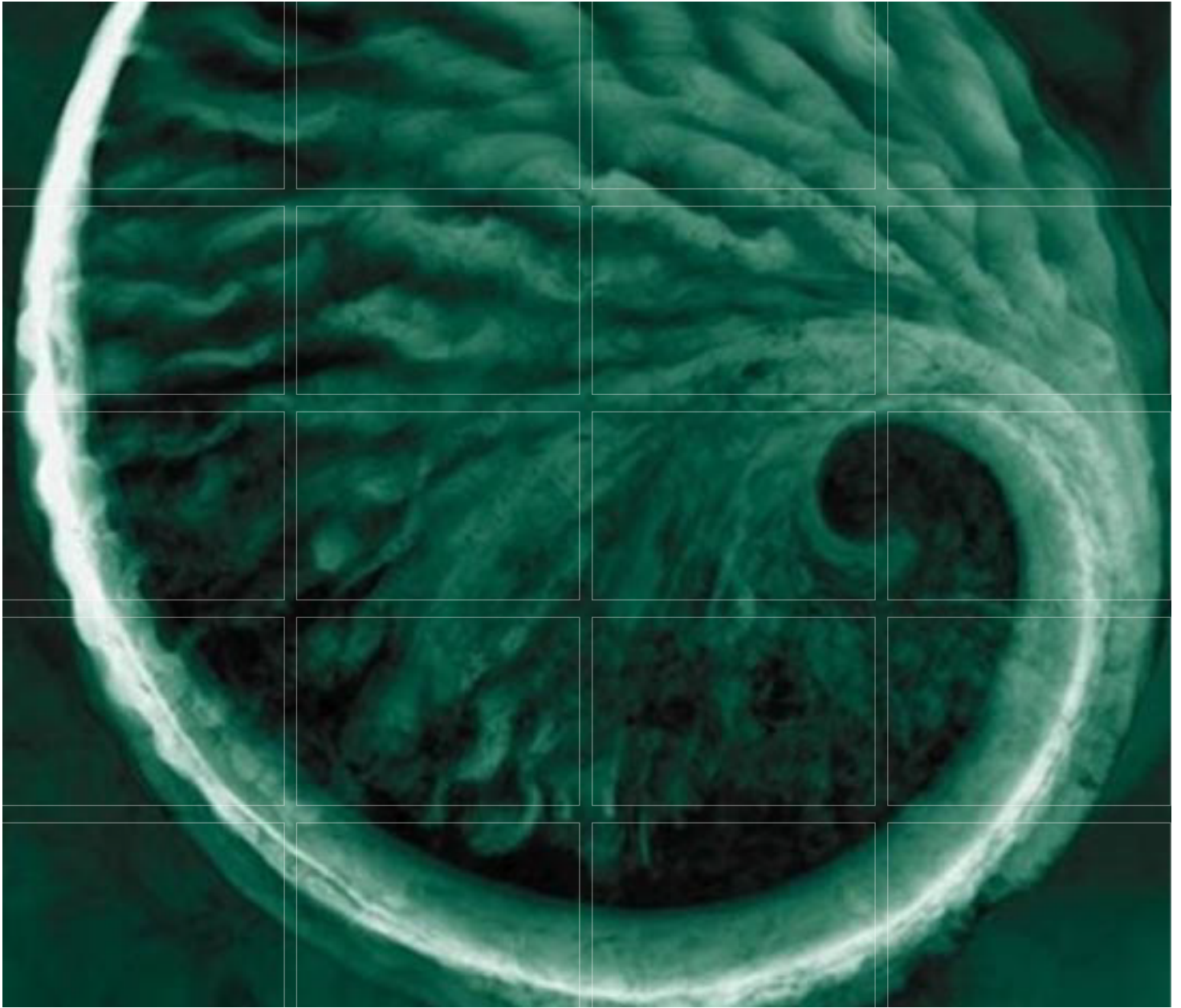


## *Appendix 9-A*

### *Air Quality Baseline Report*

HARPER CREEK PROJECT

**Application for an Environmental Assessment Certificate /  
Environmental Impact Statement**



*Prepared for:*



**HARPER CREEK**  
MINING CORP.

## HARPER CREEK PROJECT **Air Quality Baseline Report**

June 2014

**Harper Creek Mining Corporation**

HARPER CREEK PROJECT  
**Air Quality Baseline Report**

**June 2014**

Project #0230881-0003

Citation:

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## EXECUTIVE SUMMARY

The Harper Creek Project (the Project) is a proposed open pit copper mine located in south-central British Columbia (BC), approximately 150 km northeast by road from Kamloops. The Project has an estimated 28-year mine life based on a process plant throughput of 70,000 tonnes per day. The Proponent, Harper Creek Mining Corporation, is a wholly owned subsidiary of Yellowhead Mining Inc., which is a public BC junior mineral development company trading on the Toronto Stock Exchange.

This report presents the results of the 2011 to 2013 air quality monitoring program. The objective of the baseline program was to collect information on existing ambient conditions prior to project commencement. This data will be used for planning of the Project, describing the environmental setting, and assessing potential environmental effects of the various Project phases.

The baseline monitoring program began in September 2011 and included dustfall measurements collected at six locations, three sites located in Vavenby and three sites located in the Project site. In 2012, an additional site was installed at Birch Island and a site at Vavenby was deactivated.

Dustfall analyses included particulates (total, soluble and insoluble), anions (sulphate, nitrate, chloride and ammonia), total metals and various cations. The monthly dustfall results ranged from less than 0.10 to 1.53 mg/dm<sup>2</sup>/day. Maximum dustfall deposition rates of 0.62, 0.82 and 1.53 mg/dm<sup>2</sup>/day, were measured in 2011, 2012 and 2013 respectively. All the dustfall results measured were below the BC MOE objective of 1.75 mg/dm<sup>2</sup>/day (BC MOE 1979).

Anions of nitrate and sulphate were analyzed from the dustfall samples in order to calculate acid deposition. The monthly acid deposition results ranged from 79.1 (October 2011) to 242 eq/hq/yr (January 2012). The acid deposition results were all below the guideline value of 250 eq/hq/yr (WHO 2000).

Dustfall samples were also analyzed for metals. The majority of metal deposition levels analyzed were either very low or below detection limits. The reported metal deposition rates are predominantly the result of natural sources in the area.

## ACKNOWLEDGEMENTS

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# HARPER CREEK PROJECT

## Air Quality Baseline Report

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Appendix A. 2011-2013 Dustfall Results

## 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.

<b>AIR</b>	Application Information Requirements
<b>BC</b>	British Columbia
<b>BC EAA</b>	British Columbia <i>Environmental Assessment Act</i>
<b>BC EAO</b>	British Columbia Environmental Assessment Office
<b>BDL</b>	Below Detection Limit
<b>CEA Agency</b>	Canadian Environmental Assessment Agency
<b>CEAA, 1992</b>	<i>Canadian Environmental Assessment Act, 1992</i>
<b>CEARIS</b>	Canadian Environmental Assessment Registry Internet Site
<b>Critical acid load</b>	Amount of acid deposition a particular region can receive without being adversely affected
<b>EA</b>	Environmental Assessment
<b>EIS</b>	Environmental Impact Statement
<b>eq/ha/yr</b>	Total acidity equivalency per hectare per year
<b>HCMC</b>	Harper Creek Mining Corporation
<b>kg/ha/yr</b>	Kilograms per hectare per year
<b>mg/dm<sup>2</sup>/day</b>	Milligrams per square decimetre per day
<b>Proponent, the</b>	Harper Creek Mining Corporation
<b>t/d</b>	tonne per day
<b>t/y</b>	tonne per year
<b>TMF</b>	Tailings Management Facility
<b>TSX</b>	Toronto Stock Exchange
<b>µg/m<sup>3</sup></b>	Microgram per cubic metre
<b>WHO</b>	World Health Organization
<b>YMI</b>	Yellowhead Mining Inc.



# 1. INTRODUCTION

## 1.1 PROJECT DESCRIPTION

Harper Creek Mining Corporation (HCMC) proposes to construct and operate the Harper Creek Project (the Project), an open pit copper mine near Vavenby, British Columbia (BC). The Project has an estimated 28-year mine life based on a process plant throughput of 70,000 tonnes per day (25 million tonnes per year). Ore will be processed on site through a conventional crushing, grinding and flotation process to produce a copper concentrate, with gold and silver by-products, which will be trucked from the Project site along approximately 24 km of existing access roads to a rail load-out facility located at Vavenby. The concentrate will be transported via the existing Canadian National Railway network to the existing Vancouver Wharves storage, handling and loading facilities located at the Port of Vancouver for shipment to overseas smelters.

The Project consists of an open pit mine, on-site processing facility, tailings management facility (TMF) (for tailings solids, subaqueous storage of PAG waste rock, and recycling of water for processing), waste rock stockpiles, low grade and overburden stockpiles, a temporary construction camp, ancillary facilities, mine haul roads, sewage and waste management facilities, a 24 km access road between the Project site and a rail load-out facility located on private land owned by HCMC in Vavenby, and a 12 km power line connecting the Project site to the BC Hydro transmission line corridor in Vavenby. The Project location and infrastructure is shown in Figure 1.1-1.

This report describes the air quality baseline conditions for the purposes of the Application for an Environmental Assessment (EA) Certificate under the British Columbia *Environmental Assessment Act* (BC EAA) in accordance with the Application Information Requirements (AIR) for the Project approved on October 21, 2011. This report also meets the purposes of the Environmental Impact Statement (EIS) in accordance with the 'Background Information for the Initial Federal Public Comment Period on the Comprehensive Study pursuant to the *Canadian Environmental Assessment Act* of the Harper Creek Mine Project near Kamloops British Columbia'.

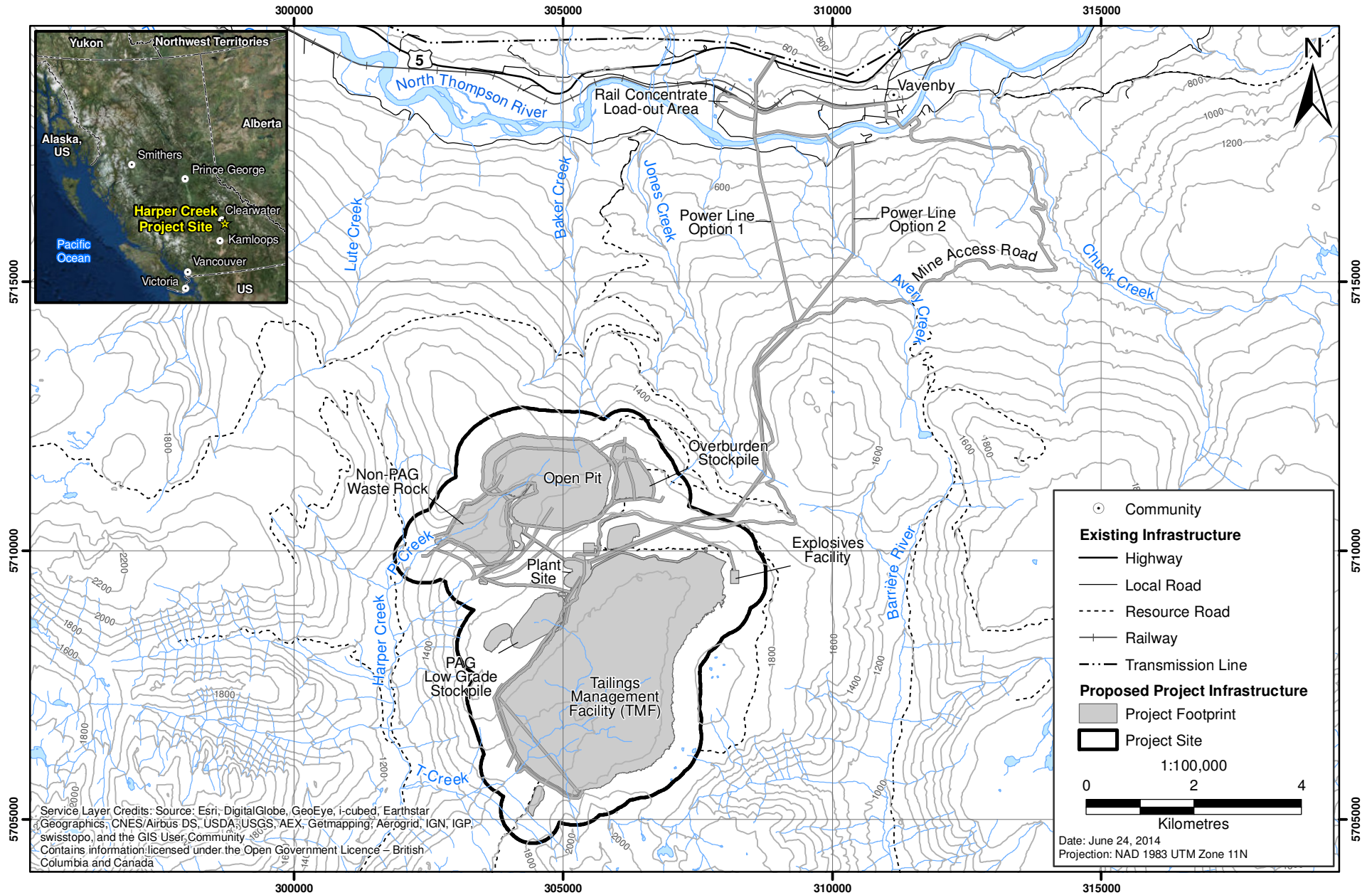
## 1.2 PROJECT LOCATION

The Project is located in the Thompson-Nicola area of BC, approximately 150 km north-east of Kamloops along Yellowhead Highway #5, approximately 10 km southwest of the unincorporated municipality of Vavenby, British Columbia. The Project is located within National Topographic System (NTS) map sheets 82M/5 and 82M/12, is geographically centred at 51°30'N latitude and 119°48'W longitude, and is situated at approximately 1800 Metres above sea level (masl). The mineral claims comprising the Project cover an area of 42,636.48 hectares. The Project location is shown in Figure 1.2-1.

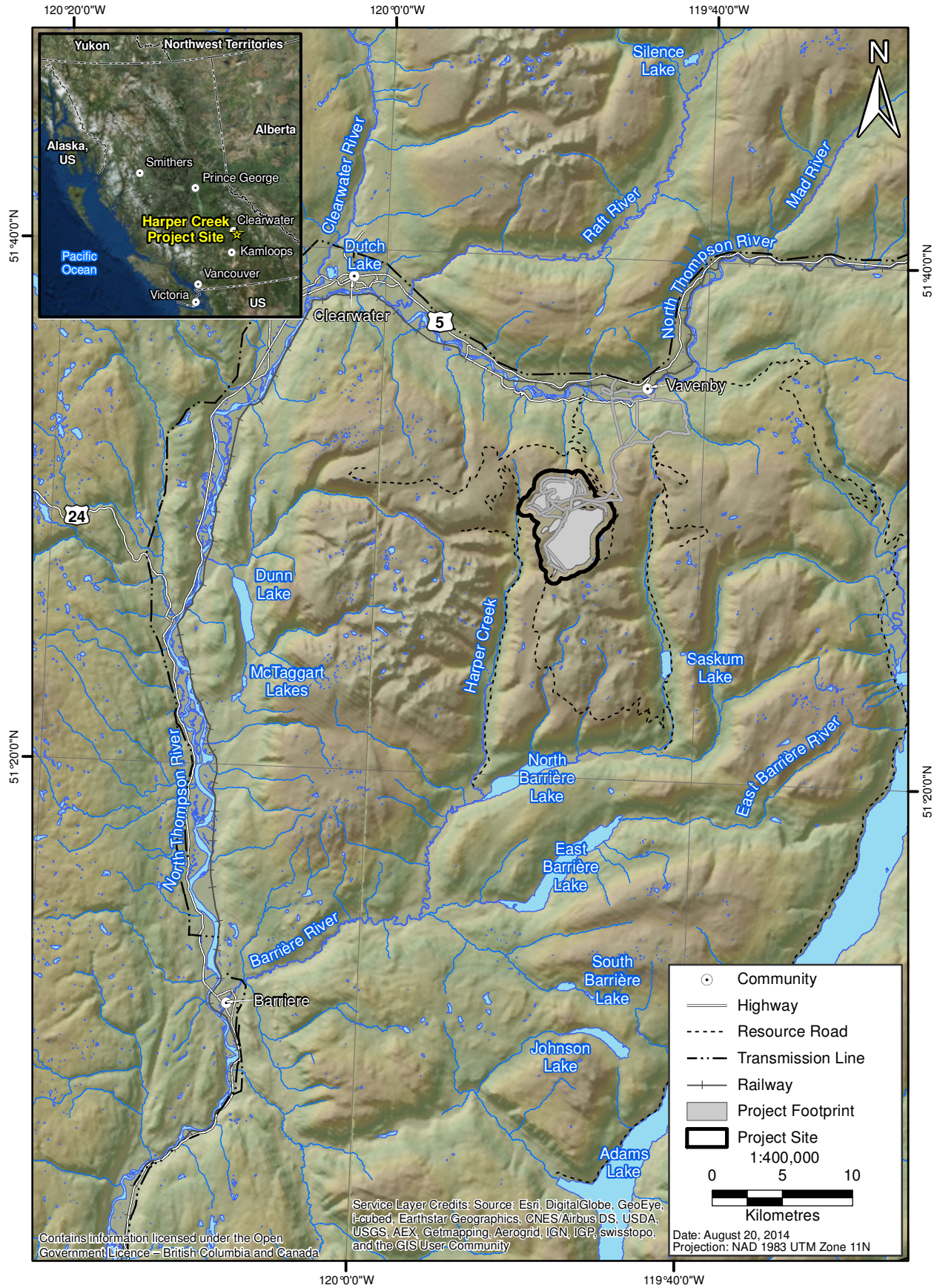
## 1.3 PROJECT PROPONENT

The Proponent of the Project is HCMC, a wholly owned subsidiary of Yellowhead Mining Inc. (YMI). YMI was formed in 2005 as a private British Columbia company specifically to acquire, explore and, if feasible, develop the Project. YMI is now a publicly owned BC based mineral development company trading on the Toronto Stock Exchange (TSX) in Canada. HCMC's strategy is to engineer, permit, finance, construct, and operate the Project.

**Figure 1.1-1**  
**Project Location and Infrastructure**



**Figure 1.2-1**  
**Project Location**



## 1.4 PROJECT SETTING

The Project is located in the interior of BC, just west of the Columbia Mountains. Meteorological conditions at the Project are heavily influenced by continental air masses and the local and regional complex terrain. Winds are primarily from the southeast and south-southeast in all seasons. Wind speeds are typically higher during the winter (October to April) than the summer (May to September).

There a number of potential air pollution sources in the surrounding area. The unincorporated municipality of Vavenby is located approximately 10 km to the northwest of the Project. There is also active logging in the area surrounding the Project location, with a network of forestry roads and a sawmill located in Vavenby. The Yellowhead #5 Highway runs along the North Thompson River and, at its closest point, is approximately 7 km to the north of the Project site.

## 1.5 STUDY OBJECTIVES

The objective of the air quality baseline program was to collect information on the existing ambient air quality conditions prior to Project commencement. This data will be used for planning of the Project, describing the environmental setting, and assessing potential environmental effects of the Project as it moves through the various design phases. This objective was achieved by:

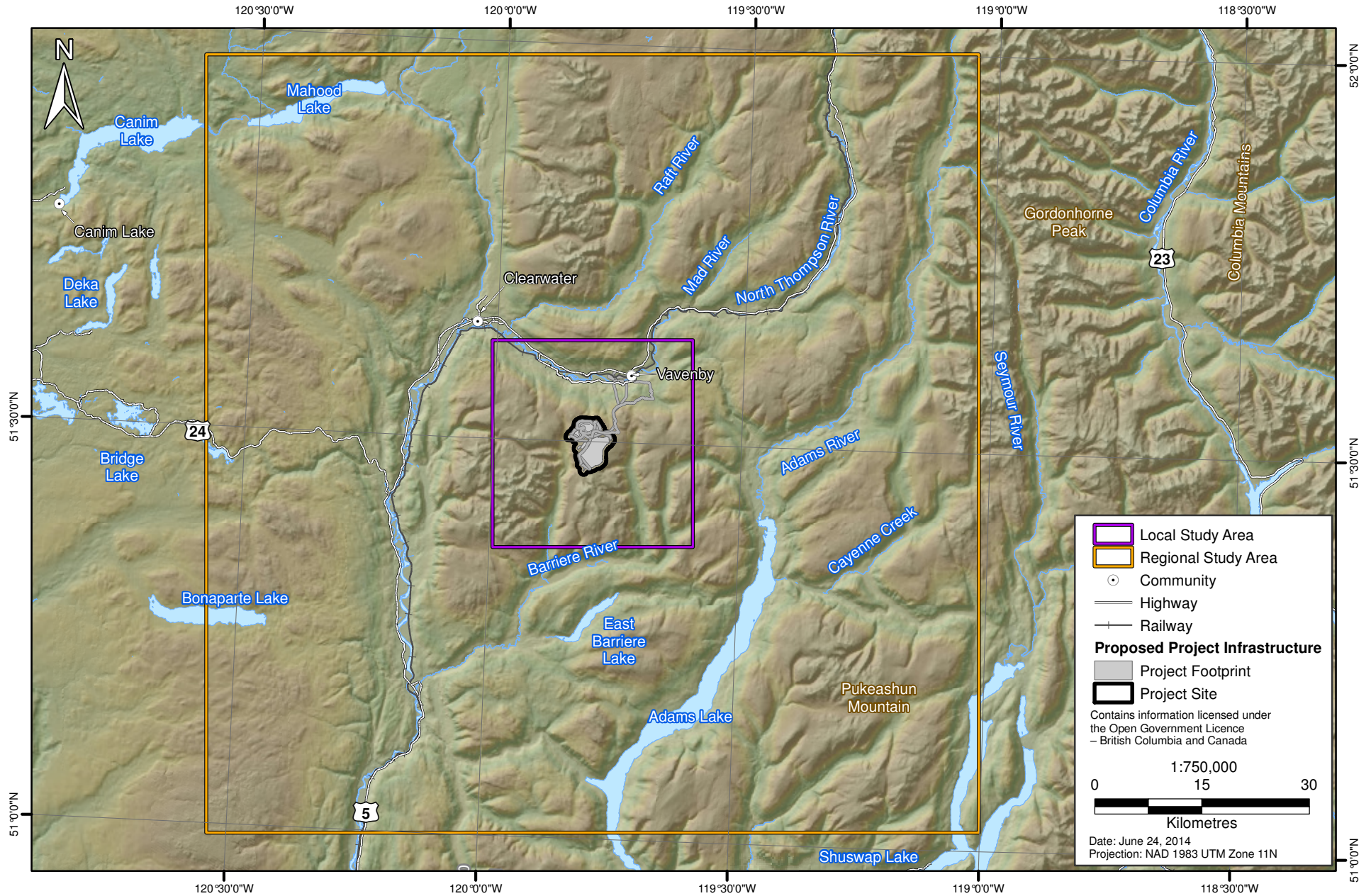
- Installing dustfall stations to collect data on dust deposition; and
- Comparing the amount of dustfall and acid deposition to applicable guidelines.

This report details the methodology used in the development of the air quality monitoring program and a comparison of the results to relevant legislation and guidelines. Chapter 2 of this report presents the relevant legislation, Chapter 3 provides details of the methodology, Chapter 4 presents the results and discussion, and Chapter 5 provides a summary. All raw data obtained from the laboratories are included as appendices to this report.

## 1.6 BASELINE STUDY AREA

The air quality baseline study area is shown in Figure 1.6-1. The local study area encompasses the Project site and a 10 km buffer, and the regional study area extends 50 km from the Project site. The baseline monitoring program focused on the Project site, anticipated to be the location of main site activity and air emissions during the operations phase of the Project, and also the closest receptor locations including the towns of Vavenby and Birch Island.

**Figure 1.6-1**  
**Air Quality Study Areas**



## **2. BACKGROUND REVIEW**

### **2.1 LEGISLATION, REGULATIONS, AND GUIDELINES**

The Project is subject to both provincial and federal environmental assessment (EA) requirements under the British Columbia *Environmental Assessment Act* (2002) and *Canadian Environmental Assessment Act 1992* (CEAA; 1992). The EA will undergo a coordinated review by the BC Environmental Assessment Office (EAO) and the Canadian Environmental Assessment Agency (CEA Agency) in accordance with the 2004 Canada-BC Agreement for Environmental Assessment Cooperation. The requirements for the provincial EA are defined in the AIR for the Project, approved by the BC Environmental Assessment Office (EAO) on October 21, 2011. Requirements of the federal EA are outlined in the 'Background Information for the Initial Federal Public Comment Period on the Comprehensive Study pursuant to the *Canadian Environmental Assessment Act* of the Harper Creek Mine Project near Kamloops British Columbia' as issued in April 2011 on the CEA Agency's Registry Internet Site (CEARIS).

The management of air quality across Canada requires collaboration between multiple governmental levels, including federal, provincial, regional and municipal. The federal government has set National Ambient Air Quality Objectives (NAAQOs), Canada Wide Standards (CWS) and Canadian Ambient Air Quality Standards (CAAQS). The CAAQS, which were adopted in 2013 and will be effective from 2015 and 2020, will supersede the CWSs. CAAQSs and CWSs are intended to be achievable targets that will reduce health and environmental risks within a specific timeframe, whereas NAAQOs identify benchmark levels of protection for people and the environment. At a provincial level, BC has also developed air quality objectives for a number of contaminants. There are no NAAQO, CWS, CAAQS or provincial air quality objectives applicable to the parameters monitored at the Project. The following sections therefore include a brief discussion of any other relevant criteria.

#### **2.1.1 Total Dustfall**

The Pollution Control Objectives for the Mining, Smelting, and Related Industries of British Columbia (BC MOE 1979) identify the maximum desirable ambient air objective for dustfall as 1.75 mg/dm<sup>2</sup>/day averaged over 30 days.

The Ministry of Environment's (MOE) *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* outlines and defines the baseline study requirements and information considerations necessary to propose a mineral development project in BC. The standard methodology for dustfall collection is outlined in *ASTM D1739-98 Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter)* (ASTM Standard D1739-98 Reapproved 2010).

#### **2.1.2 Acid Deposition**

Acid deposition is the end product of the reaction between sulphur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>) and water and oxygen in the atmosphere to form sulphuric acid and nitric acid. Acid deposition occurs when these acid-forming pollutants are deposited on the earth's surface. The critical load is a

quantitative estimate of the maximum amount of acid generating pollutants that environmental receptors can withstand without being adversely affected, according to present knowledge.

There are no air quality standards for acid deposition in BC; however critical loads of acid deposition proposed by the World Health Organization (WHO 2000) range from less than 250 eq/ha/year to more than 1,500 eq/ha/year, dependent on soil type. A conservative critical load value of 250 eq/ha/year was chosen for the assessment.

### **2.1.3 Metal Deposition**

There are currently no specific criteria for total metals in dustfall. The atmospheric metal levels are generally low; however, they tend to contribute to the deposition in soils. Metal deposition results can be used in order to model future concentrations of metals in soil or vegetation, which can then be used to assess the potential for effects to wildlife or humans through uptake of metals via the food chain.

## **2.2 PREVIOUS ENVIRONMENTAL STUDIES**

No existing air quality studies were identified. The closest airshed management planning study is the Kamloops Airshed Management Plan (City of Kamloops, 2012).

### 3. METHODOLOGY

The following section describes the methodology associated with the dustfall monitoring.

#### 3.1 SAMPLING METHODS

The baseline monitoring program was conducted by Knight Piesold Ltd. from October 2011 to November 2013. Results from the monitoring program are available for October 2011 to September 2013.

The dustfall monitoring program was developed in accordance with sampling method ASTM D1739-98 (ASTM Standard D1739-98 Reapproved 2010), for all sites except DF-01. The dustfall monitoring stations collect particles small enough to pass through a 1 mm stainless steel sieve and large enough to settle by virtue of weight. Each dustfall station was comprised of two sample containers with separate mounts. The containers used were open-topped cylinders not less than 150 mm in diameter placed at the top of the stands at a height of 2 m above ground. The containers were installed on 2 m poles, surrounded by a windscreen to improve the dustfall collection efficiency.

Sample containers were exposed to the atmosphere for approximately 30 days, after which they were sent to the laboratory for analysis. One container was then analysed for particulates (total, soluble and insoluble) and total metals and various cations. Additional analysis of anions (sulphate, nitrate, chloride and ammonia) was carried out in October 2011 and January 2012. Sulphate was analysed in March 2012.

#### 3.2 SAMPLING LOCATIONS

The baseline program began in September 2011. Dustfall measurements were collected at six locations: three sites located in the town of Vavenby and three sites located around the Project boundary. The dominant wind direction was taken into consideration when selecting the site locations. In 2012 an additional site was installed at Birch Island and the site DF-01 at Vavenby was deactivated. The locations of the dustfall monitoring stations are presented in Table 3.2-1 and shown in Figure 3.2-1.

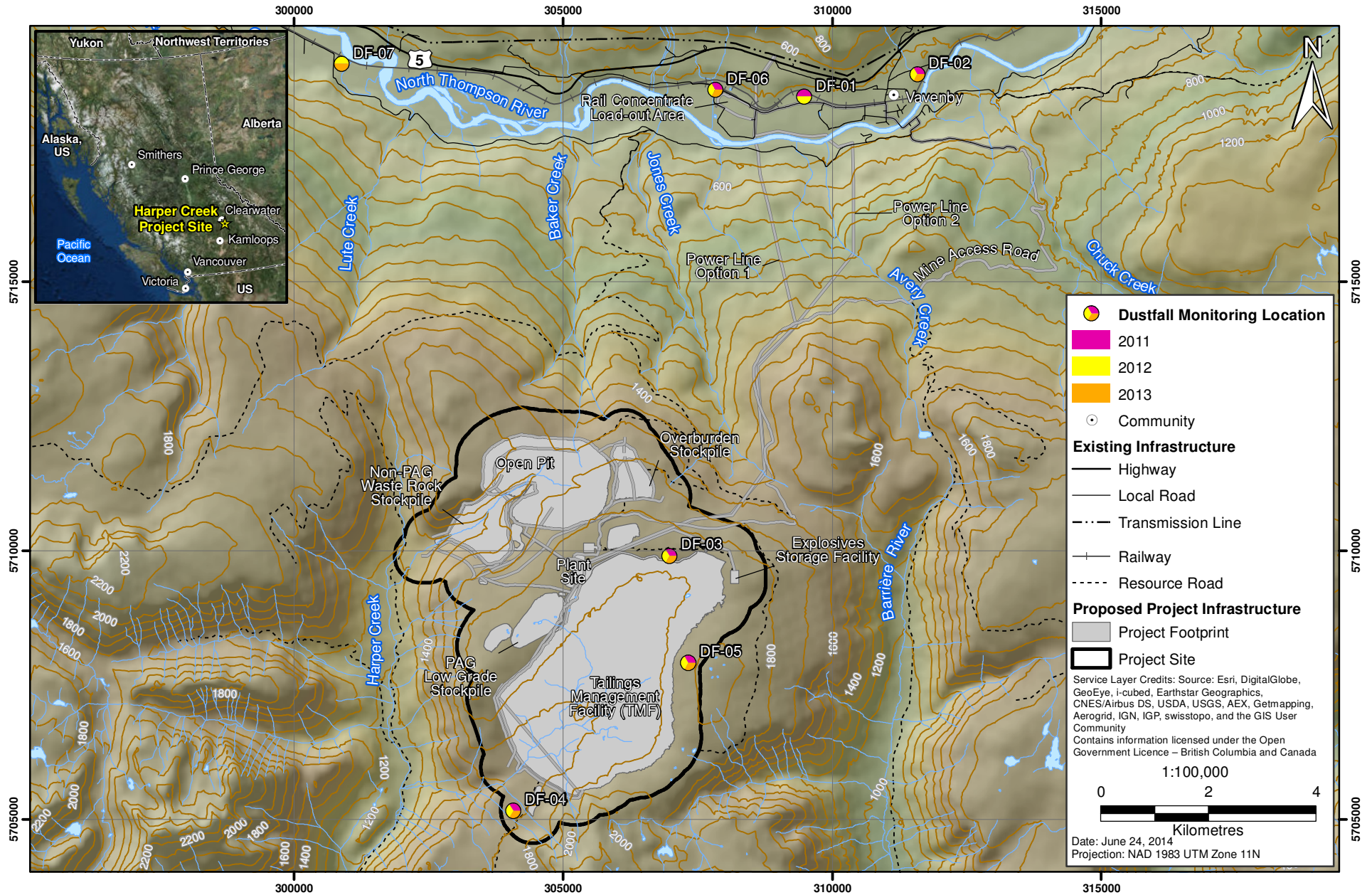
**Table 3.2-1. Summary of Air Quality Monitoring Stations (2011–2013)**

Name	UTM Easting (m)	UTM Northing (m)	Location	Monitoring Period		
				2011	2012	2013
DF-01	E 0309480	N5718442	Near Canfor Plant	Sep - Oct	Jan - Jun	-
DF-02	E0311580	N5718858	Near school	Sep - Oct	Jan - Aug	Sep - Nov
DF-03	E0306977	N5709899	Near Met Station	Sep - Oct	Aug	Sep
DF-04	E0304082	N5705158	Near South side of Tailings Pond	Sep - Oct	Aug	Sep
DF-05	E0307327	N5707910	Near East side of Tailings Pond	Sep - Oct	Aug	Sep
DF-06	E0307829	N5718569	Near Canfor Plant (East Side)	Sep - Oct	Jan - Aug	Sep - Nov
DF-07	E0300888	N5719051	Birch Island - Opposite McNeil house	-	Aug	Sep - Nov

*Note: Geodetic network U11.*



**Figure 3.2-1**  
**Dustfall Monitoring Locations, 2011 - 2013**



### 3.3 DATA ANALYSIS

The dustfall samples were sent to the ALS Laboratory for analysis following each sampling period. Following receipt of the results from the laboratory, acid deposition rates were calculated based on sulphate and nitrate content measured in each dustfall sample. The unit conversion factors used to calculate charge equivalency were obtained from the 2004 Canadian Acid Deposition Science Assessment (EC 2004). The unit conversion factors are presented in Table 3.3-1

**Table 3.3-1. Conversion Units for Atmospheric Deposition**

Chemical Species	kg/ha/yr	eq/ha/yr
SO <sub>4</sub> <sup>2-</sup>	1.00	20.8
N	1.00	71.4

### 3.4 LIMITATIONS AND ASSUMPTIONS

The baseline monitoring program ran from 2011 to 2013, with monitoring occurring for two months in 2011, four months in 2012 and three months in 2013; a full year of data is not available. Based on the limited dataset, seasonal or annual change in deposition values could not be assessed.

Site DF-01 was not established in accordance with sampling method ASTM D1739-98, the results are therefore less reliable than those from the other sites, however it is believed that these samples will still provide a representative average daily dustfall levels for the location sampled.

In a number of cases the containers were exposed for longer than the recommended time period. The March and August 2012 samples were exposed for two months, rather than the recommended 30 day period, and the January and June 2012 samples were exposed for approximately three months. It is not anticipated that any appreciable degradation of the sample would have occurred during this short time period, however there is the potential for canisters to fill up with rain water and overflow, or become damaged. The containers were checked when collected and no evidence was found to suggest the containers were not suitable for analysis.

## 4. RESULTS AND DISCUSSION

### 4.1 TOTAL DUSTFALL

Dustfall results for 2011 to 2013 are summarized in Table 4.1-1 and Figure 4.1-1. The monthly dustfall results ranged from less than 0.10 to 1.53 mg/dm<sup>2</sup>/day. Maximum dustfall deposition rates of 0.62, 0.82 and 1.53 mg/dm<sup>2</sup>/day, were measured in 2011, 2012 and 2013 respectively. All the dustfall results measured were below the objective of 1.75 mg/dm<sup>2</sup>/day.

**Table 4.1-1. Total Dustfall Results, 2011-2013 (mg/dm<sup>2</sup>/day)**

	DF-01	DF-02	DF-03	DF-04	DF-05	DF-06	DF-07
Sep-11	0.62	0.54	0.35	0.39	0.21	0.39	-
Oct-11	0.40	0.35	0.16	0.12	0.15	0.34	-
Jan-12	0.82	0.12	-	-	-	0.56	-
Mar-12	0.23	<0.10	-	-	-	<0.10	-
Jun-12	0.22	0.22	-	-	-	0.24	-
Aug-12	-	0.19	<0.10	0.13	0.10	0.64	0.15
Sep-13	-	0.34	0.27	0.33	<0.11	1.53	<0.10
Oct-13	-	0.16	-	-	-	<0.10	<0.10
Nov-13	-	0.45	-	-	-	0.59	0.12
Average	0.46	0.27	0.21	0.24	0.13	0.49	0.09

*Note: The values below detection limits were assumed to be half of the detection limit in the calculation of averages.*

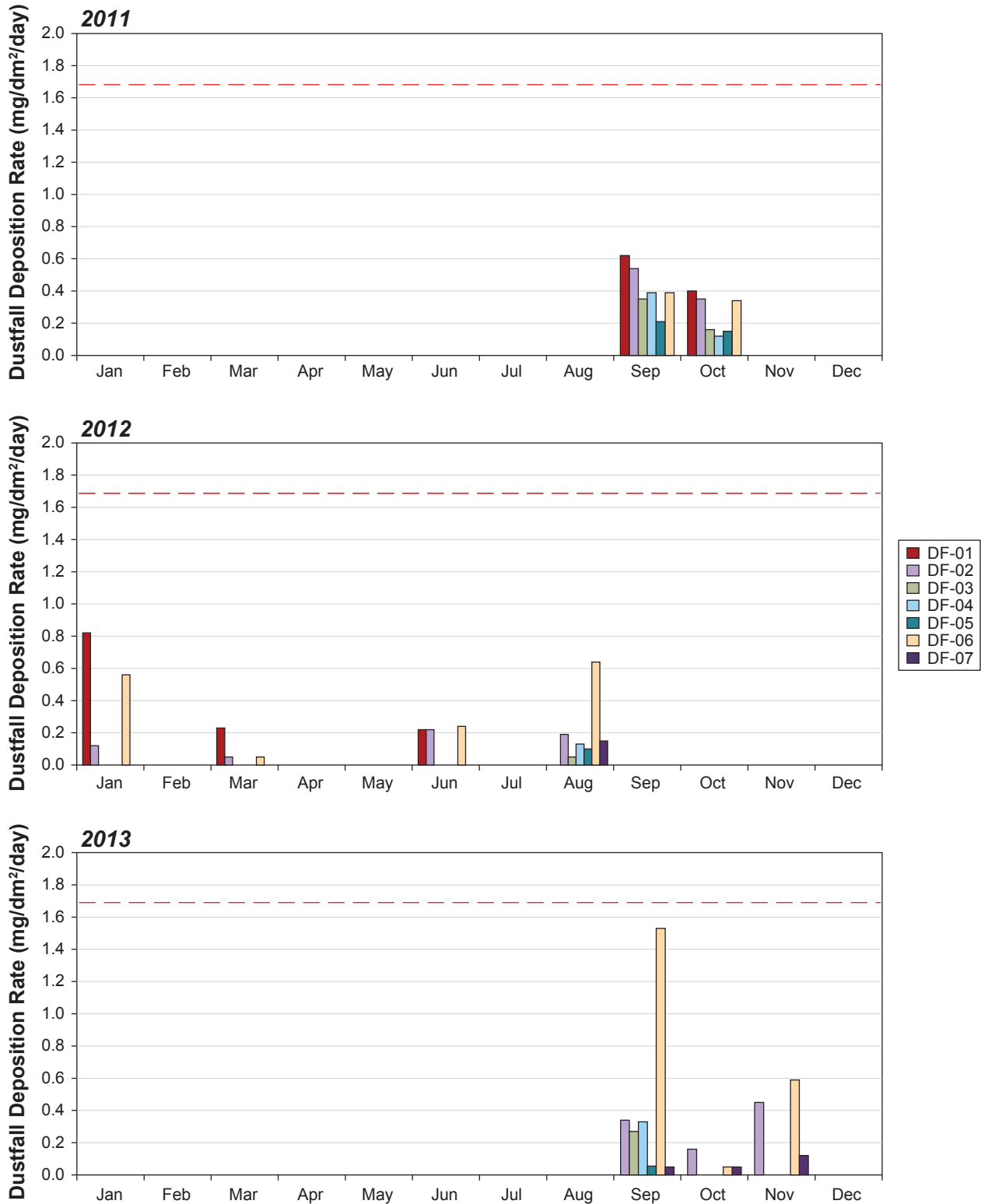
### 4.2 ACID DEPOSITION

Anions of nitrate and sulphate were analyzed from the dustfall samples and are presented in Table 4.2-1. The acid deposition rates are presented in Table 4.2-2. The monthly acid deposition results ranged from 79.1 (October 2011) to 242 eq/hq/yr (January 2012). The acid deposition results were all below the WHO guideline value of 250 eq/hq/yr.

### 4.3 METAL DEPOSITION

Table 4.3-1 shows the maximum metal deposition averaged over the 30-day collection period. All analytical results are presented in Appendix 1. The majority of the metal deposition values were either very low or below the detection limits. In 2013, 12 of the 33 metals that were analyzed were always below the detection limits. In 2012, 8 were also always below the detection limit and in 2011, 10 were always below the detection limits. All other metals had at least one reading that was above the detection limits, but generally with very low metal deposition rates.

**Figure 4.1-1**  
**Dustfall Results,**  
**2011 to 2013**



Note: Red dashed line represents BC Pollution Control Objective - Most Stringent (1.7 mg/dm<sup>2</sup>/day).

**Table 4.2-1. Nitrate and Sulphate Deposition Analysis Results from Dustfall, 2011-2013 (mg/dm<sup>2</sup>/day)**

	DF-01	DF-02	DF-03	DF-04	DF-05	DF-06	DF-07
<b>Nitrate</b>							
Sep-11	-	-	-	-	-	-	-
Oct-11	0.002	0.002	0.004	0.005	0.005	0.002	-
Jan-12	0.006	0.003	-	-	-	0.005	-
Mar-12	-	-	-	-	-	-	-
Jun-12	-	-	-	-	-	-	-
Aug-12	-	-	-	-	-	-	-
Sep-13	-	-	-	-	-	-	-
Oct-13	-	-	-	-	-	-	-
Nov-13	-	-	-	-	-	-	-
<b>Sulphate</b>							
Sep-11	-	-	-	-	-	-	-
Oct-11	<0.012	<0.011	<0.018	<0.028	<0.024	<0.010	-
Jan-12	<0.021	<0.006	-	-	-	<0.017	-
Mar-12	<0.004	<0.003	-	-	-	<0.003	-
Jun-12	-	-	-	-	-	-	-
Aug-12	-	-	-	-	-	-	-
Sep-13	-	-	-	-	-	-	-
Oct-13	-	-	-	-	-	-	-
Nov-13	-	-	-	-	-	-	-

Notes:

(-) No sampling undertaken.

The values below detection limits were assumed to be half of the detection limit in the calculation of averages.

**Table 4.2-2. Calculated Acid Deposition Rates, 2011-2013 (eq/ha/yr)**

	DF-01	DF-02	DF-03	DF-04	DF-05	DF-06	DF-07
Sep-11	-	-	-	-	-	-	-
Oct-11	88.6	84.0	181	232	213	79.1	-
Jan-12	242	101	-	-	-	195	-
Mar-12 <sup>a</sup>	-	-	-	-	-	-	-
Jun-12	-	-	-	-	-	-	-
Aug-12	-	-	-	-	-	-	-
Sep-13	-	-	-	-	-	-	-
Oct-13	-	-	-	-	-	-	-
Nov-13	-	-	-	-	-	-	-

Note:

(-) No sampling undertaken.

<sup>a</sup> Nitrate values were not available in March 2012 and therefore acid deposition has not been calculated.

**Table 4.3-1. Maximum Metal Deposition from all Dustfall Stations, 2011-2013**

Metal	Maximum Deposition Rate (mg/dm <sup>2</sup> /day)			Metal	Maximum Deposition Rate (mg/dm <sup>2</sup> /day)		
	2011	2012	2013		2011	2012	2013
Aluminum (Al)-Total	4.9E-03	2.7E-03	2.1E-03	Mercury (Hg)-Total	BDL	BDL	BDL
Antimony (Sb)-Total	8.0E-07	8.6E-07	4.8E-06	Molybdenum (Mo)- Total	2.2E-06	1.9E-06	3.1E-06
Arsenic (As)-Total	1.8E-06	1.4E-05	2.7E-05	Nickel (Ni)-Total	1.7E-05	1.2E-04	1.6E-05
Barium (Ba)-Total	8.6E-05	4.9E-05	9.1E-05	Phosphorus (P)-Total	2.0E-03	6.6E-03	4.4E-02
Beryllium (Be)-Total	BDL	BDL	BDL	Potassium (K)-Total	BDL	1.1E-02	7.3E-02
Bismuth (Bi)-Total	BDL	BDL	BDL	Selenium (Se)-Total	BDL	BDL	BDL
Boron (B)-Total	BDL	BDL	3.2E-04	Silicon (Si)-Total	6.6E-03	4.8E-03	3.6E-03
Cadmium (Cd)-Total	2.1E-06	7.5E-07	2.6E-05	Silver (Ag)-Total	BDL	2.3E-07	5.3E-07
Calcium (Ca)-Total	5.7E-02	4.6E-03	6.3E-03	Sodium (Na)-Total	BDL	BDL	BDL
Chromium (Cr)-Total	1.8E-05	1.2E-05	2.0E-05	Strontium (Sr)-Total	2.9E-04	2.7E-05	3.6E-05
Cobalt (Co)-Total	3.1E-06	2.0E-06	BDL	Thallium (Tl)-Total	BDL	BDL	BDL
Copper (Cu)-Total	2.5E-04	2.2E-04	4.5E-04	Tin (Sn)-Total	2.9E-06	5.3E-06	BDL
Iron (Fe)-Total	7.6E-03	6.1E-03	6.2E-03	Titanium (Ti)-Total	2.6E-04	1.3E-04	BDL
Lead (Pb)-Total	6.5E-06	4.1E-05	6.7E-06	Uranium (U)-Total	3.3E-07	1.8E-07	BDL
Lithium (Li)-Total	BDL	BDL	BDL	Vanadium (V)-Total	9.7E-06	5.7E-06	BDL
Magnesium (Mg)- Total	2.9E-03	2.8E-03	6.0E-03	Zinc (Zn)-Total	2.1E-04	4.7E-04	4.9E-04
Manganese (Mn)- Total	2.3E-04	1.6E-04	4.6E-04				

Note: BDL = Below Detection Limit

## 5. CONCLUSIONS

The air quality baseline monitoring program ran from 2011 to 2013. The program began in September 2011 and included dustfall measurements collected at six locations, three sites located in Vavenby and three sites located around the Project boundary. In 2012, an additional site was installed at Birch Island and a site at Vavenby was deactivated.

Dustfall analyses included particulates (total, soluble and insoluble), anions (sulphate, nitrate, chloride and ammonia), total metals and various cations. The monthly dustfall results ranged from less than 0.10 to 1.53 mg/dm<sup>2</sup>/day. Maximum dustfall deposition rates of 0.62, 0.82 and 1.53 mg/dm<sup>2</sup>/day, were measured in 2011, 2012 and 2013 respectively. All the dustfall results measured were below the dustfall objective of 1.75 mg/dm<sup>2</sup>/day.

Anions of nitrate and sulphate were analyzed from the dustfall samples in order to calculate acid deposition. The monthly acid deposition results ranged from 79.1 (October 2011) to 242 eq/hq/yr (January 2012). The acid deposition results were all below the WHO guideline value of 250 eq/hq/yr.

Dustfall samples were also analyzed for metals. The majority of metal deposition levels analyzed were either very low, or below detection limits. The reported metal deposition rates are predominantly the result of natural sources in the area.

## REFERENCES

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

British Columbia *Environmental Assessment Act* (2002)

*Canadian Environmental Assessment Act 1992* (1992)

ASTM Standard D1739-98. Reapproved 2010. *Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter)*. West Conshohocken, PA: ASTM International.

BC MOE. 1979. *Pollution Control Objectives for The Mining, Smelting, and Related Industries of British Columbia*. Victoria, BC: BC Ministry of Environment.

City of Kamloops. 2012. Airshed Management Plan. Available at <http://www.city.kamloops.bc.ca/environment/pdfs/13-05-AirshedManagementPlan.pdf> (accessed May 2014).

EC. 2004. 2004 *Canadian acid deposition science assessment*. Downsview, Ontario: Meteorological Service of Canada.

WHO. 2000. *Air Quality Guidelines for Europe, Second edition*. WHO Regional Publications, European Series No. 91.



# *Appendix A*

## *2011-2013 Dustfall Results*

HARPER CREEK PROJECT

**Air Quality Baseline Report**



KNIGHT PIESOLD LTD.  
ATTN: Oscar Gustafson  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 23-SEP-11  
Report Date: 06-OCT-11 10:16 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1063019  
Project P.O. #: NOT SUBMITTED  
Job Reference: 101-458/5  
C of C Numbers:  
Legal Site Desc:

**Comments:** ADDITIONAL 05-OCT-11 17:29

Andre Langlais  
Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1063019-1	L1063019-2	L1063019-3	L1063019-4	L1063019-5
					L1063019-1 DUSTFALL 23-SEP-11	L1063019-2 DUSTFALL 23-SEP-11	L1063019-3 DUSTFALL 23-SEP-11	L1063019-4 DUSTFALL 23-SEP-11	L1063019-5 DUSTFALL 23-SEP-11
					DF-01 (AUG16-SEP23)	DF-02 (AUG17-SEP23)	DF-03 (AUG17-SEP23)	DF-04 (AUG17-SEP23)	DF-05 (AUG17-SEP23)
Grouping	Analyte								
<b>DUSTFALL</b>									
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.62	0.54	0.35	0.39	0.21			
	Total Insoluble Dustfall (mg/dm2.day)	0.35	0.24	<0.10	<0.10	<0.10			
	Total Soluble Dustfall (mg/dm2.day)	0.29	0.30	0.28	0.30	0.15			
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00485	0.00202	0.000479	0.00122	0.000904			
	Antimony (Sb)-Total (mg/dm2.day)	0.00000080	0.00000054	<0.00000059	<0.00000055	<0.00000064			
	Arsenic (As)-Total (mg/dm2.day)	0.00000139	0.00000091	<0.00000059	0.00000080	0.00000074			
	Barium (Ba)-Total (mg/dm2.day)	0.0000790	0.0000352	0.0000115	0.0000223	0.0000172			
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000027	<0.0000021	<0.0000030	<0.0000028	<0.0000032			
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000027	<0.0000021	<0.0000030	<0.0000028	<0.0000032			
	Boron (B)-Total (mg/dm2.day)	<0.000054	<0.000042	<0.000059	<0.000055	<0.000064			
	Cadmium (Cd)-Total (mg/dm2.day)	0.00000035	<0.00000021	0.00000105	0.00000140	<0.00000032			
	Calcium (Ca)-Total (mg/dm2.day)	0.00330	0.00171	0.00066	0.00201	0.00176			
	Chromium (Cr)-Total (mg/dm2.day)	0.0000172	0.0000094	<0.0000030	0.0000034	<0.0000032			
	Cobalt (Co)-Total (mg/dm2.day)	0.00000314	0.00000127	<0.00000059	0.00000094	<0.00000064			
	Copper (Cu)-Total (mg/dm2.day)	0.0000327	0.0000255	0.0000174	0.0000307	0.0000266			
	Iron (Fe)-Total (mg/dm2.day)	0.00763	0.00358	0.00040	0.00104	0.00083			
	Lead (Pb)-Total (mg/dm2.day)	0.00000558	0.00000300	0.00000150	0.00000314	0.00000213			
	Lithium (Li)-Total (mg/dm2.day)	<0.000027	<0.000021	<0.000030	<0.000028	<0.000032			
	Magnesium (Mg)-Total (mg/dm2.day)	0.00231	0.00097	<0.00059	0.00087	0.00076			
	Manganese (Mn)-Total (mg/dm2.day)	0.000227	0.0000961	0.0000209	0.0000749	0.0000580			
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000027	<0.00000021	<0.00000030	<0.00000028	<0.00000032			
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000212	0.00000151	<0.00000030	0.00000066	<0.00000032			
	Nickel (Ni)-Total (mg/dm2.day)	0.0000111	0.0000106	0.0000033	0.0000059	0.0000087			
	Phosphorus (P)-Total (mg/dm2.day)	<0.0016	<0.0013	<0.0018	0.0018	0.0020			
	Potassium (K)-Total (mg/dm2.day)	<0.011	<0.0085	<0.012	<0.011	<0.013			
	Selenium (Se)-Total (mg/dm2.day)	<0.0000054	<0.0000042	<0.0000059	<0.0000055	<0.0000064			
	Silicon (Si)-Total (mg/dm2.day)	0.00663	0.00277	0.00066	0.00190	0.00128			
	Silver (Ag)-Total (mg/dm2.day)	<0.00000022 <sup>DLB</sup>	<0.00000017 <sup>DLB</sup>	<0.00000024 <sup>DLB</sup>	<0.00000022 <sup>DLB</sup>	<0.00000025 <sup>DLB</sup>			
	Sodium (Na)-Total (mg/dm2.day)	<0.011	<0.0085	<0.012	<0.011	<0.013			
	Strontium (Sr)-Total (mg/dm2.day)	0.0000299	0.0000187	0.00000469	0.0000149	0.00000988			
Thallium (Tl)-Total (mg/dm2.day)	<0.00000054	<0.00000042	<0.00000059	<0.00000055	<0.00000064				
Tin (Sn)-Total (mg/dm2.day)	0.00000114	<0.00000042	<0.00000059	0.00000288	<0.00000064				
Titanium (Ti)-Total (mg/dm2.day)	0.000262	0.000093	<0.000059	<0.000055	<0.000064				
Uranium (U)-Total (mg/dm2.day)	0.000000334	0.000000088	<0.00000059	<0.00000055	<0.00000064				
Vanadium (V)-Total (mg/dm2.day)	0.0000097	0.0000045	<0.0000059	<0.0000055	<0.0000064				
Zinc (Zn)-Total (mg/dm2.day)	0.0000756	0.0000415	0.0000412	0.0000611	0.0000550				

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1063019-6 DUSTFALL 23-SEP-11  DF-06 (AUG17-SEP23)			
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.39			
	Total Insoluble Dustfall (mg/dm2.day)	0.16			
	Total Soluble Dustfall (mg/dm2.day)	0.23			
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00203			
	Antimony (Sb)-Total (mg/dm2.day)	0.00000047			
	Arsenic (As)-Total (mg/dm2.day)	0.00000175			
	Barium (Ba)-Total (mg/dm2.day)	0.0000368			
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000021			
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000021			
	Boron (B)-Total (mg/dm2.day)	<0.000042			
	Cadmium (Cd)-Total (mg/dm2.day)	0.00000027			
	Calcium (Ca)-Total (mg/dm2.day)	0.00284			
	Chromium (Cr)-Total (mg/dm2.day)	0.0000093			
	Cobalt (Co)-Total (mg/dm2.day)	0.00000169			
	Copper (Cu)-Total (mg/dm2.day)	0.0000297			
	Iron (Fe)-Total (mg/dm2.day)	0.00347			
	Lead (Pb)-Total (mg/dm2.day)	0.00000277			
	Lithium (Li)-Total (mg/dm2.day)	<0.000021			
	Magnesium (Mg)-Total (mg/dm2.day)	0.00140			
	Manganese (Mn)-Total (mg/dm2.day)	0.000123			
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000021			
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000128			
	Nickel (Ni)-Total (mg/dm2.day)	0.0000167			
	Phosphorus (P)-Total (mg/dm2.day)	0.0016			
	Potassium (K)-Total (mg/dm2.day)	<0.0085			
	Selenium (Se)-Total (mg/dm2.day)	<0.0000042			
	Silicon (Si)-Total (mg/dm2.day)	0.00291			
	Silver (Ag)-Total (mg/dm2.day)	<0.00000017 <sup>DLB</sup>			
	Sodium (Na)-Total (mg/dm2.day)	<0.0085			
	Strontium (Sr)-Total (mg/dm2.day)	0.0000218			
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000042			
	Tin (Sn)-Total (mg/dm2.day)	<0.00000042			
	Titanium (Ti)-Total (mg/dm2.day)	0.000091			
Uranium (U)-Total (mg/dm2.day)	0.000000100				
Vanadium (V)-Total (mg/dm2.day)	0.0000046				
Zinc (Zn)-Total (mg/dm2.day)	0.0000630				

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection limit was raised due to detection of analyte at comparable level in Method Blank.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE DUSTFALLS
Dustfall analysis is carried out in accordance with procedures published by the B.C. Ministry of Environment Laboratory.			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).			
<b>MET-DUST(DM2-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>MET-DUST(DM2-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*





KNIGHT PIESOLD LTD.  
ATTN: Oscar Gustafson  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 20-OCT-11  
Report Date: 28-OCT-11 12:12 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1074764  
Project P.O. #: NOT SUBMITTED  
Job Reference: 101-458/5  
C of C Numbers: 10-168089  
Legal Site Desc:

**Comments:** the Blank sample represents the original solution added to canisters.

Andre Langlais  
Account Manager

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ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

28-OCT-11 12:12 (MT)

Version: FINAL

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1074764-1	L1074764-2	L1074764-3	L1074764-4	L1074764-5
					L1074764-1 DUSTFALL 19-OCT-11 16:00 DF-01 (SEP23 - OCT19/11)	L1074764-2 DUSTFALL 19-OCT-11 16:30 DF-02 (SEP23 - OCT19/11)	L1074764-3 DUSTFALL 19-OCT-11 17:00 DF-03 (SEP23 - OCT19/11)	L1074764-4 DUSTFALL 19-OCT-11 16:00 DF-04 (SEP23 - OCT19/11)	L1074764-5 DUSTFALL 19-OCT-11 14:00 DF-05 (SEP23 - OCT19/11)
Grouping	Analyte								
<b>DUSTFALL</b>									
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.40	0.35	0.16	0.12	0.15			
	Total Insoluble Dustfall (mg/dm2.day)	0.12	<0.12	<0.12	<0.12	<0.12			
	Total Soluble Dustfall (mg/dm2.day)	0.27	0.29	0.14	0.12	0.13			
<b>Anions and Nutrients</b>	Ammonia (as N) (mg/dm2.day)	0.00107	0.00072	0.00219	0.00228	0.00249			
	Chloride (Cl) (mg/dm2.day)	0.035	0.039	0.050	0.051	0.050			
	Nitrate (as N) (mg/dm2.day)	0.00165	0.00162	0.00431	0.00484	0.00467			
	Sulfate (SO4) (mg/dm2.day)	<0.012	<0.011	<0.018	<0.028	<0.024			
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00222	0.00155	0.000678	0.000951	0.000727			
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000048 <sup>DLB</sup>	<0.0000034 <sup>DLB</sup>	<0.0000037	<0.0000056	<0.0000047			
	Arsenic (As)-Total (mg/dm2.day)	<0.0000024	<0.0000023	<0.0000037	<0.0000056	<0.0000047			
	Barium (Ba)-Total (mg/dm2.day)	0.0000446	0.0000411	0.0000317	0.0000332	0.0000348			
	Beryllium (Be)-Total (mg/dm2.day)	<0.000012	<0.000011	<0.000018	<0.000028	<0.000024			
	Bismuth (Bi)-Total (mg/dm2.day)	<0.000012	<0.000011	<0.000018	<0.000028	<0.000024			
	Boron (B)-Total (mg/dm2.day)	<0.00024	<0.00023	<0.00037	<0.00056	<0.00047			
	Cadmium (Cd)-Total (mg/dm2.day)	<0.0000012	<0.0000011	<0.0000018	<0.0000028	<0.0000024			
	Calcium (Ca)-Total (mg/dm2.day)	0.0029	0.0029	0.0029	0.0035	0.0031			
	Chromium (Cr)-Total (mg/dm2.day)	0.000018	0.000013	<0.000018	<0.000028	<0.000024			
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000024	<0.0000023	<0.0000037	<0.0000056	<0.0000047			
	Copper (Cu)-Total (mg/dm2.day)	0.000232	0.000118	0.000249	0.0000867	0.0000873			
	Iron (Fe)-Total (mg/dm2.day)	0.00552	0.00405	<0.0011	<0.0017	<0.0014			
	Lead (Pb)-Total (mg/dm2.day)	0.0000051	0.0000053	0.0000065	0.0000051	0.0000061			
	Lithium (Li)-Total (mg/dm2.day)	<0.00012	<0.00011	<0.00018	<0.00028	<0.00024			
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0024	<0.0023	<0.0037	<0.0056	<0.0047			
	Manganese (Mn)-Total (mg/dm2.day)	0.000173	0.000125	0.0000939	0.000127	0.0000825			
	Mercury (Hg)-Total (mg/dm2.day)	<0.0000012	<0.0000011	<0.0000018	<0.0000028	<0.0000024			
	Molybdenum (Mo)-Total (mg/dm2.day)	0.0000022	0.0000021	<0.0000018	<0.0000028	<0.0000024			
	Nickel (Ni)-Total (mg/dm2.day)	<0.000012	<0.000011	<0.000018	<0.000028	<0.000024			
	Phosphorus (P)-Total (mg/dm2.day)	<0.0073	<0.0069	<0.011	<0.017	<0.014			
	Potassium (K)-Total (mg/dm2.day)	<0.048	<0.046	<0.074	<0.11	<0.094			
	Selenium (Se)-Total (mg/dm2.day)	<0.000024	<0.000023	<0.000037	<0.000056	<0.000047			
	Silicon (Si)-Total (mg/dm2.day)	0.0036	0.0027	<0.0018	<0.0028	<0.0024			
	Silver (Ag)-Total (mg/dm2.day)	<0.00000073 <sup>DLB</sup>	<0.00000069 <sup>DLB</sup>	<0.0000015 <sup>DLB</sup>	<0.0000022 <sup>DLB</sup>	<0.0000014 <sup>DLB</sup>			
	Sodium (Na)-Total (mg/dm2.day)	<0.048	<0.046	<0.074	<0.11	<0.094			
	Strontium (Sr)-Total (mg/dm2.day)	0.0000205	0.0000163	0.0000147	0.0000179	0.0000153			
Thallium (Tl)-Total (mg/dm2.day)	<0.0000024	<0.0000023	<0.0000037	<0.0000056	<0.0000047				
Tin (Sn)-Total (mg/dm2.day)	<0.0000024	<0.0000023	<0.0000037	<0.0000056	<0.0000047				
Titanium (Ti)-Total (mg/dm2.day)	<0.00024	<0.00023	<0.00037	<0.00056	<0.00047				

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.



# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID				
	L1074764-6 DUSTFALL 19-OCT-11 15:00 DF-06 (SEP23 - OCT19/11)	L1074764-7			
		BLANK			
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.34			
	Total Insoluble Dustfall (mg/dm2.day)	<0.12			
	Total Soluble Dustfall (mg/dm2.day)	0.29			
<b>Anions and Nutrients</b>	Ammonia (as N) (mg/dm2.day)	0.00082	<0.00013		
	Chloride (Cl) (mg/dm2.day)	0.038	0.042		
	Nitrate (as N) (mg/dm2.day)	0.00158	<0.00013		
	Sulfate (SO4) (mg/dm2.day)	<0.010	<0.013		
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.000978			
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000021			
	Arsenic (As)-Total (mg/dm2.day)	<0.0000021			
	Barium (Ba)-Total (mg/dm2.day)	0.0000861			
	Beryllium (Be)-Total (mg/dm2.day)	<0.000010			
	Bismuth (Bi)-Total (mg/dm2.day)	<0.000010			
	Boron (B)-Total (mg/dm2.day)	<0.00021			
	Cadmium (Cd)-Total (mg/dm2.day)	0.0000021			
	Calcium (Ca)-Total (mg/dm2.day)	0.0570			
	Chromium (Cr)-Total (mg/dm2.day)	<0.000010			
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000021			
	Copper (Cu)-Total (mg/dm2.day)	0.0000797			
	Iron (Fe)-Total (mg/dm2.day)	0.00216			
	Lead (Pb)-Total (mg/dm2.day)	0.0000030			
	Lithium (Li)-Total (mg/dm2.day)	<0.00010			
	Magnesium (Mg)-Total (mg/dm2.day)	0.0029			
	Manganese (Mn)-Total (mg/dm2.day)	0.000130			
	Mercury (Hg)-Total (mg/dm2.day)	<0.0000010			
	Molybdenum (Mo)-Total (mg/dm2.day)	0.0000012			
	Nickel (Ni)-Total (mg/dm2.day)	<0.000010			
	Phosphorus (P)-Total (mg/dm2.day)	<0.0062			
	Potassium (K)-Total (mg/dm2.day)	<0.041			
	Selenium (Se)-Total (mg/dm2.day)	<0.000021			
	Silicon (Si)-Total (mg/dm2.day)	0.0022			
	Silver (Ag)-Total (mg/dm2.day)	<0.00000062 <sup>DLB</sup>			
	Sodium (Na)-Total (mg/dm2.day)	<0.041			
	Strontium (Sr)-Total (mg/dm2.day)	0.000294			
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000021			
Tin (Sn)-Total (mg/dm2.day)	<0.0000021				
Titanium (Ti)-Total (mg/dm2.day)	<0.00021				

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1074764-1 DUSTFALL 19-OCT-11 16:00 DF-01 (SEP23 - OCT19/11)	L1074764-2 DUSTFALL 19-OCT-11 16:30 DF-02 (SEP23 - OCT19/11)	L1074764-3 DUSTFALL 19-OCT-11 17:00 DF-03 (SEP23 - OCT19/11)	L1074764-4 DUSTFALL 19-OCT-11 16:00 DF-04 (SEP23 - OCT19/11)	L1074764-5 DUSTFALL 19-OCT-11 14:00 DF-05 (SEP23 - OCT19/11)
Grouping	Analyte					
<b>DUSTFALL</b>						
<b>Metals</b>	Uranium (U)-Total (mg/dm2.day)	<0.00000024	<0.00000023	<0.00000037	<0.00000056	<0.00000047
	Vanadium (V)-Total (mg/dm2.day)	<0.000024	<0.000023	<0.000037	<0.000056	<0.000047
	Zinc (Zn)-Total (mg/dm2.day)	0.000086	0.000077	0.000070	0.000075	0.000069

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1074764-6 DUSTFALL 19-OCT-11 15:00 DF-06 (SEP23 - OCT19/11)	L1074764-7   BLANK		
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Metals</b>	Uranium (U)-Total (mg/dm2.day)	<0.0000021			
	Vanadium (V)-Total (mg/dm2.day)	<0.000021			
	Zinc (Zn)-Total (mg/dm2.day)	0.000207			

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

**Qualifiers for Individual Parameters Listed:**

Qualifier	Description
DLB	Detection limit was raised due to detection of analyte at comparable level in Method Blank.

**Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
<b>CL-IC-VA</b>	Dustfall	Dustfall Chloride by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The chloride analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE DUSTFALLS
<p>Dustfall analysis is carried out in accordance with procedures published by the B.C. Ministry of Environment Laboratory.</p>			
<b>HG-DUST(DM2-CVAFS-VA)</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2-ICP-VA)</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2-MS-VA)</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			
<b>NH3-F-VA</b>	Dustfall	Dustfall Ammonia by Fluorescence	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The ammonia analysis is specifically carried out using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
<b>NO3-IC-VA</b>	Dustfall	Dustfall Nitrate by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The nitrate analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			
<b>SO4-IC-VA</b>	Dustfall	Dustfall Sulphate by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The sulphate analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

**Chain of Custody Numbers:**

10-168089

## Reference Information

### GLOSSARY OF REPORT TERMS

*Surrogate* - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

*mg/kg* - milligrams per kilogram based on dry weight of sample.

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample.

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight of sample.

*mg/L* - milligrams per litre.

*<* - Less than.

*D.L.* - The reported Detection Limit, also known as the Limit of Reporting (LOR).

*N/A* - Result not available. Refer to qualifier code and definition for explanation.

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



<b>Report To</b>	<b>Report Format / Distribution</b>	<b>Service Request:</b> (Rush subject to availability - Contact ALS to confirm TAT)
Company: <u>Knight Piesold Ltd.</u>	Standard: <input checked="" type="checkbox"/> Other (specify):	<input checked="" type="checkbox"/> Regular (Standard Turnaround Times - Business Days)
Contact: <u>Oscar Gustafson</u>	Select: PDF <input checked="" type="checkbox"/> Excel Digital Fax	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address: <u>1400-750 West Pender St.</u>	Email 1: <u>ogustafson@knightpiesold.com</u>	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
<u>Vancouver BC</u>	Email 2:	Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone: <u>604-685-0543</u> Fax:		

<b>Invoice To</b> <u>Same as Report</u> (circle) Yes or No (if No, provide details)	<b>Client / Project Information</b>	<b>Analysis Request</b> (Indicate Filtered or Preserved, F/P)											
Copy of Invoice with Report? (circle) <u>Yes</u> or No	Job #: <u>101-458/5</u>												
Company:	PO / AFE:	Total Metals											
Contact:	LSD:												
Address:													
Phone: Fax:	Quote #:												

<b>Lab Work Order # (lab use only)</b>	<u>L1074764</u>	<b>ALS Contact:</b>	<b>Sampler:</b>
--	-----------------	---------------------	-----------------

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals	Number of Containers																	
	DF-01 (rep 1)	19-04-2011	1600	Dustfall	X																		
	DF-01 (rep 2)	"	1600	"	X																		
	DF-02 (rep 1)	"	1630	"	X																		
	DF-02 (rep 2)	"	1630	"	X																		
	DF-03 (rep 1)	"	1700	"	X																		
	DF-03 (rep 2)	"	1700	"	X																		
	DF-04 (rep 1)	"	1600	"	X																		
	DF-04 (rep 2)	"	1600	"	X																		
	DF-05 (rep 1)	"	1400	"	X																		
	DF-05 (rep 2)	"	1400	"	X																		
	DF-06 (rep 1)	"	1500	"	X																		
	DF-06 (rep 2)	"	1500	"	X																		

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Standard analysis for dustfall

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

<b>SHIPMENT RELEASE (client use)</b>			<b>SHIPMENT RECEPTION (lab use only)</b>				<b>SHIPMENT VERIFICATION (lab use only)</b>			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
			<u>cut</u>	<u>04/2011</u>	<u>1430</u>	<u>12.8 °C</u>				



KNIGHT PIESOLD LTD.  
ATTN: Peter Troffe  
1400 - 750 WEST PENDER STREET  
VANCOUVER BC V6C 2T8

Date Received: 30-JAN-12  
Report Date: 08-FEB-12 17:28 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1108792  
Project P.O. #: NOT SUBMITTED  
Job Reference: 101-458/5  
C of C Numbers: 10-196447  
Legal Site Desc:

Andre Langlais  
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1108792-1	L1108792-2	L1108792-3		
Description	DUSTFALL	DUSTFALL	DUSTFALL		
Sampled Date	26-JAN-12	26-JAN-12	26-JAN-12		
Sampled Time	14:00	14:30	15:00		
Client ID	DF-02 (DEC19/11 - JAN26/12)	DF-06	DF-01 (OCT19/11 - JAN26/12)		
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.12	0.56	0.82	
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	0.13	0.32	
	Total Soluble Dustfall (mg/dm2.day)	<0.10	0.44	0.50	
<b>Anions and Nutrients</b>	Ammonia, Total (as N) (mg/dm2.day)	0.000551	0.00153	0.00117	
	Chloride (Cl) (mg/dm2.day)	<0.0060	0.036	0.038	
	Nitrate (as N) (mg/dm2.day)	0.00301	0.00501	0.00624	
	Sulfate (SO4) (mg/dm2.day)	<0.0060	<0.017	<0.021	
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.000354	0.000483	0.000658	
	Antimony (Sb)-Total (mg/dm2.day)	<0.00000051	<0.0000014	<0.0000011	
	Arsenic (As)-Total (mg/dm2.day)	0.00000056	<0.0000014	<0.0000011	
	Barium (Ba)-Total (mg/dm2.day)	0.0000122	0.0000272	0.0000232	
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000025	<0.0000069	<0.0000056	
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000025	<0.0000069	<0.0000056	
	Boron (B)-Total (mg/dm2.day)	<0.000051	<0.00014	<0.00011	
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000025	<0.00000069	<0.00000056	
	Calcium (Ca)-Total (mg/dm2.day)	0.00098	0.00208	0.00161	
	Chromium (Cr)-Total (mg/dm2.day)	0.0000034	<0.0000069	<0.0000056	
	Cobalt (Co)-Total (mg/dm2.day)	<0.00000051	<0.0000014	<0.0000011	
	Copper (Cu)-Total (mg/dm2.day)	0.0000610	0.0000697	0.0000534	
	Iron (Fe)-Total (mg/dm2.day)	0.00123	0.00145	0.00197	
	Lead (Pb)-Total (mg/dm2.day)	0.0000699	0.0000407	0.0000287	
	Lithium (Li)-Total (mg/dm2.day)	<0.000025	<0.000069	<0.000056	
	Magnesium (Mg)-Total (mg/dm2.day)	<0.00051	<0.0014	<0.0011	
	Manganese (Mn)-Total (mg/dm2.day)	0.0000408	0.000107	0.0000925	
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000025	<0.00000069	<0.00000056	
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000046	<0.00000069	0.00000081	
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000025	<0.0000069	<0.0000056	
	Phosphorus (P)-Total (mg/dm2.day)	<0.0015	<0.0041	<0.0033	
	Potassium (K)-Total (mg/dm2.day)	<0.010	<0.028	<0.022	
	Selenium (Se)-Total (mg/dm2.day)	<0.0000051	<0.000014	<0.000011	
	Silicon (Si)-Total (mg/dm2.day)	0.00073	0.00077	0.00104	
	Silver (Ag)-Total (mg/dm2.day)	<0.000000051	<0.00000014	<0.00000011	
	Sodium (Na)-Total (mg/dm2.day)	<0.010	<0.028	<0.022	
	Strontium (Sr)-Total (mg/dm2.day)	0.00000486	0.0000107	0.0000084	
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000051	<0.0000014	<0.0000011	
	Tin (Sn)-Total (mg/dm2.day)	0.00000129	0.0000028	0.0000053	
	Titanium (Ti)-Total (mg/dm2.day)	<0.000051	<0.00014	<0.00011	



# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1108792-1 DUSTFALL 26-JAN-12 14:00 DF-02 (DEC19/11 - JAN26/12)	L1108792-2 DUSTFALL 26-JAN-12 14:30 DF-06	L1108792-3 DUSTFALL 26-JAN-12 15:00 DF-01 (OCT19/11 - JAN26/12)		
Grouping	Analyte					
<b>DUSTFALL</b>						
<b>Metals</b>	Uranium (U)-Total (mg/dm2.day)	<0.000000051	<0.00000014	<0.00000011		
	Vanadium (V)-Total (mg/dm2.day)	<0.0000051	<0.000014	<0.000011		
	Zinc (Zn)-Total (mg/dm2.day)	0.000028	0.000057	0.000054		

## Reference Information

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>CL-IC-VA</b>	Dustfall	Dustfall Chloride by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The chloride analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE DUSTFALLS
<p>Dustfall analysis is carried out in accordance with procedures published by the B.C. Ministry of Environment Laboratory.</p>			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2)-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2)-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			
<b>NH3-F-VA</b>	Dustfall	Dustfall Ammonia by Fluorescence	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The ammonia analysis is specifically carried out using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
<b>NO3-IC-VA</b>	Dustfall	Dustfall Nitrate by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The nitrate analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			
<b>SO4-IC-VA</b>	Dustfall	Dustfall Sulphate by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
<p>The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The sulphate analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

### Chain of Custody Numbers:

10-196447

### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*





KNIGHT PIESOLD LTD.  
ATTN: Peter Troffe  
1400 - 750 WEST PENDER STREET  
VANCOUVER BC V6C 2T8

Date Received: 04-APR-12  
Report Date: 18-APR-12 17:00 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1131425  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:**  
**C of C Numbers:** 10-206862  
**Legal Site Desc:**

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Stefanie Teo  
Account Manager

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID			
	L1131425-1 DUSTFALL 31-MAR-12 17:15 DF-02 (26-JAN-12-31-MAR-12)	L1131425-2 DUSTFALL 31-MAR-12 17:15 DF-06 (26-JAN-12-31-MAR-12)	L1131425-3 DUSTFALL 31-MAR-12 17:15 DF-01 (26-JAN-12-31-MAR-12)	
Grouping	Analyte			
<b>DUSTFALL</b>				
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	<0.10	<0.10	0.23
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	0.17
	Total Soluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10
<b>Anions and Nutrients</b>	Sulfate (SO4) (mg/dm2.day)	<0.0034	<0.0033	<0.0041
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.000671	0.000268	0.00108
	Antimony (Sb)-Total (mg/dm2.day)	<0.00000068	<0.00000067	<0.00000082
	Arsenic (As)-Total (mg/dm2.day)	<0.00000068	<0.00000067	<0.00000082
	Barium (Ba)-Total (mg/dm2.day)	0.0000336	0.0000204	0.0000372
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000034	<0.0000033	<0.0000041
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000034	<0.0000033	<0.0000041
	Boron (B)-Total (mg/dm2.day)	<0.000068	<0.000067	<0.000082
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000034	<0.00000033	<0.00000041
	Calcium (Ca)-Total (mg/dm2.day)	0.00252	0.00182	0.00254
	Chromium (Cr)-Total (mg/dm2.day)	0.0000073	0.0000034	0.0000079
	Cobalt (Co)-Total (mg/dm2.day)	<0.00000068	<0.00000067	0.00000199
	Copper (Cu)-Total (mg/dm2.day)	<0.000020 <sup>DLB</sup>	<0.000023 <sup>DLB</sup>	0.0000550
	Iron (Fe)-Total (mg/dm2.day)	0.00324	0.00152	0.00372
	Lead (Pb)-Total (mg/dm2.day)	0.00000223	0.00000178	0.00000291
	Lithium (Li)-Total (mg/dm2.day)	<0.000034	<0.000033	<0.000041
	Magnesium (Mg)-Total (mg/dm2.day)	<0.00068	<0.00067	<0.00082
	Manganese (Mn)-Total (mg/dm2.day)	0.000160	0.0000798	0.000149
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000034	<0.00000033	<0.00000041
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000115	0.00000061	0.00000108
	Nickel (Ni)-Total (mg/dm2.day)	0.0000054	0.0000043	0.0000050
	Phosphorus (P)-Total (mg/dm2.day)	<0.0020	<0.0020	<0.0025
	Potassium (K)-Total (mg/dm2.day)	<0.014	<0.013	<0.016
	Selenium (Se)-Total (mg/dm2.day)	<0.0000068	<0.0000067	<0.0000082
	Silicon (Si)-Total (mg/dm2.day)	0.00137	0.00048	0.00203
	Silver (Ag)-Total (mg/dm2.day)	<0.00000068	<0.00000067	<0.00000082
	Sodium (Na)-Total (mg/dm2.day)	<0.014	<0.013	<0.016
	Strontium (Sr)-Total (mg/dm2.day)	0.0000129	0.00000852	0.0000132
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000068	<0.00000067	<0.00000082
	Tin (Sn)-Total (mg/dm2.day)	<0.00000068	<0.00000067	<0.00000082
	Titanium (Ti)-Total (mg/dm2.day)	<0.000068	<0.000067	<0.000082
	Uranium (U)-Total (mg/dm2.day)	<0.00000068	<0.00000067	<0.00000082
	Vanadium (V)-Total (mg/dm2.day)	<0.0000068	<0.0000067	<0.0000082
	Zinc (Zn)-Total (mg/dm2.day)	0.000043	0.000043	0.000044

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

**Qualifiers for Individual Parameters Listed:**

Qualifier	Description
DLB	Detection limit was raised due to detection of analyte at comparable level in Method Blank.

**Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE DUSTFALLS
Dustfall analysis is carried out in accordance with procedures published by the B.C. Ministry of Environment Laboratory.			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).			
<b>MET-DUST(DM2)-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>MET-DUST(DM2)-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			
<b>SO4-IC-VA</b>	Dustfall	Dustfall Sulphate by Ion Chromatography	BC LAB MAN. - PART. - SOLUBLE - ANIONS
The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The sulphate analysis is specifically carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

**Chain of Custody Numbers:**

10-206862

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*





KNIGHT PIESOLD LTD.  
ATTN: Jessica Mackie  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 25-JUN-12  
Report Date: 12-JUL-12 15:40 (MT)  
Version: FINAL REV. 2

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1167273  
Project P.O. #: NOT SUBMITTED  
Job Reference: VA101-458/6  
C of C Numbers: 10-251685  
Legal Site Desc:

**Comments:** ADDITIONAL 05-JUL-12 17:34  
12-JUL-12: Revised report  
Dustfall articulates analysis has been added.

  
\_\_\_\_\_  
Andre Langlais  
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1167273-1 DUSTFALL 19-JUN-12 17:15 DF-06	L1167273-2 DUSTFALL 20-JUN-12 18:55 DF-01	L1167273-3 DUSTFALL 20-JUN-12 18:00 DF-02		
Grouping	Analyte					
<b>DUSTFALL</b>						
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.24	0.22	0.22		
	Total Insoluble Dustfall (mg/dm2.day)	0.17	0.16	0.16		
	Total Soluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10		
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00135	0.00274	0.00106		
	Antimony (Sb)-Total (mg/dm2.day)	0.00000064	0.00000086	0.00000067		
	Arsenic (As)-Total (mg/dm2.day)	<0.0000030 <sup>DLM</sup>	<0.0000024 <sup>DLM</sup>	<0.0000010 <sup>DLM</sup>		
	Barium (Ba)-Total (mg/dm2.day)	0.0000274	0.0000488	0.0000238		
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000025	<0.0000024	<0.0000025		
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000025	<0.0000024	<0.0000025		
	Boron (B)-Total (mg/dm2.day)	<0.000049	<0.000049	<0.000050		
	Cadmium (Cd)-Total (mg/dm2.day)	0.00000075	0.00000031	<0.0000025		
	Calcium (Ca)-Total (mg/dm2.day)	0.00421	0.00457	0.00321		
	Chromium (Cr)-Total (mg/dm2.day)	0.0000078	0.0000118	0.0000060		
	Cobalt (Co)-Total (mg/dm2.day)	0.00000101	0.00000166	0.00000071		
	Copper (Cu)-Total (mg/dm2.day)	<0.000099 <sup>DLB</sup>	0.000221	<0.000075 <sup>DLB</sup>		
	Iron (Fe)-Total (mg/dm2.day)	0.00321	0.00610	0.00271		
	Lead (Pb)-Total (mg/dm2.day)	<0.000049 <sup>DLB</sup>	<0.000073 <sup>DLB</sup>	<0.000030 <sup>DLB</sup>		
	Lithium (Li)-Total (mg/dm2.day)	<0.000025	<0.000024	<0.000025		
	Magnesium (Mg)-Total (mg/dm2.day)	0.00177	0.00283	0.00110		
	Manganese (Mn)-Total (mg/dm2.day)	0.0000992	0.000153	0.0000675		
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000025	<0.00000024	<0.00000025		
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000126	0.00000191	0.00000125		
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000074 <sup>DLB</sup>	0.000122	<0.000012 <sup>DLB</sup>		
	Phosphorus (P)-Total (mg/dm2.day)	0.0036	0.0066	<0.0015		
	Potassium (K)-Total (mg/dm2.day)	<0.0099	0.0113	<0.010		
	Selenium (Se)-Total (mg/dm2.day)	<0.0000049	<0.0000049	<0.0000050		
	Silicon (Si)-Total (mg/dm2.day)	0.00240	0.00478	0.00194		
	Silver (Ag)-Total (mg/dm2.day)	0.000000102	0.000000226	<0.000000050		
	Sodium (Na)-Total (mg/dm2.day)	<0.0099	<0.0097	<0.010		
	Strontium (Sr)-Total (mg/dm2.day)	0.0000213	0.0000270	0.0000189		
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000049	<0.00000049	<0.00000050		
	Tin (Sn)-Total (mg/dm2.day)	<0.00000049	0.00000067	<0.00000050		
	Titanium (Ti)-Total (mg/dm2.day)	0.000056	0.000131	0.000054		
Uranium (U)-Total (mg/dm2.day)	0.000000118	0.000000182	0.000000067			
Vanadium (V)-Total (mg/dm2.day)	<0.0000049	0.0000057	<0.0000050			
Zinc (Zn)-Total (mg/dm2.day)	0.000061	0.000469	0.000044			

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection limit was raised due to detection of analyte at comparable level in Method Blank.
DLM	Detection Limit Adjusted For Sample Matrix Effects

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE
<p>This analysis is carried out using procedures modified from British Columbia Environmental Manual "Particulate." Particulates or Dustfall are determined gravimetrically. Total Insoluble Dustfall is determined by filtering a sample through a 0.45 um membrane filter and drying the filter at 104 degrees celsius. Total Soluble Dustfall is determined by evaporating the filtrate to dryness at 104 degrees celsius. The Total Dustfall is the sum of Insoluble Dustfall and the Soluble Dustfall.</p>			
<b>HG-DUST(DM2-CVAFS-VA)</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2-ICP-VA)</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2-MS-VA)</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

### Chain of Custody Numbers:

10-251685

### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*





KNIGHT PIESOLD LTD.  
ATTN: Lawrence Duong  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 27-AUG-12  
Report Date: 06-SEP-12 15:57 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1200300  
Project P.O. #: NOT SUBMITTED  
Job Reference: VA101-458/6  
C of C Numbers: 10-195732  
Legal Site Desc:

Andre Langlais  
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1200300-1 Dustfall 23-AUG-12  DF-02	L1200300-2 Dustfall 23-AUG-12  DF-03	L1200300-3 Dustfall 23-AUG-12  DF-04	L1200300-4 Dustfall 23-AUG-12  DF-05	L1200300-5 Dustfall 23-AUG-12  DF-06
Grouping	Analyte					
<b>DUSTFALL</b>						
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.19	<0.10	0.13	0.10	0.64
	Total Insoluble Dustfall (mg/dm2.day)	0.19	<0.10	<0.10	<0.10	0.55
	Total Soluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	<0.10	<0.10
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00149	0.000622	0.00142	0.000723	0.00131
	Antimony (Sb)-Total (mg/dm2.day)	<0.00000054	0.00000039	0.00000058	0.00000052	0.00000054
	Arsenic (As)-Total (mg/dm2.day)	0.00000070	0.0000130	0.0000139	0.0000140	0.00000180
	Barium (Ba)-Total (mg/dm2.day)	0.0000284	0.0000156	0.0000221	0.0000173	0.0000150
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000027	<0.0000012	<0.0000022	<0.0000020	<0.0000027
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000027	<0.0000012	<0.0000022	<0.0000020	<0.0000027
	Boron (B)-Total (mg/dm2.day)	<0.000054	<0.000024	<0.000045	<0.000040	<0.000053
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000027	0.00000015	<0.00000022	0.00000036	<0.00000027
	Calcium (Ca)-Total (mg/dm2.day)	0.00261	0.00176	0.00212	0.00209	0.00423
	Chromium (Cr)-Total (mg/dm2.day)	0.0000066	0.0000016	0.0000033	0.0000095	0.0000048
	Cobalt (Co)-Total (mg/dm2.day)	0.00000140	0.00000050	0.00000077	0.00000064	0.00000170
	Copper (Cu)-Total (mg/dm2.day)	<0.000049 <sup>DLB</sup>	0.0000900	0.000121	0.000178	<0.000051 <sup>DLB</sup>
	Iron (Fe)-Total (mg/dm2.day)	0.00327	0.000726	0.00157	0.00123	0.00251 <sup>DLB</sup>
	Lead (Pb)-Total (mg/dm2.day)	0.00000245	0.00000433	0.00000535	0.00000733	<0.0000021 <sup>DLB</sup>
	Lithium (Li)-Total (mg/dm2.day)	<0.000027	<0.000012	<0.000022	<0.000020	<0.000027
	Magnesium (Mg)-Total (mg/dm2.day)	0.00112	0.00062	0.00091	0.00067	0.00251
	Manganese (Mn)-Total (mg/dm2.day)	0.000144	0.0000433	0.0000596	0.0000593	0.000118
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000027	<0.00000012	<0.00000022	<0.00000020	<0.00000027
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000065	0.00000030	0.00000084	0.00000133	0.00000065
	Nickel (Ni)-Total (mg/dm2.day)	0.0000085	0.0000026	0.0000028	0.0000054	0.0000069
	Phosphorus (P)-Total (mg/dm2.day)	<0.0016	<0.00072	<0.0013	<0.0012	0.0035
	Potassium (K)-Total (mg/dm2.day)	<0.011	<0.0048	<0.0090	<0.0080	<0.011
	Selenium (Se)-Total (mg/dm2.day)	<0.0000054	<0.0000024	<0.0000045	<0.0000040	<0.0000053
	Silicon (Si)-Total (mg/dm2.day)	0.00247	0.00132	0.00292	0.00137	0.00233
	Silver (Ag)-Total (mg/dm2.day)	<0.000000054	0.000000060	0.000000079	0.000000101	<0.000000053
	Sodium (Na)-Total (mg/dm2.day)	<0.011	<0.0048	<0.0090	<0.0080	<0.011
	Strontium (Sr)-Total (mg/dm2.day)	0.0000158	0.0000111	0.0000146	0.0000125	0.0000178
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000054	<0.00000024	<0.00000045	<0.00000040	<0.00000053
	Tin (Sn)-Total (mg/dm2.day)	<0.00000054	<0.00000024	<0.00000045	<0.00000040	<0.00000053
	Titanium (Ti)-Total (mg/dm2.day)	0.000079	0.000026	0.000049	<0.000040	0.000064
Uranium (U)-Total (mg/dm2.day)	0.000000090	0.000000040	0.000000079	0.000000048	0.000000063	
Vanadium (V)-Total (mg/dm2.day)	<0.0000054	<0.0000024	<0.0000045	<0.0000040	<0.0000053	
Zinc (Zn)-Total (mg/dm2.day)	0.000044	0.0000298	0.000040	0.000051	0.000046	

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1200300-6 Dustfall 23-AUG-12  DF-07				
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.15			
	Total Insoluble Dustfall (mg/dm2.day)	<0.10			
	Total Soluble Dustfall (mg/dm2.day)	<0.10			
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	<0.000016			
	Antimony (Sb)-Total (mg/dm2.day)	<0.00000054			
	Arsenic (As)-Total (mg/dm2.day)	<0.00000054			
	Barium (Ba)-Total (mg/dm2.day)	<0.00000054 <sup>DLB</sup>			
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000027			
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000027			
	Boron (B)-Total (mg/dm2.day)	<0.000054			
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000027			
	Calcium (Ca)-Total (mg/dm2.day)	<0.00027			
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000027			
	Cobalt (Co)-Total (mg/dm2.day)	<0.00000054			
	Copper (Cu)-Total (mg/dm2.day)	<0.000014 <sup>DLB</sup>			
	Iron (Fe)-Total (mg/dm2.day)	<0.00016			
	Lead (Pb)-Total (mg/dm2.day)	<0.00000054 <sup>DLB</sup>			
	Lithium (Li)-Total (mg/dm2.day)	<0.000027			
	Magnesium (Mg)-Total (mg/dm2.day)	<0.00054			
	Manganese (Mn)-Total (mg/dm2.day)	0.00000031			
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000027			
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000027			
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000027			
	Phosphorus (P)-Total (mg/dm2.day)	<0.0016			
	Potassium (K)-Total (mg/dm2.day)	<0.011			
	Selenium (Se)-Total (mg/dm2.day)	<0.0000054			
	Silicon (Si)-Total (mg/dm2.day)	<0.00027			
	Silver (Ag)-Total (mg/dm2.day)	<0.000000054			
	Sodium (Na)-Total (mg/dm2.day)	<0.011			
	Strontium (Sr)-Total (mg/dm2.day)	<0.00000054			
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000054			
	Tin (Sn)-Total (mg/dm2.day)	<0.00000054			
	Titanium (Ti)-Total (mg/dm2.day)	<0.000054			
Uranium (U)-Total (mg/dm2.day)	<0.000000054				
Vanadium (V)-Total (mg/dm2.day)	<0.0000054				
Zinc (Zn)-Total (mg/dm2.day)	<0.000016				

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection limit was raised due to detection of analyte at comparable level in Method Blank.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE
<p>This analysis is carried out using procedures modified from British Columbia Environmental Manual "Particulate."            Particulates or Dustfall are determined gravimetrically. Total Insoluble Dustfall is determined by filtering a sample through a 0.45 um membrane filter and drying the filter at 104 degrees celsius. Total Soluble Dustfall is determined by evaporating the filtrate to dryness at 104 degrees celsius. The Total Dustfall is the sum of Insoluble Dustfall and the Soluble Dustfall.</p>			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

### Chain of Custody Numbers:

10-195732

### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*







KNIGHT PIESOLD LTD.  
ATTN: Lawrence Duong  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 27-SEP-13  
Report Date: 09-OCT-13 14:46 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1370048  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** VA101-458/9  
**C of C Numbers:**  
**Legal Site Desc:**

Andre Langlais  
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1370048-1 DUSTFALL 20-SEP-13 09:10 DF-06 AUG.22- SEPT.20	L1370048-2 DUSTFALL 20-SEP-13 09:32 DF-02 AUG.22- SEPT.20	L1370048-3 DUSTFALL 20-SEP-13 17:00 DF-07 AUG.22- SEPT.20		
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	1.53	0.34	<0.10	
	Total Insoluble Dustfall (mg/dm2.day)	0.62	0.16	<0.10	
	Total Soluble Dustfall (mg/dm2.day)	0.91	0.18	<0.10	
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00126	0.00125	0.000209	
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000016	<0.0000014	<0.0000020	
	Arsenic (As)-Total (mg/dm2.day)	0.0000273	<0.0000014	<0.0000020	
	Barium (Ba)-Total (mg/dm2.day)	0.0000450	0.0000471	0.0000176	
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000081	<0.0000070	<0.000010	
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000081	<0.0000070	<0.000010	
	Boron (B)-Total (mg/dm2.day)	0.00020	<0.00014	<0.00020	
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000081	<0.00000070	<0.0000010	
	Calcium (Ca)-Total (mg/dm2.day)	0.00609	0.00351	0.0014	
	Chromium (Cr)-Total (mg/dm2.day)	0.0000085	<0.0000070	<0.000010	
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000016	<0.0000014	<0.0000020	
	Copper (Cu)-Total (mg/dm2.day)	0.000453	0.000361	0.000071	
	Iron (Fe)-Total (mg/dm2.day)	0.00338	0.00343	<0.00060	
	Lead (Pb)-Total (mg/dm2.day)	0.00000329	0.00000268	0.0000013	
	Lithium (Li)-Total (mg/dm2.day)	<0.0000081	<0.0000070	<0.000010	
	Magnesium (Mg)-Total (mg/dm2.day)	0.0060	<0.0014	<0.0020	
	Manganese (Mn)-Total (mg/dm2.day)	0.000303	0.000128	0.0000430	
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000081	<0.00000070	<0.0000010	
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000192	<0.00000070	<0.0000010	
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000081	0.0000105	<0.000010	
	Phosphorus (P)-Total (mg/dm2.day)	0.0441	<0.0042	<0.0060	
	Potassium (K)-Total (mg/dm2.day)	0.073	<0.028	<0.040	
	Selenium (Se)-Total (mg/dm2.day)	<0.000016	<0.000014	<0.000020	
	Silicon (Si)-Total (mg/dm2.day)	0.00280	0.00217	<0.0010	
	Silver (Ag)-Total (mg/dm2.day)	0.00000020	<0.00000014	<0.00000020	
	Sodium (Na)-Total (mg/dm2.day)	<0.033	<0.028	<0.040	
	Strontium (Sr)-Total (mg/dm2.day)	0.0000357	0.0000191	0.0000129	
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000016	<0.0000014	<0.0000020	
	Tin (Sn)-Total (mg/dm2.day)	<0.0000016	<0.0000014	<0.0000020	
	Titanium (Ti)-Total (mg/dm2.day)	<0.00016	<0.00014	<0.00020	
	Uranium (U)-Total (mg/dm2.day)	<0.00000016	<0.00000014	<0.00000020	
	Vanadium (V)-Total (mg/dm2.day)	<0.000016	<0.000014	<0.000020	
Zinc (Zn)-Total (mg/dm2.day)	0.000278	0.000122	0.000073		

## Reference Information

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE
<p>This analysis is carried out using procedures modified from British Columbia Environmental Manual "Particulate."            Particulates or Dustfall are determined gravimetrically. Total Insoluble Dustfall is determined by filtering a sample through a 0.45 um membrane filter and drying the filter at 104 degrees celsius. Total Soluble Dustfall is determined by evaporating the filtrate to dryness at 104 degrees celsius. The Total Dustfall is the sum of Insoluble Dustfall and the Soluble Dustfall.</p>			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2)-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2)-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*


*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

<b>Report To</b>			<b>Report Format / Distribution</b>			<b>Service Requested (Rush for routine analysis subject to availability)</b>											
Company: <u>Knight Priced</u>			<input checked="" type="checkbox"/> Standard <input checked="" type="checkbox"/> Other <u>EDD</u>			<input checked="" type="radio"/> Regular (Standard Turnaround Times - Business Days)											
Contact: <u>Lawrence Duong</u>			<input type="checkbox"/> PDF <input type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax			<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT											
Address: <u>1400-750 W. Pender</u>			Email 1: <u>LDUONG@knightpriced.com</u>			<input type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT											
<u>Vancouver BC V6G 1K7</u>			Email 2:			<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT											
Phone: <u>604-685-0543</u> Fax: <u>604-685-0147</u>			Email 3:			<b>Analysis Request</b>											
Invoice To Same as Report? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			<b>Client / Project Information</b>			Please indicate below Filtered, Preserved or both (F, P, F/P)											
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Job #: <u>VA101-458/9</u>			STANDARD DUST FALL ANALYSIS											
Company: <u>Yellowhead Mining</u>			PO / AFE:									Number of Containers					
Contact: <u>Charlene Higgins</u>			LSD:														
Address: <u>CHiggins@yellowheadmining.com</u>			Quote #:														
Phone: _____ Fax: _____			ALS Contact: <u>Andre</u> Sampler: <u>Ryan Papp</u>														
Lab Work Order # (lab use only): <u>L1370048</u>																	
<b>Sample #</b>	<b>Sample Identification</b> (This description will appear on the report)		<b>Date</b> (dd-mmm-yy)	<b>Time</b> (hh:mm)	<b>Sample Type</b>												
	<u>DF - <del>06</del> 06</u>		<u>20-09-13</u>	<u>09:10</u>	<u>Dust Fall</u>	<input checked="" type="checkbox"/>											
	<u>DF - 02</u>		<u>20-09-13</u>	<u>09:32</u>	<u>Dust Fall</u>	<input checked="" type="checkbox"/>											
	<u>DF - 07</u>		<u>20-09-13</u>	<u>17:00</u>	<u>Dust Fall</u>	<input checked="" type="checkbox"/>											
 L1370048-COFC																	
<b>Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details</b> <u>PLEASE ONLY ANALYZE ONE CONTAINER FROM EACH PAIR.</u>																	
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab. Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.																	
SHIPMENT RELEASE (client use)				SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)									
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF							
			<u>Rise</u>	<u>Sept 27</u>	<u>16:20</u>	<u>12.0 °C</u>											



KNIGHT PIESOLD LTD.  
ATTN: Lawrence Duong  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 24-OCT-13  
Report Date: 04-NOV-13 16:55 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1382823  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** VA101-458/9  
**C of C Numbers:**  
**Legal Site Desc:**

Andre Langlais  
Account Manager

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1382823-1 Dustfall 20-OCT-13 11:38 DF-06 (SEP 20- OCT 20)	L1382823-2 Dustfall 20-OCT-13 11:12 DF-02 (SEP 20- OCT 20)	L1382823-3 Dustfall 20-OCT-13 10:28 DF-07 (SEP 20- OCT 20)		
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	<0.10	0.16	<0.10	
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	
	Total Soluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.000424	0.000847	0.000364	
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	
	Arsenic (As)-Total (mg/dm2.day)	0.0000017	0.0000012	0.0000013	
	Barium (Ba)-Total (mg/dm2.day)	0.0000255	0.0000278	0.0000356	
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000058	<0.0000058	<0.0000058	
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000058	<0.0000058	<0.0000058	
	Boron (B)-Total (mg/dm2.day)	<0.00012	<0.00012	<0.00012	
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000058	<0.00000058	0.00000112	
	Calcium (Ca)-Total (mg/dm2.day)	0.00233	0.00235	0.00161	
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000058	0.0000105	<0.0000058	
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	
	Copper (Cu)-Total (mg/dm2.day)	0.0000660	0.000108	0.000196	
	Iron (Fe)-Total (mg/dm2.day)	0.00170	0.00458	0.00158	
	Lead (Pb)-Total (mg/dm2.day)	0.00000173	0.00000182	0.00000427	
	Lithium (Li)-Total (mg/dm2.day)	<0.000058	<0.000058	<0.000058	
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0012	<0.0012	<0.0012	
	Manganese (Mn)-Total (mg/dm2.day)	0.0000899	0.000130	0.0000641	
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000058	<0.00000058	<0.00000058	
	Molybdenum (Mo)-Total (mg/dm2.day)	0.00000095	0.00000157	<0.00000058	
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000058	<0.0000058	<0.0000058	
	Phosphorus (P)-Total (mg/dm2.day)	<0.0035	<0.0035	<0.0035	
	Potassium (K)-Total (mg/dm2.day)	<0.023	<0.023	<0.023	
	Selenium (Se)-Total (mg/dm2.day)	<0.000012	<0.000012	<0.000012	
	Silicon (Si)-Total (mg/dm2.day)	0.00099	0.00234	0.00116	
	Silver (Ag)-Total (mg/dm2.day)	<0.00000012	<0.00000012	<0.00000012	
	Sodium (Na)-Total (mg/dm2.day)	<0.023	<0.023	<0.023	
	Strontium (Sr)-Total (mg/dm2.day)	0.0000100	0.0000112	0.0000112	
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	
	Tin (Sn)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	
	Titanium (Ti)-Total (mg/dm2.day)	<0.00012	<0.00012	<0.00012	
	Uranium (U)-Total (mg/dm2.day)	<0.00000012	<0.00000012	<0.00000012	
	Vanadium (V)-Total (mg/dm2.day)	<0.000012	<0.000012	<0.000012	
Zinc (Zn)-Total (mg/dm2.day)	0.000040	0.000053	0.000044		

## Reference Information

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE
<p>This analysis is carried out using procedures modified from British Columbia Environmental Manual "Particulate."            Particulates or Dustfall are determined gravimetrically. Total Insoluble Dustfall is determined by filtering a sample through a 0.45 um membrane filter and drying the filter at 104 degrees celsius. Total Soluble Dustfall is determined by evaporating the filtrate to dryness at 104 degrees celsius. The Total Dustfall is the sum of Insoluble Dustfall and the Soluble Dustfall.</p>			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2)-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2)-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*







KNIGHT PIESOLD LTD.  
ATTN: Lawrence Duong  
1400 - 750 West Pender Street  
Vancouver BC V6C 2T8

Date Received: 04-DEC-13  
Report Date: 13-DEC-13 17:47 (MT)  
Version: FINAL

Client Phone: 604-685-0543

## Certificate of Analysis

**Lab Work Order #:** L1399554  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** VA101-458/9 (OCT20-NOV20)  
**C of C Numbers:** 1  
**Legal Site Desc:**

Andre Langlais  
Account Manager

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1399554-1 DUST FALL 20-NOV-13 12:30 DF-02	L1399554-2 DUST FALL 20-NOV-13 14:25 DF-06	L1399554-3 DUST FALL 20-NOV-13 15:10 DF-07	L1399554-4 DUST FALL 20-SEP-13 11:20 DF-03	L1399554-5 DUST FALL 20-SEP-13 13:30 DF-05	
Grouping	Analyte					
<b>DUSTFALL</b>						
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.45	0.59	0.12	0.27	<0.11
	Total Insoluble Dustfall (mg/dm2.day)	0.23	0.39	<0.10	0.16	<0.11
	Total Soluble Dustfall (mg/dm2.day)	0.22	0.20	<0.10	<0.11	<0.11
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00206	0.00123	0.00111	0.000849	0.00113
	Antimony (Sb)-Total (mg/dm2.day)	0.0000048	<0.0000026	<0.0000027	<0.0000021	<0.0000031
	Arsenic (As)-Total (mg/dm2.day)	0.0000029	<0.0000026	0.0000073	<0.0000021	<0.0000031
	Barium (Ba)-Total (mg/dm2.day)	0.0000910	0.0000536	0.0000582	<0.000019 <sup>DLB</sup>	0.0000211
	Beryllium (Be)-Total (mg/dm2.day)	<0.000014	<0.000013	<0.000013	<0.000010	<0.000015
	Bismuth (Bi)-Total (mg/dm2.day)	<0.000014	<0.000013	<0.000013	<0.000010	<0.000015
	Boron (B)-Total (mg/dm2.day)	<0.00029	0.00032	<0.00027	<0.00021	<0.00031
	Cadmium (Cd)-Total (mg/dm2.day)	0.0000101	0.0000258	0.0000154	<0.0000010	<0.0000015
	Calcium (Ca)-Total (mg/dm2.day)	0.0063	0.0056	0.0048	0.0025	0.0022
	Chromium (Cr)-Total (mg/dm2.day)	0.000020	0.000019	<0.000013	<0.000010	<0.000015
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000029	<0.0000026	<0.0000027	<0.0000021	<0.0000031
	Copper (Cu)-Total (mg/dm2.day)	0.000217	0.000123	0.000237	0.000147	0.000016
	Iron (Fe)-Total (mg/dm2.day)	0.00624	0.00493	0.00242	0.00109	0.00107
	Lead (Pb)-Total (mg/dm2.day)	0.0000056	0.0000047	0.0000049	0.0000067	0.0000021
	Lithium (Li)-Total (mg/dm2.day)	<0.00014	<0.00013	<0.00013	<0.00010	<0.00015
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0029	0.0029	<0.0027	<0.0021	<0.0031
	Manganese (Mn)-Total (mg/dm2.day)	0.000458	0.000290	0.000243	0.0000804	0.0000572
	Mercury (Hg)-Total (mg/dm2.day)	<0.0000014	<0.0000013	<0.0000013	<0.0000010	<0.0000015
	Molybdenum (Mo)-Total (mg/dm2.day)	0.0000019	0.0000031	<0.0000013	<0.0000010	<0.0000015
	Nickel (Ni)-Total (mg/dm2.day)	<0.000014	0.000016	<0.000013	<0.000010	<0.000015
	Phosphorus (P)-Total (mg/dm2.day)	<0.0087	0.0180	<0.0081	<0.0062	<0.0093
	Potassium (K)-Total (mg/dm2.day)	<0.058	<0.053	<0.054	<0.042	<0.062
	Selenium (Se)-Total (mg/dm2.day)	<0.000029	<0.000026	<0.000027	<0.000021	<0.000031
	Silicon (Si)-Total (mg/dm2.day)	0.0036	0.0023	0.0017	0.0021	0.0026
	Silver (Ag)-Total (mg/dm2.day)	0.00000053	<0.00000026	0.00000030	<0.00000021	<0.00000031
	Sodium (Na)-Total (mg/dm2.day)	<0.058	<0.053	<0.054	<0.042	<0.062
	Strontium (Sr)-Total (mg/dm2.day)	0.0000298	0.0000277	0.0000185	0.0000107	0.0000139
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000029	<0.0000026	<0.0000027	<0.0000021	<0.0000031
	Tin (Sn)-Total (mg/dm2.day)	<0.0000029	<0.0000026	<0.0000027	<0.0000021	<0.0000031
	Titanium (Ti)-Total (mg/dm2.day)	<0.00029	<0.00026	<0.00027	<0.00021	<0.00031
	Uranium (U)-Total (mg/dm2.day)	<0.00000029	<0.00000026	<0.00000027	<0.00000021	<0.00000031
Vanadium (V)-Total (mg/dm2.day)	<0.000029	<0.000026	<0.000027	<0.000021	<0.000031	
Zinc (Zn)-Total (mg/dm2.day)	0.000194	0.000491	0.000256	0.000120	<0.000093	

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1399554-6				
Description	DUST FALL				
Sampled Date	20-SEP-13				
Sampled Time	14:36				
Client ID	DF-04				
Grouping	Analyte				
<b>DUSTFALL</b>					
<b>Particulates</b>	Total Dustfall (mg/dm2.day)	0.33			
	Total Insoluble Dustfall (mg/dm2.day)	<0.11			
	Total Soluble Dustfall (mg/dm2.day)	0.23			
<b>Metals</b>	Aluminum (Al)-Total (mg/dm2.day)	0.00090			
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000037			
	Arsenic (As)-Total (mg/dm2.day)	<0.0000037			
	Barium (Ba)-Total (mg/dm2.day)	0.0000281			
	Beryllium (Be)-Total (mg/dm2.day)	<0.000019			
	Bismuth (Bi)-Total (mg/dm2.day)	<0.000019			
	Boron (B)-Total (mg/dm2.day)	<0.00037			
	Cadmium (Cd)-Total (mg/dm2.day)	<0.0000019			
	Calcium (Ca)-Total (mg/dm2.day)	0.0026			
	Chromium (Cr)-Total (mg/dm2.day)	<0.000019			
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000037			
	Copper (Cu)-Total (mg/dm2.day)	0.000295			
	Iron (Fe)-Total (mg/dm2.day)	<0.0011			
	Lead (Pb)-Total (mg/dm2.day)	0.0000021			
	Lithium (Li)-Total (mg/dm2.day)	<0.00019			
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0037			
	Manganese (Mn)-Total (mg/dm2.day)	0.000132			
	Mercury (Hg)-Total (mg/dm2.day)	<0.0000019			
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.0000019			
	Nickel (Ni)-Total (mg/dm2.day)	<0.000019			
	Phosphorus (P)-Total (mg/dm2.day)	<0.011			
	Potassium (K)-Total (mg/dm2.day)	<0.074			
	Selenium (Se)-Total (mg/dm2.day)	<0.000037			
	Silicon (Si)-Total (mg/dm2.day)	0.0025			
	Silver (Ag)-Total (mg/dm2.day)	<0.00000037			
	Sodium (Na)-Total (mg/dm2.day)	<0.074			
	Strontium (Sr)-Total (mg/dm2.day)	0.0000124			
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000037			
	Tin (Sn)-Total (mg/dm2.day)	<0.0000037			
	Titanium (Ti)-Total (mg/dm2.day)	<0.00037			
	Uranium (U)-Total (mg/dm2.day)	<0.00000037			
	Vanadium (V)-Total (mg/dm2.day)	<0.000037			
Zinc (Zn)-Total (mg/dm2.day)	0.00013				

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

**Qualifiers for Individual Parameters Listed:**

Qualifier	Description
DLB	Detection Limit was raised due to detection of analyte at comparable level in Method Blank.

**Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
<b>DUSTFALLS-COM-DM2-VA</b>	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE
<p>This analysis is carried out using procedures modified from British Columbia Environmental Manual "Particulate."            Particulates or Dustfall are determined gravimetrically. Total Insoluble Dustfall is determined by filtering a sample through a 0.45 um membrane filter and drying the filter at 104 degrees celsius. Total Soluble Dustfall is determined by evaporating the filtrate to dryness at 104 degrees celsius. The Total Dustfall is the sum of Insoluble Dustfall and the Soluble Dustfall.</p>			
<b>HG-DUST(DM2-CVAFS-VA</b>	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).</p>			
<b>MET-DUST(DM2-ICP-VA</b>	Dustfall	Total Metals in Dustfalls by ICPOES	EPA 6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
<b>MET-DUST(DM2-MS-VA</b>	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

**Chain of Custody Numbers:**

1

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

