MARY RIVER PROJECT

Terrestrial Environment
2023 Annual Monitoring Report

Prepared For
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ENVIRONMENTAL DYNAMICS INC.
Down to Earth Biology

Cover photo:

EDI Environmental Dynamics Inc. and Inuit participants
—from Arctic Bay and Pond Inlet—
conducting Vegetation Abundance Monitoring.

ᓇᐃᓈᖅᓯᒪᔪᖅ

ᓄᓘᔫᖕᓂ ᐱᓕᕆᐊᖅ (ᐱᓕᕆᐊᖅ) ᓴᕕᒃᓴᓂᒃ ᐅᔭᕋᖕᓂᐊᖅᑐᑦ ᕿᑭᖅᑖᔫᑉ ᓄᓇᖁᑖᓂ ᐅᐊᖕᓇᖓᓂ ᕿᑭᖅᑖᔫᑉ, ᓄᓇᕗᒻᒥ. ᐱᓕᕆᐊᖅ ᐱᖃᓯᐅᑦᔨᓯᒪᔪᖅ ᓴᓇᔭᐅᓂᒃᓴᖕᖓᓂᒃ, ᐊᐅᓚᑕᐅᓂᖕᖓᓂᒃ, ᒪᑐᔭᓂᒃᓴᖕᖓ, ᐊᒻᒪᓗ ᓄᓇᖕᖓᑕ ᑕᐅᑦᑐᕆᓚᐅᖅᑕᖕᖓᓄᑦ ᐅᑎᖅᑎᑦᑎᓂᖅ ᓄᓇᓕᖕᖓᓂᒃ 22.2 ᒥᓕᐊᓐ ᑕᓐᓯᓂᒃ ᐊᕐᕌᒍᑕᒫᑦ ᐃᑎᖅᓴᓕᐅᕐᓗᑎᒃ 21−ᓄᑦ ᐊᕐᕌᒍᓄᑦ ᐊᐅᓚᓂᖃᕐᓂᐊᖅᐳᓂ. 2023−ᒥ, ᐹᕙᓐᓈᓐᑯᑦ ᐅᓯᒃᖅᑕᓚᐅᖅᑐᑦ 5.4 ᒥᓕᐊᓐ ᑕᓐᓯᐸᓗᓪᓗᐊᓂ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᕿᙳᐊᓂ ᑲᑎᑦᑎᑎᕚᖕᒧᑦ. ᑕᐃᔅᓯᒪᓂ ᐊᕐᕌᒍᒥ, ᓴᓇᔭᐅᔭᕆᐊᓕᖕᓄᑦ-ᐊᒃᑐᐊᔪᑦ ᐸᕙᓪᓕᐊᒪᓵᓚᐅᖅᐳᑦ ᓴᓇᔭᐅᒪᓵᒃᑲᑎᓪᓗ ᐋᖅᑭᒃᑕᐅᔭᕆᐊᕌᓪᓗ ᐱᕐᑯᑎᕐᔪᐊᑦ ᐃᓂᖃᕐᕖᓪᓗ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᕿᙳᐊᓂᓪᓗ ᑲᔪᓯᓂᖃᑦᑎᐊᕐᑯᓪᓗᒋᑦ ᐊᐅᓚᓃᑦ. ᑲᑎᓪᓗᒋᑦ ᐱᓕᕆᐊᒥ ᐃᓂᐅᓕᖅᑐᖅ 612 Hᐃᒃᑎᐅᔅᓂᒃ ᐊᕐᕌᔾᔫᑉ ᓄᙳᐊᓂ 2023−ᖑᑎᓪᓗᒍ.

ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓂᑦ ᐅᔭᕋᖕᓂᐊᕈᓇᐅᑎ ᓈᓴᐅᑖ 005 ᐱᖃᓯᐅᑎᕗᖅ ᐅᓄᖅᑐᓂᒃ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓂ ᐹᕙᓐᓈᓐ ᓴᕕᒃᓴᓂ ᐅᔭᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᒃᑯᑦ (ᐹᕙᓐᓈᓐ) ᐱᓕᕆᐊᖃᕐᑯᓪᓗᒋᑦ ᐊᒃᑐᐃᓂᕐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓂᕐᓂᒥᒃ ᓄᓇᖕᖓᑕ ᐊᕙᑎᖓᓂᒃ. ᐱᓕᕆᐊᖑᔪᑦ ᑖᒃᑯᓄᖓ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓂᒃ ᖃᐅᔨᓴᖅᐸᔅᔨᐊᖑᓂᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᖃᐅᔨᒪᔅᔪᑎᖃᖅᐳᑎᒃ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓂ ᐸᓚᐅᒪᑎᑦᑎᓇᓱᖕᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓕᐊᖑᓂᕐᓂᕐᒧᑦ ᐸᕐᓇᑎᒥᒃ (ᐹᕙᓐᓈᓐ ᓴᕕᒃᓴᓂᒃ ᐅᔭᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᖕᖓ 2016ᐃ) ᐊᒻᒪᓗ 2023−ᒥ ᑎᑎᕋᖅᑕᐅᕐᖔᖅᓯᒪᔪᖅ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓂ ᐸᓚᐅᒪᑎᑦᑎᓇᓱᖕᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓂᕐᓂᕐᒧᑦ ᐸᕐᓇᐅᑏᑦ (ᐹᕙᓐᓈᓐ ᓴᕕᒃᓴᓂᒃ ᐅᔭᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᓐ 2023ᐃ). ᑲᒪᒋᔭᐅᔪᑦ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᓂ (TEWG), ᐃᓚᐅᔪᑦ ᐃᓚᒋᔭᐅᔪᓂ ᐹᕙᓐᓈᓐᑯᓐᓂᖕᒋᖅᑐᑦ, ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᓂ, ᒐᕙᒪᖕᒋᓐᓂ ᓄᓇᕘᑉ, ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᖕᖓᓄᑦ ᑲᓇᑕᒥᒃᑯᓐᓂᑦ, ᒥᑦᑎᒪᑕᓕᒃ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ ᑎᒥᖁᑖᓂᒃ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᓇᐅᖅᑎᖅᓱᖅᑏᑦ ᑲᓇᑕᒥ ᐅᑭᐅᖅᑕᖅᑐᒥ ᑭᓇᐅᔭᑎᒍᑦ ᐱᕙᓪᓕᐊᓂᕐᒧᑦ ᑎᒥᐅᔪᒥᑦ (CANNOR), ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓂᑦ, ᐊᒻᒪᓗ ᓄᓇᒦᙶᖅᑐᓕᕆᔩᑦ ᑲᓇᑕᒥᒃᑯᓐᓂᑦ (NRCAN). ᑎᓴᒪᒃᑲᓐᓃᑦ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ ᑎᒥᖁᑎᖏᑦ (ᐃᑲᔪᖅᑎᑦ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ; IHTA, ᓇᖕᒪᐅᑐᖅ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ; NHTO, ᐊᒻᒪᓗ ᐃᒡᓗᓕᒃ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ; IHTO,ᓴᓂᕋᔭᖕᒥ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ; HBHTA) ᐃᓚᐅᓕᓚᐅᖅᑐᑦ ᕗᕚᐊᕆ 2023-ᒥ ᐃᓚᒋᔭᐅᓕᖅᐳᑎᓪᓗ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒋᓄᑦ ᐃᓚᐅᔪᒪᒍᑎᒃ. ᓄᓇᐅᑉ ᐊᕙᑎᖓᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓂᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᐱᒋᐊᓚᐅᖅᑐᖅ 2012-ᒥ ᑲᔪᓰᓐᓇᖅᐳᓂᓗ 2023-ᒧᑦ ᐋᖅᑭᒋᐊᕐᓂᖅᑕᖅᐳᓂ ᐱᓕᕆᐊᓄᑦ ᑐᙵᕕᒋᓪᓗᒋᑦ ᖃᐅᔨᔭᐅᔪᑦ ᐅᖃᐅᓯᐅᕙᒃᑐᓗ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒋᓂᑦ.

ᑖᓐᓇ ᐅᓂᒃᑳᖅ ᓇᐃᓪᓕᑎᕆᓯᒪᔪᖅ ᑎᑎᖅᑲᕐᑎᓂᒃ ᑲᑎᑕᐅᓯᒪᔪᓂᒃ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓂᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᓄᑦ 2023-ᒥ ᐱᓕᕆᐊᒧᑦ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐅᑯᐊ ᐃᓗᓕᖕᒋᑦ (ᐃᓈᖅᓯᒪᔪᑦ ᐊᑐᐃᓐᓇᐅᔪᖅ ᑎᑎᕋᖅᓯᒪᔪᖅ 0):

- ᓯᓚᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓂᕐᓂᖅ
- ᖁᓕᒥᒎᑦ ᖁᓚᐅᓐᓂᖕᒋᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ;
- ᐱᑕᖃᐃᓐᓇᖅᑐᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᓂᖕᖓᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓂᕐᓂᖅ
- ᐱᑕᖃᐃᓐᓇᖅᑐᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᓂᖕᖓᓂᒃ ᕿᒥᕐᕈᓂᖅ;

- ᐱᕈᖅᑐᖃᑦᑎᐊᕐᓂᖓᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙳᓇᕐᓂᖅ;
- ᐊᐳᒻᒥ ᑐᒥᓯᐅᕐᓃᑦ ᖃᐅᔨᓴᕐᓂᖅ;
- ᐊᐳᔾᔭᓇᖕᓂᐅᕙᒃᑐᑦ ᐳᖅᑐᓂᙳᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙳᓇᕐᓂᖅ
- ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ
- ᖃᖓᑕᓲᒃᑯᑦ ᑐᒃᑐᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ;
- ᐅᖓᓯᒃᑐᒦᓪᓗᑎᒃ ᐊᔾᔨᓕᐅᕈᑎᑎᒍᑦ ᖃᐅᔨᓴᕐᓂᖅ;
- ᐊᖑᓇᓱᒃᑎᑦ ᐳᕌᓇᐊᖅᓯᒪᔪᑦ ᐊᑎᓕᐅᖃᑦᑕᕐᓂᖏᑕ ᑎᑎᕋᖅᑕᐅᓯᒪᓂᖏᑦ;
- ᑎᖕᒥᐊᑦ ᑎᑭᑉᐸᒃᑐᑦ ᐃᕙᕝᕕᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ; ᐊᒻᒪᓗ
- ᐆᒪᔪᓂᒃ ᑕᑯᓯᒪᔪᑦ ᑐᕐᑯᑕᐅᔪᓪᓗ.

ᐃᓄᐃᑦ ᐃᓚᐅᓂᖏᑦ - 8 ᐃᓄᐃᑦ ᐃᑲᔪᓚᐅᖅᑐᑦ ᖃᖓᑕᓲᒃᑯᑦ ᑐᒃᑐᓂ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ, ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ ᑐᒃᑐᓂᒃ, ᐃᔾᔪᕐᒥᒃ ᐱᕈᖅᑐᓂᓪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙳᓇᕐᓃᑦ ᐃᑲᕐᕋᓄᑦ 916.5–ᙳᔪᓂᒃ 2023–ᒥ ᓯᓚᒥ ᐱᓕᕆᓐᓇᐅᑎᓪᓗᒍ.

ᓯᓚ - ᓯᓚᐅᑉ ᖃᓄᐃᓕᖓᓂᖓ 2023–ᒧᑦ ᓇᐃᓪᓕᑎᖅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓄᑦ ᕿᒥᕐᕈᔭᐅᓪᓗᑎᒃ ᖃᓄᐃᓕᖓᓂᐅᕙᔫᒃᑐᓄᑦ. ᓂᓪᓚᓯᕆᑦ ᐅᖅᑰᓪᓗ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ 2023-ᒧᑦ ᐃᓗᐊᓃᑦᑐᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ ᐊᑐᖅᓂᑯᓂ. 2023-ᒥ ᓂᓪᓚᓱᖕᓂᖓ ᑐᓚᒃᑕᕐᕕᖕᒥ ᑕᐃᒪᐃᒐᔪᒃᑐᒦᖏᓐᓇᓚᐅᖅᑐᑦ ᐅᐱᕐᖔᓕᒫᖅ, ᐅᑭᐊᒃᓵᖅ ᐊᐅᔾᔭᕐᓗ, ᓂᓪᓚᓱᖕᓂᖅᓴᐅᓪᓗᓂ ᔫᓄᐊᕆᒥ ᐊᒻᒪᓗ ᕖᕝᕗᐊᕆᒥ ᐊᒻᒪ ᐅᖅᑰᓂᖅᓴᐅᓪᓗᓂ ᓄᕕᐱᕆᒥ ᑎᓯᐱᕆᒥᓗ. ᑕᒪᕐᒥᒃ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᐊᒻᒪᓗ ᕿᓐᒪᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ ᓯᓚᓐᓂᐊᕈᑏᑦ ᑎᑎᕋᖅᓯᔭᕆᐅᓚᐅᖅᑐᑦ ᒪᕐᑯᐃᓐᓈᓗᖃᑦᑕᖅᑎᓪᓗᒍ 18-ᓂᒃ ᐅᓪᓗᓂᒃ ᒪᕐᑯᒃᓱᓂ ᐃᒪᖅᑯᖅᑐᓂᖃᓕᖅᓱᓂ 84.6 ᓵᑕᑏᑕᒥᒃ ᒪᕐᑯᖕᒥᑦ. ᐊᓄᕆᐅᑉ ᐃᓗᐊᕆᔭᖓ ᑕᐅᕝᕙᓇ ᐅᐊᖕᓇᔫᖅ ᐱᓇᖕᓇᖅᐸᓯᖕᒥᑦ–ᓂᒋᕐᒥᑦ ᑲᓇᖕᓇᔫᒧᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ, ᑲᓇᖕᓇᕐᖕᓇᙱᒃᑲᓗᐊᖅᑎᓪᓗᒍ ᓴᙱᕈᖕᒍᖃᑦᑕᖅᓯᒪᔪᖅ ᓯᓚᓐᓂᐊᕈᑎᑎᒍᑦ. ᐃᓕᖅᑯᓯᐅᓕᖅᐸᒃᑐᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ 2023-ᒥ, ᒪᓕᑐᐃᓐᓇᖅᑐᑦ 2021-ᒥᓂᑦ ᐊᒻᒪᓗ ᒫᓐᓇᓕᕌᖑᓂᖅᓴᐅᔪᒃᓴᐅᔪᑦ, ᐊᓄᕆ ᐃᓗᐊᕆᔭᖃᓕᖅᓯᒪᔪᖅ ᓂᒋᖅᐸᓯᖕᓂ ᐱᓇᖕᓇᔫᒥᑦ (ᓯᒡᔭᖕᒪᓂ ᐊᒡᒍᕋᖅᓱᓂ ᑲᖏᖅᓱᒃ) ᐊᒻᒪᓗ ᐅᐊᖕᓇᖅ-ᐅᐊᖕᓇᔫᖅ ᐱᓇᖕᓇᔫᖅᓱᓂ (ᓯᒡᔭᒥᑦ ᐊᓄᕌᖅᑐᑦ ᓴᓂᒧᑦ ᑲᖏᖅᓱᒃ). ᐃᓕᖅᑯᓯᐅᓕᖅᐸᒃᑐᖅ ᐊᓯᔾᔨᖅᑰᔨᔪᖅ ᐊᑐᖓᖅᑐᓂ ᖁᓕᓂ ᐊᕐᕌᒍᓂ, ᐊᑕᐅᓯᐊᖅᓱᓂ ᓵᙱᔪᒥᒃ ᐅᐊᖕᓇᖕᒪᓂ-ᐅᐊᖕᓇᔫᖅ ᐱᓇᖕᓇᔫᖅ ᐊᒻᒪᓗ ᓂᒋᖅ–ᓂᒋᖅᐸᓯᒃ ᑲᓇᖕᓇᔫᕐᒥ ᐊᓄᕌᖃᑦᑕᕐᓂᖓ ᐊᒃᓯᐊᓘᙱᓂᖅᓴᐅᓕᖅᓱᓂᓗ ᑕᐃᒪᐃᙱᓂᖅᓴᐅᓕᕐᓱᓂᓗ, ᐊᒻᒪᓗ ᐊᓄᕌᕐᔪᐊᖅᐸᒃᑐᖅ ᓂᒋᖅᐸᓯᖕᒥ ᐱᓇᖕᓇᔫᒥ ᐊᒻᒪᓗ ᐅᐊᖕᓇᒥ-ᐅᐊᖕᓇᔫᖅ ᐱᓇᖕᓇᖅᐸᓯᖕᒥᓂᑦ ᓄᑖᖅ ᐃᓗᐊᕆᓕᖅᑕᖓ ᐊᓄᕆᐅᑉ ᑕᐅᕙᓂ.

ᕐᑯᓕᒧᑦ ᕐᑯᓚᐅᖃᑦᑕᕐᓂᖏᑦ - ᕐᑯᓕᒨᑦ ᕐᑯᓚᐅᖃᑦᑕᕐᓂᙳᓂᒃ ᕿᒥᕐᕈᓂᕐᒥ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙳᓇᕐᓂᖅ ᐸᒡᕕᓴᐃᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓄᑦ ᑎᖕᒥᐊᓂᒃ ᐊᓯᖏᓐᓂᓪᓗ ᓂᕐᔪᑎᓂᒃ ᓄᓇᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᖃᐅᔨᓴᕝᕕᐅᔪᒥ ᐊᒻᒪᓗ ᑎᒃᑯᐊᖅᑕᐅᓯᒪᔪᖅ ᑲᙳᖃᕐᕕᖕᒥᒃ. 2023-ᒥ 7–ᕆᓕᖅᑕᖓ ᐊᕐᕌᒍ ᕿᒥᕐᕈᓂᒃᑲᓃᑦ (ᓛᕐᓗ ᐃᓱᒪᒋᔭᐅᖃᓯᐅᑎᓗᑎᒃ ᐊᖁᑏᑦ ᐃᓱᒪᒋᔭᖏᑦ) ᐃᓚᓕᐅᔾᔭᐅᓯᒪᔪᖅ ᕐᑯᓚᐅᓐᓂᕐᒧᑦ ᕿᒥᕐᕈᓂᕐᓄᑦ. ᐅᔾᔨᕐᓇᖅᓱᓂ, ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᖃᖓᑕᓂᕐᒧᑦ 'ᒪᓕᒃᑐᑦ ᐃᓱᒪᒋᔭᐅᔪᒥᒃ' ᓴᖀᔮᖅᑎᑦᑎᔪᑦ 68% ᑲᑎᕆᒋᑦ ᖃᖓᑕᔭᐅᔪᑦ ᐃᑲᕐᕋᑦ ᕿᒥᕐᕈᔭᐅᓯᒪᔪᑦ ᕿᒥᕐᕈᓂᕐᒥ. ᐃᓱᒪᒋᔭᐅᓚᐅᒃᑐᑦ ᖃᖓᑕᓂᕐᓄᑦ ᐊᑦᑎᓈᓗᐊᕐᓂᕐᒧᑦ 2023-ᒥ ᑲᑎᓪᓗᒋᑦ (38% ᑲᑎᕆᒋᑦ ᖃᖓᑕᓃᑦ ᐃᑲᕐᕋᑦ), ᖃᓂᑦᑐᒧᑦ ᖃᖓᑕᓃᑦ (19%) ᐊᒻᒪᓗ ᓯᓚᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᖃᓄᐃᓕᖓᓕᕐᓃᑦ (9%). 2023-ᒥ, ᑲᑎᕆᒋᑦ ᒪᓕᖕᓂᕐᒧᑦ ᕐᑯᓕᒨᑦ

ᖁᓚᐅᖃᑦᑕᕐᓂᖏᓐᓄᑦ 95.46%-ᖑᓚᐅᖅᑐᑦ. ᑕᒪᐃᓐᓄᑦ ᑲᑎᕆᒋᑦ ᒪᓕᖕᓂᕐᒧᑦ ᐅᖓᑖᓃᓯᒪᔪᖅ 90% 2018-ᒥᓂᑦ, ᒪᓕᙱᑦᑐᑦ ᖃᖓᑕᓃᑦ ᐊᓯᔾᔨᖅᑕᖅᑲᑎᒃ ᐊᑯᓐᓂᖓᓂ 4% ᐊᒻᒪᓗ 8%. ᐅᑎᖅᑕᖅᑐᑦ ᖃᔅᓯᐅᓂᖏᑦ (19%) ᐊᒻᒪᓗ ᖃᖓᑕᓂᕐᒧᑦ ᐃᑲᕐᕋᑦ (5%) ᑲᖑᖃᕐᕕᐅᔪᒥ ᐃᓴᐅᓕᖅᑎᓪᓗᒋᑦ ᐅᓄᕐᓂᖅᓴᐅᓚᐅᖅᑐᑦ ᐊᕐᕋᒎᓚᐅᖅᑐᓂ ᑕᓪᓕᒪᓂ, ᑭᓯᐊᓂᓕ ᒪᓕᖖᒋᑦᑐᑦ ᖃᖓᑕᓃᑦ ᐊᒃᐸᕆᐊᓚᐅᖅᑐᖅ 7%-ᒥᒃ 2023-ᒥ, ᐊᑦᑎᓛᖑᓪᓗᓂᓗ ᑕᐃᒪᙵᓂ 2019-ᒥᓂᑦ.

ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖ - ᓈᓴᐅᑎᐅᒐᔾᑐᖅ ᑲᑎᕆᒋᑦ ᓄᓇᓯᐅᑏᑦ ᐅᑎᖅᑕᖅᑐᑦ 2023-ᒥ 258.7-ᖑᓚᐅᖅᑐᖅ ᐅᑎᖅᑕᖅᑐᑦ ᐊᑐᓂ ᐅᓪᓗᕐᒧᑦ (ᓴᕕᒃᓴᓂᒃ ᐅᓯᔪᑦ ᓈᓴᐅᑎᖃᖅᑲᑎᒃ 234.2 ᐅᑎᖅᑕᖅᑐᑦ ᐊᑐᓂ ᐅᓪᓗᕐᒧᑦ). ᑕᒪᒃᑯᐊ ᖃᐅᑕᒫᑦ ᓈᓴᐅᑏᑦ ᑎᑭᐅᒪᔪᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ ᓈᓴᐅᑎᓄᑦ (236 ᓴᕕᒃᓴᓂᒃ ᐅᓯᔾᒃ ᐅᑎᖅᑕᖅᑐᑦ ᐊᒻᒪᓗ 40 ᓴᕕᒃᓴᐅᙱᑦᑐᓂᒃ ᐅᓯᔪᑦ ᐅᑎᖅᑕᖅᑐᑦ) ᑭᖑᓪᓕᖅᐹᒥᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᐊᓂᐊᖅᑐᑦ ᐅᓂᒃᑳᓂ ᐊᐃᒍᓂ ᐅᔾᕋᖕᓂᐊᕆᐊᓪᓚᒍᒪᓂᕐᒧᑦ ᑐᒃᓯᕋᐅᒧᑦ.

ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᖅ – 2023–ᒥ ᐱᑕᖃᐃᓐᓇᖅᑐᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᒥᒃ ᖃᐅᔨᓴᖅᐸᓯᓕᐊᖏᓐᓇᕐᓃᑦ ᐊᑐᓚᐅᖅᑐᑦ 49-ᓂᒃ (43-ᖑᔪᑦ 2.0-ᒥᒃ ᐅᖅᑐᓂᓕᖕᒥᒃ ᐊᒻᒪᓗ ᐊᕐᕕᓂᓛᑦ 0.5-ᒥᒃ ᐳᖅᑐᓂᓛᑦ) ᐱᑕᖃᐃᓐᓇᖅᑐᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖓᓄᑦ ᑲᑎᖅᓱᐃᕖᑦ ᐆᒃᑐᕋᖅᑕᐅᖁᓪᓗᒋᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ ᐊᒃᑐᐊᓂᓕᖕᓄᑦ ᐱᓕᕆᐊᒥ ᐱᓕᕆᓂᕐᓄᑦ. ᑲᑎᕆᒋᑦ ᖃᔅᓯᐅᓂᖏᑦ ᖃᑦᑖᕐᔪᐃᑦ ᐅᓄᕈᓐᓃᖅᐹᓪᓕᖅᓯᒪᔪᑦ 2022-ᒥ ᐊᕐᕕᓂᓕᖕᓄᑦ 0.5 ᖃᐅᔨᓴᕐᕖᑦ ᐊᒻᒪᓗ 4 ᐅᐊᖕᓇᖓᓂ RR ᖃᐅᔨᓴᕐᕖᑦ ᐋᖅᑕᐅᓯᒪᓪᓗᑎᒃ 2023-ᒥ ᕿᒥᕐᕈᓂᕐᒥ (ᐅᐃᒍᖅ ᒥ). 36-ᖑᔪᑦ ᑲᑎᖅᓱᐃᕖᑦ ᖃᐅᔨᓴᕚᓴᓕᐅᖅᑕᐅᖃᑦᑕᓚᐅᖅᑐᑦ ᑕᖅᑭᑕᒫᑦ, ᐊᒥᐊᒃᑯᖏᑦ ᖃᐅᔨᓴᕚᓴᓕᐅᖅᑕᐅᕙᒃᑲᑎᒃ ᐊᐅᔾᑯᑐᐊᖅ. ᐊᖏᓂᖓ ᐊᕐᕌᒍᑕᒫᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ ᐅᔾᕋᖕᓂᐊᕐᕕᖓᒥ ᖃᐅᔨᓴᕚᓴᓕᐅᕐᕕᖕᓂ ᐊᒃᐸᓯᖕᓂᖅᓴᐅᓚᐅᖅᑐᑦ ᐆᒃᑐᕋᖅᑕᐅᓯᒪᔪᓂ ᒫᓐᓇᓕᓴᐅᔪᓄᑦ. ᖁᕝᕙᓯᓛᖅ ᐳᔪᕋᖅ ᓯᐊᒻᒪᓛᖑᓚᐅᖅᑐᖅ ᐅᔾᕋᖕᓂᐊᕐᕕᖓᒥ ᐊᒃᑐᐊᓂᓕᒃ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂ. ᒥᑦᑕᕐᕕᒃ ᓱᕐᕋᙱᑦᑐᒥᒃ ᖁᕝᕙᓯᓛᒥᒃ ᐳᔪᕋᕐᒥᒃ ᓯᐊᒻᒪᖃᑦᑕᕐᕕᐅᓯᒪᔪᖅ ᐅᔾᖃᖕᓂᐊᕐᕕᖓᒥ ᐊᕐᕌᒍᓗᒃᑖᓂ ᑭᓯᐊᓂ 2019-ᒥ, ᑲᑎᕆᒋᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᑕᐃᑲᓂ ᐃᓂᒥ ᐊᒃᐸᓯᓛᖑᓚᐅᖅᑐᖅ 2023-ᒥ. ᐊᖏᓂᖓ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᕿᙱᐊᓂ ᑐᓚᒃᑕᕐᕕᖓᒥ ᓱᕐᕋᙱᑦᑐᑦ ᐅᕝᕙᓘᓐᓃᑦ, ᐃᓛᓐᓂᒃᑯᑦ, ᐊᒃᐸᕆᐊᖅᓯᒫᕐᔪᒃᐸᒃᑲᓂ, ᐃᓕᖅᑯᓯᐅᔪᖅ ᐱᒋᐊᓚᐅᖅᑐᖅ 2018-ᒥ. ᖁᕝᕙᓯᓛᖅ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᕿᙱᐊᓂ ᑐᓚᒃᑕᕐᕕᕈᔪᖕᒥ ᐊᒃᑐᐊᓂᖃᓚᐅᖅᑐᑦ ᓴᕕᒃᓴᓂᒃ ᑲᑎᖅᓱᐃᕖᕕᖕᒥ, ᑐᖖᓈᓃᓐᓴᖅᓴᐅᓪᓗᓂ ᐳᔾᕋᖃᖅᑎᑕᐅᔪᒥ ᐅᒥᐊᕐᔪᐊᖃᕐᕕᐅᔪᒥ. ᑕᐅᕗᓇ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᒍᑦ, ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ 2023-ᒥ ᒪᓕᑐᐃᓐᓇᓚᐅᖅᑐᖅ ᐅᐊᖕᓇᖓᓂ ᐃᒃᑳᕐᕖᑦ ᐃᓂᖏᓐᓂᒃ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᑦ ᕿᒥᕐᕈᔭᐅᓪᓗᑎᒃ ᒫᓐᓇᓕᓴᕐᓄᑦ. ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᐊᖏᓂᖓ ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᖅ ᖃᐅᔨᓴᖅᑕᐅᓪᓗᓂ ᖃᖓᑦᑕᖅᑎᑕᐅᓯᒪᔪᑎᒍᑦ ᐊᔾᔨᙳᐊᑎᒍᑦ. ᑕᒪᓐᓇ ᕿᒥᕐᕈᓂᖅ ᐱᓕᕆᐊᖑᓚᐅᑐᑦ ᓇᓗᓇᐃᖅᑕᐅᖁᓪᓗᒋᑦ ᐃᓄᐃᑦ ᓄᓇᒥᒃ ᐊᑐᖅᑏᑦ ᐅᖃᐅᓯᕆᖃᑦᑕᖅᑕᖏᑦ ᑕᑯᖃᑦᑕᕐᓂᖏᓐᓄᑦ ᐳᔪᕋᒥᒃ ᐅᖓᑖᓅᖅᓯᒪᔪᓂᒃ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂ ᐱᒋᐊᕈᑕᐅᔪᓂ ᖃᐅᔨᓴᕈᑎᓂᑦ ᐋᖅᑭᒋᐊᖅᑕᐅᓯᒪᔪᓂ ᐊᒻᒪᓗ ᑕᑯᓂᒃᑯᑦ ᐊᖏᓂᖓ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᐃᓂᓂ ᖃᐅᔨᔭᐅᔪᓐᓇᖁᐊᙱᑦᑐᓂ ᐳᔪᕋᒥᒃ ᑲᑎᖅᓱᐃᕕᖕᓂ. ᐃᓕᖅᑯᓯᖓ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᐊᖏᓂᖓ ᓄᓇᒥ ᐊᔾᔨᐸᓗᒋᔭᖓ 2014-ᒥ 2023-ᒧᑦ ᐃᓂᓗᒃᑖᓄᑦ, ᐱᑕᖃᕐᓂᐅᓛᑦ ᖃᓂᒌᔭᓂ ᐱᓕᕆᐊᑉ ᐊᒻᒪᓗ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᑦ ᐅᖓᕙᖅᐸᓪᓕᐊᓪᓗᓂ ᐅᐊᖕᓇᔮᒧᑦ ᑲᓇᖕᓇᔮᒧᑦ ᑕᐅᕗᓇ ᕿᙱᐊᓂ, ᐱᓇᖕᓇᔮᒧᑦ ᓂᒋᕐᒧᑦ ᐅᔾᕋᖕᓂᐊᕐᕕᖓᒥ, ᓂᒋᖅᐸᓯᒃ ᐱᓇᖕᓇᔮᖓᓂ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂ ᐃᑳᕐᕕᖓᒥ (ᑮᓛᒥᑕ 78) ᐊᓄᓇᐅᑉ ᐃᓗᐊᕆᔭᖓᒍᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐊᓄᕌᔪᐊᕐᓂᐅᕙᒃᑐᒃᑯᑦ. ᐹᕙᓐᓛᓐᑯᑦ ᐊᑐᖃᑦᑕᖅᑐᑦ ᐊᒥᓱᒐᓚᖕᓂᒃ ᐅᔾᕋᖕᓂᐊᕐᕕᖕᒥᒍᑖᖅ ᐳᔫᒍᐊᔾᔭᐃᒃᑯᑎᓂᒃ ᐱᓗᐊᕐᑯᓇᒋᑦ ᑕᒪᒃᑯᐊ ᑎᒃᑕᐅᕙᒃᑐᑦ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐃᒥᖅ ᐃᓚᖃᖅᑲᓂ ᐊᖅᑯᑎᒃᑯᑦ, ᐊᑐᖅᑕᐅᖏᓐᓇᖅᑲᑎᒃ ᐅᓛᑦ ᓴᕕᒃᓴᓂ ᓯᖃᓪᓕᑦᑎᕕᖓᒥ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓂᖏᑦ

ᑎᖕᒥᑲᔫᑦ (DusTreat), ᑎᖕᒥᑳᕐᕕᐅᒐᔪᒃᑐᑦ ᓴᕕᒃᓴᓂᒃ ᑲᑎᖅᓱᐃᕝᕕᖕᒥ 2023-ᒥ. ᑎᖕᒥᑲᕈᑏᑦ (DustBlockr®) ᑎᖕᒥᑳᖅᑎᑕᐅᖃᑦᑕᖅᑐᑦ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑎᓗᒃᑖᖓᓂ ᐊᐅᔾᑯᑦ 2023-ᒥ. ᐊᑐᖅᑕᐅᖕᒋᓐᓇᕐᓂᖕᒋᑦ ᐳᔫᓗᐊᔾᔭᐃᒃᑯᑏᑦ, ᑎᖕᒥᑳᔫᑦ (DustBlockr®) ᑎᖕᒥᑳᕐᕕᐅᔫᑦ ᓴᕕᒃᓴᓂᒃ ᑲᑎᖅᓱᐃᕝᕕᖕᒥ ᐊᑐᖅᑕᐅᒐᔪᓚᐅᖅᑐᑦ 2023-ᒥ. ᑎᖕᒥᑳᔫᖅ (DusTreat) ᐅᓗᕆᐊᓇᖕᖏᑦᑐᖅ, ᐃᒪᐅᓪᓗᓂ ᐊᒻᒪᓗ ᐊᑯᓂ ᐳᔫᓗᐊᔾᔭᐃᒃᑯᑕᐅᔫᖅ ᐊᓂᐊᑎᑦᑎᖕᖏᔾᔪᑕᐅᓪᓗᓂ ᑲᑎᖅᓱᐃᕝᕕᐅᔪᒥ ᐳᔪᕋᖃᕐᑯᓇᒍ ᐊᒻᒪᓗ ᐸᕐᓇᒃᓯᒪᔪᑦ ᐊᑐᖅᑕᐅᒐᔪᖕᓂᖅᓴᐅᓗᓂ ᑲᑎᖅᓱᐃᕝᕕᐅᔪᓂ ᕿᖕᒍᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ.

ᐱᕈᖅᑐᑦ – ᐱᕈᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ 2023-ᒥ ᑐᕋᒐᖃᓚᐅᖅᑐᑦ ᐊᓯᔾᔨᑐᐃᓐᓇᕆᐊᓕᖕᓂᒃ ᐱᕈᖅᑐᑦ ᐊᒥᔫᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ ᖃᓄᐃᓕᖓᓂᖕᒋᓐᓄᑦ ᐊᑯᓂᐅᔪᒃᑯᑦ ᐊᔾᔨᒌᙱᑦᑐᓂᒃ ᐅᖓᓯᒌᓕᓃᖕᓂ ᐱᓕᕆᐊᒥ ᐱᕚᓪᓕᐊᑎᑕᐅᕝᕕᐅᔪᒥ (PDA). ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᓂᖃᑐᐃᓐᓇᕆᐊᓛᑦ ᐊᒃᑐᐃᓃᑦ ᑲᑎᙵᕆᑦ ᐱᕈᖅᑐᖃᕐᕕᐅᔪᓄᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᒃᑐᐊᓂᖃᖅᑐᓄᑦ ᐅᖓᓯᒌᖕᓂᖕᒋᓐᓄᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᕿᒥᕐᕈᔭᐅᓪᓗᑎᒃ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖕᒋᓐᓄᑦ ᑲᑎᑕᐅᓚᐅᖅᓯᒪᔪᓄᑦ ᑎᑎᖅᑲᕐᑯᑎᓄᑦ (ᔫᕐᓗ 2017-ᒥᑦ 2019-ᒧᑦ, 2023). ᓇᓗᓇᐃᕈᑎᑕᖅᖏᑦᑐᖅ ᐊᓯᔾᔨᕐᓂᖕᒋᓐᓄᑦ ᐳᓴᓐᑎᖕᒋᓐᓂ ᐱᕈᖅᑐᖃᐅᕐᓂᐅᔪᑦ ᐊᒻᒪᓗ ᓄᓇᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᖃᓄᐃᓕᖓᓂᖕᒋᓐᓄᑦ ᐅᖓᓯᒡᓕᕚᓪᓕᐊᓪᓗᑎᒃ ᐱᓕᕆᐊᒥ ᐱᕚᓪᓕᐊᑎᑕᐅᕝᕕᐅᔪᒥ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ. ᓈᓴᐅᓯᕆᔾᔪᑏᑦ ᑎᑎᖅᑲᕐᑯᑏᑦ ᐃᓕᖅᑯᓯᖕᒋᑦ ᐱᔾᔪᑕᐅᓪᓗᐊᑕᓚᐅᖅᑐᑦ ᐊᕐᕌᒍᑕᒫᑦ ᐊᔾᔨᕈᖃᑦᑕᙱᓐᓇᕐᒋᓐᓄᑦ (ᔫᕐᓗ ᐊᕐᕌᒍᑕᒫᑦ ᐊᔾᔨᕈᖃᑦᑕᙱᑦᑐᑦ ᐱᕈᖅᑐᑦ ᐱᕈᖅᐸᓪᓕᐊᓂᖕᒋᑦ ᓄᓇᖓᓂᓗᒃᑖᖅ). ᐆᒃᑐᕋᖅᑕᐅᔭᓇᙱᑦᑐᑦ ᓂᕐᒪᕝᕕᐅᔫᑦ ᐊᒃᑐᖅᑕᐅᔪᑦ ᖃᐅᔮᔭᐅᓚᐅᙱᑦᑐᑦ. ᐃᔾᔩᑉ ᒪᓴᐅᓂᖓ ᒪᓴᐅᓂᖅᓴᐅᖅᑰᔭᒐᓗᐊᖅᑎᓪᓗᒍ 2019-ᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑦ ᕿᒥᕐᕈᓪᓗᒍ 2023-ᒧᑦ, ᐊᔾᔨᒌᙱᖕᒋᓐᓂᖕᒋᑦ ᓇᓗᓇᐃᖅᑕᐅᔫᓇᓚᐅᙱᑦᑐᑦ ᐅᖓᓯᒌᒃᑕᕐᓂᖕᒋᓐᓄᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᐊᒻᒪᓗ ᐊᕐᕌᒍᖕᒋᓐᓄᑦ. ᖃᓄᐃᓕᖓᓂᓇᕙᒃᑕᖕᒋᑦ ᐱᕈᖅᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᖃᓄᐃᓕᖓᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ ᐃᔾᔩᑉ ᒪᓴᐅᓂᖓᓄᑦ ᓇᓗᓇᐃᕈᑎᖃᖅᑰᔨᙱᑦᑐᑦ ᒥᑭᑦᑐᕋᕈᑦ-ᐃᓂᒋᔭᐅᔪᒪᓂᖅᓴᑦ ᐊᔾᔨᙱᑦᑐᓂ ᐱᕈᖅᑐᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᐊᔾᔨᙱᑦᑐᓄᑦ ᐃᔩᑉ ᒪᓴᐅᓂᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᓄᑦ.

ᓂᕐᔪᑏᑦ - ᐊᐳᒻᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᕆᑦ ᐆᒪᔪᑦ ᐃᓕᖅᑯᓯᓕᖅᐸᒃᑕᖕᒋᑦ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂ, ᐱᓗᐊᖅᑐᒥᒃ ᑐᒃᑐᓄᑦ. ᐊᕐᕕᓃᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᔭᓃᖅᑕᐅᓚᐅᖅᑐᑦ 2023-ᒥ. ᐊᔾᔨᓕᓗᓂᐅᒃ ᑭᖑᓂᖔᑦᑎᓐᓂ ᐊᕐᕌᒍᓄᑦ, ᑐᒥᓗᒃᑖᐸᓗᐃᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ ᑎᕆᓚᓂᐊᖑᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᐊᕿᒡᒋᑦ, ᑐᒃᑐᓄᑦ ᑐᒥᓂᒃ ᐅᔾᔨᕆᔭᐅᔪᖃᓚᐅᖅᑐᖅ 2023-ᒥ. 4%-ᑐᐃᓐᓇᑦ ᐅᔾᔨᕆᔭᐅᔪᑦ ᑐᒦᑦ ᕿᒪᐃᕙᓪᓕᐊᓚᐅᖅᑐᑦ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂᒃ.

ᐊᐳᔾᔭᕆᖕᓃᑦ ᐳᖅᑐᓂᖕᒋᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᕆᑦ ᒪᓕᒪᖕᓂᕐᒧᑦ ᐊᐅᓚᓂᖅᑲᕐᓂᕐᒥ 1 ᒦᑕᓂᒃ ᐳᖅᑐᓃᑦ, ᑲᒪᒋᔭᖃᖅᑐᓂ ᐆᒪᔪᑦ ᐃᑳᕈᓐᓇᕐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ ᓴᖅᑮᔭᓕᖅᑎᑦᑎᓪᓗᓂ ᐊᕐᑯᑎᓄᑦ ᓂᕐᔪᑎᓂᒃ ᐊᐳᖅᓯᕐᑯᓇᒋᑦ. ᐊᐳᔾᔭᕆᖕᓂᐅᕙᒃᑐᑦ ᐳᖅᑐᓂᖕᒋᓐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ 2023-ᒥ ᐅᑭᐅᒃᑯᑦ. ᑭᐅᔾᔪᑕᐅᓇᓱᐊᖅᑐᓂ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᖏᑦ ᑐᒃᓯᕋᐅᑖᓄᑦ, ᐆᒃᑐᕋᐃᓃᑦ ᐃᓂᓂ ᑎᒃᑯᐊᖅᑕᐅᑐᐃᓐᓇᖃᑦᑕᖅᓯᒪᔪᑦ 2020-ᒥᓂᑦ ᐊᑐᙱᕐᑯᑎᒃ ᑖᒃᑯᓂᖓᒃᓴᐃᓐᓇᖅ ᑭᗏᒥᑕᓄᑦ ᓇᓗᓇᐃᒃᑯᑕᓂᒃ ᐆᒃᑐᕋᐃᓂᕐᒧᑦ. ᑕᒪᐃᓐᓄᓗᒃᑖᖅ, ᒪᓕᖕᓂᖅ 88%-ᖑᓯᒪᔪᖅ, ᐊᒃᐸᔨᖕᓂᖅᓵᕐᔪᒃ 2022-ᒥᓂᑦ (91%) ᑭᓯᐊᓂᓕ ᐃᓗᐊᓃᑦᑐᖅ ᔨᓕ ᐊᔨᖕᒋᓐᓄᑦ ᐊᕐᕌᒍᓄᑦ ᐊᐳᔾᔭᕆᖕᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕈᑎᓄᑦ.

ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᑐᒃᑐᐃᑦ, ᓇᓅᓐᓂᖏᑦ ᐃᓕᖅᑯᓯᕆᕓᒃᑕᖏᓪᓗ ᐱᓕᕆᕝᕕᐅᔪᒥ ᐱᕙᓪᓕᐊᕝᕕᐅᔪᒥ ᓄᕐᕆᐅᕐᓇᖅᑎᓪᓗᒍ. ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᔾᔪᑎᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᑯᓂᖓᓂ ᔫᓂ 2 ᐊᒻᒪᓗ ᔫᓂ 11, 2023-ᒥ. ᑲᑎᖦᒋᑦ ᓇᐅᑦᑎᖅᓱᕐᓂᐅᔪᑦ 16 ᐃᑲᕐᕋᑦ ᐊᒻᒪᓗ 51 ᒥᓇᑦ, (ᐅᓄᕈᓐᓂᖅᐹᓪᓕᖅᑐᑦ 2022-ᒥᓂᑦ ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᕐᑯᓕᒥᒎᑦ ᖃᖓᑕᖃᑦᑕᓚᐅᙱᓐᓂᖏᓐᓂᑦ ᐊᑦᑕᕐᓇᖅᑕᐃᓕᒪᓪᓗᑎᒃ) ᓇᐅᖅᑎᖅᓱᕐᓂᐅᓚᔪᒃᑐᑦ ᐊᑐᓂ ᖃᐅᔨᓴᕐᕕᖕᒥ 40 ᒥᓇᑦᖑᓚᐅᖅᑐᑦ. ᑐᒃᑐᓂᒃ ᑕᑯᔭᐅᔪᖃᓚᐅᙱᑦᑐᖅ ᑖᒃᑯᓇᓂ ᖃᐅᔨᓴᕐᓂᐅᔪᓂ 2023-ᒥ, ᑭᓯᐊᓂᓕ ᑐᒃᑐᐃᑦ ᑐᒥᖏᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᔫᓂ 9, 2023-ᒥ ᐃᓗᑐᓂᐊᕐᔪᖕᒥ ᑐᑭᐊᓂ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂ ᑭᒑᒥᑕ 90.5-ᒥ. ᑕᒪᓐᓇ ᒪᓕᑐᐃᓐᓇᖅᑐᑦ ᐊᑕᖏᖅᒐᒋᑦ ᖃᐅᔨᓴᕈᑎᕕᓂᕐᓂ 2013-ᖑᐊᓂᓚᐅᖅᑎᓪᓗᒍ ᐊᒻᒪᓗ ᐅᓄᖕᒌᓐᓇᖅᑐᑦ ᓄᓇᖓᓂ ᑐᒃᑐᐃᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ. ᓴᖅᑭᓯᒪᔪᑦ ᐅᖓᓯᒃᑐᒦᖦᒋᑦ ᐊᔾᔨᓕᐅᕈᑎᑎᒍᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓃᑦ, ᐃᑲᔪᖅᑐᖅᑐᑦ ᐱᓕᕆᐊᑦ ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ, ᑐᒃᑐᓂᒃ ᑕᑯᔭᐅᕝᕕᐅᓚᐅᙱᑦᑐᑦ ᔫᓄᐊᕆ 1, 2023-ᒥᑦ ᑎᓯᐱᕆ 28, 2023-ᒧᑦ. ᖃᖓᑕᓲᒃᑯᑦ ᑐᒃᑐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ ᒫᔾᔨ 2023-ᒥ, ᑐᒃᑐᐃᑦ ᓄᕐᕆᐅᓚᐅᖅᑎᓇᒋᑦ ᓱᓕ. ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ, 112 ᑐᒃᑐᐃᑦ ᐊᒻᒪᓗ 36 ᑐᒃᑐᐃᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ. ᑐᒃᑐᒃᑖᑦ ᑕᑯᔭᐅᔪᑦ ᓂᒋᐊᓂ ᐊᕕᒃᑐᖅᓯᒪᒃᑲᓂᐅᔭᖅᑐᓂ ᓂᕐᔪᑎᓂᒃ ᓄᓇᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᖃᐅᔨᓴᕐᕕᐅᔪᓂ, ᐊᒻᒪᓗ ᒪᕐᕈᑐᐊᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ (ᕐᑯᓕᖃᙱᑐᐃᓐᓇᖅᑐᑦ ᑲᑎᖦᒋᑦ) ᑐᔾᔭᐱᒃᖢᑎᒃ ᐃᓚᖏᑦ ᐅᐊᖕᓇᖓᓂ ᐊᕕᒃᑐᖅᓯᒪᒃᑲᓂᐅᔭᖅᑐᓄᑦ.

ᑎᖕᒥᐊᑦ - ᑎᑭᑉᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕝᕕᕆᕚᒃᑕᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᔭᕇᖅᑕᐅᓚᐅᖅᑐᑦ ᖃᓄᑐᐃᓐᓇᖅ ᐱᕈᖅᑐᓂᒃ ᑲᒪᒋᔭᐅᕞᓂᓚᐅᖅᑎᓇᒋᑦ ᐅᕝᕙᔫᓐᓃᑦ ᒪᓂᕋᕐᒥ ᐸᑦᕕᓴᐃᓂᖅᑕᖅᑳᖅᑎᓇᒍ ᐅᔭᕋᖅᓂᐊᕐᕕᖕᒥ ᓄᓕᐅᑎᓪᓗᒋᑦ ᑎᖕᒥᐊᑦ (ᒪᐃ 17-ᒥᑦ ᐋᒡᒋᓯ 19-ᒧᑦ). ᖃᐅᔨᓴᕐᓃᑦ ᐱᖃᓯᐅᔾᔨᓯᒪᓚᐅᖅᑐᑦ ᓇᐅᑦᑎᖅᓱᖅᖢᑎᒃ ᐊᑐᖅᖢᑎᒃ ᐊᒃᖢᓈᒥᒃ-ᑲᑎᑲᑕᒃᖢᑎᒃ ᐱᓕᕆᔾᔪᓯᕐᒥ (ᕋᐅᒃ 2015) ᖃᐅᔨᓇᓱᒃᖢᑎᒃ ᐃᕙᕝᕕᑐᐃᓐᓇᕐᓂᖅ ᓴᓇᓯᒋᐊᖅᑳᖅᑎᓇᒋᑦ. ᐃᓚᖓ ᖃᐅᔨᓴᕐᓂᖅ ᐱᔭᕇᖅᑕᐅᓚᐅᖅᑐᑦ 2023-ᒥ, ᐊᒻᒪᓗ ᐃᕙᕝᕖᑦ ᖃᐅᔨᔭᐅᓚᐅᙱᑦᑐᑦ.

ᐊᒥᓱᓚᓪᓚᑦ ᐊᕐᕋᒍᐃᑦ ᑎᖕᒥᐊᓂᒃ ᓂᕿᑐᖅᑎᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓂᖅ, ᐃᓂᖃᕐᓂᖏᑦ ᐊᒻᒪᓗ ᐃᕐᓂᐅᓂᖏᑦ ᓱᕐᕌᖅᑰᔨᓯᒪᙱᑦᑐᑦ, ᓇᓗᓇᐃᒃᑯᑕᖅᑕᖃᕋᓂᓗ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓂᖃᕐᓂᖏᓐᓂᒃ ᑎᖕᒥᐊᓂᒃ ᓂᕿᑐᖅᑎᓂᒃ. ᑕᐃᒪᐃᓐᓂᖓᓄᑦ, ᑎᖕᒥᐊᑦ ᓂᕿᑐᖅᑏᑦ ᑕᐅᕙᓃᓐᓂᖏᑦ ᐊᒻᒪᓗ ᐃᕐᓂᐅᖅᐸᖕᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᓃᑦ ᓄᖅᑲᖅᑎᑕᐅᓯᒪᔪᑦ 2021-ᒥᓂᑦ. ᓯᕗᓂᒃᓴᒥᒃ ᖃᐅᔨᓴᕐᓂᕐᓂᒃ ᑐᒃᓯᕋᖅᑕᐅᓯᒪᔪᖃᙱᑦᑐᖅ.

ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ - ᐊᑯᓂᖓᓂ ᐊᕙᑏᑦ ᑎᓴᒪᓪᓗ ᓂᕐᔪᑎᓂᒃ ᑐᕐᑰᑎᔪᖃᓚᐅᖅᑐᖅ ᐅᖃᐅᓯᐅᔪᓂᒃ 2023-ᒥ, ᐊᑕᖏᖅᒐᒋᑦ ᐃᓛᒃᑯᑦ ᐊᓯᐅᔨᓂᐅᓪᓗᑎᒃ. ᑐᕐᑯᔪᑦ 2023-ᒥ ᐱᖃᓯᐅᔾᔨᓯᒪᔪᑦ ᒪᕐᕉᖅᓂᒃ ᐊᕐᕕᓂᓖᖅᓂᒃ ᐊᔾᔨᒌᙱᑦᑐᓂᒃ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᐊᕐᔪᖅᓂᖏᓐᓂᒃ: ᑎᕆᒐᓂᐊᖅ (2), ᐅᑲᓕᖅ (3), ᐊᐅᐸᖅᑐᖅ ᑎᕆᒐᓂᐊᖅ (1), ᐊᒪᕈᖅ (1), ᕐᑯᐸᓄᐊᖅ (3), ᖃᐅᔾᒪᔭᐅᙱᑦᑐᖅ ᑭᓲᓂᖓ ᑎᖕᒥᐊᕈᓯᖅ (1), ᐊᒻᒪᓗ ᒥᑎᖅ (13). ᐃᖏᕐᕋᔾᔪᑎᓄᑦ ᐊᐳᖅᑕᐅᓯᒪᓂᖏᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐅᕝᕙᔫᓐᓃᑦ ᑲᖏᑦᑎᔭᐅᓪᓗᑎᒃ ᐊᑕᖏᖅᒐᒋᑦ ᐊᒫᒪᒃᑎᑦᑎᓲᑦ ᑐᕐᑯᑕᐅᓂᖏᑦ. ᑕᒪᐃᓐᓂᒃ ᑎᖕᒥᐊᑦ ᑐᕐᑯᑕᐅᓂᖏᑦ ᑕᐃᒪᐃᓐᓇᓱᒋᔭᐅᔪᑦ ᐃᓪᓗᓄᑦ ᐱᕐᑯᑎᕐᔪᐊᓄᓘᓐᓃᑦ ᐊᐳᖅᖢᑎᒃ. ᐊᔪᕐᓇᙱᑐᐊᕋᖓᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᙵᑦ ᐊᑐᓕᖅᑎᑕᐅᓲᑦ ᐅᓗᕆᐊᓇᓗᐊᕐᑯᓇᒋᑦ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᓂᕐᔪᑏᑦ ᐋᓐᓂᕐᓂᖏᓐᓄᑦ ᑐᕐᑯᓂᖏᓐᓄᓪᓗᓐᓂᑦ.

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᔮᓐᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓈᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓪᓕᐅᒪᑎᑦᑎᓇᓱᖕᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓈᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
ᓯᓇᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ	ᐃᑲᔪᖅᑐᐃᔪᑦ ᐊᓯᓗᒃᑖᖏᓐᓂᒃ ᑲᑎᖅᓱᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ	ᓯᓚᐅᑉ ᖃᓄᐃᓕᖓᓂᖏᑦ ᑎᑎᕋᖅᑕᐅᖃᑦᑕᓚᐅᖅᑐᑦ ᐃᑲᕐᕋᑕᒫ ᓯᓚᓐᓂᐊᕐᕕᖕᒥ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᐊᒻᒪᓗ ᕿᖑᐊᓂ. ᓯᓚᒧᑦ ᑎᑎᖅᑲᕐᑯᑏᑦ ᑎᑎᕋᖅᑕᐅᖏᓐᓇᖃᑦᑕᖅᓯᒪᔪᑦ 2005-ᒥᓂᑦ (ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ) ᐊᒻᒪᓗ 2006 (ᕿᖑᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ). ᓯᓚᒥ ᖃᐅᔨᓴᐅᑏᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐃᑲᔫᑕᐅᓪᓗᑎ ᐊᓯᖏᓐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ; ᐸᓪᓕᐅᒪᑎᑦᑎᓇᓲᑏᑦ ᐊᑐᖃᐊᖃᖏᑦᑐᑦ. ᓯᓚᓐᓂᐊᕈᑏᑦ ᖃᐅᔨᓴᕐᕖᑦ ᑲᔪᓰᓐᓇᕐᓂᐊᖅᑐᑦ ᑲᑎᖅᓱᐃᓗᑎᒃ ᓯᓚᒧᑦ ᑎᑎᖅᑲᕐᑯᑎᓂᒃ 2024-ᒥ.	ᐱᑕᖃᖏᑦᑐᖅ
ᕐᑯᓕᒥᒎᑦ ᕐᑯᓚᐅᖃᑦᑕᕐᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ	ᑲᒪᒋᔭᓕᒃ ᐱᓕᕆᐊᒥ ᒪᓕᒃᑕᐅᔪᒃᓴᓂᒃ 59, 71, ᐊᒻᒪᓗ 72	ᐊᐅᓚᓂᕐᓄᑐᐊᖅ, ᐊᒻᒪᓗ ᐱᔾᔪᑕᐅᓪᓗᓂ ᖃᖓᑕᓲᒥ ᐊᕐᖁᑏᑦ ᐃᓱᒪᖅᓱᑏᕆᓪᓗᓂᔾᔪᒃ ᐱᔾᔪᑕᐅᓪᓗᓂ ᖃᖓᑕᓲᑦ ᐊᒻᒪᓗ ᐃᓄᐃᑦ ᐊᑦᑕᕐᓇᖅᑕᐃᓕᒪᓂᖏᑦ, ᖃᖓᑕᓲᒥ ᐊᕐᖁᑏᑦ ᖃᖓᑕᓂᖃᐃᓐᓇᓇᐊᓖᑦ 650 ᒦᓂᒃ ᐊᐅᓪᓚᕐᕕᖓᓂᑦ–ᑎᑭᓐᓇᓱᒃᑕᖓᓄᑦ ᐃᖏᕐᕋᑎᓪᓗᖏᑦ ᐃᓂᓂ ᑎᑭᑉᐸᒃᑐᓂᒃ ᑎᖕᒥᐊᓂᒃ ᓇᔪᖅᑕᐅᕙᒃᑐᓂ, ᐊᒻᒪᓗ 1,100 ᒦᑕᑦ ᕐᑯᒻᒧᑦ ᐊᒻᒪᓗ 1,500 ᒦᑕᑦ ᓴᓂᒧᑦ ᐅᖓᓯᖕᓂᖅᑰᓪᓗᑎᒃ ᑕᑯᔭᐅᕝᕕᐅᔪᓂ ᐱᑕᖃᕐᓂᐅᔪᓂ ᑎᑭᑉᐸᒃᑐᓂᒃ ᑎᖕᒥᐊᓂ (ᓲᕐᓗ ᑲᖑᖅᑳᕐᕖᑦ). ᖃᖓᑕᓂᕐᒧᑦ ᐊᖅᑯᑏᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᑦ ᐊᑐᖅᑕᐃᓕᒪᓲᑦ ᐃᓂᒋᔭᐅᓪᓚᑲᒃᑐᓂᒃ ᐱᒻᒪᕆᐅᓪᓗᑎᒃ ᓂᕐᔪᑎᓄᑦ.	ᓂᕆᐅᒋᔭᐅᓚᐅᖅᑐᑦ ᐃᓚᖏᑦ ᑲᖑᐃᑦ ᐃᓂᒋᕙᒃᑕᖏᓐᓃᑦᑐᓐᓃᕋᔭᕆᐊᒃᓴᖏᓐᓂᒃ ᐱᓕᕆᐊᒥ-ᐊᒃᑐᐊᔪᓄᑦ ᐱᓕᕆᓂᕐᓄᑦ ᑭᓯᐊᓂᓕ ᓅᓪᓗᑎᒃ ᖃᓂᒋᔮᓄᑦ, ᐅᓚᕕᓴᖅᑕᐅᓗᐊᙱᓐᓂᖅᓴᒧᑦ. ᐃᓚᐃᓐᓇᖓ ᑲᖑᖅᑳᕝ ᕐᑯᓕᒨᒃᑯᑦ ᖃᖓᑕᕝᕕᐅᖃᑦᑕᕋᔭᕐᓂᖓᓄᑦ ᐊᒻᒪᓗ ᐃᓂᖃᓪᓗᐊᑕᖅᑐᑦ ᓯᓚᑖᓂ ᐃᓂᐅᔪᑦ ᐊᒃᑐᖅᑕᐅᔪᑦ, ᐊᒃᑐᐃᓈᑦ ᑭᒡᓕᖃᕋᔭᖅᑐᒃᓴᐅᔪᑦ. ᑕᒪᐃᓐᓅᖓᔪᓄᑦ, ᓄᓇᖓᓂ ᐅᖓᓯᒃᑐᑦ ᐊᒃᑐᐊᓂᓪᓗᑦ ᐱᓕᕆᐊᒥ

[1] ᐱᓕᕆᐊᒥ ᒪᓕᒃᑕᐅᔭᕆᐊᓖᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᒥ ᐱᓂᐊᕐᓂᕋᕈᑏᑦ ᐊᑐᖅᓱᕆᑦ ᓄᓇᕘᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᐅᔭᕋᖕᓂᐊᕈᓇᐅᑎᐅᑉ ᓈᓴᐅᑖ 005 (ᓄᓇᕘᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ 2014

[2] ᓄᓘᔮᓐᓂ ᐱᓕᕆᐊᒧᑦ ᑭᖑᓪᓕᖅᐹᒥᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᐊᓂᐊᖅᑐᑦ ᐅᓂᒃᑳᑦ: ᕿᒥᕐᕈᐊᖅ 6 –ᓄᓇᐅᑉ ᐊᕙᑎᖓ (ᐹᕙᓪᓛᓐ ᓴᕕᒃᓴᓂᒃ ᐅᔭᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᑦ 2012ᐃ) ᐊᒻᒪᓗ ᓄᓘᔮᓐᓂ ᐱᓕᕆᐊᒧᖅ ᑮᓇᐅᔾᔭᒃᓵᓪᓚᓇᓱᐊᕐᓂᕐᒧᑦ ᐅᐃᒍᖅ ᑖᒃᑯᓇᖓ ᑭᖑᓪᓕᖅᐹᒥᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᐊᓂᐊᖅᑐᑦ ᐅᓂᒃᑳᑦ: ᕿᒥᕐᕈᐊᖅ 6 ᓄᓇᐅᑉ ᐊᕙᑎᖓ (ᐹᕙᓪᓛᓐ ᓴᕕᒃᓴᓂᒃ ᐅᔭᕋᖕᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᑦ 2013ᐃ)

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓯᓕᐊᕆᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᓐᓇ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᖁᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᔾᔪᑎᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᖕᒋᕆᔾᔪᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᖕᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔾᔪᐅᓂᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
		2023-ᒥ, ᒪᓕᖕᓂᕐᒧᑦ ᐳᖅᑐᔭᕆᐊᖃᕐᓂᖏᓐᓄᑦ ᐃᓗᐊᓂ ᑲᖑᖃᕐᕕᖕᓂ ᐃᓴᐅᖅᑎᓪᓗᒋᑦ (ᔪᓚᐃᒥ ᐋᒡᒋᓯᒧᑦ) 93%-ᖑᓚᐅᖅᑐᖅ, ᐊᒻᒪᓗ ᒪᓕᒃᑐᑦ ᓯᓚᑖᓂ ᑲᖑᖃᕐᕖᑦ ᐃᓂᓗᒃᑖᓂ ᑕᖅᑭᓗᒃᑖᓂ ᕿᒥᕐᕈᓂᕐᒥ (ᒪᐃᒥᑦ ᓯᑎᐱᕆᒧᑦ) 95%-ᖑᓚᐅᖅᑐᖅ. ᐊᕐᕕᓂᓖᑦ ᒪᕐᕿᓕᖅᑐᑦ ᐊᕐᕋᒍᑦ ᑭᖑᓕᕆᑦ, ᑯᓚᐅᓐᓂᕐᒧᑦ ᑎᑎᖅᑲᕐᑯᑏᑦ ᐊᒃᑐᐊᓕᖅᑎᑕᐅᓯᒪᔪᑦ ᖃᐅᑕᒫᖅᓯᐅᑎᓄᑦ ᖃᖓᑕᓲᖅᑏᑦ ᑎᑎᕋᕐᕕᕆᕙᒃᑕᖕᒋᓐᓄᑦ ᑕᒻᒪᖅᓯᒪᙱᒃᑲᓗᐊᕐᒪᖔᑕ ᐊᑦᑎᓈᓗᐊᕐᑐᕕᓂᕐᓄᑦ 2023-ᒥ. ᐊᑦᑎᓈᓗᐊᖅᑐᑦ ᓈᒻᒪᒃᑐᒥᒃ ᐃᓱᒪᒋᔭᐅᔪᓄᑦ ᐃᓱᒪᒋᖃᓯᐅᔭᐅᓯᒪᔪᑦ "ᒪᓕᒃᑐᑦ ᐃᓱᒪᒋᔭᖃᕐᓗᑎᒃ" ᓈᒻᒪᒃᑐᓂᒃ ᐃᓱᒪᒋᔭᐅᔪᓂᒃ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᓯᓚ, ᑲᓕᓐᓃᑦ, ᖃᖓᑕᓚᐅᑳᕐᔫᓐᑦ, ᐱᖕᒋᖕᓇᖅᑐᓕᕆᓃᑦ, ᖃᐅᔨᓴᕐᓃᑦ, ᐋᖅᑭᐅᒪᑎᑦᑎᓇᓱᖕᓂᕐᒧᑦ ᖃᖓᑕᓃᑦ, ᑐᐊᕕᕐᓇᖅᑐᓕᕆᓂᑦ ᐊᒻᒪᓗ ᓄᓇᓕᕆᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᓃᑦ. ᑯᓕᒥᖒᒃᑯᑦ ᖃᖓᑕᓃᑦ ᑯᓚᐅᓐᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓃᑦ ᑲᔪᓯᓂᖃᕐᓂᐊᖅᑐᑦ ᑭᓯᐊᓂᓕ ᐃᓕᖅᑯᓯᐅᓕᖅᑐᑦ ᓇᓗᓇᐃᖅᑕᐅᒍᑎᒃ.	ᐱᕚᓕᐊᕝᕕᐅᔪᒥ ᐊᒻᒪᓗ ᓄᓇᖓᓂ ᖃᐅᔨᓴᕐᕕᐅᔪᒥ ᐊᖏᓂᖏᑦ ᓂᕆᐅᒋᔭᐅᓯᒪᔪᑦ ᐃᓚᖓᓂᒃ ᐃᒃᐱᖕᓂᖅᓴᕋᐃᓐᓂᕐᒧᑦ ᐸᒡᕕᓴᒃᑕᐅᐅᓃᑦ, ᑭᓯᐊᓂᓕ ᓴᖅᑭᓯᒪᙱᑦᑐᑦ ᐊᒃᑐᐃᓂᕐᓗᓐᓂᖅᔪᐊᕐᓂᖏᓐᓂᒃ ᑲᖑᐃᑦ ᐊᒥᓲᓂᖏᓐᓂᒃ. ᑐᕐᑯᑕᐅᖃᑦᑕᕐᓂᖏᑦ ᐱᖁᑕᐅᓪᓗᑎᒃ ᖃᖓᑕᓲᓄᑦ ᑕᐃᒪᐃᓇᔭᕋᓱᕆᔭᐅᙱᑦᑐᑦ ᐊᒻᒪᓗ, ᑕᐃᒪᐃᓂᖓᓄᑦ, ᓂᕆᐅᕆᔭᐅᔪᑦ ᐊᒃᑐᐃᓂᕐᓗᖕᓂᖃᕋᓱᕆᔭᐅᙱᓐᓂᒃ. ᒪᓕᖕᓃᑦ ᐊᑦᑎᓈᖅᑐᑦ ᑯᓕᒥᒌᑦ ᑯᓚᐅᓐᓂᖏᑦ ᕿᑎᖅᓯᒪᐸᓗᓚᐅᖅᑐᑦ 2023-ᒥ ᐃᓱᒪᒋᖃᓯᐅᔭᐅᓗᑎᒃ ᖃᖓᑕᓲᖅᑏᑦ ᐃᓱᒪᒋᔭᖏᑦ ᐊᑦᑎᓈᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᖓᑕᓂᕐᒧᑦ ᐃᑲᕐᕋᑦ ᐃᓗᐊᓂ ᑲᖑᖃᕐᕕᐅᔪᒥ ᐃᓴᐅᖅᑎᓪᓗᒋᑦ. ᖃᖓᑕᓃᑦ ᑲᖑᖃᕐᕕᐅᔪᒥ ᐃᓱᓕᖃᖅᑐᑦ ᓂᒋᖅᐸᓯᐊᓂ ᑲᓇᖕᓇᔾᔪᒥ ᑭᒡᓕᖃᖅᑐᑦ, ᖃᓄᑐᐃᓐᓇᖅ ᐃᒃᐱᖕᓂᖅᓴᕋᐃᑦᑐᓄᑦ ᐸᒡᕕᓴᐅᑏᑦ ᐱᓗᐊᖅᑎᑕᐅᑦᑕᐃᓕᔪᑦ ᐊᒃᑐᐊᔪᑦ ᑲᖑᖃᕐᕕᐅᔪᓗᒃᑖᒥ, ᒪᓕᒃᑐᑦ ᑭᖑᓪᓕᖅᐹᒥᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᐊᓂᐊᖅᑐᑦ ᐅᓂᒃᑳᓂ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂ. ᑭᓯᐊᓂᓕ, ᓈᒻᒪᙱᑦᑐᖅ ᖃᐅᔨᓴᖅᐸᓯᓕᐊᕆᓇᓪᓚᑦᑖᕐᓗᒍ ᐊᒃᑐᐃᓂᐅᓇᔭᖅᑐᓄᑦ ᐊᑦᑕᕐᓈᖅᑐᓄᑦ ᑲᖑᖃᕐᕕᖕᓂ ᐊᓯᖏᓄᓪᓗᓐᓂᑦ ᑎᑭᐸᒃᑕᓄᑦ ᑎᖕᒥᐊᓄᑦ ᐱᖃᓯᐅᔾᔨᓯᒪᓇᔭᖅᑐᑦ ᐅᐸᒃᓯᒪᔪᓇᖅᑕᖕᒋᓐᓂᒃ ᑲᖑᐃᑦ

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᔮᖕᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᕝᕙᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᒃᐱᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᖕᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓃᑦ	ᖃᓄᐃᙱᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓯᒃᑕᐅᓯᒪᔪᓄᑦ[2]
			ᐃᓱᐅᕐᕕᖏᓐᓂᒃ ᕐᑯᓕᒥᑰᒃᑯᑦ ᑕᐃᒪᐃᙵᓂᖓᓄᑦ ᓴᖅᑮᓂᖅ ᐸᒡᕕᓴᐃᓂᕐᔪᐊᖑᓂᖅᓴᒥᒃ ᑕᐃᒪᐃᑐᐃᙵᓇᐊᓕᒃ. ᑐᕐᑯᑕᐅᓪᓚᑦᑖᖅᑕᑦᑕᖅᓯᒪᔪᖃᖏᑦᑐᖅ ᐱᕝᕙᑕᐅᓗᑎᒃ ᖃᖓᑕᓲᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓂ, ᒪᓕᑐᐃᙶᖅᑐᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓯᒃᑕᐅᓯᒪᔪᓂᒃ.
ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓂᖅ	ᐊᒃᑐᐊᖅᑎᕆᑦ ᓂᕐᔪᑏᑦ ᐸᒡᕕᓴᒃᑕᐅᓂᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐃᑲᔪᖅᑑᑕᐅᔪᑦ ᑎᑎᖅᑲᕐᑯᑎᓄᑦ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖓᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓂᕐᒧᑦ ᐱᓕᕆᐊᒧᑦ	ᐊᕐᕌᒍᑕᒫᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ ᐃᖏᕐᖁᖃᑦᑕᐃᙵᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓃᖅ. ᑕᑯᔭᐅᔪᖃᓪᓚᑖᖅᓯᒪᙱᑦᑐᖅ ᓂᕆᐅᒋᔭᐅᙱᑦᑐᓂᒃ ᐊᒃᑐᐃᓂᕐᓂᒃ. ᐃᖏᕐᖁᖃᑦᑕᕐᓂᕐᓄᑦ ᐅᓄᕐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓂᖅ ᑲᔪᓯᖃᐃᓇᕐᓂᐊᖅᑐᑦ.	ᓈᓴᐅᑕᐅᒐᔭᒃᑐᖅ ᑲᑎᖒᒥᑦ ᐃᖏᕐᕋᔾᔪᑏᑦ ᐅᑎᖅᑕᖃᑦᑕᕐᓂᖏᓐᓄᑦ 2023-ᒥ 258.7 ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒦᑦ (ᓴᕕᒃᓴᓂᒃ ᐅᓯᔪᑦ ᓈᓴᐅᑎᖃᖅᑯᑎᒃ 234.2 ᐅᑎᖅᑕᖅᑐᑦ ᖃᐅᑕᒦᑦ) ᑖᒃᑯᐊ ᖃᐅᑕᒦᒧᑦ ᓈᓴᐅᑏᑦ ᑐᖕᒋᓃᑦᑐᑦ ᒥᒃᓴᐅᓯᒃᑕᐅᓯᒪᔪᓂ ᓈᓴᐅᑎᓄᑦ (236 ᓴᕕᒃᓴᓂᒃ ᐅᓯᔫᒃᓴᑦ ᐅᑎᖅᑕᖅᑐᑦ) ᑕᐃᑲᓂ ᑭᙳᓪᓚᖅᐹᒥᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᐊᓂᐊᖅᑐᑦ ᐅᓂᒃᑳᓂ ᐅᐃᒎᖓᓂ ᐅᔭᕋᖕᓂᐊᕆᐊᓪᓚᒎᒪᓂᕐᒧᑦ ᑐᒃᓯᕋᐅᒻᒧᑦ
ᐱᑕᖃᐃᓐᓇᖅᑐᑦ ᐳᔪᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᙱᓐᓂᖓᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓂᖅ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒥ ᒪᓕᒃᑕᐅᔫᒃᓴᑦ 36, 50, 54ᑭ, 58ᑎ ᐊᒻᒪᓗ ᐱᓕᕆᐊᒥ ᐱᓂᐊᕐᓂᕋᕈᑎ 60	ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᓄᑦ ᑲᑎᖅᓱᐃᕝᕕᒃ 43-ᓂ ᐊᔾᔨᒌᙱᑦᑐᓂ ᐃᓂᓂ ᐃᓕᐅᖅᑲᖅᑕᐅᓚᐅᖅᑐᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ, ᐃᓚᖏᑦ ᐅᖓᓯᙵᓂᖅᓴᐅᓗᑎᒃ ᐱᓕᕆᕝᕕᖕᒥ ᐱᕙᓪᓕᐊᕝᕕᐅᔪᒥ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓇᖅᑯᑎᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓂᕐᒧᑦ ᑐᖅᑲᖅᑕᕐᕕᖏᓐᓄᑦ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ. 2021 ᐱᖃᓯᐅᔾᔭᓯᒪᔪᖅ ᐃᓚᒋᔭᐅᓗᑎᒃ ᐊᕐᕕᓂᓕᖕᓂᒃ 'ᐳᒃᑭᑦᑐᓂᒃ' ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓇᕈᑎᓂᒃ ᐃᓚᒋᔭᐅᓗᓂ ᖃᐅᔨᓴᖅᑕᐅᓕᓵᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᓂᕐᓂ (ᑐᒃᓯᕋᖅᑕᐅᓯᒪᔪᑦ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔭᖅᑎᕇᖏᓐᓂ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᕇᓐᓂ) ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐊᔾᔨᖅᑲᑦᑕᙱᓐᓂᖏᑦ ᑖᒃᑯᓇᓂ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᒥ	ᐊᕐᕌᒍᑕᒫᑦ ᑲᑎᖒᒥᑦ ᑕᖏᓐᓂᑦ ᖃᖓᑦᑕᖅᑐᑦ ᒥᑭᑦᑐᕋᓐᓂᑦ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᑦ ᖃᓄᐃᓕᖓᓂᖏᑦ ᒥᒃᓴᐅᓯᒃᑕᐅᓯᒪᔪᑦ ᐅᖓᑕᐅᔾᔨᓂᐊᕐᓂᖏᓐᓂᒃ 50 ᒍᕋᒻ/ᒦᑕᑦ ᑭᐸᖓᓇᒃᑐᑦ ᐃᓗᐊᓂ ᐱᓕᕆᕝᕕᐅᔫᑉ ᐱᕙᓪᓕᐊᕝᕕᒋᔭᖓᓂᒃ, ᑲᑎᖒᒥᑦ ᑕᖏᓐᓂᑦ ᒥᑭᑦᑐᕋᓐᓂᑦ ᖃᓄᐃᓕᖓᓂᖏᑦ ᐅᖄᓕᓐᓂᖅᐸᓪᓕᐊᓗᑎᒃ ᑐᖅᑲᖅᑕᕐᕕᐅᔪᓄᑦ ᓯᓚᑖᓂᑦᑐᓄᑦ ᐱᓕᕆᕝᕕᐅᔫᑉ ᐱᕙᓪᓕᐊᕝᕕᐊᓂ. 2023-ᒥ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᖃᐅᔨᔭᐅᔪᑦ ᒪᓕᑐᐃᙶᓚᐅᖅᑐᑦ ᒥᒃᓴᐅᓯᒃᑕᐅᓯᒪᔪᓂ

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᔾᔨᖕᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᙱᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓃᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
		ᖃᐅᔨᓴᙳᒃᓴᓕᐅᕐᓂᕐᓂ ᐊᑐᖅᑕᐅᖁᔪᒃᑐᓂ ᐳᖅᑐᓂᐅᔪᒥ 2.0 ᒦᑕᓂ ᐊᒻᒪᓗ ᑕᐃᒃᑯᓄᖓ ᖃᓂᓐᓂᖅᓴᐅᔪᑦ ᒪᓂᖅᑲᒧᑦ (ᓱᕐᓗ 0.5 ᒦᑕᕐ). ᖁᓖᑦ ᐊᑕᐅᓯᕐᓗ ᐊᕐᕌᒍᐃᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓃᑦ ᐋᖏᓯ 2013-ᒥ ᑎᓯᐱᓇ 2023−ᒧᑦ ᐱᔭᕇᖅᑕᐅᓯᒪᔪᑦ ᐊᑐᖅᓱᑎᒃ 2.0 ᒦᑕᓂᒃ ᐳᖅᑐᓂᓕᖕᓄᑦ ᑲᑎᖅᓯᐃᕝᕙᖕᓄᑦ. ᐱᑕᖃᐃᓇᖅᑐᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒫᒃᐸᓪᓕᐊᖑᓇᕐᓂᖓᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓂᖅ ᓇᓗᓇᐃᖅᓯᔪᖅ ᐃᓅᑦ ᐳᔪᕋᒥᒃ ᓯᐊᒻᒫᒡᕙᐅᕐᔪᐊᕐᓂᖅᑐᑦ ᑮᓪᓕᖅᖅᑐᑦ ᐃᓗᐊᓂᓪᓗᐊᑕᖅ 1,000 ᒦᑕᑦ ᐱᓕᕆᐊᒥ ᐱᓕᕆᕝᕕᐅᔪᒥ; ᖃᐅᔨᓴᕐᓂᖅ ᐳᔪᕋᖅ ᓯᐊᒻᒫᖅᑦᑕᖅᑐᑦ ᖃᐅᔨᓴᕐᕕᖕᓂ ᓯᓚᑖᓂ ᐱᓕᕆᐊᒥ ᐱᓕᕆᕙᐅᔫᑉ, ᑭᓯᐊᓂᓕ ᐃᓗᐊᓃᑦᑐᑦ 5,000 ᒦᑕᑦ ᐊᖑᓗᖅᑐᒥ, ᓇᓗᓇᐃᖅᓯᔪᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒫᖅᑦᑕᖅᑐᑦ ᐊᒃᐸᓯᒃᑐᒥ 2023-ᒥᓗᒃᑖᖅ. ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᔭᐅᔪᖃᓚᐅᙱᑦᑐᖅ ᐳᔪᕋᖅ ᓯᐊᒻᒫᖅᑦᑕᖅᑐᑦ ᐆᒃᑐᕋᖅᑕᐅᑎᓪᓗᒍ ᐊᑐᖅᑕᐅᕙᔪᒃᑐᒥ ᐳᖅᑐᓂᐅᔪᒥ 2.0 ᒦᑕᓂᑦ ᐊᒻᒪᓗ 0.5 ᒦᑕᓂ. ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓃᑦ ᑲᔪᓯᓂᐊᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐳᔪᕋᖅ 43-ᓂ ᐃᓂᐅᔪᓂ ᐊᐅᔭᓗᒃᑖᖅ ᐊᒻᒪᓗ ᐋᖅᑭᒃᑕᐅᒃᑲᓂᖅᓯᒪᔪᓂ 36-ᓂ ᐊᕐᕌᒍᓕᒫᖅ ᐃᓂᐅᔪᓂ.	ᐳᔪᕋᖅ ᓯᐊᒻᒪᓚᖑᓂᐊᕋᓱᒋᔭᐅᓪᓗᓂ ᐃᓗᐊᓂ ᐱᓕᕆᕝᕕᐅᑉ ᐱᕙᓪᓕᐊᕝᕙᐊᓂ.
ᐱᕈᖅᑐᑦ ᐊᒥᖅᓂᖕᒋᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓂᖅ & ᐃᔾᔪᒥᒃ ᐱᕈᖅᑐᓂᓪᓗ ᓴᕝᕋᔭᖕᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓃᑦ	ᑲᒪᒋᔭᓕᒃ ᐱᓕᕆᐊᒥ ᒪᓕᒃᑕᐅᔫᒃᓴᑦ 34, 36, 38, 50 ᐊᒻᒪᓗ ᐱᓕᕆᐊᒥ ᐱᓂᐊᕐᓂᕋᑏᑦ 60 ᐊᒻᒪᓗ 107	ᐱᕈᖅᑐᑦ ᐊᒥᖅᓂᖕᒋᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓃᑦ ᐱᔭᕇᖅᑕᐅᓚᐅᖅᑐᑦ ᑕᐅᕝᕙ ᖃᐅᔨᓴᙳᒃᓴᓕᐅᕐᕕᐅᔪᓂ ᑐᑭᓕᐅᓂ ᐃᓗᓕᖅᖅᓱᑎᒃ ᑎᓴᒪᓂᒃ ᐃᔾᔪᐊᖅᑕᐅᓯᒪᔪᓂ ᖃᐅᔨᓴᙳᒃᓴᓕᐅᕐᕕᐅᔪᓂ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ ᐅᖓᓯᒌᒃᑕᕐᓂᖕᒋᓐᓄᑦ ᐊᑯᑦᑐᓂᖕᒋᑦ (30, 100, 750, ᐊᒻᒪᓗ 1,200 ᒦᑕᓂ) ᐅᖓᓯᒡᓕᓯᒪᔪᖅ ᐆᖓᓯᒡᓕᕙᓪᓕᐊᓯᒪᓪᓗᓂ ᑐᑭᓕᐅᓂ ᐊᒻᒪᓗ ᓈᒻᒪᓈᖅᓯᒪᔪᒥᒃ ᐊᑯᓂᖅᑲᖅᓱᑎᒃ ᐱᓕᕆᕝᕕᐅᔪᒥ ᐱᕙᓪᓕᐊᕝᕕᐅᔪᒥ. 15 ᐱᕈᖅᑐᓄᑦ ᑐᑭᓕᐅᑦ	2023-ᒥ ᖃᐅᔨᔭᐅᔪᑦ ᒪᓕᒃᑐᐃᓇᖅᑐᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᔪᓂ. ᐆᒃᑐᕋᖅᑕᐅᔪᓇᙱᑦᑐᓂᒃ ᐊᒃᑐᐃᓂᕐᓂᒃ ᐱᕈᖅᑐᑦ ᐊᒥᖅᓂᖕᒋᓇᓄᑦ ᐱᑕᖃᓚᐅᙱᑦᑐᖅ ᓯᓚᑖᓂ ᐱᓕᕆᕝᕕᐅᔫᑉ ᐱᕙᓪᓕᐊᕝᕙᓂ.

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓂᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᕐᒥ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐᖅ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᒃᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓃᑦ	ᖃᓄᐃᓐᓂᖅᓵᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓵᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
		ᖃᐅᔨᓴᖅᑕᐅᓯᒪᔪᑦ ᐊᒃᑐᐊᓂᖃᖅᓱᑎᒃ ᐱᓕᕆᐊᒥ ᐱᕐᑯᑎᕐᔪᐊᖃᕐᕕᐅᔪᓄᑦ – ᐱᖃᓯᐅᑎᓪᓗᒍ ᐅᔭᖃᖕᓂᐊᕐᕕᒃ (ᐊᕐᕕᓂᓖᑦ ᑐᑭᓕᓅᑦ), ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᒍᑦ (ᑕᓪᓕᒪᑦ ᑐᑭᓕᓅᑦ), ᐊᒻᒪᓗ ᕿᙳᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ (ᑎᓴᒪᑦ ᑐᑭᓕᓅᑦ) - ᓴᖅᑮᓯᒪᓪᓗᓂ 60-ᓂᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᕕᖕᓂᒃ ᑲᑎᕆᒋᑦ. ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ 15-ᓂ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓇᖅᑐᓂ ᐃᓂᓂ ᐃᓂᖃᖅᑐᓂ 20-ᒥᑦ 30-ᐸᓗᓐᓄᑦ ᑮᓵᒥᑐᓂᒃ ᐅᖓᓯᖕᓂᖃᖅᑐᑦ ᐱᓕᕆᕝᕕᖕᒥ ᐱᕙᓪᓕᐊᕝᕕᐅᔪᒥ. ᓇᓗᓇᐃᕈᑎᑕᖃᖅᓯᒪᙱᑦᑐᑦ ᐊᓯᔾᔨᖅᑐᓂ ᐳᓴᐅᑎᖏᓐᓄᑦ ᐱᕈᖅᑐᖃᕐᕕᐅᒧᑦ ᐊᒻᒪᓗ ᐱᕈᖅᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ ᐊᒃᑐᐊᓃᑦ ᐅᖓᓯᖕᓂᖏᓐᓄᑦ ᐱᓕᕆᕝᕕᐅᔫᑉ ᐱᕙᓪᓕᐊᕝᕕᖓᓂ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ. ᓈᓴᐅᓯᕆᔾᔪᑏᑦ ᐋᖅᑭᒃᓱᖅᓯᒪᔪᑦ ᐃᓕᖅᑯᓯᖏᑦ ᐱᓪᓗᐊᑕᕐᓂᖃᓚᐅᖅᑐᑦ ᐊᕐᕌᒍᑕᒫᑦ ᐊᔾᔨᒌᖃᑦᑕᙱᓐᓂᖓᓄᑦ. ᐆᒃᑐᖃᖅᑕᐅᔪᓇᖅᑐᖃᓚᐅᙱᑦᑐᖅ ᓂᕐᒪᕝᕕᐅᔪᑦ ᐊᒃᑐᖅᑕᐅᓂᖏᓐᓄᑦ ᖃᐅᔮᔭᐅᔪᒥᒃ. ᐃᔾᔪᐃ ᒪᓴᐅᓂᖓᓄᑦ ᐃᓕᖅᑯᓯᐅᔪᑦ ᒪᓴᐅᓂᖅᓴᐅᑲᓗᐊᖅᑎᓪᓗᖏᑦ 2019-ᒥ ᕿᒥᕐᕈᓪᓗᒋᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᓚᐅᕐᒪᖔᑕ 2023-ᒥ, ᐊᔾᔨᒌᙱᓐᓂᖅᑕᖅᓯᒪᙱᑦᑐᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ ᐅᖓᓯᒌᒃᑕᕐᓂᖏᓐᓄᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᐊᕐᕌᒍᓄᓪᓗ. ᐃᔾᔪᕐᒥ-ᓴᕕᕋᔭᑦ ᐊᒻᒪᓗ ᓂᕿᓂ-ᓴᕕᕋᔭᖕᓂᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᕖᑦ ᐱᓕᕆᐊᖑᓚᐅᙱᑦᑐᑦ 2023-ᒥᑦ. ᐃᔾᔪᕐᒥ–ᓴᕕᕋᔭᑦ ᐊᒻᒪᓗ ᓂᕿᓂ–ᓴᕕᕋᔭᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᕖᑦ ᕿᒥᕐᕈᔭᐅᓚᐅᖅᑐᑦ ᐅᓂᒃᑳᐅᓯᐅᓪᓗᑎᒡᓗ 2022ᒥ. ᐃᔾᔪᕐᒥ-ᓴᕕᕋᔭᑦ ᐊᒻᒪᓗ ᓂᕿᓂ–ᓴᕕᕋᔭᑦ ᐱᑕᖃᐅᓂᐅᔪᑦ ᓴᖅᑮᓯᒪᓚᐅᖅᑐᑦ	

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓈᔾᖕᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᖕᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓃᑦ	ᖃᓄᐃᓐᓂᖅᓵᐅᓂᖕᒋᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
		ᐅᓗᕆᐊᓇᙱᑦᑐᓂᒃ ᐊᕙᑎᒧᑦ ᐊᒻᒪᓗ ᐃᓄᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖕᒋᓐᓄᑦ 2022-ᒥ.	
ᐊᐳᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒥ ᒪᓖᒃᑕᐅᔭᕆᐊᓕᖕᓂᒃ 54dii ᐊᒻᒪᓗ 58 ᒥ ᑲᒪᒋᔭᖃᖅᑯᓂ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔭᖃᑎᒌᑦ ᐃᓱᒫᓘᑎᖓᓂᒃ ᐊᐳᔾᔭᕆᖕᓃᑦ ᐳᖅᑐᓂᖕᒋᓐᓂᒃ ᐊᒻᒪᓗ ᐊᒃᑐᐃᓃᑦ ᓂᕐᔪᑎᓄᑦ	ᐊᕐᕕᓂᓖᑦ ᐊᐳᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᔭᕇᖅᑕᐅᓚᐅᖅᑐᑦ ᑕᐅᕝᕙ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᒍᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᓅᖃᑦᑕᕐᓂᖕᒋᑦ ᐃᓕᖅᑯᓯᖕᒋᓪᓗ ᑐᒃᑐᐃᑦ ᒫᔾᔨᒥ, ᒪᐃᒥ, ᐅᑐᐱᕆᒥ, ᓄᕙᐱᕙᒥ ᐊᒻᒪᓗ ᑎᓯᐱᕆᒥ 2023-ᒥ. ᑎᕆᐅᓂᐊᑦ, ᐅᑲᓖᑦ, ᐊᕙᙱᑦ ᐊᒻᒪᓗ ᐊᕿᒡᒌᑦ ᐆᒪᔪᓂ ᐊᔾᔨᒌᙱᕐᐊᕐᔫᒃᑐᓂ ᖃᐅᔨᔭᐅᔫᑕᓚᐅᖅᑐᑦ 2023-ᒥ ᖃᐅᔨᓴᕐᓂᕐᓂᓗ; ᓇᓗᓇᐃᕈᑎᑕᖅᙱᕆᓗᓂ ᑐᒃᑐᐃᑦ ᑕᑯᔭᐅᓯᒪᓂᖕᒋᓐᓂᒃ ᖃᓂᒋᔮᓂ ᐃᑳᕐᕙᖕᓂᓪᓘᓐᓃᑦ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂ ᔮᓄᐊᕆ 2020-ᒥᓂᑦ. ᐆᒪᔪᑦ ᐃᓕᖅᑯᓯᕆᓕᖅᐸᒃᑕᖕᒋᑦ ᐊᖅᑯᑎᒥ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ ᐊᑐᓂ ᐃᓂᒥ ᑐᒦᑦ ᑕᑯᔭᐅᕝᕙᖕᒋᓐᓂ. ᐊᐳᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓃᑦ ᑲᔪᓂᐊᖅᑐᑦ 2024-ᒥ ᐊᑯᓚᐃᓐᓂᖅᓴᐅᓗᑎᒃ ᖃᐅᔨᓴᕈᒥᓇᕋᙱᑦ ᖃᓄᐃᓕᙱᓃᑦ ᐊᒻᒪᓗ ᐊᑦᑕᕐᓇᖅᑕᐃᓕᒪᓂᕐᒧᑦ ᐃᓱᒪᒋᖅᑲᓯᐅᔾᔭᐅᔪᑦ ᑎᑭᑕᐅᓯᒪᓕᙵᓚ.	ᑐᒃᑐᐃᑦ ᓈᖅᑦᑕᓗᐊᕈᓐᓃᖅᓯᒪᔪᑦ ᐱᓕᕆᕝᕕᖕᒥ ᐱᖁᑎᕐᔪᐊᒃᑯᕕᓗᒃᑖᒥ ᐊᐅᓚᓂᖅᑲᕐᓂᓗᒃᑖᖕᒋᓐᓂᒃ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᓚᐅᖅᑐᖅ, ᑭᓯᐊᓂᓕ ᓂᕆᐅᒋᔭᐅᙳᕆᑦᑐᑦ ᐊᖕᒋᕚᓂᐊᕐᓂᙱᓂᒃ ᐅᐊᖕᓇᙱᓂ ᕿᑭᖅᑖᓪᔫᑉ ᑐᒃᑐᖕᒋᑦᑕ ᐅᓄᕐᓂᖕᒋᓐᓄᑦ. ᑎᑎᖅᑲᕐᑯᑏᑦ ᐊᐳᒥ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ ᐊᑐᖅᑕᐅᔪᓐᓇᖅᑐᑦ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ ᒥᒃᓴᐅᓴᐃᓲᓄᑦ ᑐᒃᑐᐃᑦ ᖃᒃᓯᐅᓂᖕᒋᓐᓂᒃ ᐅᓄᖅᓯᒋᐊᕐᓂᖕᒋᓐᓄᑦ ᓈᖅᑦᑕᕐᓂᕐᒨᓪᓗ ᐃᓕᖅᑯᓯᖕᒋᓐᓂᒃ ᓄᓇᓂ ᐊᕙᒃᑐᖅᓯᒪᔪᓂ ᖃᐅᔨᓴᕐᕙᐅᔪᒥ. ᒪᓂᕋᕐᒥᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓃᑦ ᑐᒃᑐᓂᒃ ᐃᒪᐃᖅᑰᔨᑎᑦᑎᒍᓂ ᐊᐳᖅᑕᕐᕙᖕᓄᑦ ᐊᒃᑐᐃᓃᑦ (ᓲᕐᓗ ᑐᓪᓕᓃᑦ ᑕᐅᕗᙱᖅᐸᓪᓕᐊᔪᑦ ᑭᓯᐊᓂᓕ ᐃᑳᖅᓯᒪᙱᕆᓗᑎᒃ ᐊᖅᑯᑎᒥᒃ) ᐊᒻᒪᓗ ᑐᒃᑐᐃᑦ ᐊᒥᓲᓂᖕᒋᓐᓄᑦ ᓇᓗᓇᐃᒃᑯᑕᑦ ᓴᖅᑮᔾᔭᖅᑎᑦᑎᒍᑎᒃ ᐅᓄᖅᓯᕚᓪᓕᐊᓂᖕᒋᓐᓂᒃ ᑕᐃᒪᓕ ᖃᙵᑕᓲᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐊᑐᖅᑕᐅᑐᐃᓐᓇᕆᐊᓖᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐊᒃᑐᐃᓂᒃᑲᓂᐅᑐᐃᓐᓇᕆᐊᓖᑦ. ᓱᖃᐃᒻᒪ ᑐᒃᑐᐃᑦ ᑐᒥᖃᙱᓐᓂᖕᒋᓐᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐊᐳᒥᒃ ᑐᒥᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᓂ 2023-ᒥ, ᓇᓗᓇᐃᖅᑕᐅᔫᓇᙱᑦᑐᖅ ᐱᓕᕆᐊᒥ

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓈᕗᑦ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᕋᓇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᕋᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᒃᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᕋᐅᓂᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
			ᐱᕐᑯᑎᕐᔪᐊᑦ ᐊᒃᑐᐃᓂᖃᕐᒪᖔᑕ ᑐᒃᑐᐃᑦ ᓅᑉᐸᖕᓂᖏᓐᓂᒃ.
ᐊᐅᔾᔭᓇᖕᓃᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ	ᑲᒪᒋᔭᖃᖅᑐᑦ ᐱᓕᕆᐊᒥ ᒪᓕᒋᐊᓖ 53ai ᐊᒻᒪᓗ 53 ᑎ ᑲᒪᒋᔭᖃᖅᑐᑦ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖏᑦᑕ ᐃᓱᒫᑑᑎᖕᒐ ᐊᐅᔾᔪᓇᖕᓃᑦ ᐳᖅᑐᓂᖏᑕ ᒥᒃᓵᓄᑦ ᐊᒻᒪᓗ ᐊᒃᑐᐃᓃᑦ ᓂᕐᔪᑎᓄᑦ	ᐊᐅᔾᔭᓇᖕᓃᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᐱᓕᕆᐊᖑᖃᑦᑕᓚᐅᖅᑐᖅ ᑕᖅᑭᑕᓖᑦ ᔫᓄᐊᕆᒥᑦ-ᒪᐃᒧᑦ ᐊᒻᒪᓗ ᓄᕕᐱᕆᒥᑦ-ᑎᓯᐱᕆᒧᑦ, 2023 ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᒪᓕᖕᓂᖕᒋᓐᓂ 1 ᒦᑕᒥᒃ ᐳᖅᑐᓂᓕᖕᓄᑦ ᖃᓄᐃᓪᓕᔪᖃᖅᑳᖅᑎᓇᒍ ᑭᒡᓕᐅᔪᓄᑦ. ᐊᐅᓚᑕᐅᓂᖏᑦ ᐊᐅᔾᔭᓇᖕᓃᑦ ᐳᖅᑐᓂᖏᑦ ᐊᐅᓚᑕᐅᕐᑯᓪᓗᒋᑦ ᓂᕐᔪᑏᑦ ᐃᑳᕝᕕᖏᑦ ᐊᒻᒪᓗ ᐊᕐᑯᑏᑦ ᐅᔭᐅᒪᔪᓐᓇᕐᓂᖏᑦ ᓂᕐᔪᑏᑦ-ᐃᖏᕐᕋᔾᔪᑏᑦ ᐊᐅᕐᑯᓇᒋᑦ. ᒪᓕᒃᓗᒋᑦ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᖒᑦ ᑐᒃᓯᕋᐅᑎᖏᑦ, ᐆᒃᑐᕋᐃᓃᑦ ᐃᓂᓂᒃ ᐱᓕᕆᐊᖑᖃᑦᑕᓚᐅᖅᑐᑦ ᑎᒃᑯᐊᖅᓯᓯᒪᙱᓗᑎᒃ 2020-ᒥ. 2023-ᒥ, ᒪᓕᖕᓂᐅᓚᔪᒃᑐᖅ ᐊᐅᔾᔭᓇᖕᓂᕐᒧᑦ ᐳᖅᑐᓂᕐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ 88%-ᖑᓚᐅᖅᑐᑦ, ᐊᑎᖕᓂᖅᓵᕐᔩᓗᓂ 2022-ᒥ (91%) , ᑭᓯᐊᓂᓕ ᒪᓕᒃᑐᖅ ᒪᓕᖕᓂᐅᕚᒃᑐᓂᑦ 2014-ᒥᓂᑦ (80%-ᒥᑦ 91%-ᒧᑦ), ᑭᓯᐊᓂ ᐊᑎᓖᖑᓚᐅᖅᑐᖅ 2017-ᒥ (66%). ᐃᓚᖏᓐᓂᒃ ᐃᓂᓂ, ᐊᐅᔾᔭᓇᖕᓃᑦ ᐋᖅᑭᒋᐊᖅᑕᐅᔪᓐᓇᓚᐅᙱᑦᑐᑦ ᓄᓇᖓ ᐱᓪᓗᒍ ᐅᕚᓘᓐᓃᑦ ᐊᑦᑕᕐᓇᖅᑕᐃᓕᒪᓂᕐᒧᑦ ᑭᒡᓕᖅᑐᓄᑦ. ᐊᐅᔾᔭᓇᖕᓂᕐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᑲᔪᓯᓂᐊᖅᑐᑦ ᐅᑭᐅᖓᓂ 2024.	ᓄᒃᑕᓗᐊᕈᓐᓃᕐᓂᖏᑦ ᑐᒃᑐᐃᑦ ᑕᐅᕝᕙ ᐱᓕᕆᐊᒥ ᐱᕐᑯᑎᕐᔪᐊᓂ ᐊᐅᓚᓂᓗᒃᑖᓂ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᖅ. ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᐸᓚᐅᒪᑎᑦᑎᓇᓲᑏᑦ ᐊᖅᑯᒥ (ᓱᕐᓗ ᐊᐅᔾᔭᓇᖕᓂᕐᓂᒃ ᐊᐅᓚᑦᑎᓂᖅ, ᐳᒃᑭᑦᑑᑎᑦᑎᓇᓱᖕᓂᖅ), ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖ ᑐᓗᕈᑕᐅᓯᒪᙳᑦᑐᖅ ᑐᒃᑐᐃ ᓅᖃᑦᑕᕐᓂᖕᒋᓐᓄᑦ. ᑲᒪᑎᐊᙳᓐᓂᕐᒧᑦ ᑐᒃᑐᓂᒃ ᑐᕐᑰᑎᖃᑦᑕᕐᓂᐊᕋᓱᒋᔭᐅᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᖅ ᐱᔾᔪᑕᐅᓗᓂ, ᐊᒻᒪᓗ ᐊᒃᑐᐃᓃᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐊᖏᕐᕌᓂᐊᕋᓱᒋᔭᐅᙳᕆᓪᓗᑎᒃ ᐅᐊᖕᓇᖓᓂ ᕿᑭᖅᑖᓗᑉ ᑐᒃᑐᖕᒋᑕ ᐅᓄᕐᓂᖕᒋᓐᓄᑦ. ᒪᓕᑎᐊᖅᓯᒪᓪᓚᕆᒃᑐᑦ ᐊᐅᔾᔭᓇᖕᓃᑦ ᐳᖅᑐᓂᖏᓐᓂᒃ ᐳᖅᑐᓯᑎᑎᓗᐊᖅᑕᐃᓕᒪᓪᓗᑎᒃ ᐅᓯᑲᖅᑕᖅᑏᑦ ᐊᖅᑯᑖᓂ ᑐᓗᕈᑕᐅᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓄᑦ ᑐᒃᑐᐃᑦ ᓅᑉᐸᓪᓕᐊᑎᓪᓗᒍ. ᑭᓯᐊᓂᓕ, ᓈᒻᒫᓂᙱᑦᑐᑦ ᑕᑯᖃᑦᑕᕐᓂᕐᒧᑦ ᑎᑎᖅᑲᕐᑯᑎᑕᖃᖅᑎᓪᓗᒍ ᐊᑑᑎᖃᖅᑑᑎᑦᑎᓇᓱᖕᓂᕐᒧᑦ ᑕᒪᑐᒥᖓ ᐸᓚᐅᒪᑎᑦᑎᓇᓲᑎᒧᑦ ᑐᒃᑐᐃᑦ ᓅᖃᑦᑕᖅᑎᓪᓗᒋᑦ ᐅᓄᙱᓗᐊᖅᑎᓪᓗᖕᒋᑦ ᑐᒃᑐᐃᑦ. ᑐᒃᑐᐃᑦ ᐅᓄᖅᓯᕗᓪᓕᐊᑎᓪᓗᒋᑦ, ᓇᓚᐅᑖᖅᑕᐅᓯᒪᔪᑦ ᐃᓄᐃᑦ ᐃᓕᖅᑯᓯᖕᒋᓐᓄᑦ

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓂᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᔾᔨᓐᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓂᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᖕᓂᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᖅᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓂᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
			ᖃᐅᔨᒪᓂᓕᖕᓄᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓂᕐᓇᕐᓂᖅ ᑐᒃᑐᐃᑦ ᓅᑲᑦᑕᕐᓂᖏᓐᓄᑦ ᑕᐅᕗᓇ ᐊᖅᑯᑎᒃᑯᑦ ᐊᑐᓕᖅᑎᑕᐅᓂᐊᖅᑐᑦ.
ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ ᑐᒃᑐᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ	ᑲᒪᒋᔭᒃ ᐱᓕᕆᐊᒥ ᒪᓕᒋᐊᓖᑦ 53ᐃ, 53ᐱ, 54ᐱ ᐊᒻᒪᓗ 58ᐱ	ᒪᕐᕉᒃ EDI ᐊᕙᑎᓕᕆᔩᑦ ᑕᐃᓈᒥᒃᓴ ᐃᒃᑯᐊᐳᕇᑦ (EDI) ᐆᒪᔪᓕᕆᔨᖏᑦ ᒪᕐᕉᖕᓂᒃ ᐃᓅᓂᒃ ᐃᓚᐅᔪᖃᖅᑐᓂ ᐱᓕᕆᐊᖃᓚᐅᖅᑐᑦ ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓂᕐᓂᒃ ᑐᒃᑐᐃᑦ ᓄᕐᓇᐅᓕᖅᑎᓪᓗᒋᑦ (ᐱᒋᐊᓕᕐᖓᖅᑎᓪᓗᒍ ᔫᓂ 2023-ᒥ). ᑲᑎᖦᒋᑦ ᓇᐅᑦᑎᖅᓱᕐᓃᑦ 16 ᐃᑲᕐᕋᑦ ᐊᒻᒪᓗ 51 ᒥᓇᑦ, ᓇᐅᑦᑎᖅᓱᕐᓂᐅᓚᐅᔪᖅ ᐊᑐᓂ ᖃᐅᔨᓴᕐᕕᖕᒧᑦ 40 ᒥᓇᑦᑐᓪᓗᐅᖅᑐᖅ. ᐊᑕᐅᓯᕐᒥᒃ ᑐᒥᓂᒃ ᑕᑯᔭᐅᔪᖃᓪᓚᐅᖅᑐᖅ, ᑐᒃᑐᓂᒃ ᑕᑯᔪᖃᖅᓯᒪᙱᓐᓂ ᑕᒪᒃᑯᓂᖓ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ 2023-ᒥ. 2016-ᒥ, ᐊᑐᖅᑕᐅᓛᖅ ᓄᓇᙳᐊᓕᐅᕈᑏᑦ ᐱᔭᕇᖅᑕᐅᓚᐅᖅᑐᑦ ᓴᖅᑭᔮᖅᑎᑦᑎᓇᓱᐊᖅᓱᑎᒃ ᐃᓂᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᔪᓂᒃ ᓇᐅᑦᑎᖅᓱᕝᕕᐅᔪᓐᓇᖅᑐᓂᒃ ᐱᓕᕆᐊᖅᑎᓪᓗᒋᑦ ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓂᕐᓂᒃ. ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓃᑦ ᑲᔪᓯᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᕐᕌᒍᑕᒫᑦ ᓄᕐᓇᐅᖅᑎᓪᓗᒋᑦ. 2023-ᒥ ᓇᐅᑦᑎᖅᓱᕝᕕᑦ ᐃᓚᔭᐅᒃᑲᓂᕐᓱᑎᒃ ᑎᑎᖅᑲᑦᑎᖃᕐᓂᖅᓴᐅᓕᖁᓪᓗᒋᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓂᕋᓱᙱᑦ ᑲᔪᓯᖁᓪᓗᒋᑦ ᐱᓕᕆᐊᖃᕐᓂᓕᕐᑎᐊᖏᓐᓂᒃ. ᖁᓕᑦ ᒪᕐᕉᓗ ᐅᖓᓯᒃᑐᒦᓱᑎᒃ ᐊᔾᔨᓕᐅᕆᔾᔪᑏᑦ ᐋᖅᑭᒃᑕᐅᓚᐅᖅᑑᒃ 2021-ᒥ, ᐊᕐᕕᓂᓕᖕᓂ ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᕕᖕᓂ, ᐊᔾᔨᓕᐅᕆᓯᒪᙱᑦᑐᑦ ᑐᒃᑐᓂᒃ ᐊᑯᓐᓂᖓᓂ ᔫᓄᐊᕆ 2023-ᒥ ᐊᒻᒪᓗ ᑎᓯᐱᕆ 2023-ᒥ.	ᖃᐅᔨᓴᕐᓃᑦ ᒥᒃᓴᐅᓴᐃᓯᒪᔪᑦ ᐃᓚᖏᓐᓂᒃ ᐊᒃᑐᐊᓪᓚᑦᑖᖅᑕᕆᓗᑎᒃ ᓇᔪᒐᖏᓐᓂᒃ ᐊᓯᐅᔨᑎᑦᑎᓃᑦ ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᐃᒃᐱᖕᓂᖅᓴᕋᓂᕐᓄᑦ ᐸᕝᕕᓴᒃᑕᐅᓂᑦ ᐊᒻᒪᓗ ᐳᔪᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᓂᖓᓄᑦ, ᑎᑭᐅᑎᓪᓗᑎ ᓇᔪᒐᒃᑎᑦᐊᖑᓂᕐᓂᕐᒧᑦ ᐃᓗᐊᓂ ᑭᒡᓕᐅᔪᑦ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᑦ. ᑭᓯᐊᓂᓪᓕ, ᓇᔪᒐᒃᑎᐊᕐᓂᖅ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᖅ ᒥᑦᓯᑎᐊᖅᓯᒪᓂᖓᓂᒃ 2-ᒥᑦ 4%-ᒧᑦ. ᐃᓚᖏᑦ ᐸᕝᕕᓴᐃᓅᑦ (ᓱᕐᓗ ᐅᑎᖅᑕᕋᖅᑐᑦ) ᕿᓚᒻᒥᐅᔪᑦ ᐊᒻᒪᓗ ᑐᒃᑐᐃᑦ ᓱᖏᐅᑎᑐᐃᓐᓇᓇᐊᓛᑦ ᑕᒪᒃᑯᓂᖓ ᐸᕝᕕᓴᐃᔾᔪᑎᓂᒃ. ᐊᒥᓱᑦ ᐊᑐᖔᓕᖅᑕᑦᑕᖅᑐᑦ ᓄᕐᓇᐅᕝᕕᖕᓂ ᐱᑕᖅᖃᖅᑐᓂᒃ ᐃᓗᐊᓂ ᐊᒻᒪᓗ ᓯᓚᑖᓂ ᑭᒡᓕᐅᔪᓂᒃ ᐊᒃᑐᖅᑕᐅᕝᕕᐅᓱᓂ. ᐊᒃᑐᐊᓂᖃᓪᓚᑦᑖᖅᑎᑦᑐᑦ ᓇᔪᒐᕐᓂᒃ ᐊᓯᐅᔨᓃᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ ᐊᔾᔨᒌᖅᑎᑦᑑᔭᐅᓇᕐᓂᖏᓐᓂᒃ ᑕᐃᒪᐃᑐᐃᓐᓇᖅᑐᑦ ᐊᔾᔨᒌᖃᑦᑕᖅᑎᓐᓂᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐊᖏᔪᓂᑎᒃ ᐅᐊᖕᓇᖓᓂ ᕿᑭᖅᑖᓘᑉ ᑐᒃᑐᖏᑦᑕ ᐅᓄᕐᓂᖏᓐᓄᑦ. ᐅᓪᓗᒥᒧᑦ, ᓈᒻᒪᓂᖕᖏᑦᑐᓂᒃ ᑐᒃᑐᓂᒃ ᑕᑯᔭᐅᔪᖃᖃᑦᑕᖅᓯᒪᔪᖅ ᐱᓕᕆᐊᖃᖅᑎᓪᓗᒋᑦ ᓇᓯᑦᑕᖅᑐᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᕐᓂᑦ ᖃᐅᔨᓴᕈᑎᓪᓗᒋᑦ ᖃᓄᐃᓐᓇᖅ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᓂᒃ ᐊᒃᑐᐃᓂᕐᓂᒃ ᑐᒃᑐᐃᑦ

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙱᓐᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᔾᔪᓐᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᙱᖅ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓃᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓭᑕᐅᓯᒪᔪᓄᑦ[2]
			ᐃᓕᖅᑯᓯᙱᓐᓄᑦ ᐊᒻᒪᓗ ᓇᔪᒐᕐᒥᒃ ᐊᑐᖅᑕᑦᑕᕐᓂᕐᒧᑦ.
ᐊᖑᓇᓱᒃᑏᑦ ᐳᓛᓇᐊᖅᓯᒪᔪᑦ ᐊᑎᓕᐅᖅᑳᑦᑕᕐᓂᖏᑕ ᑎᑎᕋᖅᑕᐅᓯᒪᓂᖏᑦ;	ᑲᒪᖏᔭᓕᒃ ᐱᓕᕆᐊᒥ ᒪᓕᒋᐊᓕᒃ 54ᒥ	ᒪᓕᒋᐊᖃᕐᓂᙱᓈᙱᑦᑑᒐᓗᐊᖅ ᑭᓯᐊᓂᓕ ᐊᑐᕐᓂᙱᓄᑦ ᐹᕙᓖᓐᑯᑦ ᐱᕐᑯᑎᙱᓄᑦ, ᐳᓛᖅᑐᑦ ᐅᔭᖃᙳᐊᕐᕕᙵᑦ ᖃᐅᔨᒋᐊᕆᐊᓖᑦ ᐹᕙᓖᓐᑯᑦ ᐅᐊᑦᑎᔮᙱᓄᑦ. ᐊᑯᓐᓂᖓᓂ ᔫᓄᐊᕆ 1, 2023, ᐊᒻᒪᓗ ᑎᓯᐱᕆ 31, 2023-ᒥ, ᑲᑎᓪᓗᒋᑦ ᓄᓇᒥᒃ ᐊᑐᖅᑏᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᒥ. ᐊᑐᕐᓂᙱᑦ ᐊᖑᓇᓱᒃᑏᑦ ᐊᒻᒪᓗ ᐳᓛᖅᑏᑦ ᐊᑎᓕᐅᖅᖄᖅᑕᙱᓄᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ ᑲᔪᓯᓂᐊᖅᑐᑦ ᐅᔭᕋᙱᐊᕐᓂᓗᒃᑖᙱᓂ.	ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓂᐅᓚᓗᐊᖅᑎᓪᓗᒋᑦ ᑕᑯᖃᑦᑕᐅᓂᙱᑦ ᓄᓇᒥᒃ-ᐊᑐᕐᓂᕐᒧᑦ ᐱᓕᕆᓂᕐᒧᑦ, ᓱᕐᓗ ᓂᕿᒃᓴᖅᓯᐅᕐᓃᑦ, ᐃᙱᕐᕋᖃᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᐊᐅᓪᓛᖅᓯᒪᓃᑦ, ᐊᒃᑐᐃᓃᑦ ᓂᕆᐅᒋᔭᐅᙱᑦᑐᑦ ᐱᓗᐊᕐᓂᐊᕐᓂᙱᓂᒃ. ᐱᔭᐅᓇᓂ 2020 ᐊᒻᒪᓗ ᑉᐃᓕᐅᔪᑦ ᐊᒃᑐᐊᓂᓖᑦ ᓄᕙᒡᔪᐊᕐᓇᒧᑦ ᓄᓇᕐᔪᐊᒥ ᑲᔪᓯᓚᐅᖅᑎᓪᓗᒍ 2021-ᒧᑦ, ᐊᖑᓇᓱᒃᑏᑦ ᐊᒻᒪᓗ ᐳᓛᖅᑐᑦ ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᙱᑦ ᓱᕋᙱᑦᑐᑦ ᐊᒻᒪᓗ ᐅᓄᖅᓯᒋᐊᖅᐸᓪᓕᐊᓯᒪᔪᑦ 2017-ᒥ ᓈᓴᐅᑎᙱᑦ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐊᒥᓱᑦ ᐊᖑᓇᓱᙱᕐᒥ ᐊᒻᒪᓗ ᐊᐅᓪᓛᖅᓯᒪᓂᕐᒧᑦ ᐃᙱᕐᕋᖃᑦᑕᕐᓃᑦ.
ᑎᖕᒥᐊᑦ ᑎᑭᑉᐸᒃᑐᑦ ᐃᕙᕕᙱᓂᒃ ᖃᐅᔨᓴᕐᓂᖅ	ᑲᒪᖏᔭᓕᒃ ᐱᓕᕆᐊᒥ ᒪᓕᒋᐊᓖᑦ 66 ᐊᒻᒪᓗ 70	2023-ᒥ, 15,868 ᒦᑕᑦ ᑭᑉᐹᓇᒃᑐᑦ (m²) (1.5 Hᐃᐊᒃᑐᔅ) ᓄᓇᖓ ᐸᒡᕕᓭᑕᐅᓯᒪᔪᑦ ᐱᓕᕆᐊᒥ ᐱᖁᑎᕐᔪᐊᓂ ᐃᕐᓂᐅᖅᑎᓪᓗᒋᑦ ᑎᖕᒥᐊᑦ (ᒪᐃ 17-ᒥᑦ ᔫᓚᐃ 19-ᒧᑦ). ᐊᑕᐅᓯᖅ ᑎᑭᑉᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕕᕆᕙᒃᑕᙱᓂᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐱᔭᕇᖅᑕᐅᓚᐅᖅᑐᖅ, ᐊᒻᒪᓗ ᑎᖕᒥᐊᑦ ᐃᕙᕕᙱᓂᒃ ᓇᓂᔭᐅᔪᖃᓚᐅᙱᑦᑐᖅ. ᖃᐅᔨᓴᕐᓃᑦ ᐱᓕᕆᐊᖑᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᐱᕈᖅᑐᑦ ᐱᔭᖅᑕᐅᓂᐊᕐᕋᙳᑕ ᐅᕙᓗᓐᓃᑦ ᒪᓂᖅᑲᒥ ᐸᕝᕕᓴᐃᓂᖅᑕᖃᕐᕋᙳᑦ ᐃᕐᓂᐅᖅᑎᓪᓗᒋᑦ ᑎᖕᒥᐊᑦ.	ᒥᑭᓛᙳᑎᑦᑎᓂᒃᑯᑦ ᐱᓕᕆᐊᑉ ᐃᓂᐊᓂᒃ, ᐱᓕᕆᐊᖃᖅᑎᓪᓗᒋᑦ ᑎᑭᑉᐸᒃᑐᑦ ᑎᖕᒥᐊᑦ ᐃᕙᕕᕆᕙᒃᑕᙱᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᓂᒃ ᐊᒻᒪᓗ ᐊᑐᓕᖅᑎᑦᑎᓂᖅ ᐃᕙᕕᙱᓂᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂᒃ, ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓃᑦ ᐃᕙᕕᙱᓄᑦ ᑎᖕᒥᐊᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐱᓗᐊᔾᔮᙱᓐᓂᙱᓂᒃ ᐅᕙᓗᓐᓂᑦ ᐱᑕᖃᙱᓪᓗᑎᒃ.
ᐆᒪᔪᓂᒃ ᑕᑯᓯᒪᔪᑦ ᑐᕐᑯᑕᐅᔪᓪᓗ.	ᑲᒪᖏᔭᓕᒃ ᐱᓕᕆᐊᒥ ᒪᓕᒋᐊᓖᑦ 53ᐃ, 53ᐱ ᐊᒻᒪᓗ 57ᑭ	ᖃᓄᑐᐃᓐᓇᖅ ᑕᑯᖃᑦᑕᐅᑎᓃᑦ ᑐᕐᑰᑎᓃᓗᓐᓃᑦ ᐱᖃᐅᓯᔾᔨᔪᑦ ᓂᕐᔪᑎᓂᒃ ᐱᓕᕆᕙᐅᑉ ᐃᓂᐊᓂ ᐅᖃᐅᓯᐅᓲᑦ ᖃᐅᔨᓴᖅᑕᐅᓗᑎᒡᓗ ᐊᕐᕌᒍᓗᒃᑖᖅ. ᐊᔪᕐᓇᙱᒃᑯᓂ,	ᐊᒃᑐᐊᓪᓚᑦᑖᖅᑐᑦ ᓂᕐᔪᑎᓂᒃ ᑐᕐᑯᑎᖃᑦᑕᕐᓃᑦ ᐱᓕᕆᐊᒥ-ᐊᒃᑐᐊᔪᓄᑦ ᐱᓕᕆᓂᕐᓂ ᓇᓚᐅᑦᑖᖅᑕᐅᓯᒪᔪᑦ

ᑎᑎᕋᖅᓯᒪᔪᖅ 0. ᓇᐃᓈᖅᓯᒪᔪᑦ ᐊᕙᑎᒥ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᑦ ᓄᓘᔾᖓᓂ ᐱᓕᕆᐊᒥ 2023-ᒥ.

ᖃᐅᔨᓴᕐᓂᖅ	ᐱᔾᔪᑖ ᖃᐅᔨᓴᖅᑐᑉ[1]	ᐱᔭᕇᖅᑕᑦ, ᐊᒃᑐᐃᓃᑦ ᐅᔾᔨᕆᔭᑦ, ᐸᓚᐅᒪᑎᑦᑎᓇᓱᓐᓂᖅ ᐊᒻᒪᓗ ᓱᕗᓂᒃᓴᑦᑎᓐᓂ ᖃᓄᐃᓕᖓᕐᑯᔭᐅᓃᑦ	ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᓐᓂᒃ ᕿᒥᕐᕈᓂᖅ ᐊᒃᑐᐃᓂᕐᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓄᑦ[2]
		ᐸᓚᐅᒪᑎᑦᑎᓇᓲᑏᑦ ᐊᑐᓕᖅᑎᑕᐅᓲᑦ ᐱᓗᐊᕐᑯᓇᒋᑦ ᓯᕗᓂᒃᓵᒥ ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᓃᑦ ᑐᕐᑰᑎᖃᑦᑕᕐᓃᓪᓗ. 2023-ᒥ, 24 ᐃᓛᒃᑰᖅᑐᑦ ᓂᕐᔪᑏᑦ ᑐᕐᑕᐅᓂᖃᓚᐅᖅᑐᑦ ᐅᖃᐅᓯᐅᔪᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᒫᕐᕉᒃ ᐊᕐᕕᓃᓪᓚᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᐊᕐᔫᑦ: ᑎᓇᒐᓂᐊᖅ (2), ᐅᑲᓖᑦ (3), ᐊᐅᐸᖅᑐᑦ ᑎᓇᒐᓂᐊᖅ (1), ᐊᒪᕈᖅ (1), ᕐᑯᐸᓄᐊᑦ (3), ᖃᐅᔨᒪᔭᐅᙱᑦᑐᖅ ᑎᖕᒥᐊᕈᓯᖅ (1), ᐊᒻᒪᓗ ᒥᑏᑦ (13). ᐹᕙᓛᓐᑯᑦ ᐸᓚᐅᒪᑎᑦᑎᓇᓯᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓂᕐᓂᒃ ᐱᓕᕆᕝᕕᐅᔪᒥ ᐃᓕᓐᓂᐊᕐᓂᒃᑯᑦ, ᐊᑐᓕᖅᑎᑦᑎᓂᒃᑯᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓗᑎᒃ ᐊᑐᖅᑕᐅᔾᔫᔭᓐᓃᖅᑐᓂᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᐅᓯᐅᕚᒃᑐᓂᒃ ᖃᐅᔨᒪᔾᔭᑎᓂᒡᓗ. ᓂᕐᔪᑎᓂᒃ ᑕᑯᖃᑦᑕᐅᑎᖃᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᑐᕐᑰᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖑᓇᕐᓂᖅ ᑲᔪᓯᓂᖃᕐᓂᐊᖅᑐᖅ 2024-ᒧᑦ.	ᐅᓄᙱᑦᑑᓂᐊᕐᓂᖏᓐᓂᒃ ᐱᑕᖃᙱᓪᓗᑎᓪᓘᓐᓃᑦ ᑎᖕᒥᐊᓄᑦ ᓂᕿᑐᖅᑎᓄᑦ, ᑎᒥᐊᓄᑦ, ᑐᒃᑐᓄᑦ ᐊᓯᖏᓐᓄᓪᓗ ᓂᕐᔪᑎᓄᑦ. ᑐᕐᑯᑕᐅᔪᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᓴᖅᑮᓯᒪᓂᐊᕐᓂᖏᓐᓂᒃ ᐅᓐᓂᕆᑦᑐᓂᒃ ᐃᓚᐃᓐᓇᖏᓐᓂᓄᑦ ᑕᒪᐃᓐᓅᖓᔪᓄᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ. ᓂᕐᔪᑏᑦ ᑐᕐᑯᑕᐅᔪᑦ 2023-ᒥ ᐊᑕᖏᖅᑰᑎᒃ ᐃᓛᒃᑰᖅᑐᐃᓐᓇᐅᓪᓗᑎᒃ ᐊᓯᐅᔨᓂᐅᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᐊᒃᑐᐃᓂᖃᖅᓯᒪᓇᑎᒃ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᐊᕐᔫᒃᑐᓂᒃ ᐅᓗᓇᐊᓇᖅᑐᒦᑦᑐᓂᒃ. ᑕᐃᒪᐃᓐᓂᖓᓄᑦ, ᓂᕐᔪᑏᑦ ᑐᕐᑯᑕᐅᔪᑦ ᐅᓄᓚᐅᙱᑦᑐᑦ ᑕᐃᒪᐃᓐᓅᖓᔪᑎᒍᑦ ᐊᒻᒪᓗ ᓴᖅᑭᔮᖅᑎᑦᑎᓪᓗᑎᒃ ᐅᓄᙱᑦᑐᒪᓇᖕᓂᒃ ᑕᒪᐃᓐᓅᖓᔪᓄᑦ ᐅᓄᕐᓂᖏᓐᓂᓄᑦ, ᒪᓕᑐᐃᓐᓇᖅᑐᖅ ᐊᒃᑐᐃᓂᕐᒧᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂᒃ. 2023-ᒥ ᑐᕐᑯᑕᐅᔪᑦ ᑲᑎᓲᒥᑦ ᑐᖔᓐᓃᓐᓂᖅᓴᐅᕋᕐᔪᓚᐅᖅᑐᑦ ᐅᓄᓛᙳᓯᒪᔪᓂ ᑐᕐᑯᑕᐅᖃᑦᑕᖅᓯᒪᔪᓂ, 2015-ᒥ ᐅᓄᙱᓛᙳᓗᑎᒃ (5) ᐊᒻᒪᓗ 2016-ᒥ ᐅᓄᓛᙳᓗᑎᒃ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑎᒍᑦ 25 ᖃᔅᓯᐅᓂᖏᑦ ᑐᕐᑯᑕᐅᔪᑦ.

SUMMARY

The Mary River Project (the Project) is an iron ore mine 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. In 2023, Baffinland hauled roughly 5.4 million tonnes (mt) of iron ore from the Mine Site to the Milne Port stockpile. That year, construction-related activities were limited to ongoing development and construction and maintenance of infrastructure and laydowns at the Mine Site and Milne Port to support operations. The total Project footprint was 612 ha at year-end 2023.

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 conducted for the Terrestrial Environment Monitoring Program is guided by the Terrestrial Environment Mitigation and Monitoring Plan (Baffinland Iron Mines Corporation 2016a) and the 2023 Draft Terrestrial Environment Mitigation and Monitoring Plan (Baffinland Iron Mines Corporation 2023a). It is overseen by the Terrestrial Environment Working Group (TEWG), including members from Baffinland, the Qikiqtani Inuit Association (QIA), the Government of Nunavut, Environment and Climate Change Canada, and the Mittimatalik Hunters and Trappers Organization, as well as observers from the Canadian Northern Economic Development Agency (CanNor), the Nunavut Impact Review Board (NIRB), and Natural Resources Canada (NRCan). An additional four Hunters and Trappers Organizations (Ikajutit Hunters and Trappers Association; IHTA, Nangmautuq Hunters and Trappers Organization; NHTO, Igloolik Hunters and Trappers Organization; IHTO, and Hall Beach Hunters and Trappers Association; IHTA) were included as of February 2023 and can obtain TEWG member status if they choose to participate. The Terrestrial Environment Monitoring Program began in 2012 and continued through 2023 with adaptations to the program based on results and input from the TEWG.

This report summarizes the data collection and monitoring programs conducted in 2023 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 abundance monitoring;
- snow track surveys;
- snowbank height monitoring;
- Height of Land (HOL) caribou surveys;
- aerial caribou survey;
- remote camera monitoring;
- hunter and visitor log summaries;
- Active Migratory Bird Nest Surveys; and,
- wildlife interactions and mortalities.

Inuit Participation — Eight local Inuit residents assisted with fixed-wing aerial caribou surveys, Height of Land caribou surveys and soil and vegetation monitoring for 916.5 hours during the 2023 field season.

Climate — Weather conditions in 2023 were summarized and compared to average conditions. Minimum and maximum temperatures for the Mine Site in 2023 lie within the recorded historical range. 2023 temperatures at Milne Port were close to average throughout the spring, fall and summer, with a colder January and February and a warmer November and December. Both the Mine Site and Milne Port stations recorded August as unusually rainy with 18 rain days and a volume of 84.6mm of precipitation. The wind blows predominately along a northwest-southeast axis at the Mine Site, although uncommon easterly winds tend to be the highest wind speeds recorded at the meteorological station. The pattern observed in 2023, which has been consistent since at least 2021 and possibly earlier, has winds blowing predominately from the southwest (onshore winds blowing down the inlet) and north-northwest (onshore winds blowing across the inlet). The pattern appears to have changed over the last decade, with the once-significant north-northeasterly and south-southeasterly winds becoming calm and infrequent, and the powerful southwesterly and north-northwesterly winds becoming the new dominant wind patterns in the area.

Helicopter Overflights — The helicopter flight height analysis monitors potential disturbance to birds and other wildlife within the Regional Study Area and a designated Snow Goose area. 2023 was the seventh consecutive year that additional analysis (i.e., accounting for pilot rationale) was incorporated into overflight analysis. Notably, the categorization of flights as 'compliant with rationale' represented 68% of the total flight hours evaluated in the analysis. The most common rationales for flying below the cruising altitude requirements in 2023 were slinging (38% of the total flight hours), short-distance flights (19%) and weather-related circumstances (9%). In 2023, combined compliance of helicopter overflights was 95.46%. Overall combined compliance has been above 90% since 2018, with non-compliant flights fluctuating between 4 and 8%. The number of transits (19%) and flight hours (5%) within the Snow Goose area during moulting season were higher than the previous five years, but non-compliant flights were down to 7% in 2023, the lowest since 2019.

Tote Road Traffic — The mean number of combined vehicle transits for 2023 was 258.7 transits per day (ore haul accounted for 234.2 transits per day). These daily means meet the predicted value (236 ore haul transits and 40 non ore haul transits) in the Final Environmental Impact Statement Addendum for the Production Increase Proposal.

Dustfall — The 2023 passive dustfall monitoring program used 49 (43 at 2.0 m height and six at 0.5 m height) passive dustfall collectors to measure dust deposition related to Project activities. The total number of canisters decreased from 2022 as six 0.5 m stations and 4 north RR stations were removed from 2023 analysis (Appendix F). Thirty-six collectors are sampled monthly, while the rest are sampled during the summer only. The magnitude of annual dustfall deposition at Mine Site sample locations was lower than measured in recent years. The highest dustfall deposition at the Mine Site was associated with the mine haul road. While the airstrip has consistently had the highest dustfall deposition in the Mine Site area in all years except 2019, total dustfall was lowest at this location in 2023. The magnitude of dustfall deposition at Milne Port has remained constant or, in some cases, has slightly decreased, a trend that began in 2018. The highest dustfall deposition in the Milne Port area was associated with the ore stockpiles, with lesser amounts generated by the sealift staging area. Along the Tote Road, dustfall in 2023 was consistent at the north crossing location when compared with recent years. Dustfall extent was also characterized by examining 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 pattern of dustfall extent on the landscape was similar from 2014 to 2023 for all areas, with the highest concentrations near the Project and dustfall extending northeast along Milne Inlet, west and south of the Mine Site, and southwest of the Tote Road south crossing (km 78) in the direction of prevailing and/or strong winds. 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 2023. Continued use of the dust suppressant, DusTreat, was applied to ore stockpiles regularly in 2023. 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 more frequently to stockpiles at Milne Port.

Vegetation — The vegetation monitoring program in 2023 focused on potential changes to vegetation abundance and composition over time and at varying distances from the Project Development Area (PDA). Potential Project-related effects on total vegetation cover were evaluated in relation to distance class and compared with previously collected data (i.e., 2017 to 2019, 2023). No evidence of changes in percent plant cover and plant group composition with distance from the PDA were identified. Statistical data trends were primarily attributed to inter-annual variation (i.e., yearly differences in vegetation growth throughout the region). No measurable grazing effect was detected. Although soil moisture regime appeared wetter in 2019 compared to 2023, no differences were identified among distance classes and years. Trends between plant group composition and soil moisture regime appeared indicative of micro-site preferences by different plant groups for different soil moisture conditions.

Wildlife — Snow track surveys were conducted to assess wildlife response to the Tote Road, particularly for caribou. Six surveys were completed in 2023. Like previous years, most tracks observed were from Arctic foxes and Ptarmigan, and no caribou tracks were observed in 2023. Only 4% of observed tracks were observed deflecting 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 conducted in 2023 during the winter. In response to a TEWG request, measurement locations have been randomized since 2020 instead of using repeated kilometre markers for measurements. Overall, compliance was at 88%, slightly lower than 2022 (91%) but within range of other years of snowbank monitoring.

The Height of Land (HOL) surveys were conducted to assess caribou, distribution and behaviour in the PDA during the calving season. The HOL surveys were completed between June 2 and June 11, 2023. The total observation time was 16 hours and 51 minutes, (down from 2022 due to helicopters being grounded for safety reasons) while the average observation time per station was 40 minutes. No caribou were observed during these surveys in 2023, but a caribou track was noted on June 9, 2023 in a small depressions paralleling the tote road around KM 90.5. This is consistent with all previous surveys after 2013 and the low regional caribou population. Results from remote camera monitoring, a supplemental program to the HOL surveys, had no caribou observations from January 1, 2023, to December 28, 2023. An aerial caribou survey was conducted in March 2023, before caribou calving. During the survey, 112 caribou and 36 caribou groups were observed. All caribou observations were in the southern subregion of the wildlife Regional Study Area (RSA), and only two groups (nine individuals total) were in an overlapping portion of the northern subregion.

Birds — Active Migratory Bird Nest Surveys (AMBNS) 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 (Rausch 2015) to detect any nesting birds before construction. One survey was completed in 2023, and no nests were detected.

After several years of raptor effects monitoring, occupancy and productivity were deemed to be stable, and no evidence was found of Project-related effects on raptors. Therefore, raptor occupancy and productivity surveys have been paused since 2021. No future surveys are proposed.

Wildlife Interactions — Twenty-four wildlife mortalities were reported in 2023 (all individual mortalities). Mortalities in 2023 involved seven different species: Arctic fox (2), Arctic hare (3), Red fox (1), Arctic wolf (1), Snow Bunting (3), unknown songbird (1), and King Eider (13). Vehicle collisions were confirmed or suspected for all mammal mortalities; bird mortalities are suspected to result from building or infrastructure collisions. Whenever possible, mitigations are implemented to reduce the risk of Project-related wildlife injury or mortality.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2023.

Survey	Reason for Survey[1]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[2]
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 (Mine Site) and 2006 (Milne Port). Weather data are used to support other monitoring programs; mitigations are not necessary. Meteorological stations will continue to collect weather data in 2024.	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 Goose area). Flight corridors are also used to avoid areas of significant wildlife importance. In 2023, compliance with height requirements within the Snow Goose area during the moulting season (July to August) was 93%, and compliance outside the Snow Goose area and in all areas in all months of analysis (May to September) was 95%. For the seventh consecutive year, flight height data were cross-referenced with daily pilot logs to justify low-level flights in 2023. Low-level flights with reasonable rationales were considered "compliant with rationale". Reasonable rationales included weather, slinging, short-distance flights, search and rescue, inspections, maintenance flights, Medivac and geophysical surveys. 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 Goose area is subject to helicopter flyovers and is mainly located outside the Zone of Influence, effects would likely be limited. Overall, local disturbance relative to the 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 2023 when considering the pilots' rationale for low-level flying and flight hours within the Snow Goose area during the moulting season. Flights over the Snow Goose area were limited to its southeastern edge, such that any sensory disturbance would be minimal relative to the entire Snow Goose area, consistent with Final Environmental Impact Statement predictions. However, it is not sensible to directly monitor the potential effects of low-level flying on Snow Geese or other migratory birds as doing so would involve accessing the Snow Goose

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

[2] Mary River Project Final Environmental Impact Statement: Volume 6 – Terrestrial Environment (Baffinland Iron Mines Corporation 2012a) 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 2023.

Survey	Reason for Survey[1]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[2]
			moulting areas by helicopter, thus introducing greater disturbance potential. No direct mortality due to aircraft has been documented, which is consistent with impact predictions.
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 number of combined vehicle transits for 2023 was 258.7 transits per day (ore haul accounted for 234.2 transits per day). These daily means are below the predicted value (236 ore haul transits) in the Final Environmental Impact Statement Addendum for the Production Increase Proposal.
Passive dustfall monitoring	Addresses Project Conditions 36, 50, 54d, 58c and Project Commitment 60	Dustfall collectors at 43 different locations are distributed around the Project area, some further away from the PDA as Reference sites monitoring background levels. 2021 included the addition of 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 those closer to ground level (i.e., 0.5 m). Eleven years of monitoring from August 2013 to December 2023 are now complete using the 2.0 m height collectors. Passive dustfall monitoring indicated 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, indicated dustfall was generally low throughout 2023. 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 43 sites through the summer season and a subset of 36 year-round sites.	Annual Total Suspended Particulates deposition levels were predicted to exceed 50 $g/m^2/year$ within the PDA, with Total Suspended Particulates levels decreasing to background outside of the PDA. The 2023 dustfall results were consistent with predictions that the highest dustfall would be within the PDA.
Vegetation abundance monitoring & Soil and Vegetation	Addresses Project Conditions 34, 36, 38, 50 and Project Commitments 60 and 107	Vegetation abundance monitoring completed along sampling transects comprising four replicated sampling sites at defined distance intervals (30, 100, 750, and 1,200 m) that extended perpendicularly from the transect and were appropriately spaced from the PDA. Fifteen vegetation transects were assessed in	2023 results were consistent with predictions. There are no measured effects on vegetation abundance outside of the PDA.

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2023.

Survey	Reason for Survey[1]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[2]
base metals monitoring		relation to Project infrastructure areas—including the Mine Site (six transects), Tote Road (five transects), and Milne Port (four transects)—resulting in 60 sample sites total. Controls were assessed at 15 Reference sites located approximately 20 to 30 km from the PDA. No evidence of changes in percent plant cover and plant group composition in relation to distance from the PDA were identified. Statistical data trends were primarily attributed to inter-annual variation. No measurable grazing effect was detected. Although soil moisture regime appeared wetter in 2019 compared to 2023, no differences were identified among distance classes and years. Soil-metal and lichen-metal sampling was not conducted in 2023. Soil-metal and lichen-metal sampling were evaluated and reported in 2022. Soil-metal and lichen-metal concentrations represented a low risk to environmental and human health in 2022.	
Snow track surveys	Addresses Project Conditions 54dii and 58f Addresses 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 March, May, October, November and December 2023. Arctic fox, Arctic hare, lemming and Ptarmigan were the only species detected during the 2023 surveys; no evidence of caribou has been observed near or crossing the Tote Road since January 2020. Wildlife response to the road was recorded at each location where tracks were seen. Snow track monitoring will continue in 2024 at increased intervals when ideal survey conditions and safety considerations are met.	A reduction in caribou movement across Project infrastructure throughout the Operation phase was predicted, but not expected to be significant at the scale of the North Baffin Island caribou population. Data from the snow track survey can be used to investigate that prediction when caribou numbers increase and movement resumes in the Regional Study Area. If ground monitoring of caribou suggests barrier effects (e.g., 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 2023, it cannot be determined whether Project infrastructure is impacting caribou movement.
Snowbank height surveys	Addresses Project Conditions 53ai and 53c	Snowbank height monitoring was conducted monthly from January-May and November-December, 2023 to assess compliance with the 1 m height threshold. Management of snowbank height facilitates wildlife crossings and increases driver	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

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2023.

Survey	Reason for Survey[1]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[2]
	Addresses QIA concerns about snowbank heights and the effects on wildlife	visibility to help reduce wildlife-vehicle collisions. As per the TEWG's request, measurement locations were randomized in 2020. In 2023, the average compliance for snowbank height surveys was 88%, slightly lower than in 2022 (91%), but consistent in the compliance range since 2014 (80% to 97%), except for the low in 2017 (66%). In some areas, snowbanks could not be modified because of landscape or safety limitations. Snowbank height monitoring will continue during the winter of 2024.	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, insufficient observational data exist to quantify the effectiveness of this mitigation on caribou movement due to low caribou numbers. As caribou numbers increase, as predicted by Inuit traditional knowledge, increased monitoring of caribou movement across the roadway will be implemented.
Height of Land (HOL) caribou surveys	Addresses Project Conditions 53a, 53b, 54b and 58b	Two EDI Environmental Dynamics Inc. (EDI) biologists with two local Inuit participants conducted HOL surveys during the caribou calving season (early June 2023). The total observation time was 16 hours and 51 minutes, while the average observation time per station was 40 minutes. One track was observed, but no caribou were observed during these surveys in 2023. In 2016, viewshed mapping was completed to demonstrate the extent of area surveyors could observe while conducting HOL surveys. The HOL surveys will continue annually during the calving season. The 2023 observations add to a more extensive database as monitoring efforts continue through the Project's life. Twelve remote cameras were deployed in 2021, at six HOL stations, and recorded no images of caribou between January 2023 and December 2023.	The assessment predicted some indirect habitat loss for caribou due to sensory disturbance and dust deposition, leading to reduced habitat effectiveness within the Zone of Influence. However, habitat effectiveness was estimated to be reduced by 2 to 4%. Some disturbances (i.e., traffic) are short-duration and caribou may adapt to these disturbances, thus limiting potential impacts. Many alternate calving sites exist within and outside the Zone of Influence. 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, there have been insufficient caribou observations during HOL surveys 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. Between January 1, 2023, and December 31, 2023, a total of 286 land use person days were recorded at the Project. The 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 pandemic that continued into 2021, hunter

Table 0. Summary of environmental effects monitoring and research activities at the Mary River Project in 2023.

Survey	Reason for Survey[1]	Work Completed, Effects Observed, Required Mitigation and Recommendations for Future Work	Comparison to Impact Predictions[2]
			and visitor check-ins have remained steady and increased from pre-2017 numbers, including numerous hunting and camping trips.
Active Migratory Bird Nest Surveys (AMBNS)	Addresses Project Conditions 66 and 70	In 2023, approximately 15,868 m² (1.5 ha) of land were disturbed for Project infrastructure during the breeding bird window (May 17 to August 19). One AMBNS was completed, and no bird nests were found. Surveys will continue to be conducted whenever vegetation clearing or surface disturbance occurs 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.
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 2023, 24 individual wildlife mortality incidents were reported involving seven different species: Arctic fox (2), Arctic hare (3), red fox (1), Arctic wolf (1), Snow Bunting (3), unknown songbird (1), and King Eider (13). 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 2024.	Direct wildlife mortality from Project-related activities was predicted to be low to nil for raptors, birds, caribou and other wildlife. Any mortalities that occur were expected to represent a small fraction of the overall population. Wildlife mortalities in 2023 were all individual losses and did not impact any species at risk. Thus, wildlife mortalities were low overall and represented a very small proportion of overall populations, consistent with impact predictions. The 2023 mortality totals are slightly below the highest range of past mortalities, with 2015 being the lowest (5) and 2016, recording the highest (25) number of mortalities.

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AICc	Akaike's Information Criteria
ΔAIC	Difference in AICc between the given model and the lowest AICc.
AMBNS	Active Migratory Bird Nest Surveys
ANOVA	Analysis of Variance
Baffinland	Baffinland Iron Mines Corporation
CanNor	Canadian Northern Economic Development Agency
CI	Confidence interval
CPUE	Catch per Unit Effort
CWS	Canadian Wildlife Service
DS	Distance sampling
EDI	EDI Environmental Dynamics Inc.
EPP	Environment Protection Plan
GN	Government of Nunavut
GPS	Geographic Positioning System
HB HTA	Hall Beach (Sanirajak) Hunters and Trappers Association
IHTA	Ikajutit Hunters and Trappers Association
IHTO	Igloolik Hunters and Trappers Organization
HOL	Height of Land
LSA	Local Study Area
magl	Metres above ground level
masl	Metres above sea level
MHTO	Mittimatalik Hunters and Trappers Organization
MR	Mark-recapture
MRDS	Mark-recapture distance sampling
NHTO	Nanmautuq (Clyde River) Hunters and Trappers Organization
NIRB	Nunavut Impact Review Board
NRCan	Natural Resources Canada
PC	Project Condition
PDA	Potential Development Area
PRISM	Program for Regional and International Shorebird Monitoring
Project	Mary River Project
QIA	Qikiqtani Inuit Association
RSA	Regional Study Area

Acronym/Abbreviation	Definition
SDI	Snow Darkening Index
SMR	Soil moisture regime
TEAMR	Terrestrial Environment Annual Monitoring Report
TEMMP	Terrestrial Environment Mitigation and Monitoring Plan
TEWG	Terrestrial Environment Working Group
TSP	Total suspended particulates
VECs	Valued Ecosystem Components
ZOI	Zone of influence

1 OVERVIEW

The Mary River Project (the Project) is an iron ore mine in the Qikiqtaaluk Region on North Baffin Island, Nunavut. As a condition of Project approval, 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 completed 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; refer to Section 2), which is comprised of representatives from Baffinland, the Qikiqtani Inuit Association, the Government of Nunavut, Environment and Climate Change Canada, and the Mittimatalik Hunters and Trappers Organization, as well as observers from the Canadian Northern Economic Development Agency (CanNor), the Nunavut Impact Review Board (NIRB), and Natural Resources Canada (NRCan). An additional four Hunters and Trappers Organizations (Ikajutit Hunters and Trappers Association; IHTA, Nangmautuq Hunters and Trappers Organization; NHTO, Igloolik Hunters and Trappers Organization; IHTO, and Hall Beach Hunters and Trappers Association; IHTA) were included as of February 2023 and can obtain TEWG member status if they choose to participate. The World Wildlife Fund, Nunavut Impact Review Board, Canadian Northern Economic Development Agency, and Natural Resources Canada all participate as observers on the TEWG. 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 TEMMP (illustrated in Figure 1-1) comprises the guidance, methods, and standards for assessing potential Project-related effects on multiple (often interrelated) Valued Ecosystem Components (VECs). Where possible, monitoring design and data capture facilitate cross-referencing between monitoring components to better determine cause and effect and support more effective corrective actions. For example, dustfall deposition is captured by passive dustfall sampling. Dustfall effects on vegetation are captured by vegetation monitoring (including abundance, composition, and health). A caribou tissue regional sampling program monitors potential bioaccumulation effects in caribou (associated with metal uptake and transfer up the food chain). Table 1-1 summarizes components of the Terrestrial Environment Monitoring Program at the Project (2010 to present). Results and trend summaries from these monitoring programs are presented in each respective Terrestrial Environment Annual Monitoring Report (EDI Environmental Dynamics Inc. 2013−2022). The 2023 Annual Monitoring Report for the Terrestrial Environment Monitoring Program includes the following data collection and monitoring programs in 2023, 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 abundance;
- snow track surveys;
- snowbank height monitoring;
- Height of Land caribou surveys;
- remote camera monitoring;
- aerial caribou survey;
- Active Migratory Bird Nest Surveys;
- hunter and visitor log summaries; and,
- wildlife interactions, incidental observations, and mortalities.

Table 1-1. Overview of Terrestrial Environment Monitoring Program components (2010 to present).

Monitoring Programs and Endpoints	Previous Monitoring	Next Anticipated Monitoring
Passive Dustfall	2013–2023	2024
Dustfall Extent Imagery Analysis	2020–2023	2024
Soil and Vegetation Base Metals Monitoring	2012–2017, 2019–2022	2025
Vegetation Abundance Monitoring	2012–2017, 2019, 2023	2024
Normalized Difference Vegetation Index Analysis	2020	None Scheduled *(may reassess in future years)*
Exotic Invasive Vegetation Monitoring and Natural Revegetation	2014, 2019, 2020	2024
Height of Land Caribou Surveys	2013–2023	2024
Snow Track Surveys and Snowbank Height Monitoring	2014–2023	2024
Noise Monitoring	2020, 2022	None Scheduled *(may reassess in future years)*
Hunter and Visitor Logs	2010–2023	2024
Wildlife Observations, Incidents, and Mortality Logs	2020–2023	2024
Active Migratory Bird Nest Surveys	2013–2023	2024
Helicopter Flight Height Analysis	2015–2023	2024
Cliff-nesting Raptor Occupancy and Productivity Surveys	2011–2020	None Scheduled *(may reassess in future years)*
Caribou Fecal Pellet Collection	2011–2014, 2020	None Scheduled
Caribou Water Crossing Surveys	2014	None Scheduled *(single occurrence monitoring, may reassess in future years)*
Carnivore Den Survey	2014	None Scheduled *(single occurrence monitoring, may reassess in future years)*
Communication Tower Surveys	2014–2015	None Scheduled
Roadside Waterfowl Surveys	2012–2014	None Scheduled
Staging Waterfowl Surveys	2015	None Scheduled
Tundra Breeding Bird PRISM (Program for Regional and International Shorebird Monitoring) Plots	2012–2013, 2018–2019, 2022–2023	2024 *(to be completed by Environment and Climate Change Canada)*
Bird Encounter Transects	2013	None Scheduled *(single occurrence monitoring, may reassess in future years)*
Coastline Nesting and Foraging Habitat Surveys	2012 (Steensby Inlet), 2013 (Milne Inlet)	None Scheduled *(single occurrence monitoring, may reassess in future years)*
Red Knot (*Calidris canutus*) Surveys	2014, 2019	None Scheduled *(may reassess in future years)*

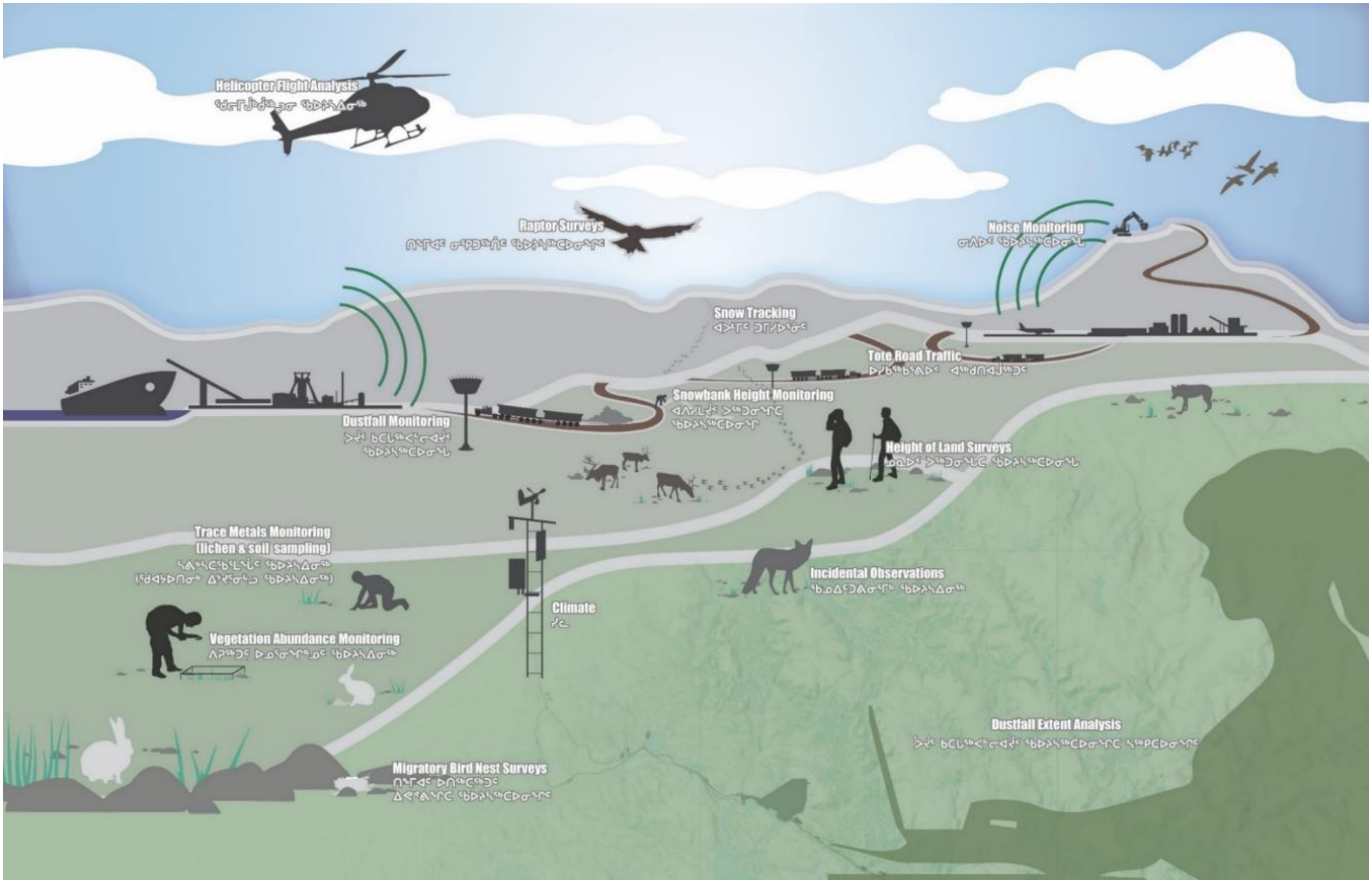

Figure 1-1. Graphical overview of the Project's Terrestrial Environment Monitoring Program.

2 TERRESTRIAL ENVIRONMENT WORKING GROUP

The Terrestrial Environment Working Group (TEWG) was formed in 2012 as a collaborative forum to discuss monitoring approaches and refine procedures based on data trends, local knowledge, and recent advances in science and technology. Historically, the TEWG has (at a minimum) convened biannually via in-person or teleconference meetings, typically before and after the summer field monitoring period. If/where possible, annual technical reports and other relevant discussion content are distributed before meetings. Baffinland Iron Mines Corporation (Baffinland) invites commentary from all representatives, reviews all comments and recommendations, and tries to provide meaningful responses to the TEWG.

Baffinland hosted two TEWG meetings (in-person) on February 14 and 16 and December 13 and 14, 2023 and a virtual meeting on April 19, 2023. In addition to standing discussion of the monitoring programs and recent outcomes, these meetings focused on ongoing dustfall monitoring, revised management plans for the Terrestrial Environment Mitigation and Monitoring Plan, Air Quality and Noise Abatement Monitoring Plan, and Roads Management Plan, and a future operations status update related to the Steensby development. Feedback responses and actions from the 2022 Annual Monitoring Report are presented in Appendix E.

3 INUIT PARTICIPATION

Baffinland Iron Mines Corporation (Baffinland) actively encourages and facilitates recruitment of Inuit participants at the Mary River Project (the Project) via:

- hiring and training Inuit assistants to work on terrestrial monitoring programs;
- supporting the participation of the Mittimatalik Hunters and Trappers Organization, Ikajutit Hunters and Trappers Association, Nangmautuq Hunters and Trappers Association, Igloolik Hunters and Trappers Organization, and Hall Beach Hunters and Trappers Organization in the Terrestrial Environment Working Group;
- providing funding for four full-time, on-site Environmental Monitors, to be appointed and solely employed by the Qikiqtani Inuit Organization 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 (Qikiqtani Inuit Association and Baffinland Iron Mines Corporation 2018).

In their capacity as research assistants and consultants, Inuit participants from numerous communities from the Baffin region have contributed to many components of the Terrestrial Environment Monitoring Program since its inception (e.g., Height of Land caribou surveys, vegetation abundance surveys, vegetation and soil base metals sampling, and raptor monitoring), and have provided strategic support and insight on field programs. Inuit 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.

Eight local Inuit residents assisted with fixed-wing aerial caribou surveys, Height of Land caribou surveys, and soil and vegetation monitoring for 916.5 hours during the 2023 field season (Figure 3-1). Additionally, Inuit Baffinland staff assisted with components of the 2023 Terrestrial Environment Monitoring Program as on-site Environmental Technicians. All but one of the Inuit assistants reside within Nunavut in one of the following communities: Arctic Bay, Pond Inlet, Sanirajak, or Iqaluit.

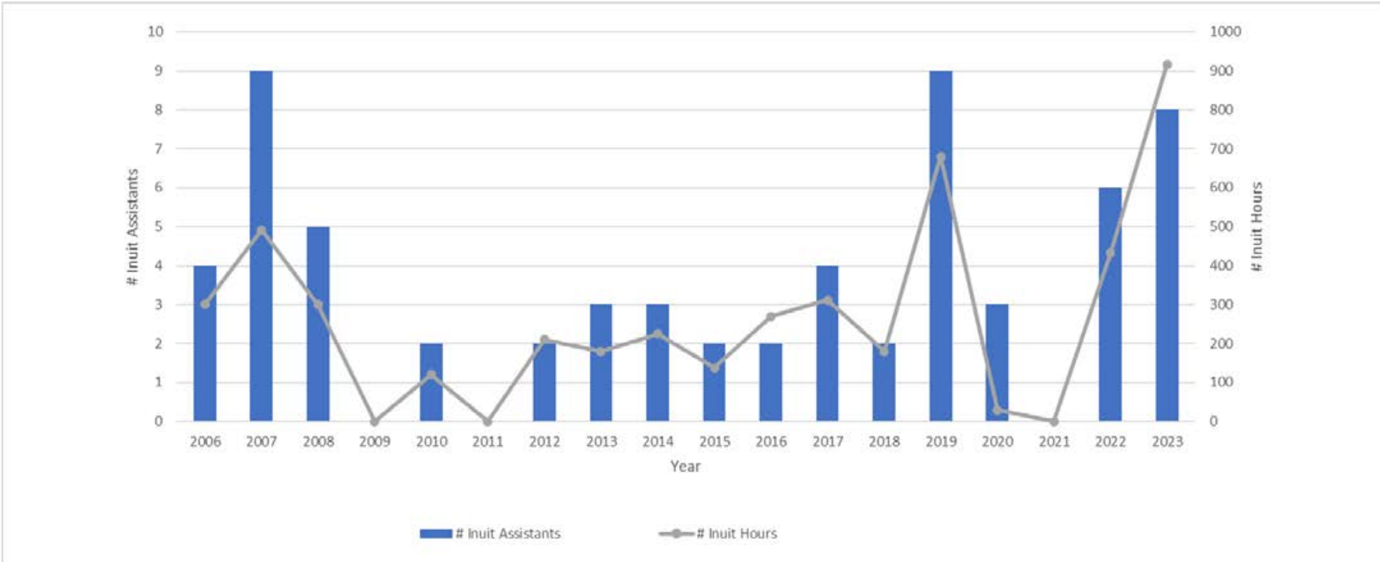

Figure 3-1. Inter-annual trend (2006 to 2023) of Inuit participation in the Terrestrial Environment Monitoring Program.

** The COVID pandemic resulted in little to no Inuit participation to minimize its spread.*

4 CLIMATE

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

- **PC #57** *"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."*

Recent climate data are compared to historical baseline data to document potential changes in climate patterns in the Regional Study Area. The climate data recorded at the Project are also cross-referenced with other datasets and analyses. For example, 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 specific patterns and trends in dustfall. Wind data are also used to estimate snow distribution before and during snow tracking surveys.

4.1 METHOD

From 1963 to 1965, Environment Canada operated a meteorological (MET) climate station at Mary River during the summer (Baffinland Iron Mines Corporation 2012b). These climate data have been included to compare to data collected from Baffinland's on-site MET stations. Baffinland established a MET station at Mary River Camp in June 2005 and Milne Port in June 2006. Data from these stations created a 'baseline' dataset from 2005 to 2010, preceding the development of the mine. Baffinland continues to collect data from these stations (Baffinland Iron Mines Corporation 2012b). Where relevant, the 2023 weather data were compared with the baseline (2005 to 2010) and post-baseline (2013 to 2022) weather data. Data included hourly air temperature, precipitation and wind speed and direction.

Weather conditions from January 1, 2023, to December 31, 2023, were reported from on-site MET stations at the Mine Site and Milne Port (Photo 4-1, Photo 4-2). Summaries of 2023 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. Temperature and precipitation data were accurate and reliable throughout 2023.

Comparisons of 2023 weather data were made in relation to baseline (2005 to 2010) and post-baseline (2013 to 2022) 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 wind speed and direction proportions were calculated based on data across all years within each period. The complete 2023 climate dataset is contained in Appendix A.

Photo 4-1. Mine Site meteorological weather station.

Photo 4-2. Milne Port meteorological weather station.

4.2 AIR TEMPERATURE AND PRECIPITATION

4.2.1 MINE SITE

In 2023, monthly mean temperatures at the Mine Site were lowest in February (−40.1°C), rising above zero in June (1.5°C) and peaking in July (10.3°C). Monthly means fell back below zero in October (−8.9°C). February 2023 presented the largest monthly anomaly, 9.2°C colder than the baseline average, while November was 8.3°C above the baseline. The temperature from June 16 until September 1 remained above 0°C (Figure 4-1).

Minimum and maximum temperatures in 2023 at the Mine Site were recorded on February 20 (−48.9°C) and July 30 (21.3°C), respectively. These extremes lie within the recorded historical range. The lowest temperature recorded at the Mine Site during the baseline period was −59.1°C in April 2007[3], though -48.9°C exceeds the old post-baseline record of −46.6°C from January 2015[4]. 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 1964. The highest temperatures previously registered at the Mine Site during the baseline and post-baseline periods were 22.8°C in July 2009 and 24.5°C in July 2016. These peak temperatures in the baseline, post-baseline and 2023 study periods are all higher than what was identified in the historical record (20.6°C in July 1965). See Appendix A for a complete monthly comparison among the baseline (2005 to 2010) and all post-baseline years (2013 to 2023).

June through August tend to be the wettest months for North Baffin Island, as presented in historical data trends from the Mine Site (Appendix Table A-1, Appendix Table A-2). Based on precipitation frequency and total precipitation, 2023 appears comparable to previously recorded means (Figure 4-2). Most noteworthy is the unusually rainy fall period in August and September 2023, with August setting the record for most rain days (18) and volume of precipitation (84.6 mm), exceeding the previous records of 17 rain days in July 2006 and 67.8 mm of precipitation in both August 2014 and July 2017. The number of days with precipitation continues to be reported to allow for direct comparisons with years when exact precipitation amounts became unclear due to rain gauge failures.

[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.

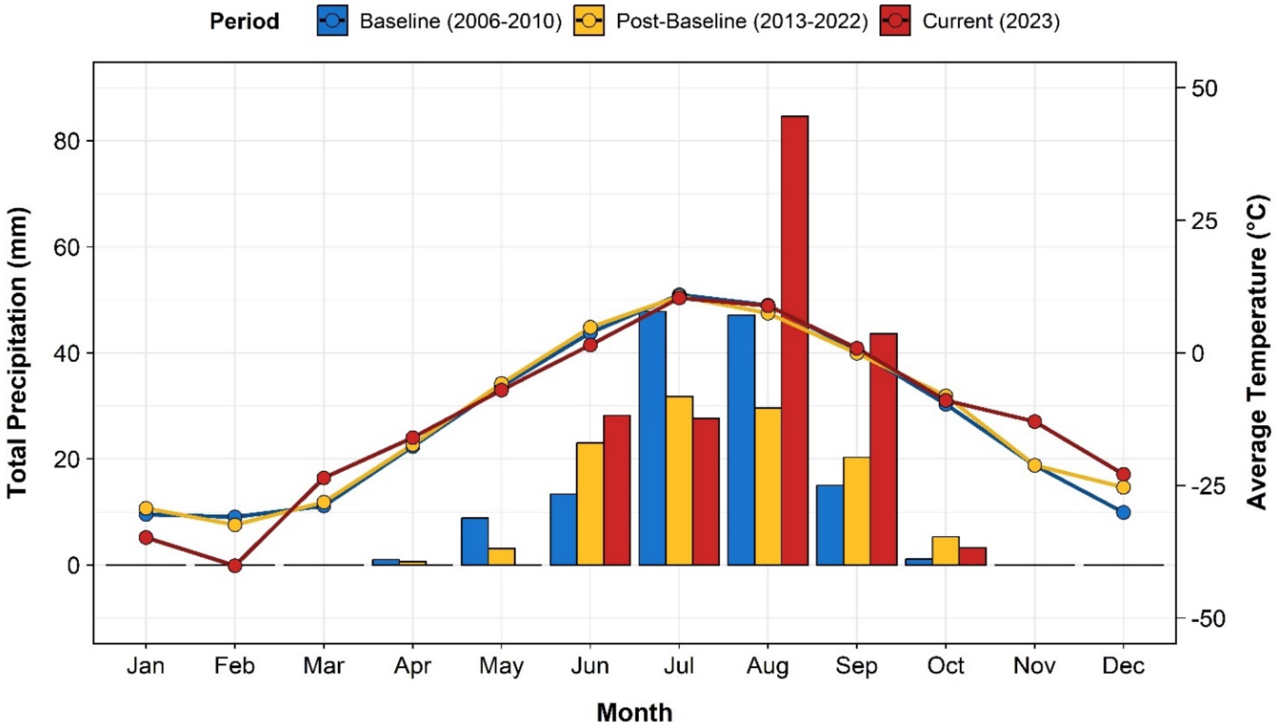

Figure 4-1. Mine Site monthly average air temperatures (lines) and total precipitation (bars) during the baseline period (2005 to 2010), post-baseline period (2013 to 2022) and most recent year (2023).

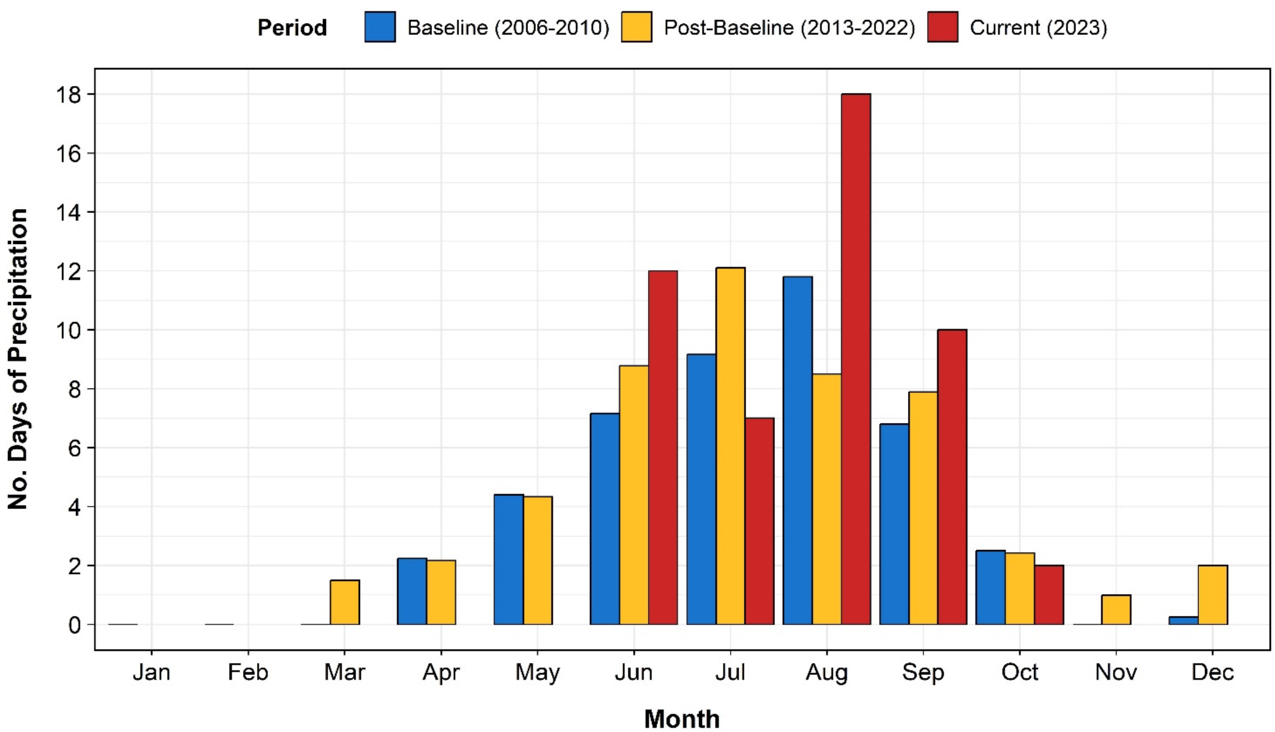

Figure 4-2. Mine Site monthly precipitation frequency (number of days experiencing precipitation) during the baseline period (2005 to 2010), post-baseline period (2013 to 2022) and most recent year (2023).

4.2.2 MILNE INLET

The 2023 trends in temperature and precipitation 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 February (−43.9°C), rising above freezing in June (0.9°C) and peaking in July (8.4°C) before dropping back below freezing in October (−8.2°C). From June 26 to September 6, 2023, the temperature remained above freezing (Figure 4-3). Milne Port in 2023 closely resembled baseline temperatures throughout the spring, fall and summer, with a colder January and February and a warmer November and December.

The lowest temperature of 2023 at Milne Port was −43.9°C on February 21, while the highest was 19.6°C on August 1. The coldest temperature noted 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. See Appendix A for a complete monthly comparison among the baseline (2006 to 2010) and post-baseline years (2013 to 2023).

Milne Port experienced 45 rain days in 2023, 17 of which were in a record-breaking August, which broke the previous monthly precipitation days record (15 in July 2006) and had the second-most volume of precipitation after July 2018 (74.8 mm). As with the Mine Site, August was unusually rainy by both measures of precipitation (Figure 4-4).

Comparing trends between the two weather stations, Milne Port is consistently cooler and drier than the Mine Site. In 2023, temperatures recorded at Milne Port were, on average, 0.4°C cooler than the Mine Site throughout the year. The Mine Site is slightly cooler in the winter and warmer in the summer, possibly due to the ocean's moderating influence at Milne Port. Since the start of the baseline recording, Milne Port has averaged 2.1°C cooler than simultaneous measurements from the Mine Site.

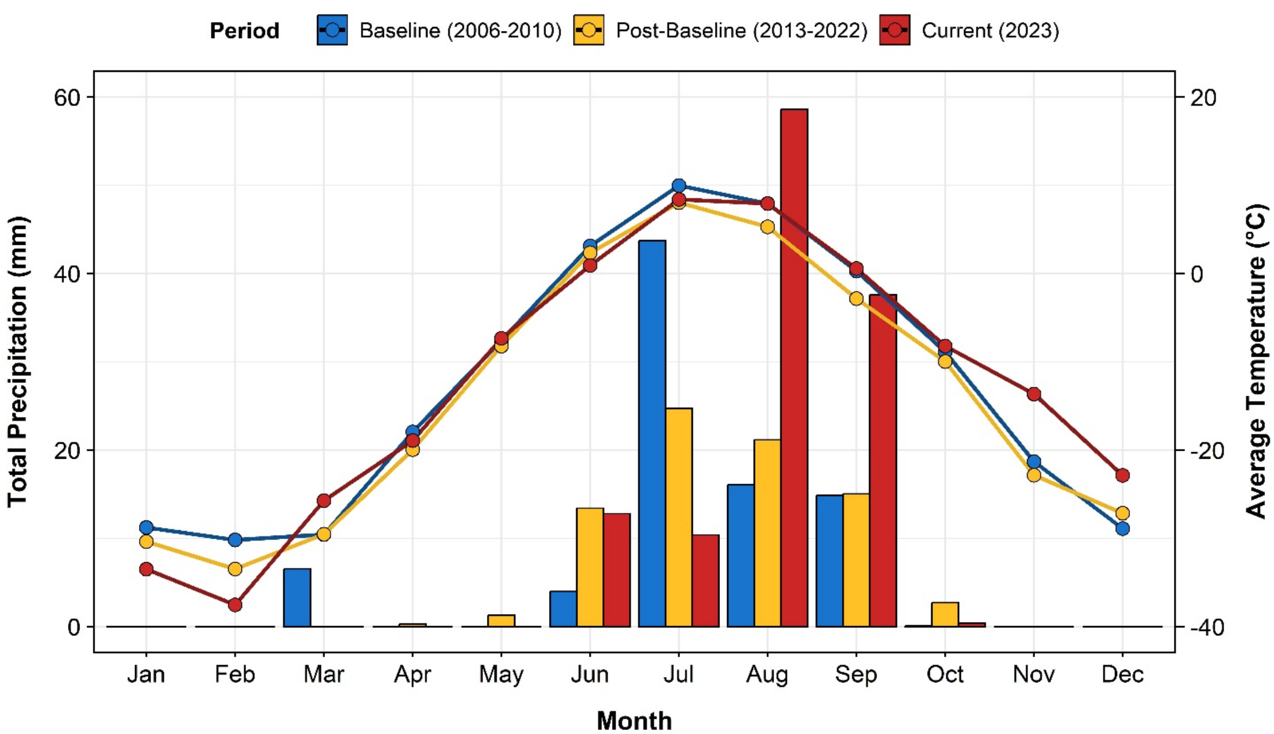

Figure 4-3. Milne Port monthly average air temperatures (lines) and total precipitation (bars) during the baseline period (2005 to 2010), post-baseline period (2013 to 2022) and most recent year (2023).

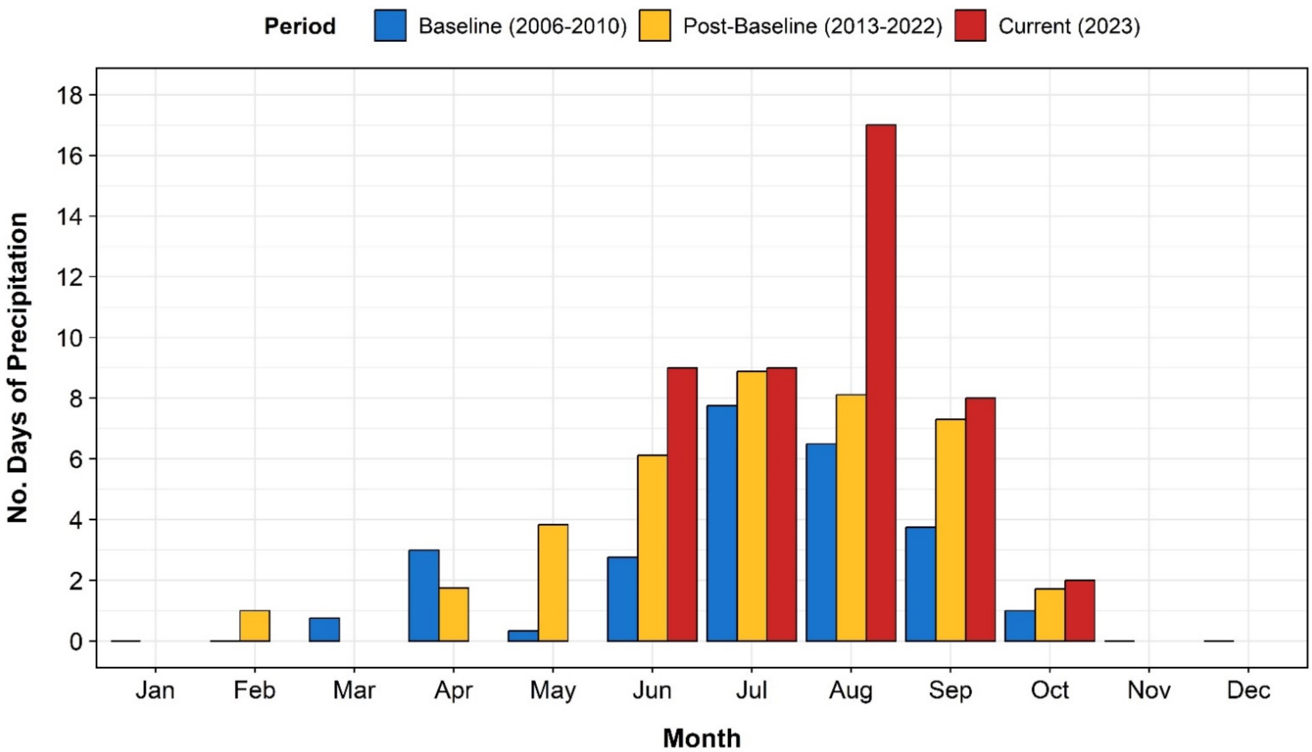

Figure 4-4. Milne Port monthly precipitation frequency (number of days experiencing precipitation) during the baseline period (2005 to 2010), post-baseline period (2013 to 2022) and most recent year (2023).

4.3 WIND SPEED AND DIRECTION

A comparison between wind conditions in 2023, post-baseline and baseline periods is provided in this subsection. Wind speed and direction are presented using wind rose plots, with any average speeds >20.8 m/s classified as 'gale' on the Beaufort scale in the wind rose plot (Table 4-1) because of their relatively low frequency of occurrence. In this chapter, wind speeds will be characterized by their name on the Beaufort scale. Wind data with zero values for hourly average wind speed and wind direction were excluded from analyses. Environment Canada did not record wind data at the Mine Site meteorological station between 1963 and 1965, so no comparison was possible.

Table 4-1. Beaufort scale used for wind speed at the Project.

Beaufort Number	Name	Knots	km/h	m/s
0	Calm	<1	<1	<0.3
1	Light Air	1–3	1–5	0.3–1.5
2	Light Breeze	4–6	6–11	1.6–3.3
3	Gentle Breeze	7–10	12–19	3.4–5.5

Table 4-1. Beaufort scale used for wind speed at the Project.

Beaufort Number	Name	Knots	km/h	m/s
4	Moderate Breeze	11–16	20–28	5.5–7.9
5	Fresh Breeze	17–21	29–38	8.0–10.7
6	Strong Breeze	22–27	39–49	10.8–13.8
7	Near Gale	28–33	50–61	13.9–17.1
8	Gale	34–40	62–74	17.2–20.7
9	Strong Gale	41–47	75–88	20.8–24.4
10	Storm	48–55	89–102	24.5–28.4
11	Violent Storm	56–63	103–117	28.5–32.6
12	Hurricane	64>	117>	32.7>

4.3.1 MINE SITE

At the Mine Site MET station in 2023, the prevailing wind directions were along a northwest-southeast axis, predominately from the southeast (Figure 4-5). Relative wind speeds were also proportional to the most frequent wind direction: southeastern winds had more episodes characterized as 'gentle breeze' (3.3 to 5.6 m/s), 'moderate breeze' (5.6 to 8.1 m/s) and 'fresh breeze' (8.1 to 10.8 m/s). A few episodes of east and northeast winds were the only ones to reach speeds classified as 'gale' (17.2 to 20.8 m/s). Northerly, westerly and southwesterly winds were uncommon and generally weak. The maximum wind speed recorded at the Mine Site station was 28.6 m/s from the east on the afternoon of October 23. This, as well as a 28.5 m/s wind measured on the morning of December 1, both narrowly broke the old post-baseline record of 28.4 m/s, set in December 2016. 2023's peak wind speeds have a Beaufort classification of 'violent storm' (28.5 to 32.6 m/s).

2023 wind directions and velocities at the Mine Site were consistent with the 2005–2010 baseline and 2013–2022 post-baseline years (Figure 4-6). 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' and a 'fresh breeze', 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 2023, except for a 41.9 m/s 'hurricane' reading in June 2006.

In summary, the wind blows predominately along a northwest-southeast axis at the Mine Site, although uncommon easterly winds tend to be the highest wind speeds recorded at the MET station.

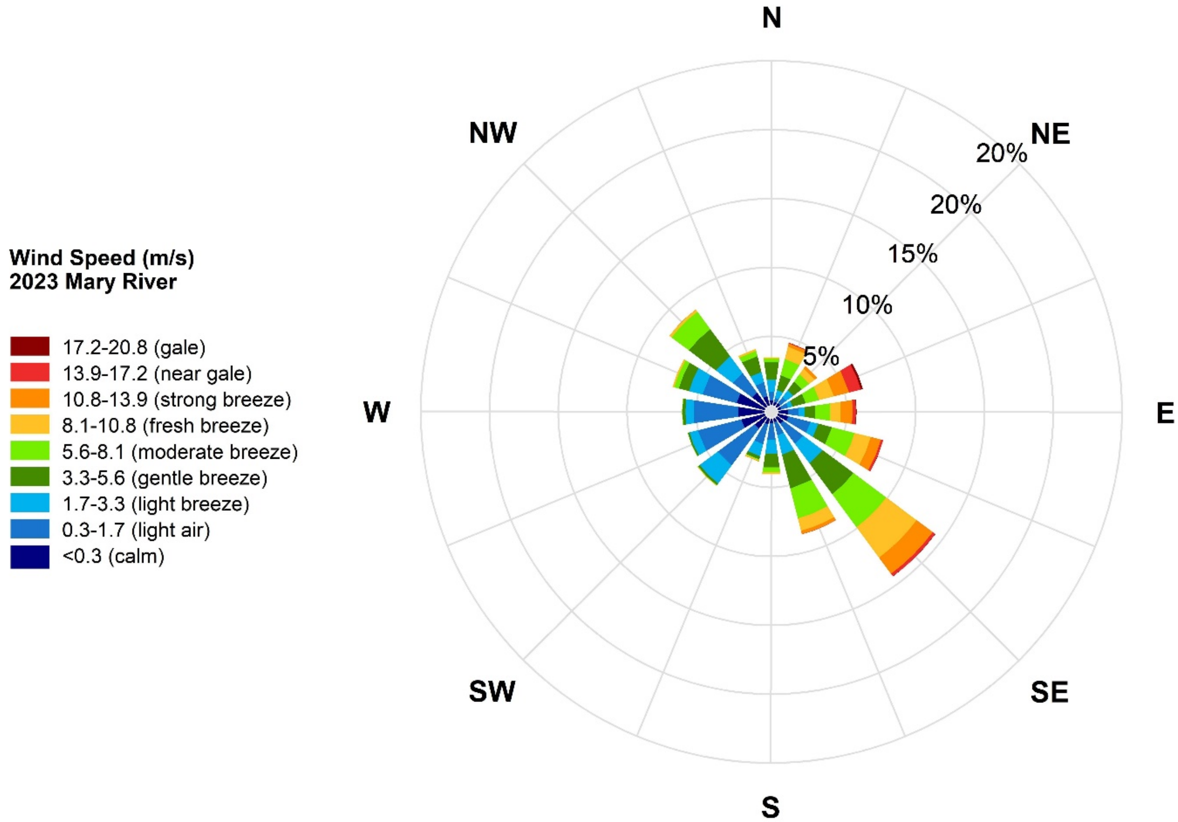

Figure 4-5. The cumulative proportions of wind speeds and directions at the Mine Site meteorological station in 2023.

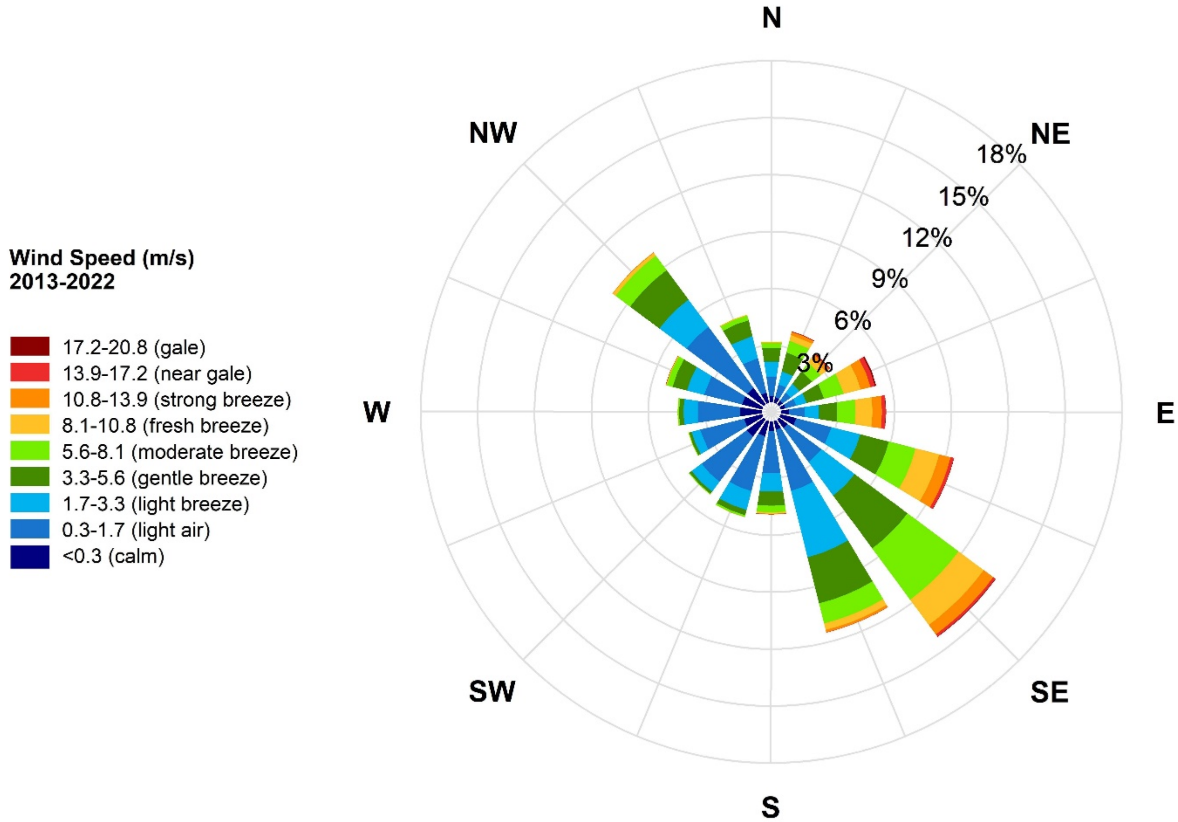

Figure 4-6. The cumulative proportions of wind speeds and directions at the Mine Site meteorological station from 2013 to 2022.

4.3.2 MILNE INLET

The prevailing wind directions at Milne Port in 2023 were from the north-northwest (offshore winds blowing across the width of the inlet) and southwest (onshore winds blowing down the length of the inlet), with very little wind from the west or east (Figure 4-7). Winds exceeding 'gale' force were detected in these prevailing directions. The southwesterly winds were stronger, with nearly half being greater than a 'fresh breeze', while the north-northeasterly winds were above a 'moderate breeze' nearly half of the time. The maximum wind speed recorded in 2023 was a 'violent storm' (31.7 m/s) in the late morning of December 1.

Recorded wind directions at Milne Inlet prior to June 26, 2021, demonstrated some inconsistency and variability because of calibration errors. The 2023 wind records at Milne Inlet are consistent with the prior year's values (Figure 4-8). The pattern in both years has winds blowing predominately from the southwest (onshore winds blowing down the inlet) and north-northwest (onshore winds blowing across the inlet). Winds classified as 'gale' were recorded from all westerly directions in 2023. Maximum wind speeds during baseline and post-baseline years (excluding anomalous readings from 2018) were comparable to 2023, such as a 29.9 m/s 'violent storm' in October 2008 and a 40.35 m/s 'hurricane' in April 2016.

An investigation of 2023 monthly wind patterns showed distinctive seasonal variation. During winter, winds blew along a southwest-northeast axis, predominately from the southwest. This pattern defined January and February (Figure 4-9). In the late winter, including March and April, offshore winds from the north became more common, although the strongest winds continued to blow from the southwest. As the year transitioned into summer, winds were primarily from the north and northwest, a trend beginning as early as May but most prominent in June and July (Figure 4-10). As winter returned, the frequency of winds blowing to the north-northwest returned to a lower level. However, this north-northwest wind remained present throughout the year.

The current seasonal pattern shows that winds from the southwest are common and strong throughout the year, except in July, which is in the very middle of the summer. Winds from the north-northwest are also common in spring, summer and fall, becoming uncommon only in the depths of winter in January and February.

The period from 2019 to August 2021 saw instrument failures occasionally interrupt the collection of climate data, causing difficulties with interpreting the annual data for dustfall and dust control measures and interpretation of satellite imagery. No such issues have been detected since August 2021. Improvements to the meteorology monitoring program included monthly meteorology data quality checks. The data are also reviewed quarterly by independent subject matter experts and compared against other regional weather monitoring data.

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

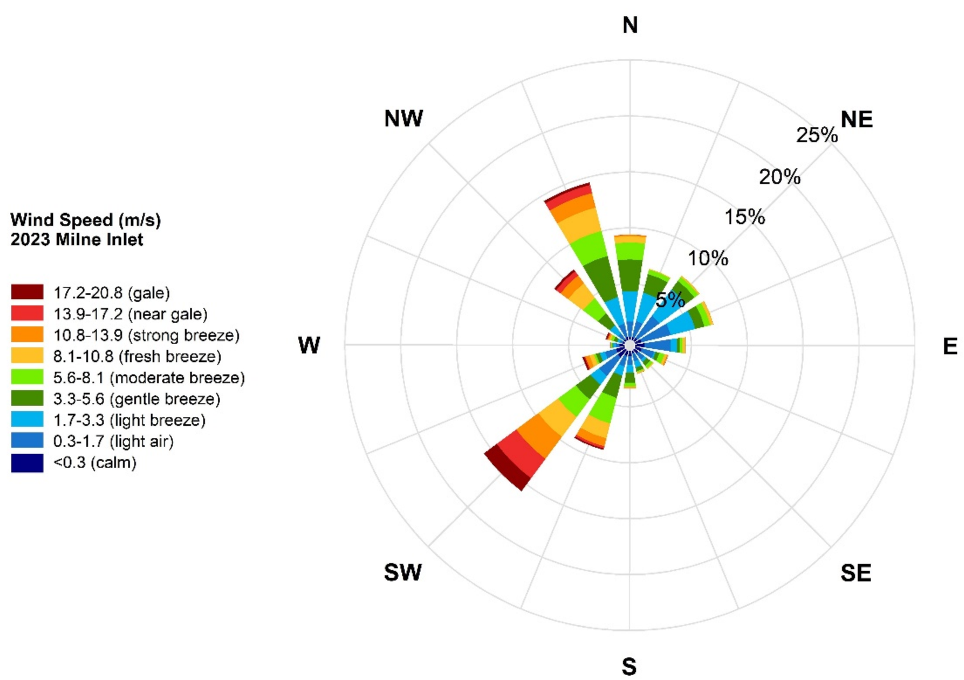

Figure 4-7. The cumulative proportions of wind speeds and directions at the Milne Port meteorological station in 2023.

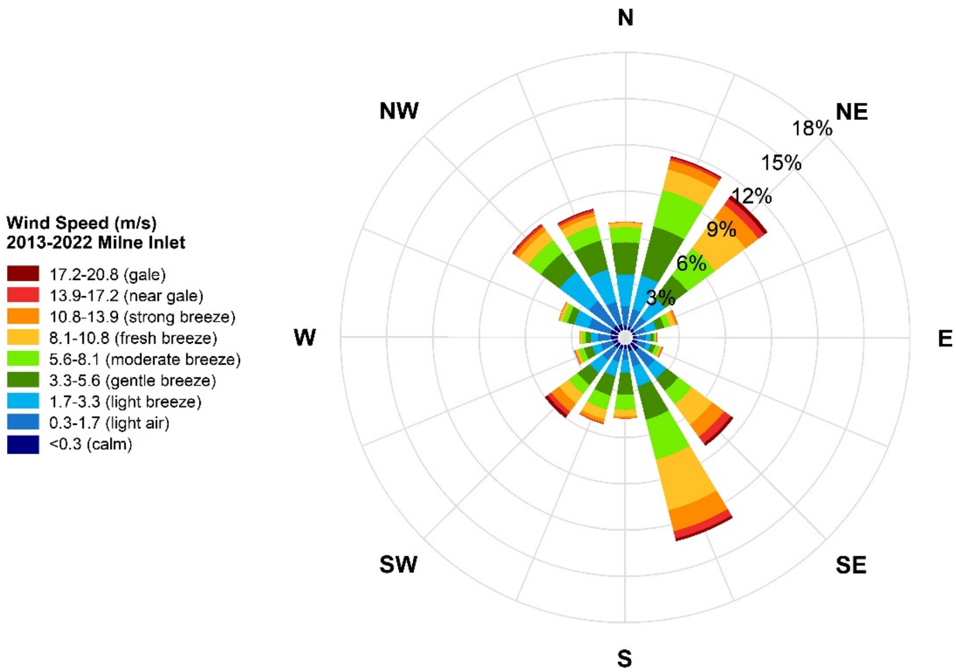

Figure 4-8. The cumulative proportions of wind speeds and directions at the Milne Port meteorological station from 2013 to 2022.

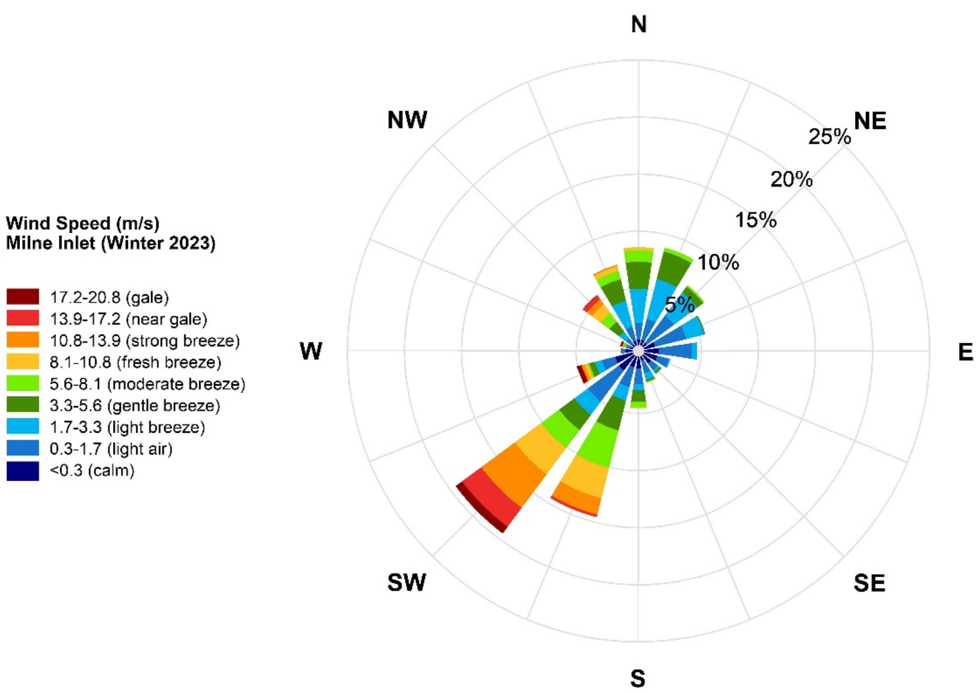

Figure 4-9. Winter wind pattern at the Milne Port meteorological station from January-March and December 2023.

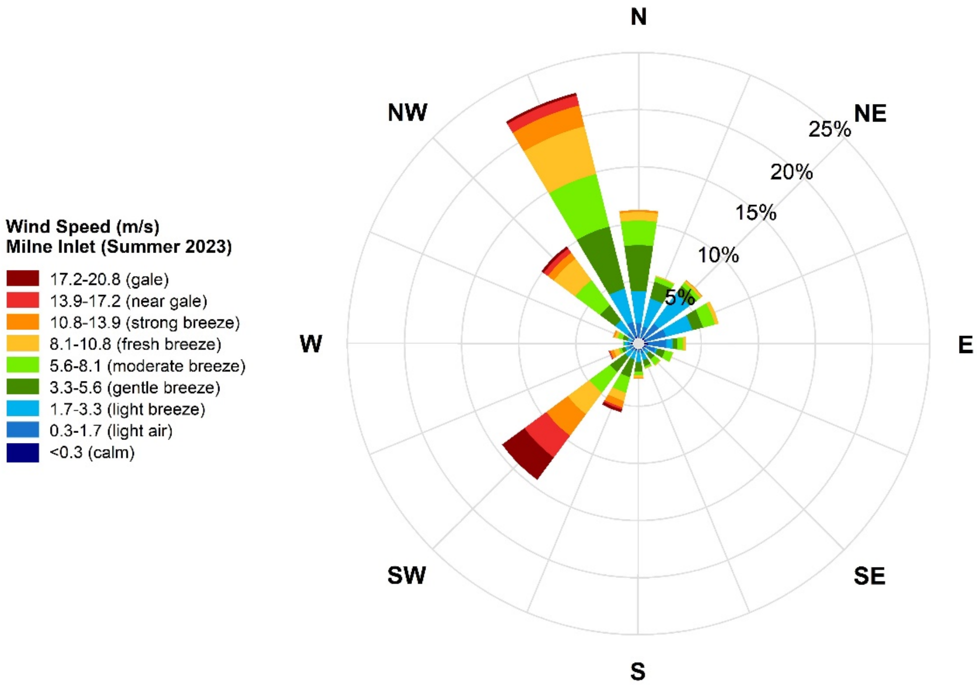

Figure 4-10. Summer wind pattern at the Milne Port meteorological station from June-September 2023.

5 HELICOPTER OVERFLIGHTS

The Nunavut Impact Review Board Project Certificate No. 005 Amendment 5 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 include:

- **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 1,50 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), is 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 PCs and Baffinland's commitments.

5.1 METHODS

5.1.1 MONITORING HISTORY AND CHANGES IN OVERFLIGHT ANALYSIS AT THE PROJECT

Changes have been made to the helicopter overflight monitoring and analysis program based on data analysis, interpretation, and input from the TEWG. The following summarizes key milestones and responses to TEWG comments leading to the 2023 helicopter overflight analysis.

2015 — Start of helicopter overflight analysis. Compliance is determined based on the elevation above the ground of points using data from helicopter flight logs.

2017 — Pilot rationale for low-level flights were included in flight logs and used in compliance evaluation.

2020 — Additional reporting on helicopter pilot rationale and flight time was requested during the 2020 TEWG meeting (Baffinland Iron Mines Corporation 2020). Recommendations led to re-analyzing the 2017 to 2019 helicopter flight data[5] to align with updated (2020) standards.

2021 — The Government of Nunavut (GN) requested—in commentary on the 2020 Terrestrial Environment Annual Monitoring Report (TEAMR; refer to comment GN AR#02; Nunavut Impact Review Board 2021)—re-analysis of 2015 to 2016 helicopter overflight data[6] to align with 2020 standards using the methods described in this section.

2023 — The GN requested—in commentary on the 2022 Nunavut Impact Review Board Annual Report (refer to comment GN AR#01; Baffinland Iron Mines Corporation 2023a)—amendments to the helicopter overflight rationale definitions that were addressed through ancillary consultations and discussions[7]. The 2023 helicopter overflight data were collected using the amended list of rationale. The 2017 to 2022 helicopter data were recategorized into the new rationale to compare with the 2023 helicopter data.

5.1.2 DATA COLLECTION AND ANALYSIS

A discrepancy exists between PC #59 (i.e., which prescribes a cruising altitude requirement of 610 metres above ground level [magl] in areas likely to have migratory birds) and PC #71 (i.e., 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 from May through September 2023 were likely to have migratory birds present, the default minimum cruising altitude for the analysis was 650 magl.

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

- 1,100 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);

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[5] 2017 to 2019 data re-analysis provided in Appendix D, 2020 TEAMR (EDI Environmental Dynamics Inc. 2021).

[6] 2015 to 2016 data re-analysis presented in Appendix B, 2021 TEAMR (EDI Environmental Dynamics Inc. 2022a). Only the flight time portion of the analysis could be conducted (partial analysis given that pilot rationale for non-compliance was not collected).

[7] "Baffinland met with Brad Pirie, John Ringrose, and Agnes Simonfalvy from the GN Department of Environment, at 10:00 am EST on January 5, 2023, via ZOOM to discuss the current list of acceptable rationale for low-level helicopter flights. Baffinland jointly developed a revised list of acceptable rationale for low-level helicopter flights with the GN to aid with raising compliance, which is included as Table 4.22 in PC # 59 of the NIRB Annual Report" (from the TEWG No. 30 meeting minutes Action ID T-28042022-2; Baffinland Iron Mines Corporation 2023).

- 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 further explain the need for transits that did not meet cruising altitude requirements. Point data were provided in feet above sea level and converted to metres above sea level (masl). A digital elevation model 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 calculate the elevation above ground level in metres (i.e., magl) at each tracklog point, the masl from the digital elevation model was subtracted from the masl from the helicopter tracklog.

Quality assurance/quality control procedures were completed by comparing calculated values in relation to the status field of the flight tracklog data. 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 6,041 points, the average elevation above ground level was 11.78 m. The standard deviation in 2023 indicated accuracy was approximately ±13.08 m.

The flight tracklog points were joined with the pilot rationale 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. Tracklog points were recorded approximately every two minutes during flight, resulting in line segments with a duration of two minutes but of variable length, depending on the flight speed. 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 daily timesheets.

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 and 1,500 m horizontal distance requirement; and (2) data outside the Snow Geese area during the moulting season, and in all areas during all other months of the migratory bird season (May to September), in relation to the 650 magl cruising altitude requirement. Flights during months outside of the migratory bird season were not included in the analysis (April and October). The datasets were then analyzed separately to assess specific cruising altitude allowances using the different areas and minimum 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 with rationale'. Based on these criteria, flight data were organized into six categories described in Table 5-1.

To comply with the horizontal guidelines, pilots were given the spatial boundaries of any identified concentrations of migratory birds, which were buffered by the required 1,500 m horizontal avoidance distance. The boundaries were programmed into the helicopter GPS and pilots were directed to avoid flying in these areas as specified in the *Canadian Helicopters Instructions Local Operating Procedures* checklist. The only area provided for horizontal avoidance and analysis in 2023 was the key moulting area for Snow Geese provided by Environment and Climate Change Canada.

Table 5-1. Helicopter overflight compliant categories.

Compliant Category	Description
Compliant	Data within the Snow Geese area in July and August where the 1,100 magl cruising altitude requirement was achieved.
Compliant	Data outside the Snow Geese area in July and August, and in all areas during all other months, where the 650 magl cruising altitude requirement was achieved.
Compliant with rationale	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 outside the Snow Geese area in July and August, and in all areas during all other months, where the 650 magl cruising altitude requirement was not achieved, but a rationale for low-level flying was given.
Non-compliant	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 during all other months, where the 650 magl cruising altitude requirement was not achieved and no rationale for low-level flying was given.

5.2 RESULTS AND DISCUSSION

5.2.1 COMPLIANCE

Only the key moulting area for Snow Geese was identified for helicopter avoidance in 2023. No locations or boundaries of areas prescribed explicitly by the TEWG or areas of observed concentrations of other migratory birds were identified in 2023. As a result, except for the Snow Geese area, no analysis was required to determine compliance with the 1,100 m vertical and 1,500 m horizontal distances for any other location. No known public complaints were recorded in 2023 about helicopter overflights that required specific follow-up actions.

In 2023, Canadian Helicopters operated four helicopters during the beginning of the summer season, the same number of helicopters compared to 2022. However, the first helicopter that arrived on site on April 15 was removed from service on June 10. The remaining three helicopters (arriving on site May 6, 12, and 15) were in operation for the remainder of the season and with two departing October 5 and one departing October 14.

A total of 1,799 transits were flown from May to September 2023; 335 transits (18.6%) intersected the Snow Geese area (key moulting area plus the 1,500 m horizontal buffer) during the moulting season (July and August) and 1,464 transits (81.4%) were outside the Snow Geese area and in all areas in other months (Table 5-2). The total flight time was 1,041.89 hours, accounting for 28.37% of available hours from May 1 to September 30 (3,672 hours). During the moulting season, 48.05 hours (4.62%) were flown within the Snow Geese area. 993.84 hours (95.39%) were flown outside of the Snow Geese area and in other areas in other months (Table 5-3).

Flights within the Snow Geese area during the 2023 moulting season (July and August) increased to 18.6% of all transits and 4.62% of total flight hours compared to 2022, when 4.3% of all transits and 1.22% of total flight hours were flown within the Snow Geese area. These flight hours accounted for 3.23% of the total available hours during the two months of the moulting period (1,488 hours), up from 1.06% in 2022. Cruising altitude compliance within the Snow Geese area during the moulting season was 19.12% compliant, 74.26% compliant with rationale, and 6.63% non-compliant (Table 5-4, Map 5-3, Map 5-4). Combined compliance (compliant plus compliant with rationale) was 93.37%. Non-compliant flights were primarily related to transits to Steensby Inlet. All non-compliant flights (and most compliant or compliant with rationale flights) within the Snow Geese area during the moulting season were along the eastern edge, away from the core of the Snow Geese area, identified as having higher concentrations of geese[8] (Map 5-3, Map 5-4).

Overall, compliance in all areas between May and September 2023 was 27.47% compliant, 67.99% compliant with rationale, and 4.54% non-compliant (Table 5-5, Map 5-1 to Map 5-5). Combined compliance (compliant plus compliant with rationale) was between 94.54 and 99.34% for all months except June, which was 88.40%. Non-compliant flights followed defined flight corridors to work areas and monitoring sites such as Brucehead, Steensby Inlet, surrounding lakes, and survey sites (Map 5-1 to Map 5-5). No flights went to Eqe Bay in 2023.

Table 5-2. The 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, 2023.

Month	Total № of Transits	Within Snow Geese Area During Moulting Season (July and August)		Outside Snow Geese Area During Moulting Season and All Areas in Other Months	
		№ of Transits	% Transits	№ of Transits	% Transits
May	293	-	-	293	100.0
June	292	-	-	292	100.0
July	545	184	33.8	361	66.2
August	373	151	40.5	222	59.5
September	296	-	-	296	100.0
Total	**1,799**	**335**	**18.6**	**1,464**	**81.4**

[8] Flights within the Snow Geese area are considered non-compliant if they do not meet the altitude requirements or are not provided rationale in the pilot daily timesheets. 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 and prolongs potential disturbance. Alternatively, pilots occasionally fly over the eastern edge of the Snow Geese area to reduce flight time and minimize potential disturbance. Baffinland understands that Snow Geese are typically concentrated in the core of the moulting area and are seldom present along its periphery. Disturbance to birds under flight paths along this periphery is expected to be minimal.

Table 5-3. Number of flight hours per month with a breakdown of flight time (hours and %) flown within and outside the Snow Geese area, May 1 to September 30, 2023.

Month	Total Hours per Month	Total Flight Hours	Within Snow Geese Area During Moulting Season (July and August)		Outside Snow Geese Area During Moulting Season and All Areas in Other Months	
			Flight Hours	% Flight Time	Flight Hours	% Flight Time
May	744	207.75	-	-	207.75	100.00
June	720	194.39	-	-	194.39	100.00
July	744	337.92	18.40	5.45	319.52	94.55
August	744	165.00	29.65	17.97	135.36	82.03
September	720	136.83	-	-	136.83	100.00
Total	**3,672**	**1,041.89**	**48.05**	**4.62**	**993.84**	**95.39**

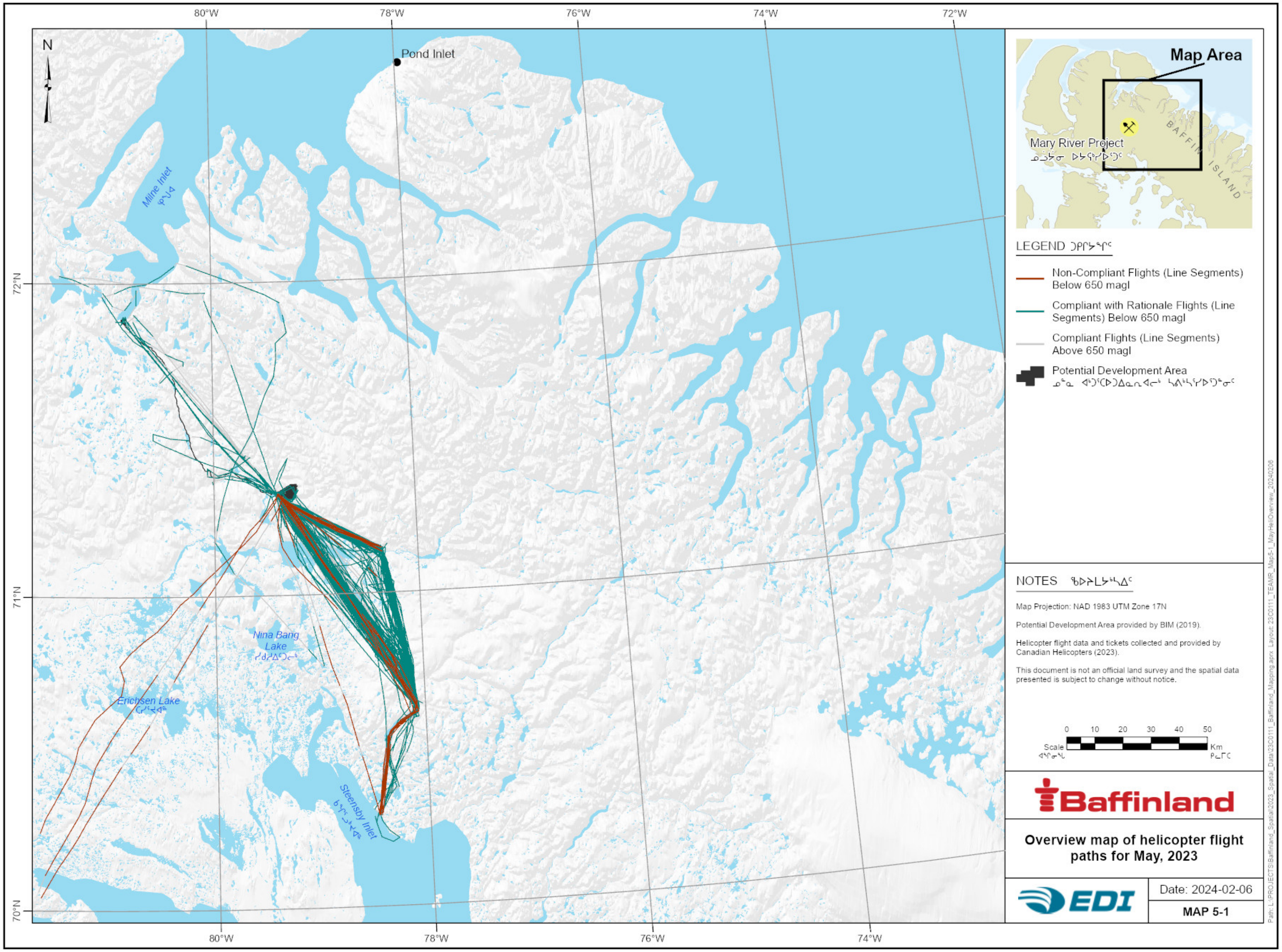
Table 5-4. Number of flight hours of cruising altitude compliance (≥1,100 magl) within the Snow Geese area during the moulting season, July 1 to August 31, 2023.

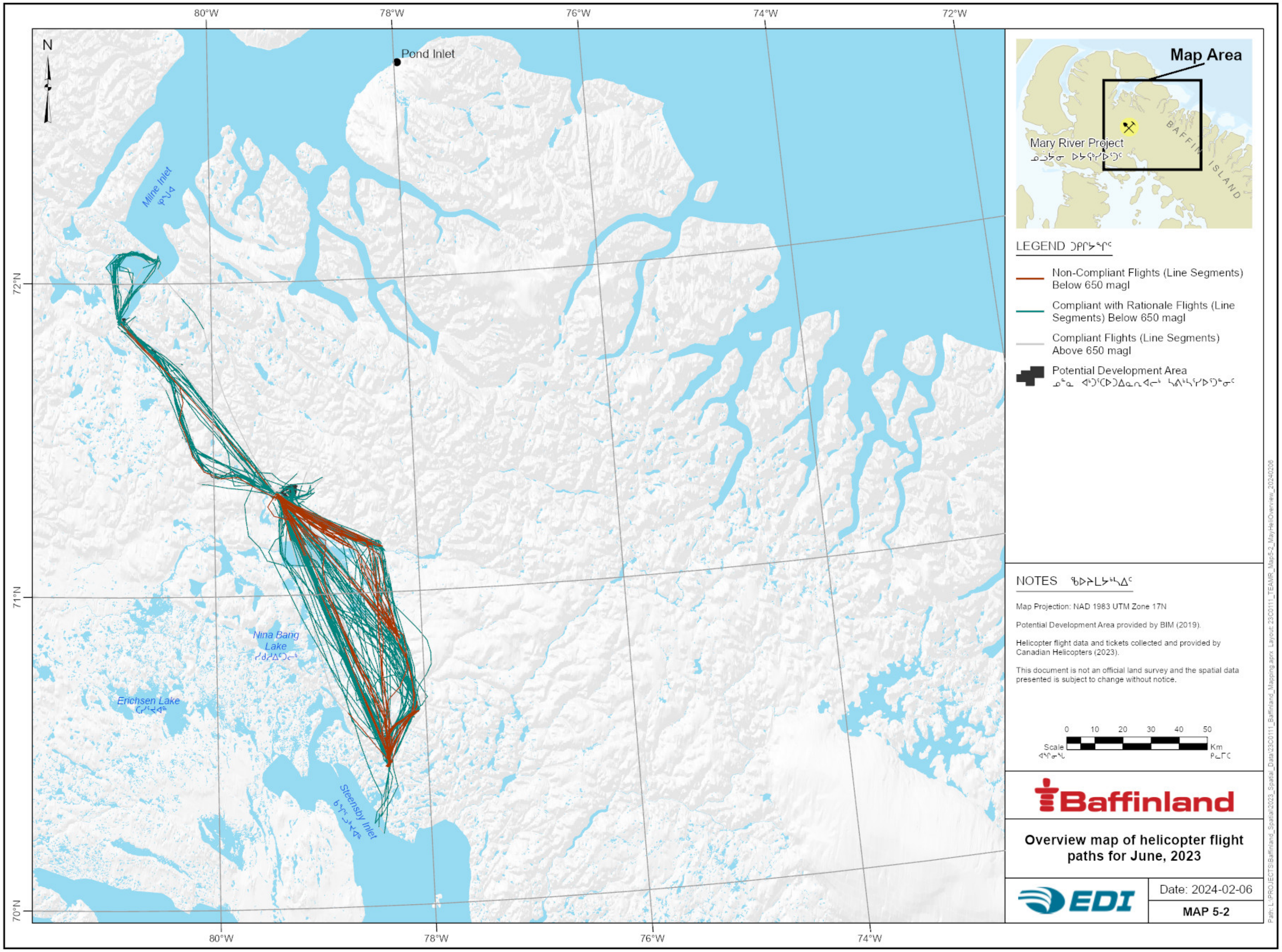
Month	Area	Total Hours per Month	Total Flight Hours	Compliant		Compliant with Rationale		Combined Compliance	Non-compliant	
				hrs	%	hrs	%	%	hrs	%
July	Within SNGO[1] Area	744	18.40	3.27	17.77	14.71	79.96	97.73	0.42	2.27
August	Within SNGO[1] Area	744	29.65	5.92	19.95	20.96	70.71	90.67	2.77	9.33
Total		**1,488**	**48.05**	**9.19**	**19.12**	**35.67**	**74.26**	**93.37**	**3.19**	**6.63**

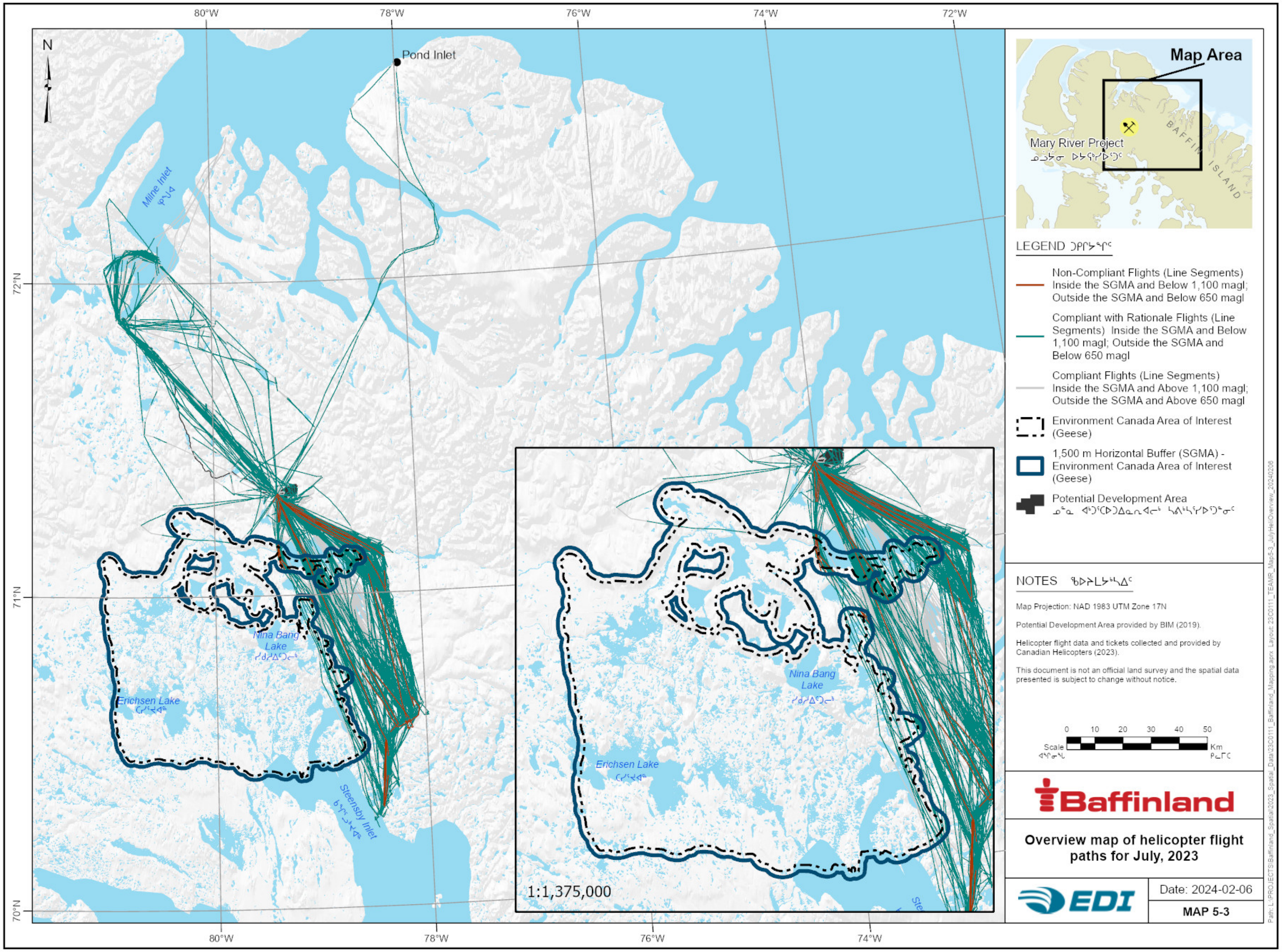
[1] SNGO = Snow Geese.

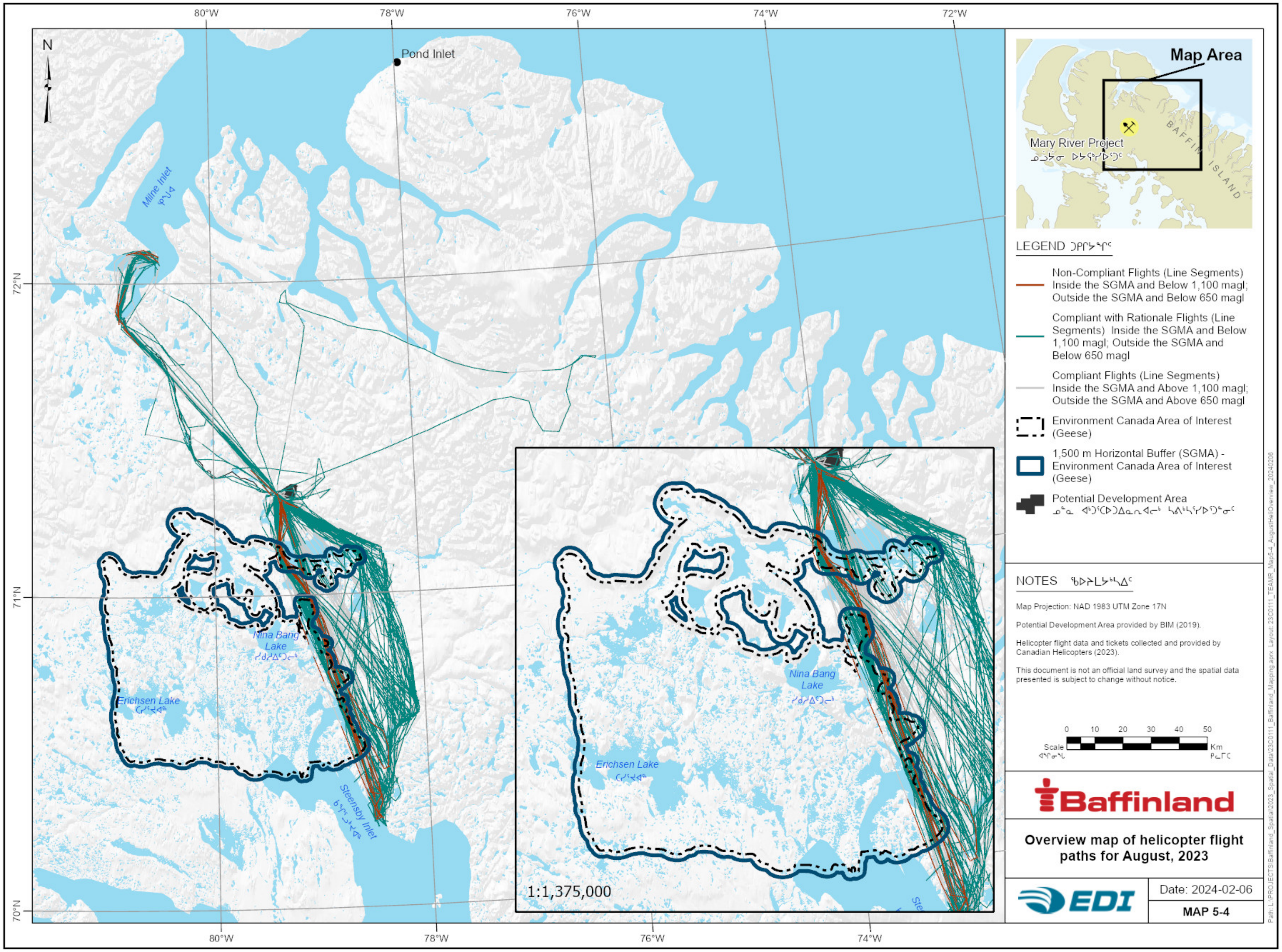
Table 5-5. Number of flight hours of overall cruising altitude compliance in all areas for all months between May 1 to September 30, 2023.

Month	Area	Total Hours per Month	Total Flight Hours	Compliant		Compliant with Rationale		Combined Compliance	Non-compliant	
				hrs	%	hrs	%	%	hrs	%
May	All Areas	744	207.75	42.00	20.22	154.41	74.33	94.54	11.34	5.46
June	All Areas	720	194.39	35.36	18.19	136.48	70.21	88.40	22.55	11.60
July	All Areas	744	337.92	95.66	28.31	236.23	69.91	98.21	6.04	1.79
August	All Areas	744	165.00	64.24	38.93	94.32	57.16	96.10	6.44	3.90
September	All Areas	720	136.83	48.99	35.80	86.94	63.54	99.34	0.90	0.66
Total		**3,672**	**1,041.89**	**286.25**	**27.47**	**708.38**	**67.99**	**95.46**	**47.26**	**4.54**


Pond Inlet
Milne Inlet
Nina Bang Lake
Erichsen Lake
Steensby Inlet
80°W
78°W
76°W
74°W
72°W
72°N
71°N
70°N
N
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant Flights (Line Segments) Below 650 magl
Compliant with Rationale Flights (Line Segments) Below 650 magl
Compliant Flights (Line Segments) Above 650 magl
Potential Development Area
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2023).
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
Scale
Km
Baffinland
Overview map of helicopter flight paths for May, 2023
EDI
Date: 2024-02-06
MAP 5-1


Pond Inlet
Milne Inlet
Nina Bang Lake
Erichsen Lake
Steensby Inlet
80°W
78°W
76°W
74°W
72°W
72°N
71°N
70°N
N
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant Flights (Line Segments) Below 650 magl
Compliant with Rationale Flights (Line Segments) Below 650 magl
Compliant Flights (Line Segments) Above 650 magl
Potential Development Area
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2023).
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
Scale
Km
Baffinland
Overview map of helicopter flight paths for June, 2023
EDI
Date: 2024-02-06
MAP 5-2


Pond Inlet
Milne Inlet
Nina Bang Lake
Erichsen Lake
Steensby Inlet
80°W
78°W
76°W
74°W
72°W
72°N
71°N
70°N
N
1:1,375,000
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant with Rationale Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant 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: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2023).
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
Scale
Km
Baffinland
Overview map of helicopter flight paths for July, 2023
EDI
Date: 2024-02-06
MAP 5-3


Map Area
Mary River Project
Pond Inlet
Milne Inlet
Nina Bang Lake
Erichsen Lake
Steensby Inlet
80°W
78°W
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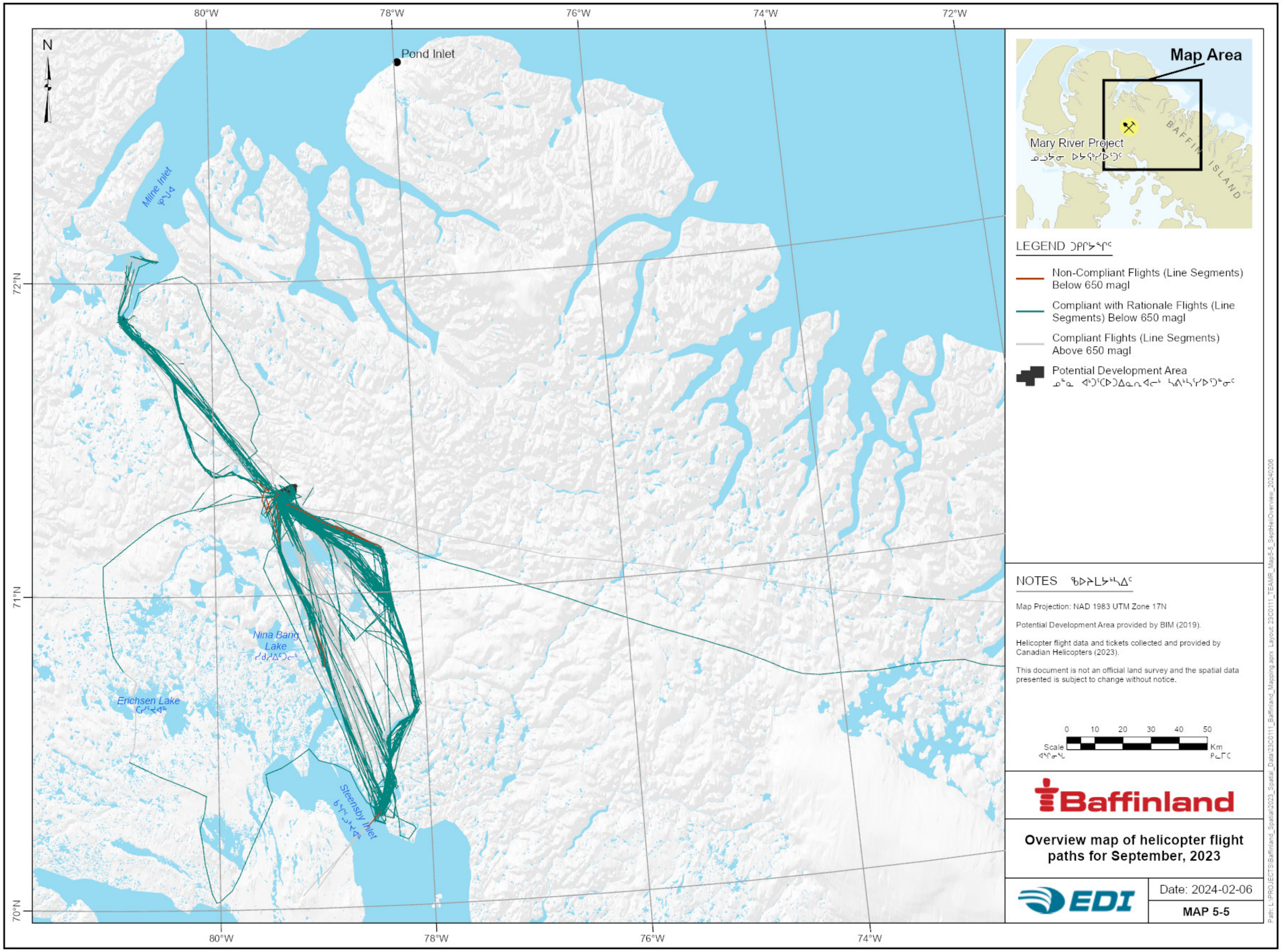
74°W
72°W
72°N
71°N
70°N
N
1:1,375,000
LEGEND
Non-Compliant Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant with Rationale Flights (Line Segments) Inside the SGMA and Below 1,100 magl; Outside the SGMA and Below 650 magl
Compliant Flights (Line 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: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2023).
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
Scale
Km
Baffinland
Overview map of helicopter flight paths for August, 2023
EDI
Date: 2024-02-06
MAP 5-4


Pond Inlet
Milne Inlet
Nina Bang Lake
Erichsen Lake
Steensby Inlet
80°W
78°W
76°W
74°W
72°W
72°N
71°N
70°N
N
Map Area
Mary River Project
BAFFIN ISLAND
LEGEND
Non-Compliant Flights (Line Segments) Below 650 magl
Compliant with Rationale Flights (Line Segments) Below 650 magl
Compliant Flights (Line Segments) Above 650 magl
Potential Development Area
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
Helicopter flight data and tickets collected and provided by Canadian Helicopters (2023).
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
Scale
Km
Baffinland
Overview map of helicopter flight paths for September, 2023
EDI
Date: 2024-02-06
MAP 5-5

5.2.2 COMPLIANCE RATIONALE

Cruising altitude data were cross-referenced with pilot rationale from daily timesheets for the seventh consecutive year in 2023. Flight data were collected following the amended rationale descriptions in Table 5-6. For analytical purposes, flight line segments were designated as either:

- **compliant** — if/when cruising altitude requirements were followed;
- **compliant with rationale** — if/when cruising altitude requirements were not met, but pilot discretionary rationale was provided (refer to Table 5-6 for rationale categories and descriptors); or,
- **non-compliant** — if/when cruising altitude requirements were not met, and explanation and/or rationale were not provided.

A breakdown of primary low-level flight hours with rationale for 2023 is provided in Table 5-7. Flights with justification from pilot daily timesheets accounted for 67.99% of total flight hours, lower than in 2022 (70.64%). Within the Snow Geese area during the moulting season, where the cruising altitude requirement is ≥1,100 magl, compliant with rationale flights accounted for 3.42% of total flight hours. Outside the Snow Geese area and in all areas in all other months where the cruising altitude requirement is ≥650 magl, compliant with rationale flights accounted for 64.57% of total flight hours.

Low-level flights with rationale are expected to continue in future due to safety requirements, operations, and assessment activities (e.g., slinging, surveys), and/or because of multiple short-distance flights whereby helicopters are unable to reach the required elevations between take-off and landing sites (e.g., sampling, drop-offs/pickups). In 2023, the most common reasons for flying below the cruising altitude requirements included slinging (38.14% of total flight hours), short-distance flights (19.13% of total flight hours), and weather-related circumstances (9.34% of total flight hours) (Table 5-7). In 2023, low-level flights within the Snow Geese area during the moulting season associated with weather-related circumstances accounted for 6.58 hours and 13.7% of the total flight hours (48.05 hours) within the Snow Geese area during moulting season—an increase from 0.52 hours and 3.3% of the total flight hours (15.8 hours) in 2022. This increase is contrary to the mitigation protocol implemented in 2021 (summarized in EDI Environmental Dynamics Inc. 2022), which requires helicopters to travel around the Snow Geese area during the moulting season on days with poor weather. Further investigation into leading causes is recommended.

Overall, 2023 cruising altitude combined compliance was high (95.46%) and similar to 2022 (95.08%). The high percentage was primarily due to the inclusion of 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.

Non-compliant flight line segments included 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 ferrying flights to and from the Project at the start and end of the season, as well as approaches and departures. Only the first and last flight segments can be identified as take-off or landing segments because the time and distance to reach the required cruising altitude (if reached at all) varies between flights. 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. Baffinland will continue to work with Canadian Helicopters to document cruising altitude compliance and communicate elevation requirements and protocols to pilots throughout the flying season.

Table 5-6. Descriptions of pilot rationales given for low-level flights[1,2].

Rationale	Description
Slinging	Helicopters slinging external loads fly low for safety purposes, so if there is an issue, the load can be quickly lowered to the ground in a controlled manner or dropped and maintain visual reference of the landing location.
Short Distance	At the discretion of the pilot who is operating the aircraft during the flight, by considering the distance travelled during a flight as well as other contributing factors, it is determined that gaining an altitude of 650 magl is unreasonable, unsafe, or impractical. These types of trips are generally associated with specific monitoring programs that are MANDATORY and there are no other practical ways of completing them (e.g., water sampling locations not accessible by foot or boat, dustfall sampling, wildlife observations, noise sampling, prospecting).
Weather	Poor visibility associated with low cloud restricts pilots to flying below the cloud line, which is under 650 magl. High winds and/or flat light conditions (reduces a pilot's depth-of-field causing poor ground reference) can make it difficult to maintain a consistent 650 magl flight height. Even if pilots have enough ceiling to reach the required altitude at take-off, there could be poor weather conditions along the route or later in the day. Flights to return staff from remote work areas to camp are required regardless of the ceiling.
Search and Rescue	Flying the aircraft at low levels where Search and Rescue members have sufficient visual detail of the ground.
Inspection	Visual inspection of features on the ground (e.g., waterbodies, site infrastructure) where low-level flying is required for personnel to have sufficient visual detail.
Maintenance Flight	Flying the aircraft at low levels for purposes related to maintenance of the aircraft.
Medical Evacuation / Emergency Response	Flying the aircraft for purposes of a medical evacuation and/or emergency response where efficiency and/or other factors are of utmost importance.
Geophysical Survey	Low-level flying is required as part of the survey methodology (e.g., flying a low-level grid pattern for a geophysical survey, keeping a sensor at a constant elevation relative to the ground). The length of the survey is dependent on the size of the area to be surveyed. These surveys, if required, are conducted outside of bird nesting or moulting windows.

[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 Geese area during the moulting season (July and August).

[2] The pilot will have final authority for the disposition of the aircraft during the time in which they are in command.

Table 5-7. Helicopter compliant with rationale 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, 2023.

Rationale	Total Hours	Flight Hours	% of Total Flight Hours[1]	≥1,100 magl Cruising Altitude Requirement		≥650 magl Cruising Altitude Requirement	
				Flight Hours	% of Total Flight Hours[1]	Flight Hours	% of Total Flight Hours[1]
Slinging	3,672	397.40	38.14	12.72	1.22	384.69	36.92
Short Distance	3,672	199.29	19.13	16.30	1.56	182.98	17.56
Weather	3,672	97.29	9.34	6.58	0.63	90.71	8.71
Search and Rescue	3,672	-	-	-	-	-	-
Inspection	3,672	12.56	1.21	0.08	0.01	12.49	1.20
Maintenance Flight	3,672	-	-	-	-	-	-
Medical Evacuation / Emergency Response	3,672	1.84	0.18	-	-	1.84	0.18
Geophysical Survey	3,672	-	-	-	-	-	-
Total	**3,672**	**708.38**	**67.99**	**35.68**	**3.42**	**672.71**	**64.57**

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

5.2.3 INTER-ANNUAL TRENDS

Flights within the Snow Geese area during the moulting season in 2023 consisted of 18.6% of transits and 4.6% of total flight hours compared to the previous five years (2018 to 2022), which ranged from 4 to 8% of transits and 1 to 2% of total flight hours (Figure 5-1, Table 5-8, Table 5-9). The values were similar to 2017, with 15.1% of transits and 5.94% of total flight hours flown within the Snow Geese area during the moulting season. The percentage of disturbance hours (28.37%), calculated as total flight hours divided by total hours of the active helicopter period (varies between years), was lower than the last two years and similar to 2020 (25.40%).

Helicopter cruising altitude combined compliance within the Snow Geese area during the moulting season was 93.37% (19.12% compliant and 74.26% compliant with rationale) in 2023 (Figure 5-1). Compliance, including compliance with rationale, for 2023 was higher than the previous three years (60.06 to 89.00%) and similar to 2019 (93.70%; Figure 5-1). However, 2023 had more flight hours within the Snow Geese area at 48.04 hours, second only to 2015 at 50.84 hours. Helicopter cruising altitude combined compliance outside the Snow Geese area during the moulting season and in all areas during all other months for 2023 was 95.56%, similar to the past five years, which were all between 91.54 and 96.35% (Figure 5-2).

The 2017 to 2022 helicopter data were recategorized into the amended rationale from Table 5-6 to compare with the 2023 helicopter data (Table 5-10). Slinging was the most common pilot rationale for low-level flights in 2023 (38.14% of all provided rationale), consistent with previous reporting over the past three years (ranging from 36.53 to 47.06%). This was followed by short-distance (14.16 to 37.00%) and weather-related circumstances (1.52 to 9.34%). In 2018 and 2021, geophysical surveys accounted for 14.60% and 6.8% of total flight hours, respectively.

Total flight hours decreased in 2023 by ~200 hours compared to 2022 and 2021 (Table 5-11). The percentage of compliant flight hours increased to 27.47% in 2023 from 24.45% in 2022. The compliant with rationale percentage decreased to 67.99%, down from 70.64% in 2022, but comparable with 2021 (66.02%). The percentage of non-compliant flights in 2023 (4.54%) was similar to 2022 (4.92%) but decreased 16.42 hours.

During the moulting season within the Snow Geese area, with a cruising altitude requirement of ≥1,100 magl, the percentage of compliant flight hours in 2023 (19.12%) was similar to the last two years (18.96 to 20.01%; Table 5-12). The percentage of compliant with rationale flights increased by 33.16% between 2022 and 2023. This increase was mirrored by a similar decrease (33.61%) in the percentage of non-compliant flights, reflecting a reduction of half the non-compliant flight hours from 2022 to 2023 (6.32 down to 3.18 hours). The compliant with rationale flight hour percentages fluctuated every year or two, with 2023 having similar compliance values to 2020 and 2018. The total number of hours flown within the 1,100 magl cruising altitude requirement in 2023 was 48.05 hours, the second highest after 50.84 hours in 2015. Compliance with the ≥650 magl cruising altitude requirement in 2023 followed a similar pattern as overall compliance, with an increase in the percentage of compliant flight hours and a similar percentage of non-compliant flight hours.

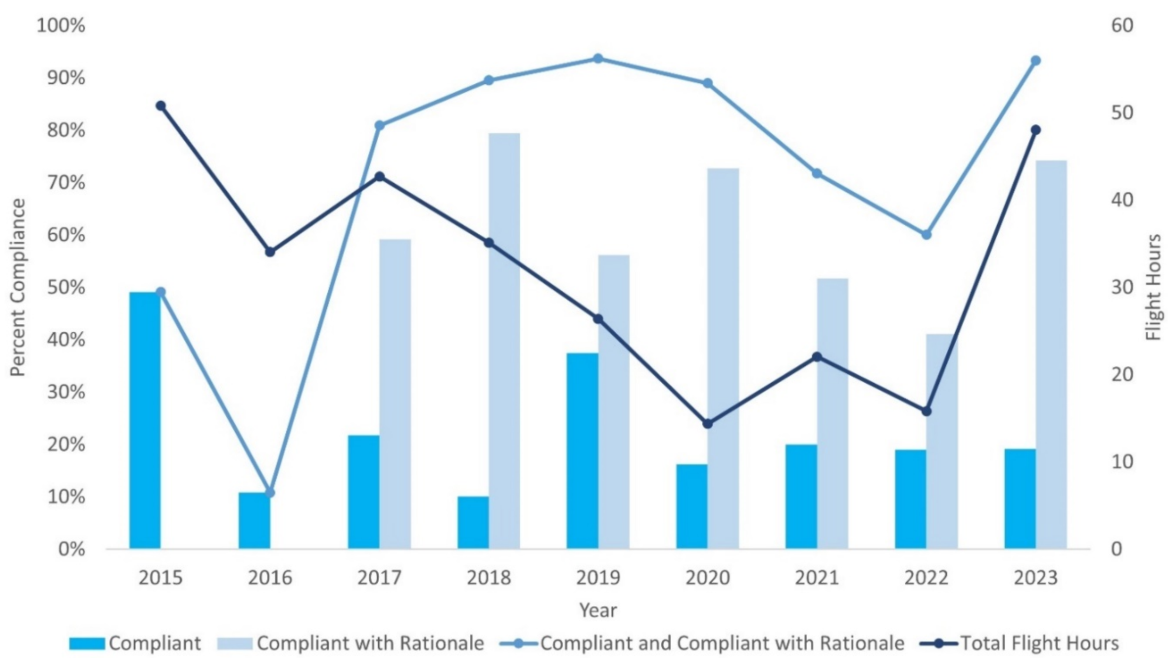


Figure 5-1. Percent compliance and total flight hours for flights within the Snow Geese area during the moulting season, 2015 to 2023.

Table 5-8. 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 2023.

Year	Total № of Transits	≥1,100 magl Cruising Altitude Requirement		≥650 magl Cruising Altitude Requirement	
		№ of Transits	% Transits	№ of Transits	% Transits
2015	919	134	14.6	785	85.4
2016	1,063	175	16.5	888	83.5
2017	1,350	204	15.1	1,146	84.9
2018	2,489	198	8.0	2,291	92.0
2019	3,110	207	6.7	2,903	93.3
2020	1,863	77	4.1	1,786	95.9
2021	2,565	178	6.9	2,387	93.1
2022	2,715	117	4.3	2,598	95.7
2023	1,797	335	18.6	1,462	81.4

Table 5-9. Number of flight hours per year with a breakdown of flight time (hours and %) within the ≥1,100 magl and ≥650 magl cruising altitude requirements, 2015 to 2023.

Year	Total Hours	Total Flight Hours	% Disturbance Hours	≥1,100 magl Cruising Altitude Requirement		≥650 magl Cruising Altitude Requirement	
				Flight Hours	% Flight Hours	Flight Hours	% Flight Hours
2015	3,192	893.07	27.98	50.84	5.69	842.23	94.31
2016	2,616	589.52	22.54	34.05	5.78	555.47	94.22
2017	3,096	719.62	23.24	42.72	5.94	676.90	94.06
2018	3,360	1,583.71	47.13	35.13	2.22	1,548.59	97.78
2019	3,120	1,340.33	42.96	26.41	1.97	1,313.92	98.03
2020	3,168	804.56	25.40	14.38	1.79	790.18	98.21
2021	3,024	1,271.45	42.05	22.06	1.74	1,249.39	98.26
2022	3,480	1,295.45	37.23	15.82	1.22	1,279.64	98.78
2023	3,672	1,041.89	28.37	48.05	4.62	993.84	95.39

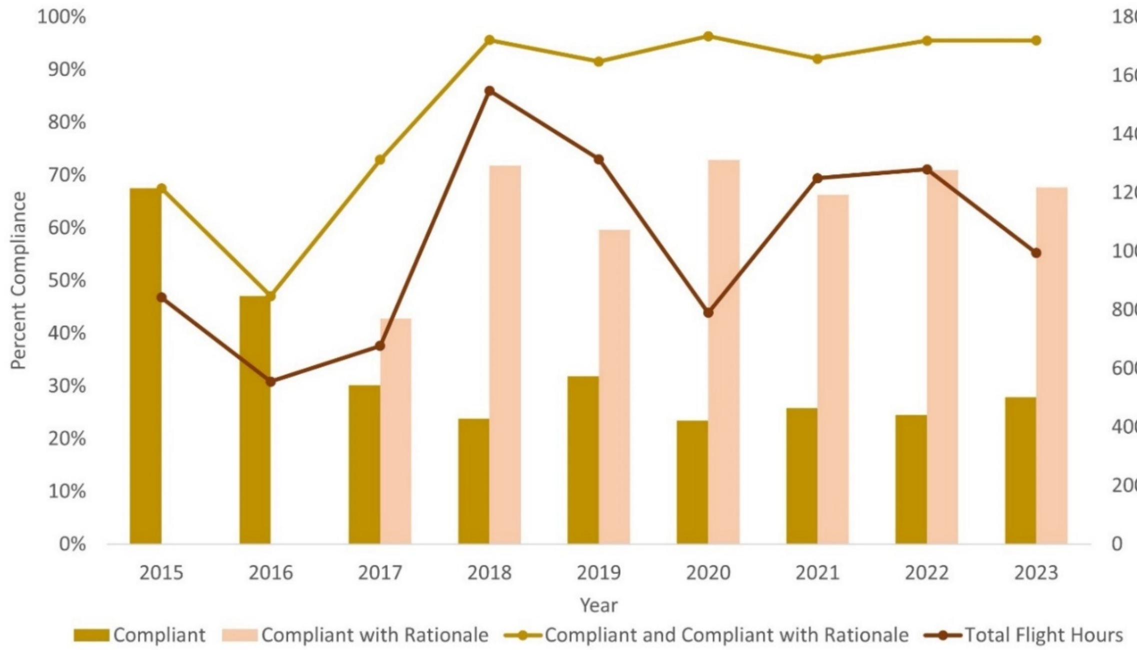


Figure 5-2. **Percent compliance and total flight hours for flights outside the Snow Geese area during the moulting season and in all areas in all other months, 2015 to 2023.**

Table 5-10. **Flight hours and percentage of total flight hours for compliant with rationale flights summarized by rationale category, 2017 to 2023.**

Rationale		Slinging	Short Distance	Weather	Search and Rescue	Inspection	Maintenance Flight	Medical Evacuation / Emergency Response	Geophysical Survey	Total
2017	hrs	121.79	133.87	57.75	-	-	-	1.37	-	**314.77**
	%[1]	16.92	18.60	8.03	-	-	-	0.19	-	**43.74**
2018	hrs	511.84	299.86	64.17	0.20	30.10	-	2.44	231.27	**1,139.89**
	%[1]	32.32	18.93	4.05	0.01	1.90	-	0.15	14.60	**71.98**
2019	hrs	248.07	495.88	23.00	-	29.08	-	2.80	-	**798.84**
	%[1]	18.51	37.00	1.72	-	2.17	-	0.21	-	**59.60**
2020	hrs	293.91	240.65	37.35	-	11.48	-	3.04	-	**586.43**
	%[1]	36.53	29.91	4.64	-	1.43	-	0.38	-	**72.89**
2021	hrs	521.73	180.00	35.62	2.74	11.62	0.40	0.67	86.63	**839.41**
	%[1]	41.03	14.16	2.80	0.22	0.91	0.03	0.05	6.81	**66.02**
2022	hrs	609.68	279.45	19.65	-	6.14	-	0.13	-	**915.05**
	%[1]	47.06	21.57	1.52	-	0.47	-	0.01	-	**70.64**
2023	hrs	397.40	199.29	97.29	-	12.56	-	1.84	-	**708.38**
	%[1]	38.14	19.13	9.34	-	1.21	-	0.18	-	**67.99**

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

Table 5-11. Total flight hours and overall cruising altitude compliance by flight hours and percentage, 2015 to 2023.

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	719.62	213.34	29.65	314.77	43.74	73.39	191.50	26.61
2018	1583.71	372.32	23.51	1139.89	71.98	95.49	71.50	4.51
2019	1340.33	428.72	31.99	798.84	59.60	91.59	112.77	8.41
2020	804.56	187.74	23.33	586.43	72.89	96.22	30.39	3.78
2021	1271.45	326.74	25.70	839.41	66.02	91.72	105.30	8.28
2022	1295.45	316.72	24.45	915.05	70.64	95.08	63.68	4.92
2023	1041.89	286.25	27.47	708.38	67.99	95.46	47.26	4.54

Table 5-12. 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 2023.

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	42.72	9.30	21.77	25.27	59.16	8.15	19.07	676.90	204.04	30.14	289.50	42.77	183.36	27.09
2018	35.13	3.55	10.10	27.90	79.44	3.67	10.46	1,548.59	368.78	23.81	1,111.98	71.81	67.83	4.38
2019	26.41	9.90	37.49	14.84	56.22	1.66	6.30	1,313.92	418.82	31.88	783.99	59.67	111.11	8.46
2020	14.38	2.34	16.26	10.46	72.74	1.58	11.00	790.18	185.40	23.46	575.97	72.89	28.81	3.65
2021	22.06	4.42	20.01	11.42	51.75	6.23	28.24	1,249.39	322.32	25.80	827.99	66.27	99.07	7.93
2022	15.82	3.00	18.96	6.50	41.10	6.32	39.94	1,279.64	313.72	24.52	908.55	71.00	57.36	4.48
2023	48.05	9.19	19.12	35.68	74.26	3.18	6.63	993.84	277.06	27.88	672.71	67.69	44.08	4.44

5.3 HELICOPTER OVERFLIGHT SUMMARY

Analysis of flight tracklog data and daily pilot timesheets (with flight details) was used to determine helicopter overflight compliance at the Project.

Compliance — Total flight time in 2023 was 1,041.89 hours, less than in 2022. Overall, compliance was 27.47% compliant, 67.99% compliant with rationale (combined compliance of 95.46%), and 4.54% non-compliant. Flights within the Snow Geese area accounted for 48.05 hours (4.62% of total flight hours) and 18.6% of all transits. During moulting season (July 1 to August 31), compliance in the Snow Geese area was 19.12% compliant, 74.26% compliant with rationale (combined compliance of 93.37%), and 6.63% non-compliant.

Compliance Rationale — Flights with pilot rationale accounted for 67.99% of total flight hours. The most common rationales for flying below the cruising altitude requirements in 2023 were slinging (38.14% of total flight hours), short-distance flights (19.13% of total flight hours), and weather-related circumstances (9.34% of total flight hours). Within the Snow Geese area during the moulting season, compliant with rationale flights accounted for 74.26% of flight hours, where the cruising altitude requirement is ≥1,100 magl, and 3.42% of total flight hours.

Inter-annual Trends — Overall, combined compliance has been above 90% since 2018, with non-compliant flights fluctuating between 4% and 8%. The number of transits (18.6%) and flight hours (4.6%) within the Snow Geese area during moulting season was higher than the previous five years, but non-compliant flights decreased to 6.6% in 2023, the lowest since 2019.

6 TOTE ROAD

Site Security at the Mary River Project (the Project) monitors and records traffic along the Tote Road and records non-haul vehicle traffic (e.g., transits related to personnel transfer, equipment, and fuel). Ore haul traffic is managed and recorded by Mine Operations staff. Tote Road traffic data are compiled and compared with projected ore haul and non-haul vehicle transits. Not all vehicle travel on the Tote Road comprises return/round-trip travel between the Mine Site and Milne Port. Therefore, traffic is tracked in terms of 'vehicle transits' accounting for one-way trips (i.e., return/round-trip travel comprises two transits).

The mean number of combined ore haul and non-haul vehicle transits from January 1 to December 31, 2023, was 258.7 transits per day (Table 6-1, Figure 6-1). The mean number of ore haul transits from January 1 to December 31, 2023, was 234.2 transits per day (Table 6-1, Figure 6-2). These daily means meet the predicted value in the Final Environmental Impact Statement Addendum for the Production Increase Proposal (i.e., 236 ore haul transits; Stantec Consulting Ltd. 2018). The mean number of non-haul vehicle transits from January 1 to December 31, 2023, was 24.4 transits per day, which was less than predicted in the Final Environmental Impact Statement Addendum (i.e., 40 non-haul vehicle transits; Stantec Consulting Ltd. 2018). The monthly mean number of all vehicle transits combined varied from a low of 180 transits in May to a high of 326 transits in April (Table 6-1, Table 6-2, Figure 6-2). The mean daily vehicle transits and the amount of ore hauled down the Tote Road each year since 2019 have been relatively consistent (Figure 6-1)

Weather-related closures of the Tote Road in 2023, which resulted in multi-day stoppages of ore haul transits, occurred in late May (spring melt resulting in road saturation), August (heavy rainfall event), and late November/early December (snow/high winds resulting in low visibility). These events are visually displayed in Figure 6-2.

Table 6-1. Mean and total transits along the Tote Road, including ore haul, non-haul, and all vehicles combined, from 2015 through 2023.

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	227.2	82,911	28.6	10,440	255.8	93,351
2022	243.6	88,908	26.7	9,749	269.7	98,443
2023	234.2	85,144	24.4	8,921	258.7	94,065

Table 6-2. Mean ore haul and non-haul transits and total monthly transits from January 1 to December 31, 2023.

Month	Daily Mean Ore Haul Transits	Daily Mean Non-haul Transits	Daily Mean Total Transits
January	264	21	285
February	260	20	279
March	275	20	295
April	309	17	326
May	165	14	180
June	211	16	226
July	246	30	276
August	165	28	194
September	238	42	280
October	233	38	271
November	194	23	218
December	251	23	275

Figure 6-1. Mean ore haul and non-haul vehicle transits per day and total ore hauled between 2015 and 2023.

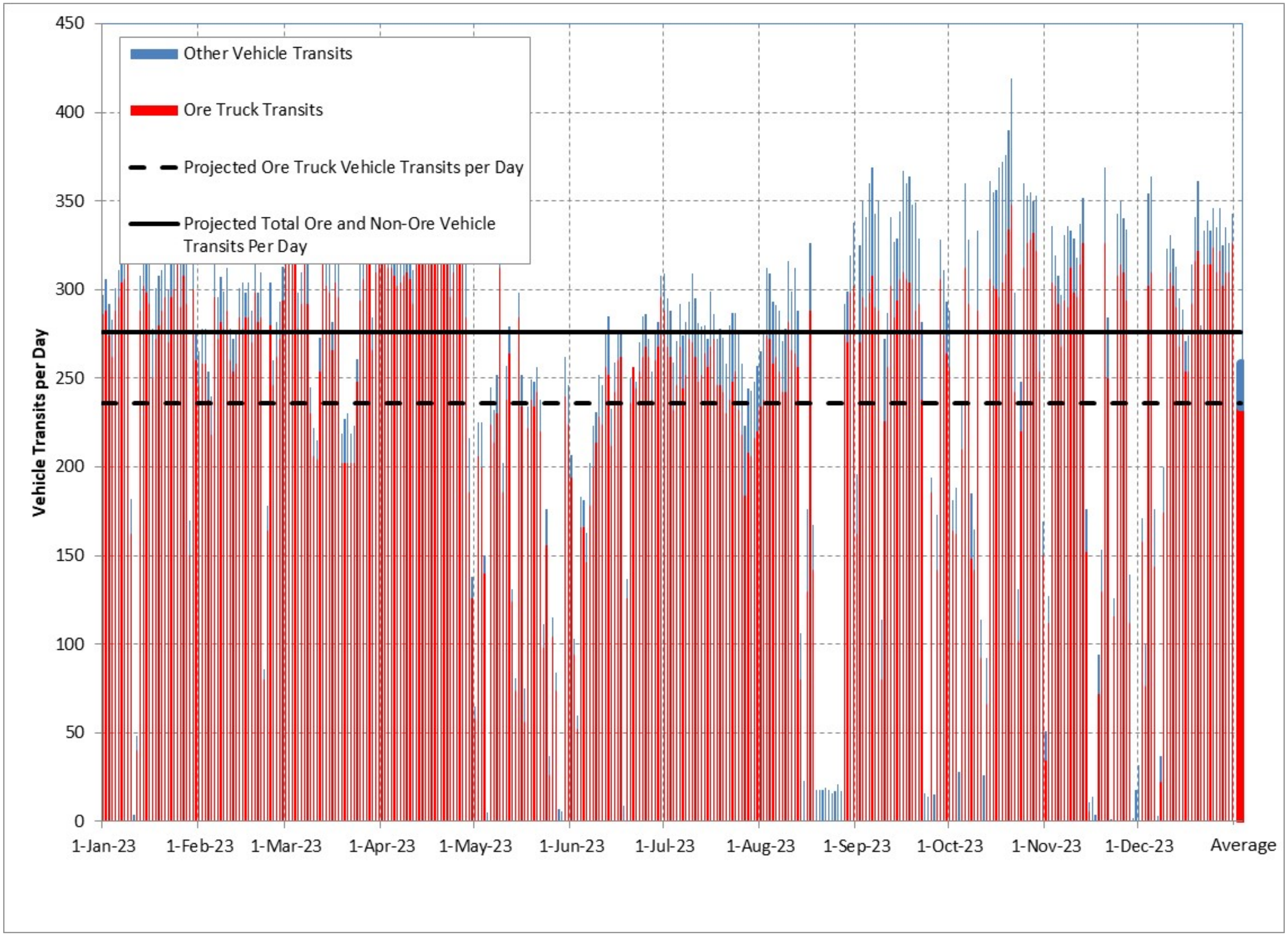


Figure 6-2. Vehicle transits per day on the Tote Road, including ore trucks (red) and all other traffic (blue), January 1 to December 31, 2023. *Also included are the projected maximum number of vehicle transits per day and the projected maximum number of ore haul trucks per day on the Tote Road.*

7 DUSTFALL

Project Conditions #36, 50, 54d, 58c, 187, and 188 relate to the effects of dustfall and dustfall monitoring at the Mary River Project (the Project; Nunavut Impact Review Board 2020). Since the summer of 2013, the Project has implemented a dustfall monitoring program intended to meet these conditions, the objectives 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 of 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 Section 4.

7.1 HISTORY OF DUSTFALL MONITORING AT THE PROJECT

The dustfall monitoring program has evolved based on data analysis, interpretation, and input from the Terrestrial Environment Working Group (TEWG). The following summarizes key milestones and responses to comments from the TEWG leading up to dustfall monitoring in 2023:

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

2014 — The dustfall monitoring program was expanded in September 2014 to increase the number of monitoring stations at the Mine Site and Milne Port; three sites were added at the Mine Site and four at Milne Port. Additional stations were intended to improve understanding of 'how dustfall pattern may change with distance from Project infrastructure'. One site at Milne Port was removed because Project infrastructure rendered it inaccessible. The total number of monitoring stations at the end of 2014 was 32.

2015 — The first full year of dustfall monitoring during mine operations occurred in 2015. One additional monitoring site was added at the Mine Site to address a gap in the program associated with dustfall at distances greater than 1,000 m; site DF-M-08 was established 4,000 m from the Potential Development Area (PDA). The total number of monitoring stations at the end of 2015 was 33.

2019 — Data collection at 1,000 m from the Tote Road was increased in 2019 in response to a request from the Qikiqtani Inuit Organization and the Mittimatalik Hunters and Trappers Organization. Six additional dustfall monitors were installed (three paired monitoring stations, one of each on the east and west sides of the Tote Road at KM 25, KM 56, and KM 75). Additionally, dustfall data collection at other 1,000 m distant sites was increased to year-round (only collected during the summer months from 2013 to 2018). This brought the total number of dustfall monitors at the 1,000 m PDA boundary to 12. One monitor at Milne Port (DF-P-01) was relocated and renamed (DF-P-08) to allow for the expansion of an ore stockpile. The total number of monitoring stations at the end of 2019 was 39.

2020 — Satellite imagery analysis of dustfall extent was conducted in 2020 to address concerns from the Mittimatalik Hunters and Trappers Organization 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 — Quantitative measurements from the dustfall satellite imagery analysis were reported as requested by the Nunavut Impact Review Board, including dustfall concentrations and area using the Snow Darkening Index (SDI), a measure of mineral dust on snow. Data from Steensby Inlet were included as a reference area for comparison. Fourteen 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 the proposed Phase 2 railway that departs from the Tote Road right-of-way to define baseline conditions; and,
- six dustfall monitors installed to collect dust at a height of 0.5 m. These non-standard monitors are part of a pilot study investigating 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 Government of Nunavut and the Qikiqtani Inuit Organization.

At the end of 2021, 53 dustfall monitors (including the six 'short' monitors as part of the trial) were installed at defined/pre-existing monitoring locations.

2022 — Following one year of data collection intended for baseline data capture, sampling at the four dustfall monitors along the section of the proposed Phase 2 railway that departs from the Tote Road right-of-way were discontinued in October 2022 (i.e., following the Ministerial decision that Phase 2 expansion would not proceed at this time). The total number of monitoring stations at the end of 2022 was 49 monitors located across 43 monitoring stations.

The dustfall imagery analysis study area was expanded to account for additional areas of interest (i.e., beyond the original 20 km buffer of the PDA) identified in consultation with the TEWG or highlighted in supplementary information requests (Response to the Qikiqtani Inuit Association in 2022 Production Increase Proposal Renewal (QIA-09; Baffinland Iron Mines Corporation 2022a) and ancillary reports. The 2022 and baseline imagery were processed for the expanded study area.

2023 — The pilot study to investigate dustfall monitoring closer to ground level was concluded in 2023. Following two years of data collection, the study determined there was no difference in sampling dustfall at the standardized height of 2.0 m and in the non-standardized shorter dustfall samplers (EDI Environmental Dynamics Inc. 2023). Based on these results, dustfall monitoring at 0.5 m will be discontinued and the dustfall monitoring program will continue to monitor dustfall via passive dustfall canisters at the standardized height of 2.0 m. At the end of the 2023 season, there were 49 (43 regular and 6 at 0.5m height) dustfall monitors, each at an independent monitoring station.

A terrain correction (Teillet et al. 1982, Hantson and Chuvieco 2011) was applied to the imagery to reduce the effects of bright south-facing slopes on the SDI. Imagery from all years were reprocessed for the expanded dustfall imagery analysis study area from 2022 and the terrain correction.

7.2 DUSTFALL SUPPRESSION AND MITIGATION

Baffinland Iron Mines Corporation (Baffinland) implemented dustfall suppression measures throughout 2023 to mitigate dustfall from all Project areas.

Dustfall Suppression along the Tote Road — Vehicle transits along the Tote Road result in Project-related dust generated from wheel entrainment with the road surface. Dust suppression activities occurred along the Tote Road from late June through early September when non-freezing conditions allowed the safe use of dust suppressants on the road. Suppression consisted of seasonal application of water, calcium chloride, and DUST/BLOKR® to the road surface. Approximately 105,069 m^3 of water and 154,400 kg of calcium chloride was applied to the Tote Road at various locations throughout the summer. Also, Baffinland conducted a detailed evaluation of the efficacy of calcium chloride and DUST/BLOKR® from July 15 to August 31, 2023. Calcium chloride was applied to a section of the Tote Road from KM 91 to KM97, on July 20 and August 7, while DUST/BLOKR® was applied on a section of the Tote Road from KM 97 to KM 100 on July 15, 17, 19 and August 1. The results of this focused evaluation determined that DUST/BLOKR®, when applied as per the manufacturer's recommendations is not suitable for use on the Tote Road as it did not perform well in terms of dust reduction even after repeated maintenance applications, and caused rapid degradation of the road's running surface as compared to the calcium chloride treated section of road. Baffinland will continue to investigate alternative methods for dust suppression on the Tote Road.

Dust Suppression at the Airstrip — Airplane landings and take-offs can generate dust when the airstrip bed materials are dry. From June through early September, water was applied as a dust suppressant to the airstrip and apron before the arrival and departure of 737 passenger and cargo aircraft. Water was applied as needed when dry conditions were observed.

Dust Suppression at the Crusher — Baffinland is implementing mitigations to decrease dust associated with ore crushing and loading activities. In 2023, DusTreat dust suppressant was applied to the 'C' ore feed on June 14, July 16 to 20, July 21 to 22, and December 3 to 15, 2023. Qualitative observations determined that applying DusTreat to the crusher ore feed successfully decreased ambient dust in the crusher area up to and including loading the ore into B-trains for transport to Milne Port (Photo 7-1 and Photo 7-2). Given the initial success of this trail, Baffinland intends to expand the treatment capacity at the crusher and will continue with observations on the effect of the application of DusTreat on dust reduction across the material handling chain in 2024.

Photo 7-1. Loading B-train with untreated ore, December 18, 2023.

Photo 7-2. Loading B-train with ore treated with DusTreat, December 18, 2023.

Dust Suppression at the Ore Stockpiles (Milne Port) — The ore stockpiles at Milne Port are a source of Project-related dustfall. Dust is generated when ore is stacked onto the stockpiles and from the stockpiles via wind action, particularly during the non-shipping season when ore stockpiles grow in height.

Dust mitigation at the stockpiles in 2023 started at the crusher where the ore was treated with DusTreat (trials described above in the crusher section). Approximately 8,000 tonnes of fine ore treated with DusTreat were delivered to Milne Port on December 5, 2023. Baffinland will continue monitoring this mitigation to confirm its ability to decrease dust generation during stacking (Photo 7-3, Photo 7-4).

The ore stockpiles were also treated with DusTreat. The product was sprayed directly onto the surface of the stockpiles to create a crust that would decrease wind-generated dust (Photo 7-5, Figure 7-1). There were five dust suppression applications at the ore stockpile at Milne Port in 2023 (i.e., January 10, 15, and 16, March 11, and April 16).

Photo 7-3. Stacker C at the crusher ore stockpile with untreated ore.

Photo 7-4. Stacker C at the crusher ore stockpile with treated ore.

Photo 7-5. DusTreat application to the Milne Port ore stockpile, January 15, 2023.

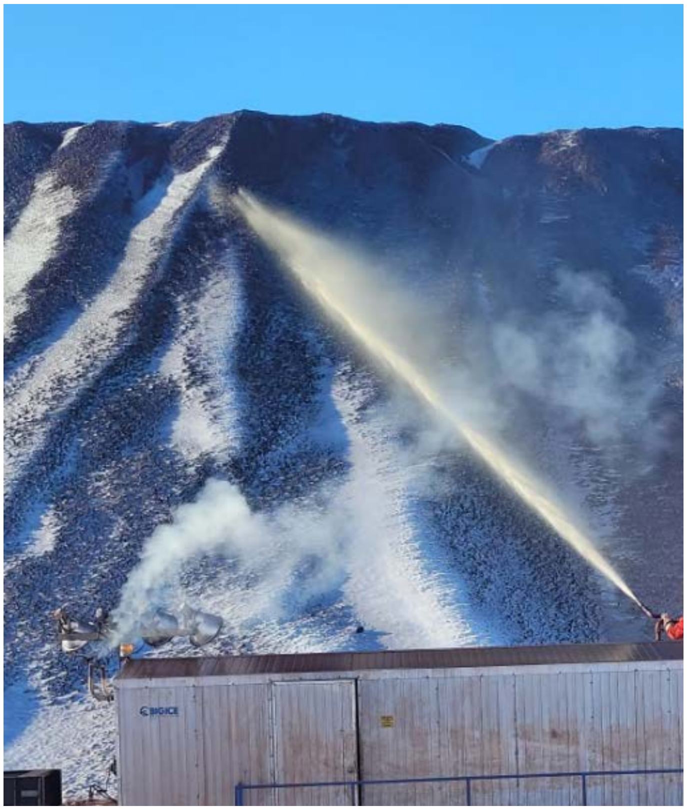


Photo 7-6. DusTreat application to the Milne Port ore stockpile, March 11, 2023.

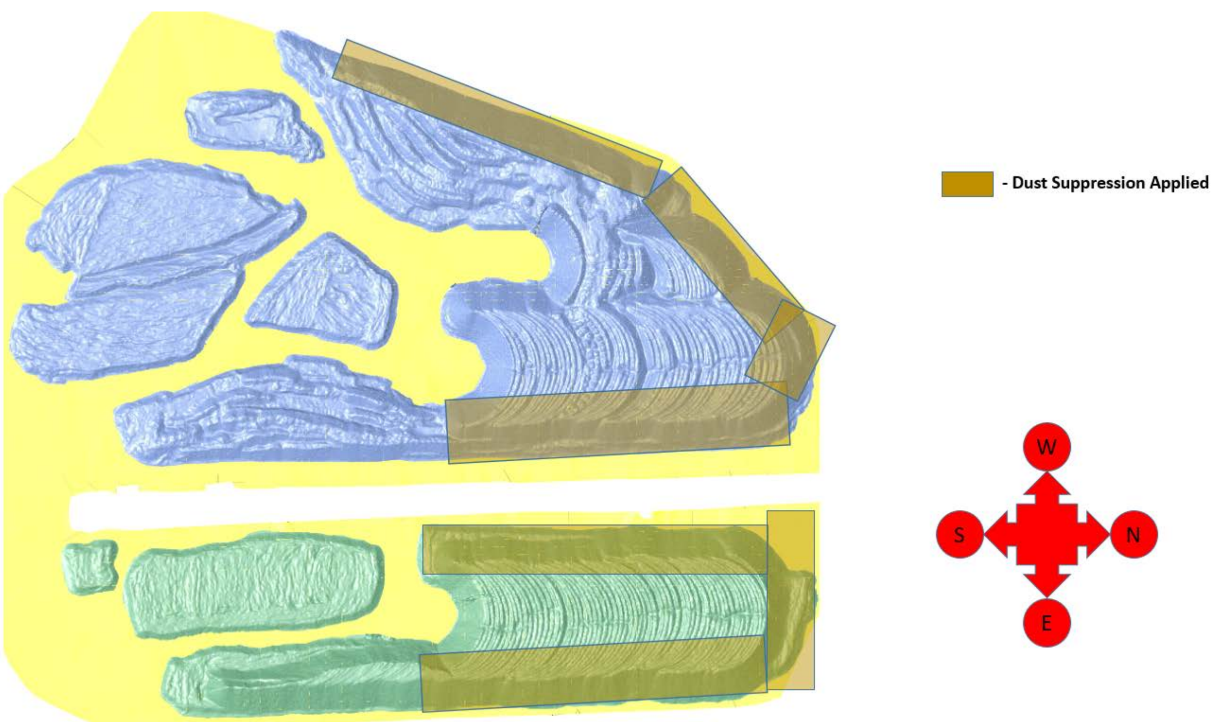


Figure 7-1. DusTreat application to ore stockpiles at Milne Port; as of April 16, 2023.

7.3 PASSIVE DUSTFALL MONITORING

7.3.1 METHODS

7.3.1.1 Supporting Data Review

The dustfall monitoring program incorporated a review of supporting data to characterize the Project setting and identify factors that could influence the volume and extent of dustfall during 2023. These supporting data comprise an overview of weather conditions at the Mine Site and Milne Port 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; and,
- Traffic data (including the number of ore haul truck transits and other vehicle transits on the Tote Road) are presented in Section 6.

7.3.1.2 Passive Dustfall Sampling

The 2023 dustfall monitoring program comprised deploying passive dustfall samplers across the Project area for collecting and measuring dustfall following standard test methods (ASTM International 2010). Each dustfall sampler comprised a dust collection canister within a bowl-shaped terminal holder affixed to an approximately 2-m tall post that was anchored to solid ground. The terminal bowl was crowned with 'bird spikes' to prevent birds from perching and contaminating samples with feces (Photo 7-6). Dust collection canisters were pre-charged with 250 mL of algaecide in summer (June, July and August) and 250 mL of isopropyl alcohol in months outside the summer period. The percentage of isopropyl alcohol in the canisters was increased from 40% to 75% solution in 2021 to prevent freezing of the liquid media. Collection vessels, for all sites can be safety accessed, were changed once per month, either year-round, or for more remote sites during the summer period (Table 7-1) and shipped to ALS Environmental Laboratory in Waterloo, Ontario, to analyze total insoluble dustfall and a suite of metals. Dustfall samples were also analyzed for total metal concentrations to characterize contaminants of potential concern and inform other monitoring endpoints (refer to Section 8).

As summarized in Table 7-1, the Regional Study Area (RSA) was divided into four areas to review dustfall data:

- Mine Site;
- Milne Port;
- Tote Road north crossing (KM 28); and,
- Tote Road south crossing (KM 78).

In 2023, the study design comprised 43 monitoring locations distributed across the Project area (Map 7-1).

- Nine dustfall monitors were 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 were located at Milne Port: four active sites on the Port Site footprint, five active sites at the PDA boundary, and one reference site on a ridge approximately 3,000 m northeast (upwind) outside of the predicted extent of dustfall.
- Twenty-two dustfall monitors were located along the Tote Road.
    - Sixteen dustfall monitors were divided between two sites along the Tote Road (north and south sites). These two sites were 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 dustfall monitors organized as three pairs, all located at a 1,000 m distance from the Tote Road.
- Two reference dustfall monitors located 14,000 m southwest of the Tote Road (one at the north sites and one at the south sites). These monitoring stations were established to be outside the 14 km caribou zone of influence as defined by Boulanger et al. (2012).

Dustfall sampling occurred year-round at 36 of 43 monitoring stations in 2023. These year-round stations are distributed within 1,000 m of the PDA and tend to experience higher dustfall levels. The remaining 11 monitoring stations are situated at, or greater than, 1,000 m from the PDA. For these 11 monitoring stations, sampling occurred monthly from May to October and was paused during winter (i.e., November to April) due to remote locations and inaccessibility without helicopter support. The sampling categories were delineated for data analysis as 'year-round' and 'summer.'

The 2023 dustfall monitoring program included data collected for a full calendar year from early January 2023 through early January 2024 (Table 7-2).

Photo 7-7. Dustfall monitoring station DF-P-01 south of Milne Port ore stockpiles.

Table 7-1. Summary of dustfall monitoring stations (locations and sampling period), 2023.

Site ID	Monitor Height (m)	Location	Sample Period	Distance to PDA[1] (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-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[3]	9,000	Nil	71.2197	-79.3277
DF-M-05	2.0	Mine Site	summer[3]	9,000	Nil	71.3731	-78.923
DF-M-06	2.0	Mine Site	summer[3]	1,000	Moderate	71.3196	-79.156
DF-M-07	2.0	Mine Site	summer[3]	1,000	Moderate	71.3	-79.1953
DF-M-08	2.0	Mine Site	summer[3]	4,000	Moderate	71.2945	-79.1002
DF-M-09	2.0	Mine Site	summer[3]	2,500	Low	71.2936	-79.4127
DF-RS-01	2.0	Tote Road – south, KM 78	summer[3]	5,000	Nil	71.3275	-79.8001
DF-RS-02	2.0	Tote Road – south, KM 78	year-round	1,000	Low	71.3893	-79.8324
DF-RS-03	2.0	Tote Road – south, KM 78	year-round	Within PDA, 100 m from Tote Road	Moderate	71.3967	-79.8228

Table 7-1. Summary of dustfall monitoring stations (locations and sampling period), 2023.

Site ID	Monitor Height (m)	Location	Sample Period	Distance to PDA[1] (m)	Expected Dustfall Exposure[2]	Latitude	Longitude
DF-RS-04	2.0	Tote Road – south, KM 78	year-round	Within PDA, 30 m from Tote Road	Moderate	71.3975	-79.8222
DF-RS-05	2.0	Tote Road – south, KM 78	year-round	Within PDA, 30 m from Tote Road	Moderate	71.398	-79.8228
DF-RS-06	2.0	Tote Road – south, KM 78	year-round	Within PDA, 100 m from Tote Road	Moderate	71.3986	-79.8234
DF-RS-07	2.0	Tote Road – south, KM 78	year-round	1,000	Nil	71.4077	-79.8182
DF-RS-08	2.0	Tote Road – south, KM 78	summer[3]	5,000	Nil	71.4489	-79.7106
DF-RN-01	2.0	Tote Road – north, KM 27	summer[3]	5,000	Nil	71.6883	-80.5363
DF-RN-02	2.0	Tote Road – north, KM 27	year-round	1,000	Low	71.7145	-80.4704
DF-RN-03	2.0	Tote Road – north, KM 27	year-round	Within PDA, 100 m from Tote Road	Moderate	71.7186	-80.4473
DF-RN-04	2.0	Tote Road – north, KM 27	year-round	Within PDA, 30 m from Tote Road	Moderate	71.7189	-80.4456
DF-RN-05	2.0	Tote Road – north, KM 27	year-round	Within PDA, 30 m from Tote Road	Moderate	71.7185	-80.4414
DF-RN-06	2.0	Tote Road – north, KM 27	year-round	Within PDA, 100 m from Tote Road	Moderate	71.7189	-80.4397
DF-RN-07	2.0	Tote Road – north, KM 27	year-round	1,000	Nil	71.7226	-80.4165
DF-RN-08	2.0	Tote Road – north, KM 27	summer[3]	5,000	Nil	71.7435	-80.2898
DF-P-03	2.0	Milne Port	summer[3]	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-09	2.0	Milne Port	year-round	1,000	Moderate	71.855286	-80.893269
DF-P-10	2.0	Milne Port	year-round	Within PDA	Moderate	71.876033	-80.919739
DF-P-11	2.0	Milne Port	year-round	1,000	Moderate	71.875471	-80.95393
DF-P-12	2.0	Milne Port	year-round	1,000	Moderate	71.86558	-80.951059
DF-RR-01	2.0	Reference – Road	summer[3]	14,000	Nil	71.2805	-80.245
DF-RR-02	2.0	Reference – Road	summer[3]	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

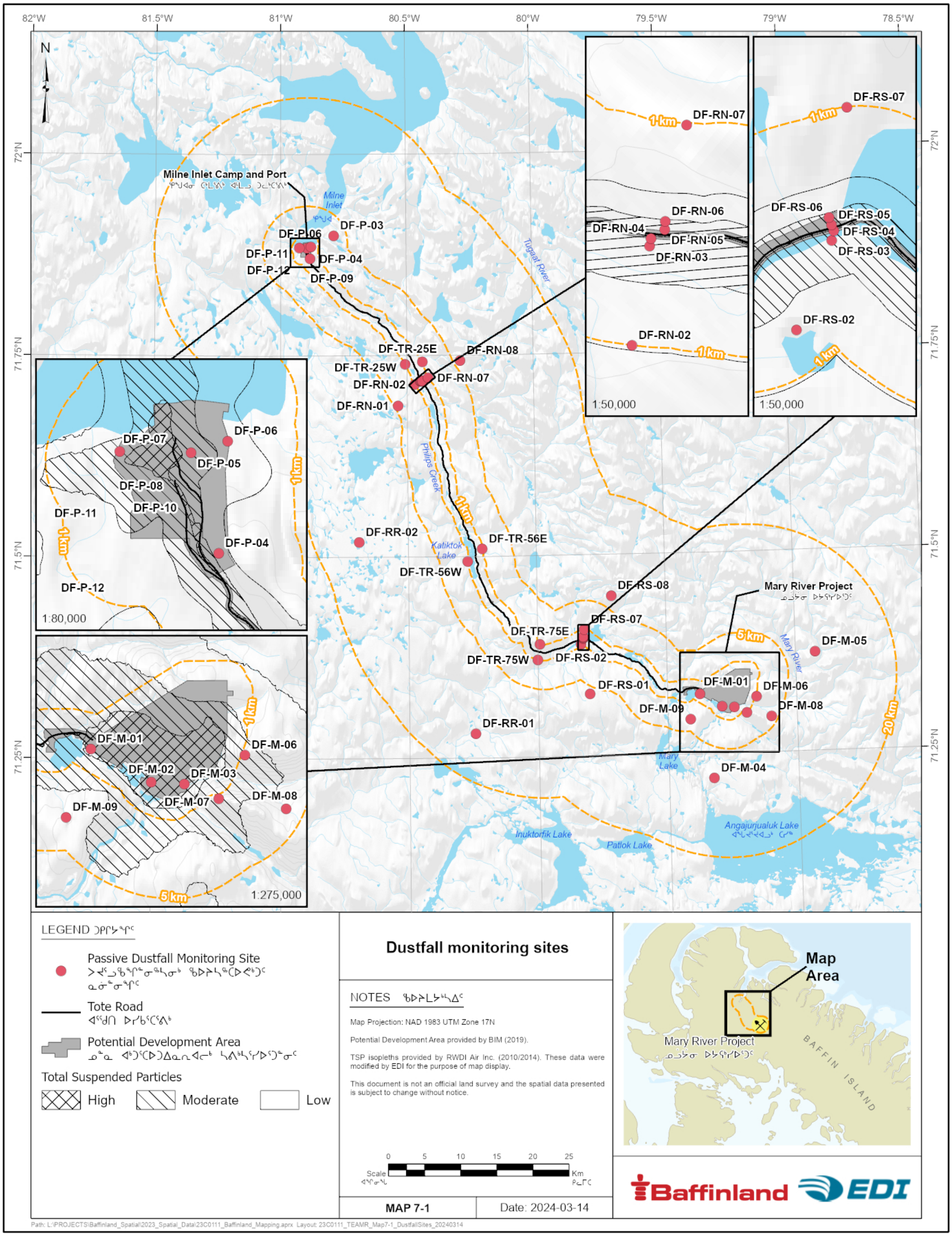
Table 7-1. Summary of dustfall monitoring stations (locations and sampling period), 2023.

Site ID	Monitor Height (m)	Location	Sample Period	Distance to PDA[1] (m)	Expected Dustfall Exposure[2]	Latitude	Longitude
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

[1] PDA = Potential Development Area.

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

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


Dustfall monitoring sites
MAP 7-1
Date: 2024-03-14
Milne Inlet Camp and Port
Mary River Project
Milne Inlet
Tugaat River
Phillips Creek
Katiktok Lake
Mary River
Mary Lake
Inuktorfik Lake
Patlok Lake
Angajurjualuk Lake
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-TR-56E
DF-TR-56W
DF-TR-75E
DF-TR-75W
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-RS-01
DF-RS-02
DF-RS-03
DF-RS-04
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DF-RS-08
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
1 km
5 km
20 km
1:80,000
1:275,000
1:50,000
LEGEND
Passive Dustfall Monitoring Site
Tote Road
Potential Development Area
Total Suspended Particles
High
Moderate
Low
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
TSP isopleths provided by RWDI Air Inc. (2010/2014). These data were modified by EDI for the purpose of map display.
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
Km
Map Area
BAFFIN ISLAND
Baffinland
EDI
Path: L:\PROJECTS\Baffinland_Spatial\2023_Spatial_Data\23C0111_Baffinland_Mapping.aprx Layout: 23C0111_TEAMR_Map7-1_DustfallSites_20240314

Table 7-2. Dustfall monitoring sampling record, 2023 (date shown indicates the day the sample canister was collected).

Site ID	January	February	March	April	May	June	July	August	September	October	November	December
DF-M-01	16-Feb	11-Mar	09-Apr	08-May	03-Jun	01-Jul	29-Jul	28-Aug	25-Sep	-	18-Nov	24-Dec
DF-M-02	16-Feb	11-Mar	10-Apr	08-May	03-Jun	01-Jul	29-Jul	28-Aug	25-Sep	-	19-Nov	23-Dec
DF-M-03	16-Feb	11-Mar	10-Apr	09-May	03-Jun	01-Jul	29-Jul	28-Aug	25-Sep	-	24-Nov	27-Dec
DF-M-04	-	-	-	-	-	01-Jul	31-Jul	31-Aug	06-Oct	-	-	-
DF-M-05	-	-	-	-	-	01-Jul	29-Jul	31-Aug	06-Oct	-	-	-
DF-M-06	-	-	-	-	-	01-Jul	29-Jul	31-Aug	06-Oct	-	-	-
DF-M-07	-	-	-	-	-	01-Jul	29-Jul	31-Aug	06-Oct	-	-	-
DF-M-08	-	-	-	-	-	01-Jul	29-Jul	31-Aug	06-Oct	-	-	-
DF-M-09	-	-	-	-	-	01-Jul	31-Jul	31-Aug	06-Oct	-	-	-
DF-P-03	-	-	-	-	-	28-Jun	26-Jul	30-Aug	30-Sep	-	-	-
DF-P-04	16-Feb	19-Mar	18-Apr	17-May	14-Jun	12-Jul	11-Aug	09-Sep	09-Oct	08-Nov	08-Dec	08-Jan
DF-P-05	16-Feb	19-Mar	18-Apr	17-May	14-Jun	12-Jul	11-Aug	09-Sep	08-Oct	08-Nov	08-Dec	08-Jan
DF-P-06	16-Feb	19-Mar	18-Apr	17-May	14-Jun	12-Jul	11-Aug	09-Sep	08-Oct	08-Nov	08-Dec	08-Jan
DF-P-07	16-Feb	19-Mar	18-Apr	17-May	14-Jun	12-Jul	11-Aug	09-Sep	08-Oct	08-Nov	08-Dec	08-Jan
DF-P-08	16-Feb	19-Mar	18-Apr	17-May	14-Jun	12-Jul	11-Aug	09-Sep	08-Oct	08-Nov	08-Dec	08-Jan
DF-P-09	28-Jan	27-Feb	26-Mar	30-Apr	30-May	28-Jun	26-Jul	30-Aug	30-Sep	-	-	07-Jan
DF-P-10	16-Feb	19-Mar	18-Apr	17-May	14-Jun	12-Jul	11-Aug	09-Sep	09-Oct	08-Nov	08-Dec	08-Jan
DF-P-11	28-Jan	27-Feb	26-Mar	30-Apr	30-May	28-Jun	26-Jul	30-Aug	30-Sep	-	02-Dec	-
DF-P-12	28-Jan	27-Feb	26-Mar	30-Apr	30-May	28-Jun	26-Jul	30-Aug	30-Sep	-	02-Dec	-
DF-RN-01	-	-	-	-	-	28-Jun	29-Jul	30-Aug	02-Oct	-	-	-
DF-RN-02	25-Jan	24-Feb	31-Mar	30-Apr	30-May	28-Jun	29-Jul	30-Aug	05-Oct	-	02-Dec	07-Jan
DF-RN-03	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RN-04	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RN-05	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RN-06	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RN-07	25-Jan	24-Feb	31-Mar	30-Apr	30-May	28-Jun	26-Jul	30-Aug	05-Oct	-	02-Dec	07-Jan
DF-RN-08	-	-	-	-	-	28-Jun	26-Jul	30-Aug	30-Sep	-	-	-

Table 7-2. Dustfall monitoring sampling record, 2023 (date shown indicates the day the sample canister was collected).

Site ID	January	February	March	April	May	June	July	August	September	October	November	December
DF-RS-01	-	-	-	-	-	-	30-Jul	01-Sep	05-Oct	-	-	-
DF-RS-02	24-Jan	24-Feb	27-Mar	28-Apr	31-May	01-Jul	30-Jul	31-Aug	02-Oct	-	02-Dec	07-Jan
DF-RS-03	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RS-04	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RS-05	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RS-06	17-Feb	18-Mar	16-Apr	19-May	14-Jun	12-Jul	12-Aug	08-Sep	10-Oct	06-Nov	09-Dec	08-Jan
DF-RS-07	24-Jan	24-Feb	27-Mar	28-Apr	31-May	30-Jun	30-Jul	31-Aug	02-Oct	-	02-Dec	07-Jan
DF-RS-08	-	-	-	-	-	01-Jul	30-Jul	01-Sep	05-Oct	-	-	-
DF-RR-01	-	-	-	-	-	-	-	01-Sep	05-Oct	-	-	-
DF-RR-02	-	-	-	-	-	-	-	30-Aug	05-Oct	-	-	-
DF-TR-25E	25-Jan	24-Feb	31-Mar	30-Apr	04-Jun	28-Jun	26-Jul	30-Aug	30-Sep	-	02-Dec	07-Jan
DF-TR-25W	25-Jan	24-Feb	31-Mar	30-Apr	04-Jun	28-Jun	26-Jul	30-Aug	30-Sep	-	02-Dec	07-Jan
DF-TR-56E	24-Jan	24-Feb	28-Mar	30-Apr	31-May	28-Jun	30-Jul	30-Aug	02-Oct	-	02-Dec	07-Jan
DF-TR-56W	24-Jan	24-Feb	28-Mar	30-Apr	31-May	28-Jun	30-Jul	30-Aug	02-Oct	-	02-Dec	07-Jan
DF-TR-75E	24-Jan	24-Feb	27-Mar	28-Apr	31-May	30-Jun	30-Jul	01-Sep	05-Oct	-	02-Dec	07-Jan
DF-TR-75W	24-Jan	24-Feb	27-Mar	28-Apr	31-May	30-Jun	30-Jul	01-Sep	05-Oct	-	02-Dec	07-Jan

7.3.1.3 Data Trends and Statistical Analysis

Extent and Magnitude of Dustfall at Various Sites — Dustfall deposition rates (as total suspended particulates [TSP]) for each site were compiled for the 2023 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 data from the summer sampling period (June to September) were used to evaluate the potential relationship between dustfall and distance from the road for the Mine Site and Tote Road. Mixed effects models were used to test the relationship between distance from Project infrastructure and daily dustfall.

- Sites were treated as the random effect.
- Distance from the Mine Site was treated as a categorical variable with three classes: Near (within footprint), Far (1,000 to 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 were tested by distance class using non-parametric Kruskall-Wallis tests, with data stratified by sampling month. Pairwise Wilcoxon tests were performed to determine which distance classes were different. Ninety-five percent bias-corrected and accelerated confidence intervals (CIs) were calculated for each estimate by bootstrapping datasets and testing mixed effects models 1,000 times. A Holm's p-value correction was applied when conducting pairwise comparisons. Medians and inter-quartile ranges were reported to summarize dustfall within distance classes. Statistical analysis was conducted using R version 4.3.1 (R Development Core Team 2023a).

Seasonal Variation in Dustfall — Daily dustfall was assessed at year-round sites within all Project areas (i.e., Mine Site, Milne Port, and Tote Road crossings) to determine whether there were discrete seasonal/monthly patterns or continuous temporal patterns. The month of dustfall collection was identified from the time between consecutive sample dates (e.g., samples collected early [<15] in December were associated with dustfall in November. In contrast, samples collected later [>15] in December were associated with dustfall in December). Generalized least-squares regressions were 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 and the interaction between them. Time-series models were used to test the main effects of sample site and cosinusoidal functions of month and the interaction between them. All dustfall data were $\log_e$ transformed before 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 time

(Zuur et al. 2009). Model selection procedures followed an information theoretic approach using corrected Akaike's Information Criteria (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, bootstrap resampling (1,000 times) was conducted to develop 95% bias-corrected and accelerated CIs for each estimate. If evidence of an effect of season or month on daily dustfall was detected, estimated marginal means were used to determine the geometric mean effect after accounting for the effect of the sample site (Lenth et al. 2018). Statistical analysis was conducted using R version 4.3.1 (R Development Core Team 2023a).

Annual Dustfall — Within the Early Revenue Phase Final Environmental Impact Statement, 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 (EDI Environmental Dynamics Inc 2023b). 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 — ≥50 $g/m^2/year$.

The 2023 dustfall sampling program results for monitoring sites with year-round data collection were converted from $mg/dm^2 \cdot day$ units to $g/m^2/year$. These were compared with the modelled dust deposition isopleths for the Project to determine if deposition rates exceeded 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 winter; therefore, annual accumulation was not calculated for these sites. Very low dustfall accumulation, often below laboratory detection, was observed at these sites during summer.

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

Inter-annual Trends — Linear mixed-effects models were used to test for effects of year and season (summer and winter), month, or time (month time series) on daily dustfall accumulation for each Project area (i.e., Mine Site, Milne Port, and Tote Road crossings). Only sites that were sampled throughout the year were included in analyses. The month of dustfall collection was identified from the time between consecutive sample dates (e.g., samples collected early [<15] in December were associated with dustfall in November whereas samples collected later [>15] in December were associated with dustfall in December). Monthly models were used to test the main effects of month and year and the interaction between them.

Time-series models were used to test the main effects of year and sine/cosine functions of month and the interaction between them. The 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 variance structure was parameterized on the number of sampling days per month in a given year for all models (Zuur et al. 2009).

Residual diagnostic plots were examined, and formal tests (Shapiro Wilk and Leven's tests) were conducted to confirm assumptions of normality and equality of variance in the residuals. If these assumptions were violated, pairwise Wilcoxon tests were performed for factorial (categorical) designs and bootstrap resampling (1,000 times) was used to develop 95% bias-corrected and accelerated CIs for each estimate. If evidence of an effect of month on daily dustfall was detected, estimated marginal means were used to determine the geometric mean effect (Lenth et al. 2018). Model selection procedures followed an information theoretic approach using corrected 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 4.3.1 (R Development Core Team 2023a).

7.3.2 RESULTS AND DISCUSSION

7.3.2.1 Magnitude and Extent of 2023 Dustfall

Mine Site — The 2023 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, near the airstrip, ranged from 0.41 to 4.32 mg/dm²·day, with the highest dustfall recorded in September (Table 7-3). At DF-M-02, located nearest to the crusher, dustfall deposition rates ranged from 0.26 mg/dm²·day in August to 3.80 mg/dm²·day in December. At DF-M-03, located just south of the Mine haul road near the ore deposit, dustfall deposition rates ranged from a low of 0.17 mg/dm²·day in August to a high of 10.60 mg/dm²·day in September.

Outside the Mine footprint but within the 5,000 m buffer, sites DF-M-06, DF-M-07, DF-M-08, and DF-M-09 were sampled during summer (i.e., mid May through mid October). Dustfall sampled at these stations was low, generally ranging from below detection (<0.10 mg/dm²·day) to a high of 0.28 mg/dm²·day in July at DF-M-09 (Table 7-3). Dustfall deposition rates at DF-M-04 and DF-M-05, which are greater than 5,000 m from the PDA and were only sampled during summer, were below detection during all sampling events (June to September).

Dustfall was significantly higher at Near sites versus Far and Reference sites ($\chi^2_1 = 97.95$, $P < 0.0001$; Figure 7-2 and Figure 7-3). Geometric mean daily dustfall was highest in the Near distance class at 1.63 mg/dm²·day (95% CI = 1.17 to 2.28), which was significantly higher than the other two distance classes (all $P < 0.001$). Only three samples (19%) in the Far distance class were above the detection limit (0.1 mg/dm²·day); the geometric mean daily dustfall recorded at the Far distance class was

0.18 mg/dm²·day (95% CI = 0.11 to 0.31). No samples in the Reference site distance class were above the detection limit (0.1 mg/dm²·day).

Table 7-3. Summary of total insoluble dustfall (mg/dm²·day), 2023.

Site ID	January	February	March	April	May	June	July	August	September	October	November	December
DF-M-01	0.49	0.52	0.81	1.80	1.81	1.39	2.44	0.41	4.32	-	2.72	2.15
DF-M-02	3.71	2.50	2.62	2.63	1.14	0.90	2.07	0.26	1.50	-	2.3	3.8
DF-M-03	0.95	1.16	6.08	4.00	2.98	3.24	3.61	0.17	10.60	-	1.08	1.89
DF-M-04	-	-	-	-	-	<0.11	<0.10	<0.10	<0.50	-	-	-
DF-M-05	-	-	-	-	-	<0.11	<0.10	<0.10	<0.50	-	-	-
DF-M-06	-	-	-	-	-	<0.11	<0.10	<0.10	<0.88	-	-	-
DF-M-07	-	-	-	-	-	<0.11	<0.10	<0.10	<0.50	-	-	-
DF-M-08	-	-	-	-	-	<0.11	<0.10	<0.10	<0.50	-	-	-
DF-M-09	-	-	-	-	-	0.15	0.28	<0.10	1.10	-	-	-
DF-P-03	-	-	-	-	-	<0.10	<0.11	<0.10	<0.10	-	-	-
DF-P-04	<0.11	0.19	1.08	0.83	0.25	0.50	0.43	0.40	0.24	<0.30	<0.15	<0.14
DF-P-05	0.78	1.65	2.65	4.57	1.36	0.96	2.86	2.00	3.47	1.44	0.94	0.82
DF-P-06	0.13	0.38	1.14	0.57	<0.11	0.16	0.20	<0.20	<0.15	0.57	<0.15	0.19
DF-P-07	0.18	0.44	<0.10	0.47	0.38	0.20	0.52	0.34	0.52	<0.29	0.16	<0.14
DF-P-08	0.49	1.65	0.92	0.87	0.61	0.94	3.05	1.00	1.28	1.27	0.31	0.87
DF-P-09	0.10	<0.10	0.14	-	1.11	0.17	0.52	0.22	0.21	-	-	0.13
DF-P-10	0.20	1.78	0.44	0.75	0.26	0.40	2.20	0.71	1.49	0.68	0.7	0.82
DF-P-11	<0.10	<0.10	<0.11	-	0.18	<0.10	<0.11	<0.10	<0.10	-	<0.10	-
DF-P-12	<0.10	<0.10	<0.11	-	<0.10	<0.10	<0.11	0.30	0.26	-	0.17	-
DF-RN-01	-	-	-	-	-	<0.10	0.15	<0.10	<0.13	-	-	-
DF-RN-02	<0.10	<0.10	<0.10	<0.10	0.21	0.23	0.51	0.24	0.30	-	0.12	<0.10
DF-RN-03	0.22	0.29	1.26	2.58	1.70	5.60	10.40	4.89	5.75	0.49	1.45	0.5
DF-RN-04	0.51	0.51	1.80	4.81	3.25	11.40	24.30	10.40	14.30	1.30	2.47	1.3
DF-RN-05	0.79	1.13	4.70	8.55	5.33	12.20	18.50	5.46	9.53	0.95	1.68	1.73
DF-RN-06	0.33	0.57	2.91	4.84	2.52	4.37	7.30	2.15	4.00	0.56	0.86	1.01
DF-RN-07	<0.10	<0.10	<0.10	0.27	0.50	0.38	0.31	0.27	0.18	-	<0.10	<0.10
DF-RN-08	-	-	-	-	-	<0.10	<0.11	<0.10	<0.14	-	-	-

Table 7-3. Summary of total insoluble dustfall (mg/dm²·day), 2023.

Site ID	January	February	March	April	May	June	July	August	September	October	November	December
DF-RS-01	-	-	-	-	-	-	0.14	<0.10	<0.10	-	-	-
DF-RS-02	<0.10	<0.10	<0.10	0.77	0.86	0.88	0.71	<0.10	0.86	-	0.16	<0.10
DF-RS-03	0.25	0.54	1.76	4.91	2.70	5.00	5.58	0.64	5.5	0.54	0.39	0.47
DF-RS-04	0.95	2.63	5.42	15.40	9.13	18.60	25.6	6.58	29.0	2.61	1.05	2.08
DF-RS-05	0.79	1.59	6.72	9.92	3.13	15.40	23.0	12.30	26.0	2.12	0.93	1.01
DF-RS-06	0.20	0.43	2.79	5.70	0.93	2.81	5.88	2.00	4.10	0.54	0.31	0.31
DF-RS-07	<0.10	<0.10	<0.10	0.21	0.27	0.12	0.12	<0.10	0.12	-	<0.10	<0.10
DF-RS-08	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-
DF-RR-01	-	-	-	-	-	-	-	<0.10	<0.10	-	-	-
DF-RR-02	-	-	-	-	-	-	-	<0.10	<0.10	-	-	-
DF-TR-25E	<0.10	<0.10	-	<0.10	0.26	0.48	0.66	0.53	0.13	-	<0.10	<0.10
DF-TR-25W	<0.10	<0.10	-	<0.10	<0.10	0.92	0.61	0.66	0.69	-	0.19	<0.10
DF-TR-56E	<0.11	<0.10	<0.10	0.19	0.22	0.36	0.41	0.30	<0.10	-	-	<0.10
DF-TR-56W	<0.11	<0.10	<0.10	0.16	0.32	0.25	0.80	0.26	0.34	-	0.12	<0.10
DF-TR-75E	<0.10	<0.10	<0.10	<0.10	0.18	0.32	0.28	0.13	0.18	-	<0.10	<0.10
DF-TR-75W	<0.10	0.12	0.13	0.75	1.12	0.77	0.37	0.31	0.49	-	0.21	0.16

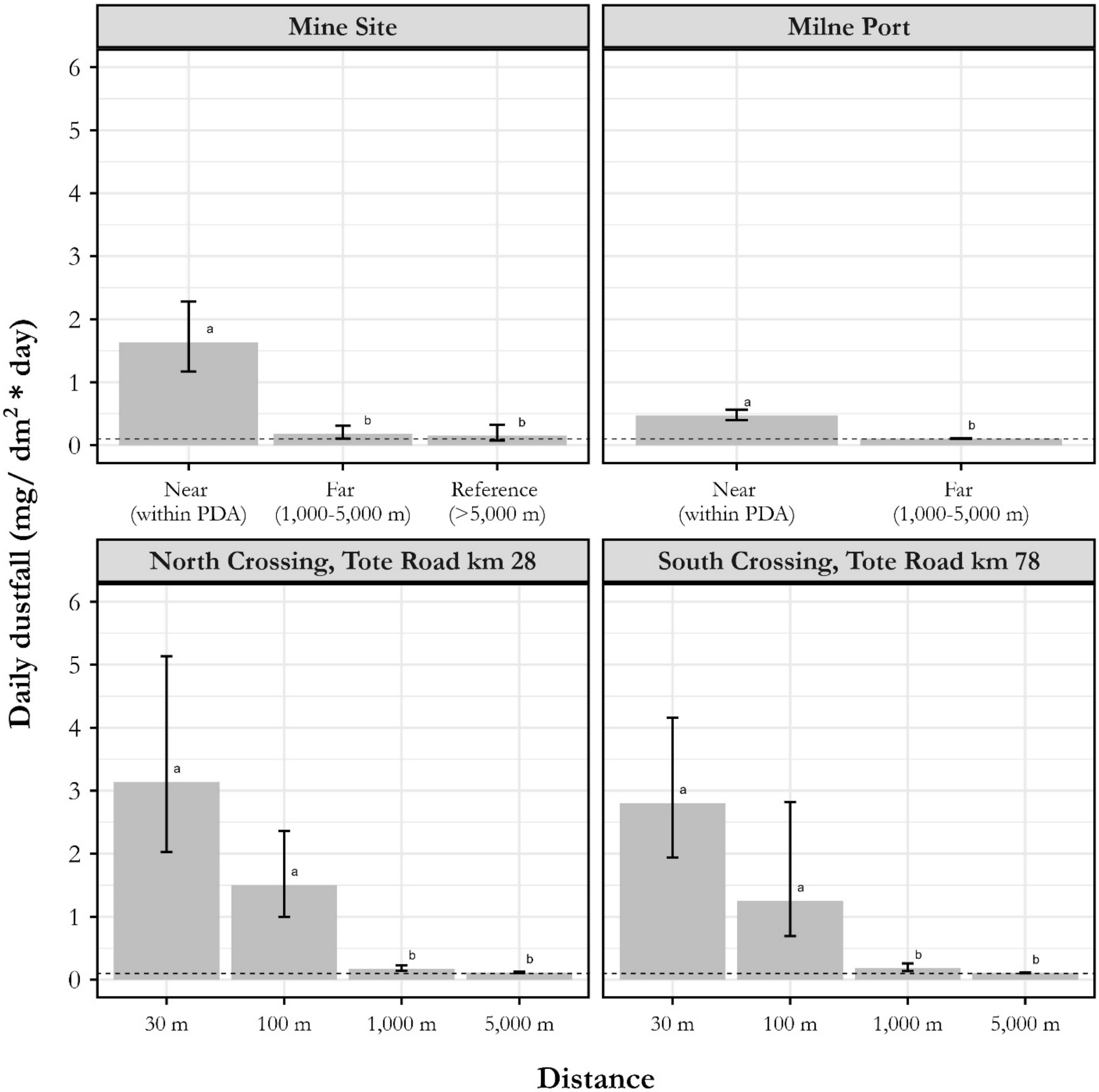


Figure 7-2. Geometric mean daily dustfall (mg/dm²·day) for the Mine Site, Milne Port, Tote Road north crossing (KM 28), and Tote Road south crossing (KM 78). The Tote Road sites are measured as a function of distance from the Tote Road. Scales are equal for each area to allow comparison of differences between each area.

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the $\log_e$ scale and back-transformed to the natural scale. Letters indicate mean estimates that are either statistically similar (same letters) or different (different letters) based on pairwise comparisons of all estimates. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.

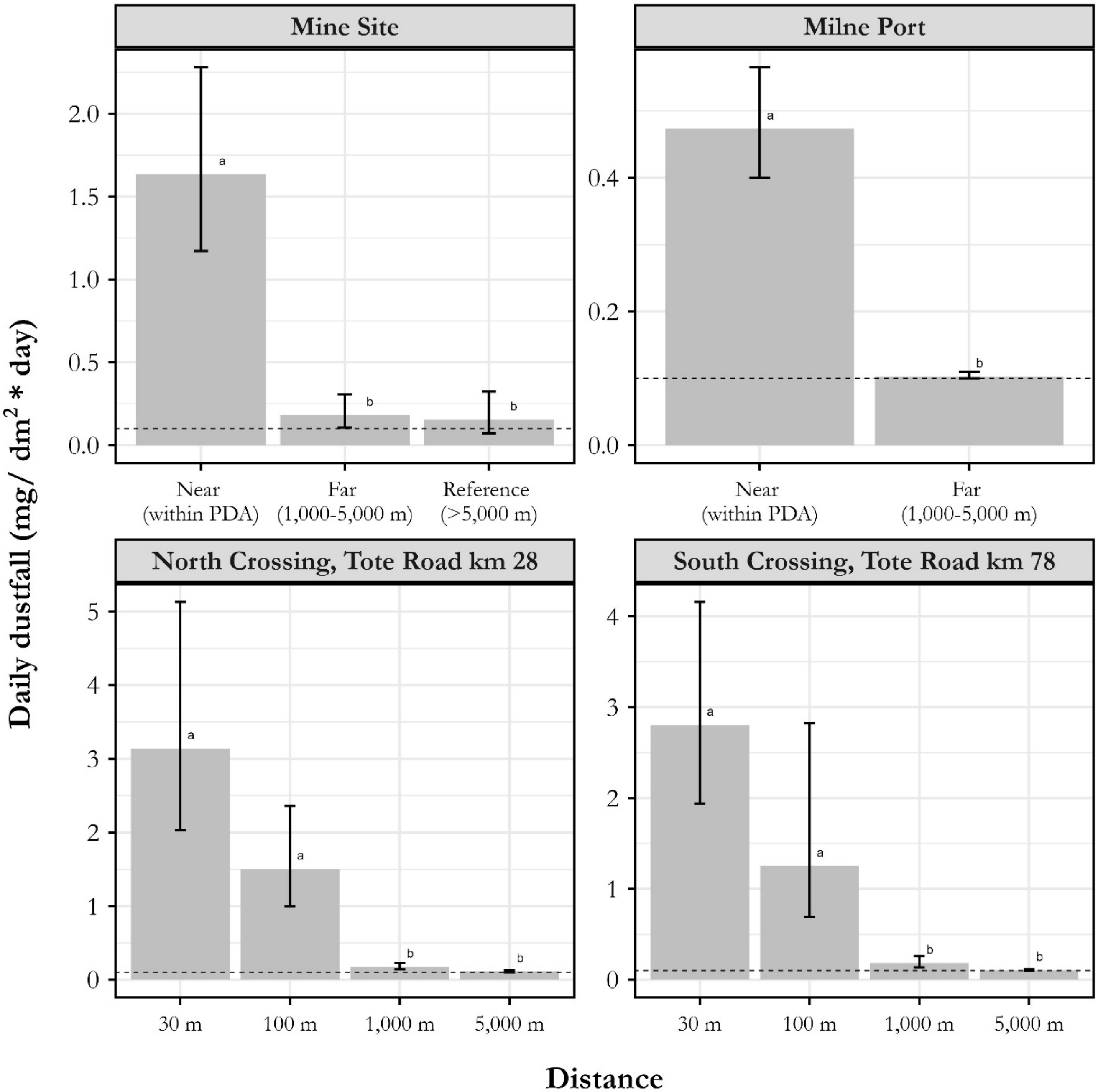


Figure 7-3. **Geometric mean daily dustfall (mg/dm²·day) for the Mine Site, Milne Port, Tote Road north crossing (KM 28), and Tote Road south crossing (KM 78). The Tote Road sites are measured as a function of distance from the Tote Road. Scales are different for each area to allow a review of differences between the sites in each area.**

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the log_e scale and back-transformed to the natural scale. Letters indicate mean estimates that are either statistically similar (same letters) or different (different letters) based on pairwise comparisons of all estimates. The dashed horizontal line indicates the minimum detection limit 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 2023 (Table 7-1, Map 7-1): four active sites on the Milne Port footprint and six at and outside the PDA boundary. 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, and ranged from 0.78 mg/dm²·day in January to 4.57 mg/dm²·day in April (Table 7-3). Dustfall deposition rates at DF-P-06, located nearest to the sealift staging pad on the west side, ranged from 0.13 to 1.14 mg/dm²·day (Table 7-3). Dustfall deposition rates at DF-P-08, located nearest the ore pad, ranged from 0.31 to 3.05 mg/dm²·day, while dustfall deposition rates at DF-P-10, located in the same direction but further out near the PDA boundary, ranged from 0.20 to 2.20 mg/dm²·day. Dustfall deposition rates at DF-P-07, located near the ore pad but further to the north, ranged from below the laboratory detection limit (0.10 mg/dm²·day) to 0.52 mg/dm²·day in July. Dustfall deposition rates at DF-P-04, primarily associated with the Tote Road and quarry operations, ranged from below the laboratory detection limit to 1.08 mg/dm²·day. Sites DF-P-11 and DF-P-12 are located west of the PDA at approximately 1,000 m distance; dustfall deposition rates ranged from below the detection limit to a high of 0.18 mg/dm²·day and 0.30 mg/dm²·day, respectively. Dustfall deposition rates at DF-P-03, sampled only in summer months, were below the detection limit during all sampling events (June to October).

Monitoring stations in the Far distance class (1,000 to 5,000 m from the PDA) had significantly less dustfall than those in the Near distance class (within the PDA). Evidence that Near and Far distance classes were different in their geometric mean daily dustfall was detected ($\chi^2_1 = 9.74$, $P = 0.002$; Figure 7-2, Figure 7-3). Geometric mean daily dustfall was highest in the Near distance class at 0.47 mg/dm²·day (95% CI = 0.40 to 0.57) followed by the Far distance class at 0.10 mg/dm²·day (95% CI = 0.10 to 0.11). Fifty-two samples (80%) in the Near distance class and no samples in the Reference distance class were above the detection limit (0.1 mg/dm²·day).

Tote Road Dustfall — Twenty-four dustfall monitors were associated with the Tote Road in 2023: eight at each of two transects perpendicular to the road (the north crossing site at KM 28 of the Tote Road and south crossing site at KM 78 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 KM 25, KM 56, and KM 75 of the Tote Road.

North Crossing, Tote Road KM 28 — Dustfall deposition rates were highest at the monitors nearest the centerline on both sides of the Tote Road (DF-RN-04 and DF-RN-05), with dustfall ranging from 0.51 to 24.30 mg/dm²·day at DF-RN-04 and from 0.72 to 18.50 mg/dm²·day at DF-RN-05. Dustfall deposition rates decreased with distance from the centerline. Dustfall deposition rates at DF-RN-03 and DF-RN-06 ranged from 0.22 to 10.40 mg/dm²·day and from 0.33 to 7.30 mg/dm²·day, respectively. Dustfall deposition rates at two monitors located 1,000 m from the PDA (DF-RN-02 and DF-RN-07) ranged from below the detection limit to 0.51 mg/dm²·day and from below the detection limit to 0.50 mg/dm²·day, respectively. Dustfall deposition data collected during the summer season at the farthest sites (DF-RN-01 and DF-RN-08) ranged from below the laboratory detection limit to 0.0.15 mg/dm²·day and were below the detection limit in all samples, respectively (Table 7-3).

Evidence of an effect of distance from the north road on daily dustfall was detected (χ^2_3 = 55.10, P < 0.0001; Figure 7-2, Figure 7-3). Geometric mean daily dustfall was higher in the 30 m distance class (3.14 mg/dm²·day, 95% CI = 2.03 to 5.13) compared to the 1,000 m and 5,000 m distance classes (all P < 0.0001) but was not statistically different from the 100 m distance class (P = 0.09). Geometric mean daily dustfall in the 100 m distance class was 1.50 mg/dm²·day (95% CI = 1.00 to 2.36), which was significantly higher than the two farther distance classes (all P < 0.0001). No evidence of a difference in dustfall between the 1,000 m and 5,000 m distance classes was detected (P = 0.23). Geometric mean daily dustfall in the 1,000 m distance class was 0.17 mg/dm²·day (95% CI = 0.14 to 0.23), and 55% of all samples were above the detection limit. One-eighth (13%) of the samples in the 5,000 m distance class were above the detection limit of 0.1 mg/dm²·day.

South Crossing, Tote Road KM 78 — Dustfall deposition rates were highest at monitors nearest the centerline on the south side of the Tote Road (DF-RS-04), where dustfall ranged from 0.89 to 29.0 mg/dm²·day. On the north side of the road (DF-RS-05), dustfall deposition rates ranged from 0.79 to 26.0 mg/dm²·day. Dustfall deposition rates decreased with distance from the centerline, and dustfall at DF-RS-03 and DF-RS-06 ranged from 0.25 to 5.58 mg/dm²·day and from 0.20 to 5.88 mg/dm²·day, respectively. Dustfall deposition rates in collectors at 1,000 m from the PDA (DF-RS-02 and DF-RS-07) ranged from below the detection limit to 0.88 mg/dm²·day and from below the detection limit to 0.27 mg/dm²·day, respectively. Dustfall deposition data collected during the summer season at the farthest sites (DF-RN-01 and DF-RN-08) ranged from below the detection limit to 0.14 mg/dm²·day and below the detection limit in all samples, 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, increasing dust production. The winds then blow toward the south of the Tote Road. Dustfall at the south crossing generally represents the 'worst-case scenario' for dustfall along the Tote Road.

Evidence of an effect of distance from the south road on daily dustfall was detected (χ^2_3 = 48.10, P < 0.0001; Figure 7-2, Figure 7-3). Geometric mean daily dustfall was highest in the 30 m distance class at 2.80 mg/dm²·day (95% CI = 1.94 to 4.16), which was significantly higher than the 1,000 m and 5,000 m distance classes (all P < 0.001) but not statistically different from the 100 m distance class (P = 0.11). Geometric mean daily dustfall in the 100 m distance class was 1.25 mg/dm²·day (95% CI = 0.69 to 2.82); evidence that this was higher than the 1,000 m and 5,000 m distance classes was detected (all P < 0.001). Little evidence of a difference in geometric mean daily dustfall between the 1,000 m (0.18 mg/dm²·day [95% CI = 0.14 to 0.26]) and 5,000 m (0.11 mg/dm²·day [95% CI = 0.10 to 0.12]) distances classes was detected (P = 0.11). Eleven samples (50%) in the 1,000 m distance class and one sample (14%) 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 during summer months, were below the laboratory detection limit in all samples (Table 7-3).

Dustfall at Sites 1,000 m from the PDA — Twelve dustfall monitoring sites were located 1,000 m from the PDA: two at the Mine Site and 10 at various locations along the Tote Road. The two Mine Site collectors were sampled only during the summer, whereas the Tote Road sites were sampled throughout the year.

Evidence of differences in dustfall among sites located 1,000 m from Project infrastructure was detected during summer (χ^2_{11} = 22.47, *P* = 0.02; Figure 7-4). Geometric mean daily dustfall was highest at DF-TR-25 W (0.79 mg/dm²·day [95% CI = 0.27to 2.28)]) and lowest at DF-RS-07 (0.11 mg/dm²·day [95% CI = 0.04 to 0.32)]) (difference = 0.68 mg/dm²·day, *P* = 0.03). Evidence of differences in dustfall among sites located 1,000 m from Project infrastructure based on year-round data was detected (χ^2_{11} = 32.48, *P* = 0.0006; Figure 7-5). Geometric mean daily dustfall was highest at DF-TR-25 W (0.32 mg/dm²·day [95% CI = 0.19 to 0.55)]) and lowest at DF-RS-07 (0.13 mg/dm²·day [95% CI = 0.07–0.22)]) (difference = 0.19 mg/dm²·day, *P* = 0.02).

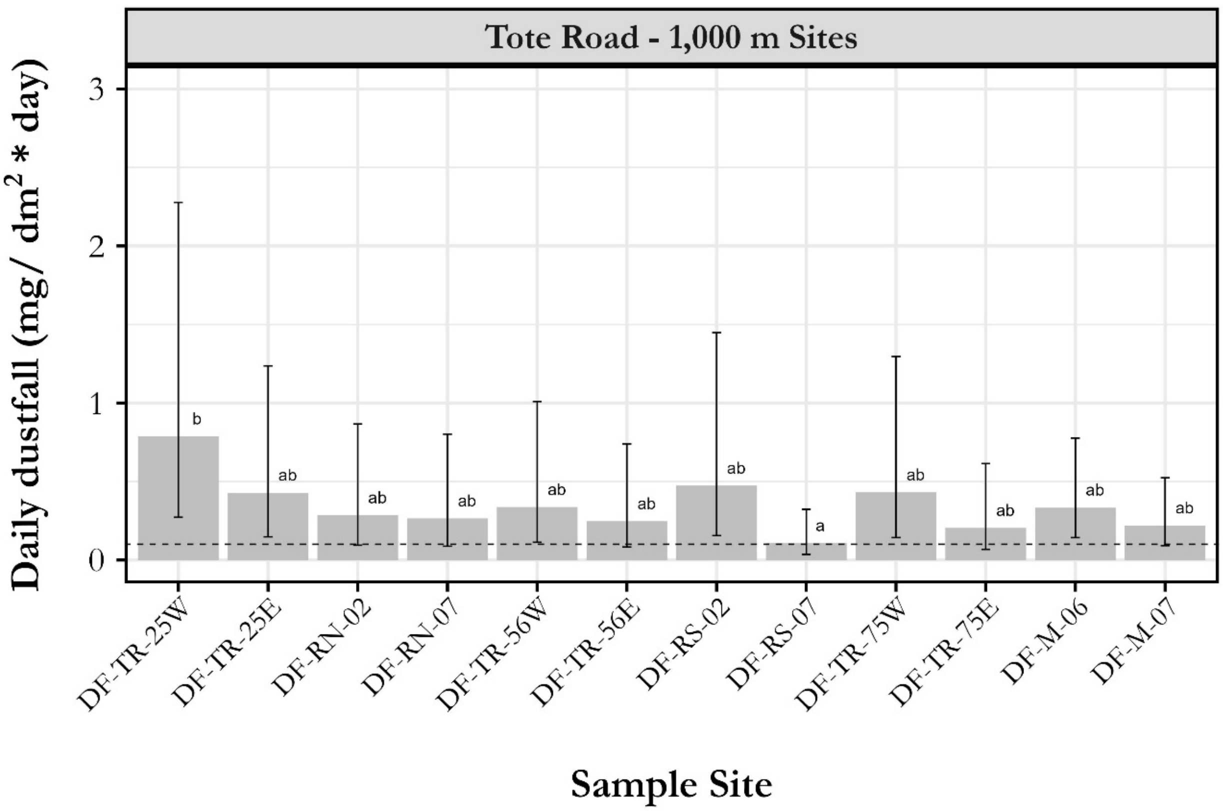


Figure 7-4. Geometric mean daily dustfall (mg/dm²·day) for all sites located 1,000 m from Project infrastructure during the summer season.

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the log$_e$ scale and back-transformed to the natural scale. Letters indicate mean estimates that are either statistically similar (same letters) or different (different letters) based on pairwise comparisons of all estimates. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.

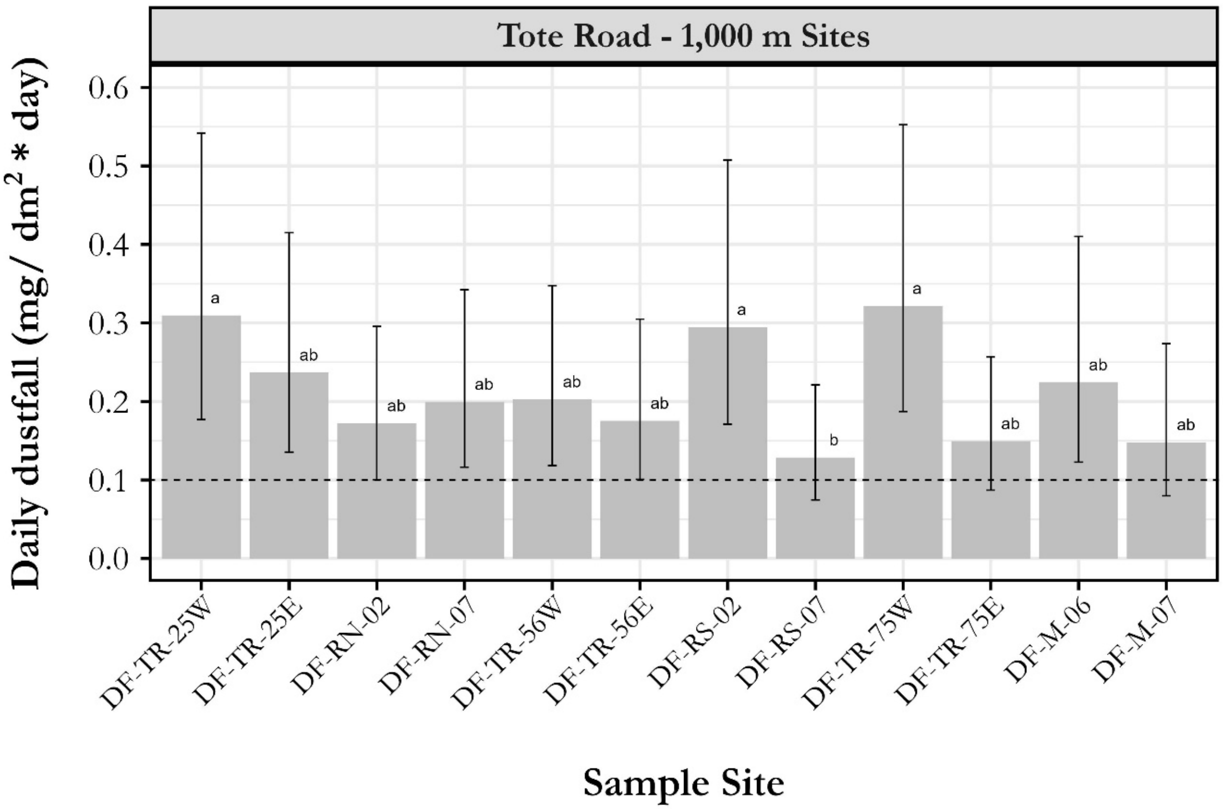


Figure 7-5. Geometric mean daily dustfall (mg/dm²·day) for all sites located 1,000 m from the Tote Road using year-round data.

Bar heights show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the $\log_e$ scale and back-transformed to the natural scale. Letters indicate mean estimates that are either statistically similar (same letters) or different (different letters) based on pairwise comparisons of all estimates. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.

7.3.2.2 Seasonal Comparisons of 2023 Dustfall

Seasonal variations in dustfall were investigated as per the dustfall monitoring objectives. Dustfall deposition across the PDA indicated different seasonal trends depending on location. For example, dustfall at the Mine Site and Milne Port was elevated in late winter/early spring (April/May) and again in September, whereas dustfall along the Tote Road was elevated through the early summer months, with a peak in June/July and again in September. It has been noted for several years that September freeze/thaw conditions present challenges for dustfall mitigations such as road treatments (e.g., watering).

Mine Site — Patterns across time were best represented by a common fluctuation in dustfall across months (F_1 = 4.47, P = 0.04). Peaks occurred in April, July, and September/October (Figure 7-6). This model had a similar trade off in complexity and variance, which was explained relative to a model with month-only effects (AICc = 96.26 versus 98.36, respectively). The highest daily dustfall occurred in September (4.73 mg/dm²·day [95% CI = 2.84 to 7.88]) and the lowest daily dustfall occurred in August (0.26 mg/dm²·day [95% CI = 0.15 to 0.44]).

Milne Port — Patterns across time were best represented by mean differences among sites ($F4 = 53.40$, $P < 0.0001$) and a common fluctuation in dustfall across months ($F1 = 6.84$, $P = 0.01$). Peaks occurred in April and September (Figure 7-6). This model had a similar trade off in complexity and variance, which was explained relative to a model with month-only effects (AICc = 125.39 versus 192.90, respectively). The highest daily dustfall occurred in July at site DF-P-05 (2.79 $mg/dm^2 \cdot day$ [95% CI = 1.55 to 5.02]) and the lowest daily dustfall occurred in January at site DF-P-06 (0.11 $mg/dm^2 \cdot day$ [95% CI = 0.06 to 0.21]).

North Crossing, Tote Road KM 28 — Patterns across time were best represented by differences in sites and season and their interaction ($F3 = 8.00$, $P = 0.0002$; Figure 7-7). This model was the most parsimonious (AICc = 48.85) compared to models with an effect of month ($\Delta AIC = 14.23$; Figure 7-8) or fluctuations across time ($\Delta AIC = 16.85$; Figure 7-6). Geometric mean daily dustfall was greatest at sites DF-RN-05 (10.28 $mg/dm^2 \cdot day$ [95% CI = 8.75 to 12.66]) and DF-RN-03 (6.31 $mg/dm^2 \cdot day$ [95% CI = 5.44 to 7.38]) in summer 2023. Geometric mean daily dustfall was lowest at sites DF-RN-03 (0.53 $mg/dm^2 \cdot day$ [95% CI = 0.31 to 0.65]) and DF-RN-06 (0.78 $mg/dm^2 \cdot day$ [95% CI = 0.50 to 0.96]) in winter 2023.

South Crossing, Tote Road KM 78 — Patterns across time were best represented by differences in sites and season and their interaction ($F3 = 4.53$, $P = 0.008$; Figure 7-7). This model was the most parsimonious (AICc = 76.55) compared to models with an effect of month ($\Delta AIC = 6.67$; Figure 7-8) or fluctuations across time ($\Delta AIC = 19.64$; Figure 7-6). Geometric mean daily dustfall was greatest at sites DF-RS-05 (18.15 $mg/dm^2 \cdot day$ [95% CI = 11.87 to 25.90]) and DF-RS-04 (17.09 $mg/dm^2 \cdot day$ [95% CI = 13.24 to 25.22]) in summer 2023. Geometric mean daily dustfall was lowest at sites DF-RS-06 (0.49 $mg/dm^2 \cdot day$ [95% CI = 0.37 to 0.71]) and DF-RS-03 (0.57 $mg/dm^2 \cdot day$ [95% CI = 0.46 to 0.72]) in winter 2023.

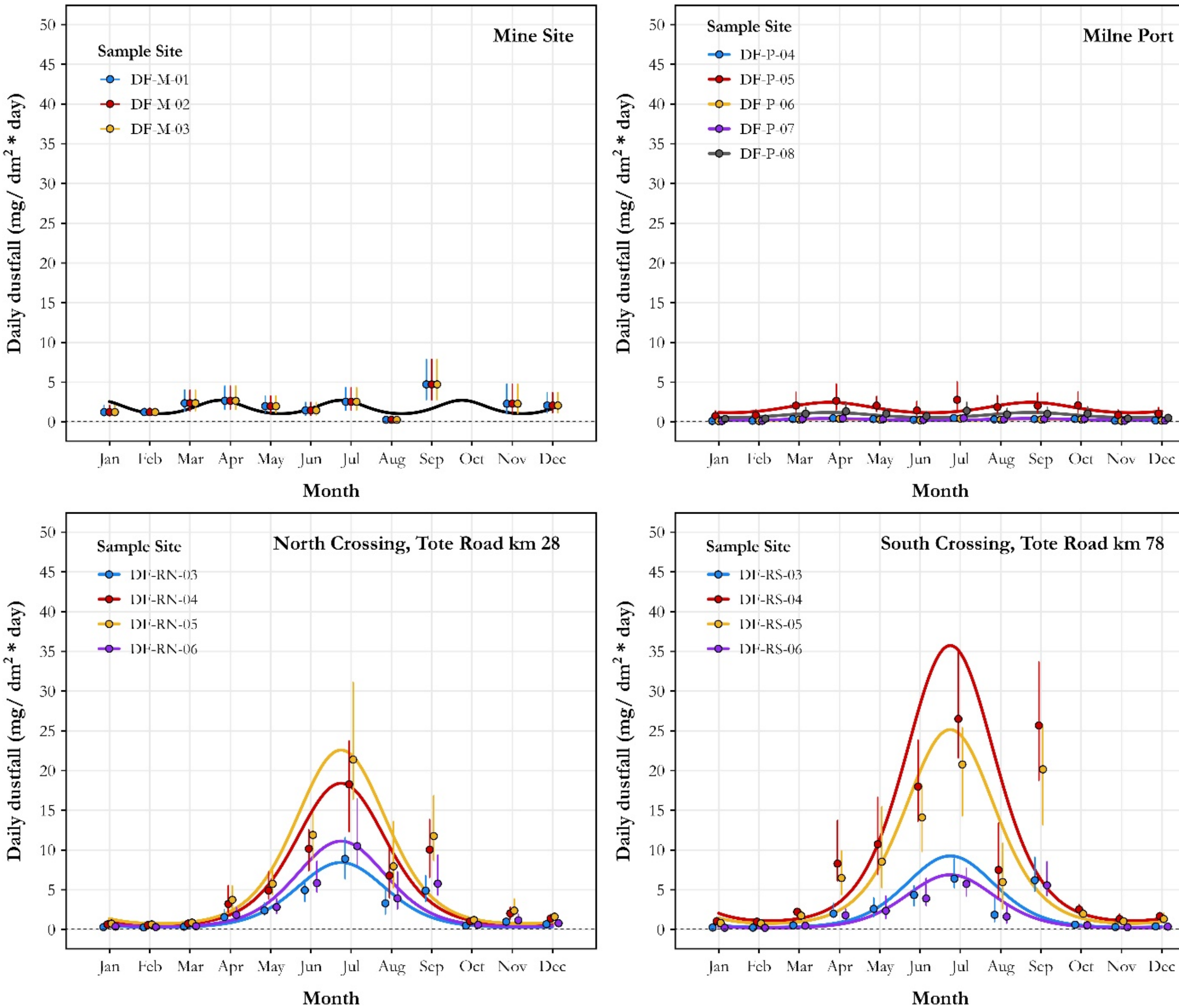


Figure 7-6. Geometric mean daily dustfall (mg/dm²·day) by site and month (time-series or category) or season (category) for the Mine Site, Milne Port, Tote Road north crossing (KM 28), and Tote Road south crossing (KM 78).

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

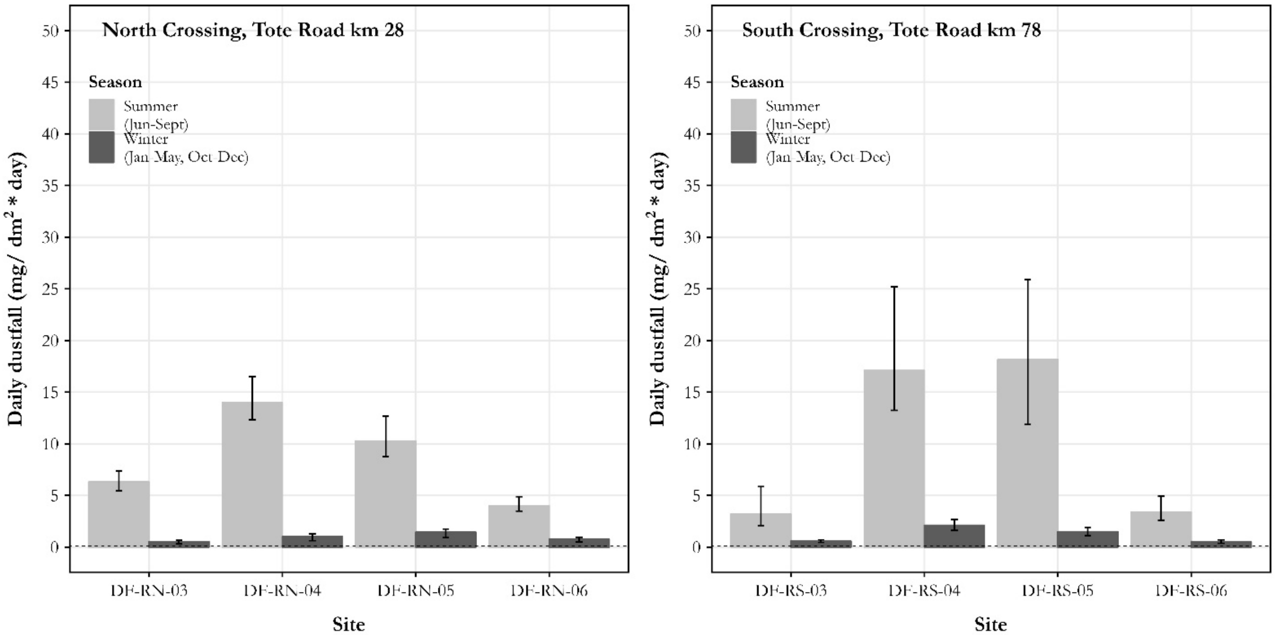


Figure 7-7. Geometric mean daily dustfall (mg/dm²·day) by site and season (summer and winter) for the Tote Road north (KM 28) and south (KM 78) crossings.

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

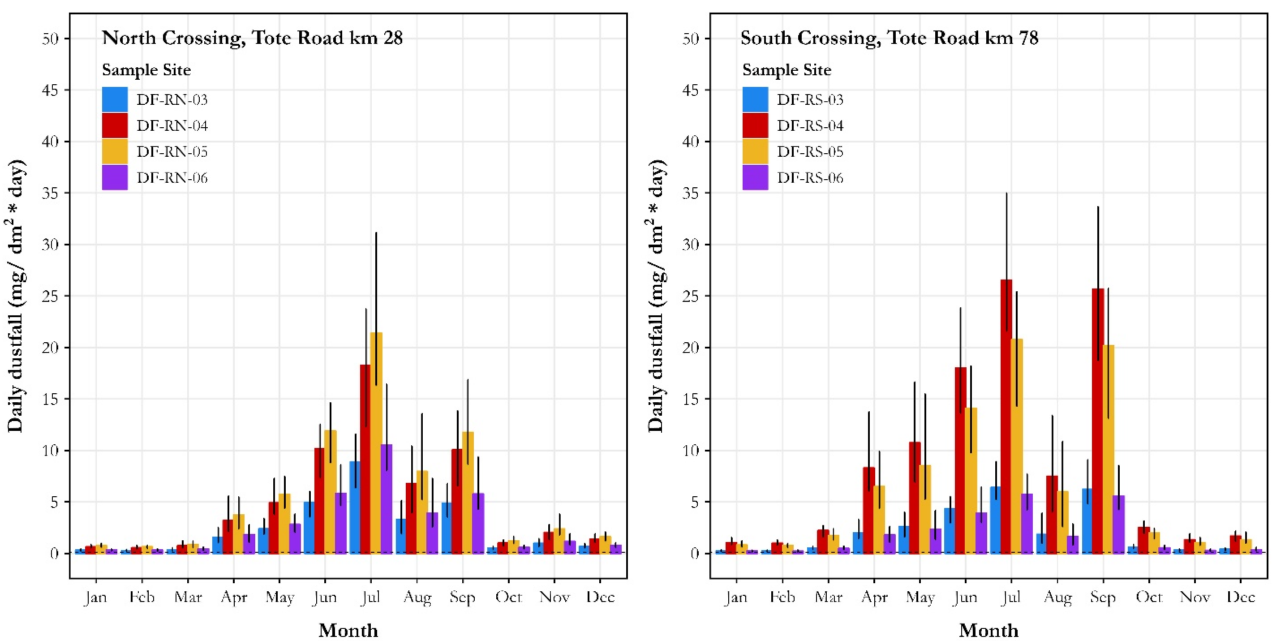


Figure 7-8. Geometric mean daily dustfall (mg/dm²·day) by site and month for the Tote Road north (KM 28) and south (KM 78) crossings.

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

7.3.2.3 2023 Annual Dustfall

Total annual dustfall for the 2023 calendar year was calculated for all sites and each area in the Project RSA (Table 7-4, Figure 7-9, Figure 7-10). Annual dustfall quantities were based on those observed during monitoring and included predicted amounts (*) for sites that were sampled partially during the year (i.e., less than 365 days). For the latter sites, the total observed dustfall quantity was summed with the predicted dustfall during winter months when sampling did not occur. Those predictions were based on a model-based approach that estimated the quantity of dustfall during winter at sites at various distances from the Mine Site, Milne Inlet Port, and Tote Road. The predicted quantities that were added to observed quantities of dustfall depended on the temporal coverage of each site during 2023. The following equation was used to calculate annual dustfall (g/m²/year) in Table 7-4:

$$Annual.Dust_{Total} = Annual.Dust_{Observed} + (Daily.Dust_{Predicted} \times [365 - Days.Sampled])$$

The annual dustfall values were compared with the annual EIS predictions, however, this modelling was updated in 2023, and presented as part of the Sustaining Operations Proposal (SOP) Air Quality Assessment (Nunami Stantec Ltd. 2023). As this proposal was approved in late 2023, the annual dustfall data for 2024 will be compared with the updated dustfall predictions.

Table 7-4. Annual dustfall accumulation for sites sampled throughout 2023[1].

Site	Area	Distance from PDA	Predicted Range[2]	Isopleth Upper Limit	Annual Dustfall (g/m²/year)	EIS Prediction Comparison
DF-M-01	Mine Site	0.00	High	N/A[3]	63.44	Within prediction
DF-M-02	Mine Site	0.00	High	N/A[3]	81.56	Within prediction
DF-M-03	Mine Site	0.00	High	N/A[3]	110.37	Within prediction
DF-M-04	Mine Site	9.23	Low	4.5	4.79*	Above prediction
DF-M-05	Mine Site	9.23	Low	4.5	4.79*	Above prediction
DF-M-06	Mine Site	1.18	Moderate	50	19.39*	Within prediction
DF-M-07	Mine Site	1.23	Moderate	50	19.00*	Within prediction
DF-M-08	Mine Site	4.09	Moderate	50	11.20*	Within prediction
DF-M-09	Mine Site	3.35	Moderate	50	13.84*	Within prediction
DF-P-03	Milne Inlet Port	3.27	Low	4.5	2.99*	Within prediction
DF-P-04	Milne Inlet Port	0.00	Low	4.5	13.94	Above prediction
DF-P-05	Milne Inlet Port	0.00	Moderate	50	72.41	Above prediction
DF-P-06	Milne Inlet Port	0.00	Low	4.5	12.59	Above prediction
DF-P-07	Milne Inlet Port	0.00	Moderate	50	11.86	Within prediction
DF-P-08	Milne Inlet Port	0.08	Moderate	50	39.79	Within prediction
DF-P-09	Milne Inlet Port	1.00	Moderate	50	11.19*	Within prediction
DF-P-10	Milne Inlet Port	0.00	Moderate	50	32.00*	Within prediction
DF-P-11	Milne Inlet Port	1.17	Moderate	50	5.10*	Within prediction
DF-P-12	Milne Inlet Port	1.35	Moderate	50	6.16*	Within prediction
DF-RN-01	Road North	4.54	Low	4.5	4.53*	Above prediction

Table 7-4. Annual dustfall accumulation for sites sampled throughout 2023[1].

Site	Area	Distance from PDA	Predicted Range[2]	Isopleth Upper Limit	Annual Dustfall ($g/m^2/year$)	EIS Prediction Comparison
DF-RN-02	Road North	1.00	Low	4.5	7.02	Above prediction
DF-RN-03	Road North	0.07	Moderate	50	105.84	Above prediction
DF-RN-04	Road North	0.00	Moderate	50	230.38	Above prediction
DF-RN-05	Road North	0.01	Moderate	50	212.62	Above prediction
DF-RN-06	Road North	0.09	Moderate	50	95.23	Above prediction
DF-RN-07	Road North	0.98	Low	4.5	7.75*	Above prediction
DF-RN-08	Road North	5.92	Low	4.5	3.60*	Within prediction
DF-RS-01	Road South	6.02	Low	4.5	3.50*	Within prediction
DF-RS-02	Road South	0.63	Low	4.5	15.51*	Above prediction
DF-RS-03	Road South	0.07	Moderate	50	85.83	Above prediction
DF-RS-04	Road South	0.00	Moderate	50	360.90	Above prediction
DF-RS-05	Road South	0.00	Moderate	50	311.61	Above prediction
DF-RS-06	Road South	0.00	Moderate	50	79.45	Above prediction
DF-RS-07	Road South	0.95	Low	4.5	4.95*	Above prediction
DF-RS-08	Road South	6.67	Low	4.5	3.11*	Within prediction
DF-RR-01	Tote Road	13.99	Low	4.5	1.13*	Within prediction
DF-RR-02	Tote Road	14.00	Low	4.5	1.13*	Within prediction
DF-TR-25E	Tote Road	1.19	Low	4.5	8.88*	Above prediction
DF-TR-25W	Tote Road	1.01	Low	4.5	11.48*	Above prediction
DF-TR-56E	Tote Road	0.90	Low	4.5	6.74*	Above prediction
DF-TR-56W	Tote Road	1.14	Low	4.5	8.69*	Above prediction
DF-TR-75E	Tote Road	1.00	Low	4.5	5.65*	Above prediction
DF-TR-75W	Tote Road	1.07	Low	4.5	15.17*	Above prediction

Note: Grey-highlighted cells represent sites with dustfall deposition above predicted values.

1 Annual accumulations are reported for the period January 16, 2023, to January 7, 2024.

2 Predictions were based on pre-project dust dispersion models. Low range is <4.5 $g/m^2/year$, moderate range is between 4.6 and 50 $g/m^2/year$, and high range is > 50 $g/m^2/year$.

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).

* Extrapolated (winter) dustfall predictions were added to the observed dustfall amount. The amount added to the observed quantity was inversely proportional to the number of sampling days (i.e., lower total sampling days resulted in greater amounts added to observed dustfall quantities).

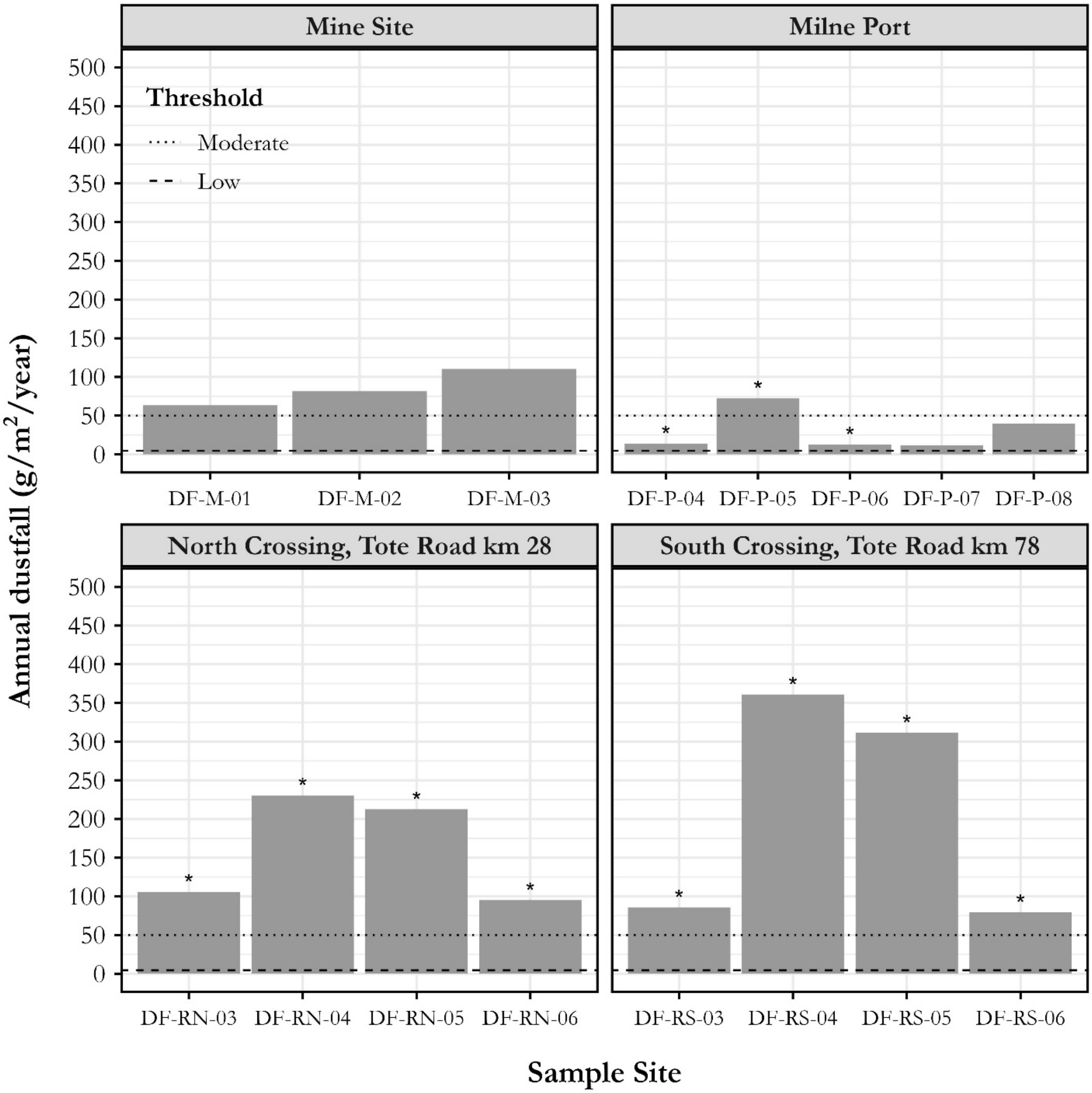


Figure 7-9. Annual dustfall (g/m²/year) for stations sampled year-round at the Mine Site, Milne Port, Tote Road north crossing (KM 28), and Tote Road south crossing (KM 78).

The 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.

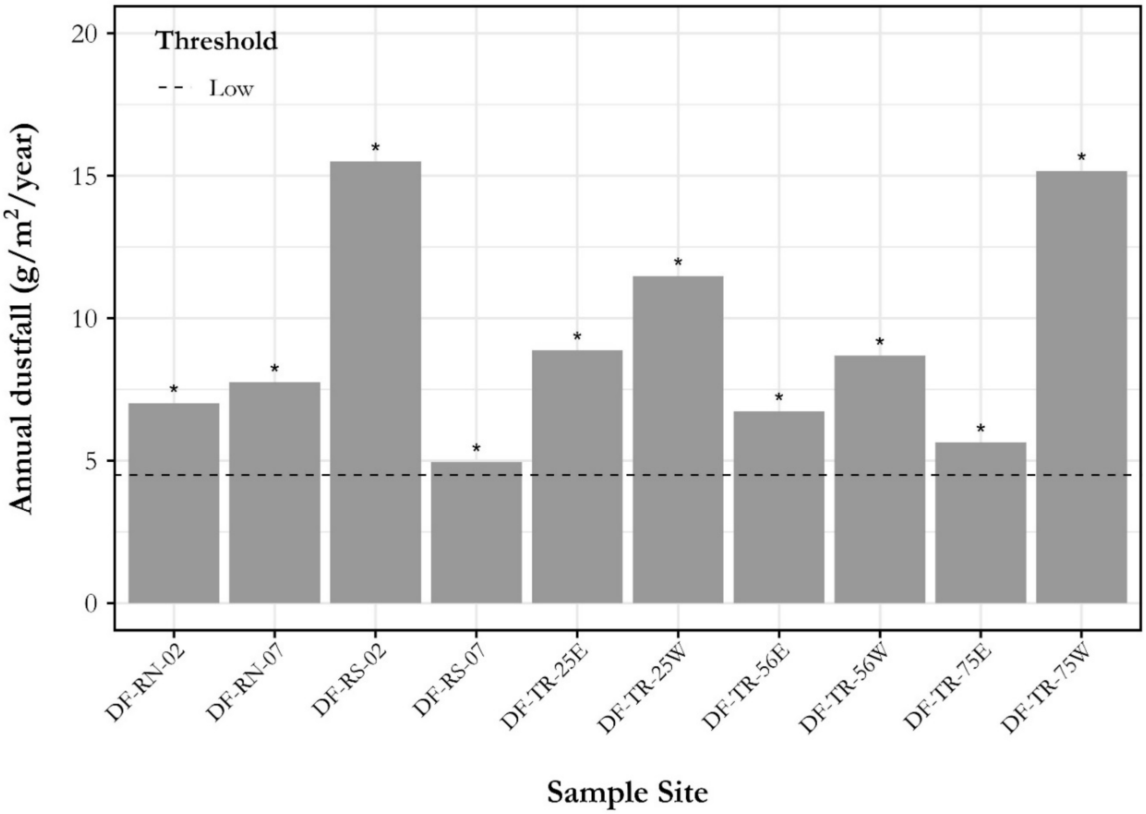


Figure 7-10. Total annual dustfall (g/m²/year) at the Tote Road sites located 1,000 m distance from the centreline. *The dashed horizontal line shows low dust isopleth upper limits. The asterisk (*) denotes that the annual dustfall was greater than projected by the predicted isopleth.*

7.3.3 INTER-ANNUAL TRENDS

7.3.3.1 Seasonal Dustfall

Mine Site — Following 2022, which had elevated dustfall deposition rates, dustfall in 2023 returned to levels consistent with previous years. It is believed that the decreases seen in 2023 were associated with wetter conditions during the summer months (refer to Section 4) combined with increased mitigations at the crusher (i.e., use of DusTreat, refer to Section 7.2). Inter-annual patterns across time were best represented by differences in months (AICc = 930.87) rather than year-specific fluctuations (ΔAIC = 22.46) or a common fluctuation across time (ΔAIC = 11.64). The strongest evidence was for the effect of month (F_{11} = 5.27, $P < 0.0001$). Although some evidence for an effect of year (F_8 = 2.14, P = 0.03; Figure 7-11) was detected, greater statistical support was evident for a month-only model over a model with both month and year effects (ΔAIC = 930.87 versus 932.94, respectively). The greatest mean differences were between August versus March, April, and May (all $P < 0.0001$) and between April versus February and March (all $P < 0.01$). Averaged across all years, the greatest geometric mean daily dustfall rates were in April (3.08 mg/dm²·day [95% CI = 1.44 to 6.59]) and May (3.05 mg/dm²·day [95% CI = 1.34 to 6.93]). The lowest geometric mean daily dustfall rates were in August (0.79 mg/dm²·day [95% CI = 0.36 to 1.70]) and December (1.16 mg/dm²·day [95% CI = 0.53 to 2.53]) across all years.

Milne Port — Inter-annual 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 the ore stockpiles from 2013 to 2019 and was decommissioned as a site in May 2019. Site DF-P-08 replaced site DF-P-01 as a sample site but was placed at a distance >1,000 m from the PDA, which is expected to experience lower dust quantities than sites at the PDA. Therefore, these sites were removed from analyses because the 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 differences in months and years (AICc = 1,289.48) rather than year-specific fluctuations (ΔAIC = 10.68) or a common fluctuation across time (ΔAIC = 27.46). The month ($F11 = 7.84$, $P < 0.0001$) and year ($F8 = 4.18$, $P < 0.0001$) effects were statistically significant. Geometric mean daily dustfall rates were consistently highest in April and October of each year. Among years, dustfall was highest in 2018/2019 and lowest in 2015/2021 (Figure 7-12).

Geometric mean daily dustfall rates were relatively low in 2023 compared to most other years (except 2015 and 2021) (e.g., a high of 1.40 mg/dm²·day [95% CI = 0.24 to 8.28] in April and a low of 0.41 mg/dm²·day [95% CI = 0.07 to 2.44] in December. Highs and lows across months were most pronounced in 2018 (e.g., high of 2.19 mg/dm²·day [95% CI = 0.36 to 13.19] in April and low of 0.64 mg/dm²·day [95% CI = 0.10 to 0.39] in December) (Figure 7-12).

Tote Road — Dustfall along the Tote Road has been consistently elevated from April through October. This corresponds with early spring melt, summer, and early fall freeze-up. During the winter season (i.e., when conditions are consistently frozen) dustfall is significantly less.

North Crossing, Tote Road KM 28 — Similar to the Mine Site, inter-annual patterns across time were best represented by differences in months and years (AICc = 962.84) rather than year-specific fluctuations (ΔAIC = 157.05) or a common fluctuation across time (ΔAIC = 148.75). Strong evidence for an effect of month ($F11 = 65.90$, $P < 0.0001$; Figure 7-13) and year ($F7 = 4.9$, $P < 0.0001$) with a two-way analysis of variance (ANOVA) was detected, but normality and homoscedasticity assumptions were violated. Pairwise Wilcoxon tests revealed that the greatest differences in dustfall were between February and May, June, and July (all $P < 0.0001$). Geometric mean daily dustfall was highest in June 2020 (7.57 mg/dm²·day [95% CI = 6.43 to 9.03]) and lowest in February 2019 (0.38 mg/dm²·day [95% CI = 0.33 to 0.46]).

South Crossing, Tote Road KM 78 — Inter-annual patterns across time were best represented by differences in months and years (AICc = 1,019.85) rather than year-specific fluctuations (ΔAIC = 255.67) or a common fluctuation across time (ΔAIC = 255.47). Strong evidence for an effect of month ($F11 = 105.57$, $P < 0.0001$) and year ($F8 = 7.95$, $P < 0.0001$) with a two-way ANOVA was detected, but normality and homoscedasticity assumptions were violated. Pairwise Wilcoxon tests revealed that the greatest differences in dustfall were between June and January, February, March, and December (all $P < 0.0001$). The greatest geometric mean daily dustfall occurred in May, June, and July for all years (Figure 7-14); the greatest values were associated with 2020 (15.52 mg/dm²·day [95% CI = 13.31 to 18.18] in June and 11.42 mg/dm² day

[95% CI = 9.38 to 13.76] in July). The lowest geometric mean daily dustfall occurred in February for most years; the lowest values were associated with February 2017 (0.28 mg/dm²·day [95% CI = 0.23 to 0.33]).

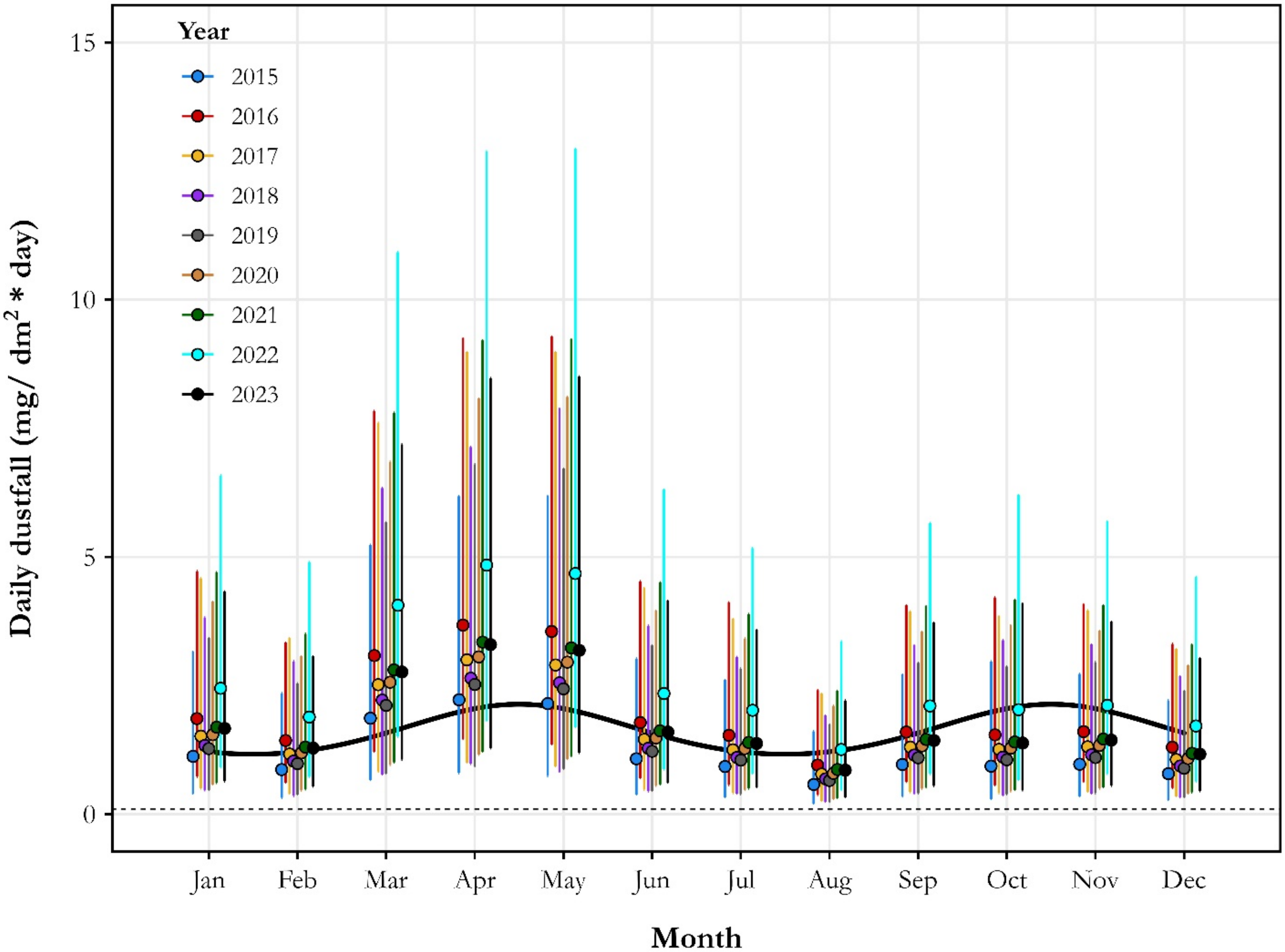


Figure 7-11. Inter-annual mean daily dustfall (mg/dm²·day) at the Mine Site (2015 to 2023).
Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the log_e scale and back-transformed to the natural scale. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.

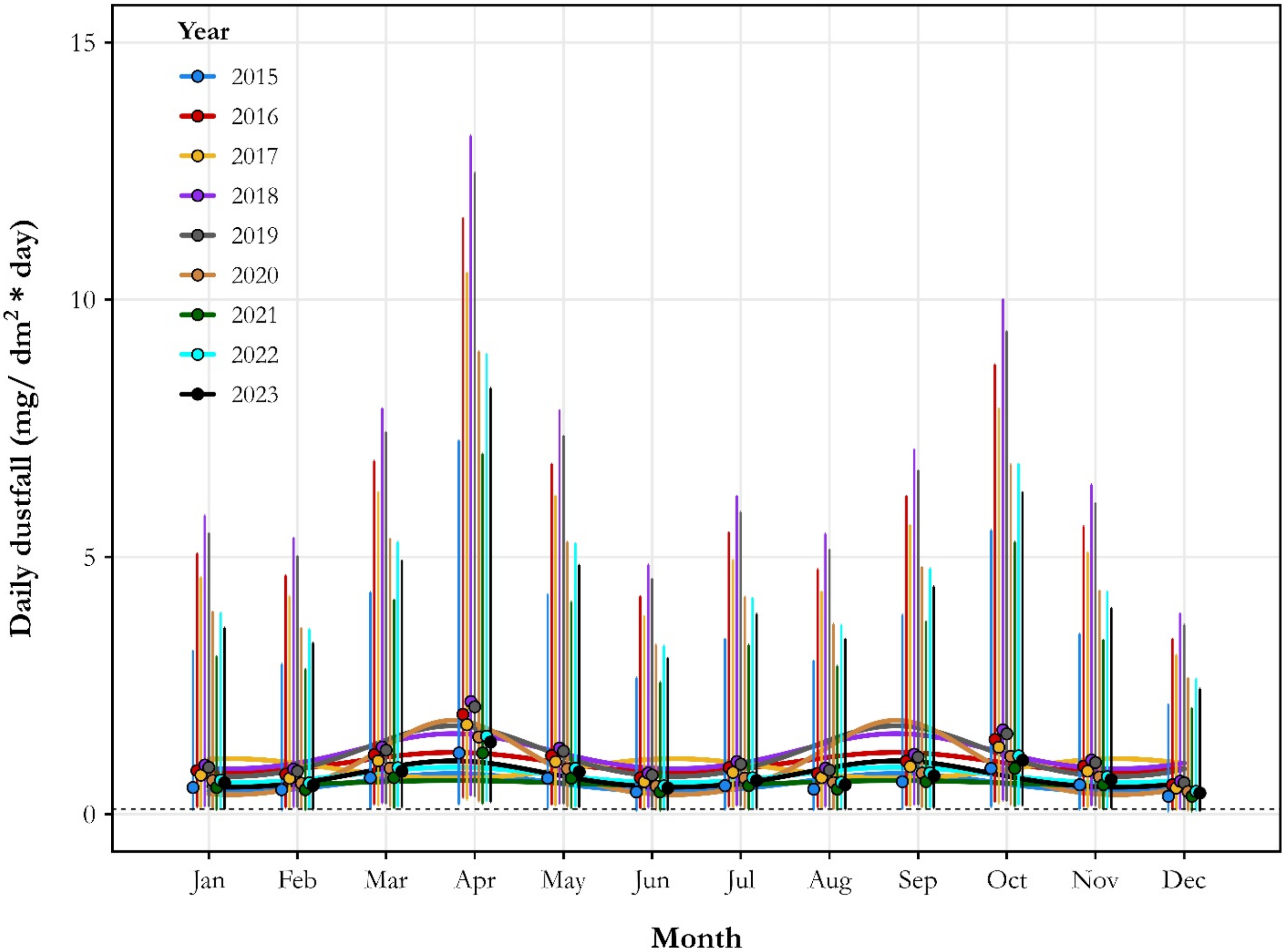


Figure 7-12. Inter-annual mean daily dustfall (mg/dm²·day) at Milne Port (2015 to 2023).
Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the $\log_e$ scale and back-transformed to the natural scale. Lines correspond with sinusoidal functions relative to each year. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.

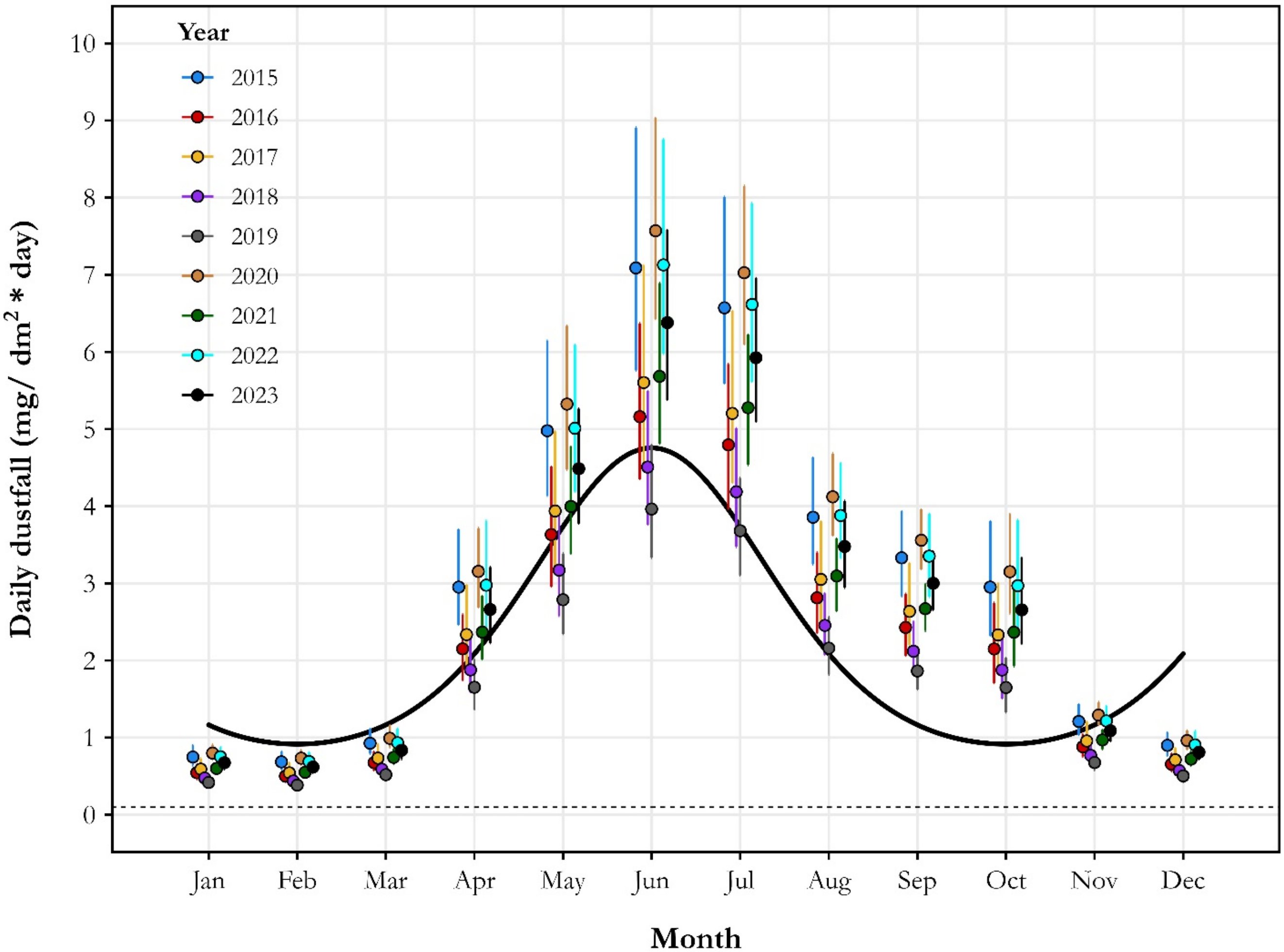


Figure 7-13. Inter-annual mean daily dustfall (mg/dm²·day) at the Tote Road north crossing (KM 28; 2015 to 2023). *Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the log_e scale and back-transformed to the natural scale. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.*

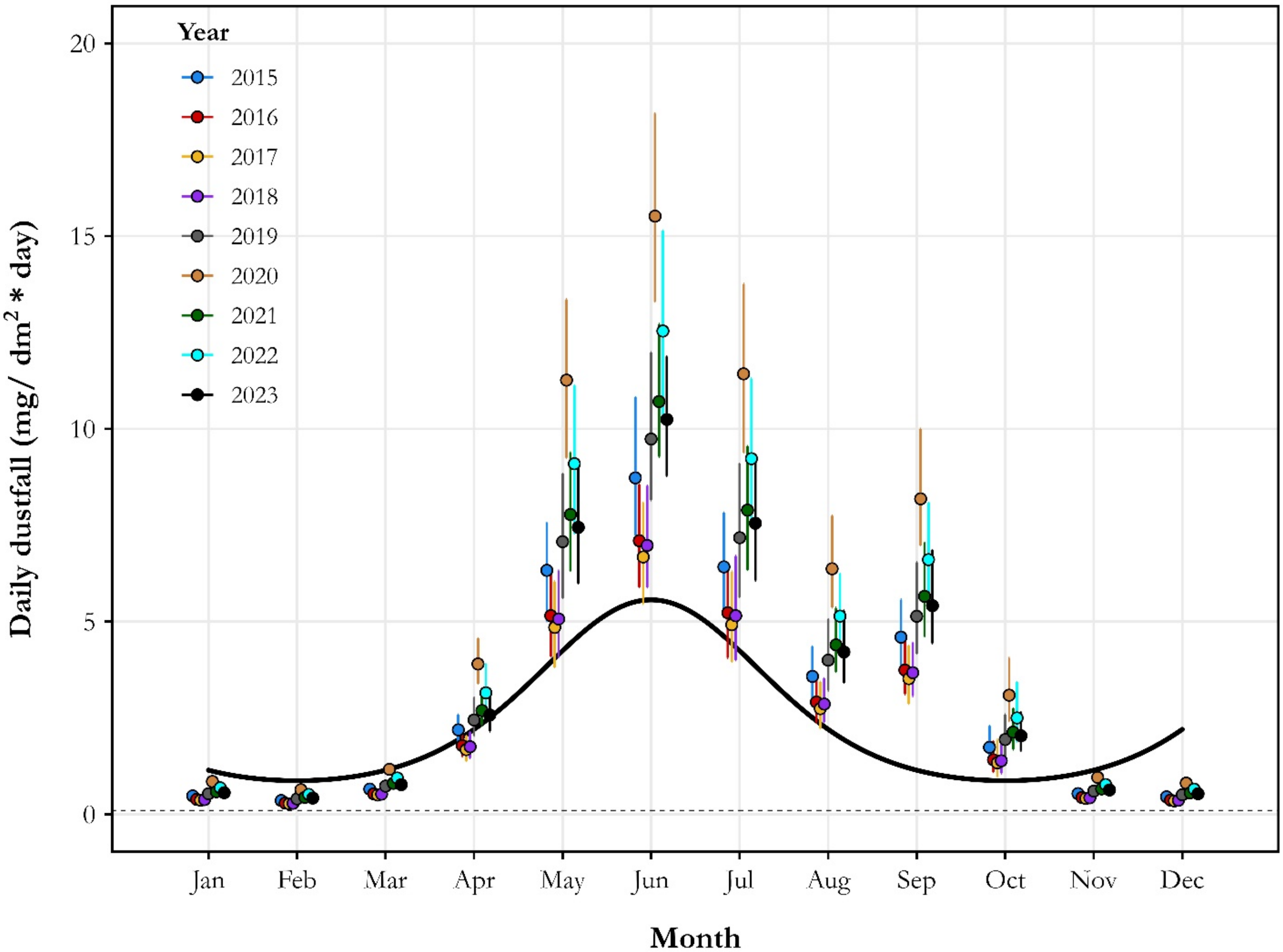


Figure 7-14. Inter-annual mean daily dustfall (mg/dm²·day) at the Tote Road south crossing (KM 78; 2015 to 2023). *Points show geometric mean daily dustfall with 95% confidence intervals. Confidence intervals are asymmetrical because dust data were analyzed on the $\log_e$ scale and back-transformed to the natural scale. The dashed horizontal line indicates the minimum detection limit for dust samples and the maximum dustfall rate at Reference sites unaffected by the Project.*

7.3.3.2 Total Annual Dustfall

From 2014 to 2016, dustfall across the PDA increased, corresponding with an increase in mine production. In 2016, production increased from 0.5 to 2.5 mtpa, corresponding with increased dustfall; however, from 2016 to 2020, dustfall generally plateaued with only modest increases/decreases in some Project areas. Post-2016 decreases in dustfall appear to correspond with the implementation of additional dustfall mitigation strategies, though there continues to be some 'noise' that is believed to be associated with climate variations, specifically the number of days with measurable rainfall. Dustfall deposition in 2023 was within the ranges observed in previous years across the Project area (Figure 7-15).

The Mine Site dustfall monitoring station DF-M-01 has recorded variable dustfall throughout all monitoring years. An increasing trend was observed from 2019 to 2021, followed by a decrease in 2022 and again in 2023. Dustfall at DF-M-02 and DF-M-03 remained relatively consistent from 2018 to 2021, increased in

2022, and then decreased substantially in 2023. The 2022 increase was likely associated with dry summer conditions while the 2023 decrease was likely associated with increased precipitation days (refer to Section 4).

Dustfall deposition at the Milne Port monitoring sites has remained relatively consistent since 2020. Dustfall at DF-P-05 decreased from 2018 to 2021 and increased slightly from 2022 to 2023. Dustfall has remained consistent at DF-P-04, DF-P-06, DF-P-07, and DF-P-08.

Dustfall along the Tote Road at the north crossing (KM 28) monitoring stations has remained relatively constant since 2019. Dustfall along the Tote Road at the south crossing (KM 78) monitoring stations 30 m from the road has been variable over the years but shows no consistent increasing or decreasing trends. Dustfall at the monitoring stations 100 m from the road has been consistent since 2015, the first full year of dustfall monitoring during mine operations.

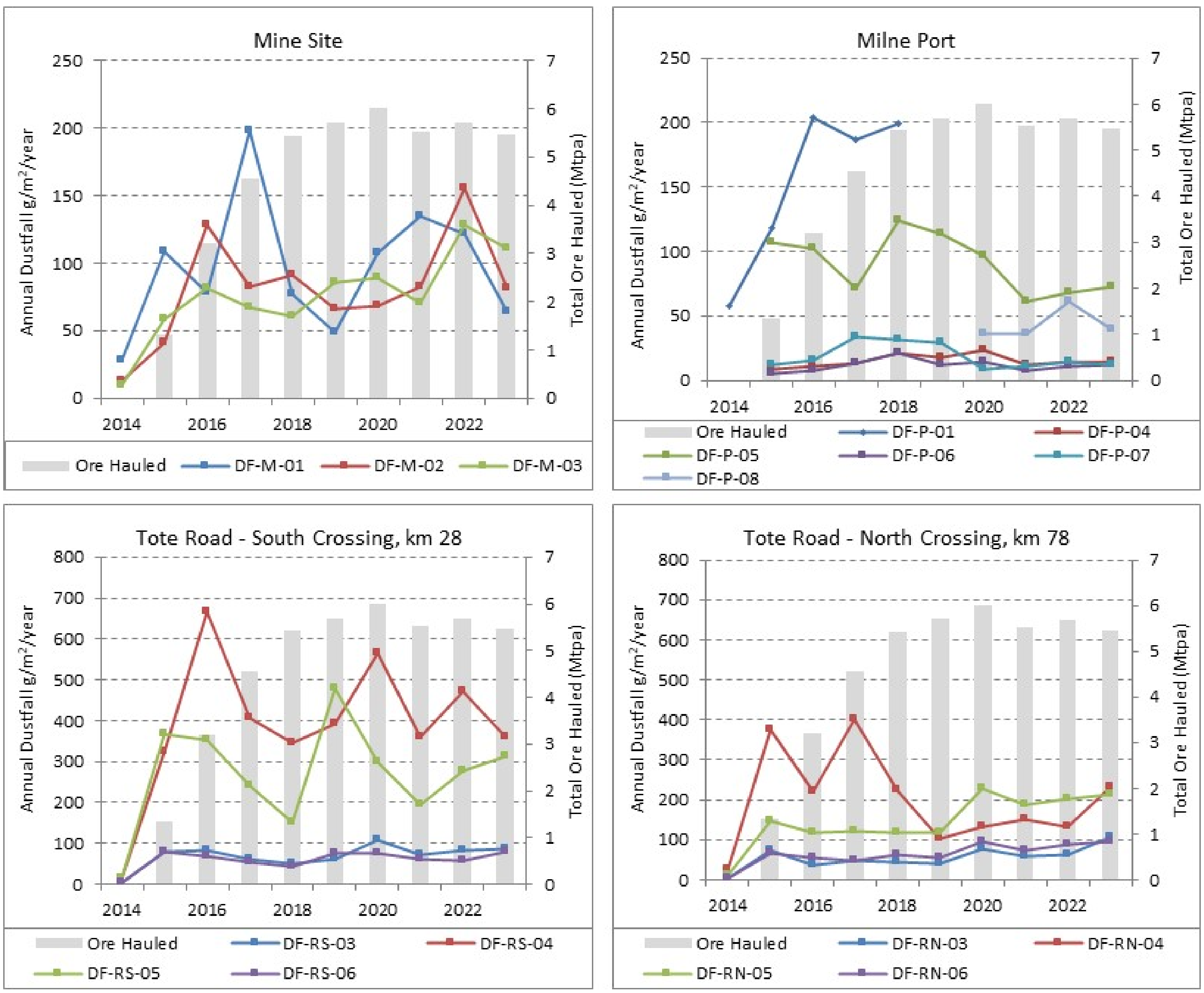


Figure 7-15. Year-over-year annual dustfall (g/m²/year) in relation to total ore hauled to Milne Port.

7.4 DUSTFALL IMAGERY ANALYSIS

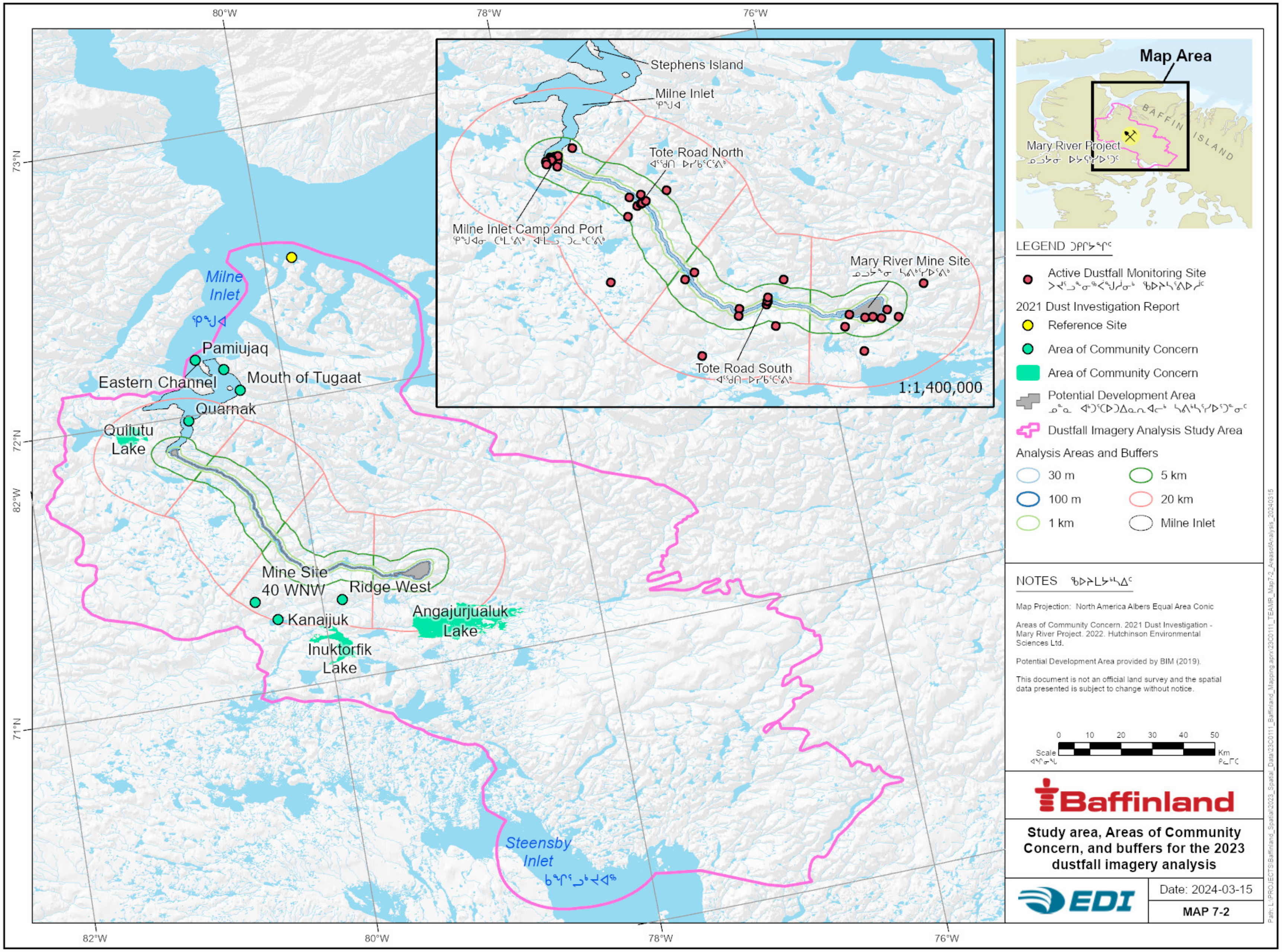
7.4.1 METHODS

Analysis of remotely sensed imagery was deemed appropriate and beneficial for estimating the spatial extents of dustfall at the Project, given (1) the high contrast and visibility of dust on the landscape[9] and (2) the detectability of dust using multispectral analysis. Dust and snow have different spectral characteristics affecting light absorption/reflection of different wavelengths. Multispectral bands (e.g., visible, near-infrared, and shortwave) of satellite imagery can differentiate dust and snow reflectance values, allowing for automated extraction of pixels representing dust coverage using comparisons of the various multispectral bands (i.e., band ratios).

7.4.1.1 Study Area

Dustfall imagery analysis has been used to estimate dustfall extent at the Project since 2020. The expanded Study Area (Map 7-2), developed in 2022, includes the 2008 Regional Study Area and Areas of Community Concern. Areas of analysis include the PDA and 30 m, 100 m, 1 km, 5 km, and 20 km buffers. The buffers were divided into five component areas: Mine Site, Milne Port, the Tote Road north, the Tote Road south, and Milne Inlet, including the inlet up to the north end of Stephens Island (Map 7-2).

[9] At ground level, dust on the snow can be visible at dustfall deposition levels as low as 0.1 to 0.2 g/m^2 (Li et al. 2013).


Stephens Island
Milne Inlet
Tote Road North
Milne Inlet Camp and Port
Mary River Mine Site
Tote Road South
1:1,400,000
Milne Inlet
Pamiujaq
Mouth of Tugaat
Eastern Channel
Quarnak
Qulutu Lake
Mine Site 40 WNW
Ridge West
Kanajjuk
Angajurjualuk Lake
Inuktorfik Lake
Steensby Inlet
80°W
78°W
76°W
82°W
73°N
72°N
71°N
Map Area
BAFFIN ISLAND
Mary River Project
LEGEND
Active Dustfall Monitoring Site
2021 Dust Investigation Report
Reference Site
Area of Community Concern
Area of Community Concern
Potential Development Area
Dustfall Imagery Analysis Study Area
Analysis Areas and Buffers
30 m
100 m
1 km
5 km
20 km
Milne Inlet
NOTES
Map Projection: North America Albers Equal Area Conic
Areas of Community Concern. 2021 Dust Investigation - Mary River Project. 2022. Hutchinson Environmental Sciences Ltd.
Potential Development Area provided by BIM (2019).
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
Scale
Km
Baffinland
Study area, Areas of Community Concern, and buffers for the 2023 dustfall imagery analysis
EDI
Date: 2024-03-15
MAP 7-2

7.4.1.2 Imagery Acquisition

Imagery from Landsat 8 Operational Land Imager (OLI), Landsat 9 Operational Land Imager-2 (OLI-2), and Sentinel-2 Multispectral Instrument (MSI) sensors were used in the dustfall extent image analysis (Table 7-5). Landsat data are available from the United States Geological Survey and have a revisit time of eight days with the combined satellites (U.S. Geological Survey 2022). Sentinel-2 data are available from the European Space Agency and have a revisit time of five days (European Space Agency 2020a). Images between March 15 and May 15, 2023, were selected for the dustfall imagery analysis. This period was chosen for extensive snow cover and available light. 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 from the United States Geological Survey EarthExplorer website (U.S. Geological Survey 2023) and the Copernicus Open Access Hub (European Space Agency 2023). The surface reflectance product contains georeferenced images corrected for topography and atmospheric conditions, giving reflectance values for each pixel as they appear at the Earth's surface (European Space Agency 2020b, Jenkerson 2023). Landsat images came with pixel quality masks identifying pixels representing clouds, cloud shadows, snow and saturated pixels. Sentinel-2 images came with a classification mask, including categories for saturated/defective pixels, clouds and cloud shadows, water, vegetation, non-vegetated areas and snow.

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

Mission	Analysis Years	Sensor	Image Tiles	Bands[1]	Resolution
Landsat 5	2004–2011 (baseline)	Thematic Mapper (TM)	26-11, 27-10, 27-11, 28-10, 28-11, 29-10, 30-09, 30-10, 31-09, 31-10, 32-09, 32-10, 33-09 and 34-09	Band 2: G 0.52–0.60 µm Band 3: R 0.63–0.69 µm	30 m 30 m
Landsat 8	2013 (baseline) 2014–2022	Operational Land Imager (OLI)	26-11, 27-10, 27-11, 28-10, 28-11, 29-10, 30-09, 30-10, 31-09, 31-10, 32-09, 32-10, 33-09 and 34-09	Band 3: G 0.53–0.59 µm Band 4: R 0.64–0.67 µm	30 m 30 m
Landsat 9	2022	Operational Land Imager-2 (OLI-2)	26-11, 27-10, 27-11, 28-10, 28-11, 29-10, 30-09, 30-10, 31-09, 31-10, 32-09, 32-10, 33-09 and 34-09	Band 3: G 0.53–0.59 µm Band 4: R 0.64–0.67 µm	30 m 30 m
Sentinel-2	2019–2022	Multispectral Instrument (MSI)	16WFE, 16XFF, 17WMV, 17WNT, 17WNU, 17WNV, 17WPT, 17WPU, 17WPV, 17XMA, 17XNA, 18WVC, 18WVD, 18WVE	Band 3: G 0.54–0.58 µm Band 4: R 0.65–0.68 µm	20 m 20 m

[1] G = Green and R = Red.

7.4.1.3 Image Preprocessing

R version 4.2.2 (R Development Core Team 2023a) and ArcGIS Pro 3.2 (ESRI 2023) were used to process and analyze the images. Saturated pixels were excluded from the analysis using the provided masks. Saturated pixels occur when the high reflectance of the surface (e.g., fresh snow) is beyond the sensor's range, causing sensor saturation. For Landsat images, saturated pixel masks were derived from the radiation saturation quality band and cloud masks were generated from the pixel quality band. For Sentinel-2 images, the provided classification masks were used to remove all pixels not classified as snow. Cloud masks were generally not adequate to remove clouds. A visual check was conducted to remove images with identifiable clouds (i.e., images 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. Sentinel-2 images with a zenith angle >70° were also excluded from analysis as recommended in the technical guide (Louis and L2A Team 2021). The resulting image database represented high-quality satellite images within the Study Area from mid-March to mid-May for 2023, when dust should be detectable against a snow-covered landscape with minimal spectral or atmospheric interference.

The surface reflectance values of the red and green bands were also corrected for topographic illumination as analysis in previous years showed artifacts on south-facing slopes in the Snow Darkening Index (SDI). The terrain correction was based on the sun's position, slope and aspect. For each image, an illumination angle raster was calculated using the equation below, where γ_i is the incidence angle, θ_s is the solar zenith angle, η_i is the slope angle, Φ_a is the solar azimuth angle and Φ_o is the aspect (Civco 1989, Colby 1991, Hantson and Chuvieco 2011).

$$\cos\gamma_i = \cos\theta_s \cos\eta_i + \sin\theta_s \sin\eta_i \cos(\Phi_a - \Phi_o)$$

The resulting illumination angle raster was used in the C-correction method (Teillet et al. 1982, Hantson and Chuvieco 2011) to create a new raster for the red and green bands with topographically corrected reflectance values.

The corrected reflectance values of each band, $\rho_{\lambda,h,i}$, were calculated, where $\rho_{\lambda,i}$ is the original band reflectance and c_λ (C-correction) is the empirical constant calculated for each band.

$$\rho_{\lambda,h,i} = \rho_{\lambda,i}\left(\frac{\cos\theta_s + c_\lambda}{\cos\gamma_i + c_\lambda}\right)$$

$$c_\lambda = \left(\frac{b_\lambda}{m_\lambda}\right)$$

The constant was determined from the regression coefficients, b_λ and m_λ, between the illumination and the band reflectance.

$$\rho_{\lambda,i} = b_\lambda + m_\lambda \cos\gamma_i$$

7.4.1.4 Image Analysis

The 2023 dustfall imagery analysis focused on identifying, extracting and quantifying mineral dust produced from mining activities at the Project. The image bands used for the 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. The SDI, (red−green)/(red+green), was used in the analysis 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 values ranged from -1 to 1, with positive values representing dust.

An SDI layer was calculated for each image from the original red and green bands (Figure 7-16A and D) and the terrain-corrected red and green bands (Figure 7-16B and E). A mask of waterbodies and flat areas was created to combine the two SDI layers because flat areas do not require terrain correction. The resulting single SDI layer used the original SDI values within the mask and the terrain-corrected SDI values for all other areas (Figure 7-16C and F).

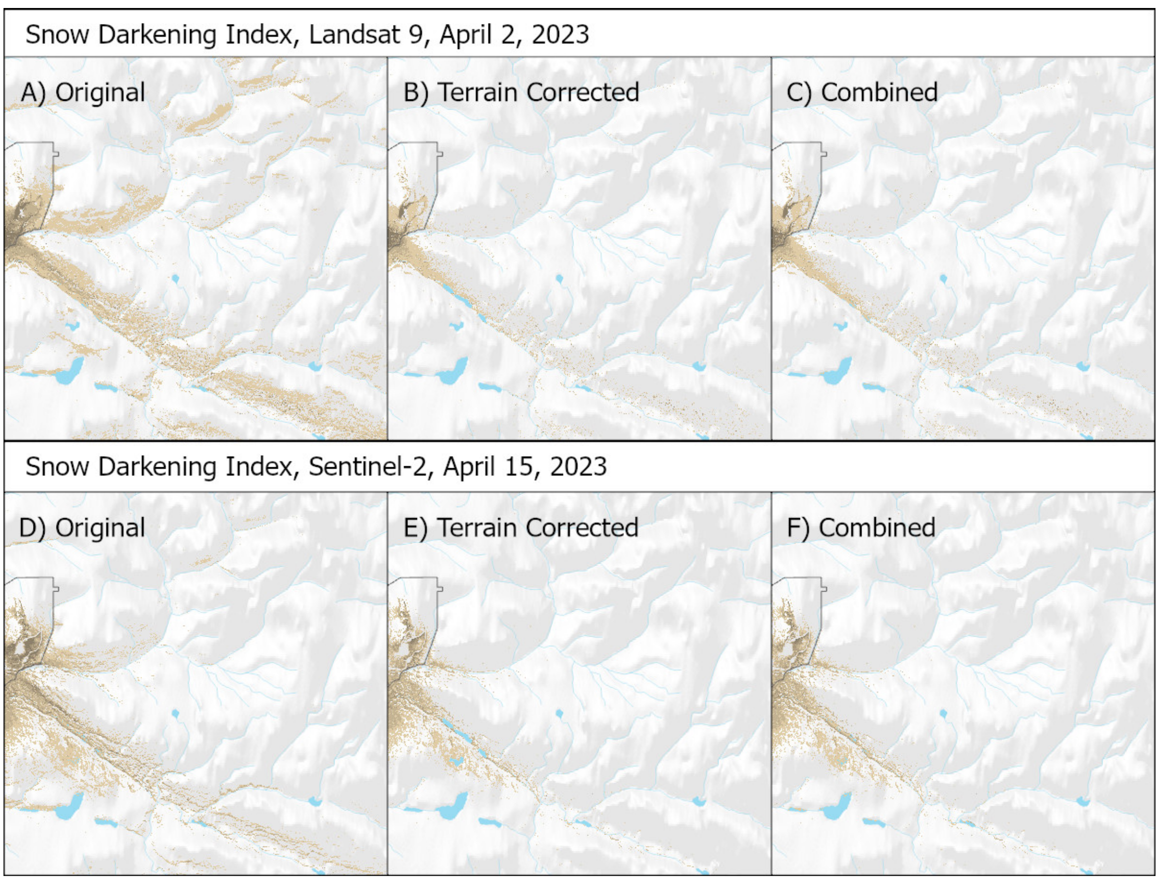


Figure 7-16. Landsat and Sentinel-2 examples of the Snow Darkening Index (SDI) results for the original imagery (A/D), terrain corrected imagery (B/E) and combined SDI (C/F).

7.4.1.5 Dustfall Extent and Magnitude

Satellite-derived dustfall concentration was estimated from the relationship between dustfall accumulation calculated from the dustfall deposition rates measured by the passive dustfall monitors and the SDI values from the imagery analysis. For each satellite image, a period of dustfall was determined, where the start date was the last snowfall event, and the end date was the date of the image. For 2022 and 2023 data, snowfall events were determined from daily recorded weather observations and precipitation measured at the Mine Site or Milne Port weather stations. For 2014 to 2021 data, on the precipitation and temperature (below freezing) were used (daily recorded weather observations not available). Dustfall accumulation (g/m^2) was calculated as the sum of the daily dustfall over each image period. SDI values were extracted from each image at dustfall monitor sites (Map 7-2) and compared with the calculated dustfall accumulation.

Landsat and Sentinel-2 images were processed separately because the SDI values between the two image datasets were determined to be significantly different (mean difference = 0.0099 [CIs = 0.0096–0.0102]; t2161 = 57.65, P <0.0001) in the 2022 TEAMR (EDI Environmental Dynamics Inc 2023c). Linear regression models were developed for each dataset and applied to the individual SDI layers. The resulting dustfall concentration layers from all images (Sentinel-2 and Landsat) were combined into a 2023 composite dataset, taking the maximum concentration at each pixel. The 2023 composite dataset represented the maximum dustfall extent and concentration within the Study Area between March 17 and May 8, 2023. Composite datasets were also recreated for the pre-baseline (2004 to 2013) and post-baseline (2014 to 2023) years to incorporate the expanded dustfall imagery analysis Study Area and the terrain-corrected SDI. Composite datasets and subsequent analysis were conducted using the North American Albers Equal Area Conic spatial reference and a 30 m pixel size.

A baseline dustfall concentration layer was created from the mean concentration of the composite datasets from 2004 to 2011 and 2013, representing the mean background dust extent and concentration before the construction of the Project. The baseline dataset was subtracted from the 2023 and previous post-baseline (2014 to 2022) dustfall concentration datasets to convey the spatial extent and estimated dustfall concentrations possibly produced by Project activities. To represent annual variability in the baseline dataset, dustfall concentration datasets were created for a high concentration and extent year (2004) and a low concentration and extent year (2013). The baseline dataset was subtracted from the high and low baseline years to allow for comparison with the post-baseline datasets.

Mean dustfall concentration was calculated within the PDA and the 30 m, 100 m, 1 km, 5 km, and 20 km buffers for the Mine Site, Milne Port, Milne Inlet, the Tote Road north and the Tote Road south areas (Map 7-2). For the Areas of Community Concern, mean dustfall concentration was calculated within the lake boundaries or a 100 m buffer around a point feature to sample multiple pixels in the area.

Dustfall concentrations were classified into six classes (i.e., <1, 1–4.5, 4.5–10, 10–20, 20–40 and >40 g/m^2) and analyzed for each component of the Study Area (i.e., Mine Site, Milne Port, Milne Inlet, the Tote Road north and the Tote Road south). The area was calculated by multiplying the number of pixels within each class by the area of the pixel (i.e., 900 m^2 for a 30 m pixel resolution).

7.4.1.6 Surface Snow Sampling Pilot Study

Calculated dustfall accumulation from the passive dustfall monitor deposition rates can provide an estimate of dustfall concentration to apply to the SDI values. This approach assumes no redistribution of dust after deposition and relies on estimating the period over which accumulation occurs. However, the SDI is a measure of the magnitude of mineral dust concentration on the snow surface at the time of image acquisition, which is influenced by dust deposition and redistribution.

To investigate a potential method for estimating the dust concentration visible in the imagery, surface snow samples were collected based on the methods of Mauro et al. (2015). Satellite image acquisition dates were provided along with the general location (i.e., Milne Port or Mine Site) to help time field sampling with image capture. Building off the snow samples collected in 2022, surface snow samples were collected in 2023 between May 6 and May 15. The following procedures were conducted during field sampling to provide quality assurance and quality control (Baffinland Iron Mines Corporation 2022b):

- The 2.5 gallon high-density polyethylene pails used for sample collection were rinsed with deionized water three times.
- New nitrile gloves were worn during each sample collection and sample set collections.
- A 1.4 m x 1.4 m (2 m²) square was measured on the snow surface, and the top 5 cm of the snowpack was transferred to a plastic pail using a plastic shovel.
- Samples were melted under cool conditions (≤4°C).
- Samples were stirred and agitated using a clean spatula.
- Bottles were rinsed three times with melt water before being filled, and a new syringe (no filter) was used for each site to fill the bottles.
- Field duplicates, field blanks, travel blanks and equipment blanks were collected.

Sample bottles, duplicates and blanks were sent to the ALS Environmental Laboratory in Waterloo, Ontario, to analyze Total Suspended Solids (units of mg/L) and a suite of metals. Only the Total Suspended Solids measurements were used for comparison with SDI values.

SDI values were extracted from Landsat and Sentinel-2 images acquired on the same date as the surface snow samples. A non-linear regression was created using R version 4.2.2 (R Development Core Team 2023a) and the rational function from Mauro et al. (2015) for mineral dust versus SDI measured from hyperspectral data collected from a spectroradiometer.

$$f(x) = \frac{p_1 x + p_2}{x + q_1}$$

A range of starting values were used for p_1 (0.05 to 0.5), p_2(-10.5 to -0.5), and q_1(0 to 1,000) and the mean of the resulting coefficients was used as the final starting value for the model. Residual diagnostic plots were examined to confirm assumptions of normality and equality of variance in the residuals.

7.4.2 RESULTS AND DISCUSSION

7.4.2.1 Scene Distribution

There were 68 suitable Sentinel-2 images in 2023, and 56 suitable Landsat images in 2023 (Table 7-6), both with more images than in 2022. For 2023, most Sentinel-2 images were from late April and early May (Figure 7-17A). The number of suitable Landsat images was highest in late March and late April (Figure 7-17A). Both satellite image datasets had good spatial coverage and multiple images for all areas within the Study Area (Figure 7-17B).

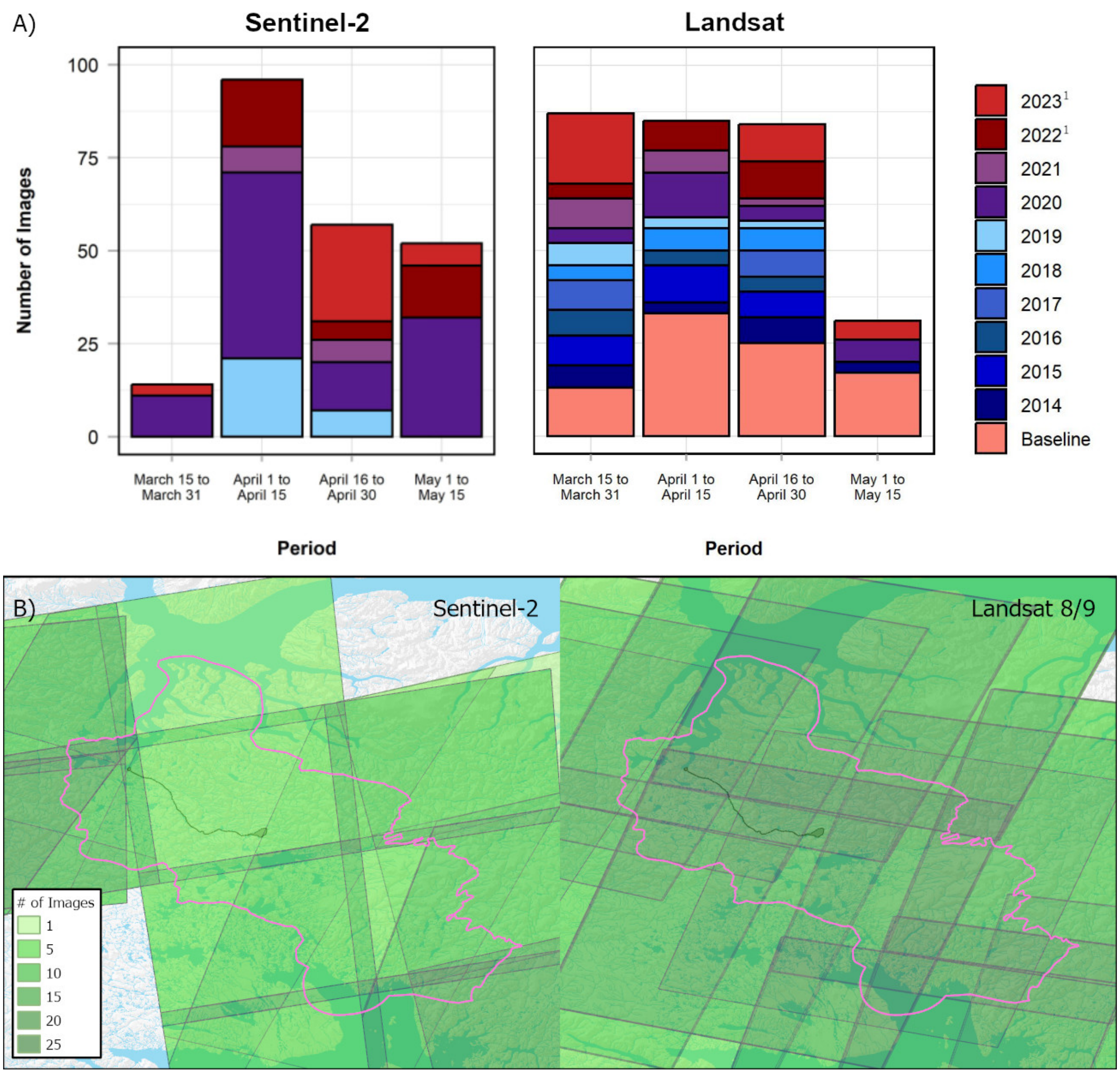


Figure 7-17. A) Sentinel-2 and Landsat images per year for dustfall imagery analysis (March 15 to May 15) and B) the spatial coverage of the 2023 imagery.

1 *Landsat imagery included Landsat 9 data.*

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

Satellite	Baseline (2004 to 2013)[1]	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Landsat 5	76	–	–	–	–	–	–	–	–	–	–
Landsat 8	12	19	25	15	15	16	11	26	16	12	28
Landsat 9	–	–	–	–	–	–	–	–	–	12	28
Sentinel-2	–	–	–	–	–	–	28	106	13	37	68

7.4.2.2 Dustfall Concentration Estimation

The linear regression models used dustfall accumulation between the image acquisition date and the last snowfall event using the deposition rates from the passive dustfall monitoring sites. The 2021 data were excluded due to issues with the precipitation measurements. The relationship between the dustfall accumulation Df and the SDI values from Landsat imagery SDI_L is presented in Figure 7-18; the equation is provided below (F_{1205} = 152.1, P <0.0001, R^2 = 0.11).

$$SDI_L = 0.00148 \times Df \ + 0.00532$$

The relationship between the dustfall accumulation Df and the SDI values from Sentinel-2 imagery SDI_{S2} is presented in Figure 7-19; the equation is provided below (F_{260} = 121.2, P <0.0001, R^2 = 0.32).

$$SDI_{s2} = 0.00338 \times Df \ + 0.0166$$

The Sentinel-2 linear model had a higher R^2 value than the Landsat linear model but was limited to lower dustfall accumulation values. The weak relationships may indicate other factors involved, such as dust dispersion. However, the linear models can estimate dust concentration from the SDI values derived from the satellite imagery to identify general spatial variability and temporal trends.

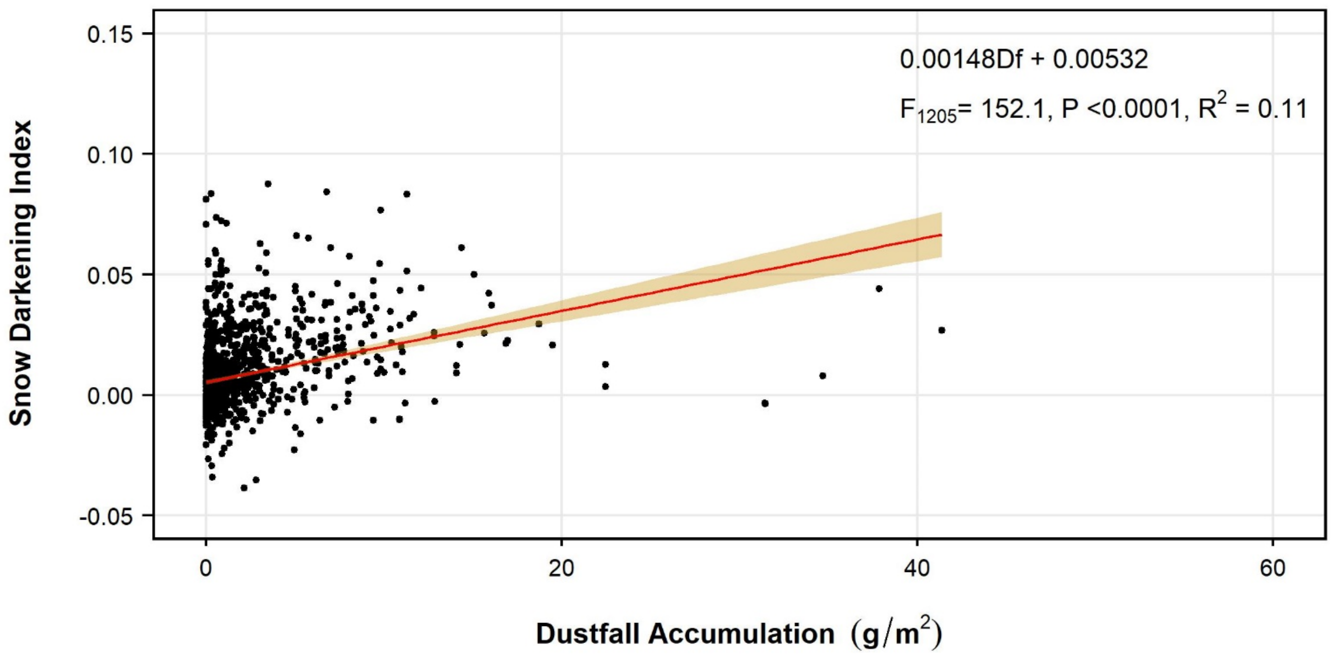


Figure 7-18. Relationship between calculated dustfall accumulation from passive dustfall deposition rates and Landsat 8/9 Snow Darkening Index.

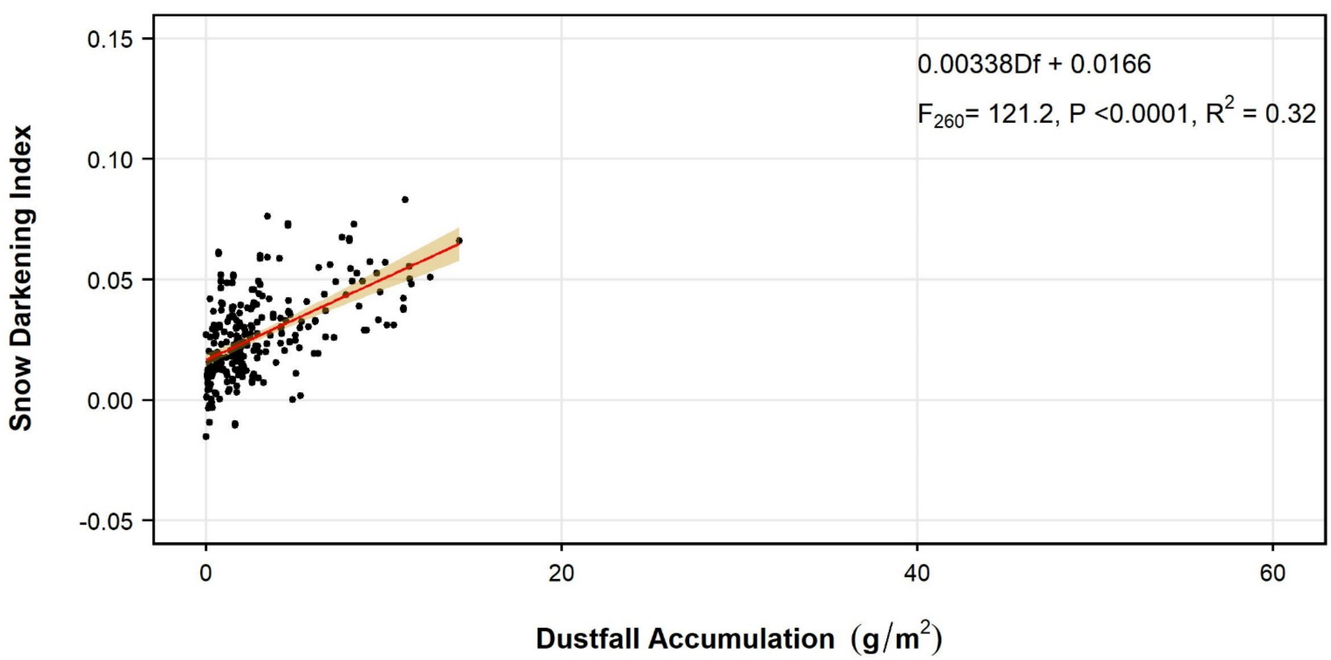


Figure 7-19. Relationship between calculated dustfall accumulation from passive dustfall deposition rates and Sentinel-2 Snow Darkening Index.

7.4.2.3 Interpretive Considerations

The following factors are considered when interpreting the results of the dustfall imagery analysis:

- Dust concentrations from remote sensing are estimates and represent the total dustfall accumulation over the satellite image capture period (i.e., mid-March to mid-May). These values are not equivalent to annual dustfall deposition.
- Clouds, snowfall events, early snow melt and timing of image acquisition affect the availability of suitable images. Consequently, the dustfall captured in these images will vary annually and may not indicate the maximum dust extent and concentration.
- The baseline dustfall data holds variability between assessment years. Mean dust concentration was used for the analysis; some baseline assessment years may have recorded higher dust concentrations (Figure 7-20A and B). The resulting dustfall extents and concentrations for post-baseline years may have a component of natural dust occurrence for years with higher natural dust. Examples of natural dust sources, such as cliffs and exposed ground, are presented in Figure 7-20C and D. To represent the baseline variability, data from 2004 (high concentration and extent) and 2013 (low concentration and extent) are presented with the inter-annual post-baseline results.
- South-facing slopes and bare ground may inadvertently contribute to the dust extent and concentration (Figure 7-20E and F). The baseline dataset accounts (to a limited extent) for this effect along with the applied terrain correction, but these circumstances may still affect data interpretations.

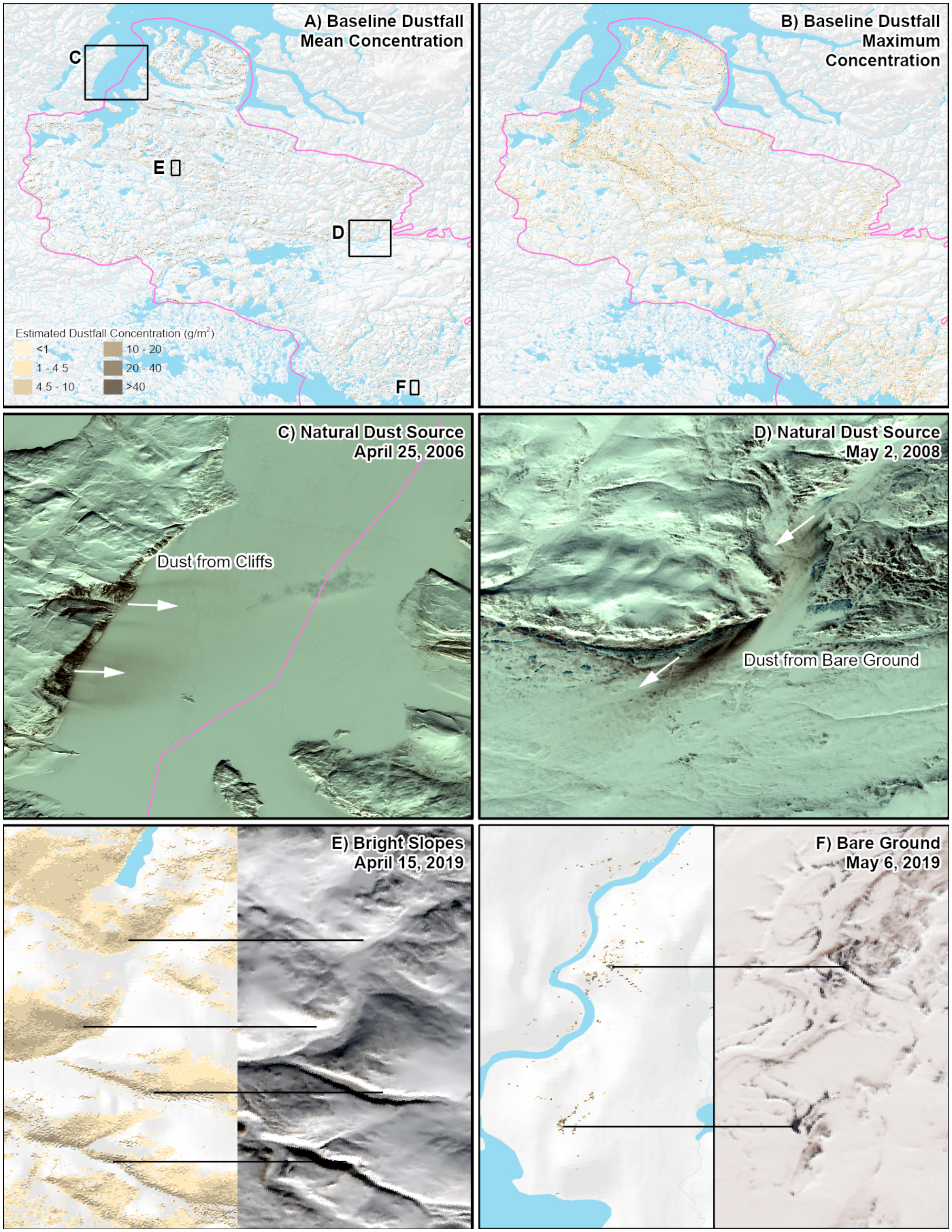


Figure 7-20. Examples of interpretive considerations for the dustfall imagery analysis. A) Baseline dustfall mean concentration, B) baseline dustfall maximum concentration, C-D) natural dust sources from baseline imagery, E) bright slopes, and F) bare ground.

7.4.2.4 Magnitude and Extent of 2023 Dustfall

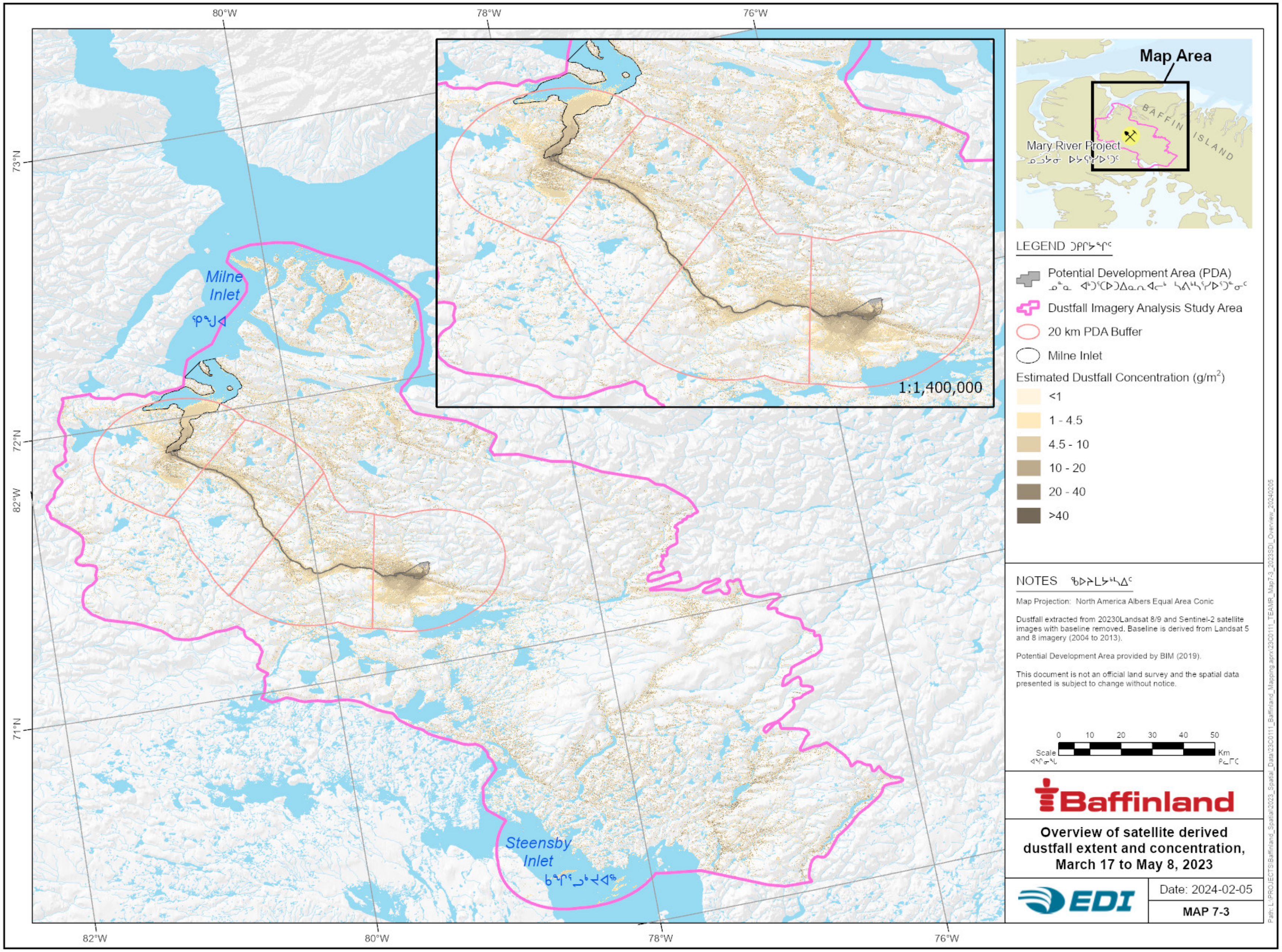
The 'extracted' dustfall extents and concentrations represent possible mineral dust accumulated on the snow cover. Dustfall extents and concentrations derived from Sentinel-2 and Landsat images were combined in the 2023 analysis to reduce the effect of low image coverage from one satellite and to provide a more consistent dataset for inter-annual comparisons.

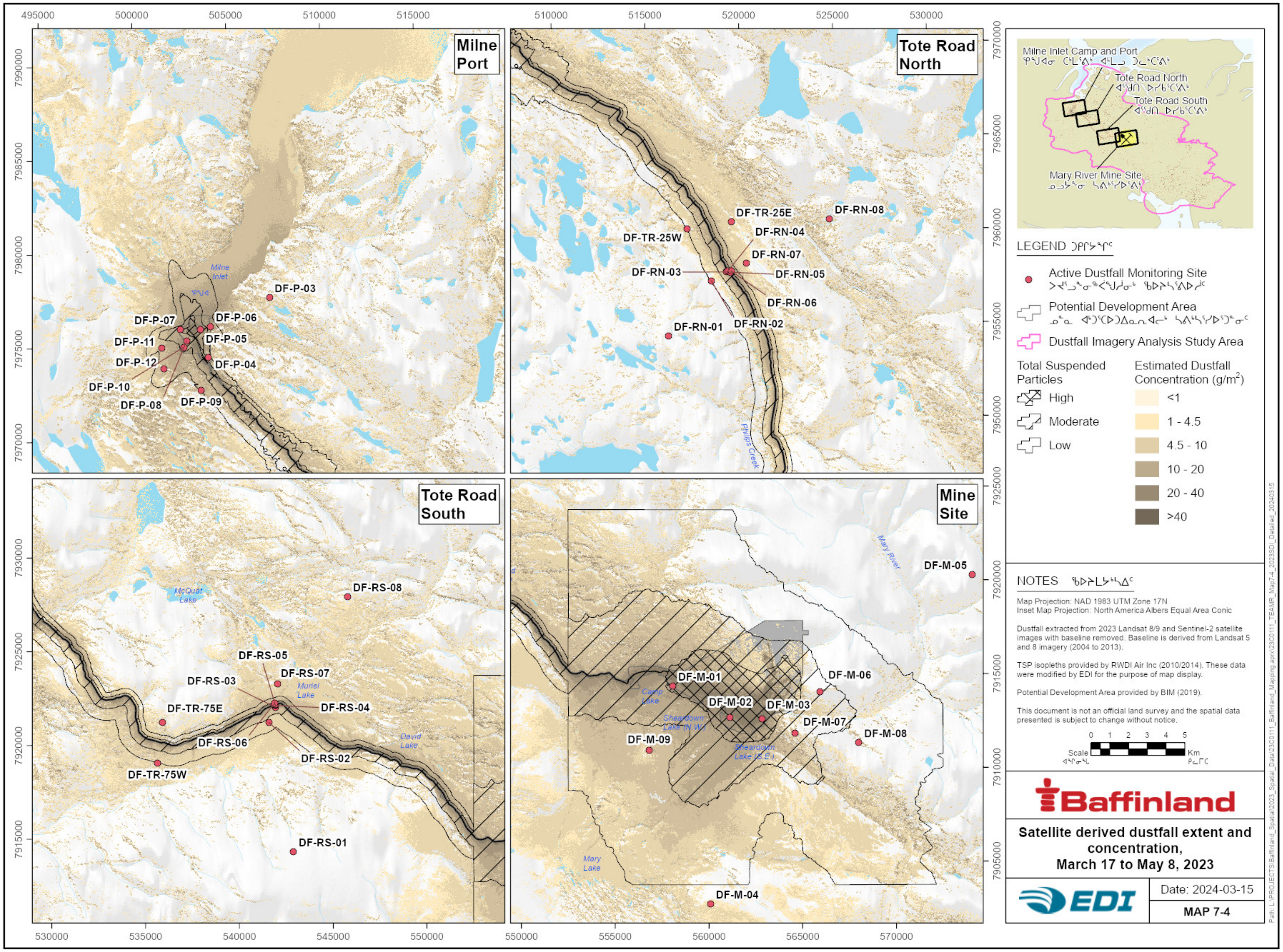
Map 7-3 and Map 7-4 represent 2023 dustfall extents and concentrations above baseline values, where baseline values are the mean dustfall concentrations calculated between 2004 and 2013. Identification and contributions from dust sources cannot be determined solely from the satellite imagery analysis presented herein. Possible dust sources across the landscape include naturally exposed/unvegetated ground, wind-exposed ridges and mining operations (e.g., stockpiles, road traffic and mining). Trends in dustfall extent and concentration around Project infrastructure (e.g., Milne Port, Map 7-3 and Map 7-4) suggest that the primary source of dust is related to mining operations, as expected. In the outer surrounding terrain away from existing Project infrastructure, dustfall extents and concentrations likely occur and originate from multiple naturally occurring sources and/or are indicative of south-facing slopes and exposed bare ground as they were present in the baseline period.

The 2023 dustfall extent covered 15.73% of the Study Area (Table 7-7 and Figure 7-21), an increase from 8.20% in 2022. Dust concentrations of <1 g/m² and 1 to 4.5 g/m² accounted for the largest areas at 4.50% and 6.85%, respectively, followed by 4.5 to 10 g/m² at 2.94%. Areas with concentrations >10 g/m² accounted for 1.45% of the Study Area. Milne Inlet and Milne Port had the largest percentage of dust extent at 35.77% and 29.97%, respectively, followed by the Tote Road south and Mine Site at 27.72% and 27.17%, respectively. The Tote Road north was the lowest at 20.74%.

Table 7-7. 2023 dustfall area extent (km² and %) by concentration classes derived from Landsat and Sentinel-2 imagery.

Concentration Class	<1 g/m²		1 to 4.5 g/m²		4.5 to 10 g/m²		10 to 20 g/m²		20 to 40 g/m²		>40 g/m²		Total Extent	
Area	**km²**	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**
Study Area	1,208.66	4.50	1,840.52	6.85	790.40	2.94	298.82	1.11	72.41	0.27	17.37	0.06	4,228.18	15.73
Mine Site	86.58	6.22	147.20	10.58	80.68	5.80	40.89	2.94	13.75	0.99	8.81	0.63	377.91	27.17
Milne Port	95.78	9.41	127.05	12.49	52.49	5.16	22.47	2.21	5.65	0.56	1.44	0.14	304.88	29.97
Milne Inlet	30.86	11.04	41.60	14.88	17.63	6.31	8.29	2.96	1.62	0.58	0.02	0.01	100.02	35.77
Tote Road South	117.48	8.28	177.77	12.53	65.37	4.61	22.57	1.59	7.72	0.54	2.38	0.17	393.29	27.72
Tote Road North	76.63	5.29	125.81	8.69	55.45	3.83	22.95	1.59	6.84	0.47	0.80	0.05	288.48	20.74


Milne Inlet
Steensby Inlet
1:1,400,000
Map Area
BAFFIN ISLAND
Mary River Project
LEGEND
Potential Development Area (PDA)
Dustfall Imagery Analysis Study Area
20 km PDA Buffer
Milne Inlet
Estimated Dustfall Concentration (g/m²)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 20230Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
Potential Development Area provided by BIM (2019).
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
Km
Baffinland
Overview of satellite derived dustfall extent and concentration, March 17 to May 8, 2023
EDI
Date: 2024-02-05
MAP 7-3


Milne Port
Tote Road North
Tote Road South
Mine Site
DF-P-03
DF-P-06
DF-P-07
DF-P-05
DF-P-11
DF-P-12
DF-P-04
DF-P-10
DF-P-08
DF-P-09
DF-TR-25E
DF-RN-08
DF-TR-25W
DF-RN-04
DF-RN-07
DF-RN-03
DF-RN-05
DF-RN-06
DF-RN-01
DF-RN-02
DF-RS-08
DF-RS-05
DF-RS-07
DF-RS-03
DF-TR-75E
DF-RS-04
DF-RS-06
DF-RS-02
DF-TR-75W
DF-RS-01
DF-M-05
DF-M-01
DF-M-06
DF-M-02
DF-M-03
DF-M-07
DF-M-09
DF-M-08
DF-M-04
Milne Inlet Camp and Port
Tote Road North
Tote Road South
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m²)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2023 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
Km
Baffinland
Satellite derived dustfall extent and concentration, March 17 to May 8, 2023
EDI
Date: 2024-03-15
MAP 7-4

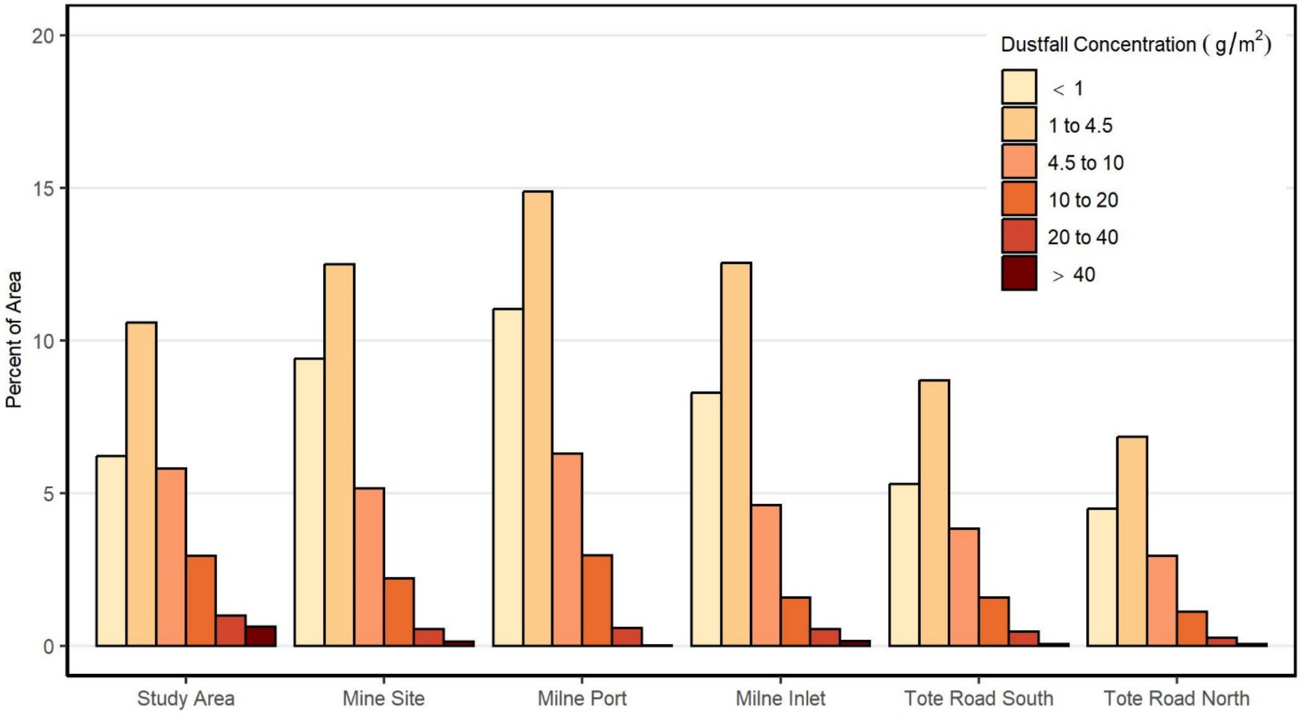


Figure 7-21. Percent dustfall area by concentration class within the Study Area for 2023.
Mean baseline has been removed from the data.

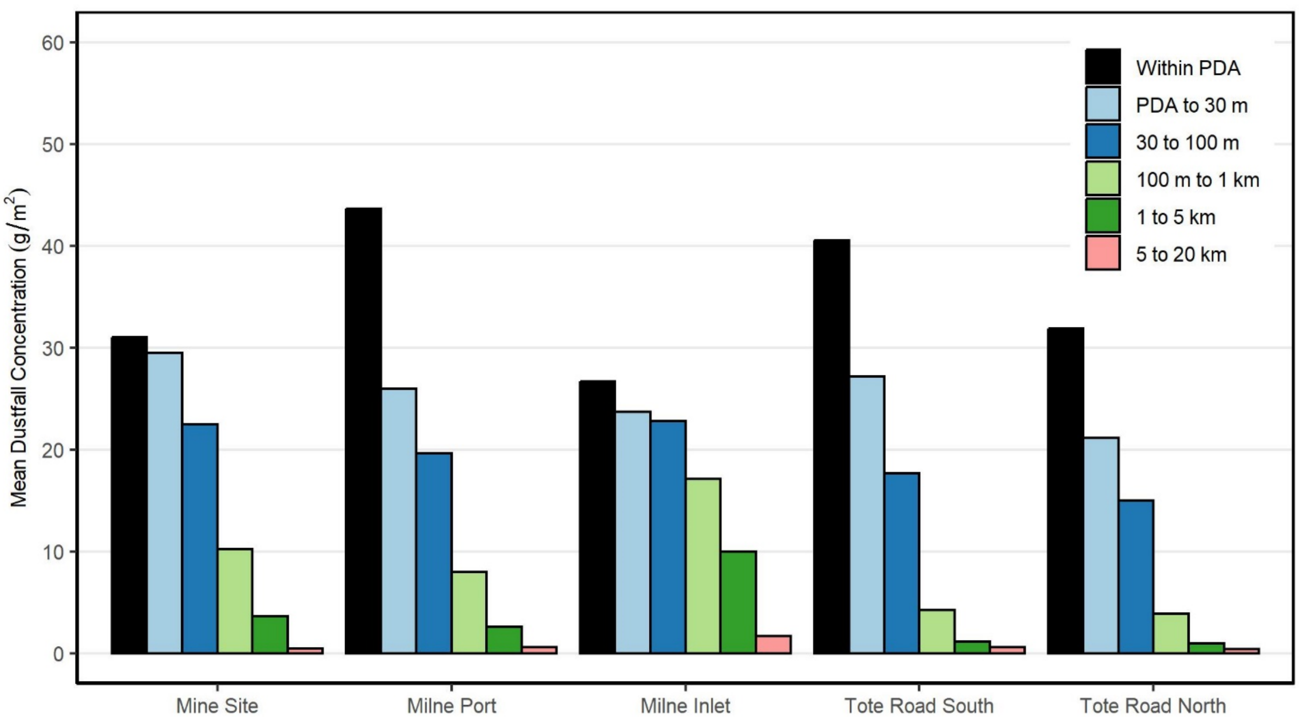


Figure 7-22. Mean dustfall concentrations within the Potential Development Area and 30 m, 100 m, 1 km, 5 km, and 20 km buffers for 2023.
The mean baseline has been removed from the data.

Dustfall concentration was highest at all sites within the PDA and decreased with distance from the Project (Figure 7-22) as reflected in the passive dustfall monitors (Section 7.3). The Milne Port area had the highest mean dustfall concentration within the PDA, followed closely by the Tote Road south area. Outside of the PDA up to 30 m, the Mine Site had the highest mean dustfall concentration, while Milne Inlet had the highest mean dustfall concentrations >30 m from the PDA. The Tote Road north area had the lowest mean dustfall concentrations outside of the PDA.

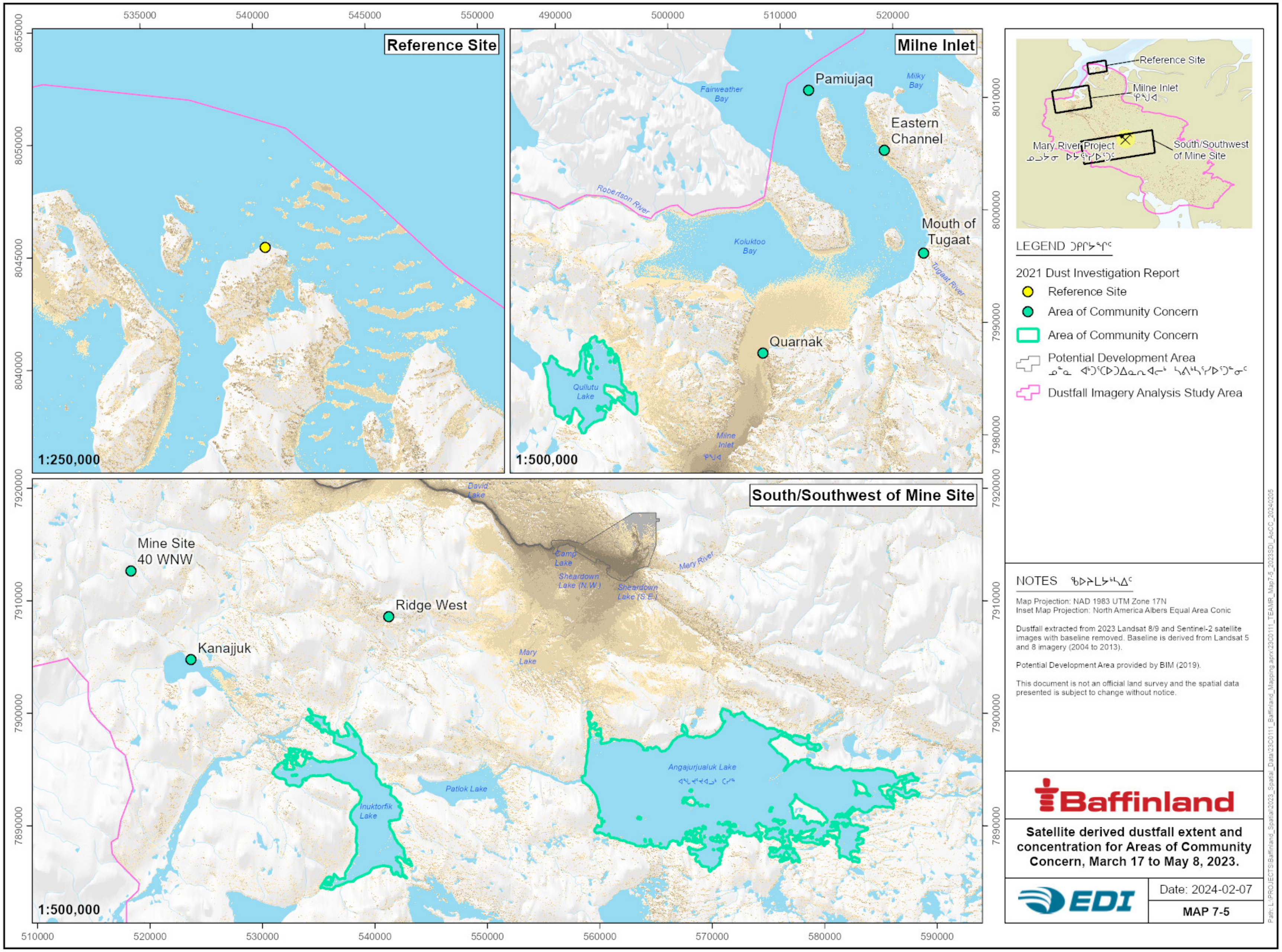
Mine Site — Dustfall extended to the northwest and southwest, reflecting the predominant winds from the southeast to northeast and uncommon but strong easterly winds (Map 7-3 and Map 7-4; Section 4). Dustfall extended beyond the modelled TSP isopleths primarily to the west but followed a similar pattern. Dustfall extent was greatest for the 1 to 4.5 g/m² dustfall concentration class at 10.58% of the Mine Site area (within 20 km of the PDA), followed by <1 g/m² at 6.22% (Table 7-7 and Figure 7-21). For concentration classes >4.5 g/m², dustfall extent decreased from 5.80% to 0.63% with increasing concentration class. Mean dustfall concentration decreased with distance from the Project. The concentration decreased from 31.0 g/m² within the PDA to 0.5 g/m² within the 5 to 20 km buffer (Figure 7-22).

Milne Port — Around Milne Port (excluding Milne Inlet), dustfall extended to the south and north (Map 7-3). Dustfall extended beyond the modelled TSP isopleths. Dustfall extent mirrored the Mine Site with the greatest extent in the 1 to 4.5 g/m² (12.49%) dustfall concentration class, followed by a decrease in dustfall extent for concentration classes >4.5 g/m², dropping from 5.16% to 0.14% (Table 7-7 and Figure 7-21). Mean dustfall concentration decreased with distance from the Project. The concentration decreased from 43.6 g/m² within the PDA to 0.6 g/m² within the 5 to 20 km buffer (Figure 7-22).

Milne Inlet — Dustfall extended northeast along Milne Inlet into Koluktoo Bay, most likely carried by strong southwest winds (Map 7-3 and Map 7-4; Section 4). Dustfall extended beyond the modelled TSP isopleths. Milne Inlet had the highest percent area in concentration classes <10 g/m² and followed a similar distribution pattern across the concentration classes as the other areas. Dustfall extent peaked at the 1 to 4.5 g/m² (14.88%) dustfall concentration class, followed by a decrease in dustfall extent for concentration classes >4.5 g/m², dropping from 6.31% to 0.1% (Table 7-7 and Figure 7-21). Mean dustfall concentration decreased with distance from the Project and had higher mean concentration values further from the PDA (>100 m) than the other areas as the dust was carried down the inlet by strong southwest winds. The concentration decreased from 26.7 g/m² within the PDA to 1.7 g/m² within the 5 to 20 km buffer (Figure 7-22).

The Tote Road North — Dustfall extent was primarily within the modelled TSP isopleths on the west side of the road, and extended beyond the TSP isopleths along the northeast side (Map 7-3 and Map 7-4). Dustfall extent was greatest for the 1 to 4.5 g/m² dustfall concentration class at 8.96% of the Tote Road north area (within 20 km of the PDA) and decreased to 0.05% with increasing concentration class (Table 7-7 and Figure 7-21). Mean dustfall concentration decreased with distance from the Project. The concentration decreased from 31.9 g/m² within the PDA to 0.4 g/m² within the 5 to 20 km buffer (Figure 7-22).

The Tote Road South — Dustfall extended past the modelled isopleths to the north between the Mine Site and the south crossing of passive dustfall monitors at km 78 as well as to the south/southwest where the Tote Road turns northwest to Milne Port (Map 7-3 and Map 7-4). The dustfall extent was reflected in the higher mean daily dustfall rates measured from dustfall monitors DF-RS-02 and DF-TR-75W versus DF-RS-07 and DF-TR-75E (Section 7.3). Dustfall extent for the Tote Road south area was greater than the Tote Road north area but mirrored the distribution pattern across the concentration classes. Dustfall extent peaked at the 1 to 4.5 g/m² (12.53%) dustfall concentration class, followed by a decrease in dustfall extent for concentration classes >4.5 g/m², dropping from 4.61% to 0.17% (Table 7-7 and Figure 7-21). Mean dustfall concentration decreased with distance from the Project and was higher than the Tote Road north area. The concentration decreased from 40.5 g/m² within the PDA to 1.2 g/m² within the 5 to 20 km buffer (Figure 7-22). The daily dustfall rates from the passive dustfall monitors also showed higher rates for the Tote Road south crossing (km 78) over the Tote Road north crossing (km 28; Section 7.3).


Reference Site
Milne Inlet
South/Southwest of Mine Site
1:250,000
1:500,000
1:500,000
Pamiujaq
Eastern Channel
Mouth of Tugaat
Quarnak
Fairweather Bay
Milky Bay
Robertson River
Koluktoo Bay
Tugaat River
Qullutu Lake
Milne Inlet
Mine Site 40 WNW
Ridge West
Kanajjuk
David Lake
Camp Lake
Sheardown Lake (N.W.)
Sheardown Lake (S.E.)
Mary River
Mary Lake
Angajurjualuk Lake
Patlok Lake
Inuktorfik Lake
Mary River Project
South/Southwest of Mine Site
LEGEND
2021 Dust Investigation Report
Reference Site
Area of Community Concern
Area of Community Concern
Potential Development Area
Dustfall Imagery Analysis Study Area
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2023 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Satellite derived dustfall extent and concentration for Areas of Community Concern, March 17 to May 8, 2023.
EDI
Date: 2024-02-07
MAP 7-5

Areas of Community Concern[10] — The Quarnak site had the highest mean dustfall concentration at 3.58 g/m², followed by the Eastern Channel site at 1.91 g/m² (Table 7-8, Map 7-5). The remaining locations were <0.1 g/m², below the Reference site concentration. The lakes had mean dustfall concentrations below 1.0 g/m², with maximum values between 26.14 and 32.09 g/m², generally along the shoreline. Qullutu Lake, near Milne Inlet, had the highest mean dustfall concentration of the lakes at 0.73 g/m² and was above the Reference site concentration.

Table 7-8. Estimated 2023 mean, minimum and maximum dustfall concentrations in Areas of Community Concern.

Location	Mean Dustfall Concentration (g/m²)	Standard Deviation (g/m²)	Minimum Dustfall Concentration (g/m²)	Maximum Dustfall Concentration (g/m²)
Pamiujaq	0.00	0.00	0.00	0.00
Eastern Channel	1.91	1.43	0.00	4.78
Mouth of Tugaat	0.02	0.07	0.00	0.36
Quarnak	3.58	0.68	2.44	4.93
Mine Site 40 WNW	0.09	0.32	0.00	1.42
Kanajjuk	0.00	0.00	0.00	0.00
Ridge West	0.03	0.45	0.00	9.50
Qullutu Lake	0.73	2.10	0.00	32.09
Angajurjualuk Lake	0.08	0.72	0.00	26.14
Inuktorfik Lake	0.11	0.85	0.00	27.16
Reference	0.14	0.65	0.00	3.12

7.4.3 INTER-ANNUAL TRENDS

The baseline (2004–2013) and post-baseline (2014–2023) imagery were reprocessed to incorporate the expanded dustfall imagery analysis Study Area and the terrain-corrected SDI.

Dustfall extents across all areas had a small peak in 2014/2015 followed by a larger peak in 2019, primarily in the <4.5 g/m² dustfall concentration classes (Figure 7-23). The 2023 dustfall extents increased compared to 2022, primarily in the concentration classes between 1 and 10 g/m². The dustfall extents within the Study Area, Milne Port and the Tote Road north areas were comparable to 2021 extents, whereas dustfall extents within the Mine Site, Milne Inlet and the Tote Road south areas were higher than 2021 extents but comparable to 2020 extents. The post-baseline years before 2018 and 2021/2022 in some areas (e.g., the Tote Road) had overall dustfall extents similar to or lower than the 2004 baseline year, but larger extents in the higher dustfall concentration classes (>20 g/m²).

[10] As informed by the QIA. Non-lake locations were digitized from Figure 11 in the 2021 Dust Investigation report (Hutchinson Environmental Sciences Ltd. 2022) at a scale of 1:750,000. Mapped locations are representative but hold some inherent variability.

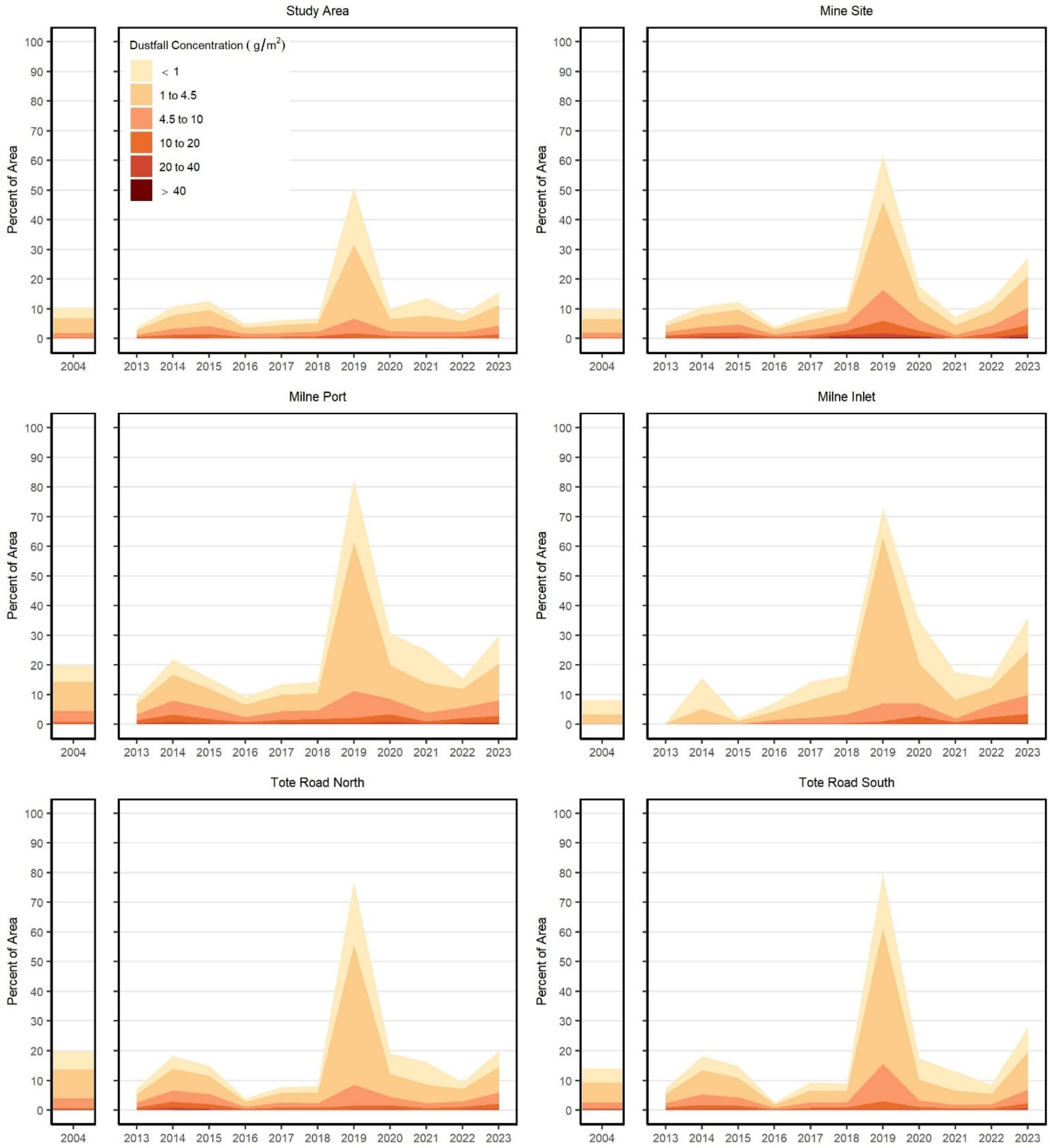
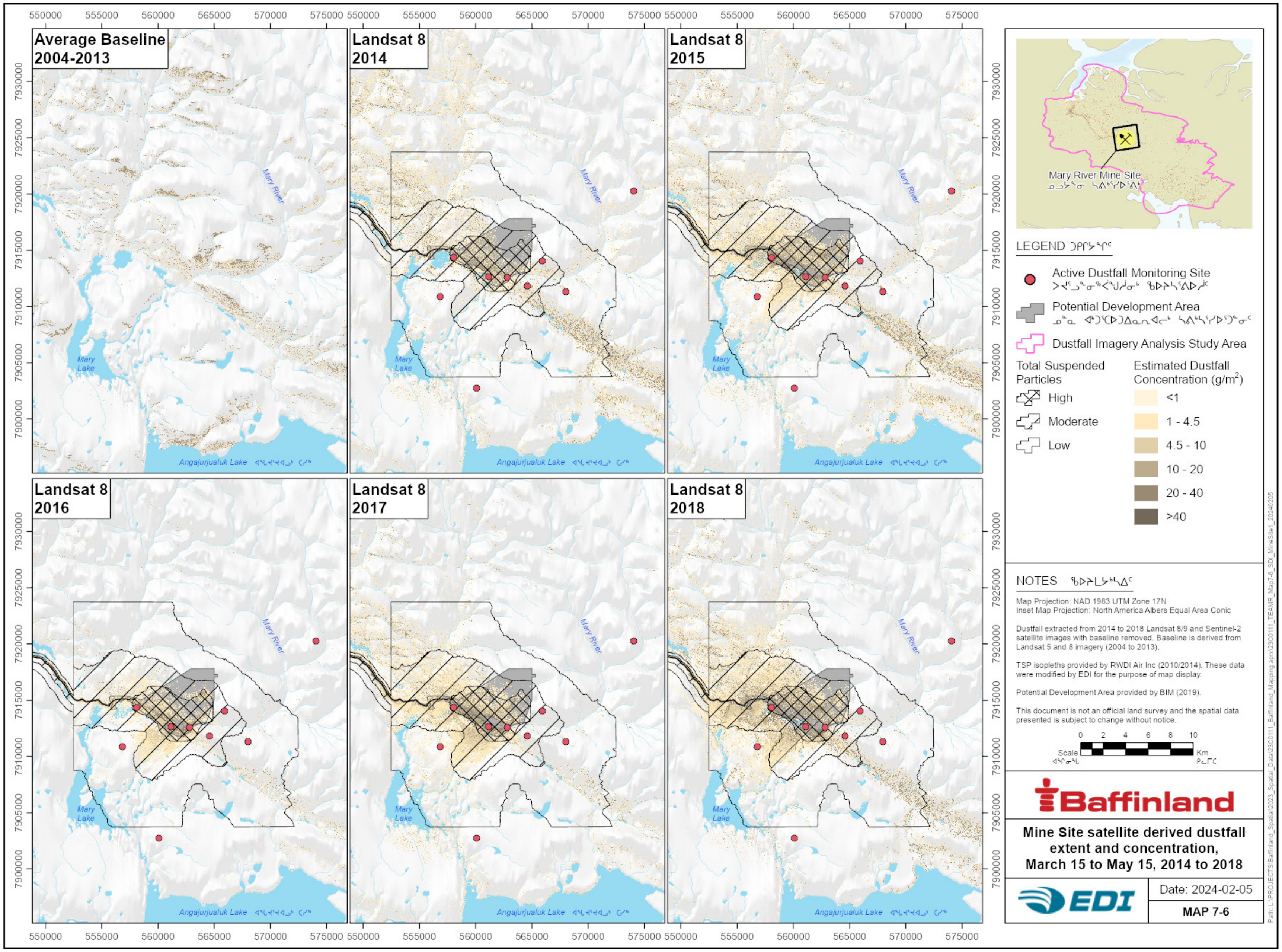
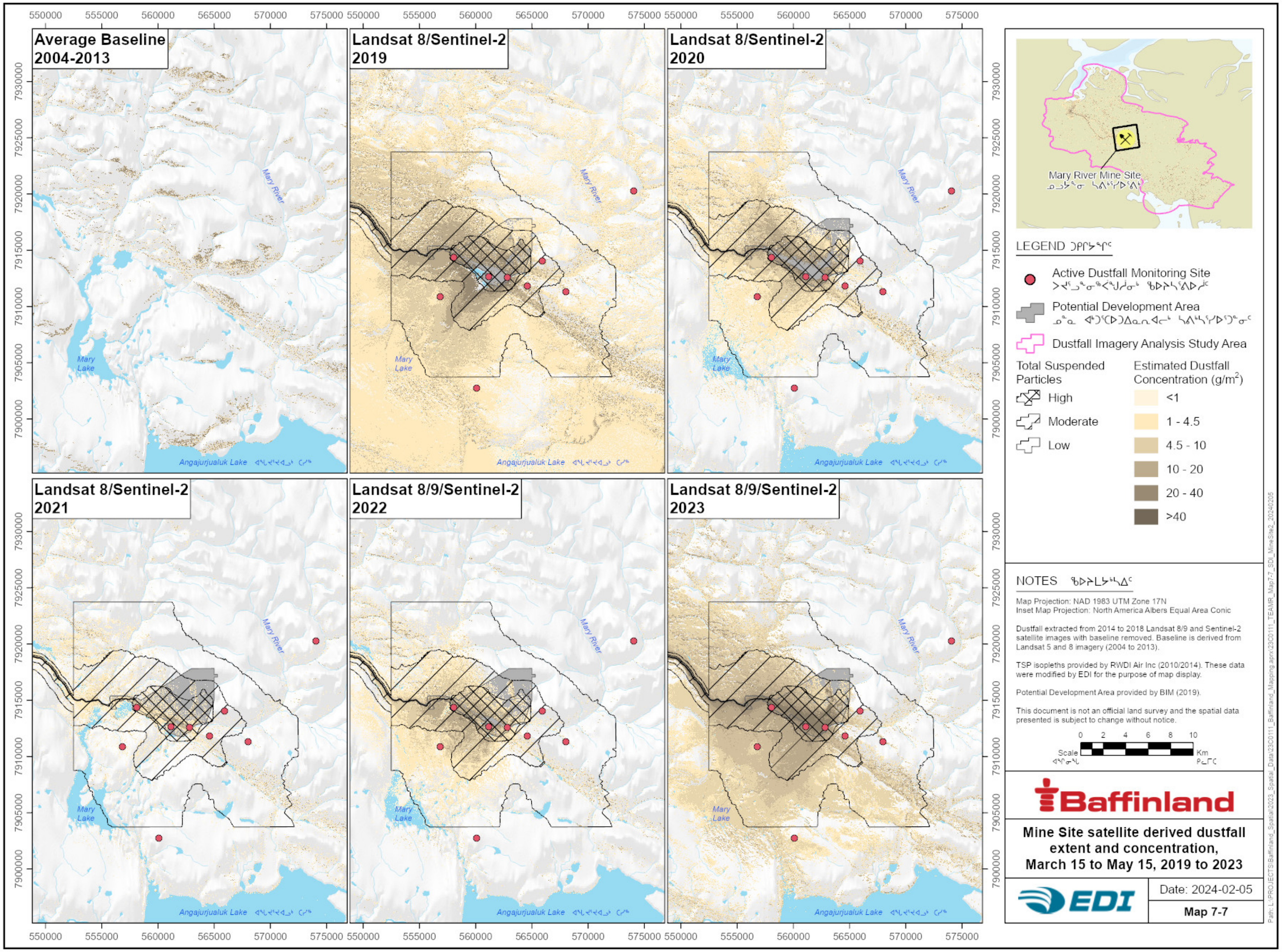
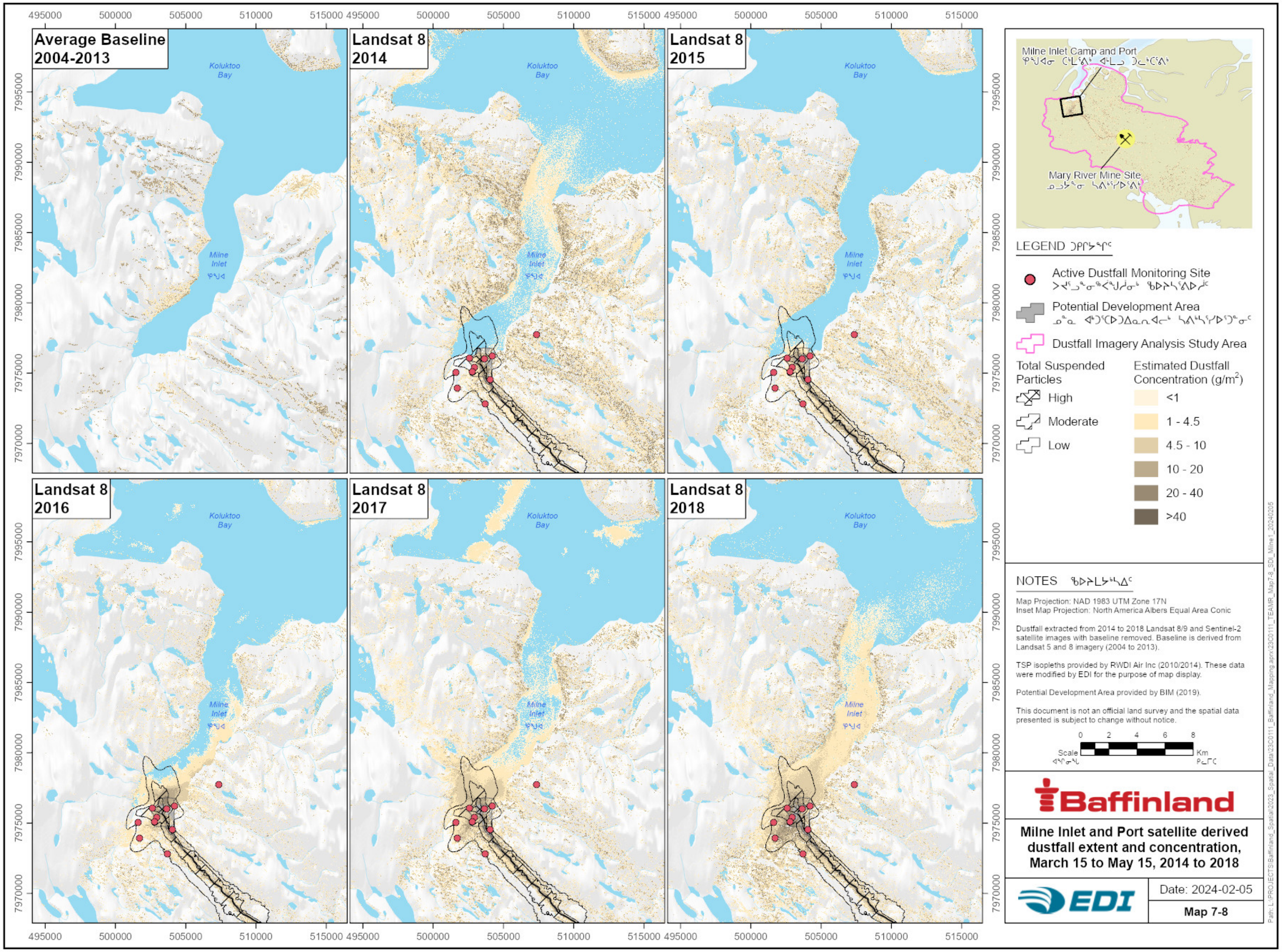
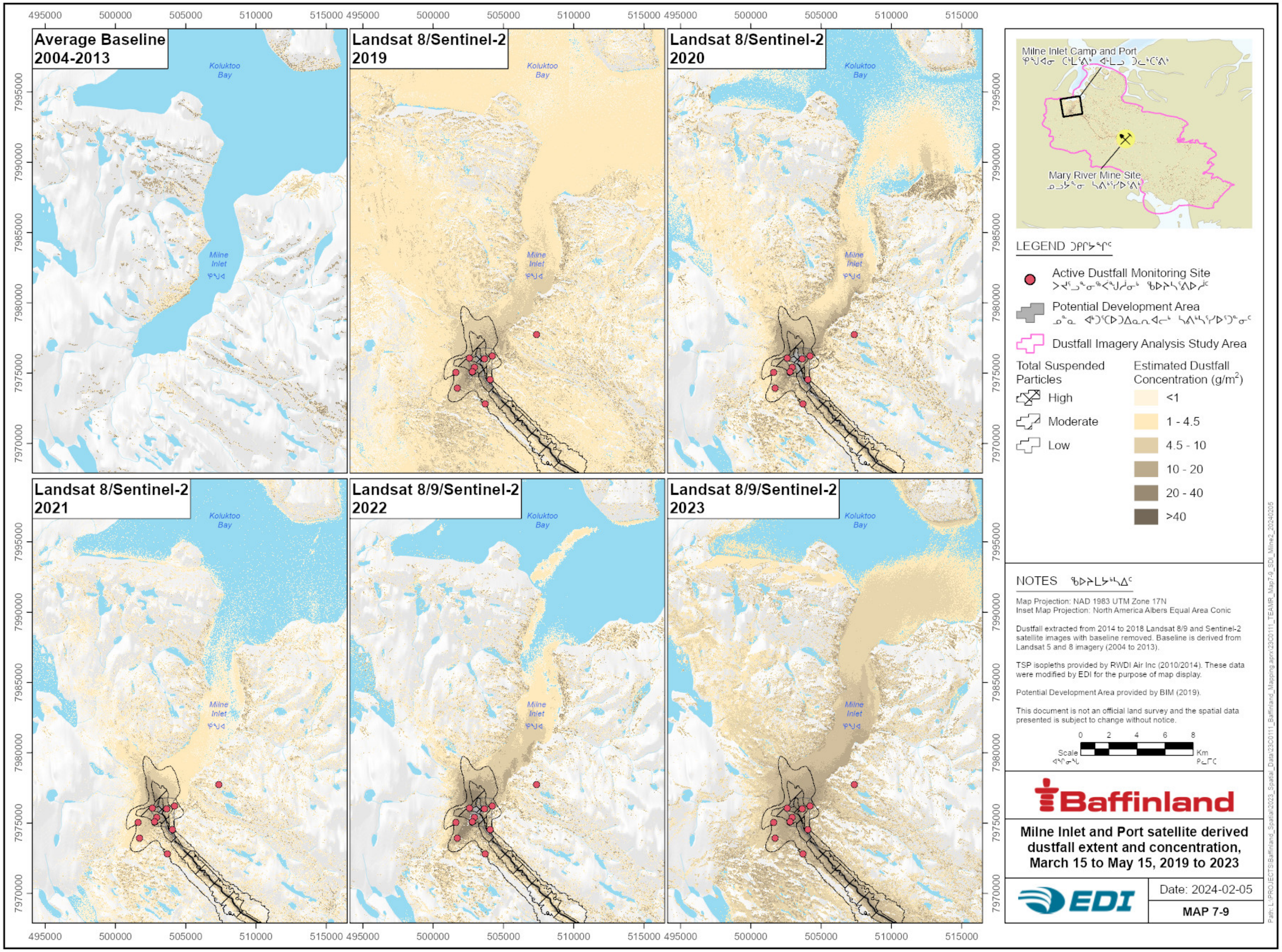


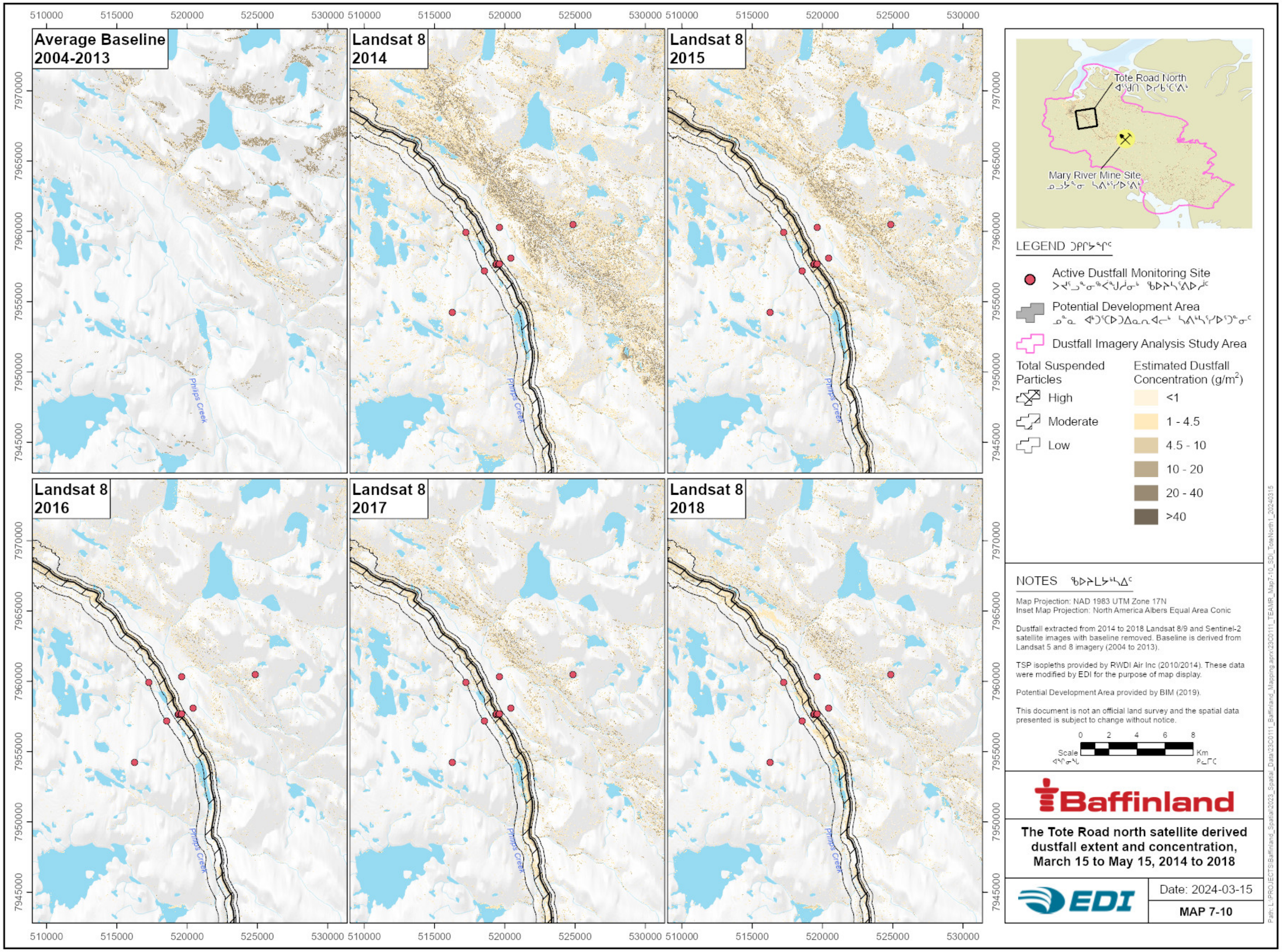
Figure 7-23. Satellite-derived dustfall extents from 2014 to 2023 with baseline years 2004 and 2013.
The mean baseline is removed from the data.

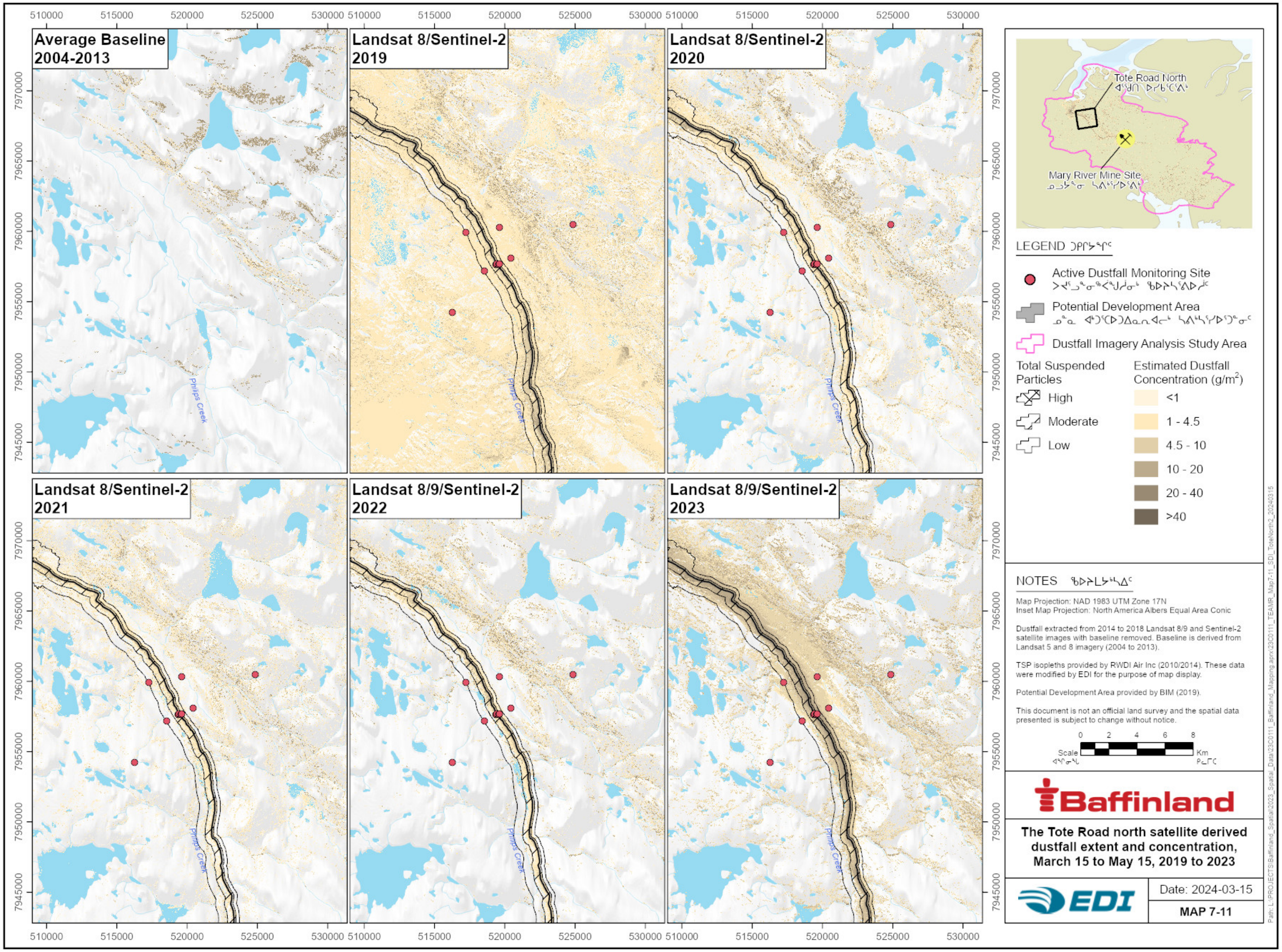

Average Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
Mary River
Mary Lake
Angajurjualuk Lake
550000
555000
560000
565000
570000
575000
7900000
7905000
7910000
7915000
7920000
7925000
7930000
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m2)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0 2 4 6 8 10
Scale
Km
Baffinland
Mine Site satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2024-02-05
MAP 7-6
Path: L:\PROJECTS\Baffinland_Spatial\2023_Spatial_Data\23C0111_Baffinland_Mapping.aprx\23C0111_TEAMR_Map7-6_SDI_MineSite1_20240205


Average Baseline 2004-2013
Landsat 8/Sentinel-2 2019
Landsat 8/Sentinel-2 2020
Landsat 8/Sentinel-2 2021
Landsat 8/9/Sentinel-2 2022
Landsat 8/9/Sentinel-2 2023
Mary River
Mary Lake
Angajurjualuk Lake
550000
555000
560000
565000
570000
575000
7900000
7905000
7910000
7915000
7920000
7925000
7930000
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m2)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0 2 4 6 8 10
Scale
Km
Baffinland
Mine Site satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2023
EDI
Date: 2024-02-05
Map 7-7


Average Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
Koluktoo Bay
Milne Inlet
495000
500000
505000
510000
515000
7970000
7975000
7980000
7985000
7990000
7995000
Milne Inlet Camp and Port
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m²)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 2 4 6 8
Km
Baffinland
Milne Inlet and Port satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2024-02-05
Map 7-8


Average Baseline 2004-2013
Landsat 8/Sentinel-2 2019
Landsat 8/Sentinel-2 2020
Landsat 8/Sentinel-2 2021
Landsat 8/9/Sentinel-2 2022
Landsat 8/9/Sentinel-2 2023
Koluktoo Bay
Milne Inlet
Milne Inlet Camp and Port
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m²)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 2 4 6 8
Km
Baffinland
Milne Inlet and Port satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2023
EDI
Date: 2024-02-05
MAP 7-9


Average Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
Phillips Creek
Tote Road North
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m2)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
Km
Baffinland
The Tote Road north satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2024-03-15
MAP 7-10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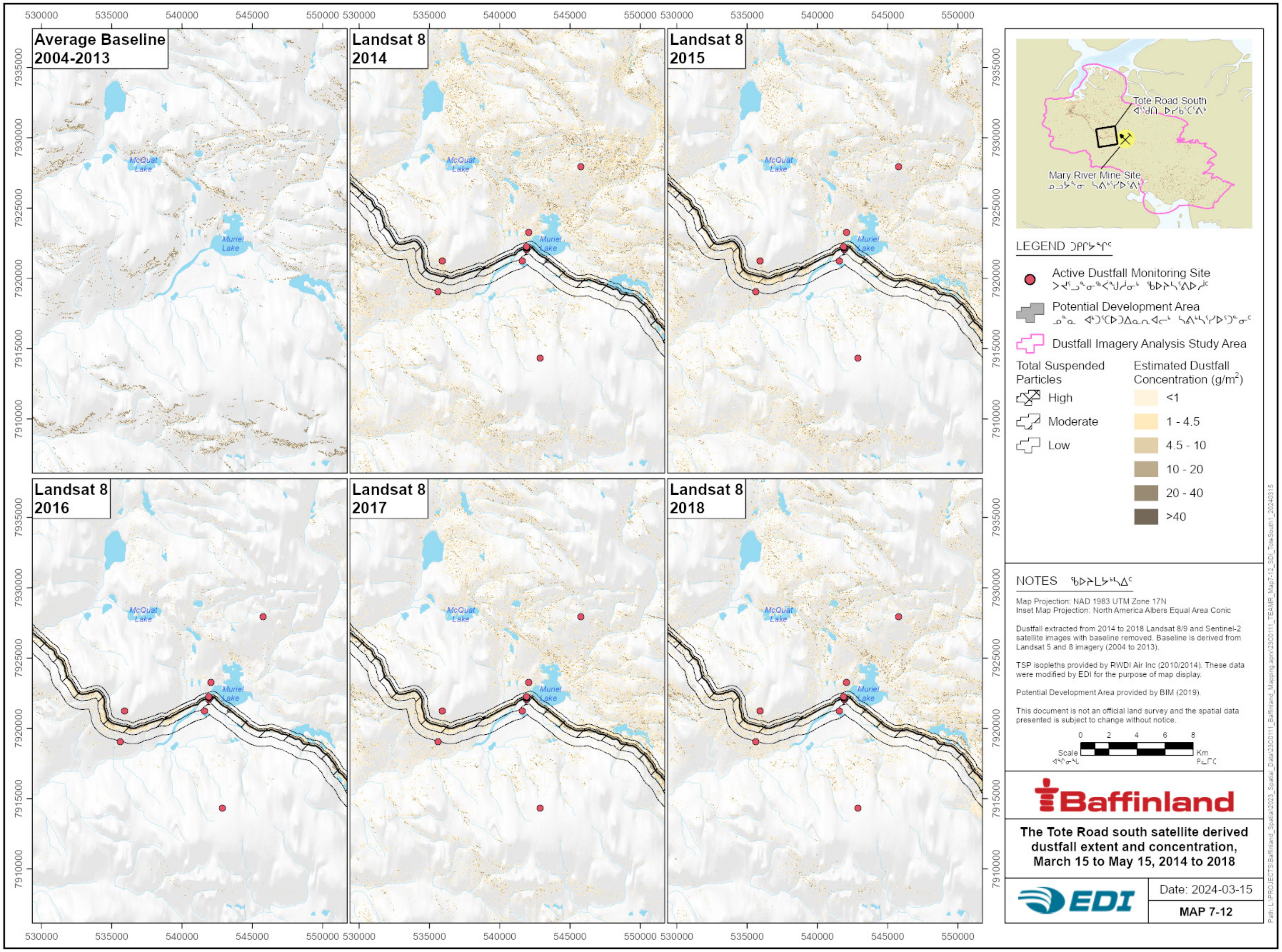
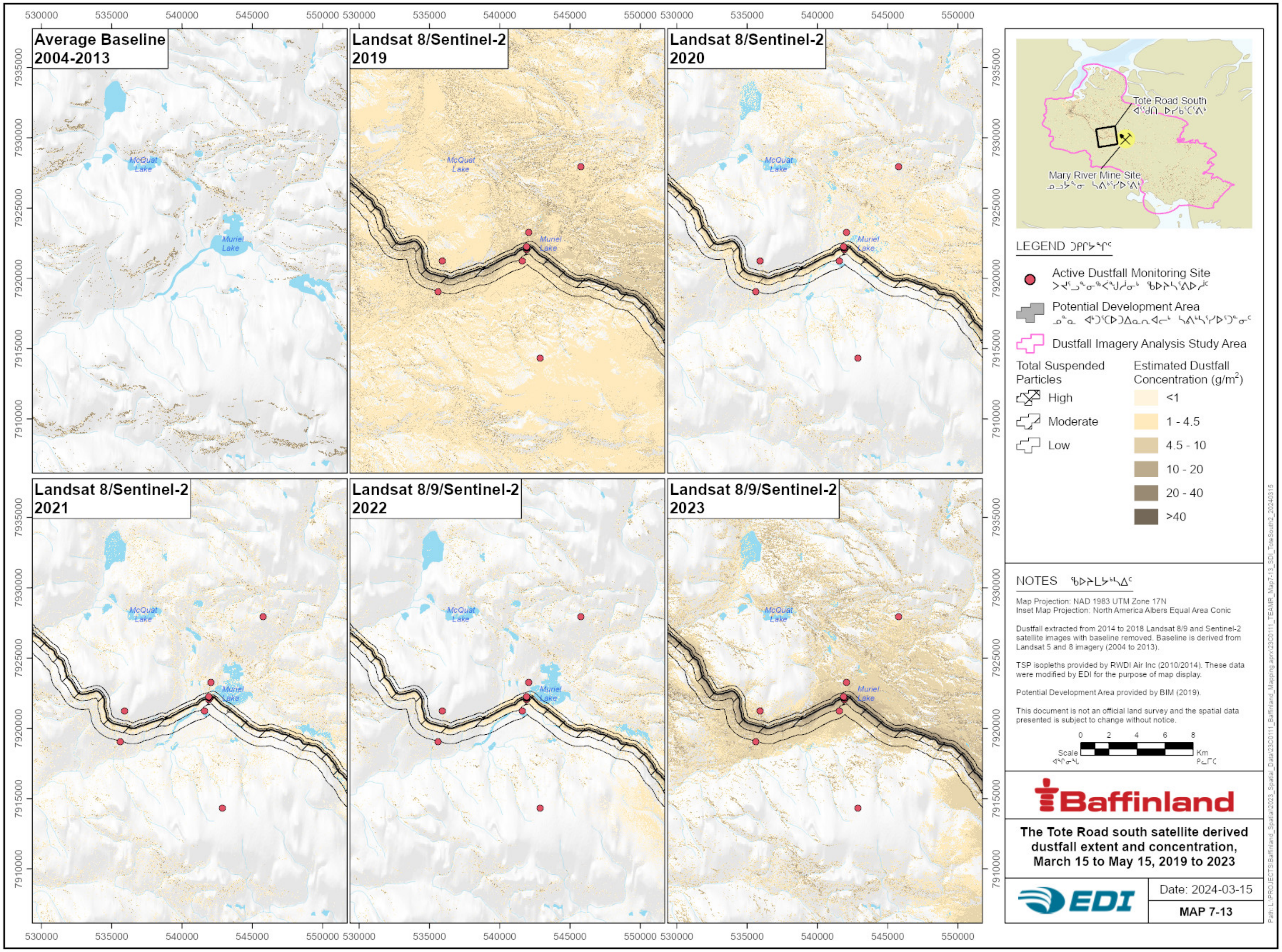
Landsat 8/Sentinel-2 2019
Landsat 8/Sentinel-2 2020
Landsat 8/Sentinel-2 2021
Landsat 8/9/Sentinel-2 2022
Landsat 8/9/Sentinel-2 2023
Phillips Creek
Tote Road North
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m²)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 2 4 6 8
Km
Baffinland
The Tote Road north satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2023
EDI
Date: 2024-03-15
MAP 7-11


Average Baseline 2004-2013
Landsat 8 2014
Landsat 8 2015
Landsat 8 2016
Landsat 8 2017
Landsat 8 2018
McQuat Lake
Muriel Lake
530000
535000
540000
545000
550000
7935000
7930000
7925000
7920000
7915000
7910000
Tote Road South
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m2)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 2 4 6 8
Km
Baffinland
The Tote Road south satellite derived dustfall extent and concentration, March 15 to May 15, 2014 to 2018
EDI
Date: 2024-03-15
MAP 7-12


Average Baseline 2004-2013
Landsat 8/Sentinel-2 2019
Landsat 8/Sentinel-2 2020
Landsat 8/Sentinel-2 2021
Landsat 8/9/Sentinel-2 2022
Landsat 8/9/Sentinel-2 2023
McQuat Lake
Muriel Lake
Tote Road South
Mary River Mine Site
LEGEND
Active Dustfall Monitoring Site
Potential Development Area
Dustfall Imagery Analysis Study Area
Total Suspended Particles
High
Moderate
Low
Estimated Dustfall Concentration (g/m2)
<1
1 - 4.5
4.5 - 10
10 - 20
20 - 40
>40
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Inset Map Projection: North America Albers Equal Area Conic
Dustfall extracted from 2014 to 2018 Landsat 8/9 and Sentinel-2 satellite images with baseline removed. Baseline is derived from Landsat 5 and 8 imagery (2004 to 2013).
TSP isopleths provided by RWDI Air Inc (2010/2014). These data were modified by EDI for the purpose of map display.
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale 0 2 4 6 8 Km
Baffinland
The Tote Road south satellite derived dustfall extent and concentration, March 15 to May 15, 2019 to 2023
EDI
Date: 2024-03-15
MAP 7-13

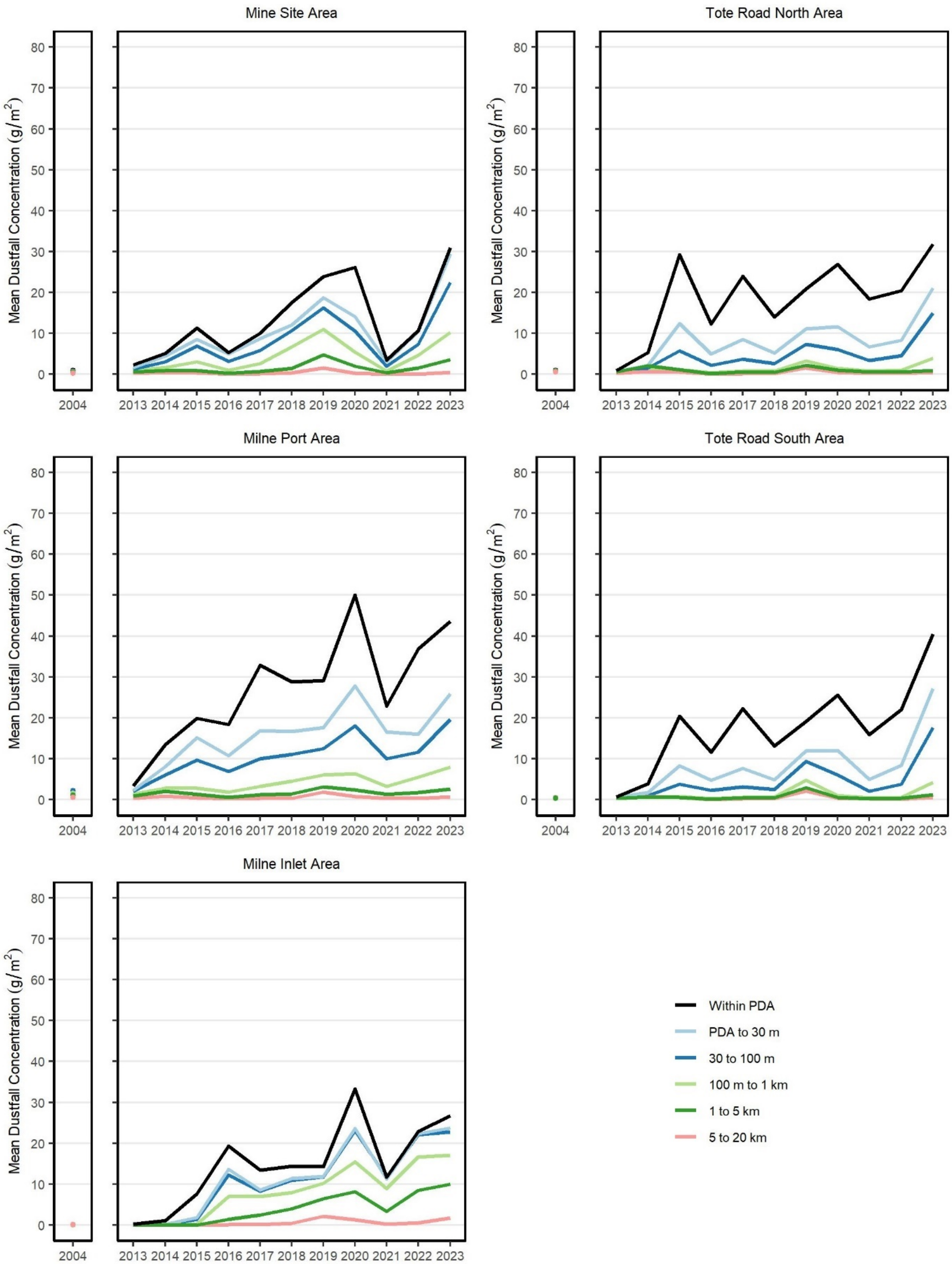


Figure 7-24. Satellite-derived mean dustfall concentrations from 2014 to 2023 with baseline years 2004 and 2013.
The mean baseline is removed from the data.

The pattern of dustfall extent on the landscape was similar from 2014 to 2023 for all areas, with the highest concentrations near the Project and dustfall extending northeast along Milne Inlet, west and south of the Mine Site, and southwest of the Tote Road south crossing (km 78) in the direction of prevailing and/or strong winds (Map 7-6 to Map 7-13).

Satellite-derived mean dustfall concentrations across all areas generally increased from 2014 to 2020 in line with increased ore production (Figure 7-24 and Figure 7-18, Section 7.3). The mean dustfall concentration decreased in 2021. All areas showed increased mean dustfall concentrations in 2023, primarily within 1 km of the PDA, except for Milne Inlet, which had similar values for 2022 and 2023.

The overall trends between satellite-derived mean dustfall concentrations and annual dustfall rates from the passive dustfall monitors were similar for the Tote Road crossings, capturing most of the same fluctuations at DF-RN-04, DF-RN-05 and DF-RS-05. For the Mine Site, the fluctuations in the mean dustfall concentration from the imagery were similar to the annual dustfall rate fluctuations of DF-M-03.

Areas of Community Concern — The Reference site mean dustfall concentrations remained <1 g/m² for all years, with peaks at ~0.8 g/m² in 2018 and 2022. Most Areas of Community Concern also had mean dustfall concentrations <1 g/m² for all years (Pamiujaqa and Mine Site 40 WNW) or all years except for 2019 (Mouth of Tugaat, Qullutu Lake, Kanajjuk, Inuktorfik Lake and Angajurjualuk Lake; Table 7-9 and Table 7-10). The mean dustfall concentrations at the Eastern Channel and Ridge West sites went over <1 g/m² more frequently (6 and 4 years, respectively), however, some of those times were during the baseline years 2004 and 2013. The Quarnak site reached mean dustfall concentrations over 4 g/m² in 2018, 2019 and 2022 and generally falls within the dustfall extent from Milne Port out along Milne Inlet.

Table 7-9. Estimated mean dustfall concentrations (and standard deviations) in Areas of Community Concern around Milne Inlet, 2004 and 2013 to 2023.

Year	Reference (g/m²)	Pamiujaq (g/m²)	Eastern Channel (g/m²)	Mouth of Tugaat (g/m²)	Quarnak (g/m²)	Qullutu Lake (g/m²)
2004	0.00 (0.00)	0.00 (0.00)	1.28 (1.47)	0.20 (0.38)	0.53 (1.02)	0.02 (0.25)
2013	0.11 (0.47)	0.00 (0.00)	1.01 (1.22)	0.00 (0.00)	0.00 (0.00)	0.01 (0.31)
2014	0.00 (0.00)	0.00 (0.00)	5.48 (5.63)	0.18 (0.67)	1.75 (0.55)	0.03 (0.59)
2015	0.00 (0.00)	0.00 (0.00)	0.89 (1.35)	0.13 (0.51)	0.00 (0.01)	0.02 (0.35)
2016	0.10 (0.46)	0.00 (0.00)	1.16 (1.72)	0.13 (0.43)	0.00 (0.00)	0.01 (0.17)
2017	0.63 (2.19)	0.00 (0.00)	0.90 (1.39)	0.01 (0.05)	0.18 (0.34)	0.02 (0.28)
2018	0.82 (2.59)	0.00 (0.00)	1.44 (1.61)	0.01 (0.05)	4.44 (0.77)	0.04 (0.64)
2019	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.61 (0.67)	4.07 (0.70)	1.36 (0.79)
2020	0.21 (0.53)	0.00 (0.00)	0.31 (0.91)	0.18 (0.34)	0.43 (0.75)	0.09 (0.41)
2021	0.00 (0.00)	0.00 (0.00)	0.10 (0.33)	0.02 (0.09)	0.31 (0.40)	0.02 (0.17)
2022	0.80 (1.93)	0.00 (0.00)	0.66 (1.00)	0.00 (0.00)	4.19 (0.67)	0.18 (1.21)
2023	0.14 (0.65)	0.00 (0.00)	1.91 (1.43)	0.02 (0.07)	3.58 (0.68)	0.03 (0.45)

Table 7-10. Estimated mean dustfall concentrations (and standard deviations) in Areas of Community Concern south/southwest of the Mine Site, 2004 and 2013 to 2023.

Year	Reference (g/m^2)	Mine Site 40 WNW (g/m^2)	Kanajjuk (g/m^2)	Ridge West (g/m^2)	Inuktorfik Lake (g/m^2)	Angajurjualuk Lake (g/m^2)
2004	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	5.09 (12.21)	0.05 (0.48)	0.05 (0.48)
2013	0.11 (0.47)	0.12 (0.53)	0.00 (0.00)	0.12 (0.32)	0.07 (0.73)	0.03 (0.40)
2014	0.00 (0.00)	0.26 (1.19)	0.00 (0.00)	1.02 (3.15)	0.12 (0.98)	0.06 (0.64)
2015	0.00 (0.00)	0.03 (0.13)	0.00 (0.00)	0.73 (1.66)	0.09 (0.74)	0.06 (0.65)
2016	0.10 (0.46)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.06)	0.01 (0.28)
2017	0.63 (2.19)	0.03 (0.15)	0.00 (0.00)	0.07 (0.31)	0.06 (0.63)	0.03 (0.46)
2018	0.82 (2.59)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.22)	0.04 (0.72)
2019	0.00 (0.00)	0.80 (1.82)	1.87 (0.70)	1.15 (1.88)	1.13 (1.18)	1.74 (1.92)
2020	0.21 (0.53)	0.11 (0.50)	0.00 (0.00)	1.23 (2.77)	0.05 (0.49)	0.02 (0.32)
2021	0.00 (0.00)	0.10 (0.44)	0.00 (0.00)	0.34 (0.97)	0.06 (0.57)	0.03 (0.37)
2022	0.80 (1.93)	0.00 (0.00)	0.00 (0.00)	0.42 (1.92)	0.03 (0.42)	0.02 (0.29)
2023	0.14 (0.65)	0.09 (0.32)	0.00 (0.00)	0.73 (2.10)	0.11 (0.85)	0.08 (0.72)

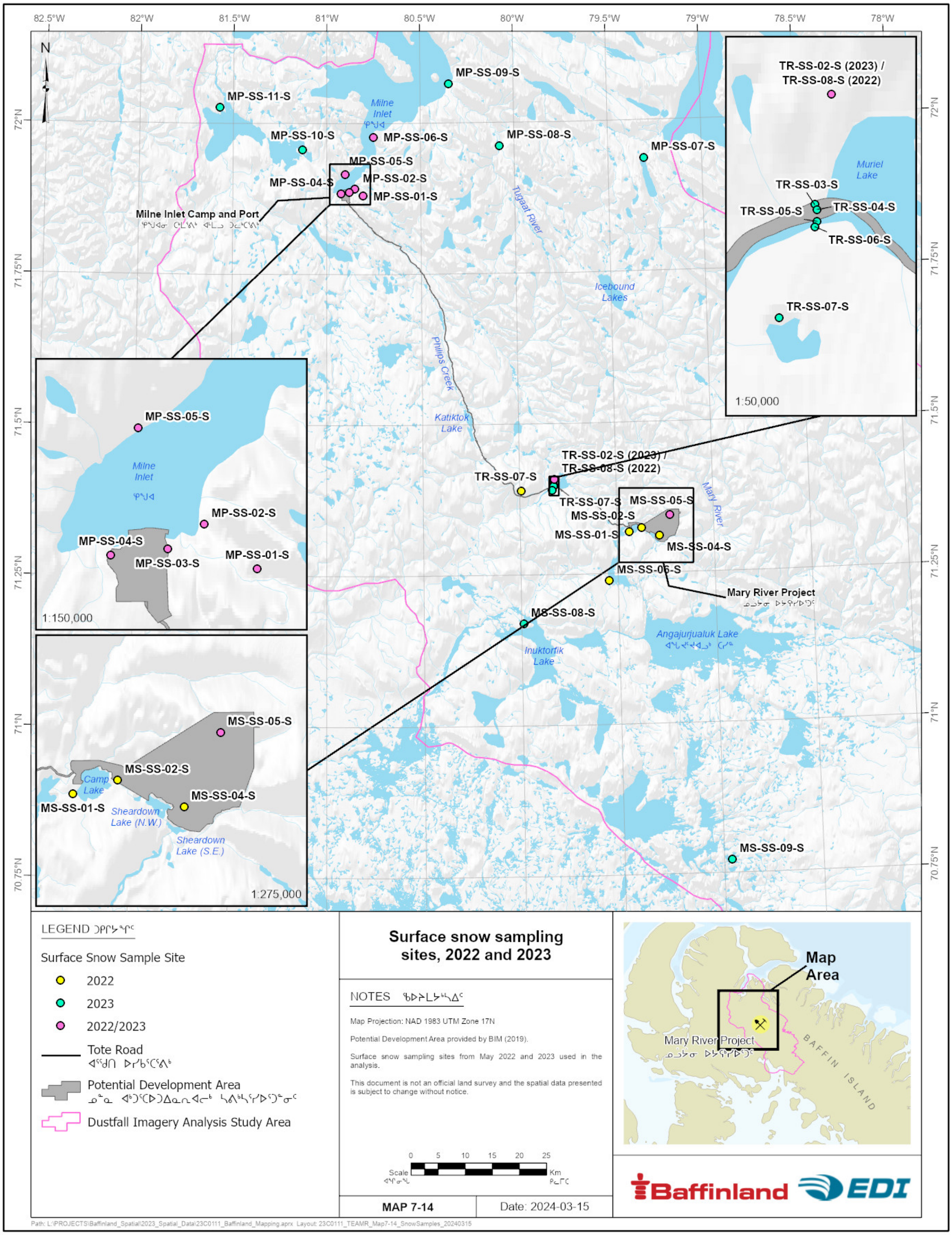
7.4.4 SNOW SAMPLING PILOT STUDY

Surface snow samples were collected in 2022 between May 1 and May 9 and in 2023 between May 6 and May 15 (Table 7-11). A total of 13 samples were collected in 2022, six around Milne Port, five around the Mine Site, and two at the Tote Road south crossing at the 78 km marker. In 2023, 26 sample were collected, 11 samples around Milne Port, nine samples around the Mine Site, and six at the Tote Road south crossing (Map 7-14).

Landsat and Sentinel-2 images were searched to find images that corresponded to the snow surface sample dates and locations. Ten sample sites in 2022 and nine sample sites in 2023 had at least one Landsat image acquired on the same date and covered the same location. Only one Sentinel-2 image corresponded with a 2022 sample site and no Sentinel-2 images corresponded with any 2023 sample sites. With only one usable sample point, no analysis can be conducted with the Sentinel-2 data at this time. The analysis results present in this section are based on the Landsat data.

Table 7-11. 2022 and 2023 surface snow sample locations.

Year	Location	Date	Easting	Northing	Site ID	Satellite Image
2022	Milne Port	May 6	504203	7976230	MP-SS-03-S	-
2022	Milne Port	May 6	502580	7976051	MP-SS-04-S	-
2022	Milne Port	May 6	508583	7986332	MP-SS-06-S	-
2022	Milne Port	May 9	506661	7975666	MP-SS-01-S	Landsat 8
2022	Milne Port	May 9	505212	7976892	MP-SS-02-S	Landsat 8
2022	Milne Port	May 9	503339	7979591	MP-SS-05-S	Landsat 8
2022	Mine Site	May 1	555807	7913700	MS-SS-01-S	Landsat 9
2022	Mine Site	May 1	552214	7904596	MS-SS-06-S	Landsat 9
2022	Mine Site	May 2	558081	7914370	MS-SS-02-S	Landsat 8
2022	Mine Site	May 2	561454	7913021	MS-SS-04-S	Landsat 8
2022	Mine Site	May 2	563308	7916817	MS-SS-05-S	Landsat 8
2022	Tote Road	May 1	535893	7921188	TR-SS-07-S	Landsat 9/Sentinel-2
2022	Tote Road	May 1	542052	7923280	TR-SS-08-S	Landsat 9
2023	Milne Port	May 6	504189	7976224	MP-SS-03-S	-
2023	Milne Port	May 6	502623	7976049	MP-SS-04-S	-
2023	Milne Port	May 11	506675	7975667	MP-SS-01-S	Landsat 9
2023	Milne Port	May 11	505210	7976908	MP-SS-02-S	Landsat 9
2023	Milne Port	May 11	503370	7979583	MP-SS-05-S	Landsat 9
2023	Milne Port	May 11	508569	7986481	MP-SS-06-S	Landsat 9
2023	Milne Port	May 11	531889	7984932	MP-SS-08-S	Landsat 9
2023	Milne Port	May 11	480269	7991947	MP-SS-11-S	Landsat 9
2023	Milne Port	May 15	558499	7982782	MP-SS-07-S	-
2023	Milne Port	May 15	522405	7996385	MP-SS-09-S	-
2023	Milne Port	May 15	495552	7984180	MP-SS-10-S	-
2023	Mine Site	May 7	-	-	MS-SS-02-S	-
2023	Mine Site	May 7	-	-	MS-SS-04-S	-
2023	Mine Site	May 7	-	-	MS-SS-10-S	-
2023	Mine Site	May 9	563309	7916812	MS-SS-05-S	-
2023	Mine Site	May 10	-	-	MS-SS-01-S	-
2023	Mine Site	May 10	-	-	MS-SS-06-S	-
2023	Mine Site	May 10	-	-	MS-SS-07-S	-
2023	Mine Site	May 12	536359	7896650	MS-SS-08-S	Landsat 8
2023	Mine Site	May 12	574911	7853193	MS-SS-09-S	Landsat 8
2023	Tote Road	May 7	541922	7922111	TR-SS-05-S	-
2023	Tote Road	May 7	541903	7922059	TR-SS-06-S	-
2023	Tote Road	May 8	541898	7922266	TR-SS-03-S	-
2023	Tote Road	May 8	541921	7922220	TR-SS-04-S	-
2023	Tote Road	May 12	542055	7923282	TR-SS-02-S	Landsat 8
2023	Tote Road	May 12	541570	7921219	TR-SS-07-S	-


Surface snow sampling sites, 2022 and 2023
MP-SS-09-S
MP-SS-11-S
Milne Inlet
MP-SS-10-S
MP-SS-06-S
MP-SS-08-S
MP-SS-07-S
MP-SS-05-S
MP-SS-04-S
MP-SS-02-S
MP-SS-01-S
MP-SS-03-S
Milne Inlet Camp and Port
Tugaat River
Icebound Lakes
Phillips Creek
Katiktok Lake
TR-SS-07-S
TR-SS-02-S (2023) /
TR-SS-08-S (2022)
TR-SS-03-S
TR-SS-04-S
TR-SS-05-S
TR-SS-06-S
Muriel Lake
MS-SS-05-S
MS-SS-02-S
MS-SS-01-S
MS-SS-04-S
MS-SS-06-S
MS-SS-08-S
MS-SS-09-S
Mary River
Mary River Project
Angajurjualuk Lake
Inuktorfik Lake
Camp Lake
Sheardown Lake (N.W.)
Sheardown Lake (S.E.)
1:150,000
1:275,000
1:50,000
LEGEND
Surface Snow Sample Site
2022
2023
2022/2023
Tote Road
Potential Development Area
Dustfall Imagery Analysis Study Area
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
Surface snow sampling sites from May 2022 and 2023 used in the analysis.
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 5 10 15 20 25
Km
Map Area
BAFFIN ISLAND
Baffinland
EDI
MAP 7-14
Date: 2024-03-15
Path: L:\PROJECTS\Baffinland_Spatial\2023_Spatial_Data\23C0111_Baffinland_Mapping.aprx Layout: 23C0111_TEAMR_Map7-14_SnowSamples_20240315

The SDI values of the Landsat images matching the timing and location of the surface snow samples were extracted at 10 sample sites in 2022 and nine sample sites in 2023. Three sample sites in 2022 had two images matching the timing and location, bringing the total sample size up from 19 to 22 (Table 7-12).

Using the rational equation presented in Mauro et al. (2015) for mineral dust versus SDI measured from hyperspectral data, a non-linear regression model was fit to the Landsat data (residual standard error = 0.0124).

$$SDI_L = \frac{0.0628 \times Conc - 4.3886}{Conc + 459.8103}$$

None of the coefficients were significant ($P > 0.1$) and there was a large gap between the higher concentration data points (650–750 mg/L) and the lower concentration data points (<200 mg/L; Figure 7-25).

A significant challenge of this study relates to matching the timing and location of the surface snow sampling with satellite image acquisition. Considering Sentinel-2 satellites and Landsat 8 and 9, images are generally acquired every 2 to 3 days, but may not align with the location of the surface snow sampling. Cloud cover can also reduce the number of available images to match with the sampling sites. This matching step determines the sample size and can limit the distribution of dustfall concentrations, contributing to the second challenge of collecting samples to represent the full range of dust concentration. Variable dust concentrations may be collected in the field, but a corresponding satellite image is need for analysis. Continuation of the pilot study is being evaluated in relation to the need for and viability of improvements to experimental design, including increased data/image capture and improved geolocation of snow sampling in relation to available satellite imagery.

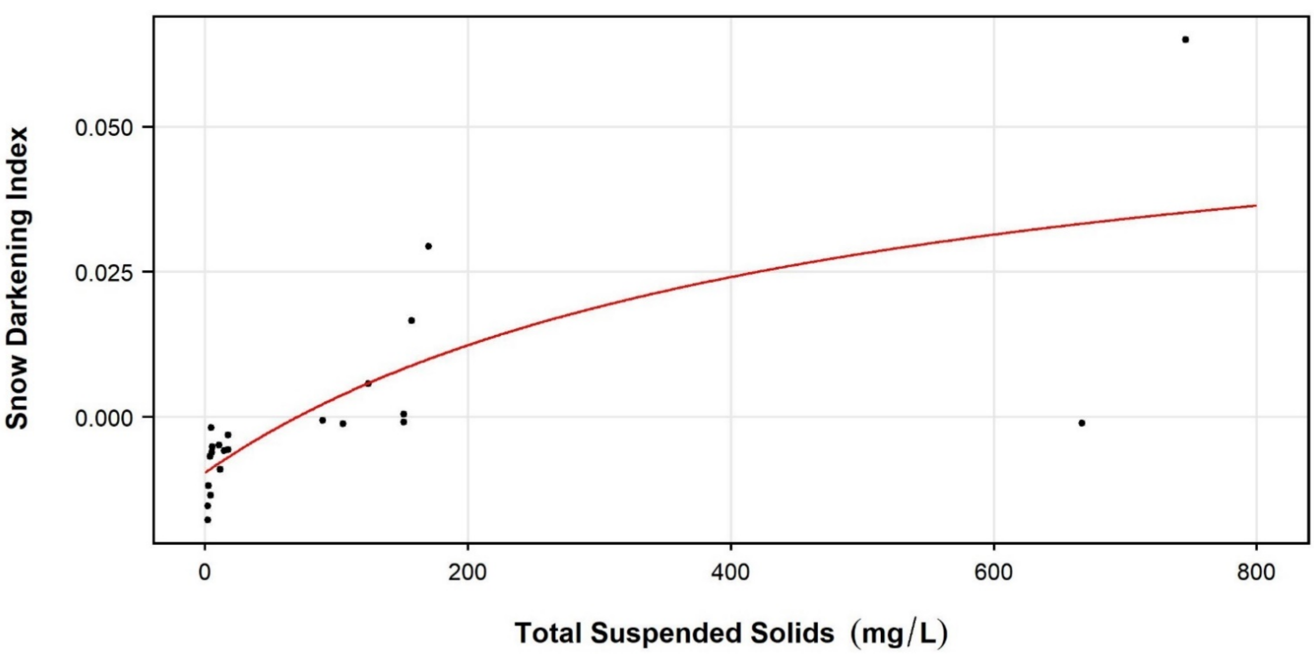


Figure 7-25. Non-linear regression (rational fit) between Total Suspended Solids and Landsat 8/9 Snow Darkening Index.

Table 7-12. 2022 and 2023 surface snow sample concentrations and corresponding Snow Darkening Index values from satellite imagery used in the analysis.

Sample ID	Date	Easting	Northing	Total Suspended Solids (mg/L)	Snow Darkening Index	Satellite
TR-SS-07-S	2022-05-01	535893	7921188	5.4	-0.002	Landsat 9
TR-SS-07-S	2022-05-01	535893	7921188	5.4	0.010	Sentinel-2
TR-SS-08-S	2022-05-01	542052	7923280	5.1	-0.006	Landsat 9
MP-SS-05-S	2022-05-09	503339	7979591	151	0.004	Landsat 8
MP-SS-05-S	2022-05-09	503339	7979591	151	0.001	Landsat 8
MP-SS-02-S	2022-05-09	505212	7976892	17.6	-0.003	Landsat 8
MP-SS-02-S	2022-05-09	505212	7976892	17.6	-0.006	Landsat 8
MP-SS-01-S	2022-05-09	506661	7975666	<2[1]	-0.018	Landsat 8
MP-SS-01-S	2022-05-09	506661	7975666	<2[1]	-0.015	Landsat 8
MS-SS-06-S	2022-05-01	552214	7904596	4.5	-0.002	Landsat 9
MS-SS-01-S	2022-05-01	555807	7913700	157	0.017	Landsat 9
MS-SS-04-S	2022-05-02	561454	7913021	746	0.065	Landsat 8
MS-SS-02-S	2022-05-02	558081	7914370	170	0.029	Landsat 8
MS-SS-05-S	2022-05-02	563308	7916817	14.5	-0.006	Landsat 8
MP-SS-01-S	2023-05-11	506675	7975667	105	-0.001	Landsat 9
MP-SS-02-S	2023-05-11	505210	7976908	124	0.006	Landsat 9
MP-SS-05-S	2023-05-11	503370	7979583	667	-0.001	Landsat 9
MP-SS-06-S	2023-05-11	508569	7986481	10.4	-0.005	Landsat 9
MP-SS-08-S	2023-05-11	531889	7984932	3.5	-0.007	Landsat 9
MP-SS-11-S	2023-05-11	480269	7991947	2.3	-0.012	Landsat 9
MS-SS-08-S	2023-05-12	536359	7896650	11.2	-0.009	Landsat 8
MS-SS-09-S	2023-05-12	574911	7853193	4	-0.013	Landsat 8
TR-SS-02-S	2023-05-12	542055	7923282	89.4	-0.001	Landsat 8

[1] < denotes below the detection limit.

7.5 DUSTFALL SUMMARY

7.5.1 PASSIVE DUSTFALL MONITORING

Dustfall deposition remained relatively constant at most year-round sampling locations throughout the Project area in 2023. Wet conditions, particularly in August, likely contributed to decreases in dustfall across the Project area.

Dustfall Scene Distributions and Magnitudes— The magnitude of annual dustfall deposition at Mine Site sample locations was lower than measured in recent years. The highest dustfall deposition at the Mine Site was associated with the mine haul road. While the airstrip has consistently had the highest dustfall deposition in the Mine Site area in all years except 2019, total dustfall was lowest at this location in 2023.

The magnitude of dustfall deposition at Milne Port has remained constant or, in some cases, has slightly decreased, a trend that began in 2018. The highest dustfall deposition in the Milne Port area was associated with the ore stockpiles, with lesser amounts generated by the sealift staging area.

Dustfall deposition along the Tote Road was consistent at the north crossing and south crossing locations compared with recent years.

Interannual Trends— Dustfall deposition at 1,000 m distance from the PDA was measured year-round at 12 sites. Dustfall deposition remained low, but measurable, at these sites across all sampling years, including in 2023. The geometric mean daily dustfall across all sites was consistently less than 1.0 $mg/dm^2 \cdot day$.

Despite increased production from 2016 to 2021, and steady production from 2021 through 2023, dustfall deposition generally plateaued and sometimes decreased across all Project areas. Post-2016 decreases in dustfall deposition are likely associated with implementing dustfall mitigation strategies across all Project areas.

7.5.2 DUSTFALL IMAGERY ANALYSIS

Satellite-estimated dustfall concentrations were derived from a relationship between the dustfall accumulation calculated from passive dustfall monitor deposition rates and the SDI.

Dustfall Scene Distribution, Magnitudes and Extents— There were 68 Sentinel-2 and 56 Landsat 8/9 images acquired from March 17 to May 8, an increase in the number of images over the last two years.

The 2023 dustfall extent covered 15.73% of the Study Area, with lower dustfall concentration classes (<4.5 g/m^2) accounting for the largest dustfall area. Milne Inlet and Milne Port had the largest percentage of dustfall extent (35.77% and 29.97%, respectively), followed by the Mine Site and the Tote Road south (both around 27%).

Mean dustfall concentrations were highest near the PDA and decreased with distance. The pattern of dustfall on the landscape, particularly along Milne Inlet and around the Mine Site, reflected the direction of prevailing and strong winds. The mean dustfall concentrations at the Areas of Community Concern were less than the Reference site (0.14 g/m²) except for those around Milne Port and along Milne Inlet (Qullutu Lake, Quarnak and the Eastern Channel sites).

Inter-Annual Trends— The 2023 dustfall extents increased compared to 2022, primarily in the concentration classes between 1 and 10 g/m² but were similar to 2020 and 2021.

Satellite-derived mean dustfall concentrations across all areas generally increased from 2014 to 2020 in line with the increase in total ore hauled to Milne Port over the same period. Mean dustfall concentrations have increased since 2021 primarily within 1 km of the PDA. Most Areas of Community Concern had mean dustfall concentrations <1 g/m² for all years, similar to the Reference site, except for 2019. The Quarnak, Ridge West and Eastern Channel sites had mean dustfall concentrations between 1 and 5.5 g/m² in three to five of the post-baseline years.

The overall trends between the satellite-derived mean dustfall concentrations and the annual dustfall from the passive dustfall monitors were similar for the Tote Road, capturing most of the same fluctuations, but they were different for the Mine Site and Milne Port.

Snow Sampling Pilot Study— There was no significant relationship between the surface snow samples and image SDI. Two main challenges are apparent with data collection: timing surface snow sample collection to coincide with the satellite image acquisition for the same area and collecting representative samples of the full range of dust concentration.

8 VEGETATION

Baffinland Iron Mines Corporation (Baffinland) is committed to monitoring the potential effects of the Mary River Project (the Project) on vegetation, specifically vegetation abundance and composition (i.e., caribou forage species) and vegetation health (i.e., soil-metal and lichen-metal concentrations) as indicators of change. Based on the committed monitoring frequency of three to five years delineated in the Terrestrial Environment Mitigation and Monitoring Plan (Baffinland Iron Mines Corporation 2016a), the 2023 monitoring program focused on vegetation abundance and composition.

8.1 VEGETATION ABUNDANCE

In 2014, Baffinland established a long-term vegetation monitoring program to study potential changes to the abundance and composition of vegetation used as caribou forage at permanent monitoring locations within the Regional Study Area (Nunavut Impact Review Board 2020). This commitment directly relates to the following Project Condition (PC):

- **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."*

The program's objective was to evaluate potential vegetation abundance and composition changes over time and at varying distances from the Potential Development Area (PDA) using percent vegetation cover and plant group composition as measurable effects.

8.1.1 METHODS

8.1.1.1 Monitoring History and Changes in Sampling Procedures

Vegetation monitoring data collection started in 2014. Annual sampling frequency and intensity of data capture have increased over time, as follows:

2014— Assessment of transects 1 to 8 and Reference sites 1 to 3. Per TEWG dialogue, experimental design adapted to account for and compare the potential effects of herbivory (exclusion fencing).

2016— Increased number of transects; assessment of transects 1 to 15 and Reference sites 1 to 6[11]. Per TEWG dialogue, sample size informed by statistical power analysis.

2017— Assessment of transects 1 to 15 and Reference sites 1 to 6.

2018— Assessment of transects 1 to 15 and Reference sites 1 to 6.

[11] Transects 4, 5, and 8 sampled only at the 1,200 m distance class; excludes Reference site 6.

2019— Increased number of Reference sites; assessment of transects 1 to 15 and Reference sites 1 to 15. Per TEWG dialogue, timing of survey verified and informed by remote sensing (historical 'green-up' period).

2023— Assessment of transects 1 to 15 and Reference sites 1 to 15.

In 2023, a multi-year trend analysis was conducted using data from all available monitoring campaigns (i.e., 2014, 2016 to 2019, and 2023) to evaluate year-over-year trend comparisons. Analysis of vegetation abundance data was also evaluated and interpreted in relation to soil moisture characterization[12].

8.1.1.2 Monitoring Design and Site Selection

The vegetation monitoring program—including assessment schedule and frequency, scope of assessment, and indicators and thresholds—is described in the Terrestrial Environment Mitigation and Monitoring Plan (Baffinland Iron Mines Corporation 2016a). Monitoring design and sample site selection were informed by the Project-specific Vegetation Baseline Report (Baffinland Iron Mines Corporation 2010), information on northern Canadian vegetation habitat types (Olthof et al. 2009) and preferred caribou forage (summarized in Baffinland Iron Mines Corporation 2012), and other relevant literature (Spatt and Miller 1981, Walker and Everett 1987, Walker 1996, Auerbach et al. 1997, Hudson and Ouimet 2011). Monitoring design was also informed by dustfall modelling and other effects monitoring programs for siting of permanent monitoring sites (Baffinland Iron Mines Corporation 2013a), as well as input from the Terrestrial Environment Working Group on caribou forage and habitat types (refer to April 23, 2014, meeting, Baffinland Iron Mines Corporation 2014).

Target Vegetation

The monitoring design applied a Before-After-Control-Impact experimental approach (Bernstein and Zalinski 1983, Stewart-Oaten et al. 1992) with a stratified random paired/block design comparing potentially impacted sites (Transect) with control sites (Reference). All vegetation sampling was conducted within the Moist to Dry Non-Tussock Graminoid/Dwarf Shrub habitat type (Northern Land Cover, Olthof et al. 2009), which represents the predominant vegetation assembly (including lichens, grasses, sedges, forbs, and deciduous shrubs) relevant to the Project (depicted in Photo 8-1). This habitat type was selected based on the following factors:

- relative abundance of the habitat type (as per Appendix 6F of the Wildlife Baseline Report, Baffinland Iron Mines Corporation 2012);
- relative habitat use by caribou, combining findings from the Resource Selection Probability Function model (Wildlife Baseline Report, Baffinland Iron Mines Corporation 2012) and the energetics model by Russell (2014); and,
- likelihood of the habitat type containing high-quality caribou forage (Appendix 6F of the Wildlife Baseline Report, Baffinland Iron Mines Corporation 2012).

[12] In response to Environment and Climate Change Canada's technical review comment #3 on the 2018 Mary River Project Terrestrial Environment Annual Monitoring Report (EDI Environmental Dynamics Inc. 2019b).

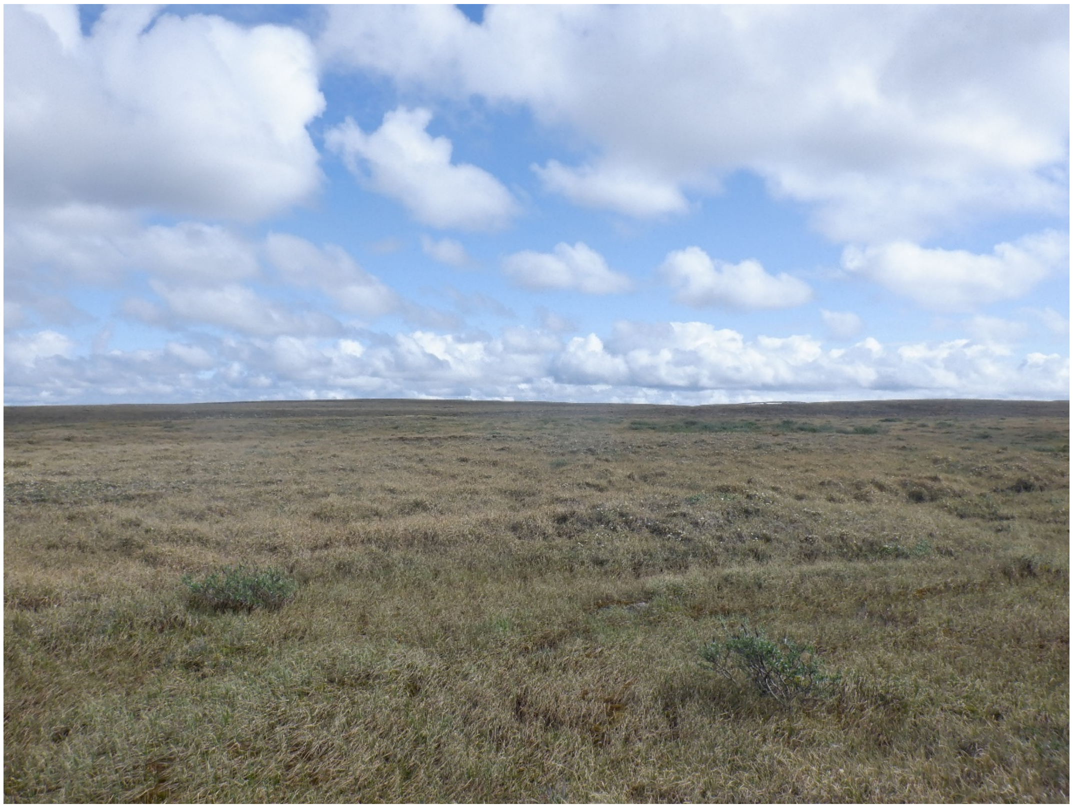
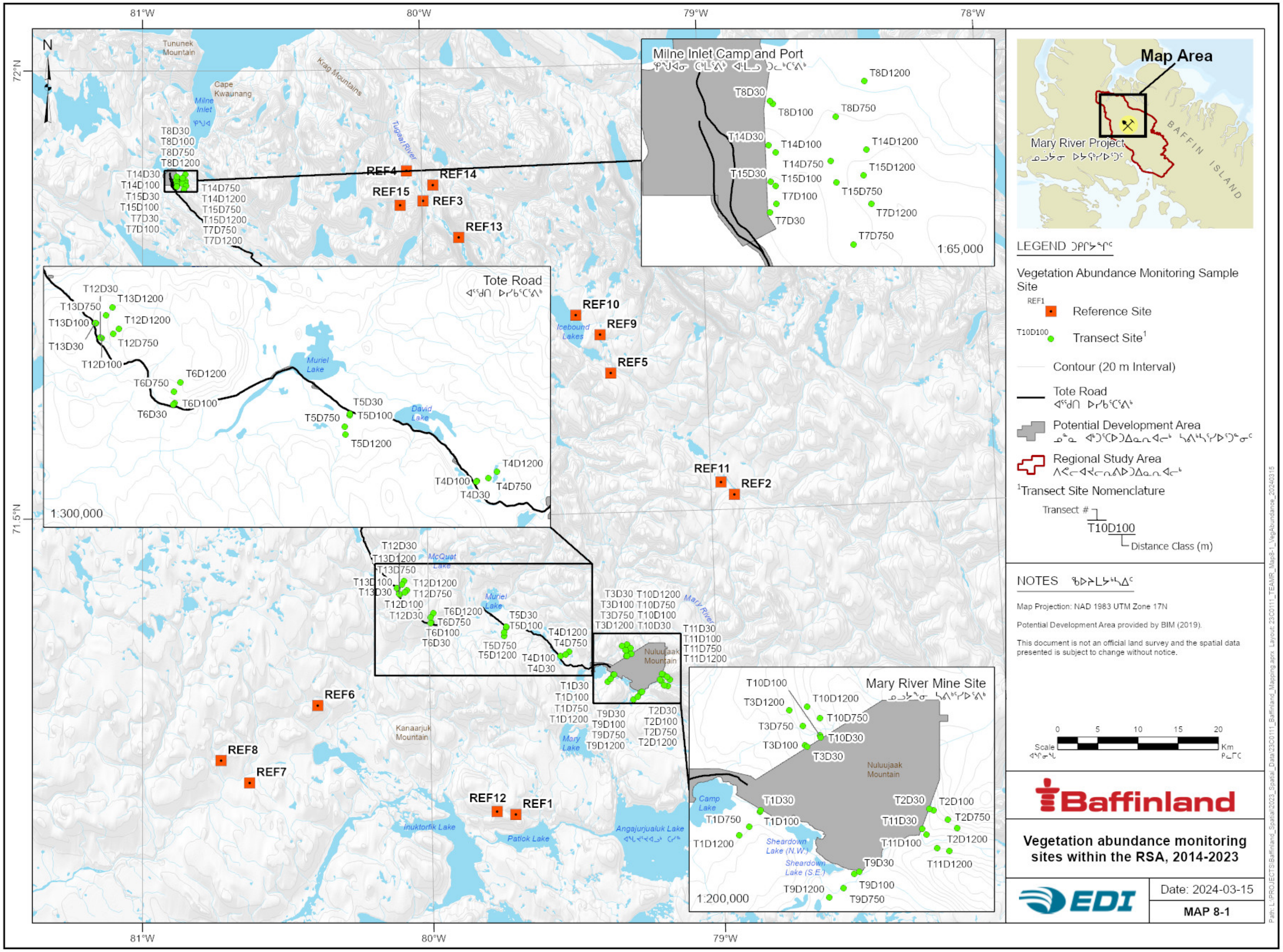


Photo 8-1. Example of the Moist to Dry Non-Tussock Graminoid/Dwarf Shrub habitat type in the Regional Study Area, which was selected for the vegetation abundance monitoring program.

Vegetation Transects and Reference Sites

Data capture for vegetation abundance was completed along sampling transects (Figure 8-1) comprising four replicated sampling sites at defined distance intervals (30, 100, 750, and 1,200 m) that extended perpendicularly from the transect and were appropriately spaced from the PDA. Fifteen vegetation transects were assessed in relation to Project infrastructure areas—including the Mine Site (six transects), Tote Road (five transects), and Milne Port (four transects)—resulting in 60 sample sites total. Controls were assessed at 15 Reference sites approximately 20 to 30 km from the PDA. All sample sites (75 in total) are shown on Map 8-1.

Figure 8-1 shows replicated vegetation plots (described further in Section 8.1.1.3) were completed at each site along all transects and Reference sites. Three replicates were completed for 'near sites' (30 and 100 m from the PDA) and two replicates were completed for 'far sites' (750 and 1,200 m from the PDA). Three replicates were completed for Reference sites. In total, 179 plots were sampled. Plots within a site were spaced at least 3 m apart to prevent replication and reduce inter-site variability. Figure 8-1 provides a schematic illustration of the sample site and plot locations along a transect. A table of all plots, transects, distances, treatments, and coordinates are provided in Appendix B.


Milne Inlet Camp and Port
Tote Road
Mary River Mine Site
Map Area
Mary River Project
LEGEND
Vegetation Abundance Monitoring Sample Site
Reference Site
Transect Site[1]
Contour (20 m Interval)
Tote Road
Potential Development Area
Regional Study Area
[1]Transect Site Nomenclature
Transect #
T10D100
Distance Class (m)
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
Baffinland
Vegetation abundance monitoring sites within the RSA, 2014-2023
EDI
Date: 2024-03-15
MAP 8-1

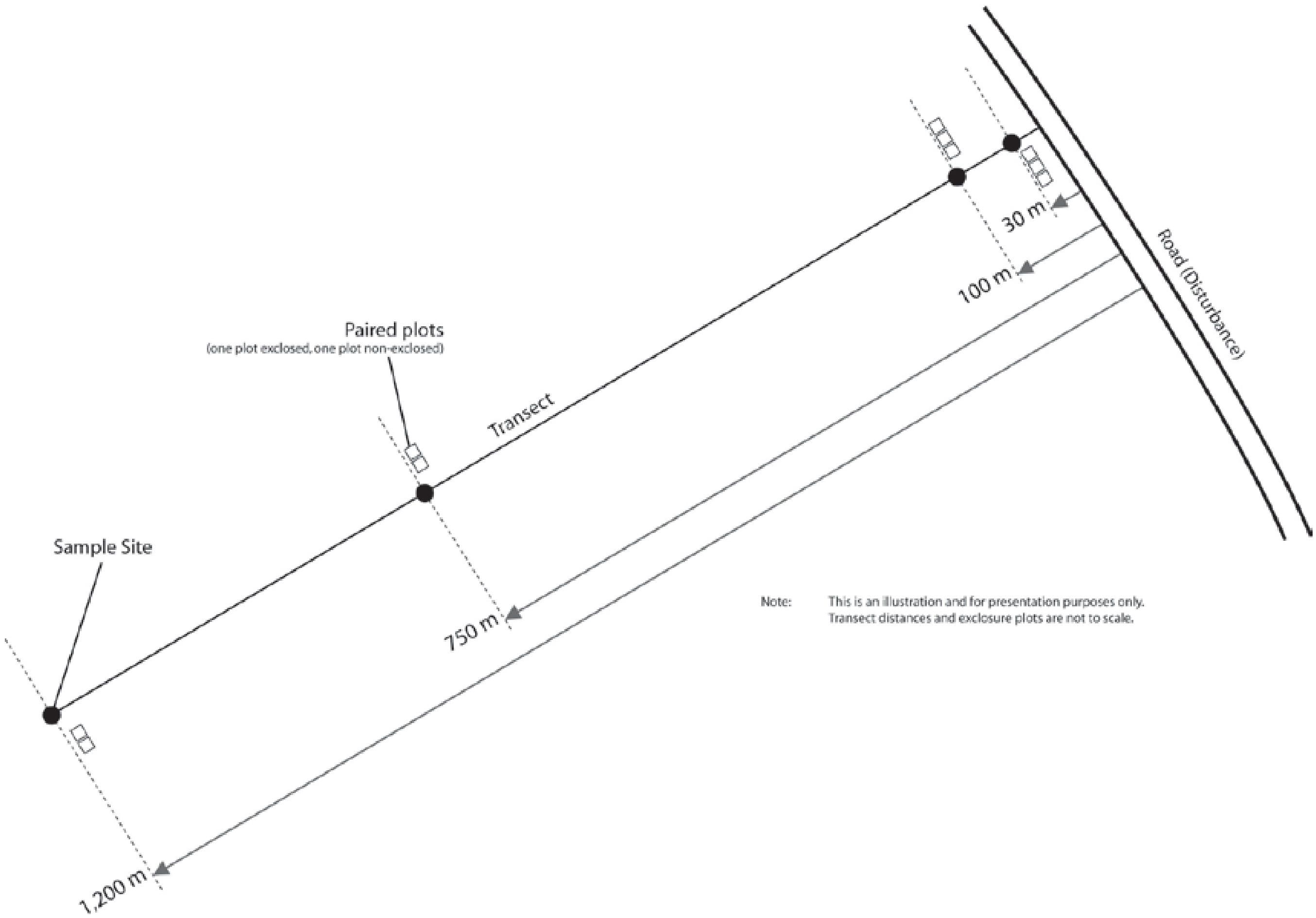


Figure 8-1. Schematic diagram showing the location of sample sites and plots along a transect.

Exclusion Fencing

Per recommendations by the Terrestrial Environment Working Group (refer to the April 23, 2014, meeting, Baffinland Iron Mines Corporation 2014), monitoring design and sampling replication were adapted to account for, and compare the potential effects of, herbivory. Exclusion fencing (a 2 x 2 m surrounding cage) was installed at one vegetation sampling replicate at each Transect site and Reference site (Photo 8-2). Data handling and analysis (refer to Section 8.1.1.5) compared potential variations in these treatments.

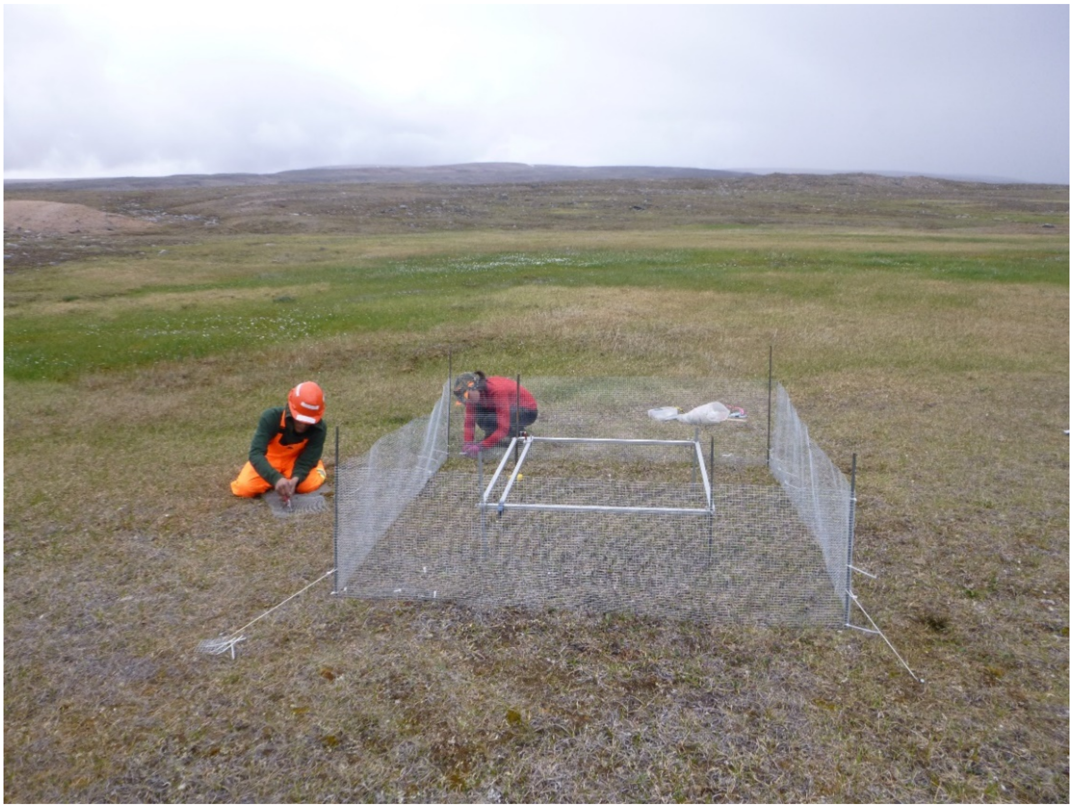


Photo 8-2. Exclusion fencing at REF11, July 19, 2019.
The roof of cage is not shown in the photo. The measuring plot erected in the cage was removed once monitoring was complete and the roof was replaced.

8.1.1.3 Assessment Plots

Assessment of vegetation abundance followed the point-quadrat method and associated standards and practices described in the Canadian Tundra and Taiga Experiment (Bean and Henry 2003, Bean et al. 2003) and International Tundra Experiment (Walker 1996). The point-quadrat method is deemed robust and appropriate for assessment of vegetation abundance as part of long-term effects monitoring in tundra plant communities (Levy and Madden 1933, Goodall 1952, Stampfli 1991, Molau and Mølgaard 1996, Elzinga et al. 1998, Hudson and Henry 2009, Bonham 2013).

The point-quadrat method comprises an assessment of vegetation at the scale of 1 x 1 m plots based on 100 observations (i.e., points) at fixed intervals (10 cm) using a grid frame (Figure 8-2). For precision, a laser (affixed to the sampling grid) was used to pinpoint vegetation observations and data recordings of plant species in the canopy layer and ground layer (Figure 8-3, Photo 8-3). Vegetation abundance percentages were determined based on the total observations/recordings and categorized into plant groups. Vegetation composition was based on inventories of all species encountered within the plots and categorized into plant groups (Molles and Cahill 2008). Plant groups—consistent with those used in the caribou energetics model (Russell 2014)—were delineated as shrubs (deciduous and evergreen), forbs, graminoids, moss and lichen, and standing dead litter[13]. Non-vegetation (bare ground, rock, or gravel and cryptobiotic soil crusts) occurring within sample plots was categorized but excluded from assessments of cover composition.

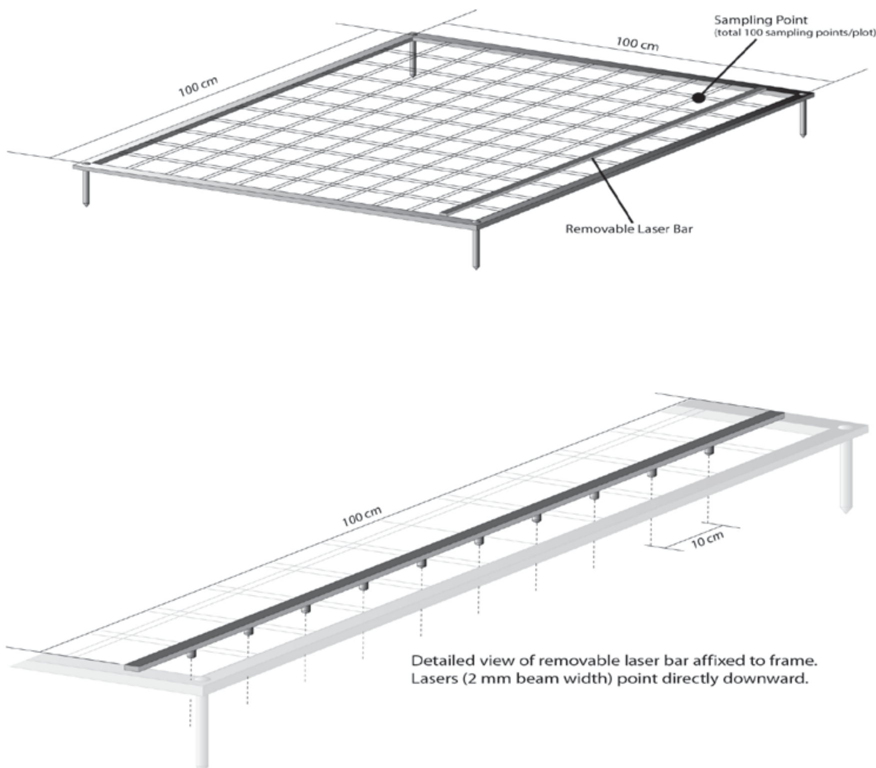


Figure 8-2. Schema of point-quadrat assessment plot (1 x 1m).

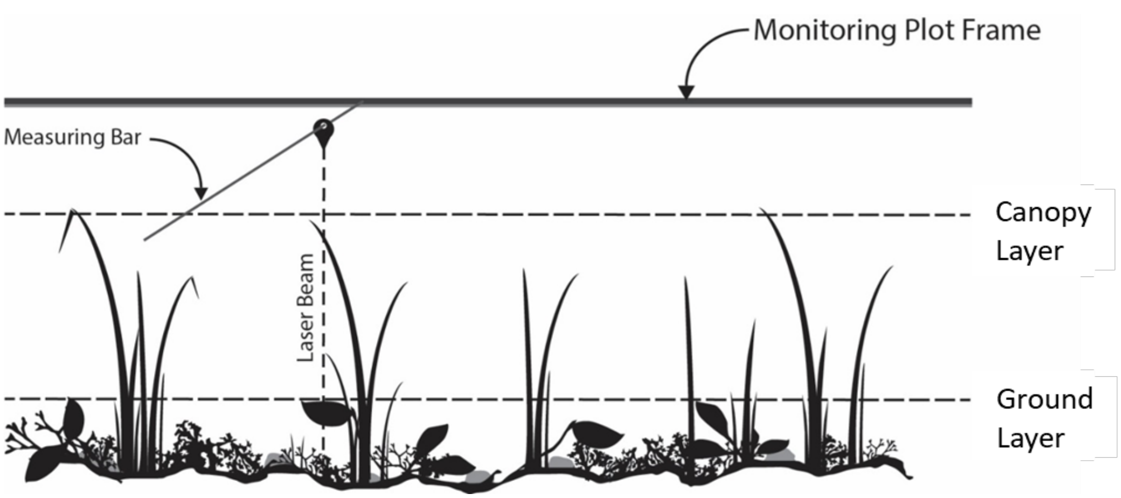


Figure 8-3. Schematic diagram of canopy and ground cover.

[13] As a source of caribou winter forage (Heggberget et al. 2002).

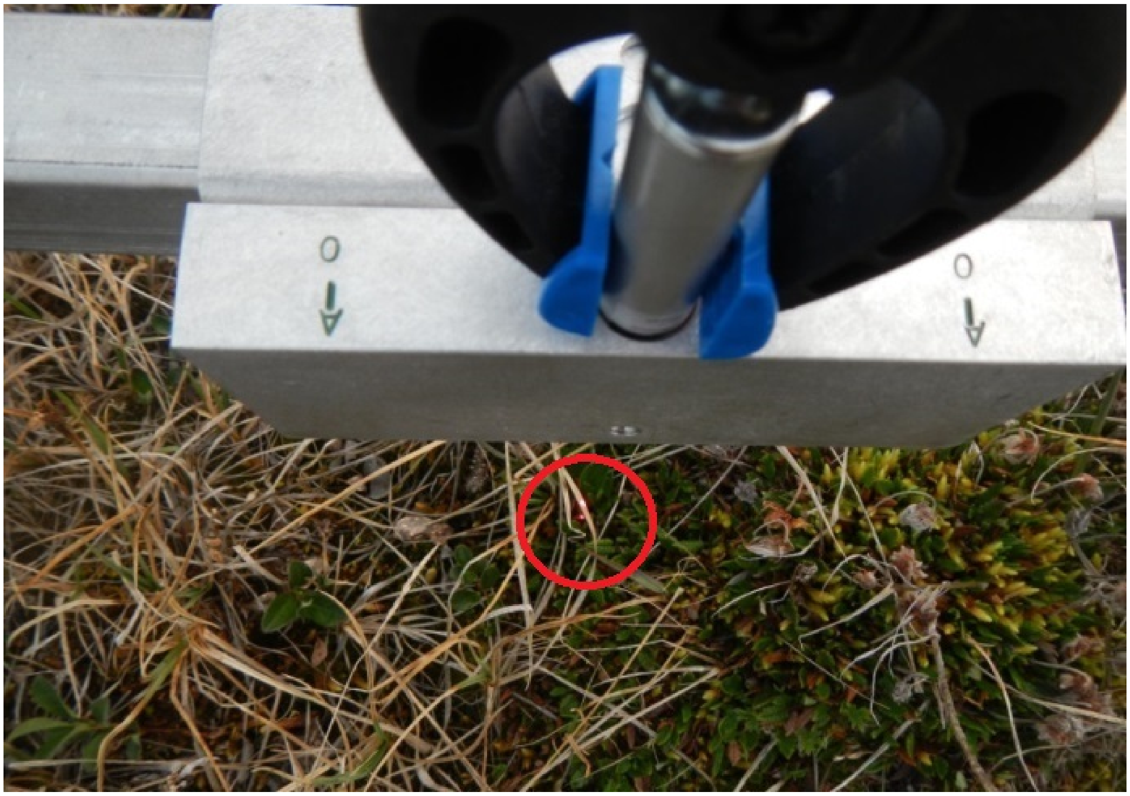


Photo 8-3. Pin-pointing vegetation observations.

8.1.1.4 Soil Characterization

Local terrain (surface expression, aspect, slope, and drainage) and site-specific soil properties (parent material, profile attributes, and moisture regime) were documented at each Transect site and Reference site. Terrain and soil data were collected using the Yukon Site Visit Form adapted to the Project's setting (e.g., including geomorphic processes and excluding assessment of seral stage). At each site, a 0.3 x 0.3 m soil pit was excavated with a hand shovel; this excavation depth (equivalent to the plant rooting zone) enabled soil characterization without disturbing permafrost. Consistent with methods described by the *Canadian System of Soil Classification* (Soil Classification Working Group 1998), documented soil characteristics included estimated humus/organic form, parent material, soil horizon depths and textures, percent coarse fragments, depth of permafrost, and seepage/water table and mottling/gleying (if present).

Drainage is an ordinal variable used to characterize soil moisture regime (SMR; Yukon Government Department of Environment 2017), which can indicate available moisture for plant growth. Drainage was characterized using a relative scale, from 'very rapidly drained' to 'very poorly drained', and allocated a moisture rating from 0 to 8, where '0' is very dry (water is removed extremely rapidly) and '8' is very wet (water is removed so slowly). A table of all sites, locations, and attributes is provided in Appendix C.

8.1.1.5 Data Analysis

All data, comprising vegetation cover and composition (by plant group), were analyzed to evaluate and compare potential trends in relation to distance class (from the PDA) and among assessment years. Data were further analyzed to determine the potential effects of herbivory (comparing closed versus open plots).

Vegetation Cover and Composition

Linear mixed effects models were applied to the data, accounting for distance class, assessment year, and plot treatment (i.e., closed versus open plots). Percent cover values were logit transformed to meet assumptions of normal distribution (Warton and Hui 2011). Not all plant groups were present in all plots; therefore, a value of 0.005 was added to plant group values before transformation (Warton and Hui 2011). All estimates of plant cover were back-transformed to the original scales and reported as mean plant cover with 95% confidence intervals. F-tests were used to determine the statistical significance of model parameters. Residual plots were visually examined to confirm that models met the normality and variance equality assumptions. All analyses were performed using R version 4.3.2 (R Development Core Team 2023b). Mixed effects models were run using the 'nlme' package (Pinheiro et al. 2023). Pairwise comparisons within groups and confidence intervals were calculated using the 'lsmeans' package (Lenth 2018).

Potential Effects of Soil Moisture

Soil moisture regime was included as a fixed effect in all models for the vegetation abundance monitoring program to account for variation in plant cover due to differences in moisture at the site level. The significance and effect size of SMR were reported for each analysis. The effect size of SMR was reported on the logit scale; negative values indicated decreasing cover with increasing SMR while positive values indicated the opposite effect. Soil moisture regime was treated as a continuous and categorical variable. An analysis of variance (ANOVA) was used to test for differences in SMR among distance classes. A Fisher's exact test was used to evaluate whether SMR classes were evenly distributed among the distance classes. A t-test was used to determine if the nine new Reference sites had a different SMR than the six existing Reference sites.

8.1.2 RESULTS

The field campaign for assessing vegetation abundance and composition was completed in July and August 2023. The timing of the campaign was intended to coincide with vegetation 'green up' and early/mid-summer flowering to optimize vegetation observations. Vegetation plots and characterization of terrain and soil were completed along 15 transects (six at the Mine Site, five along the Tote Road, and four at Milne Port) and at 15 Reference sites. Seventy-five sites were assessed in total. All vegetation sampling was conducted within the Moist to Dry Non-Tussock Graminoid/Dwarf Shrub habitat type. Representative site conditions are shown for the Mine Site (Photo 8-4), Tote Road (Photo 8-5), and Milne Port (Photo 8-6). The remnant snowpack was still on the landscape (and receding) during the early 2023 field campaign. Surface melt and runoff were prominent in some locations. Vegetation at all Transect and Reference sites was relatively late blooming and senesced vegetation appeared more abundant than during previous field campaigns (Photo 8-7).

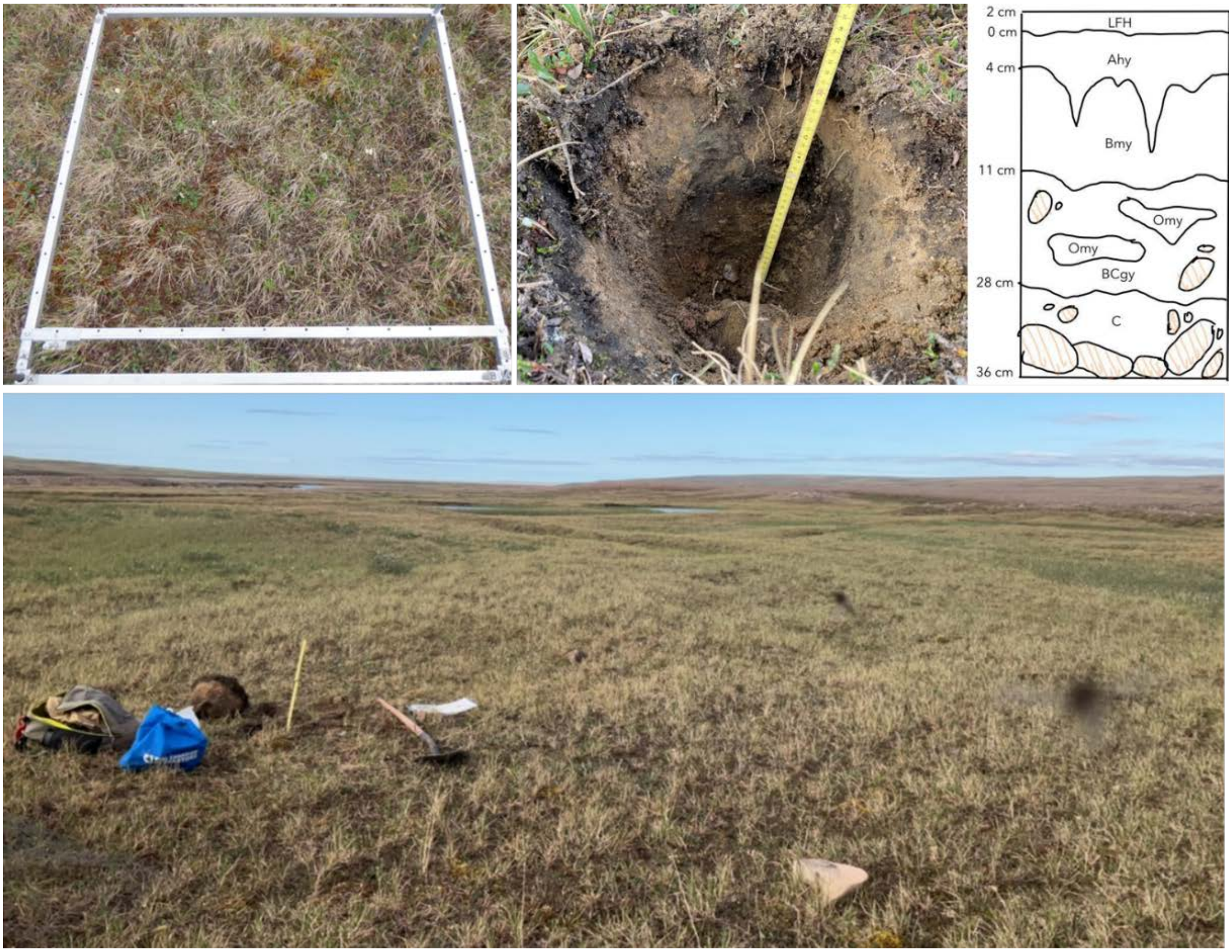


Photo 8-4. Representative site conditions (vegetation, soil, and landscape features) at the Mine Site (site T9D100; July 31, 2023).

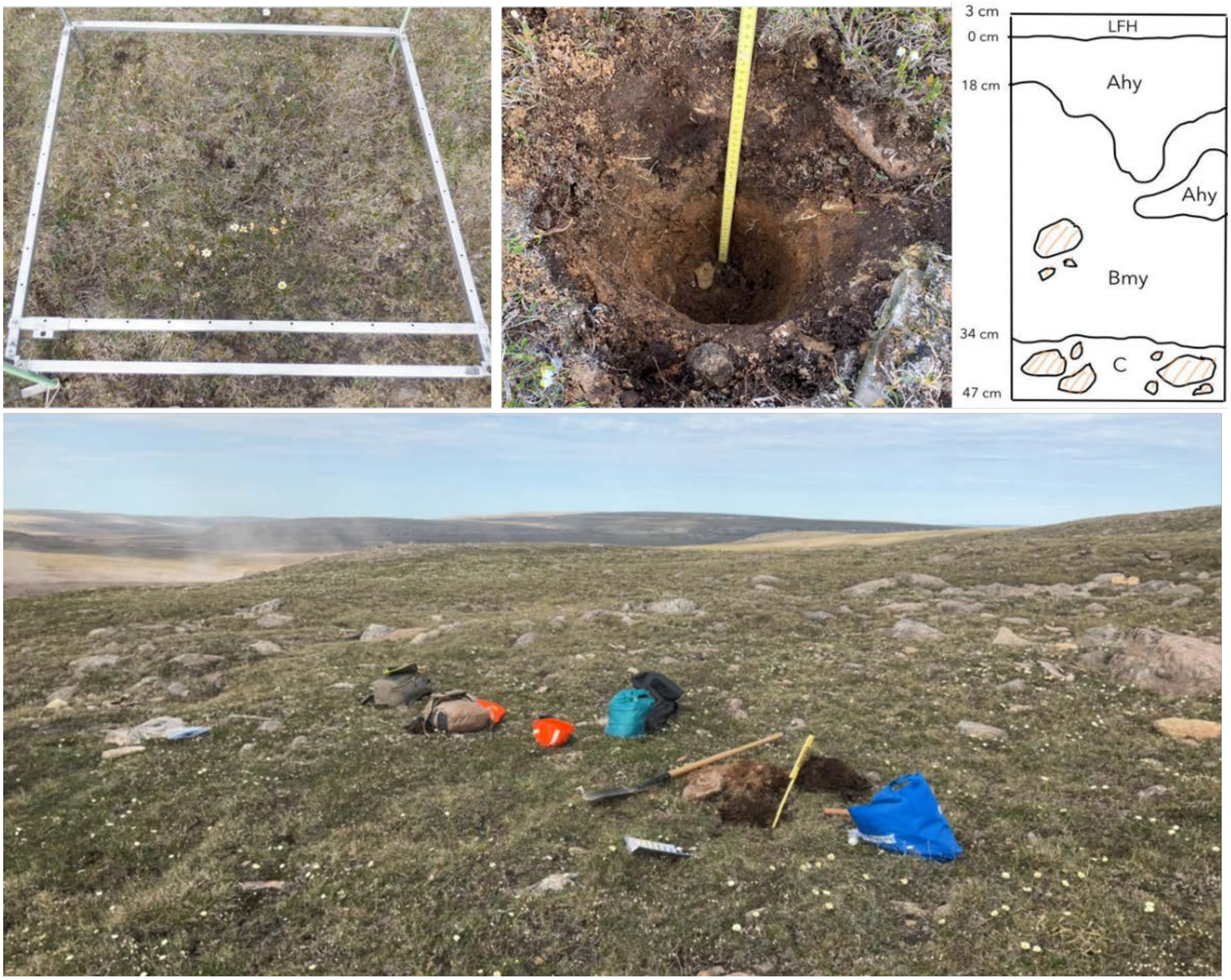


Photo 8-5. Representative site conditions at the Tote Road (site T12D30; July 25, 2023).

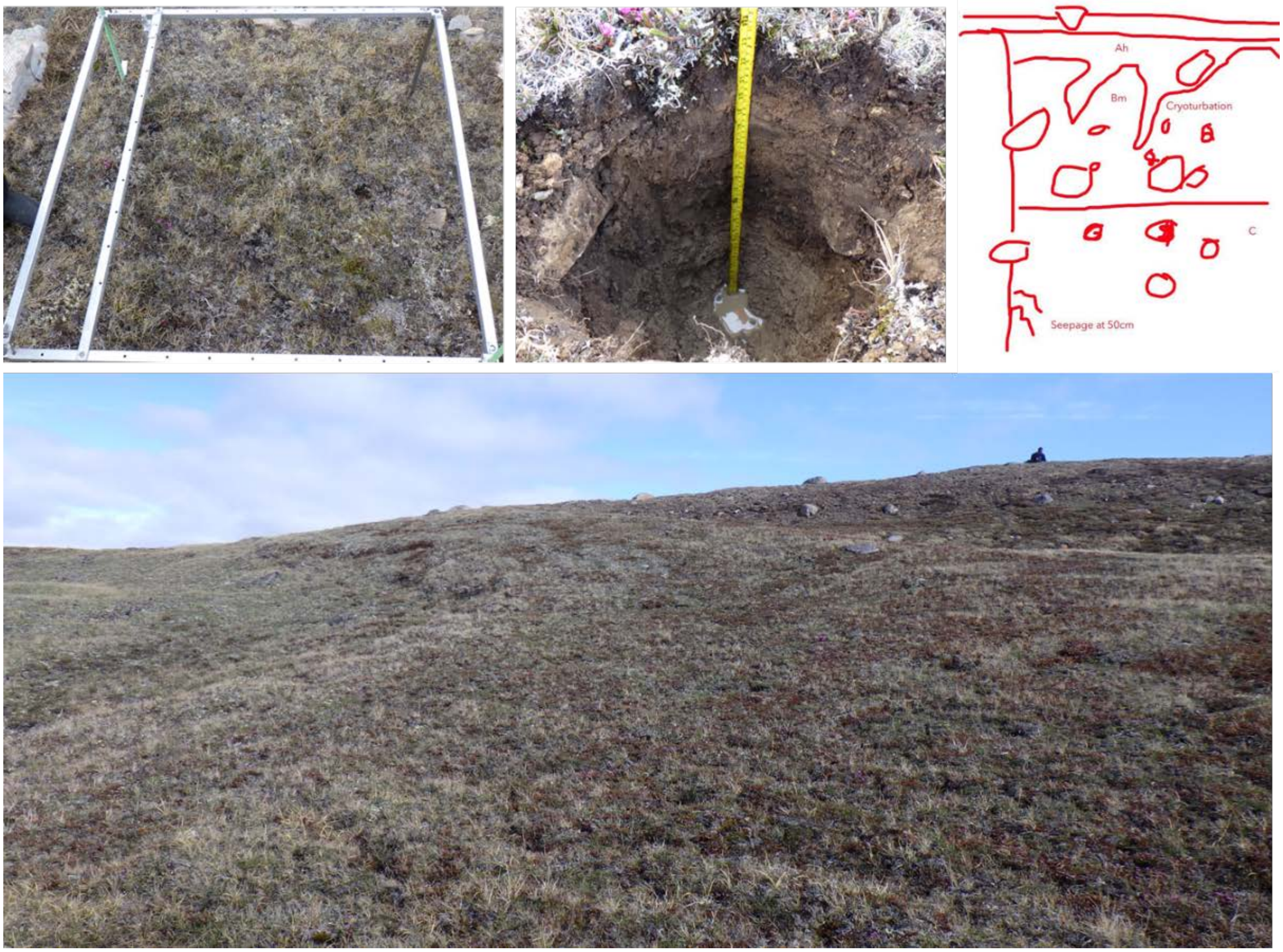


Photo 8-6. Representative site conditions at Milne Port (site T14D750; July 8, 2023).

Photo 8-7. Vegetation cover at Reference site 10 (plot ID REF10A) on July 18, 2019 (left) and July 22, 2023 (right).

8.1.2.1 Vegetation Cover

Potential Project-related effects on total vegetation cover were evaluated in relation to distance class and compared with previous field campaigns. Data were evaluated as (1) total percent vegetation cover, (2) total percent ground cover, and (3) total percent canopy cover.

Total Cover

No effect in relation to distance class and total percent vegetation cover was identified ($p = 0.39$). No distance class and year interaction were identified ($p = 0.41$). Examination of inter-annual variability in total percent vegetation cover did not identify any distinct trends (Table 8-1, Figure 8-4).

Total percent vegetation cover changed among assessment years ($p = 0.01$). Average total vegetation cover varied slightly among years, ranging from 96.0% to 96.9%. Total percent vegetation cover was lower in 2017 than in 2019 ($p = 0.03$) and 2023 ($p = 0.03$). No other total percent vegetation cover differences were identified among years (all $p > 0.18$).

Table 8-1. Average total percent vegetation cover across distance classes and years.

	Distance Class					Year					
	30 m	100 m	750 m	1,200 m	Ref	2014	2016	2017	2018	2019	2023
Average (%)	96.5	94.7	96.7	97.0	97.2	96.4	96.2	96.0	96.6	96.9	96.9
Lower CL (%)	94.2	91.1	94.6	95.1	95.3	95.2	95.1	94.9	95.7	96.0	96.1
Upper CL (%)	97.8	96.8	97.9	98.1	98.2	97.3	97.0	96.9	97.3	97.5	97.5

CL = confidence limit; Ref = Reference.

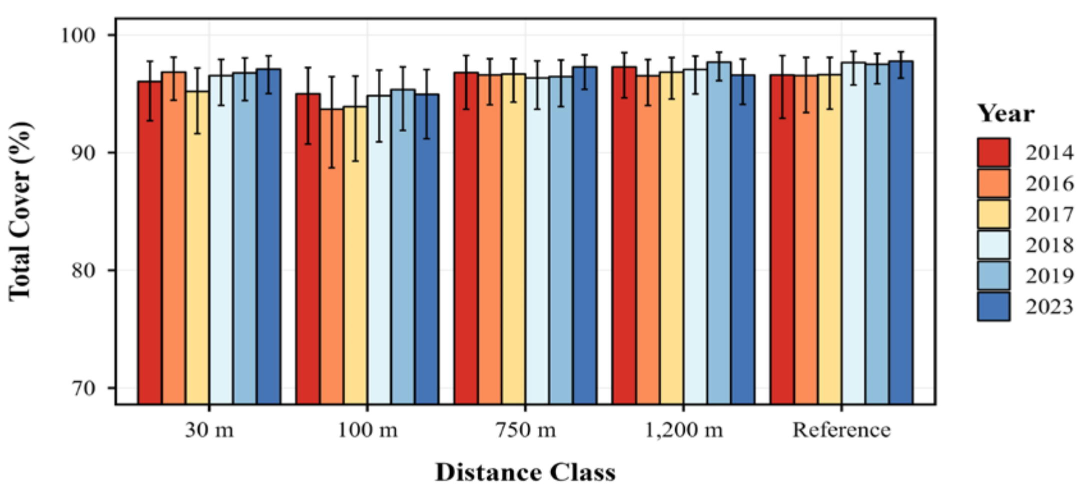


Figure 8-4. Total percent vegetation cover by distance class and year.

Ground Cover

No effect in relation to distance class and total percent ground cover was identified ($p = 0.37$). No distance class and year interaction were identified ($p = 0.29$). Examination of inter-annual variability in total percent ground cover did not identify any distinct trends (Table 8-2, Figure 8-5).

The total percent ground cover changed among different assessment years ($p < 0.001$). Average total ground cover was highest in 2014 (95.0%) and 2019 (95.7%), slightly lower in 2016 (94.3%), 2017 (93.3%), and 2018 (94.7%), and lowest in 2023 (91.9%). The total percent ground cover in 2023 was less in all years ($p \leq 0.007$) except 2017 ($p = 0.34$). No difference in total percent ground cover was found between 2019 and 2018 ($p = 0.19$) or 2019 and 2014 ($p = 0.79$); however, total percent ground cover was higher in 2019 than in 2017 ($p < 0.001$) and 2016 ($p = 0.03$). No difference in total percent ground cover was found between 2018 and 2014 ($p = 1$), 2016 ($p = 0.97$), or 2017 ($p = 0.12$). Similarly, no total percent ground cover difference was found between 2017 and 2014 ($p =0.22$) or 2016 ($p = 0. 62$).

Table 8-2. Average total percent ground cover across distance classes and years.

	Distance Class					Year					
	30 m	**100 m**	**750 m**	**1,200 m**	**Ref**	**2014**	**2016**	**2017**	**2018**	**2019**	**2023**
Average (%)	94.0	91.5	95.1	95.4	94.6	95.0	94.3	93.3	94.7	95.7	91.9
Lower CL (%)	90.4	86.4	92.2	92.6	91.2	93.2	92.6	91.4	93.2	94.6	89.8
Upper CL (%)	96.2	94.7	96.9	97.1	96.7	96.3	95.5	94.8	95.9	96.6	93.6

CL = confidence limit; Ref = Reference.

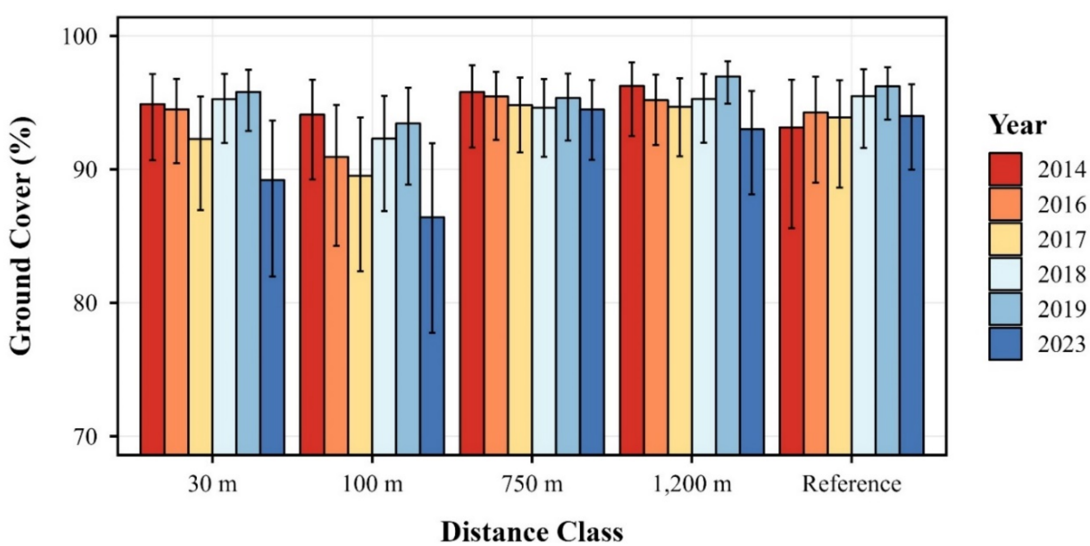


Figure 8-5. Total percent ground cover by distance class and year.

Canopy Cover

No effect in relation to distance class and total percent canopy cover was identified ($p = 0.62$). No distance class and year interaction were identified ($p = 0.37$). Examination of inter-annual variability in total percent canopy cover did not identify any distinct trends (Table 8-3, Figure 8-6).

The total percent canopy cover changed among different assessment years ($p < 0.001$). Average total percent canopy cover in 2023 was lower than in all previous years (all $p < 0.001$). Total percent canopy cover was lower in 2014 than in 2016 ($p < 0.001$), 2017 ($p < 0.001$), and 2019 ($p < 0.001$). Similarly, total percent canopy cover was lower in 2018 than in 2016 ($p < 0.001$), 2017 ($p = 0.006$), and 2019 ($p < 0.001$). No difference in total percent canopy cover was found between 2018 and 2014 ($p = 0.67$) or among the years 2016, 2017, and 2019 (all $p > 0.92$).

Differences in total percent canopy cover appeared to be affected by lower average canopy cover in 2023 (11.4%), which indicated a nearly 80% decrease in canopy cover from previous years (44.0% to 52.7%). Given that changes in total percent canopy cover in 2023 and other years were consistent across all distance classes, observed decreases in canopy cover were likely due to seasonal variation rather than Project-related effects. This would be consistent with observing remnant snowpack on the landscape and relatively late blooming and/or senesced vegetation within assessment plots.

Table 8-3. Average total percent canopy cover across distance classes and years.

	Distance Class					Year					
	30 m	**100 m**	**750 m**	**1,200 m**	**Ref**	**2014**	**2016**	**2017**	**2018**	**2019**	**2023**
Average (%)	49.3	43.6	44.5	48.4	45.7	44.0	52.7	51.3	46.7	51.8	11.4
Lower CL (%)	43.3	37.6	38.6	42.3	39.3	39.9	49.3	48.1	43.4	48.7	9.7
Upper CL (%)	55.4	49.7	50.6	54.6	52.1	48.0	55.9	54.5	49.9	54.8	13.1

CL = confidence limit; Ref = Reference.

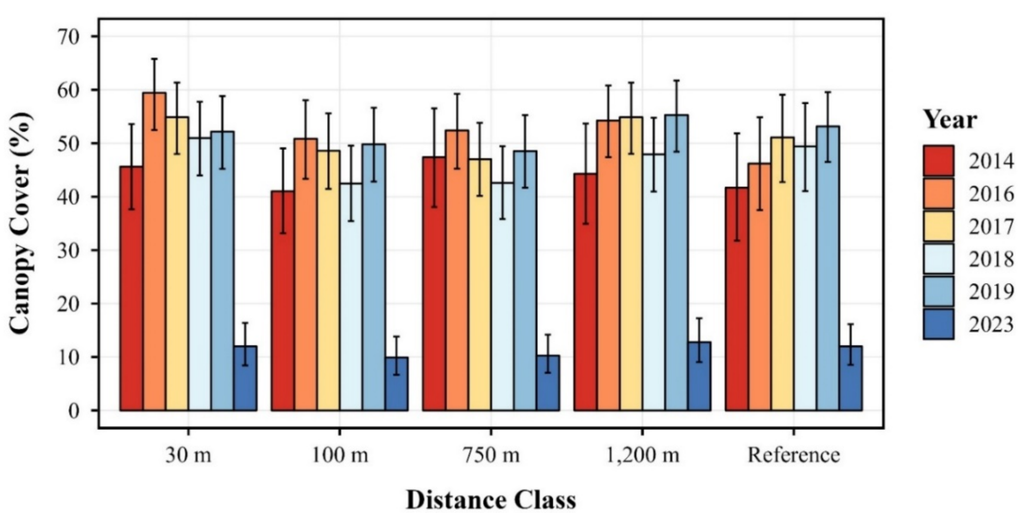


Figure 8-6. Total percent canopy cover by distance class and year.

8.1.2.2 Vegetation Cover by Plant Group

Potential Project-related effects on total vegetation cover by plant group (i.e., shrub, forb, graminoid[14], lichen, moss, and ground litter) were evaluated in relation to distance class and compared with previous field campaigns. The graminoid and ground litter plant groups constituted the highest proportion of plant cover (~30% to 40% on average), followed by shrub and moss (7% each), lichen (3%), and forb (1%) (Figure 8-7). Differences in plant groups were primarily attributed to assessment year ($p < 0.001$). More detailed examinations of plants groups in relation to distance are presented in the following sections.

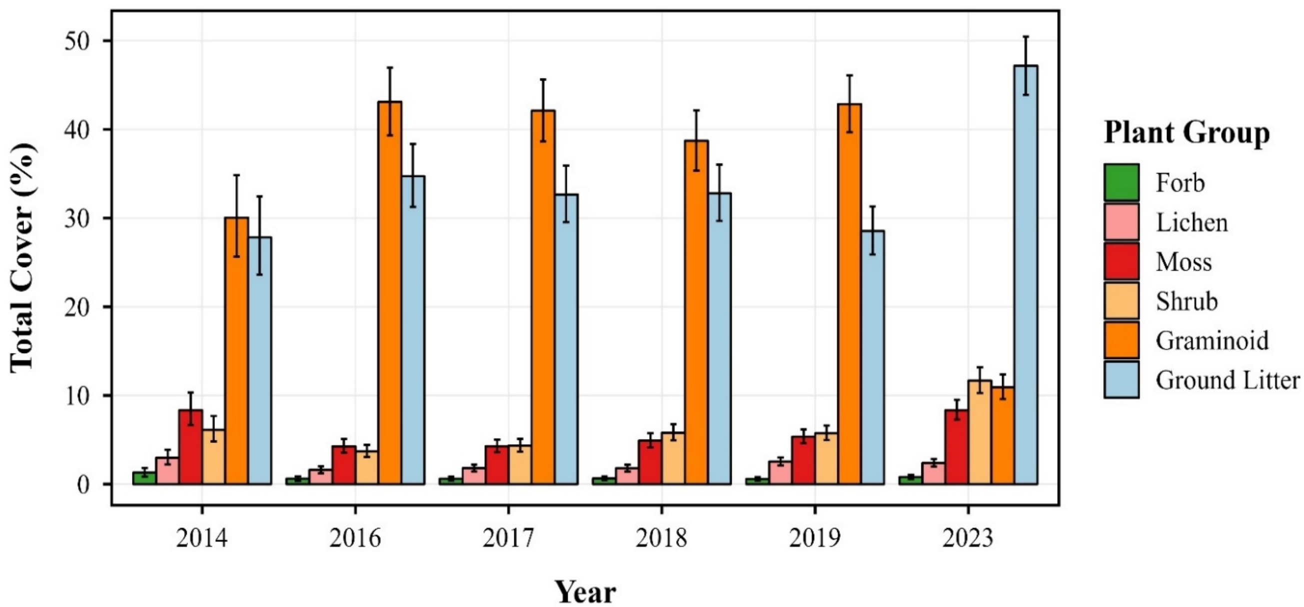


Figure 8-7. Total vegetation cover by plant group and year.

[14] Standing dead litter was combined with graminoids as a single plant group based on the results in the 2018 Terrestrial Environment Annual Monitoring Report, which indicated that graminoid cover in the canopy layer could not be measured reliably as a stand-alone plant group (EDI Environmental Dynamics Inc. 2019b). In the Arctic, graminoids go through a rapid process of green up and senescence where the leaves of the plants can be half green and half standing dead litter. This leads to a discrepancy as to whether individual plants are categorized as living plant material (graminoid) or standing dead litter. Given the small surface area of graminoid leaves and the inherent difficulty in categorizing a single leaf as living or dead, 2023 monitoring results combined graminoid and standing dead litter data.

Forbs

No effect of distance class on total percent forb cover was identified ($p = 0.59$) and no distinct inter-annual trends in forb cover were evident (Table 8-4, Figure 8-8). No distance class and year interaction was identified ($p = 0.80$).

Total percent forb cover changed among different assessment years ($p < 0.001$). Average total forb cover was highest in 2014 at 1.3%, then decreased to 0.6% between 2016 and 2019 before increasing to 0.8% in 2023. Total percent forb cover in 2023 was higher than in 2017 ($p = 0.01$) and 2018 ($p = 0.04$), but not different from 2014, 2016, or 2019 (all $p > 0.05$). The total percent forb coverage in 2014 was higher than in 2017 ($p = 0.01$), 2018 ($p = 0.02$), and 2019 ($p = 0.04$) but was not different from 2016 ($p > 0.05$). No total percent forb cover differences were found among 2016, 2017, 2018, and 2019 (all $p > 0.98$).

Table 8-4. Average total percent forb cover across distance classes and years.

	Distance Class					Year					
	30 m	100 m	750 m	1,200 m	Ref	2014	2016	2017	2018	2019	2023
Average (%)	0.7	0.7	0.7	0.5	0.4	1.3	0.6	0.6	0.6	0.6	0.8
Lower CL (%)	0.4	0.4	0.3	0.2	0.1	0.9	0.4	0.4	0.4	0.4	0.6
Upper CL (%)	1.1	1.1	1.1	0.9	0.7	1.8	0.9	0.8	0.9	0.8	1.0

CL = confidence limit; Ref = Reference.

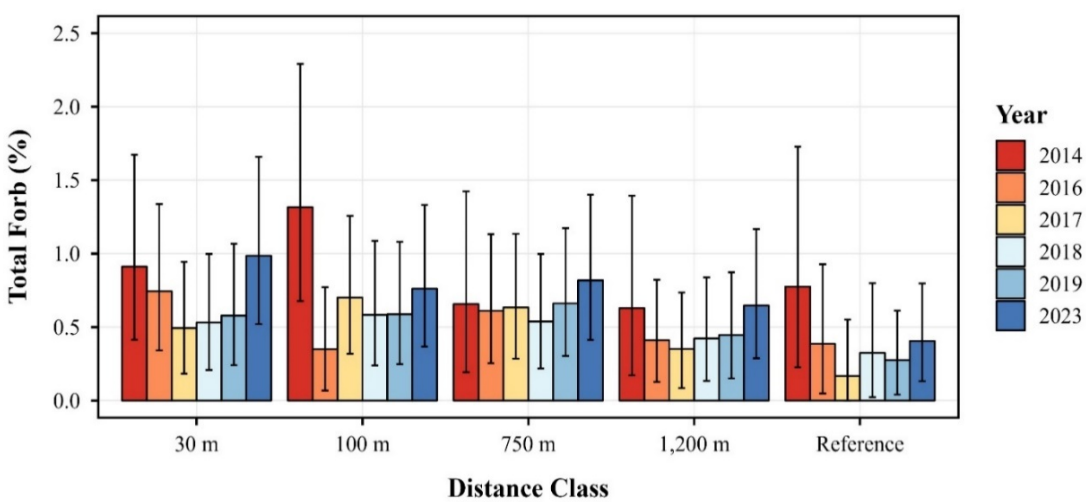


Figure 8-8. Total percent forb cover by distance class and year.

Lichen

No effect of distance class on total percent lichen cover was identified (p = 0.20). No distance class and year interaction were identified (p = 0.06). Examination of inter-annual variability in total percent lichen cover did not identify any distinct trends (Table 8-5, Figure 8-9).

The total percent lichen cover changed among different assessment years (p = 0.002). Average total lichen cover was highest in 2014 at 3.0%, then decreased to 1.6% and 1.8% between 2016 and 2018 before increasing to 2.5% and 2.4% in 2019 and 2023, respectively. Total percent lichen cover was lower in 2017 than in 2014 (p = 0.02) and 2019 (p = 0.05), but not different from 2016 (p = 0.99), 2018 (p = 1), or 2023 (p = 0.51). Total percent lichen cover was lower in 2018 than in 2014 (p = 0.02). No other differences in total percent lichen cover were identified among years (all p > 0.05).

Table 8-5. Average total percent lichen cover across distance classes and years.

	Distance Class					Year					
	30 m	100 m	750 m	1,200 m	Ref	2014	2016	2017	2018	2019	2023
Average (%)	2.3	1.3	1.5	1.9	3.5	3.0	1.6	1.8	1.8	2.5	2.4
Lower CL (%)	1.2	0.6	0.7	0.9	1.9	2.3	1.2	1.4	1.4	2.1	2.0
Upper CL (%)	4.0	2.5	2.8	3.4	6.0	3.9	2.0	2.2	2.2	3.0	2.8

CL = confidence limit; Ref = Reference.

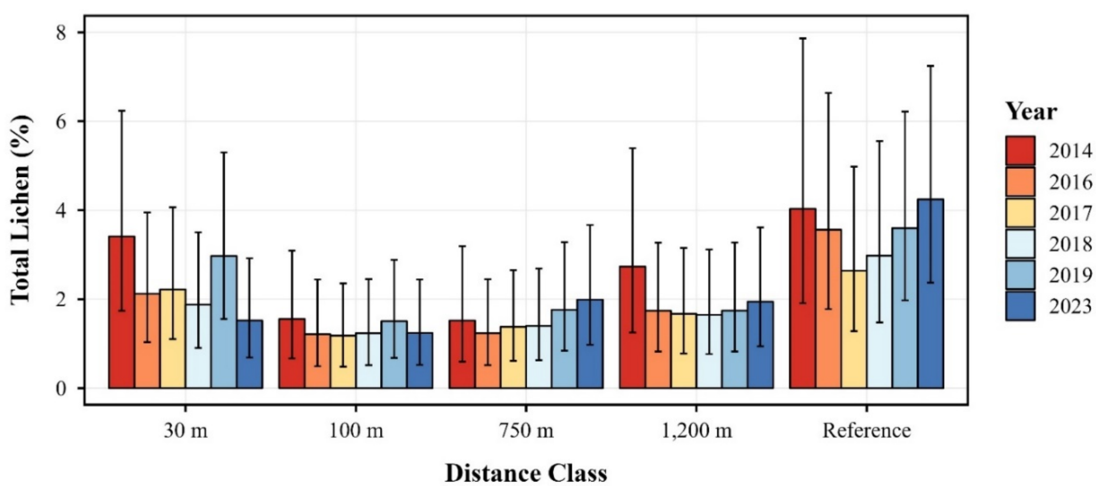


Figure 8-9. Total percent lichen cover by distance class and year.

Moss

No effect of distance class on total percent moss cover was identified ($p = 0.72$). Examination of inter-annual variability in total percent moss cover did not identify any distinct trends (Table 8-6, Figure 8-10).

The total percent moss cover changed among different assessment years ($p < 0.001$). Average total moss cover was higher in 2014 at 8.3%, then decreased to 4.3% in 2016 before gradually increasing back to 8.3% in 2023. No difference in total percent moss cover was found between 2014 and 2023 ($p = 0.55$); however, total percent moss cover was higher in 2014 and 2023 than in all other years (all $p < 0.001$). Total percent moss cover was higher in 2019 than in 2016 ($p < 0.001$) and 2017 ($p = 0.003$), but not different from 2018 ($p = 0.75$). No total percent moss cover differences were identified among 2016, 2017, and 2018 ($p > 0.05$).

The total percent moss cover differed between year and distance class ($p = 0.001$). At the 30 m and 100 m distance classes, total percent moss cover was higher in 2023 than in previous years (all $p < 0.004$) except 2014 ($p > 0.99$), and higher in 2014 than in 2016 and 2017 ($p < 0.001$). At the 750 m distance class, total percent moss cover was higher in 2014 than in subsequent years (all $p < 0.001$) and higher in 2023 than in 2016, 2017, and 2019 (all $p < 0.002$). At the 1,200 m distance class, total percent moss cover in 2023 and 2014 was higher than in all other years (all $p < 0.04$). No differences in total percent moss cover occurred among distance classes between 2014 and 2023 (all $p > 0.48$) or among the years 2016, 2017, 2018, and 2019 (all $p > 0.06$).

Table 8-6. Average total percent moss cover across distance classes and years.

	Distance Class					Year					
	30 m	**100 m**	**750 m**	**1,200 m**	**Ref**	**2014**	**2016**	**2017**	**2018**	**2019**	**2023**
Average (%)	5.0	7.2	7.2	7.6	8.1	8.3	4.3	4.3	4.9	5.3	8.3
Lower CL (%)	2.5	4.2	4.2	4.4	4.8	6.7	3.5	3.6	4.2	4.6	7.3
Upper CL (%)	8.3	11.2	11.1	11.6	12.3	10.3	5.1	5.0	5.7	6.2	9.5

CL = confidence limit; Ref = Reference.

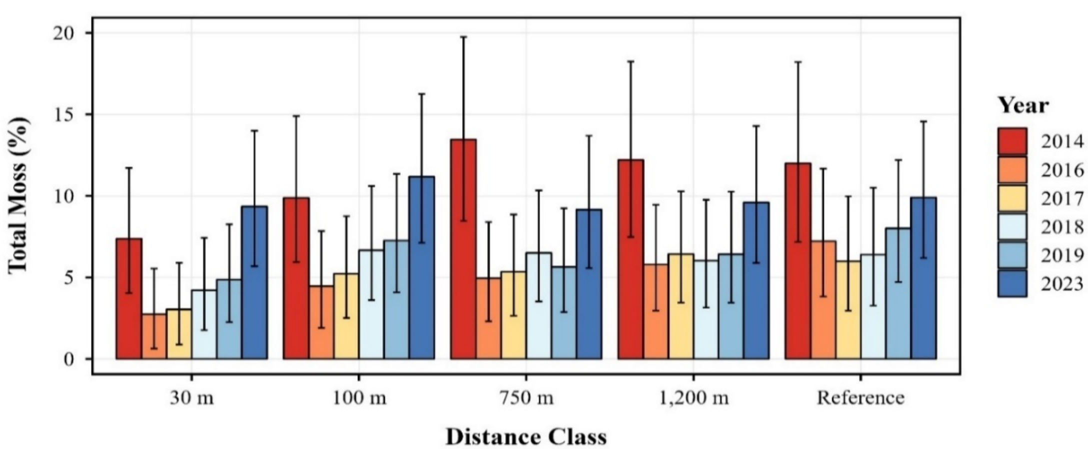


Figure 8-10. Total percent moss cover by distance class and year.

Shrubs

No effect of distance class on total percent shrub cover was identified (p = 0.14). Examination of inter-annual variability in total percent shrub cover did not identify any distinct trends (Table 8-7, Figure 8-11).

Total percent shrub cover changed among different assessment years (p < 0.001). Average total shrub cover was 6.2% in 2014, then decreased to 3.7% in 2016 before gradually increasing to 11.7% in 2023. Total percent shrub cover in 2023 was higher than in all previous years (all p < 0.001). Total percent shrub cover was lower in 2016 than in 2014, 2018, and 2019 (all p < 0.001), but not different from 2017 (p = 0.70). Total percent shrub cover in 2017 was lower than in 2018 (p = 0.003) and 2019 (p < 0.001). No total percent shrub cover differences were found among 2014, 2018, and 2019 (all p > 0.82).

The total percent shrub cover differed between year and distance class (p = 0.05). Average total shrub cover was highest at the 750 m distance class at 9.3% and lowest at the Reference distance class at 4.6%. In 2023, the total percent shrub cover at the 30 m, 100 m, 750 m and 1,200 m distance classes was higher than in all previous years (all p < 0.04), and higher at the Reference distance class than in 2016, 2017, and 2019 (all p < 0.005). At the 30 m distance class, total percent shrub cover was lower in 2016 than in 2014 (p = 0.006). At the 750 m distance class, shrub cover was lower in 2016 than in 2018 (p = 0.01) and 2019 (p < 0.001), and higher in 2019 than in 2017 (p = 0.009). No other differences among distance classes and years were identified (all p > 0.05).

Table 8-7. Average total percent shrub cover across distance classes and years.

	Distance Class					Year					
	30 m	100 m	750 m	1,200 m	Ref	2014	2016	2017	2018	2019	2023
Average (%)	7.8	6.8	9.3	7.0	4.6	6.1	3.7	4.3	5.8	5.7	11.7
Lower CL (%)	5.3	4.5	6.5	4.7	2.6	4.8	3.1	3.7	4.9	5.0	10.3
Upper CL (%)	10.8	9.6	12.5	9.9	7.0	7.7	4.4	5.1	6.8	6.6	13.2

CL = confidence limit; Ref = Reference.

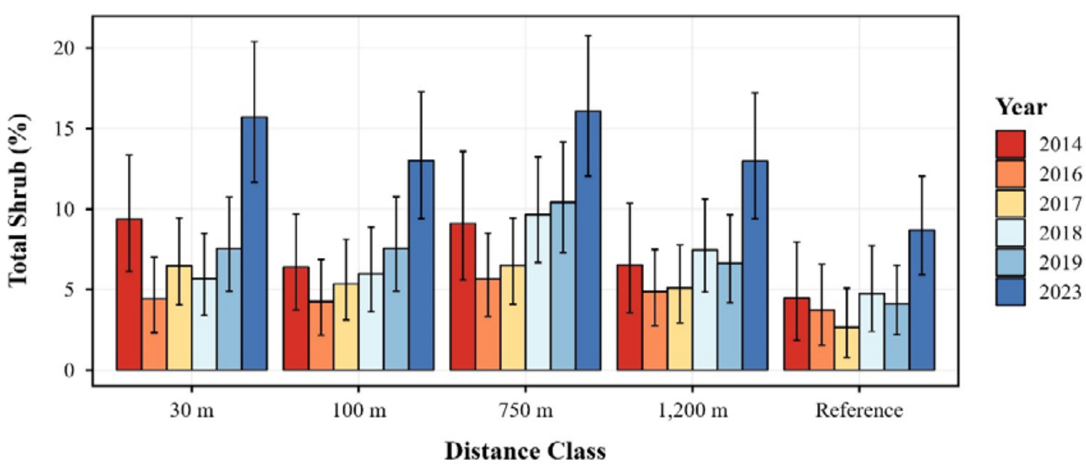


Figure 8-11. Total percent shrub cover by distance class and year.

Graminoids

No effect of distance class on total percent graminoid cover was identified ($p = 0.74$) and no distinct inter-annual trends in graminoid cover were evident (Table 8-8, Figure 8-12). No distance class and year interaction was identified ($p = 0.13$).

The total percent graminoid cover changed among different assessment years ($p < 0.001$). The average total percent graminoid cover in 2023 was lower than in all previous years (all $p < 0.001$). The total percent graminoid cover was lower in 2014 than in 2016 ($p < 0.001$), 2017 ($p <0.001$), 2018 ($p < 0.001$), and 2019 ($p < 0.001$). In 2019, the total percent graminoid cover was lower than in 2018 ($p = 0.004$). No total percent graminoid cover differences were found among 2016, 2017, 2018, and 2019 ($p > 0.06$).

Table 8-8. Average total percent graminoid cover across distance classes and years.

	Distance Class					Year					
	30 m	100 m	750 m	1,200 m	Ref	2014	2016	2017	2018	2019	2023
Average (%)	38.4	32.7	34.5	35.9	34.5	30.1	43.1	42.1	38.7	42.9	10.9
Lower CL (%)	32.4	26.8	28.6	29.9	28.4	25.6	39.3	38.7	35.4	39.7	9.6
Upper CL (%)	44.5	38.7	40.5	42.0	40.8	34.8	47.0	45.6	42.2	46.1	12.4

CL = confidence limit; Ref = Reference.

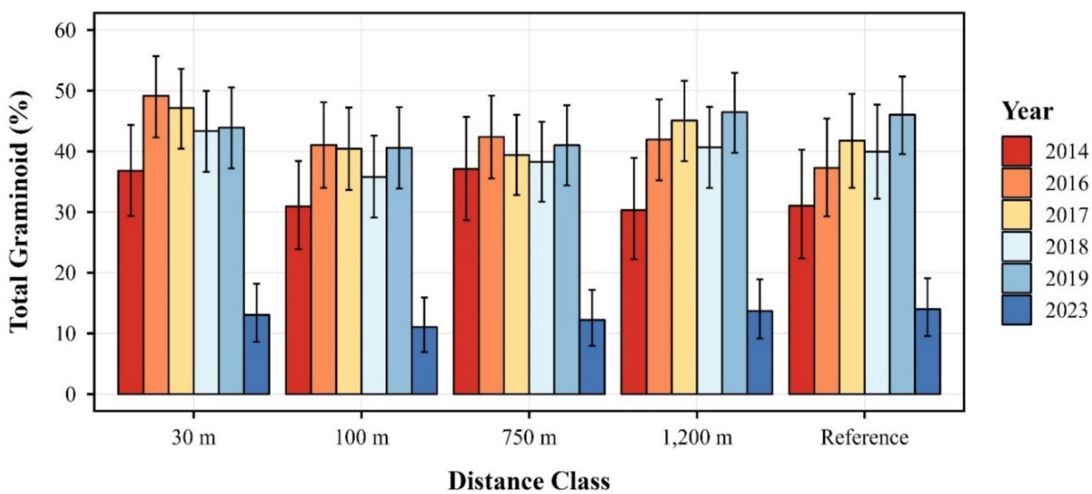


Figure 8-12. Total percent graminoid cover by distance class and year.

Ground Litter

No effect of distance class on total percent ground litter was identified ($p = 0.25$) and no distinct inter-annual trends in total percent ground litter were evident (Table 8-9, Figure 8-13).

The total percent ground litter cover changed among different assessment years ($p < 0.001$). Ground litter cover in 2023 was higher at 47.2% than in all previous years (all $p < 0.001$). In 2019, ground litter cover was lower at 28.5% than in 2016, 2017, and 2018 (all $p < 0.001$). Similarly, ground litter cover in 2014 was lower at 27.8% than in 2016 ($p < 0.001$), 2017 ($p = 0.03$), and 2018 ($p = 0.02$). No differences in total percent ground litter occurred between the years 2014 and 2019 ($p = 0.99$) or among the years 2016, 2017, and 2018 (all $p > 0.40$).

The total percent ground litter cover differed between year and distance class ($p = 0.004$). At the 30 m and Reference distance classes, total percent ground litter cover was significantly higher in 2023 than in all previous years (all $p > 0.02$). At the 100 m distance class, total percent ground litter cover was significantly higher in 2023 than in 2014, 2017, and 2019 (all $p > 0.03$), and higher in 2016 than in 2019 ($p = 0.02$). At the 750 m distance class, total percent ground litter cover was higher in 2023 than in all previous years (all $p < 0.03$), and higher in 2017 than in 2019 ($p = 0.04$). At the 1,200 m distance class, total percent ground litter cover was higher in 2023 than in all previous years (all $p < 0.001$) except 2014 ($p = 0.28$). No differences in total percent ground litter cover occurred at distance classes between 2019 and 2017 (all $p > 0.22$) or 2019 and 2018 (all $p > 0.13$), or among the years 2014, 2016, 2017, and 2018 (all $p > 0.09$).

Table 8-9. Average total percent ground litter cover across distance classes and years.

	Distance Class					Year					
	30 m	**100 m**	**750 m**	**1,200 m**	**Ref**	**2014**	**2016**	**2017**	**2018**	**2019**	**2023**
Average (%)	31.9	32.9	33.3	36.5	36.9	27.8	34.7	32.7	32.8	28.5	47.2
Lower CL (%)	28.4	29.3	29.7	32.7	32.8	23.6	31.2	29.6	29.7	25.9	43.9
Upper CL (%)	35.6	36.7	37.1	40.4	41.2	32.4	38.4	35.9	36.0	31.3	50.5

CL = confidence limit; Ref = Reference.

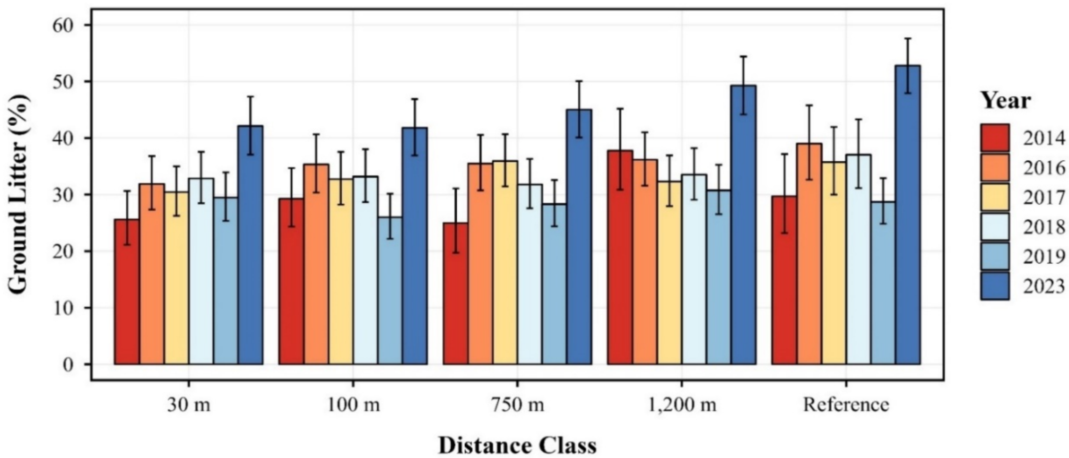


Figure 8-13. Ground litter cover by distance class and year.

8.1.2.3 Potential Effects of Herbivory

Potential effects of herbivory (e.g., caribou grazing) on vegetation abundance were assessed by comparing plot treatments (i.e., closed versus open plots) for total percent vegetation cover, total percent ground cover, and total percent canopy cover. No effect of herbivory on total percent vegetation cover ($p = 0.32$), total percent ground cover ($p = 0.12$), or total percent canopy cover ($p = 0.80$) was identified between open and closed plots. No statistical interactions occurred between treatment and year (all $p > 0.37$, Figure 8-14). There were also no three-way interactions among year, distance class, and treatment (all $p > 0.84$, Figure 8-15). No measurable grazing effect was detected.

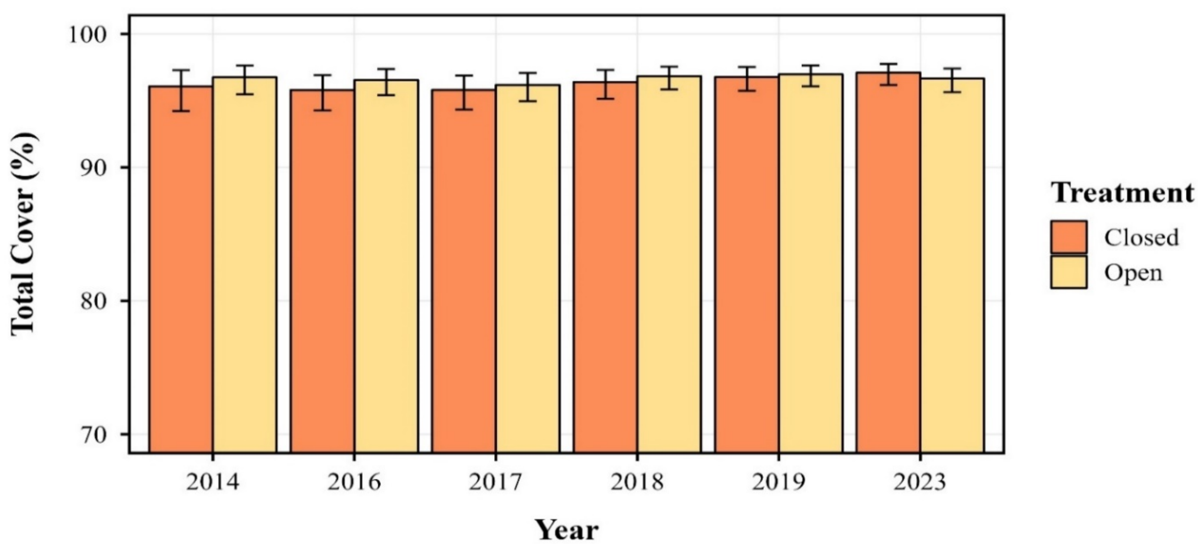


Figure 8-14. Total percent vegetation cover by treatment and year.

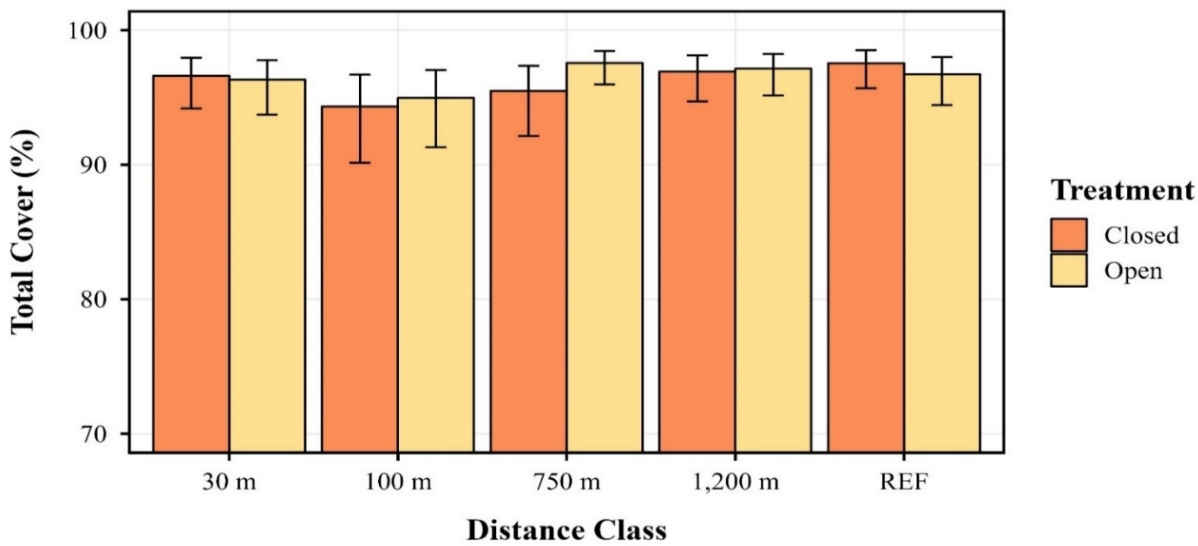


Figure 8-15. Total percent vegetation cover by treatment and distance class.

8.1.2.4 Potential Effects of Soil Moisture

Potential effects and relationships of soil moisture on vegetation abundance and composition were assessed for the 2019 and 2023 datasets. Table 8-10 presents the SMR for sites per distance class in 2019 and 2023. Figure 8-16 illustrates average SMR per distance class in 2019 and 2023. Although SMR appears wetter in 2019 versus 2023, no differences were identified among distance classes and years (all $p > 0.06$).

Total vegetation cover by plant group was evaluated in relation to SMR (Figure 8-17). Soil moisture regime was positively correlated with graminoid cover (effect = 0.40, $p < 0.001$) and moss cover (effect = 0.26, $p < 0.0001$). Soil moisture regime was negatively correlated with shrub cover (effect = -0.45, $p < 0.0001$), forb cover (effect = -0.15, $p = 0.0001$), lichen cover (effect = -0.12, $p = 0.003$), and ground litter (effect = -0.15, $p = 0.0002$). These trends indicate micro-site preferences by different plant groups for wetter versus drier soil conditions.

Table 8-10. Distribution of soil moisture regime by distance class and year.

Field Campaign	Soil Moisture Regime and Descriptor		# Sites Per Distance Class				
			30 m	100 m	750 m	1,200 m	Reference
2019	4	Mesic/average moisture	8	7	10	9	5
	5	Subhygric/above average	4	4	4	4	8
	6	Hygric/wet	1	2	0	1	1
	7	Subhydric/very wet	2	2	1	1	1
2023	2	Subxeric/dry	3	1	3	2	2
	3	Submesic /below average	3	4	5	4	5

	4	Mesic/average moisture	4	6	4	4	1
	5	Subhygric/above average	2	2	2	4	5
	6	Hygric/wet	3	2	0	0	1
	7	Subhydric/very wet	0	0	1	1	1

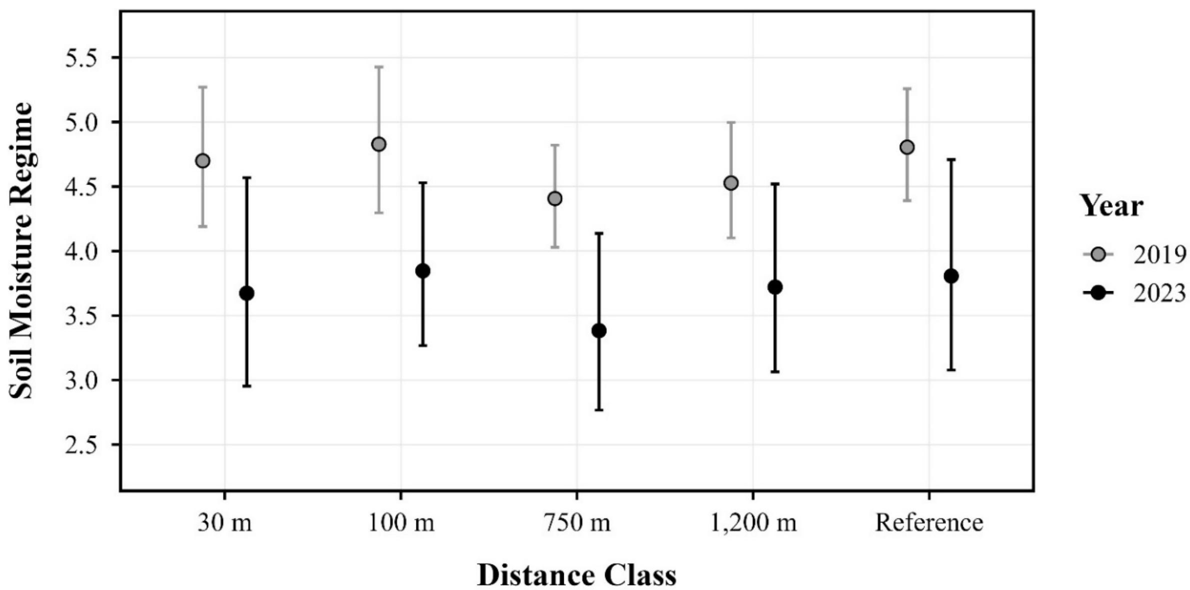


Figure 8-16. Soil moisture regime by distance class from the Potential Disturbance Area.

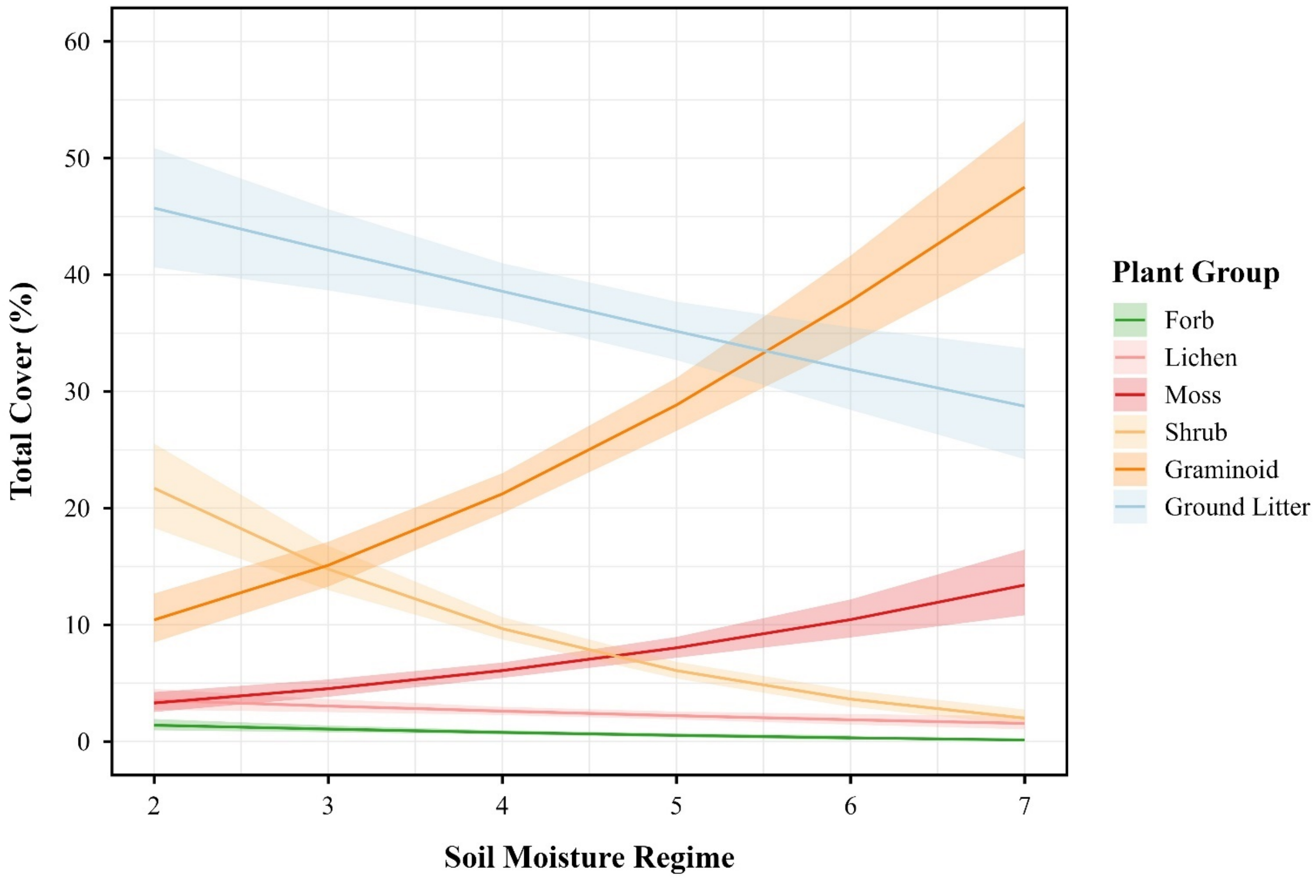


Figure 8-17. Relationship between soil moisture regime and percent cover of each plant group.

8.2 VEGETATION SUMMARY

Ground-based surveys evaluated potential changes to vegetation abundance and composition over time and at varying distances from the PDA using percent vegetation cover and plant group composition as measurable effects. The following list summarizes key findings from 2023 monitoring activities at the Project for vegetation:

Vegetation Cover — Potential Project-related effects on total vegetation cover were evaluated in relation to distance class and compared with previous field campaigns (i.e., 2017 to 2019, 2023). No evidence of changes in percent plant cover and plant group composition in relation to distance from the PDA was identified. Any statistical data trends were primarily attributed to inter-annual variation.

Potential Effects of Herbivory — No effect of herbivory on total vegetation cover, total ground cover, or total canopy cover was identified between open and closed plots. No measurable grazing effect was detected.

Potential Effects of Soil Moisture — Although SMR appeared wetter in 2019 versus 2023, no differences were identified among distance classes and years. Any trends between plant group and SMR appeared indicative of micro-site preferences by different plant groups for wetter versus drier soil conditions.

9 MAMMALS

Using multiple indicators and approaches, surveillance monitoring of mammals at the Mary River Project (the Project) is intended to better understand, predict, and mitigate potential mammal interactions within and/or near the Potential Development Area (PDA).

Caribou—a keystone species in the North Baffin Island ecosystem—is recognized as a key wildlife indicator because of its ecological and social significance. However, in 2019, North Baffin Island caribou (*Rangifer tarandus*) were at a low point in their 60 to 80-year population cycle (Government of Nunavut 2019), and caribou observations from site personnel are recorded infrequently, incidentally or during surveys. The current survey methods and frequency are appropriate for low caribou densities; if/when caribou densities increase the frequency of surveys will be increased accordingly.

9.1 SNOW TRACK SURVEYS

The following Project Conditions (PCs) 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."*

Snow track surveys were conducted between March and November 2023 to address these PCs. Surveys focused on the surveillance of potential wildlife movement (including caribou and other species) near roadways and documentation of behavioural responses to human activities near the Project.

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 within 48 hours following a fresh snowfall. Surveys were led by two or three Baffinland Iron Mines Corporation (Baffinland) personnel along the Tote Road from a light truck at a speed of ~30 km/hr. If/when wildlife tracks were suspected, personnel would further investigate on foot to confirm the identity of the species and follow the tracks (to or from the roadway) to document the patterns of movement, behaviour, and habitat use (if/where possible). The following information was recorded:

- georeferencing (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).

Potential factors influencing the data capture and species identification may include deterioration of snow conditions (i.e., from sun or wind) and visibility for initial detection; these factors are recorded during each survey and allocated a 'condition score' ranging from poor (limited visibility) to good (visibility adequate, some limitations) or excellent (no limitations on visibility).

Based on a commitment resulting from the SOP application regarding snow track frequency, Baffinland has agreed to implement snow track surveys and will make best efforts to conduct them at a frequency of once per week along the Tote Road during the 2023/2024 snow cover seasons when environmental conditions permit the surveys to be conducted effectively and safely[15]. The conditions criteria include fresh snowfall (within the last 48 hours) and suitable light conditions.

9.1.2 RESULTS AND DISCUSSIONS

A total of 104 tracks were observed during six surveys after recent snowfall conducted between March and November 2023[16]. Of the 104 tracks recorded, 75% were deemed to belonging to fox, (either Arctic fox [*Vulpes lagopus*] or red fox [*Vulpes vulpes*] as it is difficult to distinguish between their tracks), 11% were Arctic hare (*Lepus arcticus*), 8% were Ptarmigan (*Lagopus* sp.) and 4% were lemming (*Lemmus sp.*). Based on 2023 snow track survey results (Figure 9-1), 11% of recorded Ptarmigan, 15% of Arctic hare and 2% of foxes deflected from the road, whereas 67% of Ptarmigan, 40% of lemming, 23% of Arctic hare and 54% of foxes travelled along the Tote Road. The remaining 22% of Ptarmigan, 60% of lemming, 62% of hare, and 44% of foxes crossed the Tote Road. Only 4.3% of all tracks were recorded as deflections from the Tote Road.

Representative site survey conditions and observed tracks are shown in Photo 9-1 to Photo 9-4. Observed track locations of tracks and their direction of travel in relation to the Tote Road are presented in Map 9-1. Snow track surveys will continue regularly after snowfalls and will be conducted more frequently if/when caribou should be observed near the Project—to be informed by other monitoring inputs, including Height of Land (HOL) monitoring data, incidental monitoring data, and/or observations during aerial surveys.

[15] Survey condition criteria will be the ultimate driver of the number of surveys conducted each month and may be less than the frequency of once per week and due to darkness will not generally be possible in December, January and February

[16] On March 6, May 5, October 14, October 25, November 1 and November 7 and 9, 2023.

March 6, 2023 — The survey was completed approximately 24 hours after a snowfall with excellent visibility, good tracking conditions, and mild winds for the survey duration. Snow cover was consistently high (85%) along the length of the Tote Road. Surveyors observed 12 tracks, with 8 noted as fresh and distinct sets, during the March survey. Fox tracks accounted for nine of the total tracks, with two-thirds occurring on the west side of the Tote Road. The remaining three tracks belonged to Ptarmigan on the west side of the Tote Road, and two Arctic hares located on the east side of the Tote Road. Of the 12 tracks, none were observed to deflect from the Tote Road; all tracks were either travelling parallel or crossing the Tote Road. No signs of caribou or other mammal tracks were observed.

May 5, 2023 — The survey was completed approximately 48 hours after a snowfall with excellent visibility and tracking conditions, and moderate winds for the survey duration. Snow cover was approximately 70% along the length of the Tote Road. Surveyors observed 13 tracks total. Nine tracks were fox, three were Ptarmigan and one set could not be identified. Only one set of Ptarmigan tracks deflected from the Tote Road. All other tracks either travelled along or crossed the road. No signs of caribou or other mammal tracks were observed.

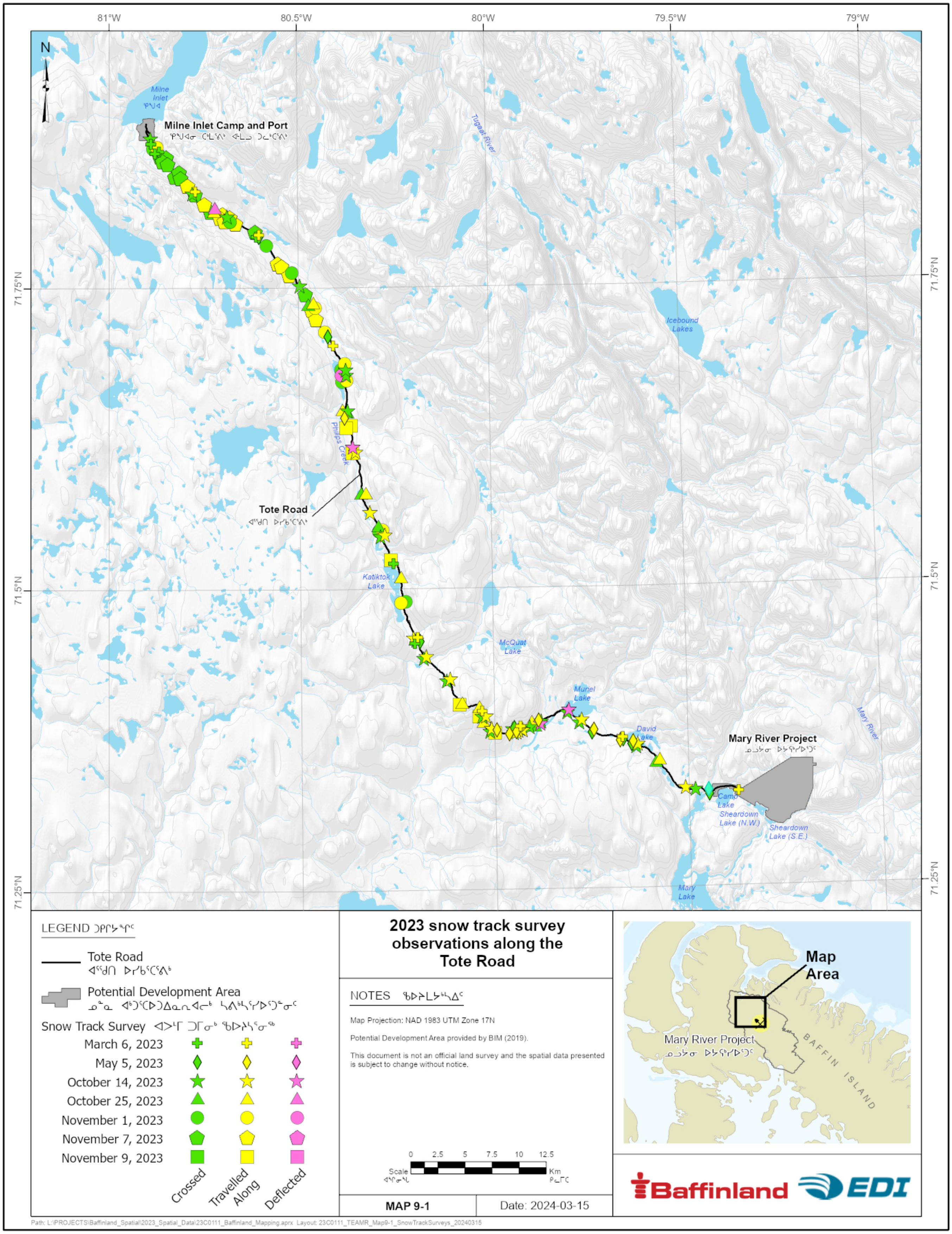
October 14, 2023 — The survey was completed approximately 24 hours after a snowfall with good visibility, and no winds for the survey duration. Snow cover was 100% along the length of the Tote Road. In total 26 tracks were observed, with 18 fresh and distinct sets of tracks, predominantly on the east side of the Tote Road. Fourteen fox tracks, five Arctic hare, three Ptarmigan, three lemming and one unidentified set of tracks were recorded. Two Arctic hares and the unidentified set of tracks deflected from the Tote Road, while the remaining travelled along and/or crossed the Tote Road. No signs of caribou or other mammal tracks were observed.

October 25, 2023 — The survey was completed approximately 36 hours after a snowfall with excellent visibility, and low winds for the survey duration. Snow cover was very high (95%) along the length of the Tote Road. In total 11 tracks were observed, with four fresh and distinct sets of tracks. All tracks were attributed to foxes, except for one set belonging to Ptarmigan. Only one fox deflected from the Tote Road before travelling along it, while the remainder travelled alongside and/or crossed the Tote Road. No signs of caribou or other mammal tracks were observed.

November 1, 2023 — The survey was started approximately 24 hours after a snowfall, with excellent visibility and high snow cover. Surveyors observed 12 tracks with two distinct sets of tracks considered as fresh. All tracks were attributed to foxes. Only one set of tracks deflected from the Tote Road. All other species travelled along, or crossed, the Tote Road. No signs of caribou or other mammal tracks were observed.

November 7/9, 2023 — The survey was started approximately 24 hours after a snowfall, resulting in excellent tracking conditions with light winds. Surveyors observed 30 tracks in total. Of those, 24 of the tracks were identified as fox, four were Arctic hares, one was a lemming, and one was a Common Raven (*Corvus corax*). No tracks deflected from the Tote Road. All other species travelled along or crossed the Tote Road. No signs of caribou or other mammal tracks were observed.

Interannual Trend — No caribou, wolf (*Canis lupus*) or large mammal tracks were observed during snow track surveys between 2014 and 2023. The species track composition was similar to previous years, but there was a slight decline in the overall numbers of Arctic hares and Ptarmigan. Fox tracks showed about a 50% decline relative to 2022 but were similar to 2021 (Figure 9-2) which indicated 2022 was an unusually high year for fox track detections (i.e. better snow track conditions, increased fox numbers, increased fox activity).


81°W
80.5°W
80°W
79.5°W
79°W
71.75°N
71.5°N
71.25°N
N
Milne Inlet
Milne Inlet Camp and Port
Tugaat River
Icebound Lakes
Phillips Creek
Tote Road
Katiktok Lake
McQuat Lake
Muriel Lake
David Lake
Mary River Project
Mary River
Camp Lake
Sheardown Lake (N.W.)
Sheardown Lake (S.E.)
Mary Lake
LEGEND
Tote Road
Potential Development Area
Snow Track Survey
March 6, 2023
May 5, 2023
October 14, 2023
October 25, 2023
November 1, 2023
November 7, 2023
November 9, 2023
Crossed
Travelled Along
Deflected
2023 snow track survey observations along the Tote Road
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0
2.5
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Km
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Mary River Project
BAFFIN ISLAND
Baffinland
EDI
MAP 9-1
Date: 2024-03-15
Path: L:\PROJECTS\Baffinland_Spatial\2023_Spatial_Data\23C0111_Baffinland_Mapping.aprx Layout: 23C0111_TEAMR_Map9-1_SnowTrackSurveys_20240315

Photo 9-1. Fox tracks parallel to the Tote Road.

Photo 9-2. Baffinland staff conducting track survey and recording old hare tracks.

Photo 9-3. Fresh Arctic hare tracks alongside the Tote Road.

Photo 9-4. Small mammal track deflecting from the Tote Road.

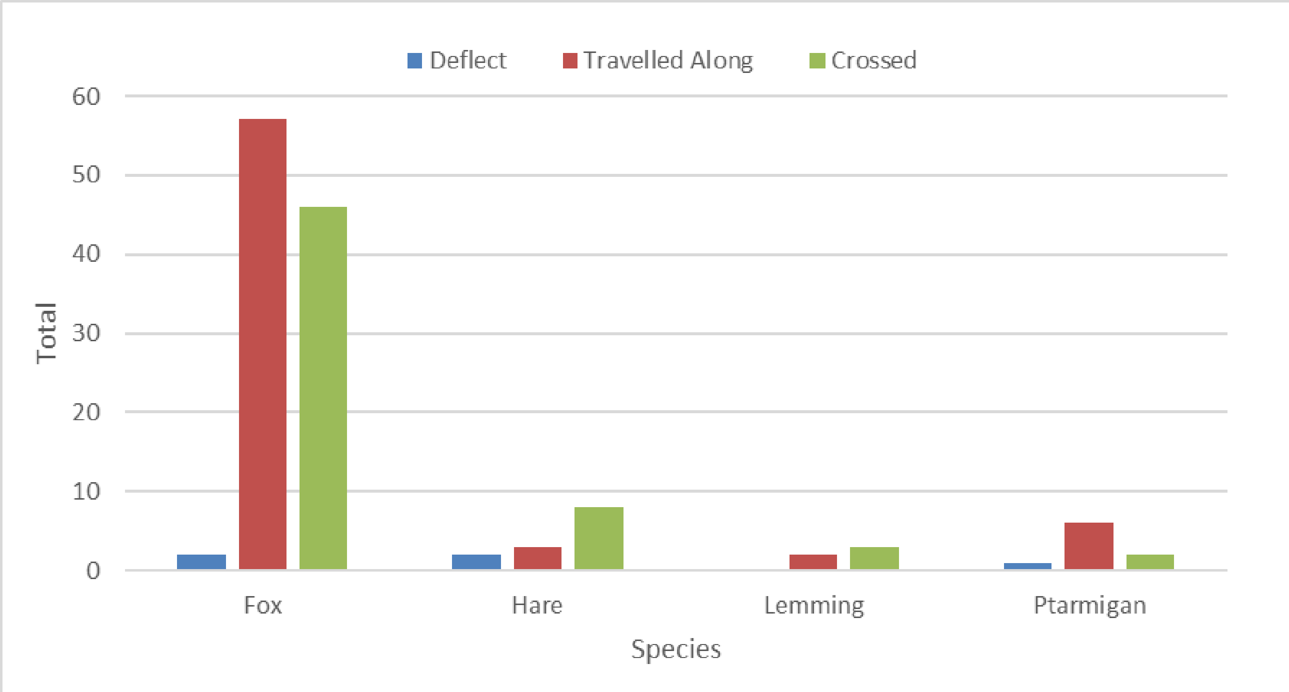


Figure 9-1. **2023 Tote Road snow track response based on species.**

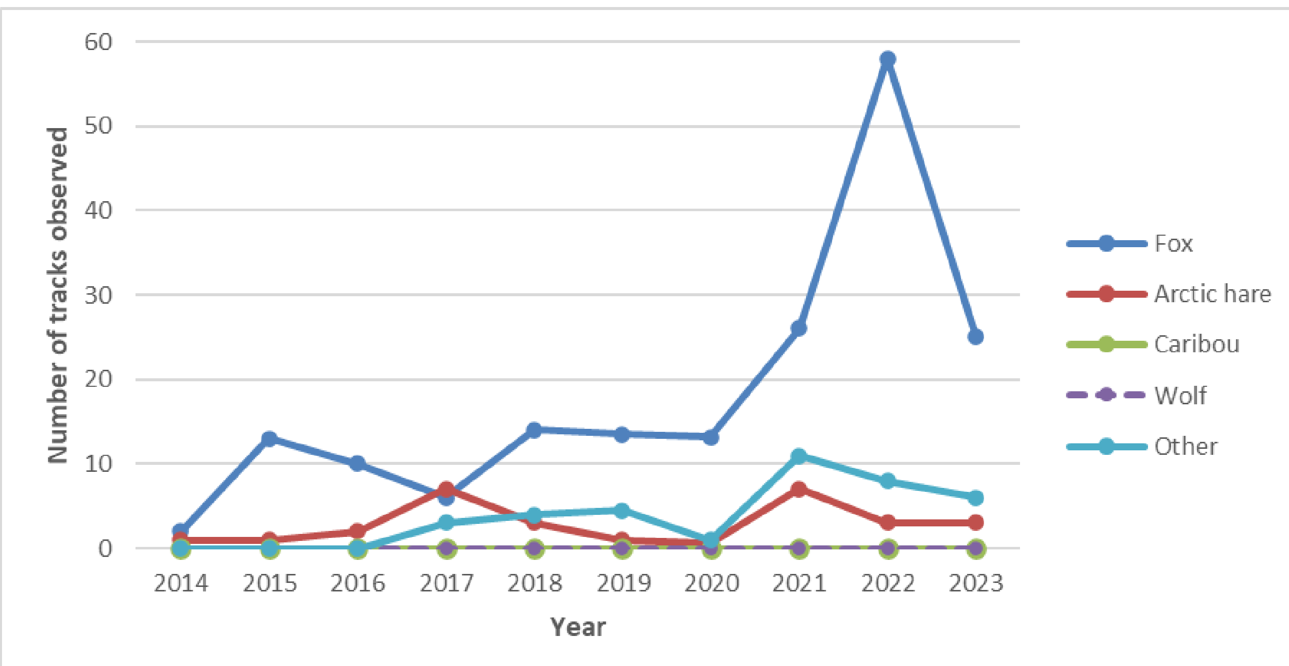


Figure 9-2. **2023 interannual trends — snow track survey (2014 to 2023).**
"Fox" includes both red and Arctic as it is difficult to distinguish based only on track. 'Other' species refer to Ptarmigan and small mammals such as lemmings and ermine.

9.2 SNOWBANK HEIGHT MONITORING

The following PCs address uncertainty in the Final Environmental Impact Statement (Baffinland Iron Mines Corporation 2012) and Early Revenue Program Final Environmental Impact Statement (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 PCs, Baffinland committed to various mitigation measures to facilitate effective caribou crossings of the Tote Road and reduce potential barriers to 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 Tote Road and improve driver visibility to reduce potential wildlife-vehicle collisions. In conjunction with the snow track surveys (Section 9.1), snowbank height monitoring was implemented to verify that these mitigation measures are being applied to the Project.

9.2.1 METHODS

Snowbank height monitoring for 2023 was conducted monthly for one day in January, February, March, April, May, October, November, and December 2023. During each survey, Baffinland personnel measured snowbank heights at up to 50 randomized kilometre marker locations along the Tote Road (e.g., KM5.8, KM16, and KM42), being mindful of safety and access[17]. In response to input from the TEWG, survey locations were randomly chosen to eliminate potential survey biases and to better capture/verify snowbank conditions along the Tote Road. At each survey location, Baffinland personnel took two snowbank height measurements (east and west-side snowbanks), photographed site conditions, and recorded any other relevant information (Photo 9-5 to Photo 9-7). Due to vehicle traffic and safety considerations, anywhere from 66 to 94 measurements were captured during each monitoring survey and deemed either 'compliant' (≤100 cm) or 'non-compliant' (>100 cm).

9.2.2 RESULTS AND DISCUSSIONS

Snowbank measurements across all surveys ranged from 0 to 640 cm in height. Compliance of snowbank height ranged from 76 to 99% (per survey) and averaged 88% for all surveys combined (Table 9-1). Mean snowbank heights per survey typically ranged between 16 to 86 cm. Snowbank heights typically increase

[17] Occasionally, measurements could not be taken due to low visibility by ore haul truck drivers and/or high traffic at the given location. Safety concerns are the primary reason for not stopping at a survey location (i.e., the narrow Tote Road would not allow for vehicles to pull over provide room for ore haul trucks to pass safely.

throughout winter because of cumulative snowfall. To reduce snowbank height and drifting, efforts are made to 'feather' (i.e., push back and redistribute) large snow piles after substantial snowfalls (Photo 9-7). Generally, snowbanks exceeding the 100 cm height threshold (Figure 9-3) were where snow could not be adequately redistributed for safety and/or operational reasons (e.g., steep or uneven topography, narrow or winding road segments).

Inter-annual Trend — Most snowbank height measurements between 2014 and 2023 complied with the 100 cm height limit. Compliance with snowbank height was similar in the 2014 to 2016 and 2018 to 2023, monitoring periods, ranging between 80% to 97%, with the 2017 measurements having the lowest overall compliance rate at 66% (Figure 9-4).

Table 9-1. 2023 Tote Road snowbank height monitoring.

Survey Date	Number of Measurements	Compliances	Exceedances	Percent Compliance
January 23, 2023	70	56	14	80%
February 10, 2023	76	69	7	91%
March 13, 2023	83	65	18	78%
April 6, 2023	78	76	2	97%
May 11, 2023	66	63	3	95%
October 13, 2023	77	76	1	99%
November 7, 2023	88	83	5	94%
December 18, 2023	94	71	23	76%
Total	**632**	**559**	**73**	**88%**

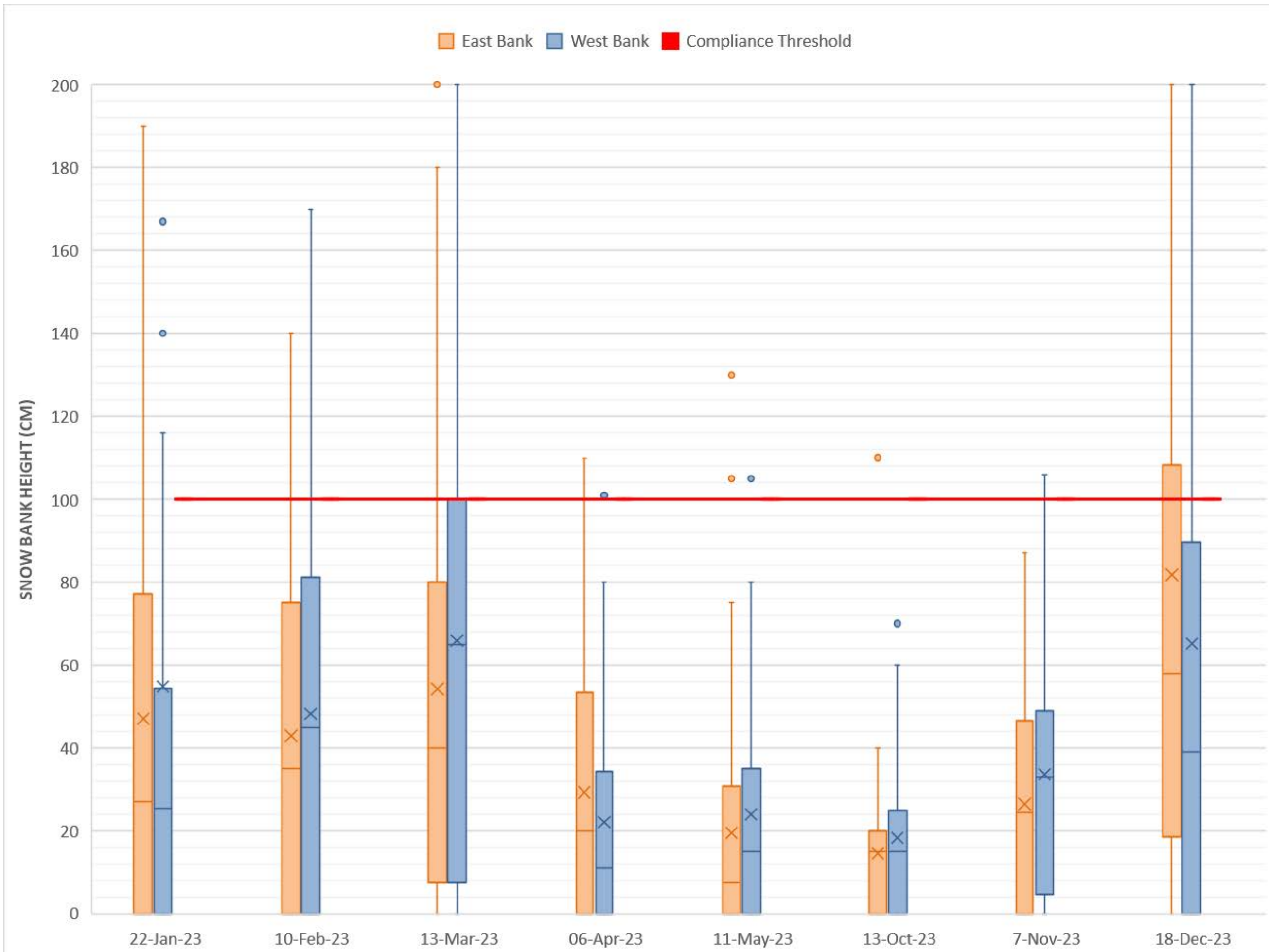


Figure 9-3. 2023 snowbank height monitoring time series and distribution for snowbank heights.
X represents the mean snowbank height for each survey. The horizontal line represents the median. The box represents the first and third quartiles. The whiskers represent the minimum and maximum values within 1.5 times the interquartile range.

Photo 9-5. Compliant snowbank (40 cm) at KM 25.

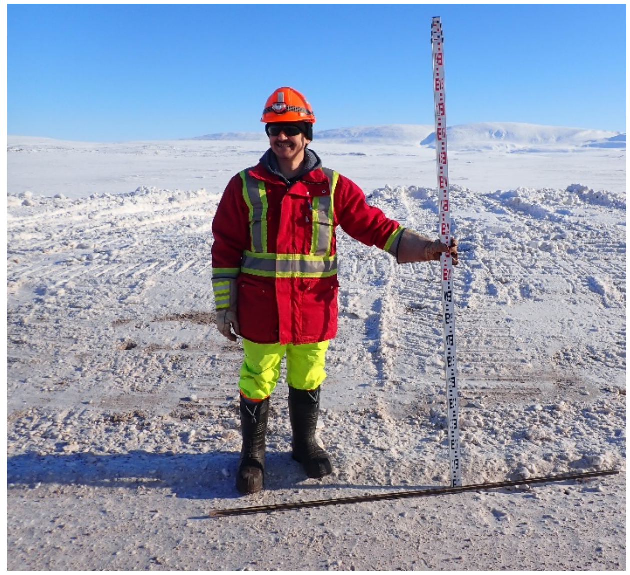


Photo 9-6. Compliant snowbank (0 cm) with signs of snowbank management (feathering).

Photo 9-7. Snowbank management (in progress) to facilitate wildlife crossing and improve driver visibility.

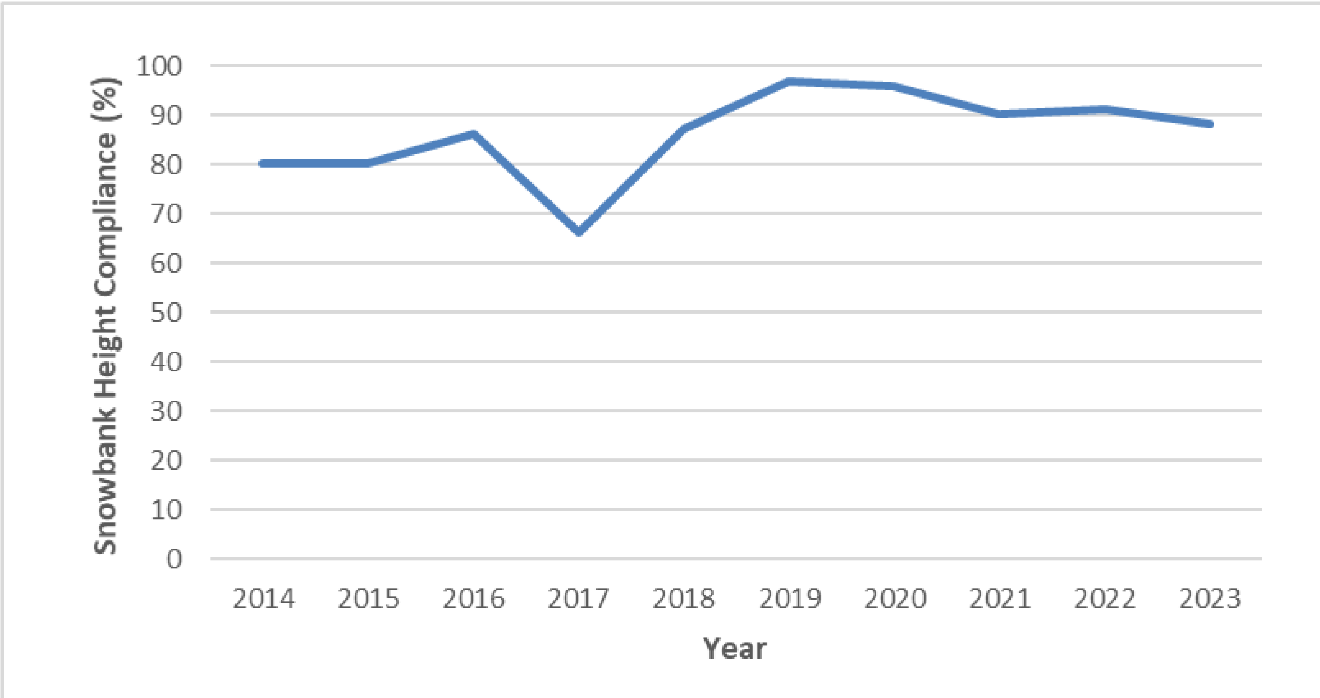


Figure 9-4. 2023 Inter-annual trends — snowbank height compliance monitoring (2014 to 2023).

9.3 HEIGHT OF LAND SURVEYS

The following 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 behaviour 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 PCs, 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. North Baffin caribou are currently at a low point in their 60 to 80-year population cycle (Government of Nunavut 2019), and caribou observations during surveys or recorded incidentally are infrequent. The HOL surveys will support long-term surveillance monitoring 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. 2019a). 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 in proximity to Project infrastructure. The 2023 HOL surveys were conducted in early summer (June 2 to 11, 2023) to observe caribou during the calving period; opportunistic late-winter surveys were not conducted in 2023.

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). Project components (e.g., the Tote Road, accommodation complexes, Deposit No. 1) were visible from each station; however, a 360-degree viewshed was seldom achieved due to obstruction from landscape/terrain. 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. Since the initiation of HOL surveys, Stations 1 to 16 have generally been accessed on foot, whereas Stations 17 to 24 are generally accessed via helicopter (e.g., due to water bodies, terrain, and travel distances).

9.3.1.1 Data Collection

Two qualified biologists from EDI Environmental Dynamics Inc. (EDI) conducted the 2023 surveys with the participation of a Baffinland personnel and two Inuit assistants. The survey procedure involved one observer scanning the viewshed with a spotting scope (i.e., focusing on the distant landscape) and three observers scanning the viewshed with binoculars (i.e., focusing on the intermediate and near landscape). EDI Environmental Dynamics Inc. conducted surveys at each HOL station for at least 40 minutes per survey. Efforts were made to visit all sites a second time but due to helicopters being grounded for safety reasons, a full second round was not able to be completed. Efforts were made to access some helicopter sites from the ground. Using digital, tablet-based forms, the following information was recorded:

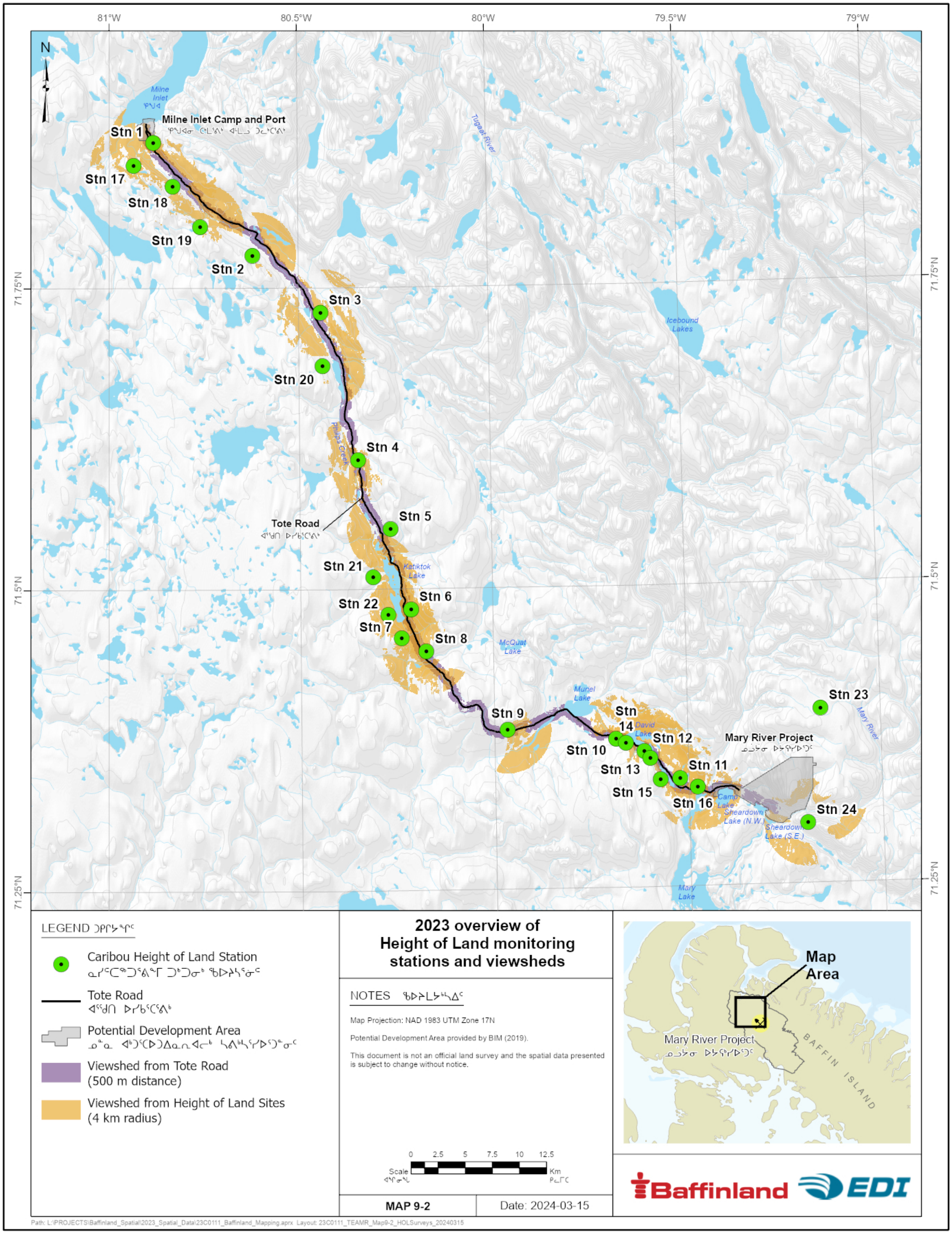
- station number (with georeferencing);
- location description (direction from road, aspect, terrain, other identifying features);
- general habitat description (vegetation and soil, if/where possible);
- presence of snow cover on landscape;
- photograph numbers (taken from multiple cardinal directions); 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). Activity categories (e.g., walking, foraging, running, bedded) would be assigned and tallied at two-minute intervals for scan sampling. 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-truth using a Global Positioning System (GPS).

9.3.1.2 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 km^2 were surveyed within the viewshed area, with viewshed ranging from 5 to 22 km^2 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 be re-evaluated to incorporate historic migration, calving patterns, and any new information relevant to HOL goals and methodologies. In 2020, the survey time was increased (as it is presently) by conducting at least two station visits for 40 minutes (previously 20 minutes).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Milne Inlet Camp and Port
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Stn 17
Stn 18
Stn 19
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Stn 23
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Mary River Project
Tugaat River
Icebound Lakes
Katiktok Lake
McQuat Lake
Muriel Lake
David Lake
Camp Lake
Sheardown Lake (N.W.)
Sheardown Lake (S.E.)
Mary River
Mary Lake
LEGEND
Caribou Height of Land Station
Tote Road
Potential Development Area
Viewshed from Tote Road (500 m distance)
Viewshed from Height of Land Sites (4 km radius)
2023 overview of Height of Land monitoring stations and viewsheds
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
0 2.5 5 7.5 10 12.5
Scale
Km
MAP 9-2
Date: 2024-03-15
Map Area
Mary River Project
BAFFIN ISLAND
Baffinland
EDI

9.3.2 RESULTS AND DISCUSSIONS

No caribou were observed during HOL surveys in 2023. A single set of 'old' (i.e., weathered) caribou tracks was noted at HOL station 13 on June 9, 2023. The tracks meandered along the west side of the road near KM 90 (a few hundred meters from road), travelling north and then ascending the hill to the plateau until the tracks were no longer visible. No other indicators (i.e., fecal matter, hair, evidence of foraging such as cratering) of caribou were observed elsewhere during surveys or enroute to survey stations.

In total, 16 hours and 51 minutes of HOL surveys were conducted in 2023 with a minimum 40 minutes and maximum of 45 minutes of survey time per station. Surveys were completed in early summer (June 2 to 11, 2023) during the peak calving season. Due to poor weather and helicopter safety logistics, a second round of surveys was not completed in 2023.

Visibility conditions during the HOL surveys had 'excellent' viewing conditions during all surveys. All sites had high snow cover (ranging from 80 to 100%) across the landscape.

Inter-annual Trend — No caribou were observed in the PDA during HOL surveys in 2023, consistent with results from 2014-2023 (Figure 9-5). Caribou were last seen during HOL surveys in 2013. This trend has been consistent (year-over-year) despite changes to survey procedures (i.e., increased survey time/effort) and supplementary/ancillary data capture (e.g., via deployment of remote cameras).

As mentioned, the current caribou ecology on North Baffin Island (i.e., low population numbers and low movement) is a primary factor contributing to a lack of caribou observations. Caribou densities in the region would need to be considerably higher to evaluate potential change in caribou behaviour and/or habitat use due to the Project (EDI Environmental Dynamics Inc. 2022b). In the interim, HOL surveys provide important data on individual-level caribou response to Project interactions and inform potential mitigations.

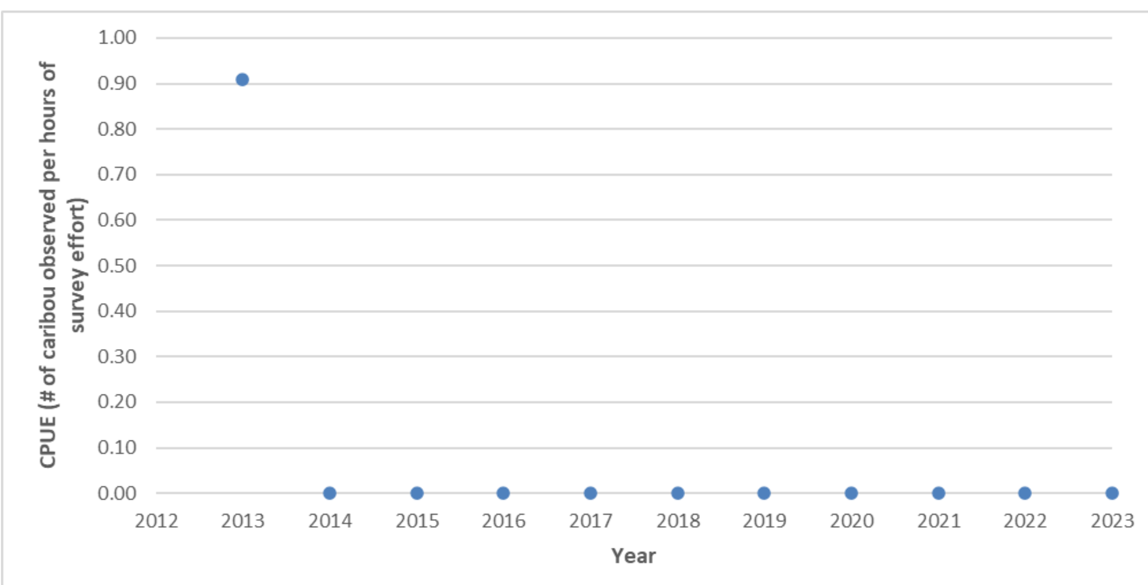


Figure 9-5. 2023 inter-annual trends — Height of Land survey (2013 to 2023 — post-baseline).
Note: CPUE = Catch per unit effort, i.e., number of caribou observed per hour of survey effort.

9.4 REMOTE CAMERAS

The following 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 PC—and related comments/recommendations from the MHTO and other TEWG members to increase the capacity for wildlife surveillance at the Project—a remote camera monitoring program was initiated in the summer of 2021. The program involves the deployment of remote cameras at 12 HOL stations (described in Section 9.3) to supplement data capture and evaluation of caribou movement at the Project. Remote cameras provide a continuous observation alternative from January 2023 to December 2023.

9.4.1 METHODS

In the summer of 2021, EDI and Baffinland personnel deployed 12 Reconyx HP2x HyperFire 2 Professional Cover IR remote cameras (two per station) at HOL survey stations #1, 3, 4, 6, 10, and 16. These locations were selected to optimize wildlife observations along the Tote Road. Wildlife in the Project area do not necessarily have established and/or defined 'usage' trails. Predicting higher usage areas and movement corridors for larger wildlife species to inform camera deployment relied on knowledge of the Project setting and previous survey observations. Remote camera stations are shown on Map 9-2; photo documentation of the camera stations (site conditions and installations) is provided in Appendix D.

Cameras were distributed within an open landscape with few-to-no physical obstacles. Baffinland personnel were responsible for camera care and maintenance (i.e., battery and SD card exchanges). The remote camera sites were accessed via helicopter or vehicle/on-foot. Most cameras were established within 500 m of an access trail or road focusing specifically on monitoring of the Tote Road. No cameras were deployed near the Mine Site. Cameras were installed using a rock drill to anchor the units to the ground using a steel/rebar tripod affixed with steel clamps. Cameras were installed approximately chest high and positioned to capture an optimal viewshed. Cameras were programmed[18] before deployment and tested/checked on site (after installation) to verify proper function and viewshed. After initial deployment in 2021 cameras are to be periodically checked (2 – 4 times annually) to provide controls for camera malfunctions, realignment, and

[18] The Reconyx HyperFire 2 cameras are motion and infrared triggered; they have a 0.2 second trigger speed and a PIR detection range of 30 meters (100 feet) (Reconyx 2024). Each unit was programmed to capture three consecutive photos when activated (referring to its '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).

servicing of batteries and SD cards. Efforts will be made to schedule checks at regular intervals to prevent large scale data loss and at times that are conducive to site personnel for logistic and safety reasons (i.e., avoidance of extreme cold temperatures and large distances from vehicles during winter). Between January and February 2023, Baffinland personnel revisited each camera station except HOL-6 stations (Baffin-1 and Baffin-5 cameras). All cameras were checked again in June 2023, in conjunction with HOL surveys by EDI staff. In mid-December 2023, all twelve cameras were visited to swap batteries and SD cards.

Data were transferred to EDI personnel for photo analysis of any/all wildlife observations, focusing on caribou and large carnivores; wildlife activities were carefully investigated and documented. The following information was recorded for each wildlife observation: species identity, age, sex (if/where possible), number of individuals, start/end time, and general comments.

9.4.2 RESULTS AND DISCUSSIONS

Over 150,000 photos were captured from the 12 cameras between January 2023 and December 31, 2023. Table 9-2 summarizes the remote camera data returns at each HOL/camera station. Active days refer to the number of days with a viable photolog/capture; weather-affected days refer to periods in which the camera function and data capture were affected by snow, frost, or fog. As temperatures dropped, more frequent and prolonged incidents of fog or frost were observed on the cameras. Active days ranged from 173 to 316 days. Variability in the data capture was attributed to obstructions of the field of view (e.g., due to blowing snow, ice crystals or fog) or camera stoppage (e.g., loss of power or exceedance of information storage capacity). Moreover, due to the large field of view, the quality of images and detectability was found to decrease in the far-field thereby reducing the ability to accurately identify and locate distant wildlife.

The occurrence rate between January 2023 and end of December 2023 for wildlife was highest overall at Baffin-11 site (23.79 individuals/100 camera days) (Figure 9-6). The lowest occurrence rate of wildlife occurred at Baffin-10 (0.33 individuals/100 camera days) with only one observation noted. Baffin-6's high occurrence rate is likely attributed to two camera events that observed 10 and 20 birds in individual images, increasing that site's relative abundance. The overall low occurrence rates across all cameras are likely a factor of weather conditions (fog, blowing snow) that prevent clear images, or deterred wildlife movement altogether, combined with cyclical lows in species populations.

A total of 44 wildlife detections were captured across all combined cameras. Ten species of mammals and birds were identified from the 12 remote camera sites. As seen in Figure 9-7, the highest number of wildlife observations were of Snow Goose (*Anser caerulescens*) (60), followed by Arctic fox (11), Ptarmigan (11), Arctic hare (11), unknown bird species (10), Common Raven (3), Sandhill Crane (*Grus canadensis*) (Photo 9-8) (3), songbirds (2), and a Snowy Owl (1). The observations of smaller mammals and birds are consistent with snow track and HOL surveys from 2023 and in previous years (Figure 9-1). No carnivores (wolves or bears) or ungulates (caribou) were captured in photos taken by the remote cameras. Larger carnivores or ungulates are not commonly seen on site, and, therefore, have a low probability of being detected on remote cameras.

Baffin-2, Baffin-6 and Baffin-11 cameras recorded the highest species richness, with five species recorded on camera (Figure 9-8). Baffin-11 also recorded one image of a potential wildlife track (Photo 9-9). Based on distance from the camera, the track appeared large and likely belonged to a medium-large animal and occurred between 13:30 and 14:00 on June 1, 2023. Baffin-6 did not begin recording 2023 images until it was serviced in June 2023, likely due to camera malfunction and/or reliability. Baffin-8, Baffin-9, and Baffin-11 cameras stopped recording images before camera servicing in late December 2023. Baffin-9 stopped recording in October 2023, for unknown reasons, Baffin-8 and Baffin-11 stopped recording images in October 2023 and early December 2023, respectively, likely due to drained batteries due to excessive photo capture triggered by nearby vehicle traffic.

Table 9-2. 2023 remote camera survey summary of remote camera data returns.

HOL Station	Camera ID	Year 3: Start Date	Year 3: End Date	Active Camera Days[1]	Weather-Affected Days [2]	# Species Recorded	# Photos	Notes
HOL 1	Baffin-3	February 16, 2023	December 24, 2023	298	13	1	5,005	—
	Baffin-4	February 16, 2023	December 24, 2023	290	21	3	4,897	—
HOL 3	Baffin-7	January 25, 2023	December 28, 2023	316	21	1	4,989	—
	Baffin-12	January 25, 2023	December 28, 2023	192	21	1	4,966	—
HOL 4	Baffin-8	January 23, 2023	December 11, 2023	206	10	2	37,692	Excessive triggers from road traffic drained batteries.
	Baffin-10	January 23, 2023	December 25, 2023	302	34	1	4,886	—
HOL 6	Baffin-1	January 1, 2023	December 28, 2023	201	157	2	5,181	Excessive fog and ice crystals
	Baffin-5	January 1, 2023	December 28, 2023	261	220	2	4,991	Excessive fog and ice crystals
HOL 10	Baffin-11	January 28, 2023	October 26, 2023	269	2	5	67,358	Excessive triggers from road traffic drained batteries.
	Baffin-9	January 28, 2023	October 10, 2023	250	5	1	3,250	—
HOL 16	Baffin-2	January 28, 2023	December 28, 2023	307	24	5	4,909	—
	Baffin-6	June 5, 2023	December 25, 2023	173	30	5	4,927	Camera malfunction before June 5 camera check – no data available.

[1] Number of days the camera is functioning properly and capable of recording timelapse and motion triggered images during the start and end of Year 3.

[2] Number of days poor weather (i.e. fog, dense blowing snow, ice build up) impedes ability to see surrounding landscape and monitor for caribou and other wildlife during the specified start and end of Year 3.

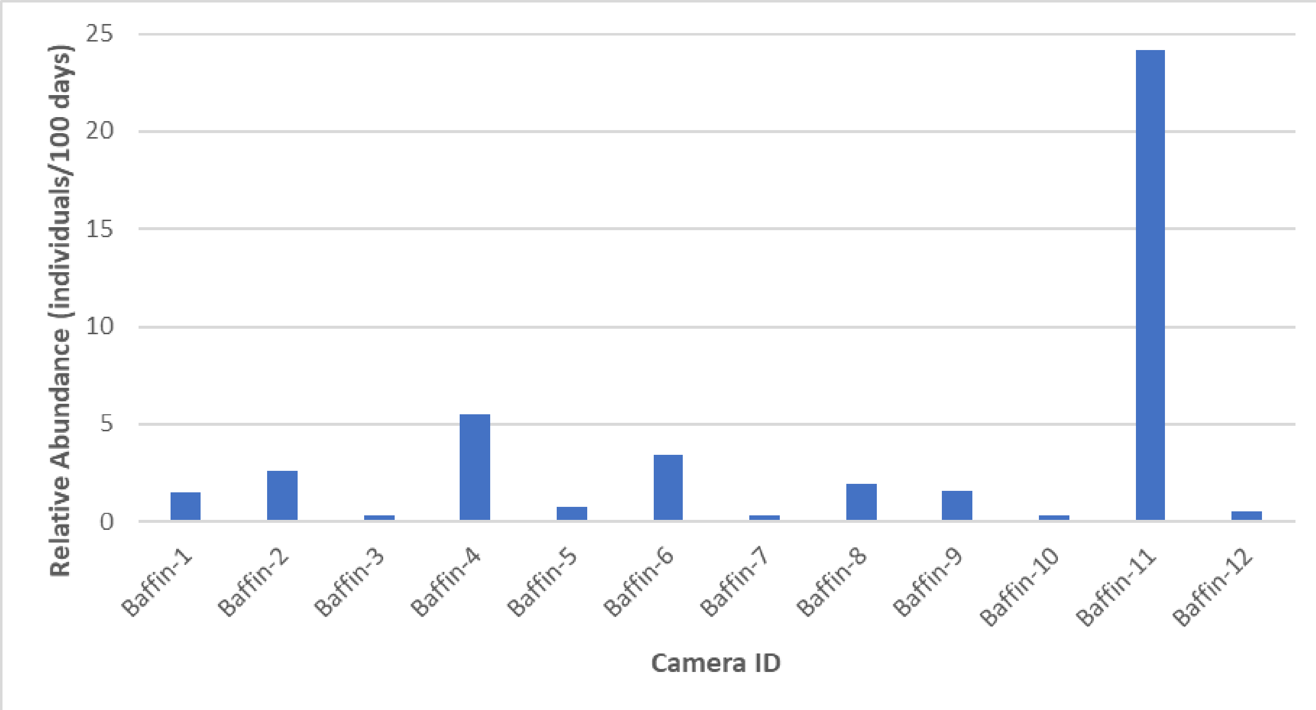


Figure 9-6. Camera occurrence rates for Baffinland Cameras between January and December 2023.

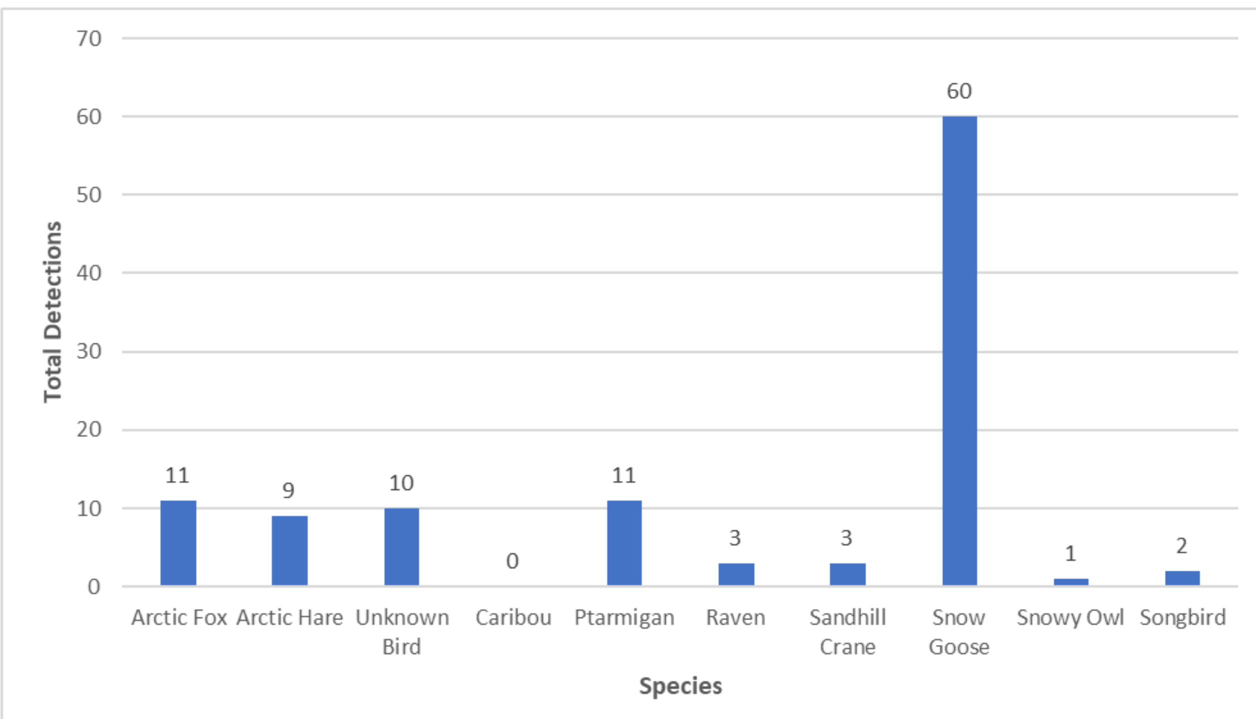


Figure 9-7. January to December 2023 remote camera survey, total wildlife observations per species.

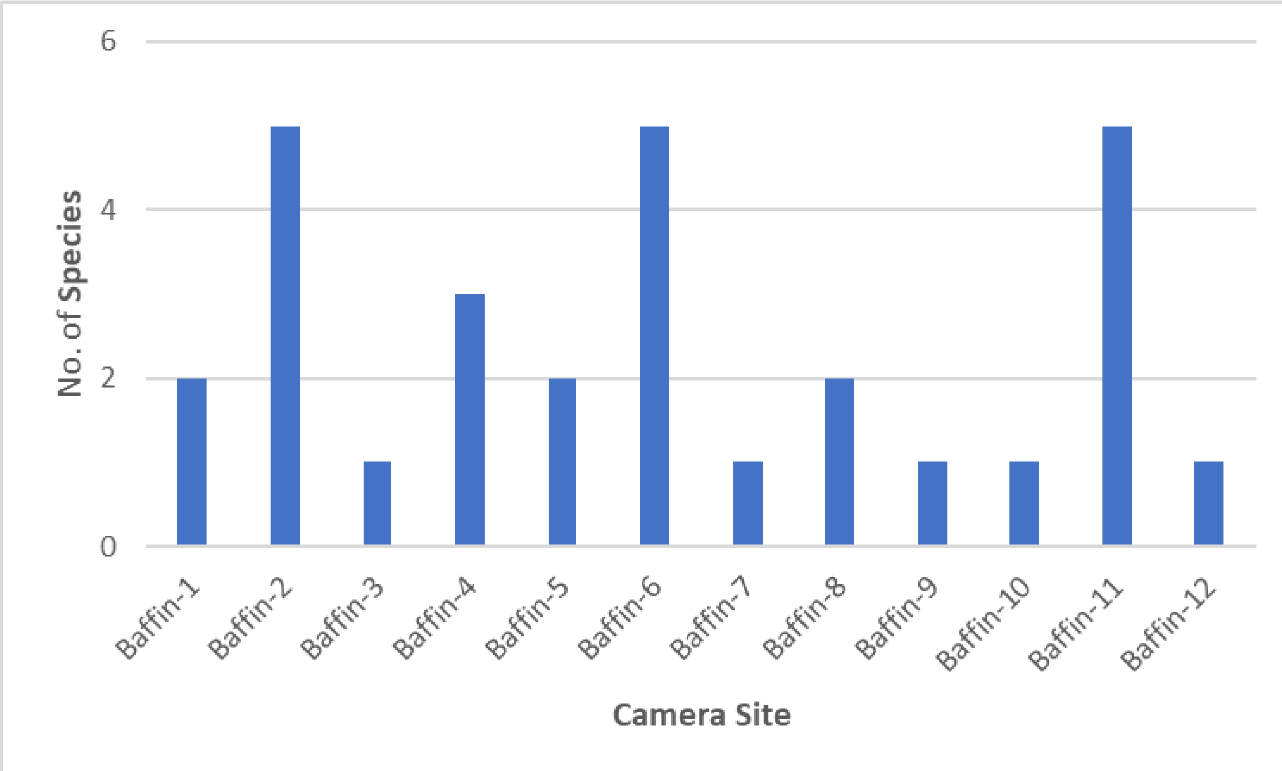


Figure 9-8. **January to December 2023 remote camera survey total species observations per Height of Land/camera station.**

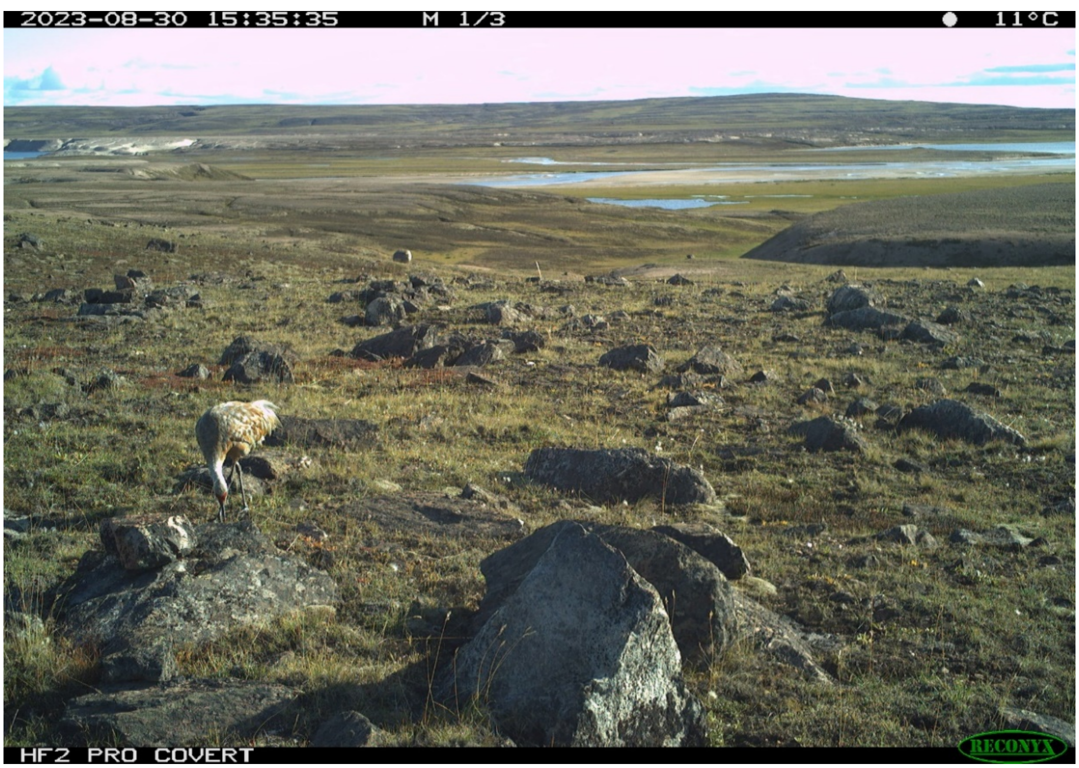


Photo 9-8. **Sandhill Crane foraging at Baffin-6 camera on August 30, 2023.**

Photo 9-9. Track seen on Baffin-11 camera on June 1, 2023.

9.5 AERIAL CARIBOU SURVEY

The following 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 behaviour 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."*

In early 2020 the TEWG discussed the status of caribou populations at the Project. Baffinland then proposed a decision framework and defined numerical triggers[19] to initiate more comprehensive caribou

[19] The decision framework emerged from the findings of a technical study on the barriers to caribou movement and potential indirect loss of caribou habitat (EDI Environmental Dynamics Inc. 2022b). The report identified two subregions within the Project area to independently assess potential impacts based on active (northern) and planned (southern) phases of the Project. It was concluded that at least 35 collared caribou were necessary to complete robust statistical analyses on movement and habitat effects. To ensure that these 35 caribou are a representative sample of the subpopulation, >350 caribou (or >35 groups of caribou) should be present in the southern and northern subregions. Further monitoring is initiated in a subregion only if the trigger is met in that subregion. This sample size trigger for each subregion was deemed reasonable in practice (i.e., in relation to the necessary field implementation effort) and necessary to facilitate appropriate statistical analyses.

monitoring (i.e., a GPS collar program to evaluate caribou movements and habitat selection in relation to the Project) to be informed by an aerial survey of the Regional Study Area (RSA) for wildlife (EDI Environmental Dynamics Inc. 2022b). A late-winter (March 24 – 27, 2023) aerial survey was conducted to assess the occurrence (presence/absence), distribution, and total counts of North Baffin caribou within the wildlife RSA and nearby areas of interest (Map 9-3). The objective of this aerial survey was to estimate the abundance and density of North Baffin caribou in the northern (i.e., active Project area) and southern (i.e., planned/future Project area) subregions of the wildlife RSA (EDI Environmental Dynamics Inc. 2022b).

9.5.1 METHODS

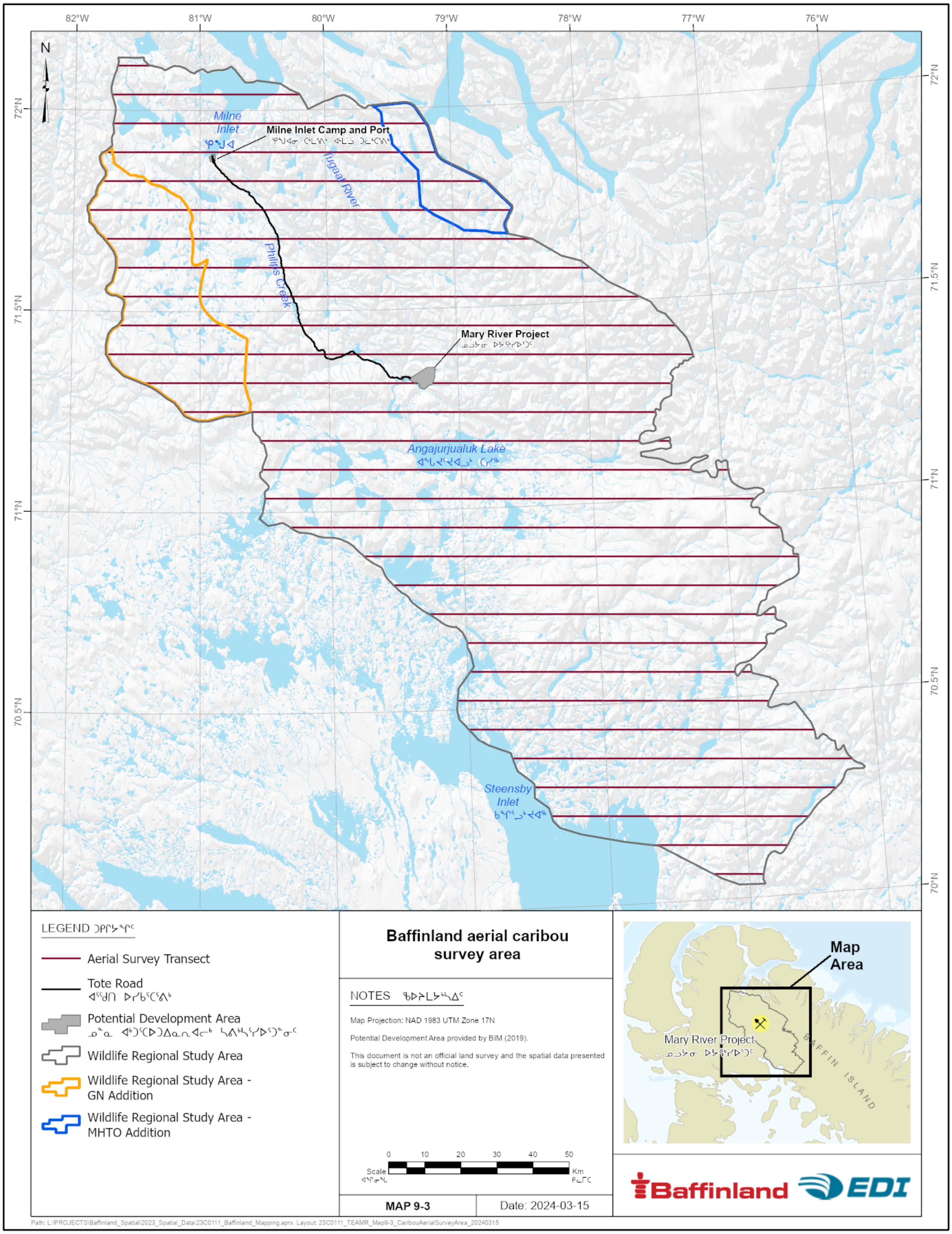
9.5.1.1 Study Area

The survey area (23,445 km²) is based on the Project's wildlife RSA (described in EDI Environmental Dynamics Inc. 2012). Based on ongoing discussions with the TEWG, two additions were made to the study area for the aerial survey: (1) an area to the north and west was added at the request of the Government of Nunavut to ensure that enough area was surveyed beyond the potential zone of influence of the northern transportation corridor (the Tote Road, TEWG June 23, 2022 meeting minutes, Baffinland Iron Mines Corporation 2022); and (2) the Ikaluit Lake area on the wildlife RSA's north and east corner, as requested by the MHTO at the February 2023 TEWG meeting (Baffinland Iron Mines Corporation 2023d). Both TEWG-requested additions were added to the wildlife RSA and are illustrated in (Map 9-3)

The survey area follows ecological and topographical boundaries. It overlaps portions of two population survey strata previously used in government surveys and management plans (Campbell et al. 2015, Government of Nunavut 2019). These overlapping subregions provide equal coverage of the mine footprint, per the study design recommendations discussed in EDI Environmental Dynamics Inc. (2022).

The *Caribou Monitoring: Triggers and Recommendations*[20] report (EDI Environmental Dynamics Inc. 2022b) further identifies a northern subregion (11,706 km², corresponding with the active Project area) and a southern subregion (15,735 km², corresponding with the planned/future Project area) that are considered in further analyses and future monitoring activities, as discussed in that report.

[20] This report more comprehensively describes the ecological setting, delineation of the Project's zone of influence, and the investigative pathways (including baseline research, surveillance programs and effects monitoring programs) needed to further inform mitigations and adaptive management at the Project (if/where necessary).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Milne Inlet Camp and Port
Tugaat River
Phillips Creek
Mary River Project
Angajurjualuk Lake
Steensby Inlet
LEGEND
Aerial Survey Transect
Tote Road
Potential Development Area
Wildlife Regional Study Area
Wildlife Regional Study Area - GN Addition
Wildlife Regional Study Area - MHTO Addition
Baffinland aerial caribou survey area
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
This document is not an official land survey and the spatial data presented is subject to change without notice.
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Date: 2024-03-15
Map Area
Mary River Project
BAFFIN ISLAND
Baffinland
EDI

9.5.1.2 Survey Design and Protocols

The aerial survey was completed from March 24–27, 2023, in a fixed-wing Caravan equipped with a radar altimeter to maintain elevation at 122 m (400 ft) above ground level (agl) and travel at 150 km/h. The survey design consisted of the 'fly-over' of 29 linear transects oriented east-to-west and spaced 8 km apart within the wildlife RSA. Transect lengths varied (minimum = 9 km, maximum = 163 km). The survey design did not include stratified flight lines for the northern and southern subregions. Instead, an equal survey effort was applied across the wildlife RSA, and the subregions were stratified *post hoc* during modelling and statistical analysis.

For continuity and alignment with previous aerial surveys, the survey design used methods that the Government of Nunavut applied during the March 2014 regional survey of the North Baffin strata (including the Mary River stratum, Campbell et al. 2015). The survey timeframe was also applied so that observations were made before calving (i.e., to minimize disturbance) and snow cover was more extensive on the landscape (thereby standardizing the observational setting and improving the detection of caribou on the landscape). In consultation with the Government of Nunavut's regional wildlife biologist, the survey was planned to occur before the GN's collaring activity (March/ early April 2023) in the North Baffin region (Ringrose 2023).

A double-observer pair configuration (cf. Figure 8 in Campbell et al. 2015; Figure 9-9) was used to optimize wildlife detections on both sides of the aircraft. The field team (seven personnel and two pilots) was comprised of EDI wildlife specialists, alternating Qikiqtani Inuit Association (QIA) environmental monitors, and other Inuit participants (Photo 9-10):

- primary observers — Justine Benjamin (EDI Field Lead), Sean Munro (EDI Wildlife Specialist);
- secondary observers — Joe Bruce Nakoolak (QIA Environmental Monitor) / Tom Williamson (QIA Environmental Monitor), Victor Kadloo (Inuit Observer);
- tertiary observers — Joel MacFabe (EDI Wildlife Specialist), Jayko Tatatuapik (Inuit Observer); and,
- data recorder — Joel MacFabe (EDI Wildlife Specialist).

The observation and detection of caribou followed a distance sampling (DS) protocol whereby observations were classified according to five distance bins (0-200 m, 200-400 m, 400-600 m, 600-1,000 m, and 1,000-1,500 m) that were marked on wing struts (cf. Figure 7 in Campbell et al. 2015; Figure 9-10). Figure 9-9 and Figure 9-10 demonstrates how the observer configuration and distance bin markers were implemented in the field. The primary observer called out caribou detections, including the number of individuals[21], locations, and distances, when they occurred at approximately 90-degree angles from the plane (i.e., perpendicular at either 9 o'clock [left] or 3 o'clock [right] off the transect line). To minimize duplicate observations and potential data artifacts, the primary observer had priority (to the extent possible) to 'call out' sightings ahead of secondary and tertiary observers. Secondary and tertiary observers had to wait until caribou had passed the 9 o'clock [left] or 3 o'clock [right] mark to confirm the sightings and/or 'call out' any

[21] Caribou individuals or clusters within ~100 m of each other were deemed to be a single group.

additional sightings the primary observer may have missed. All observers then discussed the number of caribou detected to reconcile potential discrepancies in the data capture.

The recorder documented and categorized all observations using a standard data collection form. Key information included:

- spatial identifiers (latitude and longitude coordinates);
- group size and composition (if possible, adult/calf and sex);
- side of the plane (left or right), distance bin, observer(s) (primary, secondary, tertiary); and,
- field-based habitat observations, including:
    - survey conditions (percent snow, percent cloud cover, visibility [poor, good, or excellent]); and,
    - terrain (slope [flat, moderate, or steep], topography [flat, moderate, or steep]).

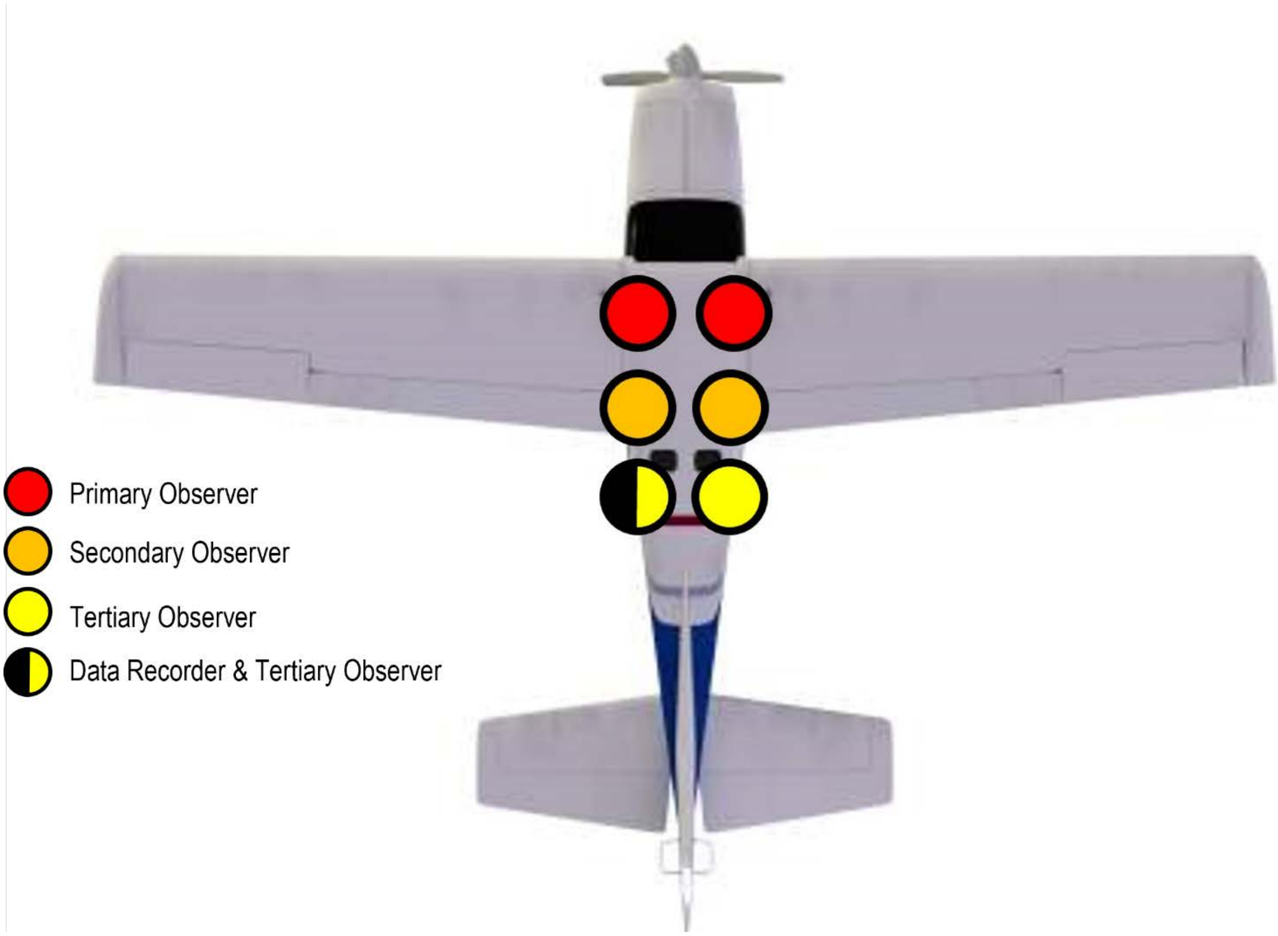


Figure 9-9. Schematic diagram of double-observer configuration.
Adapted from Figure 8 in Campbell et al. (2015).

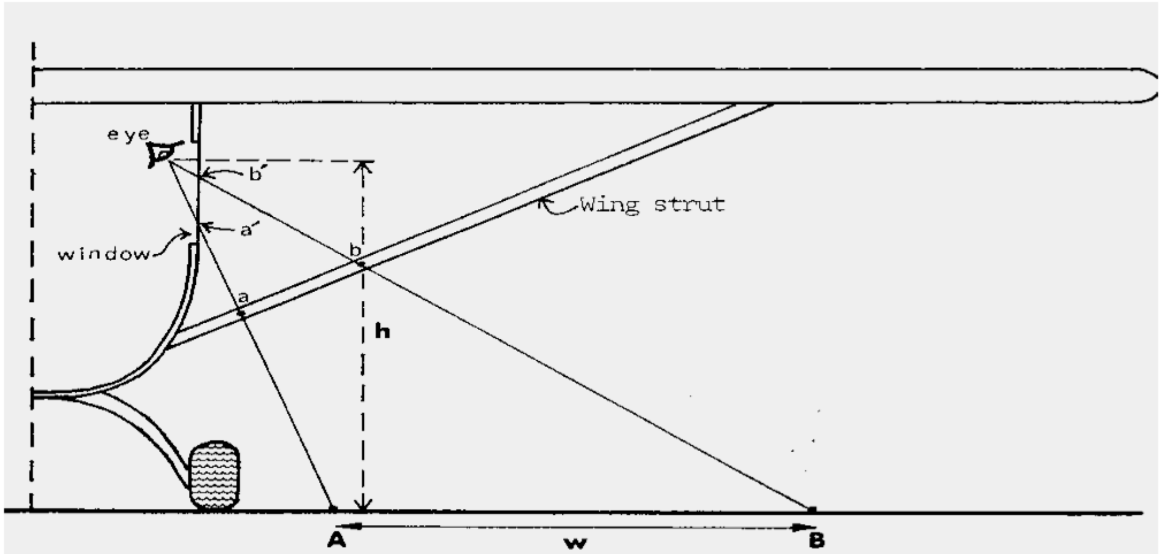


Figure 9-10. Schematic diagram of wing strut markings to identify distance bins from the aircraft.
Source: Norton-Griffiths 1978

Photo 9-10. Aerial caribou survey crew members on March 25, 2023.
From left to right: Joel MacFabe, Joe Bruce Nakoola, Jayko Tatatuapik, Sean Munro, and Victor Kadloo. Photo by Justine Benjamin. Missing: Tom Williamson.

9.5.1.3 Population Estimates

Analytical Framework

Two components were used to estimate the abundance and density of North Baffin caribou in the wildlife RSA:

- a model of the detection process (i.e., the probability that caribou are detected on the landscape); and,
- an unbiased estimator of abundance/density that accounts for the detection process.

The detection process considers the uncertainty in observing caribou when they are present. The detection process is estimated using observational data and then applied to an estimator (equation) to calculate abundance and density estimates. A mutual detection function was developed for the northern and southern subregions of the wildlife RSA. Estimates of abundance/density were stratified *post hoc* by subregion.

To model the detection process of caribou on the landscape, DS and mark-recapture (MR) methods were combined, termed mark-recapture distance sampling (MRDS). This approach combines two methods to calculate abundance while addressing shortfalls when either method is used independently. Mark-recapture distance sampling models have been successfully used to model caribou abundance on Baffin Island (Campbell et al. 2015). DS, a method commonly used to estimate wildlife populations, models animal detection as a function of distance from a transect line. MR models abundance as a function of the portion of marked animals that were detected on a survey.

Two key assumptions of DS are often violated in population surveys: (1) animals on the transect are certain to be detected, and (2) animals are detected at their original location. As for MR models, the assumption that all animals are equally likely to be detected is often violated. By combining both MR and DS methods, these assumptions can be checked or addressed to remove bias in the abundance estimation. The MR model can check the assumption that all animals on the transect were detected and, if needed, model detection on the transect. The DS model can account for reduced detection farther from the transect. Mark-recapture distance sampling combines an MR model with a DS model. In this application, the MR component estimates the detection probability of caribou on/near the transect line, and the DS component estimates the decreased probability of detection at greater distances off the transect.

The 'marking' of animals for the MR model was done using a double-observer survey (Figure 9-9). The primary observer was considered 'Observer 1' and secondary/tertiary observers were considered 'Observer 2'. Animals are 'marked' when observed by one observer and 'recaptured' if observed by the other observer.

An MRDS model was developed with the following assumptions: (1) independence of observations made by the primary and secondary observers and (2) point independence. The independent observer configuration can be assumed when two observers search independently of each other and when animals are unlikely to have moved between detections made by those observers (i.e., no duplicate observations). Duplicate observations are less likely when both observers are in the same plane, as in this survey. Point independence assumes that detections of caribou by observers are likely independent at any given location along a transect but become more correlated at farther distances. See Buckland et al. (2004) and Burt et al. (2014) for further details.

Under the point independence assumption, the overall detection probability is obtained by combining the MR model's intercept and the DS model's shape (Burt et al. 2014). In other words, the average detection probability was calculated for MR (intercept) and DS (across distances) components, and the product of these probabilities equalled the overall MRDS detection probability.

The overall detection probability was used in a Horvitz-Thompson-like estimator (Buckland et al. 2004) to approximate the abundance and density of (a) individual caribou and (b) groups of caribou in northern and southern subregions of the wildlife RSA.

All statistical analyses were completed in R software for statistical computing, version 4.2.1 (R Core Team 2022), using the package 'mrds' (Laake et al. 2022).

Model Fit and Assessment

A two-stage process was used to fit the combined MRDS model and estimate the overall detection probability of caribou on the landscape. First, an MR model was fit to the data while assuming full independence in observations. Second, a DS model was fit to the data alongside the chosen MR model while assuming point independence. In other words, the second step modified the DS model using the MR model to account for imperfect detection along and near the transect line.

Animals are not always visible. Terrain features may conceal an animal from observers. To account for factors that may alter the detection of caribou on the landscape, several covariates were included in MR and DS models: percent snow, visibility, terrain ruggedness (terrain ruggedness index; Riley et al. 1999) and slope (degrees). Three additional non-landscape covariates were considered: distance bin (categorical), group size (numeric), and observer (categorical, primary [reference level] and secondary). Caribou group size can influence detectability because larger groups are more likely to be visible on the landscape than smaller groups. The effect of observer and distance (bin) accounted for the differences in detection between primary/secondary observers and the reduced detection of caribou at greater distances, respectively. The observer and distance covariates were explicit in the MR model but implicit in the DS model (i.e., not directly specified as covariates in model formulas).

In several combinations, covariates were included in MR and DS models, and the most parsimonious model structures were chosen using Akaike's Information Criteria (AICc; Burnham and Anderson 2002). Model development was completed in an exploratory way with no *a priori* hypotheses considered. First, the best MR model structure was chosen from many covariate combinations. Then, that MR model structure was held constant while iterating through several covariate combinations for the DS model structure to develop and select the combined MRDS model.

The MR model was estimated using a logistic regression with a logit-link function to assess the probability of detection on the transect line.

The DS model considered two forms or ‘key functions’, which can predict detection probabilities as either half-normal or hazard-rate parametric functions (Buckland et al. 2004). An additional ‘key adjustment’ term (e.g., cosine or polynomial) is commonly used to modify the shape of the detection function to better fit observations across the distances sampled. However, Miller and Thomas (2015) advise caution when using key adjustments and covariates because including both cannot guarantee a monotonic non-increasing detection function (i.e., a function that does not continuously decrease with distance). Key functions were included in the MRDS model if they yielded sensible detection functions and improved model fit and parsimony (i.e., lower AICc score).

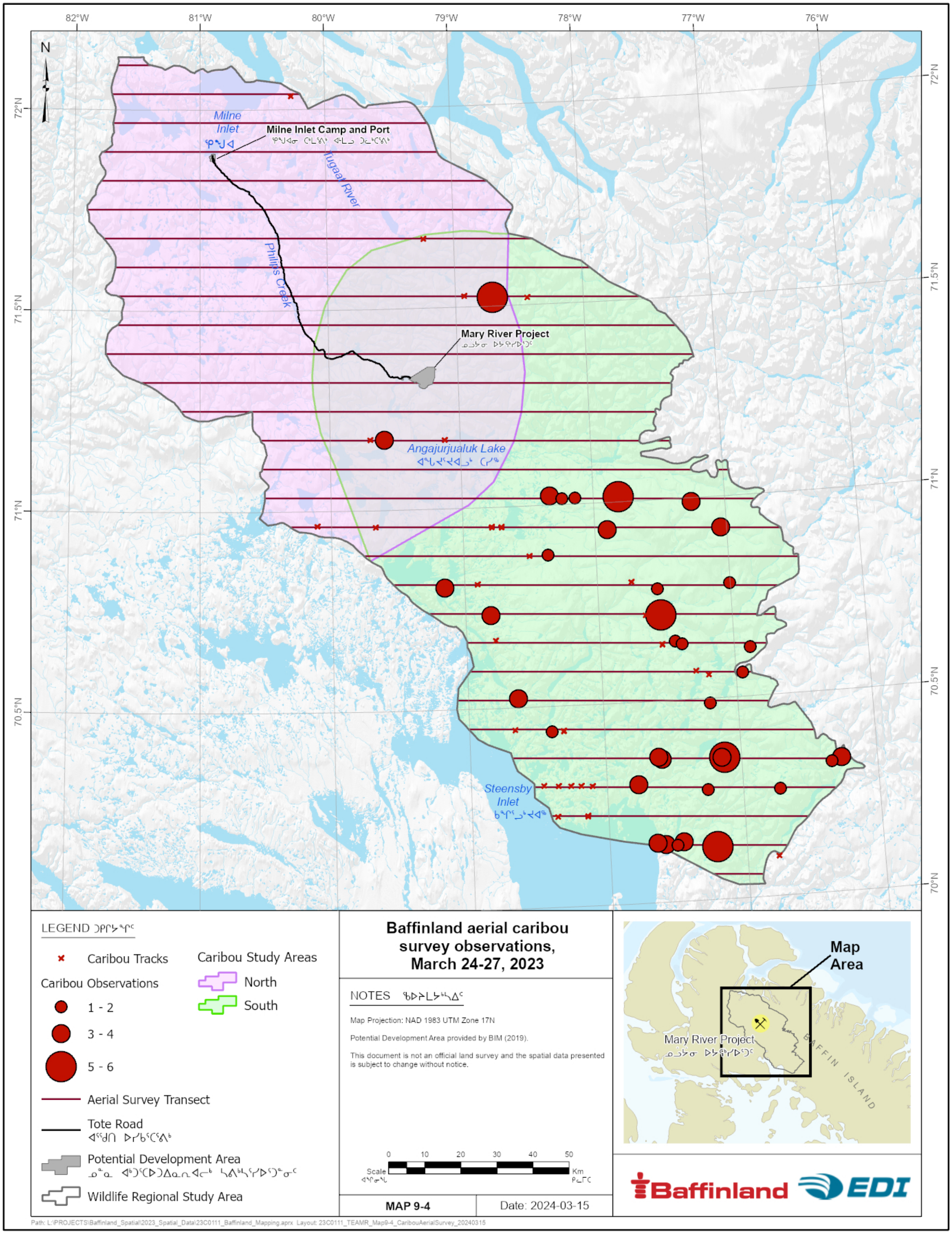
Prior to estimating abundance and density, the combined MRDS detection function was assessed using a chi-square goodness-of-fit test and a quantile-quantile plot of fitted versus empirical cumulative density functions.

9.5.2 RESULTS AND DISCUSSION

9.5.2.1 Field Observations

During the survey, 112 caribou and 36 groups were observed (Photo 9-11). All observed caribou occurred in the southern subregion of the wildlife RSA. Due to the elevation (122 magl), speed (150 km/h), and intent of the survey (i.e., this was not a composition survey), no observations were classified by sex or age. Only two groups (nine individuals total) occurred in an overlapping portion of the northern subregions (Map 9-3). Detections of caribou occurred primarily in areas with exposed, windswept ground rather than areas of expansive snow cover. Weather and visibility on the first three days (March 24 to 26) were excellent, with clear skies and sunny conditions, which allowed observers to spot tracks and wildlife easily. The final day (March 27) had periods of cloud cover, which made detecting tracks and caribou more challenging at those low light levels.

Information collected in each subregion was used to formulate a detection function for caribou across the landscape. One observation of three caribou (ObsID #50) in the southern subregion did not have recorded field-based covariate values; data imputation was required to include this observation in the analysis. Covariate values from a separate observation (ObsID #51) at the same time and location were assigned to ObsID #50 on different sides of the plane.


82°W
81°W
80°W
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78°W
77°W
76°W
72°N
71.5°N
71°N
70.5°N
70°N
N
Milne Inlet
Milne Inlet Camp and Port
Tugaat River
Phillips Creek
Mary River Project
Angajurjualuk Lake
Steensby Inlet
LEGEND
Caribou Tracks
Caribou Observations
1 - 2
3 - 4
5 - 6
Aerial Survey Transect
Tote Road
Potential Development Area
Wildlife Regional Study Area
Caribou Study Areas
North
South
Baffinland aerial caribou survey observations, March 24-27, 2023
NOTES
Map Projection: NAD 1983 UTM Zone 17N
Potential Development Area provided by BIM (2019).
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
Scale
Km
MAP 9-4
Date: 2024-03-15
Map Area
Mary River Project
BAFFIN ISLAND
Baffinland
EDI
Path: L:\PROJECTS\Baffinland_Spatial\2023_Spatial_Data\23C0111_Baffinland_Mapping.aprx Layout: 23C0111_TEAMR_Map9-4_CaribouAerialSurvey_20240315

Photo 9-11. Caribou (4) were observed during the aerial survey in the southern study portion on March 26, 2023.

9.5.2.2 Modelling Outcomes

The selected MR model included observer, group size, and percent cloud cover as covariates. It was chosen out of several candidates with similar AICc scores (ΔAIC < 2 relative to the 1st-ranked model) because it had the best model fit, i.e., log-likelihood (Table 9-3). The top DS model, modified by the selected MR model, included group size and percent cloud cover scaled with a hazard-rate key function (Table 9-4). Though ranked as 4th according to the information criterion, it had the highest log-likelihood and a ΔAIC < 2 compared to the 1st-ranked model. To determine whether key adjustments (e.g., cosine and polynomial functions) were necessary to improve fit, 3rd-order cosine and 4th-order polynomial terms were included. However, these attempts either resulted in nonmonotonic detection functions or required too many parameters to estimate based on the number of distance bins used during the survey.

The combined MRDS detection function fit well with the observed data and matched theoretical expectations. Figure 9-11 shows the predicted detection probabilities for all (pooled) observers. The detection function curve follows the decrease in detection frequency at greater distances from the transect line. Generally, the primary observer had a high detection probability across distance categories and rarely missed observations made by the secondary observer (Figure 9-12). A chi-square goodness-of-fit test demonstrated a good match between observed and expected (theoretical) detections across the distance categories ($\chi^2_6 = 9.13$, $P = 0.17$), and a quantile-quantile plot of fitted versus empirical cumulative density functions met theoretical expectations (i.e., fell along the diagonal line of unity; Figure 9-13).

Table 9-3. Double observer, full independence mark-recapture (MR) model selection.

#	Model Structure	K	AICc	ΔAIC	Log-likelihood
1	MR: ~observer + cloud	3	196.47	0.00	-95.24
2	**MR: ~observer +group size + cloud**	**4**	**197.03**	**0.56**	**-94.51**
3	MR: ~observer	2	197.57	1.10	-96.79
4	MR: ~cloud	2	198.33	1.85	-97.16
5	MR: ~distance + observer	3	198.34	1.86	-96.17
6	MR: ~observer + group size	3	198.45	1.98	-96.23
7	MR: ~group size + cloud	3	198.88	2.41	-96.44
8	MR: ~observer + TRI	3	199.23	2.76	-96.62
9	MR: ~1	1	199.43	2.95	-98.71
10	MR: ~observer + slope	3	199.46	2.99	-96.73

Table 9-4. Double observer, point independence joint mark-recapture (MR) and distance sampling (DS) model selection.

#	Model Structure	Key Function	K	AICc	ΔAIC	Log-likelihood
1	MR: ~observer + group size + cloud DS: ~cloud	hr	6	174.08	0.00	-81.04
2	MR: ~observer + group size + cloud DS: ~cloud	hn	5	174.26	0.18	-82.13
3	MR: ~observer + group size + cloud DS: ~group size + cloud	hn	6	174.34	0.26	-81.17
4	**MR: ~observer + group size + cloud** **DS: ~group size + cloud**	**hr**	**7**	**174.37**	**0.29**	**-80.19**
5	MR: ~observer + group size + cloud DS: ~1	hn	4	174.59	0.51	-83.30
6	MR: ~observer + group size + cloud DS: ~ group size + TRI	hn	6	174.63	0.55	-81.32
7	MR: ~observer + group size + cloud DS: ~group size + slope	hn	6	174.67	0.58	-81.33
8	MR: ~observer + group size + cloud DS: ~TRI	hn	5	175.46	1.38	-82.73
9	MR: ~observer + group size + cloud DS: ~1	hr	5	175.51	1.42	-82.75
10	MR: ~observer + group size + cloud DS: ~group size	hn	5	175.53	1.44	-82.76

The MR model was held constant across all DS model iterations. Only the top 10 models are provided. Hazard-rate (hr) and half-normal (hn) key functions were tested for the distance sampling model component. The selected model, parameters, and statistics are **bolded**.

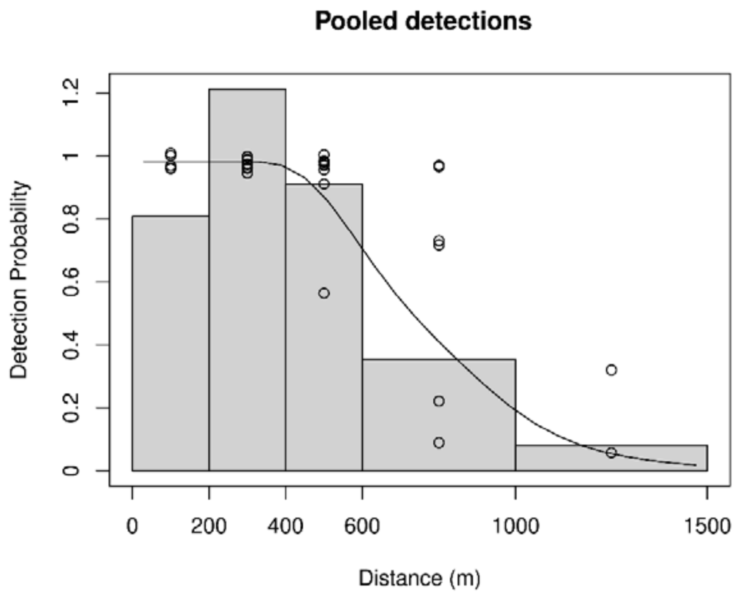

Figure 9-11. Pooled detection probabilities of caribou at increasing distance from the transect line.

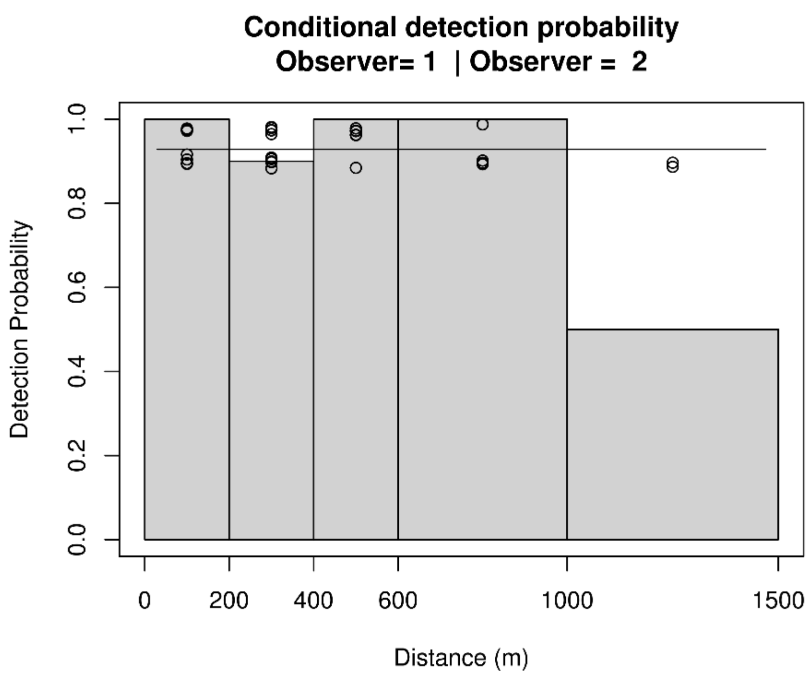

Figure 9-12. Conditional detection probabilities of the primary observer detecting caribou at increasing distance from the transect line.

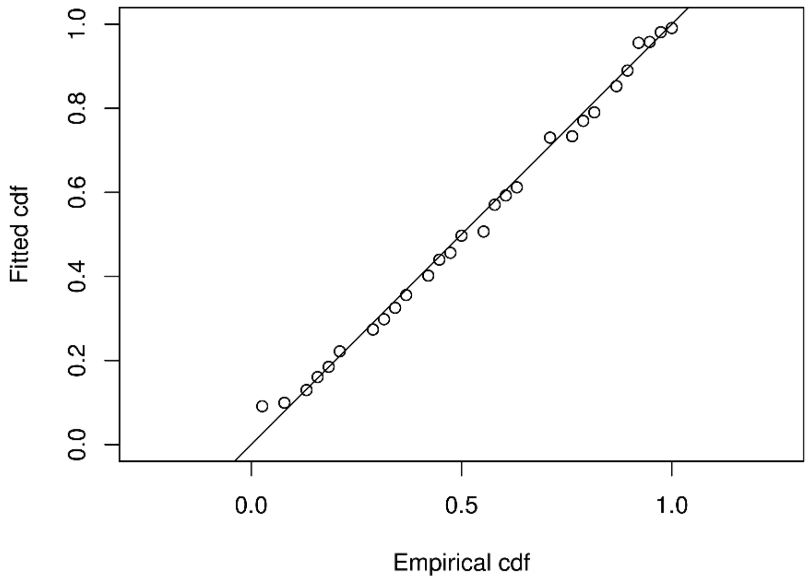

Figure 9-13. The quantile-quantile plot of fitted versus empirical cumulative density functions for the fitted mark-recapture distance sampling detection function.

9.6 INCIDENTAL OBSERVATIONS

Incidental wildlife observations are recorded by on-site personnel via wildlife logs posted in various areas. These logs are indicators of wildlife species that occur near Project infrastructure or areas where exploration or monitoring may occur. Table 9-5 summarizes the 2023 incidental wildlife observations.

Caribou — A total of 103 caribou were recorded from 22 separate observations between April 20 and November 19, 2023. Two observations were made near the Mary River mine site area, where five caribou were observed adjacent to Camp Lake on May 23, 2023. Those caribou were assumed to be spotted again three more times at KM markers parallel to the Tote Road. A single caribou was seen from the Tote Road on October 17, 2023, and four were observed approximately 1 km from the Tote Road on November 19, 2023. Most of the caribou were observed in exploration areas southeast of the Project in summer, generally during helicopter transport. In total 85 caribou were recorded in remote areas such as Steensby Camp, and near Ikaluit Lake.

Birds — A total of 22 bird species were recorded on incidental wildlife logs in 2023. Examples of the most common species reported include: Sandhill Crane, Ptarmigan, Common Raven, Snow Bunting (*Plectrophenax nivalis*), Snow Goose, Canada Goose, Rough-legged Hawk (*Buteo lagopus*), Long-tailed Duck (*Clangula hyemalis*), Cackling Goose (*Branta hutchinsii*), Peregrine Falcon (*Falco peregrinus tundrius*), Red-throated Loon (*Gavia stellata),* American Golden Plover (*Pluvialis dominica*), Common Loon (*Gavia immer*), Greater White-fronted Goose (*Anser albifrons*), Gyrfalcon (*Falco rusticolus*), Horned Lark (*Eremophila alpestris*), King Eider (*Somateria spectabilis*), Lapland Longspur (*Calcarius lapponicus*), Pacific Loon (*Gavia pacifica*), Piping Plover (*Charadrius melodus*), Semipalmated Plover (*Charadrius semipalmatus*), and Yellow-billed Loon (*Gavia adamsii*).

Table 9-5. 2023 incidental observations – wildlife species observations in the Potential Development Area (Mary River, Tote Road, Milne Port) and Remote Areas (based on wildlife logs).

Common Name	Scientific Name	Number of Observations			
		Mary River	Tote Road	Milne Port	Remote Areas
Arctic hare	*Lepus arcticus*	9	5	5	0
Arctic fox	*Vulpes lagopus*	21	4	6	0
Red fox	*Vulpes vulpes*	2	1	1	0
Fox sp.	*Vulpes* sp.	19	2	1	0
Lemming	*Lemmus* sp.	0	0	1	0
Caribou	*Rangifer tarandus groenlandicus*	1	5	0	16
Polar Bear	*Ursus maritimus*	0	3	0	0
Wolf	*Canis lupus*	0	3*	0	2

**individual wolf recorded on the same day by three separate observers.*

9.7 HUNTER AND VISITOR LOG

Baffinland Security monitors land use and the presence of land users in the Project area via hunter and visitor logs that document travel or hunting within the Project area. This is an indirect and incomplete land use record given that individuals are only required to populate the visitor logs if/when interacting with or using Baffinland facilities. Based on Baffinland. Because groups of individuals may travel together and/or use Project sites over multiple days, person-days can capture the extent of site visits in a year (i.e. one person-day is equal to one person visiting a site for one day, while ten person-days could equal one person visiting a site for ten days or five people visiting a site for two days).

Two hundred and eighty-six (286) person days were recorded between January 1, 2023, and December 31, 2023:

- Mine Site Camp: 83 individuals in 13 groups; and,
- Milne Port Accommodations Complex: 203 individuals in 43 groups.

Group sizes ranged from 1 to 18 individuals. These hunter/visitors were typically hunting, fishing, travelling, stopping for food/fuel, or servicing vehicles (Figure 9-14, Figure 9-15). Baffinland provided food, beverages, transportation, tools, supplies, fuel and mechanical assistance to hunters and visitors, if requested and safe. Overall log numbers slightly decreased from 2022 but are similar to 2018 and above pre-COVID counts.

In 2023, Baffinland assisted or was on standby in six separate Search-and-Rescue incidents (March 11, July 11, September 4, September 11, September 27, and October 8, 2023) for people reported missing or in distress. The rescue was often due to boat/ATV/snowmobile mechanical breakdowns and becoming stranded. One incident involved a medical emergency where Baffinland provided helicopter transport. In most cases, Baffinland provided aircraft support, staging, fuel, food, and accommodations.

Interannual Trend — The number of visitors recorded has increased since 2014. It shows substantial fluctuations from 2019 to 2022 (Figure 9-16), coinciding with the COVID pandemic, but may begin to level out based on 2023 data. The number of visitors each year often represents repeat groups at the start and end of their trips, making multiple trips within the year. Given that hunter and visitor registration is not mandatory, values do not represent all potential land users at the Project.

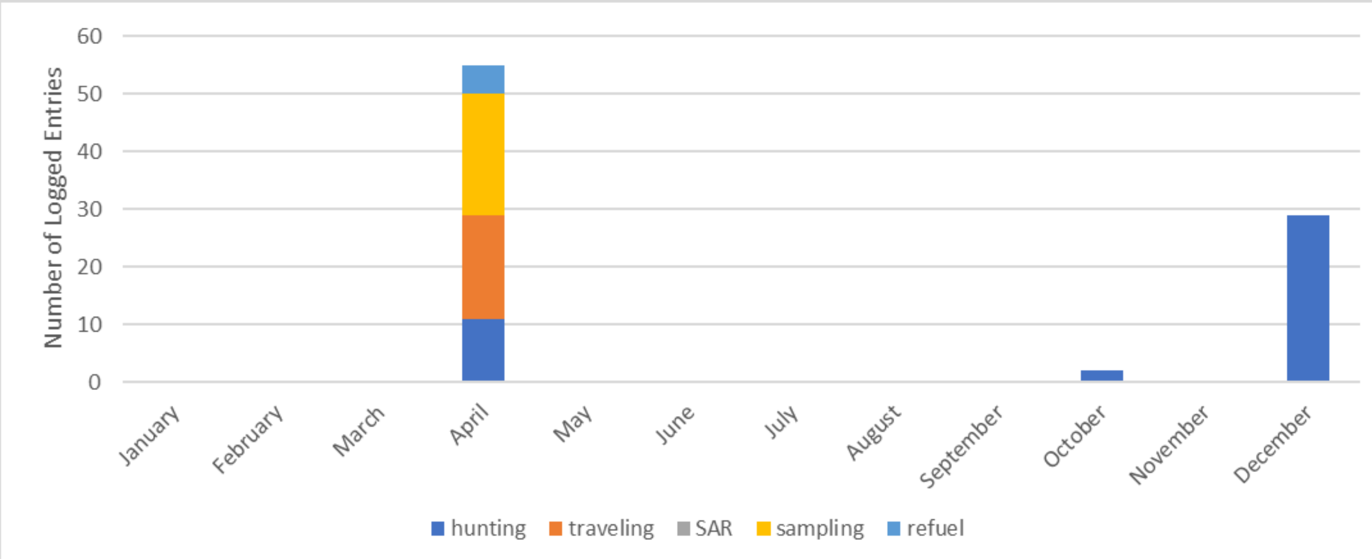

Figure 9-14. Mary River (mine site camp) number of visitor logged by security with breakdown by month with check-in rationale.

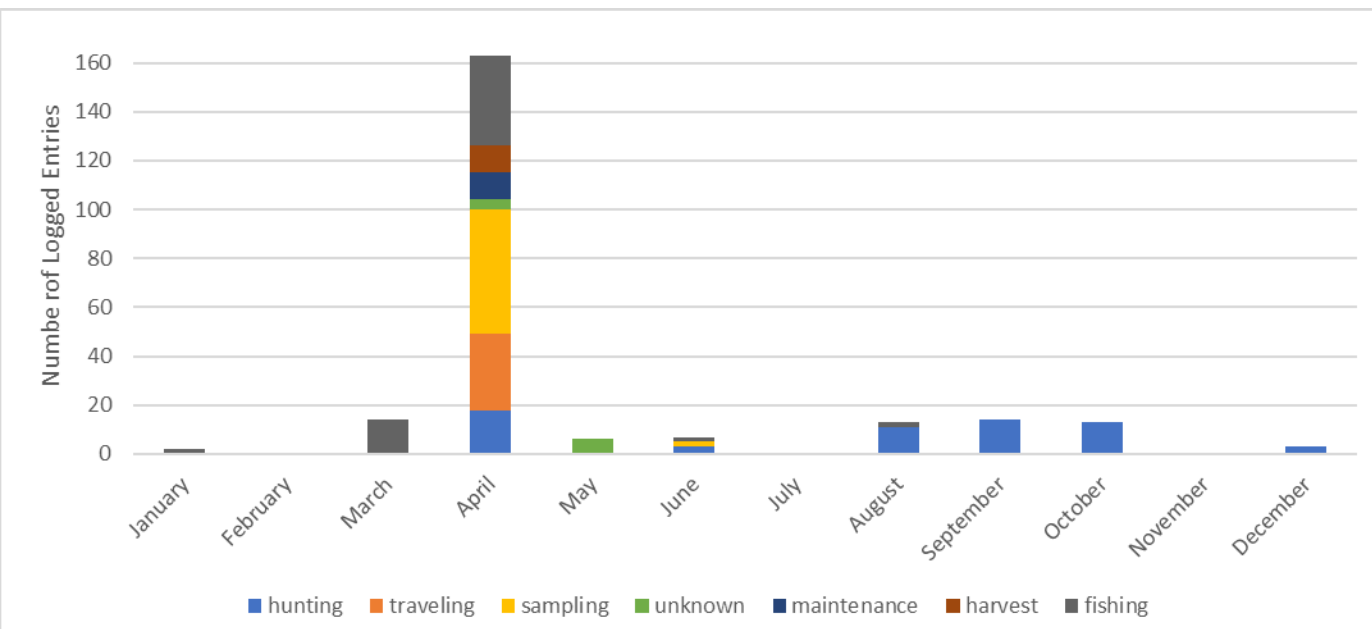

Figure 9-15. Milne Port number of visitor logged by security with breakdown by month with check-in rationale.

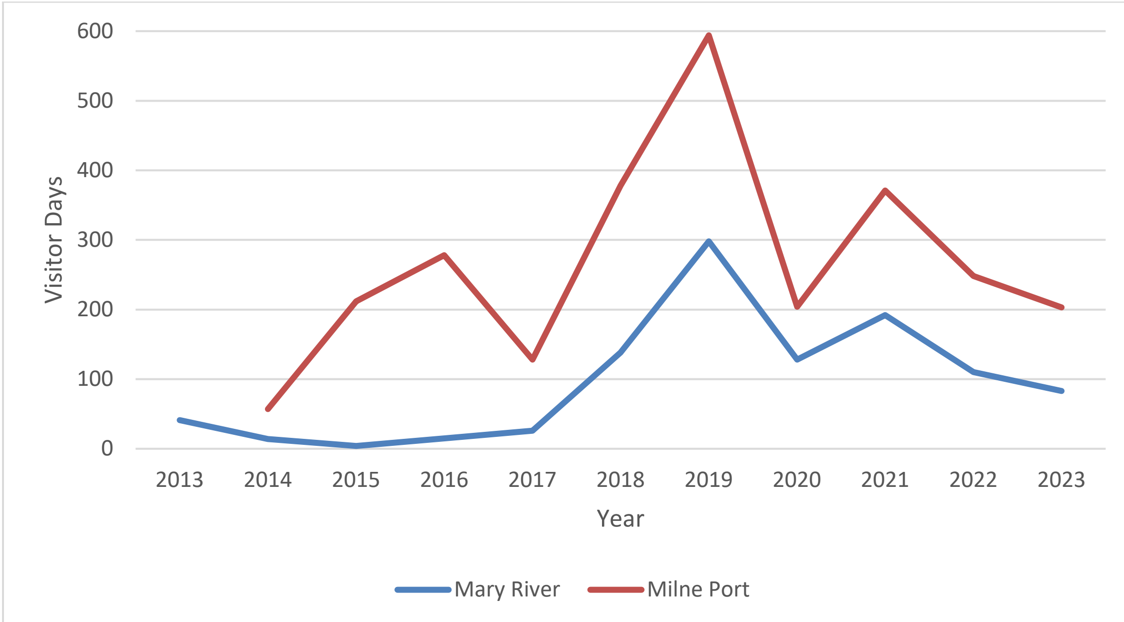

Figure 9-16. Inter-annual trends in visitor person days recorded in hunter and visitor logs (2013 to 2023).
** Site access restrictions were enforced throughout 2020 and 2021 to prevent the transmission of COVID-19, which contributed to the lower numbers of local visitors.*

9.8 MAMMAL SUMMARY

Ground-based surveys continue 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. The following are key findings from 2023 monitoring activities on mammals at the Project.

Snow Track Surveys — Six snow tracking surveys were conducted in 2023. No caribou, wolf or other large mammal tracks were observed in surveys; Arctic fox, red fox, lemming, Arctic hare and Ptarmigan tracks were noted during the various surveys. Only 4.3% of observed tracks were noted to deflect from the Tote Road.

Snowbank Height Monitoring — Snowbank height monitoring was conducted between January and December 2023. An average of 88% compliance with the 100 cm snowbank height threshold was recorded in 2023. Since 2020, survey locations have used randomized kilometre locations instead of repeated kilometre locations to improve representativeness and reduce bias.

Height of Land Surveys — Height of Land surveys were conducted during the caribou calving season (early June 2023). All HOL stations were visited at least once between June 2 and 11, 2023. The total observation time was 16 hours and 51 minutes, while the average observation time per station was 40 minutes. No caribou individuals were observed during these surveys in 2023, but a caribou track was noted. The last time a caribou was observed on a HOL survey was 2013.

Remote Cameras — Remote cameras documented a combination of birds (Ptarmigan, raptors, songbirds), Arctic hare, and Arctic fox, between January 1, and December 28, 2023. No caribou, wolves or bears were observed in any reviewed images. This supports the current observation of low caribou numbers and movement in the PDA, despite increased observation and monitoring period.

Aerial Caribou Survey — An aerial caribou survey occurred in March 2023, before caribou calving. During the survey, 112 caribou and 36 groups were observed. All observed caribou occurred in the southern subregion of the wildlife RSA, and only two groups (nine individuals total) occurred in an overlapping portion of the northern subregion.

Incidental Observations — Two incidental observations of five caribou total occurred within the PDA. A total of 98 caribou were noted outside the PDA.

Hunter and Visitor Logs — Baffinland Security monitors land use and the presence of land users in the Project area via hunter and visitor logs that document travel or hunting within the Project area. Two hundred and eighty-six (286) person days were recorded between January 1, 2023, and December 31, 2023

10 BIRDS

The following Project Condition (PC) addresses 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 analyses of the Program for Regional and International Shorebird Monitoring (PRISM) plots and 2013 analyses of the 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 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:

- Provide funding to ECCC for conducting PRISM plots every three to five years to contribute to regional monitoring efforts (completed in 2023; with results presented at the December 2023 TEWG)
- completing coastline nesting surveys of the identified islet near the proposed Steensby Port Site before the 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 indefinitely since 2021 since no Project-related trends have been observed).

In 2023, bird surveys at the Project focused on AMBNS for active migratory bird nests (if/when necessary, before vegetation clearing or surface disturbance).

10.1 ACTIVE MIGRATORY BIRD NEST SURVEYS

The following PCs 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. 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 of the 2023 AMBNS.

10.1.1 METHODS

EDI Environmental Dynamics Inc. facilitated on-site training for Baffinland personnel for AMBNS, applying search methods developed by the CWS (Baffinland Iron Mines Corporation 2016b). 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 the CWS (Rausch 2015).

Active Migratory Bird Nest Surveys were completed by at least two Baffinland searchers/observers in areas scheduled for approved construction activities during the breeding bird window (May 17 to August 19). During the survey, rope-drag equipment was systematically pulled across the search area as observers surveyed for potential breeding bird activities. Areas were surveyed for active nests up to five days before land clearing activities to inform the following mitigations:

- if active nests were found, the Project activity was postponed until the nests or nesting areas were no longer active;
- if no active nests were found, the Project activity proceeded; or,
- if no clearing for Project activity occurred within five days after a survey, the surveys were repeated, prior to clearing occurring.

If/where applicable, observers documented behavioural signs of nesting birds, including broken wing displays, alarm calls, and/or carrying food items or nesting material. Species identifications varied depending on observer experience.

10.1.2 RESULTS AND DISCUSSION

To the extent possible, Baffinland prioritized land clearing activities outside of the breeding bird window in areas directly undisturbed by the Project. Only one AMBNS was completed within the breeding bird window (on July 28, 2023) as part of haul road expansion. No active or non-active nests were detected during the 2023 AMBNS. Approximately 15,868 m^2 (1.5 ha) of land were disturbed through land clearing activities in 2023 (Table 10-1), all occurring entirely within the disturbance window for Project infrastructure.

Table 10-1. Disturbed Project area in relation to the 2023 Active Migratory Bird Nest Survey (AMBNS) disturbance window.

AMBNS Disturbance Window	Disturbance Area (m^2)
Within *(May 17 to August 19, 2023)*	15,868
Outside *(January 1 to May 16, 2023 and August 20 to December 31, 2023)*	**0**
Total	**15,868**

10.2 BIRDS SUMMARY

Baffinland is committed to a range of surveys and monitoring programs designed to enhance baseline data and evaluate the effects of Project-related activities on birds. These programs include AMBNS to verify that no active nests are present before vegetation clearing or surface disturbance occurs. The following list highlights key findings from the bird monitoring programs conducted at the Project in 2023.

- One AMBNS was completed, covering approximately 15,868 m^2. No nests were detected.
- ECCC completed a PRISM plot and reported findings during the December 2023 TEWG meeting.

11 WILDLIFE INTERACTIONS

Wildlife interactions and mortalities related to the Mary River Project (the Project) are uncommon. However, despite mitigation measures, wildlife interactions and mortalities may occur. Any incidents that may occur are recorded and carefully investigated to document leading causes and underlying circumstances.

11.1 WILDLIFE INTERACTIONS AND MORTALITIES

In 2023, 24 individual wildlife mortality incidents were reported involving seven different species:

- Arctic fox (2);
- Arctic hare (3);
- Arctic wolf (1);
- Red fox (1)
- King Eider (13);
- Snow Bunting (3); and,
- unknown songbird (1).

Vehicle collisions were confirmed or suspected in the Arctic fox, Arctic hare, and Arctic wolf mortalities. All avian mortalities were likely associated with building or infrastructure collisions.

11.2 WILDLIFE INTERACTIONS AND MORTALITY PREVENTION

Baffinland Iron Mines Corporation (Baffinland) mitigates wildlife interactions at the Project through training, implementation, waste management practices, and monitoring. All Project personnel (including managers, supervisors, and contract staff) attend mandatory Environment Protection Plan (EPP) training upon hiring and during orientation. The EPP includes mitigations and protection measures for wolf, polar bear, Arctic fox, and caribou, and waste management guidelines that are regularly reviewed, updated, and implemented. No major changes to policies and procedures occurred in 2023. Previous policy and procedure changes are described below.

Waste Management — Incineration and proper waste sorting are the most prominent deterrents used at the Project. Wildlife attractants such as food scraps and human waste are sorted and sealed in animal-proof containers and incinerated on site. Waste sorting guidelines clearly define where food and other attractants should be placed and are posted around each site.

Fencing — Significant effort was made in 2018 and 2019 to improve on-site waste management infrastructure to minimize human-wildlife interactions at the landfill. Site visits by the Nunavut Impact Review Board before 2018 resulted in recommendations to improve fencing at the landfill facility to reduce occurrences of windblown-debris escape. 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.

Other Prevention Measures — Wire skirting is used under the main camps at both sites, preventing wildlife (e.g., foxes and hares) from creating dens. As part of Baffinland's driver training, honking the horn before starting the vehicle helps scare off wildlife hiding in or near equipment. Wildlife have 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 workers found to be feeding wildlife will face disciplinary action. Bird deterrents (i.e. decoy birds, and scare crows) are used at all wastewater ponds.

11.3 INTER-ANNUAL TRENDS

Inter-annual trends regarding wildlife interactions and mortalities are tracked at the Project. Most mortalities on site between 2014 and 2023 were attributed to collisions with vehicles or infrastructure (Figure 11-1). The increased number of building collisions was attributed to a large group (13) of King Eiders striking the ship loader during the night in November. High winds and blowing snow likely reduced visibility, resulting in the collision. The first Arctic wolf mortality was recorded in 2023. The wolf was found on the Tote Road and was likely struck by a vehicle. Upon reporting to the Environment Department, the wolf was collected, retained, and reported to the Mittimatalik Hunters and Trappers Organization, Government of Nunavut, and Qikiqtani Inuit Association, as required. The wolf was then field-dressed and sent to Pond Inlet as requested by the Qikiqtani Inuit Association. No inter-annual trends were identified for wildlife mortality. No caribou mortalities have occurred thus far due to the Project (Figure 11-2).

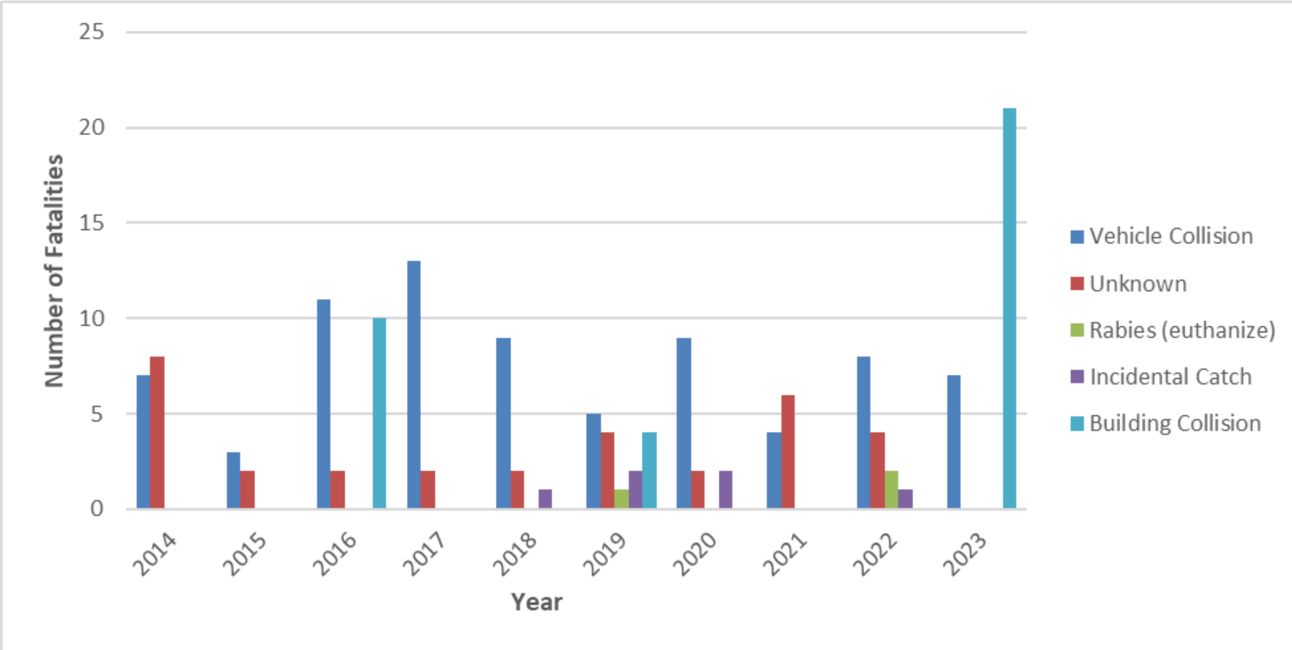

Figure 11-1. 2023 wildlife interactions – inter-annual mortality trends by cause of death (2014 to 2023).

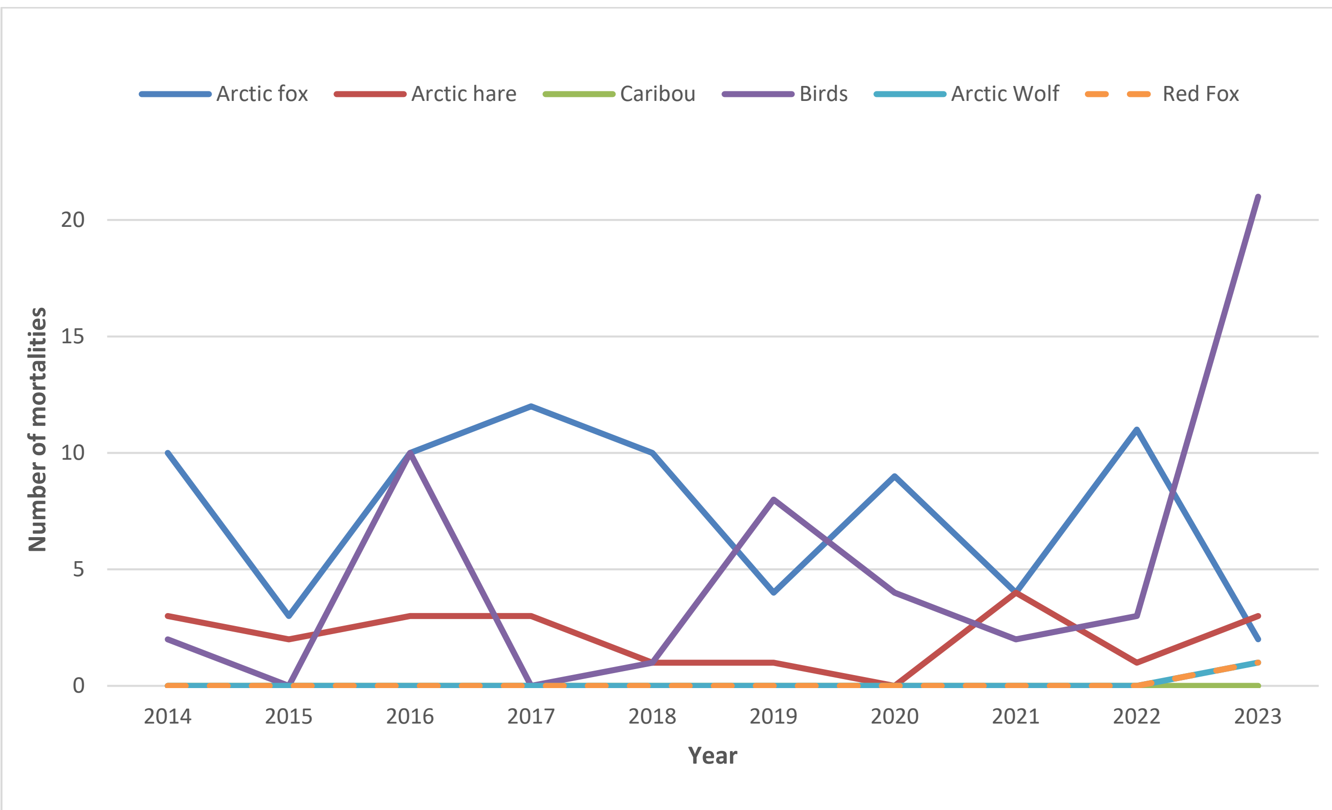

Figure 11-2. 2023 wildlife interactions – inter-annual mortality trends by species (2014 to 2023).

11.4 WILDLIFE INTERACTIONS SUMMARY

Baffinland is committed to monitoring activities and mitigation measures to minimize wildlife interactions and mortalities at the Project. Wildlife incident and mortality logs note human-wildlife conflicts to identify and minimize current and potential wildlife-related issues. Since 2014, there have been no noticeable trends in wildlife interactions and mortalities, with relatively stable low numbers given the size of the Project. The following items highlight key findings and actions regarding wildlife interactions.

- In 2023, 24 individual wildlife mortality incidents were reported involving six species: two Arctic fox, three Arctic hare, one Arctic wolf, one red fox, 13 King Eider, three Snow Bunting, and one unknown songbird.
- Vehicle collisions were confirmed or suspected in all mammal incidents. All avian mortalities were likely associated with building or infrastructure collisions.
- Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices and guidelines and integrating preventive measures into road maintenance, infrastructure design, and the EPP.

12 REFERENCES

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APPENDICES

APPENDIX A CLIMATE DATA

Appendix Table A-1. Mary River baseline climate data.

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. Mary River baseline climate data.

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. Mary River post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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

Appendix Table A-2. Mary River post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
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

Appendix Table A-2. Mary River post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
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*

Appendix Table A-2. Mary River post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
2022	Jan	-29.0	2.1	0
2022	Feb	-33.7	2.1	0
2022	Mar	-25.0	2.4	0
2022	Apr	-17.8	4.5	0
2022	May	-8.7	3.6	1.6
2022	Jun	3.4	4.1	33.2
2022	Jul	13.4	3.4	7.4
2022	Aug	8.0	3.8	32
2022	Sep	1.1	5.5	35.8
2022	Oct	-10.6	5.2	10.8
2022	Nov	-26.9	2.4	0
2022	Dec	-23.3	5.0	0
2023	Jan	-34.8	2.4	0.0
2023	Feb	-40.1	1.3	0.0
2023	Mar	-23.6	2.1	0.0
2023	Apr	-16.0	2.4	0.0
2023	May	-7.0	4.9	0.0
2023	Jun	1.5	5.0	28.2

Appendix Table A-2. Mary River post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
2023	Jul	10.3	3.9	27.6
2023	Aug	8.9	5.0	84.6
2023	Sep	0.9	5.3	43.6
2023	Oct	-9.0	4.1	3.2
2023	Nov	-12.9	6.4	0.0
2023	Dec	-22.9	4.0	0.0

Italicized grey text indicates precipitation data recorded during time periods with a potentially blocked rain gauge.

Appendix Table A-3. Milne Inlet baseline climate data.

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

Appendix Table A-3. Milne Inlet baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
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. Milne Inlet post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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

Appendix Table A-4. Milne Inlet post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
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	-	-	-

Appendix Table A-4. Milne Inlet post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
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*

Appendix Table A-4. Milne Inlet post-baseline climate data.

Year	Month	Average Air Temperature (°C)	Average Wind Speed (m/s)	Total Precipitation (mm)
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
2022	Jan	-29.4	3.4	0
2022	Feb	-33.4	3.1	0
2022	Mar	-25.8	4.1	0
2022	Apr	-18.7	6.3	0
2022	May	-9.3	5.5	0.4
2022	Jun	2.4	5.3	6.8
2022	Jul	11.3	4.7	2.4
2022	Aug	6.9	5.7	13.6
2022	Sep	0.7	6.5	39
2022	Oct	-10.3	6.0	0.2
2022	Nov	-24.8	3.7	0
2022	Dec	-23.7	6.2	0
2023	Jan	-33.5	3.7	0
2023	Feb	-37.5	4.3	0
2023	Mar	-25.7	3.2	0
2023	Apr	-18.9	2.3	0
2023	May	-7.3	6.4	0
2023	Jun	0.9	6.2	12.8
2023	Jul	8.4	4.7	10.4
2023	Aug	7.9	6.8	58.6
2023	Sep	0.6	6.3	37.6
2023	Oct	-8.2	4.7	0.4
2023	Nov	-13.6	6.2	0
2023	Dec	-22.9	5.2	0

The italicized grey text indicates precipitation data recorded during time periods with a potentially blocked rain gauge.

APPENDIX B VEGETATION ABUNDANCE MONITORING SITE LOCATIONS

Appendix Table B-1. Vegetation abundance monitoring site locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Mine Site	1	T1D30A	29	Open	71.32020	-79.35944
Mine Site	1	T1D30X	29	Closed	71.32016	-79.35923
Mine Site	1	T1D100A	102	Open	71.31966	-79.36069
Mine Site	1	T1D100X	102	Closed	71.31964	-79.36049
Mine Site	1	T1D750A	751	Open	71.31495	-79.37126
Mine Site	1	T1D750X	751	Closed	71.31495	-79.37126
Mine Site	1	T1D1200A	1,191	Open	71.31239	-79.38171
Mine Site	1	T1D1200X	1,186	Closed	71.31243	-79.38161
Mine Site	2	T2D30A	19	Open	71.31922	-79.19151
Mine Site	2	T2D30X	16	Closed	71.31921	-79.19163
Mine Site	2	T2D100A	175	Open	71.31862	-79.18756
Mine Site	2	T2D100X	174	Closed	71.31871	-79.18748
Mine Site	2	T2D750A	765	Open	71.31549	-79.17373
Mine Site	2	T2D750X	765	Closed	71.31549	-79.17373
Mine Site	2	T2D1200A	1,178	Open	71.31269	-79.16479
Mine Site	2	T2D1200B	1,177	Open	71.31271	-79.16478
Mine Site	2	T2D1200X	1,179	Closed	71.31264	-79.16482
Mine Site	3	T3D30A	30	Open	71.34010	-79.31164
Mine Site	3	T3D30X	34	Closed	71.34013	-79.31172
Mine Site	3	T3D100A	87	Open	71.34042	-79.31307
Mine Site	3	T3D100B	98	Open	71.34051	-79.31317
Mine Site	3	T3D100X	103	Closed	71.34054	-79.31329
Mine Site	3	T3D750A	734	Open	71.34668	-79.31554
Mine Site	3	T3D750X	730	Closed	71.34664	-79.31550
Mine Site	3	T3D71200A	1,445	Open	71.35172	-79.32806
Mine Site	3	T3D1200X	1,445	Closed	71.35172	-79.32806
Tote Road	4	T4D30A	35	Open	71.34193	-79.54399

Appendix Table B-1. Vegetation abundance monitoring site locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Tote Road	4	T4D30X	36	Closed	71.34193	-79.54398
Tote Road	4	T4D100A	95	Open	71.31234	-79.54282
Tote Road	4	T4D100X	98	Closed	71.34231	-79.54267
Tote Road	4	T4D750A	830	Open	71.34631	-79.52631
Tote Road	4	T4D750B	831	Open	71.34626	-79.52620
Tote Road	4	T4D750X	832	Closed	71.34362	-79.52609
Tote Road	4	T4D1200A	1,268	Open	71.34653	-79.51250
Tote Road	4	T4D1200X	1,268	Closed	71.34653	-79.51250
Tote Road	5	T5D30A	21	Open	71.37588	-79.73111
Tote Road	5	T5D30X	22	Closed	71.37586	-79.73100
Tote Road	5	T5D100A*	86	Open	71.37511	-79.73049
Tote Road	5	T5D100X	89	Closed	71.37508	-79.73042
Tote Road	5	T5D750A	730	Open	71.36990	-79.73830
Tote Road	5	T5D750B	738	Open	71.36984	-79.73837
Tote Road	5	T5D750X	740	Closed	71.36983	-79.73842
Tote Road	5	T5D1200A*	1,106	Open	71.36624	-79.73808
Tote Road	5	T5D1200X	1,139	Closed	71.36585	-79.73741
Tote Road	6	T6D30A	42	Open	71.38194	-79.99419
Tote Road	6	T6D30B*	44	Open	71.38197	-79.99432
Tote Road	6	T6D30X	41	Closed	71.38196	-79.99448
Tote Road	6	T6D100A	91	Open	71.38248	-79.99201
Tote Road	6	T6D100X	91	Closed	71.38248	-79.99219
Tote Road	6	T6D750A*	694	Open	71.38803	-79.99321
Tote Road	6	T6D750X	694	Closed	71.38803	-79.99321
Tote Road	6	T6D1200A*	1,225	Open	71.39247	-79.98299
Tote Road	6	T6D1200X	1,226	Closed	71.39249	-79.98305
Milne Inlet	7	T7D30A*	26	Open	71.87114	-80.87792

Appendix Table B-1. Vegetation abundance monitoring site locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Milne Inlet	7	T7D30X	26	Closed	71.87122	-80.87794
Milne Inlet	7	T7D100A	105	Open	71.87211	-80.87576
Milne Inlet	7	T7D100X	99	Closed	71.87212	-80.87593
Milne Inlet	7	T7D750A	884	Open	71.86808	-80.85032
Milne Inlet	7	T7D750B	874	Open	71.86797	-80.85041
Milne Inlet	7	T7D750X	871	Open	71.86788	-80.85025
Milne Inlet	7	T7D1200A	1,136	Open	71.87198	-80.84419
Milne Inlet	7	T7D1200B	1,135	Open	71.87201	-80.84426
Milne Inlet	7	T7D1200X	1,133	Closed	71.87203	-80.84431
Milne Inlet	8	T8D30A	51	Open	71.88273	-80.87804
Milne Inlet	8	T8D30X	54	Closed	71.88277	-80.87793
Milne Inlet	8	T8D100A*	90	Open	71.88243	-80.87705
Milne Inlet	8	T8D100X	94	Closed	71.88245	-80.87691
Milne Inlet	8	T8D750A	818	Open	71.88108	-80.85626
Milne Inlet	8	T8D750B	822	Open	71.88110	-80.85614
Milne Inlet	8	T8D750X	826	Closed	71.88111	-80.85604
Milne Inlet	8	T8D1200A	1,098	Open	71.88471	-80.84666
Milne Inlet	8	T8D1200X	1,104	Closed	71.88476	-80.84648
Mine Site	9	T9D30A*	32	Open	71.29982	-79.26338
Mine Site	9	T9D30X	32	Closed	71.29981	-79.26321
Mine Site	9	T9D100A	135	Open	71.29912	-79.26827
Mine Site	9	T9D100X	134	Closed	71.29915	-79.26846
Mine Site	9	T9D750A	713	Open	71.29443	-79.27907
Mine Site	9	T9D750B	708	Open	71.29448	-79.27903
Mine Site	9	T9D750X	701	Closed	71.29453	-79.27890
Mine Site	9	T9D1200A	1,186	Open	71.29173	-79.29365
Mine Site	9	T9D1200X	1,182	Closed	71.29176	-79.29358

Appendix Table B-1. Vegetation abundance monitoring site locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Mine Site	10	T10D30A	28	Open	71.34274	-79.29750
Mine Site	10	T10D30X	34	Closed	71.34280	-79.29755
Mine Site	10	T10D100A	127	Open	71.34355	-79.29861
Mine Site	10	T10D100B	127	Open	71.34355	-79.29861
Mine Site	10	T10D100X	127	Closed	71.34355	-79.29861
Mine Site	10	T10D750A	650	Open	71.34911	-79.29802
Mine Site	10	T10D750X	650	Closed	71.34911	-79.29802
Mine Site	10	T10D1200A*	1,219	Open	71.35276	-79.31007
Mine Site	10	T10D1200X	1,219	Closed	71.35276	-79.31007
Mine Site	11	T11D30A	29	Open	71.31259	-79.19954
Mine Site	11	T11D30X	17	Closed	71.31273	-79.19974
Mine Site	11	T11D100A	233	Open	71.31095	-79.19546
Mine Site	11	T11D100X	233	Closed	71.31095	-79.19546
Mine Site	11	T11D750A*	804	Open	71.30648	-79.18466
Mine Site	11	T11D750B	805	Open	71.30640	-79.18483
Mine Site	11	T11D750X	802	Closed	71.30642	-79.18486
Mine Site	11	T11D1200A	1,219	Open	71.30536	-79.17309
Mine Site	11	T11D1200X	1,225	Closed	71.30538	-79.17287
Tote Road	12	T12D30A	55	Open	71.41457	-80.1019
Tote Road	12	T12D30X*	50	Closed	71.41467	-80.1021
Tote Road	12	T12D100A	113	Open	71.41430	-80.10019
Tote Road	12	T12D100X	113	Closed	71.4143	-80.10019
Tote Road	12	T12D750A	757	Open	71.41617	-80.08279
Tote Road	12	T12D750B	757	Open	71.41617	-80.08279
Tote Road	12	T12D750X	757	Closed	71.41617	-80.08279
Tote Road	12	T12D1200A*	1,141	Open	71.41851	-80.07372
Tote Road	12	T12D1200X	1,140	Closed	71.41859	-80.07383

Appendix Table B-1. Vegetation abundance monitoring site locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Tote Road	13	T13D30A	35	Open	71.42143	-80.10964
Tote Road	13	T13D30B	35	Open	71.42143	-80.10964
Tote Road	13	T13D30X	35	Closed	71.42143	-80.10964
Tote Road	13	T13D100A	87	Open	71.42149	-80.10794
Tote Road	13	T13D100X	87	Closed	71.42149	-80.10794
Tote Road	13	T13D750A	669	Open	71.42509	-80.09329
Tote Road	13	T13D750X	674	Closed	71.42512	-80.09317
Tote Road	13	T13D1200A	1,166	Open	71.42884	-80.08349
Tote Road	13	T13D1200X	1,165	Closed	71.42895	-80.08375
Milne Inlet	14	T14D30A	43	Open	71.87797	-80.87826
Milne Inlet	14	T14D30X	37	Closed	71.87815	-80.87845
Milne Inlet	14	T14D100A	129	Open	71.87736	-80.87571
Milne Inlet	14	T14D100X	118	Closed	71.87738	-80.87601
Milne Inlet	14	T14D750A	756	Open	71.87649	-80.85755
Milne Inlet	14	T14D750X	749	Closed	71.87649	-80.85775
Milne Inlet	14	T14D1200A	1,178	Open	71.87772	-80.84550
Milne Inlet	14	T14D1200B	1,173	Open	71.87770	-80.84564
Milne Inlet	14	T14D1200X	1,170	Closed	71.87766	-80.84573
Milne Inlet	15	T15D30A	48	Open	71.87430	-80.87769
Milne Inlet	15	T15D30X	50	Closed	71.87434	-80.87763
Milne Inlet	15	T15D100A	104	Open	71.87393	-80.87603
Milne Inlet	15	T15D100X	100	Closed	71.87391	-80.87615
Milne Inlet	15	T15D750A*	812	Open	71.87411	-80.85563
Milne Inlet	15	T15D750X	806	Closed	71.87427	-80.85583
Milne Inlet	15	T15D1200A	1,130	Open	71.87504	-80.84659
Milne Inlet	15	T15D1200X	1,126	Closed	71.87500	-80.84671
Total (60 sites)	**--**	**134 plots**	--	--	--	--

Appendix Table B-1. Vegetation abundance monitoring site locations.

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Reference	1	REF1A	19,450	Open	71.16658	-79.71055
Reference	1	REF1B*	19,448	Open	71.16658	-79.71037
Reference	1	REF1X	19,450	Closed	71.16655	-79.71028
Reference	2	REF2A	20,409	Open	71.51695	-78.91855
Reference	2	REF2B	20,410	Open	71.51694	-78.91845
Reference	2	REF2X	20,407	Closed	71.51690	-78.91839
Reference	3	REF3A*	20,595	Open	71.85313	-79.99586
Reference	3	REF3B*	20,593	Open	71.85307	-79.99581
Reference	3	REF3X	20,594	Closed	71.85302	-79.99567
Reference	4	REF4A*	21,178	Open	71.88674	-80.05467
Reference	4	REF4B	21,185	Open	71.88678	-80.05450
Reference	4	REF4X	21,190	Closed	71.88680	-80.05435
Reference	5	REF5A*	33,185	Open	71.65634	-79.34103
Reference	5	REF5B	33,184	Open	71.65635	-79.34108
Reference	5	REF5X	33,184	Closed	71.65638	-79.34125
Reference	6	REF6A	16,435	Open	71.29160	-80.39122
Reference	6	REF6B	16,429	Open	71.29161	-80.39097
Reference	6	REF6X	16,432	Closed	71.29155	-80.39089
Reference	7	REF7A	22,537	Open	71.2059	-80.6292
Reference	7	REF7B	22,537	Open	71.2059	-80.6292
Reference	7	REF7X	22,537	Closed	71.2059	-80.6292
Reference	8	REF8A	23,336	Open	71.2309	-80.7278
Reference	8	REF8B	23,336	Open	71.2309	-80.7278
Reference	8	REF8X	23,336	Closed	71.2309	-80.7278
Reference	9	REF9A	34,634	Open	71.6994	-79.3761
Reference	9	REF9B	34,634	Open	71.6994	-79.3761
Reference	9	REF9X	34,634	Closed	71.6994	-79.3761

Appendix Table B-1. **Vegetation abundance monitoring site locations.**

Site Location	Transect/ Reference No.	Plot ID[1]	Actual Distance to Potential Disturbance Area (m)	Treatment Type	Latitude	Longitude
Reference	10	REF10A	32,562	Open	71.7220	-79.4602
Reference	10	REF10B	32,562	Open	71.7220	-79.4602
Reference	10	REF10X	32,562	Closed	71.7220	-79.4602
Reference	11	REF11A	21,221	Open	71.5311	-78.9635
Reference	11	REF11B	21,221	Open	71.5311	-78.9635
Reference	11	REF11X	21,221	Closed	71.5311	-78.9635
Reference	12	REF12A	20,074	Open	71.1703	-79.7754
Reference	12	REF12B	20,074	Open	71.1703	-79.7754
Reference	12	REF12X	20,074	Closed	71.1703	-79.7754
Reference	13	REF13A	22,085	Open	71.8114	-79.8702
Reference	13	REF13B	22,085	Open	71.8114	-79.8702
Reference	13	REF13X	22,085	Closed	71.8114	-79.8702
Reference	14	REF14A	22,308	Open	71.8706	-79.9601
Reference	14	REF14B	22,308	Open	71.8706	-79.9601
Reference	14	REF14X	22,308	Closed	71.8706	-79.9601
Reference	15	REF15A	17,530	Open	71.8484	-80.0778
Reference	15	REF15B	17,530	Open	71.8484	-80.0778
Reference	15	REF15X	17,530	Closed	71.8484	-80.0778
Total (15 Reference sites)	**--**	**45 plots**	--	--	--	--
Total (75 sites)	**--**	**179 plots**	--	--	--	--

[1] * Plots remeasured as part of the evaluation of the vegetation abundance monitoring methods in 2018.

APPENDIX C SOIL ASSESSMENT AT VEGETATION ABUNDANCE MONITORING SITES, 2019–2023

Appendix Table C-1. Soil assessment at vegetation abundance monitoring sites, 2019–2023.

Location	Site ID	Year	Elevation (m)	Aspect[1]	Slope	Surface Shape	Slope Position	SMR[2]	Drainage	Soil Texture[3]	% Coarse Fragments	Restriction[4] (cm)	Restriction Type[5]	Estimated Root Depth (cm)	Latitude[6]	Longitude[6]
Mine Site	REF1	2019	173	NE	Moderate = >10–30%	Straight	Mid	5	Imperfectly	FSL	3	-	Frost	55	71.1665	-79.7101
		2023	182	NW	Moderate = >10–30%	Straight	Lower	3	Well	FLS	1	-	-	28	71.1665	-79.7105
Mine Site	REF2	2019	540	-	Level = <2%	Straight	Lower	7	Poorly	L	1	-	-	36	71.5169	-78.9187
		2023	105	N	Gentle = >2–10%	Straight	Level	5	Imperfectly	S	0	24	Frost	15	71.5169	-78.9185
Milne Port	REF3	2019	137	-	Level = <2%	Straight	Level	4	Well	S	60	-	-	29	71.8530	-79.9957
		2023	135	SE	Gentle = >2–10%	Concave	Mid	3	Well	FLS	0	29	Frost	17	71.8531	-79.9959
Milne Port	REF4	2019	98	-	Level = <2%	Straight	Toe	5	Moderately Well	SL/L	5	-	-	>31	71.8867	-80.0548
		2023	122	SE	Gentle = >2–10%	Straight	Toe	4	Moderately Well	LS	15	-	-	25	71.8868	-80.0545
Tote Road	REF5	2019	602	-	Level = <2%	Straight	Level	5	Moderately Well	SL	0	-	-	21	71.6563	-79.3409
		2023	609	-	Level = <2%	Straight	Dep	5	Rapid	S	0	24	Frost	15	71.6564	-79.3412
Tote Road	REF6	2019	229	NW	Moderate = >10–30%	Straight	Mid	4	Moderately Well	L	5	-	-	49	71.2915	-80.3910
		2023	205	W	Moderate = >10–30%	Undulating	Mid	3	Moderately Well	CLS	5	-	-	27	71.2916	-80.3911
Tote Road	REF7	2019	146	NW	Moderate = >10–30%	Straight	Mid	4	Moderately Well	S	0	43	Frost	33	71.2059	-80.6292
		2023	153	N	Gentle = >2–10%	Straight	Upper	3	Moderately Well	Organic	0	21	Frost	21	71.2059	-80.6290
Tote Road	REF8	2019	162	SW	Gentle = >2–10%	Straight	Lower	4	Moderately Well	SL	0	42	Frost	39	71.2309	-80.7278
		2023	167	SE	Gentle = >2–10%	Convex	Lower	2	Well	CS	0	35	Frost	18	71.2309	-80.7279
Tote Road	REF9	2019	644	-	Level = <2%	Straight	Level	5	Moderately Well	S	5	37	Frost	9	71.6993	-79.3761
		2023	625	-	Level = <2%	Undulating	Level	2	Well	CS	0	-	-	6	71.6993	-79.3766
Tote Road	REF10	2019	610	-	Level = <2%	Straight	Level	5	Imperfectly	S	0	-	-	13	71.7220	-79.4595
		2023	618	-	Level = <2%	Straight	Level	7	Poorly	FS	0	31	Frost	7	71.7220	-79.4601
Mine Site	REF11	2019	533	NE	Gentle = >2–10%	Straight	Mid	5	Imperfectly	S	0	-	-	15	71.5309	-78.9634
		2023	535	N	Level = <2%	Straight	Crest	5	Well	S	0	18	Frost	10	71.5310	-78.9635
Mine Site	REF12	2019	199	SW	Gentle = >2–10%	Straight	Mid	4	Moderately Well	L	0	24	Frost	24	71.1703	-79.7754
		2023	201	NW	Gentle = >2–10%	Undulating	Mid	3	Moderately Well	FLS		19	Frost	11	71.1704	-79.7754
Milne Port	REF13	2019	147	-	Level = <2%	Straight	Level	6	Imperfectly	L	60	-	-	20	71.8113	-79.8697
		2023	151	-	Level = <2%	Straight	Level	6	Imperfectly	FLS	20	-	-	14	71.8113	-79.8701
Milne Port	REF14	2019	145	-	Level = <2%	Straight	Level	5	Moderately Well	L	15	-	-	33	71.8706	-79.9604
		2023	155	-	Level = <2%	Straight	Level	5	Moderately Well	FSL	5	34	Frost	23	71.8706	-79.9601
Milne Port	REF15	2019	218	NE	Gentle = >2–10%	Straight	Mid	5	Moderately Well	L/S	0	31	Frost	30	71.8484	-80.0777
		2023	-	N	Gentle = >2–10%	Straight	Upper	5	Moderately Well	FLS	0	24	Frost	18	71.8484	-80.0779
Mine Site	T1D30	2019	175	-	Level = <2%	Straight	Level	4	Well	LS	60	-	-	>22	71.3201	-79.3594
		2023	190	NW	Gentle = >2–10%	Straight	Lower	6	Poorly	CS	40	38	Lithic	14	71.3202	-79.3594
Mine Site	T1D100	2019	187	-	Level = <2%	Straight	Level	6	Imperfectly	FSL/SL	40	-	-	20	71.3196	-79.3606
		2023	342	SE	Gentle = >2–10%	Straight	Mid	4	Moderately Well	CS	60	38	Lithic	17	71.3196	-79.3607
Mine Site	T1D750	2019	182	-	Level = <2%	Straight	Level	4	Well	LS	0	24	Frost	24	71.3150	-79.3713
		2023	190	NE	Gentle = >2–10%	Straight	Dep	5	Imperfectly	CS	0	39	Frost	22	71.3150	-79.3712
Mine Site	T1D1200	2019	170	-	Level = <2%	Straight	Level	6	Imperfectly	SL	10	-	-	>30	71.3123	-79.3818
		2023	183	N	Gentle = >2–10%	Straight	Toe	5	Moderately Well	CLS	3	-	-	24	71.3124	-79.3816

Appendix Table C-1. Soil assessment at vegetation abundance monitoring sites, 2019–2023.

Location	Site ID	Year	Elevation (m)	Aspect[1]	Slope	Surface Shape	Slope Position	SMR[2]	Drainage	Soil Texture[3]	% Coarse Fragments	Restriction[4] (cm)	Restriction Type[5]	Estimated Root Depth (cm)	Latitude[6]	Longitude[6]
Mine Site	T2D30	2019	337	SW	Gentle = >2–10%	Undulating	Level	5	Moderately Well	SL	10	-	-	30	71.3193	-79.1915
		2023	349	SW	Moderate = >10–30%	Straight	Lower	3	Well	CLS	5	-	-	21	71.3192	-79.1917
Mine Site	T2D100	2019	339	-	Level = <2%	Straight	Mid	5	Moderately Well	SL	25	-	-	31	71.3187	-79.1877
		2023	343	SE	Gentle = >2–10%	Straight	Lower	3	Well	CLS	5	39	Lithic	19	71.3187	-79.1877
Mine Site	T2D750	2019	348	SW	Gentle = >2–10%	Undulating	Mid	5	Moderately Well	SL	5	-	-	50	71.3155	-79.1740
		2023	249	NW	Strong = >30–45%	Undulating	Mid	2	Rapid	CLS	20	-	-	25	71.3155	-79.1739
Mine Site	T2D1200	2019	322	-	Level = <2%	Undulating	Mid	4	Well	LS/SL	35	37	Frost	37	71.3126	-79.1648
		2023	330	NW	Moderate = >10–30%	Undulating	Mid	2	Rapid	CS	5	-	-	18	71.3126	-79.1650
Mine Site	T3D30	2019	320	-	Level = <2%	Straight	Level	4	Moderately Well	LS	5	30	Frost	29	71.3401	-79.3116
		2023	319	W	Gentle = >2–10%	Undulating	Upper	4	Moderately Well	SiL	0	14	Frost	14	71.3401	-79.3117
Mine Site	T3D100	2019	306	-	Level = <2%	Straight	Dep	7	Poorly	LS	5	32	Frost	32	71.3406	-79.3134
		2023	321	W	Gentle = >2–10%	Undulating	Upper	4	Moderately Well	SiL	0	8	Frost	8	71.3405	-79.3132
Mine Site	T3D750	2019	341	-	Level = <2%	Straight	Level	4	Well	LS	60	-	-	25	71.3466	-79.3153
		2023	347	W	Gentle = >2–10%	Undulating	Upper	2	Rapid	SiL	55	36	Lithic	13	71.3466	-79.3155
Mine Site	T3D1200	2019	330	SW	Gentle = >2–10%	Straight	Toe	4	Moderately Well	SiL	0	27	Frost	26	71.3517	-79.3279
		2023	333	W	Gentle = >2–10%	Straight	Upper	4	Rapid	SiL	2	10	Frost	10	71.3517	-79.3281
Tote Road	T4D30	2019	181	W	Gentle = >2–10%	Straight	Level	5	Imperfectly	L	15	-	-	25	71.3420	-79.1544
		2023	184	S	Gentle = >2–10%	Straight	Lower	4	Rapid	Organic	1	40	Frost	25	71.3419	-79.5440
Tote Road	T4D100	2019	182	W	Gentle = >2–10%	Convex	Toe	5	Imperfectly	L	0	-	-	24	71.3424	-79.5429
		2023	184	S	Gentle = >2–10%	Straight	Lower	4	Well	SL	0	16	Frost	15	71.3424	-79.5427
Tote Road	T4D750	2019	183	-	Level = <2%	Straight	Mid	7	Poorly	SL	0	23	Frost	23	71.3463	-79.5264
		2023	197	NW	Moderate = >10–30%	Straight	Mid	7	Imperfectly	Of/Om	0	19	Frost	19	71.3463	-79.5262
Tote Road	T4D1200	2019	172	-	Level = <2%	Straight	Mid	5	Moderately Well	SCL	0	37	Frost	37	71.3465	-79.5127
		2023	184	SW	Gentle = >2–10%	Straight	Upper	5	Moderately Well	Of/FLS	0	34	Frost	23	71.3465	-79.5123
Tote Road	T5D30	2019	176	E	Moderate = >10–30%	Straight	Mid	4	Well	LS	0	-	-	34	71.3758	-79.7311
		2023	180	N	Moderate = >10–30%	Straight	Lower	3	Rapid	S	3	-	-	15	71.3759	-79.7310
Tote Road	T5D100	2019	186	E	Gentle = >2–10%	Straight	Level	4	Moderately Well	LS	0	-	-	29	71.3750	-79.7302
		2023	186	E	Gentle = >2–10%	Undulating	Upper	2	Well	CS	0	-	-	20	71.3751	-79.7304
Tote Road	T5D750	2019	174	-	Level = <2%	Straight	Mid	4	Well	LS/SL	50	-	-	20	71.3700	-79.7382
		2023	184	SW	Moderate = >10–30%	Undulating	Toe	3	Well	FLS	10	-	-	21	71.3699	-79.7383
Tote Road	T5D1200	2019	170	-	Level = <2%	Straight	Level	4	Well	L	70	13	LIthic	13	71.3658	-79.7373
		2023	174	-	Level = <2%	Undulating	Mid	3	Well	FSL	10	23	Lithic	12	71.3660	-79.7375
Tote Road	T6D30	2019	244	W	Gentle = >2–10%	Straight	Lower	5	Moderately Well	S	0	26	Frost	26	71.3819	-79.9944
		2023	258	W	Gentle = >2–10%	Straight	Toe	5	Well	S	0	15	Frost	15	71.3819	-79.9944
Tote Road	T6D100	2019	257	W	Moderate = >10–30%	Straight	Lower	6	Imperfectly	SL	10	40	Frost	38	71.3825	-79.9921
		2023	263	W	Gentle = >2–10%	Straight	Toe	6	Imperfectly	Organic	0	21	Frost	21	71.3825	-79.9921
Tote Road	T6D750	2019	297	SW	Gentle = >2–10%	Straight	Mid	4	Well	SL	5	-	-	34	71.3880	-79.9932
		2023	305	W	Gentle = >2–10%	Concave	Mid	4	Well	SL	2	50	Frost	25	71.3880	-79.9932

Appendix Table C-1. Soil assessment at vegetation abundance monitoring sites, 2019–2023.

Location	Site ID	Year	Elevation (m)	Aspect[1]	Slope	Surface Shape	Slope Position	SMR[2]	Drainage	Soil Texture[3]	% Coarse Fragments	Restriction[4] (cm)	Restriction Type[5]	Estimated Root Depth (cm)	Latitude[6]	Longitude[6]
Tote Road	T6D1200	2019	327	-	Level = <2%	Straight	Level	4	Well	LS	75	-	-	36	71.3925	-79.9833
		2023	333	-	Level = <2%	Concave	Dep	4	Rapid	LS	8	24	Lithic	15	71.3925	-79.9830
Milne Port	T7D30	2019	116	NW	Moderate = >10–30%	Convex	Upper	4	Well	SL	70	-	-	24	71.8713	-80.8780
		2023	130	W	Moderate = >10–30%	Convex	Crest	2	Very Rapid	S	45	31	Lithic	20	71.8712	-80.8780
Milne Port	T7D100	2019	114	-	Level = <2%	Concave	Level	4	Well	SiL	25	-	-	26	71.8722	-80.8763
		2023	121	NW	Gentle = >2–10%	Concave	Dep	3	Moderately Well	SiL	35	42	Lithic	24	71.8720	-80.8758
Milne Port	T7D750	2019	115	-	Level = <2%	Undulating	Level	4	Moderately Well	SL	70	-	-	40	71.8679	-80.8503
		2023	108	N	Level = <2%	Concave	Dep	3	Rapid	SiL	35	-	-	19	71.8679	-80.8504
Milne Port	T7D1200	2019	156	-	Level = <2%	Concave	Lower	4	Well	SL	60	-	-	34	71.8720	-80.8441
		2023	148	S	Gentle = >2–10%	Undulating	Upper	3	Well	SiL	15	-	-	15	71.8719	-80.8443
Milne Port	T8D30	2019	34	-	Level = <2%	Undulating	Mid	4	Well	CL	30	25	Frost	11	71.8828	-80.8780
		2023	35	N	Moderate = >10–30%	Straight	Lower	4	Imperfectly	SiL	15	34	Lithic	23	71.8827	-80.8779
Milne Port	T8D100	2019	37	-	Level = <2%	Undulating	Level	5	Moderately Well	SiL	60	-	-	11	71.8824	-80.8772
		2023	42	N	Gentle = >2–10%	Concave	Lower	5	Imperfectly	SiL	20	-	-	20	71.8824	-80.8770
Milne Port	T8D750	2019	70	-	Level = <2%	Straight	Level	4	Well	SL	25	-	-	>24	71.8812	-80.8562
		2023	63	N	Gentle = >2–10%	Straight	Upper	3	Rapid	SiL	15	-	-	25	71.8811	-80.8562
Milne Port	T8D1200	2019	31	W	Level = <2%	Straight	Level	4	Well	FSL	5	-	-	30	71.8847	-80.8467
		2023	38	S	Gentle = >2–10%	Convex	Lower	4	Well	SiL	0	50	Frost	20	71.8847	-80.8466
Mine Site	T9D30	2019	176	-	Level = <2%	Straight	Level	4	Moderately Well	SL	5	-	-	30	71.2998	-79.2631
		2023	183	SE	Gentle = >2–10%	Straight	Toe	6	Moderately Well	FSL	15	41	Lithic	18	71.2998	-79.2633
Mine Site	T9D100	2019	180	-	Level = <2%	Straight	Level	4	Moderately Well	L	60	-	-	18	71.2992	-79.2683
		2023	182	-	Level = <2%	Straight	Level	4	Well	FLS	20	36	Lithic	16	71.2991	-79.2686
Mine Site	T9D750	2019	181	-	Level = <2%	Straight	Level	5	Moderately Well	SL/L	0	-	-	25	71.2944	-79.2794
		2023	178	-	Level = <2%	Straight	Level	4	Moderately Well	FS	0	-	-	19	71.2945	-79.2790
Mine Site	T9D1200	2019	180	-	Level = <2%	Straight	Level	5	Moderately Well	SiL/L	0	18	Frost	18	71.2918	-79.2941
		2023	179	-	Level = <2%	Straight	Level	7	Poorly	FLS	0	32	Frost	19	71.2917	-79.2937
Mine Site	T10D30	2019	407	-	Level = <2%	Straight	Dep	7	Poorly	LS	15	-	-	24	71.3428	-79.2976
		2023	413	NW	Level = <2%	Undulating	Upper	5	Moderately Well	SiL	7	13	Frost	13	71.3428	-79.2975
Mine Site	T10D100	2019	408	-	Level = <2%	Straight	Level	5	Moderately Well	SL	15	-	-	38	71.3436	-79.2985
		2023	414	W	Gentle = >2–10%	Undulating	Mid	4	Well	FSL	2	20	Frost	4	71.3436	-79.2987
Mine Site	T10D750	2019	449	-	Level = <2%	Straight	Level	5	Imperfectly	S	60	-	-	28	71.3492	-79.2980
		2023	454	N	Gentle = >2–10%	Straight	Mid	5	Imperfectly	S	0	14	Frost	14	71.3491	-79.2982
Mine Site	T10D1200	2019	413	-	Level = <2%	Straight	Dep	7	Imperfectly	L	0	-	-	36	71.3528	-79.3101
		2023	424	NW	Level = <2%	Straight	Toe	5	Imperfectly	FS	0	19	Frost	19	71.3529	-79.3101
Mine Site	T11D30	2019	293	SE	Gentle = >2–10%	Straight	Mid	5	Moderately Well	L	20	-	-	53	71.3126	-79.1997
		2023	293	SW	Moderate = >10–30%	Undulating	Mid	2	Rapid	CLS	15	-	-	22	71.3127	-79.1996
Mine Site	T11D100	2019	265	N	Gentle = >2–10%	Undulating	Gully	4	Well	S	60	-	-	38	71.3110	-79.1954
		2023	262	NW	Gentle = >2–10%	Undulating	Toe	3	Well	FLS	5	32	Lithic	5	71.3110	-79.1954

Appendix Table C-1. Soil assessment at vegetation abundance monitoring sites, 2019–2023.

Location	Site ID	Year	Elevation (m)	Aspect[1]	Slope	Surface Shape	Slope Position	SMR[2]	Drainage	Soil Texture[3]	% Coarse Fragments	Restriction[4] (cm)	Restriction Type[5]	Estimated Root Depth (cm)	Latitude[6]	Longitude[6]
Mine Site	T11D750	2019	326	NE	Gentle = >2–10%	Straight	Mid	5	Imperfectly	SL	30	-	-	40	71.3065	-79.1847
		2023	326	NE	Moderate = >10–30%	Undulating	Upper	4	Moderately Well	CLS	1	-	-	22	71.3064	-79.1850
Mine Site	T11D1200	2019	332	NE	Gentle = >2–10%	Straight	Mid	5	Imperfectly	SL	5	-	-	28	71.3054	-79.1729
		2023	330	NE	Moderate = >10–30%	Undulating	Upper	2	Rapid	FLS	3	-	-	18	71.3054	-79.1729
Tote Road	T12D30	2019	269	W	Gentle = >2–10%	Straight	Crest	4	Well	L	70	-	-	35	71.4146	-80.1021
		2023	274	NW	Gentle = >2–10%	Straight	Upper	2	Rapid	SL	10	-	-	27	71.4147	-80.1020
Tote Road	T12D100	2019	270	N	Gentle = >2–10%	Straight	Dep	4	Well	SL	40	-	-	37	71.4143	-80.1004
		2023	278	NW	Gentle = >2–10%	Concave	Dep	4	Moderately Well	CLS	10	-	-	17	71.4144	-80.1003
Tote Road	T12D750	2019	311	NW	Moderate = >10–30%	Straight	Mid	4	Well	L	75	-	-	35	71.4161	-80.0830
		2023	319	W	Gentle = >2–10%	Straight	Mid	4	Well	Organic	35	-	-	25	71.4161	-80.0828
Tote Road	T12D1200	2019	329	W	Gentle = >2–10%	Straight	Mid	4	Well	S	35	-	-	38	71.4186	-80.0737
		2023	342	W	Gentle = >2–10%	Straight	Upper	5	Imperfectly	SL	10	-	-	unknown	71.4185	-80.0739
Tote Road	T13D30	2019	241	NW	Gentle = >2–10%	Straight	Lower	7	Imperfectly	L	20	-	-	42	71.4214	-80.1096
		2023	239	W	Gentle = >2–10%	Straight	Lower	6	Poorly	Organic	0	16	Frost	16	71.4215	-80.1096
Tote Road	T13D100	2019	238	NW	Gentle = >2–10%	Straight	Mid	7	Poorly	L	35	-	-	34	71.4214	-80.1080
		2023	251	W	Gentle = >2–10%	Straight	Lower	6	Poorly	Organic	0	12	Frost	12	71.4215	-80.1080
Tote Road	T13D750	2019	284	NW	Moderate = >10–30%	Straight	Mid	4	Well	SL	50	-	-	35	71.4252	-80.0931
		2023	291	W	Gentle = >2–10%	Straight	Upper	2	Rapid	S	35	-	-	25	71.4251	-80.0933
Tote Road	T13D1200	2019	290	N	Gentle = >2–10%	Straight	Mid	4	Well	LS	70	-	-	43	71.4289	-80.0836
		2023	279	W	Gentle = >2–10%	Concave	Dep	3	Rapid	SiL	20	-	-	13	71.4289	-80.0836
Milne Port	T14D30	2019	74	-	Level = <2%	Undulating	Level	4	Well	FSL/SL	70	-	-	20	71.8781	-80.8785
		2023	91	N	Moderate = >10–30%	Concave	Dep	3	Rapid	SL	20	29	Frost	25	71.8780	-80.8784
Milne Port	T14D100	2019	111	-	Level = <2%	Straight	Level	4	Well	L	60	-	-	33	71.8774	-80.8759
		2023	114	-	Level = <2%	Concave	Level	5	Imperfectly	LS	20	-	-	20	71.8774	-80.8758
Milne Port	T14D750	2019	82	-	Level = <2%	Undulating	Mid	4	Well	FSL/L	50	-	-	22	71.8764	-80.8577
		2023	84	W	Moderate = >10–30%	Convex	Lower	3	Well	L	20	-	-	15	71.8765	-80.8577
Milne Port	T14D1200	2019	117	-	Level = <2%	Straight	Lower	5	Moderately Well	SL/LS	15	-	-	>21	71.8777	-80.8454
		2023	111	S	Moderate = >10–30%	Concave	Toe	4	Well	LS	20	42	Lithic	20	71.8777	-80.8456
Milne Port	T15D30	2019	111	-	Level = <2%	Straight	Toe	6	Imperfectly	SiCL	55	-	-	40	71.8743	-80.8776
		2023	114	W	Gentle = >2–10%	Straight	Lower	4	Well	SL	20	-	-	30	71.8743	-80.8776
Milne Port	T15D100	2019	118	W	Moderate = >10–30%	Straight	Mid	4	Well	L	40	-	-	33	71.8739	-80.8763
		2023	122	W	Moderate = >10–30%	Straight	Mid	3	Rapid	L	30	52	Frost	15	71.8739	-80.8760
Milne Port	T15D750	2019	91	W	Gentle = >2–10%	Undulating	Mid	4	Well	L	60	-	-	35	71.8743	-80.8558
		2023	94	W	Moderate = >10–30%	Straight	Lower	3	Rapid	FS	20	-	-	20	71.8742	-80.8558
Milne Port	T15D1200	2019	162	W	Moderate = >10–30%	Straight	Upper	4	Well	L	50	-	-	35	71.8750	-80.8466
		2023	160	W	Moderate = >10–30%	Straight	Crest	3	Rapid	SiL	35	-	-	20	71.8750	-80.8466

[1] Aspect: N = north; S =south; E = east; W = west; "-" = no aspect. / [2] SMR = soil moisture regime. / [3] Soil texture: S = sand; LS = loamy sand; SL = sandy loam; FSL = fine sandy loam; SCL = sandy clay loam; SCL = sandy clay; Si = silt; SiL = silt loam; L = loam; SiCL = silty clay loam; CL = clay loam. / [4] Depth of restriction present in soil pit (cm). / [5] Restriction type; "-" = no restriction encountered in soil pit. / [6] Soil pit location at associated vegetation abundance monitoring site.

APPENDIX D REMOTE CAMERA LOCATIONS

Site Name	Camera Name	Location	Camera Orientation	Latitude / Longitude	Access	Site Photo
HOL 1	Baffin-3	KM 4	NE	71.8710, -80.8828	Helicopter, vehicle, foot	
HOL 1	Baffin-4	KM 4	SW	71.8710, -80.8828	Helicopter, vehicle, foot	

Site Name	Camera Name	Location	Camera Orientation	Latitude / Longitude	Access	Site Photo
HOL 3	Baffin-7	KM 27	NE	71.7297, -80.4418	Helicopter, vehicle, foot	
HOL 3	Baffin-12	KM 27	SW	71.7297, -80.4418	Helicopter, vehicle, foot	

Site Name	Camera Name	Location	Camera Orientation	Latitude / Longitude	Access	Site Photo
HOL 4	Baffin-8	KM 42	E	71.6073, -80.347	Helicopter, vehicle, foot	
HOL 4	Baffin-10	KM 42	W	71.6073, -80.347	Helicopter, vehicle, foot	

Site Name	Camera Name	Location	Camera Orientation	Latitude / Longitude	Access	Site Photo
HOL 6	Baffin-1	KM 57	NE	71.4832, -80.213	Helicopter, vehicle, foot	
HOL 6	Baffin-5	KM 57	SW	71.4832, -80.213	Helicopter, vehicle, foot	

Site Name	Camera Name	Location	Camera Orientation	Latitude / Longitude	Access	Site Photo
HOL 10	Baffin-9	KM 85.5	N	71.3732, -79.6859	Helicopter, vehicle, foot	
HOL 10	Baffin-11	KM 85.5	S	71.3732, -79.6859	Helicopter, vehicle, foot	

Site Name	Camera Name	Location	Camera Orientation	Latitude / Longitude	Access	Site Photo
HOL 16	Baffin-2	KM 95	NW	71.3321, -79.4779	Helicopter, vehicle, foot	
HOL 16	Baffin-6	KM 95	SE	71.3321, -79.4779	Helicopter, vehicle, foot	

APPENDIX E BAFFINLAND RESPONSE TO COMMENTS RECEIVED ON 2022 NIRB ANNUAL REPORT

Note: Appendix highlights comments relevant to the 2022 TEAMR and adjustments made in this 2023 TEAMR.

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
QIA 2022 NIRB AQ&N # 2.	PC Condition 10 states "The Proponent shall update its Dust Management and Monitoring Plan to address and/or include the following additional items: a. Outline the specific plans for monitoring dust along the first few kilometres of the rail corridor leaving the Mary River mine site. b. Identify the specific adaptive management measures to be considered should monitoring indicate that dust deposition from trains transporting along the rail route is greater than initially predicted. c. Outline specific plans for monitoring dustfall at intervals along and in the vicinity of the Milne Inlet Tote Road to determine the amount and extent of dustfall. d. Identify the specific adaptive management measures to be considered if monitoring indicates that dust deposition from traffic on the Milne Inlet Tote Road is greater than initially predicted. e. The Proponent shall implement its Dust Management and Monitoring Plan, report all monitoring data to the NIRB annually, and take all adaptive management measures described in its Dust Management and Monitoring Plan if monitoring indicates that dust in the ambient air or dust deposition from the increased traffic associated with the increased volume of ore being shipped is greater than initially predicted." The QIA disagrees with Baffinland's statement of compliance. Although Baffinland outlines the current and planned efforts being executed regarding dust suppression, the specifics of adaptive management measures are not mentioned.	Baffinland to outline specific adaptive management measures developed respecting dust management.	**Document Name:** Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board **Section: 4.6.2**, PC Condition 10 **Page: 82 to 85 (PDF p. 138 to 141)**	Baffinland refers the author to the 2022 TEAMR which outlines dust controls currently employed at the Project that are a result of adaptive management process since the start of operations. In addition to this Baffinland is currently conducting trials of a dust suppression product applied at the crusher equipment to coat the ore and reduce dust during subsequent material handling. **A comprehensive summary will be included in the 2023 TEAMR regarding specific controls implemented during the 2023 calendar year.** In addition to the current adaptive management efforts regarding dust described in the TEAMR, Baffinland also included an action toolkit in the draft revised Air Quality and Noise Abatement Management Plan (AQNAMP), released for public review on May 15, 2023. The action toolkit described possible actions to implement should a moderate or high risk level threshold be met, as described in the AQNAMP's trigger, action, response plan (TARP).	A comprehensive summary of dust controls, with photographs, is provide in Section 7.2 Dustfall Suppression and Mitigation of the 2023 TEAMR.

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
QIA 2022 NIRB TE# 8.	There is no information in Section 10.4 on the maximum detection range and orientation of remote cameras selected for this program, nor is there information on proximity of remote cameras to project components (e.g., X m west of the Tote Road). Now that the remote camera program is underway, it would be useful for Baffinland to start reporting on this information to assist with interpreting the results. In particular, it would be useful for Baffinland to quantify the maximum area covered by remote cameras, similar to the viewshed modelling and analysis that has been provided for HOL surveys. This context is necessary to interpret the results of remote camera monitoring, and whether study design is sufficient to maximize the potential for detection of caribou and other wildlife species. QIA notes that this unknown information contributes to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53	To better understand how remote camera monitoring results provide insight on caribou avoidance of the project area and improve compliance with PC Condition 53, Baffinland to report on and analyze the following for the 2023 remote camera monitoring program: • maximum detection range for each type of camera used; • orientation of each remote camera deployed (e.g., north, east south, west); • if relevant, proximity of each remote camera / HOL station to project components, including distance and type of component. QIA notes that project components within at least 500m should be reported; This information should be used to quantify a maximum total viewshed for each camera and HOL station (a map of each remote camera viewshed, relative to the HOL viewshed would be also ideal) to assist with interpreting the findings of remote camera monitoring, including its spatial limitations.	**Document Name:** Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report **Section:** Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.4 – Remote Cameras **PDF Page:** 258 to 263 of 703; 106 to 112	Experimental design parameters (and limitations) are described in the 2022 Terrestrial Environment Annual Monitoring Report (TEAMR; EDI, 2023; refer to 10.4 Remote Cameras, 10.4.1 Methods; pg.226-227). Analysis of field of view (aspect/orientation, coverage) was completed in 2021 and reported in Section 9.4 and Appendix E of the 2021 TEAMR (EDI, 2022). **The proposed suggestions will be considered as part of future reporting.** <u>References:</u> Environmental Dynamics Inc. (EDI), 2022. 2021 Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 2022. Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.	QIA proposed suggestions were considered. Camera specifications (including maximum detection range and related settings/parameters) are provided (refer to footnote #18, Section 9.4.1 Methods of the 2023 TEAMR). The level of details provided in the reporting was deemed appropriate. No modifications to the experimental design of the remote camera program were applied in 2023.
QIA 2022 NIRB TE# 9.	QIA has previously recommended that Baffinland take reasonable measures to prevent field of view obstructions due to blowing snow, ice, or fog. Examples provided to Baffinland in response to the 2021 TEAMR included installing a cover or shelf, using silica gel packs to prevent moisture build-up in cases, and applying anti-fogging products. There is no indication in Section 10.4 of the 2022 TEAMR that Baffinland attempted any of these measures and no rationale as to why they would be ineffective in the context of the Project has been provided in Baffinland's responses to QIA's 2021 TEAMR comments. As shown in Table 10-2 (p. 109) there are still a high number of days where the camera field of view is obstructed per remote camera and as such this is still a limitation on the method. While QIA acknowledges that weather events are beyond Baffinland's control, Baffinland should at least attempt to implement easy potential solutions or provide rationale and evidence that the proposed solution has not	To maximize remote camera monitoring data to provide insight on caribou avoidance of the project area and improve compliance with PC Condition 53, Baffinland to implement measures to minimize field of view obstructions due to snow, ice, or fog, including: • installing a protective case and shade on each deployed camera • using silica gel packs to prevent moisture build-up within cases • applying anti-fog products to camera lenses QIA also requests Baffinland report on the number of times (and date) when each remote camera was checked (on a per camera basis), whether servicing was required, and if so, what type (e.g. removal of obstruction, battery replacement, SD card collection, etc.).	**Document Name:** Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report **Section:** Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.4 – Remote Cameras **PDF Page:** 258 to 263 of 703; 106-112	No [physical] field of view obstructions have been recorded. The proposed suggestions are not required based on evidence available to date.	As described under Section 9.4.1 Methods, HOL camera sites were serviced in Jan–Feb 2023, June 2023 and Dec 2023. As described under 9.4.2 Results and Discussion (refer to Table 9.2), estimates of 'active. vs. 'weather-affected days' camera days are summarized. Here, it is specified that: "*active days refer to the number of days with a viable photolog/capture; weather-affected days refer to periods in which the camera function and data capture were affected by snow, frost, or fog. As temperatures dropped, more frequent and prolonged incidents of fog or frost were observed on the cameras. Active days ranged from 173 to 316 days. Variability in the data capture was attributed to obstructions of the field of view (e.g., due to blowing snow, ice crystals or fog) or camera stoppage (e.g., loss of power or exceedance of information storage capacity).*" QIA suggestions to mitigate weather-affected camera function have been considered; however,

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
	worked in the past in similar contexts. If the measures do not work, then this can be reported on in the following year's TEAMR. In addition, in Section 10.4.1, it is generally stated that cameras are to be periodically checked (2-4 times annually), but there is not reporting on how frequently each remote camera was checked in Section 10.4.2 or in Table 10-2, making it difficult to assess the level of reasonable effort to minimize non- active days. QIA notes that these issues contribute to the integrity Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53				there are limitations to implementation due to the project setting and climate. Further, as noted in Table 9-2, only 2 cameras (Baffin-1, Baffin-5 at HOL 6) were excessively affected by fog and ice crystals suggesting that this issue may be localized. Note: The previous Baffinland Response strictly referred to physical field of view obstructions (see Appendix D for representative camera site fields of view). The 2023 TEAMR (as described above) has clarified this in relation to the QIA comment/suggestion.
QIA 2022 NIRB TE# 10.	In response to the 2021 TEAMR, QIA requested that Baffinland deploy remote cameras at all 24 HOL stations (vs. a sample of only 6), or if this was not possible, to select locations based on the best available IQ and western science. Since the purpose of the remote camera monitoring is to capture supplemental data on caribou movement in relation to the Project, locations should be selected based on maximizing the potential for detecting caribou. Baffinland responded that it was not feasible to deploy cameras at all 24 HOL stations due to accessibility considerations, mainly with ongoing maintenance requirements in mind. However, Baffinland has not provided a rationale for why HOL stations 1, 3, 4, 6, 10, and 16, specifically, were selected. Was this based primarily on feasibility/accessibility or maximizing the potential for caribou detections? Did Baffinland explicitly verify these locations with MHTO prior to deploying cameras? In addition, are these six HOL stations the only ones that can be accessed as required for maintenance (per Baffinland, 2-4 times per year)? QIA notes that HOL stations 1 – 16 are generally accessed on foot (Section 10.3.1). Has Baffinland considered deploying remote cameras at HOL stations subject to access constraints in an effort to capture at least some data (e.g., during seasons when caribou are known to be calving or migrating). QIA notes that all HOL stations are at least accessible during some portions of the year (i.e., when HOL monitoring typically occurs in	To respond to study design concerns regarding remote camera monitoring and improve compliance with PC Condition 53, Baffinland to provide the following: • a rationale for why HOL stations 1, 3, 4, 6, 10, and 16 were selected for remote camera monitoring. Please also confirm whether or not MHTO was asked to comment on the use of these HOL stations prior to remote camera program initiation. • clarify whether HOL stations 1, 3, 4, 6, 10 and 16 are the only ones that can be accessed 2-4 times a year, as needed for remote camera maintenance. Baffinland to make additional effort to deploy remote cameras at as many HOL stations as possible, even if this means only collecting data for limited periods of the year (due to maintenance inaccessibility).	**Document Name:** Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report **Section:** Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.4 – Remote Cameras **PDF Page:** 258 to 263 of 703; 106-112	The Remote Camera program was developed with input from the Terrestrial Environment Working Group (TEWG). Sites 1, 3, 4, 6, 10 and 16 were selected to provide a regular distribution along/at the Project. Methods/experimental design are appropriate for current regional low- density of caribou. Refer to 2023 TEAMR, Map 10-2 (EDI, 2023; pg.224), shown below. Based on monitoring outcomes to date, additional Trap Camera deployment is not warranted. References: Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.	**N/A**

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
	June) and that remote cameras could be deployed at this time with the intention of collecting at least some data. QIA notes that these study design questions regarding remote camera locations contribute to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53				
QIA 2022 NIRB TE# 15.	Baffinland states that "Out of 2,691 transits flown from May to September, 112 (4%) intersected the Snow Geese area during the moulting season, and only 22 hours (1%) of a total flight time of 1,694 hours were flown within the Snow Geese area during the moulting season." (p. 284). This approach to reporting is highly misleading as it compares the amount of "rule breaking" (i.e., times when pilots flew over the Snow Geese area) to flight transits and hours that occurred during periods when this "rule" did not apply (i.e., May, June, September). Presenting results this way creates a significant underestimate of the proportion of time when Baffinland's helicopters were not in compliance with the 1,500m horizontal buffer portion of PC Condition 59. Baffinland should not be claiming credit for not breaking the rules during times when they were not applicable.	For subsequent TEAMR and NIRB AMR reporting, Baffinland should only express periods (transits and flight hours) of non-compliance with the 1,500m horizontal buffer around the Snow Geese area portion of PC Condition 59 relative to the periods when this rule was applicable. This will avoid significantly under-estimating non-compliance in year-end reporting to NIRB.	**Document Name:** Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board; Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report **Section:** Section 4.6.8 (PC Condition 59) **PDF Page:** 281 to 286 of 703	**Future TEAMR and NIRB AMR reporting will be adjusted as requested in this comment.**	Section 5.1.1 Monitoring History and Changes in Overflight Analysis at the Project summarize the timeline for "key milestones and responses to TEWG comments leading to the 2023 helicopter overflight analysis". Under 5.1.2 Data Collection and Analysis, Table 5-1 summarizes revised/updated Helicopter Overflight Compliant Categories. A breakdown/description of flight hour compliance only within the Snow Geese area and 1,500 m horizontal buffer during the moulting season (July and August) when the cruising altitude compliance is 1,100 m above ground level is provided under 5.2.1. Compliance and in Table 5-4. A breakdown/description of low-level flight hours with rationale is provided under 5.2.2 Compliance Rationale.
GN AR #01	In 2022, between May and September, 2,691 helicopter flights (totaling 1693 hours of flying) were made to support Project-related activities (EDI 2023, Tables 5-2, 5-5). Of these flights, 58% were below the minimum altitudes set by Project terms and conditions for reducing disturbance of migratory birds and established in the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) to avoid disturbance of other wildlife (EDI 2023, Table 5-5; BIMC 2016, Section 3.3.2). Although most of these low-level flights had a rationale for flying below minimum altitude thresholds (and were therefore deemed compliant with Project terms and conditions), low level helicopter flights are a potential source	The GN recommends that the Proponent: 1. Clarify the definition of a short distance helicopter flight, as used in classifying helicopter flights as compliant or non-compliant, in terms of a specific distance threshold. Please confirm whether short distance flights are defined, for the purpose of the Proponent's annual reporting, as those less than 15 nautical miles. Add to the reporting of helicopter flights, in the current and future annual reports, descriptive statistics of distance for the flights classified as compliant because of short distance. This should include the mean, standard deviation,	• Baffinland Iron Mines Corporation (BIMC). (2016). Terrestrial Environment Mitigation and Monitoring Plan. • Baffinland Response to Comments Received for Baffinland's Production Increase Proposal Extension 2021 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2023). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report. • Government of Nunavut (GN). (2019a). Comments on Baffinland	This issue/request has been previously addressed via multiple discussions and dedicated meetings between the GN, Baffinland and EDI. 1. Short distance flights are determined at the discretion of the pilot who is operating the aircraft during the flight. The pilot will consider the distance travelled during a flight as well as other contributing factors, and then determine whether gaining an altitude of 650 magl is unreasonable, unsafe, or impractical. These types of trips are generally associated with specific monitoring programs that are MANDATORY and there are no other practical ways of completing them (water sampling locations not accessible by foot or boat, dustfall sampling, wildlife observations, noise	Refer to Response/Follow-up Actions listed (above) under QIA 2022 NIRB TE# 15.

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
	of disturbance to wildlife such as caribou (e.g. Wolfe et al. 2000; Wilson and Wilmhurst 2019). In the 2022 Annual Report, the proponent provides a summary of the various rationales provided by pilots to justify flying below the minimum altitude thresholds. The most common justification provided was the short distance of a flight. Following up on comments made regarding the 2021 Annual Report (GN 2022 -GN AR Comment #3), the GN seeks to further understand how flights are being classified as 'short distance' to determine whether this is an appropriate justification for what amounted to 48% of total flying time in 2022. Given the relatively high intensity of Project-related helicopter traffic, and the expectation that this will continue, it is important to understand the basis upon which low level flying is being justified. In this regard the following comments are noted: 1. Table 5-5 (EDI 2023) indicates that 52% of helicopter hours flown in 2022 were below minimum altitude requirements set in the Project certificate and/or specified in the TEMMP but were classified as compliant because an appropriate justification for low level flying was provided by the pilot. Forty-eight percent of total flying hours in 2022, were below minimum altitude requirements but classified as compliant based on the justification that they were short distance flights (Table 5-7). 2. Table 5-6 of the (EDI 2023) describes short distance flights as: "The short distance between take-off and landing sites does not allow enough time to gain 650 magl [meters above ground level]." 3. In comments on the 2021 Annual Report, the GN asked the Proponent to clarify what criteria (distance and/or time) are used to determine when a flight is of short enough distance or duration to justify being classified as short distance and thus deemed compliant with altitudes specified in Project Certificate. (GN 2022: GN-ARC-03, part (2)). In response, the Proponent provided the following information: "The helicopter's average airspeed when not	minimum and maximum distances of the short distance flights.	Iron Mines 2018 Annual Report to the Nunavut Impact Review Board. • Wolfe et al. (2000). Polar Research 19: 63-13. • Wilson and Wilmhurst (2019) Rangifer, 39: 27-42. DOI 10.7557/2.39.1.4586	sampling, etc. also prospecting). **Amendments to helicopter overflight definitions and reporting (per resolutions from meetings/discussions held on January 5 and February 14-16, 2023) including applicable short distance flight statistics will be applied henceforth.**	

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
	slinging is much faster than while slinging, therefore the pilots aren't expected to be able to reach and come down from 2,132 ft on a distance lower than 15 NM [nautical miles]." (BIMC 2022) Based on this response, it seems for the purpose of classification that a short distance flight is defined as one less than 15 nautical miles. However, this is not explicit in Proponent's response and should be clarified. Given the high number of short distance flights conducted in 2022, 906 hours from a total 1,693 flown, it is important to understand whether the distance of these flights fit the definition of short distance provided by the Proponent to justify low level flying. This information is not provided in the annual report.				
GN AR #02	For monitoring caribou, the Project currently relies on snow track and Height-of-Land (HOL) surveys, as well as the recent addition (in 2021) of a pilot remote camera program. Since 2014, these monitoring programs have recorded no caribou observations, thus leaving the Proponent unable to conclude whether impacts on caribou are occurring despite community concerns that they are witnessing impacts (EDI 2023, Table O; NIRB 2022). Further, the Proponent has concluded that caribou numbers in the vicinity of the Project are too low to warrant either mitigation through adaptive management (e.g. through measures such as road or helicopter traffic management) or the implementation of more in-depth caribou monitoring at a more intensive or regional scale (e.g. EDI 2022a). As reported in the 2022 Terrestrial Environment Monitoring Report (EDI 2023), the Proponent conducted 4 snow track surveys and 36 hours of HOL surveys in 2022. This yielded zero caribou observations leading the Proponent to conclude again that: "[B]ecause no caribou tracks were identified during snow track surveys in 2022, it cannot be determined whether Project infrastructure is impacting caribou movement." And "To date, insufficient caribou observations during HOL surveys have occurred to assess any Project-related effects on caribou behaviour or habitat use." (EDI 2023a, Table O) As detailed in comments on six previous annual reports (e.g. GN 2019a, 2020, 2022) and during review of the Final Environmental Impact	The GN recommends that: 1. The Proponent clarify the purpose of the snow track and HOL surveys in terms of surveillance or monitoring impacts on caribou. 2. If current monitoring programs are for caribou surveillance rather than impact assessment, the Proponent should identify which programs are currently monitoring Project effects on caribou.	• Agnico Eagle Mines (AEM) Ltd. (2015). Terrestrial Environment Management and Monitoring Plan - Meliadine Gold Project, Nunavut. • Agnico Eagle Mines (AEM) Ltd. (2019). Meadowbank Division Terrestrial Ecosystem Management Plan, Version 7. • Baffinland Iron Mines Corporation (BIMC). (2016). Terrestrial Environment Mitigation and Monitoring Plan. • Baffinland Iron Mines Corporation (BIMC). (2022). Baffinland Response to Comments Received for Baffinland's Production Increase Proposal Extension 2021 Annual Monitoring Report. • Baffinland Iron Mines Corporation (BIMC). (2023). Mary River Project – Sustaining Operations Proposal, NIRB File No. 08MN053 • Environmental Dynamics Inc (EDI). (2023). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2015). Mary River Project Terrestrial Environment 2014 Annual Monitoring Report.	1. The purpose of the snow track and HOL surveys in relation to Project Conditions and Commitments are described in the 2022 TEAMR (EDI, 2023). ○ Section 10.1.1 (Snow Track Survey, pg.211-12): "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. ○ Section 10.3 (Height of Land Survey, pg.222): "The HOL surveys are intended to examine if/how caribou (especially cows with calves) respond to Project- related activities and infrastructure. […] The HOL surveys will support long- term surveillance monitoring of caribou behaviour throughout the life of the Project and provide information to verify predicted Project-related effects on caribou movement and habitat use. 2. Per the 2022 TEAMR (Section 10 Mammals, pg.211): "North Baffin caribou are currently at a low point in their 60 to 80-year population cycle (Government of Nunavut 2019), and caribou observations are recorded infrequently, incidentally or during surveys. The current survey approaches and frequency are appropriate for low caribou densities; if/when	1. N/A 2. The results of the 2023 aerial survey are presented in Section 9.5 Aerial Caribou Survey. 3. N/A

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
	Assessment for the Phase 2 Development Proposal (GN 2019b, 2019c), the Government of Nunavut (GN) has repeatedly expressed concern that these snow track and HOL surveys continue to fail in meeting the objective of detecting caribou for the purposes of mitigating and monitoring project related effects. The fact that no caribou were observed during the last 9 years of these surveys could be a result of the following: 1) Caribou were not detected because they are simply not present in the area during the survey, owing to low population density or low survey effort. 2) Caribou were not detected due to avoidance behaviour and/or deflection from Project infrastructure and activities. The GN remains concerned that the current survey methods and level of survey effort do not offer the power to distinguish between these two possibilities. The snow track and HOL surveys have insufficient detection range and are conducted so infrequently that they are very unlikely to detect caribou present near the Project. Contrary to the Proponent's view, the GN deems these monitoring methods inadequate as surveillance mechanisms for triggering mitigation of Project effects on caribou or for acting as an early warning mechanism triggering additional monitoring programs. As such, the GN deems BIMC to be non-compliant with Project Certificate Terms and Conditions 53 (b) and (c), and 58 (b). In addition to expressing on-going concern about the adequacy of current caribou monitoring methods employed by the Project, the GN seeks clarification from the Proponent about the purpose and objectives of snow track and height-of-land surveys, having noticed inconsistency between the annual reports and recent documents submitted by the Proponent to NIRB. Detailed supporting rationales for the GN's concerns regarding the Project's caribou monitoring programs have been previously provided and are not repeated here (see GN for example GN 2019a, 2020, 2021). Instead, the GN notes some inconsistency in the Proponent's		• Environmental Dynamics Inc (EDI). (2016). Mary River Project Terrestrial Environment 2015 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2017). Mary River Project Terrestrial Environment 2016 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2018). Mary River Project Terrestrial Environment 2017 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2019). Mary River Project Terrestrial Environment 2018 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2020). Mary River Project Terrestrial Environment 2019 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2021). Mary River Project Terrestrial Environment 2020 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2022a). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report. • Environmental Dynamics Inc (EDI). (2022a). Mary River Project Caribou Monitoring: Triggers and Recommendations. • Government of Nunavut (GN). (2019a). Comments on Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board. • Government of Nunavut (GN). (2019b). Technical Review Comments for Baffinland Iron Mines Corp.'s (BIMC) "Phase 2 Development" project proposal. • Government of Nunavut (GN). (2019c). Final Written Submissions for Baffinland's (BIMC) "Phase 2	caribou densities increase the frequency of survey will be increased correspondingly." Presently, wildlife monitoring applies surveillance methods/approaches to determine if/where caribou are interacting with the Project. Per the TEMMP, more targeted survey to determine potential impacts on caribou would be triggered if/when caribou densities increase. In early 2020 — following discussions of the Terrestrial Environment Working Group (TEWG, including representatives of governments and community Hunter and Trapper Organizations) — a decision framework and defined numerical triggers to initiate more comprehensive caribou monitoring (i.e., a GPS collar program to evaluate caribou movements and habitat selection in relation to the Project) to be informed by an aerial survey of the Regional Study Area (RSA) for wildlife (EDI Environmental Dynamics Inc. 2022). A late-winter aerial survey was completed (March 2023) to assess the occurrence (presence/absence), distribution, and total counts of north Baffin caribou within the Wildlife RSA and nearby areas of interest (defined further, below). The objective of this aerial survey was to estimate the abundance and density of north Baffin caribou in the northern (i.e., active Project area) and southern (i.e., planned/future Project area) subregions of the RSA in relation to the predefined monitoring triggers. **Outcomes of the aerial survey will be included in the 2023 TEAMR.** 3. Snow track surveys must be completed within 24 hours of snowfall and are therefore done opportunistically, and completion cannot be guaranteed, especially with the proposed frequency of 2x weekly. Additionally, increasing snow track surveys to twice a week would not increase the number of caribou track encounters. North Baffin Island caribou occur at very low densities (compared to other projects that the GN cross-references), they are non-migratory (i.e. their annual movements are minimal), and there are very few caribou encounters with the Tote Road throughout the year. Caribou track encounters will increase only when caribou densities increase, and those caribou interact with the Project.	

Cmt. #	Reviewer's Detailed Comment	Recommendations	Reference Section	Baffinland's Response	Addressed in 2023 TEAMR
	statements regarding the purpose and objectives of these programs. In response to the GN's comments on caribou monitoring in the 2021 annual report (GN 2022), the Proponent provided the following response: "Regarding the Government of Nunavut's (GN's) comment: "Since 2014, these monitoring programs have recorded no caribou observations, thus leaving the Proponent unable to conclude whether impacts on caribou are occurring despite community concerns that they are witnessing impacts…" Baffinland is disappointed to see this statement given the number of times Baffinland has engaged with the GN to discuss the objective and intent of the current monitoring programs. Baffinland has been very clear that surveillance monitoring (e.g., Height of Land (HOL) and snow track surveys) is not meant to assess Project impacts but rather the presence of caribou in the area." (BIMC 2022) This statement indicates that snow track and HOL survey are for surveillance purposes rather than impact monitoring. However, this response contradicts other information that has been provided about these programs. For example: • Over the last 9 years, successive annual reports for the Project, including the 2021 report, have concluded that: "[B]ecause no caribou tracks were identified during snow track surveys in 2022, it cannot be determined whether Project infrastructure is impacting caribou movement." and "To date, insufficient caribou observations during HOL surveys have occurred to assess any Project-related effects on caribou behaviour or habitat use." (EDI 2023a, Table O) These statements suggest that snow track and HOL surveys are indeed the means of monitoring project impact.		Development" Project Proposal • Government of Nunavut (GN). (2020). Comments on Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board. • Government of Nunavut (GN). (2022). Comments on Baffinland Iron Mines 2021 Annual Report to the Nunavut Impact Review Board. • Nunavut Impact Review Board (NIRB). (2022). Reconsideration Report and Recommendations for Baffinland's Phase 2 Development Proposal.	References: Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.	

APPENDIX F DUSTFALL STATION SAMPLE HEIGHT PILOT STUDY MEMO

Mary River Project
Passive Dustfall Monitoring

ENVIRONMENTAL DYNAMICS INC.

To:	Baffinland Iron Mine Corporation
	Lou Kamermans, Senior Director - Sustainable Development
Date:	November 24, 2023
Project No:	23C0111
RE:	**Sample Height Pilot Study**

Since 2014, the Mary River Project's passive dustfall monitoring program has monitored the measurable magnitude and extent of dustfall within and outside of the Project Development Area (PDA). The monitoring program identifies areas that produce the highest dust and the times of the year when the highest dustfall occurs in each project area. Baffinland's environmental staff then uses these data to direct dustfall mitigation efforts efficiently. Passive dustfall monitoring at the Mary River Project follows the American Society for Testing and Materials (ASTM) International *Standard Test Method for Collection and Measurement of Dustfall* (ASTM International 2010). ALS Environmental performs the laboratory analysis following the British Columbia Ministry of Environment (MOE) laboratory methods for inorganic air constituents (Austin 2023).

During the December 2018 Terrestrial Environment Working Group (TEWG) meeting, the Government of Nunavut (GN) initiated discussions, ultimately leading to a request for further investigation into non-standard dustfall collectors that would be closer to ground level. During the February 2020 TEWG meeting, the GN and the Qikiqtani Inuit Association (QIA) requested that collectors be installed at a height of 1-metre or less; this request was also highlighted in the QIA-requisitioned 2021 Dust Investigation — Mary River Project (Hutchinson Environmental Sciences Ltd. 2022). This commentary was also introduced at the Phase 2 Development hearing, with the NIRB Executive Director stating [falsely[i]] that other Nunavut Mines had modified their dustfall monitoring to sample closer to the ground (Costello 2021).

Given these TEWG and NIRB requests, Baffinland resolved to conduct a pilot study to determine the necessity of deviating from the ASTM standard. This memorandum reports on study findings, identifies a significant correlation with standard method results, and suggests completing the pilot study and returning to standard sampling. Do not hesitate to contact the undersigned should you have any further questions.

Lyndsay Doetzel | MSc, RPBio
Senior Biologist

SAMPLING HEIGHT PILOT STUDY

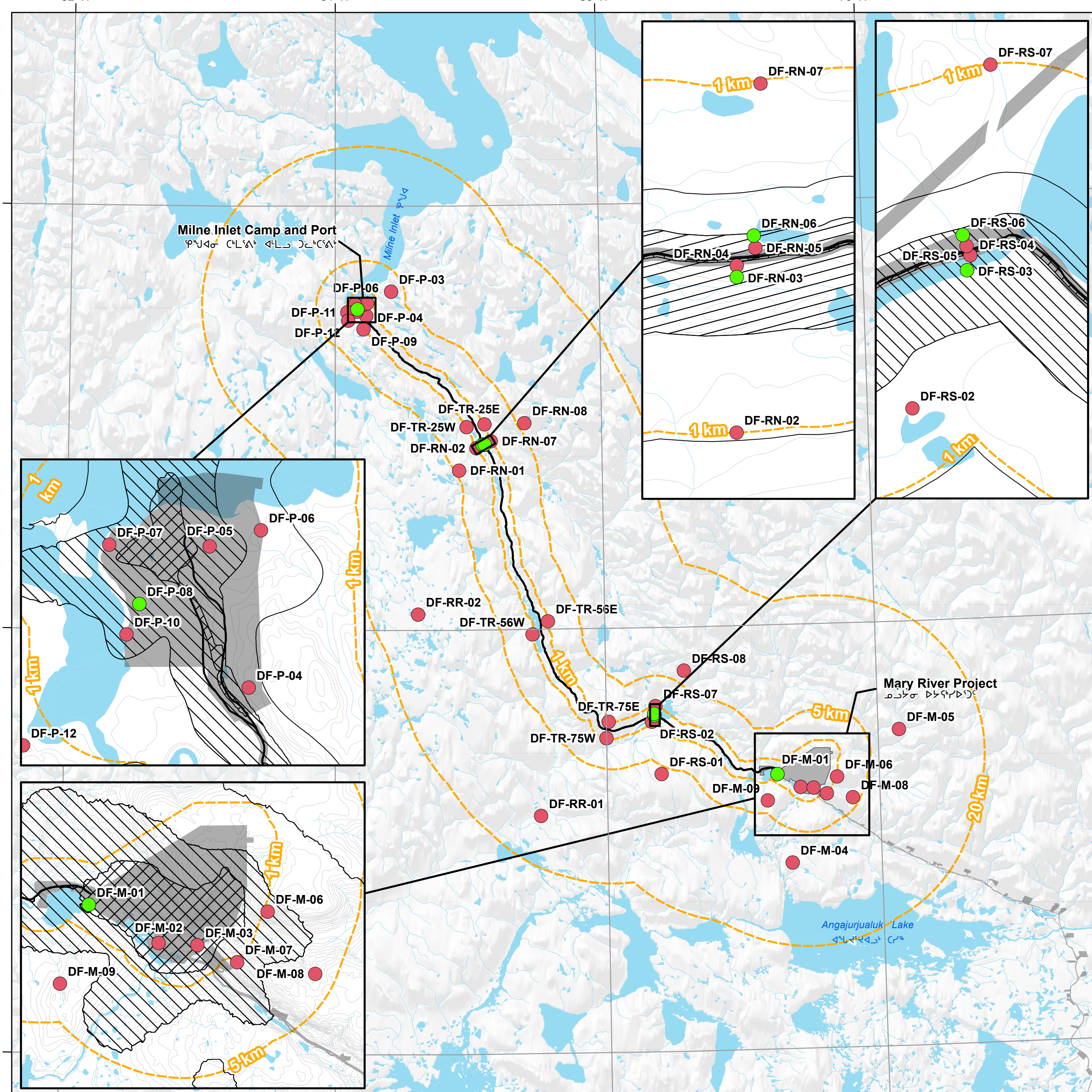
Experimental Design & Analysis

In September 2021, six (6) 'short' dustfall monitors were installed in tandem with 2.0 m standard monitors to compare potential differences and variability between non-standard and standard design — referring to dustfall stations DF-M-01, DF-P-08, DF-RN-03, DF-RN-06, DF-RS-03, and DF-RS-06 (Photo 1 and Map 1). Key measurables compared daily dustfall accumulation. Over two years (September 2021 – September 2023), a total of 143 samples were collected from each paired collector over two years:

- DF-M-01 = 25 samples
- DF-P-08 = 24 samples
- DF-RN-03 = 24 samples
- DF-RN-06 = 23 samples
- DF-RS-03 = 23 samples
- DF-RS-06 = 24 samples.

Parametric statistical analyses (assuming normal distribution) were applied to the data to determine if daily dustfall accumulation differed between sampling heights. A paired *t*-test compared mean difference in dustfall among short and standard collectors. Standardized major axis (type II) regression was used (accounting for potential sampling error in both axes) to determine whether the linear relationship between daily dustfall in standard 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 verify assumptions of normality and equality of variance in the residuals.

Photo 1. Side-by-side standard (2.0 m) and short (0.5 m) dustfall collectors.



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Passive Dustfall Monitoring Sites

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- Dustfall Monitoring Location
- Paired Height Monitoring (2 m & 0.5 m)
- Milne Inlet Tote Road
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- Potential Development Area
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Total Suspended Particles

- High
- Moderate
- Low

Dustfall monitoring sites, including paired stations

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Potential Development Area provided by BIM (2019).

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

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

Scale ᐊᒃᒋᓂᖓ

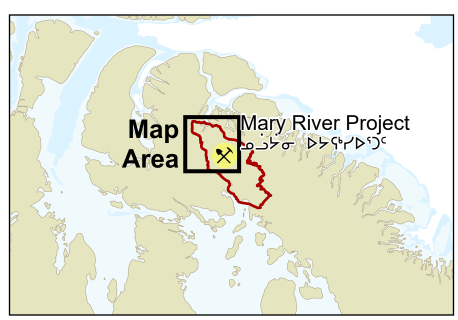
0 5 10 15 20 25

Km ᑭᓛᒥᑕ

Map Scale ᐊᒃᒋᓂᖓ: 1:750,000 (printed on 8.5 x 11)

Map Projection: NAD 1983 UTM Zone 17N

Drawn: CT	Checked: LD	Map 1	Date: 2023-02-22



Baffinland Iron Mines Corporation

EDI

Path: L:\PROJECTS\Baffinland_Spatial\2022_SpatialData\22Y0273_Baffinland_Mapping.aprx Layout: TEAMR_Map8-1_DustfallSites_20230223

Results

Figure 1 presents the correlation and regression analysis for non-standard 'short' (0.5 m) vs. standard (2.0 m) dustfall collectors[ii]. Paired *t*-test determined that the mean difference between short and standard dustfall collectors was no different than zero (mean difference = –0.03 [95% CI = –0.07–0.02]; t_{140} = –1.18, P = 0.24). There was a strong correlation between dustfall at short and standard collectors (r_{cor} = 0.96, P < 0.0001), and standardized major axis regression demonstrated a very strong fit between dustfall quantities in both collector types (intercept = -0.03, slope = 1.02, R^2 = 0.92). Tests of the regression parameters identified that neither the intercept (t_{139} = –1.26, P = 0.21) nor slope (r_{139} = 0.08, P = 0.39) differed from the expectation of unity (i.e., intercept = 0 and slope = 1).

Conclusion

Based on these findings (2021–'23), there is no significant difference between sampling heights. Furtherance of the pilot study is not warranted. Continued dustfall monitoring using ASTM standard (2.0 m) height is recommended (1) to maintain the continuity and integrity of ongoing data capture at the Project and (2) to align with industry standards applied at other northern mines and the direction provided by the air quality experts of Environment and Climate Change Canada (e.g., (Walker 2020). Baffinland's passive dustfall sampling program adequately informs on project-related dustfall.

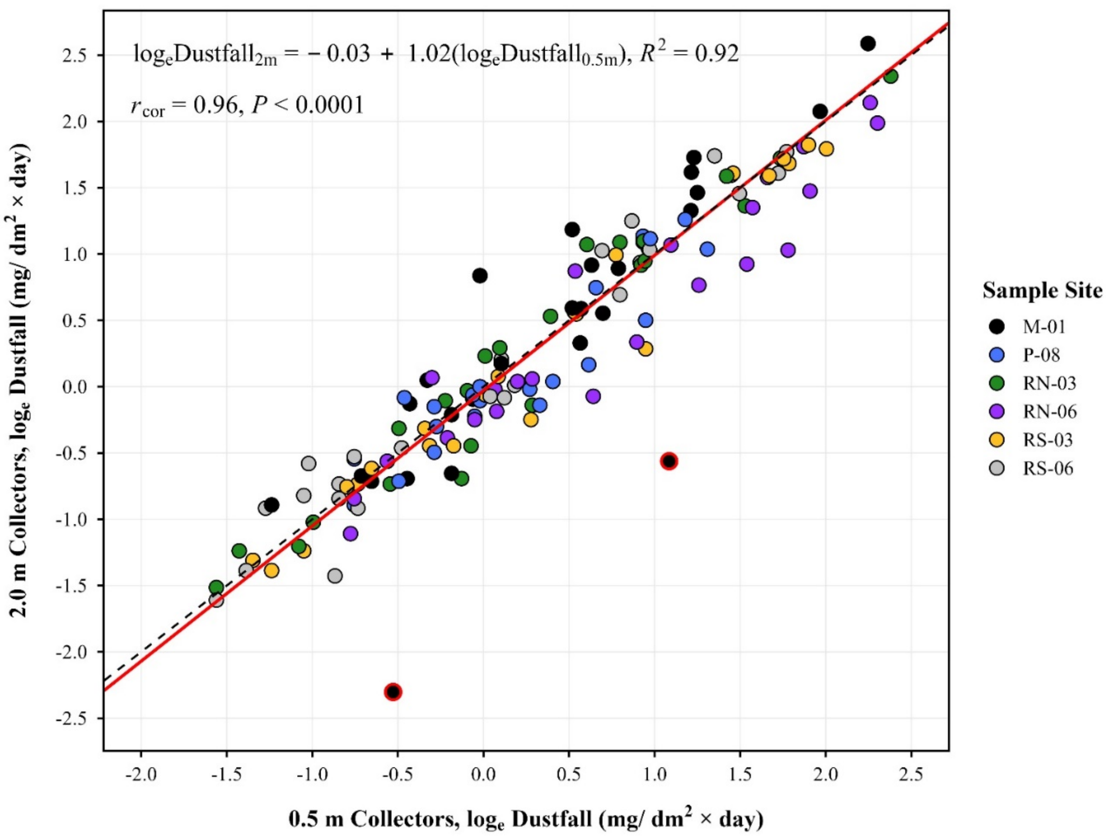


Figure 1. **Standardized major axis regression of the relationship between standard and short collector daily dustfall (mg/dm² x day).**

Points show paired daily dustfall values between standard and short dustfall collectors; points outlined in red are outliers excluded from analysis. Dustfall analyzed on the natural logarithm scale. Red line depicts the regression (intercept and slope) estimate, and the dashed line indicates the line of unity (intercept = 0, slope = 1).

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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.

ENDNOTE / SUPPLEMENTARY INFORMATION

[i] 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 (Environment and Climate Change Canada 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's comments and recommendations (Environment and Climate Change Canada 2018, Walker 2020) on the Meadowbank 2018 Air Quality and Dustfall Monitoring Report (Agnico Eagle Mines Limited – Meadowbank Division 2019), and following an on-site study that indicated that dustfall variability was higher in ground-level sampling, Agnico switched dustfall monitoring to the ASTM's 2-metre sampling height (Agnico Eagle Mines Limited – Meadowbank Division 2020).

[ii] Two samples were dropped from the analysis because they were extreme outliers, and their presence also violated the assumptions of normality and equal variance in the residuals. Both samples were from site DF-M-01, collected on November 18, 2022 ($dustfall_{short}$ = 2.96 $mg/dm^2 \cdot \times$ day, $dustfall_{tall}$ = 0.57 $mg/dm^2 \cdot \times$ day) and January 19, 2023 ($dustfall_{short}$ = 0.59 $mg/dm^2 \cdot \times$ day, $dustfall_{tall}$ = 0.10 $mg/dm^2 \cdot \times$ day). Note, however, that the excluded data points are displayed in Figure 1, outlined in red.

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EDI ENVIRONMENTAL DYNAMICS INC.

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ᐱᓕᕆᐊᑉ ᓈᓴᐅᑖ:	23C0111
ᐱᔾᔪᑖ:	**ᖃᐅᔨᓴᕈᑏᑦ ᐳᖅᑐᔪᓂᒃ ᐱᒋᐊᕈᑕᐅᔪᑦ ᖃᐅᔨᓴᕐᓂᖅ**

2014-ᒥᓂ, ᓄᓘᔫᖕᓂ ᐱᓕᕆᐊᒥ ᐳᔪᖃᕐᓂᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᓇᐅᑦᑎᖅᓯᓲᖅ ᐆᒃᑐᖃᖅᑕᐅᔪᓐᓇᖅᑐᑦ ᐊᖕᒋᔫᓂᖓ ᐊᒻᒪᓗ ᓯᐊᒻᒪᒃᓯᒪᓂᖓ ᐳᔪᖅ ᐃᓗᐊᓂ ᐱᓕᕆᐊᒥᓗ ᐱᓕᕆᐊᑉ ᐱᕚᓪᓕᐊᕖᖓᓂ. ᖃᐅᔨᓴᐃᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᓇᓗᓇᐃᖅᓯᔪᖅ ᐃᓂᓂᒃ ᐳᔪᖃᓗᐊᖅᑐᓂᒃ ᐊᒻᒪᓗ ᖃᖓᒃᑰᓂᖓ ᐊᖅᑰᒥ ᐳᔪᖃᓗᐊᕐᓂᖅᓴᐅᖃᑦᑕᕐᓂᖓ ᐊᑐᓂ ᐱᓕᕆᕝᕕᖕᒥ ᐃᓂᐅᔪᓂ. ᐹᓇᓛᓐᑯᑦ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐃᖅᑲᓇᐃᔭᖅᑎᖏᑦ ᐊᑐᖅᓯᖃᑦᑕᖅᑐᑦ ᑕᒪᒃᑯᓂᖓ ᑎᑎᖅᑲᖁᑎᓂᒃ ᑐᑭᒧᐊᖁᓗᒋᑦ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖓᓄᑦ ᐸᓚᐅᒪᑎᑦᑎᔾᔪᑕᐅᓇᓱᒃᑐᓂᒃ ᐊᑑᑎᖃᑦᑎᐊᖁᓗᒋ. ᐳᔪᖃᐃᓐᓇᖅᐸᒃᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᖅ ᓄᓘᔫᖕᓂ ᐱᓕᕆᐊᒥ ᒪᓕᒃᑐᑦ ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖕᒋᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᖁᑎᓄᒃ (ASTM) ᓄᓇᕐᔪᐊᒥᒃ ᐊᑐᖅᑕᐅᕙᔪᒃᑐᑦ ᖃᐅᔨᓴᕐᒧᑦ ᑲᑎᖅᓱᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐆᒃᑐᖃᖅᑕᐅᓂᖕᒋᓐᓄᑦ ᐳᔪᑦ. ALS ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐱᓕᕆᖃᑦᑕᖅᑐᑦ ᖃᐅᔨᓴᕐᕕᖕᒥ ᕿᒥᕐᕈᓂᕐᓂᒃ ᒪᓕᒃᓱᒋᑦ ᐳᕆᑦ ᑲᓚᐱᐊᒥ ᒥᓂᔅᑕᐅᕚᖑᑦ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ (MOE) ᖃᐅᔨᓴᕐᕕᖕᒥ ᐱᓕᕆᔪᓂᑦ ᐆᒪᔪᓂᖕᒑᖅᓯᒪᙱᑦᑐᑦ ᐊᓂᖅᓵᖅᐸᒃᑕᑦᑎᓐᓄᐊᓲᓂᒃ (ᐋᑎᓐ 2023).

ᑲᑎᒪᑎᓪᓗᒋᑦ ᑎᓯᐱᕆ 2018-ᒥ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖅᑲᑎᖕᒋᑦ, ᒐᕙᒪᒃᑯᑦ ᓄᓇᕗᒻᒥ ᐅᖅᖃᑎᒌᒃᐸᓪᓕᐊᑎᑦᑎᓕᓚᐅᖅᑐᑦ, ᑎᑭᐅᑎᓪᓚᕆᒃᓯᒪᓪᓗᑎᒃ ᑐᒃᓯᕋᕐᓂᕐᒧᑦ ᕿᒥᕐᕈᔭᐅᒃᑲᓐᓂᖅᑯᓪᓗᑎᑦ ᐳᔪᖅ ᓯᐊᒻᒃᐸᓪᓕᐊᓂᖓᓄᑦ ᑲᑎᖅᓱᐃᕚᖓᓂᒃ ᒪᓂᕋᕐᒧᑦ ᖃᓂᓐᓂᖅᓴᐅᓗᑎᒃ. ᑲᑎᒪᑎᓪᓗᒋᑦ ᕖᕝᕗᐊᕆ 2020-ᒥ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖅᑲᑎᑦ, ᒐᕙᒪᒃᑯᑦ ᓄᓇᕗᒻᒥ ᐊᒻᒪᓗ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖕᒋᑦ ᑐᒃᓯᕋᓚᐅᖅᑐᑦ ᐋᒃᑭᒃᓯᓗᑎᒃ ᑲᑎᖅᓱᐃᕚᖓᓂᒃ ᐳᖅᑐᓕᖕᓂᒃ 1 ᒦᑕᒥ ᑐᖕᓕᓂᓪᓘᓐᓃ; ᑖᓐᓇ ᑐᒃᓯᕋᖅᑕᐅᔪᖅ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᖃᓯᐅᑎᔪᖅ ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖕᒋᑕ ᑎᓕᐅᕆᔾᔪᑎᖓ 2021-ᒥ ᐳᔪᖅᓂ ᕿᒥᕐᕈᓂᕐᒧᑦ – ᓄᓘᔫᖕᓂ ᐱᓕᕆᐊᖅ (ᕼᐋᑦᔨᔅᓴᓐ ᐊᕙᑎᓕᕆᔨ ᑭᓪᓕᓯᓂᐊᖅᑏᑦ ᓕᒥᑎᑦ 2022). ᑖᓐᓇ ᐅᖃᐅᓯᒃᓴᖅ ᓴᖅᑭᓚᐅᖅᑐᖅ ᐱᓕᕆᐊᑉ ᒪᕈᒥᓕᖅᑕᖓᓄᑦ

ᐱᕙᓪᓕᐊᓂᕐᒧᑦ ᓈᓚᖓᓂᖄᖅᑎᓪᓗᒋᑦ, ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᑐᑭᒧᐊᖅᑎᑦᑎᔨᖕᒐ ᐅᖃᓚᐅᖅᑐᖅ [ᓱᓕᖏᑦᑐᖅ] ᐊᓯᖏᑦ ᓄᓇᕗᒻᔪ ᐅᔭᕋᖓᓂᐊᕐᕖᑦ ᐋᕿᒋᐊᖅᓯᓚᐅᖅᑐᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖕᒐᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᕆᓐᓇᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕈᑎᓂᒃ ᖃᓂᓐᓂᖅᓴᐅᓪᓗᑎᒃ ᒪᓂᕋᕐᒧᑦ (ᑲᔅᑎᓘ 2021).

ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᑖᒃᑯᐊ ᓄᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᑦ ᐊᒻᒪᓗ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᑐᒃᓯᕋᐅᑎᖏᑦ, ᐹᕙᓛᓐᑯᑦ ᐱᒋᐊᕈᒪᓕᓚᐅᖅᑐᑦ ᓯᕗᓪᓕᕐᒥᒃ ᖃᐅᔨᓴᕐᓗᑎᒃ ᑐᑭᓯᓇᓱᐊᖅᓗᒋᑦ ᐱᔭᕆᐊᖃᖅᑕᖏᑦ ᐊᑐᖅᑕᐅᖅᐳᕐᖠᓕᕐᓗᑎᒃ ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᕐᑯᑎᓄᒃ (ASTM) ᐊᑐᒐᔾᑕᖏᓐᓂᒃ. ᑖᓐᓇ ᑐᑭᓯᐅᒪᖃᑎᒌᖏᓐᕐᒧᑦ ᐅᓂᒃᑳᖅ ᖃᐅᔨᓴᕐᓂᕐᒥ ᖃᐅᔨᔭᐅᔪᓂ, ᓇᓗᓇᐃᔭᐃᔪᖅ ᐊᒃᑐᐊᖃᑎᒌᖏᓐᕐᔪᐊᖏᓐᓂᒃ ᐊᑐᖅᑕᐅᓚᔾᑐᓂᒃ ᐱᓕᕆᔾᔪᓯᕐᓂᑦ ᖃᐅᔨᔭᐅᔪᓂ, ᐃᒪᐃᑎᑦᑎᖅᑰᔩᓪᓗᓂᓗ ᐱᔭᕇᖅᑕᐅᓂᖓ ᓯᕗᓪᓕᕐᐹᒥᒃ ᖃᐅᔨᓴᕐᓗᑎᒃ ᐊᒻᒪᓗ ᐅᑎᕐᕕᒋᓗᒋᑦ ᐊᑐᖅᑕᐅᓚᔾᑯᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᕐᒧᑦ. ᐅᖃᖃᑎᒋᑦᑕᐃᓕᓂᐊᙱᓚᑦ ᐊᑎᓕᐅᖅᓯᒪᔪᖅ ᐊᑖᓂ ᐊᐱᖅᑯᑎᒃᓴᖃᒃᑲᓐᓂᕐᓂᕈᕕᑦ.

ᓕᓐᓯ ᑐᐊᑦᔪ | ᖁᕝᕙᓯᓛᖅ ᑮᓕᓯᓂᐊᕐᓂᕐᒧᑦ, ᐆᒪᔪᓕᕆᔩᓪᓚᕆᒃ
ᐆᒪᔪᓕᕆᔩᒻᒪᕆᒃ

ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᖅ ᐳᖅᑐᔪᓂ ᓯᕗᓪᓕᖅᐹᒥᒃ ᖃᐅᔨᓴᕐᓂᖅ

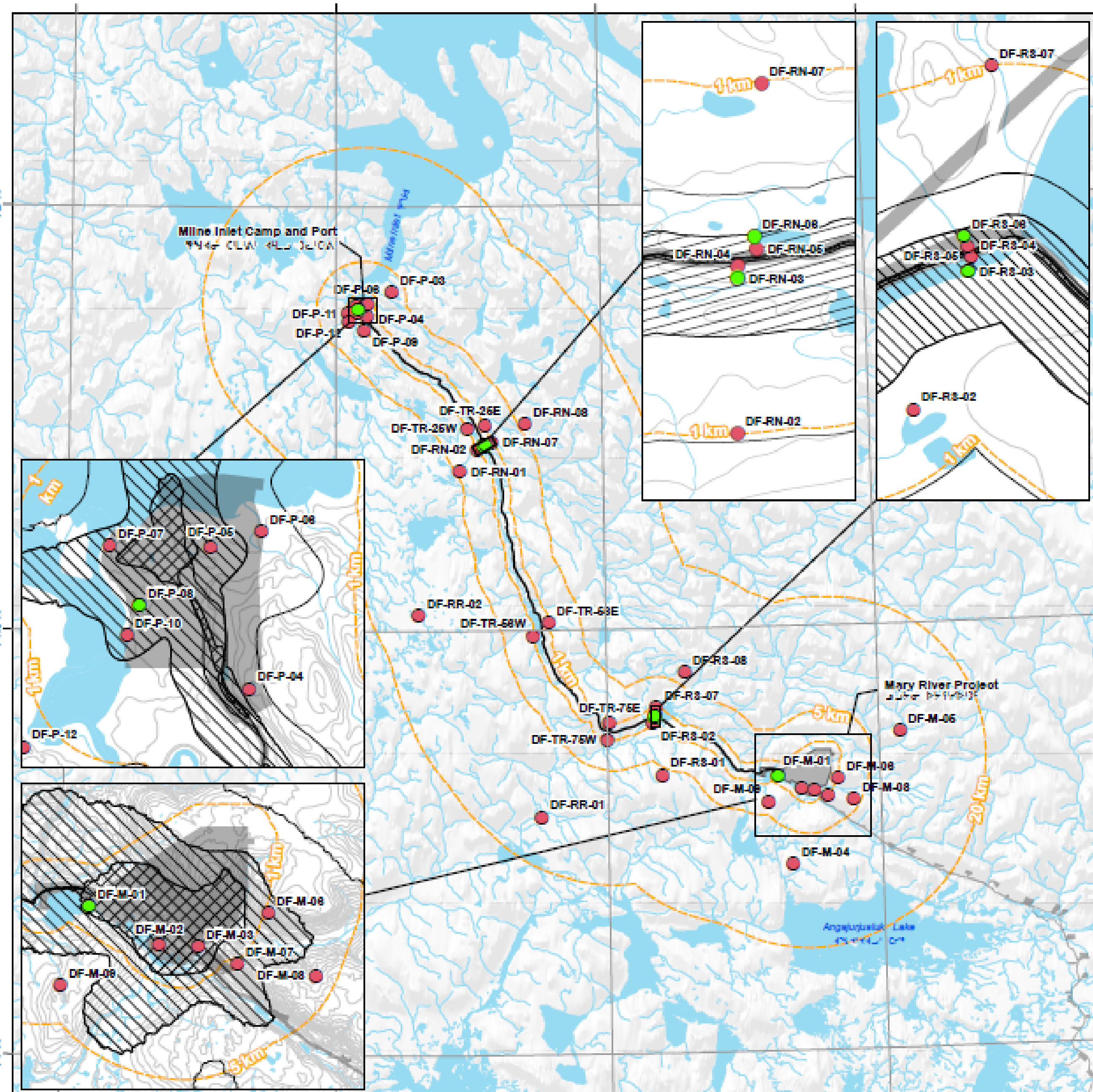
ᖃᐅᔨᓴᐅᑎᒃᑯᑦ ᓴᓇᒪᓂᖔ ᐊᒻᒪᓗ ᕿᒥᕐᕈᓂᖅ

ᓯᑎᐱᕆ 2021-ᒥ, ᐊᕝᕙᓂᓖᑦ (6) “ᓇᐃᑦᑐᑦ” ᐳᔪᕋᖅ ᓱᐊᒻᒪᖃᑦᑕᕐᓂᖕᖓᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᔾᔪᑏᑦ ᐋᖅᑭᒃᑕᐅᓚᐅᑐᑦ ᑕᑭᓕᓈᒃ 2.0 ᒦᑕᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᔾᔪᑕᐅᓚᔪᒃᑐᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᕐᒪᖖᑕ ᐊᔾᔨᒌᖕᒋᓐᓂᖕᒋᑦ ᐊᔾᔨᒌᙱᑦᑕᕐᓂᖕᒋᓪᓗ ᐊᑐᖅᑕᐅᓚᔪᙱᑦᑐᓄᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓚᔪᒃᑐᓄᓪᓗ ᓴᓇᓯᒪᓂᖕᒋᓐᓄᑦ - ᐃᓱᒪᒋᓪᓗᒋᓪᓗ ᐳᔪᕋᖅ ᓱᐊᒻᒪᖃᑦᑕᖅᑐᓄᑦ ᖃᐅᔨᓴᕐᑯᑦ DF-M-01, DF-P-08, DF-RN-03, DF-RN-06, DF-RS-03 (ᐊᔾᔨᙳᐊᖅ 1 ᐊᒻᒪᓗ ᓄᓇᙳᐊᖅ 1). ᐆᒃᑐᕋᒐᒃᓴᓪᓗᐊᑕᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᕐᒪᖖᑕ ᖃᐅᑕᒫᑦ ᐳᔪᕋᐃᑦ ᑲᑎᕝᐸᓪᓕᐊᔪᓄᑦ. ᐊᕐᕌᒍᒃ ᒪᕐᕉᒃ ᐅᖓᑖᓄ (ᓯᑎᐱᕆ 2021 - ᓯᑎᐱᕆ 2023), ᑲᑎᕽᓗᒋᑦ 143 ᖃᐅᔨᓴᒐᒃᓴᑦ ᑲᑎᖅᓱᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᑐᓂ ᑐᑭᓕᓈᓂ ᖃᐅᔨᓴᕐᕕᖕᓂ ᐅᖓᑖᓄ ᐊᕐᕌᒍᑦ ᒪᕐᕉᖕᓄᑦ:

- DF-M-01 = 25 ᖃᐅᔨᓴᒐᒃᓴᑦ
- DF-P-08 = 24ᖃᐅᔨᓴᒐᒃᓴᑦ
- DF-RN-03 = 24 ᖃᐅᔨᓴᒐᒃᓴᑦ
- DF-RN-06 = 23 ᖃᐅᔨᓴᒐᒃᓴᑦ
- DF-RS-03 = 23 ᖃᐅᔨᓴᒐᒃᓴᑦ
- DF-RS-06 = 24 ᖃᐅᔨᓴᒐᒃᓴᑦ

ᑭᒡᓕᐅᔪᑦ ᓈᓴᐅᓯᕆᓂᕐᒧᑦ ᕿᒥᕐᕈᓂᕐᒥ (ᐃᓱᒪᒋᓪᓗᒋᑦ ᓇᓃᑐᐃᓐᓇᖃᑦᑕᕐᓂᖕᒋᑦ) ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᖃᐅᑕᒫᑦ ᐳᔪᕋᑦ ᓱᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᑲᑎᑉᐸᓪᓕᐊᓂᖕᒋᓐᓄᑦ ᐊᔾᔨᒌᖕᒋᓐᓂᖕᒋᑦ ᐳᖅᑐᓕᓈᖕᓂᖕᒋᓐᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᕖᑦ. ᒪᕐᕉᒃ ᑎ–ᖃᐅᔨᓴᕈᑏᒃ ᖃᓄᐃᓐᓂᖅᓴᐅᕐᒪᖖᑕ ᐊᔾᔨᒌᖕᒋᓐᓂᖕᒋᓐᓄᑦ ᐳᔪᕋᑦ ᓱᐊᒻᒪᒃᐸᓪᓕᐊᔪᓂ ᕿᓚᒥᐅᔪᒃᑯᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓚᔪᒃᑐᓄᑦ ᑲᑎᖅᓱᐃᔾᔪᑎᓄᑦ. ᐊᑐᖅᑕᐅᓚᔪᒃᑐᑦ ᓴᓂᒧᑦ (ᖃᓄᐃᑦᑑᓂᖓ II) ᓈᓴᐅᓯᓇᔾᔪᑏᑦ ᐊᑐᖅᑕᐅᔪᑦ (ᐃᓱᒪᒋᓪᓗᒋᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᐅᑐᐃᓐᓇᕆᐊᓖᑦ ᑕᒻᒪᖅᓯᒪᒍᑎᒃ ᑕᒪᐃᓐᓄᑦ ᓴᓂᓱᑦ) ᓇᓗᓇᐃᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᑐᑭᓕᐊᖅᑐᖅ ᐊᒃᑐᐊᖃᑎᒌᒃᑐᑦ ᖃᐅᑕᒫᑦ ᐳᔪᕋᖅ ᓱᐊᒻᒪᒃᐸᓪᓕᐊᑎᓪᓗᒋ ᐊᑐᖅᑕᐅᓚᔪᒃᑐᓂ ᐊᒻᒪᓗ ᓇᐃᑦᑐᓂ ᑲᑎᖅᓱᐃᕙᖕᓂ ᐊᔾᔨᒌᙱᓐᓂᖅᓴᐅᕐᔪᐊᒪᖖᑕ ᐊᑕᐅᓯᐅᔪᒥ (ᓱᕐᓗ 1:1 ᐊᒃᑐᐊᖃᑎᒌᑦ ᑐᙵᕙᒋᓪᓗᒋᑦ ᓄᖅᑲᕙᒋᕚᒃᑕᖕᒋᑦ = 0 ᐊᒻᒪ ᓯᕙᖕᖓᓂᖕᖓ = 1). ᐊᒥᐊᒃᑯᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ ᐃᓅᑦ ᖃᐅᔨᓴᖅᑕᐅᓯᒪᔪᑦ, ᖃᐅᔨᓴᖅᑕᐅᓪᓚᑦᑖᖅᓗᑎᒃ (ᓱᕐᓗ ᓴᐸᐃᕈ - ᕗᐃᐅᒃ) ᐱᓕᕆᐊᕐᔪᓚᐅᖅᑐᑦ ᑲᖏᕆᔭᐅᓪᓗᑎᒃ ᑕᐃᒪᐃᑕᐃᓐᓇᖃᑦᑕᕐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ ᐊᔾᔨᒌᖕᓂᖕᒋᑦ ᐊᔾᔨᒌᙱᒋᖃᑦᑕᖅᑐᑦ ᐊᒥᐊᒃᑯᓂ.

ᐊᔾᔨᖑᐊᖅ 1. ᓴᓂᓕᒌᒃᑐᑦ ᐊᑐᖅᑕᐅᒐᔪᒃᑐᑦ (2.0 ᒦᑕᑦ) ᐊᒻᒪᓗ ᓇᐃᑦᑐᖅ (0.5 ᒦᑕᑦ) ᐳᔪᕋᓄᑦ ᓯᐊᖅᒪᒃᐸᓪᓕᐊᔪᓄᑦ ᑲᑎᖅᓱᐃᕝᕕᑦ.



LEGEND

Passive Dustfall Monitoring Sites

- Dustfall Monitoring Location
- Paired Height Monitoring (2 m & 0.5 m)
- Milne Inlet Tote Road
- Potential Development Area

Total Suspended Particles

High | Moderate | Low

Dustfall monitoring sites, including paired stations

NOTES

Potential Development Area provided by BIM (2019).

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

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

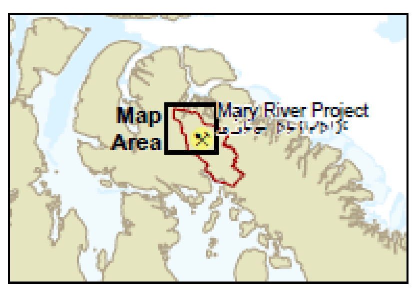
Scale

0 5 10 15 20 25

Km

Map Scale: 1:750,000 (printed on 8.5 x 11)
Map Projection: NAD 1983 UTM Zone 17N

Drawn: CT	Checked: LD	Map 1	Date: 2023-02-22



Baffinland

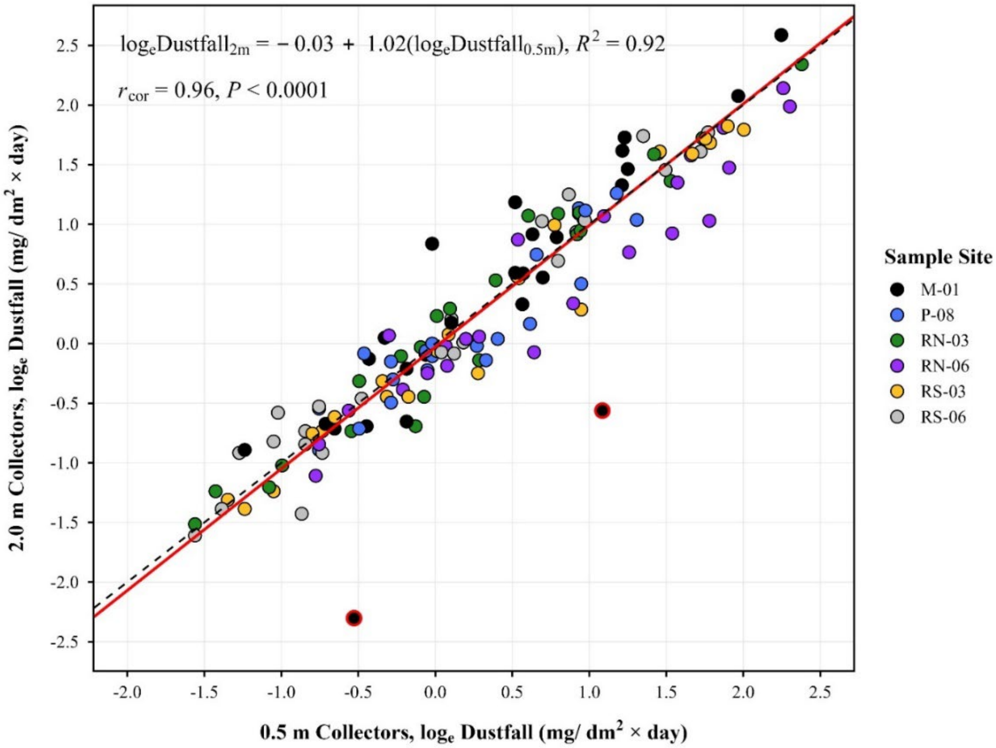
EDI

ᖃᐅᔨᔭᐅᔪᑦ

ᐊᔾᔨᙳᐊᖅ 1 ᓴᖅᑮᔭᖅᑎᑦᑎᔪᖅ ᐊᒃᑐᐊᖃᑎᒌᓂᒃ ᐊᒻᒪᓗ ᖃᓄᐃᓕᖓᓂᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑐᓂᒃ ᕿᒥᕐᕈᓪᓗᑎᒃ ᐊᑐᖅᑕᐅᓚᐅᕐᑎᑦᑐᓂᒃ "ᓇᐃᑦᑐᓂ" (0.5 ᒥᓚᒦᑕ) ᑕᑯᓐᓘᖅᓱᕆᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᖅ (2.0 ᒥᓚᒦᑕ) ᐳᔪᕋᕐᓂ ᑲᑎᖅᓯᐃᕚᖕᓂ[i] ᐊᔾᔨᒋᙱᓚᐅᙱᑕᖓ 0–ᒥᑦ (ᐊᔾᔨᒋᙱᔾᔪᑖ = –0.03[95% CI = –0.07–0.02]; t_{140} = –1.18, P = 0.24). ᐱᑕᖃᓚᐅᖅᑐᖅ ᐊᒃᑐᐊᖃᑎᒌᖕᓂᓪᓚᖕᓂᒃ ᑖᒃᑯᓇᓂ ᐸᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᖅ ᓇᐃᑦᑐᓂ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓚᔪᒃᑐᓂ ᑲᑎᖅᓯᐃᕚᖕᓂ (r_{cor} = 0.96, P < 0.0001), ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓚᔪᒃᑐᑦ ᓴᓂᒨᖕᓚᕐᔪᐊᖅᑐᑦ ᖃᓄᐃᓕᖓᓂᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑐᓂᒃ ᓴᖅᑮᔭᖅᑎᑦᑎᓚᐅᖅᑐᑦ ᐋᖅᑭᓪᓚᑦᑖᖅᓯᒪᓂᖃᓚᐅᖅᑐᑦ ᑖᒃᑯᓇᓂ ᐳᔪᕋᑦ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᐅᓄᕐᓂᖏᓐᓂᒃ ᑕᒪᐃᓐᓂᒃ ᑲᑎᖅᓯᐃᕚᖕᓂ ᖃᓄᐃᑦᑑᓂᖏᓐᓂ (ᓄᖅᑲᕐᕙᖏᑦ = -0.03, ᓯᕙᙵᓂᙵ = 1.02, R^2 = 0.92). ᖃᐅᔨᓴᖅᑕᐅᓂᖏᑦ of ᖃᓄᐃᓕᖓᓂᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑐᓂᒃ ᑭᒡᓕᖏᓐᓂᒃ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᓇᓕᐊᖕᓂᑐᐃᓐᓇᖅ ᓄᖅᑲᕐᕙᖕᒐᓂᓘᓐᓃᑦ (t_{139} = –1.26, P = 0.21) ᓯᕙᙵᓂᙵᓂᐅᙱᑦᑐᕐᓗ (r_{139} = 0.08, P = 0.39) ᐊᔾᔨᒌᙱᐊᕐᔪᓚᐅᖅᑐᑦ ᓂᖓᐅᒥᔭᐅᔪᓂ ᐊᑕᐅᓯᐅᖃᑎᒌᒃᑐᓂ (ᓲᕐᓗ, ᓄᖅᑲᕐᕙᖕᒐ = 0 ᐊᒻᒪᓗ ᓯᕙᙵᓂᙵ = 1).

ᐃᓯᓕᔾᔪᑎᒋᓗᒍ

ᑐᙵᕕᒋᓪᓗᒋᑦ ᑖᒃᑯᐊ ᖃᐅᔨᔭᐅᔪᑦ (2021-'23), ᐱᑕᖃᕐᒥᑦᑐᖅ ᐊᔾᔨᒌᙱᔾᔪᑕᐅᔪᓂᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᖅᑕᐅᔪᑦ ᐳᖅᑐᓕᓃᓂᕐᒋᓇᓂ. ᐱᕙᓪᓕᐊᑎᓪᓗᒋᑦ ᐸᕐᓇᐅᑏᑦ ᓯᕗᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᖃᐅᔨᓴᕐᓃᑦ ᐱᔪᓐᓇᐅᑎᖃᕐᒋᑦᑐᑦ. ᑲᔪᓰᓐᓇᖅᑐᑦ ᐳᔪᕋᕐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓃᑦ ᐊᑐᕐᓗᑎᒃ ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᕐᑯᑎᓄᒃ (ASTM) ᐊᑐᖅᑕᐅᕙᒃᑐᓂᒃ (2.0 ᒦᑕ) ᐅᖅᑐᓂᓕᒃ ᐊᑐᓕᕐᑯᔭᐅᓯᒪᔪᖅ (1) ᐋᖅᑭᐅᒪᑎᑕᐅᖏᓐᓇᕐᑯᓪᓗᖏᑦ ᑲᔪᓰᓐᓇᕐᓗᑎᒃ ᐊᒻᒪᓗ ᓱᓕᔪᓐᓇᕐᓂᖏᑦ ᑎᑎᖅᑲᕐᑯᑏᑦ ᑎᑎᕋᖅᑕᐅᕙᓪᓕᐊᖏᓐᓇᕐᓗᑎᒃ ᐱᓕᕆᐊᒥ ᐊᒻᒪᓗ (2) ᒪᓕᒡᓗᑎᒃ ᓴᓇᕚᑦ ᐊᑐᖅᐸᒃᑕᖏᓐᓄᑦ ᐊᑐᓕᖅᑎᑕᐅᓯᒪᔪᑦ ᐊᓯᖏᓐᓄᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐅᔭᕋᖕᓂᐊᕐᕚᖕᓄᑦ ᐊᒻᒪ ᑐᑭᒧᐊᒍᑏᑦ ᐊᑐᐃᓐᓇᕈᖅᑕᐅᔪᑦ ᐊᓂᖅᓅᖅᐸᒃᑕᑦᑎᓐᓄᑦ ᖃᐅᔨᒪᔨᑕᓂ ᐊᕙᑎᓕᕆᓂᕐᒥᑦ ᐊᒻᒪ ᓯᓚᒥᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᑲᓇᑕᒥᒃᑯᓐᓂᑦ (ᓲᕐᓗ, (ᕗᐊᑯ 2020). ᐹᕙᓐᓈᓐᑯᑦ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᖏᓐᓇᖅᐸᖏᓐᖓᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᓈᒻᒪᒃᑐᒥᒃ ᑐᑭᓯᐅᒪᑎᑦᑎᔪᖅ ᐱᓕᕆᐊᒧᑦ-ᐊᒃᑐᐊᔪᓂᒃ ᐳᔪᕋᓂᒃ ᓯᐊᒻᒪᒃᐸᒃᑐᓂᒃ.



ᐊᔾᔨᙳᐊᖅ 1. ᐊᑐᖅᑕᐅᕙᒃᑐᖅ ᓴᓂᒨᖓᔪᕐᔪᐊᑦ ᖃᓄᐃᓕᖓᓂᕆᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑐᓄᑦ ᐊᒃᑐᐊᔪᑦ ᑖᒃᑯᓇᓂ ᐊᑐᖅᑕᐅᒐᔪᒃᑐᓂ ᐊᒻᒪᓗ ᓇᐃᑦᑐᓂ ᑲᑎᖅᓯᐃᕝᕕᐅᔪᓂ ᖃᐅᑕᒫᑦ ᐳᔪᕋᕐᓂ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᓂ (mg/dm² x ᖃᐅᑕᒫᑦ).

ᓇᓗᓇᐃᖅᓯᔾᔪᑏᑦ ᓴᖅᑮᖅᑎᑕᔪᑦ ᑲᑎᖕᒐᔪᓂᒃ ᖃᐅᑕᒫᑦ ᐳᔪᕋᐅᑉ ᓯᐊᒻᒪᒃᑕᕐᓂᖓᓄᑦ ᓈᓴᐅᑏᑦ ᑖᒃᑯᓇᓂ ᐊᑐᖅᑕᐅᒐᔪᒃᑐᓂ ᐊᒻᒪᓗ ᓇᐃᑦᑐᓂ ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᑕᖅᑐᓄᑦ ᑲᑎᖅᓯᐃᕝᕕᖓᓂ; ᐅᖃᐅᓯᐅᔪᑦ ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᔪᑦ ᐊᐅᐸᖅᓯᑎᓯᒪᔪᑦ ᓇᓗᓇᐃᔭᐅᑏᑦ ᐃᓚᐅᑎᑕᐅᙱᑦᑐᑦ ᕿᒥᕈᓂᕐᒥ. ᐳᔪᕋᖅ ᓯᐊᒻᒪᒃᑕᖅᑐᑦ ᕿᒥᕈᔭᐅᓯᒪᔪᑦ ᓈᓴᐅᑎᓯᔾᔪᑎᑎᒍᑦ. ᐊᐅᐸᖅᑐᖅ ᑐᑭᓕᐊᖅᑐᑦ ᓴᖅᑮᖅᑎᑦᑎᔪᖅ ᖃᓄᐃᓕᖓᓂᓇᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑐᓄᑦ (ᓗᖅᑲᖅᕕᖕᒋᑦ ᐊᒻᒪᓗ ᓯᕕᖕᒐᓂᖕᒐ) ᒥᒃᓵᓴᒃᑕᐅᓯᒪᔪᑦ, ᑎᑎᖅᓯᒪᔪᖅ ᑐᑭᓕᐊᖅᑐᑦ ᓇᓗᓇᐃᖅᓯᔪᖅ ᑐᑭᓕᐊᖅᑐᒥᒃ ᐊᑕᐅᓯᓂᖕᒋᓐᓂᒃ (ᓗᖅᑲᖅᕕᖕᒋᑦ= 0, ᓯᕕᖕᒐᓂᖕᒐ=1)

ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓐᓇᖅᑐᑦ

ᐋᒡᓃᓈ ᐄᒍ ᐅᔭᕋᓐᓂᐊᕐᕕᒃ ᓕᒥᑎᑦ – ᐊᐳᖅᑎᓐᓈᖅᑐᖅ 2019. ᐅᐃᒍᖅ 39 ᐊᐳᖅᑎᓐᓈᖅᑐᖅ ᓴᓇᕝᕕᒃ. 2019. ᐅᐃᒍᖅ 39 ᐊᐳᖅᑎᓐᓈᖅᑐᖅ ᐊᒻᒪᓗ ᕚᐃᔪ ᑕᐃᔪ 2018 ᐊᓂᖅᓵᖅᐸᒃᑕᑦᑕ ᖃᓄᐃᑦᑑᓂᖓ ᐊᒻᒪᓗ ᐳᔪᕋᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᕐᕆᓐᓇᕐᓂᖅ ᐅᓂᒃᑳᖅ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔾᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᑎᑎᖅᑲᑯᑎᖏᑦ 190409-03MN107 16MN056. ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔾᑯᑦ ᑲᑎᒪᓕᖏᑦᑕ ᑎᑎᕋᖅᑕᐅᓯᒪᕝᕕᖓᑕ ᓈᓴᐅᑖ 324365. ᐋᒡᓂᑯ ᐄᒍ ᐅᔭᕋᓐᓂᐊᕐᕕᒃ ᓕᒥᑎᑦ 229 ᒪᒃᐱᒐᖅ.

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ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᖁᑎᓄᒃ (ASTM) ᓄᓇᕐᔪᐊᒥ. 2010. ᐊᑐᖅᑕᐅᒐᔫᒃᑐᑦ ᖃᐅᔨᓴᕈᑦᔫᑦ ᑲᑎᖅᓯᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐆᒃᑐᕋᐃᓂᕐᒧᑦ ᐳᔪᕋᕐᓂᒃ (ᓯᐊᒻᒪᕐᔪᑦ ᑕᕐᕆᓖᑦ); ᑎᒃᑯᐊᖅᑕᐅᓯᒪᔪᖅ D1739-98 (ᐊᕐᕆᖅᑕᐅᒃᑲᓐᓂᖅᓯᒪᔪᖅ 2010), ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᖁᑎᓄᒃ, ᐱᓇᓐᓇᖅ ᑳᔅᓯᕼᐆᑲᓐ, PA, ᐊᒥᐊᓕᑲᐃᑦ

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ᐃᓱᓕᑦᑎᔾᔪᑏᑦ ᓇᓗᓇᐃᔭᐅᑏᑦ / ᐃᓚᒋᐊᑭᑏᑦ ᑐᑭᓯᒋᐊᑭᑏᑦ

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i ᐋᓪᓃᑯ ᐄᒍᑯᑦ ᐊᐳᖅᑎᓈᖅᑐᖅ ᐱᓕᕆᐊᖓᑦ ᓯᕗᓪᓕᕐᒥ ᑲᑎᖅᓯᐃᓚᐅᖅᑐᑦ ᐳᔪᖃᕐᕕᓐᓇᖅᑐᓂᒃ ᒪᓂᖅᑲᒥ ᑎᑭᕘᒍ 2018-ᒧᑦ. ᑭᓯᐊᓂᓕ ᐊᕙᑎᓕᕆᓂᕐᒥᑦ ᐊᒻᒪ ᓯᓚᒥᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᑲᓇᑕᒥᒃᑯᑦ ᐅᖃᐅᓯᒃᓴᖃᓚᐅᖅᑐᑦ 2018-ᒥ ᑕᒪᓐᓇ ᑲᑎᖅᓯᐃᓂᖅ ᐳᔪᕋᒥᒃ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᓂᒃ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᖅ ᒪᓂᖅᑲᒥ ᐱᓕᕆᐊᖑᐃᓐᓇᖃᑦᑕᙱᓐᓂᖓᓂᒃ (ᐊᕙᑎᓕᕆᓂᕐᒥᑦ ᐊᒻᒪ ᓯᓚᒥᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᑲᓇᑕᒥᒃᑯᑦ 2018). ᐊᕙᑎᓕᕆᓂᕐᒥᑦ ᐊᒻᒪ ᓯᓚᒥᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᑲᓇᑕᒥᒃᑯᑦ ᓇᓗᓇᐃᖅᓯᓚᐅᖅᑐᑦ ᐊᔾᔨᒌᙱᕐᔪᐊᕐᓂᖏᓐᓂᒃ ᐱᑕᖃᕐᓂᐅᔪᖅ ᒥᑎᑦᑑᑎᓂᒃ ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖏᓐᓂᒃ ᓄᓇᑭᓐᓂᖅᓴᐅᔪᓂ ᐊᒻᒪᓗ ᑕᒪᕐᒦᒃ ᐊᓄᕆ ᐊᐳᓪᓗ ᒪᓂᖅᑲᒥ ᐊᒃᑐᐃᓂᖃᕐᓂᐊᖅᑐᑦ ᑎᑎᖅᑲᕐᑯᑎᓂᒃ. ᓱᓕᒃᑲᓐᓂᖅ, ᓇᓗᓇᐃᖅᓯᓚᐅᕐᕕᐅᔪᑦ ᐱᐅᒃᓴᕐᓂᖅᓴᐅᓪᓗᑎᒃ ᐱᓕᕆᔾᔪᓯᕐᓂᒃ ᐃᓗᓕᖃᖅᑐᓂᒃ ᐃᓂᓂᒃ ᐊᒻᒪᓗ ᒪᓕᒃᓗᒋᑦ ᐊᒃᑐᐊᔪᑦ ᖃᓄᐃᑦᑑᓂᖏᓐᓄᑦ ᓇᓗᓇᕆᑦᑎᐊᕐᓗᑎᒃ ᖃᐅᔨᒪᔾᔪᑕᐅᔪᑦ, ᓈᕐᓗ ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᕐᑯᑎᓄᑦ (ASTM) 2010. ᑭᐅᔾᔪᑕᐅᓗᓂ ᐊᕙᑎᓕᕆᓂᕐᒥᑦ ᐊᒻᒪ ᓯᓚᒥᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᑲᓇᑕᒥᒃᑯᓐᓄᑦ ᐅᖃᐅᓯᒃᓴᕆᓯᒪᔭᖓᓄᑦ ᐊᑐᓕᕐᑯᔭᖏᓐᓄᓗ (ᐊᕙᑎᓕᕆᓂᕐᒥᑦ ᐊᒻᒪ ᓯᓚᒥᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᑲᓇᑕᒥᒃᑯᑦ 2018, ᕗᐊᑯ 2020) ᐊᐳᖅᑎᓈᖅᑐᖅ 2018 ᐊᓂᖅᓵᖅᐸᒃᑕᑦᑕ ᖃᓄᐃᑦᑑᓂᖓᓄᑦ ᐊᒻᒪᓗ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖓᓄᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙵᓐᓇᕐᓂᕐᒧᑦ ᐅᓂᒃᑳᖅ (ᐋᓪᓃᑯ ᐄᒍ ᐅᔭᕋᓐᓂᐊᕐᕕᒃ ᓕᒥᑎᑦ - ᐊᐳᖅᑐᓈᖅᑐᖅ ᓴᓇᕝᕕᒃ 2019), ᑭᙳᓂᖓᒍᓗ ᐅᔭᕋᓐᓂᐊᕐᕕᖕᒥ ᖃᐅᔨᓴᕐᓂᖅ ᓇᓗᓇᐃᖅᓯᓚᐅᖅᑐᖅ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᕐᓂᖓᓄᑦ ᐊᔾᔨᒌᖃᑦᑕᙱᑦᑐᑦ ᖁᕙᓯᓐᓂᖅᓴᐅᓗᑎᒃ ᒪᓂᖅᑲᒥ ᖃᐅᔨᓴᒃᓴᓕᐅᖅᑕᐅᔪᑦ, ᐋᓪᓃᑯᒃᑯᑦ ᐊᑐᖖᓕᓚᐅᖅᑐᑦ ᐳᔪᖅ ᓯᐊᒻᒪᖃᑦᑕᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᙵᓐᓇᕐᓂᖅ ᐊᑐᖅᐳᑎᒃ ᐊᒥᐊᓕᑲᒥ ᑲᑐᔾᔨᖃᑎᒌᖏᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐱᕐᑯᑎᓄᑦ (ASTM) 2-ᒦᑕᓂᒃ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕖᑦ ᐳᖅᑐᓂᖃᖅᐳᑎᒃ (ᐋᓪᓃᑯ ᐄᒍ ᐅᔭᕋᓐᓂᐊᕐᕕᒃ ᓕᒥᑎᑦ - ᐊᐳᖅᑐᓈᖅᑐᖅ ᓴᓇᕝᕕᒃ 2020).

ii ᒪᕐᕉᒃ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕖᑦ ᐱᓕᕆᐊᖑᔪᓐᓃᓚᐅᖅᑐᑦ ᕿᒥᕐᕈᓂᕐᒥ ᓃᖅᑲᐃᓪᒪ ᐱᑐᐊᖅᓯᒪᓪᓗᑎᒃ ᑭᓪᓕᓕᖅᓯᓯᒪᓂᖏᓐᓄᑦ, ᐊᒻᒪᓗ ᐱᑕᖃᕐᓂᖏᑦ ᓯᕐᑯᒦᓪᓗᑎᒃ ᑲᖏᕆᔭᐅᔪᓂᒃ ᑕᐃᒪᐃᑐᐃᓐᓇᖅᑐᓂᒃ ᐊᒻᒪᓗ ᓇᓕᒧᖏᓐᓄᑦ ᐊᔾᔨᒌᙱᖃᑦᑕᖅᑐᑦ ᐊᒥᐊᒃᑯᓂ. ᑕᒪᕐᒦᒃ ᖃᐅᔨᓴᒃᓴᓕᐊᑦ ᑕᐃᑲᙵᓕᓚᐅᖅᑑᒃ ᐃᓂᒥ DF-M-01, ᐱᔭᐅᓪᓗᑎᒃ ᓄᕕᐱᕆ 18, 2022 (ᐳᔪᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ $_{\text{ᓇᐃᑦᑐᓂ}}$ = 2.96 mg/dm^2·× ᖃᐅᑕᒫᑦ, ᐳᔪᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ $_{\text{ᓇᐃᑦᑐᓂ}}$ = 0.57 mg/dm^2·× ᖃᐅᑕᒫᑦ,) ᐊᒻᒪ ᔮᓄᐊᕆ 19, 2023 (ᐳᔪᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ $_{\text{ᓇᐃᑦᑐᓂ}}$ = 0.59 mg/dm^2·× ᖃᐅᑕᒫᑦ, ᐳᔪᖅ ᓯᐊᒻᒪᒃᐸᓪᓕᐊᔪᖅ $_{\text{ᓇᐃᑦᑐᓂ}}$ = 0.10 mg/dm^2·× ᖃᐅᑕᒫᑦ). ᐅᔾᔨᕆᓂᐊᖅᐸᑦ, ᑭᓯᐊᓂᓕ, ᑕᒪᓐᓇ ᑭᑭᑕᐅᓂᖏᑦ ᑎᑎᖅᑲᕐᑯᑏᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᑦ ᓴᖅᑮᔭᖅᑐᑦ ᐊᔾᔨᙳᐊᖅ 1-ᒥ, ᓇᓗᓇᐃᔭᐅᑎᖃᖅᐳᑎᒃ ᐊᐅᐸᖅᑐᒥᒃ.