MARY RIVER PROJECT

Terrestrial Environment
2021 Annual Monitoring Report

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Down to Earth Biology

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ᓇᐃᓈᖅᓯᒪᔪᑦ

ᓄᓘᔾᔪᓐ ᐱᓕᕆᐊᖅ (ᐱᓕᕆᐊᖅ) ᓴᕕᒃᓴᓂᒃ ᐅᔾᕋᖕᓂᐊᕐᕕᐅᒧᖅ ᐃᓂᖃᖅᐳᓂ ᕿᑭᖅᑖᓗᑉ ᓄᓇᖁᑎᖏᓐᓂᒃ ᐅᐊᖕᓇᖕᒐᓂ ᕿᑭᖅᑖᓗᑉ ᕿᑭᖅᑖᓗᖕᒥ, ᓄᓇᕗᒻᒥ. ᐱᓕᕆᐊᖅ ᐃᓚᖃᖅᑐᑦ ᓴᓇᔾᔭᐅᓂᖕᒐᓂᒃ, ᐊᐅᓚᑕᐅᓂᖕᒐᓂᒃ, ᒪᑐᔾᔭᐅᓂᖕᒐᓂᒃ ᐊᒻᒪᓗ ᓄᓇᖕᒐ ᐅᑎᖅᑎᑕᐅᓗᓂ 22.2 ᒥᓕᐊᓐ ᑕᓐᓯ ᐊᕐᕌᒍᑕᒦᑦ (mpta) ᐃᑎᖅᓴᓕᐅᕐᔪᑎᒃ ᐅᔾᕋᖕᓂᐊᖅᑐᑦ ᐊᐅᓚᑕᐅᓂᐊᖅᑐᑦ 21-ᓄᑦ ᐊᕐᕌᒍᓄᑦ. ᐱᐅᔪᒻᒪᕆᓂᒃ ᓴᕕᒃᓴᖅ ᓈᒻᒪᒃᑐᖅ ᓄᓇᕐᔪᐊᓕᒫᒧᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᔫᖅ ᓯᖃᓕᔾᔭᐅᓚᐅᖅᑎᓪᓗᒍ ᐊᕕᒃᑐᖅᑕᐅᓪᓗᓂᓗ ᐅᕕᓂᖓᑦ ᐆᓇᖅᑐᓄᑦ ᑲᒪᒋᔾᔭᐅᕝᕕᖃᕐᒋᓗᓂ. ᓴᓇᓯᒋᐊᓚᐅᖅᑐᑦ ᐱᒋᐊᖅᓗᓂ 2013-ᒥ, ᐊᒻᒪᓗ ᐅᔾᕋᖕᓂᐊᓯᒋᐊᖅᓗᑎᒃ ᓯᑎᐱᕆ 2014-ᒥ. ᐱᓕᕆᐊᖅ ᒫᓐᓇ ᑮᓇᐅᔾᔭᒃᓵᓕᓇᓱᖕᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᖅ (ERP), ᐃᓗᓕᖃᖅᓗᓂ ᐅᔾᕋᖕᓂᐊᕐᓂᖏᑦ ᑎᑭᓪᓗᒍ 4.2 ᒥᓕᐊᓐ ᑕᓐᓯᑦ ᐊᕐᕌᒍᑕᒦᑦ ᐅᔾᕋᖕᓂᐊᕙᒃᓴᒥ 1-ᒥ. ᐊᖏᖅᑕᐅᓯᒪᓚᐅᕆᒃᑐᑦ ᐅᔾᕋᖕᓂᐊᕆᐊᓪᓚᒃᓯᒪᓗᑎᒃ ᐅᓯᒃᖅᑕᕐᓗᑎᒃ ᐊᖅᑯᑎᑯᑖᒃᑯᑦ ᐊᒻᒪᓗ ᐊᐅᓪᓚᖅᑎᑦᑎᔪᓇᖅᓗᑎᒃ 6.0 ᒥᓕᐊᓐ ᑕᓐᓯ ᐊᕐᕌᒍᑕᒦᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕐᕕᒃᑯᑦ ᐊᖏᖅᑕᐅᓚᐅᖅᓯᒪᔪᖅ ᓯᑎᐱᕆ 2018-ᒥ ᐊᒻᒪᓗ ᐅᖓᕙᕆᐊᖅᑕᐅᓯᒪᓪᓗᓂ ᑎᑭᓪᓗᒍ 2021-ᒧᑦ (ᒥᓂᔅᑕ ᐅᑭᐅᖅᑕᖅᑐᓕᕆᓂᕐᒧᑦ 2020). ᐊᖏᖅᑕᐅᓯᒪᒃᑲᓂᖅᐳᓂᓗ ᑭᓯᐊᓂᓕ ᓴᓇᔾᔭᐅᓯᒫᓂᙱᑦᑐᖅ ᓱᓕ ᓄᓇᓯᐅᑎᑯᑖᒃᑯᑦ ᐊᖅᑯᑎᑯᑖᖅ ᐅᓯᒃᖅᑕᕐᓂᐊᖅᑐᑦ 18.0 ᒥᓕᐊᓐ ᑕᓐᓯᓂᒃ ᓴᕕᒃᓴᓂᒃ ᐅᔾᕋᖕᓂᐊᕐᕕᖕᒥ ᑐᒃᓯᕋᖅᑕᐅᓯᒪᔪᒧᑦ ᐊᕐᕌᒍᓕᒫᑦ, ᐃᑎᔫᒥᓪᓗᓂ ᑐᓚᒃᑕᕐᕕᒃ ᐃᒃᐱᑭᑦᑐᕐᔪᐊᓂ, ᓴᕕᒃᓴᖅ ᐅᓯᓕᖅᓱᖅᑕᐅᓂᐊᖅᐳᓂ ᐅᒥᐊᕐᔪᐊᓄᑦ ᓴᕕᒃᓴᓂᒃ ᐅᓯᔫᒃᓴᓄᑦ ᑕᕆᐅᑉ ᐊᑭᐊᓄᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᓗᑎᒃ ᐊᒥᑦᑑᑉ ᐃᒪᖕᒐᒍᑦ.

2021-ᒥ, ᐹᕝᕚᓐᑯᑦ ᐅᓯᒃᖅᑕᓚᐅᖅᑐᑦ 5.8 ᒥᓕᐊᓐ ᑕᐸᓗᖕᓂᒃ ᐅᔾᕋᖕᓂᐊᕐᕕᖕᒥᑦ ᕿᙵᐊᓄᑦ ᑲᑎᖅᓯᐃᕝᕕᖕᒧᑦ ᐊᒻᒪᓗ ᐊᐅᓪᓚᖅᑎᑦᑎᓪᓗᑎᒃ 5.6 ᒥᓕᐊᓐ ᑕᓐᓯᓂᒃ ᓴᕕᒃᓴᓂᒃ ᕿᙵᐊᑕ ᑐᓚᒃᑕᕐᕕᖕᒐᒍᑦ. ᓴᓇᔾᔭᐅᓯᒋᐊᕐᓂᖕᒐ 2021-ᒥ ᑭᒡᓕᖃᓚᐅᖅᑐᑦ ᐅᑯᓄᖕᒐ; ᐱᕙᓪᓕᐊᖏᓐᓇᕐᓗᑎᒃ ᐊᒻᒪᓗ ᓴᓇᔭᐅᓗᑎᒃ ᐱᕐᑯᑎᕐᔪᐊᑦ ᐱᕐᑯᑎᒃᑯᕕᒡᓗ ᐱᑕᖃᕆᐊᓖᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ ᐊᒻᒪᓗ ᐅᔾᕋᖕᓂᐊᕐᕕᖕᒥ ᐃᓂᐅᔪᒥᒃ ᐃᑲᔪᖅᓯᕐᑯᓪᓗᒍ ᐊᐅᓚᓂᐅᔪᓂᒃ ᓱᓇᒃᑯᑖᒃᑲᓂᕐᓄᑦ ᐊᒻᒪᓗ ᐱᕐᑎᑕᖃᕆᐊᖃᕐᓂᖕᒐᓄᑦ, ᐊᒻᒪᓗ ᖀᒃᑲᓂᐊᒍᑦ ᐃᒥᕐᒧᑦ ᐊᐅᓚᑦᑎᔾᔪᑏᑦ ᐱᕐᑎᕐᔪᐊᑦ ᑕᐃᑲᓂ ᐅᔾᕋᖕᓂᐊᕙᒃᓴᖅ 1-ᒥ. ᓄᙳᐊᓂ 2021, ᑲᑎᓗᒃᑖᖅᐳᒋᑦ ᐱᓕᕆᐊᑉ ᐃᓂᒋᔪᓐᓇᖅᑖ ᐃᒪᓐᓇᑎᒋᐅᓚᐅᖅᑐᑦ 587 Hᐃᐊᒃᑐᔅ.

ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᐅᔾᕋᖕᓂᐊᕈᓐᓇᐅᑖ ᓇᐃᓴᐅᑎ 005 ᐱᖃᓯᐅᔾᔨᓯᒪᔪᖅ ᐊᒥᓱᓚᖕᓂᒃ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓂᒃ ᐹᕝᕚᓐᑯ ᓴᕕᒃᓴᓂᒃ ᐅᔾᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᒃᑯᖏᓐᓂᒃ (ᐹᕝᕚᓐᑯ) ᐱᓕᕆᐊᖃᕐᑯᓪᓗᒋᑦ ᐊᒃᑐᐃᓂᕐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒥᒃ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ. ᐱᓕᕆᐊᕆᔭᐅᔪᑦ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᓃᑦ ᖃᐅᔨᒪᔨᑕᖃᖅᐳᑎᒃ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓗᐊᕐᔾᔭᐃᒃᑐᑎᓄᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓄᑦ (ᐹᕝᕚᓐᑯ ᓴᕕᒃᓴᓂᒃ ᐅᔾᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᒃ 2016ᐃ). ᑲᒪᒋᔾᔭᐅᔪᖅ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᖏᓐᓂᑦ (TEWG), ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐃᓚᒋᔾᔭᐅᔪᑦ ᐹᕝᕚᓐᑯᓐᓂᑦ, ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖏᓐᓂᒃ, ᒐᕙᒪᖏᓐᓂᑦ ᓄᓇᕘᑉ, ᐊᕙᑎ ᐊᒻᒪᓗ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᖕᒐᓄᑦ ᑲᓇᑕᒥᒃᑯᑦ, ᐊᒻᒪᓗ ᒥᑦᑎᑐᒪᓕᖕᒥ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ ᑎᒥᖁᑖ. ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᐱᓕᕆᐊᖑᔪᓯᒋᐊᓚᐅᖅᑐᑦ 2012-ᒥ ᐊᒻᒪᓗ ᑲᔪᓰᓐᓇᖅᐳᓂ 2021-ᒧᓱᖕᒐᖅ ᐋᖅᑭᒋᐊᖅᕕᖃᐃᓐᓇᖅᑐᒥᒃ ᐱᓕᕆᐊᒧᑦ ᑐᙵᕕᓖᑦ ᖃᐅᔨᔾᔭᐅᔪᓄᑦ ᐊᒻᒪᓗ ᐅᖃᕐᕕᐅᖃᑦᑕᕐᓂᖏᓐᓄᑦ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᖏᓐᓂᑦ (TEWG). ᑖᓐᓇ ᐅᓂᒃᑳᖅ ᓇᐃᓪᓕᑎᕆᓯᒪᔪᖅ ᖃᐅᔨᓴᕈᑎᓂᒃ ᑲᑎᖅᓱᖅᑕᐅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᖅ ᐱᓕᕆᐊᖑᓯᒪᔪᑦ 2021-ᒥ ᐱᓕᕆᐊᒧᑦ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐅᑯᐊ ᐃᓗᓕᖏᑦ (ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᑐᐃᓐᓇᐅᑎᑕᐅᔪᑦ ᑎᑎᕋᖅᓯᒪᔪᖅ 0–ᒥ):

- ᓯᓚᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᖅᓂᖅ;
- ᖁᓕᒥᑰᒃᑯᑦ ᖃᖕᒐᑕᓅᑦ ᐳᖅᑐᓂᕐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ;
- ᐳᔪᖅ ᑲᖕᒐᑦᑕᐃᓐᓇᐅᔭᖅᑐᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ;
- ᐊᐅᔾᔭᕆᒃᒥᖃᖅᑕᖅᑐᓂᒃ ᐳᖅᑐᓯᕙᒃᑐᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ;
- ᓇᓯᑦᑕᖅᑐᕐᕕᖕᒥ ᑐᒃᑐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ;
- ᐅᖓᓱᒃᑐᑏᑦᑐᓂᒃ ᐊᑐᕐᓗᑎᒃ ᐊᔾᔨᓕᐅᕈᑎᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ;

- ᐳᔪᕋᖅ ᑲᑕᒐᖃᑦᑕᕐᓂᖓᓄᑦ ᐊᖏᓂᖓ ᐊᔾᔨᙱᐊᑎᒍᑦ ᖃᐅᔨᓴᕐᓂᖅ
- ᐱᕈᖅᑐᑦ ᐊᒻᒪᓗ ᐃᔾᔪᕐᒥᖖᖅᑐᑦ ᓴᕕᕋᔭᖕᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ
- ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ;
- ᐊᖑᓇᓱᒃᑏᑦ ᐊᒻᒪᓗ ᐳᓖᖅᑐᑦ ᐊᑎᓕᐅᕐᕕᖏᑦ ᓇᐃᓪᓕᑎᖅᓯᒪᔪᑦ;
- ᑎᑭᑉᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕝᕕᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ; ᐊᒻᒪᓗ
- ᐆᒪᔪᑦ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓂᖏᑦ ᐊᒻᒪᓗ ᑐᕐᑯᑕᐅᓂᖏᑦ.

ᓇᓗᓇᐃᖅᓯᔾᔪᑎ: ᐃᓄᐃᑦ ᐃᓚᐅᑎᑕᐅᓂᖏᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᖅ ᓄᓇᒥ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓂᑦ ᐱᓕᕆᐊᖑᓯᒪᔪᓂ ᐹᕙᓖᓐᑯᓐᓂᑦ. ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᐱᕙᓪᓕᐊᖏᓐᓇᖅᑐᑦ ᓄᓇᕗᒻᒥ ᑎᑭᖃᑦᑕᕐᑯᔾᔫᖏᓐᓃᑦ ᐊᐅᓪᓚᖃᑦᑕᕐᑯᔨᖏᓐᓃᑦ ᐊᒃᑐᐊᔪᑦ ᓄᕙᒡᔪᐊᕐᓇᖅ-19-ᒧᑦ ᓄᓇᕐᔪᐊᒥ ᖃᓂᒪᓇᕐᔪᐊᒧᑦ, 2021-ᒥ ᐹᕙᓖᓐᑯᑦ ᐃᓚᐅᑎᑦᑎᔪᓇᓚᐅᙱᑦᑐᑦ ᐃᓄᖕᓂᒃ ᖃᐅᔨᓴᖅᑎᓄᑦ ᐃᑲᔪᖅᑎᓂ ᕿᑭᖅᑖᓗᖕᒥ ᓄᓇᓕᖕᓂᖕᖠᖅᑐᓂᒃ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ.

ᓯᓚᐅᑉ ᖃᓄᐃᓕᖓᓂᖓ 2021-ᒥ ᓇᐃᓪᓕᑎᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᖃᓄᐃᙵᓂᖅᓴᐅᖕᒪᖔᑦ ᖃᓄᐃᓕᖓᓂᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖔᑦᑎᓐᓂ ᐊᕿᒍᓂ. ᐊᐅᓚᓂᖃᑦᑎᐊᖏᓐᓂᖓᓄᑦ ᓂᓪᓚᓱᖕᓂᖓᓄᑦ ᐅᖅᑰᓂᖓᓄᑦ, ᒪᕐᑯᖃᑦᑕᕐᓂᖓᓄᑦ, ᐊᒻᒪᓗ ᐊᓄᕆᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᖏᓐᓇᕈᑏᑦ ᖃᓄᐃᙵᓂᖅᓴᐅᖕᒪᖔᑕ ᑕᒪᒃᑯᓄᖓ ᖃᓄᐃᓕᖓᓂᕐᓄᑦ ᐊᔪᕐᓇᖅᑑᓚᐅᖅᑐᑦ 2021-ᒥ, ᑭᓯᐊᓂᓕ, ᓇᓗᓇᐃᒐᒃᓴᐅᔪᑦ ᐃᓕᖅᑯᓯᕆᕚᒃᑕᖏᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐅᖅᑰᓂᖅᓴᐅᑎᓪᓗᒍ ᓯᓚ ᐊᐅᔭᒃᑯᑦ ᑕᖅᑭᖏᓐᓂᒃ 2021-ᒥ ᕿᒥᕐᕈᔭᐅᓚᐅᖅᑐᑦ ᖃᓄᐃᙵᓂᖅᓴᐅᖕᒪᖔᑕ ᐱᕆᐊᕈᑕᐅᔪᓄᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ, ᐊᓄᓇᐅᑉ ᓱᒃᑲᓂᖓ ᓯᓂ ᒪᓂᑐᐃᓐᓇᖅᑯᓂ ᐱᕆᐊᕈᑕᐅᔪᓄᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ ᐊᕿᒍᓄᑦ.

ᖃᐅᑕᒫᖅᓯᐅᑕᐅᓚᔪᒃᑐᖅ ᑲᑎᓪᓗᒋᑦ ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᕐᓂᖏᑦ (ᐅᓯᑲᖅᑕᕐᓂᕐᒧᑦ ᐊᓯᖏᓐᓄᓪᓗ) ᐊᖅᑯᑎᑯᑖᒃᑯᑦ 2021-ᒥ 255.8–ᖑᓚᐅᖅᑐᑦ ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒫᑦ. ᑕᒪᓐᓇ ᓇᐃᓴᐅᑎᐅᓚᔪᒃᑐᖅ ᓴᕝᓴᓂᒃ ᐅᓯᔪᑦ ᐅᑎᖅᑕᕐᓂᖏᑦ ᐊᑐᓂ ᐅᓪᓗᕐᒧᑦ ᐊᖅᑯᑎᑯᑖᒃᑯᑦ, ᔮᓄᐊᕆ 1-ᒥᑦ ᑎᓯᐱᕆ 31, 2021-ᒧᑦ, ᐃᒪᓐᓇᑎᕆᐅᓚᐅᖅᑐᖅ 227.1, ᐊᒃᐸᓯᖕᓂᖅᓵᔫᓗᓂ ᑕᐃᑲᓂ ᑭᖑᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓃᑦ ᐅᓂᒃᑳᖏᓐᓄᑦ (FEIS) ᐅᐃᒍᕐᒥ ᒥᒃᓴᐅᓵᑕᐅᓯᒪᔪᑦ. ᐊᓯᖏᑦ ᓄᓇᓯᐅᑏᑦ ᐃᖏᕋᖃᑦᑕᕐᓂᖏᑦ (ᓲᕐᓗ ᐅᓯᔭᐅᓂᖏᑦ ᐃᖅᑲᓇᐃᔭᖅᑏᑦ ᐊᒻᒪᓗ ᐱᕐᑯᑏᑦ) ᐊᕐᕋᒍᑕᒫᖅᓯᐅᑎᖃᓚᐅᖅᑐᑦ 28.6-ᒥᒃ ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒫᑦ.

ᑯᓕᒨᒃᑯᑦ ᖃᖓᑕᓂᕐᒧᑦ ᑯᓚᐅᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᓃᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕈᑏᑦ ᐊᒃᑐᐃᓂᐅᑐᐃᓐᓇᐊᖅᑐᓄᑦ ᑎᖕᒥᐊᓄᑦ ᐊᒻᒪᓗ ᐊᓯᖏᓐᓄᑦ ᓂᕐᔪᑎᓄᑦ ᐃᓗᐊᓂ ᓄᓇᐃᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᖃᐅᔨᓴᕝᕕᖏᓐᓂ (RSA) ᐊᒻᒪᓗ ᑎᒃᑯᐊᖅᑕᐅᓯᒪᔪᑦ ᑲᖑᖃᕝᕕᐅᔪᑦ (ᑎᓪᔭᐅᕐᓂᖏᓐᓄᑐᐊᖅ ᔪᓚᐃᒥ ᐊᒻᒪᓗ ᐋᒡᒋᓯᒥ). 2021 ᖃᐅᔨᓴᕈᑏᑦ ᐃᓚᓕᐅᑎᓯᒪᔪᑦ ᓇᓗᓇᐃᔭᐅᑎᒃᑲᓂᕐᓂᒃ ᑐᒃᓯᕋᖅᑕᐅᓯᒪᔪᑦ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᓂᑦ (TEWG) 2020–ᒥ ᑲᑎᒪᓂᕐᓂ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᖃᖓᑕᓃᑦ ᐊᑯᓂᐅᓂᖏᑦ ᐊᒻᒪᓗ ᐊᕐᑰᑦ ᐃᓱᒪᒋᔭᖏᑦ. 2021-ᒥ, ᐃᓚᓕᐅᔾᔭᐅᓚᐅᖅᑎᓪᓗᒋᑦ ᐊᕐᑰᑦ ᐃᓱᒪᒋᔭᖏᑦ, ᑯᓕᒨᒃᑯᑦ ᖃᖓᑕᓃᑦ ᑯᓚᐅᓂᖏᑦ ᒪᓕᓚᐅᖅᑐᑦ ᐃᓗᐊᓂ ᑲᖑᖃᕝᕕᐅᔪᒥ ᐃᒪᓐᓇᑎᕆᑦ 72%, ᐊᒻᒪᓗ ᐊᑕᖏᓗᒃᑖᕐᓗᑎᑦ ᒪᓕᙵᓂᖏᑦ ᑕᖅᑭᓗᒃᑖᓂ 92%-ᖑᓚᐅᖅᑐᖅ. ᐊᕐᑯᑎᓂ ᐃᓱᒪᒋᔭᐅᓚᔪᓚᐅᖅᑐᑦ ᐊᓂᒃᑖᖅᑕᐅᓗᓕ ᐊᑦᑎᓈᖅᑐᓄᑦ ᖃᖓᑕᓂᕐᓄᑦ ᓂᕕᖓᔪᑦ, ᐊᒡᔭᖅᓯᑎᓗᑎᑦ/ᐊᐃᒃᓯᖅᑎᓗᑎᑦ, ᐊᒻᒪᓗ ᓯᓚ. ᐊᑕᖏᓗᒃᑖᖅᓯᒪᔪᓄᑦ ᒪᓕᖕᓂᕐᒧᑦ ᐊᒃᐸᕆᐊᓚᐅᖅᑐᑦ 2021-ᒥ ᖃᓄᐃᙵᓂᖅᓴᐅᓂᖏᑦ ᑕᑯᓗᑎᑦ 2020–ᒥ, ᐅᓄᕐᓂᖅᓴᐃᑦ ᖃᖓᑕᓃᑦ ᐱᑕᖃᙱᑎᓗᑎᑦ ᐊᕐᑰᑦ ᑎᑎᕋᕝᕕᒃᓴᖏᓐᓄᑦ ᑐᓴᐅᒪᔾᔪᑏᑦ.

2021 ᐳᔪᕋᖅ ᖃᖓᑦᑕᐃᓐᓇᐅᓇᖅᑐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᐱᓕᕆᐊᖅ ᐊᑐᖅᓯᒪᔪᖅ 53-ᓂᒃ ᐳᔪᕋᖅ ᖃᖓᑦᑕᐃᓐᓇᐅᔭᖅᑐᓄᑦ ᑲᑎᖅᓱᐃᕝᕕᒃ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓗᒍ ᐳᔪᖃᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ ᐊᒃᑐᐊᔪᑦ ᐱᓕᕆᐊᒥ ᐱᓕᕆᓂᕐᓂᒃ. 2021-ᒥ ᐱᓕᕆᐊᖅ ᐱᖁᓯᐅᔾᔨᓚᐅᖅᑐᑦ, ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓂᒃ ᐱᓕᕆᖃᑎᒌᑦ

ᑐᑦᓯᕋᓚᐅᕐᓂᖏᓐᓄᑦ, ᐊᕐᕕᓂᓖᑦ ‘ᓇᐃᑦᑐᑦ’ ᖃᐅᔨᓴᕐᐸᓪᓕᐊᖏᓐᓇᕈᑏᑦ ᐃᓚᒋᔭᐅᓪᓗᓂ ᓯᕗᓪᓕᖅᐹᒥᒃ ᖃᐅᔨᓴᕐᓂᐅᔪᒥᒃ ᖃᐅᔨᓴᕐᓂᖅ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᑦ ᑖᒃᑯᓇᓂ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᓂ ᖃᐅᔨᓴᒃᓴᓂ ᒪᓕᒃᑕᐅᓯᐊᖃᖅᑐᖅ ᐳᖅᑐᓂᖓᓂ 2.0 ᒦᑕᓂᒃ ᐊᒻᒪᓗ ᖃᓂᓐᓂᖅᓴᐅᓪᓗᓂ ᒪᓂᕋᕐᒧᑦ. 26-ᖑᔪᑦ ᑲᑎᖅᓱᐃᕖᑦ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕕᐅᔫᑦ ᑕᖅᑭᑖᒥᑦ, ᐃᓚᖏᑦ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕕᐅᕙᒃᓱᑎᒃ ᐊᐅᔭᒃᑯᑦ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᐅᖓᓯᒍᐊᕐᓂᖏᓐᓄᑦ ᓂᒋᑦ. ᐳᔪᕋᖅ ᖃᖓᑦᑕᐃᓐᓇᐅᔭᖅᑐᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᓴᖅᑮᓯᒪᔪᖅ ᓇᓗᓇᐃᖅᓯᓪᓗᑎᒃ ᑕᒪᓐᓇ ᐳᔪᕋᖅ ᐱᓕᕆᕝᕕᐅᔪᓗᒃᑖᓂ (ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ, ᕿᙱᐊᓂ ᑕᓚᒃᑕᕐᕕᖕᒥ, ᐊᒻᒪᓗ ᐊᖅᑯᑎᒋᑖᒥ ᐊᒃᑐᐊᔪᑦ ᒫᕿᖕᓄᑦ) ᒪᓖᓐᓇᖅᑐᑦ 2018-ᒥᓂᑦᓗᒃ. ᑭᓯᐊᓂᓕ, ᑭᖑᓂᖕᖠᑦᑎᓂ ᐊᕐᕋᒍᓂ ᑕᐃᒪᐃᓚᐅᕐᒪᑦ, ᐳᔪᕋᖅ ᐅᖓᑕᐅᔾᔨᓯᒪᓪᓚᕚᒃᑐᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂ ᕿᙵᐊᓂ ᑕᐅᕘᓇᓗ ᐊᖅᑯᑎᑯᑖᒃᑯᑦ. ᐳᔪᕋᖅ ᖃᖓᑦᑲᑦᑕᖅᑐᑦ ᐊᖏᓂᖓ ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᔪᖅ ᖃᐅᔨᓴᖅᑕᐅᓪᓗᑎᒃ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᖃᖓᑦᑕᖅᑎᑕᐅᓯᒪᔪᑦ ᐊᔾᔨᙱᐊᑦ. ᑕᒪᓐᓇ ᖃᐅᔨᓴᕐᓂᖅ ᐱᓕᕆᐊᖑᖃᑦᑕᖅᑐᑦ ᓇᓗᓇᐃᖅᑕᐅᖁᓪᓗᒋᑦ ᐃᓄᐃᑦ ᓄᓇᒥᒃ ᐊᑐᕉᑦ ᐅᓂᒃᑳᖏᑦ ᑕᖁᑲᑦᑕᕐᓂᖏᓐᓄᑦ ᐳᔪᕋᕐᒥᒃ ᐅᖓᑖᓅᖅᓯᒪᔪᓂᒃ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᐃᑦ ᑕᐃᑲᓂ ᐱᒋᐊᕈᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᕈᑏᑦ ᐋᖅᑭᙱᐊᖅᑕᐅᓯᒪᔪᓂ, ᐊᒻᒪᓗ ᑕᑯᔭᐅᔪᓇᖅᑐᖅ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᖅ ᐊᖏᓂᖓᓂᒃ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᐃᓂᓂᑦ ᐊᒃᐸᓯᖕᓂᖅᓴᒥᒃ ᖃᐅᔨᔭᐅᔪᓇᖅᑐᑦ ᐳᔪᕋᕐᓄᑦ ᑲᑎᖅᓱᐃᕝᕕᖕᓂᑦ. 2021–ᒥ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑑᑉ ᐊᖏᓂᖓ ᒥᒃᓵᓂᐊᖅᓯᒪᓕᖅᑐᑦ ᕿᙱᐊᓂ, ᐱᔾᔪᑕᐅᔫᒃᓴᐅᓪᓗᓂ ᐊᑐᖅᑕᐅᖃᑦᑕᕐᓂᖏᑦ ᑎᖕᒦᑳᓲᑦ (DustBlockr®), ᐊᒻᒪᓗ ᐊᔾᔨᒌᐸᓗᖏᓂᒃ 2020-ᒥ ᖃᐅᔨᓴᖑᓂᐅᕙᓚᐅᖅᑐᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᐊᖏᓂᖅᓴᑎᒍᑦ. 2021-ᒥ ᐳᔪᕋᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᑦ ᐊᖏᓪᓕᓯᒪᔪᖅ ᑕᐅᕘᓇ ᐊᖅᑯᑎᑯᑖᒃᑯᑦ ᐊᔾᔨᐸᓗᒋᓚᐅᖅᑕᖏᑦ ᑭᖑᓂᖕᖠᑦᑎᓐᓂ ᐊᕐᕋᒍᑎᑐᑦ. 2021-ᒥ ᐳᔪᕋᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᑦ ᐊᖏᓪᓕᓯᒪᓂᖏᑦ ᓴᖅᑮᔭᖅᑯᔨᔪᑦ ᐊᖏᓂᖅᓴᐅᓕᖅᖢᓂ ᖃᓂᒌᔭᓂ ᓄᓇᐃᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ ᖃᐅᓐᓂᖅᓴᐃᓂᖏᑦ ᑕᑯᓪᓗᒋᑦ 2020–ᒥ ᐊᖏᓂᕆᓚᐅᖅᑕᖏᑦ ᑭᓯᐊᓂᓕ ᐊᔾᔨᐸᓗᒋᔭᖏᑦ 2019-ᑎᒍᑦ ᐊᖏᓂᐅᓚᐅᖅᑐᑎᑐᑦ. ᑲᑎᓗᒃᑖᖅᖢᒋᑦ ᐳᔪᕋᑦ ᑲᑕᒐᖃᑦᑕᖅᑐᑦ ᐃᓂᐅᔪᒥ ᐱᓕᕆᐊᒥ 2021-ᒥ ᐃᒪᓇᑎᒋᐅᓖᖅᑐᑦ 552.9 ᑭᓖᒥᑕᑦ ᑭᑉᐹᓇᒃᑐᑦ (km^2) (4.7%) ᐊᒻᒪᓗ ᓄᓇᙳᐊᑎᒎᑦ ᖃᖓᑦᑕᖅᑎᑕᐅᓯᒪᔪᑎᒎᑦ ᐃᒪᓇᑎᒋᐅᔪᖅ 1,787.6 ᑭᓖᒥᑕᑦ ᑭᑉᐹᓇᒃᑐᑦ (km^2) (15.2%) ᓴᓐᑕᓐᓂᐅᓪ-2-ᒥᒃ.

ᐹᕝᕙᓖᓐᑯᑦ ᐊᑐᖃᑦᑕᖅᑐᑦ ᐊᒥᓱᓂᒃ ᐅᔭᕋᖕᓂᐊᕐᕕᓗᒃᑖᒥ ᐳᔫᓗᐊᔾᔭᐃᒃᑯᑎᓂᒃ ᐱᓕᕆᔾᔪᑎᓂᒃ ᒥᒃᓵᓂᐊᖅᓯᒪᕐᖁᓪᓗᒋᑦ ᑕᒪᒃᑯᐊ ᐳᔫᖅᑲᑦᑕᖅᑐᑦ, ᐱᖅᓯᐅᑎᓪᓗᒋᑦ ᒪᓴᒃᑎᖅᑕᐅᓪᓗᓂ ᐊᒻ ᑕᕆᐅᓕᖅᑕᐅᓪᓗᓂ ᐊᖅᑯᑦ, ᐊᑐᖅᑕᐅᖏᓐᓇᖅᓱᑎᒃ ᐅᓖᑦ ᐊᒻᒪᓗ ᒪᑐᓯᒪᔭᐅᓪᓗᑎᒃ ᓴᕝᓴᓂᒃ ᓯᖃᓕᑦᑎᕕᖓᒥ, ᐊᒻᒪᓗ ᐱᐅᓯᕆᐊᖅᓯᒪᓪᓗᑎᒃ ᐱᓕᕆᔾᔪᔾᔫᑦ ᓄᒃᑎᖅᑎᓇᑎᓪᓗᒋᑦ ᓴᕝᓴᓂᒃ ᑲᑎᖅᓱᐃᕖᕙᖑᒧᑦ. ᐳᔫᓗᐊᔾᔭᐃᒃᑯᑎ ᑎᖕᒦᑳᕈᑦ (DustBlockr®) ᑎᖕᒦᑳᖅᑎᑕᐅᖃᑦᑕᖅᑐᖅ ᐊᖅᑯᑎᑯᑖᓗᒃᑖᒥ ᐊᐅᔭᖑᓂ 2021-ᒥ. ᐊᓯᐊᑦᑕᐅᖅ ᓄᑖᖅ ᐅᔫᓗᐊᔾᔭᐃᒃᑯᑎ, ᑎᖕᒦᑳᖅᑎᑦᑎᔾᔪᑎ (DusTreat), ᑎᖕᒦᑳᖅᑎᑕᐅᖃᑦᑕᖅᑐᑦ ᓴᕝᓴᓄᑦ ᑲᑎᖅᓱᐃᕝᑯᖑᒧᑦ ᐊᑯᓚᐃᓕᓅᓂᒃ ᔮᓄᐊᕆᒥᑦ ᐊᐃᕐᕆᓕᒧᑦ 2021-ᒥ, ᐊᒻᒪᓗ ᓄᙳᐊᓂ ᔫᓂ 2021-ᒥ. ᐳᔫᓗᐊᔾᔭᐃᒃᑯᑎ ᑎᖕᒦᑳᕈᑦ (DusTreat) ᐅᕕᓂᖕᒧᑦ–ᐆᓇᖅᑐᖃᙱᑦᑐᑦ, ᐃᒪᐅᓪᓗᓂ, ᐊᒻᒪᓗ ᐊᑯᓂᐅᔪ–ᐊᑐᕈᓇᖅᓱᓂ ᑎᖕᒦᑳᕈᑎ ᐅᔅᓯᒃᓯᑎᑦᑎᔩᖅ ᑲᑎᖅᓱᖅᑕᐅᔪᓂᒃ ᐳᔾᔫᔭᐃᖅᓯᒪᕐᖁᓪᓗᒋᑦ ᐊᒻᒪᓗ ᐸᕐᓇᒃᑕᐅᓯᒪᔪᖅ ᐊᑐᖅᑕᐅᑲᓂᐅᔭᖃᑦᑕᕐᓂᐊᖅᖢᓂ ᑲᑎᖅᓱᖅᑕᐅᔪᓂ ᕿᙱᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ.

ᐱᕈᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ 2021-ᒥ ᐱᖃᓯᐅᔾᔨᓯᒪᓚᐅᖅᑐᑦ ᐱᕈᖅᑐᓂᒃ ᐊᒻᒪᓗ ᐃᔾᔪᒥᒃ ᓴᕕᕋᔭᖕᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᓂᒃ. ᐃᔾᔪᕐᒥᑦ-ᓴᕕᕋᔭᑦ ᐊᒻᒪᓗ ᓂᕐᓇᓂ–ᓴᕕᕋᔭᖃᖅᑐᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ ᓇᓗᓇᐃᖅᓯᓚᐅᖅᑐᑦ ᐊᓯᔾᔨᖅᑐᖃᙱᓐᓂᖓᓂᒃ ᖃᓄᐃᓐᓂᖅᓴᐅᓕᕐᒪᖔᑕ ᕿᒥᕐᕈᔭᐅᑎᓪᓗᒋᑦ ᐱᒋᐊᕈᑕᐅᔪᓄᑦ ᖃᐅᔨᓴᕈᑎᑦ ᓇᐃᓴᐅᑎᖏᓐᓂᑦ. ᓇᐃᓴᐅᑎᑦ ᐊᒃᐸᓯᖕᓂᖅᓴᐅᓚᐅᖅᑐᑦ ᐅᓄᐊᓂᓘᓐᓃᑦ ᓈᒻᒪᒋᔭᐅᔪᑦ ᓇᐃᓴᐅᑎᒃᓴᖏᓐᓂ. ᒫᓇ, ᐃᔾᔪᕐᒥᑦ-ᓴᕕᕋᔭᑦ ᐊᒻᒪᓗ ᓂᕐᓇᓂ–ᓴᕕᕋᔭᖃᖅᑐᑦ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᑦ ᐊᒃᐸᓯᒃᑐᒥᒃ ᖁᐊᖅᓵᕐᓇᕈᓇᕐᓂᖏᓐᓂᒃ ᐊᕙᑎᒧᑦ ᐃᓄᐃᓪᓗ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᓐᓄᑦ.

ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᖅᑲᑦᑕᕐᓂᖅ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᓂᕐᔪᑏᑦ ᐃᓕᖅᑯᓯᖏᑦ ᐊᖅᑯᑎᑯᑖᒥ, ᐱᓗᐊᖅᑐᒥᒃ ᑐᒃᑐᐃᑦ ᐃᓕᖅᑯᓯᕆᓕᖅᐸᒃᑕᖏᑦ. ᐊᕐᕕᓂᓖᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᐊᓂᒃᑕᐅᓚᖅᑐᑦ 2021-ᒥ; ᑎᓴᒪᑦ ᐅᐱᕐᖔᒥ (ᕖᕝᕗᐊᕆ 17, ᒫᔅᓯ 18, ᐊᐃᕐᕆᓕ 7, ᐊᐃᕐᕆᓕ 27) ᐊᒻᒪᓗ ᒪᕐᕉᒃ ᐅᑭᐅᖅ (ᐅᑐᐱᕆ 10 ᐊᒻᒪᓗ ᓄᕕᐱᕆ 1). ᖃᐅᔨᓴᕈᑎᕕᓃᑦ, ᑐᒦᑦ

ᐅᔾᔨᕆᔭᐅᓚᐅᖅᑐᑦ ᑎᑎᕋᓂᐊᓂ ᐅᑲᓕᕐᓂᓕᓗ, ᑭᓯᐊᓂᓕ ᑐᒃᑐᓂᒃ ᑐᒥᓯᒪᐅᙱᑦᑐᑦ ᑕᑯᔭᕆᓐᓂ. ᓇᑉᐸᓪᓕᐊᖏᑦ ᑐᒦᑦ ᑕᑯᔭᐅᔪᑦ ᓂᕐᔪᑏᑦ ᐱᓱᒃᑎᓪᓗᒋᑦ ᑕᐅᕝᕙ ᐊᖑᑎᒃᑯᑦ; 40%-ᐸᓗᐃᑦ ᐃᑳᖅᑐᑎᒃ ᐊᒻᒪ 7%-ᐸᓗᐃᑦ ᓴᖑᕆᐊᓚᐅᖅᑐᑦ ᐊᖑᑎᑯᑖᕐᒥ.

ᐊᐅᔾᔭᓂᒃᓯᖃᑦᑕᖅᑐ ᐳᖅᑐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᐱᓕᕆᐊᕐᒍᓚᐅᖅᑐᖅ ᖃᐅᔨᓴᖅᑕᐅᕐᔪᓗᒋᑦ ᒪᓕᖕᒪᖕᒌᑕ ᐊᐅᓚᓂᕐᒧᑦ 1 ᒦᑕᒥᒃ ᐳᖅᑐᓂᖃᕐᓗᑎᒃ, ᐱᒋᐊᖅᑎᑦᑎᓗᓂ ᓂᕐᔪᑏᑦ ᐃᑳᕈᓇᕐᓗᒋᑦ ᐊᒻᒪ ᑕᒃᓴᐅᓂᖅᓴᐅᓕᕐᓗᓂ ᐊᕐᑯᑎᓄᑦ ᓂᕐᔪᑎᓂᒃ ᐊᐅᖅᓯᖃᑦᑕᕐᑯᓇᕆᑦ. ᐊᐅᔾᔭᓂᒃᓯᖃᑦᑕᖅᑐᑦ ᐳᖅᑐᓂᖏᓄᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᐊᕐᒍᓯᔪᓚᐅᖅᑐᑦ ᒪᕐᕈᐃᖅᓱᑎᒃ ᐱᖕᒐᓯᐃᖅᓱᑎᒡᓘᓐᓃᑦ ᑕᖅᑭᑕᓛᑦ ᐅᑭᐅᖑᑎᓗᒍ. ᑭᐅᔾᔪᑕᐅᓇᓯᐊᖅᓱᓂ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᑦ (TEWG) ᑐᒃᓯᕋᐅᑎᖏᓐᓂᒃ, ᖃᐅᔨᓴᖅᑕᐅᕝᕕᐅᕙᒃᑐᑦ ᐃᓅᑦ ᓂᕈᐊᖅᑕᐅᑐᐃᓐᓇᓚᐅᖅᑐᑦ ᑕᐃᒪᓐᓇᒥᐊᖅ 2020-ᒥ ᐊᑐᙱᖕᒑᖅᓱᑎᒃ ᑖᒃᑯᓂᖓᔅᓴᐃᓐᓇᖅ ᑭᓵᒥᑕᓄᑦ ᓇᓗᓇᐃᒃᑯᑕᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ. ᐊᑕᖏᓗᒃᑖᖅᓱᒋᑦ, ᒪᓕᖕᓂᖅ ᖁᕝᕙᓯᒃᑐᒻᒪᕆᐅᓚᐅᖅᑐᑦ 90%-ᖕᒐᓅᖓᓗᓂ, ᐊᒃᐸᓯᖕᓂᖅᓵᕐᔩᓗᓂ 2020-ᒥᓂᑦ.

ᓇᓯᑦᑕᖅᑐᕐᕕᖕᓂ ᖃᐅᔨᓴᕐᓂᑦ ᐱᓕᕆᐊᖑᓚᐅᕐᒥᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᔪᓗᒋᑦ ᑐᒃᑐᑕᖅᒪᖕᒌᑦ, ᓇᓃᓐᓂᖏᑦ, ᐊᒻᒪ ᐃᓕᖅᑯᓯᕆᔭᖏᑦ ᐱᔾᔪᑎᒋᓗᒍ ᐱᓕᕆᐊᒥ ᐱᓕᕆᐊᑦ ᓄᕐᕆᐅᖅᑎᓗᒋᑦ. ᓇᓯᑦᑕᖅᑐᕐᓃᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᐊᓂᒃᑕᐅᓚᐅᖅᑐᑦ ᐊᑯᓐᓂᖕᒐᓂ ᔫᓂ 6 ᐊᒻᒪ ᔫᓂ 17, 202-ᒥ. ᓇᓯᑦᑕᖅᑐᕐᕕᓗᒃᑖᑦ ᑕᑯᔭᖅᑐᖅᑕᐅᓚᐅᖅᑐᑦ ᒪᕐᕈᐃᖅᓱᑎᒃ. ᑕᒪᒃᑯᓂᖓ ᖃᐅᔨᓴᖅᑎᓗᒋᑦ, ᑐᒃᑐᓂᒃ ᑕᑯᔪᖃᓚᐅᙱᑦᑐᖅ, ᒪᓕᑐᐃᓐᓇᖅᓱᓂ ᑭᖑᓂᖕᒌᑦᑎᓐᓂ ᖃᐅᔨᓴᕈᑎᕕᓂᓗᒃᑖᓂᒃ 2013-ᖑᓚᐅᖅᑎᓗᒍ ᐊᒻᒪ ᐊᒃᐸᓯᒃᑐᑦ ᓄᓇᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᑐᒃᑐᐃᑦ ᐅᓄᕐᓂᖏᑦ. ᖃᐅᔨᔭᐅᔪᑦ ᑖᒃᑯᓇᙵᓕᑦ ᐅᖓᓯᒃᑐᒦᖅᑎᒃ ᐊᔾᔨᓕᐅᕈᑎᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕈᑎᓂ ᓴᖅᑮᔭᖅᑎᑦᑎᓚᐅᕐᒥᔪᖅ ᑐᒃᑐᓂᒃ ᑕᑯᔭᐅᔪᖃᓚᐅᙱᓐᓂᖏᓐᓂᒃ ᓄᙳᐊᓂ ᔪᓚᐃ 2021-ᒥᑦ ᕿᑎᐊᓄᑦ ᐅᑐᐃᓇ 2021-ᒧᑦ ᐃᓚᒋᔭᐅᓗᓂ ᐱᓕᕆᐊᖅ ᓇᓯᑦᑕᖅᑐᕐᕕᖕᓄᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ.

ᐊᑐᖅᑕᐅᔪᑦ ᑎᑭᑉᐊᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕝᕕᖕᒋᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᑦ ᐱᐊᓂᒃᑕᐅᓚᐳᖅᑐᑦ ᐱᕈᖅᑐᑦ ᓄᖑᑕᐅᓚᐅᖕᒋᓐᓂᖕᒋᓐᓂᒃ ᐅᕝᕙᔫᓐᓃᑦ ᓄᓇᐅᑉ ᖄᖕᒐᓂ ᐊᓪᕕᓴᖕᓂᖅᑕᖃᓚᐅᙱᓐᓂᖕᒐᓂ ᐱᓕᕆᕝᕕᐅᔪᒥ ᕿᑐᕐᖑᕆᐅᖅᑎᓗᒋᑦ (ᒪᐃ 17-ᒥᑦ ᐋᒡᒋᓯ 19-ᒧᑦ). ᖃᐅᔨᓴᕐᓂᑦ ᐃᓗᓕᖅᑕᐅᓚᐅᖅᑐᑦ ᐅᔾᔨᖅᓯᕐᓂᕐᓂᒃ ᐊᑐᖅᓱᑎᒃ ᐊᒃᓱᕉᒥᒃ–ᐅᓂᐊᖅᓱᑎᒃ ᐱᓕᕆᔾᔪᓯᕐᒥᒃ (ᐊᑐᐃᓐᓇᕈᖅᑕᐅᔪᖅ ᑲᓇᑕᒥ ᓂᕐᔪᑎᓕᕆᔨᓄᑦ) ᖃᐅᔨᔭᐅᕐᔪᓗᒋᑦ ᐃᕙᕝᕖᑦ ᑎᒃᒥᐊᓂᑦ ᓴᓇᔭᐅᕙᓕᓕᐊᔪᑦ. ᒪᕐᕉᒃ ᖁᐸᓄᐊᓄᑦ ᐃᕙᕝᕖᑦ ᓇᓂᔭᐅᓚᐅᖅᑐᑦ, ᐊᒻᒪ ᓴᓇᓃᑦ ᑭᖑᕙᕆᐊᖅᑕᐅᓗᑎᒃ ᑕᐅᕙᓂ ᑭᓯᐊᓂ ᐱᐊᕋᕆᑦ ᑎᓪᔭᐅᓚᐅᖅᑎᓗᒋᑦ.

ᐊᕐᕌᒍᑲᓚᐃᑦ ᓂᕿᑐᖅᑎᓂᒃ ᑎᖕᒥᐊᓂᒃ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕈᑏᑦ, ᑕᐅᕙᓃᓐᓂᖏᑦ ᐃᕐᓂᐅᖅᐸᖕᓂᖏᓪᓗ ᓴᖅᑭᑉᐸᓪᓕᖅᐸᖕᓂᖏᑦ ᓰᕋᖅᑯᔨᙱᑦᑐᑦ ᐊᒻᒪ ᓇᓗᓇᐃᖅᓯᔾᔨᑎᑦᑕᖅᑲᖕᒋᓗᓂ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓃᑦ ᓂᕿᑐᖅᑎᓄᑦ ᑎᖕᒥᐊᓄᑦ. ᑕᐃᒪᐃᓐᓂᖓᓄᑦ, ᓂᕿᑐᖅᑏᑦ ᑎᖕᒥᐊᑦ ᑕᐅᕙᓃᓐᓂᖏᑦ ᐊᒻᒪ ᐃᕐᓂᐅᖅᐸᖕᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᓂᑦ ᓄᖅᑲᖅᑎᑕᐅᓚᐅᑲᓚᐅᖅᑐᑦ 2021-ᒥ, ᐱᓕᕆᓃᓕᓗ ᑲᔪᓯᒋᐊᖅᑎᑕᐅᓗᑎᒃ ᑎᑎᕋᖅᑕᐅᒋᐊᖖᒐᕐᓂᖕᒐᓄᑦ ᐃᖅᑲᓇᐃᔭᖅᑎᕆᑦ-ᕿᒥᕐᕈᕐᑯᓕᕐᓗᓂᑦ ᓴᖅᑭᑕᐅᔾᔭᓂᒃ.

ᒪᕿᖕᓂᒃ ᑐᕐᑯᑕᐅᙱᓗᑎᒃ ᓂᕐᔪᑏᖕᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᔪᖃᓚᐅᖅᑐᑦ ᐊᒻᒪ 10 ᓂᕐᔪᑏᑦ ᑐᕐᑯᑕᐅᔪᑦ ᐅᖃᐅᓯᐅᓚᐅᖅᑐᑦ 2021-ᒥ, ᐊᑕᖏᖅᓱᑎᒃ ᐃᓛᒃᑰᖅᓱᑎᒃ ᐊᓯᐅᔾᔭᐅᓚᐅᖅᑐᑦ. ᑎᓴᒪᑦ ᑐᕐᑯᑕᐅᓚᐅᖅᑐᑦ ᑎᑎᕋᓂᐊᖑᓗᑎᒃ, ᒪᕿᒃ ᓄᓇᓯᐅᑎᒧᑦ ᐊᐳᖅᑕᐅᓗᑎᒃ, ᐊᒻᒪ ᒪᕿᒃᑲᓐᓂᒃ ᓯᓕ ᓇᓗᓇᖅᑐᑦ. ᒪᕿᒃ ᑐᕐᑯᓚᐅᖅᑑᒃ ᖁᐸᓄᐊᒃ; ᐊᑕᐅᓯᖅ ᓂᖃᐅᓕᓗᓂ, ᐊᒻᒪ ᐱᖃᑖ ᓇᓗᓇᖅᓱᓂ. ᐊᑕᐅᓯᖅ ᐅᑯᓕᖅ ᑐᕐᑯᖕᒐᔪᖅ ᓇᓂᔭᐅᓚᐅᖅᑐᑦ ᐊᐳᖅᑕᐅᔾᔭᐅᓗᓂ. ᐱᖕᒐᓯᑦ ᐅᑲᓖᑦ ᑐᕐᑯᓂᖃᖅᑕᐅᓚᐅᖅᑐᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᙱᑦᑐᖅ ᐃᓅᔪᓐᓃᕈᑎᖓ. ᐊᔪᕐᓇᙱᑐᐊᕌᖕᒐᑦ ᐱᓗᐊᔾᔭᐃᒃᑯᑏᑦ ᐊᑐᓕᖅᑎᑕᐅᓰᑦ ᖁᐊᖅᓵᕐᓇᙱᓐᓂᖅᓴᐅᕐᑯᓗᒋᑦ ᓂᕐᔪᑏᑦ ᐋᓂᖃᔭᕐᓂᖏᓐᓄᑦ ᑐᕐᑯᓇᔭᕐᓂᖏᓐᓄᓗ ᐱᓕᕆᕝᕕᐅᔪᒥ.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓃᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ, ᐱᓗᐊᖅᔭᐃᒃᑯᑕᐅᔭᕆᐊᓖᑦ ᐊᑐᓕᕐᑯᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖓᐅᓪᓚᓪᓖᑕ ᐊᒃᑐᐃᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]
ᓯᓚᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᖅ	ᐃᑲᔪᖅᓯᖅᑐᖅ ᐊᓯᓗᒃᑖᙱᓐᓂᒃ ᑎᑎᖅᑲᖁᑎᓂᒃ ᑲᑎᖅᓱᖅᑕᐅᔪᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ	ᓯᓚᐅᑉ ᖃᓄᐃᓐᓂᓕᖓᓂᖓ ᑎᑎᕋᖅᑕᐅᖃᑦᑕᖅᓱᓂ ᐃᑲᕋᑕᒫᑦ ᓯᓚᓐᓂᐊᕐᑯᖓᒥ ᐅᔭᕋᖕᓂᐊᕐᕕᒥ ᕿᙳᐊᓂ ᑐᓚᒃᑕᕐᕕᖓᒧᓗ. ᓯᓚᓐᓂᐊᕈᑏᑦ ᑎᑎᕋᖅᑕᐅᖃᑦᑕᐃᓐᓇᖅᓯᒪᔪᑦ 2005-ᒥ ᐊᒻᒪᓗ 2006-ᒥ, ᐱᓪᓗᒋᑦ. ᓯᓚᓐᓂᐊᕈᑏᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐃᑲᔪᖅᓯᕐᑯᓪᓗᒋᑦ ᐊᓯᖏᓐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᔾᔪᑎᓄᑦ; ᐱᓗᐊᖅᔭᐃᒃᑯᑏᑦ ᐊᑐᙱᒃᑲᓗᐊᕈᑎᒃ ᖃᓄᐃᙱᓗᓂ. ᓯᓚᓐᓂᐊᕐᑰᑦ ᑲᑎᖅᓯᐃᖏᓐᓇᖅᑐᑦ ᓯᓚᒧᑦ ᖃᐅᔨᓴᕈᑎᓂᒃ 2022-ᒥ.	N/A ᐱᑕᖃᙱᑦᑐᖅ
ᖁᓕᒥᒨᑦ ᖁᓚᐅᖃᑦᑕᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᓂᖅ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒥ ᒪᓕᒃᑕᐅᔭᕆᐊᓖᑦ 59, 71, ᐊᒻᒪᓗ 72	ᐊᐅᓚᓂᕐᓅᙱᑦᑐᖅ ᑭᓯᐊᓂ, ᐊᒻᒪᓗ ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᐊᕐᑯᑎᐅᑉ ᐃᓱᒪᒋᔭᖏᓐᓄᑦ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᖁᓕᒨᑦ ᐃᓄᐃᑦᓗ ᐊᑦᑕᕐᓇᖅᑕᐃᓕᒪᓂᖏᑦ, ᐊᕐᑰᑦ ᖁᓚᐅᖃᑦᑕᓇᐊᖃᖅᑐᑦ 650 ᒦᑕᓂᒃ ᖃᖓᑕᑎᓪᓗᒋᑦ ᑕᐅᕙᙵᑦ ᑕᐅᕗᖓ ᐃᖏᕿᑎᓪᓗᒋᑦ ᐃᓂᓂ ᑎᑭᐸᒃᑐᓂᒃ ᑎᖕᒥᐊᖃᖅᑐᑦ, ᐊᒻᒪᓗ 1,100 ᒦᑕᑦ ᖁᓪᓗᑦ ᐊᒻᒪᓗ 1,500 ᒦᑕᑦ ᓴᓂᒧᑦ ᐅᖓᓂᖕᓃᑦ ᑕᑯᔭᐅᖃᑦᑕᖅᑐᑦ ᐱᑕᖃᕐᕕᐅᒧᑦ ᑎᖕᒥᐊᓂᒃ ᑎᑭᐸᒃᑐᓂᒃ (ᓲᕐᓗ ᑲᙵᐃᑦ ᐃᓂᖏᑦ). ᖃᖓᓂᕐᒧᑦ ᐊᖅᑯᑏᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᑦ ᐅᐸᒃᓯᑦᑕᐃᓕᓂᕐᒧᑦ ᐃᓂᓂᒃ ᓂᕐᔪᑎᓄᑦ ᐱᒻᒪᕆᐅᔪᓄᑦ. 2021-ᒥ, ᒪᓕᖕᓂᕐᒧᑦ ᖁᓚᐅᑦᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔭᕆᐊᓕᖕᓂᒃ ᑲᙳᖃᕐᕕᐅᔪᓂᒃ ᑎᓯᐅᑎᓪᓗᒋᑦ (ᔪᓚᐃᒥᑦ ᐋᒡᒋᓯᒧᑦ) 72%-ᖑᓚᐅᖅᑐᑦ, ᐊᒻᒪᓗ	ᓂᕆᐅᒋᔭᐅᔪᑦ ᐃᓚᖏᑦ ᑲᙳᐃᑦ ᐊᓯᐊᓅᖅᑎᑕᐅᔪᑦ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐱᓕᕆᓃᑦ ᑭᓯᐊᓂᓕ ᓄᒃᑎᕋᔭᖅᑐᑦ ᖃᓂᒋᔭᖓᓄᑦ, ᐸᕝᕙᓴᒃᑕᐅᙱᓐᓂᖅᓴᓄᑦ. ᐃᒪᐃᓐᓇᕐᒋᑦ ᑲᙳᖃᕐᕕᐅᔪᑦ ᐱᔾᔪᑕᐅᔪᑦ ᖁᓕᒨᓄᑦ ᖁᓚᐅᑕᐅᖃᑦᑕᕐᓂᕐᒋᑦ ᐊᒻᒪᓗ ᐃᓂᖃᖅᑲᐅᑎᒃᑐᐊᑕᕆᐊᖅᖢᑎᒃ ᓯᓚᑖᓂ ᑮᓕᒋᑎᑕᐅᔪᖅ ᐊᒃᑐᐃᓂᕐᒧᑦ (ZOI), ᐊᒃᑐᐃᓃᑦ ᑮᓕᖃᕋᔭᖅᑐᒃᓴᐅᔪᑦ. ᐊᑕᖏᖅᖢᒋᑦ, ᓄᓇᒥᒃ ᐸᕝᕙᓴᐃᓃᑦ ᐊᒃᑐᐅᔪᑦ ᐱᓕᕆᕝᕕᐅᔪᖅ ᐱᕙᓪᓕᐊᕝᕕᒋᔭᖓᓄᑦ (PDA) ᓄᓇᖓᓂᒃ ᖃᐅᔨᓴᕝᕕᐅᔪᑦ (LSA) ᐊᖏᓂᖏᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐃᒃᐱᖕᓂᖅᓴᕋᐃᑐᓄᑦ ᐸᕝᕙᓴᒃᑕᐅᓃᑦ ᑭᓯᐊᓂᓕ ᓴᖅᑮᓯᒪᙱᑦᑐᑦ ᐊᒃᑐᐃᓂᕐᒍᖕᓂᕐᓂᒃ ᑲᙳᐃᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ. ᑐᕐᑯᑕᐅᓪᓚᑦᑖᖃᑦᑕᖅᑐᑦ

[1] ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓖᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᒧᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᑦ ᒪᓕᒃᓱᒋᑦ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔩᖏᑦᑕ ᐅᔭᕋᖕᓂᐊᕈᓇᖅᑎ ᓇᐃᓴᐅᑖ 005 (ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ 20214).

[2] ᓄᐃᔮᖕᓂ ᐱᓕᕆᐊᖅ ᑭᖑᓪᓕᖅᐸᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᐅᓂᒃᑳᑦ; – ᕿᒥᕐᕈᐊᖅ 6 ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ (ᐸᕙᓖᓐᑯᑦ ᓴᕝᓴᓂᒃ ᐅᔭᕋᓐᓂᐊᖅᑏᑦ ᑯᐊᐅᓈᓴᑦ 2012) ᓄᐃᔮᖕᓂᓪᓗ ᐱᓕᕆᐊᖅ ᑮᓇᐅᔾᔭᒃᓵᓕᓇᓯᐊᖅᑎᓪᓗᒋᑦ ᐅᐃᒍᖅ ᑭᖑᓪᓕᖅᐸᖅᓯᐅᑎᓄᑦ ᐊᕙᑎᒃ ᐊᒃᑐᐃᓂᖓᑦ ᐅᓂᒃᑳᑦ: ᕿᒥᕐᕈᐊᖅ 6 – ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ (ᐸᕙᓖᓐᑯᑦ ᓴᕝᓴᓂᒃ ᐅᔭᕋᓐᓂᐊᖅᑏᑦ ᑯᐊᐅᓈᓴᑦ 2013a).

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓂᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ, ᐱᓗᐊᖿᐃᒃᑯᑕᐅᔭᕆᐊᓖᑦ ᐊᑐᓕᕐᑯᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖖᑕ ᐊᒃᑐᐃᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]
		ᒪᓕᖕᓂᕐᒧᑦ ᓯᓚᑖᓂ ᑲᖑᖃᕐᕕᐅᔪᓂᒃ ᐊᒻᒪᓗ ᐃᓂᓗᒃᑖᓂ ᑕᖅᑭᓗᒃᑖᓂ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ (ᒪᐃᒥᑦ ᓯᑎᐱᕆᒧᑦ) 92%-ᖑᓚᐅᖅᑐᖅ. ᑖᓪᓕᒪᒋᓕᖅᑕᖖᓂ, ᖁᓚᐅᑦᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᑎᑎᖅᑲᖁᑏᑦ ᐅᖃᐅᓯᒃᑳᓂᖅᓯᒪᔪᑦ ᖃᐅᔨᒫᑦ ᐊᖁᑏᑦ ᑎᑎᕋᕐᕕᓕᕇᒃᑕᖕᒋᓐᓂ ᐅᓂᒃᑳᖅᑕᐅᖁᓪᓗᒋᑦ ᐊᑦᑎᓈᓗᐊᖅᑐᑦ ᖃᖓᑕᓃᑦ 2021-ᒥ. ᐊᑦᑎᓈᓗᐊᖅᑐᑦ ᓈᒻᒪᓈᖅᓯᒪᔪᒥᒃ ᐃᓱᒪᒋᔭᐅᑎᓪᓗᒋᑦ ᐱᖃᓯᐅᔾᔨᓯᒪᔪᑦ ᓯᓚᒥᒃ, ᑲᓕᓐᓂᕐᒥᒃ, ᖃᐅᔨᓴᕐᓂᕐᒥᒃ, ᐊᐃᒃᓯᕐᓂᕐᒥᒃ/ᐊᖏᔭᖅᓯᓂᕐᒥᒃ ᖃᐅᔨᓴᕕᒃᓴᓂᒃ, ᐊᒻᒪᓗ ᖃᖓᑕᓚᐅᑲᖕᓃᑦ. ᖁᓕᒥᒎᒃᑯᑦ ᖁᓚᐅᓐᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᓃᑦ ᑲᔪᓰᓐᓇᕐᓂᐊᖅᑐᑦ ᑭᓯᐊᓂ ᒪᓕᑦᑎᐊᓕᖅᐸᑕ ᖃᓄᐃᓕᖖᓂᐅᖏᒃᑐᓂᒃ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂᒃ.	ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᖃᖕᒪᑕᓲᑦ ᑕᐃᒪᐃᓐᓇᔭᕋᓱᒋᔭᐅᙱᑦᑐᑦ ᐊᒻᒪᓗ ᓂᕆᐅᒋᔭᐅᓪᓗᑎᒃ ᐊᒃᑐᐃᓂᕐᔪᓐᓂᖄᔭᕋᓱᒋᔭᐅᙱᕈᑎᒃ. ᒪᓕᖓᓂᑦ ᐊᑦᑎᓈᓖᑦ ᖁᓕᒥᒎᒃᑯᑦ ᖁᓚᐅᓐᓂᑦ ᕿᑎᕋᖅᓯᒪᓚᐅᖅᑐᑦ 2021-ᒥ ᐃᓱᒪᒋᖃᓯᐅᑎᓗᒋᑦ ᐊᖁᑏᑦ ᐃᓱᒪᒋᔭᖏᑦ ᐊᑦᑎᓈᖅᑐᓄᑦ ᖃᖓᑕᓂᕐᓄᑦ ᐊᒻᒪᓗ ᖃᖓᑕᖃᑦᑕᕐᓂᖏᑦ ᐃᑲᕐᕋᑦ ᑲᖑᖃᕐᕕᐅᔪᒥ ᑎᓵᐅᓕᖅᑎᓪᓗᒋᑦ. ᖃᖓᑕᓃᑦ ᑲᖑᖃᕐᕕᐅᔪᒥ ᑭᒻᓕᖃᓚᐅᖅᑐᑦ ᓂᒋᐊᓂ ᖃᓇᖕᓇᖅᐸᓯᐅᑉ ᐃᓱᐊᓂ, ᓇᓕᐊᑐᐃᓐᓇᖅ ᐃᒃᐱᖕᓂᖅᓴᕋᐃᑦᑐᑦ ᒥᑭᑦᑑᓇᓱᒋᔭᐅᔪᑦ ᐱᓪᓗᒋᑦ ᑲᖑᖃᕐᕕᐅᔪᑦ, ᒪᓕᒃᑐᑦ ᑭᖑᓪᓕᖅᐹᒥᒃ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS) ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ. ᑭᓯᐊᓂᓕ, ᐊᔪᕐᓇᖅᓯᒪᔪᖅ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᓪᓚᑦᑖᕐᓗᒍ ᐊᒃᑐᐃᓂᐅᓇᔭᖅᑐᑦ ᐊᑦᑎᓈᖅᓂᖅ ᑲᖑᕐᓄᑦ ᐊᓯᖏᓐᓄᓖᓐᓃᑦ ᑎᑭᐸᒃᑐᓄᑦ ᑎᖏᐊᓄᑦ.
ᐊᖅᑯᑎᑯᑖᖏ ᐃᖏᕐᕋᖃᑦᑕᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕐᓂᖅ	ᐊᒃᑐᐊᖃᑎᒌᒃᑐᑦ ᓂᕐᔪᑎᓂᒃ ᐸᕝᕕᓴᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᑐᓂᓯᓗᑎᒃ ᐃᑲᔪᖅᓲᑎᓂᒃ ᖃᐅᔨᓴᕐᑯᑎᓂᒃ ᐳᔪᕋᖅ ᑲᑕᑲᖃᑦᑕᖅᑐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ.	ᐊᕐᕌᒍᑕᒫᖅᓯᐅᑏᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ ᐃᖏᕐᕋᖃᑦᑕᐃᓐᓇᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕐᓃᑦ. ᐊᒃᑐᐊᓪᓚᑲᒃᑐᓂᒃ ᑕᑯᔭᐅᔪᓂᒃ ᓂᕆᐅᒋᔭᐅᔪᖃᙱᑦᑐᖅ ᐊᒃᑐᐃᓂᕐᓂᒃ. ᐃᖏᕐᕋᖃᑦᑕᖅᑐᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕐᓂᖅ ᑲᔪᓰᓐᓇᕐᓂᐊᖅᑐᑦ ᐊᑯᓚᐃᓕᓂᓂᒃ.	ᖃᐅᑕᒫᖅᓯᐅᑏᑦ ᑲᑎᓗᒃᑖᕐᓗᒋᑦ ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᖅᑐᑦ (ᐅᓯᑲᖅᑕᖅᑐᑦ ᐊᓯᖏᓪᓗ) ᐊᖅᑯᑎᑖᖕᒥ 2021-ᒥ ᐃᒪᓇᑎᓲᓚᐅᖅᑐᖅ 255.8 ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒫᑦ. ᑕᒪᓇ ᑐᑭᖃᖅᑐᑦ ᓇᐃᓴᐅᑎᐅᒐᔮᒃᑐᑦ ᓴᕝᕙᓂᒃ ᐅᓯᔪᑦ ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒫᑦ ᐊᖅᑯᑎᑖᒃᑯᑦ, ᔾᔫᓄᐊᕆ 1-ᒥᑦ ᑎᓯᐱᕆ 31-ᒧᑦ, 2021-ᒥ, ᐃᒪᓇᑎᑦᓯᐅᓚᐅᖅᑐᑦ 227.1, ᐊᑦᑎᖕᓂᖅᓵᕐᔪᒃ ᑭᖑᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓄᑦ ᐅᐃᒍᒥ ᒥᒃᓴᐅᓴᒃᑕᐅᒥᒪᔪᑦ. ᐊᓯᖏᑦ ᐃᖏᕐᕋᖃᑦᑕᕐᓃᑦ ᐊᕐᕌᒍᑕᒫᖅᓯᐅᑎᖃᓚᐅᖅᑐᑦ 28.6 ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒫᑦ.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓃᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ, ᐱᓗᐊᔾᔭᐃᒃᑯᑕᐅᔭᕆᐊᓖᑦ ᐊᑐᓕᖅᑯᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᒻᒪᕆᒻᒪ ᐊᒃᑐᐃᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]
ᐳᔪᖅ ᑲᑕᖓᖃᑦᑕᐃᓐᓇᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᕐᕆᓇᕐᓂᖅ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓂᒃ 36, 50, 54ᑭ, ᐊᒻᒪ 58ᑎ, ᐱᓕᕆᐊᒨᓗ ᐊᖏᖅᑕᐅᓯᒪᔪᖅ 60	53-ᖑᔪᑦ ᐳᔪᕋᖅ ᑲᑕᒫᐃᓐᓇᐅᔭᖅᑐᓄᑦ ᑲᑎᖅᓱᐃᕝᕕᒃᑕᖃᖅᑐᑦ ᐃᓕᐅᖅᑲᖅᑕᐅᓯᒪᔪᓂᒃ ᐱᓕᕆᕝᕕᐅᔪᒥ, ᐃᓚᖏᑦ ᐅᖓᓯᙵᓂᖅᓴᐅᓪᓗᑎᒃ ᐱᓕᕆᐊᑉ ᐱᕙᓪᓕᐊᓂᖓᓂᒃ (PDA) ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐃᓅᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕐᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᓂᑯᓄᑦ ᖁᕝᕙᓯᓕᓃᑦ. 2021 ᐱᖃᓯᐅᔾᔨᔪᖅ ᐊᕐᕕᓂᓕᖕᓂᒃ ‘ᕿᓚᒻᒥᐅᔪᓂᒃ’ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᔾᔪᑎᓂᒃ ᐃᓚᒋᔭᐅᓪᓗᓂ ᓯᕗᓪᓕᖅᐹᒥᒃ ᖃᐅᔨᓴᕐᓂᐅᔪᒥᒃ ᖃᐅᔨᓴᕐᓂᖅ (ᑐᒃᓯᕋᖅᑕᐅᓯᒪᔪᖅ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᓂᒃ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᓂᒃ) ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᐊᔾᓯᙱᖃᑦᑕᕐᓂᖏᑦ ᐳᔪᖓᑦ ᑲᑕᖓᖃᑦᑕᖅᑐᑦ ᖃᐅᔨᓴᒐᒃᓴᑦ ᒪᓕᒃᑕᐅᒋᐊᖃᖅᑐᖅ ᐳᖅᑐᓂᖓ 2.0 ᒦᑕᐅᔪᖅ ᐊᒻᒪᓗ ᖃᓂᓐᓂᖅᓴᐅᓪᓗᓂ ᒪᓂᖅᑲᒧᑦ. ᖁᓕᖅᑲᖏᑐᐃᓐᓇᖅᑐᑦ ᐊᕐᕌᒍᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕈᑏᑦ ᐋᒡᒋᓯ 2013-ᒥᑦ ᑎᓯᐱᓇ 2021-ᒧᑦ ᐱᐊᓂᒃᓯᒪᓕᖅᑐᑦ. ᐳᔪᕋᖅ ᑲᑕᒫᐃᓐᓇᐅᔭᖅᑐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕈᑏᑦ ᓇᓗᓇᐃᖅᓯᓚᑦ ᑖᒃᑯᐊ ᐃᓅᑦ ᐳᔪᕋᕐᒥᒃ ᑲᑕᒐᕝᕕᐅᖏᓇᐅᔭᖅᑐᑦ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᓪᓗᑎᒃ ᑭᒡᓕᖃᓪᓗᐊᑕᖅᑐᑦ ᐃᓗᐊᓂ 1,000 ᒦᑕᑦ ᐱᓕᕆᐊᑉ ᐱᕗᓪᓕᐊᓂᖓᓂᒃ (PDA); ᖃᐅᔨᓴᕐᓂᖅ ᐳᔪᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᒥᒃ ᖃᐅᔨᓴᕝᕕᐅᔪᓂ ᓯᓚᑖᓂ ᐱᓕᕆᐊᑉ ᐱᕗᓪᓕᐊᓂᖓᓂᒃ (PDA), ᑭᓯᐊᓂ ᐃᓗᐊᓂ 5,000 ᒦᑕᑦ ᑭᒡᓕᐅᔪᓂᒃ ᓇᓗᓇᐃᖅᓯᔪᖅ ᑕᒪᓐᓇ ᐳᔪᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᑦ ᐊᒃᐸᔫᓐᓇᓚᐅᕐᓂᖓᓂᒃ 2021 ᐊᑐᖅᑎᓪᓗᒍ. ᐊᔾᔨᒌᙱᔾᔪᑎᓂᒃ ᓇᓂᓯᔪᖃᓚᐅᙱᑦᑐᖅ ᐳᔪᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᖏᓐᓂᒃ	ᐊᕐᕋᒍᑕᒫᖅᓯᐅᑏᑦ ᑲᑎᓪᓗᒃᑖᖅᓗᒋᑦ ᖃᖓᑦᑕᖃᑦᑕᖅᑐᑦ ᑕᖏᓖᑦ (TSP) ᓯᐊᒻᒪᖃᑦᑕᖅᑐᓄᑦ ᖁᕝᕙᓯᓕᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᓚᐅᖅᑐᑦ ᐅᖓᑖᓂ g/m²/ᐊᕐᕋᒍᑕᒫᑦ ᐃᓗᐊᓂ ᐱᓕᕆᐊᑉ ᐱᕗᓪᓕᐊᕝᕕᖓᓂ (PDA), ᑲᑎᓪᓗᒃᑖᖅᓗᒋᑦ ᖃᖓᑦᑕᖃᑦᑕᖅᑐᑦ ᑕᖏᓖᑦ (TSP) ᖁᕝᕙᓯᓕᓃᑦ ᒥᒃᓴᕗᓪᓕᐊᓗᑎᒃ ᓯᓚᑖᓂ ᐱᓕᕆᐊᑉ ᐱᕗᓪᓕᐊᕝᕕᖓᓂ (PDA). 2021-ᒥ ᐳᔪᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᒪᓕᑐᐃᓐᓇᓚᐅᖅᑐᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂ ᑕᐃᑲᓂ ᐳᔪᖅ ᑲᑕᒐᕐᓂᖅᐹᖑᕝᕕᐅᔪᒥ ᑭᒡᓕᖃᕋᔭᖅᑐᑦ ᑖᔅᓱᒧᙵᓗᐊᑕᖅ ᐱᓕᕆᕝᕕᐅᑉ ᐱᕗᓪᓕᐊᕝᕕᒋᔭᖓᓂ (PDA).

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓃᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ, ᐱᓗᐊᔾᔭᐃᒃᑯᑕᐅᓯᕆᐊᓖᑦ ᐊᑐᓕᖁᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒫᑕ ᐊᒃᑐᐃᓃᑦ ᒥᒃᓵᓴᒃᑕᐅᓯᒪᔪᑦ [2]
		ᒪᓕᒃᑕᐅᒋᐊᖃᖅᑐᖅ ᐳᖅᑐᓂᖓᓂᒃ 2.0 ᒦᑕᓂᒃ ᐊᒻᒪᓗ 0.5 ᒦᑕᓂ. ᓯᕗᓂᒃᓴᒥ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓂᕐᓂᐊᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᐳᔪᖅ ᑲᑕᒐᖃᑦᑕᖅᑐᖅ ᑖᒃᑯᓇᓂ 47-ᖑᔪᓂ ᖃᐅᔨᓴᕝᕕᐅᔪᓂ ᐊᐅᔭᓗᒃᑖᖅ ᐊᒻᒪᓗ ᐊᐃᑉᐸᖏᑦ 26 ᐊᕐᕌᒍᓕᒫᖅ ᐃᓂᐅᔪᓂ.	
ᐱᕈᖅᑐᑦ ᐊᒻᒪᓗ ᐃᔾᔪᕐᒥᑦᑐᑦ ᓴᕕᕆᔭᖕᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓂᕐᓂᖅ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓂᒃ 34, 36, 38, ᐊᒻᒪ 50, ᐱᓕᕆᐊᒧᓪᓗ ᐊᖏᖅᑕᐅᓯᒪᔪᖅ 60 ᐊᒻᒪᓗ 107.	ᐃᔾᔪᕐᒦᑦᑐᑦ-ᓴᕕᕆᔭᐃᑦ ᐊᒻᒪᓗ ᓂᕐᓇᓃᑦᑐᑦ–ᓴᕕᕆᔭᐃᑦ ᐱᑕᖃᕐᓂᖏᑦ ᖃᐅᔨᓴᒃᓴᓕᐅᖑᓚᐅᖅᑐᑦ 2021-ᒥ. ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᖅ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᖅ ᐱᖓᓱᓂᑦ ᐅᖓᓯᑦᔨᖓᓂ ᐱᓕᕆᐊᑉ ᐱᕙᓪᓕᐊᓂᖓᓂ (PDA) (ᖃᓂᑦᑐᖅ: 0–100 ᒦᑕᑦ, ᐅᖓᓯᒃᑐᖅ: >100–1,000 ᒦᑕᑦ, ᐊᒻᒪᓗ ᖃᐅᔨᒪᔾᔪᑕᐅᔪᖅ: >1,000 ᒦᑕᑦ).	ᐃᔾᔪᕐᒦᑦᑐᑦ-ᓴᕕᕆᔭᐃᑦ ᐊᒻᒪᓗ ᓂᕐᓇᓃᑦᑐᑦ–ᓴᕕᕆᔭᐃᑦ ᐱᑕᖃᕐᓂᖏᑦ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᑦ ᕐᑯᐊᖅᓵᕐᓇᓗᐊᙱᑦᑐᓂᒃ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐃᓄᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᓐᓄᑦ.
ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓂᒃ 54dii ᐊᒻᒪᓗ 58ᒥ ᑲᒪᒋᔭᖃᖅᑐᑦ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᖏᑦ (QIA) ᐃᓱᒫᓘᑎᖏᓐᓂᒃ ᐊᐅᔾᔭᕆᒃᓯᖃᑦᑕᖅᑐᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᐊᒻᒪᓗ ᐊᒃᑐᐃᖓ ᓂᕐᔪᑎᓄᑦ	ᐊᕝᕕᓃᓪᓚᑦ ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᐊᓂᒃᑕᐅᓚᐅᖅᑐᑦ ᐊᖅᑯᑎᑯᑖᑉ ᖃᓂᒌᔭᓂ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᐱᓱᓐᓂᕆᐅᒃᑕᖏᑦ ᐃᓕᖅᑯᓯᖏᓪᓗ ᑐᒃᑐᐃ ᕚᕝᕗᐊᕆᒥ, ᒫᔾᔨᒥ, ᐊᐃᕐᕆᓕᒥ, ᐅᑐᐱᕆᒥ ᓄᕙᐱᕆᒥᓗ 2021-ᒥ. ᑎᕆᒐᓂᐊᑦ, ᐅᑲᓖᑦ, ᐊᕿᒡᒋᑦ ᐊᕕᙵᐃᓪᓗ ᐆᒪᔪᑐᐊᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ; ᓇᓗᓇᐃᒃᑯᑦᑕᖅᑕᖅᓯᓂ ᑐᒃᑐᓂᒃ ᑕᑯᔭᖃᓚᐅᕐᒪᖔᑦ. ᓂᕐᔪᑏᑦ ᐃᓕᖅᑯᓯᖏᑦ ᐊᖅᑯᒧᑦ ᑎᑎᕋᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᑐᓂ ᐃᓂᒥ ᑐᒦᑦ ᑕᑯᔭᐅᑎᓪᓗᒋᑦ. ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᑲᔪᓯᓂᐊᖅᑐᑦ 2022-ᒥ.	ᐅᓄᕈᓐᓃᖅᓂᖅᓴᐃᑦ ᑐᒃᑐᑦ ᐱᓯᖃᑦᑕᖅᑐᑦ ᐱᓕᕆᐊᒥ ᒪᑭᒪᔾᔪᑕᐅᕝᕕᐅᔪᒥ ᐊᐅᓚᓂᓗᒃᑖᓂ ᐱᓕᕆᑎᓪᓗᒋᑦ ᒥᒃᓵᓴᒃᑕᐅᓚᐅᖅᑐᑦ, ᑭᓯᐊᓂᓕ ᓂᕆᐅᒋᔭᐅᓚᐅᙱᑦᑐᑦ ᐅᓄᖅᑐᒪᕆᐅᓇᔭᕋᓱᒋᔭᐅᓚᐅᙱᑦᑐᑦ ᐅᐊᖕᓇᖖᓂ ᑐᒃᑐᑦ ᐅᓄᕐᓂᖏᑦ. ᖃᐅᔨᓴᕈᑎᕝᕓᑦ ᑖᒃᑯᓈᙳᑦ ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᓂᒃ ᐊᑐᖅᑕᐅᔪᓐᓇᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᑎᓪᓗᒋᑦ ᒥᒃᓵᓴᒃᑕᐅᓯᒪᔪᑦ ᑐᒃᑐᑦ ᓇᐃᓴᐅᑎᖏᑦ ᐅᓄᖅᓯᒋᐊᕐᒪᖔᑕ ᐊᒻᒪᓗ ᐱᓱᒡᕕᒋᖃᑦᑕᖅᑕᖏᑦ ᑲᔪᓯᒪᖔᑕ ᓄᓇᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᖃᐅᔨᓴᕝᕕᐅᔪᒥ (RSA). ᒪᓂᖅᑲᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᖅᓂᖅ ᐃᒪᐃᓐᓇᓱᕆᓈᒍᓂ ᑐᓗᕈᑕᐅᓗᓂ ᐊᒃᑐᐃᓂᖅ (ᑐᓪᓕᓂᖏᑦ ᖃᒡᓕᕙᓪᓕᐊᓗᑎᒃ ᐊᓯᓂᓕ ᐊᑳᖅᓯᒪᙱᓪᓗᑎᒃ ᐊᖅᑯᒥᒃ) ᐊᒻᒪᓗ ᑐᒃᑐᐃᑦ ᐅᓄᕐᓂᖏᓄᑦ ᓇᓗᓇᐃᔭᐅᑏᑦ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᑦ ᐅᓄᖅᓯᕙᓪᓕᐊᓂᖏᓐᓂᒃ, ᖃᖓᑕᓲᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ

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ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓃᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᖃᕐᓯᐅᔪᑦ, ᐱᓗᐊᖃᐃᒃᑯᑕᐅᓯᕆᐊᓖᑦ ᐊᑐᓕᖁᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᒻᒪᕆᑕ ᐊᒃᑐᐃᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]
			ᐊᑐᖅᑕᐅᑐᐃᓐᓇᕆᐊᓖᑦ ᖃᐅᔨᓴᖅᑕᐅᕙᓪᓗᓂᑦ ᐊᒃᑐᐃᓂᒃᑲᓂᐅᓇᔭᖅᑐᑦ. ᓰᖃᐃᒻᒪ ᑐᒃᑐᑦ ᑐᒥᖏᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᙱᓐᓂᖏᓐᓄᑦ ᐊᐅᒥ ᑐᒥᒃᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᖓᒃ 2021-ᒥ, ᓇᓗᓇᐃᖅᑕᐅᔪᓐᓇᙱᑦᑐᖅ ᐃᒪᐃᙱᒃᑲᓗᐊᕐᒪᖔᑦ ᐱᓕᕆᐊᒥ ᒪᑭᒪᔾᔪᑎᕐᔪᐊᑦ ᐊᒃᑐᐃᓂᖃᕐᓂᖏᓐᓂᒃ ᑐᒃᑐᑦ ᐱᓱᒃᑳᕐᓂᖏᓐᓄᑦ. ᑭᓯᐊᓂᓕ ᑕᑯᔭᐅᑲᓪᓚᒃᓯᒪᔪᖅ ᑐᑦᑐᐃᑦ ᐃᑳᖅᑎᓪᓗᒋᑦ ᐊᖅᑯᑎᑯᑖᒥ 2020–ᒍᑎᓪᓗᒍ ᐃᒪᐃᓐᓇᓯᒋᓐᓈᔪᑦ ᑕᒪᓐᓇ ᑐᓗᕈᑕᐅᙱᑦᑐᖅ ᐱᓱᒃᑲᑦᑕᕐᓂᖏᓐᓄᑦ.
ᐊᐳᔾᔭᓇᒃᓯᖃᑦᑐᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᙵᒃ 53ai ᐊᒻᒪᓗ 53ᑎ ᑲᒪᒋᔭᖃᖅᑐᑦ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᑦ ᐃᓱᒫᓘᑎᖏᓐᓂᒃ ᐊᐳᔾᔭᓇᒃᓯᖃᑦᑕᖅᑐᑦ ᐳᖅᑐᓂᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐊᒃᑐᐃᓂᖓ ᐆᒪᔪᓄᑦ	ᐊᐳᔾᔭᓇᒃᓯᖃᑦᑐᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓃᑦ ᐱᓕᕆᐊᕐᔪᓚᐅᖅᑐᑦ ᑕᖅᑭᑕᓖᑦ ᒪᕐᕈᐊᖅᑎᕐᓗᑎᓪᓘᓐᓃᑦ ᑕᖅᑭᒥ ᐱᒋᐊᕐᓗᒍ ᐅᑐᐱᕆ 2020 ᑎᓯᐱᕆ 2021-ᒧᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᒪᓕᖕᒪᙱᑕ 1 ᒥᑕ ᐳᖅᑐᓂᕐᒥᒃ ᖃᓄᐃᓪᓕᔪᖅᑳᖅᑎᓇᒍ ᑭᒡᓕᐅᔪᒥᒃ. ᑲᒪᖃᑦᑕᕐᓂᖅ ᐊᐳᔾᔭᓇᒃᓯᖃᑦᑕᖅᑐᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᐱᒋᐊᖅᑎᑦᑎᓯᒪᔪᖅ ᓂᕐᔪᑏᑦ ᐃᑳᕈᓇᖃᑦᑕᕐᓂᖏᓐᓂᒃ ᐊᒻᒪᓗ ᐊᖁᑎᓄᑦ ᑕᑯᒃᓴᐅᓂᖅᓴᐅᓕᕐᓗᑎᒃ ᐃᑲᔪᕐᑯᓪᓗᒍ ᓂᕐᔪᑏᑦ- ᐊᐳᖅᑕᐅᖃᑦᑕᕐᓂᖏᑦ ᓄᓇᓯᐅᑎᓄᑦ. ᒪᓕᒃᑐᒋᑦ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᑦ (TEWG) ᑐᒃᓯᕋᐅᑎᖓ, ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᕐᓂᖏᑦ ᐃᓂᐅᔪᑦ ᓂᖁᐊᖅᑕᐅᑐᐃᓐᓇᓚᐅᖅᑐᑦ 2020–ᒥ. 2021-ᒥ, ᒪᓕᒃᑕᐅᓂᖃᕙᔪᓚᐅᖅᑐᑦ ᐊᐳᔾᔭᓇᒃᓯᖃᑦᑕᕐᓂᕐᒧᑦ ᐳᖅᑐᓂᕐᓄᑦ ᖃᐅᔨᓴᕐᓂᖅ 90%-ᖑᓚᐅᖅᑐᑦ. ᐃᓚᖏᓐᓂ, ᐊᐳᔾᔭᖕᓂᑦ ᐋᖅᑭᒋᐊᖅᑕᐅᔪᓇᓚᐅᙱᑦᑐᑦ ᓄᓇ ᐅᕝᕙᓘᓐᓃᑦ ᐊᑦᑕᕐᓇᖅᑕᐃᓕᒪᓂᕐᒧᑦ ᑭᒡᓕᐅᔪᑦ ᒪᓕᒃᓱᒋᑦ.	ᐅᓄᕈᓐᓃᖅᐸᓪᓕᐊᓂᖏᑦ ᐱᓱᖃᑦᑕᖅᑐᑦ ᐃᑳᖅᓱᑎᒃ ᐱᓕᕆᕝᕕᐅᑉ ᒪᑭᒪᔾᔪᑎᕐᔪᐊᖏᓐᓂᑦ ᐊᐅᓚᓂᓗᒃᑖᓂ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᖅ. ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᐱᓗᐊᔾᔭᐃᒃᑯᑏᑦ ᐅᖅᑯᒥ (ᓲᕐᓗ ᐊᐳᔾᔭᓇᒃᓯᕙᒃᑐᓂᒃ ᑲᒪᓂᖅ, ᕿᒥᐊᕐᔪᕋᓛᕐ), ᐊᖅᑯᑎᑰᒃ ᓂᕆᐅᒋᔭᐅᓚᐅᙱᑦᑐᖅ ᑐᓗᕈᑕᐅᔾᔫᕋᓱᒋᔭᐅᙱᓗᑎᒃ ᑐᒃᑐᑦ ᐱᓱᒃᑲᑦᑕᕐᓂᖏᓐᓄᑦ. ᑲᒪᑦᑎᐊᖏᓐᓂᕐᒧᑦ ᑐᒃᑐᑦ ᑐᕐᑯᑕᐅᕆᐊᓪᓚᒃᑲᑦᑕᕐᓂᖏᑦ ᓂᕆᐅᒋᔭᐅᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᖅ ᐱᔾᔪᑕᐅᓗᓂ, ᐊᒻᒪᓗ ᐊᒃᑐᐃᓃᑦ ᓂᕆᐅᒋᔭᐅᓪᓗᑎᒃ ᐊᖏᕐᔫᓇᔭᕋᓱᒋᔭᐅᓇᑎᒃ ᕿᑭᖅᑖᓘᑉ ᐅᐊᖕᓇᖕᒐᓂ ᑐᒃᑐᖏᓐᓄᑦ. ᒪᓕᑦᑎᐊᖅᑐᒻᒪᕆᐅᓚᐅᖅᑐᑦ ᐊᐳᔾᔭᓇᒃᓯᖃᑦᑕᖅᑐᑦ ᐳᖅᑐᔭᕆᐊᖃᕐᓂᖏᑦ ᐲᖅᓯᕖᓪᓕᓚᐅᖅᑐᑦ ᐊᖅᑯᑎᑯᑖᒥ ᑐᓗᕈᑕᐅᓕᕐᓗᑎᒃ ᑐᒃᑐᑦ ᐱᓱᒃᑲᑦᑕᕐᓂᖏᓐᓄᑦ. ᑭᓯᐊᓂᓕ, ᓈᒻᒫᓂᙱᑦᑐᓂᒃ ᓇᐅᑦᑎᖅᓱᕐᓂᕐᒧᑦ ᑎᑎᖅᑲᖁᑎᑕᓕᒃ ᐋᑐᑎᓂᖅᓴᐅᖁᓪᓗᒍ ᑕᒪᓐᓇ ᐱᓗᐊᔾᔭᐃᒃᑯᑎ ᑐᒃᑐᑦ ᐱᓱᙱᓇᕙᒃᑕᙱᓐᓄᑦ ᐱᔾᔪᑕᐅᓗᑎᒃ ᑐᒃᑐᐃᑦ ᓇᐃᓴᐅᑎᙱᑦ ᐊᒃᐸᓯᙱᓐᓂᙱᓐᓄᑦ. ᑐᒃᑐᐃᑦ ᐅᓄᖅᓯᕙᓪᓕᐊᔪᑦ, ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᓕᒻᒥᒃ ᐱᖅᑯᓯᖅᑎᒍᑦ

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓂᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓂᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ, ᐱᓗᐊᔾᔭᐃᒃᑯᑕᐅᔭᕆᐊᓖᑦ ᐊᑐᓕᕐᑯᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᙱᓚ ᐊᒃᑐᐃᓂᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]
			ᖃᐅᔨᒪᔭᐅᔪᑎᒍᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᕆᓪᓚᓃᑎᒃ ᑐᒃᑐᓂᒃ ᐱᓱᒃᐸᒃᑐᓂᒃ ᐃᑳᕐᕕᙱᓐᓂ ᐊᖅᑯᑏᑦ ᐊᑐᓕᖅᑎᑕᐅᓂᐊᖅᑐᑦ.
ᓇᓯᑦᑕᖅᑐᕐᕖᑦ (HOL) ᑐᒃᑐᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᙱᓂᒃ 53ᐃ, 53ᐱ, 54ᐱ, ᐊᒻᒪᓗ 58ᐱ	ᐊᑕᐅᓯᖅ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ (EDI) ᐆᒪᔪᓕᕆᔩ ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᐹᕙᓗᕐᑯᑦ ᐃᖅᑲᓇᐃᔭᖅᑎᖓ ᐱᓕᕆᐊᖃᑕᐅᖅᑑᒃ ᓇᓯᑦᑕᖅᑐᕐᕕᖕᓄᑦ (HOL) ᖃᐅᔨᓴᕐᓂᕐᓂᒃ ᑐᒃᑐᐃᑦ ᓄᕐᕆᐅᖅᑎᓪᓗᒋᑦ (ᔫᓂᐅᓚᕐᓴᖅᑎᓪᓗᒍ 2021-ᒥ). ᐊᑕᖏᖅᑯᒋᑦ ᓇᓯᑦᑕᖅᑐᕐᑰᑦ ᐋᖅᑭᒃᑕᐅᓯᒪᔪᑦ ᐅᐸᒃᑕᐅᓚᐅᖅᑐᑦ ᒪᕐᕈᐊᖅᑎᖅᑯᑎᒃ. ᑲᑎᓗᒃᑖᖅᑯᒋᑦ ᑕᑯᔭᖅᑐᕐᓃᑦ ᐃᒪᓐᓇᑎᒋᐅᓚᐅᖅᑐᑦ 33.45 ᐃᑲᕐᕋᑦ, ᑕᑯᔭᖅᑐᓚᔪᖕᓃᑦ ᖃᔅᓯᐅᓂᖏᑦ ᐊᑐᓂ ᓇᓯᑦᑕᖅᑐᕐᕕᖕᒧᑦ 42 ᒥᓇᑦᖑᓚᐅᖅᑐᑦ. ᑐᒃᑐᓂᒃ ᑕᑯᔪᖃᓚᐅᙱᑦᑐᖅ ᑖᒃᑯᓂᐊ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ 2021-ᒥ. 2016-ᒥ, ᕕᐅᓴᑦ (Viewshed) ᓄᓇᙳᐊᓕᕆᓂᖅ ᐱᐊᓂᒃᑕᐅᓚᐅᖅᑐᑦ ᓴᖅᑭᔮᖅᑎᑦᑎᕐᑯᔨᓪᓗᑎᒃ ᐊᖏᓂᖓᓂᒃ ᖃᐅᔨᓴᖅᑏᑦ ᑕᑯᔭᖅᑐᖃᑦᑕᕈᓇᖅᑕᖏᓐᓂᒃ ᐱᓕᕆᓕᕿᖓᒥᒃ ᓇᓯᑦᑕᖅᑐᕕᖕᓂᒃ (HOL) ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ. ᓇᑎᑦᑕᖅᑐᕕᖕᓄᑦ (HOL) ᖃᐅᔨᓴᕈᑏᑦ ᐊᕐᕿᒍᑕᒫᑦ ᐱᓕᕆᐊᖑᐃᓇᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᓄᕐᕆᐅᖅᑎᓪᓗᒋᑦ. 2021-ᒥ ᑕᑯᔭᖅᑐᖃᑦᑕᕐᓂᖅ ᐃᓚᓕᐅᔾᔭᐅᓂᐊᖅᑐᑦ ᑎᑎᖅᑭᓇᔾᔪᑎᒃᑲᓂᐅᔭᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓇᕈᑕᐅᓇᓱᒃᑐᓄᑦ ᐅᔭᕋᖕᓂᐊᕐᓂᓕᒫᖏᓐᓂ. ᖁᓖᑦ ᒪᕐᕉᓪᓗ ᐅᖓᓯᒃᑐᒦᑦᑐᑦ ᐊᔾᔨᓕᐅᕈᑏᑦ ᐋᖅᑭᒃᑕᐅᓚᐅᖅᑐᑦ ᐊᕐᕕᓂᖓᓂ ᓇᓯᑦᑕᖅᑐᕐᕕᖓᓂ (HOL), ᐊᔾᔨᙳᐊᖅᑕᖃᙱᑦᑐᖅ ᑐᒃᑐᓂᒃ ᐊᔾᔨᓕᐅᕆᓯᒪᔪᓂ ᕿᒥᕐᕈᔭᐅᔪᓇᖅᑐᓂᒃ ᐱᓕᕆᐊᖑᑎᓪᓗᒋᑦ ᑕᐃᔅᓯᒪᓂ.	ᖃᐅᔨᓴᕐᓂᖅ ᒥᒃᓴᐅᓴᐃᓯᒪᔪᖅ ᐃᓚᖏᓐᓂᒃ ᐊᒃᑐᐊᓪᓚᕆᙱᑦᑐᓂᒃ ᓇᔪᕐᓂᒃ ᐊᓯᐅᔾᔨᓂᕐᒥᒃ ᑐᒃᑐᓄᑦ ᐱᔾᔪᑕᐅᓗᑎᒃ ᐃᒃᐱᖕᓂᖅᓴᕋᐃᓂᕐᒧᑦ ᐸᕝᕕᓵᕆᓂᑦ ᐊᒻᒪᓗ ᐳᔪᕋᑦ ᓯᐊᒻᒪᒃᓯᒪᓂᖓᓄᑦ, ᑐᖄᖅᑯᓂ ᓇᔪᒃᑯᓂᖅᓴᐅᓗᑎᒃ ᐊᑑᑎᖃᖅᑐᒥᑦ ᐃᓗᐊᓂ ᑭᒡᓕᒋᑎᑕᐅᔪᖅ ᐊᒃᑐᐃᓂᕐᒧᑦ (ZOI). ᐊᒃᑐᐊᓪᓚᕆᙱᑦᑐᑦ ᓇᔪᒥᒃ ᐊᓯᐅᔨᓂᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ ᐊᔾᔨᕐᓇᙱᑦᑑᓗᑎᒃ ᑕᐃᒪᐃᖏᓐᓇᖅᑐᓄᑦ ᐊᔾᔩᖃᑦᑕᙱᓐᓂᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐊᖏᔫᓇᓱᒋᔭᐅᓇᓂ ᐅᐊᖕᓇᖕᓂ ᕿᑭᖅᑖᓗᑉ ᑐᒃᑐᖃᕐᕕᖏᓐᓄᑦ. ᐅᓗᒥᒧᑦ, ᓈᒻᒪᓈᖅᓯᒪᙱᑦᑐᑦ ᑐᒃᑐᓂᒃ ᑕᑯᖃᑦᑕᕐᓂᑦ ᐱᓕᕆᐊᖑᑎᓗᒋᑦ ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᕈᑏᑦ ᐊᑐᖅᑕᐅᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓂᑦ ᑐᒃᑐᑦ ᐃᓕᖅᑯᓯᖏᓐᓄᑦ ᓇᔪᕐᒥᓃᓐᓂᑦ ᐊᑐᕐᓂᕐᒧᑦ.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᕝᕙᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]	ᐱᓕᕆᓂᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓂᑦ ᐅᕝᕕᕆᔭᐅᔪᑦ, ᐱᔪᐊᕝᔭᐃᒃᑯᑕᐅᔭᕆᐊᓖᑦ ᐊᑐᓕᖁᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒑᑕ ᐊᒃᑐᐃᓂᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]
ᐊᖑᓇᓱᒃᑏᑦ ᐊᒻᒪᓗ ᐳᓛᖅᑎᓄᑦ ᐊᑎᓕᐅᕐᕕᖏᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓯᒃ 54ᒥ	ᖃᓄᐃᙱᑦᑐᖅ ᐊᑐᖅᑕᐅᙱᒃᑲᓗᐊᕈᓂ ᑭᓯᐊᓂ ᐊᑐᕈᑎᒃ ᐹᖕᓈᖕᑯᑦ ᐃᒡᓗᕐᑯᑎᖏᓐᓂ, ᐳᓛᕆᐊᖅᑐᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒧᑦ ᖃᐅᔨᒋᐊᕈᓐᓇᖅᑐᑦ ᐹᖕᓈᖕᑯᓐᓂ ᐅᐊᑦᑎᔨᓂᒃ. 2021–ᒥ, ᑲᑎᙳᒋᑦ 885 ᐃᓄᐃᑦ ᑎᑭᓚᐅᖅᑐᑦ ᓄᓘᔮᖕᓄᓪᓗᓐᓂᑦ ᕿᙳᐊᓄᑦ ᑐᓚᒃᑕᕐᕕᐊᓄᓪᓗᓐᓂᑦ. ᑕᒪᓐᓇ ᑯᑦᑎᖕᓂᖅᓴᓪᒪᕆᐅᓚᐅᖅᐳᖅ 2020–ᒥᓂᑦ. ᐊᑐᓂᖅ ᐊᖑᓇᓱᒃᑎᓄᑦ ᐳᓛᖅᑎᓄᓪᓗ ᐊᑎᓕᐅᕐᕕᖕᓂᒃ ᓇᐃᓈᖅᓯᒪᔪᒥᒃ ᑲᔪᓯᓂᐊᖅᑐᑦ ᐱᓕᕆᐊᒃᓴᖅ ᐊᑐᕐᓂᓕᒫᖕᒐᓂ.	ᐱᓕᕆᐊᒧᑦ–ᐊᒃᑐᐊᒐᓗᐊᖅᑎᓪᓗᒋᑦ ᐊᒃᑐᐃᓂᑦ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᓄᓇᒥᒃ-ᐊᑐᖅᑎᓄᑦ ᐱᓕᕆᐊᓂᒃ ᓲᕐᓗ ᓂᖀᒃᓴᖅᓯᐅᕐᓃᑦ, ᐃᖏᕐᕋᔭᖕᓃᑦ, ᐊᐅᓪᓛᖅᓯᒪᓃᑦ, ᐊᒻᒪᓗ ᐊᒃᑐᐃᓃᑦ ᓂᕆᐅᒋᔭᐅᓚᐅᖅᑐᑦ ᐊᖏᔫᙱᓪᓗᑎᒃ. ᑭᓯᐊᓂᓕ 2020–ᒧᑦ ᐊᒻᒪᓗ ᑭᓪᓕᓕᖅᑕᐅᓯᒪᔪᑦ ᐊᒃᑐᐊᔪᑦ ᓄᕙᒡᔪᐊᕐᓇᖅ-19-ᒧᑦ ᓄᓇᕐᔪᐊᒥ ᖃᓂᒪᓇᐅᔪᒧᑦ ᑲᔪᓯᓚᐅᖅᑐᑦ 2021-ᒥ, ᐊᖑᓇᓱᒃᑏᑦ ᐊᒻᒪᓗ ᐳᓛᖅᑐᑦ ᖃᐅᔨᒋᐊᕐᓂᖏᑦ ᐅᓄᖅᓯᒋᐊᖅᐸᓪᓕᐊᓯᒪᔪᑦ ᑕᐃᑲᙵᓂᑦ ᑎᑎᖅᑲᐃᓐᓇᖃᑦᑕᕋᓱᓕᓚᐅᕐᓂᑦᑎᓐᓂ 2011-ᒥ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐊᒥᓱᑦ ᐊᖑᓇᓱᖕᓂᕐᒧᑦ ᐊᐅᓪᓛᕐᓂᕐᒧᓪᓗ ᑎᑭᓐᓃᑦ. 2021-ᖑᑎᓪᓗᒍ, ᑖᒃᑯᐊ ᓇᐃᓴᐅᑏᑦ ᐅᓄᖅᓯᒋᐊᖅᓯᒪᒧᑦ ᐊᕝᕋᐸᓗᒋᓪᓗᒋᑦ ᐃᓕᖅᑯᓯᐅᓚᐅᖅᑐᑦ ᑕᑯᔭᐅᓚᐅᖅᑐᑦ 2019-ᒥ.
ᐃᕙᕝᕕᐅᖃᑦᑕᑦᑐᑦ ᑐᑭᑉᐸᒃᑐᓂᒃ ᑎᖕᒥᐊᓂᒃ ᖃᐅᔨᓴᖅᓂᖅ (AMBNS)	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓯᒃ 66 ᐊᒻᒪᓗ 70	2021-ᒥ, 360,615 ᒦᑕᑦ ᑭᑉᐹᓇᒃᑐᑦ (m^2) (36 (Hᐊᒃᑐᕐ)) (ha) ᓄᓇᐃᑦ ᐸᒡᕕᓴᒃᑕᐅᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᑉ ᒪᑭᒪᕝᔪᑎᕐᔪᐊᖏᓐᓄᑦ. ᑕᕝᕙᓂ ᐃᓂᒥ, 80%-ᖑᔪᑦ ᐸᒡᕕᓴᒃᑕᐅᓚᐅᖅᑐᑦ ᓯᓚᑖᓂᑦᑐᑦ ᐃᕐᓂᐅᕐᕕᐅᔪᑦ ᑎᖕᒥᐊᓄᑦ (ᐋᒡᒌ 20-ᒥᑦ ᒪᐃ 16-ᒧᑦ), ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ 56,944 ᒦᑕᑦ ᑭᑉᐹᓇᒃᑐᑦ (m^2) (5.6 (Hᐊᒃᑐᕐ)) (ha) ᓄᓇ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ. ᑭᖑᓂᐊᒍᑦ ᑭᖑᕙᕆᐊᖅᑕᐅᓗᓂ ᑕᐅᕙᓂ ᒪᕐᕉᒃ ᖁᐸᓄᐊᓄᑦ ᐃᕙᕝᕖᑦ ᓇᓂᔭᐅᓚᐅᖅᑐᑦ, ᐊᒻᒪᓗ ᓴᓇᓃᑦ ᑭᖑᕙᕆᐊᖅᑕᐅᓗᑎᒃ ᑕᐅᕙᓂ ᑭᓯᐊᓂ ᐱᐊᕋᖏᑦ ᑎᓪᔭᐅᓚᐅᖅᑎᓪᓗᒋᑦ.	ᐱᑕᖃᓗᐊᕈᓐᓃᖅᑎᓪᓗᒋᑦ ᐱᓕᕆᐊᑉ ᐃᓂᖓᑦ, ᐱᓕᕆᓂᖅ ᐃᕙᕝᕕᐅᖃᑦᑕᑦᑐᑦ ᑐᑭᑉᐸᒃᑐᓂᒃ ᑎᖕᒥᐊᓂᒃ ᖃᐅᔨᓴᖅᓂᖅ (AMBNS), ᐊᑐᓕᖅᑎᕆᓂᕐᓗ ᐃᕙᕝᕕᖕᓂᒃ ᑲᒪᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂᒃ, ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓂᑦ ᐃᕙᖃᑦᑕᖅᑐᓄᑦ ᑎᖕᒥᐊᓄᑦ ᓂᕆᐅᒋᔭᐅᓚᐳᖅᑐᑦ ᐊᒃᐸᓱᒃᑑᓗᑎᒃ ᐱᑕᖃᙱᓪᓗᑎᓪᓗᓐᓂᑦ. ᒪᕐᕉᒃ ᑎᑭᑉᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕝᕕᖏᑦ ᓇᓂᔭᐅᓚᐅᖅᑐᑦ 2021-ᒥ, ᐊᒻᒪᓗ ᓴᓇᓂᖅ ᑭᖑᕙᕆᐊᖅᑕᐅᓗᓂ ᐱᐊᕋᖏᑦ ᑎᓪᔭᐅᓚᐅᖅᑎᓪᓗᒋᑦᓗ; ᑕᐃᒪᐃᒻᒪᑦ, ᐊᒃᑐᐃᓂᑦ ᒪᓕᒃᑐᐃᓐᓇᖅᑐᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂᒃ.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

ᖃᐅᔨᓴᕐᓂᖅ	**ᐱᔾᔪᑖ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ [1]**	**ᐱᓕᕆᓂᑦ ᐱᐊᓂᒃᑕᐅᔪᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᐟᓐᕆᔭᐅᔪᑦ, ᐱᓗᐊᔾᔭᐃᒃᑯᑕᐅᔭᕆᐊᓖᑦ ᐊᑐᓕᖁᔭᐅᔪᓐᓗ ᓯᕗᓂᒃᓴᒥ ᐱᓕᕆᐊᒃᓴᓄᑦ**	**ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒫᑕ ᐊᒃᑐᐃᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ [2]**
ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᑐᕐᑯᖃᑦᑕᖅᑐᑦ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖏᑉ 53ᐃ, 53ᐃ, and 57ᑭ	ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ ᑐᕐᑯᖃᑦᑕᕐᓃᓪᓗᓐᓃᑦ ᐊᒃᑐᐊᔪᑦ ᐆᒪᔪᓄᑦ ᐃᓗᐊᓂ ᐱᓕᕆᕝᕕᐅᔫᑉ ᐃᓂᖏᓐᓂ ᐅᖃᐅᓯᐅᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᑕᐅᕝᕙᒍᑎᒃ ᐊᕿᒍᓖᒪᖅ. ᐊᔪᕐᓇᙱᒃᑳᖓᑦ ᐱᓗᐊᔾᔭᐃᒃᑯᑏᑦ ᐱᓕᕆᔾᔪᔫᑦ ᐊᑐᓕᖅᑎᑕᐅᓚᐅᖅᑐᑦ ᐅᓄᕈᓐᓃᕐᓂᖅᓴᐅᕐᑯᓪᓗᒋᑦ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᑐᕐᑯᖃᑦᑕᕐᓃᑦ. 2021-ᒥ, ᒪᕐᕿᒃ ᑐᕐᑲᙱᕈᑎᒃ ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᓃᑦ ᐊᒻᒪᓗ 12 ᓂᕐᔪᑏᑦ ᑐᕐᑯᓚᐅᖅᑐᑦ ᐅᖃᐅᓯᐅᔪᑦ, ᐊᑕᖏᖅᑯᒋᑦ ᐊᐃᕈᒃᑰᑦ ᐊᓯᐅᔨᔭᐅᔪᑦ. ᐆᓚᔪᑦ ᑐᕐᑯᖃᑦᑕᕐᓂᖏᑦ ᐃᓚᐅᑎᑦᑎᔪᑦ ᑎᓴᒪᓂᒃ ᑎᕆᒐᓂᐊᓂᒃ, ᑎᓴᒪᓂᒃ ᐅᑲᓕᕐᓂᒃ, ᐊᑕᐅᓯᖅ ᐆᕚᓕᒃ, ᐊᑕᐅᓯᖅ ᓇᑦᑎᖅ ᐊᒻᒪᓗ ᒪᕐᕿᒃ ᕐᑯᐸᓄᐊᒃ. ᐹᕝᓛᓐᑯᑦ ᐱᓗᐊᔾᔭᐃᒃᑯᑎᓂᒃ ᑲᔪᓯᑎᑦᑏᓐᓇᕐᓂᐊᖅᑐᑦ ᐆᒪᔪᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᐱᓕᕆᕝᕕᐅᔫᑉ ᐃᓂᐊᓂ ᐃᓚᓐᓂᐊᖅᑎᑦᑎᓂᒃᑯᑦ, ᐊᑐᓕᖅᑎᕆᓂᒃᑯᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒥᒃ ᐊᒃᑕᑯᓄᑦ ᑲᒪᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᕝᕙᒃᑐᓂᒃ ᖃᐅᔨᒪᔾᔪᑕᐅᔪᓂᓪᓗ. ᐆᒪᔪᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓂᖅ ᑐᕐᑯᖃᑦᑕᕐᓂᖏᓐᓄᓪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᑲᔪᓯᓂᐊᖅᑐᑦ 2022-ᒧᑦ.	ᐆᒪᔪᑦ ᑐᕐᑯᑕᐅᓪᓚᑦᑖᖃᑦᑕᕐᓂᖏᑦ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᓂ ᐱᓕᕆᓂᕐᓂᒃ ᐊᒃᐸᓯᒃᑑᔪᖅ ᐱᑕᖃᙱᓗᑎᓪᓘᓐᓃᑦ ᑎᖏᐊᓄᑦ ᓂᕿᑐᖅᑎᓄᑦ, ᑎᖏᐊᓄᑦ, ᑐᒃᑐᓄᑦ, ᐊᓯᖏᓐᓄᓪᓗ ᐆᒪᔪᓄᑦ. ᑐᕐᑯᖃᑦᑕᕐᓃᑦ ᓇᓕᐊᑐᐃᓐᓇᖅ ᓂᕆᐅᒋᔭᐅᓚᐅᖅᑐᑦ ᑭᒡᒐᖅᑐᐃᓂᐊᕐᓗᑎᒃ ᒥᑭᑦᑐᒪᕆᙵᒃ ᐃᓚᖓᓂᒃ ᑲᑎᓗᒃᑖᖅᓱᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ. . ᐆᒪᔪᑦ ᑐᕐᑯᑕᐅᓪᓚᑦᑖᖃᑦᑕᕐᓂᖏᑦ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᓂ 2021-ᒥ ᐃᓛᒃᑰᖅᑐᐃᓇᐅᓪᓗᑎᒃ ᐊᓯᐅᔨᓂᐅᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᐊᒃᑐᐃᓯᒪᓇᑎᒃ ᓇᓕᐊᖏᓂᑐᐃᓐᓇᖅ ᐊᔾᔨᒌᙱᑦᑐᓂᒃ ᐆᒪᔪᓂᒃ ᖁᐊᖅᓵᕐᓇᖅᑐᓂᑦᑐᓂᒃ. ᑕᐃᒪᒻᒪᑦ, ᐆᒪᔪᑦ ᑐᕐᑯᖃᑦᑕᖅᑐᑦ ᐊᒃᐸᓯᒃᑐᐃᓇᐅᓚᐳᖅᑐᑦ ᐊᒻᒪᓗ ᑭᒡᒐᖅᑐᐃᓪᓗᑎᒃ ᐅᓄᙱᑦᑐᒪᕆᙵᒃ ᑲᑎᓗᒃᑖᖅᓱᑦ ᐅᓄᕐᓂᖏᓐᓂᒃ, ᒪᓕᑐᐃᓇᖅᑐᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂᒃ.

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 started in 2013, and mining began in September 2014. The Project is currently in the Early Revenue Program (ERP), consisting of a mining rate of up to 4.2 mtpa at Deposit No. 1. Temporary approval for a production increase to haul via the Tote Road and ship 6.0 mtpa from Milne Port was approved in September 2018 and extended to cover 2021 (Minister of Northern Affairs 2020). Also approved but not yet constructed is a railway system that will transport 18.0 mtpa of the ore from the Mine Site 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.

In 2021, Baffinland hauled roughly 5.8 mt of iron ore from the Mine to the Milne Port stockpile and shipped 5.6 mt of iron ore out of Milne Port. Construction in 2021 was limited to; continued development and construction of infrastructure and laydowns required at Milne Port and the Mine Site to support operations for additional supplies and equipment occurred, and the addition of water management infrastructure at Deposit No. 1. At the end of 2021, the total project footprint was 587 ha.

The Nunavut Impact Review Board 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 Environment Monitoring Program is guided by the Terrestrial Environment Mitigation and Monitoring Plan (Baffinland Iron Mines Corporation 2016a). It is overseen by the Terrestrial Environment Working Group (TEWG), including members from Baffinland, the Qikiqtani Inuit Association, the Government of Nunavut, Environment and Climate Change Canada, and the Mittimatalik Hunters and Trappers Organization. The Terrestrial Environment Monitoring Program began in 2012 and continued through 2021 with adaptations to the program based on results and input from the TEWG. This report summarizes the data collection and monitoring programs conducted in 2021 for the Project, including the following components (summaries provided in Table 0):

- weather monitoring;
- helicopter flight height analysis;
- passive dustfall monitoring;
- dustfall extent imagery analysis;
- vegetation and soil base metals monitoring;
- snow track surveys;
- snowbank height monitoring;
- Height of Land caribou surveys;
- remote camera monitoring;
- hunter and visitor log summaries;
- Active Migratory Bird Nest Surveys; and,
- wildlife interactions and mortalities.

Note: Inuit participation is standard practice in field monitoring programs conducted by Baffinland. Due to the continued territorial restrictions associated with the COVID-19 pandemic, in 2021 Baffinland was unable include Inuit research assistants from the Baffin Island communities in the Terrestrial Environment Monitoring Program.

Weather conditions in 2021 were summarized and compared to average conditions from previous years. Malfunctions in temperature, precipitation, and wind monitoring equipment made comparisons for these conditions difficult in 2021, however, notable trends included warmer weather in summer months during 2021 compared to baseline, while wind speeds remain consistent with baseline years. .

The mean daily total vehicle transits (haul and other) on the Tote Road in 2021 was 255.8 vehicle transits per day. The mean number of ore haul transits per day on the Tote Road, from January 1 to December 31, 2021, was 227.1, slightly below the FEIS addendum predictions. Other vehicle traffic (i.e. transport of personnel and supplies) had an annual mean of 28.6 vehicle transits per day.

The helicopter flight height analysis monitors potential disturbance to birds and other wildlife within the Regional Study Area (RSA) and designated Snow Goose area (for the moulting period only in July and August). The 2021 analysis incorporates additional detail requested by the TEWG in 2020 meetings regarding flight durations and pilot rationales. In 2021, after including pilot rationale, helicopter flight height compliance within the Snow Goose area was 72%, and overall compliance in all months was 92%. The most common pilot rationales reported for low-level flights were slinging, drop off/pick up, and weather. Overall compliance decreased in 2021 compared to 2020, with a higher number of flights without pilot log information.

The 2021 passive dustfall monitoring program used 53 passive dustfall collectors to measure dust deposition related to Project activities. The 2021 program also included, at the QIA and TEWG's request, six 'short' monitors as part of a pilot study to investigate the variability between dustfall sampling at the standardized height of 2.0 m and that closer to ground level. Twenty-six collectors are sampled monthly, while the rest are sampled during the summer months due to their remote location. The passive dustfall monitoring program results indicated that dustfall at all sites (the Mine, Milne Port, and the Tote Road linking the two) has remained constant since approximately 2018. However, as was the case in previous years, dustfall regularly exceeds predictions at Milne Port and along the Tote Road. Dustfall extent was also characterize by examining using satellite images. This analysis was done to verify Inuit land users' reports of seeing dust beyond what was predicted in baseline dust modelling, and a visual representation of the extent of dustfall in areas where it is below detection in dust collectors. The 2021 dustfall extents decreased at Milne Port, potentially due to the application of DustBlockr®, and were similar to the 2020 pattern seen at the Mine Site with a larger extent. The 2021 dustfall extents along the Tote Road were similar to previous years. The 2021 dustfall extents appeared to cover more area on the surrounding terrain for the remainder of the Project compared to 2020 extents but were similar to the 2019 extents. The total dustfall area for the Project in 2021 was 552.9 km^2 (4.7%) for Landsat and 1,787.6 km^2 (15.2%) for Sentinel-2.

Baffinland uses numerous site-wide dust suppression measures to reduce these emissions, including water and calcium chloride on roads, continued use of shrouds and coverings on ore crushers, and improved methods of transferring ore onto stockpiles. DustBlockr® was applied to the entire Tote Road in the summer of 2021. Another new dust suppressant, DusTreat, was applied to ore stockpiles regularly from January through April 2021, and in late June 2021. DusTreat is a non-toxic, water-based, and long-lasting suppressant that acts as a sealant on the stockpiles to prevent dust and is planned to be applied to more stockpiles at Milne Port.

Vegetation monitoring in 2021 included vegetation and soils base metals monitoring. Soil-metal and lichen-metal concentrations at the Project indicated no net changes compared with baseline values. Values were either below or within an acceptable range. Presently, soil-metal and lichen-metal concentrations represent a low risk to environmental and human health.

Snow track surveys were conducted to assess wildlife response to the Tote Road, particularly caribou response. Six surveys were completed in 2021: four in spring (February 17, March 18, April 7, and April 27) and two in winter (October 10 and November 1). As in previous surveys, most tracks observed were from Arctic foxes and Arctic hares, and no caribou tracks were observed. Approximately half of the tracks detected were from animals travelling along the road; about 40% crossed and 7% possibly deflected from the Tote Road.

Snowbank height monitoring was conducted to assess compliance with the operational 1 m height, which facilitates wildlife crossings and improves visibility for drivers to avoid wildlife collisions. Snowbank height surveys were typically conducted two to three times per month during winter. In response to a TEWG request, measurement locations were randomized in 2020 instead of using repeated kilometre markers for measurements. Overall, compliance was very high at 90%, slightly lower than 2020.

Height of Land surveys were conducted to assess caribou presence, distribution, and behaviour in response to Project activities during the calving season. Height of Land surveys were completed between June 6 and June 17, 2021. All stations were visited twice. The total observation time was 33.45 hours, with an average observation time of 42 minutes per station. During these surveys, no caribou were observed, consistent with all previous surveys after 2013 and the low regional caribou population. Results from remote camera monitoring also show that no caribou were observed from late July 2021to mid October 2021 as a supplemental program to the Hight of Land surveys.

Active Migratory Bird Nest Surveys were completed before any vegetation clearing or surface disturbance at the Project during the breeding bird season (May 17 to August 19). Surveys consisted of observers using a rope-drag method (provided by Canadian Wildlife Service) to detect any nesting birds before construction. Two Snow Bunting nests were found, and construction was subsequently postponed in the area until the chicks had fledged.

After several years of raptor effects monitoring, occupancy and productivity appear to be stable, and there has been no evidence of Project-related effects on raptors. Therefore, raptor occupancy and productivity surveys were paused for 2021, and efforts were put towards drafting a paper for peer-review publication.

Two non-fatal wildlife interactions and 10 wildlife mortality incidents were reported in 2021, all of which were individual losses. Four mortalities involved Arctic foxes; two were due to vehicle collisions, and the other two remain unknown. Two mortalities involved Snow Buntings; one was likely due to predation, and the other remains unknown. One Arctic hare was found deceased due to a vehicle collision Three Arctic hare mortalities were reported as an undetermined cause of death. Whenever possible, mitigations are implemented to reduce the risk of wildlife injury or mortality on the Project.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

Survey	Reason for Survey[3]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[4]
Weather monitoring	Supports all other data collection and monitoring programs	Weather conditions were recorded hourly at meteorological stations at the Mine Site and Milne Port. Weather data were recorded since 2005 and 2006, respectively. Weather data are used to support other monitoring programs; mitigations are not necessary. Meteorological stations will continue to collect weather data in 2022.	N/A
Helicopter flight height analysis	Addresses Project Conditions 59, 71, and 72	Except for operational purposes, and subject to pilot discretion regarding aircraft and human safety, pilots must maintain a cruising altitude of at least 650 m during point-to-point travel in areas likely to have migratory birds, and 1,100 m vertical and 1,500 m horizontal distance from observed concentrations of migratory birds (e.g., Snow Geese area). Flight corridors are also used to avoid areas of significant wildlife importance. In 2021, compliance with height requirements within the Snow Geese area during the moulting season (July to August) was 72%, and compliance outside the Snow Geese area and in all areas in all months of analysis (May to September) was 92%. For the fifth consecutive year, flight height data were cross-referenced with daily pilot logs to justify low-level flights in 2021. Low-level flights with reasonable rationales were considered compliant. Reasonable rationales included weather, slinging, surveys, drop off/pick up sampling, and short-distance flights. Helicopter flight height analysis will continue until consistent trends are identified.	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 Geese area is subject to helicopter flyovers and is mainly located outside the Zone of Influence (ZOI), effects would likely be limited. Overall, local disturbance relative to the Project development Area (PDA) and Local Study Area (LSA) extents was expected to cause some sensory disturbance but not result in significant adverse effects to the Snow Goose population. Direct mortality due to aircraft was deemed unlikely and thus expected to have no significant adverse effect. Compliance with minimum helicopter flight heights was moderate in 2021 when considering the pilots' rationale for low-level flying and flight hours within the Snow Geese area during the moulting season. Flights over the Snow Geese area were limited to its southeastern edge, such that any sensory disturbance would be minimal relative to the entire Snow Geese area, consistent with Final Environmental Impact Statement (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.

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

[4] 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 2013a).

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

Survey	Reason for Survey[3]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[4]
Tote Road traffic monitoring	Correlate to wildlife disturbance and provide supporting data to the dustfall monitoring program	Annual summary of continual traffic monitoring. No directly observed unexpected effects. Traffic volume monitoring will continue regularly.	The mean daily total vehicle transits (haul and other) on the Tote Road in 2021 was 255.8 vehicle transits per day. The mean number of ore haul transits per day on the Tote Road, from January 1 to December 31, 2021, was 227.1, slightly below the FEIS addendum predictions. Other traffic had an annual mean of 28.6 vehicle transits per day.
Passive dustfall monitoring	Addresses Project Conditions 36, 50, 54d, and 58c, and Project Commitment 60	Fifty-three dustfall collectors are distributed around the Project area, some further away from the PDA as Reference sites monitoring background levels. 2021 included six 'short' monitors as part of a pilot study (requested by the QIA and the TEWG) to investigate the variability between dustfall sampling at the standardized height of 2.0 m and that closer to ground level. Nine years of monitoring from August 2013 to December 2021 are now complete. Passive dustfall monitoring indicates that the areas with the greatest dustfall deposition are restricted mainly to within 1,000 m of the PDA; an investigation of dustfall at monitors outside the PDA, but within a 5,000 m radius indicates that dustfall was generally low throughout 2021. No difference was found in the dustfall measured at a standardized height of 2.0 m and at 0.5 m. Future monitoring will continue to investigate dustfall at the 47 sites through the summer season and a subset of 26 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. The 2021 dustfall results are consistent with predictions that the highest dustfall would be limited mainly within the PDA.
Vegetation and soil base metals monitoring	Addresses Project Conditions 34, 36, 38, and 50, and Project Commitments 60 and 107	Soil-metal and lichen-metal concentrations were sampled in 2021. Sampling was conducted at three distances from the PDA (Near: 0–100m, Far: >100–1,000 m, and Reference: >1,000 m). Soil-metal and lichen-metal concentrations at the Project mainly indicated no significant increases compared with baseline values. Some discrete increases in contaminants of potential concern (CoPC) were identified, but all values were either below or within an acceptable range.	Soil-metal and lichen-metal concentrations presently represent a low risk to environmental and human health.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

Survey	Reason for Survey[3]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[4]
Snow track surveys	Addresses Project Conditions 54dii and 58f Addresses Qikiqtani Inuit Association (QIA) concerns about snowbank heights and the effects on wildlife	Six snow track surveys were completed along the Tote Road to investigate the movement and behaviour of caribou in February, March, April, October, and November 2021. Arctic fox, Arctic hare, ptarmigan, and lemming were the only species detected during surveys; no evidence of caribou was observed. Wildlife response to the road was recorded at each location where tracks were seen. Snow track monitoring will continue in 2022.	A reduction in caribou movement across Project infrastructure throughout the Operation phase was predicted, but it not expected to be significant at the scale of the North Baffin caribou population. Data from the snow track survey can be used to investigate that prediction when caribou numbers increase and movement resumes in the RSA. If 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 may be used to investigate the potential impact further. Because no caribou tracks were identified during snow track surveys in 2021, it cannot be determined whether Project infrastructure is impacting caribou movement. However, incidental observations of caribou crossing the Tote Road in 2020 suggest that it is not a barrier to movement.
Snowbank height surveys	Addresses Project Conditions 53ai and 53c Addresses QIA concerns about snowbank heights and the effects on wildlife	Snowbank height monitoring was conducted monthly or bi-monthly from October 2020 to December 2021 to assess compliance with the 1 m height threshold. Management of snowbank height facilitates wildlife crossings and increases driver visibility to help reduce wildlife-vehicle collisions. As per TEWG's request, measurement locations were randomized in 2020. In 2021, the average compliance for snowbank height surveys was 90%. In some areas, snowbanks could not be modified because of landscape or safety limitations. Snowbank height monitoring will continue during the winter in 2022.	A reduction in caribou movement across Project infrastructure throughout the Operation phase was predicted. Due to mitigations on the road (e.g., snowbank management, low embankments), the Tote Road was not expected to be a barrier to caribou movement. A negligible increase in caribou mortality was anticipated due to the Project, and impacts were predicted to be not significant at the scale of the North Baffin caribou population. High compliance with snowbank heights minimizes the Tote Road's potential to act as a barrier to caribou movement. However, there are insufficient 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.
Height of Land (HOL)	Addresses Project Conditions	One Environmental Dynamics Inc EDI biologist and one Baffinland staff member conducted HOL surveys during the caribou calving season (early June 2021). All HOL stations were visited on two occasions. The total observation time was 33.45	The assessment predicted some indirect habitat loss for caribou due to sensory disturbance and dust deposition, leading to reduced habitat effectiveness within the ZOI. However, habitat effectiveness was estimated to be reduced by 2.00% to 4.25%. Some disturbances (i.e., traffic) are short-

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

Survey	Reason for Survey[3]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[4]
caribou surveys	53a, 53b, 54b, and 58b	hours, while the average observation time per station was 42 minutes. No caribou were observed during these surveys in 2021. In 2016, viewshed mapping was completed to demonstrate the extent of area surveyors could observe while conducting HOL surveys. HOL surveys will continue annually during the calving season. The 2021 observations add to a more extensive database as monitoring efforts continue through the Project's life. Twelve remote cameras were deployed at six HOL stations, no images of caribou were captured for the reviewed timeframe.	duration and caribou may adapt to these disturbances, thus limiting potential impacts. Many alternate calving sites exist within and outside the ZOI. Indirect habitat loss was predicted to be indistinguishable from natural variation and not significant at the scale of the North Baffin caribou population. To date, insufficient caribou observations during HOL surveys have occurred to assess any Project-related effects on caribou behaviour or habitat use.
Hunter and visitor log summaries	Addresses Project Condition 54f	Though not compulsory unless using Baffinland facilities, visitors to the site may check in with Baffinland security. In 2021, a total of 885 individuals checked in at either Mary River or Milne Port camps. This was much higher than 2020. Use of the hunter and visitor log summaries will continue throughout 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. Except for 2020 and restrictions associated with the COVID-19 pandemic that continued into 2021, hunter and visitor check-ins have steadily increased since record-keeping began in 2011, including numerous hunting and camping trips. During 2021, these numbers increased to similar trends seen in 2019.
Active Migratory Bird Nest Surveys (AMBNS)	Addresses Project Conditions 66 and 70	In 2021, approximately 360,615 m² (36 ha) of land were disturbed for Project infrastructure. Of this area, 80% was disturbed outside the breeding bird window (August 20 to May 16). During the breeding bird window (May 17 to August 19), approximately 56,944 m² (5.6 ha) of land was cleared. Two Snow Bunting nests were found, and construction was subsequently postponed in the area until the chicks had fledged. Surveys will continue to be conducted whenever vegetation clearing, or surface disturbance occur within the breeding bird window.	By minimizing the Project footprint, conducting AMBNS, and implementing a nest management plan, Project-related effects on nesting birds were expected to be low to nil. Two migratory bird nests were located in 2021, and construction was postponed until the chicks had fledged; thus, effects are consistent with impact predictions.
Wildlife interactions and mortalities	Addresses Project Conditions 53a, 53b, and 57d	Any interactions or mortalities involving wildlife within the Project area are reported and investigated year-round. If possible, mitigation measures are implemented to reduce future wildlife interactions and mortalities. In 2021, two non-fatal wildlife interactions and 12 wildlife mortality incidents were reported, all of which were individual	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 expected to represent a small fraction of the overall population. Wildlife mortalities in 2021 were all individual losses and did not impact any species at risk. Thus, wildlife mortalities were

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2021.

Survey	Reason for Survey[3]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[4]
		losses. Wildlife mortalities involved four Arctic foxes, four Arctic hare, one narwhal, one ring seal, and two Snow Buntings. 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 2022.	low overall and represented a very small proportion of overall populations, consistent with impact predictions.

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Field crews included Matthew Frey (EDI), Jordyn Renaud (EDI), Morgan Kanak (EDI) and various research assistants from the 2021 Baffinland Environment team and the Baffinland Human Resources team. Baffinland Environment staff conducted passive dustfall monitoring throughout the year and were instrumental in providing ground-based transportation and field support.

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AICc	Akaike Information Criterion
Al	Aluminum
ALS	ALS Environmental Laboratory
AMBNS	Active Migratory Bird Nest Surveys
ANOVA	Analyses of Variance
As	Arsenic
Baffinland	Baffinland Iron Mines Corporation
BHL	Baffinland Hematite Lump
CCME	Canadian Council of Ministers of the Environment
Cd	Cadmium
CI	Confidence interval
COA	Certificate of Analysis
CoPC	Contaminants of potential concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
Cu	Copper
CVAAS	Cold Vapour-Atomic Absorption
CWS	Canadian Wildlife Service
DEM	Digital Elevation Model
ECCC	Environment and Climate Change Canada
EDI	EDI Environmental Dynamics Inc.
EPP	Environment Protection Plan
ERP	Early Revenue Program
ESA	European Space Agency
FEIS	Final Environmental Impact Statement
GIS	Geographic Information System
GN	Government of Nunavut
GPS	Geographic Positioning System
HOL	Height of Land
IIBA	Inuit Impact and Benefit Agreement
LSA	Local Study Area
MDL	Minimum detection limit
MHTO	Mittimatalik Hunters and Trappers Organization
MSI	Multispectral Instrument
NIRB	Nunavut Impact Review Board
OLI	Operational Land Imager
Pb	Lead
PC	Project Condition
PDA	Project Development Area

Acronym/Abbreviation	Definition
PRISM	Program for Regional and International Shorebird Monitoring
QAQC	Quality Assurance and Quality Control
QIA	Qikiqtani Inuit Association
RDL	Relation to laboratory detection limits
ROW	Right-of-way
RSA	Regional Study Area
SDI	Snow Darkening Index
Se	Selenium
SNGO	Snow Goose
TEMMP	Terrestrial Environment Mitigation and Monitoring Plan
TEWG	Terrestrial Environment Working Group
TSP	Total Suspended Particulates
USGS	United States Geological Survey
VEC	Valued Ecosystem Component
Zn	Zinc
ZOI	Zone of Influence

UNITS

Unit	Definition
cm	centimetre
dm	decimetre
g	gram
g/m^2	grams per metre square
$g/m^2/year$	grams per metre square per year
ha	hectare
hrs	hours
kg	kilogram
kg/km	kilogram per kilometre
km	kilometre
km^2	kilometres square
km/hr	kilometres per hour
L	litre
m	metre
m/s	metres per second
m^2	metre square
magl	metres above ground level
masl	metres above sea level
mg	milligram
$mg/dm^2 \cdot day$	milligram per decimetre square day
mg/kg	milligrams per kilogram
mm	millimetre
mtpa	million tonne per annum
µm	micrometre
%	percent°
°C	degrees Celsius

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1 OVERVIEW

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 Environment Monitoring Program is guided by Inuit Qaujimajatuqangit and the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) (Baffinland Iron Mines Corporation 2016a). This work is overseen by the Terrestrial Environment Working Group (TEWG), which is composed of representatives 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 Environment Monitoring Program, the frequency of which is outlined in the TEMMP(Baffinland Iron Mines Corporation 2016a).

The Terrestrial Environment Monitoring Program provides a holistic assessment of potential Project effects on numerous inter-related Valued Ecosystem Components (VECs). Individual data collection and monitoring programs are designed to complement each other and provide a greater understanding of ecosystem-wide responses and pathways, rather than single, stand-alone programs. For example, dustfall deposition is captured by passive dustfall sampling, dustfall effects on plants are captured by vegetation monitoring, and any bioaccumulation effects in caribou would then be monitored by caribou tissue samplings. To date, numerous data collection and monitoring programs have been conducted for the Project, including:

Table 1-1. Baffinland terrestrial monitoring program, past and future monitoring dates.

Monitoring Program	Previous Years of Monitoring	Next Anticipated Monitoring Year
Passive Dustfall	2013 to 2021	2022
Dustfall Extent Imagery Analysis	2020 to 2021	2022
Vegetation Abundance Monitoring	2012 to 2017, 2019 to 2021	2022
Exotic Invasive Vegetation Monitoring and Natural Revegetation	2014, 2019 and 2020	2022/2023
Height of Land (HOL) caribou surveys	2013 to 2021	2022
Snow Track Surveys and Snowbank Height Monitoring	2014 to 2021	2022
Noise Monitoring	2020	2022
Hunter and Visitor Logs	2010 to 2021	2022
Wildlife Observations, Incidents, and Mortality Logs	2020 to 2021	2022
Active Migratory Bird Nest Surveys (AMBNS)	2013 to 2021	2022
Helicopter Flight Height Analysis	2015 to 2021	2022
Cliff-Nesting Raptor Occupancy and Productivity Surveys	2011 to 2020	None Scheduled
Caribou Fecal Pellet Collection	2011 to 2014, 2020	None Scheduled

Monitoring Program	Previous Years of Monitoring	Next Anticipated Monitoring Year
Caribou Water Crossing Surveys	2014	None Scheduled
Carnivore Den Survey	2014	None Scheduled
Communication Tower Surveys	2014 and 2015	None Scheduled
Roadside Waterfowl Surveys	2012 to 2014	None Scheduled
Staging Waterfowl Surveys	2015	None Scheduled
Tundra Breeding Bird PRISM (Program for Regional and International Shorebird Monitoring) Plots	2012, 2013, 2018	None Scheduled
Bird Encounter Transects	2013	None Scheduled
Coastline Nesting and Foraging Habitat Surveys	2012 (Steensby Inlet) and 2013 (Milne Inlet)	None Scheduled
Normalized Difference Vegetation Index Analysis	2020	None Scheduled
Red Knot (*Calidris canutus*) Surveys	2014, 2019	None Scheduled

The results of the various data collection and monitoring programs conducted between 2012 and 2020 are described in the Terrestrial Environment Annual Monitoring Reports (EDI Environmental Dynamics Inc. 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020).

Figure 1-1 illustrates the Mary River Project's Terrestrial Environment Monitoring Program. The Terrestrial Environment Monitoring Program included the following data collection and monitoring programs in 2021, the results of which are summarized in this report:

- weather monitoring;
- helicopter flight height analysis;
- Tote Road traffic monitoring;
- passive dustfall monitoring;
- dustfall extent imagery analysis;
- vegetation and soil base metals monitoring;
- snow track surveys;
- snowbank height monitoring;
- HOL caribou surveys;
- remote camera monitoring;
- AMBNS;
- hunter and visitor log summaries; and,
- wildlife interactions, incidental observations, and mortalities.

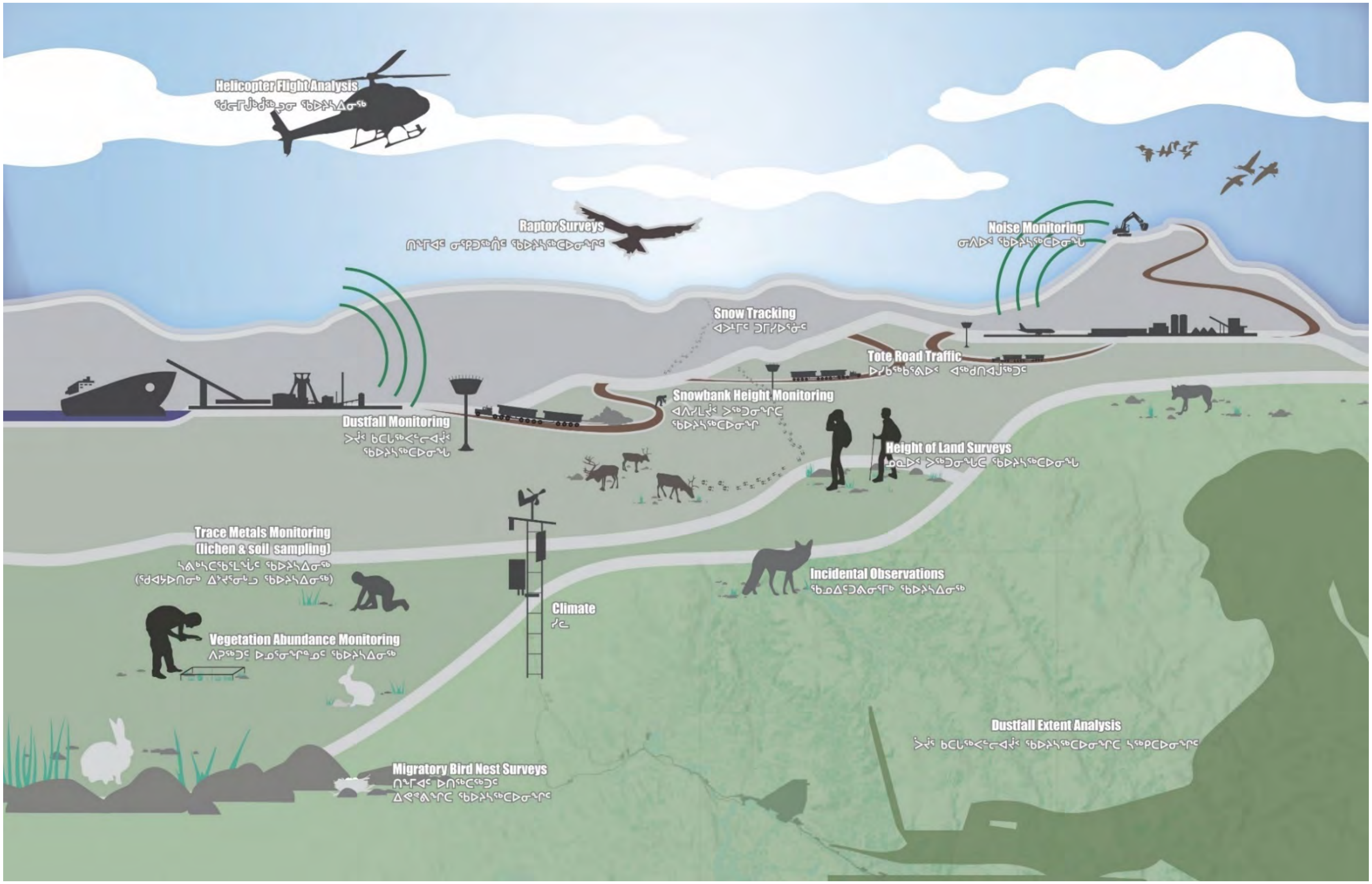


Figure 1-1. Graphical overview of the Mary River Project Terrestrial Environment Monitoring Program.

2 TERRESTRIAL ENVIRONMENT WORKING GROUP

The Terrestrial Environment Working Group (TEWG) was formed in 2012 as a collaborative effort to develop and refine monitoring programs based on the best available science and local knowledge. The group typically schedules two (2) yearly in-person meetings, in addition to hosting two (2) interim teleconferences per year. In 2021, engagement with the TEWG was reduced to avoid consultation fatigue and overlap with scheduled engagements associated with the Phase 2 Proposal.

Draft technical annual reports and other documentation are provided to the TEWG in advance of meetings to the extent possible and on an on-going basis to allow for review, comment and advice to be provided by all members. Baffinland reviews all comments received on draft reports, makes effort to provide meaningful responses to each comment, and in so doing, takes into consideration the suggestions for improvement of the report and advice provided by TEWG. This mechanism allows TEWG members to provide constructive feedback on annual reporting efforts.

Baffinland held one TEWG meeting on June 30, 2021 (via teleconference). In addition to discussing the monitoring results from the previous year, the meeting focused on a potential caribou monitoring via aerial surveys and the trade-offs of doing so, and helicopter impacts on moulting areas for Snow Geese (*Anser caerulescens*).

In response to comments from the TEWG on the 2020 Terrestrial Environment Annual Monitoring Report, monitoring in 2021 included: 1) a new protocol for helicopters for poor weather days to travel around the moulting area for Snow Geese; 2) a pilot study to determine differences in dust collected with shorter dustfall collectors; and 3) the addition of remote cameras at some Height of Land stations. Discussion about the aerial survey were abbreviated because the GN's technical member was unavailable to comment, however follow-up occurred with the GN Regional Wildlife Biologist in August 2021.

As previously, the TEWG members were invited to review and provide commentary on the draft version of this 2021 Terrestrial Environment Annual Monitoring Report. TEWG comments and Baffinland's rejoinder are presented at the closure of this report (Appendix G).

3 INUIT PARTICIPATION

Inuit participation is standard practice in field monitoring programs conducted by Baffinland and includes:

- hiring and training Inuit to work on terrestrial monitoring programs;
- supporting the participation of the Mittimatalik Hunters and Trappers Organization (MHTO) in the Terrestrial Environment Working Group (TEWG);
- funding for two full-time on-site Environmental Monitors to be appointed and solely employed by the Qikiqtani Inuit Organization (QIA) following Article 15.8 of the Inuit Impact and Benefit Agreement (Qikiqtani Inuit Association and Baffinland Iron Mines Corporation 2018); and,
- resourcing a community-based monitoring program through the Mary River Inuit Impact and Benefit Agreement (IIBA) (Qikiqtani Inuit Association and Baffinland Iron Mines Corporation 2018).

In all years before 2020, Inuit have participated in various terrestrial monitoring programs as research assistants and consultants (e.g., Height of Land, vegetation abundance, vegetation and soils base metals, and raptor monitoring). Inuit research assistants from numerous communities on Baffin Island provided critical support and insight for field programs. Inuit research assistants have gained essential skills and training through participation in field programs such as plant identification, bird identification, Arctic biology, field logistics, Geographic Positioning System (GPS) navigation, data collection methods, and data management.

Due to the continued territorial restrictions associated with the COVID-19 pandemic, in 2021 Baffinland was unable include Inuit research assistants from the Baffin Island communities in the Terrestrial Environment Monitoring Program. However, Baffinland did find opportunities for Inuit participation in this year's field programs by pulling in staff from other departments within the Project. These Baffinland staff members lived outside of Nunavut in 2021, so they did not pose a risk of community exposure to COVID-19 within Nunavut.

Regular inclusion of Inuit research assistants in field programs is expected to resume in 2022, assuming it is safe to do so and consistent with GN Public Health Guidelines.

4 CLIMATE

Climate data are recorded and summarized for the Mary River Project (the Project) according to Nunavut Impact Review Board (NIRB) Project Certificate No. 005 Project Condition #57(g) (Nunavut Impact Review Board 2020):

- *"The Proponent shall report annually regarding its terrestrial environment monitoring efforts, with inclusion of the following information: an assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries."*

The climate data recorded at the Mary River Project contributes to several other datasets and analyses. Recent climate data are compared to historical baseline data to assess changes in climate patterns in the RSA. Dustfall dispersion and deposition are strongly related to weather conditions (e.g., dustfall dispersion tends to be higher during dry, windy conditions than rainy conditions). Incorporating observed weather conditions into the dustfall analyses can help explain certain patterns and trends in dustfall. Wind data are also used to estimate snow distribution before and during snow tracking surveys.

From 1963 to 1965, Environment Canada operated a climate station at Mary River during the summer (Baffinland Iron Mines Corporation 2012). These climate data have been included to compare data collected from Baffinland's on-site meteorological stations. Baffinland established a meteorological station at Mary River Camp in June 2005 and at Milne Port in June 2006. Data from these stations were used to create a baseline dataset from 2005 to 2010. Baffinland continues to collect data from these stations (Baffinland Iron Mines Corporation 2012). Where relevant, the 2021 weather data were compared with the baseline (2005 to 2010) and post-baseline (2013 to 2020) weather data. Data included hourly air temperature, precipitation, and wind speed and direction.

Weather conditions from January 1, 2021, to December 31, 2021, were reported from on-site meteorological stations at the Mine Site and Milne Port (Map 4-1). Summaries of 2021 weather conditions at the Mine Site and Milne Port included monthly air temperatures (mean, minimum and maximum), monthly precipitation (quantity and frequency), wind direction and speed.

At the Mine Site, air temperatures from the start of 2021 until August 24 contained a consistent error due to an incorrect offset value in the datalogger program. This error was corrected by subtracting 10°C from each measurement before the correction of the program. Precipitation data before late August is unreliable at both the Mine Site and Milne Port due to obstructed rain gauges. These data were also corrected, and the subsequent readings can be regarded as reliable. Precipitation measurements from August and earlier will not be used as part of a historical baseline for future reporting.


81° W
80.5° W
80° W
79.5° W
71.75° N
71.5° N
71.25° N
Milne Port
Milne Inlet Camp and Port
Milne Inlet Tote Road
Mary River Project
Mine Site
McQuat L.
Muriel Lake
David L.
Sheardown L. (N.W.)
Sheardown L. (S.E.)
LEGEND
Weather Station
Milne Inlet Tote Road
Potential Development Area
Locations of on-site meteorological stations for the Project
NOTES
Potential Development Area provided by BIM (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: 1:400,000 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N
Drawn: CT
Checked: JB
Date: 2022-02-17
MAP 4-1
Map Area
Mary River Project
Baffinland
EDI

Comparisons of 2021 weather data were made against baseline (2005 to 2010) and post-baseline (2013 to 2020) periods. Baseline data were referenced from Appendix 5A of the Mary River Project Final Environmental Impact Statement (Carrière et al. 2010). Mean air temperatures and precipitation (quantities and frequencies) were averaged across the years when those data were collected within the baseline and post-baseline periods. Cumulative proportions of wind speed and direction were calculated based on data across all years within each period.

4.1 AIR TEMPERATURE AND PRECIPITATION

4.1.1 MINE SITE

In 2021, monthly mean temperatures measured at the Mine Site meteorological station were lowest in March (−29.9°C), rising above zero in June (6.2°C) and peaking in July (7.0°C). Monthly means fell back below zero in September (−1.6°C). January and February 2021 were both warmer than the baseline by 8.6°C and 4.7°C, respectively. July 2021 was 3.9°C cooler than the baseline, while October was 7.2°C warmer. The temperature from June 5 until September 4 remained consistently above zero, except for one hour on August 28 (Figure 4-1).

Minimum and maximum temperatures in 2021 were recorded on February 17 (−44.9°C) and July 10 (16.9°C), respectively. These extremes lie within the historical range. The lowest temperature recorded at the Mine Site during the baseline period was −59.1°C in April 2007[3] and was −46.6°C in January 2015 of the post-baseline period[4] , and −44.9°C in February of 2021. Comparable historical data (1963 to 1965) in winter months are lacking, but the lowest temperature recorded in late winter/spring was −40.6°C in April of 1964. The highest temperatures recorded at the Mine Site were 22.8°C in July 2009 of the baseline period, 24.5°C in July 2016 of the post-baseline period, and 16.9°C in July 2021. These summer temperatures were greater than what was identified in the historical record (20.6°C in July 1965). For a complete monthly comparison among baseline (2005 to 2010) and all post-baseline years (2013 to 2021), see Appendix A.

June through August tend to be the wettest months for North Baffin Island, and this trend is representative of historical data from the Mine Site. Until August 24, the rain gauge was blocked. It is possible that this blockage began as early as October 2019. This casts uncertainty on a large portion of the year's data. However, the measurement of days with precipitation was not affected by this failure to measure depth, and by counting the number of precipitation days, 2021 appears to be comparable to historical means (Figure 4-2). May was comparatively dry, with 1 rainy day compared to a baseline of 4.4, while October was comparatively wet, with 6 rainy days compared to a baseline of 2.5. Of the months with reliable measurements, October was notable for its high precipitation, recording 22.6 mm of precipitation compared to a baseline mean of 1.1 mm. October 2021 is notable for being both unusually mild and unusually wet.

[3] Excluding erroneous readings of extreme lows below −60°C, post September 2009.

[4] Excluding an erroneous low of −73°C in September of 2014.

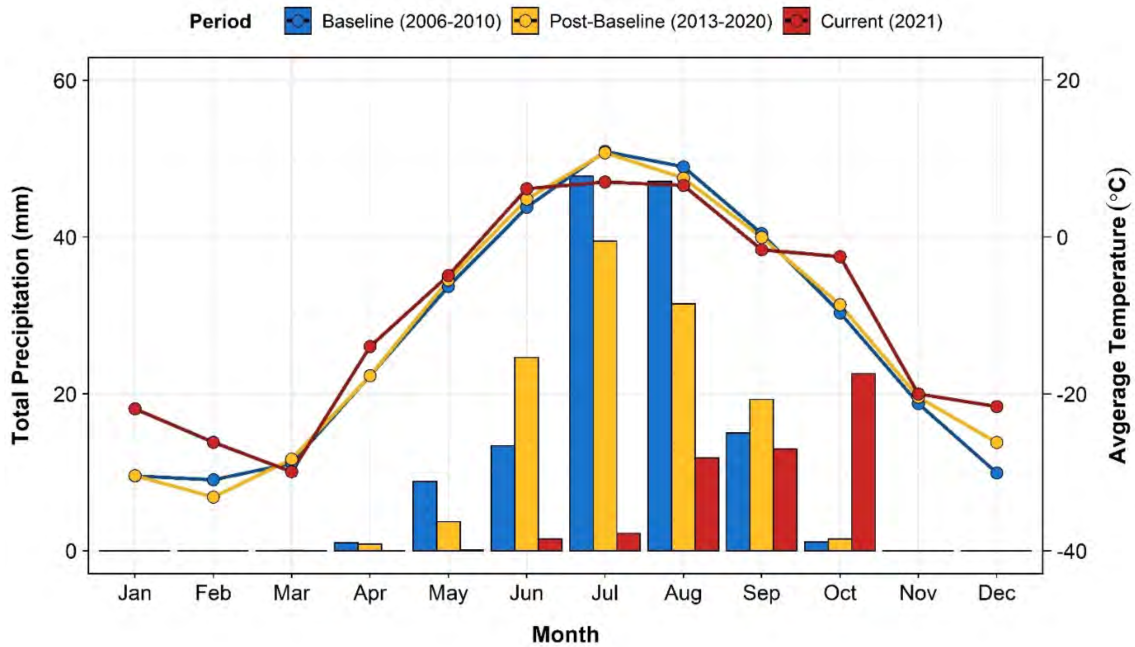


Figure 4-1. Mine Site monthly average air temperatures (lines) and total precipitation (bars) during the baseline period (2005 to 2010), post-baseline period (2013 to 2020) and most recent year (2021). Precipitation data before August 24 are considered unreliable due to an obstructed rain gauge.

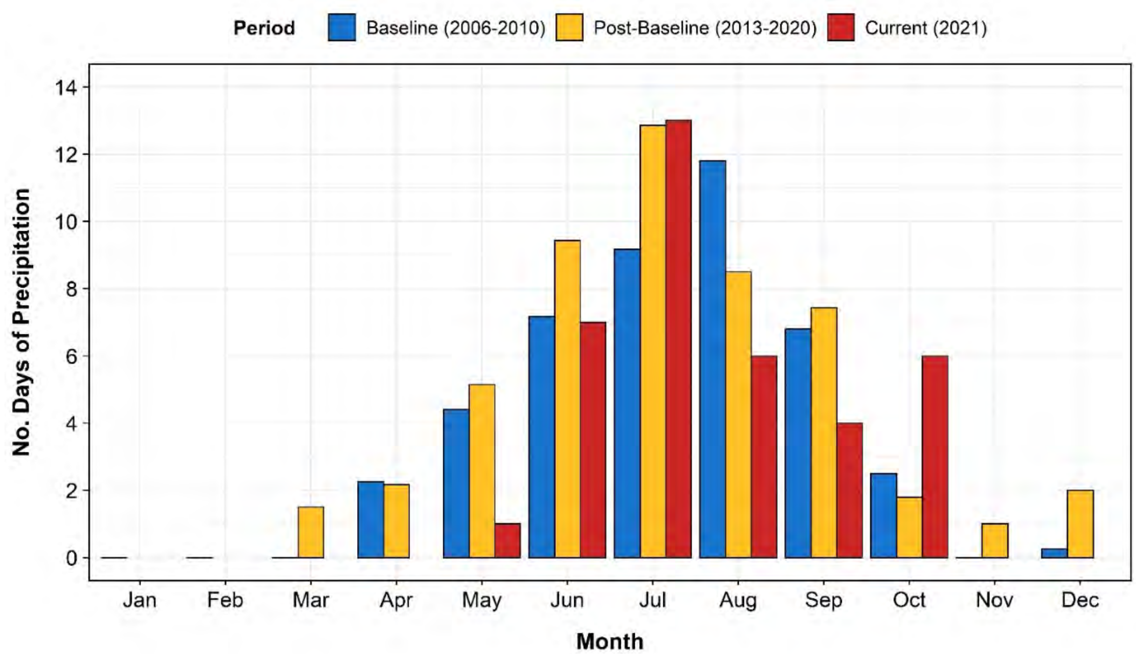


Figure 4-2. Mine Site monthly precipitation frequency (number of days experiencing precipitation) during the baseline period (2005 to 2010), post-baseline period (2013 to 2020) and most recent year (2021).

4.1.2 MILNE INLET

2021 trends measured at the Mine Site meteorological station closely reflect the readings from Milne Port. Monthly mean temperatures at Milne Port were at their lowest in March 2021 (−29.2°C), rising above freezing in June (4.3°C) and peaking in July (5.9°C) before dropping back below freezing in September (−1.3°C). January and October 2021 were both warm outliers, 6.3°C and 6.6°C warmer than the baseline, respectively. From June 5 to September 4, 2021, the temperature remained above the freezing point (Figure 4-3). The year of 2021 at Milne Port can be characterized as having milder winters and a cooler summer.

The lowest temperature of 2021 was −43.2°C on February 20, while the highest was 16.3°C on July 10. The coldest temperature recorded since the beginning of baseline data recording in 2006 was −50.2°C in January 2019, while the record high of 22.7°C was set in July 2020. For a complete monthly comparison among baseline (2006 to 2010) and all post-baseline years (2013 to 2021), see Appendix A.

The Milne Port meteorological station suffered from similar technical problems to the station at the Mine Site, with its rain gauge becoming obstructed as early as August 2020. This blockage was cleared on August 22, 2021. As such, data from August 2020 to September 2021 are considered unreliable. A failure to detect precipitation depth did not prevent the measurement of rainy days. Milne Port experienced only 17 rain days, most of which were in October. As was the case at the Mine Site, October 2021 was an unusually rainy month, experiencing 5 rainy days compared to a baseline average of 1.0. July 2021 was unusually dry, experiencing 2 rainy days compared to a baseline average of 7.8 (Figure 4-4).

Rain days were absent or minimal during the months where sensor failure occurred but matched or exceeded the baseline records after the blockage was cleared. It may be the case that the blockage at the Milne Port rain gauge was severe enough to cause some, but not all, days of rainfall to go undetected, or that the summer of 2021 was unusually dry at this location.

Milne Port is consistently cooler and drier than the Mine Site. In 2021, temperatures recorded at Milne Port were, on average, 0.6°C cooler than the Mine Site throughout the year. This difference is smaller than normal; since the start of the baseline recording, Milne Port has averaged 2.2°C cooler than simultaneous measurements from the mine site.

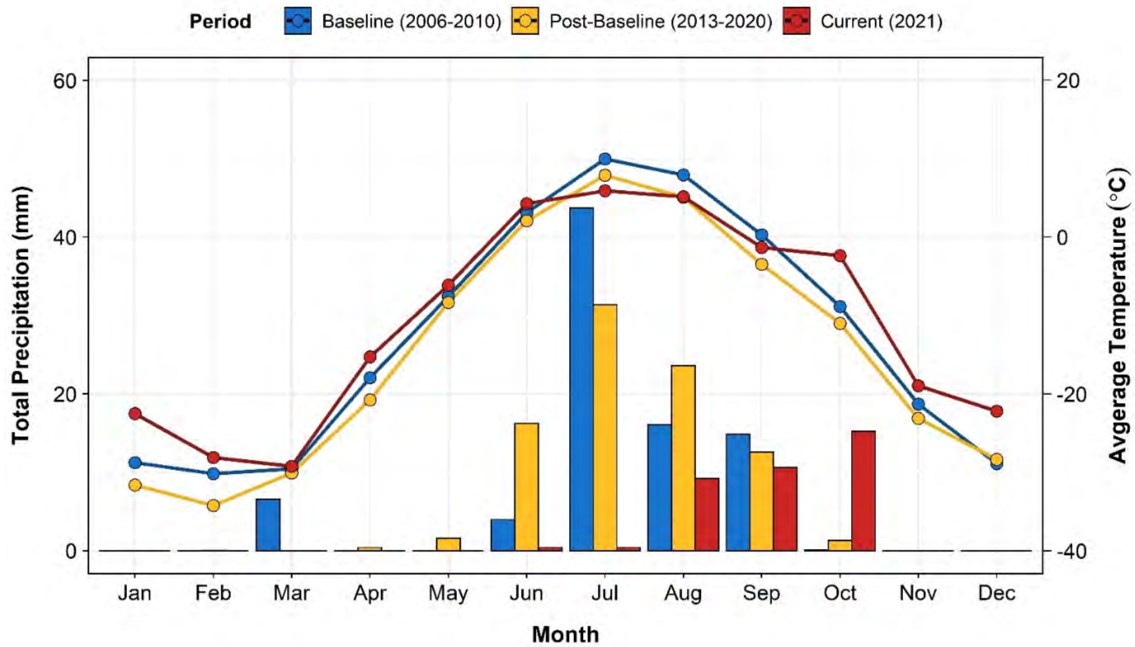


Figure 4-3. Milne Port monthly average air temperatures (lines) and total precipitation (bars) during the baseline period (2005 to 2010), post-baseline period (2013 to 2020) and most recent year (2021). Precipitation data prior to August 22 are considered highly unreliable due to an obstructed rain gauge.

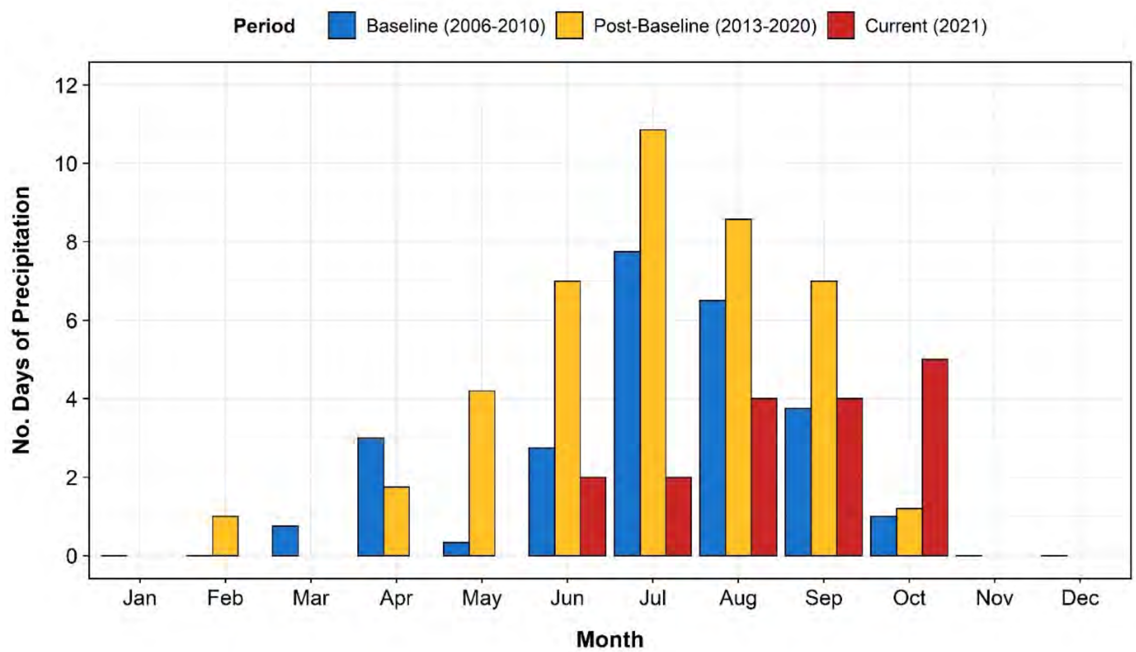


Figure 4-4. Milne Port monthly precipitation frequency (number of days experiencing precipitation) during the baseline period (2005 to 2010), post-baseline period (2013 to 2020) and most recent year (2021).

4.2 WIND SPEED AND DIRECTION

Wind data with zero values for both hourly average wind speed and wind direction were excluded from analyses. A comparison between wind conditions in 2021, post-baseline, and baseline periods is provided in the text below. To visualize wind speed and direction using wind rose plots, any average speeds >20.8 m/s were classified as 'gale' on the Beaufort scale because of their relatively low frequency of occurrence. Wind data were not recorded by Environment Canada at the Mine Site meteorological station between 1963 to 1965, so no comparison was possible.

4.2.1 MINE SITE

At the Mine Site meteorological station in 2021, the prevailing wind direction was southeast, followed by northwest (Figure 4-5). Relative wind speeds were also proportional to the most frequent wind direction: southeastern winds had more episodes characterized as 'moderate breeze' (5.6 to 8.1 m/s), 'fresh breeze' (8.1 to 10.8 m/s), and 'strong breeze' (10.8 to 13.9 m/s) on the Beaufort scale. A few episodes of east and northeast winds were the only ones to reach speeds classified as 'near gale' (13.9 to 17.2 m/s) and 'gale' (17.2 to 20.8 m/s). Northerly and westerly winds were uncommon and generally weak. The maximum velocity recorded at the Mine Site station was 28.15 m/s from the east-northeast just after midnight on November 24, which, on the Beaufort scale, is classified as 'storm' (24.5 to 28.4 m/s).

Baseline (2005 to 2010) and post-baseline (2013 to 2019) wind directions and speeds at Mine Site were reasonably consistent compared to those in 2021. In baseline years, most winds were southeasterly and characterized as 'moderate breeze' to 'strong breeze.' Post baseline years also had predominantly southeasterly winds, typically ranging between a 'gentle breeze' (3.3 to 5.6 m/s) and a 'fresh breeze' (8.1 to 10.8 m/s), though occasional 'gale' (17.2 to 20.8 m/s) and 'strong gale' winds occurred. Maximum wind speeds during baseline and post-baseline years were similar to 2021, except for a 41.9 m/s 'hurricane' reading in June 2006. A 28.4 m/s storm narrowly exceeded the peak wind speed for 2021 on December 2016.

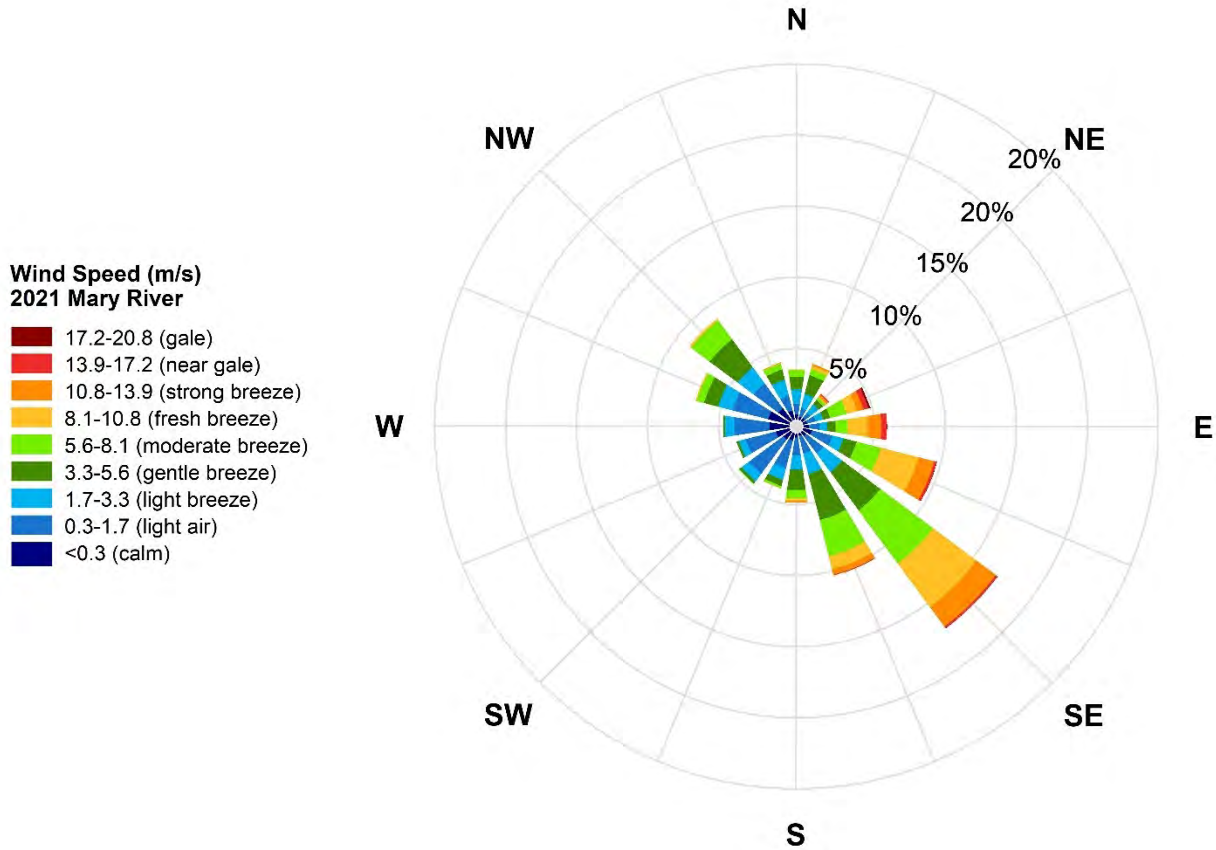


Figure 4-5. The cumulative proportions of wind speeds and directions at the Mine Site meteorological station in 2021.

4.2.2 MILNE PORT

The prevailing wind directions at Milne Port were north-northeast (i.e., coming off Milne Inlet) and southeast (i.e., coming from the Mine Site), with very little wind from the west or east (Figure 4-6). Winds exceeding gale force (17.2 to 20.8 m/s) were detected from all directions except for the east and west. The prevailing southwesterly winds were predominately below a 'strong breeze' (10.8 to 13.9 m/s). The maximum velocity recorded in 2021 was a 'violent storm' of 32.05 m/s, in the early morning hours on January 8.

Baseline (2005 to 2010) and post-baseline (2013 to 2020) wind directions and speeds were consistent with 2021 data. Both had primarily north-northeasterly and southeasterly winds, with the strongest winds from the southeast. These two periods were similar to the 2021 data regarding the predominant southeasterly winds. Maximum wind speeds during baseline and post-baseline years were comparable to 2021, such as a 29.9 m/s 'violent storm' in October 2008 and, excluding anomalous readings from 2018, a 40.35 m/s 'hurricane' in April 2016.

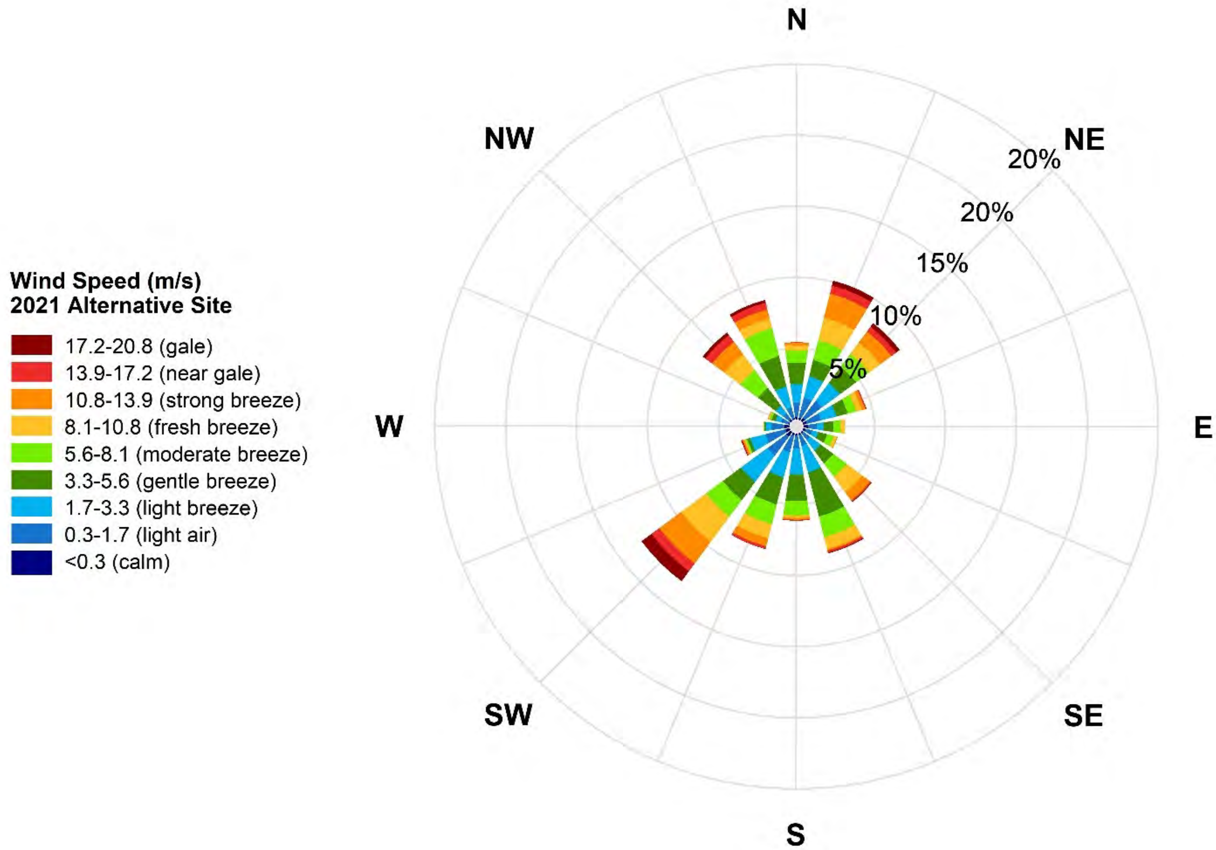


Figure 4-6. The cumulative proportions of wind speeds and directions at the Milne Port meteorological station in 2021.

Baffinland acknowledges that the operational issues (instrument malfunctions, technical problems) with the meteorology monitoring stations during 2018 to 2021 has caused challenges with the interpretation of the annual data for dustfall, dust control measures and the interpretation of satellite imagery. Recent changes have been made to improve the meteorology monitoring program include monthly meteorology data quality checks and the data are reviewed quarterly by independent subject matter experts and compared against other weather monitoring data in the region.

When data quality issues arise, the meteorology monitoring equipment is physically checked. Physical checks for the Milne Port and Steensby meteorology stations is only possible when there is a helicopter available; during winter there is no helicopter available.

5 HELICOPTER OVERFLIGHTS

The Nunavut Impact Review Board (NIRB) Project Certificate No. 005 Amendment 3 includes three Project Conditions (PCs) to confirm that disturbance to birds and wildlife caused by aircraft at the Mary River Project (the Project) is minimized whenever possible (Nunavut Impact Review Board 2020). The conditions are as follows:

- PC #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…"*
- PC #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 1,500 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."*
- PC #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 Iron Mines Corporation (Baffinland), in collaboration with the Terrestrial Environment Working Group (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). Data from helicopter flight logs were analyzed to determine compliance with these Project Conditions and Baffinland's commitment.

The helicopter overflight analysis initially reported on compliance based on the elevation above the ground of points from the helicopter flight logs. Starting in 2017, pilot rationale for low-level flights were recorded on the pilots' daily timesheets and used to assess compliance. During 2020 TEWG meetings, additional reporting on helicopter pilot rationale and flight time was requested (Baffinland Iron Mines Corporation 2020). The helicopter flight database used for assessing compliance was re-analyzed from 2017 to 2019 and incorporated into the 2020 analysis to address this request. The 2017 to 2019 re-analysis results were previously presented in Appendix D of the 2020 Terrestrial Environment Annual Monitoring Report (TEAMR) (EDI Environmental Dynamics Inc. 2021a).

In response to the 2020 TEAMR, the GN requested, in comment GN AR#02 (Nunavut Impact Review Board 2021), to re-analyze the 2015 and 2016 helicopter overflight data using the methods described in Section 5.1. No analysis was conducted using pilot rationale because rationale data were not collected in 2015 and 2016. The monthly breakdown of the number of transits flown, flight hours, and flight hours of cruising altitude compliance for 2015 and 2016 is presented in Appendix Table B-1 to Appendix Table B-8, and the inter-annual comparison is presented in Section 5.3.

5.1 METHODS

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

- 1,100 metres above ground level (magl) while travelling within the key moulting area for Snow Geese during the moulting season (July and August), or maintaining 1,500 m horizontal distance from the boundary of the key moulting area (the combined areas hereafter referred to as the Snow Geese area);
- 650 magl during point-to-point travel in areas outside the Snow Geese area during the moulting season, and in all areas in all other months; and,
- 1,100 magl and 1,500 m horizontal distance from observed concentrations of migratory birds year-round (i.e., all months).

Canadian Helicopters supplied flight tracklog data and daily pilot timesheets (with flight details) to provide context and explain the need for transits that did not adhere to cruising altitude requirements. 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 above sea level, which provided elevation data 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 tracklog.

To check that the calculated values were correct, a Quality Assurance/Quality Control procedure was completed by querying the flight tracklog data's status field. It was assumed that when the helicopter status was 'TakeOff' or 'Landing Time', the elevation would be at or close to 0 magl. With a sample size of 10,099 points, the average elevation above ground level was 5.4 m. The standard deviation in 2021 indicated that accuracy was approximately ±7.7 m.

The flight tracklog points were joined with the pilot logs from daily timesheets and converted to flight line segments for analysis. Each line segment represented a straight line between two consecutive flight tracklog points within the same transit. The flight time and minimum cruising altitude were calculated for each flight line segment. Flight time was calculated for each pilot rationale stated in the pilot logs.

Data were split into two categories: 1) data within the Snow Geese area during the moulting season (July and August) in relation to the 1,100 magl cruising altitude requirement and 2) data outside the Snow Geese area during the moulting season, and in all areas in all other months, in relation to the 650 magl cruising altitude requirement. The datasets were then analyzed separately to assess specific cruising altitude allowances using the different areas and minimum cruising altitude requirements. The first and last flight line segments of a flight as the helicopter takes off or lands were considered compliant, despite being below the cruising altitude requirement. Flight data with rationale for flying at lower elevations than required were deemed compliant. Based on these criteria, flight data were organized into the following six categories:

- data within the Snow Geese area in July and August where the 1,100 magl cruising altitude requirement was achieved (compliant);
- data within the Snow Geese area in July and August where the 1,100 magl cruising altitude requirement was not achieved, but a rationale for low-level flying was given (compliant with rationale);
- data within the Snow Geese area in July and August where the 1,100 magl cruising altitude requirement was not achieved and no rationale for low-level flying was given (non-compliant);
- data outside the Snow Geese area in July and August, and in all areas in all other months, where the 650 magl cruising altitude requirement was achieved (compliant);
- data outside the Snow Geese area in July and August, and in all areas in all other months, where the 650 magl cruising altitude requirement was not achieved, but a rationale for low-level flying was given (compliant with rationale); and,
- data outside the Snow Geese area in July and August, and in all areas in all other months, where the 650 magl cruising altitude requirement was not achieved and no rationale for low-level flying was given (non-compliant).

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

5.2 RESULTS AND DISCUSSION

A discrepancy exists between Project Condition #59, which prescribes a cruising altitude requirement of 610 magl in areas likely to have migratory birds, and Project Condition #71, which prescribes a cruising altitude requirement of 650 magl in areas likely to have migratory birds. Considering that most, if not all, areas where Baffinland operated in May through September 2021 were likely to have migratory birds present, the default minimum cruising altitude for the analysis was 650 magl.

No “observed concentrations of migratory birds” or areas prescribed explicitly by the TEWG other than the key moulting area were identified in 2021. Except for the Snow Geese area, no analysis was required 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 that required specific follow-up actions. In 2021, Canadian Helicopters operated six helicopters during the summer season, an increase of two helicopters compared to the 2018 to 2020 operational requirements. The increase in operational requirements was necessary to support increased monitoring efforts undertaken in 2021, the addition of supplemental baseline work for Steensby and support for Baffinland's Eqe Bay exploration project.

A total of 2,560 transits were flown from May to September, of which 261 (10%) intersected the Snow Geese area (key moulting area plus the 1,500 m horizontal buffer; all months), and 2,299 (90%) were outside the Snow Geese area (Table 5-1). The total flight time was 1,440.60 hours, with 42.13 hours (2.92%) flown within the Snow Geese area (all months) and 1,398.48 hours (97.08%) flown outside the Snow Geese area (Table 5-2).

In 2021, cruising altitude compliance within the Snow Geese area during the moulting season was 72.10% (Table 5-3; Map 5-3 and Map 5-4). The low compliance in July (55.22%) compared to August (81.13%) was due to the lower number of total flight hours. The number of non-compliant flight hours was similar in July and August at around 3 hours, but the total number of flight hours in July was half that of August. Overall, compliance in all areas for all months was 92.21% (Table 5-4; Map 5-1 to Map 5-5).

Pilots maintain a 1,100 m vertical distance above ground level when flying within the Snow Geese area during the moulting season whenever possible. If this cruising altitude is not possible for safety or operational reasons, pilots maintain a 1,500 m horizontal distance if the flight path allows. However, this 1,500 m horizontal buffer is not always practical as it results in longer flight times, which causes more overall disturbance. As an alternative, pilots sometimes fly over the eastern edge of the Snow Geese area. Baffinland understands that Snow Geese are typically concentrated in the core of the moulting area and are seldom present near the edges; therefore, disturbance to birds under flight paths at the edge of the Snow Geese area is expected to be minimal. This alternative reduces the overall flight time and associated disturbance. Flights within the Snow Geese area are considered non-compliant.

Table 5-1. Number of transits flown per month with a breakdown of transits (№ and %) flown within and outside the Snow Geese area, May 1 to September 30, 2021.

Month	Total № of Transits	№ of Transits Over Snow Geese Area	% Transits Over Snow Geese Area	№ of Transits Outside Snow Geese Area	% Transits Outside Snow Geese Area
May	44	1	2.3	43	97.7
June	261	26	10.0	235	90.0
July	800	73	9.1	727	90.9
August	941	102	10.8	839	89.2
September	514	59	11.5	455	88.5
Total	**2,560**	**261**	**10.2**	**2,299**	**89.8**

Table 5-2. Number of flight hours per month with a breakdown of flight time (hrs and %) flown within and outside the Snow Geese area, May 1 to September 30, 2021.

Month	Total Flight Hours	Flight Hours Over Snow Geese Area	% Flight Time Over Snow Geese Area	Flight Hours Outside Snow Geese Area	% Flight Time Outside Snow Geese Area
May	47.70	0.44	0.93	47.26	99.07
June	146.79	4.03	2.74	142.77	97.26
July	516.84	7.70	1.49	509.14	98.51
August	452.84	14.39	3.18	438.45	96.82
September	276.43	15.57	5.63	260.86	94.37
Total	**1,440.60**	**42.13**	**2.92**	**1,398.48**	**97.08**

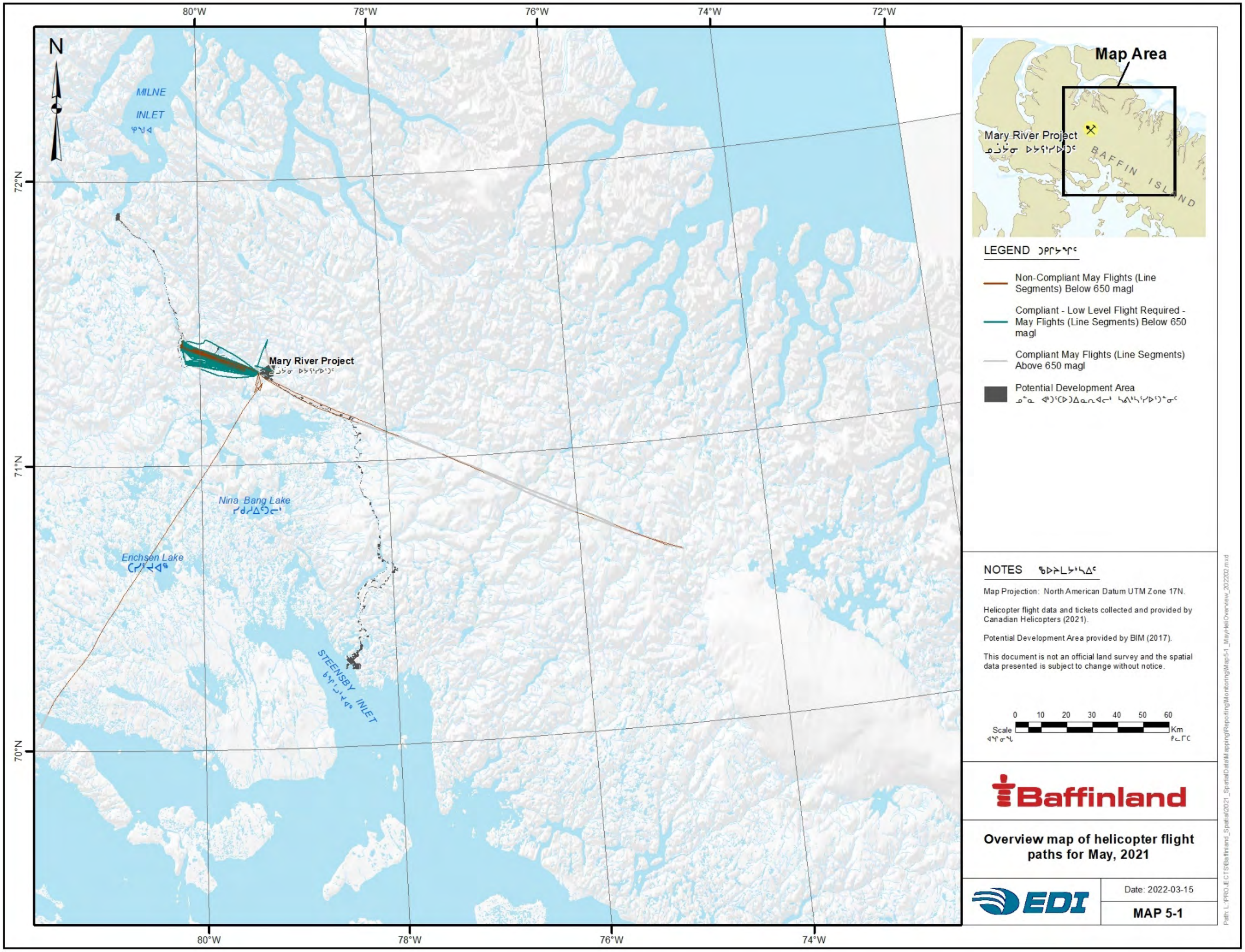
Table 5-3. Number of flight hours of cruising altitude compliance (≥ 1,100 magl) within the Snow Geese area during the moulting season, July 1 to August 31, 2021.

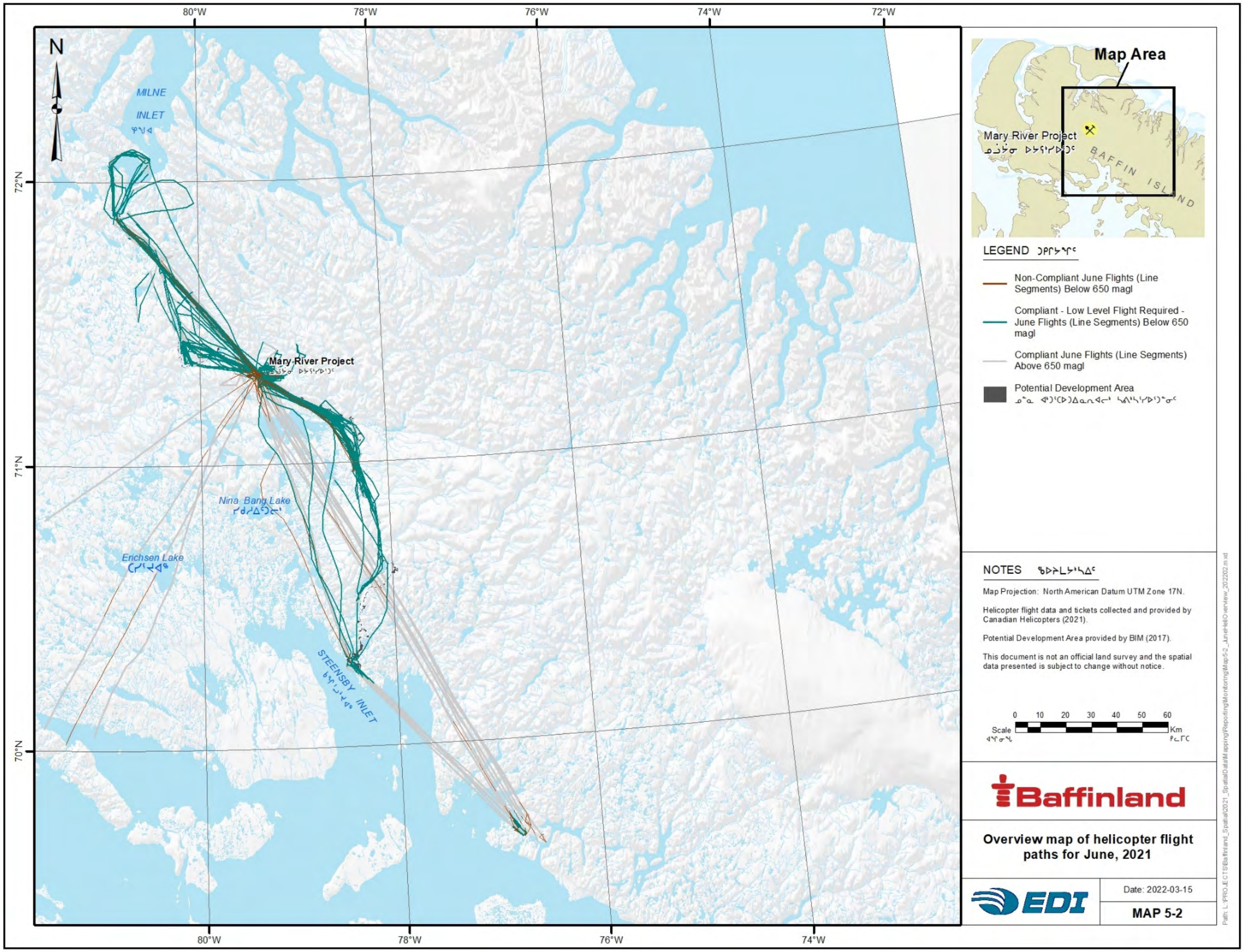
Month	Area	Total Flight Hours	Compliant		Compliant with Rationale		Combined Compliance	Non-compliant	
			hrs	%	hrs	%	%	hrs	%
July	Within SNGO Area	7.699	0.411	5.338	3.84	49.877	55.215	3.448	44.785
August	Within SNGO Area	14.394	4.034	28.026	7.643	53.099	81.125	2.717	18.875
Total		**22.093**	**4.445**	**20.119**	**11.483**	**51.976**	**72.095**	**6.165**	**27.905**

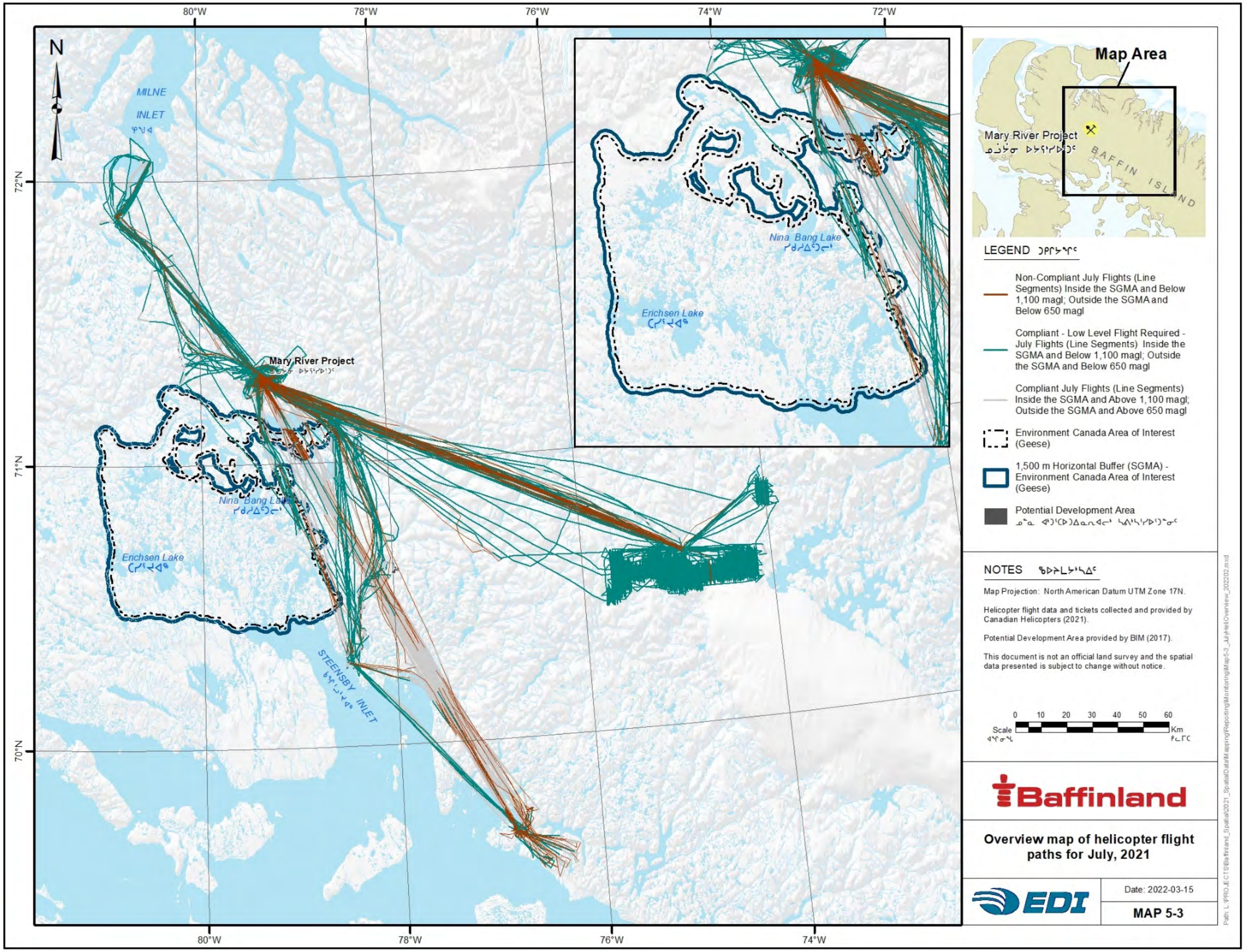
Note: SNGO (Snow Goose)

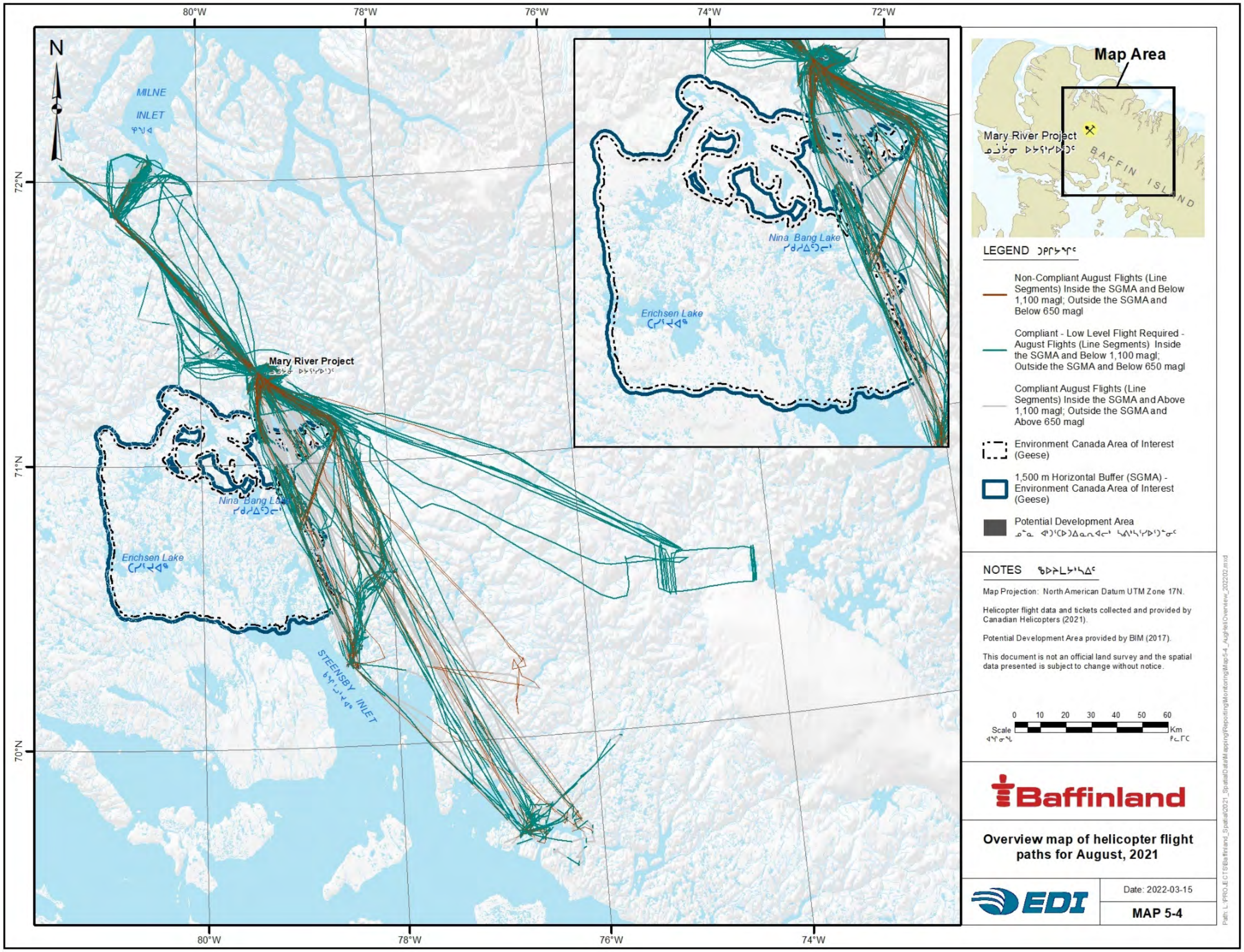
Table 5-4. Number of flight hours of overall cruising altitude compliance in all areas for all months between May 1 to September 30, 2021.

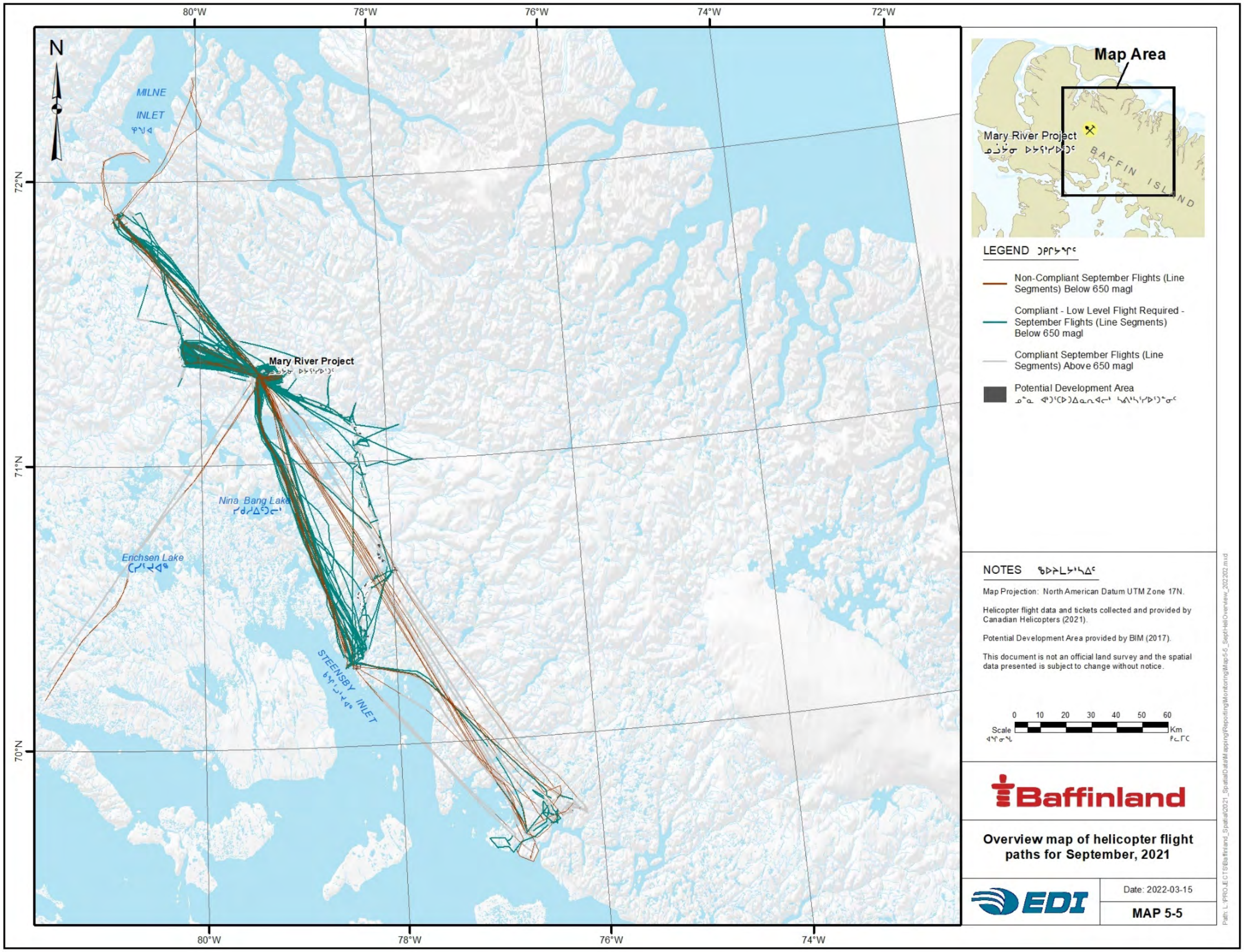
Month	Area	Total Flight Hours	Compliant		Compliant with Rationale		Combined Compliance	Non-compliant	
			hrs	%	hrs	%	%	hrs	%
May	All Areas	47.7	10.01	20.99	32.18	67.46	88.45	5.51	11.55
June	All Areas	146.79	58.68	39.98	73.43	50.02	90	14.68	10.00
July	All Areas	516.84	172.91	33.46	298.37	57.73	91.19	45.56	8.81
August	All Areas	452.84	177.63	39.23	251.88	55.62	94.85	23.33	5.15
September	All Areas	276.43	69.48	25.13	183.81	66.49	91.62	23.14	8.38
Total		**1,440.6**	**488.71**	**33.92**	**839.67**	**58.29**	**92.21**	**112.22**	**7.79**


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 May Flights (Line Segments) Below 650 magl
Compliant - Low Level Flight Required - May Flights (Line Segments) Below 650 magl
Compliant May Flights (Line Segments) Above 650 magl
Potential Development Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2021).
Potential Development Area provided by BIM (2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale 0 10 20 30 40 50 60 Km
Baffinland
Overview map of helicopter flight paths for May, 2021
EDI
Date: 2022-03-15
MAP 5-1


Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant June Flights (Line Segments) Below 650 magl
Compliant - Low Level Flight Required - June Flights (Line Segments) Below 650 magl
Compliant June Flights (Line Segments) Above 650 magl
Potential Development Area
MILNE INLET
Mary River Project
Nina Bang Lake
Erichsen Lake
STEENSBY INLET
80°W
78°W
76°W
74°W
72°W
72°N
71°N
70°N
NOTES
Map Projection: North American Datum UTM Zone 17N.
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2021).
Potential Development Area provided by BIM (2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
Km
Baffinland
Overview map of helicopter flight paths for June, 2021
EDI
Date: 2022-03-15
MAP 5-2


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
BAFFIN ISLAND
LEGEND
Non-Compliant July Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant - Low Level Flight Required - July Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant July Flights (Line Segments) Inside the SGMA and Above 1,100 magl; Outside the SGMA and Above 650 magl
Environment Canada Area of Interest (Geese)
1,500 m Horizontal Buffer (SGMA) - 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 (2021).
Potential Development Area provided by BIM (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 July, 2021
EDI
Date: 2022-03-15
MAP 5-3


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 (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant - Low Level Flight Required - August Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant August Flights (Line Segments) Inside the SGMA and Above 1,100 magl; Outside the SGMA and Above 650 magl
Environment Canada Area of Interest (Geese)
1,500 m Horizontal Buffer (SGMA) - 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 (2021).
Potential Development Area provided by BIM (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, 2021
EDI
Date: 2022-03-15
MAP 5-4


Map Area
Mary River Project
BAFFIN ISLAND
MILNE INLET
Mary River Project
Nina Bang Lake
Erichsen Lake
STEENSBY INLET
LEGEND
Non-Compliant September Flights (Line Segments) Below 650 magl
Compliant - Low Level Flight Required - September Flights (Line Segments) Below 650 magl
Compliant September Flights (Line Segments) Above 650 magl
Potential Development Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2021).
Potential Development Area provided by BIM (2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 10 20 30 40 50 60 Km
Baffinland
Overview map of helicopter flight paths for September, 2021
EDI
Date: 2022-03-15
MAP 5-5

Cruising altitude data were cross-referenced with pilot logs from daily timesheets for the fifth consecutive year in 2021. For analytical purposes, flight line segments were designated 'compliant' when cruising altitude requirements were followed, 'compliant with rationale' when cruising altitude requirements were not met, but the pilot's discretionary rationale for deviating from cruising altitudes was provided, and 'non-compliant' if the pilot did not meet cruising altitude requirements and no explanation was provided. Pilot rationales given to explain low-level flights are described in Table 5-5.

A breakdown of primary low-level flight hours with rationale for 2021 is provided in Table 5-6. Results showed that most low-level flight line segments were compliant when considering the rationale provided by pilots for low-level flying. Flights with justification from pilot logs accounted for 58.29% of the total flight hours. Within the Snow Geese area during the moulting season, where the cruising altitude requirement is ≥1,100 magl, 0.80% of the total flight hours were compliant with rationale. Outside the Snow Geese area and in all areas in all other months, where the cruising altitude requirement is ≥650 magl, 54.56% of the total flight hours were compliant with rationale. The percentage of low-level flights compliant with rationale was lower than in 2020.

Low-level flights with rationale will likely continue in future years as most of the helicopter work conducted at the Project requires either low-level flying for safety/operational reasons (e.g., slinging, surveys) or 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 2021, the most common reasons for flying below the cruising altitude requirements were slinging, weather, drop off/pick up, and sampling. Overall, 2021 cruising altitude compliance was high both within and outside the Snow Geese area. The high level of compliance observed in 2021 was due primarily to the additional analysis performed, which considered rationale provided by pilots for many of the transits flown below the cruising altitude requirements, as well as improved documentation (i.e., enhanced communications) of the rationale for low-level flights by pilots and Baffinland staff over the years.

Pilots made efforts to avoid the Snow Geese area during the 2021 moulting season whenever possible, as only 10.2% of all transits and 2.9% of total flight hours were flown within the Snow Geese area (Table 5-1; Table 5-2). Most transits within the Snow Geese area appeared to be direct flights between the Project and Steensby Port or Eqe Bay, skirting the eastern edge of the Snow Geese area boundary. Most flights near the boundary were within a well-defined track, away from the core of the Snow Geese area identified as having higher concentrations of geese.

Non-compliant flight line segments were those that did not achieve cruising altitude requirements and where no rationale for low-level flying was provided. Some non-compliant flight line segments included the ferrying flights to and from the Project at the start and end of the season, mistaking flying height requirements as altitude above sea level rather than above ground, and takeoffs and landings. Currently, only the first and last flight segments can be identified as takeoff or landing segments. However, it may take multiple flight segments for a helicopter to reach or land from the required cruising altitude, resulting in non-compliant or compliant with rationale intermediary flight segments. Non-compliant flight segments may also result from a constant flight altitude over undulating terrain, as seen in the flights from the Project to Eqe Bay in Map 5-3. Baffinland will continue to work with Canadian Helicopters to document cruising altitude compliance and communicate elevation requirements to pilots throughout the flying season.

Although most transits were below the recommended elevations, based on the results of the noise monitoring study conducted in 2020, helicopter noise, while consistently above 55 dBA in all distance categories, was infrequent, especially away from the Mine Site (EDI Environmental Dynamics Inc. 2021a). Excluding the Mine Site Near site, no single site exceeded 1% frequency of impulsive aircraft noise (i.e., airplanes, helicopters), and cumulative frequency of impulsive aircraft noise over these sites was still less than 2%. Thus, any disturbance to wildlife caused by aircraft noise is likely too infrequent and short in duration in all Project areas away from the Mine Site to cause any significant disturbance to wildlife. Accordingly, no recommendations for future mitigations are required at this time.

Table 5-5. Descriptions of pilot rationales given for low-level flights[1].

Rationale	Description
Drop off/pick up	The distance between take-off and landing sites does not allow enough time to gain 650 magl; the topography between sites, particularly around the drill locations, has large elevation changes over a short distance that do not allow the helicopter to reach 650 magl, or it is not practical for the helicopter to climb to 650 magl (e.g., when descending from Nuluujaak Mountain).
Survey	Surveys can involve short-duration flights between survey points that do not allow enough time to gain 650 magl; some surveys require low-level flying as part of the survey methodology, such as flying a low-level grid pattern for a geotechnical survey, keeping a sensor at a constant elevation relative to the ground.
Slinging	Helicopters slinging heavy loads fly low for safety purposes; if there is an issue, the load can be quickly lowered to the ground in a controlled manner or dropped while maintaining a visual reference of the landing location.
Short distance	The short distance between take-off and landing sites does not allow enough time to gain 650 magl.
Sampling	Sampling can involve short-duration flights between sampling points that do not allow enough time to gain 650 magl.
Staking	Very low-level flying is required while staking out a grid; stakes are deployed from the helicopter during transit and crew members are in and out of the helicopter at grid corners.
Weather	Poor visibility associated with low cloud restricts pilots to flying below the cloud line under 650 magl; high winds and/or flat light conditions (reduces a pilot's depth-of-field, causing poor ground reference) can make it challenging to maintain a consistent 650 magl cruising altitude.
Mobilization/Demobilization	Ferrying of the aircraft to and from the Project where operational constraints (e.g., fuel capacity and flight range) are factors.
Wildlife Safety Sweeps	Low-level flying is required to visually scan the helicopter landing site for potential predators or directing predators away from the site. This activity would only be done as directed by the Baffinland Environmental Superintendent.
Other	The flight's nature requires low-level flying or short distances/durations (e.g., tours, maintenance flights, evacuations, and search and rescue).

[1] Descriptions are stated with a cruising altitude requirement of 650 magl and apply to a cruising altitude requirement of 1,100 magl in the snow goose area.

Table 5-6. Helicopter flight hours summarized according to pilot rationale for flights within the ≥1,100 magl and ≥650 magl cruising altitude requirements, May 1 to September 30, 2021.

Rationale	Flight Hours	% of Total Flight Hours	≥1,100 magl Cruising Altitude Requirement		≥650 magl Cruising Altitude Requirement	
			Flight Hours	% of Total Flight Hours	Flight Hours	% of Total Flight Hours
Slinging	567.58	39.40	0.94	0.07	566.63	39.33
Weather	96.84	6.72	6.73	0.47	90.11	6.25
Drop off/Pick up	73.30	5.09	0.17	0.01	73.13	5.08
Sampling	34.56	2.40	0.99	0.07	33.57	2.33
Short Flight Distance	33.12	2.30	2.13	0.15	30.99	2.15
Survey	27.13	1.88	0.34	0.02	26.79	1.86
Other	4.77	0.33	0.17	0.01	4.60	0.32
Wildlife Safety Sweep	2.10	0.15	0.00	0.00	2.10	0.15
Demobilization	0.27	0.02	0.00	0.00	0.27	0.02
Total	**839.67**	**58.29**	**11.48**	**0.80**	**828.19**	**57.49**

5.3 INTER-ANNUAL TRENDS

Flights within the Snow Geese area during the moulting season have decreased over the last seven years, from 14.6% of transits and 5.7% of flight hours in 2015 down to 6.8% of transits and 1.5% of flight hours in 2021 (Table 5-7 and Table 5-8).

Helicopter cruising altitude compliance within the Snow Geese area during the moulting season was 72% (20% compliant and 52% compliant with rationale) in 2021 (Table 5-3). Compliance, including compliance with rationale for 2021 was higher than 2015 (49%) and 2016 (11%), but still below compliance seen between 2017 and 2020, which ranged from 82% to 94% (Figure 5-1). Helicopter cruising altitude combined compliance outside the Snow Geese area during the moulting season and in all areas in all other months for 2021 (93%) was the same as 2019 (93%), with 2020 (97%) marking the highest compliance year with rationale included.

The top pilot rationales for low-level flights between 2017 and 2021 were slinging, drop off/pick up, surveys and weather, with the percentage of total flight hours ranging from 1.3 to 39.4% (Table 5-9). Other reasons for low-level flights have varied over the years and may be due to phrasing or classification changes.

Total flight hours increased in 2021 to numbers similar to 2019 (Table 5-10). Overall, the 'compliant', 'compliant with rationale', and 'non-compliant' percentages of flight hours in 2021 were similar to the compliance percentages in 2019. In comparison, the percentage of fully compliant flight hours increased from 27.6% in 2020 to 33.9% in 2021, while the combined compliance decreased from 96.4% in 2020 to 92.2% in 2021. The percentage of non-compliant flight hours in 2021 (7.8%) was higher than in the last three years (3.6 to 7%). This may be due to more long-distance non-compliant flights in 2021 than in 2018, 2019, and 2020.

During the moulting season within the Snow Geese area, with a cruising altitude requirement of ≥1,100 magl, the percentage of fully compliant flight hours remained the same 2021 from 2020

Table 5-11). The total number of hours flown below the 1,100 magl cruising altitude requirement increased from 15 hours in 2020 to 22 hours in 2021, signifying a slight increase in total flight time in the area. Compliance to the ≥650 magl cruising altitude compliance followed a similar pattern as overall compliance. The increase in flight hours across the two cruising altitude requirements is representative of the total increase in flight hours for 2021 compared to 2020. It is more in line with the totals recorded in 2019.

Table 5-7. Number of transits flown per year with a breakdown of transits (№ and %) within the ≥1,100 magl and ≥650 magl cruising altitude requirements, 2015 to 2021.

Year	Total № of Transits	≥1,100 magl Cruising Altitude Requirement		≥650 magl Cruising Altitude Requirement	
		№ of Transits	% Transits	№ of Transits	% Transits
2015	919	134	15	785	85
2016	1,063	175	16	888	84
2017	1,345	205	15	1,140	85
2018	2,489	198	8	2,291	92
2019	3,110	207	7	2,903	93
2020	1,863	77	4	1,786	96
2021	2,560	175	7	2,385	93

Table 5-8. Number of flight hours per year with a breakdown of flight time (hrs and %) within the ≥1,100 magl and ≥650 magl cruising altitude requirements, 2015 to 2021.

Year	Total Flight Hours	≥1,100 magl Cruising Altitude Requirement		≥650 magl Cruising Altitude Requirement	
		Flight Hours	% Flight Hours	Flight Hours	% Flight Hours
2015	893.07	50.84	5.69	842.23	94.31
2016	589.52	34.05	5.78	555.47	94.22
2017	762.15	45.30	5.94	716.85	94.06
2018	1,701.60	35.31	2.07	1,666.30	97.93
2019	1,411.63	26.82	1.90	1,384.81	98.10
2020	852.34	15.05	1.77	837.29	98.23
2021	1,440.60	22.09	1.53	1,418.51	98.47

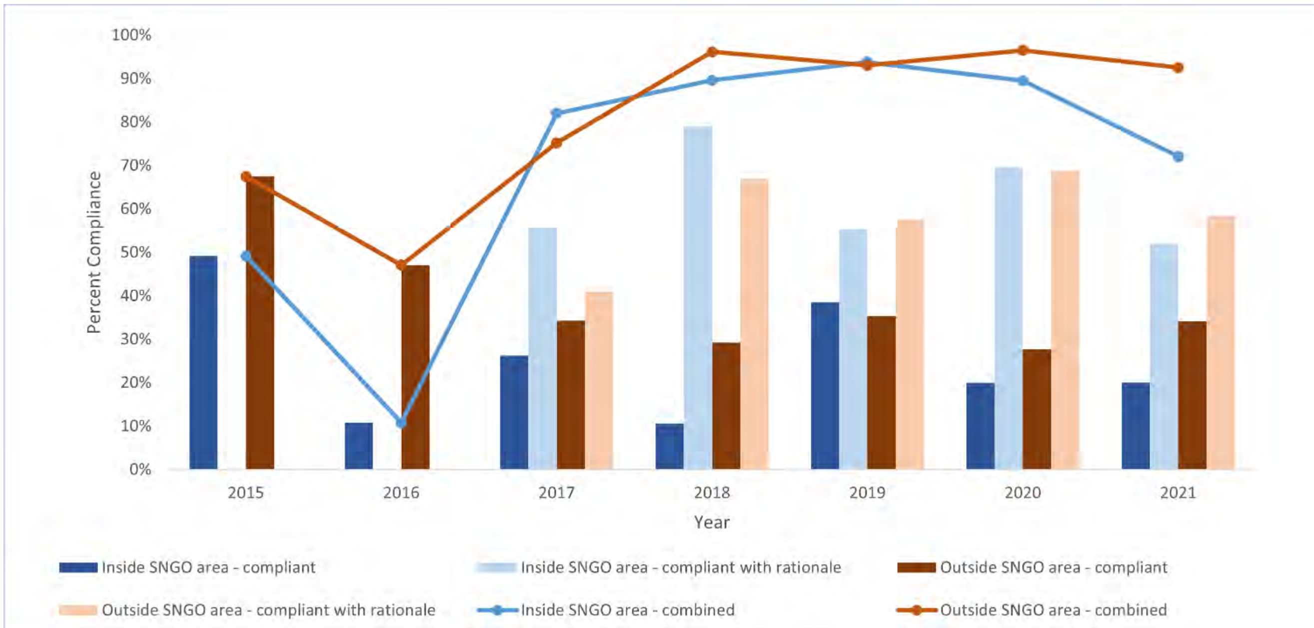


Figure 5-1. Percent compliance for flights within the Snow Geese (SNGO) area during the moulting season and outside the Snow Geese area during the moulting season and in all areas in all other months, 2015 to 2021.

Table 5-9. Flight hours and percentage of total flight hours for 'compliant with rationale' flights summarized by rationale category, 2017 to 2021.

Rationale	2017		2018		2019		2020		2021	
	hrs	%[1]	hrs	%[1]	hrs	%[1]	hrs	%[1]	hrs	%[1]
Slinging	114.58	15.03	486.91	28.62	227.87	16.14	292.01	34.26	567.58	39.40
Drop off/Pick up	63.20	8.29	277.22	16.29	326.26	23.11	132.26	15.52	73.30	5.09
Survey	36.12	4.74	288.85	16.98	176.21	12.48	67.55	7.93	27.13	1.88
Weather	57.65	7.56	55.12	3.24	18.55	1.31	39.33	4.61	96.84	6.72
Short Distance	0.35	0.05	0.00	0.00	0.07	0.00	48.87	5.73	33.12	2.30
Staking	32.03	4.20	0.00	0.00	17.12	1.21	0.00	0.00	0.00	0.00
Sampling	2.17	0.29	11.35	0.67	10.94	0.77	3.27	0.38	34.56	2.40
Mobilization/ Demobilization	12.65	1.66	0.00	0.00	21.22	1.50	0.00	0.00	0.27	0.02
Other	0.00	0.00	24.07	1.41	15.02	1.06	2.67	0.31	4.77	0.33
Wildlife Safety Sweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.10	0.15
Total	**318.74**	**41.82**	**1,143.52**	**67.20**	**813.25**	**57.61**	**585.96**	**68.75**	**839.67**	**58.29**

[1] Percentages are calculated from the Rationale flight hours divided by the total annual flight hours.

Table 5-10. Total flight hours and overall cruising altitude compliance by flight hours and percentage, 2015 to 2021.

Year	Total Flight Hours	Compliant		Compliant with Rationale		Combined Compliance	Non-compliant	
		hr	%	hr	%	%	hr	%
2015	893.07	593.38	66.44	n/a	n/a	66.44	299.69	33.56
2016	589.52	265.18	44.98	n/a	n/a	44.98	324.33	55.02
2017	762.15	257.84	33.83	318.74	41.82	75.65	185.56	24.35
2018	1,701.60	490.22	28.81	1,143.52	67.20	96.01	67.86	3.99
2019	1,411.63	500.02	35.42	813.25	57.61	93.03	98.36	6.97
2020	852.34	235.52	27.63	585.96	68.75	96.38	30.86	3.62
2021	1,440.60	488.71	33.92	839.67	58.29	92.21	112.22	7.79

Table 5-11. Flight hours and overall cruising altitude compliance by flight hours and percentage within the ≥1,100 magl and ≥650 magl cruising altitude requirements, 2015 to 2021.

Year	≥1,100 magl Cruising Altitude Requirement							≥650 magl Cruising Altitude Requirement						
	Flight Hours	Compliant		Compliant with Rationale		Non-compliant		Flight Hours	Compliant		Compliant with Rationale		Non-compliant	
		hr	%	hr	%	hr	%		hr	%	hr	%	hr	%
2015	50.84	24.98	49.13	n/a	n/a	25.86	50.87	842.23	568.40	67.49	n/a	n/a	273.83	32.51
2016	34.05	3.68	10.81	n/a	n/a	30.37	89.19	555.47	261.50	47.08	n/a	n/a	293.96	52.92
2017	45.30	11.89	26.24	25.27	55.78	8.15	17.98	716.85	245.96	34.31	293.47	40.94	177.42	24.75
2018	35.31	3.73	10.56	27.90	79.03	3.67	10.40	1,666.30	486.49	29.20	1,115.62	66.95	64.19	3.85
2019	26.82	10.31	38.45	14.84	55.35	1.66	6.20	1,384.81	489.71	35.36	798.40	57.65	96.70	6.98
2020	15.05	3.01	20.01	10.46	69.48	1.58	10.51	837.29	232.51	27.77	575.50	68.73	29.28	3.50
2021	22.09	4.45	20.12	11.48	51.97	6.17	27.91	1,418.51	484.26	34.14	828.19	58.38	106.06	7.48

5.4 HELICOPTER OVERFLIGHT SUMMARY

Overall helicopter cruising altitude compliance for 2021 was similar to 2019, but lower than 2020, and cruising altitude compliance within the Snow Geese area decreased compared to the previous four years.

- In response to the 2020 TEAMR, the GN requested the re-analysis of the 2015 and 2016 helicopter overflight data using the methods described in Section 5.1. No analysis was conducted using pilot rationale because rationale data were not available for 2015 and 2016.
- Helicopter cruising altitude continues to be used to monitor avoidance of potential disturbance to birds and other wildlife within and outside the Snow Geese area.
- In 2021, after incorporating pilot rationale, helicopter cruising altitude compliance within the Snow Geese area during the moulting season was 72.1% (Table 5-3). Overall compliance in all areas in all months was 92.2% (Table 5-4).
- The 2021 flight season was the fifth consecutive year that additional analysis was performed that considered rationale provided by pilots for many of the transits flown below the elevation requirements.
- This additional analysis showed that when considering the rationale provided by pilots for low-level flying (e.g., slinging, pickups/drop-offs, weather), most low-level flight segments were compliant.
- The percentage of low-level compliant flights within the Snow Geese area decreased in 2021 from what was observed between 2017 to 2020 due to a larger number of long-distance non-compliant flights over the eastern side of the Snow Geese area.
- Although low-level flights are expected to continue being required for operational purposes in future years, noise monitoring data suggests that aircraft noise is likely too infrequent and short in duration in all Project areas away from the Mine Site to cause any significant disturbance to wildlife. No additional recommendations for mitigations are needed at this time.

6 TOTE ROAD TRAFFIC

Traffic along the Tote Road is monitored and recorded by Site Security at the Mary River Project. Site Security records both ore haul traffic and non-haul vehicle traffic (e.g., transits related to personnel transfer, equipment, and fuel). These data are then compared with the projected ore haul and non-haul vehicle transits. Not all vehicle travel on the Tote Road consists of a round trip from the Mine Site to the Port Site. Traffic is therefore tracked as 'vehicle transits', which are counted as a one-way trip; return trips comprise two transits.

The mean number of ore haul transits from January 1 to December 31, 2021, was 227.1 transits per day (Table 6-1; Figure 6-1 and Figure 6-2). This is slightly below what was predicted in the Final Environmental Impact Statement (FEIS) Addendum for the Production Increase Proposal (i.e., 236 ore haul transits; (Stantec Consulting Ltd. 2018)), and has been consistent since 2019. The mean number of non-haul vehicle transits in 2021 was 28.6 transits per day, still below the FEIS Addendum (i.e., 40 non-haul vehicle transits (Stantec Consulting Ltd. 2018)). The mean number of all vehicle transits combined (i.e., haul and non-haul) in 2021 was 255.8 transits per day, and varied from a low of 67 transits in May to a high of 313 transits in March (Table 6-1; Table 6-2; Figure 6-1 and Figure 6-2).

Table 6-1. Mean and total vehicle transits along the Tote Road, including ore haul, non-haul, and all vehicles combined, from January 1 to December 31, 2021.

Sample Year	Ore Haul Transits		Non-Haul Vehicle Transits		Combined Vehicle Transits	
	Daily Mean	Total	Daily Mean	Total	Daily 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
2020	243.3	88,807	28.4	10,361	271.7	99,168
2021	227.1	82,911	28.6	10,440	255.8	93,351

Table 6-2. Mean ore haul and non-haul vehicle transits and total per month from January 1 to December 31, 2021.

Month	Daily Mean Ore Haul Transits	Daily Mean Non-Haul Transits	Daily Mean Total Transits
January	265	26	291
February	186	21	207
March	290	23	313
April	216	26	242
May	48	19	67
June	240	25	265
July	265	24	289
August	264	33	296
September	268	41	309
October	168	31	199
November	263	43	306
December	252	32	283

Figure 6-1. Mean ore haul and non-haul vehicle transits per day and total ore shipped between 2015 and 2021.

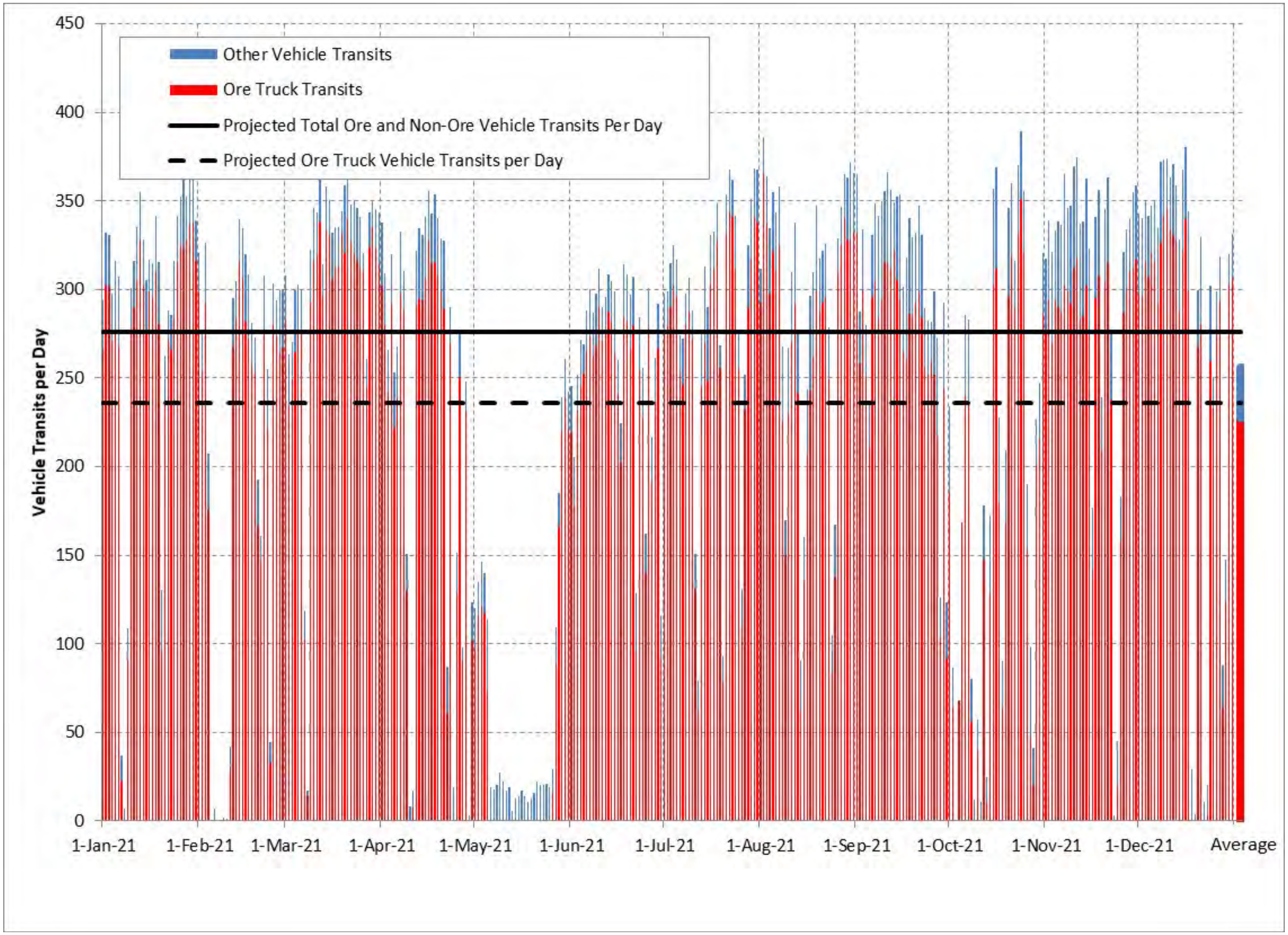


Figure 6-2. Vehicle transits per day on the Tote Road, including ore trucks (red) and all other traffic (blue), January 1 to December 31, 2021.
Also included are the projected maximum number of vehicle transits per day and the projected maximum number of ore haul trucks per day on the Tote Road.

7 DUSTFALL

Several Project Conditions (PCs; e.g., PC# 36, 50, 54d, and 58c) relate to the effects of dustfall and dustfall monitoring at the Project (Nunavut Impact Review Board 2020). Since summer 2013, the Project has implemented a dustfall monitoring program intended to meet these conditions, the objective of which 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 (Baffinland Iron Mines Corporation 2013b).

The following subsections summarize the study design, methods, results, and discussion for the dustfall monitoring program.

Note: PC# 57g—referring to the requirements for "*an assessment and presentation of annual environmental conditions including timing of snowmelt, green-up and standard weather summaries*"—is considered ancillary to the dustfall monitoring program. Supporting information about these topics is presented in the section Climate section.

7.1 HISTORY OF DUSTFALL MONITORING AT THE PROJECT

Over time, changes have been made to the dustfall monitoring program based on data analysis, interpretation, and input from the Terrestrial Environment Working Group (TEWG). The following summarizes key milestones and responses to TEWG comments, leading to the 2021 Dustfall Monitoring:

2013 — The dustfall monitoring program was initiated in August 2013. A total of 26 monitoring stations were established near Project infrastructure at the Mine Site, Milne Port, along the Tote Road, and reference sites (located 14 km from the Project).

2014 — First full year of monitoring, which includes Project activities during the Construction Phase. Based on preliminary analysis, the program was expanded in September 2014 to increase the number of monitoring stations at the Mine Site and Milne Port. Additional stations were intended to improve understanding of 'how dustfall pattern may change with distance from Project infrastructure'.

2015 — First full year of monitoring during Mine Operations. One additional monitoring site was added at the Mine Site to address a gap in the program.

2019 — Data collection at 1,000 m distant from the Tote Road was increased in response to a request from the Qikiqtani Inuit Organization (QIA) and the Mittimatalik Hunters and Trappers Organization (MHTO). Six additional dustfall monitors were installed (three paired monitoring stations, one of each on the east and west sides of the Tote Road at KM25, KM56, and KM75). Additionally, dustfall data collection at other 1,000 m distant sites was changed to year-round, where data were only collected during the summer months from 2013 to 2018. This brought the total number of dustfall monitors at the 1,000 m Potential Development Area (PDA) boundary to 12.

A monitor at Milne Port (DF-P-01) was relocated and was renamed (DF-P-08) to allow for the expansion of an ore stockpile.

2020 — Satellite imagery analysis of dustfall extent was conducted to address concerns from the MTHO that the past dustfall monitoring data and analyses did not reflect what hunters saw on the ground. The analysis included Landsat and Sentinel-2 imagery from 2004 to 2020 between March 15 and May 15.

2021 — Reported quantitative measurements from the dustfall satellite imagery analysis as requested from the NIRB, including dustfall concentrations and area using the Snow Darkening Index, a measure of mineral dust on snow. Included data from Steensby Inlet as a reference area for comparison.

2021 — A total of 14 new dustfall monitoring stations were installed, including:

- four additional monitors at Milne Port to better characterize dustfall moving off the Milne Port site;
- four new monitors along the section of Phase 2 railway that departs the Tote Road right-of-way (ROW). These monitors are to define baseline conditions; and,
- six dustfall monitors installed to collect dust at a height of 0.5 m. These 'short' monitors are part of a pilot study to investigate the variability between dustfall sampling at the standardized height of 2.0 m and closer to ground level. This program was implemented in response to specific requests from the QIA.

As of the end-of-year 2021, a total of 53 dustfall monitors (including the six 'short' monitors as part of the trial) have been installed at defined/pre-existing monitoring locations.

7.2 DUSTFALL SUPPRESSION AND MITIGATION

Baffinland Iron Mines Corporation (Baffinland) implemented dustfall suppression works throughout the 2021 calendar year to mitigate dustfall from all Project areas.

Dustfall Suppression at the Milne Port Ore Stockpiles — DusTreat, a specialized crusting agent produced by SUEZ Water Technologies & Solutions Canada, and the equipment to apply this product was purchased and arrived in 2020 sealift. DusTreat is a non-toxic substance that coats the outside of the stockpiles and acts as a sealant to prevent the lift-off of dust from the stockpiles. This type of application effectively reduces dust from stockpiles at other sites, is known to last for months, and is rain resistant. Baffinland began the application of DusTreat in November 2020. Application of the product to the ore stockpile was carried out regularly from January through April 2021 and in late June 2021.

Specific application locations included the southeast corner to the top of the fine ore pile, the Baffinland Hematite Lump (BHL) pile (both corners), and both corners to the top of the lump pile; in total the applications covered an area of approximately 3,000 m².

Dustfall Suppression along the Tote Road —DustBlockr®, produced by Cypher Environmental, was used for dust suppression along the Tote Road. The 2021 application began on June 13, as soon as ambient air temperatures permitted. The application was completed along the full length of the Tote Road by June 22. Following initial application, maintenance applications continued, as and where needed, until July 10. In total, approximately 156,000 L of DustBlockr® was applied along the Tote Road at a rate of approximately 280 L/km in 2021.

When DustBlockr®, reapplication ended due to ambient air temperatures, the application of water continued for the duration of the dust season. Additionally, road maintenance applied 222,500 kg of calcium chloride along the entire Tote Road at a rate of approximately 1,350 kg/km in 2021.

Other Initiatives — Other ongoing studies and initiatives at the Project are intended to understand dustfall and dustfall suppression better; these include the following:

- Ore handling added longer strips on the stackers and have programmed the stackers to hug the stockpiles as closely as possible to limit exposure to wind (ongoing optimization).
- The Crusher has had multiple dust hoods installed along the conveyor (previously), which are routinely replaced and maintained (dust covers also cover the jaw discharge conveyors). Installation of dust hoods on the Crusher A cone discharge conveyor was initiated. Also, rubber bellows on the fine ore stackers (previously installed) are routinely replaced as needed.
- A plan exists to treat more ore stockpiles at Milne Port with DusTreat.
- Ongoing installation of hoods and shrouds on Crusher Facility equipment (stackers and conveyors) to minimize dust generation during crushing operations.
- Ongoing installation of rubber bellows on Crusher Facility equipment to control the fall of ore to the pad and reduce the dispersion of dust as ore is discharged to the pad.

7.3 PASSIVE DUSTFALL MONITORING

7.3.1 METHODS

7.3.1.1 Review of Supporting Data

The dustfall monitoring program involves reviewing supporting data that could influence the volume and extent of dustfall during 2021. These supporting data comprise an overview of weather conditions at the Mine Site and Milne Inlet meteorological stations and vehicle traffic on the Tote Road:

- Climate data (including a summary of air temperature and precipitation data) are presented in Section 4 - Climate.
- Traffic data (including the number of ore haul truck transits and other vehicle transits on the Tote Road) are presented in Section 6 - Tote Road Traffic.

7.3.1.2 Passive Dustfall Sampling

The 2021 dustfall monitoring program involves passive dustfall sampling across the Project area following standard test methods for collecting and measuring 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 from perching and contaminating samples with feces (Photo 7-1). 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; the percentage of isopropyl alcohol in the canisters was increased in 2021 to prevent freezing of the liquid media. Collection vessels were changed out once per month and shipped to ALS Environmental Laboratory (ALS) in Waterloo, Ontario, to analyze Total Suspended Particulates (TSP; units of $mg/dm^2 \cdot day$) and a suite of metals. In addition to the TSP analysis, 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.

Photo 7-1. Dustfall monitoring station DF-P-01.

As summarized in Table 7-1, the Regional Study Area (RSA) was divided into four areas for the purposes of reviewing dustfall data:

1. Mine Site;
2. Milne Port;
3. Tote Road North crossing (KM28); and,
4. Tote Road South crossing (KM78).

For 2021, the study design comprised 47 dustfall monitors distributed across the Project area (Map 7-1):

- nine dustfall monitors located at the Mine Site (three within the Mine Site, four outside the mine footprint within low to moderate isopleth areas and two reference sites [one to the northeast and one to the south]) located at least 14,000 m from any Project infrastructure, outside of the extent of expected dustfall;
- ten dustfall monitors located at Milne Port: four active sites on the Port Site footprint, five located at the PDA boundary, and one reference site situated on a ridge approximately 3,000 m northeast (upwind) of the Port Site outside of the predicted extent of dustfall;
- sixteen dustfall monitors divided between two sites along the Tote Road (North sites and South sites); these two sites are organized into transects, each composed of eight dustfall monitors 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.
    - six additional Tote Road monitors are organized as three pairs, all located 1,000 m distant from the Tote Road;
- two reference dustfall monitors located 14,000 m southwest of the Tote Road (one at the North site, one at the South site); and
- four dustfall monitors along the section of the proposed railway between the Mine Site and Milne Port.

Monthly passive dustfall sampling was conducted year-round at 26 of the 47 monitoring locations in 2021; these sites are all distributed within 1,000 m of the PDA and tend to experience higher dustfall levels. Five new sites added in August 2021 will become year-round monitoring locations. The remaining 16 monitoring stations are situated at, or greater than, 1,000 m from the PDA and historically experience lower dustfall levels. For these 16 sites monthly seasonal sampling was conducted from mid-May through mid-September but paused during winter (e.g., September to May) due to their remote locations and inaccessibility without helicopter support. For data analysis, these sampling categories are delineated as 'year-round' and 'summer.'[5]

The 2021 dustfall monitoring program includes data collected for a full calendar year from late December 2020 through late December 2021 (Table 7-2).

[5] This seasonal delineation is also supported by seasonal patterns.

Table 7-1. 2021 summary of dustfall monitoring stations (locations and sampling period).

Site ID	Monitor Height (m)	Location	Sample Period	Distance to PDA (m)	Expected Dustfall Exposure[2]	Latitude	Longitude
DF-M-01	2.0	Mine Site	year-round	Within PDA	High	71.3243	-79.3747
DF-M-01-S	0.5	Mine Site	year-round	Within PDA	High	71.3243	-79.3747
DF-M-02	2.0	Mine Site	year-round	Within PDA	High	71.3085	-79.2906
DF-M-03	2.0	Mine Site	year-round	Within PDA	High	71.3072	-79.2433
DF-M-04	2.0	Mine Site	summer [1]	9,000	Nil	71.2197	-79.3277
DF-M-05	2.0	Mine Site	summer [1]	9,000	Nil	71.3731	-78.923
DF-M-06	2.0	Mine Site	summer [1]	1,000	Moderate	71.3196	-79.156
DF-M-07	2.0	Mine Site	summer [1]	1,000	Moderate	71.3	-79.1953
DF-M-08	2.0	Mine Site	summer [1]	4,000	Moderate	71.2945	-79.1002
DF-M-09	2.0	Mine Site	summer [1]	2,500	Low	71.2936	-79.4127
DF-RS-01	2.0	Tote Road – south, KM78	summer [1]	5,000	Nil	71.3275	-79.8001
DF-RS-02	2.0	Tote Road – south, KM78	year round	1,000	Low	71.3893	-79.8324
DF-RS-03	2.0	Tote Road – south, KM78	year round	Within PDA, 100 m from Tote Road	Moderate	71.3967	-79.8228
DF-RS-03-S	0.5	Tote Road – south, KM78	year round	Within PDA, 100 m from Tote Road	Moderate	71.3967	-79.8228
DF-RS-04	2.0	Tote Road – south, KM78	year round	Within PDA, 30 m from Tote Road	Moderate	71.3975	-79.8222
DF-RS-05	2.0	Tote Road – south, KM78	year round	Within PDA, 30 m from Tote Road	Moderate	71.398	-79.8228
DF-RS-06	2.0	Tote Road – south, KM78	year round	Within PDA, 100 m from Tote Road	Moderate	71.3986	-79.8234
DF-RS-06-S	0.5	Tote Road – south, KM78	year round	Within PDA, 100 m from Tote Road	Moderate	71.3986	-79.8234
DF-RS-07	2.0	Tote Road – south, KM78	year round	1,000	Nil	71.4077	-79.8182
DF-RS-08	2.0	Tote Road – south, KM78	summer [1]	5,000	Nil	71.4489	-79.7106
DF-RN-01	2.0	Tote Road – north, KM27	summer [1]	5,000	Nil	71.6883	-80.5363
DF-RN-02	2.0	Tote Road – north, KM27	year round	1,000	Low	71.7145	-80.4704
DF-RN-03	2.0	Tote Road – north, KM27	year round	Within PDA, 100 m from Tote Road	Moderate	71.7186	-80.4473
DF-RN-03-S	0.5	Tote Road – north, KM27	year round	Within PDA, 100 m from Tote Road	Moderate	71.7186	-80.4473
DF-RN-04	2.0	Tote Road – north, KM27	year round	Within PDA, 30 m from Tote Road	Moderate	71.7189	-80.4456
DF-RN-05	2.0	Tote Road – north, KM27	year round	Within PDA, 30 m from Tote Road	Moderate	71.7185	-80.4414
DF-RN-06	2.0	Tote Road – north, KM27	year round	Within PDA, 100 m from Tote Road	Moderate	71.7189	-80.4397
DF-RN-06-S	0.5	Tote Road – north, KM27	year round	Within PDA, 100 m from Tote Road	Moderate	71.7189	-80.4397

Table 7-1. 2021 summary of dustfall monitoring stations (locations and sampling period).

Site ID	Monitor Height (m)	Location	Sample Period	Distance to PDA (m)	Expected Dustfall Exposure[2]	Latitude	Longitude
DF-RN-07	2.0	Tote Road – north, KM27	year round	1,000	Nil	71.7226	-80.4165
DF-RN-08	2.0	Tote Road – north, KM27	summer [1]	5,000	Nil	71.7435	-80.2898
DF-P-03	2.0	Milne Port	summer [1]	3,000	Nil	71.8996	-80.7884
DF-P-04	2.0	Milne Port	year round	Within PDA	Low	71.871	-80.8828
DF-P-05	2.0	Milne Port	year round	Within PDA	Moderate	71.8843	-80.8945
DF-P-06	2.0	Milne Port	year round	Within PDA	Low	71.8858	-80.879
DF-P-07	2.0	Milne Port	year round	Within PDA	Moderate	71.8838	-80.916
DF-P-08	2.0	Milne Port	year round	1,000	Moderate	71.8722	-80.9126
DF-P-08-S	0.5	Milne Port	year round	1,000	Moderate	71.8722	-80.9126
DF-P-09	2.0	Milne Port	year round		Moderate	71.855286	-80.893269
DF-P-10	2.0	Milne Port	year round		Moderate	71.876033	-80.919739
DF-P-11	2.0	Milne Port	year round		Moderate	71.875471	-80.95393
DF-P-12	2.0	Milne Port	year round		Moderate	71.86558	-80.951059
DF-RR-01	2.0	Reference – Road	summer [1]	14,000	Nil	71.2805	-80.245
DF-RR-02	2.0	Reference – Road	summer [1]	14,000	Nil	71.5189	-80.6923
DF-TR-25E	2.0	Tote Road	year round	1,000	Nil	71.7425	-80.4394
DF-TR-25W	2.0	Tote Road	year round	1,000	Low	71.7395	-80.5068
DF-TR-56E	2.0	Tote Road	year round	1,000	Nil	71.5097	-80.2109
DF-TR-56W	2.0	Tote Road	year round	1,000	Low	71.4944	-80.2685
DF-TR-75E	2.0	Tote Road	year round	1,000	Nil	71.3902	-79.9917
DF-TR-75W	2.0	Tote Road	year round	1,000	Low	71.3709	-80.0007
DF-RW-01	2.0	Railway	year round	Within PDA	Low	71.35975	-80.15492
DF-RW-02	2.0	Railway	year round	Within PDA	Low	71.36128	-80.15661
DF-RW-03	2.0	Railway	year round	Within PDA	Low	71.36169	-80.15511
DF-RW-04	2.0	Railway	year round	Within PDA	Low	71.36053	-80.15936

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

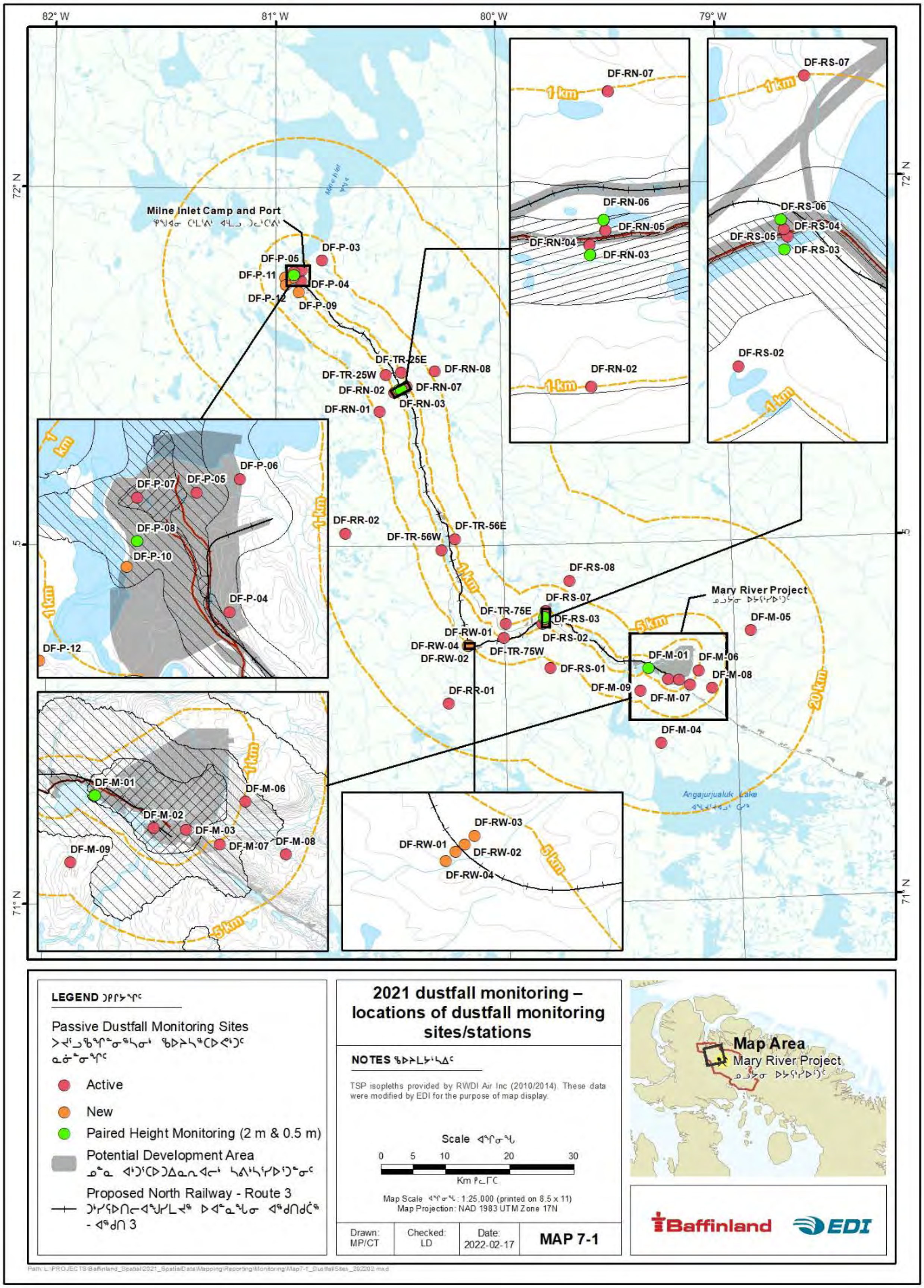
[2] Low (1 to 4.5 $g/m^2/year$), Moderate (4.6 to 50 $g/m^2/year$), High (≥50 $g/m^2/year$).

Table 7-2. 2021 dustfall monitoring — sampling record.

Sampling Session	Start Date[1]	End Date[1]	No. of Days	No. of Canisters Deployed	No. of Canisters Analyzed	Sampling Solution
1	20-Dec-20	18-Jan-21	28-29	26	26	Alcohol
2	18-Jan-21	17-Feb-21	29-31	26	26	Alcohol
3	17-Feb-21	20-Mar-21	31	16	16	Alcohol
4	20-Mar-21	25-Apr-21	33-36	16	16	Alcohol
5	25-Apr-21	20-May-21	26-98	26	26	Alcohol
6	20-May-21	29-Jun-21	29 -32	39	39	Alcohol
7	20-Jun-21	18-Jul-21	28-32	39	39	Algaecide
8	31-Jul-21	18-Aug-21	27-31	47	47	Algaecide
9	29-Aug-21	18-Sep-21	15-31	47	47	Algaecide
10 [2]	18-Sep-21	18-Oct-21	27-31	37	23	Alcohol
11	19-Oct-21	18-Nov-21	28-57	23	37	Alcohol
12	18-Nov-21	17-Dec-21	29-31	33	33	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 is presented here.

[2] Samples from 14 sites could not be accessed in late October due to poor snow conditions for snowmobiling. These samples were all collected at the end of November, and had 60-day sampling intervals, rather than 30. These sites include: DF-RS-02, DF-RS-07, DF-RN-02, DF-TR-07, DF-TR-25W, DF-TR-25E, DF-TR-56W, DF-TR-56E, DF-TR-75W, DF-TR-75E, DF-RW-1, DF-RW-2, DF-RW-3 and DF-RW-4.


82° W
81° W
80° W
79° W
72° N
71° N
Milne Inlet Camp and Port
Mary River Project
Angajurjualuk Lake
1 km
5 km
20 km
DF-P-03
DF-P-04
DF-P-05
DF-P-06
DF-P-07
DF-P-08
DF-P-09
DF-P-10
DF-P-11
DF-P-12
DF-TR-25E
DF-TR-25W
DF-RN-01
DF-RN-02
DF-RN-03
DF-RN-04
DF-RN-05
DF-RN-06
DF-RN-07
DF-RN-08
DF-RR-01
DF-RR-02
DF-TR-56E
DF-TR-56W
DF-RS-01
DF-RS-02
DF-RS-03
DF-RS-04
DF-RS-05
DF-RS-06
DF-RS-07
DF-RS-08
DF-TR-75E
DF-TR-75W
DF-RW-01
DF-RW-02
DF-RW-03
DF-RW-04
DF-M-01
DF-M-02
DF-M-03
DF-M-04
DF-M-05
DF-M-06
DF-M-07
DF-M-08
DF-M-09
LEGEND
Passive Dustfall Monitoring Sites
Active
New
Paired Height Monitoring (2 m & 0.5 m)
Potential Development Area
Proposed North Railway - Route 3
2021 dustfall monitoring – locations of dustfall monitoring sites/stations
NOTES
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Scale
0 5 10 20 30
Km
Map Scale: 1:25,000 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N
Drawn: MP/CT
Checked: LD
Date: 2022-02-17
MAP 7-1
Map Area
Mary River Project
Baffinland
EDI

7.3.1.3 Sampling Height Pilot Study

Through previous engagements at the TEWG and in comments on Baffinland's annual reports, the QIA questioned the utility of the standard 2.0 m height of dustfall monitors (described in Section 7.3.1.2) and suggested that ground-level dustfall deposition could be underestimated. To investigate potential sampling variability at 2.0 m height versus ground level, paired dustfall monitors (standard 2.0 m height and 'ground-level' 0.5 m height) were installed at six sites in October 2021. Sites close to Project infrastructure (i.e., commonly having higher dustfall exposure) were selected: DF-M-01, DF-RS-03, DF-RS-06, DF-RN-03, DF-RN-06, and DF-P-08. Data collection at these sites began in September 2021. Results summarized in this report represent preliminary findings, given that only three months of data are available; the 2022 annual monitoring report will present data from a full year of sampling.

The shorter dustfall height was chosen based on discussions in the TEWG beginning in 2018, culminating in a request by NIRB during the Phase 2 hearing, and Baffinland acquiescing and installing six 0.5 m dustfall collectors in the fall of 2021 to address the repeated requests and interests in non-standard dustfall sampling.

At the December 2018 TEWG meeting, the GN began requesting experimenting with dustfall collector heights. The request was made again in the June 2019 TEWG meeting. The GN, together with the QIA who supported the GN request, requested shorter collectors in February 2020. The topic was also introduced at the Phase 2 hearing, where the transcript includes (from NIRB's Executive Director Karen Costello[6]):

> *"It is the Board's understanding that Baffinland currently places their dust fall monitoring stations at a standardized height of 2 metres at varying distances away from the tote road. Modifications to this approach had been made by other Nunavut mines and have — and it has been recommended by several – at several terrestrial environment working group meetings with members that Baffinland should install dust fall stations at multiple heights at each location in order to increase Baffinland's understanding of the potential effects that dust from the tote road may be having on the nearby terrestrial environment.*
>
> *…and noting that other Nunavut mines have modified this 2-metre standard, can Baffinland explain their rationale for continuing to only measure at a height of 2 metres despite community and intervenor concerns about their dust monitoring program?"*

Baffinland provided a written response to NIRB's request[7], clarifying to the NIRB that, as an example, Agnico Eagle's Meadowbank Project initially collected passive dustfall at ground-level up until 2018. However, Environment and Climate Change Canada (ECCC) commented in 2018 that collecting dustfall samples at the ground-level was not common practice[8]. ECCC indicated wide variability in the concentration of particles subject to settling at low heights and that both wind and snow at ground-level will unacceptably impact data. Further, they indicated a preference for methods to be consistent among sites and follow relevant quality

[6] Costello, K. 2021. Hearing Volume 4: Phase 2 Development Project Proposal - Mary River Iron Ore Mine NIRB File Number 08MN053. Nunavut Impact Review Board Transcripts, Iqaluit and Pond Inlet, Nunavut.

[7] Response to NIRB-9, *Baffinland Iron Mines Corporation. 2021. Post-Hearing Question Responses Phase 2 Proposal – Mary River Project. NIRB Registry No. 334146. Oakville, Ontario, Canada. 339 pp.*

[8] *Environment and Climate Change Canada. 2018. Agnico Eagle Mines Ltd. – Meadowbank Gold Project and Whale Tail Project – 2017-2018 Annual Monitoring Report ECCC, Responses to NIRB Recommendations. NIRB File 03MN107/16MN056, NIRB Registry No. 321551. 9 pp.*

assurance guidance, such as ASTM 2010. In response to ECCC comments and recommendations[9] on the Meadowbank 2018 Air Quality and Dustfall Monitoring Report[10], Agnico switched dustfall monitoring to the ASTM's 2-metre sampling height[11].

Though Baffinland believes their passive dustfall sampling program adequately informs on project-related dustfall and has triggered adaptive management responses as it was designed to do, Baffinland initiated dustfall sampling at a height of 0.5 m at several year-round sampling locations.

The 0.5 m was selected to be as close to ground level as possible while avoiding ground contamination (ground level sampling at Meadowbank has been contaminated by small rodents, who have been found in the sample containers).

7.3.1.4 Data Trends and Statistical Analysis

Extent and Magnitude of Dustfall at Various Sites — Dustfall deposition rates (as TSP) for each site were compiled for the 2021 monitoring season; data were grouped according to the four study areas within the RSA. Data were reviewed to determine which sites in each sampling area were most affected by dustfall relative to reference sites.

Daily dustfall from summer sampling periods (June, July, August, and September) were used to evaluate the potential relationship between dustfall and distance from the road for the Mine Site, the Tote Road. Mixed effects models were used to test for a relationship between distance from Project infrastructure and daily dustfall.

- Sites were treated as the random effect.
- 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 m, 100 m, 1,000 m, and 5,000 m.

Data for daily dustfall as a function of distance from Project infrastructure did not always meet the assumptions of normality (Shapiro-Wilk test) or equality of variance (Levene's test) in the residuals required for a linear model. In such cases, differences in the distribution of dustfall by distance class were tested using non-parametric Kruskal-Wallis tests, with data stratified by sampling month. Kruskal-Wallis tests were performed using the R package 'coin' (Hothorn et al. 2008). If an effect of distance class on dustfall was identified, pairwise tests were used to determine which distance classes were different. Both 95% bias-correct and accelerated confidence intervals (CIs) were calculated for each estimate by bootstrapping datasets and

[9] *Walker, E. 2020. ECCC Comments RE: 03MN107/16MN056 – Agnico Eagle Mines Ltd. – Meadowbank Gold Mine and Whale Tail Pit Projects - 2019 Annual Report. NIRB File: 03MN107/16MN056, NIRB Registry No. 330678. Environmental Protection Operations Directorate, Prairie and Northern Region, Yellowknife, Northwest Territories, Canada. 15 pp.*

[10] Agnico Eagle Mines Limited – Meadowbank Division. 2019. Appendix 39 Meadowbank and Whale Tail 2018 Air Quality and Dustfall Monitoring Report NIRB Document 190409-03MN107 16MN056. NIRB Registry No. 324365. Agnico Eagle Mines Limited. 229 pp.

[11] *Agnico Eagle Mines Limited – Meadowbank Division. 2020. Appendix 41. Meadowbank and Whale Tail 2019 Air Quality and Dust Monitoring Report; NIRB Document 2000421-03MN107 16MN056. NIRB Registry No. 329470. Agnico Eagle Mines Limited. 64 pp.*

testing mixed effects models 1,000 times. Medians and interquartile ranges were reported to summarize dustfall within distance classes. Statistical analysis was conducted using R version 4.1.0 (R Development Core Team 2020).

Seasonal Variation in Dustfall — Daily dustfall was assessed at year-round sites in all Project areas (Mine Site, Milne Port, Tote Road) to determine if either discrete seasonal/monthly patterns or continuous temporal patterns occurred. The month of dustfall collection was identified from the time period between consecutive sample dates, e.g., samples collected early (<15th of the month) in December were associated with dustfall in November, whereas samples collected later ($\geq$15th of the month) in December were associated with dustfall in December. Generalized least-squares regression was used to test for effects of season (summer and winter) or time (month time-series) and sample site on daily dustfall accumulation. Seasonal models were used to test the main effects of season and sample site, as well as the interaction between them. Time-series models were used to test the main effects of sample site and cosinusoidal functions of month, as well as the interaction between them. All 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 most similar to samples from the preceding period (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 period time (Zuur et al. 2009). Model selection procedures followed an information-theoretic approach using corrected Akaike's Information Criterion (AICc; Burnham and Anderson 2002). Models with the lowest scores were identified as the best trade-off between parsimony and explained variance.

Residual diagnostic plots were examined, and formal tests (Shapiro-Wilk and Levene's tests) were conducted, to confirm assumptions of normality and homogeneity of variance in the residuals. If these assumptions were violated, nonparametric Kruskal-Wallis tests were conducting using R package 'coin' (Hothorn et al. 2008), and bootstrap resampling (1,000 times) was conducted to develop 95% bias-correct and accelerated CIs for each estimate. If there was evidence of an effect of season or month on daily dustfall, estimate marginal means were used to determine the geometric mean effect after accounting for the effect of sample site (Lenth et al. 2018). Statistical analysis was conducted using R version 4.1.0 (R Development Core Team 2020).

Annual Dustfall — Within the Early Revenue Program (ERP) Final Environmental Impact Statement (FEIS), annual TSP rate 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. Values for these annual TSP rate predictions are as follows:

- Low: 1 to 4.5 g/m^2/year;
- Moderate: 4.6 to 50 g/m^2/year; and,
- High: $\geq$50 g/m^2/year.

The results of the 2021 dustfall sampling program for monitoring site with year-round data collection were converted from units of mg/dm^2·day to g/m^2/year. They 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.

Note 1: Sites in the nil and low isopleth zones were not sampled during the 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.

Note 2: The laboratory detection limit for dustfall sampling is 0.10 mg/dm²·day, which converts to an annual dustfall of 3.6 g/m²/year and is a substantial proportion of the low dustfall threshold of 4.5 g/m²/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 year and season (summer and winter), month, or time (month time-series) on daily dustfall accumulation for each Project area (mine site, Milne Inlet port, north road and south road). Only sites that were sampled throughout the year were included in analyses. The month of dustfall collection was identified from the time period between consecutive sample dates, e.g., samples collected early (<15th of the month) in December were associated with dustfall in November, whereas samples collected later (≥15th of the month) in December were associated with dustfall in December. Monthly models were used to test the main effects of month and year, as well as the interaction between them. Time series models were used to test the main effects of year and sine/cosine functions of month, as well as the interaction between them. Sample site was included as a random effect to account for a lack of independence in samples collected from the same location over time. All dustfall data were log^e transformed before 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 dust fall; the same structure was used for year effects in the time-series model (Zuur et al. 2009).

Residual diagnostic plots were examined, and formal tests (Shapiro Wilk and Leven's tests) conducted, to confirm assumptions of normality and equality of variance in the residuals. If these assumptions were violated, nonparametric Kruskal-Wallis tests were conducted using R package 'coin' (Hothorn et al. 2008), and bootstrap resampling (1,000 times) was conducted to develop 95% bias-correct and accelerated CIs for each estimate. If evidence was found of an effect of season or month on daily dustfall, estimate marginal means were used to determine the geometric mean effect (Lenth et al. 2018). Model selection procedures followed an information-theoretic approach using corrected Akaike's Information Criterion (AICc; Burnham and Anderson 2002). Models with the lowest scores were identified as the best trade-off between parsimony and explained variance. Statistical analysis was conducted using R version 4.1.0 (R Development Core Team 2020).

Sampling Height Pilot Study — Paired tall (2 m) versus short (0.5 m) dustfall collectors were assessed to see if they differed in their daily dustfall accumulation. Fifteen samples across five paired collectors occurred, i.e., three samples per pair). Two analyses were conducted to determine if these collectors yielded similar data. First, paired t-tests were conducted between paired collectors to determine whether the mean difference in dustfall among short and tall collectors differed from zero. Second, a standardized major axis (type II) regression was used, due to sampling error in both axes, to determine whether the linear relationship between daily dustfall in tall and short collectors differed significantly from unity, i.e., a 1:1 relationship based on an intercept = 0 and a slope = 1. Residual diagnostic plots were examined, and formal tests (e.g., Shapiro Wilk) were conducted to confirm assumptions of normality and equality of variance in the residuals.

7.3.2 RESULTS AND DISCUSSION

7.3.2.1 Magnitude and Extent of 2021 Dustfall

Mine Site — The 2021 monitoring program included nine dustfall monitors at 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 7-1).

Within the Mine footprint, dustfall deposition rates at DF-M-01, located near the airstrip, ranged from 0.46 to 10.4 mg/dm²·day, with the highest dustfall recorded in January 2021 (Table 7-3). At DF-M-02, located nearest the crusher, the dust deposition rates ranged from 0.27 mg/dm²·day (July 2021) to 8.70 mg/dm²·day in January 2021. At site DF-M-03, located just south of the Mine haul road near the ore deposit, the dustfall deposition rates ranged from 0.50 mg/dm²·day in August 2021 to a high of 7.98 mg/dm²·day, measured in September 2021.

Outside the PDA but within a 5,000 m radius, sites DF-M-06, -07, -08, and -09 were sampled during the summer months, from mid-May through mid-September. Dustfall sampled at these stations was low, generally ranging from below detection (<0.10 mg/dm²·day) to a high of 0.37 mg/dm²·day in September 2021 at DF-M-07 (Table 7-3). Two outlying data points were identified, one from DF-M-04 (12.5 mg/dm²·day) and one from DF-M-07 (4.13 mg/dm²·day), both during July 2021; a review of the helicopter flight data indicates that because of a low ceiling during July sample collection, the helicopter flew low, directly over the dustfall monitors, likely contaminating the samples.

Dustfall was significantly higher in the Near sites when compared with Far and Reference sites ($\chi^2 2 = 9.73$, $P = 0.008$; Figure 7-1 and Figure 7-2). Geometric mean daily dustfall was highest in the Near sites at 1.13 (CI = 0.66–2.84) mg/dm²·day, which was significantly higher than the other two types of sites (all $p < 0.04$). Ten samples (67%) in the Far sites were above the detection limit (0.1 mg/dm²·day); the geometric mean daily dustfall recorded at the Far sites was 0.26 (CI = 0.16–0.78) mg/dm²·day. Only one sample (16%) in the Reference sites was above the detection limit (0.1 mg/dm²·day), which was the outlier data point from DF-M-04 in July.

Table 7-3. 2021 summary of Total Suspended Particulates (TSP, mg/dm²·day).

Site Name	Sample Collection Start Date											
	18-Jan	17-Feb	20-Mar	25-Apr	20-May	20-Jun	18-Jul	18-Aug	18-Sep	18-Oct	18-Nov	17-Dec
DF-M-01	10.4	0.93	2.61	2.97	10.20	3.26	0.46	1.22	3.33	1.05	0.88	7.97
DF-M-01-S	-	-	-	-	-	-	-	-	-	0.72	0.65	7.15
DF-M-02	8.70	1.34	1.67	1.82	1.22	1.40	0.27	0.38	2.92	0.88	1.05	6.08
DF-M-03	0.83	0.89	1.51	0.78	0.78	4.39	1.35	0.50	7.98	0.56	1.60	2.01
DF-M-04	-	-	-	-	-	<0.10	12.50 [2]	<0.10	<0.10	-	-	-
DF-M-05	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-
DF-M-06	-	-	-	-	-	0.18	<0.10	<0.10	0.15	-	-	-
DF-M-07	-	-	-	-	-	0.13	4.13 [2]	<0.10	0.37	-	-	-
DF-M-08	-	-	-	-	-	<0.10	0.22	<0.10	0.12	-	-	-
DF-M-09	-	-	-	-	-	0.22	5.63 [2]	0.13	0.21	-	-	-
DF-P-03	-	-	-	-	-	<0.10	1.17	<0.10	<0.10	-	-	-
DF-P-04	0.20	0.12	0.11	0.38	0.22	0.98	0.77	0.11	0.37	0.34	0.15	<0.10
DF-P-05	1.82	0.97	1.28	1.78	3.21	3.17	1.63	0.71	0.98	2.37	1.30	1.07
DF-P-06	0.29	0.14	0.30	0.37	<0.10	0.20	0.10	<0.10	0.18	0.34	0.15	0.12
DF-P-07	0.51	0.15	0.36	1.06	0.24	<0.10	0.15	<0.10	0.21	0.30	0.30	0.13
DF-P-08	1.71	0.96	1.67	1.85	0.64	1.17	1.17	0.35	0.45	0.58	0.49	0.98
DF-P-08-S	-	-	-	-	-	-	-	-	-	0.47	0.61	1.31
DF-P-09	-	-	-	-	-	-	-	0.16	0.45	-	-	-
DF-P-10	-	-	-	-	-	-	-	0.27	0.34	0.29	0.38	1.21
DF-P-11	-	-	-	-	-	-	-	<0.10	0.13	-	-	-
DF-P-12	-	-	-	-	-	-	-	<0.10	0.10	-	-	-
DF-RN-01	-	-	-	-	-	<0.10	1.35 [2]	<0.10	<0.10	-	-	-
DF-RN-02	<0.10	<0.10	-	-	<0.10	0.41	0.27	<0.10	0.17	- [1]	<0.10	<0.10
DF-RN-03	0.53	0.26	0.33	0.92	1.43	5.01	2.99	1.64	1.83	2.92	0.73	0.48
DF-RN-03-S	-	-	-	-	-	-	-	-	-	1.83	0.61	0.58
DF-RN-04	0.97	0.58	0.72	1.84	7.52	17.30	5.63	3.32	4.10	4.77	1.47	1.02
DF-RN-05	1.22	1.03	0.86	4.00	2.40	23.50	12.50	2.24	4.89	4.97	1.84	1.29
DF-RN-06	0.55	0.43	0.40	1.55	1.16	8.52	4.13	0.72	1.86	2.39	0.98	0.68
DF-RN-06-S	-	-	-	-	-	-	-	-	-	1.71	1.07	0.81

Table 7-3. 2021 summary of Total Suspended Particulates (TSP, mg/dm²·day).

Site Name	Sample Collection Start Date											
	18-Jan	17-Feb	20-Mar	25-Apr	20-May	20-Jun	18-Jul	18-Aug	18-Sep	18-Oct	18-Nov	17-Dec
DF-RN-07	<0.10	<0.10	-	-	<0.10	0.59	0.46	0.13	0.19	- [1]	<0.10	<0.10
DF-RN-08	-	-	-	-	-	<0.10	2.04 [2]	<0.10	0.10	-	-	-
DF-RS-01	-	-	-	-	-	0.12	2.99 [2]	<0.10	<0.10	-	-	-
DF-RS-02	0.10	<0.10	-	-	0.19	1.33	0.98	0.23	0.72	- [1]	<0.10	<0.10
DF-RS-03	0.37	0.36	0.56	0.55	1.00	7.71	2.04	1.89	11.50	1.33	0.48	0.64
DF-RS-03-S	-	-	-	-	-	-	-	-	-	2.58	0.48	0.73
DF–RS-04	1.23	1.05	1.47	2.35	7.58	40.20	11.70	8.78	60.50	5.65	1.98	2.56
DF-RS-05	1.13	0.63	1.17	1.88	6.70	21.30	4.58	8.25	16.10	3.55	1.71	1.89
DF-RS-06	0.36	0.22	0.52	0.87	2.42	8.29	1.24	1.49	3.34	1.23	0.44	0.48
DF-RS-06-S	-	-	-	-	-	-	-	-	-	1.11	0.35	0.43
DF-RS-07	<0.10	<0.10	-	-	0.15	0.36	1.63 [2]	<0.10	0.14	- [1]	<0.10	<0.10
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	11.70 [2]	<0.10	<0.10	-	-	-
DF-TR-25E	<0.10	<0.10	-	-	<0.10	0.91	0.15	0.22	0.49	- [1]	<0.10	<0.10
DF-TR-25W	0.10	<0.10	-	-	<0.10	0.52	0.77	0.22	0.19	- [1]	0.14	<0.10
DF-TR-56E	<0.10	<0.10	-	-	<0.10	0.16	1.24 [2]	<0.10	0.18	- [1]	<0.10	<0.10
DF-TR-56W	<0.10	<0.10	-	-	0.14	0.35	4.58 [2]	<0.10	0.10	- [1]	0.11	0.11
DF-TR-75E	<0.10	<0.10	-	-	0.10	0.27	<0.10	<0.10	0.17	- [1]	<0.10	<0.10
DF-TR-75W	0.14	<0.10	-	-	0.19	1.26	0.22	0.21	0.76	- [1]	0.13	0.18
DF-RW-01	-	-	-	-	-	-	-	<0.10	0.10	- [1]	<0.10	-
DF-RW-02	-	-	-	-	-	-	-	<0.10	<0.10	- [1]	<0.10	-
DF-RW-03	-	-	-	-	-	-	-	<0.10	0.10	- [1]	<0.10	-
DF-RW-04	-	-	-	-	-	-	-	<0.10	0.11	- [1]	<0.10	-

[1] Samples from 14 sites could not be accessed in late October due to poor snow conditions for snowmobiling. These samples were all collected at the end of November, and had 60-day sampling intervals, rather than 30. These sites include: DF-RS-02, DF-RS-07, DF-RN-02, DF-TR-07, DF-TR-25W, DF-TR-25E, DF-TR-56W, DF-TR-56E, DF-TR-75W, DF-TR-75E, DF-RW-1, DF-RW-2, DF-RW-3 and DF-RW-4.

[2] Dustfall at multiple helicopter access monitoring locations was elevated in July. Flight data review indicated poor weather conditions (low cloud ceiling) resulted in low flight lines, which is believed to have resulted in additional dust deposition in the sampling vessels. These data were included in 2021 analyses but have been flagged as potentially artificially elevated.

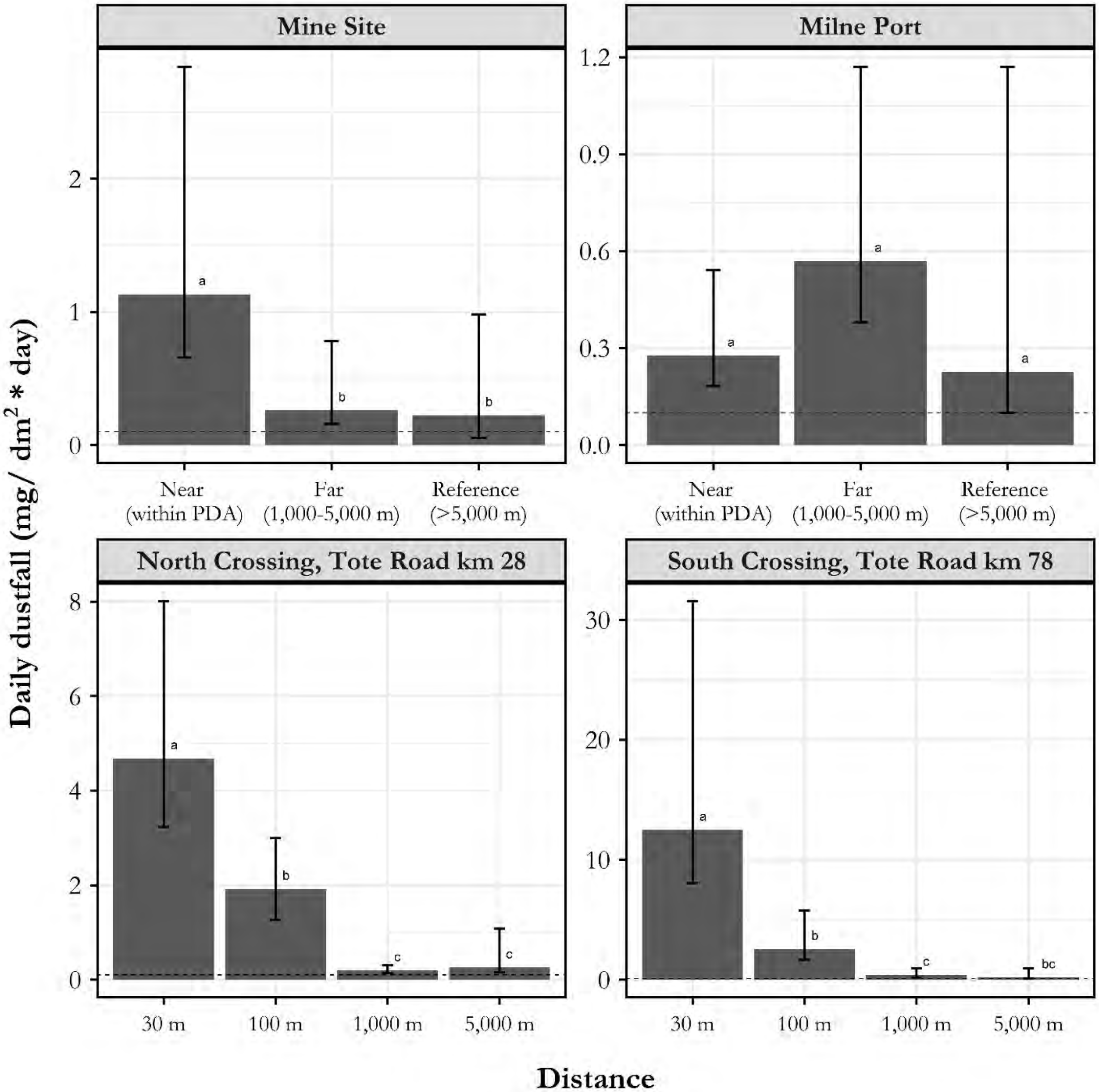


Figure 7-1. 2021 mean daily dustfall (mg/dm²·day) at the Mine Site, Milne Port and the Tote Road crossings (KM28, KM78) — variable/best-fit y-axis.

The Tote Road sites are measured as a function of distance from the Tote Road. Scales are different for each area to allow a review of differences between the sites at each area. Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge 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.

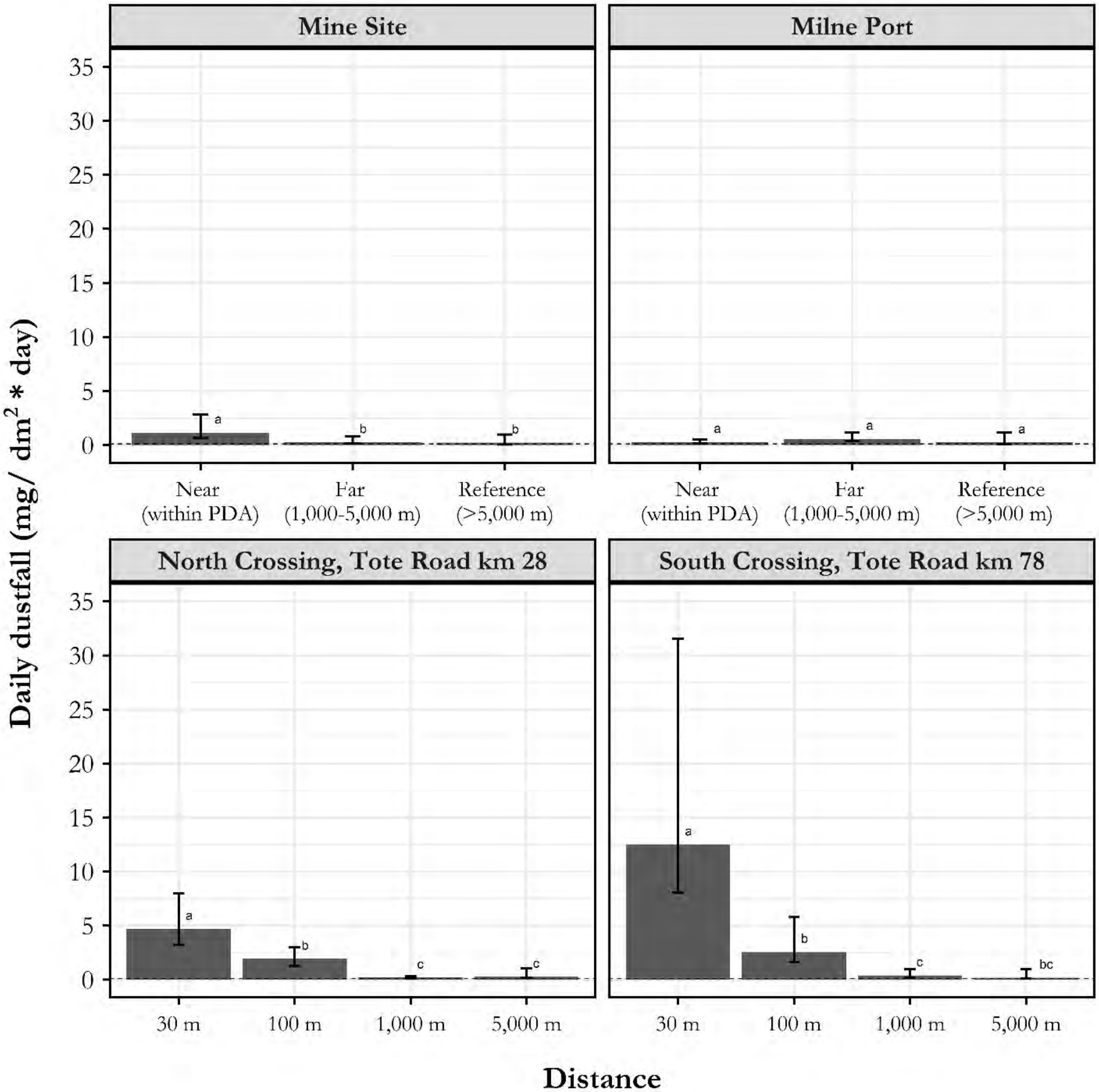


Figure 7-2. 2021 mean daily dustfall (mg/dm²·day) for the Mine site, Milne Port, and the Tote Road crossings (KM28, KM78) — fixed y-axis.

The Tote Road sites are measured as a function of distance from the Tote Road. Scales are equal for each area to allow a comparison of differences between each area. Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back-transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples and the maximum dustfall rate at reference sites unaffected by the Project.

Milne Port — Ten dustfall monitors were associated with Milne Port in 2021, though some were installed in late summer and therefore do not have a complete annual data set (Table 7-1; Map 7-1): five active sites on the Milne Port footprint, four just outside the PDA boundary, and one Reference site located northeast of Milne Port. The two main sources of dustfall at Milne Port are the sealift staging area and the ore stockpile area.

Dustfall deposition rates at Milne Port were highest at DF-P-05, located centrally in the camp area and east of the sealift staging pad, where dustfall ranged from 0.70 mg/dm²·day (August 2021) to 3.21 mg/dm²·day in May 2021 (Table 7-3). Dustfall deposition rates at DF-P-06, nearest to the sealift staging pad on the west side, ranged from 0.10 mg/dm²·day to a high of 0.37 mg/dm²·day. (Table 7-3). Dustfall deposition at DF-P-08, nearest the ore pad, ranged from 0.35 mg/dm²·day to 1.85 mg/dm²·day, while dustfall at DF-P-10, which is in the same direction but further out near the PDA boundary, ranged from 0.27 to 1.21 mg/dm²·day. Dustfall at DF-P-07, near the ore pad but further to the north, had dustfall ranging from below detection (<0.10 mg/dm²·day) to 1.06 mg/dm²·day (April 2021). Dustfall at DF-P-04, primarily associated with the Tote Road and quarry operations, ranged from below detection to 0.98 mg/dm²·day. Sites DF-P-11 and DF-P-12 are located to the west of the PDA, at approximately 1,000 m distant; dustfall was only available for August and September at these sites, and data ranged from below detection to 0.13 mg/dm²·day. Dustfall deposition rates at the Milne Port Reference site, DF-P-03, which was sampled only in summer months, ranged from below detection to 1.17 mg/dm²·day (July 2021).

No evidence was found that Near, Far, and Reference sites were different in their geometric mean daily dustfall ($\chi^2 2 = 1.95$, $P = 0.38$; Figure 7-1 and Figure 7-2). Geometric mean daily dustfall was highest at the Far sites at 0.57 (CI = 0.38–1.17), followed by the Near sites at 0.28 (CI = 0.18–0.54). Though counter-intuitive, this finding is likely associated with dustfall at DF-P-08, which is located downwind of the ore stockpiles and has elevated dustfall in comparison with other Milne Port sites but falls in the 'far' distance class. Therefore, at Milne Port, distance from the Project area is less important than location with respect to the ore stockpiles, which are the largest source of dustfall in the area. Eight samples (83%) from the Near sites and only one sample (33%) from the Reference sites were above the detection limit (0.10 mg/dm²·day).

Tote Road Dustfall — Twenty-four dustfall monitors were associated with the Tote Road in 2021: eight at each of two transects perpendicular to the road (the North crossing site at KM28 of the Tote Road, and South crossing site at KM78 of the Tote Road), two Reference monitors located approximately 14,000 m from the road, and three pairs of two sites located 1,000 m from each side of the road at KM25, KM56, and KM75. These six paired sites were added in 2019, at the request of the QIA and the MHTO, to increase monitoring of dustfall at 1,000 m from the Tote Road.

North Crossing, Tote Road KM28 — Dustfall was highest at the monitors nearest the centerline on both sides of the Tote Road (DF-RN-04 and -05) with dustfall that ranged from 0.58 to 17.30 mg/dm²·day at DF-RN-04 and from 0.86 to 23.50 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 0.26 to 5.01 mg/dm²·day, and from 0.40 to 8.52 mg/dm²·day, respectively. Dustfall in two monitors 1,000 m from the PDA (DF-RN-02 and -07) ranged from below detection to 0.41 mg/dm²·day, and below detection to 0.59 mg/dm²·day, respectively. Dustfall deposition data collected during the summer season at the farthest sites (DF-RN-01 and -08) ranged from below laboratory detection to 1.35 mg/dm²·day, and below detection to 2.04 mg/dm²·day (Table 7-3).

Evidence was found of an effect of distance from the North Crossing monitors on daily dustfall ($\chi^2 3 = 19.21$, P = 0.002; (Figure 7-1 and Figure 7-2). Geometric mean daily dustfall was highest in the 30 m distance class, 12.48 (CI = 8.03–31.54) mg/dm²·day, compared to all others (all P < 0.02). Geometric mean daily dustfall in the 100 m distance class 2.55 (CI = 1.66–5.79) mg/dm²·day, which was significantly higher than the two farther distance classes (all P < 0.008). No significant difference in dustfall occurred between the 1,000 m and 50,00 m distance classes ($\chi^2 1 = 1.48$, P = 0.22). Geometric mean daily dustfall in the 1,000 m distance class was 0.19 (CI = 0.14–0.30) mg/dm²·day, and 83% of all samples were above the detection limit. Half (50%) of the 5,000 m distance class samples were above the detection limit of 0.1 mg/dm²·day.

South Crossing, Tote Road KM78 — Dustfall was highest at monitors nearest the centerline on the south side of the Tote Road (DF-RS-04), where dustfall ranged from 1.05 to 60.50 mg/dm²·day. On the north side of the road (DF-RS-05), the dustfall ranged from 0.63 to 21.30 mg/dm²·day. Dustfall decreased with distance from the centerline, and dustfall at DF-RS-03 and DF-RS-06 ranged from 0.36 to 11.50 mg/dm²·day and from 0.22 to 8.29 mg/dm²·day, respectively. Dustfall in collectors at 1,000 m from the PDA (DF-RS-02 and -07) ranged from below detection to 1.33 mg/dm²·day, and below detection to 1.63 mg/dm²·day, respectively. Dustfall deposition data collected during the summer season at the farthest sites (DF-RN-01 and -08) ranged from below detection to 2.99 mg/dm²·day, and below detection to 0.10 mg/dm²·day, respectively (Table 7-3). The South Crossing monitors are in a wide valley where high winds are common, generally travelling north to south; these sites are also just north of a bridge crossing. As vehicles exit the bridge, they accelerate, resulting in increased dust production, which the winds then blow towards the south of the Tote Road. Therefore, dustfall at the south crossing is generally higher than other monitoring locations along the Tote Road.

Evidence was found of an effect of distance from the South Crossing monitors on daily dustfall ($\chi^2 3 = 13.50$, P = 0.004; Figure 7-1 and Figure 7-2). Geometric mean daily dustfall was highest in the 30 m distance class at 13.66 (CI = 4.30–43.38) mg/dm²·day, which was significantly higher than 100 m, 1,000 m, and 5,000 m distance classes (all P ≤ 0.02). Geometric mean dustfall in the 100 m distance class was 2.82 (CI = 0.89–8.95) mg/dm²·day; there was suggestive evidence that this was higher than the 1,000 m distance class (P = 0.04) but not the 5,000 m distance class (P = 0.08). Geometric mean dustfall in 1,000 m (0.39 [CI = 0.19–0.97] mg/dm²·day) and 5,000 m (0.18 [CI = 0.10–0.96] mg/dm²·day) distances classes were no different from each other (P = 0.07). Five samples (83%) in the 1,000 m distance class and four samples (33%) in the 5,000 m distance class were above the detection limit.

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, except for one which was at DF-RR-02 from July, and was believed to have been contaminated by a low-flying helicopter (Table 7-3). These sites are not included in graphs such as Figure 7-1 and Figure 7-2.

Dustfall at Sites 1,000 m from the PDA — Twelve dustfall monitoring sites were located at 1,000 m distance from the PDA; two were located at the Mine Site, and the other ten were in various locations along the Tote Road. The two Mine Site collectors were sampled only during the summer; however, the road sites were sampled throughout the year.

During summer, no significant difference in dustfall occurred among the sites located 1,000 m from the Project infrastructure ($\chi^2 11 = 10.17$, $P = 0.52$; Figure 7-3). Significant differences in dustfall were identified among the sites located 1,000 m from the project infrastructure based on year-round data ($\chi^2 11 = 29.49$, $P = 0.002$; Figure 7-4). Geometric mean daily dustfall was highest for DF-RS-02 at 0.26 (CI = 0.13–0.52) mg/dm²·day. Suggestive evidence was found that dustfall was higher at DF-RS-02 than DF-M-06 ($P = 0.04$) and DF-RN-02 ($P = 0.04$).

Dustfall along the Proposed Railway Diversion — Four dustfall monitors were installed along the proposed railway diversion to capture baseline dustfall in the area. Monitors were installed in mid-July 2021, with the first data collection in mid-August, following the standard 30-day sampling period. Monitors were not visited in October due to snow conditions that did not permit snowmobile access but were visited in November and December 2021. The results at all four sites ranged from below detection (<0.10 mg/dm²·day) to at or just above the detection limit (0.11 mg/dm²·day at site DF-RW-04 in September 2021 was the highest dustfall recorded among these sites; Table 7-3).

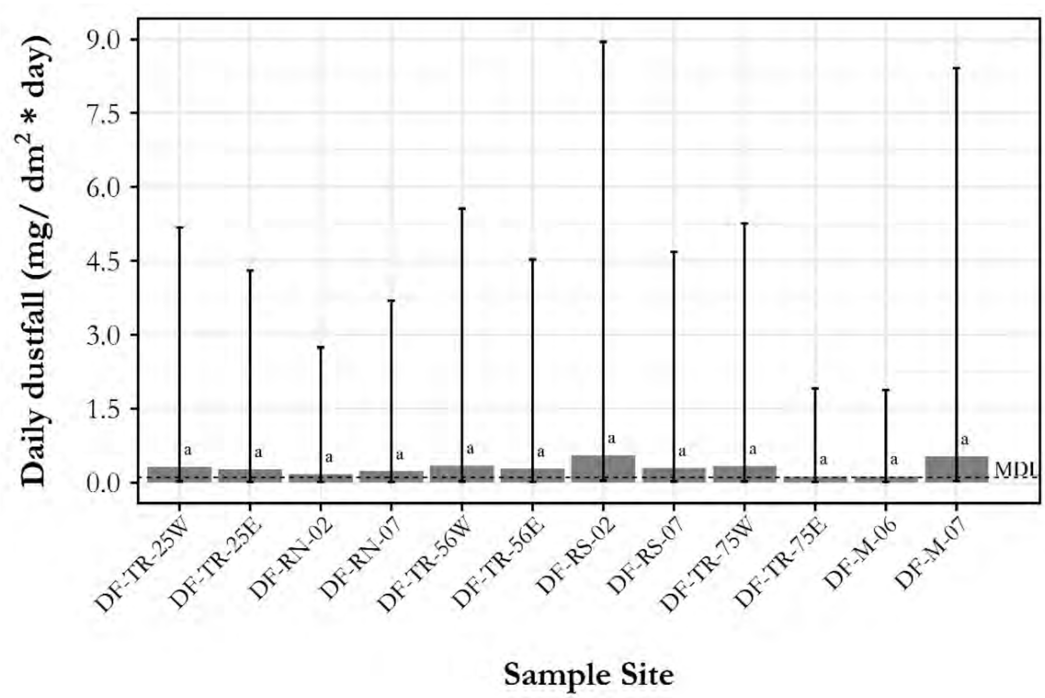


Figure 7-3. 2021 mean daily dustfall (mg/dm²·day) at 1,000 m from the Potential Development Area (summer sampling).

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back-transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples and the maximum dustfall rate at reference sites unaffected by the Project.

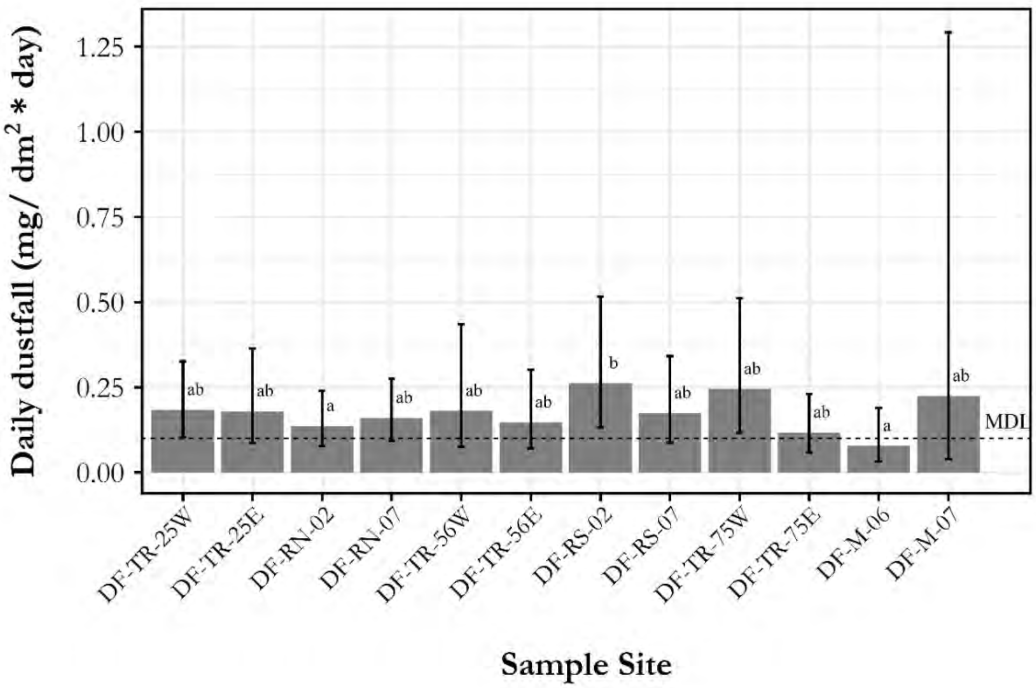


Figure 7-4. 2021 mean daily dustfall (mg/dm²·day) at 1,000 m from the Potential Development Area (year-round sampling).

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back-transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples and the maximum dustfall rate at reference sites unaffected by the Project.

7.3.2.2 Seasonal Comparisons of 2021 Dustfall

Seasonal variations in dustfall were investigated as per the dustfall monitoring objectives. Dustfall deposition across various components of the PDA did not respond consistently to seasonality; dustfall at the Mine Site and Milne Port was elevated in early spring (March/April) and early fall (September), while dustfall deposition along the Tote Road seemed to be elevated through the summer months with a peak in September.

Mine Site — Patterns across time were best represented by a sinusoidal function of month, whereby fluctuations in geometric mean daily dustfall followed a four-month cyclic pattern with peaks in January, May, and September ($F1,34 = 7.16$, $P = 0.01$; Figure 7-5). This model better explained variation in the data than a model categorizing months (AICc = 100.66 versus 114.84, respectively). No differences were found in geometric mean daily dustfall among sites ($F2,22 = 1.61$, $P = 0.22$); all sites had overlapping CIs for each month. The sinusoidal function corresponds with a mean value of 1.68 (CI = 1.22–2.30) mg/dm²·day that fluctuations to a high of 3.02 in April and September and a low of 0.93 in mid-summer and mid-winter months.

Milne Port — Patterns across time were best represented by a sinusoidal function of month, whereby fluctuations in geometric mean daily dustfall followed a three-month cyclic pattern with peaks in April, July, and October ($F1,54 = 16.95$, $P = 0.0001$; Figure 7-5). These cycles corresponded to different mean values that were dependent on the site (different functions for each site; $F4,54 = 37.61$, $P < 0.0001$; Figure 7-5). This model was most parsimonious and better explained variation in the data than a model predicting site-by-month effects (AICc = 108.41 versus 109.80, respectively). The sinusoidal functions correspond with a mean value of those fluctuations between periods of highs (April, July, and October) and lows (February, May, and August) in geometric mean daily dustfall. Site DF-P-05 had the highest geometric mean dustfall during peaks, 2.28 mg/dm²·day, followed by DF-P-08 with the second-highest peaks at 1.30 mg/dm²·day. Site DF-P-06 had the lowest daily rate peaks, 0.26 mg/dm²·day.

North Crossing, Tote Road KM28 — Patterns across time were best represented by differences in months rather than fluctuating patterns across time (AICc = 58.83 versus 77.89, respectively). This is made clear by the relatively poor fitting sinusoidal function (three-month periods in fluctuations; Figure 7-5). Modelling seasonal (AICc = 79.62) differences did not explain variation better than differences in months (Figure 7-6 and Figure 7-7). No clear differences in geometric mean daily dustfall at a given site were identified between summer and winter seasons ($F_{1,43} = 0.54$, $P = 0.47$). Therefore, differences in months ($F_{11,33} = 43.86$, $P < 0.0001$) and sites ($F_{3,33} = 29.40$, $P < 0.0001$) best explained variation in daily geometric mean dustfall. Geometric mean daily dustfall was greatest at site DF RN-05 (17.09 [CI = 12.47–23.42] mg/dm²·day) and DF RN-04 (14.69 [CI = 10.71–20.14] mg/dm²·day) during June 2021. Geometric mean daily dustfall was least at site DF-RN-03 in February (0.32 [CI = 0.23–0.44] mg/dm²·day) and March (0.34 [CI = 0.24–0.47] mg/dm²·day) of 2021.

South Crossing, Tote Road KM78 — Patterns across time were best represented by differences per month rather than season or fluctuating patterns across time (AICc = 67.16 versus 71.77 and 153.62, respectively). This is made clear by the relatively poor fitting sinusoidal function (four-month periods in fluctuations; Figure 7-5) and similar dustfall rates among seasons (Figure 7-7). Very strong evidence was found of an effect of site ($F_{3,33} = 89.70$, $P < 0.0001$) and month ($F_{10,33} = 36.15$, $P < 0.0001$). Geometric mean daily dustfall was consistently highest at site DF-RS-04 across several months (Figure 7-5 and Figure 7-6); the highest values were associated with the months of June (38.62 mg/dm²·day; [CI = 24.62–60.56]) and September (34.32 mg/dm²·day; [CI = 24.50–48.07]). This same pattern was evident across all sites, even those with relatively low dustfall overall, e.g., highest rates for site DF-R-06 were 7.17 (CI = 4.58–11.24) mg/dm²·day in June and 6.38 (CI = 4.56–8.91) mg/dm²·day in September.

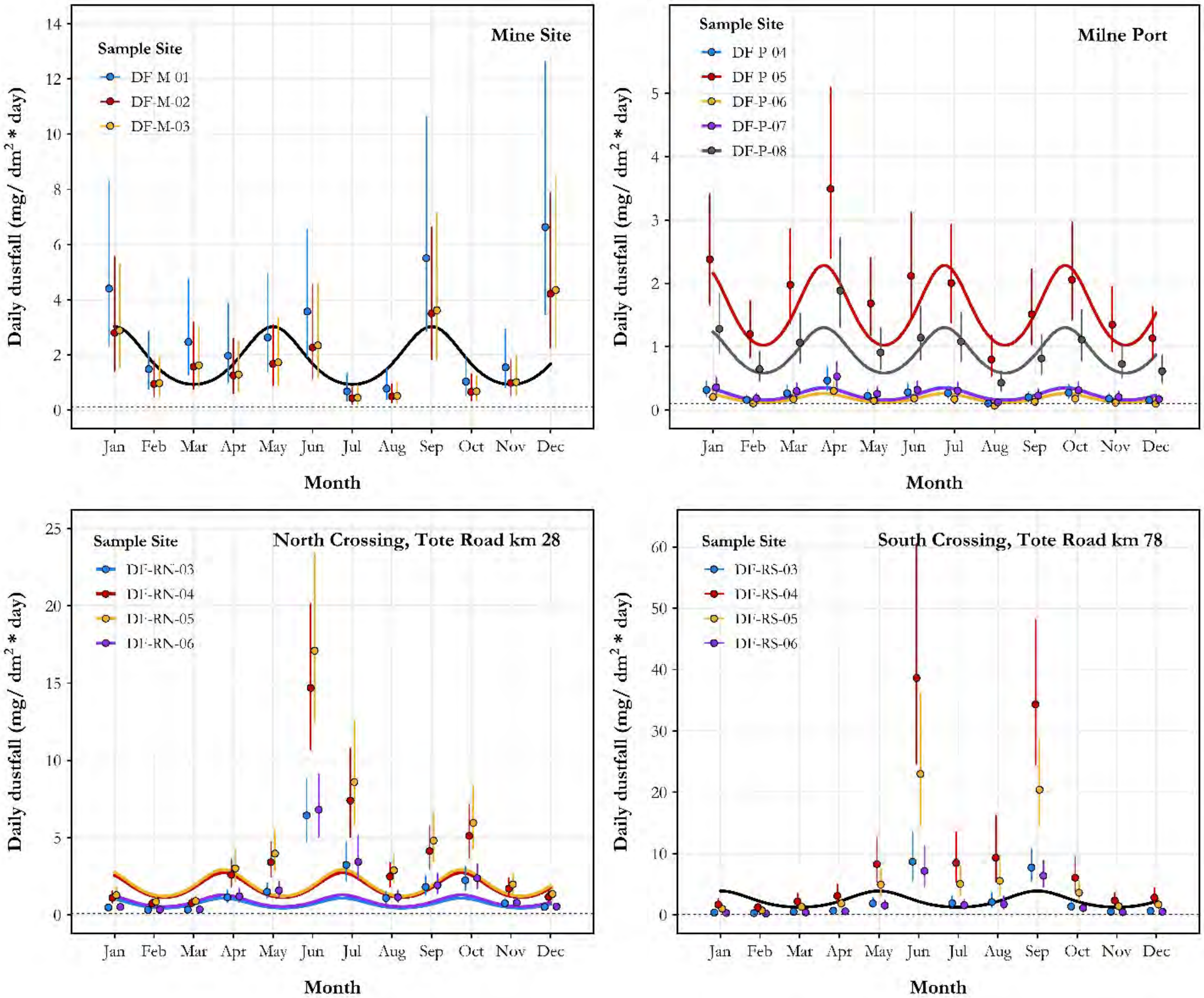


Figure 7-5. 2021 mean daily dustfall (mg/dm²·day) by site and month (time-series or category) or season (category) across the Project.

Scales are different for each area to allow review of differences between the sites at each area.

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. Lines correspond with sinusoidal functions relative to each sample site. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

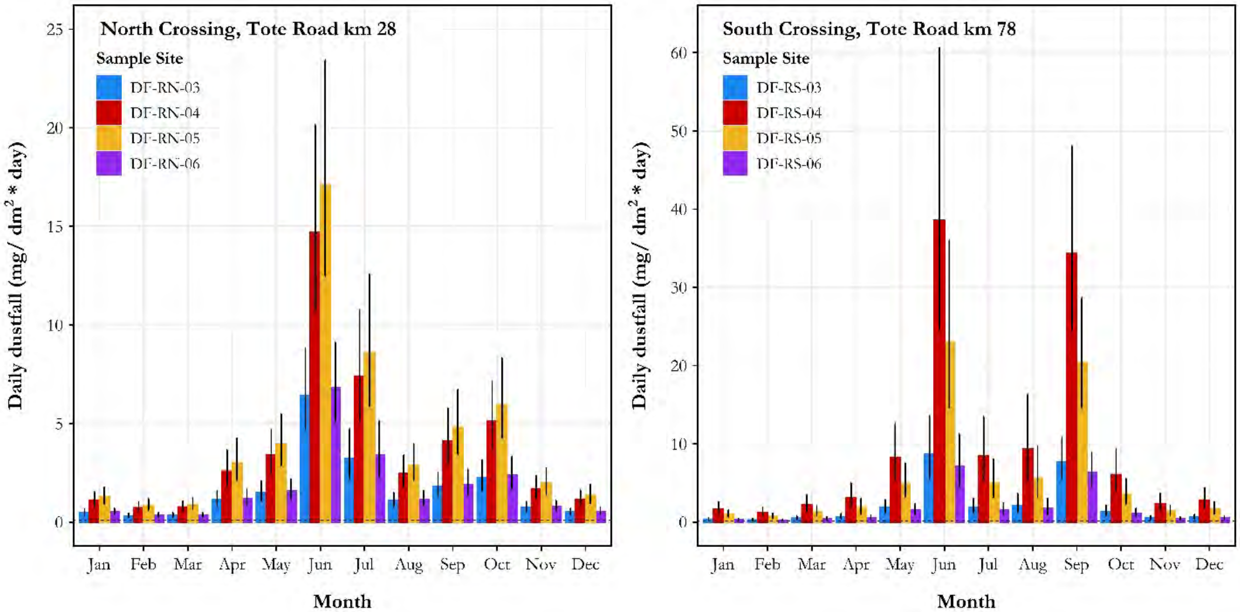


Figure 7-6. 2021 mean daily dustfall (mg/dm²·day) by site and month at the Tote Road crossings (KM28, KM78).

Scales are different for each area to allow review of differences between the sites at each area.

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

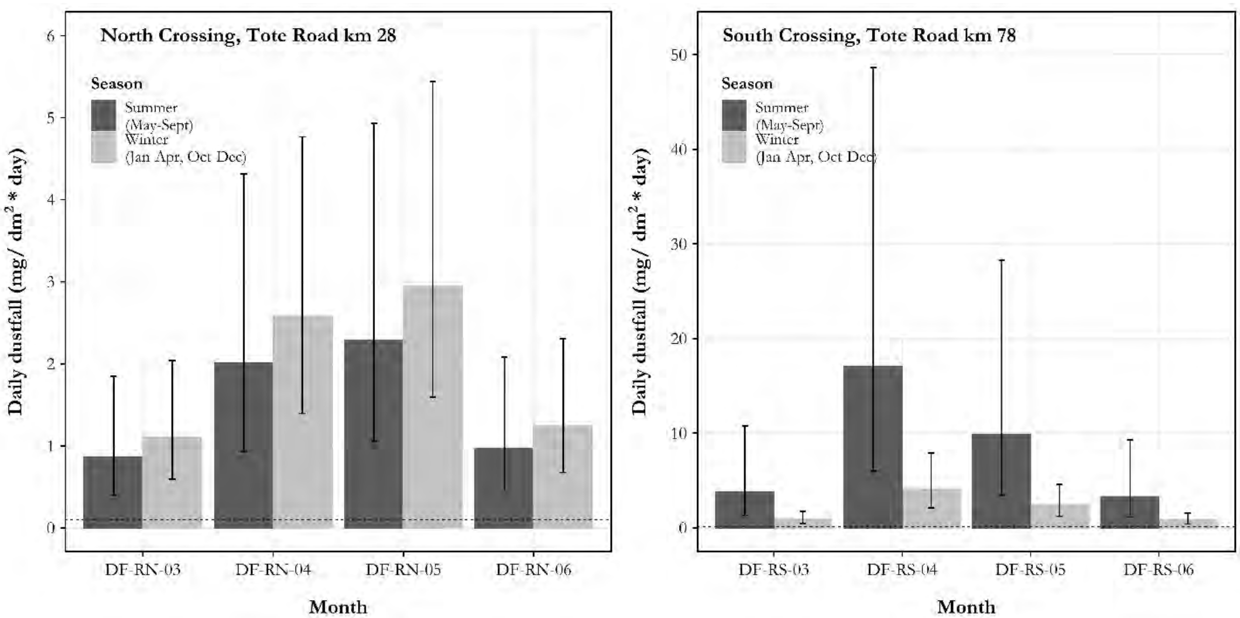


Figure 7-7. 2021 mean daily dustfall (mg/dm²·day) by site and season (summer and winter) at Tote Road Crossings (KM28, KM78).

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

7.3.2.3 2021 Annual Dustfall

Total annual dustfall for the 2021 calendar year was calculated for all sites having year-round sampling. 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, low dustfall accumulation (i.e., near or below laboratory detection limits) was observed at these remote sites during the summer months. It can, therefore, be reasonably assumed that this would also be the case in the winter months.

Annual dustfall in monitors 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-01 (134.48 g/m²/year), followed by DF-M-02 (82.37 g/m²/year) and DF-M-03 (70.56 g/m²/year) (Table 7-4; Figure 7-8).

Year-round dustfall sampling at Milne Port Site DF-P-05 had annual dustfall deposition rates 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-05 was 60.89 g/m²/year (Table 7-4). Annual dustfall at DF-P-08 was 36.40 g/m²/year, which falls within the predicted moderate isopleth. Annual dustfall from Milne Port Sites DF-P-04, -06 and -07 fell into the moderate isopleth with annual dustfall rates of 11.65, 7.29 and 11.11g/m²/year, respectively; however, DF-P-04 and -06 were modelled to be in the low isopleth range (Figure 7-8).

Annual dustfall at the Tote Road North Crossing and South Crossing locations within 30 m and 100 m of the road centerline fell within the high isopleth, though they were modelled to fall into the moderate isopleth range (Table 7-4; Figure 7-8).

Annual dustfall at all 10 Tote Road monitors located 1,000 m from the road centerline fell above the 'low' isopleth threshold of 4.5 g/m²/year. Annual dustfall at these sites ranged from 4.33 to 18.68 g/m²/year, with the highest annual dustfall of the 1,000 m sites recorded at DF-TR-56W (Table 7-4; Figure 7-9).

Table 7-4. 2021 annual dustfall accumulation at all sites.

Site	Area	Distance from PDA	Predicted Range [2]	Isopleth Upper Limit	Annual Dustfall (g/m^2/year)	FEIS Prediction Comparison
DF-M-01	Mine Site	0	High	N/A [3]	134.48	Within prediction
DF-M-02	Mine Site	0	High	N/A	82.37	Within prediction
DF-M-03	Mine Site	0	High	N/A	70.56	Within prediction
DF-P-04	Milne Inlet Port	0	Low	4.5	11.65	Above prediction
DF-P-05	Milne Inlet Port	0	Moderate	50	60.89	Above prediction
DF-P-06	Milne Inlet Port	0	Low	4.5	7.29	Above prediction
DF-P-07	Milne Inlet Port	0	Moderate	50	11.11	Within prediction
DF-P-08	Milne Inlet Port	0	Moderate	50	36.40	Within prediction
DF-RN-03	Road North	100	Moderate	50	58.21	Above prediction
DF-RN-04	Road North	30	Moderate	50	149.39	Above prediction
DF-RN-05	Road North	30	Moderate	50	188.18	Above prediction
DF-RN-06	Road North	100	Moderate	50	72.15	Above prediction
DF-RS-03	Road South	100	Moderate	50	71.37	Above prediction
DF-RS-04	Road South	30	Moderate	50	359.16	Above prediction
DF-RS-05	Road South	30	Moderate	50	195.50	Above prediction
DF-RS-06	Road South	100	Moderate	50	59.81	Above prediction
DF-RN-02	Tote Road	1,000	Low	4.5	5.24	Above prediction
DF-RN-07	Tote Road	1,000	Low	4.5	6.52	Above prediction
DF-RS-02	Tote Road	1,000	Low	4.5	12.86	Above prediction
DF-RS-07	Tote Road	1,000	Low	4.5	9.31	Above prediction
DF-TR-25E	Tote Road	1,000	Low	4.5	7.62	Above prediction
DF-TR-25W	Tote Road	1,000	Low	4.5	7.75	Above prediction
DF-TR-56E	Tote Road	1,000	Low	4.5	7.53	Above prediction
DF-TR-56W	Tote Road	1,000	Low	4.5	18.68	Above prediction
DF-TR-75E	Tote Road	1,000	Low	4.5	4.33	Within prediction
DF-TR-75W	Tote Road	1,000	Low	4.5	11.12	Above prediction

[1] Annual accumulations are reported for the period January 18 to December 21, 2021.

[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/m^2/year of total suspended particulate matter (dustfall).

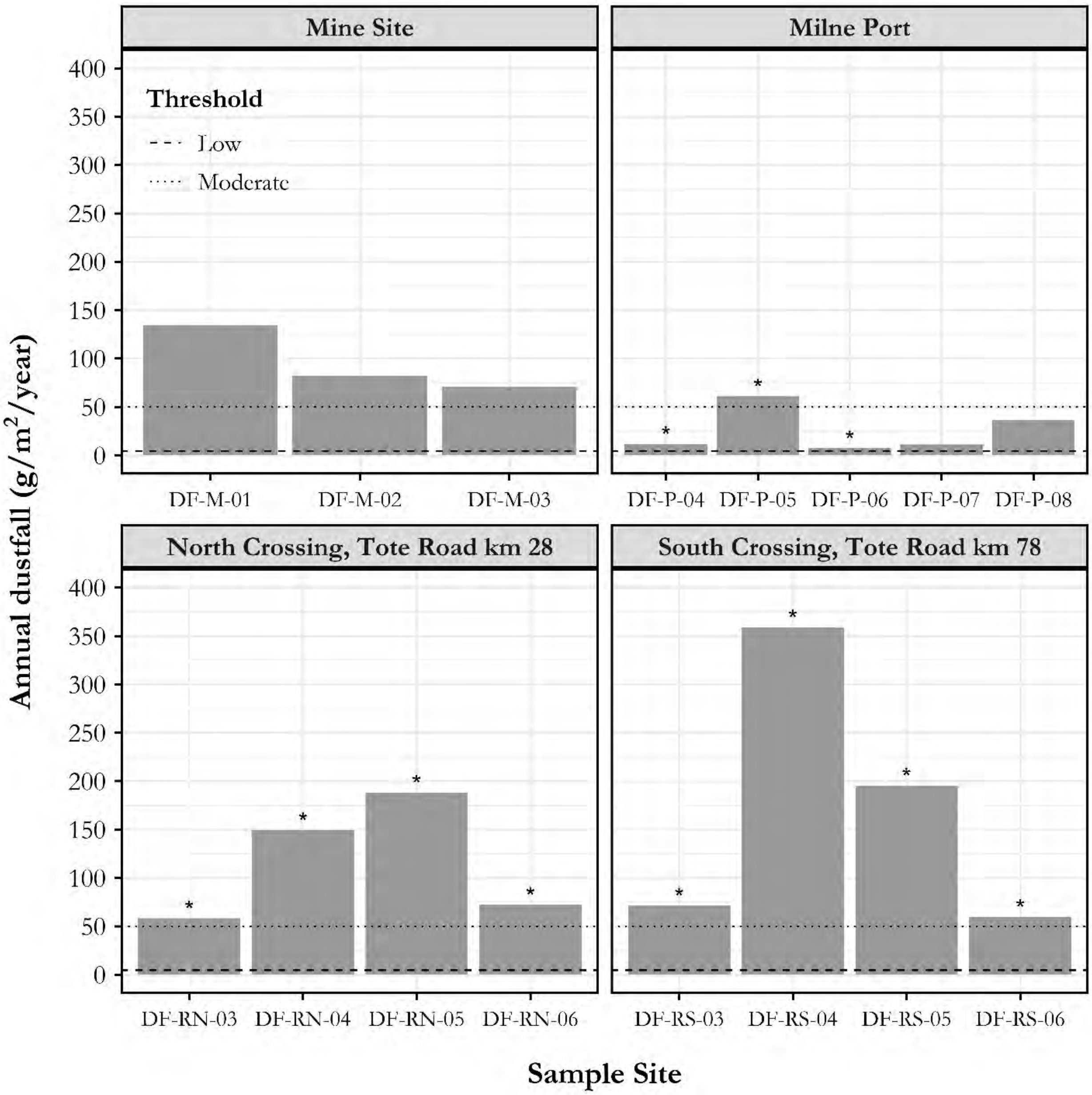


Figure 7-8. 2021 annual dustfall (g/m²/year) for stations sampled year-round.

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.

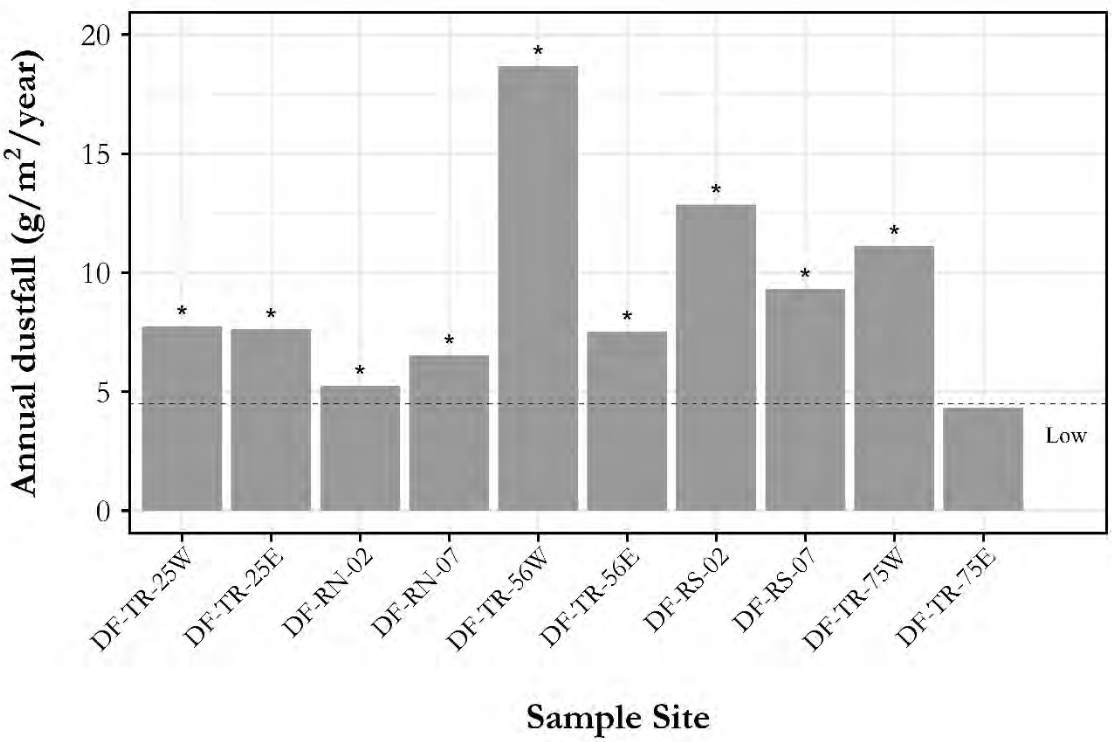


Figure 7-9. 2021 total annual dustfall (g/m²/year) at 1,000 m from the Tote Road.
Dashed horizontal line shows low dust isopleth upper limits. The asterisk (*) denotes that the annual dustfall was greater than projected by the predicted isopleth.

7.3.3 INTER-ANNUAL TRENDS

7.3.3.1 Seasonal Dustfall

Mine Site — No multi-year trends in increasing dustfall were identified, however dustfall in 2021 was among the highest measured since 2016, driven by increases as DF-M-01. Inter-annual patterns across time were best represented by differences in months rather than year-specific fluctuations or a common fluctuation across time (AICc = 732.81 versus 759.79 and 750.78, respectively). The strongest evidence was for the effect of month (F11,240 = 4.94, $P < 0.0001$; Figure 7-10). No evidence was found for a year effect (F6,240 = 0.93, P = 0.48). The highest dustfall at the Mine Site was routinely seen in March, April and May (spring months). The greatest mean differences were between February and March, April, and May (all $P < 0.004$); May and April, July, and October (all $P < 0.005$); and April and July and October (all $P < 0.007$). The greatest geometric mean daily dustfall rates were in May of 2021 (3.67 [CI = 1.17–11.44] mg/dm²·day) and 2016 (3.55 [CI = 1.13–11.15] mg/dm²·day). The least geometric mean daily dustfall rates were in February of 2015 (0.64 [CI = 0.20–2.05] mg/dm²·day) and October of 2015 (0.69 [CI = 0.20–2.35] mg/dm²·day).

Milne Port — Sites DF-P-01 and DF-P-08 were removed from inter-annual dustfall analyses at Milne Port. Site DF-P-01 was located within 100 m of ore stockpiles from 2013 to 2019 and was decommissioned as a site in May of 2019. Site DF-P-08 replaced DF-P-01 as a sample unit but was placed at distances >1,000 m from the PDA, which is expected to experience lower dust quantities than sites at the PDA. Therefore, both sites were removed from analyses because inclusion of both would bias the inter-annual estimates of dustfall by erroneously indicating a sudden decrease in mean dustfall in 2020 and 2021. Inter-annual patterns were best represented by year specific sinusoidal functions rather than a common fluctuation or month effect (AICc = 781.10 versus 801.97 and 814.08, respectively). Fluctuations in geometric mean daily dustfall seemed to follow a six-month cyclic pattern that varied in magnitude by year with peaks occurring in April and October ($F_{6,323} = 5.68$, $P < 0.0001$; Figure 7-11). This was consistent with certain years having greater overall dustfall ($F_{7,323} = 3.71$, $P = 0.0007$). Highs and lows across months were most pronounced in 2018 (e.g., high of 1.26 [CI = 0.28–5.68] mg/dm²·day in April and low of 0.42 [CI = 0.09–1.90] mg/dm²·day in December) (Figure 7-11). Fluctuations in 2021 were limited, with highs in April (0.68 [CI = 0.15–3.09] mg/dm²·day) and lows in December (0.22 [CI = 0.05–1.02] mg/dm²·day). The relatively flat curve in 2015 is because those data did not conform well with an approximate six-month period, unlike other years, and because the standard error of the monthly estimates for 2015 were greater than corresponding mean values.

North Crossing, Tote Road KM28 — As at the Mine Site, inter-annual patterns across time were best represented by differences in months and years rather than year specific fluctuations or a common fluctuation across time (AICc = 807.78 versus 944.23 and 940.39, respectively). Strong evidence was found for an effect of month ($F_{11,313} = 31.50$, $P < 0.0001$; Figure 7-12) and year ($F_{6,313} = 3.97$, $P = 0.0008$). The greatest mean differences were between January/February and May, June, and July (all $P < 0.0001$). Geometric mean daily dustfall was highest in July 2020 (6.65 [CI = 2.33–18.97] mg/dm²·day) and lowest in February 2019 (0.40 [CI = 0.14–1.14] mg/dm²·day). A decrease in dustfall at noted at dustfall monitors at the North Crossing in June, July, August of 2021 compared with 2020, when there were similar traffic transits, may be related to the application of DustBlockr®, along the full length of the Tote Road.

South Crossing, Tote Road KM78 — Inter-annual patterns across time were best represented by differences in months and years rather than year-specific fluctuations or a common fluctuation across time (AICc = 807.27 versus 1016.99 and 1029.80, respectively). Strong evidence occurred for an effect of month ($F_{11,319} = 84.43$, $P < 0.0001$) and year ($F_{6,319} = 9.60$, $P < 0.0001$). The greatest geometric mean daily dustfall occurred in May, June, and July for all years (Figure 7-13); the greatest values were associated with 2020 (17.06 [CI = 4.76–61.21] mg/dm²·day in May and 16.05 [CI = 4.42–58.26] mg/dm²·day in June). The least geometric mean daily dustfall occurred in February for most years; the lowest values were associated with February 2017 (0.21 [CI = 0.06–0.77] mg/dm²·day). A decrease in dustfall at noted at dustfall monitors at the South Crossing in June, July, August of 2021 compared with 2020, when there were similar traffic transits, may be related to the application of DustBlockr®, along the full length of the Tote Road.

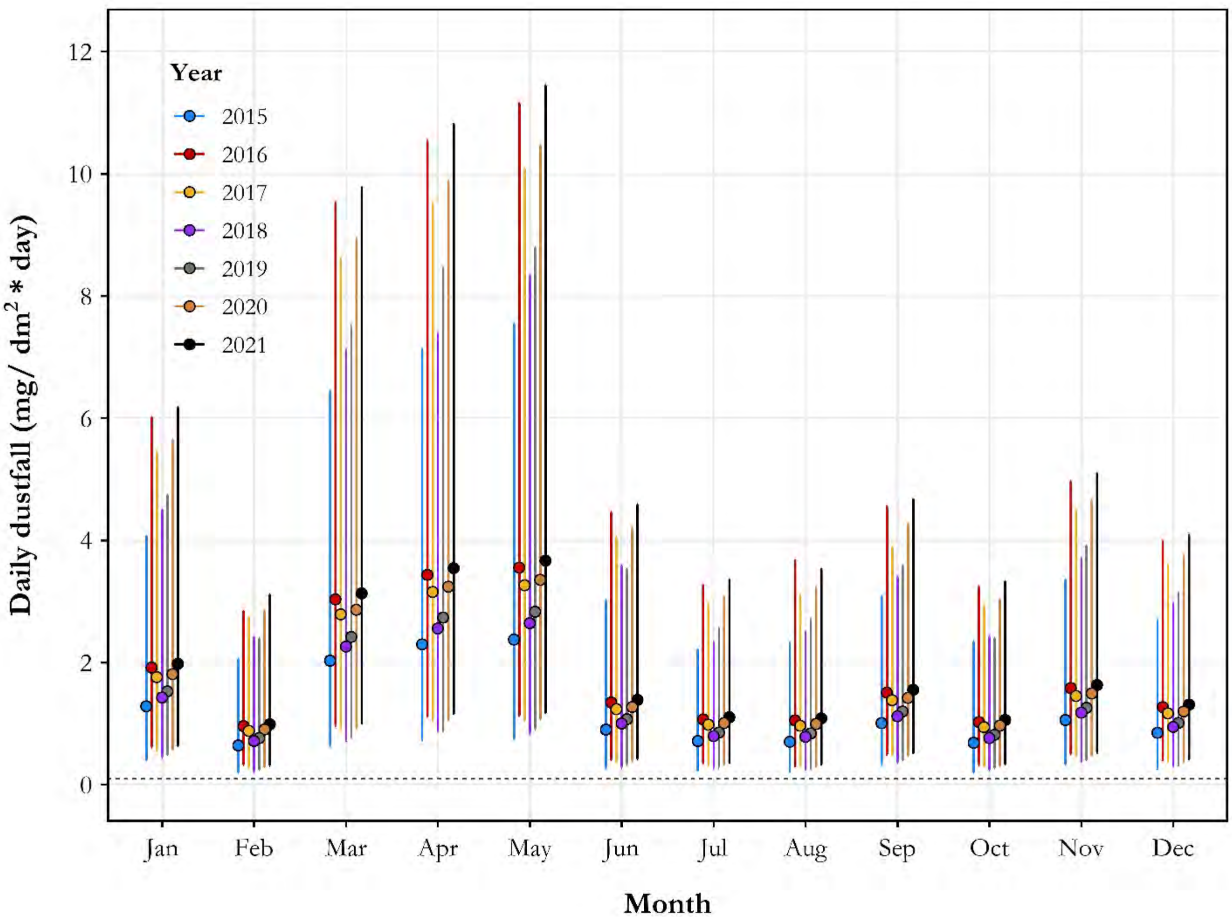


Figure 7-10. 2021 inter-annual mean daily dustfall (mg/dm²·day) at the Mine Site (2015 to 2021).

Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

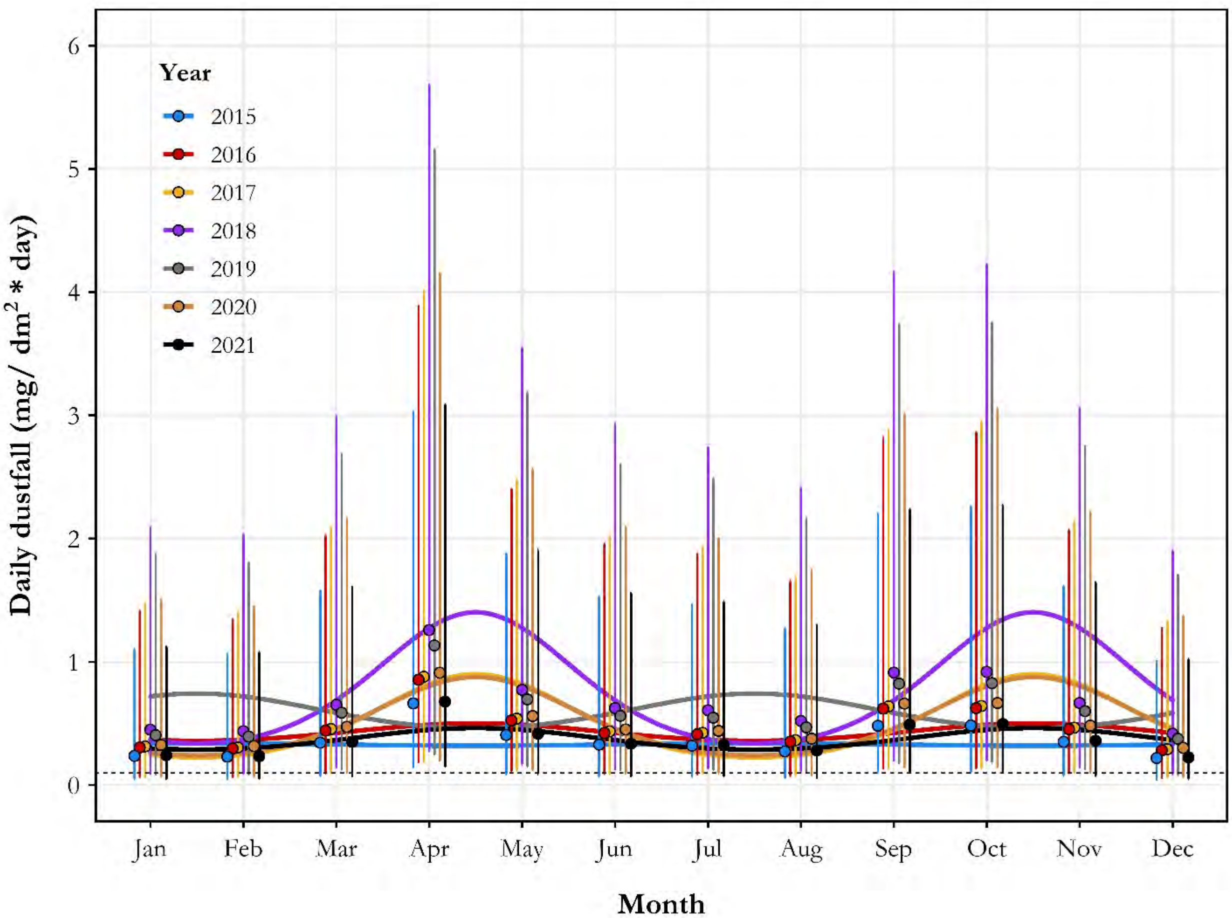


Figure 7-11. 2021 inter-annual mean daily dustfall (mg/dm²·day) at Milne Port (2015 to 2021).

Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. Lines correspond with sinusoidal functions relative to each year. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

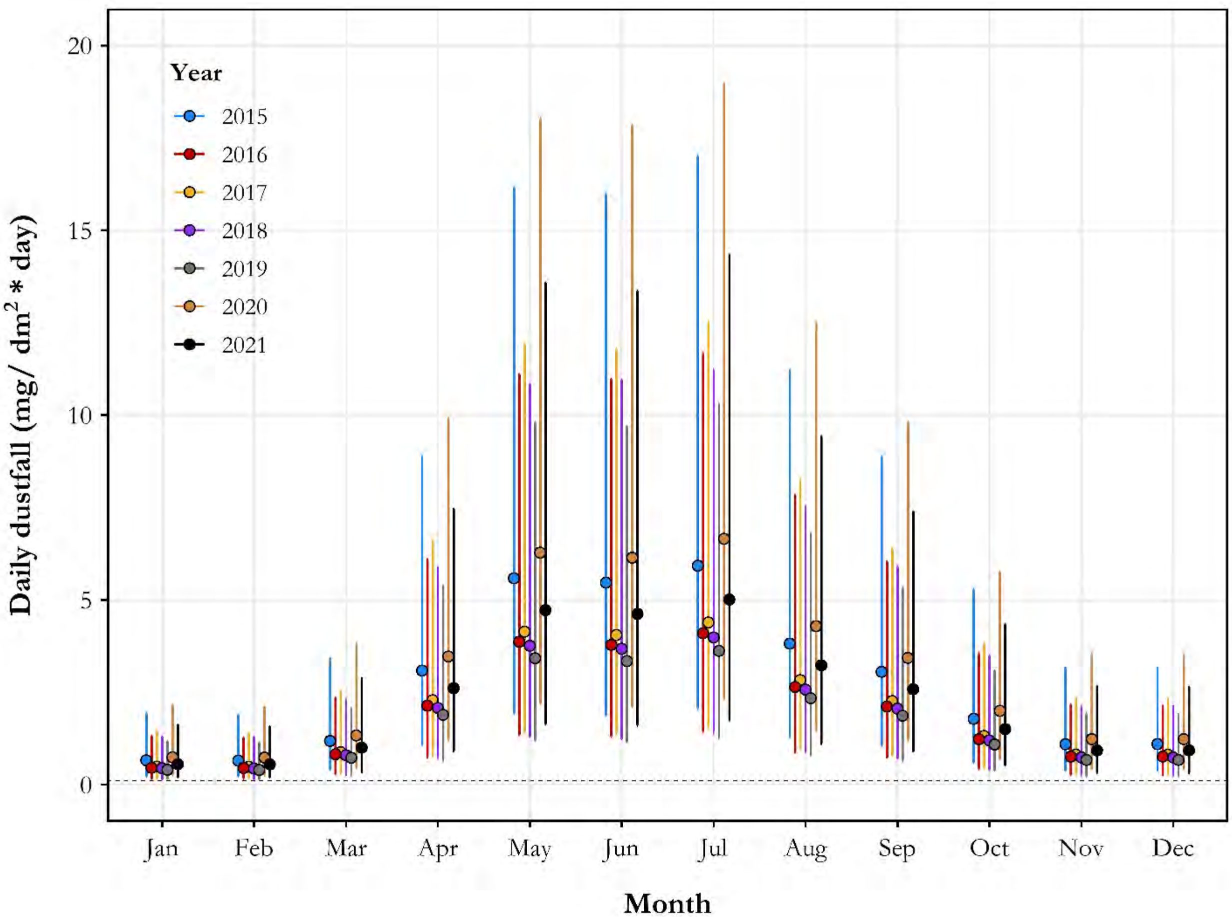


Figure 7-12. 2021 inter-annual mean daily dustfall (mg/dm²·day) at the North Crossing, the Tote Road KM28 (2015 to 2021).

Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

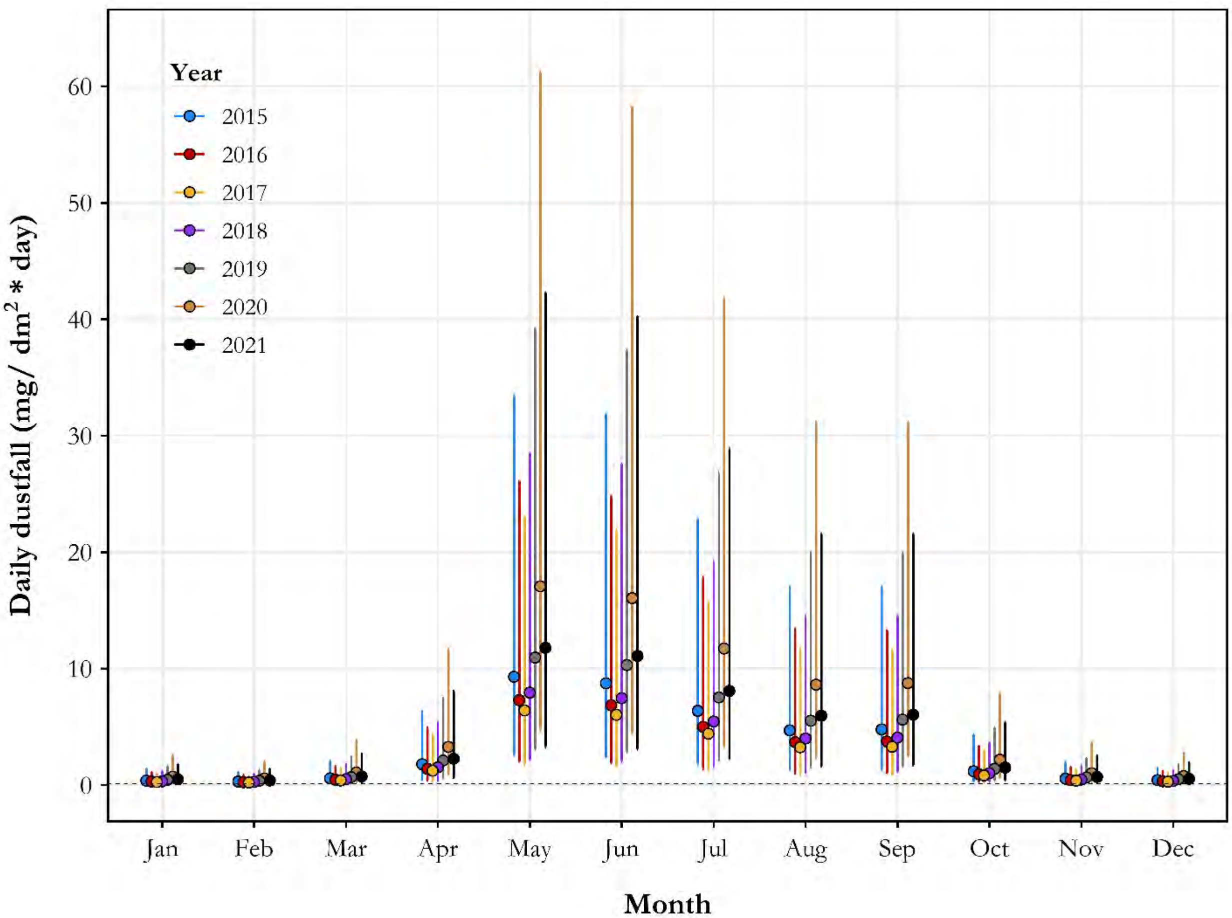


Figure 7-13. 2021 inter-annual mean daily dustfall (mg/dm²·day) at the South Crossing, the Tote Road KM78 (2015 to 2021).

Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the loge scale and back transformed to the natural scale. The dashed horizontal line indicates the MDL for dust samples, and the maximum dustfall rate at reference sites unaffected by the Project.

7.3.3.2 Total Annual Dustfall

Dustfall deposition in 2021 was within the ranges observed in previous years across the Project area (Figure 7-14). The Mine Site dustfall monitoring station DF-M-01 has had variable dustfall throughout all monitoring years, with no discernable trend. Dustfall at DF-M-02 and -03 has remained relatively consistent since 2018. Dustfall at all Milne Port monitoring sites remained consistent with previous years and trends. Dustfall at DF-P-05 decreased since 2018, while dustfall remained consistent at DF-P-04, DF-P-06 and DF-P-07. Dustfall along the Tote Road decreased at both the North Crossings (KM28) and South Crossings (KM78). From 2014 to 2016, dustfall across the PDA increased in line with Mine production. In 2016 there was a large increase in production from 0.5 MTPA to 2.5 MTPA, and there was a corresponding increase in dustfall, however, from 2016 to 2020, dustfall generally plateaued with only modest increases in some Project areas. Post-2016 decreases in dustfall are likely associated with implementation of dustfall mitigation strategies. (Figure 7-14). No extreme or abnormal weather events were recorded from weather monitoring (refer to Section 4 Climate) that could ostensibly factor into dustfall trends in the Project area.

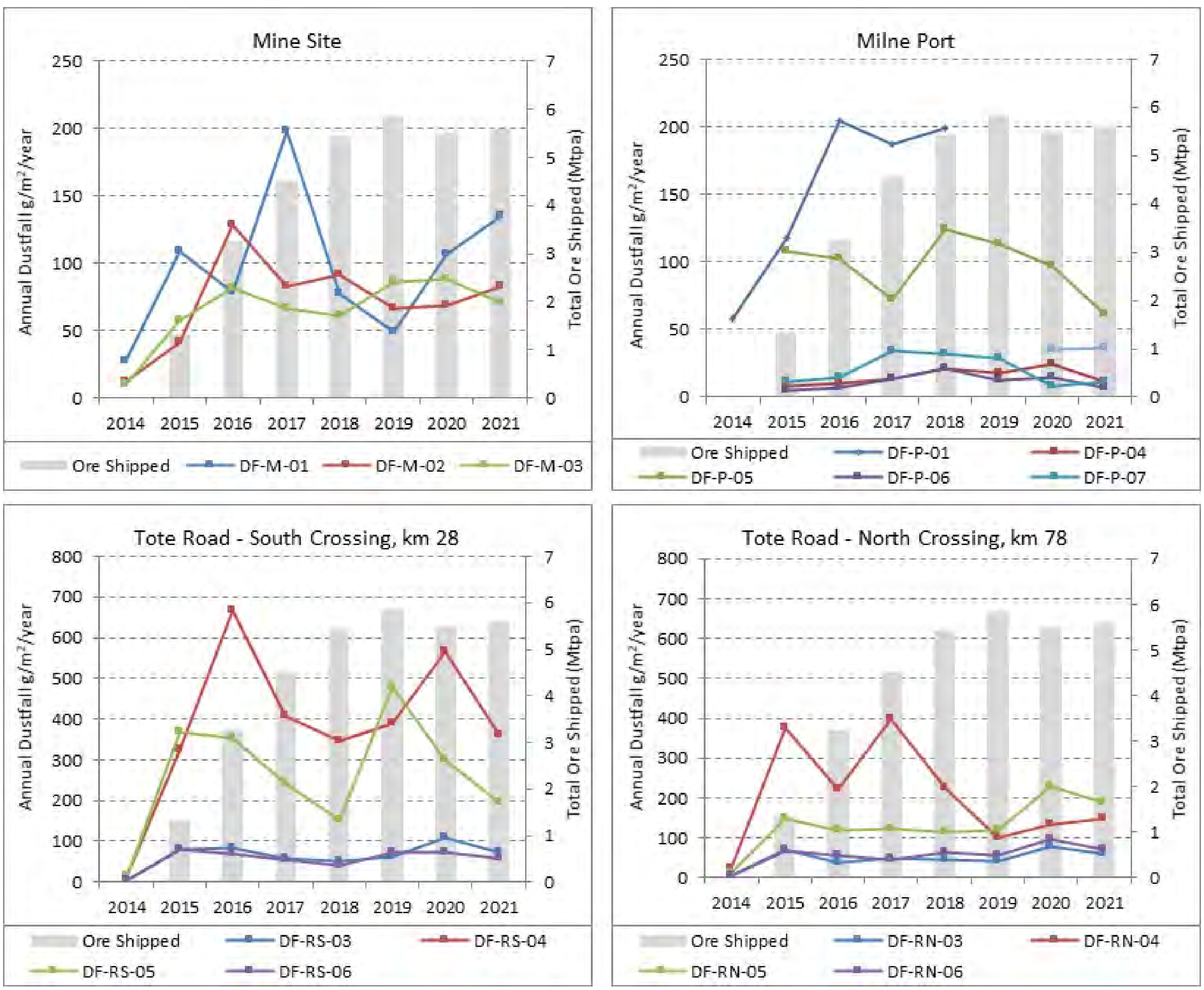


Figure 7-14. Year-over-year annual dustfall (g/m²/year) in relation to total ore shipped.

7.3.3.3 Sampling Height Pilot Study

No difference was found in the dustfall measured at a standardized height of 2.0 m and the QIA-requested 0.5 m. The paired t-test determined that the mean difference between tall and short dustfall collectors was no different than zero (mean difference = 0.10 [CIs = -0.03–0.23]; t_{14} = 1.59, P = 0.14). Similarly, the standardized major axis regression model yielded a strong correlation among tall and short dustfall collectors (R^2 = 0.91, P < 0.0001; Figure 7-15). Tests of the regression parameters identified that neither the intercept (r_{13} = 0.26, P = 0.32) nor slope (t_{13} = 1.57, P = 0.14) differed from the expectation of unity (i.e., intercept = 0 and slope = 1).

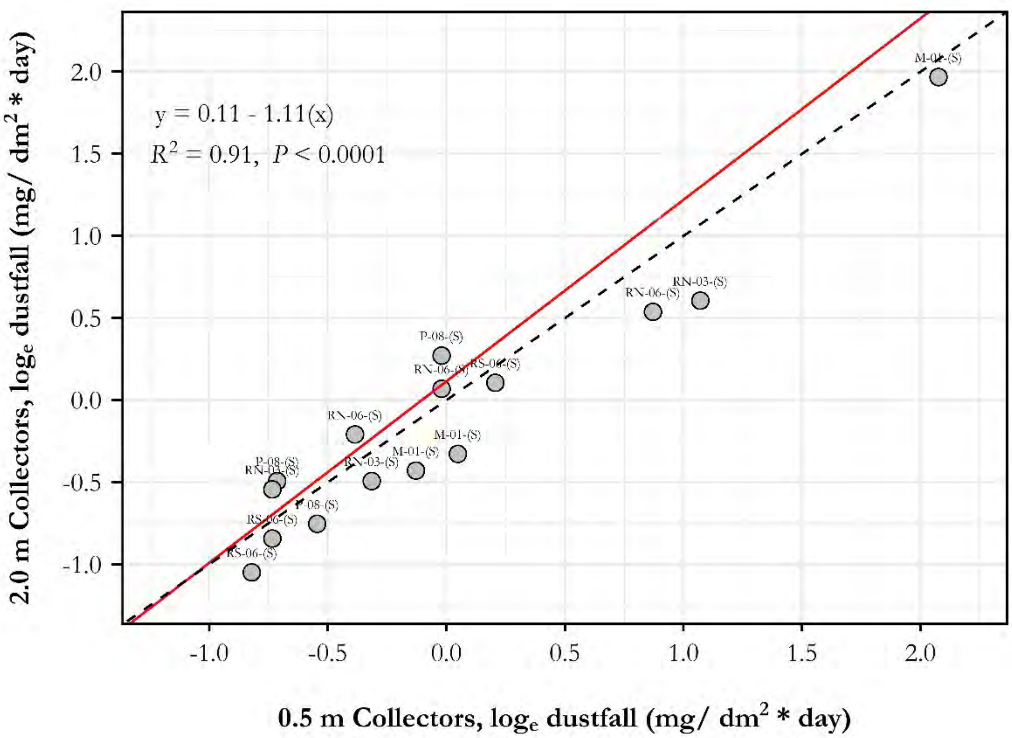


Figure 7-15. 2021 daily dustfall (mg/dm²·day) comparison of tall (2 m) and short (0.5 m) paired dustfall collectors.
Standardized major axis regression of the relationship between tall and short collector daily dustfall. Points show paired daily dustfall values between tall and short dustfall collectors. Dustfall was analyzed on the loge scale. Red line depicts the regression (intercept and slope) estimate, and the dashed line indicates the line of unity (intercept = 0, slope = 1).

7.4 DUSTFALL IMAGERY ANALYSIS

7.4.1 METHODS

Given the high contrast and visibility of dust on the landscape[12] and its detectability using multispectral analysis, remote sensing and dustfall imagery analysis were deemed appropriate/beneficial for estimating spatial extents of dustfall at the Project. Using remote sensing tools, dust and snow have different spectral characteristics affecting light absorption/reflection in different wavelengths. Multispectral bands (e.g., visible, near-infrared, shortwave) of satellite imagery can differentiate reflectance values of dust and snow, allowing for automated extraction of pixels representing dust coverage using comparisons of the various multispectral bands (band ratios).

7.4.1.1 Imagery Acquisition

Imagery from Landsat 8 Operational Land Imager (OLI) and Sentinel-2 Multispectral Instrument (MSI) sensors were used in the dustfall image analysis (Table 7-5). Landsat data are available from the United States Geological Survey (USGS) and have a revisit time of 16 days (USGS 2020). Sentinel-2 data are available from the European Space Agency (ESA) and have a revisit time of 5 days (ESA 2020a).

Images between March 15 and May 15, 2021 were selected for the 2021 dustfall imagery analysis. This period was chosen for extensive snow cover and available light. Additional image filters were applied to maximize dust detection: cloud cover ≤10% and snow cover ≥50%. Where available, multiple images covering the same area were chosen to account for dustfall extent variability due to snowfall events that can regularly bury dust and snowmelt that can cause dust to accumulate on the snow surface (Li et al. 2013).

Surface reflectance products were downloaded using the getSpatialData R Statistical software package (Schwalb-Willmann 2018) and the USGS EarthExplorer website (U.S. Geological Survey 2021). The surface reflectance product contains georeferenced images corrected for topography and atmospheric conditions, giving reflectance values for each pixel as they would appear at the Earth's surface (Jenkerson 2019, ESA 2020b). Landsat images came with a pixel quality band layer identifying pixels representing clouds, cloud shadows, and snow. Sentinel-2 images came with a classification mask including categories for saturated/defective pixels, clouds and cloud shadows, water, vegetation, non-vegetated and snow.

[12] At ground-level, dust on snow can be visible at dustfall deposition as low as 0.1 to 0.2 g/m² (Li et al. 2013).

Table 7-5. Summary of satellite imagery used for dustfall extent image analysis.

Mission	Analysis Years	Sensor	Image Tiles	Bands[1]	Resolution
Landsat 8	2013 – 2021	Operational Land Imager (OLI)	27-10, 27-11, 28-10, 28-11, 29-10, 30-09, 30-10, 31-09, 31-10, 32-09, 32-10, and 33-09	Band 2: B 0.45 – 0.51 µm Band 3: G 0.53 – 0.59 µm Band 4: R 0.64 – 0.67 µm Band 5: NIR 0.85 – 0.88 µm Band 6: SWIR1 1.57 – 1.65 µm Band 7: SWIR2 2.11 – 2.29 µm	30 m 30 m 30 m 30 m 30 m 30 m
Sentinel-2	2019-2021	Multispectral Instrument (MSI)	17WMV, 17WNT, 17WNU, 17WNV, 17WPT, 17WPU, and 17WPV	Band 2: B 0.46 – 0.52 µm Band 3: G 0.54 – 0.58 µm Band 4: R 0.65 – 0.68 µm Band 8a: NIR 0.86 – 0.88 µm Band 11: SWIR1 1.57 – 1.66 µm Band 12: SWIR2 2.10 – 2.28 µm	20 m 20 m 20 m 20 m 20 m 20 m

[1] B = Blue, G = Green, R = Red, NIR = Near Infrared, and SWIR = Shortwave Infrared.

7.4.1.2 Image Preprocessing

Both R Statistical software (R Development Core Team 2020), ESRI ArcMap 10.8, and ArcGIS Pro 2.8 (ESRI 2020, 2021) were used to process and analyze the images. Images were reprojected to UTM zone 17 NAD83 and clipped to a 20 km buffer around the present and proposed infrastructure of the PDA. Saturated, cloud-covered, and non-snow pixels were excluded from the analysis using masks. For Landsat images, pixel values of 20,000 represented saturated pixels and were masked out as they do not contain valid reflectance values. Saturated pixels occur when the high reflectance of the surface (e.g., fresh snow) is beyond the sensor's range, causing sensor saturation. Cloud and snow masks were derived from pixel quality bands using the Landsat Quality Assessment ArcGIS Toolbox (USGS 2017). For Sentinel-2 images, the provided classification masks were used to remove all pixels not classified as snow. Some cloud masks were not adequate to completely remove clouds. A visual check was conducted to remove images with identifiable clouds (i.e., that could skew data analysis); images with thin clouds or fog that were not distinguishable from the snow cover may not have been identified and removed from the analysis. The resulting image database represented a selection of high-quality satellite images of the PDA and 20 km buffer from mid-March to mid-May for 2021, when dust should be detectable against a snow-covered landscape with minimal spectral or atmospheric interference.

The image bands used for the dustfall extent analysis represent ranges of wavelengths on the electromagnetic spectrum. Features such as snow, rock, and vegetation absorb and reflect at different wavelengths. These distinct absorption and reflection characteristics can be used to identify and extract features from the imagery using combinations of bands called band ratios.

7.4.1.3 Image Analysis

The 2021 imagery analysis focused on identifying, extracting, and quantifying mineral dust produced from the mining activities of the Project. For the initial dustfall extent imagery analysis presented in the 2020 Annual Monitoring Report (EDI Environmental Dynamics Inc. 2021a), a literature review was conducted to determine potential band ratios and combinations of band ratios that could be used to identify and extract iron dust from the satellite imagery.

Previously (as part of 2020 analyses; EDI Environmental Dynamics Inc. 2021), two band ratios were reported: the Snow Darkening Index (SDI) and a ferric iron band ratio. For the 2021 dustfall imagery analysis[13], the SDI, (Red−Green)/(Red+Green), was chosen as it was explicitly created to extract mineral dust on snow from imagery and can provide a relative estimation of mineral dust magnitude (Mauro et al. 2015). The SDI band ratio values ranged from −1 to 1, with values greater than 0 indicating the presence of dust. The relative magnitude increases as the SDI value increases, with 0 representing no dust and 1 representing the most dust.

A composite dataset for 2021 was calculated by taking the maximum value of all the image SDI layers to represent the maximum dustfall extent and relative magnitude. A new baseline dataset for the SDI was created from the 2004 to 2013 Landsat data for the 2021 dustfall imagery analysis. The previous baseline used the maximum SDI value. The new baseline used the average[14] SDI value representing the background dust extent and relative magnitude between 2004 and 2013, before the construction of the Project. The baseline was subtracted from the 2021 Landsat and Sentinel-2 SDI datasets to convey the spatial extent and relative magnitude of dust possibly produced by Project activities. The previous post-baseline composite datasets from 2014 to 2020 were recalculated with the new baseline.

Satellite-derived dustfall concentrations were estimated based on relationship between dustfall concentrations measured by the passive dustfall monitors and the SDI values from 2014 to 2021. Passive dustfall collectors estimate dust concentrations based on a continuous, year-long accumulation of dust. Whereas the SDI values capture a 'snapshot' of visible dust that can be susceptible to environmental conditions (e.g., snowfall events) that can affect estimates of dustfall at the time of image acquisition. To account for these differences in data capture, a period of dustfall accumulation was determined for each satellite image where (1) the start date was the last snowfall event, and (2) the end date was the date of the image. Snowfall events were determined as days where precipitation was recorded at the Mine Site or Milne Port weather stations and the temperature was below freezing. The daily dustfall concentrations from the dustfall monitors were summed over each image period. The SDI value was extracted from each image at the dustfall monitor locations (Map 7-2) and compared with the summed dustfall concentrations. Landsat and Sentinel-2 images were processed separately, and a linear model was developed for each dataset. The linear models were applied to the baseline and

[13]The ferric iron band ratio (Red/Green) was not used for the 2021 dustfall imagery analysis because the NIRB requested reporting on dustfall concentration which the ferric iron band ratio cannot provide. The band ratio may also underestimate dustfall extent after the baseline is removed and is specific to iron so it may not extract other types of dust. Also, the band ratio requires a threshold value to separate pixels classified as "dust" and "non-dust." The threshold value can vary between images due to changes in the lighting and land cover (e.g., snow cover, exposed ground) present in each image, which may introduce noise into the combined dataset.

[14] The average was calculated in response to QIA comment no. 36 on the 2020 Terrestrial Environment Annual Monitoring Report.

composite SDI datasets from 2014 to 2021 to estimate dustfall concentration within the 20 km radius buffer of the PDA.

The area of dustfall extent was calculated by multiplying the number of pixels with a concentration greater than 0 by the area of the pixel. Landsat 8 pixels are 30 m by 30 m with an area of 900 m² and Sentinel-2 pixels are 20 m by 20 m with an area of 400 m².

7.4.2 RESULTS AND DISCUSSION

7.4.2.1 Scene Distribution

The number of suitable Landsat 8 images in 2021 was similar to previous years (Table 7-6). However, there was limited coverage over the Mine Site (i.e., having only one image in 2021) resulting in minimal dustfall extent extraction (Map 7-1). The number of suitable Sentinel-2 images in 2021 decreased from 87 to 36 images compared to 2020 (Table 7-6). Years with a low number of images or areas with a low number of overlapping images may not represent the greatest dustfall extent or concentration. Some areas may only have one or two overlapping images that may underestimate the dustfall if captured following a snowfall event.

For 2021, March and early April provided the most satellite images, while late April provided the least images (Figure 7-16). Images from late April were available but were rejected due to cloud cover. Sentinel-2 has a higher revisit time (5 days) and smaller footprint than Landsat (16 days), resulting in more available images for analysis.

Table 7-6. Remote sensing sources used for dustfall imagery analysis.

Satellite	Baseline (2004 to 2013)	2014	2015	2016	2017	2018	2019	2020	2021
Landsat 5	49								
Landsat 8	8	22	33	16	14	17	12	13	12
Sentinel-2							26	87[1]	36

[1] Additional images were included in the analysis when the new baseline and concentration were calculated.

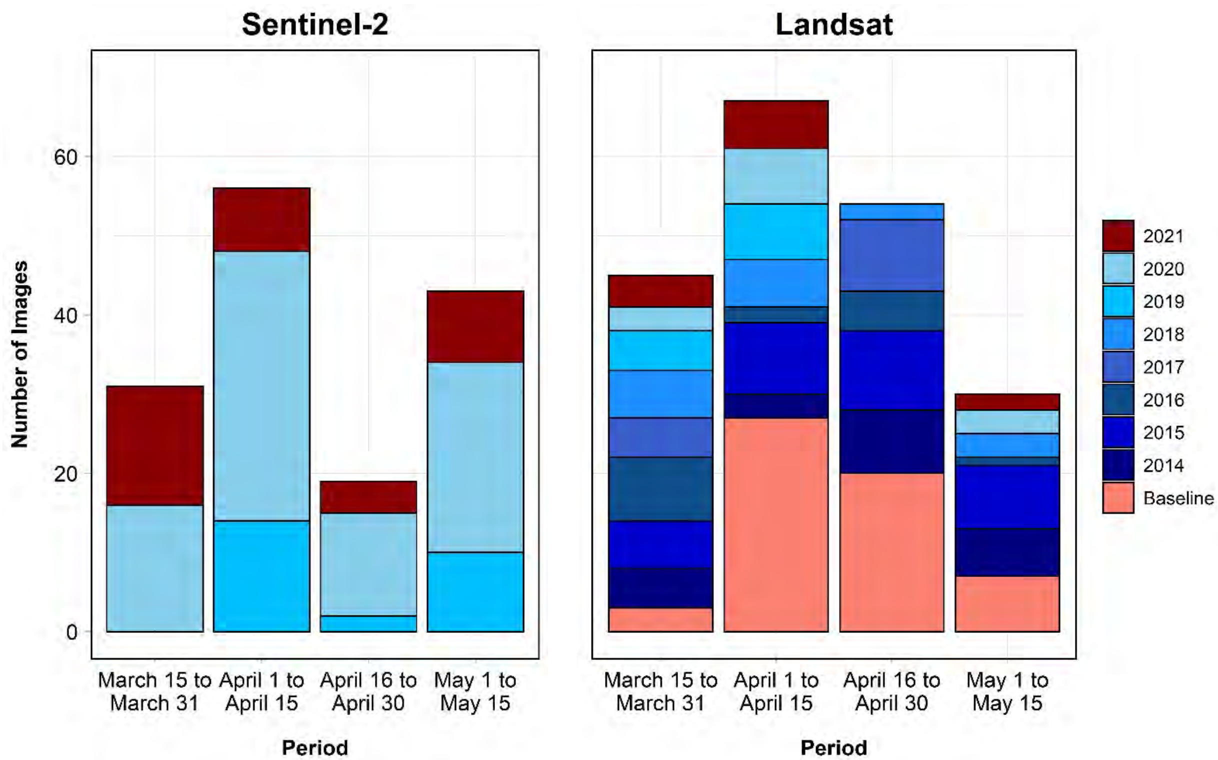


Figure 7-16. Sentinel-2 and Landsat images per year for dustfall imagery analysis (March 15 to May 15).

7.4.2.2 Dustfall Concentration Estimation

The relationship between the dustfall concentrations from the passive dustfall monitors, Df and the SDI from Landsat 8, SDI_{L8}, is illustrated in Figure 7-17 with standard error and the equation below ($F_{1,902} =$ 99.46, $P <$ 0.00001, $R^2 =$ 0.10):

$$SDI_{L8} = 0.0005253 \times Df + 0.007974$$

The relationship between the dustfall concentrations from the passive dustfall monitors, Df and the SDI from Sentinel-2, SDI_{S2}, is illustrated in Figure 7-18 with standard error and the equation below ($F_{1,375} =$ 142.9, $P <$ 0.00001, $R^2 =$ 0.28):

$$SDI_{S2} = 0.0006502 \times Df + 0.01991$$

Separate relationships were determined for each satellite because of differences in band wavelengths and resolution that can affect the surface reflectance values used to calculate the SDI (Table 7-5). The 2021 dataset was excluded from the relationships due to the issues with the precipitation measurements as stated in Section 4 Climate. The precipitation was used to estimate snowfall events that provided a start date for the periods over which the daily dustfall concentrations were summed.

The linear models are statistically significant, but do not fit the data well (low R^2 values). The Landsat model has few data points above 75 g/m2 with high variability which may explain the lower R^2 value than the Sentinel-2 model. Both datasets have high variability across all concentrations possibly due to the different methods of estimating dustfall concentration. The concentration from the passive dustfall monitors is based on the estimated dustfall rate over a period between the image acquisition date and the last estimated snowfall date. This estimate may not fully represent the dust concentration on the ground when the image was captured. Snow samples collected during satellite image acquisition may improve the model fit.

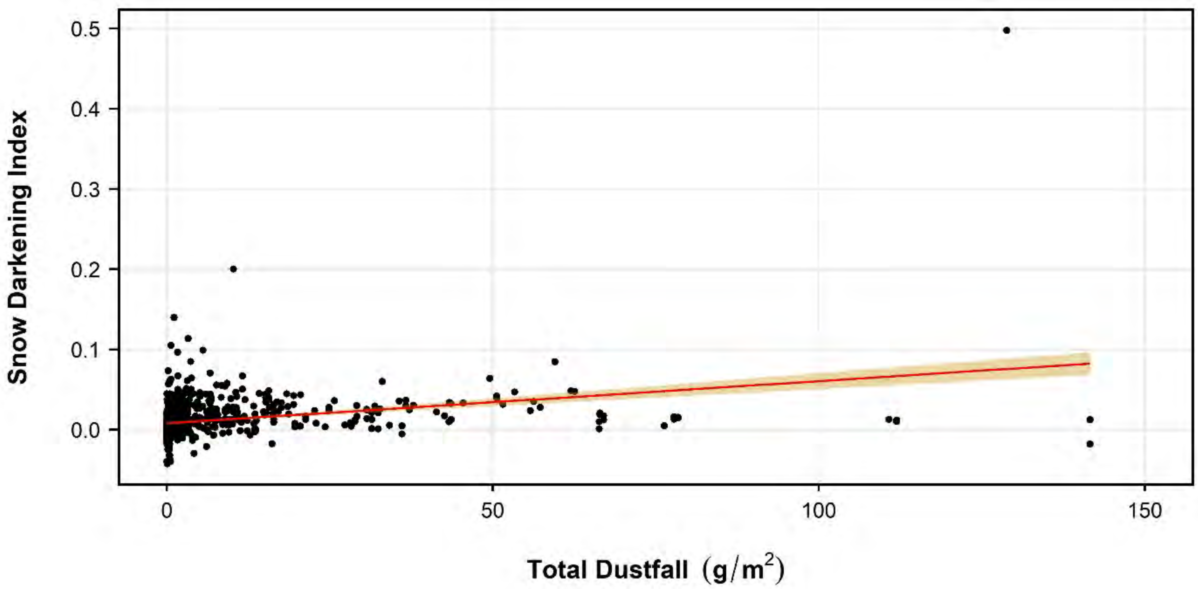
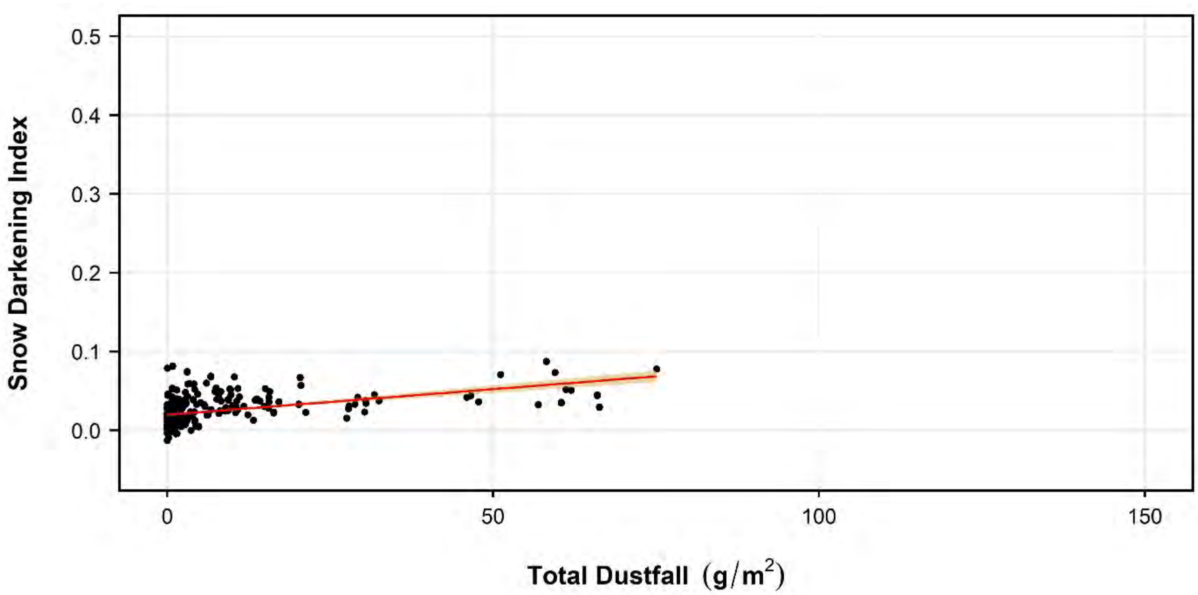


Figure 7-17. 2021 relationship between passive dustfall measurements and Landsat 8 Snow Darkening Index.



80

Figure 7-18. 2021 relationship between passive dustfall measurements and Sentinel-2 Snow Darkening Index.

7.4.2.3 Dustfall Extent and Concentration

The extracted dustfall extents and concentrations represent possible extents and concentrations of mineral dust accumulated on the snow cover. Dustfall concentrations were classified for display into groups similar to the TSP modelling isopleths created for the FEIS described in Section 7.3.1.4. These classes represented total concentrations over the satellite image observation period and are not equivalent to annual concentrations. Dustfall extents derived from Sentinel-2 imagery in 2021 were more extensive than Landsat derived data (Figure 7-19). The difference may be due to the different resolutions of Sentinel-2 (20 m) and Landsat (30 m) imagery, the dates of the imagery, and the greater number of Sentinel-2 images.

The 4.5 to 50 g/m^2 dustfall concentration made up the largest portion of the dustfall extent, followed by concentrations <4.5 g/m^2. Dustfall concentrations >50 g/m^2 covered 0.5% (56.2 km^2) for Landsat and 2.4% (286.7 km^2) for Sentinel-2 of the total PDA 20 km buffer area (11,758.5 km^2).

The dustfall in Map 7-2 to Map 7-11 represent above average (baseline) dustfall extents and concentrations resulting from baseline mean values subtracted from the annual maximum dustfall. Identification and contributions from dust sources cannot be determined solely from the satellite imagery analysis presented here. Possible sources of dust across the landscape are natural exposed ground, wind-exposed ridges, and mining operations (e.g., stockpiles, road traffic, mining). Trends in dustfall extent and concentration around the Project infrastructure (e.g., Milne Port, Map 7-2 and Map 7-3) suggest that the primary source of dust is related to mining operations. However, in the surrounding terrain away from the Project infrastructure, such as around Steensby Inlet (Map 7-10 and Map 7-11), dustfall extents and concentrations may be from multiple naturally occurring sources.

Baseline — Baseline datasets, shown in Map 7-3, Map 7-5, Map 7-7, Map 7-9, and Map 7-11 had extensive dustfall across the landscape. However, other landscape features appeared to be captured in the same band ratios as dustfall upon visual inspection. The main features also extracted included south-facing slopes and bare ground not excluded by the snow masks. These other extracted features were present in all years, not just the baseline datasets. These features' effects were minimized by subtracting the baseline, which contains these features, from subsequent years. By subtracting the baseline, the average concentrations pre-Project were removed, and the remaining above-average concentrations are consistent with the post-baseline years.

Milne Port — The dustfall extent and concentration around Milne Port in the 2021 Landsat dataset represented the TSP modelling isopleths (Map 7-2). The isopleths captured the general pattern of higher dustfall concentration around Milne Port for the 2021 Sentinel-2 dataset. However, dust was still observed up Milne Inlet outside of the isopleths. High dustfall concentrations were observed in the surrounding terrain, however this was due to unmasked exposed ground in the May imagery (Figure 7-20).

Mine Site — The usable Landsat imagery was limited to one image at the Mine Site from April 13, 2021. The resulting dustfall extent and concentration did not appear to be representative of the 2021 dustfall when compared to the Sentinel-2 dataset (Map 7-4). Therefore, the results of dustfall extent at the Mine Site are based solely on the Sentinel-2 dataset.

High concentrations of dustfall were observed near the Project infrastructure at the Mine Site and in localized pockets in the surrounding terrain resulting from exposed ground in the May imagery (Map 7-4 and Figure 7-20). Dustfall was most extensive to the west and south of the Mine Site.

North Crossing, Tote Road (KM28) — The 2021 dustfall concentrations from both datasets showed the general pattern of TSP modelling isopleths along the Tote Road at the North Crossing (Map 7-6). However, dustfall was present across the surrounding terrain outside of the isopleths. The dustfall extents were greater in the Sentinel-2 dataset than the Landsat dataset.

South Crossing, Tote Road (KM78) — The 2021 dustfall concentrations from both datasets had localized high concentrations in the surrounding terrain resulting from exposed ground in the May imagery (Map 7-8 and Figure 7-20). The 2021 Sentinel-2 dustfall extended beyond the TSP modelling isopleths onto the surrounding terrain, but the pattern of concentration along the Tote Road, at the South Crossing, was still discernable.

Steensby Inlet — High dustfall concentrations and extensive dust on the landscape were extracted from the 2021 Sentinel-2 dataset (Map 7-10). The Landsat 8 dustfall was less extensive and lower in concentration. This area has not been developed yet and may represent the year's background dustfall concentration and extent and exposed ground (Figure 7-20).

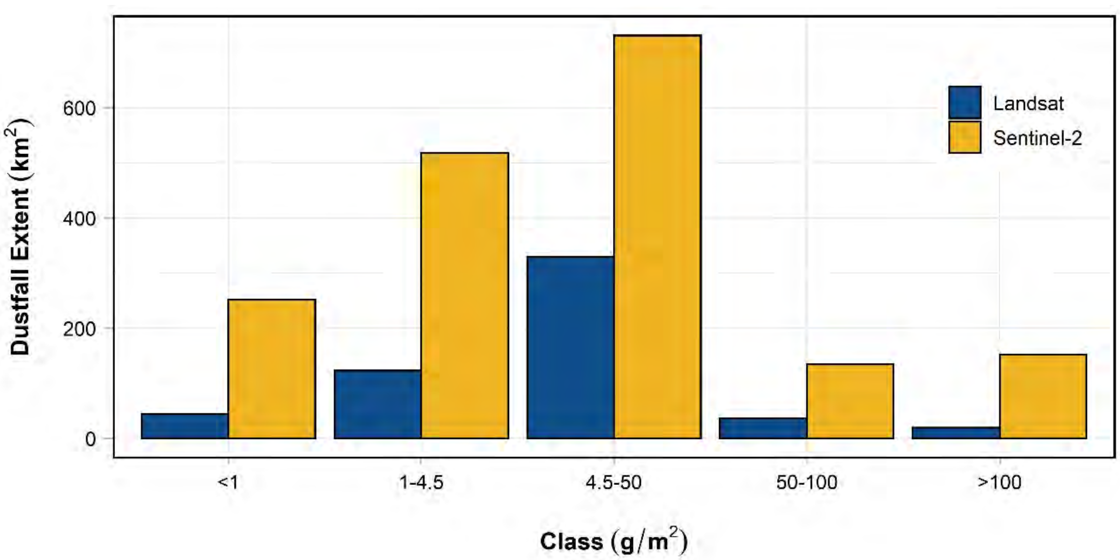


Figure 7-19. 2021 estimated dustfall extents based on Landsat and Sentinel-2 imagery.

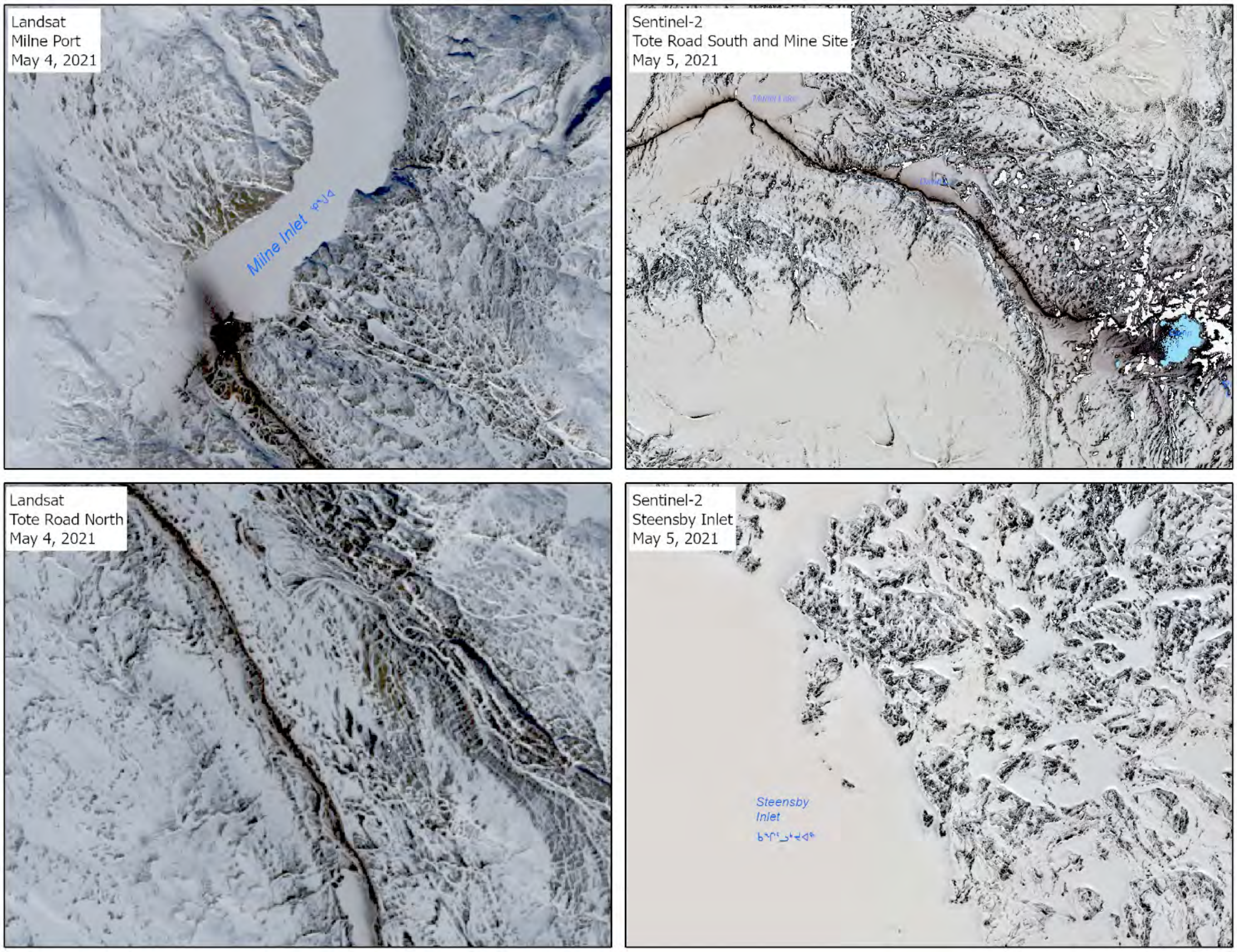


Figure 7-20. Exposed ground in the satellite imagery from the month of May.

7.4.3 INTER-ANNUAL TRENDS

The inclusion of the quantitative analysis of dustfall extent area and concentration resulted in a reanalysis of the post-baseline years 2014 to 2020 and the 2021 dataset (Map 7-2 to Map 7-11). The general trends and observations presented in the 2020 TEAMR (EDI Environmental Dynamics Inc. 2021a) were still valid after the SDI values were converted to dustfall concentration.

The total dustfall extent area in 2021 was greater than in 2020, but less than 2019 for the Sentinel-2 dataset (Table 7-7). For the Landsat dataset, the total dustfall extent decreased in 2020 and 2021. However, limited image coverage occurred around the Mine Site and to the south, which may explain the low 2021 Landsat dustfall extent area. For all years, dustfall concentrations between 4.5 and 50 g/m^2 made up the largest portion of the dustfall extent, followed by 1 to 4.5 g/m^2 and <1 g/m^2. Dustfall concentrations >50 g/m^2 usually covered less than 1% of the PDA 20 km buffer area (11,758.5 km^2), but the Sentinel-2 2021 >50 g/m^2 concentrations covered a larger area than in previous years. This was also apparent in Map 7-2, Map 7-4, Map 7-6, and Map 7-8.

Milne Port — Dustfall extents derived from 2021 Landsat and Sentinel-2 imagery were less than the 2019 and 2020 extents (Map 7-2). The dustfall extents decreased from 2019 to 2021 in both datasets and may reflect the regular application of DusTreat on the ore stockpiles over the winter months (Section 7.2). Before 2021, the dustfall extent up Milne Inlet was consistent with and followed a similar pattern to ore shipments (Figure 7-14), whereby dustfall increased from 2014 to 2019 and slightly decreased in 2020 (i.e., to 2018 levels). Aside from the high concentrations in the surrounding terrain due to exposed ground, the 2021 Landsat dustfall concentration appeared higher around Milne Port than in previous years.

Mine Site — The 2021 Sentinel-2 dustfall extent showed a similar pattern to the 2020 extent, but dust extended further to the south and the northwest than it did in 2020 (Map 7-4). The dustfall on the surrounding terrain to the south extended beyond the modelled isopleths, as it did in 2019 (Map 7-4).

North Crossing, Tote Road (KM28) — The dustfall extents derived from 2021 Landsat and Sentinel-2 imagery were larger than the 2020 extents, similar to the 2019 extents (Map 7-6). The 2021 dustfall concentrations from both datasets were higher along the Tote Road. Given the satellite imagery analysis requires imagery with snow, the efficacy of DustBlockr®, as a summer suppressant cannot be assessed through this method. The dustfall extents from 2014 to 2021 (Map 7-6 and Map 7-7) did not reflect a parallel relationship to the increase in ore haul transits or total transits along the Tote Road (Section 6 Tote Road Traffic).

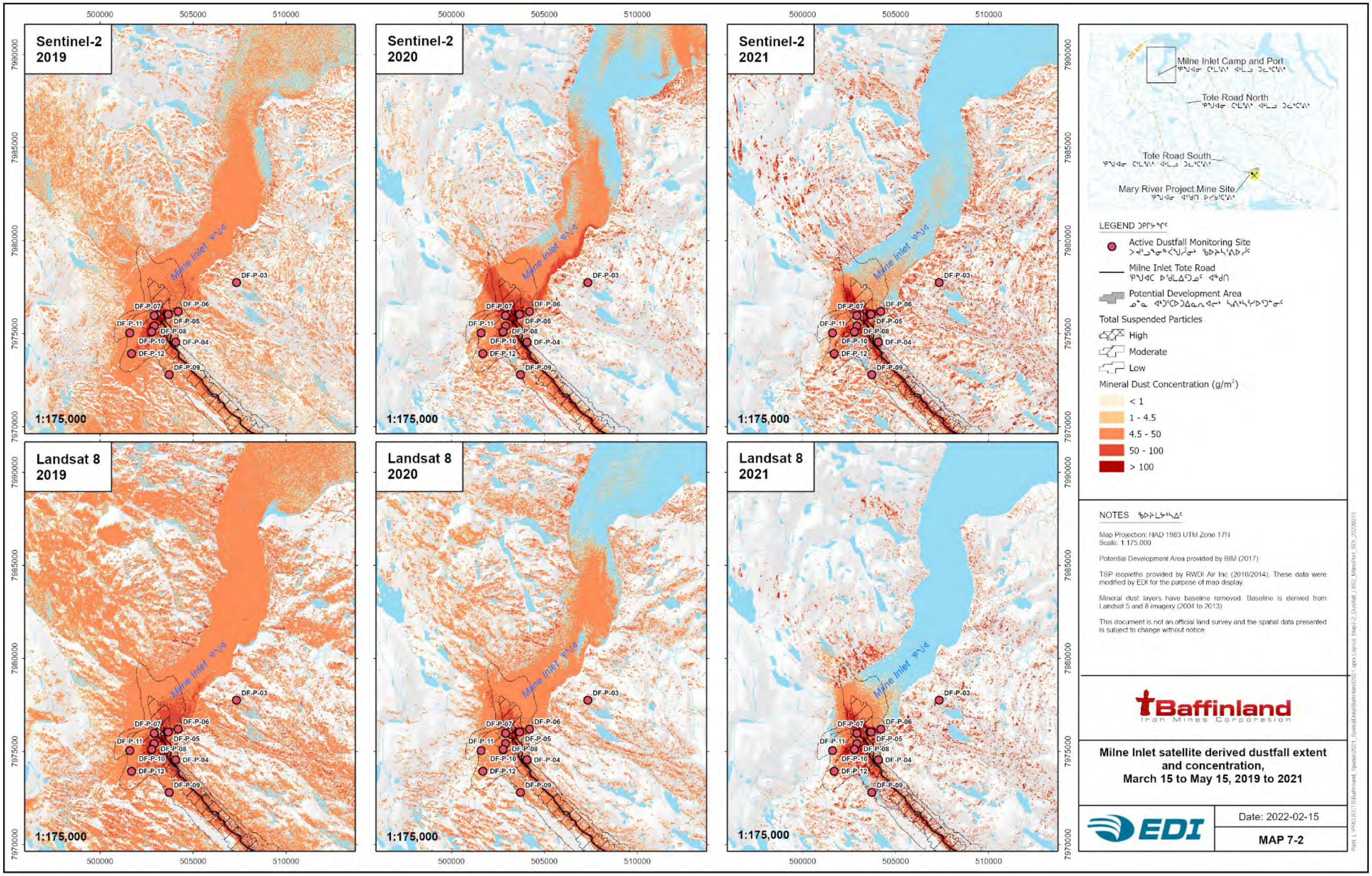
South Crossing, Tote Road (KM78) — The dustfall extent derived from 2021 Landsat imagery was smaller around the Tote Road than the 2019 and 2020 extents (Map 7-8). However, the dustfall extent extracted from the 2021 Sentinel-2 imagery was larger than the 2020 extent and similar to the 2019 extent (Map 7-8). The difference between the Landsat and Sentinel-2 extents may be due to the fewer Landsat images in this area. Given that the satellite imagery analysis requires imagery with snow, the efficacy of DustBlockr®, as a summer suppressant cannot be assessed through this method. The dustfall extents from 2014 to 2021 (Map 7-8 and Map 7-9) did not reflect a parallel relationship to the increase in ore haul transits or total transits along the Tote Road (Section 6 Tote Road Traffic).

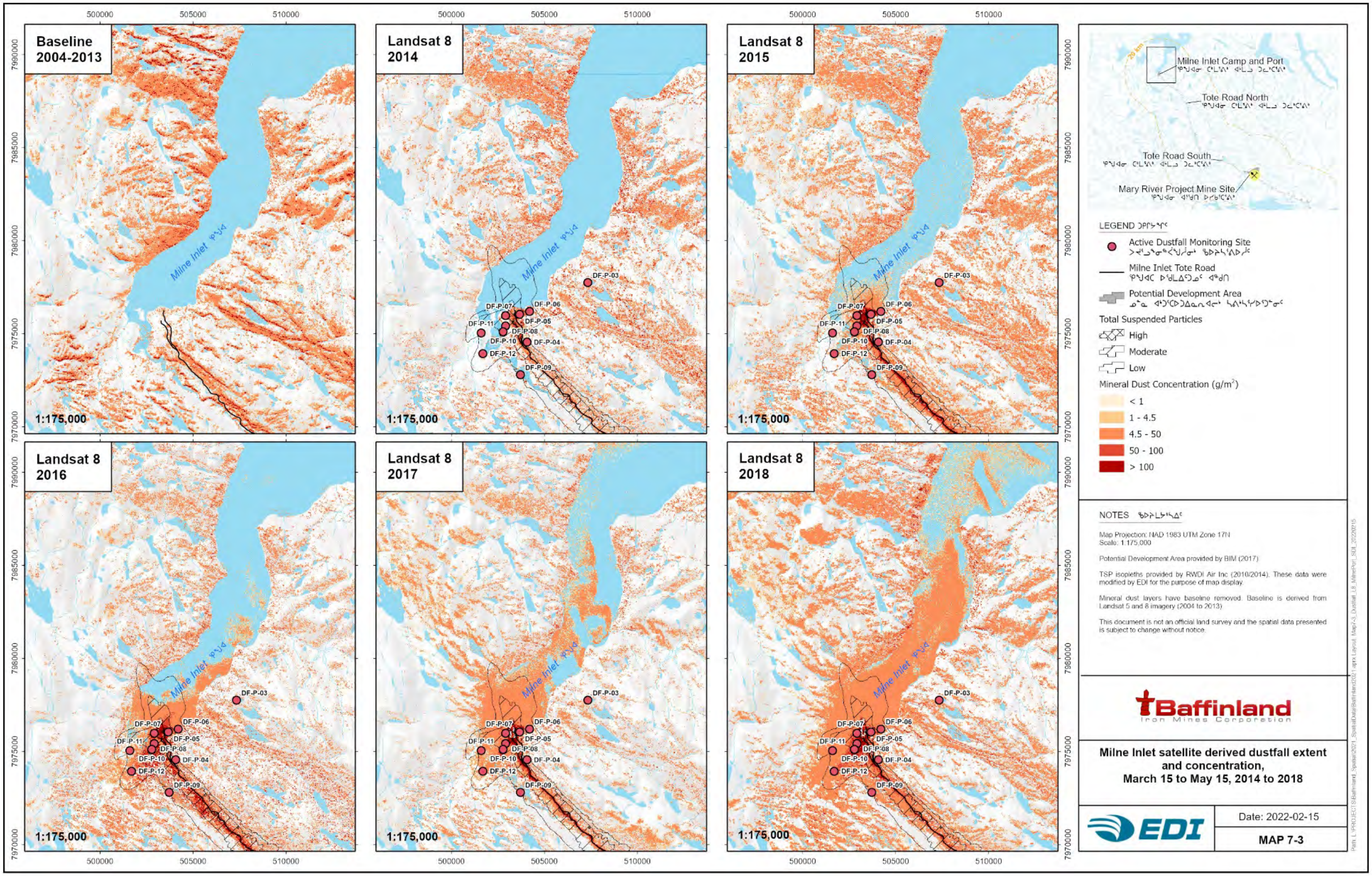
Steensby Inlet — The dustfall extents and concentrations on the landscape in Map 7-10 and Map 7-11 followed a similar pattern to the surrounding terrain around the Project infrastructure shown in Map 7-2 to Map 7-9, particularly the large dustfall extents in 2015, 2019 and 2021. This area has not been developed yet and may represent the year's background dustfall concentration and extent.

Table 7-7. 2021 dustfall area extent (km² and %) by dustfall classes based on Landsat and Sentinel 2 imagery.

Concentration Class		< 1 g/m²	1 to 4.5 g/m²	4.5 to 50 g/m²	50 to 100 g/m²	> 100 g/m²	Total
Year	Sensor	Area km² (%)	Area km² (%)	Area km² (%)	Area km² (%)	Area km² (%)	Area km² (%)
Baseline	Landsat 5	136.3 (1.2)	355.2 (3.0)	664.3 (5.6)	83.6 (0.7)	108.2 (0.9)	1347.6 (11.5)
2014	Landsat 8	108.3 (0.9)	293.2 (2.5)	713.4 (6.1)	45.6 (0.4)	11.6 (0.1)	1172.1 (10.0)
2015	Landsat 8	224.5 (1.9)	608.1 (5.2)	1436.1 (12.2)	88.2 (0.8)	26.7 (0.2)	2383.6 (20.3)
2016	Landsat 8	115.5 (1.0)	294.9 (2.5)	590.2 (5.0)	47.2 (0.4)	24.7 (0.2)	1072.5 (9.1)
2017	Landsat 8	48.8 (0.4)	127.8 (1.1)	260.6 (2.2)	13.7 (0.1)	6.4 (0.1)	457.4 (3.9)
2018	Landsat 8	120.8 (1.0)	343.4 (2.9)	917.8 (7.8)	54.9 (0.5)	13.4 (0.1)	1450.2 (12.3)
2019	Landsat 8	260.8 (2.2)	727.4 (6.2)	1813.5 (15.4)	89.6 (0.8)	10.1 (0.1)	2901.4 (27.4)
2019	Sentinel-2	333.4 (2.8)	720.4 (6.1)	953.2 (8.1)	76.3 (0.6)	41.4 (0.4)	2124.7 (18.1)
2020	Landsat 8	100.4 (0.9)	278.0 (2.4)	730.4 (6.2)	30.3 (0.3)	2.7 (0.0)	1141.9 (9.7)
2020	Sentinel-2	26.5 (0.2)	69.8 (0.6)	204.3 (1.7)	23.9 (0.2)	9.9 (0.1)	334.5 (2.8)
2021	Landsat 8	44.5 (0.4)	123.2 (1.0)	329.1 (2.8)	36.4 (0.3)	19.8 (0.2)	552.9 (4.7)
2021	Sentinel-2	252.0 (2.1)	517.9 (4.4)	731.1 (6.2)	135.0 (1.1)	151.7 (1.3)	1787.6 (15.2)

Note: Baseline is the average dustfall concentration between 2004 and 2013 while the post-project years (2014 to 2021) have the baseline removed. Percentages are based on the total area of the PDA 20 km buffer.


Sentinel-2 2019
Sentinel-2 2020
Sentinel-2 2021
Landsat 8 2019
Landsat 8 2020
Landsat 8 2021
1:175,000
Milne Inlet
DF-P-03
DF-P-04
DF-P-05
DF-P-06
DF-P-07
DF-P-08
DF-P-09
DF-P-10
DF-P-11
DF-P-12
500000
505000
510000
7970000
7975000
7980000
7985000
7990000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Potential Development Area provided by BIM (2017)
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Iron Mines Corporation
Milne Inlet satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2021
EDI
Date: 2022-02-15
MAP 7-2


Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
1:175,000
Milne Inlet
DF-P-03
DF-P-04
DF-P-05
DF-P-06
DF-P-07
DF-P-08
DF-P-09
DF-P-10
DF-P-11
DF-P-12
500000
505000
510000
7970000
7975000
7980000
7985000
7990000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Potential Development Area provided by BIM (2017)
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013)
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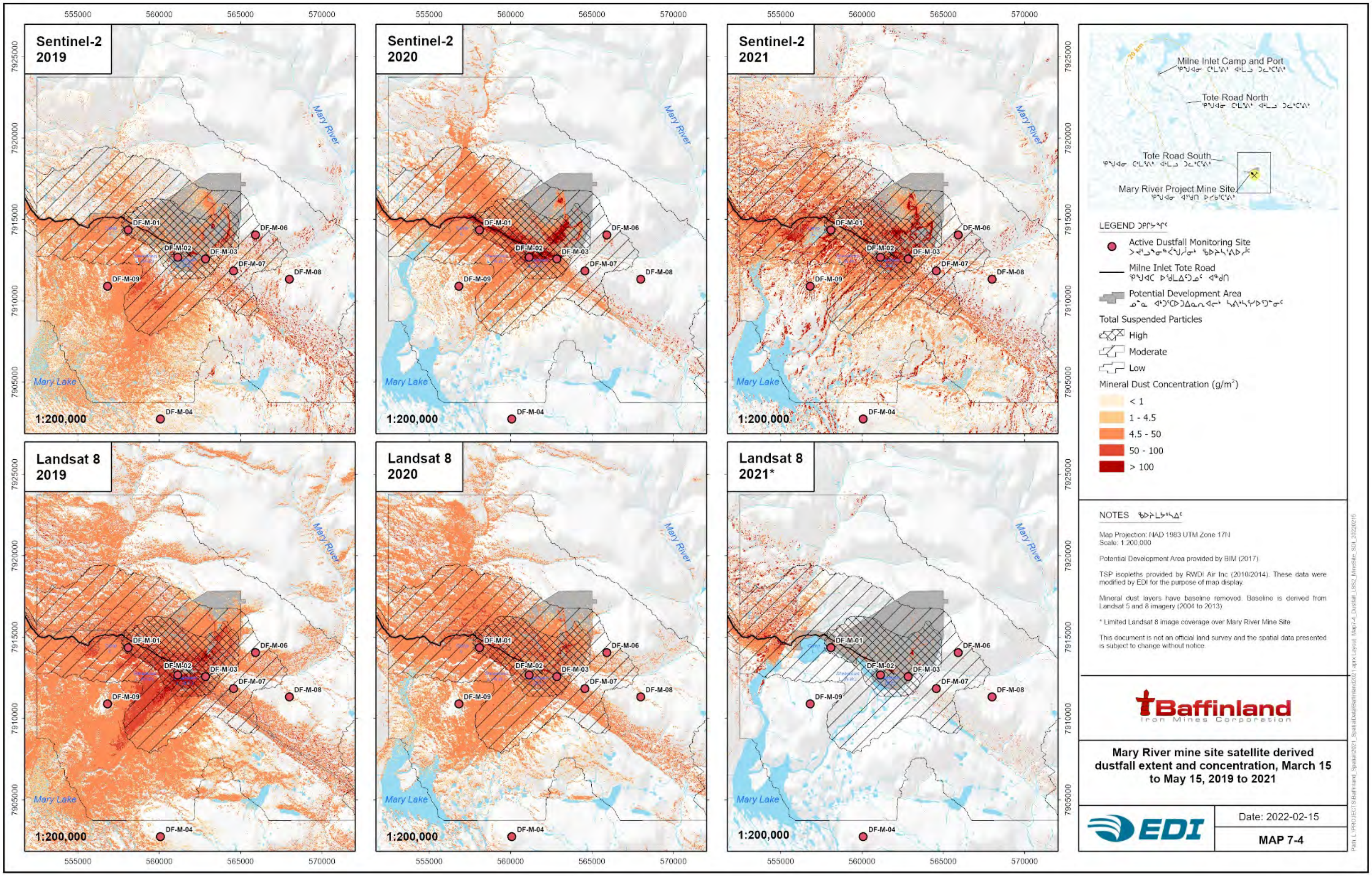
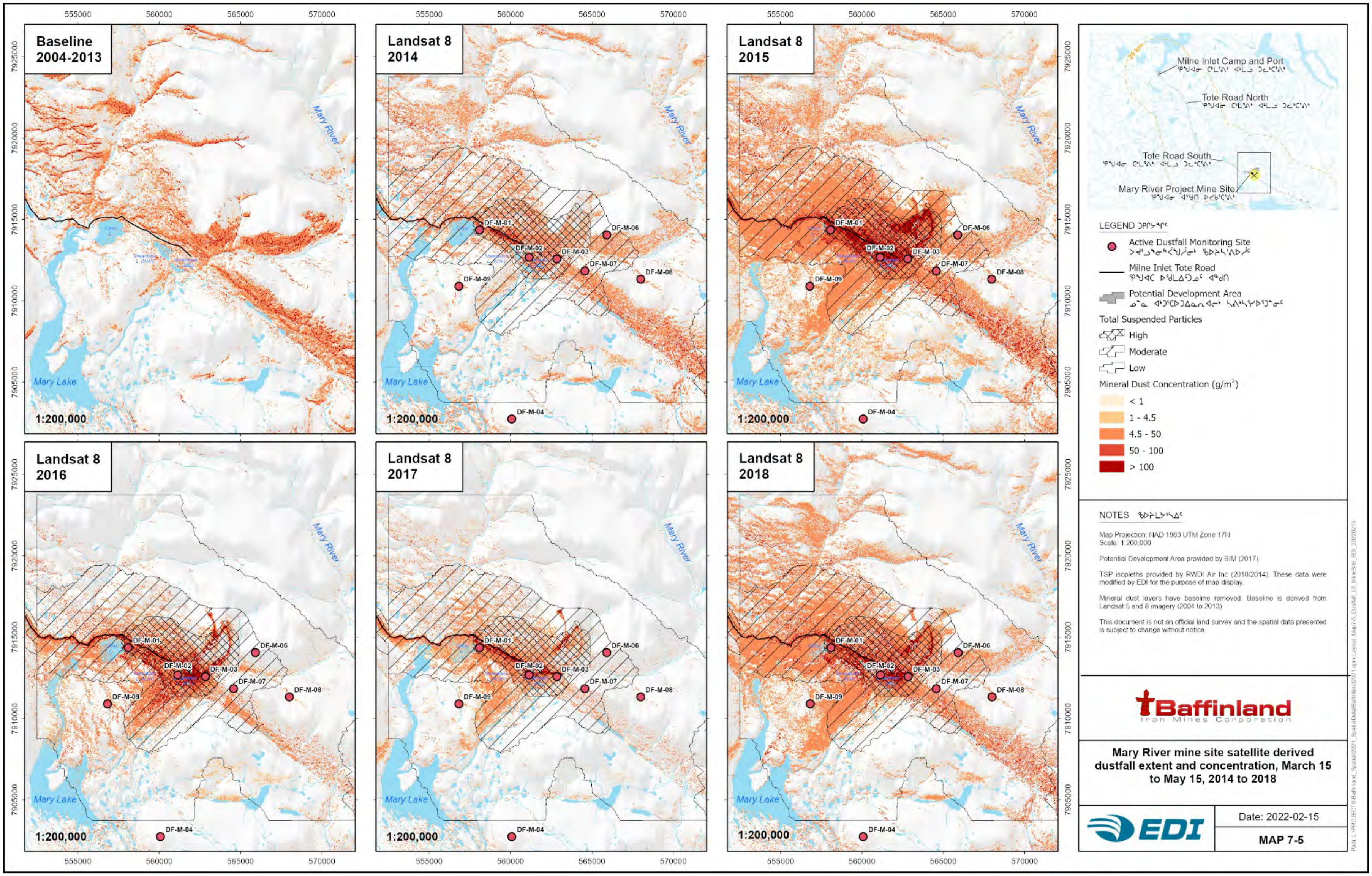
Baffinland
Iron Mines Corporation
Milne Inlet satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2022-02-15
MAP 7-3


Sentinel-2 2019
Sentinel-2 2020
Sentinel-2 2021
Landsat 8 2019
Landsat 8 2020
Landsat 8 2021*
1:200,000
Mary River
Mary Lake
DF-M-01
DF-M-02
DF-M-03
DF-M-04
DF-M-06
DF-M-07
DF-M-08
DF-M-09
555000
560000
565000
570000
7905000
7910000
7915000
7920000
7925000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:200,000
Potential Development Area provided by BIM (2017).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
* Limited Landsat 8 image coverage over Mary River Mine Site
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Iron Mines Corporation
Mary River mine site satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2021
EDI
Date: 2022-02-15
MAP 7-4


Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
1:200,000
Mary Lake
Mary River
DF-M-01
DF-M-02
DF-M-03
DF-M-04
DF-M-06
DF-M-07
DF-M-08
DF-M-09
555000
560000
565000
570000
7905000
7910000
7915000
7920000
7925000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:200,000
Potential Development Area provided by BIM (2017).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
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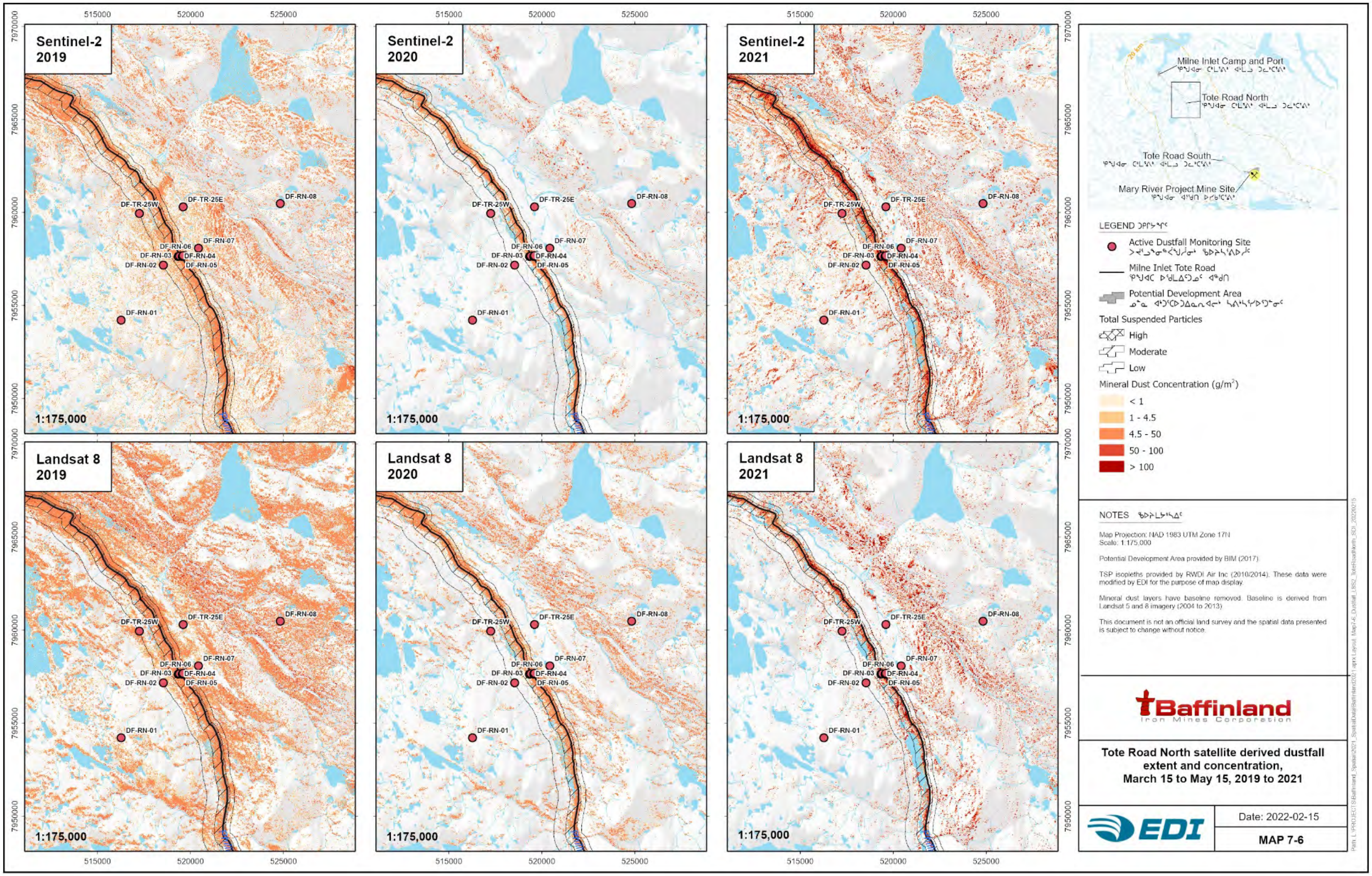
Baffinland
Iron Mines Corporation
Mary River mine site satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2022-02-15
MAP 7-5


Sentinel-2 2019
Sentinel-2 2020
Sentinel-2 2021
Landsat 8 2019
Landsat 8 2020
Landsat 8 2021
1:175,000
DF-TR-25W
DF-TR-25E
DF-RN-08
DF-RN-07
DF-RN-06
DF-RN-03
DF-RN-04
DF-RN-02
DF-RN-05
DF-RN-01
515000
520000
525000
7970000
7965000
7960000
7955000
7950000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Potential Development Area provided by BIM (2017).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
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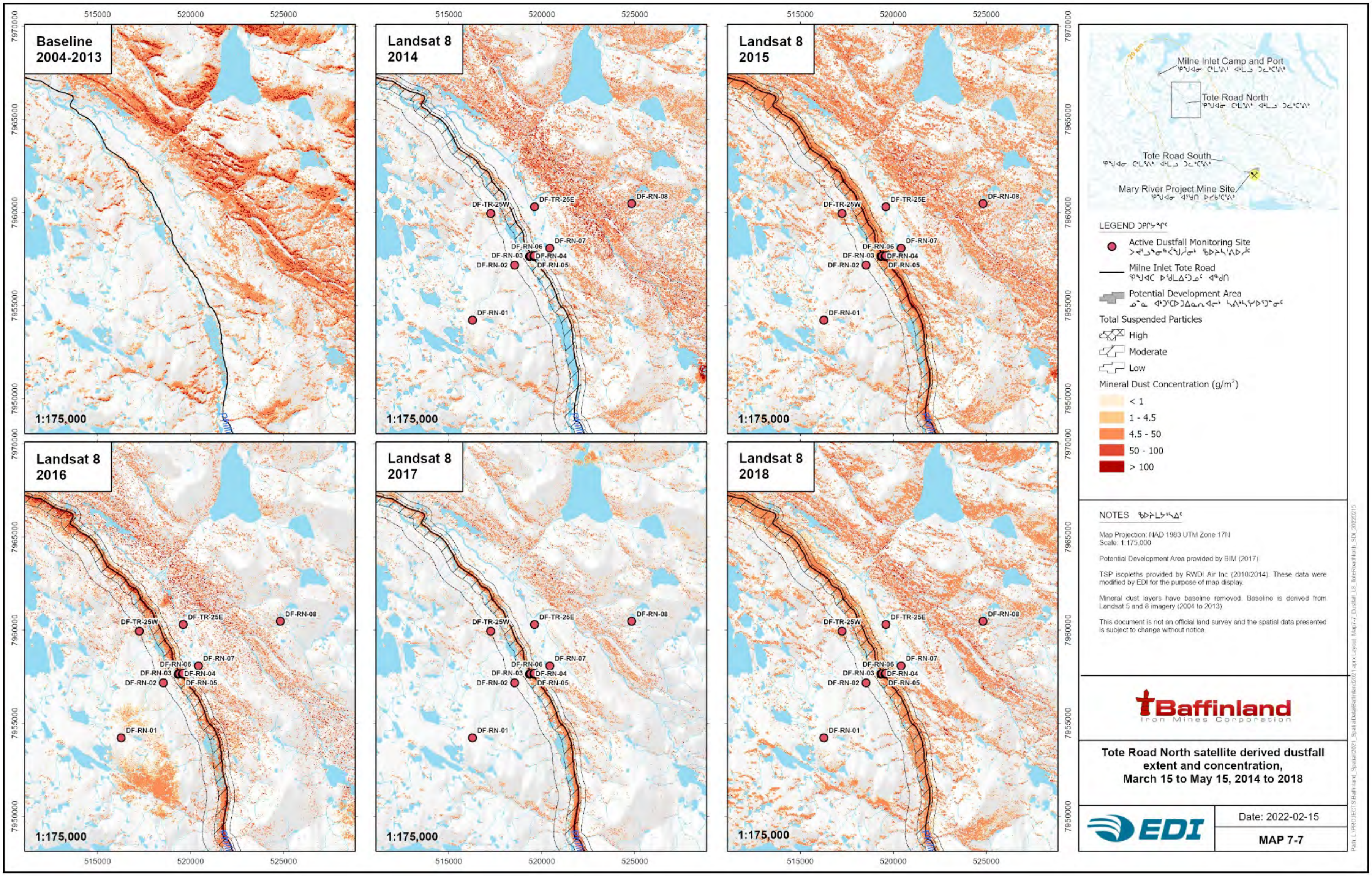
Baffinland
Iron Mines Corporation
Tote Road North satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2021
EDI
Date: 2022-02-15
MAP 7-6


Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
1:175,000
515000
520000
525000
7970000
7965000
7960000
7955000
7950000
DF-TR-25W
DF-TR-25E
DF-RN-08
DF-RN-07
DF-RN-06
DF-RN-03
DF-RN-04
DF-RN-02
DF-RN-05
DF-RN-01
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Potential Development Area provided by BIM (2017)
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
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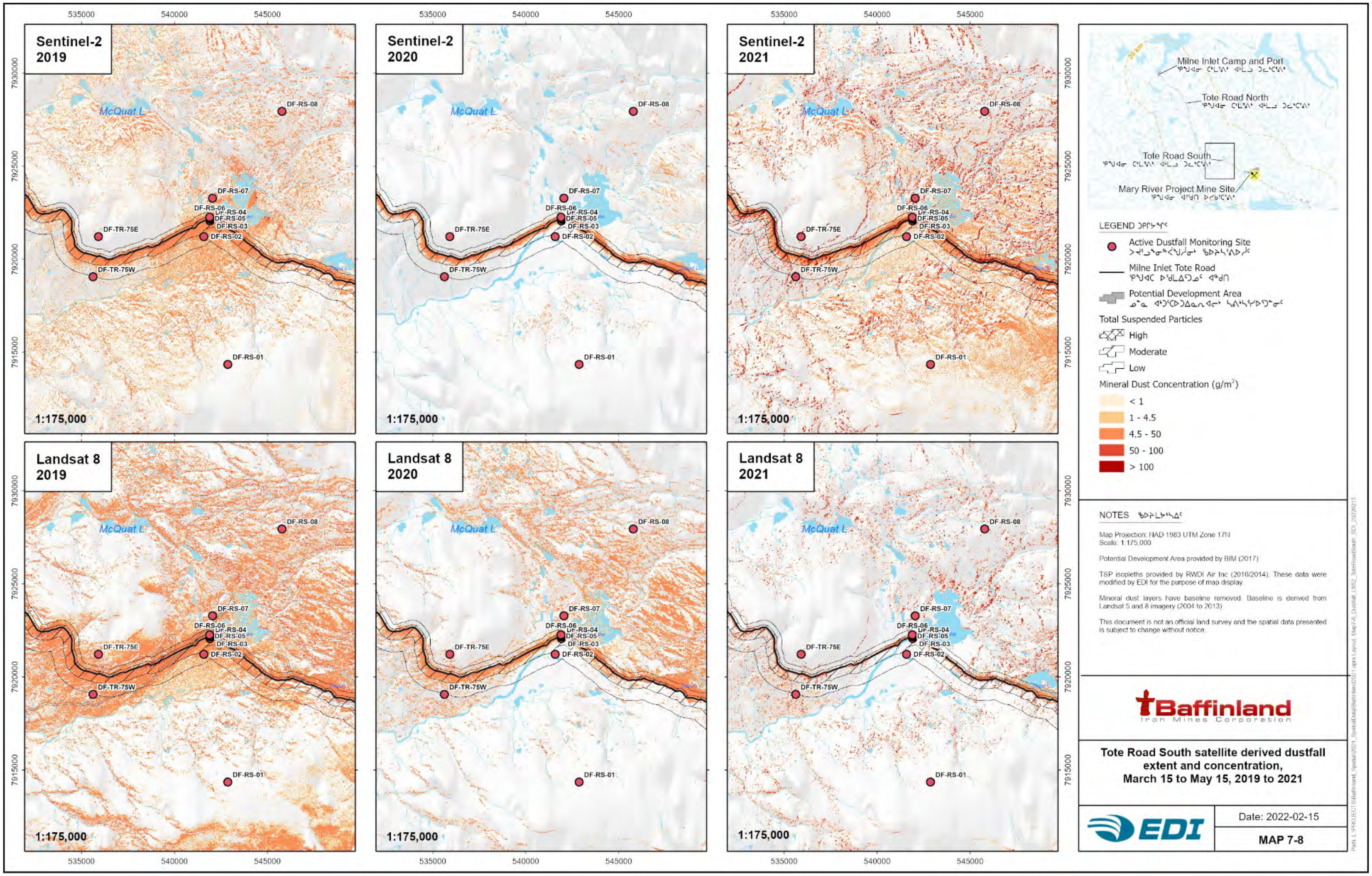
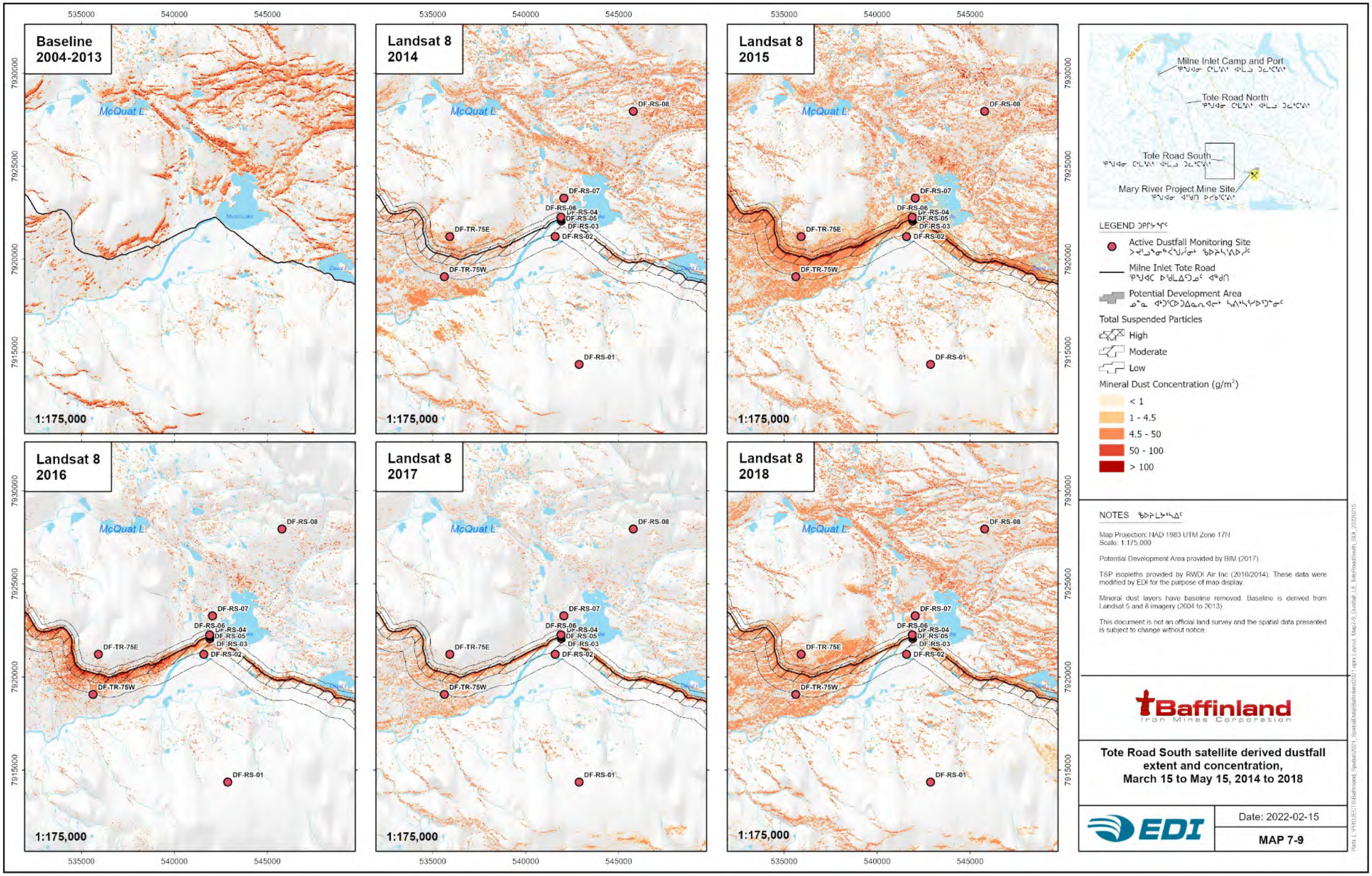
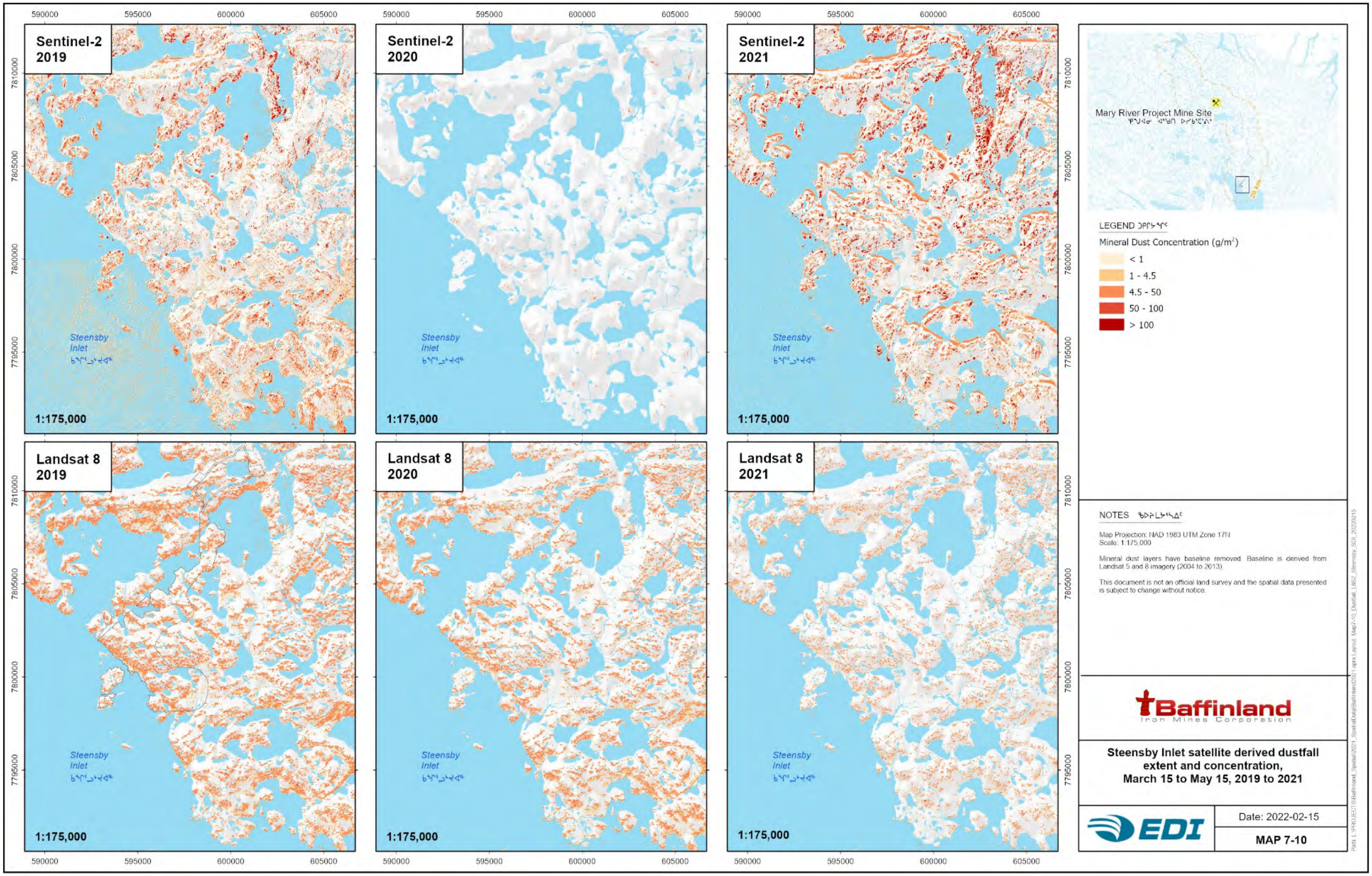
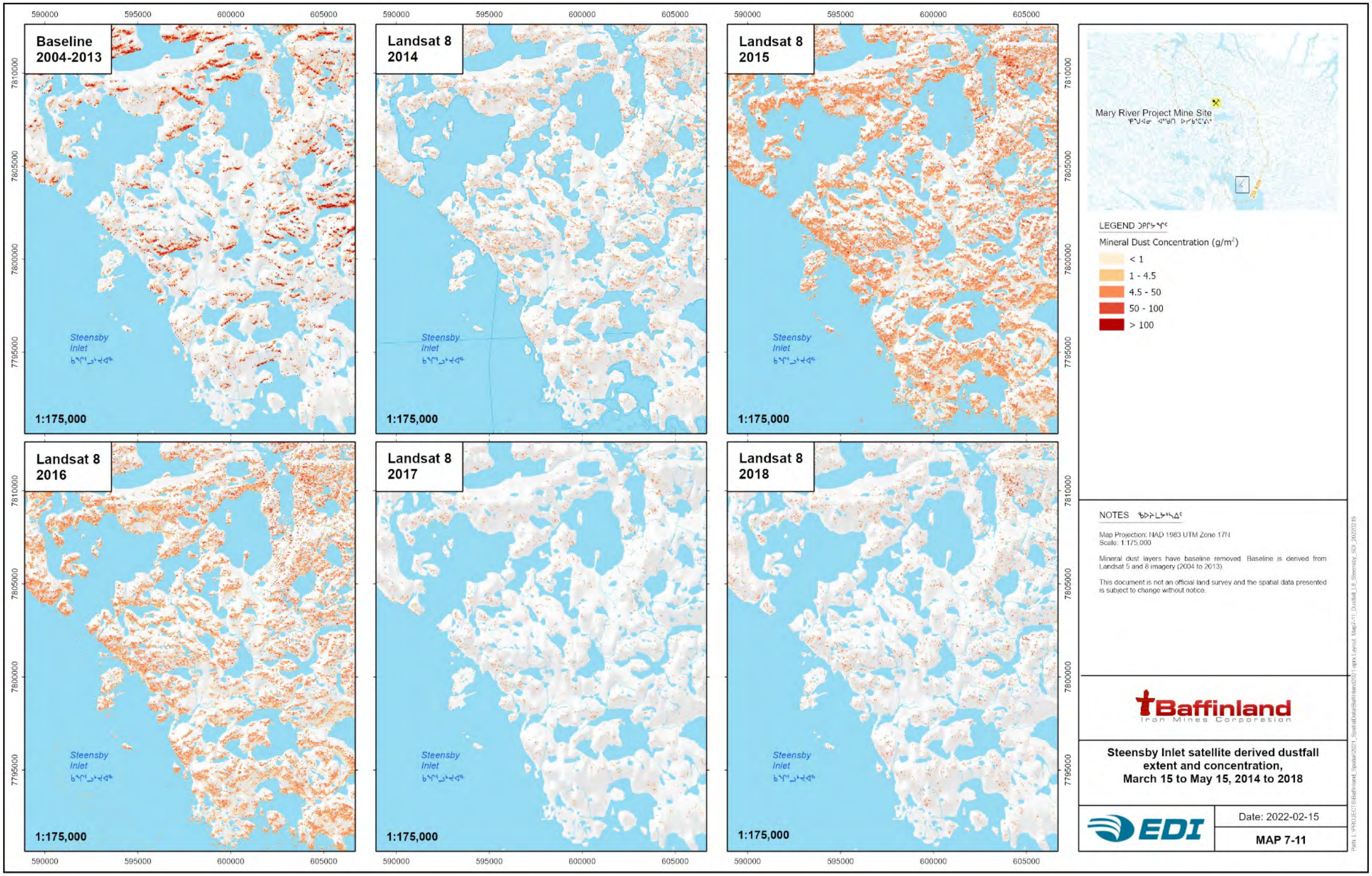
Baffinland Iron Mines Corporation
Tote Road North satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2022-02-15
MAP 7-7



Sentinel-2 2019
Sentinel-2 2020
Sentinel-2 2021
Landsat 8 2019
Landsat 8 2020
Landsat 8 2021
McQuat L.
DF-RS-01
DF-RS-02
DF-RS-03
DF-RS-04
DF-RS-05
DF-RS-06
DF-RS-07
DF-RS-08
DF-TR-75E
DF-TR-75W
1:175,000
535000
540000
545000
7915000
7920000
7925000
7930000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Potential Development Area provided by BIM (2017)
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013)
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Iron Mines Corporation
Tote Road South satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2021
EDI
Date: 2022-02-15
MAP 7-8


Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
1:175,000
McQuat L.
DF-RS-01
DF-RS-02
DF-RS-03
DF-RS-04
DF-RS-05
DF-RS-06
DF-RS-07
DF-RS-08
DF-TR-75E
DF-TR-75W
535000
540000
545000
7915000
7920000
7925000
7930000
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Project Mine Site
LEGEND
Active Dustfall Monitoring Site
Milne Inlet Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Potential Development Area provided by BIM (2017).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Iron Mines Corporation
Tote Road South satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2022-02-15
MAP 7-9


Sentinel-2 2019
Sentinel-2 2020
Sentinel-2 2021
Landsat 8 2019
Landsat 8 2020
Landsat 8 2021
Steensby Inlet
1:175,000
590000
595000
600000
605000
7810000
7805000
7800000
7795000
Mary River Project Mine Site
LEGEND
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland Iron Mines Corporation
Steensby Inlet satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2021
EDI
Date: 2022-02-15
MAP 7-10


Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
Steensby Inlet
1:175,000
Mary River Project Mine Site
LEGEND
Mineral Dust Concentration (g/m²)
< 1
1 - 4.5
4.5 - 50
50 - 100
> 100
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Scale: 1:175,000
Mineral dust layers have baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Iron Mines Corporation
Steensby Inlet satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2022-02-15
MAP 7-11

7.5 DUSTFALL SUMMARY

The passive dustfall monitoring program data collected in 2021 indicted that dustfall remained relatively constant or decreased at most year-round sampling locations throughout the Project area.

- Dustfall monitoring data were compared to predictions made in the Project's FEIS and are important in the context of effects on other indicators, including potential vegetation and soil changes.
- The mean number of ore haul transits per day in 2021 was 227.2, and the number of non-haul transits per day was 28.6. These data are consistent with recent years and fall below the projected number of ore and non-ore haul transits for 2021.
- The magnitude of annual dustfall at the Mine Site sample locations was consistent with recent years. In 2021, the highest dustfall at the Mine Site area was associated with the airstrip and the Mine haul road. The airstrip consistently had the highest dustfall deposition in the Mine Site area in all years except 2019.
    - Dustfall at the Mine Site in 2021 did not show a clear summer/winter difference; it followed a four-month cyclical pattern, with the highest dustfall measured in January, May, and September. This cyclical annual pattern was not evident in an inter-annual comparison; elevated dustfall was noted in late winter/early spring months of March through May each year, with a non-significant increase in September.
- The magnitude of dustfall at Milne Port has remained constant, or in some cases has slightly decreased, a trend that began in 2018. The highest dustfall in the Milne Port area is associated with the ore stockpiles, with lesser amounts generated by the sealift staging area. Decreases in 2021 may be related to the application of DusTreat on the stockpiles, which works to prevent dust lift-off from the piles.
    - Dustfall at Milne Port in 2021 did not show a clear summer/winter difference; it followed a three-month cyclical pattern, with the highest dustfall measured in April, July and October.
- Along the Tote Road in 2021, dustfall was less in 2021 when compared with recent years, despite comparable traffic transit numbers; this decrease which may have been associated with the application of DustBlockr®, along the full length of the road.
    - In all areas along the Tote Road, dustfall was elevated in May/June and September, which are the "shoulder seasons", when air temperatures are not high enough to allow the application of DustBlockr®, but conditions are not continuously frozen.
- Dustfall at multiple helicopter access monitoring locations was artificially elevated in July. Review of flight data indicated poor weather conditions (low cloud ceiling) resulted in low flight lines, which likely resulted in additional dust deposition in the sampling vessels. These data were included in 2021 analyses but have been flagged as likely artificially elevated. Dustfall sample collection protocols will be revised to prevent this from occurring in the future.
- Dustfall 1,000 m from the PDA, was measured at 12 sites in 2021. Dustfall was low at all sites.

Despite increased in production from 2016 to 2020, dustfall generally plateaued with only modest increases in some Project areas. Post-2016 decreases in dustfall are likely associated with implementation of dustfall mitigation strategies in all Project areas. The 2021 dustfall imagery analysis included a quantitative analysis of dustfall extents and concentrations. The additional analysis indicated extents and concentrations of dustfall increased from 2020 but were less than 2019 within 20 km of the PDA.

- Dustfall extents and relative magnitudes were extracted from satellite images using the Snow Darkening Index (Red−Green)/(Red+Green) band ratio, and baseline (average dustfall between 2004 and 2013) was removed.
- A relationship between the passive dustfall collector concentration measurements and the SDI was calculated to convert the SDI values to concentrations.
- For all years, dustfall concentrations between 4.5 and 50 g/m^2 covered the most, followed by concentrations <4.5 g/m^2. Concentrations >50 g/m^2 covered the least area and were generally less than 1% of the PDA 20 km buffer area used in the analysis.
- The 2021 dustfall extents decreased at Milne Port, potentially due to the application of DusTreat, and were similar to the 2020 pattern at the Mine Site with a larger extent. Along the Tote Road, the 2021 dustfall extents were similar to previous years along the road. The dustfall extents appeared to cover more area on the surrounding terrain than the 2020 extents but were similar to the 2019 extents. Total dustfall area was 552.9 km^2 (4.7% of the PDA 20 km buffer area) for Landsat and 1787.6 km^2 (15.2%) for Sentinel-2.
- The 2021 dustfall concentrations were high near Milne Port, the Mine Site, and along the Tote Road. Localized pockets of high dustfall concentrations occurred on the surrounding terrain that were also apparent around the undisturbed Steensby Inlet area are most likely due to unmasked exposed ground in the May imagery.
- The modelling isopleths for total suspended particles captured the pattern of 2021 dustfall concentrations around the Project infrastructure but did not account for the localized high dustfall concentrations in the surrounding terrain.
- Based on the results presented in Section 8 – Vegetation, although dustfall levels have been consistently higher than FEIS predictions, dustfall associated with the Project does not pose a risk to environmental or human health, and at present remains primarily an aesthetic effect, rather than a biophysical concern.

8 VEGETATION

Data collection for long-term vegetation monitoring was completed in 2021 at the Mary River Project for the following programs:

- dustfall monitoring (Section 7 Dustfall); and,
- vegetation and soil base metals monitoring.

8.1 VEGETATION AND SOIL BASE METALS MONITORING

The following Project Conditions (PCs) were used to address concerns regarding potential increases in trace metal concentrations in vegetation and soil from Project activities (Nunavut Impact Review Board 2020):

- PC#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.*
- PC#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.*

Note: PC#38 and PC#50 and Project Commitments #67, 69, and 107 also relate (direct or indirectly) to these concerns and reporting requirements for the vegetation and soil base metals monitoring program.

To address these PCs, a long-term vegetation and soil base metals monitoring program was initiated in 2012, as described in the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) (Baffinland Iron Mines Corporation 2016a). 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,
- verify that metal concentrations are below or within the acceptable range for established soil quality guidelines and relevant vegetation indicator values.

Given that dustfall deposition is the primary source of anthropogenic metals at the Project, the vegetation and soil base metals monitoring program has been designed to align and facilitate comparisons with the dustfall monitoring program (Section 7 Dustfall) to assess metals uptake in vegetation and soil related to Project activities.

8.1.1 METHODS

8.1.1.1 Monitoring History and Changes in Sampling Procedures

Procedures for the vegetation and soil base metals monitoring program have been adapted over time due to Project circumstances, investigative outcomes, and recommendations from the Terrestrial Environment Working Group (TEWG).

- Pre-construction baseline data on vegetation and soil base metal concentrations were first collected for the Project in 2008; however, these data were not used due to sampling and analytical discrepancies. Additionally, collection methods were not effectively documented and did not facilitate data continuity or comparability (Baffinland Iron Mines Corporation 2010a).
- Additional baseline sampling was conducted within the Regional Study Area in 2012 and 2013. Vegetation sampling targeted three focal groups: lichen (*Flavocetraria cucullata*, *F. nivalis*, *Cladina arbuscula*, and *C. rangiferina*), willow (*Salix* spp.), and blueberry (*Vaccinium uliginosum*). The analysis focused on seven metals/metalloids deemed to be contaminants of potential concern (CoPC): aluminum (Al), arsenic (As), cadmium (Cd), copper (Cu), lead (Pb), selenium (Se), and zinc (Zn) (EDI Environmental Dynamics Inc. 2014). Standardized sampling procedures and soil quality guidelines from the Canadian Council of Ministers of the Environment (CCME) were used as threshold values for soil. Peer-reviewed literature sources were used in the absence of explicit quality guidelines for lichen. Monitoring design and key findings are presented in the 2013 Terrestrial Environment Annual Monitoring Report (EDI Environmental Dynamics Inc. 2014).
- Sampling design and intensity were increased in 2014 to improve data capture and analysis. Lichen—recognized as an indicator of environmental conditions and accumulator of atmospheric pollutants (Naeth and Wilkinson 2008, Aslan et al. 2011)—was selected as the key indicator and focal group for metals uptake. Blueberry and willow were removed as assessment targets due to their limited abundance or lack of reference guidelines (EDI Environmental Dynamics Inc. 2015). Aluminum was removed as a CoPC due to its high variability, ubiquitous nature, and lack of CCME and US Environment Protection Agency (US EPA) soil quality guidelines to protect environmental and human health.
- The Nunavut Impact Review Board (NIRB) 2014–2015 Annual Monitoring Report for the Mary River Project (Nunavut Impact Review Board 2015) addressed recommendations from the NIRB and Government of Nunavut to further modify the vegetation and soil base metals monitoring program. Before implementing any modifications, Baffinland Iron Mines Corporation (Baffinland) evaluated the program's experimental design—especially concerning statistical power and the ability to detect Project-related effects—to optimize sampling intensity and distribution. Ultimately, the study design was expanded to facilitate 'Near', 'Far', and 'Reference' locations; the procedures were then aligned with the dustfall monitoring program where feasible. Monitoring design and key findings are presented in the 2017 and 2018 Terrestrial Environment Annual Monitoring Reports (EDI Environmental Dynamics Inc. 2017, 2018).

- The vegetation and soil base metals monitoring program was formalized in 2019 (using present methodology) with considerations and inclusions per the NIRB and GN recommendations (EDI Environmental Dynamics Inc. 2017). The analysis focused on six CoPCs in soil and lichen: As, Cd, Cu, Pb, Se, and Zn. Soil and lichen CoPC concentrations were compared between the 'Before' and 'After' periods and the distance from the Potential Development Area (PDA).
- Ten additional sample sites were added in 2020 to the Far distance category. Since most Project-emitted dust is deposited within 1,000 m of the PDA, increasing sample size in this range is expected to improve statistical ability to detect and quantify changes in metal concentrations associated with this distance. This modification to the study design was implemented in response to TEWG reviewer comments in 2019 (QIA; 2018 TEAMR comments; T-24042019).
- In 2021, the soil and vegetation metals monitoring sampling program had met its 5-year monitoring commitments. For logistical reasons, timing and access, sampling (12 sites) primarily focussed on Milne Porte and the Tote Road resulting in a reduced sample size; sampling of Far/Reference sites were less represented in the data capture.

At present, the 2021 vegetation and soil base metals monitoring program is directly comparable with assessments from 2016 to 2019. Where possible, modifications to the methods have incorporated input from the TEWG and NIRB to improve and further refine data capture and baseline comparisons. Baseline data for the vegetation and soil base metals monitoring program includes sampling from 2012 to 2016.

8.1.1.2 Vegetation and Soil Sampling

The study area was divided into three Project areas (Milne Port, Tote Road, Mine Site), and sampling was conducted at three distances from the PDA (Near: 0–100 m, Far: >100–1,000 m, and Reference: >1,000 m). Sampling distances were informed by the results of the dustfall monitoring program (EDI Environmental Dynamics Inc. 2015). In 2020, all past sampling sites were renamed with a permanent Site ID to compare metal concentrations between sampling periods. To account for variability in site selection (which may differ due to GPS accuracy, microsite, and lichen availability), past sampling sites that were within a 35 m radius of each other were assumed to represent the same Site ID.

Vegetation (i.e., lichen) and soil sampling were conducted on July 26 and 27, 2021. A total of 12 sites were sampled across the study area; sampling sites and locations are presented in Table 8-1 and shown on Map 8-1. Site summary descriptors (location identifiers, georeferencing, and other parameters) for the vegetation and soil base metals monitoring program are presented in Appendix C.

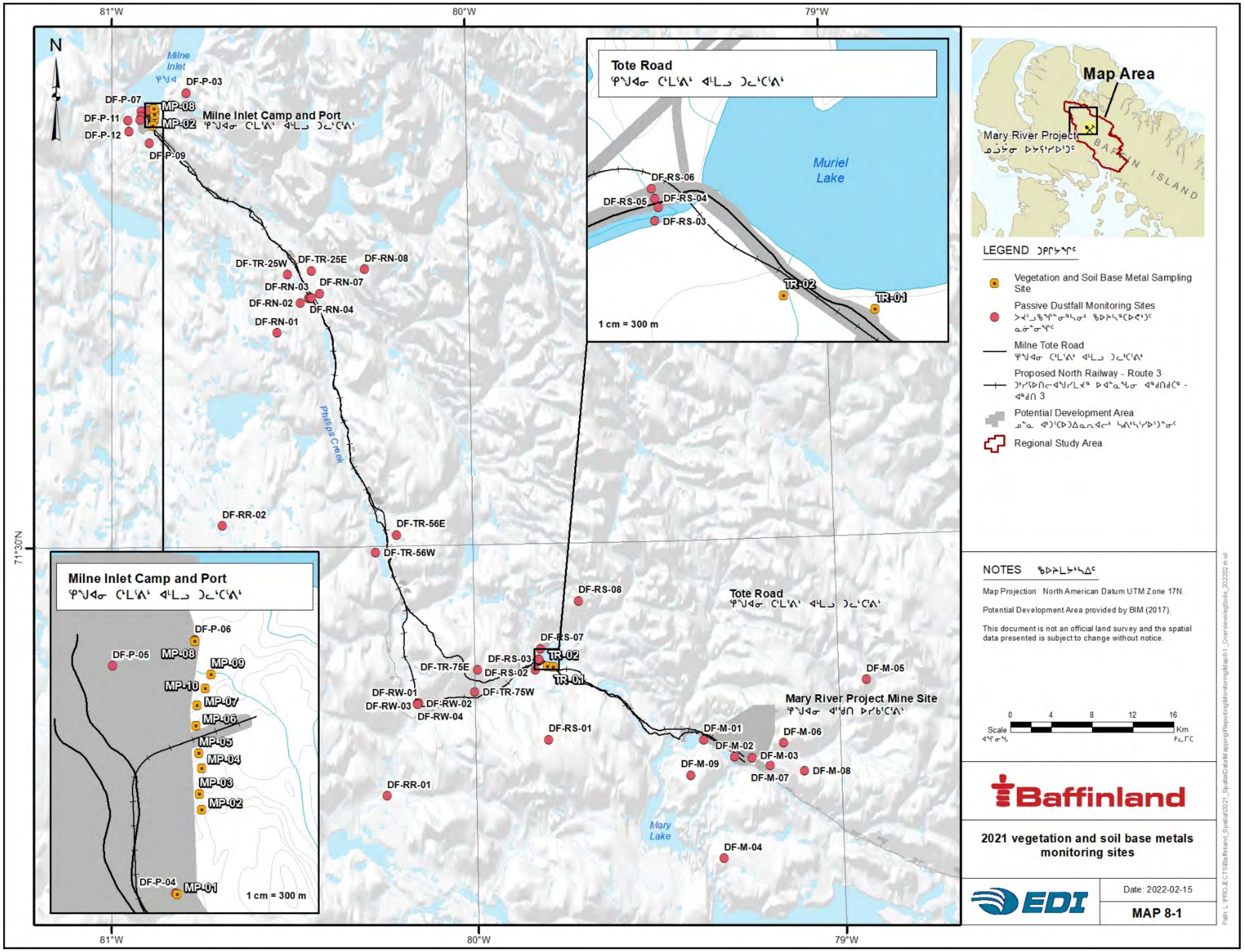
During field sampling, the following technical procedures were conducted to provide quality assurance and quality control (QAQC).

- New/clean nitrile gloves were worn at each sample site.
- A stainless-steel spoon (cleaned before/after each use) was used for sample collection.
- A minimum 10 g vegetation sample was collected at each site.

- A minimum 100 g soil sample was collected from the A horizon (typically at a depth of 5 to 15 cm from the surface and above the permafrost). The sample area coincided with the rooting zone where plant metal uptake is primarily expected to occur.
- Samples were transferred to new/clean plastic bags, maintained under cold conditions (0ºC), and submitted to an accredited laboratory for further handling and analysis.
- Replicate samples of both soil and lichen were collected at one or more sample sites as internal quality controls to evaluate the precision of field and laboratory methods and inherent variability of the samples (Horowitz 1990).

Table 8-1. Survey summary details for vegetation and soil base metals monitoring in 2021.

Distance Category	Distance from PDA (m)	No. Sites	Project Area	No. Samples	
				Soil	Lichen
Near	0–100	11	Milne Port	9	9
			Mine Site	—	—
			Tote Road	2	2
Far	>100–1,000	1	Milne Port	1	1
			Mine Site	—	—
			Tote Road	—	—
Reference	>1,000	—	Milne Port	—	—
			Mine Site	—	—
			Tote Road	—	—
Total	**—**	**12**	**—**	**12**	**12**


Milne Inlet Camp and Port
Tote Road
Muriel Lake
Mary River Project Mine Site
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Vegetation and Soil Base Metal Sampling Site
Passive Dustfall Monitoring Sites
Milne Tote Road
Proposed North Railway - Route 3
Potential Development Area
Regional Study Area
NOTES
Map Projection: North American Datum UTM Zone 17N.
Potential Development Area provided by BIM (2017).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
Km
Baffinland
2021 vegetation and soil base metals monitoring sites
EDI
Date: 2022-02-15
MAP 8-1
1 cm = 300 m
Milne Inlet
Phillips Creek
Mary Lake

8.1.1.3 Vegetation and Soil Base Metals Analysis

Soil and vegetation samples were analyzed for a total of 36 elements by ALS Laboratories[15] . The Certificate of Analysis (COA), comprising the comprehensive list of metals analyzed and respective assessment standards and analytical detection limits, is presented in Appendix D. Six metal/metalloid CoPCs have been reported on since 2012: As, Cd, Cu, Pb, Se, and Zn. The CoPCs presented in this report (and previous annual reports) represent a subset of the base metals analysis. These CoPCs were selected based on the following criteria:

- analysis and outcomes of baseline metal concentrations in soil and vegetation (EDI Environmental Dynamics Inc. 2015, 2017);
- analysis and outcomes of metal concentrations in the ore sampled from the Project (Appendix 6G-1, FEIS; Baffinland Iron Mines Corporation 2010b), comprised of iron (64%) and 21 other trace metals; mercury was not present at measurable concentrations in the ore sampled and therefore was not considered for analytical presentation;
- review of various guidelines and information sources relating to metals of concern for vegetation health, with the potential for uptake by wildlife and humans:
- the CCME soil quality guidelines for the protection of environmental and human health (CCME Canadian Council of Ministers of the Environment 2006);
- 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);
- peer-reviewed literature 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, Intrinsik Environmental Sciences Inc 2011).

Base metal concentration thresholds for soil and vegetation (i.e., lichen) are presented in Table 8-2. The CCME soil quality guidelines for the protection of environmental and human health were used (if/where available) as threshold values to determine exceedances for soil-metal concentrations. The 'Agricultural' land use category, representing the highest soil quality standard in Canada, was chosen as a point reference for the Project based on the following criteria:

- land use types at the Project (i.e., hunting and foraging) with a potential for soil and food ingestion (CCME Canadian Council of Ministers of the Environment 2006);

[15] 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 spectrometry (CVAAS) was used.

- background soil-metal concentrations, which were already well below CCME guidelines for Agricultural land use (compared to commercial or industrial land uses); and,
- CCME guidelines, which were consistent with the risk assessment and evaluation of exposure potential from ore dusting events in selected Valued Ecosystem Components (VECs; Intrinsik Environmental Sciences Inc 2011).

Currently, no quality standard (from CCME or other agencies) is available for lichen base metal concentrations in Arctic environments. For this reason, indicator values were chosen from peer-reviewed literature sources pertinent to the Canadian High Arctic. Indicator values were defined for cadmium, copper, lead, and zinc (Table 8-2), whereas no reference indicator values could be defined for selenium or arsenic. The threshold values were selected to signal an early indicator for potential changes in vegetation health, including reduced vigour or growth. Values are predictive and describe a 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 or other relevant research initiatives, indicator values may be revised to improve the dose-response relationship between metals and lichen.

Table 8-2. Concentration thresholds for vegetation and soil base metals monitoring in 2021.

Contaminants of Potential Concern (CoPC)	Soil Guidelines (mg/kg)	Lichen Indicator Values (mg/kg dry weight)
pH	6–8	– [2]
Arsenic	12	– [2]
Cadmium	1.4	30 [3]
Copper	63	15–20 [4]
Lead	70	5–15 [5]
Selenium	1	– [2]
Zinc	200	178

1 CCME soil quality guidelines for the protection of environmental and human health.

2 No reference indicator values identified.

3 From Nash 1975, Nieboer et al. 1978.

4 From Tomassini et al. 1976, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988.

5 From Tomassini et al. 1976, Nieboer et al. 1978, Kinalioglu et al. 2010.

6 From Nash 1975, Nieboer et al. 1978, Folkeson and Andersson-Bringmark 1988.

8.1.1.4 Data Trends and Statistical Analysis

Before conducting statistical analyses, each sample's soil and vegetation base metal concentrations were vetted and compared with CCME soil quality guidelines or lichen indicator values. For this report, means and estimates of variance were calculated for each CoPC. Besides evaluating environmental compliance, these values were examined to identify potential trends and tendencies that could warrant further investigation. Statistical data were grouped and analyzed according to the Project area and sampling distances to determine trends across the entire Project. Statistical analyses were handled in two stages.

Stage 1: General Trends — Two-way Analyses of Variance (ANOVA), used to estimate variation among and between groups, were applied to the data to compare baseline (2012 to 2016) versus 2019, 2020, and 2021 monitoring outcomes. Pairwise comparisons (applying Tukey's range test) were used to determine which groupings (e.g., Project area and sampling distance) were significantly different from one another. All data distributions were evaluated and handled to verify the assumptions of the parametric analyses. Statistical significance, referring to the probability that the means are different from one another, was set at 95% (i.e., p-value <0.05).

Stage 2: Distance Analysis — If pairwise comparisons indicated differences in metal concentrations across sampling distance, a linear model was fit to the data, and a simple regression analysis was used to estimate parameters and further describe the data trend. Both metal concentrations and distance were log-transformed for this analysis. Any values within the dataset below the metal analysis level of detection were allocated a value one-half of the detection limit.

All analyses were performed using R version 3.6.3 (R Development Core Team 2020). Pairwise comparisons were conducted using the 'emmeans' package for R, version 1.4.2. Graphs were created using 'ggplot2', version 3.3.0.

8.1.2 RESULTS AND DISCUSSION

Soil-metal concentrations and lichen-metal concentrations mainly were below or otherwise within acceptable ranges in relation to applicable CCME soil quality guidelines or lichen indicator values. The results suggest that soil and vegetation base metal concentrations currently represent a low risk to environmental and human health. The following subsections are intended to highlight potential trends and tendencies that may warrant more in-depth consideration during future monitoring activities. Discussions on these findings are provided for CoPCs, emphasizing areas of the Project indicating discrete increases or other notable trends. For brevity and clarity of presentation, comprehensive statistical analyses are not shown but available as required. The dataset for soil and vegetation base metal concentrations and quality assurance certificates for all laboratory analyses from the 2021 monitoring program are provided in Appendix D.

8.1.2.1 Soil-Metal Concentrations

Table 8-3 summarizes net changes in soil-metal CoPCs (i.e., comparing 2021 values with baseline conditions) across Project areas and sampling distances. Colour categories highlight if/where (1) mean concentrations are significantly greater than baseline and/or (2) mean concentrations exceed CCME soil quality guidelines. Overall, nearly all 2021 mean concentrations across Project areas and sample distances showed no significant changes in relation to baseline values. As expected, some minor discrete increases in CoPCs in relation to baseline conditions were recorded at Milne Port (As, Pb), but there were no exceedances in relation to CCME soil quality guidelines, and all values were within an acceptable range of variability. Given their respective toxicities and effects on environmental and human health, any significant increases in CoPCs at the Project—even those below soil quality thresholds and within acceptable concentrations—have been flagged for further characterization.

The following paragraphs summarize net changes, trends, and distributions for specific soil-metal CoPCs (As, Cu, Pb, and Zn) that indicated changes in mean concentrations in relation to baseline conditions in 2019, 2020, and/or 2021. For brevity, the remaining soil-metal CoPCs (Cd, Se)—those that did not indicate any significant changes during this timeline—are not presented in further detail.

Table 8-3. Net changes in soil-metal contaminants of potential concern in 2021.

Analyte	Mine Site			Tote Road			Milne Port		
	Near (0-100m)	Far (100-1,000m)	Reference (>1,000m)	Near (0-100m)	Far (100-1,000m)	Reference (>1,000m)	Near (0-100m)	Far (100-1,000m)	Reference (>1,000m)
Arsenic	N/A	N/A	N/A		N/A	N/A			N/A
Cadmium	N/A	N/A	N/A		N/A	N/A			N/A
Copper	N/A	N/A	N/A		N/A	N/A			N/A
Lead	N/A	N/A	N/A		N/A	N/A			N/A
Selenium	N/A	N/A	N/A		N/A	N/A			N/A
Zinc	N/A	N/A	N/A		N/A	N/A			N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline, mean concentration below CCME soil quality guideline.

N/A = No samples were collected.

As — Table 8-4 summarizes net changes in soil-As concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-5 provides a further breakdown of soil-As concentrations (i.e., mean and median values and maximum and minimum ranges) in relation to laboratory detection limits (RDL) and applicable soil quality thresholds. Figure 8-1 illustrates the distribution of soil-As concentrations at the Project (2019 to 2021 values), while Figure 8-2 shows the distribution of soil-As concentrations at Milne Port (2019 to 2021), where significant soil-As increases were observed. Significant increases in the soil-As concentrations compared to baseline conditions were observed at Near and Far sites at Milne Port. However, all mean values were below the CCME soil quality guideline. Soil-As does not presently pose a risk to environmental or human health.

Note: Based on the evaluation of exposure potential from ore dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, Intrinsik Environmental Sciences Inc 2011), soil-As is not predicted to experience incremental exceedance above soil quality guideline due to Project-related dust. Presently, it cannot be determined whether soil-As increases at Milne Port are Project-related or naturally occurring (e.g., no Reference samples >1,000m were collected in 2021 for comparison). Soil-As will continue to be monitored to evaluate this potential trend.

Table 8-4. Net change in soil-arsenic concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline; mean concentration below CCME soil quality guideline.

N/A = No samples were collected.

Table 8-5. Mean soil-arsenic concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
Mine Site	Near	Baseline[1]	12	0.5	50.0	0.49	0.43	0.65	0.25	1.53	12	0.0
		2019	11	0.5	54.55	0.54	0.25	0.91	0.25	3.35	12	0.0
		2020	10	0.5	30.00	0.79	0.66	1.43	0.25	3.29	12	0.0
	Far	Baseline	4	0.5	75.00	0.31	0.25	0.08	0.25	0.56	12	0.0
		2019	4	0.5	50.00	0.50	0.51	0.65	0.25	1.30	12	0.0
		2020	11	0.5	54.55	0.44	0.25	0.49	0.25	1.52	12	0.0
	Reference	Baseline	14	0.5	50.00	0.47	0.41	0.58	0.25	1.86	12	0.0
		2019	5	0.5	60.00	0.37	0.25	0.34	0.25	0.71	12	0.0
		2020	4	0.5	25.00	0.62	0.74	0.23	0.25	1.09	12	0.0
Tote Road	Near	Baseline	15	0.5	80.00	0.33	0.25	0.00	0.25	1.25	12	0.0
		2019	12	0.5	83.33	0.32	0.25	0.00	0.25	1.08	12	0.0
		2020	10	0.5	70.00	0.41	0.25	0.53	0.25	1.56	12	0.0
		2021	2	0.5	100.00	0.25	0.25	0.00	0.25	0.25	12	0.0
	Far	Baseline	9	0.5	66.67	0.37	0.25	0.35	0.25	1.26	12	0.0
		2019	4	0.5	100.00	0.25	0.25	0.00	0.25	0.25	12	0.0
		2020	4	0.5	100.00	0.25	0.25	0.00	0.25	0.25	12	0.0
	Reference	Baseline	14	0.5	42.86	0.58	0.62	0.65	0.25	4.14	12	0.0
		2019	4	0.5	25.00	0.62	0.76	0.32	0.25	1.03	12	0.0
		2020	3	0.5	33.33	0.74	0.98	0.70	0.25	1.65	12	0.0
Milne Port	Near	Baseline	15	0.5	20.00	0.77	0.81	0.42	0.25	2.78	12	0.0
		2019	10	0.5	0.00	1.54	1.31	2.06	0.69	4.38	12	0.0
		2020	10	0.5	10.00	1.31	1.29	0.89	0.25	3.59	12	0.0
		2021	9	0.5	0.00	1.95	1.76	1.04	1.05	6.18	12	0.0
	Far	Baseline	4	0.5	75.00	0.33	0.25	0.13	0.25	0.75	12	0.0
		2019	3	0.5	0.00	1.65	1.79	0.72	1.02	2.46	12	0.0

Table 8-5. Mean soil-arsenic concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
		2020	5	0.5	0.00	1.38	1.41	0.27	1.13	1.75	12	0.0
		2021	1	0.5	0.00	2.91	2.91	0.00	2.91	2.91	12	0.0
	Reference	Baseline	3	0.5	0.00	0.75	0.83	0.16	0.57	0.89	12	0.0
		2019	4	0.5	25.00	0.76	0.91	0.65	0.25	1.65	12	0.0
		2020	3	0.5	0.00	1.18	1.09	0.29	0.97	1.55	12	0.0

1 Baseline = baseline sampling during pre-construction for all years up to and including 2016.

2 Number of sample sites.

3 Maximum MDL across all sampling years.

4 Guidelines based on CCME Soil Quality Guidelines for the Protection of Environmental and Human Health.

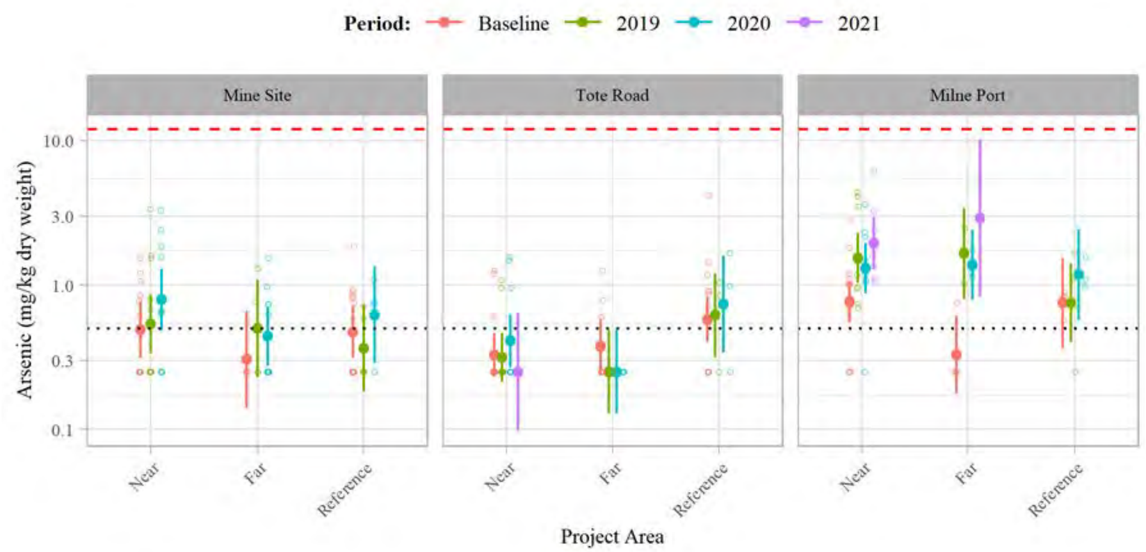


Figure 8-1. Distribution of soil-arsenic concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the CCME soil quality guideline (12 mg/kg), and the black dotted line shows the minimum detection limit (0.5 mg/kg).

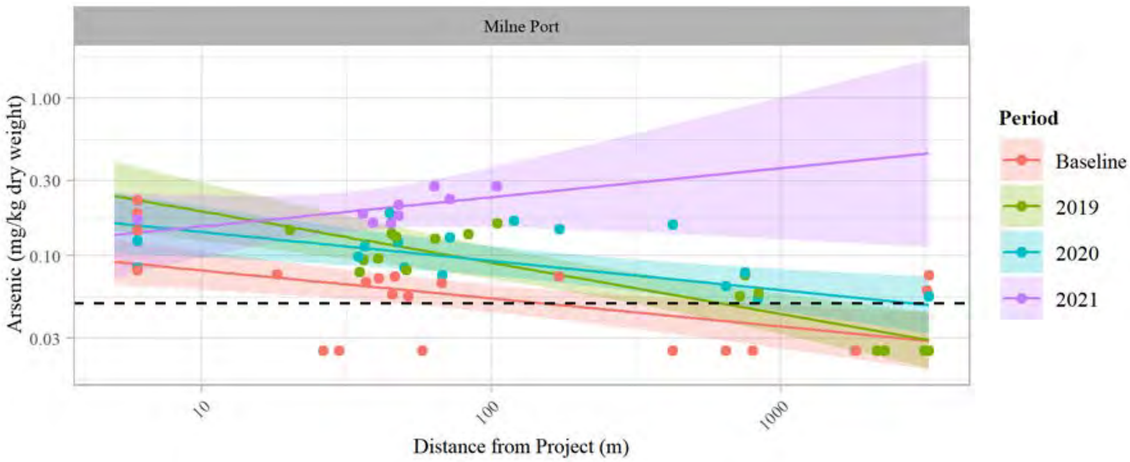


Figure 8-2. Distribution of soil-arsenic concentrations (Milne Port) in 2021.

Each colour represents a sampling period; solid lines are mean concentrations, and shaded areas are 95% confidence regions. The red dashed line shows the CCME soil quality guideline (12 mg/kg), and the black dotted line shows the minimum detection limit (0.5 mg/kg).

Cu — Table 8-6 summarizes net changes in soil-Cu concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-7 provides a further breakdown of soil-Cu concentrations (i.e., mean and median values and maximum and minimum ranges) in relation to RDL and applicable soil quality thresholds. Figure 8-3 illustrates the distribution of soil-As concentrations at the Project (2019 to 2021 values). Unlike 2019 and 2020, the 2021 soil-Cu concentrations indicated no change from baseline conditions. All mean values were below the CCME soil quality guideline. Soil-Cu does not presently pose a risk to environmental or human health.

Table 8-6. Net change in soil-copper concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline; mean concentration below CCME soil quality guideline.

N/A = No samples were collected.

Table 8-7. Mean soil-copper concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
Mine Site	Near	Baseline[1]	12	0.5	0.00	4.60	4.66	5.06	1.54	19.10	63.00	0.00
		2019	11	0.5	0.00	6.04	3.74	5.67	2.13	81.20	63.00	9.09
		2020	10	0.5	0.00	9.33	5.94	11.00	2.09	370.00	63.00	10.00
	Far	Baseline	4	0.5	0.00	2.89	2.90	0.64	2.09	3.97	63.00	0.00
		2019	4	0.5	0.00	2.36	2.86	2.47	0.90	4.77	63.00	0.00
		2020	11	0.5	0.00	3.58	3.19	2.52	1.86	6.07	63.00	0.00
	Reference	Baseline	14	0.5	0.00	4.68	4.57	4.99	0.86	16.90	63.00	0.00
		2019	5	0.5	0.00	2.70	2.32	1.23	2.03	4.07	63.00	0.00
		2020	4	0.5	0.00	5.53	7.57	3.48	1.30	12.60	63.00	0.00
Tote Road	Near	Baseline	15	0.5	13.33	1.11	1.06	0.45	0.25	7.03	63.00	0.00
		2019	12	0.5	0.00	1.97	1.50	0.60	0.89	49.80	63.00	0.00
		2020	10	0.5	0.00	2.02	2.12	2.51	0.51	5.85	63.00	0.00
		2021	2	0.5	50.00	0.58	0.81	0.56	0.25	1.36	63.00	0.00
	Far	Baseline	9	0.5	0.00	1.65	1.77	3.24	0.52	4.45	63.00	0.00
		2019	4	0.5	25.00	0.71	0.98	0.23	0.25	1.07	63.00	0.00
		2020	4	0.5	0.00	1.59	1.87	1.25	0.74	2.69	63.00	0.00
	Reference	Baseline	14	0.5	0.00	4.00	4.79	2.74	0.67	8.77	63.00	0.00
		2019	4	0.5	0.00	4.27	5.85	2.26	1.04	9.37	63.00	0.00
		2020	3	0.5	0.00	5.09	9.13	4.39	1.42	10.20	63.00	0.00
Milne Port	Near	Baseline	15	0.5	0.00	5.00	5.25	1.88	1.56	27.20	63.00	0.00
		2019	10	0.5	0.00	7.14	6.30	8.64	3.41	18.10	63.00	0.00
		2020	10	0.5	0.00	6.52	6.49	2.30	2.28	14.60	63.00	0.00
		2021	9	0.5	0.00	8.64	7.35	4.20	5.29	23.00	63.00	0.00
	Far	Baseline	4	0.5	0.00	3.02	3.43	1.14	1.55	4.56	63.00	0.00
		2019	3	0.5	0.00	7.69	7.69	3.54	4.92	12.00	63.00	0.00
		2020	5	0.5	0.00	7.59	6.23	2.03	5.37	15.40	63.00	0.00
		2021	1	0.5	0.00	14.00	14.00	0.00	14.00	14.00	63.00	0.00
	Reference	Baseline	3	0.5	0.00	5.23	4.20	3.03	3.55	9.60	63.00	0.00
		2019	4	0.5	0.00	4.90	5.30	1.91	2.65	7.80	63.00	0.00
		2020	3	0.5	0.00	4.86	4.12	2.19	3.53	7.90	63.00	0.00

1 Baseline = baseline sampling during pre-construction for all years up to and including 2016.

2 Number of sample sites.

3 Maximum MDL across all sampling years.

4 Guidelines based on CCME soil quality guidelines for the protection of environmental and human health.

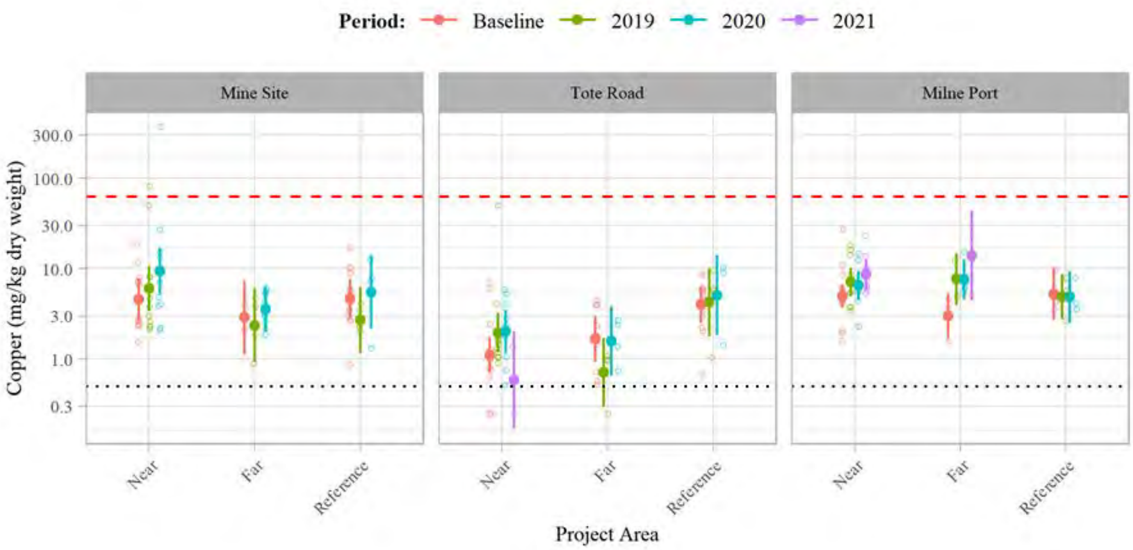


Figure 8-3. Distribution of soil-copper concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the CCME soil quality guideline (63 mg/kg), and the black dotted line shows the minimum detection limit (0.5 mg/kg).

Pb — Table 8-8 summarizes net changes in soil-Pb concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-9 provides a further breakdown of soil-As concentrations (i.e., mean and median values and maximum and minimum ranges) in RDL and applicable soil quality thresholds. Figure 8-4 illustrates the distribution of soil-Pb concentrations at the Project (2019 to 2021 values), while Figure 8-5 shows the distribution of soil-Pb concentrations at Milne Port (2019 to 2021) where significant soil-Pb increases were observed. As in 2019 and 2020, significant increases in the soil-Pb concentrations compared to baseline conditions were observed at Far sites at Milne Port. However, all mean values were below the CCME soil quality guideline. Soil-Pb does not presently pose a risk to environmental or human health.

Note: Based on the evaluation of exposure potential from ore dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, Intrinsik Environmental Sciences Inc 2011), soil-Pb is not predicted to experience incremental exceedance above soil quality guideline due to Project-related dust. Presently, it cannot be determined whether soil-As increases at Milne Port are Project-related or naturally occurring (e.g., no Reference samples >1,000m were collected in 2021 for comparison). Soil-As will continue to be monitored to evaluate this potential trend.

Table 8-8. Net change in soil-lead concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline; mean concentration below CCME soil quality guideline.

N/A = No samples were collected.

Table 8-9. Mean soil-lead concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
Mine Site	Near	Baseline[1]	12	0.5	0	5.11	4.29	4.94	2.61	11.20	70.00	0.00
		2019	11	0.5	0	4.50	4.62	4.93	1.84	17.90	70.00	0.00
		2020	10	0.5	0	5.26	4.48	3.67	1.72	38.50	70.00	0.00
	Far	Baseline	4	0.5	0	2.87	2.85	1.49	2.02	4.34	70.00	0.00
		2019	4	0.5	0	2.90	2.85	1.11	1.60	5.42	70.00	0.00
		2020	11	0.5	0	2.82	2.53	1.09	1.66	5.15	70.00	0.00
	Reference	Baseline	14	0.5	0	3.65	4.15	1.94	1.40	6.83	70.00	0.00
		2019	5	0.5	0	3.24	2.96	2.07	2.35	4.72	70.00	0.00
		2020	4	0.5	0	4.49	5.68	1.12	2.12	5.98	70.00	0.00
Tote Road	Near	Baseline	15	0.5	0	1.35	1.18	0.72	0.54	6.51	70.00	0.00
		2019	12	0.5	0	1.65	1.27	0.40	0.80	28.20	70.00	0.00
		2020	10	0.5	0	1.81	1.65	1.65	0.80	4.90	70.00	0.00
		2021	2	0.5	0	1.15	1.18	0.26	0.92	1.44	70.00	0.00
	Far	Baseline	9	0.5	0	1.47	1.29	1.17	0.82	3.89	70.00	0.00
		2019	4	0.5	0	1.10	1.10	0.10	0.96	1.26	70.00	0.00
		2020	4	0.5	0	1.35	1.45	1.11	0.86	2.16	70.00	0.00
	Reference	Baseline	14	0.5	0	3.70	3.95	2.39	1.18	7.85	70.00	0.00
		2019	4	0.5	0	3.18	3.45	1.45	1.78	4.91	70.00	0.00
		2020	3	0.5	0	3.16	3.64	2.82	1.26	6.90	70.00	0.00
Milne Port	Near	Baseline	15	0.5	0	5.08	4.73	2.68	1.64	22.50	70.00	0.00
		2019	10	0.5	0	7.41	6.29	5.61	3.69	14.00	70.00	0.00
		2020	10	0.5	0	5.75	5.80	2.55	2.12	12.30	70.00	0.00
		2021	9	0.5	0	8.09	8.00	4.85	5.02	17.70	70.00	0.00
	Far	Baseline	4	0.5	0	3.18	3.52	0.73	1.82	4.52	70.00	0.00
		2019	3	0.5	0	9.71	9.31	6.92	5.17	19.00	70.00	0.00
		2020	5	0.5	0	8.15	7.05	4.71	5.63	11.60	70.00	0.00
		2021	1	0.5	0	15.30	15.30	0.00	15.30	15.30	70.00	0.00

Table 8-9. Mean soil-lead concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
	Reference	Baseline	3	0.5	0	3.37	2.98	0.75	2.92	4.41	70.00	0.00
		2019	4	0.5	0	3.54	4.13	1.63	1.39	6.65	70.00	0.00
		2020	3	0.5	0	4.57	4.32	1.08	3.74	5.89	70.00	0.00

[1] Baseline = baseline sampling during pre-construction for all years up to and including 2016.

[2] Number of sample sites.

[3] Maximum MDL across all sampling years.

[4] Guidelines based on CCME soil quality guidelines for the protection of environmental and human health.

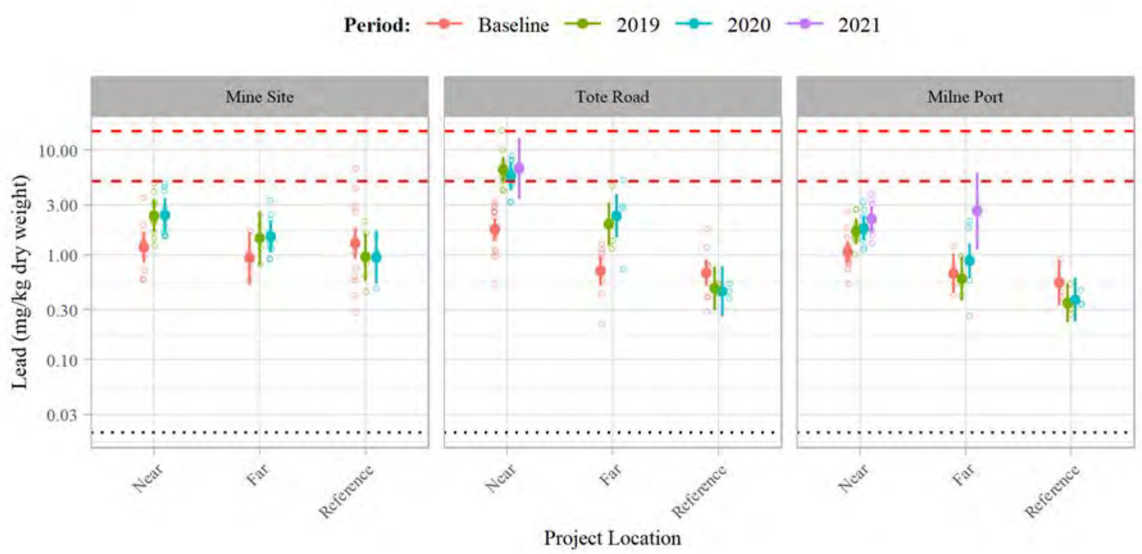


Figure 8-4. Distribution of soil-lead concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the CCME soil quality guideline (63 mg/kg), and the black dotted line shows the minimum detection limit (0.5 mg/kg).

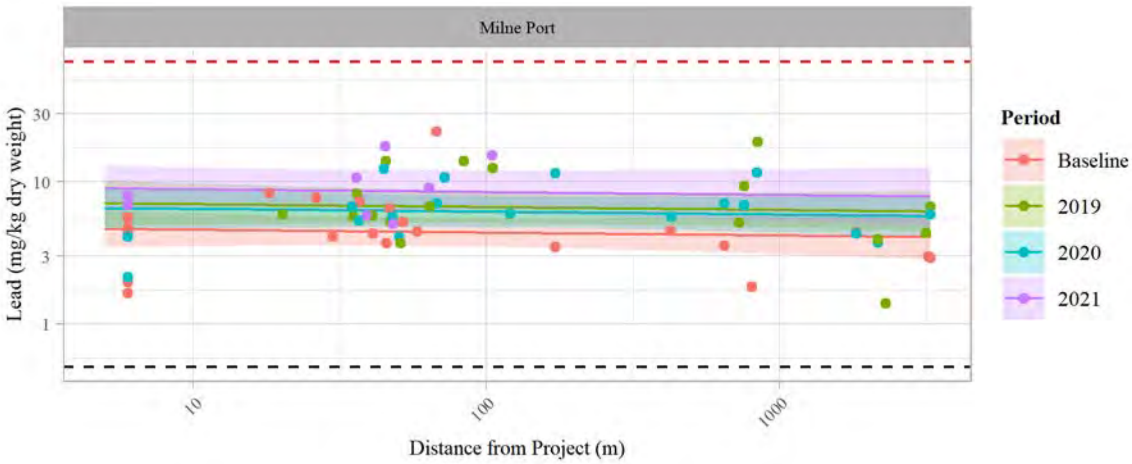


Figure 8-5. Distribution of soil-lead concentrations (Milne Port) in 2021.

Each colour represents a sampling period; solid lines are mean concentrations and shaded areas are 95% confidence regions. The red dashed line shows the CCME soil quality guideline (70 mg/kg), and the black dotted line shows the minimum detection limit (0.5 mg/kg).

Zn — Table 8-10 summarizes net changes in soil-Zn concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-11 provides a further breakdown of soil-Zn concentrations (i.e., mean and median values and maximum and minimum ranges) in relation to RDL and applicable soil quality thresholds. Figure 8-6 illustrates the distribution of soil-Zn concentrations at the Project (2019 to 2021 values). Unlike 2020, the 2021 soil-Zn concentrations indicated no change from baseline conditions. All mean values were below the CCME soil quality guideline. Soil-Cu does not presently pose a risk to environmental or human health.

Table 8-10. Net change in soil-zinc concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from Baseline

Yellow = Significant increase from Baseline, mean concentration below CCME soil quality guideline.

N/A= No samples were collected.

Table 8-11. Mean soil-zinc concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sample Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
Mine Site	Near	Baseline [1]	12	2	0.00	13.29	12.80	6.83	6.4	29.7	200.00	0.00

Table 8-11. Mean soil-zinc concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sample Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Guideline[4]	Above Guideline[4] (%)
		2019	11	2	0.00	13.23	9.20	11.85	4.2	88.4	200.00	0.00
		2020	10	2	0.00	18.09	12.90	17.05	8.1	152.0	200.00	0.00
	Far	Baseline	4	2	0.00	9.59	10.10	0.65	7.9	10.5	200.00	0.00
		2019	4	2	0.00	5.38	5.40	5.35	2.9	11.7	200.00	0.00
		2020	11	2	0.00	9.32	10.00	2.35	2.9	15.0	200.00	0.00
	Reference	Baseline	14	2	0.00	14.42	14.70	4.13	4.1	39.6	200.00	0.00
		2019	5	2	0.00	10.34	10.30	2.20	6.9	19.9	200.00	0.00
		2020	4	2	0.00	15.02	19.00	10.18	5.4	26.9	200.00	0.00
Tote Road	Near	Baseline	15	2	13.33	3.43	3.30	1.85	1.0	16.2	200.00	0.00
		2019	12	2	0.00	4.76	3.65	0.90	2.4	86.2	200.00	0.00
		2020	10	2	10.00	7.41	5.80	5.95	1.0	316.0	200.00	10.00
		2021	2	2	0.00	3.24	3.30	0.60	2.7	3.9	200.00	0.00
	Far	Baseline	9	2	11.11	4.69	4.80	5.60	1.0	17.0	200.00	0.00
		2019	4	2	25.00	2.30	2.85	1.15	1.0	3.5	200.00	0.00
		2020	4	2	0.00	4.24	4.10	1.65	2.6	7.4	200.00	0.00
	Reference	Baseline	14	2	0.00	10.91	14.20	8.43	2.4	19.4	200.00	0.00
		2019	4	2	0.00	9.88	11.40	9.03	4.2	19.3	200.00	0.00
		2020	3	2	0.00	11.33	14.30	9.05	4.5	22.6	200.00	0.00
Milne Port	Near	Baseline	15	2	0.00	15.39	15.80	10.35	4.1	35.3	200.00	0.00
		2019	10	2	0.00	20.18	19.25	12.10	9.7	32.0	200.00	0.00
		2020	10	2	0.00	24.22	18.95	10.70	13.6	179.0	200.00	0.00
		2021	9	2	0.00	23.89	26.10	15.00	14.1	48.0	200.00	0.00
	Far	Baseline	4	2	0.00	10.80	11.80	7.78	4.2	23.9	200.00	0.00
		2019	3	2	0.00	25.21	30.60	7.05	16.9	31.0	200.00	0.00
		2020	5	2	0.00	27.86	22.90	9.10	20.3	49.6	200.00	0.00
		2021	1	2	0.00	33.30	33.30	0.00	33.3	33.3	200.00	0.00
	Reference	Baseline	3	2	0.00	12.85	11.40	5.05	9.5	19.6	200.00	0.00
		2019	4	2	0.00	12.74	14.80	6.68	5.8	21.1	200.00	0.00
		2020	3	2	0.00	16.76	20.30	5.95	10.4	22.3	200.00	0.00

[1] Baseline = baseline sampling during pre-construction for all years up to and including 2016.

[2] Number of sample sites.

[3] Maximum MDL across all sampling years.

[4] Guidelines based on CCME soil quality guidelines for the protection of environmental and human health.

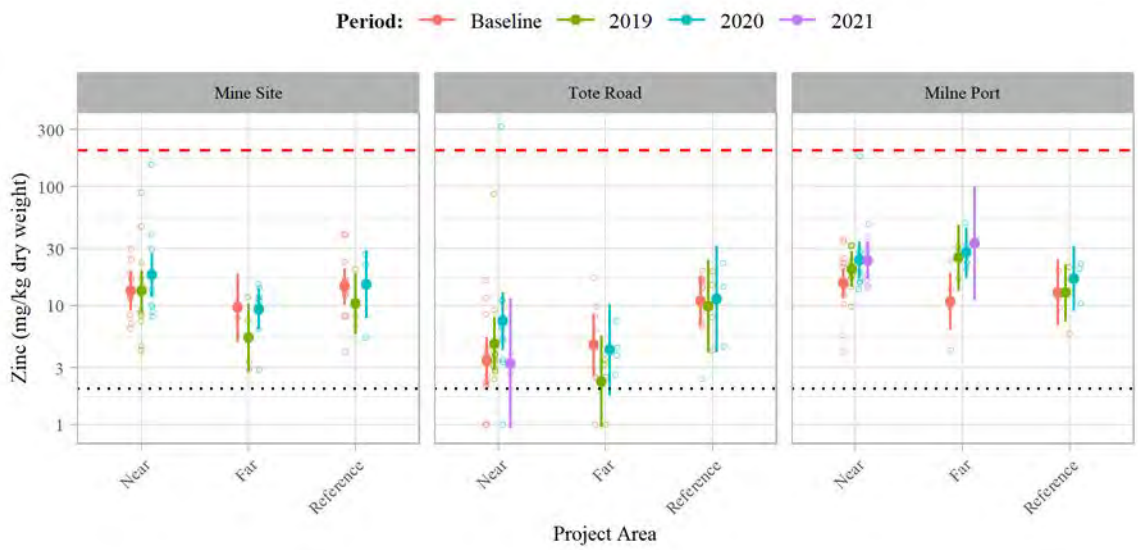


Figure 8-6. Distribution of soil-zinc concentrations (Project-wide) in 2021.
Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the CCME soil quality guideline (200 mg/kg), and the black dotted line shows the reportable detection limit (2 mg/kg).

8.1.2.2 Lichen-Metal Concentrations

Table 8-12 summarizes net changes in lichen-metal CoPCs (i.e., comparing 2021 values with baseline conditions) across Project areas and sampling distances. Colour categories highlight if/where (1) mean concentrations are significantly greater than baseline and/or (2) mean concentrations exceed threshold indicator values (based on peer-reviewed literature sources). Overall, many 2021 mean concentrations across Project areas and sample distances showed no significant changes in relation to baseline values. Discrete increases in CoPCs in relation to baseline conditions were recorded along the Tote Road (Cd, Pb), where some individual values (Pb) where at or marginally above indicator value thresholds. Discrete increases in CoPCs were also recorded at Milne Port (As, Pb, Se) at Near and Far sampling locations, but no threshold exceedances were recorded. Mean values were generally within an acceptable range of variation. Nevertheless, given their respective toxicities and effects on environmental and human health, any significant increases in COPCs at the Project have been flagged for further characterization.

The following paragraphs summarize net changes, trends, and distributions for specific lichen-metal CoPCs (As, Cu, Pb, and Zn) that indicated changes in mean concentrations in relation to baseline conditions in 2019, 2020, and/or 2021. For brevity, the remaining lichen-metal CoPCs (Cd)—those that did not indicate any significant changes during this timeline—are not presented in further detail.

Table 8-12. Net changes in lichen-metal contaminants of potential concern in 2021.

Analyte	Mine Site			Tote Road			Milne Port		
	Near	Far	Reference	Near	Far	Reference	Near	Far	Reference
Arsenic	N/A	N/A	N/A		N/A	N/A			N/A
Cadmium	N/A	N/A	N/A		N/A	N/A			N/A
Copper	N/A	N/A	N/A		N/A	N/A			N/A
Lead	N/A	N/A	N/A		N/A	N/A			N/A
Selenium	N/A	N/A	N/A		N/A	N/A			N/A
Zinc	N/A	N/A	N/A		N/A	N/A			N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline, mean concentration below lichen indicator value.

Orange = Significant increase from baseline, mean concentration above lower lichen indicator value.

N/A = No samples were collected.

As — Table 8-13 summarizes net changes in lichen-As concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-14 provides a breakdown of lichen-As concentrations in relation to the RDL. Figure 8-7 illustrates the distribution of lichen-As concentrations at the Project (2019 to 2021 values); Figure 8-8 shows the distribution of lichen-As concentrations at Milne Port (i.e., the Project areas where significant increases in lichen-As were observed compared to baseline values). Upon closer evaluation, this increase is associated with high variability and wide confidence intervals. Although no threshold values are available for lichen-As to determine specific risks to environmental or human health, most lichen-As concentrations were consistently low across all sample sites and either at or below the detection limit. Lichen-As is not presently considered a risk to environmental or human health.

Note: Based on the evaluation of exposure potential from ore dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, Intrinsik Environmental Sciences Inc 2011), As holds a low potential for significant bioaccumulation or biomagnification in the terrestrial food web. Presently, it cannot be determined whether lichen-As increases at Milne Port are Project-related or naturally occurring. Lichen-As will continue to be monitored to evaluate this potential trend.

Table 8-13. Net change in lichen-arsenic concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline, mean concentration above lower lichen indicator value.

N/A = No samples were collected.

Table 8-14. Mean lichen-cadmium concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value[4]	Above Indicator Value (%)
Mine Site	Near	Baseline[1]	12	0.05	0.00	0.09	0.10	0.03	0.06	0.24	-	-
		2019	11	0.05	0.00	0.17	0.15	0.04	0.11	0.33	-	-
		2020	10	0.05	0.00	0.17	0.17	0.03	0.14	0.23	-	-
	Far	Baseline	4	0.05	50.00	0.05	0.05	0.05	0.03	0.11	-	-
		2019	4	0.05	0.00	0.12	0.13	0.05	0.09	0.15	-	-
		2020	11	0.05	0.00	0.14	0.16	0.06	0.08	0.20	-	-
	Reference	Baseline	13	0.05	30.77	0.08	0.09	0.10	0.03	1.10	-	-
		2019	5	0.05	40.00	0.07	0.07	0.10	0.03	0.36	-	-
		2020	4	0.05	50.00	0.05	0.04	0.06	0.03	0.14	-	-
Tote Road	Near	Baseline	15	0.05	0.00	0.18	0.19	0.06	0.10	0.35	-	-
		2019	12	0.05	0.00	0.23	0.23	0.06	0.18	0.31	-	-
		2020	10	0.05	0.00	0.16	0.15	0.03	0.13	0.24	-	-
		2021	2	0.05	0.00	0.17	0.17	0.00	0.17	0.17	-	-
	Far	Baseline	9	0.05	0.00	0.08	0.07	0.04	0.05	0.11	-	-
		2019	4	0.05	0.00	0.10	0.08	0.03	0.07	0.19	-	-
		2020	4	0.05	0.00	0.08	0.09	0.02	0.05	0.11	-	-
	Reference	Baseline	11	0.05	72.73	0.04	0.03	0.03	0.03	0.15	-	-
		2019	4	0.05	75.00	0.03	0.03	0.01	0.03	0.07	-	-
		2020	3	0.05	100.0	0.03	0.03	0.00	0.03	0.03	-	-
Milne Port	Near	Baseline	14	0.05	21.43	0.07	0.07	0.02	0.03	0.23	-	-
		2019	10	0.05	0.00	0.12	0.13	0.04	0.08	0.16	-	-
		2020	10	0.05	0.00	0.11	0.12	0.04	0.08	0.19	-	-
		2021	9	0.05	0.00	0.18	0.18	0.05	0.12	0.28	-	-
	Far	Baseline	4	0.05	75.00	0.03	0.03	0.01	0.03	0.07	-	-
		2019	3	0.05	0.00	0.06	0.06	0.01	0.06	0.08	-	-
		2020	5	0.05	0.00	0.09	0.08	0.08	0.05	0.16	-	-
		2021	1	0.05	0.00	0.28	0.28	0.00	0.28	0.28	-	-
	Reference	Baseline	3	0.05	33.33	0.05	0.06	0.03	0.03	0.08	-	-
		2019	4	0.05	100.0	0.03	0.03	0.00	0.03	0.03	-	-
		2020	3	0.05	66.67	0.03	0.03	0.02	0.03	0.06	-	-

1 Baseline = baseline sampling during pre-construction for all years up to and including 2016.

2 Number of sample sites.

3 Maximum MDL across all sampling years.

4 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 vigor or growth.

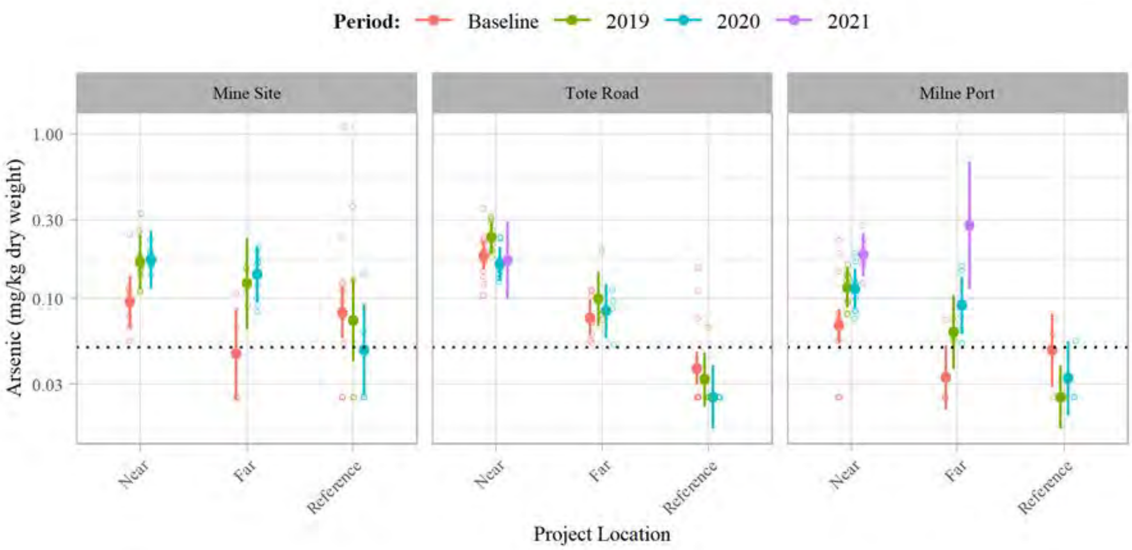


Figure 8-7. Distribution of lichen-arsenic concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The black dotted line shows the minimum detection limit (0.05 mg/kg).

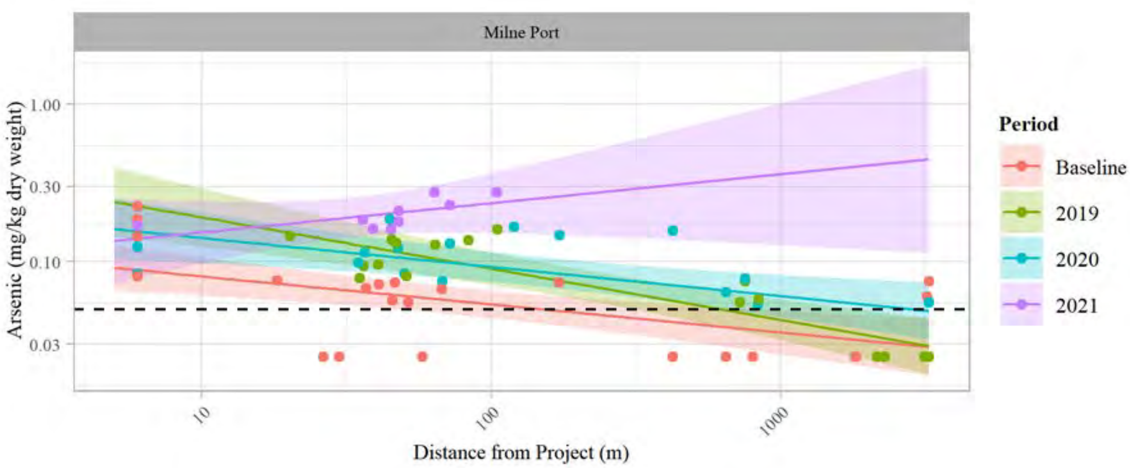


Figure 8-8. Distribution of lichen-arsenic concentrations (Milne Port) in 2021.

Each colour represents a sampling period; solid lines are mean concentrations, and shaded areas are 95% confidence regions. Concentrations below the detection limit are displayed as half the detection limit. The black dotted line shows the minimum detection limit (0.05 mg/kg).

Cd — Table 8-15 summarizes net changes in lichen-Cd concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-16 provides a further breakdown of lichen-Cd concentrations in relation to the RDL. Figure 8-9 illustrates the distribution of lichen-Cd concentrations at the Project (2019 to 2021 values), while Figure 8-10 shows the distribution of lichen-Cd concentrations along the Tote Road (i.e., the Project areas where significant increases in lichen-Cd were observed compared to baseline values). All values are below the lichen-Cd indicator value and either at or below the detection limit. Lichen-Cd is not presently considered to pose a risk to environmental or human health.

Note: Based on the evaluation of exposure potential from ore dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, Intrinsik Environmental Sciences Inc 2011), Cd holds a moderate to high potential for significant bioaccumulation or biomagnification in the terrestrial food web. Presently, it cannot be determined whether lichen-Cd increases along the Tote Road and at Milne Port are Project-related or naturally occurring. Lichen-Cd will continue to be monitored to evaluate this potential trend.

Table 8-15. Net change in lichen-cadmium concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.
Yellow = Significant increase from baseline, mean concentration below lichen indicator value.
N/A = No samples were collected.

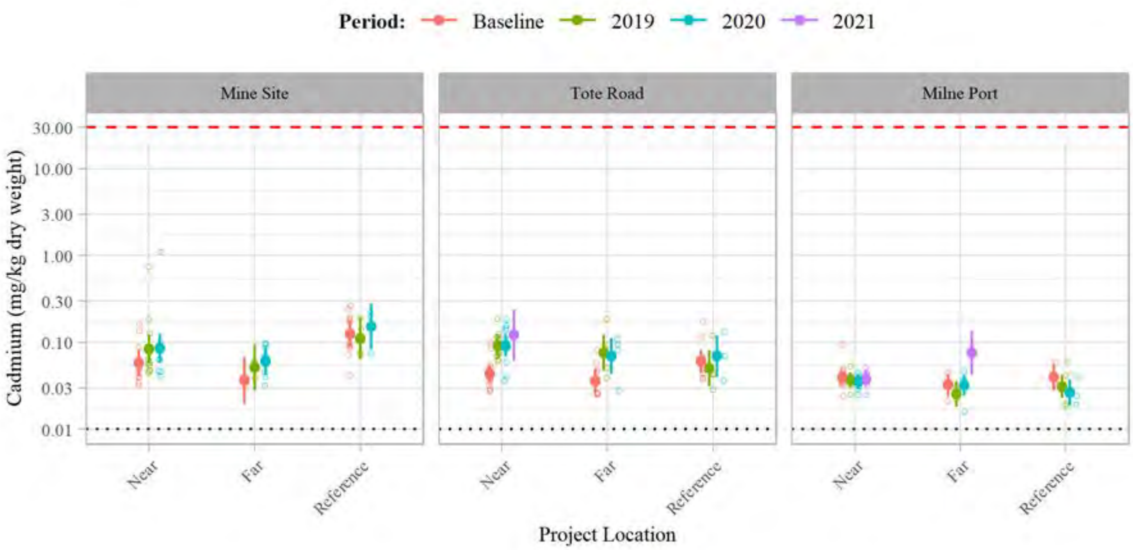


Figure 8-9. Distribution of lichen-cadmium concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lichen indicator value (30 mg/kg), and the black dotted line shows the minimum detection limit (0.01 mg/kg).

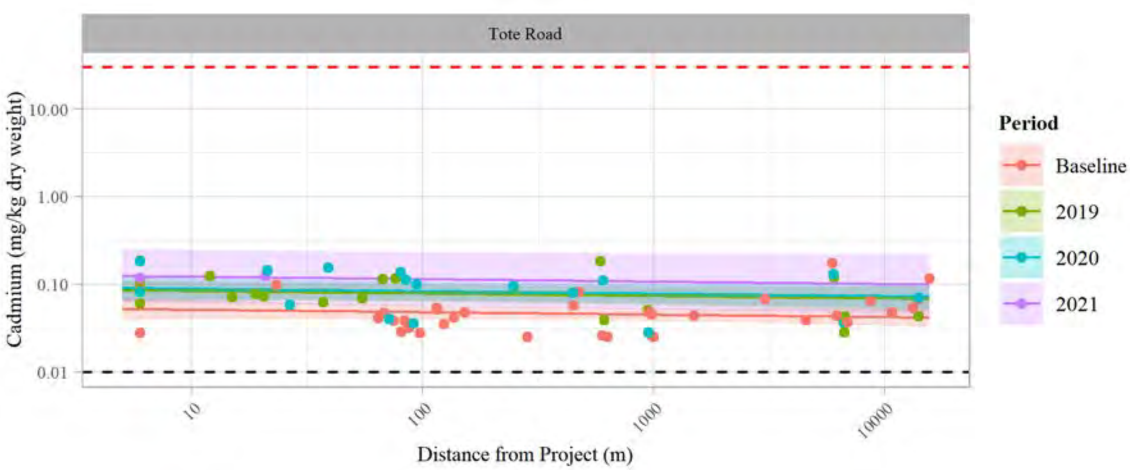


Figure 8-10. Distribution of lichen-cadmium concentrations (Tote Road) in 2021.

Each colour represents a sampling period; solid lines are mean concentrations, and shaded areas are 95% confidence regions. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lichen indicator value (30 mg/kg), and the black dotted line shows the minimum detection limit (0.01 mg/kg).

Cu —Table 8-17 summarizes net changes in lichen-Cu concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-18Table 8-17 provides a further breakdown of lichen-Cu concentrations in relation to the RDL. Figure 8-11 illustrates the distribution of lichen-Cu concentrations at the Project (2019 to 2021 values), while Figure 8-12 shows the distribution of lichen-Cu concentrations at Milne Port (i.e., the Project areas where significant increases in lichen-Cu were observed compared to baseline values). All values are below the lichen-Cu indicator value and either at or below the detection limit. Lichen-Cu is not presently considered to pose a risk to environmental or human health.

Table 8-16. Net change in lichen-lead concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.
Yellow = Significant increase from baseline, mean concentration below lichen indicator value.
Orange = Significant increase from baseline, mean concentration above lower lichen indicator value.
N/A = No samples were collected.

Table 8-17. Mean lichen-lead concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value[4]	Above Indicator Value (%)
Mine Site	Near	Baseline[1]	12	0.10	0.00	2.10	2.03	0.94	1.29	3.44	15/20	0.00
		2019	11	0.10	0.00	3.11	2.88	1.23	1.89	12.70	15/20	0.00
		2020	10	0.10	0.00	2.61	2.45	0.89	1.51	4.58	15/20	0.00
	Far	Baseline	4	0.10	0.00	1.48	1.07	0.95	0.93	4.49	15/20	0.00
		2019	4	0.10	0.00	1.94	1.88	0.92	1.45	2.88	15/20	0.00
		2020	11	0.10	0.00	1.91	1.82	1.06	1.36	2.86	15/20	0.00
	Reference	Baseline	13	0.10	0.00	1.28	1.14	0.43	0.81	3.18	15/20	0.00
		2019	5	0.10	0.00	1.12	1.09	0.45	0.84	1.64	15/20	0.00
		2020	4	0.10	0.00	1.14	1.01	0.52	0.77	2.20	15/20	0.00
Tote Road	Near	Baseline	15	0.10	0.00	3.21	3.38	1.27	1.16	6.06	15/20	0.00
		2019	12	0.10	0.00	4.87	4.34	1.76	3.32	8.94	15/20	0.00
		2020	10	0.10	0.00	2.68	2.59	0.87	2.08	4.00	15/20	0.00
		2021	2	0.10	0.00	3.56	3.61	0.58	3.03	4.18	15/20	0.00
	Far	Baseline	9	0.10	0.00	1.35	1.22	0.85	0.69	3.82	15/20	0.00
		2019	4	0.10	0.00	1.72	1.58	0.59	1.31	2.72	15/20	0.00
		2020	4	0.10	0.00	1.59	1.72	0.34	1.06	2.05	15/20	0.00
	Reference	Baseline	11	0.10	0.00	0.94	0.87	0.27	0.66	2.14	15/20	0.00
		2019	4	0.10	0.00	0.87	0.88	0.14	0.74	1.03	15/20	0.00
		2020	3	0.10	0.00	0.95	1.04	0.14	0.78	1.05	15/20	0.00
Milne Port	Near	Baseline	14	0.10	0.00	0.99	0.86	0.38	0.68	2.12	15/20	0.00
		2019	10	0.10	0.00	1.08	1.10	0.21	0.91	1.41	15/20	0.00
		2020	10	0.10	0.00	1.10	1.09	0.14	0.91	1.48	15/20	0.00
		2021	9	0.10	0.00	1.57	1.61	0.27	1.19	2.06	15/20	0.00
	Far	Baseline	4	0.10	0.00	0.87	0.84	0.13	0.76	1.06	15/20	0.00
		2019	3	0.10	0.00	0.80	0.84	0.11	0.68	0.90	15/20	0.00
		2020	5	0.10	0.00	0.96	0.93	0.48	0.67	1.31	15/20	0.00
		2021	1	0.10	0.00	1.77	1.77	0.00	1.77	1.77	15/20	0.00
	Reference	Baseline	3	0.10	0.00	0.84	0.82	0.08	0.77	0.93	15/20	0.00
		2019	4	0.10	0.00	0.75	0.77	0.12	0.63	0.87	15/20	0.00
		2020	3	0.10	0.00	0.73	0.74	0.11	0.63	0.84	15/20	0.00

[1] Baseline = baseline sampling during pre-construction for all years up to and including 2016.

[2] Number of sample sites.

[3] Maximum MDL across all sampling years.

[4] 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 vigor or growth. The indicator value includes lower and upper lichen-metal/metalloid concentration thresholds (5 and 15 mg/kg).

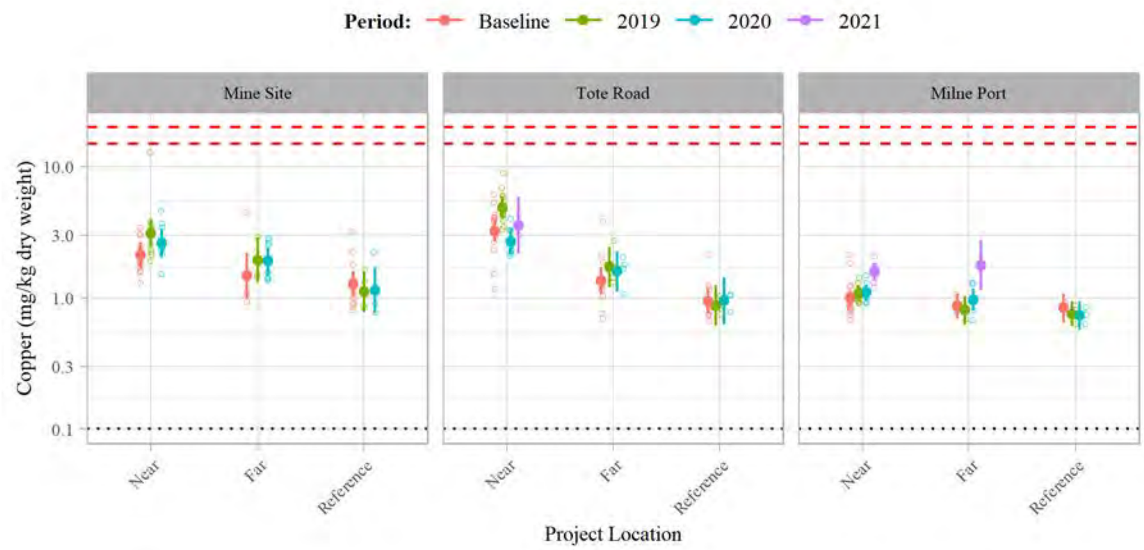


Figure 8-11. Distribution of lichen-copper concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lower and upper lichen indicator values (15 and 20 mg/kg), and the black dotted line shows the minimum detection limit (0.1 mg/kg).

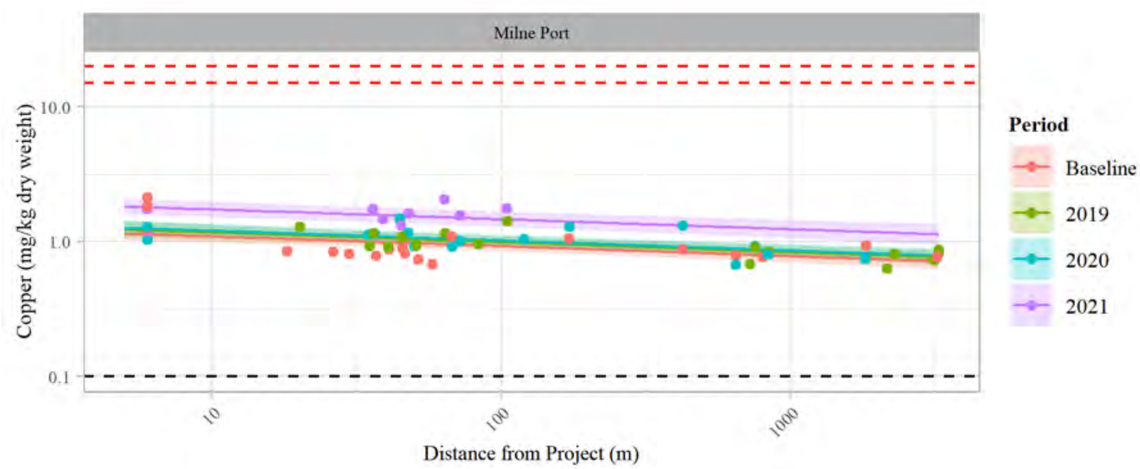


Figure 8-12. Distribution of lichen-copper concentrations (Milne Port) in 2021.

The solid line shows mean concentrations, and the shaded area is the 95% confidence region. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lower and upper lichen indicator values (15 and 20 mg/kg), and the black dotted line shows the minimum detection limit (0.1 mg/kg).

Pb — Table 8-19 summarizes net changes in lichen-Pb concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-20 provides a further breakdown of lichen-Pb concentrations in relation to the RDL. Figure 8-13 illustrates the distribution of lichen-Pb concentrations at the Project (2019 to 2021 values), while Figure 8-14 shows the distribution of lichen-Pb concentrations along the Tote Road and at Milne Port (i.e., the Project areas where significant increases in lichen-Pb concentrations were observed compared to baseline values). Significant increases for lichen-Pb from baseline conditions were recorded along the Tote Road. Most values were below the lower lichen indicator value, whereas isolated samples along the Tote Road and at Milne Port; lower threshold exceedances also occurred along the Tote Road. This is a sustained/stable trend since 2019. Upon closer evaluation, this trend is associated with high variability and wide confidence intervals. Most lichen-Pb concentrations were consistently low across all sample sites and either at or below the detection limit. Lichen-Pb is not presently considered a risk to environmental or human health.

Note: Based on the evaluation of exposure potential from ore dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, Intrinsik Environmental Sciences Inc 2011), Pb holds a moderate potential for significant bioaccumulation or biomagnification in the terrestrial food web. Presently, it cannot be determined whether lichen-Pb increases along the Tote Road Port are Project-related or naturally occurring. Lichen-Pb will continue to be monitored to evaluate this potential trend.

Table 8-18. Net change in lichen-lead concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	**2019**	**2020**	**2021**	**Baseline**	**2019**	**2020**	**2021**	**Baseline**	**2019**	**2020**	**2021**
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port												N/A

Gray = No change from baseline.
Yellow = Significant increase from baseline, mean concentration below lichen indicator value.
Orange = Significant increase from baseline, mean concentration above lower lichen indicator value.
N/A = No samples were collected.

Table 8-19. Mean lichen-lead concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value[4]	Above Indicator Value (%)
Mine Site	Near	Baseline[1]	12	0.02	0.00	1.18	1.23	0.50	0.58	3.47	5/15	0.00
		2019	11	0.02	0.00	2.35	2.19	1.28	1.22	4.82	5/15	0.00
		2020	10	0.02	0.00	2.40	2.16	2.20	1.49	4.77	5/15	0.00
	Far	Baseline	4	0.02	0.00	0.92	0.89	0.49	0.56	1.67	5/15	0.00
		2019	4	0.02	0.00	1.43	1.52	0.92	0.81	2.38	5/15	0.00
		2020	11	0.02	0.00	1.49	1.40	0.72	0.91	3.32	5/15	0.00
	Reference	Baseline	13	0.02	0.00	1.28	1.41	1.95	0.28	6.71	5/15	7.69/0.00
		2019	5	0.02	0.00	0.95	0.82	0.98	0.44	2.11	5/15	0.00
		2020	4	0.02	0.00	0.95	1.05	0.29	0.48	1.53	5/15	0.00
Tote Road	Near	Baseline	15	0.02	0.00	1.74	1.76	1.31	0.53	3.23	5/15	0.00
		2019	12	0.02	0.00	6.48	6.18	1.62	4.05	15.30	5/15	83.33/8.33
		2020	10	0.02	0.00	5.63	6.14	3.01	3.17	8.72	5/15	60.00/0.00
		2021	2	0.02	0.00	6.65	6.68	0.62	6.06	7.29	5/15	100.00/0.00
	Far	Baseline	9	0.02	0.00	0.70	0.78	0.47	0.22	1.26	5/15	0.00
		2019	4	0.02	0.00	1.96	1.74	1.42	1.14	4.53	5/15	0.00
		2020	4	0.02	0.00	2.35	2.85	1.17	0.73	5.15	5/15	25.00/0.00
	Reference	Baseline	11	0.02	0.00	0.67	0.70	0.35	0.29	1.76	5/15	0.00
		2019	4	0.02	0.00	0.48	0.48	0.08	0.43	0.53	5/15	0.00
		2020	3	0.02	0.00	0.45	0.45	0.07	0.38	0.53	5/15	0.00
Milne Port	Near	Baseline	14	0.02	0.00	1.07	0.97	0.36	0.53	2.60	5/15	0.00
		2019	10	0.02	0.00	1.69	1.60	0.50	1.01	2.71	5/15	0.00
		2020	10	0.02	0.00	1.79	1.66	0.86	1.11	3.18	5/15	0.00
		2021	9	0.02	0.00	2.19	2.28	1.34	1.28	3.83	5/15	0.00
	Far	Baseline	4	0.02	0.00	0.67	0.65	0.40	0.41	1.19	5/15	0.00
		2019	3	0.02	0.00	0.59	0.53	0.28	0.41	0.97	5/15	0.00
		2020	5	0.02	0.00	0.88	0.94	1.26	0.26	2.10	5/15	0.00
		2021	1	0.02	0.00	2.62	2.62	0.00	2.62	2.62	5/15	0.00
	Reference	Baseline	3	0.02	0.00	0.55	0.45	0.25	0.40	0.91	5/15	0.00
		2019	4	0.02	0.00	0.35	0.32	0.08	0.27	0.53	5/15	0.00
		2020	3	0.02	0.00	0.37	0.34	0.06	0.34	0.46	5/15	0.00

1 Baseline = baseline sampling during pre-construction for all years up to and including 2016.

2 Number of sample sites.

3 Maximum MDL across all sampling years.

4 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 vigor or growth. The indicator value includes lower and upper lichen-metal/metalloid concentration thresholds (5 and 15 mg/kg).

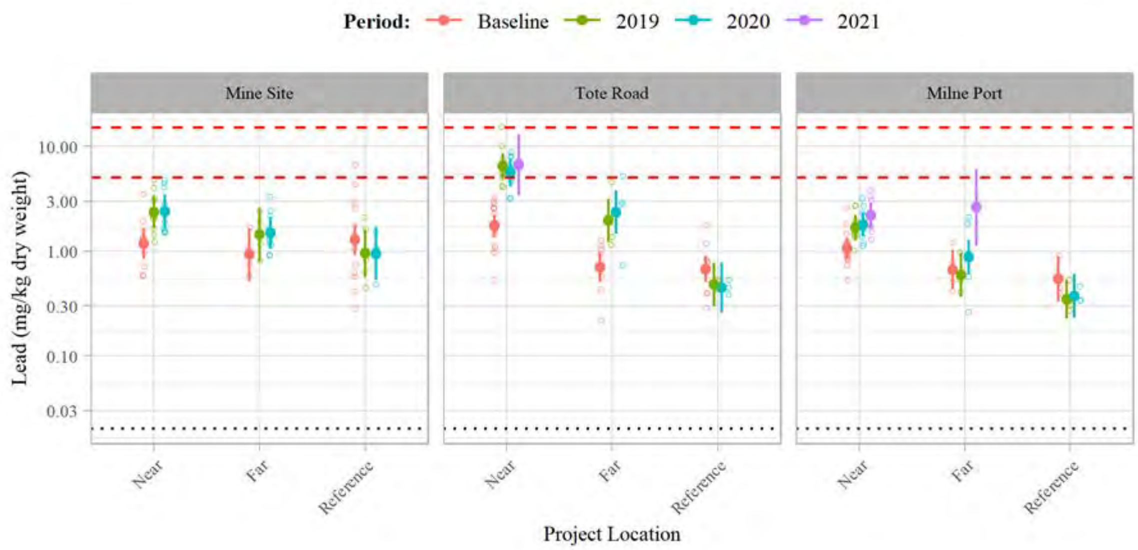


Figure 8-13. Distribution of lichen-lead concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval), open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lower lichen indicator value of 5 mg/kg (upper value is 15 mg/kg), and the black dotted line shows the minimum detection limit (0.02 mg/kg).

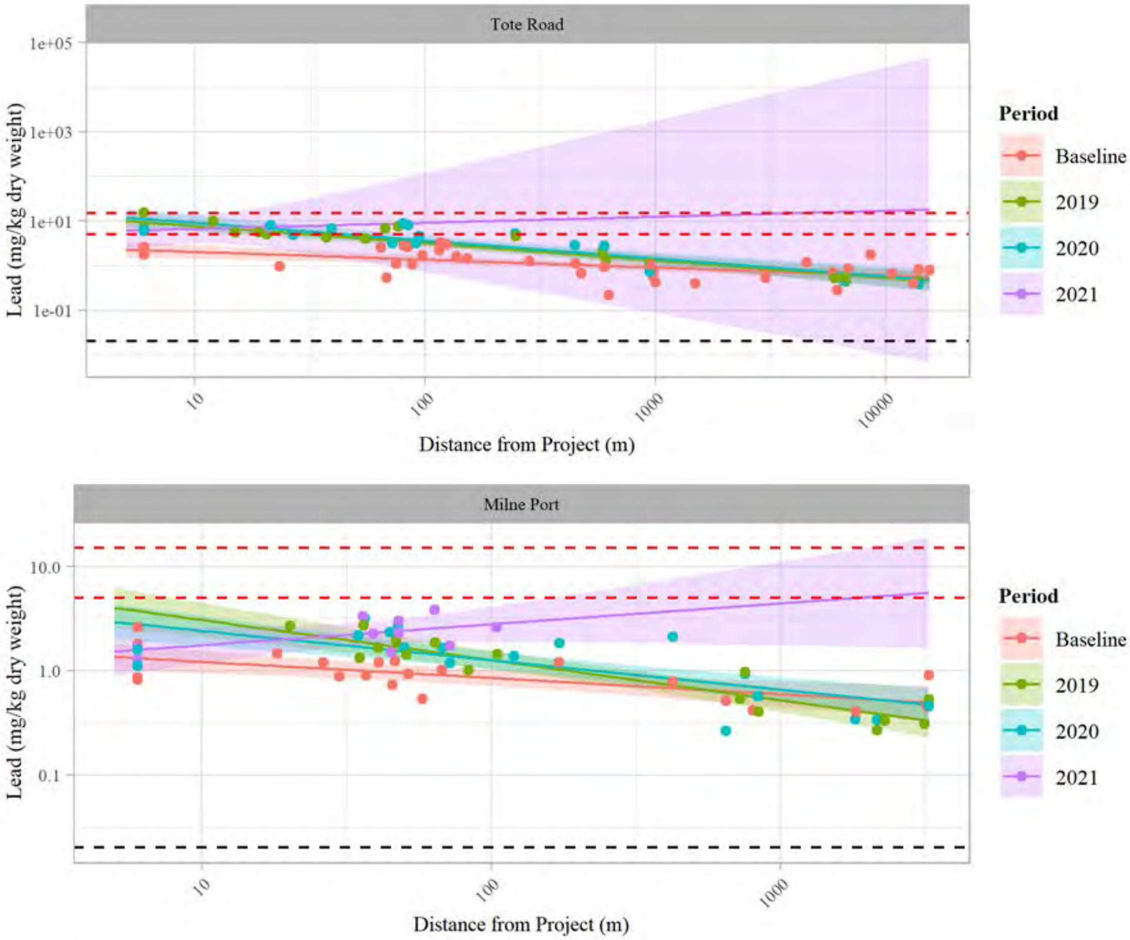


Figure 8-14. Distribution of lichen-lead concentrations (Tote Road and Milne Port) in 2021.

The solid line shows mean concentrations, and the shaded area is the 95% confidence region. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lower and upper indicator values (5 and 15 mg/kg), and the black dotted line shows the minimum detection limit (0.02 mg/kg).

Se — Table 8-21 summarizes net changes in lichen-Se concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-22 provides a further breakdown of lichen-Se concentrations in relation to the RDL. Figure 8-15 illustrates the distribution of lichen-Se concentrations at the Project (2019 to 2021 values). Unlike 2019 and 2020, no significant increases in lichen-Se concentrations were observed in 2021. Although no threshold values are available for lichen-Se, most lichen-Se concentrations were consistently low across all sample sites and either at or below the detection limit. Lichen-Se is not presently considered a risk to environmental or human health.

Note: Based on the evaluation of exposure potential from ore dusting (Appendix 6G-1 and 6G-2, FEIS; Baffinland Iron Mines Corporation 2010b, Intrinsik Environmental Sciences Inc 2011), Se holds a moderate to high potential for significant bioaccumulation or biomagnification in the terrestrial food web. Presently, it cannot be determined whether lichen-Se increases at Milne Port are Project-related or naturally occurring. Lichen-Se will continue to be monitored to evaluate this potential trend.

Table 8-20. Net change in lichen-selenium concentrations in 2021.

Project Area	Near (0 – 100 m)				Far (100 – 1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port								N/A				N/A

Gray = No change from baseline.

Yellow = Significant increase from baseline, mean concentration below lichen indicator value.

N/A = No samples were collected.

Table 8-21. Mean lichen-selenium concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value[4]	Above Indicator Value (%)
Mine Site	Near	Baseline[1]	12	0.05	8.33	0.06	0.07	0.02	0.03	0.09	-	-
		2019	11	0.05	0.00	0.08	0.08	0.03	0.06	0.11	-	-
		2020	10	0.05	0.00	0.08	0.08	0.01	0.07	0.11	-	-
	Far	Baseline	4	0.05	75.00	0.03	0.03	0.01	0.03	0.07	-	-
		2019	4	0.05	0.00	0.07	0.07	0.01	0.06	0.08	-	-
		2020	11	0.05	9.09	0.07	0.08	0.02	0.03	0.11	-	-
	Reference	Baseline	13	0.05	15.38	0.07	0.08	0.04	0.03	0.20	-	-
		2019	5	0.05	0.00	0.09	0.09	0.02	0.07	0.12	-	-
		2020	4	0.05	0.00	0.08	0.08	0.02	0.07	0.11	-	-
Tote Road	Near	Baseline	15	0.05	0.00	0.07	0.07	0.02	0.05	0.08	-	-
		2019	12	0.05	8.33	0.06	0.07	0.01	0.03	0.08	-	-
		2020	10	0.05	0.00	0.07	0.07	0.02	0.06	0.09	-	-
		2021	2	0.05	0.00	0.09	0.09	0.01	0.08	0.11	-	-
	Far	Baseline	9	0.05	44.44	0.04	0.06	0.04	0.03	0.07	-	-
		2019	4	0.05	25.00	0.05	0.07	0.02	0.03	0.08	-	-
		2020	4	0.05	0.00	0.07	0.07	0.01	0.06	0.07	-	-
	Reference	Baseline	11	0.05	45.45	0.04	0.06	0.03	0.03	0.07	-	-
		2019	4	0.05	0.00	0.06	0.06	0.01	0.05	0.08	-	-
		2020	3	0.05	0.00	0.07	0.07	0.01	0.07	0.08	-	-
Milne Port	Near	Baseline	14	0.05	7.14	0.07	0.07	0.02	0.03	0.14	-	-
		2019	10	0.05	0.00	0.07	0.07	0.01	0.05	0.08	-	-
		2020	10	0.05	10.00	0.06	0.07	0.01	0.03	0.09	-	-
		2021	9	0.05	0.00	0.09	0.09	0.01	0.08	0.10	-	-
	Far	Baseline	4	0.05	25.00	0.05	0.06	0.02	0.03	0.07	-	-
		2019	3	0.05	33.33	0.05	0.06	0.02	0.03	0.06	-	-

Table 8-21. Mean lichen-selenium concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value[4]	Above Indicator Value (%)
		2020	5	0.05	20.00	0.06	0.07	0.02	0.03	0.08	-	-
		2021	1	0.05	0.00	0.11	0.11	0.00	0.11	0.11	-	-
	Reference	Baseline	3	0.05	0.00	0.06	0.05	0.01	0.05	0.07	-	-
		2019	4	0.05	50.00	0.04	0.04	0.03	0.03	0.06	-	-
		2020	3	0.05	33.33	0.05	0.06	0.02	0.03	0.07	-	-

1 Baseline = baseline sampling during pre-construction for all years up to and including 2016.

2 Number of sample sites.

3 Maximum MDL across all sampling years.

4 No indicator value is available.

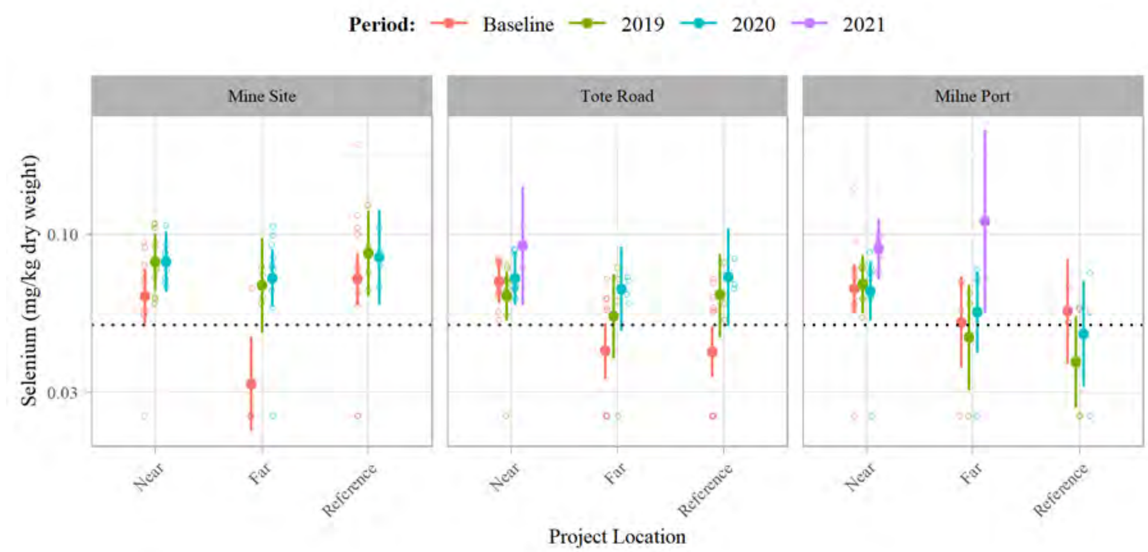


Figure 8-15. Distribution of lichen-selenium concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The black dotted line shows the minimum detection limit (0.05 mg/kg).

Zn — Table 8-23 summarizes net changes in lichen-Zn concentrations (i.e., comparing 2019, 2020, and 2021 values with baseline conditions) across Project areas and sampling distances. Table 8-24 provides a further breakdown of lichen-Zn concentrations in relation to the RDL. Figure 8-16 illustrates the distribution of lichen-Zn concentrations at the Project (2019 to 2021 values). No significant increases in lichen-Zn concentrations were observed in 2021. All values were below the lichen indicator value for Zn. Lichen-Zn is not presently considered to pose a risk to environmental or human health.

Table 8-22. Net change in lichen-zinc concentrations in 2021.

Project Area	Near (0–100 m)				Far (100–1,000 m)				Reference (>1,000 m)			
	Baseline	2019	2020	2021	Baseline	2019	2020	2021	Baseline	2019	2020	2021
Mine Site				N/A				N/A				N/A
Tote Road								N/A				N/A
Milne Port								N/A				N/A

Gray = No change from Baseline.

Yellow = Significant increase from Baseline, mean concentration below lichen indicator value.

Orange = Significant from Baseline, mean concentration above lower lichen indicator value.

N/A = No samples were collected.

Table 8-23. Mean lichen-zinc concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value [4]	Above Indicator Value (%)
Mine Site	Near	Baseline[1]	12	0.50	0.00	14.27	14.25	5.10	10.80	20.40	178.00	0.00
		2019	11	0.50	0.00	17.74	17.60	5.85	13.30	25.50	178.00	0.00
		2020	10	0.50	0.00	16.68	16.00	1.33	12.50	29.40	178.00	0.00
	Far	Baseline	4	0.50	0.00	11.18	10.65	3.93	9.08	15.50	178.00	0.00
		2019	4	0.50	0.00	14.99	14.25	4.53	12.30	20.50	178.00	0.00
		2020	11	0.50	0.00	15.72	16.00	4.60	10.10	22.10	178.00	0.00
	Reference	Baseline	13	0.50	0.00	17.08	18.00	5.40	9.82	29.10	178.00	0.00
		2019	5	0.50	0.00	19.12	19.00	4.20	13.70	27.50	178.00	0.00
		2020	4	0.50	0.00	25.00	27.60	10.70	14.40	36.20	178.00	0.00
Tote Road	Near	Baseline	15	0.50	0.00	16.91	18.00	3.60	8.57	28.80	178.00	0.00
		2019	12	0.50	0.00	19.78	20.70	4.73	14.40	24.30	178.00	0.00
		2020	10	0.50	0.00	16.90	17.50	6.33	12.60	21.40	178.00	0.00
		2021	2	0.50	0.00	17.51	17.95	3.95	14.00	21.90	178.00	0.00
	Far	Baseline	9	0.50	0.00	12.96	12.30	3.10	7.14	33.20	178.00	0.00
		2019	4	0.50	0.00	16.38	17.10	3.98	12.20	20.30	178.00	0.00
		2020	4	0.50	0.00	16.27	17.05	3.95	10.30	23.40	178.00	0.00
	Reference	Baseline	11	0.50	0.00	13.80	15.30	5.15	6.47	20.60	178.00	0.00
		2019	4	0.50	0.00	13.40	13.21	8.72	8.76	22.70	178.00	0.00
		2020	3	0.50	0.00	17.26	20.60	7.58	9.94	25.10	178.00	0.00
Milne Port	Near	Baseline	14	0.50	0.00	10.55	10.55	2.94	7.16	16.20	178.00	0.00
		2019	10	0.50	0.00	9.49	9.29	1.37	7.97	11.60	178.00	0.00
		2020	10	0.50	0.00	10.03	9.89	1.80	7.92	13.50	178.00	0.00
		2021	9	0.50	0.00	11.93	11.70	2.30	10.20	14.50	178.00	0.00
	Far	Baseline	4	0.50	0.00	9.90	10.65	1.35	7.70	11.00	178.00	0.00
		2019	3	0.50	0.00	7.51	7.90	1.09	6.32	8.49	178.00	0.00
		2020	5	0.50	0.00	8.49	8.99	1.59	6.41	9.94	178.00	0.00
		2021	1	0.50	0.00	12.70	12.70	0.00	12.70	12.70	178.00	0.00
	Reference	Baseline	3	0.50	0.00	11.30	12.10	1.65	9.40	12.70	178.00	0.00

Table 8-23. Mean lichen-zinc concentrations (mg/kg) in 2021.

Area	Distance from PDA	Sampling Period	n[2]	RDL	Below RDL[3] (%)	Mean	Median	Inter-quartile range	Min	Max	Indicator Value [4]	Above Indicator Value (%)
		2019	4	0.50	0.00	8.44	8.28	2.21	6.37	11.70	178.00	0.00
		2020	3	0.50	0.00	9.17	9.41	1.52	7.67	10.70	178.00	0.00

[1] Baseline = baseline sampling during pre-construction for all years up to and including 2016.

[2] Number of sample sites.

[3] Maximum MDL across all sampling years.

[4] 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.

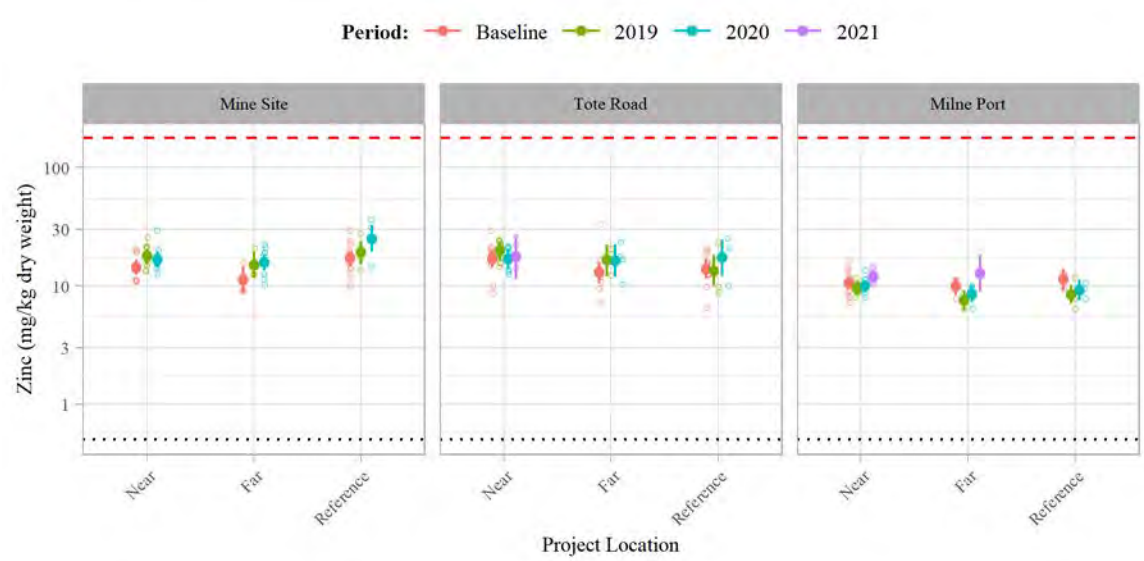


Figure 8-16. Distribution of lichen-zinc concentrations (Project-wide) in 2021.

Solid points with error bars show means (± 95% confidence interval); open circles show individual sample values. Concentrations below the detection limit are displayed as half the detection limit. The red dashed line shows the lichen indicator value (178 mg/kg), and the black dotted line shows the minimum detection limit (0.5 mg/kg).

8.1.3 SUMMARY

Soil-metal concentrations at the Project predominantly indicated no net change (i.e., no significant increases) from the baseline values. Values were below or within an acceptable range for soil-metal concentrations. Lichen-metal concentrations had some discrete increases at the Project, but all sample locations were below or within an acceptable range for lichen-metal concentrations. As such, soil-metal and lichen-metal concentrations presently represent a low risk to environmental and human health. Baffinland will continue monitoring these conditions and further document CoPCs. Should these values increase and result in exceedances of threshold values, it may be necessary to re-evaluate and refine potential triggers and corrective actions.

9 MAMMALS

Mammal monitoring conducted along the Tote Road, Milne Port and Mine Site at the Mary River Project in 2021 included several surveys designed to enhance baseline data and monitor the effects of Project-related activities on caribou and other wildlife. These monitoring programs for mammals are used for surveillance-level monitoring of Project effects within and near the Potential Development Area (PDA). Surveillance-level monitoring collects relative and reconnaissance information that allows Baffinland Iron Mines Corporation (Baffinland) to understand, predict, and mitigate potential mammal interactions with the Project. Specific surveys conducted as part of the mammal monitoring program in 2021 included snow track surveys, snowbank height monitoring, Height of Land caribou surveys, remote camera deployments, incidental observations and the wildlife log.

Given that the North Baffin caribou are currently at a low point in their 60–80-year population cycle (Government of Nunavut 2019), caribou observations made during surveys or incidentally are infrequent. Nevertheless, Height of Land surveys, in conjunction with snow track surveys, snowbank surveys, and remote cameras, can provide reconnaissance and surveillance data on local caribou behaviours and interactions with the Project, and, when data is available, may provide an early indicator of relative changes in caribou populations. These surveys are designed to monitor individual-level responses to the Project (e.g., disturbance during calving, deflection from the Tote Road) and inform appropriate mitigations and adaptive management actions to minimize any negative Project-related effects, regardless of overall caribou population size.

As outlined in the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP), the current survey frequency is appropriate for low caribou densities; when caribou densities increase, survey frequency will be increased correspondingly.

9.1 SNOW TRACK SURVEYS

The following Project Conditions (PCs) were used to address concerns regarding potential caribou crossings of linear features (i.e., train or vehicle traffic) and constraining of wildlife movement across roadways (Nunavut Impact Review Board 2020):

- PC#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*
- PC#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.*

To address these Project Conditions, discrete snow track surveys were conducted from February to April and October to November 2021. These surveys allowed for studying the movements of caribou and other wildlife in proximity to roadways and documentation of their behavioural response to human activities near the Project footprint.

9.1.1 METHODS

The purpose of snow track surveys is to monitor the patterns of movement and response of caribou and other wildlife to Project-related activities based on their observable tracks in proximity to roadways. Snow track surveys were conducted on February 17, March 18, April 7 and 27, October 10, and November 1, 2021, typically within 24 to 48 hrs following a fresh snowfall. Two or three Baffinland personnel led surveys, who surveyed the Tote Road from a light truck at a speed of ~30 km/hr. If/when wildlife tracks were suspected, personnel would investigate on-foot, confirm the species' identity and follow the tracks (to or from the roadway) to document the patterns of movement, behaviour, and habitat use to the extent possible. The following information was recorded:

- geo-referencing (latitude and longitude) at the location of the tracks/wildlife crossing;
- species identity;
- number of distinct sets of tracks (i.e., group size);
- description of the pattern of movement (e.g., deflected, travelled along, or crossing the road);
- height of the snowbank 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,
- site photo-documentation and other miscellaneous survey observations (if/where applicable).

Snow track survey limitations may include deterioration of snow conditions from sun or wind for species identification, and low light visibility for initial detection, all of which are noted during each survey.

9.1.2 RESULT AND DISCUSSIONS

A total of 74 tracks were observed over six surveys conducted between February 17, 2021, and November 1, 2021, after recent snowfall events. Of the total tracks recorded, 44 were estimated to be 'fresh', belonging to species such as Arctic fox (*Vulpes lagopus)*, Arctic hare (*Lepus arcticus*), Ptarmigan (*Lagopus* sp.), lemming (*Cricetidae* sp.), or ermine (*Mustela* sp.). In addition to wildlife tracks, one burrow was noted on February 17, 2021, and recorded as an ermine burrow on the east side, roughly 1 m from the Tote Road.

Typical site conditions and examples of observed tracks during the surveys in February, March, and April 2021 are displayed in Photo 9-1 to Photo 9-4. Locations of tracks and their responses to the Tote Road are depicted in Map 9-1. Snow track surveys will continue annually and will be conducted more often by on-site staff once caribou are observed near the 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 harvesters and as reported to Baffinland and the Terrestrial Environment Working Group [TEWG]).

February 17, 2021 — The survey was completed approximately 36 hours after a snowfall with good visibility, good tracking conditions, and moderate winds for the survey duration. Snow cover was consistently high along the length of the Tote Road. Wind speeds recorded at the Project in the 12 hours leading up to the survey were light to moderate, generally ranging from 3 to 7 m/s, which likely limited the snow's re-distribution after the snowfall, allowing for high confidence in detection and age estimation of observed tracks. Surveyors observed 14 distinct sets of Arctic fox tracks during the February survey, primarily on the Tote Road's east side. Of the seven sets of tracks considered fresh, four crossed the Tote Road, while three paralleled the road. No deflections of fox were noted. Seven sets of ermine tracks, two sets of lemming tracks and three sets of Ptarmigan tracks were also recorded; however, no caribou or other mammal tracks were observed.

March 18, 2021 — The survey was completed approximately 36 hours after a snowfall with excellent visibility, good tracking conditions, and light winds for the survey duration. Snow cover was consistently high along the length of the Tote Road. Wind speeds recorded at the Project in the 12 hours leading up to the survey were light, generally ranging less than 1 m/s, which likely limited the snow's re-distribution after the snowfall, allowing for high confidence in detection and age estimation of observed tracks. Surveyors observed 10 distinct sets of Arctic fox tracks during the March survey on both sides of the Tote Road, seven of which were considered fresh. Of the sets of tracks, seven travelled along the Tote Road, while three crossed the road. Two sets of Ptarmigan tracks, two sets of Arctic hares, one set of lemmings were also recorded paralleling the road and one set of ermine tracks that crossed the Tote Road. No signs of caribou or other mammal tracks were observed.

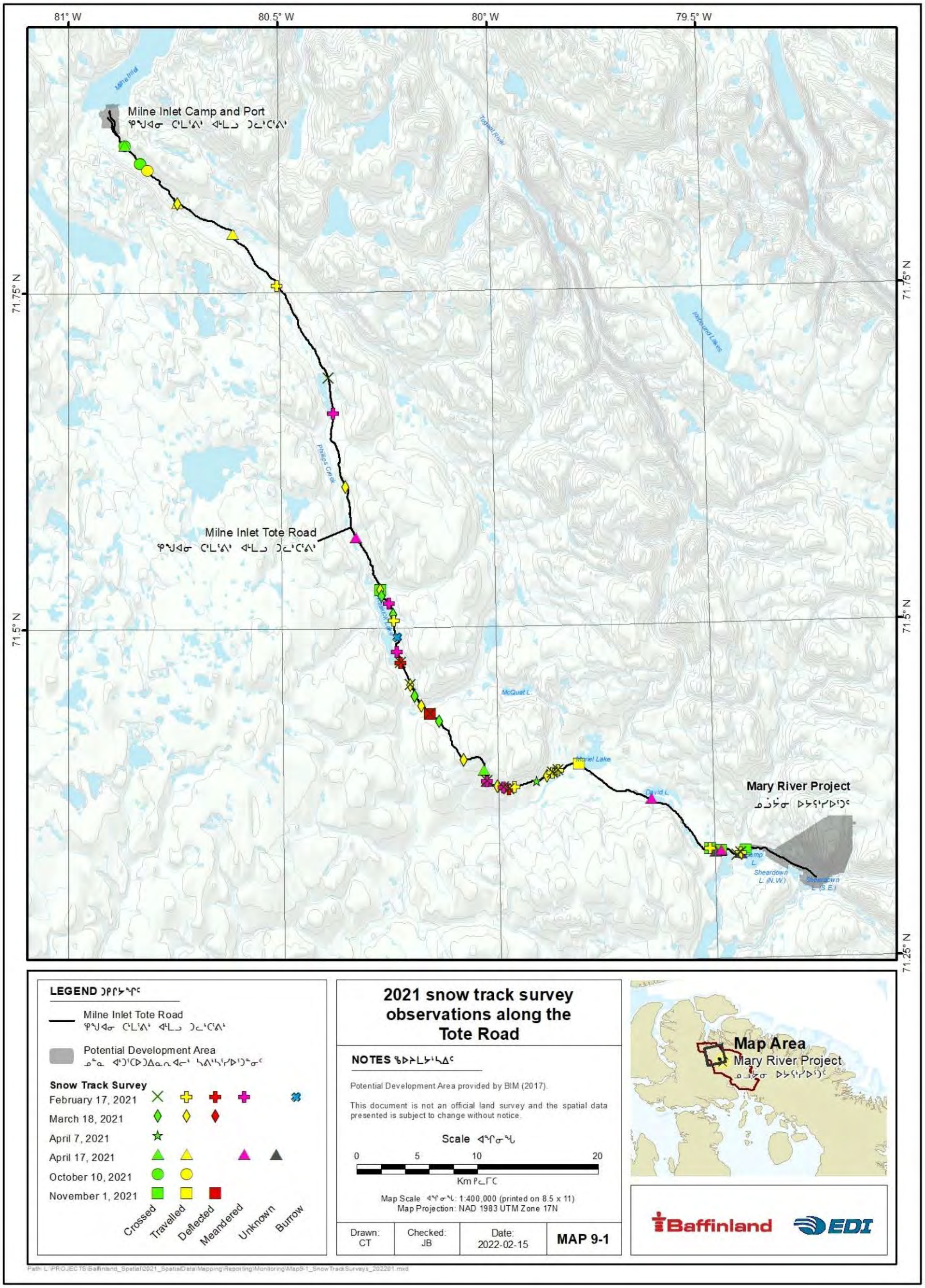
April 7, 2021 — The survey was completed approximately 24 hours after a snowfall with excellent visibility, poor tracking conditions, and moderate winds for the survey duration. Snow cover was consistently high along the length of the Tote Road. Wind speeds recorded at the Project in the 12 hours leading up to the survey were light to moderate, generally ranging from 4 to 9 m/s, which likely re-distributed the snow shortly after the snowfall event, resulting in a light dusting of windswept snow. Surveyors observed one distinct fresh set of Arctic fox tracks on both sides as it crossed the Tote Road. Observers tested snow conditions and found the snow to be very rigid, with new snow that could support the weight of a fox without deforming. No signs of caribou or other mammal tracks were observed.

April 27, 2021 — The survey was completed approximately 48 hours after a snowfall, resulting in poor tracking conditions despite excellent visibility and moderate winds. Recent snow removal caused very high snowbanks in places, and actively feathering the banks caused the tracks to be lost. Wind speeds recorded at the Project in the 12 hours leading up to the survey were light to moderate, generally ranging from 2 to 5 m/s, which likely limited the snow's re-distribution after the snowfall, allowing for high confidence in detection and age estimation of observed tracks. Surveyors observed 10 distinct sets of Arctic fox tracks during the April 27 survey, with six that were considered fresh. Only one set of tracks crosses the Tote Road, with the remaining five travelling along the Tote Road and one deflected from the road. No signs of caribou or other mammal tracks were observed.

October 10, 2021 — The survey was completed to take advantage of recent snowfall and adequate light conditions (i.e., surveys usually only occur in spring due to limited snowfall and light in late fall and winter). The survey was conducted approximately 24 hours after a light snowfall with poor tracking conditions but excellent visibility and light winds for the survey duration. Wind speeds recorded at the Project in the 12 hours leading up to the survey were light to moderate, generally ranging from 3 to 7 m/s, which likely limited the snow's re-distribution after the snowfall, allowing for high confidence in detection and age estimation of observed tracks. Surveyors observed two sets of fresh Arctic fox tracks, with both crossing the Tote Road, and two fresh sets of Arctic hare tracks, with one that crossed the Tote Road and one that travelled parallel to it. No caribou or other mammal tracks were observed.

November 1, 2021 — The November 1 survey was conducted approximately 48 hours after a snowfall. Survey conditions were good, with excellent visibility and light winds for the duration of the survey. Wind speeds recorded at the Project in the 12 hours leading up to the survey were light, generally ranging less than 2 m/s, which likely limited the snow's re-distribution after the snowfall, allowing for high confidence in detection and age estimation of observed tracks. Surveyors detected four sets of Arctic fox tracks, two of which were considered fresh. Of these, one crossed and one travelled alongside the Tote Road. Two sets of fresh Arctic hare tracks (crossed) and two sets of Ptarmigan tracks (deflected) were also observed. No caribou or other mammal tracks were observed.

Based on 2021 snow track survey results, 29% of recorded ptarmigan, 25% of ermine, and 2% of foxes deflected from the road, while 38% of hares, 35% of foxes, 33% of lemming, 29% of ptarmigan, and 13% of ermine travelled along the tote road. It should be noted that some small sample sizes of certain species can make it challenging to accurately interpret avoidance of the tote road.


81° W
80.5° W
80° W
79.5° W
71.75° N
71.5° N
71.25° N
Milne Inlet Camp and Port
Milne Inlet Tote Road
Mary River Project
McQuat L.
David L.
Sheardown L. (N.W.)
Sheardown L. (S.E.)
LEGEND
Milne Inlet Tote Road
Potential Development Area
Snow Track Survey
February 17, 2021
March 18, 2021
April 7, 2021
April 17, 2021
October 10, 2021
November 1, 2021
Crossed
Travelled
Deflected
Meandered
Unknown
Burrow
2021 snow track survey observations along the Tote Road
NOTES
Potential Development Area provided by BIM (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: 1:400,000 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N
Drawn: CT
Checked: JB
Date: 2022-02-15
MAP 9-1
Map Area
Mary River Project
Baffinland
EDI

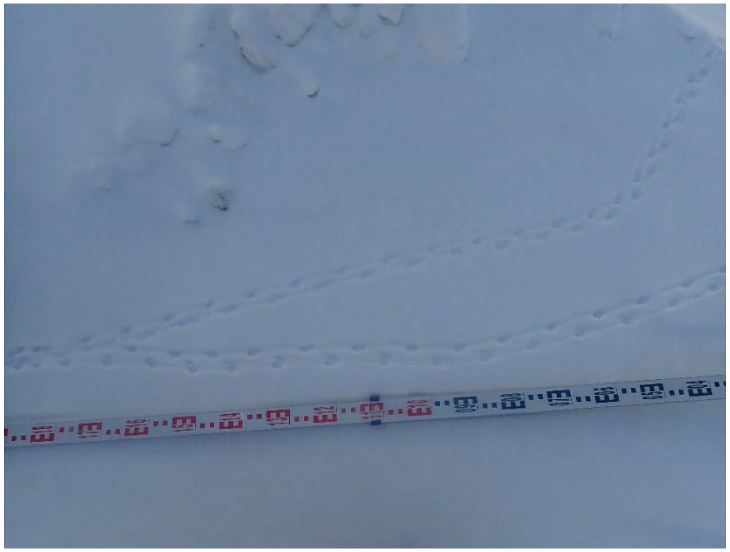


Photo 9-1. Ermine track at KM73.5 (February 17, 2021).

Photo 9-2. Lemming track at KM11.5 (March 18, 2021).

Photo 9-3. Arctic fox track at KM94.5 (April 27, 2021).

Photo 9-4. Arctic hare track at KM6.5 (October 21, 2021).

9.2 SNOWBANK HEIGHT MONITORING

The following Project Conditions (PCs) were used to address uncertainty in the Final Environmental Impact Statement (FEIS; (Baffinland Iron Mines Corporation 2012) and Early Revenue Program (ERP) FEIS (Baffinland Iron Mines Corporation 2013a) concerning caribou movement (Nunavut Impact Review Board 2020):

- PC#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.*
- PC#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 Project Conditions, Baffinland committed to various mitigation measures to facilitate effective caribou crossings of the Tote Road and reduce potential barriers on caribou movement. Mitigation measures include snowbank management by (1) maintaining the snowbank heights <100 cm along roadways and (2) smoothing/contouring the snowbanks on the edges of roadways to reduce the probability of drifting snow. These mitigations were designed to minimize obstacles to caribou crossing the transportation corridor and improve driver visibility to reduce potential wildlife-vehicle collisions. In conjunction with the snow track surveys (described in Section 9.1), snowbank height monitoring was implemented to verify that these mitigations measures are being applied at the Project.

9.2.1 METHODS

Monitoring of snowbank heights along the transportation corridor was conducted between one and three times monthly from November 2020 to December 2021 for a total of 13 surveys[16]. For each survey, Baffinland personnel measured snowbank heights at up to 50 randomized kilometre markers along the Tote Road (e.g., KM5.8, KM16, KM42), being mindful of safety and access[17]. In response to input from the TEWG, survey locations were regularly refreshed to eliminate potential survey biases, and better capture/verify snowbank conditions along the Tote Road. At each survey location, Baffinland personnel captured two snowbank height measurements (east- and west-side snowbanks), photo-documented site conditions and recorded any other relevant information (Photo 9-5 to Photo 9-8); up to a total of 100 measurements were captured during each monitoring survey and deemed either 'compliant' (<100 cm) or 'non-compliant' (>100 cm).

[16] Addressing TEWG requests for more frequent surveys, this represents an increase (up to three-fold) in the total number of snowbank height monitoring surveys during the same periods from 2018 to 2020, when only one survey was conducted per month.

[17] Occasionally, measurements could not be recorded due to low visibility and/or high traffic at the given location.

9.2.2 RESULT AND DISCUSSIONS

Snowbank height monitoring was conducted once during October and November 2020, three times in January 2021, twice during February and March 2021, and once in April, May, November and December 2021. Each survey was completed over one day.

Snowbank measurements across all surveys ranged from 0 to >200 cm in height. Compliance of snowbank height ranged from 77 to 100% and averaged 90% for all surveys combined (Table 9-1). During several of the surveys, many of the snowbanks were pushed back and feathered out to reduce drifting and height (Photo 9-5 and Photo 9-8). Mean snowbank heights per survey typically ranged between 15 to 85 cm. Generally, sample locations with snowbanks exceeding the 100 cm height threshold could not be pushed back or feathered out for safety and operational reasons, such as steep topography or winding sections of road constraining snowbank maintenance (Figure 9-1).

Table 9-1. 2021 Tote Road snowbank height monitoring.

Survey Date	Number of Measurements	Compliances	Exceedances	Percent Compliance
October 25, 2020	100	100	0	100%
November 13, 2020	96	96	0	100%
January 2, 2021	96	74	22	77%
January 14, 2021	90	77	13	86%
January 27, 2021	98	88	10	90%
February 16, 2021	80	73	7	91%
February 28, 2021	94	81	13	86%
March 11, 2021	98	94	4	96%
March 23, 2021	100	98	2	98%
April 14, 2021	86	69	17	80%
May 4, 2021	98	77	21	79%
November 6, 2021	75	65	10	87%
December 1, 2021	71	66	5	93%
Total	**1,182**	**1058**	**124**	**90%**

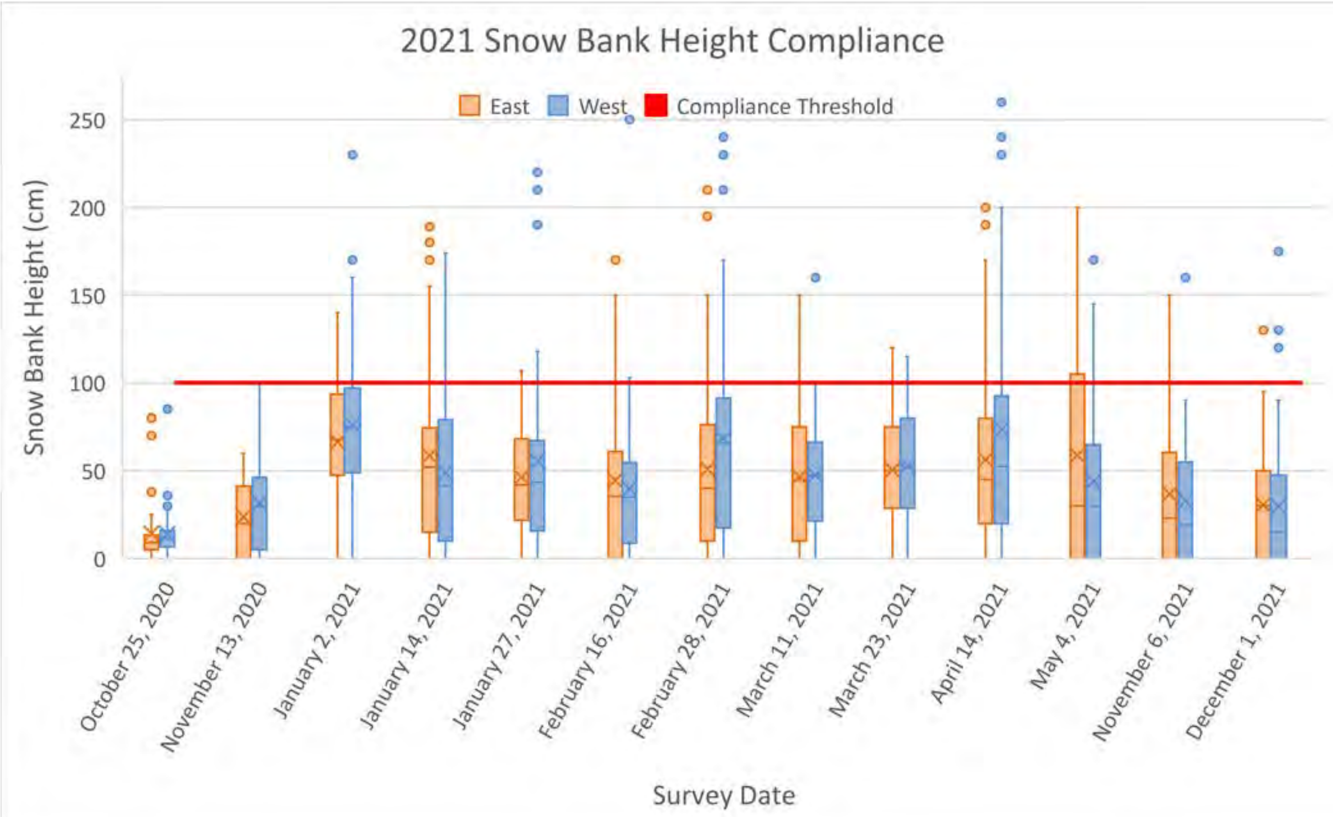


Figure 9-1. 2021 snowbank height monitoring time series and distribution for snowbank heights.

X represents the mean snowbank height for each survey. The horizontal line represents the median. The box represents the first and third quartiles. The whiskers represent the minimum and maximum values within 1.5 times the interquartile range.

Photo 9-5. Compliant snowbank (60 cm) at KM3.8 (March 23, 2021).

Photo 9-6. Non-compliant snowbank (160 cm) KM33.3 (January 2, 2021).

Photo 9-7. Snowbank management to facilitate wildlife crossing and improve driver visibility (April 14, 2021).

Photo 9-8. Snowbank management (in progress) to facilitate wildlife crossing and improve driver visibility (December 27, 2021).

9.3 HEIGHT OF LAND SURVEYS

The following Project Conditions (PCs) were developed to monitor and mitigate potential disturbance to caribou calving near or interacting with the Project (Nunavut Impact Review Board 2020):

- PC#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.*
- PC#54b *Monitoring for caribou presence and behavior during railway and Tote Road construction.*
- PC#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 these 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—particularly during the calving season (i.e., May and June). Behaviour sampling can provide insight into responses to environmental stimuli (Martin and Bateson 1993). The HOL surveys are intended to examine if/how caribou (especially cows with calves) respond to Project-related activities and infrastructure. When data is available, the HOL surveys can allow for long-term monitoring and observation of caribou behaviour throughout the life of the Project and provide information to verify predicted Project-related effects on caribou movement and habitat use.

9.3.1 METHODS

The HOL survey methods were developed in consultation with the TEWG (specifically the Mittimatalik Hunters and Trappers Organization [MHTO]) and incorporated Inuit Qaujimajatuqangit into strategies for detecting caribou (EDI Environmental Dynamics Inc. 2019). The HOL surveys comprise observations from a high point of land (i.e., to increase the observable area) for a prescribed amount of time using binoculars and a spotting scope. The objective is to detect and record caribou and their proximity to Project infrastructure. The 2021 HOL surveys were conducted in early summer (June 6 to 17, 2021) to observe caribou during the calving period; opportunistic late-winter surveys were not conducted in 2021.

Surveys were conducted at pre-established HOL stations (1 to 24) distributed throughout the Project footprint, typically at the highest points of the landscape, to optimize the viewshed (Map 9-2). A 360-degree viewshed was seldom achieved due to obstruction from landscape/terrain. Project components (e.g., the Tote Road, accommodation complexes, Deposit No. 1) were visible from each station. The locations of the stations were selected based on strategic positioning along the Project footprint, elevation gain (i.e., for improved viewshed), and accessibility during spring conditions. Depending on weather conditions, Stations 1 to 16 were generally accessible on foot, whereas Stations 17 to 24 were primarily accessible via helicopter (e.g., due to waterbodies, terrain and travel distances). Two qualified biologists from EDI Environmental Dynamics Inc. (EDI) conducted the 2021 surveys. Unlike previous surveys, Baffinland personnel and Inuit assistants did not participate in the survey due to COVID-19 restrictions (i.e. minimizing interactions between site personnel).

The survey procedure involved one observer scanning the viewshed with a spotting scope (i.e., focusing on the distant landscape) and one observer scanning the viewshed with binoculars (i.e., focusing on the intermediate and near landscape). EDI conducted a minimum of two surveys at each HOL station for 40 minutes. Using digital, tablet-based forms, the following information standards were recorded:

- station number (with georeferencing),
- location description (direction from road, aspect, terrain, other identifying features);
- general habitat description (vegetation and soil, if/where possible),
- presence of snow cover on landscape;
- photograph numbers (taken from multiple cardinal directions); and,
- survey observation timeframe (start/end times).

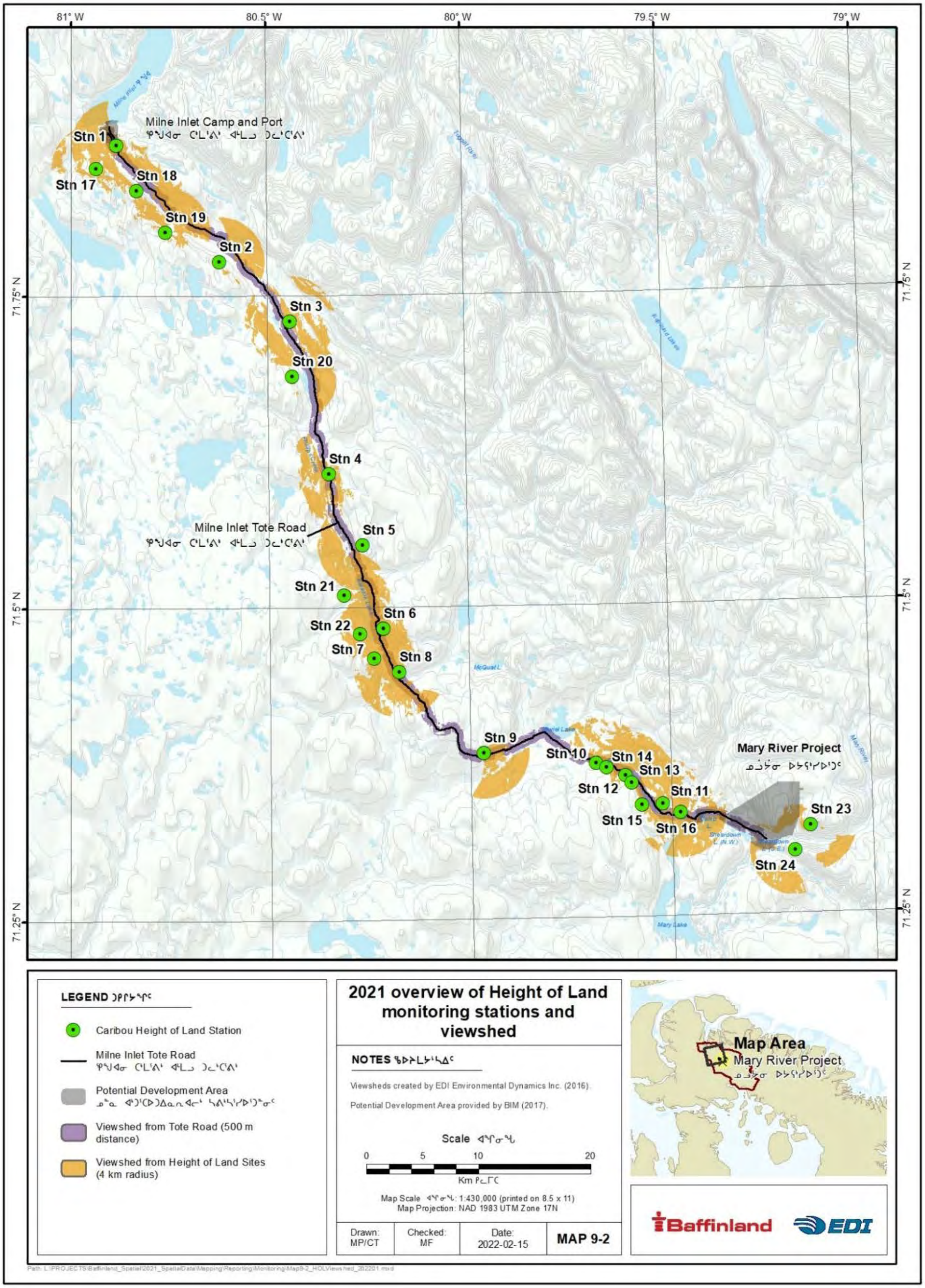
If caribou were observed, the survey team would monitor behaviour following established protocols described in the 2013 Annual Monitoring Report (EDI Environmental Dynamics Inc. 2014). Depending on the number of caribou, observations would be made as either a focal or scan sample ((Martin and Bateson 1993). For scan sampling, activity categories (e.g., walking, foraging, running, lying) would be assigned and tallied at two-minute intervals. For the focal sample, activity observations would be recorded at two-minute intervals; Project-related activities or events (e.g., truck travel along the Tote Road) would also be recorded to document any unique responses. Distances and directions of the observed individual or group to and from Project infrastructure were estimated (if/where applicable) and ground-truthed using a GPS.

Modifications to Survey Procedures

In 2016, viewshed modelling and mapping were completed to determine the amount of viewable area at each HOL survey station. A total of 227 km² were surveyed within the viewshed area, with viewshed ranging from 5 to 22 km² at each HOL station (Map 9-2). Refer to Section 4.3.1 of the 2016 Annual Monitoring Report for a detailed description of viewshed modelling and mapping (EDI Environmental Dynamics Inc. 2017).

During the June 2019 TEWG meeting, the MHTO suggested that HOL station locations should be re-evaluated to incorporate historic migration and calving patterns and any new information relevant to HOL goals and methodologies. In 2020 and 2021, the survey intensity was increased (as it is presently) by conducting a minimum of two (2) station visits and increasing survey observations from 20 to 40 minutes. To date, Baffinland has not been able to confirm with the MHTO alternate locations for the HOL stations, but will continue to consult with MHTO representatives on the program via the TEWG and other engagement methods. It is expected that further consultation can occur in 2022 assuming COVID-19 restrictions are lifted across the territory (i.e. to ease in-field engagement). As an interim solution, the remote camera monitoring program was implemented in 2021 to address comments from the MHTO that caribou were being 'missed' during the HOL surveys (see Section 9.4 – Remote Cameras).

Map 9-2. **2021 overview of Height of Land monitoring stations and viewshed.**



9.3.2 RESULTS

No caribou were observed during HOL surveys in 2021. No caribou tracks or other indicators (i.e. fecal matter, hair, evidence of foraging such as cratering) of caribou were observed during surveys or on route to survey stations.

In total, approximately 34 hours of HOL surveys (33 hours 45 minutes) were conducted at an average of 42 minutes of survey time per station visit[18]. All surveys were completed in early summer (June 6 to17, 2021) during the peak calving season (Table 9-2). All HOL stations were visited on two occasions. Stations 4, 9, 10, 14 and 16 were accessed on foot, whereas the remaining stations were accessed by helicopter.

Weather conditions during the HOL surveys ranged from 'excellent' clear viewing conditions to 'good' overcast conditions with wind. Temperatures during the surveys ranged from 1 to 8°C and with an intermittent snow cover (ranging from 2 to 98%) across the landscape. Snow cover at most survey locations was insufficient for the detection of observable snow tracks.

Table 9-2. 2021 Height of Land survey summary details.

Mode of Access to Height of Land Station	Survey Period	# Observers per Survey	# Visits per Station	Survey Effort
Helicopter, Truck-Travel, and Hiking to/from the Tote Road	June 6–9, June 11–17	2	2	~40 minutes per survey
Total	**11 days**	**—**	**48**	**~34 hours**

9.4 REMOTE CAMERAS

The following Project Conditions (PCs) were developed to address concerns regarding potential caribou crossings of linear features (i.e., train or vehicle traffic) and constraining of wildlife movement across roadways (Nunavut Impact Review Board 2020):

- PC#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*

To address this Project Condition, and comments received from the MHTO and other TEWG members on the perceived lack of effort and suggested study design deficiencies associated with the HOL program, a remote camera monitoring program was initiated in summer 2021. The study involved installing remote

[18] Survey times at each station ranged from 40 to 53 minutes in duration, with observation times typically exceeding 40 minutes if observers were attempting to distinguish an unidentifiable object on the landscape (e.g., a suspected animal).

cameras paired with HOL stations (described in Section 9.3) to supplement HOL surveys and further evaluate caribou movement in response to the Tote Road and proposed rail line. Unlike the HOL surveys, which are limited to 2-3 weeks, the cameras provide a continuous observation alternative spanning a period from late July 2021 to mid October 2021.

9.4.1 METHODS

On July 28 and August 6, 2021, EDI and Baffinland personnel deployed 12 Reconyx HP2x HyperFire 2 Professional Cover IR remote cameras (two per site/station) at strategic locations corresponding with HOL survey stations along the Tote Road. Baffinland personnel were responsible for camera care and maintenance (i.e., battery and SD card exchanges). Remote camera stations are shown on Map 9-2; photo-documentation of the camera stations (site conditions and installations) are provided in Appendix E.

The remote camera sites were accessed via helicopter, vehicle, or foot. Most cameras were established within 500 m of an access trail or road. Cameras were installed using a rock drill to anchor the units to the ground using a steel/rebar tripod and affixed with steel clamps. Cameras were set approximately chest high and positioned to capture an optimal viewshed. Cameras were programmed[19] before deployment and tested/checked onsite (after installation) to verify proper function and viewshed.

The cameras were checked and maintained in fall 2021 to swap batteries and SD cards and apply any necessary realignment. On October 16, 2021, Baffinland personnel revisited each HOL/camera station. Nine cameras were fully operational, whereas Baffin-4, Baffin-6, and Baffin-10 indicated depleted batteries and/or no photo storage capacity. Baffinland personnel returned to Baffin-5, Baffin-9, and Baffin-11 on January 30, 2022. Data were relayed to EDI personnel for photo analysis of any/all wildlife observations focusing on caribou and large carnivores; wildlife activities (even outside the study's focus area) were carefully investigated and documented. The following information was recorded for each wildlife observation: species identity, age and sex (if/where possible), number of individuals, start/end time, and general comments. Examples of photos are provided in Appendix F.

9.4.2 RESULT AND DISCUSSIONS

Cameras were deployed at HOL1, HOL3, HOL4, HOL6, HOL10, and HOL16 (Map 9-2) at relatively even distance intervals to optimize wildlife observations along the Tote Road. Over 42,000 photos were captured from the 12 cameras over the collection period. Table 9-3 summarizes the remote camera data returns at each HOL/camera station. Active days refer to the number of days with a viable photolog/capture; non-active days refer to periods in which the camera was not operational and/or the viewshed was blocked by snow, frost or fog. As temperatures dropped, more frequent and prolonged incidents of fog or frost were observed on the cameras. Camera data were analyzed from July 28, 2021, to August 6, 2021 (i.e., initial deployment) and

[19] The Reconyx HP2X HyperFire 2 Professional Covert IR cameras are motion and infrared triggered and were set to take three consecutive photos when activated ('Rapidfire' mode) with no delay between triggered events. The cameras were programmed to capture time-lapse photos each hour, 24 hours per day, to document baseline environmental conditions and surrounding landscape; each photo was 'timestamped' (time/date/temperature).

periodically reviewed until October 16, 2021 (i.e., most recent image download). Active days ranged from 33 to 80 days, indicating obstructions in the field of view due to snow, ice or fog build-up, or the camera stopped working while deployed as a result of dead batteries or too many files and lack of storage space.

A total of 41 wildlife detections were observed across all combined cameras. Eight species of mammals and birds were identified from the 12 remote camera sites. The highest number of wildlife observations were of unknown/unidentified birds[20] (12 individuals), Ptarmigan (11 individuals), and Arctic hare (7 individuals). The observation of smaller mammals and birds is consistent with snow track and HOL surveys from 2021 and in previous years. (Figure 9-2). No carnivores (wolves or bears) or ungulates (caribou) were captured in photos taken by any of the remote cameras. Larger carnivores or ungulates are not regularly seen on site, and therefore, have a low probability of being detected on remote cameras.

Baffin-4 camera recorded the highest species diversity, with four different species recorded on camera (Figure 9-3). Birds were seen on four of the cameras, followed by Arctic hare that were noted on three of the cameras. Baffin-1, Baffin-9 and Baffin-12 cameras did not record any wildlife occurrences for the duration of deployment. Baffin-2, Baffin-5, and Baffin-8 also recorded images of tracks of wildlife. Based on shape and spacing, tracks were presumed to be Arctic hare, Ptarmigan or small mammal species.

Baffin-4, Baffin-6, and Baffin-10 cameras stopped recording images before camera servicing in October. Baffin-4 and Baffin-6 last images were dated September 7 and 8, respectively, and Baffin-10s last recorded on September 16. Cameras were triggered from passing vehicles, likely resulting in prematurely draining batteries and or maxing out the storage capacity of the SD cards.

Camera deployment was distributed within an open landscape with relatively few obstacles. Wildlife in the area do not have set definitive trails they use, which makes it challenging to predict higher use access areas for wildlife movement that would improve the ability of cameras to record larger wildlife species. Due to the large field of view, the quality of images and detectability deteriorates further from the camera, reducing the ability to identify and locate wildlife in the distance accurately.

Table 9-3. 2021 remote camera survey summary of remote camera data returns.

Site Name	Camera ID	Active Days	# Species Recorded	# Photos	Notes
HOL 1	Baffin-3	80	2	1996	—
HOL 1	Baffin-4	41	4	5762	Pointed at/across a road. Therefore, lots of triggers from trucks and heavy equipment driving by.
HOL 3	Baffin-7	80	1	1941	—
HOL 3	Baffin-12	80	0	1936	—

[20] On August 7, 2021, several white spots were noted on the Baffin-4 camera in the distance (Appendix Photo F-1). Based on their relative size and proximity to the wetlands and then dispersal throughout the green grassy areas, it is reasonable to assume this may be a flock of Snow Geese (*Chen caerulescens*). Roughly 14 geese were seen over the course of three hours, moving about the greened-up landscape, likely grazing. This group is again noted the following day on August 8 in the same area for 1 hour.

Table 9-3. 2021 remote camera survey summary of remote camera data returns.

Site Name	Camera ID	Active Days	# Species Recorded	# Photos	Notes
HOL 4	Baffin-8	71	1	1879	Camera angle slightly shifted during deployment.
HOL 4	Baffin-9	65	0	5128	Reviewed images until January 30, 2022.
HOL 6	Baffin-5	80	1	4590	Reviewed images until January 30, 2022.
HOL 6	Baffin-10	41	3	3438	Pointed at/across a road. Therefore, lots of triggers from trucks and heavy equipment driving by.
HOL 10	Baffin-1	80	0	1988	—
HOL 10	Baffin-11	76	1	4530	Reviewed images until January 30, 2022.
HOL 16	Baffin-2	71	2	1957	—
HOL 16	Baffin-6	33	3	7577	Pointed at/across a road. Therefore, lots of triggers from trucks and heavy equipment driving by. Camera angle slightly shifted during deployment.

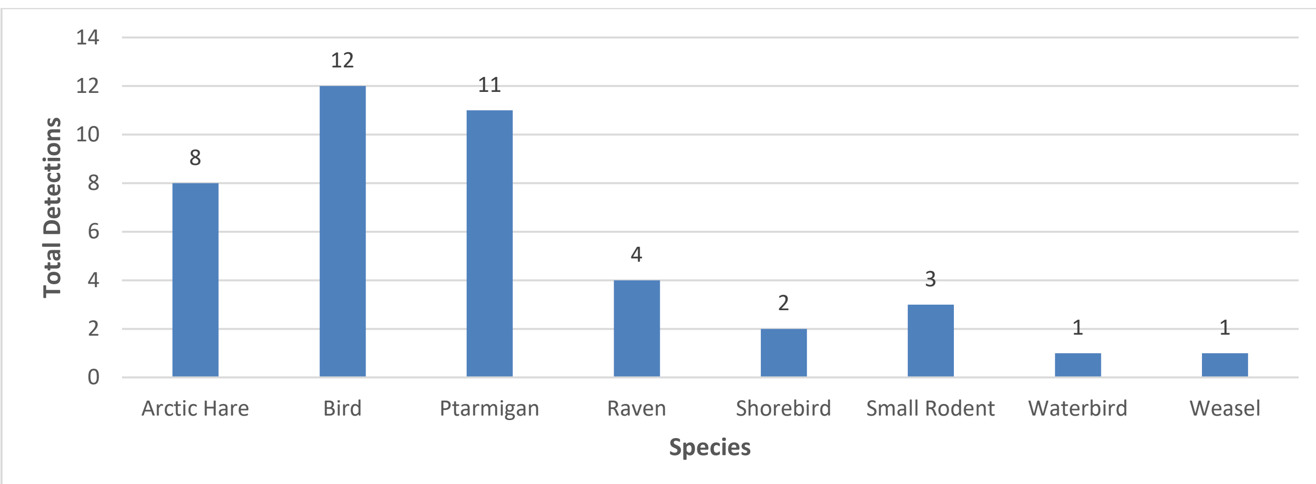


Figure 9-2. 2021 remote camera survey total wildlife observations per species.

Note: ~30 wildlife observations of unknown/unidentified species omitted due to distant observation and poor/inconclusive image quality.

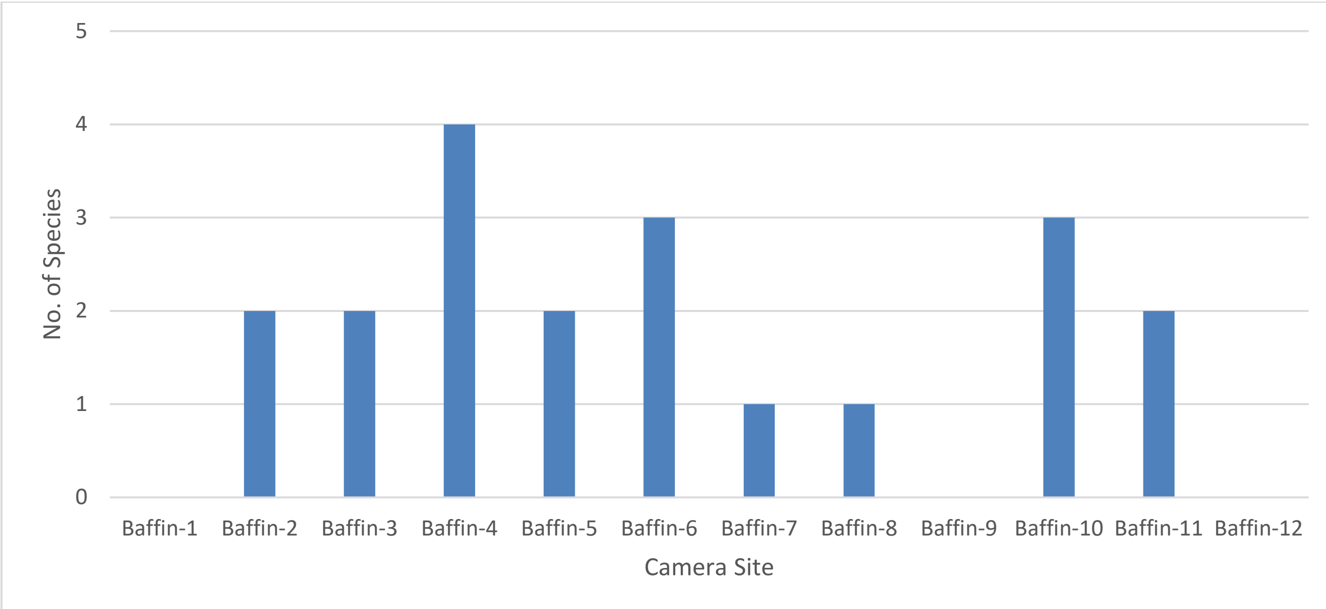


Figure 9-3. 2021 Remote camera survey total species observations per Height of Land/camera station.

9.5 INCIDENTAL OBSERVATIONS

Incidental wildlife observations are actively recorded by Baffinland and ancillary personnel in wildlife logs at Sailiivik Camp (i.e., the Accommodations Complex at the Mine Site) and Milne Port Accommodations Complex. These logs are indicators of wildlife species that occur in proximity to Project infrastructure or areas where exploration or monitoring may be occurring. Table 9-4 summarizes 2021 incidental wildlife observations.

Caribou — A total of 104 caribou from 33 separate observations between June 25 and September 11, 2021, were reported; all observations were made outside the PDA. Most of the caribou were observed in exploration areas southeast of the Project in summer (Eqe Bay, reference Lake, Steensby, Cockburn Lake, . Observers noted caribou sex when able to, with six of the caribou believed to be male and four recorded as female and the remaining as unclassified. One calf was noted during incidental observations in the Eqe Bay area on July 10, 2021.

Birds — Several birds were also recorded on the wildlife logs, including: Snow Bunting (*Plectrophenax nivalis*), Lapland Longspur (*Calcarius lapponicus*), Common Raven (*Corvus corax*), Ptarmigan (*Lagopus* sp.), Sandhill Crane (*Grus canadensis*), Long-tailed Duck (*Clangula hyemalis*), Common Loon (*Gavia immer*), Cackling/Canada Goose (*Branta hutchinsii*, *B. canadensis*), Snow Goose (*Chen caerulescens*), Glaucous Gull (*Larus hyperboreus*), Rough-legged Hawk (*Buteo lagopus*), Snowy Owl (*Bubo scandiacus*), and Peregrine Falcon (*Falco peregrinus tundrius*).

Table 9-4. 2021 incidental observations – wildlife species observations at the Project (based on wildlife logs).

Common Name	Scientific Name	Number of Observations			
		Mary River	Tote Road	Milne Port	Outside PDA[1]
Arctic hare	*Lepus arcticus*	26	5	34	7
Arctic fox	*Vulpes lagopus*	31	12	9	3
Bowhead whale	*Balaena mysticetus*	-	-	-	1
Red fox	*Vulpes*	10	–	2	–
Fox sp.	*Vulpes* sp.	41	3	4	–
Lemming sp.	*Lemmini* sp.	–	–	2	1
Ermine	*Mustela ermine*	4	1	1	1
Caribou	*Rangifer tarandus groenlandicus*	–	–	–	104

Notes:
[1] Wildlife sightings in areas outside the PDA.

9.6 HUNTER AND VISITOR LOG

Baffinland Security monitors land use and presence of land users in the Project area via hunter and visitor logs to document travel or hunting within the Project area. This is an indirect and incomplete land use record. Individuals are only required to populate the visitor logs if/when interacting with or using Baffinland facilities.

Eight hundred eighty-five (885) individual entries were recorded at the Mine Site Camp (413 individuals in 93 groups) and Milne Port Accommodations Complex (472 individuals in 112 groups) between January 1, 2021 and December 31, 2021. Group sizes ranged from 1 to 19 individuals; these hunter/visitors were typically hunting, resting, stopping for food, or having vehicles serviced. Baffinland provided food, beverages, transportation, tools, supplies, fuel and mechanical assistance to hunters and visitors, if requested and safe. Overall log numbers increased similar to 2019 counts before the start of the COVID pandemic, likely because of reduced restrictions and availability of vaccinations. Very few to no check-ins occurred from June to August and October thru November.

In 2021, Baffinland assisted in four separate Search-and-Rescue incidents (January 10, June 14, September 2, and September 11, 2021) for people reported missing or in distress — often due to ATV/snowmobile mechanical breakdown.

9.7 INTER-ANNUAL TRENDS

Height of Land, Snow Track Surveys — No caribou were observed in the PDA during HOL surveys; consistent with results from 2014-2021 (Figure 9-4). Survey effort has increased over the years in response to TEWG input (i.e., increasing minimum survey time from 20 to 40 minutes, increasing the 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).

The current caribou ecology on North Baffin Island (low numbers and low movement) is the primary factor contributing to a lack of caribou observations and subsequent lack of measurable change in caribou behaviour or habitat use. While greater survey effort would provide additional confidence in the lack of caribou observations, more effort would be unlikely to provide the data needed to document changes in caribou behaviour or habitat use. Remote cameras deployed in summer of 2021 and various HOL sites supported the current low caribou numbers and movement in the PDA , with no caribou being documented on the cameras that were left up since late July 2021. Caribou densities in the region would need to be considerably higher to allow for the identification of these changes (EDI Environmental Dynamics Inc. 2021b). Ground-based caribou surveys (HOL, snow tracking, snowbank height) continue to provide important data on individual-level caribou response to Project interactions. Even when caribou occurrences are low, they can inform individual-level mitigations such as reduced activity near a calving caribou. They also provide an early relative estimate of caribou abundance, influencing the timing for regional-level surveys. No caribou, wolf or other large mammal tracks were observed during snow tracking surveys conducted between 2014 and 2021. Most tracks observed were from Arctic foxes and Arctic hares, whose detection rates have remained similar throughout all survey years (Figure 9-5).

Snowbank Height Monitoring — Most snowbank height measurements complied with the 100 cm height limit between 2014 and 2021. Compliance of snowbank height was similar for 2014, 2015, 2016, 2018, 2019, 2020, and 2021 ranging between 80% to 97%, with the 2017 measurements having the lowest overall compliance rate at 66% (Figure 9-6).

Hunter and Visitor Logs — Substantially more visitors were recorded in 2021 than in 2020 and are in line with trends from 2019 (Figure 9-7). 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 and 2019 to 539 and 936 visitors, respectively. The sharp drop in visitor check-ins in 2020 was most likely due to restricted travel and interaction caused by the COVID-19 pandemic. These numbers often represent the same group(s) of visitors leaving and returning from trips and making multiple trips in a year. As checking in is not mandatory, these numbers may not represent all land users that interact with the Project site.

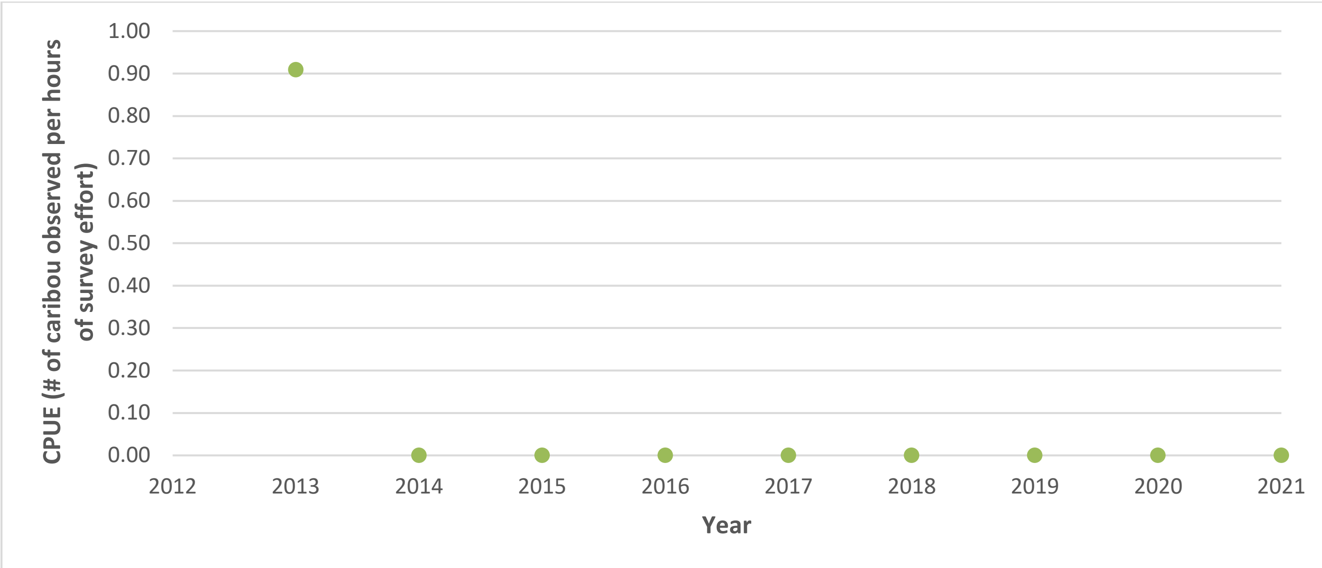


Figure 9-4. 2021 inter-annual trends — Height of Land survey (2013 to 2021).
Note: CPUE = Catch per unit effort, i.e., number of caribou observed per hour of survey effort.

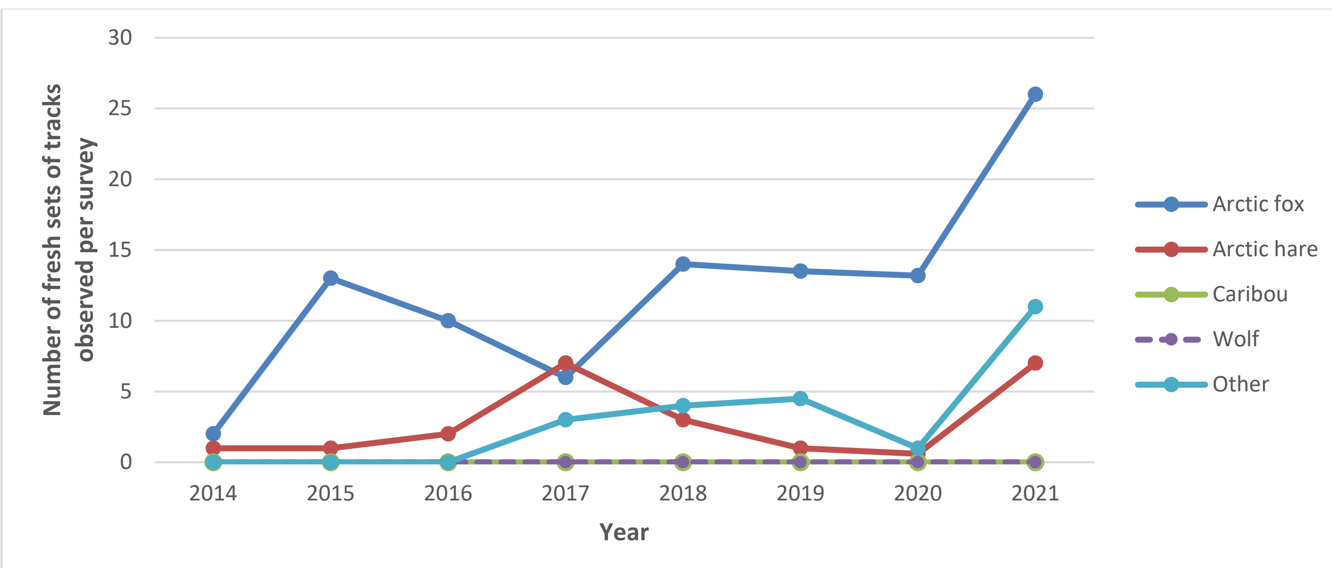


Figure 9-5. 2021 inter-annual trends — snow track survey (2014 to 2021).
'Other' species refer to Ptarmigan and small mammals such as lemming and ermine.

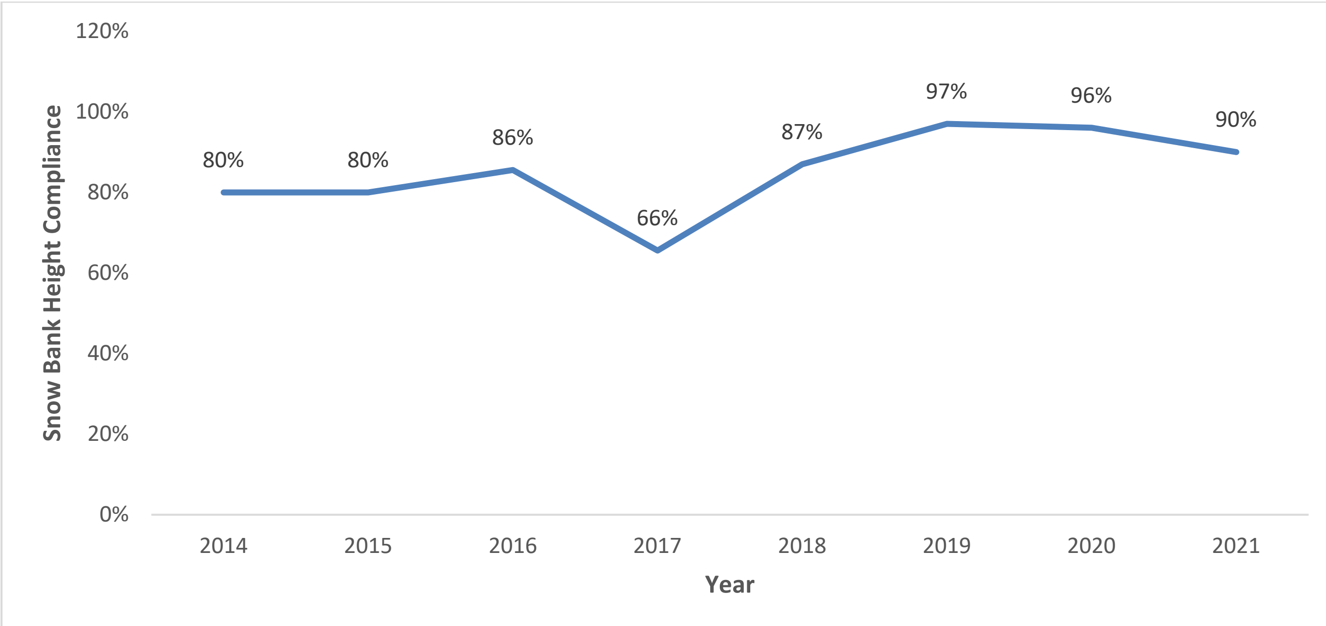


Figure 9-6. 2021 Inter-annual trends — snowbank height compliance monitoring (2014 to 2021).

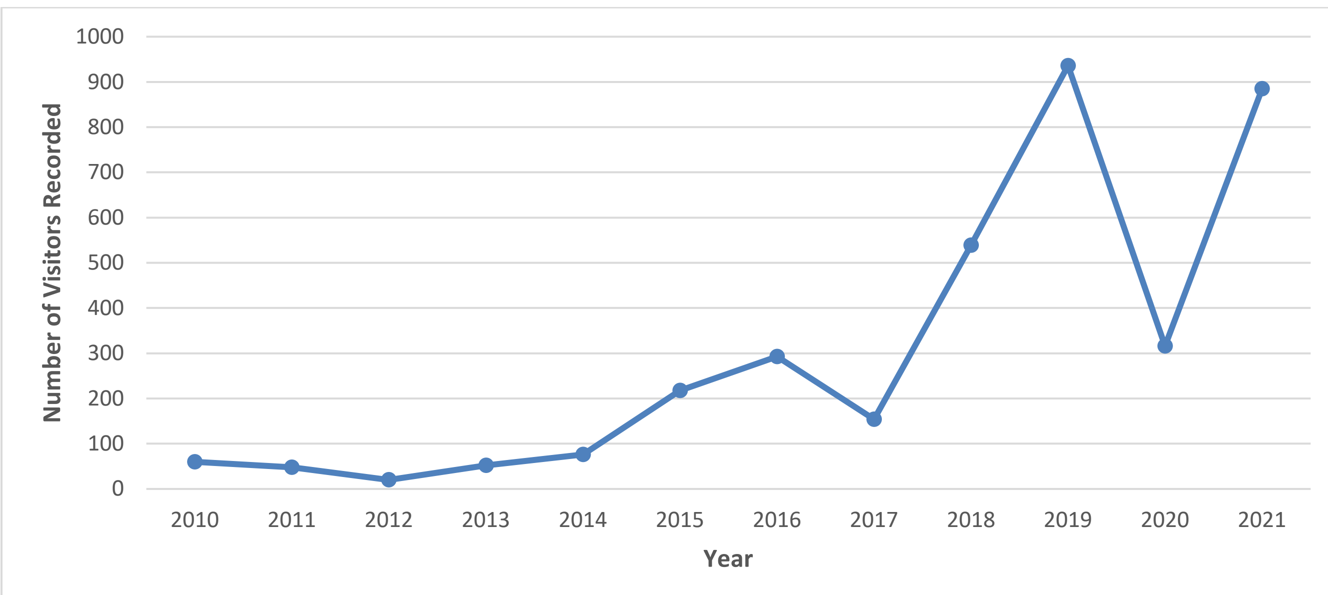


Figure 9-7. 2021 Inter-annual trends in the number of visitors recorded in hunter and visitor logs (2010 to 2021).

9.8 MAMMAL SUMMARY

The following are key findings from 2021 monitoring activities at the Project on mammals.

- Ground-based surveys continue to be used to monitor potential wildlife interactions with the Project. These include snow track surveys, snowbank height surveys, HOL surveys, remote camera monitoring and incidental sighting reports from on-site personnel.
- Six snow tracking surveys were conducted in 2021. No caribou, wolf or other large mammal tracks were observed in surveys; Arctic fox and Arctic hare tracks were observed in greater numbers to previous surveys and represent the highest quantities observed to date.
- Snowbank height monitoring was conducted between October 2020, and December 2021. An average of 90% compliance with the 100 cm snowbank height threshold was recorded in 2021. Since 2020, survey locations used randomized kilometre locations instead of repeated kilometre locations to improve representativeness and reduce bias.
- Height of Land surveys were conducted during the caribou calving season (early June 2021). All HOL stations were visited twice between June 6 and 17, 2021. Total observation time was 33 hours and 45 minutes, while the average observation time per station was 42 minutes. No caribou were observed during these surveys in 2021.
- No incidental observations of caribou occurred within the PDA. A total of 104 caribou were noted outside the PDA, mainly southeast of the RSA.
- Remote cameras documented a combination of birds (Ptarmigan, Raven, songbirds, shorebirds, and waterbirds), Arctic hare, weasel, and small rodents between July 28 and October 16, 2021. No caribou, foxes, wolves or bears were observed in any reviewed images, which supports the current low caribou numbers and movement in the PDA, despite increased observation and monitoring period.
- Height of Land, snow track surveys, snowbank height surveys, remote camera monitoring and incidental observations using wildlife logs will continue in 2022.

10 BIRDS

The following Project Condition (PC) was used to address concerns regarding migratory birds and raptors at the Mary River Project (the Project) (Nunavut Impact Review Board 2020):

- PC#74 — *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.*

To address all or a portion of this PC, bird surveys at the Project have historically included effects monitoring of songbirds and shorebirds. Based on 2012 and 2013 analysis of Program for Regional and International Shorebird Monitoring (PRISM) plots and 2013 bird encounter transects, it was identified that the level of detection for Project-related effects on songbirds and shorebirds was low due to the low number of birds present. In consultation with the Terrestrial Environment Working Group (TEWG) and Canadian Wildlife Service (CWS), it was resolved that effects monitoring for tundra breeding birds could be discontinued; instead, Baffinland Iron Mines Corporation (Baffinland) would commit to the following:

- conducting 20 PRISM plots every five years to contribute to regional monitoring efforts (completed in 2018; next scheduled for 2023);
- completing coastline nesting surveys of the identified islet near the proposed Steensby Port Site before construction of the port;
- conducting Active Migratory Bird Nest Surveys (AMBNS) before any vegetation clearing or surface disturbance during the nesting season; and,
- continuing monitoring programs for cliff-nesting raptors (annual occupancy and productivity) and inland waterfowl (roadside waterfowl surveys) when qualified biologists are available and on site (paused for 2021).

In 2021, bird surveys at the Project focused primarily on AMBNS for active migratory bird nests (if/when necessary, before vegetation clearing or surface disturbance) and ongoing effects monitoring and baseline data collection for cliff-nesting raptors was paused this year.

10.1 ACTIVE MIGRATORY BIRD NEST SURVEYS

The following PCs were used to address concerns regarding migratory birds (Nunavut Impact Review Board 2020):

- PC#66 — *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.*

- PC#70

  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.

Active Migratory Bird Nest Surveys were conducted before vegetation clearing or surface disturbance to verify that no active bird nests were near the Project area (Baffinland Iron Mines Corporation 2016a). To the extent possible, Baffinland has resolved to pre-emptively clear potential development areas before the breeding bird window (May 17 to August 19) to avoid or minimize potential effects on nesting birds. This section summarizes the methods and outcomes from the 2021 AMBNS.

10.1.1 METHODS

In June 2020, EDI Environmental Dynamics Inc. (EDI) provided on-site training to Baffinland personnel for AMBNS, applying search methods provided by CWS (TEWG meeting no. 6; April 22, 2015). Methods included 'rope-drags' and identification indicators for common species known to occur in the Project area. Rope-drag equipment was constructed following the template provided by CWS (Rausch 2015).

In 2021, AMBNS were conducted by Baffinland personnel in areas scheduled for approved construction activities during the nesting season (May 17 to August 19). The AMBNSs were completed by a minimum of three searchers/observers. During each survey, the 'rope-drag' equipment was systematically pulled across the search area, and the observers took note of any bird activities observed. Areas were surveyed for active nests a maximum of five days before vegetation clearing or surface disturbance.

- If active nests were found, development was delayed until the nests or nesting areas were no longer active.
- If no active nests were found but the area was not developed within the five-day window, surveys were conducted again to confirm no birds had started nesting.

While searching for nests, observers looked for behavioural signs of nesting birds, including broken wing displays, alarm calls, or carrying food items or nesting material. Observers recorded all bird observations during the surveys, but species identification was limited to the individual observers' skill level.

10.1.2 RESULTS AND DISCUSSION

To the extent possible, Baffinland prioritized most vegetation clearing and surface disturbance outside of the breeding bird window; however, some vegetation clearing and surface disturbance occurred during summer when ground conditions were more favourable. In total, approximately 360,615 m^2 (36 ha) were disturbed for Project infrastructure in 2021 (Table 10-1).

Two active Snow Bunting (*Plectrophenax nivalis*) nests were detected during the 2021 AMBNS near the KM104.5 staging area; a no-disturbance buffer was established around these nests and construction was postponed until the chicks had fledged and left the area. Two non-active nests were documented at the KM10.5 laydown expansion area. Neither nest indicated signs of recent nesting activity; fox tracks were observed within the vicinity of one of these nests. Baffinland personnel recorded numerous songbirds, numerous Snow Bunting, and one Common Raven (*Corvus corax*) during the surveys, but no behavioural signs indicative of nesting birds (e.g., carrying food items or nesting material) were observed.

Table 10-1. Disturbed Project area in relation to the 2021 AMBNS breeding bird window.

AMBNS Disturbance Window	Disturbance Area (m²)
Within (May 17 – August 19, 2021)	56,944
Outside (August 20 to May 16, 2021)	303,671
Total	**360,615**

10.2 RAPTOR EFFECTS MONITORING

The following PC was used to address concerns regarding Project-related effects on Peregrine Falcon (*Falco peregrinus*) and Gyrfalcon (*Falco rusticolus*) (Nunavut Impact Review Board 2020). During the final hearing, Baffinland committed to monitoring relevant sections of the Project area for Peregrine Falcon nesting activities, as per Project Commitment (C) #75.

- PC#74 — *The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Management System, Terrestrial Environment Mitigation and Monitoring Plan prior to construction. The key indicators for follow up monitoring under this plan will include: peregrine falcon, gyrfalcon, common and king eider, red knot, seabird migration and wintering, and songbird and shorebird diversity.*
- PC#75 — *Baffinland is committed to monitoring relevant sections of the project area for nesting and migration activities, noting both areas and patterns, for Falcons, Eiders, Red Knots, seabirds, songbirds and shorebirds.*

To meet this PC, a raptor monitoring program was conducted from 2011 to 2020 in collaboration with Arctic Raptors Inc. As reported previously and discussed with the TEWG, the study design is statistically robust. It has provided trends in raptor occupancy and productivity for the Project. After several years of monitoring, a key finding is that occupancy and productivity appear to be stable, and there has been no evidence of Project-related effects on raptors. Therefore, raptor occupancy and productivity surveys were paused for 2021 and efforts were put into preparing a manuscript for a peer-reviewed publication.

10.3 BIRDS SUMMARY

Baffinland is committed to a range of surveys and monitoring programs designed to enhance baseline data and evaluate effects of Project-related activities on birds. These programs include AMBNS to verify that no active nests are present prior to vegetation clearing or surface disturbance, and effects monitoring of raptor presence and yearly nesting success. The following items highlight key findings from 2021 monitoring programs at the Project pertaining to birds.

- Fifteen AMBNS surveys were completed, covering 7.2 ha in total. Two active Snow Bunting nests were detected and construction was postponed in the area until the chicks had fledged.
- The raptor monitoring program at the Project was initiated in 2011 in collaboration with Arctic Raptors Inc. After several years of monitoring, it was determined that occupancy and productivity appear to be stable and there has been no evidence of Project-related effects on raptors. Raptor occupancy and productivity surveys were paused for 2021.

11 WILDLIFE INTERACTIONS

Wildlife interactions and mortalities related to the Mary River Project (the Project) are uncommon. Despite mitigation measures, wildlife interactions and mortalities have occurred. Each incident is recorded and carefully investigated to document leading causes and underlying circumstances.

11.1 WILDLIFE INTERACTIONS AND MORTALITIES

In 2021, two non-fatal wildlife interactions and 10 wildlife mortality incidents were reported. The first non-fatal incident involved a polar bear that was a safety risk too close to the Mine Site on June 6, 2021. The bear was observed near Sheardown Lake and was safely hazed with aircraft to direct the bear away from the site, as per the Polar Bear Safety Plan (Baffinland Iron Mines Corporation 2016b). The second non-fatal interaction involved a fox with two bundles of shock tubes in its mouth on December 14, 2021. Staff noticed the fox with the items and attempted to retrieve them. The fox left the area with the one bundle, while the other bundle was successfully recovered.

The 10 wildlife mortalities each referred to individuals and five different species:

- Arctic fox (4);
- Arctic hare (4);
- and,
- Snow Bunting (2).

The cause of death was undetermined for most of the fatal wildlife incidents. Two Arctic foxes, one Arctic hare, and one Snow Bunting were found deceased without any evidence indicating the cause of death. Mortalities of one Arctic fox and three Arctic hares were confirmed or suspected vehicle collisions. One Snow Bunting appears to have been predated on by a pair of falcons that were observed hunting nearby. A deceased Arctic fox was discovered near 380M Camp on February 25, 2021, when workers came to inspect a heat trace cable that had tripped. The tripped cable had been gnawed; the cause of death is assumed to be related to electrocution.

11.2 WILDLIFE INTERACTIONS 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. The EPP includes protection measures for wolf, polar bear, Arctic fox, and caribou and waste management guidelines that are continually updated and implemented.

Waste Management — 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.

Fencing — Significant effort was made in 2018 and 2019 to improve on-site waste management infrastructure with the objective of minimizing human-wildlife interactions at the landfill. The Nunavut Impact Review Board (NIRB) site visits prior to 2018 resulted in recommendations to improve the fencing at the landfill facility to reduce windblown debris escaping. A 275 m fence was installed on the west side (downwind) of the landfill in the fall of 2018 to address these concerns. The fence also repurposed over 800 used tires as part of Baffinland's used tire disposal and recycling initiative. The fence captures windblown debris from the landfill effectively. In 2019, after procuring additional materials on the summer sealift, Baffinland fully enclosed the active cells at the landfill in accordance with the Landfill Fence Design that was submitted to NIRB on August 26, 2019. Maintenance inspections of the fence will be incorporated in ongoing inspections of the landfill.

Other Prevention Measures — Wire skirting is used under the main camps at both sites to make sure 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 or near the equipment. Wildlife has the right of way on all roadways unless they create a safety hazard. Snowbanks along the Tote Road are reduced where feasible by feathering back snow with equipment to make sure personnel along the Tote Road can view wildlife crossing the road. Feeding wildlife is strictly prohibited, and non-compliance is dealt with accordingly.

11.3 INTER-ANNUAL TRENDS

Most mortalities on site from 2014 to 2021 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 dispatching of animals by on-site staff when rabies was suspected.

No inter-annual trends were identified for wildlife mortality. In 2021, two avian species mortalities were reported within the range of historic avian mortalities for the Project. Four Arctic fox and four Arctic hare mortalities were reported, which is also typical for the Project. No other mortalities were reported in 2021. No caribou mortalities have occurred thus far because of the Project (Figure 11-1).

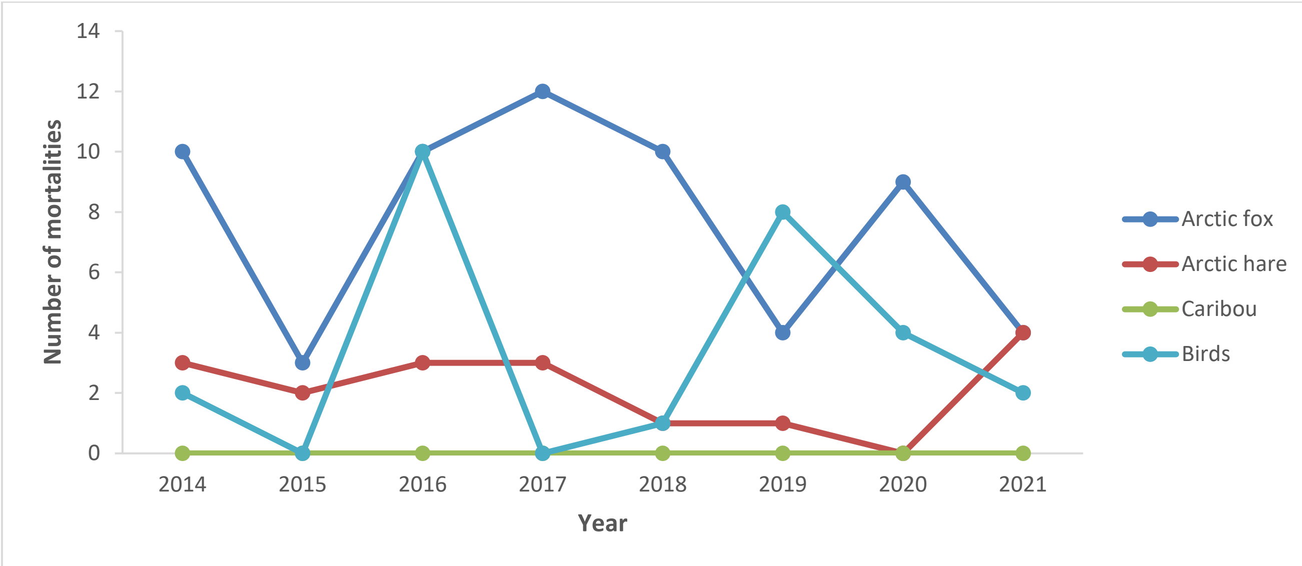


Figure 11-1. 2021 wildlife interactions – inter-annual wildlife mortality trends (2014 to 2021).

11.4 WILDLIFE INTERACTIONS SUMMARY

Baffinland is committed to a range of monitoring activities and mitigation measures to minimize wildlife interactions and mortalities at the Project. Wildlife incident and mortality logs are used as needed to note human-wildlife conflicts to identify and minimize current and potential wildlife-related issues. The following items highlight key findings and actions on wildlife interactions:

- In 2021, two non-fatal wildlife interactions and 10 wildlife mortality incidents were reported, all of which were individual losses.
- Two of the mortalities in 2021 involved Snow Buntings, one of which was likely due to predation, and one remains unknown.
- Four of the mortalities in 2021 involved Arctic foxes, two of which were due to collisions with vehicles and the other two remain unknown, though one may be a result of electrocution.
- 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 the Environment Protection Plan.

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APPENDICES

APPENDIX A CLIMATE DATA

Appendix Table A-1. Baseline data for the Mine Site (2005 to 2010).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
2005	Jun		5.0	13.9
2005	Jul	8.4	4.4	112.5
2005	Aug	8.6	4.2	37.1
2005	Sep	-0.2	5.0	5.1
2005	Oct		2.7	
2005	Nov			
2005	Dec			
2006	Jan			
2006	Feb			
2006	Mar			
2006	Apr			
2006	May			
2006	Jun	3.5	4.8	22.1
2006	Jul	9.7	4.2	94.8
2006	Aug	9.1	4.1	74.5
2006	Sep	2.4	3.3	25.4
2006	Oct	-4.8	4.0	4.2
2006	Nov	-19.8	2.8	0.0
2006	Dec	-29.7	2.5	0.0
2007	Jan	-32.3	1.4	0.0
2007	Feb	-26.2	2.6	0.0
2007	Mar	-31.0	2.5	0.0
2007	Apr	-20.0	1.9	0.0
2007	May	-11.7	3.6	0.1
2007	Jun	3.6	4.2	0.9
2007	Jul	13.2	4.3	37.8
2007	Aug	9.6	3.3	57.4
2007	Sep	-0.9	2.9	9.3
2007	Oct	-12.4	3.3	0.1
2007	Nov	-21.5	4.3	0.0
2007	Dec	-30.6	1.6	0.1
2008	Jan	-29.6	4.1	0.0
2008	Feb	-35.3	2.1	0.0
2008	Mar	-27.8	4.5	0.0
2008	Apr	-15.2	4.7	0.0
2008	May	-0.8	3.2	23.8
2008	Jun		6.5	0.0

Appendix Table A-1. Baseline data for the Mine Site (2005 to 2010).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
2008	Jul		5.0	11.4
2008	Aug		3.2	30.4
2008	Sep		4.9	8.8
2008	Oct	-11.8	4.5	0.1
2008	Nov	-22.4	3.4	0.0
2008	Dec	-29.9	2.5	0.0
2009	Jan	-27.8	2.6	0.0
2009	Feb	-31.3	1.4	0.0
2009	Mar	-27.8	3.1	0.0
2009	Apr	-17.8	2.7	3.1
2009	May	-6.4	2.6	3.1
2009	Jun	4.3	5.1	35.2
2009	Jul	12.5	3.2	28.4
2009	Aug	8.6	3.3	36.2
2009	Sep		4.7	26.6
2009	Oct		4.4	0.1
2009	Nov		2.6	0.0
2009	Dec		5.4	0.0
2010	Jan	-32.1	3.9	0.0
2010	Feb		4.5	0.0
2010	Mar		3.5	0.0
2010	Apr		3.0	1.0
2010	May		4.8	8.4
2010	Jun		4.6	8.2
2010	Jul		2.2	1.9

Appendix Table A-2. Post-baseline data for the Mine Site (2013 to 2021).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)[1]
2013	Aug	2.0	2.8	0.4
2013	Sep	-1.8	4.8	4.0
2013	Oct	-8.4	4.8	1.1
2013	Nov	-27.2	2.1	0.0
2013	Dec	-31.2	2.0	0.0
2014	Jan	-28.5	2.5	0.0
2014	Feb	-31.7	1.5	0.0
2014	Mar	-29.0	1.8	0.0
2014	Apr	-18.2	4.2	0.1
2014	May	-7.8	2.9	7.5
2014	Jun	2.7	4.8	43.8
2014	Jul	11.5	2.8	36.1
2014	Aug	6.0	4.0	67.8
2014	Sep	-2.1	3.2	3.1
2014	Oct	-10.6	3.8	0.4
2014	Nov	-20.9	2.5	0.0
2014	Dec	-29.9	2.1	0.0
2015	Jan	-35.4	1.3	0.0
2015	Feb	-37.0	1.2	0.0
2015	Mar	-30.3	1.8	0.2
2015	Apr	-22.6	1.8	0.0
2015	May	-6.1	4.5	3.2
2015	Jun	4.3	4.1	18.2
2015	Jul	12.2	4.2	34.6
2015	Aug	7.1	4.2	41.8
2015	Sep	0.2	4.9	48.5
2015	Oct	-10.3	3.9	5.0
2015	Nov	-23.5	2.8	0.0
2015	Dec	-32.0	3.4	0.0
2016	Jan	-25.9	2.5	0.0
2016	Feb	-31.6	2.3	0.0
2016	Mar	-29.4	0.5	0.0
2016	Apr	-15.4	4.1	2.8
2016	May	-4.2	5.2	6.0
2016	Jun	5.8	3.3	17.4
2016	Jul	11.8	4.1	31.8
2016	Aug	10.6	3.6	59.9

Appendix Table A-2. Post-baseline data for the Mine Site (2013 to 2021).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)[1]
2016	Sep	-1.9	4.8	51.5
2016	Oct	-11.2	5.0	0.2
2016	Nov	-16.8	3.6	0.0
2016	Dec	-29.4	2.0	0.0
2017	Jan	-26.4	3.5	0.0
2017	Feb	-31.2	1.6	0.0
2017	Mar	-30.6	2.8	0.0
2017	Apr	-15.4	4.4	1.0
2017	May	-5.6	3.9	1.4
2017	Jun	4.2	4.2	21.9
2017	Jul	7.2	5.4	67.8
2017	Aug	8.6	3.4	56.7
2017	Sep	-0.3	4.1	1.6
2017	Oct			
2017	Nov			
2017	Dec			
2018	Jan	-32.2	0.6	0.0
2018	Feb	-34.6	2.0	0.0
2018	Mar	-25.3	3.4	0.0
2018	Apr	-17.6	3.2	1.7
2018	May	-8.5	3.2	0.6
2018	Jun	4.8	4.3	26.0
2018	Jul	7.5	4.4	51.3
2018	Aug	6.4	4.0	2.0
2018	Sep	-2.1	4.7	25.1
2018	Oct	-14.2	3.3	0.0
2018	Nov	-25.4	2.0	0.0
2018	Dec	-26.5	2.9	0.0
2019	Jan	-31.4	3.0	0.0
2019	Feb	-33.6	0.8	0.0
2019	Mar	-27.8	2.9	0.0
2019	Apr	-20.6	3.3	0.1
2019	May	-0.1	4.1	7.1
2019	Jun	6.4	4.4	45.2
2019	Jul	11.0	4.0	54.4
2019	Aug	11.2	4.0	22.6
2019	Sep	2.4	4.4	20.6

Appendix Table A-2. Post-baseline data for the Mine Site (2013 to 2021).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)[1]
2019	Oct	3.0	4.8	*2.4*
2019	Nov	-8.9	3.1	*0.1*
2019	Dec	-14.9	3.7	*0.0*
2020	Jan	-33.1	1.0	*0.0*
2020	Feb	-32.4	0.6	*0.0*
2020	Mar	-25.9	2.3	*0.0*
2020	Apr	-13.9	1.5	*0.0*
2020	May	-6.1	2.9	*0.1*
2020	Jun	5.8	1.8	*0.2*
2020	Jul	14.1	2.2	*0.4*
2020	Aug	8.5	2.2	*0.9*
2020	Sep	5.3	2.5	*0.0*
2020	Oct			
2020	Nov			
2020	Dec	-19.6	4.8	*0.0*
2021	Jan	-21.9	3.6	*0.0*
2021	Feb	-26.2	4.0	*0.0*
2021	Mar	-29.9	3.3	*0.0*
2021	Apr	-13.9	5.6	*0.0*
2021	May	-4.9	3.9	*0.1*
2021	Jun	6.2	4.5	*1.5*
2021	Jul	7.0	4.5	*2.2*
2021	Aug	6.6	5.3	*11.8*
2021	Sep	-1.6	3.8	13.0
2021	Oct	-2.5	5.9	22.6
2021	Nov	-20.0	2.3	0.0
2021	Dec	-21.6	3.4	0.0

[1] Total precipitation values in italics indicate data recorded during time periods with a potentially blocked rain gauge.

Appendix Table A-3. Baseline data for Milne Port (2006 to 2010).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
2006	Jun		5.6	1.5
2006	Jul	8.6	5.5	76.5
2006	Aug	8.1	6.4	35.8
2006	Sep	1.6	5.0	52.3
2006	Oct	-4.8	5.0	0.3
2006	Nov	-19.1	4.9	0.0
2006	Dec	-28.2	3.7	0.0
2007	Jan	-30.6	2.4	0.0
2007	Feb	-25.3	4.7	0.0
2007	Mar	-30.9	4.0	0.0
2007	Apr	-18.6	4.2	0.0
2007	May	-10.7	2.8	0.0
2007	Jun	2.8	5.0	0.0
2007	Jul	9.9	5.4	16.1
2007	Aug	7.8	5.1	24.7
2007	Sep	-1.0	5.0	7.2
2007	Oct	-10.5	5.3	0.0
2007	Nov	-22.9	5.2	0.0
2007	Dec	-29.7	3.5	0.0
2008	Jan	-28.0	4.4	0.0
2008	Feb	-34.2	3.0	0.0
2008	Mar	-29.9	4.8	0.0
2008	Apr	-17.3	5.3	0.0
2008	May	-4.6	4.9	0.0
2008	Jun		5.1	14.4
2008	Jul	9.9	5.5	82.2
2008	Aug		3.7	3.9
2008	Sep		5.3	0.0
2008	Oct	-11.3	5.3	0.0
2008	Nov	-21.9	3.5	0.0
2008	Dec	-28.8	5.2	0.0
2009	Jan	-27.7	4.5	0.0
2009	Feb	-31.0	2.6	0.0
2009	Mar	-27.9	4.6	0.0
2009	Apr	-17.9	3.2	0.0
2009	May	-7.5	3.8	0.0
2009	Jun	3.5	5.7	0.0

Appendix Table A-3. Baseline data for Milne Port (2006 to 2010).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
2009	Jul	11.5	5.8	0.0
2009	Aug		6.3	0.0
2009	Sep		4.5	0.0
2009	Oct		4.5	0.0
2009	Nov		4.5	0.0
2009	Dec		4.5	0.0
2010	Jan			
2010	Feb			
2010	Mar		13.9	26.2

Appendix Table A-4. Post-baseline data for Milne Port (2013 to 2021).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)[1]
2013	Aug	2.1	5.2	37.4
2013	Sep	-1.8	6.2	0.6
2013	Oct	-7.9	5.1	1.4
2013	Nov	-25.7	3.1	0.0
2013	Dec	-30.2	2.8	0.0
2014	Jan	-29.2	4.2	0.0
2014	Feb	-31.2	3.8	0.0
2014	Mar	-29.0	2.4	0.0
2014	Apr	-19.4	4.8	1.0
2014	May	-7.5	4.3	1.8
2014	Jun	1.8	5.0	13.9
2014	Jul	10.5	4.0	8.9
2014	Aug	5.4	5.7	10.3
2014	Sep	-2.3	4.0	3.0
2014	Oct	-10.6	3.6	0.2
2014	Nov	-21.3	2.1	0.0
2014	Dec	-29.2	4.3	0.0
2015	Jan	-33.8	2.6	0.0
2015	Feb	-35.3	2.5	0.0
2015	Mar	-29.5	3.0	0.0
2015	Apr	-23.7	3.6	0.0
2015	May	-8.3	5.2	1.1
2015	Jun	2.5	4.9	10.1
2015	Jul	10.0	4.8	8.0
2015	Aug	6.0	5.5	7.7
2015	Sep	-0.1	5.9	10.1
2015	Oct	-9.5	5.8	6.5
2015	Nov	-21.6	4.5	0.0
2015	Dec	-30.5	6.8	0.0
2016	Jan	-25.3	4.9	0.0
2016	Feb	-31.6	3.3	0.2
2016	Mar	-29.3	2.5	0.0
2016	Apr	-16.8	5.7	1.2
2016	May	-5.8	5.8	5.3
2016	Jun	4.0	4.0	8.8
2016	Jul	9.9	5.4	22.7
2016	Aug	8.7	5.3	39.8

Appendix Table A-4. Post-baseline data for Milne Port (2013 to 2021).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)[1]
2016	Sep	-1.6	6.2	18.5
2016	Oct	-10.6	5.5	0.1
2016	Nov	-16.8	5.1	0.0
2016	Dec	-27.0	3.2	0.0
2017	Jan	-25.7	4.9	0.0
2017	Feb	-30.7	3.4	0.0
2017	Mar	-30.4	4.0	0.0
2017	Apr	-16.7	5.3	0.0
2017	May	-6.9	4.4	0.0
2017	Jun	3.1	5.0	0.0
2017	Jul	6.9	6.2	34.1
2017	Aug	7.0	4.9	10.8
2017	Sep	-0.7	6.5	8.9
2017	Oct			
2017	Nov			
2017	Dec			
2018	Jan	-31.0	21.5	0.0
2018	Feb	-35.1	16.7	0.0
2018	Mar	-26.9	5.4	0.0
2018	Apr	-19.4	6.9	0.1
2018	May	-9.8	4.8	0.0
2018	Jun	3.3	5.6	19.3
2018	Jul	6.7	6.3	74.8
2018	Aug	4.9	5.9	52.5
2018	Sep	-11.8	6.0	18.1
2018	Oct	-23.4	6.8	0.0
2018	Nov	-35.3	2.5	0.0
2018	Dec	-34.2	14.4	0.0
2019	Jan	-40.9	11.5	0.0
2019	Feb	-41.1	30.5	0.0
2019	Mar	-36.2	5.0	0.0
2019	Apr	-31.3	6.0	0.5
2019	May	-12.0	6.0	2.8
2019	Jun	-4.4	5.5	30.5
2019	Jul	-0.3	6.3	50.1
2019	Aug	0.3	5.7	30.4
2019	Sep	-8.1	2.9	41.3

Appendix Table A-4. Post-baseline data for Milne Port (2013 to 2021).

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)[1]
2019	Oct	-8.2	0.0	1.0
2019	Nov	-19.1	0.0	0.0
2019	Dec	-25.1	0.0	0.0
2020	Jan	-35.3	0.0	0.0
2020	Feb	-34.7	0.0	0.0
2020	Mar	-29.3	0.0	0.0
2020	Apr	-17.9	0.0	0.0
2020	May	-7.9	0.0	0.2
2020	Jun	4.4	0.0	31.0
2020	Jul	11.5	0.0	20.9
2020	Aug	6.6	0.1	*0.0*
2020	Sep	-1.4	2.5	*0.3*
2020	Oct	-6.8	4.6	*0.0*
2020	Nov	-22.1	5.6	*0.0*
2020	Dec	-22.4	5.5	*0.0*
2021	Jan	-22.5	4.8	*0.0*
2021	Feb	-28.1	5.1	*0.0*
2021	Mar	-29.2	5.3	*0.0*
2021	Apr	-15.3	5.4	*0.0*
2021	May	-6.1	4.7	*0.0*
2021	Jun	4.3	5.5	*0.4*
2021	Jul	5.9	6.2	*0.4*
2021	Aug	5.2	6.6	*9.2*
2021	Sep	-1.3	5.2	10.6
2021	Oct	-2.4	8.6	15.2
2021	Nov	-18.9	3.3	0.0
2021	Dec	-22.2	5.3	0.0

[1] Total precipitation values in italics indicate data recorded during time periods with a potentially blocked rain gauge.

APPENDIX B 2015 AND 2016 HELICOPTER OVERFLIGHT SUMMARY TABLES

As requested by the Nunavut Impact Review Board (NIRB) in comment GN AR#02 (Nunavut Impact Review Board 2021) in response to the 2020 Terrestrial Environment Annual Monitoring Report (TEAMR), the 2015 and 2016 helicopter overflight data were re-analyzed using the methods described in Section 5.1. No analysis was conducted using pilot rationale because rationale data were not collected in 2015 and 2016. It should also be noted that the June and July flight log data from 2015 was only spatially accurate to the minute in both latitude and longitude (units of degrees, minutes seconds), whereas the rest of the flight log data were provided to the second.

The following tables summarize the monthly breakdown of the number of transits flown, flight hours, and flight hours of cruising altitude compliance for 2015 and 2016. The inter-annual comparison of the data is given in Section 5.3.

Appendix Table B-1. Number of transits flown per month with a breakdown of transits (№ and %) flown within and outside the Snow Geese area, June 1 to September 30, 2015.

Month	Total № of Transits	№ of Transits Over Snow Geese Area	% Transits Over Snow Geese Area	№ of Transits Outside Snow Geese Area	% Transits Outside Snow Geese Area
June	192	4	2	188	98
July	307	28	9	279	91
August	304	106	35	198	65
September	116	26	22	90	78
Total	**919**	**164**	**18**	**755**	**82**

Appendix Table B-2. Number of flight hours per month with a breakdown of flight time (hrs and %) flown within and outside the Snow Goose area, June 1 to September 30, 2015.

Month	Total Flight Hours	Flight Hours Over Snow Geese Area	% Flight Time Over Snow Geese Area	Flight Hours Outside Snow Geese Area	% Flight Time Outside Snow Geese Area
June	74.20	1.10	1.48	73.10	98.52
July	143.85	7.22	5.02	136.63	94.98
August	212.37	43.62	20.54	168.75	79.46
September	462.65	9.83	2.12	452.82	97.88
Total	**893.07**	**61.77**	**6.92**	**831.29**	**93.08**

Appendix Table B-3. Number of flight hours of cruising altitude compliance (≥ 1,100 magl) within the Snow Geese area during the moulting season, July 1 to August 31, 2015.

Month	Area	Total Flight Hours	Compliant		Non-compliant	
			hrs	%	hrs	%
July	Within SNGO Area	7.22	3.71	51.34	3.51	48.66
August	Within SNGO Area	43.62	21.27	48.77	22.35	51.23
Total		**50.84**	**24.98**	**49.13**	**25.86**	**50.87**

Note: Snow Goose (SNGO)

Appendix Table B-4. Number of flight hours of overall cruising altitude compliance in all areas for all months between June 1 to September 30, 2015.

Month	Area	Total Flight Hours	Compliant		Non-compliant	
			hrs	%	hrs	%
June	All Areas	74.20	26.68	35.95	47.52	64.05
July	All Areas	143.85	65.69	45.66	78.16	54.34
August	All Areas	212.37	113.03	53.23	99.33	46.77
September	All Areas	462.65	387.98	83.86	74.67	16.14
Total		**893.07**	**593.38**	**66.44**	**299.69**	**33.56**

Appendix Table B-5. Number of transits flown per month with a breakdown of transits (№ and %) flown within and outside the Snow Geese area, May 1 to September 30, 2016.

Month	Total № of Transits	№ of Transits Over Snow Geese Area	% Transits Over Snow Geese Area	№ of Transits Outside Snow Geese Area	% Transits Outside Snow Geese Area
May	2	0	0	2	100
June	173	43	25	130	75
July	370	66	18	304	82
August	381	109	29	272	71
September	137	16	12	121	88
Total	**1,063**	**234**	**22**	**829**	**78**

Appendix Table B-6. Number of flight hours per month with a breakdown of flight time (hrs and %) flown within and outside the Snow Geese area, May 1 to September 30, 2016.

Month	Total Flight Hours	Flight Hours Over Snow Geese Area	% Flight Time Over Snow Geese Area	Flight Hours Outside Snow Geese Area	% Flight Time Outside Snow Geese Area
May	22.25	0.00	0.00	22.25	100.00
June	101.03	3.38	3.35	97.65	96.65
July	188.47	9.61	5.10	178.86	94.90
August	192.88	24.44	12.67	168.44	87.33
September	84.88	5.63	6.63	79.26	93.37
Total	**589.52**	**43.06**	**7.30**	**546.46**	**92.70**

Appendix Table B-7. **Number of flight hours of cruising altitude compliance (≥ 1,100 magl) within the Snow Geese area during the moulting season, July 1 to August 31, 2016.**

Month	Area	Total Flight Hours	Compliant		Non-compliant	
			hrs	%	hrs	%
July	Within SNGO Area	9.61	2.45	25.45	7.16	74.55
August	Within SNGO Area	24.44	1.23	5.05	23.21	94.95
Total		**34.05**	**3.68**	**10.81**	**30.37**	**89.19**

Note: Snow Goose (SNGO)

Appendix Table B-8. **Number of flight hours of overall cruising altitude compliance in all areas for all months between May 1 to September 30, 2016.**

Month	Area	Total Flight Hours	Compliant		Non-compliant	
			hrs	%	hrs	%
May	All Areas	22.25	20.92	94.01	1.33	5.99
June	All Areas	101.03	41.14	40.72	59.90	59.28
July	All Areas	188.47	93.43	49.57	95.04	50.43
August	All Areas	192.88	82.64	42.84	110.25	57.16
September	All Areas	84.88	27.06	31.88	57.82	68.12
Total		**589.52**	**265.18**	**44.98**	**324.33**	**55.02**

APPENDIX C VEGETATION AND SOIL BASE METALS MONITORING SITES, 2012 TO 2021

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
MP-01	Near	2014	L-56	1	1	1		0.00	DF-P-04	14.25	71.8709	-80.8824
		2020	MP-01_2020	1	1			0.00	DF-P-04	37.40	71.8710	-80.8817
		2021	MP-L-56	1	1			0.00	DF-P-04	14.27	71.87098	-80.8820
MP-02	Near	2016	L-101	1	1			50.93	DF-P-04	594.69	71.8761	-80.8778
		2019	L-118	1	1			50.12	DF-P-04	573.38	71.8759	-80.8778
		2020	MP-02_2020	1	1			49.39	DF-P-04	572.11	71.8759	-80.8778
		2021	MP-L-118	1	1			45.86	DF-P-04	571.27	71.8759	-80.8778
MP-03	Near	2016	L-100	1	1			36.01	DF-P-04	654.69	71.8767	-80.8783
		2019	L-119	1	1			39.89	DF-P-04	666.35	71.8768	-80.8782
		2020	MP-03_2020	1	1			35.72	DF-P-04	665.37	71.8768	-80.8783
		2021	MP-L-119	1	1			35.97	DF-P-04	666.25	71.8767	-80.8782
MP-04	Near	2016	L-97	1	1			63.31	DF-P-04	833.29	71.8783	-80.8777
		2019	L-121	1	1			57.18	DF-P-06	817.54	71.8785	-80.8779
		2020	MP-04_2020	1	1			66.90	DF-P-06	837.00	71.8783	-80.8776
		2021	MP-L-121	1	1			60.27	DF-06-06	843.31	71.8783	-80.8777
MP-05	Near	2016	L-96	1	1			45.74	DF-P-06	750.13	71.8791	-80.8783
		2019	L-122	1	1			46.14	DF-P-06	738.98	71.8792	-80.8783
		2020	MP-05_2020	1	1			46.84	DF-P-06	739.01	71.8792	-80.8783
		2021	MP-L-122	1	1			44.46	DF-P-06	741.51	71.8791	-80.8782
MP-06	Near	2016	L-94	1	1			25.28	DF-P-06	549.02	71.8809	-80.8791
		2019	L-144	1	1			35.28	DF-P-06	560.19	71.8808	-80.8788
		2020	MP-06_2020	1	1			33.83	DF-P-06	552.37	71.8809	-80.8789
		2021	MP-L-144	1	1			34.85	DF-P-06	561.25	71.8808	-80.8789
MP-07	Near	2016	L-91	1	1			66.59	DF-P-06	438.74	71.8819	-80.8780
		2019	L-145	1	1			44.35	DF-P-06	426.50	71.8820	-80.8786
		2020	MP-07_2020	1	1			43.67	DF-P-06	426.48	71.8820	-80.8786

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
		2021	MP-L-145	1	1			44.47	DF-P-06	426.58	71.8819	-80.8784
MP-08	Near	2014	L-57	1		1		0.00	DF-P-06	6.37	71.8858	-80.8790
		2020	MP-08_2020	1	1			0.00	DF-P-06	12.14	71.8859	-80.8790
		2021	MP-57-2021	1	1			0.00	DF-P-06	6.94	71.8858	-80.8790
MP-09	Far	2019	L-147	1	1			104.15	DF-P-06	247.90	71.8838	-80.8760
		2020	MP-09_2020	1	1			119.47	DF-P-06	250.19	71.8838	-80.8755
		2021	MP-L-147	1	1			104.37	DF-P-06	249.44	71.8834	-80.8766
MP-10	Near	2019	L-146	1	1			82.92	DF-P-06	322.07	71.8830	-80.8770
		2020	MP-10_2020	1	1			71.19	DF-P-06	303.79	71.8832	-80.8773
		2021	MP-L-146	1	1			82.41	DF-P-06	322.52	71.8830	-80.8771
MP-11	Far	2016	L-93	1	1			171.14	DF-P-06	469.25	71.8818	-80.8750
		2020	MP-11_2020	1	1			171.37	DF-P-06	472.55	71.8818	-80.8750
MP-12	Far	2016	L-102	1	1			424.04	DF-P-04	758.30	71.8757	-80.8670
		2020	MP-12_2020	1	1			425.51	DF-P-04	760.84	71.8757	-80.8670
MP-13	Far	2019	L-142	1	1			841.35	DF-P-04	1034.94	71.8742	-80.8548
		2020	MP-13_2020	1	1			839.30	DF-P-04	1033.37	71.8742	-80.8549
MP-14	Far	2019	L-136	1	1			755.54	DF-P-04	1003.25	71.8753	-80.8574
		2020	MP-14_2020	1	1			755.34	DF-P-04	1000.59	71.8752	-80.8574
MP-15	Far	2016	L-103	1	1			649.33	DF-P-04	984.57	71.8765	-80.8606
		2020	MP-15_2020	1	1			647.47	DF-P-04	981.13	71.8765	-80.8607
MP-16	Reference	2013	L-02	1	1	1		3269.31	DF-P-03	0.84	71.8996	-80.7884
		2019	L-135	1	1			3266.82	DF-P-03	25.58	71.8994	-80.7882
		2020	MP-16_2020	1	1			3268.13	DF-P-03	18.93	71.8995	-80.7882
MP-17	Reference	2019	L-141	1	1			2168.16	DF-P-03	1744.01	71.8865	-80.8157
		2020	MP-17_2020	1	1			2164.88	DF-P-03	1742.16	71.8865	-80.8158
MP-18	Reference	2016	L-105	1	1			1824.06	DF-P-04	2055.62	71.8770	-80.8268

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
		2020	MP-18_2020	1	1			1822.94	DF-P-04	2053.91	71.8770	-80.8268
MP-19	Near	2016	L-92	1	1			44.65	DF-P-06	493.40	71.8814	-80.8786
		2019	L-143	1	1			34.25	DF-P-06	493.24	71.8814	-80.8789
MP-20	Near	2016	L-98	1	1			40.07	DF-P-04	763.50	71.8777	-80.8783
		2019	L-120	1	1			19.25	DF-P-04	759.54	71.8777	-80.8789
MP-21	Near	2013	L-01	1	1			0.00	DF-P-05	139.00	71.8850	-80.8912
MP-22	Reference	2019	L-140	1	1			2303.95	DF-P-03	1842.41	71.8848	-80.8118
MP-23	Near	2014	L-58	1	1			0.00	DF-P-07	324.09	71.8838	-80.9159
MP-24	Near	2016	L-95	1	1			28.98	DF-P-06	638.24	71.8801	-80.8789
MP-25	Near	2016	L-99	1	1			17.22	DF-P-04	704.72	71.8772	-80.8789
MP-26	Far	2019	L-137	1	1			726.06	DF-P-04	1051.98	71.8766	-80.8584
MP-27	Near	2013	L-03	1	1		1	0.00	DF-P-04	103.98	71.8702	-80.8844
MP-28	Reference	2019	L-139	1	1			3157.83	DF-P-03	127.06	71.8988	-80.7909
MP-29	Far	2016	L-104	1	1			805.58	DF-P-04	1024.99	71.8748	-80.8559
MP-30	Reference	2016	L-106	1	1			3217.83	DF-P-03	70.63	71.8999	-80.7902
MS-01	Near	2020	MS-01_2020	1	1			0.00	DF-M-01	42.23	71.3243	-79.3759
MS-02	Near	2019	L-128	1	1			30.95	DF-M-01	709.06	71.3202	-79.3595
		2020	MS-02_2020	1	1			38.52	DF-M-01	710.67	71.3201	-79.3596
MS-03	Near	2016	L-83	1	1			92.95	DF-M-07	1142.60	71.3101	-79.2012
		2019	L-154	1	1			87.41	DF-M-07	1144.64	71.3101	-79.2015
		2020	MS-03_2020	1	1			90.23	DF-M-07	1142.10	71.3101	-79.2014
MS-04	Near	2016	L-85	1	1			63.14	DF-M-03	1189.10	71.3102	-79.2114
		2019	L-155	1	1			74.36	DF-M-03	1192.90	71.3101	-79.2112
		2020	MS-04_2020	1	1			71.50	DF-M-03	1198.63	71.3101	-79.2111
MS-05	Near	2016	L-86	1	1			46.83	DF-M-03	817.49	71.3094	-79.2215
		2019	L-156	1	1			55.68	DF-M-03	803.94	71.3093	-79.2218

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
		2020	MS-05_2020	1	1			59.59	DF-M-03	806.40	71.3093	-79.2217
MS-06	Near	2016	L-88	1	1			53.84	DF-M-03	313.01	71.3075	-79.2346
		2019	L-157	1	1			53.23	DF-M-03	335.66	71.3076	-79.2340
		2020	MS-06_2020	1	1			53.58	DF-M-03	336.72	71.3076	-79.2340
MS-07	Near	2019	L-153	1	1			18.73	DF-M-02	1103.30	71.3004	-79.2729
		2020	MS-07_2020	1	1			26.40	DF-M-02	1109.90	71.3003	-79.2729
MS-08	Near	2016	L-82	1	1			69.06	DF-M-03	1214.29	71.2997	-79.2679
		2019	L-131	1	1			71.21	DF-M-03	1224.70	71.2997	-79.2683
		2020	MS-08_2020	1	1			66.38	DF-M-03	1219.61	71.2997	-79.2682
MS-09	Near	2019	L-130	1	1			33.83	DF-M-03	1094.74	71.2998	-79.2634
		2020	MS-09_2020	1	1			27.76	DF-M-03	1092.06	71.2999	-79.2635
MS-10	Near	2019	L-132	1	1			1.56	DF-M-03	1033.91	71.3000	-79.2615
		2020	MS-10_2020	1	1			0.00	DF-M-03	1027.77	71.3000	-79.2614
MS-11	Far	2019	L-134	1	1			238.26	DF-M-01	867.31	71.3181	-79.3600
		2020	MS-11_2020	1	1			242.25	DF-M-01	866.72	71.3181	-79.3601
MS-12	Far	2020	MS-12_2020	1	1			335.08	DF-M-01	669.35	71.3187	-79.3679
MS-13	Far	2019	L-159	1	1			367.31	DF-M-07	1150.49	71.3103	-79.1922
		2020	MS-13_2020	1	1			365.40	DF-M-07	1149.14	71.3103	-79.1923
MS-14	Far	2016	L-115	1	1			451.95	DF-M-07	1186.34	71.3105	-79.1894
		2020	MS-14_2020	1	1			451.78	DF-M-07	1188.66	71.3105	-79.1894
MS-15	Far	2020	MS-15_2020	1	1			162.69	DF-M-03	479.82	71.3070	-79.2299
MS-16	Far	2020	MS-16_2021	1	1			353.30	DF-M-02	1302.34	71.2976	-79.2774
MS-17	Far	2020	MS-17_2021	1	1			655.56	DF-M-07	755.76	71.3043	-79.2116
MS-18	Far	2020	MS-18_2020	1	1			781.12	DF-M-02	1501.15	71.2951	-79.2891
MS-19	Far	2020	MS-19_2020	1	1			537.87	DF-M-02	1302.74	71.2969	-79.2854
MS-20	Far	2019	L-129	1	1			744.82	DF-M-01	1043.56	71.3150	-79.3712

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
		2020	MS-20_2020	1	1			740.84	DF-M-01	1040.50	71.3150	-79.3711
MS-21	Far	2020	MS-21_2020	1	1			947.46	DF-M-01	1173.86	71.3138	-79.3757
MS-22	Reference	2013	L-29	1	1	1		9228.31	DF-M-04	0.84	71.2197	-79.3277
MS-22	Reference	2019	L-165	1	1			9227.39	DF-M-04	3.28	71.2197	-79.3276
		2020	MS-22_2020	1	1			9233.41	DF-M-04	12.88	71.2196	-79.3274
MS-23	Reference	2019	L-138	1	1			4139.17	DF-M-08	303.03	71.2968	-79.0955
		2020	MS-23_2020	1	1			4143.27	DF-M-08	299.61	71.2968	-79.0954
MS-24	Reference	2019	L-166	1	1			10254.11	DF-M-05	1403.66	71.3843	-78.9051
		2020	MS-24_2020	1	1			10235.26	DF-M-05	1393.70	71.3843	-78.9057
MS-25	Reference	2014	L-65	1	1	1		1230.76	DF-M-07	2.38	71.3000	-79.1953
		2019	L-170	1	1			1221.17	DF-M-07	7.48	71.3001	-79.1953
		2020	MS-25_2020	1	1			1219.94	DF-M-07	22.60	71.3001	-79.1959
MS-26	Reference	2014	L-64	1	1			1186.92	DF-M-06	4.26	71.3196	-79.1559
		2016	L-113	1	1			1182.06	DF-M-06	5.49	71.3196	-79.1560
		2019	L-174	1	1			1215.24	DF-M-06	36.63	71.3196	-79.1550
MS-27	Reference	2014	L-66	1	1	1		4092.75	DF-M-08	2.87	71.2945	-79.1001
MS-28	Reference	2012	L-20	1	1			32532.26	DF-RS-08	28077.06	71.6457	-79.2153
MS-29	Reference	2012	L-28	1	1			39601.07	DF-M-05	30884.62	71.5403	-78.2296
MS-30	Reference	2016	L-111	1	1			10383.88	DF-M-05	1600.41	71.3860	-78.9034
MS-31	Reference	2012	L-27	1	-			2447.89	DF-M-06	7062.32	71.3758	-79.2471
MS-32	Reference	2012	L-26	1	1			2880.93	DF-M-06	3122.46	71.3391	-79.0935
MS-33	Far	2012	L-24	1	1			128.79	DF-M-01	979.85	71.3331	-79.3766
MS-34	Near	2019	L-133	1	1			18.65	DF-M-01	357.19	71.3220	-79.3677
MS-35	Far	2016	L-90	1	1			403.25	DF-M-01	707.93	71.3182	-79.3691
MS-36	Near	2016	L-84	1	1			83.75	DF-M-07	1168.22	71.3101	-79.2043
MS-37	Near	2016	L-87	1	1			62.94	DF-M-03	636.98	71.3089	-79.2263

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
MS-38	Near	2013	L-25	1	1	1		0.00	DF-M-03	2.44	71.3072	-79.2433
MS-39	Near	2019	L-158	1	1			92.01	DF-M-03	252.95	71.3060	-79.2373
MS-40	Near	2016	L-89	1	1			90.01	DF-M-03	339.23	71.3047	-79.2379
MS-41	Near	2016	L-117	1	1			46.20	DF-M-03	1150.47	71.2998	-79.2657
MS-42	Reference	2016	L-110	1	1			3869.16	DF-M-08	402.83	71.2981	-79.1020
MS-43	Reference	2014	L-67	1	1	1	1	3346.77	DF-M-09	5.01	71.2936	-79.4128
MS-44	Reference	2016	L-109	1	1			9105.87	DF-M-04	124.22	71.2208	-79.3274
MS-45	Reference	2016	L-112	1	1			1044.33	DF-M-06	141.07	71.3202	-79.1594
MS-46	Far	2016	L-114	1	1			391.40	DF-M-07	1095.36	71.3098	-79.1921
MS-47	Far	2019	L-160	1	1			417.07	DF-M-07	1250.49	71.3111	-79.1897
MS-48	Near	2013	L-23	1	1		1	0.00	DF-M-01	4.33	71.3243	-79.3747
MS-49	Near	2016	L-81	1	1			56.11	DF-M-02	1115.09	71.3001	-79.2737
TR-01	Near	2019	L-152	1	1			17.83	DF-RS-03	1549.83	71.3913	-79.7827
		2020	TR-01_2020	1	1			20.28	DF-RS-03	1554.86	71.3913	-79.7826
		2021	TR_152_2021	1	1			19.87	DF-RS-03	1549.02	71.3912	-79.7826
TR-02	Near	2020	TR-02_2020	1	1			92.93	DF-RS-03	1015.34	71.3920	-79.7984
TR-03	Near	2013	L-16	1	1	1		0.00	DF-RS-06	1.46	71.3986	-79.8234
		2019	L-151	1	1			0.00	DF-RS-06	3.56	71.3986	-79.8235
		2020	TR-03_2020	1	1			0.00	DF-RS-06	1.07	71.3986	-79.8234
TR-04	Near	2016	L-79	1	1			0.00	DF-RS-03	1554.84	71.3891	-79.7862
		2020	TR-04_2020	1	1			0.00	DF-RS-03	1530.50	71.3893	-79.7867
		2021	TR-79-2021	1	1			0.00	DF-RS-03	0.00	71.3891	-79.7864
TR-05	Near	2013	L-15	1	1		1	67.05	DF-RS-03	0.53	71.3967	-79.8228
		2019	L-124	1	1			66.03	DF-RS-03	7.12	71.3967	-79.8230
		2020	TR-05_2020	1	1			83.57	DF-RS-03	31.38	71.3965	-79.8234
TR-06	Near	2019	L-125	1	1			75.11	DF-RS-03	207.05	71.3962	-79.8284

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Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
		2020	TR-06_2020	1	1			79.38	DF-RS-03	216.10	71.3961	-79.8286
TR-07	Near	2019	L-149	1	1			36.10	DF-RS-03	786.23	71.3958	-79.8447
		2020	TR-07_2020	1	1			38.12	DF-RS-03	789.90	71.3958	-79.8448
TR-08	Near	2019	L-172	1	1			19.48	DF-RN-05	11.16	71.7186	-80.4414
		2020	TR-08_2020	1	1			25.63	DF-RN-05	34.50	71.7188	-80.4416
TR-09	Near	2013	L-07	1	1			86.51	DF-RN-06	1.15	71.7189	-80.4397
		2020	TR-09_2020	1	1			90.05	DF-RN-06	3.50	71.7189	-80.4397
TR-10	Near	2013	L-06	1	1	1		73.72	DF-RN-03	3.79	71.7186	-80.4473
		2020	TR-10_2020	1	1			70.77	DF-RN-03	1.79	71.7186	-80.4473
TR-11	Far	2019	L-123	1	1			246.74	DF-RS-03	205.76	71.3954	-79.8187
		2020	TR-11_2020	1	1			245.67	DF-RS-03	204.98	71.3954	-79.8187
TR-12	Far	2016	L-116	1	1			449.12	DF-RS-02	2032.15	71.3833	-79.8862
		2020	TR-12_2020	1	1			446.80	DF-RS-02	2032.08	71.3833	-79.8862
TR-13	Far	2013	L-17	1	1	1		954.74	DF-RS-07	1.28	71.4077	-79.8182
		2016	L-77	1	1			976.34	DF-RS-07	28.53	71.4079	-79.8187
		2019	L-162	1	1			943.12	DF-RS-07	11.15	71.4076	-79.8182
		2020	TR-13_2020	1	1			945.14	DF-RS-07	16.80	71.4076	-79.8186
TR-14	Far	2013	L-14	1	1			627.65	DF-RS-02	4.26	71.3893	-79.8324
		2016	L-76	1	1			599.30	DF-RS-02	27.96	71.3896	-79.8326
		2019	L-161	1	1			611.19	DF-RS-02	14.93	71.3894	-79.8328
		2020	TR-14_2020	1	1			600.00	DF-RS-02	25.11	71.3896	-79.8327
TR-15	Reference	2013	L-12	1	1	1	1	13986.35	DF-RR-01	2.77	71.2805	-80.2450
		2019	L-169	1	1			13978.40	DF-RR-01	14.09	71.2806	-80.2451
		2020	TR-15_2020	1	1			13975.85	DF-RR-01	17.45	71.2806	-80.2451
TR-16	Reference	2013	L-22	1	-	1		6022.58	DF-RS-01	1.78	71.3275	-79.8001
		2019	L-168	1	1			6032.35	DF-RS-01	20.36	71.3275	-79.8007

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Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
		2020	TR-16_2020	1	1			6002.17	DF-RS-01	35.52	71.3278	-79.8006
TR-17	Reference	2013	L-19	1	-	1		6672.12	DF-RS-08	1.33	71.4489	-79.7106
		2019	L-167	1	1			6663.09	DF-RS-08	19.48	71.4489	-79.7112
		2020	TR-17_2020	1	1			6648.29	DF-RS-08	38.95	71.4486	-79.7103
TR-18	Reference	2014	L-63	1	1	1		10692.18	DF-P-03	11616.77	71.8805	-80.4592
TR-19	Reference	2014	L-59	1	1	1		13242.00	DF-RN-08	7368.60	71.7752	-80.1047
TR-20	Reference	2013	L-09	1	1	1		5925.58	DF-RN-08	1.78	71.7435	-80.2898
TR-21	Far	2013	L-08	1	1	1		979.87	DF-RN-07	0.84	71.7226	-80.4165
TR-22	Near	2019	L-173	1	1			13.98	DF-RN-04	48.43	71.7192	-80.4466
TR-23	Far	2016	L-75	1	1			282.93	DF-RS-03	215.51	71.3948	-79.8217
TR-24	Near	2016	L-72	1	1			63.07	DF-RS-03	712.12	71.3967	-79.8428
TR-25	Far	2013	L-05	1	1	1		998.63	DF-RN-02	0.84	71.7145	-80.4704
TR-26	Reference	2013	L-04	1	1	1		4544.76	DF-RN-01	1.48	71.6882	-80.5363
TR-27	Reference	2012	L-11	1	1			3019.46	DF-TR-56E	5924.75	71.5628	-80.2148
TR-28	Reference	2013	L-10	1	-	1		14000.46	DF-RR-02	2.30	71.5189	-80.6923
TR-29	Reference	2016	L-108	1	1			6899.43	DF-RS-08	293.17	71.4515	-79.7117
TR-30	Reference	2012	L-18	1	1			1494.38	DF-RS-07	820.09	71.4113	-79.7981
TR-31	Reference	2019	L-164	1	1			6723.69	DF-RS-08	50.97	71.4493	-79.7100
TR-32	Far	2019	L-163	1	1			587.64	DF-RS-06	1034.30	71.4004	-79.8519
TR-33	Near	2016	L-73	1	1			79.93	DF-RS-06	324.75	71.3984	-79.8325
TR-34	Near	2019	L-171	1	1			0.00	DF-RS-05	13.24	71.3981	-79.8230
TR-35	Near	2019	L-150	1	1			2.79	DF-RS-06	240.90	71.3980	-79.8299
TR-36	Near	2019	L-126	1	1			10.97	DF-RS-04	163.68	71.3978	-79.8177
TR-37	Near	2019	L-127	1	1			0.00	DF-RS-04	15.44	71.3974	-79.8225
TR-38	Near	2016	L-74	1	1			122.81	DF-RS-03	55.88	71.3962	-79.8227
TR-39	Near	2016	L-71	1	1			115.29	DF-RS-02	1011.26	71.3944	-79.8560

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Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
TR-40	Near	2019	L-148	1	1			53.92	DF-RS-02	910.20	71.3941	-79.8532
TR-41	Near	2016	L-70	1	1			151.45	DF-RS-02	1311.70	71.3933	-79.8671
TR-42	Near	2016	L-69	1	1			82.69	DF-RS-02	1191.70	71.3904	-79.8657
TR-43	Near	2016	L-80	1	1			135.29	DF-RS-03	1812.00	71.3904	-79.7759
TR-44	Near	2016	L-68	1	1			113.77	DF-RS-02	1577.96	71.3884	-79.8766
TR-45	Near	2014	L-60	1	1	1	1	22.33	DF-M-01	6617.87	71.3423	-79.5512
TR-46	Reference	2012	L-13	1	1			8657.51	DF-RR-01	6532.74	71.3387	-80.2239
TR-47	Reference	2012	L-21	1	1			15563.78	DF-RS-01	11813.00	71.2216	-79.7948
TR-48	Far	2014	L-61	1	1	1	1	474.82	DF-M-01	5580.24	71.3383	-79.5246
TR-49	Reference	2016	L-107	1	1			6196.55	DF-RS-01	179.61	71.3259	-79.8008
TR-50	Near	2016	L-78	1	1			96.48	DF-RS-03	969.72	71.3922	-79.7995
SP[3]-01	Near	2012	L-52	1	1			114648.66	DF-M-04	106703.48	70.3044	-78.4834
SP-02	Reference	2012	L-53	1	1			116160.98	DF-M-04	108425.81	70.3025	-78.3506
SP-03	Reference	2012	L-54	1	1			122627.02	DF-M-04	114788.92	70.2413	-78.3607
SP-04	Reference	2012	L-51	1	1			108650.57	DF-M-04	100549.82	70.3491	-78.6165
SR[4]-01	Reference	2012	L-30	1	1			13826.31	DF-M-08	10252.60	71.2144	-78.9602
SR-02	Near	2012	L-31	1	1			17505.65	DF-M-08	13534.96	71.2128	-78.8212
SR-03	Reference	2012	L-32	1	1			32466.09	DF-M-05	24196.07	71.3204	-78.2655
SR-04	Reference	2012	L-33	1	1			23731.69	DF-M-04	14793.63	71.0875	-79.2946
SR-05	Reference	2012	L-34	1	1			36223.15	DF-M-08	32282.17	71.0966	-78.4455
SR-06	Near	2012	L-35	1	1			40222.23	DF-M-08	36202.87	71.0947	-78.3074
SR-07	Reference	2012	L-36	1	1			44424.52	DF-M-08	40362.82	71.0926	-78.1693
SR-08	Reference	2012	L-37	1	1			49880.53	DF-M-05	43090.31	71.1990	-77.8489
SR-09	Reference	2012	L-38	1	1			61126.19	DF-M-05	54910.40	71.1263	-77.5989
SR-10	Reference	2012	L-39	1	1			46027.24	DF-M-04	37303.99	70.8878	-79.2013
SR-11	Reference	2012	L-40	1	1			56697.25	DF-M-04	51289.90	70.8778	-78.3816

Appendix Table C-1. Vegetation and soil base metals monitoring sites, 2012 to 2021.

Site ID	Distance Category	Year	Visit ID[1]	Soil	Lichen	Willow	Blue-berry	Distance to PDA (m)	Associated Dustfall Site[2]	Distance to Dustfall Site (m)	Latitude	Longitude
SR-12	Near	2012	L-41	1	1			59477.26	DF-M-04	54729.82	70.8763	-78.2491
SR-13	Reference	2012	L-42	1	1			62698.21	DF-M-04	58552.22	70.8734	-78.1139
SR-14	Reference	2012	L-43	1	1			85517.56	DF-M-08	81479.30	70.8591	-77.2928
SR-15	Reference	2012	L-44	1	1			66939.34	DF-M-04	58475.05	70.7046	-79.0278
SR-16	Reference	2012	L-45	1	1			75851.59	DF-M-04	69487.49	70.7024	-78.2643
SR-17	Far	2012	L-46	1	1			79833.16	DF-M-04	73738.24	70.6845	-78.1393
SR-18	Reference	2012	L-47	1	1			90414.17	DF-M-04	81810.38	70.4932	-79.0190
SR-19	Far	2012	L-48	1	1			97006.40	DF-M-04	89650.45	70.4844	-78.3384
SR-20	Reference	2012	L-49	1	1			98863.91	DF-M-04	91743.17	70.4813	-78.2233
SR-21	Reference	2012	L-50	1	1			114424.91	DF-M-04	109190.26	70.4673	-77.4203
SR-22	Reference	2012	L-55	1	1			128982.36	DF-M-04	122594.05	70.2890	-77.5545
SR-23	Near	2014	L-62	1	1	1	1	36343.66	DF-M-08	32283.33	71.1324	-78.3563

[1] Visit ID represents the specific position that the sample was taken for a particular sampling year. All Visit IDs have an associated Site ID.

[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.

[3,4] SB = Steensby Inlet Port; SR = South Rail.

APPENDIX D VEGETATION AND SOIL BASE METALS MONITORING 2021 LABORATORY RETURNS

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Connor Devereaux/Kendra Button
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 05-AUG-21
Report Date: 08-OCT-21 15:49 (MT)
Version: FINAL

Client Phone: 647-253-0596

Certificate of Analysis

Lab Work Order #: L2622892
Project P.O. #: 4500090295
Job Reference: BIM SOIL AND LICHEN TISSUE - TRACE METALS
C of C Numbers:
Legal Site Desc:

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

(No parameter exceedances)

ALS Environmental

ANALYTICAL REPORT

Physical Tests - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-3	L2622892-6	L2622892-9	L2622892-12	L2622892-15	L2622892-18	L2622892-21	L2622892-24	L2622892-27
Sample Date				26-JUL-21	26-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				TR-L-152-2021	TR-L-79-2021	MP-L-57-2021	MP-L-147-2021	MP-L-146-2021	MP-L-146-2021-R	MP-L-144-2021	MP-L-122-2021	MP-L-121-2021
% Moisture	%	-	-	7.78	7.47	12.1	18.2	12.5	13.8	32.8	9.99	20.4
pH	pH units	-	-	6.92	5.85	8.54	7.44	7.76	7.79	5.61	7.55	6.79

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.

ALS Environmental

ANALYTICAL REPORT

Physical Tests - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-30	L2622892-33	L2622892-36	L2622892-39
Sample Date				27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				MP-L-119-2021	MP-L-118-2021	MP-L-145-2021	MP-L-56-2021
% Moisture	%	-	-	7.67	10.9	17.3	12.7
pH	pH units	-	-	7.68	7.60	7.85	7.59

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	L2622892-1	L2622892-2	L2622892-4	L2622892-5	L2622892-7	L2622892-8	L2622892-10	L2622892-11	L2622892-13
			Sample Date	26-JUL-21	26-JUL-21	26-JUL-21	26-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
			Sample ID	TR-L-152-2021 UNWASHED	TR-L-152-2021 WASHED	TR-L-79-2021 UNWASHED	TR-L-79-2021 WASHED	MP-L-57-2021 UNWASHED	MP-L-57-2021 WASHED	MP-L-147-2021 UNWASHED	MP-L-147-2021 WASHED	MP-L-146-2021 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
% Moisture	%	-	-	44.9	83.7	61.6	85.9	32.4	76.8	32.6	78.8	28.3

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	L2622892-14	L2622892-16	L2622892-17	L2622892-19	L2622892-20	L2622892-22	L2622892-23	L2622892-25	L2622892-26
			Sample Date	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
			Sample ID	MP-L-146-2021 WASHED	MP-L-146-2021-R UNWASHED	MP-L-146-2021-R WASHED	MP-L-144-2021 UNWASHED	MP-L-144-2021 WASHED	MP-L-122-2021 UNWASHED	MP-L-122-2021 WASHED	MP-L-121-2021 UNWASHED	MP-L-121-2021 WASHED
		Guide Limits										
Analyte	**Unit**	**#1**	**#2**									
% Moisture	%	-	-	80.4	27.9	74.8	29.0	69.9	21.8	81.3	19.5	77.1

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

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-28	L2622892-29	L2622892-31	L2622892-32	L2622892-34	L2622892-35	L2622892-37	L2622892-38
Sample Date				27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				MP-L-119-2021 UNWASHED	MP-L-119-2021 WASHED	MP-L-118-2021 UNWASHED	MP-L-118-2021 WASHED	MP-L-145-2021 UNWASHED	MP-L-145-2021 WASHED	MP-L-56-2021 UNWASHED	MP-L-56-2021 WASHED
% Moisture	%	-	-	18.1	67.5	21.1	74.7	26.8	75.6	14.8	70.1

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.

ALS Environmental

ANALYTICAL REPORT

Metals - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-3	L2622892-6	L2622892-9	L2622892-12	L2622892-15	L2622892-18	L2622892-21	L2622892-24	L2622892-27
Sample Date				26-JUL-21	26-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				TR-L-152-2021	TR-L-79-2021	MP-L-57-2021	MP-L-147-2021	MP-L-146-2021	MP-L-146-2021-R	MP-L-144-2021	MP-L-122-2021	MP-L-121-2021
Aluminum (Al)	ug/g	-	-	1340	606	9250	11200	12500	19200	10700	5180	7550
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	-	0.24	<0.10	2.39	2.91	3.26	4.82	1.95	1.35	1.58
Barium (Ba)	ug/g	2000	-	4.32	2.38	18.1	27.7	27.8	37.6	20.9	18.6	21.7
Beryllium (Be)	ug/g	8	-	<0.10	<0.10	0.55	0.65	0.73	1.02	0.46	0.33	0.47
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	55.3	34.9	55.5	71.9	15.8	12.6	12.9
Cadmium (Cd)	ug/g	22	-	0.023	<0.020	0.062	0.066	0.076	0.073	0.099	0.028	0.063
Calcium (Ca)	ug/g	-	-	505	189	107000	31900	106000	107000	4470	44900	2160
Chromium (Cr)	ug/g	87	-	6.84	4.05	28.0	27.9	31.7	45.0	25.4	10.0	18.6
Cobalt (Co)	ug/g	300	-	1.04	0.49	4.84	6.48	6.78	9.00	5.34	3.25	4.35
Copper (Cu)	ug/g	91	-	1.36	<0.50	10.4	14.0	13.6	18.3	9.86	5.49	6.32
Iron (Fe)	ug/g	-	-	3330	1700	12000	17700	17200	23700	19400	8430	14200
Lead (Pb)	ug/g	260	-	1.44	0.92	6.87	15.3	10.8	14.7	10.6	5.02	9.06
Lithium (Li)	ug/g	-	-	<2.0	<2.0	45.0	38.2	47.9	72.5	25.1	15.0	20.9
Magnesium (Mg)	ug/g	-	-	933	345	59600	20000	41300	47900	7540	28200	4370
Manganese (Mn)	ug/g	-	-	22.4	9.3	168	273	276	320	238	164	214
Mercury (Hg)	ug/g	24	-	<0.0050	<0.0050	0.0080	0.0241	0.0183	0.0198	0.0464	<0.0050	0.0091
Molybdenum (Mo)	ug/g	40	-	<0.10	<0.10	0.51	0.50	0.37	0.50	0.76	0.32	0.40
Nickel (Ni)	ug/g	89	-	3.98	1.16	14.9	17.2	19.5	27.0	11.8	6.40	10.3
Phosphorus (P)	ug/g	-	-	129	65	397	542	459	561	481	249	265
Potassium (K)	ug/g	-	-	290	110	4110	2470	4260	6550	1600	1120	1250
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	1140	101	203	206	72	101	69
Strontium (Sr)	ug/g	-	-	1.99	1.23	48.2	21.5	62.0	66.0	15.1	16.7	6.06
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	<0.050	<0.050	0.148	0.248	0.231	0.327	0.184	0.121	0.141
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	-	-	101	67.7	369	364	432	547	589	291	335

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-30	L2622892-33	L2622892-36	L2622892-39
Sample Date				27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				MP-L-119-2021	MP-L-118-2021	MP-L-145-2021	MP-L-56-2021
Aluminum (Al)	ug/g	-	-	4800	4400	25000	8820
Antimony (Sb)	ug/g	40	-	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	ug/g	12	-	1.11	1.05	6.18	1.76
Barium (Ba)	ug/g	2000	-	13.5	13.9	43.7	21.4
Beryllium (Be)	ug/g	8	-	0.31	0.26	1.33	0.58
Bismuth (Bi)	ug/g	-	-	<0.20	<0.20	<0.20	<0.20
Boron (B)	ug/g	-	-	10.0	11.3	95.2	17.5
Cadmium (Cd)	ug/g	22	-	0.029	0.021	0.067	0.040
Calcium (Ca)	ug/g	-	-	34800	44600	102000	28600
Chromium (Cr)	ug/g	87	-	10.0	8.94	55.2	13.3
Cobalt (Co)	ug/g	300	-	2.90	2.71	10.3	4.02
Copper (Cu)	ug/g	91	-	6.20	5.29	23.0	7.35
Iron (Fe)	ug/g	-	-	9390	8300	29100	15500
Lead (Pb)	ug/g	260	-	5.75	5.11	17.7	8.00
Lithium (Li)	ug/g	-	-	14.2	12.9	93.1	26.6
Magnesium (Mg)	ug/g	-	-	19800	21500	42800	19000
Manganese (Mn)	ug/g	-	-	150	137	320	268
Mercury (Hg)	ug/g	24	-	0.0095	0.0054	0.0135	0.0168
Molybdenum (Mo)	ug/g	40	-	0.16	0.20	0.59	0.30
Nickel (Ni)	ug/g	89	-	5.82	5.16	32.2	7.69
Phosphorus (P)	ug/g	-	-	195	220	597	401
Potassium (K)	ug/g	-	-	760	770	8810	1330
Selenium (Se)	ug/g	2.9	-	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	ug/g	40	-	<0.10	<0.10	0.10	<0.10
Sodium (Na)	ug/g	-	-	88	83	196	137
Strontium (Sr)	ug/g	-	-	16.4	18.7	71.2	16.5
Sulfur (S)	ug/g	-	-	<1000	<1000	<1000	<1000
Thallium (Tl)	ug/g	1	-	0.139	0.109	0.363	0.191
Tin (Sn)	ug/g	300	-	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	ug/g	-	-	276	234	545	363

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-3	L2622892-6	L2622892-9	L2622892-12	L2622892-15	L2622892-18	L2622892-21	L2622892-24	L2622892-27
Sample Date				26-JUL-21	26-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				TR-L-152-2021	TR-L-79-2021	MP-L-57-2021	MP-L-147-2021	MP-L-146-2021	MP-L-146-2021-R	MP-L-144-2021	MP-L-122-2021	MP-L-121-2021
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	-	0.259	0.159	0.802	1.49	1.04	1.23	3.37	1.13	5.64
Vanadium (V)	ug/g	130	-	5.17	2.52	28.3	28.1	31.0	41.9	31.0	14.5	21.0
Zinc (Zn)	ug/g	410	-	3.9	2.7	18.0	33.3	26.1	33.7	48.0	14.5	28.7
Zirconium (Zr)	ug/g	-	-	<1.0	<1.0	13.9	3.4	13.9	19.4	1.8	7.6	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	L2622892-30	L2622892-33	L2622892-36	L2622892-39
			Sample Date	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
			Sample ID	MP-L-119-2021	MP-L-118-2021	MP-L-145-2021	MP-L-56-2021
		Guide Limits					
Analyte	**Unit**	**#1**	**#2**				
Tungsten (W)	ug/g	-	-	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	33	-	1.08	0.948	1.55	2.12
Vanadium (V)	ug/g	130	-	14.6	13.5	51.3	20.1
Zinc (Zn)	ug/g	410	-	16.3	14.1	37.5	31.3
Zirconium (Zr)	ug/g	-	-	1.9	2.2	32.3	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.

ALS Environmental

ANALYTICAL REPORT

Metals - TISSUE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-1	L2622892-2	L2622892-4	L2622892-5	L2622892-7	L2622892-8	L2622892-10	L2622892-11	L2622892-13
Sample Date				26-JUL-21	26-JUL-21	26-JUL-21	26-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				TR-L-152-2021 UNWASHED	TR-L-152-2021 WASHED	TR-L-79-2021 UNWASHED	TR-L-79-2021 WASHED	MP-L-57-2021 UNWASHED	MP-L-57-2021 WASHED	MP-L-147-2021 UNWASHED	MP-L-147-2021 WASHED	MP-L-146-2021 UNWASHED
Aluminum (Al)-Total	mg/kg	-	-	2200	1010	1490	1410	378	357	772	693	837
Antimony (Sb)-Total	mg/kg	40	-	0.012	<0.010	<0.010	0.014	0.014	0.011	0.016	0.018	0.010
Arsenic (As)-Total	mg/kg	12	-	0.174	0.122	0.165	0.162	0.169	0.172	0.277	0.257	0.229
Barium (Ba)-Total	mg/kg	2000	-	23.7	18.5	26.2	25.9	3.50	3.44	6.77	6.49	5.02
Beryllium (Be)-Total	mg/kg	8	-	0.101	0.061	0.080	0.079	0.024	0.023	0.050	0.045	0.054
Bismuth (Bi)-Total	mg/kg	-	-	0.155	0.128	0.145	0.146	0.014	0.013	0.024	0.025	0.018
Boron (B)-Total	mg/kg	-	-	2.1	1.4	1.8	1.9	2.4	2.3	2.4	2.1	3.9
Cadmium (Cd)-Total	mg/kg	22	-	0.125	0.129	0.119	0.111	0.0434	0.0415	0.0761	0.0751	0.0364
Calcium (Ca)-Total	mg/kg	-	-	22900	23100	22300	21700	33200	31900	33900	30500	27300
Cesium (Cs)-Total	mg/kg	-	-	0.472	0.324	0.371	0.372	0.119	0.108	0.221	0.204	0.216
Chromium (Cr)-Total	mg/kg	87	-	5.08	2.66	3.85	3.69	1.07	1.05	1.98	1.79	1.99
Cobalt (Co)-Total	mg/kg	300	-	1.18	0.605	0.837	0.812	0.243	0.236	0.517	0.477	0.466
Copper (Cu)-Total	mg/kg	91	-	4.18	2.70	3.03	2.96	1.19	1.16	1.77	1.63	1.56
Iron (Fe)-Total	mg/kg	-	-	4840	2330	3200	3200	1790	1580	3950	3910	2450
Lead (Pb)-Total	mg/kg	260	-	7.29	7.08	6.06	6.26	1.28	1.23	2.62	2.57	1.74
Lithium (Li)-Total	mg/kg	-	-	3.82	1.73	2.64	2.36	1.22	1.21	1.94	1.67	2.50
Magnesium (Mg)-Total	mg/kg	-	-	2380	1540	2330	2140	1730	1820	1510	1390	1920
Manganese (Mn)-Total	mg/kg	-	-	90.1	61.7	86.8	78.7	19.1	19.7	35.7	34.1	31.9
Mercury (Hg)-Total	mg/kg	24	-	0.0358	0.0400	0.0468	0.0500	0.0468	0.0468	0.0563	0.0553	0.0553
Molybdenum (Mo)-Total	mg/kg	40	-	0.902	0.472	0.728	0.626	0.187	0.191	0.334	0.324	0.216
Nickel (Ni)-Total	mg/kg	89	-	3.63	2.08	2.56	2.48	0.80	0.75	1.46	1.33	1.31
Phosphorus (P)-Total	mg/kg	-	-	619	623	604	605	377	395	344	323	356
Potassium (K)-Total	mg/kg	-	-	2740	2600	2210	2300	1480	1220	1360	1030	1460
Rubidium (Rb)-Total	mg/kg	-	-	14.3	11.8	11.6	12.0	2.65	2.19	5.02	4.01	4.57
Selenium (Se)-Total	mg/kg	2.9	-	0.078	0.089	0.107	0.108	0.100	0.087	0.110	0.119	0.093
Silver (Ag)-Total	mg/kg	40	-	0.0743	0.0745	0.0804	0.0845	0.0141	0.0142	0.0214	0.0230	0.0202
Sodium (Na)-Total	mg/kg	-	-	317	340	247	250	477	379	375	273	365
Strontium (Sr)-Total	mg/kg	-	-	30.6	31.5	40.4	38.5	50.8	49.2	30.9	28.8	24.1
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	-	0.0648	0.0369	0.0447	0.0449	0.0064	0.0063	0.0149	0.0140	0.0170

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ALS Environmental

ANALYTICAL REPORT

Metals - TISSUE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-14 27-JUL-21 MP-L-146-2021 WASHED	L2622892-16 27-JUL-21 MP-L-146-2021-R UNWASHED	L2622892-17 27-JUL-21 MP-L-146-2021-R WASHED	L2622892-19 27-JUL-21 MP-L-144-2021 UNWASHED	L2622892-20 27-JUL-21 MP-L-144-2021 WASHED	L2622892-22 27-JUL-21 MP-L-122-2021 UNWASHED	L2622892-23 27-JUL-21 MP-L-122-2021 WASHED	L2622892-25 27-JUL-21 MP-L-121-2021 UNWASHED	L2622892-26 27-JUL-21 MP-L-121-2021 WASHED
Aluminum (Al)-Total	mg/kg	-	-	672	611	469	693	591	718	497	1210	809
Antimony (Sb)-Total	mg/kg	40	-	0.010	0.013	0.011	0.014	0.017	0.013	0.010	0.017	0.020
Arsenic (As)-Total	mg/kg	12	-	0.190	0.194	0.165	0.185	0.170	0.210	0.174	0.276	0.204
Barium (Ba)-Total	mg/kg	2000	-	4.57	4.99	4.24	9.37	7.96	7.18	6.62	8.99	7.62
Beryllium (Be)-Total	mg/kg	8	-	0.042	0.036	0.030	0.052	0.042	0.048	0.036	0.076	0.055
Bismuth (Bi)-Total	mg/kg	-	-	0.014	0.015	0.014	0.027	0.026	0.029	0.023	0.033	0.029
Boron (B)-Total	mg/kg	-	-	3.0	2.8	2.2	1.7	1.2	1.7	1.3	2.8	1.9
Cadmium (Cd)-Total	mg/kg	22	-	0.0313	0.0384	0.0309	0.0451	0.0430	0.0443	0.0452	0.0513	0.0456
Calcium (Ca)-Total	mg/kg	-	-	26300	22800	23000	26000	23200	42600	40000	27900	26000
Cesium (Cs)-Total	mg/kg	-	-	0.175	0.156	0.127	0.279	0.230	0.309	0.263	0.399	0.333
Chromium (Cr)-Total	mg/kg	87	-	1.60	1.52	1.19	1.74	1.42	1.61	1.22	2.65	1.85
Cobalt (Co)-Total	mg/kg	300	-	0.375	0.414	0.321	0.456	0.394	0.459	0.334	0.665	0.463
Copper (Cu)-Total	mg/kg	91	-	1.37	1.66	1.30	1.74	1.58	1.61	1.35	2.06	1.58
Iron (Fe)-Total	mg/kg	-	-	2050	3430	3050	3480	3180	3260	2610	4110	3080
Lead (Pb)-Total	mg/kg	260	-	1.49	1.28	1.21	3.31	3.04	3.02	2.70	3.83	3.42
Lithium (Li)-Total	mg/kg	-	-	1.82	1.52	1.12	1.76	1.54	1.90	1.23	3.28	2.10
Magnesium (Mg)-Total	mg/kg	-	-	1870	1740	1530	1340	1230	1430	1220	1850	1500
Manganese (Mn)-Total	mg/kg	-	-	28.3	29.4	25.3	41.8	36.9	39.0	31.7	51.1	38.6
Mercury (Hg)-Total	mg/kg	24	-	0.0516	0.0475	0.0463	0.0502	0.0495	0.0440	0.0448	0.0507	0.0471
Molybdenum (Mo)-Total	mg/kg	40	-	0.172	0.304	0.239	0.369	0.361	0.291	0.274	0.350	0.284
Nickel (Ni)-Total	mg/kg	89	-	1.08	1.15	0.91	1.26	1.04	1.18	0.87	1.70	1.18
Phosphorus (P)-Total	mg/kg	-	-	359	402	381	362	368	334	337	477	407
Potassium (K)-Total	mg/kg	-	-	1250	1540	1270	1570	1220	1340	1310	1440	1470
Rubidium (Rb)-Total	mg/kg	-	-	3.67	3.22	2.55	7.19	5.24	6.06	5.51	6.76	6.21
Selenium (Se)-Total	mg/kg	2.9	-	0.078	0.077	0.076	0.098	0.086	0.096	0.085	0.084	0.090
Silver (Ag)-Total	mg/kg	40	-	0.0189	0.0170	0.0168	0.0259	0.0226	0.0241	0.0228	0.0297	0.0287
Sodium (Na)-Total	mg/kg	-	-	308	444	343	354	271	339	358	343	379
Strontium (Sr)-Total	mg/kg	-	-	23.6	37.9	36.5	26.0	22.3	27.1	26.5	31.8	30.9
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	-	0.0128	0.0093	0.0077	0.0163	0.0131	0.0158	0.0099	0.0246	0.0173

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ALS Environmental

ANALYTICAL REPORT

Metals - TISSUE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-28	L2622892-29	L2622892-31	L2622892-32	L2622892-34	L2622892-35	L2622892-37	L2622892-38
Sample Date				27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				MP-L-119-2021 UNWASHED	MP-L-119-2021 WASHED	MP-L-118-2021 UNWASHED	MP-L-118-2021 WASHED	MP-L-145-2021 UNWASHED	MP-L-145-2021 WASHED	MP-L-56-2021 UNWASHED	MP-L-56-2021 WASHED
Aluminum (Al)-Total	mg/kg	-	-	689	534	865	574	509	401	714	567
Antimony (Sb)-Total	mg/kg	40	-	<0.010	0.012	<0.010	<0.010	0.011	<0.010	0.019	<0.010
Arsenic (As)-Total	mg/kg	12	-	0.162	0.140	0.180	0.135	0.161	0.152	0.123	0.112
Barium (Ba)-Total	mg/kg	2000	-	7.00	6.55	8.37	6.82	4.69	4.41	12.2	10.3
Beryllium (Be)-Total	mg/kg	8	-	0.046	0.033	0.056	0.038	0.034	0.028	0.045	0.037
Bismuth (Bi)-Total	mg/kg	-	-	0.022	0.020	0.024	0.021	0.017	0.015	0.022	0.018
Boron (B)-Total	mg/kg	-	-	1.8	1.4	2.7	1.7	1.8	1.5	2.2	1.7
Cadmium (Cd)-Total	mg/kg	22	-	0.0379	0.0402	0.0360	0.0315	0.0246	0.0233	0.0318	0.0275
Calcium (Ca)-Total	mg/kg	-	-	37500	36400	39000	35200	20000	18200	17100	15000
Cesium (Cs)-Total	mg/kg	-	-	0.264	0.238	0.267	0.233	0.164	0.141	0.252	0.234
Chromium (Cr)-Total	mg/kg	87	-	1.50	1.22	1.67	1.23	1.31	0.976	1.27	1.10
Cobalt (Co)-Total	mg/kg	300	-	0.390	0.319	0.442	0.317	0.309	0.255	0.371	0.297
Copper (Cu)-Total	mg/kg	91	-	1.47	1.33	1.62	1.41	1.31	1.24	1.74	1.59
Iron (Fe)-Total	mg/kg	-	-	2420	1820	2110	1550	2270	1870	1930	1630
Lead (Pb)-Total	mg/kg	260	-	2.28	2.16	2.31	1.96	1.51	1.44	1.68	1.54
Lithium (Li)-Total	mg/kg	-	-	1.82	1.42	2.39	1.47	1.41	1.06	1.65	1.24
Magnesium (Mg)-Total	mg/kg	-	-	1380	1300	1530	1360	1310	1230	1400	1280
Manganese (Mn)-Total	mg/kg	-	-	33.4	28.6	39.2	29.0	26.0	23.4	40.0	32.9
Mercury (Hg)-Total	mg/kg	24	-	0.0513	0.0492	0.0643	0.0621	0.0517	0.0481	0.0681	0.0638
Molybdenum (Mo)-Total	mg/kg	40	-	0.267	0.234	0.289	0.256	0.262	0.208	0.399	0.321
Nickel (Ni)-Total	mg/kg	89	-	0.98	0.81	1.07	0.80	0.89	0.73	0.88	0.74
Phosphorus (P)-Total	mg/kg	-	-	288	299	346	341	485	518	445	439
Potassium (K)-Total	mg/kg	-	-	1280	1350	1360	1400	1540	1520	1620	1690
Rubidium (Rb)-Total	mg/kg	-	-	5.17	4.94	5.24	4.90	3.37	2.94	6.89	7.00
Selenium (Se)-Total	mg/kg	2.9	-	0.093	0.088	0.092	0.096	0.075	0.085	0.075	0.089
Silver (Ag)-Total	mg/kg	40	-	0.0215	0.0241	0.0208	0.0214	0.0151	0.0149	0.0172	0.0166
Sodium (Na)-Total	mg/kg	-	-	266	300	272	316	413	384	357	394
Strontium (Sr)-Total	mg/kg	-	-	22.1	21.5	21.7	21.0	24.2	22.3	17.3	16.3
Tellurium (Te)-Total	mg/kg	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	mg/kg	1	-	0.0167	0.0131	0.0196	0.0139	0.0104	0.0082	0.0195	0.0167

Guide Limit #1: CCME - Soil(coarse)-IACR 1 in 100000-CL-Groundwater Unprotected

ANALYTICAL REPORT

Metals - TISSUE

			Lab ID	L2622892-1	L2622892-2	L2622892-4	L2622892-5	L2622892-7	L2622892-8	L2622892-10	L2622892-11	L2622892-13
			Sample Date	26-JUL-21	26-JUL-21	26-JUL-21	26-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
			Sample ID	TR-L-152-2021 UNWASHED	TR-L-152-2021 WASHED	TR-L-79-2021 UNWASHED	TR-L-79-2021 WASHED	MP-L-57-2021 UNWASHED	MP-L-57-2021 WASHED	MP-L-147-2021 UNWASHED	MP-L-147-2021 WASHED	MP-L-146-2021 UNWASHED
Analyte	**Unit**	**Guide Limits #1**	**#2**									
Tin (Sn)-Total	mg/kg	300	-	0.20	<0.10	0.13	0.13	<0.10	<0.10	<0.10	0.81	<0.10
Titanium (Ti)-Total	mg/kg	-	-	143	69.4	98.6	93.4	19.0	18.2	34.5	32.7	37.5
Uranium (U)-Total	mg/kg	33	-	0.993	0.698	0.774	0.791	0.250	0.239	0.511	0.475	0.419
Vanadium (V)-Total	mg/kg	130	-	3.97	1.86	2.59	2.44	0.89	0.85	1.53	1.34	1.75
Zinc (Zn)-Total	mg/kg	410	-	24.3	22.0	21.9	22.0	11.7	12.4	12.7	11.9	11.8
Zirconium (Zr)-Total	mg/kg	-	-	4.78	2.69	3.13	3.24	1.07	1.07	1.86	1.74	2.05

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	L2622892-14	L2622892-16	L2622892-17	L2622892-19	L2622892-20	L2622892-22	L2622892-23	L2622892-25	L2622892-26
			Sample Date	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
			Sample ID	MP-L-146-2021 WASHED	MP-L-146-2021-R UNWASHED	MP-L-146-2021-R WASHED	MP-L-144-2021 UNWASHED	MP-L-144-2021 WASHED	MP-L-122-2021 UNWASHED	MP-L-122-2021 WASHED	MP-L-121-2021 UNWASHED	MP-L-121-2021 WASHED
Analyte	Unit	Guide Limits #1	Guide Limits #2									
Tin (Sn)-Total	mg/kg	300	-	<0.10	<0.10	<0.10	<0.10	0.79	<0.10	<0.10	0.12	<0.10
Titanium (Ti)-Total	mg/kg	-	-	30.8	25.3	19.3	33.3	27.0	35.9	24.5	61.7	42.3
Uranium (U)-Total	mg/kg	33	-	0.304	0.371	0.292	0.938	0.808	1.11	1.01	1.52	1.12
Vanadium (V)-Total	mg/kg	130	-	1.43	1.21	0.86	1.29	1.01	1.36	0.94	2.42	1.57
Zinc (Zn)-Total	mg/kg	410	-	11.3	13.5	11.3	13.2	12.7	11.2	12.0	14.5	12.9
Zirconium (Zr)-Total	mg/kg	-	-	1.67	1.33	1.09	2.04	1.91	2.23	1.81	3.28	2.36

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.

ANALYTICAL REPORT

Metals - TISSUE

Analyte	Unit	Guide Limits #1	Guide Limits #2	L2622892-28	L2622892-29	L2622892-31	L2622892-32	L2622892-34	L2622892-35	L2622892-37	L2622892-38
Sample Date				27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21	27-JUL-21
Sample ID				MP-L-119-2021 UNWASHED	MP-L-119-2021 WASHED	MP-L-118-2021 UNWASHED	MP-L-118-2021 WASHED	MP-L-145-2021 UNWASHED	MP-L-145-2021 WASHED	MP-L-56-2021 UNWASHED	MP-L-56-2021 WASHED
Tin (Sn)-Total	mg/kg	300	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium (Ti)-Total	mg/kg	-	-	37.7	28.3	48.5	34.2	24.7	18.9	43.9	35.8
Uranium (U)-Total	mg/kg	33	-	0.905	0.668	0.876	0.796	0.396	0.353	0.559	0.462
Vanadium (V)-Total	mg/kg	130	-	1.29	0.98	1.66	1.06	0.94	0.74	1.11	0.86
Zinc (Zn)-Total	mg/kg	410	-	10.2	10.2	10.9	10.6	10.6	10.8	14.0	13.8
Zirconium (Zr)-Total	mg/kg	-	-	2.43	1.48	2.17	1.54	1.40	1.08	1.55	1.31

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.

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 CVAAS (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 200.2/6020B (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-TISS-VA	Tissue	% Moisture in Tissues	Puget Sound WQ Authority, Apr 1997

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.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

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

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-WT	**Soil**							
Batch R5548037								
WG3593997-2 CRM		**WT-SS-2**						
Mercury (Hg)			99.0		%		70-130	11-AUG-21
WG3593997-6 DUP		**WG3593997-5**						
Mercury (Hg)		0.0135	0.0147		ug/g	8.3	40	11-AUG-21
WG3593997-3 LCS								
Mercury (Hg)			101.0		%		80-120	11-AUG-21
WG3593997-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	11-AUG-21
Batch R5548651								
WG3595415-2 CRM		**WT-SS-2**						
Mercury (Hg)			97.5		%		70-130	12-AUG-21
WG3595415-6 DUP		**WG3595415-5**						
Mercury (Hg)		<0.0050	<0.0050	RPD-NA	ug/g	N/A	40	12-AUG-21
WG3595415-3 LCS								
Mercury (Hg)			103.0		%		80-120	12-AUG-21
WG3595415-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	12-AUG-21
MET-200.2-CCMS-WT	**Soil**							
Batch R5548584								
WG3593997-2 CRM		**WT-SS-2**						
Aluminum (Al)			117.6		%		70-130	11-AUG-21
Antimony (Sb)			103.5		%		70-130	11-AUG-21
Arsenic (As)			114.9		%		70-130	11-AUG-21
Barium (Ba)			107.8		%		70-130	11-AUG-21
Beryllium (Be)			118.2		%		70-130	11-AUG-21
Bismuth (Bi)			0.15		mg/kg		0-0.34	11-AUG-21
Boron (B)			10.1		mg/kg		3.5-13.5	11-AUG-21
Cadmium (Cd)			103.7		%		70-130	11-AUG-21
Calcium (Ca)			108.2		%		70-130	11-AUG-21
Chromium (Cr)			110.4		%		70-130	11-AUG-21
Cobalt (Co)			107.4		%		70-130	11-AUG-21
Copper (Cu)			97.7		%		70-130	11-AUG-21
Iron (Fe)			110.4		%		70-130	11-AUG-21
Lead (Pb)			105.3		%		70-130	11-AUG-21
Lithium (Li)			106.8		%		70-130	11-AUG-21
Magnesium (Mg)			115.0		%		70-130	11-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5548584								
WG3593997-2 CRM		**WT-SS-2**						
Manganese (Mn)			111.0		%		70-130	11-AUG-21
Molybdenum (Mo)			109.5		%		70-130	11-AUG-21
Nickel (Ni)			106.5		%		70-130	11-AUG-21
Phosphorus (P)			105.8		%		70-130	11-AUG-21
Potassium (K)			118.9		%		70-130	11-AUG-21
Selenium (Se)			0.15		mg/kg		0-0.34	11-AUG-21
Silver (Ag)			90.9		%		70-130	11-AUG-21
Sodium (Na)			107.0		%		70-130	11-AUG-21
Strontium (Sr)			111.6		%		70-130	11-AUG-21
Thallium (Tl)			0.087		mg/kg		0.029-0.129	11-AUG-21
Tin (Sn)			106.9		%		70-130	11-AUG-21
Titanium (Ti)			117.5		%		70-130	11-AUG-21
Uranium (U)			113.0		%		70-130	11-AUG-21
Vanadium (V)			111.4		%		70-130	11-AUG-21
Zinc (Zn)			98.9		%		70-130	11-AUG-21
Zirconium (Zr)			114.8		%		70-130	11-AUG-21
WG3593997-6 DUP		**WG3593997-5**						
Aluminum (Al)		25000	23700		ug/g	5.3	40	11-AUG-21
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	11-AUG-21
Arsenic (As)		6.18	5.90		ug/g	4.7	30	11-AUG-21
Barium (Ba)		43.7	41.4		ug/g	5.3	40	11-AUG-21
Beryllium (Be)		1.33	1.25		ug/g	5.8	30	11-AUG-21
Bismuth (Bi)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	11-AUG-21
Boron (B)		95.2	92.8		ug/g	2.5	30	11-AUG-21
Cadmium (Cd)		0.067	0.073		ug/g	8.1	30	11-AUG-21
Calcium (Ca)		102000	97600		ug/g	4.2	30	11-AUG-21
Chromium (Cr)		55.2	53.1		ug/g	3.7	30	11-AUG-21
Cobalt (Co)		10.3	9.93		ug/g	3.9	30	11-AUG-21
Copper (Cu)		23.0	22.2		ug/g	3.4	30	11-AUG-21
Iron (Fe)		29100	27800		ug/g	4.7	30	11-AUG-21
Lead (Pb)		17.7	17.2		ug/g	2.9	40	11-AUG-21
Lithium (Li)		93.1	91.1		ug/g	2.2	30	11-AUG-21
Magnesium (Mg)		42800	40500		ug/g	5.6	30	11-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5548584								
WG3593997-6 DUP		**WG3593997-5**						
Manganese (Mn)		320	305		ug/g	4.8	30	11-AUG-21
Molybdenum (Mo)		0.59	0.57		ug/g	2.8	40	11-AUG-21
Nickel (Ni)		32.2	31.2		ug/g	3.1	30	11-AUG-21
Phosphorus (P)		597	586		ug/g	1.8	30	11-AUG-21
Potassium (K)		8810	8460		ug/g	4.0	40	11-AUG-21
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	11-AUG-21
Silver (Ag)		0.10	<0.10	RPD-NA	ug/g	N/A	40	11-AUG-21
Sodium (Na)		196	190		ug/g	3.4	40	11-AUG-21
Strontium (Sr)		71.2	68.3		ug/g	4.1	40	11-AUG-21
Sulfur (S)		<1000	<1000	RPD-NA	ug/g	N/A	30	11-AUG-21
Thallium (Tl)		0.363	0.352		ug/g	2.9	30	11-AUG-21
Tin (Sn)		<2.0	<2.0	RPD-NA	ug/g	N/A	40	11-AUG-21
Titanium (Ti)		545	516		ug/g	5.4	40	11-AUG-21
Tungsten (W)		<0.50	<0.50	RPD-NA	ug/g	N/A	30	11-AUG-21
Uranium (U)		1.55	1.47		ug/g	5.3	30	11-AUG-21
Vanadium (V)		51.3	49.2		ug/g	4.2	30	11-AUG-21
Zinc (Zn)		37.5	38.2		ug/g	1.7	30	11-AUG-21
Zirconium (Zr)		32.3	31.9		ug/g	1.3	30	11-AUG-21
WG3593997-4 LCS								
Aluminum (Al)			105.3		%		80-120	11-AUG-21
Antimony (Sb)			102.5		%		80-120	11-AUG-21
Arsenic (As)			103.0		%		80-120	11-AUG-21
Barium (Ba)			101.3		%		80-120	11-AUG-21
Beryllium (Be)			97.3		%		80-120	11-AUG-21
Bismuth (Bi)			101.3		%		80-120	11-AUG-21
Boron (B)			92.3		%		80-120	11-AUG-21
Cadmium (Cd)			98.2		%		80-120	11-AUG-21
Calcium (Ca)			98.3		%		80-120	11-AUG-21
Chromium (Cr)			100.4		%		80-120	11-AUG-21
Cobalt (Co)			100.5		%		80-120	11-AUG-21
Copper (Cu)			99.5		%		80-120	11-AUG-21
Iron (Fe)			100.9		%		80-120	11-AUG-21
Lead (Pb)			101.6		%		80-120	11-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5548584								
WG3593997-4 LCS								
Lithium (Li)			98.2		%		80-120	11-AUG-21
Magnesium (Mg)			106.7		%		80-120	11-AUG-21
Manganese (Mn)			102.8		%		80-120	11-AUG-21
Molybdenum (Mo)			103.6		%		80-120	11-AUG-21
Nickel (Ni)			99.0		%		80-120	11-AUG-21
Phosphorus (P)			109.3		%		80-120	11-AUG-21
Potassium (K)			104.3		%		80-120	11-AUG-21
Selenium (Se)			97.8		%		80-120	11-AUG-21
Silver (Ag)			105.3		%		80-120	11-AUG-21
Sodium (Na)			103.5		%		80-120	11-AUG-21
Strontium (Sr)			105.6		%		80-120	11-AUG-21
Sulfur (S)			100.5		%		80-120	11-AUG-21
Thallium (Tl)			102.7		%		80-120	11-AUG-21
Tin (Sn)			101.3		%		80-120	11-AUG-21
Titanium (Ti)			97.4		%		80-120	11-AUG-21
Tungsten (W)			100.0		%		80-120	11-AUG-21
Uranium (U)			101.8		%		80-120	11-AUG-21
Vanadium (V)			102.5		%		80-120	11-AUG-21
Zinc (Zn)			100.3		%		80-120	11-AUG-21
Zirconium (Zr)			103.8		%		80-120	11-AUG-21
WG3593997-1 MB								
Aluminum (Al)			<50		mg/kg		50	11-AUG-21
Antimony (Sb)			<0.10		mg/kg		0.1	11-AUG-21
Arsenic (As)			<0.10		mg/kg		0.1	11-AUG-21
Barium (Ba)			<0.50		mg/kg		0.5	11-AUG-21
Beryllium (Be)			<0.10		mg/kg		0.1	11-AUG-21
Bismuth (Bi)			<0.20		mg/kg		0.2	11-AUG-21
Boron (B)			<5.0		mg/kg		5	11-AUG-21
Cadmium (Cd)			<0.020		mg/kg		0.02	11-AUG-21
Calcium (Ca)			<50		mg/kg		50	11-AUG-21
Chromium (Cr)			<0.50		mg/kg		0.5	11-AUG-21
Cobalt (Co)			<0.10		mg/kg		0.1	11-AUG-21
Copper (Cu)			<0.50		mg/kg		0.5	11-AUG-21
Iron (Fe)			<50		mg/kg		50	11-AUG-21

Client:	Baffinland Iron Mine's Corporation (Oakville) 2275 Upper Middle Rd. E. Suite #300 Oakville ON L6H 0C3
Contact:	Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5548584								
WG3593997-1	**MB**							
Lead (Pb)			<0.50		mg/kg		0.5	11-AUG-21
Lithium (Li)			<2.0		mg/kg		2	11-AUG-21
Magnesium (Mg)			<20		mg/kg		20	11-AUG-21
Manganese (Mn)			<1.0		mg/kg		1	11-AUG-21
Molybdenum (Mo)			<0.10		mg/kg		0.1	11-AUG-21
Nickel (Ni)			<0.50		mg/kg		0.5	11-AUG-21
Phosphorus (P)			<50		mg/kg		50	11-AUG-21
Potassium (K)			<100		mg/kg		100	11-AUG-21
Selenium (Se)			<0.20		mg/kg		0.2	11-AUG-21
Silver (Ag)			<0.10		mg/kg		0.1	11-AUG-21
Sodium (Na)			<50		mg/kg		50	11-AUG-21
Strontium (Sr)			<0.50		mg/kg		0.5	11-AUG-21
Sulfur (S)			<1000		mg/kg		1000	11-AUG-21
Thallium (Tl)			<0.050		mg/kg		0.05	11-AUG-21
Tin (Sn)			<2.0		mg/kg		2	11-AUG-21
Titanium (Ti)			<1.0		mg/kg		1	11-AUG-21
Tungsten (W)			<0.50		mg/kg		0.5	11-AUG-21
Uranium (U)			<0.050		mg/kg		0.05	11-AUG-21
Vanadium (V)			<0.20		mg/kg		0.2	11-AUG-21
Zinc (Zn)			<2.0		mg/kg		2	11-AUG-21
Zirconium (Zr)			<1.0		mg/kg		1	11-AUG-21
Batch R5549319								
WG3595415-2	**CRM**	**WT-SS-2**						
Aluminum (Al)			109.6		%		70-130	12-AUG-21
Antimony (Sb)			111.7		%		70-130	12-AUG-21
Arsenic (As)			100.4		%		70-130	12-AUG-21
Barium (Ba)			108.0		%		70-130	12-AUG-21
Beryllium (Be)			110.5		%		70-130	12-AUG-21
Bismuth (Bi)			0.14		mg/kg		0-0.34	12-AUG-21
Boron (B)			10.3		mg/kg		3.5-13.5	12-AUG-21
Cadmium (Cd)			113.5		%		70-130	12-AUG-21
Calcium (Ca)			104.2		%		70-130	12-AUG-21
Chromium (Cr)			106.8		%		70-130	12-AUG-21
Cobalt (Co)			104.5		%		70-130	12-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5549319								
WG3595415-2 CRM		**WT-SS-2**						
Copper (Cu)			106.1		%		70-130	12-AUG-21
Iron (Fe)			104.6		%		70-130	12-AUG-21
Lead (Pb)			100.7		%		70-130	12-AUG-21
Lithium (Li)			107.3		%		70-130	12-AUG-21
Magnesium (Mg)			106.1		%		70-130	12-AUG-21
Manganese (Mn)			110.3		%		70-130	12-AUG-21
Molybdenum (Mo)			108.5		%		70-130	12-AUG-21
Nickel (Ni)			104.2		%		70-130	12-AUG-21
Phosphorus (P)			101.7		%		70-130	12-AUG-21
Potassium (K)			110.1		%		70-130	12-AUG-21
Selenium (Se)			0.13		mg/kg		0-0.34	12-AUG-21
Silver (Ag)			86.2		%		70-130	12-AUG-21
Sodium (Na)			104.6		%		70-130	12-AUG-21
Strontium (Sr)			104.8		%		70-130	12-AUG-21
Thallium (Tl)			0.083		mg/kg		0.029-0.129	12-AUG-21
Tin (Sn)			100.1		%		70-130	12-AUG-21
Titanium (Ti)			111.2		%		70-130	12-AUG-21
Uranium (U)			101.6		%		70-130	12-AUG-21
Vanadium (V)			108.1		%		70-130	12-AUG-21
Zinc (Zn)			102.9		%		70-130	12-AUG-21
Zirconium (Zr)			105.9		%		70-130	12-AUG-21
WG3595415-6 DUP		**WG3595415-5**						
Aluminum (Al)		5180	5170		ug/g	0.2	40	12-AUG-21
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	12-AUG-21
Arsenic (As)		1.35	1.39		ug/g	2.4	30	12-AUG-21
Barium (Ba)		18.6	19.0		ug/g	2.1	40	12-AUG-21
Beryllium (Be)		0.33	0.35		ug/g	4.6	30	12-AUG-21
Bismuth (Bi)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	12-AUG-21
Boron (B)		12.6	12.8		ug/g	1.5	30	12-AUG-21
Cadmium (Cd)		0.028	0.030		ug/g	9.1	30	12-AUG-21
Calcium (Ca)		44900	44000		ug/g	2.0	30	12-AUG-21
Chromium (Cr)		10.0	10.8		ug/g	7.2	30	12-AUG-21
Cobalt (Co)		3.25	3.42		ug/g	5.1	30	12-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5549319								
WG3595415-6 DUP		**WG3595415-5**						
Copper (Cu)		5.49	5.69		ug/g	3.6	30	12-AUG-21
Iron (Fe)		8430	8560		ug/g	1.5	30	12-AUG-21
Lead (Pb)		5.02	5.18		ug/g	3.3	40	12-AUG-21
Lithium (Li)		15.0	15.3		ug/g	1.9	30	12-AUG-21
Magnesium (Mg)		28200	29300		ug/g	4.1	30	12-AUG-21
Manganese (Mn)		164	169		ug/g	2.7	30	12-AUG-21
Molybdenum (Mo)		0.32	0.33		ug/g	5.7	40	12-AUG-21
Nickel (Ni)		6.40	6.55		ug/g	2.4	30	12-AUG-21
Phosphorus (P)		249	275		ug/g	9.9	30	12-AUG-21
Potassium (K)		1120	1180		ug/g	5.7	40	12-AUG-21
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	12-AUG-21
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	12-AUG-21
Sodium (Na)		101	111		ug/g	9.2	40	12-AUG-21
Strontium (Sr)		16.7	16.9		ug/g	1.3	40	12-AUG-21
Sulfur (S)		<1000	<1000	RPD-NA	ug/g	N/A	30	12-AUG-21
Thallium (Tl)		0.121	0.128		ug/g	5.4	30	12-AUG-21
Tin (Sn)		<2.0	<2.0	RPD-NA	ug/g	N/A	40	12-AUG-21
Titanium (Ti)		291	297		ug/g	2.1	40	12-AUG-21
Tungsten (W)		<0.50	<0.50	RPD-NA	ug/g	N/A	30	12-AUG-21
Uranium (U)		1.13	1.20		ug/g	6.0	30	12-AUG-21
Vanadium (V)		14.5	15.3		ug/g	5.0	30	12-AUG-21
Zinc (Zn)		14.5	15.0		ug/g	3.2	30	12-AUG-21
Zirconium (Zr)		7.6	7.6		ug/g	0.7	30	12-AUG-21
WG3595415-4 LCS								
Aluminum (Al)			109.7		%		80-120	12-AUG-21
Antimony (Sb)			113.7		%		80-120	12-AUG-21
Arsenic (As)			110.3		%		80-120	12-AUG-21
Barium (Ba)			113.3		%		80-120	12-AUG-21
Beryllium (Be)			104.4		%		80-120	12-AUG-21
Bismuth (Bi)			96.5		%		80-120	12-AUG-21
Boron (B)			101.8		%		80-120	12-AUG-21
Cadmium (Cd)			107.9		%		80-120	12-AUG-21
Calcium (Ca)			105.5		%		80-120	12-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5549319								
WG3595415-4 LCS								
Chromium (Cr)			107.2		%		80-120	12-AUG-21
Cobalt (Co)			108.2		%		80-120	12-AUG-21
Copper (Cu)			107.6		%		80-120	12-AUG-21
Iron (Fe)			108.3		%		80-120	12-AUG-21
Lead (Pb)			102.1		%		80-120	12-AUG-21
Lithium (Li)			105.0		%		80-120	12-AUG-21
Magnesium (Mg)			108.3		%		80-120	12-AUG-21
Manganese (Mn)			109.6		%		80-120	12-AUG-21
Molybdenum (Mo)			110.7		%		80-120	12-AUG-21
Nickel (Ni)			107.3		%		80-120	12-AUG-21
Phosphorus (P)			109.3		%		80-120	12-AUG-21
Potassium (K)			106.3		%		80-120	12-AUG-21
Selenium (Se)			105.2		%		80-120	12-AUG-21
Silver (Ag)			113.6		%		80-120	12-AUG-21
Sodium (Na)			106.4		%		80-120	12-AUG-21
Strontium (Sr)			108.7		%		80-120	12-AUG-21
Sulfur (S)			107.0		%		80-120	12-AUG-21
Thallium (Tl)			104.0		%		80-120	12-AUG-21
Tin (Sn)			108.4		%		80-120	12-AUG-21
Titanium (Ti)			102.8		%		80-120	12-AUG-21
Tungsten (W)			105.4		%		80-120	12-AUG-21
Uranium (U)			100.5		%		80-120	12-AUG-21
Vanadium (V)			111.9		%		80-120	12-AUG-21
Zinc (Zn)			106.9		%		80-120	12-AUG-21
Zirconium (Zr)			111.6		%		80-120	12-AUG-21
WG3595415-1 MB								
Aluminum (Al)			<50		mg/kg		50	12-AUG-21
Antimony (Sb)			<0.10		mg/kg		0.1	12-AUG-21
Arsenic (As)			<0.10		mg/kg		0.1	12-AUG-21
Barium (Ba)			<0.50		mg/kg		0.5	12-AUG-21
Beryllium (Be)			<0.10		mg/kg		0.1	12-AUG-21
Bismuth (Bi)			<0.20		mg/kg		0.2	12-AUG-21
Boron (B)			<5.0		mg/kg		5	12-AUG-21
Cadmium (Cd)			<0.020		mg/kg		0.02	12-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5549319								
WG3595415-1 MB								
Calcium (Ca)			<50		mg/kg		50	12-AUG-21
Chromium (Cr)			<0.50		mg/kg		0.5	12-AUG-21
Cobalt (Co)			<0.10		mg/kg		0.1	12-AUG-21
Copper (Cu)			<0.50		mg/kg		0.5	12-AUG-21
Iron (Fe)			<50		mg/kg		50	12-AUG-21
Lead (Pb)			<0.50		mg/kg		0.5	12-AUG-21
Lithium (Li)			<2.0		mg/kg		2	12-AUG-21
Magnesium (Mg)			<20		mg/kg		20	12-AUG-21
Manganese (Mn)			<1.0		mg/kg		1	12-AUG-21
Molybdenum (Mo)			<0.10		mg/kg		0.1	12-AUG-21
Nickel (Ni)			<0.50		mg/kg		0.5	12-AUG-21
Phosphorus (P)			<50		mg/kg		50	12-AUG-21
Potassium (K)			<100		mg/kg		100	12-AUG-21
Selenium (Se)			<0.20		mg/kg		0.2	12-AUG-21
Silver (Ag)			<0.10		mg/kg		0.1	12-AUG-21
Sodium (Na)			<50		mg/kg		50	12-AUG-21
Strontium (Sr)			<0.50		mg/kg		0.5	12-AUG-21
Sulfur (S)			<1000		mg/kg		1000	12-AUG-21
Thallium (Tl)			<0.050		mg/kg		0.05	12-AUG-21
Tin (Sn)			<2.0		mg/kg		2	12-AUG-21
Titanium (Ti)			<1.0		mg/kg		1	12-AUG-21
Tungsten (W)			<0.50		mg/kg		0.5	12-AUG-21
Uranium (U)			<0.050		mg/kg		0.05	12-AUG-21
Vanadium (V)			<0.20		mg/kg		0.2	12-AUG-21
Zinc (Zn)			<2.0		mg/kg		2	12-AUG-21
Zirconium (Zr)			<1.0		mg/kg		1	12-AUG-21
MOISTURE-WT	**Soil**							
Batch R5545676								
WG3591619-3 DUP		**L2623193-1**						
% Moisture		11.8	12.0		%	2.0	20	07-AUG-21
WG3591619-2 LCS								
% Moisture			99.98		%		90-110	07-AUG-21
WG3591619-1 MB								
% Moisture			<0.25		%		0.25	07-AUG-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT	**Soil**							
Batch R5545931								
WG3591992-3 DUP		**L2622635-5**						
% Moisture		15.3	15.2		%	0.9	20	07-AUG-21
WG3591992-2 LCS								
% Moisture			98.6		%		90-110	07-AUG-21
WG3591992-1 MB								
% Moisture			<0.25		%		0.25	07-AUG-21
PH-WT	**Soil**							
Batch R5547518								
WG3592303-1 DUP		**L2622844-2**						
pH		7.79	7.83	J	pH units	0.04	0.3	10-AUG-21
WG3593773-1 LCS								
pH			7.01		pH units		6.9-7.1	10-AUG-21
AG-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-5 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			113.0		%		70-130	07-OCT-21
WG3631987-3 CRM		**VA-NRC-DORM4**						
Silver (Ag)-Total			119.3		%		70-130	07-OCT-21
WG3631948-6 DUP		**L2622892-22**						
Silver (Ag)-Total		0.0241	0.0243		mg/kg	0.9	40	08-OCT-21
WG3631987-2 DUP		**L2622892-34**						
Silver (Ag)-Total		0.0151	0.0143		mg/kg	5.9	40	07-OCT-21
WG3631948-4 LCS								
Silver (Ag)-Total			101.6		%		80-120	07-OCT-21
WG3631987-4 LCS								
Silver (Ag)-Total			105.1		%		80-120	07-OCT-21
WG3631948-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	07-OCT-21
WG3631987-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	07-OCT-21
HG-DRY-CVAFS-N-VA	**Tissue**							
Batch R5614172								
WG3631948-5 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			89.2		%		70-130	07-OCT-21
WG3631987-3 CRM		**VA-NRC-DORM4**						
Mercury (Hg)-Total			87.7		%		70-130	07-OCT-21
WG3631948-6 DUP		**L2622892-22**						

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DRY-CVAFS-N-VA	**Tissue**							
Batch R5614172								
WG3631948-6 DUP		**L2622892-22**						
Mercury (Hg)-Total		0.0440	0.0444		mg/kg	0.8	40	07-OCT-21
WG3631987-2 DUP		**L2622892-34**						
Mercury (Hg)-Total		0.0517	0.0493		mg/kg	4.7	40	07-OCT-21
WG3631948-4 LCS								
Mercury (Hg)-Total			97.0		%		80-120	07-OCT-21
WG3631987-4 LCS								
Mercury (Hg)-Total			94.3		%		80-120	07-OCT-21
WG3631948-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	07-OCT-21
WG3631987-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	07-OCT-21
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-5 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			107.7		%		70-130	07-OCT-21
Arsenic (As)-Total			102.4		%		70-130	07-OCT-21
Barium (Ba)-Total			104.5		%		70-130	07-OCT-21
Beryllium (Be)-Total			0.013		mg/kg		0.005-0.025	07-OCT-21
Bismuth (Bi)-Total			0.014		mg/kg		0.002-0.022	07-OCT-21
Boron (B)-Total			101.0		%		70-130	07-OCT-21
Cadmium (Cd)-Total			99.5		%		70-130	07-OCT-21
Calcium (Ca)-Total			103.5		%		70-130	07-OCT-21
Cesium (Cs)-Total			105.8		%		70-130	07-OCT-21
Chromium (Cr)-Total			108.8		%		70-130	07-OCT-21
Cobalt (Co)-Total			106.6		%		70-130	07-OCT-21
Copper (Cu)-Total			101.5		%		70-130	07-OCT-21
Iron (Fe)-Total			108.4		%		70-130	07-OCT-21
Lead (Pb)-Total			102.5		%		70-130	07-OCT-21
Lithium (Li)-Total			1.15		mg/kg		0.71-1.71	07-OCT-21
Magnesium (Mg)-Total			97.2		%		70-130	07-OCT-21
Manganese (Mn)-Total			99.6		%		70-130	07-OCT-21
Molybdenum (Mo)-Total			101.4		%		70-130	07-OCT-21
Nickel (Ni)-Total			101.2		%		70-130	07-OCT-21
Phosphorus (P)-Total			99.9		%		70-130	07-OCT-21
Potassium (K)-Total			107.6		%		70-130	07-OCT-21

Quality Control Report

Workorder: L2622892 Report Date: 08-OCT-21

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-5 CRM		**VA-NRC-DORM4**						
Rubidium (Rb)-Total			107.5		%		70-130	07-OCT-21
Selenium (Se)-Total			110.2		%		70-130	07-OCT-21
Sodium (Na)-Total			107.7		%		70-130	07-OCT-21
Strontium (Sr)-Total			102.5		%		70-130	07-OCT-21
Thallium (Tl)-Total			91.5		%		70-130	07-OCT-21
Uranium (U)-Total			103.7		%		70-130	07-OCT-21
Vanadium (V)-Total			105.3		%		70-130	07-OCT-21
Zinc (Zn)-Total			117.1		%		70-130	07-OCT-21
Zirconium (Zr)-Total			0.31		mg/kg		0.05-0.45	07-OCT-21
WG3631987-3 CRM		**VA-NRC-DORM4**						
Aluminum (Al)-Total			105.5		%		70-130	07-OCT-21
Arsenic (As)-Total			104.5		%		70-130	07-OCT-21
Barium (Ba)-Total			102.9		%		70-130	07-OCT-21
Beryllium (Be)-Total			0.016		mg/kg		0.005-0.025	07-OCT-21
Bismuth (Bi)-Total			0.012		mg/kg		0.002-0.022	07-OCT-21
Boron (B)-Total			103.3		%		70-130	07-OCT-21
Cadmium (Cd)-Total			103.3		%		70-130	07-OCT-21
Calcium (Ca)-Total			106.8		%		70-130	07-OCT-21
Cesium (Cs)-Total			106.7		%		70-130	07-OCT-21
Chromium (Cr)-Total			109.3		%		70-130	07-OCT-21
Cobalt (Co)-Total			106.1		%		70-130	07-OCT-21
Copper (Cu)-Total			103.1		%		70-130	07-OCT-21
Iron (Fe)-Total			110.1		%		70-130	07-OCT-21
Lead (Pb)-Total			107.2		%		70-130	07-OCT-21
Lithium (Li)-Total			1.18		mg/kg		0.71-1.71	07-OCT-21
Magnesium (Mg)-Total			99.2		%		70-130	07-OCT-21
Manganese (Mn)-Total			99.7		%		70-130	07-OCT-21
Molybdenum (Mo)-Total			104.4		%		70-130	07-OCT-21
Nickel (Ni)-Total			99.6		%		70-130	07-OCT-21
Phosphorus (P)-Total			100.4		%		70-130	07-OCT-21
Potassium (K)-Total			104.5		%		70-130	07-OCT-21
Rubidium (Rb)-Total			108.6		%		70-130	07-OCT-21
Selenium (Se)-Total			113.6		%		70-130	07-OCT-21
Sodium (Na)-Total			102.9		%		70-130	07-OCT-21

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631987-3 CRM		**VA-NRC-DORM4**						
Strontium (Sr)-Total			98.4		%		70-130	07-OCT-21
Thallium (Tl)-Total			99.1		%		70-130	07-OCT-21
Uranium (U)-Total			97.5		%		70-130	07-OCT-21
Vanadium (V)-Total			104.2		%		70-130	07-OCT-21
Zinc (Zn)-Total			116.4		%		70-130	07-OCT-21
Zirconium (Zr)-Total			0.31		mg/kg		0.05-0.45	07-OCT-21
WG3631948-6 DUP		**L2622892-22**						
Aluminum (Al)-Total		718	607		mg/kg	17	40	08-OCT-21
Antimony (Sb)-Total		0.013	0.010		mg/kg	28	40	08-OCT-21
Arsenic (As)-Total		0.210	0.182		mg/kg	14	40	08-OCT-21
Barium (Ba)-Total		7.18	6.79		mg/kg	5.5	40	08-OCT-21
Beryllium (Be)-Total		0.048	0.040		mg/kg	18	40	08-OCT-21
Bismuth (Bi)-Total		0.029	0.026		mg/kg	13	40	08-OCT-21
Boron (B)-Total		1.7	1.4		mg/kg	16	40	08-OCT-21
Cadmium (Cd)-Total		0.0443	0.0444		mg/kg	0.1	40	08-OCT-21
Calcium (Ca)-Total		42600	40200		mg/kg	5.9	60	08-OCT-21
Cesium (Cs)-Total		0.309	0.288		mg/kg	7.0	40	08-OCT-21
Chromium (Cr)-Total		1.61	1.37		mg/kg	16	40	08-OCT-21
Cobalt (Co)-Total		0.459	0.375		mg/kg	20	40	08-OCT-21
Copper (Cu)-Total		1.61	1.48		mg/kg	8.1	40	08-OCT-21
Iron (Fe)-Total		3260	2840		mg/kg	14	40	08-OCT-21
Lead (Pb)-Total		3.02	2.92		mg/kg	3.4	40	08-OCT-21
Lithium (Li)-Total		1.90	1.52		mg/kg	22	40	08-OCT-21
Magnesium (Mg)-Total		1430	1310		mg/kg	8.9	40	08-OCT-21
Manganese (Mn)-Total		39.0	35.0		mg/kg	11	40	08-OCT-21
Molybdenum (Mo)-Total		0.291	0.271		mg/kg	7.2	40	08-OCT-21
Nickel (Ni)-Total		1.18	1.00		mg/kg	17	40	08-OCT-21
Phosphorus (P)-Total		334	360		mg/kg	7.8	40	08-OCT-21
Potassium (K)-Total		1340	1360		mg/kg	1.7	40	08-OCT-21
Rubidium (Rb)-Total		6.06	5.92		mg/kg	2.2	40	08-OCT-21
Selenium (Se)-Total		0.096	0.102		mg/kg	5.7	40	08-OCT-21
Sodium (Na)-Total		339	356		mg/kg	4.7	40	08-OCT-21
Strontium (Sr)-Total		27.1	27.0		mg/kg	0.2	60	08-OCT-21

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-6 DUP		**L2622892-22**						
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	08-OCT-21
Thallium (Tl)-Total		0.0158	0.0125		mg/kg	23	40	08-OCT-21
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	08-OCT-21
Uranium (U)-Total		1.11	1.03		mg/kg	7.4	40	08-OCT-21
Vanadium (V)-Total		1.36	1.11		mg/kg	20	40	08-OCT-21
Zinc (Zn)-Total		11.2	10.7		mg/kg	4.2	40	08-OCT-21
Zirconium (Zr)-Total		2.23	1.95		mg/kg	13	40	08-OCT-21
WG3631987-2 DUP		**L2622892-34**						
Aluminum (Al)-Total		509	428		mg/kg	17	40	07-OCT-21
Antimony (Sb)-Total		0.011	<0.010	RPD-NA	mg/kg	N/A	40	07-OCT-21
Arsenic (As)-Total		0.161	0.143		mg/kg	12	40	07-OCT-21
Barium (Ba)-Total		4.69	4.55		mg/kg	2.9	40	07-OCT-21
Beryllium (Be)-Total		0.034	0.029		mg/kg	17	40	07-OCT-21
Bismuth (Bi)-Total		0.017	0.015		mg/kg	9.9	40	07-OCT-21
Boron (B)-Total		1.8	1.6		mg/kg	13	40	07-OCT-21
Cadmium (Cd)-Total		0.0246	0.0255		mg/kg	3.5	40	07-OCT-21
Calcium (Ca)-Total		20000	19700		mg/kg	1.9	60	07-OCT-21
Cesium (Cs)-Total		0.164	0.150		mg/kg	8.7	40	07-OCT-21
Chromium (Cr)-Total		1.31	1.02		mg/kg	25	40	07-OCT-21
Cobalt (Co)-Total		0.309	0.274		mg/kg	12	40	07-OCT-21
Copper (Cu)-Total		1.31	1.27		mg/kg	2.8	40	07-OCT-21
Iron (Fe)-Total		2270	1760		mg/kg	25	40	07-OCT-21
Lead (Pb)-Total		1.51	1.48		mg/kg	1.7	40	07-OCT-21
Lithium (Li)-Total		1.41	1.13		mg/kg	21	40	07-OCT-21
Magnesium (Mg)-Total		1310	1270		mg/kg	3.1	40	07-OCT-21
Manganese (Mn)-Total		26.0	23.7		mg/kg	8.9	40	07-OCT-21
Molybdenum (Mo)-Total		0.262	0.246		mg/kg	6.5	40	07-OCT-21
Nickel (Ni)-Total		0.89	0.74		mg/kg	18	40	07-OCT-21
Phosphorus (P)-Total		485	509		mg/kg	4.8	40	07-OCT-21
Potassium (K)-Total		1540	1670		mg/kg	8.2	40	07-OCT-21
Rubidium (Rb)-Total		3.37	3.40		mg/kg	0.8	40	07-OCT-21
Selenium (Se)-Total		0.075	0.072		mg/kg	3.7	40	07-OCT-21
Sodium (Na)-Total		413	437		mg/kg	5.8	40	07-OCT-21

Client: Baffinland Iron Mine's Corporation (Oakville)
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631987-2 DUP		**L2622892-34**						
Strontium (Sr)-Total		24.2	23.6		mg/kg	2.2	60	07-OCT-21
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	07-OCT-21
Thallium (Tl)-Total		0.0104	0.0092		mg/kg	13	40	07-OCT-21
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	07-OCT-21
Uranium (U)-Total		0.396	0.369		mg/kg	7.1	40	07-OCT-21
Vanadium (V)-Total		0.94	0.78		mg/kg	19	40	07-OCT-21
Zinc (Zn)-Total		10.6	10.9		mg/kg	2.4	40	07-OCT-21
Zirconium (Zr)-Total		1.40	1.13		mg/kg	21	40	07-OCT-21
WG3631948-4 LCS								
Aluminum (Al)-Total			101.2		%		80-120	07-OCT-21
Antimony (Sb)-Total			105.1		%		80-120	07-OCT-21
Arsenic (As)-Total			102.2		%		80-120	07-OCT-21
Barium (Ba)-Total			98.8		%		80-120	07-OCT-21
Beryllium (Be)-Total			102.2		%		80-120	07-OCT-21
Bismuth (Bi)-Total			99.2		%		80-120	07-OCT-21
Boron (B)-Total			102.1		%		80-120	07-OCT-21
Cadmium (Cd)-Total			99.4		%		80-120	07-OCT-21
Calcium (Ca)-Total			102.0		%		80-120	07-OCT-21
Cesium (Cs)-Total			104.7		%		80-120	07-OCT-21
Chromium (Cr)-Total			102.7		%		80-120	07-OCT-21
Cobalt (Co)-Total			103.2		%		80-120	07-OCT-21
Copper (Cu)-Total			102.1		%		80-120	07-OCT-21
Iron (Fe)-Total			103.3		%		80-120	07-OCT-21
Lead (Pb)-Total			100.4		%		80-120	07-OCT-21
Lithium (Li)-Total			105.9		%		80-120	07-OCT-21
Magnesium (Mg)-Total			98.9		%		80-120	07-OCT-21
Manganese (Mn)-Total			102.0		%		80-120	07-OCT-21
Molybdenum (Mo)-Total			106.4		%		80-120	07-OCT-21
Nickel (Ni)-Total			100.7		%		80-120	07-OCT-21
Phosphorus (P)-Total			109.3		%		80-120	07-OCT-21
Potassium (K)-Total			108.5		%		80-120	07-OCT-21
Rubidium (Rb)-Total			104.3		%		80-120	07-OCT-21
Selenium (Se)-Total			104.2		%		80-120	07-OCT-21

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-4 LCS								
Sodium (Na)-Total			106.5		%		80-120	07-OCT-21
Strontium (Sr)-Total			104.2		%		80-120	07-OCT-21
Tellurium (Te)-Total			104.0		%		80-120	07-OCT-21
Thallium (Tl)-Total			100.9		%		80-120	07-OCT-21
Tin (Sn)-Total			101.8		%		80-120	07-OCT-21
Uranium (U)-Total			100.2		%		80-120	07-OCT-21
Vanadium (V)-Total			105.1		%		80-120	07-OCT-21
Zinc (Zn)-Total			103.5		%		80-120	07-OCT-21
Zirconium (Zr)-Total			105.3		%		80-120	07-OCT-21
WG3631987-4 LCS								
Aluminum (Al)-Total			100.9		%		80-120	07-OCT-21
Antimony (Sb)-Total			108.3		%		80-120	07-OCT-21
Arsenic (As)-Total			103.5		%		80-120	07-OCT-21
Barium (Ba)-Total			101.1		%		80-120	07-OCT-21
Beryllium (Be)-Total			106.1		%		80-120	07-OCT-21
Bismuth (Bi)-Total			101.9		%		80-120	07-OCT-21
Boron (B)-Total			104.9		%		80-120	07-OCT-21
Cadmium (Cd)-Total			104.8		%		80-120	07-OCT-21
Calcium (Ca)-Total			105.1		%		80-120	07-OCT-21
Cesium (Cs)-Total			108.6		%		80-120	07-OCT-21
Chromium (Cr)-Total			103.0		%		80-120	07-OCT-21
Cobalt (Co)-Total			105.5		%		80-120	07-OCT-21
Copper (Cu)-Total			101.8		%		80-120	07-OCT-21
Iron (Fe)-Total			107.0		%		80-120	07-OCT-21
Lead (Pb)-Total			105.0		%		80-120	07-OCT-21
Lithium (Li)-Total			109.7		%		80-120	07-OCT-21
Magnesium (Mg)-Total			101.2		%		80-120	07-OCT-21
Manganese (Mn)-Total			103.3		%		80-120	07-OCT-21
Molybdenum (Mo)-Total			109.5		%		80-120	07-OCT-21
Nickel (Ni)-Total			101.5		%		80-120	07-OCT-21
Phosphorus (P)-Total			106.7		%		80-120	07-OCT-21
Potassium (K)-Total			104.9		%		80-120	07-OCT-21
Rubidium (Rb)-Total			108.0		%		80-120	07-OCT-21
Selenium (Se)-Total			107.1		%		80-120	07-OCT-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631987-4 LCS								
Sodium (Na)-Total			102.6		%		80-120	07-OCT-21
Strontium (Sr)-Total			106.9		%		80-120	07-OCT-21
Tellurium (Te)-Total			109.2		%		80-120	07-OCT-21
Thallium (Tl)-Total			103.1		%		80-120	07-OCT-21
Tin (Sn)-Total			107.9		%		80-120	07-OCT-21
Uranium (U)-Total			100.6		%		80-120	07-OCT-21
Vanadium (V)-Total			104.9		%		80-120	07-OCT-21
Zinc (Zn)-Total			101.9		%		80-120	07-OCT-21
Zirconium (Zr)-Total			107.2		%		80-120	07-OCT-21
WG3631948-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	07-OCT-21
Antimony (Sb)-Total			<0.010		mg/kg		0.01	07-OCT-21
Arsenic (As)-Total			<0.020		mg/kg		0.02	07-OCT-21
Barium (Ba)-Total			<0.050		mg/kg		0.05	07-OCT-21
Beryllium (Be)-Total			<0.010		mg/kg		0.01	07-OCT-21
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	07-OCT-21
Boron (B)-Total			<1.0		mg/kg		1	07-OCT-21
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	07-OCT-21
Calcium (Ca)-Total			<20		mg/kg		20	07-OCT-21
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	07-OCT-21
Chromium (Cr)-Total			<0.050		mg/kg		0.05	07-OCT-21
Cobalt (Co)-Total			<0.020		mg/kg		0.02	07-OCT-21
Copper (Cu)-Total			<0.10		mg/kg		0.1	07-OCT-21
Iron (Fe)-Total			<3.0		mg/kg		3	07-OCT-21
Lead (Pb)-Total			<0.020		mg/kg		0.02	07-OCT-21
Lithium (Li)-Total			<0.50		mg/kg		0.5	07-OCT-21
Magnesium (Mg)-Total			<2.0		mg/kg		2	07-OCT-21
Manganese (Mn)-Total			<0.050		mg/kg		0.05	07-OCT-21
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	07-OCT-21
Nickel (Ni)-Total			<0.20		mg/kg		0.2	07-OCT-21
Phosphorus (P)-Total			<10		mg/kg		10	07-OCT-21
Potassium (K)-Total			<20		mg/kg		20	07-OCT-21
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	07-OCT-21
Selenium (Se)-Total			<0.050		mg/kg		0.05	07-OCT-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-1 MB								
Sodium (Na)-Total			<20		mg/kg		20	07-OCT-21
Strontium (Sr)-Total			<0.050		mg/kg		0.05	07-OCT-21
Tellurium (Te)-Total			<0.020		mg/kg		0.02	07-OCT-21
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	07-OCT-21
Tin (Sn)-Total			<0.10		mg/kg		0.1	07-OCT-21
Uranium (U)-Total			<0.0020		mg/kg		0.002	07-OCT-21
Vanadium (V)-Total			<0.10		mg/kg		0.1	07-OCT-21
Zinc (Zn)-Total			<0.50		mg/kg		0.5	07-OCT-21
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	07-OCT-21
WG3631987-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	07-OCT-21
Antimony (Sb)-Total			<0.010		mg/kg		0.01	07-OCT-21
Arsenic (As)-Total			<0.020		mg/kg		0.02	07-OCT-21
Barium (Ba)-Total			<0.050		mg/kg		0.05	07-OCT-21
Beryllium (Be)-Total			<0.010		mg/kg		0.01	07-OCT-21
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	07-OCT-21
Boron (B)-Total			<1.0		mg/kg		1	07-OCT-21
Cadmium (Cd)-Total			<0.0050		mg/kg		0.005	07-OCT-21
Calcium (Ca)-Total			<20		mg/kg		20	07-OCT-21
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	07-OCT-21
Chromium (Cr)-Total			<0.050		mg/kg		0.05	07-OCT-21
Cobalt (Co)-Total			<0.020		mg/kg		0.02	07-OCT-21
Copper (Cu)-Total			<0.10		mg/kg		0.1	07-OCT-21
Iron (Fe)-Total			<3.0		mg/kg		3	07-OCT-21
Lead (Pb)-Total			<0.020		mg/kg		0.02	07-OCT-21
Lithium (Li)-Total			<0.50		mg/kg		0.5	07-OCT-21
Magnesium (Mg)-Total			<2.0		mg/kg		2	07-OCT-21
Manganese (Mn)-Total			<0.050		mg/kg		0.05	07-OCT-21
Molybdenum (Mo)-Total			<0.020		mg/kg		0.02	07-OCT-21
Nickel (Ni)-Total			<0.20		mg/kg		0.2	07-OCT-21
Phosphorus (P)-Total			<10		mg/kg		10	07-OCT-21
Potassium (K)-Total			<20		mg/kg		20	07-OCT-21
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	07-OCT-21
Selenium (Se)-Total			<0.050		mg/kg		0.05	07-OCT-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631987-1 MB								
Sodium (Na)-Total			<20		mg/kg		20	07-OCT-21
Strontium (Sr)-Total			<0.050		mg/kg		0.05	07-OCT-21
Tellurium (Te)-Total			<0.020		mg/kg		0.02	07-OCT-21
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	07-OCT-21
Tin (Sn)-Total			<0.10		mg/kg		0.1	07-OCT-21
Uranium (U)-Total			<0.0020		mg/kg		0.002	07-OCT-21
Vanadium (V)-Total			<0.10		mg/kg		0.1	07-OCT-21
Zinc (Zn)-Total			<0.50		mg/kg		0.5	07-OCT-21
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	07-OCT-21
MOISTURE-TISS-VA	**Tissue**							
Batch R5603159								
WG3625663-3 DUP		**L2622892-37**						
% Moisture		14.8	14.4		%	2.8	20	27-SEP-21
WG3625663-2 LCS								
% Moisture			100.4		%		90-110	27-SEP-21
WG3625663-1 MB								
% Moisture			<0.50		%		0.5	27-SEP-21
Batch R5604365								
WG3625866-3 DUP		**L2622892-38**						
% Moisture		70.1	74.3		%	5.9	20	28-SEP-21
WG3625866-2 LCS								
% Moisture			100.4		%		90-110	28-SEP-21
WG3625866-1 MB								
% Moisture			<0.50		%		0.5	28-SEP-21
TI-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631948-5 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			109.2		%		70-130	07-OCT-21
WG3631987-3 CRM		**VA-NRC-DORM4**						
Titanium (Ti)-Total			104.2		%		70-130	07-OCT-21
WG3631948-6 DUP		**L2622892-22**						
Titanium (Ti)-Total		35.9	30.5		mg/kg	16	40	08-OCT-21
WG3631987-2 DUP		**L2622892-34**						
Titanium (Ti)-Total		24.7	18.8		mg/kg	27	40	07-OCT-21
WG3631948-4 LCS								
Titanium (Ti)-Total			103.2		%		80-120	07-OCT-21

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Connor Devereaux/Kendra Button

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TI-DRY-CCMS-N-VA	**Tissue**							
Batch R5614045								
WG3631987-4 LCS								
Titanium (Ti)-Total			104.6		%		80-120	07-OCT-21
WG3631948-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	07-OCT-21
WG3631987-1 MB								
Titanium (Ti)-Total			<0.25		mg/kg		0.25	07-OCT-21

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2622892-COFC

COC Number: 17 -

Page 1 of 8

Report To	Contact and company name below will appear on the final report
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact:	Patrick Audet
Phone:	403-797-0678
	Company address below will appear on the final report
Street:	220- 736 8th Avenue SW
City/Province:	Calgary, AB
Postal Code:	T2P 1H4
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

Email 2 bimcore@alsglobal.com

Email 3 paudet@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, Q78018

Job #: BIM Soil and Lichen Tissue - Trace Metals

PO / AFE: 4500073372

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): L2622892

ALS Contact:

Sampler: JR, MK

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, 2	TR-L-152-2021	26-Jul-21	11:00	Tissue	1					R	R	R		
3	TR-L-152-2021	26-Jul-21	11:00	Soil	1	R	R	R	R					
4, 5	TR-L-79-2021	26-Jul-21	11:30	Tissue	1					R	R	R		
6	TR-L-79-2021	26-Jul-21	11:30	Soil	1	R	R	R	R					
7, 8	MP-L-57-2021	27-Jul-21	9:15	Tissue	1					R	R	R		
9	MP-L-57-2021	27-Jul-21	9:15	Soil	1	R	R	R	R					
10, 11	MP-L-147-2021	27-Jul-21	9:47	Tissue	1					R	R	R		
12	MP-L-147-2021	27-Jul-21	9:47	Soil	1	R	R	R	R					
13, 14	MP-L-146-2021	27-Jul-21	10:15	Tissue	1					R	R	R		
15	MP-L-146-2021	27-Jul-21	10:15	Soil	1	R	R	R	R					
16, 17	MP-L-146-2021-R	27-Jul-21	10:25	Tissue	1					R	R	R		
18	MP-L-146-2021-R	27-Jul-21	10:25	Soil	1	R	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)

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: 16.0

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Jordyn Renaud	Date: 29 July 2021	Time:	Received by:	Date:	Time:	Received by: [signature]	Date: 8.5.21	Time: 1100

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

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2622892-COFC

COC Number: 17 -

Page 1 of

Report To	Contact and company name below will appear on the final report
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact:	Patrick Audet
Phone:	403-797-0678
	Company address below will appear on the final report
Street:	220- 736 8th Avenue SW
City/Province:	Calgary, AB
Postal Code:	T2P 1H4
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Baffinland Iron Mine
Contact:	

Project Information

ALS Account # / Quote #:	EDI100, Q78018
Job #:	BIM Soil and Lichen Tissue - Trace Metals
PO / AFE:	4500073372
LSD:	

ALS Lab Work Order # (lab use only):

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

Email 2 bimcore@alsglobal.com

Email 3 paudet@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact:

Sampler: JR, MK

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)
19, 20	MP-L-144-2021	27-Jul-21	11:25	Tissue	1					R	R	R		
21	MP-L-144-2021	27-Jul-21	11:25	Soil	1	R	R	R	R					
22, 23	MP-L-122-2021	27-Jul-21	11:47	Tissue	1					R	R	R		
24	MP-L-122-2021	27-Jul-21	11:47	Soil	1	R	R	R	R					
25, 26	MP-L-121-2021	27-Jul-21	12:30	Tissue	1					R	R	R		
27	MP-L-121-2021	27-Jul-21	12:30	Soil	1	R	R	R	R					
28, 29	MP-L-119-2021	27-Jul-21	1:00	Tissue	1					R	R	R		
30	MP-L-119-2021	27-Jul-21	1:00	Soil	1	R	R	R	R					
31, 32	MP-L-118-2021	27-Jul-21	1:30	Tissue	1					R	R	R		
33	MP-L-118-2021	27-Jul-21	1:30	Soil	1	R	R	R	R					
34, 35	MP-L-145-2021	27-Jul-21	10:50	Tissue	1					R	R	R		
36	MP-L-145-2021	27-Jul-21	10:50	Soil	1	R	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)

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 16.0

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Jordyn Renaud	Date: 29 July 2021	Time:	Received by:	Date:	Time:	Received by: [signature]	Date: 8/5/21	Time: 900

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2622892-COFC

COC Number: 17 -

Page 1 of

Report To	Contact and company name below will appear on the final report
Company:	EDI - Environmental Dynamics Inc c/o Baffinland Iron Mine
Contact:	Patrick Audet
Phone:	403-797-0678
	Company address below will appear on the final report
Street:	220- 736 8th Avenue SW
City/Province:	Calgary, AB
Postal Code:	T2P 1H4
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Baffinland Iron Mine
Contact:	

Project Information

ALS Account # / Quote #:	EDI100, Q78018
Job #:	BIM Soil and Lichen Tissue - Trace Metals
PO / AFE:	4500073372
LSD:	

ALS Lab Work Order # (lab use only):

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

Email 2 bimcore@alsglobal.com

Email 3 paudet@edynamics.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com,commercial@baffinland.com

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler: JR, MK

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)
37, 38	MP-L-56-2021	28-Jul-21	11:30	Tissue	1					R	R	R		
39	MP-L-56-2021	28-Jul-21	11:30	Soil	1	R	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)

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) IACP 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 16.0

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Jordyn Renaud	Date: 29 July 2021	Time:	Received by:	Date:	Time:	Received by:	Date: 8/5/21	Time: 900

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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

NOV 2018 FRONT

APPENDIX E REMOTE CAMERA LOCATIONS

Site Name: HOL 10 **Camera Name:** Baffin-1	**Location**: KM85.5	**Latitude / Longitude**: 71.3732, -79.6859	**Access**: Vehicle, foot

Site Name: HOL 16 **Camera Name:** Baffin-2	**Location**: KM95	**Latitude / Longitude**: 71.3321, -79.4779	**Access**: Vehicle, foot

Site Name: HOL 1 **Camera Name:** Baffin-3	**Location**: KM4	**Latitude / Longitude**: 71.8710, -80.8828	**Access**: Vehicle, foot

Site Name: HOL 1 **Camera Name:** Baffin-4	**Location**: KM4	**Latitude / Longitude**: 71.8710, -80.8828	**Access**: Vehicle, foot

Site Name: HOL 6 **Camera Name:** Baffin-5	**Location**: KM57	**Latitude / Longitude**: 71.4832, -80.213	**Access**: Vehicle, foot

No photo available for this site.

Site Name: HOL 16 **Camera Name:** Baffin-6	**Location**: KM95	**Latitude / Longitude**: 71.3321, -79.4779	**Access**: Vehicle, foot

Site Name: HOL 3 **Camera Name:** Baffin-7	**Location**: KM27	**Latitude / Longitude**: 71.7297, -80.4418	**Access**: Vehicle, foot

Site Name: HOL 4 **Camera Name:** Baffin-8	**Location**: KM42	**Latitude / Longitude**: 71.6073, -80.347	**Access**: Vehicle, foot

Site Name: HOL 4 **Camera Name:** Baffin-9	**Location**: KM42	**Latitude / Longitude**: 71.6073, -80.347	**Access**: Vehicle, foot

No photo available for this site.

Site Name: HOL 6 **Camera Name:** Baffin-10	**Location**: KM57	**Latitude / Longitude**: 71.4832, -80.213	**Access**: Vehicle, foot

Site Name: HOL 10 **Camera Name:** Baffin-11	**Location**: KM85.5	**Latitude / Longitude**: 71.3732, -79.6859	**Access**: Vehicle, foot

No photo available for this site.

Site Name: HOL 3 **Camera Name:** Baffin-12	**Location**: KM27	**Latitude / Longitude**: 71.7297, -80.4418	**Access**: Vehicle, foot

APPENDIX F WILDLIFE PHOTOS

Appendix Photo F-1. Unconfirmed wildlife (likely Snow Geese) seen at HOL 1, Baffin-4 camera, on August 7 and 8, 2021.

Appendix Photo F-2. Raven perched on a rock near HOL 16, Baffin-2 camera, on August 19, 2021.

Appendix Photo F-3. **Small unknown weasel species documented at HOL 1, Baffin-4 camera, on September 1, 2021.**

Appendix Photo F-4. **Two Arctic hare foraging at HOL 1, Baffin-3 camera, on August 3, 2021.**

Appendix Photo F-5. Two Ptarmigans seen at HOL 16, Baffin-6 camera, on September 6, 2021.

APPENDIX G TEWG COMMENTARY ON THE DRAFT 2021 TEAMR AND BAFFINLAND REJOINDER

Baffinland Mary River Project Report Working Group Comment Form

Reviewer Agency/Organization:	*Qikiqtani Inuit Association (QIA)*
Reviewers:	*Firelight Research (Susan M. Leech, Allie Mayberry, Rachel Ford), D. Bruce Stewart, Jeff W. Higdon*
Document(s) Reviewed:	• *Mary River Project Terrestrial Environment 2021 Annual Monitoring Report (TEAMR)*
Date Review Completed	*2022-06-07*

Comment No.:	QIA-01
Section Reference:	Executive summary, p. i.

Comment:

RE: "The Project involves the construction, operation, closure, and reclamation of a 22.2 million tonnes per annum (mtpa) open pit mine that will operate for 21 years."

- This 22.2 mtpa figure requires clarification and context. If the 22.2 mtpa is referring to iron ore how much rock must be removed from the pit to obtain the ore; if the 22.2 mtpa is the total weight of rock, how much ore would it yield?

Baffinland Response:

This project description has been consistent since 2012. The 22.2 mtpa refers to iron ore. The QIA should refer to the FEIS Project Description submitted to the Nunavut Impact Review Board for clarity. The comment is irrelevant to Project effects monitoring.

Comment No.:	QIA-02
Section Reference:	Executive Summary pp. i + ii; Section 4. Climate, pp. 6, 9, 10;

Comment:

RE: Executive summary

pp. ii: "Malfunctions in temperature, precipitation, and wind monitoring equipment made comparisons for these conditions difficult in 2021..."

RE: Section 4. Climate:

p. 6: "Precipitation data before late August is unreliable at both the Mine Site and Milne Port due to obstructed rain gauges."

p. 8: "Until August 24, the rain gauge was blocked. It is possible that this blockage began as early as October 2019. This casts uncertainty on a large portion of the year's data."

p. 9: Figures 4-1 and 4-2 illustrate the April through August gap left in the 2021 precipitation record from the Mine Site.

p. 10 "The Milne Port meteorological station suffered from similar technical problems to the station at the Mine Site, with its rain gauge becoming obstructed as early as August 2020. This blockage was cleared on August 22, 2021. As such, data from August 2020 to September 2021 are considered unreliable." and "It may be the case that the blockage at the Milne Port rain gauge was severe enough to cause some, but not all, days of rainfall to go undetected, or that the summer of 2021 was unusually dry at this location."

- Malfunctions of weather monitoring equipment also occurred in 2018, 2019, and 2020. These weather measurements are important for interpreting other monitoring data. Persistent and protracted losses of weather data weaken the assessment of interannual trends in dustfall, dust control measures, and the interpretation of satellite imagery. In 2021 the weather dataset was excluded from calculations of the relationship between the dustfall concentrations from the passive dustfall monitors and the satellite digital imagery due to the issues with the precipitation measurements (7.4.2.2 Dustfall Concentration Estimation, p. 74).
- What will Baffinland do in 2022 to ensure reliable collection of weather data and prompt detection and remedy of any issues that arise?

Baffinland Response:

Baffinland acknowledges that the operational issues (instrument malfunctions, technical problems) with the meteorology monitoring stations during 2018 to 2021 has caused challenges with the interpretation of the annual data for dustfall, dust control measures and the interpretation of satellite imagery.

Baffinland has implemented corrective actions to continue to improve the reliable collection of weather data and prompt detection of any equipment issues. Critical spares have been identified, inventoried, and procured to ensure they are readily available on site. Baffinland is increasing the frequency and quality of QA/QC audits to include monthly data audits. Monthly meteorological data are reviewed quarterly by independent subject matter experts. The monthly data quality checks assess the meteorology data for completeness and accuracy. When data from the Milne Port and Mary River stations is questionable, it is compared with data collected by Environment and Climate Change Canada (ECCC) at the climate station in Pond Inlet. Baffinland is continuing to improve on-site capacity to complete physical equipment inspections internally, which will enable an increase in frequency of the inspections.

The data quality checks for the rainfall data collected at the Mary River meteorology station includes comparison to rainfall data collected by a manual rain gauge located at the weatherhaven structure near the Mary River meteorology station. Meteorological data collected by the Steensby station is compared to the data from the ECCC climate station in Igloolik. Should data quality discrepancies arise, the meteorology monitoring equipment is physically checked. Physical checks for the Milne Port and Steensby meteorology stations are only possible when there is a helicopter available during the summer months and shoulder seasons. Baffinland will continue to ensure equipment inspections and maintenance are completed by a qualified individual.

Comment No.:	QIA-03
Section Reference:	Executive Summary, p. ii.; see also 7.4.2.3 Dustfall Extent and Concentration, p. 77
Comment:	

RE: "The total dustfall area for the Project in 2021 was 552.9 km. (4.7%) for Landsat and 1,787.6 km. (15.2%) for Sentinel-2." (see also Figure 7-19)

- These are remarkably different estimates. What lessons have been learned from them with respect to the collection and analysis of future satellite imagery for monitoring to interannual ensure comparability?

Baffinland Response:

As mentioned in the report (section 7.4.2.3 Dustfall Extent and Concentration, pg 76), there is low Landsat image availability around the mine, resulting in the low dustfall area estimate. Image availability and timing around snowfall events are out of Baffinland's control. It is determined by the satellite image acquisition data and the weather.

Baffinland uses all available cloud-free images from Landsat and Sentinel-2 satellites from mid-March to mid-May to estimate the dustfall extent across the landscape. Landsat 9 imagery was implemented in Nov 2021, which should provide more images to use in the analysis. In the 2022 TEAMR report, Baffinland will consider combining the Landsat and Sentinel-2 datasets into one to provide a more spatially consistent dataset.

Comment No.:	QIA-04
Section Reference:	Summary, Table 0, pg. v
Comment:	

- This table states that the purpose of Tote Road traffic monitoring is to "correlate to wildlife disturbance and dust generation." However, there is no analysis completed in the section on dust that compares dust measurements with traffic data.

Baffinland Response:

Given that the Tote Road transit data has been consistent since 2018, there has been limited value in using it as a correlate variable to dustfall. However, the data continues to be reviewed if there is unexpected increase in traffic transits that in turn affects dustfall.

Comment No.:	QIA-05
Section Reference:	Executive Summary, Table 0, p. iv.
Comment:	

RE: In the "Weather Monitoring" row the "Comparison to Impact Predictions" column entry is "N/A" and, as noted in Section 4, Climate, p. 6, "The climate data recorded at the Mary River Project contributes to several other datasets and analyses."

- Rather than leaving the table cell "N/A", a literature review could be used to summarize differences in weather parameters (e.g., precipitation, wind, temperature) that can influence interannual comparisons of the other monitoring parameters discussed in the rows that follow.

Baffinland Response:

There were no impact predictions of the Project on climate, thus the notation of "N/A" (not applicable) is relevant. A literature review is beyond the scope of annual monitoring reports.

Comment No.:	QIA-06
Section Reference:	Executive summary, Table 0, Helicopter flight height analysis row

Comment:

RE: "It was expected that some Snow Geese would be displaced by the Project-related activities but would relocate to nearby, less disturbed areas. As only a small portion of the Snow Geese area is subject to helicopter flyovers and is mainly located outside the Zone of Influence (ZOI), effects would likely be limited. Overall, local disturbance relative to the Project development Area (PDA) and Local Study Area (LSA) extents was expected to cause some sensory disturbance but not result in significant adverse effects to the Snow Goose population."

- Unfortunately, we have no direct data on the potential effects of low-level helicopter flights associated with the MRP on snow geese or other migratory birds.
- Can Baffinland recommend some options for monitoring impacts of current helicopter flight patterns on snow geese and other migratory birds? An initial step would be to provide the TEWG with a map showing the locations of flight paths and non-compliant flights in relation to the snow geese area, and estimate how much of the known snow geese area is being impacted by the current flight patterns (assuming a reasonable buffer based on a lit review). Monitoring options could include behavioural monitoring to determine if there is increased vigilance and movement away from the area that is directly impacted; possibly physical changes in snow geese over the moulting season (e.g., variation in weight gain).

Baffinland Response:

Maps of flights relevant to the snow goose area have been provided in annual monitoring reports since 2016 (EDI 2017).

Estimates of the snow goose area affected by overflights have not been a component of the annual monitoring reports and have not been requested by the authority (Environment and Climate Change Canada)that provided the information.

Snow goose behaviour monitoring is not being considered. Snow geese are abundant (e.g., based on ancillary observations from the Height of Land Monitoring) and avoidance of the snow goose area (including those higher altitudes where snow geese are observed) remains the most appropriate and effective mitigation. Behaviour monitoring and animal capture (as suggested by the QIA) would require more low-level flying and disturbance in the snow goose area, and thereby counter-act existing mitigation (e.g., flight-height restrictions in the snow goose area during the moulting season).

Baffinland

Reference

EDI Environmental Dynamics Inc. 2017. 2016 Terrestrial Environment Annual Monitoring Report. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario. 102 pp.

Comment No.:	QIA-07
Section Reference:	Executive summary, Table 0, p. v, Passive Dustfall Monitoring row
Comment:	

RE: "No difference was found in the dustfall measured at a standardized height of 2.0 m and at 0.5 m."

- Clarify in Table 0 that this is a preliminary comparison based on only 3 months of data.

The "Comparison to Impact Predictions" in the Passive Dustfall Monitoring row states, "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. The 2021 dustfall results are consistent with predictions that the highest dustfall would be limited mainly within the PDA."

- Table 7-4 (p. 60) provides more useful context for the 2021 dustfall, reporting that 20 of the 26 sites monitored for dustfall year-round received dustfall above the levels predicted in the ERP FEIS. Pertinent information should be summarized here on the locations, magnitudes, and durations of any ongoing exceedances relative to the predictions.

Baffinland Response:

The QIA is correct that the body of the report provides pertinent details. The Executive Summary provides summary comments. These entries are accurate within this context.

Comment No.:	QIA-08
Section Reference:	Executive summary, Table 0, p. vi, Snow Track Survey row
Comment:	

RE: "However, incidental observations of caribou crossing the Tote Road in 2020 suggest that it is not a barrier to movement."

- Remove this statement as it is very misleading; we have no western science data on how caribou are avoiding the road. IQ suggests avoidance of the project area by caribou.

Baffinland Response:

The caribou crossed the road. The road was not a barrier. Baffinland makes no reference to caribou either avoiding or not avoiding the Project — that is a separate measure of a potential effect.

Comment No.:	QIA-09

Section Reference:	Executive summary, Table 0, p. vi, Snowbank Height surveys row
Comment:	

RE: "Snowbank height monitoring was conducted monthly or bimonthly…"

Why was snowbank height data not collected monthly? Why were some months missed?

Re: "In 2021, the average compliance for snowbank height surveys was 90%. In some areas, snowbanks could not be modified because of landscape or safety limitations."

- How does the 90% figure compare to previous years?
- What types of landscape or safety limitations made it impossible to modify snowbanks?

Baffinland Response:

Snowbank heights are collected during months with snow accumulation (i.e., October through May). December 2020 was missed. Baffinland highlights that COVID-19 outbreaks at the Mary River mine during this time limited the movement of personnel between camps and resulted in restrictions on Tote Road usage. Additional measures were taken to avoid collaborative work (if possible) in order to ensure the safety of Baffinland staff. The full-time environmental technician at the Port site was sent to isolation for 10 days during December 2020, which further limited the ability to conduct a snowbank height survey. Efforts will continue to ensure snowbank height monitoring is conducted consistently each month until consistent snow management practices are characterized.

Interannual comparisons of snowbank height compliance is provided in the final report (Figure 9-6).

Ground conditions, adjacent landscape (e.g., hillsides), existing steep terrain, and snow piling limit the modification of snowbanks in some areas. Specific sections of the Tote Road are narrow and cannot be expanded due to surrounding terrain. In these areas, it is unsafe to use heavy equipment while loaded haul trucks are travelling along the Tote Road, due to limited capacity to complete sudden stops.

Comment No.:	QIA-10
Section Reference:	Executive summary, Table 0, p. vi, Height of Land (HOL) caribou surveys
Comment:	

RE: "The assessment predicted some indirect habitat loss for caribou due to sensory disturbance and dust deposition, leading to reduced habitat effectiveness within the ZOI…"

As discussed many times, it should be possible (based on dustfall data and noise monitoring) to re-estimate the ZOI around the Tote road and mine site. Has Baffinland undertaken a new ZOI estimate based on actual dustfall extents and locations of non-compliant helicopter flights?

Why does this section not include the information on wildlife cameras?

Baffinland Response:

The summary section of the annual report is not intended to provide a reevaluation of the ZOI. The QIA's request to do so is misplaced in the context of annual reporting, and the reasons for the request are unclear. The questions on ZOI were addressed previously in response to QIA 19, 20 and 45(b) comments on the 2020 annual report.

A more detailed summary of the wildlife cameras will be included in the final report. A brief overview was added to the HOL summary table. Refer to response to QIA-51 on logistical constraints associated with remote wildlife camera deployment and data capture.

Comment No.:	QIA-11
Section Reference:	Section 1, Overview, p. 1
Comment:	

RE: dates of data collection and monitoring programs:

- Minor point, but Active Migratory Bird Nest Surveys were conducted in 2021 (so it should be 2013-2021)

Baffinland Response:

Updated to 2021 in the final report.

Comment No.:	QIA-12
Section Reference:	Section 3, Inuit Participation, p. 5
Comment:	

How many Inuit in total have participated in terrestrial monitoring programs by year? We should be looking at opportunities to increase Inuit involvement and leadership in monitoring programs. Does Baffinland have a plan for continuous increases in Inuit involvement?

Baffinland Response:

Baffinland strives to involve Inuit in their monitoring programs. Since 2006 (and at the time of reporting), 54 Inuit participants have assisted with terrestrial environmental programs corresponding for a total of 3,642 hours. Participation has generally ranged from two to nine Inuit assistants per annum for the terrestrial environment monitoring programs. Baffinland strives towards resourcing a community-based monitoring program through the Inuit Impact and Benefit Agreement (IIBA).

The Mittimatalik Hunters and Trappers Organization (MHTO) are members of the Terrestrial Environmental Working Group (TEWG), which generally meets multiple times on an annual basis to discuss terrestrial monitoring programs and any concerns related to potential project-related effects. During 2021, Baffinland was only able to arrange one TEWG meeting due to travel restrictions related to COVID-19. This meeting was held by teleconference on June 30th, 2021. The then MHTO chair, Eric Ootoovak, attended the meeting.

Baffinland

Comment No.:	QIA-13
Section Reference:	Section 4.1.1 Mine Site
Comment:	

Your summary indicates that you have temperature data from April 1964. For comparison, it would be interesting to see what temperature lows in April 2021 and more recent averages (e.g., baseline, post-baseline) are in April.

Baffinland Response:

Climate data are publicly available to QIA should they wish to investigate their interests in temperature lows. Information relevant to potential Project effects monitoring is provided in sufficient detail in the annual report.

Comment No.:	QIA-14
Section Reference:	4.1.1 Mine site, p. 9
Comment:	

RE: “May was comparatively dry, with 1 rainy day compared to a baseline of 4.4…”

- Based on Figures 4.1 and 4.2, p. 9, rainfall frequency does not seem to be a good predictor of rainfall volume, so how was this conclusion reached when the amount of rainfall on these days is unknown?

Baffinland Response:

The data are noted as being “unreliable” instead of “unknown” as the QIA suggests. Notwithstanding, the data are sufficient to determine that May was comparatively dry relative to baseline data.

Comment No.:	QIA-15
Section Reference:	4.1.2 Milne Inlet, p. 10
Comment:	

RE: “Rain days were absent or minimal during the months where sensor failure occurred but matched or exceeded baseline records after the blockage was cleared. It may be the case that the blockage at the Milne Port rain gauge was severe enough to cause some, but not all, days of rainfall to go undetected, or that the summer of 2021 was unusually dry at this location.”

- Do we have any empirical way to test whether the blockage actually completely missed some rain days?

Baffinland Response:

There is no empirical method available to determine whether the blockage for the Milne Port rain gauge completely missed some rain days during summer 2021. Rain data were collected approximately once per week during summer 2021 from the manual rain gauge at the weatherhaven structure and compared with the tipping bucket rain gauge data from meteorology stations. The blockage of the tipping bucket rain gauge was only a partial blockage. Rain data were recorded during this timeframe but may have been momentarily underestimated.

Comment No.:	QIA-16
Section Reference:	5.1 Methods, p. 16-17; Section 5.2 Results and Discussion, p. 17
Comment:	

RE: the analysis considerations, which included:

- 1,100 m above ground level (magl) while travelling within the key moulting area…or maintaining 1,500 m horizontal distance from the boundary of the key moulting area;
- 1,100 magl and 1,500 m horizontal distance from observed concentrations of migratory birds at all times.

1. In relation to the first bullet point, when maintaining 1,500 m horizontal distance from the boundary, can you confirm that pilots are also maintaining the minimum height of 650 magl?
2. You report later in this section (on p.17) that the only area identified for horizontal avoidance was the key moulting area for snow geese. You note on p. 17 that "No "observed concentrations of migratory birds" or areas prescribed explicitly by the TEWG to avoid due to observed concentrations of migratory birds…".

    a) Remove this sentence as it implies that the TEWG is responsible for identifying other areas of concentrations – in fact this responsibility lies entirely with Baffinland.

    b) What measures did BIM undertake to identify concentrations of migratory birds? What options has Baffinland considered for better identifying concentrations of migratory birds in the future? To ensure sufficient compliance with PC #71, BIM must not only adhere to vertical and horizontal buffers around observed concentrations of migratory birds, but also make reasonable efforts to identify them.

    c) We recommend that BIM work with QIA and MHTO / other HTOs as needed to identify known and observed concentrations of migratory birds in advance of each breeding season. This should include reviewing existing Inuit Qaujimajatuqangit (IQ) datasets, conducting nesting surveys, delineating concentration areas, and reporting boundaries to helicopter contractors for triggering avoidance.

Baffinland Response:

1. In the helicopter analysis, the compliance altitude is set at 1,110 magl within 1,500 m horizontal distance from the key moulting area (including the key moulting area). Outside of the 1,500 m horizontal distance from the key moulting area, compliance altitude is set at 650 magl. These altitude restrictions are in place during the moulting season (July and August).

2.

   a) Project Condition 59, to which this section of the report addresses, identifies the TEWG as a group advising on areas of concentrations of migratory birds. The report confirms that the TEWG has not provided information additional to what had been provided by ECCC (a TEWG member).

   b) Concentrations of migratory birds were identified in 1) the Project's bird baseline report (EDI Environmental Dynamics Inc. 2011), 2) a combination of breeding bird surveys, roadside waterfowl surveys, staging waterfowl surveys and PRISM plots conducted in 2012 (EDI Environmental Dynamics Inc. 2013), 2013 (EDI Environmental Dynamics Inc. 2014), 2014 (EDI Environmental Dynamics Inc. 2015), and 2015 (EDI Environmental Dynamics Inc. 2016). The extensive raptor surveys conducted from 2012 through to 2020 (report in associated annual reports) also would have noted substantial migratory bird concentrations – none of which were noted.

      Baffinland has made substantial efforts to find and update information on known concentrations of migratory birds in the RSA. The QIA is encouraged to re-familiarize themselves with the early discussions within the TEWG and the ongoing efforts.

   c) Baffinland has an outstanding request to the Mittimatalik Hunters and Trappers Organization (MHTO) for them to identify any areas of migratory bird concentrations in the RSA which may be of concern to them related to helicopter overflights (Setterington, e-mail communication with David Qamaniq, May 18 2022). As of July 21, 2022, no information was provided. Baffinland would also like to highlight that sustainable development team corresponded with QIA throughout May, 2022 to identify areas significant to migratory birds that had been identified by IQ. The QIA stated that the Tusaqtuvut studies did not directly include the identification of areas significant to migratory birds, and could not provide any additional areas known to be of importance to migratory birds.

      Baffinland conducts pre-clearing/pre-disturbance nest surveys annually. From 2012 through 2020, Baffinland conducted cliff nesting raptor surveys. In addition to the surveys noted in answer to part (b) above, it is unclear what the QIA means by "…*This should include… conducting nesting surveys*…" and how that would inform on concentrations of migratory birds in the RSA.

      To date, the boundaries of the "snow goose area" as provided by ECCC through TEWG interactions, are known to Baffinland's helicopter pilots.

      Baffinland is unaware of IQ datasets outside of the ones used to inform the Project Baseline, including the IQ information gathered specifically for the Project. Baffinland requests that the QIA provide specific reference to the IQ datasets to which they reference.

Comment No.:	QIA-17
Section Reference:	5.1 Methods, p. 16-17
Comment:	

RE: Each line segment represented a straight line between two consecutive flight tracklog points within the same transit…the first and last flight in segments of a flight as the helicopter takes off or lands were considered compliant…

What was the average line segment length? How often is the height tracked? Please provide more explanation on how often flight heights were logged and line segment length. Regarding considering the first and last line segments compliant, this is logical but it would still be helpful to consider these areas as important disturbance locations, rather than just considering them to be compliant. How were these segments summarized based on the 6 categories you describe on p.17?

Baffinland Response:

Baffinland considers the level of reporting on helicopter overflights (Section 5) sufficiently detailed to inform on further efforts required to achieve compliance. The analysis and reporting address all TEWG recommendations to date and exceeds all known helicopter overflight reporting of all mining projects in Nunavut. The suggestions exceed the scope and intent of the TEMMP.

Comment No.:	QIA-18
Section Reference:	TEAMR, Section 5.2 – Helicopter Overflight Results
Comment:	

We disagree with BIM's decision to categorize flights within the Snow Geese area where the 1,110magl was not achieved, but a rationale for low-level flying was given, as "compliant with rationale".

The purpose of Project Conditions (PCs) #59 and #71 is to mitigate potential adverse impacts of project activities on snow geese during the moulting period and compliance should be determined based on whether or not this was achieved, not based on BIM contractors' efforts. We recognize that BIM's helicopter contractors need to prioritize aircraft and human safety, but instances where buffers could not be adhered to are actually **non-compliant with rationale**. The use of this language throughout the 2021 TEAMR (and in earlier annual reports, as we have repeatedly identified) is incredibly misleading and allows BIM to imply a much higher level of compliance with PCs #59 and #71 than what was actually achieved. In addition, BIM regularly combines "compliance with rationale" with true compliance (compliance with no rationale needed) when making conclusions about compliance throughout the 2021 TEAMR, such as in Exec summary, p. iv ("compliance with height requirements within the Snow Geese area during the moulting season (July and August) was 72%"). This is simply incorrect, as Table 5-3 shows true compliance was 20%. Table 5-4 shows an alarming 839.67 hours of helicopter time that was below 650 magl requirement, suggesting that helicopter overflights may be having a much larger effect on migratory birds and other wildlife than Baffinland predicted in the FEIS.

Recommendation:

1. All helicopter flight instances categorized as "compliant with rationale" should be re-named "non-compliant with rationale", and conclusions regarding compliance with PCs #59 and #71 made throughout the 2021 TEAMR should be revised accordingly.

2. Has there been any effort to use this extensive flight time to collect caribou observations or other wildlife observations? This seems like a missed opportunity. Consider options for concurrent collection of wildlife observations if observers can be included on flights.
3. The July map (Map 5-3) shows a lot of time spent to the southeast of the mine site – is this exploration activity? How is this activity accounted for in FEIS predictions? Was it considered as part of the cumulative effects assessment?

Baffinland Response:

1. Baffinland considers the reporting sufficient to inform on further helicopter overflight management requirements.
2. Caribou and other wildlife observations from helicopter overflights are noted in the incidental wildlife observation logs.
3. It is beyond the scope of the annual report to describe reasons for areas of helicopter activity. Cumulative effects of helicopter overflights were addressed as part of the Phase 2 assessment (Knight Piesold 2019)

References

Knight Piésold Ltd. 2019. Memorandum: Mary River Project — Phase 2 Proposal — Revised Addendum to Technical Supporting Document 27 - Cumulative Effects Assessment. NIRB Registry 326516. Submitted to Baffinland Iron Mines Corporation, Oakville, Ontario. 47 pp.

Comment No.:	QIA-19
Section Reference:	5.2, pp. 20-24
Comment:	

Maps 5-1 through 5-5 (pp. 20-24) should have walrus haulouts marked due to the species' sensitivity to aerial disturbance and possible proximity of aircraft transits.

Baffinland Response:

The Terrestrial Annual Monitoring Report focuses on terrestrial species. Walrus are a marine mammal.

Comment No.:	QIA-20
Section Reference:	5.2, pp. 20-24
Comment:	

Maps 5-1 through 5-5 (pp. 20-24) should be overlaid with IQ data on caribou calving and post-calving areas, to determine what areas should be avoided to minimize impacts to caribou.

Baffinland Response:

The helicopter overflight analysis has been focused on flight-heights related to potential disturbance to birds. Flight heights for birds (650-1100 magl, depending on location and timing with respect to moulting; refer to Section 5.1 of the 2021 TEAMR) are greater than those recommend for caribou (300 magl, per DIAND Caribou Protection Measures). The maps focus on the snow goose area and compliance with Project terms and conditions.

References:

DIAND Caribou Protection Measures, Appendix I, *Nunavut Planning Commission. 2000. North Baffin Regional Land Use Plan. 124 pp*

Comment No.:	QIA-21
Section Reference:	TEAMR, Section 5.2 – Helicopter Overflight Results and Discussion
Comment:	

BIM states that a total of 261 (10%) of transits between May and September "intersected" the Snow Goose area. It is not clear whether this is referring to transits intersecting the snow goose moulting area alone, or the snow goose moulting area plus the 1,500m horizontal boundary in which transits should be avoided. The term "over snow goose area" is also used throughout Sect 5.2 of the TEAMR (Table 5-1, Table 5-2) and it is not clear what this means.

Recommendation:

1. Please clarify whether transits that "intersect" or are "over the snow goose area" include the 1,500m horizontal avoidance buffer.

Baffinland Response:

Transits that intersect or are over the snow goose area do include the 1,500 m horizontal avoidance buffer, as the flight altitude is still 1,100 m within 1,500 m of the key moulting area. The text in the 2021 TEAMR will be updated to clarify this.

Comment No.:	QIA-22
Section Reference:	TEAMR, Section 5.2 – Helicopter Overflight Results and Discussion

Comment:

BIM states that "low-level flights with rationale will likely continue in future years as most of the helicopter work conducted at the Project required either low-level flying for safety/operational reasons (e.g. slinging, surveys) or 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)" (p. 25). QIA is concerned with this statement, considering that flights that are "compliant with rationale" make up the highest total percentage of flights, both within the Snow Geese area during the moulting season (Table 5-3) and in general (Table 5-4). Given the relatively high total hours and percentage of flights that are "compliant with rationale" (11.483 hours and 51.976%) within the snow geese area in the moulting season, measures should be taken to minimize low-level flights rather than accept that they will continue to occur. We do not agree with Baffinland's conclusion that no recommendations for future mitigations are required at this time (p. 26).

The most common reasons for flying below altitude included slinging, drop off/pick up, and sampling. Has BIM considered alternate measures to improve compliance with PCs #59 and #71? For example, could sampling locations be adjusted without impacting monitoring study design, or could drop-off/pick-up occur via the Tote Road and vehicles during the moulting season (July and August)?

Recommendation / Information Request:

1. Please provide more information on whether BIM has considered alternate measures to slinging, drop off/pick up, and sampling during the moulting season (July and August) to better avoid disturbance to the snow geese moulting area and ensure better compliance with PCs #59 and #71.
2. Baffinland is requested to review options for improving mitigation measures to ensure that the intent of PCs 59 and 71 is being met. It would be helpful to understand if non-compliant flights are well below the height requirement by activity (i.e., slinging, drop off / pick up, survey, etc. as per Table 5-5) to further explore what mitigations may be possible.

Baffinland Response:

1. There are no alternative measures to slinging. Slinging generally occurs in remote areas that are not accessible by the Tote Road. For example, to/from the Brucehead narwhal observation camp and for various monitoring programs (ie. dustfall, AEMP lakes, vegetation surveys). Due to the limited accessibility of these sites, pick-ups and drop-offs cannot be adjusted to improve compliance. Most sampling areas that are accessed by helicopter are reference sites (> 1 km from the PDA) and therefore cannot be safely accessed by field staff on foot. Many of these areas also have terrain that further limits the ability of field staff to access on foot. Additionally, eliminating the use of helicopters would prevent programs from being completed in a timely manner due to the short duration of the field season and lack of resources (ie. vehicles) on site. Baffinland encourages the QIA to review current monitoring locations that are accessed by helicopter, and provide propose alternative sampling locations with rationale, that would still satisfy the study design.
2. As mentioned in response to QIA-33, Baffinland will continue to investigate controls that can be implemented at the Project to mitigate potential impacts associated with helicopter travel.

Comment No.:	QIA-23
Section Reference:	TEAMR, Section 5.2 – Helicopter Overflight Results and Discussion, p. 26
Comment:	

Baffinland states: "Although most transits were below the recommended elevations, based on the results of the noise monitoring study conducted in 2020, helicopter noise, while consistently above 55 dBA in all distance categories, was infrequent, especially away from the Mine Site."

1. What does "cumulative frequency of impulsive aircraft noise over these sites was still less than 2%" mean?
2. What cumulative frequency are you referring to?
3. Where are these data summarized?
4. What locations were monitored for noise in relation to the locations of helicopter flights, and particularly the areas where low elevation flights regularly occurred?
5. Was there any effort to look at areas that are particularly important or sensitive to helicopter noise made?
6. Are these percentages (no single site exceeded 1% frequency of impulsive aircraft noise; cumulative frequency of impulsive aircraft noise over these sites less than 2%) summarized on an annual basis or only for time period where helicopter flights occur (i.e., the flight window between May – September)?

Baffinland Response:

1–3. Noise monitoring results were summarized in Section 5 of the 2020 annual report (EDI, 2021). A specific citation to the 2020 annual report will be included to further direct the reader.

4. This question was asked (2020 TEAMR QIA 17) and answered in the 2020 TEAMR, with sound monitoring locations mapped in TE Map 2.

5. The sound monitoring focused on distance from project; they were not area-specific.

6. The QIA should refer to Section 5 of the 2020 TEAMR that they reviewed in 2021 to address the questions they are asking.

References:

EDI Environmental Dynamics Inc. 2021. 2020 Terrestrial Environment Annual Monitoring Report. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario. 588 pp.

Comment No.:	QIA-24
Section Reference:	TEAMR, Section 5.3 – Inter-annual trends
Comment:	

The second paragraph in this section discusses compliance by grouping compliant and compliant with rationale.

Grouping flights that are compliant and compliant with rationale (see previous comment re: changing to non-compliant with rationale) does not make sense to understand the true impact of these flights. Please consistently summarize flight data into the three categories. If you need to group data, the only grouping that makes sense in terms of being able to evaluate the impacts of these flights is to group flights into compliant and non-compliant, where non-compliant includes those with and without rationale (i.e., any flight that does not meet the height requirement).

Baffinland Response:

Ungrouped values are discussed in the fourth paragraph and shown in Tables 5-10 and 5-11. We will update the inter-annual trends section in the 2021 TEAMR report to include ungrouped compliant and compliant with rationale values in the figure that the second paragraph refers to and clarify in the text that the values are combined compliance.

The category of "compliant with rationale" will continue to be used. This category addresses wording of Project Condition 59 stating… "*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*** *…*". Because the flights are conducted for specific operational purposes, the categorization is appropriate for Project Condition compliance monitoring.

Regarding assessing impacts of low-level flights, refer to the answer to QIA-06 and QIA-18.

Comment No.:	QIA-25
Section Reference:	TEAMR, Section 6 – Tote Road Traffic
Comment:	

Table 6-1 shows mean total vehicle transits along the Tote Road by year but does not provide daily maximum or minimum values. Figure 6-1 shows maximums in the vehicle transits per day, notably for 2021, where the mean is lower than the FEIS prediction, but the boxplot whiskers show many days that are well above this number. Figure 6-2 shows that there were few-to-no ore truck transits during the May 2021, however there is no discussion in Section 6 on why this is the case. The fact that there were few-to-no ore haul transits in May 2021 likely skews the annual mean number of ore haul transits for 2021, which was only slightly below the value predicted in the Final Environmental Impact Statement (FEIS) addendum and this is concerning. It is not clear whether the predicted mean number of ore transits from the FEIS is a monthly or annual value. We are concerned that monthly exceedances of the mean number of ore haul transits have implications for wildlife during sensitive periods, and the information in Section 6, as currently presented is not conducive to completing this analysis.

Recommendation:

1. Please explain why few to no ore truck transits occurred during May 2021.

2. Please confirm whether the mean number of 236 daily ore haul transits predicted in the FEIS is meant to be a monthly target or an annual target.
3. We recommend that BIM provide a breakdown of daily mean and total vehicle transits (ore haul, non-haul, and combined) by month for 2021 (e.g., a table similar to Table 6-1 for the data presented in Figure 6-2). This will help us better assess potential concerns related to wildlife, vehicle traffic, and any seasonal sensitivities. Please also report out on monthly maximum and minimum values.

Baffinland Response:

1. Operations were suspended during April and May of 2021 due to the COVID-19 Delta variant outbreak (memo attached), which resulted in fewer transits along the Tote Road.
2. The mean number of 236 daily ore haul transits is based on an annual average, which equates to 118 ore loads per day, as each load requires two transits (Mary River to Port and Port to Mary River).
3. Although the QIA makes it clear in their question that monthly averages are apparent from the current daily traffic presentations, a table of monthly averages is included in the final version of the 2021 report.

Comment No.:	QIA-26
Section Reference:	TEAMR, Section 7.1, p. 36
Comment:	

"Six Dustfall monitors installed to collect dust at a height of 0.5 m. These 'short' monitors are part of a pilot study to investigate the variability between dustfall sampling at the standardized height of 2.0 m and closer to ground level. This program was implemented in response to specific requests from the QIA."

1) The report should explain why a height of 0.5 m was chosen to represent the deposition of dust at ground level.
2) Was any effort made to correlate data from short monitors to dustfall levels on the ground? For example, snow core sampling could be an effective way to groundtruth the short monitors. Snow core sampling would show how much dust is being deposited at ground level over time, which can be compared to the dust collected by the short monitors.

Baffinland Response:

1. The explanation of the short dustfall collector program is included in the final report. The text included in the report is quoted below.

The shorter dustfall height was chosen based on discussions in the TEWG beginning in 2018, culminating in a request by NIRB during the Phase 2 hearing, and Baffinland acquiescing and installing six 0.5 m dustfall collectors in the fall of 2021 to address the repeated requests and interests in non-standard dustfall sampling.

At the December 2018 TEWG meeting, the GN began requesting experimenting with dustfall collector heights. The request was made again in the June 2019 TEWG meeting. The GN, together with the QIA who supported the GN request, requested shorter collectors in February 2020. The topic was also introduced at the Phase 2 hearing, where the transcript includes (from NIRB's Executive Director Karen Costello):

> *"It is the Board's understanding that Baffinland currently places their dust fall monitoring stations at a standardized height of 2 metres at varying distances away from the tote road. Modifications to this approach had been made by other Nunavut mines and have — and it has been recommended by several – at several terrestrial environment working group meetings with members that Baffinland should install dust fall stations at multiple heights at each location in order to increase Baffinland's understanding of the potential effects that dust from the tote road may be having on the nearby terrestrial environment.*
>
> *…and noting that other Nunavut mines have modified this 2-metre standard, can Baffinland explain their rationale for continuing to only measure at a height of 2 metres despite community and intervenor concerns about their dust monitoring program?"*

Baffinland provided a written response to NIRB's request (Baffinland 2021), clarifying to the NIRB that, as an example, Agnico Eagle's Meadowbank Project initially collected passive dustfall at ground-level up until 2018. However, Environment and Climate Change Canada (ECCC) commented in 2018 that collecting dustfall samples at the ground-level was not common practice (ECCC 2018). ECCC indicated wide variability in the concentration of particles subject to settling at low heights and that both wind and snow at ground-level will unacceptably impact data. Further, they indicated a preference for methods to be consistent among sites and follow relevant quality assurance guidance, such as ASTM 2010. In response to ECCC comments and recommendations (Walker 2020) on the Meadowbank 2018 Air Quality and Dustfall Monitoring Report (Agnico-Eagle Mines 2019), Agnico switched dustfall monitoring to the ASTM's 2-metre sampling height (Agnico-Eagle Mines 2020).

Though Baffinland believes their passive dustfall sampling program adequately informs on project-related dustfall and has triggered adaptive management responses as it was designed to do, Baffinland initiated dustfall sampling at a height of 0.5 m at six year-round sampling locations.

The 0.5 m was selected to be as close to ground level as possible, while avoiding ground contamination (ground level sampling at Meadowbank has been contaminated by small rodents, which have been found in the sample containers).

References:

Costello, K. 2021. Hearing Volume 4: Phase 2 Development Project Proposal - Mary River Iron Ore Mine NIRB File Number 08MN053. Nunavut Impact Review Board Transcripts, Iqaluit and Pond Inlet, Nunavut.
Response to NIRB-9, *Baffinland Iron Mines Corporation. 2021. Post-Hearing Question Responses Phase 2 Proposal – Mary River Project. NIRB Registry No. 334146. Oakville, Ontario, Canada. 339 pp.*

Environment and Climate Change Canada. 2018. Agnico Eagle Mines Ltd. – Meadowbank Gold Project and Whale Tail Project – 2017-2018 Annual Monitoring Report ECCC, Responses to NIRB Recommendations. NIRB File 03MN107/16MN056, NIRB Registry No. 321551. 9 pp.

Walker, E. 2020. ECCC Comments RE: 03MN107/16MN056 – Agnico Eagle Mines Ltd. – Meadowbank Gold Mine and Whale Tail Pit Projects - 2019 Annual Report. NIRB File: 03MN107/16MN056, NIRB Registry No. 330678. Environmental Protection Operations Directorate, Prairie and Northern Region, Yellowknife, Northwest Territories, Canada. 15 pp.

Agnico Eagle Mines Limited – Meadowbank Division. 2019. Appendix 39 Meadowbank and Whale Tail 2018 Air Quality and Dustfall Monitoring Report NIRB Document 190409-03MN107 16MN056. NIRB Registry No. 324365. Agnico Eagle Mines Limited. 229 pp.

Agnico Eagle Mines Limited – Meadowbank Division. 2020. Appendix 41. Meadowbank and Whale Tail 2019 Air Quality and Dust Monitoring Report; NIRB Document 2000421-03MN107 16MN056. NIRB Registry No. 329470. Agnico Eagle Mines Limited. 64 pp.

2. Dustfall rates are monitored directly through the passive dustfall monitoring program. Dustfall extent is monitored using remote sensing. Dustfall effects are also monitored indirectly at ground level via monitoring of soil and vegetation. Additionally, snow sampling was conducted in the vicinity of the passive dustfall samplers in winter 2020, 2021 and 2022; preliminary results for late 2020 were included in Baffinland's response to the NIRB Annual Monitoring Report 90 Day Recommendations, on January 28th, 2022 (available publicly via the NIRB registry).

   Efforts have been made to cross-reference passive dustfall data and snow sampling data (among other endpoints). However, these endpoints are not directly comparable (i.e., passive dustfall monitoring provides a rate of dustfall, whereas snowfall sampling will provide a concentration of total suspended solids).

Comment No.:	QIA-27
Section Reference:	7.2 Dustfall Suppression and Mitigation, p. 36
Comment:	

In the past a product called Dust Stop, also produced by Cypher Environmental, was used for dust control along the tote road.

- Why the switch in products and what are the differences between Dust Stop and DustBlockr?

Baffinland Response:

DustBlockr is the new trade name for DustStop. This product is still produced by Cypher Environmental, and there is no change besides the name.

Comment No.:	QIA-28
Section Reference:	7.2 Dust Suppression and mitigation, p. 37
Comment:	

RE: 22,900 kg of calcium chloride were applied along the tote road in 2021.

1. When and where relative to the DustBlockr and water applications was the calcium chloride applied to the Tote Road?

RE: "A plan exists to treat more ore stockpiles at Milne Port with DusTreat."

2. When will this plan be implemented?

Baffinland Response:

1. All water volumes for dust suppression are captured in Baffinland's monthly water license reports, which are submitted to NWB. These reports are publicly available for reference on the NWB public registry (https://www.nwb-oen.ca/content/public-registry). A summary of calcium chloride applications is provided in the table below, which includes application location, amount in kilograms, and date of application.

Date of Application	Amount of CaCl Applied (Kg)	Km Start	Km End	Spread distance (km)
04-Jun-2021	10,000	40	42.5	2.5
04-Jun-2021	10,000	42.5	47	4.5
04-Jun-2021	10,000	47	52	5
04-Jun-2021	10,000	52	55.5	3.5
05-Jun-2021	7,000	55.5	59	3.5
05-Jun-2021	8,000	59	63	4
11-Jun-2021	10,000	62	69	7
11-Jun-2021	10,000	69	75	6
17-Jul-2021	5000	11	16	5
17-Jul-2021	5000	16	21	5
17-Jul-2021	5000	21	26	5
17-Jul-2021	5000	26	31	5
17-Jul-2021	5000	31	36	5
17-Jul-2021	5000	36	41	5
18-Jul-2021	5000	100	95	5
18-Jul-2021	10000	95	98	5
18-Jul-2021	10000	90	85	5
22-Jul-2021	5000	69	73	4
22-Jul-2021	5000	73	77	4
22-Jul-2021	5000	69	64	5
22-Jul-2021	2500	102	MSC	1
22-Jul-2021	5000	55	60	5
22-Jul-2021	5000	50	55	5
22-Jul-2021	5000	10	15	5
22-Jul-2021	5000	40	45	5
23-Jul-2021	5000	30	35	5
23-Jul-2021	5000	50	55	5
23-Jul-2021	5000	75	80	5
23-Jul-2021	5000	80	85	5
23-Jul-2021	5000	62	67	5
23-Jul-2021	5000	20	25	5
23-Jul-2021	5000	30	35	5
23-Jul-2021	5000	35	40	5
23-Jul-2021	5000	45	50	5
24-Jul-2021	5000	OHT Laydown	MSC	1
24-Jul-2021	5000	100	97	3

A summary of DUST BLOKR applications is provided in the table below, which includes application location, amount in litres, and date of application.

Date of Application	Amount of DUST BLOKR Applied (L)	Km Start	Km End	Spread Distance (km)
13-Jun-2021	2000	1	4.5	3.5
14-Jun-2021	2000	1	4.5	3.5
14-Jun-2021	2000	100	103	3
15-Jun-2021	2000	80	87	7
15-Jun-2021	2000	28	21	7
15-Jun-2021	2000	80	77	3
15-Jun-2021	2000	100	103	3
16-Jun-2021	2000	77	80	3
16-Jun-2021	2000	87	90	3
16-Jun-2021	2000	90	93	3
18-Jun-2021	2000	74	77	3
18-Jun-2021	2000	93	102	9
18-Jun-2021	2000	4.5	14	9.5
18-Jun-2021	2000	90	93	3
19-Jun-2021	2000	73	76	3
19-Jun-2021	2000	76	79	3
19-Jun-2021	1000	80	86	6
19-Jun-2021	2000	97	100	3
19-Jun-2021	2000	14	20	6
20-Jun-2021	1000	73	76	3
20-Jun-2021	1000	40	28	12
20-Jun-2021	2000	86	91	5
20-Jun-2021	2000	6	14	8
21-Jun-2021	2000	73	77	4
21-Jun-2021	2000	14	29	15
21-Jun-2021	2000	94	91	3
22-Jun-2021	2000	33	30	3
22-Jun-2021	2000	60	57	3
		30	27	3
22-Jun-2021	2000	73	71	2
22-Jun-2021	2000	36	33	3
26-Jun-2021	2000	17	33	16
27-Jun-2021	2000	33	40	7
27-Jun-2021	2000	2	15	13
28-Jun-2021	2000	69	60	9
28-Jun-2021	2000	85	80	5
28-Jun-2021	2000	83	88	5
28-Jun-2021	2000	73	78	5
29-Jun-2021	2000	69	63	6
29-Jun-2021	2000	100	95	5
29-Jun-2021	2000	80	85	5
29-Jun-2021	2000	57	60	3

29-Jun-2021	2000	33	50	17
29-Jun-2021	2000	4	17	13
01-Jul-2021	2000	97	80	17
01-Jul-2021	2000	2	17	15
01-Jul-2021	2000	17	33	16
01-Jul-2021	2000	57	53	4
01-Jul-2021	2000	100	97	3
02-Jul-2021	2000	97	89	8
02-Jul-2021	2000	89	84	5
02-Jul-2021	2000	97	100	3
02-Jul-2021	2000	2	33	31
02-Jul-2021	1000	2	7	5
03-Jul-2021	2000	83	88	5
03-Jul-2021	2000	76	80	4
03-Jul-2021	1000	2	10	8
04-Jul-2021	1000	40	50	10
04-Jul-2021	2000	7	17	10
05-Jul-2021	2000	18	31	13
05-Jul-2021	2000	97	94	3
06-Jul-2021	2000	96	93	3
06-Jul-2021	2000	93	88	5
06-Jul-2021	2000	50	55	5
07-Jul-2021	2000	60	66	6
07-Jul-2021	2000	69	80	11
07-Jul-2021	2000	85	90	5
07-Jul-2021	2000	92	89	3
07-Jul-2021	2000	89	86	3
08-Jul-2021	2000	97	80	17
08-Jul-2021	2000	72	76	4
08-Jul-2021	2000	92	76	16
08-Jul-2021	2000	97	80	17
08-Jul-2021	2000	89	86	3
08-Jul-2021	2000	70	65	5
09-Jul-2021	2000	80	77	3
09-Jul-2021	2000	76	72	4
09-Jul-2021	2000	82	77	5
09-Jul-2021	2000	70	75	5
09-Jul-2021	2000	64	60	4
10-Jul-2021	2000	92	82	10

2. The Shiploading Department at Baffinland already documents all DusTreat applications, which is monitored internally. There were ten DusTreat applications throughout 2021, with a total of 55,000 L of DusTreat having been applied to the ore stockpile. Baffinland can consider implementing a set schedule for DusTreat applications, however, external factors (ie. cold temperatures, insufficient staff, heavy ore pad traffic during the shipping season – posing safety concerns) limit the ability to successfully execute such a program.

Erratum: The original 2021 TEAMR cited “22,900 kg of calcium chloride” application based on available information. This value has been updated according to the final application values.

Comment No.:	QIA-29
Section Reference:	7.3.1 Review of Supporting Data (Passive Dustfall Monitoring), pg. 37
Comment:	

“The dustfall monitoring program involves reviewing supporting data that could influence the volume and extent of dustfall during 2021.” Supporting data listed is climate data and traffic data.

1. How has Baffinland considered road transits in their analysis of dustfall?
2. How has Baffinland considered data on windspeed and/or rain events in their analysis of dustfall?
3. How will impacts of weather on dustfall be considered in light of ongoing failures with weather monitoring tools?

Baffinland Response:

1 & 2. During initial screening of data, potential trends and relationships are examined between Tote Road transits, weather data (including wind speed and direction), precipitation and dustfall rates. No trends or relationships have been identified to date.

3. Any failures that occur with weather monitoring tools (climate stations) result in decreased data, and so hinder the correlation investigation. Also, it is also difficult to monitor climate data to a detailed level along the Tote Road, where changing topography can result in ‘wind tunnels’ and other variable weather patterns.

Comment No.:	QIA-30
Section Reference:	7.3.1.1 Review of Supporting Data, p. 37
Comment:	

The link to the Climate section in the second bullet is broken.

Baffinland Response:

The link is fixed in the final version.

Comment No.:	QIA-31
Section Reference:	7.3.1.2 Passive Dustfall Sampling, p. 38
Comment:	

The percentage of isopropyl alcohol in the canisters was increased to 75% in 2021 to prevent freezing of the liquid media.

- During its deployment was this alcohol ever diluted by snowfall to the extent that it froze?

Baffinland Response:

It was discovered after the 2021 draft was completed that the 75% isopropyl alcohol was not used. The program runs a year behind on supplies because of the sealift schedule. The 75% isopropyl alcohol will be deployed starting in fall 2022. It is inevitable that some alcohol is diluted by snowfall and freezes; this represents an inherent challenge for winter sampling. That said, we suspect that mitigation of snowfall would simultaneously block or impair collection of dustfall.

Comment No.:	QIA-32
Section Reference:	7.3.1 Review of Supporting Data (Passive Dustfall Monitoring), Table 7-1, pg. 40
Comment:	

Table 7-1 gives a summary of dustfall monitoring stations as well as the expected dustfall exposure.

What are the definitions of the categories of "High", "Moderate" and "Low"? This should be included for reference.

Baffinland Response:

A footnote will be added to the table with the definitions of high, moderate, and low categories.

Comment No.:	QIA-33
Section Reference:	7.3.2.1 Magnitude and Extent of 2021 Dustfall, p. 47
Comment:	

Re: "…the helicopter flew low, directly over the dustfall monitors, likely contaminating the samples."
"Two outlying data points were identified, one from DF-M-04 and one from DF-M-07, both during July 2021; a review of the helicopter flight data indicates that because of a low ceiling during July sample collection, the helicopter flew low, directly over the dustfall monitors, likely contaminating the samples."

Helicopter flight influence on dustfall data is noted in table 7-3 (pg. 49), pg. 53, and pg. 90.

Pg. 90 states that dustfall at helicopter access monitoring locations was artificially elevated in July… "these data were included in 2021 analyses but have been flagged as likely artificially elevated."

This information is indicating that low helicopter flights have a real influence on the amount of dustfall occurring on the landscape.

1. What measures will be taken to prevent a recurrence of this problem in the future?
2. Dustfall dispersion by helicopters needs to be investigated further, especially when helicopters fly over areas of high importance for Inuit.

Baffinland Response:

1. Training materials for both BIM Environment staff and helicopter pilots were developed that describe mandatory distance for helicopter landings at all dustfall samplers and take off/landing instructions (based on wind direction) and flight heights. A new training review and sign-off system was developed. All new staff will be required to complete this training.
2. Baffinland will continue to investigate controls that can be implemented at the Project to mitigate dustfall dispersion by helicopters.

Comment No.:	QIA-34
Section Reference:	7.3.3.1 Seasonal Dustfall, p. 62
Comment:	

RE: "Mine Site--No direct year-over-year increases in dustfall were identified."

- Contrary to this assertion the mean daily dustfall was higher in every month of 2021 than it was in the same months of every previous year reported, except for August 2016, despite the augmented dust control measures in 2021 (see Figure 7-10). Why was more dust generated or captured in 2021?

Baffinland Response:

Sentence was adjusted: “No multi-year trends in increasing dustfall were identified, however dustfall in 2021 was among the highest measured since 2016, driven by increases at DF-M-01.”

Comment No.:	QIA-35
Section Reference:	7.3.3.1 Seasonal Dustfall, p. 63
Comment:	

Monthly mean daily dustfalls at the South Crossing of the Tote Road (K78) were higher in 2020 than in 2021 (Figure 7-13, p. 67). Application of DustBlockr along the full length of the Tote Road in 2021 was suggested as the reason for this decline in dustfall.

- What then is the explanation for lower monthly mean daily dustfalls in 2019 than in 2021, when efforts to control dust were augmented in 2021 and there were 3,949 more ore truck transits and 5,238 more non-haul transits in 2019 (Table 6.1)?

Baffinland Response:

2021 was the first year of full DustBlockr application along the full length of the Tote Road. Dustfall along the Tote Road is likely affected by many factors, including traffic transits, weather, and dustfall mitigations such as roadbed watering, application of calcium chloride, and the application of DustBlockr. It was suggested that the decrease in Tote Road dustfall in 2021 "may be related to the application of DustBlockr®". The project will continue to monitor the dustfall along the road in effort to determine if DustBlockr is resulting in a measurable effect.

Comment No.:	QIA-36
Section Reference:	7.3.3.3 Sampling Height Pilot Study, p. 69
Comment:	

This section should reiterate that the results presented are preliminary and based on only 3 months of sampling data.

Baffinland Response:

The sample duration is identified in Section 7.3.1.3, and already includes the statement "*Results summarized in this report represent preliminary findings, given that only three months of data are available; the 2022 annual monitoring report will present data from a full year of sampling.*"

Comment No.:	QIA-37
Section Reference:	7.4.2.1 Scene Distribution, p. 73
Comment:	

Only one useable Landsat 8 image was available for the mine site in 2021, which resulted in minimal dustfall extent extraction.

- What options does Baffinland have for preventing future data loss of Landsat 8 data?

Baffinland Response:

Image availability and timing around snowfall events are out of Baffinland's control. It is determined by the satellite image acquisition date and the weather. Baffinland uses all available cloud-free images from Landsat (and Sentinel-2) satellites from mid-March to mid-May to estimate the dustfall extent across the landscape. As of Nov 2021, Baffinland now has access to Landsat 9 imagery (comparable to Landsat 8), which should provide more images to use in the analysis. In the upcoming 2022 TEAMR report, we will consider combining the Landsat and Sentinel-2 datasets into one to provide a more spatially consistent dataset.

Comment No.:	QIA-38
Section Reference:	7.4.2.2 Dustfall Concentration Estimation, p. 74
Comment:	

RE: "While the dustfall monitors provided an estimate of dustfall concentration for visible dust in the satellite images, it measured all the dustfall over the sample period, not necessarily what was visible when the satellite image was captured."

- This disconnect between the point in time satellite images that are sensitive to cover by snowfall events, and the longer duration of the passive dustfall collection must add a great deal of uncertainty to the resulting satellite dustfall estimates. Has the sensitivity of the dustfall estimates to the timing and frequency of the satellite image collection and to the frequency of passive dustfall sampling been tested and, if so, how sensitive are the results and what can be done to improve their accuracy?

Baffinland Response:

A sensitivity analysis was not conducted relating the dustfall estimates to the timing and frequency of satellite image collection and to the frequency of passive dustfall sampling. As detailed on page 72, daily dustfall concentrations from the dustfall monitors were summed between the date of the last snowfall event, as determined from the precipitation data, and the date of the image. This was done to account for snowfall events and the potential issue brought up in the referenced statement. The statement referenced in the comment may be out of place in the 2021 TEAMR report and will be updated to reflect the methods.

Further analysis on dustfall concentration estimation from satellite imagery will be conducted in the 2022 TEAMR report with the addition of snow samples that were collected in the spring of 2022.

Comment No.:	QIA-39
Section Reference:	7.4.3 Inter-annual Trends, p. 78
Comment:	

RE: "The dustfall extents from 2014 to 2021 (Map 7-6 and Map 7-7) did not reflect a parallel relationship to the increase in ore haul transits or total transits along the Tote Road (Section 6 Tote Road Traffic)."

- Is this an artefact of timing of satellite photos in relation to snowfall and wind events or some other factor?

Baffinland Response:

The timing of image acquisition may be a factor; however, more traffic on the road does not necessarily mean the dustfall extent will increase. It is suspected that annual variability in wind, precipitation, and ore type (e.g., lump vs. fines being less or more prone to suspension) may play a role.

Comment No.:	QIA-40
Section Reference:	Section 7.4.3 Inter-Annual Trends (Dustfall Imagery Analysis), Map 7-2, pg. 80.
Comment:	

This map shows a substantial decrease in dust dispersion within Milne Inlet between 2020 and 2021 from both the Sentinel-2 data and the Landsat 8 data. There is a hypothesis that this is from the use of DustBlockr on ore stockpiles (pg 77 -78). This hypothesis is not examined in depth, however. Can this hypothesis be tested?

In other areas, such as the Mine Site and the Tote Road, DustBlockr is not hypothesized to be reducing dust dispersion (pg 78). In fact, pg. 78 states that dust is extending further south and northwest than in 2020 and that "dustfall concentration is higher in localized spots than in previous years". This is occurring despite the use of DustBlockr throughout the Mary River Mine.

Baffinland Response:

There was an error in the types of products mentioned for dust suppression in this section. DusTreat was used on the ore stockpiles at Milne Port, whereas DustBlockr was used on the Tote Road and airstrip by the Mine Site. The text will be corrected. Also, the ore piles were treated regularly throughout the winter months, whereas the tote road was treated during the summer months — as described in section 7.2 pg 36-37. This may explain the difference between the sites.

The application of DusTreat and the dustfall extent/concentration will need to be monitored for multiple years before an in-depth analysis can be conducted.

Comment No.:	QIA-41
Section Reference:	Section 8 Vegetation, pg. 92.
Comment:	

"Data collection for long-term vegetation monitoring was completed in 2021 at the Mary River Project for the following programs: dustfall monitoring; and vegetation and soil base metals monitoring."

Data from the vegetation monitoring program does not appear to be analyzed alongside data from dustfall monitoring.

Pg. 94 states "Sampling distances were informed by the results of the dustfall monitoring program." The report never explains how the results of the dustfall monitoring program were used to inform sampling distances.

Sampling should take place in areas where dustfall is most concentrated, as well as in areas where dustfall is less concentrated, thereby measuring the relationship among metals in lichens, soils, and dustfall.

Baffinland Response:

Dustfall Monitoring and Soil/Vegetation (Lichen) Metals Monitoring are distinct endpoints. There is no explicit requirement to consolidate these datasets and conduct a cross-disciplinary analysis.

Based on previous TEWG discussions (e.g., 26 February 2020, 11 Dec 2018, 22 March 2018, and others) regarding the potential relationship between dustfall and soil/lichen metals, the ongoing soil/vegetation metals monitoring program has emphasized the sampling of soil and lichen in proximity to permanent dustfall sampling locations. Likewise, similar sampling distance categories (Near, Far, Reference) for these locations have been applied with intention is cross-referencing any potential directional trends. In the 2020 TEAMR (EDI Environmental Dynamics Inc. 2021. Mary River Project — TEAMR. Prepared for Baffinland Iron Corporation), a preliminary cross-disciplinary evaluation of dustfall and soil/veg metals data was completed. Refer to Appendix I of the 2020 TEAMR). No meaningful and/or unifying data trends were identified.

Sampling locations are informed by methods described in the TEMMP. Rationale for siting sampling locations is provided in the 2021 TEAMR and all previous annual reporting versions. Monitoring history and changes in sampling procedures (i.e., accounting for recommendations from NIRB and the TEWG) are itemized under Section 8.1.1.1.

Comment No.:	QIA-42
Section Reference:	Section 8.1.1.2 Vegetation and Soil Sampling (Section 8 Vegetation), Table 8-1, pg. 95.
Comment:	

Table 8-1 Indicates that samples of soil and lichen were only collected near Milne Port and the Tote Road and at a distance between 100 and 1,000 m from Milne Port in 2021. No reference samples were taken.

Why was the sampling effort minimal in 2021?

Baffinland Response:

As described in the TEMMP (Baffinland Iron Mines Corporation 2019), "*…pending results from early analyses, monitoring will occur every 3–5 years as determined by changes to base metal concentrations*". Comprehensive Soil/Vegetation Metals Monitoring has been conducted annually since 2016. Baffinland has fulfilled its ongoing compliance monitoring requirements during this timeframe. Refer to section 8.1.1.1 Monitoring history and changes in sampling procedures at the Project.

For logistical reasons, timing and access, Soil/Vegetation Metals Monitoring in 2021 primarily focused on Milne Porte and the Tote Road resulting in a reduced sample size; sampling of Far/Reference sites were less represented in the data capture. These additional descriptors as to "why there was a lower sampling effort compared with previous monitoring years" will be added to Section 8.1.1.1 Monitoring history and changes in sampling procedures.

The 2022 program has targeted a comprehensive sampling schedule at the Project.

Comment No.:	QIA-43
Section Reference:	Section 8.1.1.3 Vegetation and Soil Base Metals Analysis, pg. 98, Table 8-2

Comment:

Re: cadmium guidelines in soils vs. lichen

There is an order of magnitude difference between the soil guidelines (1.4 mg/kg) and the lichen indicator values (30 mg/kg dry weight). This pattern is not repeated for other contaminants. Has Baffinland considered why the indicator level in lichen would be so much higher?

Baffinland Response:

As described in Section 8.1.1.3 of the 2021 TEAMR, soil metal concentrations are from the Canadian Council of Ministers of the Environment (CCME) soil quality guidelines for the protection of environmental and human health (available online: https://ccme.ca/en/resources/soil). No quality standards from the CCME are available for lichen metal concentrations. Therefore, indicator values were chosen from available peer-reviewed literature sources pertinent to the Canadian High Arctic (if/where available). Where available, indicator values for lichen metals were selected to signal an early indicator for potential changes in vegetation health, including reduced vigour or growth. Values are predictive and describe a potential for initial adverse effects to vegetation health, not a threshold past which acute toxicity occurs.

This methodological description is presented in Sections 8.1.1.3 Vegetation and Soil Base Metals Analysis and has been consistent since 2012

Comment No.:	QIA-44
Section Reference:	Section 8.1.1.3 Vegetation and Soil Base Metals Analysis, pg. 97

Comment:

Re: “mercury was not present at measurable concentrations in the ore sampled and therefore was not considered for analytical presentation.”

1. Are there other sources of contaminants beyond the ore itself (e.g., emissions from trucks), which should be considered in this analysis?
2. How have these sources been considered in the contaminants analysis?

Baffinland Response:

The underlying rationale for selection of Constituents of Potential Concern (COCP) is described in the TEMMP (Baffinland Iron Mines Corporation 2019). This methodological description is presented in Sections 8.1.1.3 Vegetation and Soil Base Metals Analysis and has been consistent since 2012.

As described in Section Sections 8.1.1.3, Mercury (Hg) — among 36 other elements — was included in the comprehensive suite of soil/tissue metal analysis (data presented in Appendix D). Hg concentrations were at or below detection limits among all samples. Additional discussion on point-sources of Hg is not warranted.

Comment No.:	QIA-45
Section Reference:	Section 8.1.2.1 Soil-Metal Concentrations, Table 8-7, pg. 104

Comment:

Table 8-1 shows that in 2020, at the sampling site near the Mine site, a max concentration of 370 mg/kg of copper was measured in a soil sample. Since there was no sample taken near the Mine site in 2021, there is no follow-up to indicate if this is an upward trend in soil-copper concentration or if it was a total anomaly.

There is also no discussion about why this may have occurred (the 2020 Terrestrial report also does not offer insight regarding this very high measurement except to state that it does not affect mean values for the distance category).

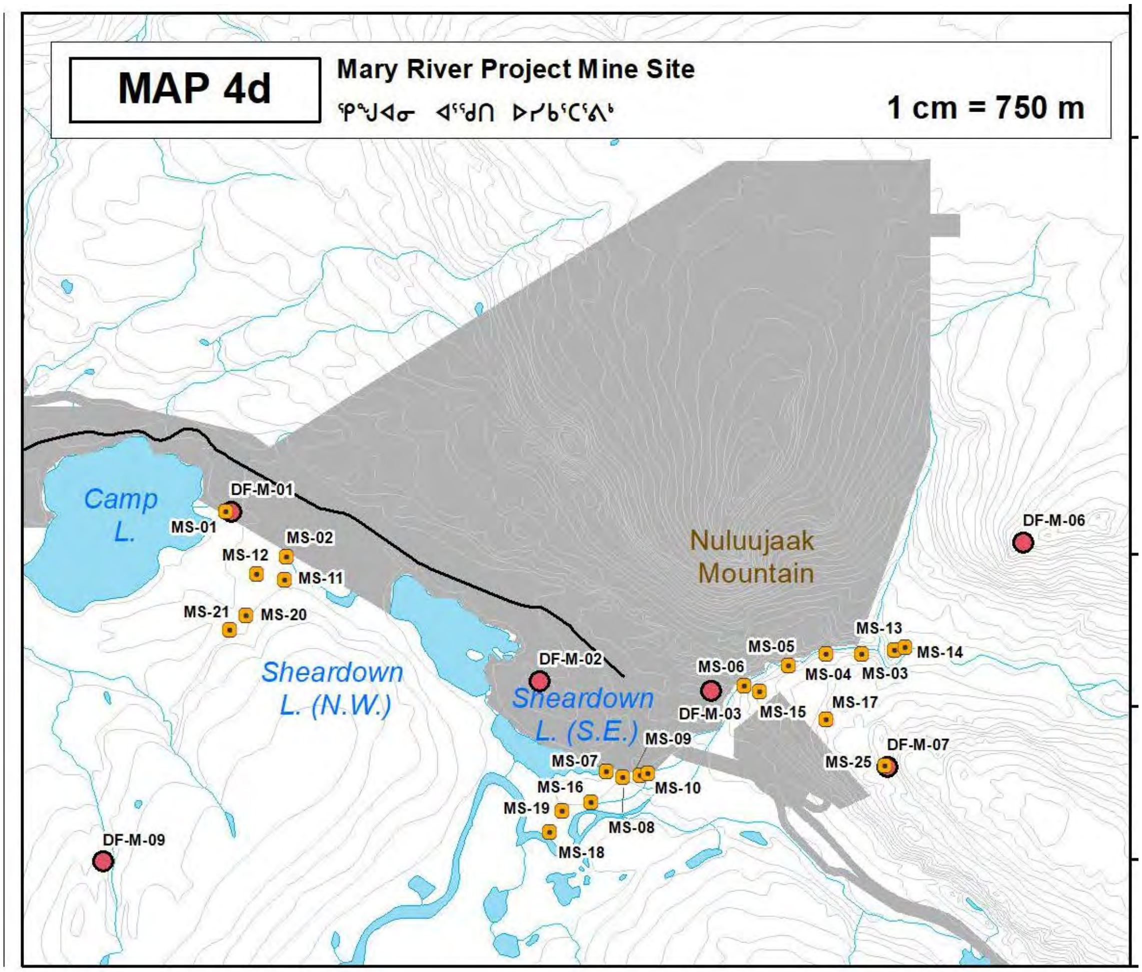
The result from the 2020 copper soil concentrations should be followed up on in 2022 and a discussion should be provided on why the sample concentrations are so high, and what can be done to remedy them.

Baffinland Response:

This comment appears to be directed to the 2020 TEAMR report (EDI Environmental Dynamics Inc. 2021).

The assertion that "…*no discussions about why this [i.e., Cu concentration of 370 ppm] may have occurred* [in 2020]" is incorrect. In the 2020 TEAMR, the sample location MS-06 is identified and further characterized to provide interpretive context (i.e., being located on a slope facing and within <100m of the Mine Site). Refer to Map 9-2, Inset Map 4d of the 2020 TEAMR report (EDI Environmental Dynamics Inc. 2021) shown below. Given that no other COPC exceedances were recorded at this or other nearby sampling locations (MS-05, MS-13, MS-14, MS-15, etc.), it could not be differentiated whether the exceedance was associated with or caused by the sample site MS-06's proximity to the active Mine and/or the possibility that the soil at this location is naturally rich in certain metal constituents. We suspect that the spike is an aberration pending further study.

As per response to QIA-42, the 2022 Soil/Vegetation Monitoring Program has targeted a comprehensive sampling schedule at the Project (approximately 60 sites). This includes sampling at MS-06.



Comment No.:	QIA-46
Section Reference:	Section 8.1.2.1 Soil-Metal Concentrations, Table 8-11, pg. 108
Comment:	

Table 8-11 shows mean soil-zinc concentrations; these data are also shown in Figure 8-6. There is no explanation for why zinc samples were so high near the mine site and along the Tote Road in 2020. Unfortunately, there is no repeat sample for zinc near the mine site in 2021; the 2021 max level along the Tote road was much lower.

1. What explanation do we have for these higher numbers in 2020?
2. Has Baffinland considered whether exceedances or samples approaching guidelines (where they exist) should trigger at a minimum a follow up sample in the subsequent year to see if the same levels are being observed consistently?

Baffinland Response:

This comment appears to be directed to the 2020 TEAMR report (EDI Environmental Dynamics Inc. 2021).

Explanation and rationale about the discrete, isolated spike in soil-Zn at TR-08 is provided in the 2020 TEAMR report; refer to Map 9-2, Inset Map 4c of the 2020 TEAMR report (EDI Environmental Dynamics Inc. 2021) shown below. Given that no other COPC exceedances were recorded at this or other nearby sampling locations (TR-01, TR-02, TR-03, TR-04, TR-05, TR-07, etc.) it could not be differentiated whether the exceedance was associated with or caused by the sample site MS-06's proximity to the Tote Road and/or the possibility that the soil at this location is naturally rich in certain metal constituents. We suspect that the spike is an aberration pending further study. We suspect that the spike is an aberration pending further study.

As per response to QIA-42 and QIA-45, the 2022 Soil/Vegetation Monitoring Program has targeted a comprehensive sampling schedule at the Project (approximately 60 sites). This includes sampling at TR-08.

Comment No.:	QIA-47
Section Reference:	Section 8.1.3 Summary (Section 8 Vegetation), pg. 128
Comment:	

"Lichen-metal concentrations had some discrete increases at the Project, but all sample locations were below or within an acceptable range for lichen-metal concentrations."

Tables 8-19 and 8-20 indicate that lichen-lead concentrations near the Tote Road have had a significant increase from baseline and that the mean concentration is above the indicator value. How is this data consistent with the statement that "all sample locations were below or within an acceptable range for lichen-metal concentrations"?

Tables 8-19 and 8-20 do not indicate what the acceptable range is; they give only an indicator value.

Baffinland Response:

As per response to QIA-43: Currently, no quality standard is available for lichen base metal concentrations; indicators values were chosen from available peer-reviewed literature sources pertinent to the Canadian High Arctic (if/where available). The lichen metal values were selected to signal an early indicator for potential changes in vegetation health, not a threshold past which acute toxicity occurs. In the case of Pb and Co, lower and upper values have been proposed as indicators. All samples were either at or below the upper indicator values.

This methods description is presented in Section 8.1.1.3 Vegetation and Soil Base Metals Analysis and has been consistent since 2012.

Comment No.:	QIA-48
Section Reference:	TEAMR, Section 9.1.1 – Snow Track Survey Methods
Comment:	

QIA remains concerned that BIM's snow track surveys are insufficient. We previously requested that BIM test the efficacy of the survey methods (by doing two simultaneous surveys and comparing results), but there is no indication in Section 9.1 that this has been done. We also previously recommended that BIM improve its approach to interpreting snow track survey results by determining what percentage of road deflections by species should be considered significant. However, there is no actual analysis or discussion of the monitoring results in Section 9.1.2, BIM only reports on survey conditions and results. BIM continues to use a 2020 incidental observation of caribou crossing the Tote Road to suggest that the road is not a barrier to caribou movement (though it is explicitly stated that it cannot be determined definitively) and this is problematic in the context of snow track survey shortcomings and a lack of effort to improve them.

It could also be useful to conduct snow track surveys during months when little to no vehicle transits occur (e.g. May 2021), and compare the results to months when vehicle traffic is present. The results, of course, would need to be interpreted considering other influencing factors such as weather conditions, seasonal patterns of wildlife movement, etc.

Recommendation:

1. We reiterate our recommendation for BIM to test snow track surveys to confirm their efficacy for understanding wildlife movement in relation to the Tote Road. Depending on these results, BIM should consider improving the design of snow track surveys (e.g. hiring trained wildlife monitors to undertake them) or completing additional surveys (e.g. using drones) to fill gaps. At an absolute minimum, BIM should include an overview of survey limitations in Section 9.1.1.
2. Update Section 9.1.2 to include interpretation of 2021 snow track survey results, including consideration for what percentage of deflections and travelling along roads may be considered significant. This analysis should be species-specific where possible.

Baffinland Response:

1. Surveys are designed around the deposit of fresh snow to better and more accurately identify fresh wildlife tracks. Increasing the number of surveys under poor snow conditions, will likely add to an inability to accurately identify tracks after sun/wind deterioration to snow. As noted in Baffinland's response to QIA in the 2020 TEAMR, the primary purpose of snow track surveys is to monitor how caribou and other wildlife may interact with the Tote Road and associated traffic at close proximity. Other surveys may be better suited to assess potential impacts at higher distances, such as Height of Land, when caribou are seen at higher numbers. Baffinland remains open to considering other suitable alternative options should they be brought forward. Baffinland highlight that the environmental technicians who complete the snow track surveys appropriately qualified with relevant training and education as wildlife monitors.

2. Species deflection percentages have been added to the 2021 final TEAMR report.

Comment No.:	QIA-49
Section Reference:	TEAMR, Section 9.2.1 – Snowbank Height Monitoring Methods
Comment:	

BIM states that snowbank management includes two measures: 1) maintaining snowbank height at <100cm and 2) smoothing/contouring the snowbanks on the edges of roadways to reduce the probability of drifting snow. However, Section 9.2.2 (snowbank height monitoring results) only reports on compliance with the snowbank height measure. What measures does BIM take to smooth/contour snowbanks, and how often does this occur? Assuming this is done regularly, BIM should also report on compliance with snowbank smoothing/contouring, not just its efforts to maintain snowbank height < 100cm. Section 9.2.2 states that snowbanks needed to be pushed back and feathered out to reduce drifting "during several of the surveys", which makes us concerned that this measure is not being implemented effectively.

Recommendation:

1. Please clarify what measures BM uses to smooth/contour snowbanks and how often this occurs.
2. BIM should ensure that personnel are collecting data on compliance with their snowbank smoothing/contouring measure. Please also provide a detailed overview of methods that have been / will be used to monitor compliance.

Baffinland Response:

1. The smoothing/contouring of snowbanks is completed using heavy equipment, such as graders. The snowbank height audits completed by site environment are used to indicate which areas require contouring (any areas approaching 100 cm in height or exceeding 100 cm). All non-compliant areas (>100 cm) or areas of concern (~80–100 cm) are documented by site environment during the snowbank height audits, and then forwarded to the road maintenance department, who visit the problem areas with heavy equipment to smooth out the snowbanks. Snowbank height audits are completed once per calendar month, and therefore smoothing/contouring of snowbanks is also completed monthly, following each audit. After snowfall events, road maintenance may perform additional works based on road conditions.

2. The snowbank height surveys are a way of monitoring compliance. All visited snowbanks exceeding 100 cm in height are documented and locations are sent to road maintenance for follow-up, as stated above.

Comment No.:	QIA-50
Section Reference:	TEAMR, Section 9.2.1 – Snowbank Height Monitoring Methods

Comment:

BIM states that monitoring of snowbank heights along the transportation corridor was conducted between one and three times monthly from November 2020 to December 2021, and that measurements were taken at 50 randomized kilometer markers. Is the timing of snowbank height monitoring surveys (within each month) also randomized? There is some general discussion on the conditions (e.g. topography, road contours, etc.) in areas where snowbank height exceedances were documented, but it would be useful to understand how this relates to weather conditions as well (e.g., amount of snowfall or wind in the days leading up to the survey).

Recommendation:

1. Please clarify whether the timing of snowbank height surveys is randomized.
2. Please provide more discussion on weather conditions (e.g. snowfall and wind) and how this may be influencing snowbank height compliance.
3. How are missing data from weather monitoring deficiencies impacting assessment of weather conditions?

Baffinland Response:

1. The sample locations of snowbank height surveys are randomized, and KM markers/monitoring locations change each time a survey is completed. The timing is also randomized (to the extent possible), as there is not a pre-set date/timeframe for the survey to happen, other than a minimum of once a month.

2. The QIA must clarify their requirements on weather conditions.

3. Weather conditions are visually assessed during snowbank height surveys; meteorological weather station data is not used during this assessment. Determining potential relationships between weather patterns and snowbank heights is beyond the scope of the monitoring program. Therefore, the impact of missing data is not relevant.

Baffinland

Comment No.:	QIA-51
Section Reference:	TEAMR, Section 9.4.1 – Remote Camera Survey Methods
Comment:	

Overall, the remote camera survey effort and results fall short of BIM's goal to help address effort gaps and study design deficiencies associated with the HOL surveys. It is our understanding that the primary reason remote cameras were deployed was to:

1) fill effort gaps associated with the HOL surveys (total number of hours observation time at each station); and
2) help address study design deficiencies associated with the HOL surveys (potential need to re-visit stations selected).

In 2021, the deployment of remote cameras made some improvement in terms of effort, but more is required. In addition, it is not clear how BIM attempted to address study design deficiencies previously raised by the TEWG.

It is not clear why remote cameras were deployed at only 6 of the 24 HOL stations. BIM provides the rationale that these cameras were deployed at "relatively even distance intervals to optimize wildlife observations along the Tote Road" (p. 143), but it is our understanding that the 24 HOL stations already consist of a representative sample of locations along the Tote Road, from BIM's perspective. Why didn't BIM deploy remote cameras at all HOL stations? In addition, the selection of HOLs 1, 3, 4, 6, 10, and 16 is relatively arbitrary. If remote cameras can only be deployed at select HOL stations, then the locations should be selected based on the best available IQ and western science on where caribou can expect to occur along the Tote Road, or to help fill gaps in HOL station viewshed where possible.

It is also not clear why remote cameras were only deployed between July 28/August 6 and October 16 (or January 30). This only resulted in 33-80 active days of monitoring, which falls well short of the maximum potential continuous 365 days of observation time that remote camera deployment offers. In addition, the deployment period for 2021 fell outside the calving season (May and June) and so this design does not address the need for greater monitoring effort related to disturbance during the calving period.

Recommendation:

We recommend that BIM continue deploying remote cameras throughout the 2022 monitoring year with the following improvements on effort:

1. Deploy remote cameras in association with all 24 HOL stations. If this is not possible, BIM must select deployment locations in close collaboration with the TEWG, using the best available IQ and western science.
2. Ensure remote cameras are deployed throughout the year, particularly during the calving period (May and June)
3. Include time lapse photography to capture movement (this will help speed up data analysis). Note recommendation from ECCC at recent (April 2022) TEWG meeting.
4. Take any reasonable measures to prevent field of view obstructions by snow, ice or fog (e.g. install a cover or shelf, use silica gel packs inside camera cases to prevent moisture build-up, applying anti-fogging products, adjusting camera alignment/placement, etc.) to help maximize the number of active days.

Baffinland Response:

1. Deployment of remote cameras at all 24 HOL locations is not feasible. Access is a fundamental constraint due to maintenance requirements. For example, some sites are only accessible via helicopter; these sites are not otherwise accessible during the winter. Efforts will be made to collaborate with the TEWG on future camera deployment locations.
2. Remote cameras are presently (and will continue to be) deployed year-round; service visits occur twice per year (minimum) to verify camera function and swap in/out SD memory cards and batteries. Cameras were initially deployed in 2021 and initial servicing occurred in October 2021. The data capture timeline will cover the May and June calving periods during 2022 reporting.
3. Current settings for cameras include time lapse photos and are noted in the final report (pg 143, footnote 13). ECCC recommendations regarding post photo analysis is being reviewed and considered.
4. Camera placement is established during initial deployment and service visits to prevent field of view obstructions. Regrettably, reduced visibility caused by weather events (e.g., blowing snow and fog) cannot be controlled; these types of events are accounted for and noted in the data capture as “loss of active days”.

Additionally, Baffinland requests that the QIA clarify which deficiencies were mentioned during the TEWG that they believe Baffinland has not adequately addressed.

Comment No.:	QIA-52
Section Reference:	TEAMR, Section 9.4.2 – Remote Camera Results and Discussion, p. 144.
Comment:	

Footnote 14 notes that several white spots were observed on Baffin-4 camera at HOL-1, presumably a flock of snow geese. This area appears to be well outside of the snow geese area discussed earlier in this report. Observations were made during the moulting period (Aug. 7 and 8).

1. Does Baffinland consider this area to be potentially important during the moulting period for snow geese?
2. Should additional mitigation measures related to helicopter overflights be considered in this location?

Baffinland Response:

1. Snow geese are observed in many areas in the RSA outside of the Snow Goose moulting area. The snow goose moulting area was identified by Environment and Climate Change Canada, and based on that information, Baffinland regards that area as important to moulting snow geese.

   Geese were also only noted for 2 days on the HOL-1 camera, suggesting the group moved on to other areas.
2. The occasional occurrence of individual birds does not warrant additional mitigation measures.

Comment No.:	QIA-53
Section Reference:	TEAMR, Section 9.5 Incidental Observations, p. 146
Comment:	

We note high numbers of caribou observed between June 25 and September 11, 2021.

1. Were these caribou located within the exploration area or enroute?
2. Does Baffinland have locations?
3. Has Baffinland considered recording observer effort along with the incidental observations made during helicopter flights to help determine whether caribou numbers are increasing?

Baffinland Response:

1. Ten of the sightings were recorded as "North of Camp Lake," but did not specify how far north. The remainder of caribou sightings occurred in remote locations, away from Mary River, and seen from helicopters enroute.
2. Approximate locations and general landmarks are noted; many of these observations were made incidentally by BIM employees or contractors (i.e., from all departments) who did not readily have access to a GPS unit (Refer to response to QIA-54).
3. Observer effort is difficult to quantify, as they are incidental observations and not part of a dedicated survey by qualified personnel. In the event of a dedicated aerial survey focused on caribou, efforts would be made to determine observer effort. As most of these are incidental observations, made by various BIM personnel, it is unrealistic to expect observation effort to be recorded and reported on. Data collected as incidental would not be an accurate representation of caribou population in the area.

Comment No.:	QIA-54
Section Reference:	TEAMR, Section 9.7 Inter-annual trends (HOL, Snow track surveys), p. 147
Comment:	

Re: "Lack of caribou observations on site is consistent with low regional caribou numbers reported through Inuit Qaujimajatuqangit…"

How have you reconciled the lack of caribou observations within the PDA with the relatively higher numbers (103) observed outside the PDA?

Baffinland Response:

Caribou observations were mostly made by BIM employees or contractors from helicopters on exploration flights or travelling to remote locations. It is not unexpected that the majority of caribou observations occurred in remote areas outside of the current project development area (PDA), as the total regional study area encompasses 21,053 km^2 of land, compared to the project development area at approximately 408 km^2 (developed areas and tote road, ~2% of the RSA). Of the incidental caribou recorded for 2021, all were recorded in remote regions, mainly towards Steensby and southwest of Mary River, with some generalized locations noted in the final report.

Comment No.:	QIA-55
Section Reference:	TEAMR, Section 10 (Birds), p. 152
Comment:	

Re: "In 2021, bird surveys at the Project focused primarily on AMBNS for active migratory bird nests (if/when necessary, before vegetation clearing or surface disturbance) and ongoing effects monitoring and baseline data collection for cliff-nesting raptors."

This appears to be an error: ongoing effects monitoring and baseline data collection for cliff-nesting raptors was paused in 2021.

Baffinland Response:

Correction has been made in the final report.

Comment No.:	QIA-56
Section Reference:	TEAMR, Section 10.3 (Birds Summary), p. 154
Comment:	

You have indicated that raptor monitoring was paused for 2021. Please confirm that these surveys will be continued as per the standard methods used from 2011 to 2020 in 2022.

Baffinland Response:

The raptor surveys have addressed the question about Project effects on cliff-nesting raptors (i.e., no effect has been observed). Further surveys are not planned. A manuscript intended for publication in the peer-reviewed literature is being drafted.

Comment No.:	QIA-57
Section Reference:	General comment
Comment:	

In the overview section of the report, please include a table listing all of the monitoring programs being undertaken by Baffinland, and indicate which programs are being summarized for the current year, as well as the planned timing for future studies (see bullet list on p. 1; add next planned year of data collection).

Baffinland Response:

These updates have been provided in the final report (Table 1-1).

Baffinland Mary River Project Report Working Group Comment Form

Reviewer Agency/Organization:	*Environment and Climate Change Canada (ECCC)*
Reviewers:	*Greg Wentworth, Paul Smith*
Document(s) Reviewed:	*Terrestrial Environment – 2021 Annual Monitoring Report*
Date Review Completed	*2022-05-03*

Comment No.:	ECCC-01
Section Reference:	Section 4 – Climate (pdf Page 28)
Comment:	

Precipitation data before August 2021 is unreliable at both the Mine Site and Milne Port due to obstructed rain gauges. This issue may have begun as early as October 2019 for the Mine Site gauge, and August 2020 for the Milne Port gauge. Frequent loss of precipitation depth (amount) data would compromise the ability to analyze long-term trends in precipitation, and to assess the impact of precipitation on dustfall.

Recommendation – add detail into the report on corrective actions that will be taken to verify proper operation of the rain gauges and prevent loss of precipitation depth data in the future.

Baffinland Response:

Details on the meteorological station malfunctions and corrective actions will be included in the final report. Please refer to Baffinland's answer to QIA-02.

Comment No.:	ECCC-02
Section Reference:	Section 7.3.1.1 – Review of Supporting Data (pdf Page 59)
Comment:	

Missing reference source for Climate section – *"**Error! Reference source not found.**"*

Recommendation – provide correct reference source.

Baffinland Response:

Corrected in the final report.

Comment No.:	ECCC-03
Section Reference:	Section 7.4.3 – Inter-annual Trends (pdf Page 99-100)
Comment:	

This section states that dustfall extents derived from 2021 Landsat and Sentinel-2 imagery were less than the 2019 and 2020 extents at the Milne Port, which may reflect the recent application of DustBlockr® on the Milne Port ore stockpiles. This appears to contradict text elsewhere in the report (e.g., Section 7.2 – Dustfall Suppression and Mitigation, pdf Page 58) that states DusTreat was used on the Milne Port ore stockpiles.

Recommendation – clarify the dustfall suppression measure(s) used on the Milne Port ore stockpiles.

Baffinland Response:

Section 7.2 provides the correct application description. The text will be corrected in section 7.4.3 to reflect that DusTreat was used on the ore stockpiles at Milne Port.

Comment No.:	ECCC-04
Section Reference:	Sections 7.3.3 and 7.4.3 – Inter-annual Trends
Comment:	

This report analyzes inter-annual trends of dustfall using two different data sets: passive dustfall monitoring (Section 7.3.3) and satellite imagery analysis (Section 7.3.4), but does not directly compare the results from these two approaches. In theory, the inter-annual trends from both data sets should be generally consistent. Similar findings from these different methods would provide additional confidence in the results and any inferences made from the analysis (e.g., effectiveness of a new mitigation measure). If discrepancies between the two approaches are found, then it could help identify limitations and/or improvements to the dustfall monitoring program.

Recommendation – consider including an explicit comparison of inter-annual trends determined by passive dustfall monitoring and satellite imagery analysis in subsequent annual reports.

Baffinland Response:

Agreed. This will be provided in subsequent annual reports.

Comment No.:	ECCC-05
Section Reference:	Section 7.4.2.2 Dustfall Concentration Estimation
Comment:	

This section contains regressions for dust concentrations versus remote sensing. It would be useful to see the R^2 values for these relationships. In addition, the model fit seems poor above 50g/m² or so.

Recommendation – provide the R^2 values and comment on the model fit above 50g/m²

Baffinland Response:

The R^2 values and comments on model fit will be provided in the final report.

Comment No.:	ECCC-06
Section Reference:	Figure 7-19. 2021 estimated dustfall extents based on Landsat and Sentinel-2 imagery (pdf page 99)
Comment:	

Errors bars are possible for this figure based on the regression parameters and would be informative to reviewers.

Recommendation – provide Figure 7-19 with error bars or provide a rationale for not including them.

Baffinland Response:

The standard error is shown in light grey on the figures. The figures will be updated to make them stand out more on the figures and will be described in the text.

Comment No.:	ECCC-07
Section Reference:	Section 7.4.2.3 Dustfall Extent and Concentration (pdf page 98)
Comment:	

This section states that: "*Although the datasets were calibrated by removing baseline values, the dustfall in Map 7-2 to Map 7-11 represent above average dustfall extents and concentrations*." It is not clear whether this means that the maps all have the baseline values subtracted and so the maps show, per pixel, annual maximum values minus baseline mean values. In Section 7.5 Dustfall Summary, it states: "*Dustfall extents and relative magnitudes were extracted from satellite images using the Snow Darkening Index (Red−Green)/(Red+Green) band ratio, and baseline (average dustfall between 2004 and 2013) was removed*." This supports ECCC's understanding described above.

Recommendation – clarify whether Maps 7-2 to 7-11 have the baseline values subtracted and whether they show annual maximum values minus baseline mean values.

Baffinland Response:

Correct, the baseline values have been subtracted and the maps show the maximum values minus baseline mean values. This clarification will be updated in the text.

Comment No.:	ECCC-08
Section Reference:	Section 2 Terrestrial Environment Working Group (pdf page 26)
Comment:	

This section states: "*In response to comments from the TEWG on the 2020 Terrestrial Environment Annual Monitoring Report, monitoring in 2021 included: 1) a new protocol for helicopters for poor weather days to travel around the moulting area for Snow Geese…*". The new protocol is not mentioned in Section 5.2 Results and Discussion.

Recommendation – clarify whether this new protocol was implemented.

Baffinland Response:

Modifications to protocol were implemented. Baffinland is committed to ongoing review and improvement to protocols to minimize potential effects on snow geese. These modifications will be included in subsequent Annual Monitoring Reports.

Comment No.:	ECCC-09
Section Reference:	Section 5.2 Results and Discussion (pdf page 39)
Comment:	

This section states: *"No "observed concentrations of migratory birds" or areas prescribed explicitly by the TEWG to avoid due to observed concentrations of migratory birds were identified in 2021."* It is unclear what is meant by this statement - does this mean that pilots reported no observations of snow geese? It is also unclear whether pilots are specifically asked to report observations of snow geese. Presumably the key area boundary was defined on the basis of previous observations of geese (/and presence of appropriate habitat), so if there are truly no geese, is this not likely to be a disturbance effect?

Recommendation – clarify what is meant by the above statement regarding no observed concentrations of migratory birds, including whether pilots are specifically asked to report observations of snow geese and whether pilots reported no observations. Clarify whether no observations of snow geese means there is likely to be a disturbance effect.

Baffinland Response:

Clarification provided in final report for the helicopter analysis, the statement means that there were no concentrations or areas identified for avoidance other than the key moulting area.

Comment No.:	ECCC-10
Section Reference:	Section 9.5 Incidental Observations (pdf page 168)

Comment:

This section describes caribou observations and states: "*A total of 104 caribou from 33 separate observations between June 25 and September 11, 2021, were reported… Observers noted caribou sex when able to, with six of the caribou believed to be male and four recorded as female and the remaining 21 unclassified.*" The numbers outlined in the last sentence regarding caribou sex (6 + 4 + 21) do not add up to the total number of caribou observed (104).

Recommendation – clarify the number of caribou observed and associated sex.

Baffinland Response:

Totals have been clarified in the final report.

Comment No.:	ECCC-11
Section Reference:	Section 9.5 Incidental Observations (pdf page 168)

Comment:

This section outlines observed birds. ECCC notes some discrepancies with the list provided: Black-Throated Loon (*Gavia arctica*) should likely be Pacific loon (*Gavia pacifica*) as the former are not found in the project area; and scientific names for Canada (*B. canadensis*) and Cackling Goose (*Branta hutchinsii*) are flipped around - likely these are all Cackling Geese as Canada Geese are not normally found in the project area.

Recommendation – update the list of observed birds with the correct names.

Baffinland Response:

The loon species name was updated in the final report.

Canada Goose was observed in the Mary River Project area during Mary River Project monitoring, and results were published in the peer-reviewed journal Arctic:

Jantunen, J., MacLeod, A.C., Leafloor, J.A., and Scribner, K.T. 2015. Nesting by Canada Geese on Baffin Island, Nunavut. ARCTIC 68(3):310. DOI: 10.14430/arctic4502

Comment No.:	ECCC-12
Section Reference:	Section 10 Birds
Comment:	

The analysis of all PRISM data is complete, including the direct tests of mine impacts and the arctic-wide analyses. These results can be shared with EDI Environmental Dynamics Inc./Baffinland, and/or presented to the TEWG.

Recommendation – N/A

Baffinland Response:

Baffinland will include a presentation spot for ECCC at an upcoming TEWG meeting.

Comment No.:	ECCC-13
Section Reference:	Table 10-1. Disturbed Project area in relation to the 2021 AMBNS breeding bird window (pdf page 176)
Comment:	

The hectares cleared during the breeding season reported in this table (7.3 ha) does not agree with the value in Table 0, pdf page 8 (5.6 ha).

Recommendation – clarify the amount of hectares cleared during the breeding season.

Baffinland Response:

The hectares cleared during breeding season has been clarified and updated in the final report.