Appendix V4-1A

Back River Project: 2011 – 2012 Air Quality Baseline

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Sabina Gold & Silver Corp.

BACK RIVER PROJECT
2011-2012 Air Quality Baseline Report

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December 2012

BACK RIVER PROJECT
2011-2012 AIR QUALITY BASELINE REPORT

December 2012
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Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Executive Summary

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of the Goose Property in 2011 and both the Goose and George Properties in 2012. Data from 2011 is referenced from *Back River Project – 2011 Air Quality Baseline Report* (Rescan 2012).

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet.

This report presents the results from the 2011 and 2012 air quality baseline program. The 2011 air quality baseline program focused on the Goose Property only and included five dustfall stations and one passive air sampling station (PASS) to measure nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3) concentrations. The dustfall and PASS stations were installed on May 24, 2011 and monitored monthly until September 18, 2011.

The 2012 air quality baseline program was expanded to include the George Property and Marine Laydown Area. Dustfall levels were measured at four locations within the Goose Property, one location within the George Property and one location in the Marine Laydown Area from June 17 to September 17, 2012. Also included in the 2012 program was the measurement of NO_2, SO_2 and O_3, with one station within each of the three geographical areas (George Property, Goose Property and Marine Laydown Area) of the Project.

Dustfall analyses included particulates (total, soluble and insoluble), anions (sulphate, nitrate, chloride and ammonia), total metals and various cations. In 2012, the maximum dustfall deposition rate of 0.57 mg/dm^2/day was also observed in July at DF7 within the Goose Property. In 2011, the maximum dustfall deposition rate of 1.13 mg/dm^2/day was also observed in July at station DF3 located within the Goose Property.

The highest mean acid deposition rate observed from June to September 2012 was 36 eq/ha/yr at DF10 located within the George Property, while the highest mean acid deposition rate observed from June to September 2011 was 115.5 eq/ha/yr. These values are less than any of the CCME published calculated critical loads of acid deposition for forest soils for provinces in Canada (Aherne 2008), given that the province with the lowest mean critical load is Saskatchewan with a value of 539 eq/ha/yr. There are no available CCME guidelines for critical loads of acid deposition for Nunavut.

Since the Project area has limited anthropogenic emission sources, most of the metal deposition levels analysed were below detection limits. The reported metal deposition rates are predominantly the result of natural sources in the area.

The passive sampling of NO_2, SO_2 and O_3 was conducted monthly from June to September. The 2012 maximum 30-day O_3 level of 55.1 $\mu g/m^3$ was observed in June at PASS 3 located in the Marine Laydown Area, while the 2011 maximum of 54.6 $\mu g/m^3$ was observed in June within the Goose Property. These values both fall within the expected background range of 49 to 78 $\mu g/m^3$ (25 to 40 ppb; Health Canada 1999). The 2012 ambient concentrations of NO_2 and SO_2, within the Goose Property, George Property and the Marine Laydown Area, were found to be a small percentage of the corresponding federal and territorial air quality objectives.

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Acronyms and Abbreviations

Acronyms 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.

AENV	Alberta Environment
BDL	Below Detection Limit
CCME	Canadian Council of Ministers of the Environment
Critical acid load	Amount of acid deposition a particular region can receive without being adversely affected
EC	Environment Canada
eq/ha/yr	Total acidity equivalency per hectare per year
kg/ha/yr	Kilograms per hectare per year
$mg/dm^2/day$	Milligrams per square decimetre per day
O_3	Ozone
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
PASS	Passive Air Sampling System
ppb	Parts per billion
RH	Relative Humidity
SO_2	Sulphur Dioxide
TSA	Tailings Storage Area
$\mu g/m^3$	Microgram per cubic metre

1. Introduction

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of the Goose Property in 2011 and both the Goose and George Properties in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- Meteorology
- Air Quality and Dust
- Noise
- Hydrology and Bathymetry
- Freshwater Water Quality, Sediment Quality, Aquatic Biology
- Freshwater Fish and Fish Habitat
- Marine Water Quality, Sediment Quality, Aquatic Biology
- Marine Fish and Fish Habitat
- Wildlife (Terrestrial and Marine)
- Wildlife DNA Study (Grizzly Bear and Wolverine)
- Ecosystem Mapping
- Vegetation and Wetlands (including Rare Plants)
- Soils and Terrain
- Country Foods
- Archaeology
- Socio-economics
- Land Use
- Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the Marine Laydown Area. It was assumed that access from the Marine Laydown Area to George and Goose properties, and access between the George and Goose properties, would be by winter road.

This report presents the results of the air quality and dust portion of the baseline program. The 2012 program was conducted from June to September of 2012 and covered the geographical areas of the Goose Property, the George Property, and the Marine Laydown Area.

Figure 1-1

Back River Project Location

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The objectives of the 2012 air quality baseline program were:

- to install four dustfall and one PASS station in the Goose Property area;
- to install one dustfall and one PASS station in the George Property area;
- to install one dustfall and one PASS station in the Marine Laydown Area;
- to compare the amount of dustfall deposition at each of the stations to the applicable guidelines;
- to calculate the acid deposition from the nitrate and sulphate anions found in dustfall samples and compare to reported critical loads;
- to summarize metal deposition levels from the dustfall samples; and
- to evaluate ambient concentrations of NO_2, SO_2 and O_3 and compare the results to available standards.

In addition to presenting results from the 2012 air quality and dust baseline program, results from the 2011 program conducted within the Goose Property only are also included (Rescan 2012). Chapter 2 of this report presents the methods, Chapter 3 presents the results, and Chapter 4 presents a summary of the data collected. All raw data obtained from the laboratories are included as appendices to this report.

2. Methods

2. Methods

2.1 DUSTFALL

As part of the 2012 ambient air quality baseline program, monthly dustfall measurements were collected at four locations within the Goose Property, one location within the George Property and one location in the Marine Laydown Area from June to September 2012. The 2011 program included five locations within the Goose Property from June to September 2011.

2.1.1 Study Area and Site Selection

The 2012 baseline air quality monitoring network was developed based on the potential infrastructure shown in Figure 2.1-1, which includes the George Property and Goose Property deposits, as well as the proposed tailings storage area in the Goose Property area and a proposed Marine Laydown Area (Table 2.1-1; Figure 2.1-1).

Table 2.1-1. Locations of Dustfall and PASS Stations, 2012

ID	DF6 (Goose)	DF7 (Goose)	DF8 (Goose)	DF9/PASS1[a] (Goose)	DF10/PASS2 (George)	DF11/PASS3 (Marine Laydown Area)
UTM Easting (m)	422,556	431,148	429,317	442,827	388,217	381,087
UTM Northing (m)	7,267,276	7,264,126	7,272,209	7,259,270	7,313,131	7,393,661
Elevation (masl)	329	338	338	337	337	337
Date Installed	17-Jun-12					

Notes:
Geodetic network used is North American Datum developed in 1983 (NAD 83) Zone 13.
[a] *PASS1 was not installed until July 7, 2012.*

The 2011 air quality monitoring network was developed based on the location of the deposits shown in Figure 2.1-1. The predominant wind direction in the Project area is from the north to northwest sector (Rescan 2011). The dustfall station locations, shown in Table 2.1-2, were selected to be located upwind (DF2), in close proximity of (DF1), and downwind (DF4 and DF5) of the deposits. One station was located off the upwind-downwind axis and could act as a potential baseline (DF3) station.

Table 2.1-2. Locations of Dustfall and PASS Stations, 2011

ID	DF1/PASS (Goose)	DF2 (Goose)	DF3 (Goose)	DF4 (Goose)	DF5 (Goose)
UTM Easting (m)	430,196	427,102	425,746	433,520	434,978
UTM Northing (m)	7,269,720	7,274,061	7,270,497	7,267,493	7,265,614
Elevation (masl)	331	328	331	332	330
Date Installed	24-May-11				

Notes:
Geodetic network used is North American Datum developed in 1983 (NAD 83) Zone 13.

Figure 2.1-2 provides the air quality monitoring stations for the Goose Property for 2012 and 2011. Figure 2.1-3 displays the air quality monitoring stations for the George Property for 2012. The 2012 station location within the Marine Laydown Area is shown in Figure 2.1-1.

Current exploration activities were considered during the site selection process. There are no local sources of air pollutants within the immediate vicinities of the stations. The dustfall monitoring stations were in open areas that are free of structures higher than 1 m within a 20 m radius of the collection container.

2.1.2 Monitoring Method

The dustfall monitoring program was developed in accordance with sampling method ASTM D1739-98 (ASTM Standard D1739-98 Reapproved 2010). 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. The containers used are 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 are partially filled with deionized water and algaecide to prevent re-suspension of dust and growth of algae in the containers.

The containers were installed on 2 m poles, surrounded by a windscreen and bird spikes. The wind screen improves the dustfall collection efficiency, and bird spikes are used to minimize contaminants from bird faeces. Sample containers were exposed to the atmosphere for approximately 30 days, after which they were sent to the laboratory for analysis. Each dustfall station was comprised of two sample containers with separate mounts (Plate 2.1-1). One of the containers was analysed for particulates (total, soluble and insoluble) and anions (sulphate, nitrate, chloride and ammonia), while the other was analysed for total metals and various cations. The dustfall stations were serviced on a monthly basis and the samples were sent to the Burnaby ALS Laboratory for analysis following each sampling period.

Plate 2.1-1. Dustfall station DF10 located within the George Property at the George Meteorological Station. The passive air sampling system shelter, for PASS2, can be seen on the right stand (June 17, 2012).

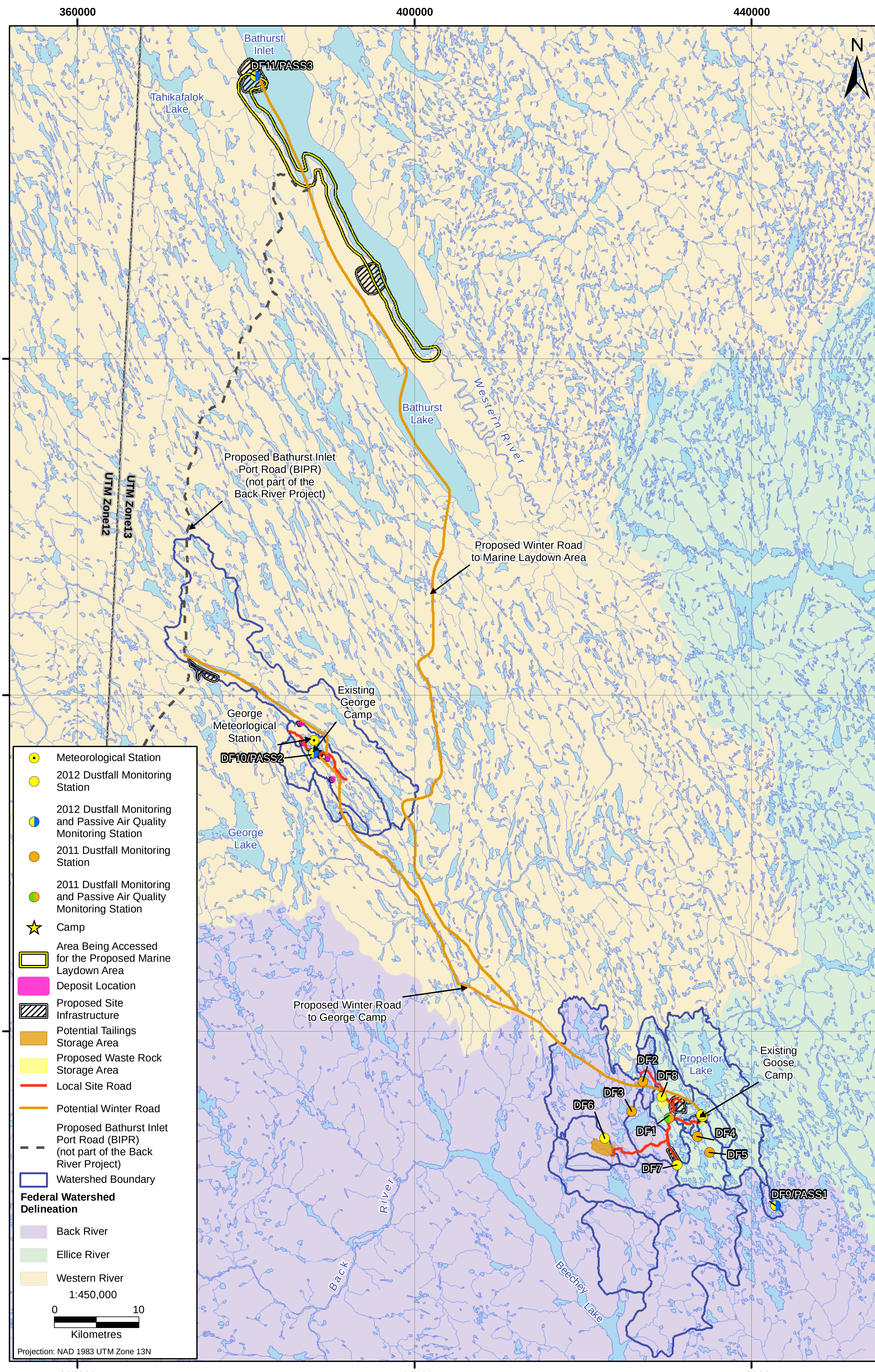

Figure 2.1-1

Overview of Dustfall and Passive Air Quality (SO_2, NO_2 and O_3) Monitoring Stations, Back River Project, 2011-2012

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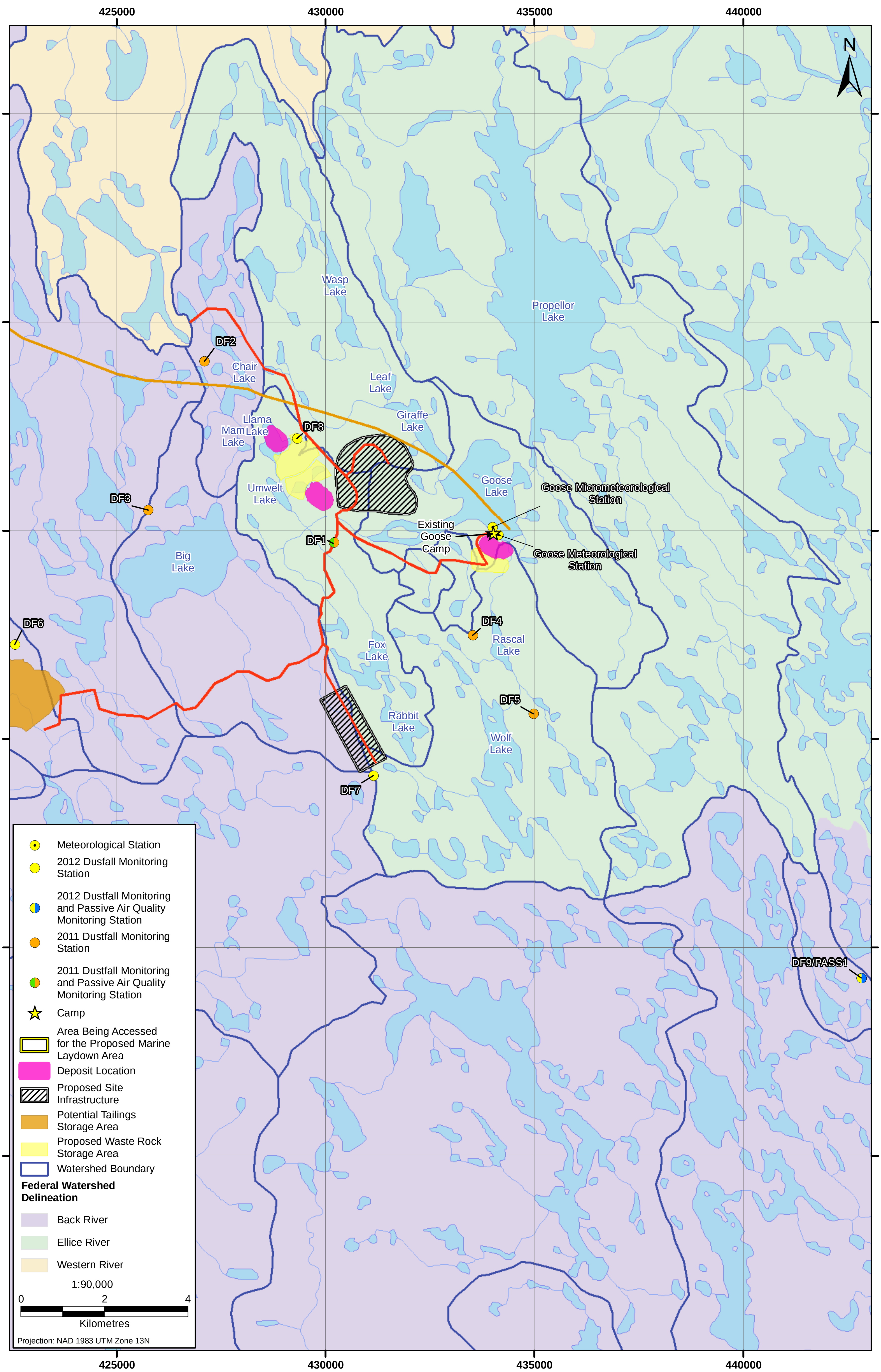

Figure 2.1-2

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Dustfall and Passive Air Quality (SO_2, NO_2 and O_3) Monitoring Stations, Goose Property, 2011-2012

Figure 2.1-2

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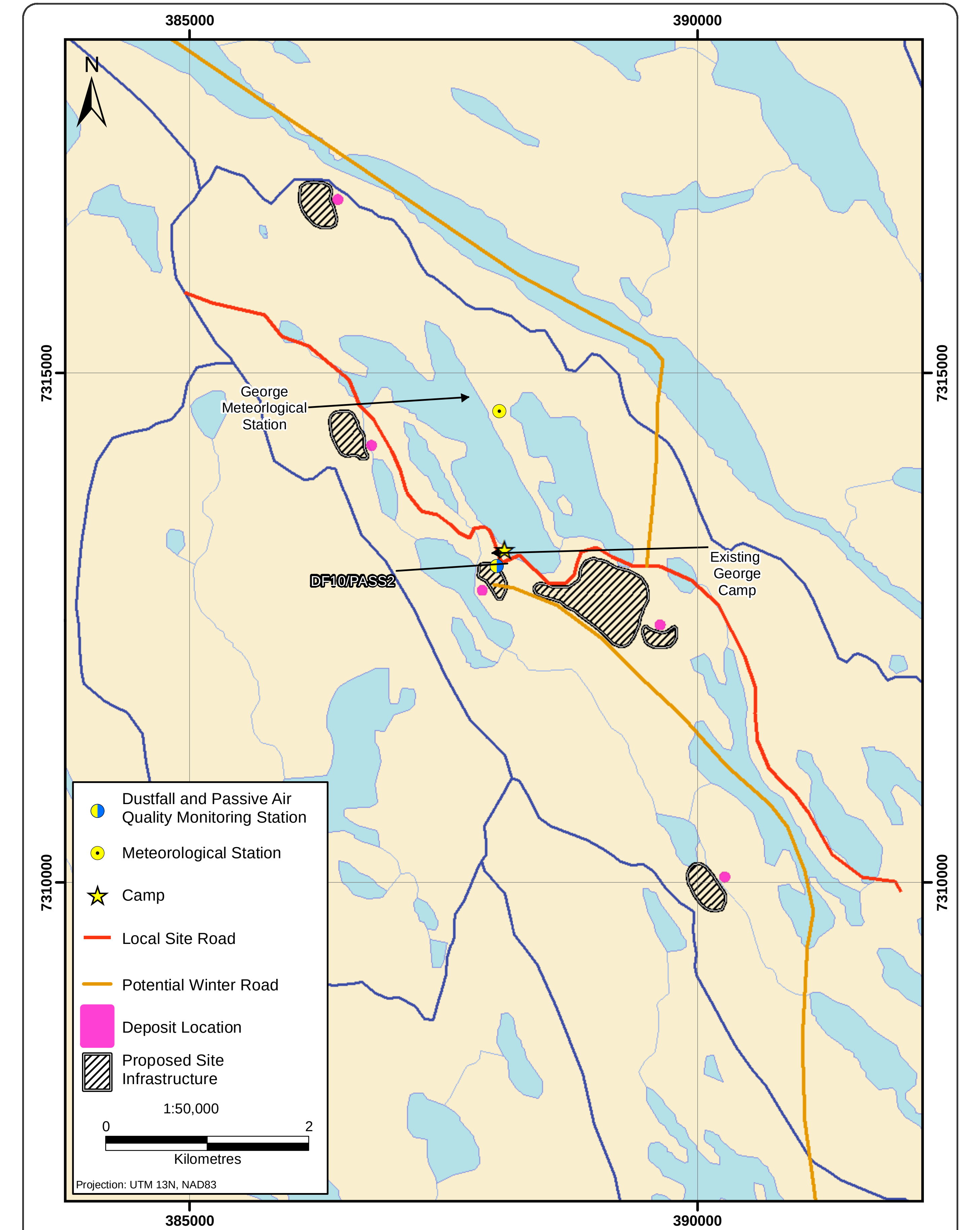

Figure 2.1-3

Dustfall and Passive Air Quality (SO_2, NO_2 and O_3) Monitoring Stations, George Property, 2012

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2.2 PASSIVE AIR SAMPLING SYSTEM (PASS) STATION

As part of the ambient air quality baseline program, monthly average concentrations of criteria air contaminants were monitored from June to September. Three Passive Air Sampling Systems (PASS) were used to monitor SO_2, NO_2 and O_3 on a monthly basis. One PASS station was located within the Goose Property at DF9, a second PASS station was located within the George Property at DF10 and the third PASS station was located within the proposed Marine Laydown Area. The 2011 program had one PASS station located within the Goose Property at DF1.

2.2.1 Site Selection

In 2012, PASS were installed at three dustfall monitoring stations in the three geographical areas of the Project (Table 2.1-1; Figure 2.1-1). DF9/PASS1 was located within the Goose Property area approximately 13 km to the southwest of the Goose camp. DF10/PASS2 was located within the George Property next to the George Meteorological Station. DF11/PASS3 was installed within the proposed Marine Laydown Area along the southeast shoreline of Bathurst Inlet (Figure 2.1-1). In 2011 two PASS were installed at the dustfall monitoring station (DF1) located central to the known deposits within Goose Property (Figure 2.1-2).

2.2.2 Monitoring Method

PASS is a diffusive method which monitors gas or vapour pollutants from the atmosphere at a rate controlled by a physical process such as diffusion through a static air layer or permeation through a membrane, which doesn't involve the active movement of air through the sampler (Tang 2001). The number of days of contact between the ambient air and the permeation membrane is important and local meteorological conditions are also used in the calculations. The meteorological parameters that are used in the PASS calculations are air temperature, wind speed and relative humidity. For the 2011 data, meteorological conditions from the regional Yellowknife Airport station operated by EC were used by the Laboratory. For the 2012 data, meteorological conditions from the George Meteorological station were used.

The PASS filters were protected from rain by small enclosures. Plate 2.2-1 provides a close-up view of one of the samplers. The three PASS samples were serviced on a monthly basis from June to September and the samples were sent to Maxxam Analytical Laboratory for analysis following each sampling period.

Plate 2.2-1. Close-up view of PASS sampler which measured NO_2, SO_2 and O_3.

3. Results

3. Results

The following section presents results from the 2012 air quality baseline program for dustfall and ambient air quality, along with the results from the 2011 program. 2011 data have been previously reported in, *Back River Project 2011 Air Quality Baseline Report (Rescan 2012)*.

3.1 TOTAL DUSTFALL

Dustfall results for 2012 and 2011 are summarized in Table 3.1-1 and Table 3.1-2 (Figure 3.1-1). The average dustfall results over sampling locations range from 0.16 to 0.32 mg/dm^2/day for dustfall locations in the Goose Property in 2012 and 0.29 to 0.53 mg/dm^2/day for the Goose Property in 2011. The highest total dustfall level of 0.57 mg/dm^2/day measured during 2012 occurred in July at DF7 in the Goose Property. The highest total dustfall level during the 2011 monitoring period was 1.13 mg/dm^2/day in July at DF3 in the Goose Property (Rescan 2012).

Table 3.1-1. Total Dustfall Results, Goose Property, George Property and Marine Laydown Area, 2012

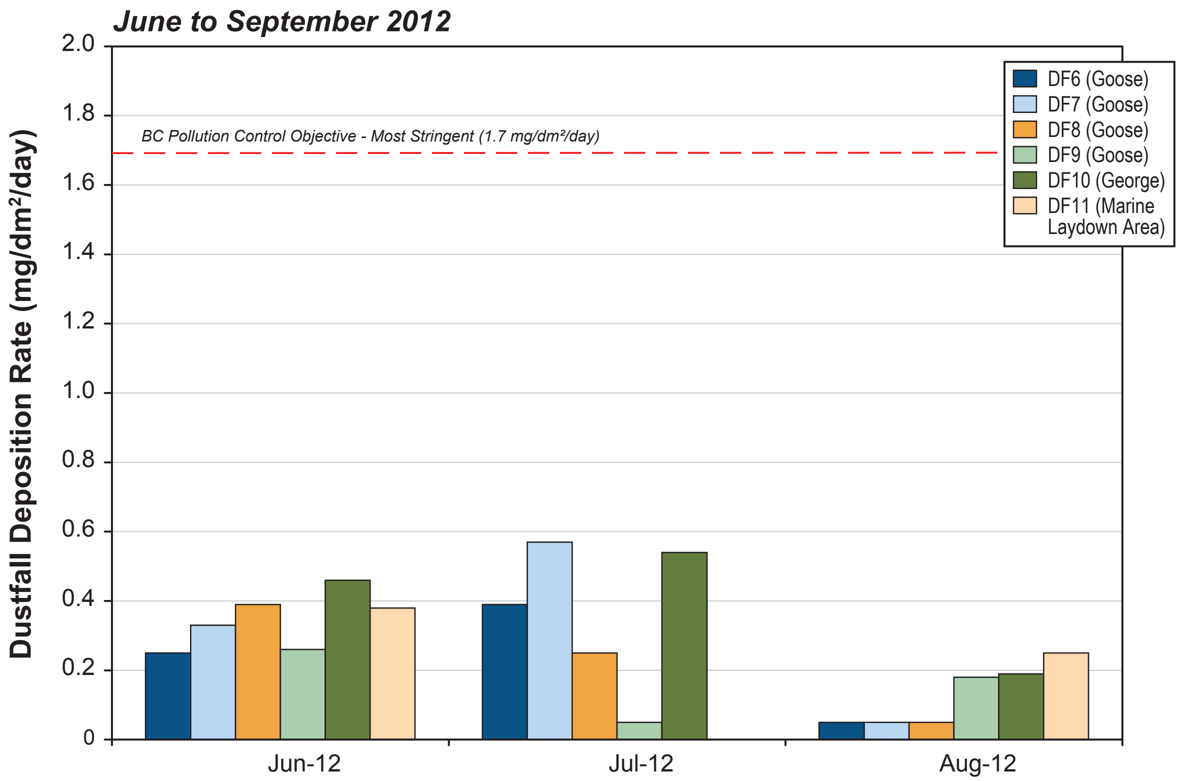
	DF6 (Goose)	DF7 (Goose)	DF8 (Goose)	DF9 (Goose)	DF10 (George)	DF11* (Marine Laydown Area)	Average
	mg/dm^2/day						
Jun-12[a]	0.25	0.33	0.39	0.26	0.46	0.38	**0.35**
Jul-12[b]	0.39	0.57	0.25	< 0.10	0.54	-	**0.44**
Aug-12[c]	< 0.10	< 0.10	< 0.10	0.18	0.19	0.25	**0.14**
Average	**0.23**	**0.32**	**0.23**	**0.16**	**0.40**	-	n/a

Notes:
The values below detection limits were assumed to be half of the detection limit in the calculation of averages.
[a] The June sampling period was from June 17 to July 18.
[b] The July sampling period was from July 18 to August 18.
[c] The August sampling period was from August 18 to September 17.
** During the July sampling period the dustfall stand was disturbed by wildlife during the July sampling period, and both the sample bottles were void.*

Table 3.1-2. Total Dustfall Results, Goose Property Area, 2011

	DF1 (Goose)	DF2 (Goose)	DF3 (Goose)	DF4 (Goose)	DF5 (Goose)	Average
	mg/dm^2/day					
Jun-11	0.33	0.42*	0.45	0.25	0.44	0.34
Jul-11	0.27	0.42*	1.13	< 0.10	< 0.10	0.36
Aug-11	0.5	0.37	0.29	0.46	0.4	0.40
Sep-11	0.55	< 0.10	0.23	0.26	0.28	0.28
Average	**0.41**	**0.21**	**0.53**	**0.26**	**0.29**	**-**

Notes:
The values below detection limits were assumed to be half of the detection limit values in the calculation of averages.
** There is only one sample at DF2 from June to July.*



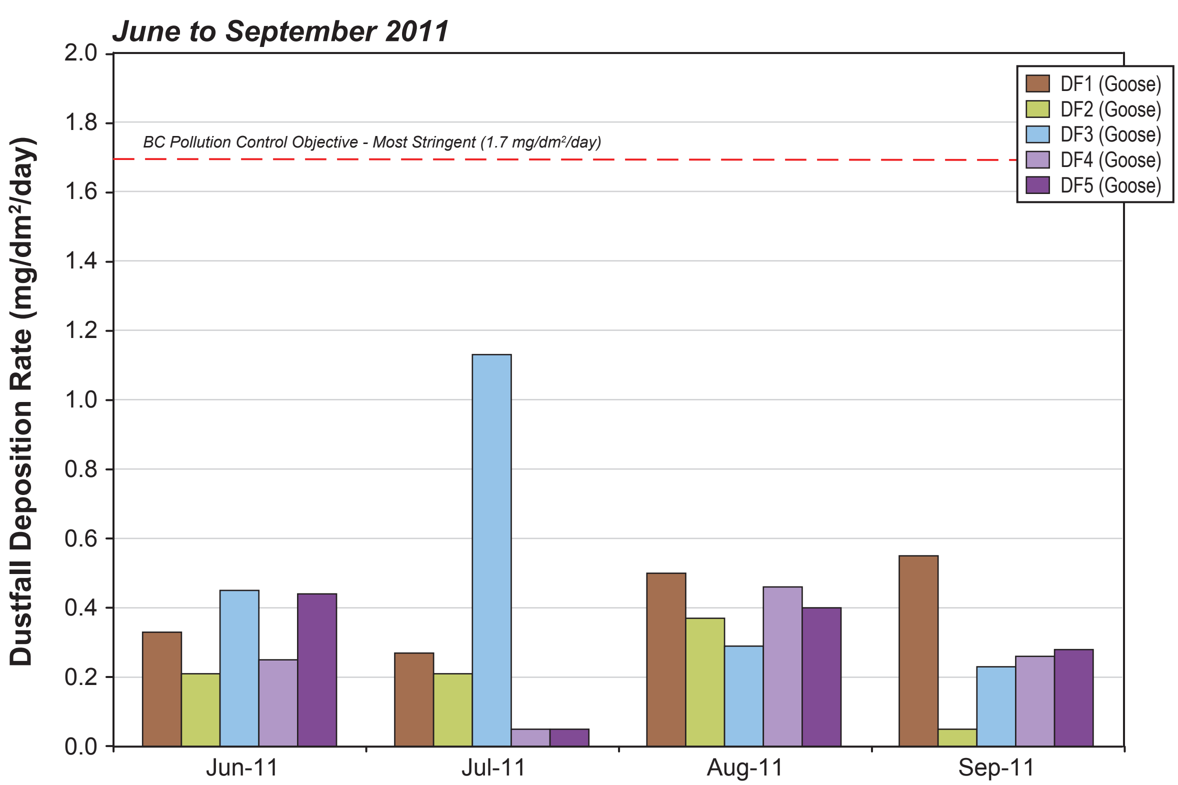


Figure 3.1-1

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Dustfall Results, 2011 and 2012

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There are no air quality standards for dustfall in Nunavut, but there are objectives and guidelines for dustfall in other jurisdictions. Table 3.1-3 shows the dustfall criteria in these jurisdictions to provide context for dustfall results. The most stringent dustfall criterion is the acceptable limit in BC which ranges from 1.7 to 2.9 mg/dm^2/day (BC MOE 1979). All of the dustfall results in the Project area were well below the BC objective of 1.7 mg/dm^2/day. The low dustfall level was expected and is typical for an area with minimal anthropogenic disturbances.

Table 3.1-3. Existing Dustfall Criteria

Jurisdiction	Criteria (mg/dm^2/day)	Notes
Alberta	1.75	Residential and recreation areas
	2.25	Commercial and industrial areas
British Columbia	1.7 to 2.9	-
Ontario	2.3	-
Saskatchewan	6.67	-

3.2 ACID DEPOSITION

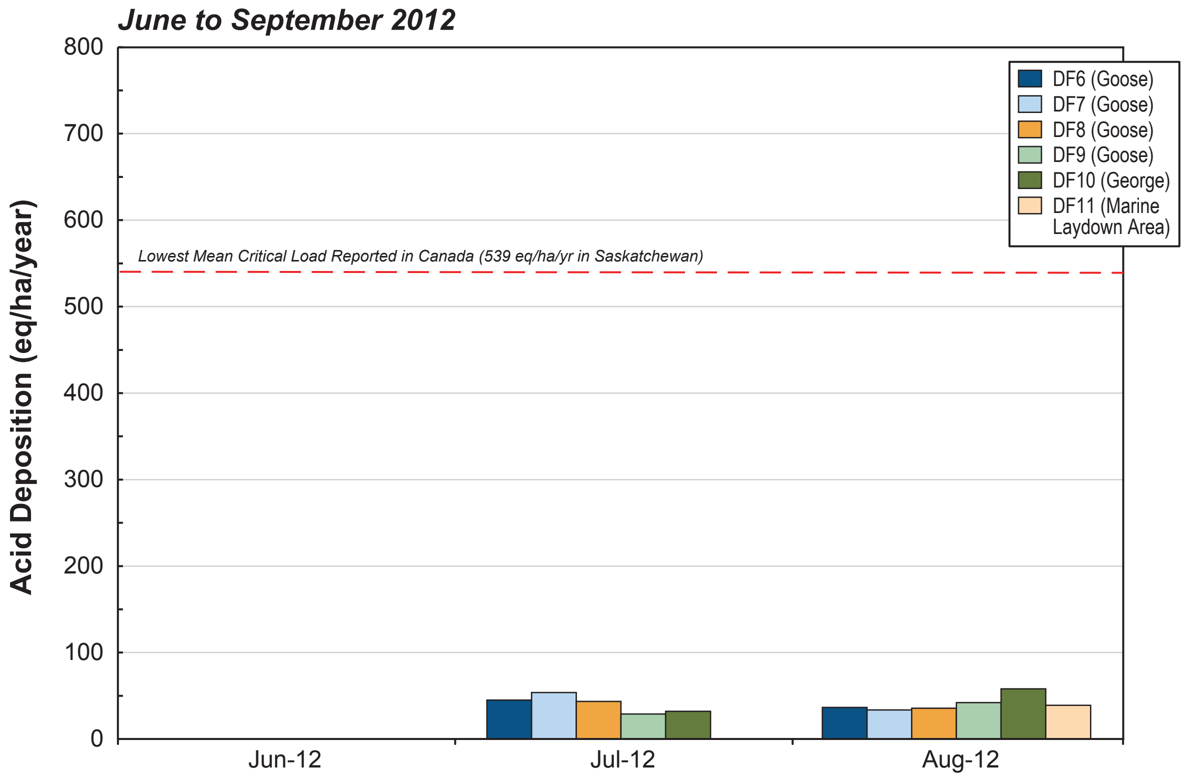
Sulphur oxides (SO_x) and nitrogen oxides (NO_x) can be converted to sulphuric acid and nitric acid by reacting with oxygen and water in the air. Acid deposition occurs when these acid-forming pollutants are deposited on the earth's surface.

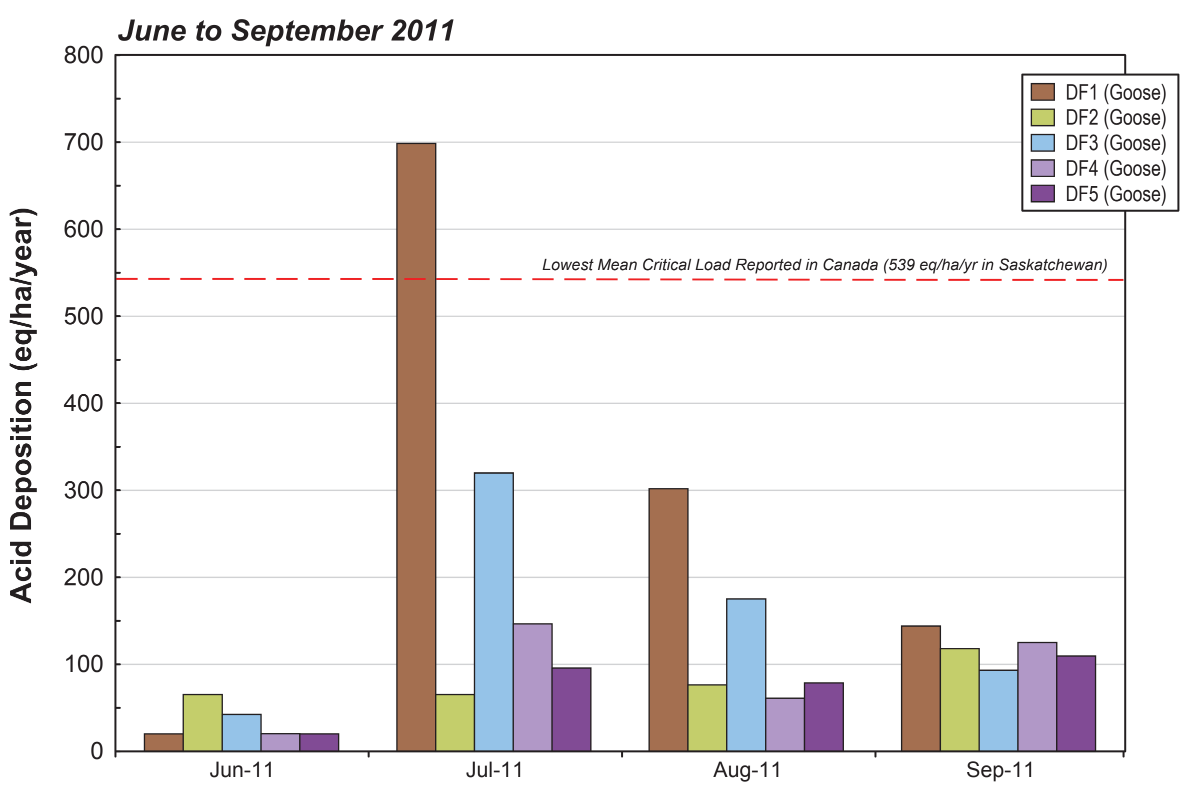
Anions of nitrate and sulphate were analyzed from the dustfall samples and presented in Table 3.2-1 and Table 3.2-2. Figure 3.2-1 shows the acid deposition rates for the four stations within the Goose Property, one station within the George Property and one station within the Marine Laydown Area for the 2012, and all five stations within the Goose Property monitored during 2011. Nitrate and sulphate concentrations were not available for the June 2012 monitoring period. The unit conversion factors used to calculate charge equivalency were obtained from the 2004 Canadian Acid Deposition Science Assessment (EC 2004) and the acid deposition rates were calculated and are presented in Table 3.2-3 and Table 3.2-4. The deposition rate values were calculated using the assumption that the sulphate concentration was half the detection limit.

Table 3.2-1. Nitrate and Sulphate Deposition Analysis Results from Dustfall, 2012

	DF6 (Goose)	DF7 (Goose)	DF8 (Goose)	DF9 (Goose)	DF10 (George)	DF11* (Marine Laydown Area)	Average
	Nitrate (mg/dm^2/day)						
12-Jun[a]	-	-	-	-	-	-	**-**
12-Jul	0.000925	0.00126	0.000914	0.000311	0.000273		**0.0007366**
12-Aug	0.000603	0.000488	0.000555	0.000624	0.00062	0.000495	**0.000564167**
Average	**0.000764**	**0.000874**	**0.0007345**	**0.0004675**	**0.0004465**	**0.000495**	**-**
	Sulphate (mg/dm^2/day)						
12-Jun[a]	-	-	-	-	-	-	**-**
12-Jul	<0.0055	<0.0055	<0.0052	<0.0055	<0.0066	-	**0.00283**
12-Aug	<0.0055	<0.0055	<0.0056	<0.0068	<0.011	<0.0069	**0.0034417**
Average	**0.00275**	**0.00275**	**0.0027**	**0.003075**	**0.0044**	**0.00345**	**-**

Notes:
The values below detection limits were assumed to be half of the detection limit values in the calculation of averages.
** During the July sampling period the dustfall stand was disturbed by wildlife, and both the sample bottles were void.*
[a] Sulphates and nitrates were not analyzed by the laboratory in June 2012.





Note: Nitrate and sulphates were not available for the June monitoring period.

Figure 3.2-1

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Acid Deposition Results, 2011 and 2012

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Table 3.2-2. Nitrate and Sulphate Deposition Analysis Results from Dustfall, Goose Property Area, 2011

	DF1 (Goose)	DF2 (Goose)	DF3 (Goose)	DF4 (Goose)	DF5 (Goose)	Average
	Nitrate ($mg/dm^2/day$)					
Jun-11	0.00038	0.00341	0.00064	0.00040	0.00039	**0.0007**
Jul-11	0.02520	0.00341	0.00266	0.00402	0.00207	**0.0071**
Aug-11	0.01060	0.00118	0.00483	0.00115	0.00156	**0.0039**
Sep-11	0.00276	0.00205	0.00124	0.00174	0.00129	**0.0016**
Average	**0.0097**	**0.0017**	**0.0021**	**0.0018**	**0.0013**	-
	Sulphate ($mg/dm^2/day$)					
Jun-11	< 0.0027	< 0.011	< 0.0068	< 0.0026	< 0.0026	**0.0020**
Jul-11	< 0.011	< 0.011	0.033	< 0.011	< 0.011	**0.0105**
Aug-11	< 0.0067	< 0.012	< 0.013	< 0.0082	< 0.010	**0.0050**
Sep-11	< 0.019	< 0.017	< 0.023	< 0.021	< 0.020	**0.0100**
Average	**0.0049**	**0.0050**	**0.0136**	**0.0054**	**0.0055**	-

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

Table 3.2-3. Calculated Acid Deposition Rates, Goose Property, George Property and the Marine Laydown Area, 2012

	DF6 (Goose)	DF7 (Goose)	DF8 (Goose)	DF9 (Goose)	DF10 (George)	DF11* (Marine Laydown Area)	Average
	eq/ha/yr						
12-Jun[a]	-	-	-	-	-	-	-
12-Jul	45	54	44	29	32	-	**41**
12-Aug	37	34	36	42	58	39	**41**
Average	**41**	**44**	**40**	**36**	**45**	-	-

Notes:
** During the July sampling period, at DF11, the dustfall stand was disturbed by wildlife, and both the sample bottles were void.*
[a] Sulphates and nitrates were not analyzed by the laboratory in June 2012, and therefore the June acid deposition rate could not be calculated.
Due to the sulphate concentration being below detectable limit, it should be noted that there is some uncertainty of the actual value calculated for acid deposition rates.

Table 3.2-4. Calculated Acid Deposition Rates, Goose Property Area, 2011

	DF1 (Goose)	DF2 (Goose)	DF3 (Goose)	DF4 (Goose)	DF5 (Goose)	Average
	eq/ha/yr					
11-Jun	20	65	43	20	20	**34**
11-Jul	698	65	320	147	96	**265**
11-Aug	302	76	175	61	79	**139**
11-Sep	144	118	93	125	110	**118**
Average	**291**	**81**	**158**	**88**	**76**	-

Acid deposition critical load is a quantitative estimate of an exposure to one or more acid generating pollutants below which significant harmful effects on specific sensitive elements of the environment do not occur according to present knowledge. Critical loads have been determined and mapped for upland forest soils in eastern Canada following guidelines established by the New England Governor-Eastern Canadian Premiers (NEG-ECP) Environmental Task Group on Forest Mapping (NEG-ECP 2001) reported in the 2004 Canadian Acid Deposition Science Assessment (EC 2004). In western Canada, the Acid Rain Task Group (ARTG: mandated by the Air Management Committee of the Canadian Council of Ministers of the Environment [CCME]) have supported the determination of critical loads as shown in Table 3.2-5.

Table 3.2-5. Summary of Acid Deposition Critical Load Estimates for all Canadian Provinces

	Mean	Median	Mode	Minimum	Maximum
Province	**eq/ha/yr**				
Alberta	872	868	264	216	3,421
British Columbia	856	750	532	174	4,026
Manitoba	1,119	870	259	185	3,240
New Brunswick	1,361	1,150	1,267	178	6,131
Newfoundland and Labrador	749	602	263	193	4,635
Nova Scotia	950	805	405	220	5,181
Ontario	775	525	250	213	4,276
Prince Edward Island	1,936	1,950	2,513	201	5,930
Quebec	747	525	377	250	3,219
Saskatchewan	539	354	303	208	2,885

Notes:
No acid deposition critical load estimates are available for Nunavut or Northwest Territories.
Adapted from Aherne 2008.

There is currently no available acid deposition critical load estimated for Nunavut. The lowest provincial mean acid deposition critical load estimate reported is 539 eq/ha/yr in Saskatchewan. The highest mean acid deposition rates measured were 45 eq/ha/yr at DF10 (George Property) in 2012 and 291 eq/ha/yr at DF3 (Goose Property) in 2011, which are both significantly less than even the lowest reported acid deposition critical load estimate in Canada.

3.3 METAL DEPOSITION

Heavy metals such as cadmium, lead and mercury are common air pollutants typically emitted from industrial activities, traffic and energy production. Although the atmospheric levels are low, they tend to contribute to the deposition in soils. Heavy metals are persistent in the environment and are subject to bioaccumulation in food-chains. Since there are currently no significant anthropogenic sources in The Project area, the metal deposition results are predominantly from natural emissions and most results were below the detection limits. Table 3.3-1 shows the maximum metal deposition averaged over the 30-day collection period from the four stations within the Goose Property, one station within the George Property and the one station within the Marine Laydown Area from June to September 2012 and the five stations within the Goose Property from June to September 2011. All analytical results are presented in Appendix 1.

Of the 33 metals that were analysed, in 2011 fourteen were always below the detection limits and in 2012 thirteen were always below the detection limit. All other metals had at least one reading during that was above the detection limits, but generally with very low metal deposition rates.

Table 3.3-1. Maximum Metal Deposition from all Dustfall Stations, 2011 and 2012

Metal	Maximum Deposition Rate ($mg/dm^2/day$)		Metal	Maximum Deposition Rate ($mg/dm^2/day$)	
	2011	2012		2011	2012
Aluminum (Al)-Total	6.98E-04	1.66E-03	Mercury (Hg)-Total	BDL	BDL
Antimony (Sb)-Total	4.30E-06	BDL	Molybdenum (Mo)-Total	5.90E-06	BDL
Arsenic (As)-Total	4.30E-06	1.31E-05	Nickel (Ni)-Total	4.20E-05	1.10E-04
Barium (Ba)-Total	3.87E-05	2.28E-05	Phosphorus (P)-Total	2.16E-02	3.35E-02
Beryllium (Be)-Total	BDL	BDL	Potassium (K)-Total	8.60E-02	3.80E-02
Bismuth (Bi)-Total	BDL	BDL	Selenium (Se)-Total	BDL	BDL
Boron (B)-Total	BDL	BDL	Silicon (Si)-Total	BDL	2.25E-03
Cadmium (Cd)-Total	3.50E-06	5.17E-06	Silver (Ag)-Total	5.10E-07	2.90E-07
Calcium (Ca)-Total	3.20E-03	4.63E-03	Sodium (Na)-Total	BDL	BDL
Chromium (Cr)-Total	BDL	9.10E-06	Strontium (Sr)-Total	1.83E-05	1.97E-05
Cobalt (Co)-Total	BDL	5.00E-06	Thallium (Tl)-Total	BDL	BDL
Copper (Cu)-Total	7.71E-04	7.67E-04	Tin (Sn)-Total	4.30E-06	1.80E-06
Iron (Fe)-Total	1.80E-03	2.81E-03	Titanium (Ti)-Total	BDL	BDL
Lead (Pb)-Total	8.91E-05	5.90E-05	Uranium (U)-Total	BDL	BDL
Lithium (Li)-Total	BDL	BDL	Vanadium (V)-Total	BDL	BDL
Magnesium (Mg)-Total	4.30E-03	6.50E-03	Zinc (Zn)-Total	8.08E-04	1.59E-04
Manganese (Mn)-Total	7.90E-05	1.03E-04			

Notes:
BDL = Below Detection Limit

3.4 AMBIENT AIR QUALITY

In 2012, PASS samplers were set up at three dustfall locations, DF9 (Goose Property), DF10 (George Property) and DF11 (Marine Laydown Area; Figure 2.1-1). The 2011 program saw two samplers at the DF1 location within the Goose Property (Figure 2.1-2). Table 3.4-1 and 3.4-2 (Figure 3.4-1) summarize the ambient concentrations of NO_2, SO_2 and O_3. Results are expressed as 30-day averages.

There are currently no 30-day criteria for NO_2, SO_2 and O_3; however, Alberta Environment (AENV) has recently published a 30-day average objective of 30 $\mu g/m^3$ for SO_2 (Government of Alberta 2011). The highest average 30-day SO_2 concentration, measured at DF9/PASS1 within the Goose Property in 2012 (1.3 $\mu g/m^3$) is 23 times lower than the AENV 30-day objective.

Health Canada states the monthly 1-hour O_3 averages between May to September should be in the range of 49 to 78 $\mu g/m^3$ (25 to 40 ppb) when the source is away from anthropogenic influence (Health Canada 1999). Ambient O_3 concentrations measured in the Project area are in the range of 33 to 56 $\mu g/m^3$ and were therefore within, or below, the range of concentrations identified by Environment Canada.

The ambient air quality standards provided by the Government of Nunavut (Government of Nunavut 2011) shown in Table 3.4-3, utilize ambient concentrations with other averaging periods. Since there are no 30-day objectives in Nunavut, 30-day averages of NO_2 and SO_2 are conservatively compared to annual average standards. The 2011 and 2012 monthly concentrations of SO_2 and NO_2 were all well below the relevant annual standards.

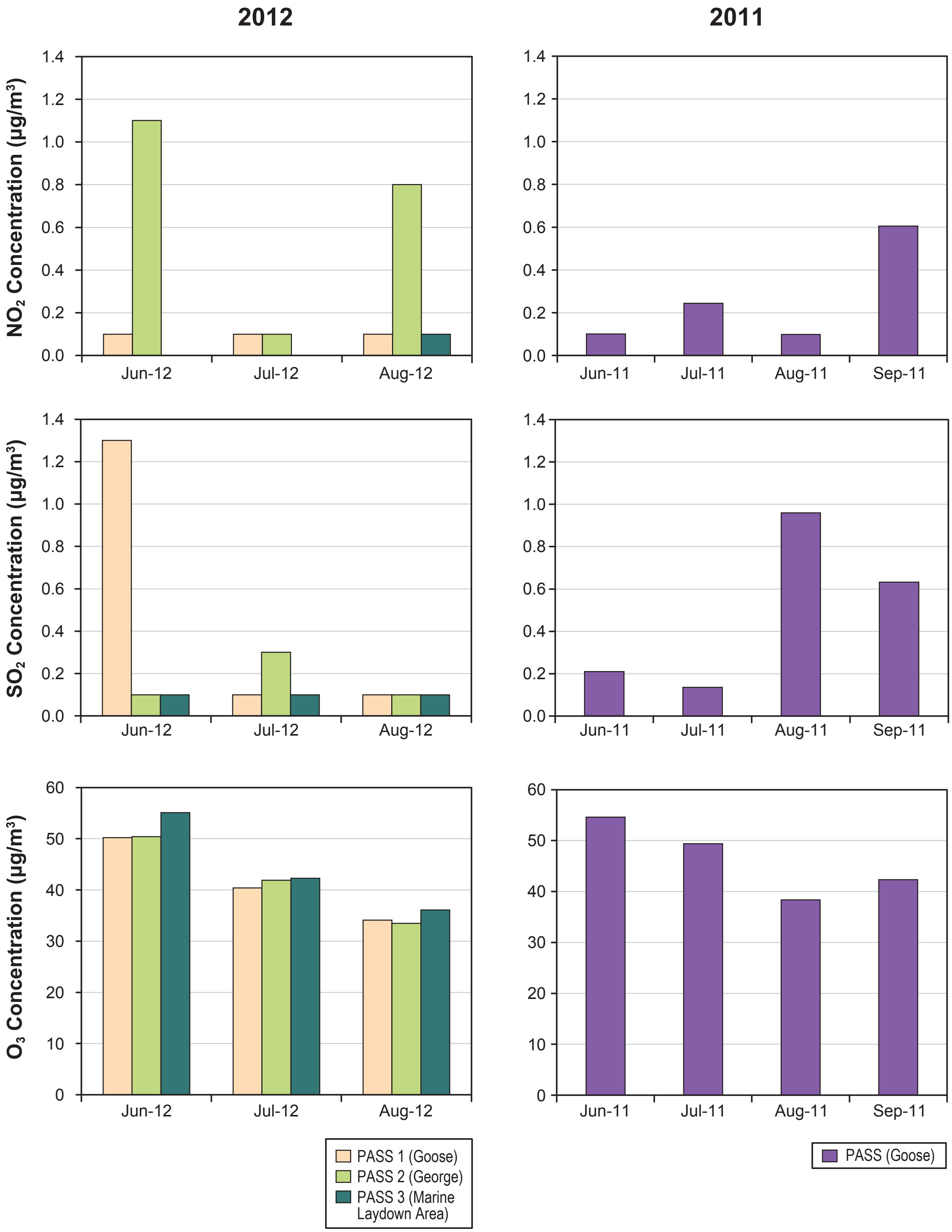

Figure 3.4-1

Monthly Ambient Concentrations of NO_2, SO_2 and O_3 Collected by PASS, 2011 and 2012

Table 3.4-1. Ambient Concentrations of NO_2, SO_2 and O_3 Collected by PASS, Goose Property, George Property and Marine Laydown Area, 2012 ($\mu g/m^3$)

	NO_2			O_3			SO_2		
	PASS 1 (Goose)	PASS 2 (George)	PASS 3 (Marine Laydown Area)	PASS 1 (Goose)	PASS 2 (George)	PASS 3 (Marine Laydown Area)	PASS 1 (Goose)	PASS 2 (George)	PASS 3 (Marine Laydown Area)
Jun-12[a]	0.1	1.1	-	50.2	50.4	55.1	1.3	0.1	0.1
Jul-12[b]	0.1	0.1	-	40.4	41.9	42.3	0.1	0.3	0.1
Aug-12	0.1	0.8	0.1	34.1	33.5	36.1	0.1	0.1	0.1

Notes:
The values below detection limits were assumed to be half of the detection limit values in the conversion calculation.
[a] The NO_2 filter was missing from the canister, due to suspected high winds.
[b] During the animal disturbance of the dustfall stands in July, it is suspected that the NO_2 canister and filter was disturbed, as the filter was missing.

Table 3.4-2. Ambient Concentrations of NO_2, SO_2 and O_3 Collected by PASS, Goose Property, 2011 ($\mu g/m^3$)

	NO_2	SO_2	O_3
Jun-11	0.10	0.21	54.62
Jul-11	0.24	0.14	49.41
Aug-11	0.10	0.96	38.35
Sep-11	0.61	0.63	42.33

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

Table 3.4-3. Ambient Air Quality Results and Nunavut Standards, 2011 and 2012 ($\mu g/m^3$)

	Nunavut Standard		June		July		August		September	
	Averaging Period	Concentration	2011	2012	2011	2012	2011	2012	2011	2012[a]
NO_2	1-hour	400	-	-	-	-	-	-	-	-
	24-hour	200	-	-	-	-	-	-	-	-
	Annual	60	0.1	0.6	0.2	0.1	0.1	0.3	0.6	-
SO_2	1-hour	450	-	-	-	-	-	-	-	-
	24-hour	150	-	-	-	-	-	-	-	-
	Annual	30	0.2	0.5	0.1	0.2	1.0	0.1	0.6	-

Notes:
Dash (-) indicates data not available.
The PASS results are averaged over 30-day period but compared to annual standards here to be conservative.
[a] There were only 3 months of data collected for 2012.
The 2012 program had one station within the Goose Property, one station within the George Property and one station within the Marine Laydown Area.

4. Summary

4. Summary

The 2012 Back River air quality baseline program was expanded to include the George Property and Marine Laydown Area. Dustfall levels were measured at four locations within the Goose Property, one location within the George Property and one location in the Marine Laydown Area from June 17 to September 17, 2012. Also included in the 2012 program was the measurement of NO_2, SO_2 and O_3, with one station within the three geographical areas of the Project. The 2011 Back River air quality baseline program included the measurement of dustfall levels at five locations within the Goose Property, and the measurement of NO_2, SO_2 and O_3 at one location within the Goose Property, from June to September 2011.

Dustfall analyses included particulates (total, soluble and insoluble), anions (sulphate, nitrate, chloride and ammonia), total metals and various cations. In 2012, the maximum dustfall deposition rate of 0.57 mg/dm^2/day was also observed in July at DF7 within the Goose Property. In 2011, the maximum dustfall deposition rate of 1.13 mg/dm^2/day was also observed in July at station DF3 located within the Goose Property.

The highest mean acid deposition rate observed from June to September 2012 was 36 eq/ha/yr at DF10 located within the George Property, while the highest mean acid deposition rate observed from June to September 2011 was 115.5 eq/ha/yr. These values are less than any of the CCME published calculated critical loads of acid deposition for forest soils for provinces in Canada (Aherne 2008), given that the province with the lowest mean critical load is Saskatchewan with a value of 539 eq/ha/yr. The CCME has not provided critical loads of acid deposition for Nunavut.

Since the Project area has limited anthropogenic emission sources, most of the metal deposition levels analysed were below detection limits. The reported metal deposition rates are predominantly the result of natural sources in the area.

The passive sampling of NO_2, SO_2 and O_3 was conducted monthly from June to September. The 2012 maximum 30-day O_3 level of 55.1 µg/m^3 was observed in June at PASS 3 located in the Marine Laydown Area, while the 2011 maximum of 54.6 µg/m^3 was observed in June within the Goose Property. These values both fall within the expected background range of 49 to 78 µg/m^3 (25 to 40 ppb; Health Canada 1999). The 2012 ambient concentrations of NO_2 and SO_2, within the Goose Property, George Property and the Marine Laydown Area, were found to be a small percentage of the corresponding federal and territorial air quality objectives.

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Appendix 1
2011 Back River Dustfall Results

RESCAN ENVIRONMENTAL SERVICES
ATTN: Tolga Olcay
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 07-JUL-11
Report Date: 18-JUL-11 17:22 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #:	**L1028446**
Project P.O. #:	NOT SUBMITTED
Job Reference:	0833-002-09
Legal Site Desc:	
C of C Numbers:	10-178474

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1028446-1	L1028446-2	L1028446-3	L1028446-4
	Description	DUSTFALL	DUSTFALL	DUSTFALL	DUSTFALL
	Sampled Date	02-JUL-11	02-JUL-11	02-JUL-11	02-JUL-11
	Sampled Time	17:43	18:00	17:34	17:24
	Client ID	DF1 (MAY 23 - JULY 2)	DF3 (MAY 23 - JULY 2)	DF4 (MAY 23 - JULY 2)	DF5 (MAY 23 - JULY 2)
Grouping	**Analyte**				
DUSTFALL					
Particulates	Total Dustfall (mg/dm2.day)	0.33	0.45	0.25	0.44
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	<0.10
	Total Soluble Dustfall (mg/dm2.day)	0.30	0.36	0.20	0.36
Anions and Nutrients	Ammonia (as N) (mg/dm2.day)	0.000208	0.000406	0.000435	0.000625
	Chloride (Cl) (mg/dm2.day)	0.0253	0.0320	0.0283	0.0256
	Nitrate (as N) (mg/dm2.day)	0.000376	0.000641	0.000399	0.000391
	Sulfate (SO4) (mg/dm2.day)	<0.0027	<0.0068	<0.0026	<0.0026
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000176	0.000171	0.000143	0.000138
	Antimony (Sb)-Total (mg/dm2.day)	0.00000128	0.0000018	<0.0000010	0.00000096
	Arsenic (As)-Total (mg/dm2.day)	0.00000070	<0.0000014	<0.0000010	<0.00000085
	Barium (Ba)-Total (mg/dm2.day)	0.00000858	0.0000225	0.00000810	0.0000118
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000033	<0.0000068	<0.0000051	<0.0000042
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000033	<0.0000068	<0.0000051	<0.0000042
	Boron (B)-Total (mg/dm2.day)	<0.000067	<0.00014	<0.00010	<0.000085
	Cadmium (Cd)-Total (mg/dm2.day)	0.00000063	0.00000101	<0.00000051	0.00000054
	Calcium (Ca)-Total (mg/dm2.day)	0.00129	0.00227	0.00087	0.00102
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000033	<0.0000068	<0.0000051	<0.0000042
	Cobalt (Co)-Total (mg/dm2.day)	<0.00000067	<0.0000014	<0.0000010	<0.00000085
	Copper (Cu)-Total (mg/dm2.day)	0.0000981	0.000103	0.0000357	0.0000482
	Iron (Fe)-Total (mg/dm2.day)	<0.00020	<0.00041	<0.00031	<0.00025
	Lead (Pb)-Total (mg/dm2.day)	0.00000814	0.00000431	0.00000371	0.00000502
	Lithium (Li)-Total (mg/dm2.day)	<0.000033	<0.000068	<0.000051	<0.000042
	Magnesium (Mg)-Total (mg/dm2.day)	<0.00067	<0.0014	<0.0010	<0.00085
	Manganese (Mn)-Total (mg/dm2.day)	0.0000293	0.0000312	0.0000265	0.0000260
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000033	<0.00000068	<0.00000051	<0.00000042
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000033	<0.00000068	<0.00000051	0.00000049
	Nickel (Ni)-Total (mg/dm2.day)	0.0000034	<0.0000068	0.0000117	0.0000212
	Phosphorus (P)-Total (mg/dm2.day)	0.0024	<0.0041	<0.0031	0.0028
	Potassium (K)-Total (mg/dm2.day)	<0.013	<0.027	<0.021	<0.017
	Selenium (Se)-Total (mg/dm2.day)	<0.0000067	<0.000014	<0.000010	<0.0000085
	Silicon (Si)-Total (mg/dm2.day)	<0.00033	<0.00068	<0.00051	<0.00042
	Silver (Ag)-Total (mg/dm2.day)	<0.000000067	0.00000024	<0.00000010	<0.000000085
	Sodium (Na)-Total (mg/dm2.day)	<0.013	<0.027	<0.021	<0.017
	Strontium (Sr)-Total (mg/dm2.day)	0.00000527	0.0000183	0.0000048	0.00000489
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000067	<0.0000014	<0.0000010	<0.00000085
	Tin (Sn)-Total (mg/dm2.day)	0.00000071	<0.0000014	<0.0000010	0.00000150
	Titanium (Ti)-Total (mg/dm2.day)	<0.000067	<0.00014	<0.00010	<0.000085

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1028446-1	L1028446-2	L1028446-3	L1028446-4	
	Description	DUSTFALL	DUSTFALL	DUSTFALL	DUSTFALL	
	Sampled Date	02-JUL-11	02-JUL-11	02-JUL-11	02-JUL-11	
	Sampled Time	17:43	18:00	17:34	17:24	
	Client ID	DF1 (MAY 23 - JULY 2)	DF3 (MAY 23 - JULY 2)	DF4 (MAY 23 - JULY 2)	DF5 (MAY 23 - JULY 2)	
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.000000067	<0.00000014	<0.00000010	<0.000000085	
	Vanadium (V)-Total (mg/dm2.day)	<0.0000067	<0.000014	<0.000010	<0.0000085	
	Zinc (Zn)-Total (mg/dm2.day)	0.0000820	0.000167	0.000099	0.000808	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-VA	Dustfall	Dustfall Chloride 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 chloride analysis is specifcially 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".

DUSTFALLS-COM-DM2-VA	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.

HG-DUST(DM2-CVAFS-VA	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).

MET-DUST(DM2)-ICP-VA	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).

MET-DUST(DM2)-MS-VA	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).

NH3-F-VA	Dustfall	Dustfall Ammonia by Fluorescence	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 ammonia analysis is specifcially 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.

NO3-IC-VA	Dustfall	Dustfall Nitrate 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 nitrate analysis is specifcially 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".

SO4-IC-VA	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 specifcially 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:

10-178474

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.

10-178474

ALS Env

L1028446-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Page ___ of ___

Report To		Report Format / Distribution		Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
Company:	Rescan Environmental Services Ltd.	Standard:	Other (specify):	✓ Regular (Standard Turnaround Times - Business Days)
Contact:	Tolga Olkay	Select: PDF ✓ Excel ✓ Digital Fax		Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address:	1177 West Hastings St (6th Floor) Vancouver, BC V6E 2J3	Email 1:	tolkay@rescan.com	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
		Email 2:		Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone:	604-689-9460 Fax:			Analysis Request
Invoice To	Same as Report ? (circle) Yes or No (if No, provide details)	Client / Project Information		(Indicate Filtered or Preserved, F/P)
	Copy of Invoice with Report? (circle) Yes or No	Job #:	0833-002-09	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:		
Lab Work Order # (lab use only)	L1028446	ALS Contact:	Amber Springer	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type													Number of Containers
1	DF1	July 2/11	542 pm	dustfall													
2	DF1	"	543 pm	"													
3	DF3	"	600 pm	"													
4	DF4	"	533 pm	"													
5	DF4	"	534 pm	"													
6	DF5	"	521 pm	"													
7	DF5	"	524 pm	"													

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

DF2 canisters (x2) and DF3 canister (x1) damaged by wildlife - not being sent to lab

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.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by: RC	Date: 7-7-11	Time: 12:00	Temperature: 19.9°C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

Sample Receipt Confirmation

Report Distribution:

Company Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Tolga Olcay
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: 604-687-4277
Email: tolcay@rescan.com
Report Name: CROSSTAB_ALS
Digital Type: --
Digital Email: --
Distribution: Hard Copy: Y Email: Y Fax: N

Invoice Distribution:

Acct Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Accounts Payable
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: --
Invoice Email: --
Project #: N/A
Account #: RES100

Client Information:

Job Reference #: 0833-002-09
Project PO #:
Legal Site Description: N/A
Quote #: N/A

Date Sampled: 02-JUL-11
Date Received: 07-JUL-11
Sampled By:
Chain Of Custody: 10-178474

Workorder Summary:

Lab Work Order #: **L1028446**
Estimated completion date: 18-JUL-11
4 Samples received at ALS in **VANCOUVER**

Client Job #: 0833-002-09
Account Manager: Amber Springer
Estimated sample disposal date: 17-AUG-11

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1028446-1	DF1 (MAY 23 - JULY 2)	02-JUL-11 17:43	07-JUL-11 12:00	18-JUL-11		DUSTFALL
L1028446-2	DF3 (MAY 23 - JULY 2)	02-JUL-11 18:00	07-JUL-11 12:00	18-JUL-11		DUSTFALL
L1028446-3	DF4 (MAY 23 - JULY 2)	02-JUL-11 17:34	07-JUL-11 12:00	18-JUL-11		DUSTFALL
L1028446-4	DF5 (MAY 23 - JULY 2)	02-JUL-11 17:24	07-JUL-11 12:00	18-JUL-11		DUSTFALL

Analysis Requested:

	Sample Handling and Disposal Fee	Dustfall Chloride by Ion Chromatography	Combined Dustfalls-Total, soluble, insol	Dustfall Ammonia by Fluorescence	Dustfall Nitrate by Ion Chromatography	Total Mercury in Dustfalls by CVAFS	Total Metals in Dustfalls by ICPOES	Total Metals in Dustfalls by ICPMS	Dustfall Sample Preparation	Dustfall Sulphate by Ion Chromatography
DF1 (MAY 23 - JULY 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF3 (MAY 23 - JULY 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF4 (MAY 23 - JULY 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF5 (MAY 23 - JULY 2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sample Integrity Observations:

No observations were identified for this work order submission.

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

RESCAN ENVIRONMENTAL SERVICES
ATTN: Tolga Olcay
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 05-AUG-11
Report Date: 16-AUG-11 10:23 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: L1041149

Project P.O. #: NOT SUBMITTED
Job Reference: BACK RIVER 0833-002-09
C of C Numbers:
Legal Site Desc:

STEFANIE TEO
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1041149-1	L1041149-2	L1041149-3	L1041149-4	L1041149-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	31-JUL-11	31-JUL-11	31-JUL-11	31-JUL-11	31-JUL-11
	Sampled Time					
	Client ID	DF-1 (JULY 2 - JULY 31)	DF-2 (JULY 2 - JULY 31) & (JUL10 - JUL31)	DF-3 (JULY 2 - JULY 31)	DF-4 (JULY 2 - JULY 31)	DF-5 (JULY 2 - JULY 31)
Grouping	**Analyte**					
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	0.27	0.42	1.13	<0.10	<0.10
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	0.17	<0.10	<0.10
	Total Soluble Dustfall (mg/dm2.day)	0.24	0.39	0.96	<0.10	<0.10
Anions and Nutrients	Ammonia (as N) (mg/dm2.day)	0.00021	0.00024	0.00438	0.00024	0.00013
	Chloride (Cl) (mg/dm2.day)	0.030	0.031	0.051	0.019	0.024
	Nitrate (as N) (mg/dm2.day)	0.0252	0.00341	0.00266	0.00402	0.00207
	Sulfate (SO4) (mg/dm2.day)	<0.011	<0.011	0.033	<0.011	<0.011
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000324	DLB <0.00020	DLB <0.00022	0.000179	0.000210
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000014	<0.0000020	<0.0000020	<0.0000014	<0.0000014
	Arsenic (As)-Total (mg/dm2.day)	<0.0000014	<0.0000020	<0.0000020	<0.0000014	<0.0000014
	Barium (Ba)-Total (mg/dm2.day)	0.00000816	0.0000070	0.0000049	0.00000494	0.0000128
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000068	<0.000010	<0.000010	<0.0000070	<0.0000070
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000068	<0.000010	<0.000010	<0.0000070	<0.0000070
	Boron (B)-Total (mg/dm2.day)	<0.00014	<0.00020	<0.00020	<0.00014	<0.00014
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000068	<0.0000010	<0.0000010	<0.00000070	<0.00000070
	Calcium (Ca)-Total (mg/dm2.day)	<0.00068	0.0012	<0.0010	0.00095	0.00191
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000068	<0.000010	<0.000010	<0.0000070	<0.0000070
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000014	<0.0000020	<0.0000020	<0.0000014	<0.0000014
	Copper (Cu)-Total (mg/dm2.day)	0.000107	0.000135	0.0000581	0.000192	0.000250
	Iron (Fe)-Total (mg/dm2.day)	<0.00041	<0.00061	<0.00061	<0.00042	0.00080
	Lead (Pb)-Total (mg/dm2.day)	0.00000318	0.0000038	0.0000028	0.00000202	0.00000323
	Lithium (Li)-Total (mg/dm2.day)	<0.000068	<0.00010	<0.00010	<0.000070	<0.000070
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0014	<0.0020	<0.0020	<0.0014	0.0033
	Manganese (Mn)-Total (mg/dm2.day)	0.00000888	0.0000112	0.0000148	0.0000117	0.0000700
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000068	<0.0000010	<0.0000010	<0.00000070	<0.00000070
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000068	<0.0000010	<0.0000010	<0.00000070	<0.00000070
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000068	0.000010	<0.000010	<0.0000070	<0.0000070
	Phosphorus (P)-Total (mg/dm2.day)	<0.0041	<0.0061	<0.0061	0.0044	0.0216
	Potassium (K)-Total (mg/dm2.day)	<0.027	<0.040	<0.040	<0.028	0.035
	Selenium (Se)-Total (mg/dm2.day)	<0.000014	<0.000020	<0.000020	<0.000014	<0.000014
	Silicon (Si)-Total (mg/dm2.day)	<0.00068	<0.0010	<0.0010	<0.00070	<0.00070
	Silver (Ag)-Total (mg/dm2.day)	0.00000051	<0.00000020	<0.00000020	<0.00000014	<0.00000014
	Sodium (Na)-Total (mg/dm2.day)	<0.027	<0.040	<0.040	<0.028	<0.028
	Strontium (Sr)-Total (mg/dm2.day)	0.0000028	0.0000055	0.0000044	0.0000036	0.0000129
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000014	<0.0000020	<0.0000020	<0.0000014	<0.0000014
	Tin (Sn)-Total (mg/dm2.day)	<0.0000014	<0.0000020	<0.0000020	<0.0000014	<0.0000014
	Titanium (Ti)-Total (mg/dm2.day)	<0.00014	<0.00020	<0.00020	<0.00014	<0.00014

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1041149-1	L1041149-2	L1041149-3	L1041149-4	L1041149-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	31-JUL-11	31-JUL-11	31-JUL-11	31-JUL-11	31-JUL-11
	Sampled Time					
	Client ID	DF-1 (JULY 2 - JULY 31)	DF-2 (JULY 2 - JULY 31) & (JUL10 - JUL31)	DF-3 (JULY 2 - JULY 31)	DF-4 (JULY 2 - JULY 31)	DF-5 (JULY 2 - JULY 31)
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.00000014	<0.00000020	<0.00000020	<0.00000014	<0.00000014
	Vanadium (V)-Total (mg/dm2.day)	<0.000014	<0.000020	<0.000020	<0.000014	<0.000014
	Zinc (Zn)-Total (mg/dm2.day)	0.000098	0.000211	0.000298	0.000107	0.000292

* 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**
CL-IC-VA	Dustfall	Dustfall Chloride 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 chloride analysis is specifcially 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".

DUSTFALLS-COM-DM2-VA	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.

HG-DUST(DM2-CVAFS-VA	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).

MET-DUST(DM2)-ICP-VA	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).

MET-DUST(DM2)-MS-VA	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).

NH3-F-VA	Dustfall	Dustfall Ammonia by Fluorescence	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 ammonia analysis is specifcially 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.

NO3-IC-VA	Dustfall	Dustfall Nitrate 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 nitrate analysis is specifcially 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".

SO4-IC-VA	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 specifcially 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:

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.

L1041149-COFC

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # L1041149

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE:	604-689-9460 / 604-689-4277				

INVOICE TO: SAME AS REPORT ? YES / NO		CLIENT / PROJECT INFORMATION:	
COMPANY:	SAME AS ABOVE	JOB #:	Back River 0833-002-09
CONTACT:		PO /AFE:	
ADDRESS:		Legal Site Description:	
CITY/ PROV		QUOTE #:	
PHONE:	FAX	ALS CONTACT	
Lab Work Order # (lab use only)			

ANALYSIS REQUEST — Please indicate below Filtered. Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partic	Cl, SO4, NO3, NH3	Total Mg, Ca, K	NUMBER OF CONTAINERS
	DF-1-TM	31-JUL-11		Water			X	
	DF-1-TP	31-JUL-11		Water	X	X		
	DF-2-TM	31-JUL-11		Water			X	
	DF-2-TP	31-JUL-11		Water	X	X		
	DF-3-TM	31-JUL-11		Water			X	
	DF-3-TP	31-JUL-11		Water	X	X		
	DF-4-TM	31-JUL-11		Water			X	
	DF-4-TP	31-JUL-11		Water	X	X		
	DF-5-TM	31-JUL-11		Water			X	
	DF-5-TP	31-JUL-11		Water	X	X		

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
		Ryan	Aug 5/11
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME: 1135

SAMPLE CONDITION (lab use only)	
TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
20°	
	If NO, Explain

08-AUG-11 10:14 (MT)

Sample Receipt Confirmation

Report Distribution:

Company Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Tolga Olcay
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: 604-687-4277
Email: tolcay@rescan.com
fhodge@rescan.com
Report Name: CROSSTAB_ALS
Digital Type: --
Digital Email: --
Distribution: Hard Copy: Y Email: Y Fax: N

Invoice Distribution:

Acct Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Accounts Payable
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: --
Invoice Email: --
Project #: N/A
Account #: RES100

Client Information:

Job Reference #: BACK RIVER 0833-002-09
Project PO #:
Legal Site Description: N/A
Quote #: N/A

Date Sampled: 31-JUL-11
Date Received: 05-AUG-11
Sampled By:
Chain Of Custody: --

Workorder Summary:

Lab Work Order #: **L1041149**
Estimated completion date: 16-AUG-11
5 Samples received at ALS in **VANCOUVER**

Client Job #: BACK RIVER 0833-002-09
Account Manager: Amber Springer
Estimated sample disposal date: 15-SEP-11

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1041149-1	DF-1 (JULY 2 - JULY 31)	31-JUL-11 00:00	05-AUG-11 11:35	16-AUG-11		WATER
L1041149-2	DF-2 (JULY 2 - JULY 31) & (JUL10 - JUL31)	31-JUL-11 00:00	05-AUG-11 11:35	16-AUG-11		WATER
L1041149-3	DF-3 (JULY 2 - JULY 31)	31-JUL-11 00:00	05-AUG-11 11:35	16-AUG-11		WATER
L1041149-4	DF-4 (JULY 2 - JULY 31)	31-JUL-11 00:00	05-AUG-11 11:35	16-AUG-11		WATER
L1041149-5	DF-5 (JULY 2 - JULY 31)	31-JUL-11 00:00	05-AUG-11 11:35	16-AUG-11		WATER

Analysis Requested:	Sample Handling and Disposal Fee	Dustfall Chloride by Ion Chromatography	Combined Dustfalls-Total, soluble, insol	Dustfall Ammonia by Fluorescence	Dustfall Nitrate by Ion Chromatography	Total Mercury in Dustfalls by CVAFS	Total Metals in Dustfalls by ICPOES	Total Metals in Dustfalls by ICPMS	Dustfall Sample Preparation	Dustfall Sulphate by Ion Chromatography
DF-1 (JULY 2 - JULY 31)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-2 (JULY 2 - JULY 31) & (JUL10 - JUL31)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-3 (JULY 2 - JULY 31)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-4 (JULY 2 - JULY 31)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Analysis Requested:

	Sample Handling and Disposal Fee	Dustfall Chloride by Ion Chromatography	Combined Dustfalls-Total, soluble, insol	Dustfall Ammonia by Fluorescence	Dustfall Nitrate by Ion Chromatography	Total Mercury in Dustfalls by CVAFS	Total Metals in Dustfalls by ICPOES	Total Metals in Dustfalls by ICPMS	Dustfall Sample Preparation	Dustfall Sulphate by Ion Chromatography
DF-5 (JULY 2 - JULY 31)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sample Integrity Observations: No observations were identified for this work order submission.

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

* L 1 0 4 1 1 4 9 - C O F C *

AL ANALY

Environmental Division

ALS

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # L1041149

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE:	604-689-9460	604-689-4277		ANALYSIS REQUEST	

INVOICE TO: SAME AS REPORT ? YES / NO		CLIENT / PROJECT INFORMATION:	
COMPANY:	SAME AS ABOVE		
CONTACT:		JOB #:	Back River 0833-002-09
ADDRESS:		PO /AFE:	
CITY/ PROV		Legal Site Description:	
PHONE:	FAX	QUOTE #:	
Lab Work Order # (lab use only)		ALS CONTACT	

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partic	Cl, SO4, NO3, NH3	Total Mg, Ca, K											NUMBER OF CONTAINERS
	DF-1-TM	31-JUL-11		Water			X											
	DF-1-TP	31-JUL-11		Water	X	X												
	DF-2-TM	31-JUL-11		Water			X											
	DF-2-TP	31-JUL-11		Water	X	X												
	DF-3-TM	31-JUL-11		Water			X											
	DF-3-TP	31-JUL-11		Water	X	X												
	DF-4-TM	31-JUL-11		Water			X											
	DF-4-TP	31-JUL-11		Water	X	X												
	DF-5-TM	31-JUL-11		Water			X											
	DF-5-TP	31-JUL-11		Water	X	X												

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
		Ryan	Aug 5/11	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME: 1135	20°	
					If NO, Explain

RESCAN ENVIRONMENTAL SERVICES
ATTN: Tolga Olcay
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 01-SEP-11
Report Date: 13-SEP-11 11:48 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #:	**L1053220**
Project P.O. #:	NOT SUBMITTED
Job Reference:	BACK RIVER 0833-002-09
C of C Numbers:	
Legal Site Desc:	

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1053220-1	L1053220-2	L1053220-3	L1053220-4	L1053220-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	26-AUG-11	26-AUG-11	26-AUG-11	26-AUG-11	26-AUG-11
	Sampled Time	09:55	11:35	10:10	10:16	10:23
	Client ID	DF-1 (JUL31-AUG26)	DF-2 (JUL31-AUG26)	DF-3 (JUL31-AUG26)	DF-4 (JUL31-AUG26)	DF-5 (JUL31-AUG26)
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	0.50	0.37	0.29	0.46	0.40
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	<0.10	<0.10
	Total Soluble Dustfall (mg/dm2.day)	0.50	0.37	0.29	0.46	0.39
Anions and Nutrients	Ammonia (as N) (mg/dm2.day)	0.000206	0.00143	0.00079	0.000268	0.00045
	Chloride (Cl) (mg/dm2.day)	0.0631	0.070	0.070	0.0738	0.073
	Nitrate (as N) (mg/dm2.day)	0.0106	0.00118	0.00483	0.00115	0.00156
	Sulfate (SO4) (mg/dm2.day)	<0.0067	<0.012 DLB	<0.013	<0.0082	<0.010
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000195	<0.000094	0.000112	0.000163	0.000108
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000015	<0.0000024	<0.0000021	<0.0000018	<0.0000019
	Arsenic (As)-Total (mg/dm2.day)	<0.0000015	<0.0000024	<0.0000021	<0.0000018	<0.0000019
	Barium (Ba)-Total (mg/dm2.day)	0.0000145	0.0000059	0.0000112	0.00000622	0.0000108
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000073	<0.000012	<0.000011	<0.0000091	<0.0000094
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000073	<0.000012	<0.000011	<0.0000091	<0.0000094
	Boron (B)-Total (mg/dm2.day)	<0.00015	<0.00024	<0.00021	<0.00018	<0.00019
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000073	<0.0000012	<0.0000011	<0.00000091	<0.00000094
	Calcium (Ca)-Total (mg/dm2.day)	<0.00073	<0.0012	<0.0011	<0.00091	<0.00094
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000073	<0.000012	<0.000011	<0.0000091	<0.0000094
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000015	<0.0000024	<0.0000021	<0.0000018	<0.0000019
	Copper (Cu)-Total (mg/dm2.day)	0.0000837	0.0000320	0.0000352	0.0000231	0.0000264
	Iron (Fe)-Total (mg/dm2.day)	<0.00044	<0.00071	<0.00063	<0.00054	<0.00056
	Lead (Pb)-Total (mg/dm2.day)	0.00000399	<0.0000012	0.0000019	0.00000132	0.00000513
	Lithium (Li)-Total (mg/dm2.day)	<0.000073	<0.00012	<0.00011	<0.000091	<0.000094
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0015	<0.0024	<0.0021	<0.0018	<0.0019
	Manganese (Mn)-Total (mg/dm2.day)	0.0000107	0.0000110	0.0000199	0.00000958	0.00000845
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000073	<0.0000012	<0.0000011	<0.00000091	<0.00000094
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000073	<0.0000012	<0.0000011	<0.00000091	<0.00000094
	Nickel (Ni)-Total (mg/dm2.day)	0.0000074	<0.000012	<0.000011	<0.0000091	<0.0000094
	Phosphorus (P)-Total (mg/dm2.day)	<0.0044	<0.0071	<0.0063	<0.0054	<0.0056
	Potassium (K)-Total (mg/dm2.day)	<0.029	<0.047	<0.042	<0.036	<0.037
	Selenium (Se)-Total (mg/dm2.day)	<0.000015	<0.000024	<0.000021	<0.000018	<0.000019
	Silicon (Si)-Total (mg/dm2.day)	<0.00073	<0.0012	<0.0011	<0.00091	<0.00094
	Silver (Ag)-Total (mg/dm2.day)	<0.00000015	<0.00000024	<0.00000021	<0.00000018	<0.00000019
	Sodium (Na)-Total (mg/dm2.day)	<0.029	<0.047	<0.042	<0.036	<0.037
	Strontium (Sr)-Total (mg/dm2.day)	0.0000041	0.0000047	0.0000061	0.0000029	0.0000030
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000015	<0.0000024	<0.0000021	<0.0000018	<0.0000019
	Tin (Sn)-Total (mg/dm2.day)	<0.0000015	<0.0000024	<0.0000021	<0.0000018	<0.0000019
	Titanium (Ti)-Total (mg/dm2.day)	<0.00015	<0.00024	<0.00021	<0.00018	<0.00019

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1053220-1	L1053220-2	L1053220-3	L1053220-4	L1053220-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	26-AUG-11	26-AUG-11	26-AUG-11	26-AUG-11	26-AUG-11
	Sampled Time	09:55	11:35	10:10	10:16	10:23
	Client ID	DF-1 (JUL31-AUG26)	DF-2 (JUL31-AUG26)	DF-3 (JUL31-AUG26)	DF-4 (JUL31-AUG26)	DF-5 (JUL31-AUG26)
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.00000015	<0.00000024	<0.00000021	<0.00000018	<0.00000019
	Vanadium (V)-Total (mg/dm2.day)	<0.000015	<0.000024	<0.000021	<0.000018	<0.000019
	Zinc (Zn)-Total (mg/dm2.day)	0.000050	0.000051	0.000053	0.000035	0.000061

* 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**
CL-IC-VA	Dustfall	Dustfall Chloride 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 chloride analysis is specifcially 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 Code	Matrix	Test Description	Method Reference**
DUSTFALLS-COM-DM2-VA	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.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-DUST(DM2-CVAFS-VA	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).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-DUST(DM2)-ICP-VA	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).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-DUST(DM2)-MS-VA	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 Code	Matrix	Test Description	Method Reference**
NH3-F-VA	Dustfall	Dustfall Ammonia by Fluorescence	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 ammonia analysis is specifcially 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.

ALS Test Code	Matrix	Test Description	Method Reference**
NO3-IC-VA	Dustfall	Dustfall Nitrate 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 nitrate analysis is specifcially 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 Code	Matrix	Test Description	Method Reference**
SO4-IC-VA	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 specifcially 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:

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.

L1053220-COFC

ALS Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM COC #

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE: 604-689-9460	604-689-4277				

INVOICE TO: SAME AS REPORT ? YES / NO

		CLIENT / PROJECT INFORMATION:	
COMPANY:	SAME AS ABOVE	JOB #:	Back River 0833-002-09
CONTACT:		PO /AFE:	
ADDRESS:		Legal Site Description:	
CITY/ PROV		QUOTE #:	
PHONE:	FAX	ALS CONTACT	
Lab Work Order # (lab use only)	L1053220		

ANALYSIS REQUEST — Please indicate below Filtered. Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partis	Cl, SO4, NO3, NH3	Total Mg, Ca, K	NUMBER OF CONTAINERS
	DF-1-TM	26-08-11	9:55	Water			X	
	DF-1-TP	26-08-11	9:55	Water	X	X		
	DF-2-TM	26-08-11	11:35	Water			X	
	~~DF-2-TP~~			~~Water~~	X	X		
	DF-3-TM	26-08-11	10:10	Water			X	
	DF-3-TP	26-08-11	10:10	Water	X	X		
	DF-4-TM	26-08-11	10:16	Water			X	
	DF-4-TP	26-08-11	10:16	Water	X	X		
	DF-5-TM	26-08-11	10:23	Water			X	
	DF-5-TP	26-08-11	10:23	Water	X	X		

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

All samples were installed on July 31, 2011

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
[signature]	Aug 29 10:00			TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY: Ryan Sept 1st	DATE & TIME: 12:20	10°C	If NO, Explain

Sample Receipt Confirmation

Report Distribution:

Company Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Tolga Olcay
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: 604-687-4277
Email: tolcay@rescan.com
fhodge@rescan.com
Report Name: CROSSTAB_ALS
Digital Type: --
Digital Email: --
Distribution: Hard Copy: Y Email: Y Fax: N

Invoice Distribution:

Acct Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Accounts Payable
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: --
Invoice Email: --
Project #: N/A
Account #: RES100

Client Information:

Job Reference #: BACK RIVER 0833-002-09
Project PO #:
Legal Site Description: N/A
Quote #: N/A

Date Sampled: 26-AUG-11
Date Received: 01-SEP-11
Sampled By:
Chain Of Custody: --

Workorder Summary:

Lab Work Order #: **L1053220**
Estimated completion date: 13-SEP-11
5 Samples received at ALS in **VANCOUVER**

Client Job #: BACK RIVER 0833-002-09
Account Manager: Amber Springer
Estimated sample disposal date: 13-OCT-11

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1053220-1	DF-1 (JUL31-AUG26)	26-AUG-11 09:55	01-SEP-11 12:20	13-SEP-11		WATER
L1053220-2	DF-2 (JUL31-AUG26)	26-AUG-11 11:35	01-SEP-11 12:20	13-SEP-11		WATER
L1053220-3	DF-3 (JUL31-AUG26)	26-AUG-11 10:10	01-SEP-11 12:20	13-SEP-11		WATER
L1053220-4	DF-4 (JUL31-AUG26)	26-AUG-11 10:16	01-SEP-11 12:20	13-SEP-11		WATER
L1053220-5	DF-5 (JUL31-AUG26)	26-AUG-11 10:23	01-SEP-11 12:20	13-SEP-11		WATER

Analysis Requested:	Sample Handling and Disposal Fee	Dustfall Chloride by Ion Chromatography	Combined Dustfalls-Total, soluble, insol	Dustfall Ammonia by Fluorescence	Dustfall Nitrate by Ion Chromatography	Total Mercury in Dustfalls by CVAFS	Total Metals in Dustfalls by ICPOES	Total Metals in Dustfalls by ICPMS	Dustfall Sample Preparation	Dustfall Sulphate by Ion Chromatography
DF-1 (JUL31-AUG26)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-2 (JUL31-AUG26)	✓					✓	✓	✓	✓	
DF-3 (JUL31-AUG26)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-4 (JUL31-AUG26)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-5 (JUL31-AUG26)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sample Integrity Observations: No observations were identified for this work order submission.

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

L1053220-COFC

ALS Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

COC #

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE: 604-689-9460	604-689-4277				

INVOICE TO: SAME AS REPORT ? YES / NO		CLIENT / PROJECT INFORMATION:	
COMPANY:	SAME AS ABOVE	JOB #:	Back River 0833-002-09
CONTACT:		PO /AFE:	
ADDRESS:		Legal Site Description:	
CITY/ PROV		QUOTE #:	
PHONE:	FAX	ALS CONTACT	
Lab Work Order # (lab use only)	L1053220		

ANALYSIS REQUEST — Please indicate below Filtered. Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partis	Cl, SO4, NO3, NH3	Total Mg, Ca, K											NUMBER OF CONTAINERS
	DF-1-TM	26-08-11	9:55	Water			X											
	DF-1-TP	26-08-11	9:55	Water	X	X												
	DF-2-TM	26-08-11	11:35	Water			X											
	~~DF-2-TP~~			~~Water~~	X	X												
	DF-3-TM	26-08-11	10:10	Water			X											
	DF-3-TP	26-08-11	10:10	Water	X	X												
	DF-4-TM	26-08-11	10:16	Water			X											
	DF-4-TP	26-08-11	10:16	Water	X	X												
	DF-5-TM	26-08-11	10:23	Water			X											
	DF-5-TP	26-08-11	10:23	Water	X	X												

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
	All samples were installed on July 31, 2011

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
[signature]	Aug 29 10:00			TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY: Ryan Sept 1st	DATE & TIME: 12:20	10°C	If NO, Explain

RESCAN ENVIRONMENTAL SERVICES
ATTN: Tolga Olcay
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 21-SEP-11
Report Date: 03-OCT-11 11:49 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #:	**L1061660**
Project P.O. #:	NOT SUBMITTED
Job Reference:	BACK RIVER-0833-002-09
C of C Numbers:	1, 2
Legal Site Desc:	

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1061660-1	L1061660-2	L1061660-3	L1061660-4	L1061660-5
	Sample ID	L1061660-1	L1061660-2	L1061660-3	L1061660-4	L1061660-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date					
	Sampled Time					
	Client ID	DF-1 (AUG26-SEP18)	DF-2 (AUG26-SEP18)	DF-3 (AUG26-SEP18)	DF-4 (AUG26-SEP18)	DF-5 (AUG26-SEP18)
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	0.55	<0.10	0.23	0.26	0.28
	Total Insoluble Dustfall (mg/dm2.day)	0.23	<0.10	<0.10	<0.10	<0.10
	Total Soluble Dustfall (mg/dm2.day)	0.32	<0.10	0.21	0.24	0.22
Anions and Nutrients	Ammonia (as N) (mg/dm2.day)	0.00240	0.00019	<0.00023	0.00022	0.00028
	Chloride (Cl) (mg/dm2.day)	0.053	0.048	0.087	0.055	0.053
	Nitrate (as N) (mg/dm2.day)	0.00276	0.00205	0.00124	0.00174	0.00129
	Sulfate (SO4) (mg/dm2.day)	<0.019	<0.017	<0.023	<0.021	<0.020
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000353	0.000255	0.000369	0.000698	0.000368
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000039	<0.0000035	<0.0000040	<0.0000043	<0.0000039
	Arsenic (As)-Total (mg/dm2.day)	<0.0000039	<0.0000035	<0.0000040	<0.0000043	<0.0000039
	Barium (Ba)-Total (mg/dm2.day)	0.0000129	0.0000113	0.0000268	0.0000387	0.0000149
	Beryllium (Be)-Total (mg/dm2.day)	<0.000020	<0.000018	<0.000020	<0.000021	<0.000020
	Bismuth (Bi)-Total (mg/dm2.day)	<0.000020	<0.000018	<0.000020	<0.000021	<0.000020
	Boron (B)-Total (mg/dm2.day)	<0.00039	<0.00035	<0.00040	<0.00043	<0.00039
	Cadmium (Cd)-Total (mg/dm2.day)	<0.0000020	<0.0000018	<0.0000020	<0.0000021	0.0000035
	Calcium (Ca)-Total (mg/dm2.day)	<0.0020	<0.0018	0.0024	0.0032	0.0022
	Chromium (Cr)-Total (mg/dm2.day)	<0.000020	<0.000018	<0.000020	<0.000021	<0.000020
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000039	<0.0000035	<0.0000040	<0.0000043	<0.0000039
	Copper (Cu)-Total (mg/dm2.day)	0.000248	0.000103	0.000323	0.000771	0.000415
	Iron (Fe)-Total (mg/dm2.day)	<0.0012	<0.0011	<0.0012	0.0018	<0.0012
	Lead (Pb)-Total (mg/dm2.day)	0.0000067	0.0000088	0.0000329	0.0000107	0.0000891
	Lithium (Li)-Total (mg/dm2.day)	<0.00020	<0.00018	<0.00020	<0.00021	<0.00020
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0039	<0.0035	<0.0040	<0.0043	<0.0039
	Manganese (Mn)-Total (mg/dm2.day)	0.0000165	0.0000220	0.0000246	0.0000507	0.0000790
	Mercury (Hg)-Total (mg/dm2.day)	<0.0000020	<0.0000018	<0.0000020	<0.0000021	<0.0000020
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.0000020	<0.0000018	<0.0000020	0.0000059	<0.0000020
	Nickel (Ni)-Total (mg/dm2.day)	<0.000020	<0.000018	0.000042	<0.000021	<0.000020
	Phosphorus (P)-Total (mg/dm2.day)	<0.012	<0.011	<0.012	<0.013	<0.012
	Potassium (K)-Total (mg/dm2.day)	<0.079	<0.070	<0.080	<0.086	<0.079
	Selenium (Se)-Total (mg/dm2.day)	<0.000039	<0.000035	<0.000040	<0.000043	<0.000039
	Silicon (Si)-Total (mg/dm2.day)	<0.0020	<0.0018	<0.0020	<0.0021	<0.0020
	Silver (Ag)-Total (mg/dm2.day)	<0.00000039	<0.00000035	<0.00000040	<0.00000043	<0.00000039
	Sodium (Na)-Total (mg/dm2.day)	<0.079	<0.070	<0.080	<0.086	<0.079
	Strontium (Sr)-Total (mg/dm2.day)	0.0000046	0.0000049	0.0000074	0.0000105	0.0000064
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000039	<0.0000035	<0.0000040	<0.0000043	<0.0000039
	Tin (Sn)-Total (mg/dm2.day)	<0.0000039	<0.0000035	<0.0000040	<0.0000043	<0.0000039
	Titanium (Ti)-Total (mg/dm2.day)	<0.00039	<0.00035	<0.00040	<0.00043	<0.00039

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1061660-1	L1061660-2	L1061660-3	L1061660-4	L1061660-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date					
	Sampled Time					
	Client ID	DF-1 (AUG26-SEP18)	DF-2 (AUG26-SEP18)	DF-3 (AUG26-SEP18)	DF-4 (AUG26-SEP18)	DF-5 (AUG26-SEP18)
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.00000039	<0.00000035	<0.00000040	<0.00000043	<0.00000039
	Vanadium (V)-Total (mg/dm2.day)	<0.000039	<0.000035	<0.000040	<0.000043	<0.000039
	Zinc (Zn)-Total (mg/dm2.day)	0.000112	0.000158	0.000193	0.000336	0.000149

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-VA	Dustfall	Dustfall Chloride 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 chloride analysis is specifcially 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 Code	Matrix	Test Description	Method Reference**
DUSTFALLS-COM-DM2-VA	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.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-DUST(DM2-CVAFS-VA	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).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-DUST(DM2)-ICP-VA	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).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-DUST(DM2)-MS-VA	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 Code	Matrix	Test Description	Method Reference**
NH3-F-VA	Dustfall	Dustfall Ammonia by Fluorescence	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 ammonia analysis is specifcially 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.

ALS Test Code	Matrix	Test Description	Method Reference**
NO3-IC-VA	Dustfall	Dustfall Nitrate 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 nitrate analysis is specifcially 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 Code	Matrix	Test Description	Method Reference**
SO4-IC-VA	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 specifcially 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:

1	2

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.

ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

L1061660-COFC

T FORM COC #

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE: 604-689-9460	604-689-4277			ANALYSIS REQUEST	

INVOICE TO: SAME AS REPORT ? YES / NO		CLIENT / PROJECT INFORMATION:	
COMPANY:	SAME AS ABOVE	JOB #:	Back River - 0833-002-09
CONTACT:		PO /AFE:	
ADDRESS:		Legal Site Description:	
CITY/ PROV		QUOTE #:	
PHONE:	FAX	ALS CONTACT	
Lab Work Order # (lab use only)	L1061660		

Please indicate below Filtered. Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partic	Cl, SO4, NO3, NH3	Total Mg, Ca, K											NUMBER OF CONTAINERS
	DF-1-TM ✓			Water			X											
	DF-1-TP ✓			Water	X	X												
	DF-2-TM ✓			Water			X											
	DF-2-TP ✓			Water	X	X												
	DF-3-TM ✓			Water			X											
	DF-3-TP ✓			Water	X	X												
	DF-4-TM			Water			X											
	DF-4-TP			Water	X	X												
	DF-5-TM			Water			X											
	DF-5-TP			Water	X	X												

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
	All samples were installed on August 26, 2011 : All samples collected Sept 18, 2011

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
		OCM	9/19/11 12:12	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	15.6	
					If NO, Explain

ALS Laboratory Group

Environmental Division

CHAIN OF CUSTODY

CANADA TOLL

www.alsenviro.com

L1061660-COFC

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE: 604-689-9460	604-689-4277			ANALYSIS REQUEST	

INVOICE TO: SAME AS REPORT ? YES / NO		CLIENT / PROJECT INFORMATION:	
COMPANY:	SAME AS ABOVE	JOB #:	Back River - 0833-002-09
CONTACT:		PO /AFE:	
ADDRESS:		Legal Site Description:	
CITY/ PROV		QUOTE #:	
PHONE:	FAX	ALS CONTACT	
Lab Work Order # (lab use only)	L1061660		

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partic	Cl, SO4, NO3, NH3	Total Mg, Ca, K	NUMBER OF CONTAINERS
	DF-1-TM			Water			X	
	DF-1-TP			Water	X	X		
	DF-2-TM			Water			X	
	DF-2-TP			Water	X	X		
	DF-3-TM			Water			X	
	DF-3-TP			Water	X	X		
	DF-4-TM ✓			Water			X	
	DF-4-TP ✓			Water	X	X		
	DF-5-TM ✓			Water			X	
	DF-5-TP ✓			Water	X	X		

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
	All samples were installed on August 26, 2011 : All samples collected Sept 18, 2011

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
				TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY: DCM	21/9/11 1216	13.7°C	If NO, Explain

21-SEP-11 20:32 (MT)

Sample Receipt Confirmation

Report Distribution:

Company Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Tolga Olcay
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: 604-687-4277
Email: tolcay@rescan.com
fhodge@rescan.com
Report Name: CROSSTAB_ALS
Digital Type: --
Digital Email: --
Distribution: Hard Copy: Y Email: Y Fax: N

Invoice Distribution:

Acct Name: RESCAN ENVIRONMENTAL SERVICES
Contact: Accounts Payable
Address: Sixth Floor, 1111 West Hastings Street
Vancouver, BC, V6E 2J3
Phone: 604-689-9460
Fax: --
Invoice Email: --
Project #: N/A
Account #: RES100

Client Information:

Job Reference #: BACK RIVER-0833-002-09
Project PO #:
Legal Site Description: N/A
Quote #: N/A
Date Sampled:
Date Received: 21-SEP-11
Sampled By:
Chain Of Custody: 1, 2

Workorder Summary:

Lab Work Order #: **L1061660**
Estimated completion date: 30-SEP-11
5 Samples received at ALS in **VANCOUVER**
Client Job #: BACK RIVER-0833-002-09
Account Manager: Amber Springer
Estimated sample disposal date: 30-OCT-11

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1061660-1	DF-1 (AUG26-SEP18)		21-SEP-11 12:16	30-SEP-11		WATER
L1061660-2	DF-2 (AUG26-SEP18)		21-SEP-11 12:16	30-SEP-11		WATER
L1061660-3	DF-3 (AUG26-SEP18)		21-SEP-11 12:16	30-SEP-11		WATER
L1061660-4	DF-4 (AUG26-SEP18)		21-SEP-11 12:16	30-SEP-11		WATER
L1061660-5	DF-5 (AUG26-SEP18)		21-SEP-11 12:16	30-SEP-11		WATER

Analysis Requested:	Sample Handling and Disposal Fee	Dustfall Chloride by Ion Chromatography	Combined Dustfalls-Total, soluble, insol	Dustfall Ammonia by Fluorescence	Dustfall Nitrate by Ion Chromatography	Total Mercury in Dustfalls by CVAFS	Total Metals in Dustfalls by ICPOES	Total Metals in Dustfalls by ICPMS	Dustfall Sample Preparation	Dustfall Sulphate by Ion Chromatography
DF-1 (AUG26-SEP18)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-2 (AUG26-SEP18)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-3 (AUG26-SEP18)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-4 (AUG26-SEP18)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DF-5 (AUG26-SEP18)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sample Integrity Observations:
No observations were identified for this work order submission.

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

L1061660-COFC

T FORM COC #

REPORT TO:		REPORT FORMAT / DISTRIBUTION		SERVICE REQUESTED	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD	REGULAR SERVICE (DEFAULT)	X
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL	PRIORITY SERVICE (2-3 DAYS)	
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com	EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com	OTHER (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE: 604-689-9460	604-689-4277			ANALYSIS REQUEST	

INVOICE TO: SAME AS REPORT ? YES / NO			
COMPANY:	SAME AS ABOVE	CLIENT / PROJECT INFORMATION:	
CONTACT:		JOB #:	Back River - 0833-002-09
ADDRESS:		PO /AFE:	
CITY/ PROV		Legal Site Description:	
PHONE:	FAX	QUOTE #:	
Lab Work Order # (lab use only)	L1061660	ALS CONTACT	

Please indicate below Filtered. Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partic	Cl, SO4, NO3, NH3	Total Mg, Ca, K											NUMBER OF CONTAINERS
	DF-1-TM ✓			Water			X											
	DF-1-TP ✓			Water	X	X												
	DF-2-TM ✓			Water			X											
	DF-2-TP ✓			Water	X	X												
	DF-3-TM ✓			Water			X											
	DF-3-TP ✓			Water	X	X												
	DF-4-TM			Water			X											
	DF-4-TP			Water	X	X												
	DF-5-TM			Water			X											
	DF-5-TP			Water	X	X												

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
	All samples were installed on August 26, 2011 : All samples collected Sept 18, 2011

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
		ACM	21/9/11 12:12	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	15.6	If NO, Explain

ALS Laboratory Group
Environmental Division

CHAIN OF CUSTODY
CANADA TOLL
www.alsenviro.com

L1061660-COFC

REPORT TO:		**REPORT FORMAT / DISTRIBUTION**	
COMPANY:	Rescan Environmental Services Ltd.	HARDCOPY:	STANDARD
CONTACT:	Tolga Olcay	ELECTRONIC	PDF and EXCEL
ADDRESS:	6th Flr, 1111 West Hastings Street	EMAIL 1:	tolcay@rescan.com
CITY/ PROV	Vancouver, BC V6E 2J3	EMAIL 2:	fhodge@rescan.com
PHONE: 604-689-9460	604-689-4277		
INVOICE TO: SAME AS REPORT ? YES / NO		**CLIENT / PROJECT INFORMATION:**	
COMPANY:	SAME AS ABOVE	JOB #:	Back River - 0833-002-09
CONTACT:		PO /AFE:	
ADDRESS:		Legal Site Description:	
CITY/ PROV		QUOTE #:	
PHONE:	FAX		
Lab Work Order # (lab use only)	L1061660	ALS CONTACT	

SERVICE REQUESTED	
REGULAR SERVICE (DEFAULT)	X
PRIORITY SERVICE (2-3 DAYS)	
EMERGENCY SERVICE (1-2 DAY / WEEKEND)	
OTHER (<1 DAY / WEEKEND) - CONTACT ALS	

ANALYSIS REQUEST

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE (dd-mmm-yy)	TIME (hh:mm)	SAMPLE TYPE	Total, Soluble, Insoluble Partic	Cl, SO4, NO3, NH3	Total Mg, Ca, K	NUMBER OF CONTAINERS
	DF-1-TM			Water			X	
	DF-1-TP			Water	X	X		
	DF-2-TM			Water			X	
	DF-2-TP			Water	X	X		
	DF-3-TM			Water			X	
	DF-3-TP			Water	X	X		
	DF-4-TM ✓			Water			X	
	DF-4-TP ✓			Water	X	X		
	DF-5-TM ✓			Water			X	
	DF-5-TP ✓			Water	X	X		

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

All samples were installed on August 26, 2011 : All samples collected Sept 18, 2011

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 below.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY: DCM	DATE & TIME: 21/9/11 1216

SAMPLE CONDITION (lab use only)	
TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ?
13.2°C	
	If NO, Explain

Appendix 2

2011 Passive Air Contaminant Sampling Results

Engineers and Scientists

Your Project #: 0833-002-09
Site: BACK RIVER, NT

Attention: Tolga Olcay
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2011/07/12

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B159231
Received: 2011/07/06, 09:40

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2011/07/08	2011/07/12	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	2	2011/07/11	2011/07/12	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	2	2011/07/08	2011/07/12	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		AX6541	AX6612		
Sampling Date		2011/05/24 11:00	2011/05/24 11:00		
	Units	**2011-01**	**2011-01 DUP**	**RDL**	**QC Batch**
Passive Monitoring					
Calculated NO2	ppb	<0.1	<0.1	0.1	4989996
Calculated O3	ppb	26.4	25.6	0.1	4994697
Calculated SO2	ppb	0.1	<0.1	0.1	4990001

RDL = Reportable Detection Limit

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	Units	% Recovery	QC Limits
4989996	Calculated NO2	2011/07/08	100	N/A	<0.1	ppb	100	76 - 118
4990001	Calculated SO2	2011/07/08	96	N/A	<0.1	ppb	100	95 - 105
4994697	Calculated O3	2011/07/11	100	N/A	<0.1	ppb	100	91 - 107

N/A = Not Applicable

Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B159231

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Linda Lin, Supervisor, Centre for Passive Sampling Technology

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics

☒ Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247

→ ◉ Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 465-1212, Fax: (780) 450-4187, Toll free: (877) 465-8889

Chain of Custody

Invoice To: Require Report? Yes ☑ No ☐

Company Name: Rescan Environmental Services Ltd.

Contact Name: Tolga Olkay

Address: 1111 West Hastings St. (6th Floor)

Prov: BC PC: V6E 2J3

Contact #s: Ph: 604-689-9460 Fax: 604-687-4217

Report To: same as invoice

Prov: PC:

Ph: Fax:

PO# / AFE#:

Quotation #:

Project #: 0833-002-09

Proj. Name: Back River

Location: Nunavut

Sampler's Initials: JS

DETECTION LIMIT REQUIREMENTS:

Check the applicable criterion and indicate land use

☐ AT1

☐ CCME

☐ OTHER

REPORT DISTRIBUTION:

EMAIL ADDRESS(S):

tolkay@rescan.com

SERVICE REQUESTED:

☐ **RUSH** (Please ensure you contact the lab to reserve)

Date Required:

☑ REGULAR Turnaround (5 to 7 Days)

#	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)1	Assessment ICP Metals2	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals ☐				WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F ☐	REGULATED METALS (CCME / AT1)3: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)							*HOLD for 60 Days	# of Containers Submitted
1	2011-N02-01		2011/07/02 1747																											
2	2011-03-01		" 1748																											
3	2011-S02-01		" 1746																											
4	2011-N02-01dup		" 1750																											
5	2011-03-01dup		" 1749																											
6	2011-S02-01dup		" 1751																											
7	Travel Blank S02		"																											
8	Travel Blank N02		"																											
9	Travel Blank 03		"																											
10																														
11																														
12																														

SOILS (footnotes defined on back) WATERS (footnotes defined on back)

All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: Julia Shewan Date/Time: July 4/11 - 0900

Sign and Print: Julia Shewan

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	CUSTODY SEAL YES / NO				

COMMENTS/SPECIAL INSTRUCTIONS:

Contact Tolga for analysis instructions

Maxxam contact. Levi Manchak.

Your Project #: 0833-002-09
Site Location: BACK RIVER, NT

Attention: TOLGA OLCAY
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2011/08/15

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B170872
Received: 2011/08/04, 12:26

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2011/08/08	2011/08/15	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	2	2011/08/15	2011/08/15	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	2	2011/08/08	2011/08/15	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B170872
Report Date: 2011/08/15

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 0833-002-09
Site Location: BACK RIVER, NT

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		BE0645	BE0646		
Sampling Date		2011/07/02	2011/07/02		
	Units	**2011-01**	**2011-01 DUP**	**RDL**	**QC Batch**
Passive Monitoring					
Calculated NO2	ppb	<0.1	0.2	0.1	5070048
Calculated O3	ppb	24.3	24.3	0.1	5090676
Calculated SO2	ppb	<0.1	<0.1	0.1	5070055

RDL = Reportable Detection Limit

Maxxam Job #: B170872
Report Date: 2011/08/15

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 0833-002-09
Site Location: BACK RIVER, NT

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	Units	% Recovery	QC Limits
5070048	Calculated NO2	2011/08/08	101	N/A	<0.1	ppb	100	76 - 118
5070055	Calculated SO2	2011/08/08	103	N/A	<0.1	ppb	104	95 - 105
5090676	Calculated O3	2011/08/15	101	N/A	<0.1	ppb	102	91 - 107

N/A = Not Applicable
Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam

Validation Signature Page

Maxxam Job #: B170872

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Linda Lin, Supervisor, Centre for Passive Sampling Technology

==

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B170872

SAMPLE ANALYSIS REQUEST FORM

Maxxam Analytics Inc 0833-002-08
Back River Project

9331 - 48 Street, Edmonton AB T6B 2R4
tel: 780-577-7100 fax: 780-466-3332

INVOICE TO: Rescan Environmental
~~Hope Bay Project - Atmospheric 1009-002-02~~
6 floor, 1111 W Hastings Street
V6E2J3 Vancouver, BC

REPORT TO: Rescan Environmental Services
6th floor, 1111 W Hasting Street
V6E 2J3 Vancouver, BC
tolcay@rescan.com

Company Name: Rescan Environmental Back River Project	**Phone:** 604-689-9460	**Area:** Sabina Gold - Back River Project
Requestor:		**Additional contact:** Fiona Hodge

Please check applicable boxes for routine analysis; for specialty work, provide a detailed description of parameters required or phone customer service rep. Levi Manchak @ (780) 468-3536 to discuss testing procedures.

Analysis completion requirement (surcharge may apply for priority analysis)
PRIORITY 1 (same day turnaround)
PRIORITY 2 (2 days turnaround)
$\boxed{\text{STANDARD}}$ 5 days turnaround)
or
specify DUE ON DATE

Sample identification or location (LSD)	Sample Point	Sampling Start Date	Sampling End Date	Priority	SO2	H2S	NO2	O3	NOx	PM 10	PM 2.5	Dustfall	TSP
SO2	Back River DF1		31-JUL-11	Standard	x								
SO2 duplicate	Back River DF1		31-JUL-11	Standard	x								
NO2	Back River DF1		31-JUL-11	Standard			x						
NO2 duplicate	Back River DF1		31-JUL-11	Standard			x						
O3	Back River DF1		31-JUL-11	Standard				x					
O3 duplicate	Back River DF1		31-JUL-11	Standard				x					
SO2 blank	Back River DF2			Standard	x								
NO2 blank	Back River DF3			Standard			x						
O3 blank	Back River DF4			Standard				x					

Other analysis:

Results to be reported to:
Name: Tolga Olcay
Fax: (604) 689-4277
e-mail: tolcay@rescan.com
Do you require a confirmation of receipt of samples? Yes

Email/Fax #/Phone #:

Maxxam to complete *Date received:* *Received By:*

Your Project #: 0833-002-09
Site Location: BACK RIVER, NT

Attention: TOLGA OLCAY
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2011/09/08

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B181359
Received: 2011/08/31, 12:30

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2011/09/07	2011/09/08	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	2	2011/09/06	2011/09/08	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	2	2011/09/08	2011/09/08	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B181359
Report Date: 2011/09/08

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 0833-002-09
Site Location: BACK RIVER, NT

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		BK1753	BK1754		
Sampling Date		2011/07/31	2011/07/31		
	Units	**2011-02**	**2011-02 DUP**	**RDL**	**QC Batch**
Passive Monitoring					
Calculated NO2	ppb	<0.1	<0.1	0.1	5153638
Calculated O3	ppb	18.0	19.3	0.1	5150727
Calculated SO2	ppb	0.3	0.4	0.1	5158488

RDL = Reportable Detection Limit

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	Units	% Recovery	QC Limits
5150727	Calculated O3	2011/09/06	98	N/A	<0.1	ppb	100	91 - 107
5153638	Calculated NO2	2011/09/07	100	N/A	<0.1	ppb	99	76 - 118
5158488	Calculated SO2	2011/09/08	101	N/A	<0.1	ppb	99	95 - 105

N/A = Not Applicable

Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam

Validation Signature Page

Maxxam Job #: B181359

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Carmen Toker, CT, Manager Air Laboratory Services

==

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Maxxam Analytics Inc

9331 - 48 Street, Edmonton AB T6B 2R4
tel: 780-577-7100 fax: 780-466-3332

SAMPLE ANALYSIS REQUEST FORM

INVOICE TO: Rescan Environmental
Back River Project - 0833-002-09
6 floor, 1111 W Hastings Street
V6E2J3 Vancouver, BC

REPORT TO: Rescan Environmental Services
6th floor, 1111 W Hasting Street
V6E 2J3 Vancouver, BC
tolcay@rescan.com

Company Name: Rescan Environmental Back River Projec	**Phone: 604-689-9460**	**Area:** Sabina Gold - Back River Project
Requestor: Tolga Olcay		**Additional contact: Fiona Hodge**

Please check applicable boxes for routine analysis; for specialty work, provide a detailed description of parameters required or phone customer service rep. Levi Manchak @ (780) 468-3536 to discuss testing procedures.

Analysis completion requirement (surcharge may apply for priority analysis)
PRIORITY 1 (same day turnaround)
PRIORITY 2 (2 days turnaround) or STANDARD (5 days turnaround)
specify DUE ON DATE

Sample identification or location (LSD)	Sample Point	Sampling Start Date	Sampling End Date	Priority	SO2	H2S	NO2	O3	NOx	PM 10	PM 2.5	Dustfall	TSP
SO2	Back River DF1	31/Jul/2011	26/Aug/2011	Standard	x								
SO2 duplicate	Back River DF1	31/Jul/2011	26/Aug/2011	Standard	x								
NO2	Back River DF1	31/Jul/2011	26/Aug/2011	Standard			x						
NO2 duplicate	Back River DF1	31/Jul/2011	26/Aug/2011	Standard			x						
O3	Back River DF1	31/Jul/2011	26/Aug/2011	Standard				x					
O3 duplicate	Back River DF1	31/Jul/2011	26/Aug/2011	Standard				x					
SO2 blank	kept in Goose Lake			Standard	x								
NO2 blank	kept in Goose Lake			Standard			x						
O3 blank	kept in Goose Lake			Standard				x					

Other analysis:

Results to be reported to:
Name: Tolga Olcay
Fax: 604-689-4277
e-mail: tolcay@rescan.com
Do you require a confirmation of receipt of samples? Yes

Email/Fax #/Phone #:

Maxxam to complete *Date received:* *Received By:*

Maxxam

Your Project #: 0833-002-09
Site Location: BACK RIVER, NT

Attention: TOLGA OLCAY
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2011/09/27

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B188922
Received: 2011/09/20, 14:34

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2011/09/26	2011/09/27	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	2	2011/09/21	2011/09/27	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	2	2011/09/26	2011/09/27	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B188922
Report Date: 2011/09/27

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 0833-002-09
Site Location: BACK RIVER, NT

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		BO7732	BO7733		
Sampling Date		2011/08/26	2011/08/26		
	Units	**1**	**2 (DUP)**	**RDL**	**QC Batch**
Passive Monitoring					
Calculated NO2	ppb	0.3	0.3	0.1	5208733
Calculated O3	ppb	20.6	19.6	0.1	5200625
Calculated SO2	ppb	<0.1	0.4	0.1	5208777

RDL = Reportable Detection Limit

General Comments

Sample exposure dates: 2011/08/26 - 2011/09/18

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	Units	% Recovery	QC Limits
5200625	Calculated O3	2011/09/22	100	N/A	<0.1	ppb	100	91 - 107
5208733	Calculated NO2	2011/09/26	98	N/A	<0.1	ppb	101	76 - 118
5208777	Calculated SO2	2011/09/26	101	N/A	<0.1	ppb	101	95 - 105

N/A = Not Applicable

Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam

Validation Signature Page

Maxxam Job #: B188922

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Linda Lin, Supervisor, Centre for Passive Sampling Technology

===

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Maxxam Analytics Inc

9331 - 48 Street, Edmonton AB T6B 2R4
tel: 780-577-7100 fax: 780-466-3332

SAMPLE ANALYSIS REQUEST FORM

INVOICE TO: Rescan Environmental
Back River Project - 0833-002-09
6 floor, 1111 W Hastings Street
V6E2J3 Vancouver, BC

REPORT TO: Rescan Environmental Services
6th floor, 1111 W Hasting Street
V6E 2J3 Vancouver, BC
tolcay@rescan.com

Company Name: Rescan Environmental Back River Projec	**Phone:** 604-689-9460	**Area:** Sabina Gold - Back River Project
Requestor:		**Additional contact:** Fiona Hodge

Please check applicable boxes for routine analysis; for specialty work, provide a detailed description of parameters required or phone customer service rep. Levi Manchak @ (780) 468-3536 to discuss testing procedures.

Analysis completion requirement (surcharge may apply for priority analysis)
PRIORITY 1 (same day turnaround)
PRIORITY 2 (2 days turnaround) or STANDARD (5 days turnaround)
specify DUE ON DATE

Sample identification or location (LSD)	Sample Point	Sampling Start Date	Sampling End Date	Priority	SO2	H2S	NO2	O3	NOx	PM 10	PM 2.5	Dustfall	TSP						
SO2	Back River DF1	26/Aug/2011	Sept, 18, 2011	Standard	x														
SO2 duplicate	Back River DF1	26/Aug/2011	Sept 18, 2011	Standard	x														
NO2	Back River DF1	26/Aug/2011	Sept 18 2011	Standard			x												
NO2 duplicate	Back River DF1	26/Aug/2011	Sept 18 2011	Standard			x												
O3	Back River DF1	26/Aug/2011	Sept 18 2011	Standard				x											
O3 duplicate	Back River DF1	26/Aug/2011	Sept 18 2011	Standard				x											
SO2 blank	kept in Goose Lake			Standard	x														
NO2 blank	kept in Goose Lake			Standard			x												
O3 blank	kept in Goose Lake			Standard				x											

Other analysis:

Results to be reported to:

Name:

Fax:

e-mail:

Do you require a confirmation of receipt of samples? Yes

Email/Fax #/Phone #:

Maxxam to complete *Date received:* *Received By:*

Appendix 3
2012 Back River Dustfall Results

RESCAN ENVIRONMENTAL SERVICES
ATTN: Jem Morrison
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 30-JUL-12
Report Date: 09-AUG-12 14:54 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: **L1186348**

Project P.O. #: NOT SUBMITTED
Job Reference: 0833-002-08
C of C Numbers: 10-253966
Legal Site Desc: BACK RIVER

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1186348-1	L1186348-2	L1186348-3	L1186348-4	L1186348-5
	Sample ID	L1186348-1	L1186348-2	L1186348-3	L1186348-4	L1186348-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	18-JUL-12	18-JUL-12	18-JUL-12	18-JUL-12	17-JUL-12
	Sampled Time					
	Client ID	BRDF 6 (JUNE 17-JULY 18)	BRDF 7 (JUNE 17-JULY 18)	BRDF 8 (JUNE 17-JULY 18)	BRDF 9 (JUNE 17-JULY 18)	BRDF 10 (JUNE 17-JULY 17)
Grouping	**Analyte**					
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	0.25	0.33	0.39	0.26	0.46
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	<0.10	<0.10
	Total Soluble Dustfall (mg/dm2.day)	0.24	0.30	0.36	0.23	0.43
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000056	0.000280	0.000082	0.000177	0.000320
	Antimony (Sb)-Total (mg/dm2.day)	<0.00000074	<0.00000074	<0.00000098	<0.00000086	<0.00000074
	Arsenic (As)-Total (mg/dm2.day)	0.00000089	0.00000098	0.00000128	<0.00000086	0.00000309
	Barium (Ba)-Total (mg/dm2.day)	0.00000862	0.0000106	0.0000216	0.0000225	0.0000195
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000037	<0.0000037	<0.0000049	<0.0000043	<0.0000037
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000037	<0.0000037	<0.0000049	<0.0000043	<0.0000037
	Boron (B)-Total (mg/dm2.day)	<0.000074	<0.000074	<0.000098	<0.000086	<0.000074
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000037	0.00000047	0.00000050	<0.00000043	0.00000163
	Calcium (Ca)-Total (mg/dm2.day)	0.00147	0.00180	0.00177	0.00222	0.00218
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000037	0.0000046	<0.0000049	<0.0000043	<0.0000037
	Cobalt (Co)-Total (mg/dm2.day)	<0.00000074	<0.00000074	<0.00000098	<0.00000086	0.00000125
	Copper (Cu)-Total (mg/dm2.day)	DLB <0.00018	DLB <0.00026	DLB <0.00020	DLB <0.00034	DLB <0.00018
	Iron (Fe)-Total (mg/dm2.day)	<0.00022	0.00091	<0.00029	<0.00026	0.00049
	Lead (Pb)-Total (mg/dm2.day)	DLB <0.000052	DLB <0.000059	DLB <0.000034	DLB <0.000039	DLB <0.000022
	Lithium (Li)-Total (mg/dm2.day)	<0.000037	<0.000037	<0.000049	<0.000043	<0.000037
	Magnesium (Mg)-Total (mg/dm2.day)	0.00120	0.00141	0.00148	0.00086	0.00170
	Manganese (Mn)-Total (mg/dm2.day)	0.0000261	0.0000376	0.0000348	0.0000779	0.0000452
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000037	<0.00000037	<0.00000049	<0.00000043	<0.00000037
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000037	<0.00000037	<0.00000049	<0.00000043	<0.00000037
	Nickel (Ni)-Total (mg/dm2.day)	DLB <0.000055	DLB <0.000033	DLB <0.000059	DLB <0.000026	DLB <0.000011
	Phosphorus (P)-Total (mg/dm2.day)	0.0052	0.0063	0.0090	0.0032	0.0077
	Potassium (K)-Total (mg/dm2.day)	<0.015	<0.015	<0.020	<0.017	0.015
	Selenium (Se)-Total (mg/dm2.day)	<0.0000074	<0.0000074	<0.0000098	<0.0000086	<0.0000074
	Silicon (Si)-Total (mg/dm2.day)	<0.00037	0.00053	<0.00049	<0.00043	0.00053
	Silver (Ag)-Total (mg/dm2.day)	DLB <0.00000015	DLB <0.00000029	DLB <0.00000020	DLB <0.00000026	DLB <0.00000015
	Sodium (Na)-Total (mg/dm2.day)	<0.015	<0.015	<0.020	<0.017	<0.015
	Strontium (Sr)-Total (mg/dm2.day)	0.00000456	0.00000642	0.00000665	0.0000197	0.0000102
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000074	<0.00000074	<0.00000098	<0.00000086	<0.00000074
	Tin (Sn)-Total (mg/dm2.day)	<0.00000074	<0.00000074	<0.00000098	<0.00000086	0.00000093
	Titanium (Ti)-Total (mg/dm2.day)	<0.000074	<0.000074	<0.000098	<0.000086	<0.000074
	Uranium (U)-Total (mg/dm2.day)	<0.000000074	<0.000000074	<0.000000098	<0.000000086	<0.000000074
	Vanadium (V)-Total (mg/dm2.day)	<0.0000074	<0.0000074	<0.0000098	<0.0000086	<0.0000074
	Zinc (Zn)-Total (mg/dm2.day)	DLB <0.00011	DLB <0.00011	DLB <0.000088	DLB <0.00010	DLB <0.00011

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1186348-6
	Description	WATER
	Sampled Date	17-JUL-12
	Sampled Time	
	Client ID	BRDF 11 (JUNE 17-JULY 17)
Grouping	**Analyte**	
DUSTFALL		
Particulates	Total Dustfall (mg/dm2.day)	0.38
	Total Insoluble Dustfall (mg/dm2.day)	0.16
	Total Soluble Dustfall (mg/dm2.day)	0.21
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000128
	Antimony (Sb)-Total (mg/dm2.day)	<0.00000074
	Arsenic (As)-Total (mg/dm2.day)	<0.00000074
	Barium (Ba)-Total (mg/dm2.day)	0.0000228
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000037
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000037
	Boron (B)-Total (mg/dm2.day)	<0.000074
	Cadmium (Cd)-Total (mg/dm2.day)	0.00000046
	Calcium (Ca)-Total (mg/dm2.day)	0.00154
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000037
	Cobalt (Co)-Total (mg/dm2.day)	<0.00000074
	Copper (Cu)-Total (mg/dm2.day)	DLB <0.00015
	Iron (Fe)-Total (mg/dm2.day)	<0.00022
	Lead (Pb)-Total (mg/dm2.day)	DLB <0.000015
	Lithium (Li)-Total (mg/dm2.day)	<0.000037
	Magnesium (Mg)-Total (mg/dm2.day)	<0.00074
	Manganese (Mn)-Total (mg/dm2.day)	0.0000181
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000037
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000037
	Nickel (Ni)-Total (mg/dm2.day)	DLB <0.00011
	Phosphorus (P)-Total (mg/dm2.day)	<0.0022
	Potassium (K)-Total (mg/dm2.day)	<0.015
	Selenium (Se)-Total (mg/dm2.day)	<0.0000074
	Silicon (Si)-Total (mg/dm2.day)	<0.00037
	Silver (Ag)-Total (mg/dm2.day)	DLB <0.00000015
	Sodium (Na)-Total (mg/dm2.day)	<0.015
	Strontium (Sr)-Total (mg/dm2.day)	0.0000102
	Thallium (Tl)-Total (mg/dm2.day)	<0.00000074
	Tin (Sn)-Total (mg/dm2.day)	<0.00000074
	Titanium (Ti)-Total (mg/dm2.day)	<0.000074
	Uranium (U)-Total (mg/dm2.day)	<0.000000074
	Vanadium (V)-Total (mg/dm2.day)	<0.0000074
	Zinc (Zn)-Total (mg/dm2.day)	DLB <0.000088

* 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**
DUSTFALLS-COM-DM2-VA	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE

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.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-DUST(DM2-CVAFS-VA	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).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-DUST(DM2)-ICP-VA	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).

ALS Test Code	Matrix	Test Description	Method Reference**
MET-DUST(DM2)-MS-VA	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:

10-253966

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.

10-253966

L1186348-COFC

ALS Enviro

Chain of Custody / Analytical Request Form
~~Canada Toll Free: 1 800 668 9878~~
www.alsglobal.com

Report To		Report Format / Distribution	Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
Company:	RESCAN ENV. SERVICES	Standard: Other (specify):	Regular (Standard Turnaround Times - Business Days)
Contact:	1111 West Hastings (JEM MORRISON)	Select: PDF ✓ Excel ✓ Digital Fax	Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address:	Vancouver BC V6E 2J3	Email 1: jmorrison@rescan.com	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
		Email 2: dcasanova@rescan.com	Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone: 604-689-9460	Fax: 604-687-4277		Analysis Request
Invoice To	Same as Report? (circle) Yes or No (if No, provide details)	Client / Project Information	(Indicate Filtered or Preserved, F/P)
	Copy of Invoice with Report? (circle) Yes or No	Job #: 0833-002-08	
Company:	Daniela Shciopu	PO / AFE:	
Contact:	accountspayable@rescan.com	LSD: Back River	
Address:			
Phone:	Fax:	Quote #:	
Lab Work Order # (lab use only)	L1186348	ALS Contact: Amber Springer; Sampler: SM	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Particulate	Total Metals											Number of Containers
1	BROF 6	17/JUN/12		Water	X												
	BROF 6	↓		↓		X											
2	BROF 7				X												
	" 7					X											
3	" 8				X												
	" 8					X											
4	" 9				X												
	" 9					X											
5	" 10				X												
	" 10					X											
6	" 11				X												
	" 11					X											

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

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.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Jem Morrison	Date: July 19/2012	Time: 9 AM	Received by: [signature]	Date: July 30	Time: 13:15	Temperature: 19.7 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY — GENF 18.01 Front

RESCAN ENVIRONMENTAL SERVICES
ATTN: Jem Morrison
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 22-AUG-12
Report Date: 05-SEP-12 16:42 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #:	**L1198177**
Project P.O. #:	NOT SUBMITTED
Job Reference:	0833-002-09
C of C Numbers:	10-253969
Legal Site Desc:	

Amber Springer

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1198177-1	L1198177-2	L1198177-3	L1198177-4	L1198177-5
	Sample ID	L1198177-1	L1198177-2	L1198177-3	L1198177-4	L1198177-5
	Description	dustfall	dustfall	dustfall	dustfall	dustfall
	Sampled Date	18-AUG-12	18-AUG-12	18-AUG-12	18-AUG-12	17-AUG-12
	Sampled Time	14:00	14:30	15:00	15:30	16:00
	Client ID	BRDF6 (18-JUL-12~18-AUG-12)	BRDF7 (18-JUL-12~18-AUG-12)	BRDF8 (18-JUL-12~18-AUG-12)	BRDF9 (18-JUL-12~18-AUG-12)	BRDF10 (18-JUL-12~18-AUG-12)
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	0.39	0.57	0.25	<0.10	0.54
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	<0.10	0.40
	Total Soluble Dustfall (mg/dm2.day)	0.38	0.56	0.25	<0.10	0.14
Anions and Nutrients	Ammonia, Total (as N) (mg/dm2.day)	<0.00027	<0.00027	<0.00026	<0.00027	0.00304
	Chloride (Cl) (mg/dm2.day)	0.0371	0.0396	0.0305	0.0080	0.0148
	Nitrate (as N) (mg/dm2.day)	0.000925	0.00126	0.000914	0.000311	0.000273
	Sulfate (SO4) (mg/dm2.day)	<0.0055	<0.0055	<0.0052	<0.0055	<0.0066
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000388	0.000062	0.000086	0.000082	0.00166
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000011	<0.0000011	<0.0000011	<0.0000011	<0.0000011
	Arsenic (As)-Total (mg/dm2.day)	<0.0000011	<0.0000011	<0.0000011	<0.0000011	0.0000131
	Barium (Ba)-Total (mg/dm2.day)	0.0000208	0.00000614	0.00000632	0.00000666	0.0000131
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000056	<0.0000056	<0.0000056	<0.0000056	<0.0000056
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000056	<0.0000056	<0.0000056	<0.0000056	<0.0000056
	Boron (B)-Total (mg/dm2.day)	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000056	<0.00000056	<0.00000056	0.00000076	0.00000517
	Calcium (Ca)-Total (mg/dm2.day)	0.00131	0.00096	0.00128	0.00199	0.00463
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000056	<0.0000056	<0.0000056	<0.0000056	0.0000087
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000011	<0.0000011	<0.0000011	<0.0000011	0.0000050
	Copper (Cu)-Total (mg/dm2.day)	0.000238	0.000234	0.000218	0.000227	0.000222
	Iron (Fe)-Total (mg/dm2.day)	0.00064	<0.00033	<0.00033	<0.00033	0.00281
	Lead (Pb)-Total (mg/dm2.day)	0.0000169	DLB <0.0000045	0.0000333	DLB <0.0000045	0.00000842
	Lithium (Li)-Total (mg/dm2.day)	<0.000056	<0.000056	<0.000056	<0.000056	<0.000056
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0011	<0.0011	<0.0011	<0.0011	0.0065
	Manganese (Mn)-Total (mg/dm2.day)	0.0000300	0.0000106	0.0000188	0.0000163	0.000103
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000056	<0.00000056	<0.00000056	<0.00000056	<0.00000056
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000056	<0.00000056	<0.00000056	<0.00000056	<0.00000056
	Nickel (Ni)-Total (mg/dm2.day)	0.0000339	0.0000108	0.0000060	<0.0000056	0.0000074
	Phosphorus (P)-Total (mg/dm2.day)	<0.0033	<0.0033	<0.0033	0.0040	0.0335
	Potassium (K)-Total (mg/dm2.day)	<0.022	<0.022	<0.022	<0.022	0.038
	Selenium (Se)-Total (mg/dm2.day)	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
	Silicon (Si)-Total (mg/dm2.day)	0.00098	<0.00056	<0.00056	<0.00056	0.00225
	Silver (Ag)-Total (mg/dm2.day)	0.00000012	<0.00000011	<0.00000011	<0.00000011	<0.00000011
	Sodium (Na)-Total (mg/dm2.day)	<0.022	<0.022	<0.022	<0.022	<0.022
	Strontium (Sr)-Total (mg/dm2.day)	DLB <0.0000078	DLB <0.0000045	DLB <0.0000056	DLB <0.0000078	0.0000157
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000011	<0.0000011	<0.0000011	<0.0000011	<0.0000011
	Tin (Sn)-Total (mg/dm2.day)	<0.0000011	<0.0000011	<0.0000011	<0.0000011	<0.0000011
	Titanium (Ti)-Total (mg/dm2.day)	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1198177-1	L1198177-2	L1198177-3	L1198177-4	L1198177-5
	Description	dustfall	dustfall	dustfall	dustfall	dustfall
	Sampled Date	18-AUG-12	18-AUG-12	18-AUG-12	18-AUG-12	17-AUG-12
	Sampled Time	14:00	14:30	15:00	15:30	16:00
	Client ID	BRDF6 (18-JUL-12~18-AUG-12)	BRDF7 (18-JUL-12~18-AUG-12)	BRDF8 (18-JUL-12~18-AUG-12)	BRDF9 (18-JUL-12~18-AUG-12)	BRDF10 (18-JUL-12~18-AUG-12)
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.00000011	<0.00000011	<0.00000011	<0.00000011	<0.00000011
	Vanadium (V)-Total (mg/dm2.day)	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
	Zinc (Zn)-Total (mg/dm2.day)	0.000104	0.000046	0.000067	0.000065	0.000159

* 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**
CL-IC-VA	Dustfall	Dustfall Chloride 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 chloride analysis is specifcially 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".

DUSTFALLS-COM-DM2-VA	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE

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.

HG-DUST(DM2-CVAFS-VA	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).

MET-DUST(DM2)-ICP-VA	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).

MET-DUST(DM2)-MS-VA	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).

NH3-F-VA	Dustfall	Dustfall Ammonia by Fluorescence	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 ammonia analysis is specifcially 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.

NO3-IC-VA	Dustfall	Dustfall Nitrate 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 nitrate analysis is specifcially 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".

SO4-IC-VA	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 specifcially 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:

10-253969

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.

10-253969

ALS Environmental

Chain of Custody / Analytical Request Form

~~Canada Toll Free: 1 800 668 9878~~

www.alsglobal.com

Page 1 of 1

Report To	
Company:	Rescan
Contact:	~~1111 West Hastin~~ Jem Morrison
Address:	1111 West Hastings, Vancouver V6E 2S3
Phone:	604-689-9460 Fax:
Invoice To	Same as Report ? (circle) Yes or No (if No, provide details)
	Copy of Invoice with Report? (circle) Yes or No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
Standard: ✓	Other (specify):
Select: PDF ✓ Excel ✓ Digital Fax	
Email 1:	
Email 2:	
Client / Project Information	
Job #:	0883-002-09
PO / AFE:	
LSD:	
Quote #:	
ALS Contact: A. Springer	Sampler: C. Pin

Service Request: (Rush subject to availability - Contact ALS to confirm TAT)

- ✓ Regular (Standard Turnaround Times - Business Days)
- Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
- Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
- Same Day or Weekend Emergency - Contact ALS to confirm TAT

Analysis Request

(Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Number of Containers
	BRDF6	18 Aug 2012	2:00 PM	2500 ml Plastic	2
	BRDF7	↓	2:30 PM	↓	2
	BRDF8	↓	3:00 PM	↓	2
	BRDF9	↓	3:30 PM	↓	2
	BRDF10	17 Aug 2012	4:00 PM	↓	2

L1198177-COFC

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

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.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: C. Pin	Date: 20 Aug 12'	Time: 12:00 PM	Received by: Brittany	Date: Aug. 22	Time: 12:25	Temperature: 17.0 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

RESCAN ENVIRONMENTAL SERVICES
ATTN: Jem Morrison
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 20-SEP-12
Report Date: 12-OCT-12 16:00 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: **L1212095**

Project P.O. #: NOT SUBMITTED
Job Reference: 0833-002-09
C of C Numbers: 1
Legal Site Desc:

Amber Springer

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1212095-1	L1212095-2	L1212095-3	L1212095-4	L1212095-5
	Description	Dustfall	Dustfall	Dustfall	Dustfall	Dustfall
	Sampled Date	17-SEP-12	17-SEP-12	17-SEP-12	17-SEP-12	17-SEP-12
	Sampled Time					
	Client ID	BRDF6 (AUG 18 TO SEP 17)	BRDF7 (AUG 18 TO SEP 17)	BRDF8 (AUG 18 TO SEP 17)	BRDF9 (AUG 18 TO SEP 17)	BRDF10 (AUG 18 TO SEP 17)
Grouping	**Analyte**					
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	0.18	0.19
	Total Insoluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	<0.10	<0.11
	Total Soluble Dustfall (mg/dm2.day)	<0.10	<0.10	<0.10	0.18	0.17
Anions and Nutrients	Ammonia, Total (as N) (mg/dm2.day)	0.000226	0.000120	0.000523	0.000597	0.00049
	Chloride (Cl) (mg/dm2.day)	0.0164	<0.0055	0.0285	0.0390	0.051
	Nitrate (as N) (mg/dm2.day)	0.000603	0.000488	0.000555	0.000624	0.00062
	Sulfate (SO4) (mg/dm2.day)	<0.0055	<0.0055	<0.0056	<0.0068	<0.011
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000089	0.000043	0.000126	0.000063	0.000446
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	<0.0000012	<0.0000018
	Arsenic (As)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	<0.0000012	0.0000025
	Barium (Ba)-Total (mg/dm2.day)	0.00000690	0.00000586	0.00000777	0.00000666	0.0000103
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000058	<0.0000058	<0.0000058	<0.0000058	<0.0000091
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000058	<0.0000058	<0.0000058	<0.0000058	<0.0000091
	Boron (B)-Total (mg/dm2.day)	<0.00012	<0.00012	<0.00012	<0.00012	<0.00018
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000058	<0.00000058	<0.00000058	<0.00000058	<0.00000091
	Calcium (Ca)-Total (mg/dm2.day)	0.00116	0.00152	0.00092	0.00115	0.00240
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000058	<0.0000058	<0.0000058	<0.0000058	<0.0000091
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	<0.0000012	<0.0000018
	Copper (Cu)-Total (mg/dm2.day)	0.000767	0.000281	0.000270	0.000173	0.000145
	Iron (Fe)-Total (mg/dm2.day)	<0.00035	<0.00035	<0.00035	<0.00035	<0.00054
	Lead (Pb)-Total (mg/dm2.day)	0.0000148	0.00000819	0.0000174	DLB <0.0000046	DLB <0.0000045
	Lithium (Li)-Total (mg/dm2.day)	<0.000058	<0.000058	<0.000058	<0.000058	<0.000091
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0012	<0.0012	<0.0012	<0.0012	<0.0018
	Manganese (Mn)-Total (mg/dm2.day)	0.0000140	0.0000143	0.0000160	0.0000150	0.0000227
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000058	<0.00000058	<0.00000058	<0.00000058	<0.00000091
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000058	<0.00000058	<0.00000058	<0.00000058	<0.00000091
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000058	<0.0000058	0.0000065	0.0000115	<0.0000091
	Phosphorus (P)-Total (mg/dm2.day)	<0.0035	<0.0035	<0.0035	<0.0035	<0.0054
	Potassium (K)-Total (mg/dm2.day)	<0.023	<0.023	<0.023	<0.023	<0.036
	Selenium (Se)-Total (mg/dm2.day)	<0.000012	<0.000012	<0.000012	<0.000012	<0.000018
	Silicon (Si)-Total (mg/dm2.day)	<0.00058	<0.00058	<0.00058	<0.00058	<0.00091
	Silver (Ag)-Total (mg/dm2.day)	0.00000018	<0.00000012	<0.00000012	<0.00000012	<0.00000018
	Sodium (Na)-Total (mg/dm2.day)	<0.023	<0.023	<0.023	<0.023	<0.036
	Strontium (Sr)-Total (mg/dm2.day)	DLB <0.0000043	DLB <0.0000043	DLB <0.0000035	DLB <0.0000039	DLB <0.0000060
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	<0.0000012	<0.0000018
	Tin (Sn)-Total (mg/dm2.day)	<0.0000012	<0.0000012	<0.0000012	<0.0000012	<0.0000018
	Titanium (Ti)-Total (mg/dm2.day)	<0.00012	<0.00012	<0.00012	<0.00012	<0.00018

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1212095-6				
	Description	Dustfall				
	Sampled Date	17-SEP-12				
	Sampled Time					
	Client ID	BRDF11 (AUG 18 TO SEP 17)				
Grouping	**Analyte**					
DUSTFALL						
Particulates	Total Dustfall (mg/dm2.day)	0.25				
	Total Insoluble Dustfall (mg/dm2.day)	<0.12				
	Total Soluble Dustfall (mg/dm2.day)	0.25				
Anions and Nutrients	Ammonia, Total (as N) (mg/dm2.day)	0.000309				
	Chloride (Cl) (mg/dm2.day)	0.0505				
	Nitrate (as N) (mg/dm2.day)	0.000495				
	Sulfate (SO4) (mg/dm2.day)	<0.0069				
Metals	Aluminum (Al)-Total (mg/dm2.day)	0.000071				
	Antimony (Sb)-Total (mg/dm2.day)	<0.0000014				
	Arsenic (As)-Total (mg/dm2.day)	<0.0000014				
	Barium (Ba)-Total (mg/dm2.day)	DLB <0.0000048				
	Beryllium (Be)-Total (mg/dm2.day)	<0.0000069				
	Bismuth (Bi)-Total (mg/dm2.day)	<0.0000069				
	Boron (B)-Total (mg/dm2.day)	<0.00014				
	Cadmium (Cd)-Total (mg/dm2.day)	<0.00000069				
	Calcium (Ca)-Total (mg/dm2.day)	0.00129				
	Chromium (Cr)-Total (mg/dm2.day)	<0.0000069				
	Cobalt (Co)-Total (mg/dm2.day)	<0.0000014				
	Copper (Cu)-Total (mg/dm2.day)	0.000327				
	Iron (Fe)-Total (mg/dm2.day)	<0.00041				
	Lead (Pb)-Total (mg/dm2.day)	0.00000860				
	Lithium (Li)-Total (mg/dm2.day)	<0.000069				
	Magnesium (Mg)-Total (mg/dm2.day)	<0.0014				
	Manganese (Mn)-Total (mg/dm2.day)	0.00000971				
	Mercury (Hg)-Total (mg/dm2.day)	<0.00000069				
	Molybdenum (Mo)-Total (mg/dm2.day)	<0.00000069				
	Nickel (Ni)-Total (mg/dm2.day)	<0.0000069				
	Phosphorus (P)-Total (mg/dm2.day)	<0.0041				
	Potassium (K)-Total (mg/dm2.day)	<0.028				
	Selenium (Se)-Total (mg/dm2.day)	<0.000014				
	Silicon (Si)-Total (mg/dm2.day)	<0.00069				
	Silver (Ag)-Total (mg/dm2.day)	<0.00000014				
	Sodium (Na)-Total (mg/dm2.day)	<0.028				
	Strontium (Sr)-Total (mg/dm2.day)	DLB <0.0000083				
	Thallium (Tl)-Total (mg/dm2.day)	<0.0000014				
	Tin (Sn)-Total (mg/dm2.day)	<0.0000014				
	Titanium (Ti)-Total (mg/dm2.day)	<0.00014				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1212095-1	L1212095-2	L1212095-3	L1212095-4	L1212095-5
	Description	Dustfall	Dustfall	Dustfall	Dustfall	Dustfall
	Sampled Date	17-SEP-12	17-SEP-12	17-SEP-12	17-SEP-12	17-SEP-12
	Sampled Time					
	Client ID	BRDF6 (AUG 18 TO SEP 17)	BRDF7 (AUG 18 TO SEP 17)	BRDF8 (AUG 18 TO SEP 17)	BRDF9 (AUG 18 TO SEP 17)	BRDF10 (AUG 18 TO SEP 17)
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.00000012	<0.00000012	<0.00000012	<0.00000012	<0.00000018
	Vanadium (V)-Total (mg/dm2.day)	<0.000012	<0.000012	<0.000012	<0.000012	<0.000018
	Zinc (Zn)-Total (mg/dm2.day)	0.000091	0.000048	0.000069	0.000082	0.000099

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1212095-6				
	Description	Dustfall				
	Sampled Date	17-SEP-12				
	Sampled Time					
	Client ID	BRDF11 (AUG 18 TO SEP 17)				
Grouping	**Analyte**					
DUSTFALL						
Metals	Uranium (U)-Total (mg/dm2.day)	<0.00000014				
	Vanadium (V)-Total (mg/dm2.day)	<0.000014				
	Zinc (Zn)-Total (mg/dm2.day)	0.000068				

* 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**
CL-IC-VA	Dustfall	Dustfall Chloride 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 chloride analysis is specifcially 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".

DUSTFALLS-COM-DM2-VA	Dustfall	Combined Dustfalls-Total, soluble, insol	BCMOE PARTICULATE

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.

HG-DUST(DM2-CVAFS-VA	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).

MET-DUST(DM2)-ICP-VA	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).

MET-DUST(DM2)-MS-VA	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).

NH3-F-VA	Dustfall	Dustfall Ammonia by Fluorescence	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 ammonia analysis is specifcially 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.

NO3-IC-VA	Dustfall	Dustfall Nitrate 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 nitrate analysis is specifcially 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".

SO4-IC-VA	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 specifcially 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, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

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.

ALS Environmental

L1212095-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Rescan Environmental Services
Contact:	Jem Morrison
Address:	1111 West Hastings Street, Vancouver, B.C. V6E 2J3
Phone:	6046899430 Fax: 6046874277
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☑ Yes ☐ No
Company:	Rescan Environmental Services
Contact:	Accounts Payable
Address:	1111 West Hastings Street, Vancouver, B.C. V6E 2J3
Phone:	(604) 689-9560 Fax: (604) 689-9460
Lab Work Order # (lab use only)	L1212095 ☑ No

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	cho@rescan.com
Email 2:	dshaw@rescan.com
Email 3:	
Client / Project Information	
Job #:	0833-002-09
PO / AFE:	
LSD:	
Quote #:	
ALS Contact:	Amber Springer
Sampler:	Chris Ho

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (Install) (dd-mmm-yy)	Date (Retrieval) (dd-mmm-yy)	Sample Type	Total Particulate	Soluble particulate	Insoluble particulate	Sulphate	Nitrate	NH3, NH4	Cl	Total Metals	Mg+	Ca+	K+		Number of Containers
	BRDF6-Rep1-Y	18-Aug-12	17-Sep-12	Water	X	X	X	X	X	X	X						1
	BRDF6-Rep2-Y	18-Aug-12	17-Sep-12	Water								X	X	X	X		1
	BRDF7-Rep1-Y (On their side in original	18-Aug-12	17-Sep-12	Water	X	X	X	X	X	X	X						1
	BRDF7-Rep2-Y } packing. Repacked in YW.	18-Aug-12	17-Sep-12	Water								X	X	X	X		1
	BRDF8-Rep1-Y	18-Aug-12	17-Sep-12	Water	X	X	X	X	X	X	X						1
	BRDF8-Rep2-Y	18-Aug-12	17-Sep-12	Water								X	X	X	X		1
	BRDF9-Rep1-Y	18-Aug-12	17-Sep-12	Water	X	X	X	X	X	X	X						1
	BRDF9-Rep2-Y	18-Aug-12	17-Sep-12	Water								X	X	X	X		1
	BRDF10-Rep1-Y	17-Aug-12	12-Sep-12	Water	X	X	X	X	X	X	X						1
	BRDF10-Rep2-Y	17-Aug-12	12-Sep-12	Water								X	X	X	X		1
	BRDF11-Rep1-Y (to be split in two for Total Metals/Mg+/Ca+/K+?)	17-Aug-12	11-Sep-12	Water	X	X	X	X	X	X	X						1
	BRDF11-Rep2-Y (Gone missing)	17-Aug-12	Missing	Water								X	X	X	X		1

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

Plus 2X unused DF bottles

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: Chris Ho	Date (dd-mmm-yy) 19-Sep-12	Time (hh-mm)	Received by: [signature]	Date: 9/19/12	Time: 15:00	Temperature: 19 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 18.01 Front

Appendix 4
2012 Passive Air Contaminant Sampling Results

Your Project #: 0833-002-08
Site Location: BACK RIVER, NT

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2012/08/22

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B263292
Received: 2012/07/20, 10:41

Sample Matrix: Air
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	3	2012/07/25	2012/08/22	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	3	2012/07/25	2012/08/22	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	3	2012/07/25	2012/08/22	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		DZ2636	DZ2703	DZ2704		
Sampling Date		2012/07/07	2012/06/17	2012/06/17		
	UNITS	**BRDF9**	**BRDF10**	**BRDF11**	**RDL**	**QC Batch**
Passive Monitoring						
Calculated NO2	ppb	<0.1	0.6	DAMAGED	0.1	6033396
Calculated O3	ppb	25.6	25.7	28.1	0.1	6034609
Calculated SO2	ppb	0.5	<0.1	<0.1	0.1	6033553

RDL = Reportable Detection Limit

General Comments

Sample DZ2704-01: NO2 sample from station BRDF11 (DZ2704) received to the lab damaged (no NO2 powder in the body, and no barrier). SS

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
6033396	Calculated NO2	2012/07/25	96	N/A	<0.1	ppb	101	76 - 118
6033553	Calculated SO2	2012/07/25	100	N/A	<0.1	ppb	101	95 - 105
6034609	Calculated O3	2012/07/25	103	N/A	<0.1	ppb	99	91 - 107

N/A = Not Applicable

Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B263292

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Linda Lin, Supervisor, Centre for Passive Sampling Technology

===

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

6744 - 50 St. Edmonton AB
tel: 780-378-8500 fax: 780-378-8699

SAMPLE ANALYSIS REQUEST FORM

INVOICE TO:
Attn: Accounts Payable
Rescan Environmental Services Ltd.
1111 W. Hastings St.
Vancouver BC V6E 2J3

REPORT TO:
Jeremy Morrison - jmorrison@rescan.com

ADDITIONAL REPORT(S) TO:

Rescan - Sabina Back River

Company Name:	Rescan	**Phone:**	(604) 689-9460	**Site/Area Name & LSD:**	Back River ~~Hay River~~
Requestor:	Jeremy Morrison	**Additional Contact:**		**Project Name/Number:**	~~Pine Point - 1070-002-02~~ 0833-002-08

Please check applicable boxes for routine analysis; for specialty work, provide a detailed description of parameters required or phone Project Manager: Levi Manchak @ (780) 468-3536 to discuss testing procedures.

Please indicate analysis completion requirement date (surcharge may apply for priority analysis)

Sample identification or location (LSD)	Sampling Start Date (DD/MM/YYYY)	Time (HH:MM)	Sampling End Date (DD/MM/YYYY)	Time (HH:MM)	SO2	H2S	NO2	O3	NOx	PM 2.5	PM10	TSP	Metal Scan	Dustfall	VOC
~~BRDF9~~	~~16/06/12~~	~~18~~	18/07												
BRDF9	07/07/12		18/07/12		✓										
BRDF9	07/07/12		18/07/12			✓									
BRDF9	07/07/12		18/07/12				✓								
BRDF10	17/06/12		17/07/12		✓										
BRDF10	17/06/12		17/07/12			✓									
BRDF10	17/06/12		17/07/12				✓								
BRDF11	17/06/12		17/07/12		✓										
BRDF11	17/06/12		17/07/12			✓									
BRDF11	17/06/12		17/07/12				✓								
Feild Blanks,															

Analysis

Extra Notes/Instructions:

Additional Information (Project #, PO#, etc.)

Maxxam to complete *Date received:* *Received By:*

Your Project #: 0833-002-08
Site Location: BACK RIVER, NT

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2012/08/29

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B274523
Received: 2012/08/22, 12:41

Sample Matrix: Air
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2012/08/24	2012/08/24	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	3	2012/08/28	2012/08/29	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	3	2012/08/24	2012/08/24	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B274523
Report Date: 2012/08/29

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 0833-002-08
Site Location: BACK RIVER, NT

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		EG5456	EG5457	EG5458		
Sampling Date		2012/07/17	2012/07/17	2012/07/17		
	UNITS	**BRDF9**	**BRDF10**	**BRDF11**	**RDL**	**QC Batch**
Passive Monitoring						
Calculated NO2	ppb	<0.1	<0.1		0.1	6112588
Calculated O3	ppb	20.6	21.4	21.6	0.1	6122728
Calculated SO2	ppb	<0.1	0.1	<0.1	0.1	6112645

RDL = Reportable Detection Limit

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
6112588	Calculated NO2	2012/08/24	96	N/A	<0.1	ppb	98	76 - 118
6112645	Calculated SO2	2012/08/24	99	N/A	<0.1	ppb	101	95 - 105
6122728	Calculated O3	2012/08/28	100	N/A	<0.1	ppb	100	91 - 107

N/A = Not Applicable

Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Validation Signature Page

Maxxam Job #: B274523

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Carmen Toker, CT, Manager Air Laboratory Services

==

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Maxxam

6744 - 50 St. Edmonton AB
tel: 780-378-8500 fax: 780-378-8699

SAMPLE ANALYSIS REQUEST FORM

INVOICE TO:
Attn: Accounts Payable
Rescan Environmental Services Ltd.
1111 W. Hastings St.
Vancouver BC V6E 2J3

REPORT TO:
Jeremy Morrison - jmorrison@rescan.com

ADDITIONAL REPORT(S) TO:

Rescan - Sabina Back River

Company Name:	Rescan	**Phone:**	(604) 689-9460	**Site/Area Name & LSD:**	Hay River
Requestor:	Jeremy Morrison	**Additional Contact:**		**Project Name/Number:**	0833-002-09

Please check applicable boxes for routine analysis; for specialty work, provide a detailed description of parameters required or phone Project Manager: Levi Manchak @ (780) 468-3536 to discuss testing procedures.

Please indicate analysis completion requirement date (surcharge may apply for priority analysis)

Sample identification or location (LSD)	Sampling Start Date (DD/MM/YYYY)	Time (HH:MM)	Sampling End Date (DD/MM/YYYY)	Time (HH:MM)	SO2	H2S	NO2	O3	NOx	PM 2.5	PM10	TSP	Metal Scan	Dustfall	VOC	
BRDF10	July 17, 2012	2:00 PM	Aug 17, 2012	4:00 PM	X		X	X								
BRDF9	July 17, 2012	3:00 PM	Aug 18 2012	3:00 PM	X		X	X								
BRDF11	July 17, 2012	2:30 PM	Aug 17, 2012	4:30 PM	X			X								

Analysis

Extra Notes/Instructions:
BRDF11 is missing NO2

Additional Information (Project #, PO#, etc.)

Maxxam to complete *Date received:* *Received By:*

Your Project #: 0833-002-08
Site Location: BACK RIVER, NT

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2012/10/03

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B286766
Received: 2012/09/27, 10:41

Sample Matrix: Air
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	3	2012/10/03	2012/10/03	EINDSOP-00148	Tang Passive NO2 in
O3 Passive Analysis (1)	3	2012/10/03	2012/10/03	EINDSOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	3	2012/10/03	2012/10/03	EINDSOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		EO6437	EO6438	EO6439		
Sampling Date		2012/08/18	2012/08/17	2012/08/17		
	UNITS	**BRDF9**	**BRDF10**	**BRDF11**	**RDL**	**QC Batch**
Passive Monitoring						
Calculated NO2	ppb	<0.1	0.4	<0.1	0.1	6223069
Calculated O3	ppb	17.4	17.1	18.4	0.1	6225146
Calculated SO2	ppb	<0.1	<0.1	<0.1	0.1	6223081

RDL = Reportable Detection Limit

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
6223069	Calculated NO2	2012/10/03	97	N/A	<0.1	ppb	99	76 - 118
6223081	Calculated SO2	2012/10/03	100	N/A	<0.1	ppb	100	95 - 105
6225146	Calculated O3	2012/10/03	100	N/A	<0.1	ppb	98	91 - 107

N/A = Not Applicable

Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B286766

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Linda Lin, Supervisor, Centre for Passive Sampling Technology

==

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Maxxam
Analytics Inc

6744 - 50 St. Edmonton AB
tel: 780-378-8500 fax: 780-378-8699

SAMPLE ANALYSIS REQUEST FORM

INVOICE TO: Rescan Environmental Services
Accounts Payable
1111 West Hastings Street
Vancouver, B.C. V6E 2J3
Phone: (604) 689-9460

REPORT TO: Rescan Environmental Services
Jem Morrison

ADDITIONAL REPORT(S) TO:
Chris Ho - cho@rescan.com
Derek Shaw - dshaw@rescan.com
Jem Morrison - jmorrison@rescan.com

Company Name: Rescan Environmental Services	**Phone:** 6046899460	**Site/Area Name & LSD:**	**Melville and Young**
Requestor: Chris Ho	**Additional Contact:**	**Project Name/Number:**	BackRiver 833-002-09

Please check applicable boxes for routine analysis; for specialty work, provide a detailed description of parameters required or phone Project Manager: Levi Manchak @ (780) 468-3536 to discuss testing procedures.

Please indicate analysis completion requirement date (surcharge may apply for priority analysis)

Regular (non-priority) turn-around time (2-3 weeks)

Analysis

Sample identification or location (LSD)	Sampling Start Date (DD/MM/YYYY)	Time (HH:MM)	Sampling End Date (DD/MM/YYYY)	Time (HH:MM)	SO2	H2S	NO2	O3	NOx	PM 2.5	PM10	TSP	Metal Scan	Dustfall	VOC
BRDF9	18/08/2012		17/09/2012		x		x	x							
BRDF11	17/08/2012		11/9/2012		x		x	x							
BRDF10	17/08/2012		12/9/2012		x		x	x							

Extra Notes/Instructions:

Additional Information (Project #, PO#, etc.)

Maxxam to complete *Date received:* 2012/09/24 10:49 *Received By:* ASAD BHATDU

18/16/16 °C
no ice

no custody seal

Appendix V4-1B

Back River Project: 2013 Air Quality Modelling Report

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
2013 Air Quality Modelling Report

Sabina
GOLD & SILVER CORP.

Rescan™ Environmental Services Ltd., an ERM company
Rescan Building, Sixth Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

October 2013

BACK RIVER PROJECT
2013 AIR QUALITY MODELLING REPORT

October 2013
Project #0194096-0040-0001

Citation:
Rescan. 2013. *Back River Project: 2013 Air Quality Modelling Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan™ Environmental Services Ltd., an ERM company
Vancouver, British Columbia

Executive Summary

an ERM company

Executive Summary

An air quality modelling study for the proposed Back River Project (the Project) was completed in order to provide a basis for an air quality effects assessment, which is a required component of the Environmental Impact Statement for the Project.

The air dispersion model CALPUFF was used for the study. Air parameters considered included sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), total suspended particulates (TSP), respirable particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). In addition, dustfall and acid deposition were modelled. Two different modelling domains were assessed, one at the Goose Property Area and one at the George Property Area. An emissions inventory that estimated maximum emissions rates associated with Project activities during the year of highest activity was used as input for the air dispersion model.

Nunavut's ambient air quality standards were used as threshold values for SO_2, NO_2 and TSP concentrations. The Canadian Ambient Air Quality Standards for were used for $PM_{2.5}$. For parameters which are not included in the Government of Nunavut standards, objectives from other jurisdictions were used. The National Ambient Air Quality Objective (NAAQO) maximum desirable CO level was used as a threshold value for CO concentrations. The British Columbia (BC) air quality objectives were used as a reference for PM_{10}. The BC dust deposition guideline was used as a dust deposition threshold and the critical acid deposition load proposed by the World Health Organisation (WHO) was used as an acid deposition threshold. These standards, objectives and guidelines were developed to protect all members of the general public, including sensitive individuals and are therefore conservative in nature.

Maximum 1-hour, 24-hour and annual average SO_2 concentrations were predicted to be well below Nunavut's ambient air quality standards at both the George Property and the Goose Property. Predicted maximum 1-hour and 8-hour average CO concentrations were also well below the corresponding NAAQOs at all locations modelled.

Predicted maximum 1-hour and 24-hour average NO_2 concentrations were below the Nunavut objective at all locations modelled. Predicted maximum annual NO_2 concentrations were all below the objective outside of the Potential Development Area (PDA) for both properties, however there were exceedances predicted within the PDA at both properties. The concentrations at the proposed camp locations were predicted to below the objectives for all averaging periods.

Predicted maximum annual TSP concentrations were all below the objective outside of the PDAs. There were exceedances predicted within the PDAs for both properties, however at the proposed camp locations no exceedances were predicted. Maximum 24-hour average TSP and PM_{10} concentrations exceeded the relevant objectives both inside and outside of the PDAs. At the Goose Property there were exceedances at the proposed camp location. At the George Property there were no exceedances of the PM_{10} objective at the assumed camp location, however there were exceedances of the TSP objective. The model was run for fugitive and non-fugitive sources separately and therefore the contribution from different sources can be assessed. The exceedances were primarily due to fugitive sources only, there were no exceedances outside the PDAs from non-fugitive sources. These exceedances can be attributed to large emissions of dust from open pit mining activities and unpaved road dust generated on the onsite roads. The model has been run assuming no anthropogenic dust control; however mitigation measures such as road watering may be implemented which will significantly reduce the amount of unpaved road dust.

Predicted maximum annual and 24-hour $PM_{2.5}$ concentrations were all below the objective outside of the PDAs at both properties. There were exceedances predicted within the PDAs, however at the proposed camp locations no exceedances were predicted.

Dust deposition rates were predicted to be below the referenced objectives. Predicted maximum annual acid deposition rates were all below the objective outside of the PDAs, however there were exceedances predicted within the PDAs extending approximately 2 km from the mill at the Goose Property and the pits at both the Goose and George Properties.

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BACK RIVER PROJECT
2013 AIR QUALITY MODELLING REPORT

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Acronyms and Abbreviations

Acronyms and Abbreviations

ANFO	Ammonium nitrate/fuel oil
BC	British Columbia
BIPR	Bathurst Inlet Port and Road
CACs	Criteria air contaminants
CCME	Canadian Council of Ministers of the Environment
CO	Carbon monoxide
EC	Environment Canada
eq	Molar equivalent
GNWT	Government of the Northwest Territories
Hp	Horsepower
MM5	Fifth-Generation Penn State/NCAR Mesoscale Model
MMM	Meso-scale Meteorological Model
MOE	Ministry of Environment
NAAQOs	National Ambient Air Quality Objectives
NO_2	Nitrogen dioxide
NO_X	Oxides of nitrogen
NU	Nunavut
NWT	Northwest Territories
O_3	Ozone
P-G	Pasquill-Gifford
PDA	Potential Development Area
$PM_{2.5}$	Fine particulate matter (less than 2.5 µm in diameter)
PM_{10}	Respirable particulate matter (less than 10 µm in diameter)
the Project	the Back River Project
SO_2	sulphur dioxide
TSP	total suspended particulates
US EPA	United States Environmental Protection Agency
US FAA	United States Federal Aviation Administration
VOCs	volatile organic compounds
WRSA	Waste Rock Storage Area
WMO	World Meteorological Organization

1. Introduction

1. Introduction

The Back River Project (the Project) is a proposed gold mine owned by Sabina Gold and Silver Corp. (Sabina) located in the Kitikmeot region of Nunavut (Figure 1-1). The Project includes the Goose Property Area, the George Property Area, a Marine Laydown Area (MLA) situated in the southern portion of Bathurst Inlet, and connecting winter roads.

Ore will be mined and trucked using conventional open pit and underground methods and processed at a mill located at the Goose Property. Ore from Goose and George Properties will be processed at this one location while waste rock will be stored in designated storage areas on the surface or backfilled in mine workings at both properties. The mine plan for the Project is a 10 year operating mine life based on currently known resources.

The activities associated with the Project have the potential to generate emissions of criteria air contaminant (CACs) and also lead to dust and acid deposition. The purpose of this report is to identify the emissions sources, outline atmospheric dispersion modelling methodology, and evaluate the predicted air quality levels associated with the Project using applicable ambient air quality criteria, standards, objectives or guidelines.

The objectives of the Air Quality Modelling study are to:

- Present background air quality conditions used in the model;
- Identify the sources of emissions associated with the Project and complete an emissions inventory;
- Evaluate the impact of the various emissions sources on air quality using appropriate air dispersion modelling; and
- Compare the results to relevant air quality objectives and guidelines.

Chapter 2 of this report sets out the scope of the modelling. Chapter 3 sets out the air quality standards, objectives and guidelines and Chapter 4 provides background air quality levels. Chapter 5 provides details of the emissions inventory, Chapter 6 describes the modelling methodology and Chapter 7 presents the modelling results. The conclusions of the modelling study are presented in Chapter 8.

Selected results of the air dispersion modelling were subsequently used to support the assessment of various VECs in the DEIS and to provide required information for other subjects. Results from the air quality model were used in the following chapters of the DEIS: Air Quality (Volume 4, Chapter 1), Country Foods (Volume 8, Chapter 5), Vegetation (Volume 5, Chapter 5), Freshwater Water Quality (Volume 6, Chapter 4), and the Human Health and Environmental Risk Assessments (Volume 8, Chapter 6).

Figure 1-1

Project Location

Sabina GOLD & SILVER CORP.

Rescan an ERM company

2. Scope of the Assessment

2. Scope of the Assessment

2.1 ASSESSMENT APPROACH

The final NIRB *Guidelines for the Preparation of an Environmental Impact Statement for Sabina Gold & Silver Corp.'s Back River (NIRB File No. 12MN036)* (NIRB 2013) which were issued in April of 2013, form the basis of this air dispersion assessment.

Standard air dispersion modelling techniques were applied to predict the potential air quality effects associated with the Project. Air dispersion modelling is commonly used to assess air quality effects of a proposed source with respect to federal and provincial ambient air quality objectives. The dispersion model allows an understanding of the interaction of existing and future emission sources with meteorology, topography and existing air quality.

2.2 SPATIAL BOUNDARIES

The air quality Regional Study Area (RSA) and Local study Area (LSA) are presented in Figure 2.2-1. Study areas were established based on the "zone of influence" beyond which the residual effects of the Project are expected to diminish to a negligible state. The expected zone of influence was determined using baseline studies, consultation, and expert knowledge.

Three LSAs were selected for the Project, encompassing the area around each of the Goose and George Properties, with boundaries of approximately 10 km in all directions from the proposed infrastructure, and also a smaller LSA around the Marine Laydown Area. The area defined by the Goose Property and George Property LSAs were the same as the domains used in the modelling.

The MLA has been identified as a source of air quality emissions; however detailed air quality modelling was scoped out due to the limited activity, and associated emissions, expected within the LSA compared to those at Goose Property Area LSA and George Property Area LSA. By modelling the areas with the highest emissions, it can be assumed that if the effects at these areas are found to be not significant, the potential effect for the entirety of the Project should also be not significant.

The RSA encompasses all 3 LSAs and matches the RSA boundary used for terrestrial wildlife.

2.3 TEMPORAL BOUNDARIES

The establishment of temporal boundaries is based on the scenario when air quality impacts would be highest throughout the life of the Project. By determining the effects of the year with the highest emissions, it can be assumed that if the effects during these years are found to be not significant, the potential effect for the entirety of the Project should also be not significant.

Available data from June 2013 on fuel consumption, waste rock production and ore production during operation and construction were used to determine the year with the highest predicted emissions. Fuel consumption was used as an estimate of the level of diesel equipment activity. In terms of fuel consumption based on information available in June 2013, Year 3 was determined to be the year with the highest emissions at the Goose Property Area and Year 7 was found to be the highest year at the George Property Area. In terms of waste rock produced, Year 4 was calculated to be the highest year at Goose with approximately 21,000 tonnes produced and Year 3 was slightly lower at 18,000 kilotonnes. At George, Year 7 was determined to be the highest year in terms of waste rock production (approximately 5,500 kilotonnes). Year 2 was determined to be the most active in terms of ore produced at the Goose Property Area with approximately 2,500 kilotonnes produced, in Year 3 ore production will be slightly lower at approximately 1,900 kilotonnes. At George, Year 7 will be the most active in terms of ore produced (approximately 600 kilotonnes). Year 3 was selected to represent the year with the highest emissions at the Goose Property Area as it was the highest year for fuel consumption and had high levels of waste rock and ore production. At the George Property Area Year 7 was selected to represent the year with the highest emissions as it had the highest fuel consumption and waste rock and ore production.

The Project maintenance/temporary closure phase, and the decommissioning and closure phases were not assessed as that emissions during these phases would be much smaller than the construction or operation phases due to a large decrease in equipment activity. Therefore, ambient air concentrations would be much less than the relevant standards and objectives.

2.3.1.1 Goose Property Area

The Goose Property includes three open pits, an underground pit, two Waste Rock Storage Areas (WRSA), an airstrip, camp and mill (Figure 2.3-1). In Year 3, the year used for the Goose Property Area modelling scenario, it was assumed that the camp, airstrip and plant are fully operational. Based on the mine schedule available from June 2013 the following pits and WRSAs are operational:

- Umwelt Pit (open pit)
- Main Pit (open pit)
- Llama Pit (open pit)
- Umwelt Pit (underground pit)
- WRSA A
- WRSA B

2.3.1.2 George Property Area

The George Property includes three open pits, three WRSAs, an airstrip and camp (which was assumed to be located east of McCoy Lake; Figure 2.3-2). In Year 7, the year used for the Goose Property Area modelling scenario, it was assumed that the camp and airstrip are fully operational. Based on the mine schedule available from June 2013 the following pits and WRSAs are operational:

- Locale 1 Pit
- WRSA D

2.4 AIR CONTAMINANTS

The air dispersion modelling study included the following parameters:

- nitrogen oxide (NOx as NO_2),
- sulphur dioxide (SO_2),
- carbon monoxide (CO),
- total suspended particulates (TSP) matter;
- particulate matter (PM_{10})
- respirable particulate matter ($PM_{2.5}$)
- dust deposition; and
- acid deposition.

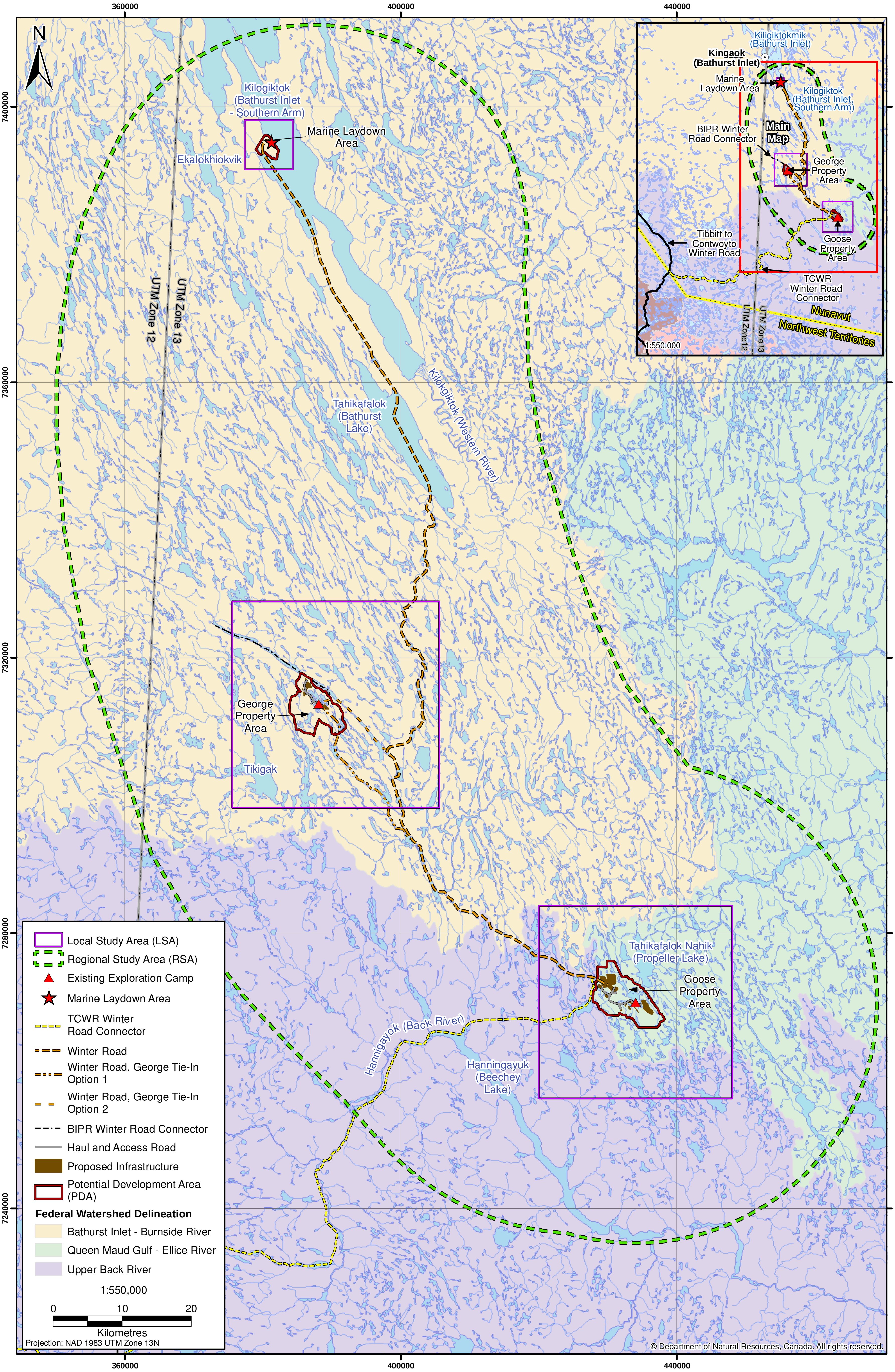
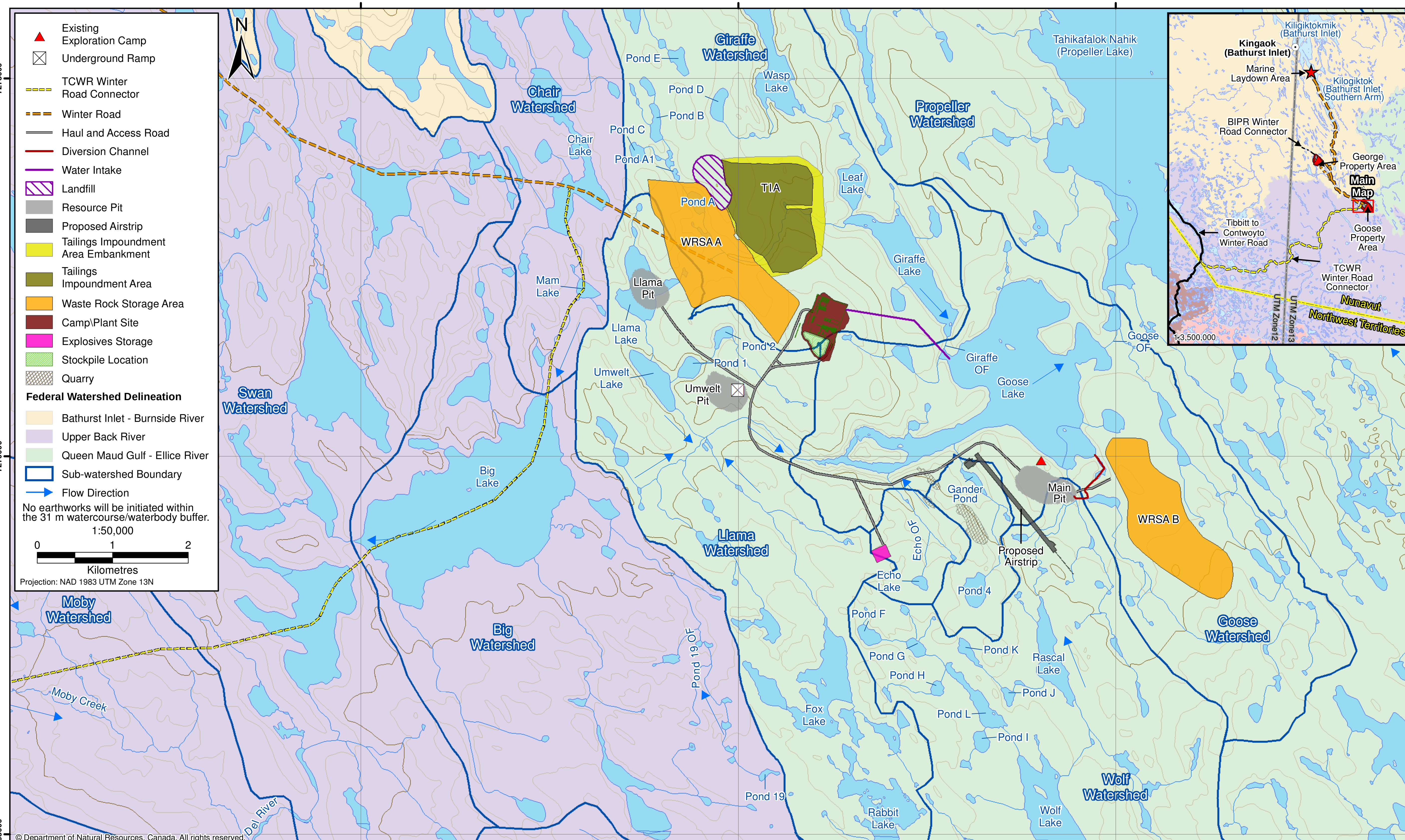


Figure 2.2-1

Local Study Area and Regional Study Area for Air Quality

Sabina GOLD & SILVER CORP.

Rescan Engineers & Scientists



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Rescan an ERM company

Figure 2.3-1

Project Site Layout - Goose Property Area Layout

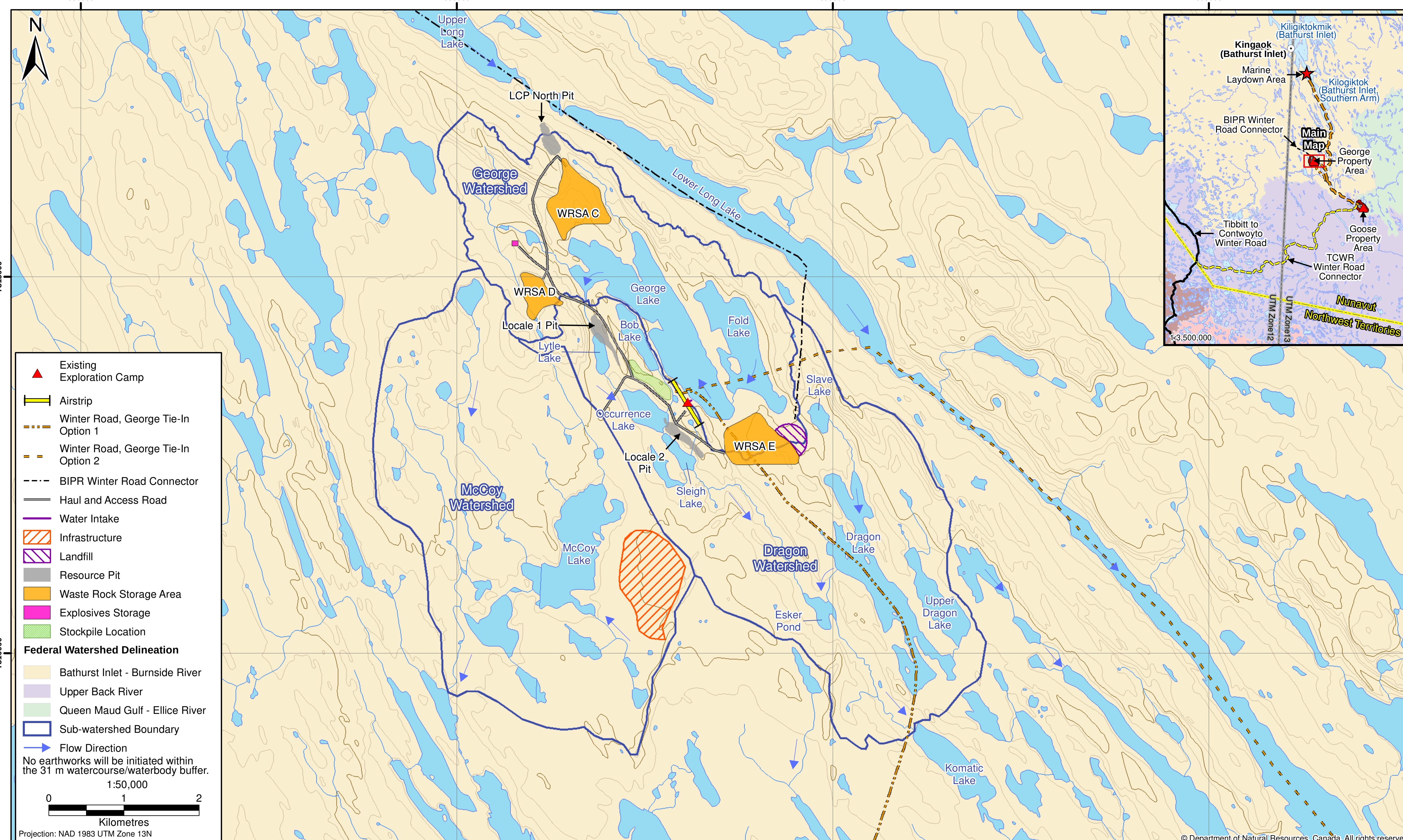

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Figure 2.3-2

Project Site Layout - George Property Area Layout

Further details of the air parameters included in the modelling study are listed in Table 2.4-1.

Table 2.4-1. Air Contaminants Included in the Air Quality Modelling Study

Species	Description
Air Contaminants	
Sulphur dioxide (SO_2)	Fossil fuels contain a small amount of organic sulphur compounds. During fuel combustion, the sulphur is oxidized and emitted as SO_2 gas with the engine exhaust. In the atmosphere, SO_2 can further oxidize to sulphate particles, which contribute to acid deposition.
Oxides of nitrogen (NO_x)	NO_x gas primarily consists of nitrogen oxide (NO) and nitrogen dioxide (NO_2). The gasses are emitted with exhaust from combustion engines and products from blasting operations. NO_x can be converted to nitric acid in the atmosphere and thus contribute to acid deposition.
Carbon monoxide (CO)	Carbon monoxide is formed as a result of incomplete combustion of fossil fuels. The gas prevents oxygen from attaching to red blood cells and is therefore toxic at high concentrations.
Total suspended particulates (TSP) matter	TSP are airborne particles that have a diameter of 100 µm or less. Sources of TSP include vehicle and engine exhaust and fugitive dust. Most particles with diameters between 2 and 30 µm are a result of fugitive dust. Fugitive dust is derived from the mechanical disturbance of granular material exposed to the air. Common sources of fugitive dust include unpaved roads, aggregate storage piles and construction operations. Particles can be composed of a wide range of materials, including minerals (sand, rock dust), engine soot, organic materials or salt.
Particulate matter (PM_{10})	PM_{10} particles are a subset of TSP and are defined as particles with a diameter less than 10 µm.
Respirable particulate matter ($PM_{2.5}$)	$PM_{2.5}$ particles are a subset of TSP and are defined as particles with a diameter less than 2.5 µm. These particles are small enough to enter deep into the respiratory system. The majority of particulate matter emitted with diesel engine exhaust is $PM_{2.5}$.
Deposition	
Dust deposition	Small, dry, solid particles projected into the air by natural forces, such as wind or by man-made processes. Dust particles are usually in the size range from about 1 to 100 µm in diameter, and they settle slowly under the influence of gravity and are deposited on the ground.
Acid deposition	Acid deposition primarily occurs as a result of atmospheric oxidation of sulphur dioxide to sulphate (sulphuric acid) and oxidation of nitrogen dioxide to nitrate (nitric acid), which is then deposited on the ground. Acid deposition can be quantified as potential acid input, which is a measure of the combined input of sulphur and nitrogen derived acid species.

Other air contaminants of potential concern include ground level ozone (O_3) and volatile organic compounds (VOCs). Ground level ozone is not emitted in large quantities but is formed in a series of complex atmospheric reactions that involve primary air pollutants such as NO_X and VOCs. The CALPUFF model does not include routines for calculating formation rates of ground level ozone. However, hourly ambient ozone concentrations data can be used by the model to calculate SO_2, NO and NO_2 conversion rates. Emissions of VOCs from Project activities could affect the ambient air quality because of its role in the formation of secondary air contaminants. However, standards or objectives for ambient VOC concentrations have yet to be established for Nunavut and Canada and emission levels are expected to be minimal. There is only one source of volatile organic compounds (VOCs) in Nunavut identified in the National Pollutant Release Inventory, the Qulliq Energy Corporation in Iqaluit, this however, is located over 1,800 km northeast of the study area (NPRI 2012). VOCs baseline concentrations are, therefore expected to be negligible within the study area.

An assessment of metal deposition rates will also be carried out in order to inform the following sections of the DEIS: Country Foods (Volume 8, Chapter 5), Vegetation (Volume 5, Chapter 5), Freshwater Water Quality (Volume 6, Chapter 4), and the Human Health and Environmental Risk Assessments (Volume 8, Chapter 6).

3. Air Quality Standards, Objectives, and Guidelines

3. Air Quality Standards, Objectives, and Guidelines

Air quality standards and objectives are generally intended to protect all members of the general public, including sensitive individuals such as the elderly, infants, and persons with compromised health. Therefore, standards are applicable in areas that are accessible to the general public. Air quality modelling predictions are typically compared to standards and objectives at the fence-line of the industrial property where emissions occur. A fence-line is defined as the limit beyond which public access is restricted, and for this assessment the Potential Development Area (PDA) has been taken as the fence-line. Air quality standards or criteria for industrial settings are defined by occupational health and safety codes. Occupational health air quality standards and criteria allow for higher concentrations of air contaminants because working individuals are assumed to be of reasonably good health and therefore have higher tolerance than sensitive receptors, personal protective equipment is used if provided and exposure is limited to the time spent at the workplace. Due to the fact that workers will be housed on-site, more emphasis is placed on the evaluation of air quality standards and objectives in the area containing the accommodation buildings. It is very unlikely that members of the public will be in areas affected by the Project for any extended period of time, therefore the effects assessment using daily and annual standards and objectives as threshold values for the general public is very conservative.

Canada's national, provincial, and territorial governments have established ambient air quality thresholds for criteria air contaminants (CACs) that are intended to ensure long-term protection of public health and the environment. The Government of Nunavut has established standards for maximum concentrations of ambient sulphur dioxide (SO_2), nitrogen dioxide (NO_2), total suspended particulate (TSP), and fine particulate matter ($PM_{2.5}$). The Canadian Council of Ministers of the Environment (CCME) have also produced Canadian Ambient Air Quality Standards for $PM_{2.5}$ (CCME 2012). These are future targets for the years 2015 and 2020, the 2020 target is more stringent than the 2015 target. The Back River Project is expected to be operational in 2020 and therefore, as a conservative approach, the 2020 values have been used in this assessment. The federal National Ambient Air Quality Objectives (NAAQOs) defined under the *Environmental Protection Act*, were also used as a reference for carbon monoxide (CO) which is not included in the Government of Nunavut standards (Environment Canada 1999). There are no territorial or national objectives for PM_{10}, therefore the British Columbia (BC) objective has been used (BC MOE 2009).

There are no air quality standards for dustfall in Nunavut; however there are objectives and guidelines for dustfall in other jurisdictions. The most stringent dustfall criterion is the acceptable limit in BC which ranges from 1.7 to 2.9 mg/dm^2/day (BC MOE 1979).

There are also no air quality standards for acid deposition in Nunavut; 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 1500 eq/ha/year, dependant on soil type. The Goose and George properties are dominated by shallow, acidic morainal and glaciofluvial deposits, characterized by variable but predominantly coarse to medium textures (Volume 5, Chapter 3). Since coarse deposits are more susceptible to acidification, a more conservative critical load value associated with this texture was chosen for the assessment of the effects of acidic deposition on local soils. The critical load guideline for acidic deposition recommended by the WHO for acidic, coarse parent materials is below 250 eq/ha/year (WHO 2000).

Table 3-1 summarizes the ambient air quality standards applicable to the Back River Project.

Table 3-1. Federal, Provincial, and Territorial Ambient Air Quality Standards and Objectives

Parameter	Averaging Period	Nunavut Ambient Air Quality Standards[a]	Dust and Acid Deposition Provincial Guideline Values	Canadian Ambient Air Quality Standards (2020)	National Ambient Air Quality Objectives[b]	
					Maximum Desirable	Maximum Acceptable
Sulphur dioxide (SO_2) (µg/m^3)	1-hour	450	-		450	900
	24-hour	150	-		150	300
	annual	30	-		30	60
Nitrogen dioxide (NO_2) (µg/m^3)	1-hour	400	-		-	400
	24-hour	200	-		-	200
	Annual	60	-		60	100
Carbon monoxide (CO) (µg/m^3)	1-hour	-	-		15,000	35,000
	8-hour	-	-		6,000	15,000
Total suspended particulate (TSP) (µg/m^3)	24-hour	120	-		-	120
	Annual[c]	60	-		60	70
PM_{10} (µg/m^3)	24-hour		50[d]			
$PM_{2.5}$ (µg/m^3)	24-hour	30	-	27[e]	-	-
	Annual			8.8		
Dust deposition (mg/dm^2/day)	30-day	-	1.7[f]		-	-
Acid deposition (eq/ha/yr)	annual	-	250 [g]		-	-

Notes:
[a] *Government of Nunavut (2011)*
[b] *Environment Canada (1999)*
[c] *Geometric mean: the average of the logarithmic values of a data set converted back to a base 10 number*
[d] *BC MOE (2009)*
[e] *The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.*
[f] *Most stringent provincial guideline (BC MOE 1979).*
[g] *The critical load guideline recommended for acidic, coarse parent materials (WHO 2000).*

4. Background Air Quality

4. Background Air Quality

The air quality in the area proposed for Project development is predominantly pristine, reflecting the region's remoteness and the lack of, and localized nature of, sources of anthropogenic air emissions sources. Local emissions are limited to stationary (power generation and heating) and mobile sources (trucks, snowmobiles, ATVs, etc.) operated by local residents. Mines operating in the wider region represent the only primary industrial emission source. Due to the limited local emissions sources, long-range transport of air contaminants is an important influence on ambient air quality.

Baseline or background air quality data, are the ambient air concentrations prior to Project commencement, due to emissions from both natural and anthropogenic sources. Since the study area is remote, there is little publically available information, however site-specific baseline air quality data have been collected in 2011, 2012 and 2013 (Rescan 2012a; Rescan 2013a).

Dustfall monitoring at the Goose Property was carried out from June to September 2011, from June to August 2012 and May to September 2013. The 2011 and 2012 results showed values ranged from <0.10 to 1.13 mg/dm^2/day. Dustfall monitoring at the George Property was carried out from June to August 2012 and May to September 2013. The results of the monitoring ranged from 0.19 to 0.54 mg/dm^2/day. As a conservative approach, and to compensate for the relatively short monitoring period, the background values have been assumed to be the highest recorded concentration. Background concentrations have been assumed to be 1.13 mg/dm^2/day at the Goose Property and 0.54 mg/dm^2/day at the George Property.

Acid deposition monitoring at the Goose Property was carried out from June to September 2011, from June to August 2012 and May to September 2013. The 2011 and 2012 results showed values at Goose ranged from 20 to 698 eq/ha/yr. Acid deposition monitoring at the George Property was carried out from June to August 2012 May to September 2013. The results of the monitoring at the George Property ranged from 32 to 58 eq/ha/yr. Due to the large range of values at the Goose Property, the average acid deposition values of 104 eq/ha/yr at the Goose Property and 45 eq/ha/yr at the George Property, were used to represent background values.

The passive sampling of NO_2, SO_2 and O_3 was conducted at the Goose Property from June to September 2011, from June to August 2012 and May to September 2013. The 2011 and 2012 results showed values at the Goose Property ranged from 0.1 to 0.6 μg/m^3 for NO_2, 0.1 to 1.3 μg/m^3 for SO_2 and 34.1 to 54.6 μg/m^3 for O_3. The monitoring at George was carried out from June to August 2012 and May to September 2013. The results showed values at George ranged from 0.1 to 1.1 μg/m^3 for NO_2, 0.1 to 0.3 μg/m^3 for SO_2 and 33.5 to 50.4 μg/m^3 for O_3. As a conservative approach, and to compensate for the relatively short monitoring period, the background values have been assumed to be the highest recorded concentrations for NO_2 and SO_2. Contaminants such as ozone will have primarily been produced from entirely natural sources and are not expected to vary greatly throughout the region. Typical ozone background concentrations in Canada range from 40 μg/m^3 to 80 μg/m^3. For ozone a conservative value of 60 μg/m^3 was used to be consistent with other studies in the area (Rescan 2013b).The measured ozone values are all below 60 μg/m^3.

The background annual average concentration of CO was assumed to be 100 μg/m^3. This value was calculated for a nearby project in the West Kitimeot (Rescan 2013b).

Monitoring of TSP, PM_{10} and $PM_{2.5}$ was carried out as part of the 2013 air quality baseline program. Particulate was sampled at two locations at the George Property and one location at the Goose Property. PM_{10} and $PM_{2.5}$ sampling at the George Property were monitored over a 24 hour period on May 27 and 28, and TSP and $PM_{2.5}$ sampling at the Goose Property Area was sampled over a 24 hour period on June 25. At the George Property Area the PM_{10} results were below the detection limit (2.1 $\mu g/m^3$) during both monitoring periods, the $PM_{2.5}$ were below the detection limit (2.1 $\mu g/m^3$) on May 27 and 2.9 $\mu g/m^3$ on May 28. At the Goose Property Area the TSP and $PM_{2.5}$ results were both below the detection limit (2.1 $\mu g/m^3$). The 2013 monitoring results were not used for baseline concentrations in the assessment as the results were not available at the time the modelling was initiated. In the absence of site-specific data, values from a proposed iron mine in Nunavut were used (Baffinland Iron Mines Corporation 2012). The baseline 24 hour TSP concentration used was 7.0 $\mu g/m^3$ and the baseline 24 hour PM_{10} value was 3.8 $\mu g/m^3$. No value for $PM_{2.5}$ was provided, therefore as a conservative approach, $PM_{2.5}$ was assumed to be the same as PM_{10}. These values are all higher than the measured values, that were subsequently available and are therefore considered conservative.

In air quality modelling studies, air contaminant background concentrations are typically added to concentrations resulting from project activities to produce predictions of total concentrations. When background concentrations are unknown or uncertain, conservative (high) estimates of background concentrations are used to avoid under-predicting total maximum concentrations. Table 4-1 shows the background air contaminant concentrations assumed for the air quality modelling study.

Table 4-1. Assumed Background Air Contaminant Concentrations

Air Contaminant ($\mu g/m^3$)	Averaging Period	Assumed Background Concentration - Goose	Assumed Background Concentration - George
Sulphur Dioxide (SO_2)	30 day	1.3	0.3
Nitrogen Dioxide (NO_2)	30 day	0.6	1.1
Ozone (O_3)	Annual	60	60
Carbon Monoxide (CO)	Annual	100	100
PM_{10}	24 hour	3.8	3.8
$PM_{2.5}$	24 hour	3.8	3.8
Total Suspended Particulates (TSP)	24 hour	7	7
Total Dustfall ($mg/dm^2/day$)	30 day	1.13	0.54
Acid Deposition (eq/ha/year)	30 day	104	45

In order to convert between the various averaging periods required for the various standards and objectives, the conversions factors from EPA (1992) were applied. Conversion factors are presented in Table 4-2. In cases where the monitoring was carried out over a 30 day period, as a conservative approach, the values were considered to be representative of annual values.

Table 4-2. Averaging Time Conversion Factors

Averaging Time	Conversion Factor (1 hour average x conversion factor)
8 hours	0.7
24 hours	0.4
Annual	0.08

5. Emissions Inventory

5. Emissions Inventory

An emissions inventory was prepared for the air quality modelling study which was then used as an input for the air dispersion model. The objective of the emissions inventory was to estimate maximum air emissions of air contaminants from Project activities.

The emissions inventory has been generated from manufacturers' specifications when available, AP-42 emission factors (US EPA 1995), NONROAD2008 model Tier 4 emission standards (US EPA 2005) and Emissions and Dispersion Modeling System (EDMS) version 5.1.4 emission rates (US FAA 2013).

5.1 EMISSIONS SOURCES

The air emissions associated with the Project within the modelling domains are outlined below. These are grouped into point sources and area sources.

Point Sources

- Stack emissions, such as generators and incinerators; and
- Dust from baghouses and dust collectors.

Area sources

- Equipment exhaust emissions from vehicles such as dozers, haul trucks, forklift, graders, and fuel trucks;
- Aircraft emissions,
- Fugitive dust on unpaved roads from vehicles travelling on onsite roads; and
- Fugitive dust emissions from mining activities such as bulldozing, grading, drilling and blasting and CAC emissions from explosives used in blasting.

Each of the emission sources are discussed below. Appendix A provides details of the emissions sources included in the inventory, the emission factors used and the sources of the emission factors.

5.1.1 Point Sources

5.1.1.1 Stack Emissions

Electrical power will be generated using diesel-powered generators. Pollutants from internal combustion engines include NOx, SO_2, CO, TSP, PM_{10} and $PM_{2.5}$. Emission rates for the generators were taken from manufacturers specifications, calculated on the basis of power output. Sulphur dioxide (SO_2) emission rates are based on 0.0015% fuel sulphur content. All equipment was assumed to be running 24 hours a day, seven days a week throughout the year, as a conservative approach.

In the case of lighting equipment, no information was available on the emission rates; however, information on the US EPA tier level was provided, which was then used to estimate the emission rates. The lighting equipment were assumed to be operational from dusk to dawn.

No details were available on the type of incinerator in June 2013; therefore, it was assumed an incinerator similar to Eco Waste Solutions CA-600 Incinerator would be used. The incinerator emissions were scaled using number of employees at the camp as camp waste is typically proportional to the number of employees.

5.1.1.2 Dust from Baghouses and Dust Collectors

Baghouse and dust collectors will emit TSP, PM_{10} and $PM_{2.5}$. No details were available on the emission rates in June 2013 and therefore emissions from the Ontario Air and Noise Best Practice guidelines were used (Ontario MOE 2011). All equipment was assumed to be running 24 hours a day, seven days a week throughout the year, as a conservative approach.

5.1.2 Area Sources

5.1.2.1 Equipment Exhaust Emissions

Diesel-powered mining equipment such as drills, loaders, shovels, haul trucks, etc. as well as on-road transport trucks, are all sources of CACs. Emission rates depend on factors such as the engine size (i.e., horsepower rating), emissions control equipment, age of the equipment and sulphur fuel content for SO_2 emissions.

US EPA has developed the NONROAD2008 model to provide emissions factors for predicting accurate and reproducible nonroad emissions inventories. NONROAD2008 provides emissions estimates based on fuel-use in a diverse collection of vehicles and equipment, classified categories. Air emissions from the diesel equipment were based on the horsepower (hp) rating and utilization factor for each piece of equipment and emission factors from the NONROAD2008 model (NONROAD). Equipment lists, including operating hours, were supplied by AMC Consultants (Appendix A).

5.1.2.2 Aircraft Emissions

In order to calculate aircraft emissions the Federal Aviation Administration's (FAA) emission inventory for aircraft entitled Emissions and Dispersion Modeling System (EDMS) version 5.1.4 was used (US FAA 2013). It was assumed there would be three fixed-wing aircraft flights a day and one helicopter flight per day from both the Goose and George Properties during operation.

5.1.2.3 Unpaved Roads

For vehicles travelling on an unpaved industrial road, the fugitive dust emissions are a function of the road surface silt content and the mean vehicle weight. The emissions factors for unpaved roads can be adjusted to account for the reduction in fugitive dust emissions on rainy days. Fugitive dust emissions are assumed to be negligible if the daily precipitation is at least 0.254 mm (0.01 inches). Only the onsite roads have been taken into account in the calculations of unpaved road dust as the winter roads are not expected to contribute to dust levels as the vehicles will be travelling on ice.

Emissions of TSP, PM_{10} and $PM_{2.5}$ for the road were included in the CALPUFF modelling study. These fugitive dust emissions were not corrected for any anthropogenic dust controls such as road watering or chemical spray; however, they were corrected based on the amount of mean annual precipitation. The modelling results for ambient TSP, PM_{10} and $PM_{2.5}$ concentrations along the road are intended to provide a conservative estimate of expected maximum concentrations and to provide information about the expected concentration gradients with distance from the road. Thus, the results do not represent the most probable concentrations, but possible concentrations based on the specified conservative assumptions.

5.1.2.4 Mining Activities

In order to calculate emissions from mining activities, the US EPA's AP-42 document – Compilation of Air Pollutant Emission Factors, Volume 1 – Stationary Point and Area Sources – 5th Edition (US EPA 1995) was used. Fugitive dust emissions were calculated for grading, bulldozing, drilling and blasting activities. SO_2, NO_2 and CO emissions from explosives detonation (ANFO) were also calculated.

There are not expected to be significant emissions associated with stockpiles and WRSAs. The majority of the material storage at the stockpiles and WRSAs are in the larger size fractions and therefore have a lower potential to be a source of emissions due to wind erosion. Also due to the climate at the site, the stockpiles and WRSAs will be frozen for the majority of the year which will limit any erosion. There are also not expected to be any emissions associated with the tailings as they will be contained under water within the Tailings Impound Area (TIA).

5.2 EMISSION SUMMARY

Table 5.2-1a and Table 5.2-1b present the total emissions for the Goose Property and George Property for each of the various sources. For the Goose Property the stacks are the largest contributor to NO_x, SO_x and CO emissions, whereas at the George Property, where there is no plant, the equipment exhausts are the largest contributors. At both sites aircraft and blasting emissions only contribute a very small fraction of the NO_x, SO_x and CO emissions. At both sites the unpaved road dust has the most significant contribution to TSP, PM_{10} and $PM_{2.5}$ emissions.

Table 5.2-1a. Emissions Summary - Goose Property Area

	Emissions (t/y)					
Sources	**NO_x**	**SO_x**	**CO**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
Stacks	885.7	30.0	253.5	118.3	96.0	26.2
Equipment	236.7	0.4	51.9	7.1	7.1	6.9
Aircraft	1.2	0.3	7.2	0.0	0.0	0.0
Unpaved road dust	-	-	-	1,473.1	362.0	36.2
Grading	-	-	-	4.9	1.4	0.2
Bulldozing	-	-	-	43.5	7.1	4.6
Drilling	-	-	-	38.6	19.7	5.8
Blasting	53.7	6.7	228.3	0.1	0.1	0.0
Total	**1,177.3**	**37.3**	**540.9**	**1,685.8**	**493.5**	**79.8**

Table 5.2-1b. Emissions Summary - George Property Area

	Emissions (t/y)					
Sources	**NO_x**	**SO_x**	**CO**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
Stacks	176.1	0.0	17.0	32.1	17.4	7.7
Equipment	230.2	0.4	51.9	6.9	6.9	6.7
Aircraft	1.2	0.3	7.2	0.0	0.0	0.0
Unpaved road dust	-	-	-	308.6	75.8	7.6
Grading	-	-	-	1.1	0.3	0.0
Bulldozing	-	-	-	61.6	11.6	6.5
Drilling	-	-	-	14.3	7.3	2.2
Blasting	12.4	1.6	52.9	53.8	28.0	1.6
Total	**419.9**	**2.2**	**129.0**	**478.5**	**147.4**	**32.3**

6. Modelling Methodology

6. Modelling Methodology

6.1 MODEL SELECTION

The CALPUFF air dispersion modelling system (US EPA approved version 5.8) was chosen for the modelling study. The CALPUFF modelling system is a non-steady-state Lagrangian Gaussian air quality modelling system for regulatory use, which consists of two main model packages CALMET and CALPUFF which serve as a diagnostic 3-dimensional meteorological model and an air quality dispersion model, respectively (Scire, Strimaitis, and Yamartino 2000). In this report, *CALPUFF* will refer to the CALPUFF modelling system as a whole, and *CALPUFF model* will refer to the individual CALPUFF model packages.

The US EPA has promulgated the use of CALPUFF for long range dispersion model studies and for near field studies on a case-by-case basis (US EPA 2003). CALPUFF offers considerable flexibility with respect to meteorological, geo-physical and emissions inputs. The CALMET model accepts observed surface meteorological data and upper air meteorological data or meso-scale meteorological model (MMM) data, or a combination of observed and model data. Several routines are available for extrapolating or merging observed and modelled meteorological data. The model allows for constant, time-varying or conditional emissions from point, line, area or volume sources (Scire, Strimaitis, and Yamartino 2000).

There is inherent uncertainty associated with the use of any model as real world processes, such as atmospheric conditions, are simplified. In general, air dispersion models accurately but conservatively predict atmospheric concentrations and deposition levels so that model results are often interpreted with the understanding that the predicted effects are likely overestimated.

6.2 MODEL DOMAINS AND RECEPTORS

Two modelling domains were selected for the Project, encompassing the area around each of the Goose and George properties, with boundaries of approximately 10 km in all directions from infrastructure (Figure 2.2-1). The sizes of the modelling domain were established such that the majority of air contaminant species would approach background concentrations within the modelling domains. For species with predicted maximum concentrations that were well above background concentrations, it was ensured that areas of potential exceedances of standards and objectives were well within the modelling domains.

The grid resolution of the two CALMET meteorological modelling domains was 1 km by 1 km. A large CALMET domain was used (200 km east-west by 225 km north-south), and smaller subdomains of the CALMET domain were then used for CALPUFF.

The receptor grid spacing for the CALPUFF model domains follows the guidelines presented in the BC air dispersion modelling guide (BC MOE 2008), which ranged from a 50 m to 1 km spacing interval. The sensitive receptors were determined by baseline data for the VECs Country Food and Water Quality. Figure 6.2-1a and 6.2-1b presents the air dispersion modelling domain and the receptor grids selected for model runs.

The extent of the winter roads made it impractical to include the winter roads in the CALPUFF model. The winter road section included in the modelling domain was assumed to be representative of a typical winter road section; that is, it was assumed that the model predictions of gradients of air contaminant concentrations with distance from the winter road section would be indicative of the air contaminant concentrations along the entire winter road. It is expected that the results of the winter road within the model domain can be applied to all of the winter roads as the number of vehicles using winter roads is the same, and because the terrain is relatively similar. The only major factor which varies along the winter road is the orientation of the road relative to the predominant wind directions (see Figure 6.3-1a and 6.3-1b). On average, airborne pollutants will have higher concentrations downwind of the source. At the George Property it was assumed that the southern of the two winter road options would be used (George Tie-in Option 1).

6.3 MODEL INPUT PARAMETERS

The CALMET model was used in hybrid mode, where surface site-specific meteorological station data were used in conjunction with MMM output for upper air assumptions.

Arctic winter the meteorological conditions often result in very stable boundary layer conditions. Stable boundary layer conditions result in less dispersion of emitted air contaminants and, as a result, higher ambient contaminant concentrations. The Back River Project is expected to operate all year round. As a result, these activities will occur when conditions for dispersing air contaminants are least favourable. Air quality data collected in the Northwest Territories shows that maximum ambient air contaminant concentrations are generally recorded during the winter months (GNWT 2006). CALPUFF was run using hourly time steps for a total of 365 consecutive days which included the site-specific meteorology data for the period of January through December, 2009 (Rescan 2012b). 2009 was used as it was consistent with other projects in the area (Rescan 2013b).

Several assumptions were used in the modelling study to ensure that predicted concentrations of air contaminants would reflect a reasonably conservative scenario. Many of the emissions sources for the Project would not be active 24 hours a day, but it was assumed that estimated maximum emissions occurred throughout the modelling period (January to December). This assumption was made to ensure that maximum hourly emissions would coincide with the meteorological conditions that were least ideal for dispersion. While this approach may result in reasonable estimates of maximum hourly ambient air contaminant concentrations, the predicted 24-hour and annual average concentrations are overestimated.

6.3.1 Meteorological Input Data

Air dispersion models require input of meteorological data to generate a model meteorological field from which air dispersion characteristics are calculated. Site specific or local observed surface and upper air meteorological data are preferred as model inputs. Typically, hourly records of various meteorological parameters are required. For projects located in remote regions local or regional meteorological data is often limited or unavailable, particularly upper air data (BC MOE 2008).

The site-specific meteorological monitoring program for the Project began in 2004 with the commissioning of the George and Goose meteorological stations. The climatic variables monitored by the meteorological stations are air temperature, precipitation as rainfall, solar radiation, wind speed and wind direction (Rescan 2012b). CALPUFF was run using meteorology data for the period of January through December, 2009. Meteorological data from the station at the Hackett Project site was also included to increase the number of observational data for the CALMET domain.

The MMM data used was from the Fifth-Generation Penn State/NCAR Mesoscale Model (MM5), at 12 km resolution as there is no site specific data available for upper air stations.

Running the CALPUFF model requires the following gridded fields of meteorological input data, which is generated by the CALMET model:

- 3-dimensional wind components;
- 3-dimensional air temperature;
- Surface friction velocity;
- Convective velocity scale;
- Mixing height;

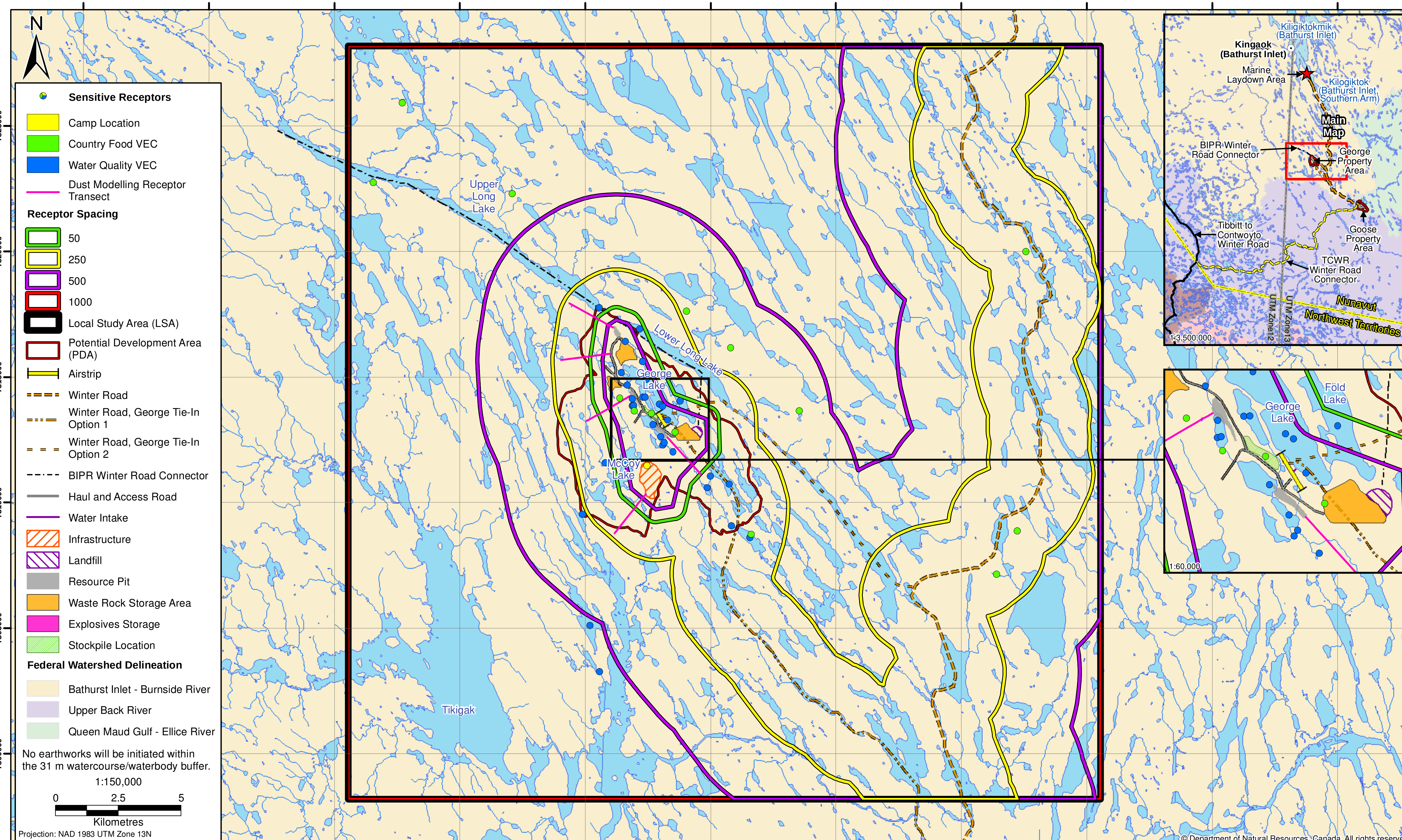

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Figure 6.2-1a

CALPUFF Model Domain and Receptor Locations - George Property Area

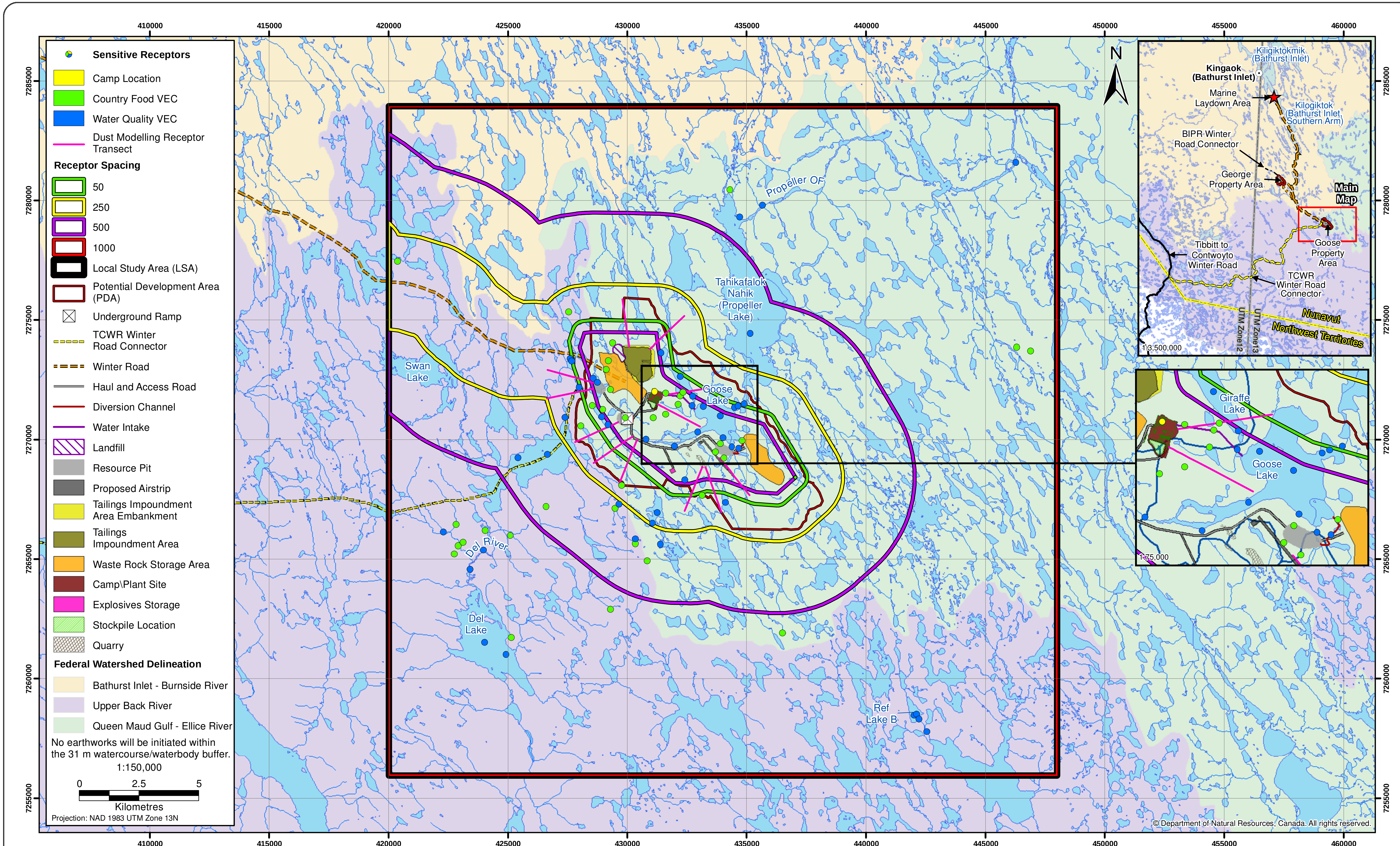


Figure 6.2-1b

CALPUFF Model Domain and Receptor Locations - Goose Property Area

- Monin-Obukhov length;
- Pasquill-Gifford (P-G) stability classes; and
- Precipitation rate.

6.3.1.1 Wind Data

Hourly records of modelled wind speed and wind direction were compared to station observations in order to ensure that the model results were in-line with observations. Figures 6.3-1a and 6.3-1b show the 2009 wind rose and frequency distributions for Goose and George domains, respectively.

The meteorological station wind data and the modelled wind data are very similar for both Goose and George Properties. The wind directions are almost exactly the same and the wind speed classes are similar with the modelled results being slightly higher than the observations.

6.3.1.2 Mixing Heights

Site-specific records of mixing heights are not available as they cannot be determined from the standard EC recommended 10 m tower, therefore, mixing heights were calculated from the MM5 model data. Historical regional mixing height data were used to compare against the mixing height model output. Figure 6.3-2 shows monthly mean afternoon mixing heights recorded at several stations located in Nunavut and Northwest Territories between 1965 and 1969 (Fisheries and Environment Canada 1977), as well as the modelled mixing heights located at the George and Goose stations.

Table 6.3-1 shows the World Meteorological Organization (WMO) station numbers, distance, and direction from the Project for the historic mixing height stations. The nearest station is Kugluktuk located approximately 420 km northwest of Bathurst Inlet. The nearest inland station is Baker Lake which is approximately 550 km east-southeast of Bathurst Inlet. The Project is inland and is therefore expected to have seasonal mixing heights similar to those regional inland stations. The modelled mixing heights relate well to the observed regional meteorological station mixing heights, with regards to seasonal patterns. The afternoon mixing heights at the George and Goose meteorological stations are similar to each other, and have similar values compared to historical observations.

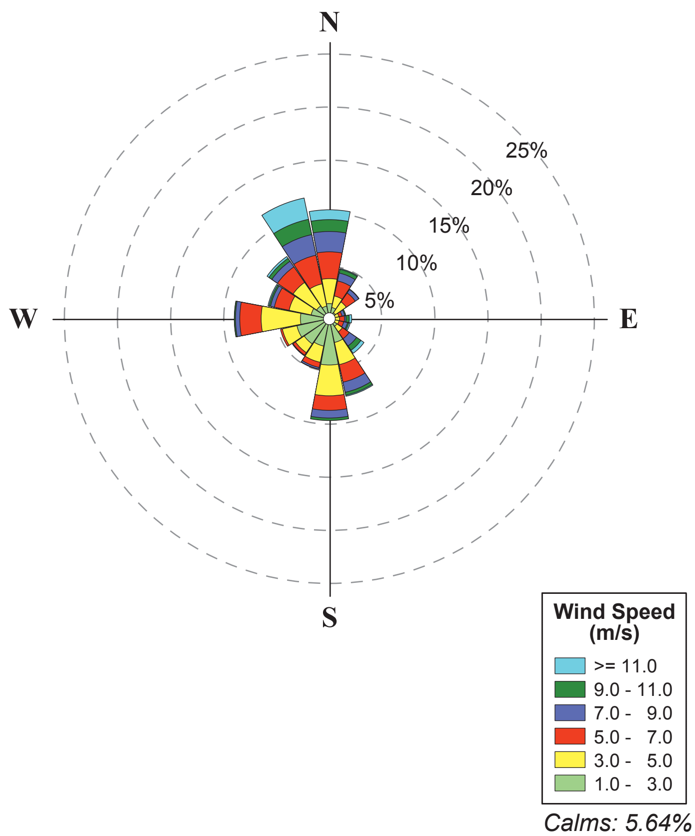
Table 6.3-1. Mixing Height Stations

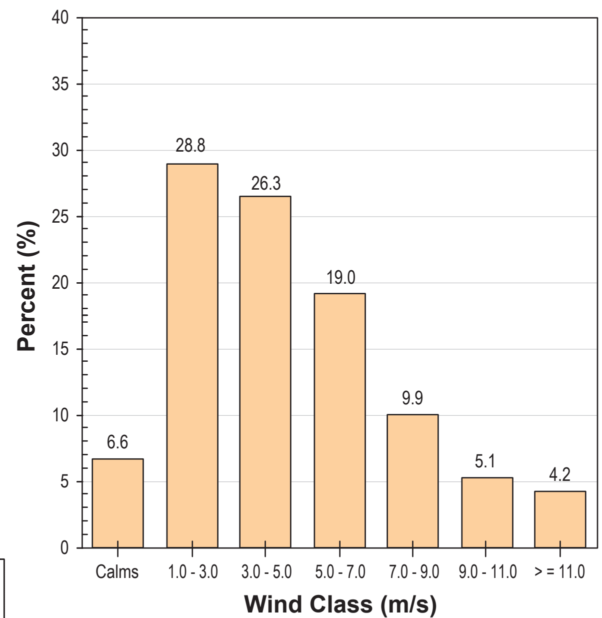
Station	WMO Number	Distance from the Project (km)	Direction
Kugluktuk, NU	72938	420	Northwest
Baker Lake, NU	72926	550	East-southeast
Norman Wells, NWT	74043	900	West
Clyde, NU	74090	1,630	Northwest

Mixing heights are in part determined by the input of solar energy into the atmosphere. The effect of solar radiation on the mixing heights can be seen by the gradual increase in mixing heights for all stations in the summer months followed by a decrease as fall and winter approaches (Figure 4.4-2). When mixing heights are low, atmospheric dispersion conditions are generally poor. Therefore, the maximum air contaminant concentrations can be expected to occur during the winter months in the Arctic.

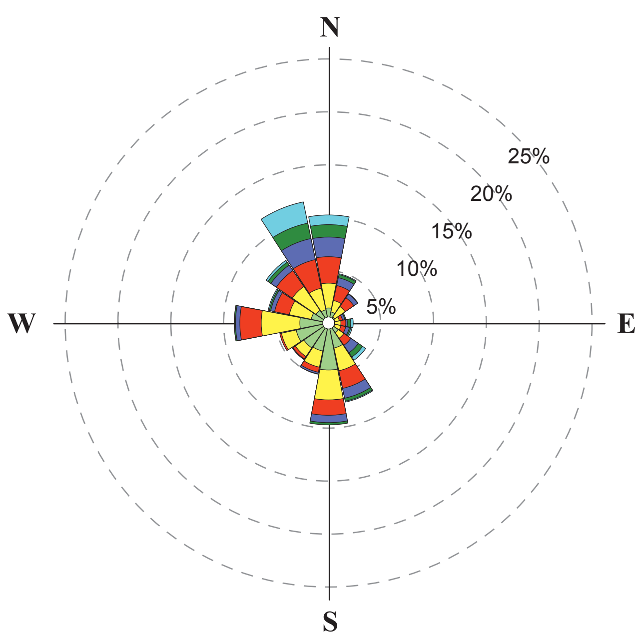
Mixing heights can be associated with large diurnal variation. Night-time mixing heights are typically shallow because of the limited input of solar energy to the atmosphere. Following sunrise, air heated near the earth's surface rises, which results in an increase in the depth of the mixing layer. However, during the dark Arctic winters, the sun only appears on the horizon for a few hours daily, if at all. Therefore, the diurnal variability in mixing heights may not be as pronounced as the variability in mixing heights at more southern latitudes.

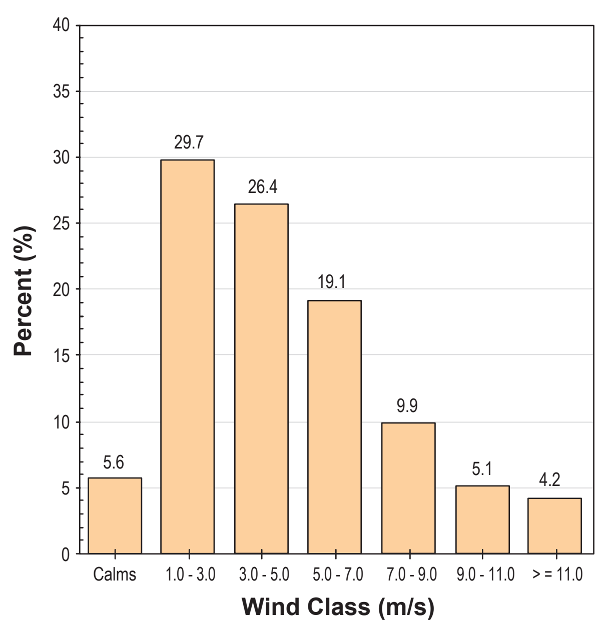
Goose Meteorological Station, 2009





Goose CALMET Model Output, 2009





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Goose Weather Station and CALMET Model Output Wind Comparison

Figure 6.3-1a

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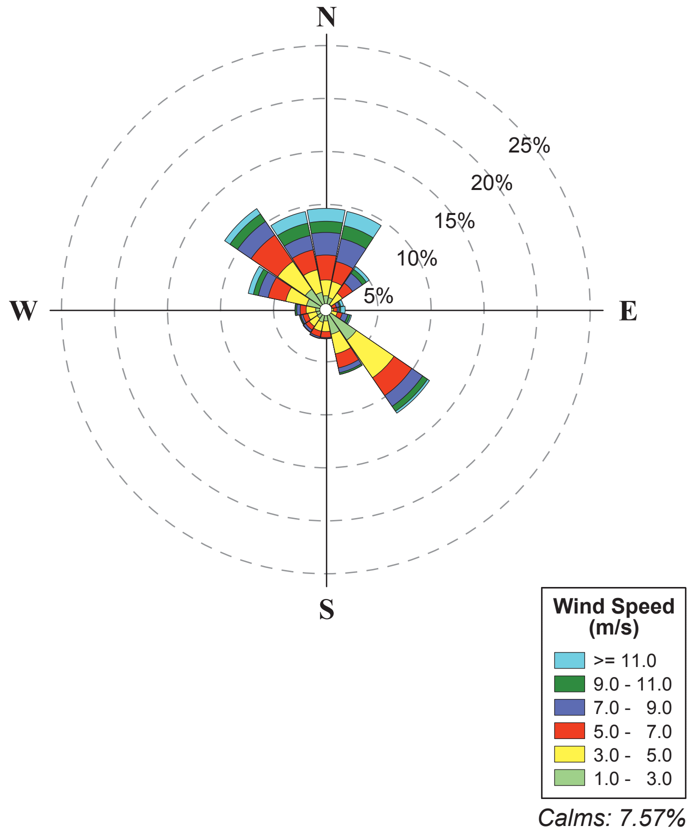
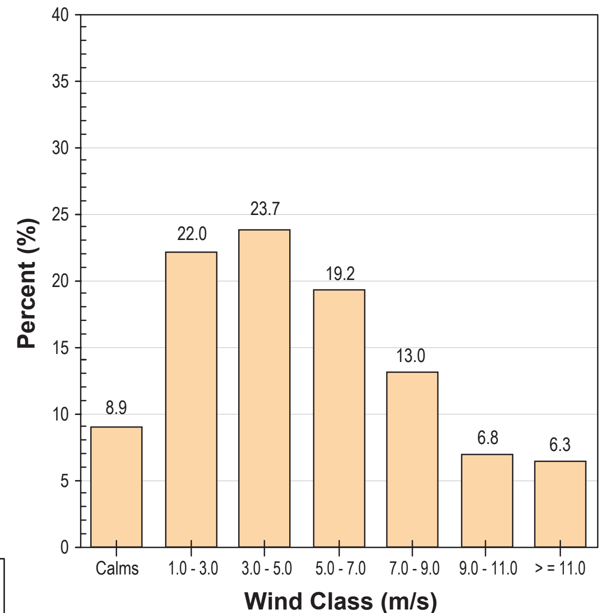
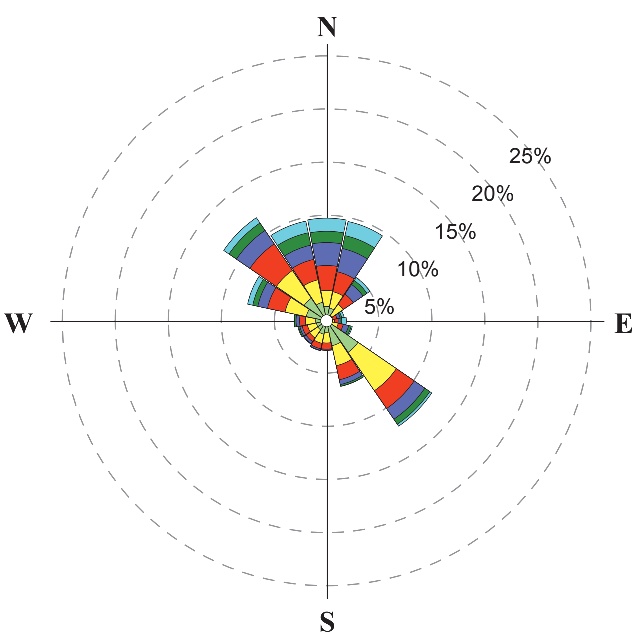
George Meteorological Station, 2009





George CALMET Model Output, 2009



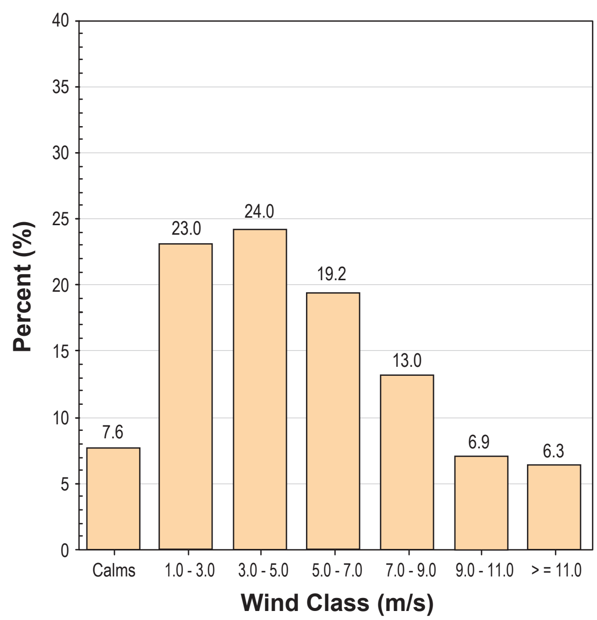


Figure 6.3-1b

George Weather Station and CALMET Model Output Wind Comparison

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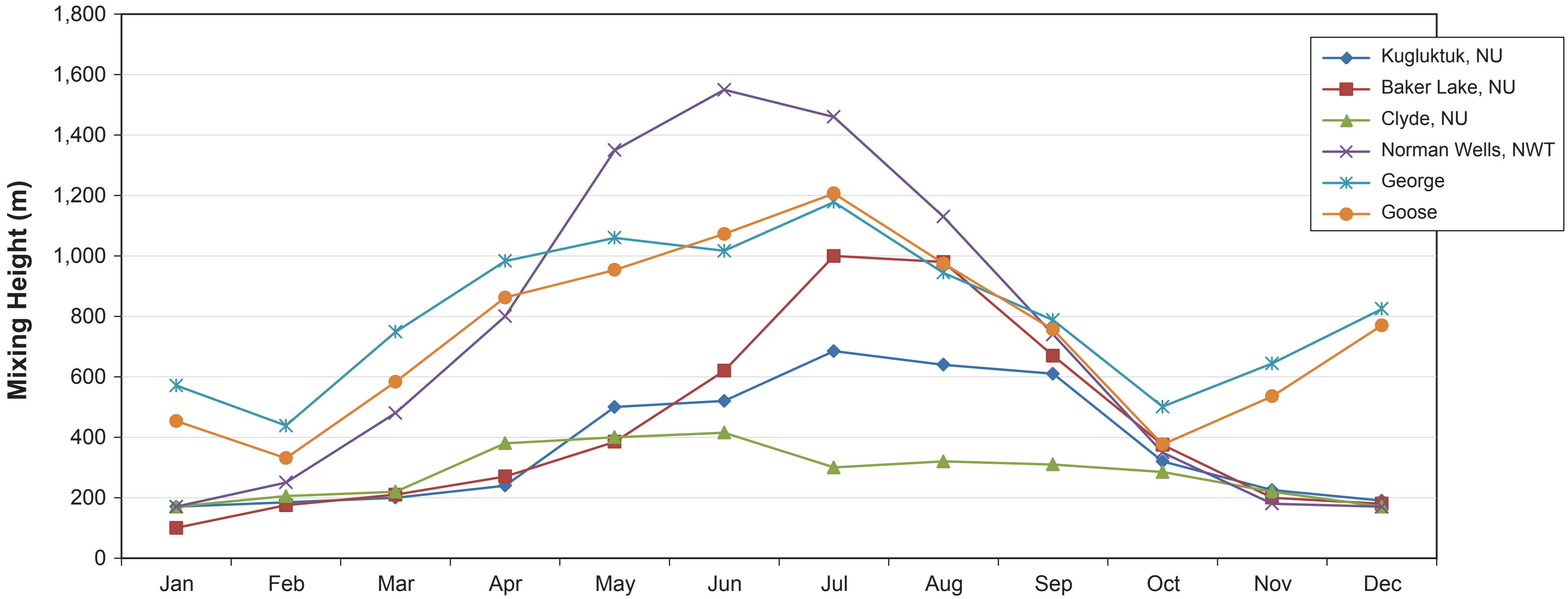

Notes: Mean afternoon mixing heights at locations other than Goose and George were calculated from data from 1965 to 1969. Source: Fisheries and Environment Canada, 1977. Mean afternoon mixing heights at the Goose and George locations were from the CALMET model output for 2009.

Figure 6.3-2

Monthly Mean Afternoon Mixing Heights

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6.3.1.3 Atmospheric Stability

Atmospheric stability is the tendency for air to rise and fall without direct forcing. A stable atmosphere is one where the atmosphere inhibits vertical motion, and is a concern to air quality as pollutants cannot be dispersed vertically. An unstable atmosphere is one where the atmosphere promotes vertical motion helping to disperse any pollutants. The Pasquill-Gifford (P-G) stability class is an atmospheric stability classification scheme which ranges from Class 1 (Very Unstable) to Class 6 (Stable). This stability class is required by the CALPUFF model due to its large influence on air pollution dispersion.

Figure 6.3-3 shows the seasonal variation of atmospheric stability in the modelled domains, in terms of the P-G class frequency distribution for each month. Overland, it is expected that the atmosphere is less stable during the summer months and more stable during the winter months, on a seasonal basis. There is a general diurnal variation as well, which is similar to the mixing height diurnal pattern: more stable in the early morning, and more unstable in the afternoon.

The modelled stability in the two domains, show a similar trend, with a higher frequency of unstable conditions during the summer and more stable conditions during the winter. The George and Goose sites are both very similar.

6.3.2 Buildings

The presence of large buildings near point emission sources may influence ground level concentrations of air pollutants because of the building downwash effect. Building downwash occurs when the aerodynamic turbulence induced by nearby buildings cause a pollutant emitted from an elevated source to be mixed rapidly toward the ground (downwash), resulting in higher ground level concentrations. The main buildings on site, including the process plant, crushing plant, accommodating building, offices and airstrip buildings, were included in dispersion modelling with the Building Profile Input Program (BPIP).

6.3.3 Emission Sources

Two types of emission sources were included in the model, point sources and area sources. The point sources model input parameters are listed in Table 6.3-2a for Goose and Table 6.3-3a for George. Stack height, exhaust temperature and velocity were provided by the Project engineers, Tetra Tech.

The equipment and mine activity sources were modelled as area sources and are listed in Table 6.3-2b for the Goose Property and Table 6.3-3b for the George Property. Area emission rates in $g/s/m^2$ were calculated by dividing instantaneous emission rates, by the area. Due to limitations in the area source module in CALPUFF, the source is restricted to being a 5-sided polygon. As a result, the larger open pits and WRSAs including WRSA A and WRSA B at the Goose Property and Locale 1 Pit at the George Property were subdivided into several smaller area sources to accommodate these limitations. The total emissions for each open pit were divided by the total area of the sources for input into the model.

6.4 MODEL RUN PARAMETERS

The CALPUFF model run was devised to predict potential maximum 1-hour, 8-hour, 24-hour, and annual average air contaminant concentrations, depending on the pollutant modelled. The first highest concentration was modelled for all pollutants. For $PM_{2.5}$ the seventh highest value was also calculated in order to calculate the 98th percentile.

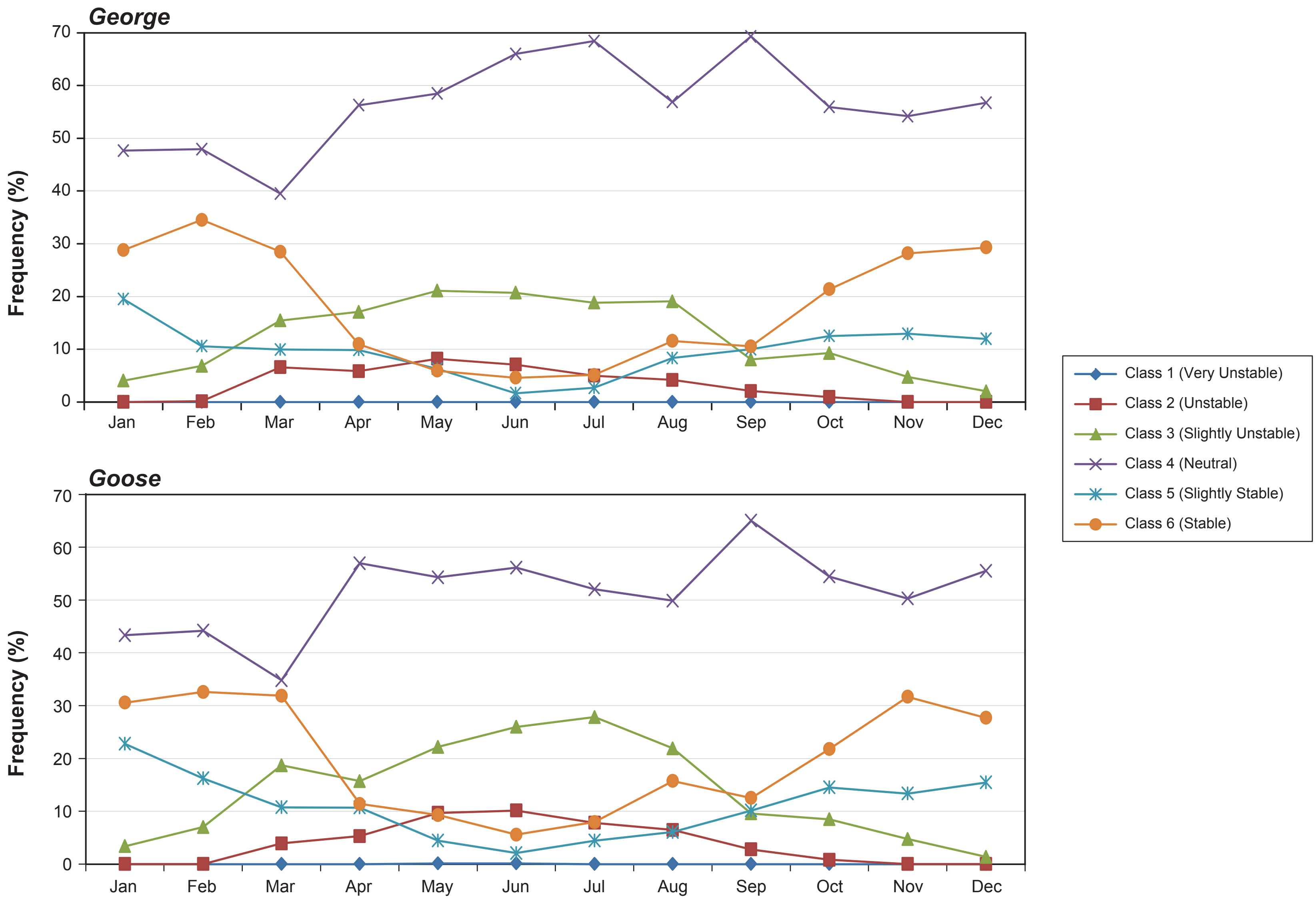

Figure 6.3-3

Seasonal Variation of P-G Stability Class, 2009

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Rescan Engineers & Scientists

Table 6.3-2a. Implementation of Point Sources - Goose Property Area

Emission Source	Location	UTM Coordinates (mE)	(mN)	Stack Height (m above ground)	Stack Inner Diameter (m)	Velocity m/s	Exhuast Temperature (°C)	Emission Rates (g/s) NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$
Primary Crusher Dust collector	Crushing	430898	7271735	18.3	1.78	15.2	10	n/a	n/a	n/a	0.755	0.385	0.113
Crushing Conveyor Transfer Dust collector #1	Crushing	430962	7271706	12.2	0.43	16.1	10	n/a	n/a	n/a	0.024	0.012	0.004
Crushing Conveyor Transfer Dust collector #2	Crushing	430966	7271718	12.2	0.43	16.1	10	n/a	n/a	n/a	0.024	0.012	0.004
Crushing & Screening Dust Collector	Crushing	430939	7271744	15.2	1.12	15.5	10	n/a	n/a	n/a	0.152	0.078	0.023
Ball mill Surge Bin Dust Collector	Ball mill surge bin	431003	7271721	18.3	0.38	14.9	10	n/a	n/a	n/a	0.017	0.009	0.003
Ball mill Surge Bin Reclaim Dust Collector	Ball mill surge bin	431013	7271700	15.2	0.51	15.1	10	n/a	n/a	n/a	0.031	0.016	0.005
Smelting furnace dust collector	Refinery	431072	7271883	15.2	0.64	14.9	10	n/a	n/a	n/a	0.047	0.024	0.007
Lime silo bin vent	Process plant	431037	7271896	21.3	0.18	15.2	10	n/a	n/a	n/a	0.004	0.002	0.001
Diesel fired generator	Power plant	430988	7271854	6.1	0.71	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Diesel fired generator	Power plant	430984	7271843	6.1	0.71	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Diesel fired generator	Power plant	430980	7271831	6.1	0.71	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Diesel fired generator	Power plant	430975	7271820	6.1	0.71	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Diesel fired generator	Power plant	430971	7271808	6.1	0.71	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Lab dry dust collector	Truck shop	431106	7271746	15.2	0.53	14.8	10	n/a	n/a	n/a	0.033	0.017	0.005
Mine portal (decline)	Umwelt Pit	429991	7270885	0.1	5.5	7.2	0	1.01	0.936	5.220	1.800	1.800	0.135
Air raise (heater)	Umwelt Pit	429870	7270840	2	0.6	10	600	0.650	0.010	0.160	0.110	0.110	0.050
Air raise (heater)	Umwelt Pit	429880	7270855	2	0.6	10	600	0.650	0.010	0.160	0.110	0.110	0.050
Generator	Main Pit	433752	7269789	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Generator	Unwelt underground	429926	7271002	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Generator	Umwelt Pit	429791	7271066	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Generator	Llama Pit	428970	7272220	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Incinerator	Camp	431517	7271349	6	0.25	20	1000	0.027	0.000	0.000	0.321	0.160	0.107
Generator	Camp	431297	7271881	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Generator	Airstrip	433230	7269941	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Lighting Equipment	WRSA A	429437	7272001	1.5	0.7	32.5	600	0.003	0.000	0.005	0.001	0.001	0.001
Lighting Equipment	WRSA A	429590	7272692	1.5	0.7	32.5	600	0.003	0.000	0.005	0.001	0.001	0.001
Lighting Equipment	WRSA B	434991	7270130	1.5	0.7	32.5	600	0.003	0.000	0.005	0.001	0.001	0.001
Lighting Equipment	WRSA B	429590	7272692	1.5	0.7	32.5	600	0.003	0.000	0.005	0.001	0.001	0.001

Table 6.3-2b. Implementation of Area Sources - Goose Property Area

			Emission Rate (g/m²-s)					
Emission Source	Location	Modelled Area (m²)	NO_x	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$
Vehicle Emissions (exhaust)	Umwelt Pit	177,616	4.31E-06	5.82E-09	1.20E-06	1.81E-07	1.81E-07	1.76E-07
	Llama Pit	167,103	4.58E-06	6.19E-09	1.27E-06	1.93E-07	1.93E-07	1.87E-07
	Main Pit	233,487	3.28E-06	4.43E-09	9.11E-07	1.38E-07	1.38E-07	1.34E-07
	WRSA A	1,832,572	5.22E-08	1.62E-10	2.10E-08	3.20E-09	3.20E-09	3.11E-09
	WRSA B	1,596,568	5.99E-08	1.87E-10	2.42E-08	3.68E-09	3.68E-09	3.57E-09
	Onsite Roads	134,918	3.71E-05	5.60E-08	6.87E-06	8.66E-07	8.66E-07	8.40E-07
	Winter road	199,371	5.67E-08	4.20E-10	2.18E-08	2.39E-09	2.39E-09	2.32E-09
Unpaved Road Dust (fugitive dust)	Onsite Roads	134,646	n/a	n/a	n/a	3.39E-04	8.33E-05	8.33E-06
	Winter road	49,319	n/a	n/a	n/a	2.18E-05	5.35E-06	5.35E-07
Grading	Onsite Roads	134,646	n/a	n/a	n/a	6.231E-07	1.824E-07	1.932E-08
Bulldozing	Umwelt Pit	177,616	n/a	n/a	n/a	8.87E-07	1.03E-07	9.31E-08
	Llama Pit	167,103	n/a	n/a	n/a	9.42E-07	1.10E-07	9.90E-08
	Main Pit	233,487	n/a	n/a	n/a	6.74E-07	7.84E-08	7.08E-08
	WRSA A	1,832,572	n/a	n/a	n/a	2.48E-07	4.67E-08	2.60E-08
	WRSA B	1,596,568	n/a	n/a	n/a	2.84E-07	5.36E-08	2.99E-08
Drilling	Llama Pit	167,103	n/a	n/a	n/a	2.568E-06	1.310E-06	3.852E-07
	Goose Pit	276,892	n/a	n/a	n/a	2.568E-06	1.310E-06	3.852E-07
Blasting	Llama Pit	167,103	7.74E-09	4.03E-09	2.32E-10	7.74E-09	4.03E-09	2.32E-10
	Goose Pit	276,892	1.07E-08	5.56E-09	3.21E-10	1.07E-08	5.56E-09	3.21E-10
Aircraft	Airstrip	115,319	2.13E-08	8.89E-09	5.30E-07	1.57E-09	1.53E-09	1.53E-09
	Helipad	225	4.31E-05	1.06E-05	2.53E-04	7.08E-07	6.91E-07	6.91E-07

Table 6.3-3a. Implementation of Point Sources - George Property Area

		UTM Coordinates		Stack Height	Stack Inner Diameter	Velocity	Exhuast Temperature	Emission Rates (g/s)					
Emission Source	Location	(mE)	(mN)	(m above ground)	(m)	m/s	(°C)	NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$
Primary Crusher Dust collector	Crushing	387363	7313686	18.3	1.78	15.2	10	n/a	n/a	n/a	0.755	0.385	0.113
Incinerator	Camp	387120	7311298	6	0.25	20	1000	0.016	0.000	0.000	0.187	0.093	0.062
Generator	Camp	387285	7311564	6.1	0.7	32.5	518	2.379	0.000	0.236	0.036	0.035	0.032
Generator	Locale 1 Pit	386846	7314338	6.1	0.7	32.5	1000	2.379	0.000	0.236	0.036	0.035	0.032
Generator	Airstrip	388046	7313336	6.1	0.7	32.5	518	0.810	0.000	0.064	0.005	0.005	0.005
Lighting Equipment	WRSA D	386105	7314954	1.5	0.7	32.5	600	0.003	0.000	0.005	0.001	0.001	0.001

Table 6.3-3b. Implementation of Area Sources - George Property Area

Emission Source	Location	Modelled Area (m^2)	Emission Rate (g/m^2-s)					
			NO_x	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$
Vehicle Emissions	Locale 1 Pit	66,316	3.03E-05	4.16E-08	8.82E-06	1.28E-06	1.28E-06	1.24E-06
	WRSA D	182,849	1.36E-06	4.22E-09	6.54E-07	8.37E-08	8.37E-08	8.12E-08
	Onsite Roads	30,165	1.65E-04	2.45E-07	3.05E-05	3.84E-06	3.84E-06	3.72E-06
	Onsite (inc camp)	80,393	9.38E-08	6.92E-10	3.50E-08	3.90E-09	3.90E-09	3.78E-09
	Goose/George Winter Road	302,009	6.10E-08	4.44E-10	2.33E-08	2.57E-09	2.57E-09	2.49E-09
	Winter Road to MLA	566,553	6.20E-08	4.58E-10	2.38E-08	2.61E-09	2.61E-09	2.53E-09
Unpaved Road Dust	Onsite Roads	30,168	n/a	n/a	n/a	2.76E-04	6.79E-05	6.79E-06
	Onsite Roads (inc camp)	80,411	n/a	n/a	n/a	1.80E-05	4.43E-06	4.43E-07
	Goose/George Winter Road (on-site)	18,873	n/a	n/a	n/a	2.29E-05	5.63E-06	5.63E-07
Grading	Onsite Roads	30,165	n/a	n/a	n/a	7.190E-07	2.105E-07	2.229E-08
Bulldozing	Locale 1 Pit	66,316	n/a	n/a	n/a	1.47E-05	2.77E-06	1.55E-06
	WRSA D	182,849	n/a	n/a	n/a	5.34E-06	1.01E-06	5.61E-07
Drilling	Locale 1 Pit	66,316	n/a	n/a	n/a	6.391E-06	3.260E-06	9.587E-07
Blasting	Locale 1 Pit	66,316	6.85E-06	3.56E-06	2.05E-07	6.85E-06	3.56E-06	2.05E-07
Aircraft	Airstrip	20,796	1.42E-07	1.32E-06	6.19E-09	6.04E-09	6.04E-09	3.81E-04
	Helipad	225	1.52E-06	9.05E-05	2.69E-07	2.62E-07	2.62E-07	4.09E-03

Fugitive dust sources were modelled separately from other sources of TSP, PM_{10} and $PM_{2.5}$. The rational for this is that there are large uncertainties associated with fugitive dust emission factors from AP-42. Various AP-42 emission factors will be used for fugitive dust for unpaved road, blasting, drilling, grading and bulldozing. Fugitive dust sources are also expected to have the highest contribution of TSP, PM_{10} and $PM_{2.5,}$ thereby by modelling the fugitive and non-fugitive sources separately the contribution of the different sources can be analysed.

6.5 MODEL RUN POST PROCESS

6.5.1 Nitrogen Dioxide

In CALPUFF, NO_2 emissions are modelled as NO_X emissions. NO_X from internal combustion sources is mainly comprised of NO gas (approximately 90%) with approximately 5% to 10% NO_2 and smaller quantities of other oxides of nitrogen. In the atmosphere, ozone readily oxidizes NO to NO_2. Predicted maximum concentrations of NO_2 can be estimated from NOx concentrations by using the ozone limiting method (BC MOE 2008). The ozone limiting method is applied as follows:

$$NO_2\ conc. = 0.10 \times NO_X\ conc. + \text{the lesser of } (O_3\ conc.\ OR\ 0.90 \times NO_X) + \text{background } NO_2\ conc.$$

This method was employed in the development of the modeling results to provide a refined estimate of predicted NO_2 concentrations that are then compared to the relevant standards (BC MOE 2008).

6.5.2 Acid Deposition

Acid deposition primarily occurs as a result of atmospheric oxidation of sulphur dioxide to sulphate (sulphuric acid) and oxidation of nitrogen dioxide to nitrate (nitric acid). Acid deposition can be quantified as potential acid input, which is a measure of the combined input of sulphur and nitrogen derived acid species. Acid deposition was predicted using CALPUFF modelling of SO_2 and NOx with chemical transformation, to determine sulphate and nitrate deposition rates. Both wet and dry deposition was modelled using the MESOPUFF II chemistry scheme in CALPUFF and expressed as a flux in units of kilograms per hectare per year (kg/ha/yr).

6.5.3 Metals

A portion of the fugitive dust concentrations predicted by the model will be comprised of metals such as iron, aluminium and calcium. As an approximate approach, and in the absence of detailed metals analyses from all dust deposition sources, metals content in the rock was applied to dust concentration results. Metal proportions in rock (split into potentially acid generating (PAG) and non-potentially acid generating (nPAG)) and ore were available from baseline samples from June 2013. The following assumptions about metal content of dust were made:

- unpaved road dust had metal concentrations similar to non-potentially acid generating (nPAG) waste rock;
- fugitive dust from equipment activities (bulldozing/grading) had metal concentrations that were an average of all types of rock; and
- blasting and drilling fugitive dust had metal concentrations that were an average of all types of rock.

Results from the metal content of fugitive dust were used as information for the water quality (Volume 6, Chapter 4), country foods (Volume 8, Chapter 5) and the human health and environmental risk assessment (Volume 8, Chapter 6).

7. Modelling Results

7. Modelling Results

The output from the CALPUFF model is 1-hour average concentrations at each of the modelled receptor points, for each hour of meteorology included in the CALMET data file. This assessment was based on a full year of meteorological data. Hourly data was then post-processed to determine the maximum predicted 1-hour average, 24-hour average, monthly or annual concentrations at each of the receptors. Deposition rates ($g/m^2/s$) were also determined.

As discussed in Chapter 3, ambient air quality standards are primarily applicable to the area beyond the Potential Development Area (PDA). The concentrations within the PDA fall under the occupational health and safety (OH&S) regulations and not under ambient air quality standards/objectives. The only location where this does not apply is at the workers camp, where off-duty workers will spend time.

The maximum air contaminant concentrations resulting from the Project emission scenarios are presented in Table 7.1-1a and Table 7.1-1b. A complete set of maps showing the geographic distribution of maximum air concentrations for each contaminant and modelling scenario is included in Appendix B. A discussion of these results for each scenario is presented in the following sections, along with maps showing where predicted maximum air contaminants are above the relevant standard or objective.

7.1 GOOSE PROPERTY AREA

Predicted maximum 1-hour, 24-hour and annual average SO_2 concentrations were all well below the Nunavut standards at all locations modelled.

Predicted maximum 1-hour and 24-hour average NO_2 concentrations were below the Nunavut objective, both within and outside the PDA. Predicted maximum annual NO_2 concentrations were all below the objective outside of the PDA, however there were exceedances predicted within the PDA. This is similar to other mine sites in the area (Areva Resources Canada Inc 2011, Rescan 2013b). The concentrations at the proposed camp were predicted to below the objectives for all averaging periods.

Predicted maximum 1-hour and 8-hour average CO concentrations were all well below the Nunavut standards at all locations modelled.

Predicted maximum annual TSP concentrations were all below the objective outside of the PDA. There were exceedances predicted within the PDA, however at the proposed camp location no exceedances were predicted. Maximum 24-hour average TSP and PM_{10} concentrations exceeded the Nunavut standard both inside and outside of the PDA, however the exceedances were well within the LSA. Figure 7.1-1 and 7.1-2 shows the 24-hour average TSP and PM_{10} concentration contours. This is similar to results from other mine sites in the area which also predicted exceedances of 24-hour average TSP and PM_{10} concentrations (Baffinland Iron Mine Corporation 2012; Areva Resources Canada Inc 2011; Cumberland Resources Ltd 2005, Rescan 2013b). To examine the nature of the predicted exceedances, a frequency analysis was completed. It was predicted that these TSP and PM_{10} exceedances outside of the PDA will occur 4.4% and 1.6% of the time, respectively. At the proposed amp location, exceedances of the 24-hour TSP and PM_{10} objective were expected to occur 17.0% and 7.7% of the time, respectively. The model was run for fugitive and non-fugitive sources separately and therefore the contribution from different sources can be assessed. Table 7.1-2 shows the exceedances outside of the PDA and at the proposed camp location were from fugitive sources only. These exceedances can be attributed to emissions of dust from open pit mining activities, in particular unpaved road dust generated on onsite. The model has been run assuming no anthropogenic dust control; however, mitigation measures such as road watering may be implemented which will significantly reduce the amount of unpaved road dust. Other means of emission control are described in the Air Quality Management Plan (Volume 10).

Table 7.1-1a. Predicted Maximum Air Contaminants Resulting from Project Activities - Goose

Pollutant	Averaging Period	Concentrations (µg/m^3), Dust Deposition Rate (mg/dm^2/day) and Acid Deposition Rate (eq/ha/year)						
				Outside of PDA			Camp Location[a]	
		Objective	Background	Maximum Predicted Concentration - (Project)	Maximum Predicted Concentration - (Project + Background)	Frequency of Exceedance per Year (%)	Maximum Predicted Concentration (Project + Background)	Frequency of Exceedance per Year (%)
SO_2	1-hour	450	16.25	13.5	29.7	-	32.4	-
	24-hour	150	6.5	2.3	8.8	-	9.3	-
	Annual	30	1.3	0.2	1.5	-	1.6	-
NO_2[b]	1-hour	400	7.5	83.1	90.6	-	148.4	-
	24-hour	200	3	67.6	70.6	-	86.3	-
	Annual	60	0.6	4.7	5.3	-	23.5	-
CO	1-hour	15,000	1250	322.0	1572.0	-	1,389.0	-
	8-hour	6,000	875.0	164.7	1039.7	-	938.6	-
TSP	24-hour	120	7	**391.3**	**398.3**	**4.4**	**493.1**	**17.0**
	Annual	60	1.4	21.1	22.5	-	59.0	-
PM_{10}	24-hour	50	3.8	**98.9**	**102.7**	**1.6**	**125.3**	**7.7**
$PM_{2.5}$	24-hour	27	3.8	6.9	10.7	-	13.7	-
	Annual	8.8	0.76	0.8	1.5	-	2.9	-
Dustfall (mg/dm^2/day)	30-day	1.7	1.1	0.004	1.1	-	n/a	-
Acid Deposition	Annual	250	104	82.3	186.3	-	n/a	-

Notes:
n/a = not applicable
Exceedances highlighted in bold.
[a] *The camp was assumed to be in the polygon east of McCoy Lake as the proposed location of a camp was not available in June 2013.*
[b] *Ozone limiting method was used.*

Table 7.1-1b. Predicted Maximum Air Contaminants Resulting from Project Activities - George

Pollutant	Averaging Period	Concentrations (µg/m³), Dust Deposition Rate (mg/dm²/day) and Acid Deposition Rate (eq/ha/year)						
				Outside of PDA			Camp Location	
		Objective	Background	Maximum Predicted Concentration - (Project)	Maximum Predicted Concentration - (Project + Background)	Frequency of Exceedance per Year (%)	Maximum Predicted Concentration (Project + Background)	Frequency of Exceedance per Year (%)
SO_2	1-hour	450	3.75	3.3	7.1	-	5.3	-
	24-hour	150	1.5	0.9	2.4	-	1.9	-
	Annual	30	0.3	0.1	0.4	-	0.4	-
NO_2 [a]	1-hour	400	13.75	109.7	123.4	-	90.4	-
	24-hour	200	5.5	71.6	77.1	-	52.8	-
	Annual	60	1.1	7.4	8.5	-	6.5	-
CO	1-hour	15,000	1250	211.4	1461.4	-	1,344.0	-
	8-hour	6,000	875.0	122.1	997.1	-	932.9	-
TSP	24-hour	120	7	350.6	357.6	4.7	139	0.8
	Annual	60	1.4	18.6	20.0	-	12	-
PM_{10}	24-hour	50	3.8	80.3	84.1	1.6	39	-
$PM_{2.5}$	24-hour	27	3.8	12.4	16.2	-	8	-
	Annual	8.8	0.76	1.3	2.0	-	1	-
Dustfall (mg/dm²/day)	30-day	1.7	0.5	0.002	0.5	-	n/a	-
Acid Deposition	Annual	250	45	76.3	121.3	-	n/a	-

Notes:
n/a = not applicable
Exceedances highlighted in bold.
[a] *Ozone limiting method was used.*

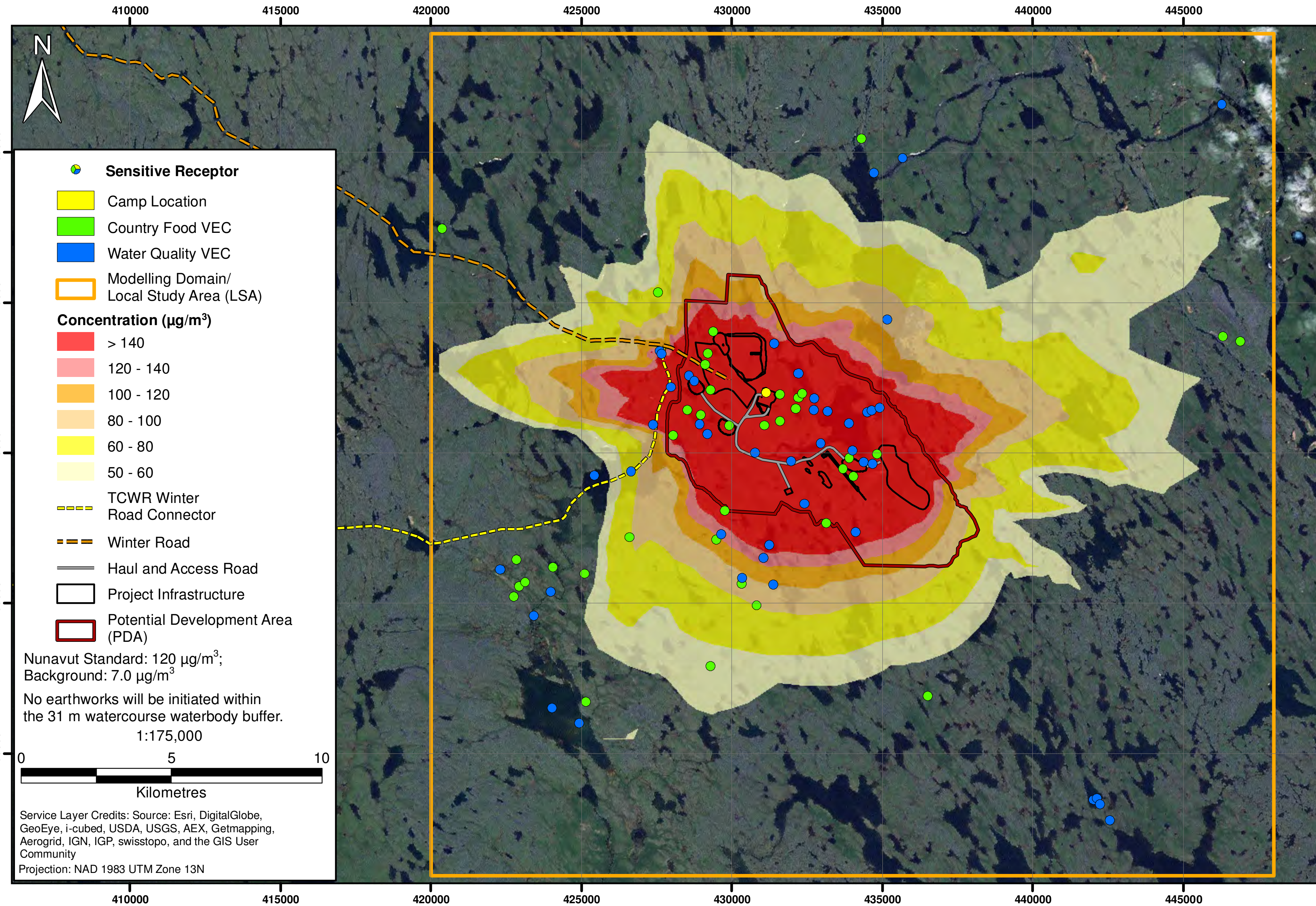

Figure 7.1-1

Maximum Total 24-hour TSP Concentration, Goose Property Area

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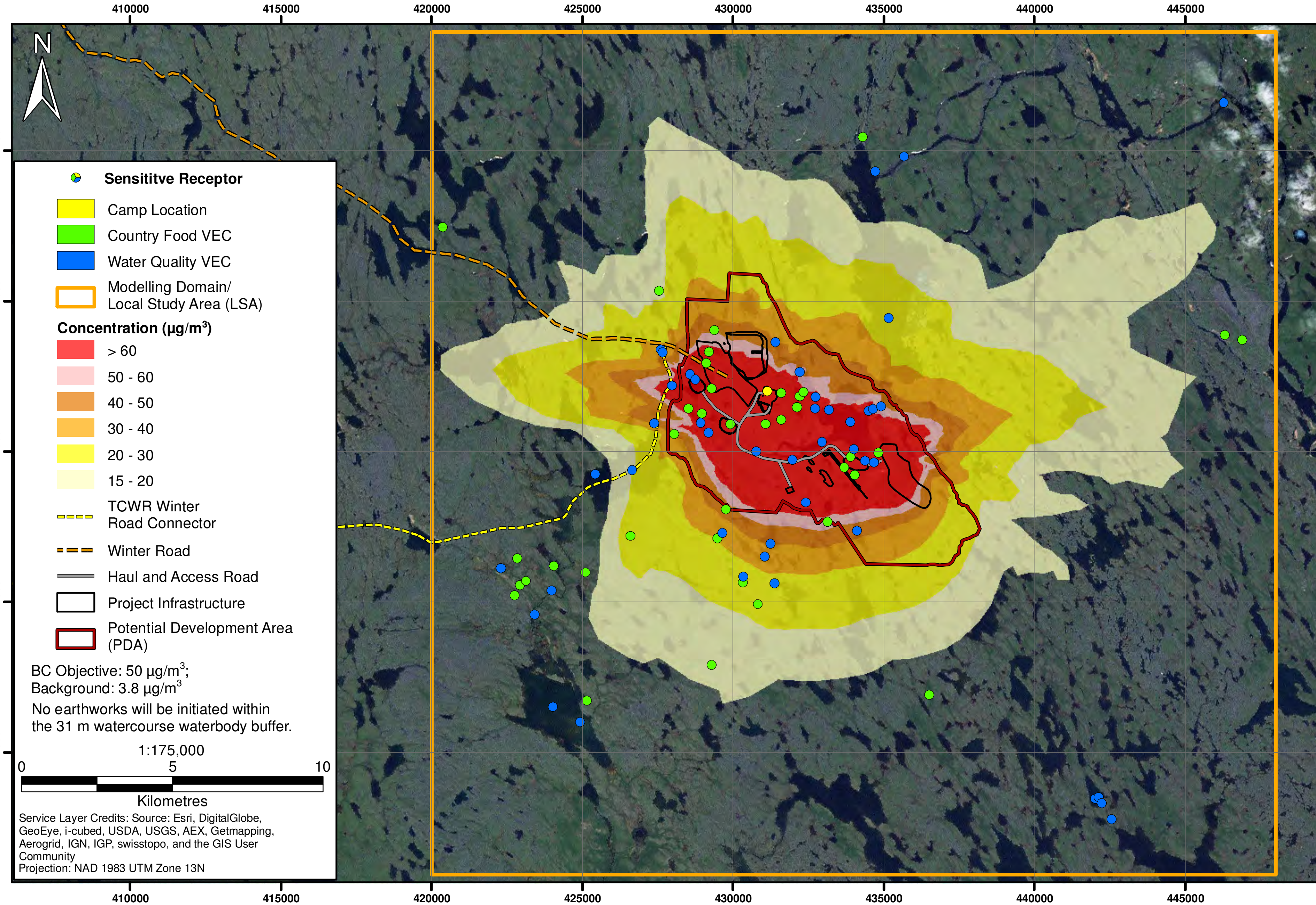

Figure 7.1-2

Maximum Total 24-hour PM_{10} Concentration, Goose Property Area

Sabina GOLD & SILVER CORP.

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Table 7.1-2. TSP, PM_{10} and $PM_{2.5}$ Fugitive and Non-Fugitive Sources - Goose

		Concentrations (µg/m³)								
				Maximum Predicted Concentrations (Project + Background)					
				Non-Fugitive		Fugitive		Total (Non-fugitive + Fugitive)	
Pollutant	Averaging Period	Objective	Background	Outside of PDA	Camp Location	Outside of PDA	Camp Location	Outside of PDA	Camp Location
TSP	24-hour	120	7	11.6	13.0	**396.8**	**490.4**	**398.3**	**493.1**
	Annual	60	1.4	1.7	2.2	22.2	58.2	22.5	59.0
PM_{10}	24-hour	50	3.8	8.4	9.7	**101.3**	**122.7**	**102.7**	**125.3**
$PM_{2.5}$	24-hour	27	3.8	5.2	6.5	9.3	11.8	10.7	13.7
	Annual	8.8	0.76	0.9	1.3	1.4	2.4	1.5	2.9

Predicted maximum annual and 24-hour $PM_{2.5}$ concentrations were all below the objective outside of the PDA. There were exceedances predicted within the PDA, however at the proposed camp location no exceedances were predicted.

Dust deposition rates were predicted to be below the referenced objectives. These deposition values were used as information for the water quality (Volume 6, Chapter 4), country foods (Volume 8, Chapter 5) and the human health and environmental risk assessments (Volume 8, Chapter 6).Predicted maximum annual acid deposition rates were all below the objective outside of the PDA. There were exceedances predicted within the PDA, which is similar to other mine sites in the area (Areva Resources Canada Inc 2011). Annual acid precipitation will exceed the WHO critical load guideline in 20% of the Goose PDA. The areas where predicted annual acid deposition rates are expected to exceed the guidelines will extend up to approximately 2 km around the processing plant and pits. These deposition values are further evaluated in vegetation (Volume 5, Chapter 4).

7.2 GEORGE PROPERTY AREA

Predicted maximum 1-hour, 24-hour and annual average SO_2 concentrations were all well below the Nunavut standards at all locations modelled.

Predicted maximum 1-hour and 24-hour average NO_2 concentrations were below the Nunavut objective, both within and outside the PDA. Predicted maximum annual NO_2 concentrations were all below the objective outside of the PDA, however there were exceedances predicted within the PDA. This is similar to other mine sites in the area (Areva Resources Canada Inc 2011, Rescan 2013b). The concentrations at the camp (which was assumed to be located east of McCoy Lake) were predicted to below the objectives for all averaging periods.

Predicted maximum 1-hour and 8-hour average CO concentrations were all well below the Nunavut standards at all locations modelled.

Predicted maximum annual TSP concentrations were all below the objective outside of the PDA. Maximum 24-hour average TSP and PM_{10} concentrations exceeded the Nunavut standard both inside and outside of the PDA, however the exceedances were well within the LSA. Figure 7.2-1 and 7.2-2 shows the 24-hour average TSP and PM_{10} concentration contours. This is similar to results from other mine sites which also predicted exceedances of 24-hour average TSP and PM_{10} concentrations (Baffinland Iron Mine Corporation 2012; Areva Resources Canada Inc 2011; Cumberland Resources Ltd 2005; Rescan 2013b). There were no exceedances of the PM_{10} objective at the camp (which was assumed to be located east of McCoy Lake), however there were exceedances of the TSP objective. To examine the nature of the predicted exceedances, a frequency analysis was completed. It was predicted that these TSP and PM_{10} exceedances outside of the PDA will occur 4.7% and 1.6% of the time, respectively. At the assumed camp location, exceedances of the 24-hour TSP objective were expected to occur 0.8% of the time. The model was run for fugitive and non-fugitive sources separately and therefore the contribution from different sources can be assessed. Table 7.2-1 shows the exceedances outside of the PDA and at the assumed camp location were from fugitive sources only. These exceedances can be attributed to emissions of dust from open pit mining activities, in particular unpaved road dust generated onsite. The model has been run assuming no anthropogenic dust control, however, mitigation measures such as road watering may be implemented which will significantly reduce the amount of unpaved road dust. Other means of emission control are described in the Air Quality Management Plan (Volume 10).

Table 7.2-1. TSP, PM_{10} and $PM_{2.5}$ Fugitive and Non-Fugitive Sources - George

		Concentrations (µg/m³)							
				Maximum Predicted Concentrations (Project + Background)					
				Non-fugitive		Fugitive		Total (Non-fugitive + Fugitive)	
Pollutant	Averaging Period	Objective	Background	Outside of PDA	Camp Location	Outside of PDA	Camp Location	Outside of PDA	Camp Location
TSP	24-hour	120	7	11.3	10.7	**353.9**	**137**	**357.6**	**139**
	Annual	60	1.4	1.7	1.7	19.7	12	20.0	12
PM_{10}	24-hour	50	3.8	8.1	5.7	**80.4**	**37**	**84.1**	**39**
$PM_{2.5}$	24-hour	27	3.8	6.4	5.1	14.0	7	16.2	8
	Annual	8.8	0.76	1.0	1.0	1.8	1	2.0	1

Predicted maximum annual and 24-hour $PM_{2.5}$ concentrations were all below the objective outside of the PDA. There were exceedances predicted within the PDA, however at the assumed camp location no exceedances are predicted.

Dust deposition rates were predicted to be below the referenced objectives. These deposition values were used as information for the water quality (Volume 6, Chapter 4), country foods (Volume 8, Chapter 5) and the human health and environmental risk assessments (Volume 8, Chapter 6).

Predicted maximum annual acid deposition rates are all below the objective outside of the PDA. There are exceedances predicted within the PDA, which is similar to other mine sites in the area (Areva Resources Canada Inc 2011). Annual acid precipitation will exceed the WHO critical load guideline in 6% of the George PDA. The areas where predicted annual acid deposition rates are expected to exceed the guidelines will extend up to approximately 2 km around the Locale 1 Pit. These deposition values are further evaluated in vegetation (Volume 5, Chapter 4).

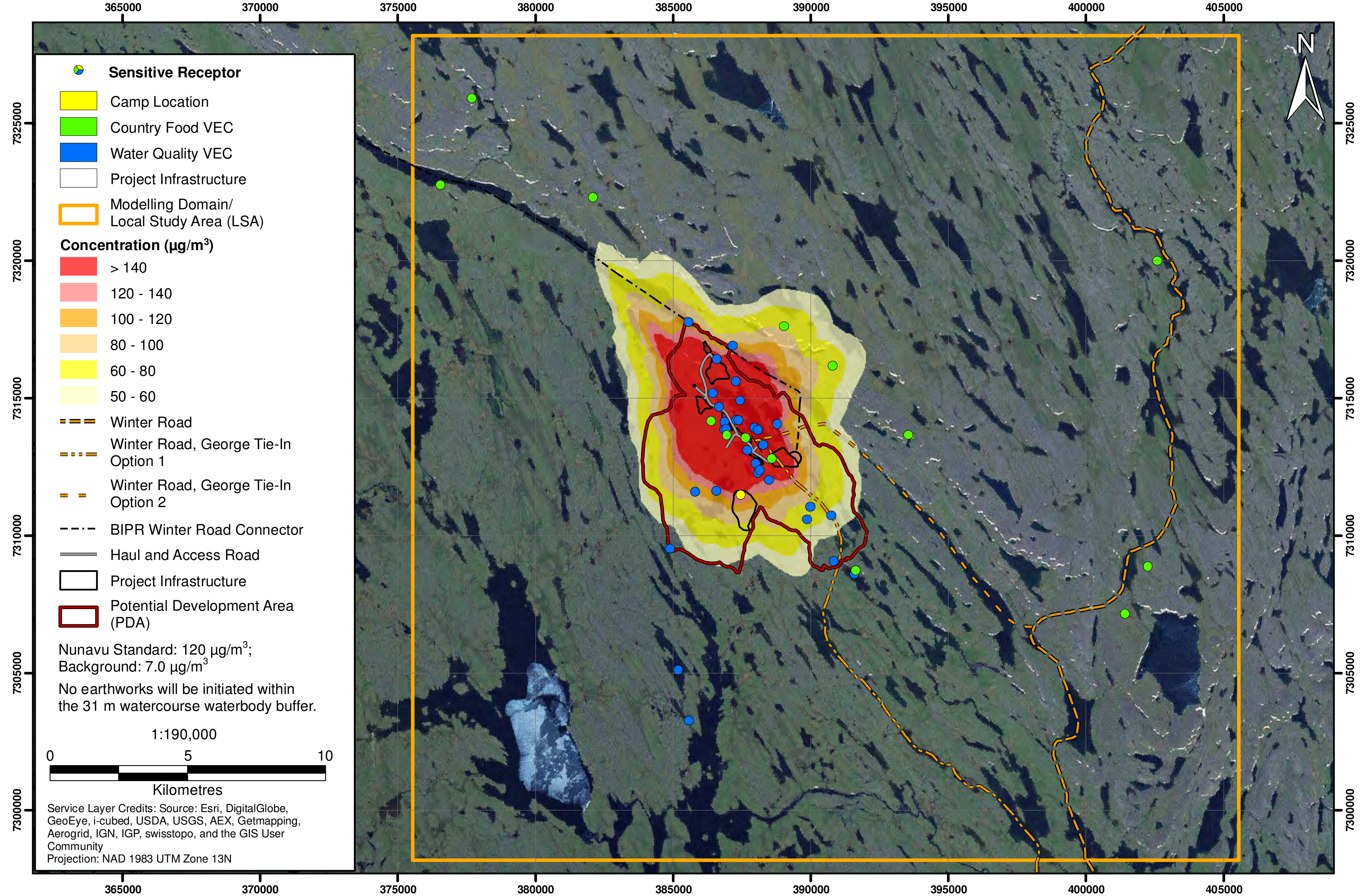

Figure 7.2-1

Sabina GOLD & SILVER CORP.

Maximum Total 24-hour TSP Concentration, George Property Area

Figure 7.2-1

Rescan an ERM company

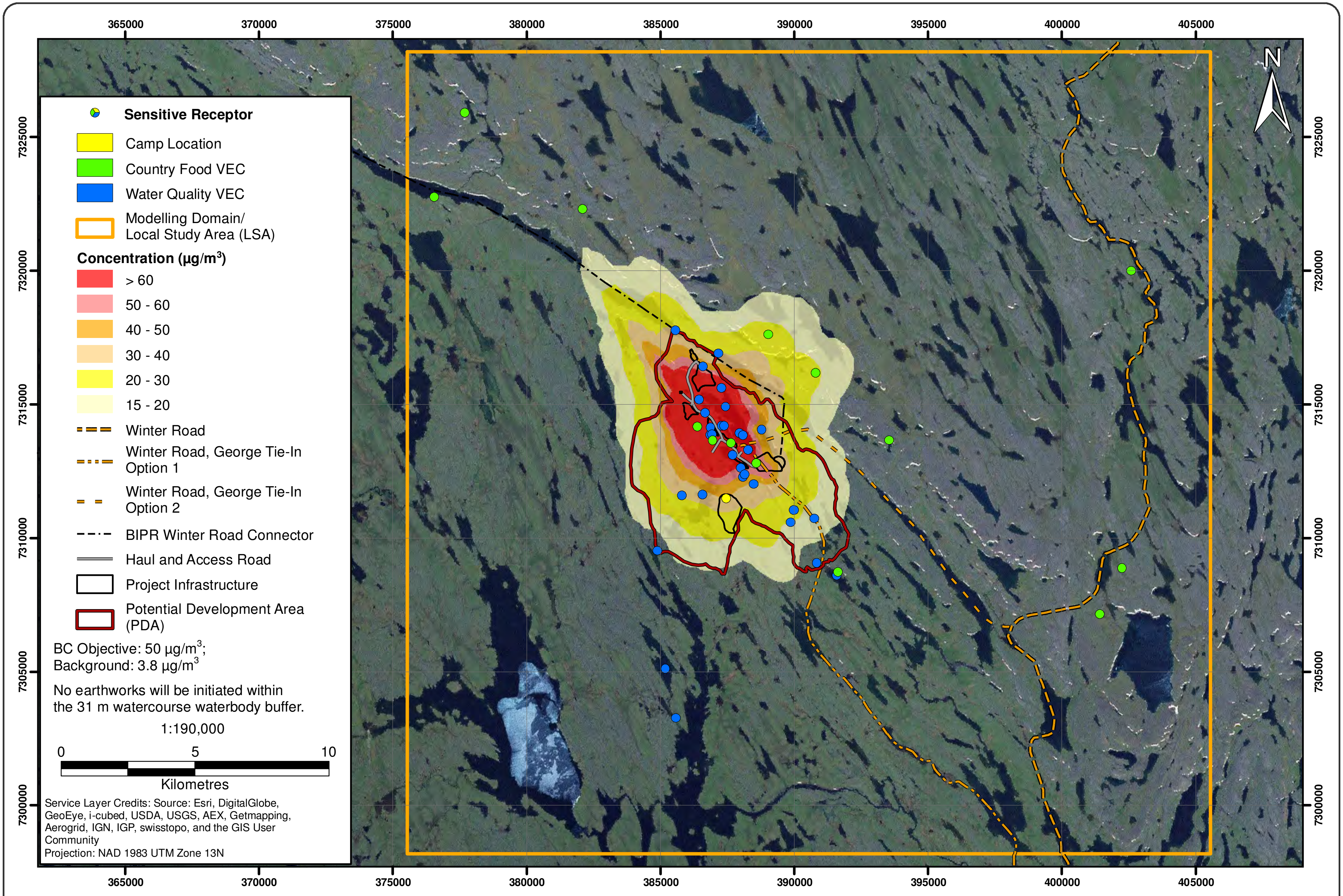

Figure 7.2-2

Maximum Total 24-hour PM_{10} Concentration, George Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

8. Conclusions

8. Conclusions

The air quality modelling study for the Project included an evaluation of increases in the concentrations of various contaminants associated with the Back River Project. These concentrations were then evaluated, and compared to ambient air quality criteria.

Maximum 1-hour, 24-hour and annual SO_2 concentrations were predicted to be well below Nunavut's ambient air quality standards at all locations modelled.

Predicted maximum 1-hour and 24-hour average NO_2 concentrations were below the Nunavut objective at all locations modelled. Predicted maximum annual NO_2 concentrations were all below the objective outside of the Goose and George PDAs, however there were exceedances predicted within the PDAs at both Goose and George. The concentrations at the proposed camps were predicted to below the objectives for all averaging periods.

Predicted maximum 1-hour and 8-hour CO concentrations were also well below the corresponding NAAQOs at all locations modelled.

Maximum TSP, PM_{10} and $PM_{2.5}$ concentrations as well as dust deposition rates are difficult to predict because of the inherent uncertainties associated with the emissions estimates. Maximum annual concentrations were predicted to be well below Nunavut's ambient air quality standards at all locations modelled. The modelling predictions show 24-hour average exceedances of TSP and PM_{10} within the PDA at both the Goose and George properties. Predicted maximum 24-hour TSP concentrations at the Goose and George properties show exceedances occur 4.4% and 4.7% respectively. At the at Goose and George camp locations exceedances occur 17.0% and 0.8%, respectively. Predicted maximum 24-hour PM_{10} concentrations show exceedances occur 1.6% at both Goose and George. At the proposed Goose camp location 24-hour PM_{10} exceedances occur 7.7% of the time, however there are no exceedances at the assumed location of the George camp. These exceedances are primarily due to fugitive emissions, which can be attributed to emissions of dust from open pit mining activities, in particular unpaved road dust generated onsite. The model has been run assuming no anthropogenic dust control, however, mitigation measures such as road watering may be implemented which would significantly reduce the amount of unpaved road dust.

Predicted maximum annual and 24-hour $PM_{2.5}$ concentrations are below the objective outside of the PDAs at both the Goose and George properties. There are exceedances predicted within the PDAs at both properties, however, at the proposed camp locations no exceedances are predicted.

Dust deposition rates were predicted to be below the referenced objectives. Annual acid deposition rates were also predicted to be well below the most stringent objectives available at all locations outside the PDA and at the proposed camp locations.

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An explanation of the acronyms used throughout this reference list can be found in the *Acronyms and Abbreviations* section.

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Appendix A
Emission Sources

Appendix A. Emission Sources

Table A-1. Goose Property Area - Stack Air Emission Sources and Characteristics

						Emission Factor (g/s)						
Stack Description	**Location**	**Power Rating**	**Load Factor**	**Operating Hours**	**Control Device**	**NO_x**	**SO_x**	**CO**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**Emission Source**
Primary Crusher Dust collector	Crushing	-	-	8760	Baghouse, fan, rotary valve	-	-	-	0.755	0.385	0.113	Ontario Air and Noise Best Practice (2011)
Crushing Conveyor Transfer Dust collector #1	Crushing	-	-	8760	Bin Vent with exhaust fan	-	-	-	0.024	0.012	0.004	Ontario Air and Noise Best Practice (2011)
Crushing Conveyor Transfer Dust collector #2	Crushing	-	-	8760	Bin Vent with exhaust fan	-	-	-	0.024	0.012	0.004	Ontario Air and Noise Best Practice (2011)
Crushing & Screening Dust Collector	Crushing	-	-	8760	Baghouse, fan, rotary valve	-	-	-	0.152	0.078	0.023	Ontario Air and Noise Best Practice (2011)
Ball mill Surge Bin Dust Collector	Ball mill surge bin	-	-	8760	Bin Vent with exhaust fan	-	-	-	0.017	0.009	0.003	Ontario Air and Noise Best Practice (2011)
Ball mill Surge Bin Reclaim Dust Collector	Ball mill surge bin	-	-	8760	Baghouse, fan, rotary valve	-	-	-	0.031	0.016	0.005	Ontario Air and Noise Best Practice (2011)
Smelting furnace dust collector	Refinery	-	-	8760	Baghouse, fan, rotary valve	-	-	-	0.047	0.024	0.007	Ontario Air and Noise Best Practice (2011)
Lime silo bin vent	Process plant	-	-	8760	Bin Vent with exhaust fan	-	-	-	0.004	0.002	0.001	Ontario Air and Noise Best Practice (2011)
Lab dry dust collector	Truck shop	-	-	8760	Baghouse	-	-	-	0.033	0.017	0.005	Ontario Air and Noise Best Practice (2011)
Diesel fired generator	Power plant	1 MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Diesel fired generator	Power plant	1 MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Diesel fired generator	Power plant	1 MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Diesel fired generator	Power plant	1 MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Diesel fired generator	Power plant	1 MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Mine portal (decline)	Umwelt Pit	-	-	8760	-	1.01	0.936	5.220	1.800	1.800	0.135	BC MOE (2008)
Air raise (heater)	Umwelt Pit	-	-	5928	-	0.650	0.010	0.160	0.110	0.110	0.050	RWDI (2011)
Air raise (heater)	Umwelt Pit	-	-	5928	-	0.650	0.010	0.160	0.110	0.110	0.050	RWDI (2011)
Generator	Main Pit	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Generator	Unwelt underground	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Generator	Umwelt Pit (open)	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Generator	Llama Pit	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Incinerator	Camp	-	-	8760	-	0.027	0.000	0.000	0.321	0.160	0.107	Manufacturer's specification adjusted based on camp size
Generator	Camp	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Generator	Airstrip	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Light plant	WRSA A	13kW	-	4380	-	0.003	0.000	0.005	0.001	0.001	0.001	Tier 4 emission standards (ECFR 2013)
Light plant	WRSA A	13kW	-	4380	-	0.003	0.000	0.005	0.001	0.001	0.001	Tier 4 emission standards (ECFR 2013)
Light plant	WRSA B	13kW	-	4380	-	0.003	0.000	0.005	0.001	0.001	0.001	Tier 4 emission standards (ECFR 2013)
Light plant	WRSA B	13kW	-	4380	-	0.003	0.000	0.005	0.001	0.001	0.001	Tier 4 emission standards (ECFR 2013)

Table A-2. Goose Property Area - Equipment Air Emission Sources and Characteristics

Type of Equipment	Units Year 3	Fuel Type	Power (hp)	Load Factor	Operating Hours per Year	Emission Factor (g/hp-hr)						Emission Source
						NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Haul Truck CAT-785D	5	Diesel	1348	0.59	6,707	2.47	0.00	0.45	0.06	0.06	0.06	NONROAD (2008)
Haul Truck CAT-777G	9	Diesel	1025	0.59	6,707	2.47	0.00	0.45	0.06	0.06	0.06	NONROAD (2008)
Front end loaders CAT 993K	3	Diesel	1025	0.59	5,817	3.38	0.00	0.93	0.13	0.13	0.13	NONROAD (2008)
Rubber Tyre Dozers CAT 824 H	2	Diesel	354	0.59	5,957	1.25	0.00	0.50	0.08	0.08	0.07	NONROAD (2008)
Bulldozers CAT D-10	5	Diesel	580	0.59	5,585	1.25	0.00	0.50	0.08	0.08	0.07	NONROAD (2008)
Motor Graders CAT 16M	3	Diesel	297	0.59	5,212	0.65	0.00	0.20	0.03	0.03	0.03	NONROAD (2008)
Vertical Drill Rig MD 6240 (rotary)	3	Diesel	800	0.43	4,840	4.71	0.00	1.09	0.18	0.18	0.18	NONROAD (2008)
Vertical Drill Rig MD 5125 (Track)	2	Diesel	325	0.43	4,840	3.08	0.00	0.88	0.14	0.14	0.13	NONROAD (2008)
Mechanics Truck	1	Diesel	225	0.59	730	0.32	0.00	0.12	0.01	0.01	0.01	NONROAD (2008)
School bus	1	Diesel	305	0.59	2,190	0.52	0.00	0.20	0.02	0.02	0.02	NONROAD (2008)
95 tonnes/truck[a]	42	Diesel	475	0.59	50	0.52	0.00	0.20	0.02	0.02	0.02	NONROAD (2008)
Fuel trucks	-	Diesel	130	0.59	1,989[b]	0.33	0.00	0.15	0.01	0.01	0.01	NONROAD (2008)

[a] *Within Goose Property Area modelling domain.*
[b] *All vehicles.*

Table A-3. Goose Property Area - Aircraft Air Emission Sources and Characteristics

Source	Number of Flights per Year (round trips)	Emission Factor (g/yr)						Emission Source
		NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Dash-7	1095	70.813	29.511	1758.746	5.095	5.095	5.095	EDMS v5.1.4
Helicopter	365	837.712	207.016	4920.451	13.436	13.436	13.436	EDMS v5.1.4

Table A-4. Goose Property Area - Unpaved Road Dust Air Emission Sources and Characteristics

Type of Equipment	Weight Ton	Speed (km/hr)	Load Factor	Operating Hours	Emissions Factors (g/km)						Emission Source
					NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Haul Truck CAT-785D	202	20	-	2,072	-	-	-	4,259	1,047	105	AP-42 Chapter 13.2.2 for unpaved road dust
Haul Truck CAT-777G	128	20	-	2,072	-	-	-	3,463	851	85	AP-42 Chapter 13.2.2 for unpaved road dust

(continued)

Table A-4. Goose Property Area - Unpaved Road Dust Air Emission Sources and Characteristics (completed)

Type of Equipment	Weight Ton	Speed (km/hr)	Load Factor	Operating Hours	Emissions Factors (g/km)						Emission Source
					NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Mechanics Truck	5	20	-	730	-	-	-	803	197	20	AP-42 Chapter 13.2.2 for unpaved road dust
School bus	16	20	-	2,190	-	-	-	1,359	334	33	AP-42 Chapter 13.2.2 for unpaved road dust
95 tonnes/truck	118	35	0.59	594	-	-	-	3,337	820	82	AP-42 Chapter 13.2.2 for unpaved road dust
Fuel truck	8	35	0.59	566	-	-	-	1,019	250	25	AP-42 Chapter 13.2.2 for unpaved road dust

Table A-5. Goose Property Area - Activity Air Emission Sources and Characteristics

Source	Speed (km/h)	Distance (km/yr)	Silt Content (%)	Moisture Content	No of Holes per Year	Area per Blast (m^2)	Explosives Used (Mg)	Emission Factor						Emission Source
								NO_2	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$	
Graders								kg/km						AP-42 Chapter 11.9 for grading
	11.4	3283.0	n/a	n/a	n/a	n/a	n/a	-	-	-	1.49	0.44	0.05	
Bulldozers								kg/km						AP-42 Chapter 11.9 for bulldozing of overburden
	n/a	n/a	Pits = 6.9	Pits = 7.9	n/a	n/a	n/a	-	-	-	0.62	0.07	0.07	
	n/a	n/a	WRSA = 1	WRSA = 3	n/a	n/a	n/a	-	-	-	1.80	0.34	0.19	AP-42 Chapter 11.9 for bulldozing of overburden
Drilling								kg/hole						AP-42 Chapter 11.9 Appendix B.2 - used for PM_{10} and $PM_{2.5}$ ratios
	n/a	n/a	n/a	n/a	Llama Pit = 27,496 Main Pit = 38,004	n/a	n/a	-	-	-	0.59	0.3009	0.0885	
Blasting								kg/blast						AP-42 Chapter 13.3 for blasting
	n/a	n/a	n/a	n/a	n/a	159	n/a	-	-	-	0.4426	0.2301	0.0133	
								kg/Mg						AP-42 Chapter 11.9 for blasting
	n/a	n/a	n/a	n/a	n/a	n/a	Llama Pit = 2,819 Main Pit = 3,896	34	8	1	-	-	-	

Table A-6. George Property Area - Stack Air Emission Sources and Characteristics

Stack Description	Location	Power Rating	Load Factor	Operating Hours	Control Device	Emission Factor (g/s)						Emission Source
						NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Primary Crusher Dust collector	Crushing	-	-	8760	Baghouse, fan, rotary valve	-	-	-	0.755	0.385	0.113	Ontario Air and Noise Best Practice (2011)
Incinerator	Camp	-	-	8760	-	0.016	0.000	0.000	0.187	0.093	0.062	Manufacturer's specification adjusted based on camp size
Generator	Camp	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Generator	Locale 1 Pit	1MW	0.68	8760	-	2.379	0.000	0.236	0.036	0.035	0.032	Manufacturer's specification
Generator	Airstrip	0.5MW	0.68	8760	-	0.810	0.000	0.064	0.005	0.005	0.005	Manufacturer's specification
Light plant	WRSA D	13kW	-	4380	-	0.003	0.000	0.005	0.001	0.001	0.001	Tier 4 emission standards (ECFR 2013)

Table A-7. George Property Area - Vehicle Air Emission Sources and Characteristics

Type of Equipment	Units Year 7	Fuel Type	Power (hp)	Load Factor	Operating Hours per Year	Emission Factor (g/hp-hr)						Emission Source
						NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Haul Truck CAT-785D	5	Diesel	1348	0.59	6,707	2.47	0.00	0.45	0.06	0.06	0.06	NONROAD (2008)
Haul Truck CAT-777G	9	Diesel	1025	0.59	6,707	2.47	0.00	0.45	0.06	0.06	0.06	NONROAD (2008)
Front end loaders CAT 993K	3	Diesel	1025	0.59	5,817	3.38	0.00	0.93	0.13	0.13	0.13	NONROAD (2008)
Rubber Tyre Dozers CAT 824 H	2	Diesel	687	0.59	5,957	1.26	0.00	0.76	0.08	0.08	0.08	NONROAD (2008)
Bulldozers CAT D-10	4	Diesel	580	0.59	5,585	1.25	0.00	0.50	0.08	0.08	0.07	NONROAD (2008)
Motor Graders CAT 16M	2	Diesel	297	0.59	5,212	0.65	0.00	0.20	0.03	0.03	0.03	NONROAD (2008)
Vertical Drill Rig MD 6240 (rotary)	2	Diesel	800	0.43	4,840	4.71	0.00	1.09	0.18	0.18	0.18	NONROAD (2008)
Vertical Drill Rig MD 5125 (Track)	2	Diesel	325	0.43	4,840	3.08	0.00	0.88	0.14	0.14	0.13	NONROAD (2008)
Mechanics Truck	1	Diesel	225	0.59	730	0.32	0.00	0.12	0.01	0.01	0.01	NONROAD (2008)

(continued)

Table A-7. George Property Area - Vehicle Air Emission Sources and Characteristics (completed)

Type of Equipment	Units Year 7	Fuel Type	Power (hp)	Load Factor	Operating Hours per Year	Emission Factor (g/hp-hr)						Emission Source
						NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
School bus	1	Diesel	305	0.59	2,190	0.52	0.00	0.20	0.02	0.02	0.02	NONROAD (2008)
95 tonnes/truck [a]	42	Diesel	475	0.59	84	0.52	0.00	0.20	0.02	0.02	0.02	NONROAD (2008)
Fuel trucks	-	Diesel	130	0.59	2,591[b]	0.33	0.00	0.15	0.01	0.01	0.01	NONROAD (2008)
95 tonnes/truck [a]	42	Diesel	475	0.59	154	0.52	0.00	0.20	0.02	0.02	0.02	NONROAD (2008)
Fuel trucks	-	Diesel	130	0.59	6,171[b]	0.33	0.00	0.15	0.01	0.01	0.01	NONROAD (2008)

[a] *Within George Property Area modelling domain.*
[b] *All vehicles.*

Table A-8. George Property Area - Aircraft Air Emission Sources and Characteristics

Source	Number of Flights per Year (round trips)	Emission Factor (g/yr)						Emission Source
		NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Twin Otter	1095	440.425	84.819	789.874	3.618	3.618	3.618	EDMS v5.1.4
Helicopter	365	837.712	207.016	4920.451	13.436	13.436	13.436	EDMS v5.1.4

Table A-9. George Property Area - Unpaved Road Dust Air Emission Sources and Characteristics

Type of Equipment	Weight Ton	Speed (km/hr)	Load Factor	Operating Hours	Emissions Factor (g/km)						Emission Source
					NO_x	SO_x	CO	TSP	PM_{10}	$PM_{2.5}$	
Haul Truck CAT-785D	275	20	-	362	-	-	-	4,259	1,047	105	AP-42 Chapter 13.2.2 for unpaved road dust
Haul Truck CAT-777G	137	20	-	362	-	-	-	3,463	851	85	AP-42 Chapter 13.2.2 for unpaved road dust
Mechanics Truck	5	20	-	730	-	-	-	803	197	20	AP-42 Chapter 13.2.2 for unpaved road dust
School bus	16	20	-	2,190	-	-	-	1,359	334	33	AP-42 Chapter 13.2.2 for unpaved road dust
95 tonnes/truck	118	35	0.59	252	-	-	-	3,337	820	82	AP-42 Chapter 13.2.2 for unpaved road dust
Fuel truck	8	35	0.59	186	-	-	-	1,019	250	25	AP-42 Chapter 13.2.2 for unpaved road dust

Table A-10. George Property Area - Activity Air Emission Sources and Characteristics

Source	Speed (km/h)	Distance (km/yr)	Silt Content (%)	Moisture Content	No of Holes per Year	Area per Blast (m^2)	Explosives Used (Mg)	Emission Factor NO_2	SO_2	CO	TSP	PM_{10}	$PM_{2.5}$	Emission Source
Graders										kg/km				AP-42 Chapter 11.9 for grading
	11.4	734.1	n/a	n/a	n/a	n/a	n/a	-	-	-	1.49	0.44	0.05	
Bulldozers										kg/km				AP-42 Chapter 11.9 for bulldozing of overburden
	n/a	n/a	Pits = 6.9	Pits = 7.9	n/a	n/a	n/a	-	-	-	0.62	0.07	0.07	
	n/a	n/a	WRSA = 1	WRSA = 3	n/a	n/a	n/a	-	-	-	1.80	0.34	0.19	AP-42 Chapter 11.9 for bulldozing of overburden
Drilling										kg/hole				AP-42 Chapter 11.9 Appendix B.2 - used for PM_{10} and $PM_{2.5}$ ratios
	n/a	n/a	n/a	n/a	Locale 1 Pit = 24,322	n/a	n/a	-	-	-	0.59	0.3009	0.0885	
Blasting										kg/blast				AP-42 Chapter 13.3 for blasting
	n/a	n/a	n/a	n/a	n/a	159	n/a	-	-	-	0.4426	0.2301	0.0133	
										kg/Mg				AP-42 Chapter 11.9 for blasting
	n/a	n/a	n/a	n/a	n/a	n/a	Locale 1 Pit = 1,556	34	8	1	-	-	-	

Appendix B
Calpuff Contour Plots

PROJECT # 0194096-0040 GIS # BAC-12-028k October 15 2013

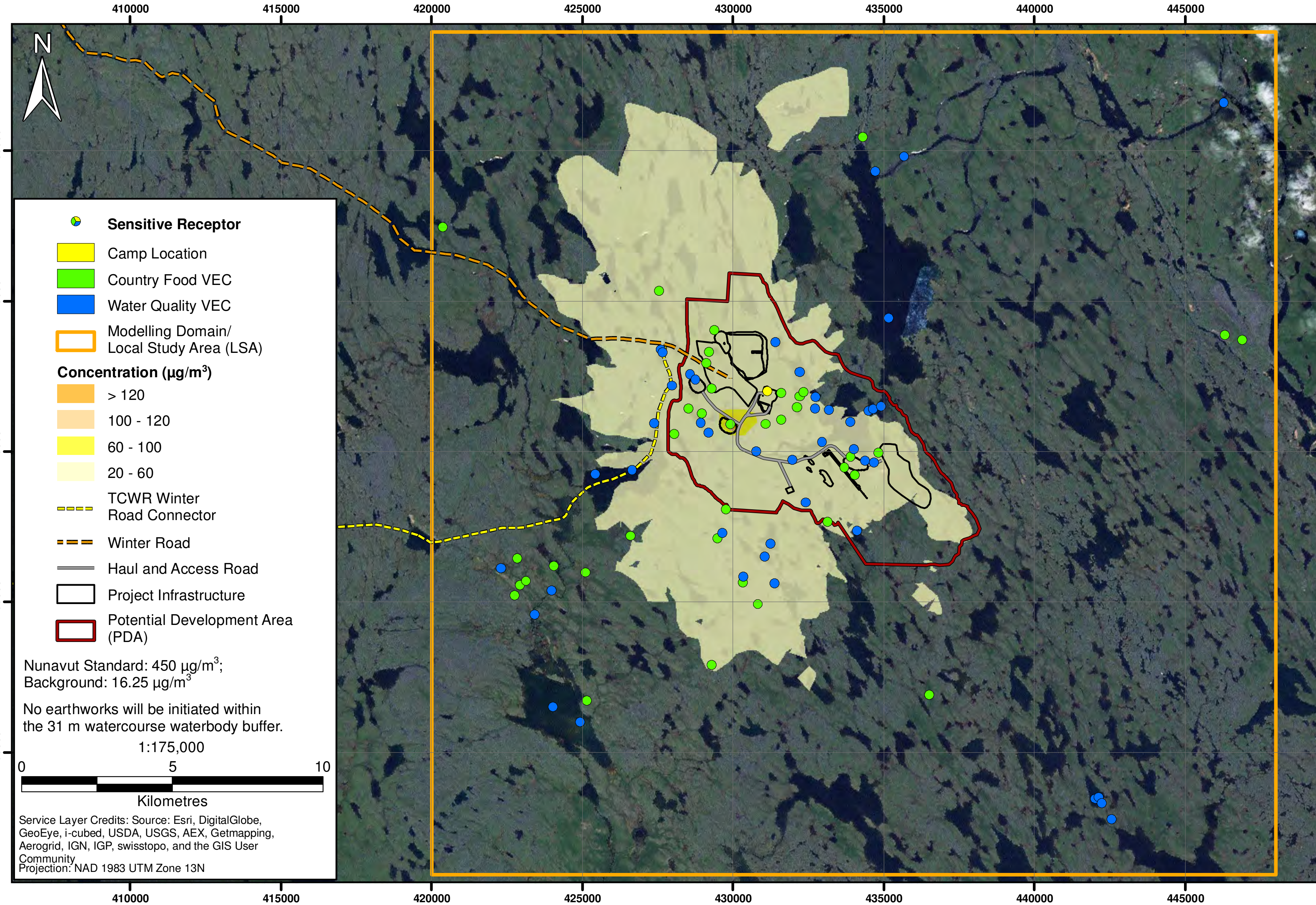

Figure B-1

Sabina GOLD & SILVER CORP.

Maximum 1-hour SO_2 Concentration, Goose Property Area

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-028l October 15 2013

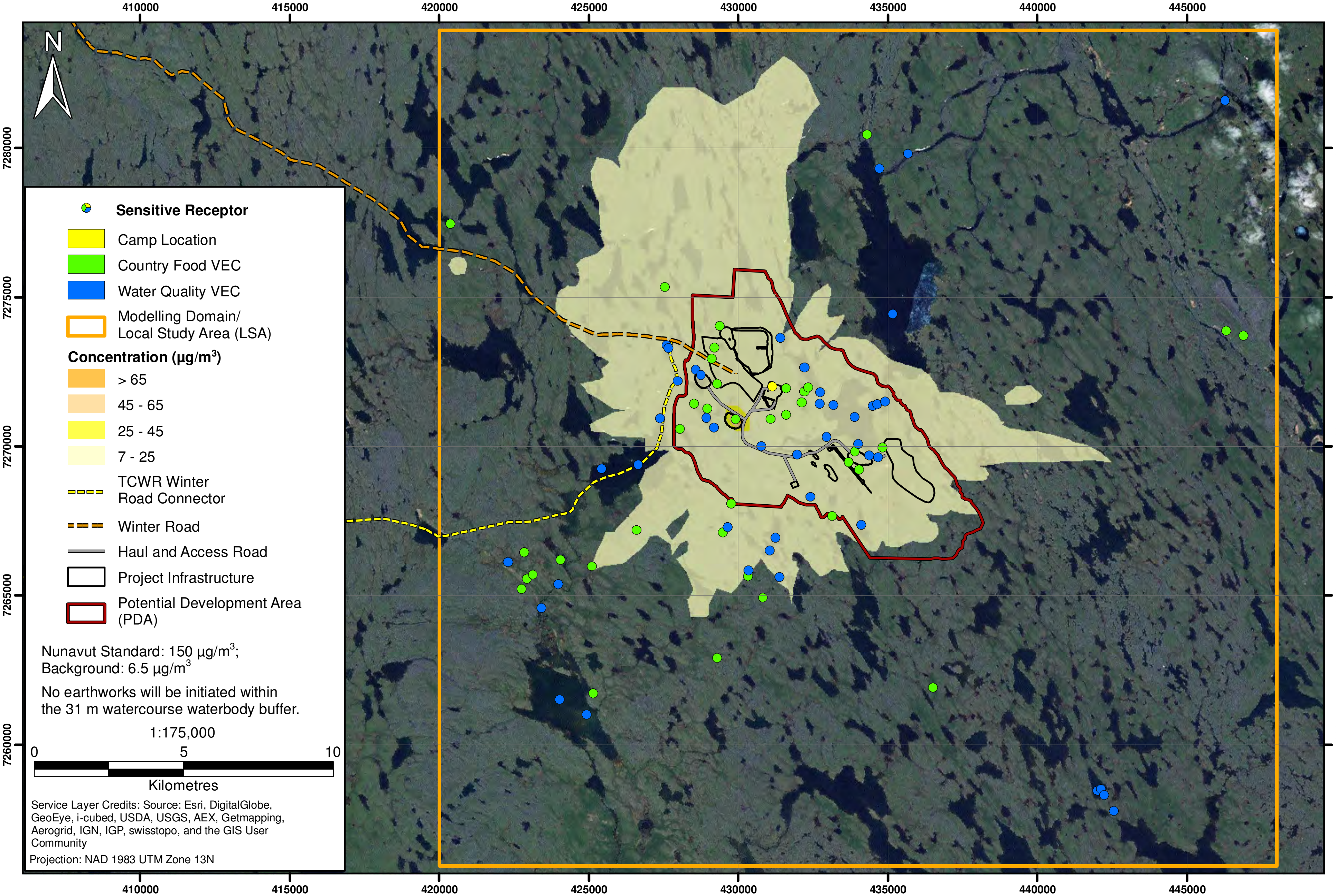

Figure B-2

Sabina GOLD & SILVER CORP.

Maximum 24-hour SO_2 Concentration, Goose Property Area

Figure B-2

Rescan an ERM company

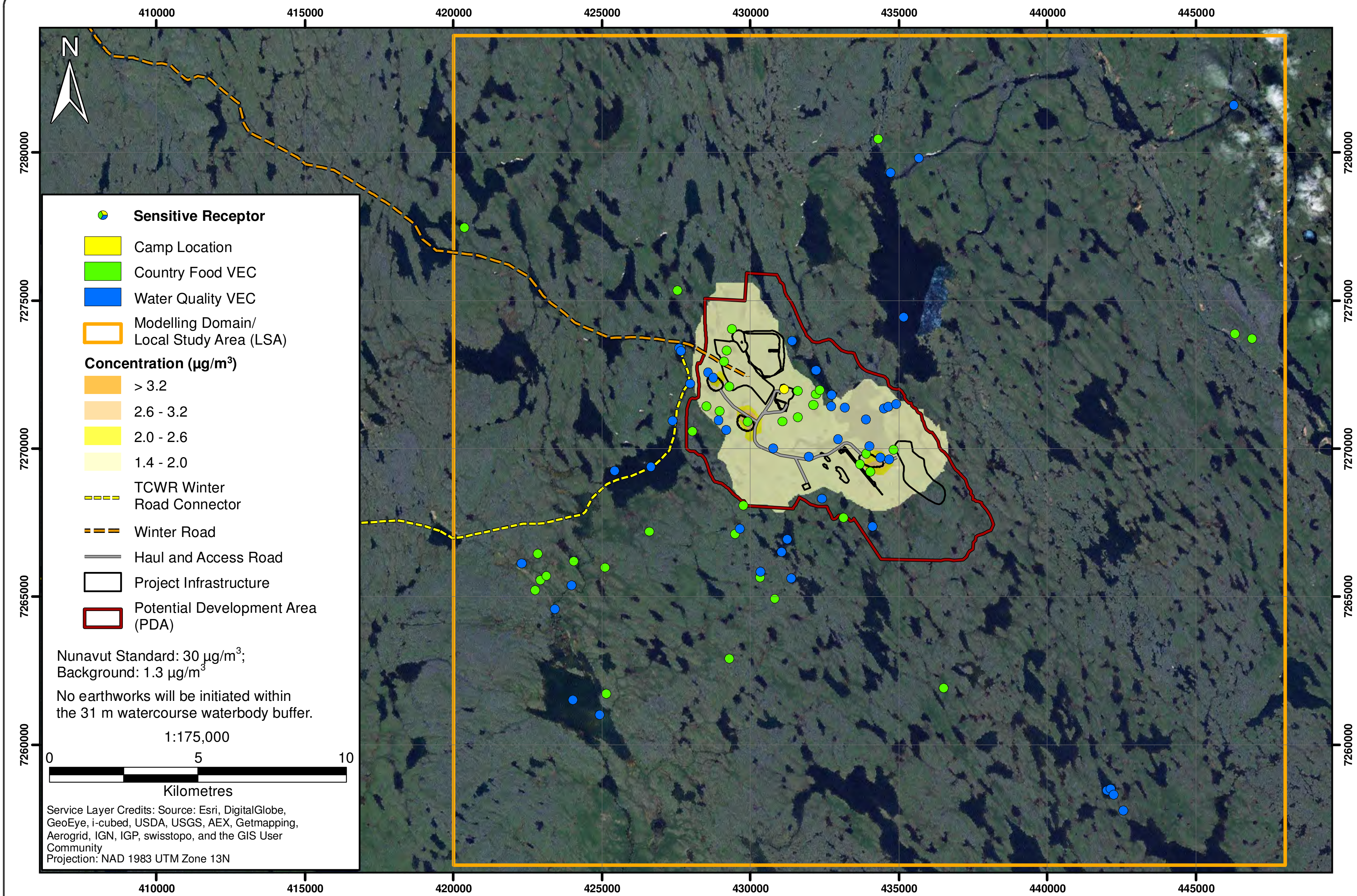

Figure B-3

Sabina GOLD & SILVER CORP.

Annual SO_2 Concentration, Goose Property Area

Rescan an ERM company

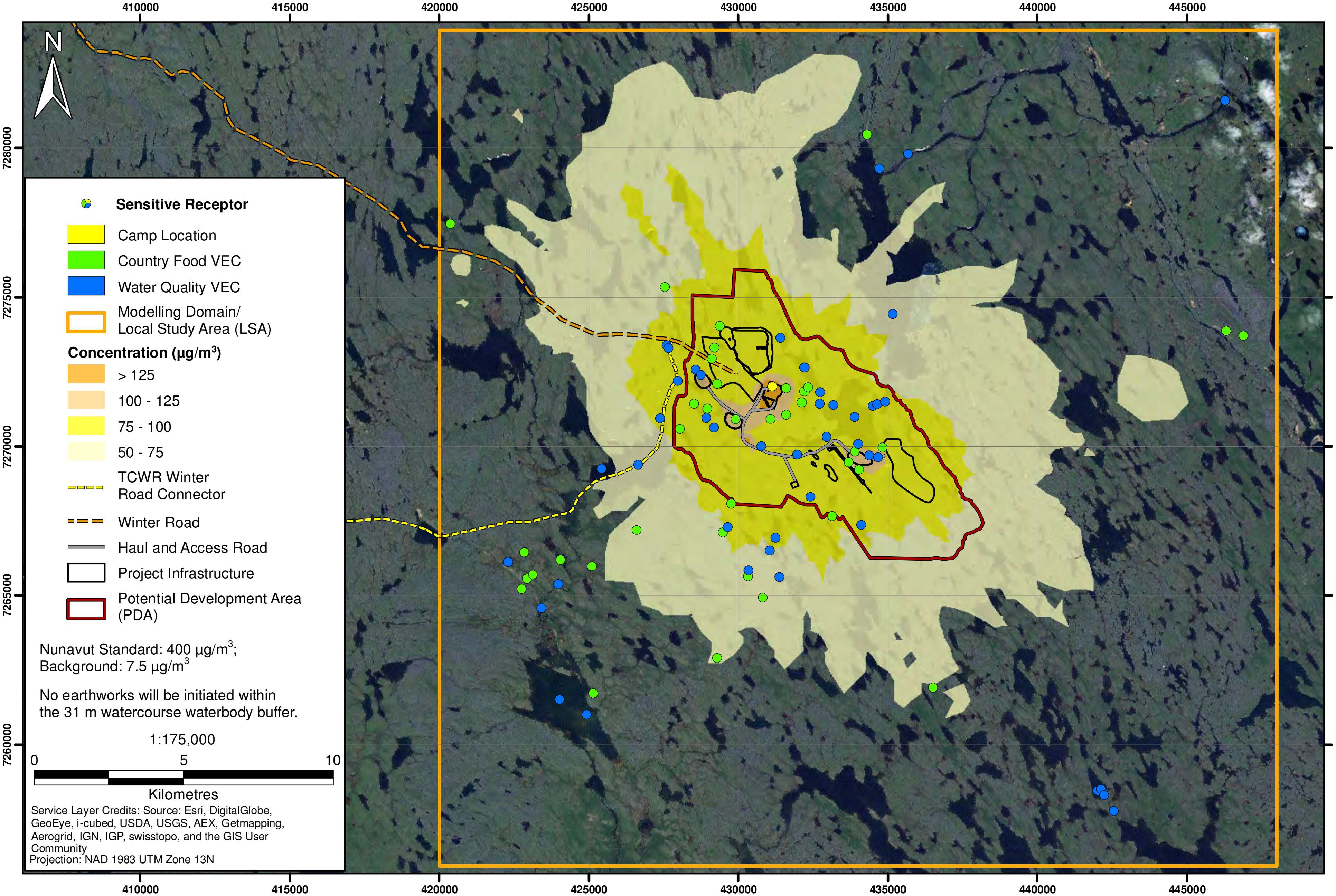

Figure B-4

Sabina GOLD & SILVER CORP.

Maximum 1-hour NO_2 Concentration, Goose Property Area

Rescan an ERM company

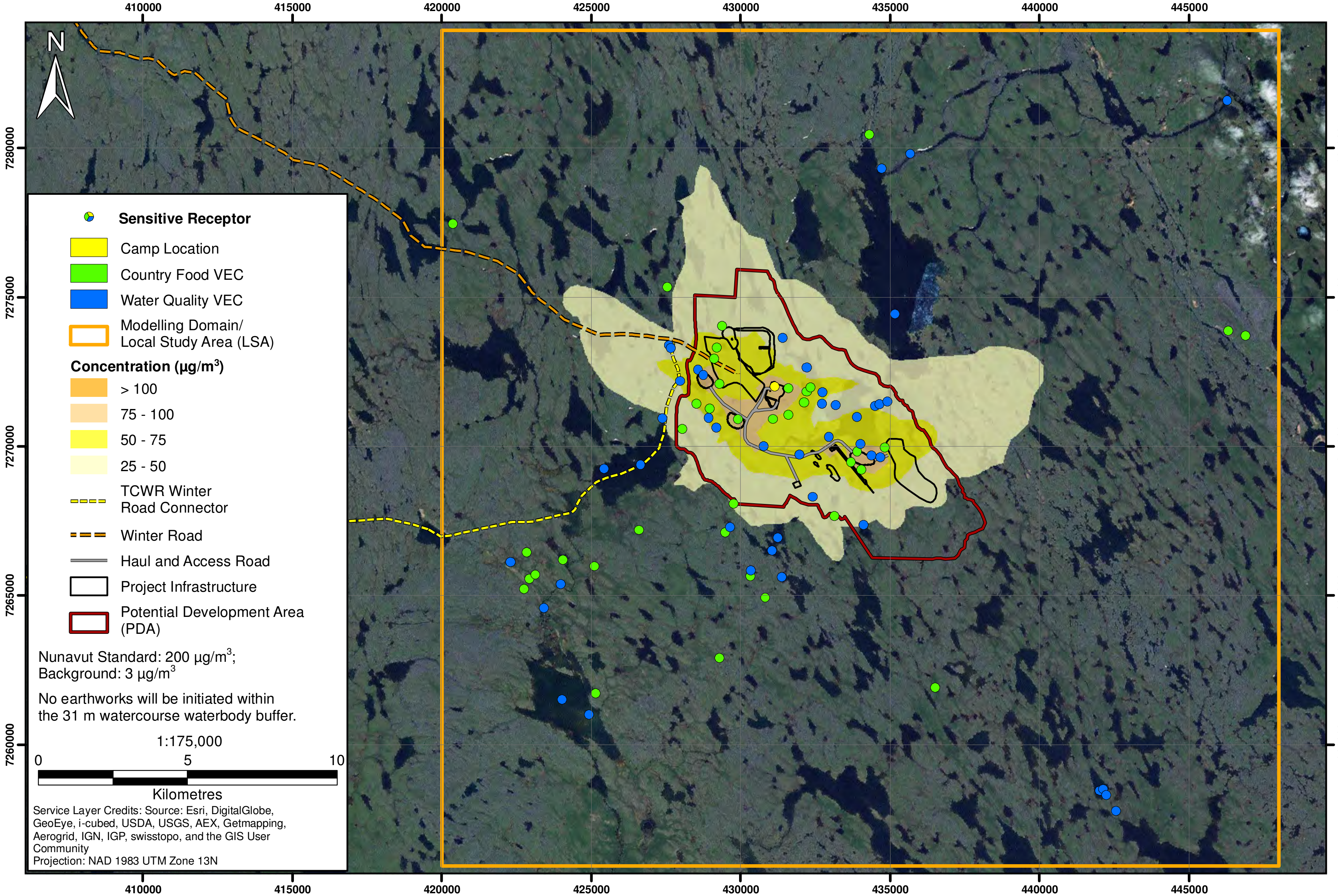

Figure B-5

Figure B-5

Sabina GOLD & SILVER CORP.

Maximum 24-hour NO_2 Concentration, Goose Property Area

Rescan an ERM company

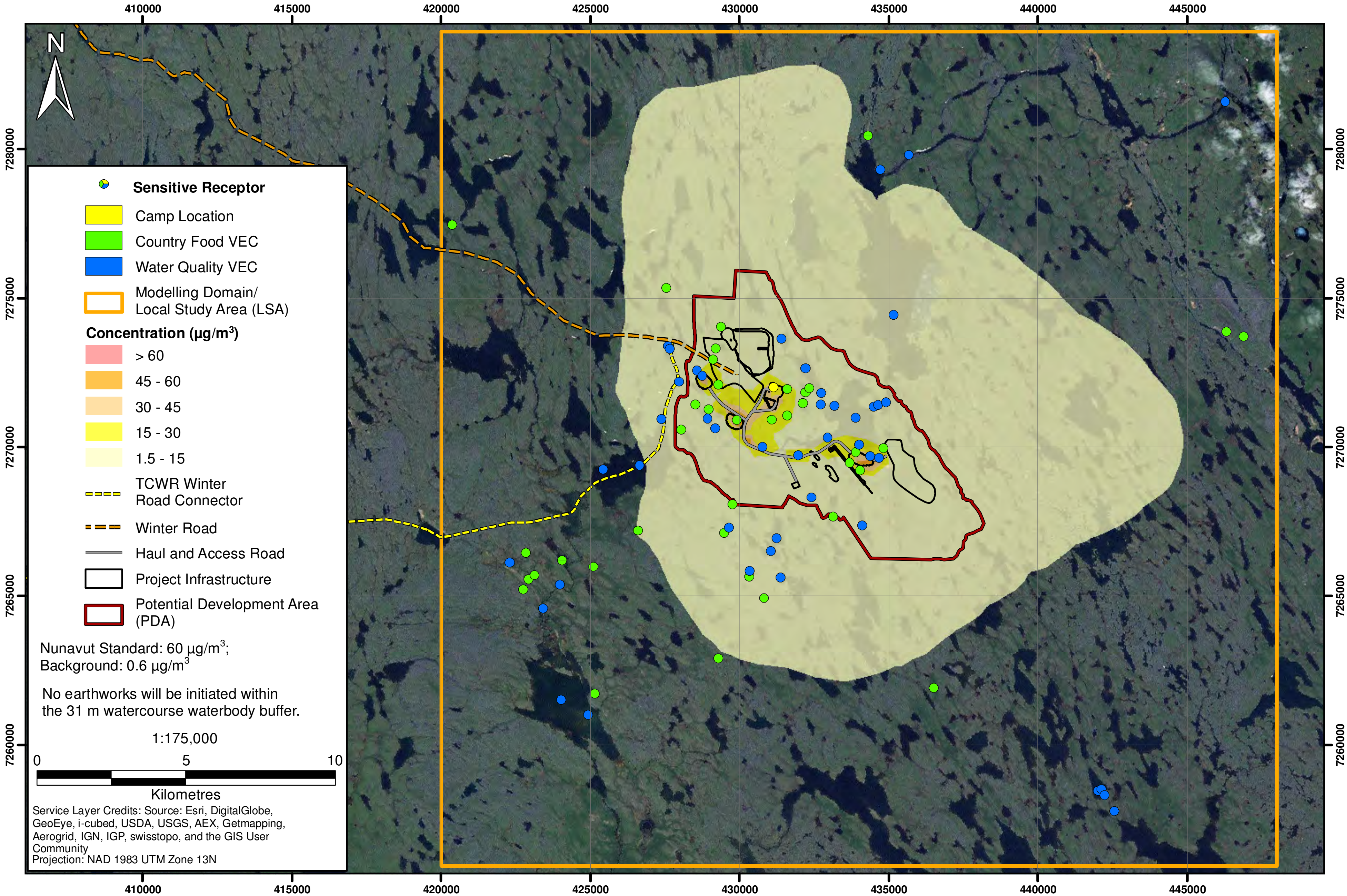

Figure B-6

Annual NO_2 Concentration, Goose Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

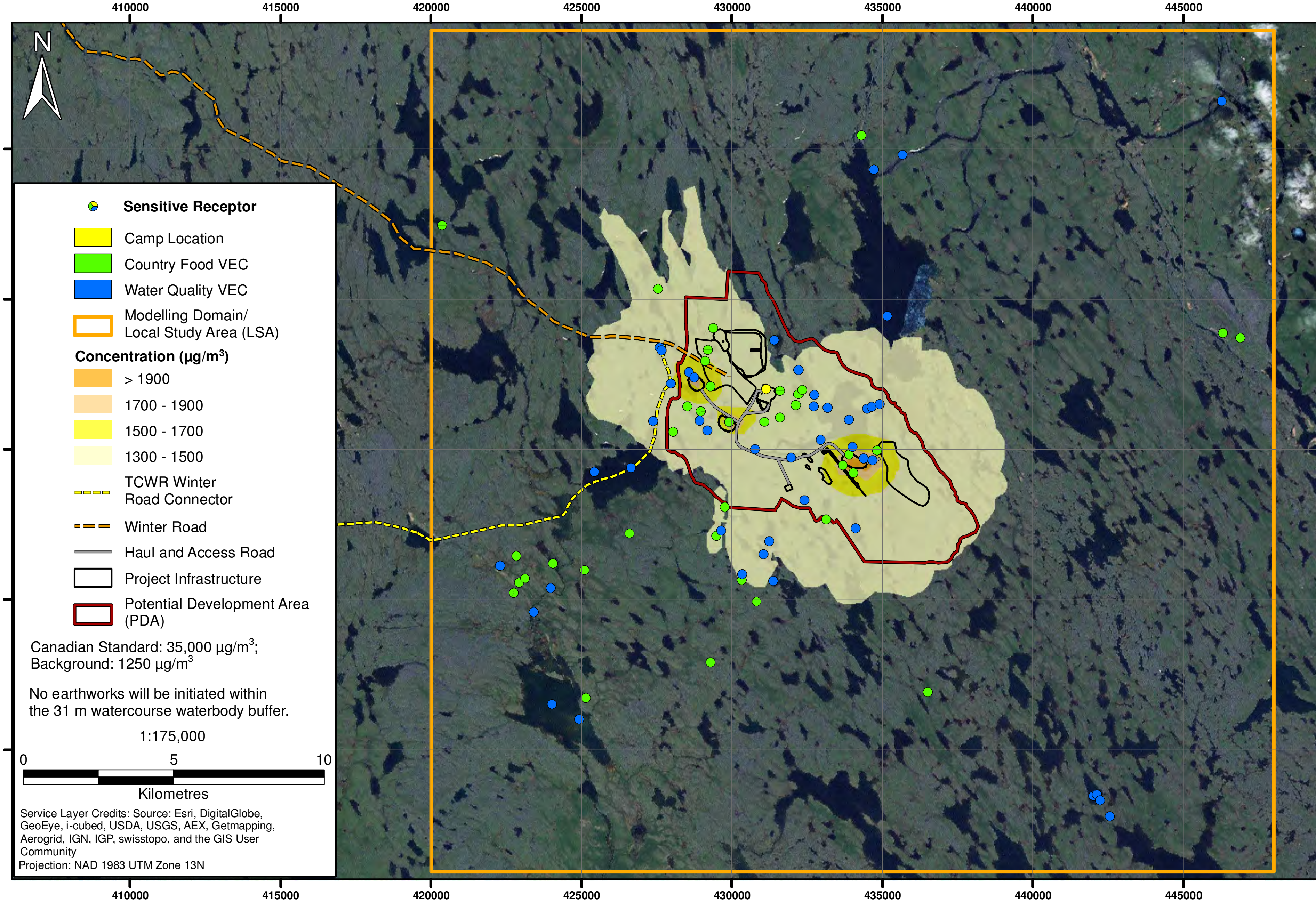

Figure B-7

Maximum 1-hour CO Concentration, Goose Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

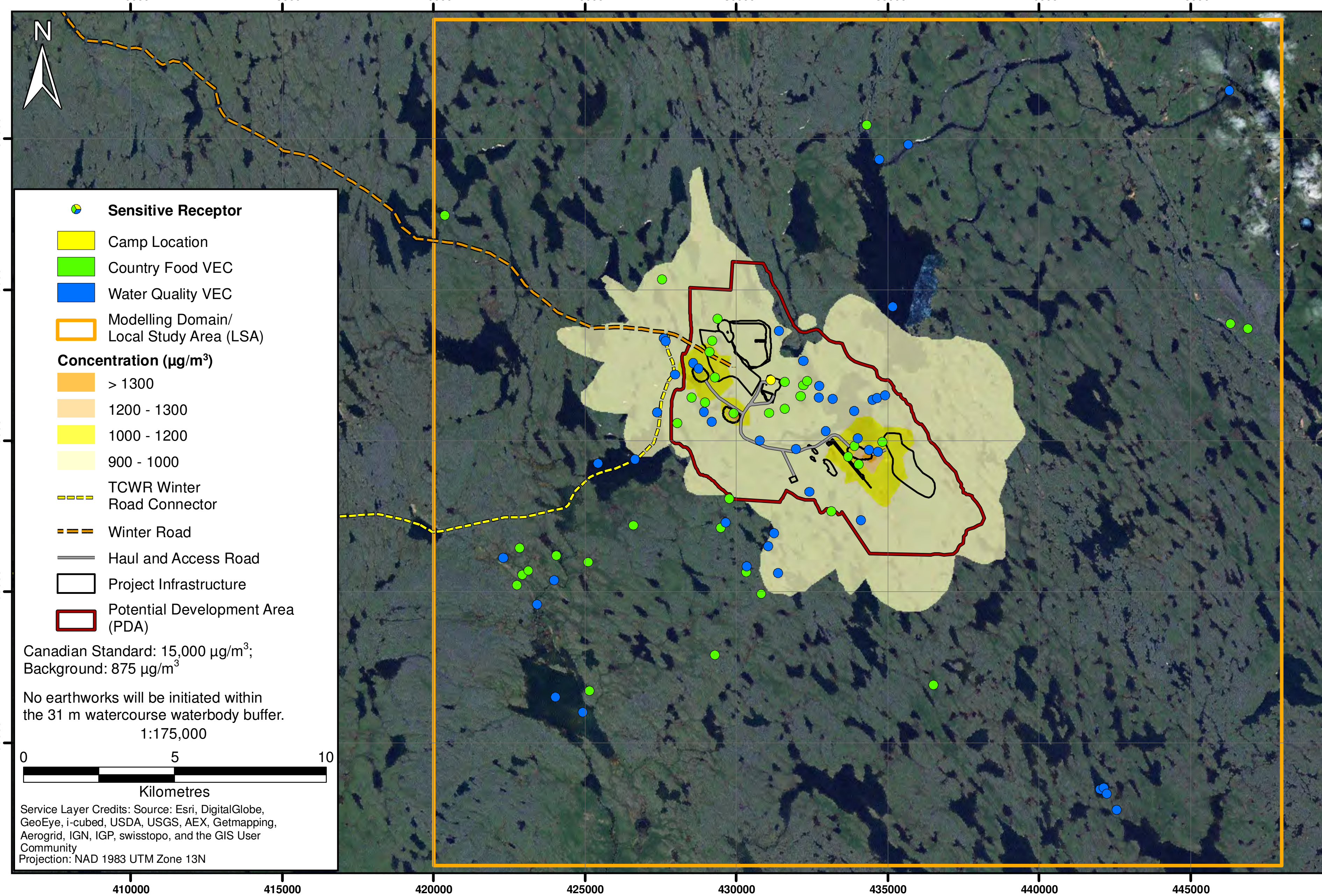

Figure B-8

Maximum 8-hour CO Concentration, Goose Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

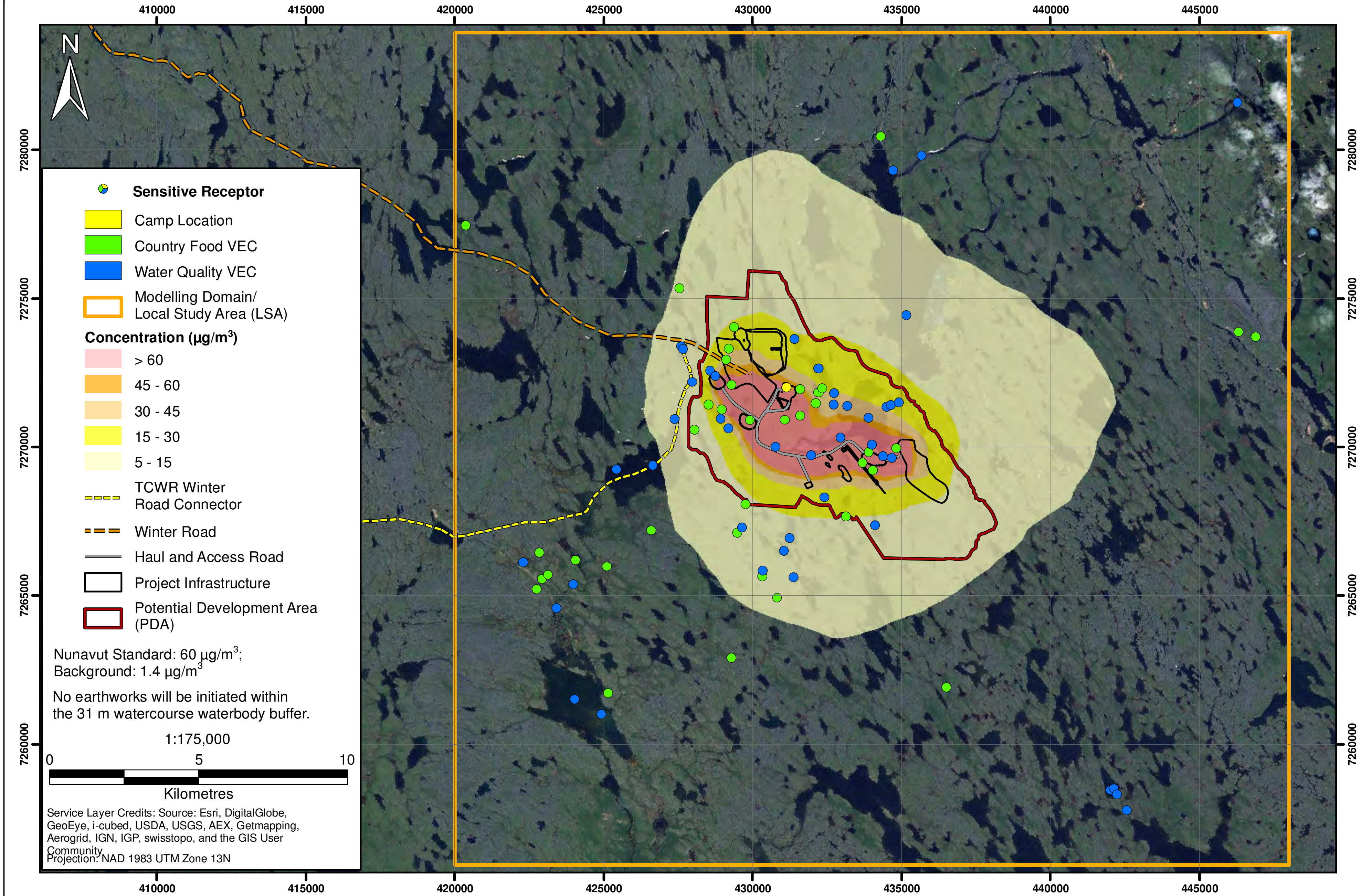

Figure B-9

Sabina GOLD & SILVER CORP.

Annual Total TSP Concentration, Goose Property Area

Rescan an ERM company

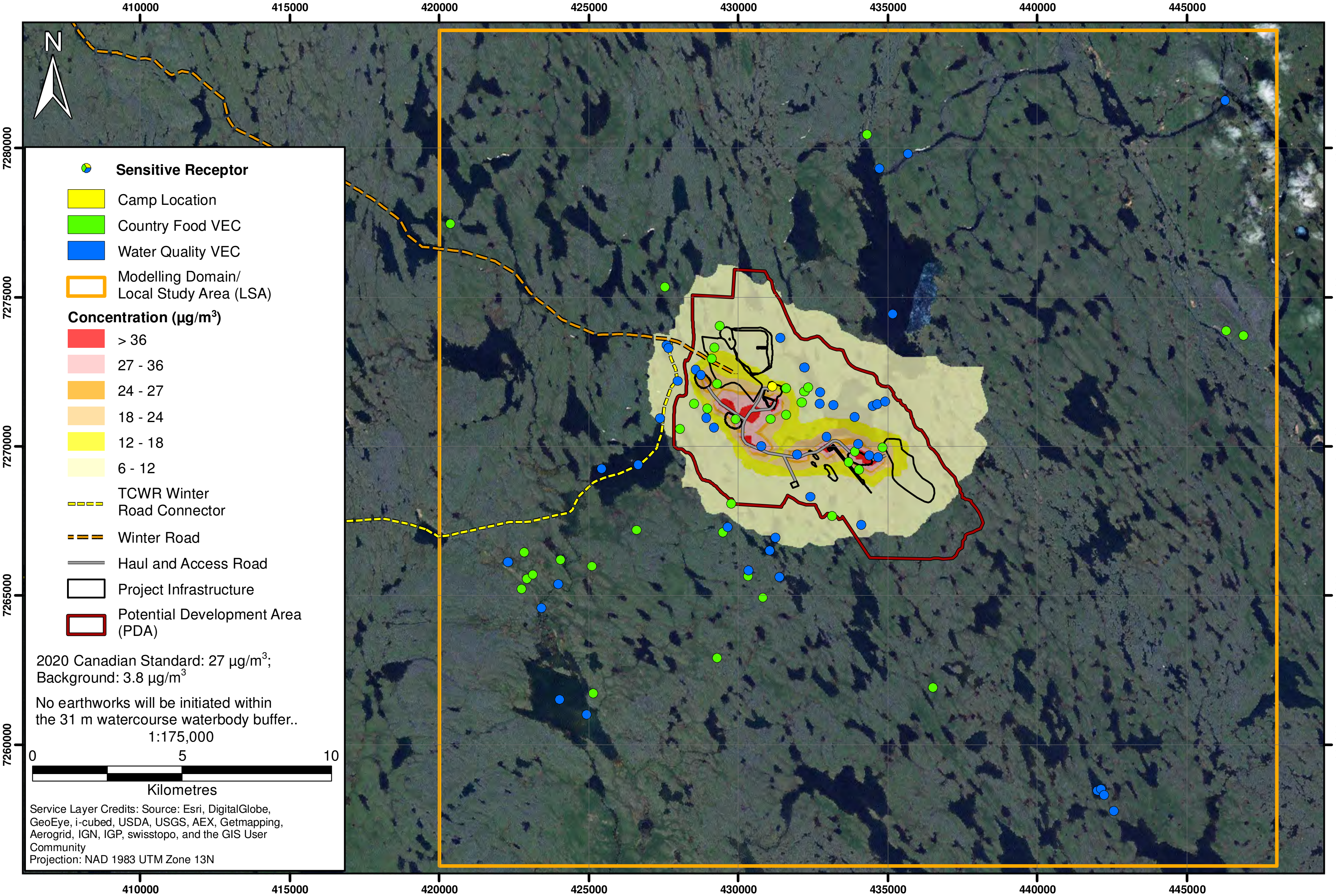

Figure B-10

Maximum Total 24-hour $PM_{2.5}$ Concentration, Goose Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

Figure B-10

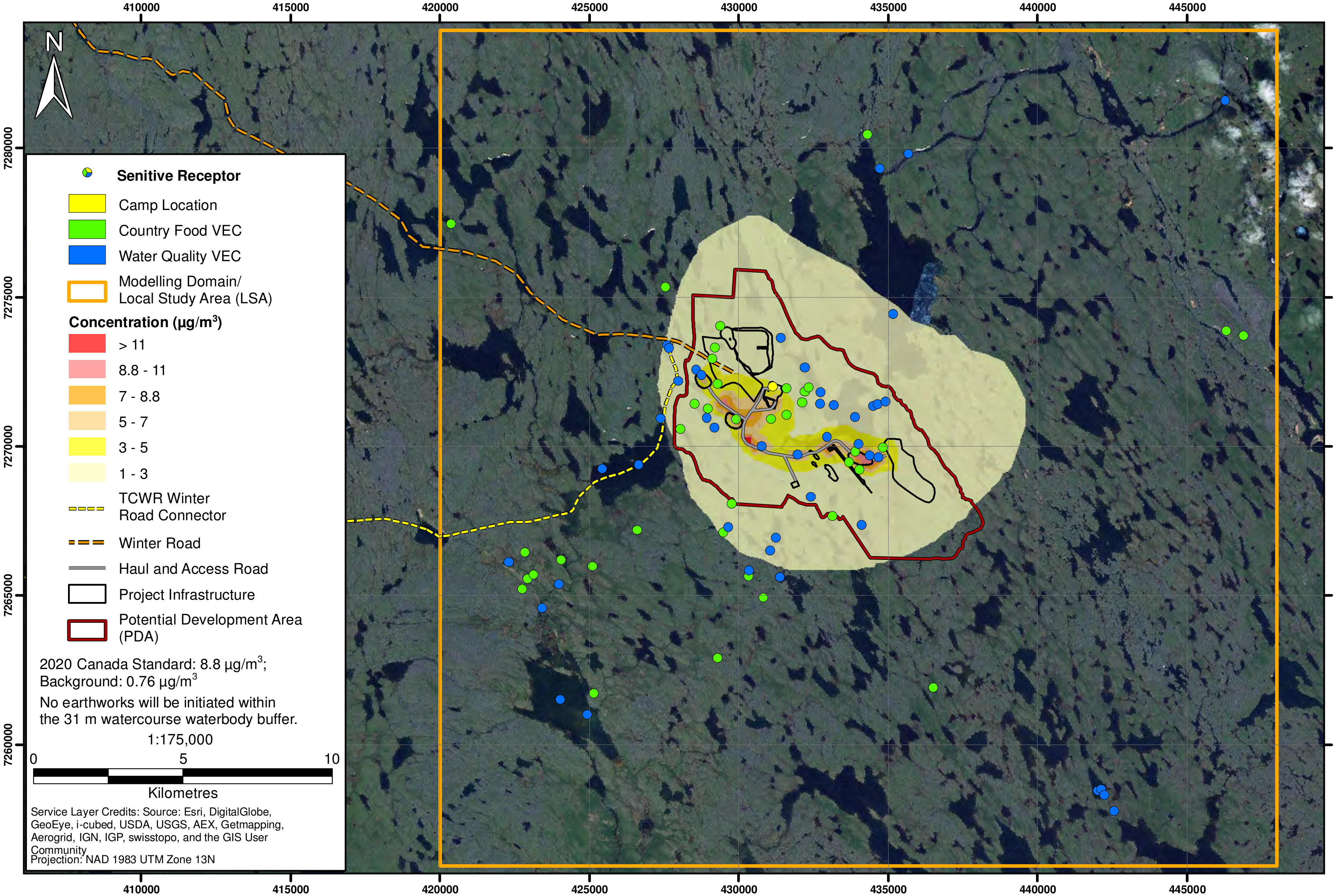

Figure B-11

Sabina GOLD & SILVER CORP.

Annual Total $PM_{2.5}$ Concentration, Goose Property Area

Rescan an ERM company

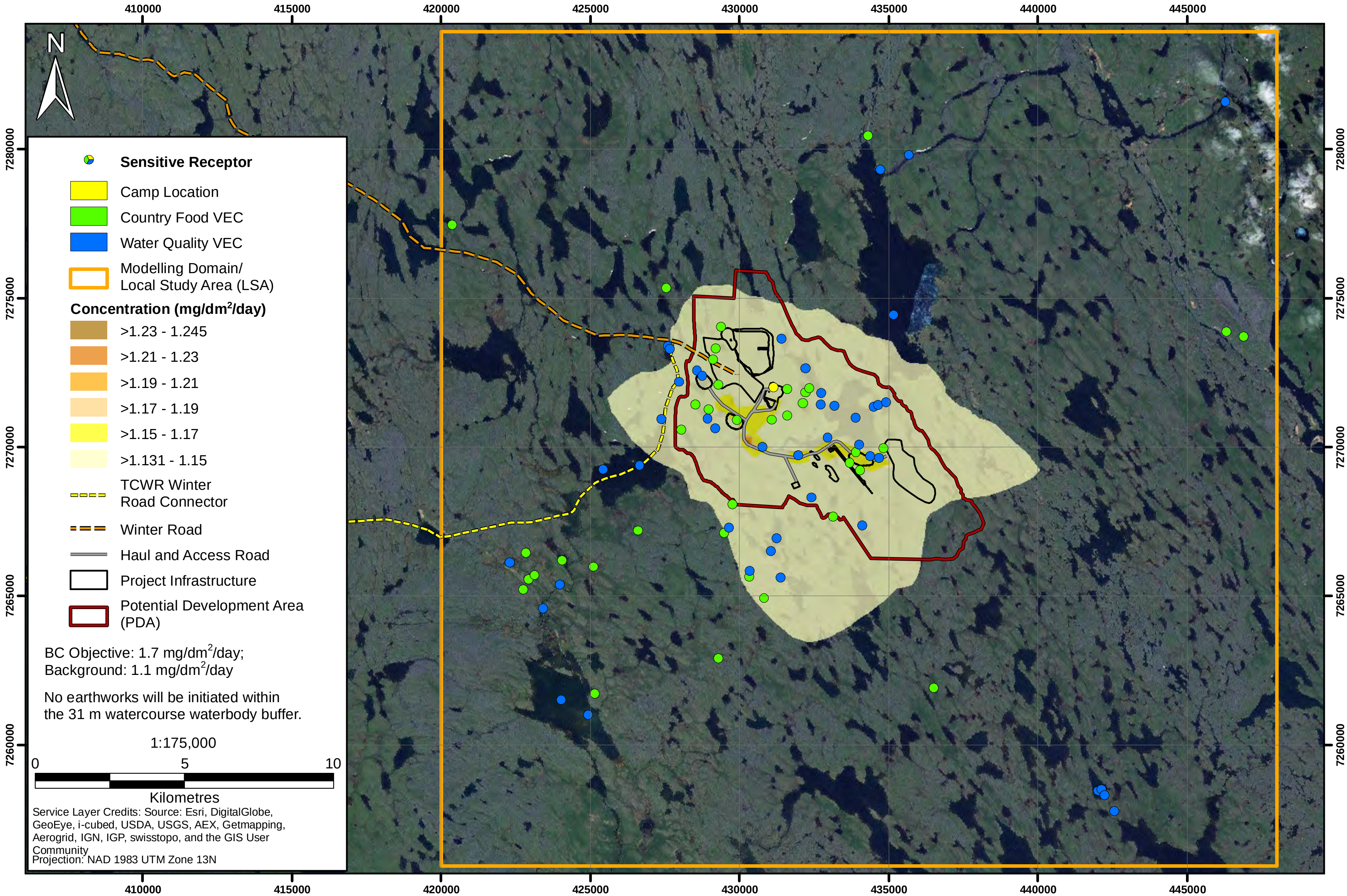

Figure B-12

Sabina GOLD & SILVER CORP.

Maximum 30-day Dust Deposition, Goose Property Area

Rescan an ERM company

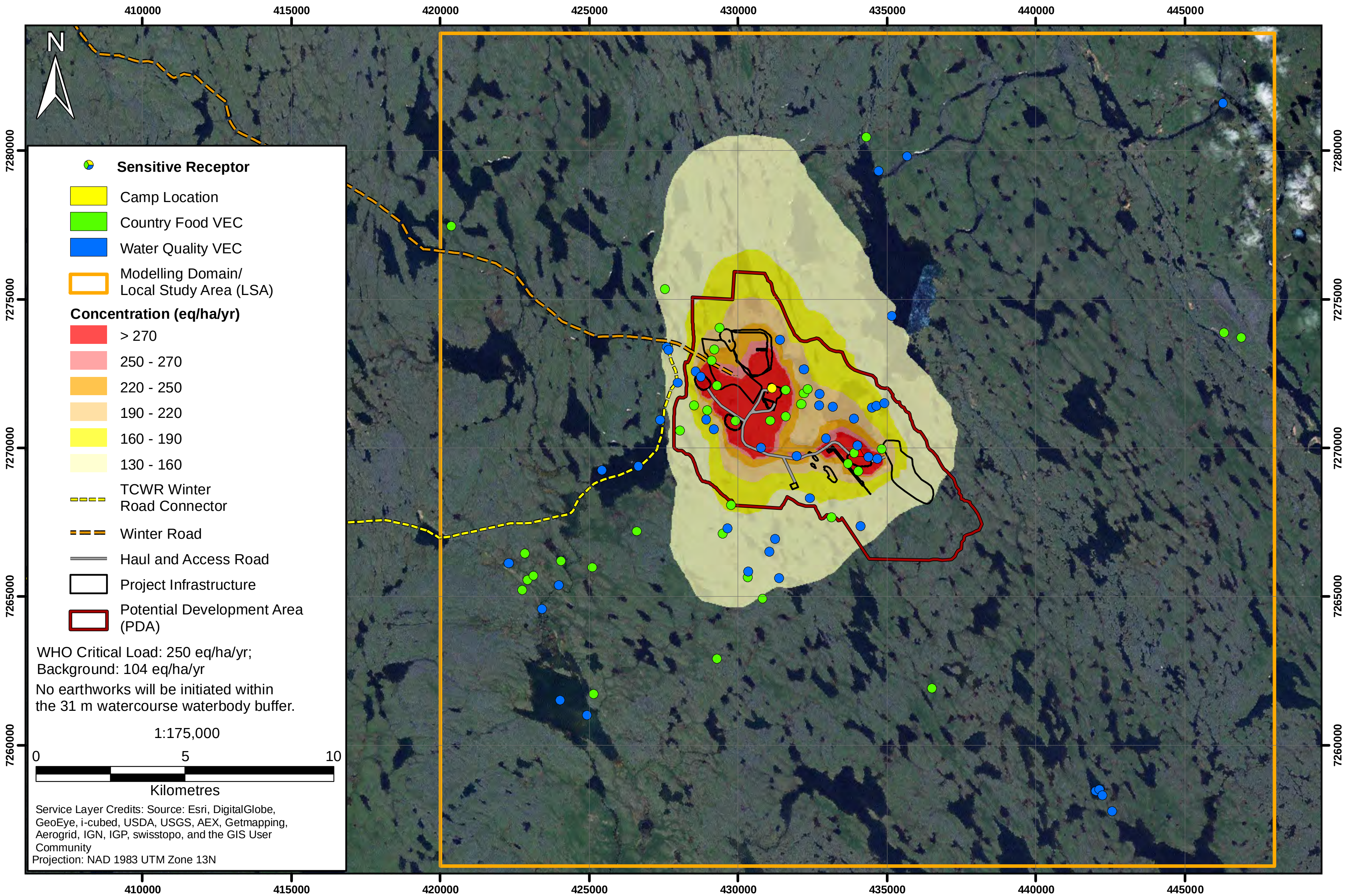

Figure B-13

Sabina GOLD & SILVER CORP.

Annual Acid Deposition, Goose Property Area

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-028z October 16 2013

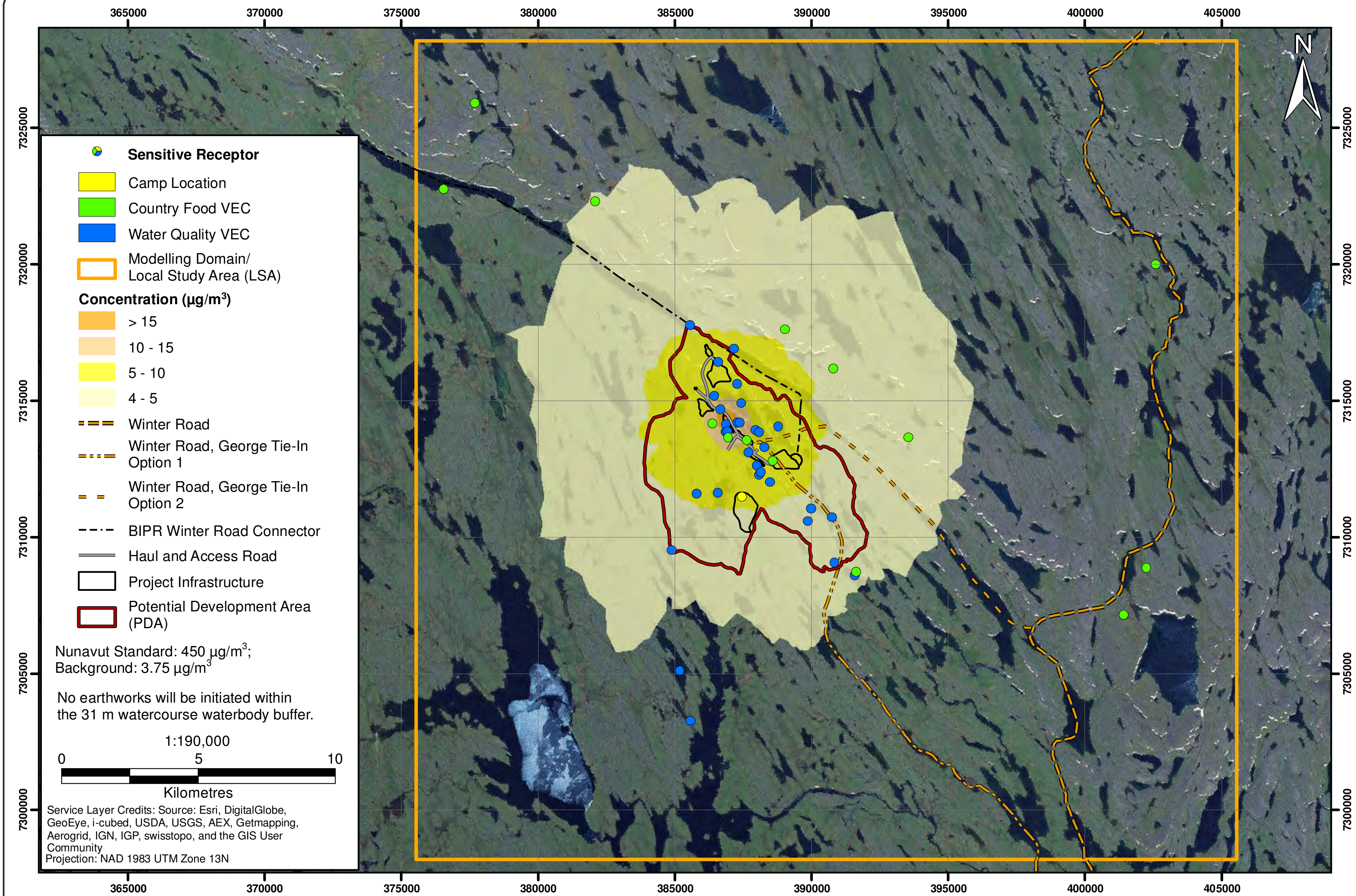

Figure B-14

Figure B-14

Sabina GOLD & SILVER CORP.

Maximum 1-hour SO_2 Concentration, George Property Area

Rescan an ERM company

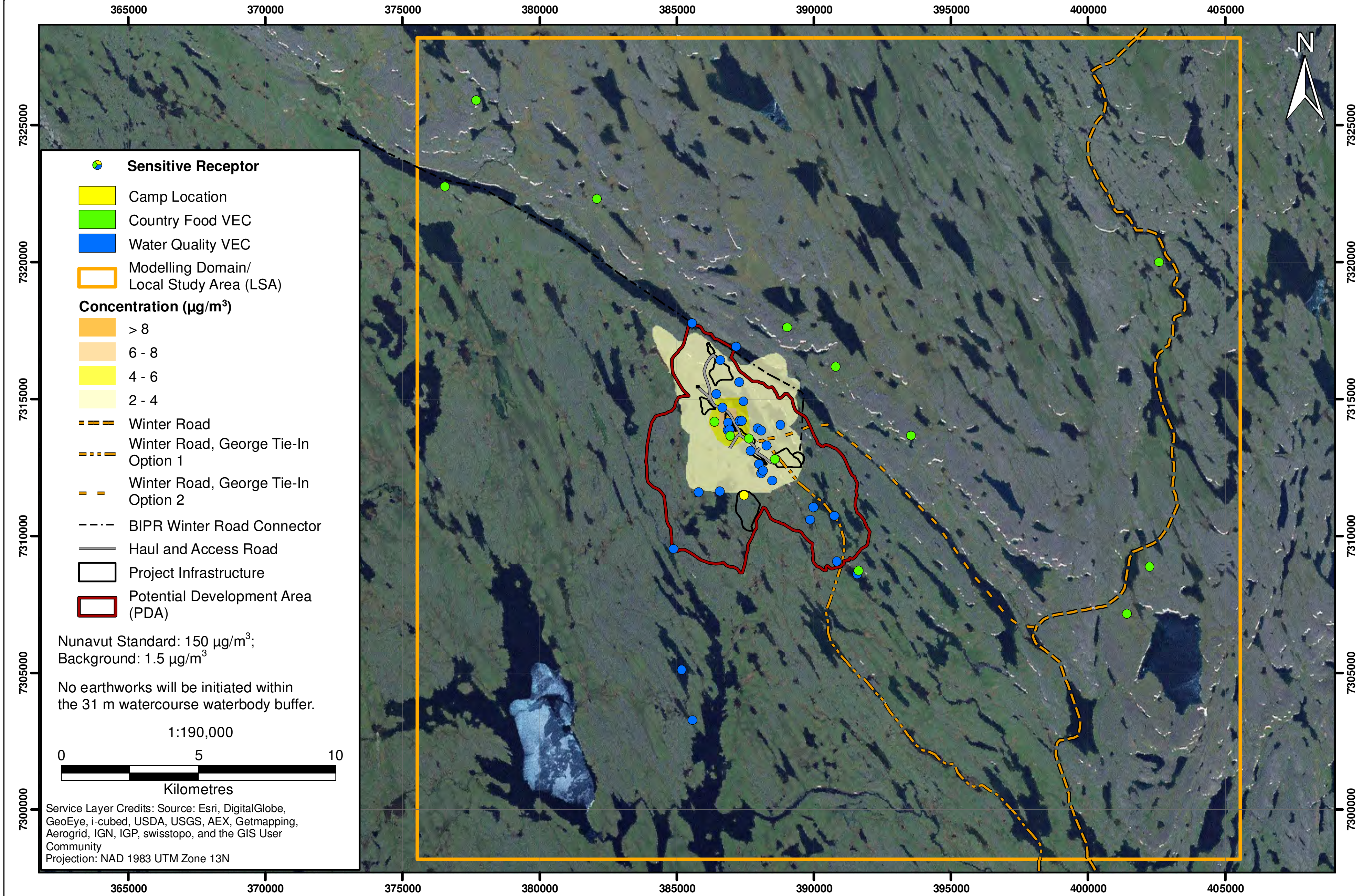

Figure B-15

Sabina GOLD & SILVER CORP.

Maximum 24-hour SO_2 Concentration, George Property Area

Rescan an ERM company

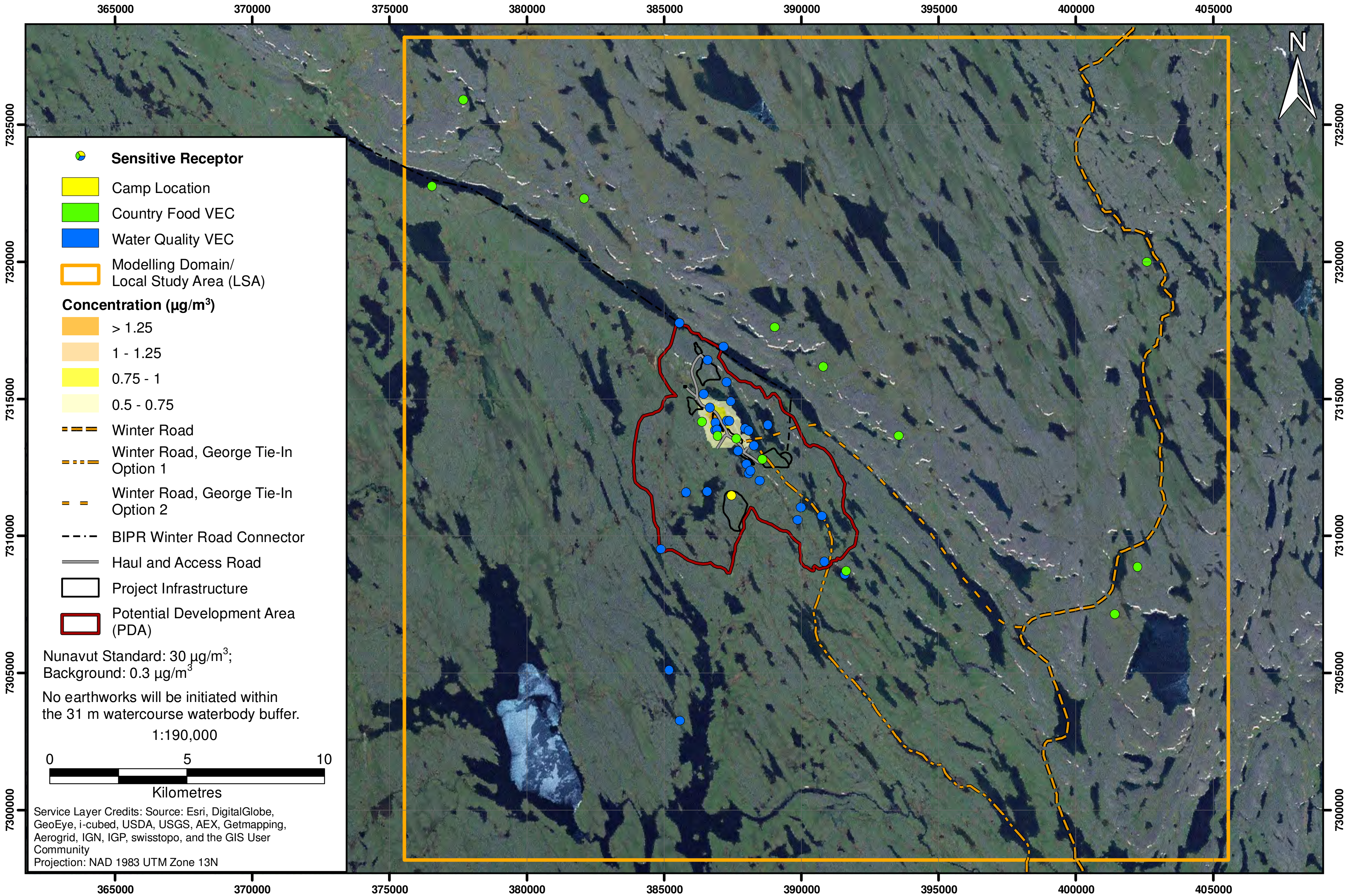

Figure B-16

Sabina GOLD & SILVER CORP.

Annual SO_2 Concentration, George Property Area

Rescan an ERM company

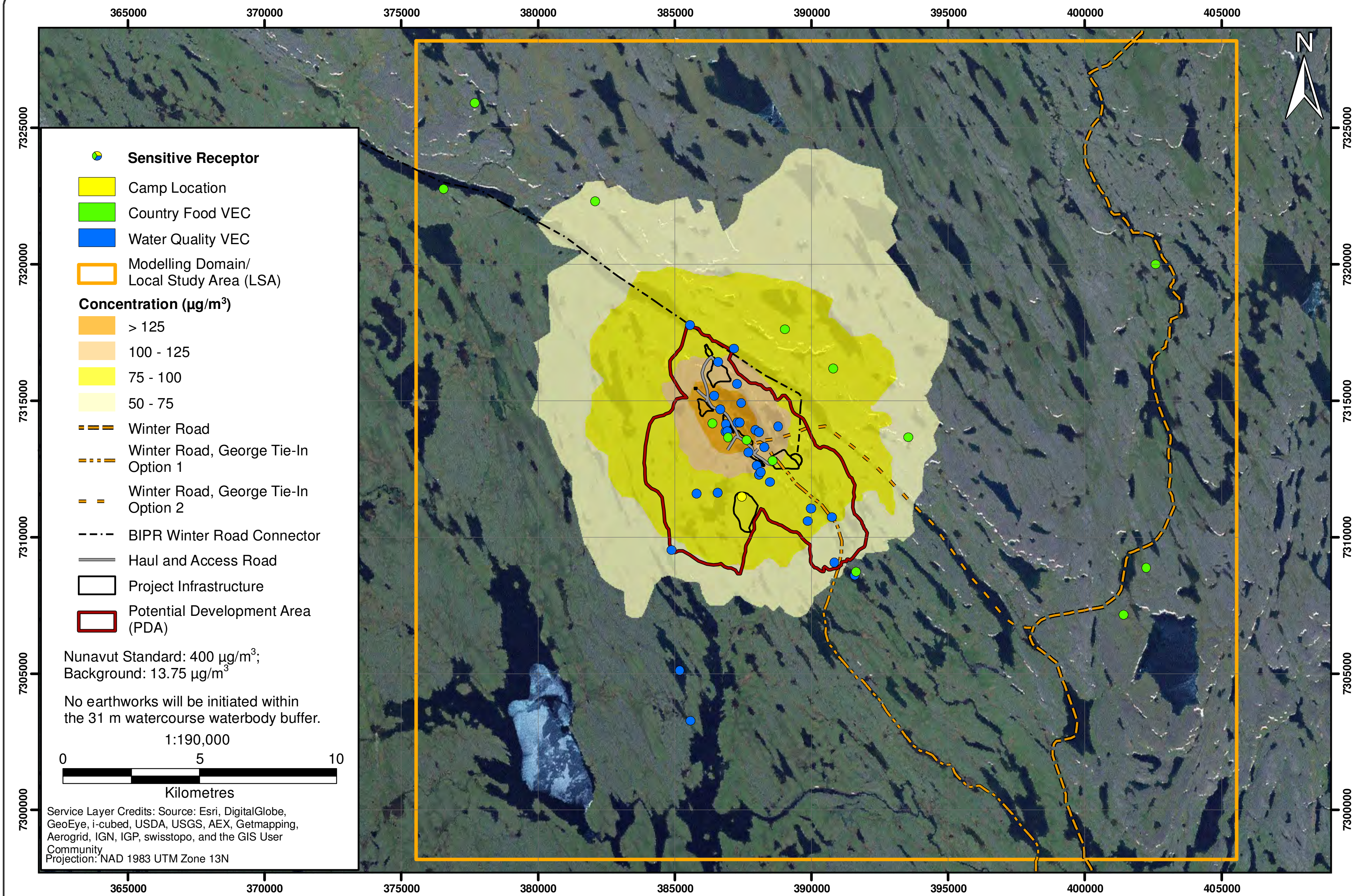

Figure B-17

Maximum 1-hour NO_2 Concentration, George Property Area

Sabina Gold & Silver Corp.

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Figure B-17

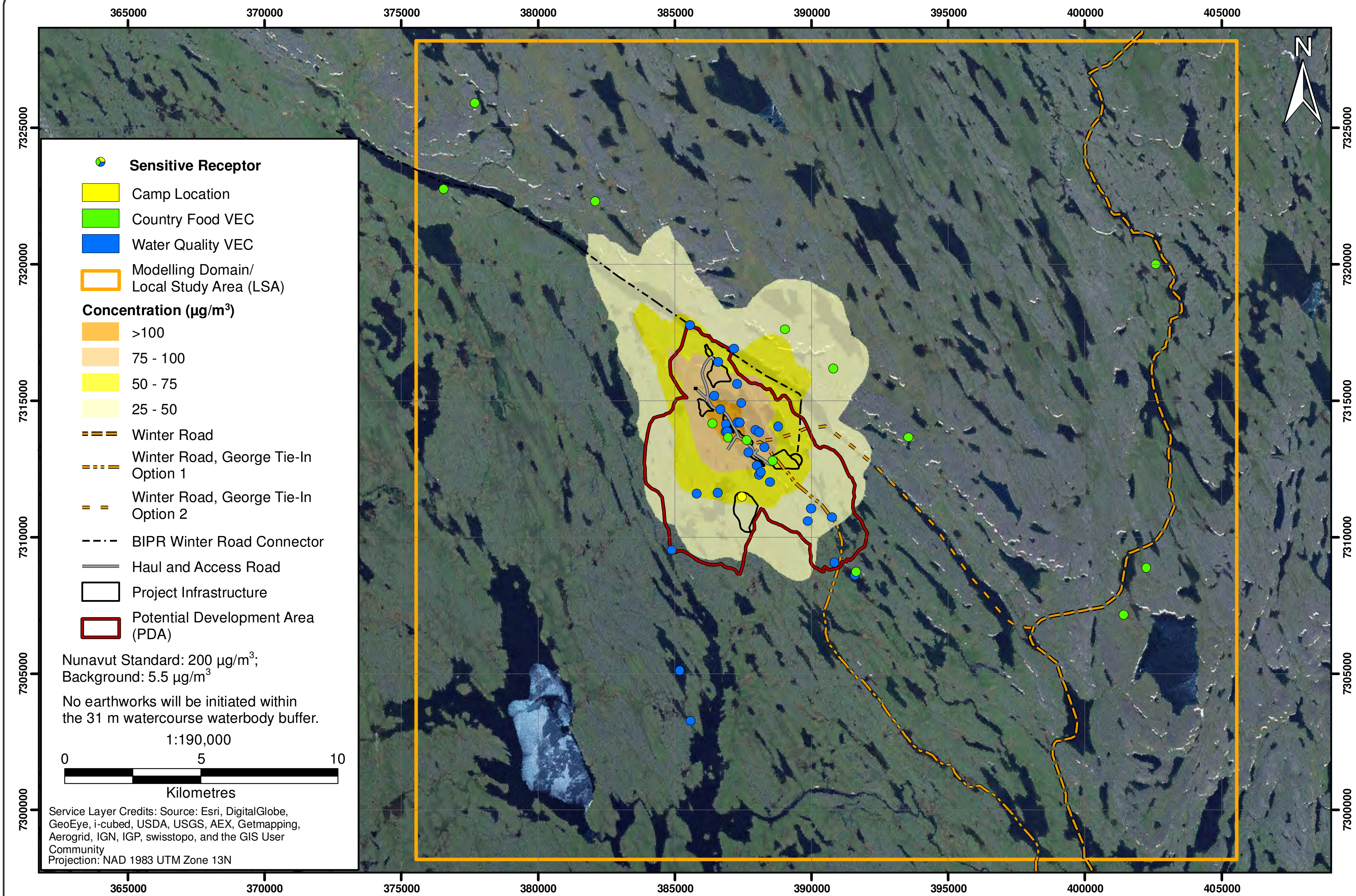

Figure B-18

Sabina GOLD & SILVER CORP.

Maximum 24-hour NO_2 Concentration, George Property Area

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-028v October 15 2013

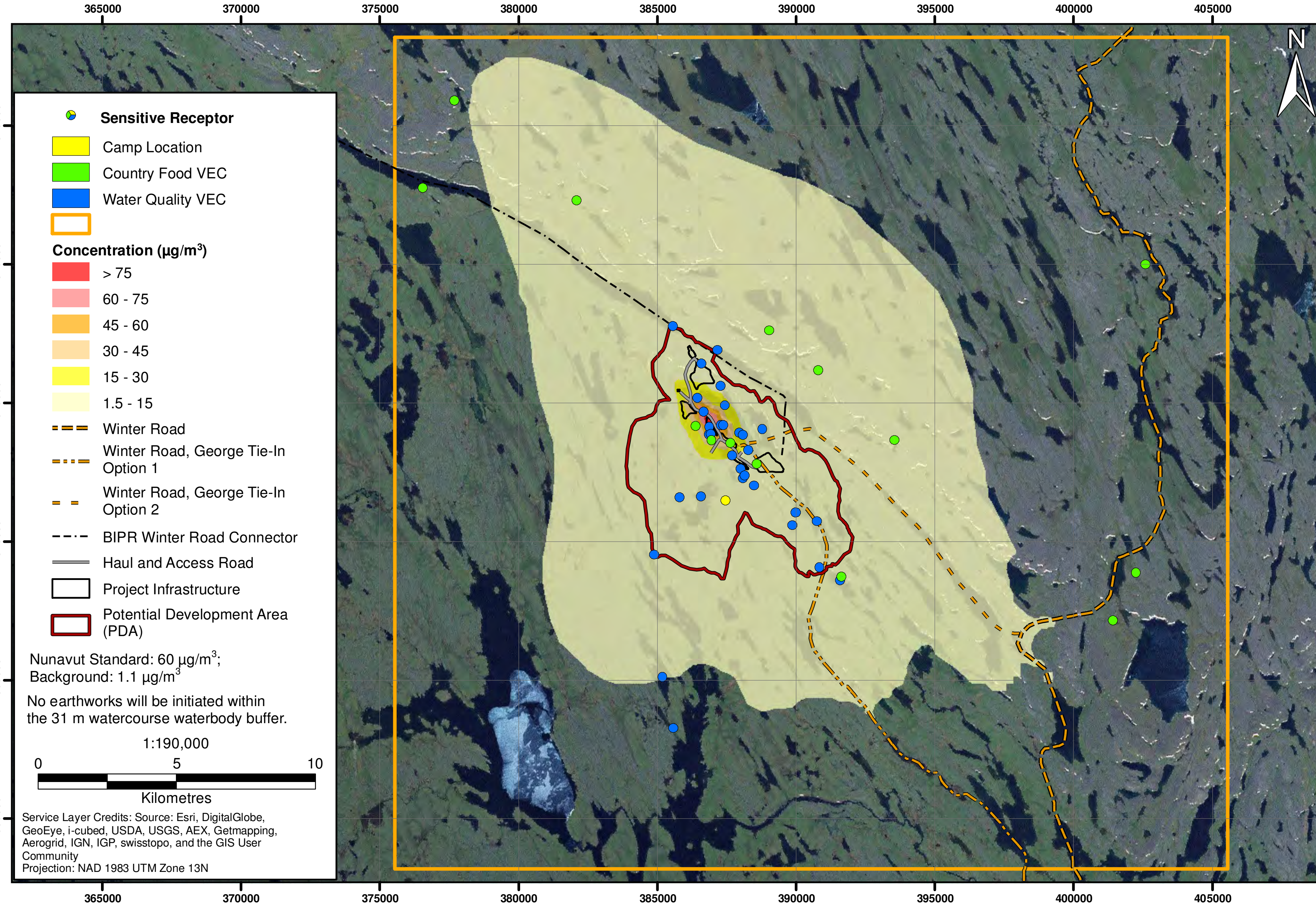

Figure B-19

Sabina GOLD & SILVER CORP.

Annual NO_2 Concentration, George Property Area

Rescan an ERM company

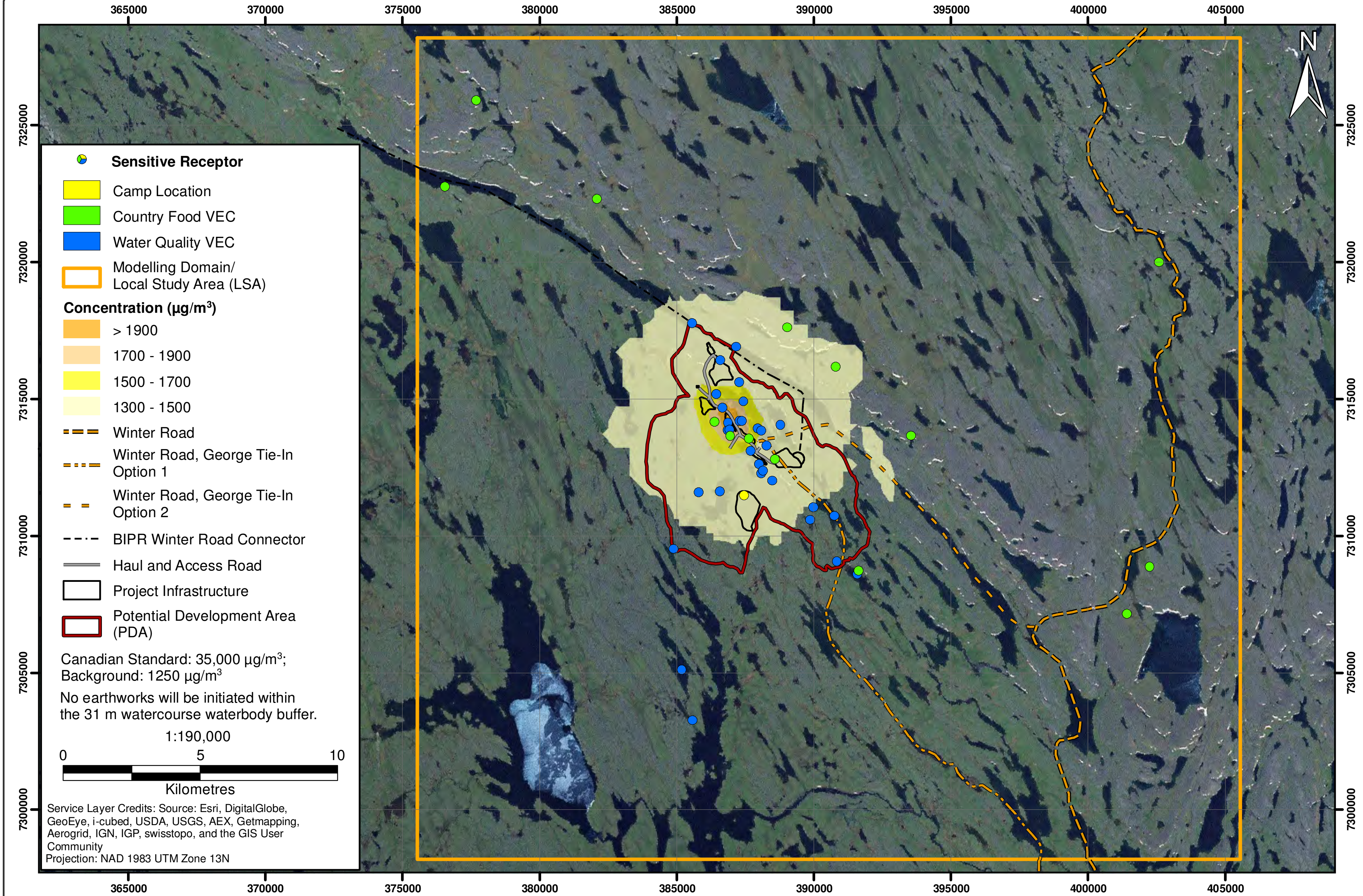

Figure B-20

Maximum 1-hour CO Concentration, George Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-028r October 15 2013

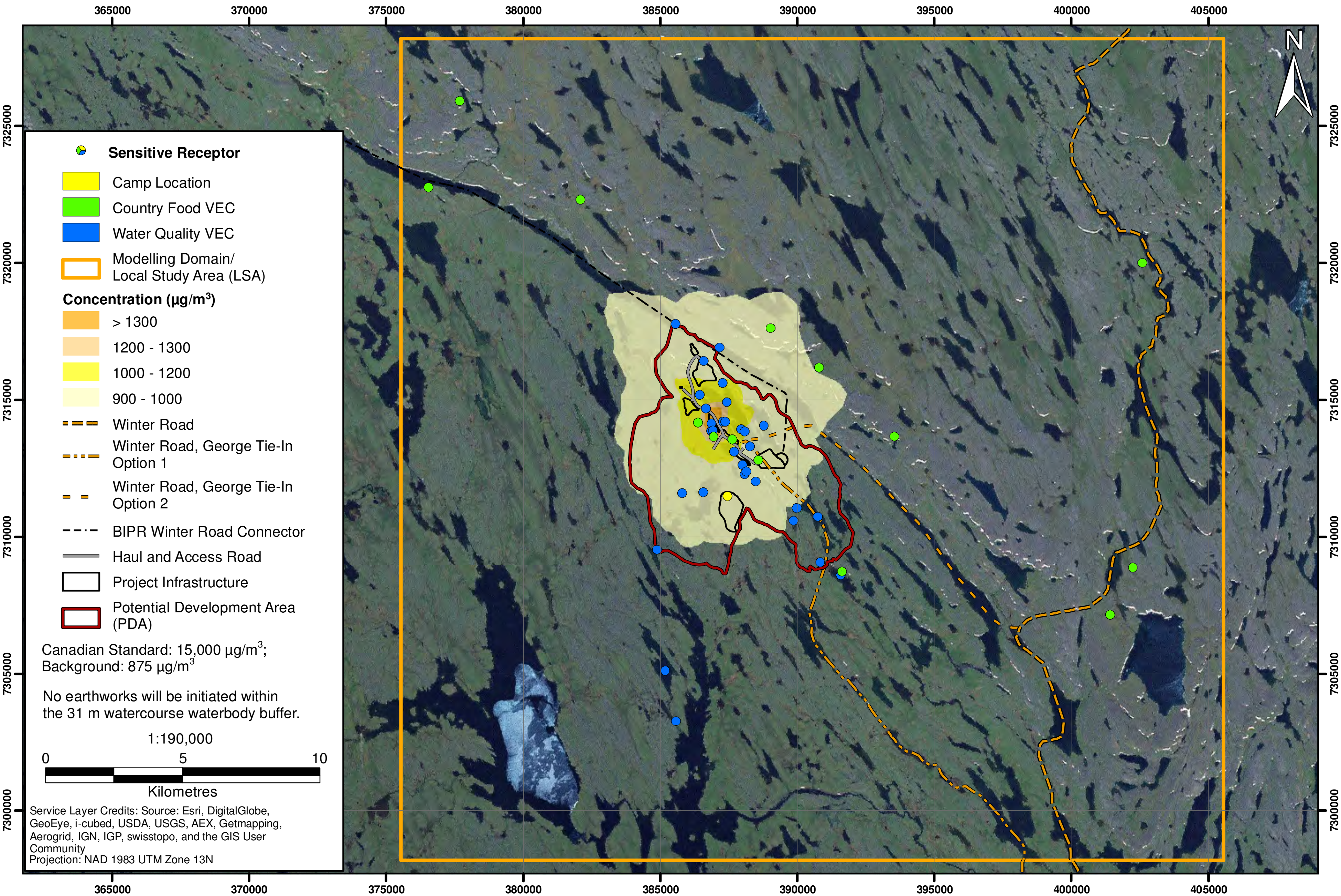

Figure B-21

Maximum 8-hour CO Concentration, George Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-028ac October 16 2013

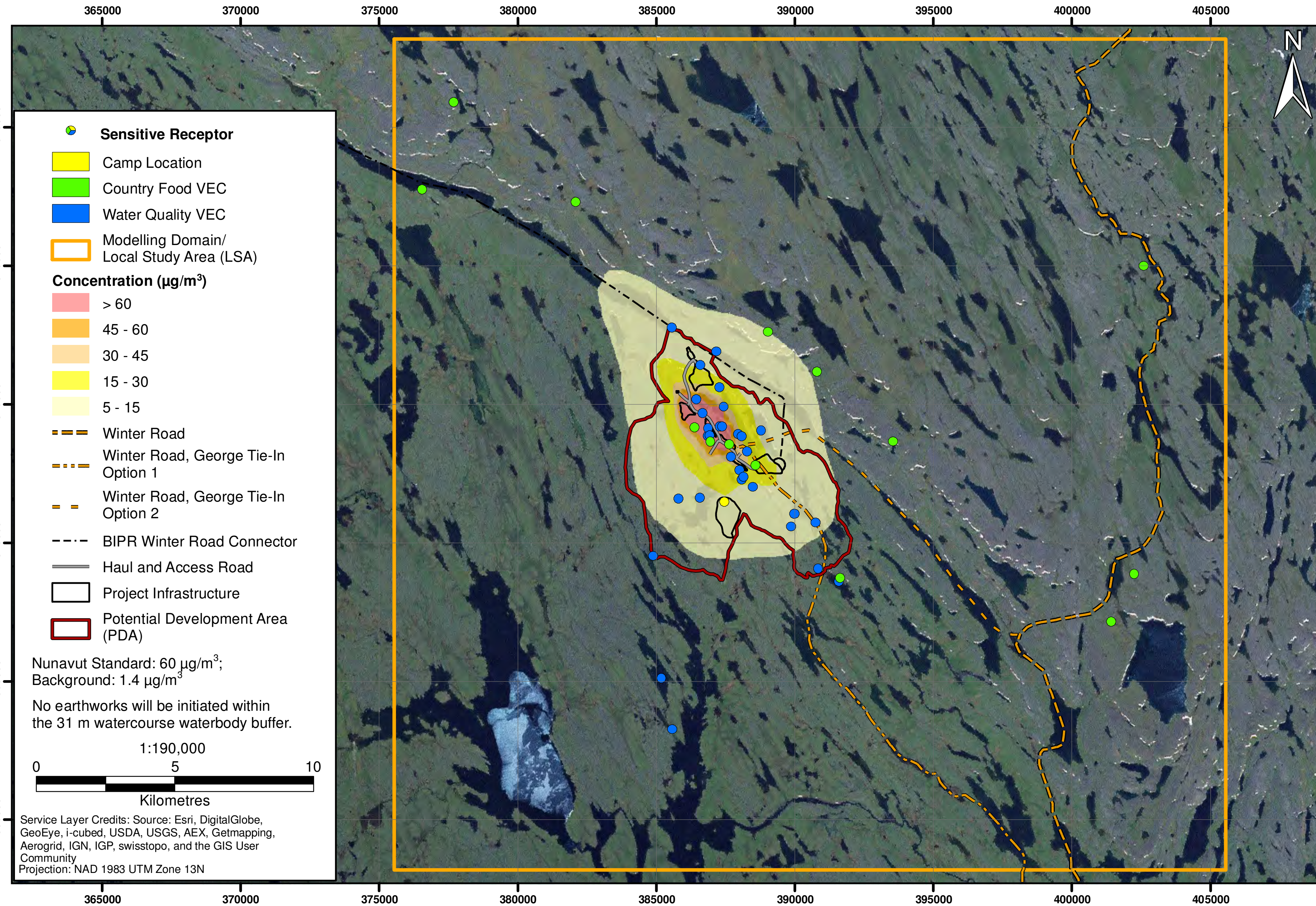

Figure B-22

Sabina GOLD & SILVER CORP.

Annual Total TSP Concentration, George Property Area

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-028x October 15 2013

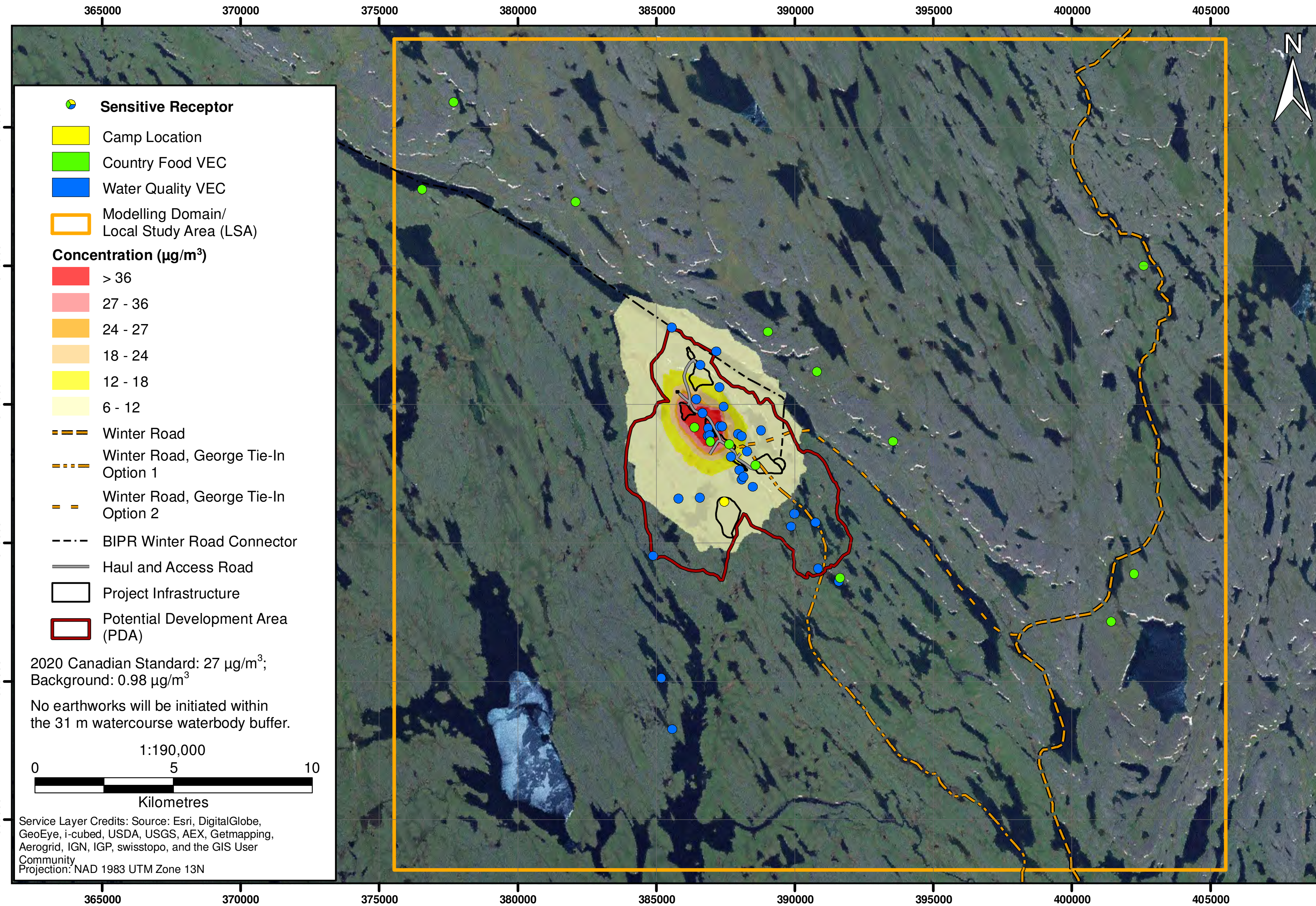

Figure B-23

Maximum Total 24-hour $PM_{2.5}$ Concentration, George Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

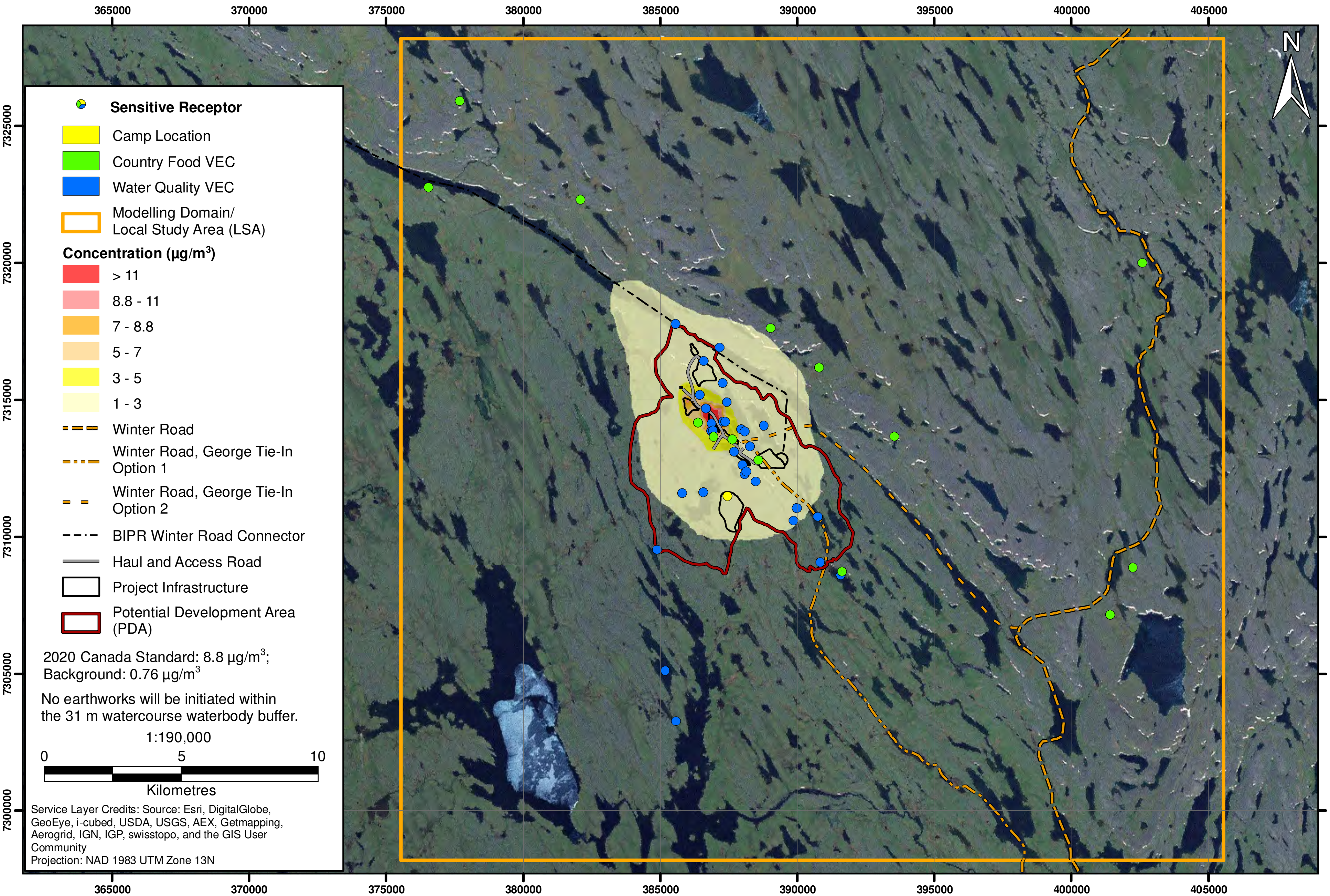

Figure B-24

Sabina GOLD & SILVER CORP.

Annual Total $PM_{2.5}$ Concentration, George Property Area

Figure B-24

Rescan an ERM company

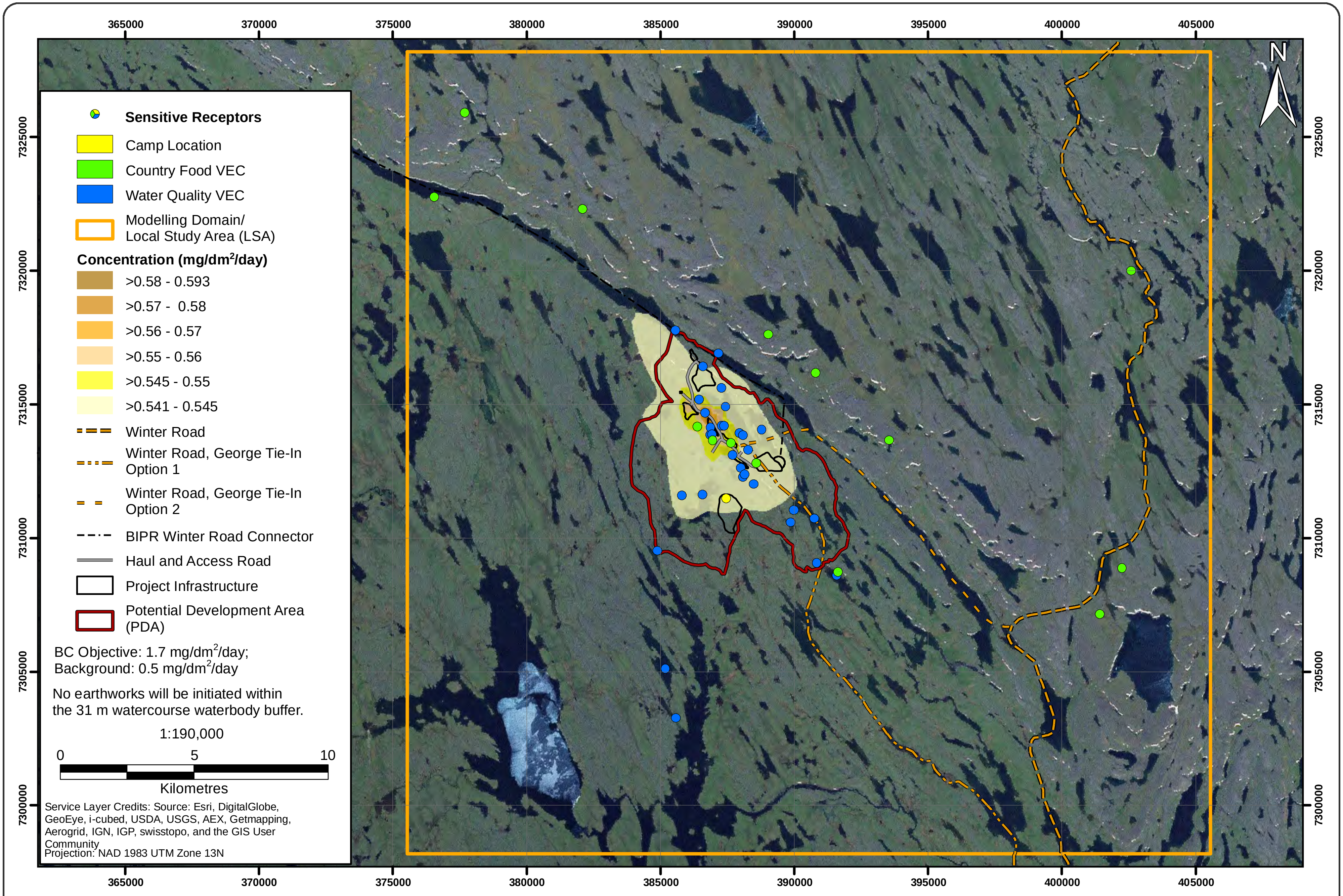

Figure B-25

Sabina GOLD & SILVER CORP.

Maximum 30-day Dust Deposition, George Property Area

Rescan an ERM company

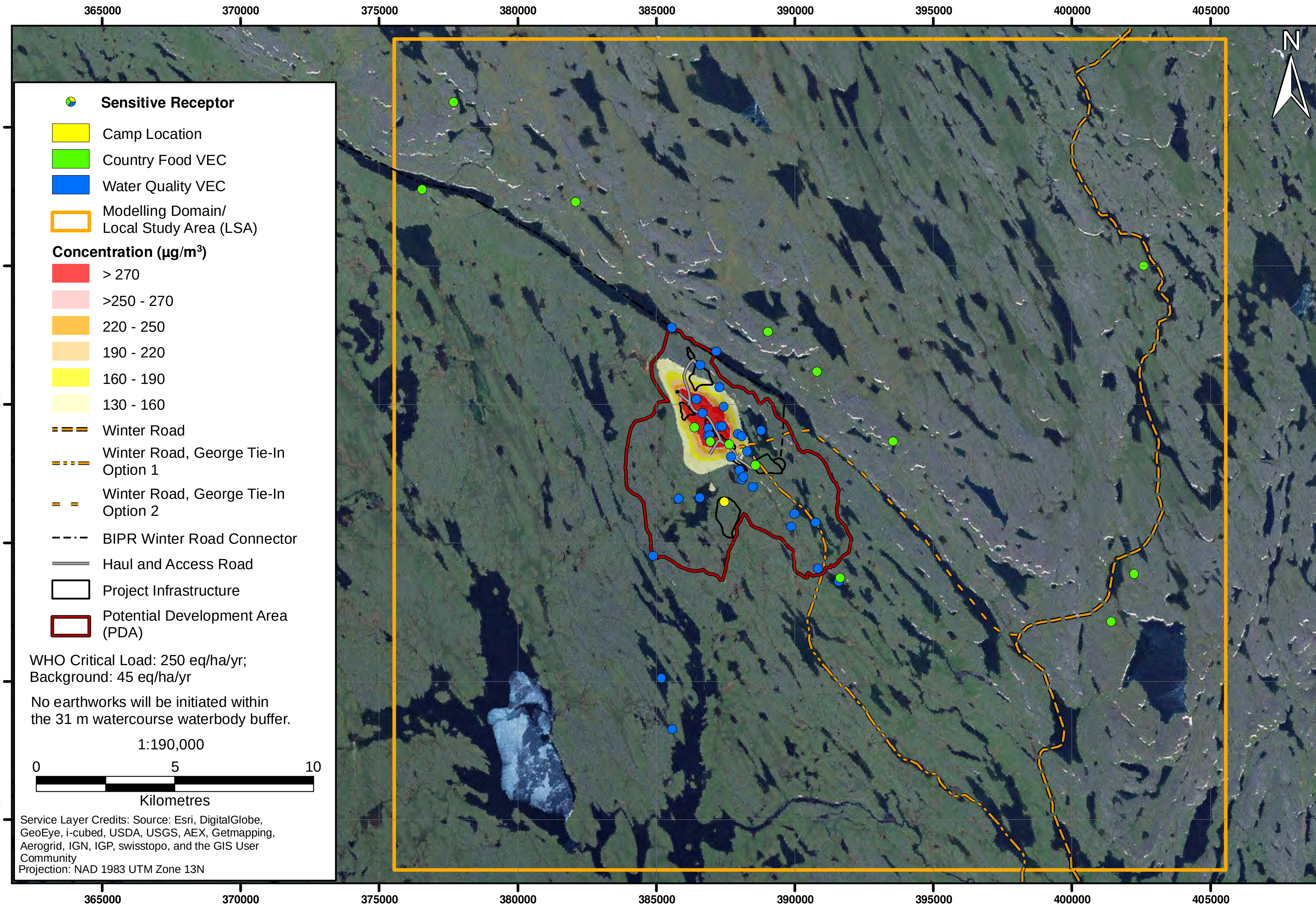

Figure B-26

Sabina GOLD & SILVER CORP.

Annual Acid Deposition, George Property Area

Rescan an ERM company

Appendix V4-2A

Back River Project: 2012 Noise Baseline Report

an ERM company

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
2012 Noise Baseline Report

Sabina
GOLD & SILVER CORP.

Rescan Engineers & Scientists

Rescan™ Environmental Services Ltd.
Rescan Building, Sixth Floor - 1111 West Hastings Street
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October 2012

BACK RIVER PROJECT
2012 NOISE BASELINE REPORT

October 2012
Project #0833-002-16

Citation:
Rescan. 2012. *Back River Project: 2012 Noise Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Engineers and Scientists

Executive Summary

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George properties in 2012.

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. This report presents the results from the 2012 noise baseline program.

Ten noise monitoring stations were set up at varying distances from Goose Camp, George Camp, and the Marine Laydown Area in 2012. Noise levels were recorded over a 24 hour period in March and June. The locations were selected to characterize the range of baseline conditions in the region, based on their proximity of known deposits and sensitive wildlife receptors. Results from the noise monitoring program captured background noise levels from stations that were located approximately 3 to 70 km away from the camps. Noise levels were also recorded at both exploration camps.

The highest logarithmic averages were measured at stations S01 and S10, which were situated at Goose and George exploration camps, which is to be expected due to the noise generated by anthropogenic sources during exploration. The next highest logarithmic averages were measured at stations S05, S06 and S03 (high to low). High winds, and increased bird calls recorded during the June sampling period could explain the high noise levels at all three of these sites. Station S03 was located approximately 3 km from Goose Camp and S05 and S06 were located along the flight path between George and Goose Camps. In comparison the two monitoring stations with the lowest logarithmic averages, S07 and S08, were the furthest away from existing infrastructure (~70 km).

Noise data collected in 2012 was reflective of pristine background noise conditions as well as exploration camp noise conditions. 2012 data compares well with background studies done in other pristine areas, where L_{eq} values can range from 9 to 22 dbA, depending on proximity to noise sources, wind speed and snow cover (Menge, Ross, and Ernenwein 2002).

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Engineers and Scientists

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Glossary and Abbreviations

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.

Absolute L_{min}	Minimum sound value recorded during a 24-hour monitoring period
dBA	Sound levels measured with an A-weighted filter, which is within a response frequency range for humans and animals, between 1 kHz to 4 kHz (1,000 to 4,000 vibrations per second)
FAT	Felsic Ash Tuff
GPS	Global Positioning System
ha	Hectares
L_{eq}	Continuous equivalent sound level over a time period
L_{90}	Ninetieth percentile level (the A-weighted sound pressure level that is exceeded 90 percent of the time during the measurement period)
L_{max}	Maximum recorded sound level during an hourly period
QA	Quality Assurance
QC	Quality Control

1. Introduction

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George properties in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- Meteorology
- Air Quality and Dust
- Noise
- Hydrology and Bathymetry
- Freshwater Water Quality, Sediment Quality, Aquatic Biology
- Freshwater Fish and Fish Habitat
- Marine Water Quality, Sediment Quality, Aquatic Biology
- Marine Fish and Fish Habitat
- Wildlife (Terrestrial and Marine)
- Wildlife DNA Study (Grizzly Bear and Wolverine)
- Ecosystem Mapping
- Vegetation and Wetlands (including Rare Plants)
- Soils and Terrain
- Country Foods
- Archaeology
- Socio-economics
- Land Use
- Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the Marine Laydown Area. It was assumed that access from the Marine Laydown Area to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the noise portion of the 2012 baseline program, which was undertaken in March and June of 2012. Chapter 2 of this report presents the methods, Chapter 3 presents the results, and Chapter 4 presents a summary of the 2012 data. All raw data collected are included as appendices to this report.

Figure 1-1

Back River Project Location

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists

2. Methodology

2. Methodology

Noise may affect wildlife populations by causing them to avoid important habitats and/or take time away from other key behaviors such as feeding, breeding, or watching for predators, which can ultimately lead to reduced reproductive productivity and/or increased mortality. To quantify baseline noise conditions, monitoring was conducted at ten locations around the Project area during March and June (Figure 2-1).

Table 2-1 provides the UTM locations of the sampling sites. The locations were selected to characterize the range of baseline conditions in the region, based on their proximity to known deposits and sensitive wildlife receptors. The time periods were chosen to encompass winter and summer conditions, and to include the critical bird nesting period and a portion of the caribou migration in June.

Table 2-1. UTM Coordinates of Noise Monitoring Stations

Location	Easting	Northing
S01	434023	7269878
S02	444229	7281281
S03	436819	7269564
S04	442052	7271258
S05	393767	7306118
S06	406727	7289932
S07	373761	7382904
S08	388656	7382021
S09	388255	7328466
S10	388124	7313269

Note: UTM references are from Zone 13 NAD 83

Noise is typically monitored as sound pressure level, in A-weighted decibels (dBA). The A-weighting is designed to match the average frequency response of the human ear. Some typical noise levels are as follows:

- rustling leaves: 20;
- humming of refrigerator: 40;
- normal conversation: 60;
- business office: 65;
- average city traffic: 80 to 85;
- jackhammer:100;
- jet take-off at 100 m distance: 130; and
- motorcycles, firecrackers, small arms fire: up to 140.

Baseline noise levels were measured using a Brüel & Kjaer Model 2250 sound level meter capable of logging data and sound files (Plate 2-1). The microphone was protected by a wind screen/weather shield and bird spikes. A weather resistant case protected the meter and battery pack, and provided a stable base for the kit. Both the average and maximum peak sound levels were measured using a sound level meter with “A” standardized frequency rating (dBA), designed to match the frequency response of the human ear. The sound level meters were calibrated prior to sampling. Noise measurements were made once every five seconds, 1.5 m above ground for a minimum of 24 consecutive hours. The Brüel & Kjaer Model 2250 sound level meter has an operating range that captures low sound levels, which are typical for undisturbed wilderness areas.

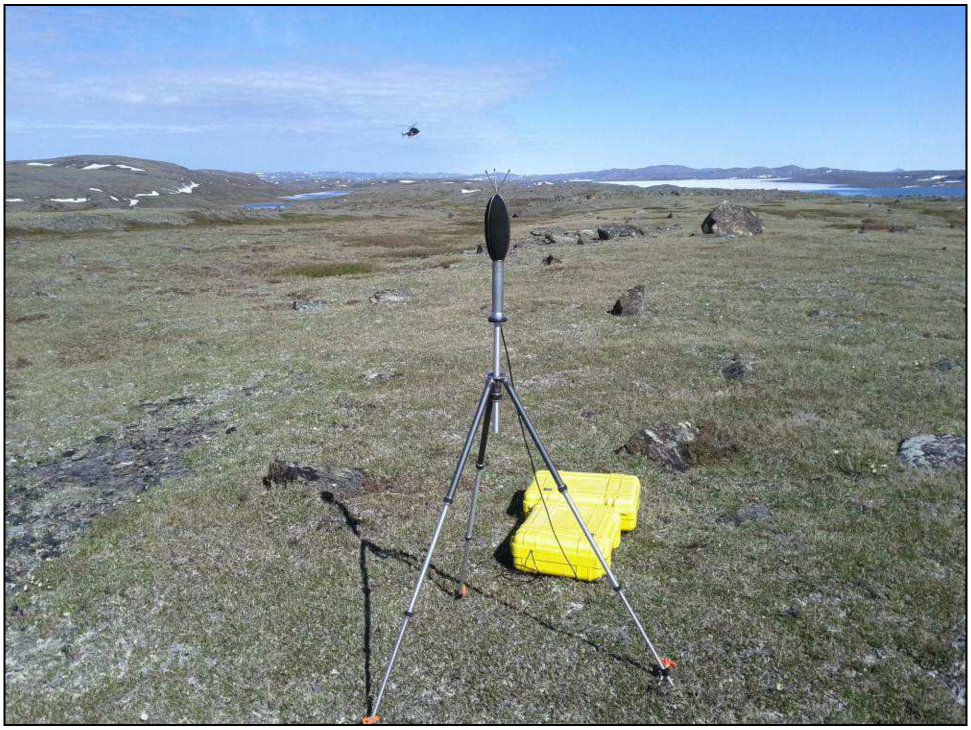

Plate 2-1. A typical sound level meter and associated environmental enclosure kits.

The first survey was conducted from March 20 – 29, 2012, and the second survey took place from June 14 - 20, 2012. These two monitoring periods had a wide range of environmental variation, such as changing wind speeds, and varying levels of noise from birds, mammals, and anthropogenic activity.

Data parameters logged during these survey periods included L_{eq}, L_{90}, L_{max}, and absolute L_{min}.

- o L_{eq} is the continuous equivalent sound level over a time period.
- o L_{90} is the ninetieth percentile level (the A-weighted sound pressure level that is exceeded 90 percent of the time during the measurement period). For example, L_{90} = 80 dBA means that the sound pressure level exceeded 80 dBA during 90% of the measurement period. L_{90} is usually regarded as the residual level or the background noise level without discrete events (e.g., helicopters, fixed wing aircraft).
- o L_{max} is the maximum value recorded during an hourly period.
- o Absolute L_{min} is the minimum value recorded during the monitoring period (24 hours).

L_{eq} values include noise from anthropogenic sources such as helicopters and aircraft movement, therefore not typically reflecting the natural noise level conditions in the area. Background noise studies done in other pristine areas, have found that L_{90} values can range from 9 to 22 dbA, depending on proximity to noise sources, wind speed and snow cover (Menge, Ross, and Ernenwein 2002). L_{90} values provide a better indication of the natural noise levels since discrete events that occur from anthropogenic sources will not be part of 90% of the measurement time period. Additionally, the sound level meters recorded audible sound files, which were used for the analysis of the baseline data to identify the peak events and the associated noise sources.

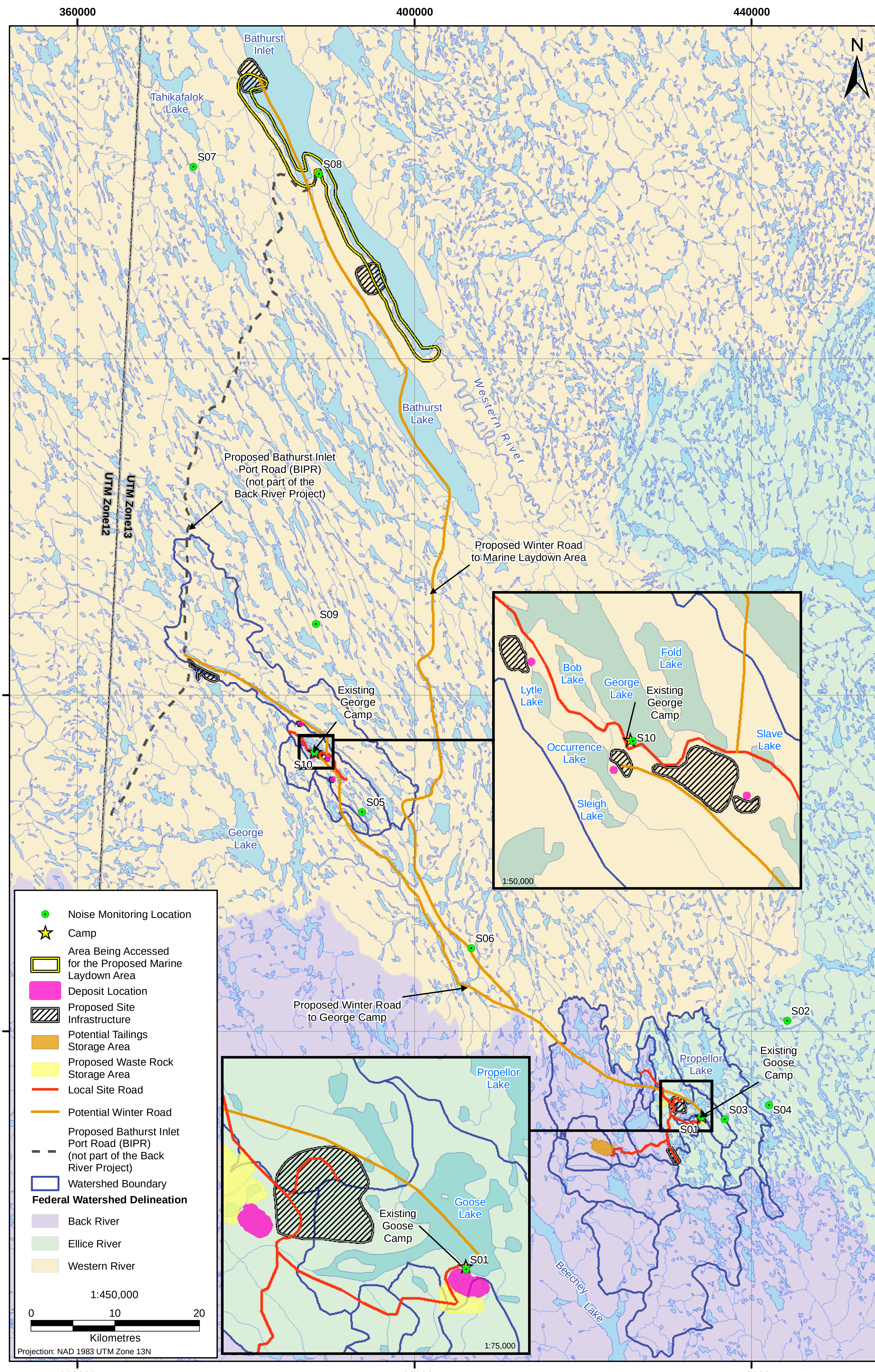

Figure 2-1

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2012 Noise Baseline Monitoring Locations, Back River Project

Figure 2-1

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The following weather parameters were recorded by the George Camp automated meteorology station during each noise measurement time period:

- relative humidity (%);
- wind speed (km/h or m/s);
- wind direction (degrees from true north);
- precipitation (mm); and
- temperature (°C).

The acceptable weather conditions for noise monitoring are:

- relative humidity of less than 90%;
- wind speeds of less than 20 km/h;
- no active precipitation (rain or snow); and
- temperatures that allow the meter body to be maintained within manufacturer's specifications.

The following information was recorded in the field during the noise monitoring program:

- descriptions of the monitoring site using sketches and pictures;
- time of set up and tear down;
- time of calibration;
- type of surface the meter is placed on;
- observed audible noise sources;
- distance from all obstacles in the area (cannot be closer than 3 m to any surface except the ground);
- global position system (GPS) location;
- serial number of the meter being used; and
- weather conditions at each site at the time of set up and tear down, including precipitation and cloud cover.

The noise meters were set up and operated to obtain reliable data given the on-site conditions. The noise meters cannot operate reliably at air temperatures below -20°C. Typical battery power for these instruments does not last long (usually less than 24 hours) in extreme cold, so a spare battery was taken into the field to be certain that the sound level meters were fully operational during the monitoring period. A housing or protection mechanism for the cable wire was used, and the tripod was secured to the ground to prevent tampering by wildlife.

Recorded sound level and audio sound were downloaded to a computer for analysis with the Brüel and Kjaer 7820 Evaluator® software program. The sound recordings were reviewed to identify noise sources, such as technician activities, wind, rain, construction and helicopter noise. Hourly values were then calculated for the 24-hour measurements from the 1-minute data. Other indicators used to identify sources of noise were time of day and field observations.

Quality Assurance (QA) and Quality Control (QC) checks were conducted on the downloaded data. Field QA/QC of equipment was not always practical as the climate and terrain were not always conducive to frequent checks. Weather data were verified in the field with a pocket weather meter. Equipment was calibrated before and after each 24-hour survey to ensure that the noise meter and microphone were operating properly. All information was recorded by the field technician.

Detailed field notes were recorded during the monitoring period to record the state of the equipment and any audible noises. The site visits were conducted by experienced technicians to ensure proper documentation and field observations.

3. Results

3. Results

This section presents the results from the baseline noise measurements in March and June of 2012. Ten locations were chosen to conduct noise monitoring. Results from each station are provided individually, and a summary of all results is provided in chapter 4.

3.1 S01

Station S01 was positioned close to the Goose exploration camp (plates 3.1-1 and 3.1-2). The sound monitor was surrounded by gently undulating hills with exposed bedrock typical of Arctic terrain. There was a layer of snow present during the March 2012 sampling period.

Plate 3.1-1. S01 Noise Monitoring Station, March 2012.

One-minute noise levels recorded during March and June 2012 are shown in Figure 3.1-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March and June 2012 sampling periods are shown in Tables 3.1-1a and 3.1-1b, respectively.

General sources of noise observed at this location were aircraft, wind noise, and heavy machinery. Sounds from birds were also detected during the summer (June) monitoring period. Precipitation was recorded during monitoring of S01 in the 2012 sampling period at 5:00 PM on June 14, 2012 and at 11:00 AM on June 15, 2012.

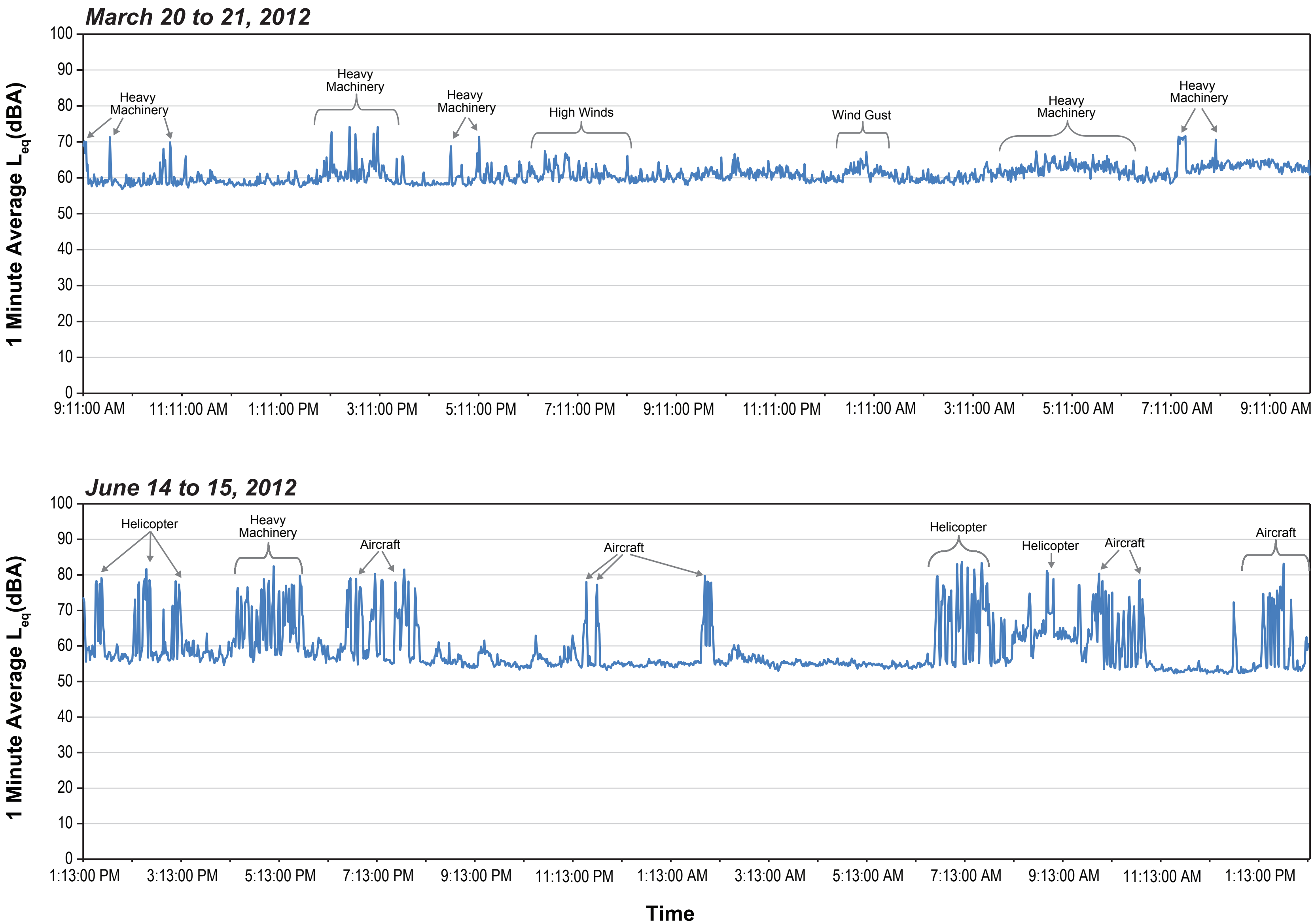

Figure 3.1-1

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Back River Noise Monitoring Station S01, March and June 2012

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Plate 3.1-2. S01 Noise Monitoring Station, June 2012.

Table 3.1-1a. Hourly Sound Levels, Station S01, March 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
3/20/2012	9:11:00 AM	10:11:00 AM	11.5	80	60	55	75
3/20/2012	10:11:00 AM	11:11:00 AM	13.9	68	61	56	75
3/20/2012	11:11:00 AM	12:11:00 PM	13.4	69	60	55	73
3/20/2012	12:11:00 PM	1:11:00 PM	15.4	67	59	55	69
3/20/2012	1:11:00 PM	2:11:00 PM	14.4	53	60	55	75
3/20/2012	2:11:00 PM	3:11:00 PM	15.6	53	65	55	81
3/20/2012	3:11:00 PM	4:11:00 PM	16.7	53	62	55	79
3/20/2012	4:11:00 PM	5:11:00 PM	20.2	52	60	55	73
3/20/2012	5:11:00 PM	6:11:00 PM	17.5	42	62	56	76
3/20/2012	6:11:00 PM	7:11:00 PM	16.5	41	63	56	80
3/20/2012	7:11:00 PM	8:11:00 PM	17.8	45	61	56	73
3/20/2012	8:11:00 PM	9:11:00 PM	19.7	45	60	56	74
3/20/2012	9:11:00 PM	10:11:00 PM	21.7	49	61	56	76
3/20/2012	10:11:00 PM	11:11:00 PM	20.8	45	62	57	77
3/20/2012	11:11:00 PM	12:11:00 AM	20.3	39	61	56	74
3/21/2012	12:11:00 AM	1:11:00 AM	18.2	19	62	58	79
3/21/2012	1:11:00 AM	2:11:00 AM	19.2	27	61	56	72
3/21/2012	2:11:00 AM	3:11:00 AM	20.4	24	60	56	72
3/21/2012	3:11:00 AM	4:11:00 AM	20.7	23	61	56	74

(continued)

Table 3.1-1a. Hourly Sound Levels, Station S01, March 2012 (completed)

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
3/21/2012	4:11:00 AM	5:11:00 AM	20.6	24	63	56	74
3/21/2012	5:11:00 AM	6:11:00 AM	21.2	24	64	57	74
3/21/2012	6:11:00 AM	7:11:00 AM	18.6	21	61	56	72
3/21/2012	7:11:00 AM	8:11:00 AM	20.0	23	66	57	79
3/21/2012	8:11:00 AM	9:11:00 AM	18.7	18	64	60	72
Maximum			*21.7*	*n/a*	*66*	*58*	*81*
Minimum			*11.5*	*n/a*	*59*	*55*	*69*
Logarithmic average[1]			*18.0*	*n/a*	*62*	*56*	*76*

[1] *Wind speed and wind direction are arithmetic averages.*

Table 3.1-1b. Hourly Sound Levels, Station S01, June 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
6/14/2012	1:13:00 PM	2:13:00 PM	14.5	320	71	55	92
6/14/2012	2:13:00 PM	3:13:00 PM	15.5	330	72	55	91
6/14/2012	3:13:00 PM	4:13:00 PM	15.0	326	68	55	89
6/14/2012	4:13:00 PM	5:13:00 PM	14.0	319	72	56	91
6/14/2012	5:13:00 PM	6:13:00 PM	15.7	325	73	56	91
6/14/2012	6:13:00 PM	7:13:00 PM	15.8	322	72	55	93
6/14/2012	7:13:00 PM	8:13:00 PM	16.0	320	74	55	89
6/14/2012	8:13:00 PM	9:13:00 PM	15.6	323	59	54	80
6/14/2012	9:13:00 PM	10:13:00 PM	15.6	319	59	53	74
6/14/2012	10:13:00 PM	11:13:00 PM	15.3	325	58	53	75
6/14/2012	11:13:00 PM	12:13:00 AM	13.7	319	67	53	86
6/15/2012	12:13:00 AM	1:13:00 AM	10.6	1	56	53	61
6/15/2012	1:13:00 AM	2:13:00 AM	12.5	312	70	54	87
6/15/2012	2:13:00 AM	3:13:00 AM	12.8	321	59	54	71
6/15/2012	3:13:00 AM	4:13:00 AM	11.9	329	56	53	63
6/15/2012	4:13:00 AM	5:13:00 AM	12.7	323	57	53	66
6/15/2012	5:13:00 AM	6:13:00 AM	10.8	325	56	53	62
6/15/2012	6:13:00 AM	7:13:00 AM	10.6	329	72	53	92
6/15/2012	7:13:00 AM	8:13:00 AM	10.9	330	76	54	90
6/15/2012	8:13:00 AM	9:13:00 AM	11.2	325	71	57	92
6/15/2012	9:13:00 AM	10:13:00 AM	11.0	325	71	56	88
6/15/2012	10:13:00 AM	11:13:00 AM	11.2	317	70	53	87
6/15/2012	11:13:00 AM	12:13:00 PM	11.7	318	54	52	66
6/15/2012	12:13:00 PM	1:13:00 PM	11.5	325	59	52	79
Maximum			*16.0*	*n/a*	*76*	*57*	*93*
Minimum			*10.6*	*n/a*	*54*	*52*	*61*
Logarithmic average[1]			*13.2*	*n/a*	*70*	*54*	*88*

[1] *Wind speed and wind direction are arithmetic averages.*

The L_{eq} ranges (*L_{eq}[max] - L_{eq}[min]*) of 7 and 22 dBA and the L_{90} ranges (*L_{90}[max] – L_{90}[min]*) of 3 and 5 dBA during March 2012, and June 2012, respectively, represent minor noise fluctuations in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 52 dBA was recorded at 11:00 AM on June 15, 2012. The L_{eq} logarithmic averages were 62 and 70 dBA and the L_{90} logarithmic averages were 56 and 54 dBA during March 2012 and June 2012, respectively. Due to heavy equipment and frequent helicopter noise in the sampling area, noise levels are reflective of exploration camp conditions.

3.2 S02

The set up for Station S02 is shown in plates 3.2-1 and 3.2-2 for the March and June 2012 monitoring periods, respectively. The device was placed on a small hill surrounded by undulating terrain typical of the Arctic, located approximately 15 km northeast of Goose exploration camp. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.2-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.2-1a, and 3.2-1b, respectively.

Plate 3.2-1. S02 Noise Monitoring Station, March 2012.

General noise sources observed at this location included aircraft and wind. No precipitation was observed during monitoring of S02 during the 2012 monitoring periods.

The L_{eq} ranges (*L_{eq}[max] - L_{eq}[min]*) of 13 and 17 dBA and the L_{90} ranges (*L_{90}[max] – L_{90}[min]*) of 4 and 13 dBA during March 2012, and June 2012, respectively, represent minor noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 18 dBA was recorded at 12:00 AM on June 15, 2012. The L_{eq} logarithmic averages were 22 and 39 dBA and the L_{90} logarithmic averages were 17 and 25 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low one value representations of baseline environmental noise in this area.

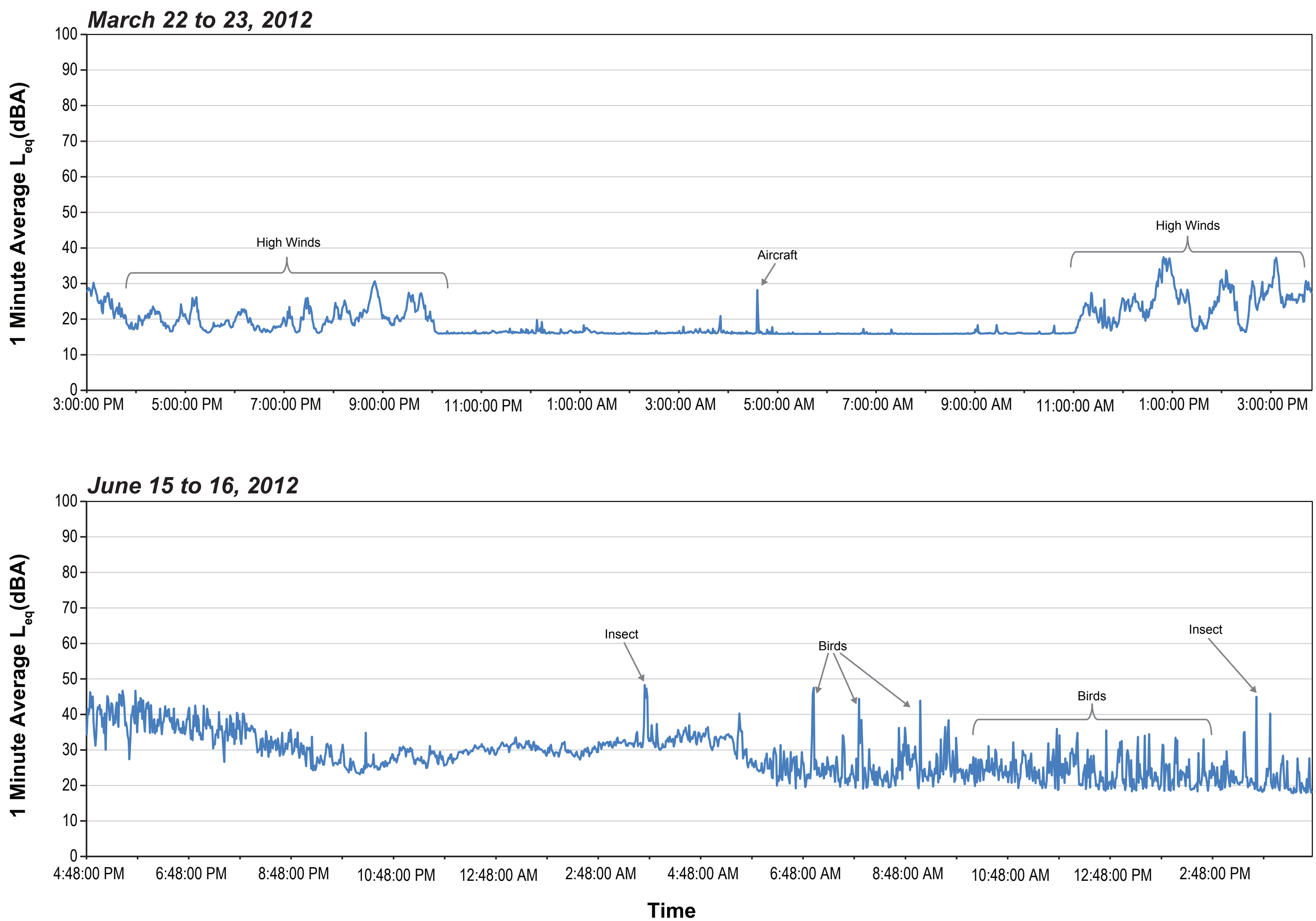

Figure 3.2-1

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Back River Noise Monitoring Station S02, March and June 2012

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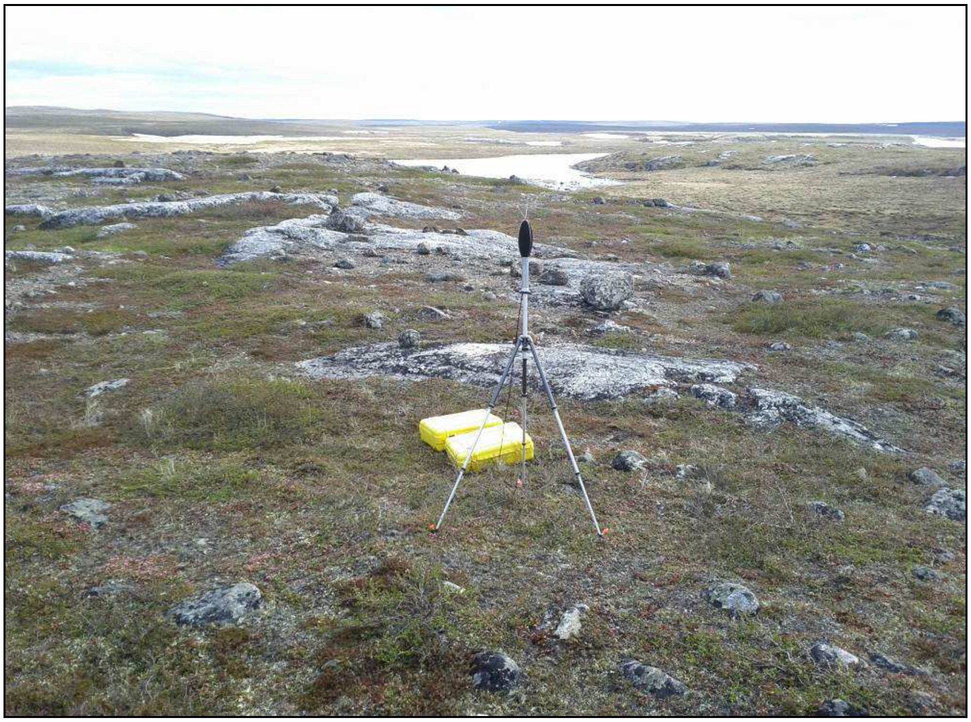

Plate 3.2-2. S02 Noise Monitoring Station, June 2012.

Table 3.2-1a. Hourly Sound Levels, Station S02, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/22/2012	3:00:00 PM	4:00:00 PM	5.7	283	25	20	36
3/22/2012	4:00:00 PM	5:00:00 PM	5.4	284	20	17	39
3/22/2012	5:00:00 PM	6:00:00 PM	4.6	287	21	17	35
3/22/2012	6:00:00 PM	7:00:00 PM	6.1	301	19	16	36
3/22/2012	7:00:00 PM	8:00:00 PM	4.8	307	20	16	42
3/22/2012	8:00:00 PM	9:00:00 PM	4.7	320	24	19	37
3/22/2012	9:00:00 PM	10:00:00 PM	4.2	330	24	19	36
3/22/2012	10:00:00 PM	11:00:00 PM	2.9	10	17	16	34
3/22/2012	11:00:00 PM	12:00:00 AM	2.2	291	16	16	36
3/23/2012	12:00:00 AM	1:00:00 AM	2.7	252	17	16	44
3/23/2012	1:00:00 AM	2:00:00 AM	3.1	317	16	16	40
3/23/2012	2:00:00 AM	3:00:00 AM	2.5	329	16	16	35
3/23/2012	3:00:00 AM	4:00:00 AM	2.3	320	17	16	39
3/23/2012	4:00:00 AM	5:00:00 AM	2.2	236	17	16	39
3/23/2012	5:00:00 AM	6:00:00 AM	3.2	296	16	16	39
3/23/2012	6:00:00 AM	7:00:00 AM	1.8	352	16	16	38
3/23/2012	7:00:00 AM	8:00:00 AM	1.4	29	16	16	38
3/23/2012	8:00:00 AM	9:00:00 AM	2.3	291	16	16	24
3/23/2012	9:00:00 AM	10:00:00 AM	1.9	342	16	16	29
3/23/2012	10:00:00 AM	11:00:00 AM	2.3	304	16	16	25

(continued)

Table 3.2-1a. Hourly Sound Levels, Station S02, March 2012 (completed)

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
3/23/2012	11:00:00 AM	12:00:00 PM	1.8	222	21	16	38
3/23/2012	12:00:00 PM	1:00:00 PM	2.4	246	28	19	46
3/23/2012	1:00:00 PM	2:00:00 PM	1.0	216	29	17	46
3/23/2012	2:00:00 PM	3:00:00 PM	1.7	188	27	17	42
Maximum			*6.1*	*n/a*	*29*	*20*	*46*
Minimum			*1.0*	*n/a*	*16*	*16*	*24*
Logarithmic average[1]			*3.1*	*n/a*	*22*	*17*	*40*

[1] Wind speed and wind direction are arithmetic averages.
[2] Not used in calculating logarithmic average or maximum sound level, as measurement contained noise from helicopter takeoff or landing.

Table 3.2-1b. Hourly Sound Levels, Station S02, June 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
6/15/2012	4:48:00 PM	5:48:00 PM	8.0	3	46	28	57
6/15/2012	5:48:00 PM	6:48:00 PM	8.9	28	46	28	61
6/15/2012	6:48:00 PM	7:48:00 PM	8.6	27	43	27	56
6/15/2012	7:48:00 PM	8:48:00 PM	9.3	27	41	25	53
6/15/2012	8:48:00 PM	9:48:00 PM	8.4	27	37	24	52
6/15/2012	9:48:00 PM	10:48:00 PM	7.4	25	35	24	60
6/15/2012	10:48:00 PM	11:48:00 PM	5.7	14	32	24	53
6/15/2012	11:48:00 PM	12:48:00 AM	3.3	4	29	26	36
6/16/2012	12:48:00 AM	1:48:00 AM	6.2	350	31	18	35
6/16/2012	1:48:00 AM	2:48:00 AM	0.9	32	32	29	35
6/16/2012	2:48:00 AM	3:48:00 AM	1.5	81	31	28	45
6/16/2012	3:48:00 AM	4:48:00 AM	1.7	140	40	30	60
6/16/2012	4:48:00 AM	5:48:00 AM	1.0	176	36	31	57
6/16/2012	5:48:00 AM	6:48:00 AM	1.2	147	36	25	56
6/16/2012	6:48:00 AM	7:48:00 AM	2.0	131	33	19	53
6/16/2012	7:48:00 AM	8:48:00 AM	3.3	155	42	19	65
6/16/2012	8:48:00 AM	9:48:00 AM	4.1	186	35	19	58
6/16/2012	9:48:00 AM	10:48:00 AM	5.2	164	38	19	63
6/16/2012	10:48:00 AM	11:48:00 AM	5.3	205	32	19	58
6/16/2012	11:48:00 AM	12:48:00 PM	3.2	191	33	19	57
6/16/2012	12:48:00 PM	1:48:00 PM	4.0	56	35	19	62
6/16/2012	1:48:00 PM	2:48:00 PM	3.5	37	31	18	53
6/16/2012	2:48:00 PM	3:48:00 PM	3.5	3	29	18	53
6/16/2012	3:48:00 PM	4:48:00 PM	5.1	12	35	18	62
Maximum			*9.3*	*n/a*	*46*	*31*	*65*
Minimum			*0.9*	*n/a*	*29*	*18*	*35*
Logarithmic average[1]			*4.6*	*n/a*	*39*	*25*	*58*

[1] Wind speed and wind direction are arithmetic averages.

3.3 S03

The set up for Station S03 is shown in plates 3.3-1 and 3.3-2 for the March and June 2012 monitoring periods, respectively. The device was placed on the top of an esker, located approximately 3 km east of Goose exploration camp, surrounded by terrain consisting of gentle hills typical of the Arctic. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.3-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.3-1a and 3.3-1b, respectively. General noise sources observed at this location included drilling from exploration, aircraft, and wind. Precipitation was recorded during the monitoring of S03 at 5:00 PM on June 14, 2012 and at 11:00 AM on June 15, 2012.

Plate 3.3-1. S03 Noise Monitoring Station, March 2012.

Plate 3.3-2. S03 Noise Monitoring Station, June 2012.

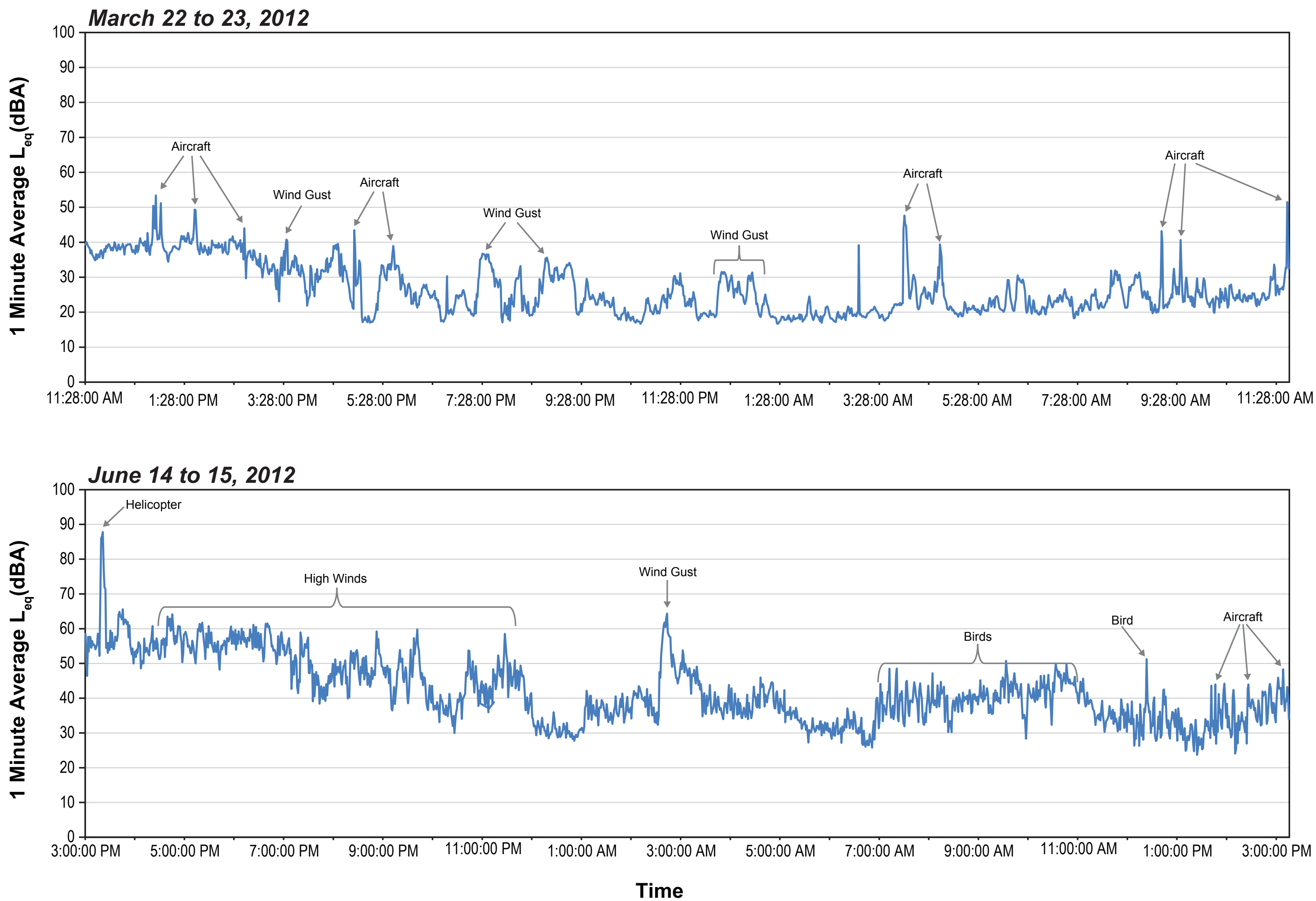

Figure 3.3-1

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Back River Noise Monitoring Station S03, March and June 2012

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Table 3.3-1a. Hourly Sound Levels, Station S03, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/22/2012	11:28:00 AM	12:28:00 PM	4.7	303	38	30	47
3/22/2012	12:28:00 PM	1:28:00 PM	5.0	308	42	34	59
3/22/2012	1:28:00 PM	2:28:00 PM	4.7	291	41	33	57
3/22/2012	2:28:00 PM	3:28:00 PM	5.0	273	39	30	53
3/22/2012	3:28:00 PM	4:28:00 PM	5.7	283	33	21	50
3/22/2012	4:28:00 PM	5:28:00 PM	5.4	284	34	21	50
3/22/2012	5:28:00 PM	6:28:00 PM	4.6	287	31	17	41
3/22/2012	6:28:00 PM	7:28:00 PM	6.1	301	24	17	42
3/22/2012	7:28:00 PM	8:28:00 PM	4.8	307	31	17	41
3/22/2012	8:28:00 PM	9:28:00 PM	4.7	320	29	18	40
3/22/2012	9:28:00 PM	10:28:00 PM	4.2	330	28	20	37
3/22/2012	10:28:00 PM	11:28:00 PM	2.9	10	20	17	28
3/22/2012	11:28:00 PM	12:28:00 AM	2.2	291	25	19	35
3/23/2012	12:28:00 AM	1:28:00 AM	1.8	222	28	22	34
3/23/2012	1:28:00 AM	2:28:00 AM	3.1	317	20	17	28
3/23/2012	2:28:00 AM	3:28:00 AM	2.5	329	20	17	29
3/23/2012	3:28:00 AM	4:28:00 AM	2.3	320	33	18	57
3/23/2012	4:28:00 AM	5:28:00 AM	2.2	236	31	20	50
3/23/2012	5:28:00 AM	6:28:00 AM	3.2	296	21	19	29
3/23/2012	6:28:00 AM	7:28:00 AM	1.8	352	25	19	33
3/23/2012	7:28:00 AM	8:28:00 AM	1.4	29	23	19	29
3/23/2012	8:28:00 AM	9:28:00 AM	2.3	291	27	21	36
3/23/2012	9:28:00 AM	10:28:00 AM	1.9	342	30	20	49
3/23/2012	10:28:00 AM	11:28:00 AM	2.3	304	25	20	34
Maximum			*6.1*	*n/a*	*42*	*34*	*59*
Minimum			*1.4*	*n/a*	*20*	*17*	*28*
Logarithmic average[1]			*3.6*	*n/a*	*33*	*26*	*50*

[1] Wind speed and wind direction are arithmetic averages.

Table 3.3-1b. Hourly Sound Levels, Station S03, June 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/14/2012	3:00:00 PM	4:00:00 PM	15.0	326	62	45	74
6/14/2012	4:00:00 PM	5:00:00 PM	14.0	319	62	45	74
6/14/2012	5:00:00 PM	6:00:00 PM	15.7	325	61	46	72
6/14/2012	6:00:00 PM	7:00:00 PM	15.8	322	60	42	75
6/14/2012	7:00:00 PM	8:00:00 PM	16.0	320	54	37	69
6/14/2012	8:00:00 PM	9:00:00 PM	15.6	323	55	38	69
6/14/2012	9:00:00 PM	10:00:00 PM	15.6	319	53	33	71
6/14/2012	10:00:00 PM	11:00:00 PM	15.3	325	50	33	65

(continued)

Table 3.3-1b. Hourly Sound Levels, Station S03, June 2012 (completed)

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/14/2012	11:00:00 PM	12:00:00 AM	13.7	319	51	28	71
6/15/2012	12:00:00 AM	1:00:00 AM	11.9	311	38	27	52
6/15/2012	1:00:00 AM	2:00:00 AM	12.5	312	42	31	52
6/15/2012	2:00:00 AM	3:00:00 AM	12.8	321	58	34	76
6/15/2012	3:00:00 AM	4:00:00 AM	11.9	329	43	31	59
6/15/2012	4:00:00 AM	5:00:00 AM	12.7	323	44	32	59
6/15/2012	5:00:00 AM	6:00:00 AM	10.8	325	37	26	54
6/15/2012	6:00:00 AM	7:00:00 AM	10.6	329	40	26	56
6/15/2012	7:00:00 AM	8:00:00 AM	10.9	330	44	31	59
6/15/2012	8:00:00 AM	9:00:00 AM	11.2	325	42	32	54
6/15/2012	9:00:00 AM	10:00:00 AM	11.0	325	47	34	63
6/15/2012	10:00:00 AM	11:00:00 AM	11.2	317	48	34	62
6/15/2012	11:00:00 AM	12:00:00 PM	11.7	318	39	27	50
6/15/2012	12:00:00 PM	1:00:00 PM	11.5	325	44	24	69
6/15/2012	1:00:00 PM	2:00:00 PM	11.4	336	39	24	55
6/15/2012	2:00:00 PM	3:00:00 PM	10.6	1	46	29	64
Maximum			*16.0*	*n/a*	*62*	*46*	*76*
Minimum			*10.6*	*n/a*	*37*	*24*	*50*
Logarithmic average[1]			*13.0*	*n/a*	*55*	*38*	*69*

[1] *Wind speed and wind direction are arithmetic averages.*

The L_{eq} ranges ($L_{eq}[max]$ - $L_{eq}[min]$) of 23 and 25 dBA and the L_{90} ranges ($L_{90}[max]$ – $L_{90}[min]$) of 17 and 22 dBA during March 2012 and June 2012, respectively, represent moderate noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 24 dBA was recorded at 12:00 PM on June 15, 2012. The L_{eq} logarithmic averages were 34 and 55 dBA and the L_{90} logarithmic averages were 26 and 38 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low one value representations of baseline environmental noise in this area.

3.4 S04

The set up for Station S04 is shown in plates 3.4-1 and 3.4-2 for the March and June 2012 monitoring periods, respectively. The device was placed approximately 8 km east of Goose exploration camp on bedrock with a slight incline surrounded by terrain consisting of gentle hills typical of the Arctic. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.4-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.4-1a and 3.4-1b, respectively. General noise sources observed at this location included aircraft and wind. No precipitation was observed during monitoring of S04 in the 2012 period.

The L_{eq} ranges ($L_{eq}[max]$ - $L_{eq}[min]$) of 22 and 21 dBA and the L_{90} ranges ($L_{90}[max]$ – $L_{90}[min]$) of 14 and 13 dBA during March 2012 and June 2012, respectively, represent minor noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 17dBA was recorded at 3:05 AM on March 24, 2012. The L_{eq} logarithmic averages were 31 and

39 dBA and the L_{90} logarithmic averages were 22 and 25 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low one value representations of baseline environmental noise in this area.

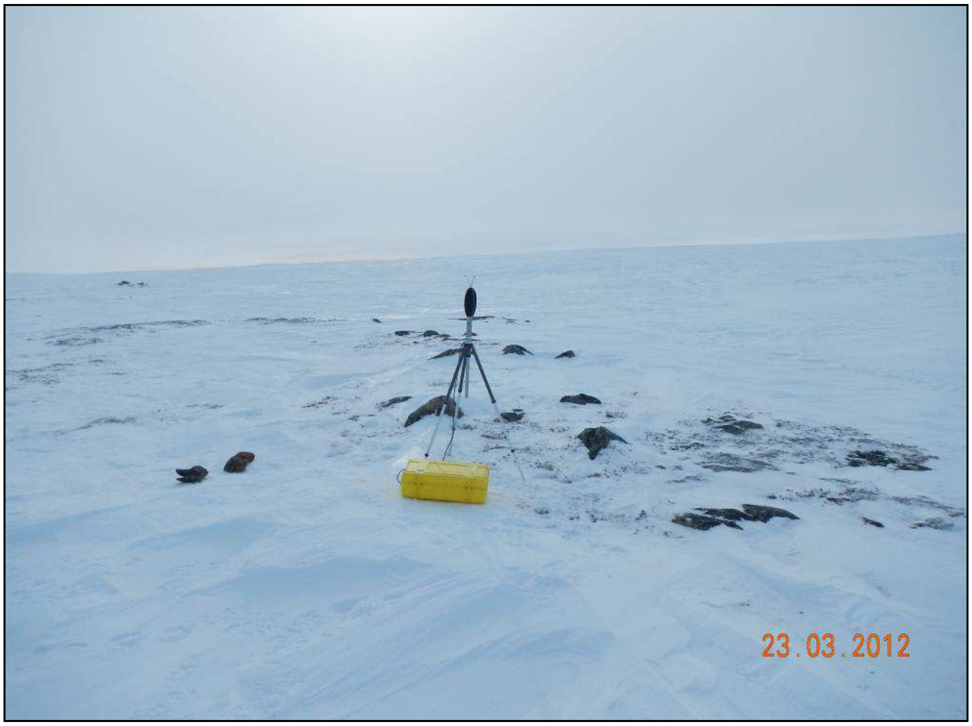

Plate 3.4-1. S04 Noise Monitoring Station, March 2012.

Plate 3.4-2. S04 Noise Monitoring Station, June 2012.

PROJECT # 0833-002-16 ILLUSTRATION # a37993w October 9, 2012

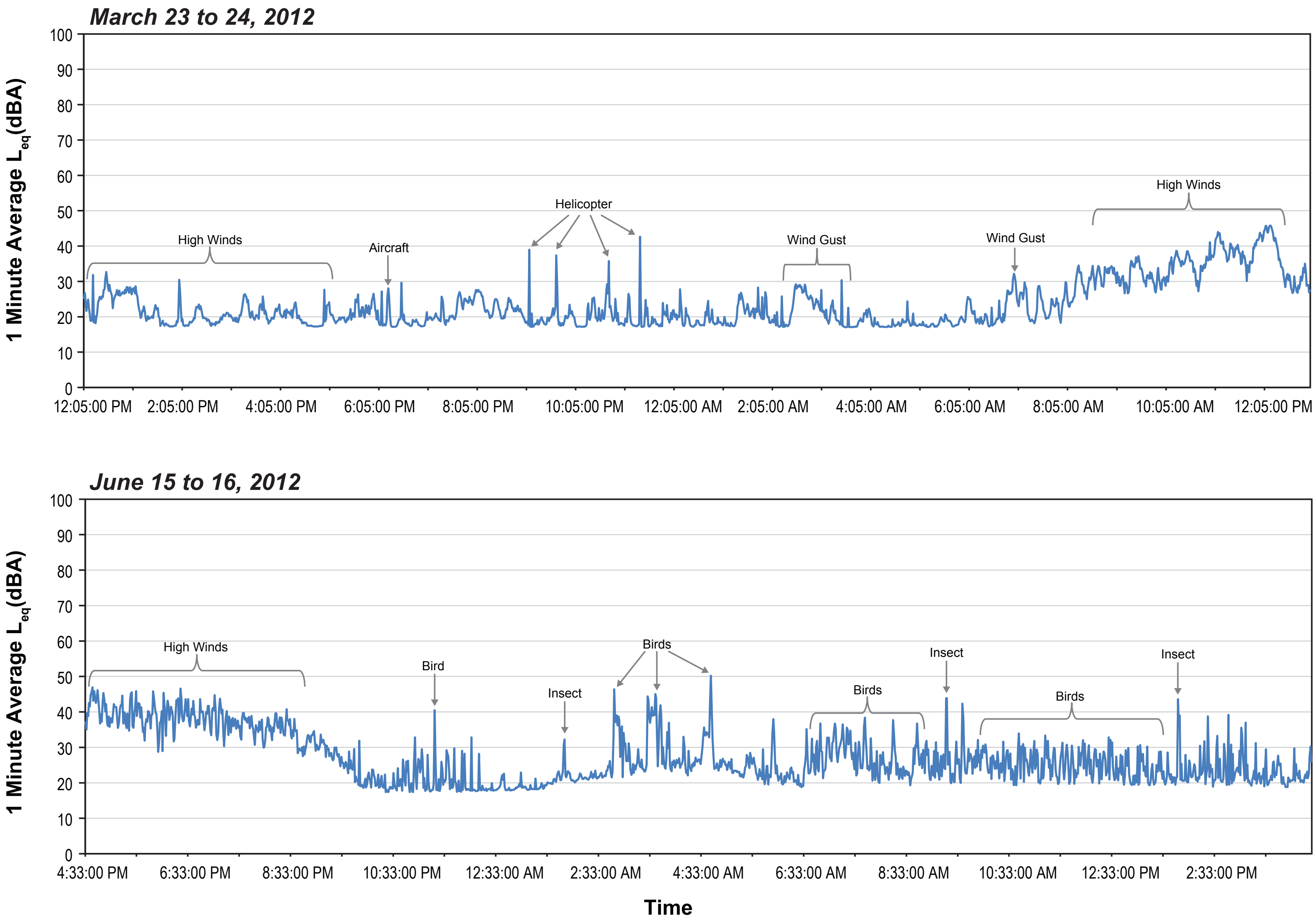

Figure 3.4-1

Sabina GOLD & SILVER CORP.

Back River Noise Monitoring Station S04, March and June 2012

Figure 3.4-1

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Table 3.4-1a. Hourly Sound Levels, Station S04, March 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
3/23/2012	12:05:00 PM	1:05:00 PM	7.2	180	40	25	50
3/23/2012	1:05:00 PM	2:05:00 PM	5.9	255	23	17	33
3/23/2012	2:05:00 PM	3:05:00 PM	3.3	225	21	17	34
3/23/2012	3:05:00 PM	4:05:00 PM	4.0	219	22	18	29
3/23/2012	4:05:00 PM	5:05:00 PM	4.2	225	20	17	38
3/23/2012	5:05:00 PM	6:05:00 PM	4.0	230	22	18	31
3/23/2012	6:05:00 PM	7:05:00 PM	5.5	229	21	17	40
3/23/2012	7:05:00 PM	8:05:00 PM	5.9	242	22	18	30
3/23/2012	8:05:00 PM	9:05:00 PM	5.5	245	24	19	30
3/23/2012	9:05:00 PM	10:05:00 PM	5.9	250	25	17	50
3/23/2012	10:05:00 PM	11:05:00 PM	6.7	229	23	17	44
3/23/2012	11:05:00 PM	12:05:00 AM	6.5	224	26	17	54
3/24/2012	12:05:00 AM	1:05:00 AM	6.8	235	20	17	40
3/24/2012	1:05:00 AM	2:05:00 AM	6.7	216	22	17	40
3/24/2012	2:05:00 AM	3:05:00 AM	4.9	208	25	17	38
3/24/2012	3:05:00 AM	4:05:00 AM	5.6	209	21	17	42
3/24/2012	4:05:00 AM	5:05:00 AM	5.2	202	19	17	35
3/24/2012	5:05:00 AM	6:05:00 AM	5.9	202	18	17	24
3/24/2012	6:05:00 AM	7:05:00 AM	5.7	200	23	18	38
3/24/2012	7:05:00 AM	8:05:00 AM	6.3	200	25	18	35
3/24/2012	8:05:00 AM	9:05:00 AM	6.2	193	31	22	40
3/24/2012	9:05:00 AM	10:05:00 AM	5.0	186	32	25	41
3/24/2012	10:05:00 AM	11:05:00 AM	5.3	188	35	27	50
3/24/2012	11:05:00 AM	12:05:00 PM	4.0	192	40	31	48
Maximum			*7.2*	*n/a*	*40*	*31*	*54*
Minimum			*3.3*	*n/a*	*18*	*17*	*24*
Logarithmic average[1]			*5.5*	*n/a*	*31*	*22*	*45*

[1] *Wind speed and wind direction are arithmetic averages.*

Table 3.4-1b. Hourly Sound Levels, Station S04, June 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
6/15/2012	4:33:00 PM	5:33:00 PM	8.0	3	47	34	57
6/15/2012	5:33:00 PM	6:33:00 PM	8.9	28	44	31	60
6/15/2012	6:33:00 PM	7:33:00 PM	8.6	27	44	31	58
6/15/2012	7:33:00 PM	8:33:00 PM	9.3	27	42	30	53
6/15/2012	8:33:00 PM	9:33:00 PM	8.4	27	39	27	52
6/15/2012	9:33:00 PM	10:33:00 PM	7.4	25	32	19	47

(continued)

Table 3.4-1b. Hourly Sound Levels, Station S04, June 2012 (completed)

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
6/15/2012	10:33:00 PM	11:33:00 PM	5.7	14	28	17	45
6/15/2012	11:33:00 PM	12:33:00 AM	3.3	4	35	17	61
6/16/2012	12:33:00 AM	1:33:00 AM	6.2	350	25	19	54
6/16/2012	1:33:00 AM	2:33:00 AM	0.9	32	23	18	41
6/16/2012	2:33:00 AM	3:33:00 AM	1.5	81	39	21	58
6/16/2012	3:33:00 AM	4:33:00 AM	1.7	140	44	21	59
6/16/2012	4:33:00 AM	5:33:00 AM	1.0	176	42	21	60
6/16/2012	5:33:00 AM	6:33:00 AM	1.2	147	34	20	54
6/16/2012	6:33:00 AM	7:33:00 AM	2.0	131	33	19	60
6/16/2012	7:33:00 AM	8:33:00 AM	3.3	155	34	22	54
6/16/2012	8:33:00 AM	9:33:00 AM	4.1	186	30	20	47
6/16/2012	9:33:00 AM	10:33:00 AM	5.2	164	36	20	59
6/16/2012	10:33:00 AM	11:33:00 AM	5.3	205	31	20	52
6/16/2012	11:33:00 AM	12:33:00 PM	3.2	191	30	19	48
6/16/2012	12:33:00 PM	1:33:00 PM	4.0	56	30	19	45
6/16/2012	1:33:00 PM	2:33:00 PM	3.5	37	33	19	59
6/16/2012	2:33:00 PM	3:33:00 PM	3.5	3	33	19	59
6/16/2012	3:33:00 PM	4:33:00 PM	5.1	12	30	19	57
Maximum			*9.3*	*n/a*	*44*	*34*	*61*
Minimum			*0.9*	*n/a*	*23*	*17*	*41*
Logarithmic average[1]			*4.6*	*n/a*	*39*	*25*	*57*

[1] *Wind speed and wind direction are arithmetic averages.*

3.5 S05

The set up for Station S05 is shown in plates 3.5-1 and 3.5-2 for the March and June 2012 monitoring periods, respectively. The device was placed approximately 10 km southeast of George exploration camp on the top of a rocky outcrop surrounded by flat, gently rolling terrain typical of the Arctic.

One-minute noise levels recorded during March and June 2012 are shown in Figure 3.5-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.5-1a and 3.5-1b, respectively. General noise sources observed at this location included aircraft and wind. Precipitation was observed during monitoring of S05 at 2:00 PM to 6:00 PM on June 19, 2012.

The L_{eq} ranges ($L_{eq}[max]$ - $L_{eq}[min]$) of 31 and 45 dBA and the L_{90} ranges ($L_{90}[max]$ - $L_{90}[min]$) of 14 and 3 dBA during March 2012 and June 2012, respectively, represent minor noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 15 dBA was recorded at 8:00 AM on March 25, 2012. The L_{eq} logarithmic averages were 36 and 58 dBA and the L_{90} logarithmic averages were 23 and 44 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low/moderate one value representations of baseline environmental noise in this area.

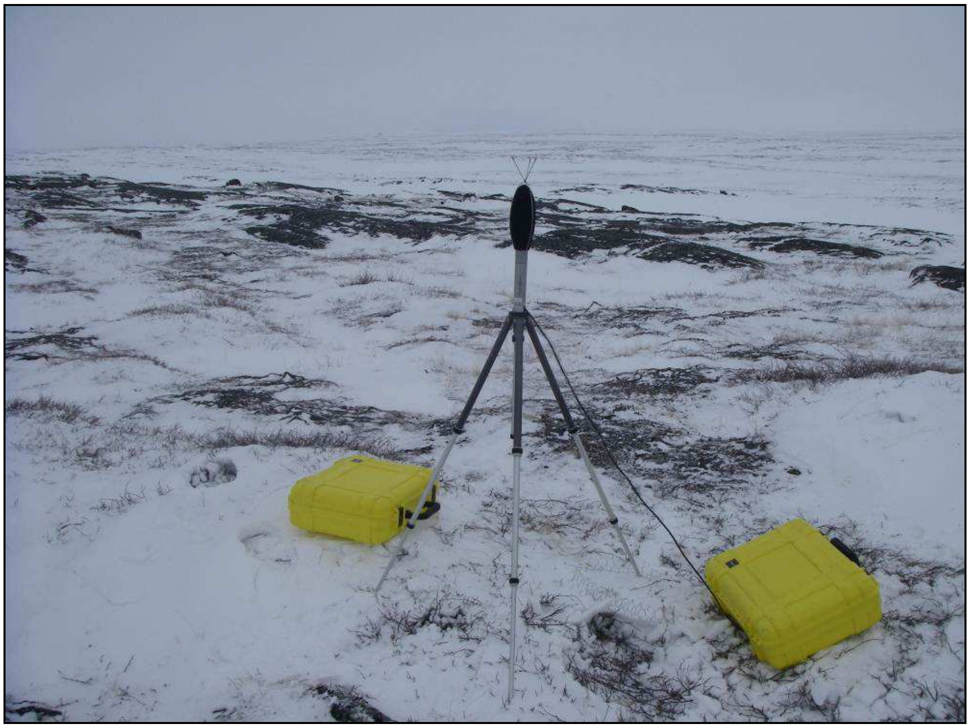

Plate 3.5-1. S05 Noise Monitoring Station, March 2012.

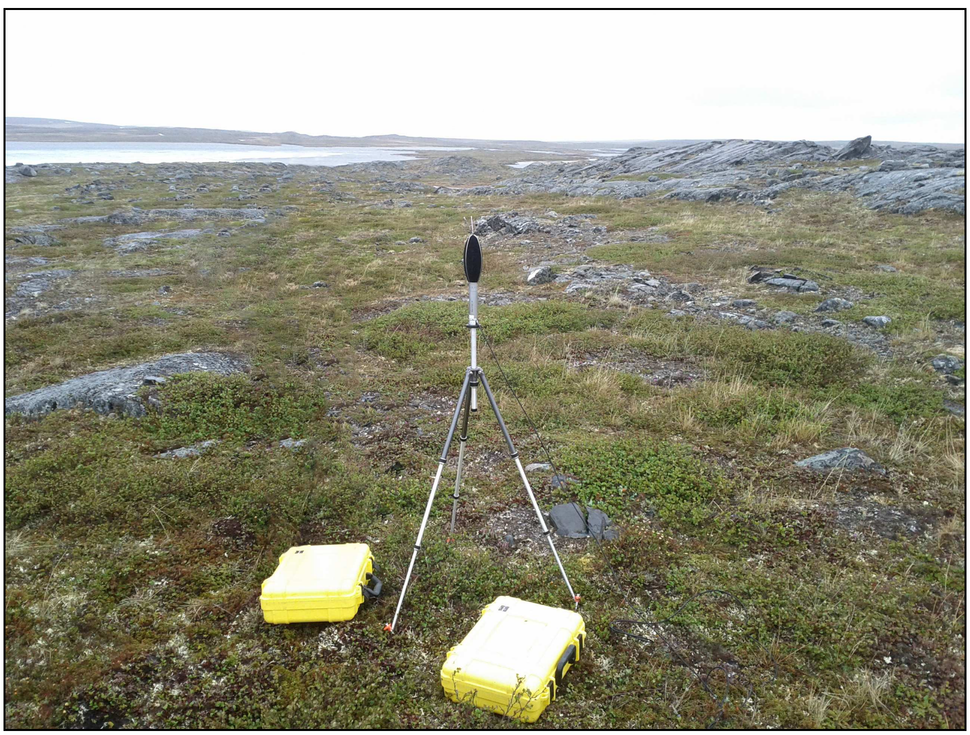

Plate 3.5-2. S05 Noise Monitoring Station, June 2012.

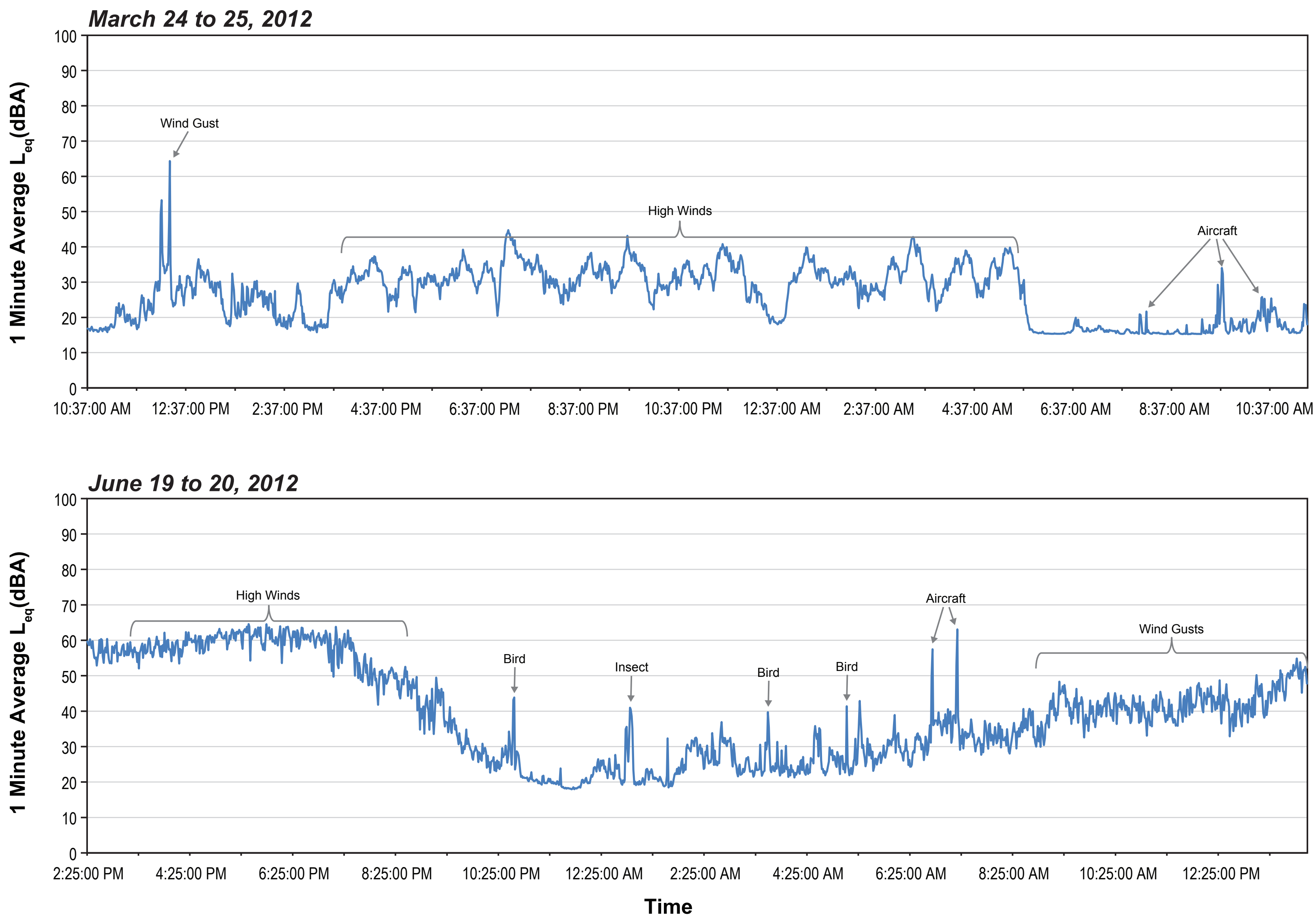

Figure 3.5-1

Sabina GOLD & SILVER CORP.

Back River Noise Monitoring Station S05, March and June 2012

Figure 3.5-1

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Table 3.5-1a. Hourly Sound Levels, Station S05, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/24/2012	10:37:00 AM	11:37:00 AM	5.3	188	17	16	28
3/24/2012	11:37:00 AM	12:37:00 PM	4.0	191	22	16	35
3/24/2012	12:37:00 PM	1:37:00 PM	7.2	180	47	23	75
3/24/2012	1:37:00 PM	2:37:00 PM	7.2	193	27	18	40
3/24/2012	2:37:00 PM	3:37:00 PM	6.2	189	25	17	53
3/24/2012	3:37:00 PM	4:37:00 PM	8.6	195	26	16	39
3/24/2012	4:37:00 PM	5:37:00 PM	8.9	193	32	23	43
3/24/2012	5:37:00 PM	6:37:00 PM	7.5	175	31	24	40
3/24/2012	6:37:00 PM	7:37:00 PM	11.5	181	33	25	46
3/24/2012	7:37:00 PM	8:37:00 PM	11.0	188	38	29	50
3/24/2012	8:37:00 PM	9:37:00 PM	9.8	184	32	23	45
3/24/2012	9:37:00 PM	10:37:00 PM	8.5	183	35	27	55
3/24/2012	10:37:00 PM	11:37:00 PM	9.6	180	31	24	43
3/24/2012	11:37:00 PM	12:37:00 AM	9.2	183	36	28	49
3/25/2012	12:37:00 AM	1:37:00 AM	8.7	185	26	18	48
3/25/2012	1:37:00 AM	2:37:00 AM	8.0	183	34	27	48
3/25/2012	2:37:00 AM	3:37:00 AM	7.8	183	31	23	45
3/25/2012	3:37:00 AM	4:37:00 AM	8.0	183	36	23	51
3/25/2012	4:37:00 AM	5:37:00 AM	8.4	186	34	25	46
3/25/2012	5:37:00 AM	6:37:00 AM	8.6	188	34	16	47
3/25/2012	6:37:00 AM	7:37:00 AM	7.3	189	16	15	27
3/25/2012	7:37:00 AM	8:37:00 AM	5.8	192	16	15	31
3/25/2012	8:37:00 AM	9:37:00 AM	5.8	208	16	15	46
3/25/2012	9:37:00 AM	10:37:00 AM	6.2	224	22	15	42
Maximum			*11.5*	*n/a*	*47*	*29*	*75*
Minimum			*4.0*	*n/a*	*16*	*15*	*27*
Logarithmic average[1]			*7.9*	*n/a*	*36*	*23*	*61*

[1] *Wind speed and wind direction are arithmetic averages.*

Table 3.5-1b. Hourly Sound Levels, Station S05, June 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					Leq	L90	Lmax
6/19/2012	2:25:00 PM	3:25:00 PM	12.7	16	61	50	71
6/19/2012	3:25:00 PM	4:25:00 PM	13.7	22	62	50	71
6/19/2012	4:25:00 PM	5:25:00 PM	13.9	21	63	51	73
6/19/2012	5:25:00 PM	6:25:00 PM	14.1	22	66	52	72
6/19/2012	6:25:00 PM	7:25:00 PM	13.2	27	66	52	72
6/19/2012	7:25:00 PM	8:25:00 PM	12.1	20	63	43	75

(continued)

Table 3.5-1b. Hourly Sound Levels, Station S05, June 2012 (completed)

					Sound Level (dBA)		
Date	**Start Time**	**End Time**	**Wind Speed (m/s)**	**Wind Direction (degrees)**	**Leq**	**L90**	**Lmax**
6/19/2012	8:25:00 PM	9:25:00 PM	12.0	22	54	36	65
6/19/2012	9:25:00 PM	10:25:00 PM	9.7	22	46	27	59
6/19/2012	10:25:00 PM	11:25:00 PM	5.9	3	39	21	60
6/19/2012	11:25:00 PM	12:25:00 AM	4.5	336	21	18	35
6/20/2012	12:25:00 AM	1:25:00 AM	14.8	254	31	39	48
6/20/2012	1:25:00 AM	2:25:00 AM	5.9	318	32	19	50
6/20/2012	2:25:00 AM	3:25:00 AM	6.4	298	34	23	46
6/20/2012	3:25:00 AM	4:25:00 AM	7.4	297	34	21	56
6/20/2012	4:25:00 AM	5:25:00 AM	7.8	286	34	21	54
6/20/2012	5:25:00 AM	6:25:00 AM	6.6	276	38	22	59
6/20/2012	6:25:00 AM	7:25:00 AM	8.0	277	45	24	71
6/20/2012	7:25:00 AM	8:25:00 AM	8.8	260	48	28	73
6/20/2012	8:25:00 AM	9:25:00 AM	9.0	249	39	27	58
6/20/2012	9:25:00 AM	10:25:00 AM	9.5	246	46	32	61
6/20/2012	10:25:00 AM	11:25:00 AM	11.7	251	46	33	57
6/20/2012	11:25:00 AM	12:25:00 PM	12.2	246	46	32	61
6/20/2012	12:25:00 PM	1:25:00 PM	12.6	250	48	33	62
6/20/2012	1:25:00 PM	2:25:00 PM	12.1	246	53	36	64
Maximum			*14.8*	*n/a*	*66*	*52*	*75*
Minimum			*4.5*	*n/a*	*21*	*18*	*35*
Logarithmic average[1]			*10.1*	*n/a*	*58*	*44*	*68*

[1] *Wind speed and wind direction are arithmetic averages.*

3.6 S06

The set up for Station S06 is shown in plates 3.6-1 and 3.6-2 for the March and June 2012 monitoring periods, respectively. The device was placed approximately half way between George and Goose exploration camps long the potential access corridor on flat terrain typical of the Arctic. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.6-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.6-1a, 3.6-1b, respectively. General noise sources observed at this location included aircraft and wind. Precipitation was observed during monitoring of S06 at 2:00 PM to 6:00 PM on June 19, 2012.

The L_{eq} ranges (*L_{eq}[max] - L_{eq}[min]*) of 56 and 34 dBA and the L_{90} ranges (*L_{90}[max] – L_{90}[min]*) of 16 and 21 dBA during March 2012, and June 2012, respectively, represent moderate noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 16 dBA was recorded at 3:00 PM on March 25, 2012. The L_{eq} logarithmic averages were 36 and 51 dBA and the L_{90} logarithmic averages were 25 and 32 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low one value representations of baseline environmental noise in this area.

Plate 3.6-1. S06 Noise Monitoring Station, March 2012.

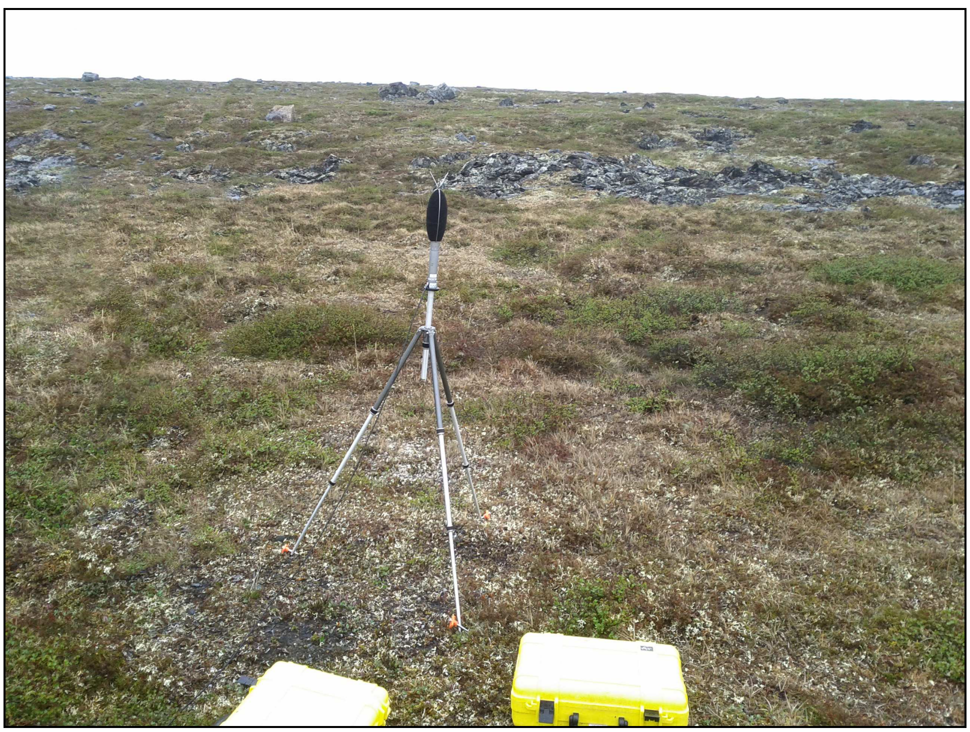

Plate 3.6-2. S06 Noise Monitoring Station, June 2012.

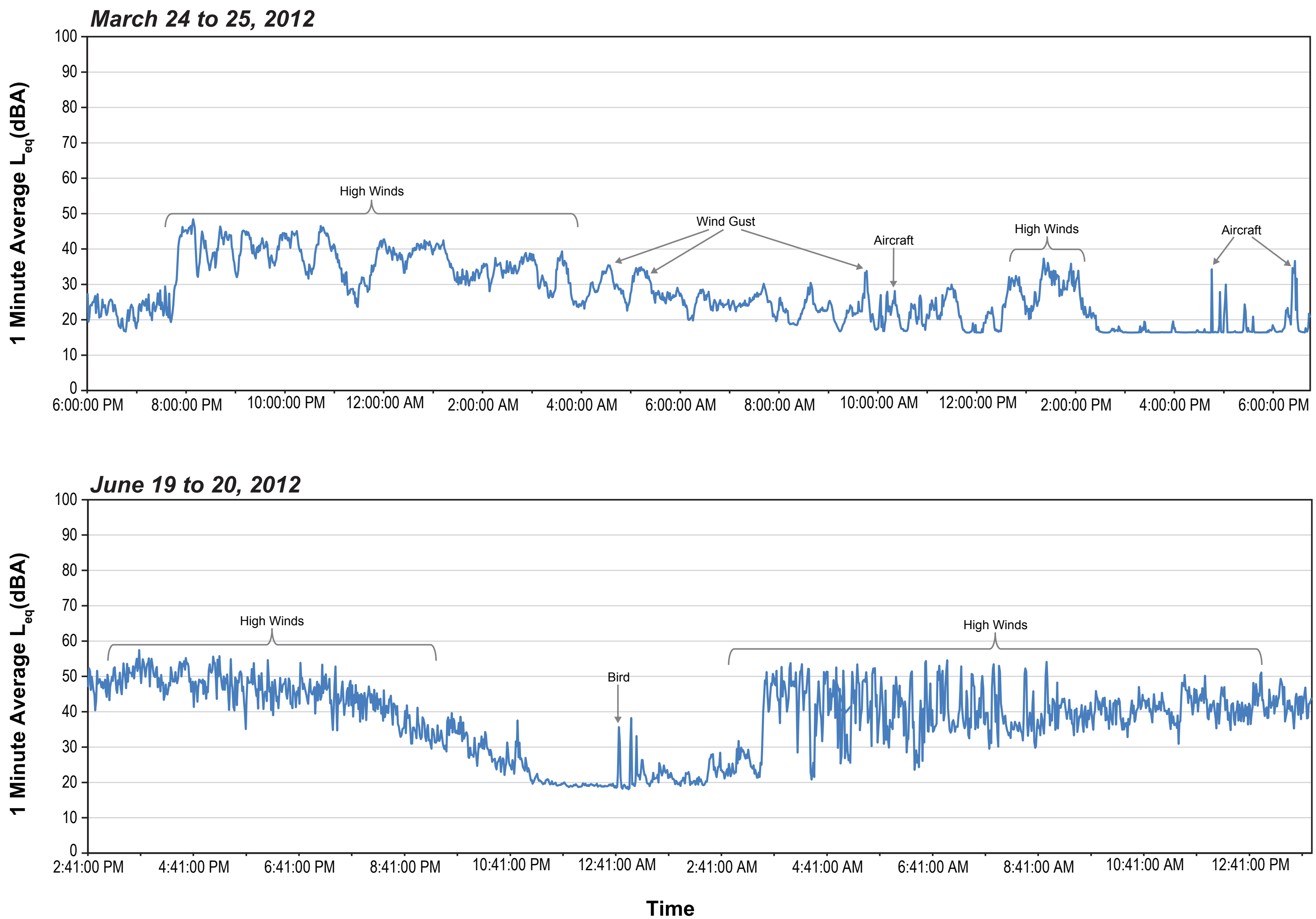

Figure 3.6-1

Sabina GOLD & SILVER CORP.

Back River Noise Monitoring Station S06, March and June 2012

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Table 3.6-1a. Hourly Sound Levels, Station S06, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/24/2012	6:00:00 PM	7:00:00 PM	5.8	277	21	19	24
3/24/2012	7:00:00 PM	8:00:00 PM	11.0	189	37	18	50
3/24/2012	8:00:00 PM	9:00:00 PM	9.8	185	43	31	54
3/24/2012	9:00:00 PM	10:00:00 PM	8.5	183	42	32	52
3/24/2012	10:00:00 PM	11:00:00 PM	9.6	180	42	31	52
3/24/2012	11:00:00 PM	12:00:00 AM	9.2	183	36	23	46
3/24/2012	12:00:00 AM	1:00:00 AM	5.8	277	40	17	48
3/25/2012	1:00:00 AM	2:00:00 AM	8.0	184	37	27	46
3/25/2012	2:00:00 AM	3:00:00 AM	7.8	183	36	28	44
3/25/2012	3:00:00 AM	4:00:00 AM	8.0	183	33	22	45
3/25/2012	4:00:00 AM	5:00:00 AM	8.4	187	30	23	41
3/25/2012	5:00:00 AM	6:00:00 AM	8.6	189	31	23	39
3/25/2012	6:00:00 AM	7:00:00 AM	7.3	190	25	19	33
3/25/2012	7:00:00 AM	8:00:00 AM	5.8	192	26	20	35
3/25/2012	8:00:00 AM	9:00:00 AM	5.8	209	24	18	36
3/25/2012	9:00:00 AM	10:00:00 AM	6.2	224	24	17	40
3/25/2012	10:00:00 AM	11:00:00 AM	6.8	232	23	17	35
3/25/2012	11:00:00 AM	12:00:00 PM	7.2	252	24	16	36
3/25/2012	12:00:00 PM	1:00:00 PM	7.8	268	27	17	37
3/25/2012	1:00:00 PM	2:00:00 PM	7.8	269	31	20	43
3/25/2012	2:00:00 PM	3:00:00 PM	8.4	285	23	16	40
3/25/2012	3:00:00 PM	4:00:00 PM	6.0	291	17	16	29
3/25/2012	4:00:00 PM	5:00:00 PM	6.2	280	20	16	45
3/25/2012	5:00:00 PM	6:00:00 PM	5.8	287	19	16	39
Maximum			*11.0*	*n/a*	*43*	*32*	*54*
Minimum			*5.8*	*n/a*	*17*	*16*	*24*
Logarithmic average[1]			*7.6*	*n/a*	*36*	*25*	*46*

[1] Wind speed and wind direction are arithmetic averages.

Table 3.6-1b. Hourly Sound Levels, Station S06, June 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/19/2012	2:41:00 PM	3:41:00 PM	12.7	16	53	38	65
6/19/2012	3:41:00 PM	4:41:00 PM	13.7	22	56	40	70
6/19/2012	4:41:00 PM	5:41:00 PM	13.9	21	54	38	68
6/19/2012	5:41:00 PM	6:41:00 PM	14.1	22	54	35	66
6/19/2012	6:41:00 PM	7:41:00 PM	13.2	27	52	34	66
6/19/2012	7:41:00 PM	8:41:00 PM	12.1	20	51	32	66

(continued)

Table 3.6-1b. Hourly Sound Levels, Station S06, June 2012 (continued)

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/19/2012	8:41:00 PM	9:41:00 PM	12.0	22	46	29	62
6/19/2012	9:41:00 PM	10:41:00 PM	9.7	22	39	26	57
6/19/2012	10:41:00 PM	11:41:00 PM	5.9	3	33	22	47
6/19/2012	11:41:00 PM	12:41:00 AM	4.5	336	22	19	39
6/20/2012	12:41:00 AM	1:41:00 AM	14.8	254	28	37	55
6/20/2012	1:41:00 AM	2:41:00 AM	5.9	318	26	19	51
6/20/2012	2:41:00 AM	3:41:00 AM	6.4	298	27	19	42
6/20/2012	3:41:00 AM	4:41:00 AM	7.4	297	53	20	67
6/20/2012	4:41:00 AM	5:41:00 AM	7.8	286	56	19	68
6/20/2012	5:41:00 AM	6:41:00 AM	6.6	276	55	21	67
6/20/2012	6:41:00 AM	7:41:00 AM	8.0	277	55	23	68
6/20/2012	7:41:00 AM	8:41:00 AM	8.8	260	53	26	67
6/20/2012	8:41:00 AM	9:41:00 AM	9.0	249	51	27	67
6/20/2012	9:41:00 AM	10:41:00 AM	9.5	246	46	30	64
6/20/2012	10:41:00 AM	11:41:00 AM	11.7	251	45	31	56
6/20/2012	11:41:00 AM	12:41:00 PM	12.2	246	48	32	64
6/20/2012	12:41:00 PM	1:41:00 PM	12.6	250	48	31	64
6/20/2012	1:41:00 PM	2:41:00 PM	12.1	246	48	32	62
Maximum			*14.8*	*n/a*	*56*	*40*	*70*
Minimum			*4.5*	*n/a*	*22*	*19*	*39*
Logarithmic average[1]			*10.1*	*n/a*	*51*	*32*	*65*

[1] *Wind speed and wind direction are arithmetic averages.*

3.7 S07

The set up for Station S07 is shown in plates 3.7-1 and 3.7-2 for the March and June 2012 monitoring periods, respectively. The device was placed approximately 10 km southwest of marine laydown option 6 on Bathurst Inlet on terrain consisting of gentle hills typical of the Arctic. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.7-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.7-1a and 3.7-1b, respectively.

General noise sources observed at this location included aircraft and wind. Precipitation was observed during monitoring of S07 at 6:00 PM on March 26, 2012.

The L_{eq} ranges ($L_{eq}[max]$ - $L_{eq}[min]$) of 7 and 15 dBA and the L_{90} ranges ($L_{90}[max]$ - $L_{90}[min]$) of 1 and 16 dBA during March 2012, and June 2012, respectively, represent minor noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed. A minimum L_{90} value of 16 dBA was recorded at 10:00 AM on March 26, 2012. The L_{eq} logarithmic averages were 18 and 36 dBA and the L_{90} logarithmic averages were 16 and 28 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low one value representations of baseline environmental noise in this area.

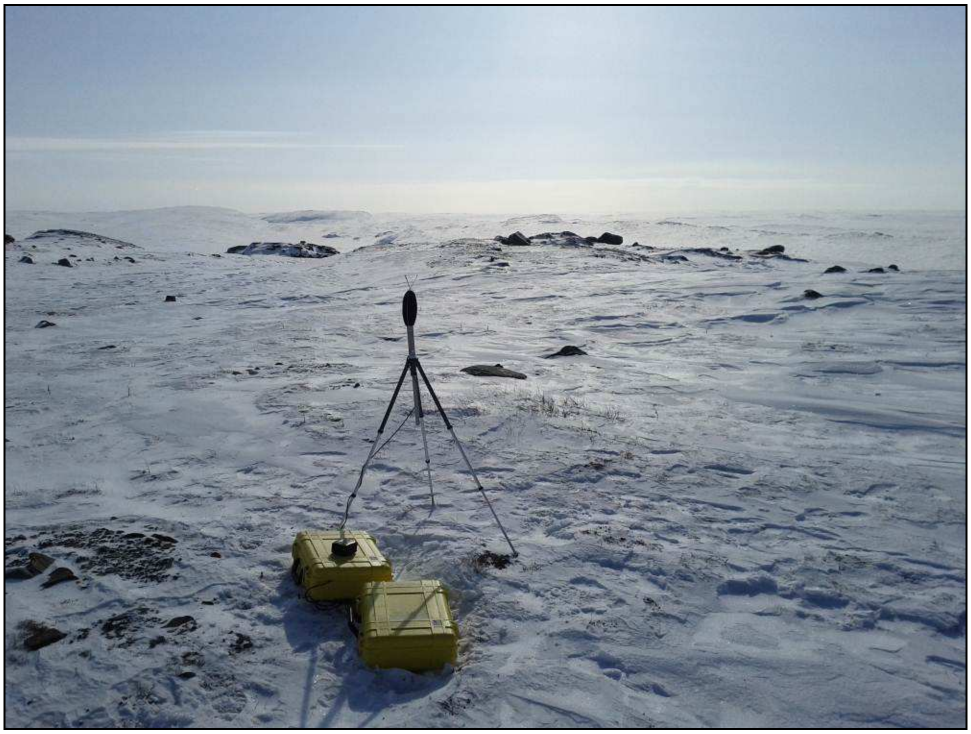

Plate 3.7-1. S07 Noise Monitoring Station, March 2012.

Plate 3.7-2. S07 Noise Monitoring Station, June 2012.

PROJECT # 0833-002-16 ILLUSTRATION # a37996w October 9, 2012

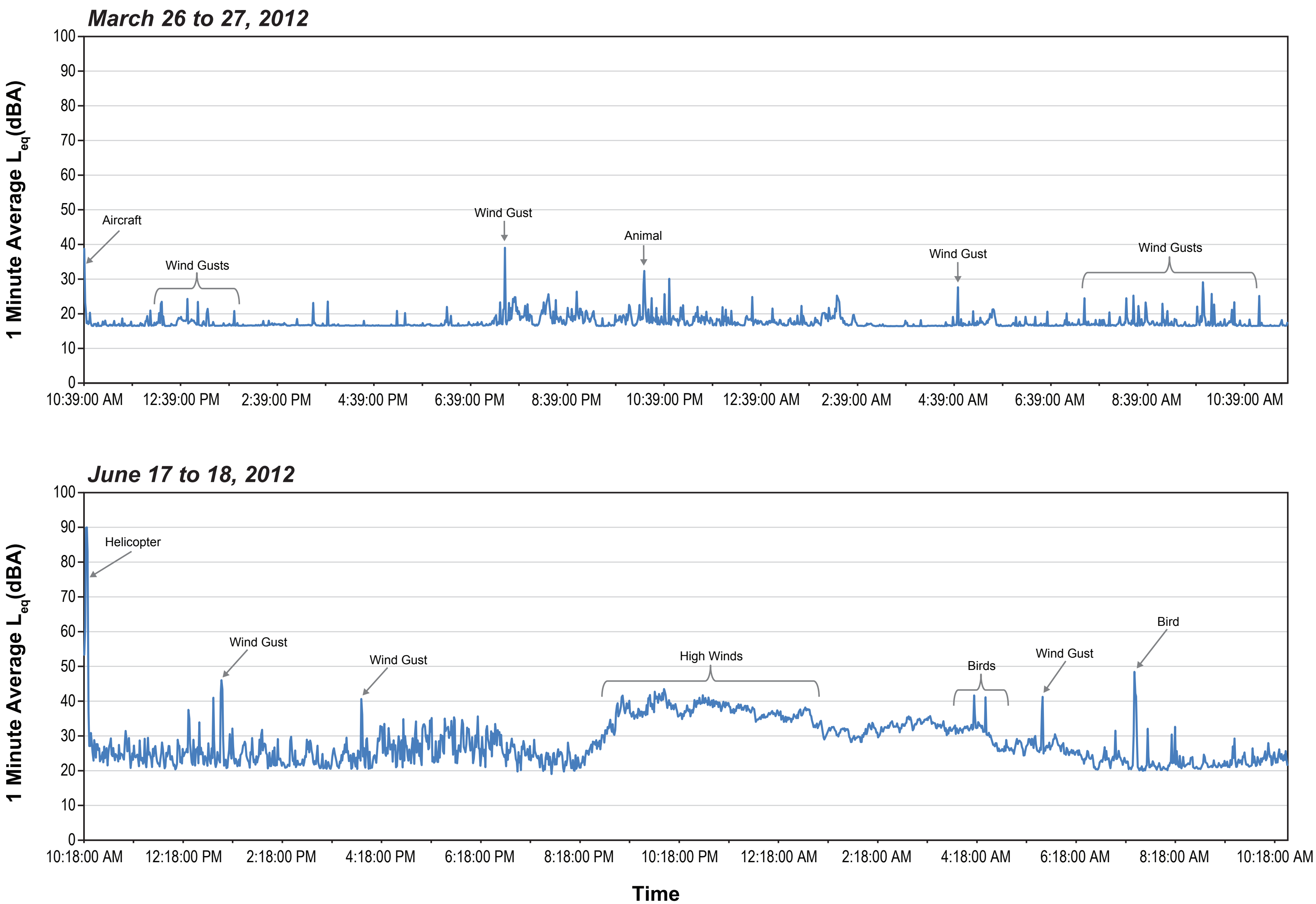

Figure 3.7-1

Sabina GOLD & SILVER CORP.

Back River Noise Monitoring Station S07, March and June 2012

Figure 3.7-1

Rescan Engineers & Scientists

Table 3.7-1a. Hourly Sound Levels, Station S07, March 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
3/26/2012	10:39:00 AM	11:39:00 AM	1.1	9	17	16	29
3/26/2012	11:39:00 AM	12:39:00 PM	1.3	36	17	16	31
3/26/2012	12:39:00 PM	1:39:00 PM	1.3	139	18	17	34
3/26/2012	1:39:00 PM	2:39:00 PM	1.5	203	17	16	31
3/26/2012	2:39:00 PM	3:39:00 PM	1.9	207	17	16	25
3/26/2012	3:39:00 PM	4:39:00 PM	1.3	190	17	16	34
3/26/2012	4:39:00 PM	5:39:00 PM	1.3	174	17	16	23
3/26/2012	5:39:00 PM	6:39:00 PM	1.0	187	17	16	31
3/26/2012	6:39:00 PM	7:39:00 PM	0.3	307	17	16	30
3/26/2012	7:39:00 PM	8:39:00 PM	1.2	218	24	17	50
3/26/2012	8:39:00 PM	9:39:00 PM	1.0	219	20	17	37
3/26/2012	9:39:00 PM	10:39:00 PM	1.1	123	18	16	30
3/26/2012	10:39:00 PM	11:39:00 PM	1.7	158	21	16	41
3/26/2012	11:39:00 PM	12:39:00 AM	2.1	140	18	16	32
3/27/2012	12:39:00 AM	1:39:00 AM	2.8	148	18	17	35
3/27/2012	1:39:00 AM	2:39:00 AM	2.4	151	18	16	31
3/27/2012	2:39:00 AM	3:39:00 AM	1.7	133	19	16	30
3/27/2012	3:39:00 AM	4:39:00 AM	2.3	150	17	16	26
3/27/2012	4:39:00 AM	5:39:00 AM	2.4	131	18	16	37
3/27/2012	5:39:00 AM	6:39:00 AM	2.9	134	18	16	27
3/27/2012	6:39:00 AM	7:39:00 AM	2.7	139	17	16	30
3/27/2012	7:39:00 AM	8:39:00 AM	2.3	124	17	16	35
3/27/2012	8:39:00 AM	9:39:00 AM	1.4	93	19	16	36
3/27/2012	9:39:00 AM	10:39:00 AM	1.8	178	19	16	40
Maximum			*2.9*	*n/a*	*24*	*17*	*50*
Minimum			*0.3*	*n/a*	*17*	*16*	*23*
Logarithmic average[1]			*1.7*	*n/a*	*18*	*16*	*38*

[1] *Wind speed and wind direction are arithmetic averages.*

Table 3.7-1b. Hourly Sound Levels, Station S07, June 2012

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
6/17/2012	10:18:00 AM	11:18:00 AM	4.5	36	30	21	51
6/17/2012	11:18:00 AM	12:18:00 PM	3.8	23	31	21	55
6/17/2012	12:18:00 PM	1:18:00 PM	4.9	39	40	21	63
6/17/2012	1:18:00 PM	2:18:00 PM	5.5	36	29	21	45
6/17/2012	2:18:00 PM	3:18:00 PM	5.6	35	27	21	43
6/17/2012	3:18:00 PM	4:18:00 PM	6.2	24	32	20	57

(continued)

Table 3.7-1b. Hourly Sound Levels, Station S07, June 2012 (completed)

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/17/2012	4:18:00 PM	5:18:00 PM	5.9	18	31	21	51
6/17/2012	5:18:00 PM	6:18:00 PM	5.9	359	35	21	59
6/17/2012	6:18:00 PM	7:18:00 PM	7.1	356	32	21	46
6/17/2012	7:18:00 PM	8:18:00 PM	7.7	18	28	20	49
6/17/2012	8:18:00 PM	9:18:00 PM	6.3	55	33	20	47
6/17/2012	9:18:00 PM	10:18:00 PM	4.4	77	42	34	55
6/17/2012	10:18:00 PM	11:18:00 PM	6.5	98	41	35	49
6/17/2012	11:18:00 PM	12:18:00 AM	7.1	107	39	34	59
6/18/2012	12:18:00 AM	1:18:00 AM	4.2	152	37	21	45
6/18/2012	1:18:00 AM	2:18:00 AM	8.0	103	32	29	39
6/18/2012	2:18:00 AM	3:18:00 AM	7.4	118	34	31	41
6/18/2012	3:18:00 AM	4:18:00 AM	4.9	134	35	30	44
6/18/2012	4:18:00 AM	5:18:00 AM	2.5	120	38	25	67
6/18/2012	5:18:00 AM	6:18:00 AM	2.0	117	34	24	55
6/18/2012	6:18:00 AM	7:18:00 AM	1.8	191	27	21	50
6/18/2012	7:18:00 AM	8:18:00 AM	3.8	146	40	20	62
6/18/2012	8:18:00 AM	9:18:00 AM	4.2	144	28	20	52
6/18/2012	9:18:00 AM	10:18:00 AM	5.1	134	28	20	20
Maximum			*8.0*	*n/a*	*42*	*35*	*67*
Minimum			*1.8*	*n/a*	*27*	*20*	*39*
Logarithmic average[1]			*5.2*	*n/a*	*36*	*28*	*57*

[1] *Wind speed and wind direction are arithmetic averages.*

3.8 S08

The set up for Station S08 is shown in plates 3.8-1 and 3.8-2 for the March and June 2012 monitoring periods, respectively. The device was placed in between marine laydown area options 4 and 6 on Bathurst Inlet on a peninsula. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.8-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.8-1a and 3.8-1b, respectively.

General noise sources observed at this location included aircraft, wind, and birds in the summer (June). Precipitation was observed during monitoring of S08 at 6:00 PM on March 26, 2012.

The L_{eq} ranges (L_{eq}*[max]* - L_{eq}*[min]*) of 11 and 22 dBA and the L_{90} ranges (L_{90}*[max]* - L_{90}*[min]*) of 8 and 13 dBA during March 2012, and June 2012, respectively, represent minor noise fluctuation in the environment. The majority of these fluctuations were caused by wildlife consisting primarily of birds, as well as changes in wind speed. A minimum L_{90} value of 15 dBA was recorded at 10:00 AM on March 27, 2012. The L_{eq} logarithmic averages were 23 and 37 dBA and the L_{90} logarithmic averages were 19 and 25 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low one value representations of baseline environmental noise in this area.

Plate 3.8-1. S08 Noise Monitoring Station, March 2012.

Plate 3.8-2. S08 Noise Monitoring Station, June 2012.

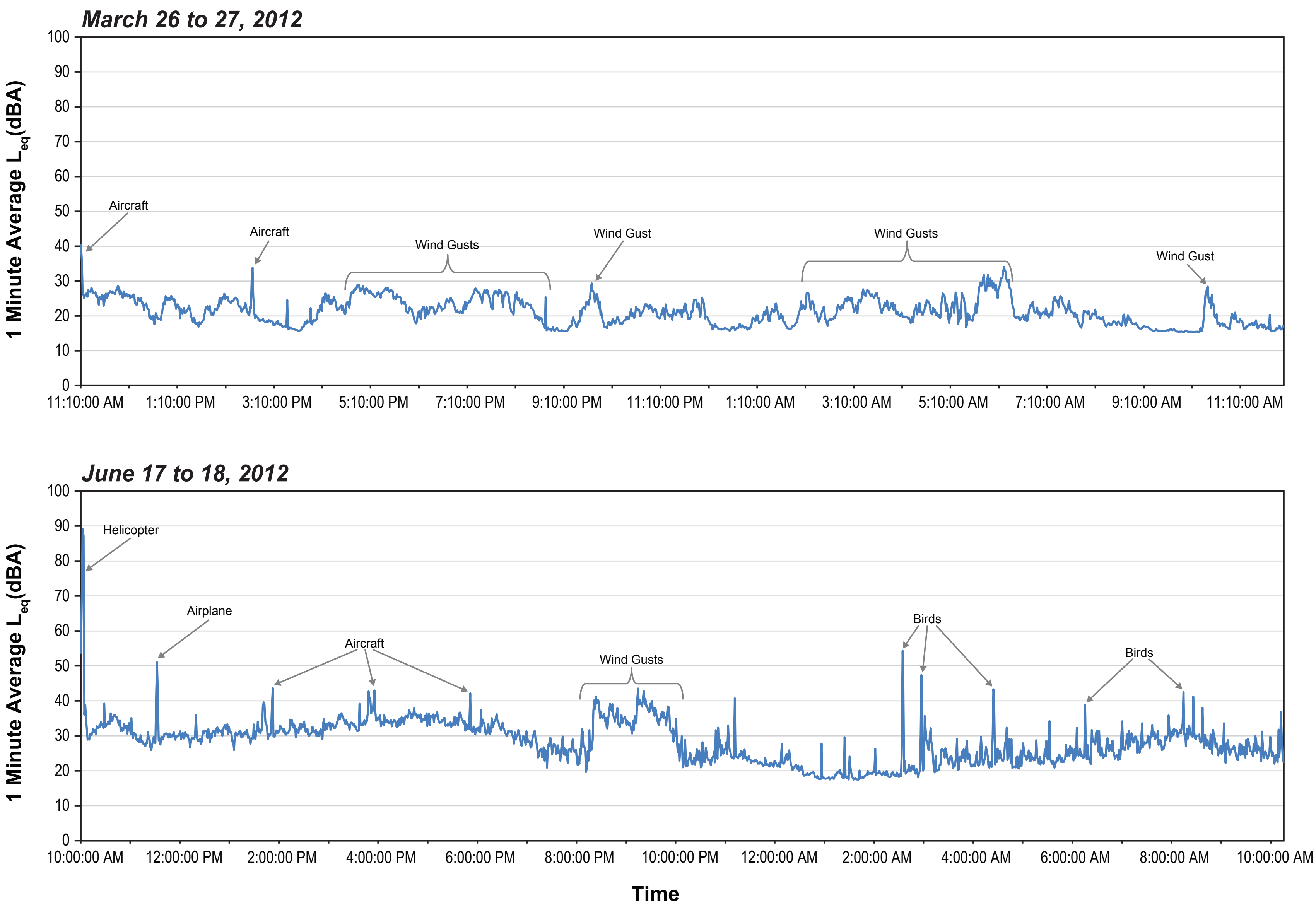

Figure 3.8-1

Sabina GOLD & SILVER CORP.

Back River Noise Monitoring Station S08, March and June 2012

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Table 3.8-1a. Hourly Sound Levels, Station S08, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/26/2012	11:10:00 AM	12:10:00 PM	1.3	36	27	23	42
3/26/2012	12:10:00 PM	1:10:00 PM	1.3	139	24	18	35
3/26/2012	1:10:00 PM	2:10:00 PM	1.5	203	22	18	32
3/26/2012	2:10:00 PM	3:10:00 PM	1.9	207	24	18	44
3/26/2012	3:10:00 PM	4:10:00 PM	1.3	190	18	16	50
3/26/2012	4:10:00 PM	5:10:00 PM	1.3	174	25	20	35
3/26/2012	5:10:00 PM	6:10:00 PM	1.0	187	26	22	37
3/26/2012	6:10:00 PM	7:10:00 PM	0.3	307	22	19	30
3/26/2012	7:10:00 PM	8:10:00 PM	1.2	218	26	21	34
3/26/2012	8:10:00 PM	9:10:00 PM	1.0	219	22	16	51
3/26/2012	9:10:00 PM	10:10:00 PM	1.1	123	22	16	34
3/26/2012	10:10:00 PM	11:10:00 PM	1.7	158	20	17	29
3/26/2012	11:10:00 PM	12:10:00 AM	2.1	140	22	19	32
3/27/2012	12:10:00 AM	1:10:00 AM	2.8	148	18	16	35
3/27/2012	1:10:00 AM	2:10:00 AM	2.4	151	20	17	29
3/27/2012	2:10:00 AM	3:10:00 AM	1.7	133	22	18	31
3/27/2012	3:10:00 AM	4:10:00 AM	2.3	150	25	21	33
3/27/2012	4:10:00 AM	5:10:00 AM	2.4	131	21	18	34
3/27/2012	5:10:00 AM	6:10:00 AM	2.9	134	26	18	43
3/27/2012	6:10:00 AM	7:10:00 AM	2.7	139	27	19	42
3/27/2012	7:10:00 AM	8:10:00 AM	2.3	124	22	18	33
3/27/2012	8:10:00 AM	9:10:00 AM	1.4	93	19	17	28
3/27/2012	9:10:00 AM	10:10:00 AM	1.8	178	16	16	24
3/27/2012	10:10:00 AM	11:10:00 AM	2.7	135	21	15	35
Maximum			*2.9*	*n/a*	*27*	*23*	*51*
Minimum			*0.3*	*n/a*	*16*	*15*	*24*
Logarithmic average[1]			*1.8*	*n/a*	*23*	*19*	*41*

[1] *Wind speed and wind direction are arithmetic averages.*

Table 3.8-1b. Hourly Sound Levels, Station S08, June 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/17/2012	10:00:00 AM	11:00:00 AM	4.5	36	38	28	60
6/17/2012	11:00:00 AM	12:00:00 PM	3.8	23	37	25	58
6/17/2012	12:00:00 PM	1:00:00 PM	4.9	39	34	26	43
6/17/2012	1:00:00 PM	2:00:00 PM	5.5	36	40	27	57
6/17/2012	2:00:00 PM	3:00:00 PM	5.6	35	35	27	48
6/17/2012	3:00:00 PM	4:00:00 PM	6.2	24	39	30	57

(continued)

Table 3.8-1b. Hourly Sound Levels, Station S08, June 2012 (completed)

					Sound Level (dBA)		
Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	L_{eq}	L_{90}	L_{max}
6/17/2012	4:00:00 PM	5:00:00 PM	5.9	18	38	30	47
6/17/2012	5:00:00 PM	6:00:00 PM	5.9	359	38	29	57
6/17/2012	6:00:00 PM	7:00:00 PM	7.1	356	35	26	43
6/17/2012	7:00:00 PM	8:00:00 PM	7.7	18	30	21	45
6/17/2012	8:00:00 PM	9:00:00 PM	6.3	55	39	23	57
6/17/2012	9:00:00 PM	10:00:00 PM	4.4	77	42	26	65
6/17/2012	10:00:00 PM	11:00:00 PM	6.5	98	30	20	45
6/17/2012	11:00:00 PM	12:00:00 AM	7.1	107	31	21	61
6/18/2012	12:00:00 AM	1:00:00 AM	4.2	152	27	21	54
6/18/2012	1:00:00 AM	2:00:00 AM	8.0	103	22	18	47
6/18/2012	2:00:00 AM	3:00:00 AM	7.4	118	44	18	65
6/18/2012	3:00:00 AM	4:00:00 AM	4.9	134	31	20	48
6/18/2012	4:00:00 AM	5:00:00 AM	2.5	120	39	21	62
6/18/2012	5:00:00 AM	6:00:00 AM	2.0	117	31	21	51
6/18/2012	6:00:00 AM	7:00:00 AM	1.8	191	34	22	54
6/18/2012	7:00:00 AM	8:00:00 AM	3.8	146	34	24	51
6/18/2012	8:00:00 AM	9:00:00 AM	4.2	144	37	23	59
6/18/2012	9:00:00 AM	10:00:00 AM	5.1	134	32	21	50
Maximum			*8.0*	*n/a*	*44*	*30*	*65*
Minimum			*1.8*	*n/a*	*22*	*18*	*43*
Logarithmic average[1]			*5.2*	*n/a*	*37*	*25*	*58*

[1] *Wind speed and wind direction are arithmetic averages.*

3.9 S09

The set up for Station S09 is shown in plates 3.9-1 and 3.9-2 for the March and June 2012 monitoring periods, respectively. The device was placed approximately 14 km north of George exploration camp on a hill surrounded by flat terrain typical of the Arctic. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.9-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.9-1a and 3.9-1b, respectively.

General noise sources observed at this location included aircraft and wind. During the June monitoring period, insects and birds were also common sources. Precipitation was observed during monitoring of S09 at 1:00 PM to 5:00 PM on March 27, 2012 and at 5:00 AM on June 19, 2012.

The L_{eq} ranges ($L_{eq}[max]$ - $L_{eq}[min]$) of 44 and 25 dBA and the L_{90} ranges ($L_{90}[max]$ – $L_{90}[min]$) of 40 and 20 dBA during March 2012, and June 2012, respectively, represent moderate to high noise fluctuation in the environment. The majority of these fluctuations were caused by changes in wind speed and aircraft operating in the vicinity. A minimum L_{90} value of 16 dBA was recorded at 8:00 AM on March 27, 2012. The L_{eq} logarithmic averages were 52 and 39 dBA and the L_{90} logarithmic averages were 47 and 26 dBA during March 2012 and June 2012, respectively. The L_{90} values provide realistic, low/moderate one value representations of baseline environmental noise in this area.

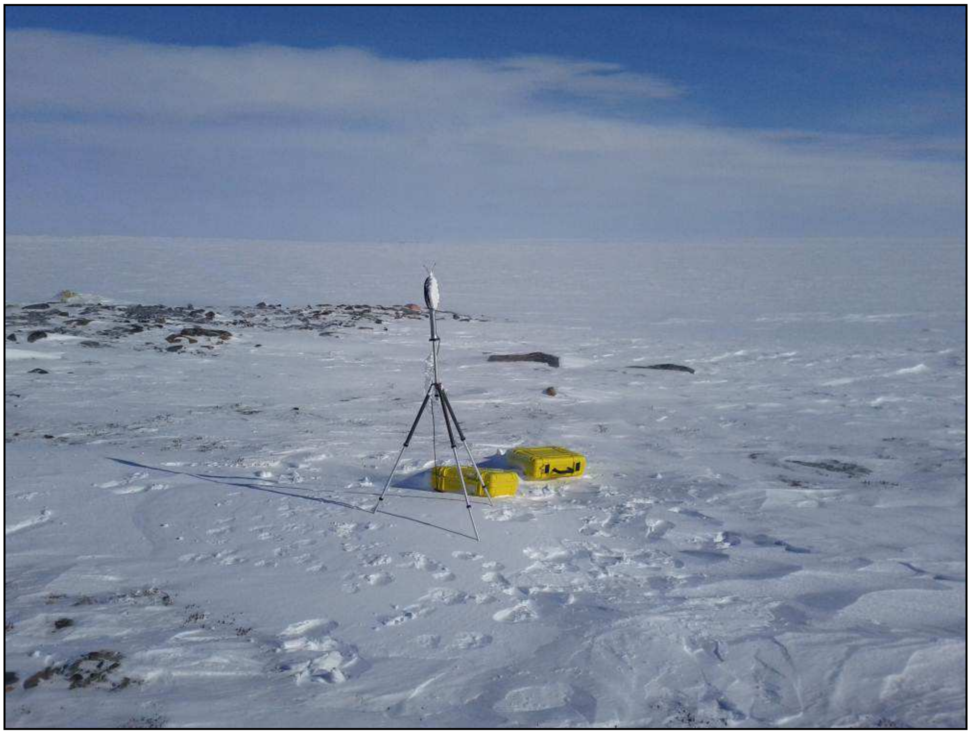

Plate 3.9-1. S09 Noise Monitoring Station, March 2012.

Plate 3.9-2. S09 Noise Monitoring Station, June 2012.

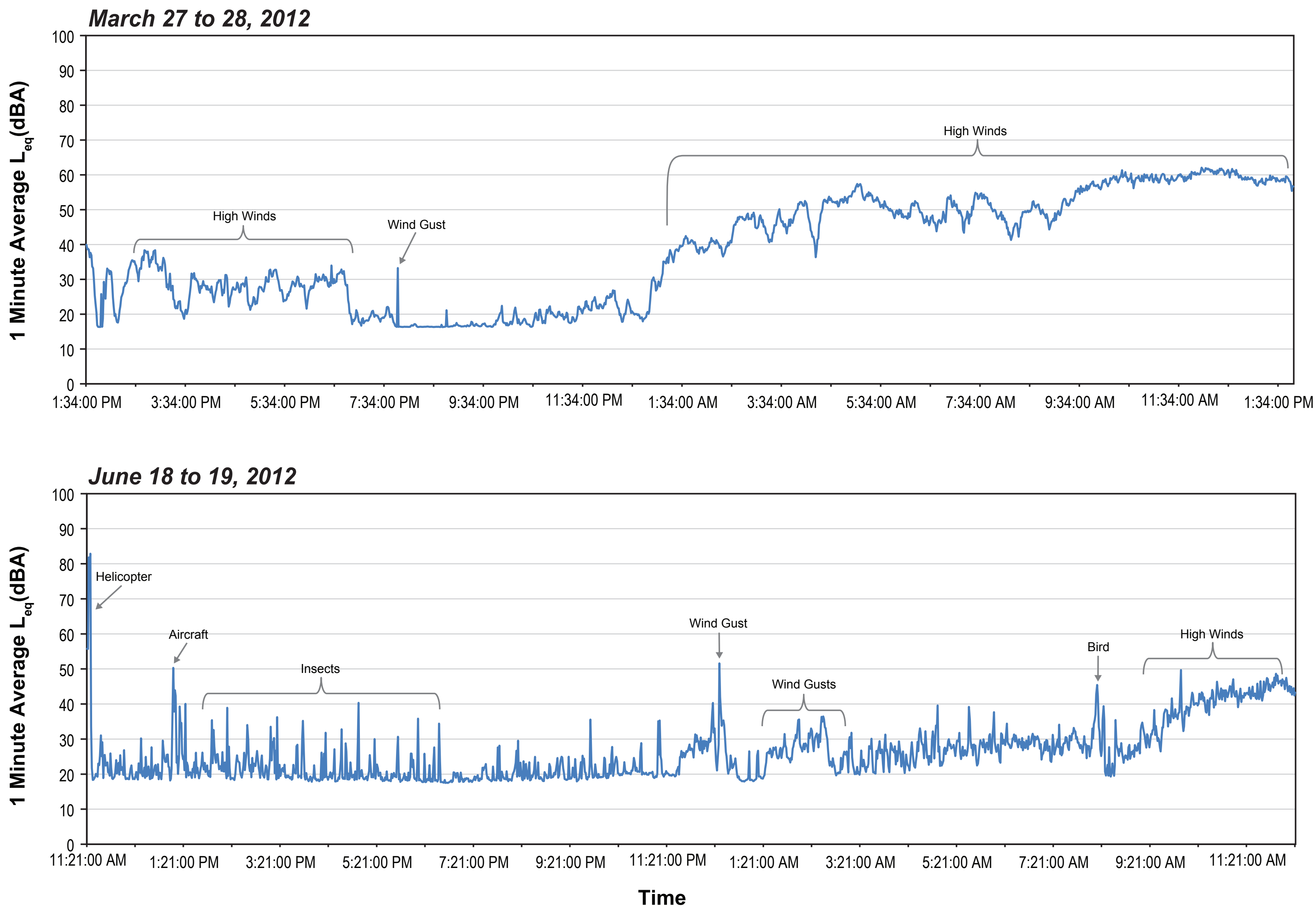

Figure 3.9-1

Sabina GOLD & SILVER CORP.

Figure 3.9-1

Back River Noise Monitoring Station S09, March and June 2012

Rescan™ Engineers & Scientists

Table 3.9-1a. Hourly Sound Levels, Station S09, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/27/2012	1:34:00 PM	2:34:00 PM	3.3	155	35	16	45
3/27/2012	2:34:00 PM	3:34:00 PM	2.6	142	33	19	41
3/27/2012	3:34:00 PM	4:34:00 PM	1.5	164	31	19	44
3/27/2012	4:34:00 PM	5:34:00 PM	1.4	169	28	20	36
3/27/2012	5:34:00 PM	6:34:00 PM	1.5	225	29	22	37
3/27/2012	6:34:00 PM	7:34:00 PM	2.1	251	29	21	43
3/27/2012	7:34:00 PM	8:34:00 PM	2.6	294	21	16	45
3/27/2012	8:34:00 PM	9:34:00 PM	3.0	315	17	16	31
3/27/2012	9:34:00 PM	10:34:00 PM	3.2	323	17	16	23
3/27/2012	10:34:00 PM	11:34:00 PM	3.0	320	19	17	32
3/27/2012	11:34:00 PM	12:34:00 AM	3.3	330	21	17	28
3/28/2012	12:34:00 AM	1:34:00 AM	1.1	359	22	18	30
3/28/2012	1:34:00 AM	2:34:00 AM	1.9	305	38	26	46
3/28/2012	2:34:00 AM	3:34:00 AM	1.7	359	44	35	52
3/28/2012	3:34:00 AM	4:34:00 AM	1.5	283	47	40	55
3/28/2012	4:34:00 AM	5:34:00 AM	1.0	178	51	40	58
3/28/2012	5:34:00 AM	6:34:00 AM	2.6	151	54	47	61
3/28/2012	6:34:00 AM	7:34:00 AM	2.9	119	49	43	57
3/28/2012	7:34:00 AM	8:34:00 AM	3.4	130	52	45	59
3/28/2012	8:34:00 AM	9:34:00 AM	4.5	141	49	42	57
3/28/2012	9:34:00 AM	10:34:00 AM	4.8	144	54	45	63
3/28/2012	10:34:00 AM	11:34:00 AM	5.3	146	59	54	65
3/28/2012	11:34:00 AM	12:34:00 PM	6.9	142	59	55	66
3/28/2012	12:34:00 PM	1:34:00 PM	6.8	140	61	56	68
Maximum			*6.9*	*n/a*	*61*	*56*	*68*
Minimum			*1.0*	*n/a*	*17*	*16*	*23*
Logarithmic average[1]			*3.0*	*n/a*	*52*	*47*	*59*

[1] Wind speed and wind direction are arithmetic averages.

Table 3.9-1b. Hourly Sound Levels, Station S09, June 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/18/2012	11:21:00 AM	12:21:00 PM	4.2	161	31	18	50
6/19/2012	12:21:00 PM	1:21:00 PM	10.3	7	49	37	57
6/18/2012	1:21:00 PM	2:21:00 PM	2.6	303	40	18	63
6/18/2012	2:21:00 PM	3:21:00 PM	5.3	304	31	18	59
6/18/2012	3:21:00 PM	4:21:00 PM	4.7	302	32	18	58
6/18/2012	4:21:00 PM	5:21:00 PM	5.2	344	32	18	58

(continued)

Table 3.9-1b. Hourly Sound Levels, Station S09, June 2012 (completed)

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/18/2012	5:21:00 PM	6:21:00 PM	4.2	340	25	18	48
6/18/2012	6:21:00 PM	7:21:00 PM	5.3	353	27	18	53
6/18/2012	7:21:00 PM	8:21:00 PM	2.7	2	24	18	49
6/18/2012	8:21:00 PM	9:21:00 PM	4.1	214	26	18	48
6/18/2012	9:21:00 PM	10:21:00 PM	4.1	191	34	18	62
6/18/2012	10:21:00 PM	11:21:00 PM	4.6	200	26	19	46
6/18/2012	11:21:00 PM	12:21:00 AM	3.9	180	30	19	51
6/19/2012	12:21:00 AM	1:21:00 AM	4.0	222	39	18	62
6/19/2012	1:21:00 AM	2:21:00 AM	5.5	284	30	19	44
6/19/2012	2:21:00 AM	3:21:00 AM	4.5	265	35	20	53
6/19/2012	3:21:00 AM	4:21:00 AM	7.3	13	33	19	50
6/19/2012	4:21:00 AM	5:21:00 AM	7.5	14	36	20	56
6/19/2012	5:21:00 AM	6:21:00 AM	3.9	333	36	23	55
6/19/2012	6:21:00 AM	7:21:00 AM	4.1	295	36	23	55
6/19/2012	7:21:00 AM	8:21:00 AM	5.8	340	34	23	54
6/19/2012	8:21:00 AM	9:21:00 AM	5.6	354	42	19	64
6/19/2012	9:21:00 AM	10:21:00 AM	5.8	14	41	25	59
6/19/2012	10:21:00 AM	11:21:00 AM	6.2	28	46	35	62
Maximum			*10.3*	*n/a*	*49*	*37*	*64*
Minimum			*2.6*	*n/a*	*24*	*18*	*44*
Logarithmic average[1]			*5.0*	*n/a*	*39*	*26*	*58*

[1] *Wind speed and wind direction are arithmetic averages.*

3.10 S10

The set up for Station S10 is shown in plates 3.10-1 and 3.10-2 for the March and June 2012 monitoring periods, respectively. The device was placed next to the George exploration camp, at the top of an esker. One-minute noise levels recorded during March and June 2012 are shown in Figure 3.10-1. Hourly, maximum, minimum, and logarithmic average L_{eq}, L_{90}, and L_{max} results of the 24-hour March 2012 and June 2012 surveys are shown in Tables 3.10-1a and 3.10-1b, respectively.

General noise sources observed at this location included continuous human activity, aircraft, and wind. Precipitation was observed during monitoring of S10 at 1:00 PM to 5:00 PM on March 27, 2012 and at 5:00 AM on June 19, 2012.

The L_{eq} ranges ($L_{eq}[max]$ - $L_{eq}[min]$) of 31 and 19 dBA and the L_{90} ranges ($L_{90}[max]$ - $L_{90}[min]$) of 14 and 3 dBA during March 2012, and June 2012, respectively, represent minor noise fluctuation in the environment. The majority of these fluctuations were caused by heavy equipment operating in the vicinity of the monitoring site. A minimum L_{90} value of 27 dBA was recorded at 11:00 AM on March 28, 2012. The L_{eq} logarithmic averages were 55 and 61 dBA and the L_{90} logarithmic averages were 37 and 47 dBA during March 2012 and June 2012, respectively. Due to heavy equipment and frequent helicopter noise in the sampling area, measured noise levels are indicative of an exploration camp.

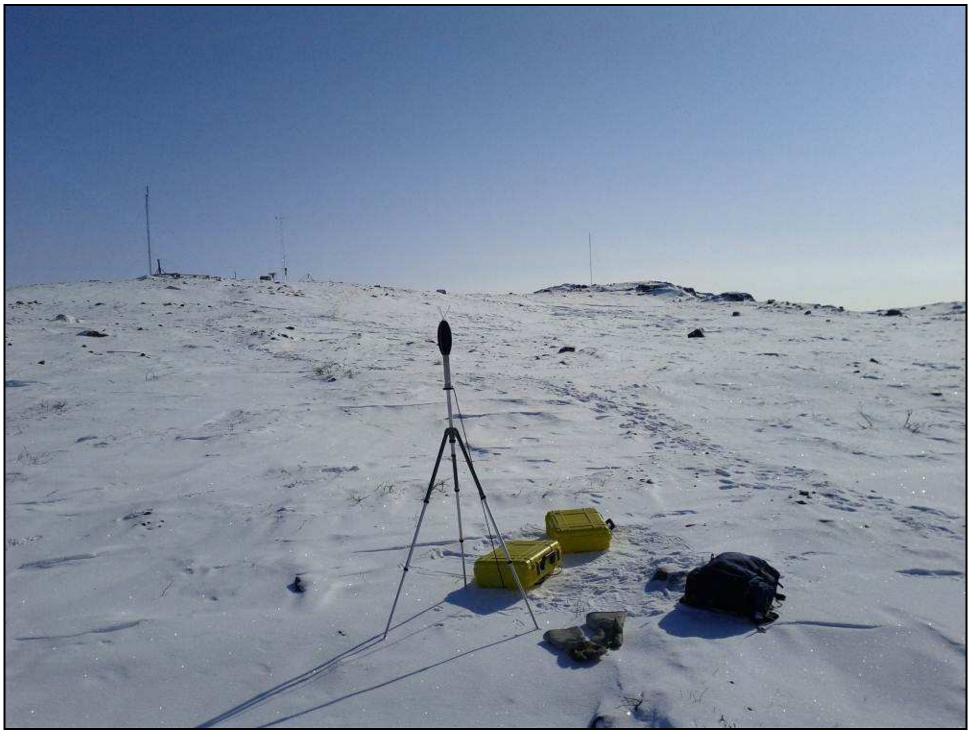

Plate 3.10-1. S10 Noise Monitoring Station, March 2012.

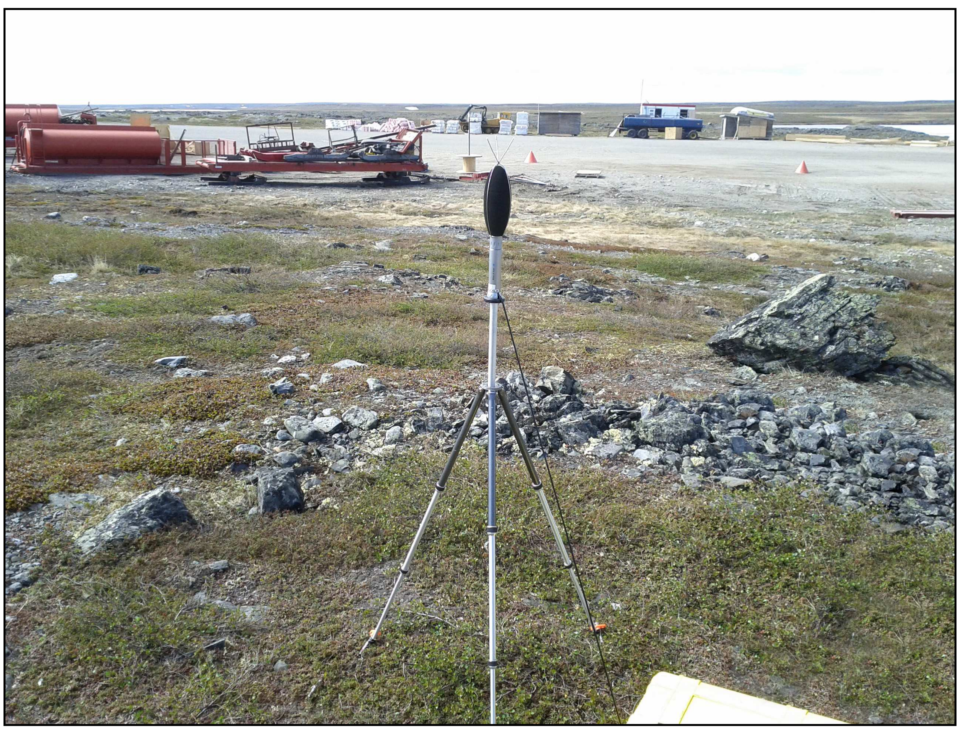

Plate 3.10-2. S10 Noise Monitoring Station, June 2012.

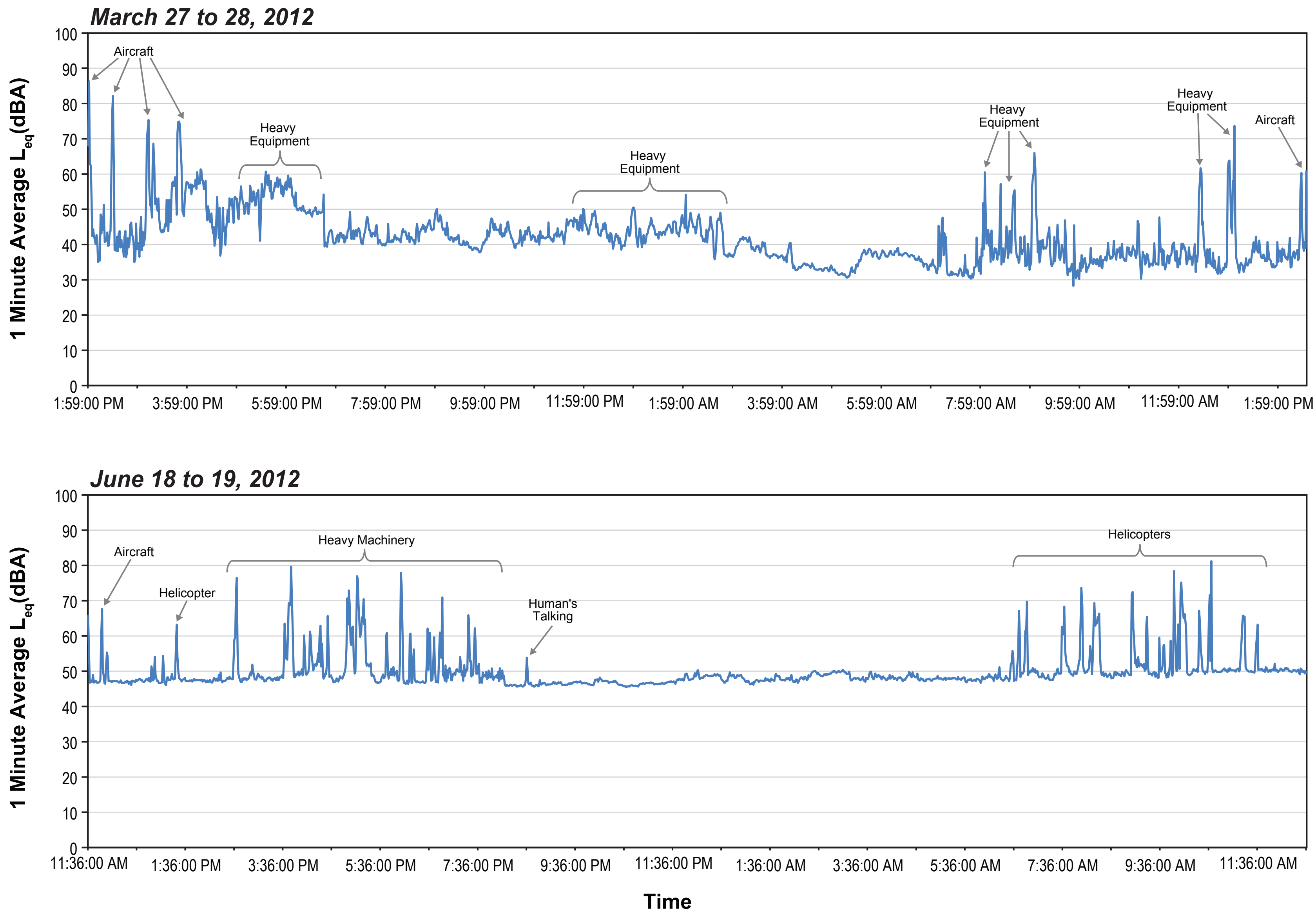

Figure 3.10-1

Back River Noise Monitoring Station S10, March and June 2012

Table 3.10-1a. Hourly Sound Levels, Station S10, March 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
3/27/2012	1:59:00 PM	2:59:00 PM	3.3	155	43[2]	35[2]	50[2]
3/27/2012	2:59:00 PM	3:59:00 PM	2.6	142	66	32	89
3/27/2012	3:59:00 PM	4:59:00 PM	1.5	164	65	40	81
3/27/2012	4:59:00 PM	5:59:00 PM	1.4	169	54	36	69
3/27/2012	5:59:00 PM	6:59:00 PM	1.5	225	56	39	68
3/27/2012	6:59:00 PM	7:59:00 PM	2.1	251	49	39	62
3/27/2012	7:59:00 PM	8:59:00 PM	2.6	294	43	40	56
3/27/2012	8:59:00 PM	9:59:00 PM	3.0	315	44	40	53
3/27/2012	9:59:00 PM	10:59:00 PM	3.2	323	42	38	56
3/27/2012	10:59:00 PM	11:59:00 PM	3.0	320	43	40	52
3/27/2012	11:59:00 PM	12:59:00 AM	3.3	330	45	41	57
3/28/2012	12:59:00 AM	1:59:00 AM	1.1	359	45	39	54
3/28/2012	1:59:00 AM	2:59:00 AM	1.9	305.	45	41	65
3/28/2012	2:59:00 AM	3:59:00 AM	1.7	359	44	36	50
3/28/2012	3:59:00 AM	4:59:00 AM	1.5	283	39	36	50
3/28/2012	4:59:00 AM	5:59:00 AM	1.0	178	35	32	41
3/28/2012	5:59:00 AM	6:59:00 AM	2.6	151	36	30	43
3/28/2012	6:59:00 AM	7:59:00 AM	2.9	119	37	33	43
3/28/2012	7:59:00 AM	8:59:00 AM	3.4	130	44	29	70
3/28/2012	8:59:00 AM	9:59:00 AM	4.5	141	51	31	71
3/28/2012	9:59:00 AM	10:59:00 AM	4.8	144	45	27	67
3/28/2012	10:59:00 AM	11:59:00 AM	5.3	146	37	30	50
3/28/2012	11:59:00 AM	12:59:00 PM	6.9	142	39	29	56
3/28/2012	12:59:00 PM	1:59:00 PM	6.8	140	53[2]	29[2]	72[2]
Maximum			*6.9*	*n/a*	*66*	*41*	*89*
Minimum			*1.0*	*n/a*	*35*	*27*	*41*
Logarithmic average[1]			*3.0*	*n/a*	*55*	*37*	*76*

[1] Wind speed and wind direction are arithmetic averages.
[2] Not used in calculating logarithmic average or maximum sound level, as measurement contained noise from helicopter takeoff or landing.

Table 3.10-1b. Hourly Sound Levels, Station S10, June 2012

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/18/2012	11:37:00 AM	12:37:00 PM	4.2	161	57	46	77
6/18/2012	12:37:00 PM	1:37:00 PM	4.0	193	49	47	65
6/18/2012	1:37:00 PM	2:37:00 PM	2.6	303	52	47	71
6/18/2012	2:37:00 PM	3:37:00 PM	5.3	304	62	47	85
6/18/2012	3:37:00 PM	4:37:00 PM	4.7	302	66	47	89

(continued)

Table 3.10-1b. Hourly Sound Levels, Station S10, June 2012 (completed)

Date	Start Time	End Time	Wind Speed (m/s)	Wind Direction (degrees)	Sound Level (dBA)		
					L_{eq}	L_{90}	L_{max}
6/18/2012	4:37:00 PM	5:37:00 PM	5.2	344	61	47	84
6/18/2012	5:37:00 PM	6:37:00 PM	4.2	340	66	47	86
6/18/2012	6:37:00 PM	7:37:00 PM	5.3	353	65	46	87
6/18/2012	7:37:00 PM	8:37:00 PM	2.7	2	62	46	78
6/18/2012	8:37:00 PM	9:37:00 PM	4.1	214	53	45	73
6/18/2012	9:37:00 PM	10:37:00 PM	4.1	191	47	46	49
6/18/2012	10:37:00 PM	11:37:00 PM	4.6	200	47	46	50
6/18/2012	11:37:00 PM	12:37:00 AM	3.9	180	48	46	51
6/19/2012	12:37:00 AM	1:37:00 AM	10.3	7	49	49	61
6/19/2012	1:37:00 AM	2:37:00 AM	5.5	284	48	47	51
6/19/2012	2:37:00 AM	3:37:00 AM	4.5	265	50	47	60
6/19/2012	3:37:00 AM	4:37:00 AM	7.3	13	49	47	55
6/19/2012	4:37:00 AM	5:37:00 AM	7.5	14	49	47	58
6/19/2012	5:37:00 AM	6:37:00 AM	3.9	333	49	47	62
6/19/2012	6:37:00 AM	7:37:00 AM	4.1	295	58	47	78
6/19/2012	7:37:00 AM	8:37:00 AM	5.8	340	60	48	80
6/19/2012	8:37:00 AM	9:37:00 AM	5.6	354	59	48	77
6/19/2012	9:37:00 AM	10:37:00 AM	5.8	14	65	48	93
6/19/2012	10:37:00 AM	11:37:00 AM	6.2	28	69	49	99
Maximum			*10.3*	*n/a*	*66*	*49*	*93*
Minimum			*2.6*	*n/a*	*47*	*45*	*49*
Logarithmic average[1]			*5.0*	*n/a*	*61*	*47*	*87*

[1] *Wind speed and wind direction are arithmetic averages.*

4. Summary

4. Summary

Ten noise monitoring stations were set up at varying distances from Goose Camp, George Camp, and the Marine Laydown Area in 2012. Noise levels were recorded over a 24 hour period in March and June of 2012. The locations were selected to characterize the range of baseline conditions in the region, based on their proximity to known deposits and sensitive wildlife receptors. Results from the noise monitoring program captured background noise levels from stations that were located approximately 3 to 70 km away from the camps. Noise levels were also recorded at both exploration camps.

Table 4-1 and Figure 4-1 provide a summary of the measured 24 hour logarithmic average (L_{eq} and L_{90}) noise levels from 2012. The June monitoring period had higher logarithmic averages for L_{eq} and L_{90} than the March monitoring period. The exception to this was station S01 that had a slightly higher L_{90} average during March and station S09 that had higher L_{eq} and L_{90} averages in March. The higher averages for station S09 are attributed to high winds during that sampling period. During the June monitoring period more non-anthropogenic noise sources, such as birds and insects, were recorded than during the March monitoring period.

Table 4-1. Summary of 24 Hour Logarithmic Average L_{eq} and L_{90} Noise Levels

Location	Approximate Distance From Nearest Exploration Camp	24 Hour Logarithmic Average L_{eq} (dBA)		24 Hour Logarithmic Average L_{90} (dBA)	
		March	June	March	June
S01	0 km (Goose)	62	70	56	52
S02	15 km (Goose)	21	38	17	25
S03	3 km (Goose)	33	54	26	38
S04	8 km (Goose)	26	38	22	25
S05	10 km (George)	36	58	23	44
S06	28 km (George)	36	52	25	32
S07	72 km (George)	18	36	16	28
S08	70 km (George)	23	37	19	25
S09	14 km (George)	51	38	47	26
S10	0 km (George)	55	60	37	47

The highest logarithmic averages were measured at stations S01 and S10, which were situated at Goose and George exploration camps, which is to be expected due to the noise generated by anthropogenic sources during exploration. The next highest logarithmic averages were measured at stations S05, S06 and S03 (high to low). High winds, and increased bird calls recorded during the June sampling period could explain the high noise levels at all three of these sites. Station S03 is located approximately 3 km from Goose Camp and stations S05 and S06 are located along the flight path between George and Goose camps. In comparison the two monitoring stations with the lowest logarithmic averages, S07 and S08, are the furthest away from existing infrastructure (~70 km).

This data compares well with background studies done in other pristine areas, where L_{eq} values can range from 9 to 22 dbA, depending on proximity to noise sources, wind speed and snow cover (Menge, Ross, and Ernenwein 2002).

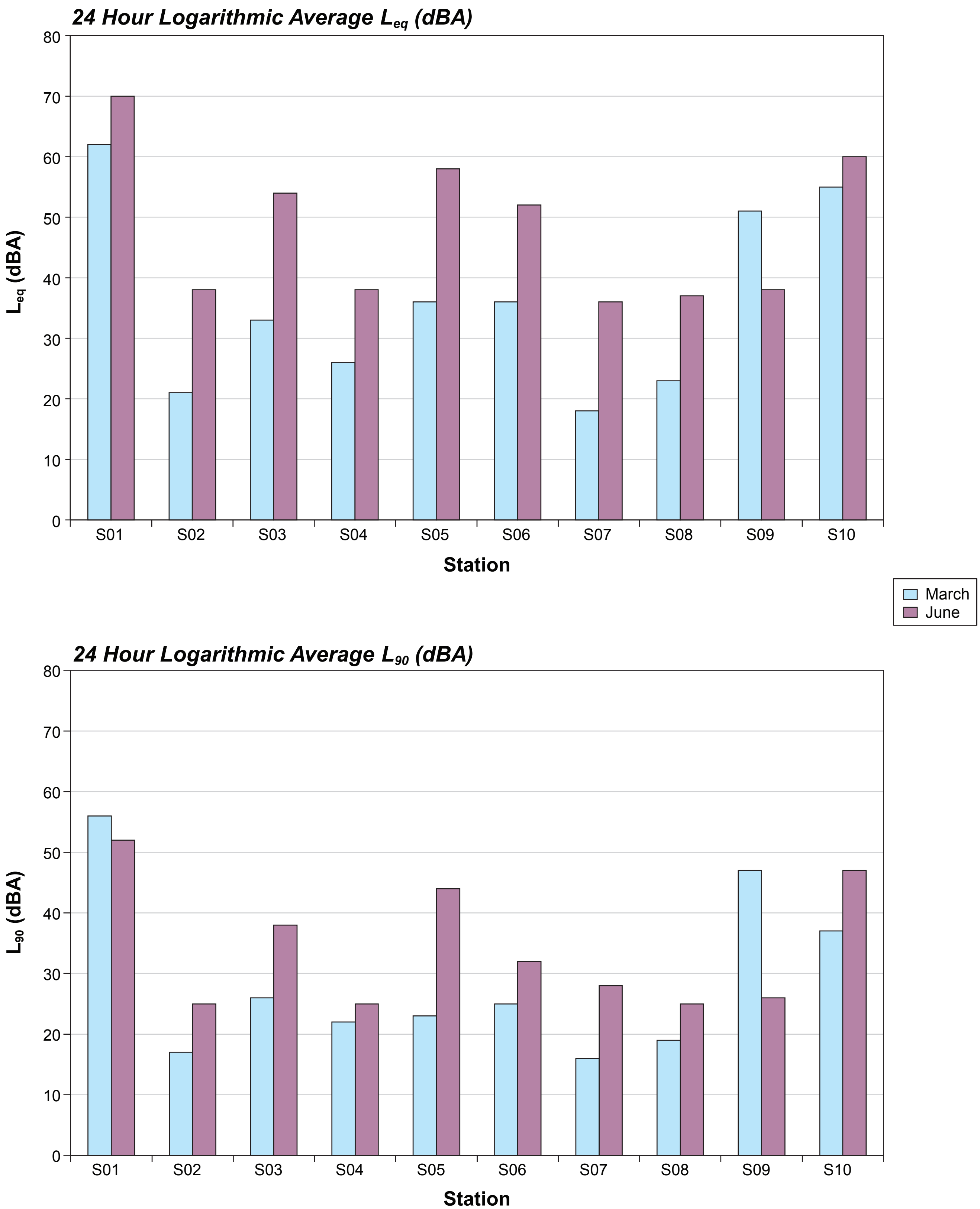

Figure 4-1

24 Hour Logarithmic Average L_{eq} and L_{90}

Sabina GOLD & SILVER CORP.

Rescan Engineers & Scientists

References

References

Menge, C. W., J. C. Ross, and R. L. Ernenwein. 2002. *Noise data from Snowmobile Pass-bys:* The Significance of Frequency Content. Society of Automotive Engineers.

Appendix 1

Noise Monitoring Field Sheets

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River — Project #: 0833-002-16

ID (e.g. S1): BR1

UTM Coordinates: 434023 E 7269878 N 13W — UTM Datum: NAD 83

Ground Cover (e.g. soil/vegetation type): Snow — Start Date/Time: 0845 Mar 20/12

Terrain (e.g. flat, hills, mountains): Camp (flat) — Finish Date/Time: ______

Weather:

Temperature (°C): -29 — Cloud Cover (%): 100

Precipitation: ☐ Heavy ☐ Moderate ☒ Mild ☐ None

☒ Snow ☐ Rain ☐ Other ______

Wind: Speed ☐ Strong ☒ Moderate ☐ Light ☐ None — Direction: E

Instrument:

Type: ~~20~~ ~~2025~~ 2250 — Serial #: 5

Calibration: ☒ Before ☐ After

Method: ______

Weighting (i.e. A): ______ — Other Settings: ______

Response (i.e. fast/slow): ______

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: Wind.

Potential noise sources: Snow mobiles, construction, planes, helicopters, wildlife

Obstacles (e.g. trees, buildings): Buildings to the east

Notes:

New Sensitivity 51.81 }
Deviation from last 0.34 } Before

Pictures taken north, east, south, west

New Sensitivity

Deviation from last

Downloaded by Dean

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: BackRIVER

Project #: 833-002-16

ID (*e.g.* S1): BR2

UTM Coordinates: 444229 E 7281281 N

UTM Datum: NAD 83

Ground Cover (*e.g.* soil/vegetation type): Bedrock / Snow

Start Date/Time: 22 March / 3:05pm

Terrain (*e.g.* flat, hills, mountains): Hill

Finish Date/Time: 23 March / 4pm

Weather:

Temperature (°C): −19

Cloud Cover (%): 35%

Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None

☐ Snow ☐ Rain ☐ Other

Wind: Speed ☐ Strong ☐ Moderate ☒ Light ☐ None

Direction

Instrument:

Type

Serial #: 1

Calibration: ☒ Before ☒ After

Method

Weighting (*i.e.* A)

Other Settings

Response (*i.e.* fast/slow)

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: Wind

Potential noise sources: wildlife, wind, helicopter, plane

Obstacles (*e.g.* trees, buildings): None

Notes:

Before: New Sensitivity 52.14 mV/Pa
Deviation from last −0.29 dB

Pictures taken facing north, east, south, west

After: New Sensitivity 50.69 mV/Pa
Deviation from last −0.25 dB

15km from camp

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Came back to camp overnight, set out again March 24 - 8km from George Camp

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River
Project #: 833-002-16
ID (*e.g.* S1): BR3
UTM Coordinates: 13W 436819 E 7269564 N
UTM Datum: Nad 83
Ground Cover (*e.g.* soil/vegetation type): Snow
Start Date/Time: March 22 11:23 am
Terrain (*e.g.* flat, hills, mountains): esker/hill top
Finish Date/Time: March 23 11:40 am

Weather:

Temperature (°C): -17 C
Cloud Cover (%): 80%
Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None
☐ Snow ☐ Rain ☐ Other ______
Wind: Speed ☐ Strong ☐ Moderate ☒ Light ☐ None
Direction ______

Instrument:

Type: 2250
Serial #: 5
Calibration: ☒ Before ☐ After
Method ______
Weighting (*i.e.* A) ______
Other Settings ______
Response (*i.e.* fast/slow) ______

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: wind

Potential noise sources: wind, wildlife, planes, helicopter, construction(?), drill (?)

Obstacles (*e.g.* trees, buildings) ______

Notes: Before - New Sensitivity 51.81 mV/Pa
Deviation from last 0.00 dB
Pictures taken facing: north, east, south, west

~~After - New Sensitivity~~ Forgot to get
~~Deviation from last~~

2.5 km from Goose camp

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River
Project #: 833-002-16
ID (*e.g.* S1): BR4
UTM Coordinates: 442052 E 7271258 N
UTM Datum: NAD 83
Ground Cover (*e.g.* soil/vegetation type): Snow
Start Date/Time: March 23 11:59am
Terrain (*e.g.* flat, hills, mountains): slight hill, bedrocky
Finish Date/Time: March 24 3:15pm

Weather:

Temperature (°C): -19C
Cloud Cover (%): 30%
Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None
☐ Snow ☐ Rain ☐ Other ______
Wind: Speed ☐ Strong ☐ Moderate ☒ Light ☐ None
Direction ______

Instrument:

Type: 2250
Serial #: 5
Calibration: ☐ Before ☒ After
Method ______
Weighting (*i.e.* A) ______
Other Settings ______
Response (*i.e.* fast/slow) ______

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: Just a bit of wind + us

Potential noise sources: Wind, helicopter, planes

Obstacles (*e.g.* trees, buildings): None

Notes:

Before: New Sensitivity 46.51 mV/Pa
Deviation from last -0.94 dB

Photos: facing north, east, south + west

After - New sensitivity 49.75 mV/Pa
Deviation from last 0.58 dB

8km to NE of camp

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River — Project #: 0833-002-16

ID (*e.g.* S1): BR5

UTM Coordinates: 393767 E 7306118 N — UTM Datum: NAD 83

Ground Cover (*e.g.* soil/vegetation type): Snow, small shrubs — Start Date/Time: March 24 10:22am

Terrain (*e.g.* flat, hills, mountains): Small bedrock hill — Finish Date/Time: March 25 11am

Weather:

Temperature (°C): ~27 — Cloud Cover (%): 100%

Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None

☐ Snow ☐ Rain ☐ Other ______

Wind: Speed ☐ Strong ☒ Moderate ☐ Light ☐ None — Direction ______

Instrument:

Type ______ — Serial #: 1

Calibration: ☒ Before ☐ After

Method ______

Weighting (*i.e.* A) ______ — Other Settings ______

Response (*i.e.* fast/slow) ______

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: Wind

Potential noise sources: Helicopter overhead & landing within 1.5km for wolverine survey, planes, wind, wildlife

Obstacles (*e.g.* trees, buildings): Circle of bedrock on western side

Notes: 8 km from George Camp

Photos taken facing: north, east, south, west

Before: New Sensitivity 56.51 mV/Pa

Deviation from last 0.95dB

After: "Calibration failed. Deviates more than 1.5 dB from initial calibration"

* Batteries were low on calibrator on day it was set - kept turning off. I replaced batteries

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River
Project #: 833-002-16
ID (*e.g.* S1): BR6 (5)
UTM Coordinates: 406727 E 7289932 N
UTM Datum: NAD 83
Ground Cover (*e.g.* soil/vegetation type): Snow
Start Date/Time: March 24 / 5:49 pm
Terrain (*e.g.* flat, hills, mountains): Flat
Finish Date/Time: March 25 / 6:30 pm

Weather:

Temperature (°C):
Cloud Cover (%): 100%
Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None
☐ Snow ☐ Rain ☐ Other
Wind: Speed ☐ Strong ☐ Moderate ☐ Light ☒ None
Direction

Instrument:

Type: 2250
Serial #: 5
Calibration: ☐ Before ☐ After
Method
Weighting (*i.e.* A)
Other Settings
Response (*i.e.* fast/slow)

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: very little

Potential noise sources: planes / helicopter - it is on heli flight path between Goose + George camps, wind, wildlife

Obstacles (*e.g.* trees, buildings): no

Notes: Before: New Sensitivity 50.60 mV/PA
Deviation from last 0.15 dB

Photos Taken Facing: North, East, South, West

* Batteries were low on calibrator
* Battery was charged overnight, but said "low battery" → seemed to work okay anyway

All-Weather Road - ½ way b/w Goose + George Camps

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name Back River

Project # 0833-002-16

ID (*e.g.* S1) BR7

13W UTM Coordinates: 0373761 E 7382904 N

UTM Datum

Ground Cover (*e.g.* soil/vegetation type): Snow

Start Date/Time 1030 26-MAR-12

Terrain (*e.g.* flat, hills, mountains): Hills

Finish Date/Time 1300 26-MAR-2012

Weather:

Temperature (°C): -20°C

Cloud Cover (%): 100

Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None

☐ Snow ☐ Rain ☐ Other

Wind: Speed ☐ Strong ☐ Moderate ☐ Light ☒ None

Direction NA

Instrument:

Type 2250

Serial # 5

Calibration: ☒ Before ☒ After

Method

Weighting (*i.e.* A)

Other Settings

Response (*i.e.* fast/slow)

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed None

Potential noise sources Wildlife

Obstacles (*e.g.* trees, buildings)

Notes:

Before New Sensitivity 50.17 mV/Pa

Deviation from Last -0.07dB

After New Sensitivity: 50.20 mV/Pa

Deviation from Last: 0.00dB

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Rock River

Project #: 0832-002-16

ID (e.g. S1): RR8

13 W UTM Coordinates: 0388656 E 7382021 N

UTM Datum:

Ground Cover (e.g. soil/vegetation type): Snow (.

Start Date/Time: 1100 26-MAR-12

Terrain (e.g. flat, hills, mountains): Peninsula

Finish Date/Time: 1200 26-MAR-12

Weather:

Temperature (°C): -20°C

Cloud Cover (%): 100

Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None

☐ Snow ☐ Rain ☐ Other

Wind: Speed ☐ Strong ☐ Moderate ☒ Light ☐ None

Direction: S

Instrument:

Type: 2250

Serial #:)

Calibration: ☒ Before ☒ After

Method:

Weighting (i.e. A):

Other Settings:

Response (i.e. fast/slow):

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: None

Potential noise sources: Wildlife

Obstacles (e.g. trees, buildings): None

Notes: Before: New Sensitivity = 55.30 mV/Pa
Deviation from Last = -0.19 dB

After: New Sensitivity: 52.33 mV/Pa
Deviation from Last: -0.48 dB

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River

Project #: 0833-002-16

ID (e.g. S1): BR9

13 W UTM Coordinates: 0388255 E 7328466 N

UTM Datum:

Ground Cover (e.g. soil/vegetation type): Snow

Start Date/Time: 1330 27-MAR-12

Terrain (e.g. flat, hills, mountains): Flat

Finish Date/Time: 1345 28-MAR-12

Weather:

Temperature (°C): -15°C

Cloud Cover (%): 50

Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☒ None

☐ Snow ☐ Rain ☐ Other

Wind: Speed ☐ Strong ☒ Moderate ☐ Light ☐ None

Direction: S

Instrument:

Type: 2250

Serial #: 5

Calibration: ☒ Before ☒ After

Method:

Weighting (i.e. A):

Other Settings:

Response (i.e. fast/slow):

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: Wind

Potential noise sources: Wildlife

Obstacles (e.g. trees, buildings):

Notes:

Before 50.96 mV/Pa
Deviation from Last 0.13 dB

After New Sensitivity = 53.86 mV/Pa
Deviation from Last = 0.48 dB

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name: Back River
Project #: 0833-002-16
ID (e.g. S1): BR10
13W UTM Coordinates: 0388130 E 7313257 N
UTM Datum:
Ground Cover (e.g. soil/vegetation type): Snow + bedrock
Start Date/Time: 1400 27-MAR-2012
Terrain (e.g. flat, hills, mountains): Hill
Finish Date/Time: 1415 28-MAR-12

Weather:

Temperature (°C): -10°C
Cloud Cover (%): 0
Precipitation: ☐ Heavy ☐ Moderate ☐ Mild ☑ None
☐ Snow ☐ Rain ☐ Other
Wind: Speed ☐ Strong ☐ Moderate ☑ Light ☐ None
Direction: S

Instrument:

Type: 2250
Serial #: 1
Calibration: ☒ Before ☒ After
Method:
Weighting (i.e. A):
Other Settings:
Response (i.e. fast/slow):

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed: Construction, snow plow -

Potential noise sources: Wildlife, wind, camp noise

Obstacles (e.g. trees, buildings):

Notes: Before New Sensitivity: 55.19 mV/Pa
@ George Camp
Deviation from Last: 0.46 dB

After New Sensitivity = 53.33 mV/Pa
Deviation from Last = -0.46 dB

Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!

No.392

Noise Data Sheet BR1 14-Jun-12

- Goose Camp
- cloudy (100%)
- high wind
- 10°C
- no precip
- located in camp

- sources:
  - → helicopters
  - → bobcats
  - → other machinery
  - → people
  - → wind
  - → weather

- dispatched @ 1300 pickup @ 1500 (15-Jun)
- Calibration beginning:
  new sensitivity = 53.03 mV/Pa
  deviation from last = -0.12 dB
- Calibration after:
  new sensitivity = 50.85 mV/Pa
  deviation from last = -0.37 dB

Unit 1

Rite in the Rain

No.392

Noise Data Sheet BRN 2 15-Jun-2012

- Clouds 90%
- Wind moderate
- Temp 10°C
- Precip none

- Sources
  aircraft
  wildlife
  weather

Install time 1645
Pickup time 1700

Calibration before
new sensitivity 54.01 mV/Pa
deviation from last 0.53 dB

Calibration after
new sensitivity 52.92 mV/Pa
deviation from last -0.18 dB

Unit 1

Rite in the Rain

No.392

Noise Data Sheet BRN3 14-Jun-2012

· Clouds 100%
· Wind high (10 m/s +)
· Temp 7°C
· Precip none

· Sources
→ wind
→ wildlife
→ helicopters + planes

Install time: 1430
Pickup time: 1545 (15-Jun)

· Calibration before
new sensitivity = 48.31 mV/Pa
dev. from last = 0.07 dB

· Calibration after
new sensitivity 54.01 mV/Pa
deviation from last 0.53 dB

Unit 2

Rite in the Rain

No.392

Noise Data Sheet BRN4 15-June-2012

· Clouds 100%
· Wind moderate
· Temp 10°C
· Precip none

· Sources
· birds
· wildlife
· weather
· aircraft

Install time 1600
Pickup time 1630

· Calibration before
new sensitivity 47.71 mV/Pa
deviation from last -0.11 dB

· Calibration after
new sensitivity 47.42 mV/Pa
deviation from last -0.05 dB

Unit 2

Rite in the Rain

No.392

Noise Data Sheet BRN5 19-JUN-2012

Clouds 100%
Wind moderate-high
Temp 5°C
Precip moderate rain

Sources
rain
helicopter
weather
wildlife

Install time 1415
Pickup time 1415

Calibration before
new sensitivity 52.96
deviation from last -0.12 dB

Unit 1

No.392

Noise Data Sheet BRN6 19-JUN-2012

Clouds 100%
Wind moderate
Temp 5°C
Precip moderate

Sources
rain
helicopter
weather
wildlife

Install time 1430
Pickup time 1430

Calibration before
new sensitivity 47.82 mV/Pa
deviation from last 0.00 dB

Unit 2

No.392

Noise Data Sheet BRN7 17-Jun-2012

Clouds 0
Wind moderate
Temp 15°
Precip none

Sources
weather
wildlife
helicopter

Install time 1015
Pickup time

Calibration before
new sensitivity 47.59 mV/Pa
deviation from last 0.03 dB

Calibration after
new sensitivity
deviation from last

Unit 2

Rite in the Rain

No.392

Noise Data Sheet BRN8 17-Jun-2012

Clouds 0%
Wind mild
Temp 15°C
Precip none

Sources
wind
weather
wildlife

Install time 1000
Pickup time

Calibration before
new sensitivity 53.18 mV/Pa
deviation from last 0.04 dB

Calibration after
new sensitivity
deviation from last

Unit 1

Rite in the Rain

No.392

Noise Data Sheet BRN9 18-JUN-2012

Clouds 50%
Wind mild
Temp 15°
Precip none

Sources
- aircraft
- wildlife
- weather

Install time 1115
Pickup time

Calibration before
new sensitivity 47.79mV/Pa
~~Calibration~~ deviation from last 0.04dB

Calibration after
new sensitivity
deviation from last

Unit 2

Rite in the Rain

No.392

~~BR10~~ Noise Data Sheet BRN10 18-JUN-2012

Clouds 50%
Wind mild
Temp 15°C
Precip none

Sources
- machines
- people
- camp noise
- people
- wildlife
- aircraft
- weather

Install time 1140
Pickup time

Calibration before
new sensitivity 53.70mV/Pa
deviation from last 0.08dB

Calibration after
new sensitivity
deviation from last

Unit 1

Rite in the Rain

Appendix V4-2B

Noise and Vibration Modelling Report

Rescan™
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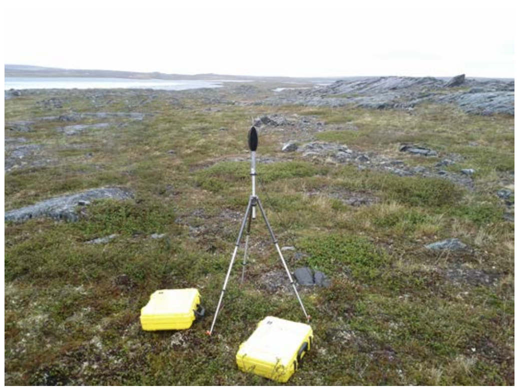
Sabina Gold & Silver Corp.

BACK RIVER PROJECT
Noise and Vibration Modelling Report

Sabina
GOLD & SILVER CORP.






Rescan™
an ERM company

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November 2013

BACK RIVER PROJECT
NOISE AND VIBRATION MODELLING REPORT

November 2013
Project #0194096 0037

Citation:

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Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan Environmental Services Ltd., an ERM company
Vancouver, British Columbia

Table of Contents

BACK RIVER PROJECT
NOISE AND VIBRATION MODELLING REPORT

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Glossary and Abbreviations

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.

%HA	Percent Highly Annoyed
ANSI	American National Standards Institute
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor.
Decibel (dB)	The unit used to describe sound levels and noise exposure. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
dB(A)	Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dB(A). The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans.
ISO	International Organization for Standardization
kg	kilogram
L_{AE}	A-weighted sound exposure level
L_{AFmax}	Maximum A-weighted, fast time constant sound level
L_{CE}	C-weighted sound exposure level
L_d	Daytime (07:00 to 22:00) equivalent sound level
L_{dn}	Day-night equivalent sound level
L_{eq} / LA_{eq}	This level represents the equivalent, or average noise energy, during a measurement period. The L_{eq}, 15min noise descriptor simply refers to the Leq noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g., L_{10}, 15 minute) as required.

L_n	Nighttime (22:00 to 07:00) equivalent sound level.
L_{peak}	The maximum absolute value of the instantaneous sound pressure.
m	Metre
MLA	Marine Laydown Area
NIHL	Noise Induced Hearing Loss
Project, the	The Back River Project
Sound Power Level (Lw) -	This is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment.
Tpd	Tonnes per day
TNT	Trinitrotoluene (explosive)
WHO	World Health Organization

1. Introduction

1. Introduction

This Noise and Vibration Modelling Report provides details of the modelling undertaken to assess the potential environmental effects of noise and vibration associated with the proposed Back River Project (the Project).

The Project is located in the Kitikmeot region of Nunavut. The Project includes the Goose Property Area, the George Property Area, the Marine Laydown Area (MLA) situated in the southern portion of Bathurst Inlet, and connecting winter roads.

Noise and vibration is an important environmental factor because a change in the noise or vibration levels may adversely affect wildlife, workers and local residents. Noise is defined as any undesirable sound that may irritate people, disturb rest or sleep, cause loss of hearing, or otherwise affect the quality of life of affected individuals. Noise can result in psychological and physiological effects (e.g., stress), mental health effects, and effects on residential behaviour (WHO 1999).

In addition, noise may negatively affect wildlife causing them to avoid important habitats and/or take time away from their key behaviours such as feeding, breeding or watching for predators, which can ultimately lead to reduced reproduction and increased mortality. Direct effects of high noise levels and shock waves on fish include mortality or internal injury (e.g., hearing, bleeding, ruptured swim bladder).

Vibration may be in the form of ground vibration or blasting overpressure, i.e., pressure waves in the atmosphere. These ground-borne or airborne vibrations can cause cosmetic and structural damage to buildings as well as disturbances to local residents, workers, and wildlife.

The existing noise environment is described as pristine wilderness with no noise effects relating to industrial activity. The construction and operation of the Project will introduce noise and vibration sources largely in the form of construction equipment, haul vehicles, blasting and vehicle and aircraft traffic.

The scope of the noise and vibration modelling study was identified based on regulatory considerations and guidance, professional judgement and community-based consultation and includes:

- noise and vibration from mining, processing and construction activities within the noise local study area (LSA); and
- air operations (including fixed wing aircraft at the George Property Area and Goose Property Area permanent airstrips) and helicopter operations between the two property areas.

Due to the anticipated lower levels of activity at the MLA, the potential noise and vibration effects at the MLA are expected to be less than at the George Property Area or the Goose Property Area. If the effects on noise of the Goose and George Property Areas are not predicted to be significant, then the potential effects from the entirety of the Project and the MLA should also be not significant. As such, the MLA is not included in the scope of this modelling report.

The broad objective of the noise and vibration modeling study is to quantify potential environmental noise and vibration levels associated with mining, processing, construction, and aviation aspects of the Project.

This report provides details of the modelling methodology and results. A full discussion of these results, quantification of any effects and provision of necessary mitigation are included in the Noise and Vibration chapter (Volume 4, Chapter 2), the Wildlife chapters (Volume 5, Chapter 5 – 10) and Human Health and Environmental Risk Assessment chapter (Volume 8, Chapter 6).

2. Existing Environment

2. Existing Environment

2.1 BASELINE NOISE

The Back River Project (the Project) is remote and void of significant noise from other projects or activities. Baseline noise monitoring was conducted in 2012 at ten noise monitoring locations across the Goose and George Property Areas and the MLA (Rescan 2012a). The noise monitoring locations were selected to characterise the range of baseline conditions in the noise regional study area (RSA), based on their proximity to known deposits and sensitive wildlife receptors (Figure 2.1-1).

Monitored average noise levels varied substantially depending on the proximity to existing infrastructure and 24 hour L_{eq} values ranged from 18 to 70 dBA. As expected, the highest average noise levels were recorded at the stations situated at the Goose and George exploration camps, due to nearby anthropogenic noise sources during exploration. The lowest average noise levels were monitored at locations furthest from the existing infrastructure.

Noise data collected in 2012 was reflective of pristine background noise conditions as well as exploration camp noise conditions. Overall monitored noise levels were consistent with other background studies done in pristine areas. These levels are comparable to those collected at a nearby location in the West Kitikmeot where 24 hour L_{A90} levels ranged from 17 to 49 dBA (Rescan 2012b). Monitored noise levels are also comparable to estimated baseline levels for quiet, rural areas as given in the Alberta EUB Directive 038, which considers a quiet, rural area with day-night sound levels due to human-made sounds to be below 45 dBA (Alberta EUB, 2007).

2.2 METEOROLOGICAL CONDITIONS

The Project is located in the vicinity of the Arctic Circle in the West Kitikmeot region of Nunavut. The Project area experiences relatively low amounts of precipitation. Due to sub-zero temperatures for the majority of the year the area experiences high snow accumulation. There is a relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains) meaning that wind speeds are generally high. The length of the snow-free season is typically from June to September (Rescan 2012c).

The site-specific meteorological monitoring program for the Project began in 2004 with the commissioning of the George and Goose meteorological stations. The climatic variables monitored by the meteorological stations are air temperature, precipitation as rainfall, solar radiation, wind speed and wind direction (Rescan 2012c). Analysis of the meteorological data collected during 2006 to 2012 has been used to provide the following information relevant to the noise modelling.

At the George meteorological station the winds are predominately from the north, north northeast, northwest and southeast. Wind speeds were in excess of 5 m/s from all directions 43% of the time.

At the Goose meteorological station the dominant wind direction was from the west to north quadrant, blowing from this quadrant 42% of the time and also from the southerly direction for 9% of the time. Wind speeds were in excess of 5 m/s from all directions over 35% of the time.

Annual average air temperatures ranged from -11.6°C to -5.8°C at George and -11.5°C to -6.6°C at Goose. Observations recorded indicate that the climate consists of a winter period (October to May) of extremely cold mean monthly temperatures ranging from -33.0 to -1.3°C; a cool spring, summer and fall period (June to September) with mean monthly temperatures ranging from -0.3 to 14.5°C.

Precipitation in the noise RSA ranged from 249.4 to 299.2 mm per year. Site-specific meteorology station precipitation was measured as rainfall during the summer period only (June to September), when temperatures were above freezing. Summer total rainfall between June and September ranged from 4 mm to 211 mm.

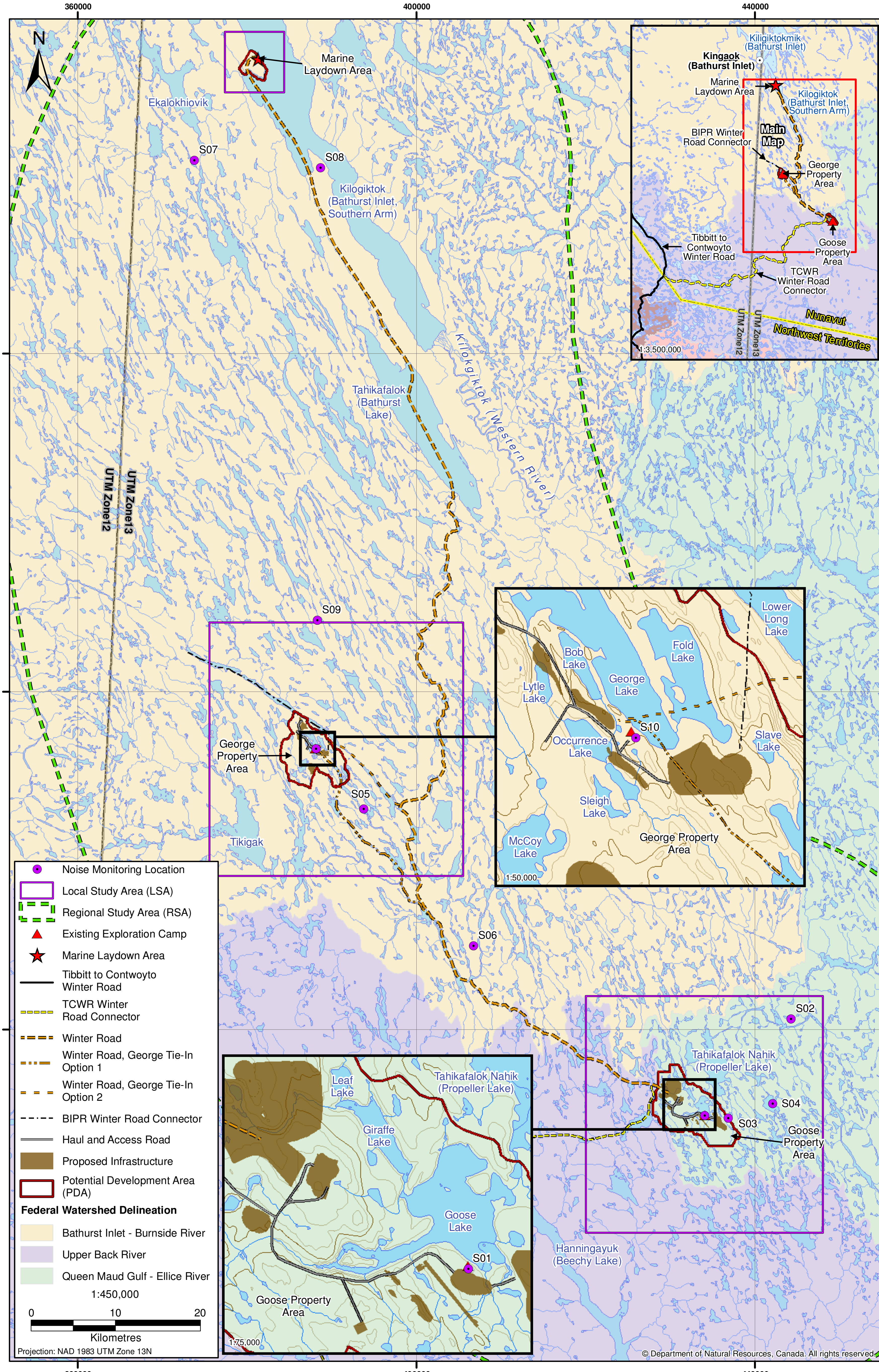

Figure 2.1-1

Sabina GOLD & SILVER CORP.

2012 Noise Baseline Monitoring Locations, Back River Project

Rescan an ERM company

3. Methodology

3. Methodology

3.1 OVERVIEW

In order to robustly model the potential effects of the Project on noise the following tasks were completed:

- identify relevant standards and guidelines, applicable to the Project and the assessment;
- review any existing Project data and/or information relevant to the assessment, including review of project site plans and proposed operational mining, quarry and construction scenarios;
- identify the closest and/or potentially most affected noise and vibration sensitive ecological and human receptors in the vicinity to the site. These locations have been adopted as the Project-specific assessment locations (sensitive receptors);
- scope the potential effects of the Project on vibration levels;
- assume typical background noise levels at representative project-specific assessment locations (sensitive receptors) and develop the Project-specific criteria at these assessment locations;
- develop a Project-specific noise model to accurately quantify mining, processing, construction and aviation noise level contributions including fixed and mobile noise sources associated with the Project; and
- compare the resultant noise levels to the Project-specific noise criteria and determine the noise levels at the closest and/or potentially most affected noise sensitive receiver locations in the vicinity of the site.

The scope of this study is to determine noise and vibration levels at human and wildlife receptors within 10 km of the noise sources. Potential noise and vibration effects are assessed in accordance with current best practice and the following relevant guidance:

- Alberta Energy and Utility Board (2007) *Alberta Noise Directive 038*;
- Health Canada (2010) *Useful Information for Environmental Assessment (Section 6: Noise Effects)*;
- WHO (1999) *Guidelines for Community Noise*;
- US EPA (1974) Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety;
- Michaud, Bly, and Keith (2008) *Using a Change in Percent Highly Annoyed with Noise as a Potential Health Effect Measure for Projects under the* Canadian Environmental Assessment Act;
- Environment Canada (2009) *The Environmental Code of Practice for Metal Mines*;
- International Standards Organization (2003) *ISO 2631/2 Mechanical Vibration and Shock - Evaluation of human exposure to whole-body vibration Part 2*;
- German Standard Organization (1970) *Vibrations in Building Construction DIN 4150*; and
- Swiss Association of Standardization (1978) *Effects of Vibration on Construction: SN640 312*.

3.2 SPATIAL AND TEMPORAL BOUNDARIES

3.2.1 Spatial Boundaries

Study areas were established based on the “zone of influence” beyond which the residual effects of the Project are expected to diminish to a negligible state. The expected zone of influence was determined using baseline studies, consultation, and expert knowledge.

Based on professional judgement, and other assessments in northern regions such as that for the Snap Lake Project, Project-related noise may be audible under calm conditions at a distance of up to 10 km (De Beers 2002). Therefore, two LSAs were selected for the Project extending 10 km in all directions from infrastructure around the Goose and George properties (Figure 3.2-1). The LSAs include the Proposed Development Area (PDAs) which contain all existing and planned infrastructure.

3.2.1.1 Noise Sensitive Receptor Locations

A point of reception or receptor may be defined as any point occupied by persons where extraneous noise and/or vibration are received. Examples of human receptor locations may include: permanent or seasonal residences; hotels, schools and daycares; hospitals and nursing homes; places of worship; and parks and campgrounds. There are no such locations at the Project and only off duty workers at the camps are considered. Wildlife receptors may be areas where wildlife frequent or migrate between habitat areas.

Tables 3.2-1 and 3.2-2 provide the identified sensitive receptors (human and wildlife) within 10 km of the George Property Area and Goose Property Area infrastructure, respectively. These are also shown on Figures 3.2-2 and 3.2-3. These locations have been adopted as the project-specific assessment locations, or the sensitive receptors. No existing human receptors were identified within 10 km of either the George Property Area or the Goose Property Area.

Table 3.2-1. George Property Sensitive Receptors

Sensitive Receptor Number	Sensitive Receptor Description	Coordinates (UTM13N)		Approximate Distance from Closest Deposit (m)	Direction from Source
		Easting	Northing		
R1	George camp[1]	387456	7311480	400 (Locale 1)	NE
R2	Peregrine falcon nest	388723	7312293	600 (Locale 2)	SE
R3	Rough-legged hawk nest	391848	7314708	3,000 (Locale 1)	NE
R4	Waterbirds - Staging area	385600	7311500	2,500 (Locale 2)	SW
R5	Wolf/ Fox - active and productive fox den	388091	7311053	1,600 (Locale 2)	S

[1] *The future George camp was assumed to be east of McCoy Lake.*

Table 3.2-2. Goose Property Sensitive Receptors

Sensitive Receptor Number	Sensitive Receptor Description	Coordinates (UTM13N)		Approximate Distance from Closest Deposit (m)	Direction from Source
		Easting	Northing		
R6	Goose camp	431139	7272010	1400 (Umwelt)	NE
R7	Caribou camera location BR28	421107	7260616	13000 (Umwelt)	SW
R8	Gyrfalcon nest	431202	7269935	900 (Umwelt)	SE
R9	Waterbirds - Staging area	435000	7265775	3500 (Main)	S
R10	Wolverine - Active den	431012	7269955	700 (Umwelt)	S
R11	Wolverine - Active den	431145	7263746	6200 (Main)	SE

PROJECT # 0194096-0040 GIS # BAC-12-040 November 06 2013

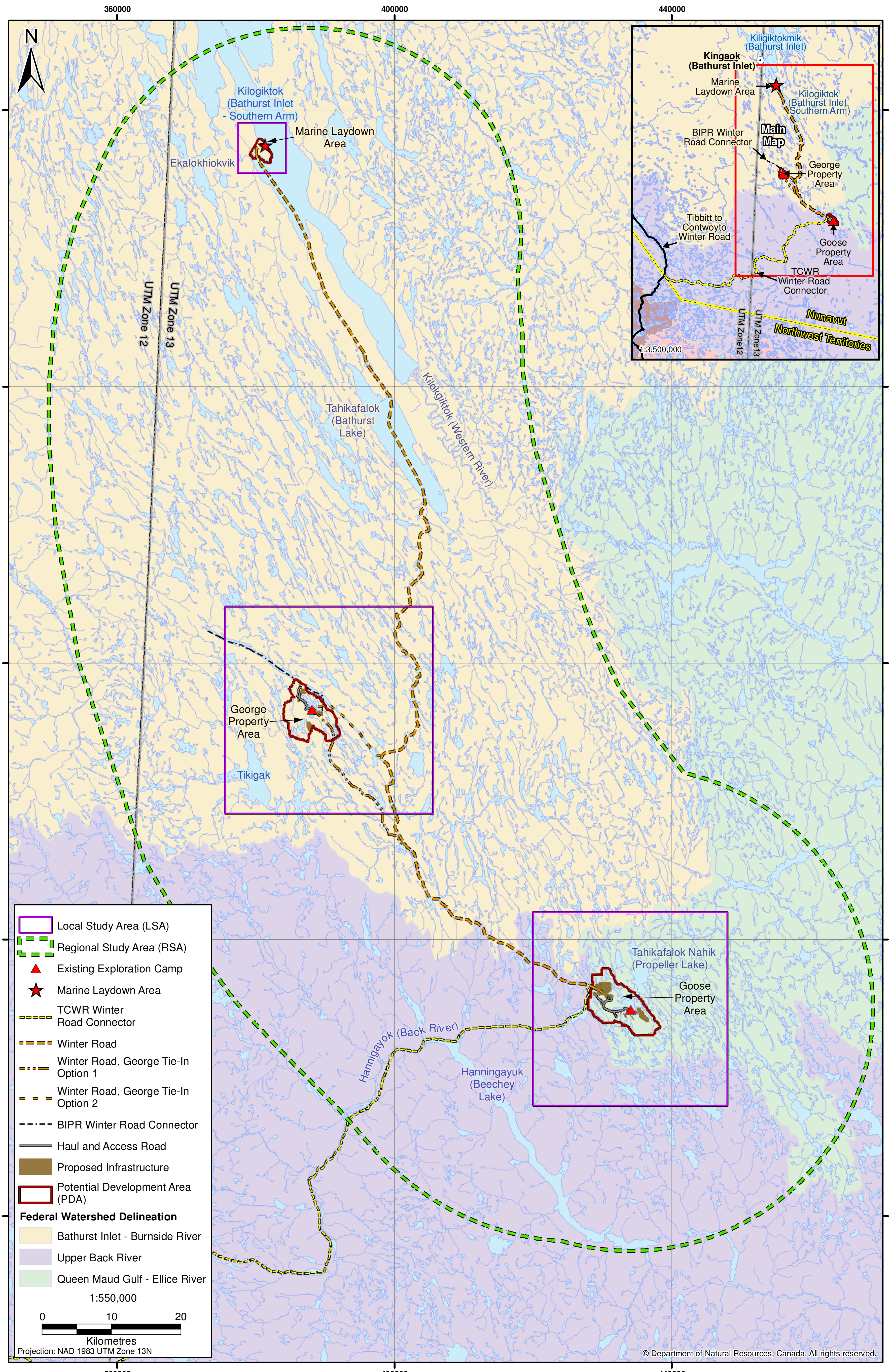

Figure 3.2-1

Sabina GOLD & SILVER CORP.

Local Study Area for Noise and Vibration

Figure 3.2-1

Rescan Engineers & Scientists

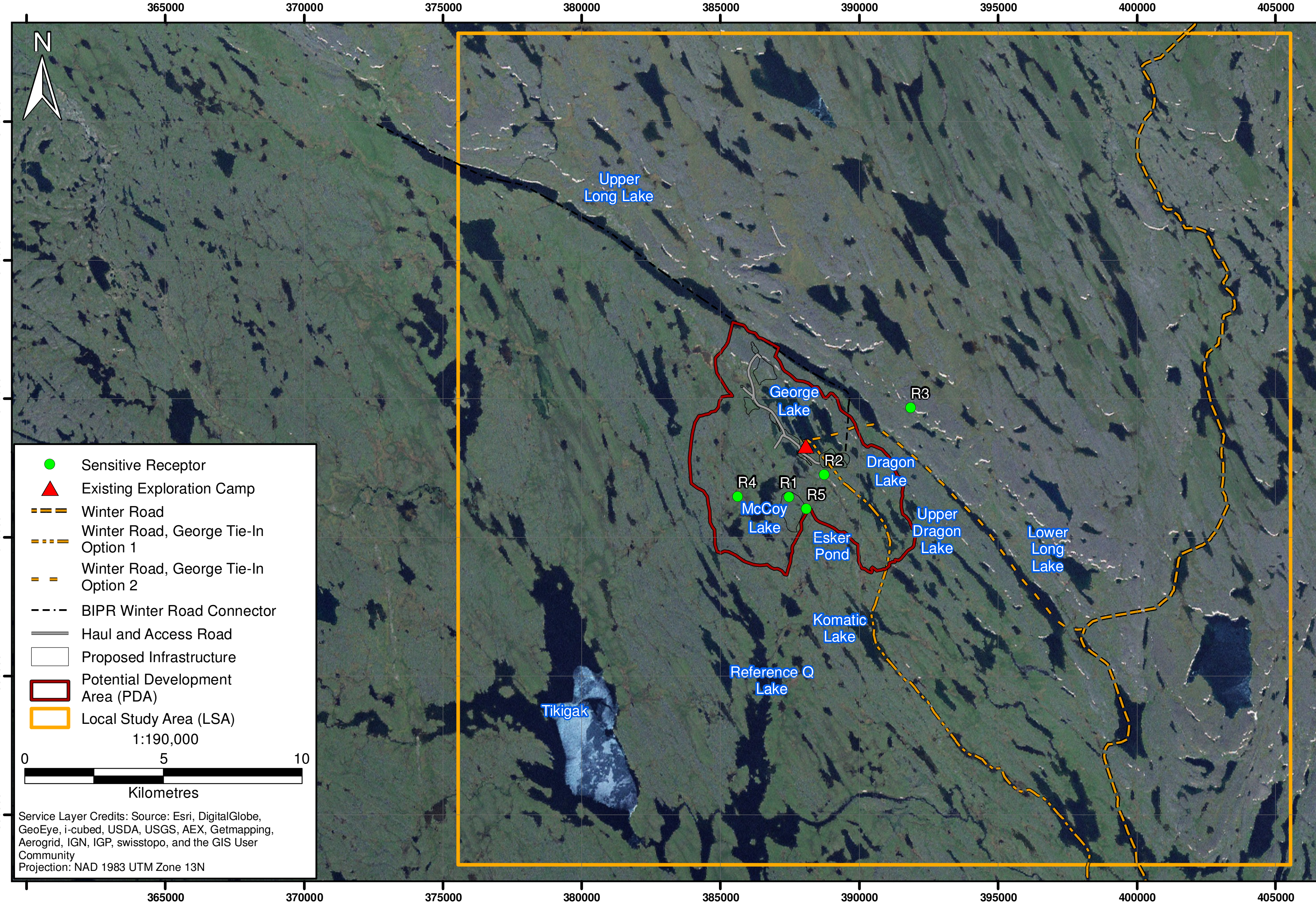

Figure 3.2-2

Sabina GOLD & SILVER CORP.

Noise Sensitive Receptors: George Property Area

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Figure 3.2-2

PROJECT # 0194096-0040 GIS # BAC-12-043b November 06 2013

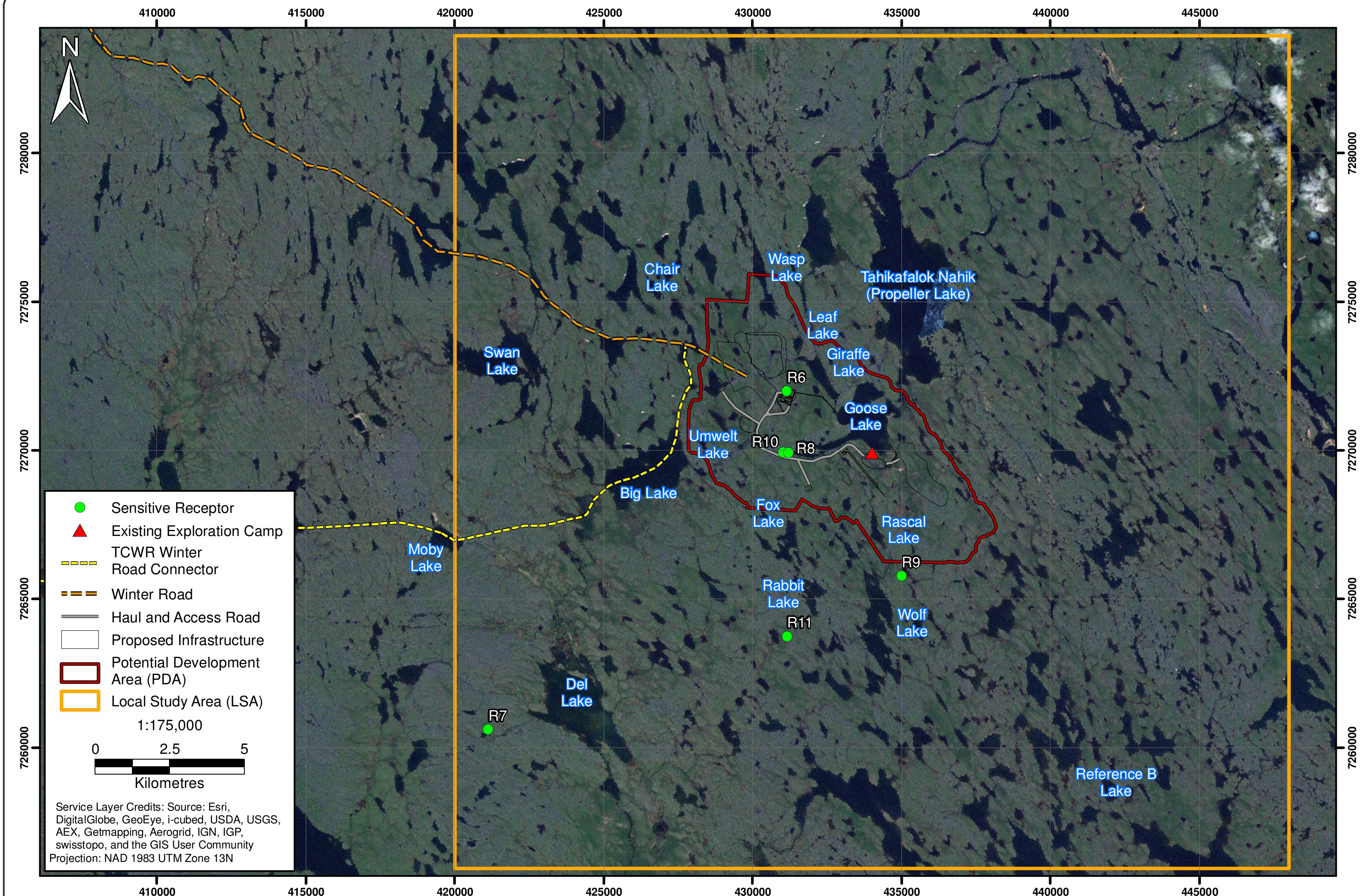

Figure 3.2-3

Sabina GOLD & SILVER CORP.

Noise Sensitive Receptors: Goose Property Area

Figure 3.2-3

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As there are no known existing human receptors within 10 km of either the George Property Area or the Goose Property Area, the potential effects of noise on human health focuses solely on the Project workers' camps. In line with current best practice the noise assessment for the worker's camps will consider the potential effects on sleep disturbance.

In line with current best practices, other potential effects such as interference with speech communications and the potential for noise complaints will not be assessed for onsite human receptors.

3.2.2 Temporal Boundaries

All of the project phases may have interactions with noise; however, only the years with the highest predicted noise emissions were included in the noise modelling study.

The noise modelling and assessment are based on the conservative approach of using the 'worst case' year for noise emissions. Modelling years were chosen to be years in which the highest numbers of mobile and fixed equipment units are expected to be in use, as follows:

- Year 3 - Goose Property Area; and
- Year 7 – George Property Area.

If the effects of these years are predicted to be not significant then the potential effect for the entirety of the Project should also be not significant. Noise does not persist once the noise-causing activities cease.

Noise and vibration levels have also been predicted for two scenarios to represent snap shots of the fixed wing aircraft operations and the helicopter operations using the permanent airstrips at the George Property Area and the Goose Property Area.

The noise effects during the site preparation, reclamation and closure, post-closure and other potential phases are expected to be less than during the construction and operation phases and therefore these other phases are not explicitly included.

3.3 PROJECT ASSUMPTIONS USED IN NOISE MODELLING

Within the Goose Property Area and George Property Area there are several mineral targets and a combination of open pit and underground mining methods are to be used for mineral extraction. Open pit mining will be carried out by conventional truck/shovel methods at six sites (Main, Umwelt, Llama, Locale 1, Locale 2 and LCP North). Umwelt is the only deposit which will be mined using underground mining methods. For underground mining, access to mineralized zones will be by decline tunnels (See Volume 2; Project Description).

Ore will be processed at a mill located within the Goose Property Area. Ore from Goose Property Area and George Property Area will be processed at this one location while waste rock will be stored in designated storage areas on the surface or backfilled in mine workings at both properties.

Ice and open water airstrips and aprons will be used during site preparation, construction and closure. At the onset of site preparation activities, an all-weather airstrip and apron capable of servicing passenger aircraft will be constructed at the Goose Property Area and the George Property Area. During winter, larger airstrips will be constructed on an adjacent lake at George Property Area and on Bathurst Inlet at the Marine Laydown Area.

Helicopters are used, and will continue to be used, within the Project area to support exploration activities, provide linkages between the camps, and between each property and Bathurst Inlet.

3.3.1 Open Pit and Surface Equipment

The major open pit mining equipment requirements for the modelled years are indicated in Table 3.3-1. The mining fleet has an estimated maximum capacity of 50,000 tpd total material. The equipment in the fleet will vary during underground operations based on production schedule, haulage distances and mineralized zones in operation.

Table 3.3-1. Estimate of Major Open Pit Equipment Requirements Used in Noise Model

Type of Equipment	Goose Property Year 3 Umwelt, Llama, and Goose Main	George Property Year 7 L1, L2, and LCP North Pits
Haul Truck CAT-785D	5	5
Haul Truck CAT-777G	9	9
Front end loaders CAT 993K	3	3
Rubber Tyre Dozers CAT 824 H	2	2
Bulldozers CAT D-10	5	4
Motor Graders CAT 16M	3	2
Vertical Drill Rig MD 6240 (rotary)	3	2
Vertical Drill Rig MD 5125 (Track)	2	2
Mechanics Truck	1	1
School bus	1	1

Table 3.3-1 also includes details of the fleet of surface equipment required at both sites to move rock from the stockpiles to the crusher, move people and freight about the site, maintain roads and remove snow. This equipment will also be used to maintain and build access roads, and to meet various site facility requirements (including stockpile maintenance, and further exploration development).

3.3.2 Underground Mine Equipment

Table 3.3-2 lists the initial underground mobile equipment fleet selected for the current mine plan, as available at the time of undertaking the noise modelling (June 2013). As for the open pit equipment, the equipment in the fleet will vary during underground operations based on production schedule, haulage distances and mineralized zones in operation.

Table 3.3-2. Estimate of Major Underground Mobile Equipment Requirements

Drilling Equipment	Quantity	Service Vehicles	Quantity
2 Boom Jumbo	4	Grader	1
Rockbolter	4	ANFO Loader	2
Cablebolter	1	Boom Truck	1
LH Production Drill	2	Flat Deck Truck	1
Secondary Breaking System	1	Mechanics Truck	1
Exploration Drill	2	Scissor Lift	2
Loading and Hauling Equipment	**Quantity**	Personnel Carrier	3
LHD, 5.4 m^3 (10 t)	3	Supervisor/Engineering Vehicle	3
LHD, 3.5 m3 (6.7 t)	1	Electrician Vehicle - Scissor Lift	1
LHD, 2.0 m3 (3.5 t)	1	Shotcrete System	1
Haulage Truck, 40 t	5	Forklift/Tractor	2

3.3.3 Hours of Operation

The mine is designed to operate 24 hours per day, 365 days per year. The mine will operate on two 12-hour daily shifts for most of the operating activities. Construction will also be undertaken 24 hours a day, 365 days a year with two 12-hour daily shifts.

3.3.4 Road Transportation

Transportation of fuel and supplies during the winter will occur via ice roads from the MLA to both the George and Goose Property Areas.

The following traffic movements are expected for the winter road during the 75-day winter period trucking window:

- 42 trucks (95-tonne trucks), each making two trips per day, totalling 84 truck trips per day for the transportation of material, equipment etc.; and
- 80 truck trips (5,000-litre fuel tankers) per day for the transportation of fuel.

3.4 ASSESSMENT INDICATORS AND THRESHOLDS

3.4.1 Noise

The following indicators\criteria were used for the noise modelling:

- effects on humans:
  - sleep disturbance;
  - interference with speech communication;
  - complaints;
  - high annoyance;
  - noise induced rattling;
  - noise induced hearing loss (NIHL);
  - cosmetic and structural damage to buildings from vibration; and
- effects on wildlife:
  - loss of wildlife habitat; and
  - disturbance to wildlife.

Details about these indicators\criteria and how they were used in the effects assessment can be found in Volume 4, Chapter 2. Table 3.4-1 provides the thresholds for each indicator that were used to compare the noise modelling results to. These thresholds were also used to characterize potential noise effects in the Noise Chapter (Volume 4, Chapter 2). All of these indicators are for off-site receptors except for sleep disturbance, where on-site mine camps have been assessed with the assumption that windows would be closed.

3.4.2 Vibration Criteria

The sensitivity of a building or structure to vibration will depend on the building itself, for example, the age and construction materials. The German standard DIN 4150 Part 3 (German Standard Organization 1970) provides vibration velocity guidelines for use in evaluating the effect of vibration on building structure. These guidelines are considered to be safe limits up to which no damage due to vibration effects have been observed (Table 3.4-2).

Table 3.4-1. Noise Indicators and Thresholds

Indicator		Description	Threshold
Human Receptors			
Sleep disturbance	L_n	Night-time noise level for assessing sleep disturbance outside the Project boundary	45 dBA
		Night-time noise level for assessing sleep disturbance inside the Project boundary (i.e., windows closed)	60 dBA
	L_{AE}	Noise level for assessing sleep disturbance outside the Project boundary	90 dBA
		Noise levels for assessing sleep disturbance inside the Project boundary (i.e., windows closed)	120 dBA
	L_{peak}	Peak sound pressure level for assessing human sensitivity to impulsive blasting noise	120 dB
	L_{AFmax}	Sleep disturbance level (internal) not to be exceeded more than 10-15 times per night	45 dBA
Interference with speech communication	L_d	Day-time noise level for assessing speech interference	55 dBA
Complaints	L_{dn}	Assessing the likelihood of complaints	62 dBA
		Legal action / Project noise mitigation required	75 dBA
High annoyance	Δ %HA	Increase in % HA metric before and after Project initiation	6.5%
	LLF	Assessing low frequency noise annoyance: sum of low frequency energy content > 65 dB and C-weighted L_{dn} exceeds A-weighted L_{dn} by 10 dB	65 dB
Noise induced rattling	LLF	Using the sum of low frequency energy content to assess the likelihood of noise-induced rattling	70 dB
Wildlife Receptors			
Loss of wildlife habitat	L_n	Night-time noise level for assessing wildlife habitat loss	45 dBA
Disturbance to wildlife	L_{AE}	Sound exposure level for assessing wildlife sensitivity to helicopter noise (ringed seal and marine birds)	70 dBA
		Sound exposure level for assessing wildlife sensitivity to helicopter noise (all other wildlife)	80 dBA
	L_{peak}	Peak sound pressure level for assessing wildlife sensitivity to impulsive blasting noise (disturbed habitat)	108 dB
		Peak sound pressure level for assessing wildlife sensitivity to impulsive blasting noise (functional habitat loss)	120 dB

Table 3.4-2. Vibration Description and Thresholds for Building Structures

Type of Structure	Threshold Value for Velocity (mm/s)
Buildings used for commercial purposes, industrial buildings and buildings of similar design	10
Dwellings and buildings of similar design and/or occupancy	5
Structures that, because of their particular sensitivity to vibration, cannot be classified under types 1 or 2 and are of great intrinsic value, e.g., listed buildings under preservation order	2.5

3.5 MODEL ASSUMPTIONS

3.5.1 Assessment Scenarios

The following scenarios were modelled to quantify potential operational, construction and aviation noise levels across the LSA.

- **Scenario 1** - representative of operational and construction noise within the George Property Area occurring at Year 3 during the Project life;
- **Scenario 2** - representative of operational and construction noise within the Goose Property Area occurring at Year 7 during the Project life;
- **Scenario 3** - representative of combined aviation operations from fixed wing aircraft using the permanent airstrips at the George Property Area and Goose Property Area;
- **Scenario 4** – representative of helicopter operations between the George Property Area and Goose Property Area;
- **Scenario 5** - representative of blasting activities (Year 3 for the Goose Property Area and Year 7 for the George Property Area); and
- **Scenario 6** – representative of winter road transportation (Year 3 for the Goose Property Area and Year 7 for the George Property Area).

Scenarios 1 and 2 offer a representative snap shot of mining and processing operations and construction activities. Scenarios 3 to 6 offer a representative snap shot of aviation operations and blasting impacts at, and between, each of the PDA's.

3.5.2 Source Term Data

The noise source term data (spectral data and overall dBA values) adopted for this model are presented in Appendix 1 and are as provided by the manufacturer or from the Rescan noise database.

3.6 MODELLING COMPONENTS

3.6.1 Operation and Construction Noise Modelling

Bruel and Kjaer noise modelling software package, Predictor V9.01 was utilised to calculate noise levels using the ISO 9613-2:1996 (ISO 1996) noise propagation algorithms. The Predictor software package allows topographic details to be combined with ground regions, water, grass, significant building structures etc. and project-specific assessment locations (sensitive receptors) to create a detailed and accurate representation of the site and surrounding area. Noise emission sources deemed representative of operating conditions under each scenario were placed at relevant locations within the site area. Site terrain was taken into account and modelled using available topographical data and maps.

ISO 9613 describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (as described in ISO 1996) and has been used to predict noise transmission from mining operations.

The noise model allowed quantification of noise levels from multiple sources, based on noise emission levels representative of the plant and equipment to be used for the Project. The model computed the noise propagation in the Project area of influence, providing overall A-weighted noise levels at identified sensitive receptors. It has been conservatively assumed that modelled sources will be operating concurrently on a 24-hour basis.

3.6.2 Aviation Noise Modelling

The US Federal Aviation Administration (FAA) Integrated Noise Model (INM) version 7.0d (FAA 2013) was used to calculate flight profiles and noise emission levels based on the following main forms of data:

- Runway geometry;
- Aircraft types;
- Aircraft performance data;
- Aircraft numbers during the operating phase;
- Flight tracks (or routes); and
- Meteorological data.

The INM was developed in the USA, and is maintained with an up to date database of aircraft performance and noise data. Version 7.0d has such data for 157 types of commercial aircraft, 115 military aircraft and 26 helicopters. The model is not solely a noise model. As well as predicting noise levels, the INM computes 3-dimensional flight paths, based on the 2-dimensional flight "track" and the vertical flight profile that it computes from individual aircraft thrust and flap settings, aircraft air speed, and headwind data specific to each aircraft operation that the user defines. INM implements the following standards:

- SAE-AIR-1845;
- SAE-AIR-5662;
- SAE-ARP-866A;
- ECAC Doc 29; and
- ICAO Circular 205.

For this study the necessary aircraft performance data was available in the INM databases. Only three types of aircraft are expected to use the two airstrips routinely as follows (Table 3.6-1):

Table 3.6-1. Aircraft Types

Aircraft Type	Description	Daily Arrivals/Departures[1]	Airstrip
Dash 8 (DHC8)	Large twin turboprop fixed-wing aircraft	3 / 3	Goose
Twin Otter (DHC6)	Small twin turboprop fixed-wing aircraft	3 / 3	George
Bell 206 Jet Ranger	11 m rotor diameter turboshaft helicopter (modeled as a B206 Long Ranger)	1 / 1	Goose and George

[1] *The flight numbers are for typical days in the busiest period of production.*

The Back River 2006 to 2012 Meteorology Baseline Report notes the area is subject to high wind speeds due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains) (Rescan 2012c). Wind speeds in the Project areas are generally greater than 3 m/s and predominately from the north westerly quadrant and therefore, a runway headwind speed of 3 m/s has been assumed in the modelling. Wind direction is predominantly from the northwest quadrant and in the summer months are often from the Easterly quadrants, therefore, it has been assumed that fixed wing and helicopter flights could operate in either direction on both of the runways. Annual mean daily temperature was taken as 0°C and pressure as 760mmHg.

In the absence of routing information, all flights were assumed to approach and depart either airstrip on the extended runway centre line. Standard aircraft operating procedures were assumed, including a 3-degree approach slope for fixed wing aircraft and helicopters flying on visual flight rules to/from altitudes of 1,000 ft. A nominal route was assumed for helicopters flying at 1,000 ft directly between the Goose and George airstrips with helipads located at the centre of the runways.

3.6.3 Road Transportation Noise Modelling

Calculation of winter road transportation noise (L_{Aeq}) was determined using the US Environment Protection Agency's traffic noise model (Report 550/9-74-004; US EPA 1978). The US EPA's method for calculation of the L_{Aeq} noise levels from traffic is an internationally accepted theoretical traffic noise prediction model which takes into account the L_{Amax} vehicle noise level (light and heavy), receiver offset distance, passby duration, vehicle speed, ground absorption (based on the ratio of soft ground and average height of propagation), number of hourly vehicle movements, receiver height, truck exhaust height and the height and location of any intervening barriers.

3.6.4 Blasting

ANSI 12.9 2005 Part 4 was used to calculate the adjusted sound exposure from C-weighted sound exposure level. The results of the blasting calculations with reference to the Project locations and closest noise sensitive receptors, and noise levels are presented in tabular form, can be found in Section 4.4.

Noise levels from blasting has been calculated for six blast locations in the Goose Property and four blast locations at the George Property, representing each end of each open pit mining area (Table 3.6-2).

Table 3.6-2. Blast Locations and Input Data

PDA	Description	X (m)[1]	Y (m)[1]	Charge Weight TNT (kg)[2]	Blast Hole Depth (m)
Goose	Llama Pit (open) North	428625	7272396	320	15
	Llama Pit (open) South	428994	7272024	320	15
	Umwelt Pit (open) North	429661	7271111	296	4.5
	Umwelt Pit (open) South	430024	7270636	296	4.5
	Main Pit (open) West	433730	7269721	187	10
	Main Pit (open) East	434471	7269477	187	10
George	LCP North Pit	386130	7317033	427	10
	Locale1 Pit	387152	7313828	320	15
	Locale 2 Pit North	387874	7313059	274	15
	Locale 2 Pit South	388265	7312606	274	15

[1] *Geographic reference UTM 13N*
[2] *ANSI S12.17 – 1996 requires explosive mass to be a TNT equivalent*

3.6.4.1 Peak Sound Pressure Levels

Peak sound pressure levels (L_{peak}) were used to assess Wildlife effects. Airblast overpressure levels (L_{peak}) have been predicted using the methodology outlined in the *ICI Blasting Guide* (ICI 1995) as follows.

$$\text{Airblast OP (dB)} = 165.3 - 24\log_{10} SD$$

Where Scaled distance (SD)

$$SD = \frac{d}{\sqrt[3]{MIC}}$$

d = distance in metres between the charge (blast location) and receptor
MIC is the maximum explosive charge mass (kilograms) detonated per delay

3.6.4.2 Vibration

Based on the size of the blast charges, the proximity of relevant receptors to the blast sites and experience from similar projects, it is not anticipated that there will be any impacts from Project-generated vibrations. As such, the potential impact of the Project on vibration is not included in this modelling study.

3.7 LIMITATIONS

For sound calculated using the ISO 9613 standard, the indicated accuracy is ± 3 dBA at source to receiver distances of up to 1,000 m and unknown at distances above 1,000 m. The noise modelling software is limited to calculate all sources within 10 km of a receiver point, as items at distances greater than 10 km would have no influence on the calculation.

The estimated sound power levels for mobile equipment are generally based on new, well-maintained equipment. Older pieces of mobile equipment would likely produce higher noise emissions. For individually modelled noise sources (fixed and mobile equipment and roads), the estimated accuracy of the sound power levels is ± 5 dBA.

Helicopter noise modelling assumes a nominal route between the two airstrips and a cruising altitude of 1,000 ft. The exact routing is not known, but deviations from that assumed would change noise levels on the ground. The aircraft noise model assumed flat ground, which is realistic at the airstrips. Local topography could change noise screening, but these effects are likely to be small when the aircraft are at altitude further from the airstrips.

4. Results

4. Results

This section presents the results of the noise modelling, with results presented for each of the scenarios. A full discussion of these results, quantification of potential effects and provision of necessary mitigation are included in the Noise and Vibration chapter (Volume 4, Chapter 2), the Wildlife chapters (Volume 5) and Human Health and Environmental Risk Assessment (Volume 8, Chapter 6).

4.1 MINING OPERATIONS

4.1.1 Human Receptors

As there are no known existing human receptors within 10 km of either the George Property Area or the Goose Property Area, the results of noise modelling on human health focus solely on the Project worker's camps. In line with current best practice the noise assessment for the worker's camps will consider the potential effects on sleep disturbance.

Calculated noise levels for each of the mining scenarios with respect to human receptors are presented in Table 4.1-1. Contour plots of predicted noise levels for Scenarios 1 and 2 are shown in Figures 4.1-1 and 4.1-2, respectively.

Table 4.1-1. Mining Operations Scenario 1 and 2: Human Receptors

Receptor	Calculated Noise Level (L_n)[1]	Limiting Criteria (L_n)[2]	Below Threshold?
George camp	57	60	Yes
Goose camp	61	60	No

[1] *All noise levels are external dBA re 2 x 10-5 Pa assuming a noise attenuation of 30 dBA to internal noise levels*
[2] *Night-time noise level for assessing sleep disturbance inside the Project boundary*

Table 4.1-1 shows that predicted noise levels meet the limiting criteria at George camp and exceed the criteria at Goose camp by 1 dBA. This exceedance is considered to be within a tolerable range and could be easily mitigated through building construction and design.

4.1.2 Wildlife Receptors

Calculated noise levels for each of the mining scenarios with respect to wildlife receptors are presented in Table 4.1-2 and Table 4.1-3. Contour plots of predicted noise levels for Scenarios 1 and 2 are shown in Figures 4.1-1 and 4.1-2, respectively. The noise modelling has assumed that operations are constant throughout the day and therefore L_d and L_n noise levels are predicted to be the same. L_n values are presented below as the L_n threshold is the most stringent.

Table 4.1-2. Mining Scenario 1 - George Property Area: Wildlife Receptors

Receptor	Calculated Noise Level (L_n)	Limiting Criteria (L_n)	Below Threshold?
Peregrine falcon nest	**48**	45	**No**
Rough-legged hawk nest	38	45	Yes
Waterbirds - Staging area	43	45	Yes
Active and productive fox den	**53**	45	**No**

Exceedances (if any) are highlighted in bold

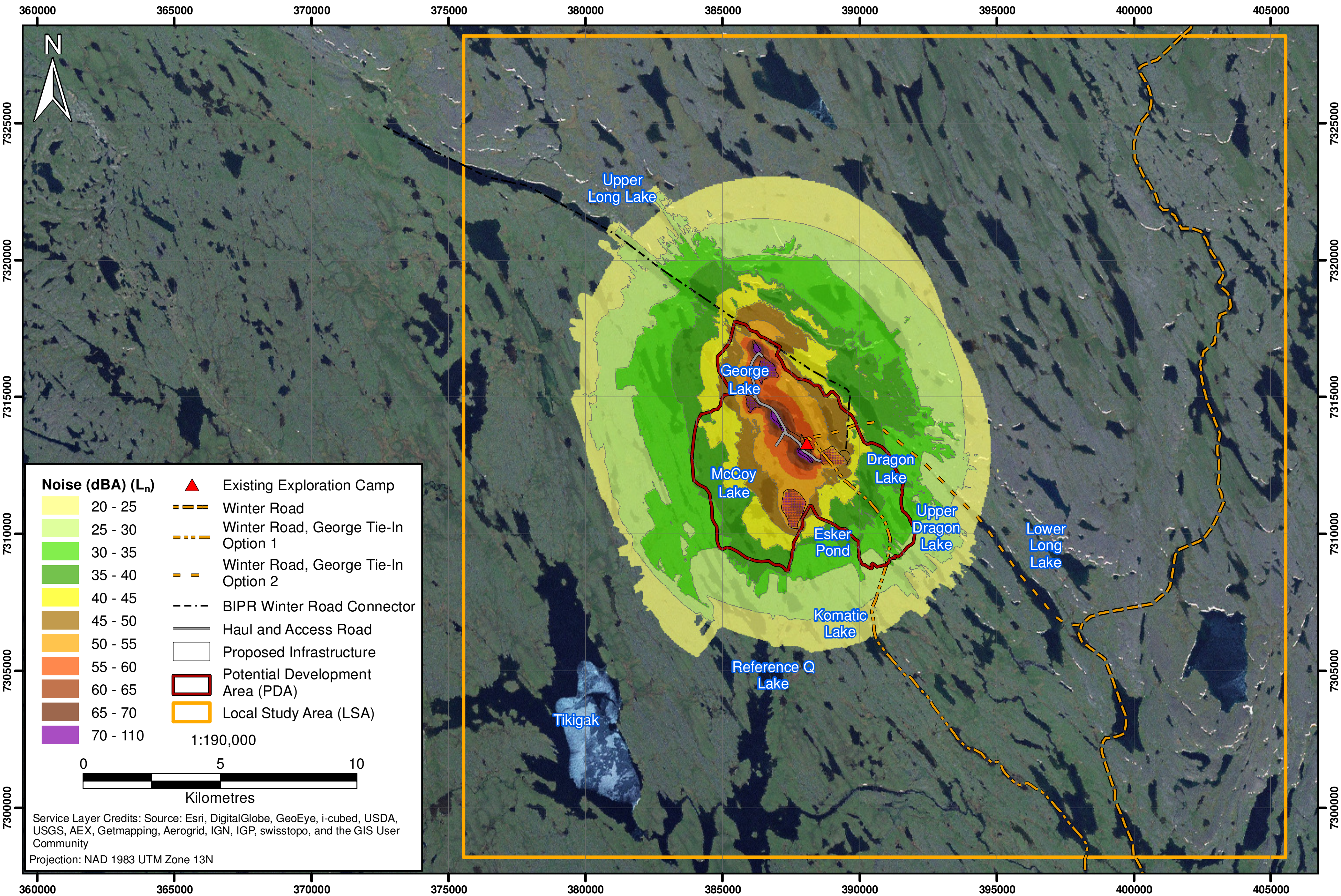

Figure 4.1-1

Sabina GOLD & SILVER CORP.

Predicted Night-time Noise (L_n) - Mining Operations George Property Area

Rescan an ERM company

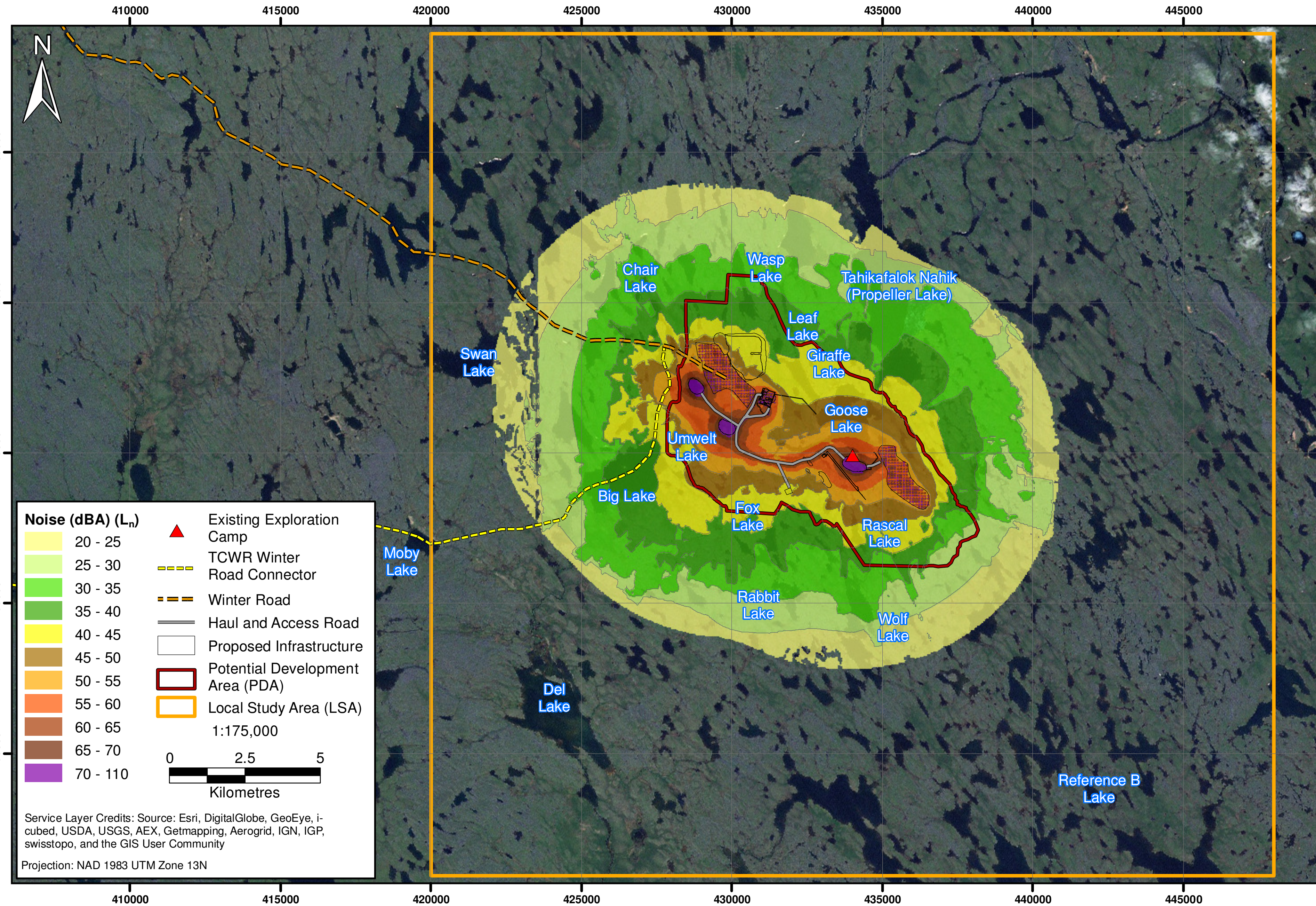

Figure 4.1-2

Predicted Night-time Noise (L_n) - Mining Operations
Goose Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

Table 4.1-3. Mining Scenario 2 – Goose Property Area: Wildlife Receptors

Receptor	Calculated Noise Level (L_n)	Limiting Criteria(L_n)	Below Threshold?
Caribou camera location BR28	<25	45	Yes
Gyrfalcon nest	**57**	45	**No**
Waterbirds - Staging area	31	45	Yes
Wolverine - Active den	**59**	45	**No**
Wolverine - Active den	23	45	Yes

Exceedances (if any) are highlighted in bold

Calculated noise levels associated with mining and construction operations are expected to comply with the criteria for all scenarios at the majority of Project-specific assessment locations (sensitive receptors), with the following exceptions:

- Peregrine falcon nest near proposed George camp (exceeds night time criteria by 3 dB);
- Active and productive fox den near proposed George camp (exceeds night time criteria by 8 dB);
- Gyrfalcon nest near proposed Goose camp in the Goose neck of Goose Lake (exceed night time criteria by 12 dB); and
- Active den in the Goose neck of Goose Lake (exceed night time criteria by 14 dB).

Further detailed discussion is included in the wildlife chapters of the DEIS (Volume 5, Chapters 5-10).

4.2 AVIATION OPERATIONS

4.2.1 Human Receptors

There will be about eight flights per day at the George and Goose airstrips[1] in the busiest period of production. For this reason, the noise modelling for aircraft operations is based on noise event levels (L_{AE}) rather than period averaged noise levels (L_n, L_d, etc.).

Calculated noise levels for each of the aviation scenarios with respect to human receptors are presented in Table 4.2-1. Contour plots of predicted noise levels for fixed wing and helicopter operations at the George PDA and Goose PDA are shown in Figures 4.2-1 to 4.2-4.

Table 4.2-1. Aviation Noise (Scenarios 3 and 4) Human Receptors

	Calculated Noise Level (L_{AE}) [1]			
Receptor	Fixed Wing	Helicopter	Limiting Criteria (L_{AE})	Below Threshold?
George camp	87	70	90	Yes
Goose camp	86	78	90	Yes

[1] All noise levels are external dBA re 2 x 10-5 Pa

Table 4.2-1 shows that aviation noise is not predicted to exceed the limiting criteria at either the proposed George or the Goose camps within the PDAs.

[1] Three aircraft and one helicopter flight per day at each area

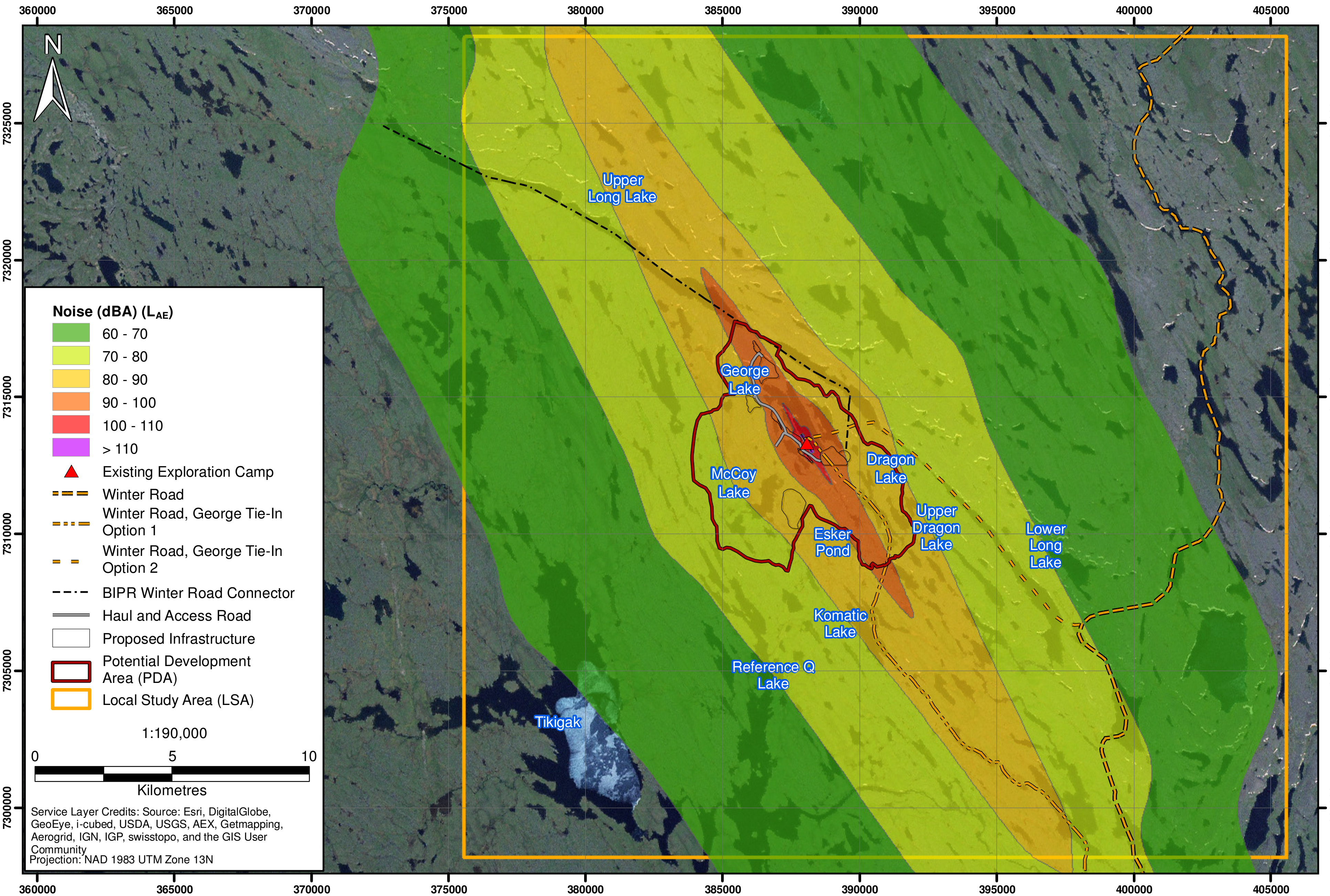

Figure 4.2-1

Predicted Noise Levels (L_{AE}) - Fixed Wing Aircraft
George Property Area

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Figure 4.2-1

PROJECT # 0194096-0040 GIS # BAC-12-036a October 31 2013

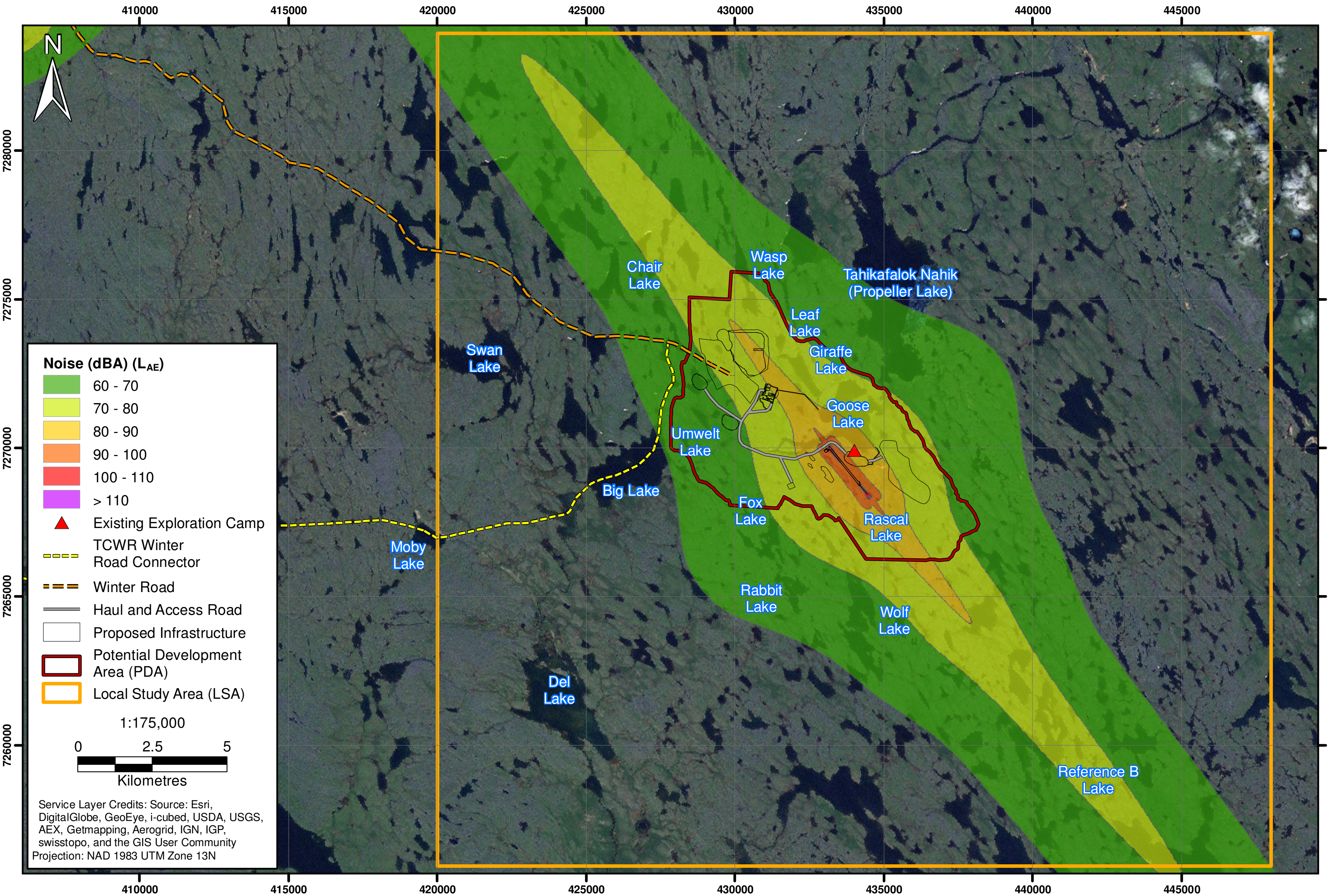

Figure 4.2-2

Sabina GOLD & SILVER CORP.

Predicted Noise Levels (L_{AE}) - Fixed Wing Aircraft
Goose Property Area

Figure 4.2-2

Rescan an ERM company

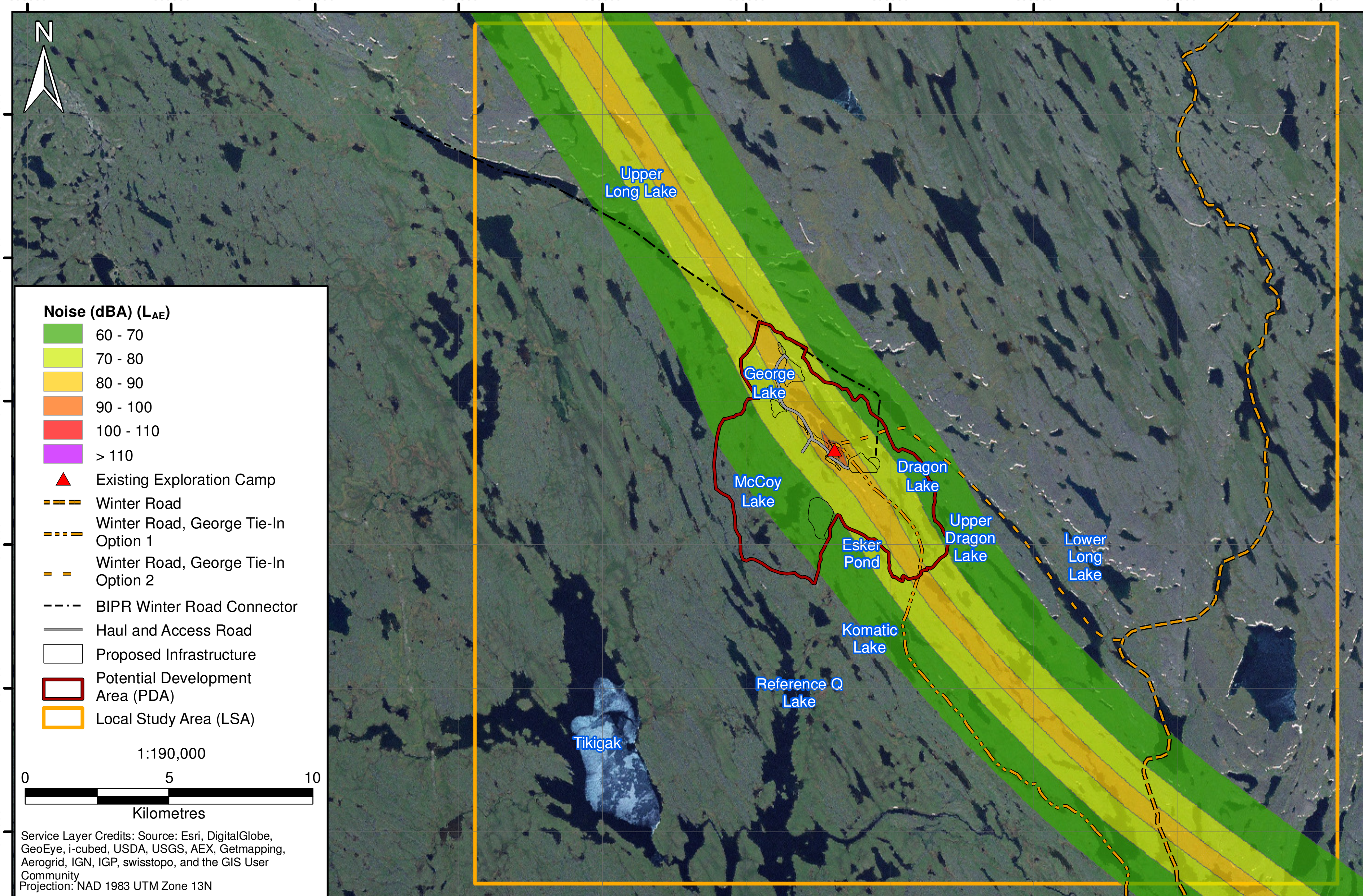

Figure 4.2-3

Predicted Noise Levels (L_{AE}) - Helicopters
George Property Area

Sabina GOLD & SILVER CORP.

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PROJECT # 0194096-0040 GIS # BAC-12-037a October 31 2013

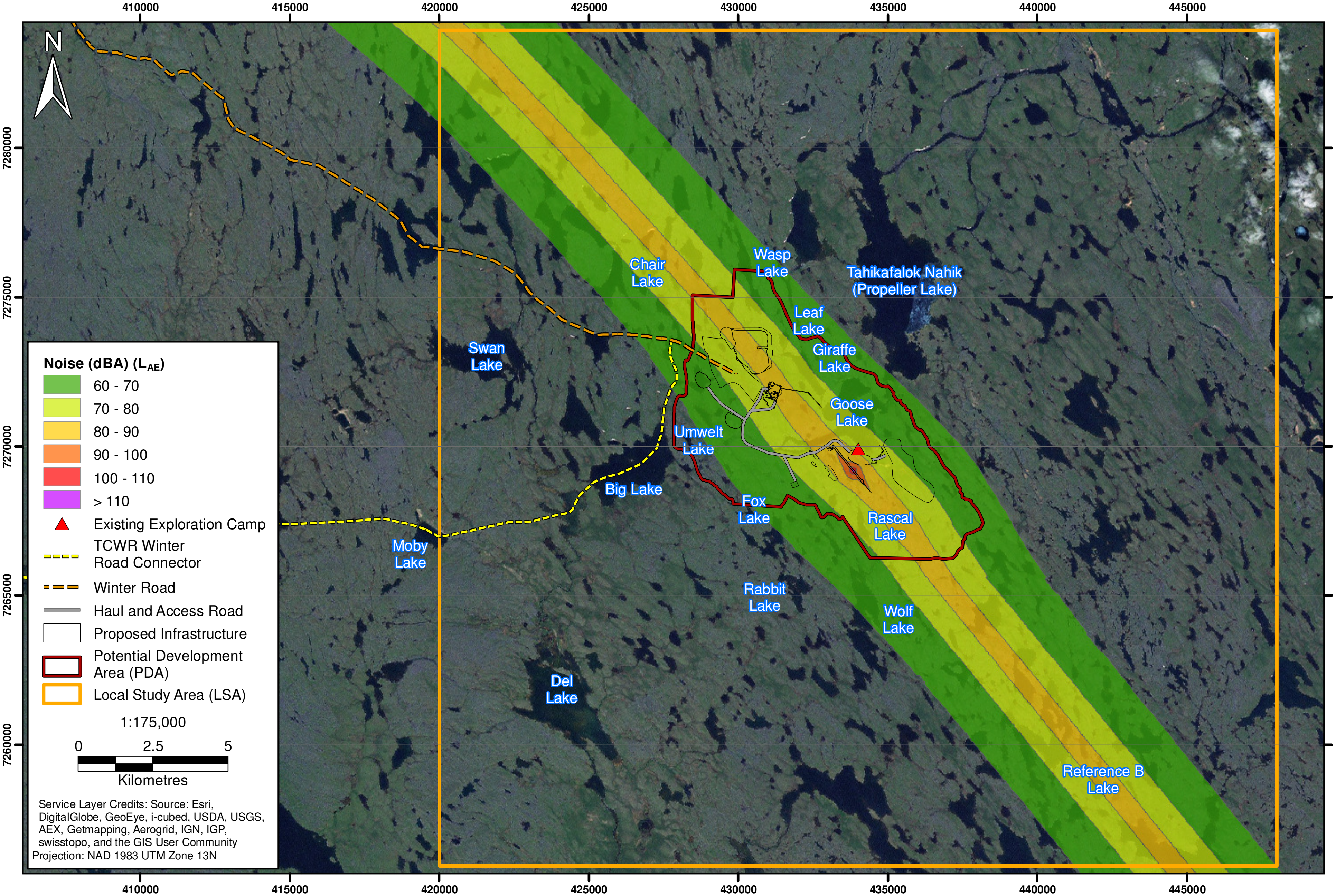

Figure 4.2-4

Sabina GOLD & SILVER CORP.

Predicted Noise Levels (L_{AE}) - Helicopters
Goose Property Area

Figure 4.2-4

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4.2.2 Wildlife Receptors

Calculated noise levels for each of the aviation scenarios with respect to wildlife receptors are presented in Table 4.2-2. Contour plots of predicted noise levels for fixed wing and helicopter operations are shown in Figures 4.2-1 to 4.2-4, respectively.

Table 4.2-2. Aviation Noise (Scenarios 3 and 4) Wildlife Receptors

Receptor	Calculated Noise Level (L_{AE})		Limiting Criteria (L_{AE})	Below Threshold?
	Fixed Wing	Helicopters		
Caribou crossing at Beechy Lake - caribou cam	37	35	85	Yes
Caribou camera location BR28	47	42		Yes
Caribou camera location BR4	54	39		Yes
Caribou camera location BR1	60	49		Yes
Caribou camera location BR2	54	39		Yes
Peregrine falcon nest	**101**	**87**		**No**
Gyrfalcon nest	74	71		Yes
Rough-legged hawk nest	77	58		Yes
Wolverine - Active den	73	70		Yes
Wolverine - Active den	60	53		Yes
Marine area near confluence of Western River	30	27		Yes
Waterbirds - Staging area	80	61		Yes
Active and productive wolf den	42	34		Yes
Active wolf den	39	34		Yes
Active and productive fox den	**87**	70		**No**
Waterbirds - Staging area	73	70		Yes

The noise modelling suggests that noise thresholds for wildlife disturbance (L_{AE} 85dB outside) will be exceeded at the following two wildlife receptors:

- active and productive fox den near the proposed George camp; and
- peregrine falcon nest near the proposed George camp.

The highest noise level are at wildlife receptors closest to the airstrips. Potential effects from helicopters en-route are lower, as there are no receptors close to the route helicopters are assumed to fly directly between the two camps. Further information is provided in the wildlife chapters of the DEIS (Volume 5, Chapter 5 – 10).

4.3 WINTER ROAD TRANSPORTATION

A generic calculation of road traffic noise has been undertaken to provide indicative offset buffers or avoidance buffers when considering the proximity of roads to wildlife receptors.

Based on the US EPA traffic noise model (US EPA 1978) and expected Project transportation requirements the winter roads would need to be a minimum of 200 metres from a wildlife receptor to meet the most stringent night time criteria of 45 dBA. Further information is provided in the wildlife chapters of the DEIS (Volume 5, Chapter 5 – 10).

4.4 BLASTING NOISE

4.4.1 Human Receptors

Calculated noise levels from blasting operations with respect to human receptors are presented in Table 4.4-1. Contour plots noise levels from blasting are shown in Figure 4.4-1.

Table 4.4-1. Blasting Noise: Human Receptors

Location	Predicted Noise Level, dBL_{peak}			
	LCP North Pit	Locale1 Pit	Locale 2 Pit N	Locale 2 Pit S
Charge Weight (kg TNT)	427	320	274	274
Receptor				
Proposed George camp	96	78	108	110
Proposed Goose camp	71	72	70	71

Location	Predicted Noise Level, dB					
	Llama Pit (open) N	Llama Pit (open) S	Umwelt Pit (open) N	Umwelt Pit (open) S	Main Pit (open) West	Main Pit (open) East
Charge Weight (kg TNT)	321	321	296	296	187	187
Receptor						
Proposed George camp	72	71	71	71	72	69
Proposed Goose Camp	104	106	108	107	85	97

Table 4.4-1 shows that predicted external noise levels from blasting exceed the sleep disturbance limit of 45 dBA at both the George Property Area and the Goose Property Area proposed camp locations. Noise levels within the camp will be reduced by at least 30 dBA which removes the majority of the predicted exceedances, although some still remain. However, this limit needs to be exceeded 10-15 times to result in sleep disturbance and blasts are expected to occur less frequently than this.

4.4.2 Wildlife Receptors

Calculated peak noise levels (L_{peak}) from blasting operations in each of the PDA with respect to wildlife receptors are presented in Table 4.4-2 and Table 4.4-3. Contour plots of noise levels from blasting at the George and Goose Property Areas are shown in Figures 4.4-1 and 4.4-2, respectively.

Table 4.4-2. Blasting Noise: Wildlife Receptors at George Property Area

George Property Area Location	Predicted Peak Noise Level, dB			
	LCP North Pit	Locale1 Pit	Locale 2 Pit N	Locale 2 Pit S
Charge Weight (kg TNT)	427	320	274	274
Receptor	dB LCE	dB LCE	dB LCE	dB LCE
Active and productive wolf den	48	39	38	38
Active wolf den	38	29	27	27
Active and productive fox den	70	40	73	76
Wolverine - Active den	40	33	30	30
Wolverine - Active den	40	33	29	29
Caribou crossing	36	32	24	25

(continued)

Table 4.4-2. Blasting Noise: Wildlife Receptors at George Property Area (completed)

George Property Area Location	Predicted Peak Noise Level, dB			
	LCP North Pit	Locale1 Pit	Locale 2 Pit N	Locale 2 Pit S
Caribou camera location BR28	40	35	29	29
Caribou camera location BR4	56	38	44	43
Caribou camera location BR1	58	38	43	43
Caribou camera location BR2	56	39	45	45
Peregrine falcon nest	72	40	80	89
Gyrfalcon nest	40	33	30	30
Rough-legged hawk nest	70	40	63	64
Marine area near confluence of Western River	44	38	32	32
Waterbirds - Staging area	72	40	69	68
Waterbirds - Staging area	39	32	28	29

Predicted peak noise levels from blasting do not exceed the threshold of 108 dB at any of the identified wildlife receptor locations. Figure 4.4-1 shows the area of predicted exceedance of the 108 dB and 120 dB thresholds associated with blasting. Further information is provided in the wildlife chapters of the DEIS (Volume 5, Chapter 5 – 10).

Table 4.4-3. Blasting Noise: Wildlife Receptors at Goose Property Area

Goose Property Area Location	Predicted Peak Noise Level, dB					
	Llama Pit (open) N	Llama Pit (open) S	Umwelt Pit (open) N	Umwelt Pit (open) S	Main Pit (open) West	Main Pit (open) East
Charge Weight (kg TNT)	321	321	296	296	187	187
Receptor	dB LCE	dB LCE	dB LCE	dB LCE	dB LCE	dB LCE
Active and productive wolf den	34	34	49	49	52	35
Active wolf den	40	40	55	55	62	44
Active and productive fox den	33	32	47	47	54	33
Wolverine - Active den	68	70	91	96	71	70
Wolverine - Active den	56	56	73	74	71	62
Caribou crossing at Beechy Lake - caribou cam	38	38	53	53	71	41
Caribou camera location BR28	50	50	65	65	67	51
Caribou camera location BR4	29	29	44	43	50	30
Caribou camera location BR1	28	28	43	43	51	29
Caribou camera location BR2	31	31	46	46	51	32
Peregrine falcon nest	32	32	47	47	54	33
Gyrfalcon nest	67	69	90	94	71	71
Rough-legged hawk nest	32	32	47	47	55	33
Marine area near confluence of Western River	26	26	40	40	59	27
Waterbirds - Staging area	32	32	46	46	54	33
Waterbirds - Staging area	55	56	73	74	71	69

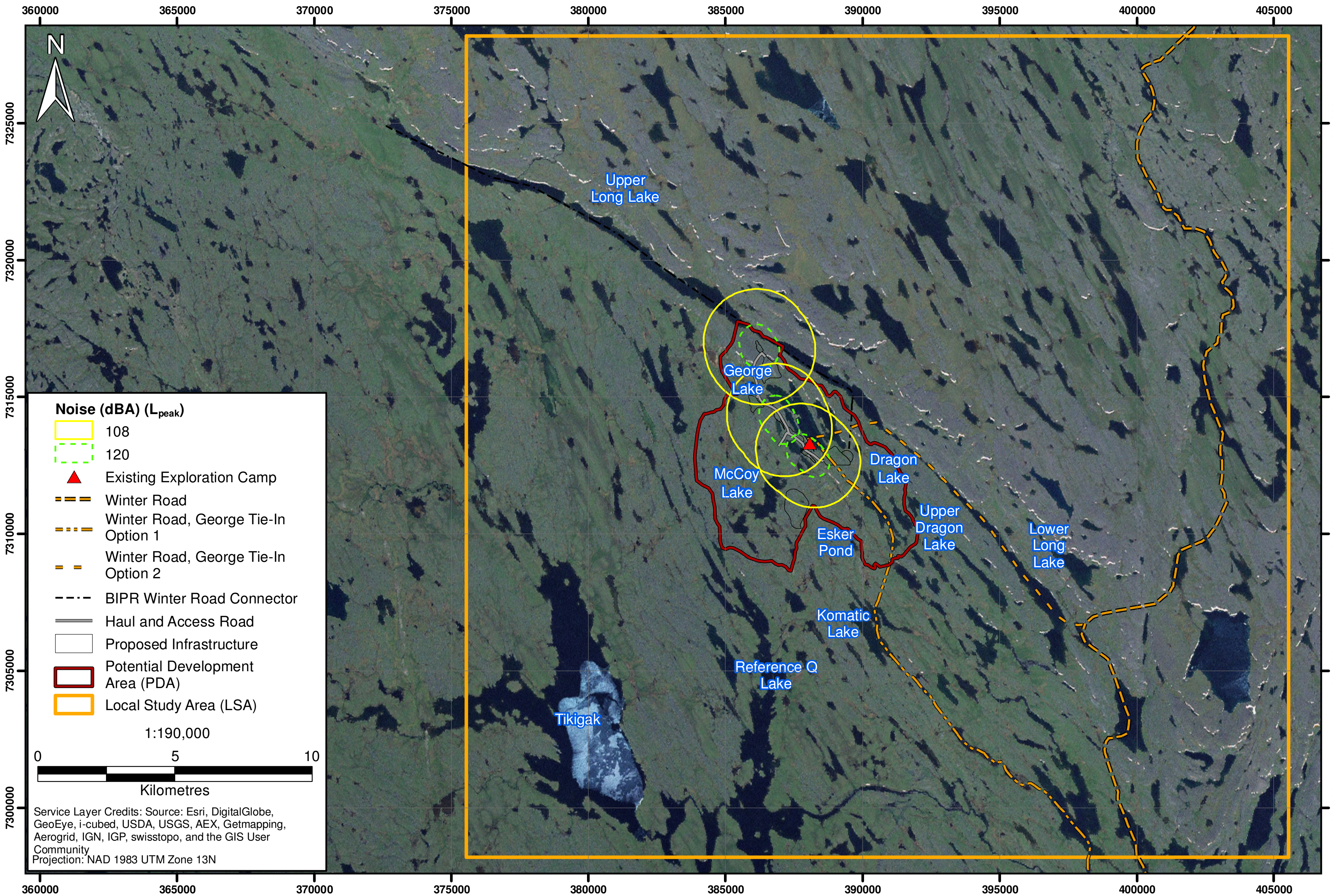

Figure 4.4-1

Sabina GOLD & SILVER CORP.

Predicted Noise Levels (L_{peak}) - Blasting George Property Area

Figure 4.4-1

Rescan an ERM company

PROJECT # 0194096-0040 GIS # BAC-12-038a October 31 2013

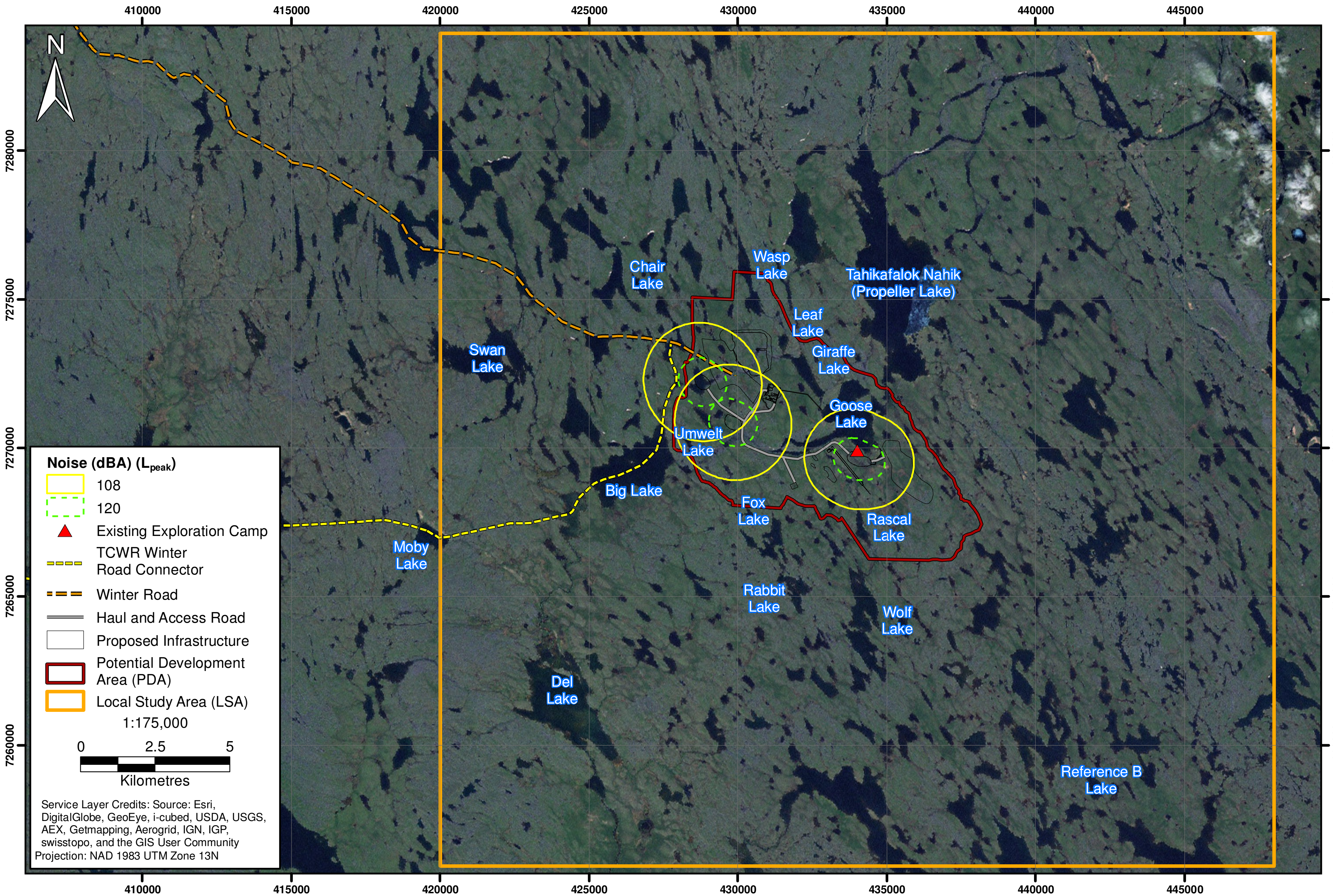

Figure 4.4-2

Sabina GOLD & SILVER CORP.

Predicted Noise Levels (L_{peak}) - Blasting Goose Property Area

Figure 4.4-2

Rescan an ERM company

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Appendix 1

Source Term Data

Table A1-1. Source Term Data – Mobile Equipment

Item	Lw 1/1 Octave Band Value, dBA										dBA
	31.5	63	125	250	500	1k	2k	4k	8k	16K	
Haul Truck CAT-785D	74	91	106	111	116	114	111	105	96	81	120
Haul Truck CAT-777G	78	91	101	106	112	113	113	107	99	85	118
Front end loader CAT 993K	79	91	96	103	106	105	104	99	88	73	111
Rubber Tyre Dozers CAT 824 H	72	90	99	99	104	105	105	101	91	22	111
Bulldozer CAT D-10 (Push+Rev)	81	89	95	104	116	112	114	105	91	76	119
Graders CAT 16M	67	81	101	100	106	106	106	100	92	81	112
Drill Rig MD 6240 (rotary)	67	90	101	104	110	111	111	105	97	87	116
Drill Rig MD 5125 (Track)	67	82	98	106	108	108	109	101	91	76	114

Table A1-2. Source Term Data – Fixed Plant

Item	Lw 1/1 Octave Band Value, dBA										dBA
	31.5	63	125	250	500	1k	2k	4k	8k	16K	
Processing Plant	72	89	97	106	114	115	114	110	102	--	120
Crushing Plant	56	88	93	98	106	107	108	106	99	--	113
Jaw Crusher	82	99	108	116	118	120	118	113	105	--	124
Jaw Crusher (full steel enclosure)	74	87	87	98	93	90	84	75	69	--	100
Jaw Crusher (partial enclosed)	74	87	94	105	100	97	91	82	76	--	107
Pumps, Fans, Compressors	78	97	104	104	106	107	104	97	88	--	113
Winder, cage, motor and gearbox	74	87	98	112	110	112	108	102	96	--	117

Appendix V4-3A

2006 to 2012 Meteorological Baseline Report

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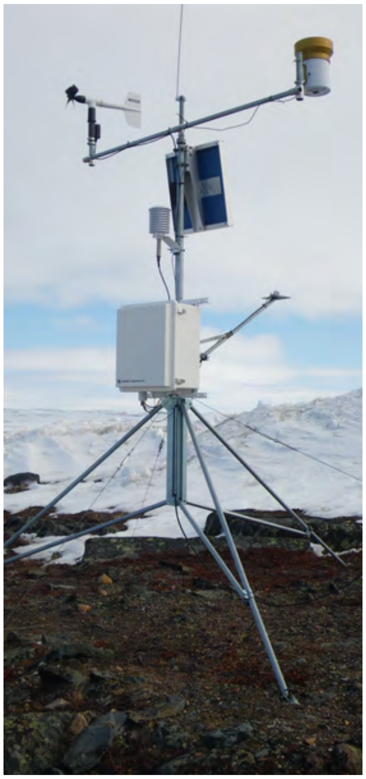
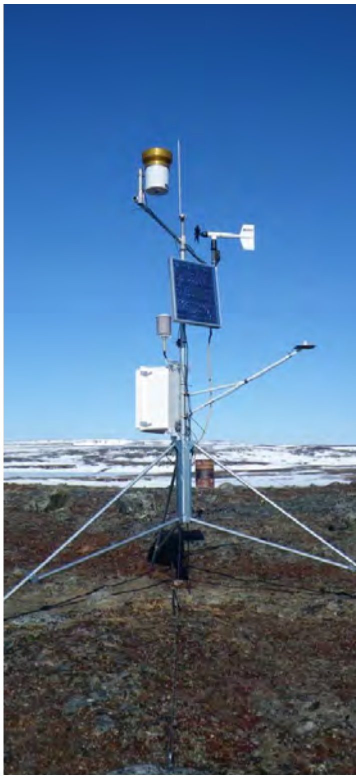
BACK RIVER PROJECT
2006 to 2012 Meteorology Baseline Report





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Rescan™ Engineers & Scientists

November 2012

BACK RIVER PROJECT
2006 TO 2012 METEOROLOGY BASELINE REPORT

November 2012
Project #0833-002-08

Citation:
Rescan. 2012. *Back River Project: 2006 to 2012 Meteorology Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Engineers and Scientists

Executive Summary

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George properties in 2012.

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The last meteorology baseline report was completed in February 2012 and covered the period of January 1, 2006 to September 2011. This report presents the meteorological data from January 1, 2006 to September 2012. There is some overlap with data previously reported, but this allows full calendar years to be presented for a consistent time period at both meteorological stations.

Observations recorded at meteorological stations operating at the George and Goose properties during the period January 2006 to September 2012 indicate that the climate in the Project area is typical of the Arctic, and consists of a winter period (October to May) of snow and extremely cold mean monthly temperatures ranging from -33.0 to -1.3°C and a cool spring, summer and fall period (June to September) with mean monthly temperatures ranging from -0.3 to 14.5°C.

The precipitation gauges recorded summer rainfall (June through September). In addition, in March 2012 winter adapters were installed to allow for year-round precipitation data collection. Hence, in future years, total annual precipitation will be recorded at both stations. During the 2006 to 2012 monitoring period, summer rainfall ranged from 4 mm to 211 mm. Summer rainfall for the months with available data is generally similar to data from the regional stations for the same period. Therefore, annual precipitation at the George and Goose meteorological stations can be inferred from the regional station data.

Based on data from regional meteorological stations, total annual precipitation ranged from a low of 125.2 mm in 2009 to a high of 344.2 mm in 2007 mm during the 2006 to 2012 period. Compared to climate normal total annual precipitation, which ranges from 249 mm to 299 mm, total annual precipitation at the regional stations was lower in 2006, 2008, 2009, 2010, 2011 and 2012 and higher in 2007, suggesting that the 2006 to 2012 period was generally drier than the climate normals. At the Kugluktuk A regional climate station, the majority of the precipitation (66%) occurred during the spring, summer and fall months. Climate normal data indicate that 53 to 60% of total precipitation fell during the spring, summer and fall months, suggesting that a slightly greater proportion of the total annual precipitation was falling during these seasons during the 2006 to 2012 period. The discrepancy between climate normal and the period reported could be from sample size differences or changes in seasonal variation.

The Back River Project area lies near the northern reaches of the North American continent. As such, it is primarily subject to cold, dry Arctic air masses and American continental air masses from the south. The area is subject to high wind speeds due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains). In the Project area wind speeds are generally greater than 3 m/s and predominately from the north westerly quadrant.

Solar radiation is monitored at both the George and Goose meteorological stations. Summer is a season of nearly perpetual sunlight, while winter is dominated by night, twilight and extreme cold. Generally there is an energy deficit during winter months (October through May) and an energy surplus during summer months (June through September).

Lake evaporation was calculated using data from the Goose Lake micro-met station installed in July 2012. Total evaporation values in the Back River Project area from July 7 to September 15, 2012 were estimated to be 129.7 and 134.0 mm based on total monthly evaporation values calculated using the Penman Combination and Priestly-Taylor methods, respectively. The data is consistent with other Arctic evaporation studies.

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2006 TO 2012 METEOROLOGY BASELINE REPORT

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Glossary and Abbreviations

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.

GLOSSARY

Bright Sunshine Hour	An hour when the average global solar radiation is greater than 120 W/m^2.
Climate Normal	The arithmetic average of a climate element such as temperature over a prescribed 30-year interval.
Extraterrestrial Solar Radiation	The solar radiation incident on top of the terrestrial atmosphere.
Energy Deficit	Total solar radiation absorbed from the Earth's surface is less than the heat radiated back out to space.
Energy Surplus	Total solar radiation absorbed from the Earth's surface is greater than the heat radiated back out to space.
Global Solar Radiation	Total incoming direct and diffuse short-wave solar radiation received from the whole dome of the sky on a horizontal surface.
Precipitation	Liquid or solid products of the condensation of water vapour falling from the clouds which include rain, hail, snow, dew, rime hoar frost, and mist precipitation.
Pyranometer	A device used for measuring global solar radiation.
Solar Radiation	The electromagnetic energy of the sun, of which 97% is confined to the spectral range 0.29 to 3.0 microns.
Tipping Bucket Rain Gauge (TBRG)	A device used to measure liquid precipitation. If retrofitted with an adapter it may also be used to measure solid precipitation.

ACRONYMS AND ABBREVIATIONS

EC	Environment Canada
masl	Metres Above Sea Level
MSC	Meteorological Services of Canada
The Project	Back River Project
SWE	Snow Water Equivalent
W/m^2	Watts per Square Metre
WMO	World Meteorological Organization

1. Introduction

Engineers and Scientists

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George properties in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- Meteorology
- Air Quality and Dust
- Noise
- Hydrology and Bathymetry
- Freshwater Water Quality, Sediment Quality, Aquatic Biology
- Freshwater Fish and Fish Habitat
- Marine Water Quality, Sediment Quality, Aquatic Biology
- Marine Fish and Fish Habitat
- Wildlife (Terrestrial and Marine)
- Wildlife DNA Study (Grizzly Bear and Wolverine)
- Ecosystem Mapping
- Vegetation and Wetlands (including Rare Plants)
- Soils and Terrain
- Country Foods
- Archaeology
- Socio-economics
- Land Use
- Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the Marine Laydown Area. It was assumed that access from the Marine Laydown Area to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the meteorology portion of the 2012 baseline program, as well as results from the period 2006 to 2011. Chapter 2 of this report presents the methods, Chapter 3 presents the results, and Chapter 4 presents a summary of the 2012 data. All raw data collected are included as appendices to this report.

Figure 1-1

Back River Project Location

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2. Materials and Methods

2. Materials and Methods

Project specific meteorological baseline data collection commenced in August 2004 at the George and Goose Meteorological Stations within the Back River Project Area (Figure 2-1). These stations continued to be operational in 2012, and in addition, a micro-meteorology station (micro-met) was installed in Goose Lake on July 7, 2012 to gather data to calculate site specific evaporation rates.

Environment Canada – Meteorological Service of Canada (EC-MSC 2004) operates meteorological stations in the West Kitikmeot Region of Nunavut (Figure 2-2). The closest stations which are currently operating are Lupin CS and Kugluktuk A and CS meteorological stations. Data from these stations have also been presented in this report. The coordinates of the monitoring stations, as well as their location in the Project area, are given in Table 2-1 and shown in Figure 2-1.

This report presents the meteorological baseline data collected from January 2006 to September 2012 for the George meteorological station and from September 2006 to September 2012 for the Goose meteorological station. Data from August 2004 to August 2006 from both stations were reported in Golder 2006 and Golder 2007, and data from August 2004 to August 2008 for the George station were reported in Rescan 2008a and Rescan 2008b.

2.1 GEORGE AND GOOSE METEOROLOGICAL STATIONS

The site-specific meteorological monitoring program for the Project began in August 2004 with the commissioning of the George and Goose meteorological stations. The original sensors were installed on 3 metre tripods as shown in Plates 2.1-1 and 2.1-2. In March 2012, the sensors were installed on 10 metre towers as per guidelines prescribed by Environment Canada, which were set by the World Meteorological Organization (WMO 2008; Plates 2.1-3 and 2.1-4). The international standard for measuring surface wind speed is at a height of 10 m (EC-MSC 2004).

Previously, the stations were unable to measure precipitation as snowfall. In March 2012, a CS705 winter precipitation adapter was installed on both of the TE525 WS tipping bucket rain gauges (Plate 2.1-5). The CS705 uses antifreeze to convert snow to liquid water. The CS705 was removed from the tipping buckets in June 2012, and re-installed in September 2012.

The climatic variables monitored by the George and Goose meteorological stations are air temperature, precipitation as rainfall, precipitation as snowfall, solar radiation, wind speed and wind direction. Table 2.1-1 lists the sensors included on the George and Goose meteorological stations and the parameters monitored.

A Campbell Scientific CR1000-55 datalogger (Campbell Scientific, Inc., Logan, UT, USA) records all measurements and stores hourly and daily averages as well as daily minimum and maximum for all variables. Data are stored on a memory card in the datalogger that is retrieved periodically by Sabina or Rescan personnel. The most recent data were retrieved from George meteorological station on September 12, 2012 and from Goose meteorological station on September 15, 2012.

Table 2-1. Locations of Meteorological Stations in the Back River Project Area

Station Name	Station ID	UTM (mE)	UTM (mN)	Zone	Elevation (masl)	Approximate Distance from Back River Project Area	Meteorological Parameters Monitored	Data Period Available
Back River Project Stations								
George		388,206	7,313,156	13	355	Within Project area	Temperature, Rainfall, Wind Speed, Wind Direction, Global Radiation	Aug 2004 to Sept 2012
Goose		434,132	7,269,906	13	277	Within Project area	Temperature, Rainfall, Wind Speed, Wind Direction, Global Radiation	Aug 2004 to Sept 2012
Goose Lake Micro-met Station		433,994	7,270,087	13	270	Within Project area	Air Temperature, Water Temperature, Rainfall, Wind Speed, Wind Direction, Global Radiation	July 2012 to Sept 2012
Environment Canada Stations								
Lupin CS[a]	230N002	488,735	7,292,657	12	488	200 km west	Temperature, Dew Point Temperature, Total Precipitation, Relative Humidity, Wind Direction, Wind Speed, Barometric Pressure	1997-present
Lupin A[a]	23026HN	488,546	7,293,089	12	490	200 km west	Temperature, Dew Point Temperature, Total Precipitation, Relative Humidity, Wind Direction, Wind Speed, Barometric Pressure	1982-2006
Kugluktuk A[b]	2300902	578,198	7,523,598	11	22.6	400 km northwest	Temperature, Total Precipitation, Snow Depth, Relative Humidity, Wind Direction, Wind Speed, Barometric Pressure	2005-present
Kugluktuk CS[b]	2300904	578,559	7,523,670	11	22.6	400 km northwest	Temperature, Total Precipitation, Snow Depth, Relative Humidity, Wind Direction, Wind Speed, Barometric Pressure	1978-present

[a] EC-MSC has two meteorological stations located at Lupin. EC-MSC uses the Lupin CS meteorological station as the default station for presentation of hourly, monthly and yearly data from 2006 onwards. EC-MSC uses the Lupin A station for the calculation of climate normals.
[b] EC-MSC has two meteorological stations located at Kugluktuk. Both stations provide data verified by EC_MSC. Previous versions of this report have used Kugluktuk CS to calculate monthly values. This current version uses Kugluktuk A.

PROJECT #0833-002-08 GIS # BAC-12-010 November 06 2012

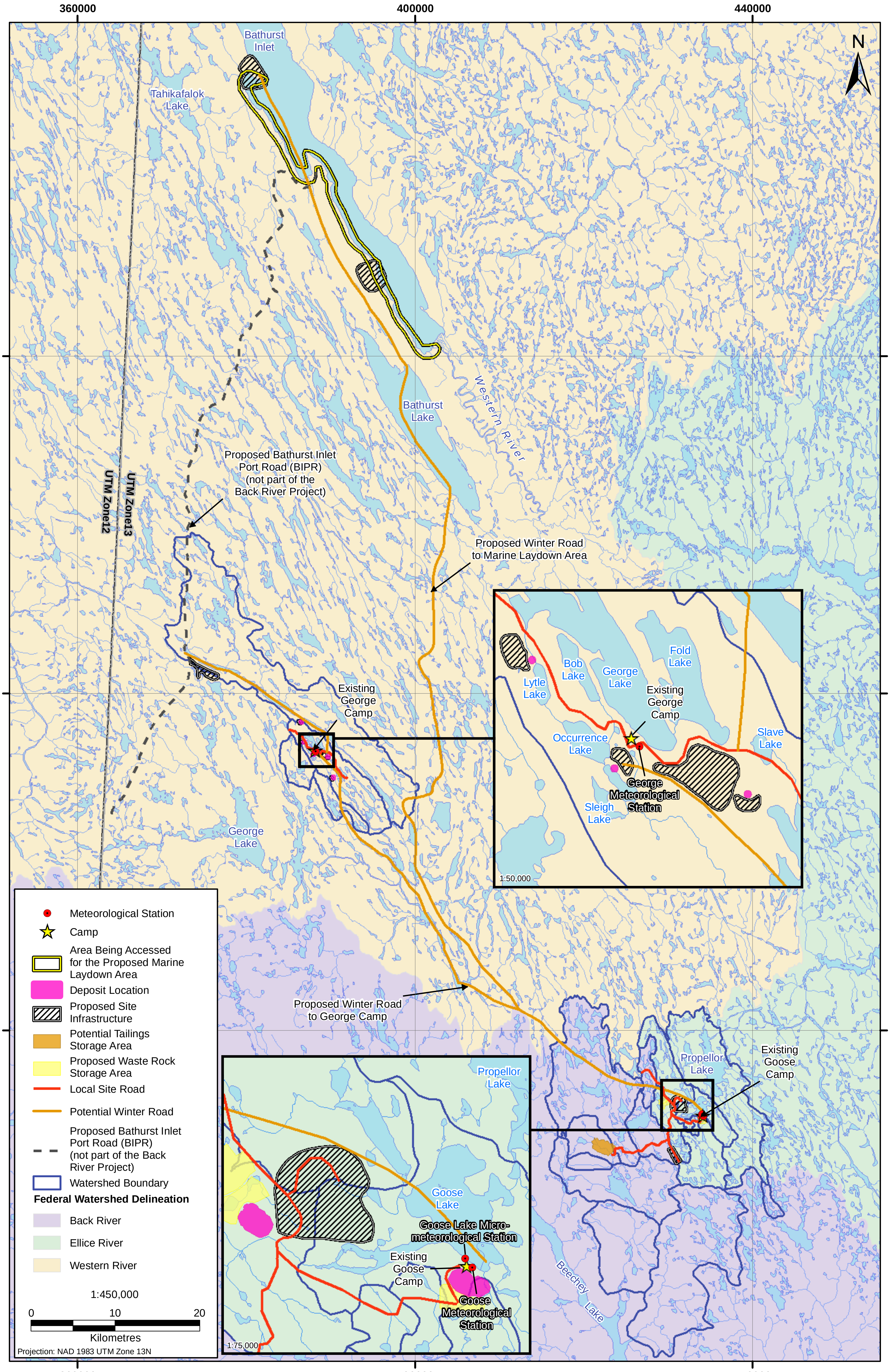

Figure 2-1

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Figure 2-1

Locations of the George, Goose and Goose Lake Meteorological Stations

Rescan Engineers & Scientists

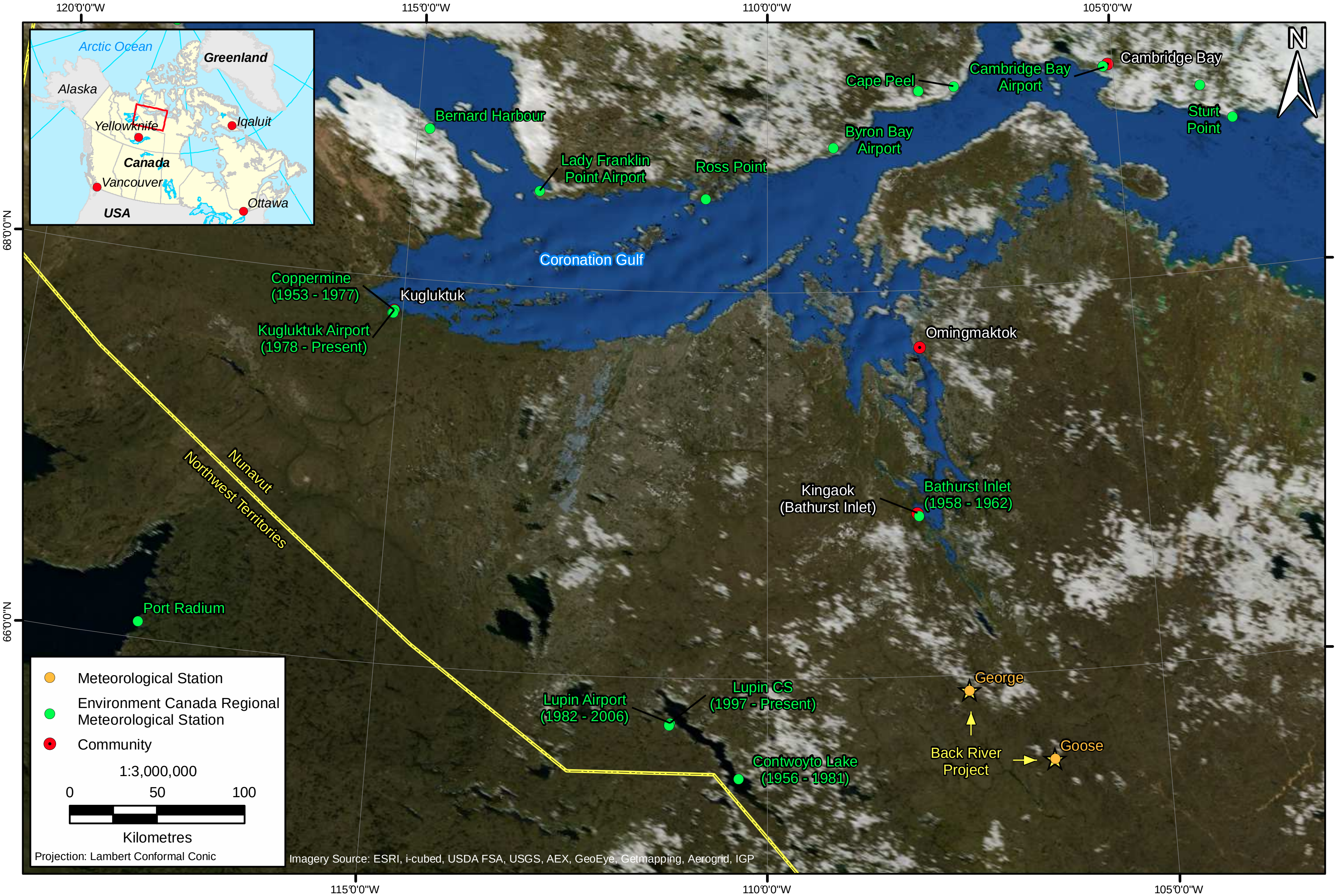


Figure 2-2

Sabina GOLD & SILVER CORP.

Locations of the George, Goose and Environment Canada Meteorological Stations

Figure 2-2

Rescan™ Engineers & Scientists

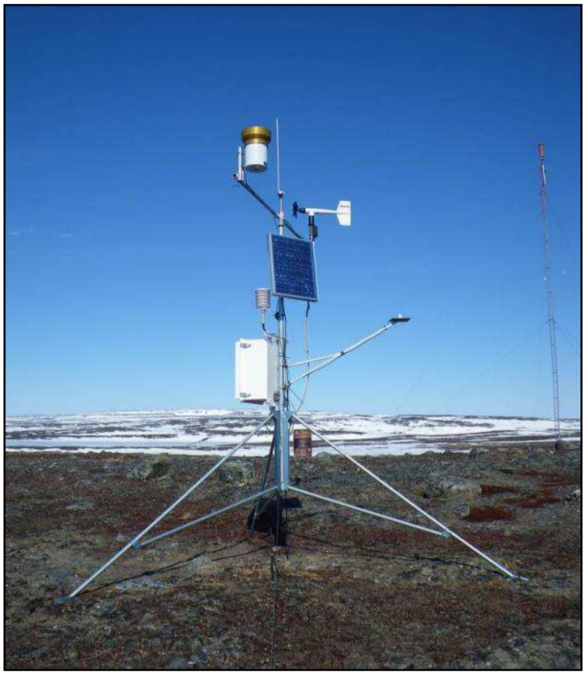


Plate 2.1-1. George meteorological station on a 3 m tripod. May 25, 2011. The station was upgraded to a 10 m tower in 2012.

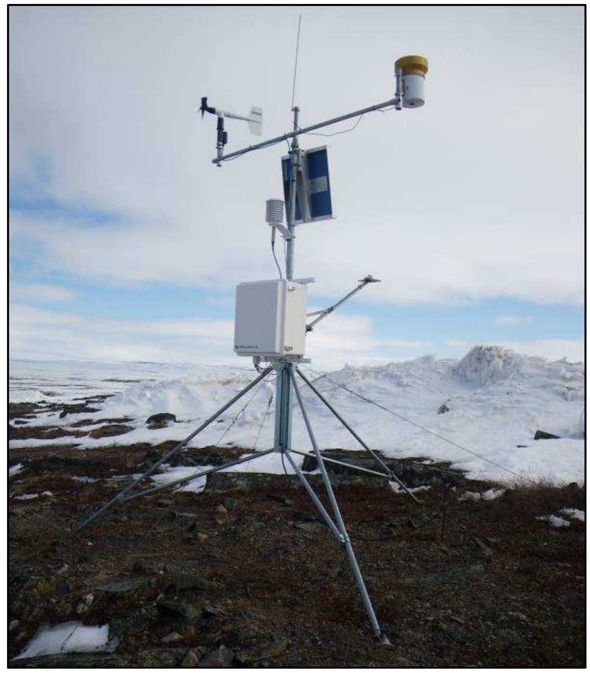


Plate 2.1-2. Goose meteorological station on a 3 m tripod. May 23, 2011 (view to the south east). The station was upgraded to a 10 m tower in 2012.

Plate 2.1-3. Goose meteorological station on June 16, 2012. The station was upgraded to a 10 m tower in March 2012.

Plate 2.1-4. George meteorological station on March 25, 2012. The station was upgraded to a 10 m tower in March 2012.

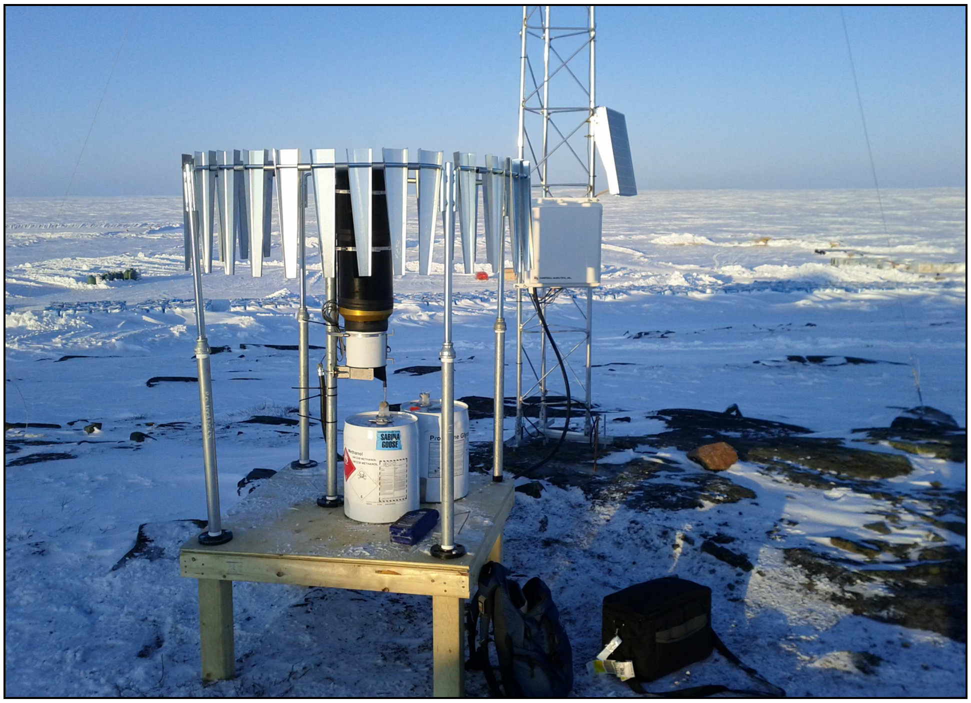


Plate 2.1-5. The CS 705 winter precipitation adapter is the black cylinder installed on the top of the white and gold TE525 tipping bucket rain gauge. These adapters were installed on both the Goose and George stations in 2012.

Table 2.1-1. Sensors and Variables Measured at the Back River Meteorological Stations

Variable	Sensor	Manufacturer
Air Temperature	YSI 44002A thermistor	Campbell Scientific
Precipitation – rain	TE525 WS Tipping Bucket Rain Gauge	Texas Electronics
Precipitation - snow	CS705 Precipitation Adapter	Campbell Scientific
Wind Speed	05103 Wind Monitor	R. M. Young Company
Wind Direction (degrees)	05103 Wind Monitor	R. M. Young Company
Standard deviation of wind direction (degrees)	05103 Wind Monitor (calculated internally in the datalogger using the Yarmartino algorithm)	R. M. Young Company, Traverse City
Relative Humidity	capacity relative humidity sensor	Vaisala
Global Radiation	SPLite Silicon Pyranometer	Kipp & Zonen

2.2 GOOSE LAKE MICRO-METEOROLOGY (EVAPORATION) STATION

In 2012 the meteorological program was expanded to include measurements of open-water evaporation at Goose Lake. A micro-meteorological station was installed in a shallow area of this lake on July 7, 2012 (Plate 2.2-1; Figure 2-1). The station was operated as close as possible to the end of the open-water season. The station was demobilized as late as possible while the Goose exploration camp was still open. Data collected at this station was used to calculate daily evaporation rates using both the Penman Combination and Preistly-Taylor methods.

The station is powered with a sealed rechargeable 8.5 Amp-hour battery that is recharged with a 50 watt solar panel. Operation of the station is controlled by a CR1000-55 datalogger whose program dictates how often the sensors will be monitored (every 5 seconds) and generates and stores hourly and daily means. Sensors for this station are mounted on a 3 m tripod which is partially submerged in the lake. Sensors (units of measure are shown in brackets) include:

- an SP Lite silicon pyranometer (solar radiation; W/m^2);
- an NR Lite net radiometer (net radiation; W/m^2);
- two HMP45C212 air temperature (ºC) and relative humidity (%) probes;
- an RM young 05103-10 wind speed (m/s) and direction (degrees from true north) sensor;
- a Met One 014A Anemometer;
- two 107B water temperature thermistors (ºC); and
- a TE525M tipping bucket rain gauge (rain precipitation; mm).

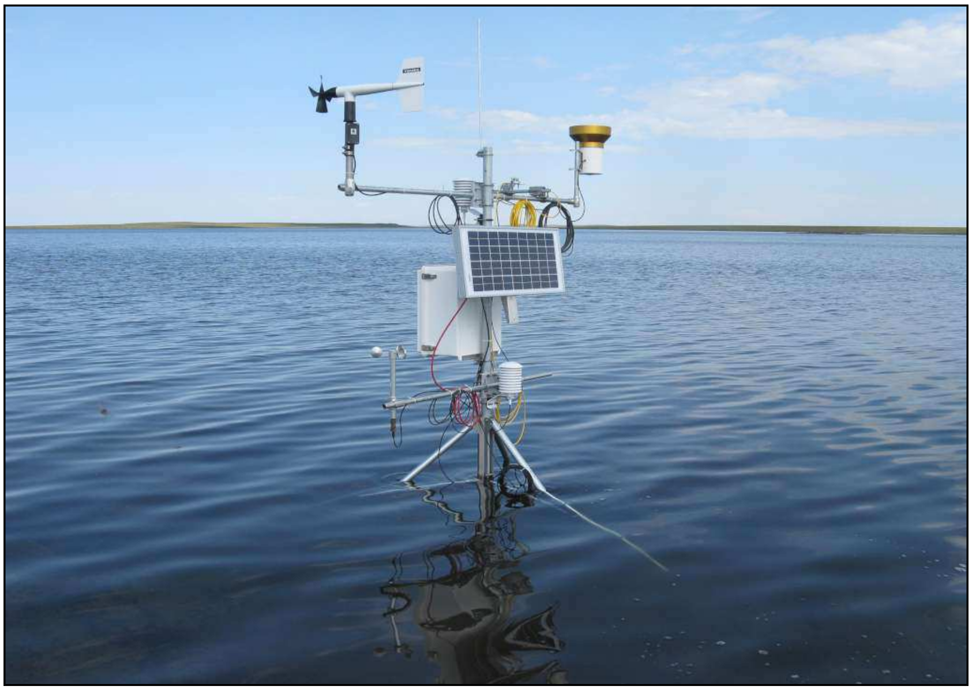


Plate 2.2-1. The Goose Lake micro-meteorology (evaporation) station on July 7, 2012.

Lake evaporation rates were calculated from mean daily weather data using the Penman Combination (PC) Method from Chow, Maidment, and Mays (1988). The Penman model is a combined energy-balance/aerodynamic mathematical model defined by the general equation:

$$E(PC) = \frac{\Delta}{\Delta+\gamma}E_R + + \frac{\gamma}{\Delta+\gamma}E_A \quad \text{with} \quad \Delta = \frac{4098e_{as}}{(237.3+T)^2} \quad \text{and} \quad \gamma = \frac{C_P P_A}{0.622 l_v}$$

where Δ is the slope of the temperature-saturated vapour pressure curve in Pa ºC; γ is the psychometric constant in Pa ºC; e_{as} is the saturated vapour pressure at air temperature T in ºC; $C_P = 1006$ J kg^{-1} ºC is the specified heat of air; $P_A = 101.3 \times 10^3$ Pa is air pressure at 20ºC; and $l_v = 2.501 \times 10^6 - 2370T$ J kg^{-1} is the latent heat of vaporization.

The energy-balance component E_R in mm/day is determined by the equation:

$$E_R = \frac{R_n - H - G}{l_v \rho_w} * 8.64 * 10^7 \quad \text{with} \quad H = -k_a\left(\frac{T_2 - T_1}{z_2}\right) \quad \text{and} \quad G = -k_w\left(\frac{T_{w2} - T_{w1}}{z_w}\right)$$

where R_n is the net solar radiation measured over water in W m^{-2}; H and G are the sensible heat flux and water heat flux; ρ_w = 999.7 kg m^{-3} is the water density at 10ºC; T_2 - T_1 and T_{w2} - T_{w1} are the change in mean daily air and water temperatures from the previous day, as measured at height z_2 and depth z_w in metres from the water surface. Yarwood & Castle (1970) give the thermal conductivities of air k_a and water k_w at 10ºC as 0.0241 and 0.615 W/m/ºC, respectively. The energy-balance equation can be simplified to a constant if it is assumed that the sensible heat flux H and water heat flux G are negligible, such that Chow et al. (1988) calculate the energy-balance component by E_R = 0.0353 * R_n.

Two modifications to the above equation were used in order to calculate the instantaneous evaporation rate. Rather than using the difference in mean daily air and water temperatures from the previous day, the instantaneous heat flux from above and below the water's surface is determined by the equations:

$$H = -k_a\left(\frac{T_2 - T_1}{z_2 - z_1}\right) \quad \text{and} \quad G = -k_w\left(\frac{T_{w2} - T_{w1}}{z_{w2} - z_{w1}}\right)$$

where T_2 - T_1 is the change in air temperature over height z_2 - z_1 and T_{w2} - T_{w1} is the change in water temperature over depth z_{w2} - z_{w1}.

The aerodynamic component E_A in mm/day is calculated as:

$$E_A = \frac{0.1062 u_2}{[\ln(z_2 / z_0)]^2} * (e_{as} - e_a) \quad \text{with} \quad e_a = -RH * e_{as} \quad \text{and} \quad e_{as} = 611 \exp\left(\frac{17.27 * T}{237.3 + T}\right)$$

where u_2 is wind speed in m s^{-1} measured at a height of z_2 in cm; Brutsaert (1982) gives the surface water roughness height z_0 as 0.01 cm; the term e_{as} - e_a is the difference between saturated vapour pressure e_{as} and actual vapour pressure e_a in Pa; and relative humidity (RH) is given as a proportion ($0 \leq RH \leq 1$).

The Priestly-Taylor (PT) method is similar to the Penman Combination method and defined by the general equation:

$$E(PT) = \alpha \frac{\Delta}{\Delta + \gamma} E_R$$

where the weighted aerodynamic component E_A is replaced by a constant α, and where the sensible heat flux term H is omitted from the energy flux term, E_R, after Shuttleworth (1993). Stewart and Rouse (1977) substantiate the constant α = 1.26 for subarctic regions.

This report uses both of the described methods for calculating evaporation.

2.3 REGIONAL DATA

Data from Lupin and Kugluktuk (EC 2012) meteorological stations, the closest currently operating Environment Canada stations, were used to characterize the climate in the regional Project Area (Table 2-1). Lupin A station (EC ID 23026HN) and Lupin CS station (EC ID 230N002) are located 200 km west of the Back River Project at the north end of Contwoyto Lake. Lupin A station replaced Contwoyto Lake station (EC ID 2300850), which operated from 1956 to 1981 approximately 50 km southeast of Lupin (Figure 2-1).

Lupin CS Station eventually replaced Lupin A station at approximately the same location and has records dating from 1997. Kugluktuk CS station (EC ID 2300904) has been operating since 1978 and is located approximately 400 km northwest of the Back River Project. Kugluktuk A station (EC ID 2300902) has been operating since 2005.

Climate normals are arithmetic averages of climate elements over a prescribed 30-year interval. At the completion of each decade, Environment Canada updates its climate normals. The most updated climate normals and extremes currently offered by Environment Canada are based on Canadian climate stations with at least 15 years of data between 1971 to 2000 (EC 2012). Climate normals for precipitation and temperature were collected from Environment Canada for the Kugluktuk CS meteorological station using all data available for the 1971 to 2000 period. Lupin A station was installed and began collecting climate data in 1982. Climate normals presented from this station are based on climate data collected from 1982 to 2000.

3. Results and Discussion

3. Results and Discussion

The Back River Project area is located near the northern boundary of the North American Continent in the vicinity of the Arctic Circle. The climate in the area is characterized by extremes. The Project area experiences relatively low amounts of precipitation, but due to sub-zero temperatures for the majority of the year, also experiences high snow accumulation. Summer is a season of nearly perpetual sunlight, while winter is dominated by night, twilight and extreme cold. Due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains), wind speeds are generally high.

The following sections describe the meteorological conditions at the Back River Project area for air temperature, precipitation, wind speed and direction and solar radiation over the period of 2006 through 2012. Table 3-1 contains a summary of the meteorological conditions as recorded by the George meteorological station from January 2006 through September 2012 and Table 3-2 contains a summary of the meteorological conditions as recorded by the Goose meteorological station from September 2006 through September 2012. It should be noted that the Goose meteorological station did not record data from late 2005 to September 2006, and did not record temperature and relative humidity from February to May 2010. The reason for this data gap was unknown at the time of reporting. Invalid data for temperature and solar radiation were removed from February to May 2011 from the George meteorological station dataset. The reasons for this data gap were due to a damaged temperature and relative humidity cable, and a disconnected solar radiation sensor. Historical climate normal data collected from Lupin A and Kugluktuk CS are included in Appendix 1 and daily precipitation and air temperature data from George and Goose stations are presented in Appendix 2.

3.1 AIR TEMPERATURE

Figures 3.1-1 to 3.1-3 summarize the daily average, daily minimum and daily maximum air temperatures at the George, Goose and regional EC-MSC meteorological stations from 2006 to 2012. Tables 3.1-1a to 3.1-1g summarize the monthly average air temperatures over the reporting period and compare them to the regional climate normals. Climate normals for the EC-MSC meteorological stations for each month are also included in the tables.

The mean monthly air temperatures for the George meteorological station ranged from -26.9°C to 11.4°C in 2006, -28.8°C to 13.9°C in 2007, -32.2°C to 12.7°C in 2008, -29.1°C to 11.0°C in 2009, -26.6°C to 13.0°C in 2010, -29.4°C in January 2011 to 14.4ºC 2011 and -30.3ºC to 13.9ºC in 2012. At the Goose meteorological station mean monthly air temperatures ranged from -20.8°C to 3.4°C between September and December 2006 (the available data range), -29.1°C to 14.0°C in 2007, -33.0°C to 13.1°C in 2008, -29.2°C to 11.4°C in 2009, -26.5°C to 13.8°C in 2010, -30°C to 14.5°C in 2011 and -30.8ºC to 14.2ºC from January to September 2012. Annual average air temperatures for 2006, 2007, 2008, 2009, 2010 and 2011 were -8.3°C, -11.3°C, -11.6°C, -10.9°C, -8.1°C and -5.8ºC, respectively, at George and -10.9°C, -11.3°C, -11.5°C, -10.8°C, -6.6°C and -9.8ºC, respectively, at Goose. Please note that the average temperature at Goose in 2010 and George in 2011 includes a period of missing data from February to May which biased the value up. Annual averages were not available for 2012 at the time of reporting, as the last downloads were made in September when the exploration camps were still open.

Observations indicated that air temperatures are very similar at George and Goose meteorological stations for the period 2006 to 2012. Comparisons to EC-MSC regional data from the nearest stations show that temperatures recorded in the Back River Project area followed regional climate trends (Figures 3.1-1 to 3.1-3 and Table 3.1-1).

Table 3-1a. 2006 Monthly Meteorological Conditions at George Meteorological Station (January 2006 to December 2006)

Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-06	-26.9	-30.0	-23.4	2.2	324	16.4	26/01/2006 16:00	-	4.2
Feb-06	-23.7	-27.8	-20.2	5.0	337	20.3	09/02/2006 11:00	-	30.0
Mar-06	-19.9	-23.8	-15.5	3.5	81	15.2	14/03/2006 18:00	-	92.4
Apr-06	-14.8	-19.8	-9.7	5.1	63	34.5	29/04/2006 16:00	-	185.3
May-06	-1.3	-4.9	2.2	3.9	109	13.2	05/05/2006 0:00	-	229.4
Jun-06	9.2	4.2	14.6	5.5	23	18.4	30/06/2006 1:00	1.5	250.3
Jul-06	10.9	7.0	15.0	5.5	4	18.7	28/07/2006 5:00	1.3	202.5
Aug-06	11.4	7.3	15.5	4.7	32	15.1	31/08/2006 12:00	1.0	162.7
Sep-06	3.6	0.2	7.9	3.9	344	13.3	13/09/2006 10:00	0.0	109.1
Oct-06	-6.1	-9.0	-3.7	6.1	345	21.1	30/10/2006 2:00	-	36.7
Nov-06	-20.8	-23.4	-18.2	5.6	339	24.0	18/11/2006 11:00	-	9.9
Dec-06	-20.7	-24.8	-16.7	4.9	199	18.8	05/12/2006 6:00	-	1.8
Average	**-8.3**	**-12.1**	**-4.3**	**4.7**	2	**19.1**	**n/a**	**n/a**	**109.5**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	n/a	**n/a**	**n/a**	**3.8**	**n/a**
Minimum	**-26.9**	**-30.0**	**-23.4**	**2.2**	n/a	**13.18**	**n/a**	**0.0**	**1.8**
Maximum	**11.4**	**7.3**	**15.5**	**6.1**	n/a	**34.53**	**n/a**	**1.5**	**250.3**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-1b. 2007 Monthly Meteorological Conditions at George Meteorological Station (January 2007 to December 2007)

Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-07	-26.3	-29.9	-22.5	4.4	349	21.1	31/01/2007 0:00	-	4.2
Feb-07	-28.8	-32.1	-25.5	5.2	349	23.9	01/02/2007 3:00	-	36.9
Mar-07	-28.4	-32.6	-24.2	4.1	344	19.9	16/03/2007 3:00	-	114.0
Apr-07	-14.6	-19.7	-9.4	3.8	56	14.7	01/04/2007 11:00	-	214.8
May-07	-8.4	-7.0	-2.3	6.2	43	19.3	05/05/2007 6:00	-	256.2
Jun-07	8.1	2.3	7.8	4.1	341	13.2	15/06/2007 11:00	7.4	289.6
Jul-07	13.9	9.0	18.7	4.5	26	19.7	31/07/2007 23:00	4.1	276.7
Aug-07	6.6	3.9	9.7	6.6	344	19.1	09/08/2007 4:00	33.5	130.6
Sep-07	-0.8	-3.1	1.8	4.9	12	14.2	29/09/2007 18:00	7.9	87.1
Oct-07	-6.9	-10.5	-4.4	6.1	67	21.4	25/10/2007 16:00	-	38.7
Nov-07	-22.6	-25.8	-19.1	6.2	5	23.3	25/11/2007 3:00	-	11.2
Dec-07	-27.1	-30.4	-23.7	4.5	324	17.6	05/12/2007 4:00	-	1.5
Average	**-11.3**	**-14.7**	**-7.7**	**5.0**	**359**	**19.0**	**n/a**	**n/a**	**121.8**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**52.8**	**n/a**
Minimum	**-28.8**	**-32.6**	**-25.5**	**3.8**	**n/a**	**13.2**	**n/a**	**4.1**	**1.5**
Maximum	**13.9**	**9.0**	**18.7**	**6.6**	**n/a**	**23.9**	**n/a**	**33.5**	**289.6**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-1c. 2008 Monthly Meteorological Conditions at George Meteorological Station (January 2008 to December 2008)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-08	-28.8	-32.1	-25.6	5.6	324	23.4	23/01/2008 0:00	-	6.6
Feb-08	-32.2	-35.6	-28.5	3.5	337	15.7	25/02/2008 15:00	-	37.4
Mar-08	-30.4	-34.8	-25.4	3.6	320	17.2	09/03/2008 7:00	-	121.5
Apr-08	-17.6	-22.5	-12.5	5.0	4	22.6	15/04/2008 11:00	-	218.1
May-08	-5.0	-8.6	-1.4	4.8	50	19.0	31/05/2008 17:00	-	289.4
Jun-08	4.7	0.5	8.8	4.7	33	25.3	03/06/2008 14:00	49.5	277.6
Jul-08	12.7	8.0	17.5	4.8	36	22.8	20/07/2008 18:00	29.7	246.6
Aug-08	9.0	5.9	12.6	5.6	30	19.2	19/08/2008 7:00	102.4	-
Sep-08	0.2	-1.8	2.3	5.8	333	20.8	24/09/2008 18:00	29.5	-
Oct-08	-5.5	-8.4	-2.6	4.6	240	16.7	11/10/2008 15:00	-	-
Nov-08	-19.0	-23.1	-15.3	3.0	34	13.4	02/11/2008 15:00	-	-
Dec-08	-27.6	-31.1	-24.2	5.1	326	15.9	14/12/2008 15:00	-	-
Average	**-11.6**	**-15.3**	**-7.9**	**4.7**	**346**	**19.3**	**n/a**	**n/a**	**-**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**211.1**	**n/a**
Minimum	**-32.2**	**-35.6**	**-28.5**	**3.0**	**n/a**	**13.4**	**n/a**	**29.5**	**-**
Maximum	**12.7**	**8.0**	**17.5**	**5.8**	**n/a**	**25.3**	**n/a**	**102.4**	**289.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-1d. 2009 Monthly Meteorological Conditions at George Meteorological Station (January 2009 to December 2009)

Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-09	-26.9	-30.7	-23.1	5.3	322	23.1	16/01/2009 0:00	-	-
Feb-09	-28.0	-32.1	-24.2	4.3	314	19.6	20/02/2009 16:00	-	-
Mar-09	-29.1	-33.5	-24.4	3.9	357	20.8	07/03/2009 16:00	-	-
Apr-09	-14.7	-18.9	-10.8	5.5	356	21.9	07/04/2009 1:00	-	-
May-09	-9.5	-13.4	-6.2	5.0	322	21.5	15/05/2009 9:00	-	-
Jun-09	4.6	0.3	8.4	4.5	52	14.3	04/06/2009 8:00	16.5	-
Jul-09	11.0	6.4	15.8	5.0	311	18.2	08/07/2009 6:00	23.9	-
Aug-09	9.1	4.9	13.7	4.9	7	16.2	07/08/2009 4:00	40.4	-
Sep-09	4.2	0.7	8.1	5.6	109	23.2	25/09/2009 5:00	34.5	-
Oct-09	-9.9	-12.9	-7.5	4.8	352	20.6	09/10/2009 1:00	-	-
Nov-09	-17.0	-20.4	-14.0	5.6	118	20.5	07/11/2009 6:00	-	-
Dec-09	-24.7	-28.2	-21.3	6.8	338	27.8	12/12/2009 0:00	-	-
Average	**-10.9**	**-14.8**	**-7.1**	**5.1**	**351**	**20.6**	**n/a**	**n/a**	**-**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**115.3**	**n/a**
Minimum	**-29.1**	**-33.5**	**-24.4**	**3.9**	**n/a**	**14.3**	**n/a**	**16.5**	**-**
Maximum	**11.0**	**6.4**	**15.8**	**6.8**	**n/a**	**27.8**	**n/a**	**40.4**	**-**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-1e. 2010 Monthly Meteorological Conditions at George Meteorological Station (January 2010 to December 2010)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-10	-26.6	-30.1	-23.3	4.7	344	22.8	29/01/2010 4:00	-	-
Feb-10	-23.2	-27.0	-19.4	2.5	329	15.2	18/02/2010 13:00	-	-
Mar-10	-18.7	-22.3	-14.5	3.8	327	19.6	16/03/2010 16:00	-	-
Apr-10	-8.3	-12.7	-4.7	5.1	130	24.7	17/04/2010 1:00	-	-
May-10	-7.7	-11.6	-4.1	3.7	306	14.3	09/05/2010 5:00	-	324.2
Jun-10	6.5	2.2	11.0	4.8	28	18.2	14/06/2010 18:00	11.4	262.9
Jul-10	13.0	9.1	17.6	5.4	53	17.1	04/07/2010 2:00	49.8	206.6
Aug-10	10.2	6.4	14.2	5.2	355	18.1	03/08/2010 15:00	9.1	181.3
Sep-10	2.2	-1.0	5.2	5.0	58	18.7	15/9/2010 9:00	21.1	36.7
Oct-10	-4.7	-8.2	-2.2	5.2	338	17.5	13/10/2010 23:00	-	-
Nov-10	-16.5	-22.2	-11.7	6.2	332	27.5	22/11/2010 3:00	-	-
Dec-10	-23.6	-27.8	-19.6	5.9	359	20.4	19/12/2010 0:00	-	-
Average	**-8.1**	**-12.1**	**-4.3**	**4.8**	**1**	**19.5**	**n/a**	**n/a**	**-**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**91.4**	**n/a**
Minimum	**-26.6**	**-30.1**	**-23.3**	**2.5**	**n/a**	**14.3**	**n/a**	**8.9**	**-**
Maximum	**13.0**	**9.1**	**17.6**	**6.2**	**n/a**	**27.5**	**n/a**	**50.0**	**324.2**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-1f. 2011 Monthly Meteorological Conditions at George Meteorological Station (January 2011 to December 2011)

Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-11	-29.4	-29.8	-28.9	3.8	320	19.2	1/15/2011 12:58	-	-
Feb-11	-	-	-	6.0	312	26.2	2/7/2011 16:30	-	-
Mar-11	-	-	-	3.2	336	17.2	3/2/2011 2:26	-	-
Apr-11	-	-	-	5.2	306	19.3	4/9/2011 2:16	-	-
May-11	-	-	-	5.3	106	16.0	5/23/2011 16:58	-	-
Jun-11	4.9	0.5	9.4	5.8	21	19.6	6/1/2011 20:01	14.2	-
Jul-11	14.4	9.7	18.9	4.8	55	19.4	7/1/2011 14:15	20.6	247.0
Aug-11	11.2	7.8	14.9	5.2	60	17.4	8/16/2011 18:05	70.1	171.6
Sep-11	3.2	0.5	6.6	5.8	39	24.0	9/7/2011 17:24	46.5	85.2
Oct-11	-5.9	-8.6	-3.3	5.7	140	22.4	10/27/2011 14:21	-	33.4
Nov-11	-18.9	-22.3	-16.0	4.6	350	20.7	11/27/2011 14:03	-	7.9
Dec-11	-25.8	-29.3	-21.8	5.7	329	28.4	12/6/2011 16:36	-	1.6
Average	**-5.8**	**-8.9**	**-2.5**	**5.1**	**320.0**	**20.8**	**n/a**	**n/a**	**-**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**151.4**	**n/a**
Minimum	**n/a**	**n/a**	**n/a**	**3.2**	**n/a**	**16.0**	**n/a**	**14.2**	**-**
Maximum	**14.4**	**9.7**	**18.9**	**6.0**	**n/a**	**28.4**	**n/a**	**70.1**	**-**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-1g. 2012 Monthly Meteorological Conditions at George Meteorological Station (January 2012 to September 2012)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-12	-30.3	-34.2	-25.8	4.7	350	22.2	1/2/2012 17:19	-	6.2
Feb-12	-23.7	-27.4	-19.5	4.8	324	19.8	2/11/2012 3:19	-	38.0
Mar-12	-26.1	-29.8	-21.2	4.9	23	21.7	3/20/2012 20:45	2.8	109.2
Apr-12	-15.1	-19.4	-10.2	5.1	326	18.7	4/6/2012 22:56	5.8	220.6
May-12	-1.3	-5.0	2.4	4.8	107	16.4	5/9/2012 6:43	3.3	267.2
Jun-12	7.9	3.7	12.4	4.9	40	16.0	6/14/2012 18:10	13.2	277.6
Jul-12	13.9	9.7	18.4	5.3	45	19.0	7/17/2012 18:24	24.1	253.1
Aug-12	10.4	6.3	15.0	5.2	32	18.6	8/30/2012 4:52	42.4	170.1
Sep-12	-	-	-	5.5	139	20.1	9/6/2012 16:01	12.2	-
Oct-12	-	-	-	-	-	-	-	-	-
Nov-12	-	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	-	-	-	-
Average	**-8.0**	**-12.0**	**-3.6**	**5.0**	**320.0**	**19.2**	**n/a**	**n/a**	**-**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**103.9**	**n/a**
Minimum	**n/a**	**n/a**	**n/a**	**4.7**	**n/a**	**16.0**	**n/a**	**2.8**	**-**
Maximum	**13.9**	**9.7**	**18.4**	**5.5**	**n/a**	**22.2**	**n/a**	**42.4**	**277.6**

Data available until September 12, 2012 when last data retrieval occurred.
Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2a. 2006 Monthly Meteorological Conditions at Goose Meteorological Station (January 2006 to December 2006)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-06	-	-	-	-	-	-	-	-	-
Feb-06	-	-	-	-	-	-	-	-	-
Mar-06	-	-	-	-	-	-	-	-	-
Apr-06	-	-	-	-	-	-	-	-	-
May-06	-	-	-	-	-	-	-	-	-
Jun-06	-	-	-	-	-	-	-	-	-
Jul-06	-	-	-	-	-	-	-	-	-
Aug-06	-	-	-	-	-	-	-	-	-
Sep-06	3.4	-0.2	5.7	3.6	325	13.9	12/09/2006 23:00	0.0	87.5
Oct-06	-5.9	-9.3	-3.4	5.2	300	16.7	29/10/2006 8:00	-	42.0
Nov-06	-20.8	-23.8	-18.1	4.5	306	20.3	18/11/2006 17:00	-	10.6
Dec-06	-20.4	-24.8	-16.0	4.5	227	18.1	05/12/2006 8:00	-	2.0
Average	**-10.9**	**-14.5**	**-7.9**	**4.4**	**278**	**17.3**	**n/a**	**n/a**	**35.5**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**0.0**	**n/a**
Minimum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**13.9**	**n/a**	**0.0**	-
Maximum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**20.3**	**n/a**	**0.0**	-

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2b. 2007 Monthly Meteorological Conditions at Goose Meteorological Station (January 2007 to December 2007)

Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-07	-26.3	-29.9	-22.9	4.0	280	22.1	31/01/2007 23:00	-	5.0
Feb-07	-29.1	-33.1	-25.4	4.8	313	22.8	01/02/2007 6:00	-	36.4
Mar-07	-28.8	-33.7	-24.3	3.5	273	15.7	16/03/2007 8:00	-	114.5
Apr-07	-15.0	-20.5	-9.7	3.4	235	13.7	21/04/2007 22:00	-	217.2
May-07	-5.8	-10.8	-1.8	4.5	250	17.5	06/05/2007 3:00	-	261.6
Jun-07	4.7	0.4	8.6	4.3	339	15.2	06/06/2007 11:00	0.3	286.3
Jul-07	14.0	8.5	19.2	3.7	355	13.5	23/07/2007 15:00	0.8	266.3
Aug-07	7.1	4.1	9.9	6.1	338	15.3	08/08/2007 18:00	0.3	124.3
Sep-07	-0.3	-2.9	2.3	4.4	13	14.3	29/09/2007 22:00	2.3	82.3
Oct-07	-6.1	-9.4	-3.7	5.0	142	15.4	16/10/2007 9:00	-	37.7
Nov-07	-22.4	-26.0	-18.5	5.2	308	16.9	30/11/2007 3:00	-	11.9
Dec-07	-27.1	-30.6	-23.6	4.4	280	16.0	04/12/2007 19:00	-	1.9
Average	**-11.3**	**-15.3**	**-7.5**	**4.5**	**314**	**16.5**	**n/a**	**n/a**	**120.5**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**3.6**	**n/a**
Minimum	**-29.1**	**-33.7**	**-25.4**	**3.4**	**n/a**	**13.5**	**n/a**	**0.3**	**1.9**
Maximum	**14.0**	**8.5**	**19.2**	**6.1**	**n/a**	**22.8**	**n/a**	**2.3**	**286.3**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2c. 2008 Monthly Meteorological Conditions at Goose Meteorological Station (January 2008 to December 2008)

Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-08	-29.1	-32.6	-25.8	5.2	265	19.2	24/01/2008 10:00	-	7.0
Feb-08	-33.0	-36.8	-29.2	3.1	289	14.7	25/02/2008 20:00	-	40.9
Mar-08	-30.6	-35.6	-25.1	3.2	286	17.1	05/03/2008 6:00	-	122.6
Apr-08	-17.5	-23.0	-11.9	4.3	267	20.0	15/04/2008 12:00	-	218.1
May-08	-5.2	-9.7	-1.3	4.2	268	18.9	31/05/2008 19:00	-	288.4
Jun-08	5.2	0.8	9.5	3.9	13	19.1	03/06/2008 15:00	20.8	263.6
Jul-08	13.1	7.5	18.0	3.9	278	14.6	25/07/2008 17:00	1.8	236.1
Aug-08	9.7	5.7	13.8	4.8	27	18.8	19/08/2008 10:00	71.1	149.5
Sep-08	0.8	-1.5	2.9	5.1	330	18.0	24/09/2008 18:00	35.6	64.9
Oct-08	-4.9	-8.2	-1.9	4.0	242	14.8	01/10/2008 0:00	-	34.6
Nov-08	-18.7	-23.6	-14.6	3.1	228	11.8	17/11/2008 17:00	-	9.3
Dec-08	-27.9	-31.5	-24.4	4.6	296	17.0	03/12/2008 7:00	-	2.0
Average	**-11.5**	**-15.7**	**-7.5**	**4.1**	**291**	**17.0**	**n/a**	**n/a**	**119.8**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**129.3**	**n/a**
Minimum	**-33.0**	**-36.8**	**-29.2**	**3.1**	**n/a**	**11.8**	**n/a**	**1.8**	**2.0**
Maximum	**13.1**	**7.5**	**18.0**	**5.2**	**n/a**	**20.0**	**n/a**	**71.1**	**288.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2d. 2009 Monthly Meteorological Conditions at Goose Meteorological Station (January 2009 to December 2009)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-09	-27.1	-30.7	-23.6	4.9	286	22.6	19/01/2009 21:00	-	6.9
Feb-09	-28.2	-32.4	-24.2	4.3	259	18.9	04/02/2009 5:00	-	37.0
Mar-09	-29.2	-34.1	-24.7	3.4	289	17.0	05/03/2009 13:00	-	119.5
Apr-09	-14.5	-19.1	-10.7	5.1	290	16.8	29/04/2009 15:00	-	203.4
May-09	-9.2	-13.1	-5.9	4.3	314	17.5	15/05/2009 1:00	-	288.1
Jun-09	4.5	-0.1	8.6	3.8	47	11.5	18/06/2009 16:00	21.3	272.0
Jul-09	11.4	6.3	16.1	4.2	266	14.0	08/07/2009 8:00	27.2	252.2
Aug-09	9.6	4.2	14.6	4.5	298	16.2	31/08/2009 20:00	25.1	172.3
Sep-09	4.7	0.7	9.1	4.9	187	19.5	24/09/2009 23:00	37.1	93.6
Oct-09	-9.4	-12.4	-7.0	4.3	351	18.1	09/10/2009 3:00	-	39.8
Nov-09	-17.0	-20.8	-13.8	4.9	163	18.2	18/11/2009 15:00	-	10.6
Dec-09	-24.9	-28.8	-21.3	6.0	303	22.5	30/12/2009 6:00	-	2.1
Average	**-10.8**	**-15.0**	**-6.9**	**4.6**	**289**	**17.7**	**n/a**	**n/a**	**124.8**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**110.7**	**n/a**
Minimum	**-29.2**	**-34.1**	**-24.7**	**3.4**	**n/a**	**11.5**	**n/a**	**21.3**	**2.1**
Maximum	**11.4**	**6.3**	**16.1**	**6.0**	**n/a**	**22.6**	**n/a**	**37.1**	**288.1**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2e. 2010 Monthly Meteorological Conditions at Goose Meteorological Station (January 2010 to December 2010)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-10	-26.5	-30.6	-23.0	4.5	292	20.9	26/01/2010 5:00	-	6.7
Feb-10	-22.7	-10.2	-7.6	3.4	228	12.8	18/02/2010 12:00	-	35.4
Mar-10	-	-	-	3.7	234	15.5	08/03/2010 2:00	-	101.2
Apr-10	-	-	-	4.5	181	17.1	17/04/2010 3:00	-	201.3
May-10	-6.3	-8.7	-1.5	2.9	276	10.6	31/05/2010 6:00	-	299.1
Jun-10	6.5	2.1	11.0	4.1	299	12.5	27/06/2010 13:00	18.5	252.4
Jul-10	13.8	9.0	18.9	4.3	55	14.4	09/07/2010 17:00	41.2	208.0
Aug-10	10.6	6.0	15.1	4.5	355	17.3	03/08/2010 22:00	6.4	179.0
Sep-10	2.6	1.0	5.6	4.1	79	17.3	15/9/2010 11:00	16.0	89.4
Oct-10	-4.4	0.0	0.0	4.6	313	17.0	11/10/2010 2:00	5.8	30.7
Nov-10	-16.1	0.0	0.0	5.8	301	24.4	21/11/2010 17:00	0.0	10.2
Dec-10	-23.6	0.0	0.0	5.3	309	18.5	25/12/2010 7:00	0.0	1.8
Average	**-6.6**	**-3.1**	**1.8**	**4.3**	**281**	**16.5**	**n/a**	**n/a**	**117.9**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**87.9**	**n/a**
Minimum	**-26.5**	**-30.6**	**-23.0**	**2.9**	**n/a**	**10.6**	**n/a**	**0.0**	**1.8**
Maximum	**13.8**	**9.0**	**18.9**	**5.8**	**n/a**	**24.4**	**n/a**	**41.2**	**299.1**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2f. 2011 Monthly Meteorological Conditions at Goose Meteorological Station (January 2011 to December 2011)

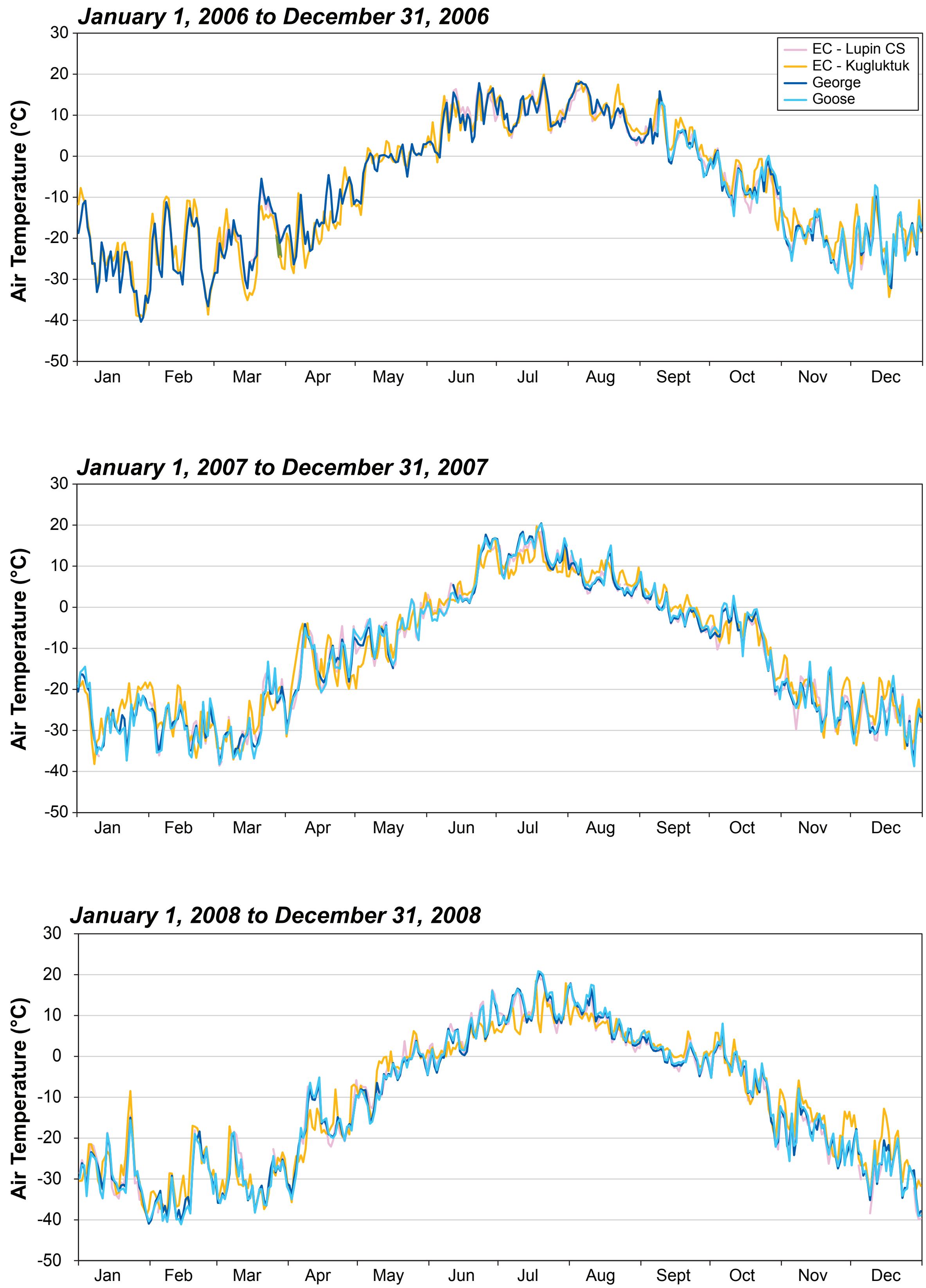
Date	Average Temperature (˚C)	Mean Daily Minimum Temperature (˚C)	Mean Daily Maximum Temperature (˚C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-11	-30.0	-30.4	-23.0	3.5	272	16.3	1/24/2011 6:00	-	7.1
Feb-11	-26.5	-26.9	-7.6	5.4	290	22.7	2/8/2011 6:00	-	35.8
Mar-11	-24.0	-24.6	0.0	2.6	295	15.1	3/10/2011 5:00	-	111.1
Apr-11	-19.0	-19.5	0.0	3.9	292	14.4	4/15/2011 4:00	-	229.0
May-11	-3.5	-4.0	-1.5	4.2	143	14.3	2/23/2011 8:00	-	291.3
Jun-11	5.3	4.8	11.0	4.8	0	17.3	6/26/2011 19:00	13.5	247.2
Jul-11	14.5	13.9	18.9	4.0	38	15.2	7/1/2011 14:00	21.1	274.4
Aug-11	11.4	10.9	15.1	4.4	53	15.9	8/22/2011 7:00	53.6	167.7
Sep-11	3.7	0.7	7.4	4.8	282	19.1	9/8/2011 2:00	65.3	84.3
Oct-11	-5.5	-8.6	-2.8	4.9	161	19.2	10/1/2011 9:40	-	34.1
Nov-11	-18.6	-22.7	-15.7	4.7	300	19.1	11/28/2011 4:18	-	11.1
Dec-11	-25.8	-29.7	-21.6	4.8	292	30.7	12/7/2011 12:50	-	1.6
Average	**-9.8**	**-11.4**	**-1.6**	**4.3**	**304.0**	**18.3**	**n/a**	**n/a**	**124.6**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**153.4**	**n/a**
Minimum	**-30.0**	**-30.4**	**-23.0**	**2.6**	**n/a**	**14.3**	**n/a**	**13.5**	**1.6**
Maximum	**14.5**	**13.9**	**18.9**	**5.4**	**n/a**	**30.7**	**n/a**	**65.3**	**291.3**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3-2g. 2012 Monthly Meteorological Conditions at Goose Meteorological Station (January 2012 to September 2012)

Date	Average Temperature (°C)	Mean Daily Minimum Temperature (°C)	Mean Daily Maximum Temperature (°C)	Average Windspeed (m/s)	Average Wind Direction (degrees from true north)	Maximum Instantaneous Windspeed (m/s)	Time of Maximum Hourly Windspeed	Rainfall (mm)	Average Solar Radiation (W/m^2)
Jan-12	-30.8	-35.1	-26.0	3.8	239	20.2	1/2/2012 16:18	-	6.6
Feb-12	-23.6	-27.7	-19.4	4.1	270	16.9	2/18/2012 11:04	-	37.9
Mar-12	-25.9	-30.3	-21.5	4.0	228	17.1	3/12/2012 21:41	3.6	110.2
Apr-12	-15.2	-20.5	-10.1	5.1	277	17.0	4/10/2012 12:52	5.1	224.4
May-12	-1.3	-4.6	1.8	4.5	161	16.6	5/9/2012 10:46	10.2	269.9
Jun-12	7.7	2.9	12.3	4.3	46	18.6	6/20/2012 17:33	16.0	266.5
Jul-12	14.2	8.7	19.0	4.8	39	17.8	7/20/2012 9:14	20.6	256.4
Aug-12	11.0	5.8	15.7	4.7	358	15.1	8/19/2012 18:06	32.3	166.8
Sep-12	-	-	-	5.5	198.0	18.4	9/6/2012 14:29	11.4	-
Oct-12	-	-	-	-	-	-	-	-	-
Nov-12	-	-	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	-	-	-	-
Average	**-8.0**	**-12.6**	**-3.5**	**4.5**	**304.0**	**17.5**	**n/a**	**n/a**	**167.3**
Sum	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**99.1**	**n/a**
Minimum	**-30.8**	**-35.1**	**-26.0**	**3.8**	**n/a**	**15.1**	**n/a**	**3.6**	**6.6**
Maximum	**14.2**	**8.7**	**19.0**	**5.5**	**n/a**	**20.2**	**n/a**	**32.3**	**269.9**

Data available until September 15, 2012 when last data retrieval occurred.
Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.



Note: Breaks in line indicate mising data.

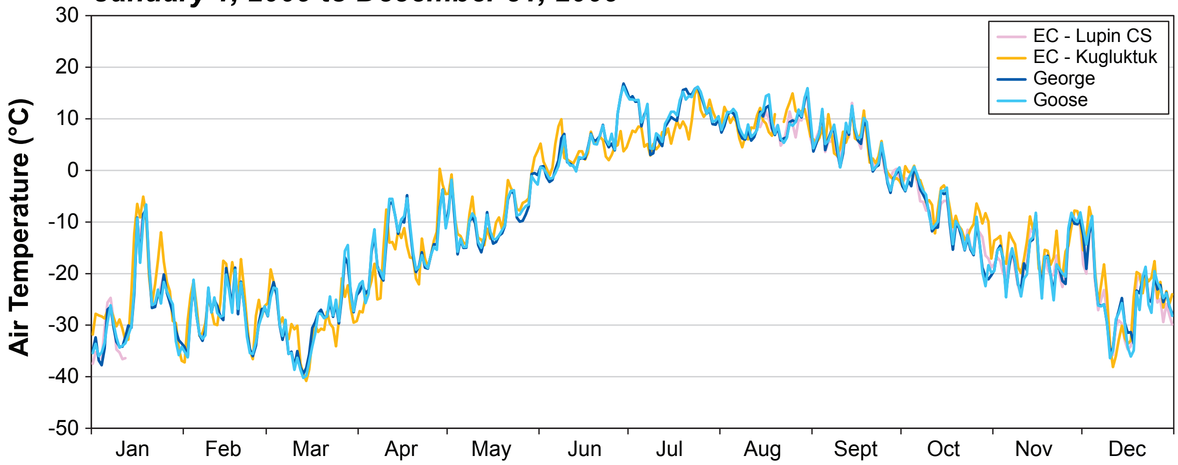
Sabina GOLD & SILVER CORP.

Back River and Regional Daily Average Air Temperatures, 2006 to 2008

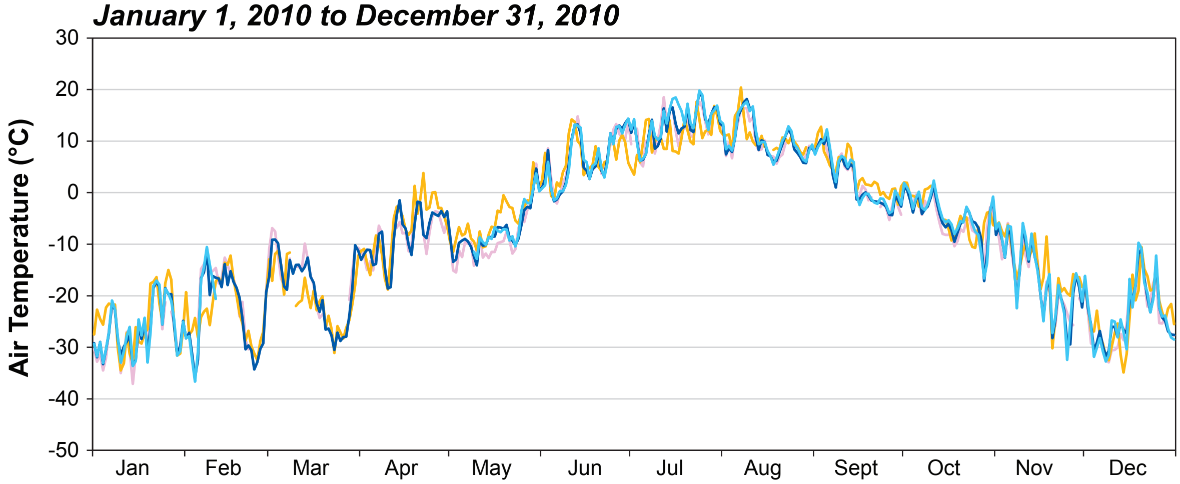
Figure 3.1-1a

Rescan Engineers & Scientists

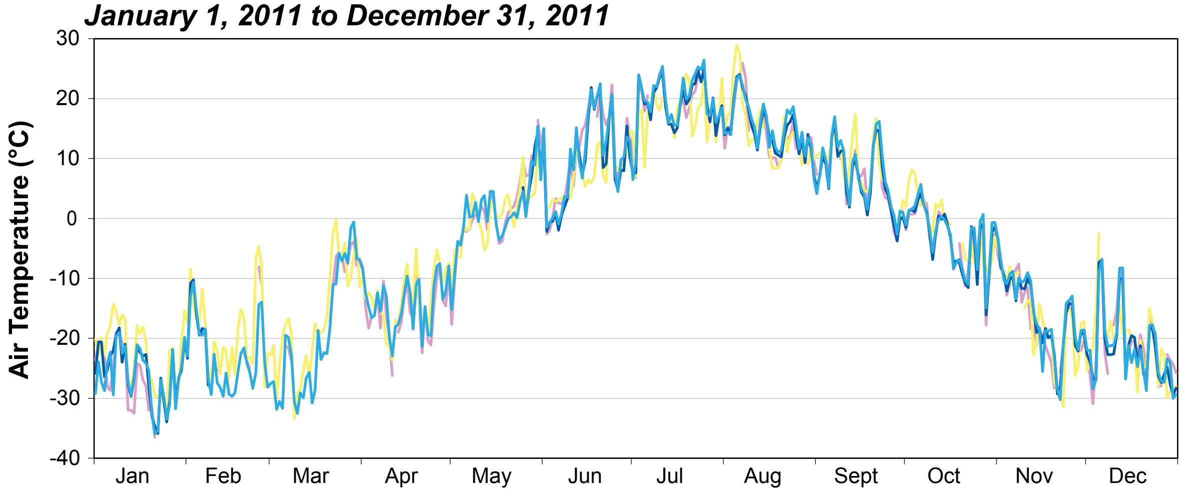
January 1, 2009 to December 31, 2009



January 1, 2010 to December 31, 2010



January 1, 2011 to December 31, 2011



Note: Breaks in line indicate mising data.

Figure 3.1-1b

Back River and Regional Daily Average Air Temperatures, 2009 to 2011

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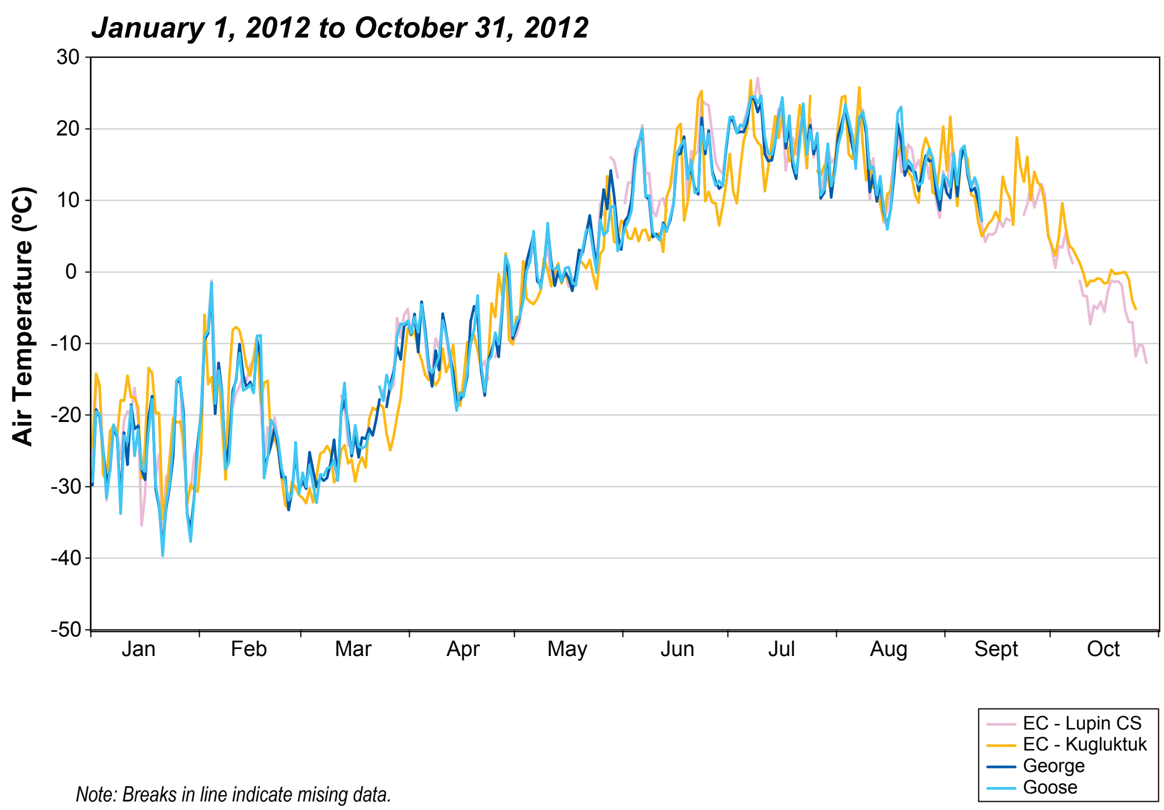


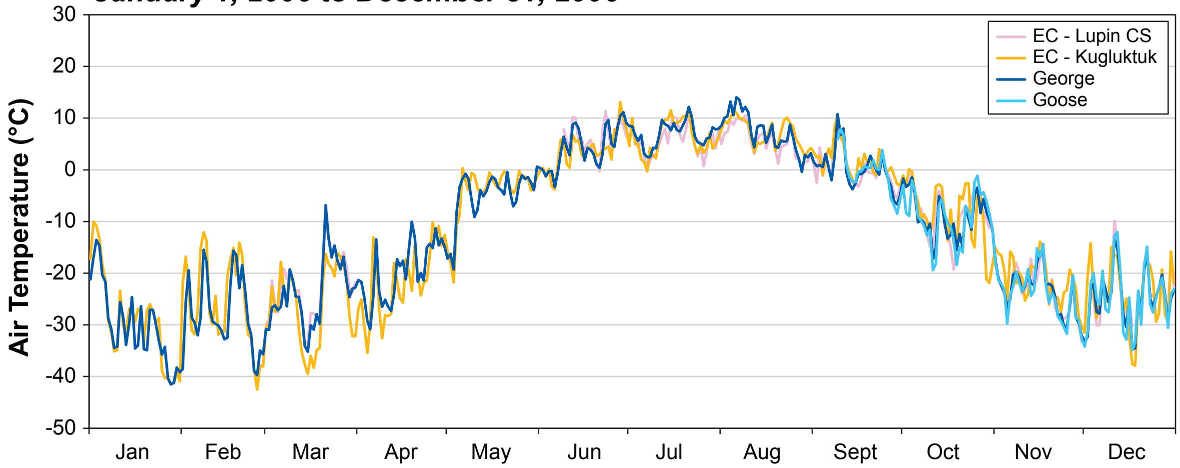
Sabina GOLD & SILVER CORP.

Back River and Regional Daily Average Air Temperatures, 2012

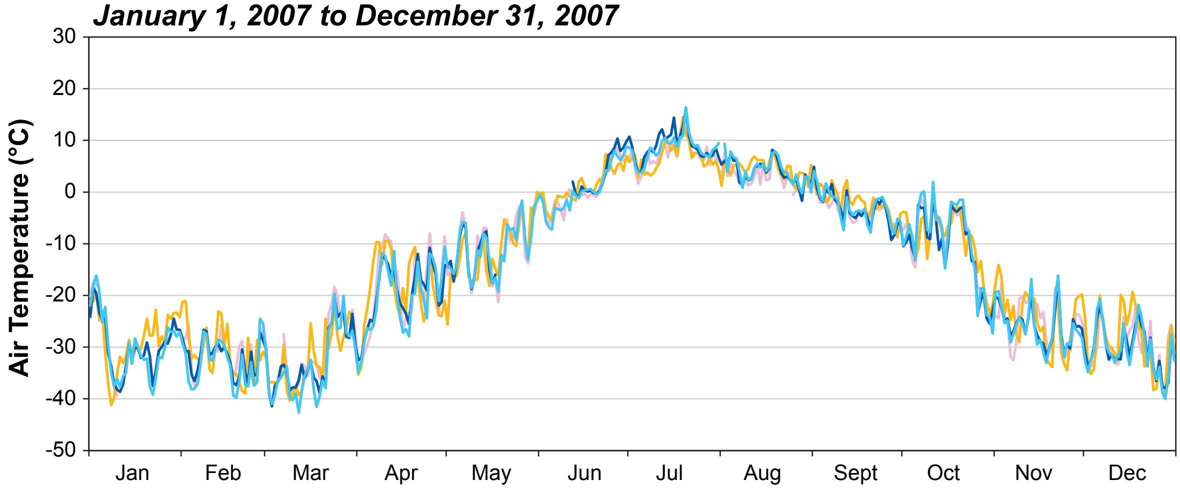
Figure 3.1-1c

Rescan Engineers & Scientists

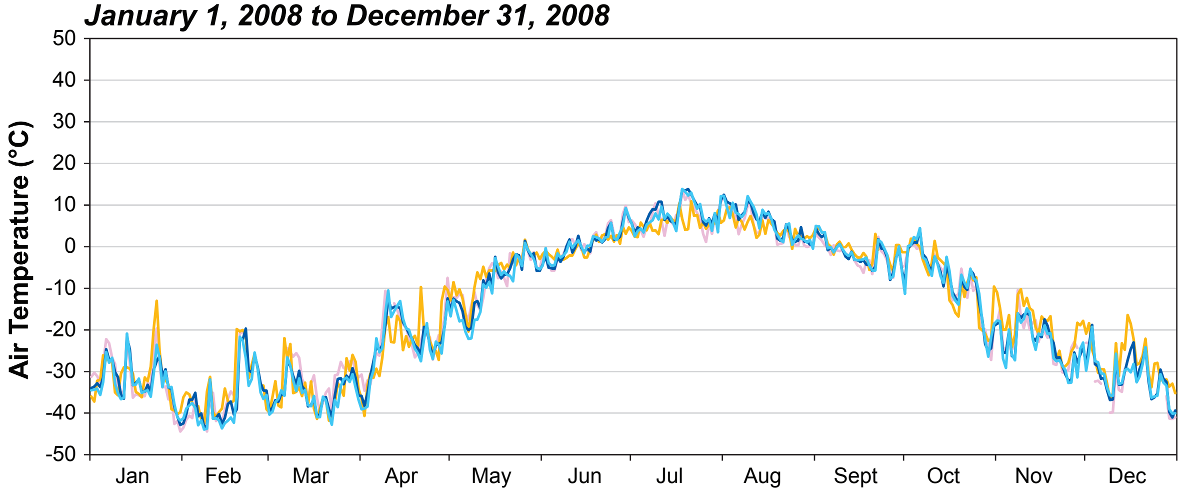
January 1, 2006 to December 31, 2006



January 1, 2007 to December 31, 2007



January 1, 2008 to December 31, 2008



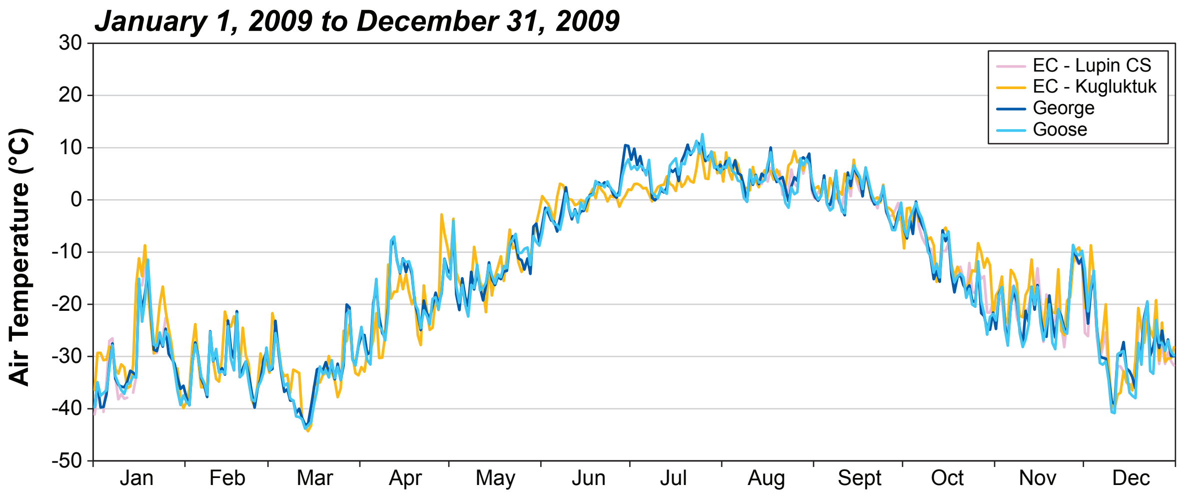
Note: Breaks in line indicate mising data.

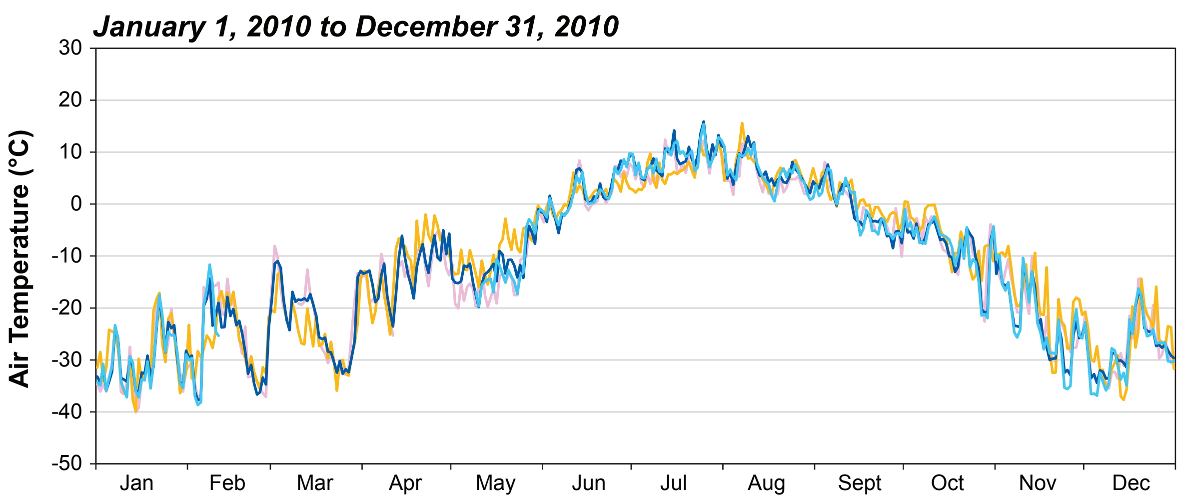
Sabina GOLD & SILVER CORP.

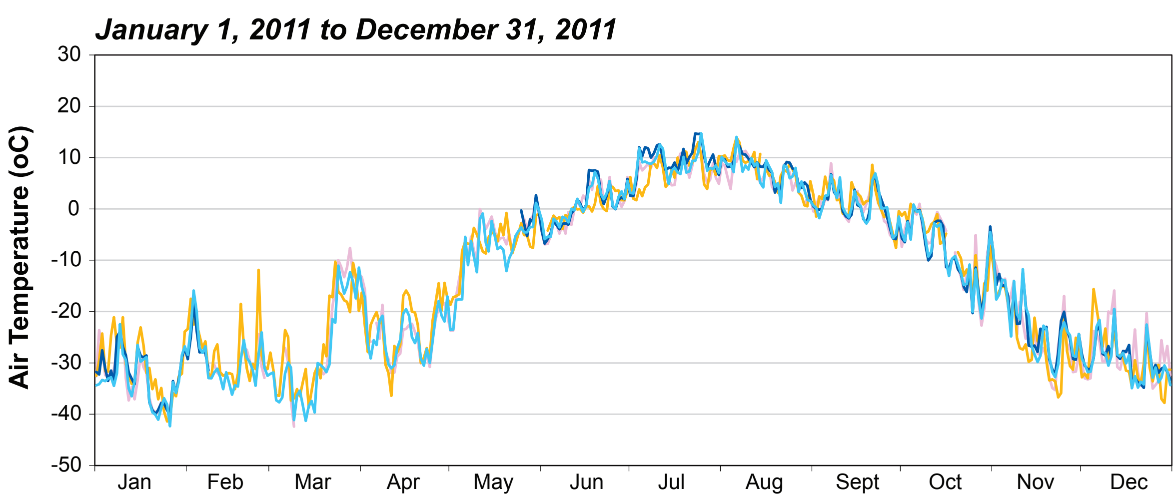
Back River and Regional Daily Minimum Air Temperatures, 2006 to 2008

Figure 3.1-2a

Rescan Engineers & Scientists







Note: Breaks in line indicate mising data.

Sabina GOLD & SILVER CORP.

Back River and Regional Daily Minimum Air Temperatures, 2009 to 2011

Figure 3.1-2b

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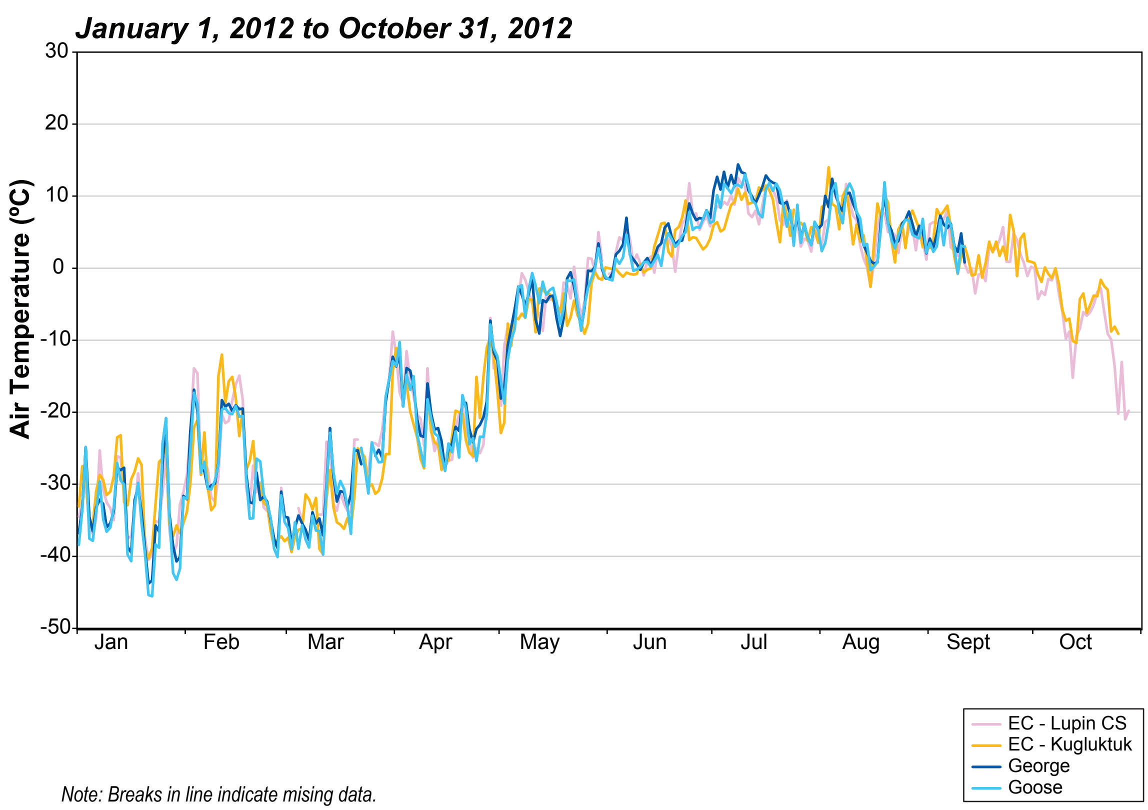


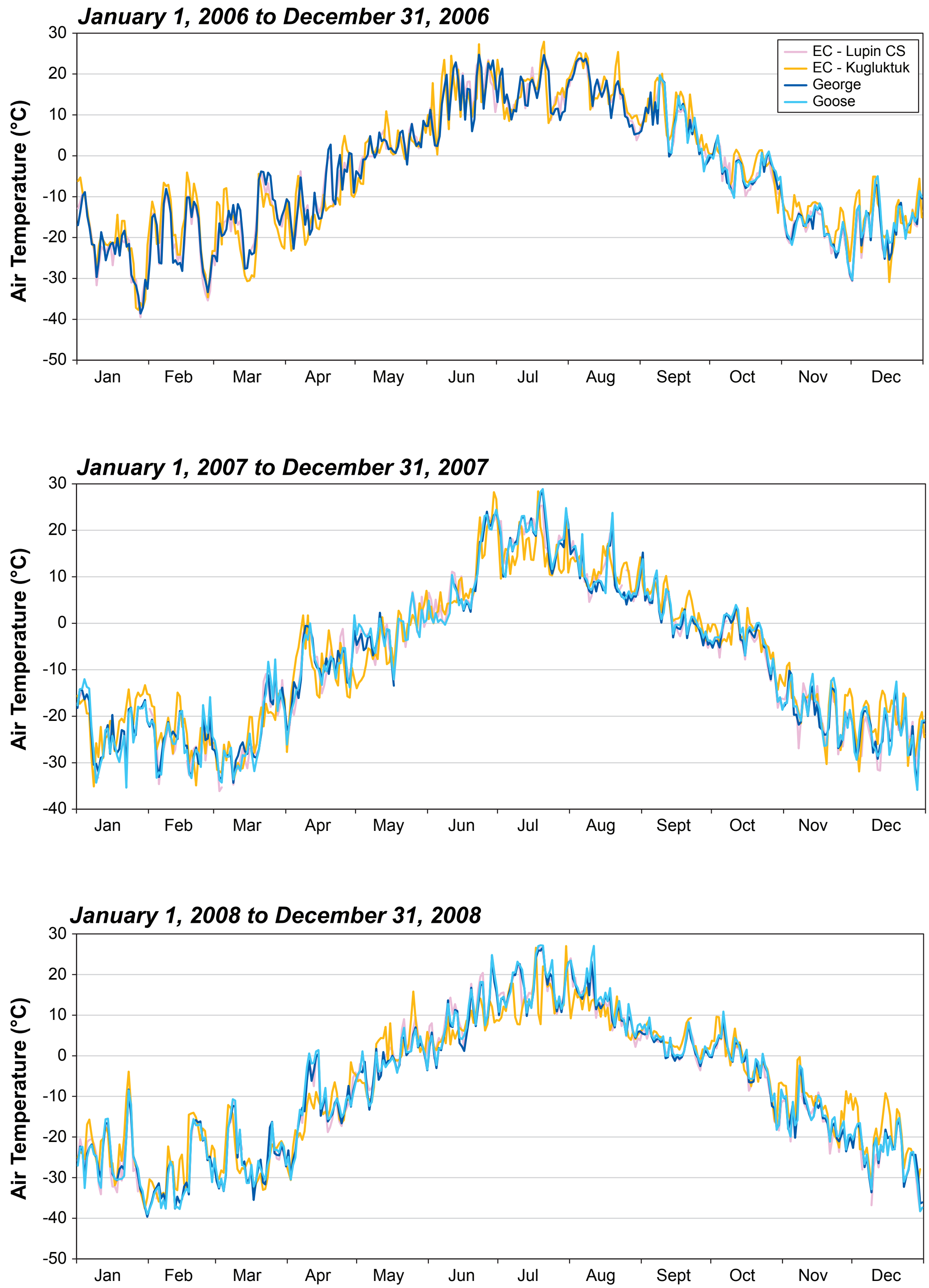
Note: Breaks in line indicate mising data.

Sabina GOLD & SILVER CORP.

Back River and Regional Daily Minimum Air Temperatures, 2012

Figure 3.1-2c

Rescan Engineers & Scientists



Note: Breaks in line indicate mising data.

Sabina GOLD & SILVER CORP.

Back River and Regional Daily Maximum Air Temperatures, 2006 to 2008

Figure 3.1-3a

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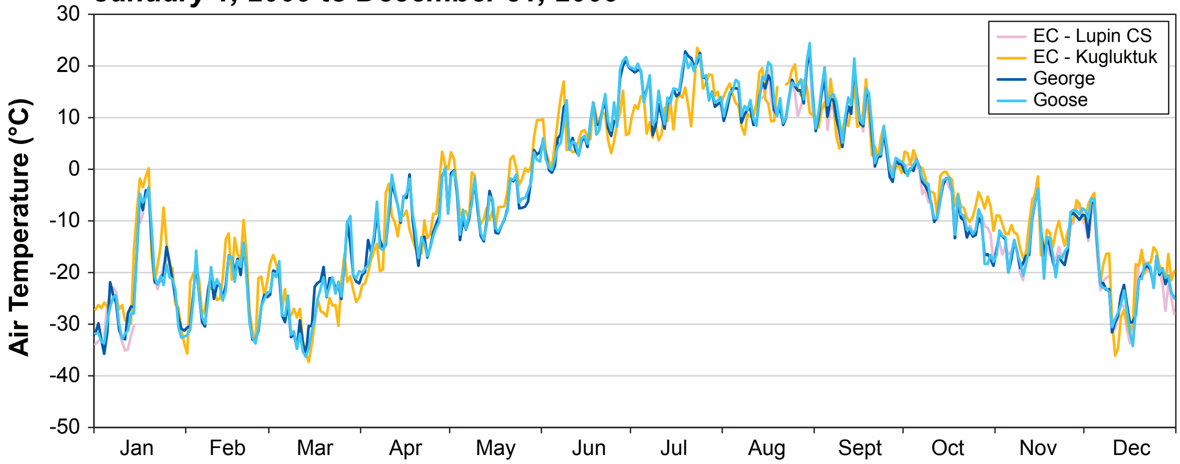
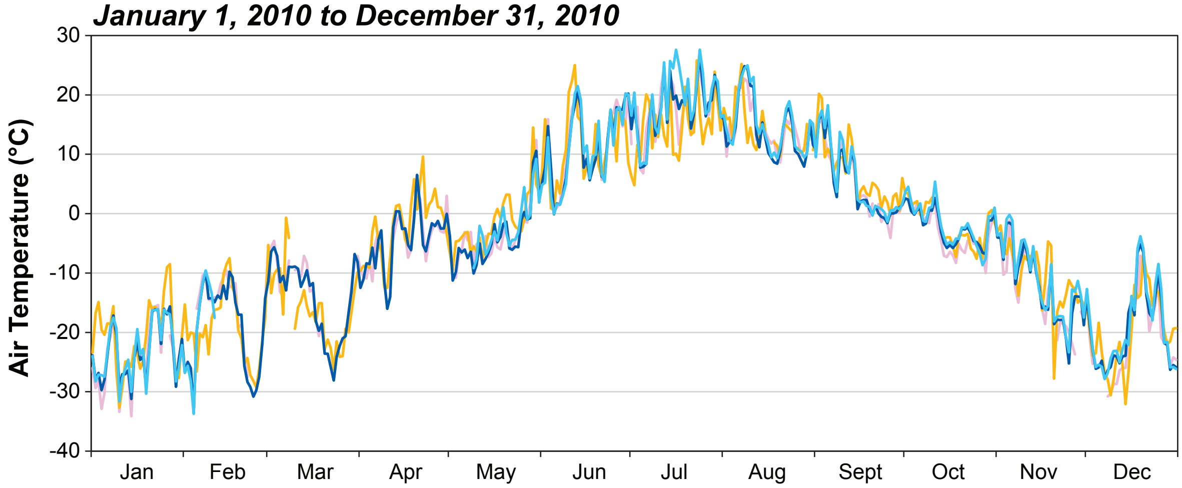
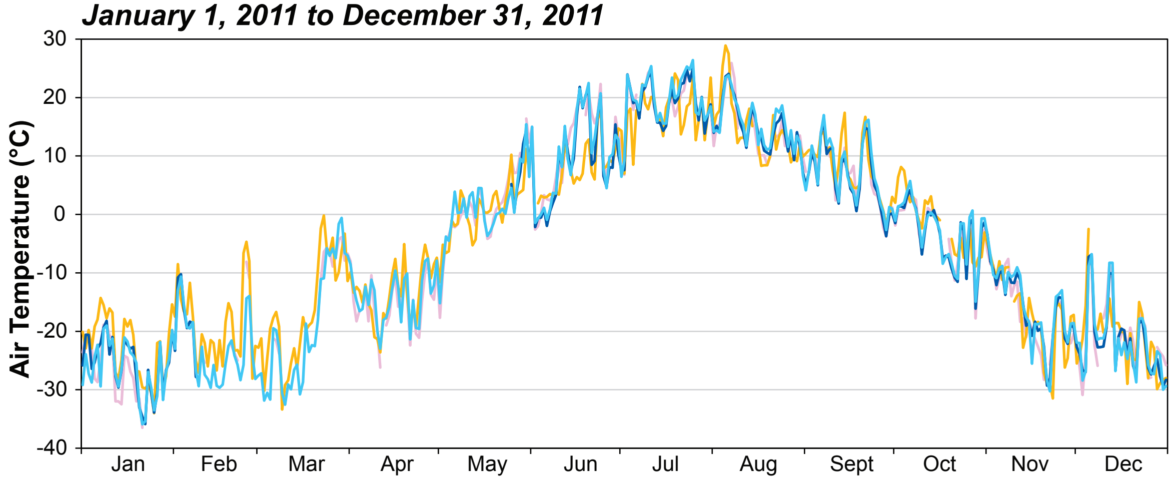
January 1, 2009 to December 31, 2009



January 1, 2010 to December 31, 2010



January 1, 2011 to December 31, 2011



Note: Breaks in line indicate mising data.

Figure 3.1-3b

Back River and Regional Daily Maximum Air Temperatures, 2009 to 2011

Sabina GOLD & SILVER CORP.

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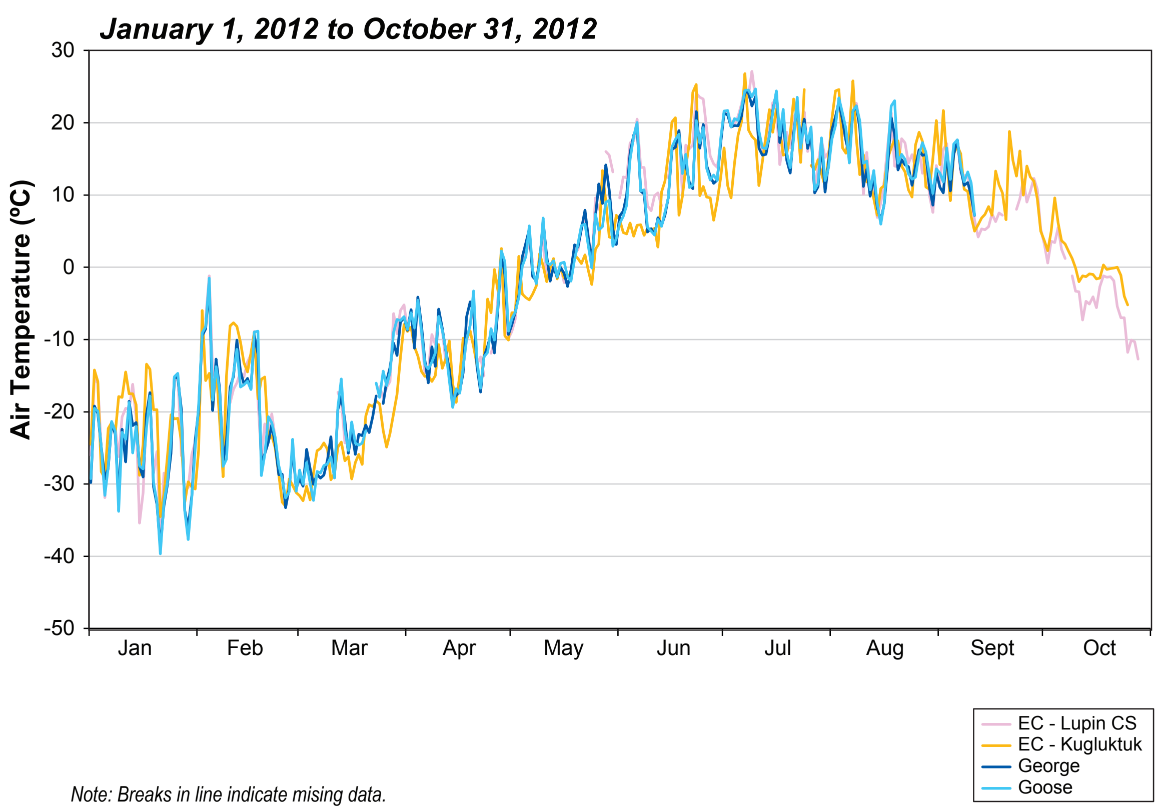

Note: Breaks in line indicate mising data.

Figure 3.1-3c

Back River and Regional Daily Maximum Air Temperatures, 2012

Sabina GOLD & SILVER CORP.

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Table 3.1-1a. 2006 Back River and Regional Monthly Average Air Temperature (°C) (January 2006 to December 2006)

Month	George (355 masl) 2006	Goose (277 masl) 2006	Lupin CS (488 masl) 2006	Kugluktuk CS (22.6 masl) 2006	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-26.9	-	-	-25.3	-30.4	-27.8
February	-23.7	-	-	-21.3	-28.5	-27.4
March	-19.9	-	-19.4	-22.2	-24.9	-25.3
April	-14.8	-	-	-16.8	-15.9	-17
May	-1.3	-	-	-1.2	-5.7	-5.3
June	9.2	-	12.2	9.3	6.5	5.2
July	10.9	-	10.7	11.0	11.5	10.7
August	11.4	-	10.7	12.0	8.8	8.8
September	3.6	3.4	4.3	5.7	1.8	2.8
October	-6.1	-5.9	-6.2	-5.6	-8.6	-7.2
November	-20.8	-20.8	-20.9	-18.2	-20.7	-19.6
December	-20.7	-20.4	-20.9	-19.6	-26.8	-25.5
Average	**-8.3**	**-**	**-**	**-7.7**	**-11.1**	**-10.6**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.1-1b. 2007 Back River and Regional Monthly Average Air Temperature (°C) (January 2007 to December 2007)

Month	George (355 masl) 2007	Goose (277 masl) 2007	Lupin CS (488 masl) 2007	Kugluktuk CS (22.6 masl) 2007	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-26.3	-26.3	-25.6	-24.5	-30.4	-27.8
February	-28.8	-29.1	-28.3	-27.4	-28.5	-27.4
March	-28.4	-28.8	-27.8	-28.4	-24.9	-25.3
April	-14.6	-15.0	-14.3	-14.1	-15.9	-17
May	-8.4	-5.8	-6.5	-7.6	-5.7	-5.3
June	8.1	4.7	5.3	5.4	6.5	5.2
July	13.9	14.0	12.8	11.1	11.5	10.7
August	6.6	7.1	7.0	7.9	8.8	8.8
September	-0.8	-0.3	-0.8	0.9	1.8	2.8
October	-6.9	-6.1	-7.6	-6.5	-8.6	-7.2
November	-22.6	-22.4	-22.1	-21.0	-20.7	-19.6
December	-27.1	-27.1	-27.0	-25.4	-26.8	-25.5
Average	**-11.3**	**-11.3**	**-11.2**	**-10.8**	**-11.1**	**-10.6**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.1-1c. 2008 Back River and Regional Monthly Average Air Temperature (°C) (January 2008 to December 2008)

Month	George (355 masl) 2008	Goose (277 masl) 2008	Lupin CS (488 masl) 2008	Kugluktuk CS (22.6 masl) 2008	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-28.8	-29.1	-27.6	-27.7	-30.4	-27.8
February	-32.2	-33.0	-31.1	-29.8	-28.5	-27.4
March	-30.4	-30.6	-23.9	-29.9	-24.9	-25.3
April	-17.6	-17.5	-15.8	-18.6	-15.9	-17
May	-5.0	-5.2	-4.1	-3.0	-5.7	-5.3
June	4.7	5.2	5.9	3.7	6.5	5.2
July	12.7	13.1	12.2	10.0	11.5	10.7
August	9.0	9.7	8.3	7.4	8.8	8.8
September	0.2	0.8	0.2	1.8	1.8	2.8
October	-5.5	-4.9	-6.0	-5.0	-8.6	-7.2
November	-19.0	-18.7	-18.4	-15.8	-20.7	-19.6
December	-27.6	-27.9	-31.6	-24.4	-26.8	-25.5
Average	**-11.6**	**-11.5**	**-11.0**	**-10.9**	**-11.1**	**-10.6**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.1-1d. 2009 Back River and Regional Monthly Average Air Temperature (°C) (January 2009 to December 2009)

Month	George (355 masl) 2009	Goose (277 masl) 2009	Lupin CS (488 masl) 2009	Kugluktuk CS (22.6 masl) 2009	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-26.9	-27.1	-26.7	-23.8	-30.4	-27.8
February	-28.0	-28.2	-	-26.4	-28.5	-27.4
March	-29.1	-29.2	-	-29.6	-24.9	-25.3
April	-14.7	-14.5	-	-16.1	-15.9	-17
May	-9.5	-9.2	-	-7.9	-5.7	-5.3
June	4.6	4.5	-	3.9	6.5	5.2
July	11.0	11.4	-	8.4	11.5	10.7
August	9.1	9.6	9.1	9.6	8.8	8.8
September	4.2	4.7	4.3	4.6	1.8	2.8
October	-9.9	-9.4	-9.3	-7.0	-8.6	-7.2
November	-17.0	-17.0	-17.0	-14.6	-20.7	-19.6
December	-24.7	-24.9	-25.3	-23.9	-26.8	-25.5
Average	**-10.9**	**-10.8**	**-**	**-10.2**	**-11.1**	**-10.6**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.1-1e. 2010 Back River and Regional Monthly Average Air Temperature (°C) (January 2010 to December 2010)

Month	George (355 masl) 2010	Goose (277 masl) 2010	Lupin CS (488 masl) 2010	Kugluktuk CS (22.6 masl) 2010	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-26.6	-26.5	-27.5	-25.1	-30.4	-27.8
February	-23.2	-22.7	-18.8	-23.0	-28.5	-27.4
March	-18.7	-	-15.0	-20.3	-24.9	-25.3
April	-8.3	-	-8.8	-6.8	-15.9	-17
May	-7.7	-6.3	-8.7	-5.4	-5.7	-5.3
June	6.5	6.5	6.6	6.6	6.5	5.2
July	13.0	13.8	12.6	10.7	11.5	10.7
August	10.2	10.6	9.7	10.6	8.8	8.8
September	2.2	2.6	2.4	3.8	1.8	2.8
October	-4.7	-4.4	-5.6	-4.1	-8.6	-7.2
November	-16.5	-16.1	-16.3	-14.4	-20.7	-19.6
December	-23.6	-23.6	-23.7	-23.6	-26.8	-25.5
Average	**-8.1**	**-**	**-7.8**	**-7.6**	**-11.1**	**-10.6**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.1-1f. 2011 Back River and Regional Monthly Average Air Temperature (°C) (January 2011 to December 2011)

Month	George (150 masl) 2011	Goose (277 masl) 2011	Lupin CS (488 masl) 2011	Kugluktuk A (22.6 masl) 2011	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-29.4	-30.0	-29.1	-26.9	-30.4	-27.8
February	-	-26.5	-24.5	-23.5	-28.5	-27.4
March	-	-24.0	-15.3	-21.0	-24.9	-25.3
April	-	-19.0	-19.7	-18.2	-15.9	-17
May	-	-3.5	-2.8	-3.1	-5.7	-5.3
June	4.9	5.3	5.4	4.1	6.5	5.2
July	14.4	14.5	13.3	12.4	11.5	10.7
August	11.2	11.4	10.7	11.1	8.8	8.8
September	3.2	3.7	3.7	4.7	1.8	2.8
October	-5.9	-5.5	-5.4	-4.2	-8.6	-7.2
November	-18.9	-18.6	-19.9	-21.1	-20.7	-19.6
December	-25.8	-25.8	-24.6	-25.7	-26.8	-25.5
Average	**-**	**-9.8**	**-9.0**	**-9.3**	**-11.1**	**-10.6**

Lupin CS and Kugluktuk stations have adjustments to the data from last issued report.
Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.1-1g. 2012 Back River and Regional Monthly Average Air Temperature (°C) (January 2012 to September 2012)

Month	George (150 masl) 2012	Goose (277 masl) 2012	Lupin CS (488 masl) 2012	Kugluktuk A (22.6 masl) 2012	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-30.3	-30.8	-28.6	-27.1	-30.4	-27.8
February	-23.7	-23.6	-21.0	-23.0	-28.5	-27.4
March	-26.1	-25.9	-20.7	-28.1	-24.9	-25.3
April	-15.1	-15.2	-15.3	-15.6	-15.9	-17
May	-1.3	-1.3	-1.1	-3.0	-5.7	-5.3
June	7.9	7.7	9.4	6.3	6.5	5.2
July	13.9	14.2	13.5	12.4	11.5	10.7
August	10.4	11.0	10.3	10.8	8.8	8.8
September	-	-	-	-	1.8	2.8
October	-	-	-	-	-8.6	-7.2
November	-	-	-	-	-20.7	-19.6
December	-	-	-	-	-26.8	-25.5
Average	-	-	-	-	**-11.1**	**-10.6**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

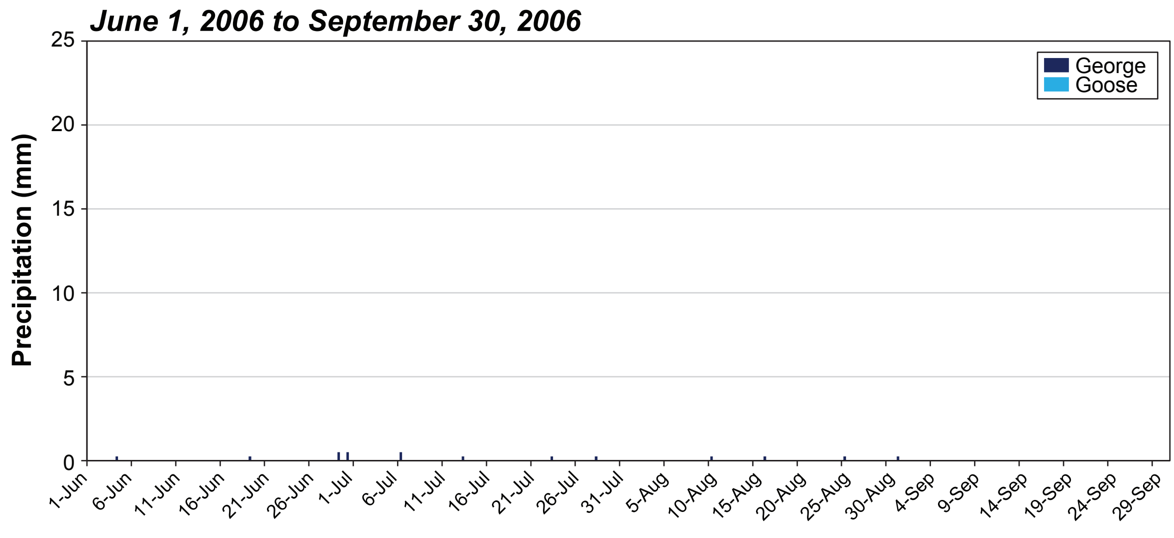
In terms of annual average air temperatures, data from the Back River Project area and EC-MSC regional stations show that 2006, 2010 and 2011 were warmer than climate normal, and 2007, 2008 and 2009 were similar to climate normals. In terms of minimum and maximum air temperatures the observations at the George and Goose meteorological stations for the period 2006 to 2012 are generally similar to the climate normals and observations at regional stations for the 2006 to 2012 period.

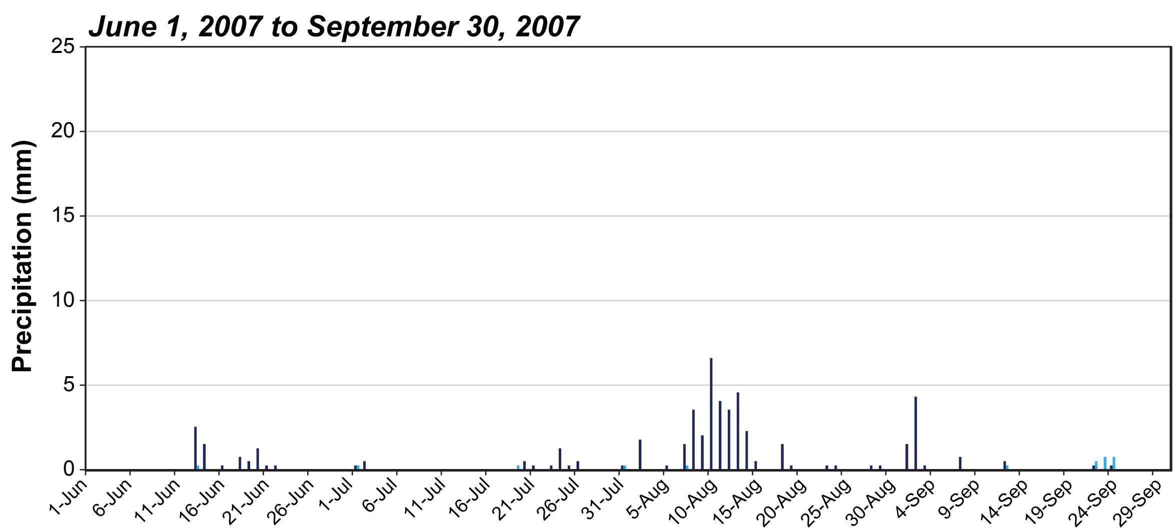
The extreme daily average maximum temperature at the George meteorological station over the 2006 to 2012 period of record was 28.2°C, recorded on July 20, 2007, and the extreme minimum temperature was -43.7°C on January 21, 2012. The extreme daily average maximum temperature at the Goose meteorological station over the 2006 to 2012 period of record was 28.9°C, recorded on July 20, 2007 and the extreme minimum temperature was -45.5°C on January 22, 2012. The 1971 to 2000 climate normal record maximum temperature at the EC-MSC operated Kugluktuk station was 34.9°C and occurred on July 15, 1989. The record low extreme minimum temperature was -49.0°C and occurred on January 8, 1987 at the EC-MSC Lupin A station.

3.2 PRECIPITATION AND RAINFALL

Precipitation climate normals in the Back River regional area range from 249.3 to 299.2 mm per year, which are typical for the area (NRCan 2009). Site-specific meteorology station precipitation was measured as rainfall during the summer period only (June, July, August, and September), when temperatures were above freezing. A winter precipitation adapter kit was installed at George and Goose meteorological stations on March 26 and March 27, respectively. The winter precipitation adapter will ensure precipitation data will be collected during the months temperatures fall below freezing.

Daily rainfall recorded at the George and Goose meteorological stations are presented in Figures 3.2-1a, 3.2-1b and 3.2-1c. Tables 3.2-1a to 3.2-1g summarize the total monthly rainfall values from George and Goose meteorological stations and monthly precipitation at the regional meteorological stations at Lupin CS and Kugluktuk.





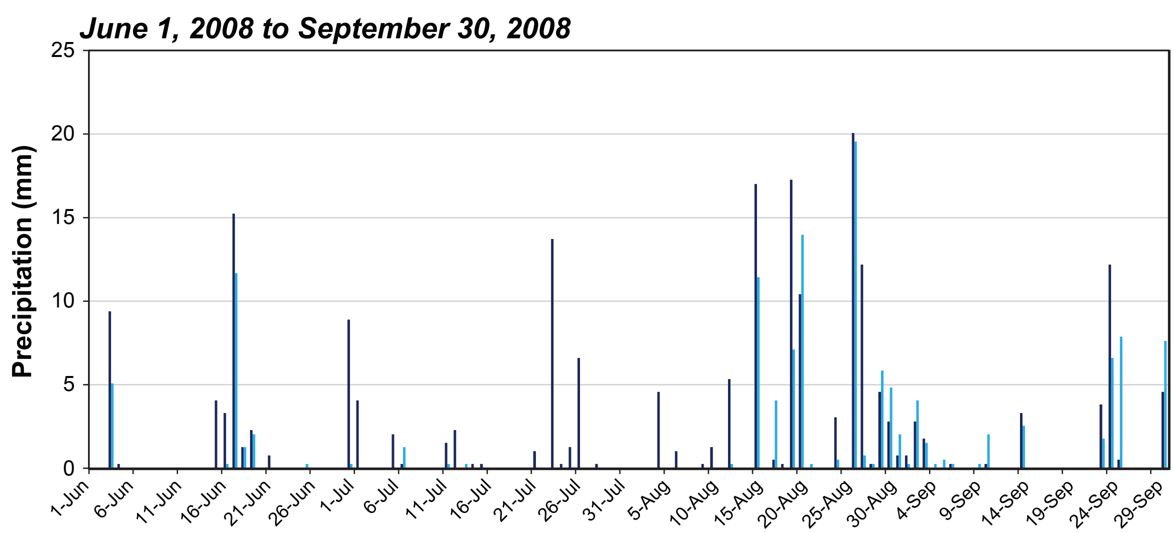


Figure 3.2-1a

Back River Rainfall, 2006 to 2008

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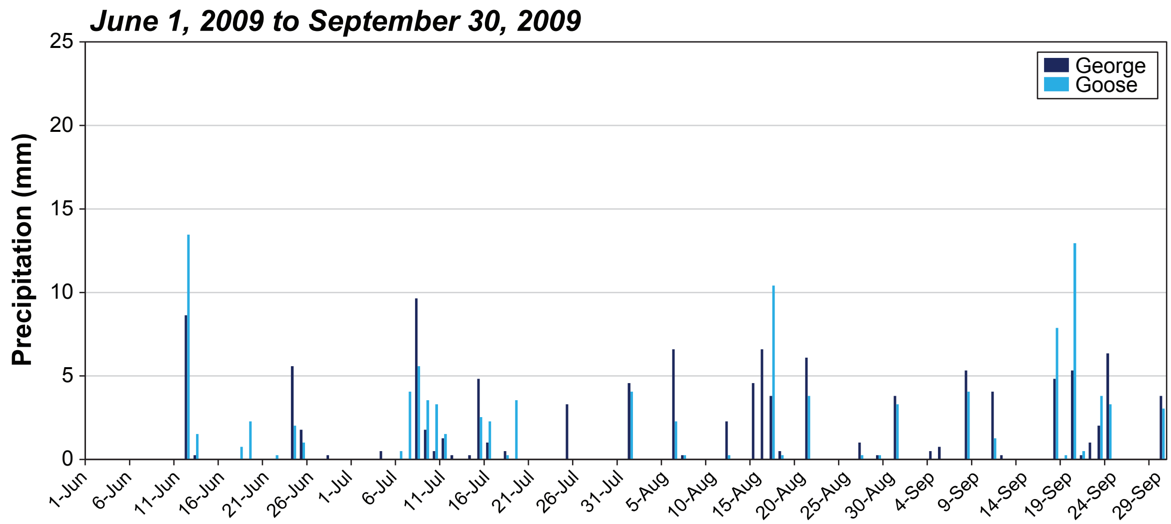
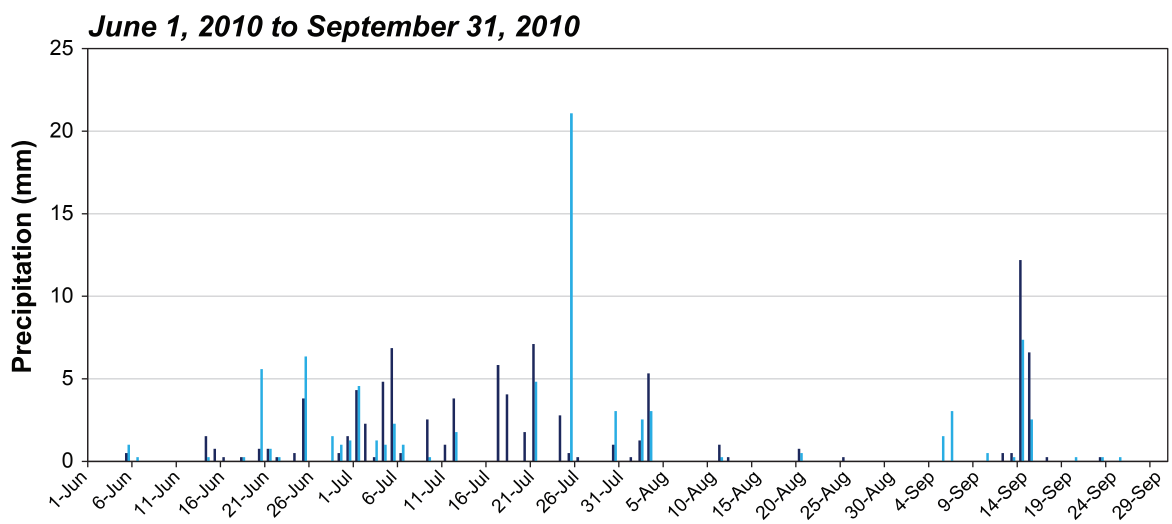




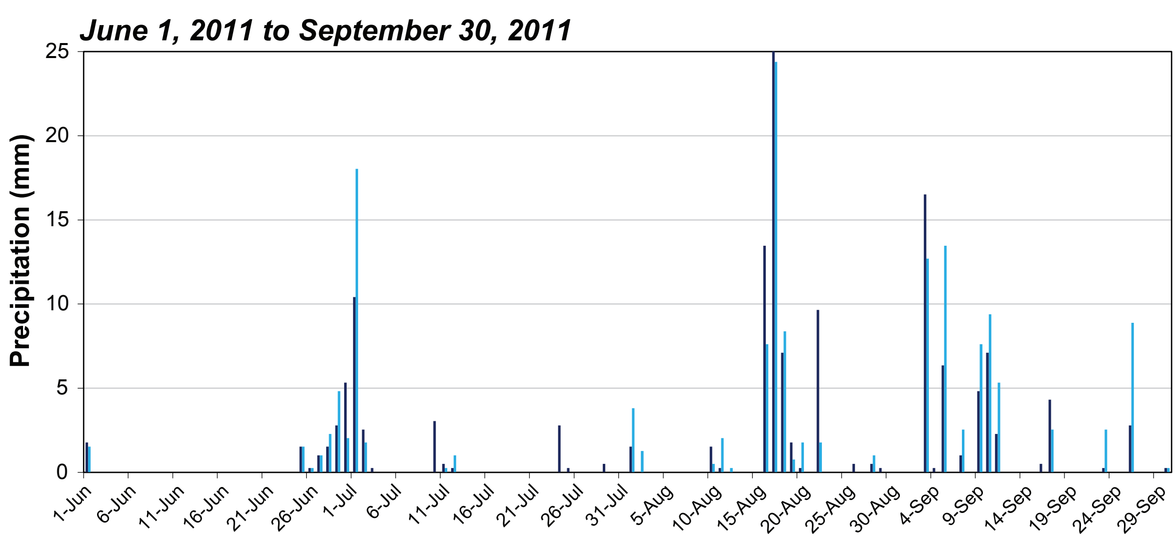


Figure 3.2-1b

Back River Rainfall, 2009 to 2011

Sabina GOLD & SILVER CORP.

Rescan Engineers & Scientists

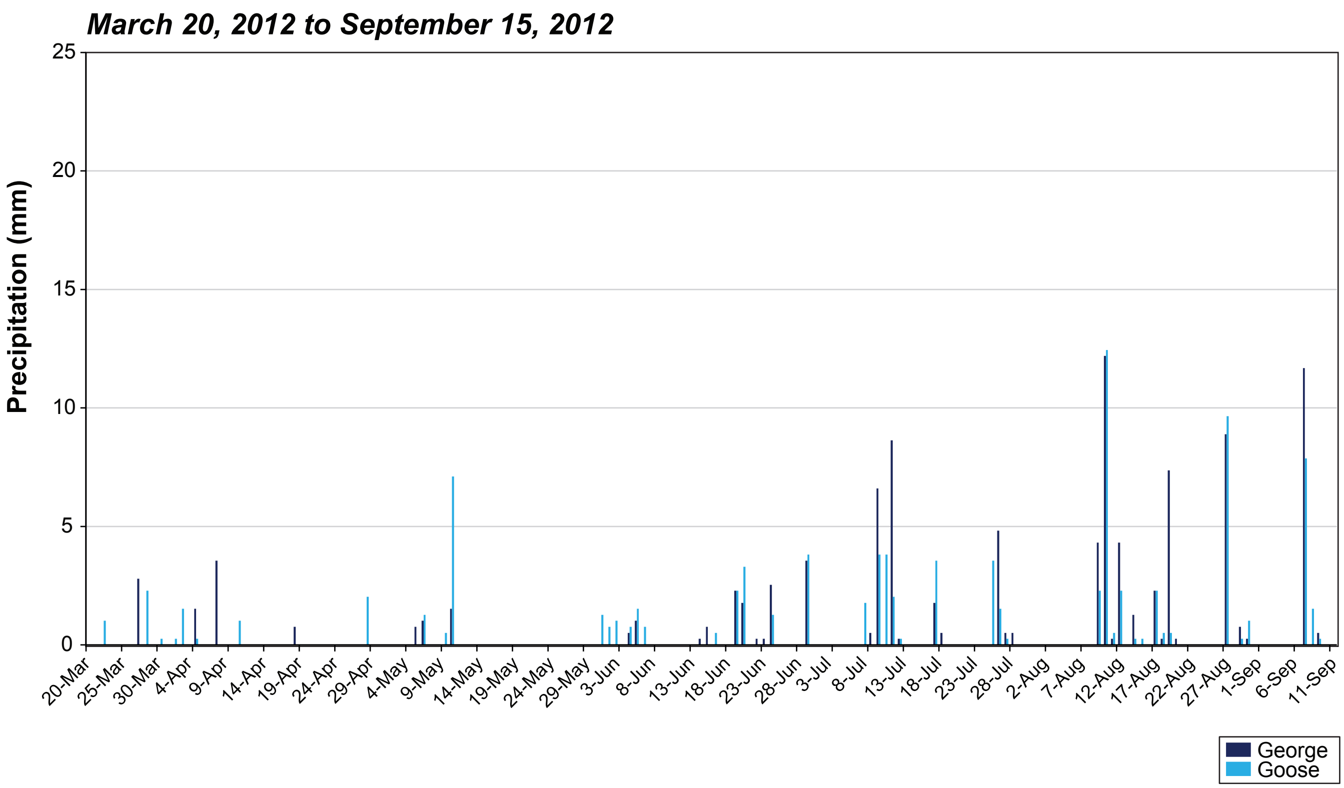


Figure 3.2-1c

Back River Rainfall, 2012

Table 3.2-1a. 2006 Back River Rainfall and Regional Total Monthly Precipitation (mm) (January 2006 to December 2006)

Month	George (355 masl) 2006	Goose (277 masl) 2006	Lupin CS (488 masl) 2006	Kugluktuk CS (22.6 masl) 2006	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	-	4.1	9.4	11
February	-	-	-	5.4	8.4	9.9
March	-	-	0.0	17.1	11.3	10.6
April	-	-	-	11.8	13.8	13.3
May	-	-	-	9.0	18.5	19.5
June	1.5	-	-	8.6	29.2	15.1
July	1.3	-	0.0	16.1	43.1	36.3
August	1.0	-	0.0	43.1	60.1	41.1
September	0.0	0.0	0.0	16.0	45.7	39
October	-	-	30.8	43.3	30.1	29.5
November	-	-	0.0	6.6	15.2	12.6
December	-	-	8.0	10.2	14.4	11.5
June to September Total	**3.8**	**-**	**-**	**83.8**	**178.1**	**131.5**
Annual Total	**-**	**-**	**-**	**191.3**	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.2-1b. 2007 Back River Rainfall and Regional Total Monthly Precipitation (mm) (January 2007 to December 2007)

Month	George (355 masl) 2007	Goose (277 masl) 2007	Lupin CS (488 masl) 2007	Kugluktuk CS (22.6 masl) 2007	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	-	5.3	9.4	11
February	-	-	-	12.0	8.4	9.9
March	-	-	-	3.1	11.3	10.6
April	-	-	14.2	11.3	13.8	13.3
May	-	-	-	27.1	18.5	19.5
June	7.4	0.3	1.0	8.3	29.2	15.1
July	4.1	0.8	44.4	183.6	43.1	36.3
August	33.5	0.3	-	38.3	60.1	41.1
September	7.9	2.3	-	8.5	45.7	39
October	-	-	19.9	37.2	30.1	29.5
November	-	-	-	2.5	15.2	12.6
December	-	-	0.7	7.0	14.4	11.5
June to September Total	**52.8**	**3.6**	**-**	**238.7**	**178.1**	**131.5**
Annual Total	**-**	**-**	**-**	**344.2**	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.2-1c. 2008 Back River Rainfall and Regional Total Monthly Precipitation (mm) (January 2008 to December 2008)

Month	George (355 masl) 2008	Goose (277 masl) 2008	Lupin CS (488 masl) 2008	Kugluktuk CS (22.6 masl) 2008	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	-	12.8	9.4	11
February	-	-	-	2.5	8.4	9.9
March	-	-	-	7.6	11.3	10.6
April	-	-	3.7	20.1	13.8	13.3
May	-	-	19.2	3.5	18.5	19.5
June	49.5	20.8	32.9	15.6	29.2	15.1
July	29.7	1.8	18.3	33.8	43.1	36.3
August	102.4	71.1	116.6	58.4	60.1	41.1
September	29.5	35.6	44.5	21.1	45.7	39
October	-	-	16.9	16.6	30.1	29.5
November	-	-	14.4	4.6	15.2	12.6
December	-	-	-	2.2	14.4	11.5
June to September Total	**211.1**	**129.3**	**212.3**	**128.9**	**178.1**	**131.5**
Annual Total	**-**	**-**	**-**	**198.8**	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.2-1d. 2009 Back River Rainfall and Regional Monthly Total Monthly Precipitation (mm) (January 2009 to December 2009)

Month	George (355 masl) 2009	Goose (277 masl) 2009	Lupin CS (488 masl) 2009	Kugluktuk CS (22.6 masl) 2009	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	5.5	1.1	9.4	11
February	-	-	-	3.8	8.4	9.9
March	-	-	-	1.2	11.3	10.6
April	-	-	-	11.8	13.8	13.3
May	-	-	-	1.6	18.5	19.5
June	16.5	21.3	-	26.0	29.2	15.1
July	23.9	27.2	-	26.0	43.1	36.3
August	40.4	25.1	-	18.0	60.1	41.1
September	34.5	37.1	45.5	29.1	45.7	39
October	-	-	5.5	3.9	30.1	29.5
November	-	-	19.9	2.4	15.2	12.6
December	-	-	1.3	0.3	14.4	11.5
June to September Total	**115.3**	**110.7**	**-**	**99.1**	**178.1**	**131.5**
Annual Total	**-**	**-**	**-**	**125.2**	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.2-1e. 2010 Back River Rainfall and Regional Monthly Total Monthly Precipitation (mm) (January 2010 to December 2010)

Month	George (355 masl) 2010	Goose (277 masl) 2010	Lupin CS (488 masl) 2010	Kugluktuk CS (22.6 masl) 2010	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	0.6	10.4	9.4	11
February	-	-	3.0	0.9	8.4	9.9
March	-	-	46.9	8.9	11.3	10.6
April	-	-	22.2	2.3	13.8	13.3
May	-	-	6.2	6.3	18.5	19.5
June	11.4	18.5	16.6	20.2	29.2	15.1
July	49.8	41.2	80.6	40.7	43.1	36.3
August	9.1	6.4	6.5	24.1	60.1	41.1
September	-	-	37.5	23.1	45.7	39
October	-	-	6.6	23.6	30.1	29.5
November	-	-	12.6	2.3	15.2	12.6
December	-	-	1.5	1.8	14.4	11.5
June to September Total	**70.4**	**66.0**	**141.2**	**108.1**	**178.1**	**131.5**
Annual Total	**-**	**-**	**240.8**	**164.6**	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.2-1f. 2011 Back River Rainfall and Regional Monthly Total Monthly Precipitation (mm) (January 2011 to December 2011)

Month	George (150 masl) 2011	Goose (277 masl) 2011	Lupin CS (488 masl) 2011	Kugluktuk A (22.6 masl) 2011	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	-	10.6	9.4	11
February	-	-	-	10.3	8.4	9.9
March	-	-	-	6.4	11.3	10.6
April	-	-	18.4	6.0	13.8	13.3
May	-	-	6.3	4.8	18.5	19.5
June	14.2	13.5	6.7	9.0	29.2	15.1
July	20.6	21.1	12.3	20.0	43.1	36.3
August	70.1	53.6	25.0	97.9	60.1	41.1
September	46.5	65.3	35.2	69.0	45.7	39
October	-	-	3.4	17.0	30.1	29.5
November	-	-	1.6	6.2	15.2	12.6
December	-	-	3.5	6.3	14.4	11.5
June to September Total	**151.4**	**153.4**	**79.2**	**195.9**	**178.1**	**131.5**
Annual Total	**-**	**-**	**-**	**263.5**	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

Table 3.2-1g. 2012 Back River Rainfall and Regional Monthly Total Monthly Precipitation (mm) (January 2012 to October 2012)

Month	George (150 masl) 2012	Goose (277 masl) 2012	Lupin CS (488 masl) 2012	Kugluktuk A (22.6 masl) 2012	Lupin A (490 masl) 1982-2000 Climate Normal	Kugluktuk (22.6 masl) 1971-2000 Climate Normal
January	-	-	2.4	13.2	9.4	11
February	-	-	19.6	6.5	8.4	9.9
March	2.8	3.6	-	8.0	11.3	10.6
April	5.8	5.1	-	9.2	13.8	13.3
May	3.3	10.2	-	5.1	18.5	19.5
June	13.2	16.0	-	15.8	29.2	15.1
July	24.1	20.6	-	27.3	43.1	36.3
August	42.4	32.3	-	23.4	60.1	41.1
September	12.2	11.4	5.3	11.1	45.7	39
October	-	-	22.0	23.2	30.1	29.5
November	-	-	-	-	15.2	12.6
December	-	-	-	-	14.4	11.5
June to September Total	**91.9**	**80.3**	-	**77.6**	**178.1**	**131.5**
Annual Total	**-**	**-**	-	-	**299.2**	**249.4**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

It is not possible to report annual precipitation at the George and Goose meteorological stations due to data not being available for the winter months. This information will be available in future years as winter precipitation gauges were installed in 2012. However, comparing the precipitation totals for the months with available data, to data from the regional stations for the same period, the precipitation is generally similar and therefore annual precipitation at the George and Goose meteorological stations can be inferred from the regional station data.

Total annual precipitation at the Lupin CS meteorological station was 266.5 mm in 2008, 240.8 mm in 2010 and 112.4 mm in 2011. There was not sufficient data capture to calculate total precipitation in 2006, 2007, 2009 or 2012. At the Kugluktuk meteorological station total annual precipitation was 191.3 mm in 2006, 344.2 mm in 2007, 198.8 mm in 2008, 125.2 mm in 2009, 164.6 mm in 2010, and 120.6 mm in 2011. Climate normal total precipitation was 299.2 mm and 249.4 mm at the Lupin A and Kugluktuk meteorological stations respectively. Compared to climate normals, total precipitation at the regional stations was lower in 2006, 2008, 2009, 2010, 2011 and 2012 and higher in 2007, suggesting that the 2006 to 2012 period was generally drier than climate normals.

At the Kugluktuk A regional climate station, the majority of the precipitation (66%) occurred during the spring, summer and fall months during the 2006 to 2011 period. Climate normal data indicate that 53 to 60% of total precipitation fell during the spring, summer and fall months, suggesting that a slightly greater proportion of the total annual precipitation was falling during these seasons during the 2006 to 2012 period. This discrepancy could be from sample size differences or changes in seasonal variation.Wind Speed and Direction

3.3 WIND SPEED AND DIRECTION

The Back River Project area lies near the northern reaches of the North American continent. As such, it is primarily subject to cold, dry Arctic air masses and American continental air masses from the south. The area is subject to a high wind speeds due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains).

Figures 3.3-1 and 3.3-2 show average annual, summer and winter wind roses based on data collected during the measurement period (2006 to September 2012) for George and Goose stations, respectively. Appendix 3 shows annual, summer, and winter wind distributions for George and Goose meteorological stations for 2006, 2007, 2008, 2009, 2010, 2011 and 2012. At both meteorological stations the trends in wind speed and direction are fairly consistent for the years 2006 to 2012.

At the George meteorological station the winds blow from north, north northeast, northwest and southeast most frequently. Wind speeds were in excess of 5 m/s from all directions 43% of the time. Broken down into summer (June to September) and winter seasons (October to May), both seasons had wind speeds that were in excess of 5 m/s from all directions over 40% of the time. In the winter period the dominant wind direction was from the northwest to north northeast quadrant 45% of the time and also from the southeast direction for 10% of the time. In the summer wind direction was predominantly from the north to north northeast 27% of the time and also from the southeast direction for 11% of the time.

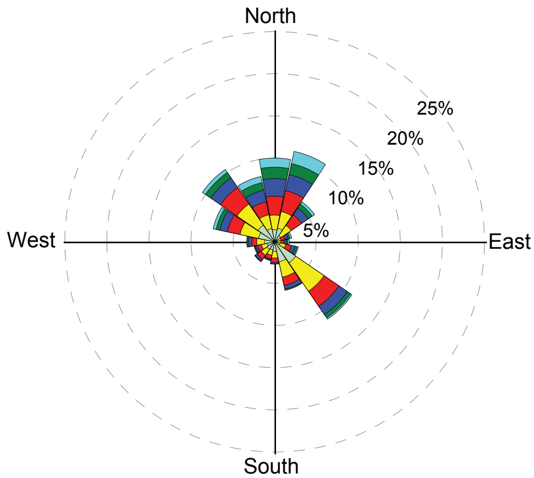
At the Goose meteorological station the dominant wind direction is from the west to north quadrant, blowing from this quadrant 42% of the time and also from the southerly direction for 9% of the time. Wind speeds were in excess of 5 m/s from all directions over 35% of the time. Broken down into summer (June to September) and winter seasons (October to May), both seasons had wind speeds that were in excess of 5 m/s from all directions over 35% of the time. In the winter period the dominant wind direction was from the north to west quadrant approximately 42% of the time and also from the southerly direction for approximately 10% of the time. In the summer wind direction was predominantly from the north northeast to north northwest approximately 34% of the time and also from the southeast to south direction for approximately 15% of the time.

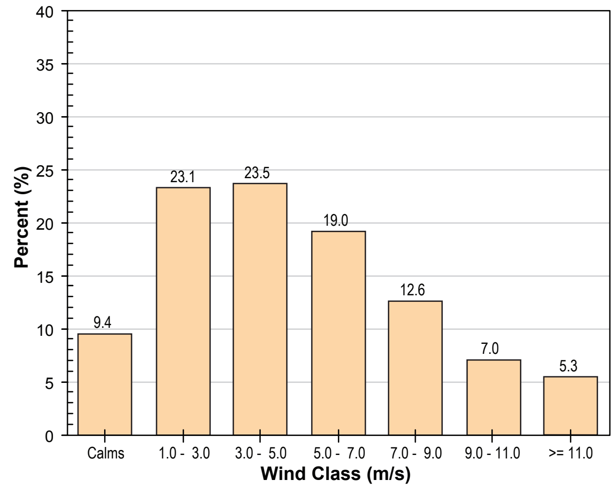
3.4 SOLAR RADIATION

Solar radiation is electromagnetic energy from the sun. Solar energy accounts for 99% of the Earth's energy budget. The solar radiation incident on top of the terrestrial atmosphere is called extraterrestrial solar radiation. Ninety seven percent of this radiation is confined to the spectral range of 0.29 to 3.0 microns and is referred to as short-wave radiation. A portion of the extraterrestrial solar radiation penetrates through the atmosphere to the earth's surface, while part of it is scattered and/or absorbed in the atmosphere by gases, aerosol particles, cloud droplets and cloud crystals. Global solar radiation is monitored at the George and Goose meteorological stations using a silicone pyranometer. Global solar radiation is the total incoming direct and diffuse short-wave solar radiation received from the whole dome of the sky on a horizontal surface.

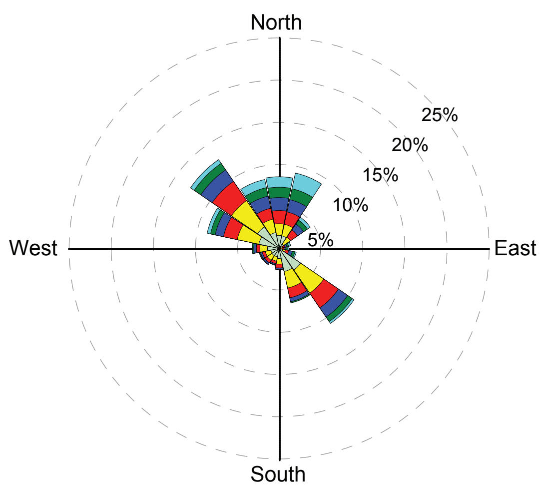
Figures 3.4-1 and 3.4-2 summarize the mean daily solar radiation values for the 2006 to 2012 period at the George and Goose meteorological stations, respectively. The highest daily average solar radiation readings were 396 W/m^2, recorded on June 8, 2008 at George and 387 W/m^2, also recorded on June 8, 2008, at Goose. A maximum hourly average solar radiation value of 942 W/m^2 was recorded at the George meteorological station on May 17, 2008. A maximum hourly average solar radiation value of 904 W/m^2 was recorded at the Goose meteorological station on July 11, 2007.

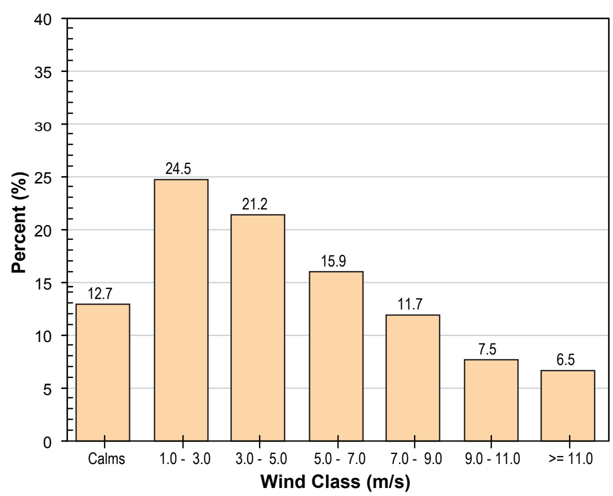
Annual



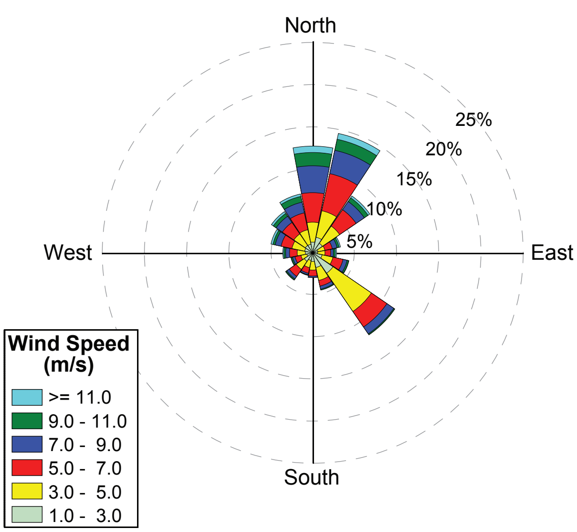


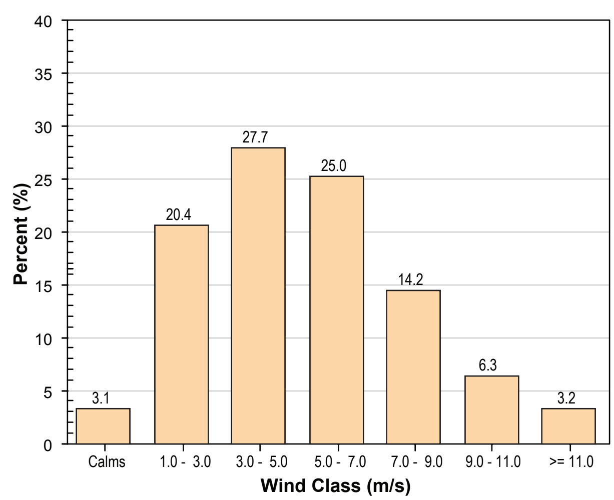
Winter





Summer





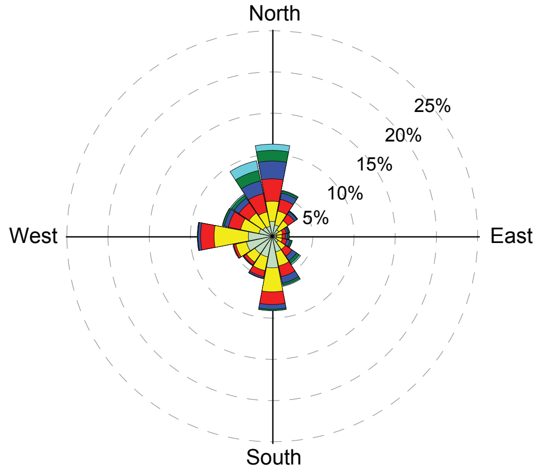
Sabina GOLD & SILVER CORP.

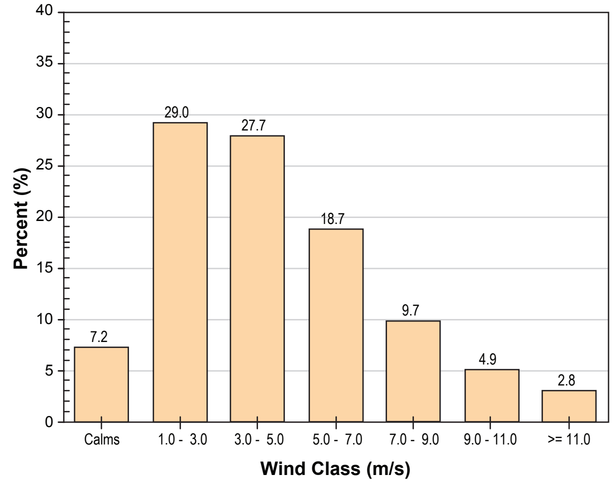
George Meteorological
Station Windroses, 2006 to 2012

Figure 3.3-1

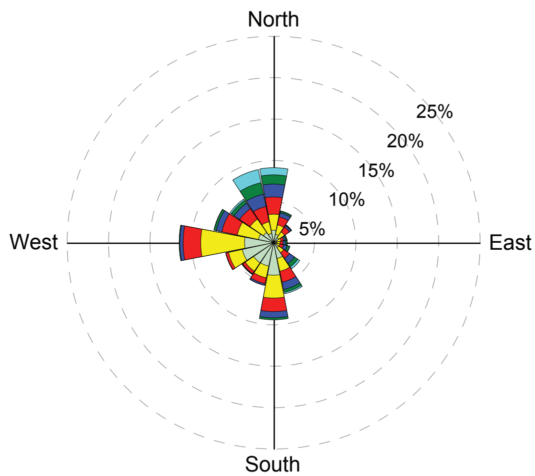
Rescan™ Engineers & Scientists

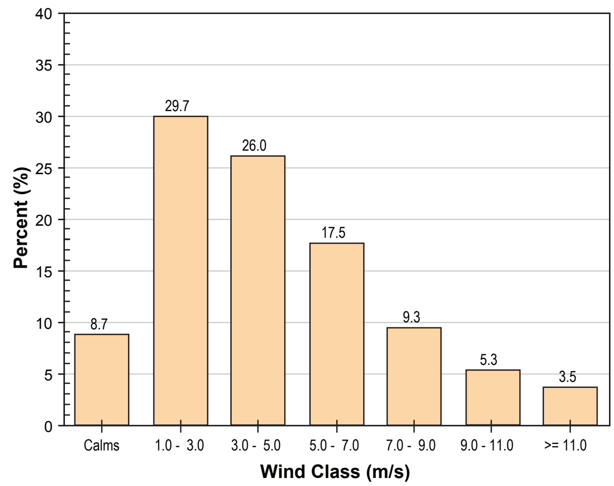
Annual



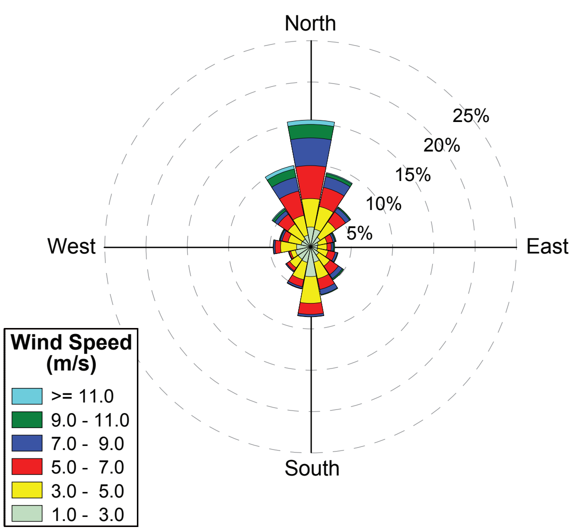


Winter





Summer



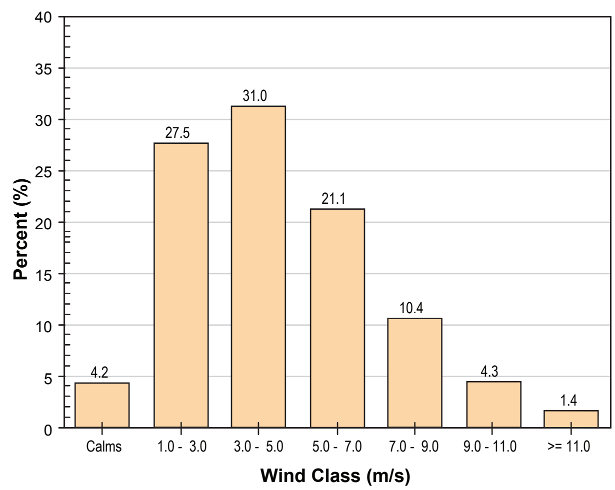


Figure 3.3-2

Goose Meteorological Station
Windroses, 2006 to 2012

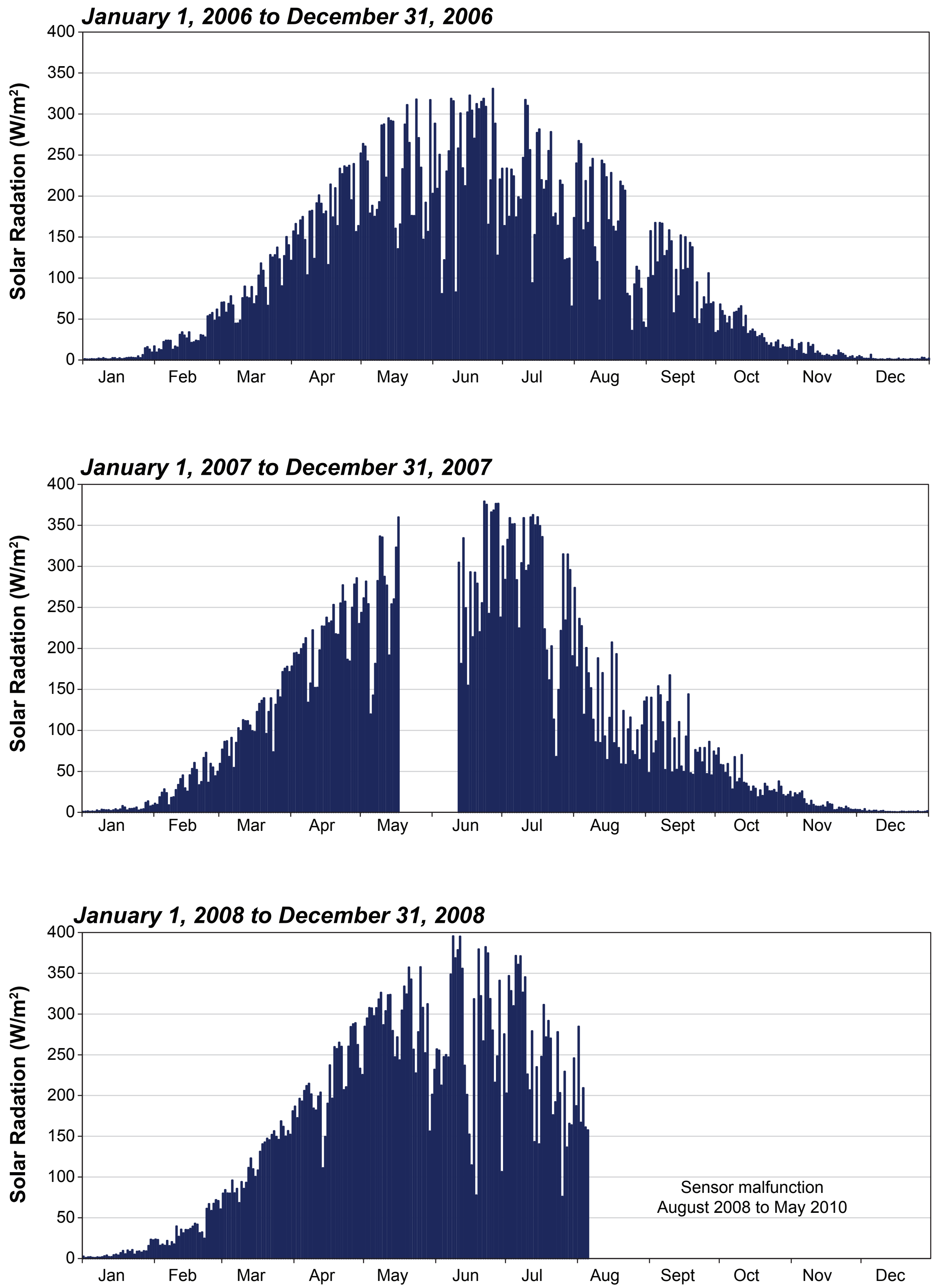


Figure 3.4-1a

George Meteorological Station Average Solar Radiation, 2006 to 2008

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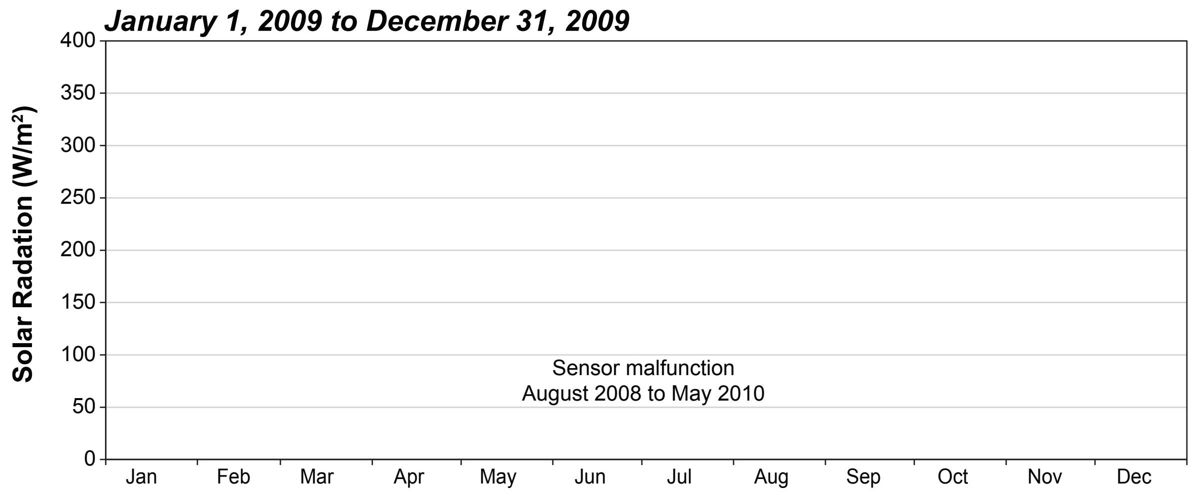

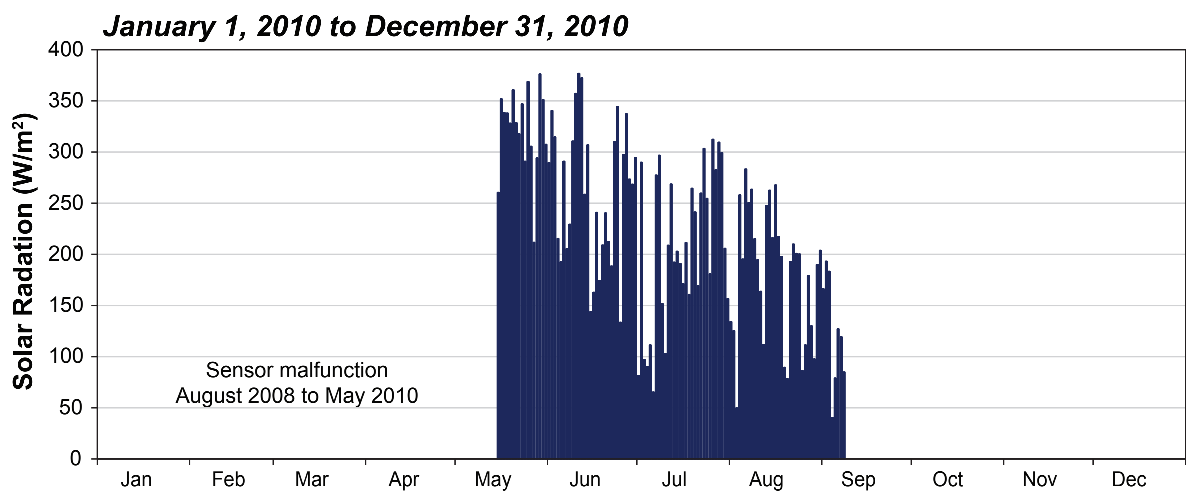

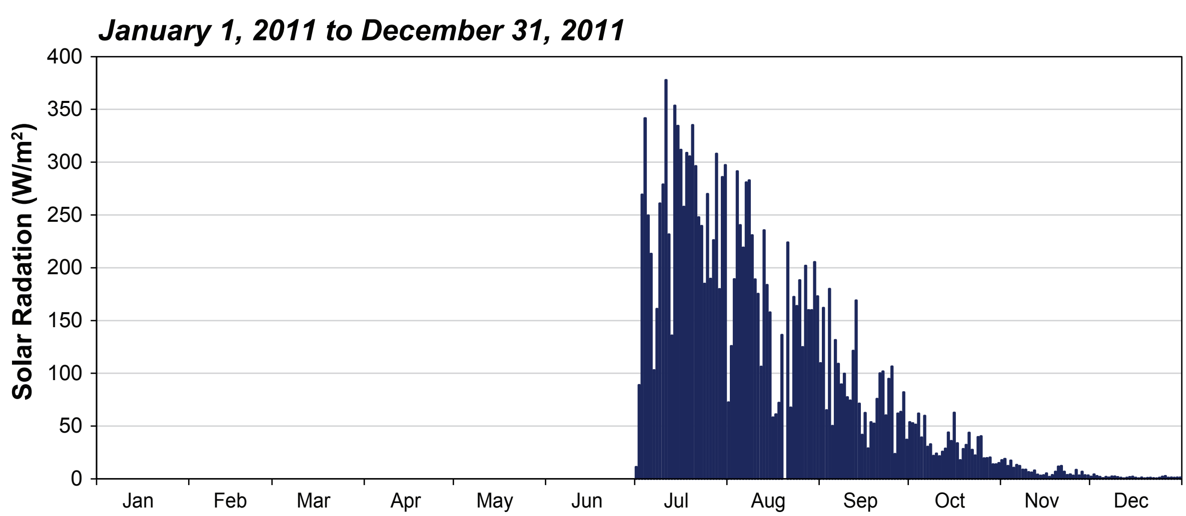

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George Meteorological Station Average Solar Radiation, 2009 to 2011

Figure 3.4-1b

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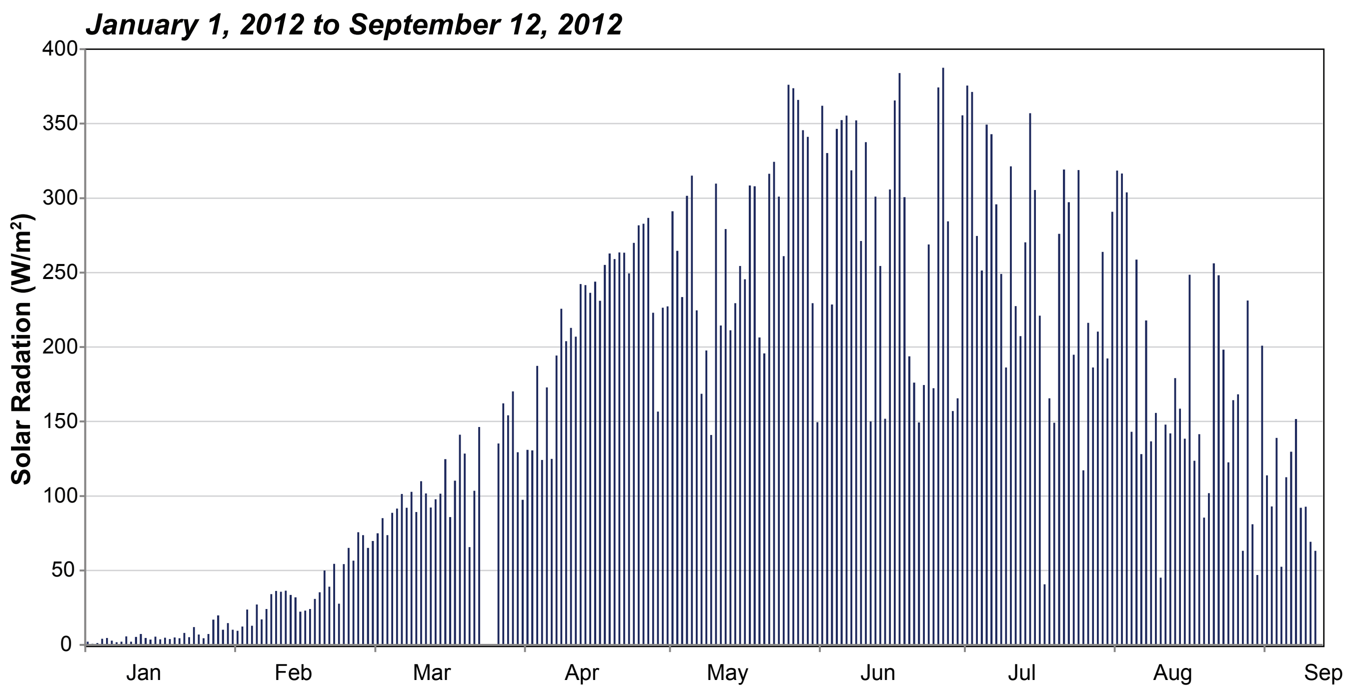
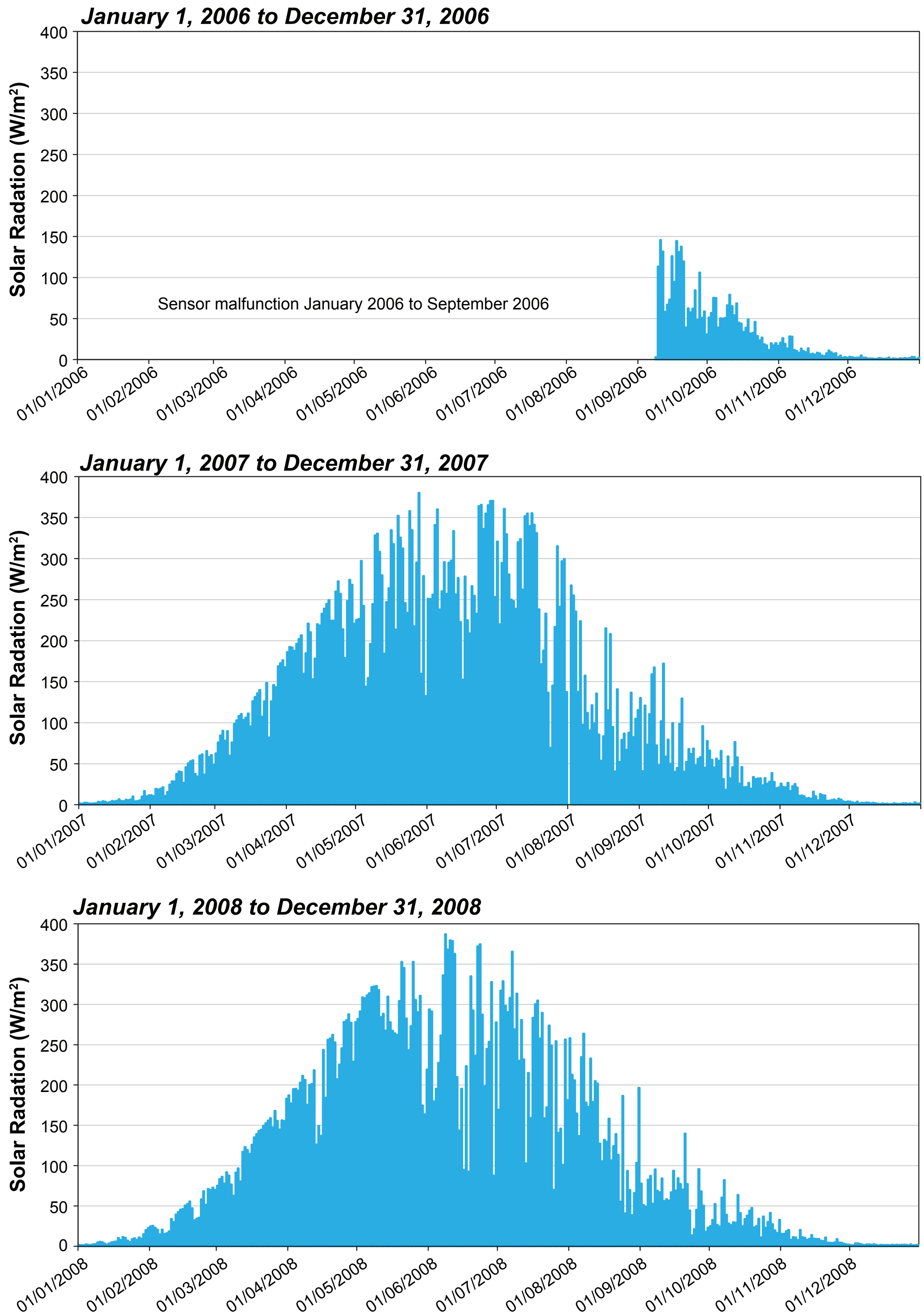


Figure 3.4-1c

George Meteorological Station
Average Solar Radiation, 2012



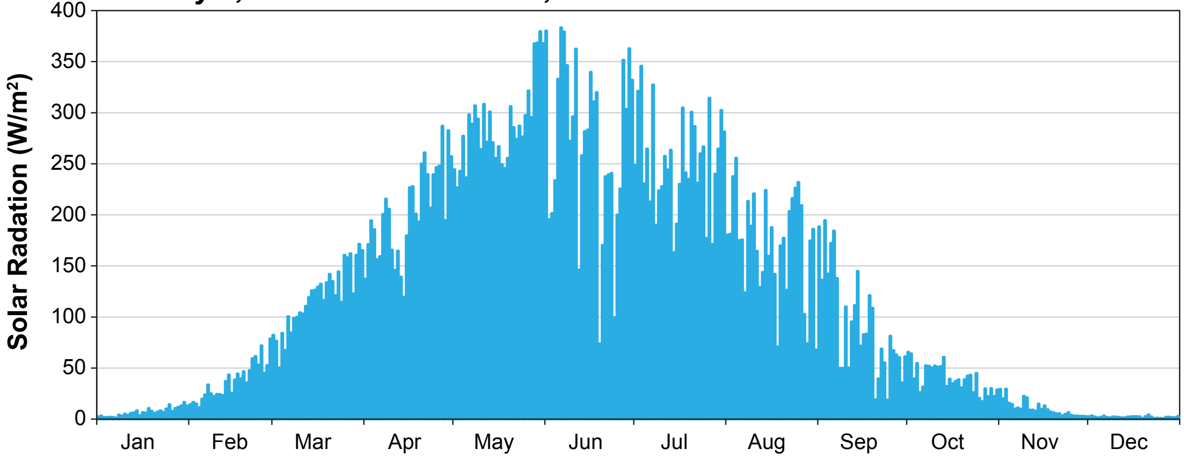
Sabina GOLD & SILVER CORP.

Goose Meteorological Station Average Solar Radiation, 2006 to 2008

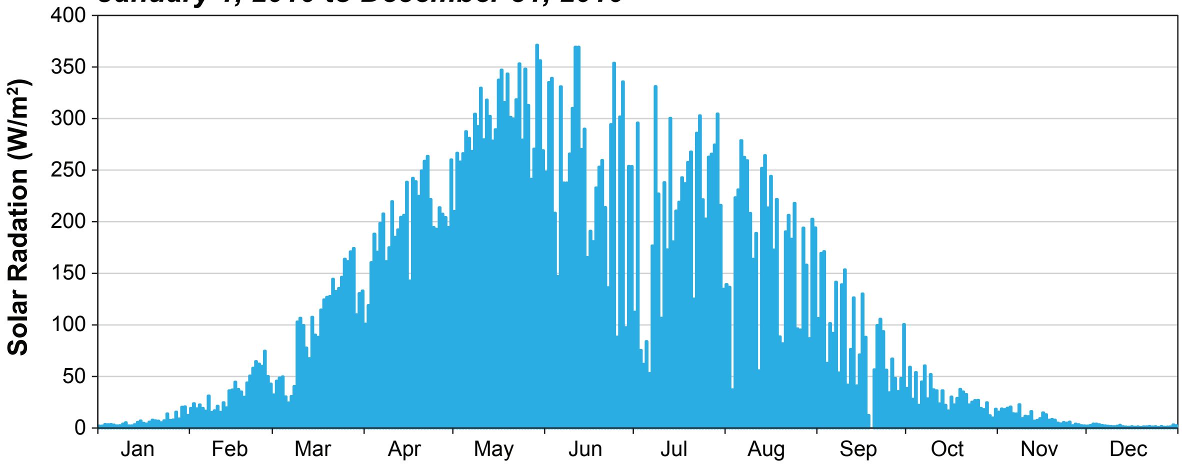
Figure 3.4-2a

Rescan Engineers & Scientists

January 1, 2009 to December 31, 2009



January 1, 2010 to December 31, 2010



January 1, 2011 to December 31, 2011

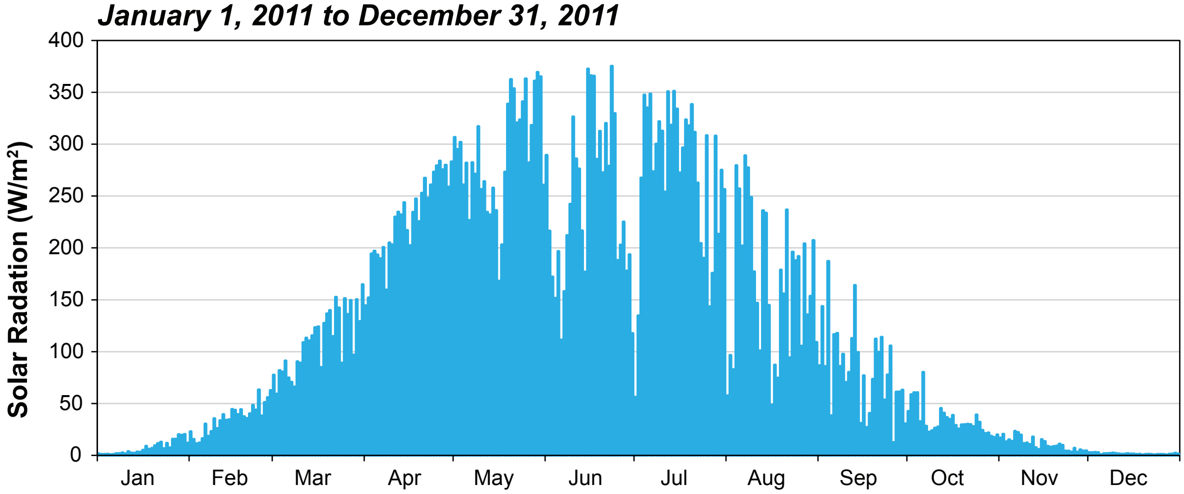


Figure 3.4-2b

Goose Meteorological Station Average Solar Radiation, 2009 to 2011

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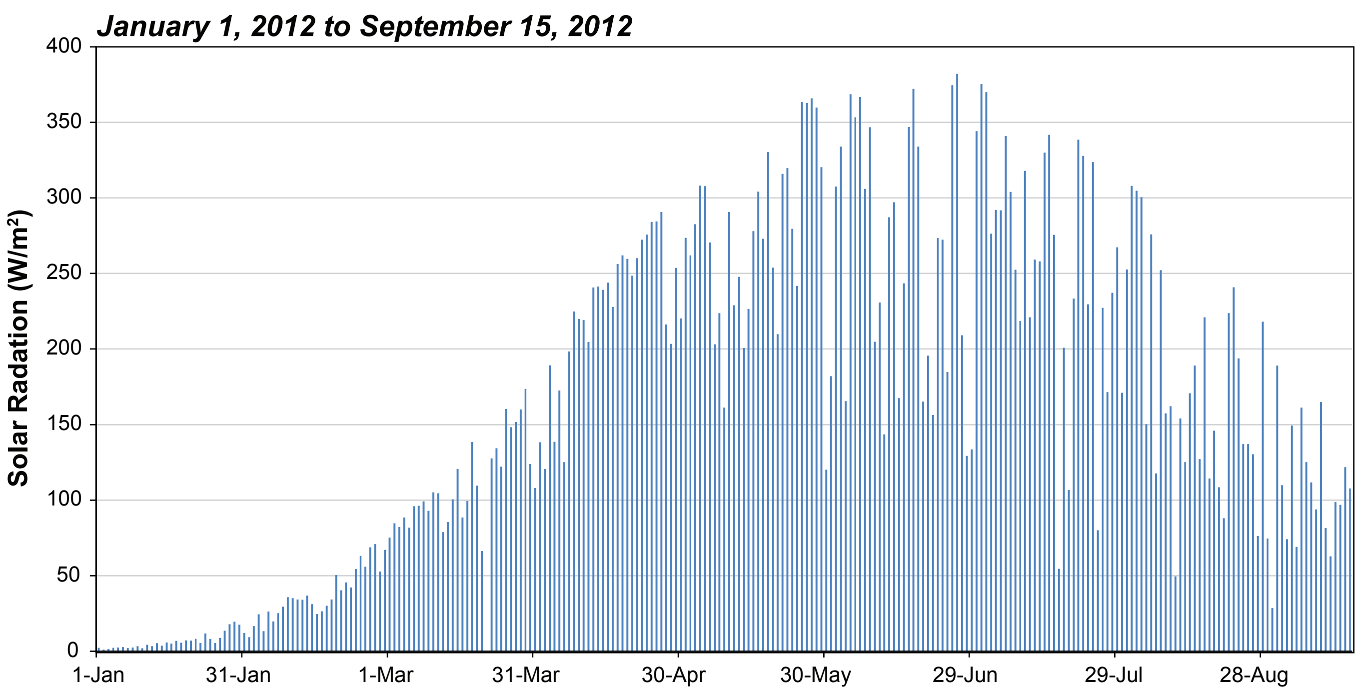

Sabina GOLD & SILVER CORP.

Goose Meteorological Station
Average Solar Radiation, 2012

Figure 3.4-2c

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The lowest solar radiation values were recorded during winter months, when the sun is low and the Back River regional area experiences near perpetual night and twilight for several weeks. This period starts in late November and ends in mid-January. Average daily and hourly solar radiation values hover around zero during this time. All of the hourly average solar radiation values recorded during night time hours were 0 W/m^2.

Tables 3.4-1a to 3.4-1g show total bright sunshine hours and mean daily global solar radiation recorded at the George and Goose meteorological stations. A bright sunshine hour is defined by the World Meteorological Organization (WMO 2008) as an hour when the average global solar radiation is greater than 120 W/m^2.

Table 3.4-1a. 2006 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2006 to December 2006)

	George (355 masl)		Goose (277 masl)	
	2006 Total Bright Sunshine Hours	**2006 Mean Daily Global Solar Radiation (W/m^2)**	**2006 Total Bright Sunshine Hours**	**2006 Mean Daily Global Solar Radiation (W/m^2)**
January	0	4	-	-
February	59	30	-	-
March	238	92	-	-
April	343	185	-	-
May	413	229	-	-
June	410	250	-	-
July	398	202	-	-
August	316	163	-	-
September	244	109	154	88
October	88	37	109	42
November	7	10	9	11
December	0	2	0	2
Average	**210**	**110**	**-**	**-**
Sum	**2,516**	**n/a**	**-**	**n/a**
Minimum	**0**	**2**	**0**	**2**
Maximum	**413**	**250**	**154**	**88**

Dash (-) indicates data missing.
n/a indicates statistic is not applicable for variable.

The number of hours of bright sunshine at George was 2,516 in 2006, 2,258 in 2007 and 2,063 in 2008. Total hours cannot be reported for 2009, 2010 or 2011 due to insufficient data capture. At Goose there were 2,587 hours in 2007, 2,555 hours in 2008, 2,674 hours in 2009, 2,489 hours in 2010 and 2,623 hours in 2011. Total hours cannot be reported for 2006 due to insufficient data capture.

Mean daily global solar radiation during this period was 110 W/m^2 and 122 W/m^2 in 2006 and 2007 respectively at George and 120 W/m^2, 120 W/m^2, 125 W/m^2 and 125 W/m^2 in 2007, 2008, 2009 and 2011, respectively at Goose. Note that the annual mean daily global radiation for some years was not reported due to missing data.

Table 3.4-1b. 2007 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2007 to December 2007)

	George (355 masl)		Goose (277 masl)	
	2007 Total Bright Sunshine Hours	2007 Mean Daily Global Solar Radiation (W/m^2)	2007 Total Bright Sunshine Hours	2007 Mean Daily Global Solar Radiation (W/m^2)
January	0	4	0	5
February	94	37	89	36
March	261	114	266	115
April	355	215	353	217
May	221	256	426	262
June	284	290	443	286
July	433	277	419	266
August	299	131	276	124
September	205	87	210	82
October	97	39	93	38
November	9	11	12	12
December	0	2	0	2
Average	**188**	**122**	**216**	**120**
Sum	**2,258**	**n/a**	**2,587**	**n/a**
Minimum	**0**	**2**	**0**	**2**
Maximum	**433**	**290**	**443**	**286**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

Table 3.4-1c. 2008 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2008 to December 2008)

	George (355 masl)		Goose (277 masl)	
	2008 Total Bright Sunshine Hours	2008 Mean Daily Global Solar Radiation (W/m^2)	2008 Total Bright Sunshine Hours	2008 Mean Daily Global Solar Radiation (W/m^2)
January	3	7	2	7
February	92	37	107	41
March	267	121	275	123
April	357	218	360	218
May	434	289	436	288
June	424	278	410	264
July	420	247	412	236
August	66	201	306	150
September	-	-	171	65
October	-	-	76	35
November	-	-	0	9
December	-	-	0	2
Average	**-**	**-**	**213**	**120**
Sum	**-**	**n/a**	**2,555**	**n/a**
Minimum	**3**	**7**	**0**	**2**
Maximum	**434**	**289**	**436**	**288**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

Table 3.4-1d. 2009 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2009 to December 2009)

	George (355 masl)		Goose (277 masl)	
	2009 Total Bright Sunshine Hours	2009 Mean Daily Global Solar Radiation (W/m^2)	2009 Total Bright Sunshine Hours	2009 Mean Daily Global Solar Radiation (W/m^2)
January	-	-	0	7
February	-	-	92	37
March	-	-	266	119
April	-	-	344	203
May	-	-	435	288
June	-	-	421	272
July	-	-	433	252
August	-	-	348	172
September	-	-	213	94
October	-	-	115	40
November	-	-	7	11
December	-	-	0	2
Average	**-**	**-**	**223**	**125**
Sum	**-**	**n/a**	**2,674**	**n/a**
Minimum	**-**	**-**	**0**	**2**
Maximum	**-**	**-**	**435**	**288**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

Table 3.4-1e. 2010 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2010 to December 2010)

	George (355 masl)		Goose (277 masl)	
	2010 Total Bright Sunshine Hours	2010 Mean Daily Global Solar Radiation (W/m^2)	2010 Total Bright Sunshine Hours	2010 Mean Daily Global Solar Radiation (W/m^2)
January	-	-	0	7
February	-	-	77	35
March	-	-	230	101
April	-	-	349	201
May	246	324	439	299
June	421	263	407	252
July	372	207	374	208
August	346	181	340	179
September	77	37	209	89
October	-	-	-	-
November	-	-	-	-
December	-	-	-	-
Average	**-**	**-**	-	-
Sum	**-**	**n/a**	-	**n/a**
Minimum	**77**	**37**	**0**	**7**
Maximum	**421**	**324**	**439**	**299**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

Table 3.4-1f. 2011 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2011 to December 2011)

	George(150 masl)		Goose (277 masl)	
	2011 Total Bright Sunshine Hours	2011 Mean Daily Global Solar Radiation (W/m^2)	2011 Total Bright Sunshine Hours	2011 Mean Daily Global Solar Radiation (W/m^2)
January	-	-	2	7
February	-	-	96	36
March	-	-	259	111
April	-	-	364	229
May	162	87	437	291
June	-	-	412	247
July	475	247	445	274
August	344	172	326	168
September	207	85	200	84
October	72	33	76	34
November	0	8	6	11
December	0	2	0	2
Average	**-**	**-**	**219**	**125**
Sum	**-**	**n/a**	**2,623**	**n/a**
Minimum	**-**	**-**	**0**	**2**
Maximum	**-**	**-**	**445**	**291**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

Table 3.4-1g. 2011 Mean Daily Solar Radiation and Total Bright Sunshine Hours (January 2012 to December 2012)

	George (150 masl)		Goose (277 masl)	
	2012 Total Bright Sunshine Hours	2012 Mean Daily Global Solar Radiation (W/m^2)	2012 Total Bright Sunshine Hours	2012 Mean Daily Global Solar Radiation (W/m^2)
January	0	6	7	2
February	94	38	38	103
March	241	109	110	243
April	355	221	224	359
May	424	267	270	422
June	440	278	267	421
July	409	253	256	417
August	318	170	167	315
September	97	101	109	129
October	-	-	-	-
November	-	-	-	-
December	-	-	-	-
Average	**-**	**-**	**-**	**-**
Sum	**-**	**n/a**	**-**	**n/a**
Minimum	**0**	**6**	**7**	**2**
Maximum	**440**	**278**	**270**	**422**

Dash (-) indicates data missing. n/a indicates statistic is not applicable for variable.

3.5 EVAPORATION

Lake evaporation rates were calculated using data from the Goose Lake micro-meteorology (evaporation) station (installed July 7, 2012) and the Goose meteorological station by two methods, the Penman Combination and the Priestly-Taylor. In total, 71 days of data were collected from the micro-met station (July 7, 2012 to September 15, 2012). On average, the Back River Project area experiences an open-water season that starts in June; however, there are variations in the length of the open water season year to year. The Goose Lake evaporation station will be installed again in 2013.

Total evaporation values in the Back River Project area from June 1 to September 15, 2012 were estimated to be 269.39 and 260.76 mm based on total monthly evaporation values calculated using the Penman Combination and Priestly-Taylor methods, respectively (Table 3.5-1).

Table 3.5-1. Back River Project – 2012 Monthly Evaporation

	Mean Daily Evaporation Rate (mm/day)		Total Monthly Evaporation (mm)	
Month	**Penman Method**	**Priestly-Taylor Method**	**Penman Method**	**Priestly-Taylor Method**
June[a]	3.63	3.22	108.91	96.59
July[b]	3.32	3.44	102.81	106.65
August	1.56	1.61	48.36	49.87
September[c]	0.62	0.51	9.31	7.64
2012 Mean[d]	**2.28**	**2.19**		
2012 Sum[d]			**269.39**	**260.76**

Notes:
[a] *All values in June were estimated using data from the Goose meteorological station.*
[b] *The Micro-meteorology station was installed on July 7, 2012. Values for this month are based on 25 days of collected data and 6 days of estimated values using data from the Goose Meteorological station.*
[c] *The micro-meteorology station was uninstalled on September 15, 2012. Data for this month is based on 15 days of data.*
[d] *Values based on 71 days of collected data and 36 days of data extrapolated from the Goose Meteorological station.*

Evaporation measured from this station between July and August shows how evaporation in August is roughly half of the evaporation in July. This is due to the fact that solar radiation has the largest influence on evaporation rate, and the water surface receives significantly more solar radiation in July than August, after which it decreases significantly (see Figure 3.4-2).

Total monthly evaporation at the Back River Project is similar to other projects in the region. Evaporation measured at Polar Lake for the EKATI Diamond Mine Project in 2008 was approximately 277 mm using the Penman method and based on 122 days of measurement (June 1 to September 31, 2008; Rescan 2009b). The EKATI Diamond Mine Project is located about 220 km to the southwest of the Back River Project, meaning that it is located at lower latitude and it experiences a slightly longer open-water season and more heating days.

Lake evaporation has also been measured at the Lupin mine site that is approximately 220 km to the west of the Back River Project. The Priestly-Taylor evaporation calculated for a 54 day period in summer 1992 was 171 mm and for a 46 day period in 1993 it was 103 mm (Gibson, Prowse, and Edwards 1996).

4. Summary

4. Summary

Observations recorded at meteorological stations operating at the George and Goose properties in the Back River Project area during the period January 2006 to September 2012 indicate that the climate in the Project area is typical of the Arctic, and consists of a winter period (October to May) of snow and extremely cold mean monthly temperatures ranging from -33.0 to -1.3°C and a cool spring, summer and fall period (June to September) with mean monthly temperatures ranging from -0.3 to 14.5°C.

The precipitation gauges recorded summer rainfall (June through September). In addition, in March 2012 winter adapters were installed to allow for year-round data collection. During the 2006 to 2012 monitoring period, summer rainfall ranged from 4 mm to 211 mm. Summer rainfall is generally similar for the months with available data to data from the regional stations for the same period. Therefore annual precipitation at the George and Goose meteorological stations can be inferred from the regional station data. Based on data from regional meteorological stations, total annual precipitation ranged from a low of 125.2 mm in 2009 to a high of 344.2 mm in 2007 mm during the 2006 to 2012 period. Compared to climate normal total annual precipitation, which ranged from 249 mm to 299 mm, total annual precipitation at the regional stations was lower in 2006, 2008, 2009, 2010, 2011 and 2012 and higher in 2007, suggesting that the 2006 to 2012 period was generally drier than the climate normals. The majority of the precipitation (65 to 70%) occurred during the spring, summer and fall months. Climate normal data indicate that 53 to 60% of total precipitation fell during the spring, summer and fall months, suggesting that a greater proportion of the total annual precipitation was falling during these seasons during the 2006 to 2012 period.

The Back River Project area lies near the northern reaches of the North American continent. As such, it is primarily subject to cold, dry Arctic air masses and American continental air masses from the south. The area is subject to high wind speeds due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains). In the Project area wind speeds are generally greater than 3 m/s and predominately from the north westerly quadrant.

Solar radiation is monitored at both the George and Goose meteorological stations. Summer is a season of nearly perpetual sunlight, while winter is dominated by night, twilight and extreme cold. Generally there is an energy deficit during winter months (October through May) and an energy surplus during summer months (June through September).

Lake evaporation was calculated using data from the Goose Lake micro-met station installed in July 2012. Total evaporation values in the Back River Project area from July 7 to September 15, 2012 were estimated to be 129.7 and 134.0 mm based on total monthly evaporation values calculated using the Penman Combination and Priestly-Taylor methods, respectively. The data is consistent with other Arctic evaporation studies.

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Appendix 1

Climate Normal Data from Environment Canada

Engineers and Scientists

Appendix 1. Climate Normal Data from Environment Canada

LUPIN A, NUNAVUT

Latitude: 65°45'33.000" N; **Longitude**: 111°15'00.000" W; **Elevation**: 490.10 m; **Climate ID**: 23026HN; **WMO ID**: n/a; **TC ID**: YWO.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Temperature:														
Daily Average (°C)	-30.4	-28.5	-24.9	-15.9	-5.7	6.5	11.5	8.8	1.8	-8.6	-20.7	-26.8	-11.1	D
Standard Deviation	3.3	3.7	3	2.4	3.2	1.7	2	1.9	1.7	1.7	4	3.3	1.3	D
Daily Maximum (°C)	-26.8	-24.8	-20.9	-11.5	-1.9	11	16.3	12.6	4.5	-6.1	-17.2	-23.2	-7.4	D
Daily Minimum (°C)	-34	-32.1	-28.8	-20.2	-9.4	1.9	6.7	5	-0.8	-11.1	-24.2	-30.4	-14.8	D
Extreme Maximum (°C)	-5	-5	0.5	6	17.5	27.5	31	27.5	21	11.5	0	-4.5		
Date (yyyy/dd)	1987/08	1986/28	1993/23	1998/18	1994/25	1999/18	1989/15	1989/14	1997/02	1988/05	1983/02+	1991/29		
Extreme Minimum (°C)	-49	-46	-44	-38	-29.5	-9	-1.5	-6.5	-11	-30.5	-40.5	-42		
Date (yyyy/dd)	1990/26+	1993/05	1991/05	1997/06	1983/02	1986/04	1983/03	1982/23	1989/30	1996/30	1982/19	1993/24		
Precipitation:														
Rainfall (mm)	0	0	0	0.1	6.2	25.6	42.7	56.9	27.7	1.9	0	0	161.1	D
Snowfall (cm)	9.4	8.4	11.3	13.7	12.3	3.6	0.5	3.3	18	28.2	15.2	14.4	138.1	D
Precipitation (mm)	9.4	8.4	11.3	13.8	18.5	29.2	43.1	60.1	45.7	30.1	15.2	14.4	299.2	D
Extreme Daily Rainfall (mm)	0	0	0	2.2	10.2	36.8	41.8	38.6	34.2	10.8	0.2	0		
Date (yyyy/dd)	1982/01+	1982/01+	1982/01+	1999/23	1992/26	1987/13	1983/09	1986/29	1999/10	1988/08	1987/02	1982/01+		
Extreme Daily Snowfall (cm)	11.6	14.2	9.6	13.8	14.3	13.4	3.4	8.8	17	31.8	14	10		
Date (yyyy/dd)	1992/02	1993/01	2001/19	1991/08	1989/11	1992/15	1985/18	1985/19	1983/27	1998/28	1987/09	1987/08		
Extreme Daily Precipitation (mm)	11.6	14.2	9.6	13.8	14.3	36.8	41.8	38.6	34.2	31.8	14	10		
Date (yyyy/dd)	1992/02	1993/01	2001/19	1991/08	1989/11	1987/13	1983/09	1986/29	1999/10	1998/28	1987/09	1987/08		
Extreme Snow Depth (cm)	20	20	21	25	10	0	0	0	4	10	18	18		
Date (yyyy/dd)	2002/31	2002/28	2002/31	2002/30	2001/31	1982/18+	1982/01+	1982/01+	1993/30	2001/31	2001/30	2001/01+		
Days with Maximum Temperature:														
<= 0 °C	31	28.3	31	28.8	19.1	0.89	0	0.05	7	28.1	30	31	235	D
> 0 °C	0	0	0.05	1.2	12	29.1	31	31	23	3	0	0	130.2	D
> 10 °C	0	0	0	0	0.47	15.9	26.9	19.7	4	0.16	0	0	67.2	D
> 20 °C	0	0	0	0	0	1.8	7.8	2.7	0.05	0	0	0	12.3	D

Appendix 1. Climate Normal Data from Environment Canada

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
> 30 °C	0	0	0	0	0	0	0.11	0	0	0	0	0	0.11	D
> 35 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	D
Days with Minimum Temperature:														
> 0 °C	0	0	0	0	1.3	19.6	29.8	27.3	10.8	0.26	0	0	89.2	D
<= 2 °C	31	28.3	31	30	30.8	16.8	3.6	8.6	23.8	31	30	31	295.8	D
<= 0 °C	31	28.3	31	30	29.7	10.4	1.2	3.7	19.2	30.7	30	31	276.1	D
< -2 °C	31	28.3	31	30	26.2	4.3	0	0.53	10.5	29.2	30	31	251.8	D
< -10 °C	31	28.3	30.8	26.9	13.1	0	0	0	0.16	15.5	29	31	205.7	D
< -20 °C	29.8	26.8	27	14.9	1.8	0	0	0	0	3.1	21.7	28.3	153.3	D
< - 30 °C	23.3	17.9	14.7	2.4	0	0	0	0	0	0.05	6.1	17.9	82.3	D
Days with Rainfall:														
>= 0.2 mm	0	0	0	0.11	2.5	7.4	11.8	15.1	9.7	0.79	0.05	0	47.5	D
>= 5 mm	0	0	0	0	0.42	1.4	2.5	3.6	1.7	0.11	0	0	9.7	D
>= 10 mm	0	0	0	0	0.05	0.58	0.79	1.5	0.37	0.05	0	0	3.3	D
>= 25 mm	0	0	0	0	0	0.21	0.16	0.11	0.11	0	0	0	0.59	D
Days With Snowfall:														
>= 0.2 cm	8.8	9.1	9	10.5	7.1	2.4	0.47	2.2	8.7	17	12.9	10.6	98.6	D
>= 5 cm	0.32	0.11	0.37	0.47	0.74	0.16	0	0.21	1.1	1.4	0.42	0.58	5.9	D
>= 10 cm	0.05	0.05	0	0.11	0.11	0.16	0	0	0.37	0.26	0.05	0.05	1.2	D
>= 25 cm	0	0	0	0	0	0	0	0	0	0.05	0	0	0.05	D
Days with Precipitation:														
>= 0.2 mm	8.8	9.1	9	10.5	9	9.2	11.8	16.1	16.1	17.4	12.9	10.6	140.4	D
>= 5 mm	0.32	0.11	0.37	0.53	1.2	1.5	2.5	3.8	2.8	1.6	0.42	0.58	15.8	D
>= 10 mm	0.05	0.05	0	0.11	0.21	0.74	0.79	1.6	0.89	0.37	0.05	0.05	4.9	D
>= 25 mm	0	0	0	0	0	0.21	0.16	0.11	0.11	0.05	0	0	0.64	D
Wind:														
Maximum Hourly Speed (km/h)	80	109	83	67	74	56	74	61	74	70	93	70		
Date (yyyy/dd)	1989/13	1982/14	1996/02	1986/09	1989/23	1992/11+	1993/07	1982/24+	1996/29	1983/24+	1985/26	1985/11		
Direction of Maximum Hourly Speed:	NW	NW	NW	NW	N	NW	N	N	NW	NW	N	NW	NW	
Degree Days:														

Appendix 1. Climate Normal Data from Environment Canada

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Above 24 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	D
Above 18 °C	0	0	0	0	0	0	2.5	0.7	0	0	0	0	3.3	D
Above 15 °C	0	0	0	0	0	1.3	14.7	5.4	0	0	0	0	21.4	D
Above 10 °C	0	0	0	0	0	21.1	79.8	38.5	1.9	0	0	0	141.3	D
Above 5 °C	0	0	0	0	1	84.7	203	133.2	19.8	0.2	0	0	441.9	D
Above 0 °C	0	0	0	0.1	14.1	199	356	273.6	84.6	2	0	0	929.3	D
Below 0 °C	934.8	804.3	771.3	476.1	189.9	5.1	0	0.3	29.5	267.8	621	831	4931.2	D
Below 5 °C	1089.8	945.6	926.3	626.1	331.9	40.8	1.9	14.9	114.8	421.1	771	986	6270.1	D
Below 10 °C	1244.8	1086.9	1081.3	776.1	485.9	127.2	33.8	75.2	246.8	575.9	921	1141	7795.8	D
Below 15 °C	1399.8	1228.3	1236.3	926.1	640.9	257.4	123.6	197.1	394.9	730.9	1071	1296	9502.2	D
Below 18 °C	1492.8	1313	1329.3	1016.1	733.9	346.1	204.5	285.4	484.9	823.9	1161	1389	10579.9	D
Humidex:														
Extreme Humidex	-5.6	-5.4	0.3	5	17.5	28.1	35.3	30.8	21.7	15.5	0	-4.5		
Date (yyyy/dd)	1987/09	1986/28	1993/23	1998/18	1994/25	1999/18	1989/17	1989/14	1997/02	1988/06	1983/03	1991/29		
Wind Chill:														
Extreme Wind Chill	-62.5	-63.3	-67.4	-51.8	-35.9	-17.8	-6.4	-12.4	-22.4	-40.7	-56.9	-60.8		
Date (yyyy/dd)	1989/31	1985/22	1991/05	1995/02	2002/02	1992/02	1989/02	1982/24	1996/29	1996/30	1985/24	1984/22		

Appendix 1. Climate Normal Data from Environment Canada

KUGLUKTUK A, NUNAVUT

Latitude: 67°49'00.000" N; **Longitude**: 115°08'38.000" W; **Elevation**: 22.60 m; **Climate ID**: 2300902; **WMO ID**: 71938; **TC ID**: YCO.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Temperature:														
Daily Average (°C)	-27.8	-27.4	-25.3	-17	-5.3	5.2	10.7	8.8	2.8	-7.2	-19.6	-25.5	-10.6	C
Standard Deviation	3.8	4.2	3.2	3	3.2	2	2	1.9	1.5	2.5	4.3	3.4	4	C
Daily Maximum (°C)	-23.7	-23	-20.6	-12.1	-1.4	9.5	15.4	13.1	6	-4	-15.7	-21.4	-6.5	C
Daily Minimum (°C)	-31.9	-31.7	-29.8	-21.8	-9.2	0.8	6	4.5	-0.4	-10.3	-23.4	-29.6	-14.7	C
Extreme Maximum (°C)	0.8	-1.2	-0.1	14	19.8	31.1	34.9	29.2	22.6	13.4	2.8	27.4		
Date (yyyy/dd)	1981/16	1980/07	1999/22	2000/06	1994/24	1996/25	1989/15	2000/01	1994/01	1988/06	1983/03	1999/19		
Extreme Minimum (°C)	-46.9	-47.2	-47	-39.7	-30.2	-12.1	0.3	-4.4	-18.9	-35.4	-41	-44.5		
Date (yyyy/dd)	2002/21	1998/20	1979/05	1979/04	1983/03	2000/01	1978/04+	1995/29	2000/26	1996/29	1985/24	1977/12		
Precipitation:														
Rainfall (mm)	0	0	0	0.6	5.8	12.8	36.3	40.8	32.1	5.1	0	0	133.4	C
Snowfall (cm)	15.4	16.5	16	17.8	16.6	2.7	0	0.3	8.1	34.1	19.7	18.6	165.7	C
Precipitation (mm)	11	9.9	10.6	13.3	19.5	15.1	36.3	41.1	39	29.5	12.6	11.5	249.3	C
Average Snow Depth (cm)	35	43	47	48	28	3	0	0	0	9	20	28	22	C
Median Snow Depth (cm)	36	42	47	49	28	1	0	0	0	9	19	28	22	C
Snow Depth at Month-end (cm)	38	45	48	42	15	0	0	0	2	17	24	32	22	C
Extreme Daily Rainfall (mm)	0	0	0	7.4	20.6	27.4	30.5	53.7	28.8	19.3	3.4	0		
Date (yyyy/dd)	1978/01+	1978/06+	1978/01+	1980/27	1992/27	1987/13	1983/10	1982/12	1983/07	1980/08	2001/17	1977/01+		
Extreme Daily Snowfall (cm)	26.2	24.6	8.6	16	21	13	0.4	5	13.5	23	12.4	26		
Date (yyyy/dd)	1988/01	1981/21	2000/27	1980/30	1993/07	1991/05	1985/07	1986/23	1981/22	1981/29	1981/06	1994/25		
Extreme Daily Precipitation (mm)	25.8	9.1	6	16	21.8	27.4	30.5	53.7	28.8	23	12.4	14.8		
Date (yyyy/dd)	1988/01	1981/21	1990/07+	1980/30	1978/25	1987/13	1983/10	1982/12	1983/07	1981/29	1981/06	1994/25		
Extreme Snow Depth (cm)	80	92	104	107	128	64	3	0	23	43	49	73		
Date (yyyy/dd)	1993/30+	1993/22+	1991/31	1991/03+	1993/08	1993/01	1986/01+	1978/01+	1981/24	1995/29	1992/30	1994/26+		

Appendix 1. Climate Normal Data from Environment Canada

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Days with Maximum Temperature:														
<= 0 °C	31	28.3	31	28.4	18.7	1.1	0	0	2.5	23.1	29.6	30.9	224.5	C
> 0 °C	0.05	0	0	1.6	12.3	28.9	31	31	27.5	7.9	0.45	0.08	140.8	C
> 10 °C	0	0	0	0.04	0.91	12	25.6	20.8	5.4	0.1	0	0.08	65	C
> 20 °C	0	0	0	0	0	2.5	6	3.9	0.22	0	0	0.08	12.7	C
> 30 °C	0	0	0	0	0	0.09	0.26	0	0	0	0	0	0.35	C
> 35 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	C
Days with Minimum Temperature:														
> 0 °C	0	0	0	0	0.95	17.9	31	27.7	14	0.71	0	0	92.3	C
<= 2 °C	31	28.3	31	30	30.8	20.7	2.7	7.6	22.7	30.9	30	31	296.7	C
<= 0 °C	31	28.3	31	30	30.1	12.1	0	3.3	16	30.3	30	31	273	C
< -2 °C	31	28.3	31	29.8	27.1	5.1	0	0.59	8.6	27.7	30	31	250.1	C
< -10 °C	30.9	28.2	30.9	28	12.8	0.09	0	0	0.39	14.6	28.6	30.9	205.3	C
< -20 °C	28.7	26.7	28.5	18.4	2	0	0	0	0	3.1	20	27.9	155.3	C
< - 30 °C	20.1	18	16.5	4.7	0.05	0	0	0	0	0.29	6.6	16.2	82.5	C
Days with Rainfall:														
>= 0.2 mm	0	0	0	0.35	2.1	6.4	10.2	12.5	10.4	1.9	0.05	0	43.8	C
>= 5 mm	0	0	0	0.04	0.27	0.65	2.6	2.4	1.9	0.27	0	0	8.1	C
>= 10 mm	0	0	0	0	0.18	0.13	0.78	0.73	0.65	0.09	0	0	2.6	C
>= 25 mm	0	0	0	0	0	0.04	0.04	0.23	0.04	0	0	0	0.35	C
Days With Snowfall:														
>= 0.2 cm	9.4	9.8	10.7	9.4	6.5	1.6	0.09	0.27	3.9	13.9	11.7	10.1	87.4	C
>= 5 cm	0.52	0.65	0.35	0.87	0.86	0.17	0	0.05	0.52	2.1	0.91	0.63	7.6	C
>= 10 cm	0.13	0.04	0	0.17	0.27	0.04	0	0	0.09	0.55	0.18	0.25	1.7	C
>= 25 cm	0.04	0	0	0	0	0	0	0	0	0	0	0.04	0.08	C
Days with Precipitation:														
>= 0.2 mm	8.6	9.1	10	8.9	7.3	7.4	10.2	12.6	12.9	14.5	10.7	9.4	121.5	C
>= 5 mm	0.3	0.22	0.17	0.52	1	0.83	2.6	2.4	2.3	1.7	0.18	0.33	12.6	C
>= 10 mm	0.04	0	0	0.13	0.45	0.17	0.78	0.73	0.74	0.32	0.05	0.08	3.5	C
>= 25 mm	0.04	0	0	0	0	0.04	0.04	0.23	0.04	0	0	0	0.39	C

Appendix 1. Climate Normal Data from Environment Canada

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Days with Snow Depth:														
>= 1 cm	31	28.3	31	30	29.5	9.8	0.7	0	2.4	25.5	29.9	31	249	C
>= 5 cm	31	28.3	31	29.9	26.1	6.4	0	0	0.7	17.8	29.1	31	231.3	C
>= 10 cm	31	28.3	31	29.8	22.8	3.1	0	0	0.39	11.4	25.7	31	214.5	C
>= 20 cm	22.9	24.6	26.6	25.7	16.8	1.4	0	0	0.13	4.8	12	20.5	155.3	C
Wind:														
Speed (km/h)	19	18.5	15.6	13.4	13.9	14	14.4	15.5	16.8	17.4	16.8	18.2	16.1	C
Most Frequent Direction	SW	SW	SW	SW	E	E	E	E	E	SW	SW	SW	SW	C
Maximum Hourly Speed (km/h)	93	76	83	72	74	61	67	74	74	80	83	93		
Date (yyyy/dd)	1988/01	1978/08+	1980/03	1984/16	1986/28	1995/26	1991/25	1986/22+	2002/24	1982/27	1994/19	1983/25		
Direction of Maximum Hourly Speed	NW	S	NW	E	NW	NW	N	NW	NW	NW	NW	NW	NW	
Maximum Gust Speed (km/h)	106	106	106	83	89	74	81	83	85	89	100	104		
Date (yyyy/dd)	1988/01	1978/06	1980/03	1984/16	1986/28	1992/11+	1988/23	1984/10+	1983/28	1982/27	1994/05	1983/26		
Direction of Maximum Gust	NW	SW	NW	E	NW	W	NW	NW	NW	NW	NW	NW	SW	
Days with Winds >= 52 km/h	1.8	2.7	1.7	0.9	0.6	0.1	0.2	0.8	1.2	1.3	0.9	2.2	14.4	C
Days with Winds >= 63 km/h	0.5	0.8	0.4	0.2	0.3	0	0	0.2	0.4	0.5	0.2	0.7	4.2	C
Degree Days:														
Above 24 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	C
Above 18 °C	0	0	0	0	0	0.6	3.1	0.8	0	0	0	0	4.4	C
Above 15 °C	0	0	0	0	0	1.8	12.3	5.7	0	0	0	0	19.7	C
Above 10 °C	0	0	0	0	0.1	13.8	60.3	37.7	2.3	0	0	0	114.1	C
Above 5 °C	0	0	0	0	1.9	56.7	178.7	129.1	20.6	0.3	0	0	387.3	C
Above 0 °C	0	0	0	0.3	14	160.6	332.2	274.9	100.3	5.2	0	0	887.5	C
Below 0 °C	855.2	783.1	782.7	510.1	177.8	6	0	0	15.8	225.4	581.5	790.4	4728.1	C
Below 5 °C	1010.2	924.5	937.7	659.7	320.7	52.2	1.5	9.2	86.1	375.5	731.5	945.4	6054.3	C
Below 10 °C	1165.2	1065.8	1092.7	809.7	474	159.2	38.1	72.8	217.9	530.2	881.5	1100.4	7607.5	C
Below 15 °C	1320.2	1207.2	1247.7	959.7	628.9	297.3	145.1	195.8	365.6	685.2	1031.5	1255.4	9339.5	C
Below 18 °C	1413.2	1292	1340.7	1049.7	721.9	386	228.9	283.9	455.6	778.2	1121.5	1348.4	10420	C
Bright Sunshine:														
Extreme Daily	5.2	8.4	12.9	17.2	22.9	24	24	19.1	14.1	10.5	6.4	1		C

Appendix 1. Climate Normal Data from Environment Canada

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Date (yyyy/dd)	1998/30	1980/27	1997/28	1994/28	1985/31	1981/09+	1982/05+	1987/01	2000/01	1988/02	2000/05	1981/01		
Humidex:														
Extreme Humidex	0.3	-1.7	-0.3	7.9	19.8	30.3	36.8	36.8	22.7	12.3	2.2	-1.5		
Date (yyyy/dd)	1981/16	1980/07	1999/22	1995/28	1994/24	1996/25	1989/15	1992/02	1994/01	1988/06	1983/03	1999/24		
Wind Chill:														
Extreme Wind Chill	-64.3	-64.4	-65	-54.4	-39.7	-15.6	-6.2	-11.8	-22.9	-46.5	-54.1	-61.5		
Date (yyyy/dd)	1990/26	1985/21	1979/05	1979/04	1983/04	1978/09	1985/21	1995/29	1992/25	1996/27	1985/25	1984/09		
Days with Wind Chill < -20	30.7	28.1	30.4	25.5	7.8	0	0	0	0.2	10.5	27.1	30.7	190.9	C
Days with Wind Chill < -30	28.4	25.3	27.2	14.7	1.2	0	0	0	0	2.4	18.8	27.1	145.1	C
Days with Wind Chill < -40	22.3	18.9	17.2	4.6	0	0	0	0	0	0.2	8.1	18	89.3	C
Pressure:														
Average Station Pressure (kPa)	101.6	101.7	101.8	101.8	101.7	101.2	101.1	101	101	101.2	101.4	101.5	101.4	C
Average Sea Level Pressure (kPa)	101.9	102	102.1	102.1	102	101.5	101.4	101.3	101.3	101.5	101.7	101.8	101.7	C

Appendix 2

George and Goose Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Engineers and Scientists

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
01/01/2006	-18.7	n/a	01/01/2006	-17.0	n/a	01/01/2006	-21.2	n/a	01/06/2006	0.0	n/a
02/01/2006	-15.6	n/a	02/01/2006	-13.6	n/a	02/01/2006	-17.0	n/a	02/06/2006	0.0	n/a
03/01/2006	-11.7	n/a	03/01/2006	-9.7	n/a	03/01/2006	-13.6	n/a	03/06/2006	0.0	n/a
04/01/2006	-10.8	n/a	04/01/2006	-8.9	n/a	04/01/2006	-14.7	n/a	04/06/2006	0.3	n/a
05/01/2006	-17.3	n/a	05/01/2006	-14.7	n/a	05/01/2006	-20.4	n/a	05/06/2006	0.0	n/a
06/01/2006	-19.9	n/a	06/01/2006	-17.7	n/a	06/01/2006	-21.7	n/a	06/06/2006	0.0	n/a
07/01/2006	-26.2	n/a	07/01/2006	-21.7	n/a	07/01/2006	-28.7	n/a	07/06/2006	0.0	n/a
08/01/2006	-26.1	n/a	08/01/2006	-21.8	n/a	08/01/2006	-30.8	n/a	08/06/2006	0.0	n/a
09/01/2006	-33.1	n/a	09/01/2006	-29.7	n/a	09/01/2006	-34.5	n/a	09/06/2006	0.0	n/a
10/01/2006	-30.8	n/a	10/01/2006	-25.6	n/a	10/01/2006	-34.2	n/a	10/06/2006	0.0	n/a
11/01/2006	-21.0	n/a	11/01/2006	-18.7	n/a	11/01/2006	-25.6	n/a	11/06/2006	0.0	n/a
12/01/2006	-23.5	n/a	12/01/2006	-21.3	n/a	12/01/2006	-28.5	n/a	12/06/2006	0.0	n/a
13/01/2006	-30.4	n/a	13/01/2006	-25.6	n/a	13/01/2006	-33.9	n/a	13/06/2006	0.0	n/a
14/01/2006	-25.5	n/a	14/01/2006	-23.4	n/a	14/01/2006	-29.8	n/a	14/06/2006	0.0	n/a
15/01/2006	-23.2	n/a	15/01/2006	-21.7	n/a	15/01/2006	-24.7	n/a	15/06/2006	0.0	n/a
16/01/2006	-29.2	n/a	16/01/2006	-21.3	n/a	16/01/2006	-34.6	n/a	16/06/2006	0.0	n/a
17/01/2006	-27.2	n/a	17/01/2006	-24.0	n/a	17/01/2006	-34.0	n/a	17/06/2006	0.0	n/a
18/01/2006	-23.2	n/a	18/01/2006	-20.1	n/a	18/01/2006	-26.4	n/a	18/06/2006	0.0	n/a
19/01/2006	-33.2	n/a	19/01/2006	-24.4	n/a	19/01/2006	-34.7	n/a	19/06/2006	0.3	n/a
20/01/2006	-29.0	n/a	20/01/2006	-19.5	n/a	20/01/2006	-34.9	n/a	20/06/2006	0.0	n/a
21/01/2006	-23.3	n/a	21/01/2006	-18.3	n/a	21/01/2006	-27.0	n/a	21/06/2006	0.0	n/a
22/01/2006	-23.3	n/a	22/01/2006	-22.3	n/a	22/01/2006	-27.1	n/a	22/06/2006	0.0	n/a
23/01/2006	-26.2	n/a	23/01/2006	-21.5	n/a	23/01/2006	-29.8	n/a	23/06/2006	0.0	n/a
24/01/2006	-31.4	n/a	24/01/2006	-29.1	n/a	24/01/2006	-33.1	n/a	24/06/2006	0.0	n/a
25/01/2006	-33.1	n/a	25/01/2006	-30.7	n/a	25/01/2006	-35.8	n/a	25/06/2006	0.0	n/a
26/01/2006	-32.8	n/a	26/01/2006	-31.7	n/a	26/01/2006	-34.3	n/a	26/06/2006	0.0	n/a
27/01/2006	-38.0	n/a	27/01/2006	-34.3	n/a	27/01/2006	-40.3	n/a	27/06/2006	0.0	n/a
28/01/2006	-40.4	n/a	28/01/2006	-38.6	n/a	28/01/2006	-41.5	n/a	28/06/2006	0.0	n/a
29/01/2006	-39.3	n/a	29/01/2006	-37.2	n/a	29/01/2006	-41.2	n/a	29/06/2006	0.5	n/a
30/01/2006	-34.0	n/a	30/01/2006	-30.3	n/a	30/01/2006	-38.3	n/a	30/06/2006	0.5	n/a
31/01/2006	-35.7	n/a	31/01/2006	-32.5	n/a	31/01/2006	-39.2	n/a	01/07/2006	0.0	n/a
01/02/2006	-32.6	n/a	01/02/2006	-25.6	n/a	01/02/2006	-38.5	n/a	02/07/2006	0.0	n/a
02/02/2006	-20.3	n/a	02/02/2006	-15.0	n/a	02/02/2006	-25.6	n/a	03/07/2006	0.0	n/a
03/02/2006	-16.4	n/a	03/02/2006	-14.3	n/a	03/02/2006	-19.4	n/a	04/07/2006	0.0	n/a
04/02/2006	-22.9	n/a	04/02/2006	-17.0	n/a	04/02/2006	-28.6	n/a	05/07/2006	0.0	n/a
05/02/2006	-27.7	n/a	05/02/2006	-26.1	n/a	05/02/2006	-29.6	n/a	06/07/2006	0.5	n/a
06/02/2006	-29.4	n/a	06/02/2006	-26.4	n/a	06/02/2006	-32.0	n/a	07/07/2006	0.0	n/a
07/02/2006	-17.3	n/a	07/02/2006	-11.7	n/a	07/02/2006	-28.7	n/a	08/07/2006	0.0	n/a
08/02/2006	-11.2	n/a	08/02/2006	-8.1	n/a	08/02/2006	-15.5	n/a	09/07/2006	0.0	n/a
09/02/2006	-13.2	n/a	09/02/2006	-10.3	n/a	09/02/2006	-17.8	n/a	10/07/2006	0.0	n/a
10/02/2006	-18.9	n/a	10/02/2006	-14.1	n/a	10/02/2006	-26.6	n/a	11/07/2006	0.0	n/a
11/02/2006	-27.6	n/a	11/02/2006	-26.2	n/a	11/02/2006	-29.3	n/a	12/07/2006	0.0	n/a
12/02/2006	-28.1	n/a	12/02/2006	-25.5	n/a	12/02/2006	-29.8	n/a	13/07/2006	0.3	n/a
13/02/2006	-28.6	n/a	13/02/2006	-26.6	n/a	13/02/2006	-30.2	n/a	14/07/2006	0.0	n/a
14/02/2006	-28.2	n/a	14/02/2006	-26.2	n/a	14/02/2006	-31.2	n/a	15/07/2006	0.0	n/a
15/02/2006	-31.3	n/a	15/02/2006	-28.2	n/a	15/02/2006	-32.8	n/a	16/07/2006	0.0	n/a
16/02/2006	-23.3	n/a	16/02/2006	-18.8	n/a	16/02/2006	-32.5	n/a	17/07/2006	0.0	n/a
17/02/2006	-17.1	n/a	17/02/2006	-10.2	n/a	17/02/2006	-22.5	n/a	18/07/2006	0.0	n/a
18/02/2006	-12.7	n/a	18/02/2006	-10.2	n/a	18/02/2006	-15.7	n/a	19/07/2006	0.0	n/a
19/02/2006	-15.8	n/a	19/02/2006	-15.0	n/a	19/02/2006	-16.5	n/a	20/07/2006	0.0	n/a
20/02/2006	-17.1	n/a	20/02/2006	-11.3	n/a	20/02/2006	-22.9	n/a	21/07/2006	0.0	n/a
21/02/2006	-15.0	n/a	21/02/2006	-12.3	n/a	21/02/2006	-18.4	n/a	22/07/2006	0.0	n/a
22/02/2006	-17.4	n/a	22/02/2006	-15.3	n/a	22/02/2006	-23.6	n/a	23/07/2006	0.3	n/a
23/02/2006	-27.4	n/a	23/02/2006	-23.6	n/a	23/02/2006	-29.8	n/a	24/07/2006	0.0	n/a
24/02/2006	-30.4	n/a	24/02/2006	-28.5	n/a	24/02/2006	-32.0	n/a	25/07/2006	0.0	n/a
25/02/2006	-34.5	n/a	25/02/2006	-30.7	n/a	25/02/2006	-38.9	n/a	26/07/2006	0.0	n/a
26/02/2006	-36.6	n/a	26/02/2006	-33.4	n/a	26/02/2006	-39.7	n/a	27/07/2006	0.0	n/a
27/02/2006	-32.6	n/a	27/02/2006	-29.9	n/a	27/02/2006	-35.0	n/a	28/07/2006	0.3	n/a
28/02/2006	-30.4	n/a	28/02/2006	-24.4	n/a	28/02/2006	-35.7	n/a	29/07/2006	0.0	n/a
01/03/2006	-28.4	n/a	01/03/2006	-24.5	n/a	01/03/2006	-30.8	n/a	30/07/2006	0.0	n/a
02/03/2006	-28.4	n/a	02/03/2006	-25.8	n/a	02/03/2006	-31.0	n/a	31/07/2006	0.0	n/a
03/03/2006	-21.2	n/a	03/03/2006	-16.5	n/a	03/03/2006	-26.6	n/a	01/08/2006	0.0	n/a
04/03/2006	-23.6	n/a	04/03/2006	-19.6	n/a	04/03/2006	-26.2	n/a	02/08/2006	0.0	n/a
05/03/2006	-24.9	n/a	05/03/2006	-19.3	n/a	05/03/2006	-27.2	n/a	03/08/2006	0.0	n/a
06/03/2006	-22.6	n/a	06/03/2006	-18.0	n/a	06/03/2006	-26.5	n/a	04/08/2006	0.0	n/a
07/03/2006	-17.9	n/a	07/03/2006	-13.5	n/a	07/03/2006	-22.5	n/a	05/08/2006	0.0	n/a
08/03/2006	-21.6	n/a	08/03/2006	-15.6	n/a	08/03/2006	-26.4	n/a	06/08/2006	0.0	n/a
09/03/2006	-15.5	n/a	09/03/2006	-12.0	n/a	09/03/2006	-19.2	n/a	07/08/2006	0.0	n/a
10/03/2006	-18.3	n/a	10/03/2006	-16.5	n/a	10/03/2006	-21.4	n/a	08/08/2006	0.0	n/a
11/03/2006	-19.4	n/a	11/03/2006	-11.8	n/a	11/03/2006	-24.5	n/a	09/08/2006	0.0	n/a
12/03/2006	-19.3	n/a	12/03/2006	-13.3	n/a	12/03/2006	-24.6	n/a	10/08/2006	0.3	n/a
13/03/2006	-24.9	n/a	13/03/2006	-19.4	n/a	13/03/2006	-27.7	n/a	11/08/2006	0.0	n/a
14/03/2006	-30.2	n/a	14/03/2006	-27.7	n/a	14/03/2006	-34.0	n/a	12/08/2006	0.0	n/a
15/03/2006	-32.2	n/a	15/03/2006	-27.5	n/a	15/03/2006	-35.2	n/a	13/08/2006	0.0	n/a
16/03/2006	-25.8	n/a	16/03/2006	-23.1	n/a	16/03/2006	-30.1	n/a	14/08/2006	0.0	n/a
17/03/2006	-27.8	n/a	17/03/2006	-24.1	n/a	17/03/2006	-30.9	n/a	15/08/2006	0.0	n/a
18/03/2006	-25.1	n/a	18/03/2006	-23.7	n/a	18/03/2006	-27.9	n/a	16/08/2006	0.3	n/a
19/03/2006	-24.2	n/a	19/03/2006	-18.3	n/a	19/03/2006	-29.8	n/a	17/08/2006	0.0	n/a
20/03/2006	-12.0	n/a	20/03/2006	-5.9	n/a	20/03/2006	-19.3	n/a	18/08/2006	0.0	n/a
21/03/2006	-5.5	n/a	21/03/2006	-3.8	n/a	21/03/2006	-6.9	n/a	19/08/2006	0.0	n/a
22/03/2006	-9.0	n/a	22/03/2006	-4.0	n/a	22/03/2006	-13.2	n/a	20/08/2006	0.0	n/a
23/03/2006	-11.6	n/a	23/03/2006	-7.1	n/a	23/03/2006	-17.0	n/a	21/08/2006	0.0	n/a
24/03/2006	-9.9	n/a	24/03/2006	-4.1	n/a	24/03/2006	-14.7	n/a	22/08/2006	0.0	n/a
25/03/2006	-12.1	n/a	25/03/2006	-4.9	n/a	25/03/2006	-17.7	n/a	23/08/2006	0.0	n/a

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
26/03/2006	-13.9	n/a	26/03/2006	-10.6	n/a	26/03/2006	-19.3	n/a	24/08/2006	0.0	n/a
27/03/2006	-14.0	n/a	27/03/2006	-11.1	n/a	27/03/2006	-16.8	n/a	25/08/2006	0.3	n/a
28/03/2006	-17.6	n/a	28/03/2006	-15.3	n/a	28/03/2006	-21.4	n/a	26/08/2006	0.0	n/a
29/03/2006	-21.1	n/a	29/03/2006	-16.9	n/a	29/03/2006	-24.7	n/a	27/08/2006	0.0	n/a
30/03/2006	-19.9	n/a	30/03/2006	-14.7	n/a	30/03/2006	-23.0	n/a	28/08/2006	0.0	n/a
31/03/2006	-18.3	n/a	31/03/2006	-13.1	n/a	31/03/2006	-22.7	n/a	29/08/2006	0.0	n/a
01/04/2006	-17.1	n/a	01/04/2006	-10.6	n/a	01/04/2006	-21.4	n/a	30/08/2006	0.0	n/a
02/04/2006	-16.8	n/a	02/04/2006	-11.4	n/a	02/04/2006	-21.7	n/a	31/08/2006	0.3	n/a
03/04/2006	-21.1	n/a	03/04/2006	-17.3	n/a	03/04/2006	-24.6	n/a	01/09/2006	0.0	n/a
04/04/2006	-26.4	n/a	04/04/2006	-22.7	n/a	04/04/2006	-29.2	n/a	02/09/2006	0.0	n/a
05/04/2006	-24.5	n/a	05/04/2006	-17.3	n/a	05/04/2006	-30.8	n/a	03/09/2006	0.0	n/a
06/04/2006	-17.9	n/a	06/04/2006	-12.1	n/a	06/04/2006	-24.6	n/a	04/09/2006	0.0	n/a
07/04/2006	-9.4	n/a	07/04/2006	-5.3	n/a	07/04/2006	-13.5	n/a	05/09/2006	0.0	n/a
08/04/2006	-16.2	n/a	08/04/2006	-10.7	n/a	08/04/2006	-23.6	n/a	06/09/2006	0.0	n/a
09/04/2006	-21.4	n/a	09/04/2006	-16.9	n/a	09/04/2006	-26.5	n/a	07/09/2006	0.0	n/a
10/04/2006	-18.4	n/a	10/04/2006	-13.3	n/a	10/04/2006	-25.1	n/a	08/09/2006	0.0	0.0
11/04/2006	-23.1	n/a	11/04/2006	-19.3	n/a	11/04/2006	-26.5	n/a	09/09/2006	0.0	0.0
12/04/2006	-22.7	n/a	12/04/2006	-18.0	n/a	12/04/2006	-27.3	n/a	10/09/2006	0.0	0.0
13/04/2006	-17.5	n/a	13/04/2006	-9.0	n/a	13/04/2006	-24.1	n/a	11/09/2006	0.0	0.0
14/04/2006	-15.4	n/a	14/04/2006	-13.6	n/a	14/04/2006	-17.3	n/a	12/09/2006	0.0	0.0
15/04/2006	-17.1	n/a	15/04/2006	-15.4	n/a	15/04/2006	-18.6	n/a	13/09/2006	0.0	0.0
16/04/2006	-16.1	n/a	16/04/2006	-15.2	n/a	16/04/2006	-17.6	n/a	14/09/2006	0.0	0.0
17/04/2006	-16.3	n/a	17/04/2006	-12.4	n/a	17/04/2006	-21.2	n/a	15/09/2006	0.0	0.0
18/04/2006	-9.7	n/a	18/04/2006	-4.4	n/a	18/04/2006	-15.1	n/a	16/09/2006	0.0	0.0
19/04/2006	-4.6	n/a	19/04/2006	1.5	n/a	19/04/2006	-10.1	n/a	17/09/2006	0.0	0.0
20/04/2006	-8.5	n/a	20/04/2006	2.7	n/a	20/04/2006	-13.3	n/a	18/09/2006	0.0	0.0
21/04/2006	-16.2	n/a	21/04/2006	-10.7	n/a	21/04/2006	-21.6	n/a	19/09/2006	0.0	0.0
22/04/2006	-15.8	n/a	22/04/2006	-11.9	n/a	22/04/2006	-20.0	n/a	20/09/2006	0.0	0.0
23/04/2006	-12.8	n/a	23/04/2006	-3.2	n/a	23/04/2006	-21.4	n/a	21/09/2006	0.0	0.0
24/04/2006	-8.0	n/a	24/04/2006	0.2	n/a	24/04/2006	-15.0	n/a	22/09/2006	0.0	0.0
25/04/2006	-11.6	n/a	25/04/2006	-8.3	n/a	25/04/2006	-14.3	n/a	23/09/2006	0.0	0.0
26/04/2006	-9.1	n/a	26/04/2006	-3.3	n/a	26/04/2006	-15.1	n/a	24/09/2006	0.0	0.0
27/04/2006	-7.2	n/a	27/04/2006	-4.0	n/a	27/04/2006	-11.3	n/a	25/09/2006	0.0	0.0
28/04/2006	-5.1	n/a	28/04/2006	0.7	n/a	28/04/2006	-14.6	n/a	26/09/2006	0.0	0.0
29/04/2006	-7.1	n/a	29/04/2006	0.4	n/a	29/04/2006	-13.3	n/a	27/09/2006	0.0	0.0
30/04/2006	-11.7	n/a	30/04/2006	-9.0	n/a	30/04/2006	-15.0	n/a	28/09/2006	0.0	0.0
01/05/2006	-10.6	n/a	01/05/2006	-3.8	n/a	01/05/2006	-17.2	n/a	29/09/2006	0.0	0.0
02/05/2006	-11.0	n/a	02/05/2006	-4.4	n/a	02/05/2006	-16.3	n/a	30/09/2006	0.0	0.0
03/05/2006	-11.6	n/a	03/05/2006	-5.6	n/a	03/05/2006	-19.3	n/a	01/06/2007	n/a	0.0
04/05/2006	-4.1	n/a	04/05/2006	-0.9	n/a	04/05/2006	-8.3	n/a	02/06/2007	n/a	0.0
05/05/2006	-1.8	n/a	05/05/2006	-0.9	n/a	05/05/2006	-3.3	n/a	03/06/2007	n/a	0.0
06/05/2006	-0.8	n/a	06/05/2006	0.2	n/a	06/05/2006	-1.8	n/a	04/06/2007	n/a	0.0
07/05/2006	0.7	n/a	07/05/2006	4.8	n/a	07/05/2006	-0.8	n/a	05/06/2007	n/a	0.0
08/05/2006	0.0	n/a	08/05/2006	1.5	n/a	08/05/2006	-1.8	n/a	06/06/2007	n/a	0.0
09/05/2006	-3.1	n/a	09/05/2006	-0.4	n/a	09/05/2006	-5.8	n/a	07/06/2007	n/a	0.0
10/05/2006	-3.6	n/a	10/05/2006	1.0	n/a	10/05/2006	-9.1	n/a	08/06/2007	n/a	0.0
11/05/2006	0.1	n/a	11/05/2006	5.7	n/a	11/05/2006	-7.7	n/a	09/06/2007	n/a	0.0
12/05/2006	0.2	n/a	12/05/2006	3.6	n/a	12/05/2006	-3.9	n/a	10/06/2007	n/a	0.0
13/05/2006	0.3	n/a	13/05/2006	4.0	n/a	13/05/2006	-5.1	n/a	11/06/2007	n/a	0.0
14/05/2006	0.1	n/a	14/05/2006	3.6	n/a	14/05/2006	-4.2	n/a	12/06/2007	0.0	0.0
15/05/2006	-0.3	n/a	15/05/2006	1.6	n/a	15/05/2006	-2.4	n/a	13/06/2007	2.5	0.3
16/05/2006	0.6	n/a	16/05/2006	1.9	n/a	16/05/2006	-1.3	n/a	14/06/2007	1.5	0.0
17/05/2006	-0.7	n/a	17/05/2006	1.1	n/a	17/05/2006	-1.9	n/a	15/06/2007	0.0	0.0
18/05/2006	-1.5	n/a	18/05/2006	0.7	n/a	18/05/2006	-3.5	n/a	16/06/2007	0.3	0.0
19/05/2006	-1.3	n/a	19/05/2006	2.2	n/a	19/05/2006	-4.0	n/a	17/06/2007	0.0	0.0
20/05/2006	1.4	n/a	20/05/2006	5.6	n/a	20/05/2006	-4.8	n/a	18/06/2007	0.8	0.0
21/05/2006	2.9	n/a	21/05/2006	6.2	n/a	21/05/2006	-0.4	n/a	19/06/2007	0.5	0.0
22/05/2006	-1.1	n/a	22/05/2006	1.9	n/a	22/05/2006	-4.3	n/a	20/06/2007	1.3	0.0
23/05/2006	-5.0	n/a	23/05/2006	-2.1	n/a	23/05/2006	-7.1	n/a	21/06/2007	0.3	0.0
24/05/2006	-0.8	n/a	24/05/2006	4.2	n/a	24/05/2006	-6.2	n/a	22/06/2007	0.3	0.0
25/05/2006	3.0	n/a	25/05/2006	7.8	n/a	25/05/2006	-2.6	n/a	23/06/2007	0.0	0.0
26/05/2006	0.9	n/a	26/05/2006	4.5	n/a	26/05/2006	-1.0	n/a	24/06/2007	0.0	0.0
27/05/2006	0.3	n/a	27/05/2006	2.4	n/a	27/05/2006	-1.8	n/a	25/06/2007	0.0	0.0
28/05/2006	0.7	n/a	28/05/2006	3.3	n/a	28/05/2006	-1.4	n/a	26/06/2007	0.0	0.0
29/05/2006	0.3	n/a	29/05/2006	2.1	n/a	29/05/2006	-2.5	n/a	27/06/2007	0.0	0.0
30/05/2006	2.9	n/a	30/05/2006	8.6	n/a	30/05/2006	-3.9	n/a	28/06/2007	0.0	0.0
31/05/2006	2.9	n/a	31/05/2006	7.3	n/a	31/05/2006	0.6	n/a	29/06/2007	0.0	0.0
01/06/2006	3.4	n/a	01/06/2006	7.3	n/a	01/06/2006	0.3	n/a	30/06/2007	0.0	0.0
02/06/2006	3.6	n/a	02/06/2006	11.2	n/a	02/06/2006	0.0	n/a	01/07/2007	0.3	0.3
03/06/2006	2.9	n/a	03/06/2006	6.5	n/a	03/06/2006	-1.2	n/a	02/07/2007	0.5	0.0
04/06/2006	1.1	n/a	04/06/2006	2.5	n/a	04/06/2006	-0.3	n/a	03/07/2007	0.0	0.0
05/06/2006	0.7	n/a	05/06/2006	2.4	n/a	05/06/2006	-0.3	n/a	04/07/2007	0.0	0.0
06/06/2006	-0.3	n/a	06/06/2006	4.8	n/a	06/06/2006	-3.3	n/a	05/07/2007	0.0	0.0
07/06/2006	6.6	n/a	07/06/2006	12.6	n/a	07/06/2006	-0.6	n/a	06/07/2007	0.0	0.0
08/06/2006	10.8	n/a	08/06/2006	16.4	n/a	08/06/2006	3.3	n/a	07/07/2007	0.0	0.0
09/06/2006	13.1	n/a	09/06/2006	19.8	n/a	09/06/2006	6.4	n/a	08/07/2007	0.0	0.0
10/06/2006	5.8	n/a	10/06/2006	8.8	n/a	10/06/2006	4.3	n/a	09/07/2007	0.0	0.0
11/06/2006	9.4	n/a	11/06/2006	15.6	n/a	11/06/2006	2.8	n/a	10/07/2007	0.0	0.0
12/06/2006	15.6	n/a	12/06/2006	21.4	n/a	12/06/2006	8.7	n/a	11/07/2007	0.0	0.0
13/06/2006	14.3	n/a	13/06/2006	22.9	n/a	13/06/2006	9.1	n/a	12/07/2007	0.0	0.0
14/06/2006	11.4	n/a	14/06/2006	18.7	n/a	14/06/2006	8.0	n/a	13/07/2007	0.0	0.0
15/06/2006	8.1	n/a	15/06/2006	11.2	n/a	15/06/2006	5.2	n/a	14/07/2007	0.0	0.0
16/06/2006	10.2	n/a	16/06/2006	19.6	n/a	16/06/2006	1.8	n/a	15/07/2007	0.0	0.0
17/06/2006	6.4	n/a	17/06/2006	8.8	n/a	17/06/2006	4.2	n/a	16/07/2007	0.0	0.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
18/06/2006	10.2	n/a	18/06/2006	16.4	n/a	18/06/2006	3.9	n/a	17/07/2007	0.0	0.0
19/06/2006	9.0	n/a	19/06/2006	16.2	n/a	19/06/2006	3.1	n/a	18/07/2007	0.0	0.0
20/06/2006	3.5	n/a	20/06/2006	6.0	n/a	20/06/2006	1.1	n/a	19/07/2007	0.0	0.3
21/06/2006	4.8	n/a	21/06/2006	9.0	n/a	21/06/2006	0.4	n/a	20/07/2007	0.5	0.0
22/06/2006	12.5	n/a	22/06/2006	19.5	n/a	22/06/2006	2.9	n/a	21/07/2007	0.3	0.0
23/06/2006	17.9	n/a	23/06/2006	24.7	n/a	23/06/2006	8.8	n/a	22/07/2007	0.0	0.0
24/06/2006	15.1	n/a	24/06/2006	21.6	n/a	24/06/2006	9.6	n/a	23/07/2007	0.3	0.0
25/06/2006	7.8	n/a	25/06/2006	11.5	n/a	25/06/2006	5.0	n/a	24/07/2007	1.3	0.0
26/06/2006	12.0	n/a	26/06/2006	17.2	n/a	26/06/2006	4.4	n/a	25/07/2007	0.3	0.0
27/06/2006	15.2	n/a	27/06/2006	22.6	n/a	27/06/2006	8.1	n/a	26/07/2007	0.5	0.0
28/06/2006	15.7	n/a	28/06/2006	21.1	n/a	28/06/2006	10.4	n/a	27/07/2007	0.0	0.0
29/06/2006	16.6	n/a	29/06/2006	23.4	n/a	29/06/2006	11.1	n/a	28/07/2007	0.0	0.0
30/06/2006	12.6	n/a	30/06/2006	18.4	n/a	30/06/2006	9.1	n/a	29/07/2007	0.0	0.0
01/07/2006	10.2	n/a	01/07/2006	13.2	n/a	01/07/2006	8.4	n/a	30/07/2007	0.0	0.0
02/07/2006	14.4	n/a	02/07/2006	19.4	n/a	02/07/2006	8.4	n/a	31/07/2007	0.3	0.3
03/07/2006	13.4	n/a	03/07/2006	21.4	n/a	03/07/2006	6.7	n/a	01/08/2007	0.0	n/a
04/07/2006	9.0	n/a	04/07/2006	12.9	n/a	04/07/2006	5.6	n/a	02/08/2007	1.8	0.0
05/07/2006	10.4	n/a	05/07/2006	15.0	n/a	05/07/2006	6.7	n/a	03/08/2007	0.0	0.0
06/07/2006	6.4	n/a	06/07/2006	12.6	n/a	06/07/2006	3.2	n/a	04/08/2007	0.0	0.0
07/07/2006	5.8	n/a	07/07/2006	8.9	n/a	07/07/2006	2.5	n/a	05/08/2007	0.3	0.0
08/07/2006	7.2	n/a	08/07/2006	11.3	n/a	08/07/2006	2.4	n/a	06/08/2007	0.0	0.0
09/07/2006	7.4	n/a	09/07/2006	10.8	n/a	09/07/2006	4.2	n/a	07/08/2007	1.5	0.3
10/07/2006	9.5	n/a	10/07/2006	15.2	n/a	10/07/2006	4.2	n/a	08/08/2007	3.6	0.0
11/07/2006	13.7	n/a	11/07/2006	19.4	n/a	11/07/2006	6.6	n/a	09/08/2007	2.0	0.0
12/07/2006	14.7	n/a	12/07/2006	18.1	n/a	12/07/2006	9.6	n/a	10/08/2007	6.6	0.0
13/07/2006	10.1	n/a	13/07/2006	12.4	n/a	13/07/2006	8.8	n/a	11/08/2007	4.1	0.0
14/07/2006	10.2	n/a	14/07/2006	12.2	n/a	14/07/2006	8.5	n/a	12/08/2007	3.6	0.0
15/07/2006	13.7	n/a	15/07/2006	17.9	n/a	15/07/2006	7.6	n/a	13/08/2007	4.6	0.0
16/07/2006	14.6	n/a	16/07/2006	18.6	n/a	16/07/2006	9.0	n/a	14/08/2007	2.3	0.0
17/07/2006	12.6	n/a	17/07/2006	16.7	n/a	17/07/2006	7.7	n/a	15/08/2007	0.5	0.0
18/07/2006	10.6	n/a	18/07/2006	14.1	n/a	18/07/2006	7.4	n/a	16/08/2007	0.0	0.0
19/07/2006	12.8	n/a	19/07/2006	16.8	n/a	19/07/2006	8.6	n/a	17/08/2007	0.0	0.0
20/07/2006	16.0	n/a	20/07/2006	21.5	n/a	20/07/2006	9.8	n/a	18/08/2007	1.5	0.0
21/07/2006	19.2	n/a	21/07/2006	24.7	n/a	21/07/2006	12.2	n/a	19/08/2007	0.3	0.0
22/07/2006	16.1	n/a	22/07/2006	22.5	n/a	22/07/2006	10.4	n/a	20/08/2007	0.0	0.0
23/07/2006	12.7	n/a	23/07/2006	20.7	n/a	23/07/2006	6.5	n/a	21/08/2007	0.0	0.0
24/07/2006	7.2	n/a	24/07/2006	10.5	n/a	24/07/2006	5.4	n/a	22/08/2007	0.0	0.0
25/07/2006	7.5	n/a	25/07/2006	10.1	n/a	25/07/2006	5.1	n/a	23/08/2007	0.3	0.0
26/07/2006	7.8	n/a	26/07/2006	11.4	n/a	26/07/2006	4.7	n/a	24/08/2007	0.3	0.0
27/07/2006	8.6	n/a	27/07/2006	11.6	n/a	27/07/2006	6.1	n/a	25/08/2007	0.0	0.0
28/07/2006	7.2	n/a	28/07/2006	8.7	n/a	28/07/2006	6.2	n/a	26/08/2007	0.0	0.0
29/07/2006	9.4	n/a	29/07/2006	10.6	n/a	29/07/2006	8.2	n/a	27/08/2007	0.0	0.0
30/07/2006	9.1	n/a	30/07/2006	10.9	n/a	30/07/2006	7.8	n/a	28/08/2007	0.3	0.0
31/07/2006	11.5	n/a	31/07/2006	16.4	n/a	31/07/2006	7.9	n/a	29/08/2007	0.3	0.0
01/08/2006	13.8	n/a	01/08/2006	18.5	n/a	01/08/2006	8.6	n/a	30/08/2007	0.0	0.0
02/08/2006	14.4	n/a	02/08/2006	18.6	n/a	02/08/2006	10.0	n/a	31/08/2007	0.0	0.0
03/08/2006	15.9	n/a	03/08/2006	20.2	n/a	03/08/2006	10.4	n/a	01/09/2007	1.5	0.0
04/08/2006	17.8	n/a	04/08/2006	23.0	n/a	04/08/2006	13.2	n/a	02/09/2007	4.3	0.0
05/08/2006	17.6	n/a	05/08/2006	23.7	n/a	05/08/2006	10.6	n/a	03/09/2007	0.3	0.0
06/08/2006	18.1	n/a	06/08/2006	23.8	n/a	06/08/2006	14.0	n/a	04/09/2007	0.0	0.0
07/08/2006	17.6	n/a	07/08/2006	23.1	n/a	07/08/2006	13.6	n/a	05/09/2007	0.0	0.0
08/08/2006	17.5	n/a	08/08/2006	23.7	n/a	08/08/2006	11.3	n/a	06/09/2007	0.0	0.0
09/08/2006	16.4	n/a	09/08/2006	22.0	n/a	09/08/2006	12.2	n/a	07/09/2007	0.8	0.0
10/08/2006	14.6	n/a	10/08/2006	18.0	n/a	10/08/2006	11.1	n/a	08/09/2007	0.0	0.0
11/08/2006	10.4	n/a	11/08/2006	12.2	n/a	11/08/2006	6.8	n/a	09/09/2007	0.0	0.0
12/08/2006	10.8	n/a	12/08/2006	16.8	n/a	12/08/2006	4.4	n/a	10/09/2007	0.0	0.0
13/08/2006	13.8	n/a	13/08/2006	18.7	n/a	13/08/2006	8.3	n/a	11/09/2007	0.0	0.0
14/08/2006	12.5	n/a	14/08/2006	16.2	n/a	14/08/2006	8.6	n/a	12/09/2007	0.5	0.3
15/08/2006	11.2	n/a	15/08/2006	14.4	n/a	15/08/2006	8.5	n/a	13/09/2007	0.0	0.0
16/08/2006	10.1	n/a	16/08/2006	16.0	n/a	16/08/2006	5.2	n/a	14/09/2007	0.0	0.0
17/08/2006	12.6	n/a	17/08/2006	18.4	n/a	17/08/2006	6.8	n/a	15/09/2007	0.0	0.0
18/08/2006	11.8	n/a	18/08/2006	15.0	n/a	18/08/2006	8.7	n/a	16/09/2007	0.0	0.0
19/08/2006	6.8	n/a	19/08/2006	9.2	n/a	19/08/2006	4.5	n/a	17/09/2007	0.0	0.0
20/08/2006	8.2	n/a	20/08/2006	13.3	n/a	20/08/2006	4.3	n/a	18/09/2007	0.0	0.0
21/08/2006	10.5	n/a	21/08/2006	17.2	n/a	21/08/2006	5.6	n/a	19/09/2007	0.0	0.0
22/08/2006	11.7	n/a	22/08/2006	18.3	n/a	22/08/2006	5.4	n/a	20/09/2007	0.0	0.0
23/08/2006	10.4	n/a	23/08/2006	15.2	n/a	23/08/2006	5.5	n/a	21/09/2007	0.0	0.0
24/08/2006	11.6	n/a	24/08/2006	14.8	n/a	24/08/2006	8.7	n/a	22/09/2007	0.3	0.5
25/08/2006	8.6	n/a	25/08/2006	9.7	n/a	25/08/2006	6.3	n/a	23/09/2007	0.0	0.8
26/08/2006	6.8	n/a	26/08/2006	9.3	n/a	26/08/2006	3.8	n/a	24/09/2007	0.3	0.8
27/08/2006	5.1	n/a	27/08/2006	7.1	n/a	27/08/2006	2.1	n/a	25/09/2007	0.0	0.0
28/08/2006	4.2	n/a	28/08/2006	7.6	n/a	28/08/2006	-0.4	n/a	26/09/2007	0.0	0.0
29/08/2006	4.0	n/a	29/08/2006	5.2	n/a	29/08/2006	2.9	n/a	27/09/2007	0.0	0.0
30/08/2006	3.9	n/a	30/08/2006	5.4	n/a	30/08/2006	2.4	n/a	28/09/2007	0.0	0.0
31/08/2006	4.7	n/a	31/08/2006	5.5	n/a	31/08/2006	3.2	n/a	29/09/2007	0.0	0.0
01/09/2006	3.3	n/a	01/09/2006	6.1	n/a	01/09/2006	1.5	n/a	30/09/2007	0.0	0.0
02/09/2006	3.6	n/a	02/09/2006	8.6	n/a	02/09/2006	0.7	n/a	31/05/2008	0.0	0.0
03/09/2006	4.9	n/a	03/09/2006	11.8	n/a	03/09/2006	0.9	n/a	01/06/2008	0.0	0.0
04/09/2006	5.5	n/a	04/09/2006	10.4	n/a	04/09/2006	0.5	n/a	02/06/2008	9.4	5.1
05/09/2006	9.1	n/a	05/09/2006	15.5	n/a	05/09/2006	3.1	n/a	03/06/2008	0.3	0.0
06/09/2006	3.1	n/a	06/09/2006	7.6	n/a	06/09/2006	0.4	n/a	04/06/2008	0.0	0.0
07/09/2006	5.7	n/a	07/09/2006	13.1	n/a	07/09/2006	-2.0	n/a	05/06/2008	0.0	0.0
08/09/2006	4.8	5.9	08/09/2006	7.9	11.6	08/09/2006	2.8	n/a	06/06/2008	0.0	0.0
09/09/2006	15.9	12.3	09/09/2006	19.6	19.7	09/09/2006	10.7	5.8	07/06/2008	0.0	0.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
10/09/2006	12.9	13.2	10/09/2006	18.5	18.4	10/09/2006	6.7	7.9	08/06/2008	0.0	0.0
11/09/2006	12.2	12.1	11/09/2006	17.9	17.7	11/09/2006	8.0	6.7	09/06/2008	0.0	0.0
12/09/2006	4.4	5.7	12/09/2006	9.2	9.3	12/09/2006	-0.6	0.8	10/06/2008	0.0	0.0
13/09/2006	-1.3	-0.2	13/09/2006	-0.2	1.0	13/09/2006	-2.7	-1.4	11/06/2008	0.0	0.0
14/09/2006	-1.8	-0.9	14/09/2006	0.7	0.7	14/09/2006	-3.8	-2.3	12/06/2008	0.0	0.0
15/09/2006	1.0	1.1	15/09/2006	6.5	6.5	15/09/2006	-2.7	-2.4	13/06/2008	0.0	0.0
16/09/2006	3.7	3.7	16/09/2006	9.7	8.8	16/09/2006	-0.8	-0.2	14/06/2008	4.1	0.0
17/09/2006	6.1	6.0	17/09/2006	13.6	14.7	17/09/2006	-0.8	-0.3	15/06/2008	3.3	0.3
18/09/2006	5.8	6.0	18/09/2006	11.4	11.6	18/09/2006	-0.4	0.7	16/06/2008	15.2	11.7
19/09/2006	6.2	6.5	19/09/2006	12.7	12.2	19/09/2006	0.8	0.5	17/06/2008	1.3	1.3
20/09/2006	6.2	5.1	20/09/2006	10.5	11.0	20/09/2006	2.7	0.4	18/06/2008	2.3	2.0
21/09/2006	2.6	2.6	21/09/2006	3.9	3.1	21/09/2006	1.4	1.9	19/06/2008	0.0	0.0
22/09/2006	3.3	1.9	22/09/2006	8.8	6.2	22/09/2006	-0.1	0.2	20/06/2008	0.8	0.0
23/09/2006	2.3	2.9	23/09/2006	5.3	6.0	23/09/2006	-0.9	0.0	21/06/2008	0.0	0.0
24/09/2006	5.4	6.3	24/09/2006	8.5	9.3	24/09/2006	2.9	3.8	22/06/2008	0.0	0.0
25/09/2006	2.0	2.7	25/09/2006	5.1	5.4	25/09/2006	0.0	0.7	23/06/2008	0.0	0.0
26/09/2006	-0.6	-0.4	26/09/2006	0.4	1.2	26/09/2006	-1.8	-2.0	24/06/2008	0.0	0.3
27/09/2006	-1.1	-0.8	27/09/2006	1.2	1.7	27/09/2006	-3.2	-5.7	25/06/2008	0.0	0.0
28/09/2006	-4.4	-5.1	28/09/2006	-2.7	-3.8	28/09/2006	-6.1	-6.9	26/06/2008	0.0	0.0
29/09/2006	-4.6	-4.3	29/09/2006	-2.0	-1.3	29/09/2006	-6.7	-8.5	27/06/2008	0.0	0.0
30/09/2006	-2.9	-2.1	30/09/2006	-1.2	0.1	30/09/2006	-4.8	-5.8	28/06/2008	0.0	0.0
01/10/2006	-1.1	-0.7	01/10/2006	0.0	0.1	01/10/2006	-1.7	-3.0	29/06/2008	8.9	0.3
02/10/2006	-1.9	-3.0	02/10/2006	0.3	-0.7	02/10/2006	-3.3	-8.3	30/06/2008	4.1	0.0
03/10/2006	0.2	-1.7	03/10/2006	2.9	1.8	03/10/2006	-2.9	-8.9	01/07/2008	0.0	0.0
04/10/2006	1.4	1.1	04/10/2006	4.8	5.0	04/10/2006	-1.5	-2.1	02/07/2008	0.0	0.0
05/10/2006	-2.2	-1.6	05/10/2006	0.4	0.6	05/10/2006	-4.7	-4.1	03/07/2008	0.0	0.0
06/10/2006	-8.4	-7.1	06/10/2006	-4.4	-4.0	06/10/2006	-10.2	-9.2	04/07/2008	2.0	0.0
07/10/2006	-6.3	-6.2	07/10/2006	-2.9	-3.0	07/10/2006	-9.7	-9.8	05/07/2008	0.3	1.3
08/10/2006	-8.7	-8.1	08/10/2006	-6.6	-3.5	08/10/2006	-10.2	-10.8	06/07/2008	0.0	0.0
09/10/2006	-9.9	-9.7	09/10/2006	-7.1	-7.9	09/10/2006	-12.0	-12.7	07/07/2008	0.0	0.0
10/10/2006	-9.5	-9.9	10/10/2006	-8.5	-8.5	10/10/2006	-10.4	-11.6	08/07/2008	0.0	0.0
11/10/2006	-12.8	-14.6	11/10/2006	-10.0	-10.3	11/10/2006	-17.3	-19.4	09/07/2008	0.0	0.0
12/10/2006	-7.2	-8.3	12/10/2006	-1.3	-1.9	12/10/2006	-15.1	-18.2	10/07/2008	1.5	0.3
13/10/2006	-2.9	-3.3	13/10/2006	-1.1	-1.3	13/10/2006	-5.1	-6.8	11/07/2008	2.3	0.0
14/10/2006	-3.8	-4.1	14/10/2006	-1.9	-2.2	14/10/2006	-6.3	-5.7	12/07/2008	0.0	0.3
15/10/2006	-7.8	-7.2	15/10/2006	-6.2	-5.7	15/10/2006	-10.6	-8.7	13/07/2008	0.3	0.0
16/10/2006	-9.3	-9.1	16/10/2006	-7.9	-7.1	16/10/2006	-13.3	-10.3	14/07/2008	0.3	0.0
17/10/2006	-9.3	-9.0	17/10/2006	-7.4	-7.5	17/10/2006	-12.6	-11.1	15/07/2008	0.0	0.0
18/10/2006	-8.0	-8.6	18/10/2006	-6.4	-6.4	18/10/2006	-10.4	-13.6	16/07/2008	0.0	0.0
19/10/2006	-9.9	-10.4	19/10/2006	-7.0	-6.4	19/10/2006	-15.5	-18.4	17/07/2008	0.0	0.0
20/10/2006	-7.6	-8.6	20/10/2006	-6.2	-6.0	20/10/2006	-12.4	-14.9	18/07/2008	0.0	0.0
21/10/2006	-10.1	-11.4	21/10/2006	-5.4	-5.5	21/10/2006	-15.0	-16.0	19/07/2008	0.0	0.0
22/10/2006	-6.2	-6.1	22/10/2006	-4.9	-4.9	22/10/2006	-7.2	-7.0	20/07/2008	1.0	0.0
23/10/2006	-3.6	-2.6	23/10/2006	0.7	0.7	23/10/2006	-9.5	-8.2	21/07/2008	0.0	0.0
24/10/2006	-8.5	-6.0	24/10/2006	-3.9	-2.3	24/10/2006	-11.6	-11.1	22/07/2008	13.7	0.0
25/10/2006	-2.5	-1.2	25/10/2006	-0.5	0.1	25/10/2006	-4.8	-2.3	23/07/2008	0.3	0.0
26/10/2006	-1.2	0.1	26/10/2006	0.9	1.0	26/10/2006	-3.4	-1.1	24/07/2008	1.3	0.0
27/10/2006	-4.4	-2.7	27/10/2006	-1.9	-1.1	27/10/2006	-8.4	-4.9	25/07/2008	6.6	0.0
28/10/2006	-4.4	-3.7	28/10/2006	-3.0	-3.1	28/10/2006	-5.7	-4.3	26/07/2008	0.0	0.0
29/10/2006	-6.7	-4.7	29/10/2006	-5.6	-3.8	29/10/2006	-8.2	-6.0	27/07/2008	0.3	0.0
30/10/2006	-9.2	-7.9	30/10/2006	-8.2	-6.0	30/10/2006	-9.7	-8.5	28/07/2008	0.0	0.0
31/10/2006	-8.7	-7.4	31/10/2006	-7.2	-5.1	31/10/2006	-11.4	-11.3	29/07/2008	0.0	0.0
01/11/2006	-15.4	-15.7	01/11/2006	-11.4	-11.2	01/11/2006	-17.3	-17.7	30/07/2008	0.0	0.0
02/11/2006	-19.1	-20.1	02/11/2006	-16.3	-17.2	02/11/2006	-21.0	-21.4	31/07/2008	0.0	0.0
03/11/2006	-21.3	-20.3	03/11/2006	-20.0	-19.2	03/11/2006	-22.4	-22.0	01/08/2008	0.0	0.0
04/11/2006	-22.1	-21.5	04/11/2006	-20.5	-20.2	04/11/2006	-23.5	-23.2	02/08/2008	0.0	0.0
05/11/2006	-24.7	-25.5	05/11/2006	-20.6	-21.8	05/11/2006	-26.7	-29.7	03/08/2008	4.6	0.0
06/11/2006	-21.5	-21.8	06/11/2006	-16.9	-19.4	06/11/2006	-24.8	-24.2	04/08/2008	0.0	0.0
07/11/2006	-17.1	-18.5	07/11/2006	-15.8	-16.4	07/11/2006	-20.3	-22.6	05/08/2008	1.0	0.0
08/11/2006	-16.9	-17.5	08/11/2006	-14.2	-14.7	08/11/2006	-19.7	-19.7	06/08/2008	0.0	0.0
09/11/2006	-17.7	-17.5	09/11/2006	-14.7	-15.0	09/11/2006	-20.9	-21.9	07/08/2008	0.0	0.0
10/11/2006	-19.4	-20.0	10/11/2006	-17.1	-16.9	10/11/2006	-23.6	-23.5	08/08/2008	0.3	0.0
11/11/2006	-19.1	-19.8	11/11/2006	-16.7	-17.2	11/11/2006	-22.5	-22.1	09/08/2008	1.3	0.0
12/11/2006	-18.0	-16.9	12/11/2006	-16.1	-14.6	12/11/2006	-19.8	-19.2	10/08/2008	0.0	0.0
13/11/2006	-17.7	-18.7	13/11/2006	-15.0	-15.1	13/11/2006	-22.0	-24.4	11/08/2008	5.3	0.3
14/11/2006	-20.5	-18.8	14/11/2006	-17.9	-14.5	14/11/2006	-22.3	-23.4	12/08/2008	0.0	0.0
15/11/2006	-14.7	-13.3	15/11/2006	-12.5	-12.1	15/11/2006	-17.9	-15.2	13/08/2008	0.0	0.0
16/11/2006	-14.9	-14.8	16/11/2006	-13.3	-13.2	16/11/2006	-16.1	-16.9	14/08/2008	17.0	11.4
17/11/2006	-13.8	-12.9	17/11/2006	-12.5	-11.6	17/11/2006	-15.3	-14.3	15/08/2008	0.0	0.0
18/11/2006	-18.7	-17.2	18/11/2006	-13.6	-12.9	18/11/2006	-22.3	-22.4	16/08/2008	0.5	4.1
19/11/2006	-21.0	-22.1	19/11/2006	-19.7	-19.5	19/11/2006	-22.1	-25.8	17/08/2008	0.3	0.0
20/11/2006	-20.4	-21.0	20/11/2006	-19.1	-19.2	20/11/2006	-22.4	-23.8	18/08/2008	17.3	7.1
21/11/2006	-22.1	-22.1	21/11/2006	-19.2	-19.3	21/11/2006	-24.5	-25.0	19/08/2008	10.4	14.0
22/11/2006	-26.0	-25.5	22/11/2006	-21.9	-21.8	22/11/2006	-28.2	-28.4	20/08/2008	0.0	0.3
23/11/2006	-25.3	-25.7	23/11/2006	-21.7	-22.5	23/11/2006	-27.9	-29.3	21/08/2008	0.0	0.0
24/11/2006	-27.6	-27.3	24/11/2006	-24.9	-23.6	24/11/2006	-30.1	-30.4	22/08/2008	0.0	0.0
25/11/2006	-27.7	-28.5	25/11/2006	-23.6	-23.4	25/11/2006	-30.6	-31.7	23/08/2008	3.0	0.5
26/11/2006	-22.2	-22.0	26/11/2006	-20.0	-19.6	26/11/2006	-26.2	-25.6	24/08/2008	0.0	0.0
27/11/2006	-17.7	-17.6	27/11/2006	-16.2	-16.2	27/11/2006	-20.4	-20.5	25/08/2008	20.1	19.6
28/11/2006	-23.8	-22.8	28/11/2006	-19.6	-19.1	28/11/2006	-28.5	-28.6	26/08/2008	12.2	0.8
29/11/2006	-27.4	-27.2	29/11/2006	-25.7	-26.0	29/11/2006	-29.7	-29.1	27/08/2008	0.3	0.3
30/11/2006	-30.7	-30.8	30/11/2006	-28.9	-28.5	30/11/2006	-32.1	-32.7	28/08/2008	4.6	5.8
01/12/2006	-32.1	-32.2	01/12/2006	-30.5	-30.3	01/12/2006	-33.3	-34.2	29/08/2008	2.8	4.8
02/12/2006	-26.6	-27.1	02/12/2006	-21.6	-22.0	02/12/2006	-32.3	-31.4	30/08/2008	0.8	2.0

Appendix 2. **George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012**

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
03/12/2006	-17.6	-17.9	03/12/2006	-13.4	-13.4	03/12/2006	-23.1	-22.0	31/08/2008	0.8	0.3
04/12/2006	-15.0	-14.7	04/12/2006	-12.2	-12.2	04/12/2006	-22.1	-20.0	01/09/2008	2.8	4.1
05/12/2006	-24.1	-23.3	05/12/2006	-22.0	-20.0	05/12/2006	-27.5	-25.0	02/09/2008	1.8	1.5
06/12/2006	-23.3	-23.1	06/12/2006	-18.1	-18.5	06/12/2006	-27.8	-26.0	03/09/2008	0.0	0.3
07/12/2006	-16.4	-16.4	07/12/2006	-13.8	-13.5	07/12/2006	-20.9	-19.6	04/09/2008	0.0	0.5
08/12/2006	-18.8	-20.6	08/12/2006	-14.1	-15.0	08/12/2006	-23.1	-27.0	05/09/2008	0.3	0.3
09/12/2006	-23.4	-24.1	09/12/2006	-20.7	-19.8	09/12/2006	-25.6	-27.6	06/09/2008	0.0	0.0
10/12/2006	-20.1	-19.5	10/12/2006	-12.9	-12.8	10/12/2006	-23.6	-22.9	07/09/2008	0.0	0.0
11/12/2006	-9.6	-7.0	11/12/2006	-7.2	-6.0	11/12/2006	-13.4	-12.8	08/09/2008	0.0	0.3
12/12/2006	-10.1	-7.7	12/12/2006	-7.2	-5.0	12/12/2006	-15.1	-12.0	09/09/2008	0.3	2.0
13/12/2006	-17.5	-15.9	13/12/2006	-15.0	-11.8	13/12/2006	-20.8	-20.0	10/09/2008	0.0	0.0
14/12/2006	-24.5	-25.9	14/12/2006	-20.7	-20.0	14/12/2006	-28.1	-31.5	11/09/2008	0.0	0.0
15/12/2006	-28.2	-28.7	15/12/2006	-25.2	-24.7	15/12/2006	-30.4	-32.8	12/09/2008	0.0	0.0
16/12/2006	-22.5	-20.8	16/12/2006	-20.0	-18.3	16/12/2006	-25.4	-24.7	13/09/2008	3.3	2.5
17/12/2006	-31.1	-31.3	17/12/2006	-25.4	-21.3	17/12/2006	-34.8	-34.8	14/09/2008	0.0	0.0
18/12/2006	-32.2	-28.4	18/12/2006	-23.7	-21.1	18/12/2006	-34.5	-33.5	15/09/2008	0.0	0.0
19/12/2006	-19.9	-19.0	19/12/2006	-17.2	-16.4	19/12/2006	-23.7	-23.4	16/09/2008	0.0	0.0
20/12/2006	-24.1	-24.3	20/12/2006	-19.3	-18.4	20/12/2006	-27.6	-30.0	17/09/2008	0.0	0.0
21/12/2006	-14.6	-14.4	21/12/2006	-12.4	-12.4	21/12/2006	-19.3	-18.4	18/09/2008	0.0	0.0
22/12/2006	-13.7	-13.6	22/12/2006	-11.5	-12.4	22/12/2006	-15.9	-14.9	19/09/2008	0.0	0.0
23/12/2006	-20.2	-20.1	23/12/2006	-15.9	-14.9	23/12/2006	-24.9	-26.1	20/09/2008	0.0	0.0
24/12/2006	-24.1	-25.5	24/12/2006	-19.5	-20.3	24/12/2006	-26.5	-27.6	21/09/2008	0.0	0.0
25/12/2006	-20.4	-20.7	25/12/2006	-17.2	-16.9	25/12/2006	-24.5	-24.7	22/09/2008	3.8	1.8
26/12/2006	-18.5	-18.5	26/12/2006	-16.6	-16.3	26/12/2006	-22.8	-22.7	23/09/2008	12.2	6.6
27/12/2006	-16.3	-16.7	27/12/2006	-14.3	-13.9	27/12/2006	-20.3	-20.9	24/09/2008	0.5	7.9
28/12/2006	-19.3	-19.8	28/12/2006	-15.5	-16.1	28/12/2006	-24.1	-24.6	25/09/2008	0.0	0.0
29/12/2006	-24.0	-23.0	29/12/2006	-16.7	-15.0	29/12/2006	-29.4	-30.5	26/09/2008	0.0	0.0
30/12/2006	-14.8	-14.7	30/12/2006	-9.0	-8.6	30/12/2006	-24.9	-24.1	27/09/2008	0.0	0.0
31/12/2006	-18.2	-17.4	31/12/2006	-10.4	-10.1	31/12/2006	-23.4	-23.1	28/09/2008	0.0	0.0
01/01/2007	-20.6	-19.4	01/01/2007	-18.2	-17.7	01/01/2007	-24.1	-22.0	29/09/2008	4.6	7.6
02/01/2007	-16.3	-15.8	02/01/2007	-14.2	-14.2	02/01/2007	-18.4	-18.0	01/06/2009	0.0	0.0
03/01/2007	-16.4	-15.2	03/01/2007	-14.5	-14.1	03/01/2007	-19.6	-16.1	02/06/2009	0.0	0.0
04/01/2007	-17.4	-14.5	04/01/2007	-16.4	-12.0	04/01/2007	-23.3	-19.1	03/06/2009	0.0	0.0
05/01/2007	-19.6	-19.5	05/01/2007	-15.3	-13.7	05/01/2007	-24.7	-25.2	04/06/2009	0.0	0.0
06/01/2007	-20.4	-18.4	06/01/2007	-16.7	-14.0	06/01/2007	-24.2	-22.2	05/06/2009	0.0	0.0
07/01/2007	-28.2	-26.8	07/01/2007	-23.9	-22.2	07/01/2007	-31.1	-29.4	06/06/2009	0.0	0.0
08/01/2007	-32.2	-31.8	08/01/2007	-30.4	-28.0	08/01/2007	-33.8	-34.9	07/06/2009	0.0	0.0
09/01/2007	-34.2	-35.8	09/01/2007	-30.2	-34.3	09/01/2007	-37.0	-37.6	08/06/2009	0.0	0.0
10/01/2007	-34.4	-34.0	10/01/2007	-32.0	-32.3	10/01/2007	-38.3	-36.2	09/06/2009	0.0	0.0
11/01/2007	-34.5	-34.8	11/01/2007	-28.9	-30.0	11/01/2007	-38.6	-37.8	10/06/2009	0.0	0.0
12/01/2007	-33.7	-32.6	12/01/2007	-28.7	-28.4	12/01/2007	-37.2	-35.6	11/06/2009	0.0	0.0
13/01/2007	-27.2	-26.9	13/01/2007	-23.7	-23.0	13/01/2007	-33.7	-34.9	12/06/2009	8.6	13.5
14/01/2007	-24.6	-24.4	14/01/2007	-21.9	-22.7	14/01/2007	-29.4	-29.2	13/06/2009	0.3	1.5
15/01/2007	-30.5	-30.6	15/01/2007	-28.1	-27.9	15/01/2007	-32.5	-33.2	14/06/2009	0.0	0.0
16/01/2007	-24.9	-25.6	16/01/2007	-19.7	-24.2	16/01/2007	-30.2	-28.3	15/06/2009	0.0	0.0
17/01/2007	-28.8	-27.9	17/01/2007	-27.1	-26.1	17/01/2007	-30.1	-29.9	16/06/2009	0.0	0.0
18/01/2007	-30.0	-30.1	18/01/2007	-27.8	-28.5	18/01/2007	-32.1	-31.7	17/06/2009	0.0	0.0
19/01/2007	-30.3	-30.9	19/01/2007	-27.1	-29.9	19/01/2007	-31.7	-32.5	18/06/2009	0.0	0.8
20/01/2007	-26.3	-29.9	20/01/2007	-23.0	-26.9	20/01/2007	-29.1	-32.2	19/06/2009	0.0	2.3
21/01/2007	-27.2	-29.3	21/01/2007	-23.3	-24.2	21/01/2007	-31.6	-37.6	20/06/2009	0.0	0.0
22/01/2007	-35.0	-37.4	22/01/2007	-31.4	-35.4	22/01/2007	-37.5	-39.2	21/06/2009	0.0	0.0
23/01/2007	-30.1	-31.6	23/01/2007	-18.5	-19.2	23/01/2007	-34.6	-36.1	22/06/2009	0.0	0.3
24/01/2007	-23.9	-23.6	24/01/2007	-18.1	-18.3	24/01/2007	-30.7	-31.9	23/06/2009	0.0	0.0
25/01/2007	-26.8	-28.9	25/01/2007	-22.7	-25.7	25/01/2007	-30.0	-32.2	24/06/2009	5.6	2.0
26/01/2007	-26.3	-25.5	26/01/2007	-24.1	-23.4	26/01/2007	-28.9	-30.2	25/06/2009	1.8	1.0
27/01/2007	-22.6	-21.1	27/01/2007	-18.0	-17.9	27/01/2007	-29.3	-26.2	26/06/2009	0.0	0.0
28/01/2007	-23.6	-23.9	28/01/2007	-18.3	-18.3	28/01/2007	-27.7	-27.1	27/06/2009	0.0	0.0
29/01/2007	-21.5	-21.5	29/01/2007	-17.7	-18.3	29/01/2007	-24.5	-26.9	28/06/2009	0.3	0.0
30/01/2007	-22.4	-23.3	30/01/2007	-16.5	-16.9	30/01/2007	-26.6	-28.0	29/06/2009	0.0	0.0
31/01/2007	-24.7	-24.7	31/01/2007	-21.0	-20.9	31/01/2007	-26.7	-27.1	30/06/2009	0.0	0.0
01/02/2007	-25.1	-25.1	01/02/2007	-22.3	-21.9	01/02/2007	-28.4	-29.3	01/07/2009	0.0	0.0
02/02/2007	-24.7	-25.4	02/02/2007	-20.7	-21.0	02/02/2007	-30.8	-31.2	02/07/2009	0.0	0.0
03/02/2007	-25.8	-28.4	03/02/2007	-22.9	-21.8	03/02/2007	-30.8	-36.6	03/07/2009	0.0	0.0
04/02/2007	-32.9	-35.4	04/02/2007	-30.3	-33.2	04/02/2007	-35.4	-38.2	04/07/2009	0.5	0.0
05/02/2007	-35.1	-35.1	05/02/2007	-33.1	-32.0	05/02/2007	-36.6	-38.0	05/07/2009	0.0	0.0
06/02/2007	-31.6	-34.8	06/02/2007	-29.2	-32.6	06/02/2007	-34.5	-37.1	06/07/2009	0.0	0.5
07/02/2007	-28.2	-29.0	07/02/2007	-25.0	-26.5	07/02/2007	-31.6	-33.4	07/07/2009	0.0	4.1
08/02/2007	-24.9	-24.5	08/02/2007	-23.9	-23.7	08/02/2007	-26.7	-27.0	08/07/2009	9.7	5.6
09/02/2007	-23.8	-23.7	09/02/2007	-21.3	-21.5	09/02/2007	-26.9	-27.5	09/07/2009	1.8	3.6
10/02/2007	-29.4	-29.6	10/02/2007	-24.4	-24.1	10/02/2007	-31.6	-32.4	10/07/2009	0.5	3.3
11/02/2007	-28.0	-29.3	11/02/2007	-23.3	-26.0	11/02/2007	-31.1	-32.6	11/07/2009	1.3	1.5
12/02/2007	-27.7	-28.1	12/02/2007	-24.0	-26.0	12/02/2007	-29.9	-30.3	12/07/2009	0.3	0.0
13/02/2007	-27.2	-26.6	13/02/2007	-24.9	-24.4	13/02/2007	-29.4	-28.6	13/07/2009	0.0	0.0
14/02/2007	-24.2	-23.7	14/02/2007	-18.9	-19.2	14/02/2007	-30.8	-28.8	14/07/2009	0.3	0.0
15/02/2007	-26.2	-25.1	15/02/2007	-19.6	-18.8	15/02/2007	-30.0	-29.8	15/07/2009	4.8	2.5
16/02/2007	-28.8	-29.8	16/02/2007	-26.3	-27.9	16/02/2007	-31.3	-32.0	16/07/2009	1.0	2.3
17/02/2007	-28.9	-29.3	17/02/2007	-26.3	-27.2	17/02/2007	-32.9	-33.6	17/07/2009	0.0	0.0
18/02/2007	-34.8	-35.8	18/02/2007	-31.9	-32.3	18/02/2007	-36.9	-39.4	18/07/2009	0.5	0.3
19/02/2007	-34.9	-36.6	19/02/2007	-33.1	-33.3	19/02/2007	-37.4	-39.8	19/07/2009	0.0	3.6
20/02/2007	-31.4	-32.5	20/02/2007	-28.4	-28.8	20/02/2007	-35.9	-36.7	20/07/2009	0.0	0.0
21/02/2007	-28.8	-29.4	21/02/2007	-26.8	-27.2	21/02/2007	-30.4	-31.4	21/07/2009	0.0	0.0
22/02/2007	-32.8	-32.3	22/02/2007	-30.2	-28.1	22/02/2007	-34.9	-37.3	22/07/2009	0.0	0.0
23/02/2007	-33.7	-34.2	23/02/2007	-30.4	-30.9	23/02/2007	-37.0	-37.6	23/07/2009	0.0	0.0
24/02/2007	-23.5	-23.0	24/02/2007	-19.2	-17.6	24/02/2007	-30.9	-32.9	24/07/2009	0.0	0.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
25/02/2007	-31.8	-30.3	25/02/2007	-25.1	-21.8	25/02/2007	-35.5	-37.4	25/07/2009	3.3	0.0
26/02/2007	-31.1	-31.3	26/02/2007	-24.8	-23.6	26/02/2007	-35.1	-36.8	26/07/2009	0.0	0.0
27/02/2007	-23.5	-22.2	27/02/2007	-20.1	-15.9	27/02/2007	-27.1	-24.5	27/07/2009	0.0	0.0
28/02/2007	-27.8	-24.9	28/02/2007	-27.0	-24.4	28/02/2007	-28.7	-25.4	28/07/2009	0.0	0.0
01/03/2007	-28.6	-28.2	01/03/2007	-27.4	-25.3	01/03/2007	-30.3	-30.6	29/07/2009	0.0	0.0
02/03/2007	-32.1	-31.9	02/03/2007	-29.2	-28.0	02/03/2007	-39.0	-39.0	30/07/2009	0.0	0.0
03/03/2007	-37.8	-38.3	03/03/2007	-33.2	-33.8	03/03/2007	-41.4	-41.0	31/07/2009	0.0	0.0
04/03/2007	-35.8	-36.8	04/03/2007	-33.5	-34.3	04/03/2007	-37.4	-39.2	01/08/2009	4.6	4.1
05/03/2007	-31.4	-31.3	05/03/2007	-27.7	-27.4	05/03/2007	-36.6	-36.3	02/08/2009	0.0	0.0
06/03/2007	-30.6	-31.6	06/03/2007	-28.6	-28.7	06/03/2007	-33.7	-35.9	03/08/2009	0.0	0.0
07/03/2007	-30.4	-30.7	07/03/2007	-28.3	-28.7	07/03/2007	-33.4	-34.9	04/08/2009	0.0	0.0
08/03/2007	-30.2	-29.1	08/03/2007	-28.6	-26.8	08/03/2007	-34.9	-33.8	05/08/2009	0.0	0.0
09/03/2007	-36.5	-36.7	09/03/2007	-34.3	-33.6	09/03/2007	-38.5	-39.7	06/08/2009	6.6	2.3
10/03/2007	-34.5	-36.1	10/03/2007	-29.6	-31.7	10/03/2007	-37.8	-40.3	07/08/2009	0.3	0.3
11/03/2007	-34.5	-34.7	11/03/2007	-28.5	-30.6	11/03/2007	-37.8	-39.0	08/08/2009	0.0	0.0
12/03/2007	-31.9	-37.0	12/03/2007	-26.5	-31.8	12/03/2007	-36.3	-42.7	09/08/2009	0.0	0.0
13/03/2007	-30.9	-33.6	13/03/2007	-25.6	-28.4	13/03/2007	-33.5	-38.6	10/08/2009	0.0	0.0
14/03/2007	-31.9	-31.9	14/03/2007	-27.5	-28.6	14/03/2007	-36.0	-35.5	11/08/2009	0.0	0.0
15/03/2007	-31.0	-30.6	15/03/2007	-28.1	-27.7	15/03/2007	-34.3	-34.2	12/08/2009	2.3	0.3
16/03/2007	-27.4	-26.9	16/03/2007	-24.4	-23.7	16/03/2007	-32.8	-32.4	13/08/2009	0.0	0.0
17/03/2007	-32.9	-34.0	17/03/2007	-27.8	-28.3	17/03/2007	-35.9	-38.3	14/08/2009	0.0	0.0
18/03/2007	-33.9	-36.8	18/03/2007	-28.8	-31.8	18/03/2007	-36.6	-41.5	15/08/2009	4.6	0.0
19/03/2007	-34.0	-34.1	19/03/2007	-28.9	-29.3	19/03/2007	-38.9	-39.4	16/08/2009	6.6	0.0
20/03/2007	-32.0	-33.3	20/03/2007	-27.1	-27.3	20/03/2007	-35.6	-36.5	17/08/2009	3.8	10.4
21/03/2007	-30.2	-30.5	21/03/2007	-23.7	-23.0	21/03/2007	-37.4	-38.0	18/08/2009	0.5	0.3
22/03/2007	-21.5	-20.8	22/03/2007	-18.0	-16.9	22/03/2007	-26.3	-26.8	19/08/2009	0.0	0.0
23/03/2007	-20.3	-20.6	23/03/2007	-13.3	-15.2	23/03/2007	-25.4	-25.2	20/08/2009	0.0	0.0
24/03/2007	-14.2	-13.2	24/03/2007	-11.2	-8.3	24/03/2007	-20.0	-19.7	21/08/2009	6.1	3.8
25/03/2007	-21.1	-19.9	25/03/2007	-16.8	-11.9	25/03/2007	-24.2	-26.5	22/08/2009	0.0	0.0
26/03/2007	-20.9	-20.9	26/03/2007	-17.5	-16.2	26/03/2007	-23.5	-26.3	23/08/2009	0.0	0.0
27/03/2007	-15.8	-14.9	27/03/2007	-9.4	-7.8	27/03/2007	-23.0	-20.1	24/08/2009	0.0	0.0
28/03/2007	-23.2	-22.6	28/03/2007	-18.1	-18.9	28/03/2007	-28.0	-27.2	25/08/2009	0.0	0.0
29/03/2007	-22.4	-21.5	29/03/2007	-16.0	-14.4	29/03/2007	-28.2	-28.0	26/08/2009	0.0	0.0
30/03/2007	-19.3	-21.5	30/03/2007	-13.9	-16.4	30/03/2007	-23.6	-26.9	27/08/2009	1.0	0.3
31/03/2007	-22.6	-23.5	31/03/2007	-18.1	-18.9	31/03/2007	-29.7	-30.3	28/08/2009	0.0	0.0
01/04/2007	-28.6	-30.8	01/04/2007	-22.9	-26.1	01/04/2007	-32.5	-34.8	29/08/2009	0.3	0.3
02/04/2007	-27.2	-27.5	02/04/2007	-21.9	-21.7	02/04/2007	-32.1	-32.8	30/08/2009	0.0	0.0
03/04/2007	-24.1	-24.3	03/04/2007	-18.0	-18.7	03/04/2007	-28.7	-29.0	31/08/2009	3.8	3.3
04/04/2007	-21.7	-22.0	04/04/2007	-12.7	-16.9	04/04/2007	-26.5	-26.3	01/09/2009	0.0	0.0
05/04/2007	-20.3	-21.0	05/04/2007	-13.9	-14.4	05/04/2007	-24.7	-26.7	02/09/2009	0.0	0.0
06/04/2007	-20.2	-19.7	06/04/2007	-16.1	-14.0	06/04/2007	-25.1	-26.0	03/09/2009	0.0	0.0
07/04/2007	-16.9	-16.7	07/04/2007	-12.2	-11.0	07/04/2007	-21.4	-23.1	04/09/2009	0.5	0.0
08/04/2007	-9.4	-10.1	08/04/2007	-3.6	-4.5	08/04/2007	-16.8	-16.4	05/09/2009	0.8	0.0
09/04/2007	-4.1	-5.0	09/04/2007	-0.5	-2.4	09/04/2007	-11.9	-11.9	06/09/2009	0.0	0.0
10/04/2007	-6.9	-7.3	10/04/2007	-0.6	-3.5	10/04/2007	-12.9	-12.3	07/09/2009	0.0	0.0
11/04/2007	-8.0	-7.2	11/04/2007	-1.2	0.0	11/04/2007	-14.0	-15.3	08/09/2009	5.3	4.1
12/04/2007	-9.6	-10.1	12/04/2007	-3.2	-4.3	12/04/2007	-16.4	-18.1	09/09/2009	0.0	0.0
13/04/2007	-10.1	-9.2	13/04/2007	-8.3	-7.8	13/04/2007	-15.2	-11.4	10/09/2009	0.0	0.0
14/04/2007	-15.0	-14.2	14/04/2007	-9.5	-9.0	14/04/2007	-19.0	-20.0	11/09/2009	4.1	1.3
15/04/2007	-16.2	-18.9	15/04/2007	-9.8	-10.6	15/04/2007	-21.5	-24.2	12/09/2009	0.3	0.0
16/04/2007	-17.4	-20.7	16/04/2007	-11.9	-13.3	16/04/2007	-22.5	-27.2	13/09/2009	0.0	0.0
17/04/2007	-18.3	-19.8	17/04/2007	-10.1	-9.0	17/04/2007	-23.6	-26.5	14/09/2009	0.0	0.0
18/04/2007	-17.2	-18.7	18/04/2007	-7.6	-10.3	18/04/2007	-25.5	-27.9	15/09/2009	0.0	0.0
19/04/2007	-14.7	-13.7	19/04/2007	-10.9	-8.4	19/04/2007	-20.0	-20.0	16/09/2009	0.0	0.0
20/04/2007	-11.4	-12.5	20/04/2007	-7.6	-7.1	20/04/2007	-16.5	-19.6	17/09/2009	0.0	0.0
21/04/2007	-9.3	-9.7	21/04/2007	-7.6	-8.4	21/04/2007	-12.0	-13.5	18/09/2009	4.8	7.9
22/04/2007	-13.6	-14.7	22/04/2007	-11.5	-11.9	22/04/2007	-17.0	-18.5	19/09/2009	0.0	0.3
23/04/2007	-12.3	-14.6	23/04/2007	-5.9	-8.5	23/04/2007	-17.9	-20.6	20/09/2009	5.3	13.0
24/04/2007	-12.8	-15.0	24/04/2007	-7.6	-8.6	24/04/2007	-19.0	-24.4	21/09/2009	0.3	0.5
25/04/2007	-7.8	-8.6	25/04/2007	-5.7	-5.3	25/04/2007	-10.8	-11.9	22/09/2009	1.0	0.0
26/04/2007	-10.2	-9.2	26/04/2007	-6.3	-5.3	26/04/2007	-13.8	-12.8	23/09/2009	2.0	3.8
27/04/2007	-14.3	-13.2	27/04/2007	-12.8	-11.5	27/04/2007	-16.0	-14.8	24/09/2009	6.4	3.3
28/04/2007	-18.1	-17.0	28/04/2007	-12.7	-13.8	28/04/2007	-22.0	-21.1	25/09/2009	0.0	0.0
29/04/2007	-13.7	-12.1	29/04/2007	-7.8	-7.5	29/04/2007	-21.3	-16.7	26/09/2009	0.0	0.0
30/04/2007	-7.2	-5.4	30/04/2007	-1.6	1.7	30/04/2007	-14.1	-10.7	27/09/2009	0.0	0.0
01/05/2007	-7.9	-6.5	01/05/2007	-4.7	-2.5	01/05/2007	-14.3	-14.5	28/09/2009	0.0	0.0
02/05/2007	-9.0	-7.2	02/05/2007	-3.5	-0.2	02/05/2007	-13.3	-14.8	29/09/2009	0.0	0.0
03/05/2007	-9.3	-8.0	03/05/2007	-2.3	-0.9	03/05/2007	-17.3	-15.9	30/09/2009	3.8	3.0
04/05/2007	-9.3	-7.1	04/05/2007	-5.8	-2.1	04/05/2007	-13.9	-14.3	01/06/2011	1.8	1.5
05/05/2007	-7.3	-5.7	05/05/2007	-5.3	-2.8	05/05/2007	-8.7	-7.9	02/06/2011	0.0	0.0
06/05/2007	-4.9	-4.2	06/05/2007	-2.6	-2.7	06/05/2007	-6.1	-5.8	03/06/2011	0.0	0.0
07/05/2007	-5.1	-2.8	07/05/2007	-3.1	-1.1	07/05/2007	-6.9	-6.0	04/06/2011	0.0	0.0
08/05/2007	-10.0	-8.3	08/05/2007	-6.9	-5.1	08/05/2007	-15.4	-15.8	05/06/2011	0.0	0.0
09/05/2007	-12.5	-12.4	09/05/2007	-5.6	-6.4	09/05/2007	-18.8	-18.6	06/06/2011	0	0.0
10/05/2007	-9.8	-9.5	10/05/2007	-3.1	-2.4	10/05/2007	-16.2	-16.2	07/06/2011	0	0.0
11/05/2007	-5.0	-4.6	11/05/2007	2.3	1.0	11/05/2007	-11.4	-11.3	08/06/2011	0	0.0
12/05/2007	-5.2	-6.7	12/05/2007	-1.9	-2.2	12/05/2007	-9.9	-12.5	09/06/2011	0	0.0
13/05/2007	-6.3	-7.1	13/05/2007	-4.1	-5.0	13/05/2007	-8.1	-8.0	10/06/2011	0	0.0
14/05/2007	-4.4	-4.6	14/05/2007	-1.5	-1.3	14/05/2007	-7.5	-8.8	11/06/2011	0	0.0
15/05/2007	-11.5	-9.9	15/05/2007	-1.5	-1.4	15/05/2007	-15.1	-13.2	12/06/2011	0	0.0
16/05/2007	-13.2	-12.5	16/05/2007	-8.6	-8.1	16/05/2007	-17.7	-17.7	13/06/2011	0	0.0
17/05/2007	-14.8	-14.1	17/05/2007	-13.4	-12.1	17/05/2007	-16.0	-16.6	14/06/2011	0	0.0
18/05/2007	n/a	-12.7	18/05/2007	n/a	-6.1	18/05/2007	n/a	-19.2	15/06/2011	0	0.0
19/05/2007	n/a	-5.7	19/05/2007	n/a	1.0	19/05/2007	n/a	-12.1	16/06/2011	0	0.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
20/05/2007	n/a	-5.2	20/05/2007	n/a	0.5	20/05/2007	n/a	-13.4	17/06/2011	0	0.0
21/05/2007	n/a	-2.6	21/05/2007	n/a	0.4	21/05/2007	n/a	-6.3	18/06/2011	0	0.0
22/05/2007	n/a	-5.4	22/05/2007	n/a	-3.7	22/05/2007	n/a	-7.4	19/06/2011	0	0.0
23/05/2007	n/a	-4.9	23/05/2007	n/a	-3.5	23/05/2007	n/a	-7.0	20/06/2011	0	0.0
24/05/2007	n/a	-1.4	24/05/2007	n/a	3.3	24/05/2007	n/a	-9.3	21/06/2011	0	0.0
25/05/2007	n/a	1.9	25/05/2007	n/a	6.5	25/05/2007	n/a	-4.1	22/06/2011	0	0.0
26/05/2007	n/a	0.7	26/05/2007	n/a	2.8	26/05/2007	n/a	-1.7	23/06/2011	0.0	0.0
27/05/2007	n/a	-5.8	27/05/2007	n/a	-1.5	27/05/2007	n/a	-9.3	24/06/2011	0.0	0.0
28/05/2007	n/a	-8.0	28/05/2007	n/a	-3.0	28/05/2007	n/a	-13.1	25/06/2011	1.5	1.5
29/05/2007	n/a	-0.5	29/05/2007	n/a	2.9	29/05/2007	n/a	-8.7	26/06/2011	0.3	0.3
30/05/2007	n/a	-1.6	30/05/2007	n/a	0.1	30/05/2007	n/a	-2.9	27/06/2011	1.0	1.0
31/05/2007	n/a	-0.4	31/05/2007	n/a	0.7	31/05/2007	n/a	-1.7	28/06/2011	1.5	2.3
01/06/2007	n/a	1.2	01/06/2007	n/a	4.9	01/06/2007	n/a	-0.5	29/06/2011	2.8	4.8
02/06/2007	n/a	-0.2	02/06/2007	n/a	1.3	02/06/2007	n/a	-1.8	30/06/2011	5.3	2.0
03/06/2007	n/a	-3.3	03/06/2007	n/a	0.1	03/06/2007	n/a	-5.8	01/07/2011	10.4	18.0
04/06/2007	n/a	-2.9	04/06/2007	n/a	2.2	04/06/2007	n/a	-6.8	02/07/2011	2.5	1.8
05/06/2007	n/a	-3.3	05/06/2007	n/a	0.2	05/06/2007	n/a	-7.3	03/07/2011	0.3	0.0
06/06/2007	n/a	-0.5	06/06/2007	n/a	0.8	06/06/2007	n/a	-3.0	04/07/2011	0.0	0.0
07/06/2007	n/a	-1.3	07/06/2007	n/a	0.4	07/06/2007	n/a	-3.3	05/07/2011	0.0	0.0
08/06/2007	n/a	-2.0	08/06/2007	n/a	-0.3	08/06/2007	n/a	-3.5	06/07/2011	0.0	0.0
09/06/2007	n/a	-1.0	09/06/2007	n/a	1.0	09/06/2007	n/a	-3.1	07/07/2011	0.0	0.0
10/06/2007	n/a	0.3	10/06/2007	n/a	2.2	10/06/2007	n/a	-1.5	08/07/2011	0.0	0.0
11/06/2007	n/a	3.3	11/06/2007	n/a	10.4	11/06/2007	n/a	-3.5	09/07/2011	0.0	0.0
12/06/2007	5.5	3.6	12/06/2007	8.4	7.7	12/06/2007	2.0	0.2	10/07/2011	3.0	0.0
13/06/2007	3.4	2.2	13/06/2007	7.0	6.8	13/06/2007	-0.3	-0.7	11/07/2011	0.5	0.3
14/06/2007	1.4	1.1	14/06/2007	4.7	3.9	14/06/2007	-1.1	-1.2	12/07/2011	0.3	1.0
15/06/2007	2.9	2.9	15/06/2007	5.0	5.2	15/06/2007	1.1	0.1	13/07/2011	0.0	0.0
16/06/2007	1.4	1.5	16/06/2007	2.7	3.0	16/06/2007	0.4	0.4	14/07/2011	0.0	0.0
17/06/2007	1.8	2.1	17/06/2007	4.2	4.9	17/06/2007	0.1	0.4	15/07/2011	0.0	0.0
18/06/2007	1.8	2.0	18/06/2007	4.1	4.3	18/06/2007	0.3	0.6	16/07/2011	0.0	0.0
19/06/2007	1.0	1.2	19/06/2007	2.5	3.2	19/06/2007	-0.1	0.0	17/07/2011	0.0	0.0
20/06/2007	2.9	3.1	20/06/2007	7.4	7.1	20/06/2007	-0.3	-0.4	18/07/2011	0.0	0.0
21/06/2007	3.5	4.7	21/06/2007	6.9	8.7	21/06/2007	0.3	0.0	19/07/2011	0.0	0.0
22/06/2007	5.9	5.9	22/06/2007	11.7	10.6	22/06/2007	1.7	1.8	20/07/2011	0.0	0.0
23/06/2007	11.0	11.0	23/06/2007	17.6	16.5	23/06/2007	3.6	4.2	21/07/2011	0.0	0.0
24/06/2007	13.3	13.7	24/06/2007	17.7	19.6	24/06/2007	7.1	4.2	22/07/2011	0.0	0.0
25/06/2007	14.3	15.3	25/06/2007	21.0	23.1	25/06/2007	7.7	6.4	23/07/2011	0.0	0.0
26/06/2007	17.7	16.9	26/06/2007	24.0	23.3	26/06/2007	8.6	8.0	24/07/2011	2.8	0.0
27/06/2007	16.3	15.1	27/06/2007	20.8	20.4	27/06/2007	10.3	7.0	25/07/2011	0.3	0.0
28/06/2007	14.9	14.2	28/06/2007	21.3	20.2	28/06/2007	8.0	6.2	26/07/2011	0.0	0.0
29/06/2007	16.6	16.3	29/06/2007	23.3	22.8	29/06/2007	8.6	7.1	27/07/2011	0.0	0.0
30/06/2007	16.8	16.8	30/06/2007	23.7	24.5	30/06/2007	9.8	8.8	28/07/2011	0.0	0.0
01/07/2007	16.6	16.3	01/07/2007	22.1	22.1	01/07/2007	10.7	8.6	29/07/2011	0.5	0.0
02/07/2007	13.6	13.2	02/07/2007	18.5	19.6	02/07/2007	8.7	8.1	30/07/2011	0.0	0.0
03/07/2007	8.0	7.9	03/07/2007	10.0	10.8	03/07/2007	5.6	4.9	31/07/2011	0.0	0.0
04/07/2007	7.2	7.0	04/07/2007	10.2	10.0	04/07/2007	3.8	3.7	01/08/2011	1.5	3.8
05/07/2007	10.4	9.9	05/07/2007	15.5	15.5	05/07/2007	4.0	3.7	02/08/2011	0.0	1.3
06/07/2007	13.0	12.5	06/07/2007	18.4	18.0	06/07/2007	6.7	4.6	03/08/2011	0.0	0.0
07/07/2007	12.4	12.1	07/07/2007	15.5	15.6	07/07/2007	7.7	6.6	04/08/2011	0.0	0.0
08/07/2007	12.6	12.9	08/07/2007	17.2	17.0	08/07/2007	8.3	8.6	05/08/2011	0.0	0.0
09/07/2007	12.7	12.5	09/07/2007	17.9	17.0	09/07/2007	7.7	8.1	06/08/2011	0.0	0.0
10/07/2007	15.5	14.7	10/07/2007	20.9	20.5	10/07/2007	8.9	7.0	07/08/2011	0.0	0.0
11/07/2007	17.7	17.0	11/07/2007	22.7	23.1	11/07/2007	11.3	7.7	08/08/2011	0.0	0.0
12/07/2007	18.4	17.9	12/07/2007	22.8	23.1	12/07/2007	12.1	9.9	09/08/2011	0.0	0.0
13/07/2007	15.4	15.4	13/07/2007	19.7	19.6	13/07/2007	10.2	10.5	10/08/2011	1.5	0.5
14/07/2007	15.9	15.7	14/07/2007	20.2	20.0	14/07/2007	10.6	9.5	11/08/2011	0.3	2.0
15/07/2007	17.3	16.6	15/07/2007	22.6	22.0	15/07/2007	11.1	9.4	12/08/2011	0.0	0.3
16/07/2007	17.2	16.5	16/07/2007	19.6	19.9	16/07/2007	14.4	10.6	13/08/2011	0.0	0.0
17/07/2007	14.5	14.4	17/07/2007	18.8	19.2	17/07/2007	9.5	8.7	14/08/2011	0.0	0.0
18/07/2007	18.2	18.4	18/07/2007	24.2	25.1	18/07/2007	10.7	10.5	15/08/2011	0.0	0.0
19/07/2007	19.5	19.6	19/07/2007	27.6	28.2	19/07/2007	12.7	10.9	16/08/2011	13.5	7.6
20/07/2007	20.4	20.3	20/07/2007	28.2	28.9	20/07/2007	16.0	16.4	17/08/2011	33.3	24.4
21/07/2007	17.1	18.4	21/07/2007	23.1	24.8	21/07/2007	10.9	11.6	18/08/2011	7.1	8.4
22/07/2007	12.7	13.9	22/07/2007	18.1	20.2	22/07/2007	8.9	9.6	19/08/2011	1.8	0.8
23/07/2007	10.5	11.8	23/07/2007	12.7	15.2	23/07/2007	8.6	8.8	20/08/2011	0.3	1.8
24/07/2007	9.4	10.6	24/07/2007	10.7	11.7	24/07/2007	8.1	9.1	21/08/2011	0.0	0.0
25/07/2007	9.1	10.0	25/07/2007	12.3	13.6	25/07/2007	7.0	7.6	22/08/2011	9.7	1.8
26/07/2007	10.6	11.0	26/07/2007	15.2	15.3	26/07/2007	6.8	7.2	23/08/2011	0.0	0.0
27/07/2007	12.1	13.1	27/07/2007	17.3	17.6	27/07/2007	7.6	7.1	24/08/2011	0.0	0.0
28/07/2007	10.8	11.1	28/07/2007	17.1	17.9	28/07/2007	6.8	6.8	25/08/2011	0.0	0.0
29/07/2007	11.5	13.6	29/07/2007	16.3	18.2	29/07/2007	7.1	8.2	26/08/2011	0.5	0.0
30/07/2007	16.6	16.8	30/07/2007	24.0	24.8	30/07/2007	8.6	8.5	27/08/2011	0.0	0.0
31/07/2007	13.6	14.9	31/07/2007	21.3	20.5	31/07/2007	6.7	9.5	28/08/2011	0.5	1.0
01/08/2007	9.3	n/a	01/08/2007	14.9	n/a	01/08/2007	5.3	n/a	29/08/2011	0.3	0.0
02/08/2007	10.6	13.7	02/08/2007	15.7	16.3	02/08/2007	6.1	9.3	30/08/2011	0.0	0.0
03/08/2007	10.8	11.4	03/08/2007	16.3	16.7	03/08/2007	5.2	3.9	31/08/2011	0.0	0.0
04/08/2007	9.9	10.7	04/08/2007	13.5	13.9	04/08/2007	7.5	7.9	01/09/2011	0.0	0.0
05/08/2007	7.9	8.5	05/08/2007	9.7	10.3	05/08/2007	6.1	6.8	02/09/2011	0.0	0.0
06/08/2007	10.5	11.7	06/08/2007	17.0	19.2	06/08/2007	6.2	6.5	03/09/2011	16.5	12.7
07/08/2007	6.1	7.3	07/08/2007	9.8	10.1	07/08/2007	1.9	4.1	04/09/2011	0.3	0.0
08/08/2007	4.6	5.3	08/08/2007	8.5	9.2	08/08/2007	1.3	0.8	05/09/2011	6.4	13.5
09/08/2007	4.5	5.6	09/08/2007	7.0	7.5	09/08/2007	3.1	3.9	06/09/2011	0.0	0.0
10/08/2007	4.1	4.9	10/08/2007	6.5	7.2	10/08/2007	2.3	2.3	07/09/2011	1.0	2.5
11/08/2007	5.6	5.7	11/08/2007	8.9	8.5	11/08/2007	2.6	2.5	08/09/2011	0.0	0.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
12/08/2007	5.8	6.2	12/08/2007	6.8	8.9	12/08/2007	4.7	4.7	09/09/2011	4.8	7.6
13/08/2007	6.7	7.1	13/08/2007	9.3	9.3	13/08/2007	5.1	5.5	10/09/2011	7.1	9.4
14/08/2007	6.9	7.3	14/08/2007	8.6	9.0	14/08/2007	5.5	4.7	11/09/2011	2.3	5.3
15/08/2007	6.1	6.9	15/08/2007	7.1	8.0	15/08/2007	5.3	5.5	12/09/2011	0.0	0.0
16/08/2007	5.4	5.3	16/08/2007	7.3	6.5	16/08/2007	3.8	4.1	13/09/2011	0.0	0.0
17/08/2007	10.1	9.7	17/08/2007	16.6	16.2	17/08/2007	4.5	4.7	14/09/2011	0.0	0.0
18/08/2007	12.5	13.2	18/08/2007	16.7	18.1	18/08/2007	8.2	7.6	15/09/2011	0.0	0.0
19/08/2007	13.1	15.1	19/08/2007	22.3	23.8	19/08/2007	7.7	7.8	16/09/2011	0.5	0.0
20/08/2007	7.0	8.9	20/08/2007	8.2	11.2	20/08/2007	6.0	7.1	17/09/2011	4.3	2.5
21/08/2007	5.2	6.4	21/08/2007	6.8	7.7	21/08/2007	3.6	4.8	18/09/2011	0.0	0.0
22/08/2007	4.4	5.1	22/08/2007	6.7	6.8	22/08/2007	2.8	3.8	19/09/2011	0.0	0.0
23/08/2007	4.5	4.7	23/08/2007	5.7	5.8	23/08/2007	3.0	3.8	20/09/2011	0.0	0.0
24/08/2007	4.7	4.3	24/08/2007	6.6	5.2	24/08/2007	2.3	2.2	21/09/2011	0.0	0.0
25/08/2007	2.8	3.3	25/08/2007	4.0	5.8	25/08/2007	1.6	1.5	22/09/2011	0.0	0.0
26/08/2007	3.8	4.7	26/08/2007	6.1	6.9	26/08/2007	2.6	3.3	23/09/2011	0.3	2.5
27/08/2007	3.4	3.9	27/08/2007	4.8	5.6	27/08/2007	0.5	1.0	24/09/2011	0.0	0.0
28/08/2007	2.8	3.2	28/08/2007	5.8	6.5	28/08/2007	-1.7	-0.2	25/09/2011	0.0	0.0
29/08/2007	4.3	4.9	29/08/2007	5.7	6.2	29/08/2007	3.3	3.0	26/09/2011	2.8	8.9
30/08/2007	5.1	5.4	30/08/2007	7.4	8.3	30/08/2007	2.7	2.9	27/09/2011	0.0	0.0
31/08/2007	6.2	6.2	31/08/2007	10.6	11.5	31/08/2007	1.3	-0.1	28/09/2011	0.0	0.0
01/09/2007	8.1	8.6	01/09/2007	15.2	13.8	01/09/2007	4.9	4.0	29/09/2011	0.0	0.0
02/09/2007	2.8	4.6	02/09/2007	4.9	6.1	02/09/2007	0.6	2.2	30/09/2011	0.3	0.3
03/09/2007	2.1	2.6	03/09/2007	6.3	6.7	03/09/2007	-1.1	-0.7	27/03/2012	2.8	0.0
04/09/2007	2.3	2.6	04/09/2007	4.5	4.8	04/09/2007	-1.9	-1.7	28/03/2012	0.0	2.3
05/09/2007	1.9	2.9	05/09/2007	4.4	5.2	05/09/2007	0.5	1.7	29/03/2012	0.0	0.0
06/09/2007	3.9	3.6	06/09/2007	9.3	9.6	06/09/2007	-0.1	0.3	30/03/2012	0.0	0.3
07/09/2007	5.4	5.9	07/09/2007	10.7	11.4	07/09/2007	1.5	-0.9	31/03/2012	0.0	0.0
08/09/2007	0.1	0.6	08/09/2007	2.6	3.1	08/09/2007	-1.4	-1.0	01/04/2012	0.0	0.3
09/09/2007	-0.6	-0.1	09/09/2007	0.1	0.9	09/09/2007	-2.1	-1.5	02/04/2012	0.0	1.5
10/09/2007	-0.4	-0.7	10/09/2007	3.5	2.3	10/09/2007	-3.4	-4.9	03/04/2012	0.0	0.0
11/09/2007	0.7	-0.1	11/09/2007	7.0	7.4	11/09/2007	-5.6	-7.4	04/04/2012	1.5	0.3
12/09/2007	3.6	3.4	12/09/2007	6.8	6.6	12/09/2007	0.3	-1.0	05/04/2012	0.0	0.0
13/09/2007	-1.2	-0.2	13/09/2007	3.4	4.0	13/09/2007	-4.0	-3.5	06/04/2012	0.0	0.0
14/09/2007	-3.8	-3.3	14/09/2007	-3.1	-2.3	14/09/2007	-4.7	-4.5	07/04/2012	3.6	0.0
15/09/2007	-2.6	-2.0	15/09/2007	-0.6	-0.3	15/09/2007	-5.0	-3.8	08/04/2012	0.0	0.0
16/09/2007	-2.7	-2.2	16/09/2007	-1.1	-0.3	16/09/2007	-4.1	-3.6	09/04/2012	0.0	0.0
17/09/2007	-2.8	-2.5	17/09/2007	-1.2	-0.5	17/09/2007	-4.6	-3.8	10/04/2012	0.0	1.0
18/09/2007	-1.4	-0.6	18/09/2007	0.0	2.1	18/09/2007	-3.6	-3.3	11/04/2012	0.0	0.0
19/09/2007	-1.6	-2.4	19/09/2007	3.0	2.6	19/09/2007	-4.9	-6.3	12/04/2012	0.0	0.0
20/09/2007	-4.7	-4.5	20/09/2007	-3.2	-2.4	20/09/2007	-7.1	-7.8	13/04/2012	0.0	0.0
21/09/2007	-2.3	-1.6	21/09/2007	-0.7	-0.3	21/09/2007	-3.8	-3.0	14/04/2012	0.0	0.0
22/09/2007	-0.4	-0.2	22/09/2007	1.2	1.4	22/09/2007	-1.5	-1.4	15/04/2012	0.0	0.0
23/09/2007	-1.1	-0.2	23/09/2007	-0.1	1.3	23/09/2007	-2.3	-1.3	16/04/2012	0.0	0.0
24/09/2007	-0.8	-0.2	24/09/2007	-0.3	0.4	24/09/2007	-1.3	-1.0	17/04/2012	0.0	0.0
25/09/2007	-1.8	-1.6	25/09/2007	-1.0	-0.8	25/09/2007	-2.7	-2.5	18/04/2012	0.8	0.0
26/09/2007	-4.1	-2.6	26/09/2007	-2.5	-1.3	26/09/2007	-5.4	-4.1	19/04/2012	0.0	0.0
27/09/2007	-6.0	-4.8	27/09/2007	-4.8	-3.1	27/09/2007	-9.3	-7.1	20/04/2012	0.0	0.0
28/09/2007	-5.7	-5.1	28/09/2007	-1.8	-1.8	28/09/2007	-8.3	-8.0	21/04/2012	0.0	0.0
29/09/2007	-5.4	-4.5	29/09/2007	-4.6	-3.7	29/09/2007	-6.2	-5.2	22/04/2012	0.0	0.0
30/09/2007	-5.2	-4.7	30/09/2007	-4.0	-3.7	30/09/2007	-5.8	-5.7	23/04/2012	0.0	0.0
01/10/2007	-7.6	-6.9	01/10/2007	-5.3	-4.4	01/10/2007	-10.5	-10.3	24/04/2012	0.0	0.0
02/10/2007	-6.9	-5.4	02/10/2007	-3.7	-3.1	02/10/2007	-9.7	-8.6	25/04/2012	0.0	0.0
03/10/2007	-6.2	-4.8	03/10/2007	-3.8	-3.0	03/10/2007	-8.3	-6.2	26/04/2012	0.0	0.0
04/10/2007	-7.0	-5.6	04/10/2007	-5.2	-3.1	04/10/2007	-10.9	-8.7	27/04/2012	0.0	0.0
05/10/2007	-7.1	-6.2	05/10/2007	-1.5	-1.4	05/10/2007	-12.8	-13.3	28/04/2012	0.0	2.0
06/10/2007	-1.1	-0.3	06/10/2007	0.8	1.7	06/10/2007	-2.5	-3.1	29/04/2012	0.0	0.0
07/10/2007	-0.7	1.0	07/10/2007	2.1	2.0	07/10/2007	-3.1	-0.2	30/04/2012	0.0	0.0
08/10/2007	-0.2	0.7	08/10/2007	1.3	1.7	08/10/2007	-3.0	0.1	01/05/2012	0.0	0.0
09/10/2007	-3.7	-2.6	09/10/2007	0.1	1.0	09/10/2007	-8.7	-7.3	02/05/2012	0.0	0.0
10/10/2007	-3.2	-2.2	10/10/2007	0.9	2.3	10/10/2007	-9.1	-7.7	03/05/2012	0.0	0.0
11/10/2007	1.9	2.8	11/10/2007	3.8	4.0	11/10/2007	-0.6	2.0	04/05/2012	0.0	0.0
12/10/2007	-2.5	-0.7	12/10/2007	2.4	2.9	12/10/2007	-5.4	-5.5	05/05/2012	0.8	0.0
13/10/2007	-5.6	-3.6	13/10/2007	-3.5	-2.1	13/10/2007	-11.2	-4.9	06/05/2012	1.0	1.3
14/10/2007	-5.5	-3.6	14/10/2007	-3.8	-0.9	14/10/2007	-9.1	-6.9	07/05/2012	0.0	0.0
15/10/2007	-10.4	-12.0	15/10/2007	-6.9	-6.9	15/10/2007	-14.4	-14.8	08/05/2012	0.0	0.0
16/10/2007	-5.3	-4.4	16/10/2007	-2.3	-1.4	16/10/2007	-10.3	-8.5	09/05/2012	0.0	0.5
17/10/2007	-1.8	-1.2	17/10/2007	-1.4	-0.8	17/10/2007	-2.4	-1.9	10/05/2012	1.5	7.1
18/10/2007	-3.0	-2.0	18/10/2007	-2.4	-1.6	18/10/2007	-3.4	-2.3	11/05/2012	0.0	0.0
19/10/2007	-3.4	-2.0	19/10/2007	-3.1	-1.3	19/10/2007	-3.8	-2.5	12/05/2012	0.0	0.0
20/10/2007	-2.1	-0.6	20/10/2007	-1.1	0.0	20/10/2007	-3.2	-1.5	13/05/2012	0.0	0.0
21/10/2007	-0.8	-0.5	21/10/2007	0.0	0.1	21/10/2007	-2.8	-1.5	14/05/2012	0.0	0.0
22/10/2007	-3.8	-3.0	22/10/2007	-1.4	-1.3	22/10/2007	-8.1	-7.3	15/05/2012	0.0	0.0
23/10/2007	-5.9	-5.4	23/10/2007	-5.0	-4.6	23/10/2007	-7.7	-7.5	16/05/2012	0.0	0.0
24/10/2007	-8.1	-7.5	24/10/2007	-5.4	-4.9	24/10/2007	-13.3	-11.9	17/05/2012	0.0	0.0
25/10/2007	-12.0	-12.0	25/10/2007	-9.2	-8.5	25/10/2007	-13.5	-14.5	18/05/2012	0.0	0.0
26/10/2007	-15.5	-15.4	26/10/2007	-12.0	-10.9	26/10/2007	-23.6	-24.0	19/05/2012	0.0	0.0
27/10/2007	-10.9	-10.5	27/10/2007	-7.7	-7.6	27/10/2007	-20.9	-18.7	20/05/2012	0.0	0.0
28/10/2007	-15.7	-15.0	28/10/2007	-12.0	-11.3	28/10/2007	-19.4	-18.6	21/05/2012	0.0	0.0
29/10/2007	-20.5	-19.7	29/10/2007	-16.9	-16.9	29/10/2007	-24.4	-23.8	22/05/2012	0.0	0.0
30/10/2007	-20.1	-19.3	30/10/2007	-16.0	-15.9	30/10/2007	-25.4	-24.1	23/05/2012	0.0	0.0
31/10/2007	-20.5	-22.4	31/10/2007	-18.3	-18.6	31/10/2007	-23.0	-27.4	24/05/2012	0.0	0.0
01/11/2007	-18.5	-18.2	01/11/2007	-17.7	-17.1	01/11/2007	-20.3	-19.3	25/05/2012	0.0	0.0
02/11/2007	-19.0	-18.2	02/11/2007	-16.8	-17.2	02/11/2007	-20.6	-19.2	26/05/2012	0.0	0.0
03/11/2007	-17.4	-17.4	03/11/2007	-10.2	-12.7	03/11/2007	-22.4	-22.1	27/05/2012	0.0	0.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
04/11/2007	-20.5	-19.6	04/11/2007	-11.1	-11.0	04/11/2007	-25.0	-25.4	28/05/2012	0.0	0.0
05/11/2007	-22.0	-21.5	05/11/2007	-19.7	-18.0	05/11/2007	-24.5	-24.9	29/05/2012	0.0	0.0
06/11/2007	-23.6	-22.9	06/11/2007	-19.7	-17.8	06/11/2007	-27.7	-29.1	30/05/2012	0.0	0.0
07/11/2007	-24.1	-24.6	07/11/2007	-21.8	-19.7	07/11/2007	-26.9	-27.5	31/05/2012	0.0	1.3
08/11/2007	-22.6	-23.4	08/11/2007	-21.2	-21.0	08/11/2007	-25.3	-25.6	01/06/2012	0.0	0.8
09/11/2007	-18.4	-18.6	09/11/2007	-15.2	-15.2	09/11/2007	-24.3	-24.3	02/06/2012	0.0	1.0
10/11/2007	-19.7	-20.9	10/11/2007	-16.7	-17.2	10/11/2007	-24.6	-25.4	03/06/2012	0.0	0.0
11/11/2007	-23.4	-24.5	11/11/2007	-19.9	-19.8	11/11/2007	-27.4	-27.5	04/06/2012	0.5	0.8
12/11/2007	-19.8	-19.2	12/11/2007	-15.2	-13.7	12/11/2007	-24.3	-24.0	05/06/2012	1.0	1.5
13/11/2007	-15.8	-13.3	13/11/2007	-13.6	-10.9	13/11/2007	-19.7	-16.8	06/06/2012	0.0	0.8
14/11/2007	-23.4	-21.7	14/11/2007	-19.7	-16.8	14/11/2007	-25.7	-25.7	07/06/2012	0.0	0.0
15/11/2007	-23.3	-24.2	15/11/2007	-17.4	-17.0	15/11/2007	-27.7	-29.5	08/06/2012	0.0	0.0
16/11/2007	-25.4	-25.1	16/11/2007	-22.3	-18.5	16/11/2007	-28.9	-28.6	09/06/2012	0.0	0.0
17/11/2007	-24.6	-24.2	17/11/2007	-22.8	-22.5	17/11/2007	-29.3	-31.0	10/06/2012	0.0	0.0
18/11/2007	-28.4	-30.3	18/11/2007	-24.0	-26.4	18/11/2007	-31.5	-33.0	11/06/2012	0.0	0.0
19/11/2007	-27.6	-27.9	19/11/2007	-23.9	-26.3	19/11/2007	-30.1	-30.0	12/06/2012	0.0	0.0
20/11/2007	-26.3	-25.6	20/11/2007	-22.5	-20.2	20/11/2007	-28.5	-28.2	13/06/2012	0.0	0.0
21/11/2007	-16.6	-15.7	21/11/2007	-13.9	-12.5	21/11/2007	-22.5	-20.2	14/06/2012	0.3	0.0
22/11/2007	-15.6	-14.6	22/11/2007	-14.2	-11.8	22/11/2007	-16.5	-16.1	15/06/2012	0.8	0.0
23/11/2007	-24.6	-23.5	23/11/2007	-15.1	-14.4	23/11/2007	-27.6	-28.0	16/06/2012	0.0	0.5
24/11/2007	-29.0	-29.3	24/11/2007	-26.9	-26.6	24/11/2007	-31.2	-31.9	17/06/2012	0.0	0.0
25/11/2007	-27.7	-26.9	25/11/2007	-26.1	-24.0	25/11/2007	-29.6	-29.3	18/06/2012	0.0	0.0
26/11/2007	-27.3	-27.1	26/11/2007	-24.6	-25.1	26/11/2007	-30.3	-29.5	19/06/2012	2.3	2.3
27/11/2007	-22.4	-21.9	27/11/2007	-19.5	-19.1	27/11/2007	-24.6	-25.4	20/06/2012	1.8	3.3
28/11/2007	-24.0	-24.7	28/11/2007	-21.2	-22.5	28/11/2007	-26.1	-26.6	21/06/2012	0.0	0.0
29/11/2007	-23.0	-23.4	29/11/2007	-18.9	-18.6	29/11/2007	-25.9	-27.3	22/06/2012	0.3	0.0
30/11/2007	-24.2	-24.7	30/11/2007	-21.3	-21.2	30/11/2007	-26.4	-28.2	23/06/2012	0.3	0.0
01/12/2007	-28.8	-30.2	01/12/2007	-25.5	-27.7	01/12/2007	-30.8	-32.6	24/06/2012	2.5	1.3
02/12/2007	-32.5	-33.2	02/12/2007	-29.3	-29.4	02/12/2007	-33.9	-34.8	25/06/2012	0.0	0.0
03/12/2007	-28.5	-28.0	03/12/2007	-26.1	-23.5	03/12/2007	-32.4	-32.3	26/06/2012	0.0	0.0
04/12/2007	-25.3	-24.6	04/12/2007	-20.6	-19.3	04/12/2007	-30.2	-30.8	27/06/2012	0.0	0.0
05/12/2007	-21.3	-20.3	05/12/2007	-19.0	-18.1	05/12/2007	-24.4	-22.8	28/06/2012	0.0	0.0
06/12/2007	-19.7	-19.0	06/12/2007	-18.8	-17.9	06/12/2007	-22.1	-20.7	29/06/2012	3.6	3.8
07/12/2007	-22.6	-22.8	07/12/2007	-20.0	-20.7	07/12/2007	-24.5	-24.7	30/06/2012	0.0	0.0
08/12/2007	-26.1	-26.2	08/12/2007	-21.9	-22.7	08/12/2007	-29.3	-29.5	01/07/2012	0.0	0.0
09/12/2007	-30.6	-29.6	09/12/2007	-27.9	-26.3	09/12/2007	-32.4	-31.0	02/07/2012	0.0	0.0
10/12/2007	-29.1	-29.9	10/12/2007	-25.5	-27.1	10/12/2007	-31.5	-31.5	03/07/2012	0.0	0.0
11/12/2007	-30.9	-30.8	11/12/2007	-29.2	-28.6	11/12/2007	-32.3	-32.9	04/07/2012	0.0	0.0
12/12/2007	-30.4	-29.7	12/12/2007	-26.3	-27.7	12/12/2007	-32.2	-31.7	05/07/2012	0.0	0.0
13/12/2007	-28.2	-27.5	13/12/2007	-25.4	-24.2	13/12/2007	-32.3	-30.6	06/07/2012	0.0	0.0
14/12/2007	-22.0	-22.1	14/12/2007	-18.6	-18.3	14/12/2007	-26.3	-25.4	07/07/2012	0.0	1.8
15/12/2007	-25.1	-25.7	15/12/2007	-21.2	-19.8	15/12/2007	-28.6	-30.9	08/07/2012	0.5	0.0
16/12/2007	-29.1	-31.1	16/12/2007	-25.3	-28.3	16/12/2007	-31.9	-33.4	09/07/2012	6.6	3.8
17/12/2007	-27.0	-27.9	17/12/2007	-25.2	-26.2	17/12/2007	-28.8	-29.8	10/07/2012	0.0	3.8
18/12/2007	-21.0	-20.2	18/12/2007	-17.1	-16.1	18/12/2007	-25.8	-26.8	11/07/2012	8.6	2.0
19/12/2007	-19.7	-16.7	19/12/2007	-14.3	-12.5	19/12/2007	-23.1	-21.8	12/07/2012	0.3	0.3
20/12/2007	-23.1	-22.5	20/12/2007	-21.3	-20.7	20/12/2007	-25.9	-24.2	13/07/2012	0.0	0.0
21/12/2007	-25.1	-25.7	21/12/2007	-24.2	-24.2	21/12/2007	-27.0	-27.8	14/07/2012	0.0	0.0
22/12/2007	-28.0	-28.8	22/12/2007	-21.1	-21.8	22/12/2007	-32.7	-33.7	15/07/2012	0.0	0.0
23/12/2007	-22.5	-21.8	23/12/2007	-18.6	-16.0	23/12/2007	-28.2	-28.5	16/07/2012	0.0	0.0
24/12/2007	-31.0	-31.5	24/12/2007	-28.2	-28.5	24/12/2007	-33.9	-34.3	17/07/2012	1.8	3.6
25/12/2007	-33.8	-32.9	25/12/2007	-28.3	-26.5	25/12/2007	-36.5	-36.3	18/07/2012	0.5	0.0
26/12/2007	-27.7	-28.2	26/12/2007	-22.1	-24.1	26/12/2007	-32.6	-33.8	19/07/2012	0.0	0.0
27/12/2007	-34.6	-35.5	27/12/2007	-30.7	-31.9	27/12/2007	-37.6	-38.8	20/07/2012	0.0	0.0
28/12/2007	-36.3	-38.7	28/12/2007	-34.4	-35.9	28/12/2007	-38.0	-40.0	21/07/2012	0.0	0.0
29/12/2007	-29.4	-28.4	29/12/2007	-25.3	-24.5	29/12/2007	-36.9	-35.9	22/07/2012	0.0	0.0
30/12/2007	-25.6	-24.7	30/12/2007	-21.4	-21.0	30/12/2007	-28.7	-27.6	23/07/2012	0.0	0.0
31/12/2007	-26.7	-25.9	31/12/2007	-21.4	-20.9	31/12/2007	-32.5	-32.6	24/07/2012	0.0	0.0
01/01/2008	-29.6	-29.8	01/01/2008	-26.6	-27.1	01/01/2008	-34.0	-34.5	25/07/2012	0.0	3.6
02/01/2008	-26.1	-26.6	02/01/2008	-22.3	-22.6	02/01/2008	-33.6	-34.4	26/07/2012	4.8	1.5
03/01/2008	-27.5	-26.6	03/01/2008	-23.4	-22.4	03/01/2008	-32.8	-34.1	27/07/2012	0.5	0.3
04/01/2008	-32.1	-34.2	04/01/2008	-29.7	-32.6	04/01/2008	-33.8	-35.6	28/07/2012	0.5	0.0
05/01/2008	-26.7	-27.6	05/01/2008	-24.1	-25.0	05/01/2008	-31.4	-32.6	29/07/2012	0.0	0.0
06/01/2008	-23.4	-23.8	06/01/2008	-22.6	-22.7	06/01/2008	-24.6	-25.3	30/07/2012	0.0	0.0
07/01/2008	-24.2	-24.6	07/01/2008	-21.8	-22.0	07/01/2008	-27.1	-27.9	31/07/2012	0.0	0.0
08/01/2008	-25.3	-25.0	08/01/2008	-24.2	-24.3	08/01/2008	-27.0	-26.7	01/08/2012	0.0	0.0
09/01/2008	-27.1	-28.9	09/01/2008	-25.0	-24.7	09/01/2008	-30.2	-32.9	02/08/2012	0.0	0.0
10/01/2008	-29.6	-33.1	10/01/2008	-28.1	-30.9	10/01/2008	-31.3	-35.2	03/08/2012	0.0	0.0
11/01/2008	-32.5	-34.8	11/01/2008	-29.9	-32.5	11/01/2008	-35.6	-36.6	04/08/2012	0.0	0.0
12/01/2008	-28.7	-28.8	12/01/2008	-21.8	-20.7	12/01/2008	-36.5	-36.3	05/08/2012	0.0	0.0
13/01/2008	-19.6	-18.8	13/01/2008	-16.6	-15.6	13/01/2008	-21.8	-20.9	06/08/2012	0.0	0.0
14/01/2008	-21.9	-21.7	14/01/2008	-16.6	-15.5	14/01/2008	-24.7	-26.1	07/08/2012	0.0	0.0
15/01/2008	-30.0	-28.8	15/01/2008	-22.2	-21.9	15/01/2008	-33.3	-33.2	08/08/2012	0.0	0.0
16/01/2008	-30.5	-30.4	16/01/2008	-29.1	-28.5	16/01/2008	-32.8	-33.2	09/08/2012	4.3	2.3
17/01/2008	-31.3	-31.0	17/01/2008	-30.2	-30.3	17/01/2008	-31.9	-31.7	10/08/2012	12.2	12.4
18/01/2008	-33.0	-33.0	18/01/2008	-30.6	-30.5	18/01/2008	-34.8	-35.2	11/08/2012	0.3	0.5
19/01/2008	-31.6	-32.6	19/01/2008	-27.9	-30.4	19/01/2008	-34.8	-34.7	12/08/2012	4.3	2.3
20/01/2008	-31.4	-32.3	20/01/2008	-27.2	-30.3	20/01/2008	-33.2	-34.5	13/08/2012	0.0	0.0
21/01/2008	-31.9	-33.4	21/01/2008	-28.0	-29.6	21/01/2008	-34.8	-36.0	14/08/2012	1.3	0.3
22/01/2008	-24.0	-25.4	22/01/2008	-19.8	-19.7	22/01/2008	-29.6	-30.7	15/08/2012	0.0	0.3
23/01/2008	-15.0	-15.6	23/01/2008	-8.3	-8.5	23/01/2008	-27.5	-23.6	16/08/2012	0.0	0.0
24/01/2008	-20.4	-20.3	24/01/2008	-14.8	-12.1	24/01/2008	-26.3	-26.7	17/08/2012	2.3	2.3
25/01/2008	-28.7	-29.2	25/01/2008	-24.7	-25.0	25/01/2008	-31.0	-33.8	18/08/2012	0.3	0.5
26/01/2008	-28.4	-28.1	26/01/2008	-26.3	-26.4	26/01/2008	-29.5	-29.9	19/08/2012	7.4	0.5

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)			Total Daily Precipitation (mm)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
27/01/2008	-32.2	-31.1	27/01/2008	-29.3	-27.8	27/01/2008	-33.9	-33.8	20/08/2012	0.254	0.0
28/01/2008	-33.3	-33.0	28/01/2008	-32.8	-31.9	28/01/2008	-34.2	-33.7	21/08/2012	0	0.0
29/01/2008	-36.4	-35.7	29/01/2008	-34.1	-33.3	29/01/2008	-38.4	-37.8	22/08/2012	0	0.0
30/01/2008	-38.9	-38.6	30/01/2008	-37.2	-36.9	30/01/2008	-40.9	-41.0	23/08/2012	0	0.0
31/01/2008	-41.0	-40.4	31/01/2008	-39.6	-39.0	31/01/2008	-42.8	-41.8	24/08/2012	0	0.0
01/02/2008	-40.1	-39.4	01/02/2008	-37.6	-37.8	01/02/2008	-42.4	-41.2	25/08/2012	0	0.0
02/02/2008	-37.8	-37.7	02/02/2008	-35.7	-36.2	02/02/2008	-40.3	-38.9	26/08/2012	0	0.0
03/02/2008	-35.4	-36.0	03/02/2008	-33.4	-34.0	03/02/2008	-36.8	-38.2	27/08/2012	8.89	9.7
04/02/2008	-34.4	-35.1	04/02/2008	-32.5	-32.9	04/02/2008	-36.8	-37.6	28/08/2012	0	0.0
05/02/2008	-32.9	-33.8	05/02/2008	-31.4	-32.3	05/02/2008	-35.1	-38.8	29/08/2012	0.762	0.3
06/02/2008	-38.2	-40.2	06/02/2008	-35.1	-37.5	06/02/2008	-40.8	-42.9	30/08/2012	0.254	1.0
07/02/2008	-36.5	-38.7	07/02/2008	-34.0	-35.5	07/02/2008	-40.1	-41.7	31/08/2012	0	0.0
08/02/2008	-39.3	-40.5	08/02/2008	-36.1	-37.6	08/02/2008	-43.4	-43.9	01/09/2012	0	0.0
09/02/2008	-35.6	-37.2	09/02/2008	-27.8	-29.1	09/02/2008	-43.0	-43.7	02/09/2012	0	0.0
10/02/2008	-29.2	-29.6	10/02/2008	-26.2	-26.0	10/02/2008	-31.9	-31.9	03/09/2012	0	0.0
11/02/2008	-35.3	-34.4	11/02/2008	-27.2	-27.3	11/02/2008	-41.3	-41.3	04/09/2012	0	0.0
12/02/2008	-39.8	-39.9	12/02/2008	-37.6	-37.5	12/02/2008	-41.2	-41.2	05/09/2012	0	0.0
13/02/2008	-37.6	-39.8	13/02/2008	-34.6	-37.2	13/02/2008	-40.2	-41.7	06/09/2012	0	0.0
14/02/2008	-40.2	-41.1	14/02/2008	-36.1	-37.7	14/02/2008	-42.5	-43.7	07/09/2012	11.684	7.9
15/02/2008	-38.3	-39.2	15/02/2008	-35.3	-35.1	15/02/2008	-41.2	-42.4	08/09/2012	0	1.5
16/02/2008	-35.0	-37.6	16/02/2008	-32.2	-33.8	16/02/2008	-37.8	-41.8	09/09/2012	0.508	0.3
17/02/2008	-34.4	-36.6	17/02/2008	-31.2	-32.7	17/02/2008	-37.2	-41.0	10/09/2012	0	0.0
18/02/2008	-37.8	-38.5	18/02/2008	-34.1	-33.5	18/02/2008	-40.4	-42.3	11/09/2012	0	0.0
19/02/2008	-27.3	-26.8	19/02/2008	-18.6	-18.5	19/02/2008	-39.1	-35.8	12/09/2012	n/a	0.0
20/02/2008	-19.6	-19.0	20/02/2008	-16.1	-15.6	20/02/2008	-22.1	-21.6	13/09/2012	n/a	1.8
21/02/2008	-20.1	-20.7	21/02/2008	-15.8	-17.1	21/02/2008	-22.4	-22.6	14/09/2012	n/a	0.0
22/02/2008	-18.4	-21.5	22/02/2008	-16.4	-17.1	22/02/2008	-19.7	-26.8	15/09/2012	n/a	0.0
23/02/2008	-23.9	-25.0	23/02/2008	-16.1	-16.8	23/02/2008	-29.7	-33.4			
24/02/2008	-24.9	-26.1	24/02/2008	-20.9	-20.7	24/02/2008	-30.2	-31.8			
25/02/2008	-22.9	-22.4	25/02/2008	-20.2	-20.1	25/02/2008	-26.2	-25.4			
26/02/2008	-27.5	-27.4	26/02/2008	-25.7	-25.3	26/02/2008	-28.7	-29.0			
27/02/2008	-29.0	-29.2	27/02/2008	-24.8	-25.4	27/02/2008	-32.8	-35.0			
28/02/2008	-31.7	-33.7	28/02/2008	-27.2	-31.1	28/02/2008	-34.6	-36.6			
29/02/2008	-30.2	-28.7	29/02/2008	-27.0	-25.2	29/02/2008	-34.6	-35.6			
01/03/2008	-35.9	-34.8	01/03/2008	-30.8	-28.8	01/03/2008	-39.6	-40.4			
02/03/2008	-35.8	-35.9	02/03/2008	-32.7	-32.4	02/03/2008	-38.7	-39.7			
03/03/2008	-33.5	-34.0	03/03/2008	-30.6	-30.2	03/03/2008	-36.9	-37.4			
04/03/2008	-34.8	-35.0	04/03/2008	-33.3	-33.2	04/03/2008	-37.3	-36.5			
05/03/2008	-32.5	-32.0	05/03/2008	-29.4	-28.9	05/03/2008	-35.3	-34.5			
06/03/2008	-28.7	-27.5	06/03/2008	-17.8	-18.0	06/03/2008	-35.8	-35.8			
07/03/2008	-19.3	-19.0	07/03/2008	-15.3	-14.7	07/03/2008	-27.3	-26.6			
08/03/2008	-19.5	-18.6	08/03/2008	-12.3	-10.7	08/03/2008	-28.8	-28.5			
09/03/2008	-25.6	-24.2	09/03/2008	-12.5	-11.0	09/03/2008	-31.1	-32.2			
10/03/2008	-29.0	-29.4	10/03/2008	-25.1	-24.0	10/03/2008	-33.1	-34.7			
11/03/2008	-25.3	-25.2	11/03/2008	-18.4	-18.1	11/03/2008	-29.9	-31.7			
12/03/2008	-30.6	-31.6	12/03/2008	-26.9	-26.8	12/03/2008	-33.5	-35.2			
13/03/2008	-30.7	-30.5	13/03/2008	-26.0	-27.2	13/03/2008	-34.5	-34.4			
14/03/2008	-35.2	-35.0	14/03/2008	-31.2	-31.4	14/03/2008	-38.4	-38.1			
15/03/2008	-34.1	-34.7	15/03/2008	-30.4	-31.3	15/03/2008	-38.0	-38.4			
16/03/2008	-31.7	-31.6	16/03/2008	-28.4	-26.8	16/03/2008	-36.6	-35.9			
17/03/2008	-37.9	-38.2	17/03/2008	-35.5	-32.2	17/03/2008	-40.9	-40.9			
18/03/2008	-35.6	-35.7	18/03/2008	-30.5	-30.6	18/03/2008	-40.3	-40.9			
19/03/2008	-32.6	-32.5	19/03/2008	-27.7	-25.9	19/03/2008	-36.4	-36.1			
20/03/2008	-31.6	-32.5	20/03/2008	-25.6	-27.7	20/03/2008	-36.1	-36.9			
21/03/2008	-35.2	-36.3	21/03/2008	-31.1	-29.3	21/03/2008	-39.0	-40.6			
22/03/2008	-36.5	-36.4	22/03/2008	-31.7	-30.5	22/03/2008	-40.8	-42.8			
23/03/2008	-31.3	-32.3	23/03/2008	-25.2	-26.8	23/03/2008	-35.7	-36.8			
24/03/2008	-27.3	-31.7	24/03/2008	-17.6	-24.8	24/03/2008	-31.8	-38.6			
25/03/2008	-25.0	-24.4	25/03/2008	-16.3	-16.4	25/03/2008	-31.6	-33.4			
26/03/2008	-28.4	-28.1	26/03/2008	-24.0	-23.2	26/03/2008	-33.1	-31.8			
27/03/2008	-27.0	-26.8	27/03/2008	-24.4	-23.1	27/03/2008	-31.0	-31.5			
28/03/2008	-28.0	-27.9	28/03/2008	-24.5	-23.8	28/03/2008	-31.9	-32.5			
29/03/2008	-25.2	-25.6	29/03/2008	-22.1	-21.4	29/03/2008	-29.2	-30.7			
30/03/2008	-27.3	-27.9	30/03/2008	-23.7	-22.5	30/03/2008	-31.5	-33.9			
31/03/2008	-31.1	-31.9	31/03/2008	-27.2	-26.9	31/03/2008	-35.8	-36.7			
01/04/2008	-31.6	-33.1	01/04/2008	-23.3	-24.9	01/04/2008	-35.9	-39.1			
02/04/2008	-34.0	-35.0	02/04/2008	-29.6	-30.5	02/04/2008	-38.3	-38.9			
03/04/2008	-30.1	-32.1	03/04/2008	-25.8	-27.0	03/04/2008	-35.3	-38.4			
04/04/2008	-27.4	-28.8	04/04/2008	-23.5	-25.1	04/04/2008	-31.0	-32.2			
05/04/2008	-22.0	-23.2	05/04/2008	-18.4	-18.4	05/04/2008	-27.6	-29.7			
06/04/2008	-19.0	-17.5	06/04/2008	-15.1	-13.3	06/04/2008	-23.9	-22.0			
07/04/2008	-20.0	-20.0	07/04/2008	-12.8	-14.7	07/04/2008	-25.0	-25.4			
08/04/2008	-18.2	-17.4	08/04/2008	-13.7	-9.0	08/04/2008	-23.7	-24.5			
09/04/2008	-11.4	-9.3	09/04/2008	-6.1	-2.8	09/04/2008	-18.8	-15.9			
10/04/2008	-7.6	-6.5	10/04/2008	-1.2	0.6	10/04/2008	-12.6	-10.5			
11/04/2008	-10.5	-9.4	11/04/2008	-6.2	-1.9	11/04/2008	-14.9	-17.0			
12/04/2008	-10.7	-10.0	12/04/2008	-3.7	-1.7	12/04/2008	-14.4	-15.5			
13/04/2008	-8.7	-7.8	13/04/2008	-0.2	1.1	13/04/2008	-14.4	-14.3			
14/04/2008	-6.6	-5.2	14/04/2008	0.5	1.4	14/04/2008	-14.8	-13.1			
15/04/2008	-16.4	-16.1	15/04/2008	-14.8	-13.1	15/04/2008	-18.2	-17.3			
16/04/2008	-15.6	-15.6	16/04/2008	-12.0	-11.4	16/04/2008	-19.4	-19.7			
17/04/2008	-16.6	-15.2	17/04/2008	-10.2	-7.9	17/04/2008	-20.9	-20.0			
18/04/2008	-19.1	-18.8	18/04/2008	-16.2	-15.6	18/04/2008	-22.2	-22.3			
19/04/2008	-19.4	-19.7	19/04/2008	-15.3	-15.3	19/04/2008	-23.7	-24.6			

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
20/04/2008	-19.8	-20.0	20/04/2008	-14.4	-13.7	20/04/2008	-24.5	-25.7
21/04/2008	-18.6	-19.0	21/04/2008	-11.7	-12.2	21/04/2008	-25.8	-27.5
22/04/2008	-14.9	-16.2	22/04/2008	-10.6	-10.5	22/04/2008	-19.3	-22.3
23/04/2008	-16.3	-15.3	23/04/2008	-14.1	-12.4	23/04/2008	-19.8	-18.4
24/04/2008	-19.0	-18.3	24/04/2008	-16.6	-15.0	24/04/2008	-23.9	-24.8
25/04/2008	-20.4	-20.7	25/04/2008	-14.3	-14.2	25/04/2008	-26.1	-27.1
26/04/2008	-17.5	-17.3	26/04/2008	-11.8	-10.6	26/04/2008	-23.7	-22.8
27/04/2008	-16.6	-16.9	27/04/2008	-7.4	-9.8	27/04/2008	-23.4	-23.6
28/04/2008	-17.2	-18.2	28/04/2008	-12.5	-12.3	28/04/2008	-23.0	-25.7
29/04/2008	-13.5	-13.4	29/04/2008	-8.7	-9.3	29/04/2008	-19.0	-18.8
30/04/2008	-9.5	-9.5	30/04/2008	-6.3	-6.7	30/04/2008	-12.5	-13.1
01/05/2008	-10.0	-10.1	01/05/2008	-4.6	-4.6	01/05/2008	-15.2	-16.7
02/05/2008	-8.1	-8.3	02/05/2008	-3.8	-3.7	02/05/2008	-12.5	-12.8
03/05/2008	-8.3	-8.9	03/05/2008	-4.1	1.1	03/05/2008	-13.2	-15.4
04/05/2008	-8.3	-10.5	04/05/2008	-1.5	-3.7	04/05/2008	-13.5	-18.0
05/05/2008	-11.7	-12.1	05/05/2008	-8.9	-10.0	05/05/2008	-15.5	-17.6
06/05/2008	-16.0	-16.5	06/05/2008	-13.3	-12.4	06/05/2008	-19.3	-20.4
07/05/2008	-15.1	-16.0	07/05/2008	-9.7	-11.4	07/05/2008	-20.0	-22.2
08/05/2008	-12.1	-13.4	08/05/2008	-4.5	-6.5	08/05/2008	-19.6	-22.0
09/05/2008	-6.5	-9.1	09/05/2008	1.7	0.9	09/05/2008	-13.5	-17.6
10/05/2008	-8.8	-10.7	10/05/2008	-5.9	-3.9	10/05/2008	-13.1	-17.5
11/05/2008	-9.2	-8.2	11/05/2008	-4.9	-3.7	11/05/2008	-14.9	-15.7
12/05/2008	-4.3	-4.6	12/05/2008	0.9	-1.1	12/05/2008	-8.1	-9.1
13/05/2008	-5.6	-5.4	13/05/2008	-2.3	-2.8	13/05/2008	-9.7	-9.9
14/05/2008	-4.3	-4.6	14/05/2008	-1.3	-2.0	14/05/2008	-6.5	-8.5
15/05/2008	-4.6	-4.9	15/05/2008	-1.1	-1.3	15/05/2008	-9.9	-11.2
16/05/2008	-1.6	-1.8	16/05/2008	0.0	-0.4	16/05/2008	-2.4	-2.7
17/05/2008	-3.6	-2.9	17/05/2008	-1.5	-1.7	17/05/2008	-6.2	-4.8
18/05/2008	-5.8	-5.5	18/05/2008	-3.8	-4.2	18/05/2008	-7.6	-6.8
19/05/2008	-4.6	-4.0	19/05/2008	-2.2	-1.8	19/05/2008	-6.8	-5.9
20/05/2008	-1.6	-1.1	20/05/2008	4.5	4.3	20/05/2008	-6.7	-6.8
21/05/2008	-1.1	-0.3	21/05/2008	4.5	6.9	21/05/2008	-5.3	-7.0
22/05/2008	-1.1	-2.8	22/05/2008	0.1	0.9	22/05/2008	-3.1	-8.3
23/05/2008	-0.7	-0.5	23/05/2008	0.9	1.0	23/05/2008	-1.8	-1.9
24/05/2008	-0.7	-0.7	24/05/2008	1.1	1.1	24/05/2008	-2.0	-2.6
25/05/2008	1.0	0.8	25/05/2008	5.3	4.6	25/05/2008	-5.5	-4.7
26/05/2008	3.8	3.5	26/05/2008	7.0	6.5	26/05/2008	1.4	0.9
27/05/2008	1.0	1.3	27/05/2008	2.1	2.3	27/05/2008	-0.8	-0.7
28/05/2008	-0.1	0.5	28/05/2008	3.0	4.8	28/05/2008	-2.3	-1.7
29/05/2008	0.3	0.4	29/05/2008	2.2	2.0	29/05/2008	-1.6	-3.0
30/05/2008	-2.3	-1.3	30/05/2008	0.0	0.4	30/05/2008	-5.8	-5.1
31/05/2008	-4.6	-4.5	31/05/2008	-3.6	-3.4	31/05/2008	-5.8	-5.4
01/06/2008	-1.5	-1.0	01/06/2008	2.3	3.2	01/06/2008	-4.3	-4.6
02/06/2008	1.8	1.8	02/06/2008	5.7	4.9	02/06/2008	-2.2	-0.3
03/06/2008	-2.5	-1.2	03/06/2008	0.4	1.2	03/06/2008	-5.0	-3.9
04/06/2008	-4.0	-3.4	04/06/2008	-3.0	-2.3	04/06/2008	-5.2	-4.6
05/06/2008	-1.8	-1.3	05/06/2008	1.9	1.8	05/06/2008	-5.4	-4.4
06/06/2008	-0.2	0.4	06/06/2008	1.4	1.7	06/06/2008	-2.5	-1.6
07/06/2008	-0.4	0.4	07/06/2008	4.3	4.8	07/06/2008	-3.7	-2.6
08/06/2008	3.5	3.3	08/06/2008	7.1	7.2	08/06/2008	-2.4	-2.0
09/06/2008	6.8	6.3	09/06/2008	13.7	12.8	09/06/2008	0.0	-1.2
10/06/2008	4.7	5.2	10/06/2008	7.3	8.4	10/06/2008	1.7	1.2
11/06/2008	3.2	3.9	11/06/2008	7.1	7.3	11/06/2008	-1.4	-0.2
12/06/2008	6.2	6.1	12/06/2008	11.3	10.9	12/06/2008	-0.1	0.7
13/06/2008	6.6	6.3	13/06/2008	11.0	10.3	13/06/2008	2.6	1.5
14/06/2008	1.2	1.8	14/06/2008	3.1	4.5	14/06/2008	-0.2	0.1
15/06/2008	0.5	1.5	15/06/2008	2.3	4.1	15/06/2008	-1.3	-1.6
16/06/2008	0.3	1.5	16/06/2008	1.2	5.0	16/06/2008	-0.4	0.2
17/06/2008	1.2	3.6	17/06/2008	5.2	6.9	17/06/2008	-1.2	0.2
18/06/2008	5.6	7.6	18/06/2008	8.9	12.5	18/06/2008	2.3	2.5
19/06/2008	9.1	9.4	19/06/2008	16.8	16.3	19/06/2008	1.5	2.3
20/06/2008	5.5	6.0	20/06/2008	11.3	12.3	20/06/2008	1.8	2.0
21/06/2008	4.3	4.3	21/06/2008	7.3	7.7	21/06/2008	1.0	1.2
22/06/2008	8.0	8.6	22/06/2008	12.3	13.8	22/06/2008	1.8	2.1
23/06/2008	11.4	11.3	23/06/2008	17.3	18.2	23/06/2008	4.5	2.4
24/06/2008	12.1	12.4	24/06/2008	17.6	18.2	24/06/2008	5.8	5.7
25/06/2008	4.2	4.8	25/06/2008	7.8	7.5	25/06/2008	1.7	2.0
26/06/2008	5.4	5.7	26/06/2008	9.5	9.9	26/06/2008	1.8	1.6
27/06/2008	8.7	8.9	27/06/2008	14.4	15.0	27/06/2008	2.4	3.4
28/06/2008	15.8	16.1	28/06/2008	24.3	24.8	28/06/2008	6.1	5.0
29/06/2008	13.5	13.5	29/06/2008	18.2	20.3	29/06/2008	9.1	9.3
30/06/2008	11.4	12.4	30/06/2008	15.5	16.8	30/06/2008	6.9	7.2
01/07/2008	7.6	8.0	01/07/2008	10.0	10.8	01/07/2008	5.6	5.5
02/07/2008	8.0	8.1	02/07/2008	14.1	14.0	02/07/2008	3.3	2.5
03/07/2008	9.9	9.7	03/07/2008	14.0	14.6	03/07/2008	4.6	3.7
04/07/2008	8.0	8.2	04/07/2008	12.2	11.9	04/07/2008	4.1	4.3
05/07/2008	9.4	8.5	05/07/2008	14.5	14.1	05/07/2008	3.9	3.4
06/07/2008	12.0	10.6	06/07/2008	16.7	15.8	06/07/2008	6.2	5.3
07/07/2008	14.9	14.3	07/07/2008	19.9	20.5	07/07/2008	7.9	5.9
08/07/2008	15.2	15.2	08/07/2008	19.9	20.5	08/07/2008	9.0	6.3
09/07/2008	16.6	16.4	09/07/2008	22.4	23.2	09/07/2008	8.9	8.0
10/07/2008	16.2	15.6	10/07/2008	22.6	22.3	10/07/2008	10.8	6.5
11/07/2008	14.3	15.2	11/07/2008	19.3	21.2	11/07/2008	10.8	9.6
12/07/2008	12.0	12.6	12/07/2008	16.6	16.5	12/07/2008	6.5	6.7

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
13/07/2008	8.3	9.5	13/07/2008	9.8	10.6	13/07/2008	7.3	8.0
14/07/2008	9.5	9.9	14/07/2008	13.6	13.9	14/07/2008	6.2	7.2
15/07/2008	8.7	9.2	15/07/2008	12.1	11.8	15/07/2008	5.7	5.6
16/07/2008	11.3	11.4	16/07/2008	16.2	16.9	16/07/2008	5.4	3.7
17/07/2008	17.6	17.8	17/07/2008	24.2	25.0	17/07/2008	9.6	9.5
18/07/2008	19.4	20.9	18/07/2008	25.9	27.0	18/07/2008	13.7	13.9
19/07/2008	20.6	20.6	19/07/2008	25.9	27.2	19/07/2008	13.5	13.2
20/07/2008	19.4	20.0	20/07/2008	26.7	27.1	20/07/2008	13.8	12.3
21/07/2008	16.6	17.1	21/07/2008	20.9	20.8	21/07/2008	12.6	13.0
22/07/2008	13.6	14.4	22/07/2008	17.5	19.3	22/07/2008	11.2	10.9
23/07/2008	14.8	15.6	23/07/2008	20.2	20.9	23/07/2008	9.9	9.1
24/07/2008	13.9	15.7	24/07/2008	19.3	23.6	24/07/2008	9.6	10.3
25/07/2008	9.4	10.7	25/07/2008	14.7	14.6	25/07/2008	5.9	6.7
26/07/2008	8.1	9.1	26/07/2008	10.9	11.7	26/07/2008	5.1	6.0
27/07/2008	9.7	10.3	27/07/2008	13.5	14.6	27/07/2008	6.8	6.7
28/07/2008	8.2	8.8	28/07/2008	10.8	11.5	28/07/2008	5.4	3.8
29/07/2008	10.5	10.7	29/07/2008	14.2	13.0	29/07/2008	8.0	8.1
30/07/2008	13.5	13.7	30/07/2008	20.6	20.8	30/07/2008	5.9	3.5
31/07/2008	16.5	17.2	31/07/2008	23.0	22.9	31/07/2008	11.2	12.2
01/08/2008	17.8	17.7	01/08/2008	23.4	23.4	01/08/2008	12.5	12.2
02/08/2008	14.7	14.8	02/08/2008	19.0	20.8	02/08/2008	10.8	9.6
03/08/2008	13.1	12.4	03/08/2008	17.7	17.7	03/08/2008	10.4	6.9
04/08/2008	12.2	13.2	04/08/2008	15.8	16.7	04/08/2008	9.9	10.6
05/08/2008	12.1	12.2	05/08/2008	14.9	14.8	05/08/2008	10.2	8.1
06/08/2008	10.2	11.1	06/08/2008	14.0	14.9	06/08/2008	6.5	7.9
07/08/2008	11.4	11.4	07/08/2008	16.6	15.9	07/08/2008	7.5	7.1
08/08/2008	13.9	15.1	08/08/2008	19.8	21.5	08/08/2008	8.3	8.0
09/08/2008	12.5	14.5	09/08/2008	14.9	18.2	09/08/2008	10.9	12.1
10/08/2008	16.5	17.5	10/08/2008	23.2	24.1	10/08/2008	10.5	10.9
11/08/2008	13.3	17.3	11/08/2008	17.2	27.1	11/08/2008	8.1	9.6
12/08/2008	8.5	10.0	12/08/2008	11.5	12.4	12/08/2008	6.5	7.7
13/08/2008	9.9	10.4	13/08/2008	13.0	13.9	13/08/2008	6.1	4.4
14/08/2008	9.5	10.8	14/08/2008	11.7	14.5	14/08/2008	8.3	8.9
15/08/2008	9.5	9.9	15/08/2008	12.7	12.9	15/08/2008	6.9	7.8
16/08/2008	11.2	11.9	16/08/2008	14.8	15.6	16/08/2008	8.4	8.0
17/08/2008	9.5	9.8	17/08/2008	13.4	13.5	17/08/2008	6.6	6.8
18/08/2008	9.7	10.9	18/08/2008	14.8	16.7	18/08/2008	6.1	4.1
19/08/2008	4.3	6.0	19/08/2008	8.7	10.5	19/08/2008	1.9	2.9
20/08/2008	4.2	4.6	20/08/2008	7.0	7.4	20/08/2008	1.4	1.7
21/08/2008	6.2	6.8	21/08/2008	10.7	11.5	21/08/2008	2.1	1.1
22/08/2008	8.8	9.1	22/08/2008	12.6	13.5	22/08/2008	5.4	5.3
23/08/2008	6.8	7.6	23/08/2008	8.6	9.2	23/08/2008	4.2	5.5
24/08/2008	4.8	4.6	24/08/2008	8.5	8.8	24/08/2008	1.7	0.4
25/08/2008	3.4	3.7	25/08/2008	5.0	5.0	25/08/2008	1.2	1.7
26/08/2008	5.6	6.9	26/08/2008	9.5	12.8	26/08/2008	1.4	2.7
27/08/2008	6.7	6.2	27/08/2008	8.7	9.5	27/08/2008	4.7	1.9
28/08/2008	2.8	3.2	28/08/2008	5.7	5.7	28/08/2008	1.3	1.7
29/08/2008	2.6	3.1	29/08/2008	4.4	4.7	29/08/2008	1.2	1.0
30/08/2008	2.9	3.9	30/08/2008	5.9	7.5	30/08/2008	0.6	1.6
31/08/2008	3.3	4.0	31/08/2008	6.0	7.9	31/08/2008	0.2	-0.5
01/09/2008	4.8	5.7	01/09/2008	5.5	6.6	01/09/2008	4.4	5.0
02/09/2008	4.6	6.4	02/09/2008	5.3	7.7	02/09/2008	3.1	4.9
03/09/2008	3.4	4.5	03/09/2008	5.6	5.3	03/09/2008	2.3	3.4
04/09/2008	5.4	5.6	04/09/2008	8.0	9.4	04/09/2008	2.9	3.5
05/09/2008	2.3	3.2	05/09/2008	4.7	5.0	05/09/2008	-0.9	-0.4
06/09/2008	1.4	1.9	06/09/2008	3.3	4.0	06/09/2008	-0.3	-0.2
07/09/2008	1.3	2.2	07/09/2008	4.0	5.1	07/09/2008	-1.2	-1.4
08/09/2008	1.5	1.8	08/09/2008	4.2	4.3	08/09/2008	-0.1	-0.2
09/09/2008	1.8	2.3	09/09/2008	3.4	3.9	09/09/2008	0.7	0.6
10/09/2008	1.4	2.4	10/09/2008	4.3	4.8	10/09/2008	-0.8	-0.7
11/09/2008	-1.4	-0.9	11/09/2008	-0.6	0.0	11/09/2008	-2.4	-1.7
12/09/2008	-1.6	-1.0	12/09/2008	-0.4	-0.1	12/09/2008	-3.0	-2.2
13/09/2008	1.0	1.5	13/09/2008	4.4	4.3	13/09/2008	-1.2	-1.4
14/09/2008	-2.0	-1.6	14/09/2008	-0.1	0.7	14/09/2008	-3.2	-3.1
15/09/2008	-2.4	-1.8	15/09/2008	-1.2	-0.1	15/09/2008	-3.3	-3.2
16/09/2008	-2.3	-1.7	16/09/2008	0.0	0.2	16/09/2008	-3.7	-3.2
17/09/2008	-2.0	-1.4	17/09/2008	-0.8	0.1	17/09/2008	-3.3	-3.1
18/09/2008	-2.3	-1.5	18/09/2008	-0.3	0.0	18/09/2008	-4.3	-2.6
19/09/2008	-1.5	-1.1	19/09/2008	1.1	1.0	19/09/2008	-4.4	-4.6
20/09/2008	-1.3	-1.5	20/09/2008	4.2	4.7	20/09/2008	-5.9	-5.7
21/09/2008	1.1	0.8	21/09/2008	7.9	8.2	21/09/2008	-4.8	-5.7
22/09/2008	2.9	3.3	22/09/2008	4.3	5.6	22/09/2008	1.8	1.7
23/09/2008	1.2	2.0	23/09/2008	2.5	2.5	23/09/2008	-0.4	1.1
24/09/2008	0.0	0.4	24/09/2008	0.4	1.1	24/09/2008	-0.6	-0.4
25/09/2008	-1.3	-0.9	25/09/2008	-0.6	-0.3	25/09/2008	-2.6	-2.0
26/09/2008	-4.9	-4.3	26/09/2008	-2.6	-1.8	26/09/2008	-8.0	-7.7
27/09/2008	-2.6	-2.7	27/09/2008	-0.6	-0.8	27/09/2008	-6.3	-7.2
28/09/2008	-0.5	0.0	28/09/2008	1.2	2.3	28/09/2008	-2.7	-2.9
29/09/2008	0.1	0.7	29/09/2008	0.7	1.5	29/09/2008	-0.6	0.0
30/09/2008	-2.2	-1.7	30/09/2008	-0.2	0.0	30/09/2008	-5.9	-6.3
01/10/2008	-5.2	-5.2	01/10/2008	-0.4	0.1	01/10/2008	-8.7	-11.3
02/10/2008	0.5	0.9	02/10/2008	1.9	2.4	02/10/2008	-0.4	0.1
03/10/2008	1.5	2.0	03/10/2008	2.9	3.3	03/10/2008	0.4	0.4
04/10/2008	2.7	3.5	04/10/2008	4.7	5.1	04/10/2008	1.1	2.3

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
05/10/2008	2.8	2.9	05/10/2008	4.4	4.5	05/10/2008	0.9	1.8
06/10/2008	7.0	8.0	06/10/2008	9.2	10.9	06/10/2008	4.1	4.5
07/10/2008	-0.2	0.6	07/10/2008	4.2	5.8	07/10/2008	-1.8	-2.6
08/10/2008	-1.3	-1.2	08/10/2008	1.5	1.4	08/10/2008	-2.7	-3.1
09/10/2008	-2.1	-2.4	09/10/2008	-0.5	-0.9	09/10/2008	-4.6	-5.1
10/10/2008	-3.8	-3.8	10/10/2008	-1.5	-1.2	10/10/2008	-5.9	-7.0
11/10/2008	0.4	0.7	11/10/2008	3.1	4.4	11/10/2008	-2.4	-2.4
12/10/2008	0.7	1.2	12/10/2008	3.1	3.6	12/10/2008	-4.2	-4.3
13/10/2008	-3.0	-3.0	13/10/2008	2.6	1.8	13/10/2008	-6.2	-7.1
14/10/2008	-4.7	-4.7	14/10/2008	-1.6	-1.7	14/10/2008	-9.6	-8.7
15/10/2008	-2.6	-1.1	15/10/2008	-1.3	0.0	15/10/2008	-4.8	-2.4
16/10/2008	-2.5	-1.2	16/10/2008	0.8	1.5	16/10/2008	-6.9	-5.8
17/10/2008	-9.0	-8.8	17/10/2008	-6.5	-5.5	17/10/2008	-10.9	-11.7
18/10/2008	-8.5	-8.4	18/10/2008	-6.6	-5.7	18/10/2008	-12.3	-13.0
19/10/2008	-10.0	-9.7	19/10/2008	-6.3	-5.5	19/10/2008	-13.6	-13.9
20/10/2008	-4.0	-3.2	20/10/2008	-1.6	-0.8	20/10/2008	-7.6	-6.7
21/10/2008	-7.3	-6.0	21/10/2008	-3.0	-1.5	21/10/2008	-9.7	-8.6
22/10/2008	-8.8	-8.2	22/10/2008	-5.4	-5.0	22/10/2008	-10.4	-9.9
23/10/2008	-2.5	-1.7	23/10/2008	0.1	0.5	23/10/2008	-5.6	-5.3
24/10/2008	-5.3	-5.0	24/10/2008	-2.7	-2.2	24/10/2008	-6.5	-7.6
25/10/2008	-6.3	-6.1	25/10/2008	-4.0	-3.8	25/10/2008	-8.9	-8.1
26/10/2008	-9.6	-8.7	26/10/2008	-7.9	-7.3	26/10/2008	-13.7	-11.3
27/10/2008	-15.9	-14.7	27/10/2008	-12.4	-11.3	27/10/2008	-17.5	-18.0
28/10/2008	-17.0	-14.2	28/10/2008	-12.9	-9.3	28/10/2008	-23.4	-22.4
29/10/2008	-22.0	-22.1	29/10/2008	-17.7	-18.2	29/10/2008	-25.1	-26.4
30/10/2008	-21.0	-19.8	30/10/2008	-17.1	-17.0	30/10/2008	-24.4	-21.8
31/10/2008	-12.2	-12.2	31/10/2008	-8.5	-8.3	31/10/2008	-19.0	-18.6
01/11/2008	-14.0	-13.5	01/11/2008	-10.3	-10.4	01/11/2008	-18.5	-17.8
02/11/2008	-15.3	-14.1	02/11/2008	-10.6	-9.9	02/11/2008	-18.1	-17.9
03/11/2008	-22.1	-21.4	03/11/2008	-18.1	-17.8	03/11/2008	-25.4	-26.9
04/11/2008	-21.0	-25.7	04/11/2008	-15.5	-19.9	04/11/2008	-25.5	-29.1
05/11/2008	-14.5	-14.0	05/11/2008	-11.8	-11.3	05/11/2008	-20.3	-19.9
06/11/2008	-24.2	-21.9	06/11/2008	-20.2	-17.1	06/11/2008	-26.3	-25.9
07/11/2008	-20.0	-21.2	07/11/2008	-13.7	-15.9	07/11/2008	-26.8	-27.3
08/11/2008	-7.9	-7.9	08/11/2008	-2.6	-2.4	08/11/2008	-16.0	-16.0
09/11/2008	-14.3	-12.4	09/11/2008	-5.3	-3.2	09/11/2008	-17.1	-18.2
10/11/2008	-12.9	-12.4	10/11/2008	-11.7	-9.6	10/11/2008	-16.3	-17.4
11/11/2008	-13.7	-13.3	11/11/2008	-11.9	-11.3	11/11/2008	-16.1	-14.8
12/11/2008	-15.6	-14.6	12/11/2008	-14.3	-13.8	12/11/2008	-16.4	-15.9
13/11/2008	-18.3	-19.2	13/11/2008	-15.8	-15.8	13/11/2008	-21.9	-22.3
14/11/2008	-19.1	-20.7	14/11/2008	-14.9	-14.9	14/11/2008	-22.6	-24.8
15/11/2008	-16.6	-15.8	15/11/2008	-11.6	-12.4	15/11/2008	-21.0	-20.9
16/11/2008	-18.0	-15.4	16/11/2008	-12.9	-9.7	16/11/2008	-21.8	-21.2
17/11/2008	-14.5	-14.1	17/11/2008	-11.6	-10.5	17/11/2008	-17.5	-18.9
18/11/2008	-16.9	-17.6	18/11/2008	-15.4	-14.8	18/11/2008	-19.0	-21.0
19/11/2008	-17.5	-16.7	19/11/2008	-15.4	-14.7	19/11/2008	-21.8	-20.8
20/11/2008	-20.6	-21.3	20/11/2008	-16.7	-15.6	20/11/2008	-23.1	-26.8
21/11/2008	-23.4	-24.0	21/11/2008	-20.6	-21.1	21/11/2008	-26.8	-27.5
22/11/2008	-21.6	-20.8	22/11/2008	-17.4	-15.8	22/11/2008	-26.6	-27.3
23/11/2008	-19.9	-18.9	23/11/2008	-16.6	-15.1	23/11/2008	-28.6	-28.7
24/11/2008	-24.4	-23.9	24/11/2008	-20.4	-19.8	24/11/2008	-30.7	-29.7
25/11/2008	-27.4	-26.9	25/11/2008	-21.1	-19.9	25/11/2008	-32.1	-32.7
26/11/2008	-25.7	-24.5	26/11/2008	-19.5	-17.5	26/11/2008	-32.0	-32.7
27/11/2008	-20.7	-19.7	27/11/2008	-18.1	-16.1	27/11/2008	-25.4	-25.9
28/11/2008	-25.7	-26.7	28/11/2008	-23.5	-23.1	28/11/2008	-27.8	-31.4
29/11/2008	-23.7	-21.9	29/11/2008	-21.3	-19.5	29/11/2008	-26.0	-24.6
30/11/2008	-22.0	-20.7	30/11/2008	-20.0	-19.4	30/11/2008	-24.0	-23.0
01/12/2008	-24.6	-26.7	01/12/2008	-22.7	-20.6	01/12/2008	-28.6	-29.8
02/12/2008	-20.4	-21.3	02/12/2008	-18.2	-18.3	02/12/2008	-23.6	-25.4
03/12/2008	-17.8	-18.1	03/12/2008	-16.9	-16.7	03/12/2008	-18.8	-19.3
04/12/2008	-23.9	-23.1	04/12/2008	-17.8	-16.6	04/12/2008	-28.2	-27.5
05/12/2008	-24.0	-23.9	05/12/2008	-22.1	-22.3	05/12/2008	-28.8	-27.8
06/12/2008	-29.2	-28.4	06/12/2008	-27.4	-26.7	06/12/2008	-31.8	-30.5
07/12/2008	-28.0	-28.0	07/12/2008	-24.7	-24.3	07/12/2008	-31.5	-30.6
08/12/2008	-31.1	-30.9	08/12/2008	-29.9	-29.3	08/12/2008	-34.4	-33.8
09/12/2008	-35.2	-34.0	09/12/2008	-33.6	-32.9	09/12/2008	-36.9	-35.7
10/12/2008	-29.6	-29.6	10/12/2008	-22.0	-22.6	10/12/2008	-36.7	-35.8
11/12/2008	-23.7	-23.0	11/12/2008	-20.4	-20.2	11/12/2008	-26.9	-25.7
12/12/2008	-31.2	-30.7	12/12/2008	-26.5	-25.6	12/12/2008	-33.1	-33.0
13/12/2008	-26.3	-26.2	13/12/2008	-22.0	-21.9	13/12/2008	-33.1	-32.7
14/12/2008	-26.4	-26.2	14/12/2008	-23.6	-23.6	14/12/2008	-30.1	-29.7
15/12/2008	-20.5	-22.3	15/12/2008	-18.2	-19.0	15/12/2008	-27.3	-29.3
16/12/2008	-23.1	-28.1	16/12/2008	-20.3	-24.5	16/12/2008	-24.6	-30.2
17/12/2008	-21.7	-23.4	17/12/2008	-19.9	-20.0	17/12/2008	-23.0	-28.1
18/12/2008	-29.2	-29.2	18/12/2008	-22.4	-23.2	18/12/2008	-32.5	-32.6
19/12/2008	-25.6	-26.0	19/12/2008	-23.0	-22.9	19/12/2008	-29.4	-31.2
20/12/2008	-23.0	-22.8	20/12/2008	-17.0	-16.2	20/12/2008	-27.6	-28.2
21/12/2008	-20.4	-20.1	21/12/2008	-15.9	-15.3	21/12/2008	-24.3	-24.1
22/12/2008	-27.0	-26.4	22/12/2008	-21.3	-21.2	22/12/2008	-32.3	-31.4
23/12/2008	-34.6	-34.1	23/12/2008	-32.3	-31.0	23/12/2008	-36.7	-36.3
24/12/2008	-32.2	-32.8	24/12/2008	-29.7	-29.5	24/12/2008	-36.2	-36.0
25/12/2008	-32.3	-32.4	25/12/2008	-28.1	-27.8	25/12/2008	-35.3	-35.8
26/12/2008	-27.2	-26.8	26/12/2008	-24.2	-23.9	26/12/2008	-29.6	-30.7
27/12/2008	-28.2	-28.3	27/12/2008	-24.5	-23.7	27/12/2008	-31.8	-32.7

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
28/12/2008	-27.9	-30.0	28/12/2008	-24.4	-27.7	28/12/2008	-32.5	-33.4
29/12/2008	-34.6	-35.3	29/12/2008	-28.9	-32.0	29/12/2008	-39.8	-39.0
30/12/2008	-38.8	-39.1	30/12/2008	-36.4	-38.3	30/12/2008	-41.1	-40.1
31/12/2008	-37.9	-38.9	31/12/2008	-36.1	-37.3	31/12/2008	-39.4	-40.0
01/01/2009	-35.0	-35.4	01/01/2009	-31.9	-31.8	01/01/2009	-39.7	-39.7
02/01/2009	-32.4	-33.6	02/01/2009	-29.8	-31.8	02/01/2009	-35.1	-34.9
03/01/2009	-36.8	-36.0	03/01/2009	-33.0	-33.4	03/01/2009	-39.7	-37.5
04/01/2009	-37.8	-35.2	04/01/2009	-35.7	-33.7	04/01/2009	-39.7	-37.0
05/01/2009	-34.5	-33.4	05/01/2009	-31.6	-29.4	05/01/2009	-37.3	-36.5
06/01/2009	-27.0	-29.4	06/01/2009	-21.9	-26.7	06/01/2009	-31.6	-32.2
07/01/2009	-26.4	-26.1	07/01/2009	-24.4	-24.8	07/01/2009	-27.5	-27.8
08/01/2009	-30.3	-29.7	08/01/2009	-25.9	-24.4	08/01/2009	-34.2	-33.7
09/01/2009	-33.2	-32.3	09/01/2009	-31.0	-29.9	09/01/2009	-35.4	-35.2
10/01/2009	-34.2	-34.3	10/01/2009	-32.6	-32.8	10/01/2009	-35.8	-36.4
11/01/2009	-34.2	-34.0	11/01/2009	-32.9	-31.9	11/01/2009	-35.9	-37.1
12/01/2009	-32.3	-33.5	12/01/2009	-27.9	-31.3	12/01/2009	-34.9	-35.3
13/01/2009	-30.1	-31.9	13/01/2009	-26.6	-27.9	13/01/2009	-32.7	-35.0
14/01/2009	-30.5	-30.2	14/01/2009	-26.6	-27.9	14/01/2009	-33.1	-33.8
15/01/2009	-23.8	-22.8	15/01/2009	-15.9	-15.1	15/01/2009	-33.7	-34.1
16/01/2009	-9.1	-9.3	16/01/2009	-5.2	-4.7	16/01/2009	-15.9	-15.1
17/01/2009	-17.3	-17.9	17/01/2009	-7.9	-6.5	17/01/2009	-21.4	-23.3
18/01/2009	-8.5	-9.8	18/01/2009	-4.1	-5.5	18/01/2009	-17.9	-19.1
19/01/2009	-7.5	-6.6	19/01/2009	-4.3	-3.5	19/01/2009	-13.6	-11.5
20/01/2009	-18.8	-18.4	20/01/2009	-13.6	-11.5	20/01/2009	-21.7	-21.0
21/01/2009	-26.7	-26.1	21/01/2009	-21.7	-20.8	21/01/2009	-28.7	-27.7
22/01/2009	-26.4	-25.8	22/01/2009	-22.2	-22.4	22/01/2009	-29.0	-28.0
23/01/2009	-23.8	-23.1	23/01/2009	-21.0	-20.7	23/01/2009	-26.7	-25.4
24/01/2009	-24.3	-25.8	24/01/2009	-20.2	-22.4	24/01/2009	-28.1	-27.9
25/01/2009	-20.2	-21.6	25/01/2009	-15.0	-18.4	25/01/2009	-24.7	-25.2
26/01/2009	-23.8	-23.5	26/01/2009	-18.0	-20.9	26/01/2009	-29.5	-26.1
27/01/2009	-25.6	-24.8	27/01/2009	-21.4	-21.3	27/01/2009	-30.4	-29.3
28/01/2009	-27.6	-26.0	28/01/2009	-24.7	-23.3	28/01/2009	-31.4	-32.7
29/01/2009	-31.0	-33.1	29/01/2009	-28.6	-30.5	29/01/2009	-34.1	-36.6
30/01/2009	-32.9	-35.8	30/01/2009	-30.8	-32.6	30/01/2009	-36.2	-39.3
31/01/2009	-33.6	-34.2	31/01/2009	-31.2	-32.4	31/01/2009	-35.6	-37.5
01/02/2009	-34.2	-35.2	01/02/2009	-30.6	-32.1	01/02/2009	-37.8	-38.6
02/02/2009	-36.1	-36.2	02/02/2009	-30.4	-31.1	02/02/2009	-39.3	-39.3
03/02/2009	-27.5	-28.1	03/02/2009	-24.3	-25.6	03/02/2009	-31.1	-31.1
04/02/2009	-22.0	-21.2	04/02/2009	-18.2	-15.8	04/02/2009	-27.3	-27.7
05/02/2009	-28.0	-28.1	05/02/2009	-24.3	-24.8	05/02/2009	-30.1	-30.3
06/02/2009	-31.9	-31.8	06/02/2009	-29.6	-28.7	06/02/2009	-34.2	-33.9
07/02/2009	-33.0	-32.7	07/02/2009	-30.4	-29.9	07/02/2009	-35.6	-35.1
08/02/2009	-30.9	-31.9	08/02/2009	-23.4	-25.3	08/02/2009	-37.8	-37.3
09/02/2009	-23.1	-22.7	09/02/2009	-20.3	-18.9	09/02/2009	-25.2	-25.3
10/02/2009	-27.5	-27.5	10/02/2009	-25.1	-23.0	10/02/2009	-30.9	-30.8
11/02/2009	-25.1	-24.6	11/02/2009	-22.5	-21.3	11/02/2009	-29.5	-28.6
12/02/2009	-26.3	-27.6	12/02/2009	-22.5	-22.6	12/02/2009	-32.9	-33.1
13/02/2009	-28.3	-28.4	13/02/2009	-25.0	-25.4	13/02/2009	-32.3	-32.8
14/02/2009	-29.0	-28.1	14/02/2009	-22.4	-23.5	14/02/2009	-33.5	-33.3
15/02/2009	-18.9	-20.2	15/02/2009	-16.7	-16.8	15/02/2009	-23.1	-24.2
16/02/2009	-22.5	-23.3	16/02/2009	-17.1	-17.0	16/02/2009	-28.4	-30.5
17/02/2009	-26.4	-27.6	17/02/2009	-20.0	-21.8	17/02/2009	-30.3	-32.7
18/02/2009	-18.8	-19.3	18/02/2009	-17.4	-17.7	18/02/2009	-21.3	-21.8
19/02/2009	-27.9	-26.8	19/02/2009	-20.5	-18.9	19/02/2009	-33.9	-33.9
20/02/2009	-21.6	-21.7	20/02/2009	-14.4	-14.2	20/02/2009	-32.3	-33.4
21/02/2009	-26.1	-26.2	21/02/2009	-20.3	-20.9	21/02/2009	-31.0	-31.0
22/02/2009	-31.4	-32.3	22/02/2009	-29.2	-29.8	22/02/2009	-33.4	-34.8
23/02/2009	-34.7	-35.4	23/02/2009	-33.0	-32.6	23/02/2009	-36.8	-38.2
24/02/2009	-36.0	-35.6	24/02/2009	-33.2	-33.8	24/02/2009	-39.8	-38.6
25/02/2009	-34.0	-33.3	25/02/2009	-31.3	-30.7	25/02/2009	-36.1	-35.9
26/02/2009	-29.5	-30.1	26/02/2009	-26.6	-26.6	26/02/2009	-34.3	-34.8
27/02/2009	-26.9	-28.2	27/02/2009	-24.3	-25.2	27/02/2009	-30.6	-33.0
28/02/2009	-26.7	-26.4	28/02/2009	-24.8	-23.8	28/02/2009	-29.0	-28.3
01/03/2009	-28.3	-28.2	01/03/2009	-24.3	-23.7	01/03/2009	-32.7	-32.7
02/03/2009	-23.8	-24.6	02/03/2009	-19.6	-20.1	02/03/2009	-32.4	-31.9
03/03/2009	-21.7	-22.7	03/03/2009	-19.9	-20.9	03/03/2009	-23.2	-25.5
04/03/2009	-24.2	-22.9	04/03/2009	-20.4	-17.8	04/03/2009	-28.8	-28.3
05/03/2009	-30.0	-29.9	05/03/2009	-28.4	-28.3	05/03/2009	-33.4	-32.7
06/03/2009	-32.8	-32.1	06/03/2009	-29.6	-28.4	06/03/2009	-36.8	-35.6
07/03/2009	-30.2	-29.0	07/03/2009	-25.8	-24.5	07/03/2009	-36.2	-35.2
08/03/2009	-35.6	-35.5	08/03/2009	-32.5	-32.1	08/03/2009	-38.4	-38.1
09/03/2009	-35.2	-35.4	09/03/2009	-31.9	-31.4	09/03/2009	-38.4	-38.5
10/03/2009	-38.1	-38.7	10/03/2009	-34.7	-34.8	10/03/2009	-40.9	-41.5
11/03/2009	-35.0	-36.3	11/03/2009	-29.3	-31.9	11/03/2009	-40.0	-41.6
12/03/2009	-38.1	-38.6	12/03/2009	-33.8	-35.3	12/03/2009	-41.8	-42.0
13/03/2009	-39.4	-40.2	13/03/2009	-36.0	-36.3	13/03/2009	-43.1	-43.8
14/03/2009	-38.3	-39.8	14/03/2009	-30.4	-34.6	14/03/2009	-42.9	-43.2
15/03/2009	-35.6	-37.1	15/03/2009	-30.4	-31.3	15/03/2009	-39.6	-42.6
16/03/2009	-30.5	-34.1	16/03/2009	-22.7	-29.1	16/03/2009	-36.1	-39.3
17/03/2009	-29.4	-31.7	17/03/2009	-22.0	-25.2	17/03/2009	-32.5	-36.5
18/03/2009	-27.7	-27.7	18/03/2009	-21.6	-23.1	18/03/2009	-32.2	-31.9
19/03/2009	-27.0	-27.8	19/03/2009	-18.9	-20.9	19/03/2009	-32.6	-33.3
20/03/2009	-28.5	-28.6	20/03/2009	-24.8	-24.6	20/03/2009	-31.1	-32.6
21/03/2009	-28.3	-28.3	21/03/2009	-21.1	-22.8	21/03/2009	-32.9	-34.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
22/03/2009	-25.5	-24.4	22/03/2009	-21.1	-20.9	22/03/2009	-31.7	-30.7
23/03/2009	-28.4	-28.1	23/03/2009	-23.1	-24.1	23/03/2009	-34.3	-34.1
24/03/2009	-25.9	-25.1	24/03/2009	-22.3	-21.8	24/03/2009	-31.4	-32.0
25/03/2009	-29.7	-29.2	25/03/2009	-25.1	-24.6	25/03/2009	-34.5	-34.5
26/03/2009	-24.5	-23.5	26/03/2009	-18.6	-18.2	26/03/2009	-31.6	-30.8
27/03/2009	-16.9	-15.6	27/03/2009	-10.1	-10.3	27/03/2009	-20.0	-21.9
28/03/2009	-18.2	-14.5	28/03/2009	-14.6	-9.1	28/03/2009	-20.6	-21.2
29/03/2009	-23.5	-24.2	29/03/2009	-20.4	-20.4	29/03/2009	-30.6	-30.6
30/03/2009	-27.5	-27.3	30/03/2009	-21.7	-21.2	30/03/2009	-31.5	-31.7
31/03/2009	-24.1	-23.7	31/03/2009	-22.1	-19.7	31/03/2009	-27.9	-27.5
01/04/2009	-23.5	-22.0	01/04/2009	-20.5	-20.0	01/04/2009	-26.1	-24.3
02/04/2009	-22.2	-21.4	02/04/2009	-19.9	-19.3	02/04/2009	-25.9	-28.0
03/04/2009	-23.9	-25.7	03/04/2009	-13.7	-18.7	03/04/2009	-29.6	-30.7
04/04/2009	-23.1	-23.9	04/04/2009	-16.0	-16.4	04/04/2009	-29.2	-31.5
05/04/2009	-15.8	-15.2	05/04/2009	-13.8	-12.5	05/04/2009	-19.7	-20.5
06/04/2009	-12.4	-11.4	06/04/2009	-8.4	-6.3	06/04/2009	-16.8	-15.2
07/04/2009	-18.5	-18.9	07/04/2009	-13.6	-15.2	07/04/2009	-22.4	-24.2
08/04/2009	-20.5	-19.5	08/04/2009	-15.4	-15.6	08/04/2009	-25.5	-25.0
09/04/2009	-21.4	-21.0	09/04/2009	-14.6	-14.2	09/04/2009	-26.4	-26.9
10/04/2009	-14.1	-12.9	10/04/2009	-8.5	-7.3	10/04/2009	-20.4	-21.5
11/04/2009	-6.5	-5.5	11/04/2009	-2.7	-1.0	11/04/2009	-8.8	-7.8
12/04/2009	-6.1	-5.5	12/04/2009	-4.7	-4.0	12/04/2009	-7.4	-7.0
13/04/2009	-8.8	-9.0	13/04/2009	-7.0	-7.0	13/04/2009	-11.6	-11.8
14/04/2009	-12.3	-11.9	14/04/2009	-10.3	-10.1	14/04/2009	-14.1	-13.9
15/04/2009	-9.8	-9.5	15/04/2009	-5.3	-5.4	15/04/2009	-11.2	-11.3
16/04/2009	-10.1	-8.9	16/04/2009	-5.6	-4.6	16/04/2009	-13.8	-12.0
17/04/2009	-4.8	-5.4	17/04/2009	-1.0	-1.8	17/04/2009	-11.8	-11.8
18/04/2009	-11.2	-10.5	18/04/2009	-9.8	-8.6	18/04/2009	-14.3	-13.7
19/04/2009	-16.7	-15.9	19/04/2009	-14.3	-12.1	19/04/2009	-19.6	-19.9
20/04/2009	-19.7	-19.2	20/04/2009	-18.7	-17.2	20/04/2009	-22.0	-21.0
21/04/2009	-18.5	-18.7	21/04/2009	-13.5	-13.2	21/04/2009	-25.0	-24.6
22/04/2009	-15.9	-16.4	22/04/2009	-13.1	-14.5	22/04/2009	-19.3	-21.2
23/04/2009	-18.8	-18.3	23/04/2009	-17.1	-16.8	23/04/2009	-21.6	-22.1
24/04/2009	-19.1	-18.9	24/04/2009	-15.0	-15.2	24/04/2009	-22.7	-23.9
25/04/2009	-16.5	-16.5	25/04/2009	-12.2	-12.9	25/04/2009	-20.4	-18.9
26/04/2009	-14.3	-14.8	26/04/2009	-10.5	-11.3	26/04/2009	-17.8	-18.6
27/04/2009	-14.4	-15.4	27/04/2009	-9.1	-10.2	27/04/2009	-20.2	-21.0
28/04/2009	-7.4	-7.9	28/04/2009	-1.3	-1.5	28/04/2009	-17.8	-17.5
29/04/2009	-3.7	-3.8	29/04/2009	0.1	0.3	29/04/2009	-11.3	-11.4
30/04/2009	-10.8	-11.2	30/04/2009	-8.4	-8.6	30/04/2009	-13.4	-14.6
01/05/2009	-7.4	-8.3	01/05/2009	-0.7	-1.5	01/05/2009	-14.1	-15.2
02/05/2009	-2.0	-1.8	02/05/2009	-0.2	-0.4	02/05/2009	-5.8	-4.0
03/05/2009	-9.1	-7.9	03/05/2009	-4.5	-3.5	03/05/2009	-18.2	-16.6
04/05/2009	-16.3	-15.8	04/05/2009	-13.7	-12.6	04/05/2009	-21.1	-19.7
05/05/2009	-13.5	-13.2	05/05/2009	-9.7	-7.8	05/05/2009	-15.0	-16.3
06/05/2009	-15.0	-14.8	06/05/2009	-11.7	-11.6	06/05/2009	-18.7	-20.1
07/05/2009	-15.0	-14.8	07/05/2009	-9.7	-9.0	07/05/2009	-20.4	-22.4
08/05/2009	-9.9	-9.7	08/05/2009	-6.3	-6.8	08/05/2009	-13.8	-16.3
09/05/2009	-9.1	-8.3	09/05/2009	-2.3	-1.7	09/05/2009	-17.2	-16.9
10/05/2009	-10.2	-9.2	10/05/2009	-8.0	-7.0	10/05/2009	-13.9	-12.4
11/05/2009	-14.5	-13.9	11/05/2009	-12.9	-12.3	11/05/2009	-16.8	-17.3
12/05/2009	-15.9	-15.0	12/05/2009	-14.0	-13.6	12/05/2009	-19.2	-16.8
13/05/2009	-13.3	-13.0	13/05/2009	-10.1	-10.8	13/05/2009	-16.4	-15.9
14/05/2009	-8.1	-8.6	14/05/2009	-4.2	-5.3	14/05/2009	-12.0	-12.5
15/05/2009	-12.1	-11.8	15/05/2009	-6.4	-5.8	15/05/2009	-15.2	-14.5
16/05/2009	-14.2	-13.3	16/05/2009	-12.3	-11.4	16/05/2009	-16.3	-16.0
17/05/2009	-13.9	-13.3	17/05/2009	-12.4	-12.1	17/05/2009	-14.7	-14.3
18/05/2009	-12.7	-12.6	18/05/2009	-10.9	-10.8	18/05/2009	-15.2	-14.8
19/05/2009	-12.2	-11.6	19/05/2009	-9.8	-9.6	19/05/2009	-13.7	-12.7
20/05/2009	-10.7	-10.6	20/05/2009	-7.7	-8.1	20/05/2009	-13.6	-13.1
21/05/2009	-5.6	-5.3	21/05/2009	-1.8	-1.8	21/05/2009	-8.9	-8.3
22/05/2009	-4.0	-4.0	22/05/2009	-2.3	-2.1	22/05/2009	-7.0	-7.6
23/05/2009	-4.5	-3.8	23/05/2009	-1.4	-1.0	23/05/2009	-8.3	-6.5
24/05/2009	-9.1	-8.7	24/05/2009	-7.6	-6.5	24/05/2009	-11.2	-10.2
25/05/2009	-9.9	-8.6	25/05/2009	-7.5	-5.7	25/05/2009	-11.6	-10.1
26/05/2009	-9.8	-7.6	26/05/2009	-7.2	-5.6	26/05/2009	-13.3	-9.4
27/05/2009	-8.5	-6.9	27/05/2009	-6.2	-4.2	27/05/2009	-11.2	-9.1
28/05/2009	-7.0	-6.6	28/05/2009	-1.8	-2.4	28/05/2009	-14.2	-12.5
29/05/2009	-0.7	-1.1	29/05/2009	3.7	3.2	29/05/2009	-5.1	-6.9
30/05/2009	-0.5	-2.0	30/05/2009	2.8	1.8	30/05/2009	-4.6	-8.1
31/05/2009	-0.9	-2.8	31/05/2009	3.4	1.5	31/05/2009	-8.1	-8.8
01/06/2009	0.7	0.6	01/06/2009	5.3	6.0	01/06/2009	-4.8	-6.3
02/06/2009	0.8	0.4	02/06/2009	2.8	1.9	02/06/2009	-1.5	-2.2
03/06/2009	-1.3	-0.6	03/06/2009	-0.1	0.3	03/06/2009	-2.5	-1.5
04/06/2009	-2.3	-1.6	04/06/2009	-0.7	-0.1	04/06/2009	-4.0	-3.5
05/06/2009	-1.9	-1.5	05/06/2009	0.7	2.0	05/06/2009	-4.2	-4.6
06/06/2009	0.2	-0.5	06/06/2009	6.0	4.4	06/06/2009	-6.1	-4.8
07/06/2009	1.9	0.8	07/06/2009	6.7	5.1	07/06/2009	-3.7	-5.7
08/06/2009	6.2	3.6	08/06/2009	12.1	9.1	08/06/2009	-0.6	-2.9
09/06/2009	7.1	6.6	09/06/2009	12.7	13.4	09/06/2009	2.4	1.3
10/06/2009	1.6	1.7	10/06/2009	3.9	3.7	10/06/2009	-1.7	-1.6
11/06/2009	1.3	0.9	11/06/2009	6.1	5.4	11/06/2009	-3.7	-3.1
12/06/2009	0.9	1.0	12/06/2009	3.7	5.0	12/06/2009	-1.8	-2.0
13/06/2009	0.0	-0.2	13/06/2009	2.7	2.6	13/06/2009	-3.3	-4.3

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
14/06/2009	2.3	2.6	14/06/2009	5.4	5.9	14/06/2009	-2.2	-0.5
15/06/2009	2.4	2.4	15/06/2009	6.3	6.5	15/06/2009	-2.1	-1.8
16/06/2009	2.3	2.8	16/06/2009	4.3	4.9	16/06/2009	-0.5	0.3
17/06/2009	4.5	4.2	17/06/2009	9.1	9.0	17/06/2009	0.9	0.8
18/06/2009	7.1	7.0	18/06/2009	12.9	12.9	18/06/2009	1.2	0.9
19/06/2009	5.7	5.2	19/06/2009	8.6	6.7	19/06/2009	3.2	3.6
20/06/2009	5.9	5.0	20/06/2009	8.7	7.5	20/06/2009	3.3	2.9
21/06/2009	6.7	6.8	21/06/2009	11.5	11.6	21/06/2009	2.8	3.0
22/06/2009	8.8	8.7	22/06/2009	13.1	14.6	22/06/2009	3.4	2.4
23/06/2009	5.7	6.0	23/06/2009	8.0	9.4	23/06/2009	2.9	3.5
24/06/2009	4.5	5.0	24/06/2009	6.4	7.5	24/06/2009	2.3	2.2
25/06/2009	5.2	7.1	25/06/2009	9.3	13.0	25/06/2009	1.0	1.7
26/06/2009	3.9	4.1	26/06/2009	9.3	8.2	26/06/2009	0.4	0.9
27/06/2009	11.1	11.1	27/06/2009	17.6	19.3	27/06/2009	1.7	0.9
28/06/2009	14.3	14.5	28/06/2009	20.0	21.0	28/06/2009	6.6	4.6
29/06/2009	16.8	16.2	29/06/2009	21.1	21.7	29/06/2009	10.5	6.7
30/06/2009	15.4	14.7	30/06/2009	19.7	19.9	30/06/2009	10.3	7.8
01/07/2009	13.9	13.7	01/07/2009	19.2	19.6	01/07/2009	7.7	5.9
02/07/2009	14.4	13.8	02/07/2009	18.8	19.2	02/07/2009	9.8	6.5
03/07/2009	13.3	13.6	03/07/2009	19.2	20.5	03/07/2009	6.7	5.7
04/07/2009	13.4	13.7	04/07/2009	19.1	18.9	04/07/2009	8.4	6.6
05/07/2009	8.5	9.3	05/07/2009	13.6	13.0	05/07/2009	5.7	6.2
06/07/2009	10.9	10.4	06/07/2009	15.4	15.2	06/07/2009	5.6	4.7
07/07/2009	11.9	12.9	07/07/2009	17.8	18.2	07/07/2009	6.1	7.6
08/07/2009	3.0	4.2	08/07/2009	6.6	8.7	08/07/2009	0.4	1.4
09/07/2009	3.3	4.2	09/07/2009	8.3	9.4	09/07/2009	-0.1	0.9
10/07/2009	6.6	7.2	10/07/2009	12.6	15.2	10/07/2009	0.6	0.3
11/07/2009	5.6	6.6	11/07/2009	10.5	11.7	11/07/2009	1.9	2.4
12/07/2009	4.7	5.5	12/07/2009	7.9	8.7	12/07/2009	1.5	1.6
13/07/2009	8.4	9.1	13/07/2009	12.6	13.9	13/07/2009	2.3	1.2
14/07/2009	9.4	10.1	14/07/2009	13.7	12.8	14/07/2009	5.9	6.6
15/07/2009	10.3	11.4	15/07/2009	15.5	15.7	15/07/2009	5.4	7.3
16/07/2009	9.9	11.4	16/07/2009	14.1	15.5	16/07/2009	6.0	7.9
17/07/2009	9.6	10.6	17/07/2009	14.6	15.2	17/07/2009	3.6	4.9
18/07/2009	12.8	13.6	18/07/2009	18.2	19.6	18/07/2009	7.5	7.0
19/07/2009	15.6	15.2	19/07/2009	22.8	22.1	19/07/2009	8.7	6.8
20/07/2009	15.8	13.7	20/07/2009	21.9	19.6	20/07/2009	10.5	9.2
21/07/2009	14.8	14.4	21/07/2009	21.5	20.7	21/07/2009	8.6	8.9
22/07/2009	14.7	14.2	22/07/2009	20.0	18.9	22/07/2009	9.5	9.3
23/07/2009	15.8	15.8	23/07/2009	20.6	21.5	23/07/2009	11.1	11.3
24/07/2009	16.2	16.2	24/07/2009	22.5	22.1	24/07/2009	10.6	8.9
25/07/2009	14.7	15.2	25/07/2009	17.8	17.9	25/07/2009	10.2	12.6
26/07/2009	12.8	13.2	26/07/2009	17.6	18.2	26/07/2009	7.4	8.2
27/07/2009	11.0	11.0	27/07/2009	13.6	13.3	27/07/2009	8.3	7.6
28/07/2009	11.7	12.1	28/07/2009	15.0	15.0	28/07/2009	8.9	9.3
29/07/2009	9.0	9.4	29/07/2009	12.1	12.9	29/07/2009	6.5	6.1
30/07/2009	8.9	9.6	30/07/2009	12.6	13.3	30/07/2009	5.8	6.4
31/07/2009	10.0	10.5	31/07/2009	12.9	14.0	31/07/2009	6.8	5.1
01/08/2009	7.4	7.8	01/08/2009	9.4	10.3	01/08/2009	5.9	6.4
02/08/2009	8.6	9.5	02/08/2009	11.4	12.6	02/08/2009	7.4	6.1
03/08/2009	10.8	11.3	03/08/2009	14.2	14.9	03/08/2009	7.6	8.0
04/08/2009	11.3	11.2	04/08/2009	15.7	15.2	04/08/2009	5.9	5.5
05/08/2009	11.1	11.9	05/08/2009	15.7	17.3	05/08/2009	7.5	5.1
06/08/2009	10.1	11.2	06/08/2009	15.6	16.9	06/08/2009	5.1	3.6
07/08/2009	7.5	8.3	07/08/2009	9.0	10.3	07/08/2009	4.8	3.5
08/08/2009	6.2	7.0	08/08/2009	10.6	12.2	08/08/2009	2.6	0.4
09/08/2009	6.0	6.3	09/08/2009	11.5	11.4	09/08/2009	-0.3	-0.4
10/08/2009	7.8	8.9	10/08/2009	11.8	13.4	10/08/2009	5.0	5.8
11/08/2009	5.8	6.5	11/08/2009	8.6	9.8	11/08/2009	2.9	3.1
12/08/2009	6.4	7.0	12/08/2009	8.7	8.4	12/08/2009	4.8	4.6
13/08/2009	8.1	7.8	13/08/2009	14.1	13.5	13/08/2009	3.0	3.3
14/08/2009	11.4	10.9	14/08/2009	16.9	17.9	14/08/2009	5.0	3.4
15/08/2009	10.4	11.5	15/08/2009	15.7	17.4	15/08/2009	4.4	3.8
16/08/2009	12.2	14.4	16/08/2009	18.2	20.7	16/08/2009	5.7	6.8
17/08/2009	12.5	14.7	17/08/2009	17.0	20.1	17/08/2009	10.0	9.1
18/08/2009	8.2	9.5	18/08/2009	11.5	13.0	18/08/2009	5.2	5.4
19/08/2009	6.9	7.1	19/08/2009	10.5	10.3	19/08/2009	3.4	4.0
20/08/2009	8.3	8.8	20/08/2009	12.1	13.8	20/08/2009	4.0	3.4
21/08/2009	5.8	6.2	21/08/2009	8.6	9.0	21/08/2009	4.4	2.5
22/08/2009	6.2	5.4	22/08/2009	9.9	10.1	22/08/2009	2.2	-0.6
23/08/2009	6.4	6.3	23/08/2009	13.6	13.8	23/08/2009	-0.2	-1.5
24/08/2009	9.4	9.1	24/08/2009	17.4	16.8	24/08/2009	2.6	2.4
25/08/2009	9.7	8.7	25/08/2009	16.1	16.3	25/08/2009	4.3	1.1
26/08/2009	9.4	9.4	26/08/2009	15.2	16.2	26/08/2009	3.6	1.5
27/08/2009	11.1	11.8	27/08/2009	15.3	17.4	27/08/2009	7.6	7.9
28/08/2009	10.3	10.5	28/08/2009	12.8	13.5	28/08/2009	8.2	6.6
29/08/2009	13.4	14.0	29/08/2009	19.7	21.0	29/08/2009	7.6	7.8
30/08/2009	15.7	15.9	30/08/2009	23.2	24.4	30/08/2009	8.9	6.9
31/08/2009	9.0	10.2	31/08/2009	14.7	13.6	31/08/2009	2.0	3.5
01/09/2009	3.7	4.3	01/09/2009	7.4	7.9	01/09/2009	0.5	1.3
02/09/2009	5.3	5.8	02/09/2009	10.1	11.1	02/09/2009	-0.1	0.1
03/09/2009	7.3	7.3	03/09/2009	14.6	15.6	03/09/2009	0.8	0.7
04/09/2009	11.5	11.9	04/09/2009	17.9	19.8	04/09/2009	4.7	3.8
05/09/2009	4.0	5.1	05/09/2009	10.2	12.4	05/09/2009	-0.8	-0.8

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
06/09/2009	6.1	5.7	06/09/2009	13.6	14.2	06/09/2009	-0.9	-2.0
07/09/2009	7.6	7.4	07/09/2009	13.5	14.5	07/09/2009	1.0	-1.5
08/09/2009	7.8	8.9	08/09/2009	9.9	13.1	08/09/2009	5.4	5.6
09/09/2009	3.9	5.3	09/09/2009	7.5	9.3	09/09/2009	0.0	0.5
10/09/2009	0.6	0.6	10/09/2009	4.3	5.1	10/09/2009	-1.8	-2.2
11/09/2009	3.3	4.0	11/09/2009	8.9	10.1	11/09/2009	-2.9	-2.5
12/09/2009	8.5	9.2	12/09/2009	12.2	13.9	12/09/2009	5.3	4.3
13/09/2009	6.9	7.3	13/09/2009	10.7	12.4	13/09/2009	2.6	4.1
14/09/2009	12.3	12.5	14/09/2009	20.5	21.4	14/09/2009	6.5	6.6
15/09/2009	7.9	8.2	15/09/2009	14.1	12.8	15/09/2009	5.0	5.5
16/09/2009	5.8	6.2	16/09/2009	8.9	9.5	16/09/2009	4.2	4.5
17/09/2009	5.1	6.5	17/09/2009	8.3	8.8	17/09/2009	0.7	2.1
18/09/2009	9.4	10.2	18/09/2009	14.3	15.6	18/09/2009	5.6	6.2
19/09/2009	8.6	9.4	19/09/2009	14.3	14.7	19/09/2009	3.3	3.8
20/09/2009	3.3	4.5	20/09/2009	6.4	8.2	20/09/2009	0.4	1.2
21/09/2009	-0.2	0.1	21/09/2009	0.5	1.2	21/09/2009	-0.9	-0.3
22/09/2009	0.6	0.7	22/09/2009	2.4	2.9	22/09/2009	-0.6	-0.8
23/09/2009	1.0	1.5	23/09/2009	2.5	2.9	23/09/2009	-0.1	0.2
24/09/2009	4.7	5.3	24/09/2009	7.3	8.4	24/09/2009	2.2	2.7
25/09/2009	1.2	2.0	25/09/2009	3.4	4.3	25/09/2009	-2.2	-1.5
26/09/2009	-2.5	-2.1	26/09/2009	-1.5	0.0	26/09/2009	-3.7	-3.5
27/09/2009	-4.3	-3.9	27/09/2009	-2.4	-1.5	27/09/2009	-5.3	-5.8
28/09/2009	-1.5	-1.9	28/09/2009	1.7	2.2	28/09/2009	-5.2	-5.8
29/09/2009	-0.6	-0.2	29/09/2009	1.1	1.8	29/09/2009	-2.5	-3.4
30/09/2009	0.1	0.6	30/09/2009	1.0	1.5	30/09/2009	-1.1	-0.5
01/10/2009	-3.1	-2.1	01/10/2009	-0.5	0.8	01/10/2009	-5.7	-5.6
02/10/2009	-4.0	-3.9	02/10/2009	-0.9	-1.3	02/10/2009	-7.4	-7.0
03/10/2009	-2.1	-1.7	03/10/2009	0.2	0.0	03/10/2009	-4.0	-3.3
04/10/2009	-3.1	-0.5	04/10/2009	-0.3	0.8	04/10/2009	-6.5	-2.1
05/10/2009	0.6	0.7	05/10/2009	1.9	1.8	05/10/2009	-0.3	-0.6
06/10/2009	-1.1	-0.8	06/10/2009	0.4	0.2	06/10/2009	-3.2	-2.3
07/10/2009	-3.7	-2.8	07/10/2009	-2.5	-1.7	07/10/2009	-4.8	-3.5
08/10/2009	-4.7	-4.0	08/10/2009	-3.3	-2.7	08/10/2009	-6.0	-5.6
09/10/2009	-5.8	-4.7	09/10/2009	-4.4	-2.8	09/10/2009	-8.7	-9.9
10/10/2009	-8.2	-8.8	10/10/2009	-6.8	-7.0	10/10/2009	-11.2	-10.8
11/10/2009	-11.8	-11.3	11/10/2009	-10.2	-9.5	11/10/2009	-15.2	-13.9
12/10/2009	-11.1	-10.7	12/10/2009	-9.2	-9.4	12/10/2009	-13.6	-12.2
13/10/2009	-11.1	-9.9	13/10/2009	-5.8	-6.1	13/10/2009	-15.7	-14.8
14/10/2009	-4.1	-4.0	14/10/2009	-3.0	-2.1	14/10/2009	-5.8	-6.6
15/10/2009	-4.6	-4.0	15/10/2009	-1.8	-1.9	15/10/2009	-7.9	-7.0
16/10/2009	-4.3	-3.3	16/10/2009	-1.8	-1.6	16/10/2009	-6.6	-6.1
17/10/2009	-10.3	-9.6	17/10/2009	-4.3	-4.2	17/10/2009	-14.4	-13.1
18/10/2009	-15.4	-14.3	18/10/2009	-13.3	-12.6	18/10/2009	-17.7	-15.8
19/10/2009	-10.7	-9.8	19/10/2009	-6.2	-4.9	19/10/2009	-14.8	-14.6
20/10/2009	-10.9	-10.8	20/10/2009	-9.4	-8.7	20/10/2009	-14.4	-14.1
21/10/2009	-12.9	-12.1	21/10/2009	-9.9	-9.0	21/10/2009	-16.3	-14.9
22/10/2009	-15.5	-15.4	22/10/2009	-13.2	-11.7	22/10/2009	-17.4	-18.8
23/10/2009	-13.1	-12.5	23/10/2009	-11.9	-11.4	23/10/2009	-16.4	-17.0
24/10/2009	-15.3	-15.0	24/10/2009	-13.0	-12.6	24/10/2009	-19.3	-20.0
25/10/2009	-16.4	-16.2	25/10/2009	-12.7	-11.7	25/10/2009	-19.6	-20.5
26/10/2009	-10.3	-9.0	26/10/2009	-9.4	-7.8	26/10/2009	-12.8	-11.8
27/10/2009	-13.9	-13.8	27/10/2009	-10.5	-9.3	27/10/2009	-21.7	-19.4
28/10/2009	-18.8	-19.7	28/10/2009	-16.7	-18.3	28/10/2009	-22.2	-21.7
29/10/2009	-20.6	-22.4	29/10/2009	-16.5	-18.3	29/10/2009	-24.7	-25.8
30/10/2009	-21.1	-18.4	30/10/2009	-17.4	-16.6	30/10/2009	-24.9	-22.4
31/10/2009	-20.3	-19.8	31/10/2009	-18.7	-17.9	31/10/2009	-21.6	-21.9
01/11/2009	-19.4	-19.5	01/11/2009	-15.7	-16.6	01/11/2009	-24.7	-23.1
02/11/2009	-15.5	-15.5	02/11/2009	-12.4	-11.8	02/11/2009	-18.0	-18.3
03/11/2009	-14.6	-15.1	03/11/2009	-13.0	-12.9	03/11/2009	-16.7	-16.7
04/11/2009	-17.3	-16.8	04/11/2009	-13.6	-13.2	04/11/2009	-23.9	-24.8
05/11/2009	-23.8	-24.6	05/11/2009	-20.0	-20.0	05/11/2009	-27.1	-27.9
06/11/2009	-18.7	-17.7	06/11/2009	-17.4	-16.2	06/11/2009	-20.1	-20.0
07/11/2009	-15.4	-15.1	07/11/2009	-13.8	-13.7	07/11/2009	-17.4	-16.6
08/11/2009	-17.8	-17.5	08/11/2009	-16.1	-16.3	08/11/2009	-19.6	-18.3
09/11/2009	-22.2	-21.8	09/11/2009	-19.2	-18.1	09/11/2009	-24.9	-25.4
10/11/2009	-23.0	-24.4	10/11/2009	-18.1	-20.6	10/11/2009	-27.8	-28.2
11/11/2009	-18.0	-21.0	11/11/2009	-16.7	-18.4	11/11/2009	-21.2	-26.7
12/11/2009	-19.4	-20.2	12/11/2009	-16.6	-15.5	12/11/2009	-23.4	-23.9
13/11/2009	-13.8	-13.6	13/11/2009	-9.8	-9.5	13/11/2009	-16.7	-16.7
14/11/2009	-13.4	-13.0	14/11/2009	-6.5	-6.4	14/11/2009	-21.0	-20.1
15/11/2009	-8.6	-8.2	15/11/2009	-4.0	-3.7	15/11/2009	-16.3	-16.7
16/11/2009	-17.4	-17.4	16/11/2009	-11.5	-11.3	16/11/2009	-22.3	-23.6
17/11/2009	-23.0	-24.8	17/11/2009	-16.6	-21.2	17/11/2009	-25.6	-26.9
18/11/2009	-17.0	-16.7	18/11/2009	-13.6	-13.1	18/11/2009	-26.2	-24.0
19/11/2009	-16.6	-16.8	19/11/2009	-14.7	-13.3	19/11/2009	-18.3	-20.0
20/11/2009	-20.2	-20.4	20/11/2009	-17.9	-16.6	20/11/2009	-23.2	-27.4
21/11/2009	-23.7	-25.2	21/11/2009	-19.9	-20.9	21/11/2009	-26.4	-28.6
22/11/2009	-18.5	-18.2	22/11/2009	-16.8	-16.8	22/11/2009	-21.0	-20.9
23/11/2009	-19.2	-19.1	23/11/2009	-17.9	-17.2	23/11/2009	-22.3	-23.1
24/11/2009	-21.4	-20.0	24/11/2009	-18.5	-16.0	24/11/2009	-24.7	-25.2
25/11/2009	-22.0	-20.6	25/11/2009	-15.8	-15.1	25/11/2009	-25.0	-25.6
26/11/2009	-11.8	-11.2	26/11/2009	-8.8	-8.3	26/11/2009	-15.8	-15.9
27/11/2009	-8.9	-8.2	27/11/2009	-8.5	-7.9	27/11/2009	-9.4	-8.6
28/11/2009	-10.3	-9.5	28/11/2009	-9.1	-8.0	28/11/2009	-10.9	-10.3

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
29/11/2009	-10.4	-10.0	29/11/2009	-9.8	-8.8	29/11/2009	-12.2	-10.6
30/11/2009	-9.6	-8.1	30/11/2009	-8.8	-7.6	30/11/2009	-11.2	-9.8
01/12/2009	-12.6	-11.2	01/12/2009	-8.9	-8.0	01/12/2009	-17.5	-13.4
02/12/2009	-19.1	-14.4	02/12/2009	-13.2	-9.6	02/12/2009	-23.7	-21.4
03/12/2009	-12.2	-11.4	03/12/2009	-6.5	-5.7	03/12/2009	-17.5	-16.7
04/12/2009	-9.8	-8.8	04/12/2009	-6.6	-5.8	04/12/2009	-14.4	-13.6
05/12/2009	-20.7	-20.3	05/12/2009	-14.4	-13.6	05/12/2009	-24.4	-24.5
06/12/2009	-26.0	-26.2	06/12/2009	-22.1	-22.4	06/12/2009	-30.0	-31.2
07/12/2009	-26.3	-26.3	07/12/2009	-22.0	-23.0	07/12/2009	-30.2	-31.6
08/12/2009	-26.0	-25.9	08/12/2009	-23.3	-23.0	08/12/2009	-30.4	-30.9
09/12/2009	-29.5	-29.3	09/12/2009	-23.2	-23.8	09/12/2009	-33.9	-34.6
10/12/2009	-35.3	-36.4	10/12/2009	-31.6	-30.5	10/12/2009	-38.7	-40.6
11/12/2009	-34.5	-34.9	11/12/2009	-29.7	-29.0	11/12/2009	-39.1	-40.9
12/12/2009	-29.2	-28.9	12/12/2009	-28.3	-27.8	12/12/2009	-29.7	-29.5
13/12/2009	-27.2	-27.7	13/12/2009	-24.5	-26.2	13/12/2009	-29.8	-29.2
14/12/2009	-24.7	-25.7	14/12/2009	-22.4	-23.5	14/12/2009	-27.2	-29.0
15/12/2009	-29.6	-29.7	15/12/2009	-26.1	-27.1	15/12/2009	-32.3	-32.6
16/12/2009	-31.5	-34.3	16/12/2009	-29.7	-31.6	16/12/2009	-32.8	-36.9
17/12/2009	-31.4	-36.1	17/12/2009	-29.5	-34.2	17/12/2009	-34.0	-37.5
18/12/2009	-33.6	-34.9	18/12/2009	-28.3	-27.4	18/12/2009	-36.1	-38.0
19/12/2009	-23.3	-23.5	19/12/2009	-21.3	-21.1	19/12/2009	-28.3	-27.4
20/12/2009	-23.8	-27.1	20/12/2009	-20.5	-21.3	20/12/2009	-28.9	-31.6
21/12/2009	-21.0	-20.7	21/12/2009	-19.1	-18.5	21/12/2009	-22.3	-23.2
22/12/2009	-19.1	-18.7	22/12/2009	-18.6	-18.2	22/12/2009	-19.7	-19.4
23/12/2009	-25.1	-26.0	23/12/2009	-19.5	-19.0	23/12/2009	-29.9	-32.8
24/12/2009	-25.5	-27.6	24/12/2009	-22.7	-23.0	24/12/2009	-28.0	-33.3
25/12/2009	-20.3	-19.5	25/12/2009	-16.8	-16.8	25/12/2009	-25.4	-23.0
26/12/2009	-23.0	-21.7	26/12/2009	-20.4	-20.0	26/12/2009	-28.4	-27.4
27/12/2009	-22.2	-22.9	27/12/2009	-19.2	-19.3	27/12/2009	-25.0	-27.4
28/12/2009	-25.5	-24.7	28/12/2009	-22.3	-21.0	28/12/2009	-28.9	-28.9
29/12/2009	-23.7	-23.8	29/12/2009	-20.9	-20.6	29/12/2009	-26.8	-27.0
30/12/2009	-26.4	-26.1	30/12/2009	-23.9	-23.8	30/12/2009	-29.9	-29.1
31/12/2009	-27.7	-28.2	31/12/2009	-24.8	-25.0	31/12/2009	-30.0	-29.8
01/01/2010	-29.2	-29.4	01/01/2010	-23.9	-24.0	01/01/2010	-33.2	-34.4
02/01/2010	-31.9	-31.8	02/01/2010	-27.9	-28.3	02/01/2010	-34.4	-34.9
03/01/2010	-29.0	-29.0	03/01/2010	-26.8	-27.1	03/01/2010	-31.6	-30.8
04/01/2010	-33.3	-33.0	04/01/2010	-29.7	-27.2	04/01/2010	-35.8	-35.9
05/01/2010	-30.5	-30.3	05/01/2010	-28.0	-27.5	05/01/2010	-34.1	-33.4
06/01/2010	-27.4	-27.1	06/01/2010	-23.9	-23.3	06/01/2010	-32.3	-31.3
07/01/2010	-21.5	-20.9	07/01/2010	-19.3	-18.9	07/01/2010	-23.9	-23.3
08/01/2010	-22.8	-22.6	08/01/2010	-17.1	-17.5	08/01/2010	-25.9	-25.9
09/01/2010	-28.5	-28.0	09/01/2010	-20.5	-19.3	09/01/2010	-33.5	-34.3
10/01/2010	-31.5	-33.0	10/01/2010	-29.2	-31.6	10/01/2010	-33.8	-35.8
11/01/2010	-29.9	-30.8	11/01/2010	-27.1	-27.8	11/01/2010	-34.2	-37.2
12/01/2010	-28.9	-27.8	12/01/2010	-27.0	-26.2	12/01/2010	-30.1	-29.3
13/01/2010	-27.7	-26.1	13/01/2010	-26.4	-24.6	13/01/2010	-31.2	-30.5
14/01/2010	-33.6	-33.6	14/01/2010	-31.2	-30.0	14/01/2010	-36.0	-36.0
15/01/2010	-32.4	-32.7	15/01/2010	-24.3	-24.1	15/01/2010	-36.1	-37.2
16/01/2010	-26.0	-24.6	16/01/2010	-21.7	-19.4	16/01/2010	-32.5	-33.7
17/01/2010	-28.4	-27.7	17/01/2010	-24.6	-23.8	17/01/2010	-32.6	-33.9
18/01/2010	-25.5	-24.3	18/01/2010	-24.1	-22.8	18/01/2010	-29.2	-30.3
19/01/2010	-30.8	-32.9	19/01/2010	-29.1	-30.3	19/01/2010	-33.2	-35.5
20/01/2010	-26.3	-27.1	20/01/2010	-23.2	-23.5	20/01/2010	-31.4	-31.1
21/01/2010	-18.6	-18.1	21/01/2010	-16.5	-16.3	21/01/2010	-24.1	-23.6
22/01/2010	-17.2	-17.1	22/01/2010	-16.1	-16.3	22/01/2010	-17.9	-17.5
23/01/2010	-18.3	-17.9	23/01/2010	-16.3	-16.1	23/01/2010	-22.4	-21.4
24/01/2010	-25.6	-25.5	24/01/2010	-21.9	-21.3	24/01/2010	-28.5	-28.5
25/01/2010	-18.5	-18.7	25/01/2010	-16.1	-16.2	25/01/2010	-22.7	-24.6
26/01/2010	-19.7	-19.6	26/01/2010	-17.0	-16.7	26/01/2010	-23.9	-25.3
27/01/2010	-19.7	-21.0	27/01/2010	-15.6	-17.0	27/01/2010	-23.3	-25.2
28/01/2010	-25.9	-24.7	28/01/2010	-21.7	-20.8	28/01/2010	-29.2	-28.3
29/01/2010	-31.4	-31.6	29/01/2010	-29.2	-28.3	29/01/2010	-34.2	-34.5
30/01/2010	-29.8	-30.7	30/01/2010	-24.5	-26.0	30/01/2010	-34.8	-35.4
31/01/2010	-24.9	-25.0	31/01/2010	-21.1	-22.1	31/01/2010	-28.2	-28.9
01/02/2010	-28.3	-28.2	01/02/2010	-26.7	-26.8	01/02/2010	-29.6	-30.0
02/02/2010	-27.2	-27.9	02/02/2010	-25.0	-25.6	02/02/2010	-29.2	-29.7
03/02/2010	-31.3	-32.4	03/02/2010	-26.0	-28.3	03/02/2010	-36.1	-37.0
04/02/2010	-35.9	-36.6	04/02/2010	-33.2	-33.7	04/02/2010	-37.7	-38.7
05/02/2010	-32.5	-30.9	05/02/2010	-19.6	-19.4	05/02/2010	-37.6	-38.1
06/02/2010	-16.6	-17.0	06/02/2010	-15.3	-15.2	06/02/2010	-19.6	-19.4
07/02/2010	-15.4	-14.5	07/02/2010	-11.8	-11.5	07/02/2010	-18.2	-16.2
08/02/2010	-11.3	-10.6	08/02/2010	-9.8	-9.6	08/02/2010	-14.3	-11.7
09/02/2010	-19.9	-13.9	09/02/2010	-14.3	-11.4	09/02/2010	-23.4	-15.4
10/02/2010	-16.2	-17.3	10/02/2010	-14.2	-13.4	10/02/2010	-21.4	-24.6
11/02/2010	-16.5	-20.6	11/02/2010	-14.9	-17.6	11/02/2010	-19.0	-25.3
12/02/2010	-16.7	n/a	12/02/2010	-13.8	n/a	12/02/2010	-23.7	n/a
13/02/2010	-18.3	n/a	13/02/2010	-14.3	n/a	13/02/2010	-23.7	n/a
14/02/2010	-13.9	n/a	14/02/2010	-12.1	n/a	14/02/2010	-17.9	n/a
15/02/2010	-17.9	n/a	15/02/2010	-14.4	n/a	15/02/2010	-21.6	n/a
16/02/2010	-15.2	n/a	16/02/2010	-9.8	n/a	16/02/2010	-20.2	n/a
17/02/2010	-17.3	n/a	17/02/2010	-10.7	n/a	17/02/2010	-23.3	n/a
18/02/2010	-18.5	n/a	18/02/2010	-15.0	n/a	18/02/2010	-22.5	n/a
19/02/2010	-20.4	n/a	19/02/2010	-17.0	n/a	19/02/2010	-24.9	n/a
20/02/2010	-24.4	n/a	20/02/2010	-17.0	n/a	20/02/2010	-28.4	n/a

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
21/02/2010	-30.4	n/a	21/02/2010	-25.6	n/a	21/02/2010	-32.7	n/a
22/02/2010	-29.7	n/a	22/02/2010	-28.3	n/a	22/02/2010	-31.0	n/a
23/02/2010	-30.6	n/a	23/02/2010	-29.2	n/a	23/02/2010	-34.5	n/a
24/02/2010	-34.3	n/a	24/02/2010	-30.8	n/a	24/02/2010	-36.7	n/a
25/02/2010	-32.8	n/a	25/02/2010	-29.8	n/a	25/02/2010	-36.2	n/a
26/02/2010	-30.3	n/a	26/02/2010	-27.5	n/a	26/02/2010	-33.4	n/a
27/02/2010	-29.2	n/a	27/02/2010	-21.9	n/a	27/02/2010	-34.7	n/a
28/02/2010	-19.4	n/a	28/02/2010	-14.2	n/a	28/02/2010	-23.7	n/a
01/03/2010	-16.2	n/a	01/03/2010	-11.4	n/a	01/03/2010	-18.2	n/a
02/03/2010	-9.1	n/a	02/03/2010	-6.4	n/a	02/03/2010	-11.5	n/a
03/03/2010	-9.1	n/a	03/03/2010	-5.6	n/a	03/03/2010	-11.0	n/a
04/03/2010	-9.8	n/a	04/03/2010	-7.1	n/a	04/03/2010	-12.3	n/a
05/03/2010	-14.2	n/a	05/03/2010	-11.5	n/a	05/03/2010	-18.4	n/a
06/03/2010	-18.2	n/a	06/03/2010	-10.5	n/a	06/03/2010	-22.3	n/a
07/03/2010	-18.8	n/a	07/03/2010	-12.9	n/a	07/03/2010	-24.3	n/a
08/03/2010	-13.1	n/a	08/03/2010	-9.0	n/a	08/03/2010	-16.9	n/a
09/03/2010	-15.7	n/a	09/03/2010	-9.0	n/a	09/03/2010	-18.8	n/a
10/03/2010	-14.0	n/a	10/03/2010	-8.9	n/a	10/03/2010	-18.4	n/a
11/03/2010	-14.0	n/a	11/03/2010	-9.3	n/a	11/03/2010	-18.5	n/a
12/03/2010	-15.3	n/a	12/03/2010	-12.3	n/a	12/03/2010	-18.1	n/a
13/03/2010	-14.4	n/a	13/03/2010	-11.1	n/a	13/03/2010	-18.7	n/a
14/03/2010	-12.6	n/a	14/03/2010	-9.5	n/a	14/03/2010	-17.3	n/a
15/03/2010	-16.4	n/a	15/03/2010	-12.2	n/a	15/03/2010	-19.3	n/a
16/03/2010	-17.5	n/a	16/03/2010	-11.7	n/a	16/03/2010	-21.6	n/a
17/03/2010	-21.5	n/a	17/03/2010	-18.1	n/a	17/03/2010	-25.6	n/a
18/03/2010	-23.1	n/a	18/03/2010	-19.8	n/a	18/03/2010	-26.0	n/a
19/03/2010	-20.9	n/a	19/03/2010	-18.5	n/a	19/03/2010	-25.7	n/a
20/03/2010	-26.5	n/a	20/03/2010	-23.6	n/a	20/03/2010	-28.4	n/a
21/03/2010	-26.4	n/a	21/03/2010	-23.6	n/a	21/03/2010	-28.6	n/a
22/03/2010	-27.7	n/a	22/03/2010	-25.8	n/a	22/03/2010	-30.3	n/a
23/03/2010	-30.5	n/a	23/03/2010	-28.1	n/a	23/03/2010	-32.5	n/a
24/03/2010	-27.1	n/a	24/03/2010	-24.1	n/a	24/03/2010	-30.2	n/a
25/03/2010	-28.8	n/a	25/03/2010	-22.3	n/a	25/03/2010	-32.7	n/a
26/03/2010	-28.0	n/a	26/03/2010	-21.0	n/a	26/03/2010	-31.8	n/a
27/03/2010	-27.9	n/a	27/03/2010	-20.6	n/a	27/03/2010	-32.4	n/a
28/03/2010	-23.9	n/a	28/03/2010	-16.7	n/a	28/03/2010	-29.4	n/a
29/03/2010	-18.7	n/a	29/03/2010	-13.1	n/a	29/03/2010	-26.4	n/a
30/03/2010	-10.2	n/a	30/03/2010	-6.8	n/a	30/03/2010	-14.1	n/a
31/03/2010	-11.3	n/a	31/03/2010	-8.1	n/a	31/03/2010	-12.9	n/a
01/04/2010	-13.0	n/a	01/04/2010	-12.5	n/a	01/04/2010	-13.4	n/a
02/04/2010	-11.9	n/a	02/04/2010	-11.0	n/a	02/04/2010	-13.2	n/a
03/04/2010	-11.1	n/a	03/04/2010	-8.4	n/a	03/04/2010	-12.8	n/a
04/04/2010	-11.1	n/a	04/04/2010	-8.5	n/a	04/04/2010	-15.4	n/a
05/04/2010	-14.1	n/a	05/04/2010	-5.7	n/a	05/04/2010	-18.9	n/a
06/04/2010	-13.8	n/a	06/04/2010	-9.2	n/a	06/04/2010	-18.2	n/a
07/04/2010	-8.0	n/a	07/04/2010	-4.4	n/a	07/04/2010	-13.8	n/a
08/04/2010	-7.6	n/a	08/04/2010	-2.8	n/a	08/04/2010	-11.5	n/a
09/04/2010	-14.6	n/a	09/04/2010	-11.5	n/a	09/04/2010	-17.7	n/a
10/04/2010	-18.6	n/a	10/04/2010	-16.0	n/a	10/04/2010	-20.9	n/a
11/04/2010	-18.3	n/a	11/04/2010	-14.0	n/a	11/04/2010	-23.6	n/a
12/04/2010	-9.0	n/a	12/04/2010	-2.3	n/a	12/04/2010	-17.2	n/a
13/04/2010	-4.3	n/a	13/04/2010	0.4	n/a	13/04/2010	-10.2	n/a
14/04/2010	-1.5	n/a	14/04/2010	0.4	n/a	14/04/2010	-6.1	n/a
15/04/2010	-6.2	n/a	15/04/2010	-2.6	n/a	15/04/2010	-10.2	n/a
16/04/2010	-7.0	n/a	16/04/2010	-2.5	n/a	16/04/2010	-13.5	n/a
17/04/2010	-10.1	n/a	17/04/2010	-5.3	n/a	17/04/2010	-15.5	n/a
18/04/2010	-12.1	n/a	18/04/2010	-6.1	n/a	18/04/2010	-18.1	n/a
19/04/2010	-6.1	n/a	19/04/2010	-0.8	n/a	19/04/2010	-12.2	n/a
20/04/2010	-1.8	n/a	20/04/2010	6.5	n/a	20/04/2010	-9.6	n/a
21/04/2010	-1.9	n/a	21/04/2010	1.4	n/a	21/04/2010	-7.7	n/a
22/04/2010	-8.2	n/a	22/04/2010	-5.3	n/a	22/04/2010	-11.2	n/a
23/04/2010	-8.8	n/a	23/04/2010	-6.3	n/a	23/04/2010	-13.3	n/a
24/04/2010	-5.9	n/a	24/04/2010	-3.8	n/a	24/04/2010	-9.0	n/a
25/04/2010	-3.9	n/a	25/04/2010	-1.6	n/a	25/04/2010	-6.0	n/a
26/04/2010	-4.2	n/a	26/04/2010	-2.1	n/a	26/04/2010	-10.3	n/a
27/04/2010	-4.5	n/a	27/04/2010	-1.2	n/a	27/04/2010	-10.9	n/a
28/04/2010	-3.6	n/a	28/04/2010	-2.5	n/a	28/04/2010	-5.0	n/a
29/04/2010	-4.7	n/a	29/04/2010	-2.5	n/a	29/04/2010	-9.6	n/a
30/04/2010	-3.6	n/a	30/04/2010	0.0	n/a	30/04/2010	-5.7	n/a
01/05/2010	-8.6	n/a	01/05/2010	-3.8	n/a	01/05/2010	-14.4	n/a
02/05/2010	-13.4	n/a	02/05/2010	-11.3	n/a	02/05/2010	-15.1	n/a
03/05/2010	-13.0	n/a	03/05/2010	-9.8	n/a	03/05/2010	-15.2	n/a
04/05/2010	-9.8	n/a	04/05/2010	-5.8	n/a	04/05/2010	-14.9	n/a
05/05/2010	-9.3	n/a	05/05/2010	-6.6	n/a	05/05/2010	-11.8	n/a
06/05/2010	-9.0	n/a	06/05/2010	-6.1	n/a	06/05/2010	-12.1	n/a
07/05/2010	-9.4	n/a	07/05/2010	-7.5	n/a	07/05/2010	-11.5	n/a
08/05/2010	-10.5	n/a	08/05/2010	-6.4	n/a	08/05/2010	-15.2	n/a
09/05/2010	-12.4	-11.5	09/05/2010	-10.1	-9.2	09/05/2010	-17.6	-16.9
10/05/2010	-14.1	-12.8	10/05/2010	-8.7	-7.7	10/05/2010	-19.8	-19.7
11/05/2010	-9.2	-8.7	11/05/2010	-5.0	-2.1	11/05/2010	-15.3	-15.6
12/05/2010	-10.3	-9.6	12/05/2010	-8.5	-3.7	12/05/2010	-13.6	-15.0
13/05/2010	-10.2	-10.1	13/05/2010	-7.6	-6.9	13/05/2010	-13.1	-14.5
14/05/2010	-8.7	-8.6	14/05/2010	-6.6	-6.0	14/05/2010	-12.4	-14.4
15/05/2010	-8.6	-9.0	15/05/2010	-5.2	-4.5	15/05/2010	-11.5	-17.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
16/05/2010	-8.5	-6.7	16/05/2010	-1.8	-3.0	16/05/2010	-14.9	-10.6
17/05/2010	-6.7	-7.4	17/05/2010	-4.8	-4.5	17/05/2010	-9.1	-11.8
18/05/2010	-6.8	-7.7	18/05/2010	-3.9	-1.3	18/05/2010	-9.7	-13.6
19/05/2010	-7.0	-7.1	19/05/2010	-1.7	1.1	19/05/2010	-13.4	-15.1
20/05/2010	-6.3	-7.1	20/05/2010	-1.3	-3.2	20/05/2010	-10.8	-12.7
21/05/2010	-8.7	-9.3	21/05/2010	-5.9	-5.4	21/05/2010	-10.7	-14.0
22/05/2010	-9.3	-8.5	22/05/2010	-6.1	-4.4	22/05/2010	-11.8	-14.9
23/05/2010	-10.2	-10.4	23/05/2010	-5.5	-4.4	23/05/2010	-14.1	-17.3
24/05/2010	-8.9	-8.3	24/05/2010	-5.6	-3.2	24/05/2010	-11.7	-13.8
25/05/2010	-6.3	-3.6	25/05/2010	-1.1	0.6	25/05/2010	-14.2	-13.2
26/05/2010	-3.4	-1.2	26/05/2010	0.3	4.5	26/05/2010	-7.6	-4.5
27/05/2010	-2.7	-2.0	27/05/2010	-1.0	-1.0	27/05/2010	-4.2	-2.9
28/05/2010	-3.0	-2.0	28/05/2010	-0.8	-0.2	28/05/2010	-5.6	-3.7
29/05/2010	0.6	0.9	29/05/2010	8.7	6.7	29/05/2010	-7.6	-5.6
30/05/2010	4.7	3.7	30/05/2010	10.6	9.2	30/05/2010	-1.0	-1.6
31/05/2010	0.7	0.2	31/05/2010	2.9	1.9	31/05/2010	-1.5	-1.0
01/06/2010	1.0	0.9	01/06/2010	5.1	4.8	01/06/2010	-1.7	-1.6
02/06/2010	2.6	1.4	02/06/2010	7.8	5.2	02/06/2010	-3.4	-2.5
03/06/2010	8.3	6.0	03/06/2010	14.7	12.9	03/06/2010	1.6	1.2
04/06/2010	0.8	0.8	04/06/2010	7.6	2.8	04/06/2010	-1.1	-0.8
05/06/2010	-1.7	-1.5	05/06/2010	-0.1	0.0	05/06/2010	-3.1	-2.7
06/06/2010	-1.3	-1.1	06/06/2010	1.7	1.6	06/06/2010	-5.6	-4.1
07/06/2010	-0.3	0.3	07/06/2010	1.5	1.5	07/06/2010	-2.3	-1.7
08/06/2010	0.2	0.3	08/06/2010	3.2	3.1	08/06/2010	-2.0	-2.2
09/06/2010	2.0	1.5	09/06/2010	6.1	5.0	09/06/2010	-1.4	-1.4
10/06/2010	5.4	4.2	10/06/2010	11.0	10.8	10/06/2010	0.4	-0.3
11/06/2010	10.4	10.0	11/06/2010	16.0	15.7	11/06/2010	2.2	2.2
12/06/2010	13.2	13.2	12/06/2010	18.3	20.2	12/06/2010	6.6	5.5
13/06/2010	13.2	13.0	13/06/2010	20.7	21.5	13/06/2010	6.9	4.1
14/06/2010	11.5	12.6	14/06/2010	17.8	19.2	14/06/2010	6.0	6.2
15/06/2010	4.8	6.4	15/06/2010	7.7	10.1	15/06/2010	1.0	2.4
16/06/2010	4.3	5.9	16/06/2010	9.3	11.5	16/06/2010	0.4	0.0
17/06/2010	2.7	2.7	17/06/2010	5.6	5.9	17/06/2010	0.4	0.2
18/06/2010	4.5	5.2	18/06/2010	7.5	9.7	18/06/2010	1.5	0.3
19/06/2010	5.1	5.7	19/06/2010	9.2	9.9	19/06/2010	1.2	1.8
20/06/2010	7.8	8.6	20/06/2010	13.1	15.6	20/06/2010	4.0	2.8
21/06/2010	4.3	4.6	21/06/2010	6.3	6.5	21/06/2010	1.4	2.5
22/06/2010	3.1	2.9	22/06/2010	5.7	5.4	22/06/2010	0.9	1.3
23/06/2010	6.7	5.9	23/06/2010	12.3	11.6	23/06/2010	1.4	1.0
24/06/2010	11.6	11.5	24/06/2010	17.4	17.5	24/06/2010	4.1	2.9
25/06/2010	9.6	9.4	25/06/2010	13.0	11.5	25/06/2010	6.8	7.1
26/06/2010	12.4	12.8	26/06/2010	17.9	17.5	26/06/2010	6.6	5.8
27/06/2010	13.0	12.9	27/06/2010	17.5	17.9	27/06/2010	8.4	6.6
28/06/2010	12.4	11.5	28/06/2010	17.5	15.0	28/06/2010	8.1	8.7
29/06/2010	13.5	13.1	29/06/2010	19.8	20.3	29/06/2010	7.5	7.1
30/06/2010	14.3	14.4	30/06/2010	20.2	20.0	30/06/2010	9.2	9.8
01/07/2010	11.6	12.3	01/07/2010	14.2	16.5	01/07/2010	9.6	9.6
02/07/2010	13.5	14.2	02/07/2010	18.0	20.4	02/07/2010	6.9	5.6
03/07/2010	10.0	9.6	03/07/2010	13.8	13.0	03/07/2010	7.8	7.9
04/07/2010	6.2	6.2	04/07/2010	7.8	8.0	04/07/2010	4.9	5.1
05/07/2010	6.4	6.7	05/07/2010	7.9	8.6	05/07/2010	4.6	5.0
06/07/2010	7.5	7.5	06/07/2010	8.4	8.4	06/07/2010	6.8	6.7
07/07/2010	11.3	10.8	07/07/2010	15.4	14.6	07/07/2010	7.2	7.5
08/07/2010	14.1	13.9	08/07/2010	19.7	20.1	08/07/2010	8.8	6.0
09/07/2010	8.5	11.0	09/07/2010	13.1	14.6	09/07/2010	6.5	8.7
10/07/2010	9.0	10.3	10/07/2010	14.9	13.5	10/07/2010	6.0	6.3
11/07/2010	10.5	10.8	11/07/2010	17.9	17.8	11/07/2010	5.4	6.2
12/07/2010	16.4	15.9	12/07/2010	24.7	25.5	12/07/2010	10.7	10.2
13/07/2010	11.8	13.4	13/07/2010	15.3	15.9	13/07/2010	10.0	10.8
14/07/2010	15.8	16.3	14/07/2010	24.1	25.7	14/07/2010	10.0	9.4
15/07/2010	16.5	18.2	15/07/2010	19.2	24.5	15/07/2010	14.2	11.7
16/07/2010	13.4	18.5	16/07/2010	19.9	27.6	16/07/2010	8.7	12.1
17/07/2010	11.5	17.1	17/07/2010	17.6	25.1	17/07/2010	7.7	9.7
18/07/2010	12.5	15.8	18/07/2010	19.1	21.8	18/07/2010	8.0	10.2
19/07/2010	12.8	13.3	19/07/2010	18.6	18.3	19/07/2010	8.3	9.1
20/07/2010	16.4	17.2	20/07/2010	21.9	22.7	20/07/2010	11.0	9.5
21/07/2010	12.2	13.6	21/07/2010	14.3	15.8	21/07/2010	8.8	10.3
22/07/2010	11.8	12.5	22/07/2010	16.6	17.3	22/07/2010	7.4	6.3
23/07/2010	16.3	16.2	23/07/2010	22.0	22.3	23/07/2010	9.3	7.1
24/07/2010	19.5	19.8	24/07/2010	26.6	27.6	24/07/2010	13.7	12.8
25/07/2010	18.6	18.9	25/07/2010	21.4	23.8	25/07/2010	15.9	15.4
26/07/2010	14.3	14.8	26/07/2010	16.4	16.8	26/07/2010	10.7	10.0
27/07/2010	13.3	12.2	27/07/2010	18.7	17.3	27/07/2010	8.4	7.2
28/07/2010	15.3	15.3	28/07/2010	19.1	21.0	28/07/2010	11.5	8.7
29/07/2010	16.5	16.0	29/07/2010	23.4	23.1	29/07/2010	9.5	9.9
30/07/2010	16.6	16.9	30/07/2010	20.8	22.2	30/07/2010	13.3	12.9
31/07/2010	13.4	13.9	31/07/2010	16.4	16.2	31/07/2010	11.3	12.3
01/08/2010	12.9	13.4	01/08/2010	15.9	16.6	01/08/2010	10.8	11.1
02/08/2010	7.4	8.5	02/08/2010	11.3	14.0	02/08/2010	4.9	5.6
03/08/2010	8.6	9.1	03/08/2010	12.1	12.3	03/08/2010	6.3	6.7
04/08/2010	7.9	8.2	04/08/2010	12.2	11.6	04/08/2010	3.7	5.4
05/08/2010	10.6	10.7	05/08/2010	14.6	15.7	05/08/2010	7.2	4.6
06/08/2010	14.7	15.3	06/08/2010	20.5	20.9	06/08/2010	9.8	9.6
07/08/2010	16.1	16.4	07/08/2010	23.2	23.0	07/08/2010	9.1	9.3

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
08/08/2010	17.6	17.1	08/08/2010	24.9	24.4	08/08/2010	10.8	9.4
09/08/2010	18.2	17.7	09/08/2010	24.4	25.0	09/08/2010	13.1	10.8
10/08/2010	16.4	15.8	10/08/2010	21.6	22.2	10/08/2010	11.0	9.3
11/08/2010	16.3	16.7	11/08/2010	21.4	23.0	11/08/2010	11.9	11.6
12/08/2010	10.8	12.1	12/08/2010	13.3	15.0	12/08/2010	7.1	7.9
13/08/2010	8.3	9.4	13/08/2010	11.2	13.4	13/08/2010	5.5	6.4
14/08/2010	10.1	9.8	14/08/2010	15.4	15.1	14/08/2010	5.4	5.1
15/08/2010	9.8	9.8	15/08/2010	12.7	13.3	15/08/2010	6.3	4.4
16/08/2010	7.3	8.0	16/08/2010	10.2	11.6	16/08/2010	4.1	3.8
17/08/2010	7.1	7.1	17/08/2010	9.4	9.5	17/08/2010	4.9	1.7
18/08/2010	5.9	5.4	18/08/2010	8.6	10.3	18/08/2010	3.6	0.5
19/08/2010	6.2	6.8	19/08/2010	8.4	9.3	19/08/2010	4.7	3.8
20/08/2010	7.8	8.3	20/08/2010	10.5	11.2	20/08/2010	5.3	5.9
21/08/2010	9.4	10.1	21/08/2010	14.5	14.4	21/08/2010	4.2	6.9
22/08/2010	10.9	11.0	22/08/2010	17.1	17.7	22/08/2010	4.1	5.1
23/08/2010	12.3	12.9	23/08/2010	17.8	18.9	23/08/2010	5.3	6.7
24/08/2010	11.3	12.0	24/08/2010	15.4	16.5	24/08/2010	8.1	6.0
25/08/2010	8.4	9.4	25/08/2010	10.5	11.4	25/08/2010	6.8	7.7
26/08/2010	7.7	8.7	26/08/2010	10.1	10.8	26/08/2010	6.1	6.3
27/08/2010	6.9	7.5	27/08/2010	9.0	10.5	27/08/2010	5.1	4.7
28/08/2010	5.8	6.4	28/08/2010	7.9	9.5	28/08/2010	4.1	4.2
29/08/2010	5.7	6.0	29/08/2010	10.4	10.1	29/08/2010	3.1	2.1
30/08/2010	8.7	8.2	30/08/2010	15.1	15.7	30/08/2010	2.1	0.9
31/08/2010	8.7	9.3	31/08/2010	11.6	15.1	31/08/2010	4.4	1.2
01/09/2010	7.7	7.4	01/09/2010	10.8	9.5	01/09/2010	3.6	3.6
02/09/2010	9.2	8.9	02/09/2010	15.7	16.2	02/09/2010	3.0	1.6
03/09/2010	10.4	9.9	03/09/2010	17.3	17.4	03/09/2010	4.7	2.1
04/09/2010	9.4	10.2	04/09/2010	12.7	14.4	04/09/2010	5.5	5.1
05/09/2010	10.9	12.3	05/09/2010	16.8	18.3	05/09/2010	7.6	6.9
06/09/2010	8.2	8.9	06/09/2010	11.7	11.9	06/09/2010	4.5	6.5
07/09/2010	3.3	4.8	07/09/2010	5.1	6.8	07/09/2010	1.4	2.0
08/09/2010	1.0	2.1	08/09/2010	2.8	3.7	08/09/2010	-0.3	0.0
09/09/2010	5.7	6.2	09/09/2010	10.5	13.8	09/09/2010	2.5	2.2
10/09/2010	7.1	7.1	10/09/2010	10.8	12.4	10/09/2010	3.8	1.9
11/09/2010	5.4	6.7	11/09/2010	7.2	8.5	11/09/2010	3.5	5.0
12/09/2010	4.6	5.0	12/09/2010	6.8	6.8	12/09/2010	3.7	3.1
13/09/2010	5.5	6.4	13/09/2010	10.6	11.3	13/09/2010	0.4	2.1
14/09/2010	4.9	5.9	14/09/2010	8.4	9.0	14/09/2010	-2.8	2.3
15/09/2010	-1.3	-0.5	15/09/2010	0.8	2.4	15/09/2010	-3.3	-2.9
16/09/2010	-1.3	-2.4	16/09/2010	2.1	1.9	16/09/2010	-3.5	-6.0
17/09/2010	-0.4	-1.0	17/09/2010	2.3	2.1	17/09/2010	-4.3	-4.7
18/09/2010	0.1	-0.2	18/09/2010	2.3	1.3	18/09/2010	-2.0	-1.2
19/09/2010	-0.6	-0.3	19/09/2010	0.7	1.2	19/09/2010	-2.4	-2.1
20/09/2010	-1.5	-1.3	20/09/2010	-0.2	-0.3	20/09/2010	-3.3	-5.1
21/09/2010	-1.7	-1.9	21/09/2010	1.3	1.3	21/09/2010	-3.2	-5.1
22/09/2010	-1.8	-2.1	22/09/2010	0.0	1.0	22/09/2010	-3.4	-5.8
23/09/2010	-2.0	-1.1	23/09/2010	-0.5	0.8	23/09/2010	-2.8	-3.0
24/09/2010	-2.3	-1.2	24/09/2010	-0.8	0.2	24/09/2010	-3.9	-3.0
25/09/2010	-2.8	-2.4	25/09/2010	-1.6	-1.4	25/09/2010	-6.2	-5.7
26/09/2010	-4.3	-4.0	26/09/2010	0.0	0.6	26/09/2010	-5.9	-5.8
27/09/2010	-4.3	-3.6	27/09/2010	0.0	0.5	27/09/2010	-8.5	-6.7
28/09/2010	-0.7	0.4	28/09/2010	0.2	1.1	28/09/2010	-5.3	-5.7
29/09/2010	-1.5	-0.5	29/09/2010	1.0	0.7	29/09/2010	-5.2	-5.6
30/09/2010	-2.7	-2.3	30/09/2010	1.5	1.6	30/09/2010	-7.5	-6.3
01/10/2010	0.9	1.9	01/10/2010	2.5	3.7	01/10/2010	-2.4	-1.0
02/10/2010	0.6	1.0	02/10/2010	2.4	4.5	02/10/2010	-5.5	-4.5
03/10/2010	-1.4	-0.2	03/10/2010	0.4	2.0	03/10/2010	-5.3	-3.5
04/10/2010	-3.9	-3.2	04/10/2010	-0.2	0.0	04/10/2010	-6.6	-6.1
05/10/2010	-1.4	-1.1	05/10/2010	0.6	0.7	05/10/2010	-3.7	-4.5
06/10/2010	-0.5	0.2	06/10/2010	0.9	1.7	06/10/2010	-7.1	-7.5
07/10/2010	-4.1	-2.9	07/10/2010	-1.9	-1.2	07/10/2010	-7.5	-7.3
08/10/2010	-3.2	-3.4	08/10/2010	-1.7	-1.4	08/10/2010	-6.5	-7.6
09/10/2010	-2.6	-2.3	09/10/2010	0.6	1.0	09/10/2010	-3.9	-4.5
10/10/2010	-1.0	-0.4	10/10/2010	0.5	1.1	10/10/2010	-3.6	-3.4
11/10/2010	1.3	2.3	11/10/2010	2.6	5.4	11/10/2010	-3.2	-2.4
12/10/2010	-1.7	-0.8	12/10/2010	0.1	1.0	12/10/2010	-5.1	-3.9
13/10/2010	-4.2	-3.2	13/10/2010	-3.1	-2.1	13/10/2010	-6.9	-6.0
14/10/2010	-6.0	-5.0	14/10/2010	-4.9	-3.9	14/10/2010	-6.7	-6.0
15/10/2010	-6.7	-5.7	15/10/2010	-5.8	-5.2	15/10/2010	-7.5	-6.3
16/10/2010	-6.0	-5.4	16/10/2010	-5.3	-4.8	16/10/2010	-10.0	-6.8
17/10/2010	-7.3	-6.1	17/10/2010	-5.8	-5.2	17/10/2010	-10.3	-8.4
18/10/2010	-9.5	-8.0	18/10/2010	-5.1	-4.2	18/10/2010	-13.1	-11.8
19/10/2010	-7.7	-6.9	19/10/2010	-4.2	-4.3	19/10/2010	-12.0	-9.8
20/10/2010	-6.0	-5.6	20/10/2010	-2.5	-2.3	20/10/2010	-7.5	-6.7
21/10/2010	-5.6	-5.8	21/10/2010	-2.7	-2.4	21/10/2010	-8.4	-10.5
22/10/2010	-2.9	-2.7	22/10/2010	-2.3	-1.6	22/10/2010	-4.7	-4.5
23/10/2010	-3.9	-3.8	23/10/2010	-3.3	-2.9	23/10/2010	-5.7	-12.2
24/10/2010	-5.6	-6.1	24/10/2010	-4.6	-4.1	24/10/2010	-6.5	-10.6
25/10/2010	-5.8	-7.5	25/10/2010	-4.8	-5.4	25/10/2010	-10.3	-11.2
26/10/2010	-6.9	-8.2	26/10/2010	-5.4	-6.8	26/10/2010	-12.4	-14.9
27/10/2010	-9.1	-11.7	27/10/2010	-6.6	-8.7	27/10/2010	-20.3	-21.5
28/10/2010	-17.2	-16.6	28/10/2010	-6.8	-7.6	28/10/2010	-20.8	-21.2
29/10/2010	-12.0	-13.7	29/10/2010	-1.2	-0.5	29/10/2010	-20.8	-21.9
30/10/2010	-3.4	-3.6	30/10/2010	-1.1	-0.4	30/10/2010	-6.9	-8.0

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
31/10/2010	-1.3	-0.8	31/10/2010	0.0	1.0	31/10/2010	-4.6	-4.3
01/11/2010	-8.2	-7.1	01/11/2010	-4.0	-3.7	01/11/2010	-13.4	-10.7
02/11/2010	-6.7	-5.9	02/11/2010	-4.1	-3.3	02/11/2010	-10.8	-9.8
03/11/2010	-9.1	-8.9	03/11/2010	-7.8	-7.4	03/11/2010	-15.3	-15.5
04/11/2010	-12.6	-12.5	04/11/2010	-1.6	-0.9	04/11/2010	-15.7	-16.6
05/11/2010	-7.3	-6.4	05/11/2010	-1.5	-0.2	05/11/2010	-15.3	-15.0
06/11/2010	-8.0	-6.6	06/11/2010	-2.0	-1.1	06/11/2010	-19.6	-19.6
07/11/2010	-13.9	-12.8	07/11/2010	-11.9	-11.0	07/11/2010	-23.4	-24.7
08/11/2010	-20.9	-22.4	08/11/2010	-9.0	-7.7	08/11/2010	-23.5	-25.7
09/11/2010	-15.2	-14.8	09/11/2010	-7.2	-4.5	09/11/2010	-23.7	-24.2
10/11/2010	-6.7	-5.9	10/11/2010	-4.7	-4.4	10/11/2010	-10.8	-10.4
11/11/2010	-9.7	-8.6	11/11/2010	-6.7	-5.9	11/11/2010	-14.0	-13.6
12/11/2010	-13.4	-13.0	12/11/2010	-9.9	-9.5	12/11/2010	-18.3	-18.9
13/11/2010	-8.8	-8.0	13/11/2010	-6.2	-5.5	13/11/2010	-13.1	-12.9
14/11/2010	-12.4	-12.2	14/11/2010	-10.0	-9.6	14/11/2010	-15.9	-17.9
15/11/2010	-14.8	-15.2	15/11/2010	-12.3	-12.9	15/11/2010	-23.2	-23.1
16/11/2010	-19.8	-19.6	16/11/2010	-15.9	-14.9	16/11/2010	-22.2	-24.9
17/11/2010	-24.2	-24.9	17/11/2010	-15.7	-16.3	17/11/2010	-26.8	-28.0
18/11/2010	-18.5	-18.0	18/11/2010	-16.2	-15.6	18/11/2010	-27.5	-25.7
19/11/2010	-16.8	-15.8	19/11/2010	-8.8	-8.5	19/11/2010	-30.0	-28.8
20/11/2010	-28.2	-27.2	20/11/2010	-18.6	-18.1	20/11/2010	-29.7	-28.6
21/11/2010	-24.7	-24.2	21/11/2010	-17.9	-17.4	21/11/2010	-29.7	-28.9
22/11/2010	-18.5	-17.9	22/11/2010	-17.9	-17.3	22/11/2010	-23.4	-22.2
23/11/2010	-20.6	-20.8	23/11/2010	-17.8	-17.3	23/11/2010	-26.0	-28.2
24/11/2010	-22.8	-23.4	24/11/2010	-21.1	-20.9	24/11/2010	-32.4	-35.4
25/11/2010	-29.1	-32.4	25/11/2010	-25.3	-23.4	25/11/2010	-31.9	-35.6
26/11/2010	-29.5	-25.1	26/11/2010	-16.9	-12.8	26/11/2010	-32.9	-35.0
27/11/2010	-19.5	-18.3	27/11/2010	-13.9	-13.2	27/11/2010	-25.3	-23.6
28/11/2010	-15.9	-15.6	28/11/2010	-14.0	-11.3	28/11/2010	-22.6	-20.3
29/11/2010	-18.3	-17.5	29/11/2010	-14.0	-13.8	29/11/2010	-25.8	-25.4
30/11/2010	-22.3	-21.1	30/11/2010	-18.8	-17.5	30/11/2010	-25.2	-25.9
01/12/2010	-16.8	-16.2	01/12/2010	-13.9	-12.7	01/12/2010	-23.0	-22.7
02/12/2010	-22.4	-21.6	02/12/2010	-18.8	-17.7	02/12/2010	-29.0	-28.9
03/12/2010	-25.7	-26.1	03/12/2010	-22.9	-22.7	03/12/2010	-33.5	-36.6
04/12/2010	-30.6	-31.8	04/12/2010	-26.1	-25.8	04/12/2010	-32.8	-36.5
05/12/2010	-29.1	-30.1	05/12/2010	-25.9	-25.4	05/12/2010	-34.4	-36.9
06/12/2010	-26.8	-28.2	06/12/2010	-24.8	-25.8	06/12/2010	-32.0	-32.5
07/12/2010	-29.7	-30.8	07/12/2010	-27.8	-27.9	07/12/2010	-32.3	-34.2
08/12/2010	-31.7	-32.8	08/12/2010	-26.4	-26.8	08/12/2010	-33.6	-35.9
09/12/2010	-30.7	-31.5	09/12/2010	-25.8	-24.4	09/12/2010	-33.5	-34.7
10/12/2010	-26.0	-24.8	10/12/2010	-23.9	-23.2	10/12/2010	-28.9	-27.8
11/12/2010	-26.1	-25.0	11/12/2010	-24.1	-23.1	11/12/2010	-28.6	-28.2
12/12/2010	-28.0	-28.0	12/12/2010	-25.2	-25.1	12/12/2010	-30.2	-31.1
13/12/2010	-25.2	-24.6	13/12/2010	-24.0	-22.8	13/12/2010	-30.1	-33.8
14/12/2010	-26.6	-27.0	14/12/2010	-24.0	-21.3	14/12/2010	-30.6	-32.5
15/12/2010	-27.2	-30.4	15/12/2010	-16.7	-22.1	15/12/2010	-31.4	-34.9
16/12/2010	-20.9	-16.8	16/12/2010	-14.7	-13.9	16/12/2010	-24.4	-22.2
17/12/2010	-21.1	-22.3	17/12/2010	-17.1	-16.3	17/12/2010	-24.9	-25.0
18/12/2010	-18.0	-17.9	18/12/2010	-6.6	-5.9	18/12/2010	-19.6	-19.3
19/12/2010	-11.8	-9.7	19/12/2010	-5.2	-3.8	19/12/2010	-17.3	-16.3
20/12/2010	-11.1	-10.8	20/12/2010	-6.5	-5.8	20/12/2010	-17.5	-17.6
21/12/2010	-16.6	-17.5	21/12/2010	-13.7	-13.1	21/12/2010	-23.9	-23.4
22/12/2010	-20.4	-19.4	22/12/2010	-16.8	-14.9	22/12/2010	-24.4	-25.4
23/12/2010	-23.2	-23.2	23/12/2010	-17.6	-18.0	23/12/2010	-24.7	-25.2
24/12/2010	-20.3	-20.7	24/12/2010	-13.9	-12.1	24/12/2010	-24.4	-24.1
25/12/2010	-13.3	-12.2	25/12/2010	-9.7	-8.5	25/12/2010	-27.3	-26.8
26/12/2010	-22.4	-22.3	26/12/2010	-14.5	-12.7	26/12/2010	-27.1	-26.7
27/12/2010	-24.2	-24.1	27/12/2010	-21.8	-21.8	27/12/2010	-27.7	-26.7
28/12/2010	-24.9	-23.8	28/12/2010	-22.1	-21.6	28/12/2010	-27.1	-26.6
29/12/2010	-26.9	-26.4	29/12/2010	-26.3	-25.9	29/12/2010	-28.2	-30.3
30/12/2010	-27.6	-28.1	30/12/2010	-25.5	-25.8	30/12/2010	-29.2	-30.4
31/12/2010	-27.6	-28.5	31/12/2010	-25.9	-26.2	31/12/2010	-29.6	-30.3
01/01/2011	-29.5	-32.1	01/01/2011	-25.8	-29.2	01/01/2011	-31.8	-34.4
02/01/2011	-26.9	-28.0	02/01/2011	-20.6	-23.9	02/01/2011	-32.3	-34.2
03/01/2011	-25.7	-29.9	03/01/2011	-20.6	-27.3	03/01/2011	-27.5	-33.3
04/01/2011	-28.8	-31.4	04/01/2011	-26.4	-28.8	04/01/2011	-31.1	-33.6
05/01/2011	-30.0	-28.4	05/01/2011	-25.3	-24.3	05/01/2011	-33.5	-33.1
06/01/2011	-27.3	-27.9	06/01/2011	-23.0	-22.3	06/01/2011	-31.5	-32.8
07/01/2011	-30.8	-32.3	07/01/2011	-22.0	-29.4	07/01/2011	-33.9	-34.5
08/01/2011	-20.8	-22.4	08/01/2011	-19.4	-19.6	08/01/2011	-24.9	-32.0
09/01/2011	-20.5	-20.5	09/01/2011	-18.2	-19.0	09/01/2011	-24.0	-22.5
10/01/2011	-25.6	-25.4	10/01/2011	-24.0	-22.5	10/01/2011	-26.8	-28.3
11/01/2011	-23.4	-24.8	11/01/2011	-21.0	-21.3	11/01/2011	-28.5	-29.4
12/01/2011	-29.6	-30.9	12/01/2011	-27.7	-27.4	12/01/2011	-31.9	-35.0
13/01/2011	-31.7	-34.0	13/01/2011	-29.6	-29.5	13/01/2011	-33.1	-36.5
14/01/2011	-30.2	-29.5	14/01/2011	-26.7	-26.5	14/01/2011	-34.2	-33.6
15/01/2011	-23.1	-22.9	15/01/2011	-21.5	-21.0	15/01/2011	-26.8	-26.5
16/01/2011	-26.5	-26.3	16/01/2011	-22.3	-21.7	16/01/2011	-28.6	-29.8
17/01/2011	-26.2	-26.7	17/01/2011	-23.0	-23.6	17/01/2011	-28.9	-29.4
18/01/2011	-25.7	-26.0	18/01/2011	-22.7	-24.2	18/01/2011	-28.6	-28.9
19/01/2011	-33.7	-33.3	19/01/2011	-28.1	-25.4	19/01/2011	-37.7	-37.5
20/01/2011	-36.3	-36.2	20/01/2011	-33.0	-32.7	20/01/2011	-39.2	-39.6
21/01/2011	-37.5	-37.9	21/01/2011	-34.6	-35.9	21/01/2011	-40.0	-40.1
22/01/2011	-37.4	-38.7	22/01/2011	-35.9	-35.4	22/01/2011	-39.1	-41.1

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
23/01/2011	-32.4	-32.1	23/01/2011	-26.6	-27.0	23/01/2011	-37.9	-38.7
24/01/2011	-32.9	-32.9	24/01/2011	-30.5	-29.7	24/01/2011	-37.9	-36.9
25/01/2011	-36.7	-36.3	25/01/2011	-33.9	-33.5	25/01/2011	-39.3	-38.1
26/01/2011	-37.2	-39.6	26/01/2011	-30.5	-31.1	26/01/2011	-40.1	-42.4
27/01/2011	-27.4	-27.1	27/01/2011	-21.9	-21.8	27/01/2011	-33.6	-33.8
28/01/2011	-34.0	-34.1	28/01/2011	-30.5	-31.8	28/01/2011	-35.8	-35.9
29/01/2011	-31.4	-31.2	29/01/2011	-26.6	-26.9	29/01/2011	-33.1	-33.6
30/01/2011	-27.4	-26.5	30/01/2011	-25.4	-24.8	30/01/2011	-29.0	-28.5
31/01/2011	-23.7	-23.5	31/01/2011	-20.2	-19.8	31/01/2011	-27.1	-26.8
01/02/2011	-26.0	-25.2	01/02/2011	-23.3	-23.0	01/02/2011	-29.3	-28.4
02/02/2011	-16.9	-17.4	02/02/2011	-10.8	-13.0	02/02/2011	-25.0	-23.1
03/02/2011	-13.6	-12.9	03/02/2011	-10.2	-10.6	03/02/2011	-18.3	-15.9
04/02/2011	-18.3	-17.5	04/02/2011	-16.2	-15.4	04/02/2011	-23.7	-20.1
05/02/2011	-23.2	-22.5	05/02/2011	-19.5	-19.3	05/02/2011	-27.9	-27.1
06/02/2011	-25.7	-26.0	06/02/2011	-18.4	-19.5	06/02/2011	-27.9	-28.1
07/02/2011	-22.7	-22.3	07/02/2011	-18.7	-18.4	07/02/2011	-28.0	-26.8
08/02/2011	-29.8	-30.0	08/02/2011	-27.8	-26.7	08/02/2011	-31.5	-32.9
09/02/2011	-30.2	-31.2	09/02/2011	-28.1	-29.4	09/02/2011	-32.3	-33.0
10/02/2011	-29.0	-27.2	10/02/2011	n/a	-22.6	10/02/2011	n/a	-31.9
11/02/2011	n/a	-29.0	11/02/2011	n/a	-27.4	11/02/2011	n/a	-31.1
12/02/2011	n/a	-31.3	12/02/2011	n/a	-28.2	12/02/2011	n/a	-32.7
13/02/2011	n/a	-32.7	13/02/2011	n/a	-29.7	13/02/2011	n/a	-35.1
14/02/2011	n/a	-28.3	14/02/2011	n/a	-25.8	14/02/2011	n/a	-31.8
15/02/2011	n/a	-31.7	15/02/2011	n/a	-29.3	15/02/2011	n/a	-33.9
16/02/2011	n/a	-32.6	16/02/2011	n/a	-29.7	16/02/2011	n/a	-36.2
17/02/2011	n/a	-32.2	17/02/2011	n/a	-29.1	17/02/2011	n/a	-34.4
18/02/2011	n/a	-30.3	18/02/2011	n/a	-25.6	18/02/2011	n/a	-34.6
19/02/2011	n/a	-25.7	19/02/2011	n/a	-22.5	19/02/2011	n/a	-29.4
20/02/2011	n/a	-23.5	20/02/2011	n/a	-21.6	20/02/2011	n/a	-25.6
21/02/2011	n/a	-26.1	21/02/2011	n/a	-24.1	21/02/2011	n/a	-29.0
22/02/2011	n/a	-27.8	22/02/2011	n/a	-25.7	22/02/2011	n/a	-29.8
23/02/2011	n/a	-29.5	23/02/2011	n/a	-28.4	23/02/2011	n/a	-31.4
24/02/2011	n/a	-30.6	24/02/2011	n/a	-25.7	24/02/2011	n/a	-34.4
25/02/2011	n/a	-20.1	25/02/2011	n/a	-14.4	25/02/2011	n/a	-28.3
26/02/2011	n/a	-18.5	26/02/2011	n/a	-14.0	26/02/2011	n/a	-24.0
27/02/2011	n/a	-29.3	27/02/2011	n/a	-24.0	27/02/2011	n/a	-30.9
28/02/2011	n/a	-30.4	28/02/2011	n/a	-28.2	28/02/2011	n/a	-32.5
01/03/2011	n/a	-29.5	01/03/2011	n/a	-27.6	01/03/2011	n/a	-32.1
02/03/2011	n/a	-29.2	02/03/2011	n/a	-27.2	02/03/2011	n/a	-31.9
03/03/2011	n/a	-34.2	03/03/2011	n/a	-31.9	03/03/2011	n/a	-37.3
04/03/2011	n/a	-34.0	04/03/2011	n/a	-30.5	04/03/2011	n/a	-37.7
05/03/2011	n/a	-33.7	05/03/2011	n/a	-31.7	05/03/2011	n/a	-36.7
06/03/2011	n/a	-23.1	06/03/2011	n/a	-19.5	06/03/2011	n/a	-32.1
07/03/2011	n/a	-23.1	07/03/2011	n/a	-19.8	07/03/2011	n/a	-29.9
08/03/2011	n/a	-26.8	08/03/2011	n/a	-22.8	08/03/2011	n/a	-30.9
09/03/2011	n/a	-37.0	09/03/2011	n/a	-30.6	09/03/2011	n/a	-41.1
10/03/2011	n/a	-34.6	10/03/2011	n/a	-32.6	10/03/2011	n/a	-36.3
11/03/2011	n/a	-32.7	11/03/2011	n/a	-29.1	11/03/2011	n/a	-35.4
12/03/2011	n/a	-34.5	12/03/2011	n/a	-29.9	12/03/2011	n/a	-38.4
13/03/2011	n/a	-35.6	13/03/2011	n/a	-26.6	13/03/2011	n/a	-41.3
14/03/2011	n/a	-32.7	14/03/2011	n/a	-25.7	14/03/2011	n/a	-38.4
15/03/2011	n/a	-33.8	15/03/2011	n/a	-30.8	15/03/2011	n/a	-37.4
16/03/2011	n/a	-33.6	16/03/2011	n/a	-28.7	16/03/2011	n/a	-39.6
17/03/2011	n/a	-23.8	17/03/2011	n/a	-18.7	17/03/2011	n/a	-30.1
18/03/2011	n/a	-26.6	18/03/2011	n/a	-23.6	18/03/2011	n/a	-30.4
19/03/2011	n/a	-27.5	19/03/2011	n/a	-22.4	19/03/2011	n/a	-31.0
20/03/2011	n/a	-28.3	20/03/2011	n/a	-22.6	20/03/2011	n/a	-31.8
21/03/2011	n/a	-22.7	21/03/2011	n/a	-18.1	21/03/2011	n/a	-30.4
22/03/2011	n/a	-17.2	22/03/2011	n/a	-11.1	22/03/2011	n/a	-21.5
23/03/2011	n/a	-16.4	23/03/2011	n/a	-10.9	23/03/2011	n/a	-22.2
24/03/2011	n/a	-8.1	24/03/2011	n/a	-5.8	24/03/2011	n/a	-11.1
25/03/2011	n/a	-9.4	25/03/2011	n/a	-7.1	25/03/2011	n/a	-14.1
26/03/2011	n/a	-11.2	26/03/2011	n/a	-5.8	26/03/2011	n/a	-16.5
27/03/2011	n/a	-11.2	27/03/2011	n/a	-7.5	27/03/2011	n/a	-15.1
28/03/2011	n/a	-5.9	28/03/2011	n/a	-1.6	28/03/2011	n/a	-12.3
29/03/2011	n/a	-6.3	29/03/2011	n/a	-0.6	29/03/2011	n/a	-14.2
30/03/2011	n/a	-11.7	30/03/2011	n/a	-6.6	30/03/2011	n/a	-17.4
31/03/2011	n/a	-9.3	31/03/2011	n/a	-7.0	31/03/2011	n/a	-11.5
01/04/2011	n/a	-11.7	01/04/2011	n/a	-8.5	01/04/2011	n/a	-15.2
02/04/2011	n/a	-14.9	02/04/2011	n/a	-12.5	02/04/2011	n/a	-17.2
03/04/2011	n/a	-18.6	03/04/2011	n/a	-14.8	03/04/2011	n/a	-26.4
04/04/2011	n/a	-22.1	04/04/2011	n/a	-16.6	04/04/2011	n/a	-29.1
05/04/2011	n/a	-20.1	05/04/2011	n/a	-16.2	05/04/2011	n/a	-25.6
06/04/2011	n/a	-19.5	06/04/2011	n/a	-12.4	06/04/2011	n/a	-26.5
07/04/2011	n/a	-19.2	07/04/2011	n/a	-15.5	07/04/2011	n/a	-21.8
08/04/2011	n/a	-15.8	08/04/2011	n/a	-11.2	08/04/2011	n/a	-20.8
09/04/2011	n/a	-21.0	09/04/2011	n/a	-13.0	09/04/2011	n/a	-27.2
10/04/2011	n/a	-24.9	10/04/2011	n/a	-19.9	10/04/2011	n/a	-30.3
11/04/2011	n/a	-27.7	11/04/2011	n/a	-23.0	11/04/2011	n/a	-31.1
12/04/2011	n/a	-24.3	12/04/2011	n/a	-18.1	12/04/2011	n/a	-30.5
13/04/2011	n/a	-22.0	13/04/2011	n/a	-17.7	13/04/2011	n/a	-27.1
14/04/2011	n/a	-20.5	14/04/2011	n/a	-15.8	14/04/2011	n/a	-25.5
15/04/2011	n/a	-16.9	15/04/2011	n/a	-12.6	15/04/2011	n/a	-20.4
16/04/2011	n/a	-14.3	16/04/2011	n/a	-9.6	16/04/2011	n/a	-19.6

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
17/04/2011	n/a	-17.2	17/04/2011	n/a	-12.4	17/04/2011	n/a	-20.8
18/04/2011	n/a	-20.2	18/04/2011	n/a	-18.5	18/04/2011	n/a	-25.0
19/04/2011	n/a	-18.3	19/04/2011	n/a	-11.1	19/04/2011	n/a	-26.2
20/04/2011	n/a	-16.2	20/04/2011	n/a	-10.1	20/04/2011	n/a	-24.2
21/04/2011	n/a	-24.7	21/04/2011	n/a	-21.4	21/04/2011	n/a	-29.2
22/04/2011	n/a	-22.0	22/04/2011	n/a	-14.7	22/04/2011	n/a	-30.5
23/04/2011	n/a	-23.6	23/04/2011	n/a	-19.4	23/04/2011	n/a	-27.3
24/04/2011	n/a	-24.7	24/04/2011	n/a	-19.6	24/04/2011	n/a	-30.0
25/04/2011	n/a	-18.4	25/04/2011	n/a	-11.3	25/04/2011	n/a	-25.7
26/04/2011	n/a	-14.6	26/04/2011	n/a	-8.0	26/04/2011	n/a	-20.8
27/04/2011	n/a	-12.7	27/04/2011	n/a	-7.5	27/04/2011	n/a	-18.0
28/04/2011	n/a	-15.2	28/04/2011	n/a	-13.5	28/04/2011	n/a	-20.7
29/04/2011	n/a	-15.7	29/04/2011	n/a	-12.2	29/04/2011	n/a	-22.0
30/04/2011	n/a	-12.6	30/04/2011	n/a	-7.9	30/04/2011	n/a	-17.1
01/05/2011	n/a	-18.9	01/05/2011	n/a	-15.2	01/05/2011	n/a	-23.6
02/05/2011	n/a	-16.2	02/05/2011	n/a	-9.0	02/05/2011	n/a	-23.5
03/05/2011	n/a	-11.8	03/05/2011	n/a	-3.8	03/05/2011	n/a	-17.7
04/05/2011	n/a	-10.8	04/05/2011	n/a	-4.5	04/05/2011	n/a	-17.6
05/05/2011	n/a	-9.1	05/05/2011	n/a	-1.3	05/05/2011	n/a	-17.6
06/05/2011	n/a	-1.8	06/05/2011	n/a	3.9	06/05/2011	n/a	-5.4
07/05/2011	n/a	-4.7	07/05/2011	n/a	0.2	07/05/2011	n/a	-11.0
08/05/2011	n/a	-2.9	08/05/2011	n/a	0.3	08/05/2011	n/a	-6.3
09/05/2011	n/a	-3.5	09/05/2011	n/a	2.7	09/05/2011	n/a	-9.3
10/05/2011	n/a	-5.6	10/05/2011	n/a	-0.5	10/05/2011	n/a	-12.3
11/05/2011	n/a	0.4	11/05/2011	n/a	3.1	11/05/2011	n/a	-2.0
12/05/2011	n/a	0.9	12/05/2011	n/a	3.8	12/05/2011	n/a	-0.9
13/05/2011	n/a	-3.3	13/05/2011	n/a	-0.5	13/05/2011	n/a	-6.6
14/05/2011	n/a	-2.4	14/05/2011	n/a	4.5	14/05/2011	n/a	-8.3
15/05/2011	n/a	1.2	15/05/2011	n/a	4.5	15/05/2011	n/a	-2.4
16/05/2011	n/a	-3.4	16/05/2011	n/a	-1.1	16/05/2011	n/a	-5.2
17/05/2011	n/a	-5.7	17/05/2011	n/a	-3.7	17/05/2011	n/a	-7.8
18/05/2011	n/a	-5.4	18/05/2011	n/a	-2.9	18/05/2011	n/a	-7.3
19/05/2011	n/a	-4.7	19/05/2011	n/a	-1.6	19/05/2011	n/a	-8.0
20/05/2011	n/a	-5.7	20/05/2011	n/a	0.0	20/05/2011	n/a	-12.1
21/05/2011	n/a	-4.8	21/05/2011	n/a	0.3	21/05/2011	n/a	-9.6
22/05/2011	n/a	-4.1	22/05/2011	n/a	1.0	22/05/2011	n/a	-8.3
23/05/2011	n/a	-2.3	23/05/2011	n/a	0.1	23/05/2011	n/a	-5.3
24/05/2011	n/a	-0.9	24/05/2011	n/a	2.7	24/05/2011	n/a	-4.4
25/05/2011	3.1	0.9	25/05/2011	5.2	4.5	25/05/2011	-0.3	-3.6
26/05/2011	-1.0	-1.7	26/05/2011	0.6	0.3	26/05/2011	-2.9	-4.5
27/05/2011	-1.0	-0.7	27/05/2011	4.5	5.1	27/05/2011	-5.3	-4.6
28/05/2011	2.8	3.2	28/05/2011	7.3	9.6	28/05/2011	-2.0	-3.5
29/05/2011	5.0	3.0	29/05/2011	12.0	8.9	29/05/2011	-2.6	-3.5
30/05/2011	8.3	8.5	30/05/2011	14.4	15.4	30/05/2011	2.7	1.2
31/05/2011	2.6	2.4	31/05/2011	8.2	6.4	31/05/2011	-0.4	-0.2
01/06/2011	4.7	5.6	01/06/2011	13.3	15.0	01/06/2011	-4.3	-2.2
02/06/2011	-4.5	-3.7	02/06/2011	-2.2	-1.5	02/06/2011	-6.8	-5.9
03/06/2011	-3.3	-3.0	03/06/2011	-0.6	-0.7	03/06/2011	-5.9	-5.4
04/06/2011	-2.6	-2.3	04/06/2011	-0.5	0.1	04/06/2011	-4.6	-5.4
05/06/2011	-1.3	-0.8	05/06/2011	0.9	1.1	05/06/2011	-2.4	-1.9
06/06/2011	-2.7	-1.6	06/06/2011	-2.0	-0.9	06/06/2011	-3.2	-2.5
07/06/2011	-2.0	-1.5	07/06/2011	0.5	0.9	07/06/2011	-3.9	-3.6
08/06/2011	-0.7	0.4	08/06/2011	2.0	3.7	08/06/2011	-2.9	-1.5
09/06/2011	-0.2	0.3	09/06/2011	3.3	3.5	09/06/2011	-2.8	-1.8
10/06/2011	4.2	4.8	10/06/2011	10.6	11.6	10/06/2011	-3.1	-2.6
11/06/2011	3.0	3.7	11/06/2011	8.2	8.1	11/06/2011	-0.8	0.0
12/06/2011	7.5	8.0	12/06/2011	14.3	15.1	12/06/2011	-0.2	-0.3
13/06/2011	5.7	4.5	13/06/2011	10.7	9.5	13/06/2011	1.9	2.0
14/06/2011	3.5	3.2	14/06/2011	7.4	6.7	14/06/2011	1.1	0.7
15/06/2011	4.7	5.7	15/06/2011	9.6	11.2	15/06/2011	-0.3	-0.6
16/06/2011	8.8	9.3	16/06/2011	16.9	18.0	16/06/2011	0.8	0.7
17/06/2011	15.2	14.7	17/06/2011	21.8	21.5	17/06/2011	7.6	4.2
18/06/2011	13.6	12.6	18/06/2011	18.2	18.4	18/06/2011	7.4	4.6
19/06/2011	13.9	14.3	19/06/2011	20.4	20.3	19/06/2011	7.5	7.2
20/06/2011	13.5	13.5	20/06/2011	21.4	22.5	20/06/2011	7.2	5.9
21/06/2011	5.3	6.4	21/06/2011	8.5	10.5	21/06/2011	2.7	2.9
22/06/2011	4.8	6.4	22/06/2011	9.2	13.0	22/06/2011	1.0	1.9
23/06/2011	10.2	10.7	23/06/2011	16.6	16.8	23/06/2011	2.7	3.1
24/06/2011	12.3	13.0	24/06/2011	20.4	20.7	24/06/2011	5.4	5.4
25/06/2011	3.1	3.6	25/06/2011	6.6	7.8	25/06/2011	0.4	0.6
26/06/2011	2.3	2.5	26/06/2011	4.7	4.5	26/06/2011	0.0	0.0
27/06/2011	4.6	5.4	27/06/2011	8.1	9.8	27/06/2011	1.8	2.4
28/06/2011	5.1	6.4	28/06/2011	8.0	10.3	28/06/2011	2.2	3.4
29/06/2011	9.3	8.6	29/06/2011	15.4	13.6	29/06/2011	1.9	1.9
30/06/2011	7.8	8.4	30/06/2011	10.3	12.8	30/06/2011	5.8	5.5
01/07/2011	5.1	4.5	01/07/2011	7.6	6.4	01/07/2011	2.6	3.2
02/07/2011	5.2	5.4	02/07/2011	7.6	9.2	02/07/2011	2.5	3.0
03/07/2011	14.5	15.1	03/07/2011	23.9	23.9	03/07/2011	5.7	6.8
04/07/2011	16.8	16.8	04/07/2011	21.6	21.5	04/07/2011	12.0	11.8
05/07/2011	15.2	14.8	05/07/2011	19.1	19.6	05/07/2011	10.3	9.1
06/07/2011	16.3	15.4	06/07/2011	19.4	19.3	06/07/2011	12.0	9.2
07/07/2011	13.9	14.1	07/07/2011	16.4	17.8	07/07/2011	11.8	8.9
08/07/2011	15.3	15.4	08/07/2011	21.1	22.2	08/07/2011	10.0	8.8
09/07/2011	16.8	16.5	09/07/2011	21.8	22.0	09/07/2011	10.9	9.2

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
10/07/2011	18.4	17.9	10/07/2011	23.5	23.7	10/07/2011	12.4	10.4
11/07/2011	18.3	18.8	11/07/2011	24.3	25.4	11/07/2011	12.6	12.6
12/07/2011	14.3	15.7	12/07/2011	18.8	19.8	12/07/2011	**9.8**	11.8
13/07/2011	11.6	11.8	13/07/2011	15.7	15.9	13/07/2011	**7.5**	8.0
14/07/2011	12.2	13.0	14/07/2011	15.7	17.4	14/07/2011	8.0	4.9
15/07/2011	11.1	11.6	15/07/2011	14.3	15.5	15/07/2011	8.0	7.5
16/07/2011	12.1	12.0	16/07/2011	15.1	15.6	16/07/2011	9.0	8.0
17/07/2011	13.7	13.9	17/07/2011	19.1	19.3	17/07/2011	7.3	7.2
18/07/2011	16.2	15.9	18/07/2011	21.3	23.4	18/07/2011	9.3	6.8
19/07/2011	15.8	15.3	19/07/2011	19.1	19.9	19/07/2011	11.7	10.1
20/07/2011	14.9	14.7	20/07/2011	19.8	20.4	20/07/2011	8.9	7.1
21/07/2011	16.5	16.3	21/07/2011	22.3	23.1	21/07/2011	10.1	7.3
22/07/2011	17.9	17.7	22/07/2011	22.5	24.1	22/07/2011	11.0	9.4
23/07/2011	19.7	19.4	23/07/2011	24.7	25.3	23/07/2011	14.7	9.4
24/07/2011	18.3	18.1	24/07/2011	22.8	24.8	24/07/2011	14.6	11.1
25/07/2011	19.6	20.6	25/07/2011	25.0	26.4	25/07/2011	14.7	14.7
26/07/2011	13.3	14.4	26/07/2011	19.0	17.5	26/07/2011	10.2	11.2
27/07/2011	12.0	12.5	27/07/2011	16.1	17.1	27/07/2011	8.0	7.4
28/07/2011	14.7	14.2	28/07/2011	20.1	20.0	28/07/2011	9.4	8.0
29/07/2011	12.0	12.7	29/07/2011	13.8	16.1	29/07/2011	10.6	7.8
30/07/2011	12.4	12.8	30/07/2011	17.0	17.1	30/07/2011	8.1	8.5
31/07/2011	13.4	13.2	31/07/2011	18.8	18.5	31/07/2011	6.6	7.0
01/08/2011	12.2	12.0	01/08/2011	14.0	14.2	01/08/2011	10.0	10.1
02/08/2011	11.9	11.8	02/08/2011	15.1	14.4	02/08/2011	9.6	9.3
03/08/2011	11.1	11.1	03/08/2011	14.1	14.0	03/08/2011	8.2	8.6
04/08/2011	13.8	13.9	04/08/2011	20.0	19.3	04/08/2011	8.3	8.8
05/08/2011	16.7	16.0	05/08/2011	23.6	23.4	05/08/2011	9.3	7.2
06/08/2011	18.9	18.6	06/08/2011	24.0	23.8	06/08/2011	12.8	14.0
07/08/2011	17.5	16.9	07/08/2011	21.7	22.2	07/08/2011	12.2	11.2
08/08/2011	15.9	14.5	08/08/2011	20.4	19.8	08/08/2011	10.7	7.3
09/08/2011	14.9	14.2	09/08/2011	18.1	18.7	09/08/2011	10.6	8.5
10/08/2011	12.0	11.9	10/08/2011	15.5	16.6	10/08/2011	9.8	7.7
11/08/2011	11.1	12.1	11/08/2011	14.1	15.3	11/08/2011	9.1	9.9
12/08/2011	9.9	10.3	12/08/2011	11.4	11.8	12/08/2011	8.1	8.4
13/08/2011	12.4	12.8	13/08/2011	15.5	16.4	13/08/2011	9.1	9.0
14/08/2011	13.5	13.7	14/08/2011	18.3	19.1	14/08/2011	8.3	5.1
15/08/2011	12.9	12.3	15/08/2011	16.5	17.1	15/08/2011	8.2	4.2
16/08/2011	10.4	10.4	16/08/2011	13.6	11.9	16/08/2011	9.1	9.5
17/08/2011	10.1	10.8	17/08/2011	13.1	14.6	17/08/2011	7.5	8.3
18/08/2011	8.6	8.8	18/08/2011	10.9	11.9	18/08/2011	7.1	7.2
19/08/2011	6.9	8.1	19/08/2011	10.6	11.1	19/08/2011	3.2	4.3
20/08/2011	7.4	8.0	20/08/2011	10.3	11.4	20/08/2011	4.6	5.0
21/08/2011	9.1	9.3	21/08/2011	13.6	14.7	21/08/2011	3.3	1.2
22/08/2011	11.0	11.9	22/08/2011	15.6	18.1	22/08/2011	8.3	8.5
23/08/2011	12.6	13.6	23/08/2011	16.1	17.4	23/08/2011	9.1	8.2
24/08/2011	12.7	12.9	24/08/2011	17.3	18.7	24/08/2011	9.0	6.0
25/08/2011	10.9	11.3	25/08/2011	13.9	15.5	25/08/2011	7.9	6.3
26/08/2011	8.6	9.3	26/08/2011	10.8	11.6	26/08/2011	7.5	8.0
27/08/2011	8.8	9.2	27/08/2011	13.4	14.4	27/08/2011	4.6	3.3
28/08/2011	6.8	7.4	28/08/2011	9.3	10.4	28/08/2011	4.1	5.4
29/08/2011	8.3	8.1	29/08/2011	14.1	13.5	29/08/2011	5.2	3.7
30/08/2011	8.1	7.5	30/08/2011	11.6	12.4	30/08/2011	4.6	1.8
31/08/2011	4.0	3.4	31/08/2011	7.2	6.6	31/08/2011	1.8	1.5
01/09/2011	2.5	2.7	01/09/2011	5.0	4.1	01/09/2011	0.5	0.6
02/09/2011	2.9	2.6	02/09/2011	7.2	7.4	02/09/2011	0.0	0.2
03/09/2011	4.6	5.1	03/09/2011	10.5	11.8	03/09/2011	-0.2	-1.8
04/09/2011	5.4	5.4	04/09/2011	9.0	9.7	04/09/2011	0.1	0.0
05/09/2011	3.6	3.8	05/09/2011	5.0	5.2	05/09/2011	2.4	2.6
06/09/2011	6.8	6.9	06/09/2011	13.5	13.8	06/09/2011	1.8	2.7
07/09/2011	10.6	11.2	07/09/2011	16.2	17.0	07/09/2011	6.8	6.6
08/09/2011	5.1	5.9	08/09/2011	10.4	11.8	08/09/2011	3.3	3.8
09/09/2011	7.1	8.1	09/09/2011	11.2	13.0	09/09/2011	2.5	2.1
10/09/2011	7.4	8.1	10/09/2011	11.4	11.4	10/09/2011	4.4	6.1
11/09/2011	1.3	2.1	11/09/2011	4.3	6.2	11/09/2011	-0.5	0.3
12/09/2011	0.0	0.6	12/09/2011	1.9	2.2	12/09/2011	-1.4	-0.9
13/09/2011	2.9	3.3	13/09/2011	8.9	9.4	13/09/2011	-1.8	-1.7
14/09/2011	4.8	5.7	14/09/2011	9.5	10.7	14/09/2011	-1.1	0.1
15/09/2011	4.9	5.4	15/09/2011	7.1	6.5	15/09/2011	3.7	3.5
16/09/2011	2.5	2.4	16/09/2011	4.4	4.9	16/09/2011	0.7	1.2
17/09/2011	1.5	2.0	17/09/2011	3.6	3.9	17/09/2011	0.4	0.5
18/09/2011	-0.9	-0.4	18/09/2011	0.6	1.5	18/09/2011	-2.0	-1.9
19/09/2011	-0.1	0.1	19/09/2011	4.3	5.6	19/09/2011	-2.8	-2.8
20/09/2011	5.0	4.7	20/09/2011	12.2	12.0	20/09/2011	-0.5	-1.9
21/09/2011	9.3	10.0	21/09/2011	14.8	15.7	21/09/2011	5.4	5.6
22/09/2011	10.4	11.1	22/09/2011	14.5	16.2	22/09/2011	6.7	6.9
23/09/2011	5.6	6.5	23/09/2011	8.7	10.6	23/09/2011	3.6	4.6
24/09/2011	3.4	4.0	24/09/2011	4.9	6.2	24/09/2011	1.9	0.1
25/09/2011	1.8	2.4	25/09/2011	3.8	4.7	25/09/2011	0.3	0.1
26/09/2011	0.1	1.0	26/09/2011	1.3	1.9	26/09/2011	-1.6	0.3
27/09/2011	-2.3	-1.3	27/09/2011	-1.2	0.5	27/09/2011	-3.8	-2.9
28/09/2011	-4.9	-4.1	28/09/2011	-3.7	-2.7	28/09/2011	-5.7	-5.7
29/09/2011	-3.2	-2.4	29/09/2011	0.0	1.3	29/09/2011	-5.9	-5.0
30/09/2011	-0.9	-0.4	30/09/2011	0.2	1.0	30/09/2011	-1.8	-1.5
01/10/2011	-3.9	-3.1	01/10/2011	-1.5	-1.1	01/10/2011	-5.7	-4.7

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
02/10/2011	-2.5	-2.4	17/04/2011	1.4	1.4	17/04/2011	-6.5	-6.2
03/10/2011	-0.6	0.1	18/04/2011	1.4	1.6	18/04/2011	-2.4	-2.6
04/10/2011	-1.6	-1.5	19/04/2011	1.1	2.1	19/04/2011	-5.3	-6.0
05/10/2011	1.4	2.0	20/04/2011	3.1	4.0	20/04/2011	0.3	0.8
06/10/2011	1.5	1.9	21/04/2011	4.2	5.7	21/04/2011	-0.3	-0.5
07/10/2011	1.0	0.8	22/04/2011	2.2	2.3	22/04/2011	-0.2	-0.4
08/10/2011	-0.2	0.1	23/04/2011	1.1	0.8	23/04/2011	-2.7	-2.0
09/10/2011	-4.4	-3.3	24/04/2011	-2.4	-1.7	24/04/2011	-7.0	-5.7
10/10/2011	-8.0	-7.1	25/04/2011	-6.8	-5.7	25/04/2011	-10.0	-9.3
11/10/2011	-6.1	-5.2	26/04/2011	-2.7	-2.1	26/04/2011	-9.2	-8.3
12/10/2011	-1.0	-1.3	27/04/2011	0.4	-0.2	27/04/2011	-2.7	-2.8
13/10/2011	-1.2	-1.2	28/04/2011	-0.1	0.3	28/04/2011	-2.3	-3.5
14/10/2011	-1.1	-1.5	29/04/2011	0.7	-0.2	29/04/2011	-2.3	-2.9
15/10/2011	-2.1	-2.8	30/04/2011	-1.0	-1.3	30/04/2011	-3.3	-5.7
16/10/2011	-6.4	-5.2	01/05/2011	-3.2	-2.7	01/05/2011	-11.4	-10.2
17/10/2011	-9.8	-10.4	02/05/2011	-7.4	-8.4	02/05/2011	-11.5	-13.1
18/10/2011	-8.2	-8.7	03/05/2011	-7.0	-7.3	03/05/2011	-9.8	-9.7
19/10/2011	-8.2	-7.9	04/05/2011	-7.4	-6.8	04/05/2011	-9.5	-9.2
20/10/2011	-10.8	-9.9	05/05/2011	-9.3	-8.4	05/05/2011	-11.8	-10.8
21/10/2011	-11.7	-11.2	06/05/2011	-10.9	-10.5	06/05/2011	-12.6	-12.4
22/10/2011	-12.8	-12.5	07/05/2011	-11.5	-11.0	07/05/2011	-15.2	-14.8
23/10/2011	-8.7	-8.6	08/05/2011	-1.4	-1.6	08/05/2011	-16.2	-14.6
24/10/2011	-8.1	-7.0	09/05/2011	-2.8	-1.5	09/05/2011	-11.0	-10.9
25/10/2011	-16.6	-15.0	10/05/2011	-11.0	-8.6	10/05/2011	-20.3	-20.1
26/10/2011	-4.3	-4.9	11/05/2011	-1.6	-0.5	11/05/2011	-11.4	-11.8
27/10/2011	-8.6	-7.0	12/05/2011	-0.9	0.7	12/05/2011	-16.1	-17.4
28/10/2011	-18.1	-18.1	13/05/2011	-16.1	-14.9	13/05/2011	-20.3	-21.3
29/10/2011	-14.7	-14.3	14/05/2011	-10.1	-9.5	14/05/2011	-17.1	-17.8
30/10/2011	-5.6	-4.3	15/05/2011	-2.3	-0.7	15/05/2011	-10.3	-9.8
31/10/2011	-2.2	-1.9	16/05/2011	-1.4	-0.7	16/05/2011	-3.4	-4.5
01/11/2011	-6.0	-5.2	17/05/2011	-3.4	-3.5	17/05/2011	-8.7	-8.1
02/11/2011	-11.7	-12.2	18/05/2011	-8.1	-7.0	18/05/2011	-14.8	-17.7
03/11/2011	-11.1	-12.8	19/05/2011	-9.5	-10.4	19/05/2011	-12.7	-16.7
04/11/2011	-13.1	-11.7	20/05/2011	-12.1	-10.9	20/05/2011	-15.0	-13.8
05/11/2011	-12.4	-11.2	21/05/2011	-10.1	-9.2	21/05/2011	-14.9	-13.9
06/11/2011	-12.7	-12.2	22/05/2011	-9.7	-8.8	22/05/2011	-17.0	-18.4
07/11/2011	-18.4	-19.8	23/05/2011	-13.8	-13.5	23/05/2011	-23.6	-24.9
08/11/2011	-12.1	-11.9	24/05/2011	-10.0	-9.9	24/05/2011	-15.2	-14.1
09/11/2011	-16.6	-14.5	25/05/2011	-11.7	-10.7	25/05/2011	-22.4	-20.5
10/11/2011	-15.6	-14.2	26/05/2011	-11.7	-10.3	26/05/2011	-22.3	-21.5
11/11/2011	-11.2	-10.5	27/05/2011	-10.0	-9.1	27/05/2011	-12.5	-11.7
12/11/2011	-15.1	-15.2	28/05/2011	-11.2	-10.4	28/05/2011	-18.4	-19.1
13/11/2011	-19.2	-17.9	29/05/2011	-15.3	-15.7	29/05/2011	-26.6	-20.7
14/11/2011	-22.9	-20.6	30/05/2011	-19.0	-17.6	30/05/2011	-26.8	-26.8
15/11/2011	-22.7	-24.3	31/05/2011	-18.6	-18.4	31/05/2011	-26.6	-28.3
16/11/2011	-24.3	-27.3	01/06/2011	-20.8	-25.5	01/06/2011	-27.8	-29.8
17/11/2011	-20.6	-21.0	02/06/2011	-18.4	-18.7	02/06/2011	-23.3	-28.6
18/11/2011	-21.8	-21.2	03/06/2011	-19.9	-18.8	03/06/2011	-23.5	-22.8
19/11/2011	-20.5	-19.6	04/06/2011	-19.5	-18.5	04/06/2011	-23.0	-23.4
20/11/2011	-26.7	-26.5	05/06/2011	-22.6	-23.2	05/06/2011	-29.4	-28.8
21/11/2011	-30.5	-30.5	06/06/2011	-29.3	-28.5	06/06/2011	-31.3	-31.8
22/11/2011	-30.7	-31.4	07/06/2011	-28.0	-30.3	07/06/2011	-32.1	-32.8
23/11/2011	-23.1	-23.6	08/06/2011	-21.0	-21.1	08/06/2011	-28.0	-30.3
24/11/2011	-18.7	-17.4	09/06/2011	-15.7	-14.1	09/06/2011	-21.8	-23.9
25/11/2011	-16.8	-17.3	10/06/2011	-14.2	-13.7	10/06/2011	-20.1	-22.1
26/11/2011	-18.0	-17.2	11/06/2011	-14.3	-13.0	11/06/2011	-23.7	-23.8
27/11/2011	-23.5	-22.2	12/06/2011	-21.2	-20.0	12/06/2011	-25.3	-24.6
28/11/2011	-24.7	-24.2	13/06/2011	-22.1	-21.9	13/06/2011	-29.2	-28.6
29/11/2011	-23.9	-23.7	14/06/2011	-19.0	-18.7	14/06/2011	-29.4	-28.8
30/11/2011	-21.1	-20.9	15/06/2011	-19.3	-18.6	15/06/2011	-24.4	-24.4
01/12/2011	-25.1	-24.7	16/06/2011	-22.7	-21.9	16/06/2011	-28.3	-29.2
02/12/2011	-27.0	-26.4	17/06/2011	-23.9	-22.0	17/06/2011	-30.5	-30.3
03/12/2011	-29.1	-30.4	18/06/2011	-26.7	-28.4	18/06/2011	-31.3	-31.8
04/12/2011	-29.3	-29.8	19/06/2011	-27.0	-26.8	19/06/2011	-31.2	-31.7
05/12/2011	-18.8	-18.9	20/06/2011	-7.3	-8.9	20/06/2011	-29.1	-28.9
06/12/2011	-18.2	-17.2	21/06/2011	-6.8	-6.8	21/06/2011	-23.7	-23.0
07/12/2011	-21.1	-20.1	22/06/2011	-20.1	-18.7	22/06/2011	-22.9	-21.6
08/12/2011	-25.1	-24.9	23/06/2011	-22.7	-21.4	23/06/2011	-28.2	-27.9
09/12/2011	-26.3	-25.7	24/06/2011	-22.7	-21.2	24/06/2011	-28.6	-28.1
10/12/2011	-25.2	-27.5	25/06/2011	-22.6	-21.2	25/06/2011	-26.7	-30.5
11/12/2011	-25.0	-23.9	26/06/2011	-19.3	-19.1	26/06/2011	-28.7	-28.8
12/12/2011	-13.5	-12.9	27/06/2011	-10.0	-8.3	27/06/2011	-19.6	-19.5
13/12/2011	-21.5	-20.4	28/06/2011	-10.1	-8.3	28/06/2011	-28.6	-28.4
14/12/2011	-27.9	-27.8	29/06/2011	-26.6	-26.8	29/06/2011	-29.2	-28.8
15/12/2011	-24.2	-24.5	30/06/2011	-21.0	-21.2	30/06/2011	-27.7	-28.1
16/12/2011	-24.4	-27.3	01/07/2011	-19.5	-24.1	01/07/2011	-27.9	-30.1
17/12/2011	-23.9	-24.4	02/07/2011	-19.9	-21.9	02/07/2011	-26.5	-28.5
18/12/2011	-29.4	-29.2	03/07/2011	-24.1	-24.7	03/07/2011	-33.7	-34.9
19/12/2011	-25.7	-25.0	04/07/2011	-21.2	-21.9	04/07/2011	-32.9	-32.6
20/12/2011	-29.4	-31.5	05/07/2011	-25.9	-25.4	05/07/2011	-33.8	-34.8
21/12/2011	-31.1	-31.4	06/07/2011	-27.5	-28.7	06/07/2011	-34.1	-33.7
22/12/2011	-29.4	-28.8	07/07/2011	-18.7	-17.9	07/07/2011	-34.9	-34.2
23/12/2011	-20.3	-19.8	08/07/2011	-18.1	-17.7	08/07/2011	-23.0	-22.5
24/12/2011	-25.5	-24.5	09/07/2011	-21.6	-19.5	09/07/2011	-27.7	-27.2

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
25/01/2011	-29.4	-29.5	25/01/2011	-26.29	-25.7	25/01/2011	-31.9	-32.9
26/01/2011	-29.0	-29.2	26/01/2011	-27.4	-27.2	26/01/2011	-30.4	-30.9
27/01/2011	-29.7	-31.0	27/01/2011	-25.98	-27.3	27/01/2011	-31.9	-33.8
28/01/2011	-26.7	-26.1	28/01/2011	-24.77	-23.4	28/01/2011	-31.1	-32.9
29/01/2011	-29.2	-25.9	29/01/2011	-27.67	-24.0	29/01/2011	-30.8	-30.5
30/01/2011	-30.5	-30.8	30/01/2011	-29.41	-30.0	30/01/2011	-31.8	-31.7
31/01/2011	-29.9	-30.4	31/01/2011	-28.31	-29.4	31/01/2011	-33.3	-34.3
01/01/2012	-33.1	-34.4	01/01/2012	-29.8	-29.3	01/01/2012	-36.8	-38.4
02/01/2012	-25.8	-26.2	02/01/2012	-19.2	-19.5	02/01/2012	-33.3	-33.6
03/01/2012	-22.6	-22.2	03/01/2012	-20.3	-19.9	03/01/2012	-24.9	-24.8
04/01/2012	-29.4	-31.7	04/01/2012	-24.9	-24.8	04/01/2012	-34.5	-37.6
05/01/2012	-33.7	-35.2	05/01/2012	-29.3	-31.6	05/01/2012	-36.5	-37.9
06/01/2012	-31.2	-31.1	06/01/2012	-27.8	-27.7	06/01/2012	-33.2	-33.7
07/01/2012	-25.6	-24.0	07/01/2012	-21.5	-21.4	07/01/2012	-32.1	-29.6
08/01/2012	-28.2	-29.7	08/01/2012	-23.1	-22.7	08/01/2012	-32.7	-34.9
09/01/2012	-34.8	-35.5	09/01/2012	-32.0	-33.8	09/01/2012	-36.0	-36.6
10/01/2012	-27.9	-29.5	10/01/2012	-22.4	-22.8	10/01/2012	-35.4	-36.0
11/01/2012	-30.9	-29.8	11/01/2012	-26.9	-23.8	11/01/2012	-33.7	-33.3
12/01/2012	-22.9	-22.0	12/01/2012	-18.5	-18.7	12/01/2012	-27.7	-27.1
13/01/2012	-25.6	-27.9	13/01/2012	-21.9	-25.7	13/01/2012	-28.0	-29.5
14/01/2012	-24.0	-25.5	14/01/2012	-21.5	-22.0	14/01/2012	-27.7	-30.0
15/01/2012	-34.0	-33.9	15/01/2012	-27.6	-27.5	15/01/2012	-38.7	-39.8
16/01/2012	-33.1	-34.1	16/01/2012	-29.0	-27.9	16/01/2012	-39.5	-40.7
17/01/2012	-28.5	-29.1	17/01/2012	-20.3	-22.2	17/01/2012	-32.2	-33.0
18/01/2012	-25.3	-25.0	18/01/2012	-17.4	-17.8	18/01/2012	-30.4	-29.8
19/01/2012	-33.0	-33.4	19/01/2012	-30.4	-29.8	19/01/2012	-33.9	-35.4
20/01/2012	-35.3	-36.3	20/01/2012	-32.8	-32.5	20/01/2012	-39.0	-39.7
21/01/2012	-40.9	-42.9	21/01/2012	-38.7	-39.7	21/01/2012	-43.8	-45.4
22/01/2012	-39.5	-40.4	22/01/2012	-33.0	-32.5	22/01/2012	-43.4	-45.5
23/01/2012	-32.3	-33.1	23/01/2012	-30.2	-29.8	23/01/2012	-35.7	-38.4
24/01/2012	-31.6	-33.1	24/01/2012	-25.8	-23.9	24/01/2012	-36.6	-38.8
25/01/2012	-22.9	-19.5	25/01/2012	-15.3	-15.2	25/01/2012	-27.3	-24.4
26/01/2012	-18.1	-17.2	26/01/2012	-15.3	-14.7	26/01/2012	-21.1	-20.8
27/01/2012	-28.2	-28.6	27/01/2012	-19.7	-20.8	27/01/2012	-34.1	-34.5
28/01/2012	-36.1	-37.6	28/01/2012	-33.7	-33.8	28/01/2012	-38.5	-42.3
29/01/2012	-38.3	-40.6	29/01/2012	-36.0	-37.7	29/01/2012	-40.7	-43.3
30/01/2012	-37.0	-38.4	30/01/2012	-31.6	-31.8	30/01/2012	-40.1	-41.7
31/01/2012	-28.1	-28.2	31/01/2012	-23.9	-25.1	31/01/2012	-31.6	-31.8
01/02/2012	-25.6	-25.1	01/02/2012	-19.7	-19.1	01/02/2012	-32.1	-32.0
02/02/2012	-18.1	-18.2	02/02/2012	-9.5	-9.1	02/02/2012	-22.6	-25.5
03/02/2012	-12.7	-12.3	03/02/2012	-8.5	-8.2	03/02/2012	-16.9	-17.3
04/02/2012	-11.5	-10.2	04/02/2012	-2.4	-1.5	04/02/2012	-19.9	-18.9
05/02/2012	-23.6	-23.4	05/02/2012	-19.8	-18.4	05/02/2012	-27.8	-28.4
06/02/2012	-20.0	-19.9	06/02/2012	-12.7	-13.8	06/02/2012	-28.2	-26.9
07/02/2012	-25.1	-24.8	07/02/2012	-16.8	-17.1	07/02/2012	-30.6	-30.6
08/02/2012	-28.2	-28.8	08/02/2012	-26.8	-27.6	08/02/2012	-30.1	-30.7
09/02/2012	-27.6	-28.1	09/02/2012	-24.1	-26.6	09/02/2012	-29.9	-29.5
10/02/2012	-21.4	-21.6	10/02/2012	-16.6	-17.6	10/02/2012	-27.0	-27.3
11/02/2012	-16.6	-16.7	11/02/2012	-15.1	-14.7	11/02/2012	-18.3	-19.7
12/02/2012	-14.5	-14.3	12/02/2012	-10.1	-11.4	12/02/2012	-19.3	-19.4
13/02/2012	-16.4	-18.5	13/02/2012	-14.4	-16.6	13/02/2012	-18.8	-20.1
14/02/2012	-18.6	-18.5	14/02/2012	-16.2	-16.3	14/02/2012	-19.8	-20.3
15/02/2012	-17.2	-17.3	15/02/2012	-15.4	-15.8	15/02/2012	-19.0	-19.1
16/02/2012	-18.5	-18.9	16/02/2012	-16.8	-16.9	16/02/2012	-19.6	-20.6
17/02/2012	-15.0	-15.3	17/02/2012	-9.5	-9.0	17/02/2012	-19.5	-20.5
18/02/2012	-22.2	-20.8	18/02/2012	-12.0	-8.9	18/02/2012	-28.5	-29.2
19/02/2012	-30.0	-31.4	19/02/2012	-27.2	-28.8	19/02/2012	-32.5	-34.8
20/02/2012	-29.5	-30.4	20/02/2012	-25.8	-25.9	20/02/2012	-32.6	-34.7
21/02/2012	-26.2	-23.9	21/02/2012	-24.2	-20.7	21/02/2012	-28.4	-26.4
22/02/2012	-26.3	-23.5	22/02/2012	-21.8	-21.5	22/02/2012	-32.2	-26.8
23/02/2012	-29.1	-28.8	23/02/2012	-24.5	-23.5	23/02/2012	-31.7	-31.4
24/02/2012	-30.4	-30.0	24/02/2012	-28.7	-27.4	24/02/2012	-32.4	-32.7
25/02/2012	-30.9	-30.8	25/02/2012	-28.6	-29.3	25/02/2012	-34.9	-34.6
26/02/2012	-35.3	-36.0	26/02/2012	-33.3	-31.9	26/02/2012	-37.6	-38.9
27/02/2012	-35.8	-37.0	27/02/2012	-30.6	-31.1	27/02/2012	-38.9	-40.1
28/02/2012	-28.0	-27.6	28/02/2012	-25.2	-23.8	28/02/2012	-31.0	-31.5
29/02/2012	-32.4	-33.2	29/02/2012	-30.6	-31.0	29/02/2012	-34.5	-35.3
01/03/2012	-32.2	-33.0	01/03/2012	-29.3	-28.1	01/03/2012	-34.6	-36.1
02/03/2012	-34.3	-34.0	02/03/2012	-30.3	-30.0	02/03/2012	-38.3	-39.0
03/03/2012	-30.9	-32.3	03/03/2012	-25.2	-27.0	03/03/2012	-36.0	-35.3
04/03/2012	-31.3	-34.4	04/03/2012	-27.8	-29.9	04/03/2012	-34.3	-39.0
05/03/2012	-33.2	-33.9	05/03/2012	-30.0	-32.3	05/03/2012	-35.4	-35.7
06/03/2012	-32.9	-33.5	06/03/2012	-28.7	-28.3	06/03/2012	-36.3	-37.7
07/03/2012	-33.6	-32.8	07/03/2012	-29.2	-28.5	07/03/2012	-37.8	-38.8
08/03/2012	-31.0	-31.2	08/03/2012	-28.8	-27.5	08/03/2012	-33.9	-34.4
09/03/2012	-31.6	-31.4	09/03/2012	-26.7	-27.2	09/03/2012	-35.5	-36.4
10/03/2012	-29.2	-29.8	10/03/2012	-23.5	-26.3	10/03/2012	-34.7	-36.5
11/03/2012	-33.4	-34.0	11/03/2012	-29.1	-29.1	11/03/2012	-37.1	-39.8
12/03/2012	-24.8	-24.5	12/03/2012	-19.7	-19.3	12/03/2012	-30.1	-30.5
13/03/2012	-20.5	-19.7	13/03/2012	-17.9	-15.5	13/03/2012	-22.2	-22.9
14/03/2012	-24.8	-25.1	14/03/2012	-21.2	-22.6	14/03/2012	-28.8	-28.3
15/03/2012	-28.8	-28.5	15/03/2012	-25.7	-25.3	15/03/2012	-32.4	-31.3
16/03/2012	-27.7	-24.8	16/03/2012	-22.8	-21.4	16/03/2012	-30.9	-29.6
17/03/2012	-29.0	-27.7	17/03/2012	-25.9	-24.4	17/03/2012	-31.1	-30.6

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
18/03/2012	-29.0	-30.0	18/03/2012	-23.1	-24.6	18/03/2012	-33.1	-33.1
19/03/2012	-27.1	-30.9	19/03/2012	-23.3	-24.4	19/03/2012	-31.5	-36.9
20/03/2012	-23.4	-24.1	20/03/2012	-21.8	-22.6	20/03/2012	-25.4	-25.0
21/03/2012	-23.8	n/a	21/03/2012	-22.9	n/a	21/03/2012	-25.3	n/a
22/03/2012	-23.9	-22.3	22/03/2012	-20.7	n/a	22/03/2012	-27.2	-24.9
23/03/2012	n/a	-22.7	23/03/2012	-17.8	-16.0	23/03/2012	n/a	-27.7
24/03/2012	n/a	-24.1	24/03/2012	0.0	-18.0	24/03/2012	n/a	-31.3
25/03/2012	n/a	-18.6	25/03/2012	-18.9	-14.4	25/03/2012	n/a	-24.2
26/03/2012	-21.9	-22.5	26/03/2012	-15.8	-16.4	26/03/2012	-26.0	-25.9
27/03/2012	-21.4	-21.3	27/03/2012	-13.9	-14.6	27/03/2012	-25.2	-26.9
28/03/2012	-17.4	-17.1	28/03/2012	-10.5	-9.0	28/03/2012	-26.3	-26.9
29/03/2012	-15.3	-13.3	29/03/2012	-12.2	-7.2	29/03/2012	-18.6	-17.9
30/03/2012	-10.2	-10.2	30/03/2012	-7.6	-7.4	30/03/2012	-15.3	-15.3
31/03/2012	-9.1	-8.9	31/03/2012	-6.9	-6.8	31/03/2012	-12.3	-12.9
01/04/2012	-12.0	-11.5	01/04/2012	-8.7	-8.6	01/04/2012	-13.7	-13.6
02/04/2012	-8.5	-8.3	02/04/2012	-5.9	-6.3	02/04/2012	-11.9	-10.3
03/04/2012	-14.6	-13.7	03/04/2012	-11.2	-8.4	03/04/2012	-19.2	-19.2
04/04/2012	-9.0	-9.4	04/04/2012	-4.1	-4.5	04/04/2012	-13.9	-14.8
05/04/2012	-11.9	-11.5	05/04/2012	-8.0	-8.9	05/04/2012	-14.2	-16.9
06/04/2012	-15.4	-14.3	06/04/2012	-12.9	-13.5	06/04/2012	-16.6	-15.0
07/04/2012	-18.7	-17.9	07/04/2012	-16.0	-14.1	07/04/2012	-20.9	-23.1
08/04/2012	-18.7	-20.0	08/04/2012	-11.0	-13.1	08/04/2012	-23.3	-25.2
09/04/2012	-18.4	-19.4	09/04/2012	-13.7	-11.9	09/04/2012	-23.4	-27.6
10/04/2012	-11.3	-12.0	10/04/2012	-5.8	-6.8	10/04/2012	-16.0	-18.2
11/04/2012	-14.0	-13.1	11/04/2012	-8.5	-8.7	11/04/2012	-20.2	-20.9
12/04/2012	-17.4	-17.8	12/04/2012	-11.5	-11.4	12/04/2012	-22.4	-22.9
13/04/2012	-18.3	-18.9	13/04/2012	-14.1	-15.7	13/04/2012	-22.2	-23.4
14/04/2012	-21.5	-22.1	14/04/2012	-18.4	-19.4	14/04/2012	-24.0	-26.0
15/04/2012	-22.4	-22.4	15/04/2012	-17.7	-16.8	15/04/2012	-28.0	-28.2
16/04/2012	-20.6	-20.7	16/04/2012	-17.2	-17.4	16/04/2012	-25.0	-24.3
17/04/2012	-19.7	-19.9	17/04/2012	-14.6	-13.8	17/04/2012	-24.4	-25.6
18/04/2012	-16.3	-17.3	18/04/2012	-6.9	-10.0	18/04/2012	-22.0	-22.7
19/04/2012	-15.1	-16.6	19/04/2012	-4.8	-8.0	19/04/2012	-22.6	-26.3
20/04/2012	-12.8	-11.4	20/04/2012	-6.3	-3.3	20/04/2012	-18.5	-17.6
21/04/2012	-16.4	-16.3	21/04/2012	-13.7	-12.9	21/04/2012	-18.7	-19.5
22/04/2012	-19.3	-19.7	22/04/2012	-17.3	-16.7	22/04/2012	-22.3	-24.5
23/04/2012	-18.5	-19.0	23/04/2012	-12.4	-12.4	23/04/2012	-24.2	-23.6
24/04/2012	-16.7	-19.1	24/04/2012	-10.9	-11.8	24/04/2012	-22.3	-26.8
25/04/2012	-16.1	-16.4	25/04/2012	-9.2	-8.5	25/04/2012	-21.8	-23.4
26/04/2012	-15.8	-16.3	26/04/2012	-11.9	-10.1	26/04/2012	-20.7	-23.4
27/04/2012	-11.3	-12.0	27/04/2012	-5.6	-5.1	27/04/2012	-18.5	-20.3
28/04/2012	-1.2	-0.7	28/04/2012	2.0	2.3	28/04/2012	-7.3	-7.8
29/04/2012	-8.4	-6.7	29/04/2012	-1.0	0.8	29/04/2012	-11.7	-11.2
30/04/2012	-11.4	-10.7	30/04/2012	-9.3	-8.8	30/04/2012	-12.8	-12.3
01/05/2012	-12.7	-11.1	01/05/2012	-8.0	-7.1	01/05/2012	-18.1	-15.6
02/05/2012	-10.7	-11.5	02/05/2012	-6.2	-6.2	02/05/2012	-16.6	-18.8
03/05/2012	-7.7	-8.1	03/05/2012	-3.9	-4.2	03/05/2012	-10.7	-12.7
04/05/2012	-3.5	-4.5	04/05/2012	1.4	0.1	04/05/2012	-8.2	-9.9
05/05/2012	-1.2	-3.0	05/05/2012	3.4	1.5	05/05/2012	-5.7	-8.5
06/05/2012	0.3	0.5	06/05/2012	5.3	5.7	06/05/2012	-2.6	-2.7
07/05/2012	-2.8	-1.5	07/05/2012	-1.3	-0.5	07/05/2012	-3.7	-2.4
08/05/2012	-4.1	-4.7	08/05/2012	-1.8	-2.3	08/05/2012	-5.2	-6.9
09/05/2012	-1.1	-0.8	09/05/2012	0.9	0.6	09/05/2012	-3.6	-2.8
10/05/2012	1.9	2.2	10/05/2012	6.3	6.8	10/05/2012	-1.5	-0.7
11/05/2012	-2.5	-0.7	11/05/2012	1.5	0.6	11/05/2012	-7.1	-2.4
12/05/2012	-5.0	-1.7	12/05/2012	-1.9	0.3	12/05/2012	-9.1	-4.8
13/05/2012	-2.2	-0.3	13/05/2012	0.0	0.9	13/05/2012	-4.4	-1.9
14/05/2012	-3.2	-2.4	14/05/2012	-1.4	-1.3	14/05/2012	-4.7	-3.7
15/05/2012	-2.3	-1.5	15/05/2012	0.0	0.5	15/05/2012	-3.9	-3.0
16/05/2012	-2.5	-1.2	16/05/2012	-0.8	0.7	16/05/2012	-3.8	-2.7
17/05/2012	-5.2	-3.1	17/05/2012	-2.6	-1.3	17/05/2012	-7.0	-4.7
18/05/2012	-4.4	-4.3	18/05/2012	-0.4	-1.9	18/05/2012	-9.4	-7.8
19/05/2012	-1.4	-1.5	19/05/2012	3.1	1.1	19/05/2012	-6.9	-5.6
20/05/2012	0.4	0.2	20/05/2012	2.8	3.2	20/05/2012	-1.4	-1.7
21/05/2012	1.5	1.3	21/05/2012	5.3	5.8	21/05/2012	-0.5	-1.8
22/05/2012	2.7	2.7	22/05/2012	7.9	6.0	22/05/2012	-2.6	-1.6
23/05/2012	-0.9	-0.2	23/05/2012	3.9	2.9	23/05/2012	-5.3	-5.2
24/05/2012	-4.8	-5.2	24/05/2012	0.9	-0.1	24/05/2012	-8.3	-8.7
25/05/2012	1.5	1.7	25/05/2012	7.0	7.3	25/05/2012	-5.5	-5.2
26/05/2012	5.4	2.0	26/05/2012	11.5	5.2	26/05/2012	-0.3	-2.7
27/05/2012	4.7	2.3	27/05/2012	8.8	5.6	27/05/2012	-0.4	-1.4
28/05/2012	7.1	4.7	28/05/2012	14.2	9.0	28/05/2012	0.2	0.0
29/05/2012	7.7	6.4	29/05/2012	10.7	9.3	29/05/2012	3.4	2.8
30/05/2012	2.6	1.1	30/05/2012	5.3	2.9	30/05/2012	-0.1	0.1
31/05/2012	0.6	0.9	31/05/2012	3.1	4.0	31/05/2012	-1.4	-1.2
01/06/2012	2.7	1.8	01/06/2012	7.1	6.1	01/06/2012	-1.5	-1.6
02/06/2012	4.2	3.0	02/06/2012	7.8	7.0	02/06/2012	-0.7	-1.7
03/06/2012	5.1	4.7	03/06/2012	10.1	8.6	03/06/2012	1.9	1.4
04/06/2012	9.7	8.7	04/06/2012	15.9	14.9	04/06/2012	2.4	0.6
05/06/2012	11.2	9.8	05/06/2012	18.3	18.2	05/06/2012	3.3	1.5
06/06/2012	12.9	13.0	06/06/2012	19.3	20.0	06/06/2012	7.0	4.7
07/06/2012	5.6	5.8	07/06/2012	10.5	10.6	07/06/2012	1.9	2.0
08/06/2012	6.1	5.6	08/06/2012	10.2	10.7	08/06/2012	1.2	-0.4
09/06/2012	2.3	2.7	09/06/2012	4.9	5.6	09/06/2012	0.6	-0.2

Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
10/06/2012	2.4	2.7	10/06/2012	5.3	5.0	10/06/2012	-0.2	0.2
11/06/2012	2.4	2.4	11/06/2012	4.5	4.5	11/06/2012	0.8	0.8
12/06/2012	3.9	3.6	12/06/2012	6.9	6.6	12/06/2012	1.4	0.9
13/06/2012	2.7	3.0	13/06/2012	5.8	5.6	13/06/2012	0.4	0.2
14/06/2012	3.9	3.8	14/06/2012	7.2	7.6	14/06/2012	1.5	1.0
15/06/2012	6.1	5.2	15/06/2012	9.7	9.7	15/06/2012	3.0	1.9
16/06/2012	10.4	9.9	16/06/2012	16.3	16.7	16/06/2012	3.5	0.3
17/06/2012	12.2	11.4	17/06/2012	16.6	17.7	17/06/2012	5.6	3.6
18/06/2012	12.9	12.2	18/06/2012	18.9	18.4	18/06/2012	6.2	4.9
19/06/2012	7.8	8.6	19/06/2012	13.6	13.0	19/06/2012	4.3	4.0
20/06/2012	7.1	7.6	20/06/2012	14.2	15.6	20/06/2012	3.3	3.0
21/06/2012	7.0	6.7	21/06/2012	11.7	11.0	21/06/2012	3.8	3.5
22/06/2012	7.0	7.8	22/06/2012	10.9	11.4	22/06/2012	3.8	4.5
23/06/2012	13.1	12.5	23/06/2012	21.6	20.3	23/06/2012	5.7	5.0
24/06/2012	13.3	13.0	24/06/2012	16.5	17.2	24/06/2012	9.0	7.8
25/06/2012	14.3	13.8	25/06/2012	19.8	19.4	25/06/2012	7.6	5.3
26/06/2012	10.9	10.3	26/06/2012	14.1	13.7	26/06/2012	6.7	5.7
27/06/2012	9.7	9.2	27/06/2012	12.6	12.1	27/06/2012	7.0	5.6
28/06/2012	9.3	9.5	28/06/2012	11.6	12.8	28/06/2012	6.8	6.9
29/06/2012	9.5	9.5	29/06/2012	12.1	12.0	29/06/2012	8.0	8.0
30/06/2012	12.3	12.6	30/06/2012	17.1	17.7	30/06/2012	7.0	6.3
01/07/2012	16.7	16.2	01/07/2012	21.3	21.6	01/07/2012	10.8	6.5
02/07/2012	17.2	17.0	02/07/2012	21.1	21.7	02/07/2012	12.7	10.1
03/07/2012	15.4	14.7	03/07/2012	19.4	19.4	03/07/2012	10.9	8.4
04/07/2012	16.5	16.5	04/07/2012	19.6	20.6	04/07/2012	13.4	11.7
05/07/2012	16.1	16.0	05/07/2012	19.6	20.3	05/07/2012	11.1	11.1
06/07/2012	17.3	17.5	06/07/2012	20.9	22.1	06/07/2012	12.9	10.4
07/07/2012	18.6	18.6	07/07/2012	24.4	24.5	07/07/2012	11.4	11.5
08/07/2012	18.5	18.7	08/07/2012	24.1	24.5	08/07/2012	14.4	11.6
09/07/2012	17.5	18.3	09/07/2012	22.3	23.6	09/07/2012	13.3	11.2
10/07/2012	18.1	19.3	10/07/2012	23.6	24.7	10/07/2012	13.1	13.0
11/07/2012	13.4	15.2	11/07/2012	16.5	18.9	11/07/2012	10.8	11.5
12/07/2012	12.5	13.6	12/07/2012	15.5	16.6	12/07/2012	9.9	9.4
13/07/2012	12.4	12.7	13/07/2012	15.6	16.4	13/07/2012	9.0	9.0
14/07/2012	14.5	13.9	14/07/2012	18.1	18.1	14/07/2012	10.1	7.5
15/07/2012	16.6	15.5	15/07/2012	21.7	21.4	15/07/2012	11.3	7.1
16/07/2012	17.7	18.0	16/07/2012	24.2	24.4	16/07/2012	12.9	10.9
17/07/2012	13.8	13.9	17/07/2012	17.3	18.2	17/07/2012	12.2	11.9
18/07/2012	15.3	16.6	18/07/2012	20.4	21.9	18/07/2012	11.9	10.7
19/07/2012	13.0	13.7	19/07/2012	14.8	15.8	19/07/2012	11.7	11.7
20/07/2012	11.1	12.1	20/07/2012	13.0	13.8	20/07/2012	9.1	10.8
21/07/2012	12.8	12.8	21/07/2012	18.5	17.8	21/07/2012	8.9	8.6
22/07/2012	16.4	16.3	22/07/2012	22.5	23.5	22/07/2012	9.2	5.8
23/07/2012	10.8	11.8	23/07/2012	17.5	16.5	23/07/2012	7.4	8.1
24/07/2012	12.5	12.2	24/07/2012	20.5	19.9	24/07/2012	4.5	3.1
25/07/2012	12.5	12.4	25/07/2012	16.4	17.2	25/07/2012	7.4	8.8
26/07/2012	10.2	11.2	26/07/2012	18.4	19.4	26/07/2012	4.1	3.5
27/07/2012	7.6	8.2	27/07/2012	10.3	10.7	27/07/2012	6.0	6.2
28/07/2012	7.7	8.8	28/07/2012	11.1	11.6	28/07/2012	4.3	4.2
29/07/2012	10.7	11.1	29/07/2012	17.1	17.9	29/07/2012	3.2	3.2
30/07/2012	8.3	9.0	30/07/2012	10.4	12.0	30/07/2012	6.3	6.5
31/07/2012	9.2	8.8	31/07/2012	14.4	13.7	31/07/2012	5.5	5.2
01/08/2012	12.8	11.6	01/08/2012	19.0	17.7	01/08/2012	6.0	2.4
02/08/2012	15.5	13.6	02/08/2012	20.8	19.6	02/08/2012	10.0	3.5
03/08/2012	16.5	16.1	03/08/2012	22.9	23.4	03/08/2012	8.5	6.3
04/08/2012	15.8	15.8	04/08/2012	20.3	21.3	04/08/2012	12.4	10.7
05/08/2012	14.2	15.9	05/08/2012	17.5	19.2	05/08/2012	10.2	11.8
06/08/2012	10.9	11.3	06/08/2012	15.6	14.4	06/08/2012	8.7	7.8
07/08/2012	14.4	14.7	07/08/2012	21.6	21.7	07/08/2012	7.9	6.3
08/08/2012	16.5	17.6	08/08/2012	22.3	22.3	08/08/2012	10.4	10.7
09/08/2012	13.6	15.2	09/08/2012	19.3	20.3	09/08/2012	10.5	11.8
10/08/2012	10.4	11.9	10/08/2012	11.2	14.4	10/08/2012	9.0	10.7
11/08/2012	10.0	10.9	11/08/2012	13.6	14.7	11/08/2012	7.8	7.8
12/08/2012	7.3	8.5	12/08/2012	9.8	10.7	12/08/2012	5.2	6.9
13/08/2012	7.9	8.8	13/08/2012	12.5	13.4	13/08/2012	3.2	3.1
14/08/2012	5.6	7.1	14/08/2012	8.4	8.9	14/08/2012	2.2	3.4
15/08/2012	2.8	3.0	15/08/2012	6.5	6.0	15/08/2012	1.0	-0.3
16/08/2012	4.6	5.3	16/08/2012	8.8	8.8	16/08/2012	0.6	0.2
17/08/2012	8.6	8.4	17/08/2012	13.8	15.6	17/08/2012	0.8	0.8
18/08/2012	12.9	13.5	18/08/2012	20.7	22.3	18/08/2012	6.8	5.8
19/08/2012	14.0	15.6	19/08/2012	18.3	23.1	19/08/2012	10.1	11.9
20/08/2012	10.2	11.2	20/08/2012	13.5	14.4	20/08/2012	6.2	6.2
21/08/2012	9.6	10.4	21/08/2012	14.9	15.6	21/08/2012	5.3	3.9
22/08/2012	8.1	9.1	22/08/2012	14.2	14.9	22/08/2012	3.4	2.7
23/08/2012	8.8	8.7	23/08/2012	13.9	12.9	23/08/2012	3.8	4.5
24/08/2012	8.9	8.9	24/08/2012	11.3	12.2	24/08/2012	6.2	5.8
25/08/2012	9.6	9.7	25/08/2012	13.9	12.5	25/08/2012	6.7	6.7
26/08/2012	11.6	11.5	26/08/2012	16.2	15.6	26/08/2012	7.9	6.6
27/08/2012	10.0	10.5	27/08/2012	15.5	17.3	27/08/2012	6.2	4.6
28/08/2012	10.4	10.6	28/08/2012	15.6	15.9	28/08/2012	4.4	4.3
29/08/2012	7.9	8.2	29/08/2012	11.0	12.7	29/08/2012	5.9	4.1
30/08/2012	6.8	8.3	30/08/2012	8.6	10.2	30/08/2012	5.1	6.8
31/08/2012	7.7	7.9	31/08/2012	13.1	13.6	31/08/2012	2.1	2.1
01/09/2012	7.7	8.7	01/09/2012	11.1	13.0	01/09/2012	4.1	3.5

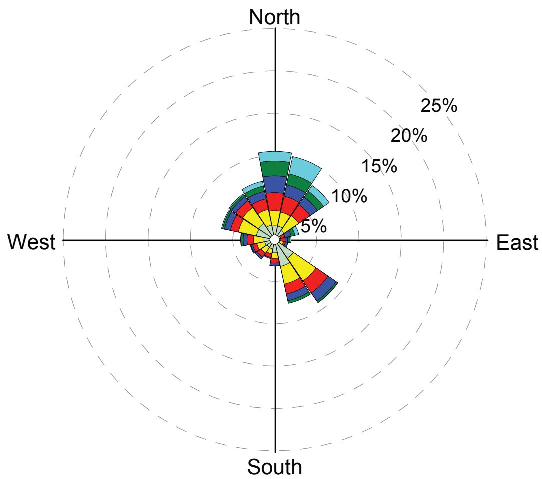
Appendix 2. George Lake and Goose Lake Daily Temperature (January to December) and Rainfall Data (June to September), 2006 to 2012

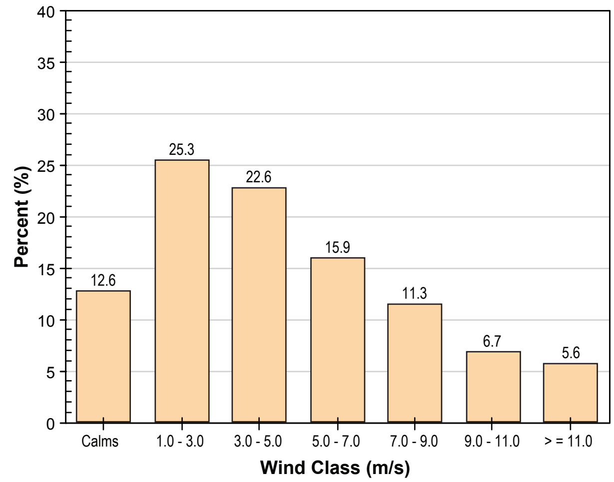
Average Daily Air Temperature (°C)			Maximum Daily Air Temperature (°C)			Minimum Daily Air Temperature (°C)		
Date	George Lake	Goose Lake	Date	George Lake	Goose Lake	Date	George Lake	Goose Lake
02/09/2012	6.1	6.4	02/09/2012	10.3	11.8	02/09/2012	2.8	2.3
03/09/2012	8.9	9.3	03/09/2012	15.8	16.5	03/09/2012	4.7	3.0
04/09/2012	8.9	9.4	04/09/2012	10.6	12.1	04/09/2012	7.3	6.7
05/09/2012	9.7	10.3	05/09/2012	15.6	17.1	05/09/2012	6.1	3.2
06/09/2012	11.7	12.3	06/09/2012	17.6	17.6	06/09/2012	5.6	7.0
07/09/2012	10.0	10.2	07/09/2012	13.6	14.0	07/09/2012	6.2	6.0
08/09/2012	6.8	7.0	08/09/2012	11.3	11.9	08/09/2012	3.1	2.9
09/09/2012	6.4	6.9	09/09/2012	11.7	13.2	09/09/2012	2.3	-0.7
10/09/2012	7.3	7.3	10/09/2012	9.9	11.7	10/09/2012	4.8	3.1
11/09/2012	4.6	5.7	11/09/2012	7.2	7.2	11/09/2012	0.8	3.0
12/09/2012	n/a	1.4	12/09/2012	1.0	4.7	12/09/2012	n/a	-1.1
13/09/2012	n/a	4.4	13/09/2012	n/a	6.7	13/09/2012	n/a	0.9
14/09/2012	n/a	2.2	14/09/2012	n/a	5.2	14/09/2012	n/a	-2.0
15/09/2012	n/a	1.4	15/09/2012	n/a	4.3	15/09/2012	n/a	-0.2

Appendix 3

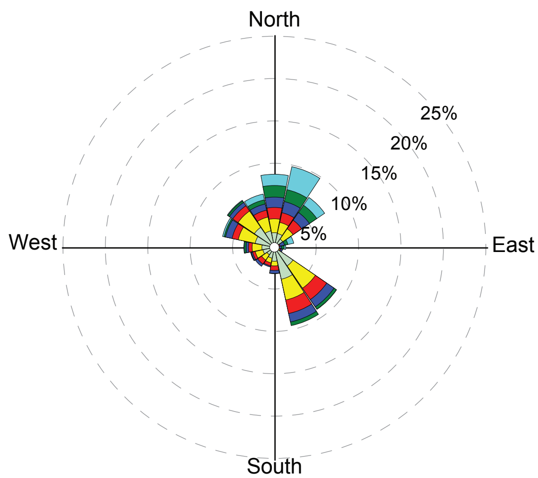
George and Goose Meteorological Stations Wind Roses, 2006 to 2011

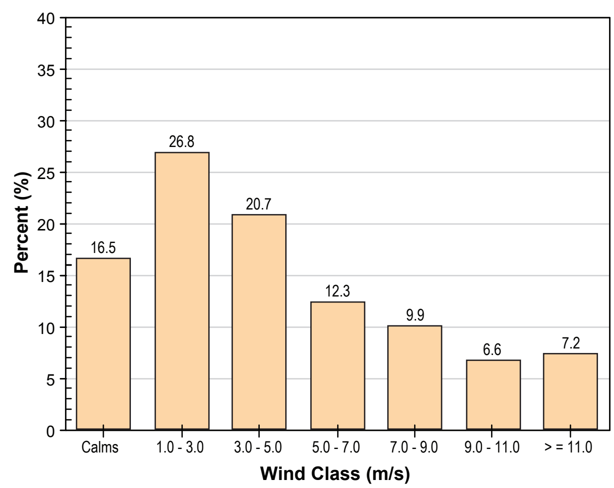
Annual



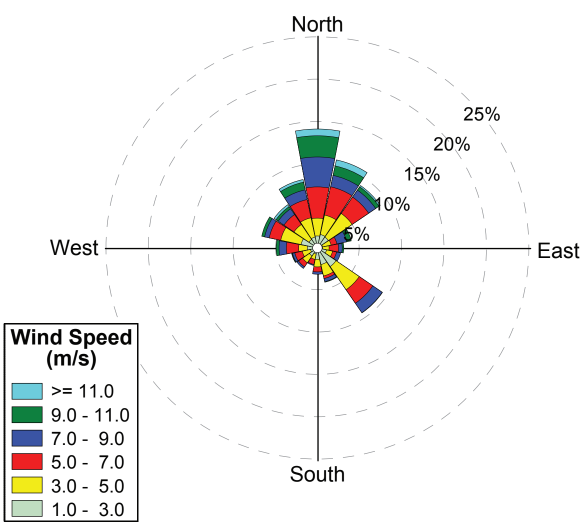


Winter





Summer



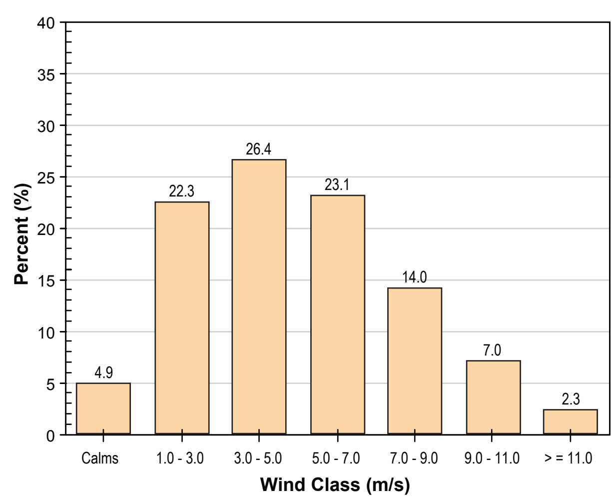


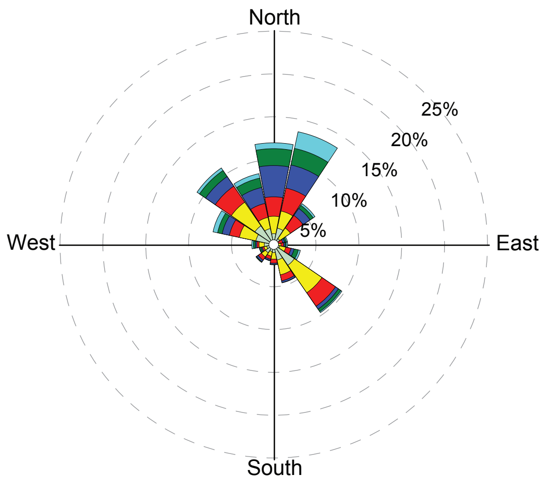
Figure A3-1

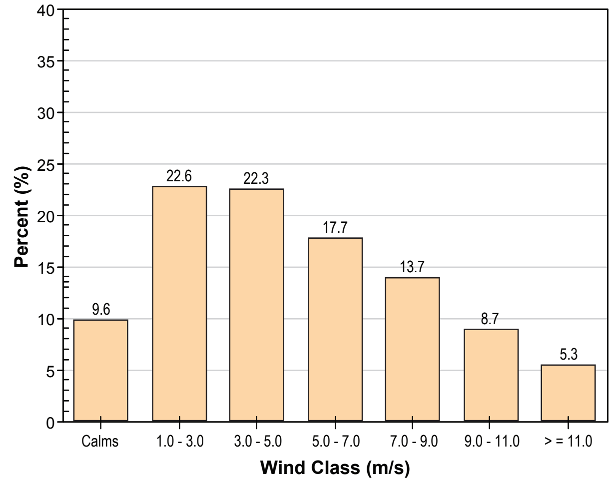
George Meteorological Station Windroses, 2006

Sabina GOLD & SILVER CORP.

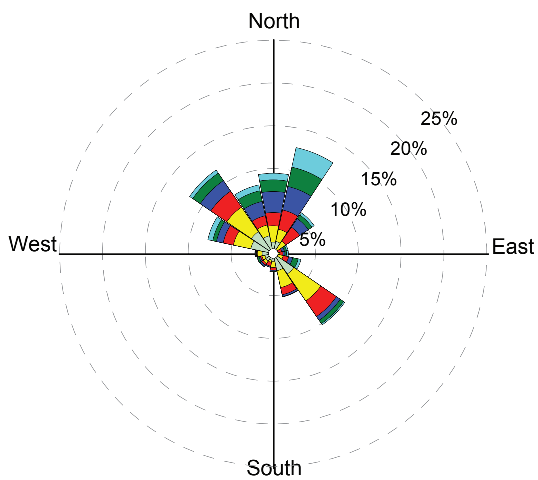
Rescan Engineers & Scientists

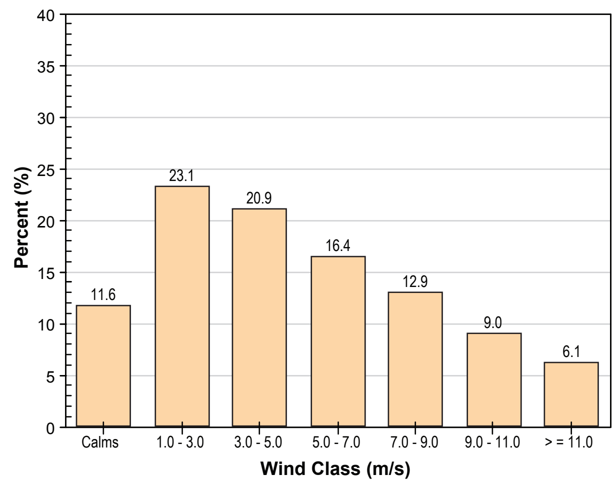
Annual



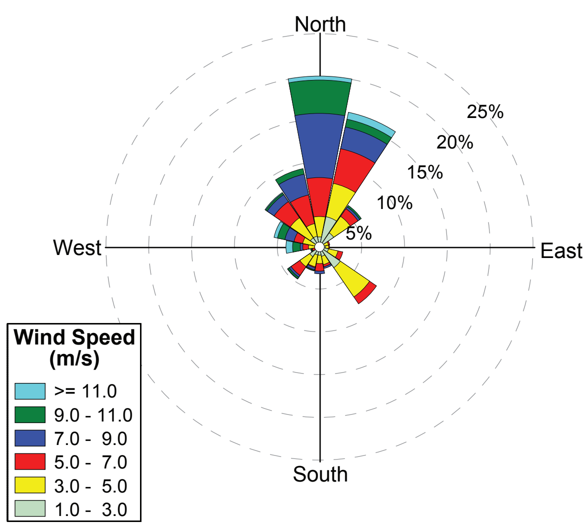


Winter





Summer



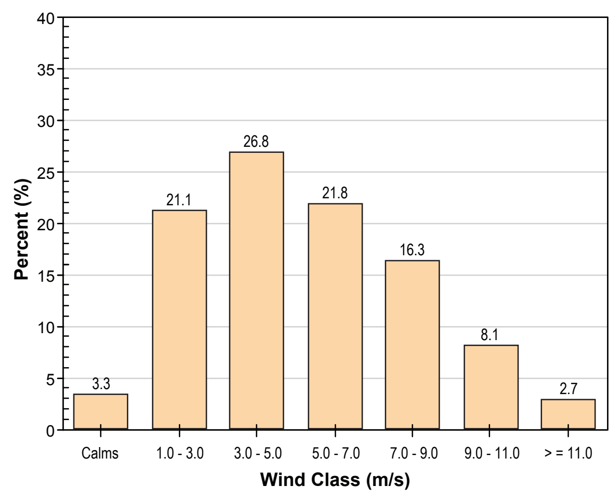


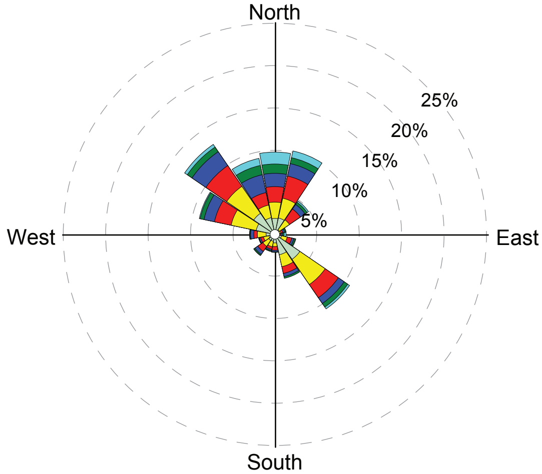
Figure A3-2

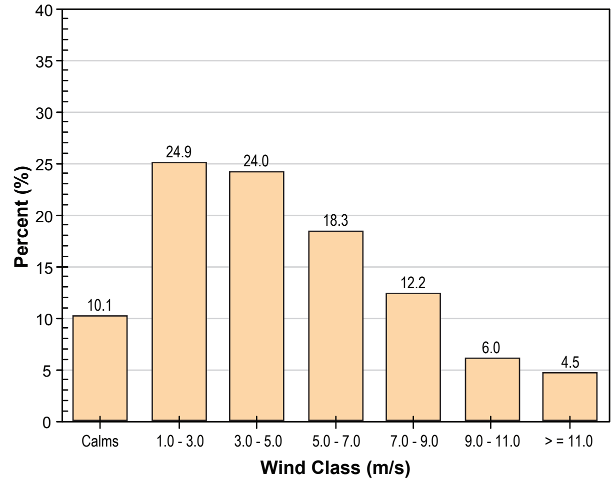
George Meteorological Station Windroses, 2007

Sabina GOLD & SILVER CORP.

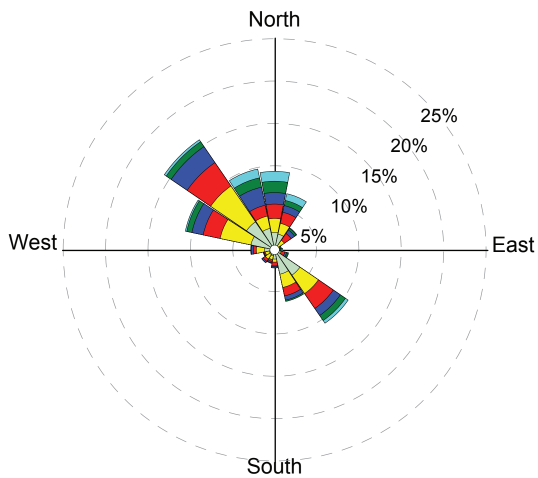
Rescan Engineers & Scientists

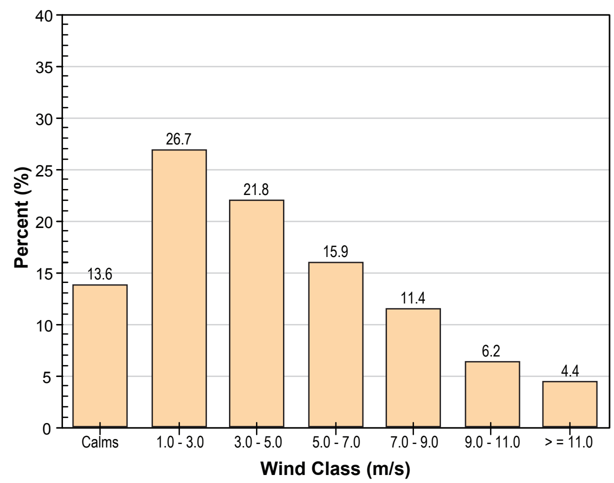
Annual



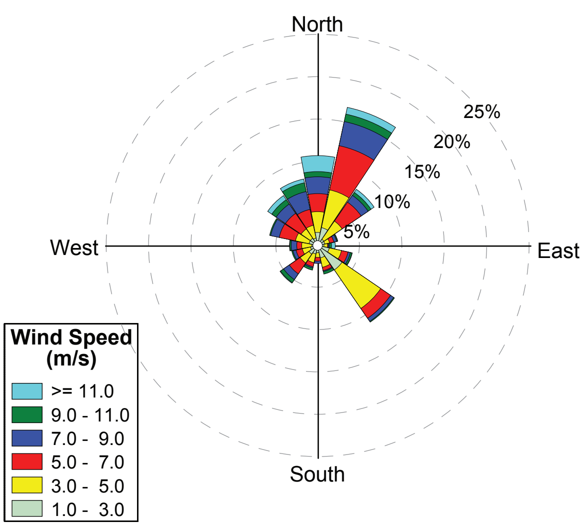


Winter





Summer



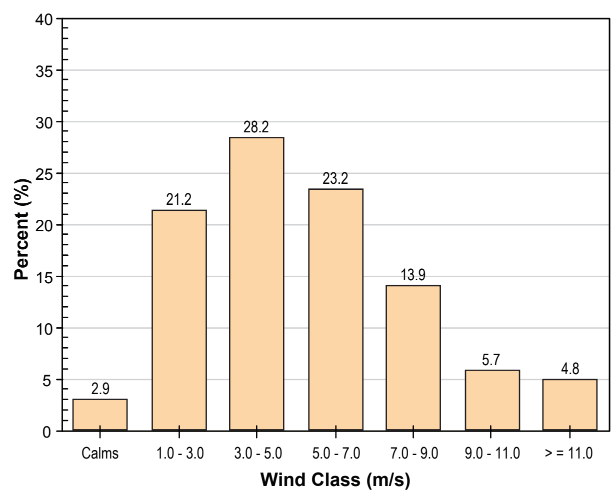


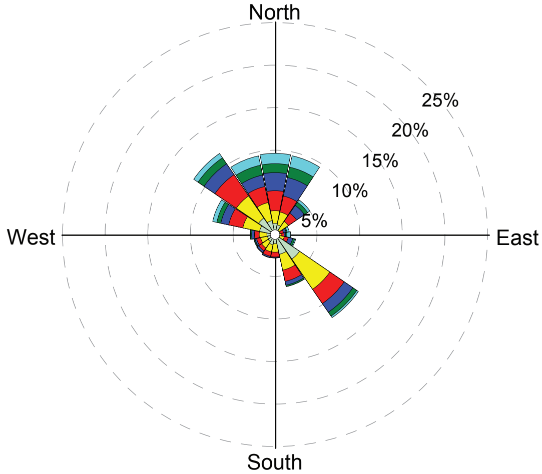
Figure A3-3

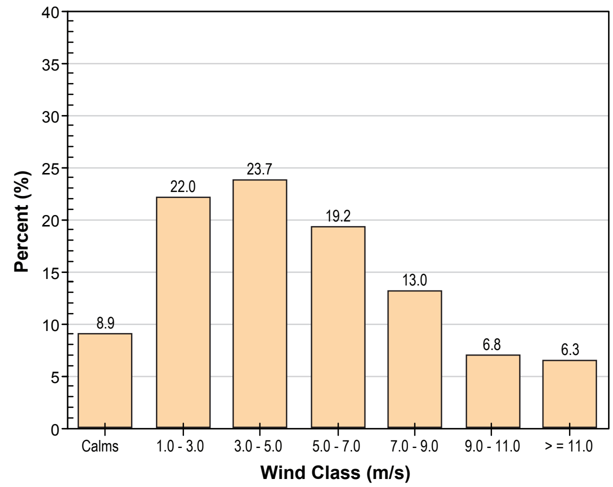
Sabina GOLD & SILVER CORP.

George Meteorological Station Windroses, 2008

Rescan Engineers & Scientists

Annual





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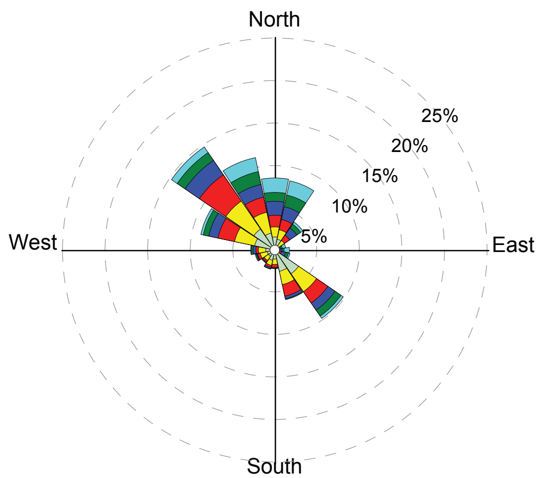
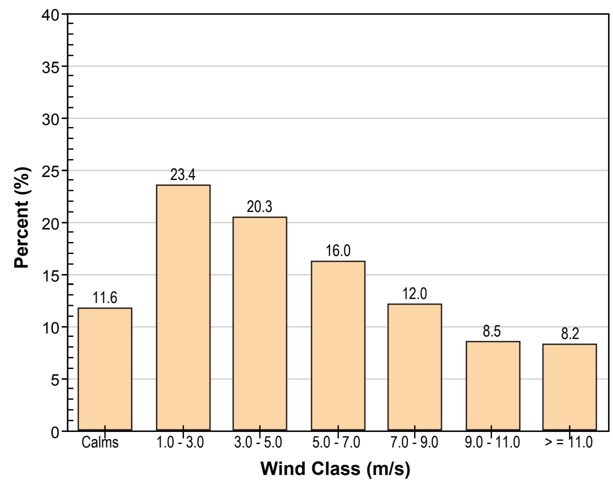
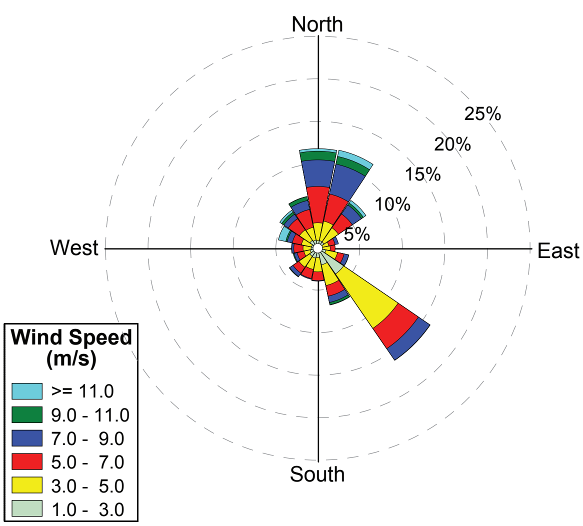




Summer



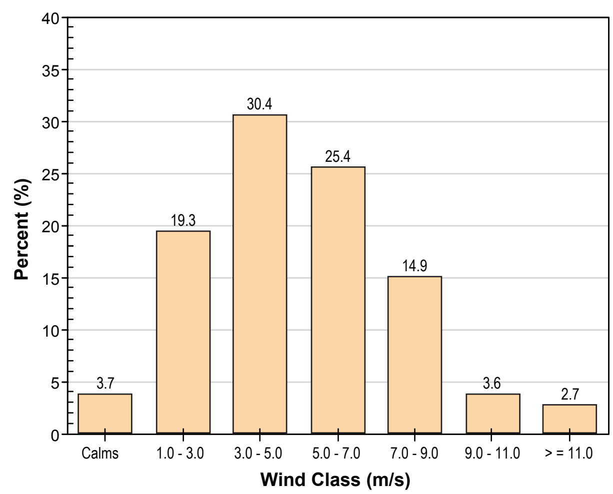


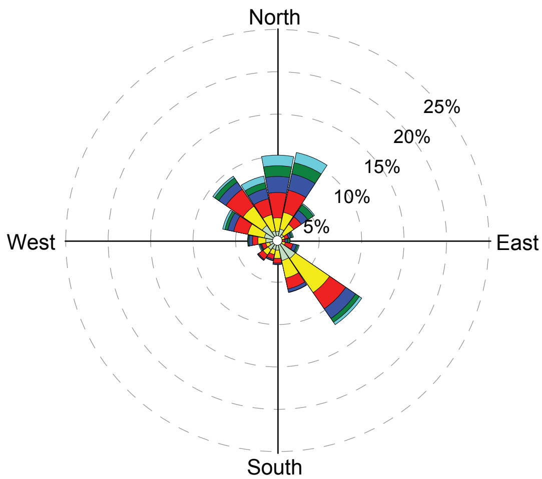
Figure A3-4

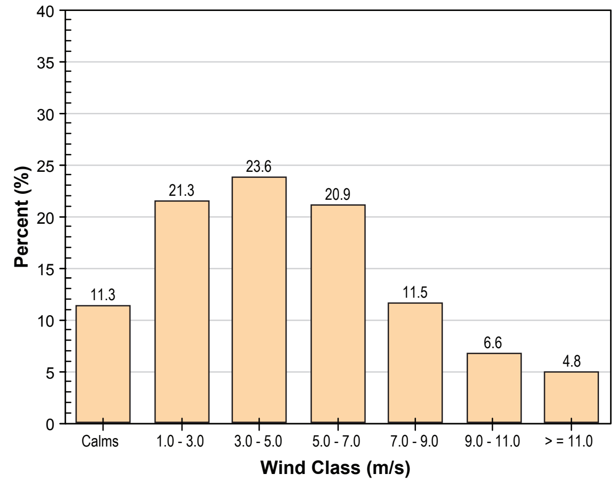
George Meteorological Station Windroses, 2009

Sabina GOLD & SILVER CORP.

Rescan Engineers & Scientists

Annual





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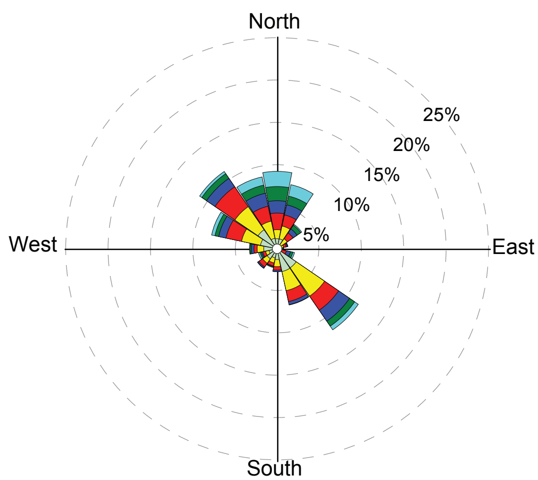
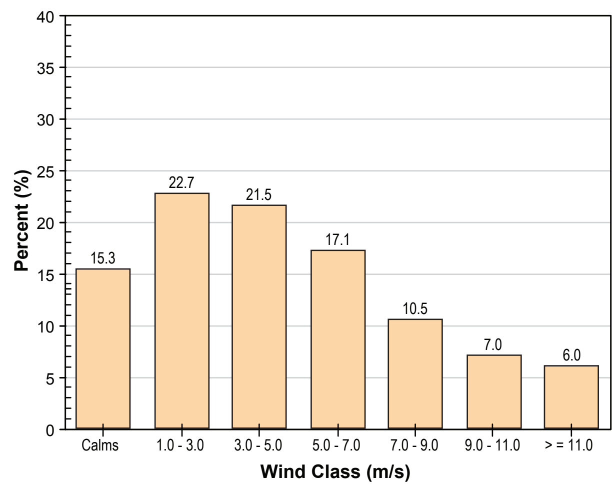
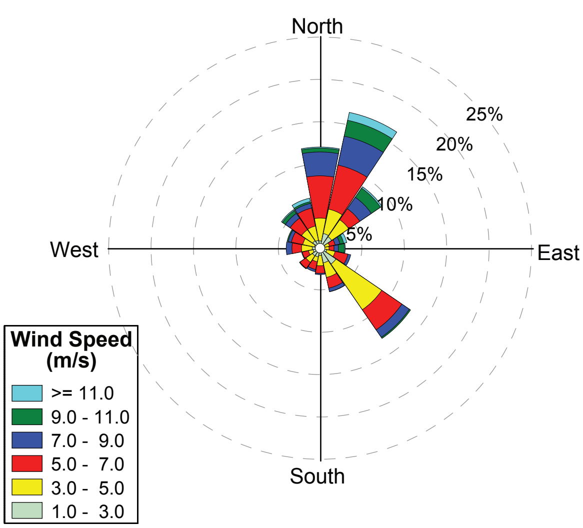




Summer



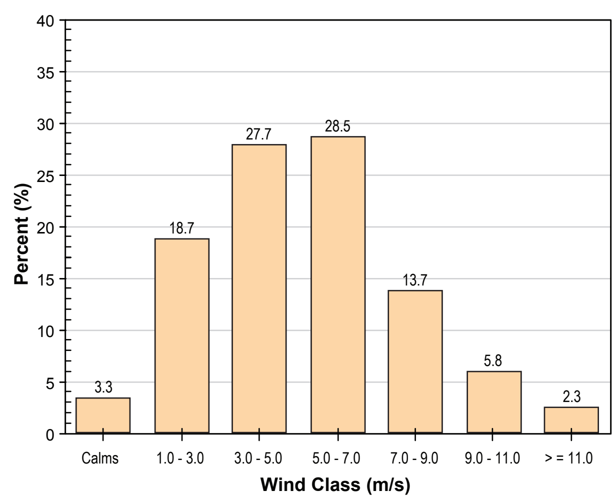


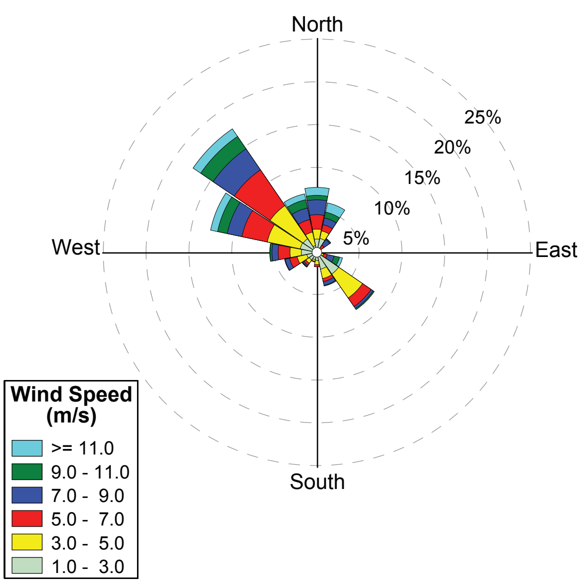
Figure A3-5

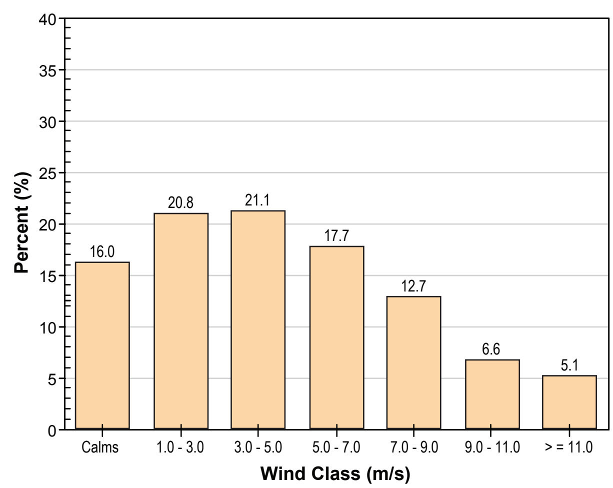
Sabina GOLD & SILVER CORP.

George Meteorological Station Windroses, 2010

Rescan Engineers & Scientists

Annual



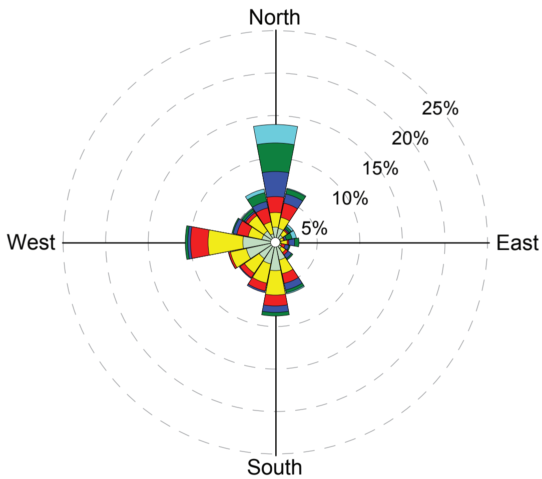


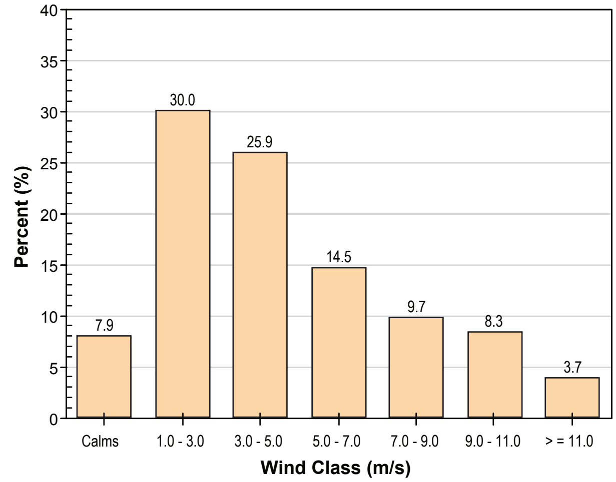
Sabina GOLD & SILVER CORP.

George Meteorological Station Windroses, 2011

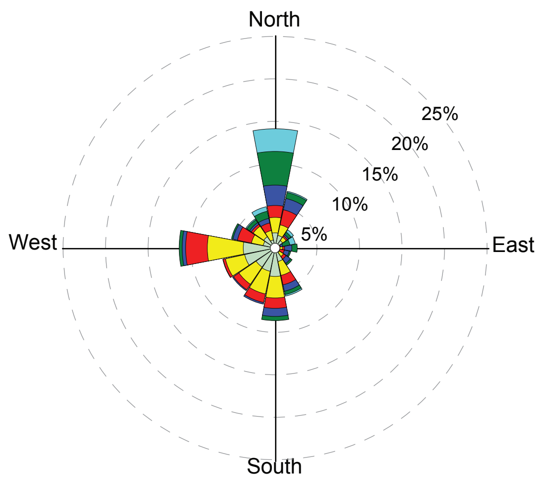
Rescan™ Engineers & Scientists

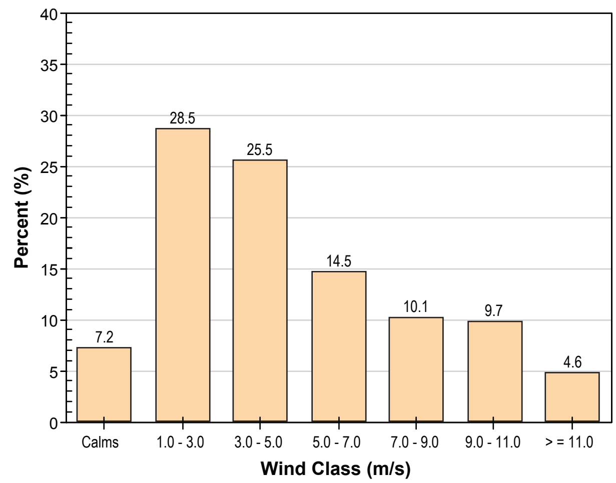
Annual



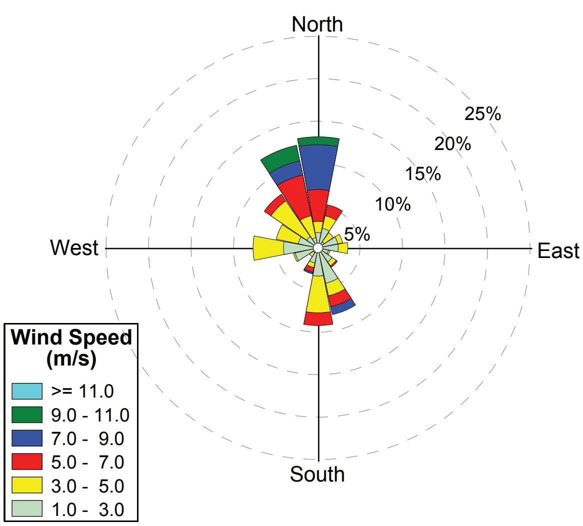


Winter





Summer



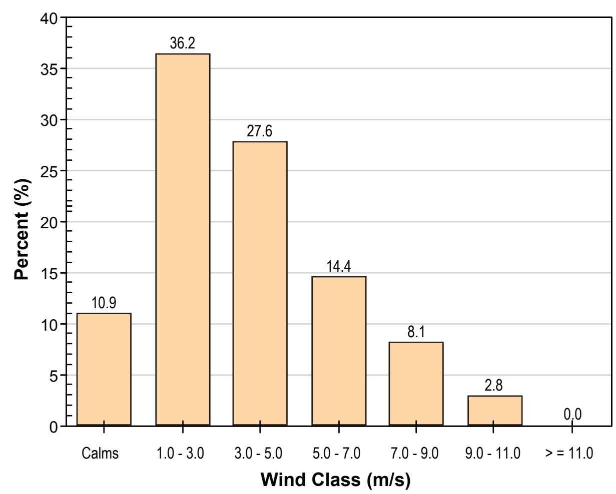


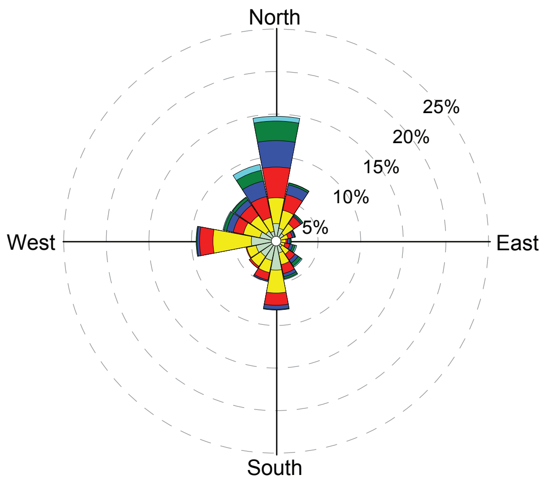
Figure A3-7

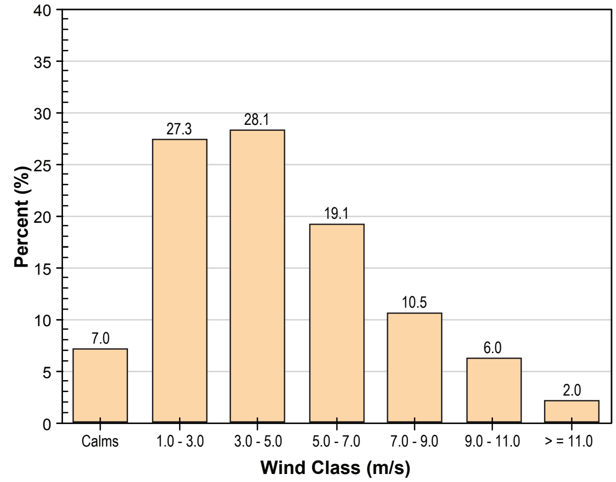
Goose Meteorological Station Windroses, 2006

Sabina GOLD & SILVER CORP.

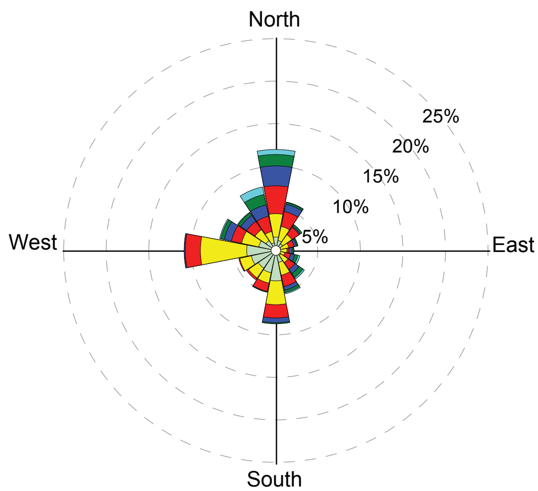
Rescan Engineers & Scientists

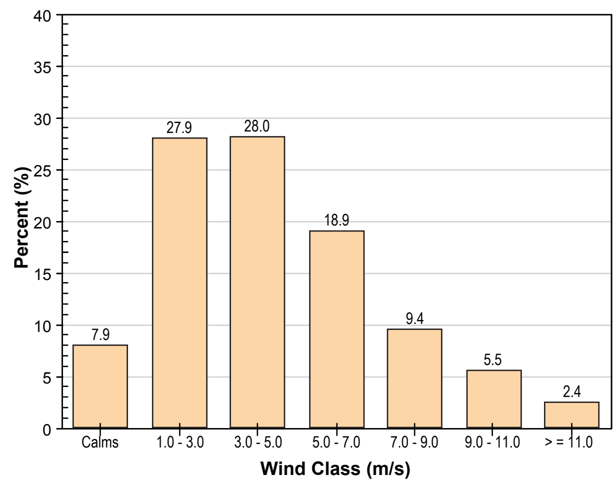
Annual



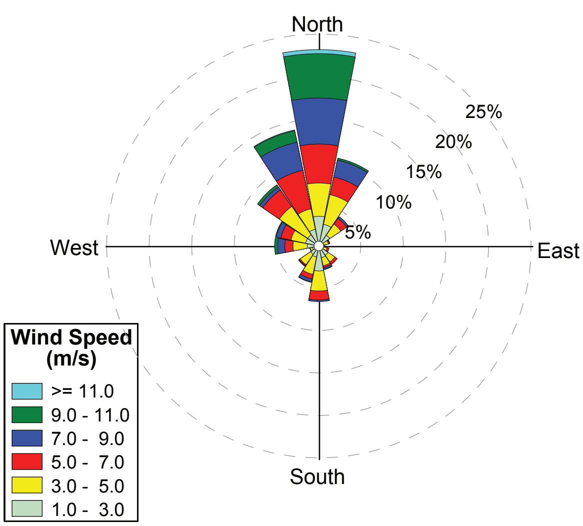


Winter





Summer



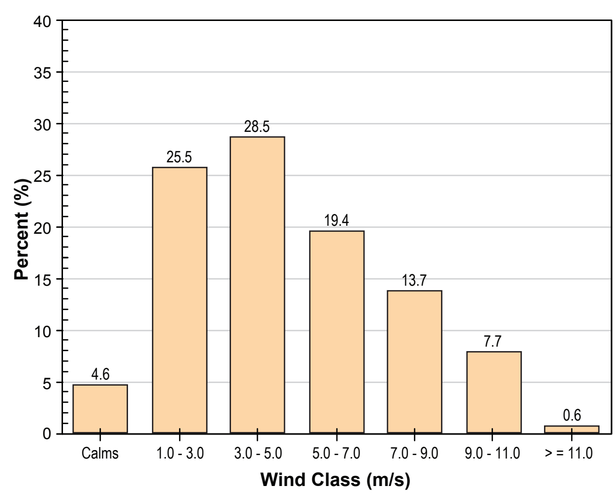


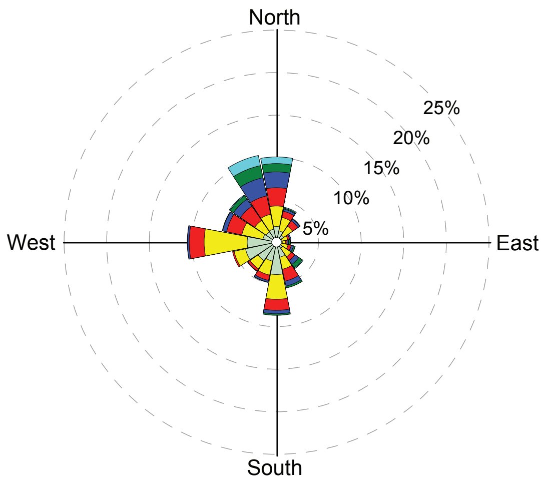
Figure A3-8

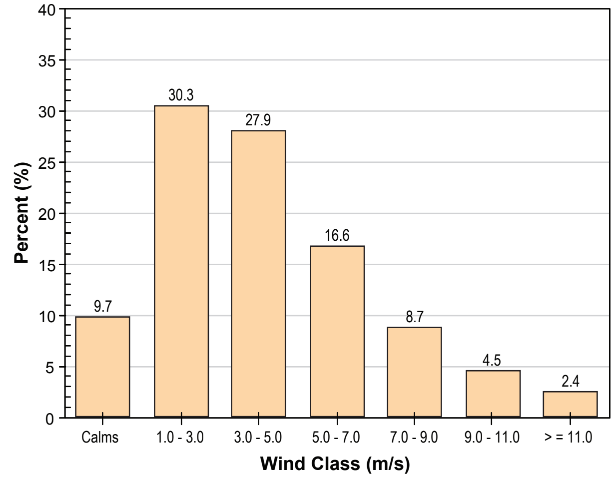
Goose Meteorological Station Windroses, 2007

Sabina GOLD & SILVER CORP.

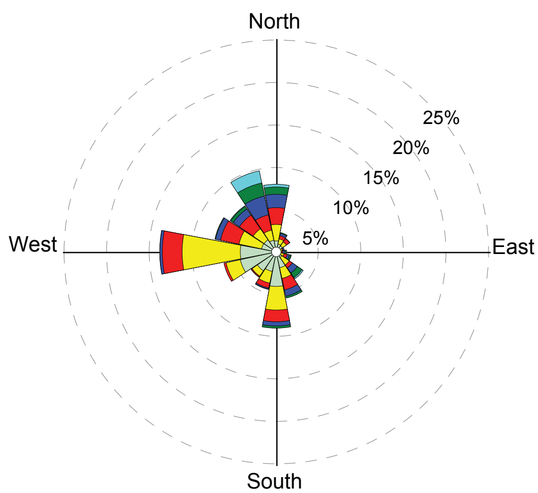
Rescan™ Engineers & Scientists

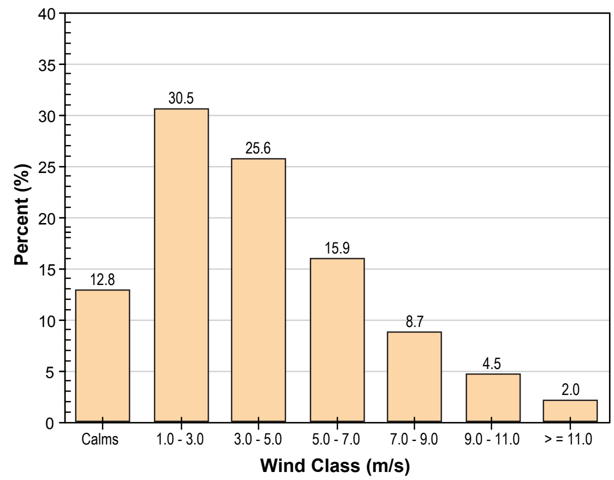
Annual





Winter





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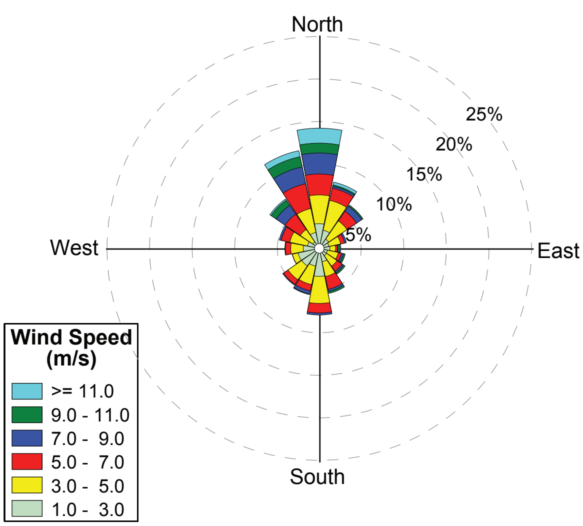


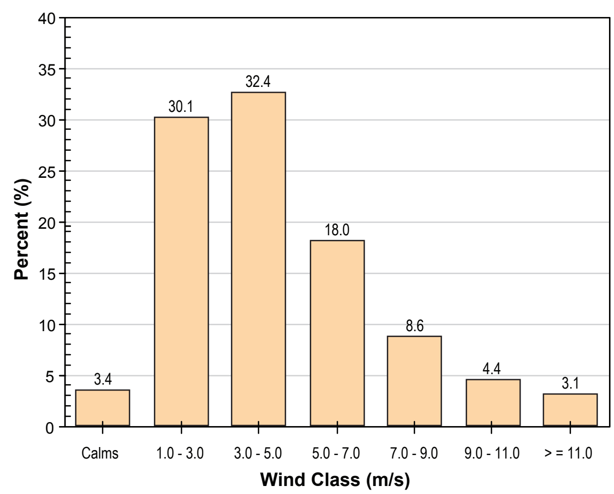


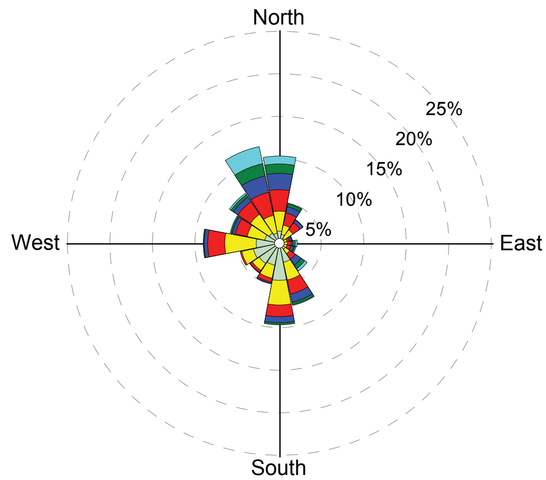
Figure A3-9

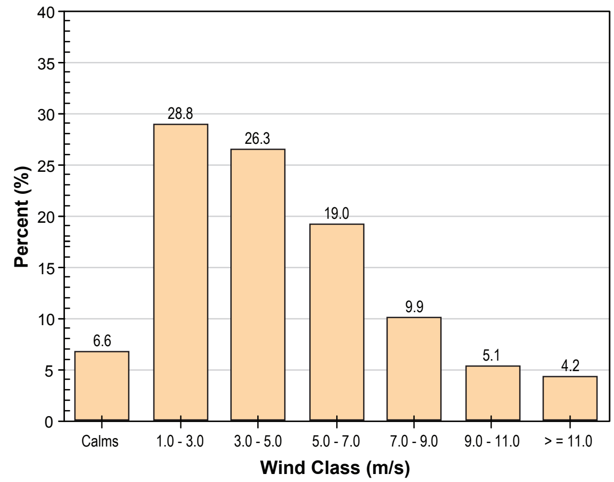
Goose Meteorological Station Windroses, 2008

Sabina GOLD & SILVER CORP.

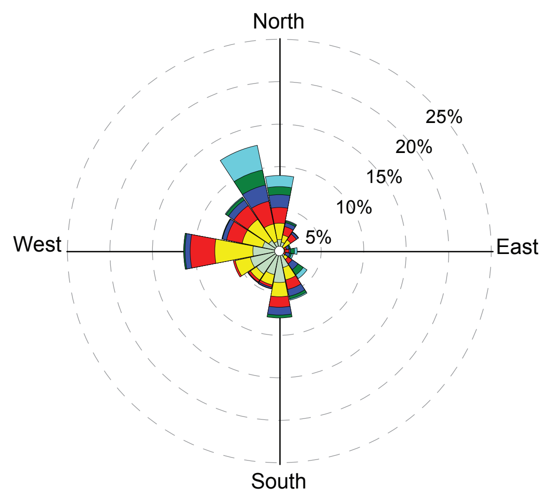
Rescan Engineers & Scientists

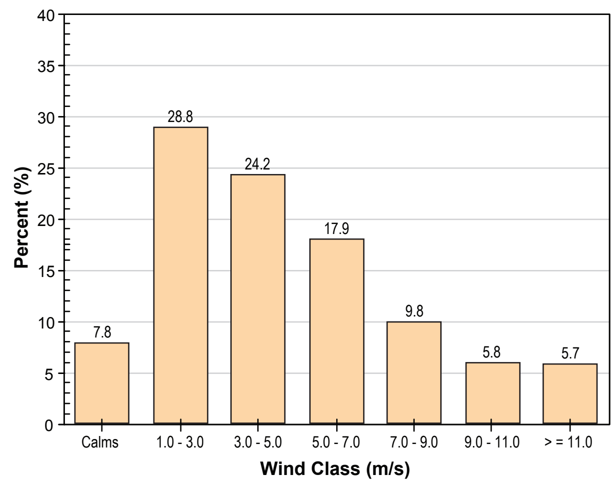
Annual



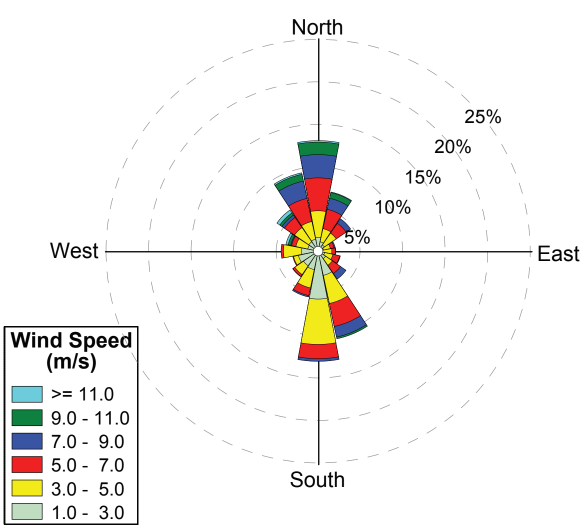


Winter





Summer



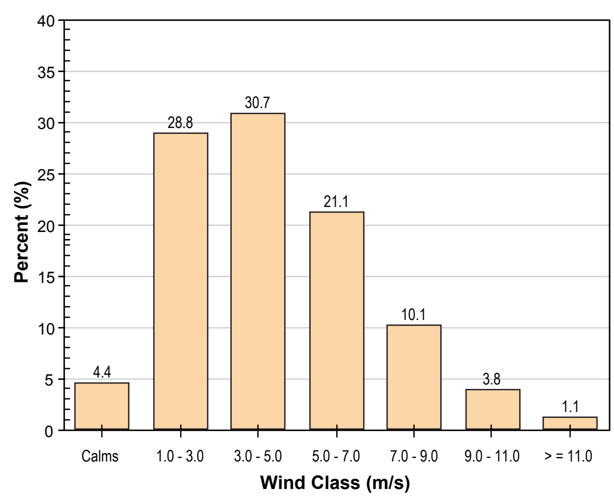


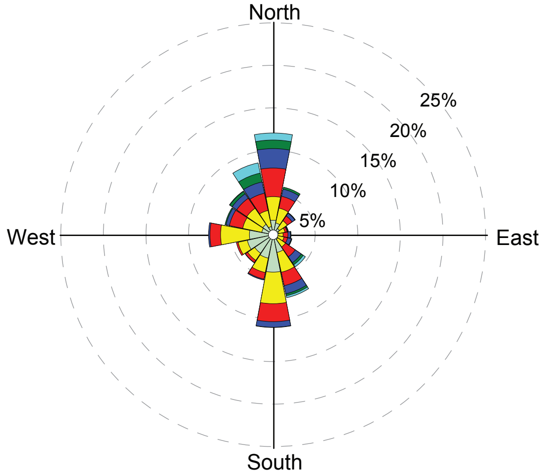
Figure A3-10

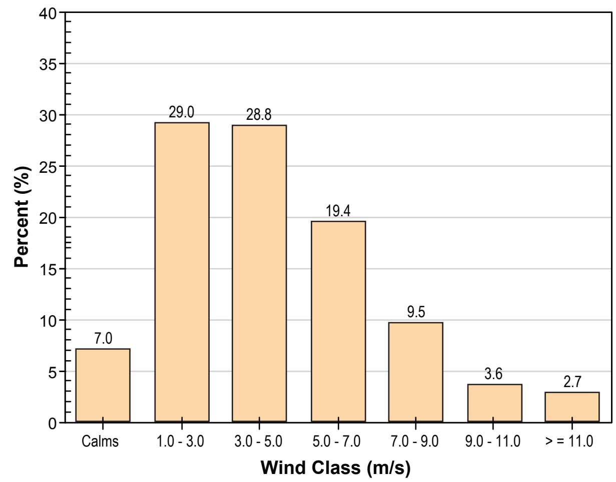
Sabina GOLD & SILVER CORP.

Goose Meteorological Station Windroses, 2009

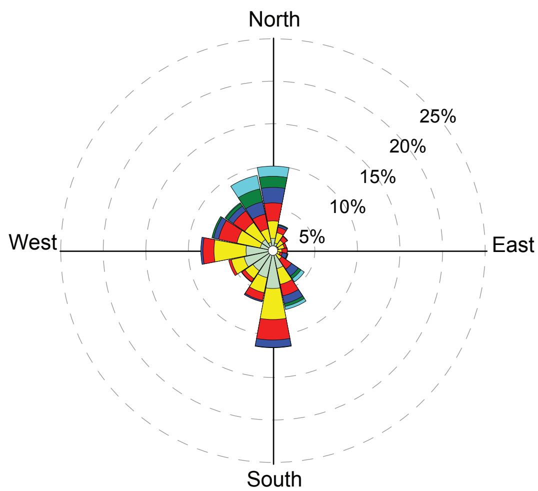
Rescan Engineers & Scientists

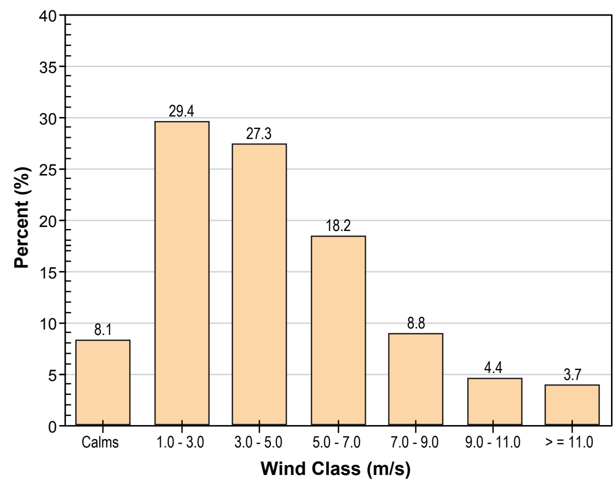
Annual



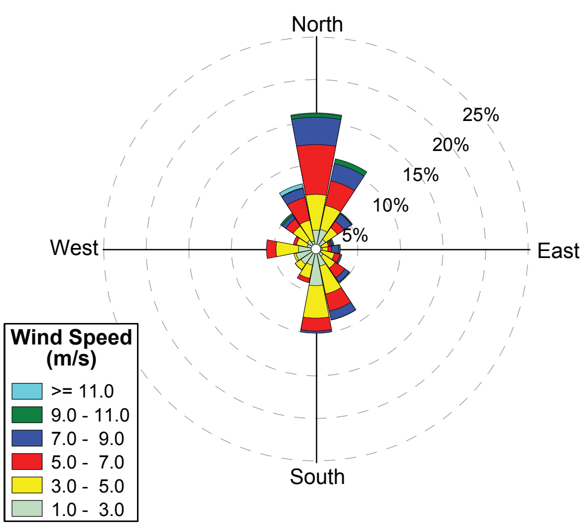


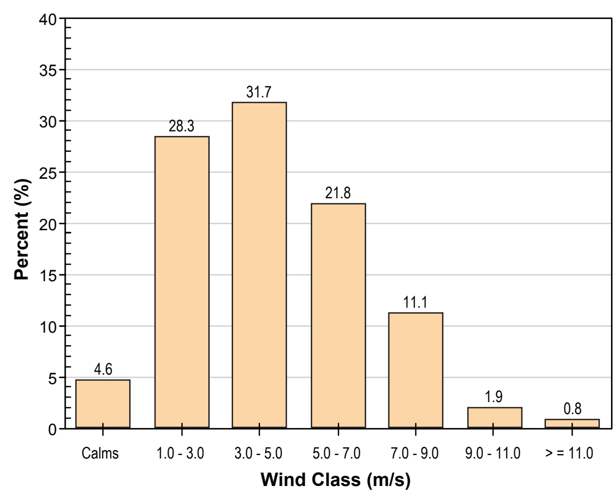
Winter





Summer





Sabina GOLD & SILVER CORP.

Goose Meteorological Station Windroses, 2010

Figure A3-11

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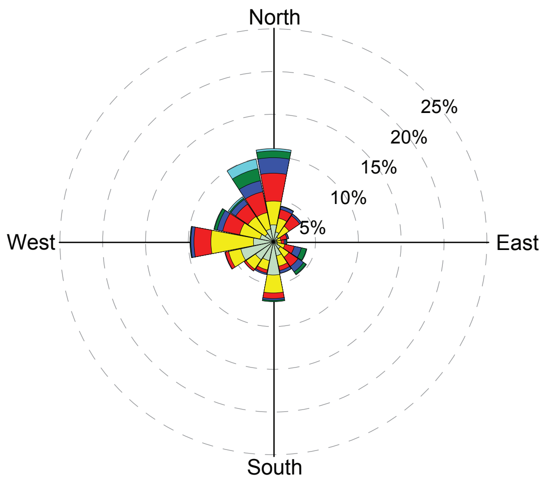
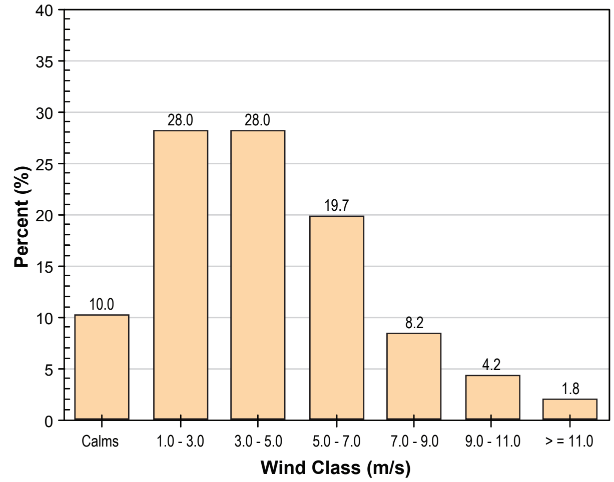
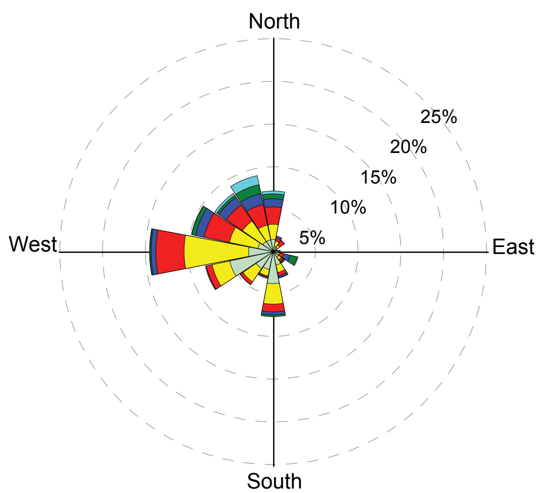
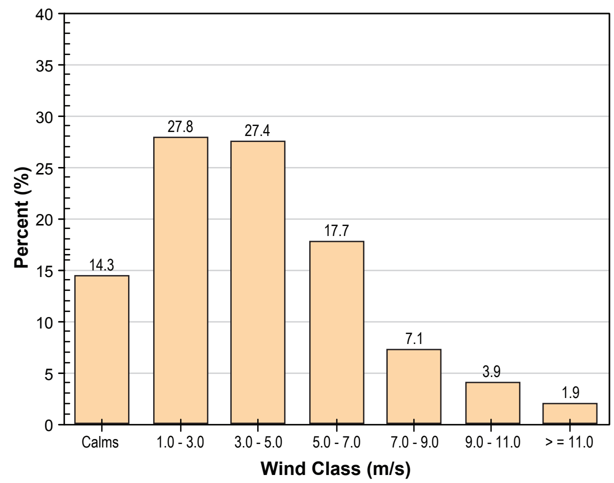
Annual



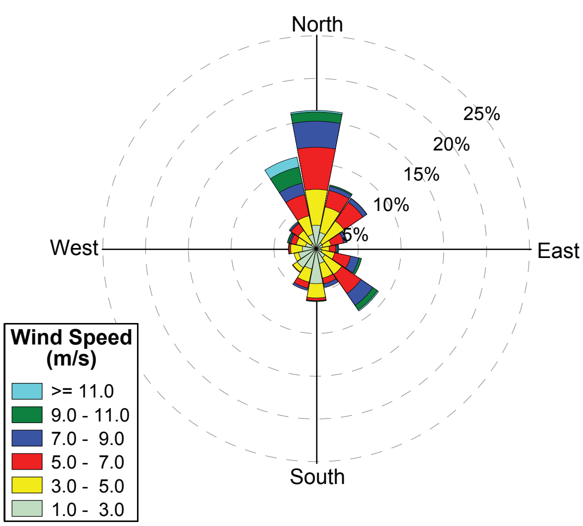


Winter





Summer



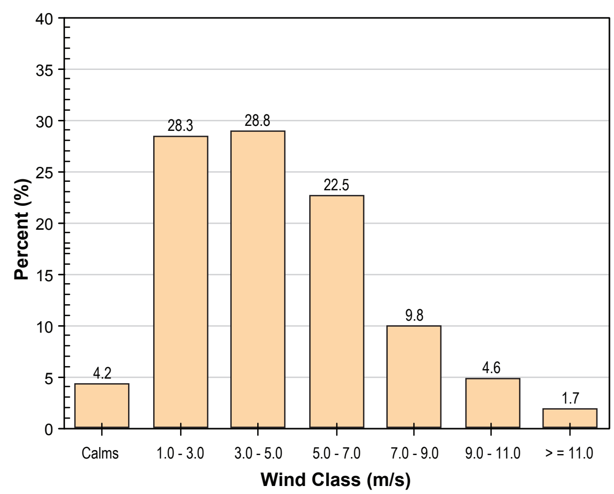


Figure A3-12

Sabina GOLD & SILVER CORP.

Goose Meteorological Station Windroses, 2011

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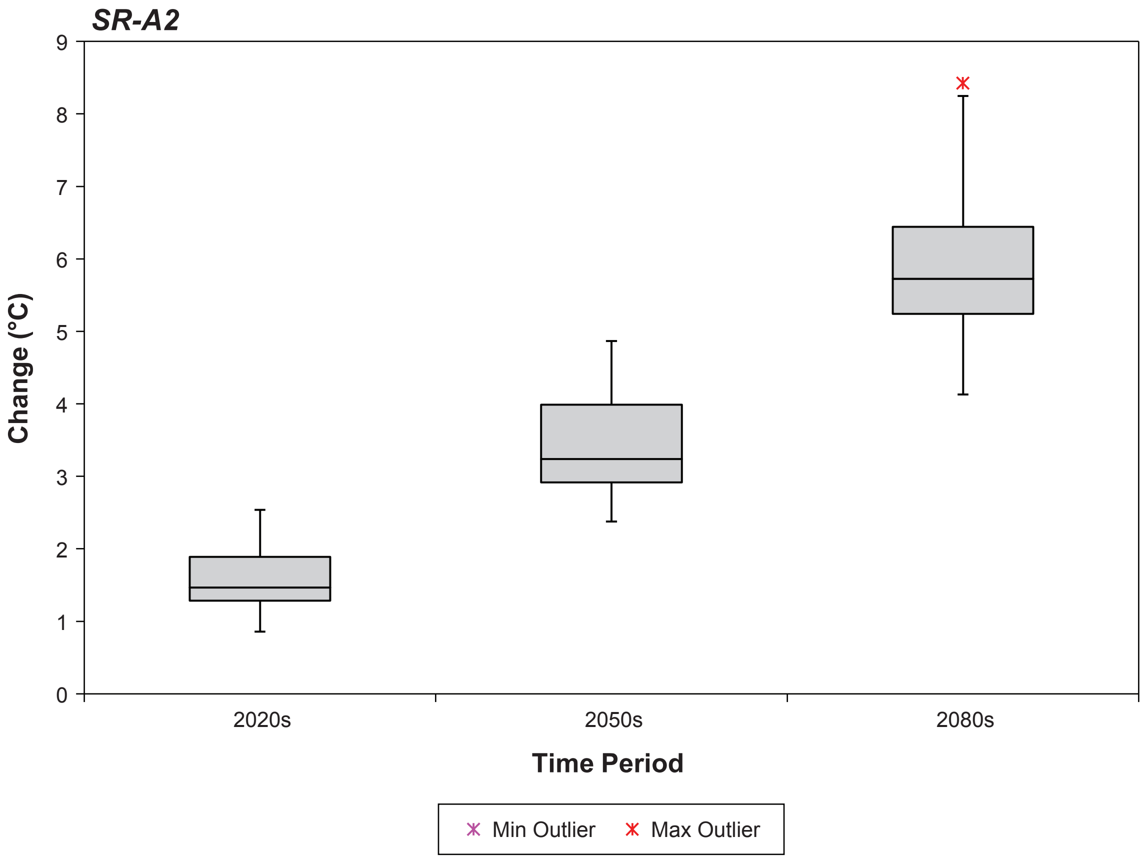
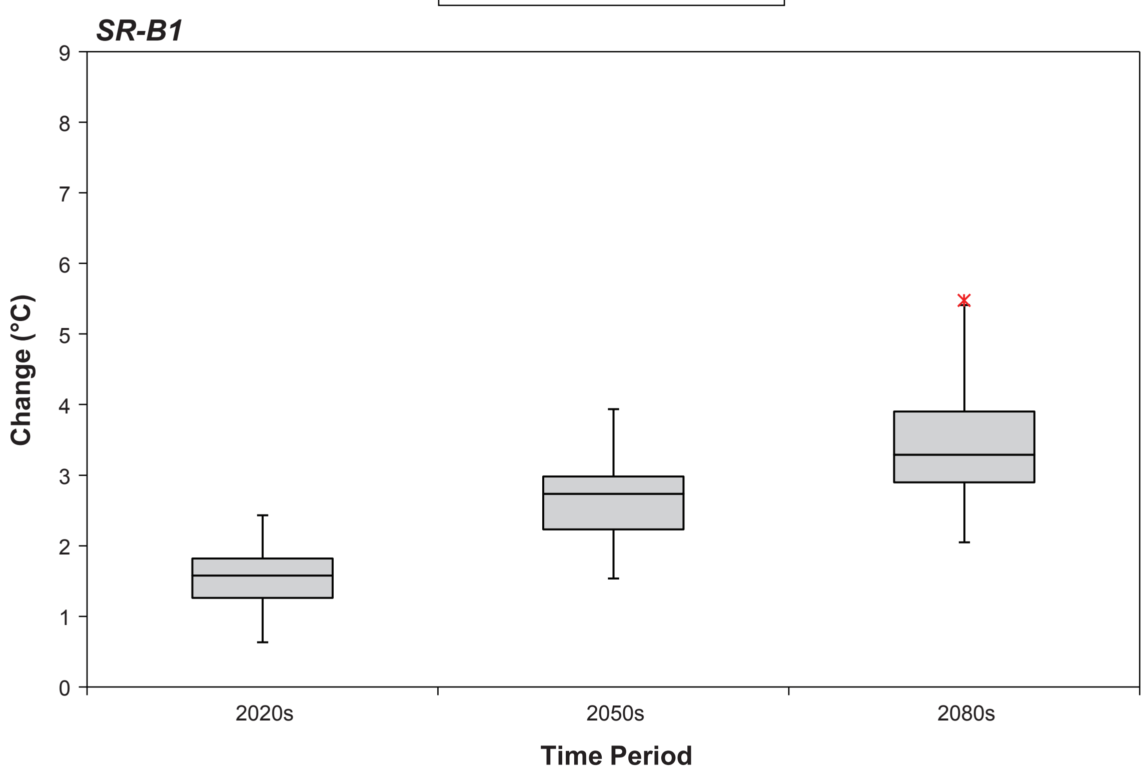
Appendix V4-3B

Climate Change Prediction – Model Variation





Notes: Box: 25th and 75th percentile, line = median.
Whiskers: The upper whisker ends at Q3+1.5(IQR) or the maximum value, whichever is lower.
The lower whisker ends at Q1-1.5(IQR) or the minimum value, whichever is greater.
Outliers: Only the Min and Max outliers are shown.

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Annual Mean Temperature Change - Model Variation

Figure V4-3B-1

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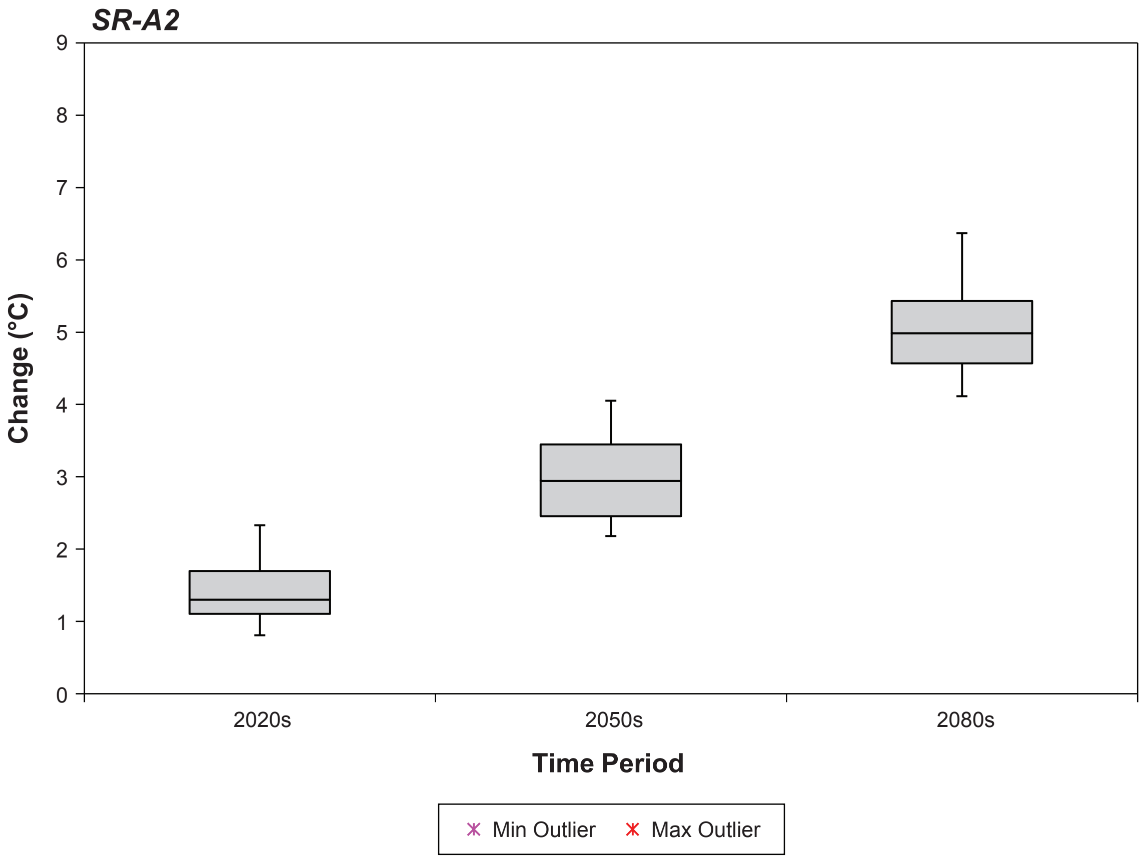

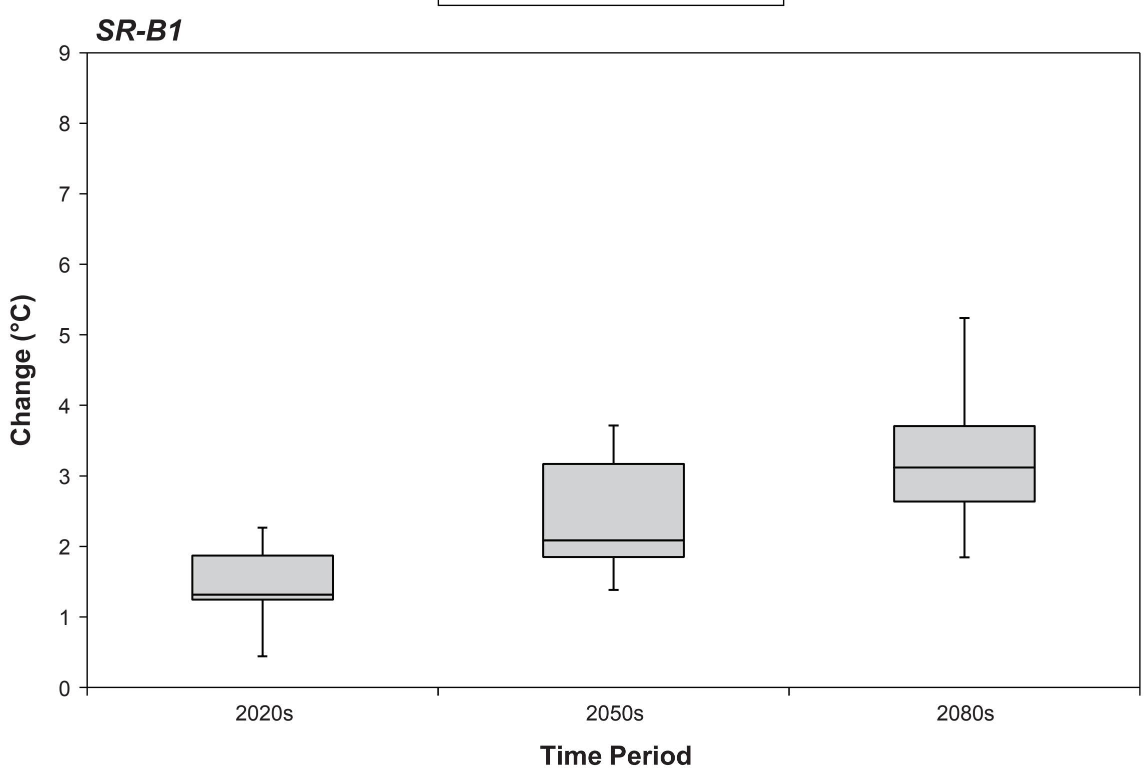

Notes: Box: 25th and 75th percentile, line = median.
Whiskers: The upper whisker ends at Q3+1.5(IQR) or the maximum value, whichever is lower.
The lower whisker ends at Q1-1.5(IQR) or the minimum value, whichever is greater.
Outliers: Only the Min and Max outliers are shown.

Figure V4-3B-2

Daily Mean Max Temperature Change - Model Variation

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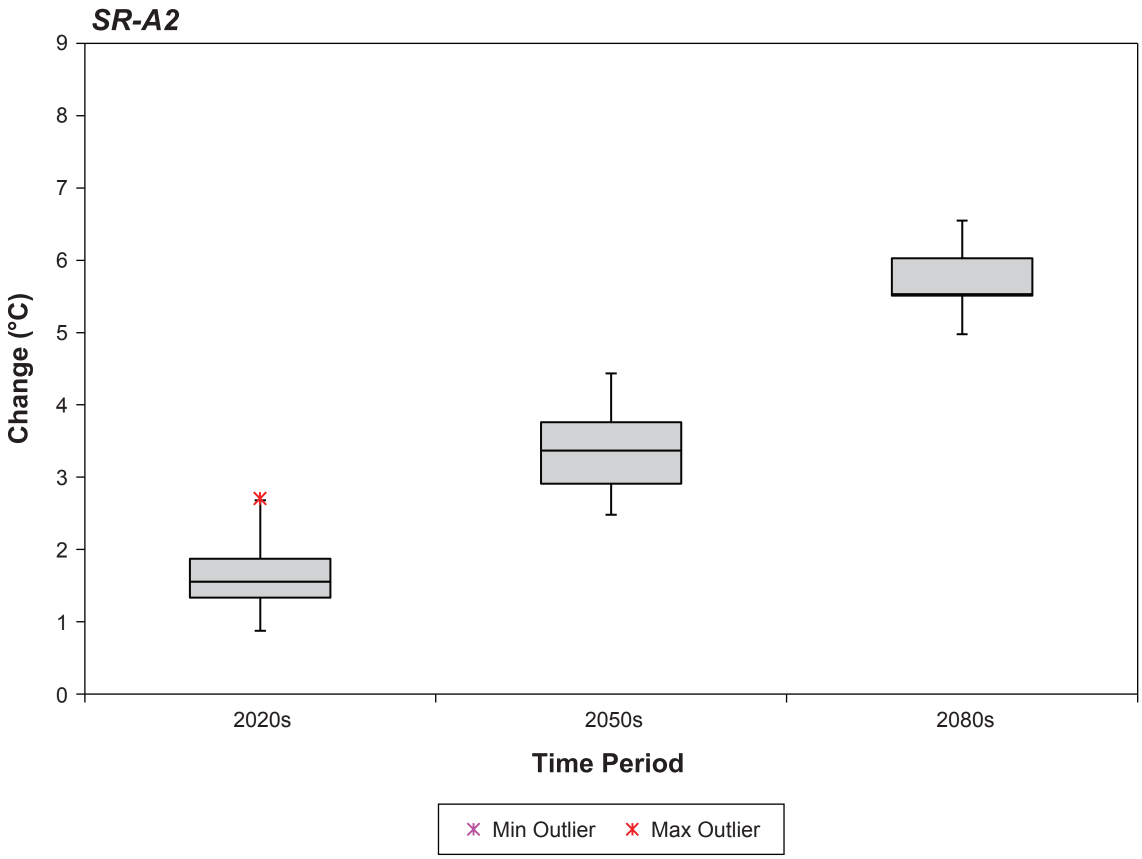

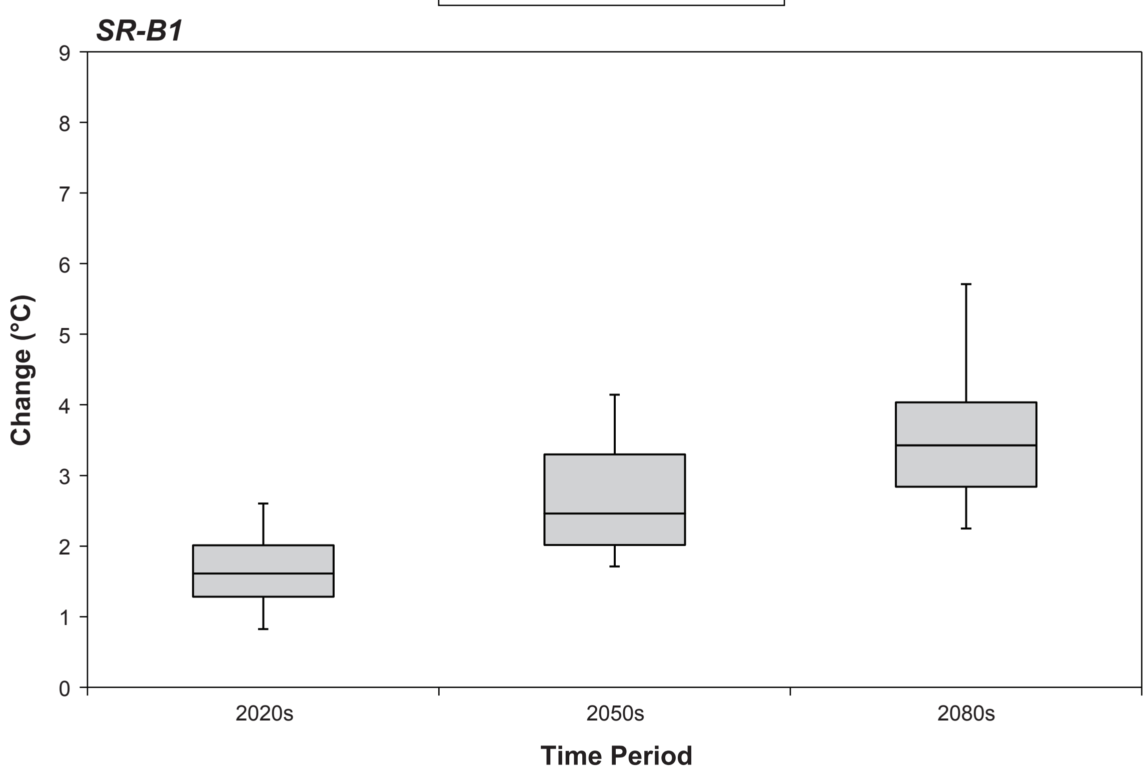

Notes: Box: 25th and 75th percentile, line = median.
Whiskers: The upper whisker ends at Q3+1.5(IQR) or the maximum value, whichever is lower.
The lower whisker ends at Q1-1.5(IQR) or the minimum value, whichever is greater.
Outliers: Only the Min and Max outliers are shown.

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Daily Mean Min Temperature Change - Model Variation

Figure V4-3B-3

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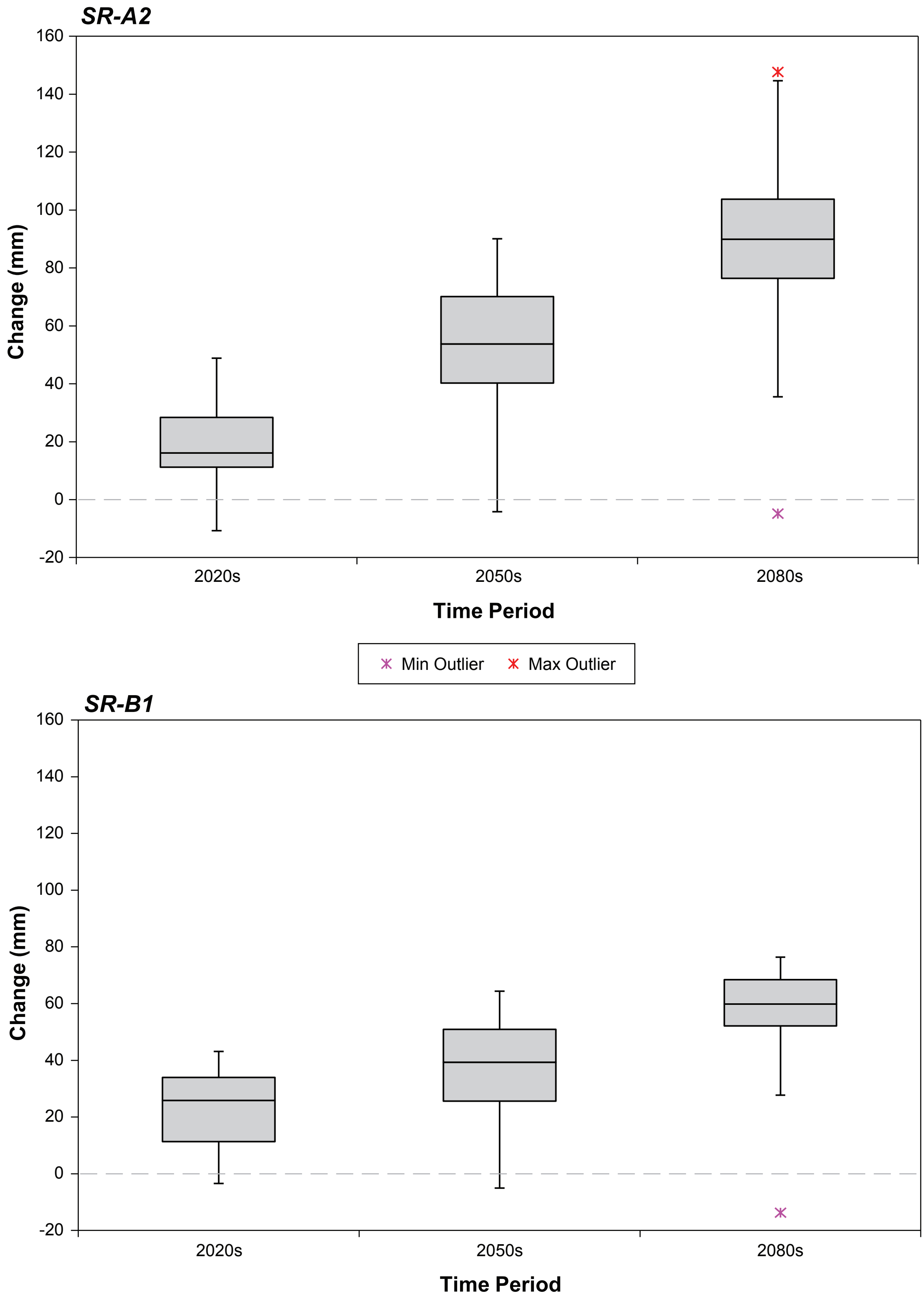

Notes: Box: 25th and 75th percentile, line = median.
Whiskers: The upper whisker ends at Q3+1.5(IQR) or the maximum value, whichever is lower.
The lower whisker ends at Q1-1.5(IQR) or the minimum value, whichever is greater.
Outliers: Only the Min and Max outliers are shown.

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Predicted Annual Mean Precipitation - Model Variation

Figure V4-3B-4

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