Appendix 28 : 2020 Dust and Vegetation Study

AGNICO EAGLE

Meliadine Project

Dust and Vegetation Study, 2020

March 2021

Project No.: 0544016-WP4

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March 2021

Meliadine Project

Dust and Vegetation Study, 2020

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EXECUTIVE SUMMARY

The Meliadine Mine (the Project), owned and operated by Agnico Eagle Mines Limited (Agnico Eagle), is located on Inuit Owned Land (IOL) approximately 25 km north of Rankin Inlet, Nunavut. A 34 km All Weather Access Road (AWAR) connects the Project to Rankin Inlet. During July each year, groups of Qamanirjuaq caribou occur in the Project area, sometimes crossing through the Project site and the AWAR.

In 2020, a study was conducted to determine the extent to which dust extends downwind from the Mine Site and AWAR, and whether that dust affects vegetation. The study was designed to identify if distance to Project infrastructure could be linked to variation in dust levels, metal concentrations in plant tissues, plant biomass, and other metrics related to the health and quality of plant species that may be consumed by caribou.

The study was completed in accordance with the Project Certificate and commitments by Agnico Eagle to conduct an on-going monitoring program to determine the distribution, abundance, and health of vegetation species used as caribou forage near Project areas.

The study was divided into two main components: a) measurement of dustfall deposition; and b) measurement of the properties of vegetation, including biomass, species composition and metals concentrations in lichen and willow plants. Measurements were taken from a Mine Site transect, an AWAR transect, and a reference site. Each transect (mine and AWAR) consisted of 8 stations placed at increasing distances from the emission source, from 50 m to 2000 m downwind.

The key findings of the study on dust and vegetation are:

- Close to the dust sources, (50 m from the mine site) dustfall was at four to five times background levels – as estimated at the reference site. At 50 m from the AWAR, dustfall was three times background levels.
- Dustfall deposition decreased quickly, following an exponential curve, with distance from the mine and AWAR and approached background levels at approximately 500 m from the source, but dust continued to decline to a distance of 1,500 m. This may be due to spatial variation in background dust levels.
- In Arctic willow tissue samples, aluminum, iron, arsenic, nickel, and zinc levels were found to decline with distance from the Mine Site, approaching background levels approximately 1,500 m from the source. From the AWAR transect this same relationship was found for aluminum and iron.
- In reindeer lichen tissue samples, aluminum, iron, and nickel levels were found to significantly decline with distance from both the Mine Site and the AWAR, approaching background levels approximately 1,500 m from the source.
- The decline in dust deposition with distance from the mine and AWAR, was generally matched by the decline in metals in vegetation samples with distance from the mine and AWAR.
- Plant biomass increased with distance from the AWAR and approached background levels approximately 250 m from the road. No relationship between biomass and distance was found for the mine transect.
- The area of the total ground covered by plants (percent cover) did not change with distance from the mine or AWAR. However, the types of plants did change with distance from the AWAR. The percent cover of grasses decreased with increasing distance from the AWAR. Lichen and moss percent cover increased with increasing distance from the AWAR. No relationships were found for the mine transect.

This study concludes that there is a correlation between dustfall and some metals content found in plants – both decline to background levels at approximately 1,500 m from the Project. Plant biomass is slightly lower within approximately 250 m of the AWAR. These results should be interpreted with caution, since there may be other environmental factors that can influence vegetation. The AWAR was constructed on a low ridge which is drier than the surrounding tundra which may alter vegetation cover and vigor, and therefore metals concentration.

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Acronyms and Abbreviations

Agnico Eagle	Agnico Eagle Mines Ltd.
AWAR	Meliadine Mine All Weather Access Road
BQCMB	Beverly Qamanirjuaq Caribou Management Board
IOL	Inuit Owned Land
GN	Government of Nunavut
GNWT ENR	Government of Northwest Territories Department of Environment and Natural Resources
NIRB	Nunavut Impact Review Board
TEMMP	Terrestrial Environment Management and Monitoring Plan
The Project	The Meliadine Mine

1. BACKGROUND

1.1 Project Overview

The Meliadine Mine (the Project), 100% owned by Agnico Eagle Mines Limited (Agnico Eagle), is located approximately 25 kilometres (km) north of Rankin Inlet, Nunavut. A 34 km All Weather Access Road (AWAR) connects the Project to Rankin Inlet. A bypass road was constructed to the west and south of Rankin Inlet to allow mine traffic to circumvent the hamlet when traveling from the AWAR to the Project marine laydown (Figure 1-1).

The Meliadine Mine was approved with a life of mine plan that includes production from six ore bodies Tiriganiaq, Wesmeg, Normeg, F-Zone, Pump and Discovery. A conceptual plan for mining these deposits was approved by the Nunavut Impact Review Board (NIRB) in 2016 (Project Certificate #006, Amendment 001; February 2019). Mining and ore processing of the Tiriganiaq deposit, including two open pits, underground mining and associated ore processing, waste management and ancillary infrastructure operation was subsequently licenced by the Nunavut Water Board (NWB) (Meliadine Mine Type A Water Licence No. 2AM-MEL1631).

Operations at the Tiriganiaq deposit began in Q2 2019. The remainder of the orebodies are planned throughout the life of the Meliadine complex.

A study monitoring the potential effects of dustfall on vegetation at the Meliadine Mine and the AWAR was conducted in July to September of 2020.

1.2 Qamanirjuaq Herd

The Qamanirjuaq caribou herd is a large caribou herd numbering approximately over 200,000 animals in 2017, down from over 300,000 animals reported in 2008 (COSEWIC 2016). The herd range is centered in south-eastern Nunavut. The herd range stretches approximately 1,000 km from Chesterfield Inlet in the north to northern Manitoba in the south, and from Hudson Bay on the east to eastern Northwest Territories and north-eastern Saskatchewan in the west (BQCMB 2020a).

The Qamanirjuaq and Beverly caribou herds are managed by the Beverly Qamanirjuaq Caribou Management Board (BQCMB), a co-management board established in 1982 to safeguard the herds. The BQCMB Board consists of eight community members from the Kivalliq, Nunavut; southern Northwest Territories (NWT); northern Saskatchewan; and northern Manitoba, along with five members representing the governments of Canada, Nunavut, NWT, Saskatchewan and Manitoba.

In 2014, the BQCMB rated the Qamanirjuaq herd as having Medium vulnerability due to continued population declines since 2008 (BQCMB 2014).

The herd generally winters below the treeline in northern Manitoba, Saskatchewan and the adjoining areas of NWT and Nunavut. Spring migration is north along the coast of Hudson Bay, past the communities of Arviat, Whale Cove and Rankin Inlet to a broad calving ground generally centered on Qamanirjuaq Lake (BQCMB 2020a).

Following calving, the caribou form into large groups and radiate out from the calving grounds, including east towards coast. During July, groups of animals from this herd interact with the hamlet of Rankin Inlet, the Meliadine Mine and the AWAR connecting the two.

During summer and fall, the caribou generally move south and inland, gradually returning south towards their wintering areas by early December.

Maps of the caribou range and movement are available on the BQCMB website (https://arctic-caribou.com/resources/#maps).

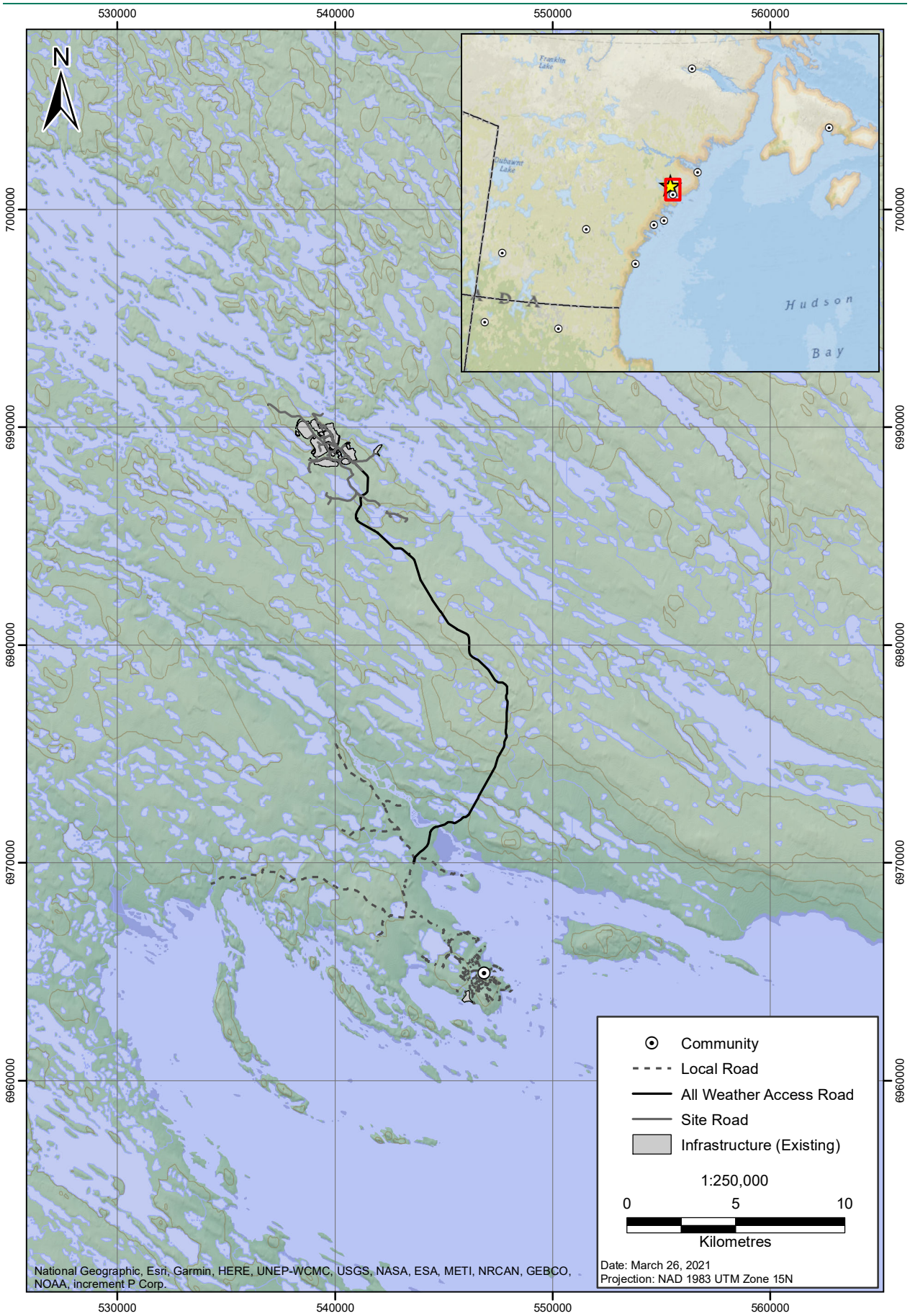

Figure 1-1: Meliadine Gold Project Location

2. STUDY OBJECTIVES

This study was designed to investigate the distance at which dust is detectable from the Meliadine Mine Site and AWAR and to investigate if dustfall is related to vegetation abundance (biomass), community composition (percent cover) and metals content. The objectives of the 2020 study were:

- To conduct a study of dust and vegetation survey at the Project site to determine whether it is appropriate in this area at this time of year.
- To measure how far from the road it is possible to detect dust deposition.
- To measure whether there are increased metals in lichens near the road, and whether these elevated metals in lichens are related to dust deposition.
- To measure whether there are increased metals in herbaceous vegetation, and whether these metals are related to soils metals and dust deposition.
- To measure whether there is a relationship between distance to the road, dust deposition, and vegetation biomass and vegetation community composition.

2.1 Terrestrial Environment Management and Monitoring Plan

The Meliadine Mine 2014 Project Certificate and 2019 Project Certificate Amendment from the Nunavut Impact Review Board (NIRB), Term and Condition 39 requires the Project to include in its annual NIRB report:

> (T&C 39) An on-going monitoring program to determine the distribution, abundance, and health of vegetation species used as caribou forage (such as lichens) near Project areas.

The Meliadine Mine Terrestrial Environment Management and Monitoring Plan (TEMMP; Agnico Eagle 2020) is designed to meet this condition, with a vegetation and wildlife habitat monitoring program (Section 4.6) that has the following objectives:

- Measure direct loss of plant communities as a result of the Project footprint;
- Measure degree of re-vegetation of disturbed areas;
- Measure distribution and abundance of non-native invasive plant species; and
- Measure plant health as part of the dust monitoring program.

The dust and vegetation study described in this report is designed to address the last of these objectives – to measure plant health.

This monitoring program also addresses the requirements provided by the NIRB to Agnico Eagle in a letter dated June 9, 2020 regarding the: Nunavut Impact Review Board Direction Regarding the “2020 Saline Discharge Strategy” submitted by Agnico Eagle Mines Limited in relation to the Meliadine Gold Mine Project. This saline discharge strategy included increasing traffic of water trucks on the AWAR. The NIRB required Agnico Eagle to make updates to four management and monitoring plans, including:

1. Terrestrial Environment Management and Monitoring Plan

   The Proponent shall update the TEMMP to include a detailed plan for enhanced monitoring of the potential for truck traffic impacts to wildlife, accounting for the increased truck traffic on the all weather access road (AWAR) to 88 one way trips per day.

3. STUDY AREA

The study area for dust and vegetation monitoring included the existing Project footprint of the Meliadine Mine site and the All Weather Access Road (AWAR), plus a 2 km buffer “downwind” of the Project, as determined by the prevailing northwest to southeast wind direction. A reference site 4 km upwind of the Project was also included in the study area.

The dominant terrain in the Project area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and lakes. A series of low relief ridges are composed of glacial deposits, oriented in a northwest-southeast direction, which control the regional surface drainage patterns. The property is about 60 meters above sea level in low-lying topography with numerous lakes (TEMMP; Agnico Eagle 2020).

The AWAR is built on a low ridge that was historically used as an All Terrain Vehicle (ATV) trail by residents of Rankin Inlet.

4. METHODS

4.1 Field Methods

To study the potential effects of dustfall on vegetation, a transect was established at the Mine Site and the AWAR (Figure 4.1-1). Each transect contained eight stations at 50 m, 100 m, 250 m, 500 m, 750 m, 1,000 m, 1,500 m, and 2,000 m southeast and downwind of the road. The stations were moved parallel to the road to place each one in the same vegetation type - heath tundra – so that sampling was conducted across a common vegetation community. An area 4 km north of Mine Site and upwind was used as a Reference Site.

4.1.1 Dustfall Sampling

To study the potential effects of dustfall on vegetation, dustfall deposition rates and metal deposition rates were monitored at the Project using on-site dustfall stations distributed along two transects (DF-Mine at the Mine Site and DF-Road at the All Weather Access Road; AWAR) as shown in Photo 4.1-1.
Each transect contained eight stations at 50 m, 100 m, 250 m, 500 m, 750 m, 1000 m, 1500 m, and 2000 m southeast and downwind of the road in heath tundra. An area 4 km north of Mine Site and upwind was used as a Reference Site (DF-1).

Photo 4-1-1: Example of a dustfall sampling station.

Dustfall monitoring was completed in accordance with sampling method ASTM International D1739-98 (ASTM International 2017) and BC ENV dustfall sampling methodology (BC ENV 2018).
Stations consisted of two laboratory supplied collection bottles with large diameter opening. The bottles were mounted at 2 m above the ground and surrounded by a windscreen to increase catch efficiency. Photo 4.1-1 shows an image of a dustfall station. Sample bottles were exposed for approximately 30-day periods, after which they were capped and exchanged for new sample bottles.

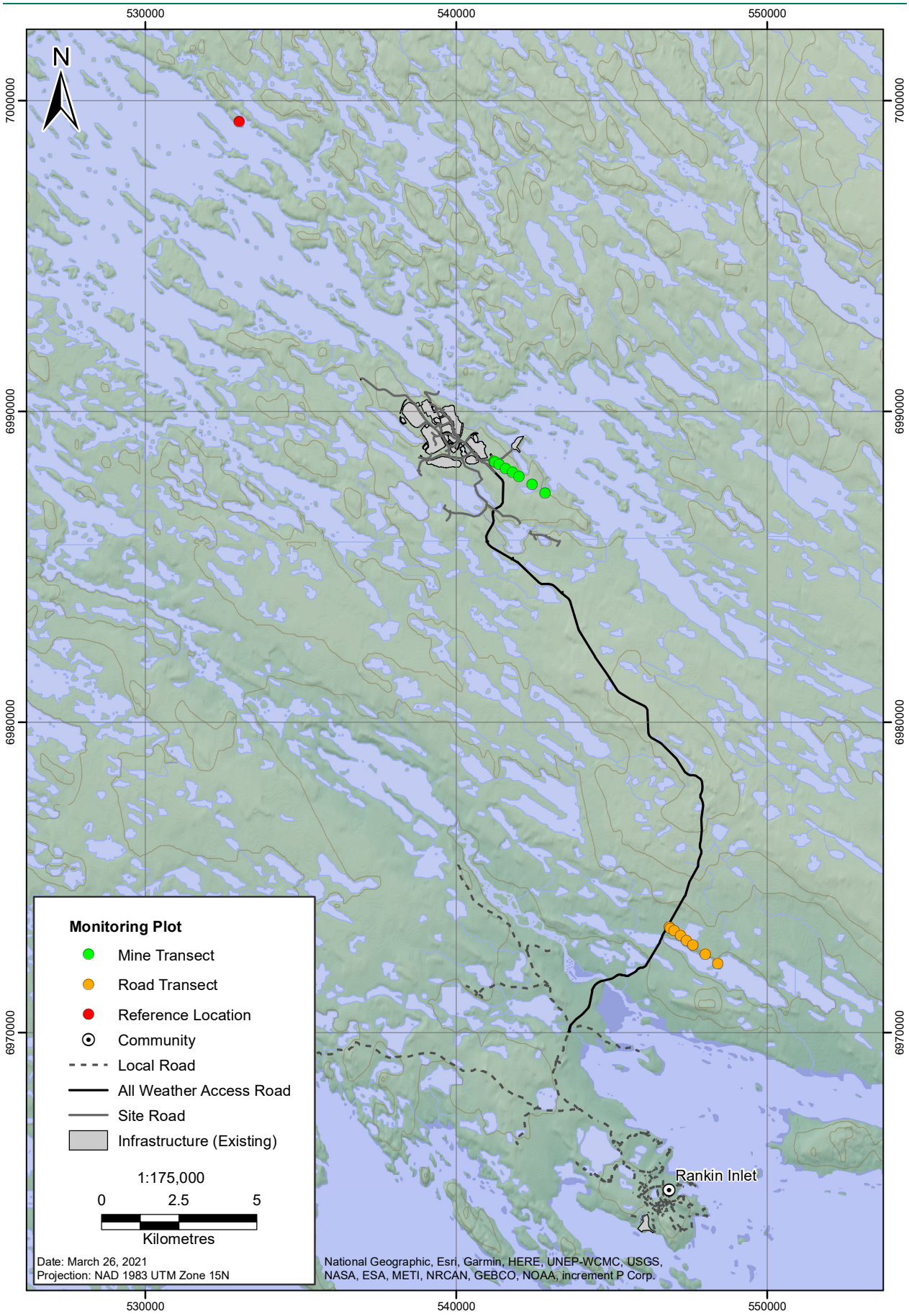

Figure 4.1-1: Locations of Dust and Vegetation Monitoring Plots

Dustfall was monitored during consecutive periods of approximately 30 days each, covering both August and September, 2020. Due to logistical issues with delivery of canisters to site, samples were analyzed by two different labs. August samples were sent to Bureau Veritas Labs in Ontario for analysis. September samples were shipped to ALS Laboratory in Vancouver for analysis.

4.1.2 Plant Tissue Sampling for Metals

The amount of metals in plant tissue was measured by collecting samples of reindeer lichen (*Cladonia rangiferina*) and Arctic willow (*Salix arctica*) at each of the eight stations at the Mine Site and AWAR. These two species were selected as they are two of the plants most commonly consumed by caribou (COSEWIC 2016) and they both occur in dry heath tundra. Plant tissue was collected by clipping with scissors at ground level and excluding soil from the sample. Three bags of each species were collected at each station; each bag contained five samples and had a minimum weight of 150 g. Three bags per species, each containing five samples were also collected at random locations at the Reference Site. Reindeer lichen was stored in paper bags, and Arctic willow was stored in either plastic or paper bags. Samples were frozen and shipped to ALS Laboratory in Vancouver for analysis.

4.1.3 Plant Biomass

Plant biomass was measured in aboveground plant biomass at both the mine site and AWAR transects. At each of the eight sampling stations, a secondary plant transect was established in heath tundra. Samples were collected every 5 m along the transect for a total of five samples at each of the eight stations. At each sampling location, all aboveground plant biomass within a 50 x 50 cm quadrat was clipped, including the lichen and moss layer, and collected into a bag. Aboveground plant biomass was also collected from five random 50 x 50 cm quadrat samples at the Reference Site. Samples were frozen and shipped to ALS in Vancouver to measure wet and dry weight.

4.1.4 Vegetation Cover and Community Composition

To test for effects on vegetation community composition, the percent cover of vegetation and bare ground was measured. One transect at each of the eight stations was established at the Mine Site and AWAR. Samples were collected by photographing a 50 x 50 cm quadrat vertically from a set height every 5 m along the transect for a total of 10 photos at each of the eight stations. Ten random 50 x 50 cm quadrat samples were photographed at the Reference Site. A fixed grid consisting of 6 x 6 lines was digitally applied to each photo to estimate percent cover and community composition. The cover type (lichen/moss, grass, forb, shrub, bare ground, or rock) at each grid intersection was recorded for a total of 36 intersections per photo (Photo 4.1-2). Community composition was estimated by dividing number of intersections of each cover type by 36.

4.2 Laboratory Analysis

Analysis of plant tissue samples for metals was conducted using standard analytical industry methods. ALS Laboratory (Vancouver, BC) performed a digestion procedure for all elements, consisting of an acid digestion-oxidation under elevated temperature and pressure in a closed Teflon vessel system. For mercury, a larger aliquot of the wet sample was digested, and the digestion was performed using similar ratios of digesting/oxidizing reagents as standard EPA procedures. Additional concentrated nitric acid was added to facilitate the digestion of the high organic content.

Photo 4.1-2: Photo of 50x50 cm quadrat sampled in the AWAR transect with a 6x6 line fixed grid digitally applied.

To analyze the dustfall and metal deposition rates, dustfall canisters were collected and sent to a laboratory at the end of each sampling period. For August, the containers were sent to Bureau Veritas Laboratories, while the containers were sent to the ALS Laboratory Group (Canadian Association for Laboratory Accreditation no. A1719) for September. Samples were analyzed for particulates (total, soluble, and insoluble), anions (sulphate, nitrate, chloride, and ammonia) and total metals. Laboratory report results are included in Appendix A.

4.3 Statistical Analysis

Laboratory data results were reviewed for anomalies before processing the data. Laboratory reports were re-issued when needed. Statistical summaries were then generated for dustfall and metal deposition results. Results from Bureau Veritas Labs for aluminum, boron, copper, iron, magnesium, manganese, and sodium were excluded due to the use of copper sulfate solution in the dustfall canisters.

For any laboratory results that were below the detection limits, the value was assumed to be equal to the detection limit to be conservative. Detection limits fluctuated depending on how much sample material was collected.

The percent of metal deposition in total dustfall was calculated by dividing the metal deposition value by the total dustfall value and multiplying by 100. This was done for each metal parameter within each sample. Summary statistics were then calculated. All datasets and calculations were reviewed by a senior atmospheric scientist as part of the QA/QC procedure.

Linear-log regressions were performed on dustfall deposition, metal concentrations in plant tissues, plant biomass, and vegetation cover in R software for statistics version 1.4.1.

5. RESULTS AND DISCUSSION

5.1 Dustfall

Dustfall deposition results are summarized in Table 5.1-1 and Figure 5.1-1. Dustfall and metals deposition rates were calculated separately for August and September. September had higher precipitation which resulted in suppression of dust emissions. This suppression of dust emissions can be seen in lower dustfall deposition rates in September where 11 of 16 dustfall samples were below detection limits. Therefore, the relationship between dustfall deposition rate and distance from the mine or AWAR shown in Figure 5.1-1 only includes data for August.

On average, total dustfall deposition at both transects ranged from 0.13 mg/dm2/day at the stations most distant from emissions sources (DF-Mine-2000) to 1.04 mg/dm2/day at the closer station (DF-Mine-50). August recorded higher deposition rates at most stations compared to September due to the precipitation discussed above.

Dustfall decreased exponentially with increasing distance from both the Mine Site and AWAR (Table 5.1-2) and Figure 5.1-1. Based on the results it appears that dustfall deposition rates approach background values at approximately 500 to 1,000 m and continue declining to 1,500 m downwind of the source.

The exponential decrease in dustfall deposition rates is expected as it has been found at other mining operations in northern Canada. Ekati Diamond Mine in the Northwest Territories reported a similar decrease in dustfall from a haul road (DDCorp 2015). The distance from the road at which background rates are reached will not be the same for all roads or emissions sources as it will be dependent on the amount of dust being produced, the wind speed at the site and particulate size distribution of the source material.

The dustfall deposition rate at the reference location (DF-Ref-1) is higher than many of the transect locations. As the reference location is upwind of dust sources related to the Meliadine Project, an explanation for this result is not obvious. It is possible that the result is a sampling anomaly.

Metal deposition results are summarized in Table 5.1-3. Many sample results were below metal parameter detection limits. On average and across all stations, the highest metal deposition was for iron: 0.063 mg/dm^2/day (at DF-Ref-1) followed by calcium: 0.032 mg/dm^2/day (at DF-Mine-50). The number of samples above the detection limit for each metal parameter are summarized in Table 5.1-3.

Laboratory detection limits change from sample to sample depending on how much sample material is available for analysis. To be conservative, values below detection limits were set to the detection limit value. In some cases, samples with results below detection limits had a higher value than other samples with results that were above the detection limit.

The percent of metal deposition in total dustfall was calculated by dividing the metal deposition value by the total dustfall value and multiplying by 100. This was done for each metal parameter within each sample for which both the dustfall and metal deposition rates were above detection limits. Table 5.1-4 presents summary statistics of these results. Based on the high number of samples below detection limits it is not possible to draw strong relationships between distance and metals deposition rates. However, it is reasonable to assume that if the source of the metals is the Mine Site or the AWAR then the same relationship exists as seen in the dustfall results.

Table 5.1-1: Total Dustfall Results, August and September, 2020

2020 Monitoring Period	DF-Road-50	DF-Road-100	DF-Road-250	DF-Road-500	DF-Road-750	DF-Road-1000	DF-Road-1500	DF-Road-2000	DF-Mine-50
August-20	0.78	0.44	0.16	0.32	0.28	0.26	0.18	0.24	1.51
September-20	**0.16**	**0.16**	**0.16**	**0.16**	**0.16**	**0.16**	0.33	**0.16**	0.58
Mean	*0.47*	*0.30*	*0.16*	*0.24*	*0.22*	*0.21*	*0.26*	*0.20*	*1.04*

2020 Monitoring Period	DF-Mine-100	DF-Mine-250	DF-Mine-500	DF-Mine-750	DF-Mine-1000	DF-Mine-1500	DF-Mine-2000	DF-Ref-1
August-20	1.13	0.41	0.18	0.27	0.28	0.16	0.13	0.26
September-20	0.95	0.40	0.18	**0.16**	**0.16**	**0.16**	**0.16**	**0.28**
Mean	*1.04*	*0.41*	*0.18*	*0.21*	*0.22*	*0.16*	*0.15*	*0.27*

Notes:
*Values below detection limits were set to the detection limit value for calculations and are **bolded**.*

Table 5.1-2: Linear-log Results of Distance and Dustfall

Site	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
Mine Site	(Intercept)	2.74	1.81 – 3.67	<0.001	***	y = 2.74 -0.37 ln(x), R^2 = 0.857
	ln(distance)	-0.37	-0.52 – -0.22	0.001	***	
	Observations	8				
	R^2	0.857				
AWAR	(Intercept)	1.07	0.48 – 1.65	0.004	**	y = 1.07 -0.12 ln(x), R^2 = 0.622
	ln(distance)	-0.12	-0.21 – -0.03	0.02	*	
	Observations	8				
	R^2	0.622				

*[1] Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.*

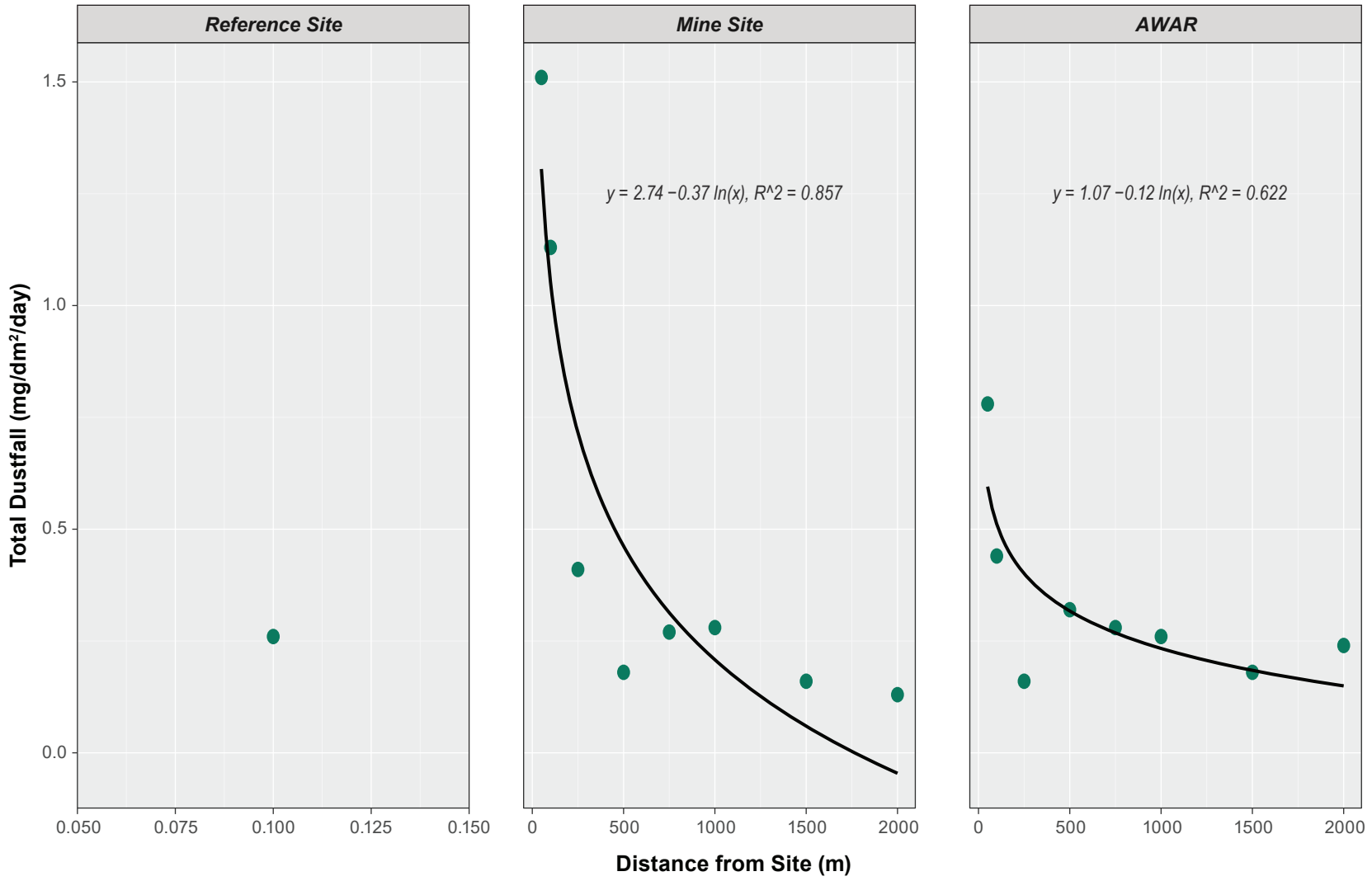

Figure 5.1-1: Total Dustfall for August with Linear-log Curve Fitted

Table 5.1-3: Dustfall and Metals Deposition Summary Results, August and September, 2020

Parameters	Number of Samples	Number of Samples above Detection Limit	Deposition (mg/dm^2/day)					
			Mean	Median	Standard Deviation	Minimum	Maximum	Station with Maximum Value
Particulates								
Dustfall, total	34	22	0.34	0.21	0.31	0.13	1.51	DF-Mine-50
Dustfall, total insoluble	34	24	0.24	0.12	0.29	0.05	1.29	DF-Mine-50
Dustfall, total soluble	34	18	0.13	0.10	0.05	0.05	0.24	DF-Road-50
Total Metals								
Aluminum, total	17	17	1.0E-03	6.3E-04	1.1E-03	1.3E-04	4.6E-03	DF-Mine-50
Antimony, total	34	17	1.1E-05	9.8E-06	7.3E-06	4.6E-06	3.4E-05	DF-Road-50
Arsenic, total	34	25	1.3E-05	8.9E-06	1.7E-05	4.6E-06	8.6E-05	DF-Mine-50
Barium, total	34	30	3.2E-05	1.3E-05	4.6E-05	4.6E-06	1.9E-04	DF-Mine-50
Beryllium, total	34	0	1.4E-05	1.4E-05	1.2E-05	2.0E-06	3.9E-05	-
Bismuth, total	34	0	1.6E-05	1.7E-05	1.1E-05	5.0E-06	3.9E-05	-
Boron, total	17	1	4.8E-04	5.0E-04	9.2E-05	1.4E-04	5.6E-04	DF-Road-250
Cadmium, total	34	15	1.9E-06	1.9E-06	1.0E-06	5.0E-07	5.4E-06	DF-Road-500
Calcium, total	34	33	6.4E-03	2.9E-03	7.3E-03	1.9E-03	3.2E-02	DF-Mine-50
Chromium, total	34	4	3.1E-05	3.0E-05	9.8E-06	2.3E-05	6.5E-05	DF-Mine-50
Cobalt, total	34	6	5.6E-06	5.0E-06	4.7E-06	3.0E-06	2.6E-05	DF-Mine-50
Copper, total	17	8	1.6E-03	2.7E-05	6.6E-03	2.3E-05	2.7E-02	DF-REF-1
Iron, total	17	14	7.3E-03	3.1E-03	1.5E-02	1.4E-03	6.3E-02	DF-REF-1
Lead, total	34	20	6.0E-06	4.3E-06	5.3E-06	2.3E-06	2.4E-05	DF-Mine-100
Lithium, total	34	2	1.5E-04	1.5E-04	1.2E-04	3.0E-05	3.9E-04	DF-REF-1
Magnesium, total	17	17	2.4E-03	2.1E-03	1.1E-03	8.5E-04	5.3E-03	DF-Mine-50
Manganese, total	17	17	8.0E-05	4.6E-05	7.9E-05	2.5E-05	2.8E-04	DF-Mine-50
Mercury, total	34	0	1.3E-03	1.2E-03	1.3E-03	1.0E-06	3.9E-03	-

Parameters	Number of Samples	Number of Samples above Detection Limit	Deposition (mg/dm^2/day)					
			Mean	Median	Standard Deviation	Minimum	Maximum	Station with Maximum Value
Total Metals *(cont'd)*								
Molybdenum, total	34	0	2.9E-06	3.0E-06	6.4E-07	2.3E-06	6.0E-06	-
Nickel, total	34	13	2.2E-05	2.4E-05	1.5E-05	5.0E-06	7.5E-05	DF-Mine-50
Phosphorus, total	34	7	1.8E-03	2.4E-03	1.1E-03	5.0E-04	3.9E-03	DF-REF-1
Potassium, total	34	14	2.7E-03	2.4E-03	1.7E-03	1.0E-03	1.0E-02	DF-Mine-50
Selenium, total	34	0	3.1E-05	3.3E-05	2.2E-05	1.0E-05	7.8E-05	-
Silicon, total	34	18	4.0E-03	2.5E-03	5.3E-03	6.0E-04	2.6E-02	DF-Mine-50
Silver, total	34	0	5.2E-07	5.0E-07	9.9E-08	4.6E-07	1.0E-06	-
Sodium, total	34	34	1.4E-02	1.5E-02	5.0E-03	6.5E-03	2.7E-02	DF-Road-100
Strontium, total	34	33	4.8E-05	2.2E-05	6.3E-05	8.6E-06	2.9E-04	DF-Road-50
Thallium, total	34	0	2.7E-06	2.6E-06	2.5E-06	3.0E-07	7.8E-06	-
Tin, total	34	2	5.8E-06	5.0E-06	3.0E-06	4.6E-06	2.2E-05	DF-Road-50
Titanium, total	34	15	3.4E-04	4.8E-04	2.6E-04	2.7E-05	8.6E-04	DF-Mine-50
Uranium, total	34	3	1.6E-06	1.8E-06	1.0E-06	5.0E-07	2.6E-06	DF-Road-50

Notes:
Values below detection limits were set to the detection limit value for calculations. Detection limits may change from sample to sample depending on sample volume.
Dash (-) indicates maximum value station is not applicable because all samples were below the detection limits.

Table 5.1-4: Percent of Metal Deposition in Total Dustfall, including Detection Limit Values, August and September 2020

Parameters	Number of Samples	Number of Samples with Both Total Dustfall and Metal above Detection Limit	Metal Deposition / Total Dustfall Deposition (%)				
			Mean	Median	Standard Deviation	Minimum	Maximum
Aluminum, total	17	6	2.9E-01	2.1E-01	2.7E-01	5.0E-02	8.0E-01
Antimony, total	34	17	6.3E-03	6.4E-03	2.9E-03	1.3E-03	1.1E-02
Arsenic, total	34	18	3.5E-03	3.3E-03	1.6E-03	1.2E-03	7.1E-03
Barium, total	34	18	9.9E-03	9.0E-03	5.6E-03	1.4E-03	2.0E-02
Beryllium, total	34	0	-	-	-	-	-
Bismuth, total	34	0	-	-	-	-	-
Boron, total	17	1	5.5E-02	5.5E-02	-	5.5E-02	5.5E-02
Cadmium, total	34	15	6.0E-04	4.6E-04	5.4E-04	6.7E-05	1.7E-03
Calcium, total	34	21	2.0E+00	1.9E+00	8.3E-01	6.0E-01	4.6E+00
Chromium, total	34	3	4.5E-03	4.5E-03	2.4E-04	4.3E-03	4.8E-03
Cobalt, total	34	6	1.2E-03	1.1E-03	4.9E-04	5.6E-04	1.8E-03
Copper, total	17	3	3.5E+00	5.3E-03	6.1E+00	3.7E-03	1.1E+01
Iron, total	17	6	4.9E+00	8.6E-01	9.6E+00	5.6E-01	2.5E+01
Lead, total	34	13	2.4E-03	2.1E-03	1.8E-03	6.2E-04	7.6E-03
Lithium, total	34	2	3.2E-03	3.2E-03	9.1E-04	2.6E-03	3.9E-03
Magnesium, total	17	6	6.4E-01	5.4E-01	3.1E-01	3.3E-01	1.1E+00
Manganese, total	17	6	3.2E-02	2.4E-02	2.1E-02	1.3E-02	6.5E-02
Mercury, total	34	0	-	-	-	-	-
Molybdenum, total	34	0	-	-	-	-	-
Nickel, total	34	13	4.5E-03	4.8E-03	1.6E-03	1.9E-03	7.2E-03
Phosphorus, total	34	7	5.0E-01	2.0E-01	6.1E-01	7.6E-02	1.8E+00
Potassium, total	34	14	8.0E-01	6.2E-01	5.5E-01	4.0E-01	2.4E+00
Selenium, total	34	0	-	-	-	-	-
Silicon, total	34	18	9.5E-01	6.8E-01	5.6E-01	3.8E-01	1.9E+00
Silver, total	34	0	-	-	-	-	-
Sodium, total	34	22	4.4E+00	3.7E+00	2.7E+00	6.8E-01	1.1E+01
Strontium, total	34	21	1.4E-02	1.2E-02	7.9E-03	5.1E-03	3.7E-02
Thallium, total	34	0	-	-	-	-	-
Tin, total	34	2	1.8E-03	1.8E-03	1.4E-03	7.6E-04	2.8E-03
Titanium, total	34	15	3.2E-02	2.0E-02	2.1E-02	1.2E-02	7.6E-02
Uranium, total	34	3	8.4E-05	7.1E-05	2.2E-05	7.1E-05	1.1E-04

Parameters	Number of Samples	Number of Samples with Both Total Dustfall and Metal above Detection Limit	Metal Deposition / Total Dustfall Deposition (%)				
			Mean	Median	Standard Deviation	Minimum	Maximum
Vanadium, total	34	8	2.3E-03	2.9E-03	1.2E-03	7.2E-04	3.4E-03

Note: values are calculated only for samples where both the metal and dustfall deposition rates are above the detection limit.

5.2 Vegetation

5.2.1 Plant Tissue Metals

Six metals were selected as indicators of plant tissue health during the 2009 Terrestrial Vegetation and Wildlife Baseline (Golder Associates 2012): Aluminum, arsenic, iron, manganese, nickel and zinc concentrations were chosen for analysis. Aluminum, arsenic, iron, and nickel concentration in reindeer lichen and Arctic willow were relatively low at the Reference Site.

Concentrations of aluminum, arsenic, iron, and nickel in both the reindeer lichen (Figure 5.2-1a) and Arctic willow (Figure 5.2-1b) samples decreased exponentially with increasing distance from the Mine Site (Table 5.2-1). At the AWAR, aluminum, iron, and nickel concentrations in reindeer lichen samples decreased significantly and exponentially with increasing distance from the AWAR, but arsenic concentrations increased (Figure 5.2-1a, Table 5.2-1). In Arctic willow samples, aluminum and iron concentrations decreased exponentially with increasing distance from the AWAR, but arsenic and zinc concentrations increased (Figure 5.2-1b, Table 5.2-1). See Figure 4.1-1 for sampling locations and Appendix B Table 1 for plant tissue metal concentrations data.

5.2.2 Plant Biomass

Distance from the Mine Site did not have a significant effect on biomass, however biomass increased with increasing distance from the AWAR (Figure 5.2-2, Table 5.2-2). Biomass from quadrats sampled at the Reference Site was generally greater (mean dry mass = 68.55 g, SE = 8.135) than at Mine site and AWAR transects. See Appendix B Table 2 for plant biomass data.

Arctic vegetation communities are notoriously slow to change with environmental conditions.
The Meliadine mine has been active for only ~3 years, which is a very short time relative to plant growth. Therefore, strong responses in plant biomass were not expected for this project.

The AWAR was constructed on a long, low ridge that has traditionally been used as an ATV trail by residents of Rankin Inlet. The slightly higher and therefore dryer conditions near the AWAR likely influence vegetation cover. When setting up the sampling transects, a common vegetation community was chosen (heath tundra) to attempt to control for changes in topography, but the plant biomass results presented here may well be explained topography alone; i.e., plants growing on higher, dryer locations near the AWAR would grow more slowly and have lower biomass.

5.2.3 Vegetation Cover and Community Composition

Grass percent cover decreased with increasing distance from the AWAR (Figure 5.2-3, Table 5.2-3). Lichen and moss percent cover increased with increasing distance from the AWAR only. Percent cover of shrubs, forbs, and bare ground was not significantly affected by distance from either the Mine Site or AWAR. See Appendix B Table 3 for vegetation cover and community composition data.

Table 5.2-1: Linear-log Regression Results of Distance and Metal Concentrations in Plant Tissue

Site	Species	Metal	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
Mine Site	Reindeer lichen	Aluminum	(Intercept)	3329.71	2753.9 – 3905.51	<0.001	***	y = 3329.71 -413.61 ln(x), R^2 = 0.795
			ln(distance)	-413.61	-506.35 – -320.88	<0.001	***	
			Observations	24				
			R^2	0.795				
		Arsenic	(Intercept)	16.53	12.63 – 20.43	<0.001	***	y = 16.53 -1.87 ln(x), R^2 = 0.633
			ln(distance)	-1.87	-2.49 – -1.24	<0.001	***	
			Observations	24				
			R^2	0.633				
		Iron	(Intercept)	6515.3	5384.02 – 7646.59	<0.001	***	y = 6515.3 -814.8 ln(x), R^2 = 0.796
			ln(distance)	-814.8	-997 – -632.6	<0.001	***	
			Observations	24				
			R^2	0.796				
		Manganese	(Intercept)	135.47	11.06 – 259.89	0.034	*	--
			ln(distance)	3.1	-16.94 – 23.14	0.751		
			Observations	24				
			R^2	0.005				
		Nickel	(Intercept)	10.11	7.84 – 12.38	<0.001	***	y = 10.11 -1.13 ln(x), R^2 = 0.653
			ln(distance)	-1.13	-1.5 – -0.77	<0.001	***	
			Observations	24				
			R^2	0.653				
		Zinc	(Intercept)	25.45	9.32 – 41.57	0.003	**	--
			ln(distance)	1.27	-1.33 – 3.87	0.321		
			Observations	24				
			R^2	0.045				

Site	Species	Metal	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
Mine Site *(cont'd)*	Arctic willow	Aluminum	(Intercept)	556.92	485.95 – 627.89	<0.001	***	y = 556.92 -67.29 ln(x), R^2 = 0.871
			ln(distance)	-67.29	-78.71 – -55.86	<0.001	***	
			Observations	24				
			R^2	0.871				
		Arsenic	(Intercept)	3.94	3.24 – 4.64	<0.001	***	y = 3.94 -0.42 ln(x), R^2 = 0.729
			ln(distance)	-0.42	-0.53 – -0.31	<0.001	***	
			Observations	24				
			R^2	0.729				
		Iron	(Intercept)	1002.11	875.46 – 1128.77	<0.001	***	y = 1002.11 -116.56 ln(x), R^2 = 0.865
			ln(distance)	-116.56	-136.96 – -96.16	<0.001	***	
			Observations	24				
			R^2	0.865				
		Manganese	(Intercept)	113.31	28.32 – 198.29	0.011		--
			ln(distance)	0.81	-12.87 – 14.5	0.903		
			Observations	24				
			R^2	0.001				
		Nickel	(Intercept)	16.81	12.61 – 21	<0.001	***	y = 16.81 -1.92 ln(x), R^2 = 0.612
			ln(distance)	-1.92	-2.59 – -1.24	<0.001	***	
			Observations	24				
			R^2	0.612				
		Zinc	(Intercept)	260.74	158.5 – 362.98	<0.001	***	--
			ln(distance)	-15.04	-31.51 – 1.42	0.071		
			Observations	24				
			R^2	0.14				

Site	Species	Metal	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
AWAR	Reindeer lichen	Aluminum	(Intercept)	2454.71	1996.58 – 2912.84	<0.001	***	y = 2454.71 -277.1 ln(x), R^2 = 0.734
			ln(distance)	-277.1	-350.88 – -203.31	<0.001	***	
			Observations	24				
			R^2	0.734				
		Arsenic	(Intercept)	-30.81	-72.23 – 10.61	0.137		y = -30.81 +8.21 ln(x), R^2 = 0.229 note intercept not significant
			ln(distance)	8.21	1.54 – 14.88	0.018	*	
			Observations	24				
			R^2	0.229				
		Iron	(Intercept)	3861.32	2838.16 – 4884.47	<0.001	***	y = 3861.32 -398.95 ln(x), R^2 = 0.534
			ln(distance)	-398.95	-563.73 – -234.16	<0.001	***	
			Observations	24				
			R^2	0.534				
		Manganese	(Intercept)	215.38	130.87 – 299.88	<0.001	***	--
			ln(distance)	-12.64	-26.25 – 0.97	0.067		
			Observations	24				
			R^2	0.144				
		Nickel	(Intercept)	5.92	4.74 – 7.11	<0.001	***	y = 5.92 -0.59 ln(x), R^2 = 0.653
			ln(distance)	-0.59	-0.78 – -0.4	<0.001	***	
			Observations	24				
			R^2	0.653				
		Zinc	(Intercept)	38.58	23.06 – 54.09	<0.001	***	--
			ln(distance)	-0.91	-3.41 – 1.59	0.459		
			Observations	24				
			R^2	0.025				

Site	Species	Metal	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
AWAR *(cont'd)*	Arctic willow	Aluminum	(Intercept)	787.68	595.79 – 979.57	<0.001	***	y = 787.68 -103.41 ln(x), R^2 = 0.686
			ln(distance)	-103.41	-134.32 – -72.51	<0.001	***	
			Observations	24				
			R^2	0.686				
		Arsenic	(Intercept)	-2.34	-8.16 – 3.48	0.413		y = -2.34 +1 ln(x), R^2 = 0.182 note intercept not significant
			ln(distance)	1	0.06 – 1.94	0.037	*	
			Observations	24				
			R^2	0.182				
		Iron	(Intercept)	1294.91	953.88 – 1635.94	<0.001	***	y = 1294.91 -159.89 ln(x), R^2 = 0.624
			ln(distance)	-159.89	-214.81 – -104.96	<0.001	***	
			Observations	24				
			R^2	0.624				
		Manganese	(Intercept)	97.07	-1.8 – 195.94	0.054		y = 97.07 +3.49 ln(x), R^2 = 0.009
			ln(distance)	3.49	-12.44 – 19.41	0.654		
			Observations	24				
			R^2	0.009				
		Nickel	(Intercept)	1.68	-0.78 – 4.15	0.171		y = 1.68 +0.26 ln(x), R^2 = 0.079
			ln(distance)	0.26	-0.13 – 0.66	0.183		
			Observations	24				
			R^2	0.079				
		Zinc	(Intercept)	77.86	-18.11 – 173.83	0.107		y = 77.86 +22.75 ln(x), R^2 = 0.298 note intercept not significant
			ln(distance)	22.75	7.29 – 38.21	0.006	**	
			Observations	24				
			R^2	0.298				

[1] *Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.*

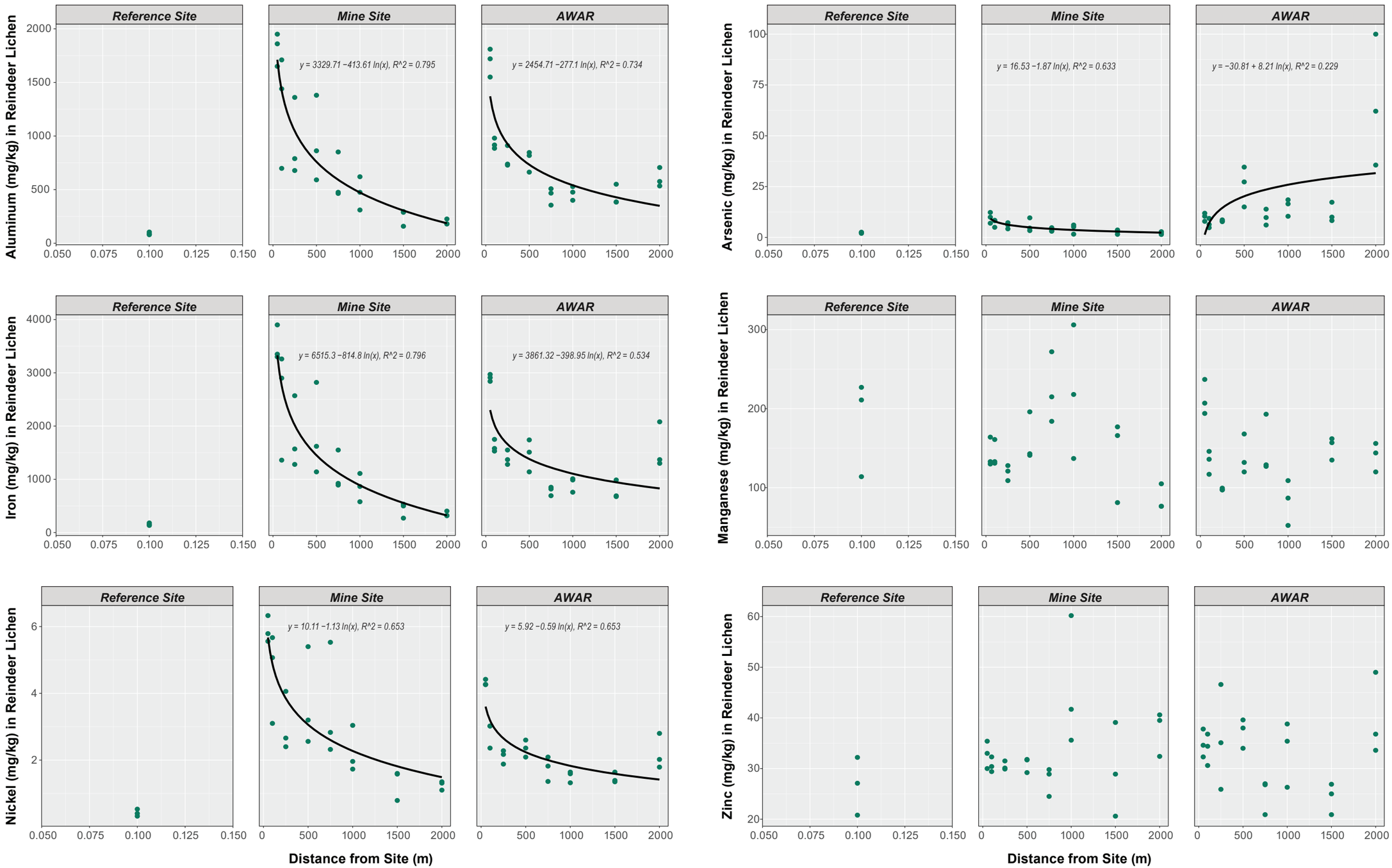

Figure 5.2-1a: Metal Concentrations in Plant Tissue Samples of Reindeer Lichen with Linear-log Curve Fitted

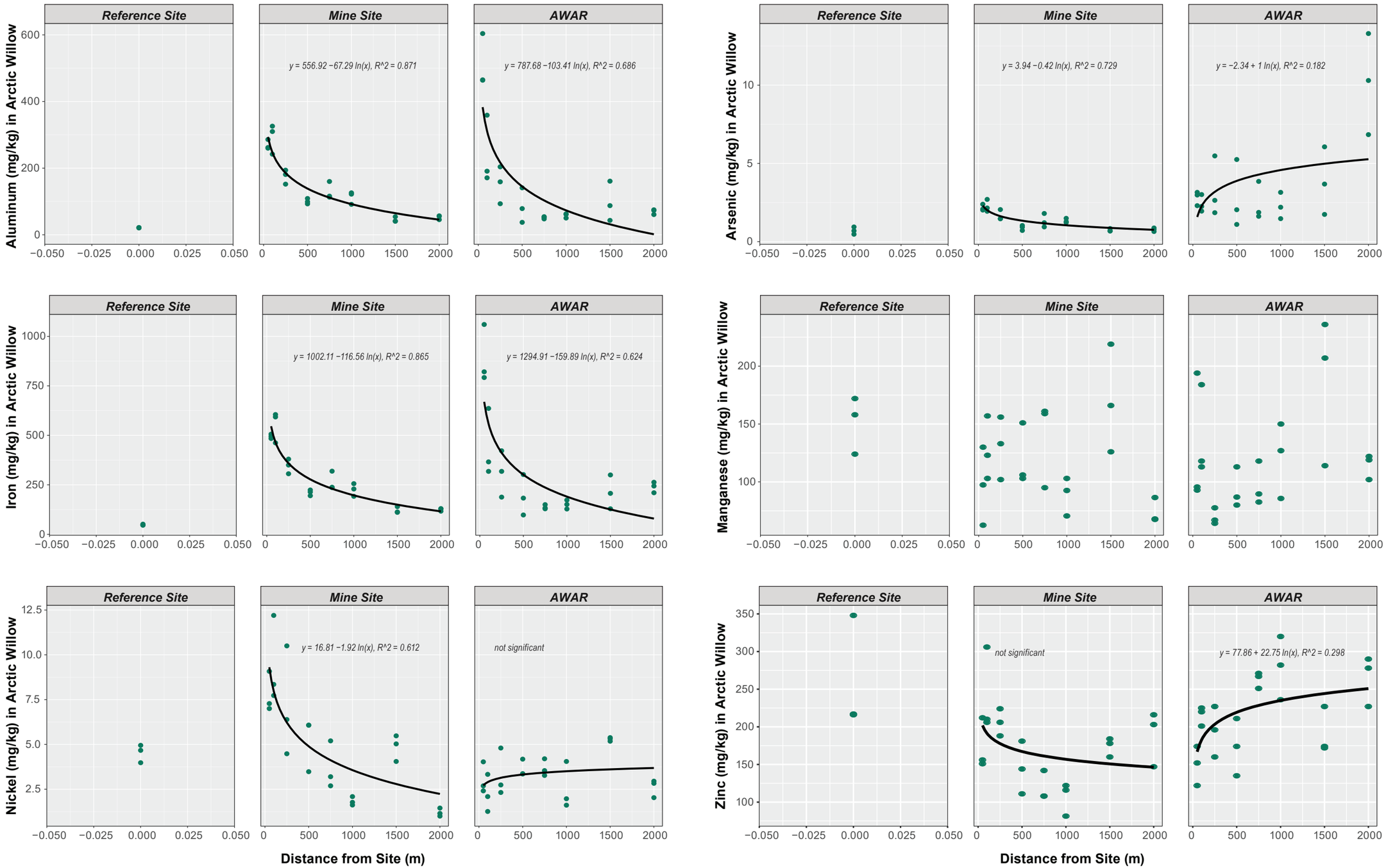

Figure 5.2-1b: Metal Concentrations in Plant Tissue Samples of Arctic Willow with Linear-log Curve Fitted

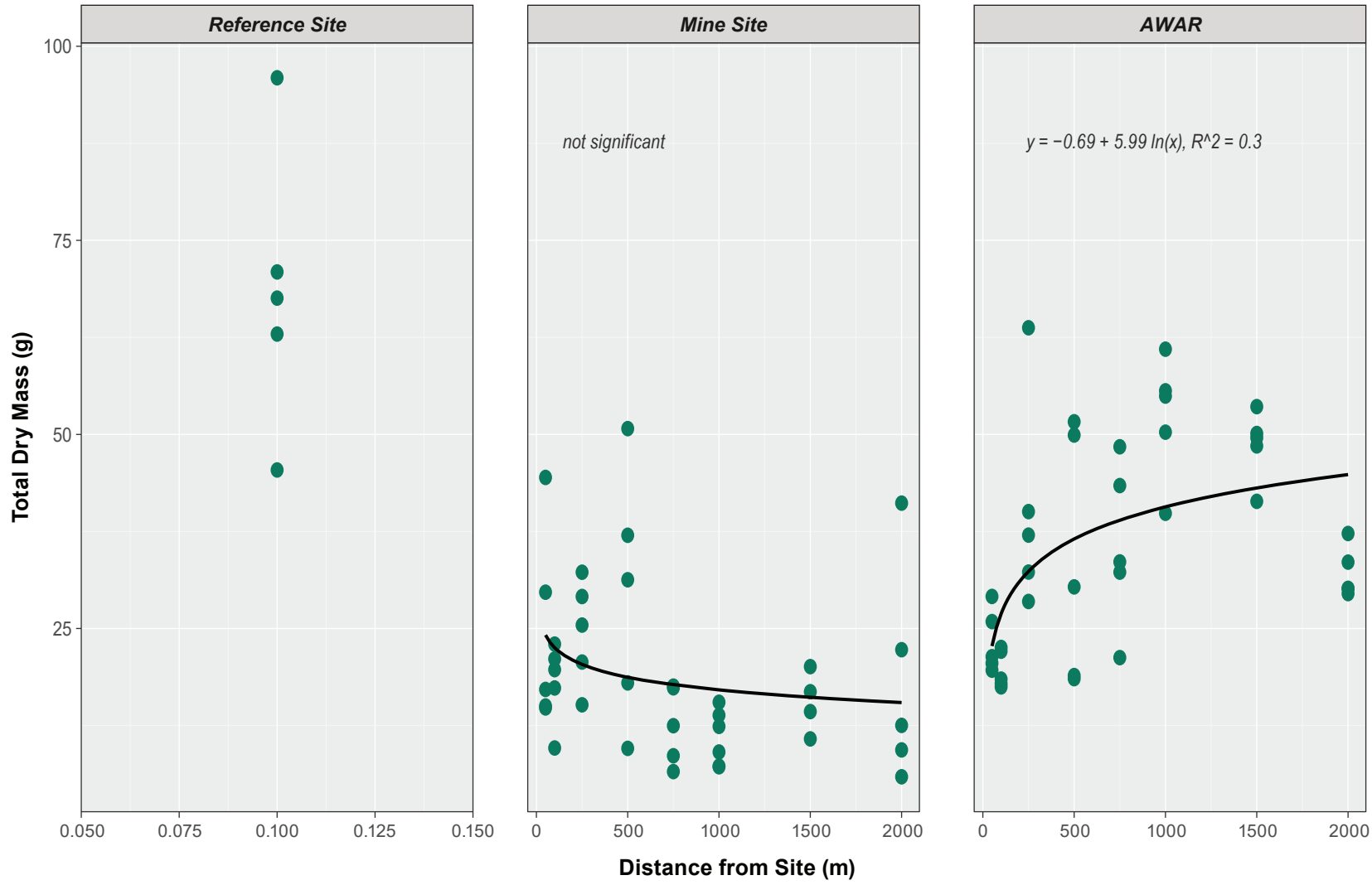

Figure 5.2-2: Plant Biomass from 50 m Quadrats with Linear-log Curve Fitted

Table 5.2-2: Linear-log Regressions Results of Distance and Biomass (dry weight)

Site	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
Mine Site	(Intercept)	33.37	16.31 – 50.43	<0.001	***	--
	ln(distance)	-2.36	-5.11 – 0.40	0.091	.	
	Observations	40				
	R^2	0.073				
AWAR	(Intercept)	-0.69	-19.33 – 17.94	0.94		y = -0.69 + 5.99 ln(x), R^2 = 0.3 note intercept not significant
	ln(distance)	5.99	2.99 – 8.99	<0.001	***	
	Observations	40				
	R^2	0.3				

[1] *Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.*

The AWAR is located on a low ridge connecting the hamlet of Rankin Inlet and the Meliadine mine. Vegetation cover in tundra communities is strongly related to the slope position, with small changes in elevation producing high areas that are dry and low areas that are waterlogged. Therefore, it is difficult to disentangle the effects of elevation and dust on vegetation composition with distance to the AWAR.

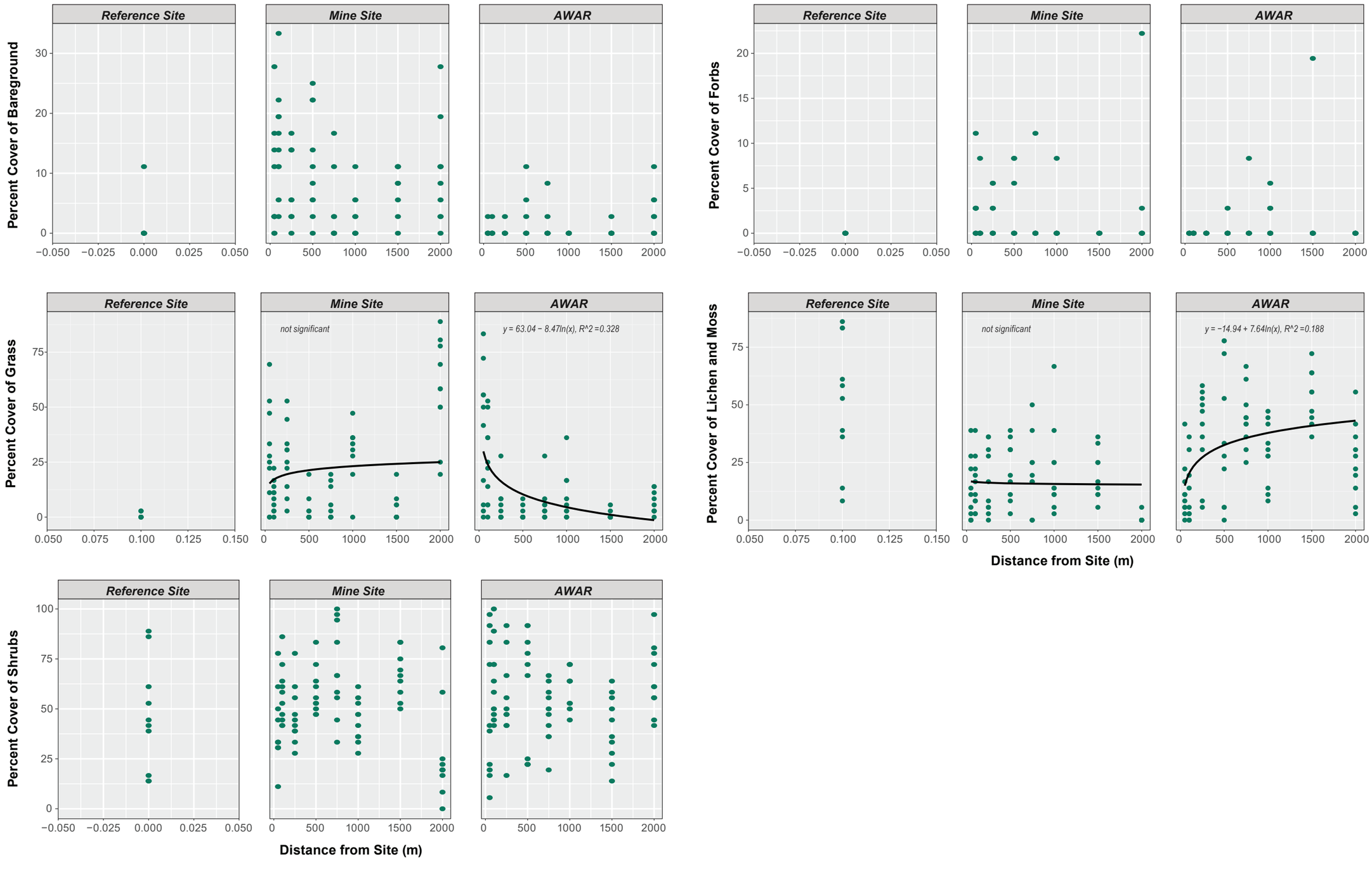

Figure 5.2-3: Percent Cover of Vegetation Types with Linear-log Curve Fitted

Table 5.3-3: Linear-log Regression Results of Distance and Vegetation Percent Cover

Site	Species	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
Mine Site	Shrub	(Intercept)	49.67	25.58 – 73.75	<0.001	***	--
		ln(distance)	0.24	-3.65 – 4.13	0.902		
		Observations	79				
		R^2	0				
	Forb	(Intercept)	2.2	-1.87 – 6.28	0.285		--
		ln(distance)	-0.13	-0.78 – 0.53	0.705		
		Observations	79				
		R^2	0.002				
	Grass	(Intercept)	4.97	-20.27 – 30.22	0.696		--
		ln(distance)	2.63	-1.44 – 6.71	0.202		
		Observations	79				
		R^2	0.021				
	Lichen and moss	(Intercept)	18.24	1.75 – 34.73	0.031	*	--
		ln(distance)	-0.37	-3.03 – 2.29	0.784		
		Observations	79				
		R^2	0.001				
	Bare ground	(Intercept)	15.91	7.04 – 24.79	0.001	***	--
		ln(distance)	-1.24	-2.68 – 0.19	0.088	.	
		Observations	79				
		R^2	0.037				

Site	Species	Predictors	Estimates	Confidence Interval	P-value	Significance[1]	Formula
AWAR	Shrub	(Intercept)	55.41	29.91 – 80.91	<0.001	***	--
		ln(distance)	-0.11	-4.21 – 4.00	0.959		
		Observations	80				
		R^2	0				
	Forb	(Intercept)	-1.39	-4.15 – 1.37	0.319		--
		ln(distance)	0.31	-0.13 – 0.76	0.163		
		Observations	80				
		R^2	0.025				
	Grass	(Intercept)	63.04	46.07 – 80.01	<0.001	***	y = 63.04 -8.47ln(x), R^2 =0.328
		ln(distance)	-8.47	-11.21 – -5.74	<0.001	***	
		Observations	80				
		R^2	0.328				
	Lichen and moss	(Intercept)	-14.94	-37.18 – 7.31	0.185		y = -14.94 + 7.64ln(x), R^2 =0.188 note intercept not significant
		ln(distance)	7.64	4.06 – 11.22	<0.001	***	
		Observations	80				
		R^2	0.188				
	Bare ground	(Intercept)	-1.27	-3.81 – 1.27	0.324		--
		ln(distance)	0.35	-0.06 – 0.76	0.092	.	
		Observations	80				
		R^2	0.036				

[1] *Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.*

6. SUMMARY

As a first year of study, these results suggest that the dustfall and vegetation monitoring methods applied here were effective. The methods can be used to identify the degree to which caribou food species may be indirectly affected by dust from Project activities. More years of data, inclusion of soil sampling, and better temporal coverage of the summer months for dustfall monitoring will improve the confidence in conclusions drawn.

The 2014 Meliadine Project FEIS (Agnico Eagle 2014) predicted that caribou may avoid Project activities due to a combination of noise and dust. Three potential Zone of Influence (ZOI) were proposed from reports in the scientific literature.

In calculating effects on habitat, the FEIS used the largest published values in order to be conservative, so a ZOI of 14 km for the mine site and 5 km for the AWAR. The values reported in this study of reaching baseline conditions within 1,000-1,500 m is considerably smaller than the predicted effects of the Project from the FEIS.

The key findings of the study on dust and vegetation are:

- Close to the dust sources, (50 m from the mine site) dustfall was at four to five times background levels – as estimated at the reference site. At 50 m from the AWAR, dustfall was three times background levels.
- Dustfall deposition decreased quickly, following an exponential curve, with distance from the mine and AWAR and approached background levels at approximately 500 m from the source, but dust continued to decline to a distance of 1,500 m. This may be due to spatial variation in background dust levels.
- In Arctic willow tissue samples, aluminum, iron, arsenic, nickel, and zinc levels were found to decline with distance from the Mine Site, approaching background levels approximately 1,500 m from the source. From the AWAR transect this same relationship was found for aluminum and iron.
- In reindeer lichen tissue samples, aluminum, iron, and nickel levels were found to significantly decline with distance from both the Mine Site and the AWAR, approaching background levels approximately 1,500 m from the source.
- The decline in dust deposition with distance from the mine and AWAR, was generally matched by the decline in metals in vegetation samples with distance from the mine and AWAR.
- Plant biomass increased with distance from the AWAR and approached background levels approximately 250 m from the road. No relationship between biomass and distance was found for the mine transect.
- The area of the total ground covered by plants (percent cover) did not change with distance from the mine or AWAR. However, the types of plants did change with distance from the AWAR. The percent cover of grasses decreased with increasing distance from the AWAR. Lichen and moss percent cover increased with increasing distance from the AWAR. No relationships were found for the mine transect.

This study concludes that there is a correlation between dustfall and some metals content found in plants – both decline to background levels at approximately 1,500 m from the Project. Plant biomass is slightly lower within approximately 250 m of the AWAR.

These results should be interpreted with caution, since there may be other environmental factors that can influence vegetation.

7. REFERENCES

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APPENDIX A DUST FALL LAB ANALYSIS RESULTS

Appendix A: Dustfall Lab Analysis Results

		August Measurement Period									
Client Sample ID		**DF-Road-50**	**DF-Road-100**	**DF-Road-250**	**DF-Road-500**	**DF-Road-750**	**DF-Road-1000**	**DF-Road-1500**	**DF-Road-2000**	**DF-Mine-50**	**DF-Mine-100**
Lab Sample ID		**VA20B8459-001**	**VA20B8459-002**	**VA20B8459-003**	**VA20B8459-004**	**VA20B8459-005**	**VA20B8459-006**	**VA20B8459-007**	**VA20B8459-008**	**VA20B8459-009**	**VA20B8459-010**
Particulates											
Dustfall, total	mg/dm².day	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	0.33	<0.16	0.58	0.95
Dustfall, total insoluble	mg/dm².day	0.14	<0.10	<0.10	<0.10	<0.10	0.14	0.11	<0.10	0.58	0.95
Dustfall, total soluble	mg/dm².day	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.22	<0.10	<0.10	<0.10
Total Metals											
Aluminum, total	mg/dm².day	0.00123	0.000675	0.000731	0.00120	0.000580	0.00145	0.000438	0.000425	0.00464	0.00256
Antimony, total	mg/dm².day	<0.0000055	<0.0000052	<0.0000056	<0.0000048	<0.0000052	<0.0000052	<0.0000049	<0.0000051	<0.0000048	<0.0000048
Arsenic, total	mg/dm².day	0.0000093	0.0000148	0.0000087	0.0000107	0.0000102	0.0000135	0.0000132	0.0000117	0.0000162	0.0000159
Barium, total	mg/dm².day	0.0000190	0.0000118	0.0000071	0.0000063	0.0000056	0.0000069	0.0000046	0.0000098	0.0000606	0.0000559
Beryllium, total	mg/dm².day	<0.000027	<0.000026	<0.000028	<0.000024	<0.000026	<0.000026	<0.000025	<0.000025	<0.000024	<0.000024
Bismuth, total	mg/dm².day	<0.000027	<0.000026	<0.000028	<0.000024	<0.000026	<0.000026	<0.000025	<0.000025	<0.000024	<0.000024
Boron, total	mg/dm².day	<0.00055	<0.00052	<0.00056	<0.00048	<0.00052	<0.00052	<0.00049	<0.00051	<0.00048	<0.00048
Cadmium, total	mg/dm².day	<0.0000022	<0.0000021	<0.0000022	<0.0000019	<0.0000021	<0.0000021	<0.0000020	<0.0000020	<0.0000019	<0.0000019
Calcium, total	mg/dm².day	0.00438	0.00292	0.00189	0.00215	0.00210	0.00249	0.00198	0.00228	0.0153	0.0163
Chromium, total	mg/dm².day	<0.000027	0.000030	<0.000028	<0.000024	<0.000026	<0.000026	<0.000025	<0.000025	<0.000024	<0.000024
Cobalt, total	mg/dm².day	<0.0000055	<0.0000052	<0.0000056	<0.0000048	<0.0000052	<0.0000052	<0.0000049	<0.0000051	0.0000057	0.0000053
Copper, total	mg/dm².day	<0.000027	0.000174	<0.000028	0.000063	0.000034	<0.000026	<0.000025	0.000027	0.000031	0.000035
Iron, total	mg/dm².day	0.00387	0.00451	0.00370	0.00314	0.00266	0.0110	0.00198	0.00232	0.0108	0.00533
Lead, total	mg/dm².day	0.0000042	0.0000049	0.0000031	0.0000048	0.0000036	0.0000053	0.0000046	0.0000044	0.0000057	0.0000059
Lithium, total	mg/dm².day	<0.00027	<0.00026	<0.00028	<0.00024	<0.00026	<0.00026	<0.00025	<0.00025	<0.00024	<0.00024
Magnesium, total	mg/dm².day	0.00289	0.00315	0.00194	0.00223	0.00220	0.00222	0.00205	0.00229	0.00529	0.00438
Manganese, total	mg/dm².day	0.0000731	0.0000451	0.0000468	0.0000447	0.0000456	0.0000683	0.0000417	0.0000421	0.000275	0.000270
Mercury, total	mg/dm².day	<0.00274	<0.00258	<0.00281	<0.00240	<0.00258	<0.00262	<0.00247	<0.00253	<0.00238	<0.00240
Molybdenum, total	mg/dm².day	<0.0000027	<0.0000026	<0.0000028	<0.0000024	<0.0000026	<0.0000026	<0.0000025	<0.0000025	<0.0000024	<0.0000024
Nickel, total	mg/dm².day	<0.000027	<0.000026	<0.000028	<0.000024	<0.000026	<0.000026	<0.000025	<0.000025	<0.000024	<0.000024
Phosphorus, total	mg/dm².day	<0.0027	<0.0026	<0.0028	<0.0024	<0.0026	<0.0026	<0.0025	<0.0025	<0.0024	<0.0024
Potassium, total	mg/dm².day	<0.0027	<0.0026	<0.0028	<0.0024	<0.0026	<0.0026	<0.0025	<0.0025	<0.0024	<0.0024
Selenium, total	mg/dm².day	<0.000055	<0.000052	<0.000056	<0.000048	<0.000052	<0.000052	<0.000049	<0.000051	<0.000048	<0.000048
Silicon, total	mg/dm².day	<0.0027	<0.0026	<0.0028	<0.0024	<0.0026	<0.0026	<0.0025	<0.0025	0.0057	0.0036
Silver, total	mg/dm².day	<0.00000055	<0.00000052	<0.00000056	<0.00000048	<0.00000052	<0.00000052	<0.00000049	<0.00000051	<0.00000048	<0.00000048
Sodium, total	mg/dm².day	0.0202	0.0274	0.0145	0.0176	0.0184	0.0170	0.0170	0.0177	0.0138	0.0138
Strontium, total	mg/dm².day	0.0000413	0.0000294	0.0000165	0.0000184	0.0000175	0.0000192	0.0000169	0.0000188	0.0000851	0.0000782
Thallium, total	mg/dm².day	<0.0000055	<0.0000052	<0.0000056	<0.0000048	<0.0000052	<0.0000052	<0.0000049	<0.0000051	<0.0000048	<0.0000048
Tin, total	mg/dm².day	<0.0000055	<0.0000052	<0.0000056	<0.0000048	<0.0000052	<0.0000052	<0.0000049	<0.0000051	<0.0000048	<0.0000048
Titanium, total	mg/dm².day	<0.00055	<0.00052	<0.00056	<0.00048	<0.00052	<0.00052	<0.00049	<0.00051	<0.00048	<0.00048
Uranium, total	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
Vanadium, total	mg/dm².day	<0.000055	<0.000052	<0.000056	<0.000048	<0.000052	<0.000052	<0.000049	<0.000051	<0.000048	<0.000048
Zinc, total	mg/dm².day	<0.000163	<0.000155	<0.000168	0.000176	<0.000155	0.000168	<0.000146	<0.000150	<0.000142	0.000172

Notes: "<" indicates samples are below detection limit, "-" indiactes no analysis done.

Appendix A: Dustfall Lab Analysis Results

		August Measurement Period						
Client Sample ID		**DF-Mine-250**	**DF-Mine-500**	**DF-Mine-750**	**DF-Mine-1000**	**DF-Mine-1500**	**DF-Mine-2000**	**DF-REF-1**
Lab Sample ID		**VA20B8459-011**	**VA20B8459-012**	**VA20B8459-013**	**VA20B8459-014**	**VA20B8459-015**	**VA20B8459-016**	**VA20B8459-017**
Particulates								
Dustfall, total	mg/dm².day	0.40	0.18	<0.16	<0.16	<0.16	<0.16	<0.28
Dustfall, total insoluble	mg/dm².day	0.40	0.18	0.16	<0.10	0.13	0.11	<0.14
Dustfall, total soluble	mg/dm².day	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.14
Total Metals								
Aluminum, total	mg/dm².day	0.000632	0.000550	0.000275	0.000791	0.000529	0.000524	-
Antimony, total	mg/dm².day	<0.0000050	<0.0000047	<0.0000046	<0.0000050	<0.0000046	<0.0000052	<0.0000078
Arsenic, total	mg/dm².day	<0.0000050	0.0000047	<0.0000046	<0.0000050	<0.0000046	<0.0000052	<0.0000078
Barium, total	mg/dm².day	0.0000148	0.0000103	0.0000061	0.0000069	0.0000056	0.0000093	0.0000110
Beryllium, total	mg/dm².day	<0.000025	<0.000024	<0.000023	<0.000025	<0.000023	<0.000026	<0.000039
Bismuth, total	mg/dm².day	<0.000025	<0.000024	<0.000023	<0.000025	<0.000023	<0.000026	<0.000039
Boron, total	mg/dm².day	<0.00050	<0.00047	<0.00046	<0.00050	<0.00046	<0.00052	-
Cadmium, total	mg/dm².day	<0.0000020	<0.0000019	<0.0000018	<0.0000020	<0.0000018	<0.0000021	<0.0000032
Calcium, total	mg/dm².day	0.00524	0.00288	0.00249	0.00210	0.00215	0.00249	0.00218
Chromium, total	mg/dm².day	<0.000025	<0.000024	<0.000023	<0.000025	<0.000023	<0.000026	<0.000039
Cobalt, total	mg/dm².day	<0.0000050	<0.0000047	<0.0000046	<0.0000050	<0.0000046	<0.0000052	<0.0000078
Copper, total	mg/dm².day	<0.000025	<0.000024	<0.000023	<0.000025	<0.000023	0.000058	-
Iron, total	mg/dm².day	0.00357	0.00150	<0.00137	<0.00150	0.00241	<0.00159	-
Lead, total	mg/dm².day	<0.0000025	<0.0000024	<0.0000023	<0.0000025	<0.0000023	<0.0000026	<0.0000039
Lithium, total	mg/dm².day	<0.00025	<0.00024	<0.00023	<0.00025	<0.00023	<0.00026	<0.00039
Magnesium, total	mg/dm².day	0.00155	0.00201	0.00165	0.00191	0.00183	0.00180	-
Manganese, total	mg/dm².day	0.0000640	0.0000358	0.0000249	0.0000319	0.0000533	0.0000295	-
Mercury, total	mg/dm².day	<0.00251	<0.00236	<0.00230	<0.00249	<0.00232	<0.00262	<0.00391
Molybdenum, total	mg/dm².day	<0.0000025	<0.0000024	<0.0000023	<0.0000025	<0.0000023	<0.0000026	<0.0000039
Nickel, total	mg/dm².day	<0.000025	<0.000024	<0.000023	<0.000025	<0.000023	<0.000026	<0.000039
Phosphorus, total	mg/dm².day	<0.0025	<0.0024	<0.0023	<0.0025	<0.0023	<0.0026	<0.0039
Potassium, total	mg/dm².day	<0.0025	<0.0024	<0.0023	<0.0025	<0.0023	<0.0026	<0.0039
Selenium, total	mg/dm².day	<0.000050	<0.000047	<0.000046	<0.000050	<0.000046	<0.000052	<0.000078
Silicon, total	mg/dm².day	<0.0025	<0.0024	<0.0023	<0.0025	<0.0023	<0.0026	<0.0039
Silver, total	mg/dm².day	<0.00000050	<0.00000047	<0.00000046	<0.00000050	<0.00000046	<0.00000052	<0.00000078
Sodium, total	mg/dm².day	0.0095	0.0145	0.0125	0.0156	0.0155	0.0147	0.0067
Strontium, total	mg/dm².day	0.0000235	0.0000192	0.0000157	0.0000163	0.0000151	0.0000161	0.0000086
Thallium, total	mg/dm².day	<0.0000050	<0.0000047	<0.0000046	<0.0000050	<0.0000046	<0.0000052	<0.0000078
Tin, total	mg/dm².day	<0.0000050	<0.0000047	<0.0000046	<0.0000050	<0.0000046	<0.0000052	<0.0000078
Titanium, total	mg/dm².day	<0.00050	<0.00047	<0.00046	<0.00050	<0.00046	<0.00052	<0.00078
Uranium, total	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
Vanadium, total	mg/dm².day	<0.000050	<0.000047	<0.000046	<0.000050	<0.000046	<0.000052	<0.000078
Zinc, total	mg/dm².day	<0.000150	<0.000142	<0.000137	0.000163	0.000142	0.000185	<0.000233

Notes: "<" indicates samples are below detection limit, "-" indiactes no analysis done.

Appendix A: Dustfall Lab Analysis Results

		September Measurement Period									
Client Sample ID		**DF-Road-50**	**DF-Road-100**	**DF-Road-250**	**DF-Road-500**	**DF-Road-750**	**DF-Road-1000**	**DF-Road-1500**	**DF-Road-2000**	**DF-Mine-50**	**DF-Mine-100**
Lab Sample ID		**OGM967**	**OGM968**	**OGM969**	**OGM970**	**OGM971**	**OGM972**	**OGM973**	**OGM974**	**OGM975**	**OGM976**
Particulates											
Dustfall, total	mg/dm².day	0.7811875	0.44	0.164	0.3178625	0.28015	0.2586	0.1885625	0.2424375	1.5085	1.131375
Dustfall, total insoluble	mg/dm².day	0.53875	0.2	0.11	0.1293	0.06465	0.0700375	<0.05	0.053875	1.293	0.96975
Dustfall, total soluble	mg/dm².day	0.2424375	0.24	0.054	0.1885625	0.2155	0.1885625	0.1346875	0.1885625	0.2155	0.161625
Total Metals											
Aluminum, total	mg/dm².day	-	-	-	-	-	-	-	-	-	-
Antimony, total	mg/dm².day	3.39413E-05	0.00001293	1.45463E-05	2.04725E-05	0.00002155	0.00002155	1.56238E-05	1.34688E-05	1.88563E-05	1.45463E-05
Arsenic, total	mg/dm².day	9.6975E-06	0.000006465	7.00375E-06	7.00375E-06	0.000006465	0.000010775	7.5425E-06	9.15875E-06	0.0000862	7.00375E-05
Barium, total	mg/dm².day	0.000156238	3.39413E-05	1.77788E-05	3.07088E-05	1.45463E-05	1.23913E-05	<0.00001	<0.00001	0.00019395	0.00015085
Beryllium, total	mg/dm².day	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Bismuth, total	mg/dm².day	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron, total	mg/dm².day	-	-	-	-	-	-	-	-	-	-
Cadmium, total	mg/dm².day	3.39413E-06	5.92625E-07	5.3875E-07	5.3875E-06	9.6975E-07	2.04725E-06	0.000000862	1.13138E-06	0.000001293	7.5425E-07
Calcium, total	mg/dm².day	0.02101125	0.00700375	0.0075425	0.0075425	0.00290925	0.003286375	0.0028015	0.003178625	0.032325	0.02586
Chromium, total	mg/dm².day	3.50188E-05	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00006465	0.000053875
Cobalt, total	mg/dm².day	7.00375E-06	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	0.00002586	2.04725E-05
Copper, total	mg/dm².day	-	-	-	-	-	-	-	-	-	-
Iron, total	mg/dm².day	-	-	-	-	-	-	-	-	-	-
Lead, total	mg/dm².day	0.000010775	<0.000003	<0.000003	9.15875E-06	<0.000003	<0.000003	<0.000003	1.83175E-05	1.83175E-05	2.42438E-05
Lithium, total	mg/dm².day	0.00003017	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00003879	<0.00003
Magnesium, total	mg/dm².day	-	-	-	-	-	-	-	-	-	-
Manganese, total	mg/dm².day	-	-	-	-	-	-	-	-	-	-
Mercury, total	mg/dm².day	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
Molybdenum, total	mg/dm².day	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Nickel, total	mg/dm².day	2.42438E-05	0.00000862	5.92625E-06	5.92625E-06	<0.000005	1.23913E-05	8.08125E-06	<0.000005	0.000075425	5.92625E-05
Phosphorus, total	mg/dm².day	0.000808125	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.003017	0.000862
Potassium, total	mg/dm².day	0.0053875	0.001777875	0.001346875	0.001454625	0.001239125	0.001562375	0.00118525	0.001293	0.01023625	0.0045255
Selenium, total	mg/dm².day	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Silicon, total	mg/dm².day	0.01346875	0.002208875	0.001131375	0.001993375	0.001293	0.001131375	0.001239125	0.000915875	0.02639875	0.0183175
Silver, total	mg/dm².day	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005
Sodium, total	mg/dm².day	0.02101125	0.01670125	0.01777875	0.01993375	0.0140075	0.01724	0.01454625	0.01670125	0.01023625	0.01131375
Strontium, total	mg/dm².day	0.000285538	0.00010775	0.00004741	4.25613E-05	2.53213E-05	0.00002586	0.000019395	1.99338E-05	0.000231663	0.000161625
Thallium, total	mg/dm².day	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003
Tin, total	mg/dm².day	0.00002155	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00000862
Titanium, total	mg/dm².day	0.000592625	7.00375E-05	3.71738E-05	0.00006465	4.41775E-05	3.12475E-05	0.000032325	<0.00003	0.000862	0.000592625
Uranium, total	mg/dm².day	0.000000862	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	1.0775E-06	8.08125E-07
Vanadium, total	mg/dm².day	2.42438E-05	3.17863E-06	<0.000003	0.000003017	<0.000003	<0.000003	<0.000003	<0.000003	4.84875E-05	0.00003448
Zinc, total	mg/dm².day	0.000247825	0.0001293	0.00010775	0.000199338	7.00375E-05	4.79488E-05	7.00375E-05	0.00006465	0.0002155	0.000355575

Notes: "<" indicates samples are below detection limit, "-" indiactes no analysis done.

Appendix A: Dustfall Lab Analysis Results

		September Measurement Period						
Client Sample ID		**DF-Mine-250**	**DF-Mine-500**	**DF-Mine-750**	**DF-Mine-1000**	**DF-Mine-1500**	**DF-Mine-2000**	**DF-REF-1**
Lab Sample ID		**OGM977**	**OGM978**	**OGM979**	**OGM980**	**OGM981**	**OGM982**	**OGM983**
Particulates								
Dustfall, total	mg/dm².day	0.4148375	0.183175	0.269375	0.28015	0.1562375	0.1346875	0.2586
Dustfall, total insoluble	mg/dm².day	0.3070875	0.1293	0.10775	0.0915875	0.075425	<0.05	<0.13
Dustfall, total soluble	mg/dm².day	0.10775	0.053875	0.161625	0.1885625	0.0808125	0.0808125	<0.13
Total Metals								
Aluminum, total	mg/dm².day	-	-	-	-	-	-	-
Antimony, total	mg/dm².day	1.40075E-05	1.34688E-05	2.31663E-05	0.00001724	1.56238E-05	0.000015085	1.18956E-05
Arsenic, total	mg/dm².day	0.000019395	0.00001293	7.5425E-06	7.5425E-06	<0.000005	<0.000005	<0.00001
Barium, total	mg/dm².day	8.08125E-05	2.90925E-05	2.26275E-05	1.56238E-05	2.74763E-05	<0.00001	<0.00002
Beryllium, total	mg/dm².day	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000004
Bismuth, total	mg/dm².day	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.00001
Boron, total	mg/dm².day	-	-	-	-	-	-	0.00014223
Cadmium, total	mg/dm².day	7.5425E-07	3.12475E-06	1.40075E-06	3.50188E-06	<0.0000005	7.00375E-07	<0.000001
Calcium, total	mg/dm².day	0.00915875	0.005172	0.006465	0.0053875	0.0028015	0.002963125	<0.002
Chromium, total	mg/dm².day	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00006
Cobalt, total	mg/dm².day	5.3875E-06	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000006
Copper, total	mg/dm².day	-	-	-	-	-	-	0.027153
Iron, total	mg/dm².day	-	-	-	-	-	-	0.063357
Lead, total	mg/dm².day	0.000015085	4.57938E-06	7.5425E-06	4.41775E-06	<0.000003	3.82513E-06	<0.000006
Lithium, total	mg/dm².day	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00006
Magnesium, total	mg/dm².day	-	-	-	-	-	-	0.00085338
Manganese, total	mg/dm².day	-	-	-	-	-	-	0.00016809
Mercury, total	mg/dm².day	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000002
Molybdenum, total	mg/dm².day	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000006
Nickel, total	mg/dm².day	2.31663E-05	1.23913E-05	1.13138E-05	0.000015085	1.13138E-05	<0.000005	<0.00001
Phosphorus, total	mg/dm².day	0.0006465	0.0032325	<0.0005	0.002155	<0.0005	0.000592625	<0.001
Potassium, total	mg/dm².day	0.00226275	0.00431	<0.001	0.00441775	<0.001	0.00140075	<0.002
Selenium, total	mg/dm².day	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002
Silicon, total	mg/dm².day	0.00808125	0.0028015	0.00420225	0.001346875	0.00118525	0.000915875	<0.0006
Silver, total	mg/dm².day	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.000001
Sodium, total	mg/dm².day	0.00700375	0.006465	0.0075425	0.00862	0.00700375	0.00915875	0.0065943
Strontium, total	mg/dm².day	7.00375E-05	4.25613E-05	3.34025E-05	2.69375E-05	1.61625E-05	1.83175E-05	<0.00001
Thallium, total	mg/dm².day	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000003	<0.0000006
Tin, total	mg/dm².day	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.00001
Titanium, total	mg/dm².day	0.000242438	9.15875E-05	4.41775E-05	4.63325E-05	3.71738E-05	2.69375E-05	<0.00006
Uranium, total	mg/dm².day	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.000001
Vanadium, total	mg/dm².day	1.40075E-05	4.9565E-06	2.8015E-06	<0.000003	<0.000003	<0.000003	<0.000006
Zinc, total	mg/dm².day	0.00010775	0.000118525	0.00015085	0.000140075	0.000075425	5.92625E-05	<0.00006

Notes: "<" indicates samples are below detection limit, "-" indiactes no analysis done.

APPENDIX B VEGETATION LAB ANALYSIS RESULTS

Appendix B: Vegetation Lab Analysis Results

Table 1: Plant Tissue Metal Concentrations Results

Site	Distance from Site (m)	Species	Percent Moisture	Dry Weight (mg/kg)					
				Aluminum	Arsenic	Iron	Manganese	Nickel	Zinc
Reference Site	-	Arctic Willow	62.2	21.4	0.939	46.2	158	3.98	348
Reference Site	-	Arctic Willow	66.0	20.6	0.694	51.3	172	4.95	217
Reference Site	-	Arctic Willow	61.1	21.9	0.472	46.7	124	4.67	216
Reference Site	-	Reindeer Lichen	19.5	79.0	2.57	134	227	0.32	20.8
Reference Site	-	Reindeer Lichen	15.6	87.9	2.41	153	114	0.40	32.2
Reference Site	-	Reindeer Lichen	23.6	104	1.99	181	211	0.53	27.1
Mine Site	50	Arctic Willow	53.2	286	2.08	506	97.4	9.08	156
Mine Site	50	Arctic Willow	59.7	262	2.39	495	130	7.28	212
Mine Site	50	Arctic Willow	68.0	260	2.02	484	62.6	7.00	151
Mine Site	50	Reindeer Lichen	9.38	1860	9.95	3350	130	5.56	30.0
Mine Site	50	Reindeer Lichen	6.84	1650	6.98	3300	164	5.79	33.0
Mine Site	50	Reindeer Lichen	10.5	1950	12.3	3900	133	6.33	35.4
Mine Site	100	Arctic Willow	54.5	326	2.15	605	123	8.35	210
Mine Site	100	Arctic Willow	55.9	242	1.94	462	103	7.73	206
Mine Site	100	Arctic Willow	54.1	310	2.70	593	157	12.2	306
Mine Site	100	Reindeer Lichen	10.0	1710	8.43	3260	133	5.67	30.4
Mine Site	100	Reindeer Lichen	10.3	1440	8.18	2900	131	5.07	32.3
Mine Site	100	Reindeer Lichen	11.9	698	4.97	1360	161	3.10	29.4
Mine Site	250	Arctic Willow	57.3	152	1.46	306	156	6.39	206
Mine Site	250	Arctic Willow	61.7	194	2.05	380	102	10.5	188
Mine Site	250	Arctic Willow	61.4	181	1.47	350	133	4.48	224

Site	Distance from Site (m)	Species	Percent Moisture	Dry Weight (mg/kg)					
				Aluminum	Arsenic	Iron	Manganese	Nickel	Zinc
Mine Site	250	Reindeer Lichen	10.5	678	4.21	1280	109	2.40	29.9
Mine Site	250	Reindeer Lichen	11.2	1360	7.23	2570	128	4.06	31.5
Mine Site	250	Reindeer Lichen	9.93	789	6.06	1570	121	2.66	30.1
Mine Site	500	Arctic Willow	58.0	92.9	0.714	195	151	6.07	181
Mine Site	500	Arctic Willow	54.8	109	0.931	224	103	6.08	144
Mine Site	500	Arctic Willow	61.5	99.1	1.03	214	106	3.48	111
Mine Site	500	Reindeer Lichen	11.3	591	3.35	1140	143	2.56	29.2
Mine Site	500	Reindeer Lichen	11.2	862	4.59	1620	196	3.20	31.8
Mine Site	500	Reindeer Lichen	9.11	1380	9.63	2820	141	5.40	31.7
Mine Site	750	Arctic Willow	45.3	160	1.80	319	161	5.20	142
Mine Site	750	Arctic Willow	55.7	113	1.21	236	95.0	3.20	108
Mine Site	750	Arctic Willow	58.8	116	0.941	238	159	2.69	108
Mine Site	750	Reindeer Lichen	12.0	464	3.03	892	215	2.83	28.9
Mine Site	750	Reindeer Lichen	10.4	475	3.21	924	184	2.32	24.5
Mine Site	750	Reindeer Lichen	11.8	851	4.78	1550	272	5.53	29.8
Mine Site	1000	Arctic Willow	52.6	122	1.22	229	70.6	1.62	81.4
Mine Site	1000	Arctic Willow	45.3	126	1.49	256	92.6	1.77	122
Mine Site	1000	Arctic Willow	54.0	91.4	1.28	192	103	2.09	116
Mine Site	1000	Reindeer Lichen	12.3	310	1.59	579	218	1.73	35.6
Mine Site	1000	Reindeer Lichen	11.0	475	6.10	866	137	1.96	41.7
Mine Site	1000	Reindeer Lichen	10.8	620	5.21	1110	306	3.04	60.2
Mine Site	1500	Arctic Willow	55.5	41.4	0.837	113	166	4.05	184
Mine Site	1500	Arctic Willow	55.8	40.6	0.682	111	126	5.48	160
Mine Site	1500	Arctic Willow	67.3	54.3	0.678	140	219	5.03	178

Site	Distance from Site (m)	Species	Percent Moisture	Dry Weight (mg/kg)					
				Aluminum	Arsenic	Iron	Manganese	Nickel	Zinc
Mine Site	1500	Reindeer Lichen	11.4	158	1.52	271	81.2	0.79	20.6
Mine Site	1500	Reindeer Lichen	11.3	288	3.66	534	166	1.58	39.1
Mine Site	1500	Reindeer Lichen	10.3	295	2.75	500	177	1.60	28.9
Mine Site	2000	Arctic Willow	48.4	56.9	0.648	130	67.6	1.45	216
Mine Site	2000	Arctic Willow	52.5	45.5	0.781	117	68.0	1.15	147
Mine Site	2000	Arctic Willow	50.8	55.6	0.873	128	86.5	1.00	203
Mine Site	2000	Reindeer Lichen	12.6	181	2.82	316	105	1.10	39.5
Mine Site	2000	Reindeer Lichen	14.4	179	1.44	321	76.6	1.31	32.4
Mine Site	2000	Reindeer Lichen	11.1	226	2.20	404	76.5	1.35	40.6
AWAR	50	Arctic Willow	46.4	604	3.15	1060	194	4.03	174
AWAR	50	Arctic Willow	54.9	464	2.30	792	95.6	2.41	122
AWAR	50	Arctic Willow	57.7	465	2.98	821	92.9	2.69	152
AWAR	50	Reindeer Lichen	11.0	1720	10.4	2910	237	4.26	32.3
AWAR	50	Reindeer Lichen	10.1	1810	7.91	2970	207	4.42	34.6
AWAR	50	Reindeer Lichen	10.4	1550	11.9	2840	194	4.27	37.8
AWAR	100	Arctic Willow	50.2	171	1.95	318	184	3.33	201
AWAR	100	Arctic Willow	66.0	191	2.25	366	118	2.09	220
AWAR	100	Arctic Willow	62.6	359	3.01	636	113	1.26	225
AWAR	100	Reindeer Lichen	10.7	916	4.77	1580	136	3.02	36.8
AWAR	100	Reindeer Lichen	9.88	885	9.34	1530	146	2.36	30.6
AWAR	100	Reindeer Lichen	9.43	980	6.36	1750	117	3.02	34.4
AWAR	250	Arctic Willow	63.5	159	1.85	318	77.6	2.74	227
AWAR	250	Arctic Willow	67.1	204	5.48	422	64.2	2.32	160
AWAR	250	Arctic Willow	56.5	93.3	2.64	188	67.0	4.80	196

Site	Distance from Site (m)	Species	Percent Moisture	Dry Weight (mg/kg)					
				Aluminum	Arsenic	Iron	Manganese	Nickel	Zinc
AWAR	250	Reindeer Lichen	45.5	911	8.02	1550	97.4	2.28	25.9
AWAR	250	Reindeer Lichen	38.9	738	8.63	1280	97.2	1.88	46.6
AWAR	250	Reindeer Lichen	30.6	728	7.75	1370	99.5	2.17	35.1
AWAR	500	Arctic Willow	65.5	78.7	2.04	183	86.9	3.37	135
AWAR	500	Arctic Willow	66.2	141	5.25	302	113	4.18	211
AWAR	500	Arctic Willow	64.9	37.4	1.10	97.8	80.0	3.35	174
AWAR	500	Reindeer Lichen	49.6	818	27.3	1510	168	2.36	34.0
AWAR	500	Reindeer Lichen	42.6	663	15.0	1140	132	2.09	39.6
AWAR	500	Reindeer Lichen	33.1	846	34.6	1740	120	2.60	38.0
AWAR	750	Arctic Willow	71.6	52.3	3.85	150	82.6	3.54	267
AWAR	750	Arctic Willow	65.8	54.4	1.87	133	89.6	4.20	271
AWAR	750	Arctic Willow	61.2	47.7	1.62	129	118	3.27	251
AWAR	750	Reindeer Lichen	59.7	508	9.77	818	127	2.09	20.9
AWAR	750	Reindeer Lichen	59.8	467	6.09	851	193	1.82	27.0
AWAR	750	Reindeer Lichen	48.4	355	13.9	692	129	1.36	26.8
AWAR	1000	Arctic Willow	62.2	50.3	1.47	128	127	4.05	282
AWAR	1000	Arctic Willow	65.0	62.8	2.20	151	85.7	1.61	236
AWAR	1000	Arctic Willow	65.8	61.4	3.15	173	150	1.97	320
AWAR	1000	Reindeer Lichen	54.7	528	16.5	1010	86.9	1.59	38.8
AWAR	1000	Reindeer Lichen	50.4	400	10.4	758	52.3	1.32	26.3
AWAR	1000	Reindeer Lichen	64.5	476	18.5	988	109	1.64	35.4
AWAR	1500	Arctic Willow	64.1	87.5	3.68	207	114	5.38	174
AWAR	1500	Arctic Willow	66.9	161	6.06	300	236	5.18	172
AWAR	1500	Arctic Willow	71.3	43.3	1.74	129	207	5.32	227

Site	Distance from Site (m)	Species	Percent Moisture	Dry Weight (mg/kg)					
				Aluminum	Arsenic	Iron	Manganese	Nickel	Zinc
AWAR	1500	Reindeer Lichen	64.3	550	17.3	988	135	1.64	20.9
AWAR	1500	Reindeer Lichen	58.1	383	8.28	690	157	1.35	26.9
AWAR	1500	Reindeer Lichen	59.3	385	10.0	676	162	1.39	25.0
AWAR	2000	Arctic Willow	72.3	75.0	10.3	244	119	2.83	278
AWAR	2000	Arctic Willow	74.0	60.8	6.84	210	102	2.95	227
AWAR	2000	Arctic Willow	73.3	73.2	13.3	263	122	2.03	290
AWAR	2000	Reindeer Lichen	68.8	534	62.1	1370	156	1.79	36.8
AWAR	2000	Reindeer Lichen	63.9	706	100	2080	144	2.80	49.0
AWAR	2000	Reindeer Lichen	62.5	576	35.6	1300	120	2.02	33.6

Processed by ALS Laboratory.

Table 2: Aboveground Biomass Results from 50 m Quadrats

Site	Distance to Site (m)	Total Wet Mass (g)	Total Dry Mass (g)	Percent Biomass (Dry Weight)	Percent Total Moisture
Reference Site	-	276.17	95.94	34.7	65.3
Reference Site	-	61.62	45.42	73.7	26.3
Reference Site	-	161.49	70.93	43.9	56.1
Reference Site	-	114.32	62.93	55.0	45.0
Reference Site	-	227.39	67.56	29.7	70.3
Mine Site	50	24.09	15.02	62.4	37.6
Mine Site	50	54.86	29.68	54.1	45.9
Mine Site	50	78.55	44.46	56.6	43.4
Mine Site	50	31.40	14.77	47.0	53.0
Mine Site	50	26.99	17.15	63.5	36.5
Mine Site	100	35.27	21.08	59.8	40.2
Mine Site	100	17.64	9.61	54.5	45.5
Mine Site	100	39.70	22.99	57.9	42.1
Mine Site	100	27.86	17.34	62.2	37.8
Mine Site	100	31.95	19.70	61.7	38.3
Mine Site	250	57.83	32.25	55.8	44.2
Mine Site	250	35.94	20.68	57.5	42.5
Mine Site	250	31.53	15.17	48.1	51.9
Mine Site	250	60.75	29.12	47.9	52.1
Mine Site	250	55.72	25.44	45.7	54.3
Mine Site	500	67.03	37.01	55.2	44.8
Mine Site	500	55.56	31.28	56.3	43.7
Mine Site	500	18.02	9.56	53.0	47.0
Mine Site	500	75.69	50.75	67.0	33.0

Site	Distance to Site (m)	Total Wet Mass (g)	Total Dry Mass (g)	Percent Biomass (Dry Weight)	Percent Total Moisture
Mine Site	500	31.62	17.99	56.9	43.1
Mine Site	750	27.24	17.58	64.5	35.5
Mine Site	750	9.70	6.57	67.8	32.2
Mine Site	750	24.07	17.36	72.1	27.9
Mine Site	750	19.46	12.48	64.1	35.9
Mine Site	750	13.59	8.61	63.4	36.6
Mine Site	1000	26.02	15.50	59.6	40.4
Mine Site	1000	13.68	7.19	52.6	47.4
Mine Site	1000	21.85	13.83	63.3	36.7
Mine Site	1000	13.91	9.09	65.4	34.6
Mine Site	1000	19.51	12.39	63.5	36.5
Mine Site	1000	11.15	7.27	65.2	34.8
Mine Site	1500	38.91	20.09	51.6	48.4
Mine Site	1500	24.07	14.30	59.4	40.6
Mine Site	1500	27.67	16.86	60.9	39.1
Mine Site	1500	18.72	10.78	57.6	42.4
Mine Site	2000	43.55	22.27	51.1	48.9
Mine Site	2000	30.48	12.52	41.1	58.9
Mine Site	2000	14.58	5.90	40.4	59.6
Mine Site	2000	66.26	41.15	62.1	37.9
Mine Site	2000	17.15	9.36	54.6	45.4
AWAR	50	31.24	19.63	62.8	37.2
AWAR	50	36.67	20.52	56.0	44.0
AWAR	50	36.31	21.37	58.9	41.1
AWAR	50	48.64	29.13	59.9	40.1

Site	Distance to Site (m)	Total Wet Mass (g)	Total Dry Mass (g)	Percent Biomass (Dry Weight)	Percent Total Moisture
AWAR	50	42.69	25.89	60.7	39.3
AWAR	100	36.51	22.56	61.8	38.2
AWAR	100	28.77	17.48	60.8	39.2
AWAR	100	34.36	18.48	53.8	46.2
AWAR	100	36.97	22.08	59.7	40.3
AWAR	100	34.17	17.90	52.4	47.6
AWAR	250	148.59	63.74	42.9	57.1
AWAR	250	71.92	40.06	55.7	44.3
AWAR	250	49.10	28.48	58.0	42.0
AWAR	250	65.60	37.03	56.5	43.5
AWAR	250	54.73	32.27	59.0	41.0
AWAR	500	39.75	18.54	46.6	53.4
AWAR	500	114.88	51.63	44.9	55.1
AWAR	500	37.51	18.94	50.5	49.5
AWAR	500	103.52	49.92	48.2	51.8
AWAR	500	67.60	30.36	44.9	55.1
AWAR	750	69.16	32.26	46.6	53.4
AWAR	750	72.92	33.58	46.1	53.9
AWAR	750	103.93	43.41	41.8	58.2
AWAR	750	114.11	48.41	42.4	57.6
AWAR	750	45.58	21.25	46.6	53.4
AWAR	1000	129.59	60.98	47.1	52.9
AWAR	1000	144.85	55.62	38.4	61.6
AWAR	1000	114.35	50.29	44.0	56.0
AWAR	1000	91.03	39.84	43.8	56.2

Site	Distance to Site (m)	Total Wet Mass (g)	Total Dry Mass (g)	Percent Biomass (Dry Weight)	Percent Total Moisture
AWAR	1000	140.95	54.94	39.0	61.0
AWAR	1500	123.77	50.12	40.5	59.5
AWAR	1500	104.60	41.38	39.6	60.4
AWAR	1500	140.99	48.52	34.4	65.6
AWAR	1500	138.00	53.58	38.8	61.2
AWAR	1500	132.44	49.57	37.4	62.6
AWAR	2000	88.94	33.55	37.7	62.3
AWAR	2000	88.93	30.17	33.9	66.1
AWAR	2000	99.97	37.24	37.2	62.8
AWAR	2000	89.35	29.50	33.0	67.0
AWAR	2000	85.31	30.15	35.3	64.7

Processed by ALS Laboratory.

Table 3: Mean and Standard Error of Percent Cover of Vegetation Types at Reference Site, Mine Site and AWAR Transects

Site	Distance (m)	Percent Cover									
		Shrub		Forb		Grass		Lichen and Moss		Bareground	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Reference site	-	45.83	8.64	0	0	0.83	0.42	52.22	8.84	1.11	1.11
Mine Site	50	40.56	5.9	2.22	1.08	28.89	7.16	12.22	4.27	8.06	2.88
Mine Site	100	56.94	4.58	0.83	0.83	9.44	2.2	15.83	3.66	15.56	2.78
Mine Site	250	46.67	4.64	1.67	0.74	26.39	4.9	16.94	4.54	7.78	1.93
Mine Site	500	58.61	3.71	2.22	1.16	3.33	1.98	22.5	3.96	11.67	2.8
Mine Site	750	70	7.29	1.11	1.11	5.83	2.47	19.17	5.29	3.33	1.84
Mine Site	1000	43.89	3.38	0.83	0.83	30	4.01	21.39	6.06	2.78	1.17
Mine Site	1500	66.98	4.05	0	0	4.32	2.18	19.75	3.54	7.72	1.37
Mine Site	2000	26.94	7.62	2.5	2.21	57.78	7.22	0.56	0.56	10	2.66
AWAR	50	48.89	10.82	0	0	38.33	9.54	12.5	3.85	0.28	0.28
AWAR	100	63.89	6.18	0	0	24.72	5.92	11.11	4.24	0.28	0.28
AWAR	250	54.17	6.87	0	0	5.28	2.73	38.61	5.94	0.28	0.28
AWAR	500	57.5	9.72	0.28	0.28	1.67	0.94	37.5	9.7	1.94	1.17
AWAR	750	47.5	4.6	0.83	0.83	5.56	2.62	44.17	4.02	1.11	0.85
AWAR	1000	60.83	3.22	1.11	0.61	8.89	3.63	28.61	4.38	0	0
AWAR	1500	40.56	5.24	1.94	1.94	0.83	0.59	54.44	3.71	0.28	0.28
AWAR	2000	64.72	5.45	0	0	6.39	1.61	25.56	5.17	2.78	1.17

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