	22.4	23.1	63.8	36.1	17.9	39.9	43.1	116	48.9	1.0
Mercury	6.6	50	0.0081	<0.0050	<0.0050	0.0090	0.0066	<0.0050	0.0112	0.0133	0.0067	0.0106	0.0050
Molybdenum	5	40	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	0.12	0.14	0.19	0.10
Nickel	45	89	4.43	2.03	2.63	5.38	4.54	2.22	4.64	4.40	9.93	6.13	0.50
Phosphorus	NA	NA	119	79	<50	133	93	78	287	295	279	338	50
Potassium	NA	NA	210	220	250	150	120	230	260	240	330	300	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Silver	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Sodium	NA	NA	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
Strontium	NA	NA	1.80	1.35	1.66	1.77	1.86	0.94	2.70	3.13	3.19	3.35	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Tin	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-125-R to L-132.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-125-R[3]	L-126	L-127	L-128	L-128-R[3]	L-129	L-130	L-130-R[3]	L-131	L-132	LDL[4]
Titanium	NA	NA	107	57.7	71.7	112	89.2	31.4	186	169	330	236	1.0
Tungsten	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Uranium	23	300	0.230	0.125	0.205	0.319	0.264	0.107	0.459	0.457	0.717	1.18	0.050
Vanadium	130	130	6.06	3.36	3.23	5.05	4.55	2.76	10.3	9.90	25.3	11.9	0.20
Zinc	250	410	4.2	2.9	3.9	4.2	3.5	2.9	7.4	6.8	16.8	8.3	2.0
Zirconium	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	1.1	<1.0	<1.0	1.3	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-133 to L-140.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-133	L-133-R[3]	L-134	L-135	L-136	L-137	L-137-R[3]	L-138	L-139	L-140	LDL[4]
pH	6-8	6-8	6.23	5.96	6.38	7.25	6.61	7.43	7.44	5.05	7.40	7.16	0.10
Aluminum	NA	NA	1550	1240	3460	8170	8110	4300	4880	1670	5570	1160	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.39	0.34	1.30	1.65	1.79	1.02	1.12	0.71	1.11	0.34	0.10
Barium	750	2000	6.20	5.39	15.0	20.5	25.8	13.1	15.0	5.74	14.1	4.24	0.50
Beryllium	4	8	<0.10	<0.10	0.17	0.45	0.44	0.22	0.26	<0.10	0.31	<0.10	0.10
Bismuth	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Boron	2	NA	<5.0	<5.0	<5.0	22.7	13.2	11.1	12.8	<5.0	18.5	<5.0	5.0
Cadmium	1.4	22	<0.020	<0.020	<0.020	0.026	0.048	0.026	0.028	<0.020	0.021	<0.020	0.020
Calcium	NA	NA	686	502	1880	7770	4330	37100	39100	530	12600	5910	50
Chromium	64	87	5.50	5.24	16.8	43.2	22.8	9.90	10.8	4.40	34.1	18.0	0.50
Cobalt	40	300	1.52	1.08	3.39	6.09	4.92	2.76	3.08	1.58	4.39	0.75	0.10
Copper	63	91	2.99	1.76	4.77	7.80	7.69	4.92	5.30	2.19	5.71	2.65	0.50
Iron	NA	NA	3700	2770	10800	14900	14500	7890	8730	4300	10800	2440	50
Lead	70	600	2.00	1.69	5.42	6.65	9.31	5.17	6.09	4.50	4.34	1.39	0.50
Lithium	NA	NA	2.6	2.1	7.5	26.1	20.3	12.7	14.6	2.1	17.5	3.8	2.0
Magnesium	NA	NA	1060	812	2450	8950	4600	14100	16600	512	10300	3690	20
Manganese	NA	NA	66.0	49.7	172	219	218	158	177	58.9	147	32.4	1.0
Mercury	6.6	50	<0.0050	<0.0050	0.0073	0.0145	0.0132	0.0108	0.0101	0.0057	0.0083	0.0062	0.0050
Molybdenum	5	40	<0.10	<0.10	0.17	0.27	0.37	0.20	0.23	<0.10	0.17	0.14	0.10
Nickel	45	89	4.54	3.59	9.83	30.3	12.3	6.25	6.62	2.29	24.7	2.34	0.50
Phosphorus	NA	NA	116	83	377	298	339	278	295	121	242	107	50
Potassium	NA	NA	330	290	780	1790	1140	730	870	310	1460	290	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Silver	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Sodium	NA	NA	<50	<50	<50	52	65	61	74	<50	<50	<50	50
Strontium	NA	NA	2.43	2.32	2.74	8.36	7.78	20.0	20.4	1.67	9.36	3.55	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	<0.050	<0.050	0.079	0.144	0.158	0.090	0.104	<0.050	0.127	<0.050	0.050
Tin	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-133 to L-140.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-133	L-133-R[3]	L-134	L-135	L-136	L-137	L-137-R[3]	L-138	L-139	L-140	LDL[4]
Titanium	NA	NA	156	108	330	376	321	232	251	100	293	70.1	1.0
Tungsten	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Uranium	23	300	0.340	0.295	0.883	1.67	4.47	0.825	0.872	0.247	0.717	0.436	0.050
Vanadium	130	130	6.65	5.07	18.4	23.7	23.7	12.6	13.8	5.86	16.3	3.57	0.20
Zinc	250	410	4.6	3.9	11.7	21.1	30.6	16.9	18.0	8.1	12.9	5.8	2.0
Zirconium	NA	NA	<1.0	<1.0	<1.0	<1.0	1.0	1.3	1.3	<1.0	1.7	<1.0	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-141 to L-148.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-141	L-141-R[3]	L-142	L-143	L-144	L-145	L-145-R[3]	L-146	L-147	L-148	LDL[4]
pH	6-8	6-8	7.20	7.31	6.43	6.59	6.17	7.66	7.64	7.66	7.56	4.54	0.10
Aluminum	NA	NA	3570	4070	8090	4140	6530	17500	16900	16000	13400	945	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.71	0.77	2.46	0.74	1.52	4.38	4.28	4.09	3.50	0.17	0.10
Barium	750	2000	10.4	11.3	16.8	10.0	22.8	34.3	33.1	34.1	29.0	3.91	0.50
Beryllium	4	8	0.19	0.23	0.46	0.27	0.37	0.95	0.92	0.85	0.73	<0.10	0.10
Bismuth	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Boron	2	NA	10.2	10.6	12.0	5.1	11.6	65.9	64.4	56.5	55.0	<5.0	5.0
Cadmium	1.4	22	0.040	0.030	0.052	<0.020	0.029	0.073	0.076	0.064	0.065	<0.020	0.020
Calcium	NA	NA	11100	9360	5220	2100	3140	109000	104000	113000	125000	316	50
Chromium	64	87	9.54	11.3	21.0	11.3	21.9	42.5	40.4	37.7	33.7	6.15	0.50
Cobalt	40	300	2.14	2.40	5.34	2.70	4.53	8.48	8.00	8.02	7.03	0.66	0.10
Copper	63	91	4.88	4.93	12.0	3.75	8.48	18.1	17.5	16.1	14.2	1.05	0.50
Iron	NA	NA	6960	8360	14000	9210	13200	21900	20900	21000	18100	4010	50
Lead	70	600	3.92	4.30	19.0	5.74	8.23	14.0	13.7	13.9	12.4	1.08	0.50
Lithium	NA	NA	9.2	10.7	20.5	12.2	16.9	65.8	63.5	58.2	52.7	<2.0	2.0
Magnesium	NA	NA	4780	4470	4900	3180	4250	39700	38000	32300	38700	552	20
Manganese	NA	NA	128	119	261	129	207	304	290	299	281	14.1	1.0
Mercury	6.6	50	0.0236	0.0180	0.0168	0.0095	0.0159	0.0192	0.0205	0.0154	0.0210	<0.0050	0.0050
Molybdenum	5	40	0.23	0.20	0.46	0.37	0.56	0.59	0.53	0.37	0.91	<0.10	0.10
Nickel	45	89	5.13	5.74	12.0	5.54	11.0	25.3	24.1	22.8	20.9	2.11	0.50
Phosphorus	NA	NA	361	322	357	202	317	537	496	439	439	97	50
Potassium	NA	NA	550	640	1140	660	1310	6090	5910	5510	4520	140	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Silver	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Sodium	NA	NA	<50	<50	63	<50	65	147	143	204	159	<50	50
Strontium	NA	NA	8.25	7.82	6.97	4.05	8.45	67.9	63.9	69.4	76.7	1.56	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	0.073	0.073	0.154	0.106	0.142	0.283	0.281	0.307	0.249	<0.050	0.050
Tin	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-141 to L-148.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-141	L-141-R[3]	L-142	L-143	L-144	L-145	L-145-R[3]	L-146	L-147	L-148	LDL[4]
Titanium	NA	NA	108	138	335	203	373	487	456	513	423	77.4	1.0
Tungsten	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Uranium	23	300	0.611	0.667	18.6	1.60	6.50	1.25	1.35	1.20	1.15	0.169	0.050
Vanadium	130	130	10.5	13.0	24.3	15.2	20.9	39.3	37.9	36.2	32.1	5.12	0.20
Zinc	250	410	16.7	17.9	31.0	17.0	23.4	31.1	30.0	31.9	32.0	2.4	2.0
Zirconium	NA	NA	<1.0	<1.0	1.6	<1.0	1.2	24.4	23.7	19.0	16.7	<1.0	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-149 to L-156-R.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-149	L-149-R[3]	L-150	L-151	L-152	L-153	L-154	L-155	L-156	L-156-R[3]	LDL[4]
pH	6-8	6-8	4.44	4.34	4.48	6.34	6.14	4.68	5.60	6.23	7.08	7.17	0.10
Aluminum	NA	NA	1270	1050	1200	1090	1110	2370	14900	6120	4460	6220	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.20	0.14	0.23	0.25	0.20	0.36	3.35	1.59	1.52	2.54	0.10
Barium	750	2000	6.43	4.81	8.00	5.49	4.72	9.57	76.5	23.5	17.0	24.7	0.50
Beryllium	4	8	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.65	0.27	0.18	0.30	0.10
Bismuth	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Boron	2	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	22.0	6.6	6.1	10.5	5.0
Cadmium	1.4	22	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.069	0.036	0.020	0.034	0.020
Calcium	NA	NA	360	253	324	369	432	797	8840	2980	5740	9320	50
Chromium	64	87	8.22	5.94	10.4	6.73	6.08	11.3	61.0	35.9	25.1	29.1	0.50
Cobalt	40	300	0.78	0.57	0.91	1.02	0.98	2.28	12.4	6.54	4.50	5.27	0.10
Copper	63	91	1.56	1.21	1.44	1.71	1.18	2.32	49.6	8.16	8.06	14.9	0.50
Iron	NA	NA	4920	3350	5880	3020	3410	5750	22900	12800	11600	11900	50
Lead	70	600	1.41	1.29	1.47	1.12	1.43	2.70	17.9	7.70	4.62	7.77	0.50
Lithium	NA	NA	<2.0	<2.0	<2.0	<2.0	<2.0	3.4	24.8	12.2	8.4	12.3	2.0
Magnesium	NA	NA	752	630	679	951	889	1740	9580	4970	5990	8470	20
Manganese	NA	NA	14.5	12.6	25.9	28.0	26.7	74.1	374	274	142	197	1.0
Mercury	6.6	50	0.0141	0.0091	0.0121	<0.0050	<0.0050	0.0066	0.0385	0.0216	0.0051	0.0099	0.0050
Molybdenum	5	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.37	0.15	<0.10	0.15	0.10
Nickel	45	89	3.19	2.33	3.33	4.26	3.26	7.10	95.1	52.1	15.8	20.0	0.50
Phosphorus	NA	NA	130	103	159	93	132	195	770	328	347	318	50
Potassium	NA	NA	240	220	250	250	280	410	2960	900	1040	1630	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.36	<0.20	<0.20	<0.20	0.20
Silver	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Sodium	NA	NA	<50	<50	<50	<50	<50	<50	125	<50	<50	59	50
Strontium	NA	NA	1.58	1.42	1.78	1.69	1.82	2.35	11.2	3.28	4.66	6.47	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.400	0.105	0.095	0.153	0.050
Tin	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-149 to L-156-R.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-149	L-149-R[3]	L-150	L-151	L-152	L-153	L-154	L-155	L-156	L-156-R[3]	LDL[4]
Titanium	NA	NA	93.3	104	85.7	82.0	99.3	264	689	409	437	468	1.0
Tungsten	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Uranium	23	300	0.268	0.347	0.287	0.250	0.261	0.416	6.50	0.655	0.507	0.650	0.050
Vanadium	130	130	6.48	4.76	7.68	4.09	5.49	9.14	41.6	22.3	19.8	20.9	0.20
Zinc	250	410	3.9	3.0	3.5	3.4	3.8	9.2	45.8	22.6	14.9	18.9	2.0
Zirconium	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.9	1.1	3.4	4.7	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-157 to L-165-R.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-157	L-158	L-159	L-160	L-161	L-162	L-163	L-164	L-165	L-165-R[3]	LDL[4]
pH	6-8	6-8	5.73	5.11	6.54	5.74	4.24	4.91	4.10	6.79	4.89	4.79	0.10
Aluminum	NA	NA	19600	2400	2080	975	550	795	834	3800	3530	3480	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.79	0.49	0.40	0.25	<0.10	0.12	0.14	0.84	0.36	0.74	0.10
Barium	750	2000	90.1	9.57	6.32	3.35	2.82	3.25	3.43	20.8	16.2	14.1	0.50
Beryllium	4	8	0.64	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	0.21	0.14	0.13	0.10
Bismuth	NA	NA	5.34	0.23	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Boron	2	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.7	6.1	<5.0	5.0
Cadmium	1.4	22	0.085	0.029	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Calcium	NA	NA	1780	705	1320	434	162	174	136	1910	852	1210	50
Chromium	64	87	42.4	12.6	10.4	4.32	4.36	7.30	5.01	13.8	12.3	18.4	0.50
Cobalt	40	300	9.62	1.92	1.60	1.18	0.25	0.84	0.62	2.83	2.28	2.73	0.10
Copper	63	91	81.2	4.64	1.86	0.90	<0.50	0.96	0.99	5.73	4.07	3.44	0.50
Iron	NA	NA	26100	7530	7010	2550	786	3980	3210	7220	7790	9630	50
Lead	70	600	13.3	6.66	2.95	1.60	0.96	1.11	1.08	3.00	2.35	2.06	0.50
Lithium	NA	NA	14.4	3.5	4.7	<2.0	<2.0	<2.0	<2.0	7.4	6.8	7.3	2.0
Magnesium	NA	NA	19900	1360	1400	654	304	508	489	2950	2370	2560	20
Manganese	NA	NA	229	78.4	50.7	31.4	5.4	22.0	16.3	123	70.1	89.2	1.0
Mercury	6.6	50	<0.0050	0.0070	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0062	<0.0050	<0.0050	0.0050
Molybdenum	5	40	7.25	0.39	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.14	0.10
Nickel	45	89	51.1	5.42	5.19	2.03	1.05	1.89	1.78	7.82	6.01	6.79	0.50
Phosphorus	NA	NA	261	146	342	68	56	<50	77	164	183	294	50
Potassium	NA	NA	4010	590	340	220	110	160	190	970	870	740	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Silver	20	40	0.24	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Sodium	NA	NA	69	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
Strontium	NA	NA	2.77	1.96	2.83	2.25	1.29	1.27	1.44	5.35	2.41	2.99	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	0.309	0.080	<0.050	<0.050	<0.050	<0.050	<0.050	0.068	0.064	0.057	0.050
Tin	5	300	4.1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-157 to L-165-R.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-157	L-158	L-159	L-160	L-161	L-162	L-163	L-164	L-165	L-165-R[3]	LDL[4]
Titanium	NA	NA	962	304	248	121	67.5	109	80.5	170	330	412	1.0
Tungsten	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Uranium	23	300	0.733	0.496	0.388	0.287	0.131	0.557	0.124	0.293	0.417	0.344	0.050
Vanadium	130	130	51.9	12.6	11.2	4.14	1.62	4.96	5.22	11.8	13.5	17.1	0.20
Zinc	250	410	88.4	8.7	7.5	3.3	<2.0	2.5	3.2	7.9	10.3	11.8	2.0
Zirconium	NA	NA	9.2	<1.0	<1.0	2.8	<1.0	<1.0	<1.0	1.3	<1.0	2.0	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-166 to L-174.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-166	L-167	L-168	L-168-R[3]	L-169	L-170	L-171	L-172	L-173	L-174	LDL[4]
pH	6-8	6-8	4.04	6.07	6.22	6.40	5.07	5.66	6.67	7.59	7.53	4.71	0.10
Aluminum	NA	NA	2980	6130	4980	7900	1450	2000	1460	2790	10400	5230	50
Antimony	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.10
Arsenic	12	12	0.25	0.68	1.03	1.44	0.33	0.37	0.24	1.08	0.95	0.59	0.10
Barium	750	2000	8.41	27.3	18.0	28.4	11.2	7.57	6.05	10.3	91.5	21.3	0.50
Beryllium	4	8	0.10	0.22	0.22	0.32	<0.10	<0.10	<0.10	0.17	0.28	0.18	0.10
Bismuth	NA	NA	<0.20	0.26	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.78	<0.20	0.20
Boron	2	NA	<5.0	9.1	5.1	6.5	<5.0	<5.0	<5.0	14.9	<5.0	<5.0	5.0
Cadmium	1.4	22	<0.020	0.026	<0.020	0.022	<0.020	<0.020	<0.020	0.021	0.207	0.029	0.020
Calcium	NA	NA	495	1580	2080	2710	1030	885	489	37600	14400	1310	50
Chromium	64	87	9.20	21.0	22.4	33.5	7.20	19.2	10.7	8.69	19.6	17.9	0.50
Cobalt	40	300	1.99	5.56	4.25	6.25	0.83	2.84	1.41	2.08	4.96	3.91	0.10
Copper	63	91	2.32	9.37	5.96	10.1	1.04	2.03	1.84	4.06	49.8	3.42	0.50
Iron	NA	NA	7090	12400	11400	16600	3860	5930	6890	6020	26500	17600	50
Lead	70	600	2.43	3.89	4.91	7.02	1.78	2.96	1.41	3.40	28.2	4.72	0.50
Lithium	NA	NA	5.7	11.5	9.0	14.3	3.1	2.9	2.5	11.3	15.4	9.8	2.0
Magnesium	NA	NA	1730	4880	2860	4390	878	1340	1080	16500	11300	3140	20
Manganese	NA	NA	67.8	167	157	211	21.4	104	37.0	125	315	591	1.0
Mercury	6.6	50	0.0107	0.0119	<0.0050	0.0059	0.0101	0.0081	<0.0050	0.0145	<0.0050	0.0104	0.0050
Molybdenum	5	40	<0.10	0.13	0.13	0.20	<0.10	<0.10	<0.10	0.25	4.18	0.15	0.10
Nickel	45	89	4.17	14.4	11.2	17.1	3.14	12.2	4.37	5.36	9.07	9.61	0.50
Phosphorus	NA	NA	172	335	454	565	182	191	134	230	300	419	50
Potassium	NA	NA	450	1170	1010	1530	210	290	290	760	5700	840	100
Selenium	1	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Silver	20	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.31	<0.10	0.10
Sodium	NA	NA	<50	<50	<50	62	<50	<50	<50	<50	119	50	50
Strontium	NA	NA	2.41	4.49	3.95	4.88	2.26	1.78	2.23	21.2	9.34	3.73	0.50
Sulfur	NA	NA	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1000
Thallium	1	1	<0.050	0.071	0.129	0.204	<0.050	<0.050	<0.050	0.064	0.435	0.100	0.050
Tin	5	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.2	<2.0	2.0

Table D-1. 2019 Soil Metal Analysis (n=57), sample sites L-166 to L-174.

Parameter[1]	CCME Agri[2]	CCME Ind[2]	L-166	L-167	L-168	L-168-R[3]	L-169	L-170	L-171	L-172	L-173	L-174	LDL[4]
Titanium	NA	NA	379	373	600	869	120	169	119	82.5	819	688	1.0
Tungsten	NA	NA	<0.50	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	0.50
Uranium	23	300	0.364	0.460	0.811	1.38	0.248	0.210	0.263	0.266	2.20	0.918	0.050
Vanadium	130	130	12.4	21.6	18.6	27.4	5.85	9.66	9.07	8.10	14.8	24.0	0.20
Zinc	250	410	10.3	19.3	14.9	23.0	4.2	6.9	4.1	9.2	86.2	19.9	2.0
Zirconium	NA	NA	<1.0	1.3	11.0	15.2	<1.0	<1.0	<1.0	<1.0	8.1	1.3	1.0

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] CCME Agri = Canadian Council of Ministers of the Environment Agriculture and Industrial Soil Quality Guidelines

[3] R = Replicate sample

[4] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-118 to L-120.

Parameter[1]	L-118 (UNWASHED)	L-118 (WASHED)	L-118-R[2] (UNWASHED)	L-118-R[2] (WASHED)	L-119 (UNWASHED)	L-119 (WASHED)	L-120 (UNWASHED)	L-120 (WASHED)	LDL[3]
Aluminum	307	308	322	399	336	378	552	432	2.0
Antimony	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	0.015	0.011	0.010
Arsenic	0.081	0.086	0.093	0.096	0.096	0.102	0.146	0.130	0.020
Barium	6.14	7.38	6.05	6.83	7.32	6.61	7.29	7.13	0.050
Beryllium	0.022	0.022	0.022	0.028	0.023	0.027	0.041	0.034	0.010
Bismuth	0.013	0.015	0.017	0.015	0.015	0.016	0.020	0.020	0.010
Boron	1.1	1.1	1.2	1.4	<1.0	1.1	1.3	1.1	1.0
Cadmium	0.0358	0.0383	0.0349	0.0367	0.0394	0.0389	0.0421	0.0382	0.0050
Calcium	44600	49300	51700	50800	33200	33100	45800	43300	20
Cesium	0.115	0.118	0.121	0.131	0.151	0.145	0.213	0.184	0.0050
Chromium	0.708	0.743	0.745	0.872	0.771	0.892	1.40	1.09	0.050
Cobalt	0.172	0.236	0.168	0.208	0.190	0.214	0.335	0.285	0.020
Copper	0.94	1.68	0.90	1.03	0.91	0.96	1.29	1.15	0.10
Iron	1010	1080	1050	1280	1120	1350	2710	1870	3.0
Lead	1.42	1.56	1.48	1.59	1.67	1.61	2.70	2.54	0.020
Lithium	0.73	0.72	0.77	0.94	0.78	0.91	1.51	1.19	0.50
Magnesium	1180	1130	1120	1200	1050	1130	1500	1500	2.0
Manganese	19.6	19.6	18.8	21.4	21.1	22.0	35.2	31.5	0.050
Mercury	0.0471	0.0474	0.0444	0.0448	0.0454	0.0448	0.0405	0.0398	0.0050
Molybdenum	0.133	0.138	0.138	0.150	0.153	0.247	0.271	0.179	0.020
Nickel	0.63	1.02	0.62	0.87	0.61	0.98	0.94	0.98	0.20
Phosphorus	286	270	274	270	293	315	313	321	10
Potassium	1160	1130	1130	1040	1160	1250	1220	1260	20
Rubidium	3.17	3.29	3.15	3.33	5.66	5.32	5.50	5.38	0.050
Selenium	0.077	0.080	0.073	0.072	0.080	0.076	0.077	0.076	0.050
Silver	0.0168	0.0166	0.0181	0.0181	0.0217	0.0213	0.0231	0.0235	0.0050
Sodium	232	213	211	228	219	220	255	268	20
Strontium	23.9	26.4	26.2	26.6	21.3	20.4	23.2	22.0	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0080	0.0085	0.0085	0.0101	0.0092	0.0105	0.0127	0.0102	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-118 to L-120.

Parameter[1]	L-118 (UNWASHED)	L-118 (WASHED)	L-118-R[2] (UNWASHED)	L-118-R[2] (WASHED)	L-119 (UNWASHED)	L-119 (WASHED)	L-120 (UNWASHED)	L-120 (WASHED)	LDL[3]
Tin	0.25	0.28	0.16	0.16	0.18	0.29	0.23	0.18	0.10
Titanium	18.0	18.6	19.0	23.0	21.0	21.4	28.0	23.2	0.25
Uranium	0.368	0.368	0.419	0.438	0.301	0.313	0.643	0.530	0.0020
Vanadium	0.57	0.58	0.61	0.75	0.65	0.72	0.99	0.77	0.10
Zinc	7.97	8.35	7.49	7.75	8.93	9.00	9.41	9.38	0.50
Zirconium	0.82	0.90	1.01	1.15	0.92	0.99	1.88	1.35	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-121 to L-123.

Parameter[1]	L-121 (UNWASHED)	L-121 (WASHED)	L-121-R[2] (UNWASHED)	L-121-R[2] (WASHED)	L-122 (UNWASHED)	L-122 (WASHED)	L-123 (UNWASHED)	L-123 (WASHED)	LDL[3]
Aluminum	571	616	288	291	385	509	1490	1890	2.0
Antimony	0.064	<0.010	<0.010	<0.010	<0.010	0.011	0.013	0.013	0.010
Arsenic	0.128	0.127	0.078	0.076	0.132	0.181	0.192	0.232	0.020
Barium	7.67	7.08	5.52	5.36	5.27	6.31	18.1	17.6	0.050
Beryllium	0.039	0.042	0.021	0.024	0.026	0.034	0.059	0.068	0.010
Bismuth	0.017	0.015	0.013	0.012	0.016	0.021	0.107	0.135	0.010
Boron	1.3	1.8	<1.0	<1.0	<1.0	1.2	1.5	1.7	1.0
Cadmium	0.0342	0.0294	0.0276	0.0287	0.0376	0.0447	0.0933	0.0705	0.0050
Calcium	29200	27600	34300	29300	38300	43900	13700	10400	20
Cesium	0.189	0.182	0.127	0.124	0.170	0.211	0.233	0.258	0.0050
Chromium	1.31	1.40	0.862	0.701	0.997	1.25	3.15	3.96	0.050
Cobalt	0.318	0.356	0.173	0.183	0.247	0.323	0.818	0.968	0.020
Copper	1.15	1.23	0.92	0.98	1.11	1.29	2.72	3.27	0.10
Iron	1820	2300	1440	1530	2210	2720	3370	4210	3.0
Lead	1.87	1.59	1.27	1.31	1.94	2.48	4.53	4.19	0.020
Lithium	1.49	1.61	0.67	0.66	0.89	1.26	1.88	2.14	0.50
Magnesium	1480	1910	1180	1110	1270	1420	2050	2100	2.0
Manganese	30.8	35.6	22.1	23.2	25.9	31.5	73.5	71.5	0.050
Mercury	0.0437	0.0412	0.0391	0.0436	0.0427	0.0461	0.0436	0.0407	0.0050
Molybdenum	0.157	0.223	0.176	0.151	0.162	0.191	0.504	0.577	0.020
Nickel	1.06	1.04	0.62	0.56	0.73	1.12	2.36	3.01	0.20
Phosphorus	302	343	309	323	384	390	534	458	10
Potassium	1250	1370	1290	1360	1350	1370	2160	1640	20
Rubidium	4.39	5.10	4.45	4.67	4.60	5.04	10.1	9.07	0.050
Selenium	0.077	0.061	0.067	0.067	0.067	0.078	0.071	0.059	0.050
Silver	0.0252	0.0185	0.0206	0.0192	0.0177	0.0214	0.0571	0.0565	0.0050
Sodium	212	318	304	288	420	378	199	133	20
Strontium	21.4	17.6	22.2	18.6	24.6	28.2	14.4	11.3	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0125	0.0136	0.0072	0.0074	0.0076	0.0101	0.0335	0.0396	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-121 to L-123.

Parameter[1]	L-121 (UNWASHED)	L-121 (WASHED)	L-121-R[2] (UNWASHED)	L-121-R[2] (WASHED)	L-122 (UNWASHED)	L-122 (WASHED)	L-123 (UNWASHED)	L-123 (WASHED)	LDL[3]
Tin	0.67	0.22	0.22	0.13	<0.10	<0.10	0.11	0.14	0.10
Titanium	30.7	36.1	14.6	15.4	19.9	25.9	94.2	112	0.25
Uranium	0.810	0.552	0.407	0.374	0.555	0.690	0.363	0.413	0.0020
Vanadium	1.11	1.29	0.50	0.52	0.68	0.94	2.40	3.00	0.10
Zinc	9.16	10.8	8.66	9.32	10.1	10.4	20.3	18.0	0.50
Zirconium	1.39	1.55	0.87	0.84	1.15	1.47	2.08	2.64	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal **Analysis** (n=57), sample sites L-124 to L-126.

Parameter[1]	L-124 (UNWASHED)	L-124 (WASHED)	L-125 (UNWASHED)	L-125 (WASHED)	L-125-R[2] (UNWASHED)	L-125-R[2] (WASHED)	L-126 (UNWASHED)	L-126 (WASHED)	LDL[3]
Aluminum	2860	2750	2450	2050	2790	3280	4340	4020	2.0
Antimony	0.011	0.010	0.012	0.012	0.012	<0.010	0.014	0.012	0.010
Arsenic	0.260	0.247	0.227	0.214	0.146	0.149	0.301	0.301	0.020
Barium	25.7	27.2	23.3	21.9	24.4	24.7	32.5	30.1	0.050
Beryllium	0.107	0.107	0.094	0.085	0.108	0.114	0.163	0.144	0.010
Bismuth	0.113	0.105	0.118	0.168	0.151	0.164	0.205	0.192	0.010
Boron	2.3	2.0	1.9	1.8	2.2	2.0	3.0	2.8	1.0
Cadmium	0.115	0.0963	0.117	0.140	0.146	0.157	0.125	0.115	0.0050
Calcium	17200	15300	21100	23500	26200	25000	27600	25700	20
Cesium	0.420	0.417	0.377	0.315	0.418	0.435	0.505	0.473	0.0050
Chromium	4.41	4.34	3.80	3.02	4.03	4.30	8.09	7.47	0.050
Cobalt	1.33	1.38	1.19	1.02	1.31	1.47	2.15	1.95	0.020
Copper	4.31	4.52	3.88	3.33	4.14	4.30	5.87	5.14	0.10
Iron	5690	5550	4780	4240	5210	5580	8570	7860	3.0
Lead	6.69	5.86	7.51	8.90	9.26	9.32	10.1	9.57	0.020
Lithium	3.41	3.44	3.16	2.64	3.72	3.93	5.56	5.15	0.50
Magnesium	2580	2630	2240	1980	2550	2850	3570	3190	2.0
Manganese	110	120	91.4	87.5	107	116	132	126	0.050
Mercury	0.0539	0.0486	0.0481	0.0463	0.0484	0.0420	0.0356	0.0309	0.0050
Molybdenum	0.755	0.654	0.800	0.544	0.743	0.825	1.14	1.31	0.020
Nickel	3.40	3.52	3.37	2.83	3.51	3.86	5.60	5.13	0.20
Phosphorus	766	778	605	576	623	592	690	597	10
Potassium	3160	2480	2800	2240	3030	2740	3050	2530	20
Rubidium	14.9	13.3	13.8	11.0	15.4	15.8	15.1	13.8	0.050
Selenium	0.063	0.065	0.069	0.066	0.059	0.068	0.070	0.061	0.050
Silver	0.0705	0.0629	0.0683	0.0716	0.0736	0.0772	0.105	0.0933	0.0050
Sodium	413	296	277	229	304	234	265	197	20
Strontium	24.5	21.5	25.2	28.0	30.5	27.6	39.5	35.3	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	0.020
Thallium	0.0615	0.0604	0.0519	0.0458	0.0573	0.0669	0.0816	0.0782	0.0020

Table D-1. 2019 Lichen Metal **Analysis** (n=57), sample sites L-124 to L-126.

Parameter[1]	L-124 (UNWASHED)	L-124 (WASHED)	L-125 (UNWASHED)	L-125 (WASHED)	L-125-R[2] (UNWASHED)	L-125-R[2] (WASHED)	L-126 (UNWASHED)	L-126 (WASHED)	LDL[3]
Tin	0.17	0.19	0.17	0.14	0.18	0.18	0.28	0.23	0.10
Titanium	184	178	154	134	167	187	230	210	0.25
Uranium	0.807	0.737	0.752	0.705	0.881	0.839	1.30	1.18	0.0020
Vanadium	4.32	4.30	3.72	3.08	3.98	4.49	6.77	6.18	0.10
Zinc	23.9	24.7	21.3	20.9	23.5	23.4	22.5	20.4	0.50
Zirconium	4.21	3.66	3.32	3.42	4.44	4.14	5.85	5.58	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-127 to L-129.

Parameter[1]	L-127 (UNWASHED)	L-127 (WASHED)	L-128 (UNWASHED)	L-128 (WASHED)	L-128-R[2] (UNWASHED)	L-128-R[2] (WASHED)	L-129 (UNWASHED)	L-129 (WASHED)	LDL[3]
Aluminum	2830	4140	2530	1370	2180	1730	1020	1100	2.0
Antimony	0.015	0.015	0.021	0.027	0.016	0.020	0.019	0.017	0.010
Arsenic	0.194	0.237	0.153	0.123	0.150	0.164	0.151	0.155	0.020
Barium	24.9	31.4	19.9	18.2	17.1	17.9	11.5	11.9	0.050
Beryllium	0.117	0.151	0.099	0.073	0.096	0.086	0.056	0.064	0.010
Bismuth	0.252	0.244	0.094	0.087	0.086	0.096	0.056	0.043	0.010
Boron	2.5	3.1	1.9	1.4	1.5	1.5	1.8	1.6	1.0
Cadmium	0.187	0.185	0.0573	0.0844	0.0647	0.0867	0.0602	0.0676	0.0050
Calcium	47200	44100	8390	11200	9950	11600	9020	9520	20
Cesium	0.402	0.591	0.253	0.205	0.278	0.238	0.142	0.160	0.0050
Chromium	4.38	5.95	4.97	3.38	4.37	3.68	2.26	2.44	0.050
Cobalt	1.32	1.93	1.49	1.07	2.51	1.14	0.896	0.912	0.020
Copper	4.36	5.62	3.57	3.14	4.78	3.14	2.88	2.76	0.10
Iron	5100	7530	5450	3460	4590	4260	4840	5060	3.0
Lead	15.3	14.4	4.04	4.58	4.45	4.36	1.87	1.91	0.020
Lithium	4.19	6.26	2.45	1.48	2.23	1.72	1.06	1.14	0.50
Magnesium	2300	3240	3040	2390	2930	2510	2080	2260	2.0
Manganese	103	146	79.7	61.0	67.6	66.5	69.0	65.5	0.050
Mercury	0.0398	0.0347	0.0406	0.0475	0.0418	0.0458	0.0570	0.0629	0.0050
Molybdenum	0.874	1.12	0.659	0.331	0.508	0.465	0.386	0.369	0.020
Nickel	3.49	4.62	3.64	2.85	3.55	3.00	2.02	2.10	0.20
Phosphorus	724	725	391	458	431	479	553	574	10
Potassium	3170	3110	2040	2050	2100	2250	2010	2280	20
Rubidium	11.5	15.7	11.4	10.6	12.1	11.5	9.90	10.8	0.050
Selenium	0.065	0.073	0.061	0.079	0.077	0.072	0.073	0.067	0.050
Silver	0.109	0.118	0.0323	0.0345	0.0323	0.0367	0.0218	0.0230	0.0050
Sodium	277	232	200	241	215	257	290	260	20
Strontium	74.3	69.4	5.47	6.39	5.58	6.65	4.58	4.73	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0636	0.0861	0.0469	0.0361	0.0483	0.0394	0.0234	0.0253	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-127 to L-129.

Parameter[1]	L-127 (UNWASHED)	L-127 (WASHED)	L-128 (UNWASHED)	L-128 (WASHED)	L-128-R[2] (UNWASHED)	L-128-R[2] (WASHED)	L-129 (UNWASHED)	L-129 (WASHED)	LDL[3]
Tin	0.20	0.28	0.17	0.10	0.14	0.13	<0.10	<0.10	0.10
Titanium	164	245	139	81.5	120	98.7	52.3	58.6	0.25
Uranium	1.89	2.14	0.650	0.585	0.703	0.641	0.334	0.344	0.0020
Vanadium	4.38	6.31	4.09	2.49	4.73	2.91	1.61	1.82	0.10
Zinc	18.5	21.7	14.8	16.2	15.0	16.1	20.5	21.9	0.50
Zirconium	6.50	8.50	2.82	2.12	2.39	2.24	1.34	1.45	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-130 to L-132.

Parameter[1]	L-130 (UNWASHED)	L-130 (WASHED)	L-130-R[2] (UNWASHED)	L-130-R[2] (WASHED)	L-131 (UNWASHED)	L-131 (WASHED)	L-132 (UNWASHED)	L-132 (WASHED)	LDL[3]
Aluminum	956	1060	975	788	690	706	905	830	2.0
Antimony	0.011	0.012	0.012	0.012	0.011	0.011	0.036	0.023	0.010
Arsenic	0.142	0.159	0.121	0.122	0.111	0.136	0.136	0.125	0.020
Barium	9.22	9.16	8.82	9.19	9.38	9.05	9.13	8.11	0.050
Beryllium	0.050	0.051	0.051	0.047	0.044	0.043	0.049	0.040	0.010
Bismuth	0.044	0.049	0.049	0.042	0.028	0.058	0.036	0.029	0.010
Boron	1.2	1.3	1.1	1.0	<1.0	<1.0	1.2	<1.0	1.0
Cadmium	0.0588	0.0544	0.0463	0.0526	0.0446	0.0501	0.0475	0.0464	0.0050
Calcium	9810	10400	8330	10100	7340	9570	11800	12700	20
Cesium	0.131	0.148	0.136	0.121	0.115	0.131	0.134	0.124	0.0050
Chromium	2.46	2.72	2.53	2.20	1.89	1.92	2.39	2.28	0.050
Cobalt	0.657	0.736	0.687	0.618	0.601	0.584	0.657	0.643	0.020
Copper	2.53	2.56	2.56	2.16	1.89	1.94	2.20	2.04	0.10
Iron	4750	5710	4160	3720	3330	4250	4600	3850	3.0
Lead	2.04	2.01	1.88	1.87	1.41	1.56	1.65	1.60	0.020
Lithium	0.94	1.08	0.97	0.82	0.68	0.70	0.92	0.87	0.50
Magnesium	1750	2100	1730	1610	1480	1300	1440	1370	2.0
Manganese	53.1	52.3	44.3	41.9	41.1	48.6	40.5	39.1	0.050
Mercury	0.0428	0.0413	0.0433	0.0538	0.0536	0.0532	0.0496	0.0476	0.0050
Molybdenum	0.502	0.527	0.472	0.428	0.332	0.390	0.437	0.370	0.020
Nickel	2.03	2.16	2.11	1.76	1.70	1.83	2.01	1.98	0.20
Phosphorus	526	535	537	546	497	519	482	445	10
Potassium	1680	1840	1680	1750	1930	2090	1670	1450	20
Rubidium	6.94	7.47	7.07	6.65	7.35	8.80	7.52	6.68	0.050
Selenium	0.076	0.064	0.063	0.078	0.062	0.075	0.072	0.056	0.050
Silver	0.0336	0.0388	0.0286	0.0270	0.0168	0.0252	0.0252	0.0258	0.0050
Sodium	483	545	385	409	352	320	390	328	20
Strontium	3.51	3.95	3.62	4.08	3.68	4.02	4.43	4.43	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0219	0.0245	0.0230	0.0204	0.0173	0.0174	0.0213	0.0196	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-130 to L-132.

Parameter[1]	L-130 (UNWASHED)	L-130 (WASHED)	L-130-R[2] (UNWASHED)	L-130-R[2] (WASHED)	L-131 (UNWASHED)	L-131 (WASHED)	L-132 (UNWASHED)	L-132 (WASHED)	LDL[3]
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.30	0.14	0.10
Titanium	55.9	63.2	62.4	48.5	39.8	40.8	57.9	52.6	0.25
Uranium	0.249	0.290	0.265	0.284	0.172	0.174	0.220	0.210	0.0020
Vanadium	1.86	1.88	1.77	1.41	1.12	1.16	1.64	1.48	0.10
Zinc	21.5	21.4	17.5	18.0	13.3	14.3	15.6	14.8	0.50
Zirconium	1.39	1.46	1.24	1.12	0.88	0.95	1.26	1.11	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-133 to L-135.

Parameter[1]	L-133 (UNWASHED)	L-133 (WASHED)	L-133-R[2] (UNWASHED)	L-133-R[2] (WASHED)	L-134 (WASHED)	L-134 (UNWASHED)	L-135 (UNWASHED)	L-135 (WASHED)	LDL[3]
Aluminum	2690	2350	6850	4280	1230	1530	241	171	2.0
Antimony	0.015	0.018	0.035	0.026	0.046	0.025	0.010	<0.010	0.010
Arsenic	0.149	0.159	0.576	0.317	0.152	0.173	0.048	0.036	0.020
Barium	18.6	21.1	42.1	30.5	10.7	10.3	3.38	2.90	0.050
Beryllium	0.107	0.099	0.241	0.185	0.060	0.076	0.011	<0.010	0.010
Bismuth	0.062	0.082	0.138	0.113	0.059	0.056	<0.010	<0.010	0.010
Boron	1.6	1.5	3.1	2.5	1.3	1.3	1.0	<1.0	1.0
Cadmium	0.0473	0.0619	0.0713	0.0856	0.0388	0.0381	0.0421	0.0387	0.0050
Calcium	5780	7350	7340	9920	8490	9010	21800	18300	20
Cesium	0.276	0.302	0.637	0.444	0.164	0.199	0.0517	0.0372	0.0050
Chromium	5.75	4.82	15.4	9.01	2.72	7.35	0.765	0.615	0.050
Cobalt	1.66	1.65	4.34	2.75	0.839	1.01	0.152	0.114	0.020
Copper	3.83	3.92	8.97	6.36	2.25	2.54	0.87	0.77	0.10
Iron	6070	5650	16900	12400	4840	6000	425	291	3.0
Lead	3.21	4.02	5.65	5.77	2.38	2.44	0.527	0.408	0.020
Lithium	2.80	2.50	7.23	4.51	1.33	1.71	0.52	<0.50	0.50
Magnesium	3000	2800	7140	4500	1970	2070	903	873	2.0
Manganese	78.4	76.3	182	128	46.9	51.5	13.0	11.8	0.050
Mercury	0.0277	0.0371	0.0425	0.0446	0.0397	0.0341	0.0590	0.0580	0.0050
Molybdenum	0.498	0.414	1.13	0.691	0.331	0.553	0.063	0.047	0.020
Nickel	5.24	3.96	10.6	7.15	2.19	2.67	0.70	0.49	0.20
Phosphorus	392	522	574	625	347	328	369	403	10
Potassium	2130	2510	4090	3380	1490	1370	1390	1420	20
Rubidium	11.6	13.6	24.7	18.8	7.07	7.68	2.74	2.36	0.050
Selenium	0.059	0.074	0.102	0.112	0.062	0.057	0.057	0.051	0.050
Silver	0.0298	0.0422	0.0491	0.0484	0.0238	0.0248	0.0065	0.0056	0.0050
Sodium	175	268	248	273	196	170	339	331	20
Strontium	4.16	5.24	6.38	6.55	4.22	3.95	10.8	9.42	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0497	0.0500	0.126	0.0851	0.0294	0.0339	0.0063	0.0048	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-133 to L-135.

Parameter[1]	L-133 (UNWASHED)	L-133 (WASHED)	L-133-R[2] (UNWASHED)	L-133-R[2] (WASHED)	L-134 (WASHED)	L-134 (UNWASHED)	L-135 (UNWASHED)	L-135 (WASHED)	LDL[3]
Tin	0.17	0.22	0.58	0.42	0.10	0.11	<0.10	<0.10	0.10
Titanium	160	135	440	259	75.4	93.6	15.9	9.88	0.25
Uranium	0.633	0.692	1.27	1.15	0.406	0.526	0.140	0.0628	0.0020
Vanadium	4.92	4.24	13.3	8.07	2.16	3.01	0.57	0.41	0.10
Zinc	13.4	16.1	26.5	21.7	12.6	11.9	8.86	8.37	0.50
Zirconium	2.91	2.62	5.42	4.53	2.03	2.69	0.38	0.36	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-136 to L-138.

Parameter[1]	L-136 (UNWASHED)	L-136 (WASHED)	L-137 (UNEASHED)	L-137 (WASHED)	L-137-R[2] (UNWASHED)	L-137-R[2] (WASHED)	L-138 (UNWASHED)	L-138 (WASHED)	LDL[3]
Aluminum	234	111	146	242	178	226	237	234	2.0
Antimony	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.010	0.010
Arsenic	0.073	0.055	0.060	0.081	0.070	0.049	0.044	0.073	0.020
Barium	4.58	3.58	4.29	4.01	3.77	7.75	7.69	4.58	0.050
Beryllium	0.015	<0.010	0.011	0.014	0.013	0.013	0.014	0.015	0.010
Bismuth	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Boron	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Cadmium	0.0308	0.0220	0.0230	0.0348	0.0298	0.189	0.159	0.0308	0.0050
Calcium	24500	29000	29900	38400	38400	10500	10600	24500	20
Cesium	0.0769	0.0487	0.0555	0.0721	0.0604	0.0438	0.0464	0.0769	0.0050
Chromium	0.662	0.327	0.433	0.655	0.551	0.647	0.574	0.662	0.050
Cobalt	0.181	0.091	0.111	0.168	0.128	0.194	0.193	0.181	0.020
Copper	0.86	0.68	0.78	0.86	0.74	0.84	1.23	0.86	0.10
Iron	1050	430	594	1050	933	470	475	1050	3.0
Lead	0.846	0.532	0.553	0.878	0.724	0.821	0.762	0.846	0.020
Lithium	0.52	<0.50	<0.50	0.53	<0.50	<0.50	<0.50	0.52	0.50
Magnesium	856	719	727	929	833	1040	993	856	2.0
Manganese	16.4	10.6	12.1	16.3	14.3	28.8	28.6	16.4	0.050
Mercury	0.0441	0.0416	0.0451	0.0380	0.0383	0.0472	0.0512	0.0441	0.0050
Molybdenum	0.094	0.076	0.090	0.095	0.088	0.045	0.065	0.094	0.020
Nickel	0.50	0.28	0.36	0.51	0.42	0.42	0.44	0.50	0.20
Phosphorus	312	296	329	325	307	486	530	312	10
Potassium	1190	1220	1240	1250	1180	1820	1840	1190	20
Rubidium	3.77	2.90	3.20	2.84	2.67	4.62	4.83	3.77	0.050
Selenium	0.057	0.059	0.060	0.060	0.055	0.075	0.075	0.057	0.050
Silver	0.0137	0.0089	0.0097	0.0138	0.0122	0.0070	0.0087	0.0137	0.0050
Sodium	340	281	260	316	281	348	331	340	20
Strontium	14.2	17.6	18.1	23.7	23.7	5.53	6.08	14.2	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0066	0.0037	0.0043	0.0055	0.0038	0.0058	0.0052	0.0066	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-136 to L-138.

Parameter[1]	L-136 (UNWASHED)	L-136 (WASHED)	L-137 (UNEASHED)	L-137 (WASHED)	L-137-R[2] (UNWASHED)	L-137-R[2] (WASHED)	L-138 (UNWASHED)	L-138 (WASHED)	LDL[3]
Tin	<0.10	<0.10	<0.10	<0.10	0.15	0.15	<0.10	<0.10	0.10
Titanium	14.4	6.50	8.46	12.8	9.41	18.7	17.2	14.4	0.25
Uranium	0.178	0.0992	0.0954	0.179	0.138	0.0334	0.0338	0.178	0.0020
Vanadium	0.52	0.25	0.33	0.57	0.40	0.51	0.48	0.52	0.10
Zinc	8.04	6.32	7.18	8.27	8.05	27.5	26.3	8.04	0.50
Zirconium	0.48	0.26	0.34	0.55	0.41	0.43	0.48	0.48	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-139 to L-141.

Parameter[1]	L-139 (UNWASHED)	L-139 (WASHED)	L-140 (UNWASHED)	L-140 (WASHED)	L-141 (UNWASHED)	L-141 (WASHED)	L-141-R[2] (UNWASHED)	L-141-R[2] (WASHED)	LDL[3]
Aluminum	130	150	122	135	100	111	82.5	103	2.0
Antimony	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Arsenic	0.040	0.046	0.043	0.044	0.041	0.061	0.042	0.037	0.020
Barium	2.32	2.32	3.44	3.47	2.69	2.70	2.66	2.62	0.050
Beryllium	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Bismuth	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Boron	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Cadmium	0.0196	0.0213	0.0600	0.0393	0.0185	0.0178	0.0188	0.0163	0.0050
Calcium	20900	23000	24700	25300	19600	20600	22500	24100	20
Cesium	0.0294	0.0316	0.0285	0.0297	0.0297	0.0290	0.0323	0.0257	0.0050
Chromium	0.490	0.530	0.353	0.365	0.301	0.346	0.330	0.291	0.050
Cobalt	0.100	0.097	0.073	0.082	0.064	0.068	0.054	0.070	0.020
Copper	0.73	0.72	0.81	1.46	0.63	0.67	0.63	0.72	0.10
Iron	246	260	408	435	321	348	259	362	3.0
Lead	0.307	0.319	0.332	0.407	0.267	0.289	0.251	0.292	0.020
Lithium	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Magnesium	1170	974	872	869	965	958	1000	930	2.0
Manganese	10.0	9.79	9.67	10.1	9.32	9.72	8.37	8.81	0.050
Mercury	0.0587	0.0582	0.0454	0.0430	0.0419	0.0459	0.0432	0.0425	0.0050
Molybdenum	0.051	0.046	0.085	0.074	0.077	0.071	0.071	0.087	0.020
Nickel	0.42	0.43	0.27	0.49	0.21	0.29	0.24	0.26	0.20
Phosphorus	396	390	315	308	353	352	340	360	10
Potassium	1470	1420	1420	1310	1360	1300	1310	1160	20
Rubidium	1.72	1.47	1.49	1.44	1.97	1.79	1.88	1.82	0.050
Selenium	<0.050	0.056	0.057	0.059	<0.050	0.052	0.061	<0.050	0.050
Silver	<0.0050	0.0055	0.0068	0.0072	0.0073	0.0055	<0.0050	<0.0050	0.0050
Sodium	346	293	313	291	348	318	331	281	20
Strontium	10.2	10.2	11.8	11.9	10.9	11.1	12.2	13.0	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0040	0.0040	0.0031	0.0037	0.0030	0.0027	0.0027	0.0025	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-139 to L-141.

Parameter[1]	L-139 (UNWASHED)	L-139 (WASHED)	L-140 (UNWASHED)	L-140 (WASHED)	L-141 (UNWASHED)	L-141 (WASHED)	L-141-R[2] (UNWASHED)	L-141-R[2] (WASHED)	LDL[3]
Tin	<0.10	<0.10	0.13	0.13	0.24	0.14	0.16	0.10	0.10
Titanium	8.19	7.94	6.56	7.46	5.24	6.24	4.42	5.58	0.25
Uranium	0.0619	0.0638	0.119	0.137	0.0380	0.0415	0.0353	0.0460	0.0020
Vanadium	0.29	0.35	0.30	0.31	0.21	0.25	0.18	0.23	0.10
Zinc	6.37	7.17	11.7	11.9	7.69	8.10	7.64	7.55	0.50
Zirconium	0.24	0.27	0.22	0.24	0.25	0.22	<0.20	0.22	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-142 to L-145.

Parameter[1]	L-142 (UNWASHED)	L-142 (WASHED)	L-143 (UNWASHED)	L-143 (WASHED)	L-144 (UNWASHED)	L-144 (WASHED)	L-145 (UNWASHED)	L-145 (WASHED)	LDL[2]
Aluminum	140	170	222	326	403	374	449	300	2.0
Antimony	0.016	0.010	<0.010	0.013	0.012	0.012	0.010	0.010	0.010
Arsenic	0.058	0.049	0.079	0.110	0.094	0.096	0.138	0.106	0.020
Barium	3.07	3.29	4.95	6.20	5.67	5.81	4.26	4.00	0.050
Beryllium	<0.010	0.010	0.015	0.023	0.037	0.032	0.031	0.021	0.010
Bismuth	<0.010	<0.010	0.012	0.015	0.020	0.020	0.013	0.012	0.010
Boron	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	2.1	1.4	1.0
Cadmium	0.0250	0.0333	0.0536	0.0474	0.0373	0.0416	0.0253	0.0244	0.0050
Calcium	20900	22900	24400	26200	20400	20000	23300	21100	20
Cesium	0.0517	0.0573	0.0902	0.121	0.194	0.197	0.133	0.109	0.0050
Chromium	0.379	0.484	0.577	0.755	0.974	0.880	1.18	0.822	0.050
Cobalt	0.095	0.116	0.148	0.239	0.277	0.263	0.308	0.223	0.020
Copper	0.84	0.87	0.92	1.22	1.15	1.18	1.08	0.96	0.10
Iron	644	817	1240	2250	2200	1980	1760	1630	3.0
Lead	0.405	0.486	1.33	1.60	2.71	2.83	1.53	1.31	0.020
Lithium	<0.50	<0.50	<0.50	0.69	1.10	1.03	1.30	0.77	0.50
Magnesium	786	799	736	1110	1270	1130	1520	1290	2.0
Manganese	12.0	13.0	22.6	32.0	33.1	34.9	27.6	23.6	0.050
Mercury	0.0424	0.0462	0.0394	0.0429	0.0443	0.0368	0.0385	0.0409	0.0050
Molybdenum	0.092	0.125	0.155	0.169	0.209	0.205	0.132	0.130	0.020
Nickel	0.38	0.38	0.46	0.71	0.73	0.70	0.85	0.63	0.20
Phosphorus	395	369	306	404	392	390	431	462	10
Potassium	1440	1350	1190	1540	1590	1510	1510	1590	20
Rubidium	4.25	3.91	3.98	5.02	5.30	5.50	3.36	3.08	0.050
Selenium	<0.050	<0.050	0.061	0.069	0.066	0.052	0.053	0.057	0.050
Silver	0.0077	0.0093	0.0121	0.0132	0.0209	0.0209	0.0169	0.0151	0.0050
Sodium	377	340	296	381	432	375	346	328	20
Strontium	11.8	12.2	19.6	23.5	20.0	22.1	20.4	19.5	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0042	0.0062	0.0049	0.0063	0.0114	0.0097	0.0096	0.0077	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-142 to L-145.

Parameter[1]	L-142 (UNWASHED)	L-142 (WASHED)	L-143 (UNWASHED)	L-143 (WASHED)	L-144 (UNWASHED)	L-144 (WASHED)	L-145 (UNWASHED)	L-145 (WASHED)	LDL[2]
Tin	0.17	0.15	0.24	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Titanium	7.38	9.14	9.83	14.0	19.6	16.2	17.3	12.4	0.25
Uranium	0.140	0.188	0.228	0.329	0.660	0.781	0.279	0.226	0.0020
Vanadium	0.29	0.35	0.39	0.52	0.68	0.56	0.92	0.55	0.10
Zinc	8.49	9.08	10.5	13.5	11.6	12.0	8.87	8.90	0.50
Zirconium	0.30	0.36	0.73	1.38	1.88	1.72	1.34	0.89	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-145 to L-148.

Parameter[1]	L-145-R[2] (UNWASHED)	L-145-R[2] (WASHED)	L-146 (UNWASHED)	L-146 (WASHED)	L-147 (UNWASHED)	L-147 (WASHED)	L-148 (UNWASHED)	L-148 (WASHED)	LDL[3]
Aluminum	303	396	307	342	419	355	4000	4180	2.0
Antimony	<0.010	0.011	0.010	0.012	0.019	<0.010	0.015	0.018	0.010
Arsenic	0.107	0.126	0.137	0.140	0.160	0.141	0.313	0.339	0.020
Barium	3.93	4.45	3.22	3.67	4.61	4.33	28.2	30.1	0.050
Beryllium	0.024	0.033	0.022	0.024	0.029	0.025	0.159	0.158	0.010
Bismuth	0.012	0.017	0.025	0.012	0.015	0.014	0.131	0.139	0.010
Boron	1.2	1.6	1.6	1.4	1.8	1.6	2.9	3.0	1.0
Cadmium	0.0233	0.0266	0.0318	0.0336	0.0370	0.0393	0.0692	0.0824	0.0050
Calcium	20400	20900	21900	22100	30300	30600	6290	8170	20
Cesium	0.116	0.158	0.0920	0.101	0.114	0.100	0.456	0.480	0.0050
Chromium	0.822	1.02	0.769	0.879	1.23	0.927	8.30	8.52	0.050
Cobalt	0.220	0.258	0.224	0.240	0.296	0.257	2.29	2.34	0.020
Copper	0.92	1.03	0.96	1.09	1.41	1.17	6.03	6.32	0.10
Iron	1740	1840	1820	1930	2230	2020	8390	9090	3.0
Lead	1.41	1.99	1.01	1.09	1.45	1.36	4.05	4.84	0.020
Lithium	0.75	1.05	0.71	0.82	1.05	0.85	5.67	5.78	0.50
Magnesium	1210	1210	1520	1510	1300	1370	3370	3410	2.0
Manganese	21.8	25.5	19.1	19.8	26.1	24.4	122	125	0.050
Mercury	0.0409	0.0385	0.0484	0.0480	0.0489	0.0545	0.0256	0.0257	0.0050
Molybdenum	0.145	0.157	0.157	0.164	0.175	0.152	1.20	1.09	0.020
Nickel	0.63	0.75	0.67	0.71	0.93	0.77	6.06	6.29	0.20
Phosphorus	426	406	339	388	401	468	356	357	10
Potassium	1470	1370	1250	1290	1360	1360	2090	2130	20
Rubidium	2.95	3.48	2.17	2.31	3.07	2.95	13.9	14.6	0.050
Selenium	0.058	0.055	0.061	0.073	0.068	0.070	0.070	0.066	0.050
Silver	0.0145	0.0163	0.0161	0.0168	0.0166	0.0144	0.0555	0.0576	0.0050
Sodium	350	339	442	479	450	506	97	102	20
Strontium	22.7	23.0	35.5	35.6	34.4	33.9	12.6	14.1	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0069	0.0090	0.0060	0.0069	0.0137	0.0084	0.0732	0.0772	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-145 to L-148.

Parameter[1]	L-145-R[2] (UNWASHED)	L-145-R[2] (WASHED)	L-146 (UNWASHED)	L-146 (WASHED)	L-147 (UNWASHED)	L-147 (WASHED)	L-148 (UNWASHED)	L-148 (WASHED)	LDL[3]
Tin	<0.10	<0.10	1.09	0.28	0.29	0.13	0.63	0.44	0.10
Titanium	12.7	15.9	11.8	12.7	18.6	16.1	208	218	0.25
Uranium	0.276	0.459	0.188	0.212	0.692	0.753	0.870	0.947	0.0020
Vanadium	0.56	0.72	0.52	0.58	0.82	0.70	6.56	6.71	0.10
Zinc	8.72	8.65	8.62	10.3	10.3	10.5	20.4	21.9	0.50
Zirconium	1.10	1.32	0.76	0.73	1.00	0.84	4.73	5.27	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-149 to L-151.

Parameter[1]	L-149 (UNWASHED)	L-149 (WASHED)	L-149-R[2] (UNWASHED)	L-149-R[2] (WASHED)	L-150 (UNWASHED)	L-150 (WASHED)	L-151 (UNWASHED)	L-151 (WASHED)	LDL[3]
Aluminum	2900	2760	3560	3850	5690	2650	2460	2030	2.0
Antimony	0.013	0.018	0.017	0.016	0.021	0.013	0.013	0.014	0.010
Arsenic	0.178	0.185	0.237	0.232	0.228	0.158	0.193	0.182	0.020
Barium	27.1	28.2	30.2	30.4	41.4	25.6	27.1	25.3	0.050
Beryllium	0.117	0.108	0.153	0.148	0.190	0.104	0.107	0.104	0.010
Bismuth	0.095	0.116	0.124	0.137	0.120	0.100	0.121	0.138	0.010
Boron	2.3	2.0	2.9	2.7	3.3	2.0	2.4	2.4	1.0
Cadmium	0.0620	0.0860	0.0959	0.0704	0.0918	0.121	0.106	0.120	0.0050
Calcium	8660	11600	9920	7360	11200	17100	18200	19400	20
Cesium	0.354	0.350	0.416	0.405	0.583	0.387	0.360	0.365	0.0050
Chromium	4.48	4.50	6.12	6.06	7.35	3.91	4.95	4.46	0.050
Cobalt	1.40	1.35	1.87	1.82	2.44	1.28	1.41	1.18	0.020
Copper	4.24	4.11	5.93	5.72	6.88	4.24	4.29	3.94	0.10
Iron	5520	5250	6990	6930	9480	4960	4900	4120	3.0
Lead	4.22	4.67	5.52	5.35	6.91	6.71	6.18	7.36	0.020
Lithium	3.73	3.44	4.83	4.49	6.73	3.45	3.55	2.89	0.50
Magnesium	2730	2870	3390	3290	4770	2630	2790	2170	2.0
Manganese	77.5	77.8	103	95.4	154	97.7	84.9	70.3	0.050
Mercury	0.0253	0.0300	0.0345	0.0311	0.0305	0.0387	0.0414	0.0487	0.0050
Molybdenum	0.841	0.749	1.21	1.14	1.10	0.848	0.689	0.568	0.020
Nickel	3.55	3.43	5.14	4.93	6.36	3.75	4.14	4.23	0.20
Phosphorus	324	385	365	332	440	490	725	744	10
Potassium	1790	2010	2110	2100	3180	2700	2450	2510	20
Rubidium	10.2	10.6	12.8	12.3	18.8	13.3	11.6	11.7	0.050
Selenium	0.054	0.063	0.073	0.068	0.064	0.061	0.066	0.070	0.050
Silver	0.0520	0.0596	0.0574	0.0533	0.0694	0.0622	0.0685	0.0720	0.0050
Sodium	97	111	107	92	151	240	240	271	20
Strontium	15.4	19.2	14.8	12.4	19.0	24.4	35.7	33.9	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0589	0.0562	0.0710	0.0696	0.0897	0.0519	0.0496	0.0476	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-149 to L-151.

Parameter[1]	L-149 (UNWASHED	L-149 (WASHED)	L-149-R[2] (UNWASHED)	L-149-R[2] (WASHED)	L-150 (UNWASHED)	L-150 (WASHED)	L-151 (UNWASHED)	L-151 (WASHED)	LDL[3]
Tin	0.46	0.32	0.27	0.30	0.49	0.37	0.38	0.29	0.10
Titanium	159	157	205	197	305	162	145	126	0.25
Uranium	0.564	0.553	0.787	0.731	0.873	0.621	0.736	0.749	0.0020
Vanadium	4.39	4.12	5.79	5.73	7.86	3.95	4.26	3.59	0.10
Zinc	15.4	17.0	22.1	20.7	24.3	22.0	21.0	20.5	0.50
Zirconium	3.51	3.04	4.37	4.35	6.49	3.87	3.47	3.70	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-152 to L-155.

Parameter[1]	L-152 (UNWASHED)	L-152 (WASHED)	L-153 (UNWASHED)	L-153 (WASHED)	L-154 (UNWASHED)	L-154 (WASHED)	L-155 (UNWASHED)	L-155 (WASHED)	LDL[2]
Aluminum	4910	3640	1160	1130	922	841	975	886	2.0
Antimony	0.015	0.016	0.018	0.013	<0.010	<0.010	0.018	<0.010	0.010
Arsenic	0.232	0.212	0.257	0.186	0.109	0.097	0.178	0.121	0.020
Barium	35.7	30.2	12.8	10.6	7.20	7.07	11.0	10.6	0.050
Beryllium	0.167	0.131	0.061	0.058	0.038	0.038	0.049	0.047	0.010
Bismuth	0.184	0.192	0.043	0.040	0.032	0.023	0.034	0.034	0.010
Boron	3.0	2.4	1.1	<1.0	1.0	1.1	1.1	1.0	1.0
Cadmium	0.0781	0.0968	0.127	0.0907	0.0759	0.0855	0.0641	0.0593	0.0050
Calcium	6810	10000	9890	9030	9710	10700	10600	10300	20
Cesium	0.519	0.440	0.161	0.153	0.126	0.120	0.178	0.149	0.0050
Chromium	11.0	8.41	3.14	3.11	2.65	2.35	2.96	2.74	0.050
Cobalt	2.49	1.93	1.01	0.886	0.629	0.568	0.733	0.668	0.020
Copper	8.94	7.38	3.07	2.71	2.11	2.04	2.30	2.19	0.10
Iron	9190	7120	7220	5790	3280	3160	3990	2930	3.0
Lead	5.57	5.86	2.19	1.96	1.22	1.19	2.03	1.76	0.020
Lithium	5.74	4.41	1.22	1.18	0.91	0.82	1.12	0.90	0.50
Magnesium	4290	3410	1930	1710	1700	1590	1610	1850	2.0
Manganese	123	102	71.2	54.9	37.4	36.0	65.3	40.4	0.050
Mercury	0.0278	0.0370	0.0512	0.0540	0.0632	0.0682	0.0721	0.0772	0.0050
Molybdenum	1.40	1.16	0.526	0.398	0.249	0.275	0.371	0.334	0.020
Nickel	7.65	5.94	2.96	3.20	2.64	2.40	3.04	2.41	0.20
Phosphorus	448	500	521	571	423	397	467	529	10
Potassium	2320	2400	2040	1490	1730	1690	1810	1890	20
Rubidium	15.8	14.2	9.89	7.27	6.48	5.80	7.27	7.08	0.050
Selenium	0.071	0.077	0.108	0.098	0.077	0.079	0.108	0.090	0.050
Silver	0.0867	0.0836	0.0328	0.0299	0.0157	0.0156	0.0232	0.0196	0.0050
Sodium	107	157	328	218	253	252	329	317	20
Strontium	11.8	14.7	6.33	4.86	2.84	3.47	4.01	4.02	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0935	0.0778	0.0216	0.0209	0.0176	0.0161	0.0241	0.0195	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-152 to L-155.

Parameter[1]	L-152 (UNWASHED)	L-152 (WASHED)	L-153 (UNWASHED)	L-153 (WASHED)	L-154 (UNWASHED)	L-154 (WASHED)	L-155 (UNWASHED)	L-155 (WASHED)	LDL[2]
Tin	0.48	0.36	0.29	0.31	0.27	0.28	0.24	0.21	0.10
Titanium	263	198	74.2	70.8	59.6	53.5	66.3	61.8	0.25
Uranium	0.808	0.729	0.257	0.250	0.183	0.183	0.251	0.204	0.0020
Vanadium	7.91	6.00	2.01	2.03	1.60	1.46	1.92	1.61	0.10
Zinc	23.5	21.9	21.1	18.3	17.0	17.5	17.6	20.2	0.50
Zirconium	5.49	4.36	1.19	1.15	1.10	0.89	1.21	1.03	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-156 to L-158.

Parameter[1]	L-156 (UNWASHED)	L-156 (WASHED)	L-156-R[2] (UNWASHED)	L-156-R[2] (WASHED)	L-157 (UNWASHED)	L-157 (WASHED)	L-158 (UNWASHED)	L-158 (WASHED)	LDL[3]
Aluminum	1420	1290	1390	1100	1770	1570	1700	1390	2.0
Antimony	0.011	<0.010	<0.010	<0.010	0.014	0.015	<0.010	<0.010	0.010
Arsenic	0.180	0.174	0.159	0.174	0.328	0.310	0.177	0.174	0.020
Barium	11.4	10.7	10.5	11.0	24.2	25.7	13.9	14.6	0.050
Beryllium	0.066	0.064	0.068	0.053	0.083	0.080	0.080	0.074	0.010
Bismuth	0.055	0.051	0.050	0.049	0.119	0.129	0.067	0.062	0.010
Boron	1.3	1.2	1.3	1.0	1.3	1.2	1.5	1.4	1.0
Cadmium	0.0543	0.0576	0.0566	0.0547	0.739	0.823	0.185	0.139	0.0050
Calcium	19100	14200	19500	12300	11700	12000	9130	11500	20
Cesium	0.242	0.212	0.230	0.206	0.275	0.244	0.227	0.206	0.0050
Chromium	3.86	3.49	3.67	3.04	4.63	4.27	4.24	3.65	0.050
Cobalt	0.902	0.893	0.909	0.774	1.25	1.13	1.13	0.982	0.020
Copper	2.88	2.95	2.76	2.64	12.7	10.6	3.38	3.14	0.10
Iron	5110	5020	4610	4390	8150	8430	6020	5210	3.0
Lead	2.46	2.68	2.43	2.22	4.82	5.17	3.03	3.09	0.020
Lithium	1.46	1.27	1.49	1.09	1.71	1.52	1.79	1.44	0.50
Magnesium	2020	1710	2100	1740	2240	2020	2310	2050	2.0
Manganese	49.3	47.7	47.9	44.0	82.7	74.2	66.5	60.9	0.050
Mercury	0.0528	0.0749	0.0546	0.0759	0.0476	0.0519	0.0660	0.0673	0.0050
Molybdenum	0.606	0.497	0.546	0.507	1.03	1.01	0.889	0.761	0.020
Nickel	2.81	2.66	2.65	2.24	4.01	3.79	3.42	3.02	0.20
Phosphorus	475	468	499	515	543	463	559	569	10
Potassium	2330	1920	2210	2210	2460	1900	2280	2340	20
Rubidium	10.6	8.62	9.66	9.60	12.5	10.3	9.07	8.75	0.050
Selenium	0.093	0.091	0.088	0.088	0.105	0.110	0.090	0.094	0.050
Silver	0.0316	0.0280	0.0326	0.0312	0.0875	0.0848	0.0385	0.0371	0.0050
Sodium	301	197	249	229	287	243	296	306	20
Strontium	6.09	4.60	5.52	4.32	7.07	7.46	4.13	4.41	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0314	0.0312	0.0299	0.0268	0.0398	0.0386	0.0350	0.0312	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-156 to L-158.

Parameter[1]	L-156 (UNWASHED)	L-156 (WASHED)	L-156-R[2] (UNWASHED)	L-156-R[2] (WASHED)	L-157 (UNWASHED)	L-157 (WASHED)	L-158 (UNWASHED)	L-158 (WASHED)	LDL[3]
Tin	0.24	0.25	0.25	0.26	0.30	0.39	0.91	0.26	0.10
Titanium	96.6	91.7	97.1	79.4	112	102	111	90.1	0.25
Uranium	0.320	0.323	0.312	0.277	0.405	0.420	0.382	0.356	0.0020
Vanadium	2.69	2.40	2.56	2.02	3.10	2.82	2.96	2.45	0.10
Zinc	18.3	16.8	17.2	16.2	25.5	25.4	21.0	20.8	0.50
Zirconium	1.80	1.82	1.60	1.59	2.09	2.30	1.84	1.58	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] R = replicate sample

[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-159 to L-162.

Parameter[1]	L-159 (UNWASHED)	L-159 (WASHED)	L-160 (UNWASHED)	L-160 (WASHED)	L-161 (UNWASHED)	L-161 (WASHED)	L-162 (UNWASHED)	L-162 (WASHED)	LDL[2]
Aluminum	591	441	581	316	969	744	464	468	2.0
Antimony	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Arsenic	0.091	0.066	0.109	0.072	0.084	0.080	0.080	0.075	0.020
Barium	4.34	4.32	5.41	3.56	10.1	11.2	6.91	7.00	0.050
Beryllium	0.028	0.024	0.032	0.020	0.038	0.036	0.023	0.023	0.010
Bismuth	0.013	0.015	0.020	0.013	0.030	0.040	0.021	0.019	0.010
Boron	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	1.2	1.0
Cadmium	0.0525	0.0598	0.0583	0.0341	0.0390	0.0523	0.0509	0.0532	0.0050
Calcium	11900	12400	9900	6300	3670	5600	15400	15000	20
Cesium	0.0881	0.0842	0.0885	0.0594	0.188	0.189	0.106	0.109	0.0050
Chromium	1.73	1.37	1.68	0.967	1.91	1.54	1.34	1.43	0.050
Cobalt	0.411	0.316	0.457	0.252	0.552	0.483	0.316	0.324	0.020
Copper	1.45	1.31	1.50	0.92	1.73	1.65	1.42	1.34	0.10
Iron	2090	1440	2630	1740	2120	1730	1390	1490	3.0
Lead	0.807	0.782	1.17	0.769	1.36	1.72	1.14	1.09	0.020
Lithium	0.66	<0.50	0.67	<0.50	1.17	0.98	0.62	0.70	0.50
Magnesium	1460	1260	1140	654	1330	1250	920	956	2.0
Manganese	25.0	21.3	33.8	20.3	52.1	50.4	24.1	25.2	0.050
Mercury	0.0464	0.0485	0.0505	0.0352	0.0346	0.0417	0.0417	0.0406	0.0050
Molybdenum	0.166	0.149	0.206	0.235	0.282	0.253	0.130	0.107	0.020
Nickel	1.24	0.99	1.28	0.73	1.52	1.30	0.97	0.98	0.20
Phosphorus	540	534	566	364	357	434	347	395	10
Potassium	2050	1890	1780	1230	1440	1750	1490	1480	20
Rubidium	5.15	5.03	4.76	3.26	9.34	10.9	4.08	4.20	0.050
Selenium	0.059	0.061	0.078	0.057	<0.050	<0.050	0.060	0.063	0.050
Silver	0.0093	0.0100	0.0201	0.0150	0.0171	0.0195	0.0133	0.0144	0.0050
Sodium	376	348	334	232	224	382	245	233	20
Strontium	3.36	3.56	4.35	2.76	4.25	5.85	7.15	7.38	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0117	0.0104	0.0126	0.0081	0.0232	0.0217	0.0118	0.0109	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-159 to L-162.

Parameter[1]	L-159 (UNWASHED)	L-159 (WASHED)	L-160 (UNWASHED)	L-160 (WASHED)	L-161 (UNWASHED)	L-161 (WASHED)	L-162 (UNWASHED)	L-162 (WASHED)	LDL[2]
Tin	0.23	0.12	0.48	0.50	1.17	1.39	0.14	0.17	0.10
Titanium	41.7	29.9	36.5	20.9	59.1	49.4	33.7	32.9	0.25
Uranium	0.112	0.0822	0.142	0.0826	0.169	0.180	0.104	0.0956	0.0020
Vanadium	1.17	0.80	1.11	0.59	1.55	1.16	0.96	0.97	0.10
Zinc	12.3	12.9	15.9	11.2	15.8	17.8	12.2	13.2	0.50
Zirconium	0.84	0.59	0.93	0.60	1.23	1.11	0.72	0.70	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-163 to L-165.

Parameter[1]	L-163 (UNWASHED)	L-163 (WASHED)	L-164 (UNWASHED)	L-164 (WASHED)	L-165 (UNWASHED)	L-165 (WASHED)	L-165-R[2] (UNWASHED)	L-165-R[2] (WASHED)	LDL[3]
Aluminum	430	388	149	150	220	230	168	176	2.0
Antimony	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Arsenic	0.074	0.092	0.035	0.033	0.073	0.070	0.050	0.059	0.020
Barium	14.1	12.7	3.84	3.94	5.56	5.35	4.97	4.36	0.050
Beryllium	0.023	0.020	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	0.010
Bismuth	0.032	0.029	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Boron	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Cadmium	0.184	0.169	0.0429	0.0482	0.115	0.111	0.132	0.0979	0.0050
Calcium	15300	13800	14900	15300	7040	5660	6530	4880	20
Cesium	0.125	0.120	0.0410	0.0417	0.0380	0.0380	0.0318	0.0348	0.0050
Chromium	1.06	1.06	0.413	0.428	0.607	0.622	0.426	0.440	0.050
Cobalt	0.339	0.328	0.110	0.107	0.191	0.206	0.158	0.154	0.020
Copper	1.31	1.25	0.92	0.94	1.09	1.05	1.04	1.02	0.10
Iron	1140	1070	410	430	967	1150	554	568	3.0
Lead	2.12	2.00	0.443	0.432	0.444	0.371	0.373	0.327	0.020
Lithium	0.58	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Magnesium	950	922	975	1030	939	1010	903	795	2.0
Manganese	50.4	54.7	12.3	12.7	35.9	43.8	40.2	37.5	0.050
Mercury	0.0494	0.0503	0.0473	0.0481	0.0399	0.0363	0.0413	0.0363	0.0050
Molybdenum	0.177	0.164	0.043	0.061	0.080	0.084	0.071	0.062	0.020
Nickel	0.91	0.91	0.31	0.34	0.53	0.54	0.46	0.55	0.20
Phosphorus	318	357	408	438	299	299	315	286	10
Potassium	1590	1610	1570	1690	1170	1100	1130	1050	20
Rubidium	7.11	7.28	2.23	2.34	3.01	3.02	2.29	2.40	0.050
Selenium	0.077	0.085	0.059	0.055	0.087	0.082	0.077	0.080	0.050
Silver	0.0228	0.0258	0.0051	<0.0050	0.0106	0.0087	0.0086	0.0085	0.0050
Sodium	220	207	404	419	125	135	131	130	20
Strontium	11.7	12.9	4.05	4.29	6.87	5.93	6.19	4.75	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0147	0.0116	0.0040	0.0040	0.0055	0.0055	0.0046	0.0053	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-163 to L-165.

Parameter[1]	L-163 (UNWASHED)	L-163 (WASHED)	L-164 (UNWASHED)	L-164 (WASHED)	L-165 (UNWASHED)	L-165 (WASHED)	L-165-R[2] (UNWASHED)	L-165-R[2] (WASHED)	LDL[3]
Tin	0.21	0.34	<0.10	<0.10	0.11	0.12	<0.10	<0.10	0.10
Titanium	32.3	28.9	10.4	9.83	14.6	13.6	11.6	10.6	0.25
Uranium	0.127	0.109	0.0290	0.0298	0.0493	0.0497	0.0418	0.0394	0.0020
Vanadium	0.74	0.66	0.30	0.30	0.39	0.40	0.30	0.31	0.10
Zinc	18.4	17.7	9.72	10.2	16.9	18.0	20.2	17.2	0.50
Zirconium	0.82	0.65	0.26	0.25	0.28	0.28	0.26	0.26	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-166 to L-168.

Parameter[1]	L-166 (UNWASHED)	L-166 (WASHED)	L-167 (UNWASHED)	L-167 (WASHED)	L-168 (UNWASHED)	L-168 (WASHED)	L-168-R[2] (UNWASHED)	L-168-R[2] (WASHED)	LDL[3]
Aluminum	191	320	292	334	114	177	167	139	2.0
Antimony	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Arsenic	0.042	0.038	0.066	0.067	0.042	0.058	0.049	0.047	0.020
Barium	10.7	13.0	5.13	5.09	6.54	6.83	5.13	5.63	0.050
Beryllium	0.015	0.031	0.016	0.022	<0.010	<0.010	<0.010	<0.010	0.010
Bismuth	<0.010	<0.010	0.012	0.012	<0.010	0.010	<0.010	<0.010	0.010
Boron	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	1.0
Cadmium	0.0778	0.0953	0.0285	0.0316	0.120	0.150	0.123	0.118	0.0050
Calcium	5310	5020	11100	11000	17700	17200	14200	16000	20
Cesium	0.0502	0.0581	0.0881	0.0879	0.0505	0.0553	0.0529	0.0472	0.0050
Chromium	0.477	0.671	0.921	1.07	0.333	0.526	0.486	0.366	0.050
Cobalt	0.228	1.75	0.210	0.250	0.105	0.140	0.145	0.123	0.020
Copper	0.87	4.17	1.03	1.15	0.83	0.92	0.87	0.81	0.10
Iron	323	435	622	680	341	513	605	507	3.0
Lead	0.623	0.761	0.534	0.553	0.514	0.649	0.593	0.579	0.020
Lithium	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	<0.50	<0.50	0.50
Magnesium	972	937	1340	1380	774	818	732	732	2.0
Manganese	38.7	52.9	18.0	18.9	14.6	18.2	17.6	18.1	0.050
Mercury	0.0421	0.0508	0.0710	0.0701	0.0439	0.0447	0.0409	0.0405	0.0050
Molybdenum	0.035	0.046	0.054	0.073	0.059	0.070	0.086	0.059	0.020
Nickel	0.47	4.22	0.62	0.67	0.29	0.50	0.41	0.33	0.20
Phosphorus	363	414	555	577	401	386	415	404	10
Potassium	1230	1390	1700	1600	1600	1510	1640	1660	20
Rubidium	3.75	4.28	2.64	2.87	5.08	4.97	5.00	4.96	0.050
Selenium	0.065	0.066	0.063	0.057	0.080	0.076	0.073	0.071	0.050
Silver	0.0093	0.0111	0.0069	0.0069	0.0067	0.0076	0.0078	0.0069	0.0050
Sodium	220	316	354	375	387	340	341	362	20
Strontium	7.99	8.04	4.48	4.67	10.3	9.67	7.57	8.99	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0056	0.0066	0.0067	0.0074	0.0033	0.0058	0.0058	0.0046	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-166 to L-168.

Parameter[1]	L-166 (UNWASHED)	L-166 (WASHED)	L-167 (UNWASHED)	L-167 (WASHED)	L-168 (UNWASHED)	L-168 (WASHED)	L-168-R[2] (UNWASHED)	L-168-R[2] (WASHED)	LDL[3]
Tin	<0.10	<0.10	0.11	0.16	0.15	<0.10	<0.10	0.11	0.10
Titanium	31.8	29.7	18.1	21.4	9.21	16.8	12.5	11.1	0.25
Uranium	0.0523	0.206	0.0517	0.253	0.0371	0.0468	0.0436	0.0367	0.0020
Vanadium	0.44	0.61	0.64	0.99	0.20	0.35	0.30	0.25	0.10
Zinc	21.1	25.3	8.76	9.68	22.7	24.7	26.0	25.4	0.50
Zirconium	0.34	0.44	0.43	0.51	<0.20	0.31	0.29	0.20	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] R = replicate sample
[3] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-169 to L-172.

Parameter[1]	L-169 (UNWASHED)	L-169 (WASHED)	L-170 (UNWASHED)	L-170 (WASHED)	L-171 (UNWASHED)	L-171 (WASHED)	L-172 (UNWASHED)	L-172 (WASHED)	LDL[2]
Aluminum	127	116	677	726	4320	4350	1610	1030	2.0
Antimony	<0.010	<0.010	<0.010	<0.010	0.011	0.011	0.017	0.013	0.010
Arsenic	0.032	0.033	0.129	0.129	0.231	0.192	0.287	0.241	0.020
Barium	3.37	3.90	5.22	5.37	34.2	34.4	25.7	23.7	0.050
Beryllium	<0.010	<0.010	0.035	0.036	0.158	0.160	0.091	0.068	0.010
Bismuth	0.013	<0.010	0.033	0.024	0.137	0.224	0.112	0.097	0.010
Boron	<1.0	<1.0	1.4	1.2	2.7	2.7	4.3	3.2	1.0
Cadmium	0.0434	0.0392	0.0705	0.0823	0.0607	0.0609	0.0730	0.0650	0.0050
Calcium	11200	9080	16400	16000	12300	12000	67300	65100	20
Cesium	0.0385	0.0367	0.121	0.129	0.610	0.583	0.384	0.322	0.0050
Chromium	0.410	0.358	2.87	2.94	6.58	7.10	3.45	2.43	0.050
Cobalt	0.103	0.090	0.553	0.589	2.53	2.26	0.866	0.598	0.020
Copper	0.74	0.81	1.64	1.69	5.36	5.11	3.32	2.61	0.10
Iron	333	341	2260	2540	8380	8320	3580	2310	3.0
Lead	0.431	0.358	1.60	1.57	6.18	5.91	5.05	4.60	0.020
Lithium	<0.50	<0.50	0.92	1.03	6.66	6.53	4.58	3.05	0.50
Magnesium	935	1050	1320	1400	3730	3650	4150	3790	2.0
Manganese	52.6	54.5	30.2	32.7	127	127	83.7	71.4	0.050
Mercury	0.0440	0.0439	0.0686	0.0645	0.0280	0.0257	0.0419	0.0423	0.0050
Molybdenum	0.052	0.050	0.146	0.162	0.661	0.786	0.553	0.392	0.020
Nickel	0.30	0.28	3.36	3.26	5.18	5.72	2.15	1.52	0.20
Phosphorus	403	412	585	604	536	497	561	602	10
Potassium	1570	1600	1860	1900	3190	2770	2300	2340	20
Rubidium	4.19	4.39	5.22	5.80	18.0	16.7	10.5	9.64	0.050
Selenium	0.052	0.057	0.091	0.097	<0.050	<0.050	0.079	0.082	0.050
Silver	0.0058	0.0064	0.0170	0.0179	0.0581	0.0579	0.0894	0.0862	0.0050
Sodium	356	309	350	380	233	177	176	191	20
Strontium	4.22	4.09	5.77	5.76	21.7	22.2	79.3	78.3	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0040	0.0034	0.0167	0.0176	0.0956	0.0933	0.0414	0.0284	0.0020

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-169 to L-172.

Parameter[1]	L-169 (UNWASHED)	L-169 (WASHED)	L-170 (UNWASHED)	L-170 (WASHED)	L-171 (UNWASHED)	L-171 (WASHED)	L-172 (UNWASHED)	L-172 (WASHED)	LDL[2]
Tin	0.12	<0.10	0.18	0.21	0.42	0.43	0.27	0.18	0.10
Titanium	9.58	8.58	51.9	52.7	292	288	94.9	65.1	0.25
Uranium	0.0236	0.0215	0.116	0.125	0.957	0.961	0.885	0.797	0.0020
Vanadium	0.26	0.24	1.50	1.62	7.44	7.28	2.70	1.72	0.10
Zinc	16.7	16.7	13.7	14.6	18.8	19.0	16.6	15.1	0.50
Zirconium	0.22	0.20	1.30	1.24	5.04	5.09	3.49	2.60	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated
[2] LDL = Lowest Detection Limit reported by the laboratory

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-173 to L-174.

Parameter[1]	L-173 (UNWASHED)	L-173 (WASHED)	L-174 (UNWASHED)	L-174 (WASHED)	LDL[2]
Aluminum	1320	1140	536	524	2.0
Antimony	0.013	<0.010	<0.010	<0.010	0.010
Arsenic	0.211	0.215	0.362	0.197	0.020
Barium	19.9	18.4	16.1	24.6	0.050
Beryllium	0.073	0.066	0.040	0.034	0.010
Bismuth	0.122	0.104	0.019	0.018	0.010
Boron	3.2	3.1	<1.0	<1.0	1.0
Cadmium	0.0716	0.0803	0.143	0.121	0.0050
Calcium	68900	73200	8100	11000	20
Cesium	0.331	0.293	0.120	0.107	0.0050
Chromium	2.72	2.27	1.50	1.61	0.050
Cobalt	0.684	0.578	0.445	0.424	0.020
Copper	3.45	3.16	1.32	1.36	0.10
Iron	2970	2370	1630	1600	3.0
Lead	5.59	5.46	2.11	1.71	0.020
Lithium	3.70	3.02	0.59	0.61	0.50
Magnesium	3170	2880	1540	1740	2.0
Manganese	63.6	55.8	48.1	62.0	0.050
Mercury	0.0386	0.0461	0.0944	0.0875	0.0050
Molybdenum	0.665	0.593	0.116	0.114	0.020
Nickel	1.73	1.55	1.32	1.31	0.20
Phosphorus	464	451	406	421	10
Potassium	1930	1730	1460	1640	20
Rubidium	8.43	7.67	8.55	9.08	0.050
Selenium	0.077	0.074	0.124	0.114	0.050
Silver	0.0759	0.0739	0.0179	0.0153	0.0050
Sodium	166	148	346	304	20
Strontium	67.6	66.5	9.80	13.0	0.050
Tellurium	<0.020	<0.020	<0.020	<0.020	0.020
Thallium	0.0342	0.0292	0.0150	0.0124	0.0020
Tin	0.17	0.18	0.23	0.32	0.10

Table D-1. 2019 Lichen Metal Analysis (n=57), sample sites L-173 to L-174.

Parameter[1]	L-173 (UNWASHED)	L-173 (WASHED)	L-174 (UNWASHED)	L-174 (WASHED)	LDL[2]
Titanium	79.2	67.6	43.5	45.3	0.25
Uranium	0.885	0.849	0.105	0.0895	0.0020
Vanadium	2.11	1.77	1.08	1.10	0.10
Zinc	14.4	14.2	19.0	17.9	0.50
Zirconium	2.81	2.68	0.67	0.53	0.20

[1] Total metals (units mg/kg dry weight) unless otherwise indicated

[2] LDL = Lowest Detection Limit reported by the laboratory

APPENDIX E. VEGETATION AND SOILS BASE METALS MONITORING CERTIFICATE OF ANALYSIS, QUALITY ASSURANCE REPORT & RAW LABORATORY RESULTS, 2019

EDI ENVIRONMENTAL DYNAMICS INC.
ATTN: Brett Pagacz
2195 Second Avenue
Whitehorse YT Y1A 3T8

Date Received: 06-AUG-19
Report Date: 19-SEP-19 16:10 (MT)
Version: FINAL

Client Phone: 867-393-4882

Certificate of Analysis

Lab Work Order #: L2323007
Project P.O. #: 4500057496
Job Reference: BIM SOIL AND LICHEN TISSUE - TRACE METALS
C of C Numbers:
Legal Site Desc:

Rick Hawthorne

Rick Hawthorne
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Federal CCME Canadian Environmental Quality Guidelines (JUN, 2018) - CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected						
L2323007-139	L-154	Metals	Nickel (Ni)	95.1	89	ug/g

Physical Tests - SOIL

			Lab ID	L2323007-1	L2323007-4	L2323007-7	L2323007-10	L2323007-13	L2323007-16	L2323007-19	L2323007-22	L2323007-25
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	23-JUL-19	23-JUL-19
			Sample ID	L-118	L-118-R	L-119	L-120	L-121	L-121-R	L-122	L-123	L-124
		Guide Limits										
Analyte	Unit	#1	#2									
% Moisture	%	-	-	10.6	10.3	16.1	21.4	17.9	18.0	16.3	19.7	1.93
pH	pH units	-	-	7.65	7.56	6.08	6.80	7.07	7.15	7.18	4.61	6.19

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - SOIL

			Lab ID	L2323007-28	L2323007-31	L2323007-34	L2323007-37	L2323007-40	L2323007-43	L2323007-46	L2323007-49	L2323007-52
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19
			Sample ID	L-125	L-125-R	L-126	L-127	L-128	L-128-R	L-129	L-130	L-130-R
Analyte	Unit	Guide Limits #1	#2									
% Moisture	%	-	-	13.4	15.4	4.24	1.46	18.5	23.0	18.6	31.0	33.8
pH	pH units	-	-	4.69	4.58	6.29	6.77	6.34	6.11	6.55	6.12	5.81

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - SOIL

			Lab ID	L2323007-55	L2323007-58	L2323007-61	L2323007-64	L2323007-67	L2323007-70	L2323007-73	L2323007-76	L2323007-79
			Sample Date	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-131	L-132	L-133	L-133-R	L-134	L-135	L-136	L-137	L-137-R
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	12.9	22.6	6.34	6.43	13.9	12.9	23.4	15.9	16.1
pH	pH units	-	-	6.41	5.73	6.23	5.96	6.38	7.25	6.61	7.43	7.44

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - SOIL

Lab ID				L2323007-82	L2323007-85	L2323007-88	L2323007-91	L2323007-94	L2323007-97	L2323007-100	L2323007-103	L2323007-106
Sample Date				24-JUL-19	16-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
Sample ID				L-138	L-139	L-140	L-141	L-141-R	L-142	L-143	L-144	L-145
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
% Moisture	%	-	-	11.7	8.78	8.82	18.9	16.4	27.3	10.6	19.4	15.0
pH	pH units	-	-	5.05	7.40	7.16	7.20	7.31	6.43	6.59	6.17	7.66

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - SOIL

			Lab ID	L2323007-109	L2323007-112	L2323007-115	L2323007-118	L2323007-121	L2323007-124	L2323007-127	L2323007-130	L2323007-133
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
			Sample ID	L-145-R	L-146	L-147	L-148	L-149	L-149-R	L-150	L-151	L-152
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	15.3	13.7	14.4	11.0	17.7	16.9	24.0	5.61	4.80
pH	pH units	-	-	7.64	7.66	7.56	4.54	4.44	4.34	4.48	6.34	6.14

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - SOIL

			Lab ID	L2323007-136	L2323007-139	L2323007-142	L2323007-145	L2323007-148	L2323007-151	L2323007-154	L2323007-157	L2323007-160
			Sample Date	13-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	15-JUL-19	15-JUL-19
			Sample ID	L-153	L-154	L-155	L-156	L-156-R	L-157	L-158	L-159	L-160
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	12.0	50.1	15.3	6.46	7.60	6.36	10.1	9.46	4.16
pH	pH units	-	-	4.68	5.60	6.23	7.08	7.17	5.73	5.11	6.54	5.74

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - SOIL

			Lab ID	L2323007-163	L2323007-166	L2323007-169	L2323007-172	L2323007-175	L2323007-178	L2323007-181	L2323007-184	L2323007-187
			Sample Date	20-JUL-19	20-JUL-19	20-JUL-19	16-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	20-JUL-19	20-JUL-19
			Sample ID	L-161	L-162	L-163	L-164	L-165	L-165-R	L-166	L-167	L-168
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	18.4	4.52	8.00	14.7	15.8	12.6	5.93	11.4	9.24
pH	pH units	-	-	4.24	4.91	4.10	6.79	4.89	4.79	4.04	6.07	6.22

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - SOIL

			Lab ID	L2323007-190	L2323007-193	L2323007-196	L2323007-199	L2323007-202	L2323007-205	L2323007-208
			Sample Date	20-JUL-19	20-JUL-19	23-JUL-19	23-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19
			Sample ID	L-168-R	L-169	L-170	L-171	L-172	L-173	L-174
		Guide Limits								
Analyte	**Unit**	**#1**	**#2**							
% Moisture	%	-	-	8.74	22.2	8.94	2.51	15.9	12.5	5.87
pH	pH units	-	-	6.40	5.07	5.66	6.67	7.59	7.53	4.71

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

			Lab ID	L2323007-2	L2323007-3	L2323007-5	L2323007-6	L2323007-8	L2323007-9	L2323007-11	L2323007-12	L2323007-14
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-118 UNWASHED	L-118 WASHED	L-118-R UNWASHED	L-118-R WASHED	L-119 UNWASHED	L-119 WASHED	L-120 UNWASHED	L-120 WASHED	L-121 UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	28.7	55.3	29.2	69.1	27.3	72.2	26.6	69.6	31.4

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

			Lab ID	L2323007-15	L2323007-17	L2323007-18	L2323007-20	L2323007-21	L2323007-23	L2323007-24	L2323007-26	L2323007-27
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
			Sample ID	L-121 WASHED	L-121-R UNWASHED	L-121 WASHED	L-122 UNWASHED	L-122 WASHED	L-123 UNWASHED	L-123 WASHED	L-124 UNWASHED	L-124 WASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
% Moisture	%	-	-	59.4	29.2	46.3	20.8	71.1	43.9	80.4	51.3	79.9

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - TISSUE

			Lab ID	L2323007-29	L2323007-30	L2323007-32	L2323007-33	L2323007-35	L2323007-36	L2323007-38	L2323007-39	L2323007-41
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	12-JUL-19
			Sample ID	L-125 UNWASHED	L-125 WASHED	L-125-R UNWASHED	L-125-R WASHED	L-126 UNWASHED	L-126 WASHED	L-127 UNWASHED	L-127 WASHED	L-128 UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	56.7	74.4	58.7	85.0	68.2	79.7	60.1	76.0	65.3

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - TISSUE

			Lab ID	L2323007-42	L2323007-44	L2323007-45	L2323007-47	L2323007-48	L2323007-50	L2323007-51	L2323007-53	L2323007-54
			Sample Date	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19
			Sample ID	L-128 WASHED	L-128-R UNWASHED	L-128-R WASHED	L-129 UNWASHED	L-129 WASHED	L-130 UNWASHED	L-130 WASHED	L-130-R UNWASHED	L-130-R WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	85.0	61.3	81.5	72.3	88.0	45.1	64.0	48.8	76.6

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

			Lab ID	L2323007-56	L2323007-57	L2323007-59	L2323007-60	L2323007-62	L2323007-63	L2323007-65	L2323007-66	L2323007-68
			Sample Date	13-JUL-19	13-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19
			Sample ID	L-131 UNWASHED	L-131 WASHED	L-132 UNWASHED	L-132 WASHED	L-133 UNWASHED	L-133 WASHED	L-133-R UNWASHED	L-133-R WASHED	L-134 UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	33.6	65.3	54.3	78.4	68.2	81.0	65.7	85.9	63.7

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

			Lab ID	L2323007-69	L2323007-71	L2323007-72	L2323007-74	L2323007-75	L2323007-77	L2323007-78	L2323007-80	L2323007-81
			Sample Date	12-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-134 WASHED	L-135 UNWASHED	L-135 WASHED	L-136 UNWASHED	L-136 WASHED	L-137 UNWASHED	L-137 WASHED	L-137-R UNWASHED	L-137-R WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	85.2	13.0	75.7	9.30	74.1	9.50	70.8	7.89	68.1

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

		Guide Limits										
			Lab ID	L2323007-83	L2323007-84	L2323007-86	L2323007-87	L2323007-89	L2323007-90	L2323007-92	L2323007-93	L2323007-95
			Sample Date	16-JUL-19	16-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-138 UNWASHED	L-138 WASHED	L-139 UNWASHED	L-139 WASHED	L-140 UNWASHED	L-140 WASHED	L-141 UNWASHED	L-141 WASHED	L-141-R UNWASHED
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	10.7	70.2	12.4	58.5	7.9	87.0	7.4	98.1	12.9

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - TISSUE

			Lab ID	L2323007-96	L2323007-98	L2323007-99	L2323007-101	L2323007-102	L2323007-104	L2323007-105	L2323007-107	L2323007-108
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-141-R WASHED	L-142 UNWASHED	L-142 WASHED	L-143 UNWASHED	L-143 WASHED	L-144 UNWASHED	L-144 WASHED	L-145 UNWASHED	L-145 WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	86.8	8.76	87.9	16.5	71.1	26.1	51.7	14.6	63.1

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨	Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥	Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - TISSUE

			Lab ID	L2323007-110	L2323007-111	L2323007-113	L2323007-114	L2323007-116	L2323007-117	L2323007-119	L2323007-120	L2323007-122
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
			Sample ID	L-145-R UNWASHED	L-145-R WASHED	L-146 UNWASHED	L-146 WASHED	L-147 UNWASHED	L-147 WASHED	L-148 UNWASHED	L-148 WASHED	L-149 UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
% Moisture	%	-	-	16.2	69.3	15.3	86.6	16.7	81.8	67.5	80.8	64.8

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

Lab ID				L2323007-123	L2323007-125	L2323007-126	L2323007-128	L2323007-129	L2323007-131	L2323007-132	L2323007-134	L2323007-135
Sample Date				25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
Sample ID				L-149 WASHED	L-149-R UNWASHED	L-149-R WASHED	L-150 UNWASHED	L-150 WASHED	L-151 UNWASHED	L-151 WASHED	L-152 UNWASHED	L-152 WASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
% Moisture	%	-	-	85.6	58.8	84.2	61.2	81.9	42.5	85.0	57.2	77.6

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

Lab ID				L2323007-137	L2323007-138	L2323007-140	L2323007-141	L2323007-143	L2323007-144	L2323007-146	L2323007-147	L2323007-149
Sample Date				13-JUL-19	13-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
Sample ID				L-153 UNWASHED	L-153 WASHED	L-154 UNWASHED	L-154 WASHED	L-155 UNWASHED	L-155 WASHED	L-156 UNWASHED	L-156 WASHED	L-156-R UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
% Moisture	%	-	-	64.9	79.3	23.3	62.1	53.1	69.4	46.5	83.6	51.5

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

			Lab ID	L2323007-150	L2323007-152	L2323007-153	L2323007-155	L2323007-156	L2323007-158	L2323007-159	L2323007-161	L2323007-162
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	15-JUL-19	15-JUL-19	15-JUL-19	15-JUL-19
			Sample ID	L-156-R WASHED	L-157 UNWASHED	L-157 WASHED	L-158 UNWASHED	L-158 WASHED	L-159 UNWASHED	L-159 WASHED	L-160 UNWASHED	L-160 WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	76.8	45.3	76.6	55.8	83.1	10.8	61.8	13.2	73.9

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - TISSUE

			Lab ID	L2323007-164	L2323007-165	L2323007-167	L2323007-168	L2323007-170	L2323007-171	L2323007-173	L2323007-174	L2323007-176
			Sample Date	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	16-JUL-19	16-JUL-19	18-JUL-19
			Sample ID	L-161 UNWASHED	L-161 WASHED	L-162 UNWASHED	L-162 WASHED	L-163 UNWASHED	L-163 WASHED	L-164 UNWASHED	L-164 WASHED	L-165 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
% Moisture	%	-	-	12.1	75.7	8.57	84.2	8.72	69.4	15.8	71.7	8.9

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

			Lab ID	L2323007-177	L2323007-179	L2323007-180	L2323007-182	L2323007-183	L2323007-185	L2323007-186	L2323007-188	L2323007-189
			Sample Date	18-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19
			Sample ID	L-165 WASHED	L-165-R UNWASHED	L-165-R WASHED	L-166 UNWASHED	L-166 WASHED	L-167 UNWASHED	L-167 WASHED	L-168 UNWASHED	L-168 WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	71.7	14.1	76.8	12.3	48.3	11.2	60.3	10.5	54.4

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Physical Tests - TISSUE

Lab ID				L2323007-191	L2323007-192	L2323007-194	L2323007-195	L2323007-197	L2323007-198	L2323007-200	L2323007-201	L2323007-203
Sample Date				20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	30-JUL-19
Sample ID				L-168-R UNWASHED	L-168-R WASHED	L-169 UNWASHED	L-169 WASHED	L-170 UNWASHED	L-170 WASHED	L-171 UNWASHED	L-171 WASHED	L-172 UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
% Moisture	%	-	-	11.8	55.9	8.35	41.0	10.2	45.4	26.9	72.3	53.5

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Physical Tests - TISSUE

			Lab ID	L2323007-204	L2323007-206	L2323007-207	L2323007-209	L2323007-210
			Sample Date	30-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19
			Sample ID	L-172 WASHED	L-173 UNWASHED	L-173 WASHED	L-174 UNWASHED	L-174 WASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**					
% Moisture	%	-	-	81.1	41.9	80.4	45.8	74.1

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - SOIL

			Lab ID	L2323007-1	L2323007-4	L2323007-7	L2323007-10	L2323007-13	L2323007-16	L2323007-19	L2323007-22	L2323007-25
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	23-JUL-19	23-JUL-19
			Sample ID	L-118	L-118-R	L-119	L-120	L-121	L-121-R	L-122	L-123	L-124
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)	ug/g	-	-	3210	4740	4460	5270	5230	4040	3750	1070	741
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	0.69	1.04	0.94	1.17	1.44	1.02	0.96	0.14	0.17
Barium (Ba)	ug/g	2000	-	10.9	15.6	13.6	16.4	14.1	10.9	10.6	6.36	3.04
Beryllium (Be)	ug/g	8	-	0.18	0.27	0.28	0.29	0.29	0.22	0.21	<0.10	<0.10
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron (B)	ug/g	-	-	6.7	10.2	<5.0	10.2	9.2	6.6	7.4	<5.0	<5.0
Cadmium (Cd)	ug/g	22	-	<0.020	0.021	0.024	0.040	0.028	<0.020	0.025	<0.020	<0.020
Calcium (Ca)	ug/g	-	-	29000	45600	1830	3240	7680	4490	3260	198	198
Chromium (Cr)	ug/g	87	-	6.34	9.57	7.68	16.0	12.9	9.67	11.3	6.10	3.67
Cobalt (Co)	ug/g	300	-	1.83	2.72	2.61	3.37	3.43	3.03	2.51	0.63	0.63
Copper (Cu)	ug/g	91	-	3.73	5.04	3.41	5.47	7.13	5.17	5.27	1.07	0.89
Iron (Fe)	ug/g	-	-	5490	8320	7990	10000	10400	7910	7710	1770	2070
Lead (Pb)	ug/g	260	-	3.69	5.39	5.77	5.92	6.65	4.99	5.20	1.26	1.00
Lithium (Li)	ug/g	-	-	9.5	13.8	13.7	14.7	14.7	11.6	10.1	<2.0	<2.0
Magnesium (Mg)	ug/g	-	-	11300	18600	3080	3440	6430	4110	3130	587	605
Manganese (Mn)	ug/g	-	-	93.8	137	157	152	182	135	118	11.7	18.8
Mercury (Hg)	ug/g	24	-	0.0073	0.0051	0.0099	0.0098	0.0119	0.0110	0.0113	0.0096	<0.0050
Molybdenum (Mo)	ug/g	40	-	0.13	0.15	0.18	0.26	0.25	0.17	0.20	<0.10	<0.10
Nickel (Ni)	ug/g	89	-	3.65	5.38	4.22	8.87	7.16	5.14	6.17	2.57	2.25
Phosphorus (P)	ug/g	-	-	132	176	147	221	227	188	198	93	<50
Potassium (K)	ug/g	-	-	570	810	370	870	760	600	650	200	190
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	53	84	<50	<50	<50	<50	<50	<50	<50
Strontium (Sr)	ug/g	-	-	14.6	21.8	2.89	5.52	5.96	4.10	4.25	1.82	1.43
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	0.085	0.119	0.085	0.125	0.119	0.098	0.097	<0.050	<0.050
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	174	271	260	265	315	270	195	86.7	66.5

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - SOIL

			Lab ID	L2323007-28	L2323007-31	L2323007-34	L2323007-37	L2323007-40	L2323007-43	L2323007-46	L2323007-49	L2323007-52
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19
			Sample ID	L-125	L-125-R	L-126	L-127	L-128	L-128-R	L-129	L-130	L-130-R
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)	ug/g	-	-	1040	1520	757	968	1310	962	703	1360	1490
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	0.15	0.23	0.11	0.14	0.33	0.23	0.76	0.31	0.31
Barium (Ba)	ug/g	2000	-	4.92	6.99	3.59	4.57	5.15	3.91	1.63	5.10	6.32
Beryllium (Be)	ug/g	8	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron (B)	ug/g	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd)	ug/g	22	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Calcium (Ca)	ug/g	-	-	274	334	270	310	2420	1810	1050	1910	2500
Chromium (Cr)	ug/g	87	-	4.35	6.23	3.50	4.50	9.23	8.82	2.24	9.26	8.76
Cobalt (Co)	ug/g	300	-	1.28	2.20	0.61	0.80	1.51	1.05	1.32	1.40	1.24
Copper (Cu)	ug/g	91	-	1.03	1.62	1.58	1.30	2.25	1.67	3.86	3.74	2.30
Iron (Fe)	ug/g	-	-	3180	5380	2180	2390	3750	2990	1910	6320	6010
Lead (Pb)	ug/g	260	-	1.05	1.33	0.80	0.97	1.84	1.41	2.75	2.11	1.89
Lithium (Li)	ug/g	-	-	<2.0	2.8	<2.0	<2.0	<2.0	<2.0	<2.0	2.8	2.8
Magnesium (Mg)	ug/g	-	-	744	1060	646	758	1390	978	712	1250	1290
Manganese (Mn)	ug/g	-	-	39.0	72.0	22.4	23.1	63.8	36.1	17.9	39.9	43.1
Mercury (Hg)	ug/g	24	-	0.0061	0.0081	<0.0050	<0.0050	0.0090	0.0066	<0.0050	0.0112	0.0133
Molybdenum (Mo)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	0.12
Nickel (Ni)	ug/g	89	-	3.07	4.43	2.03	2.63	5.38	4.54	2.22	4.64	4.40
Phosphorus (P)	ug/g	-	-	89	119	79	<50	133	93	78	287	295
Potassium (K)	ug/g	-	-	150	210	220	250	150	120	230	260	240
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50
Strontium (Sr)	ug/g	-	-	1.55	1.80	1.35	1.66	1.77	1.86	0.94	2.70	3.13
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	83.1	107	57.7	71.7	112	89.2	31.4	186	169

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - SOIL

			Lab ID	L2323007-55	L2323007-58	L2323007-61	L2323007-64	L2323007-67	L2323007-70	L2323007-73	L2323007-76	L2323007-79
			Sample Date	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-131	L-132	L-133	L-133-R	L-134	L-135	L-136	L-137	L-137-R
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)	ug/g	-	-	2780	1800	1550	1240	3460	8170	8110	4300	4880
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	0.67	0.35	0.39	0.34	1.30	1.65	1.79	1.02	1.12
Barium (Ba)	ug/g	2000	-	12.5	7.74	6.20	5.39	15.0	20.5	25.8	13.1	15.0
Beryllium (Be)	ug/g	8	-	0.11	<0.10	<0.10	<0.10	0.17	0.45	0.44	0.22	0.26
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron (B)	ug/g	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	22.7	13.2	11.1	12.8
Cadmium (Cd)	ug/g	22	-	0.024	<0.020	<0.020	<0.020	<0.020	0.026	0.048	0.026	0.028
Calcium (Ca)	ug/g	-	-	1940	2400	686	502	1880	7770	4330	37100	39100
Chromium (Cr)	ug/g	87	-	19.1	13.2	5.50	5.24	16.8	43.2	22.8	9.90	10.8
Cobalt (Co)	ug/g	300	-	2.92	1.56	1.52	1.08	3.39	6.09	4.92	2.76	3.08
Copper (Cu)	ug/g	91	-	2.57	2.13	2.99	1.76	4.77	7.80	7.69	4.92	5.30
Iron (Fe)	ug/g	-	-	17300	7460	3700	2770	10800	14900	14500	7890	8730
Lead (Pb)	ug/g	260	-	5.43	2.40	2.00	1.69	5.42	6.65	9.31	5.17	6.09
Lithium (Li)	ug/g	-	-	5.6	3.1	2.6	2.1	7.5	26.1	20.3	12.7	14.6
Magnesium (Mg)	ug/g	-	-	2320	1450	1060	812	2450	8950	4600	14100	16600
Manganese (Mn)	ug/g	-	-	116	48.9	66.0	49.7	172	219	218	158	177
Mercury (Hg)	ug/g	24	-	0.0067	0.0106	<0.0050	<0.0050	0.0073	0.0145	0.0132	0.0108	0.0101
Molybdenum (Mo)	ug/g	40	-	0.14	0.19	<0.10	<0.10	0.17	0.27	0.37	0.20	0.23
Nickel (Ni)	ug/g	89	-	9.93	6.13	4.54	3.59	9.83	30.3	12.3	6.25	6.62
Phosphorus (P)	ug/g	-	-	279	338	116	83	377	298	339	278	295
Potassium (K)	ug/g	-	-	330	300	330	290	780	1790	1140	730	870
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	<50	<50	<50	<50	<50	52	65	61	74
Strontium (Sr)	ug/g	-	-	3.19	3.35	2.43	2.32	2.74	8.36	7.78	20.0	20.4
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	<0.050	<0.050	<0.050	<0.050	0.079	0.144	0.158	0.090	0.104
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	330	236	156	108	330	376	321	232	251

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

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			Lab ID	L2323007-82	L2323007-85	L2323007-88	L2323007-91	L2323007-94	L2323007-97	L2323007-100	L2323007-103	L2323007-106
			Sample Date	24-JUL-19	16-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-138	L-139	L-140	L-141	L-141-R	L-142	L-143	L-144	L-145
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)	ug/g	-	-	1670	5570	1160	3570	4070	8090	4140	6530	17500
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	0.71	1.11	0.34	0.71	0.77	2.46	0.74	1.52	4.38
Barium (Ba)	ug/g	2000	-	5.74	14.1	4.24	10.4	11.3	16.8	10.0	22.8	34.3
Beryllium (Be)	ug/g	8	-	<0.10	0.31	<0.10	0.19	0.23	0.46	0.27	0.37	0.95
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron (B)	ug/g	-	-	<5.0	18.5	<5.0	10.2	10.6	12.0	5.1	11.6	65.9
Cadmium (Cd)	ug/g	22	-	<0.020	0.021	<0.020	0.040	0.030	0.052	<0.020	0.029	0.073
Calcium (Ca)	ug/g	-	-	530	12600	5910	11100	9360	5220	2100	3140	109000
Chromium (Cr)	ug/g	87	-	4.40	34.1	18.0	9.54	11.3	21.0	11.3	21.9	42.5
Cobalt (Co)	ug/g	300	-	1.58	4.39	0.75	2.14	2.40	5.34	2.70	4.53	8.48
Copper (Cu)	ug/g	91	-	2.19	5.71	2.65	4.88	4.93	12.0	3.75	8.48	18.1
Iron (Fe)	ug/g	-	-	4300	10800	2440	6960	8360	14000	9210	13200	21900
Lead (Pb)	ug/g	260	-	4.50	4.34	1.39	3.92	4.30	19.0	5.74	8.23	14.0
Lithium (Li)	ug/g	-	-	2.1	17.5	3.8	9.2	10.7	20.5	12.2	16.9	65.8
Magnesium (Mg)	ug/g	-	-	512	10300	3690	4780	4470	4900	3180	4250	39700
Manganese (Mn)	ug/g	-	-	58.9	147	32.4	128	119	261	129	207	304
Mercury (Hg)	ug/g	24	-	0.0057	0.0083	0.0062	0.0236	0.0180	0.0168	0.0095	0.0159	0.0192
Molybdenum (Mo)	ug/g	40	-	<0.10	0.17	0.14	0.23	0.20	0.46	0.37	0.56	0.59
Nickel (Ni)	ug/g	89	-	2.29	24.7	2.34	5.13	5.74	12.0	5.54	11.0	25.3
Phosphorus (P)	ug/g	-	-	121	242	107	361	322	357	202	317	537
Potassium (K)	ug/g	-	-	310	1460	290	550	640	1140	660	1310	6090
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	<50	<50	<50	<50	<50	63	<50	65	147
Strontium (Sr)	ug/g	-	-	1.67	9.36	3.55	8.25	7.82	6.97	4.05	8.45	67.9
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	<0.050	0.127	<0.050	0.073	0.073	0.154	0.106	0.142	0.283
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	100	293	70.1	108	138	335	203	373	487

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Lab ID				L2323007-109	L2323007-112	L2323007-115	L2323007-118	L2323007-121	L2323007-124	L2323007-127	L2323007-130	L2323007-133
Sample Date				24-JUL-19	24-JUL-19	24-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
Sample ID				L-145-R	L-146	L-147	L-148	L-149	L-149-R	L-150	L-151	L-152
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)	ug/g	-	-	16900	16000	13400	945	1270	1050	1200	1090	1110
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	4.28	4.09	3.50	0.17	0.20	0.14	0.23	0.25	0.20
Barium (Ba)	ug/g	2000	-	33.1	34.1	29.0	3.91	6.43	4.81	8.00	5.49	4.72
Beryllium (Be)	ug/g	8	-	0.92	0.85	0.73	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron (B)	ug/g	-	-	64.4	56.5	55.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd)	ug/g	22	-	0.076	0.064	0.065	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Calcium (Ca)	ug/g	-	-	104000	113000	125000	316	360	253	324	369	432
Chromium (Cr)	ug/g	87	-	40.4	37.7	33.7	6.15	8.22	5.94	10.4	6.73	6.08
Cobalt (Co)	ug/g	300	-	8.00	8.02	7.03	0.66	0.78	0.57	0.91	1.02	0.98
Copper (Cu)	ug/g	91	-	17.5	16.1	14.2	1.05	1.56	1.21	1.44	1.71	1.18
Iron (Fe)	ug/g	-	-	20900	21000	18100	4010	4920	3350	5880	3020	3410
Lead (Pb)	ug/g	260	-	13.7	13.9	12.4	1.08	1.41	1.29	1.47	1.12	1.43
Lithium (Li)	ug/g	-	-	63.5	58.2	52.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Magnesium (Mg)	ug/g	-	-	38000	32300	38700	552	752	630	679	951	889
Manganese (Mn)	ug/g	-	-	290	299	281	14.1	14.5	12.6	25.9	28.0	26.7
Mercury (Hg)	ug/g	24	-	0.0205	0.0154	0.0210	<0.0050	0.0141	0.0091	0.0121	<0.0050	<0.0050
Molybdenum (Mo)	ug/g	40	-	0.53	0.37	0.91	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel (Ni)	ug/g	89	-	24.1	22.8	20.9	2.11	3.19	2.33	3.33	4.26	3.26
Phosphorus (P)	ug/g	-	-	496	439	439	97	130	103	159	93	132
Potassium (K)	ug/g	-	-	5910	5510	4520	140	240	220	250	250	280
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	143	204	159	<50	<50	<50	<50	<50	<50
Strontium (Sr)	ug/g	-	-	63.9	69.4	76.7	1.56	1.58	1.42	1.78	1.69	1.82
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	0.281	0.307	0.249	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	456	513	423	77.4	93.3	104	85.7	82.0	99.3

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			Lab ID	L2323007-136	L2323007-139	L2323007-142	L2323007-145	L2323007-148	L2323007-151	L2323007-154	L2323007-157	L2323007-160
			Sample Date	13-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	15-JUL-19	15-JUL-19
			Sample ID	L-153	L-154	L-155	L-156	L-156-R	L-157	L-158	L-159	L-160
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)	ug/g	-	-	2370	14900	6120	4460	6220	19600	2400	2080	975
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	0.36	3.35	1.59	1.52	2.54	0.79	0.49	0.40	0.25
Barium (Ba)	ug/g	2000	-	9.57	76.5	23.5	17.0	24.7	90.1	9.57	6.32	3.35
Beryllium (Be)	ug/g	8	-	<0.10	0.65	0.27	0.18	0.30	0.64	0.11	<0.10	<0.10
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	5.34	0.23	<0.20	<0.20
Boron (B)	ug/g	-	-	<5.0	22.0	6.6	6.1	10.5	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd)	ug/g	22	-	<0.020	0.069	0.036	0.020	0.034	0.085	0.029	<0.020	<0.020
Calcium (Ca)	ug/g	-	-	797	8840	2980	5740	9320	1780	705	1320	434
Chromium (Cr)	ug/g	87	-	11.3	61.0	35.9	25.1	29.1	42.4	12.6	10.4	4.32
Cobalt (Co)	ug/g	300	-	2.28	12.4	6.54	4.50	5.27	9.62	1.92	1.60	1.18
Copper (Cu)	ug/g	91	-	2.32	49.6	8.16	8.06	14.9	81.2	4.64	1.86	0.90
Iron (Fe)	ug/g	-	-	5750	22900	12800	11600	11900	26100	7530	7010	2550
Lead (Pb)	ug/g	260	-	2.70	17.9	7.70	4.62	7.77	13.3	6.66	2.95	1.60
Lithium (Li)	ug/g	-	-	3.4	24.8	12.2	8.4	12.3	14.4	3.5	4.7	<2.0
Magnesium (Mg)	ug/g	-	-	1740	9580	4970	5990	8470	19900	1360	1400	654
Manganese (Mn)	ug/g	-	-	74.1	374	274	142	197	229	78.4	50.7	31.4
Mercury (Hg)	ug/g	24	-	0.0066	0.0385	0.0216	0.0051	0.0099	<0.0050	0.0070	<0.0050	<0.0050
Molybdenum (Mo)	ug/g	40	-	<0.10	0.37	0.15	<0.10	0.15	7.25	0.39	<0.10	<0.10
Nickel (Ni)	ug/g	89	-	7.10	95.1	52.1	15.8	20.0	51.1	5.42	5.19	2.03
Phosphorus (P)	ug/g	-	-	195	770	328	347	318	261	146	342	68
Potassium (K)	ug/g	-	-	410	2960	900	1040	1630	4010	590	340	220
Selenium (Se)	ug/g	2.9	-	<0.20	0.36	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.24	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	<50	125	<50	<50	59	69	<50	<50	<50
Strontium (Sr)	ug/g	-	-	2.35	11.2	3.28	4.66	6.47	2.77	1.96	2.83	2.25
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	<0.050	0.400	0.105	0.095	0.153	0.309	0.080	<0.050	<0.050
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	4.1	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	264	689	409	437	468	962	304	248	121

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			Lab ID	L2323007-163	L2323007-166	L2323007-169	L2323007-172	L2323007-175	L2323007-178	L2323007-181	L2323007-184	L2323007-187
			Sample Date	20-JUL-19	20-JUL-19	20-JUL-19	16-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	20-JUL-19	20-JUL-19
			Sample ID	L-161	L-162	L-163	L-164	L-165	L-165-R	L-166	L-167	L-168
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)	ug/g	-	-	550	795	834	3800	3530	3480	2980	6130	4980
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	<0.10	0.12	0.14	0.84	0.36	0.74	0.25	0.68	1.03
Barium (Ba)	ug/g	2000	-	2.82	3.25	3.43	20.8	16.2	14.1	8.41	27.3	18.0
Beryllium (Be)	ug/g	8	-	<0.10	<0.10	<0.10	0.21	0.14	0.13	0.10	0.22	0.22
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.26	<0.20
Boron (B)	ug/g	-	-	<5.0	<5.0	<5.0	8.7	6.1	<5.0	<5.0	9.1	5.1
Cadmium (Cd)	ug/g	22	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.026	<0.020
Calcium (Ca)	ug/g	-	-	162	174	136	1910	852	1210	495	1580	2080
Chromium (Cr)	ug/g	87	-	4.36	7.30	5.01	13.8	12.3	18.4	9.20	21.0	22.4
Cobalt (Co)	ug/g	300	-	0.25	0.84	0.62	2.83	2.28	2.73	1.99	5.56	4.25
Copper (Cu)	ug/g	91	-	<0.50	0.96	0.99	5.73	4.07	3.44	2.32	9.37	5.96
Iron (Fe)	ug/g	-	-	786	3980	3210	7220	7790	9630	7090	12400	11400
Lead (Pb)	ug/g	260	-	0.96	1.11	1.08	3.00	2.35	2.06	2.43	3.89	4.91
Lithium (Li)	ug/g	-	-	<2.0	<2.0	<2.0	7.4	6.8	7.3	5.7	11.5	9.0
Magnesium (Mg)	ug/g	-	-	304	508	489	2950	2370	2560	1730	4880	2860
Manganese (Mn)	ug/g	-	-	5.4	22.0	16.3	123	70.1	89.2	67.8	167	157
Mercury (Hg)	ug/g	24	-	<0.0050	<0.0050	<0.0050	0.0062	<0.0050	<0.0050	0.0107	0.0119	<0.0050
Molybdenum (Mo)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	0.13	0.14	<0.10	0.13	0.13
Nickel (Ni)	ug/g	89	-	1.05	1.89	1.78	7.82	6.01	6.79	4.17	14.4	11.2
Phosphorus (P)	ug/g	-	-	56	<50	77	164	183	294	172	335	454
Potassium (K)	ug/g	-	-	110	160	190	970	870	740	450	1170	1010
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	ug/g	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50
Strontium (Sr)	ug/g	-	-	1.29	1.27	1.44	5.35	2.41	2.99	2.41	4.49	3.95
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	<0.050	<0.050	<0.050	0.068	0.064	0.057	<0.050	0.071	0.129
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	67.5	109	80.5	170	330	412	379	373	600

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			Lab ID	L2323007-190	L2323007-193	L2323007-196	L2323007-199	L2323007-202	L2323007-205	L2323007-208
			Sample Date	20-JUL-19	20-JUL-19	23-JUL-19	23-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19
			Sample ID	L-168-R	L-169	L-170	L-171	L-172	L-173	L-174
		Guide Limits								
Analyte	**Unit**	**#1**	**#2**							
Aluminum (Al)	ug/g	-	-	7900	1450	2000	1460	2790	10400	5230
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	1.44	0.33	0.37	0.24	1.08	0.95	0.59
Barium (Ba)	ug/g	2000	-	28.4	11.2	7.57	6.05	10.3	91.5	21.3
Beryllium (Be)	ug/g	8	-	0.32	<0.10	<0.10	<0.10	0.17	0.28	0.18
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.78	<0.20
Boron (B)	ug/g	-	-	6.5	<5.0	<5.0	<5.0	14.9	<5.0	<5.0
Cadmium (Cd)	ug/g	22	-	0.022	<0.020	<0.020	<0.020	0.021	0.207	0.029
Calcium (Ca)	ug/g	-	-	2710	1030	885	489	37600	14400	1310
Chromium (Cr)	ug/g	87	-	33.5	7.20	19.2	10.7	8.69	19.6	17.9
Cobalt (Co)	ug/g	300	-	6.25	0.83	2.84	1.41	2.08	4.96	3.91
Copper (Cu)	ug/g	91	-	10.1	1.04	2.03	1.84	4.06	49.8	3.42
Iron (Fe)	ug/g	-	-	16600	3860	5930	6890	6020	26500	17600
Lead (Pb)	ug/g	260	-	7.02	1.78	2.96	1.41	3.40	28.2	4.72
Lithium (Li)	ug/g	-	-	14.3	3.1	2.9	2.5	11.3	15.4	9.8
Magnesium (Mg)	ug/g	-	-	4390	878	1340	1080	16500	11300	3140
Manganese (Mn)	ug/g	-	-	211	21.4	104	37.0	125	315	591
Mercury (Hg)	ug/g	24	-	0.0059	0.0101	0.0081	<0.0050	0.0145	<0.0050	0.0104
Molybdenum (Mo)	ug/g	40	-	0.20	<0.10	<0.10	<0.10	0.25	4.18	0.15
Nickel (Ni)	ug/g	89	-	17.1	3.14	12.2	4.37	5.36	9.07	9.61
Phosphorus (P)	ug/g	-	-	565	182	191	134	230	300	419
Potassium (K)	ug/g	-	-	1530	210	290	290	760	5700	840
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.31	<0.10
Sodium (Na)	ug/g	-	-	62	<50	<50	<50	<50	119	50
Strontium (Sr)	ug/g	-	-	4.88	2.26	1.78	2.23	21.2	9.34	3.73
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	0.204	<0.050	<0.050	<0.050	0.064	0.435	0.100
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.2	<2.0
Titanium (Ti)	ug/g	-	-	869	120	169	119	82.5	819	688

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - SOIL

			Lab ID	L2323007-1	L2323007-4	L2323007-7	L2323007-10	L2323007-13	L2323007-16	L2323007-19	L2323007-22	L2323007-25
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	23-JUL-19	23-JUL-19
			Sample ID	L-118	L-118-R	L-119	L-120	L-121	L-121-R	L-122	L-123	L-124
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	0.52	<0.50	0.53	<0.50	0.58	<0.50	<0.50
Uranium (U)	ug/g	33	-	0.713	0.977	1.52	4.77	1.88	1.39	2.00	0.385	0.155
Vanadium (V)	ug/g	130	-	8.51	12.9	11.6	15.3	16.5	12.2	12.3	4.99	2.95
Zinc (Zn)	ug/g	410	-	9.7	14.0	17.3	18.0	20.5	16.4	14.3	3.5	2.8
Zirconium (Zr)	ug/g	-	-	1.8	3.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - SOIL

		Guide Limits										
			Lab ID	L2323007-28	L2323007-31	L2323007-34	L2323007-37	L2323007-40	L2323007-43	L2323007-46	L2323007-49	L2323007-52
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19
			Sample ID	L-125	L-125-R	L-126	L-127	L-128	L-128-R	L-129	L-130	L-130-R
Analyte	**Unit**	**#1**	**#2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	33	-	0.174	0.230	0.125	0.205	0.319	0.264	0.107	0.459	0.457
Vanadium (V)	ug/g	130	-	4.04	6.06	3.36	3.23	5.05	4.55	2.76	10.3	9.90
Zinc (Zn)	ug/g	410	-	3.1	4.2	2.9	3.9	4.2	3.5	2.9	7.4	6.8
Zirconium (Zr)	ug/g	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	1.1	<1.0

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - SOIL

			Lab ID	L2323007-55	L2323007-58	L2323007-61	L2323007-64	L2323007-67	L2323007-70	L2323007-73	L2323007-76	L2323007-79
			Sample Date	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-131	L-132	L-133	L-133-R	L-134	L-135	L-136	L-137	L-137-R
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	33	-	0.717	1.18	0.340	0.295	0.883	1.67	4.47	0.825	0.872
Vanadium (V)	ug/g	130	-	25.3	11.9	6.65	5.07	18.4	23.7	23.7	12.6	13.8
Zinc (Zn)	ug/g	410	-	16.8	8.3	4.6	3.9	11.7	21.1	30.6	16.9	18.0
Zirconium (Zr)	ug/g	-	-	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	1.0	1.3	1.3

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - SOIL

			Lab ID	L2323007-82	L2323007-85	L2323007-88	L2323007-91	L2323007-94	L2323007-97	L2323007-100	L2323007-103	L2323007-106
			Sample Date	24-JUL-19	16-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-138	L-139	L-140	L-141	L-141-R	L-142	L-143	L-144	L-145
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	33	-	0.247	0.717	0.436	0.611	0.667	18.6	1.60	6.50	1.25
Vanadium (V)	ug/g	130	-	5.86	16.3	3.57	10.5	13.0	24.3	15.2	20.9	39.3
Zinc (Zn)	ug/g	410	-	8.1	12.9	5.8	16.7	17.9	31.0	17.0	23.4	31.1
Zirconium (Zr)	ug/g	-	-	<1.0	1.7	<1.0	<1.0	<1.0	1.6	<1.0	1.2	24.4

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - SOIL

			Lab ID	L2323007-109	L2323007-112	L2323007-115	L2323007-118	L2323007-121	L2323007-124	L2323007-127	L2323007-130	L2323007-133
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
			Sample ID	L-145-R	L-146	L-147	L-148	L-149	L-149-R	L-150	L-151	L-152
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	33	-	1.35	1.20	1.15	0.169	0.268	0.347	0.287	0.250	0.261
Vanadium (V)	ug/g	130	-	37.9	36.2	32.1	5.12	6.48	4.76	7.68	4.09	5.49
Zinc (Zn)	ug/g	410	-	30.0	31.9	32.0	2.4	3.9	3.0	3.5	3.4	3.8
Zirconium (Zr)	ug/g	-	-	23.7	19.0	16.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - SOIL

			Lab ID	L2323007-136	L2323007-139	L2323007-142	L2323007-145	L2323007-148	L2323007-151	L2323007-154	L2323007-157	L2323007-160
			Sample Date	13-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	15-JUL-19	15-JUL-19
			Sample ID	L-153	L-154	L-155	L-156	L-156-R	L-157	L-158	L-159	L-160
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	33	-	0.416	6.50	0.655	0.507	0.650	0.733	0.496	0.388	0.287
Vanadium (V)	ug/g	130	-	9.14	41.6	22.3	19.8	20.9	51.9	12.6	11.2	4.14
Zinc (Zn)	ug/g	410	-	9.2	45.8	22.6	14.9	18.9	88.4	8.7	7.5	3.3
Zirconium (Zr)	ug/g	-	-	<1.0	7.9	1.1	3.4	4.7	9.2	<1.0	<1.0	2.8

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - SOIL

			Lab ID	L2323007-163	L2323007-166	L2323007-169	L2323007-172	L2323007-175	L2323007-178	L2323007-181	L2323007-184	L2323007-187
			Sample Date	20-JUL-19	20-JUL-19	20-JUL-19	16-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	20-JUL-19	20-JUL-19
			Sample ID	L-161	L-162	L-163	L-164	L-165	L-165-R	L-166	L-167	L-168
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	<0.50
Uranium (U)	ug/g	33	-	0.131	0.557	0.124	0.293	0.417	0.344	0.364	0.460	0.811
Vanadium (V)	ug/g	130	-	1.62	4.96	5.22	11.8	13.5	17.1	12.4	21.6	18.6
Zinc (Zn)	ug/g	410	-	<2.0	2.5	3.2	7.9	10.3	11.8	10.3	19.3	14.9
Zirconium (Zr)	ug/g	-	-	<1.0	<1.0	<1.0	1.3	<1.0	2.0	<1.0	1.3	11.0

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - SOIL

			Lab ID	L2323007-190	L2323007-193	L2323007-196	L2323007-199	L2323007-202	L2323007-205	L2323007-208
			Sample Date	20-JUL-19	20-JUL-19	23-JUL-19	23-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19
			Sample ID	L-168-R	L-169	L-170	L-171	L-172	L-173	L-174
		Guide Limits								
Analyte	**Unit**	**#1**	**#2**							
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	0.54	<0.50
Uranium (U)	ug/g	33	-	1.38	0.248	0.210	0.263	0.266	2.20	0.918
Vanadium (V)	ug/g	130	-	27.4	5.85	9.66	9.07	8.10	14.8	24.0
Zinc (Zn)	ug/g	410	-	23.0	4.2	6.9	4.1	9.2	86.2	19.9
Zirconium (Zr)	ug/g	-	-	15.2	<1.0	<1.0	<1.0	<1.0	8.1	1.3

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-2	L2323007-3	L2323007-5	L2323007-6	L2323007-8	L2323007-9	L2323007-11	L2323007-12	L2323007-14
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-118 UNWASHED	L-118 WASHED	L-118-R UNWASHED	L-118-R WASHED	L-119 UNWASHED	L-119 WASHED	L-120 UNWASHED	L-120 WASHED	L-121 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	307	308	322	399	336	378	552	432	571
Antimony (Sb)-Total	mg/kg	40	-	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	0.015	0.011	0.064
Arsenic (As)-Total	mg/kg	12	-	0.081	0.086	0.093	0.096	0.096	0.102	0.146	0.130	0.128
Barium (Ba)-Total	mg/kg	2000	-	6.14	7.38	6.05	6.83	7.32	6.61	7.29	7.13	7.67
Beryllium (Be)-Total	mg/kg	8	-	0.022	0.022	0.022	0.028	0.023	0.027	0.041	0.034	0.039
Bismuth (Bi)-Total	mg/kg	-	-	0.013	0.015	0.017	0.015	0.015	0.016	0.020	0.020	0.017
Boron (B)-Total	mg/kg	-	-	1.1	1.1	1.2	1.4	<1.0	1.1	1.3	1.1	1.3
Cadmium (Cd)-Total	mg/kg	22	-	0.0358	0.0383	0.0349	0.0367	0.0394	0.0389	0.0421	0.0382	0.0342
Calcium (Ca)-Total	mg/kg	-	-	44600	49300	51700	50800	33200	33100	45800	43300	29200
Cesium (Cs)-Total	mg/kg	-	-	0.115	0.118	0.121	0.131	0.151	0.145	0.213	0.184	0.189
Chromium (Cr)-Total	mg/kg	87	-	0.708	0.743	0.745	0.872	0.771	0.892	1.40	1.09	1.31
Cobalt (Co)-Total	mg/kg	300	-	0.172	0.236	0.168	0.208	0.190	0.214	0.335	0.285	0.318
Copper (Cu)-Total	mg/kg	91	-	0.94	1.68	0.90	1.03	0.91	0.96	1.29	1.15	1.15
Iron (Fe)-Total	mg/kg	-	-	1010	1080	1050	1280	1120	1350	2710	1870	1820
Lead (Pb)-Total	mg/kg	260	-	1.42	1.56	1.48	1.59	1.67	1.61	2.70	2.54	1.87
Lithium (Li)-Total	mg/kg	-	-	0.73	0.72	0.77	0.94	0.78	0.91	1.51	1.19	1.49
Magnesium (Mg)-Total	mg/kg	-	-	1180	1130	1120	1200	1050	1130	1500	1500	1480
Manganese (Mn)-Total	mg/kg	-	-	19.6	19.6	18.8	21.4	21.1	22.0	35.2	31.5	30.8
Mercury (Hg)-Total	mg/kg	24	-	0.0471	0.0474	0.0444	0.0448	0.0454	0.0448	0.0405	0.0398	0.0437
Molybdenum (Mo)-Total	mg/kg	40	-	0.133	0.138	0.138	0.150	0.153	0.247	0.271	0.179	0.157
Nickel (Ni)-Total	mg/kg	89	-	0.63	1.02	0.62	0.87	0.61	0.98	0.94	0.98	1.06
Phosphorus (P)-Total	mg/kg	-	-	286	270	274	270	293	315	313	321	302
Potassium (K)-Total	mg/kg	-	-	1160	1130	1130	1040	1160	1250	1220	1260	1250
Rubidium (Rb)-Total	mg/kg	-	-	3.17	3.29	3.15	3.33	5.66	5.32	5.50	5.38	4.39
Selenium (Se)-Total	mg/kg	2.9	-	0.077	0.080	0.073	0.072	0.080	0.076	0.077	0.076	0.077
Silver (Ag)-Total	mg/kg	40	-	0.0168	0.0166	0.0181	0.0181	0.0217	0.0213	0.0231	0.0235	0.0252
Sodium (Na)-Total	mg/kg	-	-	232	213	211	228	219	220	255	268	212
Strontium (Sr)-Total	mg/kg	-	-	23.9	26.4	26.2	26.6	21.3	20.4	23.2	22.0	21.4
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0080	0.0085	0.0085	0.0101	0.0092	0.0105	0.0127	0.0102	0.0125

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-15	L2323007-17	L2323007-18	L2323007-20	L2323007-21	L2323007-23	L2323007-24	L2323007-26	L2323007-27
Sample Date				24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
Sample ID				L-121 WASHED	L-121-R UNWASHED	L-121 WASHED	L-122 UNWASHED	L-122 WASHED	L-123 UNWASHED	L-123 WASHED	L-124 UNWASHED	L-124 WASHED
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Aluminum (Al)-Total	mg/kg	-	-	616	288	291	385	509	1490	1890	2860	2750
Antimony (Sb)-Total	mg/kg	40	-	<0.010	<0.010	<0.010	<0.010	0.011	0.013	0.013	0.011	0.010
Arsenic (As)-Total	mg/kg	12	-	0.127	0.078	0.076	0.132	0.181	0.192	0.232	0.260	0.247
Barium (Ba)-Total	mg/kg	2000	-	7.08	5.52	5.36	5.27	6.31	18.1	17.6	25.7	27.2
Beryllium (Be)-Total	mg/kg	8	-	0.042	0.021	0.024	0.026	0.034	0.059	0.068	0.107	0.107
Bismuth (Bi)-Total	mg/kg	-	-	0.015	0.013	0.012	0.016	0.021	0.107	0.135	0.113	0.105
Boron (B)-Total	mg/kg	-	-	1.8	<1.0	<1.0	<1.0	1.2	1.5	1.7	2.3	2.0
Cadmium (Cd)-Total	mg/kg	22	-	0.0294	0.0276	0.0287	0.0376	0.0447	0.0933	0.0705	0.115	0.0963
Calcium (Ca)-Total	mg/kg	-	-	27600	34300	29300	38300	43900	13700	10400	17200	15300
Cesium (Cs)-Total	mg/kg	-	-	0.182	0.127	0.124	0.170	0.211	0.233	0.258	0.420	0.417
Chromium (Cr)-Total	mg/kg	87	-	1.40	0.862	0.701	0.997	1.25	3.15	3.96	4.41	4.34
Cobalt (Co)-Total	mg/kg	300	-	0.356	0.173	0.183	0.247	0.323	0.818	0.968	1.33	1.38
Copper (Cu)-Total	mg/kg	91	-	1.23	0.92	0.98	1.11	1.29	2.72	3.27	4.31	4.52
Iron (Fe)-Total	mg/kg	-	-	2300	1440	1530	2210	2720	3370	4210	5690	5550
Lead (Pb)-Total	mg/kg	260	-	1.59	1.27	1.31	1.94	2.48	4.53	4.19	6.69	5.86
Lithium (Li)-Total	mg/kg	-	-	1.61	0.67	0.66	0.89	1.26	1.88	2.14	3.41	3.44
Magnesium (Mg)-Total	mg/kg	-	-	1910	1180	1110	1270	1420	2050	2100	2580	2630
Manganese (Mn)-Total	mg/kg	-	-	35.6	22.1	23.2	25.9	31.5	73.5	71.5	110	120
Mercury (Hg)-Total	mg/kg	24	-	0.0412	0.0391	0.0436	0.0427	0.0461	0.0436	0.0407	0.0539	0.0486
Molybdenum (Mo)-Total	mg/kg	40	-	0.223	0.176	0.151	0.162	0.191	0.504	0.577	0.755	0.654
Nickel (Ni)-Total	mg/kg	89	-	1.04	0.62	0.56	0.73	1.12	2.36	3.01	3.40	3.52
Phosphorus (P)-Total	mg/kg	-	-	343	309	323	384	390	534	458	766	778
Potassium (K)-Total	mg/kg	-	-	1370	1290	1360	1350	1370	2160	1640	3160	2480
Rubidium (Rb)-Total	mg/kg	-	-	5.10	4.45	4.67	4.60	5.04	10.1	9.07	14.9	13.3
Selenium (Se)-Total	mg/kg	2.9	-	0.061	0.067	0.067	0.067	0.078	0.071	0.059	0.063	0.065
Silver (Ag)-Total	mg/kg	40	-	0.0185	0.0206	0.0192	0.0177	0.0214	0.0571	0.0565	0.0705	0.0629
Sodium (Na)-Total	mg/kg	-	-	318	304	288	420	378	199	133	413	296
Strontium (Sr)-Total	mg/kg	-	-	17.6	22.2	18.6	24.6	28.2	14.4	11.3	24.5	21.5
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0136	0.0072	0.0074	0.0076	0.0101	0.0335	0.0396	0.0615	0.0604

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - TISSUE

Lab ID				L2323007-29	L2323007-30	L2323007-32	L2323007-33	L2323007-35	L2323007-36	L2323007-38	L2323007-39	L2323007-41
Sample Date				23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	12-JUL-19
Sample ID				L-125 UNWASHED	L-125 WASHED	L-125-R UNWASHED	L-125-R WASHED	L-126 UNWASHED	L-126 WASHED	L-127 UNWASHED	L-127 WASHED	L-128 UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Aluminum (Al)-Total	mg/kg	-	-	2450	2050	2790	3280	4340	4020	2830	4140	2530
Antimony (Sb)-Total	mg/kg	40	-	0.012	0.012	0.012	<0.010	0.014	0.012	0.015	0.015	0.021
Arsenic (As)-Total	mg/kg	12	-	0.227	0.214	0.146	0.149	0.301	0.301	0.194	0.237	0.153
Barium (Ba)-Total	mg/kg	2000	-	23.3	21.9	24.4	24.7	32.5	30.1	24.9	31.4	19.9
Beryllium (Be)-Total	mg/kg	8	-	0.094	0.085	0.108	0.114	0.163	0.144	0.117	0.151	0.099
Bismuth (Bi)-Total	mg/kg	-	-	0.118	0.168	0.151	0.164	0.205	0.192	0.252	0.244	0.094
Boron (B)-Total	mg/kg	-	-	1.9	1.8	2.2	2.0	3.0	2.8	2.5	3.1	1.9
Cadmium (Cd)-Total	mg/kg	22	-	0.117	0.140	0.146	0.157	0.125	0.115	0.187	0.185	0.0573
Calcium (Ca)-Total	mg/kg	-	-	21100	23500	26200	25000	27600	25700	47200	44100	8390
Cesium (Cs)-Total	mg/kg	-	-	0.377	0.315	0.418	0.435	0.505	0.473	0.402	0.591	0.253
Chromium (Cr)-Total	mg/kg	87	-	3.80	3.02	4.03	4.30	8.09	7.47	4.38	5.95	4.97
Cobalt (Co)-Total	mg/kg	300	-	1.19	1.02	1.31	1.47	2.15	1.95	1.32	1.93	1.49
Copper (Cu)-Total	mg/kg	91	-	3.88	3.33	4.14	4.30	5.87	5.14	4.36	5.62	3.57
Iron (Fe)-Total	mg/kg	-	-	4780	4240	5210	5580	8570	7860	5100	7530	5450
Lead (Pb)-Total	mg/kg	260	-	7.51	8.90	9.26	9.32	10.1	9.57	15.3	14.4	4.04
Lithium (Li)-Total	mg/kg	-	-	3.16	2.64	3.72	3.93	5.56	5.15	4.19	6.26	2.45
Magnesium (Mg)-Total	mg/kg	-	-	2240	1980	2550	2850	3570	3190	2300	3240	3040
Manganese (Mn)-Total	mg/kg	-	-	91.4	87.5	107	116	132	126	103	146	79.7
Mercury (Hg)-Total	mg/kg	24	-	0.0481	0.0463	0.0484	0.0420	0.0356	0.0309	0.0398	0.0347	0.0406
Molybdenum (Mo)-Total	mg/kg	40	-	0.800	0.544	0.743	0.825	1.14	1.31	0.874	1.12	0.659
Nickel (Ni)-Total	mg/kg	89	-	3.37	2.83	3.51	3.86	5.60	5.13	3.49	4.62	3.64
Phosphorus (P)-Total	mg/kg	-	-	605	576	623	592	690	597	724	725	391
Potassium (K)-Total	mg/kg	-	-	2800	2240	3030	2740	3050	2530	3170	3110	2040
Rubidium (Rb)-Total	mg/kg	-	-	13.8	11.0	15.4	15.8	15.1	13.8	11.5	15.7	11.4
Selenium (Se)-Total	mg/kg	2.9	-	0.069	0.066	0.059	0.068	0.070	0.061	0.065	0.073	0.061
Silver (Ag)-Total	mg/kg	40	-	0.0683	0.0716	0.0736	0.0772	0.105	0.0933	0.109	0.118	0.0323
Sodium (Na)-Total	mg/kg	-	-	277	229	304	234	265	197	277	232	200
Strontium (Sr)-Total	mg/kg	-	-	25.2	28.0	30.5	27.6	39.5	35.3	74.3	69.4	5.47
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0519	0.0458	0.0573	0.0669	0.0816	0.0782	0.0636	0.0861	0.0469

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

Analyte	Unit	Guide Limits #1	#2	L2323007-42	L2323007-44	L2323007-45	L2323007-47	L2323007-48	L2323007-50	L2323007-51	L2323007-53	L2323007-54
Sample Date				12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19
Sample ID				L-128 WASHED	L-128-R UNWASHED	L-128-R WASHED	L-129 UNWASHED	L-129 WASHED	L-130 UNWASHED	L-130 WASHED	L-130-R UNWASHED	L-130-R WASHED
Aluminum (Al)-Total	mg/kg	-	-	1370	2180	1730	1020	1100	956	1060	975	788
Antimony (Sb)-Total	mg/kg	40	-	0.027	0.016	0.020	0.019	0.017	0.011	0.012	0.012	0.012
Arsenic (As)-Total	mg/kg	12	-	0.123	0.150	0.164	0.151	0.155	0.142	0.159	0.121	0.122
Barium (Ba)-Total	mg/kg	2000	-	18.2	17.1	17.9	11.5	11.9	9.22	9.16	8.82	9.19
Beryllium (Be)-Total	mg/kg	8	-	0.073	0.096	0.086	0.056	0.064	0.050	0.051	0.051	0.047
Bismuth (Bi)-Total	mg/kg	-	-	0.087	0.086	0.096	0.056	0.043	0.044	0.049	0.049	0.042
Boron (B)-Total	mg/kg	-	-	1.4	1.5	1.5	1.8	1.6	1.2	1.3	1.1	1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.0844	0.0647	0.0867	0.0602	0.0676	0.0588	0.0544	0.0463	0.0526
Calcium (Ca)-Total	mg/kg	-	-	11200	9950	11600	9020	9520	9810	10400	8330	10100
Cesium (Cs)-Total	mg/kg	-	-	0.205	0.278	0.238	0.142	0.160	0.131	0.148	0.136	0.121
Chromium (Cr)-Total	mg/kg	87	-	3.38	4.37	3.68	2.26	2.44	2.46	2.72	2.53	2.20
Cobalt (Co)-Total	mg/kg	300	-	1.07	2.51	1.14	0.896	0.912	0.657	0.736	0.687	0.618
Copper (Cu)-Total	mg/kg	91	-	3.14	4.78	3.14	2.88	2.76	2.53	2.56	2.56	2.16
Iron (Fe)-Total	mg/kg	-	-	3460	4590	4260	4840	5060	4750	5710	4160	3720
Lead (Pb)-Total	mg/kg	260	-	4.58	4.45	4.36	1.87	1.91	2.04	2.01	1.88	1.87
Lithium (Li)-Total	mg/kg	-	-	1.48	2.23	1.72	1.06	1.14	0.94	1.08	0.97	0.82
Magnesium (Mg)-Total	mg/kg	-	-	2390	2930	2510	2080	2260	1750	2100	1730	1610
Manganese (Mn)-Total	mg/kg	-	-	61.0	67.6	66.5	69.0	65.5	53.1	52.3	44.3	41.9
Mercury (Hg)-Total	mg/kg	24	-	0.0475	0.0418	0.0458	0.0570	0.0629	0.0428	0.0413	0.0433	0.0538
Molybdenum (Mo)-Total	mg/kg	40	-	0.331	0.508	0.465	0.386	0.369	0.502	0.527	0.472	0.428
Nickel (Ni)-Total	mg/kg	89	-	2.85	3.55	3.00	2.02	2.10	2.03	2.16	2.11	1.76
Phosphorus (P)-Total	mg/kg	-	-	458	431	479	553	574	526	535	537	546
Potassium (K)-Total	mg/kg	-	-	2050	2100	2250	2010	2280	1680	1840	1680	1750
Rubidium (Rb)-Total	mg/kg	-	-	10.6	12.1	11.5	9.90	10.8	6.94	7.47	7.07	6.65
Selenium (Se)-Total	mg/kg	2.9	-	0.079	0.077	0.072	0.073	0.067	0.076	0.064	0.063	0.078
Silver (Ag)-Total	mg/kg	40	-	0.0345	0.0323	0.0367	0.0218	0.0230	0.0336	0.0388	0.0286	0.0270
Sodium (Na)-Total	mg/kg	-	-	241	215	257	290	260	483	545	385	409
Strontium (Sr)-Total	mg/kg	-	-	6.39	5.58	6.65	4.58	4.73	3.51	3.95	3.62	4.08
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0361	0.0483	0.0394	0.0234	0.0253	0.0219	0.0245	0.0230	0.0204

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-56	L2323007-57	L2323007-59	L2323007-60	L2323007-62	L2323007-63	L2323007-65	L2323007-66	L2323007-68
			Sample Date	13-JUL-19	13-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19
			Sample ID	L-131 UNWASHED	L-131 WASHED	L-132 UNWASHED	L-132 WASHED	L-133 UNWASHED	L-133 WASHED	L-133-R UNWASHED	L-133-R WASHED	L-134 UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	690	706	905	830	2690	2350	6850	4280	1230
Antimony (Sb)-Total	mg/kg	40	-	0.011	0.011	0.036	0.023	0.015	0.018	0.035	0.026	0.046
Arsenic (As)-Total	mg/kg	12	-	0.111	0.136	0.136	0.125	0.149	0.159	0.576	0.317	0.152
Barium (Ba)-Total	mg/kg	2000	-	9.38	9.05	9.13	8.11	18.6	21.1	42.1	30.5	10.7
Beryllium (Be)-Total	mg/kg	8	-	0.044	0.043	0.049	0.040	0.107	0.099	0.241	0.185	0.060
Bismuth (Bi)-Total	mg/kg	-	-	0.028	0.058	0.036	0.029	0.062	0.082	0.138	0.113	0.059
Boron (B)-Total	mg/kg	-	-	<1.0	<1.0	1.2	<1.0	1.6	1.5	3.1	2.5	1.3
Cadmium (Cd)-Total	mg/kg	22	-	0.0446	0.0501	0.0475	0.0464	0.0473	0.0619	0.0713	0.0856	0.0388
Calcium (Ca)-Total	mg/kg	-	-	7340	9570	11800	12700	5780	7350	7340	9920	8490
Cesium (Cs)-Total	mg/kg	-	-	0.115	0.131	0.134	0.124	0.276	0.302	0.637	0.444	0.164
Chromium (Cr)-Total	mg/kg	87	-	1.89	1.92	2.39	2.28	5.75	4.82	15.4	9.01	2.72
Cobalt (Co)-Total	mg/kg	300	-	0.601	0.584	0.657	0.643	1.66	1.65	4.34	2.75	0.839
Copper (Cu)-Total	mg/kg	91	-	1.89	1.94	2.20	2.04	3.83	3.92	8.97	6.36	2.25
Iron (Fe)-Total	mg/kg	-	-	3330	4250	4600	3850	6070	5650	16900	12400	4840
Lead (Pb)-Total	mg/kg	260	-	1.41	1.56	1.65	1.60	3.21	4.02	5.65	5.77	2.38
Lithium (Li)-Total	mg/kg	-	-	0.68	0.70	0.92	0.87	2.80	2.50	7.23	4.51	1.33
Magnesium (Mg)-Total	mg/kg	-	-	1480	1300	1440	1370	3000	2800	7140	4500	1970
Manganese (Mn)-Total	mg/kg	-	-	41.1	48.6	40.5	39.1	78.4	76.3	182	128	46.9
Mercury (Hg)-Total	mg/kg	24	-	0.0536	0.0532	0.0496	0.0476	0.0277	0.0371	0.0425	0.0446	0.0397
Molybdenum (Mo)-Total	mg/kg	40	-	0.332	0.390	0.437	0.370	0.498	0.414	1.13	0.691	0.331
Nickel (Ni)-Total	mg/kg	89	-	1.70	1.83	2.01	1.98	5.24	3.96	10.6	7.15	2.19
Phosphorus (P)-Total	mg/kg	-	-	497	519	482	445	392	522	574	625	347
Potassium (K)-Total	mg/kg	-	-	1930	2090	1670	1450	2130	2510	4090	3380	1490
Rubidium (Rb)-Total	mg/kg	-	-	7.35	8.80	7.52	6.68	11.6	13.6	24.7	18.8	7.07
Selenium (Se)-Total	mg/kg	2.9	-	0.062	0.075	0.072	0.056	0.059	0.074	0.102	0.112	0.062
Silver (Ag)-Total	mg/kg	40	-	0.0168	0.0252	0.0252	0.0258	0.0298	0.0422	0.0491	0.0484	0.0238
Sodium (Na)-Total	mg/kg	-	-	352	320	390	328	175	268	248	273	196
Strontium (Sr)-Total	mg/kg	-	-	3.68	4.02	4.43	4.43	4.16	5.24	6.38	6.55	4.22
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0173	0.0174	0.0213	0.0196	0.0497	0.0500	0.126	0.0851	0.0294

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-69	L2323007-71	L2323007-72	L2323007-74	L2323007-75	L2323007-77	L2323007-78	L2323007-80	L2323007-81
Sample Date				12-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
Sample ID				L-134 WASHED	L-135 UNWASHED	L-135 WASHED	L-136 UNWASHED	L-136 WASHED	L-137 UNWASHED	L-137 WASHED	L-137-R UNWASHED	L-137-R WASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Aluminum (Al)-Total	mg/kg	-	-	1530	241	171	291	234	111	146	242	178
Antimony (Sb)-Total	mg/kg	40	-	0.025	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.173	0.048	0.036	0.075	0.073	0.055	0.060	0.081	0.070
Barium (Ba)-Total	mg/kg	2000	-	10.3	3.38	2.90	5.17	4.58	3.58	4.29	4.01	3.77
Beryllium (Be)-Total	mg/kg	8	-	0.076	0.011	<0.010	0.018	0.015	<0.010	0.011	0.014	0.013
Bismuth (Bi)-Total	mg/kg	-	-	0.056	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron (B)-Total	mg/kg	-	-	1.3	1.0	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.0381	0.0421	0.0387	0.0307	0.0308	0.0220	0.0230	0.0348	0.0298
Calcium (Ca)-Total	mg/kg	-	-	9010	21800	18300	26000	24500	29000	29900	38400	38400
Cesium (Cs)-Total	mg/kg	-	-	0.199	0.0517	0.0372	0.0856	0.0769	0.0487	0.0555	0.0721	0.0604
Chromium (Cr)-Total	mg/kg	87	-	7.35	0.765	0.615	0.758	0.662	0.327	0.433	0.655	0.551
Cobalt (Co)-Total	mg/kg	300	-	1.01	0.152	0.114	0.202	0.181	0.091	0.111	0.168	0.128
Copper (Cu)-Total	mg/kg	91	-	2.54	0.87	0.77	0.90	0.86	0.68	0.78	0.86	0.74
Iron (Fe)-Total	mg/kg	-	-	6000	425	291	1130	1050	430	594	1050	933
Lead (Pb)-Total	mg/kg	260	-	2.44	0.527	0.408	0.973	0.846	0.532	0.553	0.878	0.724
Lithium (Li)-Total	mg/kg	-	-	1.71	0.52	<0.50	0.61	0.52	<0.50	<0.50	0.53	<0.50
Magnesium (Mg)-Total	mg/kg	-	-	2070	903	873	847	856	719	727	929	833
Manganese (Mn)-Total	mg/kg	-	-	51.5	13.0	11.8	19.3	16.4	10.6	12.1	16.3	14.3
Mercury (Hg)-Total	mg/kg	24	-	0.0341	0.0590	0.0580	0.0423	0.0441	0.0416	0.0451	0.0380	0.0383
Molybdenum (Mo)-Total	mg/kg	40	-	0.553	0.063	0.047	0.097	0.094	0.076	0.090	0.095	0.088
Nickel (Ni)-Total	mg/kg	89	-	2.67	0.70	0.49	0.58	0.50	0.28	0.36	0.51	0.42
Phosphorus (P)-Total	mg/kg	-	-	328	369	403	320	312	296	329	325	307
Potassium (K)-Total	mg/kg	-	-	1370	1390	1420	1230	1190	1220	1240	1250	1180
Rubidium (Rb)-Total	mg/kg	-	-	7.68	2.74	2.36	4.20	3.77	2.90	3.20	2.84	2.67
Selenium (Se)-Total	mg/kg	2.9	-	0.057	0.057	0.051	0.064	0.057	0.059	0.060	0.060	0.055
Silver (Ag)-Total	mg/kg	40	-	0.0248	0.0065	0.0056	0.0130	0.0137	0.0089	0.0097	0.0138	0.0122
Sodium (Na)-Total	mg/kg	-	-	170	339	331	313	340	281	260	316	281
Strontium (Sr)-Total	mg/kg	-	-	3.95	10.8	9.42	15.9	14.2	17.6	18.1	23.7	23.7
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0339	0.0063	0.0048	0.0070	0.0066	0.0037	0.0043	0.0055	0.0038

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-83	L2323007-84	L2323007-86	L2323007-87	L2323007-89	L2323007-90	L2323007-92	L2323007-93	L2323007-95
			Sample Date	16-JUL-19	16-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-138 UNWASHED	L-138 WASHED	L-139 UNWASHED	L-139 WASHED	L-140 UNWASHED	L-140 WASHED	L-141 UNWASHED	L-141 WASHED	L-141-R UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	226	237	130	150	122	135	100	111	82.5
Antimony (Sb)-Total	mg/kg	40	-	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.049	0.044	0.040	0.046	0.043	0.044	0.041	0.061	0.042
Barium (Ba)-Total	mg/kg	2000	-	7.75	7.69	2.32	2.32	3.44	3.47	2.69	2.70	2.66
Beryllium (Be)-Total	mg/kg	8	-	0.013	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth (Bi)-Total	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron (B)-Total	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.189	0.159	0.0196	0.0213	0.0600	0.0393	0.0185	0.0178	0.0188
Calcium (Ca)-Total	mg/kg	-	-	10500	10600	20900	23000	24700	25300	19600	20600	22500
Cesium (Cs)-Total	mg/kg	-	-	0.0438	0.0464	0.0294	0.0316	0.0285	0.0297	0.0297	0.0290	0.0323
Chromium (Cr)-Total	mg/kg	87	-	0.647	0.574	0.490	0.530	0.353	0.365	0.301	0.346	0.330
Cobalt (Co)-Total	mg/kg	300	-	0.194	0.193	0.100	0.097	0.073	0.082	0.064	0.068	0.054
Copper (Cu)-Total	mg/kg	91	-	0.84	1.23	0.73	0.72	0.81	1.46	0.63	0.67	0.63
Iron (Fe)-Total	mg/kg	-	-	470	475	246	260	408	435	321	348	259
Lead (Pb)-Total	mg/kg	260	-	0.821	0.762	0.307	0.319	0.332	0.407	0.267	0.289	0.251
Lithium (Li)-Total	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Magnesium (Mg)-Total	mg/kg	-	-	1040	993	1170	974	872	869	965	958	1000
Manganese (Mn)-Total	mg/kg	-	-	28.8	28.6	10.0	9.79	9.67	10.1	9.32	9.72	8.37
Mercury (Hg)-Total	mg/kg	24	-	0.0472	0.0512	0.0587	0.0582	0.0454	0.0430	0.0419	0.0459	0.0432
Molybdenum (Mo)-Total	mg/kg	40	-	0.045	0.065	0.051	0.046	0.085	0.074	0.077	0.071	0.071
Nickel (Ni)-Total	mg/kg	89	-	0.42	0.44	0.42	0.43	0.27	0.49	0.21	0.29	0.24
Phosphorus (P)-Total	mg/kg	-	-	486	530	396	390	315	308	353	352	340
Potassium (K)-Total	mg/kg	-	-	1820	1840	1470	1420	1420	1310	1360	1300	1310
Rubidium (Rb)-Total	mg/kg	-	-	4.62	4.83	1.72	1.47	1.49	1.44	1.97	1.79	1.88
Selenium (Se)-Total	mg/kg	2.9	-	0.075	0.075	<0.050	0.056	0.057	0.059	<0.050	0.052	0.061
Silver (Ag)-Total	mg/kg	40	-	0.0070	0.0087	<0.0050	0.0055	0.0068	0.0072	0.0073	0.0055	<0.0050
Sodium (Na)-Total	mg/kg	-	-	348	331	346	293	313	291	348	318	331
Strontium (Sr)-Total	mg/kg	-	-	5.53	6.08	10.2	10.2	11.8	11.9	10.9	11.1	12.2
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0058	0.0052	0.0040	0.0040	0.0031	0.0037	0.0030	0.0027	0.0027

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - TISSUE

Lab ID				L2323007-96	L2323007-98	L2323007-99	L2323007-101	L2323007-102	L2323007-104	L2323007-105	L2323007-107	L2323007-108
Sample Date				24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
Sample ID				L-141-R WASHED	L-142 UNWASHED	L-142 WASHED	L-143 UNWASHED	L-143 WASHED	L-144 UNWASHED	L-144 WASHED	L-145 UNWASHED	L-145 WASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Aluminum (Al)-Total	mg/kg	-	-	103	140	170	222	326	403	374	449	300
Antimony (Sb)-Total	mg/kg	40	-	<0.010	0.016	0.010	<0.010	0.013	0.012	0.012	0.010	0.010
Arsenic (As)-Total	mg/kg	12	-	0.037	0.058	0.049	0.079	0.110	0.094	0.096	0.138	0.106
Barium (Ba)-Total	mg/kg	2000	-	2.62	3.07	3.29	4.95	6.20	5.67	5.81	4.26	4.00
Beryllium (Be)-Total	mg/kg	8	-	<0.010	<0.010	0.010	0.015	0.023	0.037	0.032	0.031	0.021
Bismuth (Bi)-Total	mg/kg	-	-	<0.010	<0.010	<0.010	0.012	0.015	0.020	0.020	0.013	0.012
Boron (B)-Total	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	2.1	1.4
Cadmium (Cd)-Total	mg/kg	22	-	0.0163	0.0250	0.0333	0.0536	0.0474	0.0373	0.0416	0.0253	0.0244
Calcium (Ca)-Total	mg/kg	-	-	24100	20900	22900	24400	26200	20400	20000	23300	21100
Cesium (Cs)-Total	mg/kg	-	-	0.0257	0.0517	0.0573	0.0902	0.121	0.194	0.197	0.133	0.109
Chromium (Cr)-Total	mg/kg	87	-	0.291	0.379	0.484	0.577	0.755	0.974	0.880	1.18	0.822
Cobalt (Co)-Total	mg/kg	300	-	0.070	0.095	0.116	0.148	0.239	0.277	0.263	0.308	0.223
Copper (Cu)-Total	mg/kg	91	-	0.72	0.84	0.87	0.92	1.22	1.15	1.18	1.08	0.96
Iron (Fe)-Total	mg/kg	-	-	362	644	817	1240	2250	2200	1980	1760	1630
Lead (Pb)-Total	mg/kg	260	-	0.292	0.405	0.486	1.33	1.60	2.71	2.83	1.53	1.31
Lithium (Li)-Total	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	0.69	1.10	1.03	1.30	0.77
Magnesium (Mg)-Total	mg/kg	-	-	930	786	799	736	1110	1270	1130	1520	1290
Manganese (Mn)-Total	mg/kg	-	-	8.81	12.0	13.0	22.6	32.0	33.1	34.9	27.6	23.6
Mercury (Hg)-Total	mg/kg	24	-	0.0425	0.0424	0.0462	0.0394	0.0429	0.0443	0.0368	0.0385	0.0409
Molybdenum (Mo)-Total	mg/kg	40	-	0.087	0.092	0.125	0.155	0.169	0.209	0.205	0.132	0.130
Nickel (Ni)-Total	mg/kg	89	-	0.26	0.38	0.38	0.46	0.71	0.73	0.70	0.85	0.63
Phosphorus (P)-Total	mg/kg	-	-	360	395	369	306	404	392	390	431	462
Potassium (K)-Total	mg/kg	-	-	1160	1440	1350	1190	1540	1590	1510	1510	1590
Rubidium (Rb)-Total	mg/kg	-	-	1.82	4.25	3.91	3.98	5.02	5.30	5.50	3.36	3.08
Selenium (Se)-Total	mg/kg	2.9	-	<0.050	<0.050	<0.050	0.061	0.069	0.066	0.052	0.053	0.057
Silver (Ag)-Total	mg/kg	40	-	<0.0050	0.0077	0.0093	0.0121	0.0132	0.0209	0.0209	0.0169	0.0151
Sodium (Na)-Total	mg/kg	-	-	281	377	340	296	381	432	375	346	328
Strontium (Sr)-Total	mg/kg	-	-	13.0	11.8	12.2	19.6	23.5	20.0	22.1	20.4	19.5
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0025	0.0042	0.0062	0.0049	0.0063	0.0114	0.0097	0.0096	0.0077

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - TISSUE

			Lab ID	L2323007-110	L2323007-111	L2323007-113	L2323007-114	L2323007-116	L2323007-117	L2323007-119	L2323007-120	L2323007-122
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
			Sample ID	L-145-R UNWASHED	L-145-R WASHED	L-146 UNWASHED	L-146 WASHED	L-147 UNWASHED	L-147 WASHED	L-148 UNWASHED	L-148 WASHED	L-149 UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	303	396	307	342	419	355	4000	4180	2900
Antimony (Sb)-Total	mg/kg	40	-	<0.010	0.011	0.010	0.012	0.019	<0.010	0.015	0.018	0.013
Arsenic (As)-Total	mg/kg	12	-	0.107	0.126	0.137	0.140	0.160	0.141	0.313	0.339	0.178
Barium (Ba)-Total	mg/kg	2000	-	3.93	4.45	3.22	3.67	4.61	4.33	28.2	30.1	27.1
Beryllium (Be)-Total	mg/kg	8	-	0.024	0.033	0.022	0.024	0.029	0.025	0.159	0.158	0.117
Bismuth (Bi)-Total	mg/kg	-	-	0.012	0.017	0.025	0.012	0.015	0.014	0.131	0.139	0.095
Boron (B)-Total	mg/kg	-	-	1.2	1.6	1.6	1.4	1.8	1.6	2.9	3.0	2.3
Cadmium (Cd)-Total	mg/kg	22	-	0.0233	0.0266	0.0318	0.0336	0.0370	0.0393	0.0692	0.0824	0.0620
Calcium (Ca)-Total	mg/kg	-	-	20400	20900	21900	22100	30300	30600	6290	8170	8660
Cesium (Cs)-Total	mg/kg	-	-	0.116	0.158	0.0920	0.101	0.114	0.100	0.456	0.480	0.354
Chromium (Cr)-Total	mg/kg	87	-	0.822	1.02	0.769	0.879	1.23	0.927	8.30	8.52	4.48
Cobalt (Co)-Total	mg/kg	300	-	0.220	0.258	0.224	0.240	0.296	0.257	2.29	2.34	1.40
Copper (Cu)-Total	mg/kg	91	-	0.92	1.03	0.96	1.09	1.41	1.17	6.03	6.32	4.24
Iron (Fe)-Total	mg/kg	-	-	1740	1840	1820	1930	2230	2020	8390	9090	5520
Lead (Pb)-Total	mg/kg	260	-	1.41	1.99	1.01	1.09	1.45	1.36	4.05	4.84	4.22
Lithium (Li)-Total	mg/kg	-	-	0.75	1.05	0.71	0.82	1.05	0.85	5.67	5.78	3.73
Magnesium (Mg)-Total	mg/kg	-	-	1210	1210	1520	1510	1300	1370	3370	3410	2730
Manganese (Mn)-Total	mg/kg	-	-	21.8	25.5	19.1	19.8	26.1	24.4	122	125	77.5
Mercury (Hg)-Total	mg/kg	24	-	0.0409	0.0385	0.0484	0.0480	0.0489	0.0545	0.0256	0.0257	0.0253
Molybdenum (Mo)-Total	mg/kg	40	-	0.145	0.157	0.157	0.164	0.175	0.152	1.20	1.09	0.841
Nickel (Ni)-Total	mg/kg	89	-	0.63	0.75	0.67	0.71	0.93	0.77	6.06	6.29	3.55
Phosphorus (P)-Total	mg/kg	-	-	426	406	339	388	401	468	356	357	324
Potassium (K)-Total	mg/kg	-	-	1470	1370	1250	1290	1360	1360	2090	2130	1790
Rubidium (Rb)-Total	mg/kg	-	-	2.95	3.48	2.17	2.31	3.07	2.95	13.9	14.6	10.2
Selenium (Se)-Total	mg/kg	2.9	-	0.058	0.055	0.061	0.073	0.068	0.070	0.070	0.066	0.054
Silver (Ag)-Total	mg/kg	40	-	0.0145	0.0163	0.0161	0.0168	0.0166	0.0144	0.0555	0.0576	0.0520
Sodium (Na)-Total	mg/kg	-	-	350	339	442	479	450	506	97	102	97
Strontium (Sr)-Total	mg/kg	-	-	22.7	23.0	35.5	35.6	34.4	33.9	12.6	14.1	15.4
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0069	0.0090	0.0060	0.0069	0.0137	0.0084	0.0732	0.0772	0.0589

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-123	L2323007-125	L2323007-126	L2323007-128	L2323007-129	L2323007-131	L2323007-132	L2323007-134	L2323007-135
			Sample Date	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
			Sample ID	L-149 WASHED	L-149-R UNWASHED	L-149-R WASHED	L-150 UNWASHED	L-150 WASHED	L-151 UNWASHED	L-151 WASHED	L-152 UNWASHED	L-152 WASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	2760	3560	3850	5690	2650	2460	2030	4910	3640
Antimony (Sb)-Total	mg/kg	40	-	0.018	0.017	0.016	0.021	0.013	0.013	0.014	0.015	0.016
Arsenic (As)-Total	mg/kg	12	-	0.185	0.237	0.232	0.228	0.158	0.193	0.182	0.232	0.212
Barium (Ba)-Total	mg/kg	2000	-	28.2	30.2	30.4	41.4	25.6	27.1	25.3	35.7	30.2
Beryllium (Be)-Total	mg/kg	8	-	0.108	0.153	0.148	0.190	0.104	0.107	0.104	0.167	0.131
Bismuth (Bi)-Total	mg/kg	-	-	0.116	0.124	0.137	0.120	0.100	0.121	0.138	0.184	0.192
Boron (B)-Total	mg/kg	-	-	2.0	2.9	2.7	3.3	2.0	2.4	2.4	3.0	2.4
Cadmium (Cd)-Total	mg/kg	22	-	0.0860	0.0959	0.0704	0.0918	0.121	0.106	0.120	0.0781	0.0968
Calcium (Ca)-Total	mg/kg	-	-	11600	9920	7360	11200	17100	18200	19400	6810	10000
Cesium (Cs)-Total	mg/kg	-	-	0.350	0.416	0.405	0.583	0.387	0.360	0.365	0.519	0.440
Chromium (Cr)-Total	mg/kg	87	-	4.50	6.12	6.06	7.35	3.91	4.95	4.46	11.0	8.41
Cobalt (Co)-Total	mg/kg	300	-	1.35	1.87	1.82	2.44	1.28	1.41	1.18	2.49	1.93
Copper (Cu)-Total	mg/kg	91	-	4.11	5.93	5.72	6.88	4.24	4.29	3.94	8.94	7.38
Iron (Fe)-Total	mg/kg	-	-	5250	6990	6930	9480	4960	4900	4120	9190	7120
Lead (Pb)-Total	mg/kg	260	-	4.67	5.52	5.35	6.91	6.71	6.18	7.36	5.57	5.86
Lithium (Li)-Total	mg/kg	-	-	3.44	4.83	4.49	6.73	3.45	3.55	2.89	5.74	4.41
Magnesium (Mg)-Total	mg/kg	-	-	2870	3390	3290	4770	2630	2790	2170	4290	3410
Manganese (Mn)-Total	mg/kg	-	-	77.8	103	95.4	154	97.7	84.9	70.3	123	102
Mercury (Hg)-Total	mg/kg	24	-	0.0300	0.0345	0.0311	0.0305	0.0387	0.0414	0.0487	0.0278	0.0370
Molybdenum (Mo)-Total	mg/kg	40	-	0.749	1.21	1.14	1.10	0.848	0.689	0.568	1.40	1.16
Nickel (Ni)-Total	mg/kg	89	-	3.43	5.14	4.93	6.36	3.75	4.14	4.23	7.65	5.94
Phosphorus (P)-Total	mg/kg	-	-	385	365	332	440	490	725	744	448	500
Potassium (K)-Total	mg/kg	-	-	2010	2110	2100	3180	2700	2450	2510	2320	2400
Rubidium (Rb)-Total	mg/kg	-	-	10.6	12.8	12.3	18.8	13.3	11.6	11.7	15.8	14.2
Selenium (Se)-Total	mg/kg	2.9	-	0.063	0.073	0.068	0.064	0.061	0.066	0.070	0.071	0.077
Silver (Ag)-Total	mg/kg	40	-	0.0596	0.0574	0.0533	0.0694	0.0622	0.0685	0.0720	0.0867	0.0836
Sodium (Na)-Total	mg/kg	-	-	111	107	92	151	240	240	271	107	157
Strontium (Sr)-Total	mg/kg	-	-	19.2	14.8	12.4	19.0	24.4	35.7	33.9	11.8	14.7
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0562	0.0710	0.0696	0.0897	0.0519	0.0496	0.0476	0.0935	0.0778

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - TISSUE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2323007-137	L2323007-138	L2323007-140	L2323007-141	L2323007-143	L2323007-144	L2323007-146	L2323007-147	L2323007-149
Sample Date				13-JUL-19	13-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
Sample ID				L-153 UNWASHED	L-153 WASHED	L-154 UNWASHED	L-154 WASHED	L-155 UNWASHED	L-155 WASHED	L-156 UNWASHED	L-156 WASHED	L-156-R UNWASHED
Aluminum (Al)-Total	mg/kg	-	-	1160	1130	922	841	975	886	1420	1290	1390
Antimony (Sb)-Total	mg/kg	40	-	0.018	0.013	<0.010	<0.010	0.018	<0.010	0.011	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.257	0.186	0.109	0.097	0.178	0.121	0.180	0.174	0.159
Barium (Ba)-Total	mg/kg	2000	-	12.8	10.6	7.20	7.07	11.0	10.6	11.4	10.7	10.5
Beryllium (Be)-Total	mg/kg	8	-	0.061	0.058	0.038	0.038	0.049	0.047	0.066	0.064	0.068
Bismuth (Bi)-Total	mg/kg	-	-	0.043	0.040	0.032	0.023	0.034	0.034	0.055	0.051	0.050
Boron (B)-Total	mg/kg	-	-	1.1	<1.0	1.0	1.1	1.1	1.0	1.3	1.2	1.3
Cadmium (Cd)-Total	mg/kg	22	-	0.127	0.0907	0.0759	0.0855	0.0641	0.0593	0.0543	0.0576	0.0566
Calcium (Ca)-Total	mg/kg	-	-	9890	9030	9710	10700	10600	10300	19100	14200	19500
Cesium (Cs)-Total	mg/kg	-	-	0.161	0.153	0.126	0.120	0.178	0.149	0.242	0.212	0.230
Chromium (Cr)-Total	mg/kg	87	-	3.14	3.11	2.65	2.35	2.96	2.74	3.86	3.49	3.67
Cobalt (Co)-Total	mg/kg	300	-	1.01	0.886	0.629	0.568	0.733	0.668	0.902	0.893	0.909
Copper (Cu)-Total	mg/kg	91	-	3.07	2.71	2.11	2.04	2.30	2.19	2.88	2.95	2.76
Iron (Fe)-Total	mg/kg	-	-	7220	5790	3280	3160	3990	2930	5110	5020	4610
Lead (Pb)-Total	mg/kg	260	-	2.19	1.96	1.22	1.19	2.03	1.76	2.46	2.68	2.43
Lithium (Li)-Total	mg/kg	-	-	1.22	1.18	0.91	0.82	1.12	0.90	1.46	1.27	1.49
Magnesium (Mg)-Total	mg/kg	-	-	1930	1710	1700	1590	1610	1850	2020	1710	2100
Manganese (Mn)-Total	mg/kg	-	-	71.2	54.9	37.4	36.0	65.3	40.4	49.3	47.7	47.9
Mercury (Hg)-Total	mg/kg	24	-	0.0512	0.0540	0.0632	0.0682	0.0721	0.0772	0.0528	0.0749	0.0546
Molybdenum (Mo)-Total	mg/kg	40	-	0.526	0.398	0.249	0.275	0.371	0.334	0.606	0.497	0.546
Nickel (Ni)-Total	mg/kg	89	-	2.96	3.20	2.64	2.40	3.04	2.41	2.81	2.66	2.65
Phosphorus (P)-Total	mg/kg	-	-	521	571	423	397	467	529	475	468	499
Potassium (K)-Total	mg/kg	-	-	2040	1490	1730	1690	1810	1890	2330	1920	2210
Rubidium (Rb)-Total	mg/kg	-	-	9.89	7.27	6.48	5.80	7.27	7.08	10.6	8.62	9.66
Selenium (Se)-Total	mg/kg	2.9	-	0.108	0.098	0.077	0.079	0.108	0.090	0.093	0.091	0.088
Silver (Ag)-Total	mg/kg	40	-	0.0328	0.0299	0.0157	0.0156	0.0232	0.0196	0.0316	0.0280	0.0326
Sodium (Na)-Total	mg/kg	-	-	328	218	253	252	329	317	301	197	249
Strontium (Sr)-Total	mg/kg	-	-	6.33	4.86	2.84	3.47	4.01	4.02	6.09	4.60	5.52
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0216	0.0209	0.0176	0.0161	0.0241	0.0195	0.0314	0.0312	0.0299

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-150	L2323007-152	L2323007-153	L2323007-155	L2323007-156	L2323007-158	L2323007-159	L2323007-161	L2323007-162
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	15-JUL-19	15-JUL-19	15-JUL-19	15-JUL-19
			Sample ID	L-156-R WASHED	L-157 UNWASHED	L-157 WASHED	L-158 UNWASHED	L-158 WASHED	L-159 UNWASHED	L-159 WASHED	L-160 UNWASHED	L-160 WASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	1100	1770	1570	1700	1390	591	441	581	316
Antimony (Sb)-Total	mg/kg	40	-	<0.010	0.014	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.174	0.328	0.310	0.177	0.174	0.091	0.066	0.109	0.072
Barium (Ba)-Total	mg/kg	2000	-	11.0	24.2	25.7	13.9	14.6	4.34	4.32	5.41	3.56
Beryllium (Be)-Total	mg/kg	8	-	0.053	0.083	0.080	0.080	0.074	0.028	0.024	0.032	0.020
Bismuth (Bi)-Total	mg/kg	-	-	0.049	0.119	0.129	0.067	0.062	0.013	0.015	0.020	0.013
Boron (B)-Total	mg/kg	-	-	1.0	1.3	1.2	1.5	1.4	<1.0	<1.0	<1.0	<1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.0547	0.739	0.823	0.185	0.139	0.0525	0.0598	0.0583	0.0341
Calcium (Ca)-Total	mg/kg	-	-	12300	11700	12000	9130	11500	11900	12400	9900	6300
Cesium (Cs)-Total	mg/kg	-	-	0.206	0.275	0.244	0.227	0.206	0.0881	0.0842	0.0885	0.0594
Chromium (Cr)-Total	mg/kg	87	-	3.04	4.63	4.27	4.24	3.65	1.73	1.37	1.68	0.967
Cobalt (Co)-Total	mg/kg	300	-	0.774	1.25	1.13	1.13	0.982	0.411	0.316	0.457	0.252
Copper (Cu)-Total	mg/kg	91	-	2.64	12.7	10.6	3.38	3.14	1.45	1.31	1.50	0.92
Iron (Fe)-Total	mg/kg	-	-	4390	8150	8430	6020	5210	2090	1440	2630	1740
Lead (Pb)-Total	mg/kg	260	-	2.22	4.82	5.17	3.03	3.09	0.807	0.782	1.17	0.769
Lithium (Li)-Total	mg/kg	-	-	1.09	1.71	1.52	1.79	1.44	0.66	<0.50	0.67	<0.50
Magnesium (Mg)-Total	mg/kg	-	-	1740	2240	2020	2310	2050	1460	1260	1140	654
Manganese (Mn)-Total	mg/kg	-	-	44.0	82.7	74.2	66.5	60.9	25.0	21.3	33.8	20.3
Mercury (Hg)-Total	mg/kg	24	-	0.0759	0.0476	0.0519	0.0660	0.0673	0.0464	0.0485	0.0505	0.0352
Molybdenum (Mo)-Total	mg/kg	40	-	0.507	1.03	1.01	0.889	0.761	0.166	0.149	0.206	0.235
Nickel (Ni)-Total	mg/kg	89	-	2.24	4.01	3.79	3.42	3.02	1.24	0.99	1.28	0.73
Phosphorus (P)-Total	mg/kg	-	-	515	543	463	559	569	540	534	566	364
Potassium (K)-Total	mg/kg	-	-	2210	2460	1900	2280	2340	2050	1890	1780	1230
Rubidium (Rb)-Total	mg/kg	-	-	9.60	12.5	10.3	9.07	8.75	5.15	5.03	4.76	3.26
Selenium (Se)-Total	mg/kg	2.9	-	0.088	0.105	0.110	0.090	0.094	0.059	0.061	0.078	0.057
Silver (Ag)-Total	mg/kg	40	-	0.0312	0.0875	0.0848	0.0385	0.0371	0.0093	0.0100	0.0201	0.0150
Sodium (Na)-Total	mg/kg	-	-	229	287	243	296	306	376	348	334	232
Strontium (Sr)-Total	mg/kg	-	-	4.32	7.07	7.46	4.13	4.41	3.36	3.56	4.35	2.76
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0268	0.0398	0.0386	0.0350	0.0312	0.0117	0.0104	0.0126	0.0081

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-164	L2323007-165	L2323007-167	L2323007-168	L2323007-170	L2323007-171	L2323007-173	L2323007-174	L2323007-176
Sample Date				20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	16-JUL-19	16-JUL-19	18-JUL-19
Sample ID				L-161 UNWASHED	L-161 WASHED	L-162 UNWASHED	L-162 WASHED	L-163 UNWASHED	L-163 WASHED	L-164 UNWASHED	L-164 WASHED	L-165 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Aluminum (Al)-Total	mg/kg	-	-	969	744	464	468	430	388	149	150	220
Antimony (Sb)-Total	mg/kg	40	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.084	0.080	0.080	0.075	0.074	0.092	0.035	0.033	0.073
Barium (Ba)-Total	mg/kg	2000	-	10.1	11.2	6.91	7.00	14.1	12.7	3.84	3.94	5.56
Beryllium (Be)-Total	mg/kg	8	-	0.038	0.036	0.023	0.023	0.023	0.020	<0.010	<0.010	<0.010
Bismuth (Bi)-Total	mg/kg	-	-	0.030	0.040	0.021	0.019	0.032	0.029	<0.010	<0.010	<0.010
Boron (B)-Total	mg/kg	-	-	1.1	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.0390	0.0523	0.0509	0.0532	0.184	0.169	0.0429	0.0482	0.115
Calcium (Ca)-Total	mg/kg	-	-	3670	5600	15400	15000	15300	13800	14900	15300	7040
Cesium (Cs)-Total	mg/kg	-	-	0.188	0.189	0.106	0.109	0.125	0.120	0.0410	0.0417	0.0380
Chromium (Cr)-Total	mg/kg	87	-	1.91	1.54	1.34	1.43	1.06	1.06	0.413	0.428	0.607
Cobalt (Co)-Total	mg/kg	300	-	0.552	0.483	0.316	0.324	0.339	0.328	0.110	0.107	0.191
Copper (Cu)-Total	mg/kg	91	-	1.73	1.65	1.42	1.34	1.31	1.25	0.92	0.94	1.09
Iron (Fe)-Total	mg/kg	-	-	2120	1730	1390	1490	1140	1070	410	430	967
Lead (Pb)-Total	mg/kg	260	-	1.36	1.72	1.14	1.09	2.12	2.00	0.443	0.432	0.444
Lithium (Li)-Total	mg/kg	-	-	1.17	0.98	0.62	0.70	0.58	0.50	<0.50	<0.50	<0.50
Magnesium (Mg)-Total	mg/kg	-	-	1330	1250	920	956	950	922	975	1030	939
Manganese (Mn)-Total	mg/kg	-	-	52.1	50.4	24.1	25.2	50.4	54.7	12.3	12.7	35.9
Mercury (Hg)-Total	mg/kg	24	-	0.0346	0.0417	0.0417	0.0406	0.0494	0.0503	0.0473	0.0481	0.0399
Molybdenum (Mo)-Total	mg/kg	40	-	0.282	0.253	0.130	0.107	0.177	0.164	0.043	0.061	0.080
Nickel (Ni)-Total	mg/kg	89	-	1.52	1.30	0.97	0.98	0.91	0.91	0.31	0.34	0.53
Phosphorus (P)-Total	mg/kg	-	-	357	434	347	395	318	357	408	438	299
Potassium (K)-Total	mg/kg	-	-	1440	1750	1490	1480	1590	1610	1570	1690	1170
Rubidium (Rb)-Total	mg/kg	-	-	9.34	10.9	4.08	4.20	7.11	7.28	2.23	2.34	3.01
Selenium (Se)-Total	mg/kg	2.9	-	<0.050	<0.050	0.060	0.063	0.077	0.085	0.059	0.055	0.087
Silver (Ag)-Total	mg/kg	40	-	0.0171	0.0195	0.0133	0.0144	0.0228	0.0258	0.0051	<0.0050	0.0106
Sodium (Na)-Total	mg/kg	-	-	224	382	245	233	220	207	404	419	125
Strontium (Sr)-Total	mg/kg	-	-	4.25	5.85	7.15	7.38	11.7	12.9	4.05	4.29	6.87
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0232	0.0217	0.0118	0.0109	0.0147	0.0116	0.0040	0.0040	0.0055

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-177	L2323007-179	L2323007-180	L2323007-182	L2323007-183	L2323007-185	L2323007-186	L2323007-188	L2323007-189
			Sample Date	18-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19
			Sample ID	L-165 WASHED	L-165-R UNWASHED	L-165-R WASHED	L-166 UNWASHED	L-166 WASHED	L-167 UNWASHED	L-167 WASHED	L-168 UNWASHED	L-168 WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Aluminum (Al)-Total	mg/kg	-	-	230	168	176	191	320	292	334	114	177
Antimony (Sb)-Total	mg/kg	40	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.070	0.050	0.059	0.042	0.038	0.066	0.067	0.042	0.058
Barium (Ba)-Total	mg/kg	2000	-	5.35	4.97	4.36	10.7	13.0	5.13	5.09	6.54	6.83
Beryllium (Be)-Total	mg/kg	8	-	0.011	<0.010	<0.010	0.015	0.031	0.016	0.022	<0.010	<0.010
Bismuth (Bi)-Total	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.012	<0.010	0.010
Boron (B)-Total	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.111	0.132	0.0979	0.0778	0.0953	0.0285	0.0316	0.120	0.150
Calcium (Ca)-Total	mg/kg	-	-	5660	6530	4880	5310	5020	11100	11000	17700	17200
Cesium (Cs)-Total	mg/kg	-	-	0.0380	0.0318	0.0348	0.0502	0.0581	0.0881	0.0879	0.0505	0.0553
Chromium (Cr)-Total	mg/kg	87	-	0.622	0.426	0.440	0.477	0.671	0.921	1.07	0.333	0.526
Cobalt (Co)-Total	mg/kg	300	-	0.206	0.158	0.154	0.228	1.75	0.210	0.250	0.105	0.140
Copper (Cu)-Total	mg/kg	91	-	1.05	1.04	1.02	0.87	4.17	1.03	1.15	0.83	0.92
Iron (Fe)-Total	mg/kg	-	-	1150	554	568	323	435	622	680	341	513
Lead (Pb)-Total	mg/kg	260	-	0.371	0.373	0.327	0.623	0.761	0.534	0.553	0.514	0.649
Lithium (Li)-Total	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50
Magnesium (Mg)-Total	mg/kg	-	-	1010	903	795	972	937	1340	1380	774	818
Manganese (Mn)-Total	mg/kg	-	-	43.8	40.2	37.5	38.7	52.9	18.0	18.9	14.6	18.2
Mercury (Hg)-Total	mg/kg	24	-	0.0363	0.0413	0.0363	0.0421	0.0508	0.0710	0.0701	0.0439	0.0447
Molybdenum (Mo)-Total	mg/kg	40	-	0.084	0.071	0.062	0.035	0.046	0.054	0.073	0.059	0.070
Nickel (Ni)-Total	mg/kg	89	-	0.54	0.46	0.55	0.47	4.22	0.62	0.67	0.29	0.50
Phosphorus (P)-Total	mg/kg	-	-	299	315	286	363	414	555	577	401	386
Potassium (K)-Total	mg/kg	-	-	1100	1130	1050	1230	1390	1700	1600	1600	1510
Rubidium (Rb)-Total	mg/kg	-	-	3.02	2.29	2.40	3.75	4.28	2.64	2.87	5.08	4.97
Selenium (Se)-Total	mg/kg	2.9	-	0.082	0.077	0.080	0.065	0.066	0.063	0.057	0.080	0.076
Silver (Ag)-Total	mg/kg	40	-	0.0087	0.0086	0.0085	0.0093	0.0111	0.0069	0.0069	0.0067	0.0076
Sodium (Na)-Total	mg/kg	-	-	135	131	130	220	316	354	375	387	340
Strontium (Sr)-Total	mg/kg	-	-	5.93	6.19	4.75	7.99	8.04	4.48	4.67	10.3	9.67
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0055	0.0046	0.0053	0.0056	0.0066	0.0067	0.0074	0.0033	0.0058

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-191	L2323007-192	L2323007-194	L2323007-195	L2323007-197	L2323007-198	L2323007-200	L2323007-201	L2323007-203
Sample Date				20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	30-JUL-19
Sample ID				L-168-R UNWASHED	L-168-R WASHED	L-169 UNWASHED	L-169 WASHED	L-170 UNWASHED	L-170 WASHED	L-171 UNWASHED	L-171 WASHED	L-172 UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Aluminum (Al)-Total	mg/kg	-	-	167	139	127	116	677	726	4320	4350	1610
Antimony (Sb)-Total	mg/kg	40	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.011	0.017
Arsenic (As)-Total	mg/kg	12	-	0.049	0.047	0.032	0.033	0.129	0.129	0.231	0.192	0.287
Barium (Ba)-Total	mg/kg	2000	-	5.13	5.63	3.37	3.90	5.22	5.37	34.2	34.4	25.7
Beryllium (Be)-Total	mg/kg	8	-	<0.010	<0.010	<0.010	<0.010	0.035	0.036	0.158	0.160	0.091
Bismuth (Bi)-Total	mg/kg	-	-	<0.010	<0.010	0.013	<0.010	0.033	0.024	0.137	0.224	0.112
Boron (B)-Total	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	1.4	1.2	2.7	2.7	4.3
Cadmium (Cd)-Total	mg/kg	22	-	0.123	0.118	0.0434	0.0392	0.0705	0.0823	0.0607	0.0609	0.0730
Calcium (Ca)-Total	mg/kg	-	-	14200	16000	11200	9080	16400	16000	12300	12000	67300
Cesium (Cs)-Total	mg/kg	-	-	0.0529	0.0472	0.0385	0.0367	0.121	0.129	0.610	0.583	0.384
Chromium (Cr)-Total	mg/kg	87	-	0.486	0.366	0.410	0.358	2.87	2.94	6.58	7.10	3.45
Cobalt (Co)-Total	mg/kg	300	-	0.145	0.123	0.103	0.090	0.553	0.589	2.53	2.26	0.866
Copper (Cu)-Total	mg/kg	91	-	0.87	0.81	0.74	0.81	1.64	1.69	5.36	5.11	3.32
Iron (Fe)-Total	mg/kg	-	-	605	507	333	341	2260	2540	8380	8320	3580
Lead (Pb)-Total	mg/kg	260	-	0.593	0.579	0.431	0.358	1.60	1.57	6.18	5.91	5.05
Lithium (Li)-Total	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	0.92	1.03	6.66	6.53	4.58
Magnesium (Mg)-Total	mg/kg	-	-	732	732	935	1050	1320	1400	3730	3650	4150
Manganese (Mn)-Total	mg/kg	-	-	17.6	18.1	52.6	54.5	30.2	32.7	127	127	83.7
Mercury (Hg)-Total	mg/kg	24	-	0.0409	0.0405	0.0440	0.0439	0.0686	0.0645	0.0280	0.0257	0.0419
Molybdenum (Mo)-Total	mg/kg	40	-	0.086	0.059	0.052	0.050	0.146	0.162	0.661	0.786	0.553
Nickel (Ni)-Total	mg/kg	89	-	0.41	0.33	0.30	0.28	3.36	3.26	5.18	5.72	2.15
Phosphorus (P)-Total	mg/kg	-	-	415	404	403	412	585	604	536	497	561
Potassium (K)-Total	mg/kg	-	-	1640	1660	1570	1600	1860	1900	3190	2770	2300
Rubidium (Rb)-Total	mg/kg	-	-	5.00	4.96	4.19	4.39	5.22	5.80	18.0	16.7	10.5
Selenium (Se)-Total	mg/kg	2.9	-	0.073	0.071	0.052	0.057	0.091	0.097	<0.050	<0.050	0.079
Silver (Ag)-Total	mg/kg	40	-	0.0078	0.0069	0.0058	0.0064	0.0170	0.0179	0.0581	0.0579	0.0894
Sodium (Na)-Total	mg/kg	-	-	341	362	356	309	350	380	233	177	176
Strontium (Sr)-Total	mg/kg	-	-	7.57	8.99	4.22	4.09	5.77	5.76	21.7	22.2	79.3
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0058	0.0046	0.0040	0.0034	0.0167	0.0176	0.0956	0.0933	0.0414

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

Metals - TISSUE

Lab ID				L2323007-204	L2323007-206	L2323007-207	L2323007-209	L2323007-210
Sample Date				30-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19
Sample ID				L-172 WASHED	L-173 UNWASHED	L-173 WASHED	L-174 UNWASHED	L-174 WASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**					
Aluminum (Al)-Total	mg/kg	-	-	1030	1320	1140	536	524
Antimony (Sb)-Total	mg/kg	40	-	0.013	0.013	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.241	0.211	0.215	0.362	0.197
Barium (Ba)-Total	mg/kg	2000	-	23.7	19.9	18.4	16.1	24.6
Beryllium (Be)-Total	mg/kg	8	-	0.068	0.073	0.066	0.040	0.034
Bismuth (Bi)-Total	mg/kg	-	-	0.097	0.122	0.104	0.019	0.018
Boron (B)-Total	mg/kg	-	-	3.2	3.2	3.1	<1.0	<1.0
Cadmium (Cd)-Total	mg/kg	22	-	0.0650	0.0716	0.0803	0.143	0.121
Calcium (Ca)-Total	mg/kg	-	-	65100	68900	73200	8100	11000
Cesium (Cs)-Total	mg/kg	-	-	0.322	0.331	0.293	0.120	0.107
Chromium (Cr)-Total	mg/kg	87	-	2.43	2.72	2.27	1.50	1.61
Cobalt (Co)-Total	mg/kg	300	-	0.598	0.684	0.578	0.445	0.424
Copper (Cu)-Total	mg/kg	91	-	2.61	3.45	3.16	1.32	1.36
Iron (Fe)-Total	mg/kg	-	-	2310	2970	2370	1630	1600
Lead (Pb)-Total	mg/kg	260	-	4.60	5.59	5.46	2.11	1.71
Lithium (Li)-Total	mg/kg	-	-	3.05	3.70	3.02	0.59	0.61
Magnesium (Mg)-Total	mg/kg	-	-	3790	3170	2880	1540	1740
Manganese (Mn)-Total	mg/kg	-	-	71.4	63.6	55.8	48.1	62.0
Mercury (Hg)-Total	mg/kg	24	-	0.0423	0.0386	0.0461	0.0944	0.0875
Molybdenum (Mo)-Total	mg/kg	40	-	0.392	0.665	0.593	0.116	0.114
Nickel (Ni)-Total	mg/kg	89	-	1.52	1.73	1.55	1.32	1.31
Phosphorus (P)-Total	mg/kg	-	-	602	464	451	406	421
Potassium (K)-Total	mg/kg	-	-	2340	1930	1730	1460	1640
Rubidium (Rb)-Total	mg/kg	-	-	9.64	8.43	7.67	8.55	9.08
Selenium (Se)-Total	mg/kg	2.9	-	0.082	0.077	0.074	0.124	0.114
Silver (Ag)-Total	mg/kg	40	-	0.0862	0.0759	0.0739	0.0179	0.0153
Sodium (Na)-Total	mg/kg	-	-	191	166	148	346	304
Strontium (Sr)-Total	mg/kg	-	-	78.3	67.6	66.5	9.80	13.0
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0284	0.0342	0.0292	0.0150	0.0124

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

		Guide Limits										
			Lab ID	L2323007-2	L2323007-3	L2323007-5	L2323007-6	L2323007-8	L2323007-9	L2323007-11	L2323007-12	L2323007-14
			Sample Date	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-118 UNWASHED	L-118 WASHED	L-118-R UNWASHED	L-118-R WASHED	L-119 UNWASHED	L-119 WASHED	L-120 UNWASHED	L-120 WASHED	L-121 UNWASHED
Analyte	**Unit**	**#1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	0.25	0.28	0.16	0.16	0.18	0.29	0.23	0.18	0.67
Titanium (Ti)-Total	mg/kg	-	-	18.0	18.6	19.0	23.0	21.0	21.4	28.0	23.2	30.7
Uranium (U)-Total	mg/kg	33	-	0.368	0.368	0.419	0.438	0.301	0.313	0.643	0.530	0.810
Vanadium (V)-Total	mg/kg	130	-	0.57	0.58	0.61	0.75	0.65	0.72	0.99	0.77	1.11
Zinc (Zn)-Total	mg/kg	410	-	7.97	8.35	7.49	7.75	8.93	9.00	9.41	9.38	9.16
Zirconium (Zr)-Total	mg/kg	-	-	0.82	0.90	1.01	1.15	0.92	0.99	1.88	1.35	1.39

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2323007-15 24-JUL-19 L-121 WASHED	L2323007-17 24-JUL-19 L-121-R UNWASHED	L2323007-18 24-JUL-19 L-121 WASHED	L2323007-20 24-JUL-19 L-122 UNWASHED	L2323007-21 24-JUL-19 L-122 WASHED	L2323007-23 23-JUL-19 L-123 UNWASHED	L2323007-24 23-JUL-19 L-123 WASHED	L2323007-26 23-JUL-19 L-124 UNWASHED	L2323007-27 23-JUL-19 L-124 WASHED
Tin (Sn)-Total	mg/kg	300	-	0.22	0.22	0.13	<0.10	<0.10	0.11	0.14	0.17	0.19
Titanium (Ti)-Total	mg/kg	-	-	36.1	14.6	15.4	19.9	25.9	94.2	112	184	178
Uranium (U)-Total	mg/kg	33	-	0.552	0.407	0.374	0.555	0.690	0.363	0.413	0.807	0.737
Vanadium (V)-Total	mg/kg	130	-	1.29	0.50	0.52	0.68	0.94	2.40	3.00	4.32	4.30
Zinc (Zn)-Total	mg/kg	410	-	10.8	8.66	9.32	10.1	10.4	20.3	18.0	23.9	24.7
Zirconium (Zr)-Total	mg/kg	-	-	1.55	0.87	0.84	1.15	1.47	2.08	2.64	4.21	3.66

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-29	L2323007-30	L2323007-32	L2323007-33	L2323007-35	L2323007-36	L2323007-38	L2323007-39	L2323007-41
Sample Date				23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	12-JUL-19
Sample ID				L-125 UNWASHED	L-125 WASHED	L-125-R UNWASHED	L-125-R WASHED	L-126 UNWASHED	L-126 WASHED	L-127 UNWASHED	L-127 WASHED	L-128 UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Tin (Sn)-Total	mg/kg	300	-	0.17	0.14	0.18	0.18	0.28	0.23	0.20	0.28	0.17
Titanium (Ti)-Total	mg/kg	-	-	154	134	167	187	230	210	164	245	139
Uranium (U)-Total	mg/kg	33	-	0.752	0.705	0.881	0.839	1.30	1.18	1.89	2.14	0.650
Vanadium (V)-Total	mg/kg	130	-	3.72	3.08	3.98	4.49	6.77	6.18	4.38	6.31	4.09
Zinc (Zn)-Total	mg/kg	410	-	21.3	20.9	23.5	23.4	22.5	20.4	18.5	21.7	14.8
Zirconium (Zr)-Total	mg/kg	-	-	3.32	3.42	4.44	4.14	5.85	5.58	6.50	8.50	2.82

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-42	L2323007-44	L2323007-45	L2323007-47	L2323007-48	L2323007-50	L2323007-51	L2323007-53	L2323007-54
Sample Date				12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19
Sample ID				L-128 WASHED	L-128-R UNWASHED	L-128-R WASHED	L-129 UNWASHED	L-129 WASHED	L-130 UNWASHED	L-130 WASHED	L-130-R UNWASHED	L-130-R WASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Tin (Sn)-Total	mg/kg	300	-	0.10	0.14	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium (Ti)-Total	mg/kg	-	-	81.5	120	98.7	52.3	58.6	55.9	63.2	62.4	48.5
Uranium (U)-Total	mg/kg	33	-	0.585	0.703	0.641	0.334	0.344	0.249	0.290	0.265	0.284
Vanadium (V)-Total	mg/kg	130	-	2.49	4.73	2.91	1.61	1.82	1.86	1.88	1.77	1.41
Zinc (Zn)-Total	mg/kg	410	-	16.2	15.0	16.1	20.5	21.9	21.5	21.4	17.5	18.0
Zirconium (Zr)-Total	mg/kg	-	-	2.12	2.39	2.24	1.34	1.45	1.39	1.46	1.24	1.12

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-56	L2323007-57	L2323007-59	L2323007-60	L2323007-62	L2323007-63	L2323007-65	L2323007-66	L2323007-68
Sample Date				13-JUL-19	13-JUL-19	13-JUL-19	13-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19	12-JUL-19
Sample ID				L-131 UNWASHED	L-131 WASHED	L-132 UNWASHED	L-132 WASHED	L-133 UNWASHED	L-133 WASHED	L-133-R UNWASHED	L-133-R WASHED	L-134 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Tin (Sn)-Total	mg/kg	300	-	<0.10	<0.10	0.30	0.14	0.17	0.22	0.58	0.42	0.10
Titanium (Ti)-Total	mg/kg	-	-	39.8	40.8	57.9	52.6	160	135	440	259	75.4
Uranium (U)-Total	mg/kg	33	-	0.172	0.174	0.220	0.210	0.633	0.692	1.27	1.15	0.406
Vanadium (V)-Total	mg/kg	130	-	1.12	1.16	1.64	1.48	4.92	4.24	13.3	8.07	2.16
Zinc (Zn)-Total	mg/kg	410	-	13.3	14.3	15.6	14.8	13.4	16.1	26.5	21.7	12.6
Zirconium (Zr)-Total	mg/kg	-	-	0.88	0.95	1.26	1.11	2.91	2.62	5.42	4.53	2.03

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-69	L2323007-71	L2323007-72	L2323007-74	L2323007-75	L2323007-77	L2323007-78	L2323007-80	L2323007-81
			Sample Date	12-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-134 WASHED	L-135 UNWASHED	L-135 WASHED	L-136 UNWASHED	L-136 WASHED	L-137 UNWASHED	L-137 WASHED	L-137-R UNWASHED	L-137-R WASHED
		Guide Limits										
Analyte	Unit	#1	#2									
Tin (Sn)-Total	mg/kg	300	-	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.15
Titanium (Ti)-Total	mg/kg	-	-	93.6	15.9	9.88	15.6	14.4	6.50	8.46	12.8	9.41
Uranium (U)-Total	mg/kg	33	-	0.526	0.140	0.0628	0.209	0.178	0.0992	0.0954	0.179	0.138
Vanadium (V)-Total	mg/kg	130	-	3.01	0.57	0.41	0.67	0.52	0.25	0.33	0.57	0.40
Zinc (Zn)-Total	mg/kg	410	-	11.9	8.86	8.37	7.90	8.04	6.32	7.18	8.27	8.05
Zirconium (Zr)-Total	mg/kg	-	-	2.69	0.38	0.36	0.62	0.48	0.26	0.34	0.55	0.41

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - TISSUE

			Lab ID	L2323007-83	L2323007-84	L2323007-86	L2323007-87	L2323007-89	L2323007-90	L2323007-92	L2323007-93	L2323007-95
			Sample Date	16-JUL-19	16-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
			Sample ID	L-138 UNWASHED	L-138 WASHED	L-139 UNWASHED	L-139 WASHED	L-140 UNWASHED	L-140 WASHED	L-141 UNWASHED	L-141 WASHED	L-141-R UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	0.15	<0.10	<0.10	<0.10	0.13	0.13	0.24	0.14	0.16
Titanium (Ti)-Total	mg/kg	-	-	18.7	17.2	8.19	7.94	6.56	7.46	5.24	6.24	4.42
Uranium (U)-Total	mg/kg	33	-	0.0334	0.0338	0.0619	0.0638	0.119	0.137	0.0380	0.0415	0.0353
Vanadium (V)-Total	mg/kg	130	-	0.51	0.48	0.29	0.35	0.30	0.31	0.21	0.25	0.18
Zinc (Zn)-Total	mg/kg	410	-	27.5	26.3	6.37	7.17	11.7	11.9	7.69	8.10	7.64
Zirconium (Zr)-Total	mg/kg	-	-	0.43	0.48	0.24	0.27	0.22	0.24	0.25	0.22	<0.20

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-96	L2323007-98	L2323007-99	L2323007-101	L2323007-102	L2323007-104	L2323007-105	L2323007-107	L2323007-108
Sample Date				24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19
Sample ID				L-141-R WASHED	L-142 UNWASHED	L-142 WASHED	L-143 UNWASHED	L-143 WASHED	L-144 UNWASHED	L-144 WASHED	L-145 UNWASHED	L-145 WASHED
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Tin (Sn)-Total	mg/kg	300	-	0.10	0.17	0.15	0.24	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium (Ti)-Total	mg/kg	-	-	5.58	7.38	9.14	9.83	14.0	19.6	16.2	17.3	12.4
Uranium (U)-Total	mg/kg	33	-	0.0460	0.140	0.188	0.228	0.329	0.660	0.781	0.279	0.226
Vanadium (V)-Total	mg/kg	130	-	0.23	0.29	0.35	0.39	0.52	0.68	0.56	0.92	0.55
Zinc (Zn)-Total	mg/kg	410	-	7.55	8.49	9.08	10.5	13.5	11.6	12.0	8.87	8.90
Zirconium (Zr)-Total	mg/kg	-	-	0.22	0.30	0.36	0.73	1.38	1.88	1.72	1.34	0.89

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-110	L2323007-111	L2323007-113	L2323007-114	L2323007-116	L2323007-117	L2323007-119	L2323007-120	L2323007-122
Sample Date				24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	24-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
Sample ID				L-145-R UNWASHED	L-145-R WASHED	L-146 UNWASHED	L-146 WASHED	L-147 UNWASHED	L-147 WASHED	L-148 UNWASHED	L-148 WASHED	L-149 UNWASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Tin (Sn)-Total	mg/kg	300	-	<0.10	<0.10	1.09	0.28	0.29	0.13	0.63	0.44	0.46
Titanium (Ti)-Total	mg/kg	-	-	12.7	15.9	11.8	12.7	18.6	16.1	208	218	159
Uranium (U)-Total	mg/kg	33	-	0.276	0.459	0.188	0.212	0.692	0.753	0.870	0.947	0.564
Vanadium (V)-Total	mg/kg	130	-	0.56	0.72	0.52	0.58	0.82	0.70	6.56	6.71	4.39
Zinc (Zn)-Total	mg/kg	410	-	8.72	8.65	8.62	10.3	10.3	10.5	20.4	21.9	15.4
Zirconium (Zr)-Total	mg/kg	-	-	1.10	1.32	0.76	0.73	1.00	0.84	4.73	5.27	3.51

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - TISSUE

			Lab ID	L2323007-123	L2323007-125	L2323007-126	L2323007-128	L2323007-129	L2323007-131	L2323007-132	L2323007-134	L2323007-135
			Sample Date	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
			Sample ID	L-149 WASHED	L-149-R UNWASHED	L-149-R WASHED	L-150 UNWASHED	L-150 WASHED	L-151 UNWASHED	L-151 WASHED	L-152 UNWASHED	L-152 WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	0.32	0.27	0.30	0.49	0.37	0.38	0.29	0.48	0.36
Titanium (Ti)-Total	mg/kg	-	-	157	205	197	305	162	145	126	263	198
Uranium (U)-Total	mg/kg	33	-	0.553	0.787	0.731	0.873	0.621	0.736	0.749	0.808	0.729
Vanadium (V)-Total	mg/kg	130	-	4.12	5.79	5.73	7.86	3.95	4.26	3.59	7.91	6.00
Zinc (Zn)-Total	mg/kg	410	-	17.0	22.1	20.7	24.3	22.0	21.0	20.5	23.5	21.9
Zirconium (Zr)-Total	mg/kg	-	-	3.04	4.37	4.35	6.49	3.87	3.47	3.70	5.49	4.36

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - TISSUE

			Lab ID	L2323007-137	L2323007-138	L2323007-140	L2323007-141	L2323007-143	L2323007-144	L2323007-146	L2323007-147	L2323007-149
			Sample Date	13-JUL-19	13-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19
			Sample ID	L-153 UNWASHED	L-153 WASHED	L-154 UNWASHED	L-154 WASHED	L-155 UNWASHED	L-155 WASHED	L-156 UNWASHED	L-156 WASHED	L-156-R UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	0.29	0.31	0.27	0.28	0.24	0.21	0.24	0.25	0.25
Titanium (Ti)-Total	mg/kg	-	-	74.2	70.8	59.6	53.5	66.3	61.8	96.6	91.7	97.1
Uranium (U)-Total	mg/kg	33	-	0.257	0.250	0.183	0.183	0.251	0.204	0.320	0.323	0.312
Vanadium (V)-Total	mg/kg	130	-	2.01	2.03	1.60	1.46	1.92	1.61	2.69	2.40	2.56
Zinc (Zn)-Total	mg/kg	410	-	21.1	18.3	17.0	17.5	17.6	20.2	18.3	16.8	17.2
Zirconium (Zr)-Total	mg/kg	-	-	1.19	1.15	1.10	0.89	1.21	1.03	1.80	1.82	1.60

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - TISSUE

			Lab ID	L2323007-150	L2323007-152	L2323007-153	L2323007-155	L2323007-156	L2323007-158	L2323007-159	L2323007-161	L2323007-162
			Sample Date	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	15-JUL-19	15-JUL-19	15-JUL-19	15-JUL-19
			Sample ID	L-156-R WASHED	L-157 UNWASHED	L-157 WASHED	L-158 UNWASHED	L-158 WASHED	L-159 UNWASHED	L-159 WASHED	L-160 UNWASHED	L-160 WASHED
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Tin (Sn)-Total	mg/kg	300	-	0.26	0.30	0.39	0.91	0.26	0.23	0.12	0.48	0.50
Titanium (Ti)-Total	mg/kg	-	-	79.4	112	102	111	90.1	41.7	29.9	36.5	20.9
Uranium (U)-Total	mg/kg	33	-	0.277	0.405	0.420	0.382	0.356	0.112	0.0822	0.142	0.0826
Vanadium (V)-Total	mg/kg	130	-	2.02	3.10	2.82	2.96	2.45	1.17	0.80	1.11	0.59
Zinc (Zn)-Total	mg/kg	410	-	16.2	25.5	25.4	21.0	20.8	12.3	12.9	15.9	11.2
Zirconium (Zr)-Total	mg/kg	-	-	1.59	2.09	2.30	1.84	1.58	0.84	0.59	0.93	0.60

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Metals - TISSUE

			Lab ID	L2323007-164	L2323007-165	L2323007-167	L2323007-168	L2323007-170	L2323007-171	L2323007-173	L2323007-174	L2323007-176
			Sample Date	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	16-JUL-19	16-JUL-19	18-JUL-19
			Sample ID	L-161 UNWASHED	L-161 WASHED	L-162 UNWASHED	L-162 WASHED	L-163 UNWASHED	L-163 WASHED	L-164 UNWASHED	L-164 WASHED	L-165 UNWASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	1.17	1.39	0.14	0.17	0.21	0.34	<0.10	<0.10	0.11
Titanium (Ti)-Total	mg/kg	-	-	59.1	49.4	33.7	32.9	32.3	28.9	10.4	9.83	14.6
Uranium (U)-Total	mg/kg	33	-	0.169	0.180	0.104	0.0956	0.127	0.109	0.0290	0.0298	0.0493
Vanadium (V)-Total	mg/kg	130	-	1.55	1.16	0.96	0.97	0.74	0.66	0.30	0.30	0.39
Zinc (Zn)-Total	mg/kg	410	-	15.8	17.8	12.2	13.2	18.4	17.7	9.72	10.2	16.9
Zirconium (Zr)-Total	mg/kg	-	-	1.23	1.11	0.72	0.70	0.82	0.65	0.26	0.25	0.28

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-177	L2323007-179	L2323007-180	L2323007-182	L2323007-183	L2323007-185	L2323007-186	L2323007-188	L2323007-189
			Sample Date	18-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	18-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19
			Sample ID	L-165 WASHED	L-165-R UNWASHED	L-165-R WASHED	L-166 UNWASHED	L-166 WASHED	L-167 UNWASHED	L-167 WASHED	L-168 UNWASHED	L-168 WASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	0.12	<0.10	<0.10	<0.10	<0.10	0.11	0.16	0.15	<0.10
Titanium (Ti)-Total	mg/kg	-	-	13.6	11.6	10.6	31.8	29.7	18.1	21.4	9.21	16.8
Uranium (U)-Total	mg/kg	33	-	0.0497	0.0418	0.0394	0.0523	0.206	0.0517	0.253	0.0371	0.0468
Vanadium (V)-Total	mg/kg	130	-	0.40	0.30	0.31	0.44	0.61	0.64	0.99	0.20	0.35
Zinc (Zn)-Total	mg/kg	410	-	18.0	20.2	17.2	21.1	25.3	8.76	9.68	22.7	24.7
Zirconium (Zr)-Total	mg/kg	-	-	0.28	0.26	0.26	0.34	0.44	0.43	0.51	<0.20	0.31

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

Lab ID				L2323007-191	L2323007-192	L2323007-194	L2323007-195	L2323007-197	L2323007-198	L2323007-200	L2323007-201	L2323007-203
Sample Date				20-JUL-19	20-JUL-19	20-JUL-19	20-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	23-JUL-19	30-JUL-19
Sample ID				L-168-R UNWASHED	L-168-R WASHED	L-169 UNWASHED	L-169 WASHED	L-170 UNWASHED	L-170 WASHED	L-171 UNWASHED	L-171 WASHED	L-172 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**Guide Limits #2**									
Tin (Sn)-Total	mg/kg	300	-	<0.10	0.11	0.12	<0.10	0.18	0.21	0.42	0.43	0.27
Titanium (Ti)-Total	mg/kg	-	-	12.5	11.1	9.58	8.58	51.9	52.7	292	288	94.9
Uranium (U)-Total	mg/kg	33	-	0.0436	0.0367	0.0236	0.0215	0.116	0.125	0.957	0.961	0.885
Vanadium (V)-Total	mg/kg	130	-	0.30	0.25	0.26	0.24	1.50	1.62	7.44	7.28	2.70
Zinc (Zn)-Total	mg/kg	410	-	26.0	25.4	16.7	16.7	13.7	14.6	18.8	19.0	16.6
Zirconium (Zr)-Total	mg/kg	-	-	0.29	0.20	0.22	0.20	1.30	1.24	5.04	5.09	3.49

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2323007-204	L2323007-206	L2323007-207	L2323007-209	L2323007-210
			Sample Date	30-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19	30-JUL-19
			Sample ID	L-172 WASHED	L-173 UNWASHED	L-173 WASHED	L-174 UNWASHED	L-174 WASHED
		Guide Limits						
Analyte	**Unit**	**#1**	**#2**					
Tin (Sn)-Total	mg/kg	300	-	0.18	0.17	0.18	0.23	0.32
Titanium (Ti)-Total	mg/kg	-	-	65.1	79.2	67.6	43.5	45.3
Uranium (U)-Total	mg/kg	33	-	0.797	0.885	0.849	0.105	0.0895
Vanadium (V)-Total	mg/kg	130	-	1.72	2.11	1.77	1.08	1.10
Zinc (Zn)-Total	mg/kg	410	-	15.1	14.4	14.2	19.0	17.9
Zirconium (Zr)-Total	mg/kg	-	-	2.60	2.81	2.68	0.67	0.53

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

🟨 Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
🟥 Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
AG-DRY-CCMS-N-VA	Tissue	Silver in Tissue by CRC ICPMS (DRY)	EPA 200.3/6020A

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

HG-200.2-CVAA-WT	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-DRY-CVAFS-N-VA	Tissue	Mercury in Tissue by CVAFS (DRY)	EPA 200.3, EPA 245.7

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry, adapted from US EPA Method 245.7.

MET-200.2-CCMS-WT	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

MET-DRY-CCMS-N-VA	Tissue	Metals in Tissue by CRC ICPMS (DRY)	EPA 200.3/6020A

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

MOISTURE-BIOPSY-VA	Tissue	Moisture Content (low weight) in tissue	Puget Sound WQ Authority, Apr 1997

This analysis is carried out gravimetrically by drying the sample at <60 deg. C for a minimum of three days.

MOISTURE-MICR-VA	Tissue	Moisture in Tissue	Puget Sound WQ Authority, Apr 1997

This analysis is carried out gravimetrically by drying the sample at <60 deg. C.

MOISTURE-TISS-VA	Tissue	% Moisture in Tissues	Puget Sound WQ Authority, Apr 1997

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

TI-DRY-CCMS-N-VA	Tissue	Ti in Tissue by CRC ICPMS (DRY)	EPA 200.3/6020A

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-WT	**Soil**							
Batch R4746727								
WG3129675-2 CRM		**WT-CANMET-TILL1**						
Mercury (Hg)			98.3		%		70-130	12-AUG-19
WG3129675-6 DUP		**WG3129675-5**						
Mercury (Hg)		0.0083	0.0081		ug/g	3.4	40	12-AUG-19
WG3129675-3 LCS								
Mercury (Hg)			107.5		%		80-120	12-AUG-19
WG3129675-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	12-AUG-19
Batch R4746739								
WG3129669-2 CRM		**WT-CANMET-TILL1**						
Mercury (Hg)			97.0		%		70-130	12-AUG-19
WG3129669-6 DUP		**WG3129669-5**						
Mercury (Hg)		0.0136	0.0127		ug/g	6.9	40	12-AUG-19
WG3129669-3 LCS								
Mercury (Hg)			116.5		%		80-120	12-AUG-19
WG3129669-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	12-AUG-19
Batch R4750009								
WG3130059-2 CRM		**WT-CANMET-TILL1**						
Mercury (Hg)			103.4		%		70-130	13-AUG-19
WG3130059-6 DUP		**WG3130059-5**						
Mercury (Hg)		0.0059	0.0056		ug/g	4.7	40	13-AUG-19
WG3130059-3 LCS								
Mercury (Hg)			110.0		%		80-120	13-AUG-19
WG3130059-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	13-AUG-19
Batch R4750011								
WG3130095-2 CRM		**WT-CANMET-TILL1**						
Mercury (Hg)			98.2		%		70-130	13-AUG-19
WG3130095-6 DUP		**WG3130095-5**						
Mercury (Hg)		<0.0050	<0.0050	RPD-NA	ug/g	N/A	40	13-AUG-19
WG3130095-3 LCS								
Mercury (Hg)			108.5		%		80-120	13-AUG-19
WG3130095-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	13-AUG-19
MET-200.2-CCMS-WT	**Soil**							

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch	**R4749414**							
WG3129669-2	**CRM**	**WT-CANMET-TILL1**						
Aluminum (Al)			92.8		%		70-130	12-AUG-19
Antimony (Sb)			96.7		%		70-130	12-AUG-19
Arsenic (As)			94.8		%		70-130	12-AUG-19
Barium (Ba)			94.3		%		70-130	12-AUG-19
Beryllium (Be)			86.7		%		70-130	12-AUG-19
Bismuth (Bi)			97.3		%		70-130	12-AUG-19
Boron (B)			2.5		mg/kg		0-8.2	12-AUG-19
Cadmium (Cd)			100.9		%		70-130	12-AUG-19
Calcium (Ca)			92.2		%		70-130	12-AUG-19
Chromium (Cr)			96.7		%		70-130	12-AUG-19
Cobalt (Co)			94.2		%		70-130	12-AUG-19
Copper (Cu)			97.2		%		70-130	12-AUG-19
Iron (Fe)			94.8		%		70-130	12-AUG-19
Lead (Pb)			100.0		%		70-130	12-AUG-19
Lithium (Li)			93.4		%		70-130	12-AUG-19
Magnesium (Mg)			91.9		%		70-130	12-AUG-19
Manganese (Mn)			96.1		%		70-130	12-AUG-19
Molybdenum (Mo)			98.9		%		70-130	12-AUG-19
Nickel (Ni)			94.5		%		70-130	12-AUG-19
Phosphorus (P)			93.0		%		70-130	12-AUG-19
Potassium (K)			93.3		%		70-130	12-AUG-19
Selenium (Se)			0.27		mg/kg		0.11-0.51	12-AUG-19
Silver (Ag)			0.21		mg/kg		0.13-0.33	12-AUG-19
Sodium (Na)			90.6		%		70-130	12-AUG-19
Strontium (Sr)			92.6		%		70-130	12-AUG-19
Thallium (Tl)			0.119		mg/kg		0.077-0.18	12-AUG-19
Tin (Sn)			1.0		mg/kg		0-3.1	12-AUG-19
Titanium (Ti)			95.1		%		70-130	12-AUG-19
Tungsten (W)			0.14		mg/kg		0-0.66	12-AUG-19
Uranium (U)			95.5		%		70-130	12-AUG-19
Vanadium (V)			95.7		%		70-130	12-AUG-19
Zinc (Zn)			91.7		%		70-130	12-AUG-19
Zirconium (Zr)			0.7		mg/kg		0-1.8	12-AUG-19
WG3129669-6	**DUP**	**WG3129669-5**						

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4749414								
WG3129669-6 DUP		**WG3129669-5**						
Aluminum (Al)		12900	11900		ug/g	8.3	40	12-AUG-19
Antimony (Sb)		0.14	0.13		ug/g	11	30	12-AUG-19
Arsenic (As)		3.82	3.45		ug/g	10	30	12-AUG-19
Barium (Ba)		103	97.7		ug/g	5.2	40	12-AUG-19
Beryllium (Be)		0.52	0.50		ug/g	4.6	30	12-AUG-19
Bismuth (Bi)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	12-AUG-19
Boron (B)		17.5	15.0		ug/g	16	30	12-AUG-19
Cadmium (Cd)		0.074	0.077		ug/g	3.2	30	12-AUG-19
Calcium (Ca)		168000	164000		ug/g	2.5	30	12-AUG-19
Chromium (Cr)		21.7	20.4		ug/g	6.1	30	12-AUG-19
Cobalt (Co)		7.52	7.31		ug/g	2.8	30	12-AUG-19
Copper (Cu)		14.8	14.4		ug/g	2.9	30	12-AUG-19
Iron (Fe)		17000	16400		ug/g	4.0	30	12-AUG-19
Lead (Pb)		8.39	8.44		ug/g	0.6	40	12-AUG-19
Lithium (Li)		18.2	17.5		ug/g	4.2	30	12-AUG-19
Magnesium (Mg)		25400	24800		ug/g	2.6	30	12-AUG-19
Manganese (Mn)		437	430		ug/g	1.6	30	12-AUG-19
Molybdenum (Mo)		0.29	0.27		ug/g	5.4	40	12-AUG-19
Nickel (Ni)		19.3	18.9		ug/g	2.5	30	12-AUG-19
Phosphorus (P)		453	444		ug/g	1.9	30	12-AUG-19
Potassium (K)		3100	2670		ug/g	15	40	12-AUG-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	12-AUG-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	12-AUG-19
Sodium (Na)		198	187		ug/g	5.6	40	12-AUG-19
Strontium (Sr)		170	166		ug/g	2.6	40	12-AUG-19
Sulfur (S)		<1000	<1000	RPD-NA	ug/g	N/A	30	12-AUG-19
Thallium (Tl)		0.152	0.145		ug/g	4.9	30	12-AUG-19
Tin (Sn)		<2.0	<2.0	RPD-NA	ug/g	N/A	40	12-AUG-19
Titanium (Ti)		339	294		ug/g	14	40	12-AUG-19
Tungsten (W)		<0.50	<0.50	RPD-NA	ug/g	N/A	30	12-AUG-19
Uranium (U)		0.828	0.813		ug/g	1.8	30	12-AUG-19
Vanadium (V)		27.5	25.3		ug/g	8.5	30	12-AUG-19
Zinc (Zn)		45.5	43.2		ug/g			12-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4749414								
WG3129669-6 DUP		**WG3129669-5**						
Zinc (Zn)		45.5	43.2		ug/g	5.2	30	12-AUG-19
Zirconium (Zr)		8.3	7.9		ug/g	5.5	30	12-AUG-19
WG3129669-4 LCS								
Aluminum (Al)			97.6		%		80-120	12-AUG-19
Antimony (Sb)			104.1		%		80-120	12-AUG-19
Arsenic (As)			98.0		%		80-120	12-AUG-19
Barium (Ba)			101.4		%		80-120	12-AUG-19
Beryllium (Be)			93.4		%		80-120	12-AUG-19
Bismuth (Bi)			99.5		%		80-120	12-AUG-19
Boron (B)			90.4		%		80-120	12-AUG-19
Cadmium (Cd)			98.0		%		80-120	12-AUG-19
Calcium (Ca)			95.8		%		80-120	12-AUG-19
Chromium (Cr)			103.8		%		80-120	12-AUG-19
Cobalt (Co)			96.1		%		80-120	12-AUG-19
Copper (Cu)			96.1		%		80-120	12-AUG-19
Iron (Fe)			105.4		%		80-120	12-AUG-19
Lead (Pb)			100.5		%		80-120	12-AUG-19
Lithium (Li)			96.2		%		80-120	12-AUG-19
Magnesium (Mg)			96.3		%		80-120	12-AUG-19
Manganese (Mn)			100.3		%		80-120	12-AUG-19
Molybdenum (Mo)			103.6		%		80-120	12-AUG-19
Nickel (Ni)			96.1		%		80-120	12-AUG-19
Phosphorus (P)			99.0		%		80-120	12-AUG-19
Potassium (K)			99.97		%		80-120	12-AUG-19
Selenium (Se)			97.7		%		80-120	12-AUG-19
Silver (Ag)			99.97		%		80-120	12-AUG-19
Sodium (Na)			96.5		%		80-120	12-AUG-19
Strontium (Sr)			99.6		%		80-120	12-AUG-19
Sulfur (S)			97.9		%		80-120	12-AUG-19
Thallium (Tl)			99.1		%		80-120	12-AUG-19
Tin (Sn)			101.1		%		80-120	12-AUG-19
Titanium (Ti)			99.6		%		80-120	12-AUG-19
Tungsten (W)			100.9		%		80-120	12-AUG-19
Uranium (U)			100.7		%		80-120	12-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4749414								
WG3129669-4 LCS								
Vanadium (V)			100.3		%		80-120	12-AUG-19
Zinc (Zn)			94.1		%		80-120	12-AUG-19
Zirconium (Zr)			101.8		%		80-120	12-AUG-19
WG3129669-1 MB								
Aluminum (Al)			<50		mg/kg		50	12-AUG-19
Antimony (Sb)			<0.10		mg/kg		0.1	12-AUG-19
Arsenic (As)			<0.10		mg/kg		0.1	12-AUG-19
Barium (Ba)			<0.50		mg/kg		0.5	12-AUG-19
Beryllium (Be)			<0.10		mg/kg		0.1	12-AUG-19
Bismuth (Bi)			<0.20		mg/kg		0.2	12-AUG-19
Boron (B)			<5.0		mg/kg		5	12-AUG-19
Cadmium (Cd)			<0.020		mg/kg		0.02	12-AUG-19
Calcium (Ca)			<50		mg/kg		50	12-AUG-19
Chromium (Cr)			<0.50		mg/kg		0.5	12-AUG-19
Cobalt (Co)			<0.10		mg/kg		0.1	12-AUG-19
Copper (Cu)			<0.50		mg/kg		0.5	12-AUG-19
Iron (Fe)			<50		mg/kg		50	12-AUG-19
Lead (Pb)			<0.50		mg/kg		0.5	12-AUG-19
Lithium (Li)			<2.0		mg/kg		2	12-AUG-19
Magnesium (Mg)			<20		mg/kg		20	12-AUG-19
Manganese (Mn)			<1.0		mg/kg		1	12-AUG-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	12-AUG-19
Nickel (Ni)			<0.50		mg/kg		0.5	12-AUG-19
Phosphorus (P)			<50		mg/kg		50	12-AUG-19
Potassium (K)			<100		mg/kg		100	12-AUG-19
Selenium (Se)			<0.20		mg/kg		0.2	12-AUG-19
Silver (Ag)			<0.10		mg/kg		0.1	12-AUG-19
Sodium (Na)			<50		mg/kg		50	12-AUG-19
Strontium (Sr)			<0.50		mg/kg		0.5	12-AUG-19
Sulfur (S)			<1000		mg/kg		1000	12-AUG-19
Thallium (Tl)			<0.050		mg/kg		0.05	12-AUG-19
Tin (Sn)			<2.0		mg/kg		2	12-AUG-19
Titanium (Ti)			<1.0		mg/kg		1	12-AUG-19
Tungsten (W)			<0.50		mg/kg		0.5	12-AUG-19

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4749414								
WG3129669-1 MB								
Uranium (U)			<0.050		mg/kg		0.05	12-AUG-19
Vanadium (V)			<0.20		mg/kg		0.2	12-AUG-19
Zinc (Zn)			<2.0		mg/kg		2	12-AUG-19
Zirconium (Zr)			<1.0		mg/kg		1	12-AUG-19
Batch R4749431								
WG3129675-2 CRM		**WT-CANMET-TILL1**						
Aluminum (Al)			98.9		%		70-130	12-AUG-19
Antimony (Sb)			102.2		%		70-130	12-AUG-19
Arsenic (As)			98.5		%		70-130	12-AUG-19
Barium (Ba)			100.0		%		70-130	12-AUG-19
Beryllium (Be)			92.4		%		70-130	12-AUG-19
Bismuth (Bi)			95.8		%		70-130	12-AUG-19
Boron (B)			3.1		mg/kg		0-8.2	12-AUG-19
Cadmium (Cd)			98.1		%		70-130	12-AUG-19
Calcium (Ca)			103.1		%		70-130	12-AUG-19
Chromium (Cr)			108.0		%		70-130	12-AUG-19
Cobalt (Co)			98.2		%		70-130	12-AUG-19
Copper (Cu)			100.8		%		70-130	12-AUG-19
Iron (Fe)			99.4		%		70-130	12-AUG-19
Lead (Pb)			100.3		%		70-130	12-AUG-19
Lithium (Li)			97.6		%		70-130	12-AUG-19
Magnesium (Mg)			97.6		%		70-130	12-AUG-19
Manganese (Mn)			100.3		%		70-130	12-AUG-19
Molybdenum (Mo)			104.5		%		70-130	12-AUG-19
Nickel (Ni)			98.4		%		70-130	12-AUG-19
Phosphorus (P)			95.6		%		70-130	12-AUG-19
Potassium (K)			105.8		%		70-130	12-AUG-19
Selenium (Se)			0.26		mg/kg		0.11-0.51	12-AUG-19
Silver (Ag)			0.23		mg/kg		0.13-0.33	12-AUG-19
Sodium (Na)			101.0		%		70-130	12-AUG-19
Strontium (Sr)			101.7		%		70-130	12-AUG-19
Thallium (Tl)			0.127		mg/kg		0.077-0.18	12-AUG-19
Tin (Sn)			1.0		mg/kg		0-3.1	12-AUG-19
Titanium (Ti)			108.7		%		70-130	12-AUG-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4749431								
WG3129675-2	**CRM**	**WT-CANMET-TILL1**						
Tungsten (W)			0.15		mg/kg		0-0.66	12-AUG-19
Uranium (U)			102.9		%		70-130	12-AUG-19
Vanadium (V)			102.3		%		70-130	12-AUG-19
Zinc (Zn)			97.0		%		70-130	12-AUG-19
Zirconium (Zr)			0.8		mg/kg		0-1.8	12-AUG-19
WG3129675-6	**DUP**	**WG3129675-5**						
Aluminum (Al)		5570	5000		ug/g	11	40	12-AUG-19
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	12-AUG-19
Arsenic (As)		1.11	1.09		ug/g	1.5	30	12-AUG-19
Barium (Ba)		14.1	12.8		ug/g	10	40	12-AUG-19
Beryllium (Be)		0.31	0.27		ug/g	12	30	12-AUG-19
Bismuth (Bi)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	12-AUG-19
Boron (B)		18.5	15.6		ug/g	17	30	12-AUG-19
Cadmium (Cd)		0.021	<0.020	RPD-NA	ug/g	N/A	30	12-AUG-19
Calcium (Ca)		12600	11000		ug/g	14	30	12-AUG-19
Chromium (Cr)		34.1	29.2		ug/g	15	30	12-AUG-19
Cobalt (Co)		4.39	4.10		ug/g	6.7	30	12-AUG-19
Copper (Cu)		5.71	5.29		ug/g	7.5	30	12-AUG-19
Iron (Fe)		10800	9980		ug/g	7.9	30	12-AUG-19
Lead (Pb)		4.34	4.15		ug/g	4.5	40	12-AUG-19
Lithium (Li)		17.5	16.0		ug/g	8.6	30	12-AUG-19
Magnesium (Mg)		10300	9110		ug/g	12	30	12-AUG-19
Manganese (Mn)		147	138		ug/g	6.5	30	12-AUG-19
Molybdenum (Mo)		0.17	0.16		ug/g	1.7	40	12-AUG-19
Nickel (Ni)		24.7	22.4		ug/g	9.9	30	12-AUG-19
Phosphorus (P)		242	204		ug/g	17	30	12-AUG-19
Potassium (K)		1460	1240		ug/g	16	40	12-AUG-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	12-AUG-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	12-AUG-19
Sodium (Na)		<50	<50	RPD-NA	ug/g	N/A	40	12-AUG-19
Strontium (Sr)		9.36	8.20		ug/g	13	40	12-AUG-19
Sulfur (S)		<1000	<1000	RPD-NA	ug/g	N/A	30	12-AUG-19
Thallium (Tl)		0.127	0.118		ug/g	7.8	30	12-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4749431								
WG3129675-6 DUP		**WG3129675-5**						
Tin (Sn)		<2.0	<2.0	RPD-NA	ug/g	N/A	40	12-AUG-19
Titanium (Ti)		293	271		ug/g	7.9	40	12-AUG-19
Tungsten (W)		<0.50	<0.50	RPD-NA	ug/g	N/A	30	12-AUG-19
Uranium (U)		0.717	0.654		ug/g	9.2	30	12-AUG-19
Vanadium (V)		16.3	15.3		ug/g	6.2	30	12-AUG-19
Zinc (Zn)		12.9	11.7		ug/g	9.6	30	12-AUG-19
Zirconium (Zr)		1.7	1.6		ug/g	4.3	30	12-AUG-19
WG3129675-4 LCS								
Aluminum (Al)			96.8		%		80-120	12-AUG-19
Antimony (Sb)			101.4		%		80-120	12-AUG-19
Arsenic (As)			96.9		%		80-120	12-AUG-19
Barium (Ba)			101.3		%		80-120	12-AUG-19
Beryllium (Be)			93.1		%		80-120	12-AUG-19
Bismuth (Bi)			97.6		%		80-120	12-AUG-19
Boron (B)			88.7		%		80-120	12-AUG-19
Cadmium (Cd)			96.5		%		80-120	12-AUG-19
Calcium (Ca)			96.1		%		80-120	12-AUG-19
Chromium (Cr)			99.1		%		80-120	12-AUG-19
Cobalt (Co)			95.0		%		80-120	12-AUG-19
Copper (Cu)			94.3		%		80-120	12-AUG-19
Iron (Fe)			99.2		%		80-120	12-AUG-19
Lead (Pb)			99.0		%		80-120	12-AUG-19
Lithium (Li)			94.4		%		80-120	12-AUG-19
Magnesium (Mg)			94.6		%		80-120	12-AUG-19
Manganese (Mn)			101.0		%		80-120	12-AUG-19
Molybdenum (Mo)			101.5		%		80-120	12-AUG-19
Nickel (Ni)			94.7		%		80-120	12-AUG-19
Phosphorus (P)			99.98		%		80-120	12-AUG-19
Potassium (K)			99.0		%		80-120	12-AUG-19
Selenium (Se)			95.5		%		80-120	12-AUG-19
Silver (Ag)			99.3		%		80-120	12-AUG-19
Sodium (Na)			95.3		%		80-120	12-AUG-19
Strontium (Sr)			99.3		%		80-120	12-AUG-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch **R4749431**								
WG3129675-4 **LCS**								
Sulfur (S)			99.0		%		80-120	12-AUG-19
Thallium (Tl)			99.3		%		80-120	12-AUG-19
Tin (Sn)			99.1		%		80-120	12-AUG-19
Titanium (Ti)			97.7		%		80-120	12-AUG-19
Tungsten (W)			99.8		%		80-120	12-AUG-19
Uranium (U)			100.3		%		80-120	12-AUG-19
Vanadium (V)			99.4		%		80-120	12-AUG-19
Zinc (Zn)			92.2		%		80-120	12-AUG-19
Zirconium (Zr)			99.5		%		80-120	12-AUG-19
WG3129675-1 **MB**								
Aluminum (Al)			<50		mg/kg		50	12-AUG-19
Antimony (Sb)			<0.10		mg/kg		0.1	12-AUG-19
Arsenic (As)			<0.10		mg/kg		0.1	12-AUG-19
Barium (Ba)			<0.50		mg/kg		0.5	12-AUG-19
Beryllium (Be)			<0.10		mg/kg		0.1	12-AUG-19
Bismuth (Bi)			<0.20		mg/kg		0.2	12-AUG-19
Boron (B)			<5.0		mg/kg		5	12-AUG-19
Cadmium (Cd)			<0.020		mg/kg		0.02	12-AUG-19
Calcium (Ca)			<50		mg/kg		50	12-AUG-19
Chromium (Cr)			<0.50		mg/kg		0.5	12-AUG-19
Cobalt (Co)			<0.10		mg/kg		0.1	12-AUG-19
Copper (Cu)			<0.50		mg/kg		0.5	12-AUG-19
Iron (Fe)			<50		mg/kg		50	12-AUG-19
Lead (Pb)			<0.50		mg/kg		0.5	12-AUG-19
Lithium (Li)			<2.0		mg/kg		2	12-AUG-19
Magnesium (Mg)			<20		mg/kg		20	12-AUG-19
Manganese (Mn)			<1.0		mg/kg		1	12-AUG-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	12-AUG-19
Nickel (Ni)			<0.50		mg/kg		0.5	12-AUG-19
Phosphorus (P)			<50		mg/kg		50	12-AUG-19
Potassium (K)			<100		mg/kg		100	12-AUG-19
Selenium (Se)			<0.20		mg/kg		0.2	12-AUG-19
Silver (Ag)			<0.10		mg/kg		0.1	12-AUG-19
Sodium (Na)			<50		mg/kg		50	12-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch	**R4749431**							
WG3129675-1	**MB**							
Strontium (Sr)			<0.50		mg/kg		0.5	12-AUG-19
Sulfur (S)			<1000		mg/kg		1000	12-AUG-19
Thallium (Tl)			<0.050		mg/kg		0.05	12-AUG-19
Tin (Sn)			<2.0		mg/kg		2	12-AUG-19
Titanium (Ti)			<1.0		mg/kg		1	12-AUG-19
Tungsten (W)			<0.50		mg/kg		0.5	12-AUG-19
Uranium (U)			<0.050		mg/kg		0.05	12-AUG-19
Vanadium (V)			<0.20		mg/kg		0.2	12-AUG-19
Zinc (Zn)			<2.0		mg/kg		2	12-AUG-19
Zirconium (Zr)			<1.0		mg/kg		1	12-AUG-19
Batch	**R4751374**							
WG3130095-2	**CRM**	**WT-CANMET-TILL1**						
Aluminum (Al)			100.0		%		70-130	13-AUG-19
Antimony (Sb)			98.5		%		70-130	13-AUG-19
Arsenic (As)			98.8		%		70-130	13-AUG-19
Barium (Ba)			97.1		%		70-130	13-AUG-19
Beryllium (Be)			90.5		%		70-130	13-AUG-19
Bismuth (Bi)			95.2		%		70-130	13-AUG-19
Boron (B)			3.0		mg/kg		0-8.2	13-AUG-19
Cadmium (Cd)			96.7		%		70-130	13-AUG-19
Calcium (Ca)			103.2		%		70-130	13-AUG-19
Chromium (Cr)			104.3		%		70-130	13-AUG-19
Cobalt (Co)			100.3		%		70-130	13-AUG-19
Copper (Cu)			98.8		%		70-130	13-AUG-19
Iron (Fe)			101.4		%		70-130	13-AUG-19
Lead (Pb)			96.5		%		70-130	13-AUG-19
Lithium (Li)			95.6		%		70-130	13-AUG-19
Magnesium (Mg)			98.4		%		70-130	13-AUG-19
Manganese (Mn)			101.7		%		70-130	13-AUG-19
Molybdenum (Mo)			100.0		%		70-130	13-AUG-19
Nickel (Ni)			98.3		%		70-130	13-AUG-19
Phosphorus (P)			96.3		%		70-130	13-AUG-19
Potassium (K)			108.9		%		70-130	13-AUG-19
Selenium (Se)			0.28		mg/kg		0.11-0.51	13-AUG-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4751374								
WG3130095-2 CRM		**WT-CANMET-TILL1**						
Silver (Ag)			0.23		mg/kg		0.13-0.33	13-AUG-19
Sodium (Na)			102.3		%		70-130	13-AUG-19
Strontium (Sr)			102.9		%		70-130	13-AUG-19
Thallium (Tl)			0.124		mg/kg		0.077-0.18	13-AUG-19
Tin (Sn)			1.0		mg/kg		0-3.1	13-AUG-19
Titanium (Ti)			115.2		%		70-130	13-AUG-19
Tungsten (W)			0.14		mg/kg		0-0.66	13-AUG-19
Uranium (U)			95.9		%		70-130	13-AUG-19
Vanadium (V)			102.5		%		70-130	13-AUG-19
Zinc (Zn)			95.8		%		70-130	13-AUG-19
Zirconium (Zr)			0.8		mg/kg		0-1.8	13-AUG-19
WG3130095-6 DUP		**WG3130095-5**						
Aluminum (Al)		4980	4910		ug/g	1.3	40	13-AUG-19
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	13-AUG-19
Arsenic (As)		1.03	0.97		ug/g	6.0	30	13-AUG-19
Barium (Ba)		18.0	18.2		ug/g	1.1	40	13-AUG-19
Beryllium (Be)		0.22	0.21		ug/g	3.4	30	13-AUG-19
Bismuth (Bi)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	13-AUG-19
Boron (B)		5.1	<5.0	RPD-NA	ug/g	N/A	30	13-AUG-19
Cadmium (Cd)		<0.020	<0.020	RPD-NA	ug/g	N/A	30	13-AUG-19
Calcium (Ca)		2080	2050		ug/g	1.6	30	13-AUG-19
Chromium (Cr)		22.4	22.6		ug/g	0.9	30	13-AUG-19
Cobalt (Co)		4.25	4.22		ug/g	0.8	30	13-AUG-19
Copper (Cu)		5.96	5.91		ug/g	0.8	30	13-AUG-19
Iron (Fe)		11400	11200		ug/g	1.5	30	13-AUG-19
Lead (Pb)		4.91	4.68		ug/g	4.9	40	13-AUG-19
Lithium (Li)		9.0	8.9		ug/g	1.6	30	13-AUG-19
Magnesium (Mg)		2860	2840		ug/g	0.6	30	13-AUG-19
Manganese (Mn)		157	154		ug/g	1.7	30	13-AUG-19
Molybdenum (Mo)		0.13	0.13		ug/g	1.1	40	13-AUG-19
Nickel (Ni)		11.2	11.3		ug/g	1.6	30	13-AUG-19
Phosphorus (P)		454	468		ug/g	3.0	30	13-AUG-19
Potassium (K)		1010	1010		ug/g	0.2	40	13-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4751374								
WG3130095-6 DUP		**WG3130095-5**						
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	13-AUG-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	13-AUG-19
Sodium (Na)		<50	51	RPD-NA	ug/g	N/A	40	13-AUG-19
Strontium (Sr)		3.95	4.05		ug/g	2.5	40	13-AUG-19
Sulfur (S)		<1000	<1000	RPD-NA	ug/g	N/A	30	13-AUG-19
Thallium (Tl)		0.129	0.120		ug/g	7.6	30	13-AUG-19
Tin (Sn)		<2.0	<2.0	RPD-NA	ug/g	N/A	40	13-AUG-19
Titanium (Ti)		600	596		ug/g	0.6	40	13-AUG-19
Tungsten (W)		<0.50	<0.50	RPD-NA	ug/g	N/A	30	13-AUG-19
Uranium (U)		0.811	0.733		ug/g	10	30	13-AUG-19
Vanadium (V)		18.6	18.7		ug/g	0.6	30	13-AUG-19
Zinc (Zn)		14.9	14.5		ug/g	2.4	30	13-AUG-19
Zirconium (Zr)		11.0	11.0		ug/g	0.7	30	13-AUG-19
WG3130095-4 LCS								
Aluminum (Al)			111.2		%		80-120	13-AUG-19
Antimony (Sb)			115.2		%		80-120	13-AUG-19
Arsenic (As)			106.0		%		80-120	13-AUG-19
Barium (Ba)			108.5		%		80-120	13-AUG-19
Beryllium (Be)			101.3		%		80-120	13-AUG-19
Bismuth (Bi)			107.8		%		80-120	13-AUG-19
Boron (B)			96.0		%		80-120	13-AUG-19
Cadmium (Cd)			104.0		%		80-120	13-AUG-19
Calcium (Ca)			107.7		%		80-120	13-AUG-19
Chromium (Cr)			108.5		%		80-120	13-AUG-19
Cobalt (Co)			106.1		%		80-120	13-AUG-19
Copper (Cu)			104.0		%		80-120	13-AUG-19
Iron (Fe)			107.3		%		80-120	13-AUG-19
Lead (Pb)			108.1		%		80-120	13-AUG-19
Lithium (Li)			101.9		%		80-120	13-AUG-19
Magnesium (Mg)			105.5		%		80-120	13-AUG-19
Manganese (Mn)			108.5		%		80-120	13-AUG-19
Molybdenum (Mo)			115.6		%		80-120	13-AUG-19
Nickel (Ni)			104.8		%		80-120	13-AUG-19

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4751374								
WG3130095-4 LCS								
Phosphorus (P)			107.2		%		80-120	13-AUG-19
Potassium (K)			110.5		%		80-120	13-AUG-19
Selenium (Se)			102.9		%		80-120	13-AUG-19
Silver (Ag)			111.2		%		80-120	13-AUG-19
Sodium (Na)			106.7		%		80-120	13-AUG-19
Strontium (Sr)			111.8		%		80-120	13-AUG-19
Sulfur (S)			103.6		%		80-120	13-AUG-19
Thallium (Tl)			107.4		%		80-120	13-AUG-19
Tin (Sn)			109.3		%		80-120	13-AUG-19
Titanium (Ti)			109.2		%		80-120	13-AUG-19
Tungsten (W)			108.6		%		80-120	13-AUG-19
Uranium (U)			108.6		%		80-120	13-AUG-19
Vanadium (V)			110.3		%		80-120	13-AUG-19
Zinc (Zn)			100.3		%		80-120	13-AUG-19
Zirconium (Zr)			113.0		%		80-120	13-AUG-19
WG3130095-1 MB								
Aluminum (Al)			<50		mg/kg		50	13-AUG-19
Antimony (Sb)			<0.10		mg/kg		0.1	13-AUG-19
Arsenic (As)			<0.10		mg/kg		0.1	13-AUG-19
Barium (Ba)			<0.50		mg/kg		0.5	13-AUG-19
Beryllium (Be)			<0.10		mg/kg		0.1	13-AUG-19
Bismuth (Bi)			<0.20		mg/kg		0.2	13-AUG-19
Boron (B)			<5.0		mg/kg		5	13-AUG-19
Cadmium (Cd)			<0.020		mg/kg		0.02	13-AUG-19
Calcium (Ca)			<50		mg/kg		50	13-AUG-19
Chromium (Cr)			<0.50		mg/kg		0.5	13-AUG-19
Cobalt (Co)			<0.10		mg/kg		0.1	13-AUG-19
Copper (Cu)			<0.50		mg/kg		0.5	13-AUG-19
Iron (Fe)			<50		mg/kg		50	13-AUG-19
Lead (Pb)			<0.50		mg/kg		0.5	13-AUG-19
Lithium (Li)			<2.0		mg/kg		2	13-AUG-19
Magnesium (Mg)			<20		mg/kg		20	13-AUG-19
Manganese (Mn)			<1.0		mg/kg		1	13-AUG-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	13-AUG-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4751374								
WG3130095-1 MB								
Nickel (Ni)			<0.50		mg/kg		0.5	13-AUG-19
Phosphorus (P)			<50		mg/kg		50	13-AUG-19
Potassium (K)			<100		mg/kg		100	13-AUG-19
Selenium (Se)			<0.20		mg/kg		0.2	13-AUG-19
Silver (Ag)			<0.10		mg/kg		0.1	13-AUG-19
Sodium (Na)			<50		mg/kg		50	13-AUG-19
Strontium (Sr)			<0.50		mg/kg		0.5	13-AUG-19
Sulfur (S)			<1000		mg/kg		1000	13-AUG-19
Thallium (Tl)			<0.050		mg/kg		0.05	13-AUG-19
Tin (Sn)			<2.0		mg/kg		2	13-AUG-19
Titanium (Ti)			<1.0		mg/kg		1	13-AUG-19
Tungsten (W)			<0.50		mg/kg		0.5	13-AUG-19
Uranium (U)			<0.050		mg/kg		0.05	13-AUG-19
Vanadium (V)			<0.20		mg/kg		0.2	13-AUG-19
Zinc (Zn)			<2.0		mg/kg		2	13-AUG-19
Zirconium (Zr)			<1.0		mg/kg		1	13-AUG-19
Batch R4752289								
WG3130059-2 CRM		**WT-CANMET-TILL1**						
Aluminum (Al)			94.8		%		70-130	13-AUG-19
Antimony (Sb)			98.1		%		70-130	13-AUG-19
Arsenic (As)			99.5		%		70-130	13-AUG-19
Barium (Ba)			95.6		%		70-130	13-AUG-19
Beryllium (Be)			90.4		%		70-130	13-AUG-19
Bismuth (Bi)			95.1		%		70-130	13-AUG-19
Boron (B)			2.6		mg/kg		0-8.2	13-AUG-19
Cadmium (Cd)			94.7		%		70-130	13-AUG-19
Calcium (Ca)			94.5		%		70-130	13-AUG-19
Chromium (Cr)			97.3		%		70-130	13-AUG-19
Cobalt (Co)			96.4		%		70-130	13-AUG-19
Copper (Cu)			97.0		%		70-130	13-AUG-19
Iron (Fe)			97.9		%		70-130	13-AUG-19
Lead (Pb)			97.6		%		70-130	13-AUG-19
Lithium (Li)			89.6		%		70-130	13-AUG-19
Magnesium (Mg)			92.8		%		70-130	13-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4752289								
WG3130059-2 CRM		**WT-CANMET-TILL1**						
Manganese (Mn)			98.2		%		70-130	13-AUG-19
Molybdenum (Mo)			98.2		%		70-130	13-AUG-19
Nickel (Ni)			95.9		%		70-130	13-AUG-19
Phosphorus (P)			100.5		%		70-130	13-AUG-19
Potassium (K)			98.1		%		70-130	13-AUG-19
Selenium (Se)			0.29		mg/kg		0.11-0.51	13-AUG-19
Silver (Ag)			0.21		mg/kg		0.13-0.33	13-AUG-19
Sodium (Na)			92.5		%		70-130	13-AUG-19
Strontium (Sr)			94.7		%		70-130	13-AUG-19
Thallium (Tl)			0.119		mg/kg		0.077-0.18	13-AUG-19
Tin (Sn)			1.0		mg/kg		0-3.1	13-AUG-19
Titanium (Ti)			98.2		%		70-130	13-AUG-19
Tungsten (W)			0.15		mg/kg		0-0.66	13-AUG-19
Uranium (U)			93.6		%		70-130	13-AUG-19
Vanadium (V)			94.9		%		70-130	13-AUG-19
Zinc (Zn)			96.1		%		70-130	13-AUG-19
Zirconium (Zr)			0.6		mg/kg		0-1.8	13-AUG-19
WG3130059-6 DUP		**WG3130059-5**						
Aluminum (Al)		4710	4800		ug/g	2.0	40	13-AUG-19
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	13-AUG-19
Arsenic (As)		1.46	1.49		ug/g	2.0	30	13-AUG-19
Barium (Ba)		22.5	22.9		ug/g	2.0	40	13-AUG-19
Beryllium (Be)		0.19	0.19		ug/g	2.0	30	13-AUG-19
Bismuth (Bi)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	13-AUG-19
Boron (B)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	13-AUG-19
Cadmium (Cd)		0.036	0.037		ug/g	2.0	30	13-AUG-19
Calcium (Ca)		41300	42100		ug/g	2.0	30	13-AUG-19
Chromium (Cr)		10.9	11.1		ug/g	2.0	30	13-AUG-19
Cobalt (Co)		3.84	3.92		ug/g	2.0	30	13-AUG-19
Copper (Cu)		5.98	6.10		ug/g	2.0	30	13-AUG-19
Iron (Fe)		9650	9840		ug/g	2.0	30	13-AUG-19
Lead (Pb)		2.95	3.00		ug/g	2.0	40	13-AUG-19
Lithium (Li)		5.6	5.7		ug/g	2.0	30	13-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4752289								
WG3130059-6 DUP		**WG3130059-5**						
Magnesium (Mg)		6010	6130		ug/g	2.0	30	13-AUG-19
Manganese (Mn)		214	218		ug/g	2.0	30	13-AUG-19
Molybdenum (Mo)		0.17	0.17		ug/g	2.0	40	13-AUG-19
Nickel (Ni)		7.17	7.32		ug/g	2.0	30	13-AUG-19
Phosphorus (P)		801	817		ug/g	2.0	30	13-AUG-19
Potassium (K)		710	720		ug/g	2.0	40	13-AUG-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	13-AUG-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	13-AUG-19
Sodium (Na)		164	167		ug/g	2.0	40	13-AUG-19
Strontium (Sr)		68.9	70.3		ug/g	2.0	40	13-AUG-19
Sulfur (S)		<1000	<1000	RPD-NA	ug/g	N/A	30	13-AUG-19
Thallium (Tl)		<0.050	<0.050	RPD-NA	ug/g	N/A	30	13-AUG-19
Tin (Sn)		<2.0	<2.0	RPD-NA	ug/g	N/A	40	13-AUG-19
Titanium (Ti)		401	410		ug/g	2.0	40	13-AUG-19
Tungsten (W)		<0.50	<0.50	RPD-NA	ug/g	N/A	30	13-AUG-19
Uranium (U)		0.409	0.418		ug/g	2.0	30	13-AUG-19
Vanadium (V)		17.9	18.3		ug/g	2.0	30	13-AUG-19
Zinc (Zn)		17.2	17.5		ug/g	2.0	30	13-AUG-19
Zirconium (Zr)		4.7	4.8		ug/g	2.0	30	13-AUG-19
WG3130059-4 LCS								
Aluminum (Al)			97.2		%		80-120	13-AUG-19
Antimony (Sb)			102.9		%		80-120	13-AUG-19
Arsenic (As)			99.4		%		80-120	13-AUG-19
Barium (Ba)			99.8		%		80-120	13-AUG-19
Beryllium (Be)			90.2		%		80-120	13-AUG-19
Bismuth (Bi)			97.2		%		80-120	13-AUG-19
Boron (B)			83.3		%		80-120	13-AUG-19
Cadmium (Cd)			97.6		%		80-120	13-AUG-19
Calcium (Ca)			95.7		%		80-120	13-AUG-19
Chromium (Cr)			97.8		%		80-120	13-AUG-19
Cobalt (Co)			96.0		%		80-120	13-AUG-19
Copper (Cu)			94.4		%		80-120	13-AUG-19
Iron (Fe)			98.8		%		80-120	13-AUG-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4752289								
WG3130059-4 LCS								
Lead (Pb)			97.8		%		80-120	13-AUG-19
Lithium (Li)			89.2		%		80-120	13-AUG-19
Magnesium (Mg)			95.1		%		80-120	13-AUG-19
Manganese (Mn)			99.0		%		80-120	13-AUG-19
Molybdenum (Mo)			100.3		%		80-120	13-AUG-19
Nickel (Ni)			94.7		%		80-120	13-AUG-19
Phosphorus (P)			104.3		%		80-120	13-AUG-19
Potassium (K)			101.4		%		80-120	13-AUG-19
Selenium (Se)			100.6		%		80-120	13-AUG-19
Silver (Ag)			98.8		%		80-120	13-AUG-19
Sodium (Na)			96.7		%		80-120	13-AUG-19
Strontium (Sr)			99.3		%		80-120	13-AUG-19
Sulfur (S)			93.0		%		80-120	13-AUG-19
Thallium (Tl)			96.9		%		80-120	13-AUG-19
Tin (Sn)			98.0		%		80-120	13-AUG-19
Titanium (Ti)			98.9		%		80-120	13-AUG-19
Tungsten (W)			97.2		%		80-120	13-AUG-19
Uranium (U)			97.1		%		80-120	13-AUG-19
Vanadium (V)			99.98		%		80-120	13-AUG-19
Zinc (Zn)			95.4		%		80-120	13-AUG-19
Zirconium (Zr)			101.9		%		80-120	13-AUG-19
WG3130059-1 MB								
Aluminum (Al)			<50		mg/kg		50	13-AUG-19
Antimony (Sb)			<0.10		mg/kg		0.1	13-AUG-19
Arsenic (As)			<0.10		mg/kg		0.1	13-AUG-19
Barium (Ba)			<0.50		mg/kg		0.5	13-AUG-19
Beryllium (Be)			<0.10		mg/kg		0.1	13-AUG-19
Bismuth (Bi)			<0.20		mg/kg		0.2	13-AUG-19
Boron (B)			<5.0		mg/kg		5	13-AUG-19
Cadmium (Cd)			<0.020		mg/kg		0.02	13-AUG-19
Calcium (Ca)			<50		mg/kg		50	13-AUG-19
Chromium (Cr)			<0.50		mg/kg		0.5	13-AUG-19
Cobalt (Co)			<0.10		mg/kg		0.1	13-AUG-19
Copper (Cu)			<0.50		mg/kg		0.5	13-AUG-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4752289								
WG3130059-1 MB								
Iron (Fe)			<50		mg/kg		50	13-AUG-19
Lead (Pb)			<0.50		mg/kg		0.5	13-AUG-19
Lithium (Li)			<2.0		mg/kg		2	13-AUG-19
Magnesium (Mg)			<20		mg/kg		20	13-AUG-19
Manganese (Mn)			<1.0		mg/kg		1	13-AUG-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	13-AUG-19
Nickel (Ni)			<0.50		mg/kg		0.5	13-AUG-19
Phosphorus (P)			<50		mg/kg		50	13-AUG-19
Potassium (K)			<100		mg/kg		100	13-AUG-19
Selenium (Se)			<0.20		mg/kg		0.2	13-AUG-19
Silver (Ag)			<0.10		mg/kg		0.1	13-AUG-19
Sodium (Na)			<50		mg/kg		50	13-AUG-19
Strontium (Sr)			<0.50		mg/kg		0.5	13-AUG-19
Sulfur (S)			<1000		mg/kg		1000	13-AUG-19
Thallium (Tl)			<0.050		mg/kg		0.05	13-AUG-19
Tin (Sn)			<2.0		mg/kg		2	13-AUG-19
Titanium (Ti)			<1.0		mg/kg		1	13-AUG-19
Tungsten (W)			<0.50		mg/kg		0.5	13-AUG-19
Uranium (U)			<0.050		mg/kg		0.05	13-AUG-19
Vanadium (V)			<0.20		mg/kg		0.2	13-AUG-19
Zinc (Zn)			<2.0		mg/kg		2	13-AUG-19
Zirconium (Zr)			<1.0		mg/kg		1	13-AUG-19
MOISTURE-WT	**Soil**							
Batch R4741576								
WG3125213-3 DUP		**L2323007-118**						
% Moisture		11.0	10.8		%	2.4	20	07-AUG-19
WG3125213-2 LCS								
% Moisture			99.97		%		90-110	07-AUG-19
WG3125213-1 MB								
% Moisture			<0.10		%		0.1	07-AUG-19
Batch R4741577								
WG3125194-3 DUP		**L2323007-88**						
% Moisture		8.82	8.73		%	1.0	20	07-AUG-19
WG3125194-2 LCS								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT	**Soil**							
Batch R4741577								
WG3125194-2 LCS								
% Moisture			100.2		%		90-110	07-AUG-19
WG3125194-1 MB								
% Moisture			<0.10		%		0.1	07-AUG-19
Batch R4743116								
WG3125335-3 DUP		**L2322933-4**						
% Moisture		12.0	11.7		%	2.9	20	08-AUG-19
WG3125335-2 LCS								
% Moisture			101.3		%		90-110	08-AUG-19
WG3125335-1 MB								
% Moisture			<0.10		%		0.1	08-AUG-19
Batch R4743118								
WG3125888-3 DUP		**L2323007-184**						
% Moisture		11.4	11.1		%	2.4	20	08-AUG-19
WG3125888-2 LCS								
% Moisture			99.6		%		90-110	08-AUG-19
WG3125888-1 MB								
% Moisture			<0.10		%		0.1	08-AUG-19
Batch R4743121								
WG3125929-3 DUP		**L2323007-136**						
% Moisture		12.0	11.9		%	0.1	20	08-AUG-19
WG3125929-2 LCS								
% Moisture			100.5		%		90-110	08-AUG-19
WG3125929-1 MB								
% Moisture			<0.10		%		0.1	08-AUG-19
Batch R4744133								
WG3126541-3 DUP		**L2323052-4**						
% Moisture		7.97	7.09		%	12	20	08-AUG-19
WG3126541-2 LCS								
% Moisture			95.8		%		90-110	08-AUG-19
WG3126541-1 MB								
% Moisture			<0.10		%		0.1	08-AUG-19
PH-WT	**Soil**							
Batch R4746149								
WG3126392-1 DUP		**L2323052-3**						
pH		7.88	8.02	J	pH units	0.14	0.3	10-AUG-19
WG3129308-1 LCS								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Soil**							
Batch R4746149								
WG3129308-1 LCS								
pH			7.00		pH units		6.9-7.1	10-AUG-19
Batch R4746150								
WG3125837-1 DUP		**L2323007-61**						
pH		6.23	6.35	J	pH units	0.12	0.3	10-AUG-19
WG3129305-1 LCS								
pH			7.02		pH units		6.9-7.1	10-AUG-19
Batch R4746151								
WG3125974-1 DUP		**L2323007-142**						
pH		6.23	6.31	J	pH units	0.08	0.3	10-AUG-19
WG3129306-1 LCS								
pH			7.02		pH units		6.9-7.1	10-AUG-19
Batch R4746154								
WG3125778-1 DUP		**L2323007-4**						
pH		7.56	7.63	J	pH units	0.07	0.3	10-AUG-19
WG3129304-1 LCS								
pH			7.00		pH units		6.9-7.1	10-AUG-19
AG-DRY-CCMS-N-VA	**Tissue**							
Batch R4765213								
WG3137853-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			103.7		%		70-130	21-AUG-19
WG3137853-2 DUP		**L2323007-87**						
Silver (Ag)-Total		0.0055	0.0051		mg/kg	8.0	40	21-AUG-19
WG3137853-4 LCS								
Silver (Ag)-Total			96.3		%		80-120	21-AUG-19
WG3137853-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	21-AUG-19
Batch R4769163								
WG3140170-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			106.5		%		70-130	26-AUG-19
WG3140170-2 DUP		**L2323007-3**						
Silver (Ag)-Total		0.0166	0.0165		mg/kg	0.7	40	26-AUG-19
WG3140170-4 LCS								
Silver (Ag)-Total			90.4		%		80-120	26-AUG-19
WG3140170-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	26-AUG-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AG-DRY-CCMS-N-VA	**Tissue**							
Batch R4773609								
WG3138058-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			100.8		%		70-130	27-AUG-19
WG3138058-5 DUP		**L2323007-206**						
Silver (Ag)-Total		0.0759	0.0757		mg/kg	0.3	40	27-AUG-19
WG3138058-4 LCS								
Silver (Ag)-Total			100.2		%		80-120	27-AUG-19
WG3138058-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	27-AUG-19
Batch R4789470								
WG3141571-7 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			104.2		%		70-130	06-SEP-19
WG3141571-6 DUP		**L2323007-207**						
Silver (Ag)-Total		0.0739	0.0769		mg/kg	4.1	40	06-SEP-19
WG3141571-8 LCS								
Silver (Ag)-Total			92.5		%		80-120	06-SEP-19
WG3141571-5 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	06-SEP-19
Batch R4793108								
WG3141248-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			99.7		%		70-130	09-SEP-19
WG3141248-2 DUP		**L2323007-185**						
Silver (Ag)-Total		0.0069	0.0066		mg/kg	3.5	40	09-SEP-19
WG3141248-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	09-SEP-19
Batch R4801014								
WG3155676-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			102.7		%		70-130	12-SEP-19
WG3155713-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			111.7		%		70-130	12-SEP-19
WG3155676-2 DUP		**L2323007-59**						
Silver (Ag)-Total		0.0252	0.0223		mg/kg	12	40	12-SEP-19
WG3155713-2 DUP		**L2323007-107**						
Silver (Ag)-Total		0.0169	0.0152		mg/kg	10	40	12-SEP-19
WG3155676-4 LCS								
Silver (Ag)-Total			74.7	MES	%		80-120	12-SEP-19
WG3155713-4 LCS								
Silver (Ag)-Total			70.5	MES	%		80-120	12-SEP-19
WG3155676-1 MB								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AG-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155676-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	12-SEP-19
WG3155713-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	12-SEP-19
Batch R4801590								
WG3155849-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			101.5		%		70-130	11-SEP-19
WG3155849-2 DUP		**L2323007-84**						
Silver (Ag)-Total		0.0087	0.0085		mg/kg	2.0	40	11-SEP-19
WG3155849-4 LCS								
Silver (Ag)-Total			87.9		%		80-120	11-SEP-19
WG3155849-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	11-SEP-19
Batch R4806335								
WG3160009-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			102.5		%		70-130	13-SEP-19
WG3160009-2 DUP		**L2323007-101**						
Silver (Ag)-Total		0.0121	0.0132		mg/kg	8.8	40	13-SEP-19
WG3160009-4 LCS								
Silver (Ag)-Total			97.1		%		80-120	13-SEP-19
WG3160009-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	13-SEP-19
Batch R4820450								
WG3162496-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			97.8		%		70-130	18-SEP-19
WG3162496-2 DUP		**L2323007-83**						
Silver (Ag)-Total		0.0070	0.0072		mg/kg	2.3	40	18-SEP-19
WG3162496-4 LCS								
Silver (Ag)-Total			94.7		%		80-120	18-SEP-19
WG3162496-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	18-SEP-19
HG-DRY-CVAFS-N-VA	**Tissue**							
Batch R4769160								
WG3137853-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			89.8		%		70-130	26-AUG-19
WG3137853-2 DUP		**L2323007-87**						
Mercury (Hg)-Total		0.0582	0.0612		mg/kg	4.9	40	26-AUG-19
WG3137853-4 LCS								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DRY-CVAFS-N-VA	**Tissue**							
Batch R4769160								
WG3137853-4 LCS								
Mercury (Hg)-Total			98.9		%		80-120	26-AUG-19
WG3137853-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	26-AUG-19
Batch R4773500								
WG3138058-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			97.0		%		70-130	28-AUG-19
WG3138058-5 DUP		**L2323007-206**						
Mercury (Hg)-Total		0.0386	0.0389		mg/kg	0.8	40	28-AUG-19
WG3138058-4 LCS								
Mercury (Hg)-Total			90.0		%		80-120	28-AUG-19
WG3138058-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	28-AUG-19
Batch R4777894								
WG3140170-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			105.0		%		70-130	30-AUG-19
WG3140170-2 DUP		**L2323007-3**						
Mercury (Hg)-Total		0.0474	0.0463		mg/kg	2.4	40	30-AUG-19
WG3140170-4 LCS								
Mercury (Hg)-Total			96.5		%		80-120	30-AUG-19
WG3140170-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	30-AUG-19
Batch R4786521								
WG3141571-7 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			100.8		%		70-130	11-SEP-19
WG3141571-6 DUP		**L2323007-207**						
Mercury (Hg)-Total		0.0461	0.0442		mg/kg	4.2	40	11-SEP-19
WG3141571-8 LCS								
Mercury (Hg)-Total			97.8		%		80-120	11-SEP-19
WG3141571-5 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	11-SEP-19
Batch R4806388								
WG3141248-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			105.8		%		70-130	13-SEP-19
WG3155676-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			102.9		%		70-130	13-SEP-19
WG3155713-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			106.4		%		70-130	13-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DRY-CVAFS-N-VA	**Tissue**							
Batch R4806388								
WG3155849-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			106.8		%		70-130	13-SEP-19
WG3141248-2 DUP		**L2323007-185**						
Mercury (Hg)-Total		0.0710	0.0698		mg/kg	1.7	40	13-SEP-19
WG3155676-2 DUP		**L2323007-59**						
Mercury (Hg)-Total		0.0496	0.0480		mg/kg	3.2	40	13-SEP-19
WG3155713-2 DUP		**L2323007-107**						
Mercury (Hg)-Total		0.0385	0.0365		mg/kg	5.3	40	13-SEP-19
WG3155849-2 DUP		**L2323007-84**						
Mercury (Hg)-Total		0.0512	0.0506		mg/kg	1.2	40	13-SEP-19
WG3141248-4 LCS								
Mercury (Hg)-Total			103.2		%		80-120	13-SEP-19
WG3155676-4 LCS								
Mercury (Hg)-Total			102.6		%		80-120	13-SEP-19
WG3155713-4 LCS								
Mercury (Hg)-Total			104.3		%		80-120	13-SEP-19
WG3155849-4 LCS								
Mercury (Hg)-Total			102.1		%		80-120	13-SEP-19
WG3141248-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	13-SEP-19
WG3155676-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	13-SEP-19
WG3155713-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	13-SEP-19
WG3155849-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	13-SEP-19
Batch R4819732								
WG3162496-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			107.5		%		70-130	18-SEP-19
WG3162496-2 DUP		**L2323007-83**						
Mercury (Hg)-Total		0.0472	0.0465		mg/kg	1.7	40	18-SEP-19
WG3162496-4 LCS								
Mercury (Hg)-Total			103.2		%		80-120	18-SEP-19
WG3162496-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	18-SEP-19
MET-DRY-CCMS-N-VA	**Tissue**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4765213								
WG3137853-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			106.4		%		70-130	21-AUG-19
Arsenic (As)-Total			95.6		%		70-130	21-AUG-19
Barium (Ba)-Total			108.1		%		70-130	21-AUG-19
Beryllium (Be)-Total			0.017		mg/kg		0.005-0.025	21-AUG-19
Bismuth (Bi)-Total			0.012		mg/kg		0.002-0.022	21-AUG-19
Boron (B)-Total			93.1		%		70-130	21-AUG-19
Cadmium (Cd)-Total			95.8		%		70-130	21-AUG-19
Calcium (Ca)-Total			99.6		%		70-130	21-AUG-19
Cesium (Cs)-Total			92.4		%		70-130	21-AUG-19
Chromium (Cr)-Total			111.0		%		70-130	21-AUG-19
Cobalt (Co)-Total			100.4		%		70-130	21-AUG-19
Copper (Cu)-Total			97.0		%		70-130	21-AUG-19
Iron (Fe)-Total			105.6		%		70-130	21-AUG-19
Lead (Pb)-Total			113.8		%		70-130	21-AUG-19
Lithium (Li)-Total			1.08		mg/kg		0.71-1.71	21-AUG-19
Magnesium (Mg)-Total			95.0		%		70-130	21-AUG-19
Manganese (Mn)-Total			95.2		%		70-130	21-AUG-19
Molybdenum (Mo)-Total			91.6		%		70-130	21-AUG-19
Nickel (Ni)-Total			92.7		%		70-130	21-AUG-19
Phosphorus (P)-Total			95.0		%		70-130	21-AUG-19
Potassium (K)-Total			96.5		%		70-130	21-AUG-19
Rubidium (Rb)-Total			98.1		%		70-130	21-AUG-19
Selenium (Se)-Total			100.1		%		70-130	21-AUG-19
Sodium (Na)-Total			96.9		%		70-130	21-AUG-19
Strontium (Sr)-Total			91.9		%		70-130	21-AUG-19
Thallium (Tl)-Total			74.6		%		70-130	21-AUG-19
Uranium (U)-Total			99.5		%		70-130	21-AUG-19
Vanadium (V)-Total			104.5		%		70-130	21-AUG-19
Zinc (Zn)-Total			110.5		%		70-130	21-AUG-19
Zirconium (Zr)-Total			0.29		mg/kg		0.05-0.45	21-AUG-19
WG3137853-2 DUP		**L2323007-87**						
Aluminum (Al)-Total		150	125		mg/kg	18	40	21-AUG-19
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	21-AUG-19
Arsenic (As)-Total		0.046	0.041		mg/kg			21-AUG-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4765213								
WG3137853-2 DUP		**L2323007-87**						
Arsenic (As)-Total		0.046	0.041		mg/kg	12	40	21-AUG-19
Barium (Ba)-Total		2.32	2.31		mg/kg	0.5	40	21-AUG-19
Beryllium (Be)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	21-AUG-19
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	21-AUG-19
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	21-AUG-19
Cadmium (Cd)-Total		0.0213	0.0203		mg/kg	4.8	40	21-AUG-19
Calcium (Ca)-Total		23000	22000		mg/kg	4.6	60	21-AUG-19
Cesium (Cs)-Total		0.0316	0.0286		mg/kg	9.9	40	21-AUG-19
Chromium (Cr)-Total		0.530	0.442		mg/kg	18	40	21-AUG-19
Cobalt (Co)-Total		0.097	0.091		mg/kg	5.4	40	21-AUG-19
Copper (Cu)-Total		0.72	0.73		mg/kg	2.1	40	21-AUG-19
Iron (Fe)-Total		260	236		mg/kg	9.6	40	21-AUG-19
Lead (Pb)-Total		0.319	0.330		mg/kg	3.4	40	21-AUG-19
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	21-AUG-19
Magnesium (Mg)-Total		974	952		mg/kg	2.3	40	21-AUG-19
Manganese (Mn)-Total		9.79	9.76		mg/kg	0.3	40	21-AUG-19
Molybdenum (Mo)-Total		0.046	0.047		mg/kg	2.4	40	21-AUG-19
Nickel (Ni)-Total		0.43	0.39		mg/kg	11	40	21-AUG-19
Phosphorus (P)-Total		390	372		mg/kg	4.8	40	21-AUG-19
Potassium (K)-Total		1420	1430		mg/kg	0.6	40	21-AUG-19
Rubidium (Rb)-Total		1.47	1.46		mg/kg	0.6	40	21-AUG-19
Selenium (Se)-Total		0.056	0.056		mg/kg	1.1	40	21-AUG-19
Sodium (Na)-Total		293	298		mg/kg	1.8	40	21-AUG-19
Strontium (Sr)-Total		10.2	9.71		mg/kg	5.1	60	21-AUG-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	21-AUG-19
Thallium (Tl)-Total		0.0040	0.0037		mg/kg	7.7	40	21-AUG-19
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	21-AUG-19
Uranium (U)-Total		0.0638	0.0598		mg/kg	6.5	40	21-AUG-19
Vanadium (V)-Total		0.35	0.30		mg/kg	16	40	21-AUG-19
Zinc (Zn)-Total		7.17	7.19		mg/kg	0.3	40	21-AUG-19
Zirconium (Zr)-Total		0.27	0.23		mg/kg	13	40	21-AUG-19
WG3137853-4 LCS								
Aluminum (Al)-Total			105.0		%		80-120	21-AUG-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4765213								
WG3137853-4 LCS								
Antimony (Sb)-Total			99.96		%		80-120	21-AUG-19
Arsenic (As)-Total			103.6		%		80-120	21-AUG-19
Barium (Ba)-Total			102.8		%		80-120	21-AUG-19
Beryllium (Be)-Total			100.5		%		80-120	21-AUG-19
Bismuth (Bi)-Total			101.5		%		80-120	21-AUG-19
Boron (B)-Total			100.1		%		80-120	21-AUG-19
Cadmium (Cd)-Total			99.7		%		80-120	21-AUG-19
Calcium (Ca)-Total			100.4		%		80-120	21-AUG-19
Cesium (Cs)-Total			99.8		%		80-120	21-AUG-19
Chromium (Cr)-Total			104.2		%		80-120	21-AUG-19
Cobalt (Co)-Total			102.5		%		80-120	21-AUG-19
Copper (Cu)-Total			102.4		%		80-120	21-AUG-19
Iron (Fe)-Total			101.1		%		80-120	21-AUG-19
Lead (Pb)-Total			102.4		%		80-120	21-AUG-19
Lithium (Li)-Total			98.2		%		80-120	21-AUG-19
Magnesium (Mg)-Total			107.6		%		80-120	21-AUG-19
Manganese (Mn)-Total			104.5		%		80-120	21-AUG-19
Molybdenum (Mo)-Total			103.7		%		80-120	21-AUG-19
Nickel (Ni)-Total			102.1		%		80-120	21-AUG-19
Phosphorus (P)-Total			110.6		%		80-120	21-AUG-19
Potassium (K)-Total			103.2		%		80-120	21-AUG-19
Rubidium (Rb)-Total			103.3		%		80-120	21-AUG-19
Selenium (Se)-Total			104.7		%		80-120	21-AUG-19
Sodium (Na)-Total			104.5		%		80-120	21-AUG-19
Strontium (Sr)-Total			104.0		%		80-120	21-AUG-19
Tellurium (Te)-Total			98.9		%		80-120	21-AUG-19
Thallium (Tl)-Total			98.9		%		80-120	21-AUG-19
Tin (Sn)-Total			101.3		%		80-120	21-AUG-19
Uranium (U)-Total			103.5		%		80-120	21-AUG-19
Vanadium (V)-Total			106.4		%		80-120	21-AUG-19
Zinc (Zn)-Total			103.9		%		80-120	21-AUG-19
Zirconium (Zr)-Total			101.2		%		80-120	21-AUG-19
WG3137853-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	21-AUG-19

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4765213								
WG3137853-1 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	21-AUG-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	21-AUG-19
Barium (Ba)-Total			<0.050		mg/kg		0.05	21-AUG-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	21-AUG-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	21-AUG-19
Boron (B)-Total			<1.0		mg/kg		1	21-AUG-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	21-AUG-19
Calcium (Ca)-Total			<20		mg/kg		20	21-AUG-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	21-AUG-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	21-AUG-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	21-AUG-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	21-AUG-19
Iron (Fe)-Total			<3.0		mg/kg		3	21-AUG-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	21-AUG-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	21-AUG-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	21-AUG-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	21-AUG-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	21-AUG-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	21-AUG-19
Phosphorus (P)-Total			<10		mg/kg		10	21-AUG-19
Potassium (K)-Total			<20		mg/kg		20	21-AUG-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	21-AUG-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	21-AUG-19
Sodium (Na)-Total			<20		mg/kg		20	21-AUG-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	21-AUG-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	21-AUG-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	21-AUG-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	21-AUG-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	21-AUG-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	21-AUG-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	21-AUG-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	21-AUG-19

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4769163								
WG3140170-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			102.2		%		70-130	26-AUG-19
Arsenic (As)-Total			94.5		%		70-130	26-AUG-19
Barium (Ba)-Total			105.4		%		70-130	26-AUG-19
Beryllium (Be)-Total			0.016		mg/kg		0.005-0.025	26-AUG-19
Bismuth (Bi)-Total			0.012		mg/kg		0.002-0.022	26-AUG-19
Boron (B)-Total			90.6		%		70-130	26-AUG-19
Cadmium (Cd)-Total			102.7		%		70-130	26-AUG-19
Calcium (Ca)-Total			101.8		%		70-130	26-AUG-19
Cesium (Cs)-Total			91.8		%		70-130	26-AUG-19
Chromium (Cr)-Total			105.6		%		70-130	26-AUG-19
Cobalt (Co)-Total			96.5		%		70-130	26-AUG-19
Copper (Cu)-Total			98.0		%		70-130	26-AUG-19
Iron (Fe)-Total			100.6		%		70-130	26-AUG-19
Lead (Pb)-Total			103.0		%		70-130	26-AUG-19
Lithium (Li)-Total			1.05		mg/kg		0.71-1.71	26-AUG-19
Magnesium (Mg)-Total			92.8		%		70-130	26-AUG-19
Manganese (Mn)-Total			95.9		%		70-130	26-AUG-19
Molybdenum (Mo)-Total			98.7		%		70-130	26-AUG-19
Nickel (Ni)-Total			103.6		%		70-130	26-AUG-19
Phosphorus (P)-Total			93.7		%		70-130	26-AUG-19
Potassium (K)-Total			95.0		%		70-130	26-AUG-19
Rubidium (Rb)-Total			100.2		%		70-130	26-AUG-19
Selenium (Se)-Total			104.3		%		70-130	26-AUG-19
Sodium (Na)-Total			95.1		%		70-130	26-AUG-19
Strontium (Sr)-Total			96.6		%		70-130	26-AUG-19
Thallium (Tl)-Total			74.7		%		70-130	26-AUG-19
Uranium (U)-Total			99.1		%		70-130	26-AUG-19
Vanadium (V)-Total			100.4		%		70-130	26-AUG-19
Zinc (Zn)-Total			110.2		%		70-130	26-AUG-19
Zirconium (Zr)-Total			0.26		mg/kg		0.05-0.45	26-AUG-19
WG3140170-2 DUP		**L2323007-3**						
Aluminum (Al)-Total		308	304		mg/kg	1.4	40	26-AUG-19
Antimony (Sb)-Total		0.011	<0.010	RPD-NA	mg/kg	N/A	40	26-AUG-19
Arsenic (As)-Total		0.086	0.091		mg/kg			26-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4769163								
WG3140170-2 DUP		**L2323007-3**						
Arsenic (As)-Total		0.086	0.091		mg/kg	5.1	40	26-AUG-19
Barium (Ba)-Total		7.38	6.33		mg/kg	15	40	26-AUG-19
Beryllium (Be)-Total		0.022	0.020		mg/kg	7.3	40	26-AUG-19
Bismuth (Bi)-Total		0.015	0.014		mg/kg	3.8	40	26-AUG-19
Boron (B)-Total		1.1	1.1		mg/kg	3.7	40	26-AUG-19
Cadmium (Cd)-Total		0.0383	0.0394		mg/kg	2.7	40	26-AUG-19
Calcium (Ca)-Total		49300	50600		mg/kg	2.6	60	26-AUG-19
Cesium (Cs)-Total		0.118	0.118		mg/kg	0.2	40	26-AUG-19
Chromium (Cr)-Total		0.743	0.723		mg/kg	2.8	40	26-AUG-19
Cobalt (Co)-Total		0.236	0.178		mg/kg	28	40	26-AUG-19
Copper (Cu)-Total		1.68	0.98	DUP-H	mg/kg	53	40	26-AUG-19
Iron (Fe)-Total		1080	1010		mg/kg	7.1	40	26-AUG-19
Lead (Pb)-Total		1.56	1.54		mg/kg	1.4	40	26-AUG-19
Lithium (Li)-Total		0.72	0.73		mg/kg	1.3	40	26-AUG-19
Magnesium (Mg)-Total		1130	1160		mg/kg	2.9	40	26-AUG-19
Manganese (Mn)-Total		19.6	19.7		mg/kg	0.5	40	26-AUG-19
Molybdenum (Mo)-Total		0.138	0.142		mg/kg	3.0	40	26-AUG-19
Nickel (Ni)-Total		1.02	1.01		mg/kg	1.4	40	26-AUG-19
Phosphorus (P)-Total		270	267		mg/kg	1.1	40	26-AUG-19
Potassium (K)-Total		1130	1170		mg/kg	3.4	40	26-AUG-19
Rubidium (Rb)-Total		3.29	3.36		mg/kg	2.2	40	26-AUG-19
Selenium (Se)-Total		0.080	0.079		mg/kg	0.6	40	26-AUG-19
Sodium (Na)-Total		213	222		mg/kg	4.3	40	26-AUG-19
Strontium (Sr)-Total		26.4	26.5		mg/kg	0.6	60	26-AUG-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	26-AUG-19
Thallium (Tl)-Total		0.0085	0.0079		mg/kg	7.9	40	26-AUG-19
Tin (Sn)-Total		0.28	0.39		mg/kg	35	40	26-AUG-19
Uranium (U)-Total		0.368	0.373		mg/kg	1.3	40	26-AUG-19
Vanadium (V)-Total		0.58	0.57		mg/kg	1.6	40	26-AUG-19
Zinc (Zn)-Total		8.35	8.08		mg/kg	3.2	40	26-AUG-19
Zirconium (Zr)-Total		0.90	0.86		mg/kg	4.1	40	26-AUG-19
WG3140170-4 LCS								
Aluminum (Al)-Total			100.0		%		80-120	26-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4769163								
WG3140170-4 LCS								
Antimony (Sb)-Total			105.2		%		80-120	26-AUG-19
Arsenic (As)-Total			102.8		%		80-120	26-AUG-19
Barium (Ba)-Total			102.6		%		80-120	26-AUG-19
Beryllium (Be)-Total			102.3		%		80-120	26-AUG-19
Bismuth (Bi)-Total			99.1		%		80-120	26-AUG-19
Boron (B)-Total			102.0		%		80-120	26-AUG-19
Cadmium (Cd)-Total			102.1		%		80-120	26-AUG-19
Calcium (Ca)-Total			100.9		%		80-120	26-AUG-19
Cesium (Cs)-Total			100.3		%		80-120	26-AUG-19
Chromium (Cr)-Total			100.9		%		80-120	26-AUG-19
Cobalt (Co)-Total			102.2		%		80-120	26-AUG-19
Copper (Cu)-Total			102.8		%		80-120	26-AUG-19
Iron (Fe)-Total			94.8		%		80-120	26-AUG-19
Lead (Pb)-Total			101.9		%		80-120	26-AUG-19
Lithium (Li)-Total			104.6		%		80-120	26-AUG-19
Magnesium (Mg)-Total			108.1		%		80-120	26-AUG-19
Manganese (Mn)-Total			103.2		%		80-120	26-AUG-19
Molybdenum (Mo)-Total			107.8		%		80-120	26-AUG-19
Nickel (Ni)-Total			102.3		%		80-120	26-AUG-19
Phosphorus (P)-Total			104.1		%		80-120	26-AUG-19
Potassium (K)-Total			102.4		%		80-120	26-AUG-19
Rubidium (Rb)-Total			106.1		%		80-120	26-AUG-19
Selenium (Se)-Total			104.8		%		80-120	26-AUG-19
Sodium (Na)-Total			102.9		%		80-120	26-AUG-19
Strontium (Sr)-Total			107.8		%		80-120	26-AUG-19
Tellurium (Te)-Total			106.6		%		80-120	26-AUG-19
Thallium (Tl)-Total			99.97		%		80-120	26-AUG-19
Tin (Sn)-Total			104.9		%		80-120	26-AUG-19
Uranium (U)-Total			96.5		%		80-120	26-AUG-19
Vanadium (V)-Total			103.8		%		80-120	26-AUG-19
Zinc (Zn)-Total			104.6		%		80-120	26-AUG-19
Zirconium (Zr)-Total			102.6		%		80-120	26-AUG-19
WG3140170-1 MB								
Aluminum (Al)-Total			5.3	B	mg/kg		2	26-AUG-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4769163								
WG3140170-1 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	26-AUG-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	26-AUG-19
Barium (Ba)-Total			<0.050		mg/kg		0.05	26-AUG-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	26-AUG-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	26-AUG-19
Boron (B)-Total			<1.0		mg/kg		1	26-AUG-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	26-AUG-19
Calcium (Ca)-Total			<20		mg/kg		20	26-AUG-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	26-AUG-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	26-AUG-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	26-AUG-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	26-AUG-19
Iron (Fe)-Total			<3.0		mg/kg		3	26-AUG-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	26-AUG-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	26-AUG-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	26-AUG-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	26-AUG-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	26-AUG-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	26-AUG-19
Phosphorus (P)-Total			<10		mg/kg		10	26-AUG-19
Potassium (K)-Total			<20		mg/kg		20	26-AUG-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	26-AUG-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	26-AUG-19
Sodium (Na)-Total			<20		mg/kg		20	26-AUG-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	26-AUG-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	26-AUG-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	26-AUG-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	26-AUG-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	26-AUG-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	26-AUG-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	26-AUG-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	26-AUG-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4773609								
WG3138058-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			108.3		%		70-130	27-AUG-19
Arsenic (As)-Total			97.8		%		70-130	27-AUG-19
Barium (Ba)-Total			100.7		%		70-130	27-AUG-19
Beryllium (Be)-Total			0.017		mg/kg		0.005-0.025	27-AUG-19
Bismuth (Bi)-Total			0.018		mg/kg		0.002-0.022	27-AUG-19
Boron (B)-Total			95.0		%		70-130	27-AUG-19
Cadmium (Cd)-Total			99.3		%		70-130	27-AUG-19
Calcium (Ca)-Total			102.2		%		70-130	27-AUG-19
Cesium (Cs)-Total			94.9		%		70-130	27-AUG-19
Chromium (Cr)-Total			108.4		%		70-130	27-AUG-19
Cobalt (Co)-Total			98.9		%		70-130	27-AUG-19
Copper (Cu)-Total			98.4		%		70-130	27-AUG-19
Iron (Fe)-Total			111.0		%		70-130	27-AUG-19
Lead (Pb)-Total			109.8		%		70-130	27-AUG-19
Lithium (Li)-Total			1.12		mg/kg		0.71-1.71	27-AUG-19
Magnesium (Mg)-Total			100.1		%		70-130	27-AUG-19
Manganese (Mn)-Total			99.2		%		70-130	27-AUG-19
Molybdenum (Mo)-Total			91.9		%		70-130	27-AUG-19
Nickel (Ni)-Total			108.3		%		70-130	27-AUG-19
Phosphorus (P)-Total			99.6		%		70-130	27-AUG-19
Potassium (K)-Total			99.9		%		70-130	27-AUG-19
Rubidium (Rb)-Total			102.9		%		70-130	27-AUG-19
Selenium (Se)-Total			105.0		%		70-130	27-AUG-19
Sodium (Na)-Total			101.8		%		70-130	27-AUG-19
Strontium (Sr)-Total			92.4		%		70-130	27-AUG-19
Thallium (Tl)-Total			80.1		%		70-130	27-AUG-19
Uranium (U)-Total			102.1		%		70-130	27-AUG-19
Vanadium (V)-Total			104.4		%		70-130	27-AUG-19
Zinc (Zn)-Total			110.3		%		70-130	27-AUG-19
Zirconium (Zr)-Total			0.23		mg/kg		0.05-0.45	27-AUG-19
WG3138058-5 DUP		**L2323007-206**						
Aluminum (Al)-Total		1320	1320		mg/kg	0.3	40	27-AUG-19
Antimony (Sb)-Total		0.013	0.014		mg/kg	6.2	40	27-AUG-19
Arsenic (As)-Total		0.211	0.211		mg/kg			27-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4773609								
WG3138058-5 DUP		**L2323007-206**						
Arsenic (As)-Total		0.211	0.211		mg/kg	0.1	40	27-AUG-19
Barium (Ba)-Total		19.9	19.7		mg/kg	1.2	40	27-AUG-19
Beryllium (Be)-Total		0.073	0.077		mg/kg	5.6	40	27-AUG-19
Bismuth (Bi)-Total		0.122	0.107		mg/kg	13	40	27-AUG-19
Boron (B)-Total		3.2	3.2		mg/kg	2.2	40	27-AUG-19
Cadmium (Cd)-Total		0.0716	0.0736		mg/kg	2.7	40	27-AUG-19
Calcium (Ca)-Total		68900	73100		mg/kg	6.0	60	27-AUG-19
Cesium (Cs)-Total		0.331	0.340		mg/kg	2.4	40	27-AUG-19
Chromium (Cr)-Total		2.72	2.74		mg/kg	0.6	40	27-AUG-19
Cobalt (Co)-Total		0.684	0.677		mg/kg	1.0	40	27-AUG-19
Copper (Cu)-Total		3.45	3.30		mg/kg	4.5	40	27-AUG-19
Iron (Fe)-Total		2970	2950		mg/kg	0.6	40	27-AUG-19
Lead (Pb)-Total		5.59	5.50		mg/kg	1.5	40	27-AUG-19
Lithium (Li)-Total		3.70	3.87		mg/kg	4.7	40	27-AUG-19
Magnesium (Mg)-Total		3170	3090		mg/kg	2.4	40	27-AUG-19
Manganese (Mn)-Total		63.6	63.9		mg/kg	0.4	40	27-AUG-19
Molybdenum (Mo)-Total		0.665	0.627		mg/kg	5.9	40	27-AUG-19
Nickel (Ni)-Total		1.73	1.75		mg/kg	1.1	40	27-AUG-19
Phosphorus (P)-Total		464	470		mg/kg	1.2	40	27-AUG-19
Potassium (K)-Total		1930	1950		mg/kg	0.7	40	27-AUG-19
Rubidium (Rb)-Total		8.43	8.56		mg/kg	1.5	40	27-AUG-19
Selenium (Se)-Total		0.077	0.072		mg/kg	6.4	40	27-AUG-19
Sodium (Na)-Total		166	173		mg/kg	3.9	40	27-AUG-19
Strontium (Sr)-Total		67.6	70.0		mg/kg	3.5	60	27-AUG-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	27-AUG-19
Thallium (Tl)-Total		0.0342	0.0337		mg/kg	1.5	40	27-AUG-19
Tin (Sn)-Total		0.17	0.16		mg/kg	4.1	40	27-AUG-19
Uranium (U)-Total		0.885	0.904		mg/kg	2.1	40	27-AUG-19
Vanadium (V)-Total		2.11	2.12		mg/kg	0.6	40	27-AUG-19
Zinc (Zn)-Total		14.4	14.3		mg/kg	0.1	40	27-AUG-19
Zirconium (Zr)-Total		2.81	2.99		mg/kg	6.3	40	27-AUG-19
WG3138058-4 LCS								
Aluminum (Al)-Total			107.1		%		80-120	27-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4773609								
WG3138058-4 LCS								
Antimony (Sb)-Total			107.5		%		80-120	27-AUG-19
Arsenic (As)-Total			105.2		%		80-120	27-AUG-19
Barium (Ba)-Total			103.8		%		80-120	27-AUG-19
Beryllium (Be)-Total			104.6		%		80-120	27-AUG-19
Bismuth (Bi)-Total			99.3		%		80-120	27-AUG-19
Boron (B)-Total			107.7		%		80-120	27-AUG-19
Cadmium (Cd)-Total			99.6		%		80-120	27-AUG-19
Calcium (Ca)-Total			102.7		%		80-120	27-AUG-19
Cesium (Cs)-Total			105.2		%		80-120	27-AUG-19
Chromium (Cr)-Total			105.5		%		80-120	27-AUG-19
Cobalt (Co)-Total			104.5		%		80-120	27-AUG-19
Copper (Cu)-Total			103.9		%		80-120	27-AUG-19
Iron (Fe)-Total			112.7		%		80-120	27-AUG-19
Lead (Pb)-Total			101.9		%		80-120	27-AUG-19
Lithium (Li)-Total			110.7		%		80-120	27-AUG-19
Magnesium (Mg)-Total			107.6		%		80-120	27-AUG-19
Manganese (Mn)-Total			107.2		%		80-120	27-AUG-19
Molybdenum (Mo)-Total			103.5		%		80-120	27-AUG-19
Nickel (Ni)-Total			103.6		%		80-120	27-AUG-19
Phosphorus (P)-Total			112.5		%		80-120	27-AUG-19
Potassium (K)-Total			109.8		%		80-120	27-AUG-19
Rubidium (Rb)-Total			108.0		%		80-120	27-AUG-19
Selenium (Se)-Total			106.8		%		80-120	27-AUG-19
Sodium (Na)-Total			105.3		%		80-120	27-AUG-19
Strontium (Sr)-Total			106.8		%		80-120	27-AUG-19
Tellurium (Te)-Total			103.4		%		80-120	27-AUG-19
Thallium (Tl)-Total			100.3		%		80-120	27-AUG-19
Tin (Sn)-Total			101.0		%		80-120	27-AUG-19
Uranium (U)-Total			104.5		%		80-120	27-AUG-19
Vanadium (V)-Total			106.8		%		80-120	27-AUG-19
Zinc (Zn)-Total			103.8		%		80-120	27-AUG-19
Zirconium (Zr)-Total			104.4		%		80-120	27-AUG-19
WG3138058-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	27-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4773609								
WG3138058-1 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	27-AUG-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	27-AUG-19
Barium (Ba)-Total			<0.050		mg/kg		0.05	27-AUG-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	27-AUG-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	27-AUG-19
Boron (B)-Total			<1.0		mg/kg		1	27-AUG-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	27-AUG-19
Calcium (Ca)-Total			<20		mg/kg		20	27-AUG-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	27-AUG-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	27-AUG-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	27-AUG-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	27-AUG-19
Iron (Fe)-Total			<3.0		mg/kg		3	27-AUG-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	27-AUG-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	27-AUG-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	27-AUG-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	27-AUG-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	27-AUG-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	27-AUG-19
Phosphorus (P)-Total			<10		mg/kg		10	27-AUG-19
Potassium (K)-Total			<20		mg/kg		20	27-AUG-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	27-AUG-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	27-AUG-19
Sodium (Na)-Total			<20		mg/kg		20	27-AUG-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	27-AUG-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	27-AUG-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	27-AUG-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	27-AUG-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	27-AUG-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	27-AUG-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	27-AUG-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	27-AUG-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4789470								
WG3141571-7 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			104.1		%		70-130	06-SEP-19
Arsenic (As)-Total			94.7		%		70-130	06-SEP-19
Barium (Ba)-Total			99.6		%		70-130	06-SEP-19
Beryllium (Be)-Total			0.014		mg/kg		0.005-0.025	06-SEP-19
Bismuth (Bi)-Total			0.010		mg/kg		0.002-0.022	06-SEP-19
Boron (B)-Total			94.4		%		70-130	06-SEP-19
Cadmium (Cd)-Total			97.7		%		70-130	06-SEP-19
Calcium (Ca)-Total			101.7		%		70-130	06-SEP-19
Cesium (Cs)-Total			93.1		%		70-130	06-SEP-19
Chromium (Cr)-Total			102.4		%		70-130	06-SEP-19
Cobalt (Co)-Total			96.2		%		70-130	06-SEP-19
Copper (Cu)-Total			94.1		%		70-130	06-SEP-19
Iron (Fe)-Total			97.7		%		70-130	06-SEP-19
Lead (Pb)-Total			100.6		%		70-130	06-SEP-19
Lithium (Li)-Total			1.08		mg/kg		0.71-1.71	06-SEP-19
Magnesium (Mg)-Total			96.7		%		70-130	06-SEP-19
Manganese (Mn)-Total			91.6		%		70-130	06-SEP-19
Molybdenum (Mo)-Total			91.9		%		70-130	06-SEP-19
Nickel (Ni)-Total			92.0		%		70-130	06-SEP-19
Phosphorus (P)-Total			91.3		%		70-130	06-SEP-19
Potassium (K)-Total			88.5		%		70-130	06-SEP-19
Rubidium (Rb)-Total			95.5		%		70-130	06-SEP-19
Selenium (Se)-Total			98.4		%		70-130	06-SEP-19
Sodium (Na)-Total			93.5		%		70-130	06-SEP-19
Strontium (Sr)-Total			88.0		%		70-130	06-SEP-19
Thallium (Tl)-Total			66.2	MES	%		70-130	06-SEP-19
Uranium (U)-Total			96.3		%		70-130	06-SEP-19
Vanadium (V)-Total			99.2		%		70-130	06-SEP-19
Zinc (Zn)-Total			104.8		%		70-130	06-SEP-19
Zirconium (Zr)-Total			0.22		mg/kg		0.05-0.45	06-SEP-19
WG3141571-6 DUP		**L2323007-207**						
Aluminum (Al)-Total		1140	1180		mg/kg	3.3	40	06-SEP-19
Antimony (Sb)-Total		<0.010	0.015	RPD-NA	mg/kg	N/A	40	06-SEP-19
Arsenic (As)-Total		0.215	0.215		mg/kg			06-SEP-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4789470								
WG3141571-6 DUP		**L2323007-207**						
Arsenic (As)-Total		0.215	0.215		mg/kg	0.3	40	06-SEP-19
Barium (Ba)-Total		18.4	18.4		mg/kg	0.2	40	06-SEP-19
Beryllium (Be)-Total		0.066	0.072		mg/kg	8.1	40	06-SEP-19
Bismuth (Bi)-Total		0.104	0.103		mg/kg	1.3	40	06-SEP-19
Boron (B)-Total		3.1	3.2		mg/kg	4.4	40	06-SEP-19
Cadmium (Cd)-Total		0.0803	0.0802		mg/kg	0.1	40	06-SEP-19
Calcium (Ca)-Total		73200	72900		mg/kg	0.4	60	06-SEP-19
Cesium (Cs)-Total		0.293	0.301		mg/kg	2.8	40	06-SEP-19
Chromium (Cr)-Total		2.27	2.39		mg/kg	5.2	40	06-SEP-19
Cobalt (Co)-Total		0.578	0.596		mg/kg	3.0	40	06-SEP-19
Copper (Cu)-Total		3.16	3.03		mg/kg	4.1	40	06-SEP-19
Iron (Fe)-Total		2370	2460		mg/kg	3.8	40	06-SEP-19
Lead (Pb)-Total		5.46	5.55		mg/kg	1.6	40	06-SEP-19
Lithium (Li)-Total		3.02	3.16		mg/kg	4.5	40	06-SEP-19
Magnesium (Mg)-Total		2880	2910		mg/kg	1.2	40	06-SEP-19
Manganese (Mn)-Total		55.8	56.6		mg/kg	1.5	40	06-SEP-19
Molybdenum (Mo)-Total		0.593	0.569		mg/kg	4.1	40	06-SEP-19
Nickel (Ni)-Total		1.55	1.57		mg/kg	1.0	40	06-SEP-19
Phosphorus (P)-Total		451	454		mg/kg	0.7	40	06-SEP-19
Potassium (K)-Total		1730	1750		mg/kg	1.1	40	06-SEP-19
Rubidium (Rb)-Total		7.67	7.80		mg/kg	1.7	40	06-SEP-19
Selenium (Se)-Total		0.074	0.071		mg/kg	4.6	40	06-SEP-19
Sodium (Na)-Total		148	150		mg/kg	1.4	40	06-SEP-19
Strontium (Sr)-Total		66.5	66.0		mg/kg	0.8	60	06-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	06-SEP-19
Thallium (Tl)-Total		0.0292	0.0293		mg/kg	0.2	40	06-SEP-19
Tin (Sn)-Total		0.18	0.21		mg/kg	17	40	06-SEP-19
Uranium (U)-Total		0.849	0.854		mg/kg	0.6	40	06-SEP-19
Vanadium (V)-Total		1.77	1.83		mg/kg	3.1	40	06-SEP-19
Zinc (Zn)-Total		14.2	14.3		mg/kg	0.7	40	06-SEP-19
Zirconium (Zr)-Total		2.68	2.69		mg/kg	0.1	40	06-SEP-19
WG3141571-8 LCS								
Aluminum (Al)-Total			104.6		%		80-120	06-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4789470								
WG3141571-8 LCS								
Antimony (Sb)-Total			101.3		%		80-120	06-SEP-19
Arsenic (As)-Total			105.5		%		80-120	06-SEP-19
Barium (Ba)-Total			104.9		%		80-120	06-SEP-19
Beryllium (Be)-Total			106.0		%		80-120	06-SEP-19
Bismuth (Bi)-Total			95.4		%		80-120	06-SEP-19
Boron (B)-Total			107.0		%		80-120	06-SEP-19
Cadmium (Cd)-Total			106.3		%		80-120	06-SEP-19
Calcium (Ca)-Total			105.4		%		80-120	06-SEP-19
Cesium (Cs)-Total			106.5		%		80-120	06-SEP-19
Chromium (Cr)-Total			104.3		%		80-120	06-SEP-19
Cobalt (Co)-Total			104.2		%		80-120	06-SEP-19
Copper (Cu)-Total			102.6		%		80-120	06-SEP-19
Iron (Fe)-Total			100.6		%		80-120	06-SEP-19
Lead (Pb)-Total			101.8		%		80-120	06-SEP-19
Lithium (Li)-Total			106.5		%		80-120	06-SEP-19
Magnesium (Mg)-Total			110.4		%		80-120	06-SEP-19
Manganese (Mn)-Total			102.2		%		80-120	06-SEP-19
Molybdenum (Mo)-Total			107.3		%		80-120	06-SEP-19
Nickel (Ni)-Total			104.1		%		80-120	06-SEP-19
Phosphorus (P)-Total			105.3		%		80-120	06-SEP-19
Potassium (K)-Total			100.4		%		80-120	06-SEP-19
Rubidium (Rb)-Total			103.7		%		80-120	06-SEP-19
Selenium (Se)-Total			101.9		%		80-120	06-SEP-19
Sodium (Na)-Total			101.3		%		80-120	06-SEP-19
Strontium (Sr)-Total			106.6		%		80-120	06-SEP-19
Tellurium (Te)-Total			106.4		%		80-120	06-SEP-19
Thallium (Tl)-Total			98.4		%		80-120	06-SEP-19
Tin (Sn)-Total			103.9		%		80-120	06-SEP-19
Uranium (U)-Total			108.3		%		80-120	06-SEP-19
Vanadium (V)-Total			106.3		%		80-120	06-SEP-19
Zinc (Zn)-Total			100.6		%		80-120	06-SEP-19
Zirconium (Zr)-Total			100.6		%		80-120	06-SEP-19
WG3141571-5 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	06-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4789470								
WG3141571-5 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	06-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	06-SEP-19
Barium (Ba)-Total			<0.050		mg/kg		0.05	06-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	06-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	06-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	06-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	06-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	06-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	06-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	06-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	06-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	06-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	06-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	06-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	06-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	06-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	06-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	06-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	06-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	06-SEP-19
Potassium (K)-Total			<20		mg/kg		20	06-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	06-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	06-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	06-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	06-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	06-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	06-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	06-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	06-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	06-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	06-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	06-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4793108								
WG3141248-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			98.8		%		70-130	09-SEP-19
Arsenic (As)-Total			95.5		%		70-130	09-SEP-19
Barium (Ba)-Total			97.1		%		70-130	09-SEP-19
Beryllium (Be)-Total			0.014		mg/kg		0.005-0.025	09-SEP-19
Bismuth (Bi)-Total			0.009		mg/kg		0.002-0.022	09-SEP-19
Boron (B)-Total			86.8		%		70-130	09-SEP-19
Cadmium (Cd)-Total			93.2		%		70-130	09-SEP-19
Calcium (Ca)-Total			90.2		%		70-130	09-SEP-19
Cesium (Cs)-Total			90.6		%		70-130	09-SEP-19
Chromium (Cr)-Total			115.0		%		70-130	09-SEP-19
Cobalt (Co)-Total			100.6		%		70-130	09-SEP-19
Copper (Cu)-Total			95.0		%		70-130	09-SEP-19
Iron (Fe)-Total			115.3		%		70-130	09-SEP-19
Lead (Pb)-Total			96.7		%		70-130	09-SEP-19
Lithium (Li)-Total			0.99		mg/kg		0.71-1.71	09-SEP-19
Magnesium (Mg)-Total			96.4		%		70-130	09-SEP-19
Manganese (Mn)-Total			100.7		%		70-130	09-SEP-19
Molybdenum (Mo)-Total			91.1		%		70-130	09-SEP-19
Nickel (Ni)-Total			90.9		%		70-130	09-SEP-19
Phosphorus (P)-Total			94.3		%		70-130	09-SEP-19
Potassium (K)-Total			101.3		%		70-130	09-SEP-19
Rubidium (Rb)-Total			100.2		%		70-130	09-SEP-19
Selenium (Se)-Total			103.2		%		70-130	09-SEP-19
Sodium (Na)-Total			97.0		%		70-130	09-SEP-19
Strontium (Sr)-Total			92.9		%		70-130	09-SEP-19
Thallium (Tl)-Total			65.0	MES	%		70-130	09-SEP-19
Uranium (U)-Total			88.6		%		70-130	09-SEP-19
Vanadium (V)-Total			95.9		%		70-130	09-SEP-19
Zinc (Zn)-Total			105.1		%		70-130	09-SEP-19
Zirconium (Zr)-Total			0.22		mg/kg		0.05-0.45	09-SEP-19
WG3141248-2 DUP		**L2323007-185**						
Aluminum (Al)-Total		292	321		mg/kg	9.3	40	09-SEP-19
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	09-SEP-19
Arsenic (As)-Total		0.066	0.071		mg/kg			09-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4793108								
WG3141248-2 DUP		**L2323007-185**						
Arsenic (As)-Total		0.066	0.071		mg/kg	7.8	40	09-SEP-19
Barium (Ba)-Total		5.13	5.46		mg/kg	6.3	40	09-SEP-19
Beryllium (Be)-Total		0.016	0.018		mg/kg	14	40	09-SEP-19
Bismuth (Bi)-Total		0.012	0.012		mg/kg	3.8	40	09-SEP-19
Boron (B)-Total		<1.0	1.1	RPD-NA	mg/kg	N/A	40	09-SEP-19
Cadmium (Cd)-Total		0.0285	0.0291		mg/kg	2.2	40	09-SEP-19
Calcium (Ca)-Total		11100	11100		mg/kg	0.4	60	09-SEP-19
Cesium (Cs)-Total		0.0881	0.0957		mg/kg	8.2	40	09-SEP-19
Chromium (Cr)-Total		0.921	1.01		mg/kg	9.3	40	09-SEP-19
Cobalt (Co)-Total		0.210	0.229		mg/kg	8.7	40	09-SEP-19
Copper (Cu)-Total		1.03	1.08		mg/kg	4.2	40	09-SEP-19
Iron (Fe)-Total		622	679		mg/kg	8.8	40	09-SEP-19
Lead (Pb)-Total		0.534	0.551		mg/kg	3.1	40	09-SEP-19
Lithium (Li)-Total		<0.50	0.54	RPD-NA	mg/kg	N/A	40	09-SEP-19
Magnesium (Mg)-Total		1340	1300		mg/kg	3.3	40	09-SEP-19
Manganese (Mn)-Total		18.0	18.4		mg/kg	2.4	40	09-SEP-19
Molybdenum (Mo)-Total		0.054	0.069		mg/kg	24	40	09-SEP-19
Nickel (Ni)-Total		0.62	0.63		mg/kg	1.6	40	09-SEP-19
Phosphorus (P)-Total		555	536		mg/kg	3.4	40	09-SEP-19
Potassium (K)-Total		1700	1620		mg/kg	5.0	40	09-SEP-19
Rubidium (Rb)-Total		2.64	2.68		mg/kg	1.6	40	09-SEP-19
Selenium (Se)-Total		0.063	0.060		mg/kg	6.0	40	09-SEP-19
Sodium (Na)-Total		354	351		mg/kg	0.7	40	09-SEP-19
Strontium (Sr)-Total		4.48	4.47		mg/kg	0.2	60	09-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	09-SEP-19
Thallium (Tl)-Total		0.0067	0.0075		mg/kg	11	40	09-SEP-19
Tin (Sn)-Total		0.11	0.17	J	mg/kg	0.06	0.2	09-SEP-19
Uranium (U)-Total		0.0517	0.0585		mg/kg	12	40	09-SEP-19
Vanadium (V)-Total		0.64	0.68		mg/kg	6.9	40	09-SEP-19
Zinc (Zn)-Total		8.76	8.76		mg/kg	0.0	40	09-SEP-19
Zirconium (Zr)-Total		0.43	0.46		mg/kg	7.2	40	09-SEP-19
WG3141248-4 LCS								
Aluminum (Al)-Total			106.1		%		80-120	09-SEP-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4793108								
WG3141248-4 LCS								
Antimony (Sb)-Total			104.9		%		80-120	09-SEP-19
Arsenic (As)-Total			103.7		%		80-120	09-SEP-19
Barium (Ba)-Total			103.2		%		80-120	09-SEP-19
Beryllium (Be)-Total			97.7		%		80-120	09-SEP-19
Bismuth (Bi)-Total			98.8		%		80-120	09-SEP-19
Boron (B)-Total			98.2		%		80-120	09-SEP-19
Cadmium (Cd)-Total			98.6		%		80-120	09-SEP-19
Calcium (Ca)-Total			98.2		%		80-120	09-SEP-19
Cesium (Cs)-Total			99.9		%		80-120	09-SEP-19
Chromium (Cr)-Total			105.6		%		80-120	09-SEP-19
Cobalt (Co)-Total			105.0		%		80-120	09-SEP-19
Copper (Cu)-Total			102.5		%		80-120	09-SEP-19
Iron (Fe)-Total			108.3		%		80-120	09-SEP-19
Lead (Pb)-Total			100.0		%		80-120	09-SEP-19
Lithium (Li)-Total			100.6		%		80-120	09-SEP-19
Magnesium (Mg)-Total			105.5		%		80-120	09-SEP-19
Manganese (Mn)-Total			105.4		%		80-120	09-SEP-19
Molybdenum (Mo)-Total			102.1		%		80-120	09-SEP-19
Nickel (Ni)-Total			102.7		%		80-120	09-SEP-19
Phosphorus (P)-Total			109.4		%		80-120	09-SEP-19
Potassium (K)-Total			108.3		%		80-120	09-SEP-19
Rubidium (Rb)-Total			106.5		%		80-120	09-SEP-19
Selenium (Se)-Total			104.4		%		80-120	09-SEP-19
Sodium (Na)-Total			104.0		%		80-120	09-SEP-19
Strontium (Sr)-Total			106.2		%		80-120	09-SEP-19
Tellurium (Te)-Total			102.3		%		80-120	09-SEP-19
Thallium (Tl)-Total			100.4		%		80-120	09-SEP-19
Tin (Sn)-Total			99.4		%		80-120	09-SEP-19
Uranium (U)-Total			99.3		%		80-120	09-SEP-19
Vanadium (V)-Total			107.1		%		80-120	09-SEP-19
Zinc (Zn)-Total			101.9		%		80-120	09-SEP-19
Zirconium (Zr)-Total			98.9		%		80-120	09-SEP-19
WG3141248-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	09-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4793108								
WG3141248-1 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	09-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	09-SEP-19
Barium (Ba)-Total			<0.050		mg/kg		0.05	09-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	09-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	09-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	09-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	09-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	09-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	09-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	09-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	09-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	09-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	09-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	09-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	09-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	09-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	09-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	09-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	09-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	09-SEP-19
Potassium (K)-Total			<20		mg/kg		20	09-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	09-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	09-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	09-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	09-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	09-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	09-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	09-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	09-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	09-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	09-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	09-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155676-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			106.7		%		70-130	12-SEP-19
Arsenic (As)-Total			97.7		%		70-130	12-SEP-19
Barium (Ba)-Total			100.4		%		70-130	12-SEP-19
Beryllium (Be)-Total			0.016		mg/kg		0.005-0.025	12-SEP-19
Bismuth (Bi)-Total			0.015		mg/kg		0.002-0.022	12-SEP-19
Boron (B)-Total			99.2		%		70-130	12-SEP-19
Cadmium (Cd)-Total			99.1		%		70-130	12-SEP-19
Calcium (Ca)-Total			98.1		%		70-130	12-SEP-19
Cesium (Cs)-Total			89.1		%		70-130	12-SEP-19
Chromium (Cr)-Total			112.3		%		70-130	12-SEP-19
Cobalt (Co)-Total			101.9		%		70-130	12-SEP-19
Copper (Cu)-Total			97.9		%		70-130	12-SEP-19
Iron (Fe)-Total			105.7		%		70-130	12-SEP-19
Lead (Pb)-Total			105.2		%		70-130	12-SEP-19
Lithium (Li)-Total			1.13		mg/kg		0.71-1.71	12-SEP-19
Magnesium (Mg)-Total			104.7		%		70-130	12-SEP-19
Manganese (Mn)-Total			99.7		%		70-130	12-SEP-19
Molybdenum (Mo)-Total			95.9		%		70-130	12-SEP-19
Nickel (Ni)-Total			106.3		%		70-130	12-SEP-19
Phosphorus (P)-Total			99.4		%		70-130	12-SEP-19
Potassium (K)-Total			101.6		%		70-130	12-SEP-19
Rubidium (Rb)-Total			101.6		%		70-130	12-SEP-19
Selenium (Se)-Total			100.2		%		70-130	12-SEP-19
Sodium (Na)-Total			105.8		%		70-130	12-SEP-19
Strontium (Sr)-Total			90.5		%		70-130	12-SEP-19
Thallium (Tl)-Total			74.4		%		70-130	12-SEP-19
Uranium (U)-Total			97.2		%		70-130	12-SEP-19
Vanadium (V)-Total			97.8		%		70-130	12-SEP-19
Zinc (Zn)-Total			107.8		%		70-130	12-SEP-19
Zirconium (Zr)-Total			0.23		mg/kg		0.05-0.45	12-SEP-19
WG3155713-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			112.9		%		70-130	12-SEP-19
Arsenic (As)-Total			102.0		%		70-130	12-SEP-19
Barium (Ba)-Total			110.8		%		70-130	12-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155713-3 CRM		**VA-NRC-DORM4**						
Beryllium (Be)-Total			0.017		mg/kg		0.005-0.025	12-SEP-19
Bismuth (Bi)-Total			0.024	MES	mg/kg		0.002-0.022	12-SEP-19
Boron (B)-Total			101.1		%		70-130	12-SEP-19
Cadmium (Cd)-Total			106.6		%		70-130	12-SEP-19
Calcium (Ca)-Total			105.0		%		70-130	12-SEP-19
Cesium (Cs)-Total			100.5		%		70-130	12-SEP-19
Chromium (Cr)-Total			114.3		%		70-130	12-SEP-19
Cobalt (Co)-Total			104.2		%		70-130	12-SEP-19
Copper (Cu)-Total			102.3		%		70-130	12-SEP-19
Iron (Fe)-Total			105.7		%		70-130	12-SEP-19
Lead (Pb)-Total			119.6		%		70-130	12-SEP-19
Lithium (Li)-Total			1.17		mg/kg		0.71-1.71	12-SEP-19
Magnesium (Mg)-Total			111.5		%		70-130	12-SEP-19
Manganese (Mn)-Total			100.4		%		70-130	12-SEP-19
Molybdenum (Mo)-Total			98.0		%		70-130	12-SEP-19
Nickel (Ni)-Total			108.0		%		70-130	12-SEP-19
Phosphorus (P)-Total			104.8		%		70-130	12-SEP-19
Potassium (K)-Total			103.5		%		70-130	12-SEP-19
Rubidium (Rb)-Total			107.4		%		70-130	12-SEP-19
Selenium (Se)-Total			106.3		%		70-130	12-SEP-19
Sodium (Na)-Total			107.7		%		70-130	12-SEP-19
Strontium (Sr)-Total			97.2		%		70-130	12-SEP-19
Thallium (Tl)-Total			75.9		%		70-130	12-SEP-19
Uranium (U)-Total			105.1		%		70-130	12-SEP-19
Vanadium (V)-Total			103.3		%		70-130	12-SEP-19
Zinc (Zn)-Total			112.4		%		70-130	12-SEP-19
Zirconium (Zr)-Total			0.25		mg/kg		0.05-0.45	12-SEP-19
WG3155676-2 DUP		**L2323007-59**						
Aluminum (Al)-Total		905	721		mg/kg	23	40	12-SEP-19
Antimony (Sb)-Total		0.036	0.021	J	mg/kg	0.016	0.02	12-SEP-19
Arsenic (As)-Total		0.136	0.125		mg/kg	8.0	40	12-SEP-19
Barium (Ba)-Total		9.13	8.49		mg/kg	7.3	40	12-SEP-19
Beryllium (Be)-Total		0.049	0.038		mg/kg	27	40	12-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155676-2 DUP		**L2323007-59**						
Bismuth (Bi)-Total		0.036	0.035		mg/kg	2.5	40	12-SEP-19
Boron (B)-Total		1.2	1.0		mg/kg	13	40	12-SEP-19
Cadmium (Cd)-Total		0.0475	0.0451		mg/kg	5.3	40	12-SEP-19
Calcium (Ca)-Total		11800	12300		mg/kg	4.7	60	12-SEP-19
Cesium (Cs)-Total		0.134	0.112		mg/kg	18	40	12-SEP-19
Chromium (Cr)-Total		2.39	1.97		mg/kg	20	40	12-SEP-19
Cobalt (Co)-Total		0.657	0.559		mg/kg	16	40	12-SEP-19
Copper (Cu)-Total		2.20	1.94		mg/kg	13	40	12-SEP-19
Iron (Fe)-Total		4600	3800		mg/kg	19	40	12-SEP-19
Lead (Pb)-Total		1.65	1.54		mg/kg	6.8	40	12-SEP-19
Lithium (Li)-Total		0.92	0.74		mg/kg	21	40	12-SEP-19
Magnesium (Mg)-Total		1440	1330		mg/kg	7.5	40	12-SEP-19
Manganese (Mn)-Total		40.5	37.1		mg/kg	8.9	40	12-SEP-19
Molybdenum (Mo)-Total		0.437	0.373		mg/kg	16	40	12-SEP-19
Nickel (Ni)-Total		2.01	1.70		mg/kg	17	40	12-SEP-19
Phosphorus (P)-Total		482	479		mg/kg	0.5	40	12-SEP-19
Potassium (K)-Total		1670	1640		mg/kg	1.5	40	12-SEP-19
Rubidium (Rb)-Total		7.52	7.05		mg/kg	6.5	40	12-SEP-19
Selenium (Se)-Total		0.072	0.065		mg/kg	9.2	40	12-SEP-19
Sodium (Na)-Total		390	393		mg/kg	0.8	40	12-SEP-19
Strontium (Sr)-Total		4.43	4.74		mg/kg	6.7	60	12-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	12-SEP-19
Thallium (Tl)-Total		0.0213	0.0180		mg/kg	16	40	12-SEP-19
Tin (Sn)-Total		0.30	<0.10	DUP-H	mg/kg	N/A	40	12-SEP-19
Uranium (U)-Total		0.220	0.199		mg/kg	9.9	40	12-SEP-19
Vanadium (V)-Total		1.64	1.26		mg/kg	26	40	12-SEP-19
Zinc (Zn)-Total		15.6	15.4		mg/kg	0.8	40	12-SEP-19
Zirconium (Zr)-Total		1.26	1.01		mg/kg	23	40	12-SEP-19
WG3155713-2 DUP		**L2323007-107**						
Aluminum (Al)-Total		449	361		mg/kg	22	40	12-SEP-19
Antimony (Sb)-Total		0.010	<0.010	RPD-NA	mg/kg	N/A	40	12-SEP-19
Arsenic (As)-Total		0.138	0.124		mg/kg	10	40	12-SEP-19
Barium (Ba)-Total		4.26	3.97		mg/kg	6.9	40	12-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155713-2 DUP		**L2323007-107**						
Beryllium (Be)-Total		0.031	0.024		mg/kg	23	40	12-SEP-19
Bismuth (Bi)-Total		0.013	0.013		mg/kg	5.2	40	12-SEP-19
Boron (B)-Total		2.1	1.8		mg/kg	17	40	12-SEP-19
Cadmium (Cd)-Total		0.0253	0.0241		mg/kg	4.9	40	12-SEP-19
Calcium (Ca)-Total		23300	23000		mg/kg	1.5	60	12-SEP-19
Cesium (Cs)-Total		0.133	0.119		mg/kg	11	40	12-SEP-19
Chromium (Cr)-Total		1.18	0.966		mg/kg	20	40	12-SEP-19
Cobalt (Co)-Total		0.308	0.257		mg/kg	18	40	12-SEP-19
Copper (Cu)-Total		1.08	1.01		mg/kg	7.2	40	12-SEP-19
Iron (Fe)-Total		1760	1540		mg/kg	13	40	12-SEP-19
Lead (Pb)-Total		1.53	1.44		mg/kg	6.1	40	12-SEP-19
Lithium (Li)-Total		1.30	1.02		mg/kg	24	40	12-SEP-19
Magnesium (Mg)-Total		1520	1400		mg/kg	8.6	40	12-SEP-19
Manganese (Mn)-Total		27.6	24.9		mg/kg	10	40	12-SEP-19
Molybdenum (Mo)-Total		0.132	0.121		mg/kg	8.8	40	12-SEP-19
Nickel (Ni)-Total		0.85	0.71		mg/kg	17	40	12-SEP-19
Phosphorus (P)-Total		431	452		mg/kg	4.8	40	12-SEP-19
Potassium (K)-Total		1510	1500		mg/kg	0.9	40	12-SEP-19
Rubidium (Rb)-Total		3.36	3.17		mg/kg	5.9	40	12-SEP-19
Selenium (Se)-Total		0.053	0.058		mg/kg	8.3	40	12-SEP-19
Sodium (Na)-Total		346	329		mg/kg	5.0	40	12-SEP-19
Strontium (Sr)-Total		20.4	20.4		mg/kg	0.1	60	12-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	12-SEP-19
Thallium (Tl)-Total		0.0096	0.0081		mg/kg	18	40	12-SEP-19
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	12-SEP-19
Uranium (U)-Total		0.279	0.251		mg/kg	11	40	12-SEP-19
Vanadium (V)-Total		0.92	0.71		mg/kg	26	40	12-SEP-19
Zinc (Zn)-Total		8.87	8.26		mg/kg	7.1	40	12-SEP-19
Zirconium (Zr)-Total		1.34	1.13		mg/kg	17	40	12-SEP-19
WG3155676-4 LCS								
Aluminum (Al)-Total			109.3		%		80-120	12-SEP-19
Antimony (Sb)-Total			98.6		%		80-120	12-SEP-19
Arsenic (As)-Total			101.9		%		80-120	12-SEP-19

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155676-4 LCS								
Barium (Ba)-Total			101.1		%		80-120	12-SEP-19
Beryllium (Be)-Total			105.2		%		80-120	12-SEP-19
Bismuth (Bi)-Total			98.0		%		80-120	12-SEP-19
Boron (B)-Total			101.9		%		80-120	12-SEP-19
Cadmium (Cd)-Total			101.7		%		80-120	12-SEP-19
Calcium (Ca)-Total			99.1		%		80-120	12-SEP-19
Cesium (Cs)-Total			99.1		%		80-120	12-SEP-19
Chromium (Cr)-Total			105.0		%		80-120	12-SEP-19
Cobalt (Co)-Total			104.2		%		80-120	12-SEP-19
Copper (Cu)-Total			101.6		%		80-120	12-SEP-19
Iron (Fe)-Total			97.3		%		80-120	12-SEP-19
Lead (Pb)-Total			101.3		%		80-120	12-SEP-19
Lithium (Li)-Total			104.4		%		80-120	12-SEP-19
Magnesium (Mg)-Total			113.4		%		80-120	12-SEP-19
Manganese (Mn)-Total			104.7		%		80-120	12-SEP-19
Molybdenum (Mo)-Total			105.0		%		80-120	12-SEP-19
Nickel (Ni)-Total			103.3		%		80-120	12-SEP-19
Phosphorus (P)-Total			110.6		%		80-120	12-SEP-19
Potassium (K)-Total			104.9		%		80-120	12-SEP-19
Rubidium (Rb)-Total			103.0		%		80-120	12-SEP-19
Selenium (Se)-Total			100.7		%		80-120	12-SEP-19
Sodium (Na)-Total			110.5		%		80-120	12-SEP-19
Strontium (Sr)-Total			102.8		%		80-120	12-SEP-19
Tellurium (Te)-Total			99.97		%		80-120	12-SEP-19
Thallium (Tl)-Total			99.1		%		80-120	12-SEP-19
Tin (Sn)-Total			102.0		%		80-120	12-SEP-19
Uranium (U)-Total			102.6		%		80-120	12-SEP-19
Vanadium (V)-Total			106.1		%		80-120	12-SEP-19
Zinc (Zn)-Total			100.5		%		80-120	12-SEP-19
Zirconium (Zr)-Total			99.9		%		80-120	12-SEP-19
WG3155713-4 LCS								
Aluminum (Al)-Total			105.7		%		80-120	12-SEP-19
Antimony (Sb)-Total			102.7		%		80-120	12-SEP-19
Arsenic (As)-Total			101.9		%		80-120	12-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155713-4 LCS								
Barium (Ba)-Total			104.2		%		80-120	12-SEP-19
Beryllium (Be)-Total			104.0		%		80-120	12-SEP-19
Bismuth (Bi)-Total			97.7		%		80-120	12-SEP-19
Boron (B)-Total			101.5		%		80-120	12-SEP-19
Cadmium (Cd)-Total			102.8		%		80-120	12-SEP-19
Calcium (Ca)-Total			101.3		%		80-120	12-SEP-19
Cesium (Cs)-Total			101.0		%		80-120	12-SEP-19
Chromium (Cr)-Total			103.4		%		80-120	12-SEP-19
Cobalt (Co)-Total			102.7		%		80-120	12-SEP-19
Copper (Cu)-Total			102.2		%		80-120	12-SEP-19
Iron (Fe)-Total			96.7		%		80-120	12-SEP-19
Lead (Pb)-Total			100.6		%		80-120	12-SEP-19
Lithium (Li)-Total			104.4		%		80-120	12-SEP-19
Magnesium (Mg)-Total			108.5		%		80-120	12-SEP-19
Manganese (Mn)-Total			104.0		%		80-120	12-SEP-19
Molybdenum (Mo)-Total			106.7		%		80-120	12-SEP-19
Nickel (Ni)-Total			103.3		%		80-120	12-SEP-19
Phosphorus (P)-Total			108.8		%		80-120	12-SEP-19
Potassium (K)-Total			101.8		%		80-120	12-SEP-19
Rubidium (Rb)-Total			102.9		%		80-120	12-SEP-19
Selenium (Se)-Total			101.3		%		80-120	12-SEP-19
Sodium (Na)-Total			104.8		%		80-120	12-SEP-19
Strontium (Sr)-Total			106.3		%		80-120	12-SEP-19
Tellurium (Te)-Total			103.7		%		80-120	12-SEP-19
Thallium (Tl)-Total			99.8		%		80-120	12-SEP-19
Tin (Sn)-Total			104.9		%		80-120	12-SEP-19
Uranium (U)-Total			100.3		%		80-120	12-SEP-19
Vanadium (V)-Total			105.4		%		80-120	12-SEP-19
Zinc (Zn)-Total			99.0		%		80-120	12-SEP-19
Zirconium (Zr)-Total			103.3		%		80-120	12-SEP-19
WG3155676-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	12-SEP-19
Antimony (Sb)-Total			<0.010		mg/kg		0.01	12-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	12-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155676-1 MB								
Barium (Ba)-Total			<0.050		mg/kg		0.05	12-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	12-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	12-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	12-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	12-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	12-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	12-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	12-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	12-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	12-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	12-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	12-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	12-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	12-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	12-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	12-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	12-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	12-SEP-19
Potassium (K)-Total			<20		mg/kg		20	12-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	12-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	12-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	12-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	12-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	12-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	12-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	12-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	12-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	12-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	12-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	12-SEP-19
WG3155713-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	12-SEP-19
Antimony (Sb)-Total			<0.010		mg/kg		0.01	12-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	12-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801014								
WG3155713-1 MB								
Barium (Ba)-Total			<0.050		mg/kg		0.05	12-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	12-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	12-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	12-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	12-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	12-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	12-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	12-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	12-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	12-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	12-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	12-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	12-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	12-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	12-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	12-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	12-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	12-SEP-19
Potassium (K)-Total			<20		mg/kg		20	12-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	12-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	12-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	12-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	12-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	12-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	12-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	12-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	12-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	12-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	12-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	12-SEP-19
Batch R4801590								
WG3155849-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			99.8		%		70-130	11-SEP-19
Arsenic (As)-Total			94.0		%		70-130	11-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801590								
WG3155849-3 CRM		**VA-NRC-DORM4**						
Barium (Ba)-Total			101.7		%		70-130	11-SEP-19
Beryllium (Be)-Total			0.015		mg/kg		0.005-0.025	11-SEP-19
Bismuth (Bi)-Total			0.009		mg/kg		0.002-0.022	11-SEP-19
Boron (B)-Total			92.7		%		70-130	11-SEP-19
Cadmium (Cd)-Total			96.0		%		70-130	11-SEP-19
Calcium (Ca)-Total			97.3		%		70-130	11-SEP-19
Cesium (Cs)-Total			94.6		%		70-130	11-SEP-19
Chromium (Cr)-Total			95.9		%		70-130	11-SEP-19
Cobalt (Co)-Total			93.6		%		70-130	11-SEP-19
Copper (Cu)-Total			93.0		%		70-130	11-SEP-19
Iron (Fe)-Total			100.1		%		70-130	11-SEP-19
Lead (Pb)-Total			102.5		%		70-130	11-SEP-19
Lithium (Li)-Total			1.07		mg/kg		0.71-1.71	11-SEP-19
Magnesium (Mg)-Total			91.9		%		70-130	11-SEP-19
Manganese (Mn)-Total			90.9		%		70-130	11-SEP-19
Molybdenum (Mo)-Total			87.6		%		70-130	11-SEP-19
Nickel (Ni)-Total			89.9		%		70-130	11-SEP-19
Phosphorus (P)-Total			95.4		%		70-130	11-SEP-19
Potassium (K)-Total			96.8		%		70-130	11-SEP-19
Rubidium (Rb)-Total			97.8		%		70-130	11-SEP-19
Selenium (Se)-Total			100.1		%		70-130	11-SEP-19
Sodium (Na)-Total			98.7		%		70-130	11-SEP-19
Strontium (Sr)-Total			88.8		%		70-130	11-SEP-19
Thallium (Tl)-Total			74.7		%		70-130	11-SEP-19
Uranium (U)-Total			92.8		%		70-130	11-SEP-19
Vanadium (V)-Total			94.6		%		70-130	11-SEP-19
Zinc (Zn)-Total			104.3		%		70-130	11-SEP-19
Zirconium (Zr)-Total			0.22		mg/kg		0.05-0.45	11-SEP-19
WG3155849-2 DUP		**L2323007-84**						
Aluminum (Al)-Total		237	201		mg/kg	16	40	11-SEP-19
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	11-SEP-19
Arsenic (As)-Total		0.044	0.041		mg/kg	5.0	40	11-SEP-19
Barium (Ba)-Total		7.69	7.52		mg/kg	2.2	40	11-SEP-19
Beryllium (Be)-Total		0.014	0.012					

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801590								
WG3155849-2 DUP		**L2323007-84**						
Beryllium (Be)-Total		0.014	0.012		mg/kg	15	40	11-SEP-19
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	11-SEP-19
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	11-SEP-19
Cadmium (Cd)-Total		0.159	0.156		mg/kg	1.9	40	11-SEP-19
Calcium (Ca)-Total		10600	9730		mg/kg	8.5	60	11-SEP-19
Cesium (Cs)-Total		0.0464	0.0417		mg/kg	11	40	11-SEP-19
Chromium (Cr)-Total		0.574	0.491		mg/kg	16	40	11-SEP-19
Cobalt (Co)-Total		0.193	0.167		mg/kg	14	40	11-SEP-19
Copper (Cu)-Total		1.23	0.81	DUP-H	mg/kg	41	40	11-SEP-19
Iron (Fe)-Total		475	405		mg/kg	16	40	11-SEP-19
Lead (Pb)-Total		0.762	0.707		mg/kg	7.5	40	11-SEP-19
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	11-SEP-19
Magnesium (Mg)-Total		993	934		mg/kg	6.1	40	11-SEP-19
Manganese (Mn)-Total		28.6	27.1		mg/kg	5.3	40	11-SEP-19
Molybdenum (Mo)-Total		0.065	0.050		mg/kg	25	40	11-SEP-19
Nickel (Ni)-Total		0.44	0.35		mg/kg	23	40	11-SEP-19
Phosphorus (P)-Total		530	538		mg/kg	1.7	40	11-SEP-19
Potassium (K)-Total		1840	1900		mg/kg	2.9	40	11-SEP-19
Rubidium (Rb)-Total		4.83	4.79		mg/kg	0.7	40	11-SEP-19
Selenium (Se)-Total		0.075	0.076		mg/kg	1.3	40	11-SEP-19
Sodium (Na)-Total		331	314		mg/kg	5.3	40	11-SEP-19
Strontium (Sr)-Total		6.08	5.90		mg/kg	3.0	60	11-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	11-SEP-19
Thallium (Tl)-Total		0.0052	0.0046		mg/kg	11	40	11-SEP-19
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	11-SEP-19
Uranium (U)-Total		0.0338	0.0292		mg/kg	15	40	11-SEP-19
Vanadium (V)-Total		0.48	0.39		mg/kg	21	40	11-SEP-19
Zinc (Zn)-Total		26.3	25.3		mg/kg	3.8	40	11-SEP-19
Zirconium (Zr)-Total		0.48	0.39		mg/kg	20	40	11-SEP-19
WG3155849-4 LCS								
Aluminum (Al)-Total			99.3		%		80-120	11-SEP-19
Antimony (Sb)-Total			95.0		%		80-120	11-SEP-19
Arsenic (As)-Total			97.6		%		80-120	11-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801590								
WG3155849-4 LCS								
Barium (Ba)-Total			99.2		%		80-120	11-SEP-19
Beryllium (Be)-Total			99.5		%		80-120	11-SEP-19
Bismuth (Bi)-Total			92.0		%		80-120	11-SEP-19
Boron (B)-Total			98.3		%		80-120	11-SEP-19
Cadmium (Cd)-Total			95.4		%		80-120	11-SEP-19
Calcium (Ca)-Total			97.9		%		80-120	11-SEP-19
Cesium (Cs)-Total			96.6		%		80-120	11-SEP-19
Chromium (Cr)-Total			97.0		%		80-120	11-SEP-19
Cobalt (Co)-Total			95.2		%		80-120	11-SEP-19
Copper (Cu)-Total			95.4		%		80-120	11-SEP-19
Iron (Fe)-Total			105.3		%		80-120	11-SEP-19
Lead (Pb)-Total			95.2		%		80-120	11-SEP-19
Lithium (Li)-Total			96.7		%		80-120	11-SEP-19
Magnesium (Mg)-Total			100.8		%		80-120	11-SEP-19
Manganese (Mn)-Total			97.4		%		80-120	11-SEP-19
Molybdenum (Mo)-Total			99.6		%		80-120	11-SEP-19
Nickel (Ni)-Total			95.8		%		80-120	11-SEP-19
Phosphorus (P)-Total			104.9		%		80-120	11-SEP-19
Potassium (K)-Total			100.9		%		80-120	11-SEP-19
Rubidium (Rb)-Total			97.5		%		80-120	11-SEP-19
Selenium (Se)-Total			99.9		%		80-120	11-SEP-19
Sodium (Na)-Total			102.3		%		80-120	11-SEP-19
Strontium (Sr)-Total			99.3		%		80-120	11-SEP-19
Tellurium (Te)-Total			97.5		%		80-120	11-SEP-19
Thallium (Tl)-Total			94.4		%		80-120	11-SEP-19
Tin (Sn)-Total			94.4		%		80-120	11-SEP-19
Uranium (U)-Total			98.2		%		80-120	11-SEP-19
Vanadium (V)-Total			99.0		%		80-120	11-SEP-19
Zinc (Zn)-Total			95.6		%		80-120	11-SEP-19
Zirconium (Zr)-Total			96.1		%		80-120	11-SEP-19
WG3155849-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	11-SEP-19
Antimony (Sb)-Total			<0.010		mg/kg		0.01	11-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	11-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4801590								
WG3155849-1 MB								
Barium (Ba)-Total			<0.050		mg/kg		0.05	11-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	11-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	11-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	11-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	11-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	11-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	11-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	11-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	11-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	11-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	11-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	11-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	11-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	11-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	11-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	11-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	11-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	11-SEP-19
Potassium (K)-Total			<20		mg/kg		20	11-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	11-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	11-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	11-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	11-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	11-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	11-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	11-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	11-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	11-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	11-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	11-SEP-19
Batch R4806335								
WG3160009-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			109.6		%		70-130	13-SEP-19
Arsenic (As)-Total			101.7		%		70-130	13-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4806335								
WG3160009-3 CRM		**VA-NRC-DORM4**						
Barium (Ba)-Total			107.0		%		70-130	13-SEP-19
Beryllium (Be)-Total			0.014		mg/kg		0.005-0.025	13-SEP-19
Bismuth (Bi)-Total			0.013		mg/kg		0.002-0.022	13-SEP-19
Boron (B)-Total			94.2		%		70-130	13-SEP-19
Cadmium (Cd)-Total			103.2		%		70-130	13-SEP-19
Calcium (Ca)-Total			102.8		%		70-130	13-SEP-19
Cesium (Cs)-Total			95.4		%		70-130	13-SEP-19
Chromium (Cr)-Total			113.4		%		70-130	13-SEP-19
Cobalt (Co)-Total			103.5		%		70-130	13-SEP-19
Copper (Cu)-Total			100.3		%		70-130	13-SEP-19
Iron (Fe)-Total			109.3		%		70-130	13-SEP-19
Lead (Pb)-Total			103.5		%		70-130	13-SEP-19
Lithium (Li)-Total			1.10		mg/kg		0.71-1.71	13-SEP-19
Magnesium (Mg)-Total			106.1		%		70-130	13-SEP-19
Manganese (Mn)-Total			99.6		%		70-130	13-SEP-19
Molybdenum (Mo)-Total			95.5		%		70-130	13-SEP-19
Nickel (Ni)-Total			96.6		%		70-130	13-SEP-19
Phosphorus (P)-Total			101.1		%		70-130	13-SEP-19
Potassium (K)-Total			108.1		%		70-130	13-SEP-19
Rubidium (Rb)-Total			109.8		%		70-130	13-SEP-19
Selenium (Se)-Total			106.6		%		70-130	13-SEP-19
Sodium (Na)-Total			111.1		%		70-130	13-SEP-19
Strontium (Sr)-Total			95.2		%		70-130	13-SEP-19
Thallium (Tl)-Total			64.0	MES	%		70-130	13-SEP-19
Uranium (U)-Total			92.3		%		70-130	13-SEP-19
Vanadium (V)-Total			104.7		%		70-130	13-SEP-19
Zinc (Zn)-Total			109.4		%		70-130	13-SEP-19
Zirconium (Zr)-Total			0.35		mg/kg		0.05-0.45	13-SEP-19
WG3160009-2 DUP		**L2323007-101**						
Aluminum (Al)-Total		222	256		mg/kg	14	40	13-SEP-19
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	13-SEP-19
Arsenic (As)-Total		0.079	0.082		mg/kg	3.5	40	13-SEP-19
Barium (Ba)-Total		4.95	5.52		mg/kg	11	40	13-SEP-19
Beryllium (Be)-Total		0.015	0.019					

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4806335								
WG3160009-2 DUP		**L2323007-101**						
Beryllium (Be)-Total		0.015	0.019		mg/kg	23	40	13-SEP-19
Bismuth (Bi)-Total		0.012	0.014		mg/kg	14	40	13-SEP-19
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	13-SEP-19
Cadmium (Cd)-Total		0.0536	0.0561		mg/kg	4.5	40	13-SEP-19
Calcium (Ca)-Total		24400	26000		mg/kg	6.2	60	13-SEP-19
Cesium (Cs)-Total		0.0902	0.100		mg/kg	10	40	13-SEP-19
Chromium (Cr)-Total		0.577	0.675		mg/kg	16	40	13-SEP-19
Cobalt (Co)-Total		0.148	0.169		mg/kg	13	40	13-SEP-19
Copper (Cu)-Total		0.92	1.02		mg/kg	10	40	13-SEP-19
Iron (Fe)-Total		1240	1440		mg/kg	15	40	13-SEP-19
Lead (Pb)-Total		1.33	1.44		mg/kg	8.4	40	13-SEP-19
Lithium (Li)-Total		<0.50	0.55	RPD-NA	mg/kg	N/A	40	13-SEP-19
Magnesium (Mg)-Total		736	842		mg/kg	13	40	13-SEP-19
Manganese (Mn)-Total		22.6	25.0		mg/kg	10	40	13-SEP-19
Molybdenum (Mo)-Total		0.155	0.142		mg/kg	8.6	40	13-SEP-19
Nickel (Ni)-Total		0.46	0.55		mg/kg	17	40	13-SEP-19
Phosphorus (P)-Total		306	325		mg/kg	6.0	40	13-SEP-19
Potassium (K)-Total		1190	1280		mg/kg	7.6	40	13-SEP-19
Rubidium (Rb)-Total		3.98	4.22		mg/kg	6.0	40	13-SEP-19
Selenium (Se)-Total		0.061	0.069		mg/kg	11	40	13-SEP-19
Sodium (Na)-Total		296	332		mg/kg	12	40	13-SEP-19
Strontium (Sr)-Total		19.6	20.6		mg/kg	5.1	60	13-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	13-SEP-19
Thallium (Tl)-Total		0.0049	0.0057		mg/kg	14	40	13-SEP-19
Tin (Sn)-Total		0.24	0.62		mg/kg	24	40	13-SEP-19
Uranium (U)-Total		0.228	0.252		mg/kg	10	40	13-SEP-19
Vanadium (V)-Total		0.39	0.44		mg/kg	12	40	13-SEP-19
Zinc (Zn)-Total		10.5	11.6		mg/kg	10	40	13-SEP-19
Zirconium (Zr)-Total		0.73	0.81		mg/kg	11	40	13-SEP-19
WG3160009-4 LCS								
Aluminum (Al)-Total			104.6		%		80-120	13-SEP-19
Antimony (Sb)-Total			100.3		%		80-120	13-SEP-19
Arsenic (As)-Total			101.8		%		80-120	13-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4806335								
WG3160009-4 LCS								
Barium (Ba)-Total			104.0		%		80-120	13-SEP-19
Beryllium (Be)-Total			100.0		%		80-120	13-SEP-19
Bismuth (Bi)-Total			100.8		%		80-120	13-SEP-19
Boron (B)-Total			101.8		%		80-120	13-SEP-19
Cadmium (Cd)-Total			103.4		%		80-120	13-SEP-19
Calcium (Ca)-Total			100.3		%		80-120	13-SEP-19
Cesium (Cs)-Total			99.0		%		80-120	13-SEP-19
Chromium (Cr)-Total			105.2		%		80-120	13-SEP-19
Cobalt (Co)-Total			100.4		%		80-120	13-SEP-19
Copper (Cu)-Total			100.1		%		80-120	13-SEP-19
Iron (Fe)-Total			91.4		%		80-120	13-SEP-19
Lead (Pb)-Total			104.8		%		80-120	13-SEP-19
Lithium (Li)-Total			99.9		%		80-120	13-SEP-19
Magnesium (Mg)-Total			110.6		%		80-120	13-SEP-19
Manganese (Mn)-Total			102.7		%		80-120	13-SEP-19
Molybdenum (Mo)-Total			99.9		%		80-120	13-SEP-19
Nickel (Ni)-Total			101.9		%		80-120	13-SEP-19
Phosphorus (P)-Total			106.9		%		80-120	13-SEP-19
Potassium (K)-Total			104.8		%		80-120	13-SEP-19
Rubidium (Rb)-Total			106.0		%		80-120	13-SEP-19
Selenium (Se)-Total			98.0		%		80-120	13-SEP-19
Sodium (Na)-Total			107.2		%		80-120	13-SEP-19
Strontium (Sr)-Total			100.7		%		80-120	13-SEP-19
Tellurium (Te)-Total			103.4		%		80-120	13-SEP-19
Thallium (Tl)-Total			100.3		%		80-120	13-SEP-19
Tin (Sn)-Total			96.7		%		80-120	13-SEP-19
Uranium (U)-Total			99.8		%		80-120	13-SEP-19
Vanadium (V)-Total			105.0		%		80-120	13-SEP-19
Zinc (Zn)-Total			97.1		%		80-120	13-SEP-19
Zirconium (Zr)-Total			98.3		%		80-120	13-SEP-19
WG3160009-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	13-SEP-19
Antimony (Sb)-Total			<0.010		mg/kg		0.01	13-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	13-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4806335								
WG3160009-1 MB								
Barium (Ba)-Total			<0.050		mg/kg		0.05	13-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	13-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	13-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	13-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	13-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	13-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	13-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	13-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	13-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	13-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	13-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	13-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	13-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	13-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	13-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	13-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	13-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	13-SEP-19
Potassium (K)-Total			<20		mg/kg		20	13-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	13-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	13-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	13-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	13-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	13-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	13-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	13-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	13-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	13-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	13-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	13-SEP-19
Batch R4820450								
WG3162496-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			103.7		%		70-130	18-SEP-19
Arsenic (As)-Total			97.2		%		70-130	18-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4820450								
WG3162496-3 CRM		**VA-NRC-DORM4**						
Barium (Ba)-Total			101.9		%		70-130	18-SEP-19
Beryllium (Be)-Total			0.014		mg/kg		0.005-0.025	18-SEP-19
Bismuth (Bi)-Total			0.012		mg/kg		0.002-0.022	18-SEP-19
Boron (B)-Total			92.0		%		70-130	18-SEP-19
Cadmium (Cd)-Total			97.5		%		70-130	18-SEP-19
Calcium (Ca)-Total			97.2		%		70-130	18-SEP-19
Cesium (Cs)-Total			92.0		%		70-130	18-SEP-19
Chromium (Cr)-Total			99.2		%		70-130	18-SEP-19
Cobalt (Co)-Total			97.6		%		70-130	18-SEP-19
Copper (Cu)-Total			95.9		%		70-130	18-SEP-19
Iron (Fe)-Total			101.7		%		70-130	18-SEP-19
Lead (Pb)-Total			104.0		%		70-130	18-SEP-19
Lithium (Li)-Total			1.05		mg/kg		0.71-1.71	18-SEP-19
Magnesium (Mg)-Total			101.7		%		70-130	18-SEP-19
Manganese (Mn)-Total			92.7		%		70-130	18-SEP-19
Molybdenum (Mo)-Total			91.0		%		70-130	18-SEP-19
Nickel (Ni)-Total			96.5		%		70-130	18-SEP-19
Phosphorus (P)-Total			99.3		%		70-130	18-SEP-19
Potassium (K)-Total			103.7		%		70-130	18-SEP-19
Rubidium (Rb)-Total			101.2		%		70-130	18-SEP-19
Selenium (Se)-Total			99.9		%		70-130	18-SEP-19
Sodium (Na)-Total			101.7		%		70-130	18-SEP-19
Strontium (Sr)-Total			91.6		%		70-130	18-SEP-19
Thallium (Tl)-Total			72.3		%		70-130	18-SEP-19
Uranium (U)-Total			87.4		%		70-130	18-SEP-19
Vanadium (V)-Total			101.4		%		70-130	18-SEP-19
Zinc (Zn)-Total			104.5		%		70-130	18-SEP-19
Zirconium (Zr)-Total			0.22		mg/kg		0.05-0.45	18-SEP-19
WG3162496-2 DUP		**L2323007-83**						
Aluminum (Al)-Total		226	233		mg/kg	3.1	40	18-SEP-19
Antimony (Sb)-Total		0.016	<0.010	RPD-NA	mg/kg	N/A	40	18-SEP-19
Arsenic (As)-Total		0.049	0.056		mg/kg	13	40	18-SEP-19
Barium (Ba)-Total		7.75	7.93		mg/kg	2.3	40	18-SEP-19
Beryllium (Be)-Total		0.013	0.012					

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4820450								
WG3162496-2 DUP		**L2323007-83**						
Beryllium (Be)-Total		0.013	0.012		mg/kg	13	40	18-SEP-19
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	18-SEP-19
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	18-SEP-19
Cadmium (Cd)-Total		0.189	0.183		mg/kg	3.1	40	18-SEP-19
Calcium (Ca)-Total		10500	10700		mg/kg	1.9	60	18-SEP-19
Cesium (Cs)-Total		0.0438	0.0448		mg/kg	2.4	40	18-SEP-19
Chromium (Cr)-Total		0.647	0.614		mg/kg	5.4	40	18-SEP-19
Cobalt (Co)-Total		0.194	0.203		mg/kg	4.6	40	18-SEP-19
Copper (Cu)-Total		0.84	0.84		mg/kg	0.1	40	18-SEP-19
Iron (Fe)-Total		470	489		mg/kg	4.0	40	18-SEP-19
Lead (Pb)-Total		0.821	0.808		mg/kg	1.5	40	18-SEP-19
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	18-SEP-19
Magnesium (Mg)-Total		1040	1090		mg/kg	4.2	40	18-SEP-19
Manganese (Mn)-Total		28.8	30.0		mg/kg	4.3	40	18-SEP-19
Molybdenum (Mo)-Total		0.045	0.055		mg/kg	20	40	18-SEP-19
Nickel (Ni)-Total		0.42	0.44		mg/kg	2.4	40	18-SEP-19
Phosphorus (P)-Total		486	507		mg/kg	4.2	40	18-SEP-19
Potassium (K)-Total		1820	1940		mg/kg	6.5	40	18-SEP-19
Rubidium (Rb)-Total		4.62	4.77		mg/kg	3.3	40	18-SEP-19
Selenium (Se)-Total		0.075	0.093		mg/kg	21	40	18-SEP-19
Sodium (Na)-Total		348	380		mg/kg	8.6	40	18-SEP-19
Strontium (Sr)-Total		5.53	5.70		mg/kg	2.9	60	18-SEP-19
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	18-SEP-19
Thallium (Tl)-Total		0.0058	0.0050		mg/kg	15	40	18-SEP-19
Tin (Sn)-Total		0.15	0.14		mg/kg	5.0	40	18-SEP-19
Uranium (U)-Total		0.0334	0.0316		mg/kg	5.5	40	18-SEP-19
Vanadium (V)-Total		0.51	0.47		mg/kg	10	40	18-SEP-19
Zinc (Zn)-Total		27.5	29.0		mg/kg	5.3	40	18-SEP-19
Zirconium (Zr)-Total		0.43	0.44		mg/kg	1.6	40	18-SEP-19
WG3162496-4 LCS								
Aluminum (Al)-Total			110.9		%		80-120	18-SEP-19
Antimony (Sb)-Total			96.5		%		80-120	18-SEP-19
Arsenic (As)-Total			108.6		%		80-120	18-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4820450								
WG3162496-4 LCS								
Barium (Ba)-Total			109.2		%		80-120	18-SEP-19
Beryllium (Be)-Total			101.5		%		80-120	18-SEP-19
Bismuth (Bi)-Total			101.6		%		80-120	18-SEP-19
Boron (B)-Total			99.8		%		80-120	18-SEP-19
Cadmium (Cd)-Total			97.7		%		80-120	18-SEP-19
Calcium (Ca)-Total			102.4		%		80-120	18-SEP-19
Cesium (Cs)-Total			100.2		%		80-120	18-SEP-19
Chromium (Cr)-Total			107.7		%		80-120	18-SEP-19
Cobalt (Co)-Total			107.6		%		80-120	18-SEP-19
Copper (Cu)-Total			106.8		%		80-120	18-SEP-19
Iron (Fe)-Total			102.8		%		80-120	18-SEP-19
Lead (Pb)-Total			103.1		%		80-120	18-SEP-19
Lithium (Li)-Total			103.1		%		80-120	18-SEP-19
Magnesium (Mg)-Total			117.5		%		80-120	18-SEP-19
Manganese (Mn)-Total			109.3		%		80-120	18-SEP-19
Molybdenum (Mo)-Total			103.5		%		80-120	18-SEP-19
Nickel (Ni)-Total			107.3		%		80-120	18-SEP-19
Phosphorus (P)-Total			117.8		%		80-120	18-SEP-19
Potassium (K)-Total			112.5		%		80-120	18-SEP-19
Rubidium (Rb)-Total			108.2		%		80-120	18-SEP-19
Selenium (Se)-Total			103.4		%		80-120	18-SEP-19
Sodium (Na)-Total			112.1		%		80-120	18-SEP-19
Strontium (Sr)-Total			105.2		%		80-120	18-SEP-19
Tellurium (Te)-Total			96.7		%		80-120	18-SEP-19
Thallium (Tl)-Total			100.3		%		80-120	18-SEP-19
Tin (Sn)-Total			97.7		%		80-120	18-SEP-19
Uranium (U)-Total			99.96		%		80-120	18-SEP-19
Vanadium (V)-Total			111.9		%		80-120	18-SEP-19
Zinc (Zn)-Total			102.2		%		80-120	18-SEP-19
Zirconium (Zr)-Total			99.8		%		80-120	18-SEP-19
WG3162496-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	18-SEP-19
Antimony (Sb)-Total			<0.010		mg/kg		0.01	18-SEP-19
Arsenic (As)-Total			<0.020		mg/kg		0.02	18-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R4820450								
WG3162496-1 MB								
Barium (Ba)-Total			<0.050		mg/kg		0.05	18-SEP-19
Beryllium (Be)-Total			<0.010		mg/kg		0.01	18-SEP-19
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	18-SEP-19
Boron (B)-Total			<1.0		mg/kg		1	18-SEP-19
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	18-SEP-19
Calcium (Ca)-Total			<20		mg/kg		20	18-SEP-19
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	18-SEP-19
Chromium (Cr)-Total			<0.050		mg/kg		0.05	18-SEP-19
Cobalt (Co)-Total			<0.020		mg/kg		0.02	18-SEP-19
Copper (Cu)-Total			<0.10		mg/kg		0.1	18-SEP-19
Iron (Fe)-Total			<3.0		mg/kg		3	18-SEP-19
Lead (Pb)-Total			<0.020		mg/kg		0.02	18-SEP-19
Lithium (Li)-Total			<0.50		mg/kg		0.5	18-SEP-19
Magnesium (Mg)-Total			<2.0		mg/kg		2	18-SEP-19
Manganese (Mn)-Total			<0.050		mg/kg		0.05	18-SEP-19
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	18-SEP-19
Nickel (Ni)-Total			<0.20		mg/kg		0.2	18-SEP-19
Phosphorus (P)-Total			<10		mg/kg		10	18-SEP-19
Potassium (K)-Total			<20		mg/kg		20	18-SEP-19
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	18-SEP-19
Selenium (Se)-Total			<0.050		mg/kg		0.05	18-SEP-19
Sodium (Na)-Total			<20		mg/kg		20	18-SEP-19
Strontium (Sr)-Total			<0.050		mg/kg		0.05	18-SEP-19
Tellurium (Te)-Total			<0.020		mg/kg		0.02	18-SEP-19
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	18-SEP-19
Tin (Sn)-Total			<0.10		mg/kg		0.1	18-SEP-19
Uranium (U)-Total			<0.0020		mg/kg		0.002	18-SEP-19
Vanadium (V)-Total			<0.10		mg/kg		0.1	18-SEP-19
Zinc (Zn)-Total			<0.50		mg/kg		0.5	18-SEP-19
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	18-SEP-19
MOISTURE-BIOPSY-VA	**Tissue**							

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-BIOPSY-VA	**Tissue**							
Batch R4809439								
WG3158616-2 LCS								
% Moisture			99.9		%		90-110	12-SEP-19
WG3158616-1 MB								
% Moisture			<2.0		%		2	12-SEP-19
MOISTURE-MICR-VA	**Tissue**							
Batch R4809300								
WG3154480-3 DUP		**L2322812-11**						
% Moisture		3.5	4.6	J	%	1.1	4	11-SEP-19
WG3154480-2 LCS								
% Moisture			100.0		%		90-110	11-SEP-19
WG3154480-1 MB								
% Moisture			<2.0		%		2	11-SEP-19
MOISTURE-TISS-VA	**Tissue**							
Batch R4760772								
WG3135924-2 LCS								
% Moisture			100.5		%		90-110	17-AUG-19
WG3135924-1 MB								
% Moisture			<0.50		%		0.5	17-AUG-19
Batch R4760808								
WG3137147-2 LCS								
% Moisture			100.2		%		90-110	17-AUG-19
WG3137147-1 MB								
% Moisture			<0.50		%		0.5	17-AUG-19
Batch R4761554								
WG3135854-5 LCS								
% Moisture			100.2		%		90-110	17-AUG-19
WG3135854-4 MB								
% Moisture			<0.50		%		0.5	17-AUG-19
Batch R4783577								
WG3150839-3 DUP		**L2323007-32**						
% Moisture		58.7	60.3		%	2.7	20	04-SEP-19
WG3150839-2 LCS								
% Moisture			100.3		%		90-110	04-SEP-19
WG3150839-1 MB								
% Moisture			<0.50		%		0.5	04-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-TISS-VA	**Tissue**							
Batch R4783612								
WG3152081-4 DUP		**L2323007-113**						
% Moisture		15.3	15.1		%	1.0	20	04-SEP-19
WG3152081-2 LCS								
% Moisture			100.6		%		90-110	04-SEP-19
WG3152081-1 MB								
% Moisture			<0.50		%		0.5	04-SEP-19
Batch R4783658								
WG3151704-3 DUP		**L2323007-62**						
% Moisture		68.2	70.8		%	3.7	20	04-SEP-19
WG3151704-2 LCS								
% Moisture			100.4		%		90-110	04-SEP-19
WG3151704-1 MB								
% Moisture			<0.50		%		0.5	04-SEP-19
Batch R4819229								
WG3165460-3 DUP		**L2323007-65**						
% Moisture		65.7	67.0		%	2.0	20	10-SEP-19
WG3165460-2 LCS								
% Moisture			100.2		%		90-110	10-SEP-19
WG3165460-1 MB								
% Moisture			<0.50		%		0.5	10-SEP-19
Batch R4819240								
WG3165469-3 DUP		**L2323007-26**						
% Moisture		51.3	57.5		%	11	20	11-SEP-19
WG3165469-2 LCS								
% Moisture			100.0		%		90-110	11-SEP-19
WG3165469-1 MB								
% Moisture			<0.50		%		0.5	11-SEP-19
TI-DRY-CCMS-N-VA	**Tissue**							
Batch R4765213								
WG3137853-4 LCS								
Titanium (Ti)-Total			102.5		%		80-120	21-AUG-19
WG3137853-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	21-AUG-19
Batch R4766153								
WG3137853-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			99.1		%		70-130	23-AUG-19
WG3137853-2 DUP		**L2323007-87**						
Titanium (Ti)-Total		7.94	7.63					

Quality Control Report

Workorder: L2323007 Report Date: 19-SEP-19

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TI-DRY-CCMS-N-VA	**Tissue**							
Batch R4766153								
WG3137853-2 DUP		**L2323007-87**						
Titanium (Ti)-Total		7.94	7.63		mg/kg	3.9	40	23-AUG-19
Batch R4769163								
WG3140170-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			137.4	MES	%		70-130	26-AUG-19
WG3140170-2 DUP		**L2323007-3**						
Titanium (Ti)-Total		18.6	18.8		mg/kg	1.2	40	26-AUG-19
WG3140170-4 LCS								
Titanium (Ti)-Total			101.1		%		80-120	26-AUG-19
WG3140170-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	26-AUG-19
Batch R4773609								
WG3138058-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			127.4		%		70-130	27-AUG-19
WG3138058-5 DUP		**L2323007-206**						
Titanium (Ti)-Total		79.2	78.4		mg/kg	1.0	40	27-AUG-19
WG3138058-4 LCS								
Titanium (Ti)-Total			103.0		%		80-120	27-AUG-19
WG3138058-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	27-AUG-19
Batch R4789470								
WG3141571-7 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			80.6		%		70-130	06-SEP-19
WG3141571-6 DUP		**L2323007-207**						
Titanium (Ti)-Total		67.6	70.4		mg/kg	4.1	40	06-SEP-19
WG3141571-8 LCS								
Titanium (Ti)-Total			101.4		%		80-120	06-SEP-19
WG3141571-5 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	06-SEP-19
Batch R4793108								
WG3141248-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			103.2		%		70-130	09-SEP-19
WG3141248-2 DUP		**L2323007-185**						
Titanium (Ti)-Total		18.1	19.8		mg/kg	8.8	40	09-SEP-19
WG3141248-4 LCS								
Titanium (Ti)-Total			104.5		%		80-120	09-SEP-19
WG3141248-1 MB								

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TI-DRY-CCMS-N-VA	**Tissue**							
Batch R4793108								
WG3141248-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	09-SEP-19
Batch R4801014								
WG3155676-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			97.7		%		70-130	12-SEP-19
WG3155713-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			98.6		%		70-130	12-SEP-19
WG3155676-2 DUP		**L2323007-59**						
Titanium (Ti)-Total		57.9	42.9		mg/kg	30	40	12-SEP-19
WG3155713-2 DUP		**L2323007-107**						
Titanium (Ti)-Total		17.3	13.7		mg/kg	23	40	12-SEP-19
WG3155676-4 LCS								
Titanium (Ti)-Total			98.1		%		80-120	12-SEP-19
WG3155713-4 LCS								
Titanium (Ti)-Total			100.3		%		80-120	12-SEP-19
WG3155676-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	12-SEP-19
WG3155713-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	12-SEP-19
Batch R4801590								
WG3155849-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			104.3		%		70-130	11-SEP-19
WG3155849-2 DUP		**L2323007-84**						
Titanium (Ti)-Total		17.2	15.0		mg/kg	14	40	11-SEP-19
WG3155849-4 LCS								
Titanium (Ti)-Total			96.7		%		80-120	11-SEP-19
WG3155849-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	11-SEP-19
Batch R4806335								
WG3160009-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			92.9		%		70-130	13-SEP-19
WG3160009-2 DUP		**L2323007-101**						
Titanium (Ti)-Total		9.83	11.7		mg/kg	18	40	13-SEP-19
WG3160009-4 LCS								
Titanium (Ti)-Total			100.5		%		80-120	13-SEP-19
WG3160009-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	13-SEP-19

Quality Control Report

Client: EDI ENVIRONMENTAL DYNAMICS INC.
2195 Second Avenue
Whitehorse YT Y1A 3T8
Contact: Brett Pagacz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TI-DRY-CCMS-N-VA	**Tissue**							
Batch R4820450								
WG3162496-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			108.3		%		70-130	18-SEP-19
WG3162496-2 DUP		**L2323007-83**						
Titanium (Ti)-Total		18.7	18.1		mg/kg	3.1	40	18-SEP-19
WG3162496-4 LCS								
Titanium (Ti)-Total			105.3		%		80-120	18-SEP-19
WG3162496-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	18-SEP-19

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
% Moisture							
	22	23-JUL-19	08-AUG-19 08:55	14	16	days	EHTR
	25	23-JUL-19	08-AUG-19 08:56	14	16	days	EHTR
	28	23-JUL-19	08-AUG-19 08:57	14	16	days	EHTR
	31	23-JUL-19	08-AUG-19 08:58	14	16	days	EHTR
	34	23-JUL-19	08-AUG-19 08:59	14	16	days	EHTR
	37	23-JUL-19	08-AUG-19 09:00	14	16	days	EHTR
	40	12-JUL-19	08-AUG-19 09:01	14	27	days	EHTR
	43	12-JUL-19	08-AUG-19 09:02	14	27	days	EHTR
	46	12-JUL-19	08-AUG-19 09:03	14	27	days	EHTR
	49	13-JUL-19	08-AUG-19 09:04	14	26	days	EHTR
	52	13-JUL-19	08-AUG-19 15:13	14	26	days	EHTR
	55	13-JUL-19	08-AUG-19 15:14	14	26	days	EHTR
	58	13-JUL-19	08-AUG-19 15:15	14	26	days	EHTR
	61	12-JUL-19	08-AUG-19 15:16	14	27	days	EHTR
	64	12-JUL-19	08-AUG-19 15:17	14	27	days	EHTR
	67	12-JUL-19	08-AUG-19 15:18	14	27	days	EHTR
	85	16-JUL-19	08-AUG-19 15:19	14	23	days	EHTR
	136	13-JUL-19	08-AUG-19 15:20	14	26	days	EHTR
	139	23-JUL-19	08-AUG-19 15:22	14	16	days	EHTR
	142	23-JUL-19	08-AUG-19 15:23	14	16	days	EHTR
	145	23-JUL-19	08-AUG-19 15:24	14	16	days	EHTR
	148	23-JUL-19	08-AUG-19 15:25	14	16	days	EHTR
	151	23-JUL-19	08-AUG-19 15:26	14	16	days	EHTR
	154	23-JUL-19	08-AUG-19 15:27	14	16	days	EHTR
	157	15-JUL-19	08-AUG-19 15:28	14	24	days	EHTR
	160	15-JUL-19	08-AUG-19 15:29	14	24	days	EHTR
	163	20-JUL-19	08-AUG-19 15:30	14	19	days	EHTR
	166	20-JUL-19	08-AUG-19 15:31	14	19	days	EHTR
	169	20-JUL-19	08-AUG-19 15:32	14	19	days	EHTR
	172	16-JUL-19	08-AUG-19 15:33	14	23	days	EHTR
	175	18-JUL-19	08-AUG-19 15:17	14	21	days	EHTR
	178	18-JUL-19	08-AUG-19 15:18	14	21	days	EHTR
	181	18-JUL-19	08-AUG-19 15:19	14	21	days	EHTR
	184	20-JUL-19	08-AUG-19 15:20	14	19	days	EHTR
	187	20-JUL-19	08-AUG-19 15:22	14	19	days	EHTR
	190	20-JUL-19	08-AUG-19 15:23	14	19	days	EHTR
	193	20-JUL-19	08-AUG-19 15:24	14	19	days	EHTR
	196	23-JUL-19	08-AUG-19 15:25	14	16	days	EHTR
	199	23-JUL-19	08-AUG-19 15:26	14	16	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2323007 were received on 06-AUG-19 14:20.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytic Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 1 of 12

Report To	Contact and company name below will appear on the final report	
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine	
Contact:	Brett Pagacz	
Phone:	867-393-4882	
	Company address below will appear on the final report	
Street:	2195 Second Ave	
City/Province:	Whitehorse, YT	
Postal Code:	Y1A 3T8	
Invoice To	Same as Report To	☐ YES ☑ NO
	Copy of Invoice with Report	☐ YES ☑ NO
Company:	Baffinland Iron Mine	
Contact:		

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)

- **4 day [P4-20%]** ☐
- **3 day [P3-25%]** ☐
- **2 day [P2-50%]** ☐

EMERGENCY

- **1 Business day [E - 100%]** ☐
- **Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]** ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

ALS Lab Work Order # (lab use only): L2323007 AP

Oil and Gas Required Fields (client use)

AFE/Cost Center:

PO#

Major/Minor Code:

Routing Code:

Requisitioner:

Location:

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
1	L-118	24-Jul-19		SOIL	1	R	R	R	R					
2,3	L-118	24-Jul-19		TISSUE	1					R	R	R		
4	L-118-R	24-Jul-19		SOIL	1	R	R	R	R					
5,6	L-118-R	24-Jul-19		TISSUE	1					R	R	R		
7	L-119	24-Jul-19		SOIL	1	R	R	R	R					
8,9	L-119	24-Jul-19		TISSUE	1					R	R	R		
10	L-120	24-Jul-19		SOIL	1	R	R	R	R					
11,12	L-120	24-Jul-19		TISSUE	1					R	R	R		
13	L-121	24-Jul-19		SOIL	1	R	R	R	R					
14,15	L-121	24-Jul-19		TISSUE	1					R	R	R		
16	L-121-R	24-Jul-19		SOIL	1	R	R	R	R					
17,18	L-121-R	24-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue sample in half + conduct pre + post wash analysis

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Brett Pagacz	Date: July 31, 2019	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 6/19	Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 2 of 12

Report To Contact and company name below will appear on the final report
Company: EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact: Brett Pagacz
Phone: 867-393-4882
Company address below will appear on the final report
Street: 2195 Second Ave
City/Province: Whitehorse, YT
Postal Code: Y1A 3T8

Invoice To Same as Report To ☐ YES ☑ NO
Copy of Invoice with Report ☐ YES ☑ NO
Company: Baffinland Iron Mine
Contact:

Report Format / Dis
Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax bimww@alsglobal.com
Email 2 bimcore@alsglobal.com
Email 3 bpagacz@edynamics.com

Invoice Distribution
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@baffinland.com,commercial@baffinland.com
Email 2

ntact your AM to confirm all E&P TATs (surcharges may apply)
Regular [R] ☑ .AT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐
EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Project Information
ALS Account # / Quote #: EDI100, Q71319
Job #: BIM Soil and Lichen Tissue - Trace Metals
PO / AFE: 4500057496
LSD:

Oil and Gas Required Fields (client use)
AFE/Cost Center:
PO#
Major/Minor Code:
Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):
ALS Contact:
Sampler:

Analysis Request
Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)								SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
19	L-122	24-Jul-19		SOIL	1	R	R	R	R												
20,21	L-122	24-Jul-19		TISSUE	1					R	R	R									
22	L-123	23-Jul-19		SOIL	1	R	R	R	R												
23,24	L-123	23-Jul-19		TISSUE	1					R	R	R									
25	L-124	23-Jul-19		SOIL	1	R	R	R	R												
26,27	L-124	23-Jul-19		TISSUE	1					R	R	R									
28	L-125	23-Jul-19		SOIL	1	R	R	R	R												
29,30	L-125	23-Jul-19		TISSUE	1					R	R	R									
31	L-125-R	23-Jul-19		SOIL	1	R	R	R	R												
32,33	L-125-R	23-Jul-19		TISSUE	1					R	R	R									
34	L-126	23-Jul-19		SOIL	1	R	R	R	R												
35,36	L-126	23-Jul-19		TISSUE	1					R	R	R									

Drinking Water (DW) Samples[1] (client use)
Are samples taken from a Regulated DW System?
☐ YES ☐ NO
Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Low volume analysis. Split tissue sample in half + conduct pre + post wash analysis
Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.
Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)
Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐
INIITIAL COOLER TEMPERATURES °C:
FINAL COOLER TEMPERATURES °C: 21.6 21.7

SHIPMENT RELEASE (client use)
Released by: Brett Pagacz
Date: July 31, 2019
Time:

INITIAL SHIPMENT RECEPTION (lab use only)
Received by:
Date:
Time:

FINAL SHIPMENT RECEPTION (lab use only)
Received by: m
Date: Aug 6/19
Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 3 of 12

Report To	Contact and company name below will appear on the final report	
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine	
Contact:	Brett Pagacz	
Phone:	867-393-4882	
	Company address below will appear on the final report	
Street:	2195 Second Ave	
City/Province:	Whitehorse, YT	
Postal Code:	Y1A 3T8	
Invoice To	Same as Report To	☐ YES ☑ NO
	Copy of Invoice with Report	☐ YES ☑ NO
Company:	Baffinland Iron Mine	
Contact:		

Report Format

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)

- **4 day [P4-20%]** ☐
- **3 day [P3-25%]** ☐
- **2 day [P2-50%]** ☐

EMERGENCY

- **1 Business day [E - 100%]** ☐
- **Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]** ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

ALS Lab Work Order # (lab use only):

Oil and Gas Required Fields (client use)

AFE/Cost Center:

PO#

Major/Minor Code:

Routing Code:

Requisitioner:

Location:

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)								SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
37	L-127	23-Jul-19		SOIL	1	R	R	R	R												
38,39	L-127	23-Jul-19		TISSUE	1					R	R	R									
40	L-128	12-Jul-19		SOIL	1	R	R	R	R												
41,42	L-128	12-Jul-19		TISSUE	1					R	R	R									
43	L-128-R	12-Jul-19		SOIL	1	R	R	R	R												
44,45	L-128-R	12-Jul-19		TISSUE	1					R	R	R									
46	L-129	12-Jul-19		SOIL	1	R	R	R	R												
47,48	L-129	12-Jul-19		TISSUE	1					R	R	R									
49	L-130	13-Jul-19		SOIL	1	R	R	R	R												
50,51	L-130	13-Jul-19		TISSUE	1					R	R	R									
52	L-130-R	13-Jul-19		SOIL	1	R	R	R	R												
53,54	L-130-R	12-Jul-19		TISSUE	1					R	R	R									

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue sample in half + conduct pre + post wash analysis.

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Brett Pagacz	Date: July 31, 2019	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 6/19	Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 4 of 12

Report To	Contact and company name below will appear on the final report
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact:	Brett Pagacz
Phone:	867-393-4882
	Company address below will appear on the final report
Street:	2195 Second Ave
City/Province:	Whitehorse, YT
Postal Code:	Y1A 3T8
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Baffinland Iron Mine
Contact:	

Report Forma

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

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Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

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- Contact your AM to confirm all E&P TATs (surcharges may apply)

ard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- 4 day [P4-20%] ☐
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EMERGENCY
- 1 Business day [E - 100%] ☐
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Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
55	L-131	13-Jul-19		SOIL	1	R	R	R	R					
56,57	L-131	13-Jul-19		TISSUE	1					R	R	R		
58	L-132	13-Jul-19		SOIL	1	R	R	R	R					
59,60	L-132	13-Jul-19		TISSUE	1					R	R	R		
61	L-133	12-Jul-19		SOIL	1	R	R	R	R					
62,63	L-133	12-Jul-19		TISSUE	1					R	R	R		
64	L-133-R	12-Jul-19		SOIL	1	R	R	R	R					
65,66	L-133-R	12-Jul-19		TISSUE	1					R	R	R		
67	L-134	12-Jul-19		SOIL	1	R	R	R	R					
68,69	L-134	12-Jul-19		TISSUE	1					R	R	R		
70	L-135	24-Jul-19		SOIL	1	R	R	R	R					
71,72	L-135	24-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

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Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Brett Pagacz	Date: July 31, 2019	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 6/19	Time: 14:20

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NOV 2012 FRONT

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Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

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L2323007-COFC

COC Number: 17 -

Page 5 of 12

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Phone: 867-393-4882
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Street: 2195 Second Ave
City/Province: Whitehorse, YT
Postal Code: Y1A 3T8

Report Format / Distribution
Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax bimww@alsglobal.com
Email 2 bimcore@alsglobal.com
Email 3 bpagacz@edynamics.com

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐
EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To Same as Report To ☐ YES ☑ NO
Copy of Invoice with Report ☐ YES ☑ NO
Company: Baffinland Iron Mine
Contact:

Invoice Distribution
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@baffinland.com,commercial@baffinland.com
Email 2

Project Information
ALS Account # / Quote #: EDI100, Q71319
Job #: BIM Soil and Lichen Tissue - Trace Metals
PO / AFE: 4500057496
LSD:

Oil and Gas Required Fields (client use)
AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):
ALS Contact:
Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
73	L-136	24-Jul-19		SOIL	1	R	R	R	R					
74, 75	L-136	24-Jul-19		TISSUE	1					R	R	R		
76	L-137	24-Jul-19		SOIL	1	R	R	R	R					
77,78	L-137	24-Jul-19		TISSUE	1					R	R	R		
79	L-137-R	24-Jul-19		SOIL	1	R	R	R	R					
80, 81	L-137-R	24-Jul-19		TISSUE	1					R	R	R		
82	L-138	16-Jul-19		SOIL	1	R	R	R	R					
83, 84	L-138	16-Jul-19		TISSUE	1					R	R	R		
85	L-139	24-Jul-19		SOIL	1	R	R	R	R					
86,87	L-139	24-Jul-19		TISSUE	1					R	R	R		
88	L-140	24-Jul-19		SOIL	1	R	R	R	R					
89,90	L-140	24-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO
Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Low volume analysis. Split tissue sample in half + conduct pre + post wash analysis.
Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.
Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)
Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)
Released by: Brett Pagacz Date: July 31,2019 Time:

INITIAL SHIPMENT RECEPTION (lab use only)
Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)
Received by: Date: Aug 6/19 Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 6 of 12

Report To	Contact and company name below will appear on the final report	**Report Format / Distribution**	
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Contact:	Brett Pagacz	Quality Control (QC) Report with Report	☑ YES ☐ NO
Phone:	867-393-4882	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Street:	2195 Second Ave	Email 1 or Fax	bimww@alsglobal.com
City/Province:	Whitehorse, YT	Email 2	bimcore@alsglobal.com
Postal Code:	Y1A 3T8	Email 3	bpagacz@edynamics.com
Invoice To	Same as Report To ☐ YES ☑ NO	**Invoice Distribution**	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Company:	Baffinland Iron Mine	Email 1 or Fax	ap@baffinland.com,commercial@baffinland.com
Contact:		Email 2	
Project Information		**Oil and Gas Required Fields (client use)**	
ALS Account # / Quote #:	EDI100, Q71319	AFE/Cost Center:	PO#
Job #:	BIM Soil and Lichen Tissue - Trace Metals	Major/Minor Code:	Routing Code:
PO / AFE:	4500057496	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		**ALS Contact:**	**Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY
- 1 Business day [E - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
92	L-141	24-Jul-19		SOIL	1	R	R	R	R					
92,93	L-141	24-Jul-19		TISSUE	1					R	R	R		
94	L-141-R	24-Jul-19		SOIL	1	R	R	R	R					
95,96	L-141-R	24-Jul-19		TISSUE	1					R	R	R		
97	L-142	24-Jul-19		SOIL	1	R	R	R	R					
98, [illegible]	L-142	24-Jul-19		TISSUE	1					R	R	R		
[illegible] 100	L-143	24-Jul-19		SOIL	1	R	R	R	R					
101,102	L-143	24-Jul-19		TISSUE	1					R	R	R		
103	L-144	24-Jul-19		SOIL	1	R	R	R	R					
104,105	L-144	24-Jul-19		TISSUE	1					R	R	R		
106	L-145	24-Jul-19		SOIL	1	R	R	R	R					
107,108	L-145	24-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue samples in half + conduct pre + post wash analysis

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-IL-GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)			**INITIAL SHIPMENT RECEPTION (lab use only)**			**FINAL SHIPMENT RECEPTION (lab use only)**		
Released by: Brett Pagacz	Date: July 31, 2019	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 6/19	Time: 14:20

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ALS www.alsglobal.com

Chain of Custody (COC) / Analytica Request Form

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 7 of 12

Report To	Contact and company name below will appear on the final report
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact:	Brett Pagacz
Phone:	867-393-4882
	Company address below will appear on the final report
Street:	2195 Second Ave
City/Province:	Whitehorse, YT
Postal Code:	Y1A 3T8
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Baffinland Iron Mine
Contact:	

Report For...

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

...elow - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY
- 1 Business day [E - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center:

PO#

Major/Minor Code:

Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
109	L-145-R	24-Jul-19		SOIL	1	R	R	R	R					
110,112	L-145-R	24-Jul-19		TISSUE	1					R	R	R		
112	L-146	24-Jul-19		SOIL	1	R	R	R	R					
113,114	L-146	24-Jul-19		TISSUE	1					R	R	R		
115	L-147	24-Jul-19		SOIL	1	R	R	R	R					
116,117	L-147	24-Jul-19		TISSUE	1					R	R	R		
118	L-148	25-Jul-19		SOIL	1	R	R	R	R					
119,120	L-148	25-Jul-19		TISSUE	1					R	R	R		
122	L-149	25-Jul-19		SOIL	1	R	R	R	R					
123,128	L-149	25-Jul-19		TISSUE	1					R	R	R		
125	L-149-R	25-Jul-19		SOIL	1	R	R	R	R					
126,127	L-149-R	25-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue samples in half + conduct pre+post wash analysis.

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Brett Pagacz	Date: July 31, 2019	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 6/19	Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 8 of 12

Report To	Contact and company name below will appear on the final report	**Report Format / Distribution**	
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Contact:	Brett Pagacz	Quality Control (QC) Report with Report	☑ YES ☐ NO
Phone:	867-393-4882	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Street:	2195 Second Ave	Email 1 or Fax	bimww@alsglobal.com
City/Province:	Whitehorse, YT	Email 2	bimcore@alsglobal.com
Postal Code:	Y1A 3T8	Email 3	bpagacz@edynamics.com
Invoice To	Same as Report To ☐ YES ☑ NO	**Invoice Distribution**	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Company:	Baffinland Iron Mine	Email 1 or Fax	ap@baffinland.com,commercial@baffinland.com
Contact:		Email 2	
Project Information		**Oil and Gas Required Fields (client use)**	
ALS Account # / Quote #:	EDI100, Q71319	AFE/Cost Center:	PO#
Job #:	BIM Soil and Lichen Tissue - Trace Metals	Major/Minor Code:	Routing Code:
PO / AFE:	4500057496	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		**ALS Contact:**	**Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days):
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY:
- 1 Business day [E - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)								SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
127	L-150	25-Jul-19		SOIL	1	R	R	R	R												
128,129	L-150	25-Jul-19		TISSUE	1					R	R	R									
130	L-151	25-Jul-19		SOIL	1	R	R	R	R												
131,132	L-151	25-Jul-19		TISSUE	1					R	R	R									
133	L-152	25-Jul-19		SOIL	1	R	R	R	R												
134,135	L-152	25-Jul-19		TISSUE	1					R	R	R									
136	L-153	13-Jul-19		SOIL	1	R	R	R	R												
137,138	L-153	13-Jul-19		TISSUE	1					R	R	R									
139	L-154	23-Jul-19		SOIL	1	R	R	R	R												
140,141	L-154	23-Jul-19		TISSUE	1					R	R	R									
142	L-155	23-Jul-19		SOIL	1	R	R	R	R												
143,144	L-155	23-Jul-19		TISSUE	1					R	R	R									

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue samples in half and conduct pre+post wash analysis.

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-IL-GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐	No ☐	
Ice Packs ☑	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐	
Cooling Initiated ☐					

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C		
				21.6	21.7	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Brett Pagacz	Date: July 31, 2019	Time:	Received by:	Date:	Time:	Received by: Am	Date: Aug 6/19	Time: 14:20

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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 9 of 12

Report To	Contact and company name below will appear on the final report	
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine	
Contact:	Brett Pagacz	
Phone:	867-393-4882	
	Company address below will appear on the final report	
Street:	2195 Second Ave	
City/Province:	Whitehorse, YT	
Postal Code:	Y1A 3T8	
Invoice To	Same as Report To	☐ YES ☑ NO
	Copy of Invoice with Report	☐ YES ☑ NO
Company:	Baffinland Iron Mine	
Contact:		

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

.../ - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4-20%]	☐	1 Business day [E - 100%]	☐
3 day [P3-25%]	☐	Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	☐
2 day [P2-50%]	☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center:

PO#

Major/Minor Code:

Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
146	L-156	23-Jul-19		SOIL	1	R	R	R	R					
146,148	L-156	23-Jul-19		TISSUE	1					R	R	R		
148	L-156-R	23-Jul-19		SOIL	1	R	R	R	R					
149,50	L-156-R	23-Jul-19		TISSUE	1					R	R	R		
152	L-157	23-Jul-19		SOIL	1	R	R	R	R					
152,153	L-157	23-Jul-19		TISSUE	1					R	R	R		
154	L-158	23-Jul-19		SOIL	1	R	R	R	R					
155,156	L-158	23-Jul-19		TISSUE	1					R	R	R		
157	L-159	15-Jul-19		SOIL	1	R	R	R	R					
158,158	L-159	15-Jul-19		TISSUE	1					R	R	R		
160	L-160	15-Jul-19		SOIL	1	R	R	R	R					
161,162	L-160	15-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

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SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			21.6	21.7	

SHIPMENT RELEASE (client use)

Released by: Brett Pagacz Date: July 31, 2019 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Aug 6/19 Time: 14:20

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ALS www.alsglobal.com

Chain of Custody (COC) / Analytica Request Form

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 10 of 12

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Contact:	Brett Pagacz
Phone:	867-393-4882
	Company address below will appear on the final report
Street:	2195 Second Ave
City/Province:	Whitehorse, YT
Postal Code:	Y1A 3T8

Invoice To

Same as Report To ☐ YES ☑ NO

Copy of Invoice with Report ☐ YES ☑ NO

Company: Baffinland Iron Mine

Contact:

Report Forn

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

elow - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
163	L-161	20-Jul-19		SOIL	1	R	R	R	R					
164,165	L-161	20-Jul-19		TISSUE	1					R	R	R		
166	L-162	20-Jul-19		SOIL	1	R	R	R	R					
167,168	L-162	20-Jul-19		TISSUE	1					R	R	R		
169	L-163	20-Jul-19		SOIL	1	R	R	R	R					
170,171	L-163	20-Jul-19		TISSUE	1					R	R	R		
172	L-164	16-Jul-19		SOIL	1	R	R	R	R					
173,174	L-164	16-Jul-19		TISSUE	1					R	R	R		
175	L-165	18-Jul-19		SOIL	1	R	R	R	R					
176,177	L-165	18-Jul-19		TISSUE	1					R	R	R		
178	L-165-R	18-Jul-19		SOIL	1	R	R	R	R					
179,180	L-165-R	18-Jul-19		TISSUE	1					R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue samples in half + conduct pre + post wash analysis.

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C 21.6 21.7

SHIPMENT RELEASE (client use)

Released by: Brett Pagacz Date: July 31, 2019 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Aug 6/19 Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 11 of 12

Report To	Contact and company name below will appear on the final report
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact:	Brett Pagacz
Phone:	867-393-4882
	Company address below will appear on the final report
Street:	2195 Second Ave
City/Province:	Whitehorse, YT
Postal Code:	Y1A 3T8
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Baffinland Iron Mine
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

- Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
4 day [P4-20%] ☐
3 day [P3-25%] ☐
2 day [P2-50%] ☐

EMERGENCY
1 Business day [E - 100%] ☐
Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center:
PO#
Major/Minor Code:
Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)								SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
181	L-166	18-Jul-19		SOIL	1	R	R	R	R												
182,183	L-166	18-Jul-19		TISSUE	1					R	R	R									
184	L-167	20-Jul-19		SOIL	1	R	R	R	R												
185,186	L-167	20-Jul-19		TISSUE	1					R	R	R									
187	L-168	20-Jul-19		SOIL	1	R	R	R	R												
188,189	L-168	20-Jul-19		TISSUE	1					R	R	R									
190	L-168-R	20-Jul-19		SOIL	1	R	R	R	R												
191,192	L-168-R	20-Jul-19		TISSUE	1					R	R	R									
193	L-169	20-Jul-19		SOIL	1	R	R	R	R												
194,195	L-169	20-Jul-19		TISSUE	1					R	R	R									
196	L-170	23-Jul-19		SOIL	1	R	R	R	R												
197,198	L-170	23-Jul-19		TISSUE	1					R	R	R									

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
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Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Low volume analysis. Split tissue samples in half + conduct pre + post wash analysis

Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected. Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-IL-GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 21.6 21.7

SHIPMENT RELEASE (client use)

Released by: Brett Pagacz Date: July 31, 2019 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

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www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2323007-COFC

COC Number: 17 -

Page 12 of 12

Report To	Contact and company name below will appear on the final report
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Contact:	Brett Pagacz
Phone:	867-393-4882
	Company address below will appear on the final report
Street:	2195 Second Ave
City/Province:	Whitehorse, YT
Postal Code:	Y1A 3T8
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Baffinland Iron Mine
Contact:	

Report Format

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimww@alsglobal.com

Email 2 bimcore@alsglobal.com

Email 3 bpagacz@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- **4 day [P4-20%]** ☐
- **3 day [P3-25%]** ☐
- **2 day [P2-50%]** ☐

EMERGENCY
- **1 Business day [E - 100%]** ☐
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For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: EDI100, Q71319

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500057496

LSD:

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Oil and Gas Required Fields (client use)

AFE/Cost Center:

PO#

Major/Minor Code:

Routing Code:

Requisitioner:

Location:

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	HG-200.2-CVAA-WT (Soil)	MET-200.2-CCMS-WT (Soil)	MOISTURE-WT (Soil)	PH-WT (Soil)	BIM-METHG-TISSUE1-WT (Metals incl Hg &	Moisture MOISTURE-MICR-VA (Tissue)	SPECIAL REQUEST-VA (Tissue - Washed)								SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
~~200~~ 199	L-171	23-Jul-19		SOIL	1	R	R	R	R												
200,201	L-171	23-Jul-19		TISSUE	1					R	R	R									
202	L-172	30-Jul-19		SOIL	1	R	R	R	R												
203,204	L-172	30-Jul-19		TISSUE	1					R	R	R									
205	L-173	30-Jul-19		SOIL	1	R	R	R	R												
206,207	L-173	30-Jul-19		TISSUE	1					R	R	R									
208	L-174	30-Jul-19		SOIL	1	R	R	R	R												
209,210	L-174.	30-Jul-19		TISSUE	1					R	R	R									

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

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Special Request: For select Tissue samples, the sample will be pre-washed prior to analysis. There will be a washed and unwashed component for the Tissue samples selected.

Guideline report:CCME -Soil (coarse)-IACR 1 in 1000000-II -GW unprotected

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☑ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				21.6	21.7		

SHIPMENT RELEASE (client use)

Released by: Brett Pagacz

Date: July 31, 2019

Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:

Date:

Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: m

Date: Aug 6/19

Time: 14:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

APPENDIX F. CORRELATIONS FOR METALS IN DUSTFALL DEPOSITION WITH SOIL AND LICHEN

Table F- 1. Correlations between metal concentrations in dustfall deposition and soil, including either simple regression estimates or significant interactions with distance category and/or soil pH.

Trace Metal	Correlation		Slope of Dustfall Deposition[3]		Interactions			
					Distance Category[4]		Soil pH[5]	
	r / ϱ	*P*	Estimate	*P*	Estimate	*P*	Estimate	*P*
Arsenic (n = 45)	-0.34[2]	0.02	-1.00	0.0005			0.14	0.0006
Cadmium (n = 45)[1]								
Copper (n = 45)	-0.17	> 0.2	-1.78	0.007			0.26	0.007
Lead (n = 44)	-0.37	0.01	-0.13	0.01	0.25	0.08		
Selenium (n = 45)[1]								
Zinc (n = 42)	-0.27	0.09	-0.20	0.09	-1.54	< 0.0001		

[1] No analysis was conducted on cadmium or selenium because ≥50% of the samples were below the RDL.

[2] Non-parametric Spearman's coefficient is provided.

[3] If a significant interaction occurred with soil pH, then the slope (of dustfall deposition) from this interaction model is provided. The slope from a simple regression model is provided either if no significant interactions occurred or if a significant interaction occurred only with distance category (to clarify the general relationship between metal concentrations in dustfall deposition and soil).

[4] Distance category analyzed as a categorical variable.

[5] Soil pH analyzed as a continuous variable.

Table F-2. Correlations between metal concentrations in dustfall deposition and lichen, including either simple regression estimates or significant interactions with distance category.

Trace Metal	Correlation		Slope of Dustfall Deposition[3]		Interaction with Distance Category[1]	
	r / ϱ	*P*	Estimate	*P*	Estimate	*P*
Arsenic (n = 45)	-0.36[1]	0.02	0.13	0.02		
Cadmium (n = 45)	0.008	> 0.9	0.003	> 0.9		
Copper (n = 45)	0.37	0.02	0.20	0.02	-0.53	< 0.0001
Lead (n = 44)	0.59	< 0.0001	0.30	< 0.0001	-0.73	0.0001
Selenium (n = 45)	-0.07	> 0.6	-0.09	> 0.3		
Zinc (n = 42)	0.09	> 0.5	0.03	> 0.5	-0.24	0.07

[1] Distance category analyzed as a categorical variable.

APPENDIX G. EXOTIC PLANT SPECIES KNOWN TO NUNAVUT

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Table G-1. Exotic plant species known to Nunavut, provided by the Government of Nunavut in 2010.

Common name	Species name
Common barley	*Hordeum vulgare*
Common dandelion	*Taraxacum officinale*
Common plantain	*Plantago major*
Field pennycress	*Thlaspi arvense*
Field sow-thistle	*Sonchus arvensis*
Oxeye daisy	*Leucanthemum vulgare*
Opium poppy	*Papaver somniferum*
Prostrate knotweed	*Polygonum aviculare*
Redroot amaranth	*Amaranthus retroflexus*
Shepherd’s purse	*Capsella bursa-pastoris*
Spreading alkali grass	*Puccinellia distans*
Tufted vetch	*Vicia cracca*
Wild caraway	*Carum carvi*
Yellow rocket	*Barbarea vulgaris*

*Personal communication with J. Saarela at the Museum of Nature on 13 November 2014 determined that *Hordeum jubatum* (foxtail barley) is the only known exotic species on Baffin Island. A few plants were found in Kimmirut, Nunavut in 2012 where it is not common, but likely persists.

APPENDIX H. BIRD SPECIES OBSERVED WITHIN THE MARY RIVER PROJECT TERRESTRIAL RSA, 2006—2019

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Table H-1. Bird species observed within the Mary River Project Terrestrial RSA, 2006 — 2019.

Species	Latin name	2006	2007	2008	2012	2013	2014	2015	2016	2017	2018	2019
Snow Goose	*Chen caerulescens*	B	B	B	S	S	B	S	S	B	B	B
Brant	*Branta bernicla*	S	-	-	-	-	-	-	-	-	-	-
Cackling Goose	*Branta hutchinsii*	-	-	-	-	B	S	S	-	B	B	B
Canada Goose	*Branta canadensis*	-	-	-	-	B	S	S	S	B	B	B
Canada/Cackling Goose	*Branta spp.*	B	B	B	B	-	-	-	-	-	B	B
Tundra Swan	*Cygnus columbianus*	-	-	B	S	-	-	-	-	S	S	S
King Eider	*Somateria spectabilis*	B	B	B	S	S	-	S	-	S	S	S
Common Eider	*Somateria mollissima*	S	S	S	S	S	-	-	-	-	S	-
Long-tailed Duck	*Clangula hyemalis*	B	B	B	S	B	S	S	S	B	B	B
Red-breasted Merganser	*Mergus serrator*	B	B	B	S	S	-	S	-	S	S	S
Rock Ptarmigan	*Lagopus muta*	-	-	-	S	S	-	S	-	S	-	-
Willow Ptarmigan	*Lagopus lagopus*	-	-	-	-	-	-	-	-	S	-	-
Unspecified Ptarmigan	*Lagopus spp.*	-	-	S	-	-	S	-	S	-	S	S
Red-throated Loon	*Gavia stellata*	B	B	B	S	B	B	S	S	B	B	B
Pacific Loon	*Gavia pacifica*	B	B	B	S	S	S	-	-	-	-	S
Common Loon	*Gavia immer*	B	B	B	S	S	S	S	-	-	S	S
Yellow-billed Loon	*Gavia adamsii*	B	B	B	S	S	B	S	S	S	S	S
Northern Fulmar	*Fulmarus glacialis*	S	-	-	-	-	-	-	-	-	-	-
Rough-legged Hawk	*Buteo lagopus*	B	B	B	B	B	B	B	B	B	B	B
Gyrfalcon	*Falco rusticolus*	B	B	B	B	B	B	B	B	B	B	B
Peregrine Falcon	*Falco peregrinus tundris*	B	B	B	B	B	B	B	B	B	B	B
Sandhill Crane	*Grus canadensis*	B	B	B	S	B	B	S	S	S	S	S
American Golden-Plover	*Pluvialis dominica*	S	S	S	B	S	S	S	-	S	S	-
Semipalmated Plover	*Charadrius semipalmatus*	-	-	-	B	B	B	S	-	-	S	B
Common Ringed Plover	*Charadrius hiaticula*	S	-	-	-	S	B	S	-	-	-	-
Dunlin	*Calidris alpina*	-	-	-	S	-	-	-	-	-	-	-
White-rumped Sandpiper	*Calidris fuscicollis*	-	-	-	-	B	-	-	-	-	-	-
Baird's Sandpiper	*Calidris bairdii*	S	S	S	B	B	B	S	S	-	-	-
Pectoral Sandpiper	*Calidris melanotos*	-	-	-	S	-	-	-	-	-	-	-
Red Phalarope	*Phalaropus fulicarius*	-	-	-	S	S	-	-	-	-	-	-
Unspecified Phalarope	*Phalaropus spp.*	-	-	S	-	-	-	-	-	-	-	-

Table H-1. Bird species observed within the Mary River Project Terrestrial RSA, 2006 — 2019.

Species	Latin name	2006	2007	2008	2012	2013	2014	2015	2016	2017	2018	2019
Herring Gull	*Larus argentatus*	-	-	-	B	-	-	-	S	-	-	-
Glaucous Gull	*Larus hyperboreus*	-	B	B	B	B	B	S	S	B	B	B
Thayer's Gull	*Larus thayeri*	-	-	-	-	B	-	S	-	-	U	-
Arctic Tern	*Sterna paradisaea*	-	S	S	-	-	-	-	-	-	-	-
Long-tailed Jaeger	*Stercorarius longicaudus*	-	-	-	S	-	-	S	-	-	-	-
Unspecified Jaeger	*Stercorarius spp.*	-	-	B	-	-	-	-	-	-	-	-
Snowy Owl	*Bubo scandiacus*	B	B	B	S	S	B	S	S	-	-	-
Short-eared Owl	*Asio flammeus*	-	-	S	-	-	-	-	-	-	-	-
Common Raven	*Corvus corax*	S	S	B	B	S	B	S	S	B	B	B
Horned Lark	*Eremophila alpestris*	S	S	S	B	S	S	S	S	S	S	S
Northern Wheatear	*Oenanthe oenanthe*	-	-	-	-	S	U	S	-	S	S	S
American Pipit	*Anthus rubescens*	S	S	S	B	B	-	S	-	B	B	B
Lapland Longspur	*Calcarius lapponicus*	S	S	S	B	B	S	S	S	B	S	B
Snow Bunting	*Plectrophenax nivalis*	S	S	S	B	B	S	S	S	B	B	B
Common Redpoll	*Carduelis flammea*	-	-	-	S	-	-	-	-	-	-	S
Hoary Redpoll	*Carduelis hornemanni*	-	-	-	S	-	-	-	-	-	-	-

Symbology: B = Confirmed Breeding; S = Confirmed Present; U = unconfirmed observation

*No formal bird surveys were conducted in 2017, and therefore all observations are incidental; from when qualified biologists were on site.

APPENDIX I. RESPONSE TO TEWG COMMENTS ON DRAFT TERRESTRIAL ENVIRONMENT ANNUAL MONITORING REPORT

Name: Krupesh Patel

Agency / Organization: ECCC / Canadian Wildlife Service

Date of Comment Submission: 15/05/2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 BIM Terrestrial AMR Draft for TEWG	Dustfall Sampling	Map: Dustfall Sample Locations Labeling for the DFRS and DFRN magnified map links to the wrong reference on the main map (DFRS links to DFRN and vice versa) Recommendation: ECCC recommends that the Proponent correct this error.	This map has been corrected and included in the final 2019 TEAMR.
2	2019 BIM Terrestrial AMR Draft for TEWG	6.1 Regional Monitoring in 201	In regards to comment "Originally, CWS recommended that the sound recorders be deployed for at least two breeding seasons to achieve the best results. However, no Red Knot were detected during 2019. CWS has thus concluded that there are no Red Knot present in the Project area, and that ARU monitoring is not necessary for 2020" This statement is partially correct, REKN surveys in the northern portion could be discontinued based on 2019 results, but ECCC recommends similar REKN surveys in the southern portion of the RSA prior to activities ramping up in those areas.	Upon recommendation by QIA and ECCC, Baffinland is considering deploying ARUs along the south rail line and in the Steensby Port area in suitable Red Knot habitat prior to increasing activities in these areas. However, this will not be possible in 2020 due to access and logistical constraints.

#	Document Name	Section Reference	Comment	Baffinland Response
			Recommendation: ECCC recommends that similar REKN surveys in the southern portion of the RSA be conducted prior to activities ramping up in those areas.	
3	2019 BIM Terrestrial AMR Draft for TEWG	7.1 Methods	In regards to the use of flight logs to validate flight altitudes below those set by the project conditions, ECCC continues to request the details of these flight logs as requested during previous TEWG meetings by various parties. Our primary concern is that the majority of flight altitudes fall below the height requirements. With only 31% in Snow Goose area during molting season and 11% during all months in all areas being compliant (prior to the rational of documentation in the flight log being included in the numbers). We understand extenuating circumstances (human health and safety, flight duration, etc.) require flights at lower altitudes, but we require a more thorough understanding of the reasons that are being presented. Recommendation: ECCC recommends that BIM provide details of the flight logs used to justify flights below required altitudes.	The helicopter flight height compliance analysis and reporting section will be updated for the 2020 TEAMR to address additional detail relating to pilot rationale and flight purpose. We will take these recommendations into consideration during analysis and reporting. Regardless, the 2019 TEAMR does include detailed breakdown of rationale for low-level flights, categorizing compliance into fully compliant, non-compliant with rationale, and non-compliant without rationale.
4	2019 BIM Terrestrial AMR Draft for TEWG	7.2 Results and Discussion	Project condition 71 indicates that if 1100m vertical height cannot be achieved then a lateral distance of 1500m	The helicopter flight height compliance analysis and reporting section will be updated for the 2020 TEAMR to address additional

#	Document Name	Section Reference	Comment	Baffinland Response
			should be maintained from the Snow Goose concentration area during the molting period (July - August). The report indicates several instances of flights that have not maintained the 1100m altitude and that have transected the eastern end of the Snow Goose area during molting season. As mentioned in previous TEWG meetings, going back to 2018, we request details for why the lateral distance could not be maintained. Recommendation: ECCC recommends BIM provide reasoning for why lateral distance could not be maintained.	detail relating to pilot rationale and flight purpose. We will take these recommendations into consideration during analysis and reporting. Regardless, the 2019 TEAMR does include detailed breakdown of rationale for low-level flights, categorizing compliance into fully compliant, non-compliant with rationale, and non-compliant without rationale.
5	2019 BIM Terrestrial AMR Draft for TEWG	8.1 Wildlife Interactions and Mortalities in 2019	Although 7 avian mortalities have been reported in the annual monitoring report, limited information has been presented on the cause of these mortalities. This information is important in identifying trends, high risk areas and further mitigation measures that may help prevent future mortalities. ECCC Recommendation: ECCC recommends BIM provide additional details on the circumstances of the 7 avian mortalities including; location, infrastructure/vehicles involved, dates/time, weather conditions, and any other details that are available.	Baffinland sent on June 22, 2020 via email additional information on 2019 Baffinland bird mortalities to ECCC (Steve.allan@canada.ca; see Attachment 1). As indicated in the email, Baffinland is updating the Reporting Procedure for Wildlife Incidents to include the details required in the notice of mortality submitted to ECCC. Specifically, the details which will be included are: location, infrastructure/vehicles involved, dates/time, weather conditions and detailed information regarding the cause of the mortality. The updated reporting procedure also includes the email address to which all notices of Project-related migratory bird mortalities are to be submitted. Previous direction from ECCC indicates that the notice of

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				Project-related migratory bird mortalities is to be provided in a timely manner after the incident has been investigated. Baffinland is proposing submission of Project-related migratory bird incidents to ECCC on a monthly basis to fulfill this requirement moving forward. Wildlife interactions and mortalities related to the human presence within the Project area are uncommon. Since 2014, a total of twenty-one (21) bird mortalities have been reported: two (2) in 2014, ten (10) in 2016 (one incident involved a group of eight (8) Common Eider ducks), one (1) in 2018 and eight (8) in 2019. To avoid wildlife interactions and mortalities, Baffinland implements general mitigation measures that apply to all bird species across the Project. These general mitigation measures are detailed in Baffinland's Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) and associated management plans and include: • Project activities are planned and conducted to minimize the Project footprint to the extent possible, thus minimizing the direct loss of habitat or the reduction of habitat effectiveness. • Project personnel orientation includes best practices with regard to waste management and avoiding wildlife.

#	Document Name	Section Reference	Comment	Baffinland Response
				• Large concentrations of foraging or molting birds are avoided by Project personnel and equipment to the extent possible. • Where required, installation of deterrents (e.g. flagging) is implemented prior to commencement of nesting to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities taking place during the nesting season. • Inspections of each work area for nests are conducted prior to any clearing of land occurring during the nesting season. Any nests (or indicated nests) found are protected with a no-disturbance buffer zone, which will be in effect until the young have fledged and left the area. If it is determined that the setbacks are not feasible, nest-specific guidelines and procedures to ensure bird nests and their young are protected will be developed by competent individuals. • If Species at Risk or their nests and eggs are encountered during Project activities, the primary mitigation is avoidance. Project personnel will establish no-disturbance buffer zones on the basis of species-specific nest setback distances. • Temporary communication towers using guy wires are fitted with bird diverters to

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				help minimize the risk of bird collisions. • Lighting is reduced when possible in areas where it may serve as an attractant to birds or other wildlife. • Whenever practical and not causing a human safety issue, a stop work policy shall be implemented when wildlife in the area may be endangered (at risk of immediate injury or death) by work being conducted. • Equipment is operated with modern mufflers, and subjected to regular maintenance. In remote areas, drilling and other site activities is guided by the presence and response of wildlife. • Project domestic waste is collected in secure containers and removed daily. All containers containing food waste or items potentially contaminated by food (e.g. food packaging) are secured in animal-proof storage waste bins or sea cans to prevent access by wildlife. • Combustible non-hazardous wastes generated at the Project are incinerated to minimize the negative impacts of attraction vectors to wildlife. • When required, audible and visual techniques are used to prevent wildlife from interacting with spilled product or a contaminated area following a spill.

#	Document Name	Section Reference	Comment	Baffinland Response
				A review of bird mortality data from 2016 to 2019 (inclusive) indicates that the migratory bird incidents which have occurred onsite to date are mainly "one off" events, which are mitigated through Baffinland's general mitigation measures identified above. The review did not indicate any trends or unexpected effects which would support the need for implementation of adaptive strategies. However, should trends or unexpected effects be identified or observed in the future, adaptive strategies will be implemented, as per the TEMMP and in consultation with stakeholders.
6	2019 BIM Terrestrial AMR Draft for TEWG	8.1 Wildlife Interactions and Mortalities in 2019	As per section 3.2.2 Reporting Migratory bird Mortalities of the Terrestrial Environment Mitigation and Monitoring Plan, BIM is to provide notice of mortality of migratory birds or birds to ECCC once the incident has been investigated. No reports were submitted to ECCC of the bird mortalities listed during the 2019 year. Recommendation: ECCC requests that BIM report all avian mortalities to ECCC, via ec.dalfnord-wednorth.ec@canada.ca, as indicated in the mitigation and monitoring plan and in a detailed and timely manner.	Baffinland sent on June 22, 2020 via email additional information on 2019 Baffinland bird mortalities to ECCC (Steve.allan@canada.ca; see Attachment 1). Baffinland and ECCC (Krupesh.patel@canada.ca) have since discussed potential next steps with regards to future bird mortalities reporting. Baffinland will provide an update as part of future meetings with the TEWG.

Baffinland

2019 Mary River Project Wildlife Incident Report

Date	Time	Location	Infrastructure/Vehicles Involved	Weather Conditions	Description	Additional Information	Corrective Action	Photos
29-Jul-19	16:00	Milne Port	Gill Net	13°C, wind 10 km/hr	During a gill net set, as part of Baffinland's Scientific Licence #: S-19/20-1033-NU, to collect fish for scientific purposes in Milne Inlet, one Red Throated Loon (Gavia Stellata) was captured in the net as bycatch. The Loon was recovered upon net retrieval however had deceased.		General site mitigation measures as per Terrestrial Environment Mitigation and Monitoring Plan (TEMMP)	Yes
03-Aug-19	3:20	Tote Road	Ore Haul Truck (OHT) Travelling Northbound on Tote Road Between Kilometers 85-84	13°C, wind 10 km/hr	A loon was killed upon impact with an OHT at km 85. Operator notified supervisor and bird was disposed of in the incinerator.	Loon flew into side of OHT.	General site mitigation measures as per TEMMP	Yes
07-Aug-19	15:45	Mary River	Warehouse	19°C, wind 8 km/hr	An American pipet flew into the warehouse and was killed upon impact with a ceiling fan. The bird was disposed of in the incinerator.	The bird entered the warehouse through the north side overhead door which was partially open to move inventory in and out. Warehouse staff saw the bird and fully opened the overhead door so the bird could fly out. The bird flew toward the overhead door on the south side of the warehouse and was killed when it contacted the ceiling fan in the warehouse.	General site mitigation measures as per TEMMP	Yes
10-Aug-19	4:00	Milne Port	Mobile Maintenance Grease Bay	2°C, wind 2 km/hr	Mechanics discovered a deceased snow bunting on the floor of the maintenance shop. Cause of death was likely due to impact with infrastructure.	Both grease bay doors were left partially open to clear the building of exhaust fumes. Technician found the deceased bird when returning from break.	Wildlife interaction presentation reviewed with Mobile Maintenance crews	No
22-Aug-19	10:45	Mary River	Dustfall Canister near Deposit 2 DF-M-07	Overcast to sun and cloud, 8°C, wind 10.8 km/h southeast	Technician discovered an American Pipit deceased in a dustfall canister while completing monthly passive dustfall monitoring program.	Suspected entrapment in canister. Dustfall samplers are designed for bird deterrance, however the cannisters are open and birds can still access the inside of the liquid-filled cannisters if they fly past the bird spikes.	General site mitigation measures as per TEMMP Note that this is the first known reported bird mortality in a dustfall cannister, and the program has been in place since 2013 with over 30 samplers across the Project area.	Yes
25-Aug-19	15:30	Mary River	Outside of Weatherhaven Complex	Overcast, 7°C, wind 20 km/h	Small American Pipit was found dead between two tents at the Mary River weatherhaven. Cause of death is undetermined.	Based on where the bird was found in open ground between two small Weatherhaven tents it is reasonably probable that the bird either died of natural causes or was fatally injured during the August 23, 2019 wind storm.	N/A	No
08-Sep-19	14:00	Milne Port	Crusher Building	7°C, wind 5 km/h northwest	A deceased common rock pigeon was discovered during an inspection of the new crusher building. The bird was a non-native species that had arrived via shipping. The bird was immediately disposed of in the incinerator.	Time or point of access is inconclusive.	General site mitigation measures as per TEMMP	Yes
11-Oct-19	22:00	Milne Port	Vessel Superstructure	-5°C	The Bridge Office of the Botnica observed a single long-tailed duck fly into the superstructure of the vessel. Upon investigation, the duck had sustained injuries and was determined to be deceased.		General site mitigation measures as per TEMMP	Yes

GN Comment # XX

Department	Environment
Organization	Government of Nunavut
Subject/Topic	Snowbank Height Monitoring
Terms and Conditions	53ai and 53c
References	Section 5.2.1 - Methods

IDENTIFICATION OF ISSUE

Snowbank height monitoring occurred from November 2018 to April 2019 with one survey conducted in each of these months. The draft report does not provide details regarding the timing of these monthly surveys relative to road maintenance activities. It is therefore, challenging to assess how representative the survey results are of the average snowbank height conditions present along the road.

IMPORTANCE TO REVIEW AND SUPPORTING RATIONALE

Excessively high or deep snowbanks may pose a risk to wildlife by several mechanisms. High banks may obstruct drivers' viewing range and increase risk of vehicle collisions with wildlife; wildlife on roads may be trapped within steep banked sections of road; high/deep banks may deter wildlife from crossing roads.

The snowbank height monitoring results reported in the draft report indicate that 97% of snowbanks were less than 1m high when measured. The general inference from this result is that compliance with snowbank height limits is high and snowbanks are therefore unlikely to pose a risk to wildlife. However, the methods section of the report does not provide details regarding the timing of monthly snowbank monitoring surveys relative to road maintenance activities; specifically snowplowing and snowbank management. It is thus unclear whether the timing of this monitoring activity is occurring independently of road management activities. Without this information, it is difficult to assess whether snowbank monitoring results provide an unbiased assessment of prevailing conditions along the Tote Road.

RECOMMENDATION(S)

In the methods section, please explain the how timing of each monthly snowbank survey was determined. Was the date within each month selected at random or the same day each month? Was the survey within each month timed to coincide with certain weather or road maintenance events? Prior to selecting the date and time of day for each survey, were survey staff aware of planned road maintenance activities during the selected date and time? Similarly, were road maintenance staff aware of the timing of snowbank surveys before they occurred? In other words, was snowbank monitoring independent of snow management activities and therefore unbiased?

RESPONSE
Snowbank compliance surveys are conducted randomly and opportunistically when the Tote Road is safe to drive and there is Site Environment staff availability. Surveys are generally avoided during periods of heavy snowfall due to safety concerns associated with driving, and reduced visibility of photos. Snowbank compliance surveys are conducted independently of road maintenance activities. Baffinland’s Road Management and Snow Management plans are available on Baffinland’s online Document Portal at https://www.baffinland.com/media-centre/document-portal/.

Name: S. Leech, J.W. Higdon, and D.B. Stewart

Agency / Organization: Qikiqtani Inuit Association (QIA)

Date of Comment Submission: May 15 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1.	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Overarching comment	Each monitoring program in the annual report should include a summary section on a) weaknesses with the current monitoring programs in terms of their ability to answer the questions, based on concerns expressed by the TEWG and on review by Baffinland consultants; and b) suggested improvements to the program based on comments from the TEWG. This would allow the TEWG to track improvements in the program over time. As this document is on the public record, it is important to provide this information clearly and transparently within the document.	Baffinland has several mechanisms of documenting and addressing TEWG concerns expressed on the monitoring programs. The information being collected, and the intent of the individual monitoring programs are summarized in each annual report, and further details on the programs are documented in the Terrestrial Environment Mitigation and Monitoring Plan. Concerns of the TEWG are recognized in meeting minutes and annual report comment forms that are included with the final annual reports. Outstanding concerns are addressed in successive field programs and annual reports.
2	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	SUMMARY, p. i	This section could update the current PI status (i.e., extension to 2021).	The extension decision was made after the 2019 reporting year and not relevant to 2019 reporting. The project description will be updated as part of the 2020 Terrestrial Environment Annual Monitoring Report (TEARM) if relevant to monitoring and interpretation of the results.

#	Document Name	Section Reference	Comment	Baffinland Response
3	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary - Climate, Dustfall and Traffic, pg. ii (see also Sec. 3.4 Dustfall Summary, pg. 42) Sec. 3.2.1.2 Precipitation (Rainfall), pg. 13	"A comparison of the 2018/2019 precipitation data was not completed because of a malfunction of the rain gauge at both Milne Inlet and Mary River meteorological stations in 2018." (pg. ii; see also pgs. 13 and 42) However elsewhere in the document comparisons were made, for example: "Summer dustfall increased modestly over the PDA in 2019 in comparison with 2018 when cooler, wetter conditions resulted in a lower than expected dustfall" (pg. 42; see also pg. 40) Why the discrepancy?	In the absence of rain gauge data, observations from Baffinland Environment staff and EDI staff working on site were gathered to gauge general weather conditions on site in 2018.
4	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary – Climate, Dustfall and Traffic, p. ii (and sections 3.2.1.1 and 3.2.1.2, pp 13-16)	It would be helpful to see air temperature trends summarized for a longer period than 2019 cf 2018. The meteorological stations at Mary River Camp and at Milne Inlet provide a baseline dataset from 2005 to 2010. The comparison of weather variables could extend beyond 2019 cf 2018. Some stronger analysis of dust deposition, using these weather and other variables, could be conducted. What was the malfunction in the rain gauges; i.e., what happened? Re: the increase in mean daily haul transits, did variability also increase? In Section 3.2.1.2 Vehicle Transits on the Tote Road – it would be useful to see information on variability in daily transit numbers	An update to the analysis and presentation of weather data is planned for the 2020 Terrestrial Environment Annual Monitoring Report (TEAMR). Baffinland will endeavor to show longer-term climate trends instead of summarizing a single year and comparing to the previous year. In addition, dustfall analysis methods will be reviewed in 2020 to include information from more variables including vehicle transits, stockpile size, etc. The rain gauges failed due to mechanical malfunctions. Variability in daily haul transits is displayed in Figure 3-1 *Vehicle transits per day on the Tote Road, including both full ore trucks (red) and all other traffic (blue) through 2019*. Including annual variability in Table 3-3 does not

#	Document Name	Section Reference	Comment	Baffinland Response
			Re: the decrease in winter dustfall, increase in summer at Milne port - how does this correlate with truck transits? Stockpile size? Wind events? This also links to marine concerns given deposition on sea ice. In general, there's probably enough data available now to do some modelling of dust fall measurements based on production levels, truck traffic, environmental conditions, etc/	seemingly provide information to inform on mitigation or impacts. Dust fall correlations with truck transits, stockpile sizes, wind events have not been developed. Baffinland recognizes the link to marine concerns given dust deposition on sea ice. For future reporting, Baffinland will consider conducting a correlation analysis of variables to dustfall as suggested by the QIA if it proves likely to inform and improve on mitigation.
5	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary - Birds, pg. iv	If they are still available from CWS and not in use for Phase 2 monitoring, consider re-deploying the sound recorders in the Steensby port area and along the south rail line to get vocalization baseline data on red knot and other species those areas.	Upon recommendation by Qikiqtani Inuit Association (QIA) and Environment and Climate Change Canada (ECCC), Baffinland is considering deploying ARUs along the south rail line and in the Steensby Port area in suitable Red Knot habitat prior to increasing activities in these areas. However, this will not be possible in 2020 due to access and logistical constraints.
6	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary - Table 0. Dustfall monitoring program, pg. vi	RE: Comparison to Impact Predictions: "2019 dustfall results are consistent with predictions that the highest dustfall would be limited to mainly within the PDA." This is not a useful comparison of sampling results to impact predictions. Where and at how many sites were predictions exceeded and by what magnitude? Where do exceedances extend outside the PDA, by what magnitude, and how far before they fall to background levels? For dustfall and all monitoring programs, this table should include exceedances so there is a quick and clear reference to predictions, results and areas of concern.	Table 0 is a summary table of results for the executive summary of the full report. Details are provided in the body of the report. Section 3.2.4 (2019 Annual Dustfall) and associated figures provides the detail and clarity that the reviewer is requesting.

#	Document Name	Section Reference	Comment	Baffinland Response
7	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary, Table 0, Snow track surveys. pg. ix	RE: "Since there were no caribou tracks identified along the Tote Road in 2019, it cannot be determined if Project infrastructure is impacting caribou movement." Suggest editing text for clarity to read "...infrastructure is or is not impacting..."	This suggested wording change has been included in the final 2019 TEAMR as recommended.
8	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary, Table 0, Snow bank height monitoring. pg. ix	RE: "As caribou numbers increase, as is predicted by traditional knowledge, increased monitoring of caribou movement across the roadway will be implemented." The ability of caribou to cross the road and railway is particularly important when the population is low. How will BIMC ensure that the data from low effort surveys provide the necessary data to ensure movements of these animals are not impeded and that the data are comparable to those from future high effort surveys?	The current caribou surveys will only be comparable to future surveys with similar methods. Baffinland is currently conducting analyses to determine the statistical power of various monitoring options to measure potential changes in caribou movement across the transportation infrastructure. The results of this work will inform decisions regarding future caribou impact monitoring effort.
9	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary - Table 0, Height-of-Land (HOL) caribou surveys, pg. x	RE: "All 24 HOL stations were visited at least twice in 2019. A total of 24.3 hours of surveys were conducted at these stations in early June." This is less than 30 minutes of survey effort per station visit. Is this person hours or team hours, and if team hours how many person hours does this represent? This seems like very low effort, particularly if the animals are stationary and resting. RE: To date, there have not been adequate caribou observations during HOL surveys to assess any Project-related effects on caribou behavior or habitat use.	All HOL stations are surveyed for a minimum of 20 minutes per visit, by a minimum of two observers. The 24.3 hours of survey time represents team hours. There were typically three or four observers present at each station in 2019, representing 89.7 person hours of total survey time. During the HOL methodology development, reviewers concluded that 20 minutes was an appropriate minimum survey time, particularly in lower quality caribou habitat, but that surveyors should use their judgement to increase survey time until they feel the viewshed has been adequately surveyed. HOL stations were often surveyed for longer time periods in areas of high-quality caribou habitat, in areas with particularly

#	Document Name	Section Reference	Comment	Baffinland Response
			To what degree is low survey effort a contributing factor? This summary should identify that this survey cannot currently pick up on changes to caribou movement and that improvements to the monitoring program are under discussion with the TEWG.	expansive viewsheds, and to verify potential caribou sightings. The current caribou ecology on North Baffin Island (low numbers and low movement) is the primary factor contributing to a lack of measurable change in caribou habitat use. While greater survey effort would provide additional confidence in the lack of caribou observations, we are reasonably confident that more effort would not provide the data needed to document changes in caribou habitat use. Baffinland is currently conducting analyses to determine the statistical power of various monitoring options that can be used to study project impacts on North Baffin Island caribou. The results of this work will inform decisions regarding future caribou monitoring efforts.
10	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary - Table 0, general comment	Relevant predictions should be revisited based on Inuit observations of effects. For example, IQ suggests caribou are avoiding the mine site. Inuit observations of dustfall far outside of the PDA are not noted. For discussion with TEWG on how to incorporate these observations into reporting. This will become increasingly important as the Inuit Advisory Committee becomes operational. For caribou, predictions do not adequately incorporate the ZOI for sensitive periods, particularly calving. The write up is concerning because it does not reflect Inuit observations or available science. The narrative regarding the ability of Inuit to continue using the project area does not reflect Inuit experience that the Tote road is in fact	Impact predictions are identified in the Mary River Project Final Environmental Impact Statement: Volume 6 — Terrestrial Environment (Baffinland Iron Mines Corporation 2012) and Mary River Project Early Revenue Phase Addendum to Final Environmental Impact Statement: Volume 6 — Terrestrial Environment (Baffinland Iron Mines Corporation 2013). Baffinland will discuss further with the TEWG potential options for integrating Inuit observations into 2020 reporting efforts. As indicated in Baffinland's Hunter and Visitor Site Access Procedure (BAF-PH1-830-PRO-0002) and in accordance with Article 13 of the Mary River Inuit Impact and Benefit Agreement, Baffinland welcomes the safe arrival and visitation of beneficiaries travelling through the

#	Document Name	Section Reference	Comment	Baffinland Response
			harder to access for hunting, due to rules about transporting carcasses. This should be corrected.	Project Area. However, it is critical to maintain the safety and wellbeing of all site personnel and those visiting Project sites during their stay. Baffinland recognizes that beneficiaries have a right of access under the Nunavut Land Claims Agreement for the purpose of harvesting. However, while passing through Baffinland's Project Area, everyone is required to comply with the Baffinland's Safety procedures and camp rules.
11	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Summary Table 0, Helicopter Flight height analysis, p. xiii	Summary of helicopter flight compliance does not adequately define compliance. This summary needs to be revised to better reflect the results requested by the TEWG (just noting for now what data will be reported would be useful).	The helicopter flight height compliance analysis and reporting section will be updated as part of the 2020 TEAMR to address additional detail relating to pilot rationale and flight purpose. However, the updated 2019 TEAMR does include a detailed breakdown of rationale for low-level flights, categorizing compliance into fully compliant, non-compliant with rationale, and non-compliant without rationale.
12	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 2 INUIT PARTICIPATION IN TERRESTRIAL MONITORING PROGRAMS, p. 3	There was 50% participation from Inuit in the caribou Height of Land surveys, and 40% Inuit participation in the vegetation monitoring program. Were no Inuit hires working on dust monitoring activities? Do the percentages reflect the amount of time Inuit participated relative to the total amount of time spent conducting the surveys?	Dust monitoring collection was completed by BIM environmental technicians and environmental summer students. Section 2 has been updated to provide greater clarity in Inuit involvement.
13	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.1.2 Dustfall sampling, pg. 5 See also Map 1, pg. 10	RE: Port site - "DF-P-5 replaced DF-P-2" Need to clarify what is meant here by "replaced", why replacement occurred, how this may alter trend assessments and how the change will be identified over the long-term to ensure that its effects are obvious in future comparisons.	DF-P-02 was replaced by DF-P-05 in September 2014 to account for the construction of camp infrastructure. This DF monitor was meant to capture DF associated with the camp, and the new location (DF-P-05) is located 200 m to the NW, in a central area of the Milne Port camp. A map showing DF-P-02 and DF-P-05 was included with the 2014, 2015, 2016, 2017 and 2018

#	Document Name	Section Reference	Comment	Baffinland Response
			Why was DF-P-02 not shown on the inset in Map 1, pg. 38 of 471	reports, and it was decided 5 years post re-location it could be removed, however, we neglected to remove the reference from the text. It has now been removed.
14	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.1.2 Dustfall sampling, pg. 5 See also: Sec. 3.1.3 Analytical methods, Annual dustfall, pg. 12	RE: "To accommodate the expansion of the ore stockpile area at Milne Port site, DF-P-01 was relocated to the boundary of the PDA. The new site is called DF-P-08, and the move was completed in May 2019." And, "…data from these two sites were compiled for the annual dustfall and inter-annual trend analysis." Need to clarify how this site change alters the monitoring program, how compiling data from the 2 sites affect interannual trend analysis, and how the change will be identified over the long-term to ensure that its effects are obvious in future comparisons.	BIM reviewed the placement of dustfall monitoring stations at Milne Port in anticipation of Phase II development, and it was determined that there was more value in monitoring dustfall at the edge of the PDA as opposed to dustfall within the PDA, where it is expected to be high. As described in the report, combining the data from the two sites is the only way to assess annual dustfall at the DF-P-08 site. However, this analysis does result in an overestimate of dustfall at the DF-P-08 site, and an underestimate of what it would have been at the DF-P-01 site. In future years, DF-P-08 will provide valuable data regarding the dustfall associated with the ore stockpile that is leaving the PDA.
15	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.1.2 Dustfall sampling, Table. 3.2, pg. 8	RE: No. of days - Based on the ranges in number of days a sampler is in operation each month, there could be variability of up to 14% in the duration of sampling at sites in a particular month (e.g., 28 to 35 days). How is this source of variability dealt with?	The collection dates of individual samples are noted for each sampling session, which provides the information of the date ranges. The analytical lab (ALS) uses the exact number of days for each individual sample calculating the final data. The data presented in Table 3.2 presents only the first day of each collection period.
16	2019 Mary River Project Terrestrial Environment Annual	Sec. 3.2.1.3 Dustfall Suppression and Mitigation in 2019, p. 17	"An additional order [of DustStop] will be made for resupply on the 2020 sealift pending ongoing review of effectiveness."	Initial application of Dust Stop® Supplies for 2021 will be brought up on sealift in 2020.

#	Document Name	Section Reference	Comment	Baffinland Response
	Monitoring Report		This would need to be ordered by now for delivery via SeaLift?	
17	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.2.2 Magnitude and extent of 2019 dustfall, pg. 18 Sec. 3.2.3 Seasonal Comparisons of 2019 Dustfall, pgs. 29 and 30 Sec. 3.2.4 2019 Annual Dustfall, pgs. 32 and 33 Sec. 3.3.1 Seasonal dustfall, pgs. 38 and 39 Sec. 3.3.2 Total annual dustfall, pg. 41	RE: Mine site (pg. 18). Milne Port (pg. 19), North Crossing, Tote Road (pg. 20), and South Crossing, Tote Road (Pg. 22): None of the reference sites measured dustfall above the minimum detection limit (MDL) of 0.1 mg/dm^2 · day (Table 4-4, pg. 25). To put dustfall rates in the project development area (PDA) in perspective captions of Figures 3.2 to 3.5, 3-8 to 3-11, 3-12 to 3-15, 3-17 to 3-20, and 3-21 should mention that the MDL also represents the maximum dustfall rate at reference sites unaffected by the project. Consistent y-scales in each of these groups of 4 figures (or the 4 panels in 3-21) would enable direct visual comparisons of dustfall among sites within each group, making it clearer where dust issues lie than do same-sized figures with different scales.	Additional figures using identical Y-axis values were included in the final 2019 TEAMR to address this request.
18	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.2.2.1 Dustfall at sites 1,000 m distant...Figure 3-7, pg. 24	Should the caption read: "Annual" median daily dustfall...?	This suggested wording was used in the final 2019 TEAMR.
19	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.2.3 Seasonal Comparisons of 2019 Dustfall, pg 27	RE: “Seasonal effects at DF-P-01 and DF-P-08 were not evaluated because site DF-P-01 was relocated at the start of the summer season.” Need to clarify how this site change will affect seasonal trend analysis, and how the change will	In future reporting years, seasonal effects at DF-P-08 will be evaluated.

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			be identified over the long-term to ensure that its effects are obvious in future comparisons.	
20	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.2.3 Seasonal Comparisons of 2019 Dustfall, Figures 3-8 to 3-11 pgs. 29 and 30	RE: Figures 3-8 to 3-11: Suggest adding the month ranges to figure keys to clarify that "summer" is 3 months and "winter" 9 months (i.e., summer = June-August Winter = Sept. - May	This suggested edit was made to the final 2019 TEAMR.
21	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.3.1 Seasonal dustfall, Figure 3-19, pg. 39	Replace Figure 3-19. It does not fit the text and is identical to Figure 3-18.	This change was made in the final 2019 TEAMR.
22	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.3.2 Total annual dustfall, pg. 40	Move last paragraph in section up to 2nd last to keep the same Mine-Port-N road- S road sequence followed elsewhere in the document 4th line from the end of the section should read "..., while ore..."	This edit was made in the final 2019 TEAMR.
23	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 3.4 Dustfall summary, Figure 3-21, pg. 42	The panels in Figure 3-21 need labels to show which one is which (i.e., Mine, Port, N Road, and S Road).	Panel labels were included in the final 2019 TEAMR.
24	2019 Mary River Project Terrestrial Environment Annual	Section 3.4 Dustfall summary	The TEWG has made several recommendations for improving dustfall monitoring in subsequent years. The limitations of the current dustfall monitoring program should be summarized in	Section 3.1.2 provides a summary on the recent modifications made to the 2019 dustfall monitoring program based on QIA's request. The final location of these additional samplers was selected by the MHTO during an August 2018 site visit.

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	Monitoring Report		this section with recommendations for improvements from the TEWG.	It is unclear from the reviewers' comments what recommendations have been made for improvement to the program that Baffinland has not already addressed.
25	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 4 VEGETATION, p. 44	"In response to comments at the TEWG meeting on February 26, 2020, Baffinland will consider alternative methods to analyzing vegetation abundance data in 2020 (Baffinland Iron Mines Corporation 2020)." When can the TEWG expect an update on this in regards to 2020 monitoring plans? Clarify direction from the TEWG in terms of reference sites and considering moisture levels in the analysis. Clarify how TEWG direction to align dust fall monitoring and vegetation monitoring will be addressed.	The statement referred to by the reviewer suggests correctly that Baffinland will consider some revisions to vegetation abundance data analysis for future reporting. The changes to the analysis do not result in any changes to 2020 monitoring plans. Vegetation monitoring plans were discussed at the June 2020 TEWG meeting. Soil moisture regime was incorporated into vegetation analyses as a covariate to account for associations with some plant groups. A new analysis included in the 2019 TEAMR examined the interactions of dustfall and trace metals in vegetation and soil. New trace metals and vegetation abundance sampling sites that were added in 2016 were located near dustfall collector sites to strengthen this analysis. Further direction from the TEWG regarding reference sites, soil moisture regime, and dustfall monitoring can be discussed at upcoming TEWG meetings.
26	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 4 and Section 4.1.2	"…the results of the soils assessment determined there was no systematic relationship between soil moisture and distance class. This confirms that the study design for the vegetation abundance monitoring program is robust and defensible to monitor vegetation in the project area." This was not the conclusion of discussions with the TEWG at the February 2020 meeting. Update this statement to clarify that reference sites may	Soil moisture regime was incorporated into vegetation analyses as a covariate to account for associations with some plant groups. Further discussions with Paul Smith (ECCC) confirmed that this analysis adequately addressed concerns brought up during the February 2020 TEWG meeting.

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			be on average wetter than the monitoring plots, which means soil moisture will need to be incorporated as a variable into the analysis.	
27	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 4.2: Vegetation and soil base metals monitoring, p. 68	"Baseline data on vegetation and soil metal concentrations for the Project first collected as a baseline in August 2008 were not used because of discrepancies in the results. Those discrepancies were either due to laboratory methods or minimum detection limits at the time of analyses. Also, the collection methods from 2008 (Baffinland Iron Mines Corporation 2010a) were not available, and it is not possible to compare to the more recent data." This is a potentially serious issue. How are "collection methods from 2008" not available? This information should be reported somewhere at minimum. As stated below, archived samples would be helpful for future analyses.	As addressed in previous annual reports, the collection methods from 2008 field work are not available. Without knowing collection methods, the 2008 data cannot be compared to the more recent data.
28	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 4.2.1 METHODS, p. 69-72	Re: 20% replicate samples, it would be useful to archive some samples for potential future analyses, for example when lab detection methods change due to new techniques, etc. Samples are frozen prior to being sent to a lab, so could be frozen for long-term archiving.	Current lab detection methods provide the information needed for the data analysis required for the scope of the project. Furthermore, laboratory quality control/quality analysis methods have specific maximum hold times which may prohibit long-term storage of samples.
29	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 4.2.1.1 Vegetation and Soil Base Metals Monitoring, p. 73	"For example, 96% and 97% of baseline soil and lichen samples, respectively, were below the reportable detection limit (RDL) for mercury." Where were sample locations where mercury was above detection limits?	Mercury in some soil and lichen samples has been slightly above the reportable detection limit (RDL) at various sites throughout sampling years. The soil and lichen samples that were above mercury RDL were still well below indicator values and are within or below typical mercury concentrations in lichens. EDI is re-evaluating the CoPCs and may include mercury

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				and iron in the 2020 base metals analysis, which would include a more detailed description of sample locations, concentrations, and trends. Additional information will be shared with the TEWG as it becomes available.
30	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 4.2.1.3 Relationship Between Metals in Dustfall Deposition to Soil and Lichen, p. 77	Distance to PDA was a categorical variable, couldn't this also be treated as a continuous variable with measured distance? Same question re: vegetation and soil base level monitoring (s. 4.2.1.1).	For standardization with other monitoring program components, distance to PDA was treated as a categorical variable. However, Baffinland is considering treating distance to PDA as a continuous variable in 2020 analyses.
31	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 4.2.1.3 Relationship Between Metals in Dustfall Deposition to Soil and Lichen, p. 78	"Main effects from distance categories used in the primary analyses for vegetation and soil base metals were ignored, and no effort was made to explore interaction between dustfall deposition and sampling period (i.e., either before or after disturbance) or dustfall deposition and year, based on the potential for confounding effects." This isn't clear to me.	The main effects of distance were ignored because those effects on metal deposition in soil/lichen are addressed in sections 4.2.1.1 and 4.2.1.2. The analyses here focused on the interaction between metal in dustfall and each level of the distance categorical variable. Only two-way interactions were addressed in analyses due to limitations by sample sizes. Because of these limitations, interactions between dustfall deposition and either sampling period (before/after) or year were not pursued because they would not account for the confounding effects of distance to the PDA. I.e., dustfall values categorized into their respective period or year would not differentiate between samples close to or far from the PDA. This has been updated in the final 2019 TEAMR.
32	2019 Mary River Project Terrestrial Environment	Sec. 4.2.1.3 Relationship Between Metals in Dustfall	"Due to the complexity of visualizing interactions between two continuous variables (i.e., dustfall deposition and soil pH), pH was divided into four	For all multivariate analyses of soil samples, pH was treated as a continuous, numerical variable. To visualize the output of these analyses, rather than producing 3-dimensional

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	Annual Monitoring Report	Deposition to Soil and Lichen, p. 78	categories: 4 to 5.5; 5.5 to 6.5; 6.5 to 7.5; and 7.5 to 9." What is the justification/support for categorizing pH as such? Breakpoints, number of categories, etc.	figures that would likely be more difficult for readers to interpret, pH was plotted as a categorical variable. In other words, the categorization of pH was for visual purposes only. The criteria for choosing breakpoints for plots were two-fold: 1) to allow relatively equal sample sizes among the ranges, and 2) to clearly visualize the positive correlation between metals in dust fall and metal accumulation in soil as pH increased.
33	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 4.2.2.2 Metals in lichen	Re: "... mechanism for increased metal concentrations in lichen is likely attributed to dustfall generated by road dust from vehicle traffic." It would be useful to see metal data compared with data on traffic levels, weather conditions that influence dust, etc.	The dustfall program studies how traffic levels and weather conditions influence dustfall (Section 3.2.1.1, 3.2.1.2). Baffinland will continue to investigate the relationship between dustfall and metal concentrations in future monitoring programs and analysis.
34	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 4.3.1 METHODS, p. 115	"Areas were surveyed on foot, with some sections surveyed in a vehicle at slow speeds along the Tote Road." Vehicle-based botany surveys do not seem to be an efficient survey method, what proportion of the survey was conducted in this manner?	Although walking surveys were the preferred method of exotic invasive plant survey, vehicle-based surveys were used to survey roadsides along the Tote Road in areas where it was unsafe and time-prohibitive to park or walk. This method has been used for roadside invasive plant survey. Approximately one third of the total person-survey hours were spent surveying the Tote Road. However, pullouts and laydowns along the Tote Road were surveyed on foot whenever possible.
35	2019 Mary River Project Terrestrial	Natural Revegetation, p. 119	How is species diversity categorized? What is "high", "moderate", and "low" diversity?	Relative diversity was used to assess natural revegetation diversity, i.e., diversity was categorized based on how it compared to other

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	Environment Annual Monitoring Report			Project areas. Table 4-17 summarizes the number of species identified during 2019 surveys, ranging from 9 (low; Tote Road) to 22 (high; Milne Inlet).
36	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.1, snow track surveys, p. 125	Snow track surveys were conducted in April, May and November – this should be corrected.	The 2019 TEAMR has been corrected as directed.
37	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.1.2 snow track survey results and discussion, p. 126	This has been noted many times, but the efficacy of this survey is really not clear. It would be good to test visibility of tracks by doing two simultaneous surveys to see if the same data are collected by each survey team. This will be particularly important once caribou start interacting with the road. Also an ongoing concern with this survey is that caribou deflections may be happening at a fair distance from the road, so caribou tracks and importantly, deflections, may not be visible from the truck. Include this limitation in the results and discussion. For TEWG to discuss how this will be addressed in the future. Radio collars may partially address. Explore potential for using drones to conduct a parallel transect. In general, the annual report should include a summary section on a) concerns expressed by the TEWG and b) suggested improvements to the program based on comments from the TEWG.	Parallel snow track surveys conducted by snowmobile away from the Tote Road were tested during methodology development. This method was discontinued because snowmobiles could not effectively travel over the rocky terrain and create further disturbance that may influence caribou movement and behaviour. The primary objective of the snow track surveys is to monitor how caribou and other wildlife interact with the Tote Road and associated traffic at close proximity; more distant interactions and behavioural changes may be captured by other monitoring programs such as Height of Land surveys. Further improvements and recommendations to the snow track survey can be discussed at the upcoming TEWG meeting.

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38	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.2, snow bank height monitoring, p. 128	Clarify what compliance means (assuming that compliance = 100 cm or less?). Clarify how measurement locations were originally selected (random subset of the total?).	As stated in section 5.2.1. Methods, "Snow bank heights were evaluated as compliant if they were at or below 100 cm, and non-compliant if they were above 100 cm." Measurement locations were selected as a random subset of the total number of km markers. Measurement locations have been re-evaluated and beginning in winter 2019–2020, are randomized before each snowbank survey (i.e., a new set of measurement locations is chosen at random for each survey).
39	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.3 Height of Land surveys (intro), p. 132	A discussion of the limitations of these surveys, which have been pointed out many times by TEWG members, should be included upfront.	The HOL surveys were designed to assess caribou presence and habitat use in proximity to the PDA, and behaviour in response to the Project activities. These objectives are achieved through HOL survey methodology, and this is described in Section 5.3. A more explicit description of HOL survey objectives can be added to the 2020 TEAMR.
40	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.3 Height of Land surveys, 5.3.1 methods	Re: MHTO suggestion that observation station locations be re-evaluated. Was this discussed at the February 2020 TEWG meeting? Please explain how this will be done before the next round of data collection. Also suggested improvements to methods should be included here (including suggestions of TEWG members to have independent observations during surveys).	The MHTO participated in the HOL surveys to evaluate the effectiveness of the method in 2017, and at that time had not suggested any re-evaluation of station locations. However, if the MHTO is now suggesting a re-evaluation, Baffinland will further engage with them to determine the reasons behind that suggestion and revise, as necessary. Station re-locations were not raised by the MHTO at the February 2020 TEWG meeting. The topic was raised at the June 2019 meeting that there are some places that could be added to the survey to better spot caribou. Baffinland acknowledged that caribou can be found elsewhere and clarified that that the purpose of

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				the HoL is to spot caribou within the project boundary. Independent observations at HOL sites are not being considered at this time while caribou numbers and encounters are low. To calibrate the survey in future years when caribou are found in abundance, independent observations may be considered if the TEWG clarifies the purpose and practicality, and the usefulness of informing on project effects of the suggestion.
41	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.3.2.1, Inuit Qaujimajatuqangit	How were the observations of the Inuit survey assistant incorporated into the methods? For example, the timing of height of land surveys (morning is better) and the wind speed may be important for seeing caribou. Labelling this as IQ is concerning; suggest checking this with the MHTO. At a minimum, this knowledge should be verified with IQ-holders and incorporated into the survey methods.	Due to logistical constraints (i.e., limited window during calving period to visit each HOL station twice), it is not feasible to change HOL survey methodology to align with all IQ recommendations (e.g., only conducting surveys in the morning). However, the recommendations of Inuit knowledge holders are reviewed with all HOL participants prior to surveys and are used to increase likelihood of caribou detection whenever possible.
42	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.4 Incidental observations	Include suggestions for how to improve reporting for incidental observations (e.g., wildlife logs that include time on the road; trained wildlife monitors going with truck drivers periodically to get better data on incidental observations). See suggestion below to include reporting out on effort. Note that if improvements are made, incidental observations, could provide an early indication of caribou population changes, which is critical for enacting mitigations; the 2018 Ringrose citation suggests a significant lag time between data collection and reporting. This may be addressed	The TEWG suggested that Baffinland may be interested in observers summarizing their search effort for incidental observations so that findings could be summarized as a “catch per unit effort” format. Baffinland is exploring the potential for doing this, but there are added challenges to record keeping and data management. As incidental observations are just that (incidental), and not necessarily related to a specific project term or condition, refinement to methods may be considered once all other

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			in the future if regional monitoring using collars is established.	Project Term and Condition requirements are addressed to the satisfaction of the TEWG and NIRB.
43	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 5.4 INCIDENTAL OBSERVATIONS, p. 137	It would be beneficial to see some reporting on effort of sightings (e.g., caribou seen per haul truck transit, km trucked, helicopter distance, etc.).	Due to the infrequency of incidental caribou observations, reporting sightings per unit effort would not yield a readily interpreted value. However, recommendations for improving incidental wildlife observations are being considered by Baffinland, namely the practicality of implementing the change, by who, and how to document.
44	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.4 Incidental observations	What time of year were caribou observed? How was the apparent “no sign of disturbance” for caribou near Phillips creek evaluated? Location of caribou (approximately 1 km west of road on the other side of Phillips Creek) illustrates why the track surveys from the truck are probably not very efficacious.	Caribou were observed between June and September. Caribou behaviour at the Philips Creek observation was assessed visually from inside a bus on the Tote Road. Caribou were observed grazing and not showing sign of disturbance response.
45	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 5.4 INCIDENTAL OBSERVATIONS, p. 138	Re: the walrus observations from the Steensby Inlet area - this could be useful information to contribute to baseline (PCC requirement) if collected in a structured manner.	Recommendations for incorporating walrus observations into baseline data can be discussed at the Marine Environment Working Group (MEWG) meetings, as necessary. Incidental wildlife sightings are recorded, including walrus. Data recorded includes date of observation, location with coordinates if available, no. animals per species, and any notable comments (e.g., swimming).
46	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	5.5. Hunters and Visitors Log; 5.6 Inter-annual trends	Data for numbers of hunters and visitors are not collected in a way that allows any statements to be made about whether people are avoiding the mine and road or not. This statement should be removed.	The hunter and visitor log is voluntary to respect individuals’ privacy, and does not represent a complete record of all visitors passing through the project area, which is explained in section 5.5. No conclusions are made in section 5.5. or 5.6 about whether people are avoiding the Tote Road. Regardless, Baffinland will continue to manage access to

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				the Project in a manner consistent with Article 13.3.1 of the IIBA and as described in Baffinland's Hunter and Visitor Site Access Procedure.
47	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 5.7 Mammals summary	The conclusion should clearly state the limitations with these data for understanding wildlife interactions with the project, and in particular for being able to understand and track changes in wildlife interactions. Snow track surveys and HOL surveys continue to provide very little data to help inform mitigations and adaptive management. It is frustrating to see these data reported without any acknowledgement of the weaknesses and recommendations for improvements. Although Baffinland has made some minor changes to methods (e.g., increasing survey frequency for HOL surveys and snow tracking surveys), the survey approaches are still not effective for meeting the requirements of the Project Conditions. In particular, it is currently impossible to say from these data whether caribou are avoiding important calving areas near the mine and/or being deflected from the Tote Road. As this is a publicly available report, it is important to state that and explain how these limitations are being addressed. Overall we suggest that the annual report include recommendations for improvements of monitoring programs by the TEWG, and describe how they will be addressed in subsequent years.	The HOL surveys and snow track surveys were designed to assess caribou presence and habitat use in proximity to the PDA, and behaviour in response to the Project activities and Tote Road. These objectives are achieved through HOL survey and snow track survey methodology. A major barrier to detecting changes in caribou behaviour and distribution is the low regional caribou abundance. Baffinland is currently investigating triggers to increasing monitoring effort for caribou as populations increase. A more explicit description of HOL survey objectives can be added to the 2020 TEAMR should the TEWG continue to require the additional text.

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48	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.2 TERMINOLOGY, pp. 149-150 (also see sec. 6.3.5.6 Reproductive Success and 5.2.6.4 Reproductive Success re: MAA values)	This section is useful and builds on previous reviews, but it would be helpful to know how these terms are applied to PEFA and RLHA, e.g., MAA - what is actual age used for these species?	The species-specific Minimum Acceptable Ages (MAAs) are as follows: PEFA = 32 days GYRF = 36 days RLHA = 32 days
49	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.5.2 Distance to Disturbance, p. 153	Measured to nearest project feature only? Could the total number of project features within a particular distance, as a measure of overall potential Project-related disturbance, be a factor?	As project features are highly variable (e.g., size, level of activity, type of disturbance), this would be a difficult factor to assess. Distance to disturbance represents an estimate of Project-related disturbance that is more easily quantified and analyzed.
50	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.5.2 Distance to Disturbance, p. 153	"Distance to disturbance (DD) values for only those sites within the RMA were retained for effects analysis on occupancy and reproductive success." What was the effect on sample sizes? It looks like six PEFA nests were removed, is this correct? One nest site is shown on the edge of the RMA in Map 8, was it included or excluded?	Baffinland addressed the sample size issue in 2015, as is stated in Section 6.3.1 of the 2019 TEAMR. The number of nesting sites within each buffer as previously done in the 2015 report (0.0km ≥ 1.0km, 1.0km ≥ 3.0km, 3.0km ≥ 5.0km, 5.0km ≥ 10.0km) could again be considered for inclusion as part of 2020 reporting efforts. The nest site on the edge of the Raptor Monitoring Area (RMA) was included.
51	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.5.5 Occupancy Modelling, pp. 155-156 (and Sec. 6.3.7 DISCUSSION)	This recent paper on Golden Eagle occupancy modelling could provide useful information for the raptor monitoring program: Mizel, J.D., C.L. McIntyre, S.B. lewis, M.S. Lindberg, and J.H. Schidt. 2018. A multi-state, time-removal model for population dynamics of cliff-nesting raptors. The Journal of Wildlife Management 82(8): 1701–1710.	The paper will be reviewed in context of the raptor monitoring program.

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52	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.5.5 Occupancy Modelling, pp. 155-156	What other ecological factors (besides distance to nearest occupied neighbour) were used as covariates? Any weather variables, etc?	No other covariates were used is the 2019 analysis. 2020 is year 3 of a 3-yr project designed to include weather and prey (small mammals and avian prey). These covariates have not been included in the past because the focus is effects monitoring. The significant effect of year likely captures the effects of weather and prey.
53	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.1 Nesting Site Detections, 157-158	Re: Table 6-2 (summary statistics for survey effort and detections), it would be useful to see proportional data, e.g, 43 PEFA sites in 2019 versus 29 in 2012, but as a proportion of the total sites checked occupancy is similar (26-27%).	This has been updated in the final 2019 TEAMR.
54	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.1 Nesting Site Detections, 157-158	The number of RLHA sites detected was highest every four years (2012 and 2015), which makes sense given typical lemming population cycles. One would expect high numbers again in 2018 or 2019 but this was not the case - any thoughts on why lemming numbers have not rebounded?	Baffinland also anticipated 2019 would be high based on the 4-year cycle. However, 3 to 5 years between highs are not uncommon. Lemming trapping is proposed for the 2020 monitoring program to continue to track lemming population cycles. An investigation into the mechanism(s) behind lemming population cycles is beyond the scope of the TEAMR.
55	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.2 Assigning Nesting Sites to Nesting Territories, p. 158	"... n.b., the analysis conducted for the 2018 report incorporated known nesting sites prior to 2012, including those that had not been occupied from 2012 to 2018, and those that had been occupied by irruptive species such as the Snowy Owl." How does this affect comparability of monitoring results across different years?	It does not affect the comparison among years – the 2019 analysis was a stand-alone analysis of the data as described in the Methods (Section 6.3.5). The statement is simply a clarification of the analytical approach employed. There is only one Snowy Owl nest in the current RMA.

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56	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.2 Assigning Nesting Sites to Nesting Territories, p. 158	"... the 94 peregrine nesting sites were reduced to a total of 76 distinct nesting territories, and the 91 Rough-legged Hawk nesting sites were reduced to 71 distinct nesting territories (Figure 6-2)." Does Figure 6-2 (p. 159) show all nests within each defined territory that were occupied in any year, or just those occupied in 2019? Some of the territories show two nests (e.g., PEFA territory 26, RLHA territory 66), suggesting the former. Have mapped territories changed over time?	The figure does not show nests. It shows nesting sites within nesting territories. Nests exist with nesting sites (see Terminology for how these are defined).
57	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.3 Occupancy, p. 158 (and 6.3.8 INTER-ANNUAL TRENDS, etc.)	"From 2012 to 2019, the top model for the Peregrine Falcons indicated that colonization and extinction were best explained by yearly variation (see Table 6-3). Distance to disturbance, and distance to the nearest neighbour appeared in the third and fifth models with ΔAIC of 7.13 and 8.71 respectively; a drastic change from the top model and an indication that neither of the covariates explain colonization and extinction better than natural variation from year to year." Yearly variation is clearly important, but what factors influence this? Weather, etc?	Year likely incorporates variability associated with prey and weather.
58	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.3 Occupancy, p. 158	"As is typical among specialists like Rough-legged Hawks, occupancy can vary widely across years when main prey species (i.e., microtine rodents) are not available. When yearly occupancy is summarized among years (Figure 6-4), two peaks are clearly evident in 2012 and 2015."	Baffinland also anticipated 2019 would be a high based on the 4 year cycle. However, 3 to 5 years between highs are not uncommon. Lemming trapping is proposed for the 2020 monitoring program to continue to track lemming population cycles. An investigation into the mechanism(s) behind lemming population cycles is beyond the scope

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			It seems we would have expected a peak again in 2018 or 2019, which did not occur. Any suggestions as to why?	of the environmental impact monitoring and the TEAMR.
59	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.3 Occupancy, p. 158 (and 6.3.8 INTER-ANNUAL TRENDS, etc.)	"Variation in the probability of nest survival among Peregrine Falcons and Rough-legged Hawks was poorly explained by distance to nearest neighbor, distance to disturbance, and an interaction between them (Table 6-6, Figure 6-5, Figure 6-7)." What about weather-related influences like rainfall events or temperature? “Potential sources of spatial correlation include variation in food availability, environmental conditions, disturbance effects not captured by fixed variables, or various combinations of all three.” Couldn't environmental parameters and food availability be considered in the models?	2020 is year 3 of a 3-yr project designed to include weather and prey (small mammals and avian prey). These covariates have not been included in the past because the focus is effects monitoring. The significant effect of year likely captures the effects of weather and prey.
60	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.6.4 Small Mammal Monitoring, p. 169	“Small mammal monitoring in 2019 tallied to a total of 2,880 trap-nights over two, 6-night trapping sessions. Over the trapping duration, one collared lemming was captured, 42 traps misfired, and three traps had missing bait. The low detection of small mammals despite high effort indicates a regional low abundance of small mammals in 2019.” What information on lemming trends is available? It seems the cyclic pattern has changed.	An investigation into regional lemming population trends is beyond the scope of environmental impact monitoring and the TEAMR. However, lemming trapping is proposed for the 2020 monitoring program to continue to track lemming population cycles.

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62	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.7 DISCUSSION, p. 169	"Although annual variation in reproductive success for Peregrine Falcons and Rough-legged Hawks is apparent, it is most likely representative of natural variability associated with variation in prey availability and weather rather than due to the influence of anthropogenic disturbance." Given these results, these factors (variation in prey availability and weather) should be included in the models.	2020 is year 3 of a 3-yr project designed to include weather and prey (small mammals and avian prey). These covariates have not been included in the past because the focus is on project effects monitoring. The significant effect of year likely captures the effects of weather and prey.
63	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.7 DISCUSSION, p. 169 (also 6.3.8 INTER-ANNUAL TRENDS, etc.)	"A potential ongoing decline in Peregrine Falcon occupancy and weak evidence that distance to disturbance may be associated with reduced reproductive success, flagged in 2018, does not appear warranted with the additional data collected in 2019." It does speak to the need for careful monitoring in future years (and this isn't a complaint about the quality of the monitoring program, as it's well-done).	The cliff-nesting raptor monitoring program will continue in future years.
64	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 6.3.7 DISCUSSION, p. 169 (also 6.3.8 INTER-ANNUAL TRENDS, etc.)	"In addition, weather-related environmental variables are anticipated to be included with distance to anthropogenic disturbance as part of on-going modelling efforts. Based on the analysis to account for distance to disturbance and distance to nearest neighbour individually, and as an interaction, it appears that there is no negative effect of these factors on occupancy (i.e., estimates ± standard errors of λ overlap with 1.0) or reproductive success."	2012 – 2019 weather data are available for weather stations from Milne Port and Mary River. We anticipate that these data will be included in the 2020 analysis.

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			What is available for weather-related environmental variables for the years 2012-2019?	
65	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 7 HELICOPTER FLIGHT HEIGHT, pp. 171-183	Helicopter flights in relation to Foxe Basin walrus haulouts should be included in this section moving forward. Map 12 (p. 180) shows a number on non-compliant flight heights in Foxe Basin. Walrus use of haulouts depends on sea ice conditions but many are typically in use in August. September is also a month when terrestrial haulouts can be heavily used. Flight heights and paths should be compared to the locations of walrus haulouts and DFO recommendations on avoidance.	Walrus sightings are currently captured incidentally through the Wildlife Sighting Log, and is beyond the scope of the Terrestrial Environment Annual Monitoring Report. Data recorded for wildlife sightings include date of observation, location with UTM coordinates if available, no. animals per species, and any notable comments (e.g., swimming). For reference, see known walrus haulout sites in Foxe Basin and 2019 helicopter flight tracks separated by month. A 5 km buffer is maintained around each known walrus haulout.
66	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 7.1 Helicopter flight data methods, p. 173	Be clear about how the data are being re-analysed based on the TEWG comments: a) Total number of flights that are compliant by height, not compliant by height but explained, and not explained; b) Total time spent below 1,100 magl for flights within the Snow Goose areas in July-August in relation to total flight time c) Total time spent below 650 magl for all other flights compared to total flight time. These data should be provided for all of the years and based on type of flight (monitoring, exploration).	The helicopter flight height and compliance re-analysis is currently in progress. We will take these recommendations into consideration during analysis and reporting. However, the updated 2019 TEAMR does include detailed breakdown of rationale for low-level flights, categorizing compliance into fully compliant, non-compliant with rationale, and non-compliant without rationale.

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			Consider providing average flight heights and variance for flights that are below the requested elevation – this may help inform potential mitigations. Consider changing terminology to better reflect flights that are compliant with the elevation requirements vs. flights that are non-compliant but explained vs. flights that are non-compliant but not explained. The terminology that is currently used is not very transparent.	
67	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Section 7.1 Helicopter flight data methods, p. 173	Re: horizontal guidelines – beyond snow geese, it is not clear how other concentrations of migratory birds are identified. It would appear that they are not at the moment, which raises the concern that Baffinland may not be compliant with Project Condition 71. Request discussion with Baffinland and TEWG members to determine whether additional measures to identify migratory bird concentrations are needed.	Baffinland welcomes further discussion with the TEWG if the QIA is concerned about possible non-compliance with PC 71. However, no other concentrations of migratory birds have been identified in baseline studies, by the GN, ECCC, QIA, the MHTO, community meetings, TEWG meetings, or continued observations on site. This topic was further discussed in the June 2020 TEWG teleconference and no further data on known concentrations were provided, although the MHTO was not present at that meeting to provide information. Additionally, Baffinland has conducted follow-up bird surveys from 2013–2015, and contributed to bird surveys conducted by ECCC in 2018 and 2019. Baffinland will endeavor to gather information on known bird concentrations from community members when conducting engagement meetings.
68	2019 Mary River Project Terrestrial Environment Annual	Sec. 8 WILDLIFE INTERACTIONS AND MORTALITIES, p. 184	"Most of the non-fatal wildlife interactions reported involved Arctic foxes in areas with attractants, such as dumpsters, incinerator or garbage bins at the Mine and Port Sites."	Dumpsters and garbage bins are not necessarily contained within fences because they are generally contained within site facilities. Building on refinements over years of implementation of the Waste Management

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	Monitoring Report		Does access management need re-consideration? Aren't these sites fenced to keep carnivores out?	Plan, Baffinland will continue to monitor organic waste disposal and incineration to minimize scavenger attractants.
69	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 8 WILDLIFE INTERACTIONS AND MORTALITIES, p. 184	How many records of Rock Pigeon are available for north Baffin? This bird presumably arrived on a Project vessel? What was cause of death for this individual, if known? Also note that this species is not listed in Appendix H.	The Rock Pigeon arrived already deceased in a Project vessel and the cause of death was unknown. As the bird was deceased upon discovery and presumably originated from the South, it was not included in Appendix H.
70	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 8 WILDLIFE INTERACTIONS AND MORTALITIES, p. 184	"One male sub-adult ringed seal was caught in a gill net during fish collection for research purposes (Scientific Licence No. S-19/20-1033-NU)." Is this reported in the MEEMP draft? Was DFO informed? What was done with the carcass?	A project biologist reported the seal immediately and as part of the end of year scientific licence report to DFO. It was not reported in the MEEMP. The carcass was frozen and later incinerated.
71	2019 Mary River Project Terrestrial Environment Annual Monitoring Report	Sec. 8.3 INTER-ANNUAL TRENDS (Figure 8-1 Wildlife mortality trends from 2014 to 2019)	How do fox mortality numbers across years compare with data on population cycles and prey availability (lemming cycles)?	Addressing that fundamental ecological question of predator/prey relationships is beyond the scope of Project effects monitoring and the TEAMR.