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Napoleon Mackenzie, Chair
Environmental Monitoring Advisory Board
PO Box 2577
Yellowknife, NT X1A 2P9
Canada

3 July 2018

Dear Mr. Mackenzie:

Subject: 2017 Environmental Air Quality Monitoring Report

Please find enclosed the Diavik Diamond Mines (2012) Inc. (DDMI) Environmental Air Quality Monitoring Report for 2017. This report summarizes air quality observations from the following programs conducted at DDMI throughout 2017:

- Total Suspended Particulate (TSP) Continuous Monitors;
- Dustfall Monitoring as part of the Aquatic Effects Monitoring Program (AEMP);
- Snow Core Program as part of the AEMP;
- Emission Monitoring and Reporting to the Environment and Climate Change Canada (ECCC) National Pollutant Release Inventory (NPRI); and
- Greenhouse Gas (GHG) Monitoring and Reporting to ECCC.

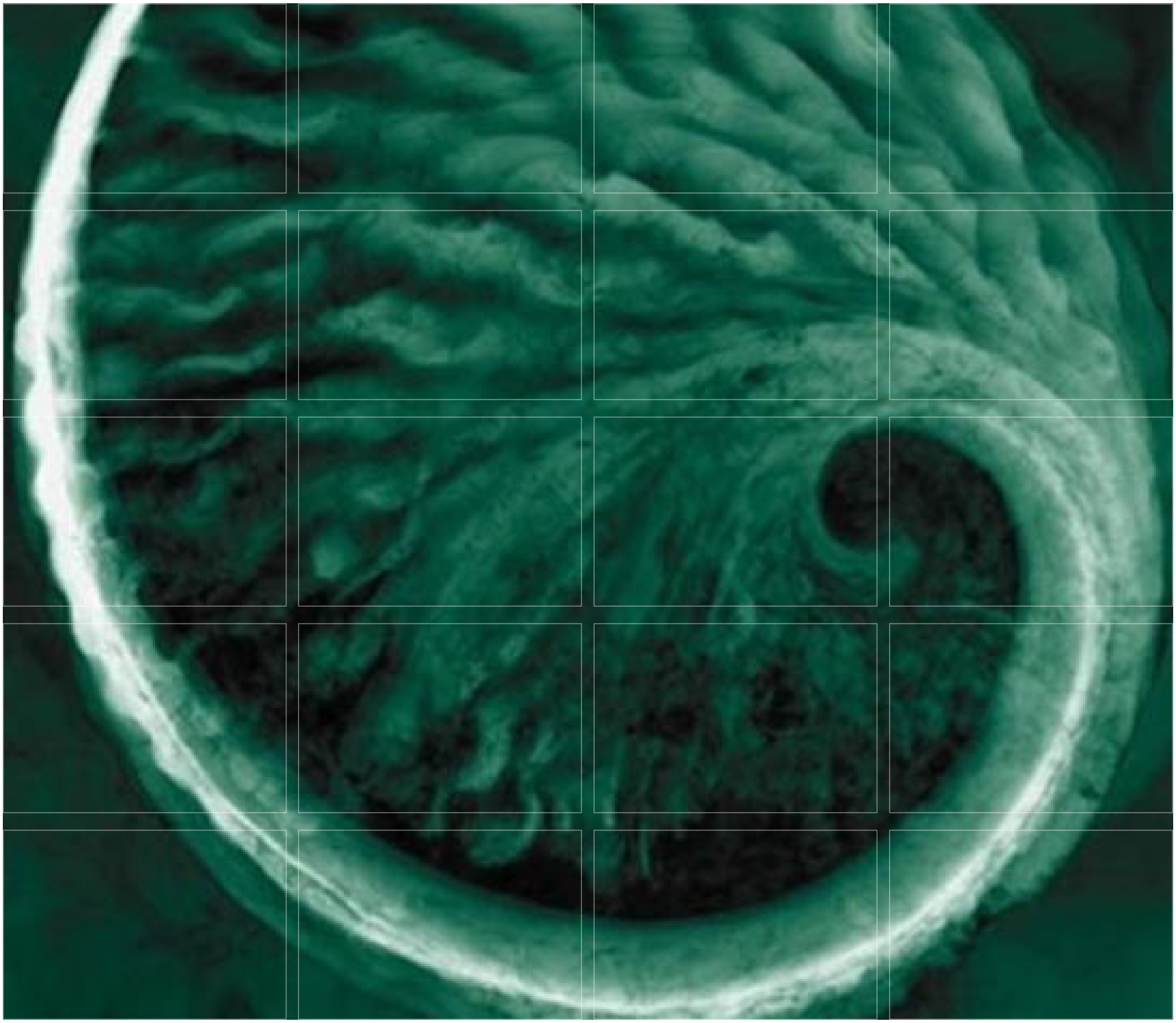
Please do not hesitate to contact the undersigned if you have any questions related to our response.

Yours sincerely,

Sean Sinclair
Superintendent, Environment

cc: John McCullum, EMAB
Aileen Stevens, GNWT

Attachment 1: DDMI 2017 Environmental Air Quality Monitoring Report



Prepared for:

Rio Tinto

Dominion Diamond Mines

Diavik Diamond Mine

DIAVIK DIAMOND MINE

2017 Environmental Air Quality Monitoring Report

July 2018

The business of sustainability

ERM

Diavik Diamond Mines (2012) Inc.

DIAVIK DIAMOND MINE
2017 Environmental Air Quality Monitoring Report

July 2018

Project #0207514-0017

Citation:
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EXECUTIVE SUMMARY

Diavik Diamond Mines (2012) Inc. has been collecting and reporting air quality related data since initial site construction in 2001. In June of 2013, Diavik Diamond Mines submitted an Environmental Air Quality Monitoring Plan to the Environmental Monitoring Advisory Board. The components of the Environmental Air Quality Monitoring Plan include total suspended particulate (TSP) monitoring, dust deposition (dustfall) monitoring (as part of the Aquatic Effects Monitoring Program (AEMP)), a snow core program (as part of the AEMP), reporting to the National Pollutant Release Inventory (NPRI), and reporting to the national greenhouse gas reporting program (GHGRP). This report presents an updated Environmental Air Quality Monitoring Report for the Diavik Diamond Mine for the calendar year 2017.

TSP was measured at two stations in 2017: the Communications Building (CB) and A154 Dike stations. The A154 Dike sampler was offsite for repair at the start of 2017 and was re-installed on January 23, 2017.

In 2017, there was one exceedance of the Government of the Northwest Territories (GNWT) 24 hour average TSP guideline (120 µg/m^3), measured at the A154 Dike station on August 13 (241.1 µg/m^3). Elevated TSP concentrations were measured by both stations from August 13 to 15 as forest fire smoke was observed at the Mine site on these dates. The annual mean TSP concentrations at both stations were similar (9.0 µg/m^3 at CB station and 9.9 µg/m^3 at A154 Dike station) and were well below the annual guideline value (60 µg/m^3).

TSP stations had valid daily data for 71% and 69% of days in 2017 for CB and A154 Dike stations, respectively.

In 2017, dustfall was monitored at 14 dustfall gauges and 27 snow survey stations located at varying distances around the mine. Two new dustfall gauge stations (Dust 11 and Dust 12) were added in October 2017, west of the Mine. Snow water chemistry was measured at 19 of the snow survey stations and compared to effluent quality criteria (EQC) set out in the Wek'èezhìi Land and Water Board (WLWB) Water Licence W2015L2-0001.

Annual dustfall estimated from each of the 14 dustfall gauges ranged from 34 to 480 mg/dm^2/y in 2017. Annual dustfall rates estimated from the 2017 snow survey data ranged from 10 to 1,351 mg/dm^2/y. Annualized dustfall rates measured at each dustfall gauge and snow survey station were less than the former BC dustfall objective for the mining industry (621–1,059 mg/dm^2/y) for all stations except for SS1-1 (1,351 mg/dm^2/y; 30 m north of the airstrip) and SS1-2 (771 mg/dm^2/y; 115 m north of the airstrip). This former objective was used for comparison purposes only: there are currently no dustfall standards or objectives for the Northwest Territories. Annualized dustfall estimated from each station in 2017 were generally less than historical dustfall estimates.

Because the dustfall gauges continuously collect dust throughout the year, and the snow surveys are only representative of dustfall accumulated over the snow cover period, the reported annual dustfall results from the dustfall gauges are expected to provide a better estimate of annual dustfall compared

to snow survey results for similar geographic areas. However, results obtained from both methods showed similar spatial patterns, with dustfall generally decreasing with distance away from the Mine.

Snow water chemistry analysis of interest included those variables with effluent quality criteria (EQC; i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc). All 2017 sample concentrations were less than their associated reference levels except for sample SS3-4 (located 615 m southeast of the closest Mine infrastructure) that had exceedances of aluminum (3,950 µg/L), chromium (86.9 µg/L), nickel (226 µg/L) and zinc (23.8 µg/L).

The Mine reported criteria air contaminant (CAC) emissions as part of the annual NPRI submission and emissions were estimated using published emission factors. Compared to 2016, 2017 emissions of carbon monoxide (CO) increased slightly (675 tonnes; <10% change) and sulphur dioxide (SO_2) emissions increased significantly (17.7 tonnes; 1,866% increase). The increase of SO_2 emissions were due to a change in mine production levels and blasting due to A21 open pit mining. There were slight decreases (<10% change) of oxides of nitrogen (NO_x) and volatile organic compound (VOC) emissions, and moderate decreases (14 to 31% decrease) of total particulate matter (TPM), particulate matter ≤ 10 µm in diameter (PM_{10}) and particulate matter ≤ 2.5 µm in diameter ($PM_{2.5}$) emissions. Particulate matter emissions decreased primarily due to a decrease in road traffic.

The Mine reported greenhouse gas (GHG) emissions as part of the annual national GHGRP submission and CO_2e emissions were estimated using published emission factors and 100-year global warming potential (GWP) ratios. Starting for 2017 reporting, the GHGRP was changed to require all facilities to report that emit the equivalent of 10,000 tCO_2e or more per year, compared to the previous 50,000 tCO_2e per year threshold.

Mine GHG emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) totalled 194,968 tCO_2e in 2017, a 2% decrease from 2016. GHG emissions at the Mine were primarily from stationary equipment fuel combustion (76.7%) and mobile equipment fuel combustion (23.1%). In 2017, the Mine's 9.2 megawatt wind farm helped to reduce the Mine's GHG footprint by generating 17.2 gigawatt-hours of electricity which saved 3.9 million litres of diesel fuel and thereby prevented the direct release of 10,500 tCO_2e.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AEMP	Aquatic Effects Monitoring Program
BC	British Columbia
BC ENV	British Columbia Ministry of Environment and Climate Change
BC MOE	British Columbia Ministry of Environment
CAC	Criteria air contaminants
CB	Communications Building
CEPA	*Canadian Environmental Protection Act*
CH_4	Methane
cm	Centimetre
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
d	Day
DDMI	Diavik Diamond Mines (2012) Inc.
dm^2	Square decimetre
Dustfall	Dust deposition
EA	Environmental Agreement
EAQMP	Environmental Air Quality Monitoring Plan
ECCC	Environment and Climate Change Canada
EMAB	Environmental Monitoring Advisory Board
EMS	Environmental Management System
ENR	Department of Environment and Natural Resources
EQC	Effluent quality criteria
ERM	ERM Consultants Canada Ltd.

GHG	Greenhouse gas
GHGRP	Greenhouse Gas Emissions Reporting Program
GNWT	Government of the Northwest Territories
GWP	Global warming potentials
L	Litre
m	Metre
Maxxam	Maxxam Analytics
mg	Milligram
N_2O	Nitrous oxide
NH_3	Ammonia
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPRI	National Pollutant Release Inventory
O_3	Ozone
PM_{10}	Particulate matter ≤ 10 μm in diameter
$PM_{2.5}$	Particulate matter ≤ 2.5 μm in diameter
QA/QC	Quality assurance and quality control
SO_2	Sulphur dioxide
SOP	Standard operating procedure
SO_x	Oxides of sulphur
tCO_2e	Tonnes of carbon dioxide equivalent
the Mine	Diavik Diamond Mine
TPM	Total particulate matter (the same as TSP)
TSP	Total suspended particulate (the same as TPM)
VOCs	Volatile organic compounds
WLWB	Wek'èezhìi Land and Water Board
μg	Microgram
y	Year

1. INTRODUCTION

Diavik Diamond Mines (2012) Inc. (DDMI) has been collecting and reporting air quality related data since initial site construction in 2001. In June of 2013, DDMI submitted an Environmental Air Quality Monitoring Plan (EAQMP) to the Environmental Monitoring Advisory Board (EMAB). The EAQMP was developed to address Article 7.2 (a) of the Environmental Agreement (EA; DDMI 2000). The EAQMP and its results are not part of a Regulatory Instrument but are subject to review by EMAB and the Parties identified under EA Article 7.5.

The purpose of this report is to provide a summary of the 2017 air quality monitoring and emissions data in relation to the Diavik Diamond Mine's (hereafter referred to as the Mine) operational activities. This *2017 Environmental Air Quality Monitoring Report* summarizes air quality observations from the following programs conducted at the Mine:

- Total Suspended Particulate (TSP) Continuous Monitors;
- Dustfall Monitoring as part of the Aquatic Effects Monitoring Program (AEMP);
- Snow Core Program as part of the AEMP;
- Emission Monitoring and Reporting to the Environment and Climate Change Canada (ECCC) National Pollutant Release Inventory (NPRI); and
- Greenhouse Gas (GHG) Monitoring and Reporting to ECCC.

In 2017, the primary sources of fugitive dust were associated with unpaved roads, airstrip usage and construction activities at A21 kimberlite pipe. The A21 kimberlite pipe is located just south of Diavik's existing mining operations. A21 development required rockfill dike construction to encircle the ore body located just offshore of existing mining operations at Lac de Gras (Rio Tinto 2014). To supress fugitive dust generation, roads were watered during the summer as needed and EK35 was applied to the airport apron (tarmac) and helipad during the spring months.

The Underground Mine production rate was steady throughout the year. Open pit mining of A21 and construction of the Waste Rock Storage Area - South Country Rock Pile commenced in December 2017. Fugitive dust generation is expected to be greatest during snow-free periods where and when there is site activity.

The 2017 predominant wind directions at the site were from the southeast, although this was not very pronounced and in fact in general the winds can be described as omni-directional. The expectation is that airborne material will be deposited in all directions around the mine with a slight northwest emphasis.

2. CONTINUOUS TOTAL SUSPENDED PARTICULATE MONITORING

2.1 BACKGROUND

Total suspended particulate (TSP) consists of small airborne particles such as dust, smoke, ash and pollen with aerodynamic diameters of typically less than 100 microns (µm). TSP is a concern for human health and welfare, as well as for animals and plants, due to effects on breathing and respiratory systems, damage to lung tissue, cancer and premature death. TSP that settles out of the air onto surfaces is called dust deposition or dustfall. Ambient TSP monitoring in strategic locations can provide monitoring information to assist in understanding, tracking and responding to potential dust deposition concerns.

In 2012 an updated air dispersion modelling assessment was undertaken for the entire the Mine (Golder 2012). The modelling results indicated that:

- Annual TSP concentrations are predicted to be lower than the Government of the Northwest Territories (GNWT) Guidelines for Ambient Air Quality (GNWT 2014) for receptors located in the vicinity of the Mine. For two days per year, 24 hour concentrations of TSP are predicted to exceed the air quality criteria; and
- Maximum TSP deposition rates (dustfall) are predicted to be higher on the Mine site (222.2 $mg/dm^2/y$) than offsite (4.1 $mg/dm^2/y$) and are generally greater than predicted in the earlier model. For example 100 $mg/dm^2/y$ was originally predicted adjacent to A154 pit (Cirrus Consultants 1998).

Two TSP monitors were installed at the Mine in April 2013. The locations of the monitors were selected based on proximity to the Mine boundary, with careful consideration of the TSP results from the updated air dispersion modelling assessment and in consideration of the availability of power (Figure 2.1-1; DDMI 2013).

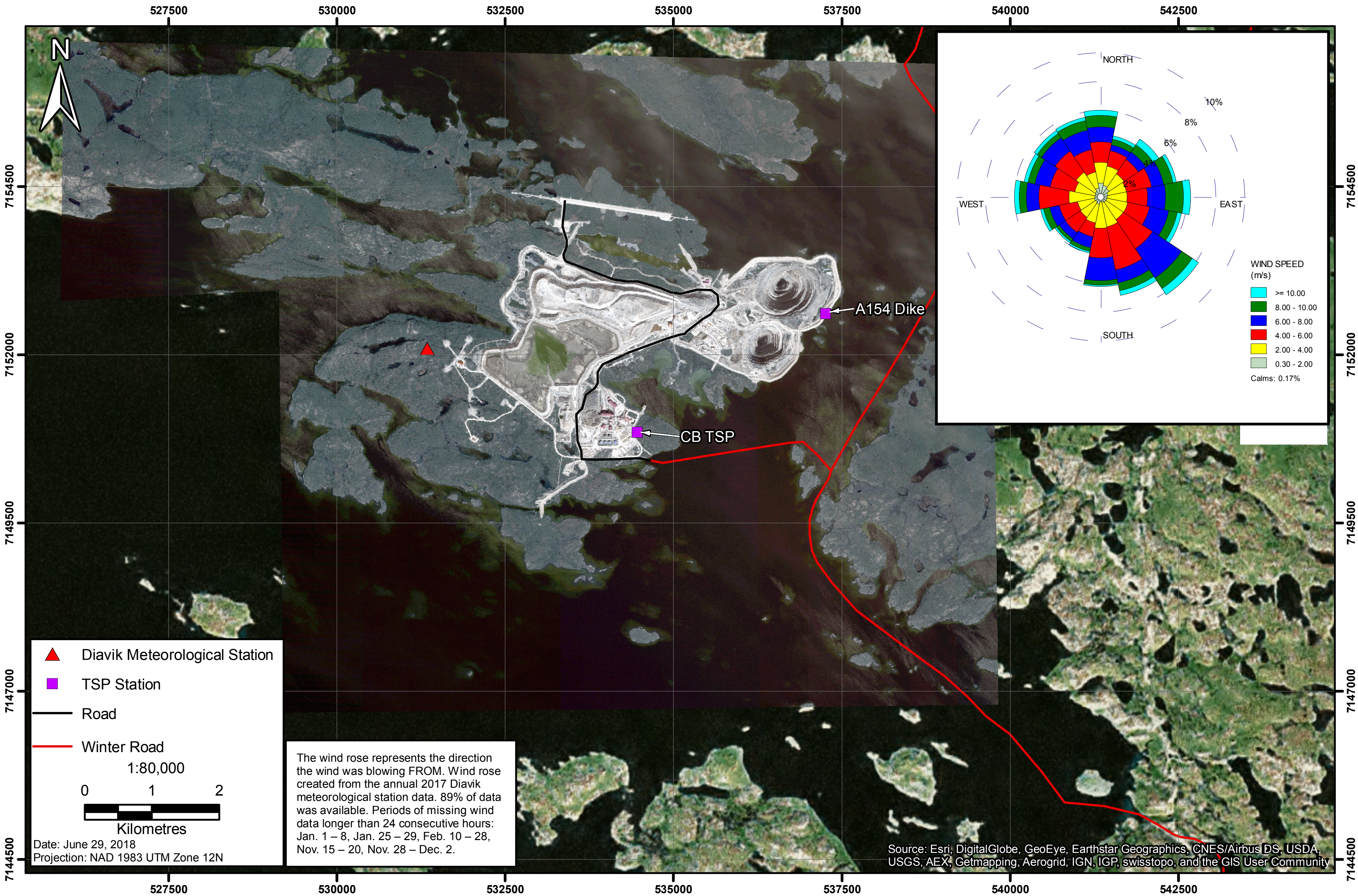
2.2 METHODS

TSP monitoring is undertaken using the Thermo SHARP 5014i monitor that uses beta attenuation monitoring technology. Ambient air is drawn through a subsonic orifice at a controlled flow rate; continuous mass measurements are conducted and hourly mass concentrations are calculated and stored in the iSeries platform data logging system. The sampling equipment is contained within a climate-controlled shelter to minimize data loss during extreme weather conditions, as recommended by the manufacturer.

The monitoring of TSP concentrations is continuous with hourly concentrations recorded over the course of 2017.

Figure 2.1-1

TSP Monitoring Locations, 2017



2.2.1 Monitoring Locations

TSP monitoring is undertaken at two locations—one sampler is near the A154 Dike (along the south-east corner of the A154 pit) and the second sampler is within the Communications Building (CB) adjacent to the accommodations complex (Figure 2.1-1). The location of the A154 Dike monitor and the site near the CB was selected based on the proximity to the boundary of the Mine footprint and the results of the updated air dispersion modelling assessment and power requirements. The locations of the DDMI TSP stations are presented in Table 2.2-1 and Figure 2.1-1.

Table 2.2-1. DDMI TSP Stations UTM Coordinates[1]

Station	Zone	Metres East	Metres North
CB	12W	534,460	7,150,847
A154 Dike	12W	537,258	7,152,609

[1] *World Geodetic System 1984 (WGS-84)*

2.2.2 Monitor Maintenance

The A154 Dike sampler was offsite for repair at the start of 2017 and was re-installed on January 23, 2017.

The DDMI TSP Monitoring Standard Operating Procedure (SOP) ENVI-801-0613 R4 (DDMI 2016) was in place and includes information about monthly, quarterly and annual servicing requirements for the samplers. Additional information about historical maintenance activities are included in TSP data memorandums in Appendix A and B.

2017 sampler maintenance and calibration records provided by DDMI are included in Appendix C.

2.2.3 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) procedures applied to TSP monitoring included the following:

- adherence to the revised DDMI TSP Monitoring SOP ENVI-801-0613 R4 (DDMI 2016);
- incorporation of the DDMI TSP into the DDMI Environmental Management System; and
- review of monitoring data and retention of calibration and maintenance records.

Where applicable, observations were adjusted by ERM using the methodology in the *Alberta Air Monitoring Directive Chapter 6: Ambient Data* (Alberta Environment and Parks 2016). This included:

- Hourly TSP concentrations between 0 and -3 $\mu g/m^3$ were set to 0 $\mu g/m^3$. This occurred 8% and 10% of the time in 2017 for the CB and A154 Dike stations, respectively.
- Hourly TSP concentrations below -3 $\mu g/m^3$ were flagged as invalid and removed from the dataset calculations. This occurred 13% and 10% of the time in 2017 for the CB and A154 Dike stations, respectively.

- For calculating valid daily TSP averages, if more than 25% (6 hours) of the hourly data in a day were invalid then the daily TSP average would also be flagged as invalid. This occurred 29% and 31% of the time in 2017 for the CB and A154 Dike stations, respectively.

Additional information about periodic ERM data review, TSP station operation and support recommendations are included in the TSP data memorandums in Appendix A and B. Descriptions for periods of missing or invalid data are included in Appendix C.

2.2.4 Analysis

Annual 24-hour TSP concentration plots were generated for each of the monitoring locations and the average annual TSP concentration were calculated from the valid hourly data. The 24-hour data were examined for trends and compared with predicted concentrations.

Periods of seasonal or event-driven elevated concentrations were compared with known site activities and natural smoke events (e.g., forest fires) to assist with identification of dominant sources or seasonal factors. The results of this analysis are presented in this report and will be used to update and modify the dust management SOPs incorporated in the Environmental Management System (EMS) if necessary.

2.3 RESULTS

TSP results were compared to the GNWT Department of Environment and Natural Resources (ENR) *Guideline for Ambient Air Quality Standards* in the Northwest Territories (GNWT 2014). ENR uses two guideline values for TSP:

- 24-hour average: 120 $\mu g/m^3$; and
- annual arithmetic mean: 60 $\mu g/m^3$.

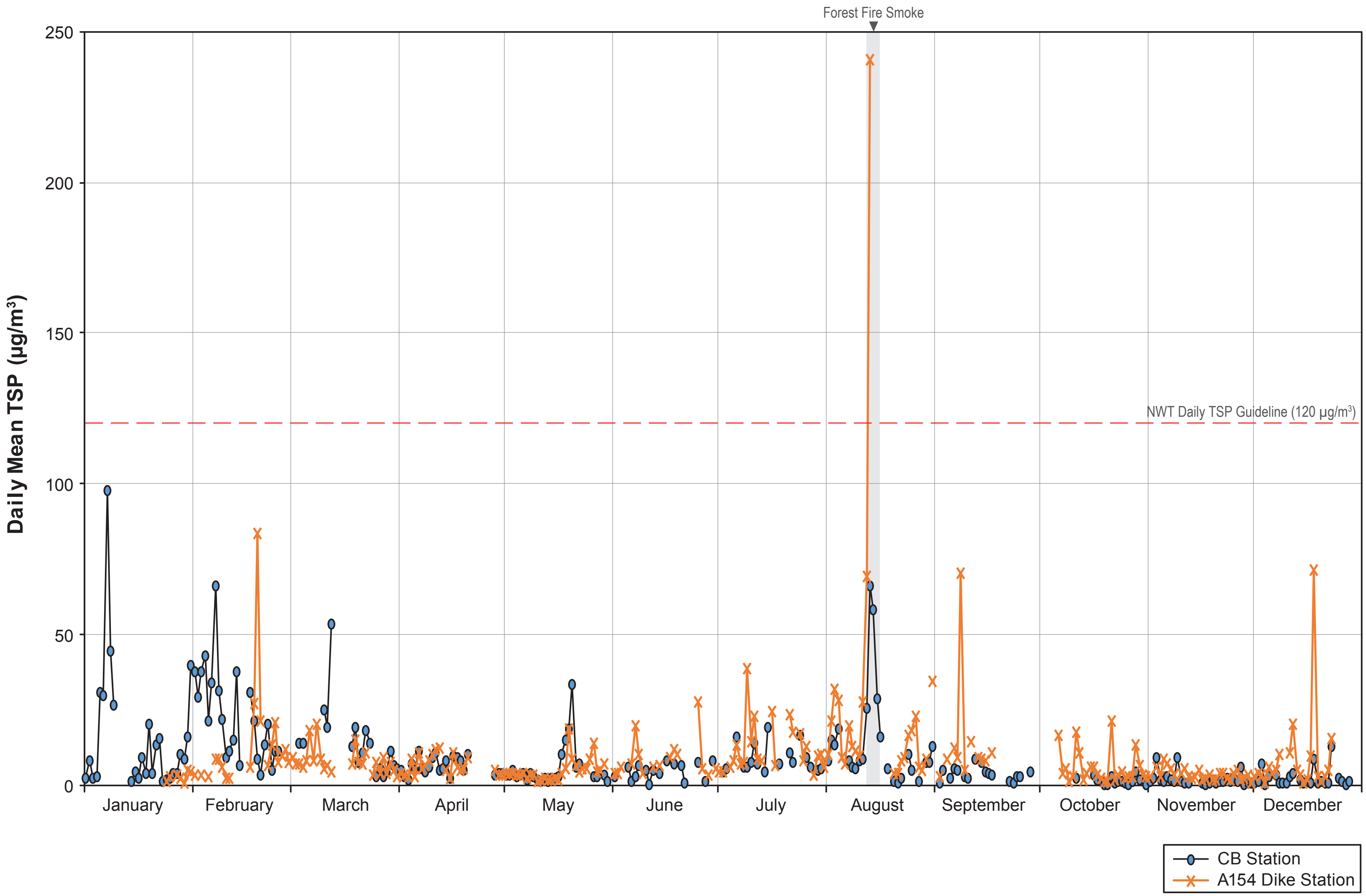
Figure 2.3-1 shows the 2017 24-hour average TSP concentrations for the CB and A154 Dike monitoring stations compared to the 24 hour GNWT guideline. Table 2.3-1 summarizes the TSP results. Appendix C contains tabulated 24-hour average TSP concentrations along with descriptions for periods of missing or invalid data.

Table 2.3-1. 2017 TSP Results, Diavik Diamond Mine

Station	2017 TSP Concentration ($\mu g/m^3$)			No. of Daily TSP Exceedances (>120 $\mu g/m^3$)	No. of Days with Valid Data Used[1]
	Annual Mean	Max. Daily Mean	Min. Daily Mean		
CB	9.0	97.9	0.5	0	260
A154 Dike	9.9	241.1	1.0	1	252

Notes:
[1] *Number of days with at least 75% (18 hours) of valid hourly data availability, out of 365 days.*

Figure 2.3-1
2017 Daily Mean TSP, CB and A154 Dike Stations



In 2017 there was one exceedance of the 24-hour average guideline (120 µg/m^3), measured at the A154 Dike station on August 13 (241.1 µg/m^3). Elevated TSP concentrations were measured by both stations from August 13 to 15 as forest fire smoke was observed at the Mine site on these dates (Figure 2.3-1).

The annual mean TSP concentrations at both stations were similar (9.0 µg/m^3 at CB station and 9.9 µg/m^3 at A154 Dike station) and were well below the annual guideline value (60 µg/m^3).

Additional data result discussions are included in the TSP data memorandums in Appendices A and B.

3. DUSTFALL MONITORING

Community interest in the possible effects of dust deposition (dustfall) on wildlife and aquatic environments are the basis for the focus of DDMI's EAQMP on TSP and dustfall. Dustfall is the deposition of airborne particulate matter on vegetation, snow and water, and it is monitored using dustfall collection gauges and snow cores.

In accordance with the EA and requirements associated with the Aquatic Effects Monitoring Program (AEMP), a dust monitoring program was initiated in 2001. The program was designed to achieve the following objectives:

- determine dustfall rates at various distances from the Mine footprint; and
- determine the chemical characteristics of dustfall that may be deposited onto, and subsequently into, Lac de Gras as a result of mining activities, in support of the AEMP.

In 2017, the dustfall monitoring program incorporated three monitoring components, with sampling conducted at varying distances from Mine infrastructure (25 to 4,852 m) along five transects:

- dustfall gauges (12 monitoring and 2 control stations);
- dustfall from snow surveys (24 monitoring and 3 control stations); and
- snow water chemistry from snow surveys (16 monitoring and 3 control stations).

Two new dustfall gauge stations were added west of the Mine in 2017, bringing the total to 14.

Additional information, data and figures can be found in the full *Diavik Diamond Mine: 2017 Dust Deposition Report* (Appendix E; ERM 2018).

3.1 DUSTFALL GAUGES

Dustfall gauges were placed at 14 stations (including two control stations) around the Mine at distances ranging from approximately 25 to 4,852 m from mining operations (Table 3.1-1 and Figure 3.1-1). Each gauge collected dustfall year-round with samples being collected for analysis approximately every three months, except for the two new stations (Dust 11 and Dust 12) that were first installed in early October 2017. The median total sampling period for the 12 existing stations was 367 days, and for the two new stations was 92 days.

Dustfall gauge stations consisted of a hollow brass cylinder (52 centimetres (cm) length, 12.5 cm inner diameter) housed in a Nipher snow gauge (Plate 3.1-1). The cylinder collected dustfall, while the Nipher snow gauge reduced air turbulence around the gauge to increase dustfall catch efficiency. At the end of each sampling period, the content of the cylinder was retrieved was processed in the DDMI environment laboratory to determine the mass of collected dustfall. This processing involved filtration, drying and weighing of samples as specified in the standard operating procedures (SOPs) ENVR-508-0112 and ENVI-303-0112 (see Appendix E). The cylinder was then exchanged with an empty, clean cylinder.

Table 3.1-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2017

Transect Line	Station ID	2017 Sample Dates	Total Sample Exposure Duration (days)[1]	UTM Coordinates[2]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[3]
				Easting (m)	Northing (m)			
Dustfall Gauges								
	Dust 1	Jan 4 (start), Mar 25, Jul 2, Sep 30, Dec 24	354	533964	7154321	75	Land	n/a
	Dust 2A	Jan 4 (start), Mar 25, Jul 2, Oct 6, Jan 6 (2018)	367	535678	7151339	435	Land	n/a
	Dust 3	Jan 4 (start), Mar 25, Jul 2, Sep 30, Jan 10 (2018)	371	535024	7151872	30	Land	n/a
	Dust 4	Jan 6 (start), Mar 25, Jul 2, Oct 7, Jan 10 (2018)	369	531397	7152127	200	Land	n/a
	Dust 5	Jan 4 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	367	535696	7155138	1,195	Land	n/a
	Dust 6	Jan 3 (start), Mar 25, Jul 2, Sep 30, Dec 24	355	537502	7152934	25	Land	n/a
	Dust 7	Jan 6 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	365	536819	7150510	1,155	Land	n/a
	Dust 8	Jan 3 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	368	531401	7154146	1,220	Land	n/a
	Dust 9	Jan 4 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	367	541204	7152154	3,810	Land	n/a
	Dust 10	Jan 6 (start), Mar 25, Jul 2, Oct 6, Jan 16 (2018)	273	532908	7148924	46	Land	n/a
	Dust 11	Oct 5 (start), Jan 6 (2018)	93	531493	7150156	805	Land	n/a
	Dust 12	Oct 6 (start), Jan 6 (2018)	92	529323	7151191	2,580	Land	n/a
	Dust C1	Jan 6 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	365	534979	7144270	4,700	Land	n/a
	Dust C2	Jan 4 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	367	528714	7153276	3,075	Land	n/a

(continued)

Table 3.1-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2017 (continued)

Transect Line	Station ID	2017 Sample Dates	Total Sample Exposure Duration (days)[1]	UTM Coordinates[2] Easting (m)	UTM Coordinates[2] Northing (m)	Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[3]
Snow Surveys								
1	SS1-1-4[4]	Apr 7	191	533911	7154288	30	Land	
	SS1-1-5[4]	Apr 7	191	533924	7154367	30	Land	
	SS1-2	Apr 7	191	533924	7154367	115	Land	
	SS1-3	Apr 7	191	533966	7154517	275	Land	
	SS1-4	Apr 7	158	534485	7155094	920	Ice	✓
	SS1-5	Apr 7	158	535099	7156279	2,180	Ice	✓
2	SS2-1	Apr 8	159	537553	7153473	180	Ice	✓
	SS2-2	Apr 8	159	537829	7153476	445	Ice	✓
	SS2-3	Apr 8	159	538484	7153939	1,220	Ice	✓
	SS2-4-4[4]	Apr 8	159	539151	7154685	2,180	Ice	✓
	SS2-4-5[4]	Apr 8	159	539151	7154685	2,180	Ice	✓
3	SS3-4	Apr 3	154	536585	7151002	615	Ice	✓
	SS3-5	Apr 3	154	537638	7150824	1,325	Ice	✓
	SS3-6	Apr 3	154	536305	7151604	60	Ice	✓
	SS3-6-regrab	Apr 30	181	536306	7151566	60	Ice	✓
	SS3-7	Apr 3	154	536343	7151368	250	Ice	✓
	SS3-8	Apr 3	154	536693	7150806	830	Ice	✓
4	SS4-1	Apr 7	191	531491	7152211	100	Land	
	SS4-2	Apr 7	191	531356	7152261	245	Land	
	SS4-3	Apr 7	191	531331	7152434	350	Land	
	SS4-4	Apr 7	158	531141	7153167	1,065	Ice	✓
	SS4-5-4[4]	Apr 7	158	531405	7154116	1,220	Ice	✓
	SS4-5-5[4]	Apr 7	158	531405	7154116	1,220	Ice	✓

(continued)

Table 3.1-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2017 (completed)

Transect Line	Station ID	2017 Sample Dates	Total Sample Exposure Duration (days)[1]	UTM Coordinates[2]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[3]
				Easting (m)	Northing (m)			
Snow Surveys *(cont'd)*								
5	SS5-1	Apr 1	185	533150	7148925	45	Land	
	SS5-2-4[4]	Apr 1	185	533150	7148875	95	Land	
	SS5-2-5[4]	Apr 1	185	533150	7148875	95	Land	
	SS5-3	Apr 1	152	533142	7148691	270	Ice	✓
	SS5-4	Apr 1	152	533143	7147956	1,021	Ice	✓
	SS5-5	Apr 1	152	533146	7146950	2,020	Ice	✓
	Control 1	Apr 1	192	534983	7144271	4,852	Land	✓[5]
	Control 2	Apr 7	190	528714	7153281	3,075	Land	✓[5]
	Control 3	Apr 3	187	538650	7148750	3,570	Land	✓[5]

Notes:

[1] *The exposure duration for snow surveys was calculated from the first snowfall for land stations (September 28, 2016) and ice freeze up for ice stations (October 31, 2016).*

[2] *UTM Zone 12W, NAD83*

[3] *n/a = not applicable*

[4] *Duplicate sample taken for snow water chemistry.*

[5] *Snow water chemistry sampled over ice, adjacent to the on-land control station; see Section 3.3 for further details.*

Figure 3.1-1

Dustfall Gauge and Snow Survey Locations, Diavik Diamond Mine, 2017

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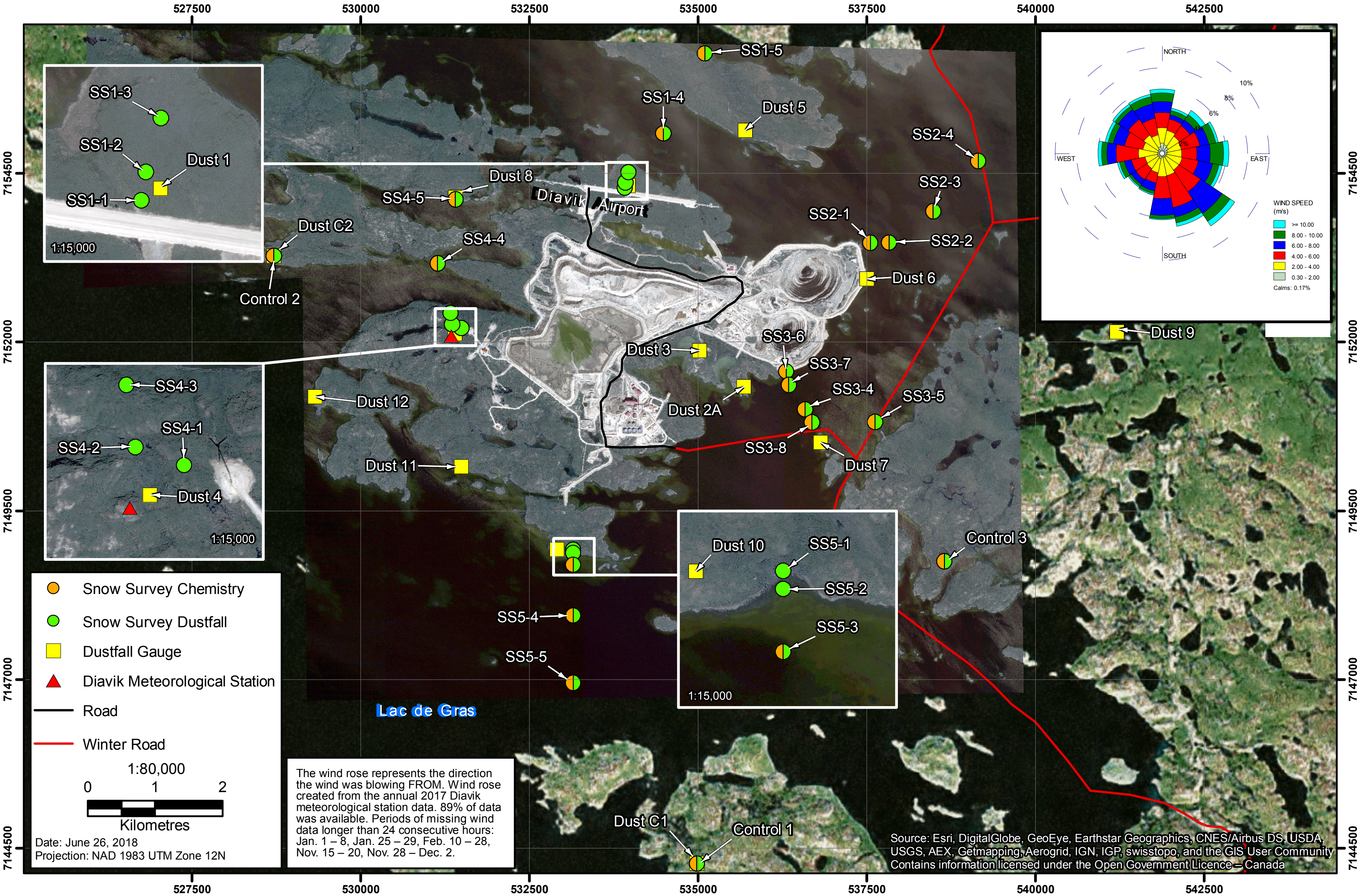

Plate 3.1-1. Dustfall gauge during sample collection. The dustfall gauge consisted of a hollow brass cylinder (centre) housed inside a Nipher snow gauge (right).

Once the mass of collected dustfall at a station was measured, the mean daily dustfall rate over the collection period was calculated as:

$$D = \frac{M}{A*T} \qquad \text{[Equation 1]}$$

where:

D = mean daily dustfall rate (mg/dm^2/d) during time period T
M = mass of dustfall collected (mg) during time period T
A = surface area of dustfall gauge collection cylinder orifice (dm^2; approximately 1.227 dm^2)
T = number of days of dustfall collection (d)

The mean daily dustfall rate (mg/dm^2/d) was then multiplied by 365 days to convert units to annual units (mg/dm^2/y).

Estimated dustfall rates were compared to the former British Columbia Ministry of Environment (BC MOE) dustfall objectives for the mining, smelting and related industries (Table 3.1-2; BC MOE 2016). The dustfall objective and sampling methodology is no longer used in BC (BC ENV 2018); however, for the purposes of this report, dustfall will be compared to the former objective to be consistent with prior dust deposition reports. The dustfall objectives ranges from 1.7 to 2.9 milligram per square decimetre per day (mg/dm^2/d), sampled and averaged over 30 days. The 1.7 mg/dm^2/d objective is often considered to be applicable at sensitive locations, whereas the 2.9 mg/dm^2/d objective is applicable to areas where it can be shown that unacceptably deleterious changes will not follow. Both values are presented throughout this report.

Table 3.1-2. Dustfall and Snow Water Chemistry Reference Values

Parameter	Value	Unit	Comment	Source
Dustfall Rate	1.7–2.9 (621-1,059)	mg/dm^2/d (mg/dm^2/y)	Former objective for the mining, smelting, and related industries	BC MOE 2016
Aluminum-Total	3,000	µg/L	Max. grab sample concentration	W2015L2-0001
Ammonia-N	12,000	µg/L	Max. grab sample concentration	W2015L2-0001
Arsenic-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Cadmium-Total	3	µg/L	Max. grab sample concentration	W2015L2-0001
Chromium-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Copper-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Lead-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001
Nickel-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Nitrite-N	2,000	µg/L	Max. grab sample concentration	W2015L2-0001
Zinc-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001

3.2 DUSTFALL SNOW SURVEYS

Dustfall was assessed as part of the snow surveys completed at 27 stations (including three control stations), along five transects around the Mine (Table 3.1-1; Figure 3.1-1). Across stations, the distance from mining operations ranged from approximately 30 to 4,852 m. The median exposure period was 159 days. The start dates used to calculate the exposure duration correspond to the first snowfall for land stations (September 28, 2016), and shortly after ice freeze up, once ice conditions were safe for work, for ice stations (October 31, 2016).

At each snow survey station, a snow corer was used to drill into the snow pack to retrieve a cylindrical snow core (6.1 cm inner diameter; Plate 3.2-1). Cores were extracted at each station and composited in the field to obtain a representative snow sample for the station. A minimum of three snow cores were collected at each (land and ice) snow sampling station, as outlined in the SOP ENVR-512-0213. Composited samples were bagged and brought to the DDMI environment laboratory for processing as specified in SOP ENVR-512-0213 and ENVI-303-0112. Processing of snow cores required filtration, drying and weighing. For QA/QC, duplicate samples were collected at the stations indicated in Table 3.1-1.

Mean daily dustfall rate (mg/dm^2/d) was calculated for the collection period using Equation 1, with surface area (*A*) equal to the surface area of the snow corer tube orifice (0.2922 dm^2) multiplied by the number of snow cores used for the composited sample at the station. The mean annual dustfall rate (mg/dm^2/y) was estimated by multiplying the mean daily dustfall rate by 365 days.

Dustfall rates were compared to the former BC dustfall objective for the mining, smelting and related industries (Table 3.1-2).

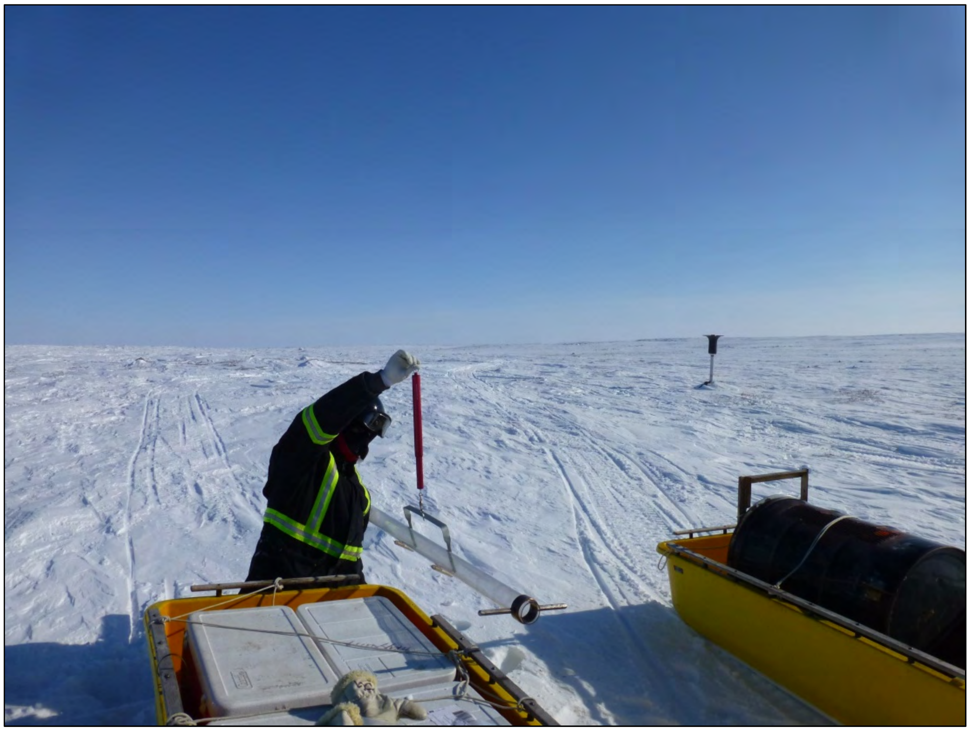

Plate 3.2-1. Snow core sample being weighed, with dustfall gauge in background.

3.3 SNOW WATER CHEMISTRY

Snow water chemistry analysis was performed on snow cores extracted from 19 of the 27 snow survey stations (including three control locations; Table 3.1-1; Figure 3.1-1). These locations included the 16 snow survey dustfall stations that were located on ice, as well as samples taken on ice adjacent to the three control stations. Across stations, the distance from mining operations ranged from approximately 60 to 4,852 m, and the median sampling exposure duration was 158 days. At each station located on ice, cores were collected for chemistry analysis immediately after the dustfall snow cores were extracted.

Snow water chemistry cores were extracted using a snow corer in accordance with the dustfall snow survey core extraction. A minimum of three cores at each site were extracted and composited to obtain the required 3 litres (L) of snow water for the laboratory chemical analysis. Snow cores were then processed and prepared for shipment to Maxxam Analytics (Maxxam) where the chemical analysis was performed. For QA/QC purposes, duplicate samples and blanks were collected at the stations indicated in Table 3.1-1. Snow water chemistry sampling methodology is detailed in Appendix E.

EQC, including "maximum average concentration" and "maximum concentration of any grab sample," are stipulated in DDMI's Water Licence (W2015L2-0001) for aluminium, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite and zinc (Table 3.1-2). Snow water chemistry results for these variables were compared to the "maximum concentration of any grab sample." These results are also presented as part of DDMI's Aquatics Effects Monitoring Program (AEMP) report.

3.4 RESULTS

Dustfall and snow water chemistry results were grouped into zones based on their relative distance from the Mine footprint (Table 3.4-1). Although station groupings into zones were first established at the outset of the program, these groupings were re-established in 2013 using satellite imagery of the site.

Table 3.4-1. Dustfall Results, Diavik Diamond Mine, 2017

Zone ID (m)	Number of Stations in Zone	2017 Dustfall ($mg/dm^2/y$) from Dustfall Gauges and Dustfall Snow Surveys			
		Median	Mean	Maximum	Minimum
0 - 100	9	286	341	1,351	64
101 - 250	5	101	224	771	51
251 - 1,000	9	137	139	318	19
1,001 – 2,500	13	92	82	132	17
Control	5	34	43	108	10

In 2017, the primary sources of fugitive dust were associated with unpaved road and airstrip usage and construction activities at A21. The distances to mining operations are shown in Table 3.1-1. Major waste rock material transfers in 2017 occurred on haul roads (392,102 tonnes) and kimberlite ore to the crusher (2,189,799 tonnes). Another source of fugitive dust is truck traffic along the ice road to the Mine. However, the consistency in dust deposition rates near the ice road alignment between winter and summer indicated that the contributions of dust from the ice road were modest relative to other sources. There is no direct measurement of dustfall due to the use of the ice road; however, dustfall stations immediately downwind of the ice road such as Dust 7, Dust 6, and SS2-4 did not show elevated readings during winter months. To supress fugitive dust generation, roads, parking areas and laydown areas were watered during the summer as needed. Between May and September 2017, approximately 1,668 m^3 of water was applied on the Mine site and 55,948 m^3 of water was applied on haul roads. The exact impact of dust suppression could not be determined from the data collected in 2017; however, it is expected that road watering reduced the amount of dust generated at the Mine in 2017. The Underground Mine production rate was steady throughout the year. Open pit mining of A21 and construction of the Waste Rock Storage Area - South Country Rock Pile commenced in December 2017. Fugitive dust generation is expected to be greatest during snow-free periods where and when there is site activity. It was expected that the highest fugitive dust generation and resulting dustfall occurred in areas closest to the roads and the airstrip and mine footprint such as near A21 and the country rock pile between May and September. Dust 1 (adjacent to the airstrip) recorded the highest dustfall during the summer months (936 $mg/dm^2/y$) compared to the winter months (230 $mg/dm^2/y$).

The 2017 predominant wind directions at the site were from the southeast, although this was not very pronounced and in fact in general the winds can be described as omni-directional (see windrose in Figure 3.1-1). The expectation is that airborne material will be deposited in all directions around the mine with a slight northwest emphasis. The results show that the direction from the mine is not the strongest indicator of dust deposition, rather proximity to mine activities and roads and the airstrip show a stronger influence. This is supported by the fact that Dust 1 had the highest recorded dustfall in 2017 (adjacent to the airstrip) and Dust 10 had the second highest recorded dustfall in 2017 which is adjacent to and south of the Mine (see Figure 3.1-1).

Results from the dustfall gauges, dustfall snow surveys, and the snow water chemistry analysis are presented below.

3.4.1 Dustfall Gauges

Total dustfall collected from each dustfall gauge throughout the year is summarized by zone in Table 3.4-1. The following list describes tables or figures that are included in the *Diavik Diamond Mine: 2017 Dust Deposition Report* (Appendix E; ERM 2018):

- 2017 annual dustfall collected at each station, relative to the Mine;
- historical records of annual dustfall for each station from 2002 to 2017;
- a comparison of dustfall versus distance from the Mine footprint for 2017 and historical 2002 – 2017 datasets; and
- boxplots summarizing the dustfall magnitude distribution from all stations in each year 2002 – 2017.

In general, dustfall decreased with increasing distance from the Mine (Table 3.4-1). The greatest estimated dustfall rate measured using gauges occurred at Dust 1 (480 mg/dm^2/y), 75 m north of the Mine's airstrip. The close snow survey station SS1-1 (30 m north of the airstrip) also experienced the highest dustfall of the snow survey stations (1,351 mg/dm^2/y). It is likely that during 2017 dust generated by airstrip activity was the cause of elevated readings adjacent to the airstrip. The second highest estimated dustfall rate measured using gauges occurred at Dust 10 (318 mg/dm^2/y) located 46 m from the Mine. The lowest dustfall rate was measured at the control station Dust C1 (34 mg/dm^2/y; 4,700 m south of the Mine) and the other control station Dust C2 (37 mg/dm^2/y; 3,075 m west of the Mine) recorded the second lowest measured dustfall.

The 2017 mean, median and interquartile range of all dustfall station rates were less than all historical dustfall rates, except 2013. The lower overall dustfall rates were likely influenced by the decrease in surface activity at the mine with no surface mining starting until December, 2017.

The annualized dustfall rates estimated from each dustfall gauge were less than the former BC objective for the mining industry (621 to 1,059 mg/dm^2/y; Table 3.1-2). This former objective was used for comparison purposes only: there are currently no dustfall standards or objectives for the Northwest Territories. However, the BC objective was generally used as a reference for comparison at other mines in the region.

3.4.2 Dustfall Snow Surveys

Annual dustfall rates estimated from each snow survey station in 2017 are included in the combined dustfall gauge and snow survey results in Table 3.4-1. Historical records of annual dustfall rates for each station, the relationships between annual dustfall rates and distance from the Mine footprint, boxplots summarizing dustfall rates measured in each year, and QA/QC analysis are presented in the annual dust deposition report (Appendix E).

Annualized dustfall rates estimated from 2017 snow survey data ranged from 10 to 1,351 mg/dm²/y. Dustfall at SS1-1 was the highest recorded of the snow survey stations. SS1-1 is located 30 m north of the airstrip which is likely the reason for the higher levels of dustfall found here. In general, snow survey dustfall rates decreased with increasing distance from the Mine, with the lowest dustfall rate recorded at station Control 1. Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 and Control zones were 341, 224, 139, 82 and 43 mg/dm²/y, respectively (Table 3.4-1). Dustfall rates at stations SS1-1, SS1-2, Dust 2A, SS3-4, Dust 7, SS4-4, SS4-5, and Control 3 were greater than the upper limit of the 95% confidence interval for their respective zones in 2017. These high dustfall rates, compared to the overall distribution of dustfall rates within each zone, indicated that higher dustfall rates were observed in the vicinity of the airstrip and to the west and southeast of the Mine.

Annualized dustfall estimated from each snow survey station in 2017 were generally less than historical dustfall estimates (Figures 3.1-2 and 3.1-3). Comparisons of mean and maximum values suggest that dustfall rates were generally lower in 2017 than in 2016 and 2015.

Annualized dustfall rates measured at each station during the 2017 snow survey were less than the former BC objective for the mining industry (621–1,059 mg/dm²/y) for all stations other than SS1-1 (1,351 mg/dm²/y; 30 m north of the airstrip) and SS1-2 (771.2 mg/dm²/y; 115 m north of the airstrip). This former objective was used for comparison purposes only: there are currently no dustfall standards or objectives for the Northwest Territories.

3.4.3 Snow Chemistry

Maximum snow water chemistry results for 2017 are presented in Table 3.4-2. All analytical results for snow water chemistry and QA/QC analysis are included in the *Diavik Diamond Mine: 2017 Dust Deposition Report* (Appendix E; ERM 2018).

Table 3.4-2. Snow Water Chemistry Results, Diavik Diamond Mine, 2017

Zone ID (m)	Number of Samples in the Zone	2017 Maximum Snow Water Chemistry Results (µg/L)										
		Aluminum	Ammonia	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Nitrite	Phosphorus	Zinc
0 - 100	1	836	-	0.2	0.0	8.4	1.3	0.7	23.1	1.7	54.2	5.4
101 - 250	2	670	110	0.2	0.0	10.4	1.4	1.0	28.5	3.4	103	16.8
251 - 1,000	5	3,950	130	0.7	0.1	86.9	8.1	3.5	226	3.3	104	23.8
1,001 - 2,500	8	1,700	220	0.6	0.0	13.9	2.4	1.4	22.9	2.2	53.5	14.8
Control	3	530	83.0	0.1	0.0	6.4	0.7	0.5	12.5	2	26.6	4.6

In general, average concentrations of snow water chemistry variables of interest decreased with increasing distance from the Mine. However, high parameter concentrations were recorded at Station SS3-4, located in the 251-1,000 zone (615 m southeast of the closest Mine infrastructure). SS3-4 is located to the southeast of the Mine (Figure 3.1-1) where higher measured dustfall was observed at the stations along the same transect compared to other transects.

All 2017 sample concentrations were less than their associated reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001 (Table 3.1-2), except for sample SS3-4 that had aluminum, chromium, nickel and zinc exceedances.

4. NATIONAL POLLUTANT RELEASE INVENTORY

4.1 PROGRAM OVERVIEW

According to ECCC, air issues such as smog and acid rain result from the presence of, and interactions between, a group of pollutants known as Criteria Air Contaminants (CAC) and some related pollutants. CAC, in particular, refer to a group of pollutants that include:

- Sulphur oxides (SO_x);
- Nitrogen oxides (NO_x);
- Particulate matter (PM);
- Volatile organic compounds (VOC);
- Carbon monoxide (CO); and
- Ammonia (NH_3).

In addition, ground-level ozone (O_3) and secondary particulate matter are often referred to among the CAC because both ground-level ozone and secondary particulate matter are by-products of chemical reactions between the CAC (ECCC 2017).

CAC are produced from a number of sources, including burning of fossil fuels and it is because of these shared sources that CAC are grouped together.

While there is no regulatory requirement or standard for these pollutant releases in the Northwest Territories, the National Pollutant Release Inventory (NPRI) is a legislated, publicly accessible inventory used to track the amount of pollutant releases (to air, water and land), disposals and transfers for recycling. The program is administered by ECCC and is a requirement of the *Canadian Environmental Protection Act* (CEPA; 1999) for owners or operators of facilities that meet the NPRI reporting requirements published in the Canada Gazette, Part I. Reporting requirements are normally revised every one or two years (ECCC 2018d), with accompanying revised guidance documents (ECCC 2016). NPRI reports containing emissions of CACs are to be submitted to ECCC before June 1 each year.

NPRI substance emissions were derived by DDMI using emission factor calculations provided by Environment Canada NPRI Toolbox (ECCC 2018f). Operational values such as fuel usage and mobile equipment hours were recorded at the Mine throughout the year and weather conditions from the Mine's (onsite) weather station were used to calculate NPRI values.

4.2 RESULTS

Table 4.2-1 compares the Mine's 2017 NPRI CAC emission submission results against the 2016 NPRI submission results. NPRI reports for previous years (2001 – 2016) are available on the NPRI website (ECCC 2018e). NPRI results for the previous year are typically released by ECCC in April, 22 months following submission on June 1 of each year (e.g., 2017 data reported by June 1, 2018 is expected to be released by ECCC in April of 2019).

Table 4.2-1. NPRI Results for CAC Emissions, Diavik Diamond Mine, 2016 and 2017

CAC Emissions	2017 Reporting Threshold (tonnes)	2016 (tonnes)	2017 (tonnes)	Reasons for Changes from Previous Year
Carbon Monoxide (CO)	20	620	675	No significant change.
Sulphur Dioxide (SO_2)	20	0.9	17.7	Change in 2017 production levels. Increased blasting due to A21 open pit mining.
Oxides of Nitrogen (NO_x; expressed as NO_2)	20	2,336	2,275	No significant change
Volatile Organic Compounds (VOCs)	10	60	57.8	No significant change
Total Particulate Matter (TPM)	20	1,048	726	Changes in 2017 production levels. A21 road construction near complete, decreased road traffic. Increased incineration, rock re-mine, and waste-oil combustion.
Particulate Matter ≤ 10 µm (PM_{10})	0.5	328	238	Changes in 2017 production levels. A21 road construction near complete, decreased road traffic. Increased incineration, rock re-mine, and waste-oil combustion.
Particulate Matter ≤ 2.5 µm ($PM_{2.5}$)	0.3	65	56	Changes in 2017 production levels. A21 road construction near complete, decreased road traffic.

There was a slight increase (<10% change) of CO emissions and a significant increase of SO_2 emissions in 2017 compared to 2016. SO_2 emissions increased due to blasting during A21 open pit mining.

There were slight decreases (<10% change) of NO_x and VOCs emissions, and moderate decreases (14 to 31% decrease) of TPM, PM_{10} and $PM_{2.5}$ emissions. Particulate matter emissions decreased primarily due to a decrease in road traffic.

5. GREENHOUSE GAS REPORTING

5.1 Program Overview

While there is no territorial regulatory requirement or standard for GHG release in the Northwest Territories, the national Greenhouse Gas Emissions Reporting Program (GHGRP) is Canada's legislated, publicly accessible inventory of facility-reported GHG data and information. The program is administered by ECCC and is a requirement of the CEPA 1999 for owners or operators of facilities that emit GHGs above a certain threshold. Starting for 2017 reporting, the GHGRP was recently changed to require all facilities to report that emit the equivalent of 10,000 tonnes of carbon dioxide equivalent units (tCO_2e) or more, per year (ECCC 2018a). The previous threshold was 50,000 tCO_2e per year. GHG reports are to be submitted prior to June 1 each year.

GHG emissions were derived by DDMI using emission factor calculations in the *Guidance Manual for Estimating Greenhouse Gas Emissions* (Environment Canada 2004). Operational values such as fuel usage and mobile equipment hours were recorded at the Mine throughout the year.

5.2 Results

Table 5.2-1 compares 2016 and 2017 GHG emissions results for the Mine. The 2017 GHG emission reporting information were filed with ECCC on May 15, 2018. GHG reports for previous years (2001 – 2016) are published by ECCC and available from the Open Government website (ECCC 2018b).

Table 5.2-1. GHG Equivalents for the Diavik Diamond Mine, 2016 and 2017

Constituent	2016 (tonnes)	2017 (tonnes)
CO_2e	198,929	194,968

GHG emissions results for the previous year are typically released by ECCC in April, 22 months following submission on June 1 of each year (e.g., 2017 data reported by June 1, 2018 is expected to be released by ECCC in April of 2019).

Three GHG emissions are calculated for the Mine: CO_2, methane (CH_4) and nitrous oxide (N_2O). To calculate CO_2e, 100-year Global Warming Potentials (GWP) are used to convert CH_4 and N_2O from tonnes to tCO_2e. The CH_4 and N_2O GWP multipliers used were 25 and 298, respectively (ECCC 2018c).

CO_2e emissions decreased between from 2016 to 2017 at the Mine (Table 5.2-1). GHG emissions at the Mine are primarily derived from stationary equipment fuel combustion and mobile equipment fuel combustion (76.7% and 23.1% of GHG emissions, respectively). There was a decrease in diesel consumption in 2017 compared to 2016.

In 2017, the Mine's 9.2 megawatt wind farm (consisting of four turbines; Plate 5.2-1) generated 17.2 gigawatt-hours of electricity (9% energy penetration) and saved 3.9 million litres of diesel fuel needed for power, thereby reducing the Mine's CO_2e by 10.5 kilotonnes. Since start-up in October 2012, the estimated diesel fuel savings has totalled 22.1 million litres and has prevented 61.3 kilotonnes of CO_2e from being emitted to the atmosphere (DDMI 2018).

Plate 5.2-1. The Diavik 9.2 megawatt wind farm. The wind farm consists of four wind turbines.

6. SUMMARY

TSP was measured at two stations in 2017: the CB and A154 Dike stations. The A154 Dike sampler was offsite for repair at the start of 2017 and was re-installed on January 23, 2017.

In 2017, there was one exceedance of the GNWT 24 hour average TSP guideline (120 µg/m^3), measured at the A154 Dike station on August 13 (241.1 µg/m^3). Elevated TSP concentrations were measured by both stations from August 13 to 15 as forest fire smoke was observed at the Mine site on these dates. The annual mean TSP concentrations at both stations were similar (9.0 µg/m^3 at CB station and 9.9 µg/m^3 at A154 Dike station) and well below the annual guideline value (60 µg/m^3).

TSP stations had valid daily data for 71% and 69% of days in 2017 for CB and A154 Dike stations, respectively.

In 2017, dustfall was monitored at 14 dustfall gauges and 27 snow survey stations located at varying distances around the mine. Two new dustfall gauge stations (Dust 11 and Dust 12) were added in October 2017, west of the Mine. Snow water chemistry was measured at 19 of the snow survey stations and compared to EQC set out in the WLWB Water Licence W2015L2-0001.

Annual dustfall estimated from each of the 14 dustfall gauges ranged from 34 to 480 mg/dm^2/y in 2017. Annual dustfall rates estimated from the 2017 snow survey data ranged from 10 to 1,351 mg/dm^2/y. Annualized dustfall rates measured at each dustfall gauge and snow survey station were less than the former BC dustfall objective for the mining industry (621–1,059 mg/dm^2/y) for all stations except for SS1-1 (1,351 mg/dm^2/y; 30 m north of the airstrip) and SS1-2 (771 mg/dm^2/y; 115 m north of the airstrip). This former objective was used for comparison purposes only: there are currently no dustfall standards or objectives for the Northwest Territories. Annualized dustfall estimated from each station in 2017 were generally less than historical dustfall estimates.

Because the dustfall gauges continuously collect dust throughout the year, and the snow surveys are only representative of dustfall accumulated over the snow cover period, the reported annual dustfall results from the dustfall gauges are expected to provide a better estimate of annual dustfall compared to snow survey results for similar geographic areas. However, results obtained from both methods showed similar spatial patterns, with dustfall generally decreasing with distance away from the Mine.

Snow water chemistry analysis of interest included those variables with effluent quality criteria (EQC; i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc). All 2017 sample concentrations were less than their associated reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001 other than sample SS3-4 (located 615 m southeast of the closest Mine infrastructure) for aluminum (3,950 µg/L), chromium (86.9 µg/L), nickel (226 µg/L) and zinc (23.8 µg/L).

The Mine reported CAC emissions as part of the annual NPRI submission and emissions were estimated using published emission factors. Compared to 2016, 2017 emissions of CO increased slightly (675 tonnes; <10% change) and SO_2 emissions increased significantly (17.7 tonnes; 1,866%

increase). The increase of SO_2 emissions were due to a change in mine production levels and blasting due to A21 open pit mining. There were slight decreases (<10% change) of NO_x and VOC emissions, and moderate decreases (14 to 31% decrease) of TPM, PM_{10} and $PM_{2.5}$ emissions. Particulate matter emissions decreased primarily due to a decrease in road traffic.

The Mine reported GHG emissions as part of the annual national GHGRP submission and CO_2e emissions were estimated using published emission factors and 100-year GWP ratios. Starting for 2017 reporting, the GHGRP was changed to require all facilities to report that emit the equivalent of 10,000 tCO_2e or more per year, compared to the previous 50,000 tCO_2e per year threshold.

Mine GHG emissions of CO_2, CH_4 and N_2O totalled 194,968 tCO_2e in 2017, a 2% decrease from 2016. GHG emissions at the Mine were primarily from stationary equipment fuel combustion (76.7%) and mobile equipment fuel combustion (23.1%). In 2017, the Mine's 9.2 megawatt wind farm helped to reduce the Mine's GHG footprint by generating 17.2 gigawatt-hours of electricity which saved 3.9 million litres of diesel fuel and thereby prevented the direct release of 10,500 tCO_2e.

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Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

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Appendix A

Total Suspended Particulates (TSP) Monthly Data Memorandum (dated October 23, 2017; includes Jan. 1, 2017 to Oct. 10, 2017 data)

Memorandum

Refer to File: A.1_Diavik TSP Sampler Memo.docx

Date: October 23, 2017

To: David Wells, Superintendent - Environment - HSE

From: Jem Morrison, Atmospheric Scientist

Cc: Carol Adly, Project Manager
Marc Wen, Partner In Charge

Subject: **Total Suspended Particulates (TSP) Monthly Data Memorandum**

1. INTRODUCTION

Diavik Diamond Mine (2012) Inc. (DDMI) installed two continuous total suspended particulate (TSP) samplers at the Diavik Diamond Mine (Mine) in accordance with their Environmental Air Quality Monitoring Plan (EAQMP; DDMI 2013) in June 2013. The locations of the monitors were selected based on proximity to the Mine boundary, with careful consideration of the TSP results from the updated air dispersion modelling assessment, and in consideration of the availability of power (DDMI 2013).

In February 2016, DDMI requested that ERM initiate a trip to the Property to perform maintenance and troubleshoot operational issues on the two TSP samplers at the Mine. It was determined that the TSP sampler located near the A154 dike was in need of offsite repairs and was sent to the vendor (CD Nova). Remote downloads and historical data analysis showed that specific alarms and data anomalies have been frequent. The vendor of the TSP samplers, CD Nova, was contracted by DDMI to facilitate troubleshooting, calibrate the instruments, and train ERM and DDMI employees on the maintenance and calibration of the samplers. A summary of the completed work can be found in the *Total Suspended Particulates Sampler Support Memorandum* (ERM 2016).

DDMI received the repaired A154 dike sampler at the beginning of July 2016. After a period of two months of sampling, it was determined that there were continued operational issues with the sampler and it was returned to CD Nova for repair. The A154 dike sampler was received from CD Nova at the beginning of January and initiated sampling on January 23, 2017 and has been operating well. Data from both TSP samplers are included in this report.

This memorandum provides a summary of the data collected in 2017 from the Communications Building (CB) TSP sampler and the A154 dike sampler and recommendations for ongoing maintenance and servicing.

2. METHODS

2.1 MONITORING LOCATION

TSP monitoring is undertaken at two locations—one sampler is near the A154 Dike (along the southeast corner of the A154 pit) and the second sampler is within the Communications Building (CB) adjacent to the accommodations complex. The location of the A154 Dike monitor was selected based on the proximity to the boundary of the Mine footprint and the results of the updated air dispersion modelling assessment and power requirements. The site near the CB was selected based on power requirements, proximity to the boundary of the Mine footprint, and the results of the updated air dispersion modelling assessment. The approximate locations of the DDMI TSP stations are presented in Table 2.1-1.

Table 2.1-1. DDMI TSP Stations UTM Coordinates[1]

Station	Zone	Metres East	Metres North
CB	12W	534,460	7,150,847
A154 Dike	12W	537,258	7,152,609

[1] *World Geodetic System 1984 (WGS-84)*

2.2 MONITORING METHODS

The TSP monitors are Thermo Fisher Scientific 5014i instruments that measure TSP using beta attenuation. Ambient air is drawn through a subsonic orifice at a controlled flow rate; continuous mass measurements are conducted and hourly mass concentrations are calculated and stored in the iSeries platform data logging system. The sampling equipment is contained within a climate-controlled shelter to minimize data loss during extreme weather conditions, as recommended by the manufacturer.

The monitoring of TSP concentrations mass loadings as micrograms/cubic metre (μg/m^3) is continuous, and hourly average concentrations are recorded. TSP monitoring is conducted continuously throughout the year. The analyses of temporal and spatial TSP trends support comparison between the measured particulate concentrations at the CB and at the A154 Dike. The readings at the CB are expected to be higher than those at the A154 Dike due the communication building's proximity to many of the diesel combustion sources (i.e., boilers and power house), the processing plant, and the run of mine (ROM) ore stockpiles. There is the possibility that episodic events in the region (e.g., a dust storm transporting airborne particulates) could result in higher measured particulate concentrations at the A154 Dike.

Where applicable, observations were adjusted by ERM using the methodology in the *Alberta Air Monitoring Directive Chapter 6: Ambient Data Quality* (Alberta Environment and Sustainable Resource Development 2016). For example, hourly average TSP concentrations that were between 0 and -3 μg/m^3 were adjusted to zero.

3. RESULTS

TSP results were compared to the Government of the Northwest Territories Department of Environment and Natural Resources (ENR) Guideline for Ambient Air Quality Standards in the Northwest Territories (GNWT 2014). ENR uses two standards for TSP:

1. 24-hr Average: 120 µg/m^3; and
2. Annual Arithmetic Mean: 60 µg/m^3.

Figures 3-1 and 3-2 displays the 24-hour average TSP concentrations for the CB station since January 1, 2017, and the A154 dike station since January 23, 2017, compared to the GNWT 2014 Standards. Table 3-1 summarizes the TSP results for the CB station since January 1, 2017. Table 3-2 summarizes the TSP results for the A154 dike station since January 23, 2017.

Table 3-1. Communication Building (CB) TSP Results

		TSP Concentration (µg/m^3)				
Interval	Station	Mean	Max. Daily Mean	Min. Daily Mean	No. of Daily TSP Exceedances (>120 µg/m^3)	Valid Days†/ Total No. of Days
January 1 to October 10, 2017	Communications Building (CB)	11.3	97.9	0.8	0	192/283 (68%)

†Number of days with at least 18 (75%) hours of available hourly data (Alberta Environment and Sustainable Resource Development 2016).

Table 3-2. A154 Dike TSP Results

		TSP Concentration (µg/m^3)				
Interval	Station	Mean	Max. Daily Mean	Min. Daily Mean	No. of Daily TSP Exceedances (>120 µg/m^3)	Valid Days†/ Total No. of Days
January 23 to October 10, 2017	A154 Dike	11.4	241.1	1.3	1	181/261 (69%)

† Number of days with at least 18 (75%) hours of available hourly data (Alberta Environment and Sustainable Resource Development 2016).

The mean TSP concentrations of 11.3 and 11.4 µg/m^3 for the monitoring period(s) for the CB and A154 Dike respectively are relatively low compared to the annual mean standard (60 µg/m^3). During the monitoring period, the CB station did not exceed the 24-hour standard. The A154 Dike location did exceed the 24-hour standard, but the exceedance may be related to heavy smoke from nearby forest fires during the period in question (August 13 – 19).

Figure 3-1

Daily Mean TSP Readings - Communications Building, January 1 to October 10, 2017

ERM

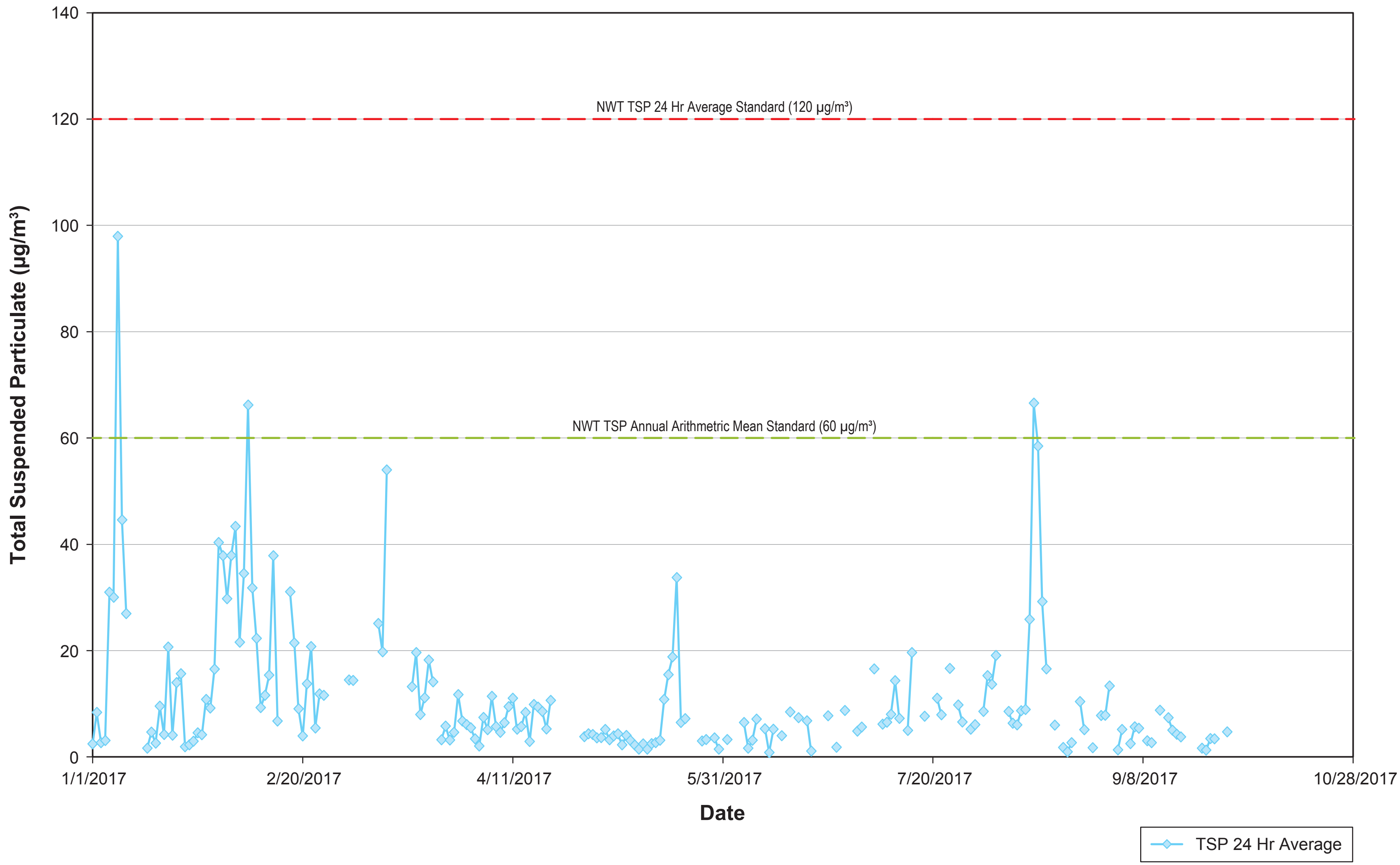
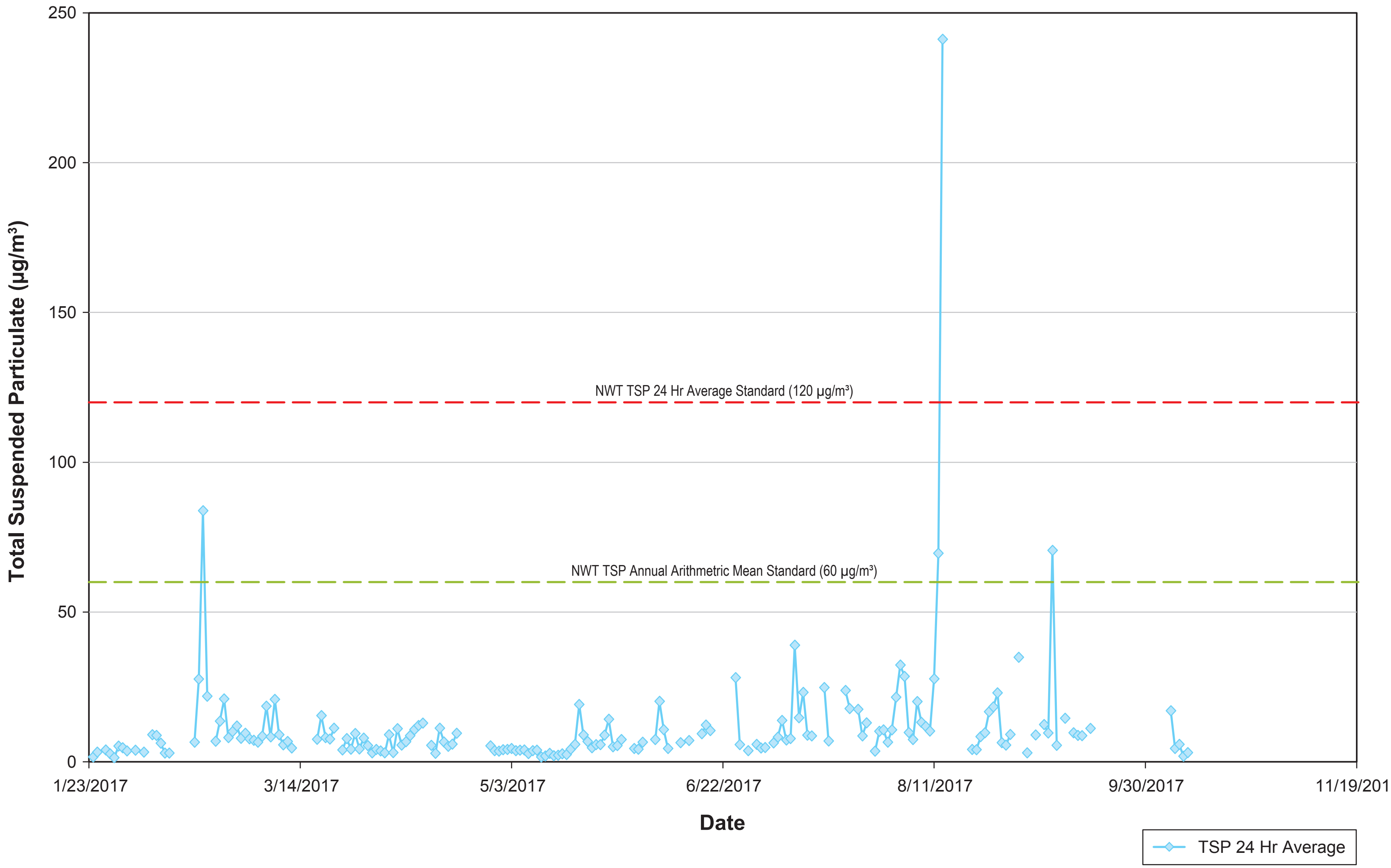


Figure 3-2

**Daily Mean TSP Readings - A154 Dike,
January 23 to October 10, 2017**



Since the monitoring period(s) began, the CB Station had valid daily data approximately 68% (192 days) of the time and the A154 Dike had valid daily data approximately 69% (181 days) of the time. The valid data throughout the monitoring period have been decreasing which is indicative of malfunctioning monitors due to internal issues or maintenance and calibration being too infrequent or not being done correctly. The invalid data has been due to equipment malfunctions, missing or invalid data, accidental operator error and critical alarm status which stopped sampling due to extremely elevated levels of smoke in the air from the nearby forest fires. Data were also considered missing if less than 75% (i.e., 18 hourly measurements) of the observations within a day were valid due to sampler malfunctions or invalid data flag (Alberta Environment and Sustainable Resource Development 2016). Values on these days were not included in the arithmetic mean calculations.

The 5014i sampler manual states that the monitor's air temperature operating range is from -30ºC to 50ºC. Considering the valid hourly data, the sampled air was outside of the range (below -30ºC) 12% of the time for the CB station and 19% of the time for the A154 Dike station. There is no obvious correlation between periods of missing data and periods of time below the -30ºC threshold. The equipment is certified through the Environmental Protection Agency (EPA) and it is likely the equipment will operate satisfactorily outside of the sampled temperature range. However, the accuracy of the data is not guaranteed outside the range specified in the manual.

The Albert Air Monitoring Directive (AMD) has a data completeness goal of 90% on an annual basis. Both the CB and A154 Dike station are below this goal, and data completeness has been decreasing over the year. In particular, since May 22, 2017, there has been a significant increase in concentration values less than -3.0 µg/m^3 in both samplers. When reviewing hourly data, concentrations less than -3.0 µg/m^3 occurred 14% of the time between January 1 and October 10, 2017, at the CB analyzer and 12% of the time between January 23 and October 10, 2017, for the A154 dike analyzer. The manual states a possible cause as being a faulty inlet heater and beta counter. It is recommended to check the heater to ensure that it is operating, perform an auto detector calibration, and speak to a CD Nova or Thermo Scientific technician further about the issues.

An additional cause of the low data completeness for the CB unit might be the periods of time (~7% based on hourly data) when there was a filter tape change alarm. Specifically over 11 days in February and March 2017 and 8 days in October 2017, which occurred in conjunction with a possible faulty pump. A major cause of approximately 19 days of missing data from the A154 station was due to the inlet tube having been left disconnected from the sampler. There are additional days of unexplained missing data that could be from power outages.

Analyzer alarms were recorded in the raw data, at both the A154 Dike and CB station, since the start of the reporting period and include:

- Alarm code "e000 and c000", which indicates a vacuum/flow/flow pressure alarm. These alarms occur consistently during the first hour of the day when the filter tape change occurs and the vacuum is lost. This is indicative of normal operation of the analyzer.
- Alarm code "2", which indicates an alpha detection alarm/filter tape change alarm. This alarm code has been very infrequent in the A154 Dike sampler, but was evident over a

number of days in February, March and October in the CB sampler, and was the cause of a number of days of missing data.

- Alarm code “802”, which indicates a barometric pressure alarm. This alarm code has been very infrequent and does not indicate a continuing issue with the analyzer at this time.
- Alarm code “200”, which indicates a relative humidity (RH) alarm. Since the beginning of the reporting period(s), this alarm has become more frequent in both analyzers, with multiple days of data recording 100% humidity. This issue has been communicated to the vendor CD Nova. CD Nova has provided some suggestions which were listed in the previous memorandum and are reiterated here, including:
  - Reseat the cable at the back of the instrument;
  - Cycle the power on the instrument;
  - Update/reload the firmware;
  - Recalibrate the ambient RH sensor; and
  - Replace the sensor from the other instrument to see if the readings change.

  The relative humidity value is used to control the heated inlet tube and the temperature of the sample coming into the measurement chamber, and could be related to the increase in negative values observed in the data. The RH sensor issue should be addressed as soon as possible as it may remedy the number of negative TSP concentration values observed.
- Alarm code “8000”, which indicates a flow alarm. These are seen frequently when the filter tape exchange occurs.
- Alarm code “202 and 802”, which indicates an ambient RH and barometric pressure alarm respectively. These are seen infrequently in both analyzers.

From the calibration records provided by site personnel, it has been observed that equipment checks and audits are occurring more frequently than in the past. If critical alarms are observed during the audits, then immediate action should be taken to remedy the issue to reduce downtime as much as possible. Due to the decrease in data completeness, continued negative values, and equipment malfunctions (tape change alarm, possible pump failures, etc.) it is recommended that site personnel increase the frequency of equipment verification audits relative to the current regime. This is an excellent practice to ensure high data quality and data completeness.

After observing the frequency of negative values in the data, possible pump issues and the decreasing data completeness, it is recommended to perform a complete maintenance and calibration regime to the entire system of the CB and A154 sampler by a certified technician.

ERM has been in contact with Thermo Scientific technical support. They have suggested a number of actions and some setting changes to the samplers that may reduce the number of negative values observed, and increase the percentage of data validity. See section 4 for their recommendations.

4. RECOMMENDATIONS

Based on the ERM QA/QC of DDMI TSP data, ERM recommends the following:

- Continue to follow recommendations provided in the *Total Suspended Particulates Sampler Support Memorandum* (ERM 2016) and use the sampler manual as a reference for more detailed information.
- Continue to use the updated DDMI TSP Sampler Standard Operating Procedures (SOP; DDMI 2016) for verification intervals, which include:
  - Monthly audit for ambient temperature, ambient RH, ambient pressure, flow check, leak check, and integrity of filter spot. If any items are out of the manufacturers specification for audit/verification, then a complete calibration of the equipment should be performed;
  - Annual calibration for ambient temperature, ambient RH, ambient pressure, vacuum flow, vacuum pressure, and flow check; and
  - Quarterly calibration of the auto detector calibration, and mass calibration.
- Perform preventative maintenance on the samplers based on the manufacturer's instructions as outlined in the DDMI TSP Sampler SOP (ERM 2016) and the sampler manual, which include:
  - Monthly cleaning inlet and sample tube assembly; and
  - Annual pump rebuilds.
- Confirm the inlet heater is operational and perform a detector calibration and contact CD Nova or Thermo Scientific about possible reasons behind the high amount of negative values observed in the data.
- Maintain all audit, calibration and maintenance records at the Mine.
- Complete calibration and maintenance log sheets.
- Increase the frequency of the audits and verification from quarterly to monthly to achieve a higher data completeness percentage and to ensure sampler and the ambient monitoring parameters (temp/RH) are operating within their operating ranges.
- Perform a complete maintenance regime and a full calibration of the CB and A154 sampler. It is recommended that this be performed by a qualified technician.
- Record if any power outages are indicated by the sampler.
- Check data from the monitors on a more frequent basis to identify instrumental malfunctions and alarms in a more timely manner.

It should be noted that if the sampler is out of any of the specified ranges during an audit, a calibration of the sampler will be required.

Table 4-1 summarizes the audits, calibrations, and frequency to perform the specific tasks and maintenance. This is recommended to continue to ensure the samplers are fully operational and to achieve the minimum of 90% data completeness goal of the AMD.

Table 4-1. DDMI TSP Sampler Audit and Calibration Schedule

TSP Sampler Parameter/Component	Audit Frequency	Calibration / Maintenance Frequency
Replace Filter Tape	N/A	Upon 10% Remaining Alarm
Clean Air Inlet System	N/A	Monthly
Rebuild Vacuum Pump	N/A	Every 12 to 18 Months
Clean Ambient Temperature/Relative Humidity Shield and Assembly	N/A	Annually
Ambient Temperature	Monthly	Annually
Ambient Pressure	Monthly	Annually
Flow	Monthly	Annually
Leak Check	Monthly	N/A
Auto Mass coefficient	N/A	Quarterly
Auto Detector	N/A	Quarterly
Streamline Pro	N/A	Annually

It should be noted that the audit and calibration frequency has increased. Unfortunately, these actions have not had a positive influence on the data. Thermo Scientific has suggested a few actions that could alleviate the data completeness, and include:

- A complete calibration including the mass foil and detector calibration, and complete maintenance regime completed on each sampler; and
- Increase the frequency of audits and leak checks beyond the manufacturer recommendations.

Also, in order to troubleshoot what might be causing some of the issues, they recommend making the following changes to one of the samplers:

- Change the volumetric conditions (temperature and pressure) that the sampler is compensating for, to standard conditions (25ºC and 1 atmosphere or 760 mmHg) from actual. This can be done by going into: Instrument Controls>Volumetric Conditions> Compensation, and then change to Std from Actual, which should be 25ºC and 760 mmHg.
- Check what the settings under data treatment are, and if data treatment is averaged then it should be changed to current. Under Instrument Controls>Datalogger Settings> SREC or LREC (whichever record you download)>Configure Datalogger>Data Treatment>Change from Avg to Cur (current):
  - The Data Treatment screen is used to select the data type for the selected record type: whether the data should be averaged over the interval, the minimum or maximum measured during the interval, or the current value (last value measured). Data treatment does not apply to all data, just to the concentration measurement. All other data points log the current value at the end of the interval.
  - Note this feature is found in all iSeries instruments, but it is recommended that the data type be set to ONLY the current value (cur), as the datalogging averaging is done in addition to the normal concentration averaging.

5. CONCLUSION

ERM performed the following work, which is the basis for this memo:

- Reviewed and conducted QA/QC of the available data to identify possible sources of sampler error;
- Provided recommendations to improve data completeness and ensure proper maintenance and calibrations are conducted; and
- Record if there are any power outages recorded by the CB analyzer.

For the current reporting period(s), there was one instance where the TSP mean daily average was greater than the 24-hr mean standard (120 µg/m^3) at either the CB station. This exceedance was observed during very high levels of particulate from forest fires near to the Mine and is most likely related to that, and not an instance of increased particulates due to mine operations. The running mean for the period of reporting for the CB and A154 stations are 11.3 and 11.4 µg/m^3, respectively. Both analyzers are showing data completeness of less than 90% and a complete calibration and maintenance regime of the samplers by a qualified technician is recommended along with an increase in the verification audits and calibrations of the analyzers until the data completeness is shown to be consistently over 90%.

The primary recommendations from this review are:

- Complete maintenance and calibration of both samplers;
- An increase in the verification/audit, leak check and calibration regime; and
- Make the recommended troubleshooting changes to the samplers as recommended by Thermo Scientific.

Prepared by:

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Reviewed by:

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Andres Soux, M.Sc.
Principal Consultant

REFERENCES

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Appendix B

Total Suspended Particulates (TSP) Biannual Data Memorandum (dated June 6, 2018; includes Oct. 1, 2017 to May 15, 2018 data)

Memorandum

Refer to File: 0.1_Diavik TSP Sampler Memo.docx

Date:	June 6, 2018
To:	Sean Sinclair, Superintendent - Environment - HSE
From:	Trevor Newton, Atmospheric Scientist
Cc:	Carol Adly, Project Manager Marc Wen, Partner In Charge
Subject:	**Total Suspended Particulates (TSP) Biannual Data Memorandum**

1. INTRODUCTION

Diavik Diamond Mine (2012) Inc. (DDMI) installed two continuous total suspended particulate (TSP) samplers at the Diavik Diamond Mine (Mine) in accordance with their Environmental Air Quality Monitoring Plan (EAQMP; DDMI 2013) in June 2013. The locations of the monitors were selected based on proximity to the Mine boundary, with careful consideration of the TSP results from the updated air dispersion modelling assessment, and in consideration of the availability of power (DDMI 2013).

In February 2016, DDMI requested that ERM initiate a trip to the Property to perform maintenance and troubleshoot operational issues on the two TSP samplers at the Mine. It was determined that the TSP sampler located near the A154 dike was in need of offsite repairs and was sent to the vendor (CD Nova). Remote downloads and historical data analysis showed that specific alarms and data anomalies have been frequent. The vendor of the TSP samplers, CD Nova, was contracted by DDMI to facilitate troubleshooting, calibrate the instruments, and train ERM and DDMI employees on the maintenance and calibration of the samplers. A summary of the completed work can be found in the *Total Suspended Particulates Sampler Support Memorandum* (ERM 2016).

DDMI received the repaired A154 dike sampler at the beginning of July 2016. After a period of two months of sampling, it was determined that there were continued operational issues with the sampler and it was returned to CD Nova for repair. The A154 dike sampler was received from CD Nova at the beginning of January 2017 and initiated sampling on January 23, 2017 and operated well until December 29, 2017. No data have been collected from the A154 dike sampler after December 29, 2017.

This memorandum provides a summary of the data collected from October 1, 2017 through May 15, 2018 from the Communications Building (CB) TSP sampler and recommendations for ongoing maintenance and servicing.

2. METHODS

2.1 MONITORING LOCATION

TSP monitoring in 2018 is undertaken at one location: within the Communications Building (CB) adjacent to the accommodations complex. The site was selected based on power requirements, proximity to the boundary of the Mine footprint, and the results of the updated air dispersion modelling assessment. The approximate location of the DDMI TSP station is presented in Table 2.1-1.

Table 2.1-1. DDMI TSP Stations UTM Coordinates[1]

Station	Zone	Metres East	Metres North
CB	12W	534,460	7,150,847

[1] *World Geodetic System 1984 (WGS-84)*

2.2 MONITORING METHODS

The TSP monitor is a Thermo Fisher Scientific 5014i instrument that measures TSP using beta attenuation. Ambient air is drawn through a subsonic orifice at a controlled flow rate; continuous mass measurements are conducted and hourly mass concentrations are calculated and stored in the iSeries platform data logging system. The sampling equipment is contained within a climate-controlled shelter to minimize data loss during extreme weather conditions, as recommended by the manufacturer.

The monitoring of TSP concentrations mass loadings as micrograms/cubic metre (μg/m^3) is continuous, and hourly average concentrations are recorded. TSP monitoring is conducted continuously throughout the year.

Where applicable, observations were adjusted by ERM using the methodology in the *Alberta Air Monitoring Directive Chapter 6: Ambient Data Quality* (Alberta Environment and Sustainable Resource Development 2016). For example, hourly average TSP concentrations that were between 0 and -3 μg/m^3 were adjusted to zero.

3. RESULTS

TSP results were compared to the Government of the Northwest Territories Department of Environment and Natural Resources (ENR) Guideline for Ambient Air Quality Standards in the Northwest Territories (GNWT 2014). ENR uses two standards for TSP:

1. 24-hr Average: 120 μg/m^3; and
2. Annual Arithmetic Mean: 60 μg/m^3.

Figure 3-1 displays the 24-hour average TSP concentrations for the CB station since October 1, 2017, compared to the GNWT 2014 Standards. Table 3-1 summarizes the TSP results for the CB station since October 1, 2017.

Table 3-1. Communication Building (CB) TSP Results

Interval	Station	TSP Concentration (μg/m³) Mean	Max. Daily Mean	Min. Daily Mean	No. of Daily TSP Exceedances (>120 μg/m³)	Valid Days†/ Total No. of Days
October 1, 2017 to May 15, 2018	Communications Building (CB)	2.6	13.1	0.3	0	192/227 (85%)

†Number of days with at least 18 (75%) hours of available hourly data (Alberta Environment and Sustainable Resource Development 2016).

The mean TSP concentration of 2.6 μg/m³ for the monitoring period is relatively low compared to the annual mean standard (60 μg/m³). During the monitoring period, the CB station did not exceed the 24-hour standard.

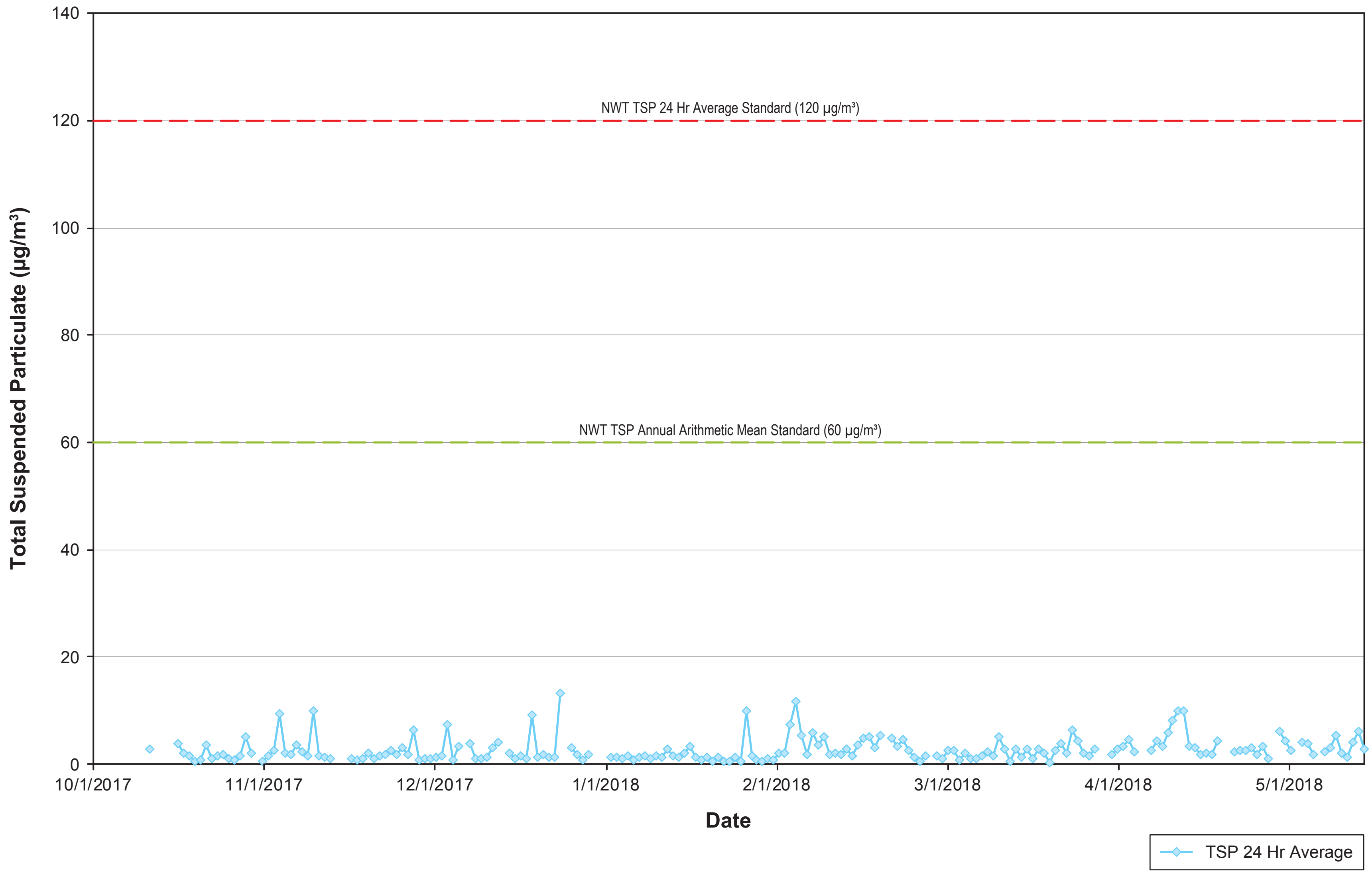
During the current monitoring period (Oct. 1, 2017 – May 15, 2018), the CB Station had valid daily data approximately 85% (192 days) of the time. ERM's previous memo, dated October 23, 2017, noted that the valid data throughout the monitoring period showed a decreasing trend, which was deemed indicative of malfunctioning monitors due to internal issues or maintenance and calibration being too infrequent or not being done correctly. However, that decreasing trend is not apparent during the current monitoring period. As before, the invalid data have been due to equipment malfunctions, missing or out-of-range values, and accidental operator error. Daily average data were also considered missing if less than 75% (i.e., 18 hourly measurements) of the observations within a day were valid due to sampler malfunctions or invalid data flags (Alberta Environment and Sustainable Resource Development 2016). Values on these days were not included in the arithmetic mean calculations.

The 5014i sampler manual states that the monitor's air temperature operating range is from -30ºC to 50ºC. Considering the valid hourly data, the sampled air was outside of the range (below -30ºC) 13% of the time. There is no obvious correlation between periods of missing data and periods of time below the -30ºC threshold. The equipment is certified through the Environmental Protection Agency (EPA) and it is likely the equipment will operate satisfactorily outside of the recommended temperature range. However, the accuracy of the data is not guaranteed outside the range specified in the manual.

The Alberta Air Monitoring Directive (AMD) has a data completeness goal of 90% on an annual basis. The CB station is below this goal, although data completeness overall has increased since the October 2017 memo. However, in recent months, there has been a trend of increasing frequency of observed hourly concentrations less than -3.0 μg/m³. When reviewing hourly data, concentrations less than -3.0 μg/m³ occurred 8% of the time between October 1 and December 31, 2017, 7% of the time between January 1 and February 28, 2018, and 13% of the time between March 1 and May 15, 2018. The manual states a possible cause as being a faulty inlet heater and beta counter. It is recommended to check the

Figure 3-1

**Daily Mean TSP Readings - Communications Building
October 1, 2017 to May 15, 2018**



heater to ensure that it is operating, perform an auto detector calibration, and speak to a CD Nova or Thermo Scientific technician further about the issues.

Analyzer alarms were recorded in the raw data since the start of the reporting period and include:

- Alarm code “e000 and c000”, which indicates a vacuum/flow/flow pressure alarm. These alarms occur consistently during the first hour of the day when the filter tape change occurs and the vacuum is lost. This is indicative of normal operation of the analyzer.
- Alarm code “2”, which indicates an alpha detection alarm/filter tape change alarm. This alarm code was evident over a number of days in October in the CB sampler, and was the cause of a number of days of missing data.
- Alarm code “802”, which indicates a barometric pressure alarm. This alarm code has been very infrequent and does not indicate a continuing issue with the analyzer at this time.
- Alarm code “200”, which indicates a relative humidity (RH) alarm. Since the beginning of the reporting period(s), this alarm has become more frequent, with multiple days of data recording 100% humidity. This issue has been communicated to the vendor CD Nova. CD Nova has provided some suggestions which were listed in the previous memorandum and are reiterated here, including:
  - Reseat the cable at the back of the instrument;
  - Cycle the power on the instrument;
  - Update/reload the firmware;
  - Recalibrate the ambient RH sensor; and
  - Replace the RH sensor with the RH sensor from the other instrument to see if the readings change.

  The relative humidity value is used to control the heated inlet tube and the temperature of the sample coming into the measurement chamber, and could be related to the increase in negative values observed in the data. The RH sensor issue should be addressed as soon as possible as it may reduce the number of negative TSP concentration values observed.
- Alarm code “8000”, which indicates a flow alarm. These are seen frequently when the filter tape exchange occurs.
- Alarm code “202 and 802”, which indicates an ambient RH and barometric pressure alarm respectively. These are seen infrequently.

From the calibration records provided by site personnel, it has been observed that equipment checks and audits are occurring more frequently than in the past. If critical alarms are observed during the audits, then immediate action should be taken to remedy the issue to reduce downtime as much as possible. Due to the decrease in data completeness, continued negative values, and equipment malfunctions (tape change alarm, possible pump failures, etc.) it is recommended that site personnel increase the frequency of equipment verification audits relative to the current regime. This is an excellent practice to ensure high data quality and data completeness.

After observing the frequency of negative values in the data and possible pump issues, it is recommended to perform a complete maintenance and calibration regime to the entire system of the CB sampler by a certified technician.

ERM has been in contact with Thermo Scientific technical support. They have suggested a number of actions and some setting changes to the sampler that may reduce the number of negative values observed, and increase the percentage of data validity. See section 4 for their recommendations.

4. RECOMMENDATIONS

Based on the ERM QA/QC of DDMI TSP data, ERM recommends the following:

- Continue to follow recommendations provided in the *Total Suspended Particulates Sampler Support Memorandum* (ERM 2016) and use the sampler manual as a reference for more detailed information.
- Continue to use the updated DDMI TSP Sampler Standard Operating Procedures (SOP; DDMI 2016) for verification intervals, which include:
  - Monthly audit for ambient temperature, ambient RH, ambient pressure, flow check, leak check, and integrity of filter spot. If any items are out of the manufacturer's specification for audit/verification, then a complete calibration of the equipment should be performed;
  - Annual calibration for ambient temperature, ambient RH, ambient pressure, vacuum flow, vacuum pressure, and flow check; and
  - Quarterly calibration of the auto detector calibration, and mass calibration.
- Perform preventative maintenance on the sampler based on the manufacturer's instructions as outlined in the DDMI TSP Sampler SOP (ERM 2016) and the sampler manual, which include:
  - Monthly cleaning inlet and sample tube assembly; and
  - Annual pump rebuilds.
- Confirm the inlet heater is operational and perform a detector calibration and contact CD Nova or Thermo Scientific about possible reasons behind the high amount of negative values observed in the data.
- Maintain all audit, calibration and maintenance records at the Mine.
- Complete calibration and maintenance log sheets.
- Increase the frequency of the audits and verification from quarterly to monthly to achieve a higher data completeness percentage and to ensure that the sampler and the ambient monitoring parameters (temperature/RH) are operating within their operating ranges.
- Perform a complete maintenance regime and a full calibration of the CB sampler. It is recommended that this be performed by a qualified technician.
- Record if any power outages are indicated by the sampler.

- Check data from the monitor on a more frequent basis to identify instrument malfunctions and alarms more quickly.

It should be noted that if the sampler is out of any of the specified ranges during an audit, a calibration of the sampler will be required.

Table 4-1 summarizes the audits, calibrations, and frequency to perform the specific tasks and maintenance. This is recommended to continue to ensure that the sampler is fully operational and to achieve the minimum of 90% data completeness goal of the AMD.

Table 4-1. DDMI TSP Sampler Audit and Calibration Schedule

TSP Sampler Parameter/Component	Audit Frequency	Calibration / Maintenance Frequency
Replace Filter Tape	N/A	Upon 10% Remaining Alarm
Clean Air Inlet System	N/A	Monthly
Rebuild Vacuum Pump	N/A	Every 12 to 18 Months
Clean Ambient Temperature/Relative Humidity Shield and Assembly	N/A	Annually
Ambient Temperature	Monthly	Annually
Ambient Pressure	Monthly	Annually
Flow	Monthly	Annually
Leak Check	Monthly	N/A
Auto Mass coefficient	N/A	Quarterly
Auto Detector	N/A	Quarterly
Streamline Pro	N/A	Annually

It should be noted that the audit and calibration frequency has increased. Unfortunately, these actions have not had a positive influence on data completeness. Thermo Scientific has suggested a few actions that could improve data completeness, and include:

- A complete calibration including the mass foil and detector calibration, and complete maintenance regime completed on the sampler; and
- Increase the frequency of audits and leak checks beyond the manufacturer's recommendations.

Also, in order to troubleshoot what might be causing some of the issues, they recommend making the following changes to the sampler:

- Change the volumetric conditions (temperature and pressure) that the sampler is compensating for, to standard conditions (25ºC and 1 atmosphere or 760 mmHg) from actual. This can be done by going into: Instrument Controls>Volumetric Conditions> Compensation, and then change to Std from Actual, which should be 25ºC and 760 mmHg.
- Check what the settings under data treatment are, and if data treatment is averaged then it should be changed to current. Under Instrument Controls>Datalogger Settings> SREC or LREC (whichever record you download)>Configure Datalogger>Data Treatment>Change from Avg to Cur (current):

- The Data Treatment screen is used to select the data type for the selected record type: whether the data should be averaged over the interval, the minimum or maximum measured during the interval, or the current value (last value measured). Data treatment does not apply to all data, just to the concentration measurement. All other data points log the current value at the end of the interval.
- Note this feature is found in all iSeries instruments, but it is recommended that the data type be set to ONLY the current value (cur), as the datalogging averaging is done in addition to the normal concentration averaging.

5. CONCLUSION

ERM performed the following work, which is the basis for this memo:

- Reviewed and conducted QA/QC of the available data to identify possible sources of sampler error;
- Provided recommendations to improve data completeness and ensure proper maintenance and calibrations are conducted; and
- Record if there are any power outages recorded by the CB analyzer.

The mean TSP concentration for the current monitoring period for the CB station is 2.6 $\mu g/m^3$. The analyzer shows data completeness of less than 90% and a complete calibration and maintenance regime of the sampler by a qualified technician is recommended along with an increase in the verification audits and calibrations of the analyzer until the data completeness is shown to be consistently over 90%.

The primary recommendations from this review are:

- Complete maintenance and calibration of the sampler;
- An increase in the verification/audit, leak check and calibration regime; and
- Make the recommended troubleshooting changes to the samplers as recommended by Thermo Scientific.

Prepared by:

signature removed

Trevor Newton, M.Sc.
Atmospheric Scientist

Reviewed by:

signature removed

Andres Soux, M.Sc.
Principal Consultant

REFERENCES

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DDMI. 2016. *SOP TSP Monitoring* (*ENVI-801-0613 R4)*. Diavik Diamond Mine (2012) Inc. February 2016.

Government of the Northwest Territories. 2014. *Guideline for Ambient Air Quality Standards in the Northwest Territories*. http://www.enr.gov.nt.ca/sites/enr/files/guidelines/air_quality_standards_guideline.pdf.

Appendix C

TSP Monitoring Station Calibration and Maintenance Records

SERVICE REPORT

Thermo Fisher Scientific
27 Forge Parkway
Franklin, MA. 02038
Phone: 866-282-0430
Fax: 508-520-2800

RA#	DATE COMPLETED
RA00065153 RG2-MA-16956	12/17/2016 5:02 AM
CUSTOMER	**CONTACT PHONE**
CD Nova Head OfficeCD Nova	(604) 430-5612
CONTACT	**CONTACT EMAIL**
Dan Molloy	dmolloy@cdnova.com
MODEL	**SERIAL NUMBER**
5014I	5014I203141210

REPORT SUBMITTED BY
Contact: Chuck Costa
Email: chuck.costa@thermofisher.com

SUBJECT: repair and calibration **REPAIR TYPE:** Time and Material **PRIORITY:** Standard

DESCRIPTION OF SERVICE REQUIRED: unit leaks and has been creating metal filings while advancing the tape. please consult with Chris Wilson on the repair and provide an estimate before proceeding with repairs and calibration

CONTAMINATED/HAZARDOUS: No
DECONTAMINATION METHOD: N/A

ACCESSORIES RECEIVED: Pump / Picnic Cooler

PHYSICAL INSPECTION (inspected for damage, missing items, pm required, cleanliness, and accuracy)

✓ Compare unit to RA detail ✓ Labeling ✓ Hardware

INSTRUMENT AS FOUND: Unit received in fair condition- ready to power up and begin NIST testing.

REPAIR NOTES: Unit received and staged. The sample path leak was confirmed due to binding of mechanism during filter changes and a faulty lower chamber O-ring. Customer complained of metal filings.

Removed and cleaned the sample chamber. Corrected leak by replacing the O-ring seal within the lower portion of the sample chamber.The chamber was binding a bit due to misalignment. This was corrected during servicing and the function of the chamber during filter changes is now smoothe and a proper seal results. Ran multiple filter changes and encountered no issues and the leak has been eliminated upon re-alignment of the chamber. Leak checks are passed with no problems. (With leak check adapter in place the flow is 16.67 LPM with vac reading of 113.6mm Hg. and with 2 adapters the flow is 16.46 LPM with vac reading of 159.1 mmHg).

Audited/calibrated the temp, pressure and RH sensors and performed flow calibration. Unit functions normally with no problems. Instrumet is runnig with no unresolved errors or status conditions.

INSTRUMENT AS LEFT: Instrument is functioning normally with no unresolved errors or status conditions

TEST EQUIPMENT AND SOURCES USED: Delta Cal Volumetric Air Flow Calibrator, Panametrics MC Series Hygrometer, Druck DP 705 Digital Pressure Indicator, Fluke 532 digital thermometer , Tektronix DMM916 True RMS Meter, Dwyer Series 473 Digital Manometer.

All measurement standards are calibrated at scheduled intervals by the National Institute of Standards and Technology (NIST), or against certified standards, which are traceable to the National Institute of Standards and Technology, formally the National Bureau of Standards (NBS). Calibration of customer equipment is performed with appropriate environmental controls, as required.

PRE-BUTTON UP INSPECTION

- ✓ Instrument interior clean and free of debris.
- ✓ All hardware is secured. (Ex. Screws, connectors, tubing, etc.)
- ✓ Cables secured and Tie wrapped where applicable
- ✓ No remaining loose hardware within the instrument closure.

FINAL QC CHECKLIST

- ✓ Instrument exterior clean.
- ✓ Serial Number/Voltage Labels intact and legible.

- ✓ All received customer accessories accounted for and clearly identified.
- ✓ Instrument turns on.
- ✓ Calibration labels/Report with instrument where applicable.
- ✓ Billing and Shipping information properly indicated on Order.
- ✓ Quantities correct and complete on Order.

Rio Tinto

AQ Unit Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name DIAVIK
Instrument Location Communication Shack
Instrument Serial Number 5014i203191211
Date 29-Dec-2016 JG

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature			0.00	+/- 0.2°C			0.00			
1 Point	Ambient Relative Humidity			#DIV/0!	+/- 2%			#DIV/0!			
1 Point	Flow Temperature			0.00	+/- 0.2°C			0.00			
1 Point	Barometer Pressure			0.00	+/- 10 mmHg			0.00			
1 Point	Volumetric Flow Rate			#DIV/0!	+/- 2%			#DIV/0!			
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!			
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!			
Calibrate	Auto Flow Calibration	16.69	17.54	4.85%	+/- 2%	Fail	17.54	0.00%	16.67	17.54	After adjusting to 17.54 the set point stabalized to 16.67 again after a couple minutes. Stream Pro has not been calibrated. I only realized this after doing the calibration.

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC		mmHg	
Start Value FLOW (AQ Unit)		LPM	
Start Value FLOW (SLR Pro)		LPM	
Leak Check Adapter VAC		mmHg	
Leak Check Adapter FLOW (AQ Unit)		LPM	
Leak Check Adapter FLOW (SLR Pro)		LPM	
Flow Variance	#DIV/0!	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date
Flow	Stream Line Pro	HL130101	24-Jan-13
Temperature	Stream Line Pro	T130101	24-Jan-13
Pressure	Stream Line Pro	HL130101	24-Jan-13
Temperature	Reed Thermo-Hygrometer	130403443	17-Apr-15
Relative Humidity	Reed Thermo-Hygrometer	130403443	17-Apr-15
Manometer			

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By JG

Signature:

Quarterly	Annually	
		1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
		Auto Detector Calibration
		Leak Check
		Clean Inlet Assemblies & Sample Tubels
		Check Cam (grease as needed)
		Calibrate AmTemp
		Calibrate RH
		Calibrate Flow Temp
		Calibrate Baro Pressure
		Auto Flow Calibration
		Calibrate Vacuum Pressure Span
		Calibrate Flow Pressure Span
		Auto Mass Calibration

COMMENTS

RioTinto

AQ Unit Calibration Sheet

Area:	8000	No:	ENVI-622-1031
Effective Date:	2016-October 25	Revision:	0
Task:	AQ Unit Calibration	By:	D. Dul
		Page:	1 of 1

Customer Name DIAVIK
Instrument Location
Instrument Serial Number
Date

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	7.4	7.5	0.10	+/- 0.2°C	Pass	7.5	0.00	-0.02	-0.03	
1 Point	Ambient Relative Humidity	91	93	2.20%	+/- 2%	Pass	93	0.00%	-0.05	-2.2	
1 Point	Flow Temperature	19.6	19.8	-0.20	+/- 0.2°C	Pass	19.7	-0.10	0.8	0.6	
1 Point	Barometer Pressure	762.6	755.6	-7.00	+/- 10 mmHg	Pass	755.6	0.00	0	0	
1 Point	Volumetric Flow Rate	24.4	24.1	1.24%	+/- 2%	Pass	24.1	0.00%	-2.3	-2.3	
Calibrate	Vacuum Pressure Span	58.9	59.2	0.01	50-70 mmHg	Pass	59.2	0.00%	-	-	
Calibrate	Flow Pressure Span	24.4	24.1	-0.01	20-30 mmHg	Pass	24.1	0.00%	-	-	
Calibrate	Auto Flow Calibration			#DIV/0!	+/- 2%			#DIV/0!			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	69.6	mmHg	
Start Value FLOW (AQ Unit)	16.67	LPM	
Start Value FLOW (SLR Pro)	16.63	LPM	
Leak Check Adapter VAC	121.4	mmHg	
Leak Check Adapter FLOW (AQ Unit)	16.65	LPM	
Leak Check Adapter FLOW (SLR Pro)	16.65	LPM	
Flow Variance	0.12%	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed Yes

Standards Used	Description	S/N	Calibration Date
Flow	Stream Line Pro	HL130101	24-Jan-13
Temperature	Stream Line Pro	T130101	24-Jan-13
Pressure	Stream Line Pro	HL130101	24-Jan-13
Temperature	Reed Thermo-Hygrometer	130403443	17-Apr-15
Relative Humidity	Reed Thermo-Hygrometer	130403443	17-Apr-15
Manometer			

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe and Kyla Gray

Signature:

Quarterly	Annually	
	Yes	1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
	Yes	Auto Detector Calibration
	Yes	Leak Check
		Clean Inlet Assemblies & Sample Tubels
		Check Cam (grease as needed)
	Yes	Calibrate AmTemp
	Yes	Calibrate RH
	Yes	Calibrate Flow Temp
	Yes	Calibrate Baro Pressure
	Yes	Auto Flow Calibration
	Yes	Calibrate Vacuum Pressure Span
	Yes	Calibrate Flow Pressure Span
	Yes	Auto Mass Calibration

COMMENTS

AQ Unit Calibration Sheet

RioTinto

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	19-Jul-2017

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	13.9	13.7	-0.20	+/- 0.2°C	Pass		13.70			
1 Point	Ambient Relative Humidity	43.6	39.86	-8.58%	+/- 2%	Fail	41.2	3.36%	-2.2	-0.4	The unit has an offset point. I'm assuming it is the same as set point
1 Point	Flow Temperature	18.8	18	0.80	+/- 0.2°C	Pass		-18.00			
1 Point	Barometer Pressure	758.4	757.6	-0.80	+/- 10 mmHg	Pass		-757.60			
1 Point	Volumetric Flow Rate	16.66	16.99	1.94%	+/- 2%	Pass		-100.00%			
Calibrate	Vacuum Pressure Span	62.1	62.5	0.01	50-70 mmHg	Pass		-100.00%	62.3	62.5	
Calibrate	Flow Pressure Span	26.4	26.7	0.01	20-30 mmHg	Pass		-100.00%	26.2	26.7	
Calibrate	Auto Flow Calibration	16.66	16.99	1.94%	+/- 2%	Pass		-100.00%	16.63	16.99	

Auto Detector Calibration

Initial High Voltage	1410	Final High Voltage	1320		
Initial Beta Count	8303	Final Beta Count	7791		
Final Beta	7791	8000-13000		Fail	Assuming Cell H37 is the same value as C38. Also assuming this is a fail.

Leak Test

Start Value VAC	71.3	mmHg		
Start Value FLOW (AQ Unit)	16.67	LPM		
Start Value FLOW (SLR Pro)	16.67	LPM		
Leak Check Adapter VAC	125.9	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.68	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.59	LPM		
Flow Variance	-0.06%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Completed NA

Standards Used	**Description**	**S/N**	**Calibration Date**	**Due Date**
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Quarterly	**Annually**	
		1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
		Auto Detector Calibration
		Leak Check
		Clean Inlet Assemblies & Sample Tubes
		Check Cam (grease as needed)
		Calibrate AmTemp
		Calibrate RH
		Calibrate Flow Temp
		Calibrate Baro Pressure
		Auto Flow Calibration
		Calibrate Vacuum Pressure Span
		Calibrate Flow Pressure Span
		Auto Mass Calibration

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe and Gord Cumming

Signature:

COMMENTS

The Barometric pressure on the unit was reading 758.4. The Streamline Pro was reading 718.3. The airport Baro was 757.6 and Wunderground website was 757.5. We decided not to use the Streamline Pro as it seems to be incorrect.

AQ Unit Calibration Sheet

Area:	8000	No:	ENVI-622-1031
Effective Date:	2016-October 25	Revision:	0
Task:	AQ Unit Calibration	By:	D. Dul
		Page:	1 of 1

Customer Name DIAVIK
Instrument Location A154 Dike
Instrument Serial Number 5014i203141210
Date 20-Jul-2017

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	14.8	15	0.20	+/- 0.2°C	Pass		15.00			
1 Point	Ambient Relative Humidity	27.4	24.43	-10.84%	+/- 2%	Fail	26.25	7.45%	4.1	5.7	Did two calibrations to try to get within a 2% variance. One of the issues is, the manual says to put the hygrometer next to the AQ unit sensor, but it is on the roof and we can not reach it.
1 Point	Flow Temperature	18.5	19.1	-0.60	+/- 0.2°C	Pass		-19.10			
1 Point	Barometer Pressure	721.6	757.9	36.30	+/- 10 mmHg	Fail	757.9	0.00	721.7	757.9	Reading after calibration: 758.1
1 Point	Volumetric Flow Rate	16.63	16.68	0.30%	+/- 2%	Pass		-100.00%			
Calibrate	Vacuum Pressure Span	58.8	59.1	0.01	50-70 mmHg	Pass		-100.00%	58.8	58.91	
Calibrate	Flow Pressure Span	20	19.7	-0.02	20-30 mmHg	Pass		-100.00%	20	19.8	
Calibrate	Auto Flow Calibration	16.68	16.42	1.58%	+/- 2%	Pass		-100.00%	16.74	16.45	

Auto Detector Calibration

Initial High Voltage	1410	Final High Voltage	1480		
Initial Beta Count	13477	Final Beta Count	14147		
Final Beta	14147	8000-13000		Fail	Assuming Cell C38 is the same value as what I put in H37

Leak Test

Start Value VAC	70.5	mmHg		
Start Value FLOW (AQ Unit)	16.66	LPM		
Start Value FLOW (SLR Pro)	16.67	LPM		
Leak Check Adapter VAC	125.9	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.67	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.6	LPM		
Flow Variance	-0.06%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Completed NA

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/\	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe and Gordon Cumming

Signature:

Quarterly	Annually	
		1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
		Auto Detector Calibration
		Leak Check
		Clean Inlet Assemblies & Sample Tubes
		Check Cam (grease as needed)
		Calibrate AmTemp
		Calibrate RH
		Calibrate Flow Temp
		Calibrate Baro Pressure
		Auto Flow Calibration
		Calibrate Vacuum Pressure Span
		Calibrate Flow Pressure Span
		Auto Mass Calibration

COMMENTS

Used Barometric pressure reading from the airport to calibrate the unit as the Stream line pro doesn't seem to be reading Baro pressure correctly. Re calibrated Baro Pressure and Relative humidity on the 21st.

Rio Tinto

AQ Unit Verification and Calibration Sheet

		No:	ENVI-622-1031
Area:	8000	Revision:	0
Effective Date:	2016-October 25	By:	D. Dul
Task:	AQ Unit Calibratior		
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	A154 Dike
Instrument Serial Number	5014i203141210
Date	18-Sep-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	13.6	13.8	0.20	+/- 0.2°C	Pass		13.80			
1 Point	Ambient Relative Humidity	44.7	43.5	-2.68%	+/- 2%	Pass		-100.00%			
1 Point	Flow Temperature	21.6	20	1.60	+/- 0.2°C	Fail	20.8	0.80	1.1	1.5	
1 Point	Barometer Pressure	756	757	1.00	+/- 10 mmHg	Pass		-757.00	Span		
1 Point	Volumetric Flow Rate	16.65	16.5	0.91%	+/- 2%	Pass		-100.00%			
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!			
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!			
Calibrate	Auto Flow Calibration			#DIV/0!	+/- 2%			#DIV/0!			

Auto Detector Calibration

Initial High Voltage	1480	Final High Voltage	
Initial Beta Count	12202	Final Beta Count	
Final Beta		8000-13000	

Leak Test

				Comments
Start Value VAC	74.6	mmHg		
Start Value FLOW (AQ Unit)		LPM		Recorded flow pressure reading 21.1 mmHg by mistake
Start Value FLOW (SLR Pro)	16.5	LPM		
Leak Check Adapter VAC	127.8	mmHg		
Leak Check Adapter FLOW (AQ Unit)		LPM		Recorded flow pressure reading 22.9 mmHg by mistake
Leak Check Adapter FLOW (SLR Pro)	16.36	LPM		
Flow Variance	#DIV/0!	LPM	+/-2.5%	

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermomet	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermomet	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By JG MPP

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration

COMMENTS

The streamline Pro barometric pressure was reading 719.3 so we referenced Weather Underground which was 757.0

RioTinto

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	18-Sep-2017
Verification and Calibration Type	Quarterly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	14.9	13.23	-1.67	+/- 0.2°C	Fail	14.1	-0.87	-0.3	0.5	
1 Point	Ambient Relative Humidity	42.2	42	-0.47%	+/- 2%	Pass		-100.00%			
1 Point	Flow Temperature	19.2	19.6	-0.40	+/- 0.2°C	Fail	19.5	-0.10	0.6	0.4	
1 Point	Barometer Pressure	757.7	756.9	-0.80	+/- 10 mmHg	Pass		-756.90	Span		
1 Point	Volumetric Flow Rate	16.66	16.54	0.73%	+/- 2%	Pass		-100.00%			
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!			
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!			
Calibrate	Auto Flow Calibration			#DIV/0!	+/- 2%			#DIV/0!			

Auto Detector Calibration

Initial High Voltage	1320	Final High Voltage	1350
Initial Beta Count	7851	Final Beta Count	7851
Final Beta	7851	8000-13000	Fail

Leak Test

Start Value VAC	80.2	mmHg
Start Value FLOW (AQ Unit)	16.67	LPM
Start Value FLOW (SLR Pro)	16.72	LPM
Leak Check Adapter VAC	135.1	mmHg
Leak Check Adapter FLOW (AQ Unit)	16.66	LPM
Leak Check Adapter FLOW (SLR Pro)	16.61	LPM
Flow Variance	0.06%	LPM +/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration

Firmware updated to:

Calibration Complete By JG MPP

Signature:

COMMENTS

Rio Tinto

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibratior	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	18-Sep-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	14.9	13.23	-1.67	+/- 0.2°C	Fail	14.1	-0.87	-0.3	0.5	
1 Point	Ambient Relative Humidity	42.2	42	-0.47%	+/- 2%	Pass		-100.00%			
1 Point	Flow Temperature	19.2	19.6	-0.40	+/- 0.2°C	Fail	19.5	-0.10	0.6	0.4	
1 Point	Barometer Pressure	757.7	756.9	-0.80	+/- 10 mmHg	Pass		-756.90		Span	
1 Point	Volumetric Flow Rate	16.66	16.54	0.73%	+/- 2%	Pass		-100.00%			
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!			
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!			
Calibrate	Auto Flow Calibration			#DIV/0!	+/- 2%			#DIV/0!			

Auto Detector Calibration

Initial High Voltage	1320	Final High Voltage	
Initial Beta Count	6451	Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	80.2	mmHg	
Start Value FLOW (AQ Unit)	16.67	LPM	
Start Value FLOW (SLR Pro)	16.72	LPM	
Leak Check Adapter VAC	135.1	mmHg	
Leak Check Adapter FLOW (AQ Unit)	16.66	LPM	
Leak Check Adapter FLOW (SLR Pro)	16.61	LPM	
Flow Variance	0.06%	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermomet	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermomet	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/Va	160885583	31-Oct-18	31-Oct-18

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By JG MPP

Signature:

COMMENTS

RioTinto

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	18-Sep-2017
Verification and Calibration Type	Quarterly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	14.9	13.23	-1.67	+/- 0.2°C	Fail	14.1	-0.87	-0.3	0.5	
1 Point	Ambient Relative Humidity	42.2	42	-0.47%	+/- 2%	Pass		-100.00%			
1 Point	Flow Temperature	19.2	19.6	-0.40	+/- 0.2°C	Fail	19.5	-0.10	0.6	0.4	
1 Point	Barometer Pressure	757.7	756.9	-0.80	+/- 10 mmHg	Pass		-756.90	Span		
1 Point	Volumetric Flow Rate	16.66	16.54	0.73%	+/- 2%	Pass		-100.00%			
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!			
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!			
Calibrate	Auto Flow Calibration			#DIV/0!	+/- 2%			#DIV/0!			

Auto Detector Calibration

Initial High Voltage	1350	Final High Voltage	1350	
Initial Beta Count	8145	Final Beta Count	8066	
Final Beta	8066	8000-13000		Pass

Leak Test

Start Value VAC	80.2	mmHg	
Start Value FLOW (AQ Unit)	16.67	LPM	
Start Value FLOW (SLR Pro)	16.72	LPM	
Leak Check Adapter VAC	135.1	mmHg	
Leak Check Adapter FLOW (AQ Unit)	16.66	LPM	
Leak Check Adapter FLOW (SLR Pro)	16.61	LPM	
Flow Variance	0.06%	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By JG MPP

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration

COMMENTS

Foil calibration completed on 2017-09-28 and auto detector calibration completed on 2017-09-30 SS2

Rio Tinto

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	A154 Dike
Instrument Serial Number	5014i203141210
Date	5-Oct-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-3.8	-3.6	0.20	+/- 0.2°C	Pass		-			
1 Point	Ambient Relative Humidity	81.5	79	-0.03	+/- 2%	Pass		-			
1 Point	Flow Temperature	17.7	11.9	-5.80	+/- 0.2°C	Fail	14	-2.10	1.5	3.5	
1 Point	Barometer Pressure	758.2	759	0.80	+/- 10 mmHg	Pass		-	Span		
1 Point	Volumetric Flow Rate	16.7	16.62	0.00	+/- 2%	Pass		-			
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	71	mmHg		
Start Value FLOW (AQ Unit)	16.67	LPM		
Start Value FLOW (SLR Pro)	16.68	LPM		
Leak Check Adapter VAC	128.5	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.67	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.58	LPM		
Flow Variance	0.00%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration

COMMENTS

When doing the inspection I found the inlet tube disconnected from the AQ unit. This may have have been left like this from when the Quarterly inspection was done on 2017-09-18. The streamline Pro barometric pressure was reading 719.3 so I referenced Weather Underground which was 759.0

RioTinto

AQ Unit Verification and Calibration Sheet

Area:	8000	No:	ENVI-622-1031
Effective Date:	2016-October 25	Revision:	0
Task:	AQ Unit Calibration	By:	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	10-Oct-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-5.8	-5.7	0.10	+/- 0.2°C	Pass		-			
1 Point	Ambient Relative Humidity	80.1	76	-5.12	+/- 2%	Fail		-			
1 Point	Flow Temperature	18.4	18.6	0.20	+/- 0.2°C	Pass		-			
1 Point	Barometer Pressure	761.9	760.8	-1.10	+/- 10 mmHg	Pass		-		Span	
1 Point	Volumetric Flow Rate	16.66	17.7	5.88	+/- 2%	Fail	17.76	0.00	16.63	17.76	
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	70.3	mmHg		
Start Value FLOW (AQ Unit)	16.67	LPM		
Start Value FLOW (SLR Pro)	16.68	LPM		
Leak Check Adapter VAC	126.1	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.66	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.65	LPM		
Flow Variance	0.06%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration

COMMENTS

I did an inspection on 2017-10-05 and found that there were 3 alarms. 1)Filter tape change fail 2) Pressure/Vacuum - Low flow 3) Flow - Low. The unit had been left in Service mode. The pump was not running and there was no flow. I scrolled through the settings and the pump was turned to the on position and LPM set to 16.67. Flow pressure was reading -0.0 mmHg. I was unable to trouble shoot at the time and did not return until the 10th. When trouble shooting on the 10th I tried turning the unit on and off. That did nothing. I decided to isolate the pump to see if it was even working at all, so I unplugged it from the AQ unit and plugged it into a wall socket. It started running, so I left going for a few minutes. After that I plugged it back into the AQ unit, and a couple minutes later it kicked in and the unit started sampling again. I did the data download and everything seems fine now. According to the data the pump stopped working on Oct 1st.

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	A154 Dike
Instrument Serial Number	5014i203141210
Date	3-Nov-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-11.7	-10	1.70	+/- 0.2°C	Fail	-10.8	0.80	1.7	0.8	
1 Point	Ambient Relative Humidity	83.4	82	-1.68	+/- 2%	Pass		-			
1 Point	Flow Temperature	15	16.5	1.50	+/- 0.2°C	Fail	15.8	0.70	3.5	2.6	
1 Point	Barometer Pressure	754.6	754.8	0.20	+/- 10 mmHg	Pass		-		Span	
1 Point	Volumetric Flow Rate	16.68	17.55	4.96	+/- 2%	Fail	17.57	0.00	16.64	17.57	
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	72.4	mmHg		
Start Value FLOW (AQ Unit)	16.67	LPM		
Start Value FLOW (SLR Pro)	16.69	LPM		
Leak Check Adapter VAC	127.6	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.67	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.54	LPM		
Flow Variance	0.00%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration
			Pump Reuild

COMMENTS

Standard Barometric pressure taken from Wunderground

RioTinto

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	3-Nov-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-10.7	-9.7	1.00	+/- 0.2°C	Fail	-10.1	0.40	0.5	0.1	
1 Point	Ambient Relative Humidity	90.2	89.9	-0.33	+/- 2%	Pass		-			
1 Point	Flow Temperature	18.4	19.2	0.80	+/- 0.2°C	Fail	19	0.20	0.4	0	
1 Point	Barometer Pressure	757.6	756.9	-0.70	+/- 10 mmHg	Pass		-		Span	
1 Point	Volumetric Flow Rate	16.65	16.88	1.36	+/- 2%	Pass		-			
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	66	mmHg		
Start Value FLOW (AQ Unit)	16.66	LPM		
Start Value FLOW (SLR Pro)	16.82	LPM		
Leak Check Adapter VAC	121.2	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.69	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.71	LPM		
Flow Variance	-0.18%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration
			Pump Reuild

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe

Signature:

COMMENTS

Standard Barometric pressure taken from Wunderground

RioTinto

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	A154 Dike
Instrument Serial Number	5014i203141210
Date	27-Nov-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-20.1	-18.21	1.89	+/- 0.2°C	Fail	-18.2	-0.01	0.6	-1.2	
1 Point	Ambient Relative Humidity	83.8	84.1	0.36	+/- 2%	Pass		-			
1 Point	Flow Temperature	11.2	14.8	3.60	+/- 0.2°C	Fail	14.8	0.00	2.7	-0.8	
1 Point	Barometer Pressure	750.5	750.57	0.07	+/- 10 mmHg	Pass		-	Span		
1 Point	Volumetric Flow Rate	16.67	16.78	0.66	+/- 2%	Pass		-			
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	126.7	mmHg	
Start Value FLOW (AQ Unit)	67.67	LPM	
Start Value FLOW (SLR Pro)	16.77	LPM	
Leak Check Adapter VAC	125.9	mmHg	
Leak Check Adapter FLOW (AQ Unit)	67.66	LPM	
Leak Check Adapter FLOW (SLR Pro)	16.79	LPM	
Flow Variance	0.01%	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By SS2

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration
			Pump Reuild

COMMENTS

Checked fan filter and it looked clean so I did not remove and wash this time. Barometric pressure from airport

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	27-Nov-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-19.8	-19	0.80	+/- 0.2°C	Fail	-19	0.00	0	-1	
1 Point	Ambient Relative Humidity	83.2	82.49	-0.85	+/- 2%	Pass		-			
1 Point	Flow Temperature	16.9	16.7	-0.20	+/- 0.2°C	Fail	16.1	0.60	-0.4	0.6	
1 Point	Barometer Pressure	751.5	750.316	-1.18	+/- 10 mmHg	Pass		-		Span	
1 Point	Volumetric Flow Rate	16.7	17.18	2.79	+/- 2%	Marginal		-			
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC	125.5	mmHg	
Start Value FLOW (AQ Unit)	16.63	LPM	
Start Value FLOW (SLR Pro)	17.31	LPM	
Leak Check Adapter VAC	125.8	mmHg	
Leak Check Adapter FLOW (AQ Unit)	16.69	LPM	
Leak Check Adapter FLOW (SLR Pro)	17.3	LPM	
Flow Variance	-0.36%	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By SS2

Signature:

Monthly	Quarterly	Annually	
			1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
			Leak Check
			Clean Inlet Assemblies & Sample Tubes
			Check Cam (grease as needed)
			Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
			Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration
			Pump Reuild

COMMENTS

Barometric pressure from airport.

AQ Unit Verification and Calibration Sheet

Area:	8000	**No:**	ENVI-622-1031
Effective Date:	2016-October 25	**Revision:**	0
Task:	AQ Unit Calibration	**By:**	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	4-Dec-2017
Verification and Calibration Type	Annual

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-23.5	-22	1.50	+/- 0.2°C	Fail	-22.7	0.70	0	-0.8	
1 Point	Ambient Relative Humidity	80.8	76	-5.94	+/- 2%	Fail	78.4	0.03	3.1	5.5	
1 Point	Flow Temperature	17.1	18.6	1.50	+/- 0.2°C	Fail	17.8	0.80	0.6	-0.2	
1 Point	Barometer Pressure	759.7	757.7	-2.00	+/- 10 mmHg	Pass	757.6	0.10	1.054	1.0512	
1 Point	Volumetric Flow Rate	16.66	15.88	4.91	+/- 2%	Fail	15.88	0.00	17.56	15.88	
Calibrate	Vacuum Pressure Span	54.6	54.6	0	50-70 mmHg	Pass	54.6		54.6	54.6	
Calibrate	Flow Pressure Span	24.3	24.3	0	20-30 mmHg	Pass	24.3	0.00%	24.4	24.3	
Calibrate	Auto Flow Calibration			-	+/- 2%			-			Same Calibration as Volumetric Flow Rate

Auto Detector Calibration

Initial High Voltage	1350	Final High Voltage	1360
Initial Beta Count	7596	Final Beta Count	7946
Final Beta	7946	8000-13000	7946

Leak Test

Start Value VAC	68.7	mmHg		
Start Value FLOW (AQ Unit)	16.65	LPM		
Start Value FLOW (SLR Pro)	16.39	LPM		
Leak Check Adapter VAC	122	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.67	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.29	LPM		
Flow Variance	-0.12%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Completed No

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe

Signature:

Monthly	Quarterly	Annually	
		Yes	1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
		Yes	Auto Detector Calibration
		Yes	Leak Check
		Yes	Clean Inlet Assemblies & Sample Tubes
		Yes	Check Cam (grease as needed)
		Yes	Calibrate AmTemp
		Yes	Calibrate RH
		Yes	Calibrate Flow Temp
		Yes	Calibrate Baro Pressure
		Yes	Auto Flow Calibration
		Yes	Calibrate Vacuum Pressure Span
		Yes	Calibrate Flow Pressure Span
		No	Auto Mass Calibration
		Yes	Pump Reuild

COMMENTS

The Volumetric Flow calibration was done twice to get a better result. The Pump was rebuilt on Oct 10th. Removed and cleaned the heater/ sample tube following the procedure in the manual. We cannot clean in the inlet asembly, as we do not have access to the roof of the building. Unable to do the Auto mass calibration as there is an issue with the bench sticking. Tried to resolve the issue with recommendations from Dan at CD Nova, but it did not work. Removed the fan filter and cleaned it.

AQ Unit Verification and Calibration Sheet

Area: 8000		**No:** ENVI-622-1031	
Effective Date: 2016-October 25		**Revision:** 0	
Task: AQ Unit Calibration		**By:** D. Dul	
		Page: 1	of 1

Customer Name	DIAVIK
Instrument Location	A154 Dike
Instrument Serial Number	5014i203141210
Date	9-Dec-2017
Verification and Calibration Type	Annual

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-16.2	-16.6	-0.40	+/- 0.2°C	Fail	-16.6	0.00	-1.1	-0.7	
1 Point	Ambient Relative Humidity	82.4	78.8	-4.37	+/- 2%	Fail	78.8	0.00	5.1	6.4	
1 Point	Flow Temperature	13.7	15.7	2.00	+/- 0.2°C	Fail	14.7	1.00	-0.1	-1.1	
1 Point	Barometer Pressure	756.8	756.4	-0.40	+/- 10 mmHg	Pass	756.4	0.00	756.7	756.4	
1 Point	Volumetric Flow Rate	16.64	17.05	2.40	+/- 2%	Fail	17.03	0.00	16.64	17.03	
Calibrate	Vacuum Pressure Span	70.5	72	1.5	50-70 mmHg	Fail	72	0.00%	70.5	72	After stabalizing the value is reading with in 50-70 mmHg
Calibrate	Flow Pressure Span	22.3	22.6	0.3	20-30 mmHg	Pass	22.6	0.00%	22.4	22.6	
Calibrate	Auto Flow Calibration			-	+/- 2%			-			Calibration is the same as Vol. Flow Rate

Auto Detector Calibration

Initial High Voltage	1470	Final High Voltage	1490
Initial Beta Count	13242	Final Beta Count	13888
Final Beta	13888	8000-13000	13888

Leak Test

Start Value VAC	71.3	mmHg		
Start Value FLOW (AQ Unit)	16.67	LPM		
Start Value FLOW (SLR Pro)	16.63	LPM		
Leak Check Adapter VAC	128.8	mmHg		
Leak Check Adapter FLOW (AQ Unit)	16.65	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.57	LPM		
Flow Variance	0.12%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Completed Yes

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By Justin Grandjambe

Signature:

Monthly	Quarterly	Annually	
		Yes	1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
		Yes	Auto Detector Calibration
		Yes	Leak Check
		Yes	Clean Inlet Assemblies & Sample Tubes
		Yes	Check Cam (grease as needed)
		Yes	Calibrate AmTemp
		Yes	Calibrate RH
		Yes	Calibrate Flow Temp
		Yes	Calibrate Baro Pressure
		Yes	Auto Flow Calibration
		Yes	Calibrate Vacuum Pressure Span
		Yes	Calibrate Flow Pressure Span
		Yes	Auto Mass Calibration
		Yes	Pump Reuild

COMMENTS

Rebuilt the pump, but did not take apart the top as we do not have replacement gaskets. Replaced the fan filter and fan guard. Did not clean the inlet assembly as we do not have access to the roof. Did not clean the heater tube as we have it spray foamed at the ceiling, to prevent water from seeping in. Removed and cleaned the sample tube following instructions from the manual. The first auto dectector calibration failed. There was an error message which I mistakingly did not record. The second calibration passed.

RioTinto

AQ Unit Verification and Calibration Sheet

Area:	8000	No:	ENVI-622-1031
Effective Date:	2016-October 25	Revision:	0
Task:	AQ Unit Calibration	By:	D. Dul
		Page:	1 of 1

Customer Name	DIAVIK
Instrument Location	Communication Shack
Instrument Serial Number	5014i203191211
Date	23-Dec-2017
Verification and Calibration Type	Monthly

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	-31.8	-30	1.80	+/- 0.2°C	Fail	-30.2	0.20	-0.8	-2.2	
1 Point	Ambient Relative Humidity	71.4	71.29	-0.15	+/- 2%	Pass		-			
1 Point	Flow Temperature	17.3	17.2	-0.10	+/- 0.2°C	Pass		-			
1 Point	Barometer Pressure	768.5	730.3	-38.20	+/- 10 mmHg	Fail	729	1.30	1.0512	0.9982	
1 Point	Volumetric Flow Rate	16.73	16.7	0.18	+/- 2%	Pass		-			
Calibrate	Vacuum Pressure Span			-	50-70 mmHg			-			
Calibrate	Flow Pressure Span			-	20-30 mmHg			-			
Calibrate	Auto Flow Calibration			-	+/- 2%			-			

Auto Detector Calibration

Initial High Voltage	1360	Final High Voltage	1360	
Initial Beta Count	7407	Final Beta Count	7309	
Final Beta	7309	8000-13000		Fail

Leak Test

Start Value VAC	124.5	mmHg		
Start Value FLOW (AQ Unit)	30.1	LPM		
Start Value FLOW (SLR Pro)	16.4	LPM		
Leak Check Adapter VAC	125.1	mmHg		
Leak Check Adapter FLOW (AQ Unit)	29.8	LPM		
Leak Check Adapter FLOW (SLR Pro)	16.45	LPM		
Flow Variance	1.01%	LPM	+/-2.5%	Pass

Auto Mass Coefficient Calibration Not Completed NA

Standards Used	Description	S/N	Calibration Date	Due Date
Flow	Stream Line Pro	HL130101	2-Feb-17	2-Feb-18
Temperature	Stream Line Pro	T130101	26-Jan-17	26-Jan-18
Pressure	Stream Line Pro	HL130101	26-Jan-17	26-Jan-18
Temperature	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Relative Humidity	Traceable Hygrometer Thermome	160718539	29-Aug-16	29-Aug-18
Manometer/Pressure/Vacuum	Traceable Monometer/Pressure/V	160885583	31-Oct-18	31-Oct-18

Technical Data: Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By SS2

Signature:

Monthly	Quarterly	Annually	
Yes	Yes		1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
			Auto Detector Calibration
Yes	Yes		Leak Check
			Clean Inlet Assemblies & Sample Tubes
Yes	Yes		Check Cam (grease as needed)
	Yes		Calibrate AmTemp
			Calibrate RH
			Calibrate Flow Temp
	Yes		Calibrate Baro Pressure
			Auto Flow Calibration
			Calibrate Vacuum Pressure Span
			Calibrate Flow Pressure Span
			Auto Mass Calibration
			Pump Reuild

COMMENTS

Barometric pressure from airport: 30.31 inHg. Temperature, Baro Pressure re-calibrated.

Appendix D

Daily TSP Data, 2017

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP (μg/m^3)	Comment	Daily TSP (μg/m^3)	Comment
1-Jan-17	2.5		-	Station removed for servicing.
2-Jan-17	8.3		-	Station removed for servicing.
3-Jan-17	2.7		-	Station removed for servicing.
4-Jan-17	3.1		-	Station removed for servicing.
5-Jan-17	31.0		-	Station removed for servicing.
6-Jan-17	30.0		-	Station removed for servicing.
7-Jan-17	97.9		-	Station removed for servicing.
8-Jan-17	44.6		-	Station removed for servicing.
9-Jan-17	26.9		-	Station removed for servicing.
10-Jan-17	-	Too many missing values.	-	Station removed for servicing.
11-Jan-17	-	Too many missing values.	-	Station removed for servicing.
12-Jan-17	-	Too many missing values.	-	Station removed for servicing.
13-Jan-17	-	Too many missing values.	-	Station removed for servicing.
14-Jan-17	1.6		-	Station removed for servicing.
15-Jan-17	4.7		-	Station removed for servicing.
16-Jan-17	2.6		-	Station removed for servicing.
17-Jan-17	9.5		-	Station removed for servicing.
18-Jan-17	4.2		-	Station removed for servicing.
19-Jan-17	20.6		-	Station removed for servicing.
20-Jan-17	4.1		-	Station removed for servicing.
21-Jan-17	14.0		-	Station removed for servicing.
22-Jan-17	15.6		-	Station removed for servicing.
23-Jan-17	1.9		-	Station re-installed. Too many missing values.
24-Jan-17	2.2		1.6	
25-Jan-17	2.9		3.2	
26-Jan-17	4.5		-	Too many missing values.
27-Jan-17	4.2		3.9	
28-Jan-17	10.8		2.6	
29-Jan-17	9.2		1.3	
30-Jan-17	16.5		5.2	
31-Jan-17	40.3		4.7	
1-Feb-17	37.8		3.6	
2-Feb-17	29.7		-	Too many negative values.
3-Feb-17	37.9		3.9	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP (μg/m^3)	Comment	Daily TSP (μg/m^3)	Comment
4-Feb-17	43.3		-	Too many negative values.
5-Feb-17	21.6		3.2	
6-Feb-17	34.5		-	Too many negative values.
7-Feb-17	66.2		9.0	
8-Feb-17	31.8		8.8	
9-Feb-17	22.3		6.2	
10-Feb-17	9.3		2.9	
11-Feb-17	11.6		2.9	
12-Feb-17	15.4		-	Too many negative values.
13-Feb-17	37.8		-	Low flow and too many missing values.
14-Feb-17	6.8		-	Too many missing values.
15-Feb-17	-	Too many negative values.	-	Too many missing and negative values.
16-Feb-17	-	Too many negative values.	-	Too many negative values.
17-Feb-17	31.1		6.5	
18-Feb-17	21.4		27.6	
19-Feb-17	9.1		83.8	
20-Feb-17	3.9		21.9	
21-Feb-17	13.8		-	Too many negative values.
22-Feb-17	20.7		6.8	
23-Feb-17	5.4		13.6	
24-Feb-17	11.9		21.0	
25-Feb-17	11.6		8.1	
26-Feb-17	-	Low flow.	10.1	
27-Feb-17	-	Low flow.	12.0	
28-Feb-17	-	Low flow.	7.8	
1-Mar-17	-	Low flow.	9.5	
2-Mar-17	-	Low flow.	7.7	
3-Mar-17	14.5		7.2	
4-Mar-17	14.4		6.6	
5-Mar-17	-	Low flow.	8.6	
6-Mar-17	-	Low flow.	18.6	
7-Mar-17	-	Low flow.	8.3	
8-Mar-17	-	Low flow.	20.8	
9-Mar-17	-	Low flow.	9.1	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP (μg/m^3)	Comment	Daily TSP (μg/m^3)	Comment
10-Mar-17	25.1		5.6	
11-Mar-17	19.8		6.7	
12-Mar-17	54.0		4.6	
13-Mar-17	-	Too many negative values.	-	Too many missing values.
14-Mar-17	-	Too many negative values.	-	Too many missing values.
15-Mar-17	-	Too many negative values.	-	Too many missing values.
16-Mar-17	-	Too many missing values.	-	Too many missing values.
17-Mar-17	-	Too many missing values.	-	Too many missing and negative values.
18-Mar-17	13.2		7.5	
19-Mar-17	19.6		15.5	
20-Mar-17	7.9		8.1	
21-Mar-17	11.1		7.6	
22-Mar-17	18.2		11.2	
23-Mar-17	14.1		-	Too many missing and negative values.
24-Mar-17	-	Too many negative values.	4.0	
25-Mar-17	3.2		7.7	
26-Mar-17	5.8		4.2	
27-Mar-17	3.2		9.4	
28-Mar-17	4.6		4.3	
29-Mar-17	11.7		7.9	
30-Mar-17	6.7		5.4	
31-Mar-17	6.1		3.0	
1-Apr-17	5.5		4.1	
2-Apr-17	3.4		3.6	
3-Apr-17	2.0		3.0	
4-Apr-17	7.4		9.0	
5-Apr-17	5.1		3.1	
6-Apr-17	11.4		11.1	
7-Apr-17	5.7		5.6	
8-Apr-17	4.6		6.7	
9-Apr-17	6.4		8.7	
10-Apr-17	9.5		10.7	
11-Apr-17	11.0		12.1	
12-Apr-17	5.2		12.9	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP ($\mu g/m^3$)	Comment	Daily TSP ($\mu g/m^3$)	Comment
13-Apr-17	5.7		-	Too many negative values.
14-Apr-17	8.4		5.5	
15-Apr-17	2.9		2.9	
16-Apr-17	9.9		11.2	
17-Apr-17	9.3		6.6	
18-Apr-17	8.6		5.2	
19-Apr-17	5.3		5.9	
20-Apr-17	10.6		9.6	
21-Apr-17	-	Too many missing values.	-	Instrument malfunction.
22-Apr-17	-	Too many missing values.	-	Instrument malfunction.
23-Apr-17	-	Too many missing values.	-	Instrument malfunction.
24-Apr-17	-	Too many missing values.	-	Instrument malfunction.
25-Apr-17	-	Too many missing values.	-	Instrument malfunction.
26-Apr-17	-	Too many missing values.	-	Instrument malfunction.
27-Apr-17	-	Too many missing values.	-	Instrument malfunction.
28-Apr-17	3.8		5.3	
29-Apr-17	4.3		3.7	
30-Apr-17	4.2		3.5	
1-May-17	3.6		4.0	
2-May-17	3.6		4.1	
3-May-17	5.2		4.5	
4-May-17	3.2		3.7	
5-May-17	3.9		3.9	
6-May-17	4.3		4.0	
7-May-17	2.3		2.7	
8-May-17	4.0		3.7	
9-May-17	3.1		3.9	
10-May-17	2.2		1.6	
11-May-17	1.4		1.9	
12-May-17	2.4		2.9	
13-May-17	1.5		2.0	
14-May-17	2.5		2.2	
15-May-17	2.7		2.6	
16-May-17	3.1		2.4	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP ($\mu g/m^3$)	Comment	Daily TSP ($\mu g/m^3$)	Comment
17-May-17	10.8		4.2	
18-May-17	15.5		5.8	
19-May-17	18.8		19.1	
20-May-17	33.7		9.0	
21-May-17	6.5		6.8	
22-May-17	7.2		4.7	
23-May-17	-	Too many missing values.	5.7	
24-May-17	-	Too many missing values.	5.7	
25-May-17	-	Too many missing values.	8.9	
26-May-17	3.0		14.2	
27-May-17	3.2		5.0	
28-May-17	-	Too many negative values.	5.4	
29-May-17	3.6		7.4	
30-May-17	1.4		-	Too many negative values.
31-May-17	-	Too many missing values.	-	Too many missing values.
1-Jun-17	3.3		4.4	
2-Jun-17	-	Too many negative values.	4.2	
3-Jun-17	-	Too many negative values.	6.5	
4-Jun-17	-	Too many negative values.	-	Too many negative values.
5-Jun-17	6.5		-	Too many negative values.
6-Jun-17	1.6		7.4	
7-Jun-17	3.1		20.2	
8-Jun-17	7.1		10.7	
9-Jun-17	-	Too many negative values.	4.5	
10-Jun-17	5.3		-	Too many negative values.
11-Jun-17	0.8		-	Too many negative values.
12-Jun-17	5.2		6.4	
13-Jun-17	-	Too many negative values.	-	Too many negative values.
14-Jun-17	4.0		7.1	
15-Jun-17	-	Too many negative values.	-	Too many negative values.
16-Jun-17	8.5		-	Too many negative values.
17-Jun-17	-	Too many negative values.	9.3	
18-Jun-17	7.4		12.3	
19-Jun-17	-	Too many negative values.	10.4	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP ($\mu g/m^3$)	Comment	Daily TSP ($\mu g/m^3$)	Comment
20-Jun-17	6.8		-	Too many negative values.
21-Jun-17	1.1		-	Too many negative values.
22-Jun-17	-	Too many missing values.	-	Too many missing values.
23-Jun-17	-	Too many missing values.	-	Too many missing values.
24-Jun-17	-	Too many missing values.	-	Too many missing values.
25-Jun-17	7.7		28.1	
26-Jun-17	-	Too many negative values.	5.7	
27-Jun-17	1.8		-	Too many negative values.
28-Jun-17	-	Too many negative values.	3.7	
29-Jun-17	8.7		-	Too many negative values.
30-Jun-17	-	Too many negative values.	5.8	
1-Jul-17	-	Too many negative values.	4.6	
2-Jul-17	4.8		4.8	
3-Jul-17	5.6		-	Too many negative values.
4-Jul-17	-	Too many negative values.	6.3	
5-Jul-17	-	Too many negative values.	8.3	
6-Jul-17	16.5		13.8	
7-Jul-17	-	Too many negative values.	7.3	
8-Jul-17	6.1		7.7	
9-Jul-17	6.5		38.9	
10-Jul-17	8.0		14.7	
11-Jul-17	14.3		23.2	
12-Jul-17	7.2		8.9	
13-Jul-17	-	Too many negative values.	8.6	
14-Jul-17	5.0		-	Too many missing values.
15-Jul-17	19.6		-	Too many missing values.
16-Jul-17	-	Too many negative values.	24.7	
17-Jul-17	-	Too many negative values.	6.9	
18-Jul-17	7.6		-	Too many negative values.
19-Jul-17	-	Too many missing and negative values.	-	Too many missing values.
20-Jul-17	-	Too many missing values.	-	Too many missing values.
21-Jul-17	11.0		23.8	
22-Jul-17	7.9		17.8	
23-Jul-17	-	Too many negative values.	-	Too many negative values.

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP (μg/m^3)	Comment	Daily TSP (μg/m^3)	Comment
24-Jul-17	16.7		17.6	
25-Jul-17	-	Too many negative values.	8.6	
26-Jul-17	9.7		13.0	
27-Jul-17	6.6		-	Too many negative values.
28-Jul-17	-	Too many negative values.	3.6	
29-Jul-17	5.2		10.1	
30-Jul-17	6.1		10.6	
31-Jul-17	-	Too many negative values.	6.5	
1-Aug-17	8.6		10.7	
2-Aug-17	15.3		21.6	
3-Aug-17	13.7		32.3	
4-Aug-17	19.1		28.5	
5-Aug-17	-	Too many negative values.	9.8	
6-Aug-17	-	Too many negative values.	7.4	
7-Aug-17	8.5		20.1	
8-Aug-17	6.3		13.1	
9-Aug-17	6.0		11.8	
10-Aug-17	8.7		10.2	
11-Aug-17	8.9		27.7	
12-Aug-17	25.9		69.6	
13-Aug-17	66.5	Smoke from forest fires.	241.1	Smoke from forest fires.
14-Aug-17	58.5	Smoke from forest fires.	-	Instrument jammed from smoke.
15-Aug-17	29.2	Smoke from forest fires.	-	Instrument jammed from smoke
16-Aug-17	16.5		-	Instrument jammed from smoke
17-Aug-17	-	Too many negative values.	-	Instrument jammed from smoke
18-Aug-17	6.0		-	Instrument jammed from smoke
19-Aug-17	-	Too many negative values.	-	Instrument jammed from smoke
20-Aug-17	1.7		4.1	
21-Aug-17	1.0		4.0	
22-Aug-17	2.7		8.4	
23-Aug-17	-	Too many negative values.	9.7	
24-Aug-17	10.4		16.7	
25-Aug-17	5.1		18.3	
26-Aug-17	-	Too many negative values.	23.0	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP ($\mu g/m^3$)	Comment	Daily TSP ($\mu g/m^3$)	Comment
27-Aug-17	1.7		6.4	
28-Aug-17	-	Too many negative values.	5.5	
29-Aug-17	7.8		9.1	
30-Aug-17	7.8		-	Too many negative values.
31-Aug-17	13.3		34.9	
1-Sep-17	-	Too many negative values.	-	Too many negative values.
2-Sep-17	1.3		3.0	
3-Sep-17	5.2		-	Too many negative values.
4-Sep-17	-	Too many negative values.	9.0	
5-Sep-17	2.5		-	Too many negative values.
6-Sep-17	5.6		12.4	
7-Sep-17	5.4		9.6	
8-Sep-17	-	Too many negative values.	70.6	
9-Sep-17	3.0		5.5	
10-Sep-17	2.7		-	Too many negative values.
11-Sep-17	-	Too many negative values.	14.5	
12-Sep-17	8.8		-	Too many negative values.
13-Sep-17	-	Too many negative values.	9.7	
14-Sep-17	7.9		8.8	
15-Sep-17	5.0		8.7	
16-Sep-17	4.2		-	Too many negative values.
17-Sep-17	3.8		11.2	
18-Sep-17	-	Too many missing values.	-	Inlet tube not installed. Not enough valid hourly data
19-Sep-17	-	Too many missing values.	-	Inlet tube not installed. Not enough valid hourly data
20-Sep-17	-	Too many missing and negative values.	-	Inlet tube not installed. Not enough valid hourly data
21-Sep-17	-	Too many negative values.	-	Inlet tube not installed. Not enough valid hourly data
22-Sep-17	1.6		-	Inlet tube not installed. Not enough valid hourly data
23-Sep-17	1.3		-	Inlet tube not installed. Not enough valid hourly data
24-Sep-17	3.4		-	Inlet tube not installed. Not enough valid hourly data
25-Sep-17	3.4		-	Inlet tube not installed. Not enough valid hourly data
26-Sep-17	-	Too many negative values.	-	Inlet tube not installed. Not enough valid hourly data
27-Sep-17	-	Too many negative values.	-	Inlet tube not installed. Not enough valid hourly data
28-Sep-17	4.7		-	Inlet tube not installed. Not enough valid hourly data
29-Sep-17	-	Too many missing values.	-	Inlet tube not installed. Not enough valid hourly data

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP (µg/m^3)	Comment	Daily TSP (µg/m^3)	Comment
30-Sep-17	-	Too many missing values.	-	Inlet tube not installed. Not enough valid hourly data
1-Oct-17	-	Too many missing values and low flow.	-	Inlet tube not installed. Not enough valid hourly data
2-Oct-17	-	Low flow.	-	Inlet tube not installed. Not enough valid hourly data
3-Oct-17	-	Low flow.	-	Inlet tube not installed. Not enough valid hourly data
4-Oct-17	-	Low flow.	-	Inlet tube not installed. Not enough valid hourly data
5-Oct-17	-	Low flow.	-	Inlet tube not installed. Not enough valid hourly data
6-Oct-17	-	Low flow.	17.1	
7-Oct-17	-	Low flow.	4.4	
8-Oct-17	-	Low flow.	5.8	
9-Oct-17	-	Low flow.	1.8	
10-Oct-17	-	Low flow.	3.1	
11-Oct-17	2.7		18.0	
12-Oct-17	-	Low flow.	11.0	
13-Oct-17	-	Low flow.	2.2	
14-Oct-17	-	Station offline for pump repair.	4.0	
15-Oct-17	-	Station offline for pump repair.	6.5	
16-Oct-17	3.8		6.5	
17-Oct-17	2.0		3.9	
18-Oct-17	1.4		2.5	
19-Oct-17	0.5		1.8	
20-Oct-17	0.7		1.8	
21-Oct-17	3.4		21.7	
22-Oct-17	1.0		2.2	
23-Oct-17	1.5		3.5	
24-Oct-17	1.6		4.9	
25-Oct-17	0.9		2.7	
26-Oct-17	0.6		3.0	
27-Oct-17	1.6		3.2	
28-Oct-17	5.0		13.8	
29-Oct-17	1.9		6.7	
30-Oct-17	-	Too many negative values.	4.0	
31-Oct-17	0.5		3.4	
1-Nov-17	1.4		3.0	
2-Nov-17	2.5		-	Too many negative values.

Appendix D. Daily TSP Data, 2017

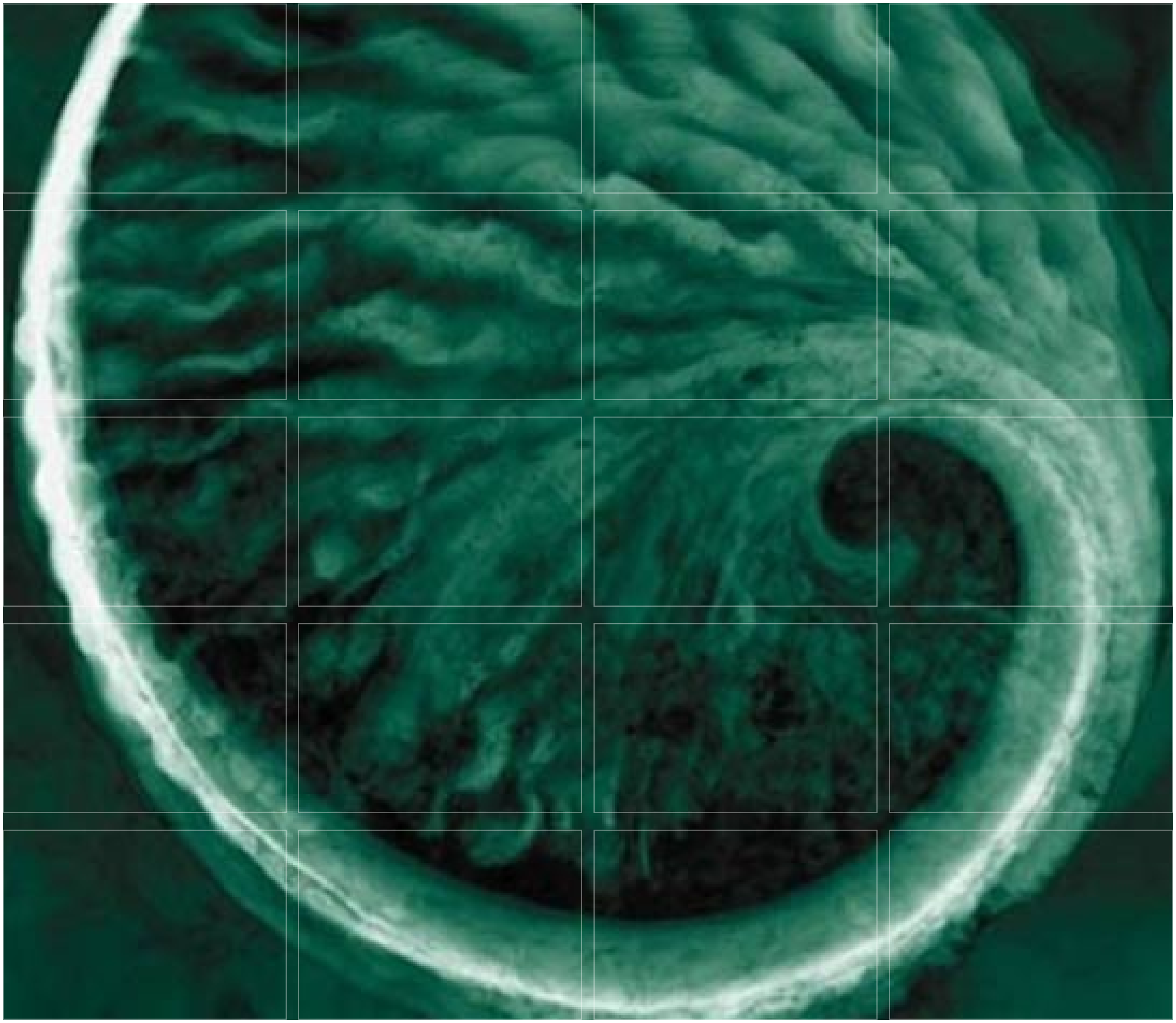
Date	CB Station		A154 Dike Station	
	Daily TSP (μg/m^3)	Comment	Daily TSP (μg/m^3)	Comment
3-Nov-17	9.3		6.5	
4-Nov-17	1.9		3.1	
5-Nov-17	1.6		9.1	
6-Nov-17	3.4		7.6	
7-Nov-17	2.3		5.9	
8-Nov-17	1.4		3.8	
9-Nov-17	9.8		2.2	
10-Nov-17	1.4		4.4	
11-Nov-17	1.2		5.6	
12-Nov-17	1.0		3.4	
13-Nov-17	-	Low flow.	2.5	
14-Nov-17	-	Low flow.	3.3	
15-Nov-17	-	Low flow.	5.1	
16-Nov-17	1.1		2.0	
17-Nov-17	0.7		2.6	
18-Nov-17	0.9		3.8	
19-Nov-17	2.0		2.2	
20-Nov-17	1.1		2.3	
21-Nov-17	1.4		4.3	
22-Nov-17	1.6		4.3	
23-Nov-17	2.6		2.5	
24-Nov-17	1.7		2.1	
25-Nov-17	2.9		4.3	
26-Nov-17	1.7		5.4	
27-Nov-17	6.3		1.9	
28-Nov-17	0.8		2.8	
29-Nov-17	1.0		3.8	
30-Nov-17	0.9		1.3	
1-Dec-17	1.3		3.3	
2-Dec-17	1.5		4.1	
3-Dec-17	7.4		3.6	
4-Dec-17	0.7		1.0	
5-Dec-17	3.2		6.1	
6-Dec-17	-	Too many missing and negative values.	4.4	

Appendix D. Daily TSP Data, 2017

Date	CB Station		A154 Dike Station	
	Daily TSP (μg/m^3)	Comment	Daily TSP (μg/m^3)	Comment
7-Dec-17	3.7		5.4	
8-Dec-17	1.0		10.6	
9-Dec-17	1.0		-	Too many missing values.
10-Dec-17	1.3		-	Too many missing values.
11-Dec-17	3.0		11.0	
12-Dec-17	4.0		20.8	
13-Dec-17	-	Too many negative values.	5.3	
14-Dec-17	2.1		3.5	
15-Dec-17	1.1		1.1	
16-Dec-17	1.5		2.0	
17-Dec-17	0.9		9.9	
18-Dec-17	9.0		71.5	
19-Dec-17	1.2		3.3	
20-Dec-17	1.8		1.7	
21-Dec-17	1.2		3.4	
22-Dec-17	1.2		5.5	
23-Dec-17	13.1		15.8	
24-Dec-17	-	Too many missing values.	-	Low flow.
25-Dec-17	2.9		-	Low flow.
26-Dec-17	1.8		-	Low flow.
27-Dec-17	0.6		-	Low flow.
28-Dec-17	1.6		-	Low flow.
29-Dec-17	-	Too many missing values.	-	Tape motor broke. Station removed for servicing.
30-Dec-17	-	Too many missing values.	-	Tape motor broke. Station removed for servicing.
31-Dec-17	-	Too many missing values.	-	Tape motor broke. Station removed for servicing.

Appendix E

Diavik Diamond Mine: 2017 Dust Deposition Report (dated June 2018)



Prepared for:

Rio Tinto

Dominion Diamond Mines

Diavik Diamond Mine

DIAVIK DIAMOND MINE

2017 Dust Deposition Report

June 2018

The business of sustainability

ERM

Diavik Diamond Mines (2012) Inc.

DIAVIK DIAMOND MINE
2017 Dust Deposition Report

June 2018

Project #0207514-0013

Citation:
ERM. 2018. *Diavik Diamond Mine: 2017 Dust Deposition Report*. Prepared for Diavik Diamond Mines (2012) Inc. by ERM Consultants Canada Ltd.: Vancouver, British Columbia.

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EXECUTIVE SUMMARY

Potential air and water quality concerns associated with airborne fugitive dust, which may result from Diavik Diamond Mine (the "Project") mining activities, were identified in the Diavik Diamond Mine Environmental Assessment (DDMI 1998). In accordance with the Environmental Assessment and requirements associated with the Aquatic Effects Monitoring Program (AEMP), a dust monitoring program was initiated in 2001. The program was designed to achieve the following objectives:

- determine dust deposition (dustfall) rates at various distances from the mine project footprint; and
- determine the chemical characteristics of dustfall that may be deposited onto, and subsequently into, Lac de Gras as a result of mining activities, in support of the AEMP.

In 2017, dustfall monitoring included three components, with sampling conducted at varying distances around the mine from 25 to 4,852 metres (m) away from infrastructure:

1. Dustfall gauges (12 monitoring and 2 control locations);
2. Dustfall from snow surveys (24 monitoring and 3 control locations); and
3. Snow water chemistry from snow surveys (16 monitoring and 3 control locations).

A general reduction in dust levels was observed in 2017 relative to prior years with 2017 having the second lowest median dustfall level over the measurement record. Overall, as expected, dustfall rates generally decreased with distance from the Project and airstrip. As there was no strongly dominant wind direction there was no direct correlation between direction from the mine and dustfall levels. Of the dustfall gauges, Dust 1 had the highest recorded dustfall in 2017 (adjacent to the airstrip) and Dust 10 (south of the Mine) had the second highest recorded dustfall in 2017. Fugitive dust generation also was the greatest during snow-free periods where and when there is site activity. Dust 1 (adjacent to the airstrip) recorded the highest dustfall during the summer months (936 mg/dm^2/y) compared to the winter months (230 mg/dm^2/y).

Annual dustfall estimated from each of the 14 dustfall gauges ranged from 34 to 480 mg/dm^2/y. The annualized dustfall rates estimated from the 2017 snow survey data ranged from 10 to 1,351 mg/dm^2/y. Although there are no dustfall standards for the Northwest Territories, all but one station's (SS1-1) 2017 dustfall rates were less than the non-residential 2.9 mg/dm^2/d (1,059 mg/dm^2/y) documented in British Columbia (BC) Ministry of Environment former dustfall objective for the mining, smelting, and related industries (Diavik 2016). This objective used in the 2015 Dust Deposition Report is no longer used in BC.

Snow water chemistry analytes of interest included those variables with effluent quality criteria (EQC; i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc) or a load limit (i.e., phosphorous) specified in the Type "A" Water Licence (W2015L2-0001, formerly W2007L2-0003). All 2017 sample concentrations other than sample SS3-4 (aluminum, chromium, nickel and zinc) were less than their associated reference levels as specified by the "maximum

concentration of any grab sample" specified in Water Licence W2015L2-0001. Concentrations of aluminum, chromium, and nickel have generally increased in recent years, while concentrations of most other analytes have generally had no strong trend in recent years. Typically, concentrations decreased with distance from the Project. High concentrations of certain variables of interest were recorded at Station SS3-4, located in the 251-1,000 m zone.

ACKNOWLEDGEMENTS

This report was prepared for Diavik Diamond Mines (2012) Inc. (DDMI) by ERM Consultants Canada Ltd. (ERM). Fieldwork and on site sample analyses were completed by DDMI, and other sample analyses were completed by Maxxam Analytics. Data analyses and reporting were completed by Andres Soux (M. Sc.). The project was managed by Carol Adly, and Marc Wen (M.Sc.) was the partner in charge.

DIAVIK DIAMOND MINE
2017 Dust Deposition Report

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AEMP	Aquatic effects monitoring program
BC	British Columbia
BC MOE	British Columbia Ministry of Environment
cm	Centimetre
d	Day
DDMI	Diavik Diamond Mines (2012) Inc.
DL	Detection limits
dm^2	Square decimetre
Dustfall	Dust deposition
EQC	Effluent quality criteria
ERM	ERM Consultants Canada Ltd.
L	Litre
m	Metre
mg	Milligram
QA/QC	Quality assurance and quality control
the Project	Diavik Diamond Mine
RPD	Relative percent difference
SOP	Standard operating procedure
WLWB	Wek'èezhìi Land and Water Board
y	Year
µg	Microgram

1. INTRODUCTION

Potential air and water quality concerns associated with airborne fugitive dust, which may result from Diavik Diamond Mine (the "Project") mining activities, were identified in the Diavik Diamond Mine Environmental Assessment (DDMI 1998). In accordance with the Environmental Assessment and requirements associated with the Aquatic Effects Monitoring Program (AEMP), a dust monitoring program was initiated in 2001. The program was designed to achieve the following objectives:

- determine dust deposition (dustfall) rates at various distances from the mine project footprint; and
- determine the chemical characteristics of dustfall that may be deposited onto, and subsequently into, Lac de Gras as a result of mining activities, in support of the AEMP.

Since 2001, the dustfall monitoring program has gone through various changes, including an increase in the number of sampling locations, the relocation of some sampling stations, and improvements to the dustfall sampling methodology. A description of annual changes is provided in Appendix A. This report includes a comparison between the 2017 observations of dustfall to all site-specific data collected between 2002 and 2017. Appendix A of the Dust Deposition Report summarizes the amendments and additions to the dust fall monitoring program since 2001. Historical dustfall monitoring results have been presented each year in the *Diavik Diamond Mine Dust Deposition* reports from 2001 to 2016 (DDMI 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017). The historical data presented is not considered baseline because construction of the mine began in 2001.

2. METHODOLOGY

The 2017 dustfall monitoring program incorporated three monitoring components, with sampling completed at varying distances around the mine along five transects, including three control locations (Table 2-1, Figure 2-1):

1. Dustfall gauges (12 monitoring and 2 control locations);
2. Dustfall from snow surveys (24 monitoring and 3 control locations); and
3. Snow water chemistry from snow surveys (16 monitoring and 3 control locations).

2.1 DUSTFALL GAUGES

Dustfall gauges were placed at 14 stations (including two control stations) around the Project at distances ranging from approximately 25 to 4,852 metres (m) from mining operations (Table 2-1). Of the 12 stations (plus two control stations), 10 collected dustfall year-round, with samples collected every three months. The average total sampling period for the 12 year-round locations was 357 days. Two new stations were installed in October 2017 (Dust 11 and Dust 12) and they sampled for 93 and 92 days, respectively.

Dustfall gauges consisted of a hollow brass cylinder (52 centimetres (cm) length, 12.5 cm inner diameter) housed in a Nipher snow gauge (Plate 2.1-1). The cylinder collected dustfall, while the Nipher snow gauge reduced air turbulence around the gauge to increase dustfall catch efficiency. The cylinder was exchanged with an empty, clean cylinder at the end of each sampling period, and the content of the cylinder that was retrieved was processed in the Diavik Diamond Mines (2012) Inc. (DDMI) environment lab to determine the mass of collected dustfall. This processing involved filtration, drying in a high heat oven, and weighing of samples as specified in the Dust Gauge Collection Standard Operating Procedure (SOP; ENVR-508-0112; Appendix E) and the Quality Assurance/Quality Control SOP (ENVR-303-0112; Appendix G).

Once the mass of collected dustfall at a station was measured, the mean daily dustfall rate over the collection period was calculated as:

$$D = \frac{M}{A * T} \qquad \text{[Equation 1]}$$

where:

D = mean daily dustfall rate (mg/dm^2/d) during time period T
M = mass of dustfall collected (mg) during time period T
A = surface area of dustfall gauge collection cylinder orifice (dm^2; approximately 1.227 dm^2)
T = number of days of dustfall collection (d)

The mean daily dustfall rate (mg/dm^2/d) was then multiplied by 365 days to estimate the mean annual dustfall rate (mg/dm^2/y).

Table 2-1. **Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2017**

Transect Line	Station ID	2017 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Dustfall Gauges								
	Dust 1	Jan 4 (start), Mar 25, Jul 2, Sep 30, Dec 24	354	533964	7154321	75	Land	n/a
	Dust 2A	Jan 4 (start), Mar 25, Jul 2, Oct 6, Jan 6 (2018)	367	535678	7151339	435	Land	n/a
	Dust 3	Jan 4 (start), Mar 25, Jul 2, Sep 30, Jan 10 (2018)	371	535024	7151872	30	Land	n/a
	Dust 4	Jan 6 (start), Mar 25, Jul 2, Oct 7, Jan 10 (2018)	369	531397	7152127	200	Land	n/a
	Dust 5	Jan 4 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	367	535696	7155138	1,195	Land	n/a
	Dust 6	Jan 3 (start), Mar 25, Jul 2, Sep 30, Dec 24	355	537502	7152934	25	Land	n/a
	Dust 7	Jan 6 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	365	536819	7150510	1,155	Land	n/a
	Dust 8	Jan 3 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	368	531401	7154146	1,220	Land	n/a
	Dust 9	Jan 4 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	367	541204	7152154	3,810	Land	n/a
	Dust 10	Jan 6 (start), Mar 25, Jul 2, Oct 6, Jan 16 (2018)	273	532908	7148924	46	Land	n/a
	Dust 11	Oct 5 (start), Jan 6 (2018)	93	531493	7150156	805	Land	n/a
	Dust 12	Oct 6 (start), Jan 6 (2018)	92	529323	7151191	2,580	Land	n/a
	Dust C1	Jan 6 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	371	534979	7144270	4,700	Land	n/a
	Dust C2	Jan 4 (start), Mar 25, Jul 6, Oct 6, Jan 6 (2018)	369	528714	7153276	3,075	Land	n/a

(continued)

Table 2-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2017 (continued)

Transect Line	Station ID	2017 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Snow Surveys								
1	SS1-1-4[3]	Apr 7	191	533911	7154288	30	Land	
	SS1-1-5[3]	Apr 7	191	533924	7154367	30	Land	
	SS1-2	Apr 7	191	533924	7154367	115	Land	
	SS1-3	Apr 7	191	533966	7154517	275	Land	
	SS1-4	Apr 7	158	534485	7155094	920	Ice	✓
	SS1-5	Apr 7	158	535099	7156279	2,180	Ice	✓
2	SS2-1	Apr 8	159	537553	7153473	180	Ice	✓
	SS2-2	Apr 8	159	537829	7153476	445	Ice	✓
	SS2-3	Apr 8	159	538484	7153939	1,220	Ice	✓
	SS2-4-4[3]	Apr 8	159	539151	7154685	2,180	Ice	✓
	SS2-4-5[3]	Apr 8	159	539151	7154685	2,180	Ice	✓
3	SS3-4	Apr 3	154	536585	7151002	615	Ice	✓
	SS3-5	Apr 3	154	537638	7150824	1,325	Ice	✓
	SS3-6	Apr 3	154	536305	7151604	60	Ice	✓
	SS3-6-regrab	Apr 30	181	536306	7151566	60	Ice	✓
	SS3-7	Apr 3	154	536343	7151368	250	Ice	✓
	SS3-8	Apr 3	154	536693	7150806	830	Ice	✓
4	SS4-1	Apr 7	191	531491	7152211	100	Land	
	SS4-2	Apr 7	191	531356	7152261	245	Land	
	SS4-3	Apr 7	191	531331	7152434	350	Land	
	SS4-4	Apr 7	158	531141	7153167	1,065	Ice	✓
	SS4-5-4[3]	Apr 7	158	531405	7154116	1,220	Ice	✓
	SS4-5-5[3]	Apr 7	158	531405	7154116	1,220	Ice	✓

(continued)

Table 2-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2017 (completed)

Transect Line	Station ID	2017 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Snow Surveys *(cont'd)*								
5	SS5-1	Apr 1	185	533150	7148925	45	Land	
	SS5-2-4[3]	Apr 1	185	533150	7148875	95	Land	
	SS5-2-5[3]	Apr 1	185	533150	7148875	95	Land	
	SS5-3	Apr 1	152	533142	7148691	270	Ice	✓
	SS5-4	Apr 1	152	533143	7147956	1,021	Ice	✓
	SS5-5	Apr 1	152	533146	7146950	2,020	Ice	✓
	Control 1	Apr 1	192	534983	7144271	4,852	Land	✓[4]
	Control 2	Apr 7	190	528714	7153281	3,075	Land	✓[4]
	Control 3	Apr 3	187	538650	7148750	3,570	Land	✓[4]

Notes:
[1] *UTM Zone 12W, NAD83*
[2] *n/a = not applicable*
[3] *Duplicate sample taken for snow water chemistry.*
[4] *Snow water chemistry sampled over ice, adjacent to the on-land control station; see Section 2.3 for further details.*

Figure 2-1

Dustfall Gauge and Snow Survey Locations, Diavik Diamond Mine, 2017

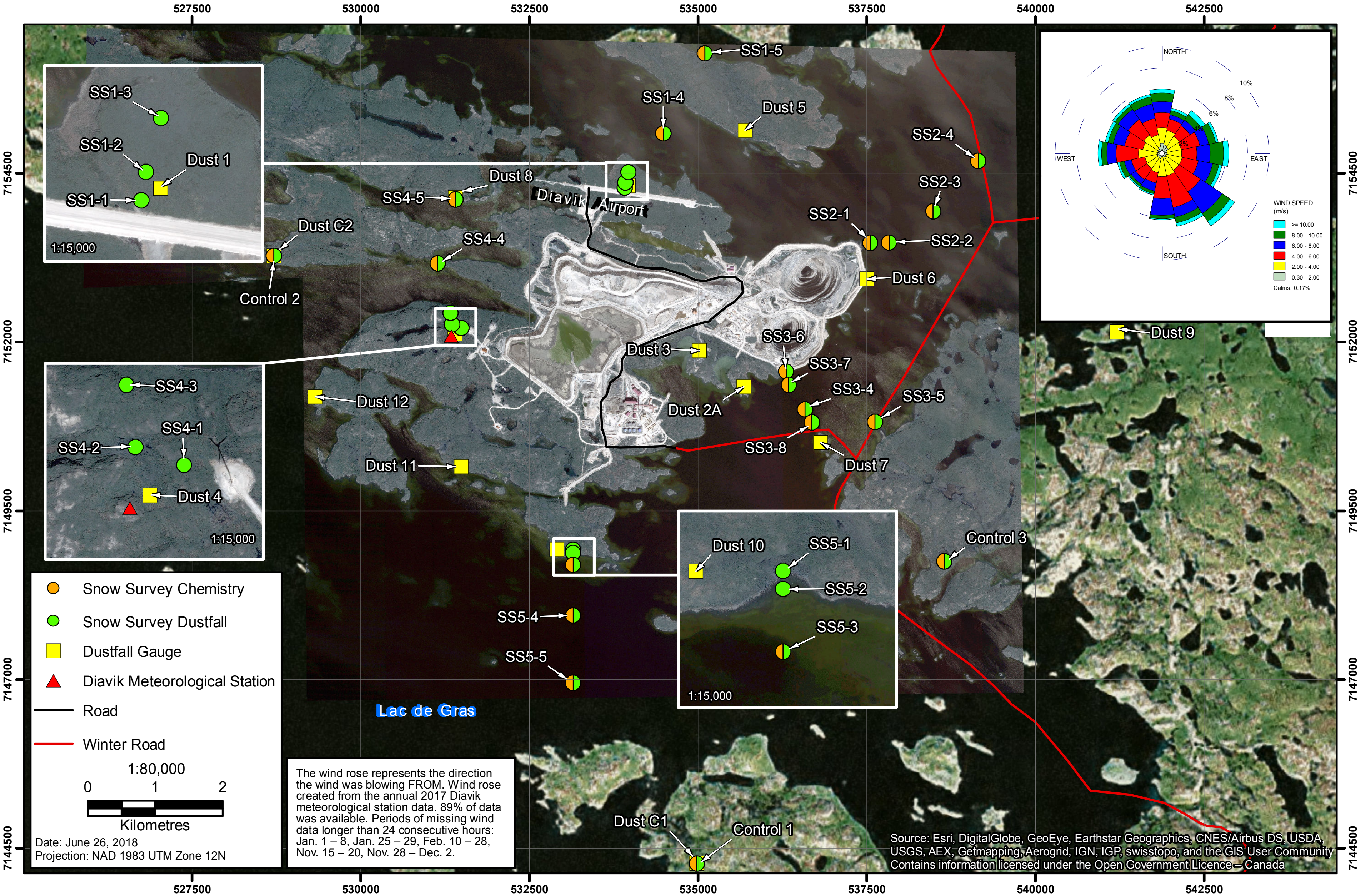


Plate 2.1-1. Dustfall gauge during sample collection. The dustfall gauge consisted of a hollow brass cylinder (centre) housed inside a Nipher snow gauge (right).

Estimated dustfall rates were compared to the former British Columbia Ministry of Environment (BC MOE) dustfall objectives for the mining, smelting and related industries (Table 2.1-1; Diavik 2016). The dustfall objective is no longer used in BC; however, for the purposes of this report, dustfall will be compared to the former objective to be consistent with prior dust deposition reports. The dustfall objectives ranged from 1.7 to 2.9 milligram per square decimetre per day (mg/dm^2/d), averaged over 30 days. The 1.7 mg/dm^2/d objective was often considered to be applicable at sensitive locations whereas the 2.9 mg/dm^2/d objective was applicable to areas where it can be shown that unacceptably deleterious changes will not follow. Both values are presented throughout this report. Snow water chemistry data were compared to effluent quality criteria (EQC) set out in Wek'èezhìi Land and Water Board (WLWB) Water Licence W2015L2-0001 (formerly W2007L2-0003).

Table 2.1-1. Dustfall and Snow Water Chemistry Reference Values

Parameter	Value	Unit	Comment	Source
Dustfall Rate	1.7–2.9 (621–1,059)	mg/dm^2/d (mg/dm^2/y)	Former objective for the mining, smelting, and related industries	Diavik 2016
Aluminum-Total	3,000	µg/L	Max. grab sample concentration	W2015L2-0001
Ammonia-N	12,000	µg/L	Max. grab sample concentration	W2015L2-0001
Arsenic-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Cadmium-Total	3	µg/L	Max. grab sample concentration	W2015L2-0001
Chromium-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Copper-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Lead-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001
Nickel-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Nitrite-N	2,000	µg/L	Max. grab sample concentration	W2015L2-0001
Zinc-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001

2.2 DUSTFALL SNOW SURVEYS

Dustfall snow surveys were performed at 27 stations (including three control stations), along five transects around the Project (Table 2-1 and Figure 2-1). Across stations, the distance from mining operations ranged from approximately 30 to 4,852 m and the average total sampling period in 2017 was 172 days. The start dates correspond to the first snowfall for land stations (September 28, 2016), and shortly after ice freeze up for ice stations (October 31, 2016).

At each snow survey station, a snow corer was used to drill into the snow pack to retrieve a cylindrical snow core (6.1 cm inner diameter; Plate 2.2-1). Cores were extracted at each station and composited in the field to ensure a representative snow sample was obtained for the station. A minimum of three snow cores were collected at each (land and ice) of the snow sampling stations, as outlined in the Snow Core Survey SOP (ENVR-512-0213; Appendix F). Composited samples were bagged and brought to the DDMI environment lab for processing as specified in the Snow Core Survey SOP (ENVR-512-0213; Appendix F) and the Quality Assurance/Quality Control SOP (ENVR-303-0112; Appendix G). Processing of snow cores involved filtration, drying in a high heat oven and weighing. For quality assurance and control, duplicate samples were collected at stations SS1-1, SS2-4, SS4-5, and SS5-2.

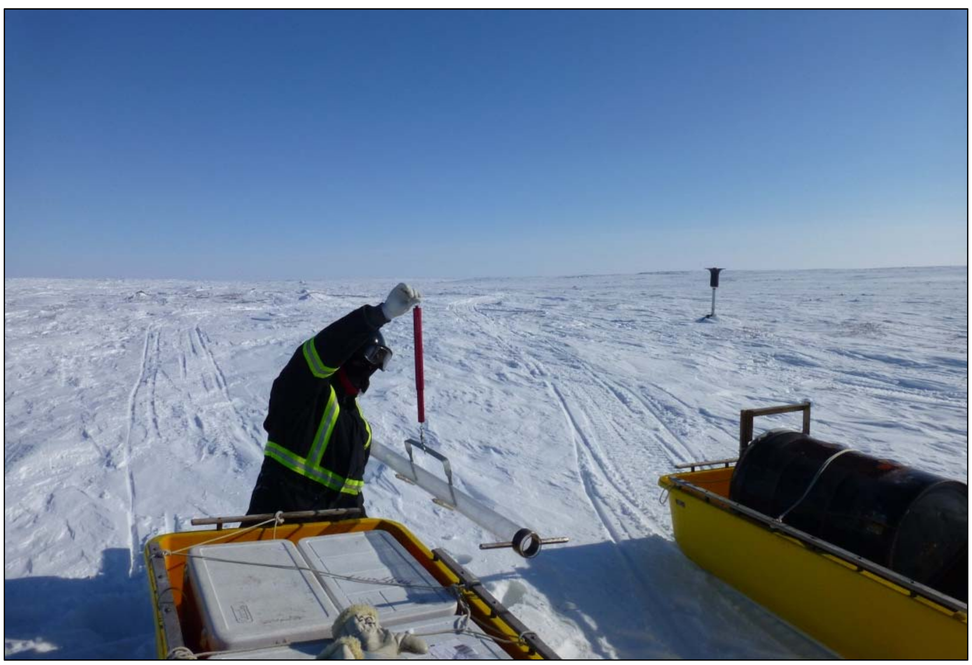


Plate 2.2-1. Snow core sample being weighed, with dustfall gauge in background.

Mean daily dustfall rate (mg/dm^2/d) was then calculated over the collection period using Equation 1, with surface area (A) equal to the surface area of the snow corer tube orifice (0.2922 dm^2) multiplied by the number of snow cores used for the composited sample at the station. The mean annual dustfall rate (mg/dm^2/y) was estimated by multiplying the mean daily dustfall rate by 365 days.

Dustfall rates were compared to the former BC dustfall objective for the mining, smelting and related industries (Table 2.1-1), for comparison purposes only.

2.3 SNOW WATER CHEMISTRY

Snow water chemistry analysis was performed on snow cores extracted from 19 locations (including three control locations; Table 2-1 and Figure 2-1). These locations included the 16 dustfall snow survey stations that were located on ice, as well as samples taken on ice adjacent to the three control stations. Across stations, the distance from mining operations ranged from approximately 60 m to 4,852 m and the average total sampling period in 2017 was 159 days. At each station located over water, cores were collected for chemistry analysis immediately after the dustfall snow cores were extracted.

Snow water chemistry cores were extracted using a snow corer in accordance with the dustfall snow survey core extraction. A minimum of three cores at each site were extracted and composited to obtain the necessary 3 litres (L) of snow water required for the laboratory chemical analysis as required (see Appendix F). Snow cores were then processed and prepared for shipment to Maxxam where the chemical analysis was performed. For quality assurance and control purposes, duplicate samples were collected at stations SS3-5and SS5-5, and an equipment blank sample was collected at station SS3-6. Snow water chemistry sampling methodology is detailed in SOP ENVR-512-0213 (see Appendix F).

EQC, including "maximum average concentration" and "maximum concentration of any grab sample," are stipulated in DDMI's Water Licence (W2015L2-0001) for aluminium, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc (Table 2.1-1). Snow water chemistry results for these variables were compared to the "maximum concentration of any grab sample." These results are also presented as part of DDMI's Aquatic Effects Monitoring Program (AEMP) report.

DDMI measures the chemistry of snow samples as this assists with characterizing the chemical content of the particulate material deposited over time. This is measured as the total metals and nutrients concentrations of the melted snow sample and makes direct comparison to maximum grab sample concentrations for EQCs difficult. It is important to note that the dust monitoring program is not designed to assess effects in the context used for most other AEMP water quality components.

DDMI compares the measured total metals levels for dust with EQC only because this is a recognizable concentration that provides a comparative reference. Similarly, DDMI contrasts measured dustfall rates with British Columbia Ministry of Environment (BC MOE) dustfall objectives for the mining, smelting and related industries. There is no intention or requirement that snow samples must meet the EQC or BC MOE objective.

While EQC are stated for convenience as 'total metals', the value represents both the dissolved and particulate concentration. The value of the EQC assumes that all of the metal is in the dissolved and therefore biologically available form. By comparison, the snow sample is demonstrated to contain significant particulate material that is not biologically available.

3. RESULTS

Dustfall and snow water chemistry results were grouped into zones based on their relative distance from the mine footprint (see Table 3.1-1). Although station groupings into zones were first established at the outset of the program, these groupings were re-established in 2013 using satellite imagery of the site.

In 2017, the primary sources of fugitive dust were associated with unpaved road and airstrip usage and construction activities at A21. The distances to mining operations are shown in Table 2-1. Major waste rock material transfers in 2017 occurred on haul roads (392,102 tonnes) and kimberlite ore to the crusher (2,189,799 tonnes). Another source of fugitive dust is truck traffic along the ice road to the Project. However, the consistency in dust deposition rates near the ice road alignment between winter and summer indicated that the contributions of dust from the ice road were modest relative to other sources. There is no direct measurement of dustfall due to the use of the ice road; however, dustfall stations immediately downwind of the ice road such as Dust 7, Dust 6, and SS2-4 did not show elevated readings during winter months. To supress dust generation, roads, parking areas and laydown areas were watered during the summer as needed. Between May and September 2017, approximately 1,668 m^3 of water was applied on the Project site and 55,948 m^3 of water was applied on haul roads. The exact impact of dust suppression could not be determined from the data collected in 2017; however, it is very likely that road watering reduced the amount of dust generated at the Mine in 2017. The Underground Mine production rate was steady throughout the year. Open pit mining of A21 and construction of the Waste Rock Storage Area - South Country Rock Pile commenced in December 2017. Fugitive dust generation is expected to be greatest during snow-free periods where and when there is site activity. It was expected that the highest fugitive dust generation and resulting dustfall occurred in areas closest to the roads and the airstrip and mine footprint such as near A21 and the country rock pile between May and September. Of the dustfall gauges, Dust 1 (adjacent to the airstrip) recorded the highest dustfall during the summer months (936 $mg/dm^2/y$) compared to the winter months (230 $mg/dm^2/y$).

The 2017 predominant wind directions at the site were from the southeast, although this was not very pronounced and in fact in general the winds can be described as omni-directional. The expectation is that airborne material will be deposited in all directions around the mine with a slight northwest emphasis. The results show the direction from the mine is not the strongest indicator of dust deposition, rather proximity to mine activities and roads and the airstrip show a stronger influence. This is supported by the fact that Dust 1 had the highest recorded dustfall of the dustfall gauges in 2017 (adjacent to the airstrip) and Dust 10 had the second highest recorded dustfall in 2017 which is adjacent to and south of the Mine (see Figure 3.1-1).

Results from the dustfall gauges, dustfall snow surveys, and the snow water chemistry analysis are presented below.

3.1 DUSTFALL GAUGES

Total dustfall collected from each dustfall gauge throughout the year is summarized in Table 3.1-1; annual 2017 dustfall for each station at its location relative to the Project is presented in Figure 3.1-1; the historical records of annual dustfall for each station are presented in Figures 3.1-2 and 3.1-3. A comparison of 2017 dustfall versus distance from the mine footprint is presented in Figure 3.1-4. Boxplots summarizing the dustfall magnitude distribution measured in each year are presented in Figure 3.1-5. Detailed information on 2017 measurements and calculations for each station are included in Appendix B.

In general, dustfall decreased with increasing distance from the Project (Table 3.1-1 and Figures 3.1-1 to 3.1-4); however, the greatest estimated dustfall rate measured using gauges occurred at Dust 1, 75 m from the Project. Dust 1 measured dustfall in 2017 was 480 mg/dm^2/y. Dust 1 is north of the Project airstrip and the snow survey near Dust 1 (SS1-1) also showed higher dustfall values (SS1-1 dustfall was 1,351 mg/dm^2/y in 2017). It is likely that during 2017 dust generated by airstrip activity was the cause of elevated readings adjacent to the airstrip. The second highest estimated dustfall rate measured using gauges occurred at Dust 10 (318 mg/dm^2/y) which recorded the highest dustfall in 2016 and is located 46 m from the Project. The lowest dustfall rate was measured at the Dust C1 (control station; 4,700 m south; 34 mg/dm^2/y) while the other control station, Dust C2 (3,075 m west), recorded the second lowest measured dustfall (37 mg/dm^2/y; Table 3.1-1; Figures 3.1-3 and 3.1-4).

Dustfall rates estimated from dustfall gauges in 2017 were less than all historical dustfall rate estimates (Figures 3.1-2 to 3.1-4) except 2013. Comparisons of mean and maximum dustfall values suggest that dustfall rates decreased at the Project in 2017 and are close to lowest dustfall rates recorded for the Project (Figures 3.1-4 and 3.1-5). The lower overall dustfall rates were likely influenced by the decrease in surface activity at the mine with no surface mining starting until December, 2017

The annualized dustfall rates estimated from gauges at each station were less than the former BC objective for the mining industry (621 to 1,059 mg/dm^2/y; Figures 3.1-2 to 3.1-4). This former objective was used for comparison purposes only: there are currently no standards or objectives for the Northwest Territories. However, the BC objective was generally used as a standard for comparison at other mines in the region.

3.2 DUSTFALL SNOW SURVEYS

Annual dustfall rates estimated from each snow survey station in 2017 are summarized in Table 3.1-1. Historical records of annual snow survey dustfall rates for each station are presented in Figures 3.1-2 and 3.1-3. The relationships between annual snow survey dustfall rates and distance from the mine footprint are shown in Figures 3.1-1 and 3.1-4. Boxplots summarizing dustfall rates measured in each year are presented in Figure 3.1-5. 2017 snow survey field datasheets and laboratory results are included in Appendix B. Duplicate samples were collected at stations SS1-1, SS2-4, SS4-5, and SS5-2 for QA/QC purposes and are discussed in Section 3.4.

Table 3.1-1. Dustfall and Snow Water Chemistry Results, Diavik Diamond Mine, 2017

				Snow Water Chemistry (µg/L)										
Zone	Station	Approx. Distance from Mining (m)	Dustfall (mg/dm^2/y)	Aluminum	Ammonia	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Nitrite	Phosphorous	Zinc
0-100 m	Dust 1	75	479.6	-	-	-	-	-	-	-	-	-	-	-
	Dust 3	30	285.5	-	-	-	-	-	-	-	-	-	-	-
	Dust 6	25	119.8	-	-	-	-	-	-	-	-	-	-	-
	Dust 10	46	317.5	-	-	-	-	-	-	-	-	-	-	-
	SS1-1	30	1,351.3	-	-	-	-	-	-	-	-	-	-	-
	SS3-6	60	288.9	836.0	-	0.2	0.01	8.4	1.3	0.7	23.1	1.7	54.2	5.4
	SS4-1	100	68.5	-	-	-	-	-	-	-	-	-	-	-
	SS5-1	45	93.0	-	-	-	-	-	-	-	-	-	-	-
	SS5-2	95	63.7	-	-	-	-	-	-	-	-	-	-	-
Mean			**341**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Median			**286**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Standard Deviation			**404**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
95% Confidence Interval (Mean +/-)			**311**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Upper Limit of 95% Confidence Interval			**652**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Lower Limit of 95% Confidence Interval			**30**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
101-250 m	Dust 4	200	85.0	-	-	-	-	-	-	-	-	-	-	-
	SS1-2	115	771.2	-	-	-	-	-	-	-	-	-	-	-
	SS2-1	180	51.1	230.0	110.0	0.1	0.01	1.5	0.6	0.2	2.8	2.0	22.6	16.8
	SS3-7	250	109.2	670.0	110.0	0.2	0.01	10.4	1.4	1.0	28.5	3.4	103.0	5.1
	SS4-2	245	101.2	-	-	-	-	-	-	-	-	-	-	-
Mean			**224**	**450.00**	**110.00**	**0.10**	**0.01**	**5.94**	**1.00**	**0.60**	**15.64**	**2.70**	**62.80**	**10.96**
Median			**101**	**450.00**	**110.00**	**0.10**	**0.01**	**5.94**	**1.00**	**0.60**	**15.64**	**2.70**	**62.80**	**10.96**
Standard Deviation			**307**	**311.13**	**0.00**	**0.069**	**0.00**	**6.31**	**0.54**	**0.51**	**18.19**	**0.99**	**56.85**	**8.26**
95% Confidence Interval (Mean +/-)			**381**	**2,795.37**	**n/a**	**0.62**	**0.02**	**56.67**	**4.83**	**4.59**	**163.40**	**8.89**	**510.79**	**74.20**
Upper Limit of 95% Confidence Interval			**605**	**3,245.37**	**n/a**	**0.72**	**0.03**	**62.61**	**5.83**	**5.19**	**179.04**	**11.59**	**573.59**	**85.16**
Lower Limit of 95% Confidence Interval			**0**	**0.00**	**n/a**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
251-1,000 m	Dust 2A	435	311.0	-	-	-	-	-	-	-	-	-	-	-
	Dust 11	805	84.8	-	-	-	-	-	-	-	-	-	-	-
	SS1-3	275	142.3	-	-	-	-	-	-	-	-	-	-	-
	SS1-4	920	40.8	170.0	130.0	0.0	0.01	0.9	0.3	0.2	1.4	2.0	14.1	2.0
	SS2-2	445	18.6	130.0	130.0	0.1	0.01	0.8	0.2	0.3	1.6	2.0	12.6	2.4
	SS3-4	615	317.9	3,950.0	100.0	0.7	0.07	86.9	8.1	3.5	226.0	3.3	104.0	23.8
	SS3-8	830	136.7	1,420.0	110.0	0.3	0.03	31.2	3.7	1.3	79.8	2.1	44.5	12.6
	SS4-3	350	138.6	-	-	-	-	-	-	-	-	-	-	-
	SS5-3	270	57.5	1,360.0	61.0	0.2	0.02	17.2	2.4	1.4	28.9	2.0	31.0	9.6
Mean			**139**	**1,406.00**	**1,406.00**	**106.20**	**0.26**	**0.03**	**27.41**	**2.94**	**1.34**	**67.54**	**2.28**	**41.24**
Median			**137**	**1,360.00**	**1,360.00**	**110.00**	**0.21**	**0.02**	**17.20**	**2.41**	**1.26**	**28.90**	**2.00**	**31.00**

(continued)

Table 3.1-1. Dustfall and Snow Water Chemistry Results, Diavik Diamond Mine, 2017 (completed)

Zone	Station	Approx. Distance from Mining (m)	Dustfall (mg/dm²/y)	Snow Water Chemistry (µg/L)										
				Aluminum	Ammonia	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Nitrite	Phosphorous	Zinc
251-1,000 m *(cont'd)*														
Standard Deviation			**109**	**1,551.62**	**1,551.62**	**28.41**	**0.28**	**0.03**	**35.59**	**3.23**	**1.32**	**94.18**	**0.57**	**37.45**
95% Confidence Interval (Mean +/-)			**84**	**1,926.59**	**1,926.59**	**35.28**	**0.34**	**0.03**	**44.19**	**4.02**	**1.64**	**116.94**	**0.71**	**46.50**
Upper Limit of 95% Confidence Interval			**223**	**3,332.59**	**3,332.59**	**141.48**	**0.60**	**0.058**	**71.60**	**6.96**	**2.98**	**184.47**	**2.99**	**87.74**
Lower Limit of 95% Confidence Interval			**55**	**0.00**	**0.00**	**70.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.57**	**0.00**
1,001-2,500 m	Dust 5	1,195	102.2	-	-	-	-	-	-	-	-	-	-	-
	Dust 7	1,155	128.1	-	-	-	-	-	-	-	-	-	-	-
	Dust 8	1,220	92.0	-	-	-	-	-	-	-	-	-	-	-
	SS1-5	2,180	84.8	420.0	54.0	0.1	0.00	2.7	0.5	0.3	3.7	2.0	19.2	3.1
	SS2-3	1,220	51.8	160.0	120.0	0.1	0.01	0.9	0.3	0.3	1.8	2.0	19.5	2.1
	SS2-4	2,180	51.3	450.0	84.0	0.1	0.00	2.8	0.4	0.3	3.6	2.0	15.9	3.3
	SS3-5	1,325	131.9	330.0	220.0	0.1	0.01	3.9	0.6	0.8	10.7	2.0	53.5	2.6
	SS4-4	1,065	106.7	360.0	110.0	0.1	0.01	3.9	0.7	0.4	8.9	2.2	30.7	3.7
	SS4-5	1,220	107.0	1,700.0	140.0	0.6	0.03	13.9	2.4	1.4	22.9	2.0	30.7	14.8
	SS5-4	1,021	23.3	100.0	55.0	0.0	0.00	1.8	0.3	0.1	2.9	2.0	10.1	1.5
	SS5-5	2,020	17.3	160.0	47.0	0.1	0.00	6.5	0.5	0.2	3.2	2.0	12.2	1.8
+2,500 m	Dust 9	3,810	37.3	-	-	-	-	-	-	-	-	-	-	-
	Dust 12	2,580	126.1	-	-	-	-	-	-	-	-	-	-	-
Mean			**82**	**460.00**	**103.75**	**0.14**	**0.0075**	**4.55**	**0.70**	**0.47**	**7.22**	**2.03**	**23.98**	**4.09**
Median			**92**	**345.00**	**97.00**	**0.08**	**0.0040**	**3.33**	**0.50**	**0.31**	**3.66**	**2.00**	**19.35**	**2.83**
Standard Deviation			**41**	**517.66**	**58.06**	**0.17**	**0.0081**	**4.12**	**0.68**	**0.41**	**7.07**	**0.07**	**14.15**	**4.39**
95% Confidence Interval (Mean +/-)			**25**	**432.77**	**48.54**	**0.15**	**0.0068**	**3.45**	**0.57**	**0.34**	**5.91**	**0.06**	**11.83**	**3.67**
Upper Limit of 95% Confidence Interval			**106**	**892.77**	**152.29**	**0.28**	**0.0143**	**8.00**	**1.27**	**0.81**	**13.13**	**2.08**	**35.80**	**7.76**
Lower Limit of 95% Confidence Interval			**57**	**27.23**	**55.21**	**0.00**	**0.0007**	**1.10**	**0.130**	**0.128**	**1.31**	**1.97**	**12.15**	**0.42**
Control	Dust C1	4,700	34.0	-	-	-	-	-	-	-	-	-	-	-
	Dust C2	3,075	36.7	-	-	-	-	-	-	-	-	-	-	-
	CONTROL 1	4,852	10.4	50.0	74.0	0.0	0.00	1.3	0.1	0.1	1.2	2.0	5.7	1.5
	CONTROL 2	3,075	24.4	530.0	83.0	0.1	0.01	6.4	0.7	0.5	8.7	2.0	12.1	4.6
	CONTROL 3	3,570	108.4	410.0	65.0	0.1	0.01	6.1	0.6	0.3	12.5	2.0	26.6	3.3
Mean			**43**	**330.00**	**74.00**	**0.073**	**0.01**	**4.59**	**0.48**	**0.30**	**7.44**	**2.00**	**14.80**	**3.11**
Median			**34**	**410.00**	**74.00**	**0.076**	**0.01**	**6.06**	**0.56**	**0.30**	**8.65**	**2.00**	**12.10**	**3.25**
Standard Deviation			**38**	**249.80**	**9.00**	**0.049**	**0.00**	**2.83**	**0.31**	**0.22**	**5.76**	**0.00**	**10.71**	**1.56**
95% Confidence Interval (Mean +/-)			**47**	**620.54**	**22.36**	**0.12**	**0.01**	**7.04**	**0.77**	**0.54**	**14.31**	**#NUM!**	**26.60**	**3.89**
Upper Limit of 95% Confidence Interval			**90**	**950.54**	**96.36**	**0.19**	**0.01**	**11.63**	**1.25**	**0.83**	**21.75**	**#NUM!**	**41.40**	**7.00**
Lower Limit of 95% Confidence Interval			**0**	**0.00**	**51.64**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**#NUM!**	**0.00**	**0.00**
Reference Levels[a]			**621 – 1,059**	**3,000**	**12,000**	**100**	**3.0**	**40**	**40.0**	**20.0**	**100**	**2,000.0**	**n/a**	**20.0**

Notes:
Dash (-) = not available (snow water chemistry not sampled)
n/a = not applicable

Figure 3.1-1
Dustfall Results, Diavik Diamond Mine, 2017

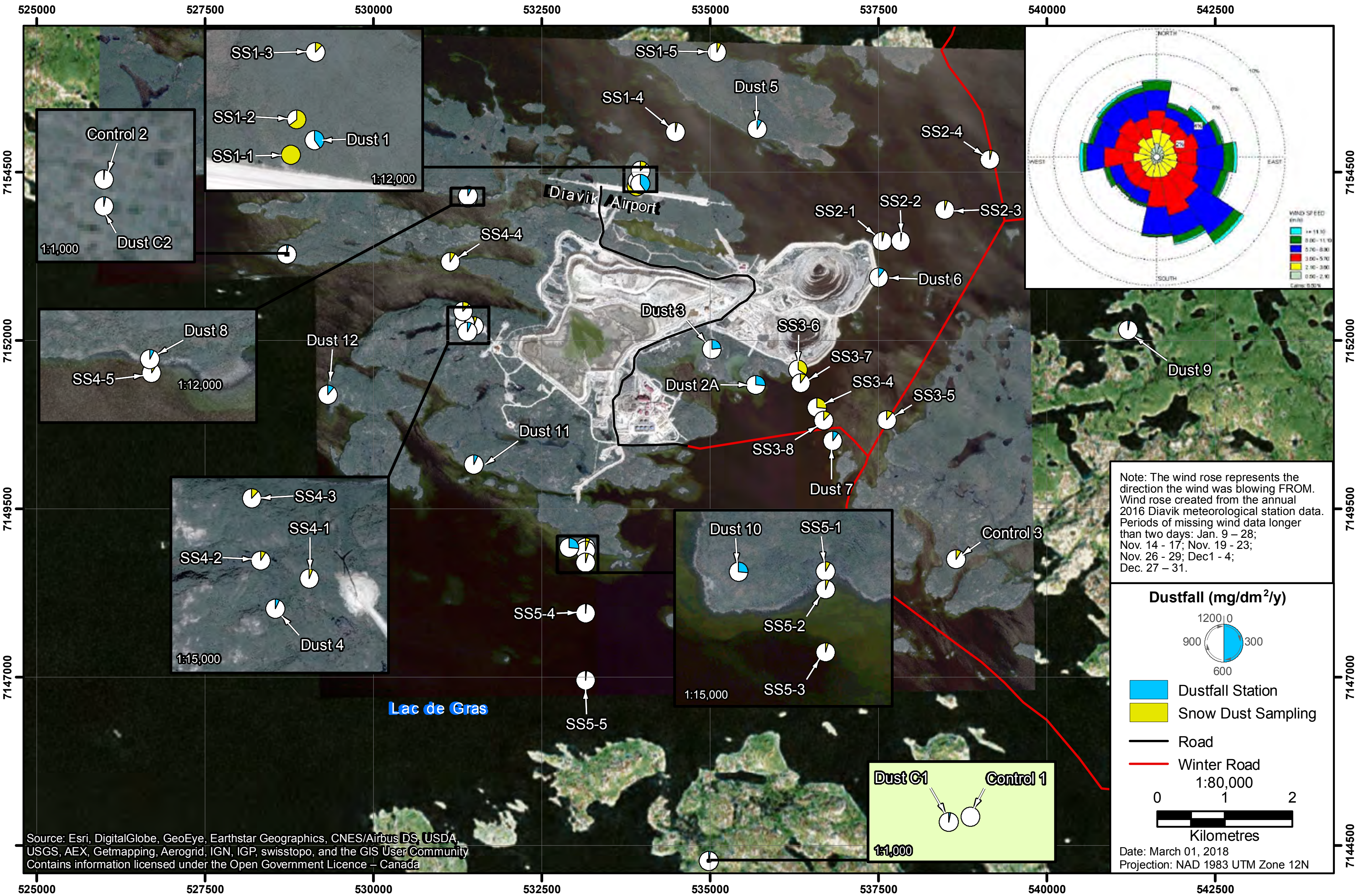
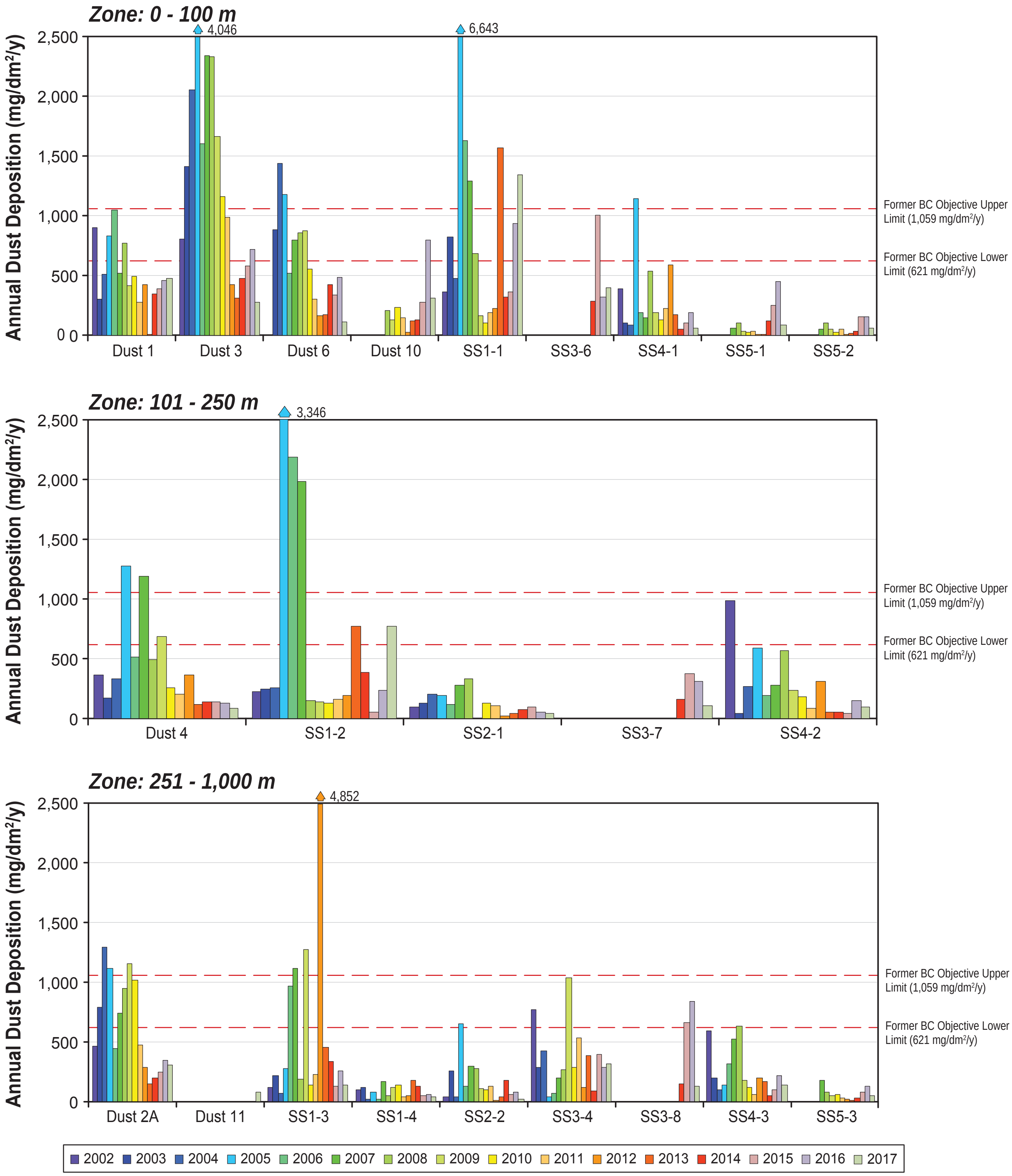


Figure 3.1-2

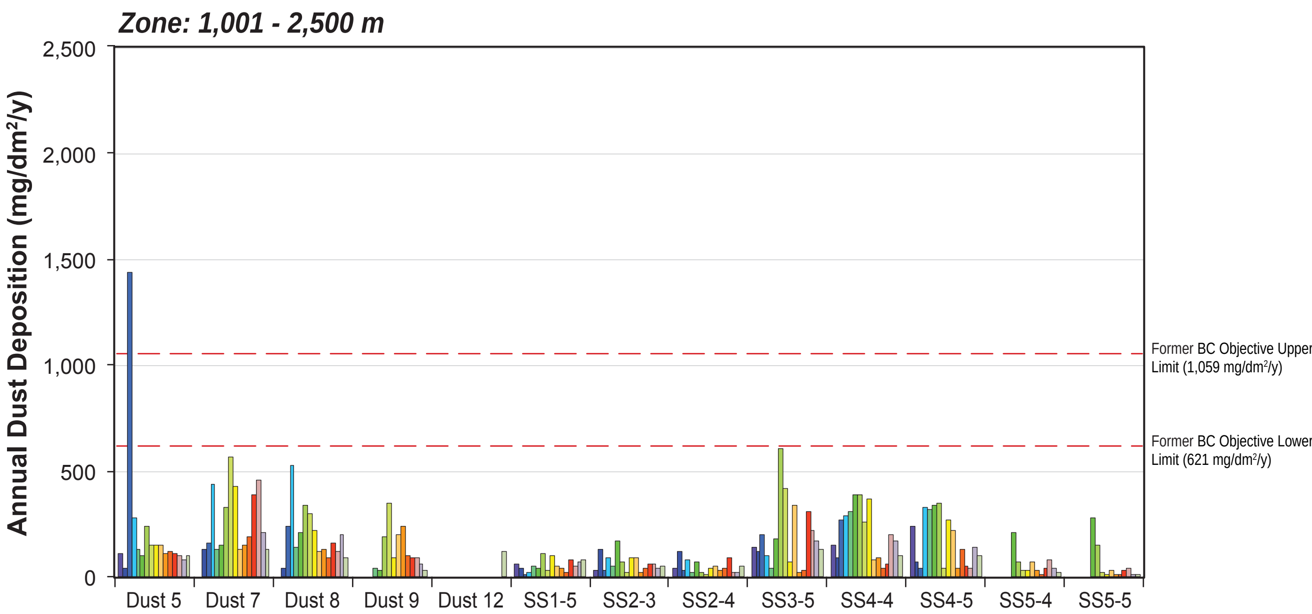
Calculated Annual Dust Deposition Rates at Dustfall Gauges and Snow Survey Locations up to 1,000 m from the Project Footprint, Diavik Diamond Mine, 2002 to 2017

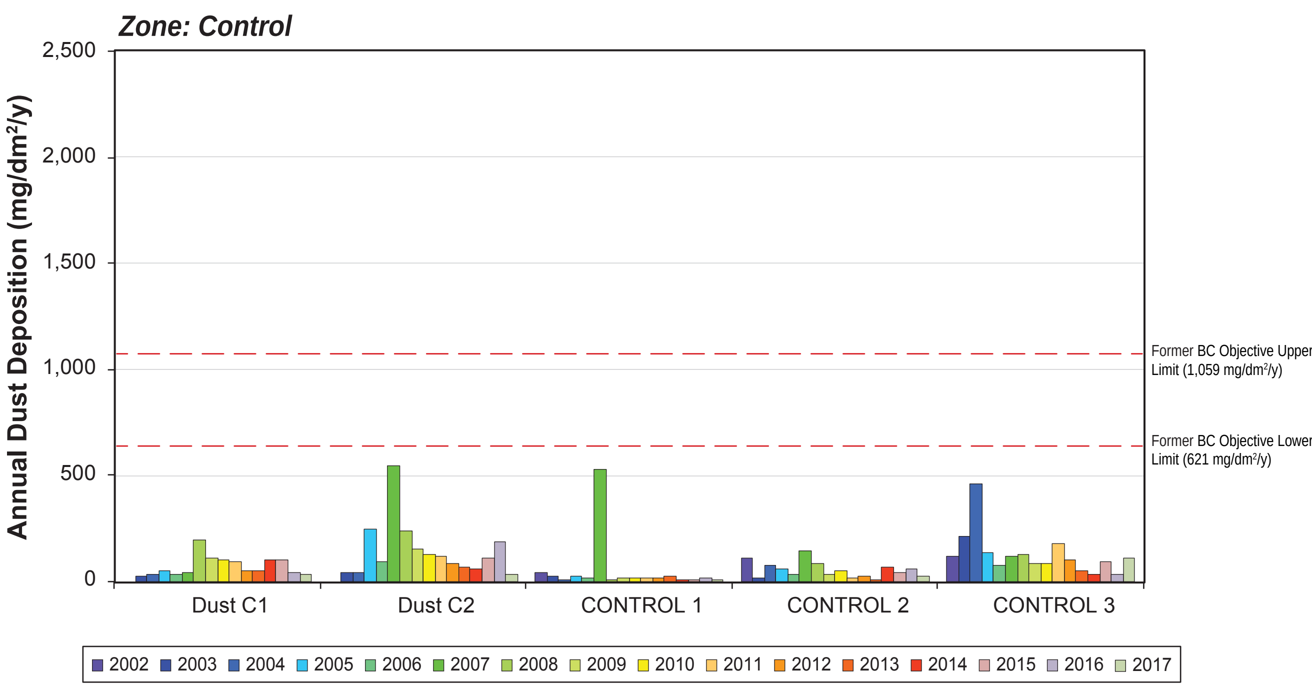


Notes: *Former BC Objective (Diavik 2016).*
Annual deposition was calculated using the methodology described in Section 2.
See Table 2-1 for actual 2017 sample exposure times.
Station locations have been grouped into zones based on their distance from the 2017 Project footprint. Some stations have historically been grouped in different zones based on their distance from the Project footprint when they were first established (see Section 3 for further details).

Figure 3.1-3

Calculated Annual Dust Deposition Rates at Dustfall Gauges and Snow Survey Locations greater than 1,000 m from the Project Footprint, Diavik Diamond Mine, 2002 to 2017

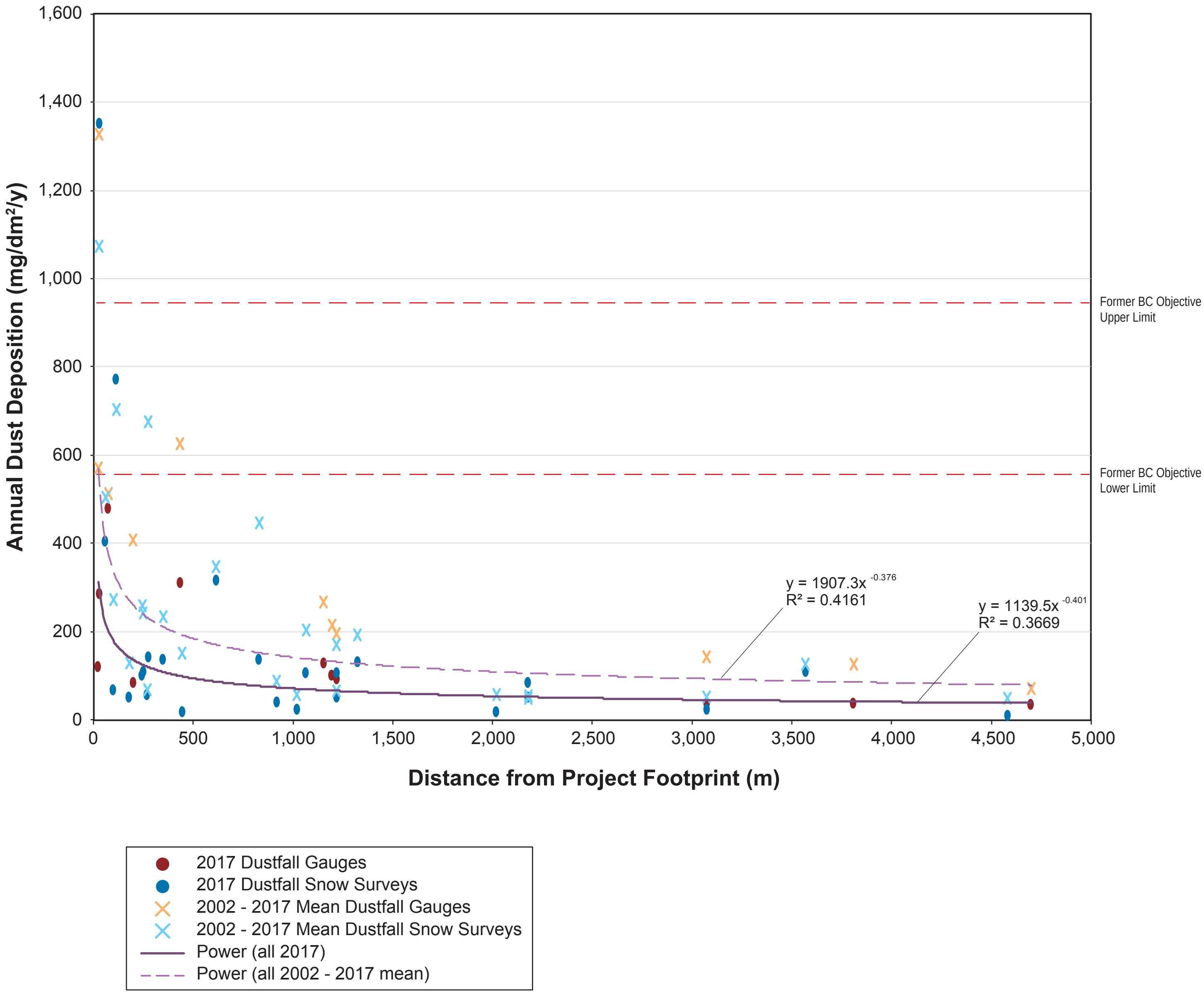




Notes: *Former BC Objective (Diavik 2016).*
Annual deposition was calculated using the methodology described in Section 2.
See Table 2-1 for actual 2017 sample exposure times.
Station locations have been grouped into zones based on their distance from the 2017 Project footprint. Some stations have historically been grouped in different zones based on their distance from the Project footprint when they were first established (see Section 3 for further details).

Figure 3.1-4

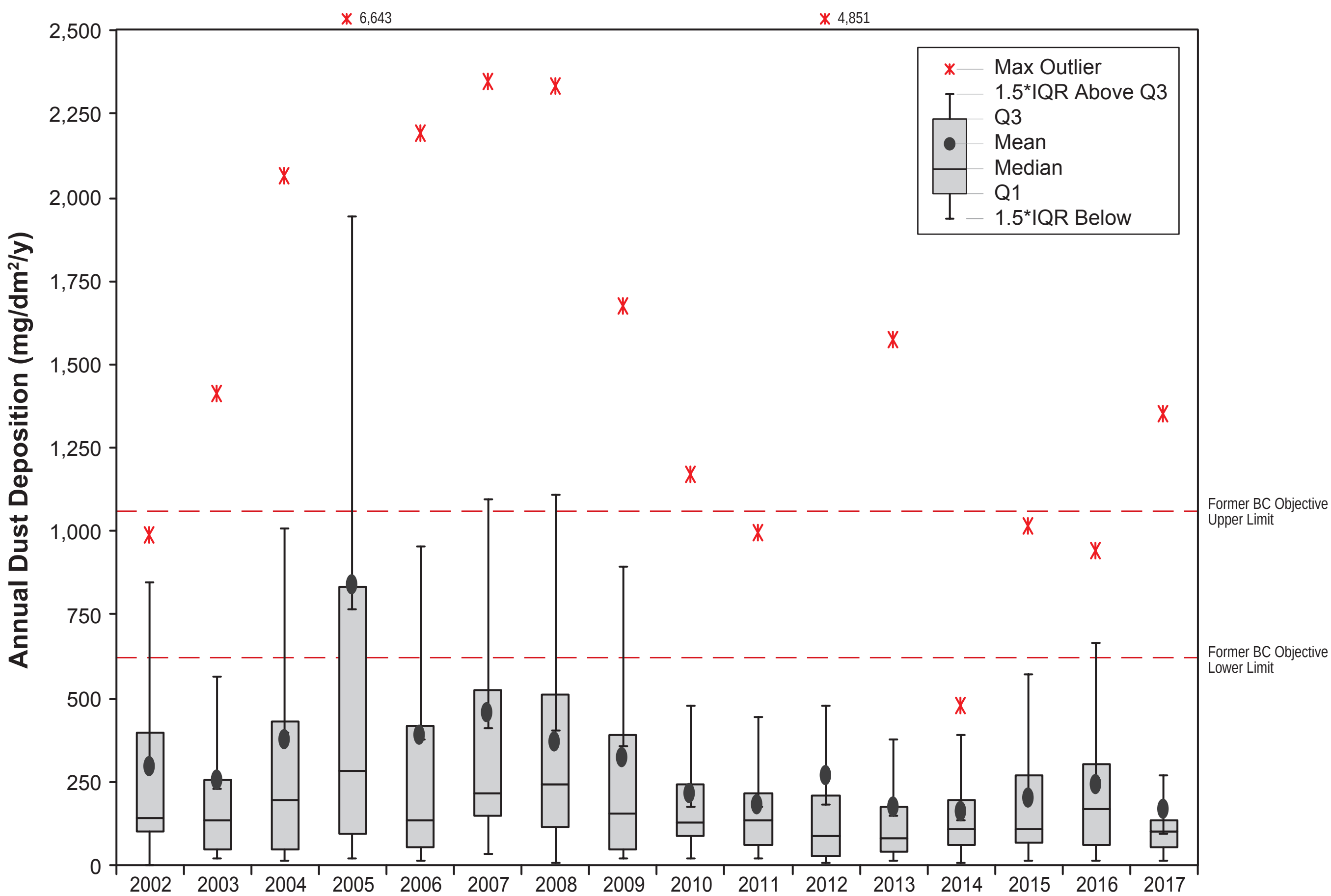
Dust Deposition Versus Distance from Project Footprint, Diavik Diamond Mine, 2017



Notes: Former BC Objective (Diavik 2016).
Annual deposition is calculated using the methodology described in Section 2.
See Table 2-1 for actual 2017 sample exposure times.

Figure 3.1-5

Dust Deposition Box Plot,
Diavik Diamond Mine, 2002 to 2017



Notes: *Former BC Objective (Diavik 2016).*
Annual deposition is calculated using the methodology described in Section 2.
See Table 2-1 for actual 2017 sample exposure times.

Annualized dustfall rates estimated from 2017 snow survey data ranged from 10 to 1,351 mg/dm^2/y (Table 3.1-1; Figures 3.1-2 and 3.1-3). Dustfall at SS1-1 was the highest recorded, followed by dustfall at SS1-2 (Figure 3.1-3). Location SS1-1 and SS1-2 are located due north of the airstrip which could have resulted in the higher levels of dustfall found here. In general, snow survey dustfall rates decreased with increasing distance from the Project, with the lowest dustfall rate recorded at station Control 1 (Table 3.1-1; Figure 3.1-4). Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 and Control zones were 341, 224, 139, 82, and 43 mg/dm^2/y, respectively (Table 3.1-1). Dustfall rates at stations SS1-1, SS1-2, Dust 2A, SS3-4, Dust 7, SS4-4, SS4-5, and Control 3 were greater than the upper limit of the 95% confidence interval for their respective zones in 2017. These high dustfall rates, compared to the overall distribution of dustfall rates within each zone, indicated that higher dustfall rates were observed in the vicinity of the airstrip and to the west and southeast of the Project (Table 3.1-1).

Annualized dustfall estimated from each snow survey station in 2017 were generally less than historical dustfall estimates (Figures 3.1-2 and 3.1-3). Comparisons of mean and maximum values suggest that dustfall rates were generally lower in 2017 than in 2016 and 2015 (Figures 3.1-4 and 3.1-5).

Annualized dustfall rates measured at each station during the 2017 snow survey were less than the former BC objective for the mining industry (621–1,059 mg/dm^2/y) for all stations other than SS1-1 and SS1-2. This former objective was used for comparison purposes only: there are currently no standards or objectives for the Northwest Territories.

3.3 SNOW WATER CHEMISTRY

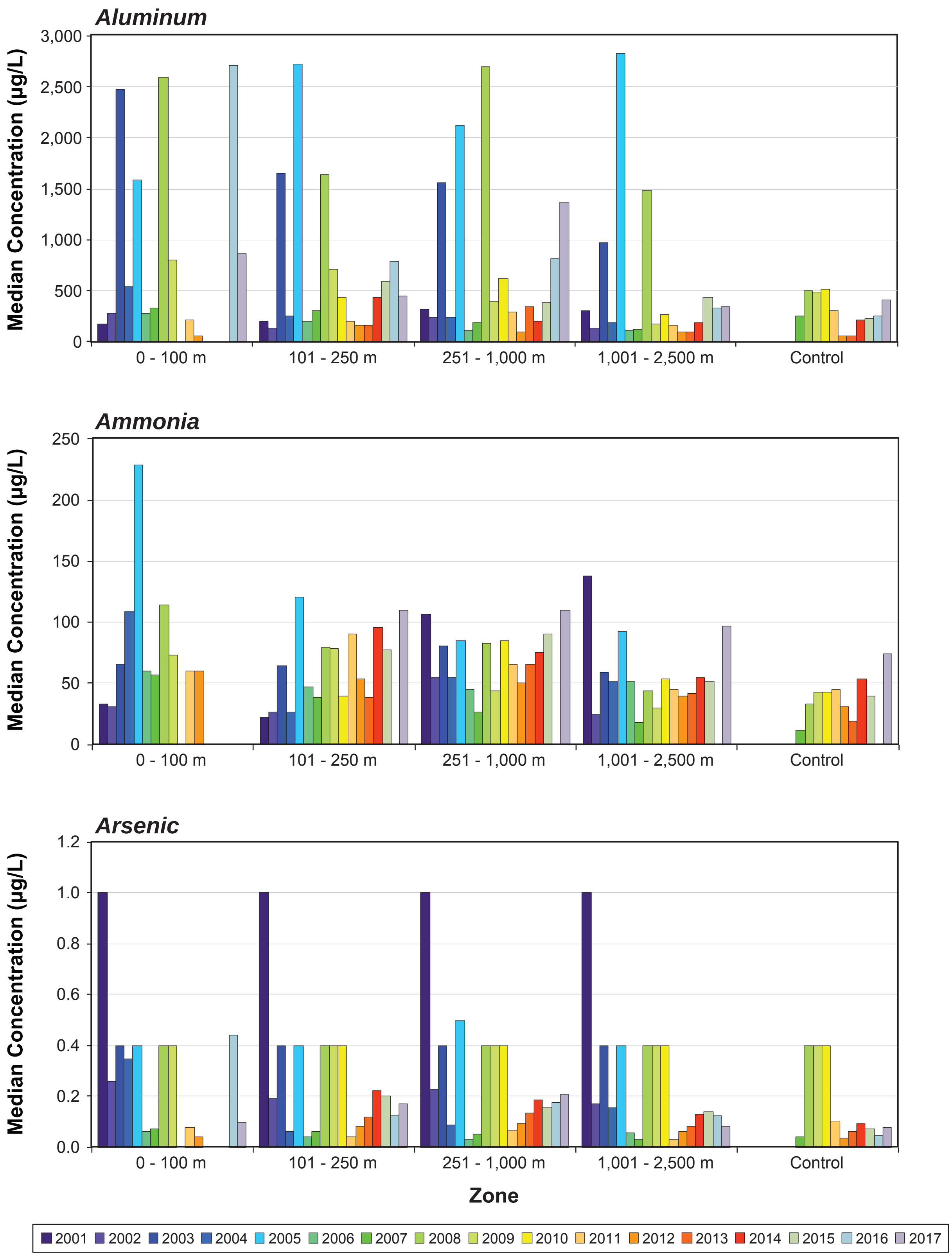
A summary of the snow water chemistry results for each variable of interest (i.e., variables with EQC and phosphorous) is provided below. The full suite of analytical results for snow water chemistry is included in Appendix D. For QA/QC purposes, duplicate samples were collected at stations SS2-4 and SS4-5, and an equipment blank sample was collected at station Control 1. Results of QA/QC samples are discussed in Section 3.4.

All 2017 sample concentrations were less than their associated reference levels other than sample SS3-4 (aluminum, chromium, nickel and zinc) as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001.

In general, average concentrations of snow water chemistry variables of interest decreased with increasing distance from the Project (Figures 3.3-1 to 3.3-4). However, high parameter concentrations were recorded at Station SS3-4, located in the 251-1,000 zone (615 m from the project). SS3-4 is located to the southeast of the Project (Figure 2-1) where higher measured dustfall was observed in 2017. It should be noted that the 0-100 zone has only one (1) sampling location; therefore, no median was reported or included in Figures 3.3-1 to 3.3-4.

Figure 3.3-1

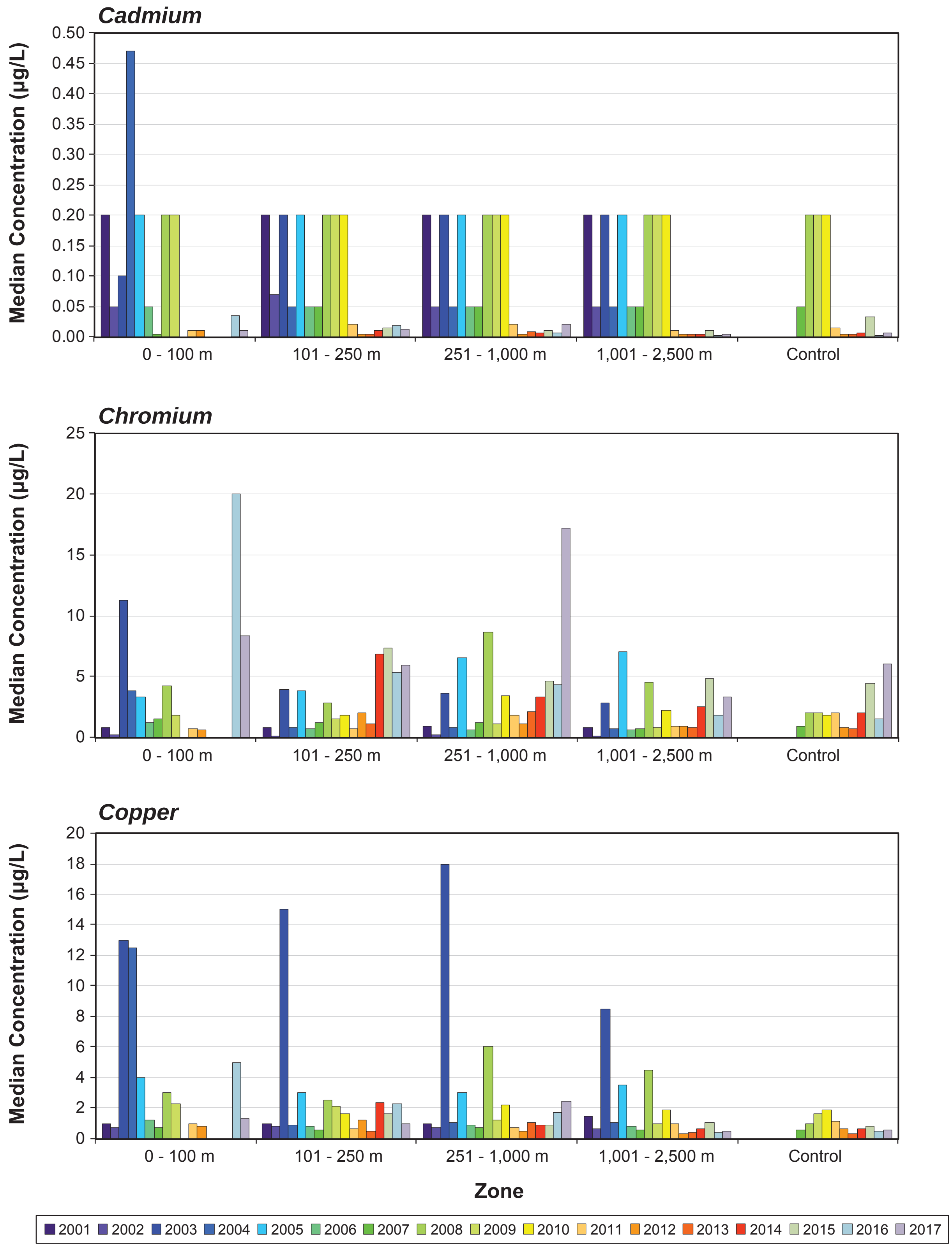
Snow Water Chemistry Results: Aluminum, Ammonia and Arsenic, 2001 to 2017



Note: The value used for the 0-100 m zone in 2017 represents one sample rather than the median.

Figure 3.3-2

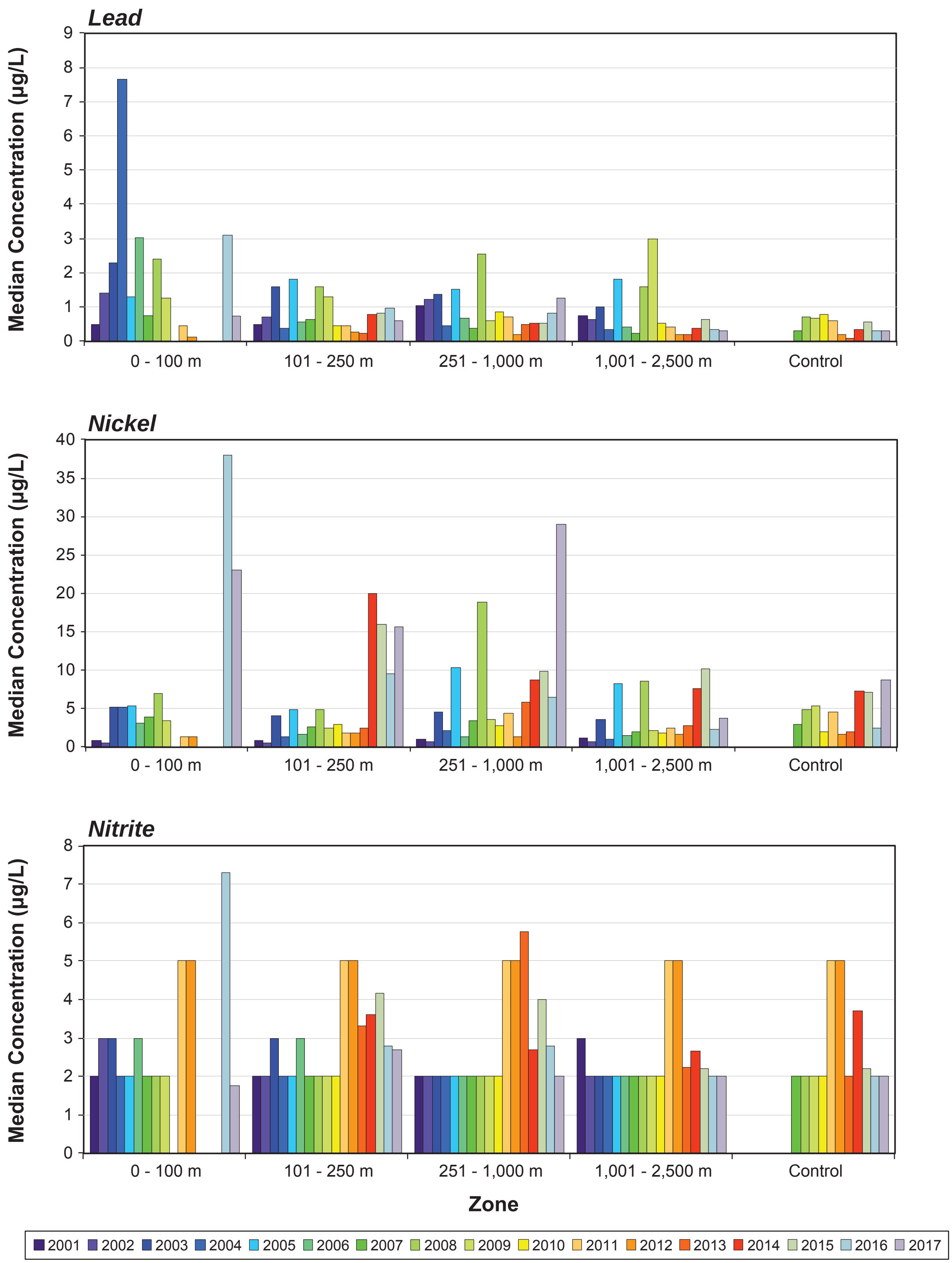
Snow Water Chemistry Results: Cadmium, Chromium and Copper, 2001 to 2017



Note: The value used for the 0-100 m zone in 2017 represents one sample rather than the median.

Figure 3.3-3

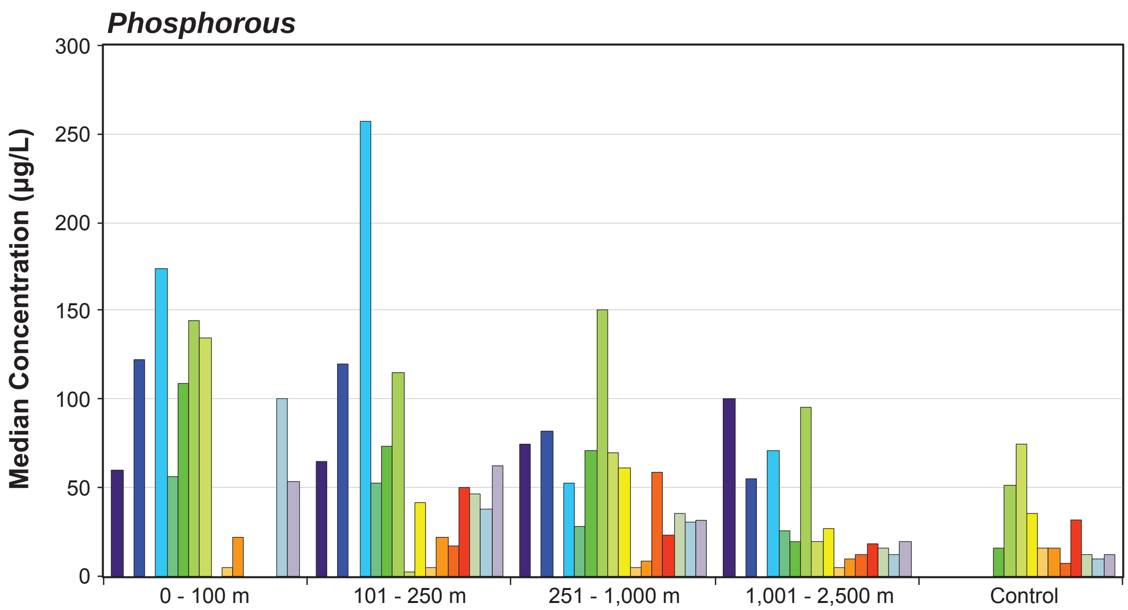
Snow Water Chemistry Results: Lead, Nickel and Nitrite, 2001 to 2017

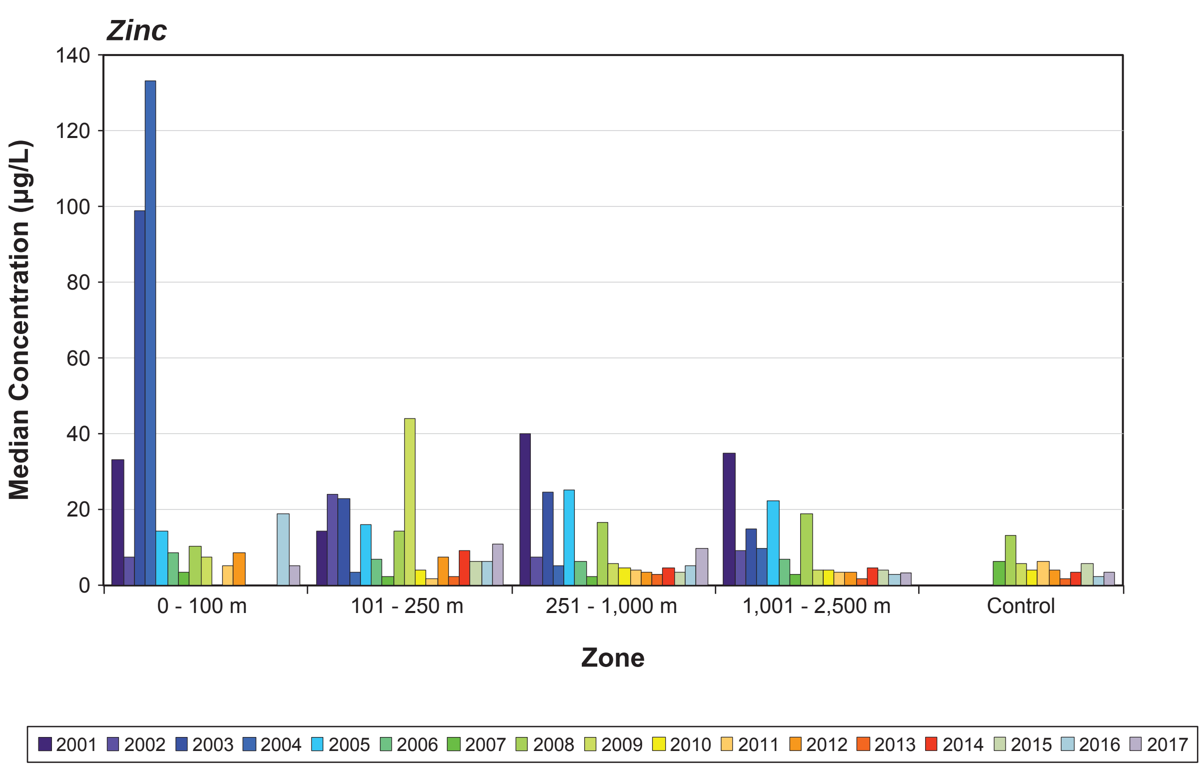


Note: The value used for the 0-100 m zone in 2017 represents one sample rather than the median.

Figure 3.3-4

Snow Water Chemistry Results: Phosphorus and Zinc, 2001 to 2017





Note: The value used for the 0-100 m zone in 2017 represents one sample rather than the median.

3.3.1 Aluminum

Aluminum concentrations measured in 2017 ranged from 50 µg/L at station Control 1 in the Control zone to 3,950 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2017 aluminum concentrations were greatest in the 251-1,000 m zone (Figure 3.3-1). Compared to previous years, the 2017 median concentration in each zone was relatively high and there was one location with a concentration greater than the reference value of 3,000 µg/L EQC specified in the Water Licence at SS3-4 (Table 3.1-1; Figure 3.3-1). There were similar concentrations of aluminum observed in snow water chemistry samples in 2017 compared to 2016 and 2015.

3.3.2 Ammonia

Ammonia concentrations measured in 2017 ranged from 47 µg/L at station SS5-5 in the 1,001-2,500 m zone to 220 µg/L at station SS3-5 in the 1,001-2,500 m zone (Table 3.1-1). All ammonia measurements were below the reference value of 12,000 µg/L specified in the Water Licence. Historical ammonia concentrations have been well below the reference value specified in the Water Licence for grab sample concentrations.

3.3.3 Arsenic

Arsenic concentrations measured in 2017 ranged from 0.02 µg/L at Control 1 station (4,852 m from Project) to 0.7 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2017 arsenic concentrations were greatest in the 251-1,000 m zone and were similar for all distance ranges (Figure 3.3-1). The 2017 median concentration in each zone was similar to 2016 median concentrations (Figure 3.3-1). All measurements were well less than the value of 100 µg/L specified in the Water Licence for grab sample concentrations.

3.3.4 Cadmium

Cadmium concentrations measured in 2016 ranged from less than the analytical detection limit (0.0025 µg/L) at multiple stations in all zones to 0.07 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2017 cadmium concentrations were near or below analytical detection limits and were similar for all distance ranges (Figure 3.3-2). Cadmium concentrations in 2017 were similar to 2016 and 2015 concentrations. The 2017 median concentration in each zone was similar to 2016 median concentrations (Figure 3.3-2). All measurements were less than the value of 3 µg/L specified in the Water Licence for grab sample concentrations.

3.3.5 Chromium

Chromium concentrations measured in 2017 ranged from less than the analytical detection limit (0.5 µg/L) at multiple stations to 90 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2016 chromium concentrations were greatest in the 251-1,000 m zone (Figure 3.3-2) and decreased with increasing distance from the Project. The 2017 median concentration in each zone was generally greater than 2016 and 2015 median concentrations (Figure 3.3-2). One measurement was greater than the value of 40 µg/L specified in the Water Licence for grab sample concentrations.

3.3.6 Copper

Copper concentrations measured in 2017 ranged from 0.1 µg/L at Control 1 station (4,852 m from Project) to 8.1 µg/L at station SS3-4 in the 251–1,000 m zone (Table 3.1-1). Median 2017 copper concentrations were greatest in the 251-1,000 m zone (Figure 3.3-2) and in general decreased with increasing distance from the Project. Modest inter-annual variations in copper concentrations were observed from 2014 to 2017 (Figure 3.3-2). All measurements were less than the value of 40 µg/L specified in the Water Licence for grab sample concentrations.

3.3.7 Lead

Lead concentrations measured in 2017 ranged from 0.1 µg/L at Control 1 station (4,852 m from Project) to 3.5 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2017 lead concentrations were greatest in the 251-1,000 m zone (Figure 3.3-3) but in general decreased with increasing distance from the Project. The 2017 median concentration in each zone was similar to 2016 and 2015 median concentrations (Figure 3.3-3). All measurements were less than the value of 20 µg/L specified in the Water Licence for grab sample concentrations.

3.3.8 Nickel

Nickel concentrations measured in 2016 ranged from 1.2 µg/L at Control 1 station (4,852 m from Project) to 226 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2017 nickel concentrations were greatest in the 251-1,000 m zone (Figure 3.3-3) but in general decreased with increasing distance from the Project. The 2017 median concentrations in each zone were higher or approximately equal to those measured in 2016 and 2015 (Figure 3.3-3). One measurement was greater than the value of 100 µg/L specified in the Water Licence for grab sample concentrations (station SS3-4).

3.3.9 Nitrite

Nitrite concentrations measured in 2017 ranged from less than the analytical detection limit (2.0 µg/L) at multiple stations in each zone to 3.4 µg/L at station SS3-7 in the 101-250 m zone (Table 3.1-1). Median 2017 nitrite concentrations were greatest (2.7 µg/L) in the 101-250 m zone and decreased with increasing distance down to the detection limit (Figure 3.3-3). The 2017 median concentrations in each zone were less than or equal to those measured in 2016 and 2015 (Figure 3.3-3). All measurements were much less than the value of 2,000 µg/L specified in the Water Licence for grab sample concentrations.

3.3.10 Phosphorous

Phosphorous concentrations measured in 2017 ranged from 5.7 µg/L at Control 1 station (4,852 m from Project) to 104 µg/L at station SS3-4 in the 251-100 m zone (Table 3.1-1). Median 2017 phosphorus concentrations were greatest (62.8 µg/L) in the 101-250 m zone and decreased with increasing distance from the Project (Figure 3.3-4). The 2017 median concentrations in each zone were very similar to those measured in 2016 and 2015 (Figure 3.3-4). Although the Water Licence has a load limit for phosphorous, there is no EQC specified in the licence.

3.3.11 Zinc

Zinc concentrations measured in 2017 ranged from 1.5 µg/L at Control 1 station (4,852 m from Project) to 23.8 µg/L at station SS3-4 in the 251-1,000 m zone (Table 3.1-1). Median 2017 zinc concentrations were greatest (11 µg/L) in the 101-250 m zone and decreased with increasing distance from the Project (Figure 3.3-4). The 2017 median concentrations in each zone were slightly greater than those measured in 2016 and approximately equal to those measured in 2015 (Figure 3.3-4). One measurement (station SS3-4) was greater than the value of 20 µg/L specified in the Water Licence for grab sample concentrations.

3.4 Quality Assurance and Control

Dustfall gauge, dustfall snow survey and snow water chemistry sampling and analysis were conducted by experienced technicians following SOPs ENVR-508-0112 R3, ENVR-512-0213 R3, and ENVI-303-0112 R2 to ensure proper field sampling and laboratory analysis. As part of SOP ENVR-512-0213, duplicate and blank samples were taken for some snow survey and snow water chemistry sample sites (Table 2-1). The results from these samples are summarized in Tables 3.4-1 and 3.4-2.

Table 3.4-1. Sample Duplicates and Blanks

	Duplicate Analytical Results (DUPW1/DUPW2; mg/dm²/y; µg/L)					Relative Percent Difference [a] (%)				
Parameter	SS1-1	SS4-5	SS5-2	SS2-4	SS4-5	SS1-1	SS4-5	SS5-2	SS2-4	SS4-5
Dustfall	1662/118	94/120	76/47	n/a	n/a	39%	25%	47%	n/a	n/a
Aluminum	n/a	n/a	n/a	450/110	1,700/1,310	n/a	n/a	n/a	121%	26%
Ammonia	n/a	n/a	n/a	84/97	140/140	n/a	n/a	n/a	14%	0%
Arsenic	n/a	n/a	n/a	0.11/0.05	0.56/0.71	n/a	n/a	n/a	77%	23%
Cadmium	n/a	n/a	n/a	*0.0025/0.0056*	0.0026/0.015	n/a	n/a	n/a	77%	54%
Chromium	n/a	n/a	n/a	2.8/0.6	13.9/10.6	n/a	n/a	n/a	129%	27%
Copper	n/a	n/a	n/a	0.43/0.26	2.4/2.1	n/a	n/a	n/a	48%	14%
Lead	n/a	n/a	n/a	0.33/0.15	1.4/1.2	n/a	n/a	n/a	77%	10%
Nickel	n/a	n/a	n/a	3.6/1.4	23.5/15.0	n/a	n/a	n/a	91%	42%
Nitrite	n/a	n/a	n/a	*2.0/2.0*	*2.0/2.0*	n/a	n/a	n/a	0%	0%
Phosphorous	n/a	n/a	n/a	15.9/40.8	30.7/38.9	n/a	n/a	n/a	88%	24%
Zinc	n/a	n/a	n/a	3.3/4.5	14.8/9.5	n/a	n/a	n/a	32%	44%

Notes:
n/a = not applicable
For measurements that were less than the detection limit, the detection limit was used for calculations and are italicized.
[a] *Relative difference between duplicates, with respect to their mean: RPD = 100 × |rep1 − rep2| / [(rep1 + rep2)/2].*

The relative percent difference (RPD) of duplicate samples from a site represents the amount of variation between duplicates. According to the Project AEMP, the data quality objective for duplicate water quality samples is a RPD of 20% when concentrations are ≥ 5 times the detection limit (DL; AEMP 2014). It is important to note that all RPD values were calculated regardless of if the concentrations were ≥ 5 times the DL. Of the calculated RPD values, almost all exceed 20%.

Table 3.4-2. Analytical Blanks for QA/QC Program

Parameter	Control 1 Blank Sample (µg/L)	Percent below Non-blank[a] Control 1 Sample	Detection Limit (µg/L)
Dustfall	n/a	n/a	n/a
Aluminum	0.67	99%	0.2
Ammonia	27.0	64%	5.0
Arsenic	*0.01*	55%	0.02
Cadmium	*0.003*	0%	0.005
Chromium	*0.03*	98%	0.05
Copper	*0.03*	82%	0.05
Lead	*0.003*	97%	0.005
Nickel	0.04	96%	0.02
Nitrite	*2.00*	0%	2.0
Phosphorous	*2.00*	65%	2.0
Zinc	*0.05*	97%	0.1

Notes:
n/a = not applicable
For measurements that were less than the detection limit, half the detection limit was used for calculations and are italicized.
[a] The non-blank sample is the result from the sample collected from Control 1 (column Control 1 results).

The results of the QA/QC duplicates indicate that snow chemistry is spatially variable on the scale of metres within which the duplicates are collected. The data quality objective from the AEMP (i.e., RPD less than 20%) is designed for surface *liquid* water samples. Surface water in a stream or lake will mix more readily than snow, particularly once snow has settled and has been compacted by wind. Sit-specific differences between snow core sampling replicates may not be visible to the sampling team, but may result in differences in the chemical composition of the snow. The SS4-5 has smaller RPD than SS2-4. The differences between the SS4-5 and SS2-4 demonstrate the sensitivity of the RPD analysis to the scale of the analytical measurements. The absolute differences between observations were similar in magnitude for both duplicates from both locations, but the substantially lower concentrations observed at SS2-4 resulted in an emphasis of this variation in the RPD analysis. The similarly in the magnitude of the variability is consistent with small-scale spatial variation, rather than data quality issues. The results of the sampling network of 19 sites has been demonstrated to detect and quantify Project effects on snow water chemistry (Section 3.3), and these results are concluded to be reliable even with consideration of the small-scale variation identified in the QA/QC program.

Dustfall RPD at SS1-1 was 39%, SS4-5 was 25%, and SS5-2 was 47% which shows that small scale variation for dustfall measures was moderate. The concentrations of all parameters in the blank processed at station Control 1 were much less than those from the non-blank sample (except for cadmium and Nitrite where both samples were at the detection limit), suggesting the data were of good quality.

4. SUMMARY

In 2017, dustfall was monitored at 14 dustfall gauges and 27 snow survey stations located at varying distances around the mine. Snow water chemistry was also measured at 19 of the snow survey stations and compared to EQC set out in the WLWB Water Licence W2015L2-0001 (formerly W2007L2-0003).

Median dustfall estimated in 2017 was the second lowest on record and also decreased with distance from the Project. Annual dustfall estimated from each of the 14 dustfall gauges ranged from 34 to 480 $mg/dm^2/y$. The annualized dustfall rates estimated from the 2017 snow survey data ranged from 10 to 1,351 $mg/dm^2/y$. Because dustfall gauges continuously collect dust throughout the year, and the snow surveys are only representative of dustfall accumulated over the snow cover period, the reported annual dustfall results from the dustfall gauges are expected to provide a better estimate of annual dustfall compared to snow survey results for similar geographic areas. However, results obtained from both methods showed similar patterns.

Dustfall levels were generally lower in 2017 than in 2016; however, they are within the range of historical data collected for the Project. Annualized dustfall estimated from each snow survey station in 2017 was less than some historical dustfall estimates. Comparisons of mean and maximum values suggest that dustfall rates were generally lower in 2017 than in 2016 and 2015 but that the range of values was higher than in previous years. Overall, as expected, dustfall rates generally decreased with distance from the Project with the lowest dustfall rate recorded at station Control 1 (4,852 m from the Project), and areas that were closer to the Project or airstrip received more dustfall than other areas. Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 and Control zones were 341, 224, 139, 82, and 43 $mg/dm^2/y$, respectively. Although there are no dustfall standards for the Northwest Territories, 2017 dustfall rates were less than non-residential 2.9 $mg/dm^2/d$ (1,059 $mg/dm^2/y$) BC MOE former dustfall objective for the mining, smelting, and related industries (Diavik 2016) other than for station SS1-1 (1,351 $mg/dm^2/y$). This objective, used in the 2015 Dust Deposition Report, is no longer used in BC.

Snow water chemistry analytes of interest included those variables with EQC (i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc) or a load limit (i.e., phosphorous) specified in the Type "A" Water Licence (W2015L2-0001, formerly W2007L2-0003). All 2017 sample concentrations were less than their associated reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001 other than sample SS3-4 (aluminum, chromium, nickel and zinc). Concentrations of aluminum, arsenic, chromium, and nickel have generally increased in recent years, while concentrations of copper, lead, phosphorus and zinc have generally decreased in recent years. Typically, concentrations decreased with distance from the Project. High concentrations of certain variables of interest (3,950 µg/L aluminum, 86.9 µg/L chromium, 226 µg/L nickel and 23.8 µg/L zinc) were recorded at Station SS3-4, located in the 251-1,000 m zone.

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Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

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Appendix A

Annual Changes to Dustfall Program

APPENDIX A. ANNUAL CHANGES TO DUSTFALL PROGRAM

2001

The 2001 dust monitoring program was based entirely upon snow survey samples collected along four radial transects emanating from the project footprint outward to a distance of approximately 1,000 metres. All sample locations were analyzed for dust deposition, while only those locations on Lac de Gras were analyzed for snow water chemistry.

2002

DDMI amended the dust monitoring program, in response to recommendations made by the Mackenzie Valley Land and Water Board, to include two snow survey control locations. In addition, five dust gauges (passive dust collectors) were deployed, one along each of the snow survey transects and one at a control location, in efforts to enhance the monitoring program.

2003

In response to further recommendations, the dust monitoring program was modified. All four snow survey transects were extended in length to a distance of approximately 2,000 metres from the project footprint. An additional five dust gauges, including a second control, were deployed.

2004

Increased construction activity necessitated further changes to the dust monitoring program. One dust gauge (Dust 02) was removed from its location to accommodate project footprint expansion, and subsequently relocated and redeployed (Dust 2A).

2005

Dust deposition monitoring was carried out with no modifications to either the snow survey or the dust gauge portion of the program.

2006

An additional dust gauge was deployed bringing the total to eleven (including two controls). Testing of Mini-Vol portable air samplers were conducted to determine feasibility of incorporation into the dust monitoring program. Preliminary findings proved the inclusion of the Mini-Vol samplers would be impractical.

2007

The snow survey portion of the program was amended with an additional snow survey transect being incorporated bringing the total number of transects to five. As well, snow water chemistry samples were collected adjacent to the pre-existing control locations as background references.

Two additional dust gauges (temporary) were deployed adjacent to two pre-existing dust gauges. The intent of the temporary gauges was to compare results from the same location when sample collection frequency is altered.

DDMI initiated contact with Environment Canada and Golder Associates with regards to remodeling dust deposition with the intent of revising predictions made in the 1998 environmental effects report.

In light of dust deposition monitoring results from previous years, several control measures were adopted to reduce dust generation on site, including the utilization of EK-35 (suppressant) on the airport apron, taxiway and helipad, and fitting a second 830E haul truck with tank for haul road watering.

2008

All of the dust gauges were modified to accommodate the replacement of the polyacrylic dust gauge inserts with brass Nipher gauge inserts, to minimize loss associated with damage during the collection and handling of the dust gauges.

An additional dust gauge was added to the program bringing the total to twelve permanently deployed (including two control), and two temporary (reference) dust gauges.

Three snow survey sample points were not sampled as they had become overtaken by construction activity and expansion of the project footprint.

Additional preparations for dust deposition modelling were completed including data collection, identification of point source inputs, selection of a modelling program and inputs (with regulator input) and discussion of cumulative effects.

2009

The two temporary dust gauges deployed in 2007 were decommissioned. All twelve permanent gauges were collected quarterly. An error in collection/deployment resulted in "No Data" being collected for Dust 03 between July 11 and September.

Snow survey sampling was conducted in April. An error in collection/analysis resulted in the Dust Deposition sample for SS2-1 being compromised; as such "No Dust Deposition Data" was available for this location.

2010

All twelve permanent dust gauges were collected quarterly during 2010. Overall, there was a reduction of observed dustfall deposition from 2009 to 2010, with the exception of Dust 1 and Dust 10.

Snow survey sampling was conducted throughout the month of April. An error in collection/ processing resulted in two missing stations for the water quality analysis. SS2-1 field results were collected; however, the sample was compromised during processing in the lab. An error also resulted with the collection of SS5-2; data collection for water quality analysis was missed in the field. No data for these two stations resulted in Zone 1 having no data for the various water chemistry results and SS5-2 was not represented in Zone 3 data for 2010.

2011

All twelve permanent dust gauges were collected quarterly during 2011. During collection and repair to Station Dust 5 in September, the sample was compromised and therefore not processed, which resulted in data loss.

Snow survey sampling was conducted throughout the month of April. Due to an internal error shipping samples, water quality samples for stations SS1-4, SS1-5, SS2-1, SS2-2, SS2-3, SS2-4, and SSC-3 arrived at the Maxxam laboratory past the recommended holding time.

2012

All twelve permanent dust gauges were collected quarterly during 2012. During collection in June, repairs were conducted on Station Dust 9 as it was found on its side, the sample was compromised, which resulted in data loss. Overall in 2012, 8 of the 12 dust gauges reported lower deposition rates compared to 2011.

Snow survey sampling was conducted on April 30, and on May 4 and 5.

2013

All twelve permanent dust gauges were collected quarterly during 2013. Station Dust 5 was dismantled upon arrival in September and the sample was compromised, which resulted in data loss for that quarter.

Snow survey sampling was conducted at 24 locations from April 26 to 28.

2014

All twelve permanent dust gauges were collected quarterly during 2014.

Snow survey sampling was conducted at 24 locations from April 7 to May 12. Three additional sites, SS3-6, SS3-7, SS3-8, were installed.

2015

No changes were made to the dustfall program in 2015.

All twelve permanent dust gauges were collected quarterly during 2015.

Snow survey sampling was conducted at 24 locations from March 31 to April 10.

2016

Due to construction activities at A21, the distance to mining operations decreased for dustfall stations Dust 10, SS5-1, SS5-2, SS5-3, SS5-4, SS5-5, Dust C1 and Control 1. The new distances to mining operations are shown in Table 2-1. Dust 10 station was 670 m from mining operations and now is 46 metres from mining operations.

All twelve permanent dust gauges were collected quarterly during 2016.

Snow survey sampling was conducted at 27 locations from March 3 to April 7.

2017

All twelve permanent dust gauges were collected quarterly during 2017.

During collection of Stations Dust 3 Dust 4, Dust 8 and Dust 10 in July were compromised and an indeterminate amount of sample was lost.

Two new permanent dust gauges (Dust 11 and Dust 12) were deployed on 2017-Oct-05

Dust 11 and 12 are 0.805 km and 2.58 km respectively from mining operations.

Snow survey sampling was conducted at 27 locations from April 1 to April 10.

Appendix B

Dustfall Gauge Analytical Results

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm²)	Days Deployed	Dust Deposition (mg/dm²/d)	Dust Deposition (mg/dm²/y)
4-Jan-17	Initial Deployment Date									
25-Mar-17	Dust 1	1	114.5	197.9	83.4	83.4	67.99	80		
2-Jul-17	Dust 1	1	115.2	427.3	312.1	312.1	254.45	99		
30-Sep-17	Dust 1	1	113.5	148.4	34.9					
30-Sep-17	Dust 1	2	123.5	263.6	140.1	175	142.68	90		
24-Dec-17	Dust 1	1	118.8	136	17.2					
24-Dec-17	Dust 1	2	119	146.4	27.4	44.6	36.36	85		
					TOTALS	**570.5**	**465.12**	**354**	**1.31**	**479.6**
4-Jan-17	Initial deployment date									
25-Mar-17	Dust 2A	1	116.6	187.7	71.1	71.1	57.97	80		
2-Jul-17	Dust 2A	1	116.3	148.6	32.3	32.3	26.33	99		
6-Oct-17	Dust 2A	1	116.1	166.6	50.5	50.5	41.17	96		
6-Jan-18	Dust 2A	1	114.7	126.3	11.6					
6-Jan-18	Dust 2A	2	115	137.3	22.3	229.7	187.27	92		
					TOTALS	**383.6**	**312.74**	**367**	**0.85**	**311.0**
4-Jan-17	Initial deployment date									
25-Mar-17	Dust 3	1	117.6	218	100.4	100.4	81.85	80		
2-Jul-17	Dust 3	1	116.3	167.7	51.4					
2-Jul-17	Dust 3	2	116.7	153	36.3	87.7	71.50	99		
30-Sep-17	Dust 3	1	111.1	176.5	65.4					
30-Sep-17	Dust 3	2	123.5	199.7	76.2					
30-Sep-17	Dust 3	3	111	137.3	26.3	167.9	136.89	90		
10-Jan-18	Dust 3	1	113.7	141.5	27.8					
10-Jan-18	Dust 3	2	115.6	155.9	40.3					
10-Jan-18	Dust 3	3	117.1	140.1	23	346.4	282.42	102		
					TOTALS	**356**	**290.24**	**371**	**0.78**	**285.5**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm²)	Days Deployed	Dust Deposition (mg/dm²/d)	Dust Deposition (mg/dm²/y)
6-Jan-17	Initial deployment date									
25-Mar-17	Dust 4	1	116.8	148.8	32	32	26.09	78		
2-Jul-17	Dust 4	1	117.7	158.9	41.2	41.2	33.59	99		
7-Oct-17	Dust 4	1	116.6	135.9	19.3	19.3	15.74	97		
10-Jan-18	Dust 4	1	118	130.88	12.88	12.88	10.50	95		
					TOTALS	**105.38**	**85.91**	**369**	**0.23**	**85.0**
4-Jan-17	Initial deployment date									
25-Mar-17	Dust 5	1	115.6	141.3	25.7	25.7	20.95	80		
6-Jul-17	Dust 5	1	115.4	135.5	20.1					
6-Jul-17	Dust 5	2	114.9	126.3	11.4					
6-Jul-17	Dust 5	3	115.1	155.6	40.5	72	58.70	103		
6-Oct-17	Dust 5	1	113	132.9	19.9	19.9	16.22	92		
6-Jan-18	Dust 5	1	118.3	126.8	8.5	8.5	6.93	92		
					TOTALS	**126.1**	**102.81**	**367**	**0.28**	**102.2**
3-Jan-17	Initial deployment date									
25-Mar-17	Dust 6	1	114.4	164.6	50.2	50.2	40.93	81		
2-Jul-17	Dust 6	1	116.9	124.4	7.5					
2-Jul-17	Dust 6	2	118.9	143.6	24.7	32.2	26.25	99		
30-Sep-17	Dust 6	1	116.3	126.4	10.1					
30-Sep-17	Dust 6	2	116.8	122.1	5.3					
30-Sep-17	Dust 6	3	120	130.7	10.7					
30-Sep-17	Dust 6	4	112.1	125.7	13.6	39.7	32.37	90		
24-Dec-17	Dust 6	1	117.9	122.2	4.3					
24-Dec-17	Dust 6	2	122.4	138.9	16.5	20.8	16.96	85		
					TOTALS	**142.9**	**116.50**	**355**	**0.33**	**119.8**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm²)	Days Deployed	Dust Deposition (mg/dm²/d)	Dust Deposition (mg/dm²/y)
6-Jan-17	Initial deployment date									
25-Mar-17	Dust 7	1	117.7	203.8	86.1	86.1	70.20	78		
6-Jul-17	Dust 7	1	115.6	143.7	28.1	28.1	22.91	103		
6-Oct-17	Dust 7	1	116.8	159.7	42.9	42.9	34.98	92		
6-Jan-18	Dust 7	1	113.9	133.8	19.9					
6-Jan-18	Dust 7	2	114.6	128.1	13.5					
6-Jan-18	Dust 7	3	116.1	125.9	9.8	43.2	35.22	92		
					TOTALS	**157.1**	**128.08**	**365**	**0.35**	**128.1**
3-Jan-17	Initial deployment date									
25-Mar-17	Dust 8	1	116.3	143.1	26.8	26.8	21.85	81		
6-Jul-17	Dust 8	1	115.3	138.6	23.3	23.3	19.00			
6-Jul-17	Dust 8	2	116.2	159.2	43	43	35.06			
6-Jul-17	Dust 8	3	116.1	116.8	0.7	0.7	0.57	103		
6-Oct-17	Dust 8	1	112.1	114.1	2					
6-Oct-17	Dust 8	2	112.2	115	2.8					
6-Oct-17	Dust 8	3	114.7	129.9	15.2	20	16.31	92		
6-Jan-18	Dust 8	1	117.1	125	7.9					
6-Jan-18	Dust 8	2	114.7	121.1	6.4	14.3	11.66	92		
					TOTALS	**113.8**	**92.78**	**368**	**0.25**	**92.0**
4-Jan-17	Initial deployment date									
25-Mar-17	Dust 9	1	115.9	125.5	9.6	9.6	7.83	80		
6-Jul-17	Dust 9	1	115	127.3	12.3					
6-Jul-17	Dust 9	2	115.9	122.4	6.5	18.8	15.33	103		
6-Oct-17	Dust 9	1	114.4	125.8	11.4	11.4	9.29	92		
6-Jan-18	Dust 9	1	114.2	120.4	6.2	6.2	5.05	92		
					TOTALS	**46**	**37.50**	**367**	**0.10**	**37.3**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm²)	Days Deployed	Dust Deposition (mg/dm²/d)	Dust Deposition (mg/dm²/y)
6-Jan-17	Initial deployment date									
25-Mar-17	Dust 10	1	116.9	147.5	30.6	30.6	24.95	78		
2-Jul-17	Dust 10	1	115.1	211.4	96.3	96.3	78.51	99		
6-Oct-17	Dust 10	1	115.1	116.4	1.3					
6-Oct-17	Dust 10	2	114.2	122.7	8.5					
6-Oct-17	Dust 10	3	112.5	143.9	31.4					
6-Oct-17	Dust 10	4	114.4	117.3	2.9	44.1	35.95	96		
16-Jan-18	Dust 10	1	114.7	150.9	36.2					
16-Jan-18	Dust 10	2	115.9	200	84.1	120.3	98.08	102		
					TOTALS	**291.3**	**237.49**	**273**	**0.87**	**317.5**
5-Oct-17	Initial deployment date									
6-Jan-18	Dust 11	1	118.2	144.7	26.5					
6-Jan-18	Dust 11	2	118.6	118.6	0	26.5	21.61	93		
					TOTALS	**26.5**	**21.61**	**93**	**0.23**	**84.8**
6-Oct-17	Initial deployment date									
6-Jan-18	Dust 12	1	116.2	147.7	31.5					
6-Jan-18	Dust 12	2	114	121.5	7.5	39	31.80	92		
					TOTALS	**39**	**31.80**	**92**	**0.35**	**126.1**
6-Jan-17	Initial deployment date									
25-Mar-17	Dust C1	1	118.3	124	5.7	5.7	4.65	78		
6-Jul-17	Dust C1	1	116.7	127.7	11	11	8.97	103		
6-Oct-17	Dust C1	1	116.4	129.4	13	13	10.60	92		
6-Jan-18	Dust C1	1	118.2	130.2	12	12	9.78	92		
					TOTALS	**41.7**	**34.00**	**365**	**0.09**	**34.0**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm²)	Days Deployed	Dust Deposition (mg/dm²/d)	Dust Deposition (mg/dm²/y)
4-Jan-17	Initial deployment date									
25-Mar-17	Dust C2	1	117.8	127.6	9.8	9.8	7.99	80		
6-Jul-17	Dust C2	1	119.3	135	15.7	15.7	12.80	103		
6-Oct-17	Dust C2	1	117.5	128	10.5	10.5	8.56	92		
6-Jan-18	DustC2	1	120.9	130.2	9.3	9.3	7.58	92		
					TOTALS	**45.3**	**36.93**	**367**	**0.10**	**36.7**

Appendix C

Dustfall Snow Survey Field Sheets and Analytical Results

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 1 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1700

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 533964 **E** 7154321 **N (Zone)** 17

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-04

Lots of visible dust in sample. ~~Removed 3 bugs~~

Total Volume of Water After Melting: 280 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.5	197.9	83.4	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet

Area:	8000	No:	ENVI-178-0312
Effective Date:	26-Mar-2012	Revision:	R0
Task:	Dust Gauge Collection Field Sheet	By:	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 2A **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1027

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 535678 **E** 7151339 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-04

Lots of dark dust. Removed 3 bugs

Total Volume of Water After Melting: 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.6	187.7	71.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 3 DATE (dd-mmm-yyyy): 25-MAR-2017 TIME (24:00): 1017

SAMPLED BY: JG JO TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 535023 E 7151872 N (Zone) 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C Wind Direction: West Wind Speed (knots): 8

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-04

lots of dark dust

Total Volume of Water After Melting : 400 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1.	117.6	218.0	100.4	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 4 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1640

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 531397 **E** 7152127 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-06

Sample water cloudy

Total Volume of Water After Melting : 520 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.8	148.8	32	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 5 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 0915

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 535695 **E** 7155138 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-04

sample water cloudy

Total Volume of Water After Melting : 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.6	141.3	25.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 6 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1040

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-03

Lots of dark visible dust in water

Total Volume of Water After Melting : 275 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.4	164.6	50.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 7 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1005

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 536818 **E** 7150510 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-06

Some dark dust

Total Volume of Water After Melting : 540 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.7	203.8	86.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 8 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1650

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other** ______

GPS COORDINATES (UTM): 531400 **E** 7154146 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-03

Sample water cloudy. Removed a small bug

Total Volume of Water After Melting : 600 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.3	143.1	26.8	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 9 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 0940

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 541204 **E** 7152154 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed

Some visible dust in water

Total Volume of Water After Melting : 175 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.9	125.5	9.5	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 10 **DATE (dd-mmm-yyyy):** 25-MAR-2017 **TIME (24:00):** 1600

SAMPLED BY: JG JB **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 532908 **E** 7148924 **N (Zone)** 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C **Wind Direction:** West **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-06

Sample water cloudy

Total Volume of Water After Melting : 375 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.9	147.5	30.6	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST C1 DATE (dd-mmm-yyyy): 25-MAR-2017 TIME (24:00): 1500

SAMPLED BY: JG TB TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 534979 E 7144270 N (Zone) 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C Wind Direction: West Wind Speed (knots): 8

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-06

Sample water kind of cloudy

Total Volume of Water After Melting : 360 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.3	124.0	5.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST L2 DATE (dd-mmm-yyyy): 25-MAR-2017 TIME (24:00): 1623

SAMPLED BY: JG JB TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 528713 E 7153276 N (Zone) 12

DESCRIPTION: Quarterly dust collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -24 °C Wind Direction: West Wind Speed (knots): 8

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-01-04

Lots of dark dust. Removed a small twig and some bits of lichen

Total Volume of Water After Melting: 460 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.8	127.6	9.8	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 1 DATE (dd-mmm-yyyy): 02-JUL-2017 TIME (24:00): 17:36

SAMPLED BY: AH + SS2 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 533964 E 7154321 N (Zone) 12

DESCRIPTION: ~~533964~~ Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 19 °C Wind Direction: S Wind Speed (knots): 10

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-03-25

flies in sample
visible dust

Total Volume of Water After Melting: 100.0 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.2	427.3	312.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	115.2	427.3	312.1	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 2A DATE (dd-mmm-yyyy): 02-JUL-2017 TIME (24:00): 16:48

SAMPLED BY: AH + SS2 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 535673 E 7151339 N (Zone) 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 18 °C Wind Direction: SE Wind Speed (knots): 13

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-03-25

flies

Total Volume of Water After Melting : 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.3	148.6	32.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.3	148.6	32.3	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 3 **DATE (dd-mmm-yyyy):** 02-JUL-2017 **TIME (24:00):** 16:25

SAMPLED BY: AH + SS2 **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 535024 **E** 7151872 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 18 °C **Wind Direction:** SE **Wind Speed (knots):** 13

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/03/25

Bucket tipped while driving and some water/dust was lost
flies, visible dust

Total Volume of Water After Melting : 300 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.3	167.7	51.4	
2	116.7	153.0	36.3	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	233	320.7	87.7	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 4 **DATE (dd-mmm-yyyy):** 02-JUL-2017 **TIME (24:00):** 15:45

SAMPLED BY: AH + SS2 **TYPE OF SAMPLE:** Dust **Other** ______

GPS COORDINATES (UTM): 531397 **E** 7152127 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 17 °C **Wind Direction:** SE **Wind Speed (knots):** 15

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-03-25

Bucket tipped while driving and some water/dust was lost
flies, visible dust

Total Volume of Water After Melting : 150 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.7	158.9	41.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.7	158.9	41.2	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 6 **DATE (dd-mmm-yyyy):** 02-JUL-2017 **TIME (24:00):** 17:14

SAMPLED BY: AH + SS2 **TYPE OF SAMPLE:** **Dust** **Other**

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 19 °C **Wind Direction:** 5 **Wind Speed (knots):** 10

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed ~~2017/08/25~~ 2017/03/25

Total Volume of Water After Melting : 275.0 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.9	124.4	7.5	
2	~~118.9~~ 118.9	143.6	24.7	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	235.8	268	32.2	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 10 **DATE (dd-mmm-yyyy):** 02-JUL-2017 **TIME (24:00):** 1457

SAMPLED BY: AH + SS2 **TYPE OF SAMPLE:** Dust **Other** ____

GPS COORDINATES (UTM): 532903 **E** 7148924 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 16 °C **Wind Direction:** SE **Wind Speed (knots):** 15

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-03-25 JG + JB

Bucket tipped while driving and some water/dust was lost
visible dust, flies

Total Volume of Water After Melting : 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.1	211.4	96.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	115.1	211.4	96.3	

Rio Tinto

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 5 **DATE (dd-mmm-yyyy):** ~~2017/07/06~~ 06-JUL-2017 **TIME (24:00):** 0825

SAMPLED BY: 552 **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 535696 **E** 7155138 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 12.7 °C **Wind Direction:** SW **Wind Speed (knots):** 6

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, ~~75%~~, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/03/25 JG/JB

green colour, flies, visible dust
dust gauge ~~stand~~ tilted ~~&~~ in stand

Total Volume of Water After Melting: 375 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.4	135.5	20.1	
2	114.9	126.3	11.4	
3	115.1	155.6	40.5	
4				
5				
6				
7				
8				
9				
10				
11				
Totals	345.4	417.4	~~70~~. 72.0	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 7 DATE (dd-mmm-yyyy): 06-JUL-2017 TIME (24:00): 0846

SAMPLED BY: 552 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 536819 E 7150510 N (Zone) 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 12.7 °C Wind Direction: SW Wind Speed (knots): 6

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed March 25, 2017

Total Volume of Water After Melting: 390 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.6	143.7	28.1	
2	~~117.3~~			
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	115.6	143.7	28.1	

Rio Tinto

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 8 **DATE (dd-mmm-yyyy):** 06-JUL-2017 **TIME (24:00):** 09:27

SAMPLED BY: SS2 **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 531401 **E** 7154146 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 14 °C **Wind Direction:** W **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-03-25 JG, JB
when transfering to beaker, some water lost (<20mL)
light Green in colour, lots of water present, lots of bugs present
Dust present as well as green particles

Total Volume of Water After Melting: ~~700~~ 400 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.3	138.6	23.3	
2	116.2	159.2	43.0	
3	116.1	116.8	0.7	
4				
5				
6				
7				
8				
9				
10				
11				
Totals	347.6	414.6	67.0	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 9 **DATE (dd-mmm-yyyy):** ~~2017-JUL~~ 06-JUL-2017 **TIME (24:00):** 08:36

SAMPLED BY: 562 **TYPE OF SAMPLE:** Dust **Other**____

GPS COORDINATES (UTM): 541204 **E** 7152154 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 12.7 °C **Wind Direction:** SW **Wind Speed (knots):** 6

Precipitation: rain / mist / snow / N/A **Cloud Cover:** ~~0%~~, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed March 25, 2017

Dust gauge cylinder was tilted in stand, used ~~#~~ rocks to keep it upright

Total Volume of Water After Melting : 50 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.0	127.3	12.3	
2	115.9	122.4	6.5	
3	~~115.6~~			
4				
5				
6				
7				
8				
9				
10				
11				
Totals	230.9	249.7	18.8	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST C1 **DATE (dd-mmm-yyyy):** 06-JUL-2017 **TIME (24:00):** 08:57

SAMPLED BY: 552 **TYPE OF SAMPLE:** **Dust** **Other**

GPS COORDINATES (UTM): 534979 **E** 7144270 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 12.7 °C **Wind Direction:** SW **Wind Speed (knots):** 6

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed March 25, 2017

Total Volume of Water After Melting : 160 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.7	127.7	11.0	
2	~~115.6~~			
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.7	127.7	11.0	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust C2 DATE (dd-mmm-yyyy): 06-JUL-2017 TIME (24:00): 09:11

SAMPLED BY: 562 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 528714 E 7153276 N (Zone) 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 14 °C **Wind Direction:** W **Wind Speed (knots):** 8

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-03-25 JG, JB

Clear liquid, some bugs, dust present

Total Volume of Water After Melting: ~~675~~ 300 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.3	135.0	15.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	119.3	135.0	15.7	

RioTinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 1 **DATE (dd-mmm-yyyy):** ~~30-09-2017~~ 30-Sep-2017 **TIME (24:00):** 16:00

SAMPLED BY: AH **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 333964 **E** 7154321 **N (Zone)** 12

DESCRIPTION: Quarterly Dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 2.14 °C **Wind Direction:** E **Wind Speed (knots):** 18.3

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

- ERT training occuring on Runway while collection taking place
- v. little water present
- bugs present
- grey in colour.

Total Volume of Water After Melting : 25 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	113.5	148.4	34.9	
2	123.5.	263.6	140.1	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	237.0	412.0	175.0	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 3 **DATE (dd-mmm-yyyy):** ~~30-09-2017~~ 30-Sep-2017 **TIME (24:00):** 15:00

SAMPLED BY: AH **TYPE OF SAMPLE:** Dust **Other** ______

GPS COORDINATES (UTM): 535024 **E** 7151872 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 2.5 °C **Wind Direction:** E **Wind Speed (knots):** 15

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

Tube deployed 2017-09-30 would not fit in holder properly, therefore ~~4~~ rocks were used to hold tube in place.
- few bugs present in tube.
- blue-green in colour

Total Volume of Water After Melting: 225 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	111.0	176.5	65.4	
2	123.5	199.7	76.2	
3	111.0	137.3	26.3	
4				
5				
6				
7				
8				
9				
10				
11				
Totals	345.6	513.5	167.9	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 6 **DATE (dd-mmm-yyyy):** ~~30-09-2017~~ 30-Sep-2017 **TIME (24:00):** 15:30

SAMPLED BY: AH **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 2.5 °C **Wind Direction:** E **Wind Speed (knots):** 15

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

- v. little water
- bugs present
- murky brown in colour

Total Volume of Water After Melting : 100 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.3	126.4	10.1	
2	116.8	122.1	5.3	
3	120.0	130.7	10.7	
4	112.1	125.7	13.6.	
5				
6				
7				
8				
9				
10				
11	465.2	504.9	39.7	
Totals				

RioTinto

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust C2 **DATE (dd-mmm-yyyy):** 06-oct-2017 **TIME (24:00):** 12:20

SAMPLED BY: MPP **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 578714 **E** 7153276 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C **Wind Direction:** NE **Wind Speed (knots):** 20

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75% 100% **Dust in area:** Visible Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-06

- Bugs in the water

Total Volume of Water After Melting : 150 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.5	128.0	10.5	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.5	128.0	10.5	

Rio Tinto

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust C1 **DATE (dd-mmm-yyyy):** 06-oct-2017 **TIME (24:00):** 1350

SAMPLED BY: MPP **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 534979 **E** 7144270 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C **Wind Direction:** NE **Wind Speed (knots):** 20

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-06

- Some bugs in the water and visible dust

Total Volume of Water After Melting: 200 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.4	129.4	13.0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.4	129.4	13.0	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 10 **DATE (dd-mmm-yyyy):** 06-Oct-2017 **TIME (24:00):** 13:37

SAMPLED BY: MPP **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 532908 **E** 7148924 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C **Wind Direction:** NE **Wind Speed (knots):** 20

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

-Lots of bugs in the water

Total Volume of Water After Melting : 350 (mL)

Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Residue Weight (mg)	Comments
1	115.1	116.4	1.3	1/4
2	114.2	122.7	8.5	2/4
3	112.5	143.9	31.4	3/4
4	114.4	117.3	2.9	4/4
5				
6				
7				
8				
9				
10				
11				
Totals	456.2	500.3	44.1	

RioTinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 9 DATE (dd-mmm-yyyy): 06-Oct-2017 TIME (24:00): 15:00

SAMPLED BY: MPP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 541204 E 7152154 N (Zone) 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C Wind Direction: NE Wind Speed (knots): 20

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-06

Bugs in the water

Total Volume of Water After Melting : 25 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.4	125.8	11.4	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	114.4	125.8	11.4	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 8 DATE (dd-mmm-yyyy): 06-oct-2017 TIME (24:00): 12:37

SAMPLED BY: MPP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 531401 E 7154146 N (Zone) 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C Wind Direction: NE Wind Speed (knots): 20

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-06

Lots of bugs in the water

Total Volume of Water After Melting: 300 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	112.1	114.1	2.0	1/3
2	112.2	115.0	2.8	3/3
3	114.7	129.9	15.2	2/3
4				
5				
6				
7				
8				
9				
10				
11				
Totals	339.0	359.0	20.0	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 7 **DATE (dd-mmm-yyyy):** 06-Oct-2017 **TIME (24:00):** 13:50

SAMPLED BY: MPP **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 536819 **E** 7150510 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C **Wind Direction:** NE **Wind Speed (knots):** 20

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-06

- Lots of bugs in the water

Total Volume of Water After Melting : 50 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.8	159.7	42.9	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.8	159.7	42.9	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 6 **DATE (dd-mmm-yyyy):** ~~30-09-2017~~ 30-Sep-2017 **TIME (24:00):** 15:30

SAMPLED BY: AH **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 2.5 °C **Wind Direction:** E **Wind Speed (knots):** 15

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

- v. little water
- bugs present
- murky brown in colour

Total Volume of Water After Melting: 100 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.3	126.4	10.1	
2	116.8	122.1	5.3	
3	120.0	130.7	10.7	
4	112.1	125.7	13.6	
5				
6				
7				
8				
9				
10				
11	465.2	504.9	39.7	
Totals				

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 5 **DATE (dd-mmm-yyyy):** 06-Oct-2017 **TIME (24:00):** 13:07

SAMPLED BY: MPP **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 535696 **E** 7155138 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C **Wind Direction:** NE **Wind Speed (knots):** 20

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-06

- Gauge was tilted in the base.
- Bugs in the sample water

Total Volume of Water After Melting: 50 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	~~114.4~~	~~125.8~~	~~11.4~~	Dust 9.
2	113.0	132.9	19.9	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	113.0	132.9	19.9	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 4 **DATE (dd-mmm-yyyy):** 07-oct-2017 **TIME (24:00):** 08:15

SAMPLED BY: ______ **TYPE OF SAMPLE: Dust** **Other** ______

GPS COORDINATES (UTM): 531397 **E** 7152127 **N (Zone)** 12

DESCRIPTION: ______

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -4 °C **Wind Direction:** NE **Wind Speed (knots):** 18

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

- Some bugs in the water and visible dust

Total Volume of Water After Melting: 140 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.6	135.9	19.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.6	135.9	19.3	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 3 **DATE (dd-mmm-yyyy):** ~~30-09-2017~~ 30-Sep-2017 **TIME (24:00):** 15:00

SAMPLED BY: AH **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 535024 **E** 7151872 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge Collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 2.5 °C **Wind Direction:** E **Wind Speed (knots):** 15

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

Tube deployed 2017-09-30 would not fit in holder properly, therefore 4 rocks were used to hold tube in place.
- few bugs present in tube.
- blue-green in colour

Total Volume of Water After Melting : 225 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	111.0	176.5	65.4	
2	123.5	199.7	76.2	
3	111.0	137.3	26.3	
4				
5				
6				
7				
8				
9				
10				
11				
Totals	345.6	513.5	167.9	

RioTinto

Dust Gauge Collection Field Sheet

Area:	8000	No:	ENVI-178-0312
Effective Date:	26-Mar-2012	Revision:	R0
Task:	Dust Gauge Collection Field Sheet	By:	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 2A **DATE (dd-mmm-yyyy):** 06-oct-2017 **TIME (24:00):** 1435

SAMPLED BY: MPP **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 536678 **E** 7151339 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -10 °C **Wind Direction:** NE **Wind Speed (knots):** 20

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

- Lots of bugs in the water

Total Volume of Water After Melting : 160 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.1	166.6	50.5	Residual bug carcasses?
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.1	166.6	50.5	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 1 **DATE (dd-mmm-yyyy):** ~~30-09-2017~~ 30-Sep-2017 **TIME (24:00):** 16:00

SAMPLED BY: AH **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 533964 **E** 7154321 **N (Zone)** 12

DESCRIPTION: Quarterly Dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 2.14 °C **Wind Direction:** E **Wind Speed (knots):** 18.3

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-07-02

- ERT training occuring on Runway while collection taking place
- v. little water present
- bugs present
- grey in colour.

Total Volume of Water After Melting : 25 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	113.5	148.4	34.9	
2	123.5.	263.6	140.1	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	237.0	412.0	~~#1.~~ 175.0	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 01 **DATE (dd-mmm-yyyy):** 24-Dec-2017 **TIME (24:00):** 10:30

SAMPLED BY: 552 AH **TYPE OF SAMPLE:** Dust **Other** ____

GPS COORDINATES (UTM): 533964 **E** 7154321 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -28 °C **Wind Direction:** N **Wind Speed (knots):** 19

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/09/30

Visible dust

Total Volume of Water After Melting : 400 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.8	136.0	17.2	
2	119.0	146.4	27.4	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	237.8	282.4	44.6	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 2A DATE (dd-mmm-yyyy): 2018-01-06 TIME (24:00): 12:35

SAMPLED BY: SS MP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 535 678 E 7151339 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -19 °C Wind Direction: NA Wind Speed (knots): 1

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

Total Volume of Water After Melting: 500 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.7	126.3	11.6	
2	115.0	137.3	22.3	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	229.7	263.6	33.9	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 3 DATE (dd-mmm-yyyy): 10-Jan-2018 TIME (24:00): ~~1430~~ 1530

SAMPLED BY: SS SS2 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 535024 E 7151872 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -32 °C Wind Direction: NW Wind Speed (knots): 9

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/09/30

-visible dust in sample

Total Volume of Water After Melting : 550 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	113.7	141.45	27.8	
2	115.6	155.9	40.3	
3	117.1	140.01	23.0	
4				
5				
6				
7				
8				
9				
10				
11				
Totals	346.4	437.5	91.1	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 4 DATE (dd-mmm-yyyy): 2018-01-10 TIME (24:00): 14:00

SAMPLED BY: SS SS2 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 531397 E 7152127 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -33 °C Wind Direction: E Wind Speed (knots): 17

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017-10-07

- hair in sample

Total Volume of Water After Melting : 650 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.0	130.8		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	118.0	130.8		

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 5 **DATE (dd-mmm-yyyy):** 2018-01-06 **TIME (24:00):** 14:50

SAMPLED BY: SS MP **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 535696 **E** 7155138 **N (Zone)** 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C **Wind Direction:** NA **Wind Speed (knots):** 1

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

Total Volume of Water After Melting: 440 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.3	126.8		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	118.3	126.8		

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST6 **DATE (dd-mmm-yyyy):** 24-Dec-2017 **TIME (24:00):** 11:40

SAMPLED BY: AH 552 **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12

DESCRIPTION: Quarterly Dust Gauge

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -29 °C **Wind Direction:** ~~NE~~ N **Wind Speed (knots):** 17

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0% 10% 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/09/30

Visible dust
filter "rusty" looking

Total Volume of Water After Melting : 325 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.9	122.2	4.3	
2	122.4	~~138.8~~ 138.9	16.5	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	240.3	261.1	20.8	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 7 **DATE (dd-mmm-yyyy):** 2018-01-06 **TIME (24:00):** 12:25

SAMPLED BY: SS MP **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 536819 **E** 7150510 **N (Zone)** 10

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C **Wind Direction:** NA **Wind Speed (knots):** 1

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

- visible dust/debris
- bird feces on tube

1 - WOLF

4 - CARIBOU

Total Volume of Water After Melting : 550 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	113.9	133.8	19.9	
2	114.6	128.1	13.5	
3	116.1	125.9	9.8	
4				
5				
6				
7				
8				
9				
10				
11				
Totals	344.6	387.8 ~~68~~	43.2	

RioTinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 8 DATE (dd-mmm-yyyy): 2018-01-06 TIME (24:00): 14330

SAMPLED BY: SS MP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 531401 E 7154146 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C Wind Direction: NA Wind Speed (knots): 1

Precipitation: rain / mist / snow / NA Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

Total Volume of Water After Melting : 550 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.1	125.0	7.9	
2	114.7	121.1	6.4	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	131.8	246.1	14.3	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 9 DATE (dd-mmm-yyyy): 2018-11-06 TIME (24:00): 12:00

SAMPLED BY: SS MP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 541204 E 7152154 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C Wind Direction: NA Wind Speed (knots): 1

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

Total Volume of Water After Melting : 300 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.2	120.4	6.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	114.2	120.4	6.2	

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 10 DATE (dd-mmm-yyyy): ~~2~~ 16-Jan-2018 TIME (24:00): 10:00

SAMPLED BY: SS SS2 TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 532908 E 7148924 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -15 °C Wind Direction: N Wind Speed (knots): 7.0

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

-visible dust

Total Volume of Water After Melting : 600 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.7	150.9	36.2	-lost 50 mL due to clamp not fitting right
2	115.9	~~199.~~ 200.0	84.1	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	229.6	350.9	120.3	

RioTinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: Dust 11 DATE (dd-mmm-yyyy): 2018-01-06 TIME (24:00): 13:55

SAMPLED BY: SS MP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 531493 E 7150156 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C Wind Direction: NA Wind Speed (knots): 1

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/05

Total Volume of Water After Melting: 740 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.2	144.87	26.5	
2	118.6	118.6 - actually 118.2	0	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	136.8	263.3	26.5	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 12 **DATE (dd-mmm-yyyy):** 2018-01-06 **TIME (24:00):** 14:10

SAMPLED BY: SS MP **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 529323 **E** 7151191 **N (Zone)** 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C **Wind Direction:** NA **Wind Speed (knots):** 1

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

- appears to be copper flakes floating on surface of water
- new copper tube deployed
- after drying, dust appeared black where as the other samples were a rusty brown colour

A FEW CARIBOU TRACKS

Total Volume of Water After Melting: 700 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.2	147.7	31.5	
2	114.0	121.5	7.5	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	130.2	269.2	39.0	

Rio Tinto

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST C1 **DATE (dd-mmm-yyyy):** 2018-01-06 **TIME (24:00):** 13:05

SAMPLED BY: SS MP **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 534979 **E** 7144270 **N (Zone)** 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C **Wind Direction:** NA **Wind Speed (knots):** 1

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

1 - W+ff
- clump of dirt on base of tube (outside).

LOTS OF CARIBOU TRACKS IN AREA

Total Volume of Water After Melting : 550 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.2	130.2	12.0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	118.2	130.2	12.0	

Rio Tinto

Dust Gauge Collection Field Sheet			
		No:	ENVI-178-0312
Area:	8000	Revision:	R0
Effective Date:	26-Mar-2012	By:	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST C2 DATE (dd-mmm-yyyy): 2018-01-06 TIME (24:00): 14:20

SAMPLED BY: SS MP TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 528714 E 7153276 N (Zone) 12

DESCRIPTION: Q4

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -18 °C Wind Direction: NA Wind Speed (knots): 1

Precipitation: rain / mist / snow / N/A Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2017/10/06

Total Volume of Water After Melting: 600 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	~~112~~. 120.9	130.2	9.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	120.9	130.2	9.3	

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSI-1-4 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 16:20

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** 4

GPS COORDINATES (UTM): 533907 **E** 7154290 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☑ Not Visible ☐ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	55	49	55		15	Y N	
	2	35	29	50		10	Y N	
	3	35	28	50		10	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1135.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.5 mg	286.7 mg	171.2 mg	twigs in sample
2	114.7 mg	706.1 mg	591.4 mg	when removing from scale some dust lost
3				
4				
Totals	230.2 mg	992.8	762.6 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3465000 ~~1545000~~ ~~1920000~~ (mL)

Bag 1 = 1920000
Bag 2 = 1545000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * ~~DUPW1~~ GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS1-1-5 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 16:05

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** DUP

GPS COORDINATES (UTM): 533907 **E** 7154190 **N (Zone)**______ **NAD 83**

DESCRIPTION: Distance to Diavik______km & Direction______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☑ Not Visible ☐ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	35	23	45		5	Y N	
	2	35	22	45		5	Y N	
	3	35	24	45		5	Y N	
	4	43	38	49		9	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	50	27	48		8	Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Dust Sample Filters

Total Volume of Melted Snow : 1050 000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.4	209.0	93.6	grass in sample, some water
2	114.9	705.3	590.4	Lost due to clamp not being on
3				tight
4				
Totals	230.3	914.3	684.0 mg	

Water Quality Bottles

Total Volume of Melted Snow : 2295000 (mL) 2.295

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DUPW2	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSI-2 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 16:40

SAMPLED BY: JG, GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** ______

GPS COORDINATES (UTM): 533916 **E** 7154363 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☑ Not Visible ☐ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	55	45	51		11	Y N	
	2	50	39	50		10	Y N	
	3	45	37	51		11	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1060,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.8	469.6	353.8	flies
2				
3				
4				
Totals	115.8	469.6	353.8 mg	

Water Quality Bottles

Total Volume of Melted Snow : ________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSI-3 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 16:55

SAMPLED BY: JG, GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** ____

GPS COORDINATES (UTM): 533968 **E** 7154518 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ____ km & Direction ____ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	46	32	48		18	Y N	
	2	44	34	48		18	Y N	
	3	39	26	46.5		16.5	Y N	
	4						Y N	
	Dust (Min. of 3 cores – Total Water Content SWE =/> 25)							
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
	Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)							

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 785.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.3	179.6	65.3	
2				
3				
4				
Totals	114.3	179.6	65.3 mg	

Water Quality Bottles

Total Volume of Melted Snow : ____________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: SS1-4 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1715

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0534487 **E** 7155091 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ________ km & Direction ________ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☐ **Snow Condition:** Crystallized ☐ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	52	50	55	40	15	Y N	
	2	53	51	55	40	15	Y N	
	3	54	53	55	40	15	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	54	50	55	40	15	Y N	
	2	54	52	54	40	14	Y N	
	3	56	54	55	40	15	Y N	
	4	57	54	56	40	16	Y N	1 of 2
	5	58	56	56	40	16	Y N	
	6	57	55	56	40	16	Y N	
	7	58	56	55	40	15	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

RioTinto

Dust Sample Filters

Total Volume of Melted Snow : 1400.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.4 mg	132.9 mg	15.5 mg	leak in original bag, caught by double bag
2				
3				
4				
Totals	117.4 mg	132.9 mg	15.5 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3465.000 (mL) 1920.000 1545.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSI-5 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1800

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0535095 **E** 7156880 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik____ km & Direction____ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	68	67	64	40	24	Y N	
	2	68	67	63	40	23	Y N	
	3	68	67	65	40	25	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	68	66	63.5	40	23.5	Y N	
	2	68	63	62	40	22	Y N	
	3	68	67	65	40	25	Y N	
	4	67	63	63	40	23	Y N	
	5	68	64	62	40	22	Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 2250000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.7 mg	149.9 mg	32.2 mg	bag leaked, double bag caught water
2				
3				
4				
Totals	117.7 mg	149 mg	32.2 mg	

1410 000
2230000

Water Quality Bottles

Total Volume of Melted Snow : 3640.000 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS2-1 **DATE (yyyy-mm-dd):** 2017-04-08 **TIME (24:00):** 12:20

SAMPLED BY: ______ **TYPE OF SAMPLE:** Dust ☐ Water Quality ☐ **QAQC:** ______

GPS COORDINATES (UTM): 537554 **E** 7153473 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -17 °C **Wind Direction:** NW **Wind Speed (knots):** 1.5

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	46	46	53	40	13	Y N	
	2	46	46	53	40	13	Y N	
	3	46	45	53	40	13	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	45	45	53	40	13	Y N	
	2	45	45	53	40	13	Y N	
	3	45	45	53	40	13	Y N	
	4	45	45	53	40	13	Y N	(LF2)
	5	46	45.5	52.5	40	12.5	Y N	
	6	46	46	53	40	13	Y N	
	7	46	45.5	52.5	40	12.5	Y N	
	8	46	45	53	40	13	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1255.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.8 mg	134.3 mg	19.5 mg	
2				
3				
4				
Totals	114.8 mg	134.3 mg	19.5 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3305.000 (mL)

1650000
1655000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS2-2 **DATE (yyyy-mm-dd):** 2017-04-08 **TIME (24:00):** 11:45

SAMPLED BY: GC, JG, WL **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:** ____

GPS COORDINATES (UTM): 537824 **E** 7153475 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ________ km & Direction ________ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -17 °C **Wind Direction:** NW **Wind Speed (knots):** 1.5

Precipitation: Rain / Mist / Snow / Ice / None

Cloud Cover: 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑

Snow Condition: Crystallized ☑ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	36	36	48	40	8	Y N	
	2	37	36	48	40	8	Y N	
	3	38	37	49	40	9	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	37	37	48.5	40	8.5	Y N	
	2	37	37	48	40	8	Y N	
	3	37	36	48	40	8	Y N	
	4	38	36	48	40	8	Y N	
	5	38	36	48.5	40	8.5	Y N	
	6	38	36	48	40	8	Y N	1 of 2
	7	36	36	48.5	40	8.5	Y N	
	8	37	36	49	40	9	Y N	
	9	37	37	48.5	40	8.5	Y N	
	10	37	36	48	40	8	Y N	
	11	36	35	48	40	8	Y N	
	12	35	35	48	40	8	Y N	2 of 2
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 815.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.6 mg	123.7 mg	7.1 mg	
2				
3				
4				
Totals	116.6 mg	123.7 mg	7.1 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3225.000 (mL)

1610 000
1615000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS2-3 **DATE (yyyy-mm-dd):** 2017-04-08 **TIME (24:00):** 11:15

SAMPLED BY: GC, JG, WL **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 538483 **E** 7153940 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ____ km & Direction ____ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NW **Wind Speed (knots):** 1.5

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	49	48	52	40	12	Y N	
	2	48	47	52	40	12	Y N	
	3	48	46	52	40	12	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	47	46	52.5	40	12.5	Y N	
	2	47	47	53	40	13	Y N	
	3	45	44	52	40	12	Y N	
	4	47	46	53	40	13	Y N	1 of 2
	5	47	46	52	40	12	Y N	
	6	45	45	52	40	12	Y N	
	7	45	45	52	40	12	Y N	
	8	46	45	51.5	40	11.5	Y N	
	9	45	44	51.5	40	11.5	Y N	2 of 2
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1205,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.1 mg	135.9 mg	19.8 mg	
2				
3				
4				
Totals	116.1 mg	135.9 mg	19.8 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3425,000 (mL)

1850 000
1575 000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS2-4-4 **DATE (yyyy-mm-dd):** 2017-04-08 **TIME (24:00):** 1010

SAMPLED BY: JT GC WL **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:** Dupl

GPS COORDINATES (UTM): 0539158 **E** 7154682 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik_____km & Direction_____ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -22 °C **Wind Direction:** SW **Wind Speed (knots):** 3.5

Precipitation: Rain / Mist / Snow / Ice / None

Dust in area: Visible ☐ Not Visible ☑

Cloud Cover: 0% / 10% / 25% / 50% / 75% / 100%

Snow Condition: Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	40	38	50	40	10	Y N	
	2	40	38	50	40	10	Y N	
	3	40	40	50	40	10	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	41	40	51.5	40	11.5	Y N	
	2	41	40	51	40	11	Y N	
	3	41	41	51.5	40	11.5	Y N	
	4	42	41	52	40	12	Y N	
	5	39	38	50.5	40	10.5	Y N	
	6	40	34	49	40	9	Y N	
	7	40	36	49.5	40	9.5	Y N	
	8	40	38	50	40	10	Y N	
	9	41	37	50	40	10	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 970,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.2 mg	~~108.~~ 129.0 mg	19.6 mg	leaves + lichen
2				
3				
4				
Totals	115.2 mg	129.0 mg	19.6 mg	

Water Quality Bottles

Total Volume of Melted Snow : 2960,000 (mL)

1525000
1435000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DUPW1	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS2-4-5 **DATE (yyyy-mm-dd):** 2017-04-18 **TIME (24:00):** 1035

SAMPLED BY: JG GC WL **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:** Dupl

GPS COORDINATES (UTM): 0539158 **E** 7154682 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -22 °C **Wind Direction:** SW **Wind Speed (knots):** 3.5

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	38	37	50	40	10	Y N	
	2	38	37	51	40	11	Y N	
	3	38	37	50	40	10	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	38	37	50.5	40	10.5	Y N	
	2	39	38	50	40	10	Y N	
	3	40	38	50	40	10	Y N	
	4	38	37	50.5	40	10.5	Y N	
	5	38	35	50	40	10	Y N	1 of 2
	6	40	38	50	40	10	Y N	
	7	40	38	50.5	40	10.5	Y N	
	8	40	39	50	40	10	Y N	
	9	40	38	50.5	40	10.5	Y N	
	10	40	35	49.5	40	9.5	Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1015.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.0 mg			1st bag leaked, caught by 2nd bag
2				
3				
4				
Totals				

Water Quality Bottles

Total Volume of Melted Snow : 3275.000 (mL)

1660000
1615000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DUPW2	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS3-4 **DATE (yyyy-mm-dd):** 2017-04-03 **TIME (24:00):** 1634

SAMPLED BY: JG SS GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 536585 **E** 7151002 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -15 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	37	36	52	40	12	Y N	
	2	37	35.5	52	40	12	Y N	
	3	37	34	51	40	11	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	38	36	52.5	40	12.5	Y N	
	2	39	36.5	52	40	12	Y N	
	3	39	35.5	51.5	40	11.5	Y N	
	4	39	35	51.5	40	~~11.5~~	Y N	1 of 2
	5	40	36	53	40	13	Y N	
	6	40	37	53	40	13	Y N	
	7	40	38	53.5	40	13.5	Y N	
	8	40	38	53.5	40	13.5	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1130,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.6 mg	233.2 mg	117.6 mg	
2				
3				
4				
Totals	115.6 mg	233.2 mg	117.6 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3175,000 (mL)

1645,000
1530,000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS3-5 **DATE (yyyy-mm-dd):** 2017-04-03 **TIME (24:00):** 1530

SAMPLED BY: SS JG GE **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** ——

GPS COORDINATES (UTM): 537638 **E** 7150824 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☒ &/or Lake ☒

Ice Road 25m to the NW

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -15 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☒ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	43	39	53.5	40	13.5	Y N	
	2	43	40	53	40	13	Y N	
	3	43	43	55	40	15	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	45	37	52.5	40	12.5	Y N	
	2	48	48	56	40	16	Y N	
	3	46	44	55	40	15	Y N	
	4	43	40	53.5	40	13.5	Y N	
	5	46	43	55	40	15	Y N	
	6	48	48	58	40	18	Y N	
	7	49	45	56	40	16	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

1/2@57 T2 90

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1295.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.6 mg	164.4 mg	48.8 mg	
2				
3				
4				
Totals	115.6 mg	164.4 mg	48.8 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3265.000 (mL)

1760.000
1505.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS3-6 **DATE (yyyy-mm-dd):** 2017-04-03 **TIME (24:00):** 1736

SAMPLED BY: JG SS GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0536305 **E** 7151604 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik Next to dike km & Direction ______ On: Land ☐ &/or Lake ☑

* moved coordinate because actual point inside dike

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -15 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	63	51	55	40	15	Y N	Little bits of ice stuck in tube from last site
	2	63	51	54.5	40	14.5	Y N	
	3	63	55.5	55	40	15	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	64	52	54	40	14	Y N	
	2	63	51	54	40	14	Y N	
	3	64	56	55	40	15	Y N	
	4	64	53	54	40	14	Y N	1 of 2
	5	65	63	58	40	18	Y N	
	6	65	53	54.5	40	14.5	Y N	
	7	64	52	54.5	40	14.5	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1370.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.9 mg	265.4 mg	149.5 mg	
2				
3				
4				
Totals	115.9 mg	265.4 mg	149.5 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3245.000 (mL)

1800.000
1445.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS3-7 **DATE (yyyy-mm-dd):** 2017-04-03 **TIME (24:00):** 17:05

SAMPLED BY: SS JG GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☐ **QAQC:** —

GPS COORDINATES (UTM): 536343 **E** 7151368 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☒ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -15 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☒ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	47	46	57.5	40	17.5	Y N	
	2	46	46	57.5	40	17.5	Y N	
	3	46	45	57	40	17	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	45	45	56.5	40	16.5	Y N	
	2	46	45	56.5	40	16.5	Y N	
	3	46	45	57	40	17	Y N	
	4	45	44	56.5	40	16.5	Y N	
	5	45	44	57	40	17	Y N	
	6	46	45	57.5	40	17.5	Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

1/2

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1635.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.1 mg	240.7 mg	125.6 mg	
2				
3				
4				
Totals	115.1 mg	240.7 mg	125.6 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3115.000 (mL)

1560.000
1555.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS 3-8 **DATE (yyyy-mm-dd):** 2017-04-03 **TIME (24:00):** 16:05

SAMPLED BY: JG, GC, SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:** ____

GPS COORDINATES (UTM): 536693 **E** 7150806 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik Ice Road 50m SE km & Direction ____ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -15 °C **Wind Direction:** N **Wind Speed (knots):** 6

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	40	40	52	40	12	Y N	
	2	40	40	52.5	40	12.5	Y N	
	3	40	39	52.0	40	12	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	41	40	52	40	12	Y N	
	2	41	41	53	40	13	Y N	
	3	41	40	53	40	13	Y N	
	4	41	40	52	40	12	Y N	1 of 2
	5	41	40	52	40	12	Y N	
	6	41	40	52	40	12	Y N	
	7	41	40.5	52.5	40	12.5	Y N	
	8	40	39	52	40	12	Y N	
	9	41	40	52	40	12	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content** $_{SWE}$ **= Wt. of Tube & Core** $_{SWE}$ **– Wt. of Empty Tube** $_{SWE}$ ***

Rio Tinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1185000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.2 mg	154.6	40.4 mg	
2				
3				
4				
Totals	114.2 mg	154.6 mg	40.4 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3635000 (mL)

1635000
2000000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: SS4-1 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 13:48

SAMPLED BY: JG, GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 531491 **E** 7152206 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NE **Wind Speed (knots):** 18

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	35	21	44		4	Y N	
	2	34	28	45		5	Y N	
	3	35	24	45		5	Y N	
	4	39	21	44		4	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Dust	1	44	37	48		8	Y N	
	2						Y N	
Water Quality Cores	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 990,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.5	145.5	31.0	twigs, leaves, moss in sample
2	115.7	~~166.8~~ 166.6	50.9	
3				
4				
Totals	230.2	312.1	81.9 mg	

Water Quality Bottles

Total Volume of Melted Snow :__________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS4-2 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1325

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0531351 **E** 7152252 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NE **Wind Speed (knots):** 18

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	43	35	48	40	8	Y N	Removed some twigs
	2	41	25	45	40	5	Y N	
	3	48	35	48	40	8	Y N	
	4	47	36	49	40	9	Y N	Removed vegitation
	Dust (Min. of 3 cores – Total Water Content SWE =/> 25)							
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
	Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)							

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 960.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.2 mg	156.1 ~~155.9~~ mg	41.9 ~~42~~ ~~41.7~~ mg	
2				
3				
4				
Totals	114.2	156.1	41.9	

Water Quality Bottles

Total Volume of Melted Snow :___________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS4-3 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1250

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0531321 **E** 7152476 **N (Zone)** ______ **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NE **Wind Speed (knots):** 18

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	57	54	53	40	13	Y N	Removed some vegitation
	2	60	57	55	40	15	Y N	Removed vegitation
	3	55	53	52	40	12	Y N	Removed veg
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1435.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.9 mg	178.5 mg	63.6 mg	
2				
3				
4				
Totals	114.9	178.5	63.6	

Water Quality Bottles

Total Volume of Melted Snow : ____________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS4-4 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1205

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 531142 **E** 7153168 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ____ km & Direction ____ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NE **Wind Speed (knots):** 18

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	79	72	55			Y N	
	2	74	76	58			Y N	
	3	74	69	58			Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	72	71	59		19	Y N	
	2	75	72	59		19	Y N	
	3	75	71	59		19	Y N	1 of 2
	4	75	79	59		19	Y N	
	5	75	71	59		19	Y N	
	6	75	74	60		20	Y N	2 of 2
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1750.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.4 mg	155.9 mg	40.5 mg	
2				
3				
4				
Totals	115.4	155.9	40.5	

Water Quality Bottles

Total Volume of Melted Snow : 3630.000 (mL)

1805.000
1825.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * ~~BLWK~~ DW(G/s)	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS4-5-4 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1100

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:** Dup/w

GPS COORDINATES (UTM): 0531409 **E** 7154119 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NE **Wind Speed (knots):** 16

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	52	50	53	40	13	Y N	
	2	52	49	52.5	40	12.5	Y N	
	3	51	48	53	40	13	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	52	49	53	40	13	Y N	
	2	51	50	52	40	12	Y N	
	3	51	50	52.5	40	12.5	Y N	
	4	51	50	52	40	12	Y N	1 of 2
	5	51	50	52	40	12	Y N	
	6	51	50	52	40	12	Y N	
	7	51	50	52.5	40	12.5	Y N	
	8	52	50	52.5	40	12.5	Y N	
	9	53	51	53	40	13	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1155.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.8 mg	150.4 mg	35.6 mg	
2				
3				
4				
Totals	114.8 mg	150.4 mg	35.6 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3440.000 (mL)

Bag 1 = 1930.000
2 = 1510.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DUPW1	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSU-5-5 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1126

SAMPLED BY: JG GL **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:** Dupe

GPS COORDINATES (UTM): 0531409 **E** 7154119 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik_____km & Direction_____On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** NE **Wind Speed (knots):** 16

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	54	52	53	40	13	Y N	
	2	54	52	53	40	13	Y N	
	3	51	50	52	40	12	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	52	51	53	40	13	Y N	
	2	52	50	52	40	12	Y N	
	3	52	50	53	40	13	Y N	
	4	52	49	52	40	12	Y N	1 of 2
	5	52	52	53	40	13	Y N	
	6	52	49	52	40	12	Y N	
	7	52	48	52	40	12	Y N	
	8	55	52	53	40	13	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1180,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.7	161.3	45.6	
2				
3				
4				
Totals	115.7	161.3	45.6mg	

Water Quality Bottles

Total Volume of Melted Snow : 3100,000 (mL) 1545.000 1555.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DUPW2	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet			
Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SS5-1 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 1105

SAMPLED BY: JG SS GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 533150 **E** 7148925 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -0.5 °C **Wind Direction:** SW **Wind Speed (knots):** 9

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	40	35	48	40	8	Y N	Removed vegitation
	2	39	35	48	40	8	Y N	Removed some vegitation
	3	30	25	46	40	6	Y N	Removed vegitation
	4	41	35	48	40	8	Y N	Removed vegitation
	Dust (Min. of 3 cores – Total Water Content SWE =/> 25)							
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
	Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)							

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 925.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.7 mg	219.6 mg	104.9 mg	Twigs & grass in sample
2				
3				
4				
Totals	114.7 mg	219.6 mg	104.9 mg	

Water Quality Bottles

Total Volume of Melted Snow : ____________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: SSS-2-4/5 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 1130

SAMPLED BY: JL SS GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** DupW1/2

GPS COORDINATES (UTM): 0533150 **E** 7148874 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -0.5 °C **Wind Direction:** SW **Wind Speed (knots):** 9

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	30	29	47	40	7	Y N	
	2	29	28	47	40	7	Y N	
	3	28	28	47	40	7	Y N	
	4	28	28	47	40	7	Y N	
	Dust (Min. of 3 cores – Total Water Content SWE =/> 25)							
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
	Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)							

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 865,000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	~~lea~~ Comments
1	117.1 mg	172.2 mg	55.1 mg	leaves
2				
3				
4				
Totals	117.1 mg	172.2 mg	55.1 mg	

Water Quality Bottles

Total Volume of Melted Snow :___________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSS-2-5 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 1138

SAMPLED BY: JG SS GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** Dupe 1/2

GPS COORDINATES (UTM): 0533150 **E** 7148874 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ________ km & Direction ________ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -0.5 °C **Wind Direction:** SW **Wind Speed (knots):** 9

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	30	30	48	40	8	Y N	
	2	31	30	48	40	8	Y N	
	3	33	32	48	40	8	Y N	
	4	31	30	48	40	8	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1000.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.4 mg	161.5 mg	45.1 mg	
2				
3				
4				
Totals	116.4 mg	161.5 mg	45.1 mg	

Water Quality Bottles

Total Volume of Melted Snow :__________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet			
Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSS-3 DATE (yyyy-mm-dd): 2017-04-01 TIME (24:00): 1150

SAMPLED BY: JG SS GC TYPE OF SAMPLE: Dust ☑ Water Quality ☑ QAQC: ______

GPS COORDINATES (UTM): 0533142 E 7198691 N (Zone) 12 NAD 83

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -0.5 °C Wind Direction: SW Wind Speed (knots): 9

Precipitation: Rain / Mist / Snow / Ice / None Cloud Cover: 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ Snow Condition: Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	30	30	49	40	9	Y N	
	2	30	29	49	40	9	Y N	
	3	30	27	49	40	9	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	29	26	48.5	40	8.5	Y N	
	2	32	30	50	40	10	Y N	
	3	32	30	50	40	10	Y N	
	4	33	31	50	40	10	Y N	
	5	33	33	51	40	11	Y N	– 1of1
	6	33	33	51	40	11	Y N	
	7	33	32	50.5	40	10.5	Y N	
	8	33	32	50.5	40	10.5	Y N	
	9	33	32	50.5	40	10.5	Y N	
	10	32	31	50.5	40	10.5	Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 845.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.6 mg	138.6 mg	21.0 mg	
2				
3				
4				
Totals	117.6 mg	138.6 mg	21.0 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3170.000 (mL) 1640000 1530000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSS-4 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 1220

SAMPLED BY: JG SS GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0533143 **E** 7147956 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ____ km & Direction ____ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -0.5 °C **Wind Direction:** SW **Wind Speed (knots):** 7

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	35	34	51	40	11	Y N	
	2	35	33	51	40	11	Y N	
	3	34	33	51	40	11	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	35	34	52	40	12	Y N	
	2	34	30	50	40	10	Y N	
	3	35	33.5	51	40	11	Y N	
	4	34	33	51	40	11	Y N	
	5	33	32	51	40	11	Y N	1 of 1
	6	34	33	51	40	11	Y N	
	7	34	32	51.5	40	11.5	Y N	
	8	33	28	50	40	10	Y N	
	9	34	32.5	51	40	11	Y N	
	10	34	29	50	40	10	Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1030.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.5 mg	126.0 mg	8.5 mg	
2				
3				
4				
Totals	117.5 mg	126.0 mg	8.5 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3335.000 (mL)

1685 000
1650 000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: SSS-5 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 13:08

SAMPLED BY: SS, GG, JG **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**________

GPS COORDINATES (UTM): 0533146 **E** 7146950 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik________km & Direction________ On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -0.5 °C **Wind Direction:** SW **Wind Speed (knots):** 7

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	45	45	54.5	40	14.5	Y N	
	2	45	45	54.5	40	14.5	Y N	
	3	45	45	54	40	14	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	45	45	54	40	14	Y N	
	2	46	45	55	40	15	Y N	
	3	46	45	55	40	15	Y N	
	4	46	45	55	40	15	Y N	1 of 2
	5	46	45	55	40	15	Y N	
	6	46	45	55	40	15	Y N	
	7	45	45	55	40	15	Y N	2 of 2
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1325.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.2 mg	121.5 mg	6.3 mg	
2				
3				
4				
Totals	115.2 mg	121.5 mg	6.3 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3195.000 (mL)

1385 000
1810 000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SCC-BAG **DATE (yyyy-mm-dd):** 2017-04-10 **TIME (24:00):** ________

SAMPLED BY: SS **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** ________

GPS COORDINATES (UTM): ________ **E** ________ **N (Zone)** ________ **NAD 83**

DESCRIPTION: Distance to Diavik ________ km & Direction ________ On: Land ☐ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ________ **Wind Speed (knots):** ______

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☐ **Snow Condition:** Crystallized ☐ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : ~~1070.000~~ 1070.0 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.6 mg	115.0 mg	0 mg	
2				
3				
4				
Totals	115.6 mg	115.0 mg	0 mg	

Water Quality Bottles

Total Volume of Melted Snow : ~~2915.000~~ 2915.0 (mL)

1050.000
1865.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * EBW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	No:	ENVI-177-0312
Effective Date:	26-MAR-2012	Revision:	R6
Task:	Snow Sampling Field Sheet	By:	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSC-1 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 14:15

SAMPLED BY: SS, JG, GC **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 534930 **E** 7144118 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -1 °C **Wind Direction:** SW **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100% Fog

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	54	41	54	40	14	Y N	
	2	53	41	52	40	12	Y N	
	3	53	40	53	40	13	Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	64	47	54	40	14	Y N	
	2	60	46	54	40	14	Y N	
	3	60	48	55	40	15	Y N	
	4	54	47	54	40	14	Y N	1 of 2
	5	48	47	55	40	15	Y N	
	6	63	45.5	55	40	15	Y N	
	7	62	45	53	40	13	Y N	2 of 2
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1215.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.3 mg	119.9 mg	4.6 mg	leaves, twigs in sample
2				
3				
4				
Totals	115.3 mg	119.9 mg	4.6 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3110.000 (mL)

1755.000
1355.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL Equipment Blank

LOCATION NAME: SSCH-1 **DATE (yyyy-mm-dd):** 2017-04-01 **TIME (24:00):** 1642

SAMPLED BY: JG GL **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:** EBW

GPS COORDINATES (UTM): ______ **E** ______ **N (Zone)** ______ **NAD 83**

DESCRIPTION: Distance to Diavik ______ km & Direction ______ On: Land ☐ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -1 °C **Wind Direction:** SW **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☐ **Snow Condition:** Crystallized ☐ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : ________ (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.6	116.6	0	
2				
3				
4				
Totals				

Water Quality Bottles

Total Volume of Melted Snow : ________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * EBW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	030917-0309
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

Area:	8000	**No:**	ENVI-177-0312
Effective Date:	26-MAR-2012	**Revision:**	R6
Task:	Snow Sampling Field Sheet	**By:**	D. Dul
		Page:	1 of 2

GENERAL

LOCATION NAME: SSC-2 **DATE (yyyy-mm-dd):** 2017-04-07 **TIME (24:00):** 1500

SAMPLED BY: JG GC **TYPE OF SAMPLE:** Dust ☐ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0588718 **E** 7153311 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ____ km & Direction ____ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** N **Wind Speed (knots):** 17

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	64	45	53	40	13	Y N	
	2	65	46	53	40	13	Y N	
	3	60	50	54	40	14	Y N	
	4						Y N	
	Dust (Min. of 3 cores – Total Water Content SWE =/> 25)							
Water Quality Cores	1	59	49	55	40	15	Y N	
	2	57	43	52	40	12	Y N	
	3	57	47	53	40	13	Y N	Some little leaves in core
	4	50	42	51	40	11	Y N	1 of 2
	5	57	43	52	40	12	Y N	
	6	56	50	53	40	13	Y N	
	7	48	41	51	40	11	Y N	
	8	53	43	52	40	12	Y N	
	9	55	45	52	40	12	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
	Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)							

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

RioTinto

Snow Sampling Field Sheet			
		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 1295.000 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.3 mg	126.5 mg	11.2 mg	twigs
2				
3				
4				
Totals	115.3 mg	126.5 mg	11.2 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3565.000 (mL)

1925.000
1640.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: SSC-3 **DATE (yyyy-mm-dd):** 2017-04-03 **TIME (24:00):** 14:46

SAMPLED BY: GC, JG, SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 538629 **E** 7148753 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik ____ km & Direction ____ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -6 °C **Wind Direction:** N **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	110	91	78.5	40	38.5	Y N	
	2	110	94	76.5	40	36.5	Y N	
	3	108	95	77.5	40	37.5	Y N	
	4	~~x~~					Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	112	100	79.0	40	39	Y N	
	2	107	91	75.0	40	35	Y N	1 of 2
	3	110	75	68.0	40	28	Y N	2 of 2
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

Rio Tinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	Revision:	R6
Effective Date:	26-MAR-2012	By:	D. Dul
Task:	Snow Sampling Field Sheet		
		Page:	2 of 2

Dust Sample Filters

Total Volume of Melted Snow : 3440,000 (mL)

2310,000
1130,000

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.3 mg	165.0 mg	48.7 mg	leaves in sample
2				
3				
4				
Totals	116.3 mg	165.0 mg	48.7 mg	

Water Quality Bottles

Total Volume of Melted Snow : 3160.000 (mL)

2265,000
895.000

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Appendix D

Snow Water Chemistry Analytical Results

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Acidity (pH 4.5)	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25	0.50	QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25	0.50	QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25	0.50	QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25	0.50	QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.25	0.50	QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25	0.50	QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.25	0.50	QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25	0.50	QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	<0.50	0.25	0.50	QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	<0.50	0.25	0.50	QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.25	0.50	QW9647	GW	
	mg/L	SS3-6	4/3/2017	<0.50	0.25	0.50	QW9648	GW	
	mg/L	SS3-6	4/30/2017	<0.50	0.25	0.50	QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.25	0.50	QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25	0.50	QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25	0.50	QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.25	0.50	QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	<0.50	0.25	0.50	QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	<0.50	0.25	0.50	QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25	0.50	QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25	0.50	QW9656	GW	
Acidity (pH 8.3)	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25	0.50	QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25	0.50	QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.6	0.6	0.50	QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25	0.50	QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.25	0.50	QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.67	0.67	0.50	QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.57	0.57	0.50	QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.6	0.6	0.50	QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.50	0.25	0.50	QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	<0.50	0.25	0.50	QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.25	0.50	QW9647	GW	
	mg/L	SS3-6	4/3/2017	<0.50	0.25	0.50	QW9648	GW	
	mg/L	SS3-6	4/30/2017	<0.50	0.25	0.50	QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.25	0.50	QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25	0.50	QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25	0.50	QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.25	0.50	QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	<0.50	0.25	0.50	QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	<0.50	0.25	0.50	QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25	0.50	QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25	0.50	QW9656	GW	
Alkalinity (PP as $CaCO_3$)	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25	0.50	QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25	0.50	QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25	0.50	QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25	0.50	QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.25	0.50	QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25	0.50	QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.25	0.50	QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25	0.50	QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	<0.50	0.25	0.50	QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	<0.50	0.25	0.50	QW9646	GW	Sample received past method-specified hold time.
	mg/L	SS3-5	4/3/2017	<0.50	0.25	0.50	QW9647	GW	Sample received past method-specified hold time.
	mg/L	SS3-6	4/3/2017	<0.50	0.25	0.50	QW9648	GW	
	mg/L	SS3-6	4/30/2017	<0.50	0.25	0.50	QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.25	0.50	QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25	0.50	QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25	0.50	QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.25	0.50	QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	<0.50	0.25	0.50	QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	<0.50	0.25	0.50	QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25	0.50	QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25	0.50	QW9656	GW	
Alkalinity (Total as $CaCO_3$) - Total	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25	0.50	QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.63	0.63	0.50	QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	1.5	1.5	0.50	QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25	0.50	QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.56	0.56	0.50	QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.6	0.6	0.50	QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25	0.50	QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.54	0.54	0.50	QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25	0.50	QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.51	0.51	0.50	QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	3.98	3.98	0.50	QW9646	GW	Sample received past method-specified hold time.
	mg/L	SS3-5	4/3/2017	2.47	2.47	0.50	QW9647	GW	Sample received past method-specified hold time.
	mg/L	SS3-6	4/3/2017	6.29	6.29	0.50	QW9648	GW	Sample received past method-specified hold time.
	mg/L	SS3-6	4/30/2017	3.18	3.18	0.50	QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	3.32	3.32	0.50	QW9649	GW	Sample received past method-specified hold time.
	mg/L	SS3-8	4/3/2017	3.08	3.08	0.50	QW9650	GW	Sample received past method-specified hold time.
	mg/L	SS4-4	4/7/2017	1.89	1.89	0.50	QW9651	GW	
	mg/L	SS4-5	4/7/2017	1.12	1.12	0.50	QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	1.03	1.03	0.50	QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	3.2	3.2	0.50	QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25	0.50	QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25	0.50	QW9656	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Aluminum (Al) - Total	ug/L	CONTROL 1	4/1/2017	45.8	45.8		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0.05	0.0458		QW9657	GW	Automatically converted from value: 45.8 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	0.67	0.67		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	529	529		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0.53	0.529		QW9658	GW	Automatically converted from value: 529 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0.41	0.405		QW9659	GW	Automatically converted from value: 405 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	405	405		QW9659	GW	
	ug/L	SS1-4	4/7/2017	166	166		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0.17	0.166		QW9639	GW	Automatically converted from value: 166 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0.42	0.418		QW9640	GW	Automatically converted from value: 418 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	418	418		QW9640	GW	
	ug/L	SS2-1	4/8/2017	227	227		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.23	0.227		QW9641	GW	Automatically converted from value: 227 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0.13	0.125		QW9642	GW	Automatically converted from value: 125 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	125	125		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.16	0.16		QW9643	GW	Automatically converted from value: 160 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	160	160		QW9643	GW	
	ug/L	SS2-4	4/8/2017	109	109		QW9645	DUPW2	
	ug/L	SS2-4	4/8/2017	449	449		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.45	0.449		QW9644	DUPW1	Automatically converted from value: 449 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0.11	0.109		QW9645	DUPW2	Automatically converted from value: 109 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	3.95	3.95		QW9646	GW	Automatically converted from value: 3950 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	3950	3950		QW9646	GW	
	ug/L	SS3-5	4/3/2017	326	326		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.33	0.326		QW9647	GW	Automatically converted from value: 326 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	2.39	2.39		QW9648	GW	Automatically converted from value: 2390 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	2390	2390		QW9648	GW	
	ug/L	SS3-6	4/30/2017	836	836		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	674	674		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.67	0.674		QW9649	GW	Automatically converted from value: 674 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	1.42	1.42		QW9650	GW	Automatically converted from value: 1420 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	1420	1420		QW9650	GW	
	ug/L	SS4-4	4/7/2017	364	364		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0.36	0.364		QW9651	GW	Automatically converted from value: 364 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	1.7	1.7		QW9652	DUPW1	Automatically converted from value: 1700 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	1.31	1.31		QW9653	DUPW2	Automatically converted from value: 1310 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	1700	1700		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	1310	1310		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	1360	1360		QW9654	GW	
	mg/L	SS5-3	4/1/2017	1.36	1.36		QW9654	GW	Automatically converted from value: 1360 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0.1	0.102		QW9655	GW	Automatically converted from value: 102 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	102	102		QW9655	GW	
	ug/L	SS5-5	4/1/2017	156	156		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0.16	0.156		QW9656	GW	Automatically converted from value: 156 ug/L to mg/L.
Ammonia (N)	mg/L	CONTROL 1	4/1/2017	0.074	0.074		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0.027	0.027		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.083	0.083		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.065	0.065		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.13	0.13		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.054	0.054		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.11	0.11		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.13	0.13		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.12	0.12		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.084	0.084		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.097	0.097		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.1	0.1		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.22	0.22		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.12	0.12		QW9648	GW	
	mg/L	SS3-7	4/3/2017	0.11	0.11		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.11	0.11		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.11	0.11		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.14	0.14		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0.14	0.14		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	0.061	0.061		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.055	0.055		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.047	0.047		QW9656	GW	
Antimony (Sb) - Total	ug/L	CONTROL 1	4/1/2017	<0.020	0.01		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	<0.020	0.01		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.00001		QW9657	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	CONTROL 2	4/7/2017	<0.00	0.00001		QW9658	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	<0.020	0.01		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.000058		QW9659	GW	Automatically converted from value: 0.058 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.058	0.058		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.020	0.01		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00	0.00001		QW9639	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.00	0.00001		QW9640	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	<0.020	0.01		QW9640	GW	
	ug/L	SS2-1	4/8/2017	<0.020	0.01		QW9641	GW	
	mg/L	SS2-1	4/8/2017	<0.00	0.00001		QW9641	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	<0.00	0.00001		QW9642	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	<0.020	0.01		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.00	0.00001		QW9643	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	<0.020	0.01		QW9643	GW	
	ug/L	SS2-4	4/8/2017	<0.020	0.01		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.020	0.01		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.00	0.00001		QW9644	DUPW1	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.00001		QW9645	DUPW2	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000049		QW9646	GW	Automatically converted from value: 0.049 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.049	0.049		QW9646	GW	
	ug/L	SS3-5	4/3/2017	<0.020	0.01		QW9647	GW	
	mg/L	SS3-5	4/3/2017	<0.00	0.00001		QW9647	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.000039		QW9648	GW	Automatically converted from value: 0.039 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.039	0.039		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.025	0.025		QZ4969	GW	Resampled at corrected coordinate.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Antimony (Sb) -	ug/L	SS3-7	4/3/2017	0.028	0.028		QW9649	GW	
Total *(cont'd)*	mg/L	SS3-7	4/3/2017	0	0.000028		QW9649	GW	Automatically converted from value: 0.028 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000026		QW9650	GW	Automatically converted from value: 0.026 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.026	0.026		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.00	0.00001		QW9651	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	<0.020	0.01		QW9651	GW	
	ug/L	SS4-5	4/7/2017	0.03	0.03		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.025	0.025		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0	0.00003		QW9652	DUPW1	Automatically converted from value: 0.030 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000025		QW9653	DUPW2	Automatically converted from value: 0.025 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.000033		QW9654	GW	Automatically converted from value: 0.033 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	0.033	0.033		QW9654	GW	
	ug/L	SS5-4	4/1/2017	<0.020	0.01		QW9655	GW	
	mg/L	SS5-4	4/1/2017	<0.00	0.00001		QW9655	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	<0.00	0.00001		QW9656	GW	Automatically converted from value: <0.020 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	<0.020	0.01		QW9656	GW	
Arsenic (As) -	mg/L	CONTROL 1	4/1/2017	0	0.000022		QW9657	GW	Automatically converted from value: 0.022 ug/L to mg/L.
Total	ug/L	CONTROL 1	4/1/2017	0.022	0.022		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.020	0.01		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	0.12	0.12		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.00012		QW9658	GW	Automatically converted from value: 0.120 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.000076		QW9659	GW	Automatically converted from value: 0.076 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.076	0.076		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0	0.000034		QW9639	GW	Automatically converted from value: 0.034 ug/L to mg/L.
	ug/L	SS1-4	4/7/2017	0.034	0.034		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0	0.000102		QW9640	GW	Automatically converted from value: 0.102 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.102	0.102		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.052	0.052		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.000052		QW9641	GW	Automatically converted from value: 0.052 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.000056		QW9642	GW	Automatically converted from value: 0.056 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.056	0.056		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.000062		QW9643	GW	Automatically converted from value: 0.062 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.062	0.062		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.106	0.106		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.047	0.047		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.000106		QW9644	DUPW1	Automatically converted from value: 0.106 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.000047		QW9645	DUPW2	Automatically converted from value: 0.047 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000717		QW9646	GW	Automatically converted from value: 0.717 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.717	0.717		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.067	0.067		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000067		QW9647	GW	Automatically converted from value: 0.067 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.000362		QW9648	GW	Automatically converted from value: 0.362 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.362	0.362		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.166	0.166		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.15	0.15		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00015		QW9649	GW	Automatically converted from value: 0.150 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000288		QW9650	GW	Automatically converted from value: 0.288 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.288	0.288		QW9650	GW	
	ug/L	SS4-4	4/7/2017	0.088	0.088		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.000088		QW9651	GW	Automatically converted from value: 0.088 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000564		QW9652	DUPW1	Automatically converted from value: 0.564 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00071		QW9653	DUPW2	Automatically converted from value: 0.710 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	0.71	0.71		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	0.564	0.564		QW9652	DUPW1	
	ug/L	SS5-3	4/1/2017	0.205	0.205		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.000205		QW9654	GW	Automatically converted from value: 0.205 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.000032		QW9655	GW	Automatically converted from value: 0.032 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	0.032	0.032		QW9655	GW	
	ug/L	SS5-5	4/1/2017	0.074	0.074		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.000074		QW9656	GW	Automatically converted from value: 0.074 ug/L to mg/L.
Barium (Ba) -	ug/L	CONTROL 1	4/1/2017	<0.020	0.01		QV4618	EBW	
Total	ug/L	CONTROL 1	4/1/2017	1.51	1.51		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0	0.00151		QW9657	GW	Automatically converted from value: 1.51 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	8.32	8.32		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0.01	0.00832		QW9658	GW	Automatically converted from value: 8.32 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0.01	0.0109		QW9659	GW	Automatically converted from value: 10.9 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	10.9	10.9		QW9659	GW	
	ug/L	SS1-4	4/7/2017	2.46	2.46		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.00246		QW9639	GW	Automatically converted from value: 2.46 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0.01	0.00557		QW9640	GW	Automatically converted from value: 5.57 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	5.57	5.57		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0	0.0042		QW9641	GW	Automatically converted from value: 4.20 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	4.2	4.2		QW9641	GW	
	ug/L	SS2-2	4/8/2017	2.82	2.82		QW9642	GW	
	mg/L	SS2-2	4/8/2017	0	0.00282		QW9642	GW	Automatically converted from value: 2.82 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	0	0.00306		QW9643	GW	Automatically converted from value: 3.06 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	3.06	3.06		QW9643	GW	
	ug/L	SS2-4	4/8/2017	6.02	6.02		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	3.87	3.87		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.01	0.00602		QW9644	DUPW1	Automatically converted from value: 6.02 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.00387		QW9645	DUPW2	Automatically converted from value: 3.87 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.12	0.124		QW9646	GW	Automatically converted from value: 124 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	124	124		QW9646	GW	
	ug/L	SS3-5	4/3/2017	13.2	13.2		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.01	0.0132		QW9647	GW	Automatically converted from value: 13.2 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.09	0.0852		QW9648	GW	Automatically converted from value: 85.2 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	85.2	85.2		QW9648	GW	
	ug/L	SS3-6	4/30/2017	21.9	21.9		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	35.6	35.6		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.04	0.0356		QW9649	GW	Automatically converted from value: 35.6 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.05	0.0541		QW9650	GW	Automatically converted from value: 54.1 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	54.1	54.1		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.01	0.0105		QW9651	GW	Automatically converted from value: 10.5 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	10.5	10.5		QW9651	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Barium (Ba) - Total *(cont'd)*	ug/L	SS4-5	4/7/2017	25.9	25.9		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	18.2	18.2		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0.03	0.0259		QW9652	DUPW1	Automatically converted from value: 25.9 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.02	0.0182		QW9653	DUPW2	Automatically converted from value: 18.2 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0.02	0.0222		QW9654	GW	Automatically converted from value: 22.2 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	22.2	22.2		QW9654	GW	
	ug/L	SS5-4	4/1/2017	3.39	3.39		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0	0.00339		QW9655	GW	Automatically converted from value: 3.39 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.0031		QW9656	GW	Automatically converted from value: 3.10 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	3.1	3.1		QW9656	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.000005		QW9657	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.010	0.005		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.010	0.005		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0	0.000013		QW9658	GW	Automatically converted from value: 0.013 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.013	0.013		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.000016		QW9659	GW	Automatically converted from value: 0.016 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.016	0.016		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.012	0.012		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000012		QW9639	GW	Automatically converted from value: 0.012 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.000014		QW9640	GW	Automatically converted from value: 0.014 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.014	0.014		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0	0.000012		QW9641	GW	Automatically converted from value: 0.012 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	0.012	0.012		QW9641	GW	
	ug/L	SS2-2	4/8/2017	<0.010	0.005		QW9642	GW	
	mg/L	SS2-2	4/8/2017	<0.00	0.000005		QW9642	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	0	0.000011		QW9643	GW	Automatically converted from value: 0.011 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.011	0.011		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.02	0.02		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.010	0.005		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.00002		QW9644	DUPW1	Automatically converted from value: 0.020 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.000005		QW9645	DUPW2	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000132		QW9646	GW	Automatically converted from value: 0.132 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.132	0.132		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.011	0.011		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000011		QW9647	GW	Automatically converted from value: 0.011 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.000062		QW9648	GW	Automatically converted from value: 0.062 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.062	0.062		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.024	0.024		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.03	0.03		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00003		QW9649	GW	Automatically converted from value: 0.030 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000052		QW9650	GW	Automatically converted from value: 0.052 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.052	0.052		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.00002		QW9651	GW	Automatically converted from value: 0.020 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.02	0.02		QW9651	GW	
	ug/L	SS4-5	4/7/2017	0.029	0.029		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	0.033	0.033		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0	0.000033		QW9652	DUPW1	Automatically converted from value: 0.033 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000029		QW9653	DUPW2	Automatically converted from value: 0.029 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.00004		QW9654	GW	Automatically converted from value: 0.040 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	0.04	0.04		QW9654	GW	
	ug/L	SS5-4	4/1/2017	<0.010	0.005		QW9655	GW	
	mg/L	SS5-4	4/1/2017	<0.00	0.000005		QW9655	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	<0.00	0.000005		QW9656	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	<0.010	0.005		QW9656	GW	
Bicarbonate (HCO_3)	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.77	0.77		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	1.83	1.83		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.68	0.68		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.72	0.72		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.66	0.66		QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.62	0.62		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	4.86	4.86		QW9646	GW	
	mg/L	SS3-5	4/3/2017	3.01	3.01		QW9647	GW	
	mg/L	SS3-6	4/3/2017	7.67	7.67		QW9648	GW	Sample received past method-specified hold time.
	mg/L	SS3-6	4/30/2017	3.88	3.88		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	4.05	4.05		QW9649	GW	Sample received past method-specified hold time.
	mg/L	SS3-8	4/3/2017	3.76	3.76		QW9650	GW	Sample received past method-specified hold time.
	mg/L	SS4-4	4/7/2017	2.31	2.31		QW9651	GW	
	mg/L	SS4-5	4/7/2017	1.26	1.26		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	1.37	1.37		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	3.9	3.9		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25		QW9656	GW	
Bismuth (Bi) - Total	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.0000025		QW9657	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.024	0.024		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.000024		QW9658	GW	Automatically converted from value: 0.0240 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.0000131		QW9659	GW	Automatically converted from value: 0.0131 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.0131	0.0131		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.0066	0.0066		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.0000066		QW9639	GW	Automatically converted from value: 0.0066 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.0000163		QW9640	GW	Automatically converted from value: 0.0163 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.0163	0.0163		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0	0.0000112		QW9641	GW	Automatically converted from value: 0.0112 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	0.0112	0.0112		QW9641	GW	
	ug/L	SS2-2	4/8/2017	0.0067	0.0067		QW9642	GW	
	mg/L	SS2-2	4/8/2017	0	0.0000067		QW9642	GW	Automatically converted from value: 0.0067 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	0	0.000012		QW9643	GW	Automatically converted from value: 0.0120 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.012	0.012		QW9643	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Bismuth (Bi) - Total *(cont'd)*	ug/L	SS2-4	4/8/2017	0.0165	0.0165		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.0108	0.0108		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.0000165		QW9644	DUPW1	Automatically converted from value: 0.0165 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.0000108		QW9645	DUPW2	Automatically converted from value: 0.0108 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000203		QW9646	GW	Automatically converted from value: 0.203 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.203	0.203		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.0206	0.0206		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.0000206		QW9647	GW	Automatically converted from value: 0.0206 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.000189		QW9648	GW	Automatically converted from value: 0.189 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.189	0.189		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.05	0.05		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.0643	0.0643		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.0000643		QW9649	GW	Automatically converted from value: 0.0643 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.0000654		QW9650	GW	Automatically converted from value: 0.0654 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.0654	0.0654		QW9650	GW	
	ug/L	SS4-4	4/7/2017	0.0225	0.0225		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.0000225		QW9651	GW	Automatically converted from value: 0.0225 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000177		QW9652	DUPW1	Automatically converted from value: 0.177 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.0000681		QW9653	DUPW2	Automatically converted from value: 0.0681 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	0.177	0.177		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.0681	0.0681		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	0.154	0.154		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.000154		QW9654	GW	Automatically converted from value: 0.154 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.000005		QW9655	GW	Automatically converted from value: 0.0050 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	0.005	0.005		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.00	0.0000025		QW9656	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	<0.0050	0.0025		QW9656	GW	
Boron (B) - Total	mg/L	CONTROL 1	4/1/2017	<0.01	0.0025		QW9657	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<5.0	2.5		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<5.0	2.5		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	<0.01	0.0025		QW9658	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	<5.0	2.5		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.01	0.0025		QW9659	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	<5.0	2.5		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<5.0	2.5		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.01	0.0025		QW9639	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.01	0.0025		QW9640	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	<5.0	2.5		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.01	0.0025		QW9641	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	<5.0	2.5		QW9641	GW	
	ug/L	SS2-2	4/8/2017	<5.0	2.5		QW9642	GW	
	mg/L	SS2-2	4/8/2017	<0.01	0.0025		QW9642	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	<0.01	0.0025		QW9643	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	<5.0	2.5		QW9643	GW	
	ug/L	SS2-4	4/8/2017	<5.0	2.5		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<5.0	2.5		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.01	0.0025		QW9644	DUPW1	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.01	0.0025		QW9645	DUPW2	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	<0.01	0.0025		QW9646	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	<5.0	2.5		QW9646	GW	
	ug/L	SS3-5	4/3/2017	<5.0	2.5		QW9647	GW	
	mg/L	SS3-5	4/3/2017	<0.01	0.0025		QW9647	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	<0.01	0.0025		QW9648	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	<5.0	2.5		QW9648	GW	
	ug/L	SS3-6	4/30/2017	<10	5		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	<5.0	2.5		QW9649	GW	
	mg/L	SS3-7	4/3/2017	<0.01	0.0025		QW9649	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	<0.01	0.0025		QW9650	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	<5.0	2.5		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.01	0.0025		QW9651	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	<5.0	2.5		QW9651	GW	
	ug/L	SS4-5	4/7/2017	<5.0	2.5		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	<5.0	2.5		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	<0.01	0.0025		QW9652	DUPW1	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	<0.01	0.0025		QW9653	DUPW2	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	<0.01	0.0025		QW9654	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	<5.0	2.5		QW9654	GW	
	ug/L	SS5-4	4/1/2017	<5.0	2.5		QW9655	GW	
	mg/L	SS5-4	4/1/2017	<0.01	0.0025		QW9655	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	<0.01	0.0025		QW9656	GW	Automatically converted from value: <5.0 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	<5.0	2.5		QW9656	GW	
Cadmium (Cd) - Total	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.0000025		QW9657	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	CONTROL 2	4/7/2017	0	0.000008		QW9658	GW	Automatically converted from value: 0.0080 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.008	0.008		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.0000074		QW9659	GW	Automatically converted from value: 0.0074 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.0074	0.0074		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.005	0.005		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000005		QW9639	GW	Automatically converted from value: 0.0050 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.00	0.0000025		QW9640	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	<0.0050	0.0025		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0	0.0000145		QW9641	GW	Automatically converted from value: 0.0145 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	0.0145	0.0145		QW9641	GW	
	ug/L	SS2-2	4/8/2017	0.007	0.007		QW9642	GW	
	mg/L	SS2-2	4/8/2017	0	0.000007		QW9642	GW	Automatically converted from value: 0.0070 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	0	0.0000055		QW9643	GW	Automatically converted from value: 0.0055 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.0055	0.0055		QW9643	GW	
	ug/L	SS2-4	4/8/2017	<0.0050	0.0025		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.0056	0.0056		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.00	0.0000025		QW9644	DUPW1	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.0000056		QW9645	DUPW2	Automatically converted from value: 0.0056 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.0000678		QW9646	GW	Automatically converted from value: 0.0678 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.0678	0.0678		QW9646	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Cadmium (Cd) - Total *(cont'd)*	ug/L	SS3-5	4/3/2017	0.0082	0.0082		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.0000082		QW9647	GW	Automatically converted from value: 0.0082 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.0000392		QW9648	GW	Automatically converted from value: 0.0392 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.0392	0.0392		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.0124	0.0124		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.0113	0.0113		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.0000113		QW9649	GW	Automatically converted from value: 0.0113 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.0000308		QW9650	GW	Automatically converted from value: 0.0308 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.0308	0.0308		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.0000101		QW9651	GW	Automatically converted from value: 0.0101 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.0101	0.0101		QW9651	GW	
	ug/L	SS4-5	4/7/2017	0.0263	0.0263		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.0151	0.0151		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0	0.0000263		QW9652	DUPW1	Automatically converted from value: 0.0263 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.0000151		QW9653	DUPW2	Automatically converted from value: 0.0151 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.0000213		QW9654	GW	Automatically converted from value: 0.0213 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	0.0213	0.0213		QW9654	GW	
	ug/L	SS5-4	4/1/2017	<0.0050	0.0025		QW9655	GW	
	mg/L	SS5-4	4/1/2017	<0.00	0.0000025		QW9655	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	<0.00	0.0000025		QW9656	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	<0.0050	0.0025		QW9656	GW	
Calcium (Ca) - Total	mg/L	CONTROL 1	4/1/2017	0.105	0.105		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.395	0.395		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.615	0.615		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.134	0.134		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.171	0.171		QW9640	GW	
	mg/L	SS2-1	4/8/2017	2.27	2.27		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.209	0.209		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.178	0.178		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.245	0.245		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.266	0.266		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	5.11	5.11		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.853	0.853		QW9647	GW	
	mg/L	SS3-6	4/3/2017	4.01	4.01		QW9648	GW	
	mg/L	SS3-6	4/30/2017	1.56	1.56		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	1.95	1.95		QW9649	GW	
	mg/L	SS3-8	4/3/2017	1.63	1.63		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.728	0.728		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.815	0.815		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	1.07	1.07		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	1.67	1.67		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.239	0.239		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.226	0.226		QW9656	GW	
Carbonate (CO_3)	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25		QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.25		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.25		QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	<0.50	0.25		QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.25		QW9647	GW	
	mg/L	SS3-6	4/3/2017	<0.50	0.25		QW9648	GW	
	mg/L	SS3-6	4/30/2017	<0.50	0.25		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.25		QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25		QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	<0.50	0.25		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25		QW9656	GW	
Chloride (Cl) - Dissolved	mg/L	CONTROL 1	4/1/2017	<0.50	0.5		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.5		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.5		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.5		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.5		QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.5		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.5		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.5		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.5		QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.5		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	<0.50	0.5		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	<0.50	0.5		QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.5		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.56	0.56		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.76	0.76		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.5		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.52	0.52		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.5		QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.5		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	<0.50	0.5		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	<0.50	0.5		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.5		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.5		QW9656	GW	
Chromium (Cr) - Total	ug/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	1.32	1.32		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0	0.00132		QW9657	GW	Automatically converted from value: 1.32 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	6.38	6.38		QW9658	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Chromium (Cr) - Total *(cont'd)*	mg/L	CONTROL 2	4/7/2017	0.01	0.00638		QW9658	GW	Automatically converted from value: 6.38 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0.01	0.00606		QW9659	GW	Automatically converted from value: 6.06 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	6.06	6.06		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.881	0.881		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000881		QW9639	GW	Automatically converted from value: 0.881 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.00266		QW9640	GW	Automatically converted from value: 2.66 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	2.66	2.66		QW9640	GW	
	ug/L	SS2-1	4/8/2017	1.48	1.48		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.00148		QW9641	GW	Automatically converted from value: 1.48 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.000845		QW9642	GW	Automatically converted from value: 0.845 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.845	0.845		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.000942		QW9643	GW	Automatically converted from value: 0.942 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.942	0.942		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.599	0.599		QW9645	DUPW2	
	ug/L	SS2-4	4/8/2017	2.79	2.79		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0	0.00279		QW9644	DUPW1	Automatically converted from value: 2.79 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.000599		QW9645	DUPW2	Automatically converted from value: 0.599 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.09	0.0869		QW9646	GW	Automatically converted from value: 86.9 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	86.9	86.9		QW9646	GW	
	ug/L	SS3-5	4/3/2017	3.91	3.91		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.00391		QW9647	GW	Automatically converted from value: 3.91 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.04	0.0435		QW9648	GW	Automatically converted from value: 43.5 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	43.5	43.5		QW9648	GW	
	ug/L	SS3-6	4/30/2017	8.37	8.37		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	10.4	10.4		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.01	0.0104		QW9649	GW	Automatically converted from value: 10.4 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.03	0.0312		QW9650	GW	Automatically converted from value: 31.2 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	31.2	31.2		QW9650	GW	
	ug/L	SS4-4	4/7/2017	3.86	3.86		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.00386		QW9651	GW	Automatically converted from value: 3.86 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.01	0.0139		QW9652	DUPW1	Automatically converted from value: 13.9 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.01	0.0106		QW9653	DUPW2	Automatically converted from value: 10.6 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	13.9	13.9		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	10.6	10.6		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	17.2	17.2		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0.02	0.0172		QW9654	GW	Automatically converted from value: 17.2 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.00184		QW9655	GW	Automatically converted from value: 1.84 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	1.84	1.84		QW9655	GW	
	ug/L	SS5-5	4/1/2017	6.48	6.48		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0.01	0.00648		QW9656	GW	Automatically converted from value: 6.48 ug/L to mg/L.
Cobalt (Co) - Total	mg/L	CONTROL 1	4/1/2017	0	0.0000797		QW9657	GW	Automatically converted from value: 0.0797 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	0.0797	0.0797		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	0.668	0.668		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.000668		QW9658	GW	Automatically converted from value: 0.668 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.000774		QW9659	GW	Automatically converted from value: 0.774 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.774	0.774		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.149	0.149		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000149		QW9639	GW	Automatically converted from value: 0.149 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.00038		QW9640	GW	Automatically converted from value: 0.380 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.38	0.38		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.315	0.315		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.000315		QW9641	GW	Automatically converted from value: 0.315 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.000142		QW9642	GW	Automatically converted from value: 0.142 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.142	0.142		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.000174		QW9643	GW	Automatically converted from value: 0.174 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.174	0.174		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.399	0.399		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.11	0.11		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.000399		QW9644	DUPW1	Automatically converted from value: 0.399 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.00011		QW9645	DUPW2	Automatically converted from value: 0.110 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.01	0.012		QW9646	GW	Automatically converted from value: 12.0 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	12	12		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.615	0.615		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000615		QW9647	GW	Automatically converted from value: 0.615 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.01	0.00632		QW9648	GW	Automatically converted from value: 6.32 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	6.32	6.32		QW9648	GW	
	ug/L	SS3-6	4/30/2017	1.48	1.48		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1.64	1.64		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00164		QW9649	GW	Automatically converted from value: 1.64 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.0049		QW9650	GW	Automatically converted from value: 4.90 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	4.9	4.9		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.000642		QW9651	GW	Automatically converted from value: 0.642 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.642	0.642		QW9651	GW	
	ug/L	SS4-5	4/7/2017	2.3	2.3		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	1.46	1.46		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0	0.0023		QW9652	DUPW1	Automatically converted from value: 2.30 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00146		QW9653	DUPW2	Automatically converted from value: 1.46 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.00207		QW9654	GW	Automatically converted from value: 2.07 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	2.07	2.07		QW9654	GW	
	ug/L	SS5-4	4/1/2017	0.188	0.188		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0	0.000188		QW9655	GW	Automatically converted from value: 0.188 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.000225		QW9656	GW	Automatically converted from value: 0.225 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	0.225	0.225		QW9656	GW	
Conductivity	us/cm	CONTROL 1	4/1/2017	1.1	1.1		QV4618	EBW	
	us/cm	CONTROL 1	4/1/2017	3.4	3.4		QW9657	GW	
	us/cm	CONTROL 2	4/7/2017	4	4		QW9658	GW	
	us/cm	CONTROL 3	4/3/2017	4.4	4.4		QW9659	GW	
	us/cm	SS1-4	4/7/2017	4.2	4.2		QW9639	GW	
	us/cm	SS1-5	4/7/2017	3	3		QW9640	GW	
	us/cm	SS2-1	4/8/2017	3.5	3.5		QW9641	GW	
	us/cm	SS2-2	4/8/2017	5	5		QW9642	GW	
	us/cm	SS2-3	4/8/2017	4.5	4.5		QW9643	GW	
	us/cm	SS2-4	4/8/2017	4.2	4.2		QW9645	DUPW2	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Conductivity *(cont'd)*	us/cm	SS2-4	4/8/2017	3.9	3.9		QW9644	DUPW1	
	us/cm	SS3-4	4/3/2017	12.9	12.9		QW9646	GW	
	us/cm	SS3-5	4/3/2017	6.7	6.7		QW9647	GW	
	us/cm	SS3-6	4/3/2017	15.8	15.8		QW9648	GW	
	us/cm	SS3-6	4/30/2017	12.2	12.2		QZ4969	GW	Resampled at corrected coordinate.
	us/cm	SS3-7	4/3/2017	12.5	12.5		QW9649	GW	
	us/cm	SS3-8	4/3/2017	8.4	8.4		QW9650	GW	
	us/cm	SS4-4	4/7/2017	6.7	6.7		QW9651	GW	
	us/cm	SS4-5	4/7/2017	5.3	5.3		QW9653	DUPW2	
	us/cm	SS4-5	4/7/2017	5.2	5.2		QW9652	DUPW1	
	us/cm	SS5-3	4/1/2017	7.4	7.4		QW9654	GW	
	us/cm	SS5-4	4/1/2017	2.9	2.9		QW9655	GW	
	us/cm	SS5-5	4/1/2017	2.7	2.7		QW9656	GW	
Copper (Cu) - Total	mg/L	CONTROL 1	4/1/2017	0	0.000139		QW9657	GW	Automatically converted from value: 0.139 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	0.139	0.139		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	0.742	0.742		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.000742		QW9658	GW	Automatically converted from value: 0.742 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.000555		QW9659	GW	Automatically converted from value: 0.555 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.555	0.555		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.261	0.261		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000261		QW9639	GW	Automatically converted from value: 0.261 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.000477		QW9640	GW	Automatically converted from value: 0.477 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.477	0.477		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.619	0.619		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.000619		QW9641	GW	Automatically converted from value: 0.619 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.000229		QW9642	GW	Automatically converted from value: 0.229 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.229	0.229		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.000256		QW9643	GW	Automatically converted from value: 0.256 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.256	0.256		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.429	0.429		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.264	0.264		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.000429		QW9644	DUPW1	Automatically converted from value: 0.429 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.000264		QW9645	DUPW2	Automatically converted from value: 0.264 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.01	0.00808		QW9646	GW	Automatically converted from value: 8.08 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	8.08	8.08		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.569	0.569		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000569		QW9647	GW	Automatically converted from value: 0.569 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.00449		QW9648	GW	Automatically converted from value: 4.49 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	4.49	4.49		QW9648	GW	
	ug/L	SS3-6	4/30/2017	1.28	1.28		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1.38	1.38		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00138		QW9649	GW	Automatically converted from value: 1.38 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.00372		QW9650	GW	Automatically converted from value: 3.72 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	3.72	3.72		QW9650	GW	
	ug/L	SS4-4	4/7/2017	0.679	0.679		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.000679		QW9651	GW	Automatically converted from value: 0.679 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00235		QW9652	DUPW1	Automatically converted from value: 2.35 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00205		QW9653	DUPW2	Automatically converted from value: 2.05 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	2.35	2.35		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	2.05	2.05		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	2.41	2.41		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.00241		QW9654	GW	Automatically converted from value: 2.41 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.000317		QW9655	GW	Automatically converted from value: 0.317 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	0.317	0.317		QW9655	GW	
	ug/L	SS5-5	4/1/2017	0.514	0.514		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.000514		QW9656	GW	Automatically converted from value: 0.514 ug/L to mg/L.
Fluoride (F)	mg/L	CONTROL 1	4/1/2017	0.013	0.013		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	0.014	0.014		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	0.015	0.015		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.015	0.015		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.016	0.016		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.016	0.016		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.015	0.015		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.015	0.015		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.015	0.015		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.015	0.015		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.015	0.015		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	0.016	0.016		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.015	0.015		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.017	0.017		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.014	0.014		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	0.016	0.016		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.015	0.015		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.015	0.015		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.015	0.015		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0.015	0.015		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	0.017	0.017		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.016	0.016		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.014	0.014		QW9656	GW	
Hardness (as $CACO_3$) - Total	mg/L	CONTROL 1	4/1/2017	1	1		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	9.18	9.18		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	10.4	10.4		QW9659	GW	
	mg/L	SS1-4	4/7/2017	1.39	1.39		QW9639	GW	
	mg/L	SS1-5	4/7/2017	3.67	3.67		QW9640	GW	
	mg/L	SS2-1	4/8/2017	10.1	10.1		QW9641	GW	
	mg/L	SS2-2	4/8/2017	1.51	1.51		QW9642	GW	
	mg/L	SS2-3	4/8/2017	1.52	1.52		QW9643	GW	
	mg/L	SS2-4	4/8/2017	3.79	3.79		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	1.42	1.42		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	143	143		QW9646	GW	
	mg/L	SS3-5	4/3/2017	7.53	7.53		QW9647	GW	
	mg/L	SS3-6	4/3/2017	75.8	75.8		QW9648	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Hardness (as $CACO_3$) - Total *(cont'd)*	mg/L	SS3-6	4/30/2017	15.5	15.5		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	20.6	20.6		QW9649	GW	
	mg/L	SS3-8	4/3/2017	50	50		QW9650	GW	
	mg/L	SS4-4	4/7/2017	7.19	7.19		QW9651	GW	
	mg/L	SS4-5	4/7/2017	20.9	20.9		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	13.8	13.8		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	22.6	22.6		QW9654	GW	
	mg/L	SS5-4	4/1/2017	2.22	2.22		QW9655	GW	
	mg/L	SS5-5	4/1/2017	3.43	3.43		QW9656	GW	
Hydroxide (OH)	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25		QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.25		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.25		QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	<0.50	0.25		QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.25		QW9647	GW	
	mg/L	SS3-6	4/3/2017	<0.50	0.25		QW9648	GW	
	mg/L	SS3-6	4/30/2017	<0.50	0.25		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.25		QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25		QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	<0.50	0.25		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25		QW9656	GW	
Iron (Fe) - Total	ug/L	CONTROL 1	4/1/2017	3.2	3.2		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	0.13	0.125		QW9657	GW	Automatically converted from value: 125 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	125	125		QW9657	GW	
	ug/L	CONTROL 2	4/7/2017	1010	1010		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	1.01	1.01		QW9658	GW	Automatically converted from value: 1010 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0.87	0.872		QW9659	GW	Automatically converted from value: 872 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	872	872		QW9659	GW	
	ug/L	SS1-4	4/7/2017	262	262		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0.26	0.262		QW9639	GW	Automatically converted from value: 262 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0.7	0.705		QW9640	GW	Automatically converted from value: 705 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	705	705		QW9640	GW	
	ug/L	SS2-1	4/8/2017	283	283		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.28	0.283		QW9641	GW	Automatically converted from value: 283 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0.18	0.184		QW9642	GW	Automatically converted from value: 184 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	184	184		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.25	0.25		QW9643	GW	Automatically converted from value: 250 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	250	250		QW9643	GW	
	ug/L	SS2-4	4/8/2017	763	763		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	148	148		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.76	0.763		QW9644	DUPW1	Automatically converted from value: 763 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0.15	0.148		QW9645	DUPW2	Automatically converted from value: 148 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	10.5	10.5		QW9646	GW	Automatically converted from value: 10500 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	10500	10500		QW9646	GW	
	ug/L	SS3-5	4/3/2017	599	599		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.6	0.599		QW9647	GW	Automatically converted from value: 599 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	5.89	5.89		QW9648	GW	Automatically converted from value: 5890 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	5890	5890		QW9648	GW	
	ug/L	SS3-6	4/30/2017	1410	1410		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1430	1430		QW9649	GW	
	mg/L	SS3-7	4/3/2017	1.43	1.43		QW9649	GW	Automatically converted from value: 1430 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	3.79	3.79		QW9650	GW	Automatically converted from value: 3790 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	3790	3790		QW9650	GW	
	ug/L	SS4-4	4/7/2017	639	639		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0.64	0.639		QW9651	GW	Automatically converted from value: 639 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	2.92	2.92		QW9652	DUPW1	Automatically converted from value: 2920 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	2.2	2.2		QW9653	DUPW2	Automatically converted from value: 2200 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	2920	2920		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	2200	2200		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	2830	2830		QW9654	GW	
	mg/L	SS5-3	4/1/2017	2.83	2.83		QW9654	GW	Automatically converted from value: 2830 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0.21	0.207		QW9655	GW	Automatically converted from value: 207 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	207	207		QW9655	GW	
	ug/L	SS5-5	4/1/2017	484	484		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0.48	0.484		QW9656	GW	Automatically converted from value: 484 ug/L to mg/L.
Lead (Pb) - Total	mg/L	CONTROL 1	4/1/2017	0	0.0000822		QW9657	GW	Automatically converted from value: 0.0822 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	0.0822	0.0822		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	0.514	0.514		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.000514		QW9658	GW	Automatically converted from value: 0.514 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.000299		QW9659	GW	Automatically converted from value: 0.299 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.299	0.299		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.204	0.204		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000204		QW9639	GW	Automatically converted from value: 0.204 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.000298		QW9640	GW	Automatically converted from value: 0.298 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.298	0.298		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.24	0.24		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.00024		QW9641	GW	Automatically converted from value: 0.240 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.000327		QW9642	GW	Automatically converted from value: 0.327 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.327	0.327		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.000259		QW9643	GW	Automatically converted from value: 0.259 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.259	0.259		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.145	0.145		QW9645	DUPW2	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Lead (Pb) - Total *(cont'd)*	ug/L	SS2-4	4/8/2017	0.325	0.325		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0	0.000325		QW9644	DUPW1	Automatically converted from value: 0.325 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.000145		QW9645	DUPW2	Automatically converted from value: 0.145 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.00349		QW9646	GW	Automatically converted from value: 3.49 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	3.49	3.49		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.756	0.756		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000756		QW9647	GW	Automatically converted from value: 0.756 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.00239		QW9648	GW	Automatically converted from value: 2.39 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	2.39	2.39		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.715	0.715		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.962	0.962		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.000962		QW9649	GW	Automatically converted from value: 0.962 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.00126		QW9650	GW	Automatically converted from value: 1.26 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	1.26	1.26		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.000418		QW9651	GW	Automatically converted from value: 0.418 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.418	0.418		QW9651	GW	
	ug/L	SS4-5	4/7/2017	1.36	1.36		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	1.23	1.23		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0	0.00136		QW9652	DUPW1	Automatically converted from value: 1.36 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00123		QW9653	DUPW2	Automatically converted from value: 1.23 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.00144		QW9654	GW	Automatically converted from value: 1.44 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	1.44	1.44		QW9654	GW	
	ug/L	SS5-4	4/1/2017	0.133	0.133		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0	0.000133		QW9655	GW	Automatically converted from value: 0.133 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.000199		QW9656	GW	Automatically converted from value: 0.199 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	0.199	0.199		QW9656	GW	
Lithium (Li) - Total	mg/L	CONTROL 1	4/1/2017	<0.00	0.00025		QW9657	GW	Automatically converted from value: <0.50 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.50	0.25		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	1.31	1.31		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.00131		QW9658	GW	Automatically converted from value: 1.31 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.00089		QW9659	GW	Automatically converted from value: 0.89 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.89	0.89		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.50	0.25		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00	0.00025		QW9639	GW	Automatically converted from value: <0.50 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.00117		QW9640	GW	Automatically converted from value: 1.17 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	1.17	1.17		QW9640	GW	
	ug/L	SS2-1	4/8/2017	1.15	1.15		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.00115		QW9641	GW	Automatically converted from value: 1.15 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	<0.00	0.00025		QW9642	GW	Automatically converted from value: <0.50 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	<0.50	0.25		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.00055		QW9643	GW	Automatically converted from value: 0.55 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.55	0.55		QW9643	GW	
	ug/L	SS2-4	4/8/2017	1.34	1.34		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.50	0.25		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.00134		QW9644	DUPW1	Automatically converted from value: 1.34 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.00025		QW9645	DUPW2	Automatically converted from value: <0.50 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.01	0.00863		QW9646	GW	Automatically converted from value: 8.63 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	8.63	8.63		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.89	0.89		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.00089		QW9647	GW	Automatically converted from value: 0.89 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.01	0.00724		QW9648	GW	Automatically converted from value: 7.24 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	7.24	7.24		QW9648	GW	
	ug/L	SS3-6	4/30/2017	2.61	2.61		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1.74	1.74		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00174		QW9649	GW	Automatically converted from value: 1.74 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.00307		QW9650	GW	Automatically converted from value: 3.07 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	3.07	3.07		QW9650	GW	
	ug/L	SS4-4	4/7/2017	1.07	1.07		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.00107		QW9651	GW	Automatically converted from value: 1.07 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.01	0.00603		QW9652	DUPW1	Automatically converted from value: 6.03 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00441		QW9653	DUPW2	Automatically converted from value: 4.41 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	6.03	6.03		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	4.41	4.41		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	4.52	4.52		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.00452		QW9654	GW	Automatically converted from value: 4.52 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	<0.00	0.00025		QW9655	GW	Automatically converted from value: <0.50 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	<0.50	0.25		QW9655	GW	
	ug/L	SS5-5	4/1/2017	<0.50	0.25		QW9656	GW	
	mg/L	SS5-5	4/1/2017	<0.00	0.00025		QW9656	GW	Automatically converted from value: <0.50 ug/L to mg/L.
Magnesium (Mg) - Total	ug/L	CONTROL 1	4/1/2017	179	179		QW9657	GW	Automatically converted from value: 0.179 mg/L to ug/L.
	mg/L	CONTROL 1	4/1/2017	0.179	0.179		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	1.99	1.99		QW9658	GW	
	ug/L	CONTROL 2	4/7/2017	1990	1990		QW9658	GW	Automatically converted from value: 1.99 mg/L to ug/L.
	ug/L	CONTROL 3	4/3/2017	2160	2160		QW9659	GW	Automatically converted from value: 2.16 mg/L to ug/L.
	mg/L	CONTROL 3	4/3/2017	2.16	2.16		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.257	0.257		QW9639	GW	
	ug/L	SS1-4	4/7/2017	257	257		QW9639	GW	Automatically converted from value: 0.257 mg/L to ug/L.
	ug/L	SS1-5	4/7/2017	787	787		QW9640	GW	Automatically converted from value: 0.787 mg/L to ug/L.
	mg/L	SS1-5	4/7/2017	0.787	0.787		QW9640	GW	
	mg/L	SS2-1	4/8/2017	1.07	1.07		QW9641	GW	
	ug/L	SS2-1	4/8/2017	1070	1070		QW9641	GW	Automatically converted from value: 1.07 mg/L to ug/L.
	ug/L	SS2-2	4/8/2017	240	240		QW9642	GW	Automatically converted from value: 0.240 mg/L to ug/L.
	mg/L	SS2-2	4/8/2017	0.24	0.24		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.262	0.262		QW9643	GW	
	ug/L	SS2-3	4/8/2017	262	262		QW9643	GW	Automatically converted from value: 0.262 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	773	773		QW9644	DUPW1	Automatically converted from value: 0.773 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	184	184		QW9645	DUPW2	Automatically converted from value: 0.184 mg/L to ug/L.
	mg/L	SS2-4	4/8/2017	0.184	0.184		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.773	0.773		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	31.7	31.7		QW9646	GW	
	ug/L	SS3-4	4/3/2017	31700	31700		QW9646	GW	Automatically converted from value: 31.7 mg/L to ug/L.
	ug/L	SS3-5	4/3/2017	1310	1310		QW9647	GW	Automatically converted from value: 1.31 mg/L to ug/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Magnesium (Mg) - Total *(cont'd)*	mg/L	SS3-5	4/3/2017	1.31	1.31		QW9647	GW	
	mg/L	SS3-6	4/3/2017	16	16		QW9648	GW	
	ug/L	SS3-6	4/3/2017	16000	16000		QW9648	GW	Automatically converted from value: 16.0 mg/L to ug/L.
	mg/L	SS3-6	4/30/2017	2.81	2.81		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	3820	3820		QW9649	GW	Automatically converted from value: 3.82 mg/L to ug/L.
	mg/L	SS3-7	4/3/2017	3.82	3.82		QW9649	GW	
	mg/L	SS3-8	4/3/2017	11.2	11.2		QW9650	GW	
	ug/L	SS3-8	4/3/2017	11200	11200		QW9650	GW	Automatically converted from value: 11.2 mg/L to ug/L.
	ug/L	SS4-4	4/7/2017	1300	1300		QW9651	GW	Automatically converted from value: 1.30 mg/L to ug/L.
	mg/L	SS4-4	4/7/2017	1.3	1.3		QW9651	GW	
	mg/L	SS4-5	4/7/2017	4.42	4.42		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	2.85	2.85		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	4420	4420		QW9652	DUPW1	Automatically converted from value: 4.42 mg/L to ug/L.
	ug/L	SS4-5	4/7/2017	2850	2850		QW9653	DUPW2	Automatically converted from value: 2.85 mg/L to ug/L.
	ug/L	SS5-3	4/1/2017	4480	4480		QW9654	GW	Automatically converted from value: 4.48 mg/L to ug/L.
	mg/L	SS5-3	4/1/2017	4.48	4.48		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.395	0.395		QW9655	GW	
	ug/L	SS5-4	4/1/2017	395	395		QW9655	GW	Automatically converted from value: 0.395 mg/L to ug/L.
	ug/L	SS5-5	4/1/2017	696	696		QW9656	GW	Automatically converted from value: 0.696 mg/L to ug/L.
	mg/L	SS5-5	4/1/2017	0.696	0.696		QW9656	GW	
Manganese (Mn) - Total	mg/L	CONTROL 1	4/1/2017	0	0.00202		QW9657	GW	Automatically converted from value: 2.02 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	2.02	2.02		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	0.063	0.063		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	14.2	14.2		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0.01	0.0142		QW9658	GW	Automatically converted from value: 14.2 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0.01	0.0126		QW9659	GW	Automatically converted from value: 12.6 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	12.6	12.6		QW9659	GW	
	ug/L	SS1-4	4/7/2017	3.64	3.64		QW9639	GW	(10% of analytes failure allowed).
	mg/L	SS1-4	4/7/2017	0	0.00364		QW9639	GW	Matrix Spike outside acceptance criteria (10% of analytes failure
	mg/L	SS1-5	4/7/2017	0.01	0.00915		QW9640	GW	Automatically converted from value: 9.15 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	9.15	9.15		QW9640	GW	
	ug/L	SS2-1	4/8/2017	29.6	29.6		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.03	0.0296		QW9641	GW	Automatically converted from value: 29.6 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.00352		QW9642	GW	Automatically converted from value: 3.52 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	3.52	3.52		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.00434		QW9643	GW	Automatically converted from value: 4.34 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	4.34	4.34		QW9643	GW	
	ug/L	SS2-4	4/8/2017	10.1	10.1		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	3.83	3.83		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.01	0.0101		QW9644	DUPW1	Automatically converted from value: 10.1 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.00383		QW9645	DUPW2	Automatically converted from value: 3.83 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.19	0.192		QW9646	GW	Automatically converted from value: 192 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	192	192		QW9646	GW	
	ug/L	SS3-5	4/3/2017	11.2	11.2		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.01	0.0112		QW9647	GW	Automatically converted from value: 11.2 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.11	0.112		QW9648	GW	Automatically converted from value: 112 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	112	112		QW9648	GW	
	ug/L	SS3-6	4/30/2017	23.6	23.6		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	29.1	29.1		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.03	0.0291		QW9649	GW	Automatically converted from value: 29.1 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.07	0.0717		QW9650	GW	Automatically converted from value: 71.7 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	71.7	71.7		QW9650	GW	
	ug/L	SS4-4	4/7/2017	11.6	11.6		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0.01	0.0116		QW9651	GW	Automatically converted from value: 11.6 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.05	0.0468		QW9652	DUPW1	Automatically converted from value: 46.8 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.03	0.0315		QW9653	DUPW2	Automatically converted from value: 31.5 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	46.8	46.8		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	31.5	31.5		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	46	46		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0.05	0.046		QW9654	GW	Automatically converted from value: 46.0 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.0038		QW9655	GW	Automatically converted from value: 3.80 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	3.8	3.8		QW9655	GW	
	ug/L	SS5-5	4/1/2017	4.93	4.93		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.00493		QW9656	GW	Automatically converted from value: 4.93 ug/L to mg/L.
Mercury (Hg) - Total	mg/L	CONTROL 1	4/1/2017	<0.00000	0.000001		QW9657	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.0020	0.001		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	<0.0020	0.001		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	<0.00000	0.000001		QW9658	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	<0.00000	0.000001		QW9659	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	<0.0020	0.001		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.0020	0.001		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00000	0.000001		QW9639	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.00000	0.000001		QW9640	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	<0.0020	0.001		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.00000	0.000001		QW9641	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	<0.0020	0.001		QW9641	GW	
	ug/L	SS2-2	4/8/2017	0.003	0.003		QW9642	GW	
	mg/L	SS2-2	4/8/2017	0	0.000003		QW9642	GW	Automatically converted from value: 0.0030 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	0	0.0000023		QW9643	GW	Automatically converted from value: 0.0023 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.0023	0.0023		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.0021	0.0021		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.0020	0.001		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.0000021		QW9644	DUPW1	Automatically converted from value: 0.0021 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00000	0.000001		QW9645	DUPW2	Automatically converted from value: <0.0020 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	<0.00000	0.000001		QW9646	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	<0.0020	0.001		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.0036	0.0036		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.0000036		QW9647	GW	Automatically converted from value: 0.0036 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.0000021		QW9648	GW	Automatically converted from value: 0.0021 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.0021	0.0021		QW9648	GW	
	ug/L	SS3-6	4/30/2017	<0.0020	0.001		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	<0.0020	0.001		QW9649	GW	
	mg/L	SS3-7	4/3/2017	<0.00000	0.000001		QW9649	GW	Automatically converted from value: <0.0020 ug/L to mg/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Mercury (Hg) - Total *(cont'd)*	mg/L	SS3-8	4/3/2017	<0.00000	0.000001		QW9650	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	<0.0020	0.001		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.00000	0.000001		QW9651	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	<0.0020	0.001		QW9651	GW	
	ug/L	SS4-5	4/7/2017	0.0022	0.0022		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	<0.0020	0.001		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	<0.00000	0.000001		QW9652	DUPW1	Automatically converted from value: <0.0020 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.0000022		QW9653	DUPW2	Automatically converted from value: 0.0022 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	<0.00000	0.000001		QW9654	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	<0.0020	0.001		QW9654	GW	
	ug/L	SS5-4	4/1/2017	<0.0020	0.001		QW9655	GW	
	mg/L	SS5-4	4/1/2017	<0.00000	0.000001		QW9655	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	<0.00000	0.000001		QW9656	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	<0.0020	0.001		QW9656	GW	
Molybdenum (Mo) - Total	ug/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	0.095	0.095		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0	0.000095		QW9657	GW	Automatically converted from value: 0.095 ug/L to mg/L.
	mg/L	CONTROL 2	4/7/2017	0	0.000111		QW9658	GW	Automatically converted from value: 0.111 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.111	0.111		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.0001		QW9659	GW	Automatically converted from value: 0.100 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.1	0.1		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.050	0.025		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00	0.000025		QW9639	GW	Automatically converted from value: <0.050 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.00	0.000025		QW9640	GW	Automatically converted from value: <0.050 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	<0.050	0.025		QW9640	GW	
	ug/L	SS2-1	4/8/2017	<0.050	0.025		QW9641	GW	
	mg/L	SS2-1	4/8/2017	<0.00	0.000025		QW9641	GW	Automatically converted from value: <0.050 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	<0.00	0.000025		QW9642	GW	Automatically converted from value: <0.050 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	<0.050	0.025		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.000324		QW9643	GW	Automatically converted from value: 0.324 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.324	0.324		QW9643	GW	
	ug/L	SS2-4	4/8/2017	<0.050	0.025		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.050	0.025		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.00	0.000025		QW9644	DUPW1	Automatically converted from value: <0.050 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.000025		QW9645	DUPW2	Automatically converted from value: <0.050 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000647		QW9646	GW	Automatically converted from value: 0.647 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.647	0.647		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.108	0.108		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000108		QW9647	GW	Automatically converted from value: 0.108 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.0021		QW9648	GW	Automatically converted from value: 2.10 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	2.1	2.1		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.194	0.194		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.266	0.266		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.000266		QW9649	GW	Automatically converted from value: 0.266 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000345		QW9650	GW	Automatically converted from value: 0.345 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.345	0.345		QW9650	GW	
	ug/L	SS4-4	4/7/2017	0.108	0.108		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.000108		QW9651	GW	Automatically converted from value: 0.108 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000215		QW9652	DUPW1	Automatically converted from value: 0.215 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.0002		QW9653	DUPW2	Automatically converted from value: 0.200 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	0.215	0.215		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.2	0.2		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	0.538	0.538		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.000538		QW9654	GW	Automatically converted from value: 0.538 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.000117		QW9655	GW	Automatically converted from value: 0.117 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	0.117	0.117		QW9655	GW	
	ug/L	SS5-5	4/1/2017	0.444	0.444		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.000444		QW9656	GW	Automatically converted from value: 0.444 ug/L to mg/L.
Nickel (Ni) - Total	mg/L	CONTROL 1	4/1/2017	0	0.00117		QW9657	GW	Automatically converted from value: 1.17 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	1.17	1.17		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	0.043	0.043		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	8.65	8.65		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0.01	0.00865		QW9658	GW	Automatically converted from value: 8.65 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0.01	0.0125		QW9659	GW	Automatically converted from value: 12.5 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	12.5	12.5		QW9659	GW	
	ug/L	SS1-4	4/7/2017	1.42	1.42		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.00142		QW9639	GW	Automatically converted from value: 1.42 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.0037		QW9640	GW	Automatically converted from value: 3.70 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	3.7	3.7		QW9640	GW	
	ug/L	SS2-1	4/8/2017	2.78	2.78		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.00278		QW9641	GW	Automatically converted from value: 2.78 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.00157		QW9642	GW	Automatically converted from value: 1.57 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	1.57	1.57		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.00184		QW9643	GW	Automatically converted from value: 1.84 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	1.84	1.84		QW9643	GW	
	ug/L	SS2-4	4/8/2017	3.62	3.62		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	1.35	1.35		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.00362		QW9644	DUPW1	Automatically converted from value: 3.62 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.00135		QW9645	DUPW2	Automatically converted from value: 1.35 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.23	0.226		QW9646	GW	Automatically converted from value: 226 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	226	226		QW9646	GW	
	ug/L	SS3-5	4/3/2017	10.7	10.7		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.01	0.0107		QW9647	GW	Automatically converted from value: 10.7 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.12	0.116		QW9648	GW	Automatically converted from value: 116 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	116	116		QW9648	GW	
	ug/L	SS3-6	4/30/2017	23.1	23.1		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	28.5	28.5		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.03	0.0285		QW9649	GW	Automatically converted from value: 28.5 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.08	0.0798		QW9650	GW	Automatically converted from value: 79.8 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	79.8	79.8		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.01	0.00887		QW9651	GW	Automatically converted from value: 8.87 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	8.87	8.87		QW9651	GW	
	ug/L	SS4-5	4/7/2017	22.9	22.9		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	15	15		QW9653	DUPW2	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Nickel (Ni) - Total *(cont'd)*	mg/L	SS4-5	4/7/2017	0.02	0.0229		QW9652	DUPW1	Automatically converted from value: 22.9 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.01	0.015		QW9653	DUPW2	Automatically converted from value: 15.0 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0.03	0.0289		QW9654	GW	Automatically converted from value: 28.9 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	28.9	28.9		QW9654	GW	
	ug/L	SS5-4	4/1/2017	2.92	2.92		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0	0.00292		QW9655	GW	Automatically converted from value: 2.92 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.0032		QW9656	GW	Automatically converted from value: 3.20 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	3.2	3.2		QW9656	GW	
Nitrate (N)	mg/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	0.0797	0.0797		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	0.107	0.107		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.0782	0.0782		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.125	0.125		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.0769	0.0769		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.112	0.112		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.151	0.151		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.136	0.136		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.125	0.125		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.12	0.12		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	0.106	0.106		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.109	0.109		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.133	0.133		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.155	0.155		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	0.0933	0.0933		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.0867	0.0867		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.129	0.129		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.147	0.147		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0.145	0.145		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	0.0747	0.0747		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.0773	0.0773		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.0695	0.0695		QW9656	GW	
Nitrate plus Nitrite (N)	mg/L	CONTROL 1	4/1/2017	0.0797	0.0797		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.107	0.107		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.0782	0.0782		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.125	0.125		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.0769	0.0769		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.112	0.112		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.151	0.151		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.136	0.136		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.125	0.125		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.12	0.12		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	0.109	0.109		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.109	0.109		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.137	0.137		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.157	0.157		QZ4969	GW	
	mg/L	SS3-7	4/3/2017	0.0967	0.0967		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.0888	0.0888		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.131	0.131		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.147	0.147		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0.149	0.149		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	0.0747	0.0747		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.0773	0.0773		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.0695	0.0695		QW9656	GW	
Nitrite (N) - Total	mg/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.0020	0.001		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	<0.0020	0.001		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.0020	0.001		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.0020	0.001		QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.0020	0.001		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.0020	0.001		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.0020	0.001		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.0020	0.001		QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.0020	0.001		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.0020	0.001		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	0.0033	0.0033		QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.0020	0.001		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.0049	0.0049		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.0017	0.0017		QZ4969	GW	
	mg/L	SS3-7	4/3/2017	0.0034	0.0034		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.0021	0.0021		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.0022	0.0022		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.002	0.002		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0.002	0.002		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	<0.0020	0.001		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.0020	0.001		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.0020	0.001		QW9656	GW	
Nitrogen (N) - Total	mg/L	CONTROL 1	4/1/2017	0.153	0.153		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0.039	0.039		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.188	0.188		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.15	0.15		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.249	0.249		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.119	0.119		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.217	0.217		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.265	0.265		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.257	0.257		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.187	0.187		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.193	0.193		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.197	0.197		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.446	0.446		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.253	0.253		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.348	0.348		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	0.209	0.209		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.237	0.237		QW9650	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Nitrogen (N) - Total *(cont'd)*	mg/L	SS4-4	4/7/2017	0.253	0.253		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.283	0.283		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0.298	0.298		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	0.112	0.112		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.121	0.121		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.106	0.106		QW9656	GW	
Orthophosphate (PO_4-P)	mg/L	CONTROL 1	4/1/2017	0.0027	0.0027		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.0010	0.0005		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.0047	0.0047		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.004	0.004		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.0032	0.0032		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.0011	0.0011		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0	0		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.0028	0.0028		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.003	0.003		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.0029	0.0029		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.0034	0.0034		QW9644	DUPW1	
	mg/L	SS3-4	4/3/2017	0.0053	0.0053		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.0041	0.0041		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.0057	0.0057		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.0098	0.0098		QZ4969	GW	
	mg/L	SS3-7	4/3/2017	0.0058	0.0058		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.0077	0.0077		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.0042	0.0042		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.008	0.008		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0.0048	0.0048		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	0.0035	0.0035		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.0031	0.0031		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.0018	0.0018		QW9656	GW	
pH	pH	CONTROL 1	4/1/2017	5.27	5.27		QV4618	EBW	
	pH	CONTROL 1	4/1/2017	5.3	5.3		QW9657	GW	
	pH	CONTROL 2	4/7/2017	5.68	5.68		QW9658	GW	
	pH	CONTROL 3	4/3/2017	6.31	6.31		QW9659	GW	
	pH	SS1-4	4/7/2017	6.3	6.3		QW9639	GW	
	pH	SS1-5	4/7/2017	5.87	5.87		QW9640	GW	
	pH	SS2-1	4/8/2017	5.46	5.46		QW9641	GW	
	pH	SS2-2	4/8/2017	5.33	5.33		QW9642	GW	
	pH	SS2-3	4/8/2017	5.59	5.59		QW9643	GW	
	pH	SS2-4	4/8/2017	5.35	5.35		QW9645	DUPW2	
	pH	SS2-4	4/8/2017	5.35	5.35		QW9644	DUPW1	
	pH	SS3-4	4/3/2017	6.91	6.91		QW9646	GW	
	pH	SS3-5	4/3/2017	6.51	6.51		QW9647	GW	
	pH	SS3-6	4/3/2017	7.07	7.07		QW9648	GW	
	pH	SS3-6	4/30/2017	6.94	6.94		QZ4969	GW	Resampled at corrected coordinate.
	pH	SS3-7	4/3/2017	6.86	6.86		QW9649	GW	
	pH	SS3-8	4/3/2017	6.52	6.52		QW9650	GW	
	pH	SS4-4	4/7/2017	6.44	6.44		QW9651	GW	
	pH	SS4-5	4/7/2017	6.21	6.21		QW9652	DUPW1	
	pH	SS4-5	4/7/2017	6.21	6.21		QW9653	DUPW2	
	pH	SS5-3	4/1/2017	6.74	6.74		QW9654	GW	
	pH	SS5-4	4/1/2017	5.63	5.63		QW9655	GW	
	pH	SS5-5	4/1/2017	5.51	5.51		QW9656	GW	
Phosphorus (P) - Dissolved (TDP)	ug/L	CONTROL 1	4/1/2017	5	5		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0.005	0.005		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.015	0.015		QW9658	GW	
	ug/L	CONTROL 2	4/7/2017	15	15		QW9658	GW	
	ug/L	CONTROL 3	4/3/2017	19.7	19.7		QW9659	GW	
	mg/L	CONTROL 3	4/3/2017	0.0197	0.0197		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.0106	0.0106		QW9639	GW	
	ug/L	SS1-4	4/7/2017	10.6	10.6		QW9639	GW	
	ug/L	SS1-5	4/7/2017	15.6	15.6		QW9640	GW	
	mg/L	SS1-5	4/7/2017	0.0156	0.0156		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.019	0.019		QW9641	GW	
	ug/L	SS2-1	4/8/2017	19	19		QW9641	GW	
	ug/L	SS2-2	4/8/2017	13.8	13.8		QW9642	GW	
	mg/L	SS2-2	4/8/2017	0.0138	0.0138		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.018	0.018		QW9643	GW	
	ug/L	SS2-3	4/8/2017	18	18		QW9643	GW	
	ug/L	SS2-4	4/8/2017	14.9	14.9		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	16.3	16.3		QW9645	DUPW2	Automatically converted from value: 0.0163 mg/L to ug/L.
	mg/L	SS2-4	4/8/2017	0.0149	0.0149		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.0163	0.0163		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.0659	0.0659		QW9646	GW	
	ug/L	SS3-4	4/3/2017	65.9	65.9		QW9646	GW	Automatically converted from value: 0.0659 mg/L to ug/L.
	ug/L	SS3-5	4/3/2017	39.2	39.2		QW9647	GW	Automatically converted from value: 0.0392 mg/L to ug/L.
	mg/L	SS3-5	4/3/2017	0.0392	0.0392		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.143	0.143		QW9648	GW	Dissolved greater than total. Reanalysis yields similar results.
	ug/L	SS3-6	4/3/2017	143	143		QW9648	GW	Dissolved greater than total. Reanalysis yields similar results.
	mg/L	SS3-6	4/30/2017	0.042	0.042		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	78.5	78.5		QW9649	GW	Automatically converted from value: 0.0785 mg/L to ug/L.
	mg/L	SS3-7	4/3/2017	0.0785	0.0785		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.033	0.033		QW9650	GW	
	ug/L	SS3-8	4/3/2017	33	33		QW9650	GW	Automatically converted from value: 0.0330 mg/L to ug/L.
	mg/L	SS4-4	4/7/2017	0.0209	0.0209		QW9651	GW	
	ug/L	SS4-4	4/7/2017	20.9	20.9		QW9651	GW	Automatically converted from value: 0.0209 mg/L to ug/L.
	ug/L	SS4-5	4/7/2017	42.8	42.8		QW9652	DUPW1	Dissolved greater than total. Reanalysis yields similar results.
	ug/L	SS4-5	4/7/2017	46.4	46.4		QW9653	DUPW2	Automatically converted from value: 0.0464 mg/L to ug/L.
	mg/L	SS4-5	4/7/2017	0.0428	0.0428		QW9652	DUPW1	Dissolved greater than total. Reanalysis yields similar results.
	mg/L	SS4-5	4/7/2017	0.0464	0.0464		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	0.0351	0.0351		QW9654	GW	
	ug/L	SS5-3	4/1/2017	35.1	35.1		QW9654	GW	Automatically converted from value: 0.0351 mg/L to ug/L.
	ug/L	SS5-4	4/1/2017	10.1	10.1		QW9655	GW	Automatically converted from value: 0.0101 mg/L to ug/L.
	mg/L	SS5-4	4/1/2017	0.0101	0.0101		QW9655	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Phosphorus (P) - Dissolved (TDP)	mg/L	SS5-5	4/1/2017	0.0134	0.0134		QW9656	GW	
	ug/L	SS5-5	4/1/2017	13.4	13.4		QW9656	GW	Automatically converted from value: 0.0134 mg/L to ug/L.
Phosphorus (P) - Total	ug/L	CONTROL 1	4/1/2017	5.7	5.7		QW9657	GW	Automatically converted from value: 0.0057 mg/L to ug/L.
	mg/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	0.0057	0.0057		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	0.0121	0.0121		QW9658	GW	
	ug/L	CONTROL 2	4/7/2017	12.1	12.1		QW9658	GW	Automatically converted from value: 0.0121 mg/L to ug/L.
	ug/L	CONTROL 3	4/3/2017	26.6	26.6		QW9659	GW	Automatically converted from value: 0.0266 mg/L to ug/L.
	mg/L	CONTROL 3	4/3/2017	0.0266	0.0266		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.0141	0.0141		QW9639	GW	
	ug/L	SS1-4	4/7/2017	14.1	14.1		QW9639	GW	Automatically converted from value: 0.0141 mg/L to ug/L.
	ug/L	SS1-5	4/7/2017	19.2	19.2		QW9640	GW	Automatically converted from value: 0.0192 mg/L to ug/L.
	mg/L	SS1-5	4/7/2017	0.0192	0.0192		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.0226	0.0226		QW9641	GW	
	ug/L	SS2-1	4/8/2017	22.6	22.6		QW9641	GW	Automatically converted from value: 0.0226 mg/L to ug/L.
	ug/L	SS2-2	4/8/2017	12.6	12.6		QW9642	GW	Automatically converted from value: 0.0126 mg/L to ug/L.
	mg/L	SS2-2	4/8/2017	0.0126	0.0126		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.0195	0.0195		QW9643	GW	
	ug/L	SS2-3	4/8/2017	19.5	19.5		QW9643	GW	Automatically converted from value: 0.0195 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	15.9	15.9		QW9644	DUPW1	Automatically converted from value: 0.0159 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	40.8	40.8		QW9645	DUPW2	Automatically converted from value: 0.0408 mg/L to ug/L.
	mg/L	SS2-4	4/8/2017	0.0159	0.0159		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.0408	0.0408		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.104	0.104		QW9646	GW	
	ug/L	SS3-4	4/3/2017	104	104		QW9646	GW	Automatically converted from value: 0.104 mg/L to ug/L.
	ug/L	SS3-5	4/3/2017	53.5	53.5		QW9647	GW	Automatically converted from value: 0.0535 mg/L to ug/L.
	mg/L	SS3-5	4/3/2017	0.0535	0.0535		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.109	0.109		QW9648	GW	
	ug/L	SS3-6	4/3/2017	109	109		QW9648	GW	Automatically converted from value: 0.109 mg/L to ug/L.
	mg/L	SS3-6	4/30/2017	0.0542	0.0542		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	103	103		QW9649	GW	Automatically converted from value: 0.103 mg/L to ug/L.
	mg/L	SS3-7	4/3/2017	0.103	0.103		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.0445	0.0445		QW9650	GW	
	ug/L	SS3-8	4/3/2017	44.5	44.5		QW9650	GW	Automatically converted from value: 0.0445 mg/L to ug/L.
	ug/L	SS4-4	4/7/2017	30.7	30.7		QW9651	GW	Automatically converted from value: 0.0307 mg/L to ug/L.
	mg/L	SS4-4	4/7/2017	0.0307	0.0307		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.0307	0.0307		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0.0389	0.0389		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	30.7	30.7		QW9652	DUPW1	Automatically converted from value: 0.0307 mg/L to ug/L.
	ug/L	SS4-5	4/7/2017	38.9	38.9		QW9653	DUPW2	Automatically converted from value: 0.0389 mg/L to ug/L.
	ug/L	SS5-3	4/1/2017	31	31		QW9654	GW	Automatically converted from value: 0.0310 mg/L to ug/L.
	mg/L	SS5-3	4/1/2017	0.031	0.031		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.0101	0.0101		QW9655	GW	
	ug/L	SS5-4	4/1/2017	10.1	10.1		QW9655	GW	Automatically converted from value: 0.0101 mg/L to ug/L.
	ug/L	SS5-5	4/1/2017	12.2	12.2		QW9656	GW	Automatically converted from value: 0.0122 mg/L to ug/L.
	mg/L	SS5-5	4/1/2017	0.0122	0.0122		QW9656	GW	
Potassium (K) - Total	ug/L	CONTROL 1	4/1/2017	<50.00	25		QW9657	GW	Automatically converted from value: <0.050 mg/L to ug/L.
	mg/L	CONTROL 1	4/1/2017	<0.050	0.025		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.217	0.217		QW9658	GW	
	ug/L	CONTROL 2	4/7/2017	217	217		QW9658	GW	Automatically converted from value: 0.217 mg/L to ug/L.
	ug/L	CONTROL 3	4/3/2017	189	189		QW9659	GW	Automatically converted from value: 0.189 mg/L to ug/L.
	mg/L	CONTROL 3	4/3/2017	0.189	0.189		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.098	0.098		QW9639	GW	
	ug/L	SS1-4	4/7/2017	98	98		QW9639	GW	Automatically converted from value: 0.098 mg/L to ug/L.
	ug/L	SS1-5	4/7/2017	182	182		QW9640	GW	Automatically converted from value: 0.182 mg/L to ug/L.
	mg/L	SS1-5	4/7/2017	0.182	0.182		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.206	0.206		QW9641	GW	
	ug/L	SS2-1	4/8/2017	206	206		QW9641	GW	Automatically converted from value: 0.206 mg/L to ug/L.
	ug/L	SS2-2	4/8/2017	74	74		QW9642	GW	Automatically converted from value: 0.074 mg/L to ug/L.
	mg/L	SS2-2	4/8/2017	0.074	0.074		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.104	0.104		QW9643	GW	
	ug/L	SS2-3	4/8/2017	104	104		QW9643	GW	Automatically converted from value: 0.104 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	206	206		QW9644	DUPW1	Automatically converted from value: 0.206 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	73	73		QW9645	DUPW2	Automatically converted from value: 0.073 mg/L to ug/L.
	mg/L	SS2-4	4/8/2017	0.206	0.206		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.073	0.073		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	1.42	1.42		QW9646	GW	
	ug/L	SS3-4	4/3/2017	1420	1420		QW9646	GW	Automatically converted from value: 1.42 mg/L to ug/L.
	ug/L	SS3-5	4/3/2017	235	235		QW9647	GW	Automatically converted from value: 0.235 mg/L to ug/L.
	mg/L	SS3-5	4/3/2017	0.235	0.235		QW9647	GW	
	mg/L	SS3-6	4/3/2017	1.2	1.2		QW9648	GW	
	ug/L	SS3-6	4/3/2017	1200	1200		QW9648	GW	Automatically converted from value: 1.20 mg/L to ug/L.
	mg/L	SS3-6	4/30/2017	0.42	0.42		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	441	441		QW9649	GW	Automatically converted from value: 0.441 mg/L to ug/L.
	mg/L	SS3-7	4/3/2017	0.441	0.441		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.528	0.528		QW9650	GW	
	ug/L	SS3-8	4/3/2017	528	528		QW9650	GW	Automatically converted from value: 0.528 mg/L to ug/L.
	ug/L	SS4-4	4/7/2017	231	231		QW9651	GW	Automatically converted from value: 0.231 mg/L to ug/L.
	mg/L	SS4-4	4/7/2017	0.231	0.231		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.863	0.863		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0.593	0.593		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	863	863		QW9652	DUPW1	Automatically converted from value: 0.863 mg/L to ug/L.
	ug/L	SS4-5	4/7/2017	593	593		QW9653	DUPW2	Automatically converted from value: 0.593 mg/L to ug/L.
	ug/L	SS5-3	4/1/2017	508	508		QW9654	GW	Automatically converted from value: 0.508 mg/L to ug/L.
	mg/L	SS5-3	4/1/2017	0.508	0.508		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.061	0.061		QW9655	GW	
	ug/L	SS5-4	4/1/2017	61	61		QW9655	GW	Automatically converted from value: 0.061 mg/L to ug/L.
	ug/L	SS5-5	4/1/2017	61	61		QW9656	GW	Automatically converted from value: 0.061 mg/L to ug/L.
	mg/L	SS5-5	4/1/2017	0.061	0.061		QW9656	GW	
Selenium (Se) - Total	ug/L	CONTROL 1	4/1/2017	<0.040	0.02		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	<0.040	0.02		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.00002		QW9657	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	<0.040	0.02		QW9658	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Selenium (Se) - Total *(cont'd)*	mg/L	CONTROL 2	4/7/2017	<0.00	0.00002		QW9658	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	<0.00	0.00002		QW9659	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	<0.040	0.02		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.040	0.02		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00	0.00002		QW9639	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.00	0.00002		QW9640	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	<0.040	0.02		QW9640	GW	
	ug/L	SS2-1	4/8/2017	<0.040	0.02		QW9641	GW	
	mg/L	SS2-1	4/8/2017	<0.00	0.00002		QW9641	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	<0.00	0.00002		QW9642	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	<0.040	0.02		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.00	0.00002		QW9643	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	<0.040	0.02		QW9643	GW	
	ug/L	SS2-4	4/8/2017	<0.040	0.02		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.040	0.02		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.00	0.00002		QW9644	DUPW1	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.00002		QW9645	DUPW2	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000067		QW9646	GW	Automatically converted from value: 0.067 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.067	0.067		QW9646	GW	
	ug/L	SS3-5	4/3/2017	<0.040	0.02		QW9647	GW	
	mg/L	SS3-5	4/3/2017	<0.00	0.00002		QW9647	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	<0.00	0.00002		QW9648	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	<0.040	0.02		QW9648	GW	
	ug/L	SS3-6	4/30/2017	<0.040	0.02		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	<0.040	0.02		QW9649	GW	
	mg/L	SS3-7	4/3/2017	<0.00	0.00002		QW9649	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	<0.00	0.00002		QW9650	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	<0.040	0.02		QW9650	GW	
	ug/L	SS4-4	4/7/2017	<0.040	0.02		QW9651	GW	
	mg/L	SS4-4	4/7/2017	<0.00	0.00002		QW9651	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	<0.00	0.00002		QW9652	DUPW1	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	<0.00	0.00002		QW9653	DUPW2	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	<0.040	0.02		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	<0.040	0.02		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	<0.040	0.02		QW9654	GW	
	mg/L	SS5-3	4/1/2017	<0.00	0.00002		QW9654	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	<0.00	0.00002		QW9655	GW	Automatically converted from value: <0.040 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	<0.040	0.02		QW9655	GW	
	ug/L	SS5-5	4/1/2017	<0.040	0.02		QW9656	GW	
	mg/L	SS5-5	4/1/2017	<0.00	0.00002		QW9656	GW	Automatically converted from value: <0.040 ug/L to mg/L.
Silicon (Si) - Total	mg/L	CONTROL 1	4/1/2017	0.11	0.113		QW9657	GW	Automatically converted from value: 113 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	113	113		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<50	25		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	1170	1170		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	1.17	1.17		QW9658	GW	Automatically converted from value: 1170 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	1.51	1.51		QW9659	GW	Automatically converted from value: 1510 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	1510	1510		QW9659	GW	
	ug/L	SS1-4	4/7/2017	290	290		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0.29	0.29		QW9639	GW	Automatically converted from value: 290 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0.74	0.74		QW9640	GW	Automatically converted from value: 740 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	740	740		QW9640	GW	
	ug/L	SS2-1	4/8/2017	359	359		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.36	0.359		QW9641	GW	Automatically converted from value: 359 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0.21	0.207		QW9642	GW	Automatically converted from value: 207 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	207	207		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.26	0.26		QW9643	GW	Automatically converted from value: 260 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	260	260		QW9643	GW	
	ug/L	SS2-4	4/8/2017	777	777		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	194	194		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.78	0.777		QW9644	DUPW1	Automatically converted from value: 777 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0.19	0.194		QW9645	DUPW2	Automatically converted from value: 194 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	9.47	9.47		QW9646	GW	Automatically converted from value: 9470 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	9470	9470		QW9646	GW	
	ug/L	SS3-5	4/3/2017	801	801		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.8	0.801		QW9647	GW	Automatically converted from value: 801 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	6.3	6.3		QW9648	GW	Automatically converted from value: 6300 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	6300	6300		QW9648	GW	
	ug/L	SS3-6	4/30/2017	2870	2870		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1790	1790		QW9649	GW	
	mg/L	SS3-7	4/3/2017	1.79	1.79		QW9649	GW	Automatically converted from value: 1790 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	3.7	3.7		QW9650	GW	Automatically converted from value: 3700 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	3700	3700		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.78	0.783		QW9651	GW	Automatically converted from value: 783 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	783	783		QW9651	GW	
	ug/L	SS4-5	4/7/2017	3100	3100		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	2410	2410		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	3.1	3.1		QW9652	DUPW1	Automatically converted from value: 3100 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	2.41	2.41		QW9653	DUPW2	Automatically converted from value: 2410 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	2.91	2.91		QW9654	GW	Automatically converted from value: 2910 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	2910	2910		QW9654	GW	
	ug/L	SS5-4	4/1/2017	242	242		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0.24	0.242		QW9655	GW	Automatically converted from value: 242 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0.44	0.439		QW9656	GW	Automatically converted from value: 439 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	439	439		QW9656	GW	
Silver (Ag) - Total	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	<0.0050	0.0025		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.0000025		QW9657	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	<0.0050	0.0025		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	<0.00	0.0000025		QW9658	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	<0.00	0.0000025		QW9659	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	<0.0050	0.0025		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.0050	0.0025		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00	0.0000025		QW9639	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	<0.00	0.0000025		QW9640	GW	Automatically converted from value: <0.0050 ug/L to mg/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Silver (Ag) - Total	ug/L	SS1-5	4/7/2017	<0.0050	0.0025		QW9640	GW	
(cont'd)	ug/L	SS2-1	4/8/2017	<0.0050	0.0025		QW9641	GW	
	mg/L	SS2-1	4/8/2017	<0.00	0.0000025		QW9641	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	<0.00	0.0000025		QW9642	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	<0.0050	0.0025		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.00	0.0000025		QW9643	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	<0.0050	0.0025		QW9643	GW	
	ug/L	SS2-4	4/8/2017	<0.0050	0.0025		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.0050	0.0025		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	<0.00	0.0000025		QW9644	DUPW1	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.0000025		QW9645	DUPW2	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.0000254		QW9646	GW	Automatically converted from value: 0.0254 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.0254	0.0254		QW9646	GW	
	ug/L	SS3-5	4/3/2017	<0.0050	0.0025		QW9647	GW	
	mg/L	SS3-5	4/3/2017	<0.00	0.0000025		QW9647	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.0000216		QW9648	GW	Automatically converted from value: 0.0216 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.0216	0.0216		QW9648	GW	
	ug/L	SS3-6	4/30/2017	<0.010	0.005		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.0055	0.0055		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.0000055		QW9649	GW	Automatically converted from value: 0.0055 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000011		QW9650	GW	Automatically converted from value: 0.0110 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.011	0.011		QW9650	GW	
	ug/L	SS4-4	4/7/2017	<0.0050	0.0025		QW9651	GW	
	mg/L	SS4-4	4/7/2017	<0.00	0.0000025		QW9651	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.0000196		QW9652	DUPW1	Automatically converted from value: 0.0196 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000011		QW9653	DUPW2	Automatically converted from value: 0.0110 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	0.0196	0.0196		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.011	0.011		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	0.0128	0.0128		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.0000128		QW9654	GW	Automatically converted from value: 0.0128 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	<0.00	0.0000025		QW9655	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	<0.0050	0.0025		QW9655	GW	
	ug/L	SS5-5	4/1/2017	<0.0050	0.0025		QW9656	GW	
	mg/L	SS5-5	4/1/2017	<0.00	0.0000025		QW9656	GW	Automatically converted from value: <0.0050 ug/L to mg/L.
Sodium (Na) -	ug/L	CONTROL 1	4/1/2017	81	81		QW9657	GW	Automatically converted from value: 0.081 mg/L to ug/L.
Total	mg/L	CONTROL 1	4/1/2017	0.081	0.081		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.102	0.102		QW9658	GW	
	ug/L	CONTROL 2	4/7/2017	102	102		QW9658	GW	Automatically converted from value: 0.102 mg/L to ug/L.
	ug/L	CONTROL 3	4/3/2017	107	107		QW9659	GW	Automatically converted from value: 0.107 mg/L to ug/L.
	mg/L	CONTROL 3	4/3/2017	0.107	0.107		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.069	0.069		QW9639	GW	
	ug/L	SS1-4	4/7/2017	69	69		QW9639	GW	Automatically converted from value: 0.069 mg/L to ug/L.
	ug/L	SS1-5	4/7/2017	92	92		QW9640	GW	Automatically converted from value: 0.092 mg/L to ug/L.
	mg/L	SS1-5	4/7/2017	0.092	0.092		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.427	0.427		QW9641	GW	
	ug/L	SS2-1	4/8/2017	427	427		QW9641	GW	Automatically converted from value: 0.427 mg/L to ug/L.
	ug/L	SS2-2	4/8/2017	115	115		QW9642	GW	Automatically converted from value: 0.115 mg/L to ug/L.
	mg/L	SS2-2	4/8/2017	0.115	0.115		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.085	0.085		QW9643	GW	
	ug/L	SS2-3	4/8/2017	85	85		QW9643	GW	Automatically converted from value: 0.085 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	81	81		QW9644	DUPW1	Automatically converted from value: 0.081 mg/L to ug/L.
	ug/L	SS2-4	4/8/2017	85	85		QW9645	DUPW2	Automatically converted from value: 0.085 mg/L to ug/L.
	mg/L	SS2-4	4/8/2017	0.081	0.081		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.085	0.085		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.287	0.287		QW9646	GW	
	ug/L	SS3-4	4/3/2017	287	287		QW9646	GW	Automatically converted from value: 0.287 mg/L to ug/L.
	ug/L	SS3-5	4/3/2017	161	161		QW9647	GW	Automatically converted from value: 0.161 mg/L to ug/L.
	mg/L	SS3-5	4/3/2017	0.161	0.161		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.227	0.227		QW9648	GW	
	ug/L	SS3-6	4/3/2017	227	227		QW9648	GW	Automatically converted from value: 0.227 mg/L to ug/L.
	mg/L	SS3-6	4/30/2017	<0.25	0.125		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	214	214		QW9649	GW	Automatically converted from value: 0.214 mg/L to ug/L.
	mg/L	SS3-7	4/3/2017	0.214	0.214		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.128	0.128		QW9650	GW	
	ug/L	SS3-8	4/3/2017	128	128		QW9650	GW	Automatically converted from value: 0.128 mg/L to ug/L.
	ug/L	SS4-4	4/7/2017	130	130		QW9651	GW	Automatically converted from value: 0.130 mg/L to ug/L.
	mg/L	SS4-4	4/7/2017	0.13	0.13		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.152	0.152		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0.082	0.082		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	152	152		QW9652	DUPW1	Automatically converted from value: 0.152 mg/L to ug/L.
	ug/L	SS4-5	4/7/2017	82	82		QW9653	DUPW2	Automatically converted from value: 0.082 mg/L to ug/L.
	ug/L	SS5-3	4/1/2017	102	102		QW9654	GW	Automatically converted from value: 0.102 mg/L to ug/L.
	mg/L	SS5-3	4/1/2017	0.102	0.102		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.063	0.063		QW9655	GW	
	ug/L	SS5-4	4/1/2017	63	63		QW9655	GW	Automatically converted from value: 0.063 mg/L to ug/L.
	ug/L	SS5-5	4/1/2017	60	60		QW9656	GW	Automatically converted from value: 0.060 mg/L to ug/L.
	mg/L	SS5-5	4/1/2017	0.06	0.06		QW9656	GW	
Strontium (Sr) -	ug/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
Total	ug/L	CONTROL 1	4/1/2017	0.745	0.745		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0	0.000745		QW9657	GW	Automatically converted from value: 0.745 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	2.41	2.41		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.00241		QW9658	GW	Automatically converted from value: 2.41 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.00413		QW9659	GW	Automatically converted from value: 4.13 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	4.13	4.13		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.749	0.749		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000749		QW9639	GW	Automatically converted from value: 0.749 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.00115		QW9640	GW	Automatically converted from value: 1.15 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	1.15	1.15		QW9640	GW	
	ug/L	SS2-1	4/8/2017	7.75	7.75		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.01	0.00775		QW9641	GW	Automatically converted from value: 7.75 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.00114		QW9642	GW	Automatically converted from value: 1.14 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	1.14	1.14		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.00102		QW9643	GW	Automatically converted from value: 1.02 ug/L to mg/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Strontium (Sr) - Total *(cont'd)*	ug/L	SS2-3	4/8/2017	1.02	1.02		QW9643	GW	
	ug/L	SS2-4	4/8/2017	1.39	1.39		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	1.65	1.65		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.00139		QW9644	DUPW1	Automatically converted from value: 1.39 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.00165		QW9645	DUPW2	Automatically converted from value: 1.65 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.06	0.0555		QW9646	GW	Automatically converted from value: 55.5 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	55.5	55.5		QW9646	GW	
	ug/L	SS3-5	4/3/2017	6.84	6.84		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.01	0.00684		QW9647	GW	Automatically converted from value: 6.84 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.04	0.0366		QW9648	GW	Automatically converted from value: 36.6 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	36.6	36.6		QW9648	GW	
	ug/L	SS3-6	4/30/2017	9.11	9.11		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	16.2	16.2		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.02	0.0162		QW9649	GW	Automatically converted from value: 16.2 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.02	0.0197		QW9650	GW	Automatically converted from value: 19.7 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	19.7	19.7		QW9650	GW	
	ug/L	SS4-4	4/7/2017	4.81	4.81		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.00481		QW9651	GW	Automatically converted from value: 4.81 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.01	0.00592		QW9652	DUPW1	Automatically converted from value: 5.92 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00422		QW9653	DUPW2	Automatically converted from value: 4.22 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	5.92	5.92		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	4.22	4.22		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	7.48	7.48		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0.01	0.00748		QW9654	GW	Automatically converted from value: 7.48 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.00163		QW9655	GW	Automatically converted from value: 1.63 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	1.63	1.63		QW9655	GW	
	ug/L	SS5-5	4/1/2017	1.13	1.13		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.00113		QW9656	GW	Automatically converted from value: 1.13 ug/L to mg/L.
Sulphate (SO_4) - Dissolved	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25		QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25		QW9640	GW	
	mg/L	SS2-1	4/8/2017	<0.50	0.25		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.25		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.71	0.71		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.57	0.57		QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.25		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.86	0.86		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.86	0.86		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	0.64	0.64		QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.52	0.52		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	<0.50	0.25		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25		QW9656	GW	
Sulphur (S) - Total	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.50	0.25		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	<0.50	0.25		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	<0.50	0.25		QW9659	GW	
	mg/L	SS1-4	4/7/2017	<0.50	0.25		QW9639	GW	
	mg/L	SS1-5	4/7/2017	<0.50	0.25		QW9640	GW	
	mg/L	SS2-1	4/8/2017	2.45	2.45		QW9641	GW	
	mg/L	SS2-2	4/8/2017	<0.50	0.25		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.50	0.25		QW9643	GW	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	<0.50	0.25		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	<0.50	0.25		QW9646	GW	
	mg/L	SS3-5	4/3/2017	<0.50	0.25		QW9647	GW	
	mg/L	SS3-6	4/3/2017	<0.50	0.25		QW9648	GW	
	mg/L	SS3-6	4/30/2017	<3.0	1.5		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	<0.50	0.25		QW9649	GW	
	mg/L	SS3-8	4/3/2017	<0.50	0.25		QW9650	GW	
	mg/L	SS4-4	4/7/2017	<0.50	0.25		QW9651	GW	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	<0.50	0.25		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	<0.50	0.25		QW9654	GW	
	mg/L	SS5-4	4/1/2017	<0.50	0.25		QW9655	GW	
	mg/L	SS5-5	4/1/2017	<0.50	0.25		QW9656	GW	
Thallium (Tl) - Total	ug/L	CONTROL 1	4/1/2017	<0.0020	0.001		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.000001		QW9657	GW	Automatically converted from value: <0.0020 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	ug/L	CONTROL 2	4/7/2017	0.01	0.01		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.00001		QW9658	GW	Automatically converted from value: 0.0100 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.0000069		QW9659	GW	Automatically converted from value: 0.0069 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.0069	0.0069		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.0048	0.0048		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.0000048		QW9639	GW	Automatically converted from value: 0.0048 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.0000081		QW9640	GW	Automatically converted from value: 0.0081 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.0081	0.0081		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.0092	0.0092		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.0000092		QW9641	GW	Automatically converted from value: 0.0092 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.0000041		QW9642	GW	Automatically converted from value: 0.0041 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.0041	0.0041		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.0000059		QW9643	GW	Automatically converted from value: 0.0059 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.0059	0.0059		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.0107	0.0107		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.0041	0.0041		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.0000107		QW9644	DUPW1	Automatically converted from value: 0.0107 ug/L to mg/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Thallium (Tl) - Total *(cont'd)*	mg/L	SS2-4	4/8/2017	0	0.0000041		QW9645	DUPW2	Automatically converted from value: 0.0041 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.0000771		QW9646	GW	Automatically converted from value: 0.0771 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.0771	0.0771		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.0099	0.0099		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.0000099		QW9647	GW	Automatically converted from value: 0.0099 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.0000643		QW9648	GW	Automatically converted from value: 0.0643 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.0643	0.0643		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.0204	0.0204		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.0146	0.0146		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.0000146		QW9649	GW	Automatically converted from value: 0.0146 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.0000257		QW9650	GW	Automatically converted from value: 0.0257 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.0257	0.0257		QW9650	GW	
	ug/L	SS4-4	4/7/2017	0.0098	0.0098		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.0000098		QW9651	GW	Automatically converted from value: 0.0098 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000051		QW9652	DUPW1	Automatically converted from value: 0.0510 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.0000366		QW9653	DUPW2	Automatically converted from value: 0.0366 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	0.0366	0.0366		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	0.051	0.051		QW9652	DUPW1	
	ug/L	SS5-3	4/1/2017	0.0322	0.0322		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.0000322		QW9654	GW	Automatically converted from value: 0.0322 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.0000034		QW9655	GW	Automatically converted from value: 0.0034 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	0.0034	0.0034		QW9655	GW	
	ug/L	SS5-5	4/1/2017	0.0034	0.0034		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.0000034		QW9656	GW	Automatically converted from value: 0.0034 ug/L to mg/L.
Tin (Sn) - Total	ug/L	CONTROL 1	4/1/2017	<0.010	0.005		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	<0.00	0.000005		QW9657	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.010	0.005		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.000028		QW9658	GW	Automatically converted from value: 0.028 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.028	0.028		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.000027		QW9659	GW	Automatically converted from value: 0.027 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.027	0.027		QW9659	GW	
	ug/L	SS1-4	4/7/2017	<0.010	0.005		QW9639	GW	
	mg/L	SS1-4	4/7/2017	<0.00	0.000005		QW9639	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.000016		QW9640	GW	Automatically converted from value: 0.016 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.016	0.016		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.021	0.021		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.000021		QW9641	GW	Automatically converted from value: 0.021 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	<0.00	0.000005		QW9642	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	<0.010	0.005		QW9642	GW	
	mg/L	SS2-3	4/8/2017	<0.00	0.000005		QW9643	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	<0.010	0.005		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.027	0.027		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.010	0.005		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.000027		QW9644	DUPW1	Automatically converted from value: 0.027 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.000005		QW9645	DUPW2	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.000094		QW9646	GW	Automatically converted from value: 0.094 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	0.094	0.094		QW9646	GW	
	ug/L	SS3-5	4/3/2017	<0.010	0.005		QW9647	GW	
	mg/L	SS3-5	4/3/2017	<0.00	0.000005		QW9647	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.00008		QW9648	GW	Automatically converted from value: 0.080 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.08	0.08		QW9648	GW	
	ug/L	SS3-6	4/30/2017	<0.20	0.1		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.035	0.035		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.000035		QW9649	GW	Automatically converted from value: 0.035 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000045		QW9650	GW	Automatically converted from value: 0.045 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.045	0.045		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.000022		QW9651	GW	Automatically converted from value: 0.022 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.022	0.022		QW9651	GW	
	ug/L	SS4-5	4/7/2017	0.115	0.115		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.105	0.105		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	0	0.000115		QW9652	DUPW1	Automatically converted from value: 0.115 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000105		QW9653	DUPW2	Automatically converted from value: 0.105 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.000124		QW9654	GW	Automatically converted from value: 0.124 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	0.124	0.124		QW9654	GW	
	ug/L	SS5-4	4/1/2017	<0.010	0.005		QW9655	GW	
	mg/L	SS5-4	4/1/2017	<0.00	0.000005		QW9655	GW	Automatically converted from value: <0.010 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.000033		QW9656	GW	Automatically converted from value: 0.033 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	0.033	0.033		QW9656	GW	
Titanium (Ti) - Total	ug/L	CONTROL 1	4/1/2017	4.14	4.14		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0	0.00414		QW9657	GW	Automatically converted from value: 4.14 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.50	0.25		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0.06	0.0561		QW9658	GW	Automatically converted from value: 56.1 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	56.1	56.1		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.04	0.0353		QW9659	GW	Automatically converted from value: 35.3 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	35.3	35.3		QW9659	GW	
	ug/L	SS1-4	4/7/2017	16.6	16.6		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0.02	0.0166		QW9639	GW	Automatically converted from value: 16.6 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0.04	0.0403		QW9640	GW	Automatically converted from value: 40.3 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	40.3	40.3		QW9640	GW	
	ug/L	SS2-1	4/8/2017	17.4	17.4		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.02	0.0174		QW9641	GW	Automatically converted from value: 17.4 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0.01	0.011		QW9642	GW	Automatically converted from value: 11.0 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	11	11		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.02	0.0151		QW9643	GW	Automatically converted from value: 15.1 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	15.1	15.1		QW9643	GW	
	ug/L	SS2-4	4/8/2017	45.3	45.3		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	8.36	8.36		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.05	0.0453		QW9644	DUPW1	Automatically converted from value: 45.3 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0.01	0.00836		QW9645	DUPW2	Automatically converted from value: 8.36 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.35	0.354		QW9646	GW	Automatically converted from value: 354 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	354	354		QW9646	GW	
	ug/L	SS3-5	4/3/2017	28.7	28.7		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.03	0.0287		QW9647	GW	Automatically converted from value: 28.7 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.22	0.217		QW9648	GW	Automatically converted from value: 217 ug/L to mg/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Titanium (Ti) - Total *(cont'd)*	ug/L	SS3-6	4/3/2017	217	217		QW9648	GW	
	ug/L	SS3-6	4/30/2017	67.6	67.6		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	57.4	57.4		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.06	0.0574		QW9649	GW	Automatically converted from value: 57.4 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.13	0.127		QW9650	GW	Automatically converted from value: 127 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	127	127		QW9650	GW	
	ug/L	SS4-4	4/7/2017	33.1	33.1		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0.03	0.0331		QW9651	GW	Automatically converted from value: 33.1 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.16	0.159		QW9652	DUPW1	Automatically converted from value: 159 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.14	0.135		QW9653	DUPW2	Automatically converted from value: 135 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	135	135		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	159	159		QW9652	DUPW1	
	ug/L	SS5-3	4/1/2017	136	136		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0.14	0.136		QW9654	GW	Automatically converted from value: 136 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0.01	0.00862		QW9655	GW	Automatically converted from value: 8.62 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	8.62	8.62		QW9655	GW	
	ug/L	SS5-5	4/1/2017	14.3	14.3		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0.01	0.0143		QW9656	GW	Automatically converted from value: 14.3 ug/L to mg/L.
Total Dissolved Solids (TDS)	mg/L	CONTROL 1	4/1/2017	2.8	2.8		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<1.0	0.5		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	3.6	3.6		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	3.2	3.2		QW9659	GW	
	mg/L	SS1-4	4/7/2017	2	2		QW9639	GW	
	mg/L	SS1-5	4/7/2017	1.6	1.6		QW9640	GW	
	mg/L	SS2-1	4/8/2017	2	2		QW9641	GW	
	mg/L	SS2-2	4/8/2017	2	2		QW9642	GW	
	mg/L	SS2-3	4/8/2017	1.6	1.6		QW9643	GW	
	mg/L	SS2-4	4/8/2017	1.6	1.6		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	2	2		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	6	6		QW9646	GW	
	mg/L	SS3-5	4/3/2017	3.6	3.6		QW9647	GW	
	mg/L	SS3-6	4/3/2017	8	8		QW9648	GW	
	mg/L	SS3-6	4/30/2017	6	6		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	11	11		QW9649	GW	
	mg/L	SS3-8	4/3/2017	7.2	7.2		QW9650	GW	
	mg/L	SS4-4	4/7/2017	5.6	5.6		QW9651	GW	
	mg/L	SS4-5	4/7/2017	4	4		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	2.8	2.8		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	6	6		QW9654	GW	
	mg/L	SS5-4	4/1/2017	2.8	2.8		QW9655	GW	
	mg/L	SS5-5	4/1/2017	1.6	1.6		QW9656	GW	
Total Kjeldahl Nitrogen (TKN) - (Calc)	mg/L	CONTROL 1	4/1/2017	0.039	0.039		QV4618	EBW	
	mg/L	CONTROL 1	4/1/2017	0.073	0.073		QW9657	GW	
	mg/L	CONTROL 2	4/7/2017	0.081	0.081		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.072	0.072		QW9659	GW	
	mg/L	SS1-4	4/7/2017	0.124	0.124		QW9639	GW	
	mg/L	SS1-5	4/7/2017	0.042	0.042		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0.105	0.105		QW9641	GW	
	mg/L	SS2-2	4/8/2017	0.114	0.114		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.121	0.121		QW9643	GW	
	mg/L	SS2-4	4/8/2017	0.066	0.066		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	0.068	0.068		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	0.088	0.088		QW9646	GW	
	mg/L	SS3-5	4/3/2017	0.337	0.337		QW9647	GW	
	mg/L	SS3-6	4/3/2017	0.116	0.116		QW9648	GW	
	mg/L	SS3-6	4/30/2017	0.191	0.191		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	0.112	0.112		QW9649	GW	
	mg/L	SS3-8	4/3/2017	0.149	0.149		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0.122	0.122		QW9651	GW	
	mg/L	SS4-5	4/7/2017	0.137	0.137		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0.15	0.15		QW9653	DUPW2	
	mg/L	SS5-3	4/1/2017	0.038	0.038		QW9654	GW	
	mg/L	SS5-4	4/1/2017	0.044	0.044		QW9655	GW	
	mg/L	SS5-5	4/1/2017	0.037	0.037		QW9656	GW	
Total Organic Carbon (TOC)	mg/L	CONTROL 1	4/1/2017	0.31	0.31		EFV176	GW	
	mg/L	CONTROL 2	4/7/2017	2.5	2.5		EFV177	GW	
	mg/L	CONTROL 3	4/3/2017	0.31	0.31		EFV190	GW	
	mg/L	SS1-4	4/7/2017	0.27	0.27		EFV140	GW	
	mg/L	SS1-5	4/7/2017	<0.20	0.1		EFV141	GW	
	mg/L	SS2-1	4/8/2017	0.29	0.29		EFV142	GW	
	mg/L	SS2-2	4/8/2017	0.47	0.47		EFV143	GW	
	mg/L	SS2-3	4/8/2017	0.33	0.33		EFV144	GW	
	mg/L	SS2-4	4/8/2017	0.25	0.25		EFV145	DUPW1	
	mg/L	SS2-4	4/8/2017	0.29	0.29		EFV146	DUPW2	
	mg/L	SS3-4	4/3/2017	0.36	0.36		EFV147	GW	
	mg/L	SS3-5	4/3/2017	0.33	0.33		EFV148	GW	
	mg/L	SS3-6	4/3/2017	0.54	0.54		EFV149	GW	
	mg/L	SS3-7	4/3/2017	0.47	0.47		EFV168	GW	
	mg/L	SS3-8	4/3/2017	0.46	0.46		EFV169	GW	
	mg/L	SS4-4	4/7/2017	0.44	0.44		EFV170	GW	
	mg/L	SS4-5	4/7/2017	0.56	0.56		EFV171	DUPW1	
	mg/L	SS4-5	4/7/2017	0.5	0.5		EFV172	DUPW2	
	mg/L	SS5-3	4/1/2017	0.38	0.38		EFV173	GW	
	mg/L	SS5-4	4/1/2017	0.2	0.2		EFV174	GW	
	mg/L	SS5-5	4/1/2017	<0.20	0.1		EFV175	GW	
Total Suspended Solids (TSS)	mg/L	CONTROL 1	4/1/2017	3.4	3.4		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	<1.0	0.5		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	7.8	7.8		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	11.1	11.1		QW9659	GW	
	mg/L	SS1-4	4/7/2017	12.2	12.2		QW9639	GW	
	mg/L	SS1-5	4/7/2017	13.3	13.3		QW9640	GW	
	mg/L	SS2-1	4/8/2017	14.2	14.2		QW9641	GW	
	mg/L	SS2-2	4/8/2017	7.2	7.2		QW9642	GW	
	mg/L	SS2-3	4/8/2017	12.1	12.1		QW9643	GW	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Total Suspended Solids (TSS) *(cont'd)*	mg/L	SS2-4	4/8/2017	12.5	12.5		QW9644	DUPW1	
	mg/L	SS2-4	4/8/2017	9.3	9.3		QW9645	DUPW2	
	mg/L	SS3-4	4/3/2017	49.8	49.8		QW9646	GW	
	mg/L	SS3-5	4/3/2017	30.1	30.1		QW9647	GW	
	mg/L	SS3-6	4/3/2017	33	33		QW9648	GW	
	mg/L	SS3-6	4/30/2017	36.4	36.4		QZ4969	GW	Resampled at corrected coordinate.
	mg/L	SS3-7	4/3/2017	32	32		QW9649	GW	
	mg/L	SS3-8	4/3/2017	16	16		QW9650	GW	
	mg/L	SS4-4	4/7/2017	14.9	14.9		QW9651	GW	
	mg/L	SS4-5	4/7/2017	14	14		QW9653	DUPW2	
	mg/L	SS4-5	4/7/2017	17	17		QW9652	DUPW1	
	mg/L	SS5-3	4/1/2017	25	25		QW9654	GW	
	mg/L	SS5-4	4/1/2017	8.3	8.3		QW9655	GW	
	mg/L	SS5-5	4/1/2017	4.3	4.3		QW9656	GW	
Turbidity	NTU	CONTROL 1	4/1/2017	<0.10	0.05		QV4618	EBW	
	NTU	CONTROL 1	4/1/2017	0.93	0.93		QW9657	GW	
	NTU	CONTROL 2	4/7/2017	2.78	2.78		QW9658	GW	
	NTU	CONTROL 3	4/3/2017	5.4	5.4		QW9659	GW	
	NTU	SS1-4	4/7/2017	1.6	1.6		QW9639	GW	
	NTU	SS1-5	4/7/2017	1.81	1.81		QW9640	GW	
	NTU	SS2-1	4/8/2017	2.33	2.33		QW9641	GW	
	NTU	SS2-2	4/8/2017	1.14	1.14		QW9642	GW	
	NTU	SS2-3	4/8/2017	1.7	1.7		QW9643	GW	
	NTU	SS2-4	4/8/2017	2.54	2.54		QW9645	DUPW2	
	NTU	SS2-4	4/8/2017	1.46	1.46		QW9644	DUPW1	
	NTU	SS3-4	4/3/2017	12.7	12.7		QW9646	GW	
	NTU	SS3-5	4/3/2017	5.75	5.75		QW9647	GW	
	NTU	SS3-6	4/3/2017	3.49	3.49		QW9648	GW	
	NTU	SS3-6	4/30/2017	10.1	10.1		QZ4969	GW	
	NTU	SS3-7	4/3/2017	10.2	10.2		QW9649	GW	
	NTU	SS3-8	4/3/2017	3.23	3.23		QW9650	GW	
	NTU	SS4-4	4/7/2017	2.35	2.35		QW9651	GW	
	NTU	SS4-5	4/7/2017	1.61	1.61		QW9652	DUPW1	
	NTU	SS4-5	4/7/2017	4.34	4.34		QW9653	DUPW2	
	NTU	SS5-3	4/1/2017	3.01	3.01		QW9654	GW	
	NTU	SS5-4	4/1/2017	1.66	1.66		QW9655	GW	
	NTU	SS5-5	4/1/2017	1.35	1.35		QW9656	GW	
Uranium (U) - Total	ug/L	CONTROL 1	4/1/2017	<0.0020	0.001		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	0.0215	0.0215		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0	0.0000215		QW9657	GW	Automatically converted from value: 0.0215 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.173	0.173		QW9658	GW	
	mg/L	CONTROL 2	4/7/2017	0	0.000173		QW9658	GW	Automatically converted from value: 0.173 ug/L to mg/L.
	mg/L	CONTROL 3	4/3/2017	0	0.000148		QW9659	GW	Automatically converted from value: 0.148 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.148	0.148		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.0514	0.0514		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.0000514		QW9639	GW	Automatically converted from value: 0.0514 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.0000917		QW9640	GW	Automatically converted from value: 0.0917 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.0917	0.0917		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.0851	0.0851		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.0000851		QW9641	GW	Automatically converted from value: 0.0851 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0	0.0000678		QW9642	GW	Automatically converted from value: 0.0678 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.0678	0.0678		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.0000553		QW9643	GW	Automatically converted from value: 0.0553 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.0553	0.0553		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.13	0.13		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.0492	0.0492		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.00013		QW9644	DUPW1	Automatically converted from value: 0.130 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.0000492		QW9645	DUPW2	Automatically converted from value: 0.0492 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.00297		QW9646	GW	Automatically converted from value: 2.97 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	2.97	2.97		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.213	0.213		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000213		QW9647	GW	Automatically converted from value: 0.213 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.00155		QW9648	GW	Automatically converted from value: 1.55 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	1.55	1.55		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.501	0.501		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1.33	1.33		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00133		QW9649	GW	Automatically converted from value: 1.33 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000823		QW9650	GW	Automatically converted from value: 0.823 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.823	0.823		QW9650	GW	
	ug/L	SS4-4	4/7/2017	0.2	0.2		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0	0.0002		QW9651	GW	Automatically converted from value: 0.200 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000907		QW9652	DUPW1	Automatically converted from value: 0.907 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000686		QW9653	DUPW2	Automatically converted from value: 0.686 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	0.907	0.907		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	0.686	0.686		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	0.895	0.895		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0	0.000895		QW9654	GW	Automatically converted from value: 0.895 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0	0.000062		QW9655	GW	Automatically converted from value: 0.0620 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	0.062	0.062		QW9655	GW	
	ug/L	SS5-5	4/1/2017	0.0502	0.0502		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0	0.0000502		QW9656	GW	Automatically converted from value: 0.0502 ug/L to mg/L.
Vanadium (V) - Total	mg/L	CONTROL 1	4/1/2017	<0.00	0.00005		QW9657	GW	Automatically converted from value: <0.10 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.10	0.05		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.10	0.05		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0	0.0014		QW9658	GW	Automatically converted from value: 1.40 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	1.4	1.4		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.00113		QW9659	GW	Automatically converted from value: 1.13 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	1.13	1.13		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.45	0.45		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.00045		QW9639	GW	Automatically converted from value: 0.45 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.00116		QW9640	GW	Automatically converted from value: 1.16 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	1.16	1.16		QW9640	GW	
	ug/L	SS2-1	4/8/2017	0.48	0.48		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0	0.00048		QW9641	GW	Automatically converted from value: 0.48 ug/L to mg/L.

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Vanadium (V) - Total *(cont'd)*	mg/L	SS2-2	4/8/2017	0	0.0003		QW9642	GW	Automatically converted from value: 0.30 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	0.3	0.3		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0	0.00041		QW9643	GW	Automatically converted from value: 0.41 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.41	0.41		QW9643	GW	
	ug/L	SS2-4	4/8/2017	1.35	1.35		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	0.23	0.23		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0	0.00135		QW9644	DUPW1	Automatically converted from value: 1.35 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0	0.00023		QW9645	DUPW2	Automatically converted from value: 0.23 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.01	0.0129		QW9646	GW	Automatically converted from value: 12.9 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	12.9	12.9		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.84	0.84		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.00084		QW9647	GW	Automatically converted from value: 0.84 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.01	0.00732		QW9648	GW	Automatically converted from value: 7.32 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	7.32	7.32		QW9648	GW	
	ug/L	SS3-6	4/30/2017	2.16	2.16		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	1.99	1.99		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00199		QW9649	GW	Automatically converted from value: 1.99 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.00467		QW9650	GW	Automatically converted from value: 4.67 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	4.67	4.67		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.00097		QW9651	GW	Automatically converted from value: 0.97 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.97	0.97		QW9651	GW	
	ug/L	SS4-5	4/7/2017	3.26	3.26		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	4.42	4.42		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0	0.00442		QW9652	DUPW1	Automatically converted from value: 4.42 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.00326		QW9653	DUPW2	Automatically converted from value: 3.26 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.00355		QW9654	GW	Automatically converted from value: 3.55 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	3.55	3.55		QW9654	GW	
	ug/L	SS5-4	4/1/2017	0.24	0.24		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0	0.00024		QW9655	GW	Automatically converted from value: 0.24 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.00035		QW9656	GW	Automatically converted from value: 0.35 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	0.35	0.35		QW9656	GW	
Zinc (Zn) - Total	ug/L	CONTROL 1	4/1/2017	<0.10	0.05		QV4618	EBW	
	ug/L	CONTROL 1	4/1/2017	1.48	1.48		QW9657	GW	
	mg/L	CONTROL 1	4/1/2017	0.00148	0.00148		QW9657	GW	Automatically converted from value: 1.48 ug/L to mg/L.
	mg/L	CONTROL 2	4/7/2017	0.0046	0.0046		QW9658	GW	Automatically converted from value: 4.60 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	4.6	4.6		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0.00325	0.00325		QW9659	GW	Automatically converted from value: 3.25 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	3.25	3.25		QW9659	GW	
	ug/L	SS1-4	4/7/2017	1.95	1.95		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0.00195	0.00195		QW9639	GW	Automatically converted from value: 1.95 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0.00308	0.00308		QW9640	GW	Automatically converted from value: 3.08 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	3.08	3.08		QW9640	GW	
	ug/L	SS2-1	4/8/2017	16.8	16.8		QW9641	GW	
	mg/L	SS2-1	4/8/2017	0.0168	0.0168		QW9641	GW	Automatically converted from value: 16.8 ug/L to mg/L.
	mg/L	SS2-2	4/8/2017	0.0024	0.0024		QW9642	GW	Automatically converted from value: 2.40 ug/L to mg/L.
	ug/L	SS2-2	4/8/2017	2.4	2.4		QW9642	GW	
	mg/L	SS2-3	4/8/2017	0.00207	0.00207		QW9643	GW	Automatically converted from value: 2.07 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	2.07	2.07		QW9643	GW	
	ug/L	SS2-4	4/8/2017	3.27	3.27		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	4.53	4.53		QW9645	DUPW2	
	mg/L	SS2-4	4/8/2017	0.00327	0.00327		QW9644	DUPW1	Automatically converted from value: 3.27 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	0.00453	0.00453		QW9645	DUPW2	Automatically converted from value: 4.53 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0.0238	0.0238		QW9646	GW	Automatically converted from value: 23.8 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	23.8	23.8		QW9646	GW	
	ug/L	SS3-5	4/3/2017	2.57	2.57		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0.00257	0.00257		QW9647	GW	Automatically converted from value: 2.57 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0.0155	0.0155		QW9648	GW	Automatically converted from value: 15.5 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	15.5	15.5		QW9648	GW	
	ug/L	SS3-6	4/30/2017	5.4	5.4		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	5.12	5.12		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0.00512	0.00512		QW9649	GW	Automatically converted from value: 5.12 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0.0126	0.0126		QW9650	GW	Automatically converted from value: 12.6 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	12.6	12.6		QW9650	GW	
	ug/L	SS4-4	4/7/2017	3.68	3.68		QW9651	GW	
	mg/L	SS4-4	4/7/2017	0.00368	0.00368		QW9651	GW	Automatically converted from value: 3.68 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.0148	0.0148		QW9652	DUPW1	Automatically converted from value: 14.8 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0.00951	0.00951		QW9653	DUPW2	Automatically converted from value: 9.51 ug/L to mg/L.
	ug/L	SS4-5	4/7/2017	14.8	14.8		QW9652	DUPW1	
	ug/L	SS4-5	4/7/2017	9.51	9.51		QW9653	DUPW2	
	ug/L	SS5-3	4/1/2017	9.6	9.6		QW9654	GW	
	mg/L	SS5-3	4/1/2017	0.0096	0.0096		QW9654	GW	Automatically converted from value: 9.60 ug/L to mg/L.
	mg/L	SS5-4	4/1/2017	0.00148	0.00148		QW9655	GW	Automatically converted from value: 1.48 ug/L to mg/L.
	ug/L	SS5-4	4/1/2017	1.48	1.48		QW9655	GW	
	ug/L	SS5-5	4/1/2017	1.78	1.78		QW9656	GW	
	mg/L	SS5-5	4/1/2017	0.00178	0.00178		QW9656	GW	Automatically converted from value: 1.78 ug/L to mg/L.
Zirconium (Zr) - Total	mg/L	CONTROL 1	4/1/2017	<0.00	0.000025		QW9657	GW	Automatically converted from value: <0.050 ug/L to mg/L.
	ug/L	CONTROL 1	4/1/2017	<0.050	0.025		QW9657	GW	
	ug/L	CONTROL 1	4/1/2017	<0.050	0.025		QV4618	EBW	
	mg/L	CONTROL 2	4/7/2017	0	0.000224		QW9658	GW	Automatically converted from value: 0.224 ug/L to mg/L.
	ug/L	CONTROL 2	4/7/2017	0.224	0.224		QW9658	GW	
	mg/L	CONTROL 3	4/3/2017	0	0.000269		QW9659	GW	Automatically converted from value: 0.269 ug/L to mg/L.
	ug/L	CONTROL 3	4/3/2017	0.269	0.269		QW9659	GW	
	ug/L	SS1-4	4/7/2017	0.071	0.071		QW9639	GW	
	mg/L	SS1-4	4/7/2017	0	0.000071		QW9639	GW	Automatically converted from value: 0.071 ug/L to mg/L.
	mg/L	SS1-5	4/7/2017	0	0.000152		QW9640	GW	Automatically converted from value: 0.152 ug/L to mg/L.
	ug/L	SS1-5	4/7/2017	0.152	0.152		QW9640	GW	
	mg/L	SS2-1	4/8/2017	0	0.000189		QW9641	GW	Automatically converted from value: 0.189 ug/L to mg/L.
	ug/L	SS2-1	4/8/2017	0.189	0.189		QW9641	GW	
	ug/L	SS2-2	4/8/2017	0.07	0.07		QW9642	GW	
	mg/L	SS2-2	4/8/2017	0	0.00007		QW9642	GW	Automatically converted from value: 0.070 ug/L to mg/L.
	mg/L	SS2-3	4/8/2017	0	0.000062		QW9643	GW	Automatically converted from value: 0.062 ug/L to mg/L.
	ug/L	SS2-3	4/8/2017	0.062	0.062		QW9643	GW	
	ug/L	SS2-4	4/8/2017	0.192	0.192		QW9644	DUPW1	
	ug/L	SS2-4	4/8/2017	<0.050	0.025		QW9645	DUPW2	

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Zirconium (Zr) - Total *(cont'd)*	mg/L	SS2-4	4/8/2017	0	0.000192		QW9644	DUPW1	Automatically converted from value: 0.192 ug/L to mg/L.
	mg/L	SS2-4	4/8/2017	<0.00	0.000025		QW9645	DUPW2	Automatically converted from value: <0.050 ug/L to mg/L.
	mg/L	SS3-4	4/3/2017	0	0.00121		QW9646	GW	Automatically converted from value: 1.21 ug/L to mg/L.
	ug/L	SS3-4	4/3/2017	1.21	1.21		QW9646	GW	
	ug/L	SS3-5	4/3/2017	0.219	0.219		QW9647	GW	
	mg/L	SS3-5	4/3/2017	0	0.000219		QW9647	GW	Automatically converted from value: 0.219 ug/L to mg/L.
	mg/L	SS3-6	4/3/2017	0	0.000895		QW9648	GW	Automatically converted from value: 0.895 ug/L to mg/L.
	ug/L	SS3-6	4/3/2017	0.895	0.895		QW9648	GW	
	ug/L	SS3-6	4/30/2017	0.44	0.44		QZ4969	GW	Resampled at corrected coordinate.
	ug/L	SS3-7	4/3/2017	0.58	0.58		QW9649	GW	
	mg/L	SS3-7	4/3/2017	0	0.00058		QW9649	GW	Automatically converted from value: 0.580 ug/L to mg/L.
	mg/L	SS3-8	4/3/2017	0	0.000392		QW9650	GW	Automatically converted from value: 0.392 ug/L to mg/L.
	ug/L	SS3-8	4/3/2017	0.392	0.392		QW9650	GW	
	mg/L	SS4-4	4/7/2017	0	0.000233		QW9651	GW	Automatically converted from value: 0.233 ug/L to mg/L.
	ug/L	SS4-4	4/7/2017	0.233	0.233		QW9651	GW	
	ug/L	SS4-5	4/7/2017	0.885	0.885		QW9653	DUPW2	
	ug/L	SS4-5	4/7/2017	0.644	0.644		QW9652	DUPW1	
	mg/L	SS4-5	4/7/2017	0	0.000644		QW9652	DUPW1	Automatically converted from value: 0.644 ug/L to mg/L.
	mg/L	SS4-5	4/7/2017	0	0.000885		QW9653	DUPW2	Automatically converted from value: 0.885 ug/L to mg/L.
	mg/L	SS5-3	4/1/2017	0	0.00105		QW9654	GW	Automatically converted from value: 1.05 ug/L to mg/L.
	ug/L	SS5-3	4/1/2017	1.05	1.05		QW9654	GW	
	ug/L	SS5-4	4/1/2017	0.17	0.17		QW9655	GW	
	mg/L	SS5-4	4/1/2017	0	0.00017		QW9655	GW	Automatically converted from value: 0.170 ug/L to mg/L.
	mg/L	SS5-5	4/1/2017	0	0.000077		QW9656	GW	Automatically converted from value: 0.077 ug/L to mg/L.
	ug/L	SS5-5	4/1/2017	0.077	0.077		QW9656	GW	

Appendix E

Dust Gauge Collection Standard Operating Procedure (ENVR-508-0112)

Environment **STANDARD OPERATING PROCEDURE**			
Area No.:	**8000**	**Document #:**	**ENVR-508-0112**
		Revision:	**5**
Task Title:	**SOP – Dust Gauge Collection**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 **ENVI-403-0112 - SOP Total Suspended Solids** - Located in: Diavik Intranet - SOPs – Environment Folder

1.2 **ENVR-301-0112 – SOP General Laboratory Safety** - Located in: Diavik Intranet – SOPs – Environment Folder

1.3 **ENVR-605-0112 - SOP Snowmobiles** – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.4 **ENVR-602-0112 - SOP Watercraft** – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.5 **ENVR-501-0112 - SOP Remote Field Safety** – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.6 **ENVI-101-0813 - SOP Lightning Response –** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.7 **ENVR-601-0112 – SOP Helicopter -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.8 **ENVI-135-0112 - Remote Field Safety Permit Form** – Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Remote Field Safety Plans

1.9 **ENVI-178-0312 - Dust Gauge Collection Field Sheet –** Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Initial Release	11-Jan-12	D. Meredith
1	New SOP format, Clarify procedures, adds photos.	23-Nov-14	D. Dul/ D. Bourassa
2	Format update	19-Jul-15	D. Birch
3	Annual Update	10-Feb-2016	S. Sinclair
4	New Template, clarification of representative sampling, decrease in oven temperature to be consistent with Standard Methods	04-Nov-16/10-Nov-16	S. Martin-Elson/N. Goodman

5	Template and area manager updated	20-Oct-2017	S. Skinner

Authorized Electronically in Documentum By:	
Area Superintendent:	D. Wells
Area Manager:	J. Kozian

Environment

STANDARD OPERATING PROCEDURE

SOP – Dust Gauge Collection

CRITICAL RISKS ARE HIGHLIGHTED IN GREY

Please click on the CRM Risks that are applicable for this SOP			
			
			
			
			


Dust Gauge Site 5 in the Summer


Dust Gauge Site 7 in the Winter

Dust Gauge Tubes in the Field Lab

Description

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when carrying out Dust Gauge Collections.

2 PURPOSE

The purpose of this Standard Operating Procedure is to outline the methodology for collecting dust gauges. This program is aimed at understanding dust deposition rates associated with project activities. Results collected from this program are compiled and placed in the Appendix of the annual AEMP report.

3 SCOPE

3.1 Scope of Procedure

This standard operating procedure (SOP) describes the responsibilities and processes for the deployment, collection and analysis of Dust Gauge Samples. These procedures apply to all Diavik Mine personnel and contractor personnel authorized for sample collection activities.

3.2 Scope of Activities

Twelve-dust gauges (10 sample sites, plus 2 control sites) are established on and around East Island for monitoring airborne dust particles. The-dust gauges are collected quarterly throughout the year.

4 DEFINITIONS

Definitions							
PPE	✓	**GPS**	✓	**DO**	✗	**NTU**	✗
MSDS	✗	**SOP**	✓	**DI Water**	✓	**ELT**	✗
Problem Bear	✓	**JHA**	✓	**AEMP**	✓	**WLWB**	✗
QA	✗	**Groundwater**	✗	**COC**	✓	**PAL**	✗
QC	✗	**Seepage**	✗	**WHMIS**	✗	**ACTS**	✗
Remote Work	✓	**SNP**	✗	**TSS**	✓	**PROVE**	✗
TSP							

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	Chemical Contact	✗	Rotating Parts	✓	Uneven Terrain / Ground	✓
Sprain / Strain	✓	Fall into Water	✓	Firearms / Deterrents	✓	Perception	✓
Working Remotely	✓	Overhead Objects	✗	Dehydration	✓	Risk to Wildlife	✓
Aircraft	✓	Visibility	✓	Ergonomics	✗	Unfamiliar Area	✗
Watercraft Operation	✓	Fire	✗	Glass	✓	Falling	✗
Snowmobile Operation	✓	Line of Fire	✓	Fumes / Gases	✗	Confined Space	✗
Light Vehicle	✓	Cuts Scrapes	✓	Entanglement	✗	Heavy Equipment	✓
Lifting	✓	Pinch Points	✓	Stored Energy	✓	Extreme Weather	✓
Manual Labour	✓	Noise	✓	Burns	✓	Electrical	✗
Wildlife	✓	Spills	✓	Equipment Loss or Damage	✓	Sample Loss or Damage	✓

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Drowning	PFD
Vehicle collision or rollover	Seat Belt, Defensive driving, Segregation
Vehicle impact on person	Seat Belt, Defensive driving/walking, Segregation

Wildlife	Scans
Aircraft transport	PPE

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
Snowmobile(2), Boat or Helicopter	**1**	**Winter/Summer/Boat Survival Gear (Set)**	**1**
GPS/ Loaded Coordinates	**2**	**Spare Batteries**	**4**
Satellite Phone	**1**	**Personal Gear (per person)**	**1**
Spot (per snowmobile)	**1**	**Wildlife Deterrents (air horn/banger kit)**	**1**
Camera (per person)	**1**	**Field Permit and Map**	**1**
Radio with spare battery (per person)	**1**	**Adjustable Wrench's**	**1**
Forceps, Pliers, Leatherman or Tweezers	**1**	**Field Sheets**	**14**
Clean Replacement Sample Tubes	**6**	**Pencils, Pens or Markers**	**2**
Glass Beakers (1000 mL)	**6**	**Large/Clear/Heavy-duty Plastic Bags or Gloves**	**6**
High Temp Oven	**1**	**TSS Filters**	**12 - 36**
Fire Proof Gloves/Tongs	**1**	**Duct Tape**	**12 - 36**
Vice Grips	**1**		

6.4 Procedural Steps

6.4..1 Pre-Deployment

Spare tubes are stored in the Environment field lab Shelf B3. **Tubes needs to be cleaned and checked for leaks**. To clean and check for leaks fill spare tubes with water and leave overnight on counter in Environment Lab. If leaks are discovered tag out and make arrangements with truck shop to have them fixed.

6.4..2 Sample Collection and Deployment

Depending on location and season samples are collected using various methods of transportation; you can walk, drive, boat, snowmobile or use a helicopter to access the various

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sites. When using a Helicopter, a Hot Loading Variance is permitted (a JHA must be completed and signed off by OHSE Manager). The map in Figure 1 provides the Dust Gauges locations, and Table 1 provides the coordinates.

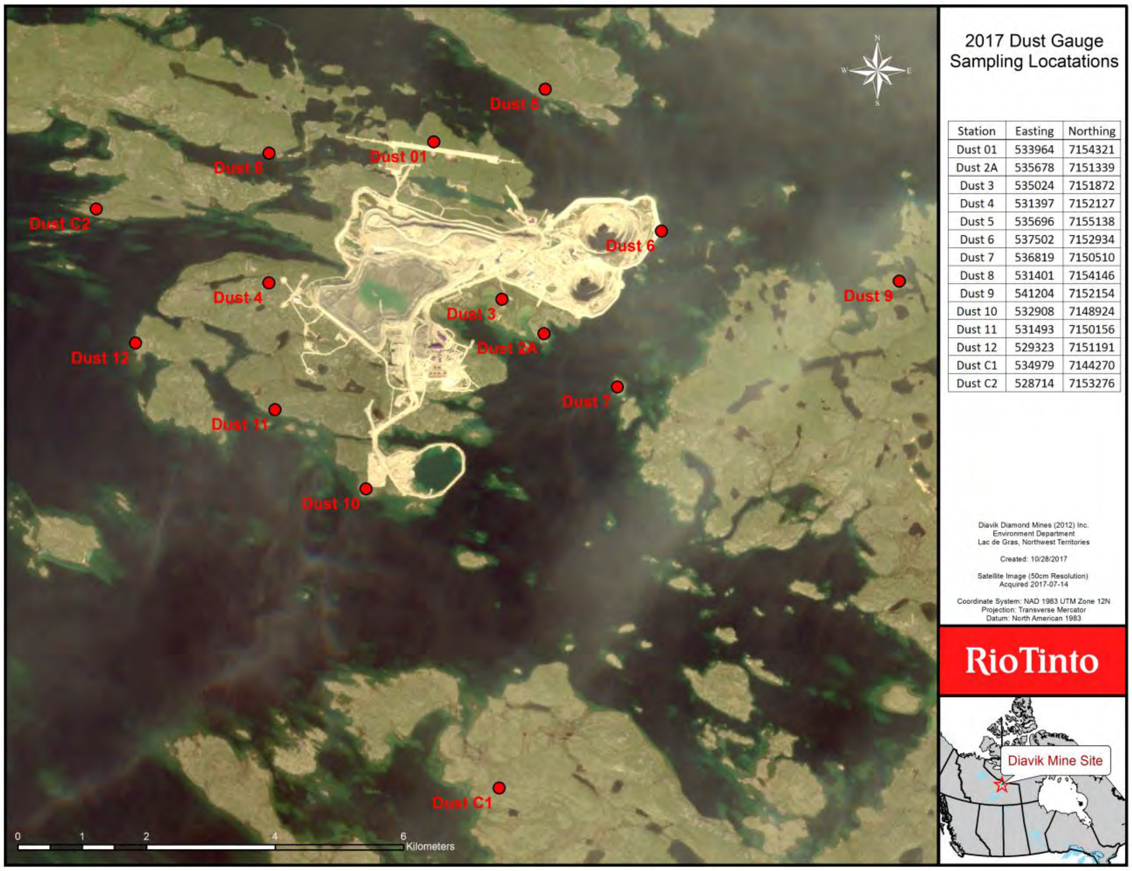


Figure 1: Map: Identifying Dust Gauge Sites

Table 1.0 below provides the coordinates for each Dust Gauge Site

STATION	EASTING	NORTHING		STATION	EASTING	NORTHING
Dust 01	533964	7154321		**Dust 8**	531401	7154146
Dust 2A	535678	7151339		**Dust 9**	541204	7152154
Dust 3	535024	7151872		**Dust 10**	532908	7148924
Dust 4	531397	7152127		**Dust 11**	531493	7150156
Dust 5	535696	7155138		**Dust 12**	529323	7151191
Dust 6	537502	7152934		**Dust C1**	534979	7144270
Dust 7	536819	7150510		**Dust C2**	528714	7153276

- When you arrive at the sample location, first inspect the station for damage (fiberglass tube on ground, station on angle etc.) and document anything noted on the Dust Gauge Collection Field Sheet - ENVI-178-0312.

- Carefully remove the copper tube out from the center of the fiberglass shield, keeping it upright. If the tube is stuck or frozen, try wiggling it, or tapping it near the bottom. If the tube is still stuck you may need extra leverage to free the tube and may if absolutely necessary use vice grips to grab the top and wiggle while pulling up. If it will not come free, you may have to remove the shield and pop the tube out. Be sure to replace the shield and insert a new tube afterwards. See photo 1 & 2 below

.

Photo 1: Tube Retrieval

Photo 2: Fiberglass Shield Removed

- Once retrieved, keep the tube upright, place an extra-large latex glove over top of tube and seal with clean plastic bag and duct tape. Ensure tube is labelled with the station number, date and time collected. Keep the tube upright and secure at all times during transport. See photo 3 below.

- Place a clean, leak tested tube into the fiberglass shield (the tube should be labelled with the Dust Gauge Site, deployment date and time). Note that tubes need to be *upright and secure in the base rims* in order for the sample to be considered representative. Some of the base rims are bent and the tubes will not seat in them properly. When this is the case, place rocks around the tube within the fiberglass shell to ensure that tube will stay upright.

Photo 3: Sealing the Tube

6.4..3 Sample Analysis

- Once back in the Environment Lab, carefully transfer sample into a triple rinsed 1000ml glass beaker. Extract all debris including bugs and twigs and be sure to triple rinse them into the beaker to capture all the dust particles. Rinse the copper tube with DI water until all dust particles are removed. Record the total volume of water on the Dust Gauge Collection Field Sheet- ENVI-178-0312. If snow is present stand up the sample tube in a clean plastic bag (prevents sample loss if there is a leak) and allow samples to melt before conducting the above procedure.

- Cover the 1000ml beaker with parafilm and store the sample in the fridge until samples can be analysed for Total Suspended Solids (ENVI-403-0112). This should be conducted as soon as possible because some solids may dissolve in water, especially after snow melt. Note that it may take multiple filters to complete one sample.

- The resulting filter(s) with the dust particles are put into ceramic crucibles; ensure that you record the sample id on the crucibles **in pencil** before putting them into the oven. (1 filter per crucible) See photo 4 below.

Photo 4: Ceramic Crucibles with filter

- The high temperature oven is set up in the fume hood with the fan running. Heavy-duty fire-proof gloves and long tongs are used when placing or removing the crucibles from the oven. Filters are processed in the oven at 550 degrees Celsius for one hour. Allow oven to heat up to temperature before use. See photo 5 & photo 6 below.

Photo 5: High Heat Oven

Photo 6: Fire Proof Glove and Long Tongs

- When samples are removed from the oven, place the crucibles into their original labeled tin tray. Let the sample cool for at least 10 minutes before carefully removing the filters from their ceramic crucible using tweezers. Add any dust that has fallen off into the crucible to the top of the filter. Place the tin tray into the desiccator and allow the sample to cool further for a minimum of one hour.

- Remove the tin tray from the desiccator and weigh the filter according to the procedure outlined in the Total Suspended Solids SOP ENVI-403-0112.

- Record the results on the Dust Gauge Data Form (ENVI-178-0312) and in 13.14 Annual Dust Gauge Collection excel file in the P-Drive in for the given year.

- The dust fall deposition rate is determined using the equation below:

Daily Dust fall Deposition (mg/dm$_2$/d) = (TP (mg) / SA (dm$_2$)) / TDD (d)

Where:
TP (mg) = Total Particulate
SA (dm$_2$) = Surface Area of Dust Gauge Collection Tube = (3.14*(6.25*6.25))*(100)
TDD = Total Days Gauge was Deployed

Calculations are setup in the excel file. If you have any questions about entering this data contact your supervisor.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Produce quality, accurate and repeatable results.

Appendix F

Snow Core Survey Standard Operating Procedure (ENVR-512-0213)

Environment STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVR-512-0213**
		Revision:	**5**
Task Title:	**Snow Core Survey**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 **ENVR-501-0112 – SOP Remote Field Safety -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 **ENVR-605-0112 - SOP Snowmobile -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.3 **ENVR-301-0112 - SOP General Laboratory Safety -** Located in: Diavik Intranet – SOPs – Environment Folder

1.4 **ENVR-303-0112 - SOP Quality Assurance and Quality Control -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.5 **ENVR-206-0112 - SOP Chain of Custody and Sample Shipment -** Located in: Diavik Intranet – SOPs – Environment Folder

1.6 **ENVR-403-0112 - SOP Total Suspended Solids Analysis -** Located in: Diavik Intranet – SOPs – Environment Folder

1.7 **ENVI-601-0916- Snowmobile Pre-Op Inspection -** Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Check Sheets

1.8 **ENVI-135-0112 – Remote Field Safety Permit -** Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Remote Field Safety Plans

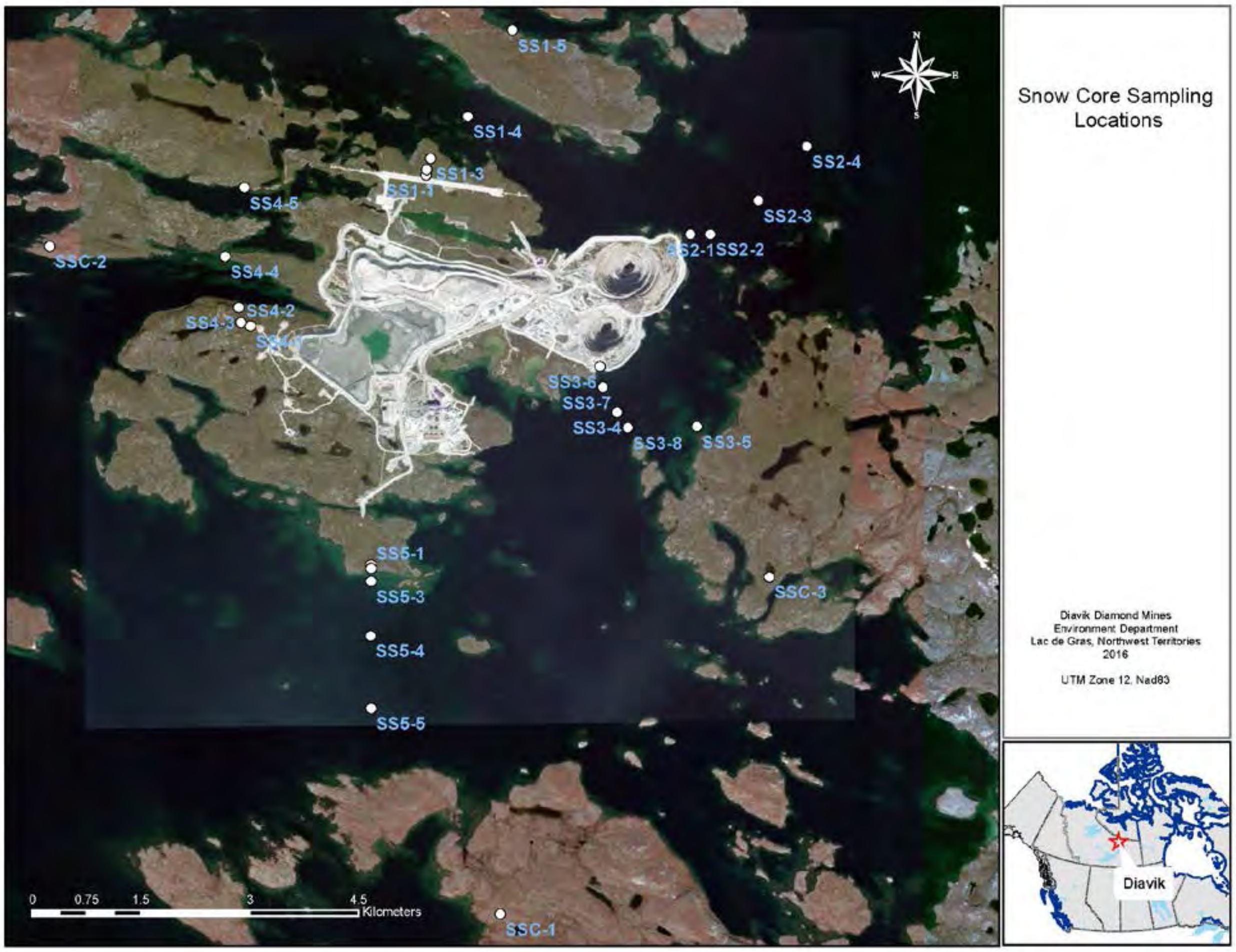
1.9 **ENVI-177-0312 – Snow Sampling Field Sheet -** Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	08-FEB-2012	D. Grabke
1	Updated Map for 2014, added SS3-6, SS3-7, SS3-8 sample points, updated to new environment SOP format	8-Apr-2014	D. Grabke
2	Format update	19-Jul-15	D. Birch
3	Format update	06-Dec-15	G.Reid
4	Format update	06-Nov-16	S. Martin-Elson
5	Format and area manager updated	20-Oct-2017	S. Skinner

Authorized Electronically in Documentum By:	
Area Superintendent:	D. Wells
Area Manager:	J. Kozian

CRITICAL RISKS ARE HIGHLIGHTED IN GREY

Please click on the CRM Risks that are applicable for this SOP			
			
			
			
			



Snow Survey Sample Program Map

Description

Snow sampling at the Diavik Diamond Mine consists of snow core sampling to monitor dust deposition rates relative to predictions outlined in the DDMI Environmental Effects Report (1998), and snow water quality sampling in support of the DDMI Aquatic Effects Monitoring Program (AEMP).

2 PURPOSE

The purpose of this guide is to promote efficient and accurate snow surveying and to establish uniform sampling procedures.

3 SCOPE

3.1 Scope of Procedure

This standard operating procedure (SOP) describes the responsibilities and processes for collecting, documenting, and processing snow samples from at the Diavik mine site a surrounding Lac de Gras area (during ice cover). This procedure applies to all Diavik Diamond Mines personnel and contractor personnel authorized to collect samples under the current years Aurora Research Institute – Aquatic Effects Monitoring Program (AEMP) Research Permit.

3.2 Scope of Activities

This procedure has been developed to be consistent with the requirements of the AEMP design document and Environmental Effects Monitoring.

4 DEFINITIONS

Definitions							
PPE	✓	GPS	✓	DO	✗	NTU	✓
MSDS	✓	SOP	✓	DI Water	✓	ELT	✗
Problem Bear	✗	JHA	✓	AEMP	✗	WLWB	✗
QA	✗	Groundwater	✗	COC	✓	PAL	✗
QC	✓	Seepage	✗	WHMIS	✓	ACTS	✗
Remote Work	✓	SNP	✗	TSS	✓	PROVE	✗
TSP	✗						

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: **ENVI-444-0415 - Environment Roles and Responsibilities** - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	Chemical Contact	✓	Rotating Parts	✓	Uneven Terrain / Ground	✓
Sprain / Strain	✓	Fall into Water	✓	Firearms / Deterrents	✗	Perception	✓
Working Remotely	✓	Overhead Objects	✗	Dehydration	✓	Risk to Wildlife	✓
Aircraft	✗	Visibility	✓	Ergonomics	✓	Unfamiliar Area	✓
Watercraft Operation	✗	Fire	✓	Glass	✗	Falling	✓
Snowmobile Operation	✓	Line of Fire	✓	Fumes / Gases	✓	Confined Space	✓
Light Vehicle	✓	Cuts Scrapes	✓	Entanglement	✓	Heavy Equipment	✗
Lifting	✗	Pinch Points	✓	Stored Energy	✓	Extreme Weather	✓
Manual Labour	✓	Noise	✗	Burns	✓	Electrical	✗
Wildlife	✓	Spills	✓	Equipment Loss or Damage	✓	Sample Loss or Damage	✓

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Wildlife	Scans
Vehicle collision or rollover	Seatbelt, Segregation, Defensive Driving
Vehicle impact on person	Seatbelt, Segregation, Defensive Driving/Walking
Drowning	PFD
Exposure to hazardous substances	PPE
Fall from height	Stay away from edges

6.3 Tools Required

Supplies, Tools and Equipment

Tool / Equipment	Quantity	Supplies	Quantity
Snow Corer & Handles	1	Snow Survey Map	2
Transport Case	1	GPS & Waypoints	2
Weighing Scale & Cradle	1	Satellite Phone	1
Sample Collection Bags & Zip Ties	20	Spot Personal Locator	2
Black Permanent Marker	2	Survival Kit	1
Field Data Sheets (Pens/Pencils) & Clipboard	10	Ice Rescue Kit	2
Snowmobile	1	Radio and Spare Battery	2
Toboggan	1	Coolers	5
Camera	1		

6.4 Procedural Steps

6.4..1 Planning

6.4..1.1 Program Management

The sampling snow survey will be completed annually in April. The survey design consists of 27 sample stations, including 3 control areas established along 5 transect lines originating from East Island and extending onto Lac de Gras.

Table 1 - Snowcore Sampling Locations

Transect Line	Station	UTM E (NAD 83)	UTM W (NAD 83)	Description
1	SS1-1	533911	7154288	Land
	SS1-2	533924	7154367	Land
	SS1-3	533966	7154517	Land
	SS1-4	534485	7155094	Ice
	SS1-5	535099	7156279	Ice
2	SS2-1	537553	7153473	Ice
	SS2-2	537829	7153476	Ice
	SS2-3	538484	7153939	Ice
	SS2-4	539151	7154685	Ice
3	SS3-4	536585	7151002	Ice
	SS3-5	537623	7150817	Ice
	SS3-6	536305	7151564	Ice
	SS3-7	536344	7151366	Ice
	SS3-8	536688	7150810	Ice
4	SS4-1	531491	7152211	Land
	SS4-2	531356	7152261	Land
	SS4-3	531331	7152434	Land
	SS4-4	531141	7153167	Ice
	SS4-5	531405	7154116	Ice
5	SS5-1	533150	7148925	Land
	SS5-2	533150	7148875	Land
	SS5-3	533150	7148700	Ice
	SS5-4	533150	7147950	Ice
	SS5-5	533150	7146950	Ice
	Control 1	534983	7144271	Land
	Control 2	528714	7153281	Land
	Control 3	538650	7148750	Land

6.4..1.2 Sampling Requirements – Dust Deposition

Dust deposition will be measured in-house using standard DDMI Total Suspended Solids laboratory procedures ENVR-403-0112. To facilitate this analysis, a composite sample comprised of a minimum of 3 snow cores will be collected at **ALL** (land and Ice) of the snow sampling stations. Water content must add up to a minimum 25 SWE for there to be sufficient water for analysis.

6.4..1.3 Sampling Requirements – Snow Water Quality

Snow water quality samples are required for all sample stations on Lac de Gras identified as **on-ice** locations, as well as at the **three control** areas Table 1 - Snowcore Sampling Locations. Snow chemistry analysis will be conducted by Maxxam Analytics. To facilitate the required analysis Table 2- Snow Water Quality Sample Requirements, a composite sample comprised of a minimum of 3 snow cores with a water Content (SWE) of at least 100 will be collected at all of the snow water quality stations.

Table 2- Snow Water Quality Sample Requirements

Bottle Filling Sequence	Maxxam Bottle	Analysis	Minimum Volume of Sample Required (ml)	Preservative
1	Metals	Total ICP Metals (Ultra Low)	60mL Falcon Tube	1ml Nitric Acid – HNO_3
2	Mercury	Total	40mL Glass Vial	1 ml Hydrochloric Acid - HCL
3	Nutrients	Ammonia	120mL HDPE	1 ml Sulfuric Acid
4	Routine	Sulfates, Nitrates, and Nitrites	1000mL HDPE	None Required
5	TSS, Turbidity & pH (Routine, 2nd Bottle)	TSS, Turbidity & pH	1000mL HDPE	None Required
Total Sample Volume Required			2220ml + 30% Triple Rinse	**3000ml = 100SWE**

Determining anticipated sample volume from Snow Water Equivalent (SWE)
Sample Water (ml) = SWE (cm) x 30(cm^2)
3000ml /30cm^2 = SWE = 100cm SWE

Therefore the aggregate Water Content SWE collected at a sample site must add up to at least 100 to ensure sufficient volume for water quality analysis.

6.4..2 Quality Assurance and Quality Control

Quality Control will be achieved through the use of duplicate and blank samples.

- Duplicate samples will be collected for a minimum 10% of the total samples (both Dust and Water Quality).
- At least **two** duplicate samples for the **dust** deposition samples
- At least **two** duplicate samples for the **water quality** samples
- One **equipment blank** will be collected and processed by Maxxam for water quality chemical analysis and internally for TSS. Maxxam DI water batch number will be

recorded on the field sheet. Equipment blanks will be completed from a single batch of DI water. Ensure that information from the DI water is recorded on the field sheet. Batch ID and Expiry date.

Quality assurance will be achieved via the following processes;

- Field data sheets will be utilized to document any and all observations, or occurrences that may impact the integrity of the samples, as well as corrective actions implemented to deal with those occurrences.
- If a sample becomes compromised, it will be recorded on the field data sheet, the sample will be discarded and a new sample collected.
- Individuals collecting the samples will take precautions to eliminate sample contamination during handling. Avoid touching insides of sample bags, avoid contacting the snow samples with anything other than the sampling corer.

Steps will be taken prior to, during, and after sampling to ensure all samples are correctly labeled with the sample date, sample ID, and sample type.

6.4..3 Equipment Inspection & Preparation

Prior to commencing the sampling program, inspect all sampling equipment for fouling, contamination, or damage. All of the polyacrylic tubes that will be utilized will be rinsed with a 10% Nitric Acid solution to ensure they are clean prior to the initiation of the program.

Snow Corer – Inspect the core tube to ensure measurement etchings are legible. Check the cutting edge to ensure blade is not deformed or damaged. Inspect the handles and threads to ensure they will assemble and disassemble without binding. Ensure the corer has been de-contaminated (acid rinsed) prior to commencing the program.

Weighing Scale and Cradle – Inspect the scale and cradle for deformity or damage

Snowmobiles – Inspection and use of snowmobiles will be in accordance with ENVR-603-0112

Communication – Inspect all communication equipment (Radios/Sat Phones, Spot Personal Locator) to ensure they are operational and functional. Ensure batteries (including spares) are fully charged. Ensure check-in times and procedures are clearly identified on the Field Work Permit.

Navigation – Inspect GPS and spare batteries to ensure equipment is functioning correctly. Verify that all sample locations are present and correct, and that the GPS Essentials file is loaded. Ensure an appropriate map is present to allow navigation back to site should the GPS fail.

Personnel Gear – In addition to winter survival equipment, each individual participating in off-site activities is expected to carry appropriate personal gear and equipment as is deemed necessary for the individual well being in an emergency situation.

Survival Kit – Inspect survival kit and Ice Rescue kits to ensure that they are complete and all items are functional and ready for use.

Misc – Individual core samples will be compiled into plastic bags (soil sampling bags) and sealed with zip-ties until they are ready for processing. Prior to the program commencing bags must be inspected to ensure they are new and clean.

6.4..4 Sample Collection

Navigate to the sampling locations – If the sample point falls on or immediately adjacent to the winter road adjusts your location to the nearest area with natural snow coverage (i.e. not impacted by the road or snow clearing).

Assemble the corer by threading the handles onto the tube, and re-inspect the snow corer for fouling and/or damage that may have occurred during transportation.

Fill in station location and weather information on the field data sheet. Identify snow conditions and dust observations in the comments section.

Prior to collecting a sample re-inspect the tube to check for cleanliness.

- **Take the weight of the empty snowcorer at each station prior to collecting any samples.**
- **For all station requiring snow water chemistry, collect the dust sample first – this will effectively rinse the corer with ambient snow minimizing cross contamination from locations.**

Hold the corer vertically (cutter end down) and drive it through the snow to the ground/ice surface below. Be sure the cutter contacts the ground/ice as compacted snow/ice may feel like the ground and result in an incomplete core.

Before raising the corer, read the depth of the snow (nearest cm) and record on the field datasheet.

Turn the corer at least one full turn to cut the core loose from the ground/ice surface. Carefully raise the corer and record the length of the core extracted. [Note: this could potentially be different from the depth of snow, see next]

Inspect the cutter end of the tube for dirt or litter, with gloves on carefully remove soil and litter from the core. If need be correct the length of the core extracted by subtracting the depth of the soil or litter (plug). Record adjusted core length and litter/soil observations on the field data sheet.

Carefully balance the corer containing the core on the weighing cradle.

- **Suspend the corer (like a pendulum) do not hold the corer tube or handles**

To ensure and accurate reading, gently tap the scale to be sure it is not sticking or binding.

Read the weight of the tube and core from the graduations on the scale. The scale is marked in cm of water.

Record the weight of the corer and the core to the nearest one-half cm.

To collect the core, lift the tube from the cradle and turn cutter und up. Gently tap the corer and the extracted core will slide out the top end. Be sure to use a clean/new sample bag to catch the core sample.

- **Ensure all sample bags are clearly labelled with the station ID, sample type, date, and number of cores included in the composite**
- **Ensure all bags are sealed using a clean zip-tie**

Weigh the empty sampling tube following the first and at least every fourth sample as the weight will change as small particle of water or snow accumulate/cling to the inside and outside of the tube and checking will make the data more accurate. Record the weight of the empty corer on the field data sheet.

Subtract the weight of the empty tube from the weight of the tube and core to obtain the water content of the sample.

Density calculations can be completed back in the lab following the completion of the program.

Density (g/cm^3) = Total SWE Collected (g/cm^{2*}) / Total Snow Core Length Collected (cm)
***assumes pure water density 1g/cm^3**

Prior to moving to the next sampling location ensure the field datasheet is complete.

6.4..5 Sample Processing

Prior to processing, all samples must be kept in a frozen state to minimize sample degradation.

When preparing the samples for decanting and analysis, remove the sample bags from the freezer. Check to ensure that the top of the bag is well twisted and the zip-tie is tight. Place the sample bag into a new (clean) sample bag and affix a zip-tie to seal the second bag. This double bagging will help to ensure no sample is lost during the melting process. To process samples, they will require anywhere from 12-36 hours to thaw at room temperature.

Place the sealed sample bags upright in clean coolers in the lab to thaw overnight.

Once a sample is completely melted it is ready for processing.

Sample volume can be determined using a scale accurate to 1g, set up scale, tare the sampling basin with two bags and 2 zip-ties. Place sample bags in the basin and record the weight of each of the bags on the field sheet.

Dust deposition samples will be processed in the DDMI Lab for TSS.

- **The entire volume of sample must be processed – this may require the use of multiple filters.**
- **For samples with large quantities of organics (twigs/leaves etc.) it may be necessary to sieve the sample through a course filter prior to processing.**
- **Given the possibility of the samples containing organic matter, sample filters will be dried in the high temperature oven (650°F) for 1hr to burn off any organics on the filter.**
- **Allow Samples to cool in the desiccator prior to weighing the filters.**

Snow Water Quality samples will be decanted to fill the appropriate (pre-labelled) Maxxam sample bottles as per standard water sampling procedures. Any excess sample water can be discarded.

6.4..6 Sample Chain of Custody

Samples will be shipped to Maxxam Analytics as per ENVR-206-0112 – CHAIN OF CUSTODY & SAMPLE SHIPPING – and accompanied by COC documentation.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

Appendix G

Quality Assurance/Quality Control Standard Operating Procedure (ENVR-303-0112)

ENVIRONMENT
STANDARD OPERATING PROCEDURE

Area No.:	**8000**	**Document #:**	**ENVR-303-0112**
		Revision:	**4**
Task Title:	**Quality Assurance/Quality Control**		
	Supersedes: ENV SOP 303		

FOR DOCUMENT CONTROL USE ONLY:
Next Review: **1 year from Area Manager Authorized Signature Date below**
Effective Date: **See Area Manager Authorized Signature Date below**

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-656-0117 DDMI Environment Lab – Training – Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.2 Training

1.2 ENVR-301-0112 – SOP- General Laboratory Safety - Located in: Diavik Intranet – SOPs – Environment Folder

1.3 ENVR-206-0112 - SOP- Chain of Custody & Sample Shipping - Located in: Diavik Intranet – SOPs – Environment Folder

1.4 ENVI-133-0112 - Aquatic Effects Field Sheet - Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

1.5 ENVI-134-0112 – 1645-19 SNP Monitoring Field Sheet – Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

1.6 ENVI-668-0117 DDMI Environment Lab – Equipment Management - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.5 Equipment

1.7 ENVI-669-0117 DDMI Environment Lab – Measurement Traceability - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.6 Measurement Traceability

1.8 ENVI-653-0117 DDMI Environment Lab – Record Control - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\4.13 Record Control

1.9 ENVI-650-0117 DDMI Environment Lab – Document Control - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\4.3 Document Control

1.10 ENVR-403-0112 – SOP Total Suspended Solids Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.11 ENVR-404-0112 – SOP pH Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.12 ENVR-405-0112 – SOP Turbidity Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.13 ENVR-604-0112 – SOP Field Meter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Initial Release	01-Jan-12	D. Grabke
1	Formatting	08-Dec-15	D. Birch
2	Revision of QC schedule and measures	29-May-16	N. Goodman
3	CALA Updates	15-Dec-16	N. Goodman
4	Update to template, area manager and CRM	21-Oct-17	A. Hehn

Authorized Electronically in Documentum By:	
Area Superintendent:	D. Wells
Area Manager:	J. Kozian

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS ARE HIGHLIGHTED IN GREY

Please click on the CRM Risks that are applicable for this SOP			
			
			
			
			

Internal QA/QC
LABBW
LDUPW1/ LDUPW2
DUPRDGS
EBINT

External QA/QC KEY		
-1	=	EBW
-2	=	FBW
-3	=	TBW
-4	=	DUPW1
-5	=	DUPW2
-6	=	DLS

Description
This SOP reviews the quality assurance and quality control measures we use to ensure best practices are being utilized while collecting and analysing samples.

2 PURPOSE

The Objective of this Standard Operating Procedure is to establish consistent and uniform criteria and procedures to be implemented for laboratory activities undertaken during water quality analysis to ensure environmental data generated and processed is scientifically valid.

This SOP is intended to define Environmental Quality Assurance (QA) and Quality Control (QC) measures in place to ensure all data generated in the DDMI Environment Laboratory shall be of known precision and accuracy, be complete, representative, and comparable.

3 SCOPE

3.1 Scope of Procedure

This procedure applies to all Diavik Diamond Mines personnel and contract personnel authorized by the Environment Superintendent to collect, analyse and ship samples. All persons conducting analyses in the DDMI laboratory are required to read, understand, and fully comply with the methods outlined in the SOP for each analytical test conducted, respectively.

This procedure has been developed to be consistent with the requirements of the Rio Tinto HS & E standards.

4 DEFINITIONS

Definitions							
PPE	✓	GPS	✓	DO	✗	NTU	✗
MSDS	✗	SOP	✓	DI Water	✗	ELT	✓
Problem Bear	✗	JHA	✓	AEMP	✗	WLWB	✗
QA	✗	Groundwater	✗	COC	✗	PAL	✗
QC	✗	Seepage	✗	WHMIS	✗	ACTS	✗
Remote Work	✓	SNP	✗	TSS	✗	PROVE	✗
TSP	✗						

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key Safety Aspects

Task Hazards							
Slip, Trip, Fall	✓	Chemical Contact	✗	Rotating Parts	✓	Uneven Terrain / Ground	✓
Sprain / Strain	✓	Fall into Water	✗	Firearms / Deterrents	✓	Perception	✗
Working Remotely	✓	Overhead Objects	✗	Dehydration	✗	Risk to Wildlife	✓
Aircraft	✓	Visibility	✗	Ergonomics	✗	Unfamiliar Area	✗
Watercraft Operation	✗	Fire	✗	Glass	✗	Falling	✗
Snowmobile Operation	✗	Line of Fire	✓	Fumes / Gases	✓	Confined Space	✗
Light Vehicle	✗	Cuts Scrapes	✗	Entanglement	✗	Heavy Equipment	✗
Lifting	✗	Pinch Points	✓	Stored Energy	✗	Extreme Weather	✓
Manual Labour	✗	Noise	✓	Burns	✗	Electrical	✗
Wildlife	✓	Spills	✓	Equipment Loss or Damage	✗	Sample Loss or Damage	✗

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
N/A	N/A

6.3 Procedural Steps

6.3.1 Quality Assurance (QA)

Quality assurance for the environmental laboratory encompasses all quality-related activities that ensure the validity of aquatics testing and analysis and all relevant technical support. All DDMI environment personnel, from management to field laboratory technicians, are required to conscientiously follow applicable quality control measures and standard operating procedures (SOPs). Adherence to these documents, combined with staff vigilance, can help ensure that the analytical data and other test results collected will be acceptable as the bases for making significant decisions.

The DDMI laboratory ("the lab") encompasses a broad range of activities including preparation of samples for internal analytical processing, calibration and maintenance of equipment, data management, and sample handling for external analysis.

Our approach to quality assurance places an emphasis on four aspects:

- Infrastructure (instruments, testing capabilities, calibrations, SOP's)
- Control Measures (internal/external)
- Personnel (competence, ethics, and integrity)
- Data Management/Control of Non-Conforming Work

The quality of the outputs is at risk if any of these four aspects are deficient in any way.

6.3.2 Infrastructure

6.3.2.1 Equipment

All equipment is to be maintained and operated in accordance with manufacturer instructions and SOPs. Modifications to equipment/equipment settings/any issues are to be recorded in the spreadsheet in the relevant Equipment folder, which is accessible to all staff and should be regularly consulted during troubleshooting, as per ENVI DDMI Environment Lab – Equipment Management.

6.3.2.2 Testing Capabilities

Continued testing capability is verified through a regular (semi-annual) program of Proficiency Testing (PT). Environmental conditions within the lab (such as sample storage areas, as well as within test-specific equipment such as ovens and desiccators) shall be maintained such that the exact requirements of specific methods are met and testing capability is not impaired. Furthermore, lab management has a responsibility to review new editions of external method reference documents (such as the Standard Methods) whenever a new edition is released to ensure continued consistency with internationally approved best practice.

6.3.2.3 Calibrations

Calibrations are performed regularly on all pieces of lab equipment with the potential to impact test results, following a predefined schedule and bearing traceability to SI units wherever possible. When performed internally, calibrations are always done in accordance with method SOPs. All observations and maintenance actions must be reported in the QA/QC Lab Performance logbook.
The logbook must also keep record of the instrument calibration history. Calibration records for fixed and portable laboratory measuring equipment, and individual monitoring devices, shall be maintained and include dates, personnel, and specifics of calibration standards and reference solutions. Instrument calibration procedures and schedules are clearly outlined in individual SOP's.

More details on calibrations and calibration records are available in ENVI-669-0117 R0 DDMI Environment Lab – Measurement Traceability, ENVI-670-0117 RO DDMI Environment Lab – Record Control, and ENVI 650-0117 R0 DDMI Environment Lab – Document Control

6.3.2.4 Purchasing and Verifying Supplies and Services

Services and supplies that affect the quality of tests and/or calibrations shall be purchased only from suppliers that have been investigated and approved. Suppliers shall only be approved when they have been verified as complying with standard specifications or requirements defined in the methods for the tests and/or calibrations concerned. All received supplies will be compared against their accompanying purchase documents, and their reception and specifications must be recorded. Supplies must be verified prior to use according to ENVI-651-0117 DDMI Environment Lab – Purchasing Supplies and Services

6.3.3 Internal Quality Control (QC) Measures

Laboratory quality control consists of both internal and external checks on precision and accuracy of analytical results. Employees are trained in quality control and good lab practices through the lab analyst certification process (ENVI-560-0616, ENVI-561-0616, ENVI-562-0616). An annual performance evaluation ensures that the integrity of analytical procedures remains intact.

Best practices in water quality monitoring dictate that QC samples will comprise at least 10% of all samples analyzed, and more as required to maintain assurance of quality across homogenous sampling matrices and conditions. Due to high sample volumes, the DDMI Environment department performs more than 10% internal QC in order to ensure that any errors or sources of contamination in procedures or equipment are caught immediately. No batch of samples is ever analyzed without some form of internal QC (at least a Lab Blank, below).

Internal Quality Control sample types (descriptions below) consist of: Lab Blanks (LBW), Lab Duplicates (LDUPW1/LDUPW2), Duplicate Readings (DUPRDGS), Laboratory Splits (DLS), and Internal Equipment Blanks (EBINT). Results of Internal Quality Control samples are recorded as per ENVI-670-0117 RO DDMI Environment Lab – Record Control, and reviewed by Environment Supervisors to detect trends.

Lab Blanks (LABBW)

A laboratory blank is a sample comprised of deionised (DI) water, prepared in the lab, which remains in the lab for analysis. This blank is exposed to any and all reagents that are used in the analytical process and is carried through the entire analytical processes including any filtration required. Lab blanks may identify unsuspected contaminates associated with DI water purity, improper cleaning procedures, filters or air contaminants in the lab. LABBWs are the most frequent form of QC at DDMI and occur every day that samples are analyzed.

Lab Duplicates (LDUPW1/LDUPW2)

A laboratory duplicate consists of a single sample to be analyzed twice internally (using the same techniques) as though it is two separate samples. The entire lab procedure is repeated twice, using two separate aliquots of water poured from the same sample bottle. Lab duplicates evaluate analytical precision and sample homogeneity, as well as consistency of lab and operator procedures. LDUPW1/LDUPW2 are the most frequent form of QC at DDMI and occur every day that samples are analyzed.

*in Monitor Pro 5 (MP5), under regular sample data entry, the sample that is to be the LDUP is assigned a sample type of "LDUPW1." Then, in the data entry section for that day's LDUPW1/LDUPW2, the corresponding sample site is to be assigned a sample type of "LDUPW2."

Duplicate Readings (DUPRDG)

Duplicate readings are intentionally obtained during the analysis of samples, with a single sample being read twice. The only aspect of the lab procedure to be repeated is the actual measurement, with sample preparation occurring only once on a single sample. Variability between duplicate readings can be attributed to instrumentation or operator error, rather than variation in the sample. Note that field meters are included in DUPRDGS.

Allowable Discrepancy Limits between LDUPWs and DUPRDGs

If the relative percent difference (RPD) exceeds 20% when analyte concentrations are ≥ 5 times the detection limit (DL), the environment supervisor must be informed so that the data can be flagged and sampling/analytical methods and instrumentation performance can be reviewed. Relevant DLs for DDMI laboratory analysis are:

TSS – 0.3mg/L

Turbidity – 0.15 NTU

Conductivity – 0.9uS/cm

pH has no applicable detection limit.

Laboratory Splits (DLS)

A laboratory split consists of a single sample divided into two aliquots, one to be analyzed internally, and the other to be sent to an external lab using the same techniques to analyze their aliquot so that the two results would be compared. Variability of results must be considered carefully in light of analyte hold times. RPD between duplicate samples will be assessed by environment supervisor.

Equipment Blanks, Internal (EBINT)

An aliquot of DI water is subjugated, in the DDMI Environmental Laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location

6.3.4 Internal QC Scheduling

DDMI Environment internal QC falls under two schedules: Station-Dependent Internal QC and Station-Independent Internal QC. Station-Dependent Internal QC is tied to different sample matrices and is included in regular sampling schedules in MP5 (ex. samplers will be required to complete one EBINT with every set of monthly pond sampling.)

Station-Dependent Internal QC		QC Frequency per sampling event		
Sample Matrix	**Sampling Frequency***	**EBINT**	**DLS**	**DUPRDGS**
Ponds	Monthly	Every event	none	none
Diffuser	Monthly	Every event	none	none
PKC	Monthly	n/a	1 in 4	1 in 4
UG /clarifiers	Biweekly	n/a	none	none
NIWTP Influent/Effluent	6 days	n/a	none	none

*Note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (ex. the monthly pond sampling includes **10** sample sites but compromises **1** sampling event.)

Station-Independent Internal QC is not tied to any particular sample matrix and QC sample types are scheduled as stand-alone events in MP5.

Station-Independent Internal QC	Frequency
LABBW	Daily when samples collected
LDUPW	Daily when samples collected

6.3.5 External Quality Control (QC) Measures

External QC samples comprise ~ 10% of all samples analyzed and are spaced across sampling matrices and sample events to capture as much process homogeneity as possible. With the exception of Trip Blanks (below), external quality control samples are prepared by DDMI Environment staff, who subjugate them to the relevant procedures. All external QC samples are then shipped off-site to a qualified external laboratory, where all analysis is conducted.

External QC sample types consist of Trip Blanks (TBW), Equipment Blanks (EBW), Field Blanks (FBW), and Duplicates (DUPW1/DUPW2). Results of External Quality Control samples are recorded as per ENVI-670-0117 RO DDMI Environment Lab – Record Control, and reviewed by Environment Supervisors to detect trends.

Trip Blanks (TBW)

A Trip Blank is an aliquot of laboratory grade distilled water, which is received from an external lab, in the same type of container that is required for the analytical test. The trip blank is sealed and labelled in the external lab from which it originates. Upon our receipt of the trip blanks they are to be stored, sealed, at ~ 4°C until such a time as they are to be utilized (no longer than 1 month). When utilized, trip blanks travel with the sampling cooler from the laboratory to the sampling site and back to the laboratory without being opened. The trip blank is then packaged and shipped to the originating laboratory to be analyzed. The purpose of the trip blank is to verify that no sample contamination occurred during transportation or sampling operations.

Equipment Blanks (EBW)

An aliquot of DI water is subjugated, in the Environment laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location.

Field Blanks (FBW)

An aliquot of DI water is subjugated, in the field, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the field blank is to demonstrate that sample contamination has not occurred during field sample collection and processing.

Duplicates (DUPW1/DUPW2)

Co-located samples are independent samples collected as close as possible to the same point in space and time and are intended to assess precision of the entire program (field and laboratory components). The use of replicates for this purpose assumes that the variability between DUPW1 and DUPW2 is affected by the sampling method or technician. In most cases natural variability between samples collected in close succession will be low. When performing duplicate samples, the second sample will consist of each bottle that is regularly collected for that station, including the DDMI internal routine bottle.

*in MP5, under regular sample data entry, the sample that is to be the DUPW is assigned a sample type of "DUPW1." Then, in the data entry section for that day's DUPW1/DUPW2, the corresponding sample site is to be assigned a sample type of "DUPW2."

6.3.6 External QC Scheduling

DDMI Environment external QC is entirely station-dependent, and QC types have different frequencies for each sample matrix that are programmed into MP5.

External QC		QC Frequency per sampling event				
Sample Matrix*	**Sampling Frequency**	**DUPW**	**FB**	**TB**	**EB**	**Total % External QC (all types)**
Ponds	Monthly	1 in 2	1 in 6	1 in 6	1 in 3	**11.7**
Diffuser	Monthly	1 in 1	1 in 6	1 in 6	1 in 3	**11.1**
PKC	Monthly	1 in 2	1 in 8	None	n/a	**12.5**
UG /clarifiers	Biweekly	1 in 6	1 in 6	1 in 12	n/a	**10.4**

NIWTP Influent/Effluent	6 days	1 in 6	1 in 12	1 in 12	n/a	**11.1**
Total QC type per month**		**3.16**	**1.21**	**0.91**	**0.66**	**5.94 QC/month 11.2 % Ext. QC**

*See ENVR-477-0815 – SOP A21 DCMP for A21 QC instructions/schedule

Again, note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (ex. the monthly pond sampling includes **10 sample sites but compromises **1** sampling event.)

6.4 Data Management

6.4.1 External Sample Tracking – Chain of Custody

All samples collected, packaged and shipped to external laboratories are tracked via Chain of Custody documentation. The CoC record is used to document change in possession from sampling to delivery to receipt by the external analytical laboratory. CoC procedures are clearly outlined in ENVR-206-0112 - SOP- Chain of Custody.

6.4.2 Internal Sample Tracking

All samples collected are documented in Monitor Pro 5 on the Environment iPads as per the regular sampling schedule.

6.4.3 Data Recording/Record Keeping

The lab has a procedure in place (ENVI-670-0117 RO DDMI Environment Lab – Record Control), to ensure accurate and appropriate record keeping and review of records.

6.4.4 Data Reporting

Immediately following laboratory analyses, all records are transferred from the applicable field sheets, to their respective electronic databases.

Laboratory supervisors will regularly review the electronic databases to ensure that laboratory recordkeeping meets the aforementioned elements. Results can then be queried and exported as required from MP5 for reporting purposes.

Reporting considerations for individual methods can be found both in individual Method Validations and summarized in method SOPs.

6.5 Control of Nonconforming Testing and/or Calibration Work

The lab has procedures in place to define responses to nonconforming test or calibration work or results (ENVI-652-0117 DDMI Environment Lab – Control of Nonconformances) Testing and/or Calibration Work). This procedure covers responsibility and authority pertaining to management of nonconforming work, evaluation of non-conformance significance, and guidelines for corrective action. Environment Supervisors are to ensure that all employees are trained in this procedure.

6.5.1.1 Corrective and Preventive Action

The laboratory has procedures (ENVI-652-0117 DDMI Environment Lab – Control of Nonconformances) in place to provide guidelines for both corrective action (as per 6.4, above, and also pertaining to departures from policies and procedures in the management system or technical operations). Procedures also provide guidance on identifying and incorporating preventive action (addressing needed improvements and potential sources of management or technical nonconformities).

6.5.1.2 Continual Improvement

The laboratory shall continually improve the effectiveness of its QAQC system and produced data through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

6.6 Personnel

6.6.1 Competency – Certification of Analyst Proficiency

Certification of Analyst Proficiency is the process for assessing and recognizing the technical competence and the effective quality processes of the DDMI Environment Laboratory and staff.

Staff proficiency means that an individual is capable of performing specified test methods and procedures correctly, and familiar with all related policies and procedures pertaining to lab quality as referenced in the Quality Manual. Staff will be trained and tested so as to document their competence for the range of activities they will be expected to perform in the lab, in accordance with all method SOPs.. A performance evaluation will be conducted annually at a minimum, to ensure that staff are fully trained and competent.

Details on staff training are available in ENVI-656-0117 R0 DDMI Environment Lab – Training.

6.6.2 Ethics

Ethics is a set of moral principles, code for right and wrong, or behaviour which conforms to acceptable professional practices.

All employees at all times shall conduct themselves in an honest and ethical manner.

Examples of unethical behaviour include but are not limited to the following:

- Improper manipulation of data or software
- Improper handling of data errors, non-compliant data, or QC outliers
- Lack of reporting unethical behaviour of others
- Artificially fabricating results
- Misrepresenting data such as peak integration, calibration, tuning, or system suitability
- Improper clock setting to meet holding times
- Intentional deletion of non-compliant data

An employee must report any suspected unethical behaviour or fraudulent activities to the Environment Supervisor.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.